8.0 Description of the Preferred Undertaking

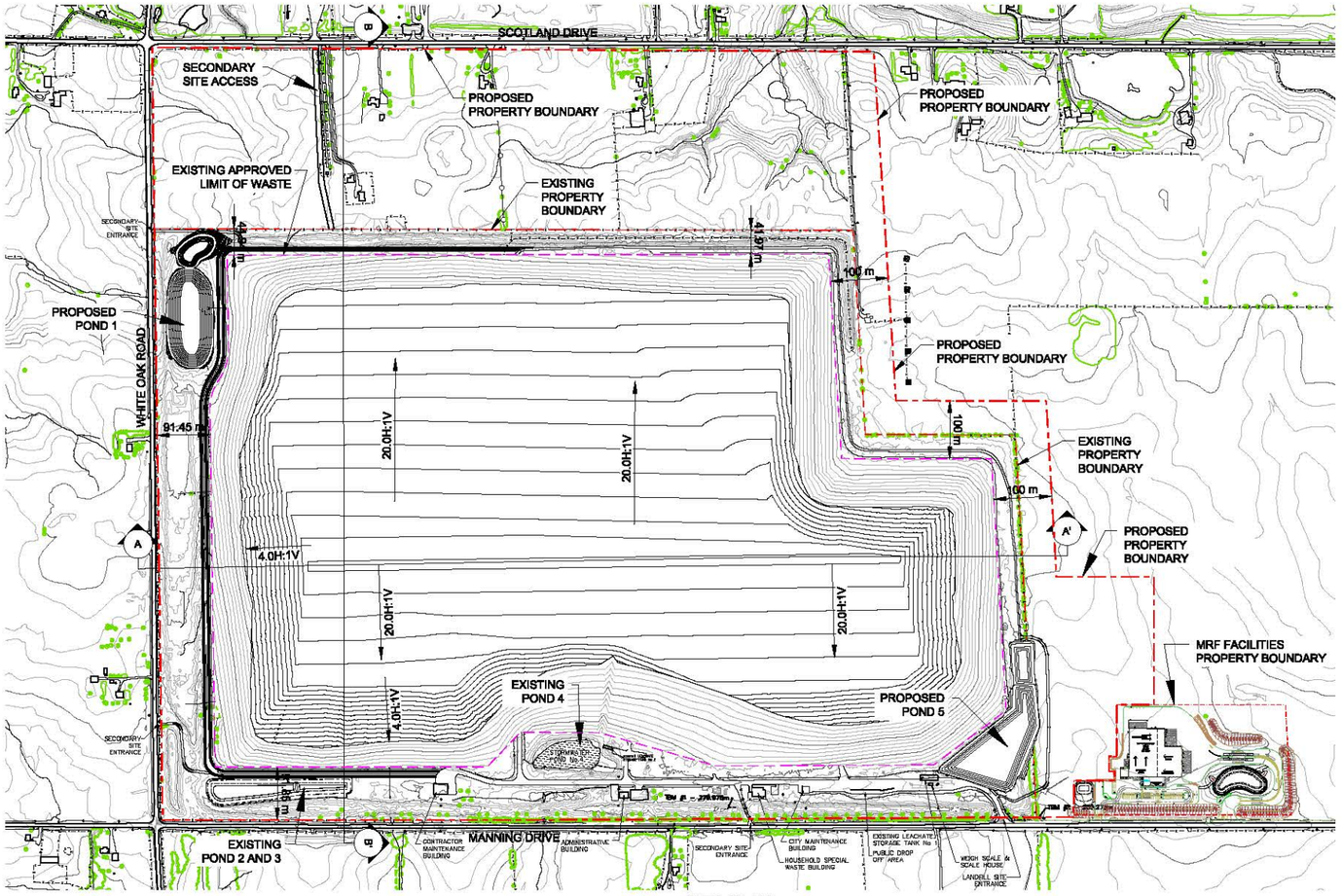
This section presents a description of the preferred method of landfill expansion. The comparative evaluation presented in Section 6.0 of this document identified Alternative 1 - vertical expansion over the existing footprint - as the overall preferred landfill expansion alternative. The factors considered in the development of Alternative 1, as described in Section 6.1, have been further refined at an EA conceptual level of design and detail to prepare this description of project to serve as the basis for detailed impact assessment. This refinement and modifications do not change Alternative 1 as it was considered in the comparative evaluation; rather it simply updates it and provides some additional details.

8.1 Description of the Landfill Expansion

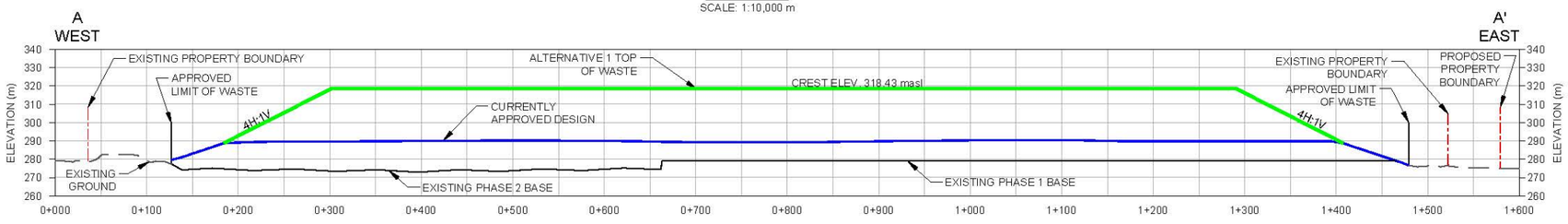
The landfill expansion consists of a vertical expansion over the existing landfill footprint. When conceptualized for comparative purposes, the expansion utilized the entire existing approved footprint area of 107 ha. However, during the subsequent final design of Cell 10 in the northwest corner of Phase 2 of the landfill as part of ongoing site operations, it was necessary to reduce the footprint in the northwest corner to adequately accommodate the perimeter access road between the footprint and the adjacent SWM pond. This reduced the total footprint available for the vertical expansion 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. Also, from further review of the detailed design of the landfill it was noticed that the actual limit of existing waste placed in the landfill is inside the approved limit of waste and that the approved limit of waste actually coincides with the limit of the final cover.

To accommodate this small reduction in overall landfill footprint and the actual limit of existing waste while continuing to provide 13.8 million m^3 of airspace, the landfill contours were adjusted. This results in an increase in the highest ridge elevation of waste of approximately 0.8 m, from elevation 317.65 masl to 318.43 masl. The location of the ridge in the south-central area of the landfill remains essentially as before. The final design contours for the top of waste are shown on Figure 8.1-1, along with north-south and west-east oriented cross-sections to illustrate the configuration of the expanded landfill. The modification in the northwest corner of the waste footprint is also shown on Figure 8.1-1. The landfill sideslope portions extend upwards from the existing sideslopes at 4H:1V and the top slope portion is at 5 % grade, both in accordance with O. Reg. 232/98 Landfill Standards.

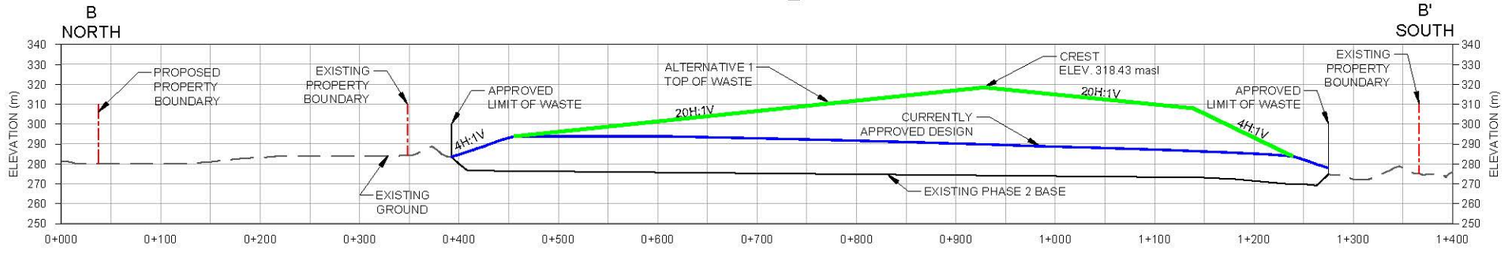
Compared to the existing landfill, this expansion configuration results in the surface water runoff from a larger area of the finished landfill towards the north, which will have to be accommodated in the design of the SWMS.



SITE PLAN
SCALE: 1:10,000 m

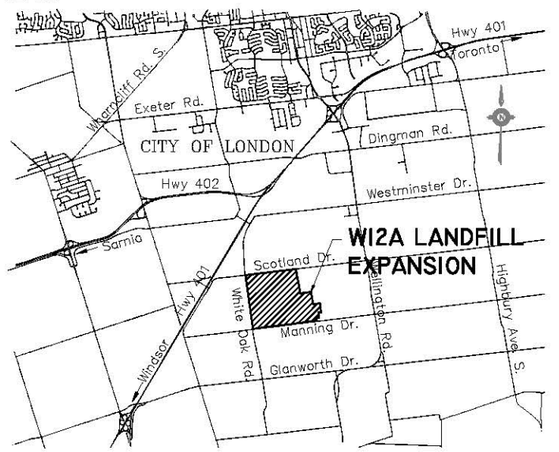


HORIZ. SCALE: 1:6,000 m
VERT. SCALE: 1:3,000 m
A-A' CROSS-SECTION



HORIZ. SCALE: 1:6,000 m
VERT. SCALE: 1:3,000 m
B-B' CROSS-SECTION

KEY MAP



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

0 100 200
1:6,000 METRES

0 250 500
1:10,000 METRES

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
GOLDER

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

PROJECT NO.	CONTROL	REV.	FIGURE
1648176	0017	B	8.1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

25 mm

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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 MRF property line. Since the development and comparative evaluation of expansion alternatives as described in Sections 6.0 and 7.0, respectively, the landfill property limits were further enlarged in the southeast corner to accommodate proposed ancillary waste diversion facilities (as described in Section 8.1.6) within the landfill property. This results in a 106.3 ha landfill footprint within a 192.4 ha landfill property.

