

March 2021

Volume I

Draft Report

Environmental Assessment of the Proposed W12A Landfill Expansion, City of London



Executive Summary

Introduction

This document is the environmental assessment study report (EASR) for the environmental assessment (EA) of the proposed expansion of the W12A Landfill site (the Project) being undertaken by the City of London (the City). This is an individual EA completed under the provincial *Environmental Assessment Act* (EAA).

The W12A Landfill is located at 3502 Manning Drive in the south end of the City of London, Ontario. The landfill has been in operation since 1977 and operates under Environmental Compliance Approval (ECA) #A042102. The residual waste disposed at the landfill is generated from an existing service area consisting of the City, the Municipality of Thames Centre, the two water treatment plants that serve the City located outside the City and a privately owned recycling facility. The site also receives Municipal Hazardous or Special Waste (MHSW) from residents and small quantity generators (businesses with limited amounts of MHSW) from within the City and from the Counties of Middlesex and Elgin; this waste is sent off-site for recycling, reuse or disposal. The landfill is expected to reach its approved capacity by 2024.

The existing W12A Landfill site has a 107 hectare (ha) fill area and is located on a 142 ha property. The average height of the landfill above ground surface is about 9 to 12 metres (m). The peak elevation is approximately 17 m above the ground surface. In summary, the currently approved W12A Landfill can be described as having a large footprint area and a low height above grade. The total approved site capacity is 12,500,000 cubic metres (m³). The site is approved to receive up to 650,000 tonnes per year of solid non-hazardous waste, noting that over the past 10 years the site typically receives between 230,000 and 320,000 tonnes of waste per year. The landfill site is located in a favourable geologic setting, underlain by a deposit of low permeability clay till that provides a natural barrier to downward groundwater (and landfill leachate) movement. The landfill has been developed in two phases. Phase 1 comprises the eastern portion of the waste footprint; the waste rests directly on the clay soil and is surrounded by a perimeter leachate collection system (LCS). Phase 2, comprising the western portion, is underlain by a continuous granular leachate collection layer/system. The collected leachate is conveyed off-site via a forcemain and municipal sanitary sewer system for treatment at the Greenway Wastewater Treatment Plant (WWTP). Completed areas of the landfill have a landfill gas (LFG) collection system; the collected LFG is sent to an on-site enclosed flare for combustion.

The W12A Landfill has had groundwater, surface water, leachate, water well and LFG monitoring programs since 1976. A summary of the results of the 2019 monitoring programs indicates that the landfill is performing acceptably and in accordance with provincial requirements in terms of potential effects of leachate on groundwater and surface water, as well as in terms of LFG migration in the subsurface.

Additional detail on the site history, design, operations and performance is provided in Sections 1.3 and 5.13 of the EASR.

Description of the Project

To plan for the future, the City has commenced the development of two long-term waste management strategies: the Resource Recovery Strategy, and the Residual Waste Disposal Strategy. The Resource Recovery Strategy involves the development of a plan to maximize waste reduction, reuse, recycling, resource recovery, energy recovery and/or waste conversion in an economically viable and environmentally responsible manner. The current residential diversion rate is 45%. The Resource Recovery Strategy is scheduled to be completed in 2022. As an interim step, in 2018 the City completed the 60% Waste Diversion Action Plan that includes the development of programs and an implementation schedule for specific activities to increase the City's diversion rate to 60% for residential waste.

The Residual Waste Disposal Strategy involves the development of a long-term plan to manage residual waste, which will require obtaining additional residual disposal capacity. Several ways of satisfying this need have been assessed (referred to as 'Alternatives To' the undertaking). The assessment of these 'Alternatives To' has been completed by the City using a previously completed long term waste management planning study, as described in Section 4 of the approved Amended ToR and summarized in Section 2.5 of this EASR. The preferred 'Alternative To' included the expansion of the W12A Landfill, which is the subject of this EA.

The purpose of the EA study is to seek approval for additional waste disposal capacity because the existing W12A landfill is reaching its approved total disposal capacity by 2024. The planning period for this EA is 25 years, so from the beginning of 2024 through to the end 2048.

To estimate the quantity of residual waste from the existing service area requiring disposal over this planning period, the City proposes to implement the Resource Recovery Strategy such that 60% residential diversion will be achieved by the end of 2022. It is projected that the expanded W12A landfill will require disposal capacity for 9,400,000 tonnes of residual waste over the 25 year planning period.

In addition, the City is proposing to assist neighbouring municipalities with their future residual waste management needs by having a larger service area for the expanded landfill. Based on interest expressed, the regional service area is proposed to consist of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County. In 2017, these municipalities annually disposed of approximately 86,000 tonnes of residual waste and had an overall residential diversion rate of 38%. Based on information about the life remaining in their existing landfills, proposed expansions of their landfills and various diversion scenarios, it is projected that an additional 500,000 tonnes of residual waste from the neighbouring municipalities could require disposal over the 25 year planning period.

Having available residual waste disposal capacity for municipalities outside of London from the proposed regional service area municipalities does not mean that London is obligated to accept waste from these municipalities in the future. City Council will have the authority to determine which, if any, municipalities or businesses outside of London can use any City facilities and under what conditions they are allowed to do so. For example, the City may require

municipalities and businesses to demonstrate that their diversion rate matches or exceeds the City's diversion rate to be allowed to dispose of residual waste at the W12A Landfill.

As such, it is proposed that the W12A Landfill expansion should be designed to dispose of 9,900,000 tonnes of waste between 2024 and 2048, which corresponds to 13,800,000 cubic metres (m³) of additional airspace. It is also proposed for the expansion that the annual maximum waste receipt be reduced from 650,000 to 500,000 tonnes per year.

Methodology

The EA was carried out in accordance with the approach described in the approved Amended ToR, which was approved on July 30, 2019. The EA was undertaken in a series of nine steps as described below. Additional details about each step are further described in Section 3.0 of this EASR.

- Step 1 – Outline the aspects of the environment considered and characterize the existing environmental conditions;
- Step 2 – Identify the 'Alternative Methods' of landfill expansion (and incorporate conceptual design mitigation measures);
- Step 3 – Qualitative and quantitative, where possible, evaluation of 'Alternative Methods';
- Step 4 – Compare the 'Alternative Methods' for landfill expansion and identify the preferred alternative;
- Step 5 – Describe the preferred 'Alternative Method' for landfill expansion;
- Step 6 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the EASR.

The environmental, socio-economic and technical components were identified in the approved Amended ToR and reviewed by the public at Open House #2 during the ToR phase of the EA. At commencement of the EA no changes to the components used to evaluate the Undertaking were identified. Likewise, the indicators and criteria to assess the effects of the proposed Undertaking were identified during the ToR phase of the project, reviewed during the EA and no changes were proposed.

Consultation

Consultation with the public, agencies, Indigenous Communities and other stakeholders was ongoing throughout the EA process. A variety of consultation events and activities were used during the EA process. The consultation program for the EA was presented in the approved Amended ToR.

The consultation activities carried out during the EA consisted of:

- Letter and email correspondence distributed to the public, interested stakeholders (e.g. businesses using the landfill, environmental groups, etc.), Government Review Team (GRT), and Indigenous communities;
- Meetings, presentations and tours with Indigenous Communities;
- Notices published in local newspapers;
- Notices on the EA project website (<https://getinvolved.london.ca/WhyWasteDisposal>);
- Two open houses in the local community;
- Presentations and discussions to the existing W12A Landfill Public Liaison Committee (PLC);
- Media releases;
- Meetings and telephone calls between the City, the EA consultants, and the Ministry of the Environment, Conservation and Parks (MECP); and
- Informal meetings, telephone calls and discussions with Indigenous Communities, local politicians, business owners, community organizations and neighbours to the existing W12A Landfill on an as needed basis throughout the EA.

A complete list of issues and concerns raised and responses was compiled and is included in Volume V – Consultation Record; a summary of these issues, responses and how each was addressed in the EA is provided in Section 4.7 of the EASR. The input received during various consultation events was carefully considered and incorporated into the EA, where applicable. The following are some of the questions and concerns raised during the EA process:

- Proposed regional service area and conditions under which the neighbouring municipalities should be allowed to use the W12A Landfill;
- Landfill and other traffic;
- Height of expanded landfill – visual impacts and effects on wind;
- Beneficial use of collected LFG;

- Importance of noise and odour control;
- The importance of expanding waste diversion and resource recovery programs in addition to additional landfill capacity;
- Visual screening of landfill operations; and
- Potential groundwater impacts – impacts to groundwater quality and influence of fractures in upper portion of clay soil underlying the landfill.

In addition, the City held two workshops that were attended by interested Indigenous Communities. The first workshop focused on the groundwater assessment work plan and resulted in modifications being made to the work program. The second workshop described the proposed expansion and the results of impact assessment for specific environmental and socio-economic components of interest. These consultation activities are described in Section 4.7.3 of the EASR.

Description of the Environment Potentially Affected

Section 5.0 of the EASR provides a description of the environmental, socio-economic, and technical components, which together are defined as the existing environment that may be affected by the undertaking. The environmental component includes atmosphere, hydrogeology, surface water and biology. The socio-economic component includes socio-economic, land use and cultural heritage. The technical component includes design and operations and transportation aspects of the environment.

Section 5.1 provides an overview of the study areas (Site, Site-vicinity and Wider study areas) to provide context for the assessment. Appropriate study areas for each component were determined based on the potential extent of the effects from the proposed expansion and along the main haul route to the landfill site.

The existing conditions for the environmental, socio-economic and technical components are detailed for each component in Volume IV, Appendices D.01 through D.12 and summarized in Sections 5.2 to 5.13 of the EASR.

The Site Study Area (or Site Area when referring to the preferred approach to expansion) is the existing landfill property and adjacent lands to the north and east where expansion could occur. This Site Study Area is occupied by the existing landfill, stormwater management (SWM) ponds and ancillary landfill operations and diversion facilities and the potential expansion areas. The general area surrounding the landfill are currently characterized by a mix of agricultural uses, with some rural residential uses. The City owns a majority of the parcels within a 500 m Site-vicinity Study Area to the east of the Site Area, as well as a number of parcels to the west and north of the Site Area.

The Haul Route Study Area consist of the haul routes associated with the landfill, specifically Manning Drive between Wellington Road South and Highway 401 and Wellington Road South between Dingman Drive and Manning Drive; also, Wonderland Road South between Decker Drive and Manning Drive.

Description of the ‘Alternative Methods’ of Landfill Expansion

‘Alternative Methods’ are different ways that the proposed expansion of the W12A Landfill could be implemented to provide an additional 13,800,000 m³ of disposal capacity over the 25 year planning period. As described in the approved Amended ToR, because of the physical constraints associated with the configuration of the existing waste footprint and geometry on the existing landfill site property, the ‘Alternative Methods’ are limited to vertical expansion above the existing waste footprint and/or lateral expansion to the north and/or east within the Site Study Area.

In the development of the landfill expansion alternatives, site-specific factors were considered, consisting of 1) site design requirements as set out in O. Reg. 232/98 (MECP, 1998); 2) existing leachate and LFG control and management systems, and SWM system; 3) conceptual mitigation measures for the landfill expansion; and 4) engineered system requirements.

Based on the above factors, three ‘Alternative Methods’ for expansion of the W12A Landfill were developed. These alternatives are referred to as:

- Alternative 1 – Vertical Expansion Over Existing Footprint
- Alternative 2 – Horizontal Expansion to the North and Vertical Expansion Over Part of the Existing Footprint
- Alternative 3 – Horizontal Expansion to the East and Vertical Expansion Over Part of the Existing Footprint

Alternative 1 consists of vertical expansion over the whole of the existing 107 ha landfill footprint, with a peak waste elevation of 317.65 metres above sea level (masl) along a west to east ridge in the south-central part of the footprint. Allowing 0.75 m for the final cover, this maximum elevation corresponds to a peak elevation that is approximately 25 m higher than the current landfill peak and 43 m higher than the average ground surface elevation. The design provides 4H:1V sideslopes upward from the existing sideslopes and a 5 % top slope; it is noted a majority of the waste footprint area (about 60 %) will be at the gradual 5 % top slope. With this alternative, it is proposed to move the northern property line of the landfill site to Scotland Drive, creating a north buffer width of approximately 300 m (noting that this land is all currently owned by the City).

Alternative 2 consists of a 200 m wide horizontal expansion to the north, increasing the waste footprint area from 107 to 134 ha. This will involve 2,040,000 m³ of excavation to form the cell and management of the excavated soil. To provide the required airspace, this alternative has a peak waste elevation of 309.8 masl along a west to east ridge in the central part of the footprint. Allowing 0.75 m for the final cover, the maximum peak elevation is approximately

18 m higher than the current landfill peak and corresponds to a height above average ground surface elevation of about 35 m, some 8 m lower than Alternative 1. The design provides 4H:1V sideslopes on the north side and upward from the existing sideslopes on much of the east and west sides, and a 5 % top slope on the area of vertical expansion above the existing footprint area.

Alternative 3 consists of a 300 to 550 m wide horizontal expansion to the east, increasing the waste footprint area from 107 to 135 ha. This will involve about 821,400 m³ of excavation to form the cell and management of the excavated soil. To provide the required airspace, this alternative has a peak waste elevation of 311.80 masl along a west to east ridge in the north end of the footprint, with the majority of the fill area having a 5 % top slope. Allowing 0.75 m for the final cover, this maximum elevation is approximately 20 m higher than the current landfill peak and corresponds to a height above average ground surface elevation of about 37 m, between Alternative 1 (higher) and Alternative 2 (lower). The design provides 4H:1V sideslopes on the horizontal expansion area and upward from the existing sideslopes on the north side and much of the east and west sides, and a 5 % top slope on the area of vertical expansion above the existing footprint. With this alternative, as with Alternative 1, it is proposed to move the northern property line of the landfill site to Scotland Drive, creating a north buffer width of approximately 300 m (nothing that this land is all currently owned by the City).

Evaluation and Comparison of Landfill Expansion Alternatives

For each of the three proposed expansion alternatives, the potential for environmental effects was assessed based on the broad definition of the environment within the Act, using a set of evaluation criteria. The evaluation criteria consist of components, sub-components and indicators; the components represent a high level aspect of the environment, each of the sub-components represents a specific aspect of the environment, and the indicators represent a potential effect of the Project.

For each sub-component, the potential effects associated with each expansion alternative were identified and comparatively evaluated using either qualitative, quantitative or a combination of each method; as well, an assessment of advantages and disadvantages of each alternative was completed. Based on the results, for each indicator the alternative methods were ranked as one of 'preferred', 'less preferred', 'least preferred', and 'equally preferred'. The next step was to compile the individual component comparative evaluations of the 'Alternative Methods' and select the overall preferred method of landfill expansion.

The detailed comparative assessment for each indicator is provided in Sections 7.2.1 to 7.2.12 of the EASR; the rationale for the selection of the overall preferred method of landfill expansion is provided in Section 7.4 of the EASR.

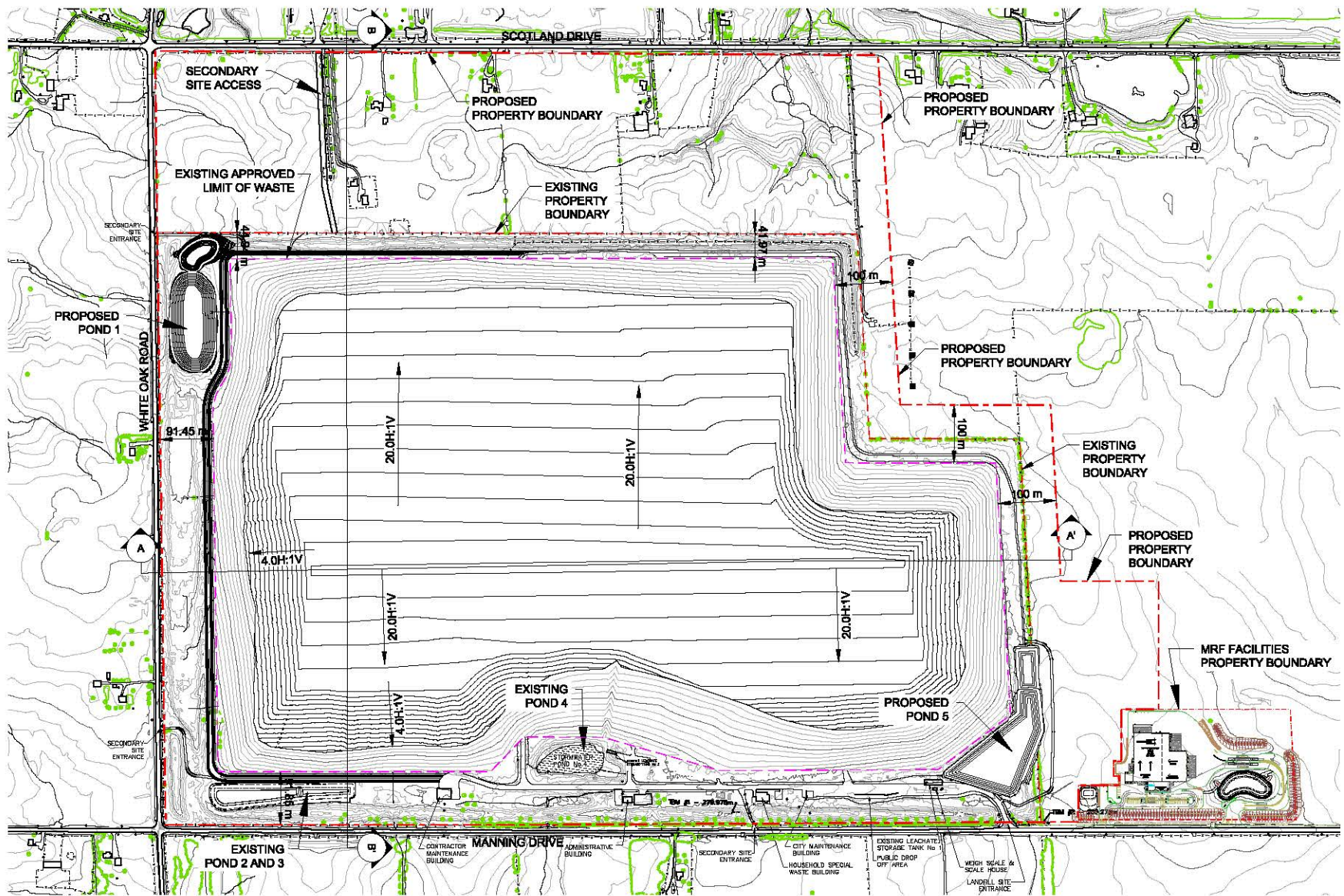
The comparative evaluation of 'Alternative Methods' of expanding the London W12A Landfill clearly identified Alternative 1 - vertical expansion over the existing footprint - as the preferred method of expanding the landfill. Alternative 1 was ranked as most preferred for 12 of the sub-components and least preferred for three. Some key advantages of this expansion alternative are that the same landfill footprint is utilized meaning that proximity to sensitive off-site

receptors stays the same and most potential nuisance impacts are indicated to be less than associated with the other expansion alternatives, no aquatic features are destroyed as a result of construction, the thickest clay till aquitard is present offering the most protection to downgradient groundwater quality, the least modifications to the stormwater management system are required, limited loss of agricultural land and least capital cost for construction.

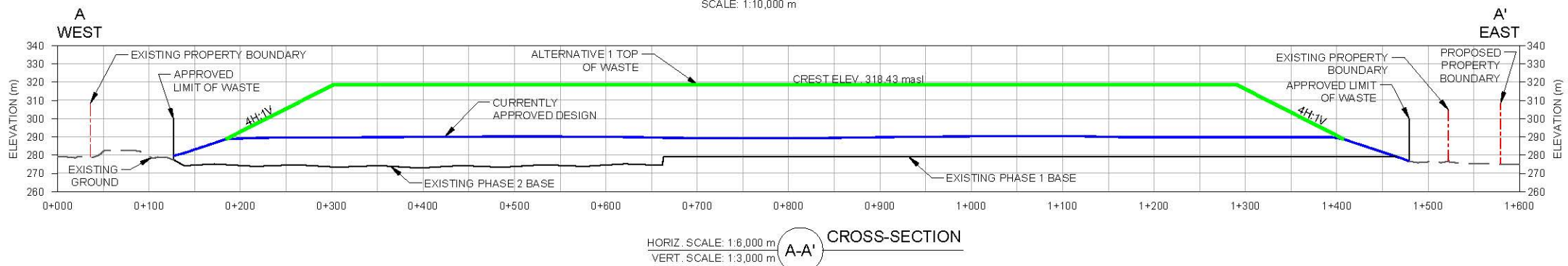
Description of the Preferred Undertaking

Following the identification of Alternative 1 as the proposed expansion, the expansion design concept was further refined to carry out a detailed impact assessment. Details of the refined concept design are provided in Section 8 of the EASR and summarized as follows and shown on Figure ES-1:

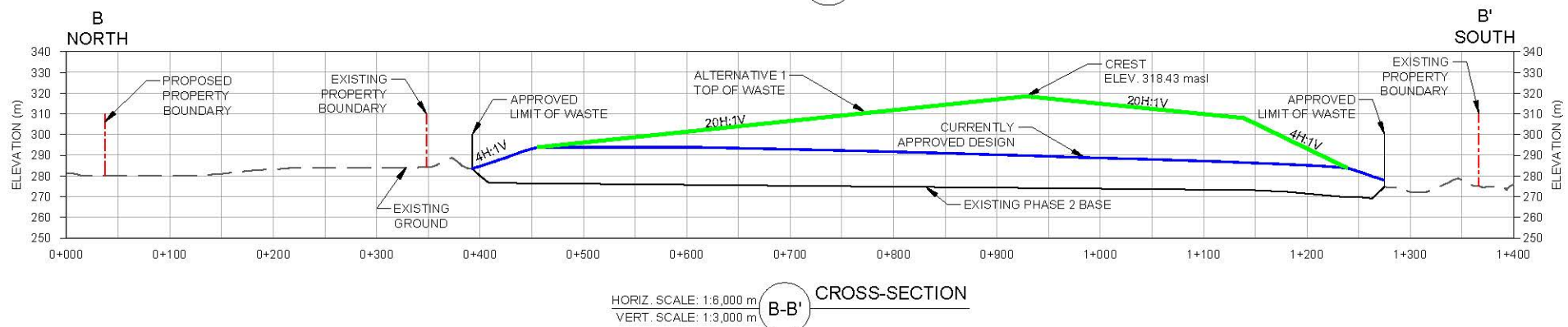
- To accommodate the final design in the northwest corner of the currently approved landfill, it was necessary to reduce the footprint in the northwest corner by 0.7 ha to 106.3 ha, comprised of the eastern approximately 59.1 ha of Phase 1 footprint and 47.2 ha of Phase 2 footprint. A design adjustment was also made regarding the currently approved limit of waste. To accommodate these changes while continuing to provide 13.8 million m³ of airspace, the landfill contours were adjusted, resulting in an increase in the highest ridge elevation of waste of approximately 0.8 m, from elevation 317.65 masl to 318.43 masl.
- To accommodate future 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 Recycling Facility (MRF) property line. This results in a 106.3 ha landfill footprint within a 192.4 ha landfill property.
- The landfill expansion will be developed sequentially in eight Phases, 1E through 8E, with four Phases in the southern part of the landfill and 4 Phases in northern part of the landfill. Filling will start in the Phase in the southwest corner of the landfill and proceed to the adjacent northern Phase. Filling will then move eastward starting at the next southern Phase followed by the adjacent northern Phase. This process will continue until all Phases have been filled. The estimated duration of landfilling in each Phase corresponds to an average annual waste receipt of 370,000 tonnes per year over the 25 year planning period. It is estimated that each Phase will provide about 1.2 to 1.9 million m³ of airspace and typically operate for a period of about 2.5 to 3.5 years.
- A separate cell dedicated for disposal of the non-decomposable portion of the waste stream (street sweepings, water treatment plant process residuals, sewage sludge ash and contaminated soil) will be provided in the southeastern area of the landfill expansion and utilized throughout the expansion operating period.



SITE PLAN
SCALE: 1:10,000 m



A-A' CROSS-SECTION



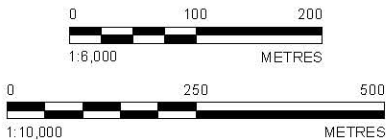
B-B' CROSS-SECTION



NOTE(S)
1. ELEVATION CONTOURS SHOWN ARE TOP OF WASTE, masl.

REFERENCE(S)
BASE INFORMATION AND EXISTING CONTOURS AS PER CITY OF LONDON SURVEY DATED NOVEMBER 22, 2016.

NOT FOR CONSTRUCTION
DRAFT



CLIENT
CORPORATION OF THE CITY OF LONDON
LONDON, ONTARIO
CANADA

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
LANDFILL EXPANSION FINAL CONTOUR PLAN AND CROSS-SECTIONS

CONSULTANT	YYYY-MM-DD	2020-10-22
DESIGNED	MLF	
PREPARED	MLF	
REVIEWED	PAS	
APPROVED	PAS	



PROJECT NO. 1648176 CONTROL 0017 REV. B FIGURE ES-1

- 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. The active area would range from about 40 m by 25 m typically (1,000 square metres) to 50 by 30 m (1,500 square metres). 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.
- To reduce air emissions (for odour control purposes during landfilling operations and to increase the overall collection of landfill gases), horizontal LFG collection pipes will be installed progressively as waste is placed.
- 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.
- 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 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 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.
- It is proposed to consider options to provide temporary leachate storage on the W12A Landfill site during storm events of significant magnitude that could result in discharge of the mixed leachate/sewage to Dingman Creek or the Thames River if the WWTP is in a by-pass situation. Although the W12A leachate represents only a small percentage of the total flow within the sewer system, the objective is to minimize the discharge of untreated leachate to these water courses. The temporarily stored leachate would be pumped off-site for treatment after the by-pass event is over.
- The leachate collected from the Phase 1 and Phase 2 LCS is currently routed through the main leachate pumping station and pumped off-site through a leachate forcemain to the Dingman Drive pump station, where it combines with municipal sewage and enters the municipal sanitary sewer system to the Greenway WWTP. Following treatment at the WWTP, the effluent is discharged to the Thames River. An assessment of the ability of this City owned, operated and maintained infrastructure to continue to manage leachate from the W12A landfill expansion was completed and the results show that this can be continued for the W12A Landfill expansion and be expected to perform acceptably during

expanded site operations and post-closure. All components of this system are part of City owned, operated and maintained infrastructure, and are accessible for repair, upgrade or replacement if and as needed in the future.

- For LFG management, 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 following completion of filling within each Phase. The collected LFG will ultimately be combusted via blowers and flares. 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 LFG collection pipes will be installed progressively as waste is placed and connected to the flare.
- Stormwater management will utilize the existing four stormwater management ponds, which will be upgraded and modified to manage and control the release of surface water runoff from the expanded landfill.
- It is proposed that many of the existing ancillary facilities at the site will be progressively upgraded or replaced during the expansion. In addition, it is proposed that 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 materials, a grade-separated small vehicle drop-off for recyclable materials (such as tires, scrap metal, ceramics, Blue Box materials, clean wood, electronics), an area for drop-off of brush, a large item drop-off area, and a new HSW depot.
- The landfill Phases will be progressively closed after the final waste contours have been reached and landfill operations have proceeded into the next Phase(s). The final cover on the landfill will consist of 600 mm of soil, topped with 150 mm of soil capable of sustaining vegetation.

Impact Assessment and Net Effects

Section 9.0 of the EASR presents an overview of the predicted effects of the proposed expansion on each of the components. These assessments were conducted in accordance with the requirements set out in the approved Amended ToR (Volume II) and detailed in Work Plans (Volume III Appendix B). Additional details on the impact assessments are provided in Volume IV Appendix D.

Atmosphere

The Atmosphere environment component comprises two sub-components: air quality (including dust, odour, greenhouse gas (GHG)) and noise. The details of the impact assessment for the Atmosphere Environment (air and noise) are provided in Volume IV Appendix D.01 and Appendix D.02, respectively.

Air Quality

The effects of the Project on air quality were identified for different phases of the expansion and involved the following three steps:

- Calculating representative emissions rates for each of the significant sources;
- Carrying out atmospheric dispersion modelling to predict off-site concentrations of the indicator compounds; and
- Comparison of predicted concentrations to existing conditions and the Applicable Guidelines.

The emission estimation methods followed accepted MECP practices including, where applicable, guidance in the Ontario MECP document *Procedure for Preparing an Emission Summary and Dispersion Modelling Report Version 4.1* (MECP, 2018b).

To determine potential effects of the proposed project on air quality and odour, the predicted concentrations of indicator contaminants were compared to Ontario's Ambient Air Quality Criteria (AAQC) (MECP 2018) and the Canadian Ambient Air Quality Standards (CAAQs) (CCME 2014).

The maximum cumulative concentrations of all indicator compounds are below the relevant guidelines for all indicator compounds, with the exception of NO₂ on a 1-hour basis related to the CAAQS but NO₂ meets the AAQC standard. Although the AAQC is less conservative for NO₂, it is technically more appropriate for the situation being considered.

The predicted compound concentrations associated with the expansion are predicted to meet the relevant air quality criteria.

In addition to the assessment of the effects of the Project on ambient air quality and odour, consideration was given to an evaluation of compliance by determining whether an Environmental Compliance Approval (ECA) for air and noise under Section 9 of the *Environmental Protection Act* (EPA) could be obtained based on whether the facility is in compliance for those sources regulated under O. Reg. 419/05. At the landfill, this would include landfill gases and materials handling emissions. All mobile equipment is exempt from compliance requirements under O. Reg. 419/05. The assessment indicates that the proposed facility will be in compliance with Schedule 3 of O. Reg. 419/05.

Noise

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 points of reception (PORs) identified within the Site-vicinity Study Area. 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.

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.

The results of the assessment indicate that mitigation measures are required when landfilling within an area of the south portion of the landfill so that the Project does not result in an adverse effect on noise (i.e., a moderate or high magnitude rating) at a specific existing receptor.

Geology and Hydrogeology

The details of the impact assessment for long-term groundwater quality and quantity are provided in Volume IV Appendix D.03.

The groundwater quality assessment was carried out using the contaminant transport model POLLUTE (Rowe et. al., 1994) and results were compared to the MECP Reasonable Use Guideline (RUG) B-7 (MECP, 1994), noting that this guideline establishes a quantitative benchmark for protecting off-site groundwater quality for drinking water purposes.

The soil stratigraphy at the landfill was simplified for the model which consisted of the Surficial Aquitard (silty clay), Upper Aquifer (sand), Lower Aquitard (silty clay) and White Oak Aquifer (lower sand aquifer). The fractures that were studied in the upper portion of the Surficial Aquitard were accounted for in the modelling. As required in O.Reg. 232/98 (MECP, 1998) the model assessed the impact of groundwater contaminants benzene, cadmium, chloride, lead, 1,4-dichlorobenzene, dichloromethane, toluene and vinyl chloride from the expanded landfill on the receiving groundwater.

The direction of groundwater flow on and in the area of the W12A Landfill can be generally described as north to south. Water supply wells in the area obtain their water supply from both the Upper Aquifer and White Oak Aquifer. The modelling demonstrated no groundwater quality impacts on the White Oak Aquifer for the groundwater contaminants of interest. In the Upper Aquifer, all RUG were met over the 1,000 year modelling time frame except for chloride that is predicted to have a peak impact of 129 mg/L, which is slightly above the allowable RUG of 128 mg/L in the Upper Aquifer. As a result, additional design mitigation measures were evaluated for off-site groundwater quality protection. The addition of incorporating leachate collection into the design of a first tier of horizontal landfill gas collector trenches required over the top surface of the Phase 1 area prior to vertical expansion was considered. With this additional mitigation design, the modelling demonstrated all groundwater quality impacts were below the RUG for the groundwater contaminants of interest in the Upper Aquifer.

Because of the existing landfill's location overlying the Surficial Aquitard, its presence does not affect the recharge of the groundwater system and has no effect on groundwater levels or groundwater quantity in the Upper and White Oak Aquifers beneath the landfill or off-site further to the south of the landfill site. With the proposed landfill expansion consisting of a

vertical expansion above the existing landfill footprint, the expansion will not have an effect on downgradient groundwater levels or groundwater quantity off-site to the south of the landfill site.

Surface Water

The details of the impact assessment for surface water quality and quantity are provided in Volume IV Appendix D.04.

The existing drainage network in the vicinity of the landfill is currently divided into four general areas with a system of berms, slopes and perimeter drainage ditches directing runoff generated within the W12A Landfill Operations Area to four separate stormwater management (SWM) ponds. During landfill expansion, surface drainage from potentially contaminated areas, i.e., originating from active landfilling areas, will be contained locally within berms and will discharge into the waste and eventually into the leachate management system. Hence there is no anticipated change to surface water quality as a result of contact with landfill expansion waste. Surface drainage from non-contaminated areas such as road areas and areas with interim or final landfill cover will be conveyed to the SWM ponds via the internal drainage ditches.

