Development & Operations Report
West Carleton Environmental Centre

Volume 1 of 2

July 2014

Prepared for:
Waste Management of Canada Corporation
2301 Carp Road
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Project No. 131-19416-00

131-19416-00

July 30, 2014

Mr. Reid Cleland
Director of Operations - Ontario Landfills
Waste Management of Canada Corporation
2301 Carp Road
OTTAWA, ON
K0A 1L0

Re: Waste Management of Canada Corporation
Development & Operations Report
West Carleton Environmental Centre

Dear Sir:

We are pleased to provide our final Development & Operations Report for the West Carleton Environmental Centre. This report consists of two (2) volumes; the first volume contains nine (9) chapters, along with the glossary, references, tables, figures and large drawings. The second volume contains all appendices.

A Financial Assurances Report has been prepared and is to be submitted to the Ministry of the Environment (MOE) as a separate confidential document.

We trust you will find all of the above satisfactory.

Yours truly,

WSP Canada Inc.

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Executive Summary

Waste Management of Canada Corporation (WM) has applied for a site expansion at the West Carleton Environmental Centre, as detailed in the Environmental Assessment documents, approved in September 2013. The Development & Operations Report is submitted for an Environmental Compliance Approval (ECA) under Part 5, Waste Management, under the Environmental Protection Act, RSO 1990, Chapter E19. The purposes of this document are as follows:

- to support the request for approval and provide sufficient information for the regulatory review;
- to provide additional detail on site design; and
- to detail development and operation beyond that provided in Supporting Document #4, the Facility's Characteristics Report (FCR)(Ref. 4) submitted with the Environmental Assessment documents.

In addition, other approvals requested include:

- OWRA approval for stormwater management systems, including open ditches, culverts, pipe systems, stormwater management ponds and infiltration basins; and
- Permit to Take Water.

In accordance with Regulation 232/98, a second report including calculations and documentation for financial assurances is submitted under separate cover.

In accordance with the EA commitments prior to submission of this document it has been posted on the WM website for viewing by the public. Two (2) public meetings were held to provide clarification and to receive input from those attending.

This report consists of two (2) volumes. Volume 1 contains nine (9) chapters, along with the glossary, references, tables, figures and large drawings and is organized as follows:

- Chapter 1 discusses the site setting, legal survey for the site and provides background information.

- Chapter 2 describes the service area being Ontario, waste types, waste input rate, volumes, receiving hours, site capacity and site life.

- Chapter 3 discusses the anticipated site traffic, main access route, and anticipated road upgrades as well as roads on-site.

- Chapter 4 discusses the site development including:

  - site preparation;
  - cell preparation;
  - phasing;
  - landfilling method;
  - liners and quality control and service lives;
  - drainage layers and service lives; and
  - other miscellaneous site aspects.

- Chapter 5 describes gas management including:

  - landfill gas volumes generated and captured;
  - early gas capture by the leachate collection system;
  - vertical well system;
  - horizontal gas collection system;
  - transmission lines and extraction system;
  - flaring system; and
  - existing gas to energy system.

- Chapter 6 describes leachate management, including:

  - leachate quantities;
  - leachate quality;
  - accommodation for treatment, discharge to the City of Ottawa sanitary sewer system; and
  - contingency disposal on a poplar/willow forest system and off-site disposal arrangements.

- Chapter 7 describes site controls including:

  - staff;
  - entrance area;
  - hours of operation;
  - control of waste entering the site;

  - various buildings;
  - road maintenance;
  - litter control;
  - signage;
  - monitoring programs;
  - equipment;
  - site maintenance;
  - site safety;
  - control of vectors and pests;
  - complaints procedure; and
  - emergency response plan.

- Chapter 8 describes stormwater management.

- Chapter 9 describes contingency plans.

Volume 2 contains all appendices.

The drawings in this report refer to large folded drawings (2' x 3'). Figures are 8.5" x 11" and 11" x 17" in size and their numbering system relates them to a particular chapter (i.e. Figure 4-3 is the third figure of Chapter 4).

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1. Introduction and Background

The West Carleton Environmental Centre (WCEC) is located adjacent to Carp Road and Highway 417 at the westerly end of Ottawa. The landfill site expansion is an extension of the existing Waste Management Facility, owned and operated by Waste Management of Canada Corporation (WM).

The new landfill site expansion was the subject of a comprehensive Environmental Assessment (EA), initiated in January 2011, following approval of the Terms of Reference (TOR) by the Minister of Environment on August 25, 2010. That EA[(Ref. 7)] was completed in September 2012, and was approved on September 5, 2013. That Notice of Approval was recommended and approved and ordered under the date of August 28, 2013. The approval of the Lieutenant Governor and Council and letter from Mr. Jim Bradley, Minister of Environment, are included in **Appendix 1-A**.

Concepts presented in this report are the preferred alternatives selected by detailed impact analysis and consultation in the EA. The proposed landfill expansion area, located within the central part of the property north of the existing landfill was selected as the preferred alternative in the environmental assessment, and is the subject of this report.

1.1 Existing Setting

The WCEC site includes the lands associated with the existing Ottawa Waste Management Facility (WMF) and the parcel required to facilitate landfill expansion which is subject to a rezoning application. The WCEC site occupies approximately 232.9 ha (155.4 ha Ottawa WMF and 77.5 ha parcel to be rezoned). The Ottawa WMF consists of the existing landfill (104.1 ha) on the west side of Carp Road and the Contaminant Attenuation Zone (CAZ) having an area of approximately 51.3 ha on the east side of Carp Road. The CAZ was designated in 2006 and 2011. Refer to **Figure 1-1** for the outline of these areas.

1.1.1 Location

The WCEC is located on Parts of Lots 2, 3 and 4, Concession 2 and parts of Lots 3, 4 and 5, Concession 3, in the former Township of Huntley, formerly in the Township of West Carleton, now the City of Ottawa, near Carp Road and Highway 417. The existing landfill footprint occupies approximately 34 hectares (ha), bordered by the City of Ottawa Road 5 (Carp Road) on the east, Highway 417 on the south, William Mooney Road to the west and private lands south of Richardson Sideroad. Those lands between Richardson Sideroad and 300 m southerly, between William Mooney Road and Carp Road, are owned by

WM, but are not designated as part of the site. The CAZ part of the site consists of two (2) land parcels, one large parcel north of Highway 417 and the second small parcel south of Highway 417. **Figure 1-1** shows these lands and various facilities within the existing and proposed landfill site.

1.1.2 Topography and Drainage

The natural topography on the area of WCEC property, which has been modified by aggregate extraction and waste disposal activities, ranges from an elevation of approximately 131 metres above sea level (masl) southwest of the landfill site to less than 110 masl on the Huntley Quarry property, east of Carp Road. The present landfill extends to an elevation of approximately 174 masl, and the Huntley Quarry has been mined to a floor elevation of less than 75 masl. Refer to **Figure 1-1** for the area conditions.

From within the boundaries of the existing landfill property, there is no direct off-site discharge of surface water that is in contact with waste that has been landfilled; internal surface water drainage is contained within the landfill property and is directed to on-site ponds, which are engineered, natural, or depressions remaining from aggregate extraction. The exceptions to this are the external slopes of the vegetated site perimeter berms along the east and south boundaries of the landfill property; this amount of surface water is very minor and is not in contact with activities at the closed landfill. Runoff from the vegetated berms flow into Carp Road and Highway 417 drainage systems. There is a small area of drainage from the extreme western end of the site, in the area of the existing service entrance which flows into the ditch along William Mooney Road and northward into the tributary of Huntley Creek.

The above noted tributary of Huntley Creek originates from the wetland west of William Mooney Road and west of the WCEC property. The wetland feeds a drainage course that collects surface water from the agricultural and residential properties along William Mooney Road, west of the WCEC property. Flowing from west to east under William Mooney Road the drainage course bends to the north and flows towards Richardson Sideroad. Along the south side of Richardson Sideroad, the creek is aligned as a roadside drainage ditch, flowing eastward to a point approximately 450 m east of William Mooney Road. Surface water from the agricultural land east of William Mooney Road and south of the Richardson Sideroad is controlled by drainage ditches and flows northward to the roadside ditch along Richardson Sideroad.

The Huntley Creek tributary then flows northward through a culvert under Richardson Sideroad. Here the creek collects drainage from the area north of Richardson Sideroad, including several residential and commercial/industrial properties. Approximately 250 m west of Carp Road, Huntley Creek flows in a southeasterly direction under Richardson Sideroad and bends towards the northeast, where it passes under Carp Road. From there, the creek flows eastward, parallel to Richardson Sideroad, then northward

through a culvert under the road, eventually discharging to the Carp River, some 3.8 km northeast of the landfill property. Ditches along both sides of Carp Road between the landfill property and Richardson Sideroad also drain into this tributary.

Drainage south of the existing landfill is contained within a large wet forested area on the westerly end. The south central and southeasterly lands largely drain through a series of on-site stormwater ditching to a sedimentation pond and infiltration pond designated Stormwater Pond #2, which in turn discharges to the low lying area of Depression #1. The southerly part of the existing landfill at the easterly end drains to Depression #2 and recharges into the water table.

The stormwater flow pattern on the lands for the new landfill footprint can be divided into two (2) zones. On the south central and easterly part, surface flow is controlled by a series of ditches and Stormwater Pond #1, which recharges the water into the water table. Surface flow is generally from southwest to northeast. Because the east end of the property was used for aggregate extraction, the ground surface is lower than the surrounding area, and consequently there is no direct off-site surface water runoff from this area. A previous residential property is located beyond the eastern limit of the former extraction area, west of Carp Road. Surface water flow is northeast, following the slope of the land surface. On the north half of the property for the new landfill footprint, and the complete westerly part, is partially wooded and partially agricultural land. The southeast corner was a manufacturing facility (Laurysen Kitchens Limited). The western and north central part is flat lying, and surface drainage follows land contours and agricultural ditches in a northerly to northeasterly orientation toward Richardson Sideroad and into the tributary of Huntley Creek described previously. The eastern portion of the new lands for the landfill slopes, and has a northeasterly orientation along the edge of a post-glacial beach ridge. Surface drainage follows the land slope into ditches along Carp Road. These ditches drain northerly into the Huntley Creek tributary. West of the previous residential properties, a large depression from aggregate extraction remains, and designated as Depression #5 on **Figure 1-1**. Where the land surface in former extraction areas are depressed, surface water collects in localized ponds. The water level in the depressions reflects low flow groundwater table elevation.

There is no flood hazard zones located within the proposed landfill area. Elevated topography and high recharge potential on beach ridge deposits along Carp Road negate the potential for surface flooding.

The reader is referred to Chapter 8 of this report for a complete description of pre-development and post landfill development conditions as well as the proposed stormwater management facilities and infiltration basins.

1.1.3 Geology and Hydrogeology

The WCEC site is set over sand and gravel deposits having a thickness ranging from approximately 4 to 16 m. The overburden is underlain by the limestone bedrock of the Bobcaygeon Formation. The shallow groundwater flow generally follows the bedrock surface topography and flows in a northerly/northeasterly direction. There is a localized groundwater mounding in the vicinity of the existing landfill. The regional groundwater flow in the deep bedrock is toward the northeast. Refer to the Hydrogeologic Assessment Report[(Ref. 29)] for a detailed description of the site geology and hydrogeology.

1.1.4 Buildings and Roads

Figure 1-1, **Drawings 1 and 3** show the existing entrance, scale facility and office. These facilities are located approximately 0+630 N on the drawing grid system.

To the south, at approximately 0+100 N is the Gas to Energy (GTE) building housing the five (5) gas-to-energy units presently running on-site. At approximately 0+470 N is the blower and flare building, together with the two (2) enclosed flares and the candlestick flare.

Figure 1-1 and **Drawings 1 and 2** show a large industrial building at approximately 1+500 N, and is used for manufacturing kitchen cabinets. An existing easterly office opposite the factory is used as a showroom and office building associated with the factory. These two (2) buildings will be taken over by Waste Management and used for their purposes.

Referring to **Figure 1-1** and **Drawings 1 and 3**, in the southwesterly corner of the site is the Waste Transfer and Processing Facility (WTPF).

On-site roads consist of paved entrance and queuing facilities associated with the existing landfill, together with inbound and outbound weigh scales. The entrance and road leading around the northeast corner of the existing site is paved to about 0+260 W, as shown on **Drawings 1 and 2**. That road extends westerly as a gravel surface road and thence southerly to the WTPF. A high level access road to the top of the existing landfill site exists at the westerly end of landfill for maintenance and monitoring purposes. Maintenance roads exist on the south side of the landfill as can be seen on **Figure 1-1** and **Drawings 1 and 3**, and also surround the biosolids storage area and the poplar forest and Closed South Cell area. Paved road extends east and south of the flare and blower building, to approximately 0+400 N. Granular surfaced road extends from there southerly to the GTE building.

Other informal trails exist on-site, but are not described here.

1.1.5 Biology

There are no permanent or intermittent streams within the WCEC site.

With respect to bird species at risk, Eastern Meadowlark has been observed west of William Mooney Road, but not on-site. Barn swallows have formed a colony and are nesting west of William Mooney Road but are not on-site.

A colony of Bank Swallows have been observed in the eastern cliff area formed by the gravel extraction pit, and will be preserved adjacent to the stormwater ponds and the Mini-Transfer Area (MTA).

Other vegetation species of note are three (3) endangered butternut trees located in the south of the landfill site property. Particular note should be made in this respect with regard to any poplar forest contingency irrigation plan. The butternuts are discussed in Subsection 6.7.4.1[(Ref. 7)].

Refer to BMP Plan (Biology)[(Ref. 38)] for recommendations related to compensation measures and site development.

1.1.6 Archaeology

A Stage 1 and Stage 2 archaeological assessment was carried out on the lands and no archaeological resources were encountered.

1.1.7 Cultural Heritage

Section 6.7.6 of the Environmental Assessment describes the cultural heritage properties in the area. The house at 2413 Carp Road is associated with the Laurysen kitchen business and may be used as a site office. However, the setting for the building has already been significantly altered for the previous industrial use. Any further alteration will not affect the cultural heritage values remaining. Other buildings described in the area of the proposed landfill expansion, on Carp Road, Richardson Sideroad and William Mooney Road will not be affected by the landfill site expansion proposed, provided required buffering is implemented.

1.2 Existing Operations

The existing site is shown on **Figure 1-1**. The Ottawa WMF operates under Amended Provisional Certificate of Approval (C of A) A461002. Sludge processing operates under Certificate of Approval A461009. The existing site is licenced to receive solid, non-hazardous waste from the Province of Ontario. The existing landfill reached its approved capacity of 8,744,000 m^3 in 2011 and has been closed to the receipt of new landfill waste.

A southerly cell south of the existing landfill contains a former landfill (historically known as the Rump Landfill) and is shown on **Figure 1-1**. This waste is designated as "Closed South Cell". The present poplar forest and irrigation system is located on the easterly two thirds of this old cell.

Activities currently carried out include the following:

- processing operations and waste transfer at the WTPF;
- public recycling drop-off facility including blue box bins, electronics and tire recycling, as well as drop-off for used construction materials (a partnership with Habitat for Humanity);
- leachate management operations;
- landfill gas management operations; and
- monitoring and site management activities.

The site has approval to operate the WTPF. The waste processing is described in Section 7.5 of this report. Organic processing, limited to leaf and yard waste may also be carried out on-site as a composting windrow operation.

The site is also approved for soil bioremediation to treat petroleum hydrocarbon impacted soil under Amended C of A (Air) No. 7816-7C9JMR.

The majority of site traffic is from the south (417 and northbound on Carp Road).

1.2.1 Leachate Management

Approximately the easterly quarter of the existing landfill was constructed with a geosynthetic liner and leachate collection system (8.22 ha). The single composite liner consisted of GCL (geosynthetic clay liner – refer to Glossary) underlaying 1.5 mm (60 mil) high density polyethylene (HDPE), geotextile geonet, comprising two (2) layers on the bottom and one (1) layer on the side slopes, overlain by a minimum of 450 mm of crushed stone, and protected with geotextile between the granular and the

overlying waste. Perimeter leachate collector pipes are installed on the east and southerly sides of the lined cell. Refer to **Figure 4-14** and **Drawings 1 to 3** for the lined site area.

The remainder of the landfill is unlined with little documented information regarding excavation depths, landfilling practices and base elevations. This unlined area was originally deemed as naturally attenuating. An eastward migration of leachate contaminated groundwater has occurred east of the site. Groundwater impacts have been, and continue to be, mitigated by the operation of groundwater purge wells along the eastern perimeter of the site. The purge well system, shown on **Figure 4-14** is not designed to "pull back" contamination that previously migrated onto the CAZ, so the remaining concentrations in the groundwater will gradually attenuate. Current monitoring results clearly indicate that the purge well system is functioning as designed. Monitoring data demonstrate that the bulk of the leachate impacts are contained within the 400 m of the purge well system (well within the CAZ boundary).

Leachate collected from the lined portion of the site and impacted groundwater collected from the groundwater purge wells, are equalized, degassed of methane at the GDT building, in the case of the purge well discharge and discharged to the City of Ottawa's sanitary sewer system via a forcemain from the site, along Carp Road to the municipal sewer system, or disposed on the hybrid poplar plantation. **Figure 4-14** also shows the approved leachate treatment plant. Refer to Section 6.1.4 for additional information regarding the leachate treatment facility.

Other Measures

- The landfill has been final covered and closed. The cover consisting of engineered soil, topsoil and vegetation has been provided on all of the landfill. The summit, consisting of approximately 6.5 ha at 5% slope or greater, has been provided with a "beanie" cap, consisting of approximately 0.9 m of clay, overlain by a layer of 30 mil PVC membrane, geotextile protective cushion, 0.6 m clay, and 0.15 m topsoil and vegetation. Where the "beanie" cap was placed, gas wells were sealed with PVC boots. The cap provides both gas/odour control as well as infiltration control.

- A poplar tree plantation exists south of the existing landfill on the Closed South Cell and is used for disposal of leachate and surplus pond water. The poplar forest is permitted for 6.2 ha and is located on most of the Closed South Cell (refer to **Figure 1-1 and Figure 4-14**).

MOE approval has been received for treatment of landfill leachate prior to discharge to the City sewer system. The leachate treatment plant will ensure compliance with the Ottawa Sewer Use Bylaw. Refer to Chapter 6 for details related to leachate management.

1.2.2 Landfill Gas Management

Landfill gas is collected through a LFG extraction system, including vertical extraction wells and horizontal extraction piping within and adjacent to the existing landfill. The geomembrane "beanie" cap and engineered landfill cover enables the collection of landfill gas. All of the gas is pulled under vacuum to the LFG blower facility shown on **Drawing 3**, and located near the southeast corner of the existing landfill.

Much of the LFG continues to the gas-to-energy (GTE) plant which can generate up to 6.4 MW of energy. Residual gas which cannot be used by electrical generation is flared by an enclosed duty flare, a backup enclosed flare and a candlestick flare. **Drawing 3** shows the location of the GTE building and gas header system.

An air barrier system injects air on eastern boundary of the site to prevent subsurface migration of landfill gas from the Closed South Cell and the existing landfill.

1.2.3 Site Management Activities and Monitoring

Site management activities include:

- Regular visual inspections of the landfill cover as well as surface air emissions surveys to determine whether gas extraction vacuum needs to be increased.
- General site housekeeping inspections including dust, litter and cleanliness of site roadways.
- Response to any odour complaints received from site neighbours.

As a condition of the ECA of the existing landfill, monitoring and site management activities are outlined in an Environmental Monitoring Plan (EMP). The annual monitoring and site management activities undertaken at the existing landfill are documented in an annual report.

- Operational monitoring and maintenance of engineered facilities including:
    - purge well system
    - quality and volume of water discharged to sanitary sewer
    - water levels in purge wells
    - regular preventive maintenance of pumps, controls and related components

- Landfill gas extraction systems:

  - operational monitoring
  - system balancing
  - preventative maintenance on collection and blower systems
  - reporting to MOE

- Environmental monitoring activities include:

  - groundwater monitoring including measurement of groundwater elevation (monthly or annually, depending on monitor location), and sampling analysis for various indicator parameters (once or twice annually, depending on monitor location).

  - surface water monitoring in various ponds and ditches around the site, including measurement of surface water elevations (monthly or annually, depending on location), and sampling analysis of various indicator parameters (once or twice annually, depending on location).

  - landfill gas monitoring on a monthly basis using hand-held multi-gas monitoring instrument in on-site gas monitoring wells.

  - annual reporting/interpretation of monitoring results.

1.3 Planning

This document is intended to simply indicate an overview of land use and planning issues. For a complete discussion in regard to the subject, the reader is referred to Reference 5 and Reference 7. Existing land uses include industrial, depleted aggregate extraction, kitchen manufacturing business, a wooded area, idle and scrub land and agriculture. Future uses planned for the lands are heavy and light industrial as outlined in the policies of the Official Plan and Carp Road Corridor Rural Employment Area. No change to the Official Plan is required for the proposed landfill expansion.

At present, the site expansion is zoned for rural, heavy industrial, mineral extraction subzone 2 and rural general industrial subzone 5. Since the landfill expansion will be defined as a solid waste disposal facility in the Zoning Bylaw, a Zoning Bylaw Amendment is being sought to permit the new landfill footprint and associated activities. This work is being carried out by others and is not addressed further in this report.

The reader is referred to Reference 8, regarding a zoning by-law amendment submission to the City of Ottawa.

1.3.1 Land Use

The south part of the property is a closed waste disposal site.

The following uses exist within the north expansion part of the site which is subject to rezoning:

- woodlot on the southwest, and north central part of the expansion area;
- agricultural field northwesterly 2/3;
- Stormwater Pond #1, a constructed facility for the existing northerly half of the existing landfill stormwater;
- Depression #3, a low lying, wet area in the central part of the site;
- a depleted resource extraction area in the southeast part of the expansion area;
- a factory building and showroom for Laurysen Kitchens in the east central part of the site; and
- a swamp/wet area and Depression #5 in the northeasterly part of the site.

The agricultural land on the east side of William Mooney Road, which will form part of the landfill site expansion, supports a dairy farm, whose major infrastructure is located on the west side of West Mooney Road. The Detailed Impact Assessment[(Ref. 7, Chapter 6)], suggested mitigation measures, one of which was to purchase the crop land, such that the farmer could buy or lease other replacement lands. This solution was implemented.

The Detailed Impact Assessment[(Ref. 5)] with respect to agriculture, recommended that Best Management Practices be implemented to minimize nuisance effects relating to surrounding agricultural operations. These practices have been agreed to by WM.

On the east side of Carp Road, opposite the existing and proposed landfill, are industrial uses. The southerly part opposite the existing landfill site is Karson Aggregates and to the north, opposite the new proposed landfill, is the Huntley Quarry. This is shown on **Figure 1-1** and **Drawing 1**.

Future Land Use

Future land use within the landfill expansion part of the site will consist of the following:

- 37.8 ha landfill area;
- existing forest and infill planted forest on the westerly buffer area, and adjoining the existing forest in the north part in the westerly half of the expansion area;
- new Stormwater Pond #1 and Infiltration Basin #1 in the southeastern part of the area;
- new Stormwater Pond #2 and Infiltration Basin #2 in the northeast part of the area;
- auxiliary uses including mini-transfer area (MTA), new access and paved access roads, scale facilities, paved road south of the landfill expansion; and
- various tree plantings and landscaping.

All lands between the northern landfill expansion site boundary and Richardson Sideroad have been acquired by WM, and provide additional buffer lands.

In future, the Laurysen building and associated office may be used as equipment maintenance and office facilities for the new landfill.

The existing main entrance to the existing landfill will be retained but closed, since a new entrance and control facility will be constructed.

The WTPF will continue to run in the southwesterly part of the site.

An area for poplar forest is shown on **Figure 4-14** should it be required to accommodate leachate or purge well water. This is further discussed later in the report.

1.4 Legal Survey

The landfill site has a boundary survey as shown in **Appendix 1-B**, prepared by Annis, O'Sullivan, Vollebekk Ltd. The property is divided into three (3) parts, A, B and C. Part A on the west side of Carp Road is generally referred to as the "site" and occupies 181.6 ha. It includes the existing landfill and expansion area which is to be rezoned. Parts B and C on the east side of Carp Road form the CAZ. Part B, north of Highway 417, is approximately 49.3 ha and Part C is south of Highway 417 and occupies approximately 2.0 ha. The combined CAZ area is 51.3 ha. The total WCEC area is 232.9 ha.

In **Appendix 1-C**, a legal description of parcels comprising the WCEC site is included.

2. Waste Streams

2.1 Service Area

An Ontario-wide service area is requested for the landfill site expansion.

2.2 Site Capacity

The Environmental Assessment approved a landfill expansion of 6,500,000 m^3 for waste and daily cover. Final cover is not included in this volume. Site capacity will be governed by approved final contours and bottom contours as defined in this Development and Operations Report.

2.3 Waste Characteristics

The site will receive up to 400,000 t/yr of solid non-hazardous waste, including residential, institutional, commercial and industrial waste. Additional solid non-hazardous waste may be received at the site, which will be primarily used as cover material.

Special waste includes non-hazardous contaminated soil, sludge, biosolids, ash, off-spec products, etc. Special waste will be non-hazardous as defined through the toxicity characteristic leaching procedure (TCLP) (Schedule 4, Regulation 347).

Each source of special waste will be tested by the generator before delivery to the site. No waste exceeding the waste acceptance criteria will be landfilled or used as cover material at the site.

3. Site Traffic and Roads

3.1 Main Access

Refer to **Figure 1-1** for the location of roads surrounding the landfill site. The major access is from Highway 417 to the south of the site, with access ramps to Carp Road east of the site. Carp Road will form the main access to the site. Secondary roads include Richardson Sideroad to the north and William Mooney Road to the west.

The reader is referred to Section 6.7.7 Transportation in the Environmental Assessment[(Ref. 7)]. The study will not be repeated but is highlighted as follows:

Expected traffic volumes generated at the site were combined with City of Ottawa traffic projections, representing the maximum traffic on Carp Road. Together these volumes were considered "worst case" conditions for traffic entering the site.

The number of trips entering and exiting the site was estimated at 70 per hour (35 entering and 35 exiting), and added to an estimated 45 trips/hour during the peak a.m. and p.m. hours, associated with auxiliary uses (35 entering and 10 exiting in the a.m., and reversed in the p.m.). Five (5) trips were assigned from the north and the remainder considered to arrive from the south as northbound left turn vehicles.

Traffic volumes for the driveway immediately east of the proposed site access were estimated at 25 employees arriving/leaving in the peak hour, 20 of which were assigned from the south and 5 assigned from and to the north. Very few trucks use this driveway.

Traffic volumes in the site vicinity resulted in the estimate of anticipated level of service for traffic on Carp Road and for traffic using the site access. In addition, impact of the potential future widening of Carp Road from two (2) to four (4) lanes on traffic operation was assessed. This widening is not included in the City's Transportation Master Plan. At the time of assessment, traffic volumes at Carp Road and Richardson Sideroad indicate that this section may also require widening in the future if growth occurs in the area.

Appendix 3-A contains Table 6-10 entitled, "Intersection Analysis Results" from the Transportation Study[(Ref. 7)]. The table indicates 75/hr (truck vehicles) turning left from Carp Road into the site, with the volume of traffic slightly over 1,100/hr total. Delays of 22 seconds might be experienced in the a.m. for

vehicles turning left at the WM access. A level of service "C" was determined for that a.m. condition. The afternoon inbound traffic is less, estimated at 45 vehicles per hour although through traffic on Carp Road northbound is slightly higher than the morning count. Delays for left turn vehicles on the northbound road are less at 12 seconds, with level of service "B". Outbound vehicles from the WM site would experience delays of 136 seconds with level of service "F". The majority of vehicles would be right turning, experiencing 25 seconds delay with level of service "C".

To summarize, more conflicts between left turning trucks and through traffic on Carp Road will occur with the landfill site expansion. Although truck traffic volumes will be similar to those during previous operations, volumes of through traffic will increase over time with City growth. Delays would be more significant for northbound traffic on Carp Road due to left turning trucks awaiting completion of their turn into the landfill site. Accordingly, it is proposed that a northbound left turn lane will improve traffic near the site access area. The new site access is proposed further north than the existing entrance. The new left turn lane will improve safety by reducing conflicts between northbound left turning and through vehicles, reducing driver frustration and improving the site distances. Northbound through drivers will not be forced to wait behind a truck turning left into the site. It was concluded, given the traffic volumes estimated, the northbound left turn lane is warranted in accordance with Provincial Standards. The following MTO geometric design standards are proposed:

- advancing volume 983
- opposing volume 1,016
- left turning volume 75
- design speed 100 km/hr
- % trucks = 100%

The left turn lane improvements are shown on Figure 3 of the Transportation Impact Study in Zoning Bylaw Amendment Submission[(Ref. 8)]. This figure was modified to address City of Ottawa comments and is included in **Appendix 3-C**. The following summarizes northbound road improvement characteristics:

- left turn area – 15 m
- left turn lane storage – 75 m
- parallel lane – 70 m
- taper – 160 m
- 2.0 m paved shoulder both sides

For the southbound lanes the following is advised:

- left turn area – 15 m
- left turn lane storage – 15 m
- parallel lane – 70 m
- taper – 160 m
- 2.0 m paved shoulder both sides

3.2 On-Site Road System

3.2.1 Main Entrance

The main entrance to the site will be four (4) lanes. The centre two (2) lanes would be for the main landfill traffic, with the outer lanes being bypass lanes and room for queuing at heavy traffic times. Queuing from inside the landfill gate at Carp Road to the scale is approximately 400 m, accommodating approximately 26 trucks per lane, with three (3) lanes available for an incoming queue, for a total of 78 vehicles. Maximum traffic through the main gate is anticipated to be as follows:

▪ Waste packers, tractor trailers and roll-offs	-	35 per hour;
▪ Importation of cover	-	4 per hour;
▪ Site preparation and cell construction	-	9 per hour;
▪ Waste transfer and processing transfer facility (WTPF) (materials recovery)	-	6 vehicles per hour;
▪ WTPF – construction and demolition waste	-	8 vehicles per hour;
▪ Small traffic (some landfill staff and some contractor vehicles)	-	16 per hour;
▪ Organic processing (leaf and yard waste)	-	included in material recycling;
▪ Residential diversion	-	included in small vehicles;
▪ Gas-to-Energy facility	-	included in staff vehicles.
TOTAL		78 per hour

The overview of traffic is anticipated to be as follows:

Vehicle Type	Average Trucks/Day (Trucks/Hour)	Seasonal Peak Trucks/Day (% of Average Day)	Daily Peak Trucks/Day (% of Average Day)	Peak Trucks Per Hour
Waste (residential, ICI)	157/d 16/hr	236/d 150%	315/d 200%	35/hr (Page 24, FCR [Ref. 4])
Daily cover and final cover	32 /d 3.2/hr	40/d 125%	40/d 125%	4/hr
Site preparation and cell construction	67/d 7/hr	90/d 133%	90/d 133%	9/hr
WTPF - Material recycling facility (MRF)	25/d 2.5/hr	35-40/d (Ref. 7 – Table 6-13) 140%	40/d (Ref. 7 – Table 6-13) 160%	6/hr
Construction & Demolition (C&D)	42/d 4/hr	55-60/d 130%	60/d 140%	8/hr
Small vehicles	78/d 8/hr	90/d 112%	120/d 150%	16/hr
Totals	401/d	546-596/d	665/d	78/hr

Refer to Section 4.3.1 regarding gates and fencing.

3.2.2 Main Scale and Surfaced Roads

A center kiosk, with double scales will be installed to weigh in and weigh out vehicles coming to the site. The spare scale indicated on **Drawing 4** is a possible future option, allowing automatic weigh in by WM trucks, and which do not require weigh out, since they have an established tare weight. The third weigh scale would reduce the weigh-in queue if required. The third scale would simply occupy the bypass lane, and would not require an additional bypass lane.

The main entrance from Carp Road to the main east/west road south of the landfill expansion will be hard surfaced, either hot mix asphalt or concrete pavement. It may also be desirable to provide concrete on the turn radiuses or frequent stops, where large vehicles are hard on asphalt pavement. Main travelling lanes will be 3.5 m wide, and there will be four (4) lanes to the first turn past the scale, and two (2) lanes from there to the turnaround area. At the scale area, additional inbound and outbound bypass area lanes are provided. The geotechnical consultant has provided recommendations regarding road design[(Ref. 18c)], and all geotechnical reports listed under Reference 18 are included in **Appendix 3-B**. Refer to **Drawing 10** for typical section of paved access road. The road south of the landfill includes a turnaround area, where trucks can be sent to turn and if required, to “fling” mud from the tires prior to entering municipal roads. This will also allow all sweeping or watering to occur on on-site roads. A typical section of the

high level access road (gravel surfaced) is also presented on **Drawing 10**. This access can accommodate 2-way traffic and an equipment road. Maximum grades are 8%.

The existing road west of the existing landfill, going to the WTPF area at the southwest corner of the site, will be reconstructed and paved to control dust. Recommendations for the construction are contained in the geotechnical report[(Ref. 18c)].

The existing road east of the existing landfill will be maintained in its existing surface and condition, for maintenance purposes and access to the blower/flare building, flares, GDT building, leachate treatment facility, GTE building, the purge well systems, air injection system, ponds, poplar plantation and other site infrastructure.

All speed limits will be limited and posted to the following:

- 20 km/hr on paved roads; and
- 10 km/hr on site haul roads and gravel roads.

3.2.3 Equipment Roads

Equipment/maintenance/construction roads circle the landfill expansion on the inside of any paved roads. This will allow 5 m wide lanes for heavy equipment to prevent destruction of the hard surfaced roads, and to prevent conflicts between inbound/outbound traffic and operating equipment. These roads will also be used for construction. They will be constructed with granular surfaces, and will require cleaning, sweeping, and granular top replacement as required. During construction or frequent travel, watering may be required to control dust. Refer to **Drawing 10** for typical section of equipment road beside paved road.

3.2.4 Mini -Transfer Area

The mini-transfer area (MTA) is discussed in Section 7.3 of the report. The intended traffic flow will be to enter the site through the main access, check in at the weigh scale and weigh if required, and proceed south and easterly to the MTA. There, loads would be deposited in the appropriate bins, and then vehicles will proceed northerly through the control gate, and easterly back to the main entrance. All roads for the MTA will be paved, and appropriate drainage provided, including an oil/water separator in case of any spills.

Up to 100 t/day may be exported from the MTA to markets for further diversion or recycle.

The kiosk shown at the north end of the MTA will be a shelter building for an attendant who may supervise the MTA.

3.3 Emergency Access

In the event of closure of the main access caused by upsets, stalled vehicles, equipment breakdowns or other emergencies, traffic would be diverted to Richardson Sideroad, southerly on William Mooney Road to the entrance to the WTPF, where the road leads to the active landfill.

Such procedures would be for short term and emergency use only, would not be frequent and would only be for the duration of the emergency.

4. Site Development

4.1 Horizontal and Vertical Control

Site control and layout will be governed by north/south and east/west grid system established throughout the site. The gridlines are shown on the D&O drawings. This grid can be tied to UTM coordinates by referring to the UTM grid ties and control points (SIB's) adjacent to Carp Road, shown on **Drawing 1**.

Site elevations referred to are geodetic. Mapping is based on aerial photography with 0.5 m contours at 0.15 m accuracy. Base Mapping Ltd. completed aerial photography in November 2013 and subsequently provided digital mapping of the site based upon the site's benchmark elevations. Refer to **Drawing 1** for the benchmark elevations.

Refer to **Drawing 2** for the existing conditions for the north part of the site where the landfill expansion will occur. The existing conditions for the southerly part of the site are shown on **Drawing 3**. The proposed final contours for expansion area are shown on **Drawing 4**.

The westerly buffer to the landfill footprint is approximately 125 m east of William Mooney Road, with the easterly buffer approximately 370 m from Carp Road. The landfill footprint is 100 m south of the northerly landfill site boundary. WM owns the property north of the landfill, providing an additional 300 m buffer, but it is not designated as part of the landfill site. On the south, there is approximately 60 m between the existing and proposed landfill. Buffers in most cases, contain auxiliary works associated with the landfill. All buffers are adequate for the purposes required including contingencies and in compliance with the MOE Landfill Standards.

4.2 General Description

The landfill site will contain two (2) separate mounds, when completed, with the existing landfill comprising the higher mound rising to approximately 174 masl, and the new landfill expansion rising to approximately 155 masl. The proposed landfill expansion will contain approximately 6.5 million m^3 for waste and daily cover. The existing site contains approximately 8.75 million m^3. The existing landfill footprint is approximately 1,145 x 300 m with an area of approximately 34.0 ha.

The new landfill expansion will have a footprint of 840 m x 450 m, with a footprint area of 37.8 ha.

Landfilling will commence in the easterly part of the expansion footprint and proceed westerly.

4.3 Site Preparation for Landfill Construction

Site preparation is required in advance of landfilling. A brief description of the activities, construction and equipment requirements before landfilling can commence is provided further in this section.

4.3.1 Fencing

A chain link fence, a minimum of 1.8 m high, will be constructed on the easterly, northerly and westerly sides to adjoin the existing chain link fence utilized for the existing landfill site.

Gates will be provided at the entrances or other required locations. These gates will be secured during non-operating hours, to prevent unauthorized access to the site.

"No Trespassing" signs will be posted at 30 m intervals on all perimeter fencing.