A summary of the key features of the proposed expansion design are provided in Table 8.1-1 below.

Table 8.1-1: Summary of Proposed W12A Landfill Expansion

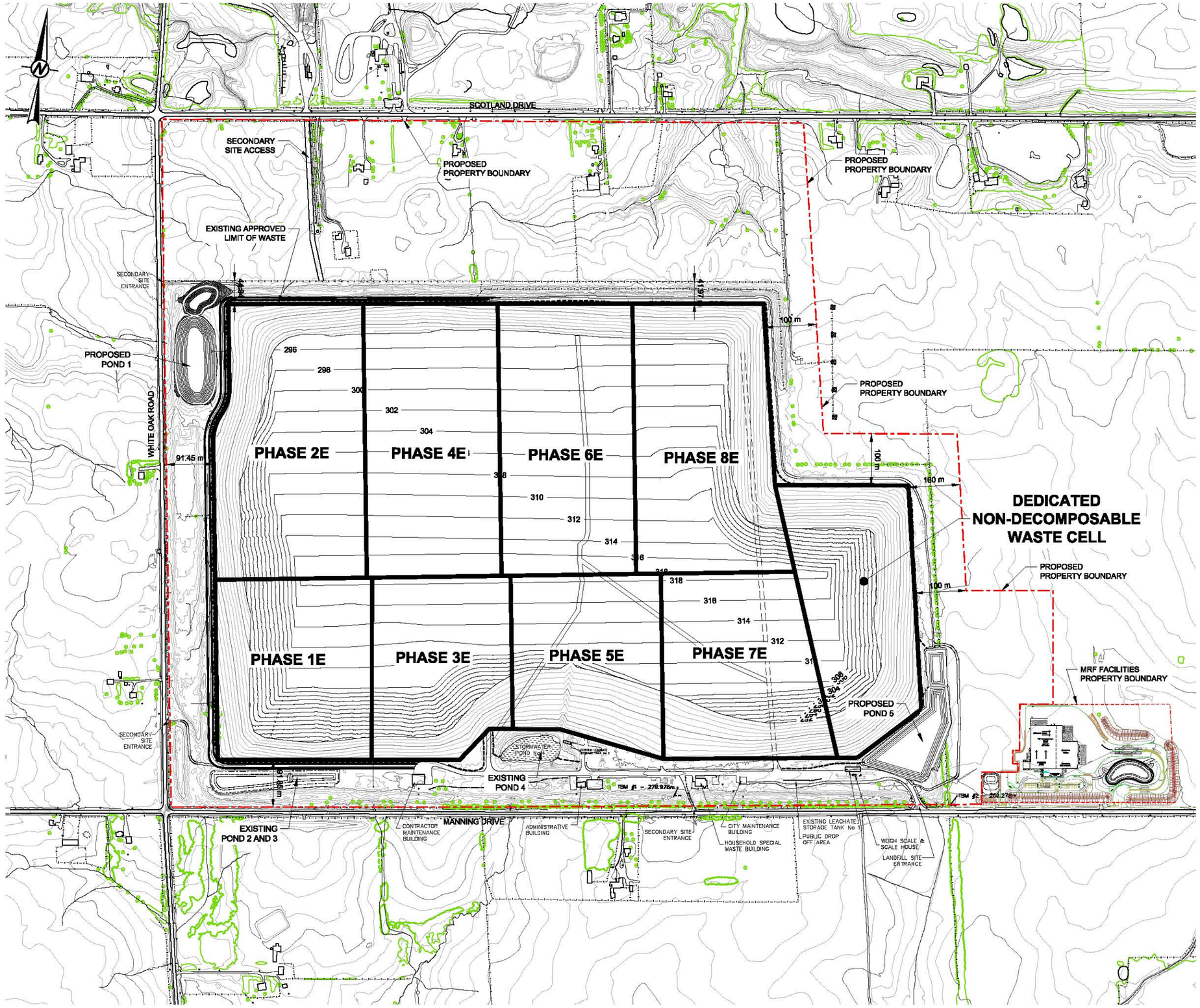
Description	Vertical Expansion Over Existing Footprint
Site/Property Area (ha)	192.4
Waste Footprint Area (ha)	106.3
Peak Waste Elevation (masl)	318.43
Height of Peak above Average Ground Elevation* (m)	43.5
Total Additional Airspace** (m^3)	13,800,000

Notes:
* includes allowance of 0.75 m of final cover thickness above top of waste
** airspace for waste and daily cover, not including final cover

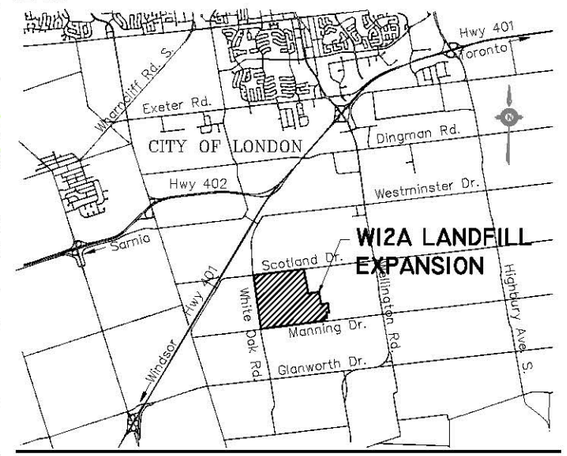
8.1.1 Landfill Phasing and Phase Development

The landfill expansion will be developed sequentially in eight Phases, 1E through 8E, as shown on Figure 8.1-2. The area and estimated duration of operation in each Phase is provided on Figure 8.1-2. The airspace in each Phase has been calculated assuming the footprint area of each Phase as shown on Figure 8.1-2. There will be temporary sideslopes onto adjacent Phases of the existing landfill that will affect the actual airspace. This will be further refined during the preparation of the Design and Operations Report as part of the subsequent ECA amendment application process.

The estimated duration of landfilling in each Phase is based on an expected typical annual air space consumption of 500,000 m^3 per year, which corresponds to an average annual waste receipt of 370,000 tonnes per year over the 25 year planning period. As shown, it is estimated that each Phase will provide about 1.2 to 1.9 million m^3 of airspace and typically operate for a period of about 2.5 to 3.5 years.



KEY MAP



LEGEND

- LANDFILL ROAD THAT CAN HANDLE HEAVY TRAFFIC WITHOUT FURTHER UPGRADE
- LANDFILL ROAD THAT NEEDS TO BE UPGRADED TO HANDLE HEAVY TRAFFIC

NOTE(S)

1. ELEVATION CONTOURS SHOWN ARE TOP OF WASTE, masl.
2. REVISED WASTE FOOTPRINT AREA = 106.26 ha.

REFERENCE(S)

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

PHASE NO.	AIR SPACE (Mm^3)	APPROX. OPERATING PERIOD (YEARS)
PHASE 1E	1.32	2.6
PHASE 2E	1.39	2.7
PHASE 3E	1.57	3.1
PHASE 4E	1.69	3.3
PHASE 5E	1.73	3.4
PHASE 6E	1.67	3.3
PHASE 7E	1.87	3.6
PHASE 8E	1.50	3
NON-DECOMPOSABLE	1.05	25

NOT FOR CONSTRUCTION

DRAFT

0 125 250
1:7,500 METRES

CLIENT
CORPORATION OF THE CITY OF LONDON
LONDON, ONTARIO
CANADA

PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
LANDFILL EXPANSION PHASING PLAN

CONSULTANT
GOLDER

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

PROJECT NO.	CONTROL	REV.	FIGURE
1648176	0017	B	8.1-2

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

0 25 mm

Path: \\golder.gds.com\ple\data\active\ottawa\Active\Spatial_IM\City\London\Site_W12A\99_PRO\21 648176\40_PROD\0017_EA-Report_Section-B | File Name: 1648176-0017-CW-0812.dwg | Last Edited By: mforgat Date: 2020-10-22 Time:10:24:35 AM | Printed By: mforgat Date: 2020-10-22 Time:11:07:51 AM

As described in Section 6.0 and shown on Figure 8.1-2, 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. Filling in this non-decomposable waste cell will take place in lifts over the 25 year expansion period as described below for other south side Phases of the landfill expansion. These waste types would be blended in to meet the temporary sideslopes in the adjacent Phases 7E and 8E as they are developed. Because this waste is non-decomposable, it would generally not receive daily cover; however, if it is observed that specific materials are generating odours or are otherwise of concern if left uncovered, daily cover material would be placed. This fill area would receive final cover consistent with that on the remainder of the landfill. However, it is not proposed to install a LFG collection system in this area as part of the final cover construction.

To commence filling in each Phase, the existing cover material would be progressively stripped from an area large enough to accommodate the year's disposal, which is estimated to average approximately 4 ha. The area of exposed waste would be limited to that needed to spread, compact and cover the waste received on a daily basis, and will vary depending on the quantity of daily waste received. Considering both the area to be used for daily waste placement as well as the adjacent areas of temporary waste sidelopes, the active area would range from about 40 m by 25 m typically (1,000 m^2) to 50 by 30 m (1,500 m^2). The waste will be spread and compacted in lifts of about 0.6 m to a height of approximately 3 m. The waste tipping face is expected to advance approximately 15 to 20 m each day. 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.

Temporary soil berms, and if necessary shallow swales, would be provided to direct surface water runoff from existing covered upslope areas around the active fill areas / Phases to the SWMS since this runoff has not been in contact with waste. Temporary waste sideslopes with interim cover would extend from the interior limits of the Phases onto the adjacent area of the existing landfill surface.

Once the filling in a southern Phase is complete, filling in similar lifts would then take place sequentially in the adjacent northern Phase until their final elevation is reached. The Phase boundaries have been designed (offset) such that the completed southern Phases (1E, 3E, 5E, 7E) will effectively screen the view of landfilling operations in the northern Phases (2E, 4E, 6E, 8E) from off-site vantage points to the south.