To update the design of the existing SWM ponds under changed conditions from the landfill expansion (peak of the landfill shifting, sideslopes of the landfill that are longer and steeper in some locations, and movement of some of the ancillary features on the site), the model Visual Otthymo was used to evaluate changes to water quantity. As a requirement of the MECP SWM Planning and Design Manual (MECP, 2003) the updated designs to the SWM ponds required Enhanced Level Protection (80% total suspended solids (TSS removal)) and matching post-expansion outlet flows from the ponds to corresponding pre-expansion flows for selected storm events.

Because of the required quality and discharge quantity controls for the SWM ponds (e.g., larger ponds, new control structures, etc.), there is not expected to be an adverse impact on off-site surface water quantity or quality. A summary of SWM pond modifications is provided as follows:

- SWM Pond 1: the pond will be expanded to the north, increasing the size of the main pond and forebay. The outlet structure will be modified such that flows will match or be less than pre-development flows. The new outlet pipe for the pond is designed as a submerged reverse sloped pipe to promote separation/floating of oils, providing potential for spilled material to be recovered prior to off-site release occurring. The existing outlet structure for the pond will be fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed. A 600 mm diameter pipe with a ditch inlet grate will be provided at two elevations to provide discharge control for larger storm events. The updated permanent pool volume of SWM Pond 1 exceeds the required permanent pool volume to achieve the Enhanced Level Protection (80% TSS removal).

- SWM Pond 2/3: the landfill expansion will result in a decreased drainage area to this pond; however, to meet the Enhanced Level Protection (80% TSS removal) as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) the permanent pool depth will be increased and some modifications will be made to the existing outlet structure. A minimum sized orifice of 75 mm will be used to control the pond outflow for the baseflow storage and 25 mm storm. The outlet pipe for the pond is designed as a submerged reverse sloped pipe to promote separation/floating of oils, providing potential for spilled material to be recovered prior to off-site release occurring. The existing outlet structure for the pond will be modified and used and fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed. An overflow weir with 1.0 m bottom width, 3H:1V sideslopes with rip-rap covering is proposed to provide discharge control for larger storm events. The updated permanent pool volume provided in the proposed wet pond of SWM Pond 2/3 exceeds the required permanent pool volume to achieve the Enhanced Level Protection (80% TSS removal).
- SWM Pond 4: under proposed expansion conditions Pond 4 would receive stormwater runoff from a smaller total drainage area. The existing permanent pool and active storage is sufficiently sized to meet the Enhanced Level Protection (80% TSS removal) as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003). The existing outlet structure will be modified with an appropriately sized orifice to control discharge and the existing double inlet catchbasin would be maintained for larger storm events. An overflow weir would be added for storm events larger than the 1:100 year return period design storm. The existing outlet structure for the pond will be modified and used and fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed. A 600 mm outlet pipe with a ditch inlet grate will be provided at one elevation for the controlled discharge of large storm events.
- SWM Pond 5: under proposed expansion conditions, Pond 5 would receive stormwater runoff from a larger total drainage area. The Pond would be expanded to the east and north to increase both the permanent pool and active storage capacities. The existing outlet structure orifice and weir will be modified to match pre-development peak flows. The existing outlet structure for the pond will be fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed. The provided permanent pool volume in the proposed wet pond exceeds the required permanent pool volume to meet the Enhanced Level Protection (80% TSS removal) requirement.

The proposed works are predicted to result in surface water quality conditions that are comparable or better to existing conditions and meet MECP PWQO (MOEE, 1994) requirements. Post-closure, the pond operations will continue such that surface water quality downstream of the site remains protected.

Biology

The Biology environment component comprises two sub-components: aquatic ecosystems and terrestrial ecosystems. The details of the impact assessment on the Biology component (aquatic and terrestrial ecosystems) are provided in Volume IV Appendix D.05.

The impact assessment considers the potential direct and indirect impacts of the W12A Landfill preferred expansion alternative on the aquatic and terrestrial ecosystems within the Site and Site-vicinity Study Areas for the construction, operations and closure stages of the landfill expansion.

The proposed expansion of the W12A Landfill avoids many potential impacts by situating the future expansion on the existing landfill fill area.

Aquatic Ecosystems

Direct Impacts:

- Because the proposed modification to SWM pond weirs and outlets will all occur within the landfill area, and there are no physical alterations to the downstream SWM infrastructure, including the ditches, culverts, or other downstream watercourses, no direct impacts to aquatic species or habitat are anticipated from the proposed modifications to SWM system. Similarly, there are no anticipated direct impacts to aquatic ecosystems during the Operations Stage and during closure and post-closure activities related to the expansion of the W12A Landfill.

Indirect Impacts:

- No indirect impacts to aquatic species or habitat are anticipated during the Construction Stage, since there are no proposed modifications to the SWM pond weirs and outlets for existing structures that convey discharged pond water to downstream watercourses;
- Although the proposed works associated with the Operations Stage for the proposed expansion are not expected to result in direct impacts to aquatic ecosystems, there will be changes to drainage areas and the resulting water balance (i.e., reduced water drainage to Dodd Creek; increased surface water drainage to Dingman Creek). The changes in drainage area are expected to have a negligible effect on runoff and drainage downstream of the site in both the Dingman and Dodd Creek subwatersheds. Further, modifications to the existing SWM infrastructure, along with mitigation measures (i.e., erosion and sediment control), are expected to result in surface water quality conditions that are comparable to existing conditions and meet the MECP PWQOs; and
- Potential indirect impacts associated with closure and post-closure activities are limited to the management of leachate and stormwater management within the landfill. With the continued operation of the leachate control system and the proposed SWM ponds, indirect impacts as a result of landfill closure are not anticipated.

Terrestrial Ecosystems

Direct Impacts:

- Direct impacts are anticipated for Confirmed Significant Wildlife Habitat for Monarch and Species at Risk Habitat for grassland birds (i.e., Eastern Meadowlark and Bobolink) during construction and operational stages on the existing landfill. Impacts related to the removal of habitat will be temporary in nature as they will be revegetated when vertical capacity is reached to mimic habitat conditions currently present (e.g., grassland species, common milkweed). The direct impacts to these areas during the construction stage are not considered to be significant and may be avoided.
- Should stripping of existing vegetation for the new diversion and drop-off facilities in the southeastern corner occur during the breeding bird window (April 1st to August 31st), there is potential for impacts to nesting birds and may contravene the *Migratory Birds Convention Act*.
- Other potential direct impacts during construction may include common wildlife species that may occupy areas of the existing landfill site; these may include groundhogs, Killdeer, common snake species, etc.
- Accidental destruction of nests, stockpiling of stripped material creating nesting opportunities for birds, or wildlife mortality may occur as part of the operations stage. These occurrences can be avoided through the implementation of standard operational measures, the continuation of measures implemented during the construction stage, and potential compensation for SAR Habitat.
- Activities associated with landfill closure include the addition of topsoil and plantings of native vegetation; as such, the project closure will result in an overall compensation for natural communities lost during construction and operations.

Indirect Impacts:

During the construction and operations stages of the expansion of the W12A Landfill, potential indirect impacts to terrestrial ecosystems are likely to be limited to the following types of impacts:

- Dust deposition on vegetation in adjacent vegetation communities during construction;
- Dust and airborne waste deposition in natural habitat during operations;
- Noise related impacts to wildlife in adjacent habitat;
- Introduction of invasive plant species via construction equipment; and
- Accidental injury or mortality of wildlife or vegetation (i.e., adjacent trees) from construction equipment and/or vehicles.

The indirect impacts during construction and operations are not considered significant and are mitigatable with standard measures. Indirect impacts as a result of landfill closure are not anticipated.

To avoid or minimize impacts to SAR and wildlife related to the construction stage, a detailed Environmental Mitigation and Monitoring Plan (EMMP) will be developed. Vegetation removal associated with the construction stage and with the operations stage will have to avoid direct impacts to the SAR Birds, including Bobolink and Eastern Meadowlark; all habitat removal should occur outside of the bird nesting season (April 1 to August 31) unless first assessed by an ecologist. The preparation and implementation of a SAR and Wildlife Observation Protocol will also be required.

Compensation for habitat loss will be required as regulated under the ESA (O. Reg. 242/08), to determine appropriate compensation measures for Bobolink and Eastern Meadowlark. Compensation for Significant Wildlife Habitat for Monarch will be achieved at project closure with the implementation of native plantings which are recommended to include common milkweed, a host plant for the species.

Land Use

The details of the impact assessment on land use are provided in Volume IV Appendix D.06.

The W12A Landfill is zoned "Waste and Resource Management (WRM) Zone 1". This zoning permits the waste management facility that currently operates on the site, as well as the MRF adjacent to the east side of the landfill.

A variety of studies were completed to assess impacts to surrounding uses. Of particular relevance to the assessment of impacts to sensitive land uses in the Site Area and Site-vicinity Study Area is the noise, odour and air assessments. Generally, it is concluded in these associated studies that the proposed landfill expansion is expected to meet all Provincial criteria with respect to noise, odour and air quality and is not expected to result in impacts in excess of these criteria to the public. These studies recommended various mitigation and monitoring programs to help minimize potential impacts associated with landfill operations following implementation of the Project.

The proposed landfill expansion does not result in the limits of waste being extended towards any of the sensitive land uses as defined by Guideline D-4 (Land Use on or Near Landfills and Dumps). Provided the recommended impact mitigation for noise and air quality (i.e., odour) are implemented, the proposed expansion is not expected to have significant adverse impacts on these uses. Further, in light of the intended use of the Site Area, it is determined that the landfill expansion would be compatible with the existing land uses within the Site-Vicinity Study Area.

It is not anticipated that sensitive land uses would be constructed in the vicinity of the W12A Landfill site within the 2035 planning horizon defined for the City's new Official Plan. Accordingly, it is determined that the Project should not adversely impact on future land uses within the Site-vicinity Study Area.

No significant impacts or adverse effects are expected with respect to the surrounding land uses, no mitigation or monitoring is required at this time from a land use perspective. Notwithstanding, the measures recommended in conjunction with this EA should be implemented to mitigate any potential impacts (noise, odour, dust) to land uses proximate to the existing landfill facility and to protect natural heritage features and functions.

Agriculture

The details of the impact assessment on agriculture are provided in Volume IV Appendix D.07.

Agricultural uses within this defined area are characterized by conventional agricultural production that is in keeping with regional and provincial trends (e.g., cash crop production, livestock operations).

The assessment of impacts on agricultural land and operations within the Site-vicinity Study Area was based on the Province's draft Agricultural Impact Assessment Guidelines (released March 2018) (OMAFRA 2018).

As an outcome of the agricultural impact assessment, the Project is expected to generate minimal land use impacts on agricultural land and/or operations in the Site-vicinity Study Area. Notwithstanding, mitigation and monitoring programs associated with the expanded landfill operations recommended in conjunction with this EA should be implemented to minimize any potential impacts on local agricultural activities and the larger agricultural system.

Archaeology

The details of the impact assessment on potential archaeological resources are provided in Volume IV Appendix D.08.

An archaeological assessment was completed to identify known archaeological resources within the Site Study Area.

The Stage 1 background study determined that portions of the Site Study Area had archaeological potential and, as such, would require Stage 2 Archaeological Assessment to identify archaeological sites that may be present. The Stage 2 assessment involved a combination of pedestrian survey at 5 m intervals and shovel test pit survey at 5 m intervals, and resulted in the identification of seven archaeological locations. One location was considered to have cultural heritage value or interest and recommended to be subject to a Stage 3 Archaeological Assessment.

The results of the Stage 3 Archaeological Assessments identified the presence of one site with archaeological potential in the Site Area (White Oak 1 site), located on the north side of the western portion of the existing landfill footprint. The presence of high artifact-yielding test units (e.g., ≥ 10 artifacts) indicates that the White Oak 1 site has further cultural heritage value or interest and will require Stage 4 mitigation prior to development. This conclusion is consistent with Section 3.4.1, Standard 1a of the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)'s *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). There are no further concerns for impacts to archaeological sites in the

remainder of the Site Study Area. This White Oak 1 site plus a 10 m buffer requires avoidance during construction, operation and closure of the Project and this can be accomplished without disruption to the Project.

The MHSTCI reviewed the results and recommendations presented in the Stage 3 Archaeological Assessment Report and accepted this report into the Provincial Register of archaeological reports, and issued a standard letter of compliance with the Ministry's 2011 *Standards and Guidelines for Consultant Archaeologists* and the terms and conditions for archaeological licensing.

Cultural Heritage

The details of the impact assessment on potential built heritage resources are provided in Volume IV Appendix D.09.

Seven properties in the Site-vicinity Study Area were identified as requiring cultural heritage assessment to determine if any of the properties had cultural heritage value or interest (CHVI) in accordance with *Ontario Heritage Act Regulation 9/06* (Ontario, 1990b). They were identified for study because they are properties with buildings or structures 40 or more years old and evaluated as having potential cultural heritage value or interest (CHVI) if they met one or more of the criteria prescribed in *Ontario Heritage Act Regulation 9/06* or was a part of a potential cultural heritage landscape. One additional property with buildings or structures 40 or more years old was also identified but evaluated to not meet at least one criterion for CHVI prescribed in O. Reg 9/06 (Ontario 1990b).

No cultural heritage resources of value or interest were identified within the Site-vicinity Study Area that could potentially be impacted by the proposed W12A Landfill expansion and no further cultural heritage studies or monitoring of any properties is recommended.

Socio-economic

The Socio-economic component comprises two sub-components: local economy; and residents and community. The details of the socio-economic impact assessment are provided in Volume IV Appendix D.10.

Local economy

The Project is not expected to create any new jobs in the community during operation, the existing landfill workforce is deemed sufficient. New jobs during construction activities are expected. It is estimated that with the additional infrastructure operations associated with the expansion, the annual operating cost could increase approximately 10% to \$5 million. Several stop-controlled approaches along the haul routes are forecast to operate at a poor level of traffic control in the future (2048) conditions. However, traffic signals, if warranted, would be due to the projected increase of background traffic volume and/or movement of this background traffic and not the traffic associated with the landfill expansion. Other businesses (excluding farms as these were assessed within the agriculture component) in the Site-vicinity Study Area are not anticipated to be affected negatively or positively as a result of the landfill

expansion. In terms of the local economy, no changes to employment or use of local vendors is anticipated and over time the landfill is expected to have increased costs and generate additional revenue for the City.

In terms of capital costs, the proposed expansion design has an estimated budget of \$55 to \$90 million, with a midpoint estimate of approximately \$72 million (in 2020 dollars).

Residents and Community

The W12A Landfill site is located in a largely agricultural area with few socio-economic features of note. The most likely potential impact to the socio-economic environment is from nuisance effects such as litter, noise, odour or dust, which can affect use and enjoyment of private properties or outdoor spaces. The presence of the landfill and proposed changes to it associated with the expansion are not expected to result in any out-migration of existing residents who are accustomed to living in an area where agricultural and industrial noise is commonplace. Adherence to applicable municipal and provincial guidelines and use of best management practices at the W12A Landfill site related to control and mitigation of effects such as litter, noise, dust or odour will assist in reducing potential effects to local residents. Continued use of a complaints protocol will be key tools in monitoring socio-economic effects and ensuring good community relations during construction and operations.

Visual

The details of the impact assessment for visual are provided in Volume IV Appendix D.11.

The visual impact of the proposed landfill expansion on existing residential properties within 3,500 m of Site-vicinity Study Area was assessed. This was done by calculating a visual effect rating using relevant factors that affect the visual impact from different viewpoints in private outdoor areas and from public rights of way within the Site-vicinity Study Area.

For the majority of the viewpoints, the visual effect is moderate to very low. However, the landfill expansion will have a very high visual impact on four properties and have a high visual impact on two properties. Three of the six properties with high to very high visual impacts are owned by the City and three properties are privately owned.

The most obvious views of the proposed landfill expansion are from the south. To reduce the visual impact of daily operations, the site development plan proposes that waste would be placed initially to build a berm along the south side of the landfill's waste disposal area and will be covered with final cover soil and seeded to establish vegetation. This berm will screen the view of subsequent filling operations north of the berm from off-site vantage points to the south.

The existing perimeter berms with trees on the south, west, north and a portion of the east sides of the landfill are effective at visually screening the existing landfill from traffic beside the landfill on Manning Drive and White Oak Drive and are expected to continue to screen the view of the expanded landfill, but not from Scotland Drive or Wellington Road South. With the proposed expansion, the landfill property boundary will be moved northward to Scotland Drive and new berms with tree plantings will be constructed along the new property boundary

(White Oak Road northward to Scotland Drive, Scotland Drive) to visually screen the landfill expansion from traffic beside the landfill on Scotland Drive.

The City will seek feedback on appropriate roadside view-mitigation measures from area residents when it updates its Community Enhancement and Mitigative Measure (CEMMP) Program. The first step in updating the CEMMP is seeking stakeholder feedback on how the program can be improved, including what are appropriate visual screening measures for individual residential properties. The project to update the CEMMP started in November 2020.

Transportation

The details of the impact assessment on transportation are provided in Volume IV Appendix D.12.

Taking into account the additional vehicles generated by the W12A Landfill, as well as applying the projected 1.0% annual growth rate for background traffic across the Site-vicinity Study Area, operational analyses along the haul routes were completed.

The two signalized intersections, found along Wellington Road at both Dingman Drive and Manning Drive, continue to operate with minor increases reported to the volume to capacity (v/c) ratio, delays, and 95th percentile queues. All movements at these two intersections, as well as the overall intersection performance, are forecast to remain at a good to reasonable level of service (LOS). Critical movements are not expected to occur by the 2048 horizon year at either of these intersections.

The remaining intersections and site accesses within the Site-vicinity Study Area operate under a stop-control condition. Compared to the existing conditions analyses, most stop-controlled intersections are not anticipated to see any significant changes to operations with a few notable exceptions: Wonderland Road (Highway 4) at both ramp terminals from Highway 401; Wellington Road at Scotland Drive; Wellington Road at Westminster Drive. These stop-controlled approach exceptions along the haul routes are forecast to operate at a poor level of traffic control in the future (2048) conditions. However, traffic signals, if warranted, would be due to the projected increase of background traffic volume and/or movement of this background traffic and not the traffic associated with the landfill expansion.

An assessment carried out on the effects of temporary major road closures and resultant use of Emergency Detour Routes (EDR) as related to the W12A Landfill traffic indicates that, depending on the road that is closed and the closure location along either Highway 401 or 402, the rerouted traffic could potentially combine with landfill traffic. If Manning Drive is closed in front of the W12A Landfill, alternate site access to and from both White Oak Road and Scotland Drive would be readily available.

Design and Operations

The details of the assessment of impacts associated with the design and operations of the proposed expansion are provided in Volume IV Appendix D.13.

The Description of the Preferred Landfill Expansion (see Section 8 of the EASR) covered off the proposed expanded landfill phasing and development; estimated leachate generation and on-site leachate management; estimated LFG generation and on-site management; and geotechnical assessment. In addition, a soil balance for the proposed expansion was completed as well as an estimate of probable capital and operational costs.

A soil balance estimates the volume of soil materials available on site for potential use in constructing various components of the expansion compared to the types and volumes of soil materials required for their construction. With the continued use of alternative daily cover materials and stripping of the existing final cover prior to placing waste for the vertical expansion, it is estimated that following construction of the final cover using on-site soils there will a surplus of 162,000 m³, which can readily be accommodated within the expanded landfill site property limits.

It is estimated that the capital costs of implementing the expansion (including engineering and contingencies) are in the range of \$55 to \$90 million, with a midpoint estimate of approximately \$72 million (in 2020 dollars). The current annual operating cost, including both staff and the operations, is approximately \$4.5 million (in 2020 dollars). It is estimated that with the additional infrastructure operations associated with the expansion, the annual operating cost could increase to \$5 million.

In terms of potential impacts associated with site design and operations:

- **Phasing and Development:** The design of the expansion phasing and the approach to development of each phase will reduce potential visual impacts (i.e., view of ongoing site landfilling operations) from off-site vantage points to the south, from where the site operations are most visible for the greatest number of existing residences. For landfilling, the area from which the existing final cover will be stripped prior to placement of waste and the active area used for waste disposal will be kept as small as practical to minimize the potential for odours and litter.
- **Management of Leachate:** The management of leachate will continue to rely on the same LCS approaches that have proven effective in preventing impacts on off-site groundwater resources and surface water quality. In addition, the design will provide sufficient temporary leachate storage to minimize the potential for untreated leachate release due to storm events that are sufficiently large to cause overflows from the off-site pumping station and WWTP.

- **Management of LFG:** The expansion will continue to utilize an active LFG collection system (installed both during landfill operations and progressively with the final cover as expansion phases are completed) to capture and flare LFG and thereby control odour and greenhouse gas releases.
- **Geotechnical Considerations:** Geotechnical analysis demonstrates that the proposed expansion will be stable in terms of overall stability of the waste, and that settlement of the underlying clay till deposit due to the weight of the vertical expansion of waste will not adversely affect the operation and performance of the underdrain LCS below the Phase 2 area.
- **Soil Balance:** The expansion is expected to use a combination of available on-site stockpiled soil and alternative daily cover consisting of off-site waste materials. It is anticipated that there will be an overall soil surplus at the end of the expansion period. The expansion will require aggregates and asphalt for infrastructure construction and maintenance; otherwise, the expansion is not expected to consume off-site soil resources from licensed pits or other borrow sources.
- **Capital and Operational Costs:** The capital costs associated with the expansion can be planned within the municipality's annual capital expenditures budgeting process. The operating costs are comparable to but somewhat higher than the current operating costs. These cost components are not expected to impact municipal finances.

Climate Change Considerations

The document entitled "Considering Climate Change in the Environmental Assessment Process" (MECP, 2019) was used as a guide for incorporating measures in the landfill expansion design that reduce both the potential impact of climate change on the landfill (i.e., climate change adaptation) and its potential impact on climate change (i.e., climate change mitigation).

In terms of potential impacts from climate change on the landfill expansion, it is expected that the planned 25 year operational period of the landfill expansion, i.e., through 2048, will be too short to be significantly affected by impacts from climate change. However, during the post-closure period, longer term changes in precipitation and temperature could possibly affect the vegetative cover growth on the closed landfill and/or runoff of surface water from the landfill final cover and the performance of the components that comprise the SWM system. The proposed stormwater pond designs were assessed to predict conditions during the 1:250 year return period storm event to evaluate potential climate change effects. It is expected that the ponds will perform acceptably under such storm conditions. The potential impacts from climate change related to precipitation will also be taken into account in the final design of site infrastructure components related to leachate collection and temporary storage on-site. Adjustments to landfill operations can be made, as required, in future to mitigate potential effects from temperature extremes and winds associated with climate change.

In terms of potential impacts from the landfill expansion on climate change, the two main ways that a landfill expansion could affect climate change are the generation of GHG that enters the atmosphere, and reduction of GHG sequestration by removal of forested areas. For the proposed vertical expansion of the W12A Landfill above the existing footprint, there will not be any clearing of forested areas, and therefore no associated adverse effects related to GHG sequestration. The annual GHG emission rates in tonnes per year for each activity for the existing landfill and the proposed expanded landfill were estimated. GHG generated from the landfill expansion, which will peak in 2049 and then decline over time, will be controlled by an active LFG collection and flaring system. The system will have a LFG collection efficiency that is expected to significantly improve by 2049 in comparison to 2020 and this will result in decrease GHG emissions annually.

Cumulative Impact Assessment

A cumulative impact assessment of the potential effects of the proposed landfill expansion in combination with past, present and reasonably foreseeable future activities, where possible, was carried out following a framework often used in federal EA processes and is described in Section 11 of the EASR.

The cumulative effects analysis involved a scoping phase and an analysis of effects phase. For the scoping phase, the components that had residual negative effects (after mitigation) from the proposed landfill expansion were identified. After this, other projects or activities in the area that may affect the same components were identified.

During the analysis of effects phase, the other projects or activities were evaluated to assess if their effects would overlap in timing or spatial extent with the effects of the Project, accounting for and including the proposed landfill expansion mitigation. The nature and extent of the possible cumulative effects were then identified along with any possible mitigation and/or monitoring strategies.

The identified environmental, socio-economic and technical components from the proposed landfill expansion with identified residual, negative effects are: atmosphere (air/odour and noise); hydrogeology; surface water (quantity); biology; land use; agriculture; socio-economic, transportation and visual. The existing zoning and land use in the vicinity of the site was considered in determining the other projects and activities to include in this cumulative assessment. It was determined that the effects from the landfill expansion would not overlap with those from other projects or activities for the hydrogeology, surface water, agriculture or visual components. For the remaining components, the landfill expansion will utilize operating procedures, monitoring programs and mitigation measures such that the landfill complies with provincial requirements. Potential remaining cumulative effects are described. In light of the existing zoning and the associated Official Plan policy framework, it is considered unlikely that new sensitive land uses would be introduced in close proximity to the landfill.

Monitoring and Contingency

The proposed expansion of the W12A Landfill has been designed to incorporate mitigation measures to minimize the potential for unacceptable environmental effects. Following the identification of mitigation measures, the environmental effects of the proposed expansion were evaluated. Although, efforts have been made to conservatively estimate potential impacts associated with the proposed W12A Landfill expansion, there is always some potential for variability between predicted and actual conditions. Effective monitoring and contingency measures are intended to address this potential variability and confirm the assumptions used in this assessment.

An effective monitoring program provides results to: indicate whether the facility is working as expected and that the assumptions used in the assessment were correct; assess on an ongoing basis whether mitigation measures as designed and operated are effective; and identify unforeseen problems so they can be addressed in a timely manner. The proposed monitoring program for the proposed W12A Landfill expansion is summarized in Section 12.0 of the EASR and details are provided in the D&O Report (Volume IV, Appendix D.13) and includes requirements for air quality, noise, groundwater quality, surface water quality and quantity, LFG and biology.

The final details will be determined in consultation with the MECP and incorporated in the ECA amendments for the proposed expansion.

In the event that the ongoing groundwater or surface water monitoring programs detect unexpected problems, it may be necessary to implement contingency measures to further reduce the potential for any adverse environmental effects associated with the proposed expansion of W12A Landfill. The current ECA for the W12A Landfill has a trigger mechanism that requires prescribed actions to be taken should the monitoring results indicate that certain thresholds are reached, whereby additional investigations and assessments are undertaken to confirm the monitoring results and determine if it is necessary to implement contingency measures to prevent non-compliance with the RUG for groundwater, or to prevent leachate-impacted waters from accessing the stormwater management ponds. As part of the ECA amendment application process for the expanded landfill, the trigger mechanisms and contingency measures will be reviewed and modified, if required.

An overview of the proposed contingency measures that could be put into effect are described in Section 12.2 of the EASR.

Summary of Commitments and Other Approvals

Section 13.0 of the EASR lists the commitments made by the City during the ToR process, how they have been considered in the preparation of the EASR and their current status. Generally, these commitments relate to a committed target of 60% residential residual waste diversion by the end of 2022, the preparation of work plans for technical studies as identified in the ToR, assessment of 'Alternative Methods' of expansion and detailed description of the preferred alternative, completing a cumulative effects assessment, preparing a draft EA for public review

and ensuring public consultation events and availability of the draft and final main body of the EASR to the public, holding workshops based on interest indicated by stakeholders, engaging with Indigenous Communities, and refining the purpose statement (if required).

Commitments made by the City during the EA study process are also listed in Section 13.0. The City will report on the status of these commitments via compliance monitoring to the MECP annually until such time as all commitments are completed or addressed/superseded in EPA/*Ontario Water Resources Act* (OWRA) conditions of approval. Generally, these commitments relate to effects monitoring requirements, design of site components, operating procedures, mitigation measures and best management practices.

Following approval of the W12A Landfill expansion EA by the Minister of the Environment, Conservation and Parks, approval under the EPA and the OWRA will then be required; these approvals will take the form of amendments to the existing landfill ECAs. Approvals will also be required under the *Ontario Heritage Act* to implement the expansion and under several pieces of legislation for specific matters related to the natural environment. Approval under the *Planning Act* related to rezoning of a portion of the expanded landfill property may also be required.

Table of Contents

Executive Summary.....	ES-1
Acronyms	xv
Units of Measure	xxi
Glossary of Terms	xxii
1.0 Introduction	1-1
1.1 Description of the Existing Landfill	1-2
1.2 Identification of Proponent	1-4
1.3 Landfill Site History and Landfill Components.....	1-4
1.3.1 Background	1-4
1.3.2 Landfill Components	1-7
1.3.3 Current Landfill Performance.....	1-7
2.0 Overview of the Environmental Assessment Process, the Project and Environmental Assessment Study Report	2-1
2.1 Purpose of the Proposed Undertaking	2-1
2.2 Approval of the Amended Terms of Reference	2-2
2.3 Updated Resource Recovery Strategy.....	2-2
2.4 Updated Service Area.....	2-3
2.4.1 Existing Service Area	2-3
2.4.2 Proposed Regional Service Area.....	2-5
2.5 Identified ‘Alternative To’ the Undertaking	2-11
2.6 Updated Rationale for the Undertaking.....	2-12
2.7 Development of the EA Study Report	2-12
2.7.1 Concordance of Approved Amended ToR and EASR Documentation	2-12
2.7.2 Organization of the EASR.....	2-13
3.0 Methodology for the Assessment	3-1
3.1 Step 1 – Characterize Existing Environmental Conditions	3-2
3.2 Step 2 – Identify ‘Alternative Methods’ of Landfill Expansion.....	3-2
3.3 Step 3 – Evaluation of ‘Alternative Methods’	3-3
3.4 Step 4 – Compare the ‘Alternative Methods’ of Landfill Expansion and Identify the Preferred Alternative	3-3

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

3.5	Step 5 – Describe the Preferred ‘Alternative Method’	3-17
3.6	Step 6 – Refine the Mitigation Measures and Determine the Net Effects of the Preferred Alternative	3-17
3.7	Step 7 – Consideration of Climate Change	3-17
3.8	Step 8 – Cumulative Impact Assessment	3-18
3.9	Step 9 – Preparation of EA Study Report	3-18
4.0	Consultation Methods and Activities	4-1
4.1	Overview	4-1
4.2	Consultation Objectives	4-1
4.2.1	Key Decision-Making Milestones	4-2
4.2.2	Issues Resolution Strategy	4-3
4.3	EA Consultation Methods	4-3
4.4	Project Contact List.....	4-4
4.4.1	Agencies.....	4-4
4.4.2	Indigenous Communities	4-5
4.5	Schedule of Events	4-5
4.6	Summary of Consultation Events.....	4-6
4.6.1	Notice of Commencement of the EA	4-6
4.6.2	Open House #3	4-6
4.6.3	Open House #4	4-8
4.6.4	On-going Activities.....	4-9
4.6.5	MECP Review of Preliminary Draft EASR	4-10
4.6.6	Indigenous Community Events and Involvement.....	4-10
4.7	Summary of Concerns Raised During Consultation.....	4-11
4.7.1	Open House #3	4-11
4.7.2	Open House #4	4-17
4.7.3	Indigenous Community Events	4-22
5.0	Description of the Environment Potentially Affected	5-1
5.1	Study Areas and Timeframes	5-1
5.2	Atmosphere	5-6
5.2.1	Air Quality	5-6

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

5.2.2	Noise	5-14
5.3	Geology and Hydrogeology	5-20
5.3.1	Geological and Hydrogeological Setting	5-20
5.3.2	W12A Landfill Site Hydrogeology	5-26
5.4	Surface Water	5-29
5.4.1	Surface Water Setting	5-29
5.4.2	Stormwater Management System	5-31
5.5	Biology	5-34
5.5.1	Physical Features and Functions.....	5-34
5.5.2	Natural Heritage Features	5-38
5.5.3	Species at Risk Assessment	5-61
5.5.4	Significant Wildlife Habitat Assessment.....	5-64
5.5.5	Significant Natural Heritage Features and Species	5-67
5.6	Land Use	5-71
5.7	Agriculture.....	5-78
5.7.1	Agricultural Setting	5-78
5.7.2	Provincial Policy Statement	5-80
5.8	Archaeology	5-81
5.8.1	Existing Conditions	5-81
5.8.2	Archaeological Potential	5-86
5.9	Cultural Heritage	5-88
5.10	Socio-economic	5-91
5.10.1	Demographic Profile	5-91
5.10.2	Existing Socio-economic Landscape	5-92
5.10.3	Existing Landfill Site Operations	5-92
5.11	Visual	5-95
5.12	Transportation.....	5-96
5.13	Design and Operations	5-105
6.0	Description of the ‘Alternative Methods’ of Landfill Expansion	6-1
6.1	Design of Expansion Alternatives	6-1
6.2	‘Alternative Methods’ for Landfill Expansion	6-4