4.3.2 Utilities

Utilities will be constructed as needed. Refer to **Figure 4-2** for the utilities initially required. **Figure 4-1** is the legend in reference to the phasing figures. The various phasing **Figures 4-2 to 4-13** indicate the start and end of required utilities. The following utilities will be installed initially during site preparation:

- 150 mm diameter purge well forcemain (PWF) - from the end of the existing forcemain at purge well PW20 (location F) to northwest corner of Phase 1 (location E) (**Figure 4-2**);
- 75 mm diameter sanitary sewer forcemain (SAF) - from the holding tank/pump station for the scale house to the septic tank at the Laurysen building (locations D to C);
- 50 mm diameter non-potable water (WM) - from the existing well supply system at the Laurysen building to the scale house (locations C to D);
- overhead hydro (OH) - from the existing office subfeeder (location J) to the scale house (location D), leachate pumping stations PS5 (primary) and PS6 (secondary) (location A), condensate drain chamber/pumping stations (CDC) if electrically powered, and any facilities requiring power at the MTA (location N);
- 75 mm leachate forcemain (LF) from location A (PS5 and PS6) to leachate pre-treatment plant at location K;

- 750 mm gas header (GH), 250 mm diameter low quality gas header (GH) and 75 mm compressed air line (CA), location B to location E, location M to location H (existing blower building).

Other utilities will be described as being extended in the individual phasing (Phase 1 to Phase 10).

General site lighting will be considered during final design and is not detailed herein but will include lighting at the scale house, MTA, maintenance building, office and leachate pumping stations.

A common raw leachate 75 mm diameter HDPE forcemain will be constructed from primary leachate pumping station PS5 and secondary leachate pumping station PS6 to the equalization tank at the leachate pre-treatment facilities. The secondary leachate pumping station forcemain will be valved such that it can be discharged to stormwater ditching if found to be satisfactory for discharge. Refer to Detail 1 on **Drawing 8**.

Generally, utilities will be installed near the 5 m equipment road for ease of maintenance on the ditch side slope. Refer to **Figure 4-2** for a typical utility trench section. Clay seals 3 m long will be spaced approximately 150 m apart along utility trenches at the site to prevent landfill gas migration. An additional 3 m long clay seal will be provided at each gas pipe trench coming directly from the landfill.

Utilities will be provided where required with insulation board over the pipes, adjacent to any structures, culverts or ditching, which could increase the depth of freezing.

4.3.3 Power Supply

3-phase power exists on the site and will be extended. 600/208 V, 3-phase, 60 Hz electricity will be provided to the scale facility, leachate pumping stations and MTA. Appropriate sub-feeds would be provided where required. Electrical upgrade to the leachate treatment facilities, poplar irrigation facilities and gas blower facilities will be provided as required. Feeds are already provided to the purge well systems, the LFG blower facility, the existing GDT building and existing GTE building. Additional power supplies will be provided to the future purge well system north of the proposed site expansion in the future. Condensate drain chambers/pumping stations will receive electric service if this option is selected under final design in lieu of compressed air. The existing overhead power supply line between the existing and the proposed landfill will be raised/restored during site preparation work when the new access road is constructed.

Standby Power

Standby power already is provided for the landfill gas blowers, and the new leachate treatment plant will have a standby generator for all process and control loads.

The office and scale house will have provision for connection to a portable generator to provide power for essential loads. Similarly, the new leachate Pumping Stations 5 and 6 will have connections for a mobile standby power unit. Section 4.5 describes the leachate pumping stations and portable generator connections.

4.3.4 Roadways

Front entrance facilities include the entrance and main access off Carp Road past the scale compound, truck queuing lanes, weigh scales, scale house and MTA. The initial road network will include the landfill perimeter road between two (2) mounds, turnaround and the paved road on the west side of the existing landfill site to the WTPF. Refer to **Figure 4-2** for roads to be provided initially during site preparation. Proposed road elevations are shown on **Drawing 4**. Phase 1 landfill development will include the northerly part of the road on the east side of the landfill, and the northerly road opposite Phase 1 development. A temporary access road to the Phase 1 area will also be constructed initially.

Existing roads will serve the new leachate treatment facility, existing blower building and landfill flare facilities, as well as the GDT degassing facility and GTE building. No new roads are required to service the existing and future facilities at the southerly and easterly side of the site.

Refer to **Drawing 10** (lower left) for the typical landfill perimeter road section proposed. Generally, the landfill perimeter roads have fill/cut as required, 450 to 550 mm of granular “B” sub-base(Ref. 18c) and 150 mm of granular “A” base. Hard surfaced roads will consist of 150 mm hot mix asphalt and applied in three (3) 50 mm layers. Concrete surfaced roads may be considered in hard usage areas.

The general site maintenance roads, other than those designated for hard surfacing, will typically be comprised of 300 mm granular “A” surface and 450 mm of granular “B” sub-base(Ref. 18c), with a finished top width of at least 5 m for equipment.

The section of road from the turnaround to the WTPF will be rebuilt with 120 mm of asphaltic concrete and 150 mm of granular “A” over in-situ granular soil.

The main entrance will consist of four (4) lanes, as shown on **Drawings 4 and 10**, having two (2) driving lanes, two (2) additional queue lanes and bypass lanes at the scale. As well, an existing scale at the site may be installed in the bypass lane to accommodate automatic weigh-in for WM vehicles. This is shown on **Drawing 4**. Each scale will be approximately 30 m (100') to accommodate the wheel loads from long transfer trailers and other large vehicles entering the site, although the majority of the waste vehicles are expected to be packers and roll offs. Scale facilities include signal lights, acoustic speakers and other apparatus associated with the scales.

Carp Road

Carp Road will undergo construction south of the main access to the landfill site to include 15 m turn area, 75 m of additional left turn lane storage, 70 m parallel and 160 m taper to existing road width. North of the entrance, road improvements will include 15 m turn area, 15 m of left turn storage, 70 m parallel and 160 m taper to existing road width. These improvements will be funded by Waste Management and are shown on **Drawing 4** and in **Appendix 3-C**.

4.3.5 Mini-Transfer Area

The MTA is shown on **Drawing 4** and will contain retaining walls, ramps, receiving bins, signage, and attendant kiosk. The drop-off area will eliminate small vehicles operating at the landfill face. A typical saw-tooth wall design will allow small vehicles to place their loads into the appropriate bins. The wall will project approximately 450 mm above finished grade to prevent vehicles from backing over the edge. The bin tops will be approximately at the level of the drop-off vehicles. Bins will be emptied by a roll off truck as required. The MTA will be paved.

The area will be staffed as required to ensure waste is properly sorted. The kiosk will be equipped with heat, AC and lighting of small office facilities.

Appliances with refrigerants, if accepted, will have the refrigerants removed, and tagging by an ozone depleting prevention (ODP) certified technician will be attached in accordance with Ontario Regulation 189/94, amended to Ontario Regulation 180/07. The scale house operator will ensure that the customer confirms that refrigerant has been removed, and the landfill supervisor will check that proper tags are affixed to all equipment containing refrigerants.

The public will be directed to the MTA after stopping at the scale, pull over or back up to the appropriate bin, place material in labelled bins and proceed to the main access road. No return to the scale will be required.

Upon exiting the MTA, a stop sign will be installed at the main access road to ensure a check for traffic on inbound and outbound roads. Automatic exit control may also be employed.
Bins may include:

- domestic waste;
- cardboard;
- metal;
- electronic waste;
- wood;
- blue box containers for plastic, glass and metal; and
- newspaper, blue box paper, fine paper and boxboard.

Household hazardous waste will not be received at the MTA.

4.3.6 Leachate Treatment Plant

Refer to Section 6.1.4 for details regarding the treatment plant. The plant is rated at 2.4 L/s (207 m^3/day). The plant is shown on **Figure 4-2**. Also included are equalization tanks, pumps, sludge treatment, all as described in the certificate of approval and the process schematic diagram shown in **Appendix 6-B**. The pre-treatment plant will receive raw leachate from the existing lined cell through a new pump installed in leachate pumping station PS1 and PS3 as well as through a new 75 mm leachate forcemain from leachate pumping stations PS5 and PS6, discharging to the equalization tank at the front end of the treatment plant. The leachate will be treated in conjunction with the leachate from the existing landfill, and subsequently discharged to the equalization tank in front of the existing pumping station at the GDT building, which discharges to a forcemain that connects to the City of Ottawa collection and treatment system.

Refer to Section 6.4.2 for additional leachate equalization storage proposed.

4.3.7 Maintenance Building and Compound Area

The existing Laurysen Building will be used as a maintenance building in the future. This facility is located as shown on **Drawings 2 and 4** between the infiltration basins. Various supplies, lubricants, parts and fuel will be housed in the facility. Washroom facilities will be serviced by an existing septic tank and septic bed facilities. The present septic tank and bed facilities are north of the building at the easterly end. The water supply for this building is serviced by an existing well, which will be continued, for a non-potable supply. Potable water will be brought in. The sanitary facilities and non-potable water supply will

also service the new scale facility. The requirements for the scale house for non-potable water and septic facilities will be negligible.

Combustible gas sensors/alarm will be provided in the scale kiosk, maintenance building and office building before any waste is landfilled in the expansion area.

A gravel access from the landfill to the maintenance building and for storage of miscellaneous equipment is shown on **Drawing 4**.

Approximate grades for the yard and maintenance compound are shown on **Drawing 4**.

4.3.8 Stormwater Management Ponds

Refer to the detailed design criteria and discussions about the stormwater ponds and infiltration basins, contained in Section 8 of this report. All ponds will be constructed initially.

The existing stormwater pond serving the north side of the existing landfill site will be abandoned, and drainage redirected to Stormwater Pond #1. Although the existing landfill site is vegetated and closed out and will not require the stormwater pond for sediment control, drainage is directed through the pond for drainage from the new road works to settle particulate, and to infiltrate all drainage from the existing site into Infiltration Basin #1.

Since there is no discharge from either Infiltration Basin #1 or #2, the normal requirement for reducing peak flow to pre-development conditions does not apply.

Drainage from the landfill site expansion will drain to Infiltration Basin #2, after having major sediment removed in the Stormwater Pond #2.

Site grades are shown preliminarily on **Drawing 4** such that general drainage patterns can be established. Section 8 of the report shows pre and post development drainage areas.

Non-contact water (any surface runoff not in contact with landfill waste), will be sumped, and pumped to on-site drainage ditches which will in turn flow through the stormwater ponds for sediment removal, and then into the infiltration basins.

4.3.9 Landscape Plantings and Buffer Enhancements

The landscape and buffering are proposed to be enhanced with plantings as shown on the attached proposed Landscape Development Plan Concept contained in **Appendix 4-A**. These generally include the following:

- maintenance of existing trees where possible;
- forest infill planting in buffer zones in the northwest and north central areas;
- edge management practices to strengthen existing wood lots where landfill facilities and auxiliary works must be constructed; these edge management practices apply at the existing wood lot in the west buffer and north central area where auxiliary facilities are to be constructed;
- creation of visual barriers with native plant species adjacent to William Mooney Road;
- plantings to create a visual barrier to enhance existing wooded areas adjacent to Stormwater Pond #2; and
- general enhancement of existing wooded areas by planting native species to create visual barriers adjacent to Carp Road and in the easterly buffer area.

Bank Swallow Nesting Habitat

An existing colony of Bank Swallow nests are located just south of Stormwater Pond #1, shown on **Drawing 4**, at about 0+880 N. These active bird nests are protected under the Migratory Birds Convention Act(Ref 5h – Section 7.2.3.2). The colony was initially established as a result of quarrying operations in the Stormwater Pond #1/Infiltration Basin #1 area. The area will now remain undisturbed and retained. No major work is proposed in the immediate area.

The landscape architect and biologist address the issue in the Environmental Impact Study (EIS) Section 8.2.3(Ref. 8) with the following recommendations:

- Remove any loose fill which had been placed at the base to approximately 3 m high of almost vertical bank. This work should be done after frost has thawed, but before early May when birds return from migration. Refer to Section C on **Drawing 9** for detail.

- Avoid heavy construction in the nesting bluff vicinity during breeding season (May 1 – July 31).

- Monitor the bank for sufficient steepness, performing some periodic excavation near the base if necessary. Inspect the physical structure of the bank in early spring to ensure suitability for the swallows. Perform any excavation work before swallows return from migration.

- Clearly mark and cordon the top and bottom of bank to maintain a safe distance for equipment and personnel and to minimize disturbance to the birds.

- Monitor the colony during breeding season in June during the site preparation years and for two (2) years following, to monitor the number of nesting pairs as a gauge of success.

4.3.10 Southerly Property Improvements

Certain improvements and mitigative measures are proposed on the south part of the WM property. These are described on Figure 7B and Figure 8 in Environmental Impact Statement (EIS) Section of the Zoning By-law Amendment Report(Ref. 8). Generally, these can be described as follows:

- mitigation of impacts and improvement to site aesthetics; and
- compensation/replacement of existing forest.

These improvements have been adopted for the site as part of the development plan and are generally described as follows:

- Approximately 2.8 ha adjoining the existing forest lands and located west of the Closed South Cell. These are mitigative measures to compensate for forest lands removed as part of the landfill expansion. Tree and shrub plantings comprising approximately 0.7 ha are proposed adjacent to existing Stormwater Pond #2, and generally east and south of Depression #1 in the southeast part of the site. These improvements are outlined on Figure 7B(Ref. 8).

- Creation of additional wetland, consisting of an extension of existing Stormwater Pond #2 located south of the Closed South Cell, and comprising approximately 1.2 ha. These particular improvements are described on Figure 8(Ref. 8).

All improvements will be carried out early in the site development stage or as early as possible considering seasonality and site conditions.

4.3.11 Meteorological Station

The on-site meteorological monitoring station will be continued and upgraded as required to permit collection of the following information:

- daily maximum, minimum and average temperatures;
- daily precipitation totals, including heated tipping bucket rain gauge for snow as well as rainfall; and
- daily maximum, minimum and average wind speeds and directions.

Appropriate data loggers for holding and downloading the data will be included.
The information can initiate storm event monitoring, provide input for air quality assessments, provide information if complaints are received, to manage dust, to assist the landfill operation and to manage application of treated leachate effluent irrigated on poplar tree plantations.

4.3.12 Medium and High Litter Fencing

Litter fencing, 10 m high with netting and wire cable mounted on poles will be located at the easterly end of the site, just west of the easterly landfill ditch (west side of access road), to prevent litter escaping from the landfill into Stormwater Pond #1, Infiltration Basin #1, Infiltration Basin #2 and Stormwater Pond #2. From the northeast corner of the landfill, intermediate litter screening 3 m high will be extended to approximately 0+500 W, and located between the landfill limit and the northerly ditch south of the access road. This will keep litter out of the adjacent trees and Stormwater Pond #2. Extension of the intermediate litter barrier will be considered further as the site progresses westerly and, as experience indicates requirements for same. Litter fencing extensions will be phased with cell construction. Refer to Section 7.11.3 and 7.11.4 for additional discussion on litter fencing.

4.4 Cell Preparation

The engineered landfill base 3.1 m in thickness is designed in full compliance with MOE Landfill Standards Generic Double Liner Option II.[(Ref. 19)]

The seismic slope stability analysis[(Ref. 4, Appendix A)] has concluded that the landfill and engineered base system will have an adequate factor of safety for an earthquake with the probability of exceedance of 2% over 50 years in accordance with the National Building Code.

Typical procedures are described in the first phase or first time encountered. These procedures will not be repeated in subsequent sections. The reader is referred to **Appendix 4-B** of the report, containing the specifications and CQA/CQC program for liner systems.

The engineered base construction methodology will be verified at the test pad to ensure that geosynthetic materials are not damaged. The results from the test pad will be maintained on file.

Refer to **Table 4-1** for the quantities of material required for each phase.

4.4.1 Preparation for Landfill in Phase 1

This work will be carried out in conjunction with other work for site preparation, but is associated directly and located mainly within Phase 1 of the landfill.

4.4.2 Clearing

Before commencing excavation and in preparation of filling, construction of the temporary road located at approximately 1+090 N will require clearing and grubbing in the westerly wood lot and in localized areas for Phase 1. Refer to **Figure 4-3** for the location of clearing required. Also refer to the Biology BMPP[(Ref. 38)].

4.4.3 Cell Construction

In general, cell construction consists of the following steps:

- any dewatering;
- remove topsoil and loose fill;
- removals as required (fencing, hydro line, decommissioning of monitoring wells, etc.);
- general cuts and fills for subgrade grading;
- construct attenuation layer;
- construct secondary clay liner;
- place 2 mm (80 mil) secondary HDPE liner in intimate contact with underlying clay liner;
- place secondary geotextile cushion;
- place secondary drainage layer;
- place secondary HDPE leachate collector pipe system within granular drainage layer;
- place geotextile separator;

- place primary clay liner;
- place primary 1.5 mm (60 mil) HDPE liner in intimate contact with primary clay liner;
- place primary geotextile cushion;
- place primary drainage layer;
- place primary leachate collection system within granular drainage layer;
- place geotextile separator for receiving overlying waste; and
- install temporary clay seal.

4.4.3.1 Dewatering

Any wet areas will be sumped and dewatered by pumping into the adjacent stormwater ponds to remove sediment prior to flowing into the infiltration basins. Refer to Figure D of **Appendix 8-C** for operational guidance for such water.

4.4.3.2 General Grading

Cuts and fills will be carried out such that the grades below the attenuation layer conform to **Drawing 5**. The bottom of attenuation layer is optimized to conform to the future groundwater table, which will mound because of the infiltration basins, and to conform to the necessary grades for the secondary leachate collector system.

All topsoil must be stripped. Any loose fills will be removed and stockpiled for reuse or use as daily cover.

Section 3, **Appendix 4-B** outlines Ontario Provincial Standard Specifications (OPSS) in regard to grading, as well as compaction and other related requirements.

4.4.3.3 Attenuation Layer

Refer to **Drawing 5** for the elevation for the bottom of the attenuation layer. In addition, refer to **Drawing 8** for landfill base detail, and landfill side slope detail. The sag under the secondary leachate collectors extends into the attenuation layer. Localized excavation and fill for the attenuation layer, below the general bottom, will be required for leachate pumping stations PS5 and PS6, located in the northeast corner of the landfill. Leachate pumping station PS6 is associated with the secondary drainage layer. PS5 is associated with the primary drainage layer. The leachate pumping stations will be described later in this section. There is a localized drop in the height of the landfill base side slope (1.5 m instead of 2.5 m) along the south limit in the proximity of the future high level access road. This drop is provided to

facilitate the high level road and adjacent drainage ditch crossing over the landfill edge consisting of liner systems. The general base of the landfill is above the maximum predicted groundwater table.

The attenuation layer shall generally be comprised of imported material, unless existing material is proven by grain size sieve analysis, as suitable for use as the attenuation layer. Permeability shall be no greater than 1 x 10^{-7} m/s.

The material requirements and the CQA/CQC program is outlined in **Appendix 4-B**, Section 5.

4.4.3.4 Secondary Clay Liner

Clay liner material will be imported to the site. Section 6 of **Appendix 4-B** specifies the requirements of liner material. Section 7 of the **Appendix 4-B** specifies the requirement for construction of the clay liner. Protection after construction and testing for hydraulic conductivity is also specified. The surface of the clay liner must be smooth to provide good contact with the overlying HDPE liner.

4.4.3.5 Secondary HDPE Liner

The typical landfill base section is shown on **Drawing 8**. The HDPE liner is 2 mm (80 mil) and is to be laid in intimate contact with the clay liner beneath.

The Geotechnical Report[(Ref. 18c)] has evaluated bearing capacity, settlement, and stability of the side slopes under various conditions. The HDPE liner is textured on the side slopes and extends into the adjacent collector trench where present, as shown on the drawings. The flat base area will be smooth HDPE. Calculated landfill base settlement[(Ref. 18a)] will be minimal and will have a negligible effect on deformation/elongation of the HDPE liner.

The material requirements and construction practices are all outlined in Section 8 of **Appendix 4-B**. Both non-destructive and destructive testing is specified. Repair procedures and requirements are also outlined.

4.4.3.6 Secondary Geotextile Cushion

Refer to **Appendix 4-C** for the sizing for geotextile cushions.

This material is to protect the HDPE liner from damage caused by overlying drainage stone and the weight of the overlying waste, or dynamic loads during construction.

Refer to **Appendix 4-B**, Section 9 for material specifications for geotextile cushion. Section 11 specifies geotextile placement requirements.

4.4.3.7 Secondary Drainage Layer

Drainage layers are meant to conduct leachate during operation and filling, as well as through the period of post closure. The MOE landfill standards have specified gradation requirements which are outlined in **Appendix 4-B**. Section 13 of **Appendix 4-B** also specifies the requirements for placement of the gravel drainage layer.

Drawing 6 shows the elevation of the proposed top of the secondary drainage layer.

Drawing 8 shows the landfill base detail including the drainage layers.

4.4.3.8 Secondary Leachate Collector System

Refer to **Drawing 6** for the plan and spacing of the secondary leachate collectors. The minimum grade of leachate flow is 0.5% and is as high as 1% in some locations. The perforated collectors are generally spaced between 50 and 58 m. The longest flow path does not exceed 100 m. The collectors are perforated within the gravel drainage layer to the edge of the side slope, and then become solid to the above ground clean-outs which will be capped.

Bedding and cover material are shown on **Drawing 8**. High density polyethylene pipe perforations are indicated on the drawing. Joining will be by butt fusion welding.

The leachate collectors will follow the landfill base and their slope will vary between 0.43 and 0.82% for the south/north runs and 0.37 and 0.55% for the north header running in the east/west direction. The minimum full pipe flow capacity of the header pipe is 22.0 L/s, i.e. much more than the expected peak flow which will be very low (0.06 L/s assuming 1% of PLCS flow and a peak factor of 3).

The leachate collectors, when installed, will be strung with stainless steel pull cables for winching in flushing/maintenance/inspection tools. Clean-out locations are shown on the drawings. All runs are straight runs to optimize cleaning and flushing or inspection procedures. Pipe strength calculations indicated DR9 pipe required. All references to pipe DR are based on polyethylene resin PE 4710. The pipe is specified as 250 mm diameter because of the heavy wall thickness to provide a larger internal diameter. Refer to the design calculations in **Appendix 4-D**.

4.4.3.9 Secondary Geotextile Separator

A geotextile separator is provided over the granular drainage layer to prevent the primary clay liner from entering the underlying drainage layer. Refer to **Appendix 4-B**, Section 10 for the material specifications for the geotextile separator.

The geotextile separator shall have a unit weight of 339 g/m^2 (10 oz/sy). All joints will be sewn.

4.4.3.10 Primary Clay Liner

The primary clay liner shall be the same material as the secondary clay liner, with the same characteristics as specified in **Appendix 4-B**. The base grades for the primary clay liner is the same as the top of the secondary drainage gravel layer shown on **Drawing 6**.

The thickness is a minimum of 0.75 m in accordance with MOE Landfill Standards. Refer to the section on **Drawing 8** in regard to details of the primary liner.

The performance requirements are outlined in **Appendix 4-B**, Section 8.

4.4.3.11 Primary HDPE Liner

The typical landfill base section is shown on **Drawing 8** in detail. The HDPE liner is 1.5 mm (60 mil) thick and is to be laid in intimate contact with the clay liner beneath.

The Geotechnical Report(Ref. 18c) has evaluated bearing capacity, settlement, and stability of the side slopes under various conditions. The HDPE liner is textured on the side slopes and extends into the adjacent collector trench where present, as shown on the drawings. The flat base area will be smooth HDPE. Calculated landfill base settlement(Ref. 18a) will be minimal and will have a negligible effect on deformation/elongation of the HDPE liner.

The material requirements and construction practices are all outlined in Section 8 of **Appendix 4-B**. Both non-destructive and destructive testing is specified. Repair procedures and requirements are also outlined.

4.4.3.12 Primary Geotextile Cushion

Refer to **Appendix 4-C** for the sizing of the geotextile cushions.

This material is to protect the HDPE liner from damage caused by the overlying drainage stone and weight of the overlying waste and from dynamic loads during construction.

Section 9 of **Appendix 4-B** provides the material specification for geotextile cushion. Section 11 specifies the geotextile placement requirements.

4.4.3.13 Primary Drainage Layer

Drainage layers are meant to conduct leachate during operation and filling, as well as through the post closure period. The MOE landfill standards has specified gradation requirements which are outlined in **Appendix 4-B**. Section 13 of **Appendix 4-B** also specifies the requirement for placement of the gravel drainage layer.

4.4.3.14 Primary Leachate Collector System

The layout of the primary leachate collector system is shown on **Drawing 7**. The spacing is 25 – 29 m depending upon the base grades. The minimum grade for the direction of leachate flow is 0.5% and as high as 1%. The longest flow path does not exceed 50 m. The collectors are perforated within the gravel drainage layer to the edge of the side slope and then become solid to the above ground cleanouts which will be capped. The leachate collector pipe grades will be the same as for the secondary collector system.

The primary leachate collector system and drainage layer will also be used to collect gas early in the site development. Refer to Section 5 and **Figure 5-7** for gas well head connections and gas extraction from the leachate collector cleanouts.

The primary leachate collectors will follow the landfill base and slopes will vary between 0.43 and 0.82% for the north/south runs and 0.37 to 0.55% for the north header running in the east/west direction. The minimum full pipe flow capacity of the header pipe is 22.0 L/s, i.e. much more than the expected peak flow of 6.3 L/s (maximum leachate generation and peak factor of 3).

The leachate collectors, when installed, will be strung with stainless steel pull cables for winching in flushing/maintenance/inspection tools. Cleanout locations are shown on the drawings. All runs are straight runs to optimize cleaning and flushing or inspection procedures. Pipe strength calculations indicated DR9 pipe is required. All dimension ratios (DR) are based on PE 4710 resin, a more tough and durable resin than PE 3408 resin. The pipe is specified as 250 mm diameter because of the heavy wall thickness to provide a larger internal diameter. Refer to the design calculations in **Appendix 4-D**.

4.4.3.15 Primary Geotextile Separator

A geotextile separator is provided over the granular drainage layer to prevent overlying waste from entering the underlying drainage layer. Refer to **Appendix 4-B**, Section 10 for the material specification for the geotextile separator.

The geotextile separator shall have a unit weight of 339 g/m^2 (10 oz/sy). All joints will be sewn.

4.4.3.16 Temporary Clay Seal

Refer to **Drawing 8** for typical section of temporary clay seal which is also shown on numerous phasing figures.

A temporary clay seal is provided along the edge of the engineered landfill base wherever a base system extension is required in the future. Usually it will be along the west side of each low level phase/cell. A temporary clay seal will protect the primary and secondary drainage layers against surface water intrusion and will prevent landfill gas emissions from the primary drainage layer. This system will also facilitate sequential connection to the existing engineered base when the adjacent new cell is constructed.

The temporary clay seal consists of compacted fine grained material (clay), plywood protection boards, HDPE flaps and extra length of various geotextiles which would be cut and wasted when the connection is made. Clay material protecting the engineered base will be removed sequentially when the connection to the new part of the base liner is done.

4.4.3.17 Service Lives

MOE Landfill Standards Generic Double Liner, Option II, has been selected for this site. To comply with such a design, various components must comply with the particular standards for that design option. These compliance issues and service lives are summarized as follows:

- The WCEC waste loading is approximately 172,000 m^3/ha which is much less than the amount allowed (287,000 m^3/ha) for Generic Double Liner Option II, with a background chloride concentration of 0 mg/L, as contained in Table 5 of the Landfill Standards(Ref. 19). The less the background chloride, the less the waste loading allowed to limit degradation of background water quality of the underlying aquifer. For the site median background chloride concentration of 46 mg/L, maximum allowable waste loading for the standard double liner system is approximately 309,000 m^3/ha. The WCEC site complies with this requirement.

- The infiltration rate through the final cover has been designed for 0.15 m/year.
- An attenuation layer 1 m in thickness will be provided, and in combination with in-situ native material, will be several metres thick. The upper 1 m layer will consist of relatively homogeneous material, and will have a hydraulic conductivity of not more than 1 x 10^{-7} m/s.
- A secondary clay liner will be provided above the attenuation layer. The clay liner will be at least 0.75 m thick, meeting the conditions of Schedule 4 of the landfill standards for unlimited service life, and have a conductivity of not more than 1 x 10^{-9} m/s.
- A secondary HDPE liner, at least 2 mm thick, meeting the conditions set out in Schedule 3, and will have a service life of at least 350 years.
- A secondary leachate collection system meeting Schedule 2, for a service life of at least 1,000 years, is provided.
- A primary clay liner, at least 0.75 m thick, meeting the conditions of Schedule 4 for an unlimited service life, and having a hydraulic conductivity of 1 x 10^{-9} m/s will be provided.
- A primary HDPE liner at least 1.5 mm thick, and meeting the condition of Schedule 3 for a 150 year service life, will be provided.
- A primary leachate collection system, meeting the conditions of Schedule 1 and having a minimum of a 60 year service life, will be provided.

4.4.4 Stockpiles

Refer to **Table 4-1** indicating volumes of material required for each phase and use.

Excess materials will be stored in the excess soil stockpile area for future use as daily cover or attenuation layer if of suitable gradation or fill. The excess soil stockpile will be managed with part designated for topsoil and part designated for subsoil or liner use and part for daily cover. Any pile anticipated to be unused for greater than one (1) year shall be stabilized to minimize erosion and prevent dust.

A silt fence will be provided at the base of stockpiles to prevent runoff into watercourses. Any water containing silt and other soil materials shall be directed to drainage ditches or sumped and pumped to drainage ditches or directly to the stormwater management ponds. Refer to **Appendix 8-C**, Figure D for operation guidance for such water.

As part of any construction contracts, contractors will be required to prepare a soil management plan, designating stockpiles, and management of materials for the individual contract.

Since the site is material-deficient, there will be no permanent excess soil stockpile on-site, but rather temporary stockpiles only. These materials will generally be stored to the west of the operating phase, to facilitate minimum travel distances.

4.5 Leachate Pumping Stations

Primary leachate pumping station PS5 and secondary leachate pumping station PS6 will be constructed as part of the site preparation for landfilling in Phase 1. The site preparation component would involve construction of the forcemain from the leachate pumping stations to the leachate pre-treatment plant. Part of the cell construction would involve construction of the actual pumping stations within Phase 1, in the northeast corner of the expansion area. The primary leachate pumping station is sized not on the estimated leachate flow, the maximum of which is indicated in **Table 6-2** at 66,300 m^3/year (2.10 L/sec, but to provide a flushing velocity for leachate discharge in a 75 mm forcemain, the smallest of which can be reasonably pigged for cleaning and maintenance, and to provide a velocity of approximately 1 m/s during pumping. This criteria requires a leachate pumping station capacity of approximately 4.41 L/s. This capacity will provide over 100% excess capacity over the maximum normal anticipated leachate flow, which is anticipated to occur during Phase 8.

The primary leachate pumping station is also sized with consideration to remove storm flow in a reasonable time, which exceeds the peak leachate flow normally generated.

The possible worst-case scenario could occur if Phase 8 was only partially filled or beginning to fill, and the rest of the landfill were contributing normal leachate flow. In this case, leachate up to Phase 7 would contribute 54,190 m^3/year (148.5 m^3/day), and if a 100 mm rainfall occurred on Phase 8, then a theoretical volume of 6.15 ha x 0.1 m rainfall = 6,150 m^3 of additional volume could be added. With the actual leachate pumping station pumping rate of approximately 5.04 L/s (435 m^3/day) (see below for 5.04 L/s), this would leave an excess pumping capacity of approximately 287 m^3/day. At this rate, approximately 21 days would be required to pump down the excess water. While this may theoretically be possible, we suggest the actual conditions would be much less severe, since it may be that cell development is less than the full site width, or less area than anticipated in the phasing shown, or alternatively, the waste has been commenced or partially placed within the cell, in which case the dry waste would be able to absorb much of the rainfall before reaching field capacity. If the worst rainfall event occurred, we calculate approximately 5.75 ha would be required to store the volume in the gravel layer and the bottom waste, assuming void ratios of 0.4 and 0.3 for the gravel and waste respectively.

Pumping stations PS5 and PS6 will discharge into a 75 mm forcemain, located beside the equipment access road, under the adjacent ditch side slope as shown on **Figure 4-2**, discharging to the leachate pre-treatment plant. Refer to Detail 1, **Drawing 8** of the connections of PS5 and PS6.

The process flow diagram for the leachate treatment plant is contained in **Appendix 6-B** and shows an equalization storage tank of 568 m^3. Equalization storage will be increased to 1,750 m^3 as per Section 6.4.2. All pumping stations will be SCADA controlled to shut down if the tank is full. The pumping stations will also be controlled with respect to leachate liquid levels on the base of the primary or secondary liners respectively, to limit the maximum head on the liner to 0.3 m under most normal conditions of operation. Under this flow condition, the pumping head is estimated to be approximately 41.15 m. The required horsepower will be approximately 5 hp (3.73 kW). This is comprised of 8.66 m static lift, 28.49 m major losses and 4 m minor losses. This selection will be finalized during final design, when more exact top water level of the equalization tank is confirmed. The pump will be tentatively equal to a Grundfos 75S50-8 (5 hp) rated at 4.41 L/s @ 41.15 m (70 USGPM and 135'), but will actually pump at 5.04 L/s at 50.81 m, being an actual operating point on the pump curve.

The control panel will be equipped with appropriate connections such that a portable generator used on-site can be hooked to each pumping station to allow operation in case of power failure.

Refer to **Drawings 6 & 7** for the location of the leachate pumping facilities. Typical sections of each pumping station are shown on **Drawing 8**. The primary pumping sump will be approximately 6.0 m bottom length, approximately 4 m wide, and have a total volume of approximately 40 m^3 within the gravel voids in the sump. Pump "on" will be at approximately elevation 123.8 masl and pump "off" will be at approximately elevation 123.65 masl. At a maximum inflow rate of 2.10 L/s, the pump "on" would be for 52 minutes and pump "off" will be approximately 74 minutes, for approximately 2.1 hours (127 minutes) cycle time. The secondary sump capacity will be larger than that of the primary sump, in gross volume, since the primary sump will be constructed within part of the secondary sump outline. Secondary sump will have bottom dimensions of approximately 4.5 m x 18 m. If similar pump capacity is assumed as the primary pump, an overall cycle would be much longer (more than one (1) day) because a minimal inflow rate is anticipated.

The primary leachate pumping station has been provided with a contingency second upslope riser, which would not normally be equipped but in times of storm conditions or other emergency conditions, could have a pump installed to pump out any leachate. Very infrequent pumping is anticipated from the secondary system. The secondary leachate pump is proposed to be designed on a similar basis to the primary pump, i.e. approximately 4.4 L/s.

Spare pumps, i.e., at least one (1) of every horsepower or two (2) in total if they are all the same horsepower, will be warehoused on site such that any pump malfunction can be changed quickly. If one spare pump is taken out of inventory, a second will be put back into inventory after being ordered and received. Alternatively, a rebuilt or reconditioned pump sent for repair may be the replacement. One new or reconditioned spare will always be available.

In the case of the secondary leachate pumping station, valving with the alternative to waste water to the peripheral ditch will be provided, since no contamination within the secondary collection system is anticipated.

The secondary drainage layer (SDL), which is located beneath the primary clay and HDPE liner, will collect dehydration water and leakage from the primary liner. Therefore, during landfill construction (connection to existing base system), water within the SDL will be representative of surface water quality and should be suitable for temporary discharge to stormwater ditches. Refer to Figure C of **Appendix 8-C** for operational guidance on such discharge.

4.6 Landfilling at the Active Face

4.6.1 Access to Disposal Area

To access Phase 1 initially, a temporary road from the main access road to the cell is required. One (1) alternative is to provide a culvert and cross the ditch and liner edge into the cell through placement of a shallow fill. The second alternative is to access from a semi-permanent road in the center of the site, in an east-west alignment at about 1+090 N, and from the westerly extent of Phase 1, a road can either proceed northeasterly or southeasterly to fill the cell. Referring to **Figure 4-4**, both possibilities are shown. As the cell builds up, a road slope will be required on the interim sloping face to reach elevation 140 masl from approximately elevation 124 masl. A road length of approximately 160 m would be required to reach the 140 masl interim plateau elevation if road grade is 10%.

To commence filling with the first alternative access described above, some additional fill would be provided on the top edge and sloping face of the primary drainage gravel near the landfill limit for extra protection. An access ramp would be constructed down the shallow slope to access the bottom of the cell to commence landfilling. Once trucks can access the cell, then unloading and pushing waste on the base of the cell will build up a working/travelling mat of at least 1 m of select waste. Select waste means waste which is relatively uniform, and not containing bulky, sharp materials.

The high access road will be used in later stages of site development. Similar procedures will be required during all subsequent phases.

4.6.2 Size of Active Face

Assuming a daily lift thickness of 3 m, the working face will be approximately 900 m^2, or approximately 20 m wide by 45 m long. This is a reasonable distance for dozers to push the waste, to spread and level the waste from the tip face, and for compactors to compact same.

An active face this wide will accommodate approximately ten (10) packers or eight (8) packers and a transfer trailer unloading simultaneously. This width should be more than adequate for peak hour traffic during average day.

At the end of each working day, the top and two sloping faces of the daily cell will be covered with daily cover. Daily cover can consist of native on-site material, imported off-site material, contaminated soil, or alternate daily cover (ADC). Daily cover will be partially removed just before landfilling on subsequent cycle days, to ensure good hydraulic conductivity within the cells vertically.