On an annual or biannual basis, final cover would then be constructed over areas reaching final grade and permanent vertical LFG wells will be installed and connected to the LFG gas collection system (as described further in Sections 8.1.4 and 8.1.8)

8.1.2 Leachate Management and Treatment

8.1.2.1 On-Site Leachate Management Systems

Leachate is the contaminated liquid generated by precipitation infiltrating through the waste and dissolving constituents of the waste as the waste degrades over time. As described in Sections 1.3 and 6.1, the Phase 1 and Phase 2 areas of the existing landfill have different leachate management systems.

Phase 2 utilizes the clay till as a natural low permeability liner, and has a continuous granular drainage blanket and piping system over a shaped subgrade to collect leachate and direct it by gravity to the south end of the Phase 2 area where the collected leachate is pumped to the main pumping station located at the southeast corner of the site for subsequent pumping off-site for treatment. The waste in the Phase 1 area rests directly on the underlying low permeability clay till and has a perimeter LCS around the north, east and south sides to intercept leachate seepage at the base of the waste. Collected leachate either drains into the Phase 2 collection system or to the storage tank for the main pumping station from where it is removed for subsequent off-site treatment. The design of the Phase 2 LCS is a site-specific design in accordance with the requirements of O. Reg. 232/98 that was approved by the MECP.

The waste in the Phase 1 area rests directly on the underlying low permeability clay till and has a perimeter LCS around the north, east and south sides to intercept leachate seepage at the base of the waste and prevent its migration away from the landfill footprint in the shallow subsurface groundwater, as well as capture any perimeter leachate seeps. Leachate from the western portion of Phase 1 (approximately 24 hectares) drains directly into the Phase 2 underdrain LCS or into a perimeter LCS that drains to the Phase 2 leachate collection maintenance hole for subsequent removal. Leachate from the remainder of the Phase 1 perimeter LCS drains by gravity to a low point at the southeast corner, and from there to the on-site pump station in the southeast corner area of the site for subsequent off-site treatment.

For the portion of the proposed vertical expansion that will involve placement of additional waste above the Phase 2 area, the existing LCS will continue to be used to collect and remove leachate from the area, which is geotechnically feasible and described in Section 8.1.3.

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. The existing perimeter LCS was constructed in sections with differing designs over a period of years. The replacement Phase 1 LCS will provide a consistent and more effective design, and in some sections may be designed to be somewhat deeper and thereby provide an even greater hydraulic influence and capture of shallow groundwater that could potentially be impacted by leachate. It may be possible to direct the flow in the western portion of the

perimeter LCS on the north side of the landfill to the west to discharge into the Phase 2 LCS, rather than conveying it to the southeast corner of the landfill.

With the vertical expansion, it is expected that the existing leachate mound within the Phase 1 disposal area will rise higher (see Volume IV, Appendix D.13). To control the potential for leachate seeps along the perimeter sideslopes that could occur as a result of this mounding, or as a result of lateral leachate migration towards the perimeter along lower permeability zones within the waste, it is proposed to construct granular finger drains around the north, east and south sides of the exterior perimeter of the Phase 1 area. These finger drains would be constructed together with the replacement of the Phase 1 perimeter LCS. It is anticipated that these finger drains would be constructed on a spacing of typically about 25 to 50 m around the perimeter up to the elevation of the existing top of landfill slope and would connect to the replacement perimeter LCS. The design of the Phase 1 perimeter LCS and finger drains will be included in the Design and Operations Report as part of the subsequent ECA amendment application process.

As described in Section 6.1, as part of the expansion operations 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 (refer to Section 8.1.2.2), 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. A conceptual approach to providing this temporary storage has been developed, as described below, and indicates that it should be feasible to design and implement. The detailed design of temporary leachate storage will be included in the Design and Operations Report as part of the subsequent ECA amendment application process.

From an assessment of the historical durations of overflow situations from the Dingman Pump Station and Greenway WWTP, as well as considering the potential of a power failure at the W12A site, it is considered that accommodating four days of temporary leachate storage will be appropriate. Based on preliminary calculations, it is estimated that there is temporary storage available in the pore spaces of the granular drainage blanket and lower portion of the waste in the southern portion of Phase 2 to contain approximately 21,700 m^3 of leachate (below elevation 272.4 masl, above which seepage at the perimeter could occur). Modelling (using the HELP model, see Volume IV, Appendix D.13) indicates that for the Phase 2 area and the western portion of the Phase 1 area that discharges leachate to the Phase 2 LCS, an estimated four days of temporary storage would correspond to a volume of approximately 7,750 m^3. This is only about 1/3 of the storage volume available.

Based on historical flow data for the Phase 1 perimeter LCS, the maximum estimated flow being conveyed is 7 m^3/ha/day; for the 24 ha area of Phase 1 that discharges leachate to the perimeter collector, this corresponds to approximately 1,000 m^3 for four days storage. Although this could readily be accommodated if pumped to storage within the base of the Phase 2 area, consideration is being given to the possibility of power being unavailable for

pumping during all or part of the four day period. As such, temporary storage for the Phase 1 collected leachate could be provided in an enclosed structure (underground chamber(s) or tank) located at the southeast corner low point in the replacement Phase 1 perimeter LCS. Under a by-pass scenario when power is available, the Phase 1 perimeter LCS leachate would be pumped from the below ground storage chamber to temporary storage in Phase 2.

8.1.2.2 Leachate Treatment

The leachate collected from the Phase 1 and Phase 2 LCS is routed through on-site piping to the main leachate pumping station located at the southeast corner of the site. From here, the leachate is 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. The following provides an assessment of the ability of this City owned, operated and maintained infrastructure to continue to manage leachate from the W12A landfill expansion.

Leachate Quality

The characteristics of the leachate generated at the W12A Landfill is monitored as part of the site's ongoing monitoring program. Current and historical data is provided in the City's 2019 Annual W12A Status Report (City of London, 2020b). Leachate quality is determined from monitoring wells installed at the base of the waste, and by analysis of the combined leachate at the main pump station; the latter represents the leachate that requires treatment at the Greenway WWTP. The leachate parameters that are relevant to the Greenway WWTP's effluent discharge criteria are ammonia, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and phosphorus. At the main pump station, the 2019 range of concentration (and 2019 average) of these parameters were as follows: ammonia – 180 to 514 mg/L (average 315 mg/L); BOD – 21 to 434 mg/L (average 129 mg/L); COD – 304 to 538 mg/L (average 393 mg/L): and phosphorus – 0.5 to 2 mg/L (average 1 mg/L). The concentrations of COD and phosphorous are stable over time, whereas the concentrations of ammonia and BOD are more variable and depend on the sequence of construction of the Phase 2 cells and how much LCS area has been constructed and is open or only thinly covered with waste together with the amount of precipitation received. It is noted that during vertical expansion the Phase 2 cells will all have been constructed and covered with 12 m of waste, which can be expected to result in more stable parameter concentrations in combined leachate pumped from the site in future.

The data also show that the combined leachate parameter concentrations are noticeably less than the leachate concentrations from monitoring wells at the base of the landfill waste. For example, chloride (which is a characteristic leachate parameter) had 2019 concentrations ranging from 1,500 to 2,200 mg/L in monitoring well samples compared to average 600 mg/L in the combined leachate at the main pump station. The O. Reg. 232/98 Landfill Standards provide leachate parameters and concentrations to be used for groundwater impact assessment; of the parameters, only the chloride concentration depends on the thickness of waste (which will increase with the W12A vertical expansion). The maximum chloride

concentration to be used is 2,500 mg/L, which is not much higher than is already being measured in the W12A monitoring well leachate. As such, it is reasonable to expect that the W12A expansion will result in only small to moderate increase in the concentrations of the leachate parameters relevant to treatment plant operation.

Leachate Quantity

As described previously, leachate is the contaminated liquid generated by precipitation infiltrating through the waste and dissolving constituents of the waste as the waste degrades over time. The main factors governing the quantity of leachate generated are the landfill footprint area and the amount of precipitation that infiltrates into the waste.

Data on the leachate quantity pumped from the main pump station (which receives the leachate collected from both Phase 1 and Phase 2 LCS) is provided in the City's 2019 Annual W12A Status Report (City of London, 2020b). The maximum leachate quantity has been 225,000 m^3/year; this was in 2013 when Cell 7 of Phase 2 was under construction and is considered to reflect open cell base and LCS in Phase 7 and high precipitation. From 2013 to 2019 the total annual leachate volume has ranged from a low of 145,000 m^3 to a high of 225,000 m^3, averaging 185,000 m^3/year. It is noted that over this seven year time period additional landfill cell areas have been added in Phase 2, such that as of 2018/2019 the area of the landfill generating leachate for collection is all but the northwestern cell 10 area, or about 90% of the whole landfill footprint.

The annual infiltration into the landfilled waste from precipitation for the expansion was estimated using the HELP model and the results are provided in Volume IV, Appendix D.13. The leachate generation is proportional to the landfill footprint area; it is noted that with the proposed vertical expansion the landfill footprint will remain the same as the existing landfill. Under final closed conditions with all waste in place and the final cover constructed, the estimated long term steady state average infiltration through a permeable clayey soil cover is 235 mm/year. For the existing (and proposed) 106.3 ha landfill footprint, this corresponds to an estimated total annual average leachate generation of approximately 250,000 m^3/year. This is also considered a reasonable estimate of the average annual leachate generation when the expansion is in operation, since the active area will be kept relatively small and there is little difference in the infiltration rate between having interim cover in place and having a permeable final cover in place. This is the average volume of leachate from the expanded W12A Landfill expected to require conveyance by the forcemain and treatment at the Greenway WWTP.

Leachate Pumping Station and Forcemain

As described in Section 8.1.6, as part of the expansion it is proposed to replace the existing main pumping station with a new pumping station that will operate more efficiently than the existing.