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

6.3	Alternative 1 – Vertical Expansion Over Existing Footprint	6-4
6.4	Alternative 2 – Horizontal Expansion to the North and Vertical Expansion Over Part of the Existing Footprint	6-4
6.5	Alternative 3 – Horizontal Expansion to the East and Vertical Expansion Over Part of the Existing Footprint	6-5
6.5.1	Summary of Alternative Methods.....	6-6
6.6	Geotechnical Assessment of Expansion Alternatives	6-9
7.0	Evaluation and Comparison of Landfill Expansion Alternatives	7-1
7.1	Methodology	7-1
7.2	Assessment of Net Environmental Effects for ‘Alternative Methods’ and Component Comparison of ‘Alternative Methods’	7-2
7.2.1	Atmosphere	7-2
7.2.2	Geology and Hydrogeology	7-16
7.2.3	Surface Water.....	7-19
7.2.4	Biology.....	7-27
7.2.5	Land Use	7-40
7.2.6	Agriculture	7-42
7.2.7	Archaeology.....	7-47
7.2.8	Cultural Heritage.....	7-50
7.2.9	Socio-economic	7-54
7.2.10	Visual.....	7-60
7.2.11	Transportation	7-65
7.2.12	Design and Operations	7-66
7.3	Public Input Regarding the Ranking of Alternatives	7-74
7.4	Comparative Evaluation.....	7-74
8.0	Description of the Preferred Undertaking.....	8-1
8.1	Description of the Landfill Expansion	8-1
8.1.1	Landfill Phasing and Phase Development	8-3
8.1.2	Leachate Management and Treatment.....	8-6
8.1.3	Geotechnical Assessment	8-11
8.1.4	Landfill Gas Management.....	8-12
8.1.5	Stormwater Management	8-19

8.1.6	Site Operations and Ancillary Components	8-22
8.1.7	Maintenance and Monitoring	8-27
8.1.8	Closure and Post-closure	8-27
8.1.9	Description of Activities.....	8-28
9.0	Impact Assessment and Net Effects	9-1
9.1	Atmosphere	9-1
9.1.1	Air Quality	9-1
9.1.2	Noise	9-9
9.2	Geology and Hydrogeology	9-22
9.2.1	Groundwater Quality Impact Assessment.....	9-22
9.2.2	Groundwater Quantity Impact Assessment	9-28
9.2.3	Additional Mitigation Measures	9-29
9.3	Surface Water	9-31
9.3.1	Stormwater Management System Design	9-31
9.3.2	Assessment of Surface Water Impacts.....	9-39
9.4	Biology	9-41
9.4.1	Construction Stage	9-44
9.4.2	Operations Stage.....	9-45
9.4.3	Closure and Post-closure Stage	9-46
9.4.4	Mitigation and Compensation	9-47
9.5	Land Use	9-49
9.5.1	Policy Overview	9-50
9.5.2	Assessment of Effects on Current Land Uses	9-61
9.5.3	Assessment of Effects on Planned Future Land Use	9-62
9.6	Agriculture.....	9-63
9.6.1	Methodology	9-63
9.6.2	Agricultural Lands and Operations	9-63
9.7	Archaeology	9-65
9.8	Cultural Heritage	9-66
9.9	Socio-economic	9-69
9.9.1	Assessment Methodology.....	9-70

9.9.2	Assessment of Impacts.....	9-70
9.10	Visual.....	9-73
9.10.1	Methodology.....	9-73
9.10.2	Results.....	9-74
9.10.3	Visual Mitigation	9-80
9.11	Transportation.....	9-81
9.11.1	Transportation Impact Assessment	9-83
9.11.2	Emergency Detour Route and Road Closure Assessment.....	9-87
9.11.3	Traffic Mitigation Measures Assessment.....	9-92
9.12	Design and Operations	9-96
9.12.1	Soil Balance.....	9-96
9.12.2	Estimates of Probable Cost	9-98
9.12.3	Impact Assessment	9-99
9.13	Comparison of Do-Nothing	9-100
10.0	Climate Change Considerations.....	10-1
10.1	Potential Impacts of Climate Change on the Landfill Expansion.....	10-1
10.2	Impacts of the Landfill Expansion on Climate Change.....	10-2
11.0	Cumulative Impact Assessment.....	11-1
11.1	Approach	11-1
11.1.1	General.....	11-1
11.1.2	Assessment Methodology.....	11-1
11.2	Scope.....	11-1
11.2.1	Identified Components.....	11-1
11.2.2	Spatial Extent	11-3
11.2.3	Timing.....	11-3
11.2.4	Other Projects and Activities.....	11-3
11.2.5	Potential Impacts Due to Other Projects and Activities.....	11-3
11.3	Analysis of Effects.....	11-5
12.0	Monitoring and Contingency	12-1
12.1	Monitoring	12-1
12.1.1	Atmosphere	12-1

12.1.2	Geology and Hydrogeology	12-3
12.1.3	Surface Water.....	12-9
12.1.4	Biology.....	12-12
12.1.5	Landfill Gas Monitoring.....	12-12
12.2	Contingency Measures	12-13
12.2.1	Groundwater.....	12-13
12.2.2	Surface Water.....	12-14
13.0	Summary of Commitments and Other Approvals	13-1
13.1	Potential Project Modifications.....	13-11
13.2	Other Approvals	13-11
14.0	References	14-1

Tables

Table 2.3-1: Potential 60% Diversion Plan.....	2-3
Table 2.4-1: Summary of Waste Generation and Diversion Rates for Existing Service Area	2-4
Table 2.4-2: Residual Waste Generation Projections (Weight) for Existing Service Area.....	2-5
Table 2.4-3: Residential Residual Waste Quantities from Proposed Regional Service Area Municipalities.....	2-7
Table 2.4-4: Remaining Site Life of Landfills in Proposed Regional Service Area Municipalities	2-9
Table 2.4-5: Summary of Residual Waste for Various Waste Diversion Scenarios from Proposed Regional Service Area Municipalities.....	2-10
Table 2.7-1: Concordance Table	2-13
Table 3.3-1: Components, Rationale, Indicators and Data Sources for the EA	3-4
Table 4.7-1: Ranking of Importance on Potential Conditions on Accepting Waste from the Regional Service Area	4-12
Table 4.7-2: Summary of Feedback and Comments Received at Open House #3.....	4-13
Table 4.7-3: Summary of Feedback and Comments Received at Open House #4.....	4-17
Table 4.7-4: Summary of Comments Received Regarding the Groundwater Work Plan.....	4-22
Table 5.1-1: Proposed Preliminary Study Areas	5-2
Table 5.2-1: NAPS Air Quality Monitoring Stations	5-8
Table 5.2-2: Existing Emissions from W12A Landfill.....	5-10

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Table 5.2-3: Existing Air Quality (background plus currently approved activities).....	5-11
Table 5.2-4: Summary of Short-term Noise Monitoring Results.....	5-17
Table 5.2-5: Predicted Existing Noise Levels.....	5-19
Table 5.5-1: Field Investigations Summary.....	5-40
Table 5.5-2: Water Chemistry Parameter Results	5-46
Table 5.5-3: Benthic Water Quality Indices Results.....	5-46
Table 5.5-4: Summary of Criteria for Significant Natural Heritage Features as outlined in Table 9 of the Middlesex Natural Heritage Systems Study (2014).....	5-48
Table 5.5-5: Vegetation Communities Summary for W12A Landfill Study Area.....	5-50
Table 5.5-6: Ontario Breeding Bird Atlas (OBBA) Significant Species Records Within or in the Vicinity of the Study Area	5-56
Table 5.5-7: Potential and Confirmed Species at Risk Within the Study Area	5-63
Table 5.10-1: Demographic Profile – City of London, 2016	5-91
Table 5.12-1: 2018 Data for the W12A Landfill	5-99
Table 5.12-2: Average Daily Traffic Volumes.....	5-100
Table 5.12-3: Existing (2019) Intersection Operations along the Haul Routes.....	5-102
Table 6.5-1: Summary of W12A Landfill Expansion Alternative Methods	6-7
Table 7.2-1: Dispersion Modelling Input Parameters per Area Source	7-4
Table 7.2-2: Emission Summary– Vinyl Chloride.....	7-5
Table 7.2-3: Summary of W12A Landfill Expansion 'Alternative Methods'	7-6
Table 7.2-4: Air Quality Evaluation of 'Alternative Methods'	7-8
Table 7.2-5: Evaluation of Advantages and Disadvantages for Air Quality	7-9
Table 7.2-6: Minimum Distances (m) to Existing PORs from Landfill Activities.....	7-12
Table 7.2-7: Landfill Guideline Qualitative Rating of Increases in Sound Levels	7-13
Table 7.2-8: Potential Increases in Noise Levels (dB)	7-14
Table 7.2-9: Noise Evaluation of the 'Alternative Methods'.....	7-15
Table 7.2-10: Evaluation of Advantages and Disadvantages for Noise	7-16
Table 7.2-11: Groundwater Quality Evaluation of 'Alternative Methods'	7-18
Table 7.2-12: Evaluation of Advantages and Disadvantages for Groundwater Quality.....	7-19
Table 7.2-13: Surface Water Quality Evaluation of 'Alternative Methods'	7-21
Table 7.2-14: Evaluation of Advantages and Disadvantages for Surface Water Quality	7-22
Table 7.2-15: Surface Water Quantity Evaluation of 'Alternative Methods'	7-25

Table 7.2-16: Evaluation of Advantages and Disadvantages for Surface Water Quantity ...	7-27
Table 7.2-17: Aquatic Ecosystem Evaluation of 'Alternative Methods'	7-29
Table 7.2-18: Evaluation of Advantages and Disadvantages for Aquatic Ecosystems	7-34
Table 7.2-19: Terrestrial Ecosystems Evaluation of 'Alternative Methods'	7-36
Table 7.2-20: Evaluation of Advantages and Disadvantages for Terrestrial Ecosystems	7-39
Table 7.2-21: Current and Planned Future Land Use Evaluation of 'Alternative Methods' ..	7-41
Table 7.2-22: Evaluation of Advantages and Disadvantages for Current and Planned Future Land Uses	7-42
Table 7.2-23: Agriculture Evaluation of 'Alternative Methods'	7-44
Table 7.2-24: Evaluation of Advantages and Disadvantages for Agriculture	7-47
Table 7.2-25: Archaeology Evaluation of 'Alternative Methods'	7-48
Table 7.2-26: Evaluation of Advantages and Disadvantages for Archaeology	7-49
Table 7.2-27: Cultural Heritage Landscapes Evaluation of 'Alternative Methods'	7-51
Table 7.2-29: Built Heritage Resources Evaluation of 'Alternative Methods'	7-53
Table 7.2-30: Evaluation of Advantages and Disadvantages for Built Heritage Resources ..	7-54
Table 7.2-31: Local Economy Evaluation of 'Alternative Methods'	7-56
Table 7.2-32: Evaluation of Advantages and Disadvantages for Local Economy	7-58
Table 7.2-33: Residents and Community Evaluation of 'Alternative Methods'	7-59
Table 7.2-34: Evaluation of Advantages and Disadvantages for Residents and Community	7-60
Table 7.2-35: Perceived Area Index Values	7-62
Table 7.2-36: Cone of View Values	7-62
Table 7.2-37: Distance to Landfill	7-63
Table 7.2-38: Visual Absorption Capability Factor Values (VACF)	7-63
Table 7.2-39: Visual Absorption Capability Factor Value Ratings	7-64
Table 7.2-40: Combined Effect Value Scale	7-64
Table 7.2-41: Visual Evaluation of 'Alternative Methods'	7-65
Table 7.2-42: Evaluation of Advantages and Disadvantages for Visual	7-65
Table 7.2-43: Traffic Evaluation of 'Alternative Methods'	7-66
Table 7.2-44: Engineering Containment Considerations for Evaluation of 'Alternative Methods'	7-68
Table 7.2-45: Engineered Containment Evaluation of 'Alternative Methods'	7-69
Table 7.2-46: Evaluation of Advantages and Disadvantages for Engineered Containment ..	7-71

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Table 7.2-47: Financial Considerations for Evaluation of 'Alternative Methods'	7-72
Table 7.2-48: Financial Evaluation of 'Alternative Methods'	7-73
Table 7.2-49: Evaluation of Advantages and Disadvantages for Financial	7-74
Table 7.4-1: Summary of the Components and Sub-components Comparative Evaluation of 'Alternative Methods'	7-1
Table 8.1-1: Summary of Proposed W12A Landfill Expansion	8-3
Table 8.1-2: Summary of Total Estimated Landfill Gas and Methane Generation for the W12A Landfill Expansion	8-14
Table 8.1-3: Summary of Estimated Landfill Gas Generation and Collection, Excluding Cells 1, 2, and 3	8-18
Table 9.1-1: Project Emission Sources	9-2
Table 9.1-2: Summary of Emission Rates from Project During Operation	9-4
Table 9.1-3: Maximum Predicted Concentrations at the Sensitive Receptors for Proposed Project	9-7
Table 9.1-4: Summary of O. Reg. 419/05 Emission Rates	9-8
Table 9.1-5: Predicted Air Quality Compliance with O. Reg. 419/05	9-9
Table 9.1-6: Landfill Guidelines Qualitative Noise Impact Ratings for Off-site Vehicles	9-11
Table 9.1-7: Sound Level Limits for Class 3 Area – Steady Stationary Sources	9-11
Table 9.1-8: Daytime Landfilling Operations Predictable Worst Case Noise Predictions	9-13
Table 9.1-9: Nighttime Landfilling Operations Predictable Worst Case Noise Predictions	9-13
Table 9.1-10: Ancillary Equipment / Emergency Generator Predictable Worst Case Noise Predictions	9-14
Table 9.1-11: Predicted Change in Noise Levels along Haul Routes	9-15
Table 9.1-12: Magnitude Ratings for Potential Noise Effects	9-16
Table 9.1-13: Predicted Daytime and Nighttime Noise Levels and Change from Baseline due to the Project	9-17
Table 9.1-14: Mitigated Daytime Landfilling Operations Predictable Worst Case Noise Predictions	9-20
Table 9.1-15: Mitigated Nighttime Landfilling Operations Predictable Worst Case Noise Predictions	9-20
Table 9.1-16: Mitigated Predicted Daytime and Nighttime Noise Levels and Change from Baseline due to the Project	9-21
Table 9.2-1: Predicted Concentrations of Key Leachate Contaminants in the Upper Aquifer	9-26

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Table 9.2-2: Predicted Concentrations of Key Leachate Contaminants in the Upper Aquifer (Phase 1 Cross-Section A-A' with Mound Control).....	9-30
Table 9.3-1: Drainage Areas.....	9-33
Table 9.3-2: Pre-Development and Proposed Expansion Conditions for Subwatersheds ...	9-38
Table 9.8-1: Cultural Heritage Impact Assessment of the Proposed Expansion.....	9-67
Table 9.10-1: Viewpoint Scoring System	9-74
Table 9.11-1: Projected 2048 Data for the W12A Landfill	9-82
Table 9.11-2: Future (2048) Intersection Operations along the Haul Routes.....	9-84
Table 9.11-3: Daily Traffic Volumes on Highway 401 and Highway 402.....	9-89
Table 9.11-4: 2048 Design Hourly Volume	9-90
Table 9.11-5: Mitigated Intersection Operations (2048) – Highway 401 and Wonderland Road (Highway 4) Interchange	9-95
Table 9.12-1: Soil Balance.....	9-97
Table 9.13-1: Comparison of Do-Nothing to the Preferred Undertaking	9-101
Table 10.2-1: GHG Emissions Sources and Methods	10-4
Table 10.2-2: Summary of Estimated GHG Annual Emissions from the Existing (early 2020) W12A Landfill	10-5
Table 10.2-3: Summary of Estimated GHG Annual Emissions from the Proposed Expansion of the W12A Landfill in Year 2049.....	10-5
Table 10.2-4: Summary of Reportable Annual GHG Emissions from the Existing (early 2020) W12A Landfill	10-6
Table 10.2-5: Summary of Reportable Annual GHG Emissions from the Proposed Expansion of the W12A Landfill in Year 2049.....	10-7
Table 10.2-6: Comparison of GHG Emissions from the Project to Ontario and Canadian Emission Totals.....	10-7
Table 11.2-1: Summary of Landfill Expansion Residual Effects.....	11-2
Table 11.2-2: Interactions Matrix – Type of Effect	11-4
Table 11.3-1: Potential Cumulative Effects.....	11-6
Table 12.1-1: Proposed Follow-Up Activities for Air Quality and Odour.....	12-2
Table 12.1-2: Groundwater Monitoring Program.....	12-3
Table 12.1-3: Leachate Monitoring Program.....	12-4
Table 12.1-4: Water Well Monitoring Program.....	12-4
Table 12.1-5: Groundwater Parameters Monitored.....	12-6

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Table 12.1-6: Surface Water Monitoring Program	12-9
Table 12.1-7: Surface Water Monitoring Parameters.....	12-10
Table 12.1-8: Surface Water Monitoring Parameters.....	12-11
Table 12.2-1: Stormwater Pond Trigger Values	12-14
Table 13-1: List of Commitments made by the City during the Development and Approval of the ToR	13-1
Table 13-2: Table of Commitments made by the City during the EA	13-6

Figures

Figure 1.1-1: Key Plan	1-3
Figure 1.3-1: Existing Landfill Site Development Plan	1-8
Figure 5.1-1: Study Areas	5-5
Figure 5.2-1: Air Quality Monitoring Stations	5-7
Figure 5.2-2: Sensitive Receptor Locations	5-9
Figure 5.2-3: Odour Rose for 2019 Odour Complaints Potentially Attributed to W12A Landfill	5-13
Figure 5.2-4: Noise Study Areas and Points of Reception	5-15
Figure 5.3-1: Historical and Current Boreholes and Test Pits	5-22
Figure 5.3-2: Geological Cross Sections.....	5-23
Figure 5.3-3: Upper Aquifer Surface Elevation	5-24
Figure 5.3-4: Surficial Aquitard Thickness	5-25
Figure 5.3-5: Groundwater Elevation in Upper Aquifer	5-27
Figure 5.3-6: Groundwater Level in the White Oak Aquifer.....	5-28
Figure 5.4-1: Existing Surface Water Features	5-30
Figure 5.4-2: Existing Drainage Areas	5-32
Figure 5.5-1: Study Area and Surrounding Land Use	5-36
Figure 5.5-2: Terrain and Drainage within the Study Area	5-37
Figure 5.5-3: Field Investigation Locations	5-39
Figure 5.5-4: Aquatic Existing Conditions	5-43
Figure 5.5-5: ELC Vegetation Communities and Vegetation Patches.....	5-54
Figure 5.5-6: Species at Risk and Significant Wildlife Habitat within the Study Area	5-65

Figure 5.5-7: Natural Heritage Features and Constraints	5-68
Figure 5.6-1: Existing Land Use.....	5-73
Figure 5.6-2: Zoning Map.....	5-77
Figure 5.7-1: Existing Agricultural Setting	5-79
Figure 5.9-1: Known and Potential Cultural Heritage Resources.....	5-90
Figure 5.10-1: Socio-economic Existing Conditions.....	5-94
Figure 5.11-1: Example of a Planted Screening Berm.....	5-96
Figure 5.12-1: Site-Vicinity (Haul Route) Study Area	5-97
Figure 7.2-1: Air and Noise Evaluation and Comparison of Landfill Expansion Alternatives ..	7-7
Figure 7.2-2: Comparison of Alternative Methods – Alternative 1	7-31
Figure 7.2-3: Comparison of Alternative Methods – Alternative 2.....	7-32
Figure 7.2-4: Comparison of Alternative Methods – Alternative 3.....	7-33
Figure 8.1-1: Landfill Expansion Final Contour Plan and Cross-Sections.....	8-2
Figure 8.1-2: Landfill Expansion Phasing Plan	8-4
Figure 8.1-3: Estimated Total Landfill Gas and Methane Generation for the W12A Landfill Expansion	8-14
Figure 8.1-4: Estimated Landfill Gas Generation and Collection, Excluding Cells 1, 2, and 3 ..	8-17
Figure 8.1-5: Post Expansion Drainage Areas Plan.....	8-20
Figure 8.1-6: Plan of Future Ancillary Facilities.....	8-24
Figure 8.1-7: Plan of Future Ancillary Facilities.....	8-25
Figure 9.1-1: Sensitive Receptor Locations	9-6
Figure 9.1-2: Noise Study Areas and Points of Reception	9-10
Figure 9.1-3: Mitigation at Existing Point of Reception R15	9-19
Figure 9.2-1: Plan View of The Landfill Showing Modelled Cross-Sections (A-A', B-B' and C-C'), Inferred Thickness of the Surficial Aquitard and Fall 2019 Groundwater Elevations in the Upper Aquifer.....	9-24
Figure 9.2-2: Chloride Concentration Versus Time for Cross-Section A-A'	9-27
Figure 9.2-3: Chloride Concentration Versus Time for Cross-Section B-B'	9-27
Figure 9.2-4: Chloride Concentration Versus Time for Cross-Section C-C'	9-28
Figure 9.3-1: Post-Expansion Drainage Areas.....	9-32
Figure 9.4-1: Proposed Landfill Expansion	9-43

Figure 9.5-1: Zoning Map.....9-60

Figure 9.10-1: Visual Impact of Landfill Expansion9-75

Figure 9.10-2: View of Expanded Landfill from 3465 Scotland Drive9-77

Figure 9.10-3: View of Expanded Landfill from 3561 Scotland Drive9-77

Figure 9.10-4: View of Expanded Landfill from 4067 Scotland Drive9-78

Figure 9.10-5: View of Expanded Landfill from 3691 Manning Drive9-78

Figure 9.10-6: View of Expanded Landfill from 3452 Glanworth Drive.....9-79

Figure 9.10-7: View of Expanded Landfill from 4233 Scotland Drive9-79

Figure 9.11-1: Emergency Detour Routes and Highway Interchanges9-88

Figure 12.1-1: Proposed Groundwater Monitoring.....12-5

ACRONYMS

Acronym	Definition
AAC	Agricultural Advisory Committee
AADT	Average Annual Daily Traffic
AAQC	Ambient Air Quality Criteria
ACE	Advisory Committee on the Environment
ADT	Average Daily Traffic
AFN	Aamjiwnaang First Nation
AG	Agricultural
ANSI	Areas of Natural and Scientific Interest
ARI	Annual Recurrence Interval
BOD	Biological Oxygen Demand
BMP	Best Management Practices
C of A	Certificate of Approval
CAAQS	Canadian Ambient Air Quality Standards
CEMMP	Community Enhancement and Mitigative Measure Program
CEPA	<i>Canadian Environmental Protection Act</i>
CH Study Area	Cultural Heritage Study Area
CHVI	Cultural Heritage Value or Interest
CLC	Community Liaison Committee
CLI	Canada Land Inventory
CO ₂ e	Carbon Dioxide Equivalents
COD	Chemical Oxygen Demand
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
COTTFN	Chippewas of the Thames First Nation
CR&D	Construction, Renovation and Demolition Waste

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Acronym	Definition
CSP	Corrugated Steel Pipe
CUH	Cultural Hedgerow
CUM	Cultural Meadow
CUT	Cultural Thicket
CUW	Cultural Woodland
DBH	diameter at breast height
DFO	Department of Fisheries and Oceans
DHV	Design Hourly Volume
EA	Environmental Assessment
EAA	<i>Environmental Assessment Act (Ontario)</i>
EASR	Environmental Assessment Study Report
EB	East Bound
ECA	Environmental Compliance Approval
ECCC	Environment and Climate Change Canada
EDR	Emergency Detour Route
EE	Engineering Estimate
EEPAC	Environmental and Ecological Planning Advisory Committee
EES	Environmental and Engineering Services
EFW	Energy from Waste
EIS	Environmental Impact Study
ELC	Ecological Land Classification
EMMP	Environmental Mitigation and Monitoring Plan
END	Endangered
EPA	<i>Environmental Protection Act (Ontario)</i>
ER	Environmental Review
ESA	<i>Endangered Species Act (Ontario)</i>

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Acronym	Definition
ESC	Erosion and Sediment Control
EX	Resource Extraction
FAQ	Frequently Asked Questions
FOD	Deciduous Forest
GAP	Generally Accepted Principles
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Emissions Reporting Program
GIS	Geographic Information System
GRT	Government Review Team
H	Horizontal
HCM	Highway Capacity Manual
HIA	Heritage Impact Assessment
HSW	Household Special Waste
IC&I	Industrial, Commercial and Institutional Waste
IPZ	Intake Protection Zone
KCCA	Kettle Creek Conservation Authority
LCS	leachate collection system
LF	Landfill
LFG	Landfill Gas
LGCCS	Landfill gas collection and control system
LIO	Land Information Ontario
LOS	Level of Service
LSW	Locally Significant Wetland
LWRIC	London Waste to Resources Innovation Centre
MAM	Mineral Meadow Marsh
MAS	Mineral Shallow Marsh

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Acronym	Definition
MBCA	<i>Migratory Bird Convention Act</i> (Canada)
MDI	Mineral Deposit Inventory
MDS	Minimum Distance Separation
MECP	Ministry of the Environment, Conservation and Parks (formerly MOECC)
MHSW	Municipal Hazardous or Special Waste
MMA	Ministry of Municipal Affairs
MNHSS	Middlesex Natural Heritage System Study
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of the Environment (now known as MECP)
MOECC	Ministry of the Environment and Climate Change (now known as MECP)
MRF	Materials Recovery Facility
MHSTCI	Ministry of Heritage, Sport, Tourism and Culture Industries
MTO	Ministry of Transportation Ontario
MU4	Muriel soils (MU4)
NAPS	National Air Pollution Surveillance Network
NB	North Bound
NHRM	Natural Heritage Reference Manual
NOC	Notice of Commencement
OAQ	Open Aquatic
OBBA	Ontario Breeding Bird Atlas
ODWQS	Ontario Drinking Water Quality Standards
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OMB	Ontario Municipal Board
OPP	Ontario Provincial Police
ORNAMENT	Ontario Road Noise Analysis Method for Environment and Transportation
OS	Open Space

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Acronym	Definition
O. Reg.	Ontario Regulation
OU	odour unit
OWRA	<i>Ontario Water Resources Act</i>
PLC	Public Liaison Committee
POR	Points of Reception
POW	Plane of Window
PPS	Provincial Policy Statement
PTE	Permission to Enter
PWQO	Provincial Water Quality Objectives
RGP	Resident Geologist Program
RUG	Reasonable Use Guideline
SAR	Species at Risk
SARA	<i>Species at Risk Act</i> (Canada)
SAS	Submerged Shallow Aquatic Ecosite
SB	South Bound
SC	Special Concern
SMW	stormwater management
SOCC	Species of Conservation Concern
SPM	suspended particulate matter
SWD	Deciduous Swamp
SWHTG	Significant Wildlife Habitat Technical Guide
SWM	Stormwater management
SWMF	stormwater management facilities
SWMS	Stormwater management system
SWT	Thicket Swamp
THR	Threatened

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Acronym	Definition
TMC	Turning Movement Count
ToR	Terms of Reference
TSS	Total Suspended Solids
UTRCA	Upper Thames River Conservation Authority
V	Vertical
VACF	Visual Absorption Capability Factor Values
VES	Visual Encounter Surveys
WB	West Bound
WCI	Western Climate Initiative
WEEE	waste electronics and electrical equipment
WHPA	Well Head Protection Area
WMWG	Waste Management Working Group
WQI	Water Quality Index
WRM	Waste and Resource Management
WMRRA	Waste Management Resource Recovery Area
WWTP	Waste Water Treatment Plant
UTRCA	Upper Thames River Conservation Authority
VACF	Visual Adsorption Capability Factor Values
v/c	Volume-to-Capacity

UNITS OF MEASURE

Acronym	Definition of Units
cm	centimetre
ha	hectare
km	kilometre
L	litres
m	metre
masl	metres above sea level
mm	millimetre
m ²	square metres
m ³	cubic metre
scfm	Standard cubic feet per minute

GLOSSARY OF TERMS

Term	Definition
'Alternative Methods'	Alternative methods of carrying out the proposed undertaking are different ways of doing the same activity associated with an undertaking. Alternative methods could include consideration of one or more of the following: alternative technologies; alternative methods of applying specific technologies; alternative sites for a proposed undertaking; alternative design methods; and, alternative methods of operating any facilities associated with a proposed undertaking.
'Alternatives To'	Alternatives to the proposed undertaking are functionally different ways of approaching and dealing with a problem or opportunity.
Ambient Air	Open air not enclosed in a structure, machine, chimney or stack.
Aquifer	A layer of permeable soil, i.e., sand and/or gravel, or bedrock through which groundwater flows and can yield enough water to supply wells for use.
Berm	At a landfill site, a narrow mound or ridge comprised of soil (for example, a screening berm used to block the view of the landfill activities from off-site).
Borehole	A hole drilled into the ground to obtain information on the soil, bedrock and groundwater conditions and characteristics. A borehole can be completed as a groundwater monitoring well.
Buffer Area	The part of the landfill site not used for waste disposal, usually between the perimeter of the disposal area and the landfill property boundary.
Certificate of Approval (Waste)	An approval issued by the Ministry of the Environment for the establishment and operation of a waste management site/facility. Now referred to as an Environmental Compliance Approval.
City of London	The City of London (the proponent); used when referencing the political or corporate administrative body.
CR&D Waste	Waste generated by the Construction, Renovation and Demolition sector of the economy.
Criteria	A description of each environmental component to be considered in the environmental assessment, consisting of the rationale for including the component and the indicator(s) to be used in the assessment.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Term	Definition
Cumulative Effects	The net effects of the proposed undertaking combined with the predicted effects of other existing and identified certain and probable projects in the area of the proposed undertaking, where the effects would overlap.
Disposal Area	The area within the landfill property approved for the disposal of residual waste; also referred to as the waste footprint.
Environment	As defined by the <i>Environmental Assessment Act</i> , environment means: <ul style="list-style-type: none"> • Air, land or water, • Plant and animal life, including human life, • The social, economic and cultural conditions that influence the life of humans or a community, • Any building, structure, machine or other device or thing made by humans, • Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or • Any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Assessment	An environmental assessment, commonly known as an individual EA, is a study that is completed by the proponent to assess the potential environmental effects (positive or negative) of an individual project.
Environmental Compliance Approval	An approval issued by the Ministry of Environment, Conservation and Parks for the establishment and operation of a waste management site/facility.
Environmental Components	Environmental components are different aspects of the physical, biological and human environments.
Greenfield Site	A parcel of land that has not been previously developed for urban use, i.e., rural or agricultural land or green space.
Groundwater	Water below the ground surface contained in the pore spaces in soil or in openings within the bedrock.
Haul Route	Public roadways used by vehicles transporting waste to a landfill site.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Term	Definition
Hazardous Waste	Waste generated from any source that is defined as hazardous by the regulations of Ontario.
Indicators	Specific characteristics of the environmental components that can be measured, qualified, quantified or determined in some way.
IC&I Waste	Waste generated by the Industrial, Commercial and Institutional sector of the economy.
Landfill	An approved site used for the long-term disposal of residual waste.
Landfill Capacity	The volume approved for disposal of residual wastes and cover materials, described in cubic metres. Also referred to as the approved airspace.
Landfill Expansion	An increase in the approved landfill capacity.
Landfill Gas	Gases generated from the anaerobic decomposition of organic waste materials; mainly consisting of methane and carbon dioxide and traces of other gases.
Landfill Gas Collection System	The system used to collect the gases generated by decomposition of the waste in the landfill, typically consisting of a network of gas wells and/or horizontal piping attached to a vacuum to extract the gas and convey it to a location where the gas can be combusted in a gas flare or processed for subsequent use.
Leachate	The liquid produced when water (typically rainwater or snowmelt) passes through a landfill and contains contaminants as a result of coming in contact with the waste.
Leachate Collection System	The system used to collect leachate generated by a landfill, usually consisting of a network of piping and drainage stone beneath or around the perimeter of the disposal area.
Mitigation Measures	Design features and/or operational approaches used to control the potential effects of the landfill on the environment.
Monitoring Well	An installation at a selected depth in a borehole in which the groundwater level can be measured and groundwater samples obtained for chemical analysis to determine its quality. At a landfill, this information is typically monitored at some frequency over time and is referred to as a groundwater monitoring program.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Term	Definition
Non-hazardous Solid Waste	Waste generated from any source that is defined as non-hazardous and solid by the regulations of Ontario.
Ontario Regulation 232/98	The regulation that governs the design, operation, closure and post-closure of new or expanding waste disposal sites in the province of Ontario.
Proponent	<p>A person, corporation, government agency or other legal entity who:</p> <ul style="list-style-type: none"> a) Proposes to carry out an undertaking, or b) Is the owner or person having charge, management or control of an undertaking. <p>For this undertaking (project), the proponent is the City of London.</p>
Reasonable Use Guideline (or Concept)	The Ministry of Environment, Conservation and Parks guideline used to determine the acceptable level of impact from landfill leachate on off-site groundwater quality and used to assess compliance of landfill sites in terms of effects on groundwater resources.
Receptor	A specific location where the effect(s) from a waste management facility may be received. Also referred to as Points of Reception (PORs).
Residential Waste	Waste generated by residences (ranging from single to multi-residential units).
Residual Waste	The waste material that cannot be diverted through recycling or other processes and requires disposal.
Service Area	The geographic area from which generated waste can be received at a recycling or disposal site, in accordance with the approval for the recycling or disposal site.
(the) Site	(the) W12A Landfill.
Site Life	The period of time during which the W12A Landfill can continue to accept wastes.
Stormwater Management System	An engineered system to manage/control the quantity and/or quality of stormwater runoff from the site, typically consisting of ditches and ponds that discharge to the natural environment.
Surface Water	Water on top of or flowing across the ground surface, i.e., lakes, rivers, ditches.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Term	Definition
Terms of Reference	A document prepared by the proponent and submitted to the Ministry of Environment, Conservation and Parks for approval. The Terms of Reference (ToR) document sets out the framework for the planning and decision-making process to be followed by the proponent during the preparation of an EA. In other words, it is the City of London's (the proponent's) work plan for what is going to be studied. If approved, the EA must be prepared according to this ToR. The ToR also provides the framework for evaluating the EA.
(the) Undertaking	The activities associated with the EA for the proposed expansion of the W12A Landfill, as described in the ToR. Also referred to as the 'project'.
Waste Generation Rate	The quantity of waste generated by an individual(s) on a daily or annual basis, typically described in tonnes (or kilograms) per person per year.
Waste Management Community Liaison Committee	A group established specifically for this project with the objective of ensuring the diverse interests of multiple stakeholders are equally and adequately represented throughout the EA process.