4.6.3 Active Landfilling

Initial Waste Placement on Engineered Base

When waste is initially placed on the engineered base, special operational procedures will be followed. Firstly, no equipment will be allowed to operate over the engineered base (upper geotextile separator) when placing the first lift of waste. Rather, the equipment will operate from previously placed waste, and dozing new waste ahead to carefully cover the top of the new base. Secondly, select waste will be used, generally meaning residential waste, which will not contain large bulky, sharp objects, which could damage the underlying liner, or tear the geotextile separator, allowing contaminants or fine material to clog the underlying primary drainage layer.

Normal Procedures

Refer to Subsection 7.6 with respect to detarping or staging area at the active face if required. Once positioned at the active face, vehicles will tip their loads.

Trucks unloading will be spaced to ensure the safety of personnel who must unlatch doors or catches before dumping. Trucks must be appropriately spaced such that the depth of waste pushed/levelled on

the active area for compaction by the compactors is neither thin nor thick. A “loose” depth of approximately 0.6 m, which will be compacted to 0.15 to 0.2 m, is anticipated. The lift for the day will total approximately 2.5 to 3 m thickness. Landfilling for the day is anticipated to be in a cell, with the cell normally located against the side and front of an adjacent waste cell previously landfilled, such that the new, exposed daily cell has one (1) side slope and one (1) front slope, as well as the flat top, which would require daily covering.

The waste, once tipped from the trucks, will be pushed over the active cell in a uniform layer of waste, ready for the compactors to run on the waste. The compactors also have a blade to level and push waste, but the dozers will push and level the majority of waste. The compactors will compact the waste by making three (3) to four (4) passes on each loose lift. **Table 7-1** indicates the anticipated equipment for various fill rates. Normally, two (2) landfill compactors and two (2) dozers are expected to be required. A waste density of 725 kg/m^3 was assumed with 15% daily cover in calculations.

To commence landfilling in the morning, equipment will remove part of the daily cover placed previously and locate it such that it can be reused on the active cell at the end of the working day. This method ensures good hydraulic connectivity from the new waste into the underlying waste for penetration of infiltration liquid and minimizes perched water that could migrate to the edge of the landfill and cause leachate seeps.

All leachate and gas collection system components will be marked in the field and will be visible to site operating staff. Any accidental damage will be rectified promptly.

The landfill equipment at the active face will generally remain at the active face overnight.

4.6.3.1 Asbestos

It is anticipated that the site will receive asbestos waste from time to time. Protocols are in place to handle and receive such waste. All waste shall be handled in accordance with Section 17 of Regulation 347 under the Environmental Protection Act, amended to Ontario Regulation 102/07.

Upon being notified that asbestos waste is anticipated to arrive at the site, the landfill supervisor will direct that a suitably sized excavation be made in the active area but aside from the active face for the day. Upon the arrival of the waste, the scale house will notify the waste inspector at the working face, who will inspect the delivery to ensure that all waste is properly bagged or contained and free from punctures, tears or leaks.

The asbestos waste will be placed into the excavation to avoid damage to the containers, preventing dust and spillage.

Upon completion of the unloading and deposition of the asbestos in the excavation, at least 1.25 m of cover or waste material shall be placed over the asbestos. All asbestos waste will be deposited to a level no higher than 1.25 m below the general elevation of the disposal area to ensure that removal of daily cover in the future does not encounter such waste.

4.6.3.2 International Waste

Since the Ottawa area is an international destination and as the Ottawa International Airport serves international flights the site may receive international waste. Only international waste generated in the Province of Ontario will be landfilled at the site. Protocols are in place to handle and receive international waste.

Upon being notified that international waste is anticipated to arrive at the site, the landfill supervisor will direct that a suitably sized excavation be made in the active area but aside from the active face. Upon arrival of the waste, the scale house will notify the waste inspector at the working face, who will inspect the delivery to ensure that all waste is properly bagged or contained and are free from punctures, tears or leaks.

The waste will be placed into the excavation to avoid damage to the containers, prevent emissions and spillage.

Upon completion of the unloading and deposition of the waste in the excavation, at least 1.25 m of cover or waste material will be placed over the disposed waste. All international waste will be deposited to a level no higher than 1.25 m below the general elevation of the disposal area to ensure that removal of daily cover in the future does not encounter such waste.

4.6.3.3 Moisture Conditioning

The existing site has approval for moisture conditioning described below. WM wishes to retain this option. In this report, moisture conditioning is defined as adding some leachate to the dry waste at the working face of the landfill.

Moisture conditioning would consist of adding leachate to the new “dry” waste, which will have gate moisture content, typically in the order of 20 to 30%, to increase moisture content to near field capacity, which is estimated to be 38%. This would allow additional moisture to be added to the waste.

To implement the system, the leachate treatment plant would have a truck load pump and control system to load a tanker truck, equipped with a spray bar, which would wet the face of the active cell after compaction by the landfill compactors.

Moisture conditioning would be carried out in favourable weather conditions approximately six (6) months of the year, May through the end of October, in non-winter conditions and excluding spring snow melt and severe rainfall periods.

Control would be based upon two (2) factors, namely weather conditions/time of year and visual appearance of the waste surface. No saturation of waste or leachate springs would be tolerated and runoff from the active face from such moisture conditioning would not be allowed.

4.6.4 Daily Cover

Daily cover is to provide the following benefits:

- prevent/reduce bird scavenging;
- provide litter and vector control;
- provide odour control;
- isolate waste from surrounding environment and is aesthetically pleasing; and
- assist in reducing infiltration of stormwater into waste by shedding part of the water.

Daily cover quantities are outlined in **Table 4-1**.

At the end of each day, daily cover must be placed over the active cell. Between 100 m^3 and 350 m^3 of material will be required for daily cover. Part of this may be available from removal of excess daily cover from the active cell in the morning. The remainder must be brought to the cell. Overall, about 15% of the waste and daily cover volume is assumed to be used for daily cover.

4.6.4.1 Alternate Daily Cover

Various types of ADC’s are proposed including:

- contaminated soil;
- polyethylene tarps or geotextile blankets;
- foam products;
- cementitious materials;
- processed green material;
- tire shred;
- slag, foundry sands, sand blast grit, dredge spoils;
- auto shredder residue;
- glass aggregate;
- industrial residuals and dry filter cake;
- crushed concrete, brick, aggregate, spent refractory brick; and
- shingles.

Refer to **Table 4-2** for a listing of these materials and limitations for use. ADC's will be used only on inside slopes. Some ADC's are described in more detail below to more definitively describe their use or limitations.

Contaminated Soils

Contaminated soils generally result from site clean ups, are seasonal, and may result in fair input volumes over a short space of time. Issues regarding contaminated soil can be noted as follows:

- perform TCLP tests in accordance with Section 2.3 of this report;
- ensure verification testing has been carried out by the generator and has suitable characteristics for receipt at this site;
- store all contaminated soils on the lined portion of the site or on already placed waste;
- ensure runoff does not enter surface drainage ditches;
- aside from the contamination aspect, employ and handle the same way as soil materials, and apply 150 mm minimum thickness for daily cover;
- contaminated soils may be mixed with other alternate daily cover materials, such as tire shred, glass aggregate, or other soil-like materials which may be of low density or have potential wind erosion issues;

These mixtures are noted in **Table 4-2**.

Polyetheylene Tarps or Geotextile Blankets

Tarps/Blanket Deployment

The use of tarps or blankets as alternate daily cover will partially substitute for soil daily cover. These would be applied on part of the active landfill face receiving more waste the following day. This means that tarps would be applied over one (1) or possibly two (2) sloping faces of the daily cell. The top portion of the daily cell would still be covered with 0.15 m of daily cover unless the new daily cell is to be landfilled immediately on top of the last daily cell.

When landfilling with the “area” method, and moving across the active lift, the active face is as described in Section 4.6.2. The top of the daily cell is approximately 900 m^2 and the two (2) exposed sloping faces would be an additional 660 m^2, which would be covered with tarps or blankets. Thus the tarps would cover up to 40 to 50% of the daily cell area.

Tarp cover would be installed at the end of the working day and removed in the morning of the next working day.

Tarps, when used, must withstand local climatic conditions, i.e. wind, rain, unexpected light snow in early or late seasons and UV exposure.

Tarps are ballasted against wind uplift by using heavy steel cable, chains and reinforced banding at intervals and around the perimeter of the cover. In cases where auto rolling and unfurling mechanisms are used, equipment ballasts the tarp. In especially severe conditions, rubber tires or sand bags can be used to provide additional ballast if necessary. No specific supplier is named; as new and better products become available, the operator may wish to switch the supplier without obtaining additional approvals. The following ADC suppliers at present are listed below:

- Tarpomatic
- Mercer Motor Works – TDS System
- Tarp Armor
- Air Space Saver
- Thor Tarp
- AAA Tarps

Tarp/geotextile materials are usually polyethylene of various unit weights. Reinforced bands, corners, pulls, lifts or adaptation to specific spreading/rolling/unfurling machines are provided.

Tarps and blankets are usually deployed and retrieved using specialized, patented application units that attach to the blade of the dozer or landfill compactor, and if motorized, are run by hydraulic connections.

Operational Control

Training will be provided annually by the landfill operator to equipment operating staff who will place the tarps/blankets.

Inspections would include the following activities:

- confirm tarps are placed to completely provide cover required;
- inspect for frays, cuts, tears or other unsuitable conditions;
- provide proper repair and maintain in good working condition;
- replace as warranted; and
- ensure daily cover is effective in prevent vector control.

If particularly severe odour conditions are encountered, use daily cover of soil or another ADC rather than tarps or blankets.

Foam Products

Foam products are proprietary materials and may be biodegradeable with time. Others are open or closed cell cementitious foams. The materials and mixers are usually provided by the manufacturer.

Because these materials require some time to “set”, they should not be applied if there is a 40% or greater chance of precipitation within eight (8) hours of use. These materials will degrade within the landfill and need not be removed before applying additional waste.

Cementitious Materials

An example of this type of material, which has been used historically at the site, is Posi-shell, a mixture of shredded newspaper, mineral fibre, synthetic material, Portland cement and water. Other suppliers are listed in **Table 4-2**. The materials are supplied by the manufacturer, who can also supply the applicator or the landfill operator can use a hydroseeder. Liquid is mixed with the dry materials in the mixer and sprayed onto the area to receive ADC with pressurized hose nozzles.

Use of liquids in winter operation may pose some difficulty.

Since this material must “set”, it should not be applied in heavy rain or the threat of heavy rain within four (4) hours.

Processed Green Material

Processed green material means any plant material. Green material includes yard trimmings, untreated wood waste, paper products, natural fiber products, compost, sawdust, wood chips, ground wood, processed C&D wood, blown straw and dewatered paper sludge. Refer to **Table 4-2** in regard to size requirements. 50% should be less than 150 mm length. The material would be applied in 150 mm minimum thickness as ADC. The material should have exposure no longer than three (3) months before re-covering with waste, intermediate cover or final cover.

If construction and demolition wood material is used, ensure that no significant gypsum board is contained in the material to prevent potential sulphate odours. Any gypsum should be less than 3% by weight.

Tire Shred

Tire shred is commonly used on many landfills. Refer to **Table 4-2** with regard to size requirements.

The applied thickness would be 150 mm minimum.

Slag and Foundry Sands, Sand Blast Grit or Dredge Spoils

This material is similar to contaminated soils. A TCLP test is required to ensure no hazardous levels are contained within the material.

If fines contain excessive dust, use liquid to control dust and/or mix with soil.

Auto Shredder Residue

Non-metallic materials in automobiles are shredded and used as ADC at many landfills.

The applied thickness, as shown on **Table 4-2** is 150 mm minimum.

Glass Aggregate

Crushed glass to 9.5 mm minus could be used as daily cover. The minimum thickness applied should be 150 mm minimum. This could be mixed with tire shred or soil.

Industrial Residuals, Dry Filter Cake

Some residuals of this nature could be used for daily cover. Physical characteristics must be suitable for daily cover. A TCLP test would be required. A thickness of 150 mm would be applied.

Crushed Concrete, Brick, Aggregate, Spend Refractory Brick

Such materials would normally be used to build landfill access roads but can also be used as daily cover. A TCLP test would be required for refractory brick.

This material would be applied in 150 mm thickness.

Shingles

Shingles can be used for daily cover. Asphalt strip roofing should be shredded prior to use as an ADC. A thickness of 150 mm is recommended. Ninety five percent (95%) of material should be smaller than 300 mm and fifty percent (50%) should be no greater than 150 mm.

4.6.5 Intermediate Plateaus

Figures 4-4 to 4-6, 4-9, 4-11 and 4-12 show the landfill constructed to final waste grades below elevation 140 masl on the south, east and north sides. That elevation can be reasonably reached with temporary access roads shown on the phasing drawings. These plateaus, although shown flat at elevation 140 masl will be provided with interim cover, and gradually sloped at 0.2 to 1% as shown on Section B/4 on **Drawing 9** to accommodate runoff. Section B/4 on **Drawing 9** illustrates this minimum slope. Similarly, the horizontal gas collectors at the intermediate elevation below 138.5 masl will slope at approximately 1 to 2%, and will not become excessively deep at the periphery edge, if the interim plateau has a slope from center to the north or south edge of side slope.

Figures 4-7 to 4-12 inclusive, for Phases 4 to 9 show a higher intermediate plateau at elevation 153 masl, just below the summit. Again, this interim plateau will be interim covered. Interim topsoil and

vegetation may be provided; however, the purpose of leaving the plateau is to allow filling to final waste grades once a period of time has elapsed and waste has settled.

4.6.6 Interim Cover

Areas remaining inactive for six (6) months or longer should be provided with 0.3 m of interim cover, gently graded to provide some runoff of precipitation. Only clean soil will be used for interim cover.

4.6.7 Final Cover

Final cover will consist of 850 mm of clayey silt cap, 150 mm topsoil and vegetation cover.
Annually, the final cover or partial final cover will be placed over areas completed to final waste grades. Final or interim topsoil will be placed, and the area seeded to minimize erosion and improve the visual aspect of the landfill. Partial final cover not having full cap thickness will be applied over areas which are expected to settle. This procedure will allow keeping the site vegetated as soon as practical to control erosion, visual impacts and gas emissions. Partially capped areas may see the interim cap and topsoil removed if settlement occurs, additional waste added and final cover replaced once the area has stabilized and additional waste settlement is not anticipated.

The final cover is designed for long-term infiltration of approximately 0.15 m per annum in accordance with the MOE Landfill Standards(Ref 19).

Refer to **Appendix 6-C** for HELP model results in regard to calculations for landfill infiltration and leachate generation. Cap of hydraulic conductivity 1 x 10^{-7} m/s was used in the HELP model.

The site will be monitored for leachate production, through flow meters on the discharge lines from pumping stations PS5 and PS6. Frost action and desiccation could increase leachate production over that normally expected for material permeability. Conversely, the storage of moisture in the waste until it reaches field capacity will reduce leachate production. Cap maintenance will be completed as required to repair cap desiccation.

On-site topsoil will be used for final cover and will comprise material stripped from the landfill before excavation. Topsoil will be beneficiated with on-site sludge solids which have been well composted and stabilized, waste from the proposed organics processing area, and a minor amount of wood chips if available. Allowing for on-site materials, little imported topsoil is required. If deficient, topsoil may be imported.

Cap material should be laid down in layers of approximately 0.2 m each, spread by a dozers and each loose lift compacted by dozer, sheepsfoot compactor or other suitable equipment. Topsoil should also be placed and fine graded to a uniform surface before vegetation is planted. Grades should be according to the final contours indicated on **Drawing 4**. The construction procedure is outlined below:

- Before placing cap material, ensure that the waste slope is graded to smooth, uniform surface to prevent projections or penetrations reducing final cap thickness. Depressions should be filled. Final trimming should be executed with a large dozer to the final waste elevations allowing for the depth of the cap and topsoil. The maximum height of the closed landfill will not exceed the completed landfill contours as shown on the drawings.

- The completed top of cap, allowing for topsoil, will conform to the elevations shown on **Drawing 4**. The final top layer should be graded transverse (90 degrees) to the slope axis to minimize rilling down the completed slope. Refer to **Table 4-1** for final cover material quantities

- Place 0.15 m of topsoil over the cap and fine grade to a uniform appearance and conform to the final contour plan. Topsoil and/or any processed compost should be dark loamy colour and texture, free of clods or lumps, stone, roots or other foreign material. Final topsoil grading should be transverse to the slope axis to minimize rilling down the completed slope.

- Topsoil and seed should be applied to all disturbed areas outside the proposed limit of landfill to mitigate erosion.

- After topsoil and seed is applied, fertilize the area and mulch if required. The fertilizer should be 7-7-7 or as recommended by specific soil tests, and applied at a rate of no less than 200 kg/ha, raked into the top 50 mm of seed bed, which will be hydroseeded or planted by a mechanical seeding device at a rate of approximately 160 kg/ha. Seeding should consist of a certified grass seed mixture containing grasses and legumes in the following proportions and for the soil type and conditions envisaged:

    - tall fescue - 20%;
    - creeping red fescue - 15%;
    - perennial rye grass - 15%;
    - timothy - 5%;
    - Alsace clover - 20%;
    - birds foot tree fall - 15%; and
    - crown vetch - 10%.

In addition, a cover crop of oats, rye or fall wheat should be included in the seeding, depending on the time of year. The nurse crop should be applied at about 140 kg/ha.

- Seeding should take place in favourable weather conditions and during an appropriate season of the year for growth, anticipated to be between August 15 and October 15.

- Hydroseeding, if applied, should contain fibre mulch applied in accordance with Ontario Provincial Standard Specifications.

4.7 Phasing

All phases of the landfill development are shown on **Figures 4-4 to 4-12** inclusive. **Table 4-1** outlines the phasing quantities for each phase. Phases were selected based upon the following:

- General compliance and agreement with the phasing proposed in the Environmental Assessment. This involves landfilling from east to west.

- Best visual screening from the east side. The existing landfill screens the site from the south.

- Development of the landfill to minimize infiltration and open areas for extended time.

- Maximize gas capture and hence lessen emissions. The phasing allows for the gas wells to begin installation relatively early in the site life.

- Sufficient landfill capacity is provided for all phases except Phases 9 and 10 for at least one (1) year and to account for a construction season duration since cell preparation work can only occur in the summer and fall with regard to clay liners and HDPE installations. The attenuation layer can be constructed either during the construction season or in the shoulder seasons.

- Phases have been selected to accommodate a platform width required for turning waste delivery vehicles, and operation of the landfill equipment.

- The leachate collection sump will be in the lowest part of the landfill base floor, which is the northeast corner of the site. Primary leachate pumping station PS5 and secondary leachate pumping station PS6 are located in the northeast corner in individual sumps in Phase 1.

Phases are designed such that the clay liners, HDPE liners, all geotextiles and the drainage gravel are installed within the construction season, in the best weather available, and the attenuation layer may be provided fully or in part for the new cell in the preceding season or shoulder season, to lessen the

intensity of construction required on the remaining part of the engineered cell base. The engineered base for the next cell would be constructed during the time when landfilling is occurring in the adjacent cell. Direct access to the particular phase in question will be from the peripheral paved access road and temporary roads constructed from the main access road into that phase. To reach elevations above the interim plateau of 140 masl, a permanent high level access road will be constructed as shown on the various phase figures. All temporary access roads are not necessarily shown and will be constructed as convenient and determined by the site operator.

To control landfill gas emissions and odours, a landfill gas control works will be constructed in phases as the landfill is developed. Refer to Section 5 for the landfill gas system details. The existing landfill site has a blower building, with three (3) blowers, two (2) enclosed flares, and a candlestick flare with blower/control skid, which flares poor quality gas. Each has appropriate headers. In addition, a gas to energy plant exists on the south part of the site adjacent to Carp Road, and contains five (5) gas to energy engine/generators. Section 5 describes these facilities.

The gas system proposed for the landfill expansion is shown on **Figure 5-2**, showing the vertical well system, early gas collection from the leachate collection system, interim level horizontal gas collectors, as well as the gas headers surrounding the site and the various subheaders and laterals.

The early gas collection and horizontal/vertical system will collect gas and prevent emissions and control odours as landfill is developed and after closure. A total of 144 vertical wells will be installed on the landfill expansion.

4.7.1 Phase 1

The reader is referred to the site preparation work shown on **Figures 4-2 and 4-3**, which is required prior to the start of landfilling. **Figure 4-4** shows the extent of landfilling during Phase 1. Refer to **Table 4-1** for quantities pertaining to Phase 1.

In general, for each low level phase, the engineered landfill base would have to be prepared before an active phase is filled to capacity. In the case of Phase 1, the Phase 2 cell base must be ready before Phase 1 is full, as noted on **Figure 4-4**. It is intended that all, or a portion of, the attenuation layer for each next low level phase may be prepared during the construction season preceding completion of the engineered base for that phase. In other words, construction of the attenuation layer may start one (1) year earlier before the next cell must be ready to accept waste. Although the engineered landfill base for Phase 2 is completed while Phase 1 is being filled, all quantities for this work are included under Phase 2 in **Table 4-1**. The same logic applies to all subsequent phases.

Several generic issues such as the working face, waste covering, liner construction, etc., have been discussed previously. Only the measures specifically connected with individual phase will be described below.

Specific works will have been constructed under site preparation work, and specifically described in Sections 4.3 and 4.4 and shown on **Figure 4-2** and **Figure 4-3**. These generally include the following:

- off-site Carp Road improvements/widening;
- hard surfaced, granular surfaced and temporary roads;
- weigh scales and scale house;
- mini-transfer area;
- engineered landfill base with leachate collection system and pumping stations;
- stormwater management ponds and infiltration basins;
- various utilities as noted on **Figure 4-2** (underground piping and overhead hydro);
- property limit fencing and litter fencing; and
- landscaping works.

The following utilities and works must be constructed within the Phase 1 area while it remains active or later:

- construction of various subheaders/laterals for landfill gas system as per **Figure 5-2**;
- intermediate level horizontal gas collectors as per **Figure 5-2**;
- leachate collection system gas wells would be activated;
- vertical gas wells 200 to 207, 215 and 223; and
- capping or partial capping of exterior side slopes completed to final waste grades.

4.7.2 Phase 2

Refer to **Figure 4-5** for Phase 2. Refer to **Table 4-1** for a summary of volumes for the phase.

The following works and utilities will be extended:

- maintenance road, location E to location P;
- gas headers and compressed air line, location E to location P and location B to location Q;
- leachate collection system gas wells associated with the Phase 2 area would come on line;
- gas subheaders and laterals per **Figure 5-2**;
- horizontal gas collectors within Phase 2 area after completed to 140 masl level;

- vertical gas wells 231, 239 and 247; and
- capping, topsoiling, vegetation or partial capping of exterior side slopes completed to final waste grades.

Excavation, fills, and construction of the attenuation layer, primary liner system and secondary liner system and various drainage layers, and leachate collection systems will be carried out as previously described. Phase 2 engineered base preparation will include connection to the previously constructed Phase 1 base system. Similar connection will be needed in all subsequent phases which require extension of the engineered base. This is not specifically noted for the following phases.

Construction of the high level access road will commence.

4.7.3 Phase 3

Phase 3 is shown on **Figure 4-6**. Refer to **Table 4-1** for quantities involved with this phase.

Preparation of the engineered base for Phase 5 is not yet required since the next fill will be Phase 4 above Phases 1, 2 and 3, previously completed.

Standard landfilling techniques previously described will be used to landfill from the base to the intermediate plateau at elevation 140 masl.

The high level access road will be extended to a 140 masl plateau. The maintenance road will be extended between location P and location R.

Gas header and compressed line will be extended along the north and south side of Phase 3. Various gas subheaders/laterals and intermediate horizontal gas collection system will be constructed and connected per **Figure 5-2**. Designated leachate collection system gas wells will be activated. The following vertical gas wells will be installed within the area completed to final grades: 240, 255, 256, 263 and 271.

Capping or partial capping will be carried out on the completed portion of the side slopes.

The equipment/maintenance road will be extended between point P and R.

4.7.4 Phase 4

Refer to **Figure 4-7** for the proposed Phase 4 development. Quantities are shown in **Table 4-1**.

Standard landfilling techniques previously described will be used to bring the landfill from the previous phase elevations to the limits shown.

A temporary access road must continue on the westerly higher landfill slope to elevation 153 masl.

Various subheaders/laterals are added per **Figure 5-2**. Vertical wells will be constructed and connected, and include the following:

- Wells 208 to 214, 216 to 222, 224 to 230, 232, 233, 234, 236, 237, 238, 241, 242, 245, 246, 248 and 254.

Capping or partial capping will be carried out on the completed portion of the landfill slopes.

The engineered base for Phase 5 will be constructed before Phase 4 is filled to capacity.

4.7.5 Phase 5

Phase 5 is shown on **Figure 4-8**. Quantities are shown on **Table 4-1**.

Standard landfilling techniques will be used as previously described. Standard excavation, base preparation and liner construction would be implemented.

Utilities and other works to be extended include the following:

- maintenance road, north side, location R to location T;
- gas header and compressed air line, location R to location T and location S to location U;
- more gas wells connected to the leachate collection system would be activated;
- subheaders/laterals as required on **Figure 5-2**;
- intermediate level horizontal gas collectors; and
- vertical gas wells 279, 287 and 295.

Capping or partial capping will be carried out on the completed portion of the landfill.

4.7.6 Phase 6

Refer to **Figure 4-9** for this phase. Phase 6 quantities are presented in **Table 4-1**.

Preparation of the engineered base for Phase 8 is not required since the next phase will be over the 140 masl plateau.

Works and utilities to be advanced include:

- maintenance road, location T to location W;
- gas headers and compressed air line, location T to location W and location U to location V;
- leachate collection system gas wells located within Phase 6 will be connected;
- intermediate level horizontal gas collectors;
- gas subheaders/laterals as per **Figure 5-2**; and
- vertical gas wells 303 and 311.

Capping or partial capping will be completed on areas filled to final waste grade.

4.7.7 Phase 7

Phase 7 is shown on **Figure 4-10**. Quantities are shown in **Table 4-1**.

Standard landfilling techniques will be used as previously described.

The high level access road will be advanced to the grade break point between 4:1 slope and the 5% slope at the top of the landfill. Temporary access will be provided to 153 masl level plateau.

Pertinent subheaders/laterals will be constructed as shown on **Figure 5-2**. Vertical well construction would include the following:

- Wells 249, 250, 252, 253, 257, 258, 261, 262, 264, 265, 266, 268, 269, 270, 272, 273, 274, 277, 278, 280, 281, 282, 284, 285, 286, 288, 289, 290, 293, 294 and 296.

Capping or partial capping will be carried out on the completed portion of the landfill slopes.

The engineered base for Phase 8 will be constructed before Phase 7 is filled to capacity.

4.7.8 Phase 8

Refer to **Figure 4-11** in regard to Phase 8. Quantities are shown in **Table 4-1**.

Standard landfilling techniques will be used as described previously.

Works and utilities to be advanced include:

- maintenance road, location W to location X (road turnaround);
- gas headers and compressed air line, location W to location V;
- pertinent gas subheaders/laterals and horizontal collectors per **Figure 5-2**;
- remaining leachate collection system gas wells will be connected; and
- vertical gas wells 319, 327 and 335 to 343.

Capping or partial capping will be carried out on the completed portion of the landfill.

The entire landfill footprint will be occupied after this phase and no further base preparation work will be required from this point onwards.

4.7.9 Phase 9

Refer to **Figure 4-12** for this phase. Quantities are shown in **Table 4-1**.

Landfilling will be extended westerly over the 140 masl plateau and the high level access road will reach the summit.

Gas subheaders/laterals will be extended to service the newly installed vertical gas wells as follows: 297, 298, 300, 301, 302, 304, 305, 306, 309, 310, 312 to 315, 316, 317 and 318.

Areas completed to final waste grades will be capped or partially capped.

4.7.10 Phase 10

Refer to **Figure 4-13** for this phase. Quantities are shown in **Table 4-1**.

Phase 10 will involve filling the westerly end of the site, including landfilling the temporary access roads at the westerly end. All remaining settlement areas, including the summit will be filled to final grades. This

may involve removal of interim cover and topsoil and vegetation. Otherwise, all small depressions will be filled and smoothed, topsoiled and revegetated.

All subheaders/laterals to attach the vertical gas wells will be constructed per **Figure 5-2**. The remaining vertical wells will be installed including the following:

- Wells 235, 243, 244, 251, 259, 260, 267, 275, 276, 283, 291, 292, 299, 307, 308, 316, 320 to 326 and 328 to 334.

Capping of the completed areas and partially capped areas, topsoiling and grass vegetation will be carried out as soon as practical. The entire landfill area will be final covered after the site is filled to capacity. Phase 10, **Figure 4-13** shows the completed landfill, with all areas filled and closed out. The high level access road will remain for maintenance and gas well servicing.

4.8 Closure

4.8.1 Ongoing Activities

Once the site no longer accepts waste, some of the following works may be decommissioned:

- site office;
- weigh scales and scale house;
- maintenance building; and
- mini-transfer area.

The owner will ultimately decide at that time which facility is no longer required and could be decommissioned. Operation of the WTPF and composting will continue beyond the life of the landfill.

Monitoring wells will remain and landfill monitoring will continue. The stormwater ponds will remain active. Gas management and leachate collection/treatment facilities will remain in operation.

Operators will remain as required for the leachate treatment plant, the landfill gas management system, gas to energy system and leachate pumping systems. The systems will be SCADA controlled and monitored, and any malfunction will trigger a dial-up alarm to the operator, who will take appropriate action to address the situation.

4.8.2 Public Notice of Site Closure

Prior to final closure of the landfill site, advertisements will be placed in local newspapers to inform the public that the landfill site will be closed indicating the closing date, after which time refuse will not be accepted at the site. Any alternative site or arrangements will be noted.

After closure, signs will be posted at the access gate to indicate site closure and redirection to any alternative site(s).

Refer to the separate report regarding financial assurances. Financial assurances will include the post-closure costs for the site.

4.9 End Use

Following filling to its approved capacity the expanded landfill will be closed. This would follow application of final cover, removal of unused structures, any site modifications to facilitate the long term closure care of the site. No decision in regard to end use has been made to this point, and options could be open as follows:

- Restricted access open space: vegetating the site and restricting public access with perimeter fencing;
- Passive public open space: conversion of the closed landfill into a park-like setting (e.g., nature park). This would entail some additional control measures such as dealing with potential erosional impacts; and
- Active public open space: conversion of the closed landfill into active public uses based on community interest and economic analyses. This would entail careful consideration of issues such as public safety, erosion, changes to infiltration rates or drainage patterns on-site.

WM will solicit community input regarding end use at a time closer to the closure date.

5. Gas Management

5.1 Landfill Gas Production and Collection

Landfill gas is produced as a by-product of biological decomposition of organic matter in refuse. Landfill gas is typically comprised of approximately 38 - 58% methane and 30 - 48% carbon dioxide and other trace compounds. The gas is combustible and a good quality fuel source.

Four (4) phases occur in the production of landfill gas as follows:

5.1.1 Aerobic Phase

In this first phase of decomposition, aerobic (oxygen-consuming) bacteria degrade organic material in the waste; this occurs only while oxygen is available in the refuse. Heat is generated, and the process lasts generally only a few days.

5.1.2 Anoxic Phase

Once the oxygen is largely consumed, anaerobic facultative bacteria dominate, producing organic acids, ammonia, hydrogen and carbon dioxide as by-products of decomposition of the waste. This phase can last weeks.

5.1.3 Anaerobic Methanogenic Unsteady Phase

This phase starts methane creation and is dominated by anaerobic, methanogenic bacteria (methanogenesis). Landfill waste and moisture conditions will determine how long this phase lasts. Dry landfills can extend this aspect of decomposition, whereas additional moisture will accelerate the onset of the next phase.

5.1.4 Anaerobic Methanogenic Steady Phase

This phase contains sufficient conditions within the landfill to encourage steady production of methane and decomposition of waste. Landfill gas containing approximately 40 to 60% methane by volume on a steady state basis will result. This phase can last many years. Most gas is methane and carbon dioxide with less than 5% of mercaptans, hydrogen sulphide, hydrogen with water vapour and hydrocarbons.

5.1.5 Factors Affecting Gas Generation

The important factors which can affect gas generation are as follows:

- refuse type, mass and age;
- refuse moisture content and movement;
- pH;
- temperature; and
- nutrients.

5.1.6 Refuse Type, Mass and Age

The amount of gas generated is proportional to the refuse organic content (and hence mass). The type of waste and age also affects the amount of gas produced. Organic waste such as food scraps, paper, etc., are readily degradable and produce high rates of gas earlier in landfill life, as opposed to moderately degradable waste such as textiles and wood which produce gas at much lower rates. Moderate degradable waste produces gas over longer periods than readily degradable waste. Since this component cannot be easily defined, and since waste mixtures are varying with increasing recycled reuse patterns, normal waste generation curves are generated, and can be considered “upper limit” as opposed to average volumes. In this case the gas collection curve has been fitted to known times, waste inputs and gas outputs.

5.1.7 Moisture Content and Movement

If waste is too dry, the steady methane-producing state will be delayed until the site reaches 20% moisture content (wet basis) and more optimally field capacity. Field capacity is estimated to be approximately 30 - 40% (wet basis) by weight.

Moisture content (wet basis) = weight of water/weight of refuse and water
Moisture content (dry basis) is defined as weight of water/weight of waste

Moisture content in this report generally refers to wet basis unless stated otherwise.

Field capacity is the volumetric water content of saturated waste at suction pressure (33 kPa). Such a state would be like a sponge full of water, and if more water is added, flow from the sponge would occur. The sponge would then be at field capacity.

Moisture movement (infiltration) through the waste is important to ensure steady landfill gas production. The moisture solubilises the decomposable portion of the waste, bringing bacteria into contact with the waste. Water also distributes the nutrients used by bacteria in the waste breakdown.

5.1.8 pH Level

Anaerobic degradation occurs best at pH levels around neutral (6.7 to 7.6). Below a pH of 6 and above pH of 8, methanogenesis is curtailed because of pH inhibiting levels. Methanogenesis is described in Sections 5.1.3 and 5.1.4.

5.1.9 Temperature

Temperature for the anaerobic state of landfills can vary from 30^{o} to over 50^{o}C. 34^{o} to 38^{o} is considered generally optimum.

5.1.10 Nutrients

Nutrients are generally nitrogen compounds and phosphorus compounds. These are the nutrients which feed the methanogenic bacteria which break down the waste.

5.2 Existing Site

The existing landfill was equipped with some gas wells beginning in the mid-1990's, with improved gas collection and increased number of wells through to 2010. Presently, there are about 180 wells, most of which are 0.9 m bore, gravel packed and equipped with 200 mm slotted PVC gas wells. In addition, because of high mounded water level in the landfill, many wells are equipped with condensate pumps and condensate discharge lines to the lined cell to improve gas removal rates.

Gas production was approximately 3.87 x 10^{7} m^{3}/year (2,600 cfm) in December 2013. It has been estimated that collection efficiencies are 85% on this site(Ref. 1C – Section 1.3.1.1).

The system is equipped with two (2) enclosed flares and one (1) candlestick flare, as well as a gas to energy (GTE) plant with five (5) reciprocating landfill gas engines with generators to convert gas to electricity. These aspects will be discussed under later sections of this section.

The site has approximately 8.74 million m^3 of waste and daily cover volume[Ref. 9]. Approximately 6.97 million tonnes of potentially biodegradable waste exists in the existing site.

5.3 Site Expansion

In accordance with Ontario Regulation 232/98 and the MOE Landfill Standards, the site expansion will incorporate active gas collection for the 6.5 million m^3 of waste and daily cover volume.

The system described herein involves the following:

- Commencing active gas collection early in the site development, by providing gas well head controls on the leachate collector cleanouts, which can extract methane from the leachate collection system from the low waste early in the site life. This aspect will assist in controlling odours and capture of gas early in the biodegradation.

- A system of horizontal gas collector piping will be provided at approximately elevation 138.5 masl below the intermediate plateau at approximately elevation 140 masl for the landfill, and will be connected to the landfill gas header, which will be installed early in the site development and extended as each phase progresses.

- Vertical wells will be installed once the landfill has reached final waste contours and provided with partial or final cover.

- Gas collected through the collection systems will be fed to the existing power generation facility and/or the flaring facilities as required in site operation. Modification to these facilities may be required and is described in later sections of this report.

5.4 Design Parameters

The USEPA Landfill Gas Emissions Model (LandGEM), version 3.02, was used[Ref. 4] to estimate gas LFG generation rates for the new landfill. The model is based on a first order decomposition rate equation for estimating emissions from the decomposition of landfilled waste in municipal solid waste landfills.

The model output was based on an annual waste disposal rate of 400,000 tonnes over ten (10) years.

The Clean Air Act (CAA) identifies default values for two (2) parameters k = 0.05 1/year (gas production coefficient) and L_0 = 170 m^3/tonne of waste (methane generation potential). The above values are recommended as upper limit values to be used for this site. L_0 is the volume of gas per mass of waste and k is the decay constant, in this case 5% per year.

Landfill gas generation estimates established for the new site are contained in Figure D-2 of Appendix D,[(Ref. 4)]. That curve is contained in **Appendix 5-A**. The peak estimate is 5.4 x 10^7 m^3/year (3,629 cfm). the gas collected would be 3,084 cfm at 85% collection efficiency.

All of the gas generated, cannot be captured, and capture efficiency usually varies from 70 to 95% depending upon the type of cap and 85% was assumed for analysis which is reasonable based on collection measures planned.