The existing forcemain was constructed in 2011. It conveys the collected leachate from the main pumping station about 6.6 km eastward along Manning Drive, north along Wellington Road South and then west along Dingman Drive to the Dingman Drive Pumping Station.

The forcemain (AECOM, 2011) is a 200 mm diameter PVC SDR26 pipe. The forcemain was designed to carry a range of flows from 10 Lps to a peak flow of 30 Lps. It has outlet pressure control, surge relief and air/vacuum release ancillary features along its length to enable acceptable operation under a variety of conditions. The existing pumping station is also designed to operate at this same range of flows.

The City carries out maintenance on the ancillary features (air relief chambers and outlet pressure control). The City maintenance program pertaining to the air release chambers and outlet pressure control includes: maintain, repair and or replace any defective air release valves, venting/filtering equipment, valves, outlet control valve assembly and all electrical controls; annual inspection of all air release valves, outlet control valve and chamber; and monthly inspection of air release and outlet control valve operation (conducted by the Landfill staff). Required maintenance primarily consists of air release and outlet control valves – annual preventative maintenance, filter media replacement; outlet chamber venting- charcoal filter replacement; and adjustment of valves during the monthly inspections. Accumulation of solids deposition along the forcemain is prevented by pumping at the maximum forcemain capacity, which provides sufficient velocity to flush and remove the solids.

Also, the forcemain is located along City-owned roadway rights-of-way and is available for replacement if or as necessary. Similarly, the sanitary sewer that conveys the combined sewage and leachate from the Dingman Drive Pumping Station to the Greenway WWTP is part of the City sewer infrastructure and included as part of the City's regular sewer system maintenance program.

As described above, it is estimated that the total annual average leachate generation will be approximately 250,000 m^3/year, recognizing there will be times when the daily, monthly or annual flows could be higher (or lower) than this average. The estimated average annual flow is equivalent to 8 Lps, or only about 25 % of the flow capacity of the forcemain. As such, the existing forcemain has adequate capacity to convey the estimated leachate flows associated with the expansion, as well as the short term flow variations from average.

Greenway Wastewater Treatment Plant

The Greenway WWTP is operated under ECA 7776-AMAQRD dated December 7, 2017. Information on plant operations and performance compared to its ECA requirements is provided in annual reports. An expansion of this chemically enhanced primary treatment plant was completed and operational in November 2019. The design capacity of the plant to treat wastewater is an average flow rate of 170 million litres/day (ML/d). As reported in the Greenway WWTP 2019 Annual Report (City of London, 2020a), in 2019 the annual average flow was 118.3 ML/d, or about 70 % of the design capacity. During 2019, the daily average peak flow was 265 ML/d and the instantaneous peak flow was 318 ML/D; typical of WWTPs,

the plant is able to accept and treat short term peak flows that are much higher than the annual average daily flow.

In 2019, the total volume of leachate pumped from the W12A Landfill site and conveyed to the Greenway WWTP was approximately 173,800 m^3, which corresponds to an average daily flow of 476 m^3/day or 0.476 ML/d. This represents only 0.4 % of the 2019 average daily flow through the WWTP. In 2019 the W12A Landfill leachate pumping ranged from 0.115 to 1.36 ML/d, with the highest contribution a small proportion of the peak flows though the WWTP.

As described above, it is estimated that the total annual average leachate generation from the landfill expansion will be approximately 250,000 m^3/year (or 0.685 ML/d). If it is assumed that in future the Greenway WWTP operates at 90 to 95 % of its average daily flow design capacity, the W12A Landfill leachate will represent less than 0.5 % of the flow receiving treatment at the WWTP.

The WWTP ECA sets effluent discharge objectives for BOD, Total Suspended Solids (TSS), ammonia and phosphorus. In 2019, the WWTP met its monthly average effluent concentration and loading objectives for BOD, TSS and ammonia 100 percent of the year. For phosphorus, it also met its monthly average loading objective 100 percent of the year and discharge concentration objective during 67 percent of the year. In view of the WWTP's overall performance and recognizing the small contribution of leachate to the overall flow treated at the WTTP, the leachate does not adversely affect the WWTP's operation and/or performance.

Summary

Based on this assessment, the current practice of pumping the leachate generated and collected from the W12A Landfill through the leachate forcemain and then conveyed via the City sewer system to the Greenway WWTP for treatment 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.

8.1.3 Geotechnical Assessment

A geotechnical assessment of the proposed landfill expansion was completed as part of the development of the expansion alternatives, and the results presented in Section 05. The assessment was carried out for Alternative 1 since it has the greatest total thickness of waste and therefore the highest sideslopes and applies the highest load to the underlying clay till subgrade. Since there have only been minor modifications to the geometry of the proposed expansion, the completed assessment is therefore directly applicable to the preferred landfill expansion alternative.

In summary, the assessment concluded that:

- The proposed 4H:1V landfill sideslopes have an acceptable factor of safety in terms of slope stability; and,
- The loading imposed by the additional waste placed in the vertical expansion, as well as the total and differential settlements of the clay till under this waste load, will not adversely affect the performance or service life of the existing LCS beneath the Phase 2 area of the landfill.

8.1.4 Landfill Gas Management

This section provides the estimation of LFG generation and the proposed approach to LFG management for the W12A Landfill expansion.

8.1.4.1 Methodology

LFG generation rates from materials to be landfilled in the W12A Landfill were estimated using the LandGEM model (1991) developed by the United States Environmental Protection Agency (US EPA). The LandGEM model is based on a first-order decay model of LFG generation. The LandGEM model was developed to estimate LFG generation rates for landfills accepting MSW (US EPA, 2005). It should be noted that first order decay modelling of LFG without the benefit of actual measurement of LFG emissions is an inexact science, and that model results can vary, perhaps substantially, from actual LFG generation rates.

The key input parameters for the LandGEM model are the LFG production potential (L_o), the LFG generation rate factor (k), the annual tonnages of waste disposed of in the landfill cell footprint, and the methane content of the LFG. Based on the published data on typical LFG composition, LFG is typically composed of about 50% methane by volume; based on measurements from the LFG going to the W12A Landfill LFG flare between January 1, 2012 and March 30, 2020, LFG generated at the landfill site is comprised of approximately 50% methane by volume.

It should be noted that the LandGEM model provides an estimate of the maximum theoretical LFG generation. The amount of LFG that can be collected is estimated by applying a collection efficiency; a typical collection efficiency could range from 60-85%.

8.1.4.2 Ultimate Methane Yield and Methane Generation Rate Constant

L_o is a measure of the ultimate methane yield in cubic metres of methane per tonne of waste (m^3/tonne), and k is the methane generation rate constant in $year^{-1}$. Both L_o and k are highly influenced by moisture content, as well as waste composition, temperature, pH, particle size and availability of nutrients.

The values selected for L_o and k were the MECP specified values of 125 m^3/tonne of waste and 0.04 $years^{-1}$, respectively (MECP, 1992).

8.1.4.3 Waste Tonnage and Waste Composition

Waste tonnages input to the LandGEM model included both historic waste tonnages and projected waste tonnages for the site. Historic waste tonnages landfilled in the W12A Landfill between 1977 and 2019 were based on waste tonnages reported in the W12A Landfill Annual

Status Report for 2019 (City of London, 2020b). Projected waste tonnages to be landfilled in the W12A Landfill between 2020 and 2048 were based on Updated Residual Waste Projections and Landfill Capacity Assessment that is provided in Volume III, Appendix C to the EASR.

Both the historic and projected waste tonnages were divided into waste types: residential; IC&I; CR&D residuals; sewage sludge ash; biosolids; “other municipal” (non-recyclable material from parks, City MRF residuals; and grit from pollution control plants); street sweepings/road waste, water treatment plant process residuals (soil-like suspended sediment from turbid lake water); and contaminated soil. Projected tonnages from the regional service area (i.e., municipalities outside of the existing service area) were also provided.

The LandGEM model assumes a waste composition similar to typical historical MSW in estimating LFG generation rates. The historic and projected waste tonnages were adjusted as discussed below based on the description of the different waste types provided in the Updated Residual Waste Projections and Landfill Capacity Assessment (Volume III, Appendix C).

Residential, IC&I, “other municipal” waste and regional service area waste were assumed to have a waste composition similar to typical MSW, and so these historic and projected waste tonnages were not adjusted. As this model was run for EA purposes rather than for purposes such as collection system design or equipment sizing, projected tonnages of landfilled residential waste were not adjusted to reflect a reduction in organics following the implementation of the proposed residential green bin program in the City.

Sewage sludge ash, street sweepings/road waste, water treatment plant process residuals and contaminated soil are considered to be generally inert with respect to LFG generation, and therefore are assumed to produce negligible quantities of LFG. Historic and projected tonnages of these materials were therefore not included in the LandGEM model.

Residuals from CR&D processing are described in the Updated Residual Waste Projections and Landfill Capacity Assessment as consisting of film plastic, insulation, flat roofing, and other materials that cannot be recycled for a variety of reasons. The City estimated that CR&D residuals are composed of about 33% organic material, including non-recyclable wood and old corrugated cardboard. It is understood that there are very low or negligible quantities of organic waste, such as food waste, in the CR&D residuals that are landfilled. The LFG generation potential of the CR&D residuals is therefore considered to be lower than typical MSW. As such, 75% of the reported historic and projected tonnages of CR&D residuals, which are projected to comprise about 20 percent of the overall residual wastes to be disposed, were used in the model to account for the reduced gas generation potential from this waste material.

Biosolids are described in the Updated Residual Waste Projections and Landfill Capacity Assessment as sewage sludge treated by lime stabilization. The process of lime stabilization began in 2007; prior to 2007 the tonnage of biosolids reported represents untreated raw sewage sludge that was landfilled when circumstances required (i.e., the sewage sludge incinerator was down for maintenance or repairs). Due to the high proportion of organic material composing biosolids, the gas generation potential of this material is likely higher than

that of typical MSW. However, given the relatively small quantity of biosolids historically or projected to be landfilled (projected to be about 1 to 2 percent of the total residuals to be disposed) and since the model was run for EA purposes, the historical tonnages for biosolids have not been adjusted to reflect a potentially higher LFG generation rate.