This page was left blank intentionally.

1.0 Introduction

This document is the environmental assessment study report (EASR) for the environmental assessment (EA) of the proposed expansion of the W12A Landfill site (the Project) being undertaken by the City of London (the City). This is an individual EA completed under the provincial *Environmental Assessment Act* (EAA). This EA was prepared following the 2014 *Code of Practice for Preparing and Reviewing Environmental Assessments* in Ontario (MOECC 2014). This EA has been completed following the approved Amended Terms of Reference (ToR) as required by subsection 6.1(1) of the EAA, and in accordance with the requirements of subsection 6.1(2) of the EAA and will be submitted to the Ministry of Environment, Conservation and Parks (MECP).

An EA is a planning study that assesses environmental effects and advantages and disadvantages of a proposed undertaking. The environment is considered in broad terms to include the natural, social, cultural, and economic aspects of the environment. The first step in the individual EA process is to develop a ToR, which provides the framework for the preparation of the EA. A ToR was developed by the City, submitted to the MECP and approved by the MECP (Minister) on July 30, 2019. An overview of the entire ToR development and approval process is provided in Section 2.2 of this EASR, as well as in Section 2.0 of the approved Amended ToR. A study known as the *W12A Landfill Area Plan* (IBI Group, 2008) commenced in 2005 to study the evolution of the W12A Landfill facility towards an integrated waste management centre, including both the landfill site itself and the land areas adjoining the landfill site within a core study area bounded by White Oak Road and Wellington Road South on the west and east, respectively, and by Scotland Drive and Manning Drive on the north and south, respectively, covering a total area of 397 hectare (ha). This study included seven 'Alternatives To' for management of residual waste generated by the City. As a part of the ToR development, the *W12A Landfill Area Plan* and its assessment of 'Alternatives To' the undertaking were described. This assessment is described in detail in Section 4.0 of the approved Amended ToR, which is provided in Volume II of the EASR.

Consultation was an important component for the development of the ToR. The City has developed a Consultation Plan (referred to by the City as a Community Engagement Program) as part of the ToR to be considered throughout the EA process. The key vehicles in the Community Engagement Program that were used to engage the public and the other stakeholders and elicit feedback were open houses, the establishment of the Waste Management Community Liaison Committee (CLC), the use of three City Advisory Committees, the establishment of a Waste Management Working Group (comprised of elected officials), the existing W12A Landfill Public Liaison Committee (PLC), on-going engagement of Indigenous Communities, letter/email correspondence, the City's Residual Waste Disposal Strategy website (the EA Website), newspaper and social media advertisements and the public processes available through local government (Civic Works Committee and Council)

It is noted that the Waste Management CLC is a liaison committee whose purpose is to ensure that the diverse interests of multiple stakeholders are equally and adequately

represented through diversification in membership throughout the ToR process by encouraging the participation of key individuals representing specific stakeholder groups.

Two public open house meetings were hosted by the City as part of the consultation process for the development of the ToR. A draft ToR was submitted to the MECP and interested stakeholders followed by a proposed ToR submitted to the MECP for review on October 12, 2018. The proposed ToR was amended February 7, 2019, based on comments received as part of the MECP review process and agency and public comment on the proposed ToR, and the Amended ToR was approved by the Minister July 30, 2019. The engagement of the public, Indigenous Communities, and other local stakeholders, and the ongoing communication about the Project has continued throughout the EA process. Two public open house meetings were hosted by the City as part of the consultation process for the EA. Additional details are provided in Section 4.0 of this report.

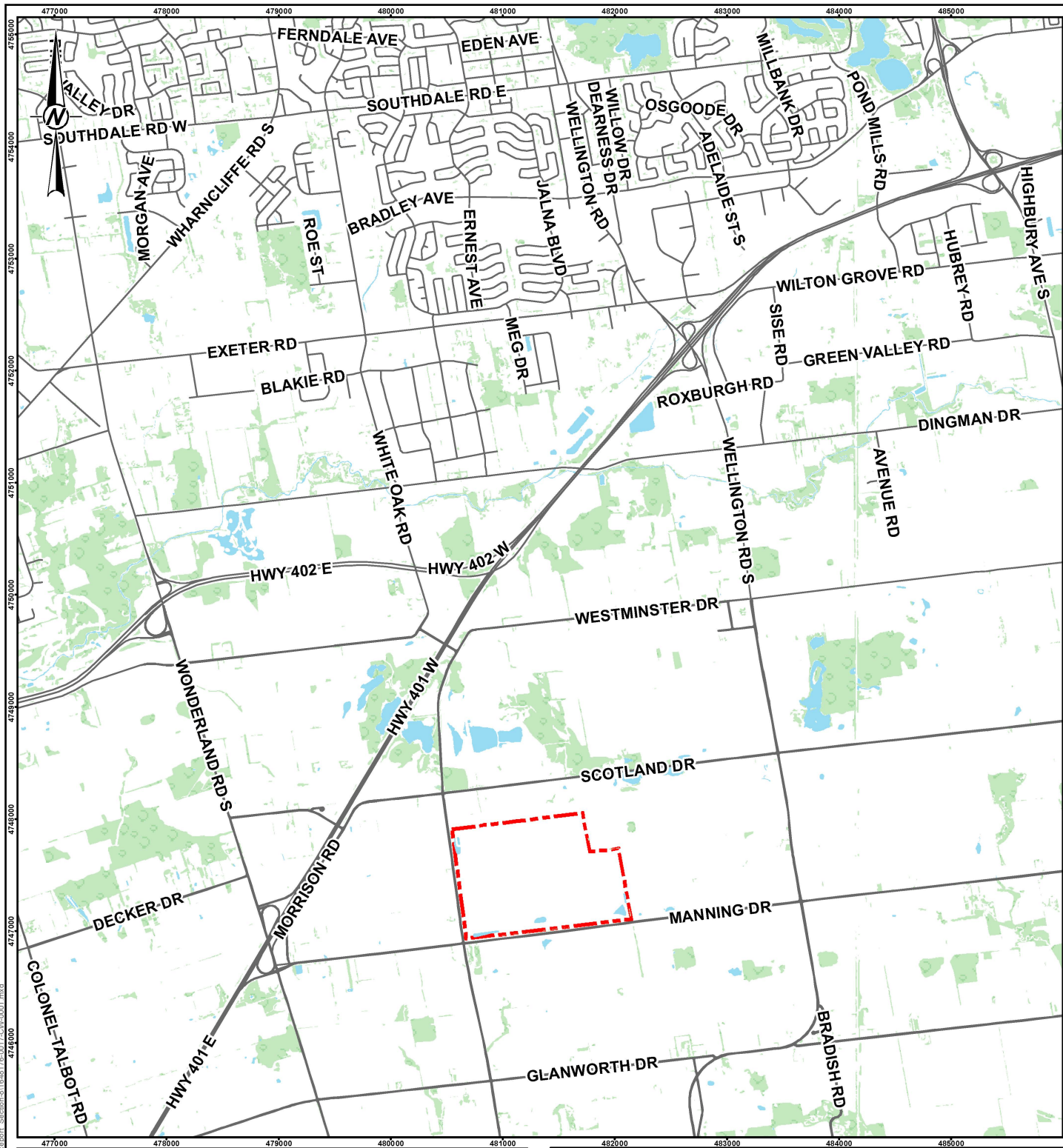
The following sections identify the proponent and describe the site, the need for the Project and the purpose of the Project. They also provide an overview of the history of the Project, along with the development of the ToR, and the scope of approvals being sought. An outline of the entire EASR is provided in Section 2.7.2 of this report.

1.1 Description of the Existing Landfill

The W12A Landfill is located at 3502 Manning Drive in the south end of the City of London, Ontario, as shown in Figure 1.1-1. The site is currently approved to accept waste from the following existing service area:

- Solid non-hazardous waste, generated from only the following areas:
 - The geographic boundaries of the City of London;
 - The geographic boundaries of the Municipality of Thames Centre;
 - Lake Huron Water Treatment Plant located at 71155 Bluewater Highway, Municipality of South Huron;
 - Elgin Area Water Treatment Plant located at 43665 Dexter Line, Municipality of Central Elgin; and
 - TRY Recycling Plants located at 21462 and 21463 Clarke Road, Municipality of Middlesex Centre.
- Municipal Hazardous or Special Waste (MHSW) from residents and small quantity generators (businesses with limited amounts of MHSW) from the following areas:
 - The geographic boundaries of the City of London;
 - The geographic boundaries of the County of Middlesex; and
 - The geographic boundaries of the County of Elgin.

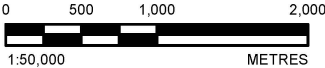
Solid, non-hazardous waste is disposed at the site while the MHSW was sent to over a dozen licensed facilities in Canada and USA for recycling, reuse or disposal in 2020.



LEGEND



EXISTING W12A LANDFILL SITE BOUNDARY



REFERENCE(S)

- 1. SERVICE LAYER CREDITS:
- 2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
- COORDINATE SYSTEM: MTM ZONE 9 VERTICAL DATUM: CGVD28

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL
EXPANSION

TITLE
KEY PLAN

CONSULTANT



YYYY-MM-DD	2020-09-08
DESIGNED	---
PREPARED	JEM
REVIEWED	TG
APPROVED	PAS

PROJECT NO.
1648176

CONTROL
0005

REV.
0

FIGURE
1.1-1

Path: N:\Active\Spatial_1648176\CityofLondon\Sites_W12A\99_PROJ\1648176\405_PROJ\0017_EA\Report_Section\81648176-0017-CW-0001.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

The City owns a number of properties adjacent to and near the W12A Landfill as depicted in Figure 1.1-2. This figure also shows the boundary of the Waste Management Resource Recovery Area, which is an area identified in the City's Official Plan for future waste management facilities and activities including landfilling.

1.2 Identification of Proponent

The City is the proponent for the proposed Project. The City is located in southern Ontario and has a total area of approximately 421 square kilometres (km²) with a 2016 population of 383,822. The contacts for this Project are as follows:

Jay Stanford, M.A., M.P.A.

Director - Environment, Fleet and Solid Waste

Phone: (519) 661-2489 ext. 5411

Fax: (519) 661-2354

E-mail: jstanfor@london.ca

Michael Losee, B.Sc.

Division Manager, Solid Waste Management

Phone: (519) 661-2489 ext. 7369

Fax: (519) 661-2354

E-mail: mlosee@london.ca

Mailing Address for the above staff is:

Corporation of the City of London

Solid Waste Management Division, 8th Floor

300 Dufferin Avenue, P.O. Box 5035

London, ON N6A 4L9

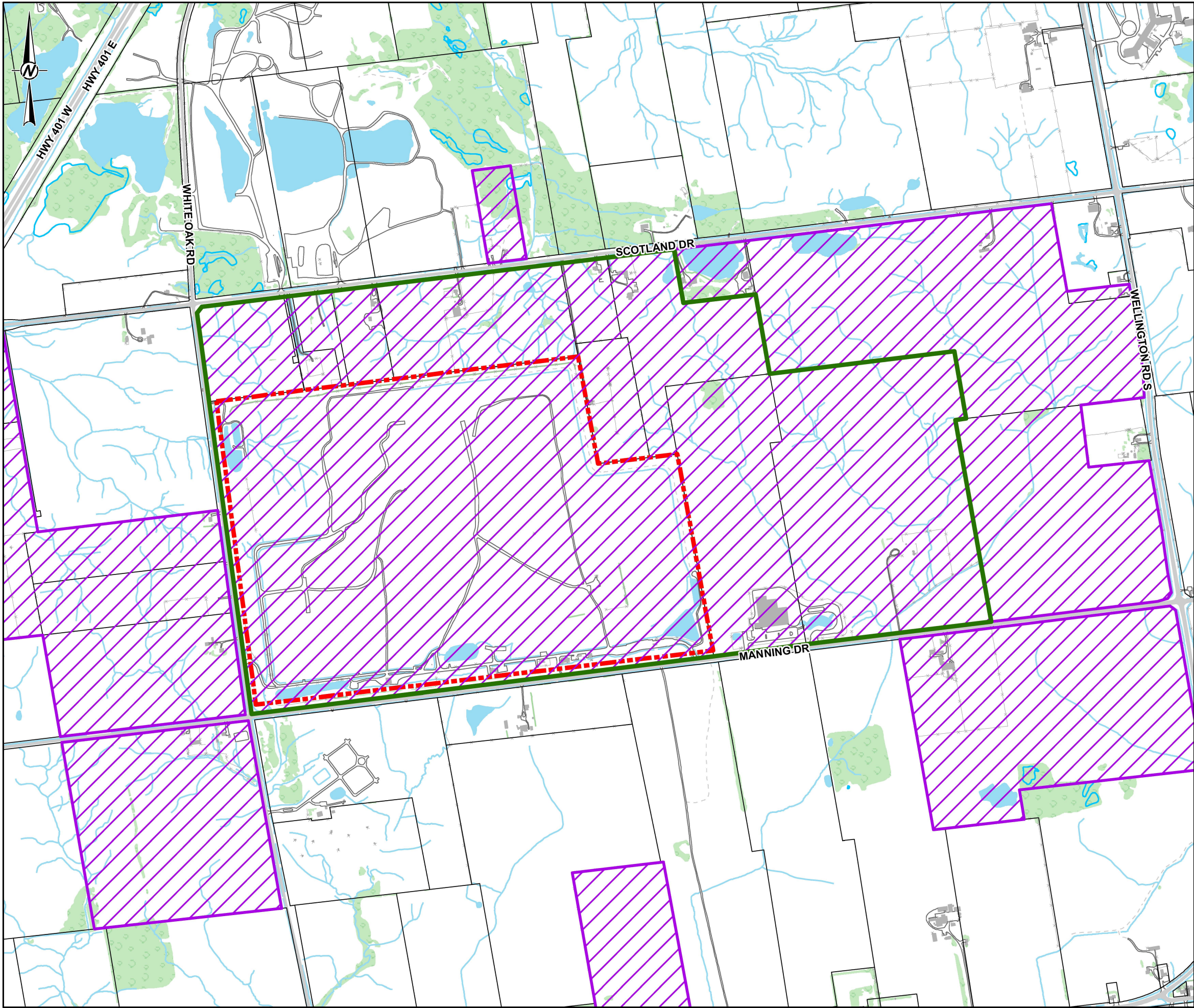
1.3 Landfill Site History and Landfill Components

1.3.1 Background

In 1969, the City commissioned James F. MacLaren Limited to develop a long-term solid waste disposal plan. The results of the study are contained in the report entitled *Report on Solid Waste Disposal for the City of London* (October 1970). The report recommended that the City proceed with the necessary approvals, detailed design and land acquisition for the development of a new landfill (referred to as W12) to be located on part of Lots 18, 19 and 20 of Concession 5 in the former Township of Westminster.

During site investigations, it was determined that the geological setting of W12 was not suitable for a landfill because a geological spillway feature containing granular soils traversed the silty clay soils that are generally predominant at surface in the area. It was also determined that the area south of W12 had thick deposits of silty clay from surface. As a result, the location of the proposed landfill was changed to the area referred to as W12A located on part of Lots 18, 19 and 20 of Concession 6 in the former Township of Westminster.

In April 1973, the City filed an application for a Certificate of Approval (C of A), (now referred to as an Environmental Compliance Approval (ECA)), for a Waste Disposal Site to the MECP for the W12A Landfill. Subsequently, the Environmental Hearing Board held a public hearing in the former Township of Westminster from July 30, 1973 to August 3, 1973 to review the application for the W12A Landfill. The Environmental Hearing approved the application.



LEGEND

- WATERCOURSE
- DRIVEWAY
- FENCELINE
- TRAIL
- BUILDING FOOTPRINT
- WOODED AREA
- WATERBODY
- CITY OWNED PROPERTY
- WASTE MANAGEMENT RESOURCE RECOVERY AREA BOUNDARY
- EXISTING W12A LANDFILL SITE BOUNDARY

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



CLIENT CORPORATION OF THE CITY OF LONDON		
PROJECT INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION		
TITLE SITE PLAN		
CONSULTANT	YYYY-MM-DD	2020-09-08
	DESIGNED	---
	PREPARED	JEM
	REVIEWED	TG
	APPROVED	PAS
PROJECT NO. 1648176	CONTROL 0017	REV. 0
		FIGURE 1.1-2

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

On November 13, 1973, the MECP issued a Provisional C of A (#A042102) for the W12A Landfill. The C of A did not permit the disposal of waste until final design plans and specifications were submitted and approved by the MECP.

In 1974, the Ontario Municipal Board (OMB) held a public hearing to address planning issues related to the establishment of a new landfill. As a result of the hearing, the OMB issued an order in January 1975 authorizing the City to acquire the necessary lands to create the W12A Landfill and spend the necessary funds to construct the new landfill. The OMB also directed the former Township of Westminster to amend its zoning by-law and any other necessary by-laws to permit landfilling in the lands referred to as the W12A Landfill.

In 1976, the final design plans and specifications for the W12A Landfill were submitted to the MECP. The original site design consisted of 14 cells covering 107 ha, five stormwater management (SWM) ponds, the use of berms and trees to provide screening, a perimeter leachate collection system (LCS) and a surface water and groundwater monitoring program. On August 16, 1976 the MECP re-issued C of A #A042102 for the W12A Landfill to permit the disposal of waste in accordance with the submitted plans.

Since 1976, the C of A or ECA has been re-issued or amended sixteen times to permit changes in the operation of the landfill. These changes have included refinement of the environmental monitoring programs, requirement for an annual report, approval of a household special waste (HSW) facility, various design changes and infrastructure upgrades and an expansion of the service area from which waste can be received.

Waste was first disposed of in the landfill during the summer of 1977. At this time, the landfill accepted non-hazardous solid waste generated from within the boundaries of London.

In 1999, the City received approval to establish a HSW depot at the landfill to accept MHSW from residents and small quantity generators from within the geographic boundaries of London and the County of Middlesex for transfer to appropriate recycling/processing facilities.

Several major engineering upgrades were approved in 2002 including approval for a full underdrain LCS and a landfill gas (LFG) collection system. The full underdrain LCS was approved for the western portion of the landfill that had not already received waste (approximately 47 ha) and is referred to as Phase 2 of the landfill. The eastern portion of the landfill with the originally approved perimeter drain LCS (approximately 60 ha) is referred to as Phase 1 of the landfill.

In 2015, an Environmental Screening was completed as per *Ontario Regulation (O. Reg.) 101/07* (under the EAA) to expand the service area of the site to include the following locations and types of waste:

- Lake Huron Water Treatment Plant (water treatment plant residuals);
- Elgin Area Water Treatment Plant (water treatment plant residuals);
- TRY Recycling's Clarke Road facility (construction, renovation and demolition (CR&D) recycling process residuals and residential garbage);

- Thames Centre (municipal non-hazardous waste); and
- Elgin County (MHSW).

An Environmental Screening Report was submitted to the MECP and an amendment to the ECA for the landfill was obtained on May 16, 2016. The expanded service area did not change the approved fill rate (amount of waste the landfill can receive in a year) or the types of waste that can be accepted.

1.3.2 Landfill Components

The W12A Landfill site has a 107 ha fill area and is located on a 142 ha property.

As described in Section 1.3.1, waste disposal at the W12A Landfill commenced in 1977. Over the first 25 years of operation, approximately 5 million tonnes of waste were deposited at the W12A Landfill in the first six cells that comprise Phase 1. These Phase 1 cells cover 59.3 ha and occupy the eastern portion of the landfill footprint (see Figure 1.3-1). The Phase 1 cells are labelled Cells 1, 2, 3, 4, 5 East and 5 West on Figure 1.3-1. Landfilling in Phase 1 is complete. A soil final cover was constructed after completion of waste placement in Phase 1 to the approved final contours and a LFG extraction well system installed.

The remainder of the landfill covers 47.7 ha and has been designed to accommodate approximately another 5.5 million tonnes. The area is referred to as Phase 2 as shown on Figure 1.3-1. Phase 2 is divided into eight cells labelled on Figure 1.3-1 as Cells 6 South South Half, South North Half, North South Half and North North Half, and Cells 7 through 10. Cells 6, 7 and 8 have been filled and landfilling is currently ongoing in Cell 9; construction of Cell 10 is underway in 2020. Phase 2 of the landfill includes a full underdrain LCS that was approved in 2002. Several other engineering upgrades were also approved in 2002 including a LFG collection system and SWM pond upgrades.

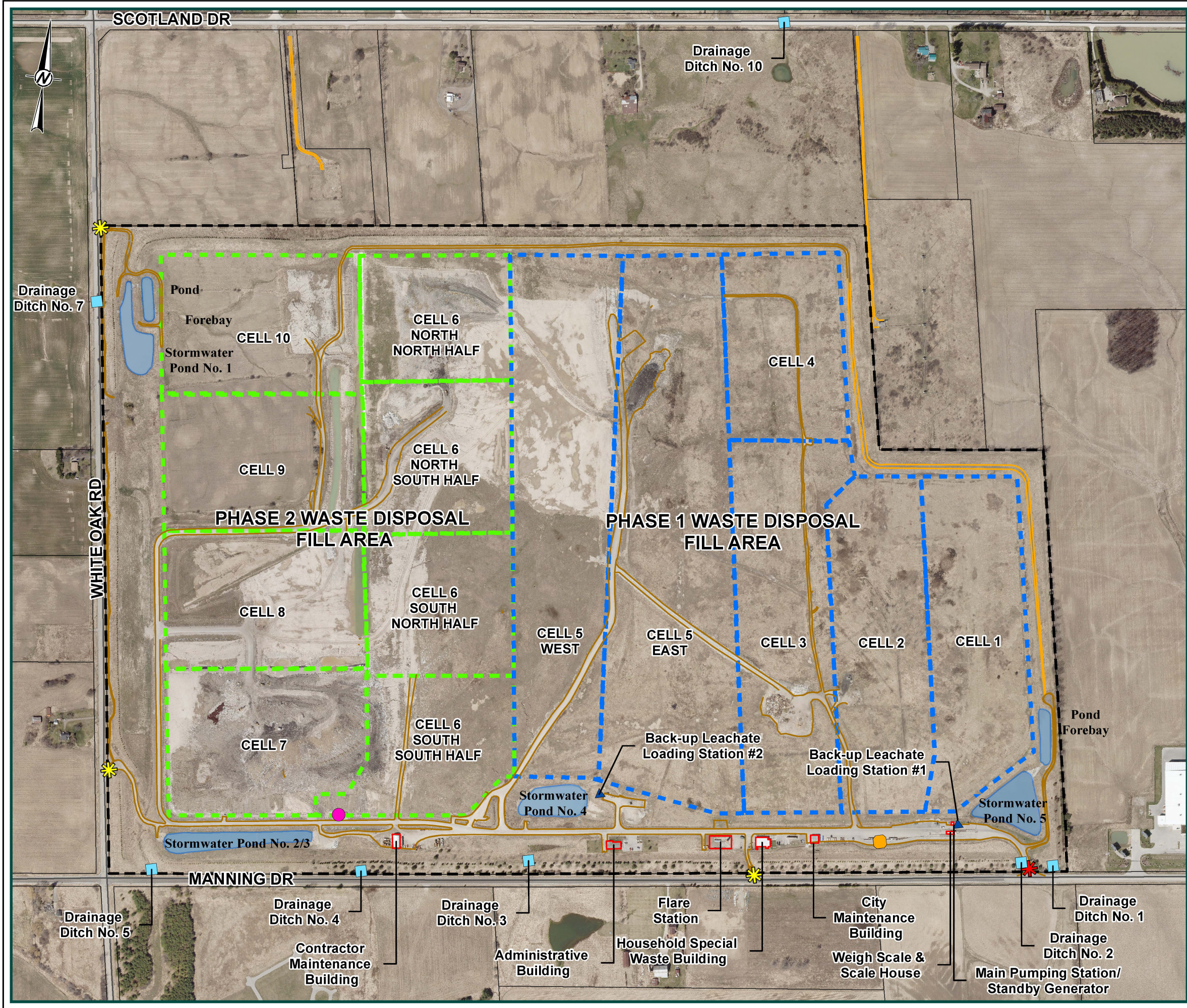
The current waste disposal ECA for the site (#A042102) permits annual disposal of 650,000 tonnes of waste, noting that over the past 10 years the site typically receives between 230,000 and 320,000 tonnes of waste per year. Information on the types and quantities of waste that have historically been received at the W12A Landfill are presented in Volume III, Appendix C – 2019 “Updated Residual Waste Projections and Landfill Capacity Assessment” (City of London, 2019).

The total approved airspace of the W12A Landfill (i.e., to hold garbage and daily cover) for the current site is 12,500,000 cubic metres (m³). As of January 2020, the remaining approved airspace in Phase 2 is approximately 1.5 million m³, which is equivalent to approximately 1.26 million tonnes of disposal capacity for waste and daily cover.

More details regarding the existing landfill are provided in Section 5.13.

1.3.3 Current Landfill Performance

The W12A Landfill has had groundwater, surface water, leachate, water well and LFG monitoring programs since it opened in 1976. The following outlines the results from these monitoring programs for 2019.



LEGEND

LANDFILL SITE ENTRANCE

LANDFILL SITE SECONDARY ENTRANCE

PUBLIC DROP OFF AREA

MH 701 PUMPING STATION/STANDBY GENERATOR

LEACHATE STORAGE

DRAINAGE DITCH

LANDFILL ACCESS ROADS

MONITORING ACCESS ROADS

PHASE 1 WASTE DISPOSAL FILL AREA (59.3 HA)

PHASE 2 WASTE DISPOSAL FILL AREA (47.7 HA)

PROPERTY INFORMATION

EXISTING W12A LANDFILL

STORMWATER PONDS/FOREBAY

BUILDINGS

REFERENCE(S)

1. DATA PROVIDED BY THE CITY OF LONDON

2. CITY OF LONDON AERIAL PHOTOGRAPHY, APRIL 2016

3. SITE FEATURES PREPARED BY CALLON DIETZ INC. LTD., OCTOBER 19, 2016.

4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83

COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28



CLIENT			
CORPORATION OF THE CITY OF LONDON			
PROJECT			
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION			
TITLE			
EXISTING LANDFILL SITE DEVELOPMENT PLAN			
CONSULTANT			
		YYYY-MM-DD	2020-09-08
		DESIGNED	----
		PREPARED	JEM
		REVIEWED	TG
		APPROVED	PAS
PROJECT NO.	CONTROL	REV.	FIGURE
1648176	0017	0	1.3-1

Path: N:\Active\Spatial_MCH\Hydro\London\Site_W12A\08_PROJ\1648176\0_PROJ\00017_EA-Report_Section-8\1648176-017-CN-0003.mxd

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

1.3.3.1 Groundwater Monitoring

There are two aquifers below the W12A Landfill - the Upper Aquifer and the White Oak Aquifer. The groundwater monitoring program includes sampling 25 monitoring wells both downgradient and upgradient of the landfill (in terms of groundwater flow direction) in the Upper Aquifer and the White Oak Aquifer for a wide range of parameters. The test results from 2019 indicate no impacts on the Upper Aquifer or White Oak Aquifer from the W12A Landfill.

Chloride has been identified as the “critical” contaminant (i.e., the parameter that engineering controls and monitoring programs are based on) because it is the only parameter expected to be detected in the downgradient monitoring wells at elevated levels based on historical contaminant transport modelling. For this reason, the trigger mechanism for implementation of contingency measures to prevent off-site groundwater impacts is based on chloride concentration levels. There has been no increase in downgradient chloride concentrations as a result of operation of the existing landfill.

1.3.3.2 Surface Water Monitoring

Surface water is monitored at six surface water sampling stations (located within the ditches surrounding the landfill). There are four critical contaminants with respect to surface water: un-ionized ammonia, biological oxygen demand, chloride and sulphate. In 2019, there were no exceedances of the trigger concentrations for the critical contaminants.

The City also undertakes sampling directly from the SWM ponds that receive runoff from areas that have been landfilled (Ponds 1, 2/3, 4 and 5). In 2019, none of the samples collected from the SWM ponds exceeded trigger concentrations for the critical contaminants.

1.3.3.3 Water Well Monitoring

The two aquifers below the landfill (the Upper Aquifer and the White Oak Aquifer) are both used as sources of drinking water in the surrounding area. Sampling for the purpose of monitoring the off-site water supply wells is conducted at 1 water well that terminates in the Upper Aquifer and 13 water wells that terminate in the White Oak Aquifer (all wells are down-gradient or cross-gradient from the landfill). Indicator parameters are tested annually. Heavy metals are analyzed on a 3-year cycle with the most recent testing occurring in 2017. The next testing is scheduled for 2020.

The results from 2019 indicated all wells had indicator parameter concentrations below the Reasonable Use Criteria (MOE, 1994). Most wells in the White Oak Aquifer continue to have high iron levels, which have been encountered in private water wells since monitoring began in 1976. Recent iron levels are similar to historical levels. The monitoring results show that the W12A Landfill is not affecting off-site water well quality.

1.3.3.4 LFG Monitoring

The LFG monitoring program consists of:

- continuous air quality monitoring for methane, oxygen and hydrogen sulphate in all on-site buildings;
- periodic testing of LFG, collected at the LFG flare inlet, to determine its composition; and

- periodic monitoring of two LFG monitoring wells installed in the buffer area of the landfill. These monitoring wells were installed at the property boundary opposite the two closest off-site buildings to the waste footprint. Three monitoring events occurred for 2019.

Monitoring of the buildings has never encountered elevated levels of methane or hydrogen sulphate or low levels of oxygen.

No testing of the LFG composition was completed in 2019. Historical testing of the LFG quality has found the LFG to be typical of other landfills with methane ranging from 55% to 60% and carbon dioxide between 40% and 45%, with trace amounts of a few non-methane organic compounds.

Testing of the LFG monitoring wells in 2019 found that the average methane levels were always less than 250 parts per million in both monitoring wells for all sampling events, indicating that LFG is not migrating off-site through the subsurface.

In summary, the landfill monitoring programs indicate that the landfill is performing acceptably and in accordance with provincial requirements in terms of potential effects of leachate on groundwater and surface water, as well as in terms of LFG migration in the subsurface.

1.3.3.5 Leachate Collection

The amount of leachate that is captured has generally increased over the years as the size of the waste footprint has increased. Approximately 174,000 m³ of leachate was captured and pumped for off-site treatment in 2019.

Leachate generation has been previously estimated to be approximately 165,000 m³ per year when the entire landfill footprint has been developed and capped as determined in the *Hydraulic Evaluation of Landfill Performance (HELP) Modeling* (Dillion Consulting, 2012). As part of this EA additional HELP modelling will be conducted.

1.3.3.6 Landfill Gas Collection

The amount of LFG that is captured has generally increased over the years as new LFG wells were installed as the waste footprint increased. In 2019, an average of approximately 1,200 standard cubic feet per minute (scfm) of LFG was captured and flared. Since October 2020, approximately 1,700 scfm of LFG has been captured and flared.

2.0 Overview of the Environmental Assessment Process, the Project and Environmental Assessment Study Report

2.1 Purpose of the Proposed Undertaking

In the City more than one tonne of waste is produced per person each year. This includes both waste generated in residences as well as waste generated by businesses, institutions, and the construction, renovation and demolition sector. Waste is diverted from disposal through numerous waste reduction, reuse, recycling, composting and recovery initiatives that have been implemented by the City and by private and institutional sectors; however, there is still a quantity of waste produced that is not diverted and requires disposal. Waste that cannot be reduced, reused, recycled or composted is considered residual waste.

The residual waste created in London from residences and some businesses is currently disposed of at the City's W12A Landfill. Some of the City's business waste is taken to landfills located outside the City for disposal. At the current disposal rates, this landfill is expected to reach its currently approved capacity by 2024.