The emission rates in this report were calculated with the LandGEM model, and compared with measured flow rates. Since good information was available with respect to the waste receipt at the existing site, and at least two (2) points on the time versus gas production curve were known, a “best fit” gas production curve was developed, and is shown in **Table 5-1**. In developing the table, existing input tonnages for each year were used, and adjusted to remove any contaminated soil material which was landfilled as waste, to arrive at the amount of waste containing potentially biodegradable material. That tonnage is shown in the second column opposite each year. The third column is the estimated gas collection for the existing site with 85% efficiency. In other words, the gas generation rate is approximately 117.6% of the estimated collection rate. The year’s 2010 gas volume was reported in Reference 1c (Atmospheric (Landfill Gas) Existing Conditions), Appendix B, as 3,285 cfm. Late in the year of 2013, the site operator confirmed gas collection at 2,600 cfm. Accordingly, the gas production curve for the existing site fits known points and is judged accurate. Maximum gas from the existing site would have occurred in approximately 2007 to 2008 at 3,547 cfm. Gas generation is now on the decline. Waste from the site expansion is shown as input from 2017 to 2026 and maximum gas is estimated to occur at the year of closure, or shortly thereafter at 6.44 x 10^7 m^3/year (4,325 cfm). The fourth column of **Table 5-**1 shows combined gas collected from the existing and expansion site. Deducting flow from the existing site, it is estimated that maximum production from the expansion would be approximately 3,174 cfm, which is within approximately 3% of that estimated for gas collected in the FCR[(Ref. 4)]. Accordingly, good agreement was obtained for these figures.

Refer to **Figure 5-1** for a plot of the gas collected from the existing and expansion site as well as combined for both sites between 1974 and 2074. The curve assumes that landfilling commences in 2017 and first gas is produced in 2018 from the new landfill.

5.5 System Components

The gas collection system collects and transports the landfill gas from the fill area to the gas header which transmits the gas to the gas to energy plant (GTE) or landfill gas flares.

5.5.1 Leachate Collector Connections

The leachate collectors will be equipped with well head gas controls to extract gas initially from the lower waste through the primary leachate collection system. Typical well head controls are shown on **Figure 5-3**. A typical leachate collector connection is shown on **Figure 5-7.** Referring to **Figure 5-2**, the gas wells are shown for each of the leachate collectors. The gas wells for each individual collector connect to a subheader constructed outside of the liner system and teeing into the main vertical well subheader which connects to the main gas header. Each leachate collector will have a tee'd connection as near the liner anchor trench elevation as possible. Any condensate from the leachate collector side of the gas well will drain back into the leachate collector and return to the landfill as leachate. Any condensate on the subheader side will drain to the main gas header, which is drained to condensate drain chambers. Refer to **Figure 5-4** for a typical condensate drain chamber detail.

The primary leachate collector spacing is shown on **Drawing 7** and **Figure 5-2** and are spaced between 25 m and 29 m depending upon the bottom grade.

Each collector is predicted to carry up to 0.09 m^3/s (190 cfm) of gas. Since there are two (2) well heads per each collector, then each well head would carry half of the flow up to 0.045 m^3/s (95 cfm).

5.5.2 Horizontal Gas Collectors

Horizontal gas collectors are proposed at the intermediate level of approximately elevation 138.5 masl and spaced at 32 m centre to centre. With such spacing, each horizontal collector will have a radius of influence of approximately 16 m, which would be sufficient to reach the base of the waste or the top of the landfill. The locations for these collectors are shown on **Figure 5-2**. These collectors will be installed approximately 1.2 m to 3 m below the intermediate plateau, which is proposed to slope at approximately 0.2 to 1% with the intermediate horizontal gas collectors sloping at approximately 1%. In this manner, the collectors will not become excessively deep at the edge of the landfill. The outer 10 m of the horizontal collectors will be a solid pipe. Horizontal collectors will be terminated with the well head connected to the subheader along the periphery of the landfill. This subheader will join the main vertical well subheader, which in turn connects to the main gas header. Each main vertical well subheader will be equipped with an isolation valve in the valve chamber near the landfill limit. Refer to **Figure 5-2** in this regard.

The perforated horizontal gas collection pipe will be enveloped in clear stone bedding and cover material or equivalent material.

Perforated 150 mm diameter landfill gas collectors may also be installed near the landfill edge along the toe of slope to control gas emissions at this particular location. If installed, LFG piping will be connected to a nearby subheader pipe.

5.5.3 Vertical Gas Wells

Several factors affect the radius of influence for vertical gas wells. The gas flow is governed by the Darcy equation for radius of influence for radial compressible fluid flow, which includes five (5) major factors. The formula is listed as follows:

$$r_1 = \left[\frac{2\ g\ kT_s\ (h_s\ /\ h_T)}{P_s\ (dG\ /dt)\ \rho\mu T}\ (P_1^2 - P_0^2)\ \frac{1}{2}\right]$$

Where

r_1 = the radius of influence of the gas well, feet
g = acceleration due to gravity, feet per second squared
k = absolute permeability of the waste, square feet
T_s = standard temperature, 520^o degrees Rankine
h_S = the length of the slotted gas pipe, feet
h_T = the total length of the gas pipe, feet
P_s = standard pressure, 2,116.8 pounds per square foot
dG / dt = the gas generation rate, cubic feet per pound second
ρ = waste density, pounds per cubic foot
μ = the absolute landfill gas viscosity, pounds per foot second
T = the temperature of the flowing gas, degrees Rankine
P_1 = the absolute pressure at extreme radius of influence, pounds per square foot
P_0 = the vacuum on the well, pounds per square foot

The major factors in the equation are as follows:

- waste permeability (k);
- landfill gas generation rate (dG / dt);
- waste density (ρ);

- difference between the absolute pressure and the vacuum pressure (P_1 - P_0); and
- flowing temperature of the landfill gas (T).

Other values that are not so influential include standard temperature and pressure, standard landfill gas viscosity and the gas well slotted length ratio to the total gas well length. Generally this ratio varies around approximately 0.66, which has been used for calculating radius of influence.

Refer to **Appendix 5-B** for the calculations which determined the spacing of vertical gas wells.

The radius of influence was determined to be approximately 27.5 m, and the spacing being 55 m (2 x the radius of influence). This spacing was selected for the north/south direction for this landfill, and spacing between the axes of wells was calculated to be 48 m in the east/west direction. This will ensure good collection efficiencies. The layout is shown on **Figure 5-2**.

Approximately 144 wells are required as shown in **Figure 5-2**. Based upon the peak gas collection rate of 4.7 x 10^7 m^3/year assuming a gas collection efficiency of 85%, and the selected well spacing, each well could be expected to collect approximately 3.3 x 10^5 m^3/year (0.01 m^3/s or 21.9 cfm). However, it is anticipated that the deepest wells might receive up to 0.028 m^3/s (60 cfm), intermediate wells up to 0.019 m^3/s (40 cfm) and the shallow wells up to 0.009 m^3/s (20 cfm). The laterals and subheaders have been conservatively designed on this basis.

Refer to **Figure 5-2** for the sizes of the laterals, subheaders and connections to the main header.

Refer to **Figure 5-3** for details in regard to the vertical gas wells. All wells are anticipated to be 0.9 m diameter, gravel packed, with 200 mm slotted PVC gas wells. Each lateral will be connected to the gas well with a flexible boot, instrumentation taps, orifice plate, pressure taps, valve control and connection to the lateral leading to the subheader. In this way, each well can be tested for methane production, vacuum and pressure, as well as shut-off or volume control.

A summary of quantities of the landfill gas collection system in relation to phasing is provided in **Table 5-2.**

Collection piping, subheaders and laterals will be constructed of DR17 solid, smooth walled high density polyethylene, and buried at least 1.2 m below ground, unless localized crossings under ditches or pipes require less, in which case solid board insulation will be used, with each 25 mm insulation thickness allowing 300 mm reduction in soil cover.

All vertical wells shall have minimum 150 mm diameter HDPE laterals, and connected to 150 mm or 200 mm subheader piping.

The landfill gas header, subheaders and lateral piping was sized to accommodate peak landfill gas recovery. Refer to **Figure 5-6** for details related to pipe joints and reductions.

5.5.4 Main Gas Header

The main landfill gas header is designed for a low head loss, and for operation in either current or counter-current direction, should maintenance be required or construction connections, necessitating part of the header to be down. The header can accommodate all gas flow, travelling in one (1) direction should it be necessary. The 750 mm diameter header has been sized for peak flow requirements, and can accommodate up to 2.26 m^3/s (4,780 cfm) for counter current flow and up to double that for concurrent flow, assuming DR26 high density polyethylene header pipe material. All dimension ratios (DR or SDR) are based on PE 4710 resin, a more tough and durable resin than PE 3408 resin. The 250 mm diameter header (DR17) has been provided to handle poor quality LFG.

Refer to the phasing **Figures 4-2 to 4-13** for phased construction of the header. The header on the east, south and north sides opposite Phase 1 (refer to **Figure 4-2**) will be constructed initially along with the paved road and ditching. The header will be extended with future phases.

The header is located below the drainage ditch side slope, near the edge of the equipment road. Refer to **Figure 5-2** and **Figure 4-2**. Header pipe will be HDPE DR26. Slopes for concurrent flow are usually 1.2%, whereas slopes for counter-current flow are -3%. Refer to **Figure 4-2** for the main gas header crossing the buffer on the easterly side of the existing landfill site, to the blower and flare area. No provision for interconnection to the existing gas header has been provided. All gas from the expansion will be carried in the new 750 mm diameter gas header or the new 250 mm diameter gas header.

The header has been equipped with condensate drain chambers (CDC) (**Figure 5-4**) to allow drainage of condensate at low points. These chambers will be operated by pneumatic or electric pumps. Discharge from the condensate chambers will be through a condensate forcemain into the primary leachate collection system adjacent to the landfill.

Isolation valves (**Figure 5-5**) are located at approximately 500 m spacing to allow maintenance and connections as facilities are built. Any phased construction should incorporate a shut-off valve for future connections, and may replace some of the valves indicated.

Condensate forcemain will be HDPE DR11 and compressed airlines will be DR9. Compressed air lines will not be required if electric pumps are selected.

Refer to **Figure 5-2** for the locations of CDC and respective elevations around expansion area.

Similarly, condensate drain chambers and isolation valves are shown on **Figure 4-2** between the new landfill site expansion, on the easterly side of the existing landfill and the flare and blower building area.

The landfill expansion area will also be serviced by 250 mm diameter low quality gas header. This line is provided to allow for additional gas collection and odour control from selected locations to increase system flexibility. Low quality gas would be transmitted separately and burned at the candlestick flare. Refer to **Figure 4-2** for low quality gas header in the common trench. Condensate from this line will drain by gravity to condensate drain chambers associated with the main header through a properly sized condensate trap.

5.5.5 Blowers

Four (4) blowers exist on-site, as follows:

▪ one (1) located on the skid for the candlestick utility flare	=	2,120 cfm ±
▪ three (3) at 1,300 cfm in the blower building (associated with the enclosed flares)	=	3,900 cfm max
Total Blower Capacity		**6,020 cfm ±**

This capacity is in excess of that required for the expansion, together with the existing site, estimated at 4,325 cfm. However, as future gas flows increase from the new site, WM will provide a standby blower and motor, to swap out such equipment if a breakdown occurs and replacements cannot be had quickly.

5.5.6 Flares

The flares on-site at present are as follows:

▪ one (1) enclosed flare at	=	1,200 cfm
▪ one (1) enclosed flare at	=	2,200 cfm
▪ one (1) candlestick flare at		2,120 cfm
Total Flare Capacity		**5,520 cfm**

The first two (2) flares are serviced by the three (3) blowers at 1,300 cfm. The third flare is a candlestick utility flare, rated at 2,120 cfm. The total flare capacity of 5,520 cfm exceeds the estimated peak gas flow from the existing and expansion site.

5.5.7 Gas to Energy Plant

A GTE plant exists on-site, with five (5) engines, and a compressor to feed the engines. The plant has:

▪ 3 units at 600 cfm at 1,600 kW ea	=	1,800 cfm
▪ 2 units at 300 cfm at 800 kW ea	=	600 cfm
Total		**2,400 cfm**

These units are part of a FIT (feed in tarrif) program, and are part of a contract between WM and Ontario Power Authority (OPA). The FIT agreement is not open, and no changes are proposed for this GTE plant. However, these works will continue to operate, with gas from the new site replacing the decline rate from the existing site. The plant is permitted to house five (5) 600 cfm, 1,600 kW generators if gas production increases.

5.6 Assessment of Subsurface Landfill Gas Migration

Landfill gas is produced from the degradation of organic materials in waste. The major constituents of landfill gas are methane and carbon dioxide, with smaller amounts of other compounds such as hydrogen sulfide, mercaptans, and non-methane organic compounds typically being present. Landfill gas can migrate laterally through unsaturated soil and fractured rock horizons for considerable distances away from a landfill footprint. Of primary concern with regard to subsurface migration is the explosive nature of the methane component of the landfill gas if it accumulates in enclosed spaces to concentrations between 5 and 15% by volume.

Landfill gas is expected to be produced within the new landfill to be developed at the WCEC facility, and is known to occur at the existing, closed landfill. The potential for subsurface migration of the landfill gas exists at the WCEC site. Landfill gas is known to exist in the subsurface surrounding the closed landfill, particularly along the northern and eastern sides. The coarse-textured soil (sand and gravel) and thicker unsaturated zone in these areas are more conducive to subsurface gas migration than elsewhere on the site, where the unsaturated zone is thinner and the soil is of finer-grained texture (silt, glacial till, etc.).

Control measures for landfill gas at the closed landfill include the landfill gas extraction system with vertical wells and horizontal collectors, as well as the positive-pressure air injection system along the

Carp Road boundary of the site. Subsurface landfill gas monitors are in-place to ensure that the systems continue to be effective in controlling gas migration. The results of the subsurface gas monitoring are reported in the Annual Reports for the existing landfill. For the past three years, WM has reported no detectable gas concentrations in the subsurface probes. The subsurface gas probes will continue to be monitored as part of the Environmental Monitoring Plan for the WCEC facility.

Continuous gas sensors and alarms are installed in all on-site buildings that are used regularly by WM personnel, such as the scale house, the GDT building and the maintenance garage. Other non-occupied structures, such as the leachate collection pump houses and flare building, have gas sensors and/or prescribed health and safety procedures for entering.

The new landfill to be developed at the WCEC site is expected to generate landfill gas within the waste. A landfill gas extraction system has been designed for the new landfill and is described herein. The landfill gas will be collected by vacuum extraction and conveyed to flares located near the southeast corner of the existing landfill. Unlike the closed landfill, the extraction system for the new landfill will be installed during development stages, thereby improving the capacity to capture landfill gas and decrease the gas pressure within the waste. This will reduce the potential for subsurface migration of landfill gas. In addition, the double-composite liner and leachate collection system, with gas/vacuum control, that is to be installed at the new landfill will prevent outward movement of landfill gas from the base of the landfill.

A comprehensive monitoring program for subsurface gas migration around both the closed and new landfills has been developed and is presented in the Environmental Monitoring Plan(Ref.30). The EMP provides a description of the design of the monitoring devices, their locations, frequency of monitoring and the parameters to be analyzed including methane gas concentrations and gas pressures within the monitoring devices. Subsurface gas probes will be monitored at the following locations:

- between the closed landfill footprint and the waste transfer/processing area;
- downstream of the air injection barrier along Carp Road; and
- surrounding the perimeter of the new landfill footprint.

In addition, the EMP provides a description of the trigger mechanisms, including gas concentration limits, and contingency plans to be implemented in a situation where subsurface migration of landfill gas is detected in the monitoring probes at unacceptable levels.

6. Leachate Management

6.1 General

This section describes leachate management including:

- existing system components;
- existing and anticipated leachate quantities;
- leachate quality;
- treatment, and disposal to the City of Ottawa sewer system; and
- contingency disposal by irrigation on a poplar plantation, and trucking off-site to other facilities.

The existing site contributes leachate by two (2) means, i.e. purge wells and raw leachate from a liner on part of the existing site. Raw leachate is blended with purge well water and discharged to the City of Ottawa sewer system, in accordance with their agreement(Ref. 15), Appendix A, Sewer Bylaw and Agreement.

6.1.1 Existing Site Purge Wells

Leachate contaminated groundwater from the existing site and Closed South Cell flows easterly and is intercepted by eleven (11) purge wells, namely PW1 through PW10 inclusive and PW20. Refer to enclosed **Figure 4-14** for their locations. Also refer to Figure 12(a)(Ref. 1e).

The purge wells discharge to a common 200 mm diameter forcemain, leading to the methane degasing separator at the GDT building.

Data with respect to purge wells flows are contained in **Table 6-1** and **Appendix 6-A**. The flows analyzed for 2012 indicate the average flow was 469 m^3/day (5.3 L/s) and month to month variation from 383 m^3/day (4.43 L/s) to 613 m^3/day (7.10 L/s). These 2012 average flows are approximately 79% of those in 2009 contained in Reference 15, repeated in **Appendix 6-A** and presented in **Table 6-1**. The average flow for 2009 – 2012 was 570 m^3/day (6.60 L/s). The average flow from 2009 – 2013 was at 542 m^3/d (6.27 L/s).

6.1.2 Existing Landfill Site Liner

The existing landfill site has a liner with a leachate collection system under approximately 8.22 ha. In addition to leachate generated through final cover infiltration, the lined cell receives a mixture of

condensate and leachate withdrawn from the vertical gas wells of the existing gas collection system. Some leachate may also be drawn into the cell from the adjacent unlined area. Raw leachate drains to leachate pumping stations PS1, PS2 and PS3. The operating pumps are in PS1 and PS3, located at the southeast and northeast corner of the existing site respectively.

Data in **Table 6-1** indicates that leachate generation (pumped leachate + poplar disposal) in 2011 to 2013 was approximately 73 m^3/day (0.84 L/s), which represents an infiltration of 0.324 m/yr from the lined part of the closed site. This is approximately double the figure obtained from HELP model for the site expansion with final cover but is within 4% of the modelled rate(Ref. 10, Pg. 5-1). However, this value is reasonable for the existing lined cell conditions with final cover configuration which is considered to be more permeable than that proposed for the expansion site.

From leachate quantity analysis(Ref. 15) it was assumed conservatively that infiltration/leachate generation for the lined portion of the site will remain relatively high, 0.3 m/year (24,660 m^3/yr) or 0.78 L/s. The leachate generation in 2009, before the site was fully closed was estimated at approximately 82 m^3/day (0.95 L/s), which represents infiltration of 0.364 m/yr on the lined site. An allowance of 2.4 L/s (207 m^3/day) was selected for raw leachate flow in the design of the leachate treatment facility. This treatment plant flow capacity was selected to allow drawdown and treatment of leachate accumulated within the existing lined cell in two (2) years.

6.1.3 Poplar Forest

An existing poplar plantation has been constructed on part of the Closed South Cell, comprising approximately 6.2 ha. The poplar plantation area is shown on **Figure 4-14**. The westerly 2.0 ha area was graded and planted in 2014. The present irrigation system has service from pumping station PS4 at the southeast corner of the existing site.

The forest is irrigated during the growing season, with a total application of approximately 0.43 m/year, allowing for disposal of up to approximately 18,100 m^3 of contaminated liquid at full capacity, comprising either leachate or purge well liquids or a blend of same. **Table 6-1** data indicates 4,678 to 12,960 m^3/year have been applied in years 2009 - 2013.

6.1.4 Leachate Treatment Plant

MOE approval has been issued for a treatment plant to accept leachate, and to treat the same to meet City of Ottawa Sewer Use Bylaw criteria.

The plant has been designed for 2.4L/s. Refer to **Figures 4-2 and 4-14** for the proposed location.

The additional leachate equalization storage discussed in Section 6.4.2 will be located adjacent to the LTP.

The allowable discharge to the City of Ottawa sewer at present is limited to 14.7 L/s (233 USGMP). The leachate treatment plant design capacity was selected to accommodate present raw leachate flow from the lined part of the existing site and to deplete any leachate inventory within the existing lined landfill cell within two (2) years. For a full explanation in regard to the leachate plant proposed, refer to Reference 15, comprising a design brief and Reference 16, comprising the specifications and final drawings for the proposed plant. The process flow diagram, Drawing P01[(Ref. 16)], is included in **Appendix 6-B** for information.

6.2 Leachate Quantities

6.2.1 Leachate Quantities Generated from Expansion Area

Although the landfill site will be based upon silty sand and sandy silt and till materials over bedrock, for the most part daily cover will be imported and could be of variable texture. Final cover will be controlled within gradation limits to control infiltration. Accordingly, a conservative approach regarding infiltration during operation has been developed, with HELP modelling. Refer to **Appendix 6-C** for HELP model printouts.

Equally important, the landfill site phasing as proposed will reduce leachate quantities generated during operation and development of the site compared to the development and capping assumptions made in the Environmental Assessment[(Ref. 4 and 7)]. Specifically, the site will be developed in ten (10) phases, with initial Phases 1, 2 and 3 resulting in a relatively large flat area (140 masl plateau), but then minimized with development of Phase 4 on the previous plateau of the three (3) preceding phases. Capping or partial capping, topsoil and vegetation will be placed to control erosion, minimize infiltration, minimize gas emissions and improve aesthetics as final waste grades are reached. A relatively small area at the top will be interim covered to allow filling resulting from additional settlements from the waste load, and to a lesser extent from degradation and decay of the underlying waste.

Refer to Section 4 and **Figures 4-2 and 4-13** for a description of Phases 1 to 10 development.

Infiltration Rates

The following infiltration rates have been assumed in developing the leachate quantities presented in **Table 6-2**:

- infiltration/leachate generation for capped or partially capped and closed part of landfill – 150 mm/year;
- infiltration/leachate generation for the active daily covered part of the landfill – 250 mm/year, including short term bowl effect, with no runoff during placement of the first lift of waste at the base of the landfill; it was conservatively assumed that such an area would occupy 4.0 ha throughout the site development;
- leachate infiltration/generation for the interim covered part of the landfill – 225 mm/year; this includes interim covered side slopes, interim covered plateaus and summit as well as interim covered westerly slope awaiting development of adjacent westerly phases.

Refer to **Table 6-2** for leachate generation anticipated for each phase. Leachate flows from the site expansion are anticipated to vary from approximately 14,900 m^3/year initially, when Phase 1 is first constructed, to a high of 66,300 m^3/year at the end of the Phase 8, the time when all of the landfill footprint has been covered with waste, declining slightly in Phase 9 because of additional closure of side slopes, and declining to 56,700 m^3/year after completion of Phase 10. The predicted leachate generation rates may vary depending upon the exact rate of infiltration through the capped, interim covered and active part of the landfill. The leachate generation will also be influenced by climate conditions.

In summary, the average leachate flow is estimated to be 2.10 L/s (66,300 m^3/year) during Phase 8, and declining to 1.8 L/s (56,700 m^3/day) after closure.

6.3 Leachate Quality

The leachate quality is shown in Table 2.2[Ref. 15] of **Appendix 6-A**, and was determined from the existing site leachate quality from a large number of samples. Key parameters are TKN, ammonia, BOD_5, COD, total phosphorus, pH, total suspended solids and alkalinity. None of the parameters from existing leachate are exceptionally high with the possible exception of TKN and ammonia, which might be more representative of older leachate from the site influencing this characteristic. Nevertheless, the treatment plant will reduce all leachate parameters to levels satisfactory for discharge to the City of Ottawa's system in compliance with the Bylaw.

Leachate quality from the expansion site is expected to be similar to that observed at the existing site. The leachate shall be compatible with the proposed engineered base system. The above statement is supported by good performance of the composite liner system in the east portion of the existing landfill.

6.4 Estimated Flows and Leachate Equalization Storage

6.4.1 Estimated Total Flows

The leachate flows can be summarized as follows:

- existing lined site - 0.78 L/s;
- expansion site - maximum flow during development - 2.10 L/s;
- long term closed expansion site - 1.8 L/s;
- combined existing and expansion site:
  - long term - 1.8 + 0.78 = 2.52 L/s
  - short term - 2.1 + 0.78 = 2.88 L/s;

Existing monthly purge well flow average varies from 4.43 L/s (383 m^3/day) (December 2012) to 7.79 L/s (673 m^3/day) (June 2009) for the eleven (11) purge wells presently pumping. The average purge well system flow is 6.60 L/s (570 m^3/day).

Additional purge wells may be required[(Ref. 29)] north of the new site, and estimated to contribute flow of approximately 3.13 L/s (270 m^3/day) but would not begin pumping until verified by groundwater sampling results in the future as landfilling progresses. Therefore, installation of this part of the system is subject to confirmatory environmental monitoring results. The existing purge well system forcemain will be extended from the north terminal point near purge well PW20 to the area of future purge wells north of Phase 1 and west of Stormwater Pond #2. This work is proposed initially during site preparation to avoid disturbance of the paved front part of the site. This flow would increase average purge well flows to 9.73 L/s (840 m^3/day) or by approximately 50%.

It is predicted that the approved treatment plant will have sufficient capacity for generated leachate due to the conservative calculation for leachate volume. However, there is the possibility that the approved leachate treatment plant capacity of 2.4 L/s might be exceeded and require expansion at some point in the future because long term leachate flow is estimated at 2.52 L/s. Flows will be closely monitored and will allow lead time if an expansion of the treatment plant is required.

The amount of purge well flow, combined with the total leachate from the existing and expansion sites after pre-treatment is not anticipated to exceed the allowable discharge of 14.7 L/s under the present

WM/Ottawa agreement. Based on the above calculations the average long term flow is estimated at 12.25 L/s (9.73 + 2.52) which is approximately 20% less than the allowable discharge rate. There is room for seasonal peaking of leachate discharge.

6.4.2 Leachate Equalization Storage

It is proposed to increase raw leachate equalization capacity in front of the proposed leachate treatment plant. The plant design calls for 568 m^3 of raw leachate equalization which is proposed to be increased to 1,750 m^3. The size of the equalization storage has been based on the following criteria:

- provide seven (7) days of storage at maximum leachate flow;
- maximum flow according to **Table 6-2** is 90,948 m^3/yr ($\pm$ 250 m^3/day);
- accordingly, required storage is 7 x 250 = 1,750 m^3.

The equalization storage may be provided in a single tank having capacity of 1,750 m^3 which could replace the currently approved storage unit. Alternatively, two (2) tanks may be used for raw leachate equalization, i.e. approved 568 m^3 plus new tank having capacity of 1,182 m^3. The detailed configuration will be decided by the plant design engineers. All raw leachate from the site will be pumped into the equalization storage in front of the leachate treatment plant.

6.5 Contingency Disposal of Treated Leachate

Two (2) contingency methods of disposal for leachate are:

- disposal on an expanded poplar/willow forest; and
- trucking off-site to an alternate approved sewage works.

Such contingencies would be considered in the following circumstances:

- on-site pre-treatment plant failure;
- forcemain failure to Ottawa sewer system;
- City plant is unable to receive effluent from the site;
- exceedance of on-site pre-treatment plant capacities; and
- exceedance of forcemain or pumping capacity beyond what is approved in the agreement between the City of Ottawa and WM.

6.5.1 Disposal on a Poplar/Willow Plantation

The Environmental Assessment(Ref.7) considered an area in the southwest corner of the landfill site for a leachate treatment forest. It was determined that a portion of that area is too wet for such use. **Figure 4-14** in this report shows potential areas for a poplar/willow forest on-site, and avoiding the wetter areas previously shown. These areas could be as follows:

- All of the Closed South Cell. This could support the area presently planted of approximately 6.2 ha, and an expansion area of approximately 0.75 ha. 6.2 ha of this 6.95 ha area are presently approved.

- A third, fourth and fifth area to be considered would be the area designated as biosolids storage and the area west of Depression #2. These areas are shown on **Figure 4-14**. These areas are approximately 2.2 ha, 2.1 ha and 1.9 ha respectively. All of these areas would require virtually no buffer, since they are internal to the site. Assuming a loading presently used and approved of 0.43 m/annum disposal, and a total area of approximately 13.1 ha, the potential capacity would be 56,545 m^3/year (1.79 L/s).

If such a plantation irrigation were implemented, leachate from the equalization tank at the treatment plant would be pumped to the expanded plantation. This installation would result in a total of 13.1 ha of leachate treatment plantation.

Wood waste from the plantation will be landfilled or processed (chipped) and used as daily cover.

Testing and Monitoring

Refer to **Appendix 6-D** regarding proposed monitoring for the existing and proposed poplar/willow area.

6.5.2 Off-Site Disposal

WM proposes to enter into long term contingency disposal agreements with leachate treatment service providers. These providers would include municipal and private treatment facilities. During use of this contingency disposal method, leachate or treated leachate would be trucked off-site to a licensed receiver.

One of these facilities will be the City of Ottawa treatment facility. The completed contingency disposal agreements will be filed as confidential documents with the MOE District office. WM commits to entering into such agreement(s).

7. Site Controls

7.1 Staff

The following personnel are anticipated to be involved with landfill operations at WCEC:

- District Manager;
- Landfill Operations Manager;
- two (2) scale house attendants (assumed split shifts);
- a landfill foreman;
- two (2) to four (4) labourers;
- two (2) to twelve (12) equipment operators (including compactors, dozers, off-road trucks and excavators); and
- one (1) mechanic.

During construction, 15 to 40 outside contracting, engineering and other technical personnel may travel to and work at the site.

In addition to landfill operators the following additional personnel are anticipated to be involved at WCEC:

Waste Transfer and Processing Facility (WTPF):

- four (4) to eight (8) staff including C&D waste recycling and leaf and yard waste processing

Mini-Transfer Area - Residential Drop-off:

- one (1) attendant

Gas to Energy Plant and Landfill Gas System and Leachate Treatment Facilities:

- two (2) to seven (7) staff/operators

7.2 Scale House

Refer to **Drawing 4** for the entrance and northeastern part of the site. The scale house will be located between the two (2) scales. Refer to Section 3.2.2 for the possible third scale description.

Traffic lights will signal red to stop before entering onto the scale and green for proceeding off the scale. Speakers will allow verbal communication to vehicles entering or leaving the site, and to direct small vehicles to the MTA south and east of the scale. Record keeping and computer systems will allow haul vehicle details to be recorded such as truck designations, details about the load or other information, etc. Weight tickets and tare weights will be issued and recorded from the scale house. In the case of the fully automatic scale, no personnel are required to weigh in or weigh out vehicles. Rather, the drivers can weigh in with a swipe card.

Servicing of the scale house will include sanitary facilities, with a holding tank, pump, and small forcemain to the sewage septic tank at the maintenance building. Similarly, non-potable water will be piped from the maintenance building water supply to the scale house. Potable water will be brought in. All proposed new buildings will be equipped with continuous combustible gas sensor(s).

7.3 Mini-Transfer Area

The recycling drop-off bins are shown on **Drawing 4**, which shows the general detail of the MTA. Refer to Section 4.3.5 for a description of the facility and its operation.

7.4 Hours of Operation and Waste Receipt

Waste shall be accepted at the site from:

- 7:00 a.m. to 7:00 p.m., Monday through Friday
- 7:00 a.m. to 6:00 p.m., Saturday

In addition to the above noted hours for waste receipt, site operations may include daily cover removal and installation for one (1) hour before and after waste receipt hours. As required extension to the above hours is requested with the written approval of the District Manager MOE, to accommodate seasonal or unusual quantities of waste or should special circumstances or emergencies develop.

WM may limit hours compared to those quoted above, provided the hours are posted at the landfill entrance and suitable notice is provided to the public of any change to the operating hours.

Activities other than waste receipt may extend beyond the above stated operating hours.

7.5 Waste Transfer and Processing Facility

A brief description of the operation of the WTPF is included here to provide an overview of the facility, and how the WTPF operates in conjunction with the waste disposal site.

The WTPF accepts 400 t/day of industrial, commercial and institutional (ICI) and construction and demolition (C&D) waste, which are designated as rich in materials which could be diverted. These loads would be weighed in at the scale but only tonnages going to the landfill after diversion would count as part of the landfill waste.

Refer to **Drawing 3** and **Figure 4-2** for the location of the WTPF. It is located in the southwest corner of the landfill property.

All waste received will be non-hazardous solid waste. Hours of operation are the same as the landfill. ICI waste vehicles will tip their loads onto a concrete pad where recoverables will be removed. The residuals will be compacted into receiving trailers. The waste will be disposed in the landfill or off-site. The recoverables will be shipped to markets or processed and used on-site for waste covering. Stockpiles of wood, asphalt, concrete, bricks and shingles (processed or unprocessed) may be present on-site until used on-site as cover material.

ICI Recoverables

The main materials identified for diversion are cardboard, wood and metal.

C&D Waste

Diverted materials would include the following:

- wood;
- asphalt;
- concrete;
- bricks;
- tires;
- shingles;
- metal;
- cardboard;
- drywall;

- plastic film; and
- mixed plastics.

Table 4[Ref. 13] below, outlines the variation of traffic:

Table 4.[Ref. 13] Range of In/Outbound Vehicle Counts Per Hour & Per Day (between 20 and 60% Recovery for Reuse/Recycling)

Vehicle Type	Vehicles/hours	Vehicles/day
Inbound IC&I Delivery Vehicles	3.3	40
Inbound C&D Materials	5	60
Outbound Transfer Trailers	0.8 - 1	10 – 12
Outbound C&D Recyclables	0.5 – 1.6	6 – 19
Outbound IC&I Recyclables	0.2 – 0.6	2 – 6
Totals	10 - 11	120 - 135

The table designates the inbound and outbound traffic for the range of recovery, reuse and recycling anticipated for the C&D and ICI waste diverted to the WTPF.

7.6 Waste Screening and Inspection Controls

7.6.1 Acceptable Waste

The site will accept solid, non-hazardous domestic, institutional, commercial and industrial waste in accordance with O. Reg. 347 as amended to O. Reg. 461/05, as well as special waste comprising mostly contaminated soil or waste materials from industrial waste processes and judged to be non-hazardous with Schedule 4, O. Reg. 347 as amended to O. Reg. 461/05. Other non-hazardous materials will be accepted for diversion and will not be counted as part of the licensed weight going into the site, consisting of the following:

- concrete and asphalt to be recycled/crushed for aggregate for on-site roads;
- tires will be separated and transferred to outside processing facilities;
- wood in various forms to be ground/chipped or added to compost if clean, or added to daily cover if slightly contaminated or salvaged if appropriate for reuse;
- metal will be separated and transferred to outside processing facilities;

- organic processing, referring to leaf and yard waste, which will be processed and reused on-site or shipped off-site;
- blue box materials consisting of those items discussed in Section 4.3.5; and
- stewardship materials consisting of tires and electronics.

Up to 100 t/d may be diverted off-site for reuse and recycling.

No liquid or hazardous wastes will be accepted at the facility.

7.6.2 Waste Screening

No waste will enter the site without prior approval of the waste type and hauler. Approved waste would include:

- WM-hauled waste from local pickups;
- waste hauled by other operators from local pickups;
- local waste haulers carrying local, regular pickups; and
- transfer trailers carrying any longer haul waste.

Haulers requesting access for normal, residential or ICI or C&D waste must identify where the waste is coming from and the type of waste proposed to be landfilled. If approved, the hauler will appear on the permitted vehicles list at the scale house. New waste haulers will be brought to the attention (radioed) of the heavy equipment operators at the working face, who also act as spotters, to pay particular attention to the waste dumping.

Additional testing or other measures may be undertaken until WM is satisfied that the waste is suitable for landfilling. Otherwise, the waste will not be unloaded, the hauler reported to the MOE and the vehicle will be sent from the site. Alternatively, if the waste does not pass inspection but has already been tipped, WM will reload the waste into appropriate containers and arrange for disposal at an appropriate site.

During tipping and placement of waste, the equipment operators who act as waste spotters are trained to watch for suspicious or prohibited material.

Waste requiring disposal off-site will receive the appropriate waste generator number and a licensed hauler will remove and dispose the waste at an approved waste disposal site facility for the type of waste being hauled.

7.6.3 Screening Special Waste

Acceptance of special waste (e.g., contaminated soils, waste from industrial products) will not be permitted at the site unless pre-approved. Any special waste must be tested by the waste generator and submitted to WM for approval.

Non-hazardous materials (in accordance with Schedule 4, O. Reg. 347, as amended to 461/05) will be appropriately authorized, along with notice that the hauler will be bringing the material to the landfill site. Again, this will appear on the scale house records as a permitted hauler.

If delivered material appears to be changing in consistency, colour, odour or other characteristics, the generator and the hauler may be requested to halt such deliveries until additional tests confirm that the material has not changed when compared to the originally submitted test results and is still in compliance. All special waste will be non-hazardous as determined by a Toxicity Characteristic Leaching Procedure (TCLP) analysis under Schedule 4 of O. Reg. 347.

Waste from industrial processes may vary, all of which must comply with O.Reg. 347 if accepted at the site. Examples of waste from industrial processes could be off-spec manufactured materials, air filter dust from bag houses or other waste products from industrial manufacturing. WM may limit the acceptance of such waste or deny acceptance if it is difficult to handle and landfill at the working face or results in nuisance.

7.7 Detarping, Staging Area and Vehicle Inspection Area

Upon entering the active area, trucks must turn around and back up to the active area. Before backing up to the tip face, if necessary, trucks will remove tarps and any safety pins other than final pins to open the gates. This will also provide some opportunity for the waste spotters to inspect the waste before dumping if alerted by the scale house.

After the above preparatory work, the trucks can back up to the dump face and open the doors, if required, and unload.