8.1.4.4 LFG Generation Estimates

The resulting theoretical maximum total LFG and methane generation rate estimates obtained from the LandGEM model are presented in Volume IV, Appendix D.01, Attachment A and illustrated in Figure 8.1-3. Table 8.1-2 presents a summary of the estimated LFG and methane theoretical maximum generation.

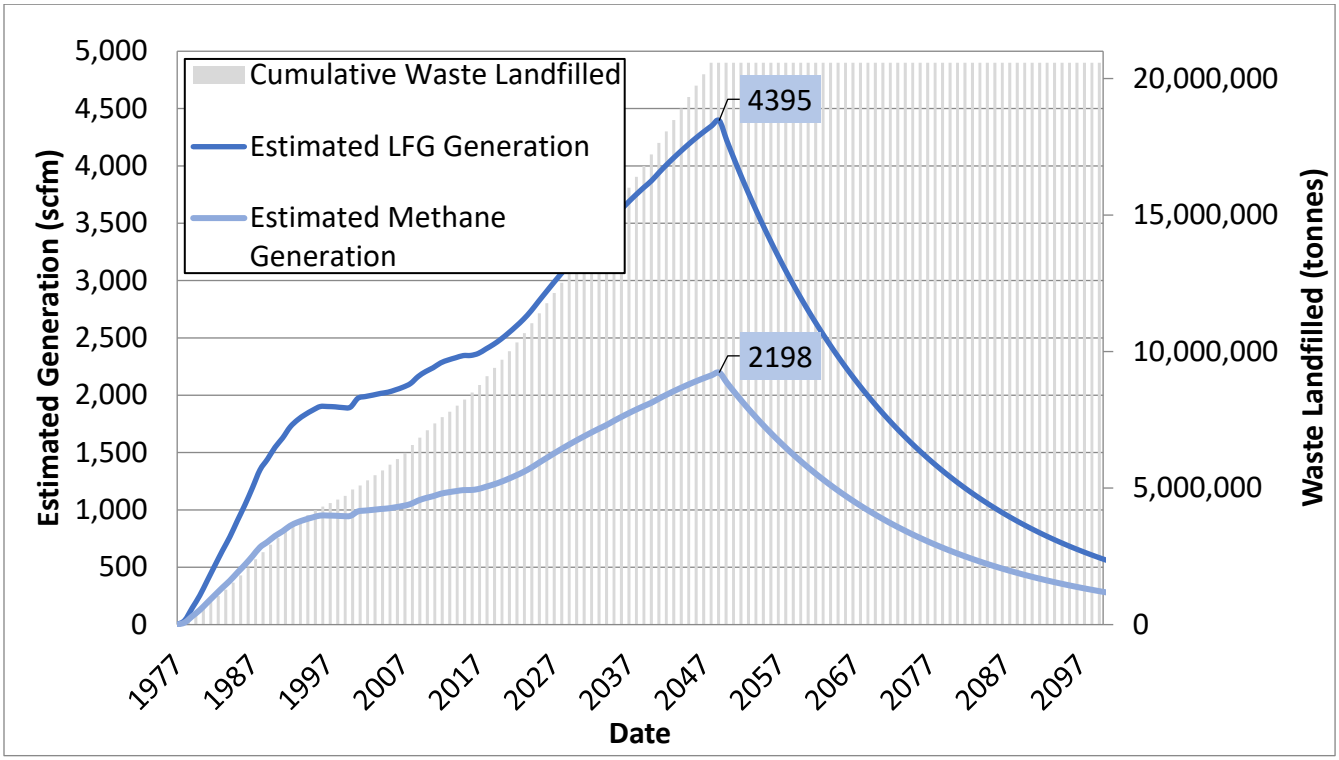


Figure 8.1-3: Estimated Total Landfill Gas and Methane Generation for the W12A Landfill Expansion

Table 8.1-2: Summary of Total Estimated Landfill Gas and Methane Generation for the W12A Landfill Expansion

Year	Landfill Gas Generation Estimate	Landfill Gas Generation Estimate	Methane Generation Estimate*	Methane Generation Estimate*
	scfm	m^3/hr	scfm	m^3/hr
2020	2,489	4,229	1,244	2,114
2035	3,552	6,035	1,776	3,017

Year	Landfill Gas Generation Estimate	Landfill Gas Generation Estimate	Methane Generation Estimate*	Methane Generation Estimate*
	scfm	m^3/hr	scfm	m^3/hr
2048 (landfill closure)	4,349	7,389	2,175	3,695
2049 (peak LFG generation)	4,395	7,468	2,198	3,734
2065	2,318	3,938	1,159	1,969
2080	1,272	2,161	636	1,081

Note: * Assumes LFG is comprised of 50% methane

8.1.4.5 Existing Flare Capacity

The W12A Landfill operates an enclosed LFG flare system that is sized to combust a maximum of approximately 1,700 standard cubic feet per minute (scfm) of LFG. The LFG collection system and flare are approved under ECA No. A042102.

In the Ontario Regulation 347 Exemption and Design Report (Comcor, 2009), included as item 30 in Schedule A of ECA No. A042102, it was stated that collecting LFG from Cells 1 and 2 and the southern portion of Cell 3, landfilled between 1977 and 1983, may not be practical or effective due to the age of the waste and due to leachate mounding in that area. The report indicated that LFG pump tests conducted in 2003 and actual LFG production in a number of vertical gas extraction wells that were installed in this area of the site in 2005 were found not to produce significant amounts of LFG. Therefore, the approved design of the LFG collection system does not include Cells 1, 2 and 3.

Given the exclusion of Cells 1, 2 and 3 from the LFG collection system, a second LandGEM model was completed to estimate the LFG for comparison with the current flare capacity. This LandGEM model used the same values for L_o and k as described above and the same assumptions about waste composition, but excluded historic landfilled waste tonnages from 1977 to 1983 that were landfilled in Cells 1, 2 and 3. The resulting theoretical total LFG generation rate estimates obtained from this LandGEM model are presented in Volume IV, Appendix D-1 Attachment B. Figure 8.1-4 and Table 8.1-3 present the results and a summary, respectively of the estimated LFG theoretical generation with assumed collection efficiency rates of 60% and 85% applied.

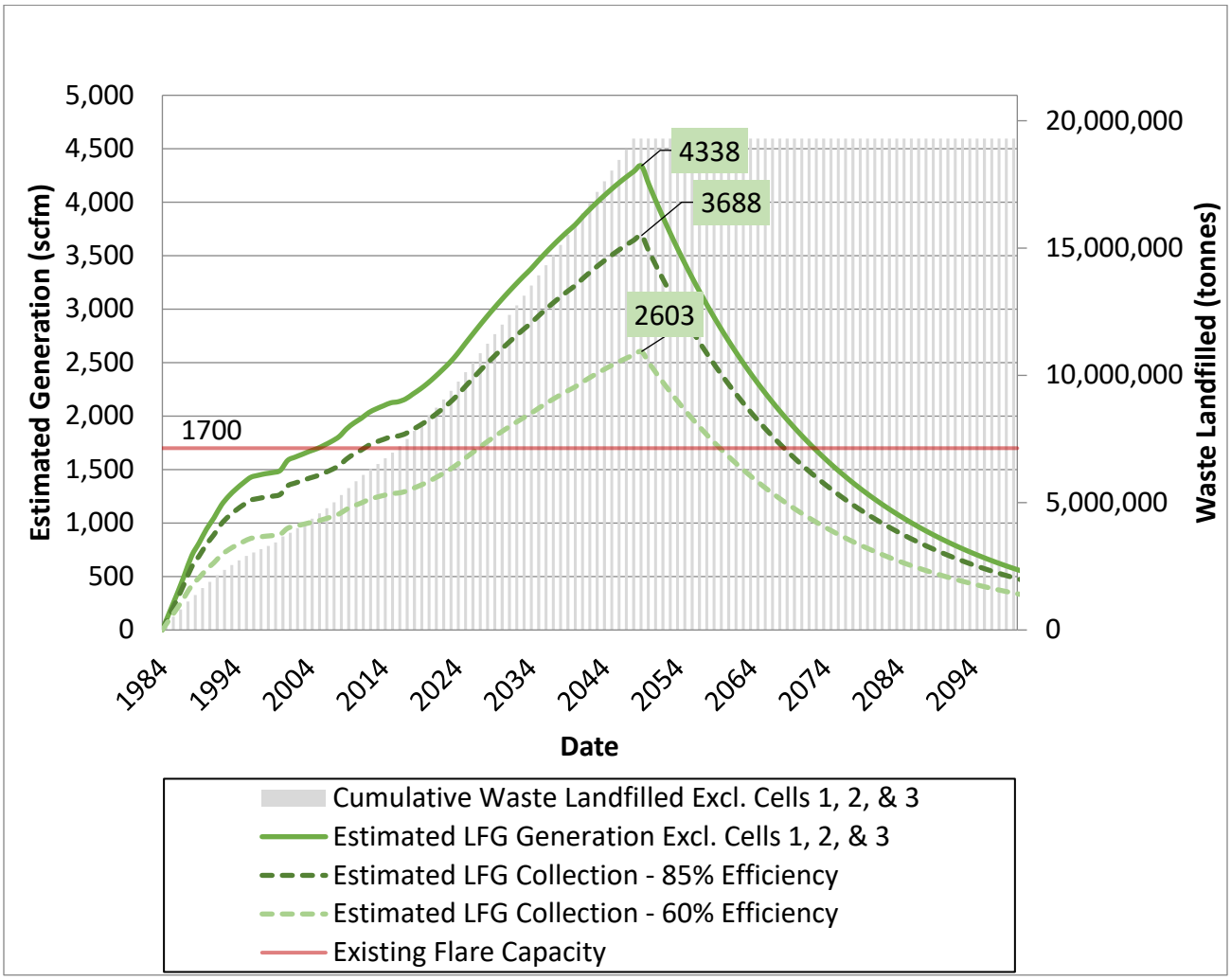


Figure 8.1-4: Estimated Landfill Gas Generation and Collection, Excluding Cells 1, 2, and 3