To plan for the future, the City has commenced the development of two long-term waste management strategies: the Resource Recovery Strategy, and the Residual Waste Disposal Strategy. The Resource Recovery Strategy involves the development of a plan to maximize waste reduction, reuse, recycling, resource recovery, energy recovery and/or waste conversion in an economically viable and environmentally responsible manner. The current residential diversion rate is 45% with the latest comprehensive assessment of existing diversion programs and proposed diversion program enhancements provided in The Road to Increased Resource Recovery and Zero Waste (Road Map 2.0). The only significant diversion component that remains undecided and unimplemented is a residential organics management program. The Resource Recovery Strategy is scheduled to be completed in early 2022.

As an interim step, in 2018 the City completed the 60% Waste Diversion Action Plan that includes the development of programs and an implementation schedule for specific activities to increase the City's diversion rate to 60% for residential waste. The 60% Waste Diversion Action Plan was approved by City Council in October 2018. Funding for the 60% Waste Diversion Action Plan was approved on March 2, 2020 as part of City's multi-year budget approval process. Due to the COVID-19 pandemic, Council approved on November 24, 2020 a revised timeline for implementing the 21 actions of the plan (i.e., between a 9 month and 1 year delay).

The Residual Waste Disposal Strategy involves the development of a long-term plan to manage residual waste, which will require obtaining additional residual disposal capacity. Several ways of satisfying this need have been assessed (referred to as 'Alternatives To' the undertaking). The assessment of these 'Alternatives To' is described in Section 4 of the approved Amended ToR and summarized in Section 2.5 of this EASR. The preferred 'Alternative To' included the expansion of the W12A Landfill.

The expansion of the W12A Landfill requires an EA and approval from the Minister of the Environment, Conservation and Parks for Ontario, pursuant to the Ontario EAA. The purpose of the EA is to obtain approval for expansion of the W12A Landfill.

One of the City's responsibilities as an Ontario municipality is to provide residual waste disposal service to its taxpayers. If the W12A Landfill is allowed to reach its currently approved capacity and other possible means of providing disposal service are not pursued by the City, then they will not be able to fulfill this obligation. Because the W12A Landfill is expected to reach its approved capacity by 2024, the City commenced this EA process in 2017 to allow adequate time for completion of both the required approvals and the implementation of the landfill expansion to be available to receive waste from its existing service area prior to the current remaining disposal capacity being consumed.

This EASR is being submitted to the MECP for approval as an individual EA under the EAA. Through completion of this EA, the City will be able to achieve its primary objective of providing the long-term preferred solution for residual waste disposal for the City. The City has reviewed the purpose of this EA throughout the EA process. The purpose has not changed from that discussed in the approved Amended ToR.

The purpose of the EA study is to seek approval for additional waste disposal capacity because the existing W12A landfill is reaching its approved total disposal capacity by 2024.

2.2 Approval of the Amended Terms of Reference

The City prepared the ToR for the proposed expansion of the W12A Landfill following the *Code of Practice – Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario* (ToR Code of Practice; MOECC, 2014). The ToR was submitted to the Minister on October 12, 2018 and revised through the submission of an amended ToR dated February 7, 2019.

As noted in the approved Amended ToR, the City commits to preparing and submitting an EA to the MECP for review and approval in accordance with the approved Amended ToR as required by subsection 6.1(1) of the EAA, and in accordance with the requirements of subsection 6.1(2) of the EAA. The Amended ToR also includes 20 other commitments.

The subsections that will be addressed by the EA are listed in Table 2.7-1. The exceptions are subsections 6.1(2)(b)(iii) and 6.1(2)(d), which describe and provide the rationale for the 'Alternatives To' the undertaking and advantages and disadvantages of the 'Alternatives To'. The 'Alternatives To' requirement is addressed in Section 4.0 of the approved Amended ToR.

2.3 Updated Resource Recovery Strategy

As previously discussed, to plan for the future the City has started development of a long term Resource Recovery Strategy. The Resource Recovery Strategy involves the development of a plan to maximize waste reduction, reuse, recycling and resource recovery in an economically viable and environmentally responsible manner.

The Resource Recovery Strategy is scheduled to be completed in early 2022. The Resource Recovery Strategy will look at opportunities for advanced resource recovery and increased

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

waste diversion through new, emerging and next generation technologies and where these technologies may play a role in London and area.

As an interim step, the City has completed the 60% Waste Diversion Action Plan, which includes the development of programs and an implementation schedule for specific activities to increase the City's residential diversion rate to 60% by the end of 2022. City Council approved the Action Plan in October 2018. As previously noted, budget was approved in March 2020 and due to the pandemic a revised timeline was approved in November 2020.

Based on current analysis and feedback, the initiatives and programs expected to be implemented to achieve 60% diversion are summarized in Table 2.3-1.

Table 2.3-1: Potential 60% Diversion Plan

Component	Diversion Rate	Comment
Existing Diversion	45%	Full details of programs in Table 3.3-1 of the approved Amended ToR, Volume II
Blue Box Recycling Programs	2%	Increase in capture rate of existing materials
New Recycling Programs and Initiatives	0.6%	New programs for scrap metal, textiles and bulk items.
Curbside Organics Management Program	10%	10% diversion anticipated based on a curbside source separation (green bin) program
Multi-Residential Organics Management Pilot Program	0.6%	0.6% diversion anticipated from pilot program for mixed waste processing at multi-residential buildings
Other Organic Management Program	0.4%	Driven by education and awareness
Waste Reduction, Reuse Initiatives and Policies	1.4%	Reduction, more recycling, etc.
Total Diversion Rate	60%	

2.4 Updated Service Area

2.4.1 Existing Service Area

The W12A Landfill is approved by the MECP to accept:

- Solid, non-hazardous waste for disposal from London, Thames Centre and three service points (Lake Huron Primary Water Treatment Plant, Elgin Area Water Treatment Plant and Try Recycling Facilities on Clarke Road just north of the City); and,
- MHSW from London, Middlesex County and Elgin County at the HSW Depot located at the W12A Landfill for transfer to appropriate recycling/processing sites.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

The location of the W12A Landfill and its approved service area (area from which it can accept materials) is shown in Volume III, Appendix C, Figure 2.

Section 3 of Volume III, Appendix C describes the different types of waste from the existing service area of the W12A Landfill. This includes waste that the City is responsible for as well as waste not controlled by the City but accepted at its landfill for disposal. Current and future generation, diversion and disposal rates were developed for each of the nine waste types, which consist of Residential, Industrial, commercial and institutional (IC&I), CR&D, Sewage Sludge Ash, Biosolids, Street Sweepings / Road Works, Other Municipal Operations, Water Treatment Plant Process Residuals and Contaminated Soil.

Residual waste quantity (by weight) projections were developed for the existing service area taking into account the City's population projections coupled with the projected generation and diversion rates for each of the waste types. Detailed calculations are presented in Appendix G of Volume III, Appendix C. A summary of waste generation and diversion rates used in the projecting the residual waste requirements from the existing service area over the 25 year planning period are provided in Table 2.4-1.

Table 2.4-1: Summary of Waste Generation and Diversion Rates for Existing Service Area

Waste Type	2018 Generation Rate (kg/person)	Diversion Rate in 2018	Diversion Rate Expected in 2025	Diversion Rate Expected in 2030	Diversion Rate Expected in 2050	Comments
Residential	400	45%	60%	60%	60%	Reach 60% by end of 2022
IC&I	420	20%	25%	30%	50%	No export by 2025
CR&D	340	55%	55%	55%	55%	No export by 2025
Sewage Sludge Ash	13	-	-	-	-	
Biosolids	13	-	-	-	-	
Street Sweepings	120	50%	50%	50%	50%	50% used as cover
Other Municipal	22	-	-	-	-	
Water Treatment Plant Residuals	30	-	-	-	-	
Contaminated Soil	48	60%	60%	60%	60%	60% used as cover
Total	1406					

A summary of the projected residual waste generation from the existing service area is provided in Table 2.4-2. It is projected that the expanded W12A landfill will require disposal capacity for 9,400,000 tonnes of waste over the 25 year planning period.

Table 2.4-2: Residual Waste Generation Projections (Weight) for Existing Service Area

Year		Quantity (tonnes) Annual	Quantity (tonnes) Running Total	Quantity (tonnes) Running Total After 2023
2019	-	289,000	-	-
2024	0	362,000	2,000,000	362,000
2028	5	371,000	3,400,000	1,800,000
2033	10	377,000	5,200,000	3,700,000
2038	15	378,000	7,200,000	5,600,000
2043	20	380,000	9,200,000	7,500,000
2048	25	380,000	11,000,000	9,400,000

2.4.2 Proposed Regional Service Area

In addition to seeking approval to expand the W12A Landfill, the City is also seeking approval to establish a regional service area for the W12A Landfill. The benefits of a regional service area include: consistency with the *Strategy for Waste-Free Ontario*; addressing a portion of the provincial shortfall in disposal capacity; providing a public disposal option for nearby organizations and municipalities; providing the opportunity for some neighbouring municipalities to close existing, smaller landfill sites that may not be able to meet the cost impacts of increasingly more stringent environmental controls, ensuring that competitive waste disposal pricing is available for municipalities; and providing a financial benefit to the City.

In the fall of 2017, during the ToR preparation, the City approached nearby lower and upper tier municipalities to determine their interest in being included in the service area of the W12A Landfill. Municipalities that expressed an interest in using the W12A Landfill were included in the proposed regional service area. The correspondence sent to municipalities asking about their interest in being included in a regional service area and their responses are provided in Volume III Appendix C. Based on their responses, a service area consisting of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County was proposed. The population of Elgin, Middlesex, Huron, Lambton and Perth Counties (including separated cities) is approximately 420,000. The proposed service area is shown in Volume III, Appendix C, Figure 3.

In September 2019, the City contacted municipalities who had previously expressed an interest in using the W12A Landfill to re-confirm their earlier interest. All municipalities confirmed their interest in being included in the service area of the W12A Landfill; therefore, no changes to the proposed regional service area are proposed.

In 2017, there were approximately 185,000 households in the proposed regional service area municipalities, who annually disposed of approximately 86,000 tonnes of residual waste and had an overall residential diversion rate of 38%.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

A detailed analysis of the amount of waste that could come to the W12A Landfill from the proposed regional service area is presented in Volume III Appendix C and summarized below:

- The previously estimated residential residual waste quantities for each municipality in the proposed regional service area were updated with data from the 2017 Resource Productivity and Resource Authority (RPRA) Datacall and are presented in Table 2.4-3.
- IC&I waste quantities were assumed to be equal to residential waste quantities as there is limited public data on IC&I residual waste quantities within the proposed regional service area. It is noted that the Province as a whole generates more IC&I residual waste than residential residual waste.
- It was assumed that there is no increase in population or per capita waste generation rate in the future.
- Information on the operating landfills within the proposed regional service area was confirmed. Three landfills closed in 2018. The remaining site life of the 21 operating landfills (see Table 2.4-4) within the proposed regional study area were obtained from public sources (e.g., MECP, annual report, website, etc.) or by contacting the owner of the landfill.
- Disposal locations for municipalities in the expanded service area were updated. The three landfills that closed serviced four municipalities, which had to find new disposal locations.
- It was assumed larger landfills within the expanded service area (Twin Creeks Landfill and City of Stratford Landfill) would be expanded when their current capacity is exhausted and therefore no waste would come to the W12A Landfill from municipalities using these landfills.
- It was assumed that the St. Marys Landfill that is currently going through an EA will be expanded and therefore no waste would come to the W12A Landfill from St. Marys.
- It was assumed that the Green Lane Landfill owned by the City of Toronto will continue to accept waste from local municipalities until the current capacity is exhausted and then close.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Table 2.4-3: Residential Residual Waste Quantities from Proposed Regional Service Area Municipalities

Municipality	Expressed Interest in Using W12A Landfill ^a	Residential Residual Waste ^b (2017, tonnes)	Residential Waste Diverted ^b (2017, tonnes)	Total (tonnes)
City of St. Thomas	yes	10,179	7,672	17,851
Town of Aylmer	yes	1,916	561	2,477
Municipality of Bayham	yes	1,024	642	1,666
Municipality of CentralElgin	yes	3,383	1,070	4,453
Municipality of Dutton/Dunwich	yes	896	339	1,235
Municipality of WestElgin	yes	833	392	1,225
Township of Malahide	yes	1,614	586	2,200
Township of Southwold	No response	862	322	1,184
Municipality of AdelaideMetcalf	yes	402	256	658
Municipality of LucanBiddulph	yes	708	450	1,159
Municipality of Middlesex Centre	yes	2,366	1,505	3,870
Municipality of NorthMiddlesex	yes	924	588	1,512
Municipality of Southwest Middlesex	yes	861	619	1,480
Municipality of Strathroy-Caradoc	yes	3,258	2,072	5,330
Municipality of ThamesCentre	yes	3,344	1,150	4,494
Village of Newbury	yes	47	49	96
Township of Ashfield-Colborne-Wawanosh	yes	1,274	838	2,112
Municipality of Bluewater	yes	1,746	1,111	2,857
Municipality of CentralHuron	yes	1,473	937	2,410
Town of Goderich	yes	1,453	866	2,318
Township of Howick	yes	420	387	807
Municipality of HuronEast	yes	305	901	1,205
Municipality of Morris-Turnberry	yes	498	296	794
Township of North Huron	yes	1,126	1,431	2,557
Township of SouthHuron	yes	1,789	1,138	2,927
City of Stratford	yes	7,315	5,241	12,556
Town of St. Marys	yes	1,192	758	1,950
Municipality of NorthPerth	yes	2,058	1,309	3,367
Township of Perth East	yes	1,573	1,000	2,573

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Municipality	Expressed Interest in Using W12A Landfill^a	Residential Residual Waste^b (2017, tonnes)	Residential Waste Diverted^b (2017, tonnes)	Total (tonnes)
Township of Perth South	yes	551	351	902
Municipality of WestPerth	yes	1,348	858	2,206
Municipality of Brooke-Alvinston	yes	383	244	627
Township of Dawn-Euphemia	yes	324	207	531
Township of Enniskillen	yes	286	245	531
Municipality of LambtonShores	yes	2,701	1,718	4,418
Village of Oil Springs	yes	110	70	180
Town of Petrolia	yes	1,546	621	2,167
Town of Plympton-Wyoming	yes	1,782	556	2,338
Village of Point Edward	yes	135	223	358
City of Sarnia	yes	17,030	10,639	27,669
Township of St. Clair	yes	4,653	1,346	5,999
Township of Warwick	yes	552	351	903
Total		86,238	51,915	138,153

Notes: a) Responses from municipalities are provided in Appendix B.
b) From the Resource Productivity and Resource Authority Datacall.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Table 2.4-4: Remaining Site Life of Landfills in Proposed Regional Service Area Municipalities

Landfill	Projected Closing Date	Comment
Morris Ward Landfill	2023	
W12A Landfill	2024	
Howick Landfill	2026	
West Elgin Landfill	2026	
Kellam Road Landfill	2032	
School Road Landfill	2032	
Dawn Landfill	2034	
Twin Creeks	2034	Assume landfill is expanded in the future.
Green Lane (Toronto)	2040	
Stanley Landfill	2044	
Stratford Landfill	2047	Assume landfill is expanded in the future.
St. Marys Landfill	2058	Assume proposed 40 year expansion is approved.
Ashefield Landfill	2062	
Thames Centre Landfill	2075	
Elam Landfill	2100	
South Easthope Landfill	2100	
Mitchell Landfill	2115	
Dutton/Dunwich Landfill	2133	
Wingham Landfill	>2090	
Perth South Landfill	>2100	
South Huron Landfill	>2100	

Four waste diversion scenarios were considered ranging from no increase in waste diversion to meeting the interim waste diversion goals in Strategy for a Waste-Free Ontario. These four scenarios were: no increase in waste diversion rates; increase in diversion rates half-way towards MECP diversion targets; increase in diversion rates 75% of the way towards MECP diversion targets; and increase in diversion rates to 100% of the MECP diversion targets. These diversion targets were taken as the interim waste diversion goals from Strategy for a Waste-Free Ontario Building a Circular Economy (MECP, 2020). The resulting residual waste projections for each of these diversion scenarios are shown in Table 2.4-5 below.

Table 2.4-5: Summary of Residual Waste for Various Waste Diversion Scenarios from Proposed Regional Service Area Municipalities

Scenario	Residual Waste (millions)	Diversion Rate in 2050	Percentage of MECP goal
No increase in waste diversion rates	0.9	25%	30%
Increase in diversion rates half way towards MECP diversion targets	0.7	53%	66%
Increase in diversion rates 75% of the way towards MECP diversion targets	0.5	66%	80%
Achieve 100% of MECP diversion targets	0.4	80%	100%

Considering the above, the residual waste quantity projections from the proposed regional service area took into consideration the Provincial interim solid waste diversion goals, but for planning purposes it is reasonable to include an allowance to accommodate some additional residual waste if the interim waste diversion goals are not met.

In selecting a waste diversion rate for the purpose of estimating the total volume of residual waste from the proposed regional service area that may require disposal over the planning period, a balance must be achieved between: 1) not picking a rate that is too low and therefore having excess licensed capacity and 2) conversely not picking a waste diversion rate that is too high and therefore not having enough residual waste disposal capacity to accommodate all the waste that is generated in the future.

It is proposed that residual waste quantities from the proposed regional service area be estimated by assuming that diversion rates achieve 80% of the interim waste diversion goals in Strategy for a Waste-Free Ontario, resulting in 0.5 million tonnes of residual waste received at the W12A Landfill over the 25 year planning period.

In total, the W12A Landfill expansion will need to accommodate approximately 9.4 million tonnes from the existing service area and approximately 0.5 million tonnes from the proposed regional service area for a total of 9.9 million tonnes of disposal capacity between 2024 and 2048. The conversion of this tonnage to landfill airspace volume (cubic metres) for the expansion is described in Section 5 of Volume III, Appendix C and used in development of the 'Alternative Methods' for landfill expansion in Section 6 of the EASR.

It must be noted that having available residual waste disposal capacity for municipalities from the proposed regional service area does not mean that London is obligated to accept waste from these municipalities in the future. City Council will have the authority to determine which, if any, municipalities or businesses outside of London can use any City facilities and under what conditions they are allowed to do so. For example, the City may require municipalities and businesses to demonstrate that their diversion rate matches or exceeds the City's diversion rate to be allowed to dispose of residual waste at the W12A Landfill.

2.5 Identified ‘Alternative To’ the Undertaking

After concluding that there was a need to provide for the disposal of post-diversion residual wastes generated in London and the existing service area, as well as interest from a number of surrounding municipalities over a 25 year planning period during the ToR, the City reviewed the *W12A Area Plan* (IBI Group, 2008). The *W12A Landfill Area Plan* commenced in 2005 to study the evolution of the W12A Landfill facility towards an integrated waste management centre, including both the landfill site itself and the land areas adjoining the landfill site. In EA terminology, these different ways to satisfy the need are referred to as ‘Alternatives To’ the project. The *ToR Code of Practice* (MOECC, 2014a) defines ‘Alternatives To’ as “functionally different ways of approaching and dealing with a problem or opportunity”, and states that consideration should be given to a reasonable range of alternatives. Seven landfill evolution alternatives (‘Alternatives To’) were developed by the study team and from public input and then evaluated as part of this *W12A Landfill Area Plan* study. The seven alternatives consisted of:

- 1) Continued use of the existing landfill until its approved capacity is reached in about 2020 to 2025, and then locate a new Greenfield landfill within the municipal boundaries of the City of London;
- 2) Expand the W12A Landfill - addition of land area to increase the life of the W12A Landfill to the 40-year time horizon;
- 3) Develop an Integrated Resource Recovery Centre - support on-site recovery of materials and EFW materials brought to the site to achieve the provincial 60% diversion target and thereby extend the landfill life beyond the 40-year time horizon, by means of an expansion of the W12A Landfill;
- 4) Develop an Industrial Eco-park - capitalize on the use of both garbage and recyclables as raw materials to manufacture new products on-site, to add value to the outputs from the site operations and complete the recycling process. This would require an expansion of the W12A Landfill and add lands for resource recovery and the industrial eco-park;
- 5) Close the landfill in August 2006 - premature closure of the W12A Landfill requiring the City to export their waste temporarily, then consider a new Greenfield site within the municipal boundaries of the City of London for the next 40 years;
- 6) Export waste - continue to use the W12A Landfill until its currently approved capacity is reached in 2020 to 2025, and then establish a waste transfer station to export waste for disposal outside of the City; and
- 7) Accelerate waste diversion to maximize landfill site life - change the City’s waste management system to achieve 60% diversion by 2010 by the addition of lands and facilities to provide a full range of waste management activities including landfill, landfill expansion and resource recovery facilities including mechanical, biological and thermal waste processing. This would involve a large investment in waste and diversion activities and extend the use of the W12A Landfill beyond the 40-year time horizon by means of an expansion of the W12A Landfill.

The basic objective to be achieved by the *W12A Land Area Plan*, as reflected by the seven alternatives described above, was to evaluate the W12A Landfill and adjoining land area for long-term waste management for the City, and by doing so continue to provide waste management services (both diversion and residuals disposal) for the City's residents and businesses. A copy of the *W12A Landfill Area Plan* report was provided as Supporting Document #1 to the ToR.

The City used the conclusion of the *W12A Landfill Area Plan* as the basis to prepare the ToR and focus the 'Alternatives To' within the EA. The preferred "Alternative To" is to develop an Integrated Resource Recovery Centre that includes the expansion of the W12A Landfill for a 25-year time horizon and the development of facilities to promote the diversion/recovery of materials and energy on the adjoining land.

In EAs it is a requirement to consider a Do-Nothing alternative as a basis for comparison of alternatives. For the City, the Do-Nothing alternative would be to allow the W12A Landfill to reach its approved capacity and not pursue any other solution for waste management for the City. One of the City's basic requirements as a municipality is to provide municipal services and infrastructure for its ratepayers. In the ToR, the preferred alternative was compared to the Do-Nothing alternative (allow the W12A Landfill to reach its approved capacity and not pursue any other solution for waste management for the City) to better understand and appreciate their relative advantages and disadvantages. The preferred "Alternative To" was found to be more advantageous than the Do-Nothing alternative.

As a result of the *W12A Landfill Area Plan*, a Special Policy Area to be used for both the expanded landfill and the integrated resource recovery centre covering some 288 ha of land was identified and subsequently incorporated into the City's Official Plan.

This recognized the Special Policy Area as the preferred location within the City for these long-term waste management activities.

2.6 Updated Rationale for the Undertaking

As noted in the approved Amended ToR and described in Section 2.1, the purpose of the undertaking has not changed from the approved Amended ToR and is to seek approval for additional waste disposal capacity and the rationale is because the existing W12A landfill will reach its approved total disposal capacity late by 2024 and the City needs to continue to responsibly manage the residual waste from its existing service area.

As mentioned, the additional waste disposal capacity will be for the City, its currently approved site users and a larger regional service area, as confirmed by those municipalities that they would like to be included, as described in Section 2.4.

2.7 Development of the EA Study Report

2.7.1 Concordance of Approved Amended ToR and EASR Documentation

As noted previously, the ToR provides the framework for conducting and evaluating the EA. This EASR fully addresses the requirements of the ToR.

Table 2.7-1 documents the concordance between the legislative EA requirements under the EAA and this document. It is intended to assist readers that wish to review and evaluate the

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

EA. The left column of the table states the requirements listed in the ToR and the right column indicates the location(s) in the EASR where the requirement is addressed.

Table 2.7-1: Concordance Table

Subsection of EAA (Ontario, 2020)	EA Requirements	Section of the EASR
6.1(2)(a)	A description of the purpose of the undertaking.	Section 2
6.1(2)(b)(i)	A description of and statement of the rationale for the undertaking.	Section 2
6.1(2)(b)(ii)	A description of and statement of the rationale for the 'Alternative Methods' of carrying out the undertaking.	Section 6
6.1(2)(b)(iii)	A description of and a statement of the rationale for the 'Alternatives To' the undertaking.	Section 2
6.1(2)(c)(i)	A description of the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly by the undertaking.	Section 5
6.1(2)(c)(ii)	A description of the effects that will be caused or that might reasonably be expected to be caused to the environment.	Sections 7 and 9
6.1(2)(c)(iii)	A description of the actions that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment.	Sections 8 and 9
6.1(2)(d)	An evaluation of the advantages and disadvantages to the environment of the undertaking, the 'Alternative Methods' of carrying out the undertaking and the 'Alternatives To' the undertaking.	Section 7 ('Alternatives To' advantages and disadvantages were provided in the ToR)
6.1(2)(e)	A description of any consultation about the undertaking by the City and the results of the consultation.	Section 4

2.7.2 Organization of the EASR

This EASR is presented in five volumes. Volume I (this volume) describes the EA studies, consultation results, effects assessment of alternatives, identification of a preferred alternative and a detailed impact assessment of the preferred alternative. Appendices to Volume I contain additional details from each of the technical assessments. Appendix A in Volume II contains the approved Amended ToR main body report (not the supporting documents or the record of consultation), Appendix B through Appendix D in Volumes III and IV contain

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

technical supporting documents to the EASR, and Appendix E in Volume V contains the record of consultation.

The main volume of the EASR contains 13 sections as follows:

Section	Content
Volume I	
Section 1	Provides an introduction to the proponent and relevant background information.
Section 2	Provides an overview of the Project and EA process.
Section 3	Presents the methodology used in the EA.
Section 4	Presents the consultation process and results of each event.
Section 5	Describes the existing environmental conditions within the study areas. In accordance with the approved Amended ToR and confirmed in the EA, the environmental components included were air quality/odour, noise, hydrogeology, surface water, aquatic and terrestrial ecology. The socio-economic components included were socio-economic, land use, agriculture, visual, archaeology and cultural heritage. The technical components included were transportation and design and operation.
Section 6	Describes the 'Alternative Methods' for landfill expansion.
Section 7	Presents the predicted effects of each 'Alternative Method' for landfill expansion and the comparative evaluation of alternatives. This includes a consideration of advantages and disadvantages of each alternative, as well as the rationale for selecting the preferred alternative.
Section 8	Describes the preferred alternative, comprising the preferred method of landfill expansion and leachate treatment.
Section 9	Presents the prediction of effects of the preferred alternative, evaluates the approvability of the preferred alternative and assesses the need for additional mitigation measures.
Section 10	Presents the prediction of effects of the preferred alternative on climate change and the effects of climate change on the preferred alternative.
Section 11	Presents the cumulative effects assessment for the preferred alternative in combination with other reasonably foreseeable projects and activities in the area.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Section	Content
Volume I	
Section 12	Describes the follow-up monitoring programs to assess that the landfill expansion is performing as expected and that assumptions in the assessment are valid. It also presents conceptual contingency measures that would be implemented should the landfill expansion not perform as expected and remedial measures are required.
Section 13	Lists the commitments made in the approved Amended ToR and in the EA.

The following Appendices of the EA are contained in Volumes II to V:

Appendix	Document Number	Document Name
Volume II		
Appendix A	A.01	Approved Amended ToR (main body report, not the supporting documents or the record of consultation)
Volume III		
Appendix B	B.01	Atmospheric (Air and Noise) Work Plan
	B.02	Groundwater Work Plan
	B.03	Surface Water Work Plan
	B.04	Biology (Aquatic and Terrestrial Ecosystems) Work Plan
Appendix C	C.01	2019 Updated Residual Waste Projections and Landfill Capacity Assessment

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Appendix	Document Number	Document Name
Volume IV		
Appendix D	D.01	Air Quality Existing Conditions and Impact Assessment Report; completed by Golder Associates Ltd.
	D.02	Noise Existing Conditions and Impact Assessment Report; completed by Golder Associates Ltd.
	D.03	Groundwater Existing Conditions and Impact Assessment Report; completed by Dillon Consulting Limited and Golder Associates Ltd., respectively
	D.04	Surface Water Existing Conditions and Impact Assessment Report; completed by Dillon Consulting Limited and Golder Associates Ltd., respectively
	D.05	Biology (Aquatic and Terrestrial Ecosystems) Existing Conditions and Impact Assessment Report; completed by AECOM
	D.06	Land Use Existing Conditions and Impact Assessment Report; completed by MHBC
	D.07	Agricultural Resources Existing Conditions and Impact Assessment Report; completed by MHBC
	D.08	Archaeology Existing Conditions and Impact Assessment Report; completed by Golder Associates Ltd.
	D.09	Heritage Impact Assessment Report; completed by Golder Associates Ltd.
	D.10	Socio-economic Existing Conditions and Impact Assessment Report; completed by Golder Associates Ltd.
	D.11	Visual Existing Conditions and Impact Assessment Report; completed by Ron Koudys Landscape Architects Inc.
	D.12	Traffic Assessment in Support of the Environmental Assessment; completed by Dillon Consulting Limited
	D.13	Design and Operations Existing Conditions and Impact Assessment Report; completed by Golder Associates Ltd.
Volume V		
Appendix E	E.01	Consultation Record

The consultants noted above for Volume IV reports contributed to the components write-ups in Sections 5, 7 and 9 of the EASR.

3.0 Methodology for the Assessment

The methodology used to conduct the EA is described in Section 7.0 of the approved Amended ToR (see Volume II Appendix A of this report) and summarized in the sections below. The methodology included characterization of the existing environment, consideration of 'Alternative Methods' for carrying out the proposed undertaking, prediction and assessment of the likely effects of these alternatives on the natural, social, cultural, built and economic aspects of the environment, identification of a preferred alternative through a comparative evaluation of alternatives and an assessment of the net effects of the preferred landfill expansion alternative.

Following the approach described in the approved Amended ToR, the EA was undertaken in a series of nine steps as follows:

- Step 1 – Outline the aspects of the environment considered and characterize the existing environmental conditions;
- Step 2 – Identify the 'Alternative Methods' of landfill expansion (and incorporate conceptual design mitigation measures);
- Step 3 – Qualitative and quantitative, where possible, evaluation of 'Alternative Methods';
- Step 4 – Compare the 'Alternative Methods' for landfill expansion and identify the preferred alternative;
- Step 5 – Describe the preferred 'Alternative Method' for landfill expansion;
- Step 6 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the EA Study Report.

Consultation with the public, Indigenous Communities, Government Review Team (GRT) members, City Advisory Committees, and other stakeholders was ongoing throughout the EA process in accordance with the consultation plan as described in Section 8 of the approved Amended ToR, noting some slight modifications to Open House #4 in relation to the COVID-19 pandemic.

The ToR contained draft EA work plans (Table 7.6-1 of the approved Amended ToR) for all environmental, socio-economic and technical components outlining the assessment approach. For some environmental components the ToR required a more detailed work plan be prepared and provided to the GRT members for review. The hydrogeology work plan was also provided to Indigenous Communities and their consultant for review and consideration. Comments received were addressed in finalized work plans, contained in Volume II Appendix B.

3.1 Step 1 – Characterize Existing Environmental Conditions

During the ToR the potential environmental effects of a landfill expansion were considered to identify relevant components of the environment potentially affected and presented to the stakeholders at Open House #2. The components of the environment identified consisted of: atmosphere (air quality and noise), geology and hydrogeology (groundwater quality), surface water (quality and quantity), biology (aquatic ecosystems and terrestrial ecosystems), land use, agriculture, archaeology, cultural heritage (landscapes and built resources), visual, socio-economic (local economy and residents and community), transportation and design and operations (engineered containment and financial). At the time of Open House #2, stakeholders were asked if the City was missing any aspect of the environment and none were identified. As such, the EA has maintained the same aspects of the environment in this EASR. An initial overview of existing environmental conditions was provided in Section 5.0 of the approved Amended ToR. The existing environment that could potentially be affected by the Project is further described for each of the environmental, socio-economic and technical components in Section 5.0 of this EASR. The work plans and methodologies that have been used to characterize existing conditions for each component are presented in Table 7.6-1 of the approved Amended ToR Volume II and Appendix B Volume III.

3.2 Step 2 – Identify ‘Alternative Methods’ of Landfill Expansion

As noted previously, the ‘Alternative Methods’ are the different ways the Project can be implemented.

The City determined ‘Alternative Methods’ of achieving the purpose of the undertaking, which is to expand the W12A Landfill to gain an additional 25 years of disposal capacity, thereby allowing the site to operate through the year 2048. During the preparation of the ToR, preliminary design concepts for the ‘Alternative Methods’ were developed to illustrate possible ways that the landfill site could be expanded to provide an additional 13,600,000 m³ of airspace, with these concepts to be refined and confirmed during the EA to provide the expansion alternatives for purposes of comparative evaluation and identification of the preferred alternative. During the initial stage of the EA, a reasonable range of expansion alternatives were identified and described at a sufficient level of detail (i.e., conceptual designs) so that potential effects of the expanded landfill alternatives on each environmental, socio-economic and technical component were assessed and compared.

Following the identification of a reasonable number of alternatives for expansion, the EA project team conducted a preliminary assessment of potential effects of each alternative for the proposed Project. Those works and activities that could potentially adversely affect the environment were identified. Potential mitigation measures to avoid or reduce the impact were identified. These proposed mitigation measures (referred to as conceptual mitigation measures) were incorporated into the conceptual design of the alternatives. These measures included, for example, appropriate modifications to the existing LCS, etc. The description and illustration of the conceptual design alternatives has been provided as a section in the EASR (Section 6) and has served as the common basis for predicting the environmental effects of the ‘Alternative Methods’.