Once loads are dumped, the trucks will again pull into the staging area to secure doors, remove any waste still caught in the box and complete preparatory work before proceeding to the scale house.

At approximately 0+315 W, just south of the outbound weigh scale, a layby area is provided for vehicle and tire inspections before exiting the site. Drivers can inspect the vehicles, and knock off loose dirt, clods or clean tires as required before exiting over the scale and out of the site. Refer to **Drawing 4** for this area.

7.8 Scavenging and Diversion

The public and WM staff are not permitted to scavenge at the landfill site. If loads are observed to be rich in materials to be diverted, the vehicle may be sent to the WTPF facility if not already directed there by the scale house. Loads containing high percentages of diversion products would not be sent to the active face but send directly to the WTPF.

7.9 Office Building

It is planned to use the Laurysen office as the WCEC office. However, since the business may still be operating when the landfill starts, the existing landfill office, which is in excellent condition, will be utilized for the site office until the Laurysen Office Building can be obtained and converted as required by WM.

The office will house the District Manager's and Operation Manager's office, conference rooms and washroom facilities.

Washroom facilities will discharge into the septic tank/pumping system, which will discharge to an existing septic bed.

Non-potable water supply will be available from exiting well facilities. Potable water will be brought in.

The building will be equipped with continuous combustible gas sensor(s) before landfilling commences within the expansion area.

Safety Protocol In Case of Methane Within Buildings or Structures

These procedures apply to all site buildings including the office building. Methane is dangerous and can cause asphyxiation by displacement of oxygen, and in sufficiently high concentrations, can ignite or trigger an explosion. Confined space entry procedures shall be followed where applicable.

If methane is detected either by permanent monitors or handheld equipment, take the following precautions:

- Do not provide any source of ignition such as matches, electrical switches or off or any other ignition or sparking means.
- Evacuate the building and/or surrounding area immediately.
- Once evacuation occurs, call qualified staff or appropriate emergency responders or 911. Staff should not enter areas without breathing apparatus where methane is detected.
- In buildings potentially exposed to methane, they should be designed for proper ventilation. If the source is temporary then leave the building or area. If the source is persistent, the building may require design with positive pressure ventilation to prevent access by methane. Proper procedures and designs would require professional staff.
- In site areas where methane could be expected, confined space and hazardous location precautions would be required with trained staff for work or access.

7.10 Maintenance Building

It is planned to use the Laurysen building as the WCEC maintenance building. This building is approximately 133 m x 35 m. The facility could accommodate several bays for storage or maintenance of heavy equipment. Also, storage of lubricants, oils, parts, change area, washroom and lunch room could be provided within the building.

Necessary grading will be carried out and granular placed to allow access of heavy equipment to the building, and to serve as a maintenance storage yard. Drainage from the site area is both northerly and southerly to the adjacent drainage ditches. Parking spaces for operators will be provided on the north side. Fuel tanks with containment will be provided. An existing septic bed shown on the drawings will be used to service sanitary facilities in the building. These sanitary facilities will also accommodate the scale house. The existing well and water supplies will provide non-potable water. Potable water will be brought in.

The building will be equipped with continuous combustible gas sensor(s) before landfilling commences within the expansion area.

7.11 Litter Control

Waste Management will have an active and comprehensive litter control program. Litter will be retrieved from:

- the external access roads;
- on-site; and
- adjacent properties and on more remote properties, if required.

Also, refer to Section 9.1.1 for clean-up of spilled waste.

7.11.1 Public Access Roads

Scale persons will:

- inspect the proper covering, and tarping of incoming vehicles; and
- warn drivers if, in their opinion, the loads are improperly covered and could allow escape of material.

Access routes will be monitored for litter, and any litter will be promptly retrieved. The main access route will be Carp Road, south of the landfill site entrance.

In addition, regular patrols will be dispatched if required to retrieve litter from Carp Road and other remote roads.

Generally, road litter is caused by small private vehicles that are inadequately tarped, improperly covered or are uncovered. When such vehicles visit the site, scale house attendants will draw this to the attention of the drivers. Large waste hauling vehicles are generally enclosed vehicles or are properly and adequately tarped.

7.11.2 On-Site

Litter is controlled by the use of good operating practices such as the following:

- prompt compaction of loose waste at the active face;
- daily cover application;
- interim cover (300 to 500 mm) on areas sitting dormant;
- partial or final capping and vegetation of completed portions of the landfill;
- gull control;
- high litter barrier fence on the downgradient side of high winds;
- moveable litter barriers near the active face that can be moved to the downwind side of the compaction and landfilling operation;

- prompt retrieval of blown litter both off and on-site; and
- tree plantings on property lines to catch litter before it reaches neighbouring properties.

7.11.3 High Litter Fence

On the east quarter of the north side of the landfill expansion, and on the easterly side of the proposed expansion, a 10 m litter fence is proposed, south of the maintenance road and west of the maintenance road respectively. This is shown on **Drawing 4**.

The 10 m high barrier will consist of pole uprights with netting or wire mesh strung between poles. The high litter fence will be erected initially before landfilling commences.

The windrose shown on Figure 2[(Ref. 1c)] indicates the highest winds which could cause blowing litter problems (>11.1 m/s) are from the south to southwest with the strongest winds from the south, southwest and occasionally from the northwest. Wind speeds greater than 11.1 m/s occur less than 2% of the time.

Some protection of at least the easterly part of the landfill during operation will be received from the existing landfill when winds are from the south, southwest.

A shorter 3 m litter fence may be installed along the north side of the landfill, extending westerly from the high litter fence, if required, and to preclude picking major litter out of trees north of the site. It will depend upon operating experience whether this litter fence is required.

All treed areas surrounding the site, and particularly near the active landfill, will assist in capturing litter. This litter will be regularly removed.

7.11.4 Moveable Litter Barriers

A series of portable litter barriers will be used to shield the downwind side of the active face from escaping litter. These barriers will be skid-mounted and can be towed into place and/or ground mounted for easy installation. Refer to **Figure 7-1** for a diagram showing these two (2) types of barriers.

7.11.5 Litter Picking

Labourers will be engaged to pick litter regularly, both on and off WM property. WM will respond to litter complaints off property within one (1) day of the complaint being received. Litter pickup on WM property

will occur at least weekly weather permitting. Extensive litter pickups will be scheduled after high wind events.

7.12 Signage

Site signage is discussed below but not limited to:

- No Trespassing

  The peripheral fencing will be signed at 30 m intervals “No Trespassing”.

- Main Site Entrance Sign

  The main site entrance sign will include:

  - Waste Management of Canada Corporation
  - West Carleton Environmental Centre
  - ECA No.
  - Hours of Waste Received
  - Nonhazardous Solid Waste Only is Accepted
  - No Liquid Waste or Hazardous Waste
  - No Unauthorized Access
  - No Dumping Outside of the Site
  - In case of emergency, call …
  - For complaints, call …

- Waste Type Signs

  At the entrance area, a sign(s) will clearly indicate:

  NON-HAZARDOUS SOLID WASTE ONLY IS ACCEPTED

  NO LIQUID WASTE

  NO HAZARDOUS WASTE

  A sign pointing to the MTA and WTPF after the weigh scale will be provided

MINI-TRANSFER AREA

WASTE TRANSFER AND PROCESSING FACILITY

At critical directional changes, signs will be arrowed to indicate direction to these two (2) facilities and active disposal area.

- Scale Instructions

Instructions on how to approach the scale:

STOP; WAIT ON RED LIGHT

PROCEED ON GREEN LIGHT

ALL VEHICLES TO GO OVER SCALE

- Drop Off Bins – Mini-Transfer Area

Drop off bins will be signed to indicate:

- various recyclables (plastics, glass, paper, cans, etc.);
- cardboard;
- metal;
- domestic waste;
- wood;
- tires; and
- electronic waste.

- Speed Limit Signs

- 20 km per hour on paved roads; and
- 10 km per hour on site haul roads and gravel roads.

- No Smoking

  The above would be posted in many locations throughout the site but particularly at building entrances, leachate control works, gas system works and obvious monitoring wells near the site entrance.

- Safety Equipment

  Signs indicating safety hard hats, safety boots, and reflective vests will be posted. There may also be specific instructions regarding ear protection, eye protection, etc., in certain areas.

- Confined Spaces

  CONFINED SPACE ENTRY REQUIREMENTS APPLY

  Such signs would be posted at all leachate manholes, cleanouts, pumping stations, condensate drain chambers and wherever a confined space is present.

- Danger - Explosive Gas Present

  This would apply to gas wells, gas systems, leachate collectors, gas management systems and flare areas and wherever explosive gas may be present.

- For Authorized Personnel Use Only

  These tags may be applied to valves, pumps, fans, leachate treatment works and gas management facilities.

- Staging Area

  The staging area could have a variety of signs designating small loads, asbestos, special waste unload locations, instructions to trucks and haulers, a directional sign towards the WTPF, etc.

  WAIT FOR SPOTTER - EQUIPMENT OPERATORS

  DETARP AREA

- Caution - Deep Water

  This sign would be posted at stormwater management ponds and infiltration basins or any deep water surface water on-site.

- Waste Trucks Leaving Site

  To control mud tracking, any special instructions to vehicles leaving the active face after dumping will be posted and revealed if appropriate if longer exit routes are required to discharge mud from vehicles prior to leaving the WM site onto Carp Road.

The above signage examples are not intended to list all signs on-site but to provide some information about the nature and types of signs that will be provided.

7.13 Fuel Handling

The large equipment at the operating face will consume the greatest quantity of fuel. The equipment will not normally be taken off the landfill unless maintenance or repairs are required. Therefore, a fuel truck will come to the active area daily or on as required intervals to fuel the machinery. Fuel consumption could vary from 2,000 to 3,000 L/day. A skid-mounted tank with 5,000 L capacity can be positioned at the active area if required for an ongoing supply.

Absorbent material and booms will also be available to contain and clean up any fuel spills on-site or accidents off-site.

7.14 Monitoring Programs and Best Management Practices Plans

Monitoring Plans

An Environmental Monitoring Plan (EMP) has been developed, including the following:

- groundwater monitoring;(Ref. 30)
- surface water monitoring; (Ref. 30)
- leachate monitoring; (Ref. 30)
- ambient air quality monitoring(Ref. 31) including dust (TSP), VOCs – 10 component including vinyl chloride, odour (reduced sulphur compounds) and total hydrocarbons (THC);

- noise monitoring; (Ref. 32)
- landfill gas monitoring; (Ref. 30) and,
- annual reporting.

Refer to the specific EMP reports for discussion on the parameters to be monitored, points of compliance, the proposed monitoring program, trigger mechanisms and compliance assessment processes.

Best Management Practice Plans

Best management practices have been developed in separate plans including the following:

- odour and landfill gas;(Ref. 34)
- dust;(Ref. 33)
- groundwater;(Ref. 43)
- combination by-products;(Ref. 35)
- noise;(Ref. 32) and
- surface water, sediment and erosion control(Ref. 37).

7.15 Equipment On-Site

7.15.1 Normal Site Equipment

Reference is made to **Table 7-1**, which indicates example of operational equipment roster for 1,000 to 2,000 t/day waste input rate. The normal operational level will be 1,200 to 2,000 t/day.

7.15.2 Construction Equipment

Table 4-1 shows the cell size for each phase.

The largest construction phase will be site preparation, followed by Phase 1. Phase 1 is anticipated to be approximately 7.1 ha, with subsequent phases approximately 6.2 ha each.

WM will issue construction tenders for site preparation and for cell base preparation phases. However, WM excavators and trucks will likely load and haul native or imported material for daily cover, and may be involved with site grading in a minor way.
The anticipated construction equipment is estimated as follows and will vary for each construction phase:

- 1 to 3 - soil compactors;
- 2 to 6 - dozers for levelling and grading;
- 1 to 3 - wheeled farm tractors with discs for clay conditioning;
- 1 to 3 - water trucks;
- 1 to 2 - road graders;
- 3 to 4 - excavators; and
- 2 to 6 - off-road trucks.

7.16 Site Maintenance

Some maintenance duties required on the site include:

- ditch cleaning;
- forebay cleaning of stormwater ponds;
- infiltration basins rejuvenation;
- road maintenance;
- wet weather and winter conditions;
- equipment maintenance;
- final cover maintenance;
- LFG system maintenance;
- leachate collector inspection and cleaning;
- pumping station maintenance;
- leachate treatment plant maintenance; and
- landfill gas flare and engine maintenance.

The above are discussed in detail below.

7.16.1 Ditch Cleaning

Ditching side slopes will erode until vegetated and stabilized. The operating landfill during extremely dry conditions or during extremely wet conditions will result in dust deposition and soil erosion on roads, which will end up in ditches, which will require periodic cleanout. The ditches, except for rip rapped steep sections, will generally be vegetated to assist in filtering sediment particles before discharge to stormwater ponds. On occasion, a smooth-bucket excavator will be required to clean the ditches. The removed material will be used for daily cover.

Refer to BMPP (Surface Water, Sediment & Erosion Control)[Ref. 37] for the inspection and maintenance schedule.

7.16.2 Forebay Cleaning of Stormwater Ponds

The stormwater ponds, particularly the forebay, will receive the siltation load from storm runoff and comprise the coarser material particles. Finer particles will flow through to the longer, more quiescent settling zone. Some fines may be colloidal, which will not settle and will discharge to the infiltration basins. Excavators with smooth buckets will clean the ponds to maintain the required storage volume and depth as required. Care in cleaning is extremely important, since the pond is lined, and damage by mechanical equipment must be prevented. Carefully place any displaced stone protective layer as required.

Refer to BMPP (Surface Water, Sediment & Erosion Control)[Ref. 37] for the inspection and maintenance schedule.

7.16.3 Infiltration Basins Rejuvenation

The infiltration basins, with time, may blind or plug, requiring rejuvenation. Carry out rejuvenation during good weather conditions, and if any water remains in the infiltration basins, pump to the alternate basin. The use of a skid steer or equivalent, to remove the top layer for disposal is recommended. Use removed material as daily cover. Replacement of this layer with proper permeable material should renovate the infiltration basins to good operating conditions.

Keep base of basins raked relatively smooth, and free of grass, weeds and other growth, which could tend to bind the soil and limit infiltration.

Refer to BMPP (Surface Water, Sediment & Erosion Control)[Ref. 37] for the inspection and maintenance schedule.

7.16.4 Roads Maintenance

All roads will be maintained in good condition to minimize noise from on-site roads.

The purpose of the long lengths of hard surface road is:

- to ensure most of the mud and dirt picked up in the landfill is dropped on site roads; and

- to minimize dust and nuisance.

All roads will be snowplowed during winter months, as required to provide continuous access to various facilities.

7.16.4.1 Gravel Road Surfaces

Gravel-surfaced roads will be kept graded and replenished with clean granular material as required to minimize dust emissions and mud tracking. A grader will maintain smooth, uniform and properly sloped road cross-sections.

Temporary roads will be serviced to ensure all weather access and safety. This may involve using recycled granular materials on temporary roads and/or wood chips near the active face to minimize mud being tracked onto site roads. Auto fluff may be used near the working face to prevent mud tracking.

Gravel roads will be scraped down during particularly adverse weather conditions, and in hot summer weather, watered with a water truck equipped with a spray bar.

The reader is also directed to Best Management Practices Plan (Dust)[(Ref. 33)] under separate cover.

7.16.4.2 Hard Surfaced Roads

Paved and/or concrete surfaced roads will be kept in good repair. Periodic repaving may be required because of heavy use. Hard surfaced roads will be maintained by scraping any dirt and mud off the travelled surface and sweeping/flushing to keep roads relatively clean. Under particularly adverse, wet conditions, a sweeper/flusher would be used to sweep on-site roads as required. The condition of the roads will be maintained to a relatively smooth, properly shaped section without potholes to allow proper maintenance and to minimize bumps, shakes and rattles that contribute to site noise.

7.16.5 Wet Weather and Winter Conditions

The operator will be prepared ahead of time to deal with wet and/or winter conditions by having on-site the necessary equipment and materials.

Traffic on-site will be maintained by having all roads ploughed promptly after a snowfall. Winter sand will be stockpiled and applied over the roads to deal with icy conditions. Wet weather should have a minimal effect on traffic, as most of the on-site roads will be paved.

The snow will be ploughed by the on-site equipment or WM may choose to contract this work out regularly or only contract out during peak winter requirements. WM will ensure safe access to all required parts of the site. The roads will be sanded to improve traction.

Daily cover material will be brought to the working face from the stockpile areas adjacent to the landfill, or from an inactive part of the active landfill. Off-road trucks which can operate under inclement weather conditions will be used to haul cover material. Alternate daily cover could also be used for waste covering under inclement weather conditions, as it is easier to apply than a soil cover.

Portable construction pumps and other equipment that may be of assistance during inclement weather will be kept on-site or rented as required.

7.16.6 Equipment Maintenance

All mechanical equipment and engineered systems on-site will be kept in good repair and remain operational as long as required. Proper muffler and exhaust systems must be maintained to minimize noise from large operating equipment. WM will also ensure that any contract equipment brought on-site is properly maintained, muffled and leak free. Refer to Reference 35 regarding Combustion By-Products BMPP.

7.16.7 Final Cover Maintenance

7.16.7.1 Inspection

Regular inspections of the partially capped and fully capped areas will be carried out at least monthly. Areas to be noted include any areas showing:

- erosion rills;
- topsoil loss;
- general settlement areas or depressions;
- shear cracks;
- tension cracks;
- deficient and/or distressed vegetation;
- leachate seeps;
- damage to gas wells or monitoring wells;
- evidence of insects; and
- evidence of vermin.

The site will also be inspected weekly for the presence of leachate seeps.

Refer to Best Management Practices Plan[Ref. 34] (Odour and Landfill Gas) and Reference 37 regarding erosion control BMPP.

7.16.7.2 Gas Monitoring

Monitoring with respect to odour is proposed for total hydrocarbon concentrations (THC), VOC and confirmatory on-site odours. Similarly, monitoring with respect to gas consisting of THC surveys, VOC and hydrogen sulphide is proposed.

For more details refer to EMP[Ref. 31] for ambient air quality monitoring requirements and BMPP[Ref. 34] for odour and landfill gas.

7.16.7.3 Repair

Repairs will be carried out to topsoil, caps, failed vegetation and auxiliary facilities that may be affected by erosion, area settlements and shear or tension cracks in the cap. In settlement areas, topsoil will be removed and additional cap fill placed to prevent water ponding. These areas would then be re-topsoiled and re-vegetated. Erosion rilling will be smoothed, topsoiled and re-vegetated as required. If slope erosion is particularly troublesome, then drainage from the top cap area will be directed toward riprap channels underlain by geotextile filter cloth to conduct the stormwater down slope without erosion. Specific drainage chutes have not been proposed as part of the design but will be implemented as required.

Shear or tension cracks in the cap are considered more serious and are not satisfactorily repaired by surface dozing or smoothing. The shear or tension crack should be dug out wide enough to permit a small walk-behind compactor to compact new cap material in the crack down to the waste. The material placement will be brought up in layers and compacted. Once this operation is complete, the area will be re-topsoiled and re-vegetated.

7.16.7.4 Major Cap Settlement

In any areas where major settlement of the cap has occurred, it may be desirable to remove the topsoil and cap layer, on a specific area of the landfill, and add additional waste and compact same to provide a proper shape and drainage to the overall landfill slope. Such areas may be affected by snow incorporated into the fill during winter operation. High organics quickly decaying and converting to gas

and water, particularly wet waste, draining downward into drier waste, or areas where waste was poorly compacted and the weight of overlying waste and cap have caused the settlement. Long term settlements of up to 25% have been documented in the literature as a result of organic decomposition and production of methane gas.

7.16.7.5 Leachate Seeps

Monitoring for leachate seeps will be carried out weekly. Any leachate seeps on the cap will be repaired. Refer to Section 9.1.2 for leachate seep control procedures.

7.16.7.6 Other Works

Particular attention is required to gas wells in the areas of settlement. Drag-down forces could damage wells or connecting piping. In addition, well seals in the cap could be affected and should be regularly checked for integrity. Water should not be permitted to pond around the gas wells, monitoring wells or piping connections.

Once the cap is stable, the inspections can be cut back to quarterly.

Access roads on the cap will be maintained for areas requiring maintenance, monitoring and sampling.

7.16.8 LFG System Maintenance

Well head monitoring will provide indications of any maintenance or adjustments required to the system. Well heads are monitored for the following:

- methane/oxygen concentrations – this is also bulk monitored at the blower building, and if excessive air content is detected, then back tracking can be carried out to locate the source;
- gas temperature;
- vacuum; and
- gas flow rate.

The site has been provided with a low volume, poor gas quality 250 diameter gas header if required, which can be directed to the candlestick flare for flaring poor quality gas.

Desirable methane values are 40 to 60% by volume. Oxygen would be less than 5% by volume. Vacuum required will depend upon the state of the landfill cover. Lower vacuum is required when starting

the landfill, and limited cover is available to prevent infiltration of air into the waste. Temperature will provide an indication of the microbiological activity and landfill state. Flow values will vary with the amount of waste landfilled, density, water content, etc.

Monitor well heads at least monthly. Conduct inspections to ensure tightness of cap, prevention of leakage, ensure no damaged or out of position pipes.

Semi-annually, or more frequently if required, measure liquid level in gas wells to ensure they are not flooding. Pump out water or install dewatering pumps as required.

Check all condensate drain chambers/pumping stations to ensure proper liquid levels and operation of the pneumatic or electric pumps as equipped.

Operate isolation valves or shut-off valves on the system twice annually to ensure valves operate properly and can function when required.

7.16.9 Leachate Collector Inspection and Cleaning

Since the leachate collector pipe system is an important component of the leachate control/removal system, regular inspections and flushing is required. Regulation 232/98 requires annual inspection to be undertaken, with cleaning as required. This interval is required for at least five (5) years post-construction.

The leachate collector pipes will be strung with stainless steel wire cable to allow inspection and cleaning tools to be winched into the collectors from either end. Flushing tools will consist of self-propelled nozzles which provide high-pressure water jets pointing backward that help propel the nozzle forward. In this case, the nozzle would actually be winched into the pipe as required. It may be necessary to provide an acid wash periodically to assist in maintaining the integrity of the drain holes.

7.16.10 Pumping Stations Maintenance

All aspects of the leachate pumping stations will be inspected/tested/maintained or repaired. In particular, high-maintenance issues in leachate pumping stations will require the periodic replacement of:

- pump and motor;
- seals;

- electrical cables; and
- controls and pressure sensors.

The function of the pumping station will be apparent from alarms, monitoring of run time and flow meter readings. Upon indication that a malfunction has occurred, immediate maintenance will be undertaken.

Since the upslope riser systems are critical, they will be duplicated in the primary leachate collector system. Spare pumps of each model will be kept on-site to ensure prompt replacement when required and that delivery times for new pumps are not an issue.

7.16.11 Leachate Treatment Plant Maintenance

The plant maintenance procedures are outlined in the O&M manuals for the treatment plant.

7.16.12 Landfill Gas Flares and GTE Engine Maintenance

The maintenance procedures are contained in the O&M manuals for the flares and engines respectively.

7.17 Site Safety

WM have an on-site safety program that is regularly reviewed and modified as required and which includes the following:

- Monthly meetings are held by WM staff to discuss site safety protocols and disposal operations and progress.
- All workers must wear hard hats, reflective vests or clothing and safety boots when outside on-site in compliance with WM's safety policy.
- Protective hearing gear may be required, depending on the requirements of the job.
- All heavy equipment must have back-up alarms.
- All on-site speed limits must be obeyed.
- Designated workers are sent on first aid training courses.
- Smoking is permitted only in designated areas.
- WM has first aid kits, fire extinguishers and spill kits on-site, and WM staff has been familiarized with their use and locations.

The proposed Emergency Response Plan is provided later in this report.

7.18 Control of Vectors and Pests

7.18.1 Vectors

Although food waste exists on-site, daily covering, heavy compaction equipment and machinery constitute a hostile environment for vectors. Rodents will be baited and poisoned on an "as required" basis by a professional pest control company. This will reduce vectors to a minimum.

7.18.2 Gull Control

As part of the detailed impact assessment carried out for the EA, a detailed study was carried out by Beacon Environmental, and is contained in Reference 5L. This report was updated and is noted as Reference 46.

The summary table from that report is included in **Appendix 7-A** for information.

Although active management of gulls are proposed at the WCEC, other facilities in the area attract gulls and include the following:

- City of Ottawa Trail Road Landfill;
- Tomlinson Waste Services Waste Transfer Station north of the WM property;
- open water sources in the area; and
- the Huntley Quarry for loafing and watering.

All of these facilities can attract gulls, which aside from general nuisance to residents and businesses in the area, the Carp airport to the north, 5 km northwest of Richardson Sideroad or about 5.5 km from the site are concerned regarding gull management.

The recommendations regarding controlling gulls would also apply to the open tipping for the WTPF, but to a lesser extent, because of the limited exposed area, combined with concentrated activity.

With respect to determining the need to amend the management efforts or employ contingencies, the consultant recommended the following criteria:

- if there are over 200 gulls regularly attracted to the site, either feeding or loafing, more than twice per week; or
- weekend use of the site by gulls exceeds 200; or

- hazardous bird activity is reported by a pilot in the vicinity of the landfill; or
- a bird strike involving a gull or a turkey vulture occurs in the proximity of the airport.

A deterrent is the maintenance of grass on side slopes associated with the stormwater ponds at more than 100 mm, since gulls do not like to loaf where grass is long.

The table in **Appendix 7-A** outlines practical steps to take in the active tipping area, waste covering, vegetation at the stormwater management ponds, keeping grass relatively long even in landscaped areas and good litter management. In buildings, if used for loafing, it is recommended that spikes or a "porcupine" peak be used to discourage landing and loafing if necessary.

Area deterrents such as whistlers and selected killing will all be used to control gulls. Communications, training, monitoring, permit requirements and reporting are recommended.

For a detailed discussion with regard to all of the above, the reader is referred to the Integrated Gull Management Plan[(Ref. 46)].

7.19 Complaints Procedure

All complaints will be directed to the landfill manager. Complaints could be received by letter, telephone call to call centre, telephone call to landfill office, email or through the municipal offices or MOE local offices. All complaints, when received, will note the complainant's name, address, telephone number, time of call, nature of complaint (e.g., dust, odours, noise, etc.), the time that the nuisance occurred and any another pertinent information that might be required. The pertinent Best Management Practices Plans contain suggested complaint logs.

All complaints will be entered in the site's complaint log. A summary of complaints will be included in the annual report. All details in regard to the complaints will be maintained at WM offices for a minimum of two (2) years.

At the time of receiving the call, if possible, provide some indication of the anticipated time to respond to the caller, first verbally and then in writing. Determine the nature of operations and meteorological conditions, if relevant, (as in the case of gas/odour emissions) dust or mud tracking in wet weather conditions, which may contribute to the cause of the complaint.

WM staff should investigate the complaint as promptly as possible, determining the source, if possible, any extenuating circumstances or reasons for the complaint.

WM staff will develop corrective action to correct the problem if possible. For instance, mechanical malfunctions will be repaired, or particularly odorous waste will be covered. Record the action taken or to be taken. If action has been taken, report this to the complainant. Otherwise, advise when corrective action is anticipated and what the action will be.

7.20 Emergency Response Plan

7.20.1 Purpose

An emergency response plan will ensure the safety of site personnel and the public and protect the environment and minimize property damage. This program has been developed and will be implemented at the site to address various emergency scenarios. Employees will be trained in emergency procedures and will review the plan periodically to familiarize themselves with the aspects of emergency preparedness. The program prepares employees to respond to an emergency in a safe, logical and effective manner.

7.20.2 Site Description

The site is the West Carleton Environmental Centre, owned by Waste Management of Canada Corporation, located at 2301 Carp Road, on the west side of Carp Road and north of Highway 417.

7.20.3 Requesting Emergency Services

Emergency services dispatch centres require the following information:

- location of incident;
- type of incident;
- name of person calling;
- telephone number where person can be reached;
- type of service required;
- if applicable, number of people injured; and
- extent of injuries.

A guideline for placing a call for emergency services is listed below:

*This is (*caller's name*) calling from Waste Management's West Carleton Environmental Centre at 2301 Carp Road.*

*I need (*police, ambulance, fire trucks, power company personnel*) to assist me.*

*We have (*describe incident, e.g., fire, injury, accident, explosion, bomb*).*

*I am located at (*to be added*). The access to the site is via the main entrance on Carp Road….*

What is the estimated time of arrival of services?

Do you need any other information?

7.20.4 General Information

Guidelines that apply to emergencies are as follows:

1. Remain calm.
2. Do not run during emergencies.
3. Communicate clearly and concisely. Avoid unnecessary details and speak slowly.
4. Forward media inquiries to the Landfill Manager or District Landfill Manager.
5. If you are directly involved in the incident, complete a written summary of your observations.
6. Be familiar with all emergency procedures.
7. Err on the side of caution when dealing with an emergency.
8. Know who on site is trained in first aid and CPR.
9. Familiarize yourself with the location of:
    a. emergency telephone numbers;
    b. evacuation plans;
    c. first aid kits;
    d. fire extinguishers;
    e. emergency gathering points;
    f. utility shut-off points; and
    g. spill kits.

7.20.5 Summary of General Procedure for All Major Emergencies

Suspend operations near the site of the incident/accident. If there is a hazard to site personnel who respond to this situation, then the following actions are required:

1. Inform scale house by radio/telephone of major emergency.
2. Scale house will call for site evacuation on the radio.
3. Scale house will contact the appropriate emergency services and notify the local MOE office if the landfill site is closed.
4. Scale house will contact the Landfill Manager or designee.
5. Shut off utilities, if required, providing time permits.
6. Employees will proceed to emergency gathering points.
7. Landfill Manager/designee will take attendance at emergency gathering points.
8. Employees wait for further instructions and arrival of emergency services.
9. District Landfill Manager must be informed; otherwise follow sequence provided by WM's Emergency Response Plan telephone list.

If no hazard to site personnel responding to the situation exists, the following actions apply:

1. Personnel nearest the incident should inform the scale house.
2. Scale house will stop traffic to the area.
3. Personnel near the incident will keep traffic/people out of the area.
4. Personnel will inform the scale house when activity can safely resume.
5. Personnel involved will inform the Landfill Manager/designee.
6. Employees involved will document the incident (memo, incident report).
7. Completed incident form will be sent to the Landfill Manager immediately.

7.20.6 Emergency Telephone Numbers

- Ambulance 911
- Police 911
- Fire 911
- Fire – Hazmat Response Unit 911

7.20.7 Auxiliary Telephone Numbers

▪ Queensway Carleton Hospital	613-721-2000
▪ Police (Ottawa Police Services)	613-572-3945
▪ Police (OPP)	613-270-9171
▪ City Hall (Mayor's Office)	613-580-2496
▪ Ministry of the Environment (Spills Centre)	800-268-6060
▪ Ministry of the Environment Ottawa District Office	613-521-3450
▪ Dangerous Goods/Disaster Services (CANUTEC)	613-996-6666
▪ Occupational Health and Safety Branch (Eastern Region)	613-274-7550
▪ Hydro Ottawa Limited	613-738-6400
▪ Enbridge Gas Distribution	866-763-5427 (For Emergencies)
▪ Tomlinson Environmental Services (Hazardous Waste Clean Up)	613-820-2332
▪ MOE Spills Centre	800-268-6060

7.20.8 WM Emergency Telephone List

1. Make these telephone calls in the order in that they appear:

2. Call the names on the following list until you reach a real voice. Leave a brief message at other numbers (e.g., "There has been an emergency at the West Carleton Environmental Centre. Please call as soon as possible.")

3. Where multiple numbers are listed, call each number before proceeding to the next person.

1. District Landfill Manager	(Work) (Cell) (Home)
2. Landfill Operations Manager	(Work) (Cell) (Home)

7.20.9 Roles and Responsibilities

7.20.9.1 Landfill Manager or Designee

This person assumes responsibility in an emergency. Every employee should know whom the designee(s) is/are in the absence of the Landfill Manager.

The Landfill Manager and designee must review the emergency duty checklist. All other employees should be familiar with it to ensure no details are neglected in an emergency.

Specific emergency response plans should be periodically reviewed.

7.20.9.2 Landfill Manager Emergency Duty Checklist

1. Verify scale house has been notified by radio or cell phone so incoming traffic is stopped.

2. Verify the scale house has called the appropriate emergency response personnel. If not, provide guidance on what services are to be called.

3. Go to the scene of the incident providing it is safe to do so and assist personnel if necessary at the incident scene.

4. Proceed to emergency evacuation gathering point.

5. Obtain attendance list/telephone list from receptionist or scale person at gathering point; take attendance.

6. Close site gate. Assign someone to the gate to allow the entry of emergency vehicles, if required.

7. Determine whether utilities were shut off. If not, and they need to be shut off, ensure that it is safe to do so before shutting them off.

8. Determine if building(s) were locked. If not, and if safe to do so, dispatch someone to do this.

9. Appoint someone to direct emergency response personnel.

10. Inform emergency response personnel upon arrival if people are missing.

11. If the site will be closed for longer than two (2) hours, begin telephoning hauling companies, transfer stations and special waste customers to inform them of the closure. If possible, provide an estimate when operations will be expected to resume.

12. Notify the District Landfill Manager. If this person is unavailable, call the WM emergency plan telephone list in order. Leave messages at the telephone numbers where there is no answer.

13. Call regulatory bodies as required.

14. Direct site personnel if they are to stay or leave. Assess whether operations will resume within a reasonable time. In the case of fire, landfill machine operators should remain on-site to assist the fire department, such as spreading cover material over smouldering areas or excavation. If fire occurs after hours, call the equipment operators in to help the fire department.

15. Begin completing an incident report.

16. Ensure persons involved in the incident complete a report or written summary statement, which should be submitted to the landfill manager within four (4) hours. In the event of a fatality, serious injury, large fire or explosion, these reports should be completed and forwarded within two (2) hours to the Landfill Manager.

17. Assist emergency response personnel as required.

18. Inspect site to allow re-entry and start up to ensure site is safe to resume operations.

19. When the all clear is provided, unlock the site gate and direct site personnel back to work. Review with staff any special requirements in view of the incident and the time remaining in the workday.

20. If utilities require restarting, contact appropriate companies, contractors and operating personnel or other persons to do so.

7.20.9.3 Scale Person

1. Notify site personnel of incident by radio.

2. Prevent incoming traffic from entering the site or divert traffic from the area of the incident, as directed by the landfill manager or designee.

3. Proceed to emergency evacuation and gathering point.

4. Remain on-site in case customer service requires assistance with information calls to customers.

7.20.9.4 Landfill Site Personnel

1. Assist with evacuating area if required and safe to do so.

2. Use radio and verbal signals to inform everyone. Look for labourers and litter pickers without radio communication and truckers unloading waste.

3. Assist site personnel with securing the site of incident if safe to do so. Provide crowd control and diversion of truck traffic as may be necessary.

4. Evacuate the area and proceed to the emergency gathering point for attendance taking.

5. Close gates if all personnel are accounted for at attendance.

6. Assist in traffic control if vehicles are attempting to enter the site.

7. Wait at emergency gathering point for further instructions from the Landfill Manager or designee.

7.20.9.5 Utility Shut-Off Locations

Site personnel should learn where shut-off valves, breakers, pumps are and how to shut them off. Any utility company valve should be inspected annually to ensure they are operational and in proper working order.

The leachate treatment plant operator and gas to energy plant operator or his assistant should assess/shut down the plant if appropriate and safe to do so.

7.20.9.6 Pumps

Depending on the nature of the incident, it may be desirable to shut off the leachate pumping station(s) power, irrigation pump power or other pumps.

7.20.9.7 Electricity

In rare incidents, it may be necessary or desirable to switch off the main breaker to the site power.

7.20.10 Emergency Evacuation Routes

Establish emergency evacuation routes. Routes for each specific work area of the site should be listed. The routes should lead to the emergency gathering point.

7.20.11 Emergency Gathering Point

The emergency gathering point for this site is located at the main parking lot at the site office east of the maintenance building. In the event of an emergency, the evacuation map leads to this point. If the emergency forbids using this point, the alternate gathering point is the main access road south of the maintenance building. Update evacuation routes as the site develops and keep the emergency response plan current.

7.20.12 Calls to Inform

> *"This is (*your name*) of Waste Management's West Carleton Environmental Centre. We have had an incident today that forced us to suspend landfill operations for (*estimated length of time, e.g., two hours, until noon, until tomorrow*). Please do not send any more trucks until (time). Questions should be directed to our Landfill Operations Manager. We are sorry for the inconvenience."*

7.20.13 Dealing with Media

All media inquiries should be directed to the Landfill Operations Manager or the District Landfill Manager. A sample response to the media is as follows:

*"There was an incident at our site. It occurred at approximately (*time of incident*). The incident was (*give type of incident, e.g., fire, explosion, spill, rollover*). Company personnel and emergency personnel are currently assessing the situation. Further information will be released by our management group later."*

7.20.14 Injury Accident

This section describes the procedure to follow for an incident where someone is seriously injured or for a fatality:

7.20.14.1 Procedure

1. The employee nearest the victim(s) should radio or telephone the scale and inform them that there is a medical emergency in the location of the victim(s). The employee should then begin to secure the area, and if he or she is trained in first aid, initiate the appropriate first aid measures.

2. The scale house should dispatch a first aid person to the incident location and call for emergency services. Emergency service may not be required if it is a minor first aid incident, e.g., simple fracture. If the incident has occurred at the working face, all traffic to the working face should be held at the scale house or redirected to another area of the landfill until the situation has been assessed by the landfill manager or designee.