Table 8.1-3: Summary of Estimated Landfill Gas Generation and Collection, Excluding Cells 1, 2, and 3

Year	Landfill Gas Generation Estimate - Excluding Cells 1-3	Landfill Gas Generation Estimate - Excluding Cells 1-3	60% Collection Efficiency	60% Collection Efficiency	85% Collection Efficiency	85% Collection Efficiency
	scfm	m^3/hour	scfm	m^3/hour	scfm	m^3/hour
2020	2,307	3,920	1,384	2,352	1,961	3,332
2027	2,844	4,831	1,706	2,899	2,417	4,107
2035	3,452	5,866	2,071	3,519	2,935	4,986
2048 (landfill closure)	4,290	7,288	2,574	4,373	3,646	6,195
2049 (peak LFG generation)	4,338	7,371	2,603	4,423	3,688	6,265
2065	2,288	3,887	1,373	2,332	1,944	3,304
2080	1,255	2,133	753	1,280	1,067	1,813

The MECP's current requirement is that a collection efficiency of 85% should be considered and is therefore presented above. Based on the LFG generation modelling and a collection efficiency of 85%, the capacity of the flare would be exceeded in 2019. However, in 2019 the flare operated at an average flow of 1,193 scfm compared to a flare capacity of about 1,700 scfm, recognizing that the LFG collection system will be expanded progressively as development and landfilling of the site and placement of final cover continues. Since September 2020, approximately 1,700 scfm of LFG has been captured and flared as a result of the LFG collection system expansion including horizontal collection pipes as well as vertical collection wells installed in the spring of 2020. Based on the 2019 data and pre LFG collection system expansion, it is reasonable to conclude a collection efficiency of around 60% is what was occurring for landfill design and existing conditions on the currently approved landfill; using this collection efficiency, the analysis indicates that the capacity of the flare would be exceeded around year 2027. The timing for installation of additional flare capacity will depend on the actual operation of the existing flare and its ability to handle the collected gas flow rate. As mentioned in late 2020 the flare was operating at capacity (1,700 scfm) and the City has commenced appropriate approvals action for enlarging the flaring station.

8.1.4.6 Landfill Gas Collection System

Prior to landfilling in an area, existing LFG wells associated with the existing landfill will be retrofitted (where feasible) so that they will continue to operate after they have been buried.

The LFG collection system proposed for the expansion will be similar in approach to the existing LFG collection system, which is comprised of three major components:

- A LFG collection system (e.g., vertical LFG extraction wells, horizontal LFG collection piping, LFG conveyance piping consisting of laterals, sub-headers and header);
- LFG control system (e.g., blowers and flares); and,
- Condensate management system.

The vertical LFG extraction wells will be installed to collect gas from within the expanded waste mass as part of the progressive construction of the final cover system following completion of filling within each Phase. The extraction wells will be connected by a series of sub-header and lateral pipes connected to a perimeter header system that will convey the collected LFG to the LFG control system. The collected LFG will ultimately be combusted via blowers and flares. The condensate formed in the LFG collection system and at the blower/flare station location(s) will be collected and transferred to the site's leachate management system.

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. Conceptually, a number of horizontal collection pipes will be installed in a granular surround at the base of each Phase, after approximately 10 m of waste has been placed and again after 20 m of waste has been placed. It is anticipated that these horizontal collection pipes will be connected by a second header (separate from the main header collecting LFG from the vertical well network) to the flare.

The design of the proposed vertical LFG well collection system, the proposed horizontal collection pipes, connecting conveyance piping systems and flare system will be included in the Design and Operations Report as part of the subsequent ECA amendment application process.

8.1.5 Stormwater Management

As described in Section 5.4, the on-site drainage network is currently divided into four general areas with a system of berms, slopes and perimeter drainage ditches directing runoff generated within the W12A Landfill property envelope to four separate SWM ponds. Under the proposed vertical expansion, the peak of the landfill mound will shift to the south and sideslopes of the mound will be longer and somewhat steeper in places, resulting in changes to the drainage boundaries to each of the ponds and, in general, reduced times to peak runoff. The post-expansion drainage areas are shown on Figure 8.1-5. To address these changes in surface water runoff, some modifications to the existing SWM ponds will be required.

SCOTLAND DRIVE

SECONDARY SITE ACCESS

PROPOSED PROPERTY BOUNDARY

PROPOSED PROPERTY BOUNDARY

SECONDARY SITE ENTRANCE

PROPOSED POND 1

WHITE OAK ROAD

SECONDARY SITE ENTRANCE

301
34.48

305
49.58

302
17.70

303
6.56

304
22.46

EXISTING POND 4

STORMWATER POND No 4

PROPOSED PROPERTY BOUNDARY

PROPOSED PROPERTY BOUNDARY

PROPOSED POND 5

MRF FACILITIES PROPERTY BOUNDARY

EXISTING POND 2 AND 3

CONTRACTOR MAINTENANCE BUILDING

MANNING DRIVE

ADMINISTRATIVE BUILDING

SECONDARY SITE ENTRANCE

CITY MAINTENANCE BUILDING

HOUSEHOLD SPECIAL WASTE BUILDING

EXISTING LEACHATE STORAGE TANK No

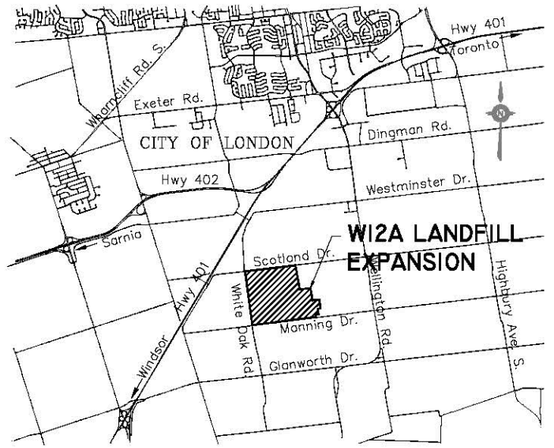
PUBLIC DROP OFF AREA

WEIGH SCALE & SCALE HOUSE

LANDFILL SITE ENTRANCE

TSN #2 269.27

KEY MAP



LEGEND

- DRAINAGE BOUNDARY
- 25 (3.45 / 3.45) DRAINAGE AREA I.D. No. RUNOFF COEFFICIENT (1:2 YEAR) AREA (ha)
- SITE BOUNDARY
- PERIMETER DITCH

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

0 200 400

METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2020-04-14	ISSUED FOR INTERNAL REVIEW	MHK	MLF	MHK	DVK

CLIENT
CORPORATION OF THE CITY OF LONDON
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PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
POST EXPANSION DRAINAGE AREAS PLAN

PROJECT NO.	CONTROL	REV.	of	FIGURE
1648176	0017	A		8.1-5

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D
0 25 mm

Under current conditions, Ponds 2/3, 4 and 5 collect an area of approximately 130 hectares of surface water runoff and provide treatment and attenuation prior to discharge off-site to the south, to the Dodd Creek Watershed. The proposed landfill expansion and mound configuration will result in a reduction of the drainage area being collected and treated by these ponds and discharged to the Dodd Creek subwatershed to 106.5 hectares. Under current conditions, Pond 1 collects a drainage area of 14.4 hectares of surface water runoff and discharges off-site to the north, to the Dingman Creek subwatershed. The proposed landfill expansion would result in an increased drainage area of 34.4 hectares to Pond 1.

Modifications to the SWM ponds will meet the following design criteria where possible:

- Match post-expansion outlet flows to corresponding pre-expansion flows for the 1:2 year through the 1:100 year return period design storm;
- Provide Enhanced Level Protection (80% TSS removal) as defined by the MECP SWM Planning and Design Manual (MECP, 2003);
- Surface drainage from non-contaminated areas such as road areas and areas with interim or final landfill cover will be conveyed to the SWM pond via the internal drainage ditches;
- Surface drainage from potentially contaminated areas, i.e., originating from active landfilling areas and water storage areas, will be contained locally within berms and will discharge into the waste and eventually into the leachate management system;
- Ditches will be sized to convey the 1:100 year return period design storm and culverts sized to convey a 1:25 year return period design storm as per O. Reg. 232/98; and,
- The 1:250 year return period design storm will also be assessed to predict conditions during such an event to accommodate climate change.

The proposed SWM features are shown on Figure 8.1-5 and described below. Additional details on the proposed SWMS design are provided in Volume IV, Appendix D.04.

8.1.5.1 Pond 1

SWM Pond 1 is located in the northwest corner of the Site and is an extended detention wet pond that receives stormwater runoff from a current total drainage area of 14.4 hectares and a proposed increased drainage area of 34.5 hectares. The existing Pond has a permanent pool storage capacity of 2,470 m^3 and an active storage capacity of 5,800 m^3. Due to the increased drainage area and reduction in time to peak resulting from the landfill expansion, the pond will be expanded to the north, increasing the size of the main pond and forebay. Pond 1 is currently designed for to meet the Enhanced Level Protection (80% TSS removal) as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) and will be expanded to remain at the same removal level for the larger drainage area. The outlet structure will be modified with an appropriately sized orifice to meet discharge requirements. The existing outlet structure for the pond will be modified and will be fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed.

8.1.5.2 Pond 2/3

SWM Pond 2/3 is located in the southwest corner of the Site and is an extended detention wet pond that currently receives stormwater runoff from a total drainage area of 30.6 hectares and under proposed conditions would have a smaller drainage area of 24.7 hectares. The existing Pond has a permanent pool storage capacity of 2,660 m^3 and an active storage capacity of 11,100 m^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. The existing outlet structure for the pond will be modified and used and is fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed.