3.3 Step 3 – Evaluation of ‘Alternative Methods’

The effects on the environment were qualitatively and/or quantitatively predicted for each ‘Alternative Method’ (i.e., including conceptual design mitigation measures) on the environment by the component consultants supported by the EA project team. The assessment was done for each component based on the conceptual designs for each alternative, including conceptual mitigation (determined in Step 2) and the existing environmental conditions (determined in Step 1).

In this step, each ‘Alternative Method’ of the W12A Landfill expansion was examined to determine if it would ultimately be approvable under the EPA. This screening step was included to eliminate any alternative that would not likely be approvable. None of the ‘Alternative Methods’ was identified to be not approvable due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or technical reasons. No additional ‘Alternatives Methods’ for the Project were identified by the public or other parties during the EA process for addition to the ‘Alternative Methods’ developed by the EA project team.

To assess and evaluate the ‘Alternative Methods’ the indicators in Table 3.3-1 as outlined in the ToR were used. The rationale for these indicators is also provided in Table 3.3-1 and in consultation with component consultants no changes to indicators were proposed. The evaluation is described in Section 7 of the EASR.

3.4 Step 4 – Compare the ‘Alternative Methods’ of Landfill Expansion and Identify the Preferred Alternative

A comparative evaluation of ‘Alternative Methods’ was conducted to identify the preferred alternative. The alternatives were compared using the environmental sub-components and indicators presented in Table 3.3-1. Feedback on the relative importance of the assessment indicators was received from the City Advisory Committees, through public open houses during preparation of the approved Amended ToR, and during Open House #3 of the EA. The comparative analysis was undertaken by the EA project team.

As part of this comparison, the advantages and disadvantages of each alternative method were described.

The outcome of this ranking exercise was used in the comparative evaluation to identify the overall preferred expansion alternative as discussed in Section 7 of the EASR.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Table 3.3-1: Components, Rationale, Indicators and Data Sources for the EA

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Atmosphere	Air quality (including dust, odour, Greenhouse Gases (GHG))	Landfill expansion and associated operations can produce gases containing contaminants that degrade air quality if they are emitted to the atmosphere. Construction activities associated with landfill expansion and continued landfill operation can lead to levels of particulates (dust) in the air. Landfill operations can also result in odour effects.	<ul style="list-style-type: none"> Expected concentrations of air quality indicator compounds (selected regulated air contaminants to represent this type of project) at the property boundary. Expected site-related odour at points of reception (POR). Expected GHG emissions. 	<ul style="list-style-type: none"> Environment Canada or MECP's regional air quality data, hourly meteorological data and climate normals. Published emission factors (including odour). Site-specific landfill gas (LFG) generation model. Preferred 'Alternative Method' landfill phasing plan. Odour complaints history. Existing site-specific studies. Applicable provincial regulations, standards and guidelines.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Atmosphere (continued)	Noise Noise	Landfill expansion and associated operations will generate noise that will be emitted into the atmosphere and could affect off-site PORs.	<ul style="list-style-type: none"> Noise Levels at off-site PORs, or vacant lots that accommodate the future construction of PORs. 	<ul style="list-style-type: none"> Landfill equipment list and expected utilization. Preferred 'Alternative Method' landfill phasing plan. Existing site-specific noise studies. Existing noise studies for facilities in the vicinity (if available). Baseline field program Manufacturer's noise data. Consultant's database of similar noise studies. Ministry of Transportation Ontario (MTO) / local municipal traffic count data or newer data collected to support this EA. Applicable provincial guidelines (i.e., Noise Guidelines for Landfill Sites, October 1998, and Publication NPC-300, October 2013)

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Geology and Hydrogeology	Groundwater quality	Contaminants associated with the landfill expansion and associated operations could enter the groundwater and impact off-site groundwater or surface water.	<ul style="list-style-type: none"> Expected effect on groundwater quality at the property boundary. 	<ul style="list-style-type: none"> Published regional sources and data on regional geological and hydrogeological conditions such as the Middlesex-Elgin Groundwater Study, Source Protection Assessment Reports. Review MNRF petroleum well records. Provincial Quaternary and Bedrock Mapping. Ontario Water Well Records (water supply wells are considered to be sensitive receptors in terms of potential impacts). Landfill Annual Monitoring Reports. Previous site characterization reports. Borehole Logs. Adjacent property assessment reports. Additional intrusive studies/investigations.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Surface Water	Surface water quality	Contaminants associated with the landfill expansion and associated operations could seep or runoff into surface water and adversely affect water quality and aquatic life.	<ul style="list-style-type: none"> Expected effect on surface water quality in the stormwater management system (SWMS) and within the Site-vicinity. 	<ul style="list-style-type: none"> Topographic maps. Air photos. Stormwater Management Master Plan (Earth Tech, 2002). Surface Water Background Study (Dillon, 2005). Annual water quality Monitoring Reports. Design and Operations Reports. Surface water drainage mapping. Agricultural farm drain mapping. Watershed/subwatershed reports, including the Watershed Report Cards (2013 and 2018) and the 2008 Kettle Creek Watershed Characterization Report. Local climate data. Published water quantity and flow information from the MECP, Environment Canada and local Conservation Authorities. Site reconnaissance. Flow observations during sampling program.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Surface Water (continued)	Surface water quantity	Operations associated with the landfill expansion could alter runoff and peak flows.	<ul style="list-style-type: none"> Expected change in peak flows (within the on-site SWMS and at the property boundary). Expected degree of off-site effects on surface water within the Site-vicinity. 	<ul style="list-style-type: none"> Topographic maps. Air photos. Stormwater Management Master Plan (Earth Tech, 2002). Surface Water Background Study (Dillon, 2005). Annual water quality Monitoring Reports. Design and Operations Reports. Surface water drainage mapping. Agricultural farm drain mapping. Watershed/subwatershed reports, including the Watershed Report Cards (2013 and 2018) and the 2008 Kettle Creek Watershed Characterization Report. Local climate data. Published water quantity and flow information from the MECP, Environment Canada and local Conservation Authorities. Site reconnaissance. Flow observations during sampling program.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Environmental Component: Biology	Aquatic ecosystems	Landfill expansion could remove or disturb the functioning of natural aquatic habitats and species, including rare, threatened or endangered species.	<ul style="list-style-type: none"> Expected change in surface water quality on-site and within the Site-vicinity. Expected impact on aquatic habitat and biota, including rare, threatened or endangered species within on-site and within the Site-vicinity. 	<ul style="list-style-type: none"> W12A Landfill Area Plan Study – Ecological Background Study and Natural Heritage Study (Earth Tech, 2005). Middlesex Natural Heritage Systems Study (Middlesex County, 2014). The London Plan (2016) City of London Inventory and Evaluation of Woodlands (North-South Environmental Inc. (2009). Dingman Creek Subwatershed Study (Aquafor Beech et.al., 1995) and Dingman Creek Subwatershed Study Update (Delcan, 2005). Dingman Creek Watershed Report Card (2012). Dodd Creek Subwatershed Strategy (Wilcox Betsy, 2005). Department of Fisheries and Oceans (DFO) Drain Classification and Fish Habitat Data from the Upper Thames River Conservation Authority (UTRCA) and Kettle Creek Conservation Authority (KCCA). Land Information Ontario (LIO). Ministry of Natural Resources and Forestry (MNR) SAR List.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
				<ul style="list-style-type: none"> • Natural Heritage Information Centre. • DFO Drain Classification and Fish Habitat Data from the UTRCA and KCCA. • Aquatic habitat and Benthic Water Quality. • Species at Risk screening & habitat assessment.
Environmental Component: Biology (continued)	Terrestrial ecosystems	Landfill expansion could remove or disturb the functioning of natural terrestrial habitats and vegetation, including rare, threatened or endangered species.	<ul style="list-style-type: none"> • Expected impact on terrestrial vegetation communities, wildlife habitat, and wildlife, including rare, threatened or endangered species on-site and within the Site-vicinity. 	<ul style="list-style-type: none"> • W12A Landfill Area Plan Study – Ecological Background Study and Natural Heritage Study (Earth Tech, 2005). • Middlesex Natural Heritage Systems Study (Middlesex County, 2014). • The London Plan (2016). • City of London Inventory and Evaluation of Woodlands (North-South Environmental Inc., 2009). • Dingman Creek Subwatershed Study (Aquafor Beech et. al., 1995) and Dingman Creek Subwatershed Study Update (Delcan, 2005). • Dingman Creek Watershed Report Card (2012). • Dodd Creek Subwatershed Strategy (Wilcox Betsy, 2005).

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
				<ul style="list-style-type: none"> • DFO Drain Classification and Fish Habitat Data from the UTRCA and KCCA. • Land Information Ontario (LIO). • MNRF Ontario SAR List. • Natural Heritage Ontario Reptile and Amphibian Atlas. • Ontario Breeding Bird Atlas. • Ontario Butterfly Atlas. • Terrestrial and wetland vegetation community investigations, breeding birds surveys, amphibians and salamanders surveys, bat habitat surveys, snake cover board and area searches, butterfly, dragonfly and damselfly surveys and wildlife habitat surveys. • Complete Species at Risk screening and habitat assessment.
Socio-Economic Components: Land Use	Current and planned future land uses	Waste disposal facilities could potentially affect the use and enjoyment of sensitive uses in the vicinity of the Site.	<ul style="list-style-type: none"> • Expected impact on sensitive land uses (i.e., dwellings, churches, and parks within the Site-vicinity). 	<ul style="list-style-type: none"> • Preferred 'Alternative Method' landfill design and phasing plan. • Existing site-specific studies. • Applicable provincial regulations, standards and guidelines. • Provincial Policy Statement (2014). • City of London Official Plan (1989).

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
				<ul style="list-style-type: none"> • City of London Zoning By-law. • Land Use Compatibility, Guideline D-1. • Land Use On or Near Landfills and Dumps, Guideline D-4. • Aerial photographic and topographic mapping. • Field reconnaissance. • Discussion with City planning department.
Socio-Economic Components: Agriculture	Agriculture	The agricultural land base or agricultural operations may be impacted by the landfill expansion and associated operations.	<ul style="list-style-type: none"> • Expected effect on agricultural land base and agricultural operations within the site and Site-vicinity. 	<ul style="list-style-type: none"> • Preferred 'Alternative Method' landfill phasing plan. • Existing site-specific studies. • Applicable provincial regulations, standards and guidelines. • Provincial Policy Statement (2014). • City of London Official Plan (1989) and The London Plan (2016). • City of London Zoning By-law. • Provincial Policy Statement (2014). • Aerial photographic and topographic mapping.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
				<ul style="list-style-type: none"> • Available soils mapping (Soils of Middlesex County mapping, CLI), municipal drain mapping, and available ownership information based on municipal assessment information and including farm tax credit information. • Field reconnaissance. • Statistics Canada agriculture profiles. • Interviews with farmers, if necessary.
Socio-Economic Components: Archaeology	Archaeology	A horizontal landfill expansion has the potential to affect archaeological resources.	<ul style="list-style-type: none"> • Expected archaeological resources potentially affected on-site. 	<ul style="list-style-type: none"> • Stage 1 Archaeological and Built Heritage Assessment, W12A Landfill Area Study (2006). • Other existing site-specific archaeological assessment reports. • Ontario Archaeological Sites Database. • Ministry of Tourism, Culture, and Sport (MTCS) Standards and Guidelines for Consultant Archaeologists. • City of London's Archaeological Master Plan.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Socio-Economic Components: Culture	Cultural Heritage Landscapes	Identified cultural heritage landscapes can be altered by the landfill expansion. Depending on the nature of identified cultural heritage landscapes, there could be an impact by the ongoing operation of the landfill.	<ul style="list-style-type: none"> Expected impact on identified cultural heritage landscapes on-site and within the Site-vicinity. 	<ul style="list-style-type: none"> Description of proposed expansion alternatives (including construction operations) to determine sources of potential impacts. Preferred landfill design. Existing site-specific studies. Applicable provincial plans, acts, regulations, standards and guidelines, and policies. Applicable municipal official plans, heritage policies, and guidance.
Socio-Economic Components: Culture (Continued)	Cultural Heritage Resources (including Built Heritage) Built Heritage Resources	Heritage attributes of identified cultural heritage resources could be impacted by the landfill expansion and associated operations.	<ul style="list-style-type: none"> Expected impact on the heritage attributes of identified cultural heritage resources on-site and within the Site-vicinity. 	<ul style="list-style-type: none"> Description of proposed expansion alternatives (including construction operations) to determine sources of potential impacts. Preferred landfill design. Existing site-specific studies. Applicable provincial plans, acts, regulations, standards and guidelines, and policies. Applicable municipal official plans, heritage policies, and guidance.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
Socio-Economic Components: Socio-economic	Local Economy	The continued operation of the landfill can influence employment and business in the wider regional area.	<ul style="list-style-type: none"> Expected effect on local employment. Expected effects on local businesses and commercial activity. Expected effects on municipal finances. 	<ul style="list-style-type: none"> City of London Official Plan. City of London Financial Returns. Land use designation database.
Socio-Economic Components: Socio-economic (continued)	Residents and Community	Waste disposal facilities can potentially affect the use and enjoyment of their properties by residents in the vicinity of the site.	<ul style="list-style-type: none"> Displacement of residents. Expected interference with use and enjoyment of residential properties (nuisance effects). 	<ul style="list-style-type: none"> Site related complaints. Discipline findings – noise, air quality, land use, cultural, visual, agriculture. Existing site related BMPs.
Socio-Economic Components: Visual	Visual	The landfill expansion can affect the local community by changes in the visual appearance of the site.	<ul style="list-style-type: none"> Expected changes in landscape views from off-site. 	<ul style="list-style-type: none"> Google Earth / GeoGratis. City of London aerial photos. ACAD drawings of existing landfill and proposed expansion alternatives. Site photos.
Technical Components: Design and Operations	Engineered Containment	Sites that require less engineering to provide protection of off-site groundwater or air quality are typically preferred from a public and regulatory perspective.	<ul style="list-style-type: none"> Expected degree of engineered containment and/or controls required. 	<ul style="list-style-type: none"> Annual environmental monitoring reports. Results of Hydrologic Evaluation of Landfill Performance model. Currently approved design and operations report.

**ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION
CITY OF LONDON**

Component	Sub-component	Rationale	Indicator(s)	Data Sources
				<ul style="list-style-type: none"> Existing site-specific studies (on site subsurface investigations, geotechnical reports). Topographic mapping, soils mapping, available water well records. O. Reg. 232/98. Commercial software specifically developed to assess slope stability.
Technical Components: Design and Operations (Continued)	Financial	Different methods of landfill expansion can have different costs based on the type and amount of engineering required.	<ul style="list-style-type: none"> Estimated costs associated with implementation of expansion alternatives. 	<ul style="list-style-type: none"> Existing cost information from the City.
Technical Components: Transportation	Traffic	The operations at the landfill can impact the traffic in the surrounding area through changes in truck traffic to/from the landfill, including potential increases in traffic associated with providing disposal services to the proposed regional service area around London.	<ul style="list-style-type: none"> Expected effect on traffic along the haul routes in the vicinity of the site. 	<ul style="list-style-type: none"> TMC, AADT, and signal timing data. Additional tonnage and resulting number of trucks to site due to expansion. Collision history statistics. Existing site-specific and related studies, consultant observations, and available City planning and engineering documents.

3.5 Step 5 – Describe the Preferred ‘Alternative Method’

The outcome of this step is the description of the preferred landfill expansion alternative described in Section 8 of the EASR.

In addition, the quantity of leachate generation from the preferred landfill expansion alternative has been predicted, the quality of the leachate associated with the expansion and requiring treatment has been assessed, and a high level assessment of the capability of the existing forcemain to continue to convey the collected leachate to the municipal sewer system and the Greenway Wastewater Treatment Plant (WWTP) to continue to treat the leachate was carried out and the results are provided in Section 8 of the EASR.

3.6 Step 6 – Refine the Mitigation Measures and Determine the Net Effects of the Preferred Alternative

The prediction of future environmental effects associated with the preferred ‘Alternative Method’ (assuming that conceptual design mitigation measures are in place) were provided by each component consultant and are summarized in Section 9 of this EASR. Assessment of potential effects was completed using appropriate objectives, standards, policies and regulations. The remaining effects or net effects, if any, have been documented.

Also, a qualitative comparison has been made between the predicted effects of the preferred expansion alternative and the Do-Nothing alternative as defined in Section 4.2 of the approved Amended ToR, considering the indicators for the environmental, socio-economic and technical components.

3.7 Step 7 – Consideration of Climate Change

The 2017 Guide- Consideration of Climate Change in EA in Ontario describes two basic aspects to be considered: 1) Project Effects on Climate Change, and 2) Climate Change Effects on the Project (MOECC, 2017). For this EA, climate change has been assessed as follows:

Project Effects on Climate Change: the GHG sources that were presented in the approved Amended ToR and confirmed in the EA include LFG, on-site traffic and any other potential sources for the preferred landfill expansion alternative, a quantitative assessment of GHG generation potential associated with the landfill expansion (waste decomposition within the landfill, stationary combustion sources, i.e., flare and building heating, and on-site traffic and mobile equipment) and the GHG reductions resulting from design mitigation measures (active gas extraction system).

Climate Change Effects on the Project: The manner in which climate change has the greatest potential to affect this Project is in terms of changes (increases) in precipitation events and associated effects on the performance of the site’s SWMS. The SWMS for each of the landfill expansion alternatives was conceptually designed in accordance with O. Reg. 232/98, which requires their SWMSs to be designed for the 100 year storm event. For the preferred landfill expansion alternative, an analysis was also conducted to assess the performance of the SWMS under the 250-year storm event.

Consideration has also been given to the potential effects of climate change on other infrastructure associated with the site, as well as ways that the Project could reduce GHG emissions or remove GHG from the atmosphere.

The total estimated GHG emissions associated with the expanded landfill has been compared to the Ontario-wide and Canada-wide emissions of GHG.

The consideration of climate change is discussed in Section 10 of this EASR

3.8 Step 8 – Cumulative Impact Assessment

The net effects of the proposed Project, as determined by the analysis conducted in Step 6, was combined with the predicted effects of other existing and identified certain and probable projects in the area of the site, where the effects would overlap in time or space. The evaluation considered potential effects on the various components to determine if there are any unacceptable predicted cumulative impacts, as measured against applicable regulatory standards. The study area for the cumulative impact assessment of the Project was based on the potential for the W12A Landfill expansion effects to interact with those of other projects, as determined by the impact assessment studies for the proposed landfill expansion. The cumulative impact assessment is described in Section 11 of this EASR

3.9 Step 9 – Preparation of EA Study Report

A Draft EASR has been prepared, consisting of the main EASR, technical supporting documents, and a Consultation Record. The EASR includes a description of the EA planning process; a summary of consultation efforts; the characterization of existing conditions; a description of each Alternative Method of landfill expansion; the qualitative/quantitative evaluation of 'Alternative Methods'; the identification and description of the preferred alternative; a summary of the methods and results of the technical studies to assess the impacts from the preferred alternative compared to the applicable regulations, standards and guidelines; consideration of climate change; cumulative impact assessment; and the identification of any proposed mitigation measures, monitoring requirements and commitments to be fulfilled by the City. The EASR contains an Executive Summary, a list of references consulted, and appropriate drawings illustrating various aspects of the overall undertaking and aspects of the environmental, socio-economic and technical component studies.

4.0 Consultation Methods and Activities

The consultation program for the EA was carried out in accordance with the approved Amended ToR at a minimum. The results of the program and supporting documents, including copies of notices, presentation materials, comments, and correspondence are contained in the Consultation Record, which is provided in Volume V of this EASR. The following sections provide a summary of the consultation program including the consultation program objectives, the individuals/groups involved, the methods of consultation, and a brief summary of the results of the consultation activities.

4.1 Overview

The Consultation Record is part of the requirements of the EA and was prepared following the requirements of the MECP's *Code of Practice: Consultation in Ontario's Environmental Assessment Process* (Consultation Code of Practice; MOECC, 2014). The results of the consultation program are summarized in this section of this EASR.

Prior to commencing the ToR development process, the City developed a Consultation Plan (referred to by the City as a Community Engagement Program) to support the development of the approved Amended ToR as well as support the EA process. The Consultation Plan is a living document and has been amended during the EA. A copy of the Consultation Plan/Community Engagement Program is provided in Volume V Appendix AA.

Following the approval of the Amended ToR and during the preparation of the EA, the consultation program continued to engage potentially interested persons, which included identified members of the public, City Advisory Committees, government agencies (including the GRT), businesses, and Indigenous Communities, as well as various interest groups and committees. As the EA development process progressed, the City updated the consultation list to reflect additional parties interested in the proposed undertaking. This same consultation list was then used to communicate with stakeholders throughout EA activities, unless otherwise noted in the sections below.

4.2 Consultation Objectives

Engagement of and consultation with the public and other stakeholders is a key component of the EA process. It enables stakeholders to participate in the planning process and enhance the quality of the project. The key vehicles in the Community Engagement Program used to engage the public and the other stakeholders and elicit feedback were open houses, the establishment of the Waste Management CLC, the existing W12A Landfill PLC, letter/email correspondence, the City's Residual Waste Disposal Strategy website (the EA Website) and newspaper and social media advertisements.

It is noted that the Waste Management CLC is a liaison committee whose purpose is to ensure that the diverse interests of multiple stakeholders are equally and adequately represented through diversification in membership throughout the EA process by encouraging the participation of key individuals representing specific stakeholder groups.

As stated in the approved Amended ToR, the objectives of the Community Engagement Program for the EA process were to:

- Engage stakeholders from the beginning of the process through the use of a variety of consultation events and activities including open houses, letters/emails, and the project website, and establishment of the Waste Management CLC;
- Ensure that there are adequate opportunities for stakeholders to learn about the project and to provide input, feedback and comments concerning the project and EA process, and that these comments are considered by the EA project team;
- Engage local elected officials to ensure that they are provided with regular and timely information concerning the EA process;
- Engage stakeholders as early as possible in the development of the ToR and the EA and to facilitate their involvement in the process in ways that meet their needs;
- Ensure the engagement process is open, transparent and inclusive;
- Document all issues and concerns identified by the public, agencies and other stakeholders and to demonstrate how these concerns and issues have been incorporated into the EASR; and
- Fulfill the EA process public consultation requirements.

Details of the engagement related to the development of this EASR is documented within the Volume V Consultation Record. The tables in the following sections summarize the primary engagement activities that occurred throughout the development of this EA.

4.2.1 Key Decision-Making Milestones

To meet the objectives of consultation, Open Houses with the public and other stakeholders were scheduled during the following key decision-making milestones in the EA process:

- Review of the proposed 'Alternative Methods' of landfill expansion, the evaluation criteria and indicators applied to compare the 'Alternative Methods' and the resulting preferred 'Alternative Method'; and
- Presentation of the impact assessment of the proposed, preferred landfill expansion and mitigation that may be required.

The frequency and timing of consultation allowed for public and other stakeholders with an interest in the proposed landfill expansion the opportunity to contribute to decision making and to influence decisions before moving forward to the next step in the planning process.

4.2.2 Issues Resolution Strategy

Throughout the EA process, the City solicited feedback and information from the local community, government agencies, Indigenous communities, and other interested persons about the proposed W12a Landfill expansion. Issues identified were reviewed by the City and a reasonable effort was made to respond to concerns raised throughout the planning process. The City has attempted to resolve all issues or disputes to reach a resolution that is amenable, recognizing that interests of multiple stakeholders and/or regulations may sometimes dictate a resolution that may not be desirable to all parties. There were no issues where mutually agreeable resolution was not achieved and the matter had to be referred to the MECP for guidance.

4.3 EA Consultation Methods

Various consultation events and activities were used during the EA process to achieve the objectives noted above for the Community Engagement Program. The consultation events were designed to optimize engagement of the potentially interested persons in the progress of the EA studies. The consultation activities carried out during the EA consisted of:

- Letter and email correspondence distributed to the public, interested stakeholders (e.g. businesses using the landfill, environmental groups, etc.), GRT, and Indigenous communities;
- Meetings, presentations and tours with Indigenous communities;
- Notices published in local newspapers;
- Notices on the EA website (<https://getinvolved.london.ca/WhyWasteDisposal>);
- Two open houses in the local community;
- Presentations and discussions to the existing W12A Landfill PLC;
- Media releases;
- Meetings and telephone calls between the City, the EA consultants, and the MECP; and
- Informal meetings, telephone calls and discussions with Indigenous groups, local politicians, business owners, community organizations and neighbours to the existing W12A Landfill on an as needed basis throughout the EA.

The results of the consultation activities are recorded in the EASR, specifically Volume V – Consultation Record. A summary of each consultation event was prepared documenting comments and issues that were raised. If no comments or issues were raised, then this was documented as well.

4.4 Project Contact List

In accordance with the Community Engagement Plan, the City has maintained a contact list of persons and organizations who might have an interest in being involved in the process. Anyone on the contact list was notified of all community engagement events as well as provided with general updates on the status of the EA Process on a regular basis. The Project contact list is comprised of the following groups:

- Government Review Team members;
- Indigenous Communities;
- Businesses that use the W12A Landfill;
- Property Owners and Tenants located within a 2 kilometer (km) radius of the Waste Management and Resource Recovery Area;
- Persons or organizations who requested to be added to the contact list; and,
- Key Community Organizations.

4.4.1 Agencies

The following federal and provincial government departments, health units and school boards, were kept informed throughout the progress of the EA.

Federal Agencies

- Environment and Climate Change Canada

Provincial Government

- Infrastructure Ontario
- Ministry of Environment, Conservation and Parks
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Heritage, Sport, Tourism and Culture Industries
- Ministry of Education
- Ministry of Citizenship and Immigration
- Ministry of Indigenous Relations and Reconciliation
- Ministry of Community Safety and Correctional Services
- Ministry of Energy
- Ministry of Health and Long-Term Care
- Ministry of Municipal Affairs and Housing
- Ministry of Natural Resources and Forestry
- Ministry of Transportation
- Ontario Provincial Police

Other

- City of London Fire Department
- Upper Thames River Conservation Authority
- Kettle Creek Conservation Authority
- Ornge
- Hydro One Networks Inc.

- Greater London International Airport Authority
- St. Thomas Municipal Airport
- Perth District Health Unit*
- Huron County Health Unit*
- Southwestern Public Health
- Lambton Public Health
- Middlessex-London Health Unit
- London District Catholic School Board
- Thames Valley District School Board

4.4.2 Indigenous Communities

It is recognized that Indigenous communities have specific interests and rights with regard to consultation on projects that might potentially affect them. The consultation with Indigenous communities provided insight into the potential effects on Indigenous communities, including the potential effects on use of lands for traditional purposes. It is also recognized that Indigenous communities may have specific and differing needs with regard to how they would like to be consulted. To address these interests, the City continued to inform Indigenous communities about the proposed undertaking and invite their participation during the EA process.

As documented in the approved Amended ToR, a list of eight potentially affected Indigenous Communities as well as the Southern First Nations Secretariat, was developed in consultation with the MECP, and the Crown-Indigenous Relations and Northern Affairs Canada. Throughout the EA process, the City provided notification and offered to consult with each of the following Indigenous communities. As an organization with membership representing five of the Indigenous Communities listed below, the Southern First Nations Secretariat did not receive notifications, as their involvement in consultation would be initiated by their members.

- Aamjiwnaang First Nation;
- Bkejwanong (Walpole Island) First Nation;
- Caldwell First Nation;
- Chippewas of the Thames First Nation;
- Chippewas of Kettle and Stony Point;
- Moravian of the Thames;
- Munsee-Delaware Nation;
- Oneida Nation of the Thames.

4.5 Schedule of Events

The principal consultation events that took place during the development of the EA included:

- Review of Draft EA Work Plans – July to December, 2019;
- Notice of Commencement (NOC) of the EA – September 19, 2020;
- Open House #3 – February 26 and 27, 2020;
- Open House #4 – November 18 and 19, 2020;
- Review of preliminary draft EASR by the MECP

- Submission of the draft EASR – April 2021; and
- Social Media Postings (throughout the process).

These consultation events are further described in the following sections. All referenced materials, including copies of all comments received, and the subsequent responses are available in Volume V of the EASR.

4.6 Summary of Consultation Events

The following is a summary of the principal consultation events that occurred during the EA phase. Note that the Appendices referred to in Section 4.6 refer to Volume V – the Consultation Record of this EASR.

4.6.1 Notice of Commencement of the EA

The City initiated the EA process by publishing the NOC of the EA on September 19, 2019 (Volume V Appendix E.01) as required under the EAA.

The NOC provided notification about the approval of the Amended ToR, a brief overview of the proposed undertaking, information about the project location, information about the EA process, contact information for the City and EA Project Team, as well as information about how to obtain further information and participate in the process.

The NOC of the EA was posted on the City's website and can be found at: <https://getinvolved.london.ca/WhyWasteDisposal> (Volume V Appendix E.01). The NOC of the EA was also published in the Londoner Newspaper on September 19 and 26, 2020 (Volume V Appendix E.02).

The NOC of the EA, accompanied by a letter from the City, was also emailed or mailed to the GRT, Indigenous Communities, local businesses that use the existing landfill, neighbours within 2 km of the Waste Management Resource Recovery Area, community groups, interested persons and organizations who asked to be on the Project contact list and PLC members between November 7 and 21, 2020. Examples of this correspondence are provided in Volume V Appendix E.03.

4.6.2 Open House #3

The third open house series occurred as follows:

February 26, 2020
Royal Canadian Legion (Basement)
7097 Kilbourne Road, London
2 – 4 p.m. and 5 – 8 p.m.

February 27, 2020
Earl Nichols Arena (Hall)
799 Homeview Road, London
2 – 4 p.m. and 5 – 8 p.m.

The open houses were advertised on the City's Facebook page and Twitter on multiple dates; on posters at select City facilities; and on the City's website (Volume V Appendix F.01). The notice of the third open house series was in the Londoner newspaper on February 13 and 20, 2020 (Volume V Appendix F.02).

Letters or emails were sent to the GRT, Indigenous Communities, local businesses that use the existing landfill, neighbours within 2 km of the Waste Management Resource Recovery

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Area, community groups, interested persons and organizations who asked to be on the Project contact list and PLC members between February 12 and February 16, 2020 and examples of this correspondence is provided in Volume V Appendix F.03.

This open house provided a general overview of current City's waste management programs, the EA process, the W12A Landfill site features, 'Alternative Methods' of expansion, environmental, socio-economic and technical components evaluation of the proposed 'Alternative Methods', a description of the preferred 'Alternative Method', and how stakeholders can be involved in the EA process.

The purpose of the open house was to inform the public of the approved Amended ToR, present the 'Alternative Methods' of expansion, the assessment of 'Alternative Methods', and the preferred 'Alternative Method'.

This event was designed to provide opportunities for attendees to speak directly with the City and the EA consulting team. Attendees were asked to sign in and were encouraged to fill out a comment sheet to provide feedback and recommendations.

Key representatives from the City and their EA consultants in attendance at Open House #3 included:

- Jay Stanford, Director - Environment, Fleet and Solid Waste, City of London;
- Mike Losee, Division Manager - Solid Waste Management, City of London;
- Jane Kittmer, Solid Waste Planning Coordinator - Solid Waste Management, City of London;
- Jennifer Levitt, Technician - Solid Waste Management, City of London
- Jessica Schalk, Technician - Solid Waste Management, City of London;
- William Roberts, Technician - Solid Waste Management, City of London;
- Tracey Lee, Administrative Assistant - Solid Waste Management, City of London;
- Lauren McGregor, Co-op Student - Solid Waste Management, City of London;
- Wesley Abbott, EA Consultant Coordinator;
- Paul Smolkin, EA Project Director, Golder Associates Ltd;
- Heather Kyer, EA Project Coordinator, Golder Associates Ltd;
- Ron Koudys, Visual Consultant, RKLA; and
- Luke Koudys, Visual Consultant, RKLA.

A total of 37 display boards (29 related to the EA) were featured at Open House #3 (Volume V Appendix F.04). Copies of the information available at the open house, the feedback sheets, FAQs #7 and blank sign in sheets are provided in Volume V Appendix F.05.

A total of 12 and 14 people attended Open House #3 on February 26 and 27, 2020, respectively. The overall atmosphere of the open house was professional, courteous and respectful.

The Project website housed a virtual Open House following the in-person open houses. The virtual Open House was available on-line till the end of March 2020 and had all the material from the in-person Open Houses as well as opportunities to ask questions and/or provide comments. One comment was received from the virtual Open House.

Comments and feedback received can be found in Volume V Appendix F.06, and are discussed in Section 4.7 of this EASR.

4.6.3 Open House #4

The fourth open house series occurred, by appointment only, as follows:

November 18 and 19, 2020
Hellenic Community Centre (Anthony's Room)
133 Southdale Road West, London
4 – 8 p.m.