3. The scale house must inform the Landfill Manager or designee of the incident.

4. The Landfill Manager will go to the scene of the incident and determine if landfill activity or any other site activity should be halted and when it is appropriate to resume activity in the area of the incident.

5. If the incident is a fatality, the landfill manager or designee should call the Occupational Health and Safety Branch at the Ministry of Labour immediately at 800-267-0915.

7.20.15 Spills/Leaks Response (Large Spill)

Spills less than 20 litres are considered small. Spills or leaks greater than 20 litres are considered large. A 5-gallon pail is approximately 20 litres. Also refer to **Appendix 8-C**, Figure B for SWM system operational guidance/emergency response.

7.20.15.1 Procedure for Large Spill

1. Clear personnel from the area.

2. Contact the Landfill Manager, designee or construction manager to assist in evaluating the situation. The landfill manager shall notify the MOE Spills Action Centre at 1-800-268-6060 immediately upon learning of the spill.

3. Don appropriate personal protective equipment for proper handling of the material.

4. If there is danger due to exposure, fire or explosion or if public safety is an issue, the Landfill Manager should suspend landfill operations by radioing the scale house and landfill operators. All personnel should evacuate to the emergency gathering point. If the emergency gathering point is an unsafe area due to conditions, personnel should proceed to the alternative emergency gathering point.

5. If the chemical is too dangerous or too toxic to handle with equipment on-site or if it appears to be dangerously reactive or unknown, contact Fire - Hazmat Response Unit and/or Tomlinson Environmental Services for assistance.

6. Contain the spill with Floor Dry, booms and absorbent pads. If necessary, ditch the area around the spill or leak, or build a berm to minimize spread.

7. Shut off valves to utilities in the area if they pose a potential risk to the spill clean-up personnel.

8. Block sewers, ditches or drains to the area that may be threatened by the spill.

9. Contact emergency response or Tomlinson Environmental Services to collect the spill with a vacuum truck, if it is too large to be collected by the spill equipment on-site, e.g., large leak in the oil or fuel storage tanks.

10. Place the spill clean-up material into an open top drum or lugger bin, including disposable PPE used in the clean-up. If there is a large amount of liquid, it will need to be drummed.

11. Label the drums as “Spill Clean-up Material”.

12. Log the spill and complete an incident report detailing the following. Note if the material entered any bodies of water or escaped the site boundary.

    a. amount of product spilled/leaked;
    b. name of material spilled/leaked, if known; if unknown, indicate spill or leak of unknown material;
    c. person noting spill/leak;
    d. date and time;
    e. estimate volume of spill clean-up material; and
    f. any other relevant details.

13. The Landfill Manager will arrange for proper disposal of spill clean-up material.

14. The Landfill Manager will indicate when normal operations can resume.

7.20.16 Spill/Leak Response (Small Spill/Leak)

Spills less than 20 L are considered small. Spills or leaks greater than 20 L are considered large. A 5-gallon pail is approximately 20 L.

7.20.16.1 Procedure for Small Spill

1. Contain the spill by using Floor Dry, absorbent pads and booms.

2. Restrict activity in the area to guarantee the safety of the personnel cleaning up the spill.

3. Shovel the spilled material and clean up debris into a drum, bag or bin. If the spill is liquid, place it in a drum.

4. Label the container(s) as spill material and the date.

5. Place in a safe storage area until disposed.

6. Log the spill and complete an incident report detailing the following:

    a. amount of product spilled/leaked;

b. name of material spilled/leaked, if known; if unknown, indicate spill or leak of unknown material;
c. person noting spill/leak;
d. date and time;
e. estimate volume of spill clean-up material; and
f. any other relevant details.

7. Write incident report/memo to the landfill manager.

8. The landfill manager will notify the appropriate agencies as required, including the MOE Spills Centre. All spill notifications and procedures shall comply with Section 92 of the Environmental Protection Act.

7.20.17 Severe Weather – Tornado

7.20.17.1 Procedure

1. If an employee sees a funnel cloud or hears of a severe weather warning for the area, inform the landfill manager/designee and the landfill supervisor.

2. Inform site personnel of approaching storm by radio.

3. The landfill supervisor should sweep the site or appoint a designate to ensure that employees do not remain exposed on-site without radio communication.

4. Shut off utilities as appropriate.

5. Employees and visitors should take shelter.

6. Do not remain in the scale house.

7. The Landfill Manager/designee should take attendance.

8. Personnel should protect their heads.

9. A radio, flashlight and candles should be readily available.

10. If personnel are caught outdoors and cannot make it inside, they should do the following as a last resort:

11. Lie flat in a ditch, excavation or culvert.

12. Find the lowest point possible. Do not remain in landfill vehicles or on heavy equipment. If there is no low spot, grab onto a tree or shrub.

7.20.18 Severe Weather – Electrical Storms

7.20.18.1 Procedure

1. Estimate the distance of the lightning by counting the second between lightning strike and the thunderclap. Each second represents about 300 m of distance. If you count fewer than five (5) seconds lightning is near.

2. Stay indoors or get indoors if possible, or get into a car or truck. Once inside, keep away from windows, doors, metal pipes, sinks and radiators. Disconnect electrical appliances, such as computers and tools. Do not handle electrical equipment during an electrical storm.

3. If caught outdoors, stay away from wire fences, metal pipes, rails and other metallic parts that could carry lightning to you.

4. Get off landfill equipment because of the high metal content. Landfill vehicles with rubber tires, such as pickup trucks, are very safe and provide excellent shelter from lightning.

5. Do not make yourself the tallest object in an open area. Get away from hilltops, top of landfill mound and trees. Do not take shelter under a tree.

6. If you cannot find shelter on the site and you feel your hair standing on end (indicates lightning is about to strike) drop to your knees and bend forward, putting your hands on your knees. Do not lie flat on the ground.

7.20.19 Severe Weather – Flood

7.20.19.1 Procedure

At this site, the main issue with respect to flooding may involve overtopping of some access road culverts, erosion, slippery slopes and roads in muddy condition, or stormwater ponds overtopping on emergency spillways.

If a flood warning occurs, the landfill manager should take the following action.

1. Order that all utilities be shut down, as the situation dictates.

2. Ensure that all visitors and site personnel are accounted for before leaving the site, if required.

3. Close the landfill.

4. After the flooding has ceased, the landfill manager and supervisory personnel should thoroughly inspect any damage. Damage and conditions should be noted and discussed with the District Landfill Manager.

5. Complete an inspection noting general conditions, areas of damage and remedial action being taken or request direction.

6. The Landfill Manager can assess any damage for insurance purposes and any environmental issues that should be reported.

7.20.20 Control of Fires

7.20.20.1 Large, Uncontrolled Fires

Procedure

The procedure for large, uncontrolled fires is as follows:

1. Contact the operations manager immediately.

2. Alert emergency services - dial 911.

3. Operations Manager or designee will begin to evacuate the site by radio.

4. All personnel should proceed to the emergency evacuation point.

5. If time permits, windows, doors and utilities should be closed.

6. Designated person will take attendance at the emergency evacuation point to ensure all personnel are present.

7. Personnel shall wait at the emergency evacuation point for further instructions from emergency response personnel and the operations manager.

8. Two (2) operators and the landfill supervisor should be on standby to assist firefighters if necessary. If fire occurs after hours, two (2) operators and the landfill supervisor must be called in.

7.20.20.2 Small Controllable Fires

Procedure

1. Inform staff of the fire and that they should move calmly move away to a point of safety. If it is at a landfill, stop all activity in the area and radio the scale house to hold incoming vehicles or divert them to a different area of the landfill away from the fire.

2. For office or shop areas, use a fire extinguisher or water for small fires in wastebaskets, bins and recycle baskets.

3. Use extinguishers only on fires involving chemicals, i.e., in the shop or on a piece of equipment. Ensure the extinguisher nozzle is aimed at the base of the fire. Use a sweeping motion as you aim at the flames.

4. At the landfill, cover the fire or smouldering area with dirt, sand or other inert, heavy cover material. If the water truck is nearby, water can also be sprayed on the area although cover material is more effective.

5. Once the area has been covered with soil, spray water over the area.

6. If the fire cannot be managed quickly, treat it as a large fire.

7. Inform the Landfill Operations Manager of the fire.

7.20.21 Hot Loads

Procedure

1. The scale house must notify the operators of the incoming load via radio immediately.

2. Landfill operations staff will prepare a special area to receive the waste.

3. Staff will ensure adequate cover is available to cover the load when it arrives.

4. Landfill equipment responding to the truck should have tracks free of debris.

5. The fire department can be called if necessary, as determined by the landfill supervisor.

7.20.22 Human Remains or Suspicious Material in Waste

Procedure

1. Stop all heavy equipment operations in the area.

2. Stop all vehicles from unloading in the area.

3. Do not allow vehicles that have unloaded or were unloading at the time leave the scene until they have been cleared to leave by the police.

4. Radio the scale house to inform them that no truck traffic should be sent to the working face and explain why.
5. If it is a body and there is a sign of life, begin first aid immediately. Radio the scale house to call an ambulance.

6. Call the police and inform the Landfill Manager and the landfill supervisor.

7. Create minimal disturbance in the area to minimize the destruction of evidence.

8. Have a staff member close the access road to the area so that only police and investigators can assess the scene.

9. Do not allow the media past the scale area unless the police have authorized them to access the area.

10. Do not answer questions by anyone other than the police and investigators.

11. All staff working in the area should complete individual incident reports.

7.20.23 Explosion or Gas Leak

Procedure

1. Begin evacuation of site. Personnel should be informed by radio.

2. Contact the Landfill Manager or designee to assist with the complete evacuation of the site. Suspend all operations.

3. Proceed to evacuation point unless it is unsafe. If this is the case, proceed to the alternative gathering point.

4. If time permits, shut off all utilities.

5. The Landfill Manager or environmental compliance manager and/or leachate treatment/gas management operator should assess the site.

6. Attendance should be taken.

7. Staff should remain at the evacuation point and await further instructions.

7.20.24 Bomb Threat

Procedure

1. Get as much information from the caller as possible; do not interrupt.

2. Listen to the caller's voice for any background noise.

3. Notify the police immediately.

4. Quickly have employees search their work areas for unusual packages. Touch or move nothing.

5. Evacuate the site.

6. Wait for the police to provide further instructions.

7.20.25 Labour Unrest/Strike/Demonstrations

These types of situation should be handled in a similar manner:

1. Do not become a spectator or involved with the action. Do not argue or provoke an incident.

2. Leave as soon as possible.

3. Lock all facility doors and gates.

4. Close drapes and blinds.

5. If someone enters your work area, calmly ask him or her to leave. Do not argue with them. Call the police to have them escorted off the premises if they are unwilling to leave.

7.20.26 Asbestos Release

Procedure

1. Clear everyone from the area where the asbestos was released, and everyone downwind of the release area.

2. Request the scale house or landfill supervisor to notify the Landfill Manager and/or District Manager.

3. Suspend operations in the area and downwind areas until the spill has been cleaned up.

4. Put on the appropriate PPE, glasses, Tyvec coveralls with hood and booties, hardhat, gloves, safety boots or rubber boots and respirator with HEPA cartridge. Duct tape wrists and ankles.

5. If the release or spill is less than 50 kg, go to step 8 of this procedure.

6. If the release or spill is 50 kg or more, call MOE Spills Centre to report the release.

7. If there is significant danger of material being transported by wind off-site, call police to have them evacuate downwind residents or, at a minimum, advise downwind residents to remain indoors until clean-up can begin.

8. Wet down the material as soon as possible to minimize release of fibres.

9. Collect spilled material and place it in drum or heavy polyethylene bags unless it is in the asbestos-disposal area, in which case it should be covered with heavy cover material immediately.

10. Transfer the material to the asbestos-disposal area.

11. Rinse all equipment used in the clean-up to wash away fibres. Do this in the asbestos-disposal area.

12. Place clean-up material in the asbestos area.

13. Cover asbestos area as per usual operating requirements. Do not compact until sufficient cover has been placed over the material. Check areas downwind to ensure that no spill material has been carried away from the spill site. If so, it must be cleaned up using protocol listed in Steps 8 to 13.

14. Remove disposable PPE and place in bag to dispose of in the asbestos-disposal area of working face. Discard respirator cartridge. Do not reuse the cartridge.

15. Reopen the working area.

16. Wash hands and face before eating, drinking, smoking or chewing gum.

17. Clean the respirator.

18. Send clothing for laundering.

19. Complete incident form.

7.20.27 Managing Highly-Emotional Person

Procedure

1. Do not make eye contact or verbal contact with the person who is exhibiting signs of anger or uncontrollable and aggressive emotions.

2. Move away from the person. Do not attempt to interfere with what they are doing.

3. If the person is in the possession of any type of object that could seriously injure other personnel or cause death (e.g., gun, stick, pipe, etc.), get as far away from the person as possible. If the person has uttered a threat or threatens to seriously injure you, get on the radio, say the words “Code Red”, and state your location.

4. When the scale house hears “Code Red”, they will immediately radio back “Code Red Confirmed” and proceed to call 911 for the police.

5. The scale house should inform a supervisor immediately and send another worker to the place where the “Code Red” is happening.
6. Once you have heard the “Code Red”, make some quick mental notes about the person, who he is, what is making him upset, etc. This will assist the police.

7. If you are on the radio and do not hear the scale house call the “Code Red Confirmed” within 15 seconds, get on your radio and confirm the “Code Red” and immediately call the police.

8. If the person does not appear to be putting anyone in immediate danger but is demonstrating unacceptable behaviour, radio the scale house to document the details of the situation and have the scale house contact a supervisor immediately.

8. Stormwater Management

The stormwater management features of the landfill expansion are shown on **Drawing 4**. Sections through the stormwater ponds and infiltration basins are shown on **Drawings 9 and 10.** Phasing **Figures 4-1 to 4-13** show the sequence of the site development including stormwater management system. **Figure 8-1** shows the drainage areas before development of the landfill expansion. Section 8.2 describes pre-development conditions in detail. **Figure 8-2** shows how drainage and subdrainage areas are broken down and controlled after the development of the new landfill footprint. Section 8.3 describes post development flow control and stormwater management ponds for the site development. **Figure 8-3** provides details related to water storage facilities.

8.1 Objectives

The general objectives of the stormwater management plan are as follows:

- control surface water draining on-site;
- control quality and rate of runoff discharging from the site to protect water quality and wildlife habitat and to prevent flooding within the South Huntley Creek watershed. Off-site discharge of surface water will be limited to the site perimeter and no offsite discharge from the existing and proposed waste fill areas will occur; and
- control sediment discharge and erosion during site operation and development.

Runoff from the landfill expansion area will drain into landfill perimeter ditching and pass through lined Stormwater Pond #2, where it will be settled before being discharged into Infiltration Basin #2. Runoff from the existing landfill footprint will be contained on-site in one of several depressions including new Infiltration Basin #1. These natural and manmade water storage facilities serve as groundwater recharge areas. Clean runoff from non-operating areas along the site perimeter will continue to drain off-site bypassing the above noted groundwater recharge areas.

The stormwater management plan complies with the MOE Landfill Standards[Ref. 19]. The design criteria for the site's stormwater facilities are as follows:

Internal Ditches and Stormwater Structures

- 1:25 year storm
- Provide overland flow route to carry peak flow from a 1:100 year storm.

Surface Water Quality Control

- Stormwater ponds sized to store/treat runoff generated from a 4-hour, 25-mm storm event.

Surface Water Quantity Control

- Control post-development peak flows from all storm events up to 1:100 year at or below pre-development levels. This applies only to the areas with direct off-site discharge along the site boundary. There will be no off-site discharge from the central part of the site containing all waste disposal areas.

Infiltration Basins

The proposed infiltration basins are sized for 1:100 year storm event and in accordance with design criteria outlined in the MOE "Stormwater Management Planning and Design Manual"[Ref. 17] as follows:

- Depth to bedrock and water table – at least 1 m
- Water storage depth – no more than 0.6 m

The 1:100 year storm is the regulatory flood for Eastern Ontario (Zone 2), which includes the WCEC Facility.

8.2 Pre-Development Conditions

Refer to **Figure 8-1** for the outline of the pre-development drainage areas. General hydrologic information concerning each drainage area is presented in **Table 8-1**.

The site is situated within the South Huntley Creek watershed which drains in an easterly direction north of the site. The South Huntley Creek is a tributary of Huntley Creek which in turn empties into the Carp River northeast of the site. South Huntley Creek is a permanent warm water system that has been significantly impacted historically by surrounding agricultural land use and roadways which have bisected

its length into smaller reaches, separated generally by culverts. The South Huntley Creek watershed extends to the south of Highway 417 west of the site. The drainage divide runs near the south limit of the WM property just north of Highway 417. The lands draining south to Highway 417 belong to the Feedmill Creek watershed. Feedmill Creek is also a Carp River tributary. The active quarry on the east side of Carp Road locally influences drainage patterns.

The site is relatively flat with the exception of the existing landfill mound which rises approximately 40 – 45 m above the adjacent ground. Generally, the land slopes northeasterly and local drainage patterns are influenced by wetlands and manmade depressions (ponds, pits). These no outlet features serve as groundwater recharge areas and contribute to South Huntley Creek base flow. A portion of the groundwater flow is also drawn by the quarry east of the site.

As shown on **Figure 8-1**, the existing landfill footprint belongs to three (3) separate, no outlet Drainage Areas B, C and D. The existing WTPF in the southwest part of the site is located within Drainage Area E. The old aggregate extraction pit (Depression #5) forms another no outlet Drainage Area A. In total, on site, no outlet areas occupy 127.5 ha out of 188.3 ha under pre-development conditions. The remaining drainage areas (SH1 and SH2) discharge off-site to the South Huntley Creek and Drainage Area FD to the Highway 417 drainage system and ultimately to Feedmill Creek. A small portion of the site near the existing landfill entrance (Drainage Area F) drains into the quarry on the east side of Carp Road. Generally, drainage areas discharging off-site are located along the site perimeter and do not encroach waste fill or waste processing areas.

The site soil textures according to the Ontario Soil Map are classified as follows:

- Kg – Kars Gravely Sandy Loam Soil Group B
- Rs – Rubicon Sand Soil Group AB
- Li – Lyons Loam Soil Group B

These soils provide good drainage and are relatively permeable.

The Rational Method was used to determine peak flows using Ottawa rainfall intensity duration frequency (IDF) data. The design rainfall intensity was calculated in accordance with the formula:

$$i = A \times T_c^{-B}$$

where i = rainfall intensity (mm/hr)
Tc = time of concentration (hr)

A, B = rainfall equation coefficients dependent on storm return frequency and meteorological station location.

The following runoff coefficients were used to calculate a cumulative runoff coefficient "C" for each drainage area:

- pavement/buildings - 0.9
- gravel areas - 0.55
- existing capped landfill – soil C - 0.45
- woods-soil B - 0.19
- pasture-soil B - 0.24
- pond, wetland - 0.05
- proposed landfill 5% slope – soil C/D - 0.42
- proposed landfill steep slope – soil C/D - 0.50
- lined stormwater pond - 0.5
- infiltration basin - 0.16

The time of concentration required to determine rainfall intensity in the Rational Method was calculated using the Kirpich Method. This method gives conservative, relatively short travel times as shown in **Table 8-1**.

In the Rational Method, peak flows for storms having a return period of more than ten (10) years were increased as follows:

- 1:25 year - 10%;
- 1:50 year - 20%; and
- 1:100 year - 25%.

8.2.1 Drainage Areas With No Off-Site Discharge

8.2.1.1 Drainage Area A

Drainage Area A, located in the northeast corner of the site, occupies approximately 10.08 ha. Surface water drains overland into Depression #5 which is an old, presently unused aggregate extraction pit. The west part of the existing Laurysen manufacturing facility and gravel yard west of the building belong to this catchment. Surface water flow is not channelized. The bottom of Depression #5 is at approximately 117.5 masl.

8.2.1.2 Drainage Area B

Drainage Area B is subdivided into two (2) subcatchments, B1 and B2. Catchment B1 collects stormwater from the north slope of the existing landfill. The landfill perimeter ditch directs stormwater to the existing Stormwater Pond #1 which overflows into the elongated natural wetland (Depression #3). Under high flow conditions Depression #3 may overflow into the rehabilitated old Dibbley Pit (Depression #4) which has a bottom elevation at approximately 122.0 masl. Sub-Area B2 drains directly into Depression #4.

Drainage Area B has a very large water storage capacity particularly within Depression #4 where the water level would have to rise more than 3 m before overflowing in a northerly direction. Drainage Area B encompasses 39.47 ha.

8.2.1.3 Drainage Area C

Drainage Area C is also subdivided into two (2) subcatchments, C1 and C2. Area C1 includes a large portion of the south slope of the existing landfill and lands to the south of the existing landfill. Sub-basin C2 collects runoff from the majority of the Closed South Cell including the poplar plantation and lands surrounding the Gas to Energy Facility. Area C1 drains via manmade ditch into existing Stormwater Pond #2. Under high flow conditions, this pond may overflow into adjacent Depression #1 which services sub-basin C2. Depression #1 also has substantial storage capacity and the water level may rise up to 124.5 masl (approximately 2 m) without overflowing. Drainage Area C encompasses 45.19 ha.

Referring to **Figure 4-14**, in the future, poplar/willow plantations may occupy part of Subcatchment Areas C1 and C2 and will ultimately drain to Depression #1. Flows would be reduced if poplars/willows were planted compared to present flows.

8.2.1.4 Drainage Area D

Drainage Area D includes the most easterly part of the existing landfill and the north section of the Closed South Cell. Stormwater drains into Depression #2 which lies south of the lined part of the existing landfill. Ground elevations range from 121.5 (bottom of Depression #2) to 170 masl at the top of the existing landfill mound. The area occupies 21.34 ha. Poplar/willow may also be developed in the west part of this area.

8.2.1.5 Drainage Area E

This 11.50 ha catchment in the southwest part of the site is very flat and mostly tree covered. Stormwater drains into the wetland inside the wooded area north of Highway 417. The existing waste transfer station is located within the slightly elevated west part of this area.

8.2.2 Drainage Areas Discharging Off-Site

8.2.2.1 Drainage Area F

This relatively small drainage area of 5.8 ha, on the west side of Carp Road near the existing landfill entrance, drains northerly along the roadside ditch which crosses Carp Road south of the existing Laurysen building entrance. Further downstream this channel enters Huntley Quarry. The 1:100 year peak flow at the Carp Road crossing is estimated at 0.99 m^3/s. This area has a higher level of imperviousness due to paved road surfaces within the Carp Road allowance and near the existing landfill entrance.

8.2.2.2 Drainage Area SH1

This large catchment of 41.35 ha occupies the northwest part of the site. Generally, it drains northerly towards South Huntley Creek through several channels. A large part of this area drains overland towards Richardson Sideroad along an undefined flow path. Ditching north of the WTPF directs stormwater westerly across William Mooney Road where it joins the tributary of South Huntley Creek. In summary, stormwater outletting from this basin follows multiple pathways instead of a single concentrated channel.

The area is relatively flat with ground elevations varying from 127 masl in the south beside the existing landfill to 121.5 masl in the north near the property boundary. This basin includes a large woodlot and open field which is used for agricultural purposes.

8.2.2.3 Drainage Area SH2

Runoff from this area of 5.77 ha, located in the northeast corner of the site, drains northerly via roadside ditch along Carp Road into South Huntley Creek. This area includes the commercial/industrial strip on the west side of Carp Road including a large part of the Laurysen manufacturing facility. Generally land in this part of the site slopes easterly towards Carp Road. The Rational Method 1:100 year peak flow at the outlet of this area was calculated as 0.75 m^3/s.

8.2.2.4 Drainage Area FD

This small drainage area of 7.79 ha is situated along the southern property boundary and drains into the Highway 417 ditching system which ultimately discharges into the Carp River through Feedmill Creek east of the site. There is minimal direct off-site discharge from this catchment, generally limited to the external slopes of perimeter berms along the south and east boundaries of the landfill property.

8.3 Post-Development Conditions

Refer to **Figure 8-2** for the outline of the post-development drainage areas. Hydrologic parameters characterizing each catchment are shown in **Table 8-2**.

Post-development conditions are characterized by higher runoff coefficients and shorter travel times (time of concentration) due to steep landfill grades and flow channelization. These factors tend to increase peak flows but because the site design is based on no off-site discharge, peak flow attenuation is not an issue for the landfill development area. Runoff from the proposed landfilling area will be contained on-site in Infiltration Basin #2.

The existing Stormwater Pond #1 and small wetland (Depression #3) located within the landfill expansion area will be eliminated and replaced with new clay lined Stormwater Pond #1 and Infiltration Basin #1 within Depression #4. Similarly, Stormwater Pond #2 and Infiltration Basin #2 are proposed in the area designated as Depression #5. Infiltration Basin #2 will service the entire landfill expansion area while Infiltration Basin #1 almost the entire north half of the existing landfill. The landfill expansion will shift drainage boundaries within Drainage Areas A and B, and in catchments located along the site perimeter (SH1, SH2 and F). Drainage patterns within the remaining part of the property will be hardly affected and generally will remain the same as under pre-development conditions. There will be a significant increase in the size of on-site no outlet areas to 151.76 ha from 127.48 ha under pre-development conditions. As a result, more stormwater will be contained on-site and recharged into groundwater and less discharged off-site as surface flow from lands located along the site perimeter.

Drainage Areas A and B were subdivided in small subcatchments for the purpose of hydrologic modelling which was used for sizing of the proposed stormwater storage facilities. Cumulative runoff coefficients and times of concentration were established in a similar fashion as those for the pre-development conditions. Runoff coefficient for the entire study area will increase to 0.35 from 0.29 before the development.

The following soil/land use CN curve numbers were used to establish cumulative CN value for each subcatchment within Drainage Areas A and B, which were subject to hydrologic modelling:

- pavement/buildings - 98
- gravel areas - 90
- existing capped landfill – soil C - 81
- pasture – native or imported soil B - 73
- lined stormwater pond - 85
- proposed landfill 5% slope – soil C/D - 81
- proposed landfill steep slope – soil C/D - 83
- infiltration basin - 70

All above values are for the average antecedent moisture conditions (AMC II).

8.3.1 Drainage Areas With No Off-Site Discharge

8.3.1.1 Drainage Area A

This drainage area was subdivided into nine (9) smaller sub-areas to facilitate hydrologic modelling. The overall size of the catchment will expand to 51.66 ha. The cumulative runoff coefficient was calculated as 0.432 in comparison to 0.29 prior to landfill expansion. The Rational Method 1:100 year peak flow at Pond #2 was calculated as 5.31 m^3/s.

Stormwater Pond #2 will control stormwater flows by providing temporary storage and treatment before releasing water into Infiltration Basin #2. All runoff originating from the landfill expansion area will be handled within this catchment. The proposed landfill will be graded such that all runoff from the mound will drain toward the landfill perimeter and be intercepted by the perimeter ditching. The ditching system will direct stormwater into Stormwater Pond #2. A large part of the on-site road network, including the main access road and scale house area, will be also routed through Stormwater Pond #2. Stormwater accumulating over the landfill base during base preparation as well as stormwater pools west of the lined area will be pumped to the perimeter ditching system, on an as required basis. Refer to **Appendix 8-C**, Figure D for decision-making criteria related to construction water.

8.3.1.2 Drainage Area B

This watershed was also subdivided into multiple sub-areas to facilitate hydrologic modelling. Drainage Area B will be smaller, 22.58 ha down from 39.47 ha originally as a result of the proposed development.

The northwest part of the catchment will be shifted into Drainage Area A and comprise part of the landfill footprint. The cumulative runoff coefficient increases to 0.398 from 0.32 prior to development. The overall CN number was estimated at 79.1 and the Rational Method 1:100 year flow at Pond #1 was calculated as 2.13 m^3/s.

Stormwater Pond #1 and Infiltration Basin #1 will function in the same fashion as stormwater storage facilities within Drainage Area A. New ditching will be provided on the west and south side of the existing landfill to intercept runoff coming from side slopes and direct it towards new Stormwater Pond #1. The south half of the main access road between two (2) mounds and the entire MTA are included within this drainage basin.

8.3.1.3 Remaining Drainage Areas

The size of Drainage Areas C, D and E will not change as a result of the landfill expansion as there is no major development planned for the south half of the WM property. Construction activities will be limited to the leachate treatment plant, contingency poplar plantation, road improvement (paving), extension of underground utilities and minor building improvements (blower building). These activities will have a negligible effect on the existing drainage patterns, and stormwater flows will remain the same as under pre-development conditions.

8.3.2 Drainage Areas Discharging Off-Site

8.3.2.1 Drainage Area F

The catchment boundary will be slightly realigned as a result of the landfill expansion with a minor reduction in size to 5.24 ha from 5.8 ha. The imperviousness level will increase with construction of the new access road off Carp Road and the Carp Road widening near the new entrance. This part of the site will also be subject to landscaping activities such as tree and bush planting, etc. The runoff coefficient for this area will increase by approximately 10% to 0.38. The 1:100 year peak flow will remain at the pre-development level of 0.99 m^3/s. This area will continue to discharge into the quarry east of the site.

8.3.2.2 Drainage Area SH1

The post-development size of this area will decrease to 18.44 ha down from 41.35 ha. For this reason there will be no increase in flows leaving the site. A decrease in size of this basin is a result of the proposed development; a portion of this area would become part of the landfill footprint.

Generally, this area extends near the limit of the development area and as such will not see major construction activities. Clearing and earthwork will be limited to the south and east catchment boundary. Landscaping and reforestation activities will take place within the westerly and northerly buffer area.

8.3.2.3 Drainage Area SH2

This area will not be heavily affected by the proposed development and its boundary will be slightly realigned because of interference with Infiltration Basin #2 and Stormwater Pond #2. Other project related activities will be limited to the Carp Road widening and minor landscaping work along the site boundary. Post-development size of this catchment will shrink to 5.06 ha down from 5.77 ha originally. The runoff coefficient remains unchanged at 0.36 after development. The 1:100 year flow was estimated as 0.66 m^3/s at the catchment outlet and is lower than under pre-development conditions.

8.3.2.4 Drainage Area FD

There will be no change in hydrologic characteristics of this area as there is no new development proposed within this part of the site.

8.3.3 Hydrologic Modelling

The Bentley Pondpack Version 8i computer program utilizing the SCS Unit Hydrograph Method was used for hydrologic modelling. Pondpack printouts for post-development conditions within Drainage Areas A and B are provided in **Appendix 8-B**. The reader is referred to the same appendix for schematic of both catchments. **Tables 8-3 and 8-4** provide a comprehensive summary of the hydrologic modelling results. These results include rainfall data, flows, runoff volumes and coefficients, water levels, storage capacities and draining times.

The synthetic SCS Type II rainfall distribution for the 24-hour storm for the Ottawa meteorological station was used for hydrograph development with the following input parameters:

- size of drainage area;
- time of concentration;
- calibrated CN curve number; and
- constant infiltration rate of 12 mm/hr for both infiltration basins as recommended by the Geotechnical Report(Ref. 18c) and hydrogeologist.

Default equations for time to peak and peak discharge of the hydrograph were used.

Hydrograph routing and addition in accordance with the drainage area schematic was carried out by the computer model. Stormwater ponds and infiltration basins were sized through an iterative process until they complied with the established design criteria. The Modified Puls Method was used for reach routing to account for hydrograph translation through the on-site ditching network.

It is interpreted that modelling results are conservative because simulated low frequency peak flows exceed those calculated manually with the Rational Method. For example, simulated 1:100 year flow at Pond #2 is 7.71 m^3/s, and is 45% higher than the same flow determined with the Rational Method. Similarly, runoff coefficients shown in **Table 8-3**, Column (7) for low frequency events are generally higher than the corresponding coefficients shown in **Table 8-2** even when accounting for the Rational Method peak flow increase factor for infrequent storms. For example, the simulated 1:100 year runoff coefficient for Catchment B is 0.533 and higher than the adjusted corresponding Rational Method coefficient of 0.498 (0.398 x 1.25) shown in **Table 8-2**. This indicates that the ponds are not undersized and that their storage capacities are adequate and conservative.

8.3.4 Stormwater System Infrastructure

8.3.4.1 Ditching

The overall layout of the proposed ditching system including invert elevations is shown on **Drawing 4**.

Ditching will be trapezoidal in the section with bottom width ranging from zero (triangular section) to 2 m depending on estimated flow. Schedule of ditch bottom widths is provided on **Drawing 4**. The highest flows will be in the landfill perimeter ditch draining into Stormwater Pond #2. The design 1:25 year flow for the south and north branches of the landfill perimeter ditch near Pond #2 inlet was calculated at approximately 1.8 m^3/s. Water depth under such flow in trapezoidal channel having a bottom width of 2 m and a slope of 0.5% would be 0.5 m which is less than the minimum ditch depth of approximately 1.1 m.

The landfill perimeter ditch will have an outer slope of 3H:1V (minimum) and an inner (landfill side) slope of 4H:1V (minimum) which is the same as the landfill side slopes. All other ditches will have side slopes not steeper than 3H:1V. Generally, the proposed ditches are relatively flat at grades around 0.5%. Flow velocity under such conditions for the 1:25 year storm event will be low at less than 1.0 m/s. Such velocities are suitable for grass lining which will assist in sediment filtering and erosion control.

Locally, ditching will be steeper and all ditches sloping at more than 3 to 4% will be rip rap lined with appropriately sized stone over geotextile. This includes ditching along the high access road having a grade of up to 8%. The rip rap lining will also be provided at all culvert ends, ditch inlets and at ditch

alignment changes exceeding 45 degrees. Rip rap grouting may be used to further reduce erosion potential and washouts. Rock check dams will be installed along the long, steep ditch sections to reduce flow velocity.

Erosion control mats and sod may be used wherever establishment of vegetation cover is critical.

8.3.4.2 Storm Sewers and Culverts

Two (2) sections of storm sewers are part of the proposed drainage system. The first is 300 mm diameter overflow line for Infiltration Basin #1 discharging into Infiltration Basin #2. This line is provided in compliance with design guidelines which require overflow protection for infiltration basins. The line will not transmit any stormwater under normal conditions.

The second short section of storm sewer will service the mini-transfer drop-off area. This sewer line will be equipped with an isolation valve and Stormceptor unit to provide continuous treatment of total suspended solids as well as oil separation in case of an accidental spill upstream within the drop-off area. The above noted system components will prevent pollution from reaching Stormwater Pond #1 and ultimately Infiltration Basin #1.

Corrugated steel pipe (circular and arch) will be used for culvert installation. Corrugated steel pipe arch (CSPA) is proposed under roads where increased depth of cover is required to withstand loadings from vehicular traffic. Concrete culverts are proposed at critical locations where heavy truck traffic is anticipated and where lighter pipe integrity could be in question.

All culverts were sized for the 1:25 year flow with sufficient spare capacity to allow for the 1:100 year flow to pass without overtopping ditch enbankments.

8.3.4.3 Stormwater Ponds

Two (2) new stormwater ponds are proposed for surface water quality control in accordance with the MOE Landfill Design Standards. The ponds will attenuate peak flows but this function is not important since pre-treated stormwater discharges into the infiltration basin where it is recharged into the shallow groundwater system. The ponds outflow rates are controlled by recharge capacity of the shallow groundwater regime in the vicinity of the downstream infiltration facilities.

Stormwater pond dimensions and outlet pipe details are outlined on **Figure 8-3**. Hydrologic modelling results related to stormwater ponds are shown in **Table 8-3**. This table shows pond flows, volumes, water

levels and drainage times. The ponds internal side slopes will be 4H:1V (minimum) and external side slopes 3H:1V (minimum). Each pond will consist of the following storage zones:

- permanent water pool, which includes sediment storage – between pond bottom and invert of the outlet pipe; and
- settlement zone – above invert of the outlet pipe.

The outlet pipe will be a relatively small diameter culvert (HDPE pipe) equipped with an isolation valve. A typical section for Pond #1 and Pond #2 are shown on **Drawing 9**. All ponds will be lined with a 600 mm clay liner. The pond base and side slopes up to 0.3 m above the normal water level will be covered with at least 150 mm of drainage gravel which will be placed over geotextile separator. The gravel layer will protect the underlying clay liner and serve as an indicator during sediment removal operations. In addition, drainage gravel will protect pond side slopes against wave action. The remaining portion of the internal side slopes will be topsoiled and vegetated. Fill placed within containment berms will consist of well compacted fine grained soils. In order to increase the infiltration contact area with native soils, fill material underlying the clay liner below the pond base will be composed of well compacted permeable granular material (sand). All surficial, in-place loose fill will be removed down to native soil before any fill placement. A large quantity of such unsuitable material has been identified through the geotechnical investigation(Ref. 18a and 18c) within Dibbley Pit (Depression #4). All of the above noted requirements are illustrated on Sections C, D and E, **Drawing 9**. The stability of pond side slopes has been assessed by the geotechnical engineer and found to be satisfactory(Ref. 18c) under various operational scenarios.

The proponent may change the lining of the stormwater ponds and use geomembrane supported geosynthetic clay liner (GCL) instead of a conventional clay liner. This option would be decided based on economics and subject to a geotechnical slope stability assessment.

Each pond will be capable of settling particles larger than 40 microns even during major storm events. It was determined that both ponds will be capable of settling particles as small as 7 microns. A high sediment capture efficiency is caused by relatively low outflow rates. Refer to **Appendix 8-A** for the theoretical size of settled particle calculations.