8.1.5.3 Pond 4

SWM Pond 4 is located centrally on the south side of the site and is an extended detention wet pond that currently receives stormwater runoff from a total drainage area of 57.7 hectares. The existing Pond has a permanent pool storage capacity of 5,200 m^3 and an active storage capacity of 20,200 m^3. Under proposed conditions Pond 4 would receive stormwater runoff from a smaller total drainage area of 25.2 hectares. 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 for the pond will be modified and used and is fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed. An outlet pipe with a ditch inlet grate will be provided for the controlled discharge of large storm events.

8.1.5.4 Pond 5

SWM Pond 5 is located on the southeast corner of the landfill site and is an extended detention wet pond that receives stormwater runoff from a total drainage area of 41.0 hectares. The existing Pond has a permanent pool storage capacity of 3,690 m^3 and an active storage capacity of 11,800 m^3. Under proposed conditions Pond 5 would receive stormwater runoff from a larger total drainage area of 56.6 hectares. The Pond would be expanded to the east and north to increase both the permanent pool and active storage capacities. The expanded Pond 5 will be designed 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 for the pond will be modified and used and is fitted with a valve to allow emergency closure to assist in spill / leachate containment activities, if needed.

8.1.6 Site Operations and Ancillary Components

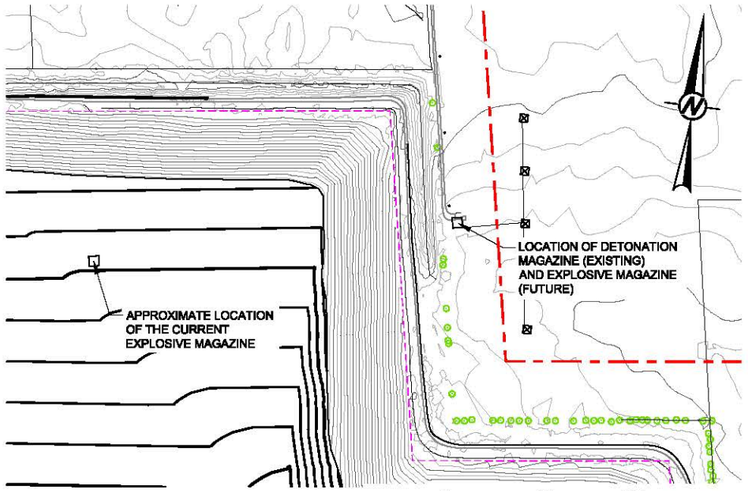
The expanded landfill will operate, at the maximum, from 7 a.m. to 5 p.m., Monday through Saturday plus one hour before, i.e., 6 a.m. to 7 a.m., for site preparations and one hour after, i.e., 5 p.m. to 6 p.m. to complete placement of daily cover. The site will be closed on Sundays; on statutory holidays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

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

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

The main site access for the expansion will be at the same location as for the existing site, off Manning Drive at the southeast corner of the site. The main ancillary facilities are located along the perimeter road across the south side of the site. It is proposed that many of the existing ancillary facilities at the site will be progressively upgraded or replaced during the expansion. These are illustrated on Figures 8.1-6 and 8.1-7 and described below:

- The existing contractor's office and garage building consists of an approximately 12 m by 20 m coverall building with adjacent staff trailers and a gravel parking area for cars and heavy equipment. It is proposed to replace this at the same location with a new combined garage and office/staff building that will be approximately double the size, as the existing, with a paved parking lot for small vehicles on one side and a gravel surfaced parking lot for heavy and tracked equipment on the other.
- The existing 22 m x 11 m one storey administration building will be replaced, at a new location close to the site entrance, by a larger building and will include a new three bay garage; a new paved parking area for small vehicles will be provided adjacent.
- The LFG controls and flare will remain in their current location, and future upgrades to flare capacity to accommodate increased LFG generation and capture will be at this same location. If in the future, the City decides to proceed with a LFG utilization facility, which is not being considered as part of this landfill expansion, it is anticipated that such a facility would be located to the west of the flare.
- The existing weigh scales/scalehouse would be replaced with a new facility whose location would be shifted some 80 to 100 m west of the existing to provide additional room for on-site vehicle queuing.
- The existing leachate pumping station in the southeast corner of the landfill property would be replaced with a new pumping station at approximately the same location.



CURRENT AND FUTURE LOCATION OF THE EXPLOSIVE AND DETONATOR MAGAZINES

0 100 200
METRES

LEGEND

- SITE BOUNDARY
- TRAFFIC FLOW DIRECTION
- EXISTING CONTOURS (0.5 m interval)
- PROPOSED LANDFILL WASTE CONTOURS (2 m interval)
- LIMIT OF LANDFILL

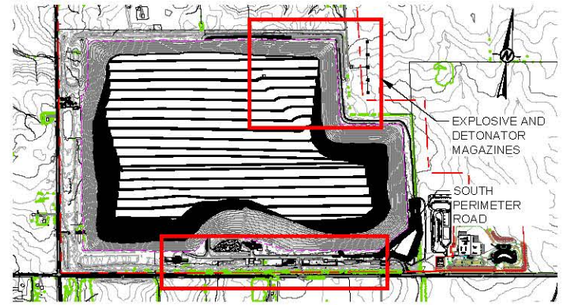
NOTE(S)

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.

KEY MAP



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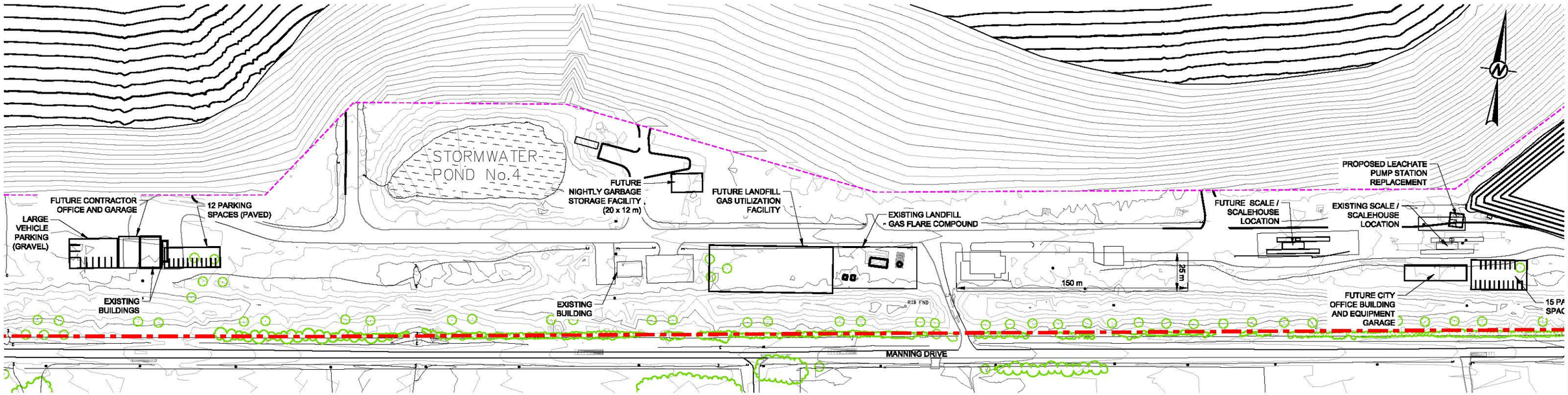

AREA ALONG LANDFILL SOUTH PERIMETER ROAD

0 50 100
METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2020-04-17	ISSUED FOR INTERNAL REVIEW	MHK	MLF	MHK	DVK

CLIENT
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PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
PLAN OF FUTURE ANCILLARY FACILITIES

PROJECT NO.	CONTROL	REV.	of	FIGURE
1648176	0017	A		8.1-6

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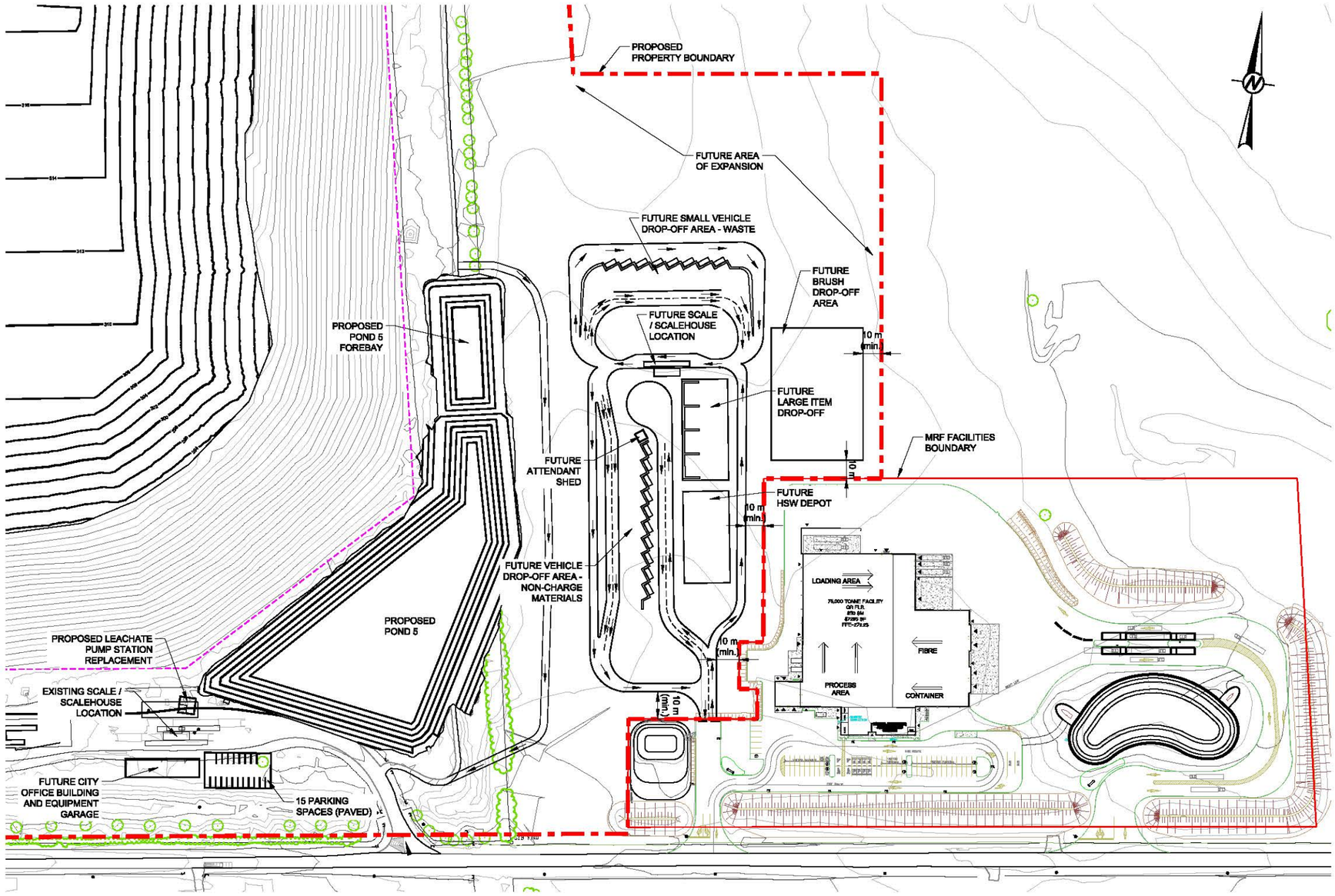