In response to the COVID-19 pandemic and to abide by provincial government restrictions and other public health safety measures, this open house was attended by scheduled appointment only.

The notice of the fourth open house series was in the Londoner newspaper on November 5 and 12, 2020 (Volume V Appendix G.01). The open house was also advertised on the City's website and the London Environmental Network website (Volume V Appendix G.02).

Letters or emails were sent to the GRT, Indigenous Communities, local businesses that use the existing landfill, neighbours within 2 km of the Waste Management Resource Recovery Area, community groups, interested persons and organizations who asked to be on the Project contact list and PLC members between November 5, 2020 and November 10, 2020 and examples of this correspondence is provided in Volume V Appendix G.03.

An offer to meet with individuals and groups was also included in the invitation and notice for Open House #4.

This open house provided a general overview of current City's waste management programs, the EA process, the W12A Landfill site features, environmental, socio-economic and technical components evaluation and impact assessment results of the preferred method of landfill expansion, mitigation, proposed monitoring and how stakeholders can be involved in the EA process.

The purpose of the open house was to inform the public of the completion of the EA study and seek input on the proposed community engagement plan, monitoring, and next steps for the project.

This event was designed to provide opportunities for attendees to speak directly with the City and the EA consulting team. Attendees were escorted to one of two viewing rooms with either City staff or the EA Consultant to view the open house content on a computer projection. The attendees were provided with handouts of the content material. Copies of the information available at the open house, the project description sheet, FAQs #8, and community enhancement plan are provided in Volume V Appendix G.04.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Key representatives from the City and their EA consultants in attendance at Open House #4 included:

- Jay Stanford, Director – Environment, Fleet and Solid Waste, City of London;
- Mike Losee, Division Manager – Solid Waste Management, City of London;
- Jane Kittmer, Solid Waste Planning Coordinator – Solid Waste Management, City of London;
- William Roberts, Technician - Solid Waste Management, City of London;
Wesley Abbott, EA Consultant Coordinator; and,
- Trish Edmond, EA Project Manager, Golder Associates Ltd.

A total of 49 display boards related to the EA were featured at Open House #4 (Volume V Appendix G.05).

A total of 11 and 7 people attended Open House #4 on November 18 and 19, 2020, respectively. The overall atmosphere of the open house was professional, courteous and respectful. All open house staff and attendees followed provincial government restrictions and other public health safety measures. People attending the open house were encouraged to provide any comments from home and to mail them or email to the City to avoid crowds or lingering at the event.

The Project website housed a virtual Open House following the in-person open houses. The virtual Open House was available on-line till December 15, 2020 and had all the material from the in-person Open Houses as well as opportunities to ask questions and/or provide comments. Comments were received from seven persons following Open House #4.

Comments and feedback received can be found in Volume V Appendix G.06, and are discussed in Section 4.7 of this EASR.

4.6.4 On-going Activities

The City continues to provide information updates regarding on-going project activities and the status of the EA process on the City's W12A project website and social media accounts (i.e., Facebook and Twitter).

Project information is also shared in regular update meetings with the PLC and written updates to the CLC. Meetings with the PLC were held on August 15, 2019, October 17, 2019, December 12, 2019 and February 20, 2020. No meetings were held after February 2020, due to Covid-19 concerns. Virtual meetings were not held because some members of the PLC were not comfortable with the technology and internet quality in the vicinity of the W12A Landfill is poor. A written update on the EA was provided to PLC members in June 2020; November 2020 and February 2021. Written updates to the CLC were provided in February 2020 and November 2020.

The website has been periodically updated throughout the EA process with relevant updates, the updated environmental component work plans, invitations to consultation events, requests to provide comments and documents for review.

4.6.5 MECP Review of Preliminary Draft EASR

In late 2020 and early 2021 the MECP Environmental Assessment Branch provided comments on a preliminary draft of the EASR Volume 1, minus the executive summary. Comments received from the MECP were predominantly EA procedural in nature relating to ensuring the document would be transparent to the public and that previous flexibility from the ToR and future flexibility of the EA were adequately considered. The detailed comments from the MECP and the City's responses are provided in Volume V Appendix I.

4.6.6 Indigenous Community Events and Involvement

During the archaeology field work conducted in 2019 the COTTfN was engaged and a member employed to assist and be present during field work. At the end of 2018, the City sent letters or emails to Indigenous Communities inviting them to engage in a meeting to discuss the project (Volume V Appendix H.01). Early in 2019, the City held separate meetings with the Chippewas of the Thames First Nation (COTTfN), Oneida Nation of the Thames First Nation, and Aamjiwnaang First Nation (AFN). The meetings were scheduled to provide information on the W12A Landfill, an overview of the EA process, introduce the PLC and CLC, and the engagement of Indigenous Communities in technical work plans and field studies, as summarized in the list below and in the meeting summaries (Volume V Appendix H.02).

- On January 15, 2019 the City met the COTTfN to discuss their involvement in the project, introduce the CLC and PLC, discuss cultural sensitivity and awareness training, and follow-up on past actions.
- On January 28, 2019, the City met with the Oneida Nation of the Thames First Nation to provide information on the W12A Landfill, an overview of the EA process, involvement in archaeological studies and introduce the PLC and CLC.
- February 1, 2019, the City met with the AFN to provide information on the W12A Landfill, an overview of the hydrogeology of the landfill, the AFN request to peer review of the hydrogeology workplan and information sharing with the surrounding First Nation communities.

The representatives of the Indigenous Communities identified in Section 4.4.2, with the exception of the Moravian of the Thames, were contacted by e-mail on April 23, 2019 to advise the status of the EA process and changes made in the approved Amended ToR in response to comments received (Volume V Appendix H.03). The City also followed-up on actions from previous meetings, where applicable, and advised communities that AFN engaged Dragun Corporation to undertake a peer review of the Groundwater Work Plan. The City advised that they would be hosting a workshop to discuss the work plan and groundwater existing condition results, following the recommendation of AFN, and are extending an invite to attend the workshop.

Dragun Corporation, on behalf of AFN, issued a letter on July 8, 2019 regarding their peer review of the Hydrogeological Background Study prepared for the Environmental Assessment of the Proposed W12A Landfill Expansion (Volume V Appendix H.04). In the letter, Dragun raised concerns related to the fractures in the surficial clayey soils present across the region

and the thickness of the surficial clay layer south of Scotland Drive. Recommendations were made to undertake additional field studies.

On July 16, representatives from the Oneida Nation of the Thames, COTTfN and Munsee-Delaware First Nation were provided with an on-site tour of the Greenway Water Pollution Control Plant, the Material Recovery Facility (MRF) and the W12A Landfill. Information about the tour and presentation material from the tour can be found in Volume V Appendix H.05.

Dragun Corporation, on behalf of AFN, issued a letter on August 13, 2019 regarding their peer review of the Groundwater Work Plan for the Environmental Assessment of the Proposed W12A Landfill Expansion (Volume V Appendix H.06). In the letter, Dragun raised concerns related to the fractures in the till and a possible pathway for leachate movement out of the landfill, and recommendations for further studies and monitoring activities.

The representatives of the Indigenous Communities identified in Section 4.4.2 were all contacted in early August 2019 to advise them about an upcoming workshop organized by the City and AFN (Volume V Appendix H.07). On August 26, 2019, the City held a workshop with the AFN, COTTfN, Munsee-Delaware First Nation, Oneida First Nation, Dragun Corporation and Dillon Consulting Limited to discuss Dragun's peer review of the Groundwater Work Plan and develop actions to address the issues presented (Volume V Appendix H.08). Feedback from this workshop resulted in changes to the Groundwater Work Plan. The revised Groundwater Work Plan and documented comment response to the concerns presented in Dragun's peer review letter, as discussed during the August 26, 2019 workshop, were issued in an email from the City on September 10, 2019 (Volume V Appendix H.09). Following the assessment of alternative methods, the City invited the Indigenous Communities identified in Section 4.4.2 to a second workshop (Volume V Appendix H.10). The second workshop was held on August 27, 2020 to present information and receive feedback on the preferred landfill expansion alternative and provide an update on groundwater, biology and archaeological field studies (Volume V Appendix H.11). Due to COVID 19 restrictions, the workshop was held on a virtual meeting platform. AFN, COTTfN and Munsee-Delaware First Nation attended the workshop. Oneida Nation of the Thames, who planned to attend, missed the meeting due to a scheduling conflict. The meeting summary can be found in Volume V Appendix H.12.

4.7 Summary of Concerns Raised During Consultation

Comments and questions were welcomed from attendees by the City during each of the consultation events described in Sections 4.6.2 and 4.6.3. Oral comments received during each Open House varied widely. Due to the nature of Open Houses, it is not possible to fully document all of these individual discussions.

4.7.1 Open House #3

Comments from the first and second sessions of Open House #3 were received from five people through the completion of the formal feedback sheet. In addition, two email exchanges were received where the public provided feedback. The public was given the opportunity to provide thoughts on the City's Facebook page about access to material electronically. Overall, meeting attendees were satisfied with the information presented and provided

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

positive feedback on the quality of the information materials and answers provided. A copy of the completed sheets and email record are included in Volume V Appendix F.06.

No feedback was received that conflicted with any of the analysis and ranking of individual components presented in Section 7.2. The ranking of components and sub-components from stakeholders was provided mostly during the previous Open House #2 during the ToR and some more on-line surveys in advance of Open House #3. The additional feedback received is summarized in Tables 4.7-1 and 4.7-2 below.

The City requested that attendees rank the importance of conditions (if any) that Council should consider placing on other municipalities that may use the W12A Landfill. The ranking of importance for conditions in accepting waste from the regional service area is summarized in Table 4.7-1.

Table 4.7-1: Ranking of Importance on Potential Conditions on Accepting Waste from the Regional Service Area

Potential Condition on Accepting Waste from the Regional Service Area	More Important	Important	Less Important
Accept waste from municipalities with comparable waste diversion programs as London	1	1	1
Accept waste from municipalities that have reduced waste per capita to a threshold equivalent to or better than London	2	1	1
Accept waste from municipalities without comparable waste diversion programs as London and charge a higher tipping fee	-	1	1
Accept waste from businesses that have waste diversion programs in place or waste diversion plans to meet provincial government requirements	-	2	-
Restrict total waste received from the regional service area	3	-	-
Restrict annual rate of fill from the regional service area	3	-	-
No conditions	-	-	-

Most respondents indicated that conditions on accepting residential waste from the regional service area were most important. People have expressed that guidance and restrictions are required before proceeding to accept waste from neighbouring municipalities.

A summary of the formal feedback comments is provided in Table 4.7-2.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Table 4.7-2: Summary of Feedback and Comments Received at Open House #3

Feedback Request	Comment Received	City Response
Do you have other conditions on waste coming from the regional service that should be considered?	<ul style="list-style-type: none"> The City should not accept waste from any other municipality (received twice) Accepting waste from the regional service area with no conditions is not an option What kind of waste from other municipalities will be accepted? Will it differ from the usual from London? What is the level of hazard? What is the current waste compared to goal? Alternative 1 build up vertical expansion – What is the downside to going vertical? Better for air quality? 	<ul style="list-style-type: none"> Noted Noted, many others also requested there be conditions. The City will consider conditions such as only accepting waste from municipalities that have a lower residential disposal rate or equivalent waste diversion programs. The waste would be solid non-hazardous waste, the same as presently accepted at the Landfill The City's current residential waste diversion goal is 60%. As outlined in detail in Section 7.4 of the EASR Alternative 1 was most preferred or equally preferred for all components of the environment except visual, engineered containment and local economy. Alternative 1 is most preferred regarding air quality.
Do you understand the different study areas presented for the proposed expansion of the W12A Landfill?	5 out of 5 said yes.	-

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Feedback Request	Comment Received	City Response
Do you have any suggestion, comments, or concerns for our consideration regarding the proposed study areas?	<ul style="list-style-type: none"> Will the number of industrial type trucks increase on Decker Drive, as this is now not officially mandated? Support opportunities to pursue a use for the gas created at the landfill. It is unfortunate that the province cancelled the gas contract London had in place. Concerned about the landfill height, as it is high enough already. No higher. 	<ul style="list-style-type: none"> Decker Drive is not presently, nor for expansion, part of the main Haul Routes (see Figure 5.1-1). The City is interested in finding a use for the LFG created and is currently exploring renewable natural gas options. The visual assessment in Section 9.10 of the EA has evaluated the potential impact of views of the expanded landfill.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Feedback Request	Comment Received	City Response
<p>Do you have any suggestions, comments or concerns regarding any of the studies and/or the studies' conclusions?</p>	<ul style="list-style-type: none"> • The southwest corner of W12A seems close to the Thames River buffer. Are there reinforcements along the landfill perimeter in particular that area? • Noise and smell abatement are key items to keep neighbours support going forward. • Concerned that increasing the height of the landfill will cause an increase in odour days from the current 1 to 2 times per week. • In future technical work as the project proceeds, take into account the growing incidence & severity of extreme weather events. 	<ul style="list-style-type: none"> • The surface water impact assessment in Section 9.3 does not predict any surface water quality impacts from the proposed landfill expansion design. • Noted, commitments regarding noise and odour mitigation and monitoring are outlined in Section 13.0. • The modelling results from the increased landfill height provided in Section 9.1.1 predict that odour will meet the required provincial standards. • Acknowledged, Section 10 of the EASR provides full details on the climate change considerations included in this EA.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

CITY OF LONDON

Feedback Request	Comment Received	City Response
The overall preferred landfill expansion is Alternative 1 (vertical expansion over the existing footprint) Do you agree with Alternative 1 being the preferred overall landfill expansion alternative?	<p>3 of 4 said yes, 1 did not respond</p> <ul style="list-style-type: none"> Concerned that an increase in landfill height will result in increased odour. Support Alternative #1 because most of the previous studies are pertinent since the footprint will be unchanged. 	<ul style="list-style-type: none"> The modelling results from the increased landfill height provided in Section 9.1.1 predict that odour will meet the required provincial standards. Noted.
Do you have any other suggestions, comments or concerns about the community engagement program?	<ul style="list-style-type: none"> What is an alternative to garbage for stiff plastic bags (i.e., horse feed bags marked recycling number 5)? Leverage the rationale to “love food hate waste” campaign (national zero waste council) to support maximizing waste reduction. Is EFS Plastics in Listowel a potential end user for the hefty bag pilot? 	<ul style="list-style-type: none"> At present the City can recycle bottles and tubs made from #5 plastic but bags must be put in the garbage or the Hefty® EnergyBag® if part of that pilot project area. Noted, good suggestion. EFS cannot process the materials in the Hefty® EnergyBag® Pilot Project. For a discussion on where the materials can be recycled, see the post dated Feb. 17, 2020 at getinvolved.london.ca/heb/news_feed/where-do-the-materials-end-up.

4.7.2 Open House #4

Comments from the first and second sessions of Open House #4 were received from 13 people. In addition, 7 email and letter exchanges were received where the public provided feedback. Responses were provided to all persons providing comments.

Overall, meeting attendees were satisfied with the information presented and provided positive feedback on the quality of the information materials and answers provided. A summary of the verbal and written comments received, and the City responses is provided in Table 4.7-3. A copy of the written comments and responses to the verbal and written comments is provided in Volume V Appendix G.06.

Table 4.7-3: Summary of Feedback and Comments Received at Open House #4

Comment Received	City Response
<ul style="list-style-type: none"> Concerns raised due to potential impact to wireless internet connection because of higher landfill. 	<ul style="list-style-type: none"> The City is committed to determining if the existing landfill or the landfill expansion will impact internet and/or cell phone reception of local residences. If it is determined there will be an impact, the City will propose measures such as small communication towers on effected properties (if any) to rectify the situation. This process could potentially be formalized and included in the CEMMP as part of the current review of the program.
<ul style="list-style-type: none"> Opposition expressed to expanding service area. There is a need to control waste coming from regional service area. An increase in the amount and type of waste should not be allowed; only residential waste should be accepted. Municipalities sending waste should have effective diversion programs. 	<ul style="list-style-type: none"> The City will consider conditions such as only accepting waste from municipalities that have a lower residential disposal rate or equivalent waste diversion programs. Feedback on potential options was presented in Table 4.7.1.
<ul style="list-style-type: none"> Objection expressed to Alternative 1; preference to Alternative 2. 	<ul style="list-style-type: none"> The comparison of alternative methods indicates that Alternative 1 is the preferred expansion alternative (see Section 7 of the EASR for full details).
<ul style="list-style-type: none"> Planning period for the landfill expansion should be longer. 	<ul style="list-style-type: none"> The Amended ToR was approved by the Minister of Environment, Conservation and Parks for a 25 year period. This cannot be increased.
<ul style="list-style-type: none"> Concerns raised regarding speeding trucks from new cement plant. 	<ul style="list-style-type: none"> Noted.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Comment Received	City Response
<ul style="list-style-type: none"> Water quality concerns expressed, and specifically the quality of nearby water wells. 	<ul style="list-style-type: none"> Groundwater monitoring wells located around the landfill do not show any off-site migration of contaminants from the landfill. Monitoring of private water wells in the area do not show any impacts from the landfill. The results do include some elevated aesthetic water quality parameters in some wells but the water is safe to drink. The elevated parameters are naturally occurring. Groundwater modelling indicates that the landfill can be designed to meet applicable groundwater quality guidelines (see Section 9.2 of the EASR).
<ul style="list-style-type: none"> Nuisance wildlife (i.e., vultures) cause damage by roosting on nearby structures. 	<ul style="list-style-type: none"> Proposed mitigation measures are being considered as part of the current review of the CEMMP. This would include a pilot project on using various turkey vulture control measures to keep turkey vultures off private property.
<ul style="list-style-type: none"> Bad odours in 2019, but none in 2020. Concerns expressed over potential increase in odours at nearby residence due to increase landfill height. Individual requested data from other landfills that have expanded vertically. Concerns over increased height and the potential for odours to travel farther. 	<ul style="list-style-type: none"> Preliminary air quality modelling completed for the Environmental Assessment indicates that the proposed expansion will be within the MECP guideline for odour (see Section 9.1 of the EASR). Additional air quality modelling and monitoring will be undertaken as part of the more technical Environmental Protection Act approval for the landfill expansion and during initial operations of the landfill expansion. This will include: <ul style="list-style-type: none"> Verify that the odour emission rates used in the odour assessment were reasonable, but conservative. This will include 1) one-time landfill gas sampling early in the expansion to confirm emission rates from the site of indicator compounds and 2) sampling analysis to include odourous compounds, Vinyl Chloride and Hydrogen Sulphide. Review and update the odour management plan and complaints response protocol.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Comment Received	City Response
<ul style="list-style-type: none"> Approval should include a sunset clause when landfill has to close or commit to not expanded again. 	<ul style="list-style-type: none"> Approval for a landfill expansion is given for a specific volume of waste not a set period of time. Landfill would not function optimally as designed if less waste is received (e.g., surface water flows would be different which could impact the stormwater management ponds). Currently increasing waste reduction extends the life of the landfill. Having a sunset clause when the landfill has to close would be a disincentive for waste reduction.
<ul style="list-style-type: none"> Various information and documents requests; <ul style="list-style-type: none"> How were residents informed about the open house Waste composition Where plastics are recycled CEMMP document Existing Conditions and Impact Assessment Study for Archeology, Biology, etc. Renderings of the view of the expanded landfill from specific properties 	<ul style="list-style-type: none"> All documents and information requested were provided.
<ul style="list-style-type: none"> Confirm screening berm will be constructed on south side of the landfill. 	<ul style="list-style-type: none"> To reduce the visual impact of daily operations to the south of the landfill, waste would be placed initially to build a berm along the south side of the landfill's waste disposal area and will be covered with final cover soil and seeded to establish vegetation. (see Section 9.9.2.2 of the EASR)
<ul style="list-style-type: none"> What can the City do to screen the view of the landfill's operating equipment from residences to the north of the landfill. 	<ul style="list-style-type: none"> The existing CEMMP will be seeking stakeholder feedback on how the program can be improved including what are appropriate screening measures for private properties. This could include the City providing funding to properties with visual impacts to construct screening measures (e.g., plant trees). (see Section 9.10 of the EASR)

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Comment Received	City Response
<ul style="list-style-type: none"> Concerned the increase landfill height will increase winds at the Islamic Cemetery of London. 	<ul style="list-style-type: none"> A desktop analysis was completed to evaluate the effects of wind flows on the cemetery. The analysis concluded that the cemetery is located outside the highly turbulent region where wind effects induced by the landfill expansion are likely. Consequently, the landfill expansion is unlikely to have significant effects on wind flows at the cemetery.
<ul style="list-style-type: none"> Asked for clarification of what agricultural land included in the on-site buffer will be used for. 	<ul style="list-style-type: none"> In general, the additional buffer lands that are currently in active agricultural production will be seeded and left fallow with the following exceptions; <ul style="list-style-type: none"> Fencing along the new landfill boundary Berms constructed along the new landfill boundary that runs long White Oak Road and Scotland Drive Land between the existing landfill and Material Recovery (Recycling) Facility that will accommodate a new small vehicle Waste and Resource Material Drop-off Area.
<ul style="list-style-type: none"> Will any listed heritage buildings be purchased as part of expansion? 	<ul style="list-style-type: none"> No heritage buildings will be purchased (see Section 9.8 of the EASR).
<ul style="list-style-type: none"> Litter from trucks 	<ul style="list-style-type: none"> Potential changes to the landfill's off-site litter management program can be considered as part of the review of the existing CEMMP. Any changes can be formalized and added to the revised CEMMP and/or to the Design and Operations report for the landfill expansion.
<ul style="list-style-type: none"> Potential health impacts 	<ul style="list-style-type: none"> Preliminary air quality, groundwater and surface water modelling completed for the EA indicates that the proposed expansion will be within applicable MECP guidelines. (see Sections 9.1, 9.2 and 9.3 of the EASR)
<ul style="list-style-type: none"> Poor treatment of local residents 	<ul style="list-style-type: none"> Noted
<ul style="list-style-type: none"> Climate change impact 	<ul style="list-style-type: none"> The document entitled "Considering Climate Change in the Environmental Assessment Process" (MECP, 2019) was used as a guide for incorporating measures in the landfill expansion design that reduce both the potential impact of climate change on the landfill (i.e., climate change adaptation) and its potential impact on climate change (i.e., climate change mitigation). (see Section 10 of the EASR).

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Comment Received	City Response
<ul style="list-style-type: none"> Road traffic concerns 	<ul style="list-style-type: none"> The anticipated increase in traffic as a result of increasing population and additional communities using the expanded landfill is not forecasted to cause any issues with traffic movement along the haul routes (see Section 9.11 of the EASR). Concerns relating to traffic movement may include changes to access/egress to the site for trucks and increased truck traffic. No changes to access and egress are anticipated from the expanded site. Potential noise impacts were evaluated using existing information and predictive modelling. The change in traffic noise levels between the existing landfill and the landfill expansion is projected to be insignificant to noticeable using the provincial scale to quantify this change; this is considered an acceptable change (see Section 9.1 of the EASR).
<ul style="list-style-type: none"> Could the City use the landfill gas to generate electricity 	<ul style="list-style-type: none"> The City is currently looking at renewable natural gas from the landfill as it is not possible to add more electricity to the grid in this area of London as the transformers are near capacity and cannot receive more electricity
<ul style="list-style-type: none"> Could near-by City land be used for creating habitat for species at risk birds 	<ul style="list-style-type: none"> The use of City land to encourage the nesting of birds, including species at risk, would likely best be handled through the CEMMP. One option for how this could work would be for the City to identify lands that they would make available for such purposes (e.g., not in agricultural production, not needed in the future for other uses, etc.) and the W12A Landfill PLC use funds from the Community Enhancement Fund to establish features on the land to encourage nesting (e.g., barn like structures for barn swallows).

4.7.3 Indigenous Community Events

The following comments were received from the Dragun consultant on behalf of AFN.

Table 4.7-4: Summary of Comments Received Regarding the Groundwater Work Plan

Comment Received	City Response
<p>In their peer review letter of the City of London W12A Landfill Area Plan Study Hydrology/Hydrogeological Background Study, dated July 8, 2019, Dragun expressed their concern of the use of vertical boreholes to investigate the presence of fractures in the surficial aquitard. As Dragun (2019) previously noted: “Even though 80% of the investigation locations in 1972 and 1973 identified fracturing evidence to a maximum observed depth of 18 feet (5.49 mbgs), the chance of encountering a vertical fracture at depths greater than 10 to 12 feet (3.05 to 3.66 mbgs) using a vertical soil boring is very slim.” To maximize the potential to identify deep fractures, the Investigation Team should consider angled drilling of the surficial aquitard.</p>	<p>At the August 26, 2019 workshop, the City agreed that a test pit would be dug to examine fractures in the surficial till soils and the work plan was revised accordingly.</p> <p>The test pit was completed on November 6, 2019.</p>
<p>In Dragun’s peer review letter dated July 8, 2019, it was noted that within the “Review of Hydrogeological Conditions” document, there was a reference to water taking from municipal groundwater in close proximity to the landfill. Can documentation be provided regarding the location of pumping well(s), construction details (well screen length and depth/elevation), timeframe of use, pumping rates, well abandonment documentation, water quality data, and reason(s) why the well(s) was/were taken out of service?</p>	<p>At the August 26, 2019 workshop it was agreed that additional information would be provided on former municipal wells in the area. Documents with the requested information were provided to Dragun on September 10, 2019.</p>

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Comment Received	City Response
Regarding the high chloride and sodium concentrations at the monitoring well 92-6 (04-6a) location, in the July 8, 2019 peer review letter, Dragun questioned whether shallow soil samples be collected around this wellhead and tested for sodium adsorption ratio and conductivity? Is it possible to review historical aerial photographs, if available, they may show areas of salt storage.	At the August 26, 2019 workshop it was agreed soil samples around monitoring well 92-6 (04-6a) location would be collected and tested for sodium adsorption ratio and conductivity. It was noted at the meeting that a previous review of historical photographs did not show any buildings in the vicinity of monitoring well 92-6 (04-6a).
In their peer review letter of the City of London W12A Landfill Area Plan Study Hydrology/Hydrogeological Background Study, dated July 8, 2019, Dragun expressed their concern that the Groundwater work plan does not present any investigation tasks related to installation of monitoring wells within the upper aquitard. The investigation team could consider the installation of three monitoring wells within the upper aquitard.	At the August 26, 2019 workshop it was agreed that information on existing till monitoring wells would be reviewed before making decisions on the installation of additional till monitoring wells. Documents with the requested information were provided to Dragun on September 10, 2019.
In the August 27, 2020 workshop, Dragun requested that modelling be completed for a third area in the southeast corner of the landfill where the surficial aquitard is not as thick. This would help to ensure that the worst-case scenario is being considered.	This modelling was completed and is discussed in Volume IV Appendix D.03.

5.0 Description of the Environment Potentially Affected

This section provides a description of the environmental, socio-economic, and technical components, which together are defined as the environment that may be affected by the undertaking. The environmental component includes air quality, noise, hydrogeology, surface water and aquatic and terrestrial biology. The socio-economic component includes socio-economic, land use and cultural. The technical component includes financial and built aspects of the environment. The environment is first described at a regional scale, as the Wider Study Area, to provide context for the assessment. The environment is then described in greater detail for the three generic study areas that were used in the EA studies: the Site Study Area, the Site-vicinity Study Area and the Wider Study Area.

Section 5.1 provides an overview of the study areas to provide context for the assessment. The existing conditions for the environmental, socio-economic and technical components are then described in Sections 5.2 to 5.13.

5.1 Study Areas and Timeframes

The study area is the area within which activities associated with the proposed project will occur and where potential environmental effects will be studied. Three preliminary generic study areas for the assessment were identified as follows:

- Site Study Area – The existing W12A Landfill Site and adjacent area of land within which landfill expansion may occur;
- Site-vicinity Study Area – The lands in the area immediately adjacent to the Site Study Area that have the potential to be directly or indirectly affected by the landfill expansion and activities within the Site Study Area. As described below, the extent of the Site-vicinity Study Area was determined for each of the environmental, socio-economic and technical component described in Section 7.3 of the approved Amended ToR and Sections 5.2 to 5.13 of this EASR; and
- Wider Study Area – lands generally beyond the Site-vicinity Study Area, which could extend to include the entire City and is considered a regional scale.

The rationale for the definition of these preliminary generic study areas is as follows:

- Site Study Area – The area of land within which ‘Alternative Methods’ of landfill expansion may occur has been defined and will be limited to the existing W12A Landfill property and a specific portion of the adjacent Special Policy Area to the immediate north and east. Note that since the ToR the area to the east of the existing landfill has been slightly enlarged to accommodate expected ancillary facilities proposed by the City in conjunction with the landfill expansion.
- Site-vicinity Study Area – The MECP Guideline D-4 Land Use on or Near Dumps describes that the most significant potential impacts typically occur within 500 m of the perimeter of the waste disposal area on a landfill site (MOE, 1995). For this reason, this Guideline distance is often used by Ontario municipalities in their Official Plans to establish a holding zone around landfills; development within these zones requires

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

proponents to demonstrate that their proposed development will not be adversely affected by the landfill site and its operations. For most components, a Site-vicinity Study Area of 500 m from the Site Study Area limits is appropriate. For specific environmental, socio-economic and technical components, the appropriate Site-vicinity Study Area is greater than 500 m from the existing or potential expanded disposal area. It should also be recognized that the W12A Landfill has been in operation for over 40 years, and monitoring and operational data demonstrates compliance with the requirements of its ECA and the limited extent for potential adverse environmental impacts to occur off-Site.

- Wider Study Area – An area that takes in the broader community generally beyond the immediate Site-vicinity and for specific components may include the entire municipality.

The preliminary extent of the study area proposed for each of the components to be studied during the EA, together with a rationale, is provided in Table 5.1-1 below.

Table 5.1-1: Proposed Preliminary Study Areas

Component	Preliminary Area(s) to be Studied	Rationale
Atmosphere	Site and Site-vicinity	Air and noise emissions are required to meet provincial requirements at the landfill site boundary or closest sensitive receptors (which are within 500 m of the landfill).
	Site and Site-vicinity	Odour emissions may travel further than 500 m but any effects are expected to be within 1.5 km of the Site Study Area.
	Site-vicinity	To assess haul route noise. See discussion under Transportation for a description on the Site-vicinity Study Area for the haul routes.
Geology and Hydrogeology	Site	Potential effects on groundwater quality have to comply with the MECP Reasonable Use Guideline at the landfill site boundary.
Surface Water	Site and Site-vicinity	Necessary to include the drainage boundaries of the subwatersheds within which the site is located.
Biology	Site and Site-vicinity	Potential effects on biological resources are expected to be limited to 500 m from the Site Study Area.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Component	Preliminary Area(s) to be Studied	Rationale
Land Use	Site and Site-vicinity	Since there are provincial requirements that govern the potential emissions or discharges from the landfill site, potential effects on land use are expected to be limited to 500 m from the Site Study Area.
Agriculture	Site and Site-vicinity	Since there are provincial requirements that govern the potential emissions or discharges from the landfill site, potential effects on agriculture are expected to be limited to 500 m from the Site Study Area.
Archaeology	Site	Potential disturbance of archaeological resources will be limited to areas associated with the landfill expansion.
Cultural Heritage	Site and Site-vicinity	In accordance with Ministry of Heritage, Sport, Tourism and Culture Industries requirements for cultural studies, the area of study considers properties immediately adjacent to the proposed limit of waste of the landfill expansion. Potential effects on cultural resources are expected to be limited to within 500 m from the Site Area. This area of study has been modified from the area described in the approved Amended ToR, which considered an area of study that extended to approximately 1.5 km from the Site Study Area as shown on Figure 5.4-1 of the approved Amended ToR.
Socio-economic	Site, Site-vicinity and Wider	To consider the potential effects of the landfill expansion within 500 m of the Site Study Area and on the broader community.
Visual	Site-vicinity	Off-site vantage points from where the landfill expansion may be visible could extend as far as 3.5 km. This area of study has been modified from the area described in the approved Amended ToR, which considered an area of study extending 5 km.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

Component	Preliminary Area(s) to be Studied	Rationale
Transportation	Site-vicinity	To consist of the haul routes associated with the landfill, specifically Manning Drive between Wellington Road South and Highway 401 and Wellington Road South between Dingman Drive and Manning Drive. Also, Wonderland Road South between Decker Drive and Manning Drive (as suggested by public feedback received during Open House #2). As shown on Figure 5.1-1, Wonderland Road South and Manning Drive intersection / interchange ramps will also be evaluated as part of the EA study.
Design and Operations	Site	This component relates only to activities associated with the landfill expansion itself.

The Site Study Area and the area extending 500 m beyond the Site Study Area are illustrated on Figure 5.1-1. The Wider Study Area is not depicted on this figure.