Both ponds have sufficient capacity to store/treat all runoff generated from the 25 mm storm event. This volume, as determined through hydrologic modelling, is 436 m^3 and 1,296 m^3 for Ponds #1 and #2 respectively and they are substantially lower than the corresponding permanent water pool volumes of 2,600 m^3 and 4,200 m^3 as is shown in **Table 8-3**.

Both ponds were sized with a relatively high length to width ratio exceeding 4:1.

A plunge pool (forebay) will be provided near each pond inlet to capture coarser suspended particles. The forebay will be 0.5 m deeper then pond bottom design elevation, providing additional sediment storage capacity. The forebay area will also be covered with drainage gravel and geotextile. Each pond inlet will be reinforced with rip rap. Accumulated sediment will be removed in accordance with criteria outlined in the BMP (Surface Water, Sediment & Erosion Control)(Ref. 37). Removed sediment will be used as daily cover within the active disposal area.

A rip rap baffle across the pond width downstream of the inlet(s) is proposed to improve flow distribution, minimize short circuiting and to separate forebay from the more quiescent settling zone. Each pond will be equipped with a rip rap lined overflow spillway sized for the 1:100 year flow rate discharging into the downstream infiltration basin. Pond draining time will not exceed 48 hours.

8.3.4.4 Infiltration Basins

Infiltration facilities are designed to capture and retain runoff and allow it to infiltrate rather than discharge to surface water. This system has several benefits such as reducing surface runoff volume and pollutant discharge as well as augmenting low flow stream conditions and thus supporting wildlife habitat during low flow periods.

Subsurface exploration consisting of several borings was carried out to determine in-situ soil and groundwater conditions within the designated groundwater recharge areas. This work is summarized in the Supplemental Geotechnical Investigation by Alston Associates Inc.(Ref. 18c) and contained in **Appendix 3-B**. The permeability of soil from numerous samples collected within the footprint of infiltration facilities was estimated with the Hazen formula and ranged from 5×10^{-2} cm/s to 1.6×10^{-5} cm/s.

The constant rate infiltration rate of 12 mm/hr was selected for design in consultation with the hydrogeologist based on the observed local subsurface conditions. This rate was used as an input in hydrologic modelling and was used for sizing of both basins.

Groundwater recharge at infiltration facilities will result in the long term localized mounding of the shallow groundwater table. The maximum long term rise of the shallow groundwater was determined by the hydrogeologist using “Modflow” groundwater flow computer model as follows:

- Infiltration Basin #1 – 120.81 masl
- Infiltration Basin #2 – 120.86 masl

Infiltration basin base elevations were selected to provide at least 1 m separation from the maximum predicted groundwater level.

Suspended solids loading in stormwater draining into each basin will be largely reduced by sedimentation taking place in both of the new stormwater ponds. This will control/reduce blinding and plugging of the basin base surface.

The following dimensions were established for the base of each infiltration basin:

- Infiltration Basin #1 – 116 x 158 m
- Infiltration Basin #2 – 118 x 217 m

Hydrologic modelling results including basin volumes, water levels and draining times are presented in **Table 8-4**. Maximum water storage under the 1:100 year design storm was calculated as 5,669 m^3 for Basin #1 and 15,530 m^3 for Basin #2. Each basin will have substantial additional capacity above the design water level which was calculated as follows:

- Infiltration Basin #1 – 19,573 m^3
- Infiltration Basin #2 – 28,062 m^3

This additional storage will provide a safety cushion in case of an extreme storm, heavier than the 1:100 year design event.

Sections of the infiltration basin are shown on **Drawings 9 and 10**. Imported, permeable fill will be required for construction of each basin. Permeable fill (sand having permeability ranging from 0.01 – 0.001 cm/s) will be placed loose over the scarified native soil following removal of all unsuitable loose fill material which was identified(Ref. 18c) mainly within Infiltration Basin #1 area. Interior and exterior side slopes of infiltration basins will be 3H:1V. Fill placed within containment berms will consist of fine grained soil with the uppermost 600 mm consisting of the clay liner. Permeable material placed below the containment berms will be compacted to 98% SPMDD. Impermeable containment berms are required to ensure integrity and stability of fills when exposed to hydraulic gradients resulting from a sudden rise of water level. This requirement applies to the east and northeast berm in Infiltration Basin #2. The remaining banks of the basins constructed as fill or cut will not require the same treatment as exterior containment berms and engineered fill may be used at these locations. The reader is also referred to Sections C and D, **Drawing 9**, showing construction requirements along the boundary between infiltration basin and stormwater pond. All interior and exterior side slopes of infiltration basins will be topsoiled and vegetated, with the base remaining bare so it could be raked and scarified when needed. Permeable

sand on the bottom of an infiltration basin will intercept silt, sediment and debris that could otherwise clog the base of the basin. The upper 50 – 100 mm of this sand layer can be readily restored following removal operations. Sand replacement material shall be of the same quality as originally installed material (hydraulic conductivity 1 x 10^{-4} to 1 x 10^{-5} m/s).

Rip rap lining for energy dissipation will be provided at all inlets into the basin for erosion control. All basins will also be equipped with an access ramp for maintenance access. Overflow spillways are provided in accordance with design guidelines to protect infiltration facilities against catastrophic failure from excessive rise in water level but due to the significant additional capacity within the basins are never anticipated to be used.

8.3.4.5 Operational Controls

Under normal conditions, isolation valves on the outlet piping from stormwater ponds will be open allowing water to drain by gravity into infiltration basins. These valves will be closed if contamination is suspected including the valve controlling drainage from the mini-transfer drop-off area.

Stormwater will flow into the ponds, deposit the coarse fraction of sediment in the forebay and settle smaller particles in the aft-bay section of the stormwater ponds before water is released into the infiltration basin.

In day-to-day operation, staff will visually monitor all stormwater ponds. Should contamination be suspected, testing of the stormwater pond's contents will be carried out by hand-held, on-site instrumentation to measure conductivity, pH and visual aesthetic conditions. Conditions present on site that might indicate the necessity to monitor the pond's contents could include the following:

- visible leachate seep to surface water flowing to one of the surface water ponds;
- evidence of dark stained water;
- oil or any other substance in amounts sufficient to create a visible film, sheen or foam on the receiving waters; or,
- accumulation of floating or settleable solids.

Refer to **Appendix 8-C** for decision-making criteria related to regular and emergency operation of stormwater ponds. Stormwater quality criteria for field and laboratory sampling are also outlined in the same appendix.

The isolation valve on the outlet piping would be closed and remain closed when the pond's water quality is in question. A sample taken for further analysis would be placed in a "rush" category for reporting by an independent laboratory. If the stormwater does not satisfy the trigger concentrations then the stormwater contingency plan will be initiated. Refer to **Appendix 8-C** for a list of contingency corrective actions.

The isolation valve controlling the MTA shall be closed immediately after spill detection and remain closed until satisfactory clean-up is completed and the area suitable for normal operations.

Depending on the type and severity of contamination, it may be desirable to remove accumulated sediment from the forebay and/or aft bay of the stormwater pond.

These procedures will allow control of surface water discharging into infiltration basins. Under normal conditions, surface water draining into infiltration facilities shall be deemed suitable for groundwater recharge.

8.4 Erosion Control

Various surface water, sediment and erosion control Best Management Practices are presented in Reference 37.

9. Contingency Plans

9.1 Contingencies

This section describes the anticipated response to issues, both expected and unexpected. In some cases, the responses have already been discussed in Section 7. Examples are injury, weather issues, floods, control of fires, hot loads, human remains in waste, explosion or gas leak, bomb threat, asbestos release and other aspects. The handling of the contents of stormwater ponds is covered in Section 8 and **Appendix 8-C**. This section will cover some additional contingency plans.

9.1.1 Spilled Waste

Spilled waste could result from a truck upset, either on site or off site. The procedure to address spilled waste would be as follows:

1. Call police/fire department/ambulance as appropriate if injuries to people have occurred. Refer to Section 7.20.15 for notification of MOE regarding spills.

2. Have personnel trained in waste clean-up procedures.

3. The Landfill Manager or landfill supervisor will dispatch the appropriate loaders, trucks or bins to clean up the waste.

4. Attend the spill at the site and proceed to clean up the waste as soon as possible.

5. If the spill is on a public roadway, conduct the appropriate traffic control if the police are not present or until their arrival.

6. Retrieve any waste as soon as possible from ditches or watercourses.

7. After the majority of the waste has been cleaned up, have site personnel sweep roads and rake shoulders and ditches to thoroughly retrieve all waste and litter.

8. Conduct any appropriate tests, if required, such as samples upstream and downstream from any watercourses to determine any impacts. The monitoring consultant can advise and assist in this regard.

9. If the material is contaminated soil, it may be advisable to take some soil samples and submit them for analysis to ensure the clean-up has been effective and contamination is not present.

9.1.2 Leachate Seeps

9.1.2.1 Contingencies for Surface Water

At landfill sites, one of the issues that must be addressed is leachate seeps, which can occur on the landfill slopes above grade. Several methods of dealing with leachate seeps are outlined below.

9.1.2.2 Hydraulic Connections into Waste

Refer to **Figure 9-1 Detail (A)** for the condition and anticipated remedy. In this case, the seep is indicated to be caused by a localized, low permeability layer, which causes water to perch on top of the layer and results in a seep. Low permeability layers may result from fine-grained daily cover, not penetrating the daily cover layer before new waste is landfilled, or low permeability waste layers. If such low-permeability layers are encountered, leachate may migrate laterally, resulting in the leachate seep if it occurs at the periphery of the site above grade. The easiest solution is to follow this procedure:

1. Locally remove topsoil and cap.
2. Excavate into the waste, puncturing the low permeability layer and allow drainage into unsaturated waste below.
3. Fill the excavation with clear stone to provide a good drainage conduit into the unsaturated waste.
4. Restore cap, topsoil and vegetation.

A similar condition could also be solved as shown on **Figure 9-1 Detail (B)**. In this case, the seep is intercepted with a clear stone trench and directed down slope to the primary drainage gravel.

9.1.3 Leachate Mound Control

The alternatives described above and depicted **Figures 9-1 Detail (A) and 9-1 Detail (B)** are most effective for localized, small seeps. However, if a landfill mound develops, the solution depicted in **Figure 9-1 Detail (A) and 9-1 Detail (B)** would not be effective.

Mounding can result from a combination of waste compaction/settlement/degradation resulting in the waste becoming clogged above the primary drainage layer. Because the above conditions developed

with time and compounded by biological slimes, the waste could become sufficiently impermeable and not allow the transmission rate of the infiltration to reach the primary drainage layer. In this case, the mound would develop until sufficient driving head occurs to overcome the impermeability condition. However, in the extreme, the mound could break out from the side of the cap above grade.

As long as the primary drainage layer remains unplugged and effective, the mounding would not have any effect on groundwater quality since any leachate that reaches the primary drainage layer could still be removed. If the primary drainage layer clogs completely and leachate cannot be withdrawn, the mound will obviously build up and must be controlled in other ways. Three (3) possible actions can be taken as follows:

9.1.3.1 Pumping Wells and/Or Sumps

Common contingency systems to control localized leachate mounds include either pumping sumps or pumping wells.

Figure 9-1 Detail (C) shows both sumps and wells being used either to control mounding, locally or over a larger area.

Sumps would generally be constructed with a larger diameter bore than wells and a large diameter perforated pipe installed, which is encased in clear stone.

A pumping well would be constructed with a standard drilling rig and installed in accordance with standard environmental practices. The well screen would be sized to permit placement of granular filter material around the well to reduce clogging. Submersible-type pumps would be explosion-proof. Leachate would be pumped to the leachate treatment plant.

9.1.3.2 Peripheral Leachate Collector

The most likely method of controlling mounding and seepages resulting from a mound would be to install a partial or total peripheral leachate collection system. This system, if installed at the outer edge of the landfill, is sufficiently shallow that it is feasible, maintainable and replaceable. **Figure 9-1 Detail (D)** indicates the location of the installation. Installation would consist of the following:

1. Remove cap and topsoil locally.

2. Excavate waste and install clear stone bedding and a perforated leachate collector pipe system, taking care not to damage the existing primary liner system. The peripheral system would be sloped in the same direction(s) that the leachate collection header(s) were installed originally.

3. Pumping systems would be installed in a manhole(s) to extract leachate.

4. Repair cap, topsoil and vegetation.

9.1.4 Groundwater, Surface Water and Landfill Gas Migration

Refer to EMP Report[Ref. 30] for contingency plans related to groundwater, surface water and landfill gas migration.

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Glossary of Terms

Glossary of Terms

DEFINITION OF ACRONYMS

Acronym	Definition
ADC	Alternate Daily Cover
ADT	Average Daily Traffic
ASR	Automobile Shredder Residue, sometimes referred to as “auto fluff”
ASTM	American Society for Testing and Materials
BOD	See Biochemical Oxygen Demand
BMP	Best Management Practice
C&D	Construction and Demolition
CA	Compressed Air
CAA	United States Clean Air Act (see Glossary)
CAZ	Contamination Attenuation Zone
CN	Curve Number which characterizes runoff properties for a particular soil/ground cover
CO	Cleanout
COD	See Chemical Oxygen Demand
C of A	Certificate of Approval (now referred to as ECA)
CQA/CQC	Construction Quality Assurance/Construction Quality Control
CSA	Canadian Standards Association
CSP	Corrugated Steel Pipe
CSPA	Corrugated Steel Pipe Arch
D&O	Design & Operations Report
DO	Dissolved Oxygen
DR	Dimension Ration
EA	Environmental Assessment
EAA	Environmental Assessment Act
ECA	Environmental Compliance Approval (previously referred to as C of A)
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Act
FCR	Facility Characteristics Report
FIT	Feed in Tariff
GCL	Geosynthetic Clay Liner
GDT	Mazzei® Trademark Process of Gas Removal from Liquid
GH	Gas Header
GPS	Global Positioning System
GTE	Gas-To-Energy
HDPE	High Density Polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
HEPA	High Efficiency Particulate Air
ICI	Industrial Commercial and Institutional
LandGEM	Landfill Gas Emissions Model
LF	Leachate Forcemain

Acronym	Definition
LFG	Landfill Gas
LTP	Leachate Treatment Plant
MARV	Minimum Average Roll Value
MNR	(Ontario) Ministry of Natural Resources
MOE	(Ontario) Ministry of the Environment
MSW	Municipal Solid Waste
MTA	Mini-Transfer Area
MTO	(Ontario) Ministry of Transportation
O&M	Operations and Maintenance
ODP	Ozone Depleting Prevention
ODWS	Ontario Drinking Water Standards
OH	Overhead Hydro
OIT	Oxidative Induction Time
OPA	Ontario Power Authority
OPSS	Ontario Provincial Standard Specifications
OReg	Ontario Regulation
Ottawa WMF	Ottawa Waste Management Facility
PLCS	Primary Leachate Collection System
PPE	Personal Protective Equipment
PS	Pumping Station, e.g., PS10 means pumping station #10.
PTTW	Permit To Take Water
PVC	Polyvinyl Chloride
PWF	Purge Well Forcemain
PWQO	Provincial Water Quality Objectives
SAF	Sanitary Sewer Forcemain
SCADA	Supervisory Control and Data Acquisition
SDL	Secondary Drainage Layer
SIB	Standard Iron Bar
SLCS	Secondary Leachate Collection System
SPMDD	Standard Proctor Maximum Dry Density
SWM	Storm Water Management
TCLP	Toxicity Characteristic Leaching Procedure, defined in Schedule 4, Regulation 347 of the Environmental Protection Act
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen - a measure of ammonia and organic nitrogen
TOR	Terms of Reference
TSP	Total Suspended Particulate
TSSA	Technical Standards and Safety Act
US EPA	United States Environment Protection Agency
UTM	Universal Transverse Mercator
UV	Ultraviolet
VOC	Volatile Organic Compounds, e.g. benzene, toluene, ethylbenzene, xylene (and others).
WCEC	West Carleton Environmental Centre

Acronym	Definition
WM	Waste Management of Canada Corporation
WTPF	Waste Transfer and Processing Facility

DEFINITION OF UNITS

Unit	Definition
°C	degrees Celsius
cfm	cubic feet per minute
cm	centimetre
d	day
g	gram
ha	hectare
hp	horse power
hr	hour
Hz	hertz
kg	kilogram
km	kilometre
kN	kilo Newton
kPa	kilopascal
kW	kilowatt
L	litre
m	metre
m^2	square metre
m^3	cubic metre
mASL (masl)	metres above sea level
mil	1/1000 of an inch in imperial measure
mg	milligram
MW	megawatt
N	newton
oz	ounce
psi	pounds per square inch
s	second
sy	square yard
T	tonnes
µg	microgram
µm	micrometre
µS	micro Siemens
USGPM	United States gallons per minute
V	volt
yr	year

GLOSSARY OF TERMS

Term	Definition
Adsorption	The accumulation of gases, liquids, or solutes on the surface of a solid or liquid.
Aerobe	An organism that can grow in the presence of air.
Aerobic	An environment that has a partial pressure of oxygen similar to normal atmospheric conditions.
Airspace	The volume of space within a landfill site which is permitted for the disposal of waste.
Alternative	A well-defined and distinct course of action.
Anaerobic	An environment without oxygen.
Anaerobe	An organism that grows in the absence of oxygen or air.
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed. This may be in the form of program approval, certificate of approval or provisional certificate of approval.
Aquifer	A soil or rock formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.
Attenuation	The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.).
Background Concentration	The amount of chemical in the soil, groundwater, air or sediment in the environment that would be considered representative of typical conditions in a given area or locality.
Bacteria	A group of diverse and ubiquitous prokaryotic single-celled microorganisms.
Berm	An earthen embankment or wall, erected to provide protection from the weather; to act as a landscaping screen; or to act as a mitigative measure against visual and noise impacts.
Best Management Practices (BMP)	A technique or methodology that, through experience or research, has been proven to reliably lead to a desired result. After researching all known management methods, the selection and adaptation of the most suitable practices for achieving the desired outcome.
Biochemical Oxygen Demand (BOD)	The requirement for molecular oxygen by microbes during oxidation of biological substances in sewage. The BOD test measures the oxygen consumed (in mg/L) over 5 days at 20 degrees C
Biodegradation	The lowering of the quality or value of a substance or object through the action of biological agents, usually air or water quality.

Term	Definition
Biomass	The amount of living matter present in a particular habitat.
Buffer	Something that reduces shock or impact or protects against other harm, usually by interception.
Buffer (Land use)	In a land use context, a buffer can be: 1. A space; or 2. A feature; or 3. A land use; or 4. Any combination of the above, interposed between two conflicting land uses for the purpose of reducing or eliminating the adverse effects of one land use upon the other. A buffer may be open space, where distance alone is relied upon to produce the desired results, or it may be a berm, wall, fence, or other structure or plantings, or other land use different from the two conflicting ones, but compatible with both.
Buffer Zone	In a landfill context, the area between the edge of the waste and property boundary, established to provide space for remedial measures, for the reduction or elimination of adverse environmental impact, and for monitoring.
Calibration	The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.
Cation Exchange	A chemical process in which cations of like charge are exchanged equally between a solid, such as zeolite, and a solution, such as water. The process is often used to soften water.
Certificate of Approval (C of A)	A Certificate of Approval is required under Part V, Section 27 of the Environmental Protection Act to establish a waste management system or a waste disposal site. This is the licence granted by the regulating agency which permits the operation of the landfill by the applicant or its agents. In Ontario, Certificates of Approval are granted by the Ontario Ministry of the Environment (MOE). The Certificates often specify numerous conditions which must be obeyed in order to retain approval to operate the landfill or waste processing facilities. A Certificate of Approval is required before a waste disposal management system or a waste disposal site can be used, operated, established, altered, enlarged or extended.
C of A (Sewage)	Certificate of Approval, Industrial Sewage Works yet to be issued. This C of A will approve the stormwater management ponds, infiltration basins, leachate treatment and disposal plant, including storage tanks and contingency irrigation on a poplar forest. Effluent requirements cited.
C of A (Air)	Certificate of Approval, Air mainly pertains to the flare systems for the gas management plant.
Chemical Oxygen Demand	The amount of oxygen in milligrams per litre to oxidize both organic and utilizable inorganic compounds.

Term	Definition
Composting	The controlled microbial decomposition of organic matter, such as food and yard wastes, in the presence of oxygen, into humus, a soil-like material. Humus can be used in vegetable and flower gardens, hedges, etc.
Conservative	Implementing a number of assumptions in an analysis that are intended to lead to a deliberate over-estimation of impacts.
Construction and Demolition (C&D) Waste	Solid waste produced in the course of residential, commercial, industrial or institutional building construction, demolition or renovation (e.g., lumber, brick, concrete, plaster, glass, stone, drywall, etc.).
Contaminant	A compound, element or physical parameter usually resulting from human activity or found naturally at elevated concentrations, that have or may have a harmful effect on public health or the environment.
Contaminant Attenuation Zone (CAZ)	A three-dimensional area that is located on land adjacent to a landfill site; is in the subsurface or extends into the subsurface; and is used or is intended to be used to reduce contaminants from the landfill site to levels that will have not have an unacceptable impact beyond the boundary of the zone (O.Reg. 232/98).
Contaminating Life Span	The period of time during which a landfill site will produce contaminants at concentrations that could have an unacceptable impact if they were to be discharged from the site.
Cover material	Material used to cover the waste in the disposal cells during or following landfilling operations. May be daily, intermediate or final.
Daily cover	A temporary cap constructed daily over the exposed surface of a landfill, usually composed of soil, but sometimes also incorporating synthetic membranes. The daily cover primarily acts as a physical barrier to control odours, vermin and wind-blown litter.
Denitrification	The formation of gaseous nitrogen and/or oxides of nitrogen from nitrate or nitrite by some bacteria during ANAEROBIC RESPIRATION. Denitrification only occurs in ANAEROBIC or MICROAEROPHILIC conditions. It can sometimes be used to remove nitrate or nitrite from liquid wastes.
Design and Operations Report	A document required for obtaining a Certificate of Approval, which describes in detail the function, elements or features of the landfill site/facility, and how a landfill site/facility would function including its monitoring and control/ management systems.
Design capacity (Total Disposal Volume)	The maximum total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m^3) includes both waste and daily cover materials, but excludes the final cover.
Design speed	The speed used to select geometric design components for a roadway, typically 10 to 20 km/h above the posted speed.
Disadvantage	A relative term used to indicate that a particular condition is deemed to be unfavourable or of an inferior condition when compared to another condition.

Term	Definition
Discussion North	All descriptions and directions identified in this document are conveyed relative to the alignment of Carp Road running north-south.
Dispersal techniques	Active wildlife management that drives birds and animals away from a location.
Dwelling	Any permanently or seasonally occupied residence with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling unit if it can be demonstrated that they are in regular and consistent use during the applicable season.
Engineered Soil	Soil which has been subjected to mechanical or chemical processes to achieve desired characteristics such as the degree of compaction or moisture content.
Enhance	Means as applied to the natural heritage/environment, strengthening the components of a natural area through management measures to increase stability, biodiversity and long term viability and in other respects to complement or strengthen the character of the area or site or structure.
Environment	As defined by the Environmental Assessment Act, environment means: (a) air, land or water, (b) plant and animal life, including human life, (c) the social, economic and cultural conditions that influence the life of humans or a community, (d) any building, structure, machine or other device or thing made by humans, (e) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or (f) any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach)
Environmental Assessment	A systematic planning process that is conducted in accordance with applicable laws or regulations aimed at assessing the effects of a proposed undertaking on the environment.
Environmental Impact Statement (EIS)	An Environmental Impact Statement is a document required by the National Environmental Policy Act (NEPA) for certain actions “significantly affecting the quality of the human environment”. An EIS is a tool for decision-making. It describes the positive and negative environmental effects on a proposed action, and it usually also lists one or more alternative actions that may be chosen instead of the action described in the EIS.
Environmental Protection Agency (USEPA)	The U.S. Environmental Protection Agency (EPA or sometimes USEPA) is an agency of the federal government of the United States charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Congress.

Term	Definition
Evapotranspiration	The water released from plants as they grow. The evaporation of water from plant surfaces and adjacent soil.
Facultative Organism	Organism that can carry out both options of a mutually exclusive process (e.g., aerobic and anaerobic metabolism).
Final Cover	A cap constructed over the completed surface of a landfill, usually composed of soil, but sometimes also incorporating synthetic membranes. The cover serves several purposes including: a physical barrier to prevent contact with buried wastes, reducing the infiltration of rain into the waste (to limit the production of leachate) and controlling the escape of any gasses into the atmosphere. Another aspect in designing the final cover is to make it compatible with the ultimate end-use of the site.
Frequency	The number of times per second that the sine wave of sound or of a vibrating object repeats itself. The unit is expressed in hertz (Hz), formerly in cycles per second (cps).
Gas Collection System	An engineered system to contain and collect landfill gas for safe dissipation, and/or energy recovery. It is commonly constructed of a combination of coarse gravel layers, wells, pipes and/or pumps.
Gas Flare	A gas flare, alternatively known as a flare stack, is used to eliminate waste gas which is otherwise not feasible to use or transport. They also act as safety systems protecting gas processing equipment from being overpressured. There are many different types of gas flares including: ground flares, elevated flares, air assist flares, and can either be open or enclosed.
Generic II – Double Liner System	A generic double liner system as specified in Ontario Regulation 232/98 for landfilling sites, consisting of (from top down): ▪ 0.3 m thick granular/perforated pipe primary leachate collection system; ▪ 0.75 m thick geomembrane/engineered clay primary liner; ▪ 0.3 m thick granular/perforated pipe secondary leachate collection system; ▪ 0.75 m thick geomembrane/engineered clay secondary liner; and ▪ 1 m thick natural or constructed soil attenuation layer.
Geosynthetic	A planar product manufactured from polymeric material used with soil, rock, earth, or other geotechnical engineering related material as an integral part of a human-made project, structure, or system. Geotextiles consist of synthetic fibers made into flexible, porous fabrics used for separation, reinforcement, filtration, and/or drainage. Geomembranes consist of relatively thin, impervious sheets of polymeric material used as a liquid or vapour barrier or both.
Groundwater	The mass of water in the ground below the unsaturated zone, occupying the total pore space in the soil or rock.

Term	Definition
Groundwater Purge Well	A groundwater purge well typically consists of a perforated pipe installed within a drilled borehole. Clean coarse sand is packed within the borehole in the zone where the pipe is perforated, to minimize the entry of soil particles into the pipe. Groundwater enters the well through the perforations and the flow is transported to the surface by means of a pump. The borehole above the perforated zone is typically sealed with low-permeability material to prevent surface water flowing into the borehole.
Hazard	A condition (e.g., the presence of gulls) with the potential to cause injury to personnel or damage to equipment or structures.
Haul route	Private and/or public roadway(s) used by vehicles transporting waste to and from a landfill site Hazardous waste.
HELP Model	The HELP (Hydrologic Evaluation of Landfill Performance) model is a computer program used for predicting landfill hydrologic processes and testing the effectiveness of landfill designs, especially cover designs. The model accepts weather, soil, and design data and uses solution techniques that account for the effects of surface storage, snowmelt, frozen soil, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical drainage, and leakage through soil, geomembrane, or composite liners. HELP is also effective in assessment of groundwater recharge rates.
Hydraulic Conductivity	Hydraulic conductivity, symbolically represented as K, is a constant which describes the rate of movement of water through pore spaces or fractures in soil or rock. For example, the lower the hydraulic conductivity, the lower the amount of water that will be conducted. Hydraulic conductivity depends on the intrinsic permeability and the degree of saturation of a material. Saturated hydraulic conductivity describes water movement through saturated media.
Hydraulic gradient	The rate of change in total hydraulic head per unit of distance of flow in a given direction.
Impact	A change brought about by a cause or agent.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way, as opposed to the actual criteria, which are fairly general.
Industrial, Commercial and Institutional (ICI) Wastes	Wastes originating from the industrial, commercial and institutional sectors.
In Situ	In place, without excavation.
Infiltration	The flow of water downward from the land surface into and through the upper soil layers.

Term	Definition
Integrated Gull Management Plan	The development of a plan to manage gulls combining both active and passive techniques. The application of different techniques and approaches helps to create an effective plan and reduce the likelihood of habituation.
Interim Area	Is typically defined as an area within the landfill site that is not actively being filled and would be covered with initial cover material to be used again in the near future for active filling.
Landfill gas (LFG)	Although consisting mainly of methane and carbon dioxide, contains trace amounts of VOCs and reduced sulphur compounds. Although these contaminants account for less than 1% by volume of landfill gas escaping from the landfill, their concentrations must be assessed because they can potentially result in health impacts at residences or businesses that surround the landfill site. The type and concentration of compounds within the landfill gas can vary greatly, depending on the composition of the decomposing waste from which the landfill gas is created.
Landfill site	An approved engineered site/facility used for the final disposal of waste.
Landfill Standards Guideline	The Ontario Ministry of the Environment Landfill Standards Guideline describes the regulatory and approval requirements for the design, operation, closure and post-closure care of new or expanding municipal (i.e. non-hazardous) waste landfilling sites. Regulatory requirements are contained in Ontario Regulation 232/98 made under the Environmental Protection Act.
LandGEM Model	The US EPA Landfill Gas Emissions Model (LandGEM) is an automated estimation tool used to estimate emission rates for total landfill gas, methane, carbon dioxide, non-methane organic compounds, and individual air pollutants from municipal solid waste landfills.
Leachate	Liquid that drains from solid waste in a landfill and which contains dissolved, suspended and/or microbial contaminants from the breakdown of this waste.
Leachate Collection System	An engineered system to control and collect leachate within a landfill. It is usually constructed of a combination of wells, coarse drainage layers, pipes and/or pumps.
Leachate indicator	The dissolved solids found in liquid that has percolated through solid waste (i.e., leachate), which tend to characterize the source of the liquid.
Leachate Recirculation	A leachate management practice sometimes used at landfill sites to temporarily store the leachate within the wastes. It involves collecting leachate that flows out of wastes and conveying it back into the waste mass. Leachate recirculation generally cannot be carried on for long periods of time since the quantity of leachate being handled continually increases due to conversion of infiltration to leachate.
Leachate Treatment System	An engineered system to improve the quality of leachate or leachate-impacted waters by physical and chemical processes. Pre-treatment refers to partial improvement in quality prior to some other form of treatment or disposal.

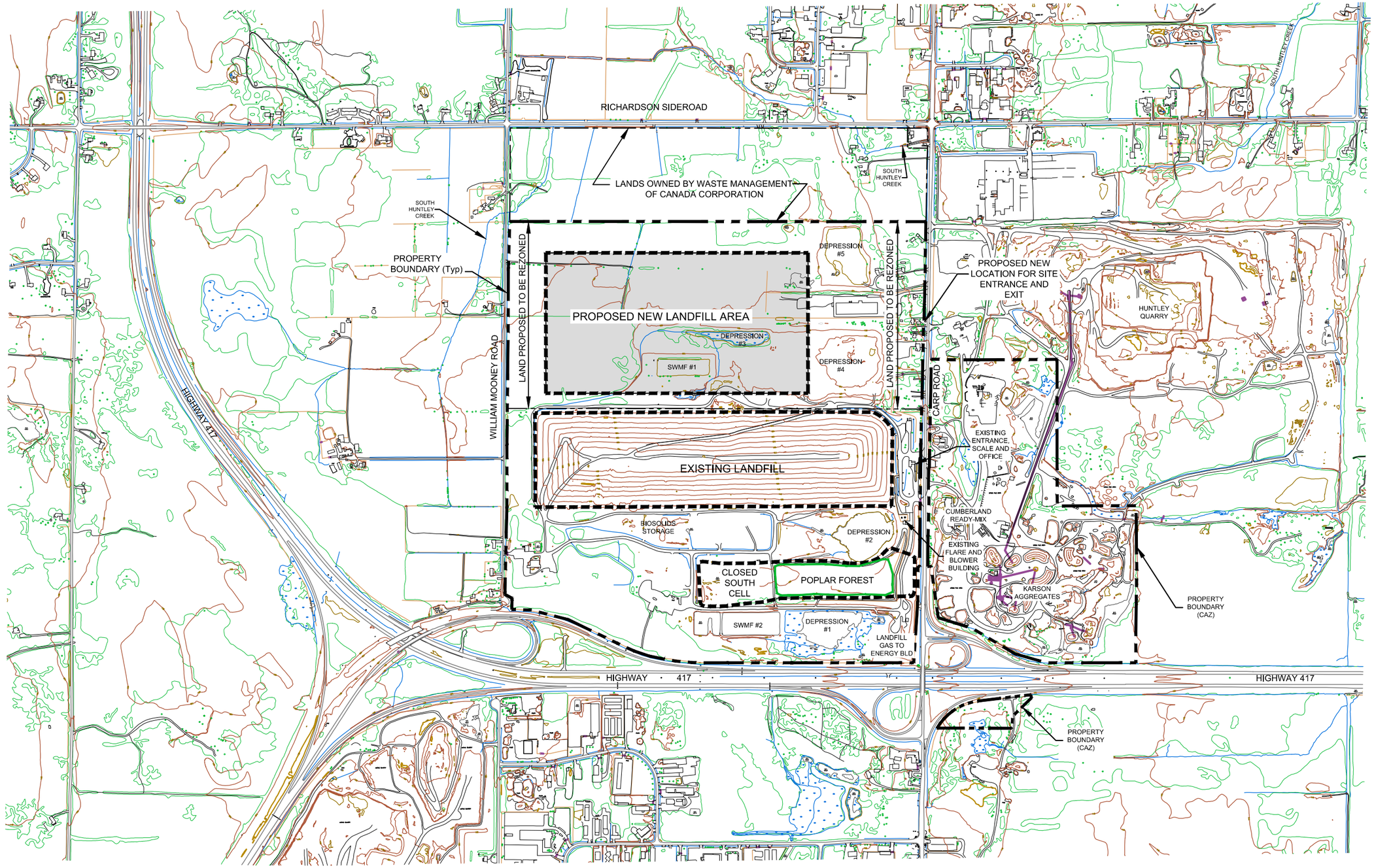
Term	Definition
Loafing	The act of resting or stopping at a particular spot for purposes other than feeding or roosting.
Measure	A basis or standard for comparison. An expression of the potential effects associated with an indicator for a criterion in qualitative and/or quantitative terms.
Medium	Any material that supports growth of an organism.
Mesophile	An organism whose optimum growth range is 20-45 degrees C. (Compare with Thermophile and Psychrophile.)
Methane gas	A colourless, odourless highly combustible gas often produced by the decomposition of decomposable waste at a landfill site. Methane is explosive in concentrations between 5% and 15% volume in air.
Methanogen	Bacteria that anaerobically oxidize hydrogen to methane and water using carbon dioxide as the electron acceptor. These occur in anaerobic muds, ponds, and sewage sludge.
Methanotroph	Aerobic bacteria that can use methane as a sole source of carbon.
Microbe	Microorganism.
Microorganisms	Includes bacteria, algae, fungi, and viruses.
Mitigation	Mitigation refers to the measures that are designed to reduce or eliminate the degree of impact on an adjacent land use.
Mitigation Measure	Action(s) that remove or alleviate to some degree the negative effects associated with the implementation of an alternative.
Nitrification	The oxidation of ammonia to nitrite and then nitrate by bacterial species such as Nitrosomonas and Nitrobacter, respectively. This process is strictly aerobic.
Noise	Generally defined as the unwanted portion of sound.
Noise Level	This is the same as sound level except that it is applied to unwanted sounds, general the sound level at a point of reception.
Non-hazardous waste	Non-hazardous wastes includes all solid waste that does not meet the definition of hazardous waste and includes designated wastes such as asbestos waste.
Odour	An odour is deemed as a nuisance if it is detected and considered to be unpleasant. When odour levels are elevated and occur frequently, they can be construed as having an adverse effect.

Term	Definition
Official Plan	An Official Plan is a statutory document adopted by a municipality, which contains the goals, objectives and policies established primarily to manage and direct physical change and the effects on the social, economic and natural environment of the municipality. An Official Plan consists of text and a series of corresponding maps.
Ontario Regulation 232/98	Ontario Regulation 232/98 under the Canadian Environmental Protection Act sets out standards, procedures, and requirements for landfilling sites in Ontario. The Regulation applies to every landfilling site that comes into existence, or landfilling site that is altered, enlarged or extended, and is intended to have a total waste volume of more than 40,000 cubic metres and to accept only municipal waste for disposal.
Ontario Regulation 419/05	The Province of Ontario has a regulation under the Environmental Protection Act that deals with local air quality (O.Reg. 419/05). This regulation sets out standards for various contaminants and procedures for assessing and reporting whether or not a proposed emission source is expected to meet the standards or cause them to be exceeded. However, O.Reg. 419/05 does not apply to discharges of contaminants from motor vehicles and, as such, is not applicable to this air quality assessment.
Overburden	The loose soil, such as silt, sand, gravel or other unconsolidated material overlying bedrock either transported or formed in place.
Perched Water	Water artificially held up (as perched on a clay layer) and not a part of the underlying water table.
pH	p(otential of) H(ydrogen); the logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per litre; used as a measure of the acidity or alkalinity of a solution on a scale of 0-14 (where 7 is neutral).
Phytoremediation	Use of plants to remediate contaminated soil or groundwater.
Potable	When referring to water, means drinkable. Potable water can be consumed safely by humans.
Proponent	A person who: (a) carries out or proposes to carry out an undertaking, or (b) is the owner or person having charge, management or control of an undertaking
Public	Means the general public, individual members and special interest groups who may be affected by or have an interest in a project.
Purge wells	Water wells that are constructed and operated for the purpose of removing contaminated groundwater as part of a remedial action program.
Pyrotechnics	Various combustible projectiles launched from a shotgun, pistol or other device to frighten wildlife by producing combinations of noise, light or smoke.