AREA BETWEEN THE W12A LANDFILL AND THE MRF FACILITIES

0 50 100
METRES

KEY MAP

LEGEND

- SITE BOUNDARY
- TRAFFIC FLOW DIRECTION
- EXISTING CONTOURS (0.5 m interval)
- PROPOSED LANDFILL WASTE CONTOURS (2 m interval)
- LIMIT OF LANDFILL

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

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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PROJECT
INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
PLAN OF FUTURE ANCILLARY FACILITIES

PROJECT NO.	CONTROL	REV.	of	FIGURE
1648176	0017	A		8.1-7

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

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Path: \\golder.gds\corp\ec\data\ottc\active\Spatial_IM\1City of London\Site_W12A\99_PRO\A1648176\40_PROD\0017_EA-Report_Section-B\ | File Name: 1648176-0017-CWv-B817A.dwg | Last Edited By: rmforget Date: 2020-07-30 Time:5:04:40 PM | Printed By: rmforget Date: 2020-09-14 Time:3:43:46 PM

- The existing HSW building, equipment shed and at-grade small vehicle waste drop-off area would be decommissioned.
- The site is currently approved to construct a receiving facility and accept garbage at night. If this becomes necessary as part of site operations, it is expected that this would involve the receipt and temporary storage of three to five loads of waste during the night; the waste would then be moved the next morning to disposal in the active area of the landfill. The approved future location of this proposed night waste storage facility is along the south side of the landfill across from the administration building. It is proposed that the facility would be an enclosed structure with concrete push walls to facilitate loading for transfer to the landfill for disposal; as such, the waste tipping and loading would take place inside this building. Access to the landfill at night will be done using card key access and automatic gates.
- It is anticipated 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. It should be noted that establishment of a new HSW Depot and the recyclable material to be collected will depend on the role of municipalities following Ontario's transition of *Waste Diversion Act* recycling programs to new frameworks under the Resource Recovery and Circular Economy Act. Program transitions are underway for tires, waste electronics and electrical equipment (WEEE), MHSW and Blue Box materials.
- The W12A Landfill is currently approved for an explosive magazine on top of the north central area of the landfill. In addition there is a detonator magazine adjacent to the east side of the landfill, which will be in the buffer zone of the expansion. These magazines are the responsibility of the London Police and Ontario Provincial Police (OPP), respectively. It is proposed to relocate the explosives magazine to the same location as the detonator magazine in the east buffer area. The City has consulted with the London Police and the OPP who agree with the proposed relocation of the explosive magazine.

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

Recyclable materials will be used in the construction of new infrastructure when practical. For example, consideration will be given to including non-recyclable glass as part of the Granular B subbase in on-site road building.

A site access off Scotland Drive to the northwest was constructed in 2020 to facilitate access for construction of Phase 2 Cell 10. This secondary site access will remain for the expansion and will be used as a secondary site access and service road for operations and maintenance vehicles to the north part of the landfill property and as an emergency access/exit. The secondary access will have a locked gate to prevent unauthorized usage.

The existing roads on the south and west sides of the landfill are paved and will remain paved for the expansion. It is proposed that the perimeter access road around the north and east sides of the landfill will be rebuilt and asphalt surfaced. The road from the secondary site access will be gravel surfaced. The vehicle access roads for the proposed recycling drop-off facilities in the southeast corner between the landfill facilities and the MRF will also be paved. Access for collection vehicles to the expansion Phases will be mainly from the south side perimeter road, and for Phases 1E and 2E from the west side perimeter road. From the south side it is anticipated that the two existing granular surfaced haul roads will continue to be utilized; one road is located in the central part of the footprint (east side of Phase 3E and veering eastward into Phase 6E) and the second in the east part (east side of Phase 7E and southward into Phase 8E).

8.1.7 Maintenance and Monitoring

A program for operational and environmental monitoring will continue to be carried out at the expanded W12A Landfill site. Operational monitoring includes ongoing inspections and recording of site conditions, maintenance, and repairs. Environmental monitoring is carried out as part of site operations to check for potential releases from the landfill and, if required, trigger investigation and mitigation measures before adverse effects occur off-site. The environmental monitoring consists of groundwater, leachate, surface water, SWM ponds and a number of water supply wells in the area surrounding the site. The environmental monitoring programs are generally described in Section 12.1. Operational and environmental monitoring programs will continue in the post-closure period.

8.1.8 Closure and Post-closure

As previously described, 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, which is expected to originate from a combination of the final cover reclaimed from the final cover on the existing landfill and on-site stockpiled clay till excavated during the construction of the existing Phase 2. If these do not provide sufficient volume of materials for the final cover, the remainder of the soil will originate from off-site sources. This is intended to be a permeable final cover design, to allow infiltrating precipitation to enter the waste and remove the contaminants from the waste as leachate, and thereby reduce the contaminating lifespan of the landfill site. This will be topped with 150 mm of soil capable of sustaining vegetation. This final cover design approach is in accordance with O. Reg. 232/98. The vertical LFG extraction wells will be installed to collect gas from within the expanded waste mass as part of the progressive construction of the final cover system following completion of filling within each Phase and will be connected to the blowers and flares.

Post-closure activities will involve continued operation and maintenance of the leachate collection and removal system, the LFG control system and the SWMS. In addition to general inspection of the site, there will be inspection of the landfill cover for evidence of erosion, leachate seeps or instability, and maintenance / repair as required and described in Section 12.1.

8.1.9 Description of Activities

The time frames over which there will be activities on the site associated with the proposed vertical expansion can be divided into three: initial construction, operations and post-closure. Following is a general description of the activities that are expected to take place during each of these periods.

Initial Construction: It is anticipated that the initial construction activities associated with the expansion will take place in the 2023 to 2025 period. Because the expansion will be a vertical expansion above the existing footprint, there will be no large-scale excavation required to construct a new cell. Construction of the replacement perimeter LCS immediately adjacent to the existing toe of the landfill around the north, east and south perimeter of Phase 1 will involve conventional trenching and pipe installation; trenches into the waste will also be extended up the existing landfill sideslopes to install finger drains. The modifications / enlargements to the existing SWMS ponds and their outlet controls will also be completed, involving relatively shallow excavation and soil berm construction in the immediate area of the existing ponds; no construction or alterations are proposed for the existing structures that convey the pond discharge below the adjacent roadways to the downstream watercourses or in the downstream watercourses themselves. Site roads will be constructed/upgraded adjacent to the north and east sides of the existing landfill. Construction of other infrastructure upgrades, i.e., main pump station, some of the buildings and some of the ancillary facilities, will take place along the south side of the site that is already occupied by site infrastructure. Construction of the new diversion and drop-off facilities in the southeast corner of the expanded site adjacent to the MRF will involve stripping of existing vegetation and then conventional construction for these types of facilities. Surplus soil resulting from this initial construction will either be temporarily stockpiled on the landfill for re-use in ongoing operations or stockpiled for future use in the on-site buffer area to the north of the landfill footprint where soil stockpiles already exist.

Operations: Operation of the expanded landfill is expected to be ongoing between 2024 and 2048. The expansion will commence in Phase 1E in the southwest and in the non-decomposable cell in the southeast, which will involve progressive stripping of the existing cover material from the active area and the placement and compaction of waste and spreading of daily cover soil, compaction and daily covering of the waste. The daily cover will be mostly suitable types of materials incoming to the site on an ongoing basis, supplemented as needed by material from on-site soil stockpiles. After completion of a cell and moving to the next disposal area (as per the phasing plan), final cover soil will be placed over the waste and revegetated and the landfill gas collection system progressively installed with the final cover. During operations, vehicles will travel on the on-site perimeter roads and on the haul roads located on the landfill, as well as to and from the soil stockpiles in the north buffer area. There will be ongoing maintenance and monitoring activities. The operations activities during the expansion will basically be a continuation of current site activities both on and adjacent to the existing landfill footprint, with raising of the landfill to reach the design configuration.

Post-Closure: When the approved capacity of the expanded landfill is reached at the end of the 25 year planning period at the end of 2048, the final cover will be placed on the last landfill Phase. After disposal operations cease, it is expected that the diversion activities may continue at the site using the established infrastructure. The activities associated with operation and maintenance of the leachate collection and pumping systems, the conveyance of collected leachate off-site for treatment, the SWM ponds and the operation and maintenance of the landfill gas collection and flaring system will continue. Post-closure groundwater and surface water monitoring programs will continue. The leachate and landfill gas management system operations will extend for many decades post-closure. Impact Assessment of the Preferred Undertaking