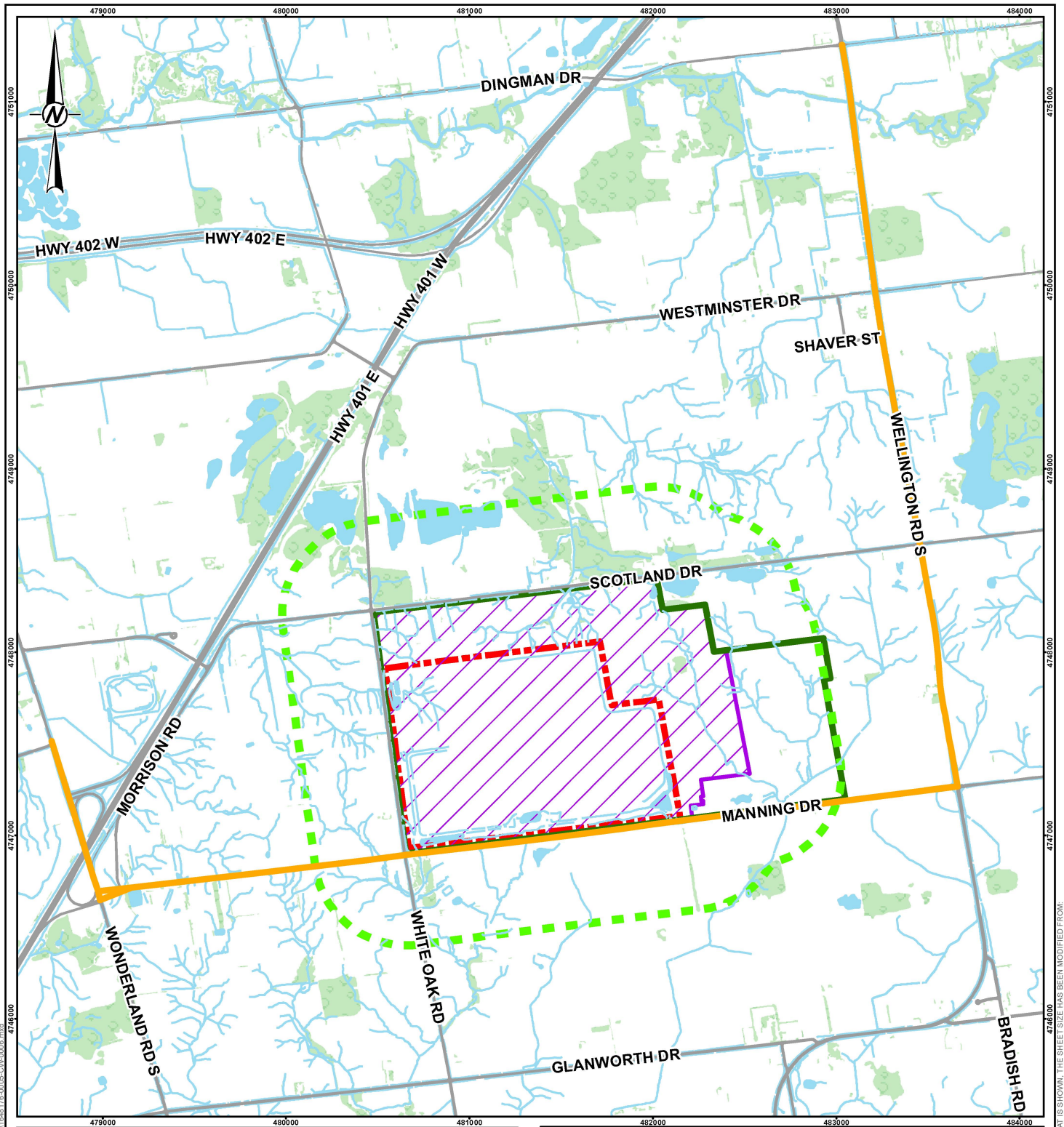
These preliminary study areas were refined and confirmed in consultation with the GRT, members of the public and Indigenous communities during the EA.

In addition to the three study areas as defined above, the term Site/Property Area was introduced in this EASR after the identification of the preferred landfill expansion alternative. This was required because the existing W12A Landfill site and adjacent area of land identified for the proposed expansion comprised only a portion of the Site Study Area, and was used in relation to the detailed impact assessment of the proposed expansion as described in Section 9.0 of this EASR.

As noted previously, the W12A Landfill is expected to reach capacity by 2024. Assuming that the necessary approvals will be in place by that time and that the expected life of the expanded landfill is approximately 25 years, then the following time frames are proposed for the assessment:

- Operations (2024 through 2048); and
- Post-closure (beyond 2048).

Landfilling operation activities will occur throughout the expanded life of the W12A Landfill (i.e., about 25 more years from 2024 through 2048). Leachate collection and treatment, LFG system operation, and site performance monitoring and maintenance activities will also be ongoing throughout this time frame as well as during the post-closure period (i.e., beyond 2048).



LEGEND

- EXISTING W12A LANDFILL SITE BOUNDARY
- SITE STUDY AREA
- 500 m BEYOND SITE STUDY AREA
- HAUL ROUTES TO BE ASSESSED
- WASTE MANAGEMENT RESOURCE RECOVERY AREA BOUNDARY

0 300 600 1,200
1:30,000 METRES

REFERENCE(S)

1. DATA PROVIDED BY THE CITY OF LONDON.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
STUDY AREAS

CONSULTANT



YYYY-MM-DD 2018-04-04

DESIGNED ---

PREPARED JEM

REVIEWED TG

APPROVED PAS

PROJECT NO.
1648176

CONTROL
0005

REV.
0

FIGURE
5.1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

5.2 Atmosphere

This section of the EASR provides a summary of the existing environment conditions for air quality (including odour) and noise in the Site-vicinity Study Area, as described in Sections 5.2.1 and 5.2.2, respectively. These summaries were compiled from the detailed studies of the Atmosphere Environment (air and noise) documented in Volume IV Appendix D.01 and Appendix D.02, respectively.

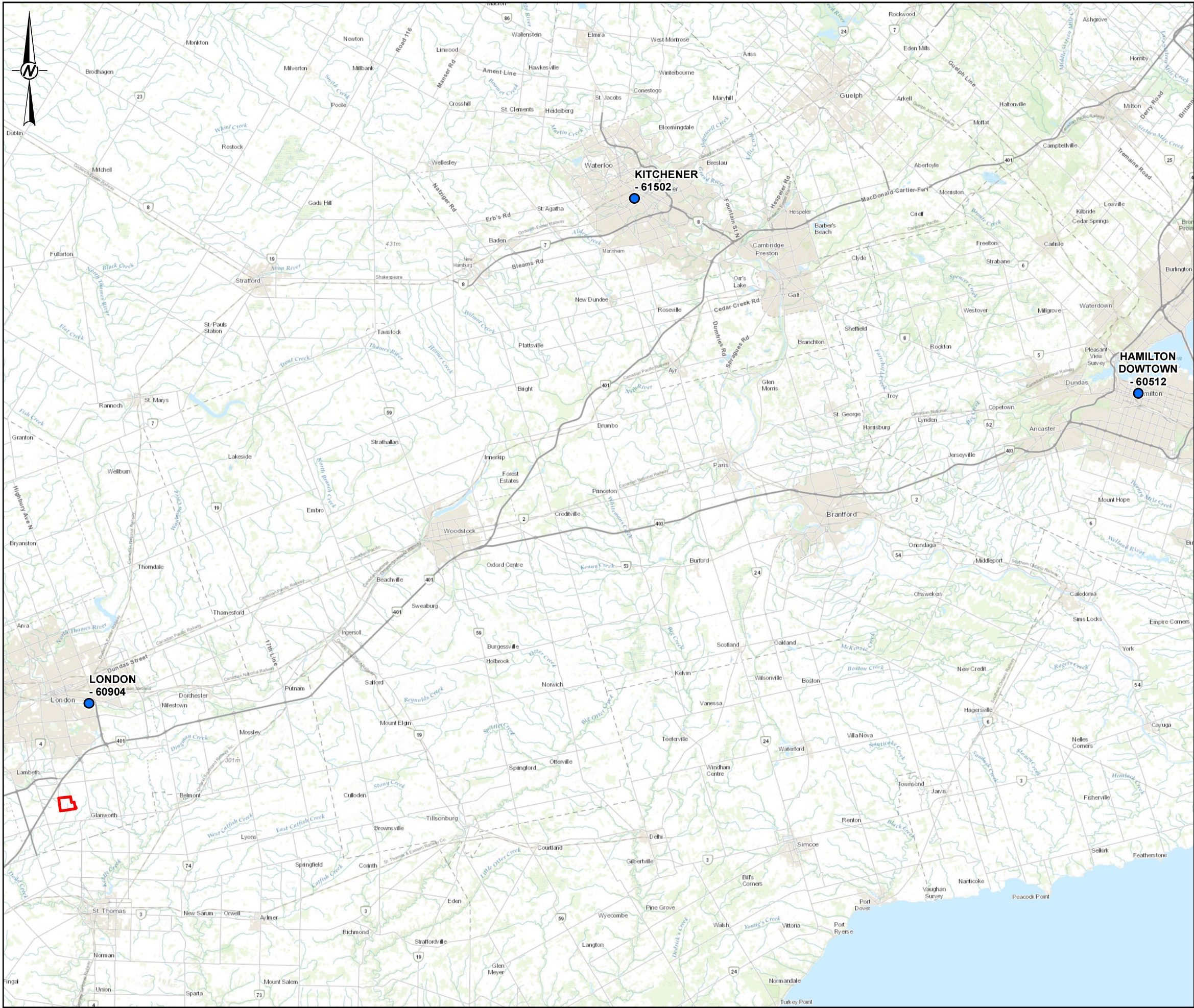
5.2.1 Air Quality

This section presents a characterization of existing background air quality within the Site-vicinity Study Area. The approach used to describe the existing sources is described below.

- The existing air quality was characterized using a combination of existing information and dispersion models;
- Field studies were not undertaken to characterize the existing air quality. Adequate data was available from existing sources to characterize regional air quality and was used to describe background air quality within the Site-vicinity Study Area; and
- The existing air quality described below considers the combination of the background air quality from regional ambient monitoring stations with the modelled existing air quality from the approved sources of air emissions at the W12A Landfill.

5.2.1.1 Air Quality Monitoring Data and Modelled Air Quality from Existing Sources

Background air quality was characterized using observations from the Environment and Climate Change Canada (ECCC) National Air Pollution Surveillance Network (NAPS) air quality monitoring stations (ECCC 2019). The closest air quality monitoring station is the London Station. This station, along with two other NAPS air quality monitoring stations in Kitchener and Hamilton, were used to determine the background air quality (see Figure 5.2-1 and Table 5.2-1).



LEGEND

- AMBIENT AIR MONITORING STATION
- W12A LANDFILL SITE

REFERENCE(S)

1. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

DRAFT

0 3,900 7,800 15,600
1:400,000 METRES

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
AIR QUALITY MONITORING STATIONS

CONSULTANT	YYYY-MM-DD	2020-08-19
	DESIGNED	----
	PREPARED	JEM
	REVIEWED	----
	APPROVED	----

PROJECT NO. 1648176	PHASE 0020	REV. A	FIGURE 5.2-1
------------------------	---------------	-----------	-----------------

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

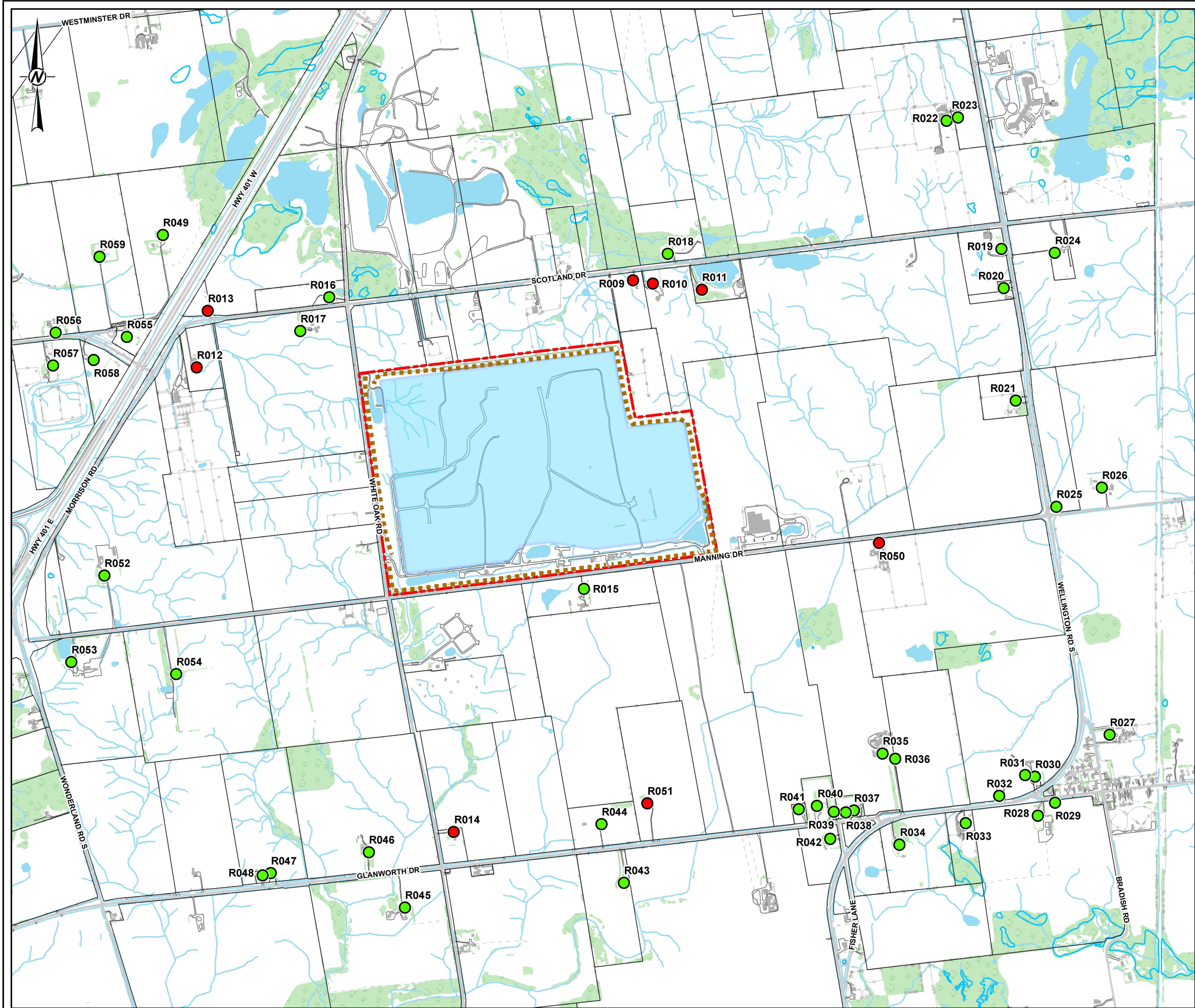
Table 5.2-1: NAPS Air Quality Monitoring Stations

City	Station ID	Distance to Site (km)	Direction	Comments
London	60904	12	northeast	Expected that the Project will experience similar wind patterns and impacts from regional transport of compounds as this station. This station has most relevant air quality indicator compounds except carbon monoxide (CO) and sulphur dioxide (SO ₂).
Kitchener	61502	87	northeast	Similar to London due to Kitchener's similar size, industry and proximity to Highway 401. This station has all relevant air quality indicator compounds except CO and SO ₂ .
Hamilton	60512	~110	northeast	The Hamilton station was selected for the CO and SO ₂ data as it was the most representative station that monitors these compounds

Existing approved on-site sources of air emissions include:

- Landfill gas generated from waste decomposition;
- By-products from combustion of landfill gas in the flare;
- Traffic, loading and unloading, on-site vehicle emissions, and landfill waste receipt activities; and
- Landfill daily and final cover activities.

The AERMOD-PRIME (AERMOD) dispersion model (Version 19191) was used to predict existing ground-level concentrations for the indicator compounds. The AERMOD modelling system was developed by the United States Environmental Protection Agency (U.S. EPA) and has been adopted in Ontario as the regulatory model recommended by the MECP. The AERMOD model (Version 19191) was used to predict concentrations at a series of off-site locations, referred to as points of reception (PORs). These off-site PORs included a series of PORs placed at nearby residences (referred to as sensitive PORs and illustrated on Figure 5.2-2). Model predictions for most of the indicator compounds are presented as the highest value from any modelled POR.



LEGEND

- CITY OWNED PROPERTY - EXISTING
- NON-CITY OWNED PROPERTY - EXISTING
- WATERCOURSE
- DRIVEWAY
- FENCELINE
- TRAIL
- APPROXIMATE BERM LOCATION
- BUILDING FOOTPRINT
- WOODED AREA
- WATERBODY
- EXISTING PROPERTY BOUNDARY
- EXISTING APPROVED LIMIT OF WASTE

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
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
SENSITIVE RECEPTOR LOCATIONS

CONSULTANT	YYYY-MM-DD	2020-08-19
	DESIGNED	----
	PREPARED	JEM
	REVIEWED	TG
	APPROVED	PAS

PROJECT NO. 1648176 CONTROL 0017 REV. 0

FIGURE 5.2-2

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

More details regarding the development of emission calculations and additional details regarding the dispersion modelling set-up are provided in Volume IV Appendix D.01.

Table 5.2-2 lists the emission rates from the W12A Landfill that were used to characterize the air quality in the Site-vicinity Study Area from currently approved sources, based on the emission rate calculations described in Volume IV Appendix D.01.

Table 5.2-2: Existing Emissions from W12A Landfill

Compound	Units	Emission Rate
SPM	g/s	1.828
PM ₁₀	g/s	0.494
PM _{2.5}	g/s	0.198
NO _x	g/s	0.959
SO ₂	g/s	0.078
CO	g/s	1.612
H ₂ S	g/s	0.020
C ₂ H ₃ Cl	g/s	0.002
Odour	OU/s	5779.037

Notes:

SPM – suspended particulate matter

PM₁₀ – particulate matter with diameter of 10 microns or less

PM_{2.5} – particulate matter with diameter of 2.5 microns or less

NO_x – Nitrogen oxides

SO₂ – Sulfur dioxide

CO – Carbon monoxide

H₂S – hydrogen sulphide

C₂H₃CL – vinyl chloride

OU – odour unit

The existing air quality conditions against which the Project will be evaluated are a combination of background air quality for the region and the modelled air quality resulting from the emissions of currently approved sources at the existing site. Table 5.2-3 provides a summary of the existing conditions for each of the indicator compounds.

Table 5.2-3: Existing Air Quality (background plus currently approved activities)

Indicator	Averaging Period	Maximum Predicted Concentration from Currently Approved Activities ($\mu\text{g}/\text{m}^3$)	Background Air Quality ($\mu\text{g}/\text{m}^3$)	Existing Air Quality ($\mu\text{g}/\text{m}^3$)
SPM	24-hour	12.01	45.83	57.84
	Annual	2.15	26.85	29.00
PM ₁₀	24-hour	5.35	25.46	30.81
PM _{2.5}	24-hour	1.57	13.75	15.32
	Annual	0.23	8.06	8.29
NO _x	1-hour	119.32	22.57	141.89
	24-hour	84.60	19.87	104.47
	Annual	2.87	11.70	14.57
SO ₂	10-minute	0.39	56.19	56.58
	1-hour	0.24	34.05	34.29
	24-hour	0.07	32.36	32.43
	Annual	0.0035	9.08	9.08
CO	½-hour	789.52	549.72	1,339.24
	1-hour	657.93	458.10	1,116.03
	8-hour	97.09	572.62	669.71
H ₂ S	10-min	2.58	0.84	3.42
	24-hour	0.41	0.21	0.62
C ₂ H ₃ Cl	24-hour	0.0335	0.00382	0.037
	Annual	0.0057	0.00147	0.007
Odour ¹	10-min	0.55	—	0.55

Note: ¹ Values are in OU/m³ and presented at the 95%ile

5.2.1.2 Review of Existing Odour Complaints Data

A review of the odour complaint records for the landfill in 2019 was conducted to identify the likelihood that the landfill may have contributed to each odour complaint. This was undertaken through a review of the location from which the complaint was made and corresponding wind direction at the time the complaint was logged. If the area of the complaint did not appear to be reasonably downwind of the W12A Landfill at the time the complaint was logged, it was deemed unlikely that W12A Landfill was a significant contributor to the complaint and thus the corresponding data was not used for further analysis.

ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION CITY OF LONDON

In 2019, a total of 58 odour complaints were received by the City in relation to W12A Landfill. This value is similar to the number of complaints received in 2018 (62 complaints) but higher than in previous years (19 in 2014, 21 in 2015, 17 in 2016, 34 in 2017).

Of the 58 odour complaints received in 2019, eight complaints were excluded based on wind direction, leaving 50 complaints that may reasonably be attributed, in whole or in part, to the W12A Landfill. These 50 “verified” complaints were received from 30 different reported addresses surrounding the site with the majority recorded at addresses along the western end of Manning Drive. It is recognized that one complaint may represent more than one person experiencing an odour episode.

Prior to 2020, the LFG collection system relied mainly on vertical extraction wells to capture LFG being generated in the waste. In the spring of 2020, the latest LFG collection system expansion was completed. This expansion included horizontal collection pipes as well as additional vertical collection wells. This is the type of LFG collection system that is proposed for the landfill expansion and is expected to be able to capture a higher percentage of LFG in the areas where it is installed.

By June 2020 the amount of LFG being collected increased to approximately 1,500 scfm. By October 2020 the amount of LFG being collected increased to approximately 1,700 scfm, which is the maximum capacity of the existing flare. In total the amount of LFG being collected increased almost 50% (500 scfm) in one year.

The increase in the amount of landfill gas being collected appears to have had a direct effect on reducing odours. Verified complaints in 2020 were 19, with only 3 in the second half of the year. There have been no complaints since October 2020.

Figure 5.2-3 below shows the frequency of complaints received for each wind direction for 2019. The majority of odour complaints have historically been recorded during times when winds are blowing from the east.

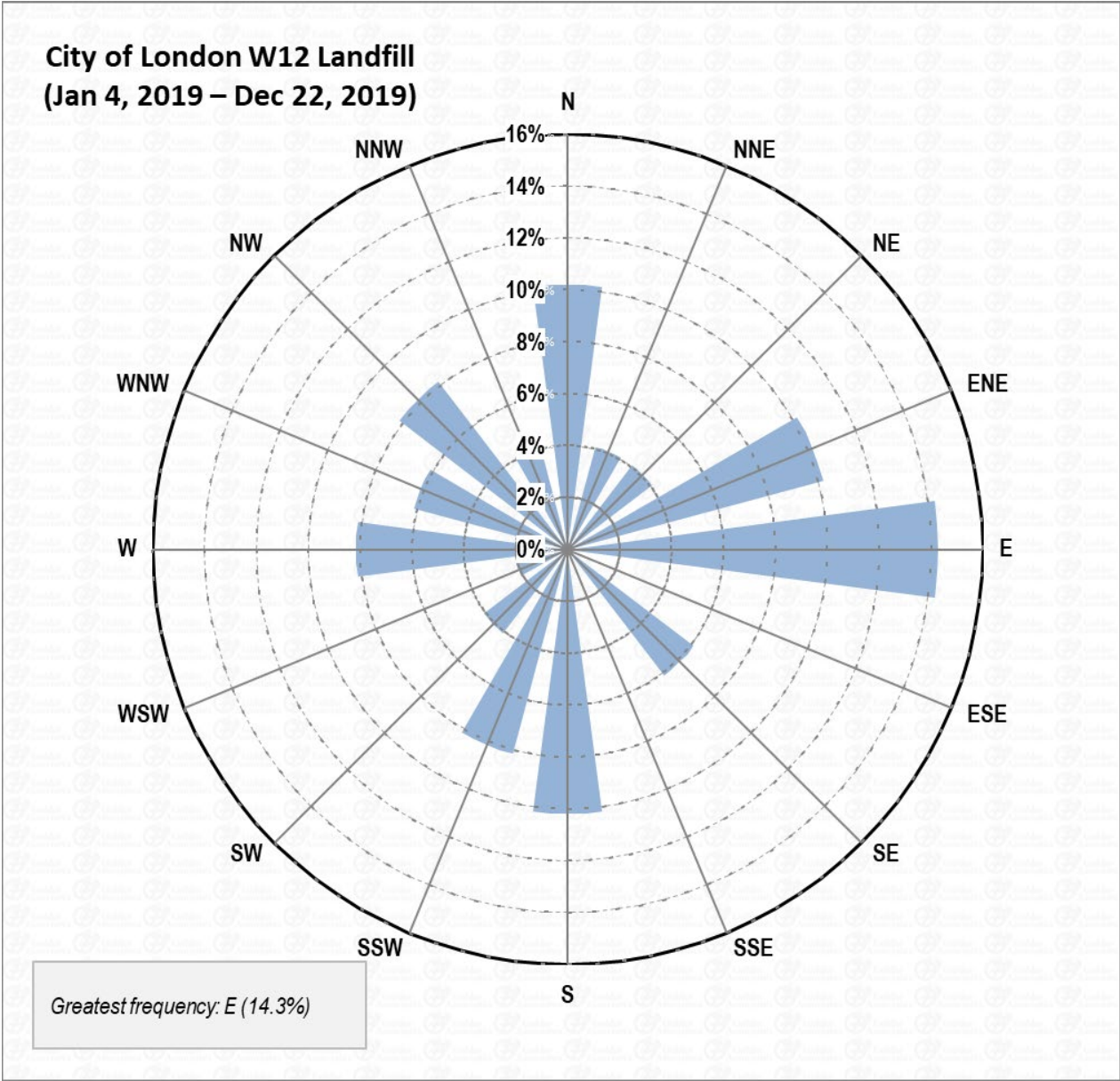


Figure 5.2-3: Odour Rose for 2019 Odour Complaints
Potentially Attributed to W12A Landfill

5.2.2 Noise

This sub-section presents a characterization of the existing acoustic environment.

Much of the lands within the Site-vicinity Study Area, near the current landfill property, are owned by the City, as shown in Figure 5.2-4, and do not contain any existing noise-sensitive buildings (i.e., vacant lands). Figure 5.2-4 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 include R01, R02, R04, R06, R10, R15, R16, R19, R23, R25 and, R50.

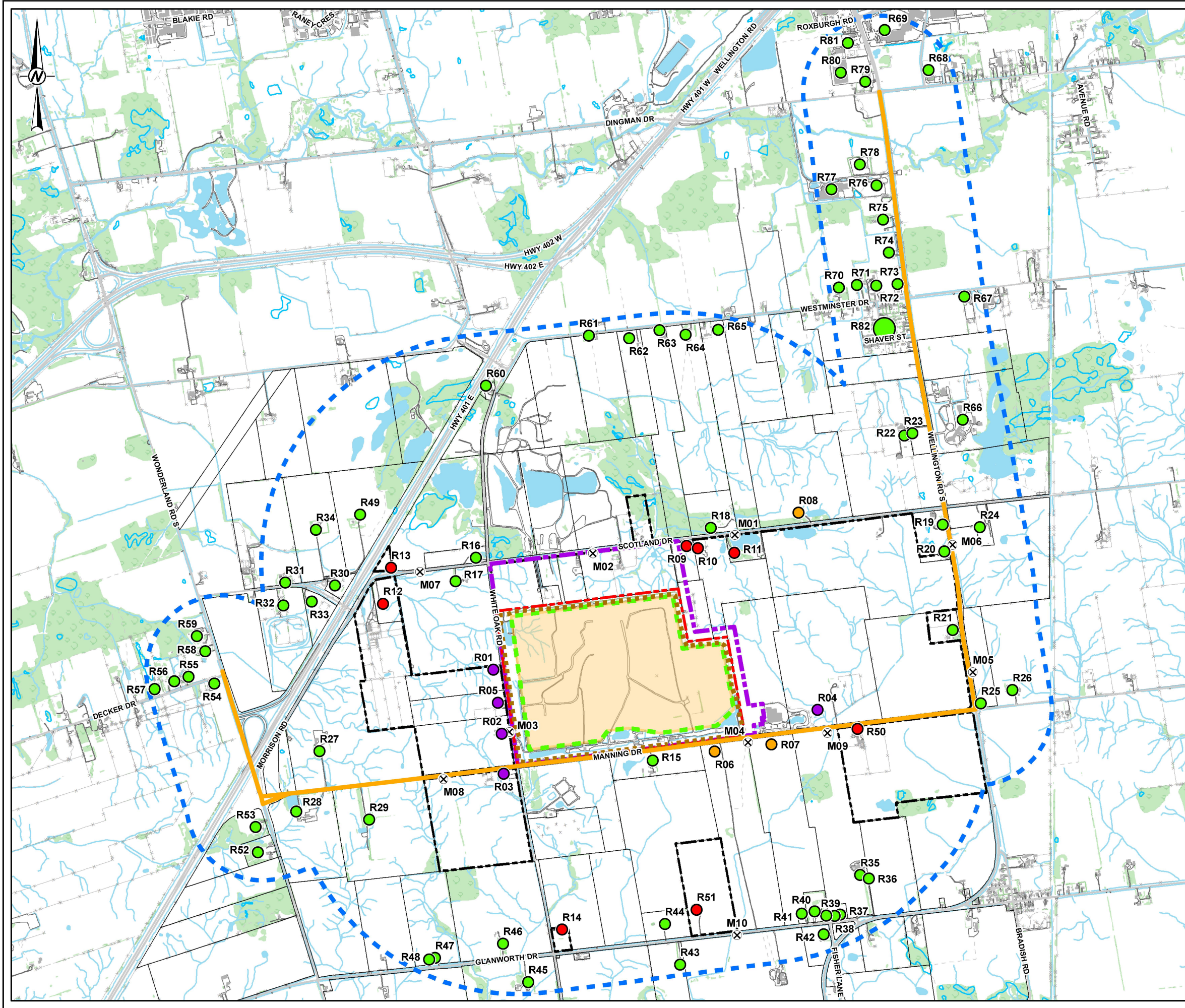
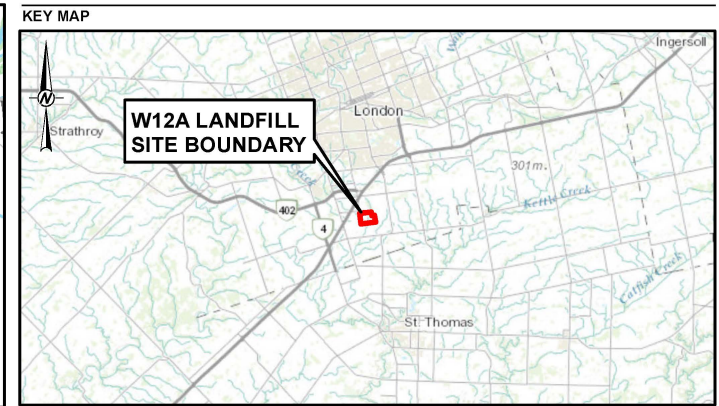
An assessment was completed to establish the existing conditions in the acoustic environment Site-vicinity Study Area, and to be subsequently used to assess the potential impacts due to the Project. Existing noise levels in the Site-vicinity Study Area are influenced by vehicle traffic, existing landfill 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 landfill.

Noise levels from the following activities were assessed to determine existing conditions:

- Landfilling operations, which are comprised of the following scenarios:
- Normal operations (7 a.m. to 5 p.m.);
- Site preparation (6 a.m. to 7 a.m.);
- Building a berm (daytime only);
- Placement of daily cover (5 p.m. to 6 p.m.); 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).



LEGEND

- CITY OWNED PROPERTY - EXISTING
- CITY OWNED PROPERTY - VACANT
- NON-CITY OWNED PROPERTY - EXISTING
- NON-CITY OWNED PROPERTY - EXISTING (RURAL SUBDIVISION OF APPROXIMATELY 40 HOUSES)
- 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

0 245 490 980
1:25,000 METRES

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
NOISE STUDY AREAS AND POINTS OF RECEPTION

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

PROJECT NO. 1648176	PHASE 0017	REV. A	FIGURE 5.2.4
------------------------	---------------	-----------	-----------------

Path: N:\data\Spatial_Maps\Hydro\London\Sites_W12A09_PROJ\1648176\00_PROCD0017_EA_Report_Section-81\648176-0017-CN-0005.mxd

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

Landfill operations noise sources and ancillary facilities noise sources are outlined in detail in Volume IV Appendix D.02.

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

5.2.2.1 *Short-term Monitoring and Landfill Equipment Sound Level Measurements*

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 5.2-4 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 monitoring locations were carried out on readily accessible public areas near the identified representative PORs, which were generally along the edge of the roads.

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 subsequent assessment for potential landfill expansion noise impacts in the Site-vicinity Study Area) on 24 August 2020.

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 summarizes the locations (shown in Figure 5.2-4) and measured noise levels at each of the 10 monitoring locations.

Table 5.2-4: 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

5.2.2.2 Noise Prediction Modelling

Noise predictions were carried out using the Computer Aided Noise Attenuation (CadnaA) noise modelling software to establish the existing conditions 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. CadnaA model input parameters are provided in Volume IV Appendix D.02.

Landfilling Equipment

The noise predictions for landfill equipment were carried out using CadnaA. The prediction method used 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 related specifically to the site. Noise sources for the landfill