Term	Definition
Rationale	Explanation of the logical reasons or principles employed in consciously arriving at a decision or estimate.
Reasonable Use Policy	The Reasonable Use Policy is aimed at ensuring that a proponent's undertaking does not impair the 'reasonable use' of ground water on neighbouring properties. It sets limits to the level of ground water impact that can occur at the proponent's site property boundaries.
Rhizosphere	Soil in the area surrounding plant roots that is influenced by the plant root. Typically a few millimetres or at most centimetres from the plant root. Important because this area is higher in nutrients and thus has a higher and more active microbial population.
Risk	Likelihood of injury or loss occurring, which is a function of exposure to hazards as well as the likelihood and the magnitude of the event.
Roosting	The act of settling for sleep. Roosting areas are safe areas in which birds congregate and sleep sometimes in large numbers.
Runoff	That part of precipitation flowing to surface streams, as opposed to the amount that seeps into the ground.
Sedimentation	The settlement of suspended solid particles from a fluid by gravity.
Service life	The period of time during which the components of a properly designed and maintained engineered facility will function and perform as designed.
Sequencing Batch Reactor (SBR)	Sequencing Batch Reactors (SBRs) are industrial processing tanks used in the treatment of wastewater, or leachate in a landfill context. The reactors treat waste water in batches through the addition of oxygen to encourage the multiplication of bacteria which consume the nutrients and settle into a sludge. The sludge is removed for further processing and the treated water is discharge into sewers or used on land. A SBR system is a leachate pre-treatment system proposed for the landfill site. The tanks associated with the SBR system operation include the raw leachate equalization tank, the SBR tank, the effluent equalization tank, and the sludge tank. Raw leachate from the leachate collection wells will be pumped to an equalization tank for storage. From the equalization tank, raw leachate will be pumped using leachate transfer pumps to the SBR tank. There will be two duty and one standby raw leachate transfer pumps.
Sorption	The process in which one substance takes up or holds another (by either absorption or adsorption).
Surface water	Water in streams, rivers, lakes, wetlands and reservoirs.
Tensiometer	An instrument used to measure the surface tension of a liquid.

Term	Definition
Terms of Reference (TOR)	The first step in an application for approval to proceed with a project or undertaking under the Environmental Assessment Act (EAA) is the submission of a Terms of Reference (TOR). Public and agency consultation is required on the preparation and submission of the TOR to the Ministry of the Environment. Approval is required by the Minister of the Environment. If approved, the TOR provides a work plan for the EA.
Thermophile	Any organism that has an optimum growth temperature above 45 degrees C.
Transducer	A device for converting sound, temperature, pressure, light or other signals to or from an electronic signal.
Undertaking	An enterprise or activity, or a proposal, plan or program that has potential environmental effects and is carried out in accordance with the requirements of the EA Act.
United States Clean Air Act (CAA)	The United States Clean Air Act is the law enacted by the U.S. Congress that defines the Environmental Protection Agency's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer.
Vector	In epidemiology, a vector is any agent (person, animal or microorganism) that carries and transmits an infectious pathogen into another living organism. The most common vectors in a landfill context are rats and flies.
Vegetative	Cells with an active metabolism. Not dormant or spores.
Volatile	Evaporating readily at normal temperatures and pressures. That can be readily vaporized.
Watershed	The area of land drained by a single stream or river.
Weathering	All physical and chemical changes produced by atmospheric agents.
Zoned	Zoned means lands which have been assigned a particular zone in the City of Ottawa Zoning By-law, where defined land uses may be carried out according to the associated zoning provisions.
Zoning By-law	A Zoning By-law is a statutory document that is adopted by a municipality to implement the goals, objectives and policies of the Official Plan. A Zoning By-law may either permit or prohibit the use of land within specific zones in a municipality, as well as regulate the key aspects of construction, building placement, and lot configuration (e.g. height, bulk, location, size, floor area, spacing, character and use of buildings or structures, the minimum frontage and depth of land parcels, and the proportion of the lot area that any building or structure may occupy).
Zoning By-law amendment	A Zoning By-law amendment is a change to the text and/or maps of the Zoning By-law. There is a specific process that a Council must follow to amend its Zoning By-law, including public consultation and formal adoption of the amendment by Council.

Figures



NOTE :

1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON AERIAL PHOTOGRAPHY BY BASE MAPPING LIMITED FROM JULY 2007

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WASTE MANAGEMENT

SITE PLAN
SURROUNDING AREA

WEST CARLETON
ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: F C F

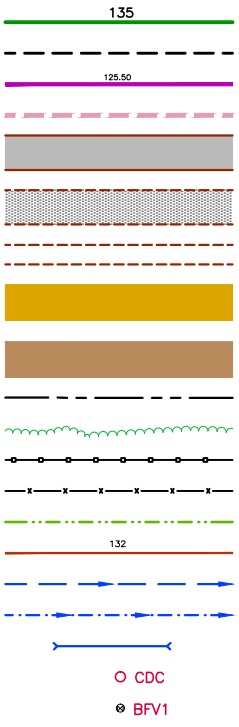
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 1-1

FIGURE
1-1

LEGEND :



AREA COMPLETED TO FINAL WASTE GRADES (SEE NOTE BELOW)

PROPOSED LIMIT OF WASTE (EXPANSION AREA)

PROPOSED BOTTOM OF WASTE CONTOURS

APPROXIMATE LIMIT OF EXISTING LANDFILL

HARD SURFACE ACCESS ROAD

GRAVEL HIGH LEVEL ACCESS ROAD

TEMPORARY GRAVEL ACCESS ROAD

WORKING AREA FOR EACH LANDFILLING PHASE

AREA OF TEMPORARY CLAY SEAL

WASTE MANAGEMENT OF CANADA CORP. PROPERTY LIMIT

TREELINE

LITTER FENCE 10m HIGH

LITTER FENCE 3m HIGH

CUT/FILL LIMIT BESIDE EXISTING LANDFILL MOUND

FILL CONTOURS BESIDE EXISTING LANDFILL MOUND

PROPOSED DITCH/SWALE

PROPOSED DITCH/SWALE RIP RAP LINED

PROPOSED CULVERT

CDC — CONDENSATE DRAIN CHAMBER/PUMPING STATION

BFV1 — 750ø BUTTERFLY ISOLATION VALVE

ABBREVIATIONS :

LF	LEACHATE FORCEMAIN
WM	WATERMAIN (NONPOTABLE)
OH	OVERHEAD HYDRO
SAF	SANITARY FORCEMAIN/SEWER
PWF	PURGE WELL FORCEMAIN
GH	GAS HEADER
CA	COMPRESSED AIR LINE
PS	PUMPING STATION (PRIMARY AND SECONDARY LEACHATE COLLECTION SYSTEM)

NOTE :

THIS AREA WILL BE PARTIALLY CAPPED AND VEGETATED AS SOON AS PRACTICAL AND FULLY CAPPED AND VEGETATED ONCE STABILIZED AND NO SIGNIFICANT SETTLEMENT IS ANTICIPATED. CONTOUR ELEVATIONS SHOWN REFLECT TOP OF FINAL COVER.

EXISTING/PROPOSED FACILITIES	
LOCATION	DESCRIPTION
(A)	PUMPING STATIONS PS5/PS6
(B)	END OF GAS HEADER AT PHASE 1 – NORTH
(C)	MAINTENANCE BUILDING
(D)	SCALE HOUSE
(E)	END OF GAS HEADER AT PHASE 1 – SOUTH
(F)	END OF EXISTING PURGE WELL FORCEMAIN (PW20)
(G)	PUMPING STATION PS1
(H)	BLOWER BUILDING AND FLARES
(J)	EXISTING OFFICE BUILDING
(K)	LEACHATE PRETREATMENT PLANT
(L)	PUMPING STATION PS3
(M)	GAS HEADER TEE FOR LANDFILL LOOP
(N)	KIOSK MINI TRANSFER AREA
(P)	END OF GAS HEADER AT PHASE 2 – NORTH
(Q)	END OF GAS HEADER AT PHASE 2 – SOUTH
(R)	END OF GAS HEADER AT PHASE 3 – NORTH
(S)	END OF GAS HEADER AT PHASE 3 – SOUTH
(T)	END OF GAS HEADER AT PHASE 5 – NORTH
(U)	END OF GAS HEADER AT PHASE 5 – SOUTH
(V)	END OF GAS HEADER AT PHASE 6 – SOUTH
(W)	END OF GAS HEADER AT PHASE 6 – NORTH
(X)	ACCESS ROAD TURNAROUND

FIGURE 4-1

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: N T S

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 4–1

LEGEND

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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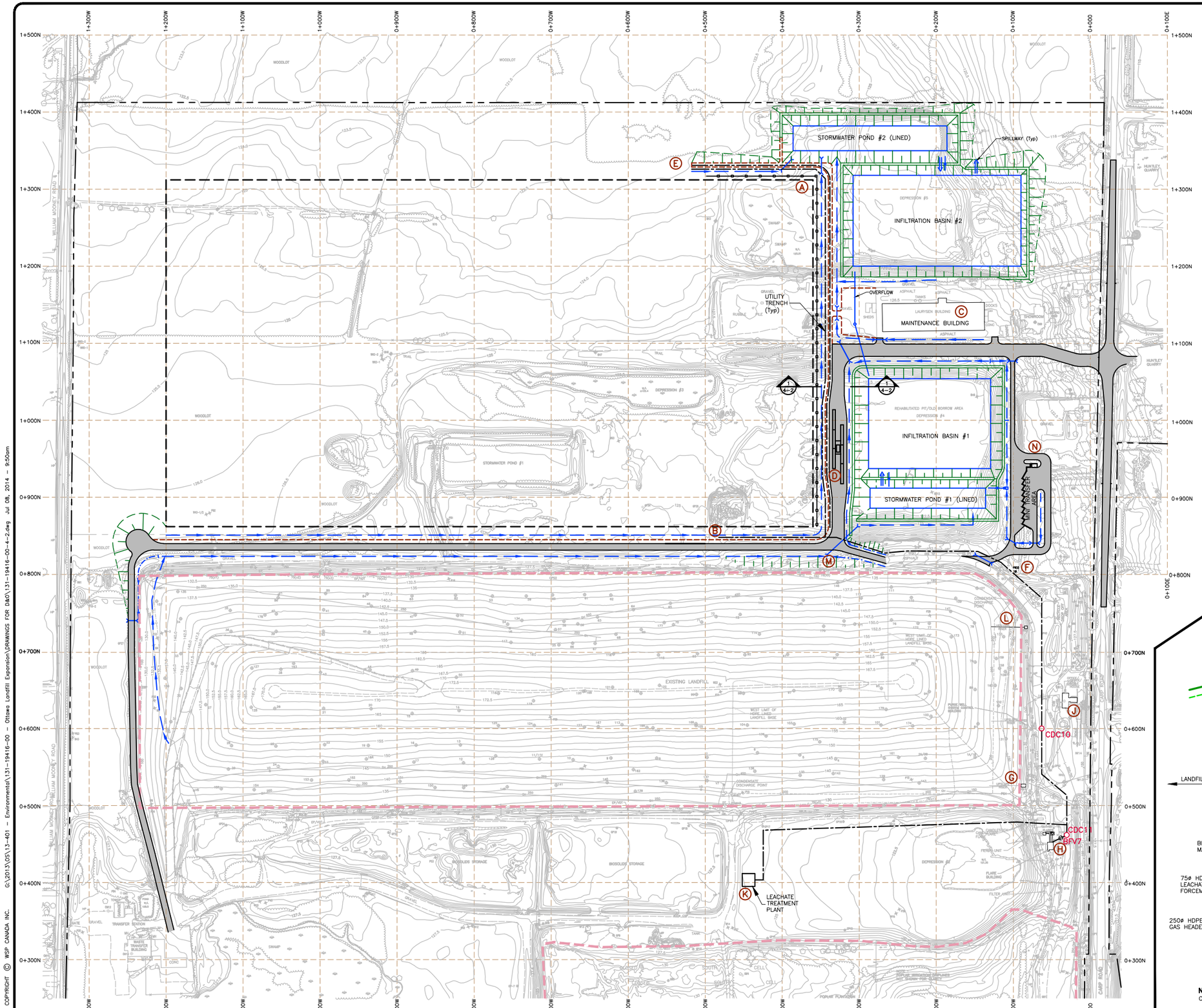
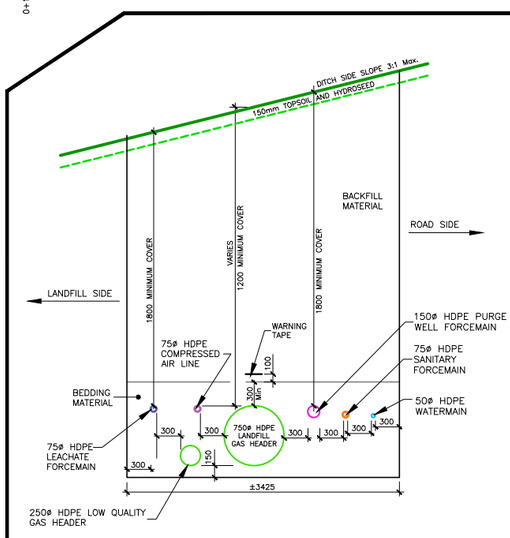


WORK DESIGNATION	
RUN	PIPING INFO
A – K	LF (75ø)
B – E	GH, GH & CA (750/250/75ø)
C – D	WM (50ø)
D – A	OH
D – C	SAF (75ø)
E – F	PWF (150ø)
H – M	GH, GH & CA (750/250/75ø)
J – D	OH
J – N	OH



UTILITY TRENCH SECTION (4-2)
SCALE: 1 : 75

NOTE :
CONFIGURATION OF COMMON TRENCH VARIES DEPENDING ON LOCATION.

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WASTE MANAGEMENT

SITE PREPARATION FOR PHASE 1 - PART 1

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: F C F

DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 – 4-2

FIGURE 4-2

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-4-2.dwg Jul 08, 2014 – 9:50am

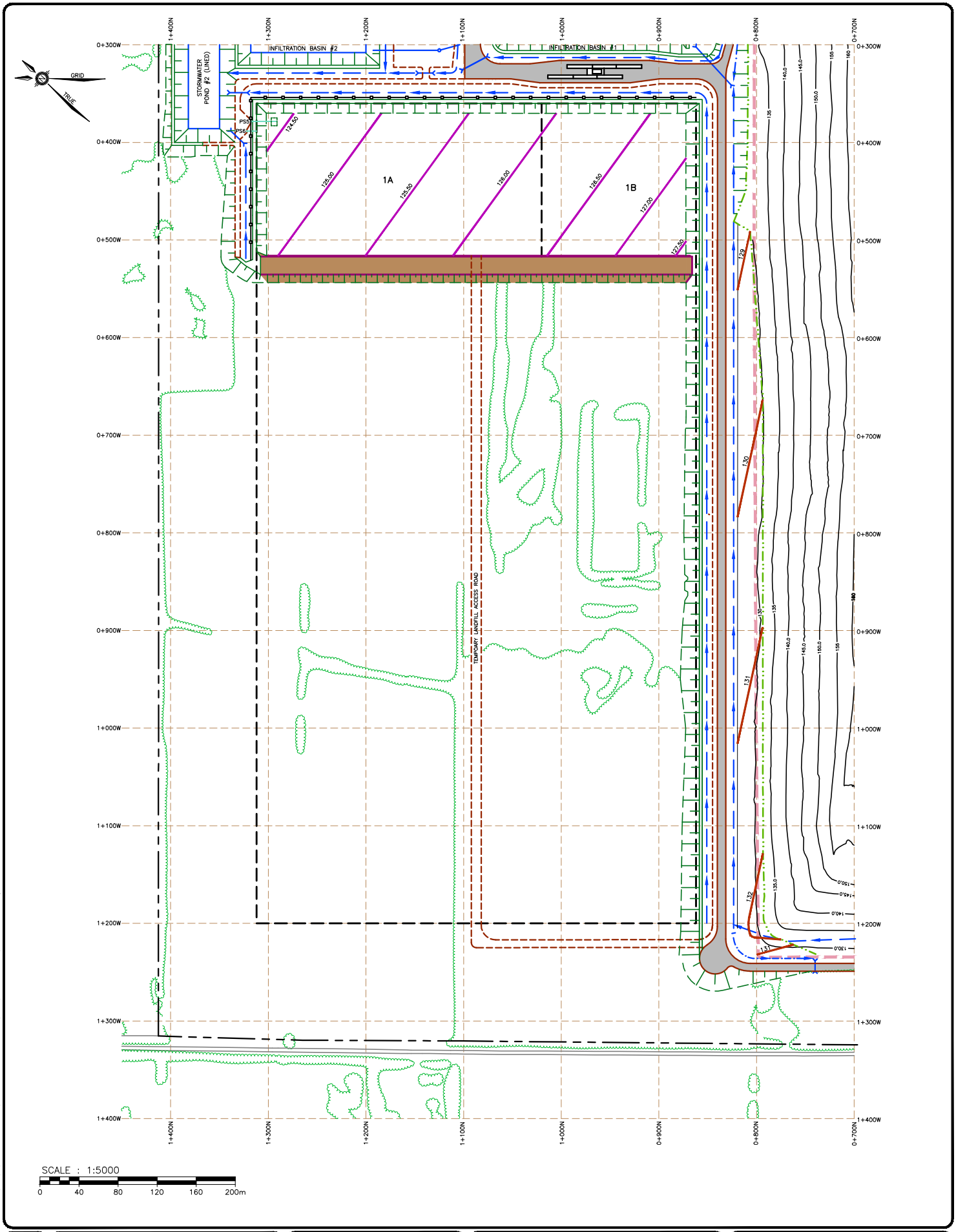

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FIGURE 4-3

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 4–3

SITE PREPARATION FOR PHASE 1 - PART 2

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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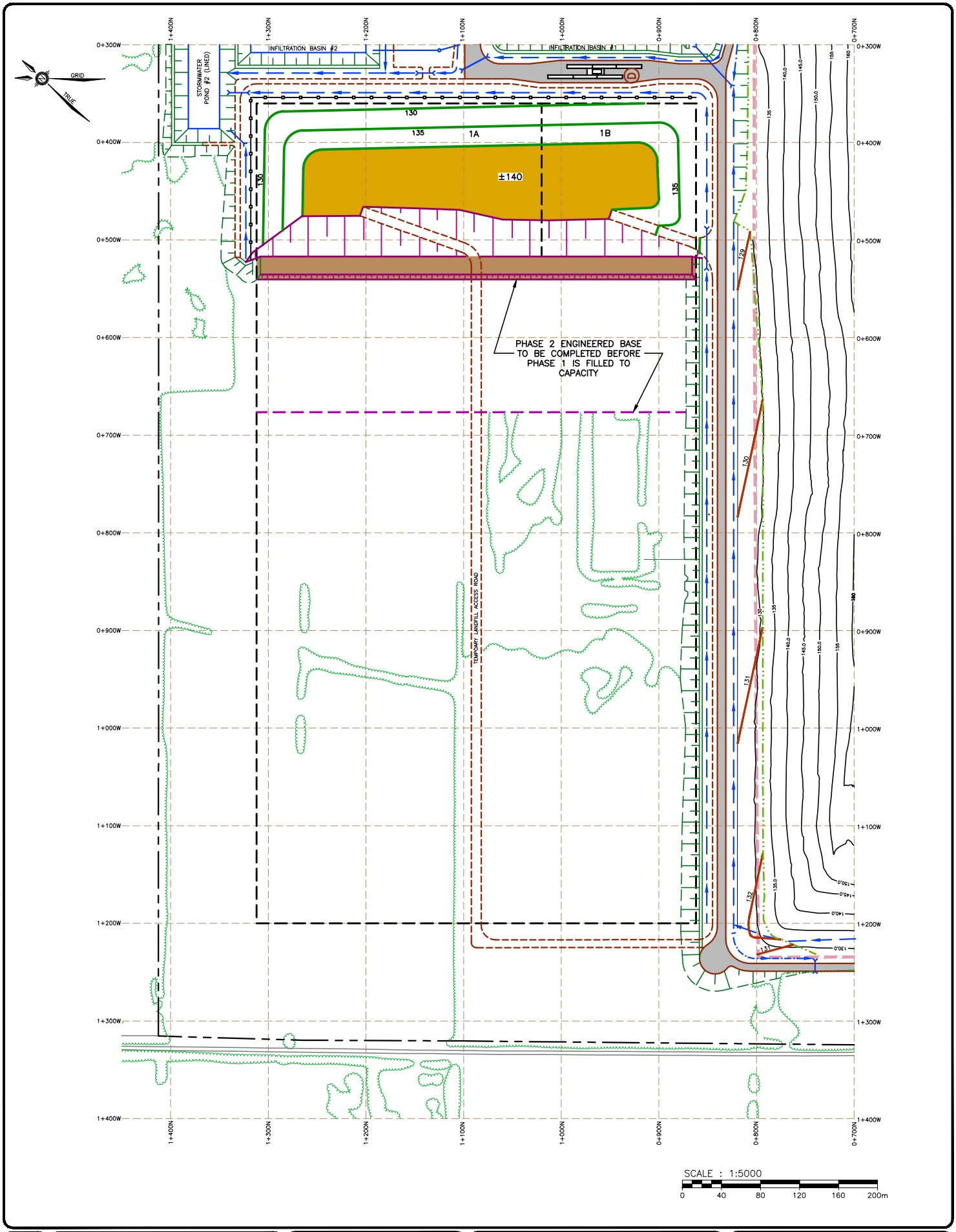

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FIGURE 4-4

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 – 4-4

PHASE 1
LANDFILL DEVELOPMENT

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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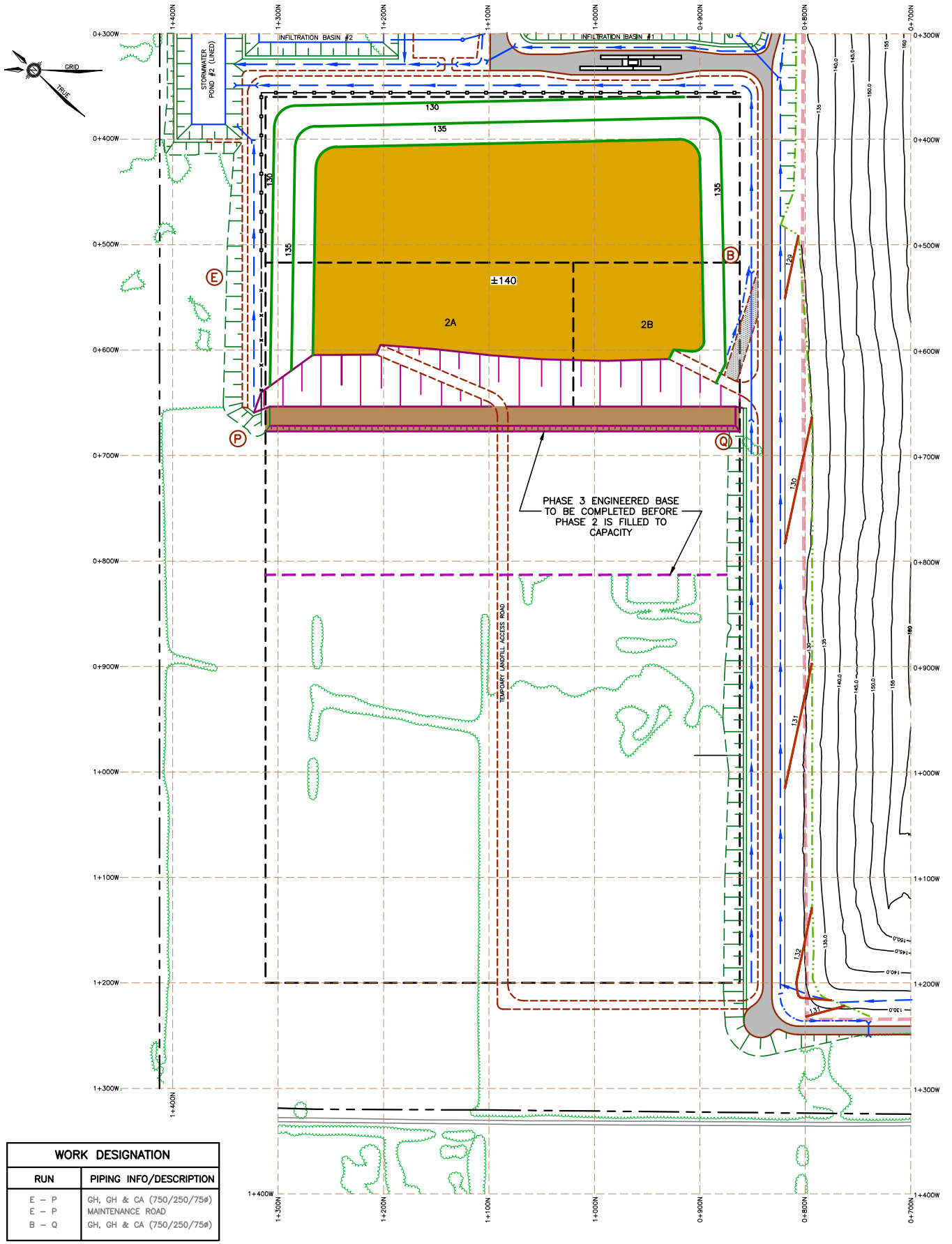

WORK DESIGNATION	
RUN	PIPING INFO/DESCRIPTION
E – P	GH, GH & CA (750/250/75ø)
E – P	MAINTENANCE ROAD
B – Q	GH, GH & CA (750/250/75ø)

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FIGURE 4-5

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 – 4-5

PHASE 2
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
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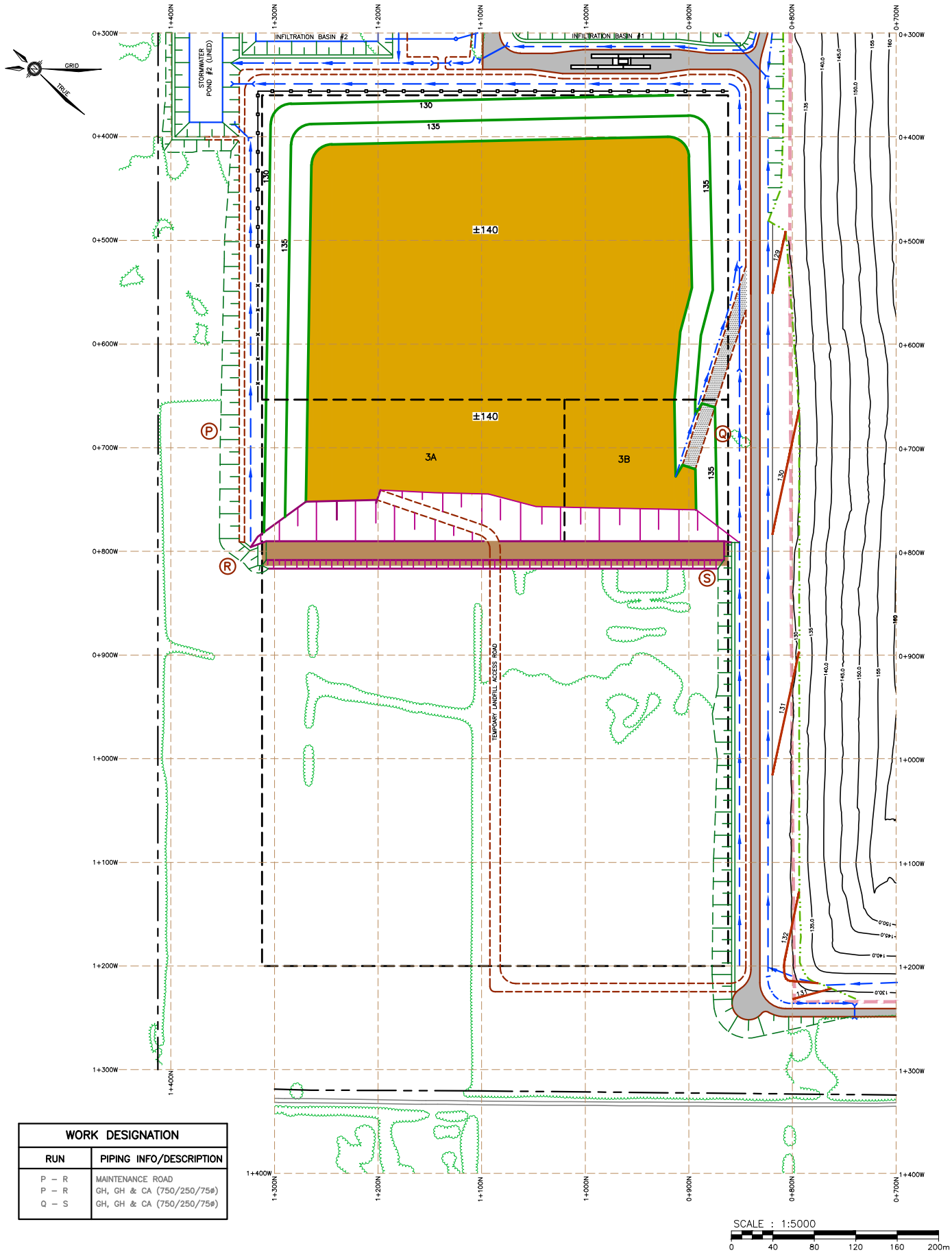

WORK DESIGNATION	
RUN	PIPING INFO/DESCRIPTION
P – R	MAINTENANCE ROAD
P – R	GH, GH & CA (750/250/75ø)
Q – S	GH, GH & CA (750/250/75ø)

FIGURE 4-6

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 4–6

PHASE 3
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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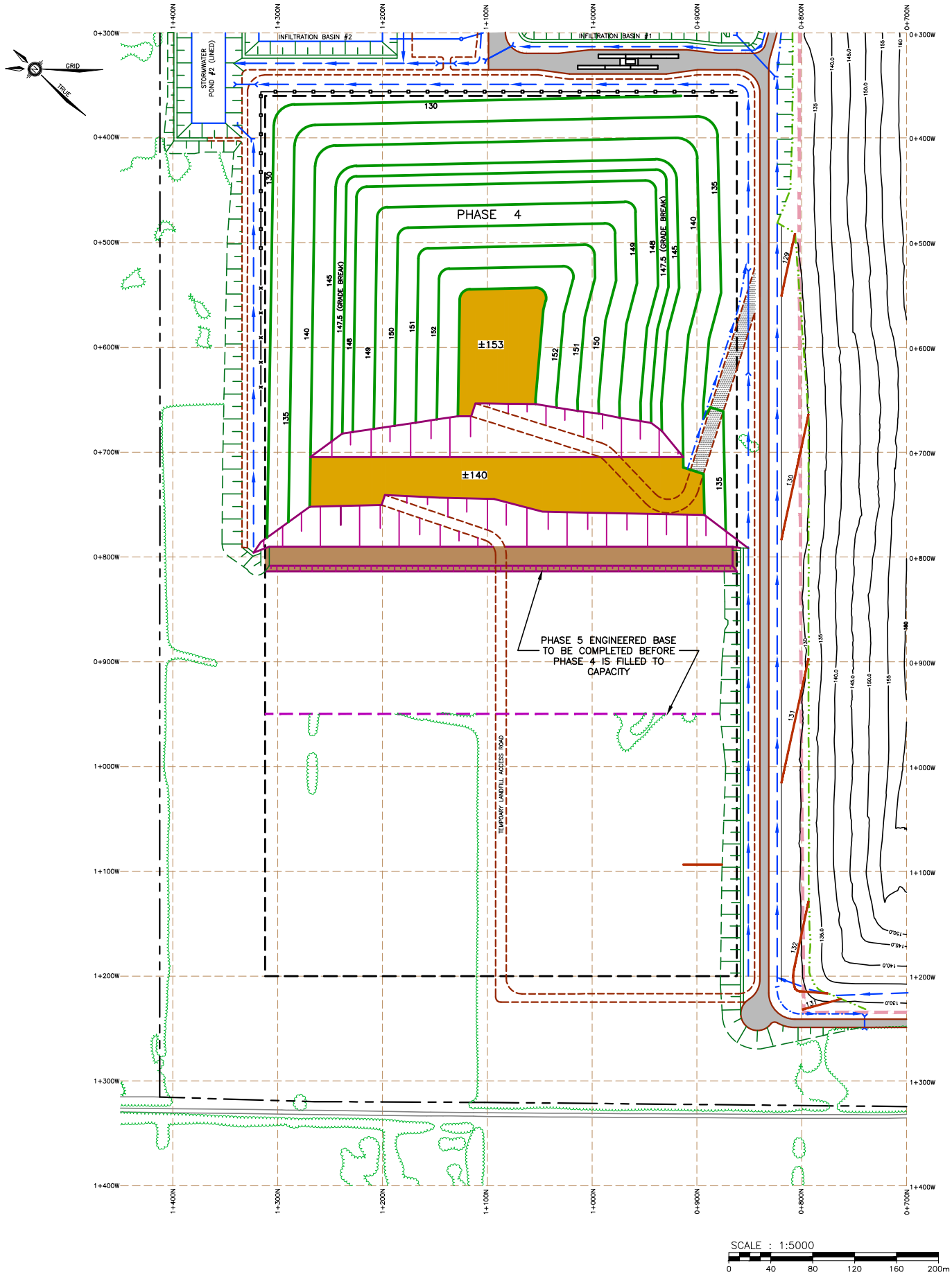

FIGURE 4-7

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 4-7

PHASE 4
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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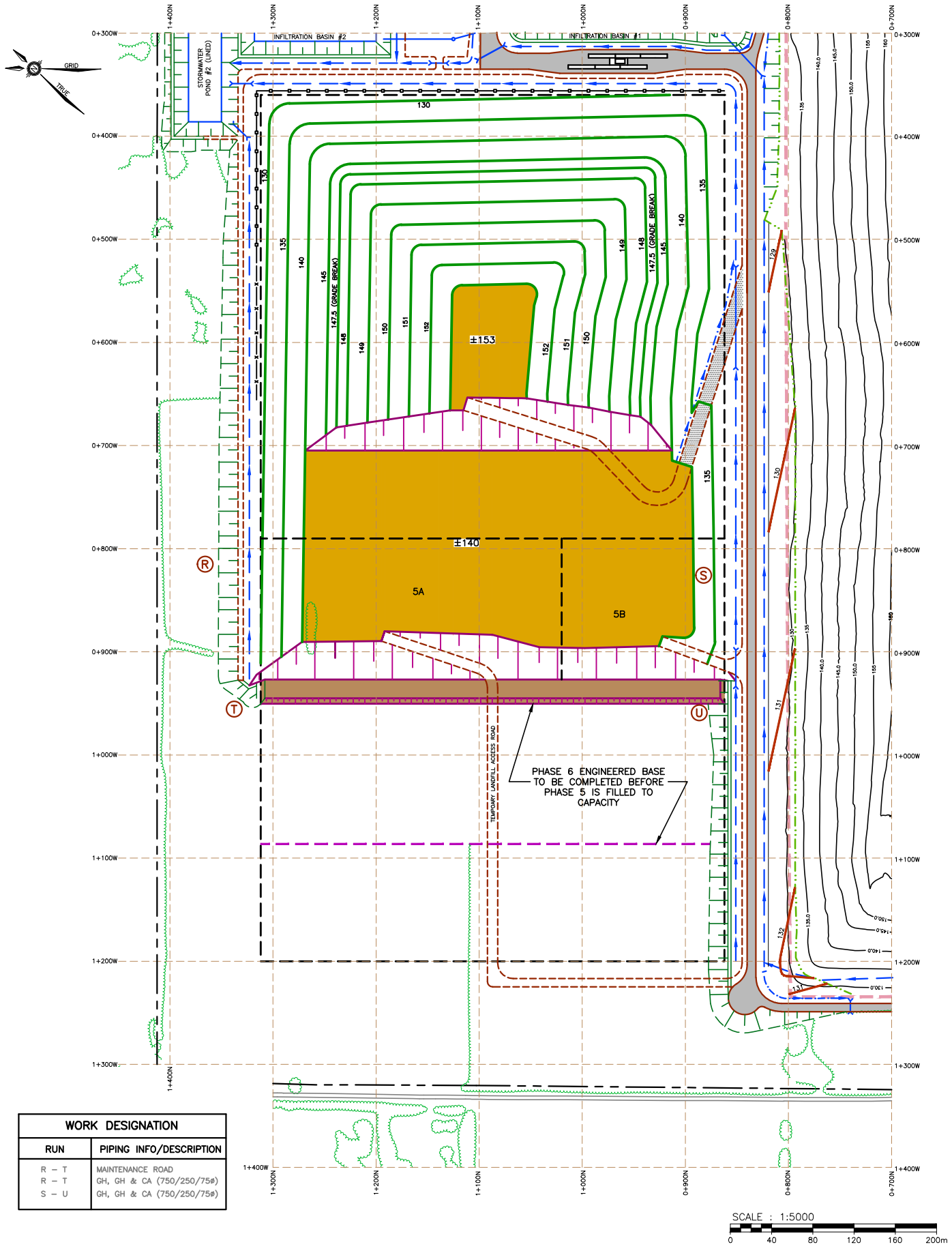

WORK DESIGNATION	
RUN	PIPING INFO/DESCRIPTION
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R – T	GH, GH & CA (750/250/75ø)
S – U	GH, GH & CA (750/250/75ø)

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FIGURE 4-8

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

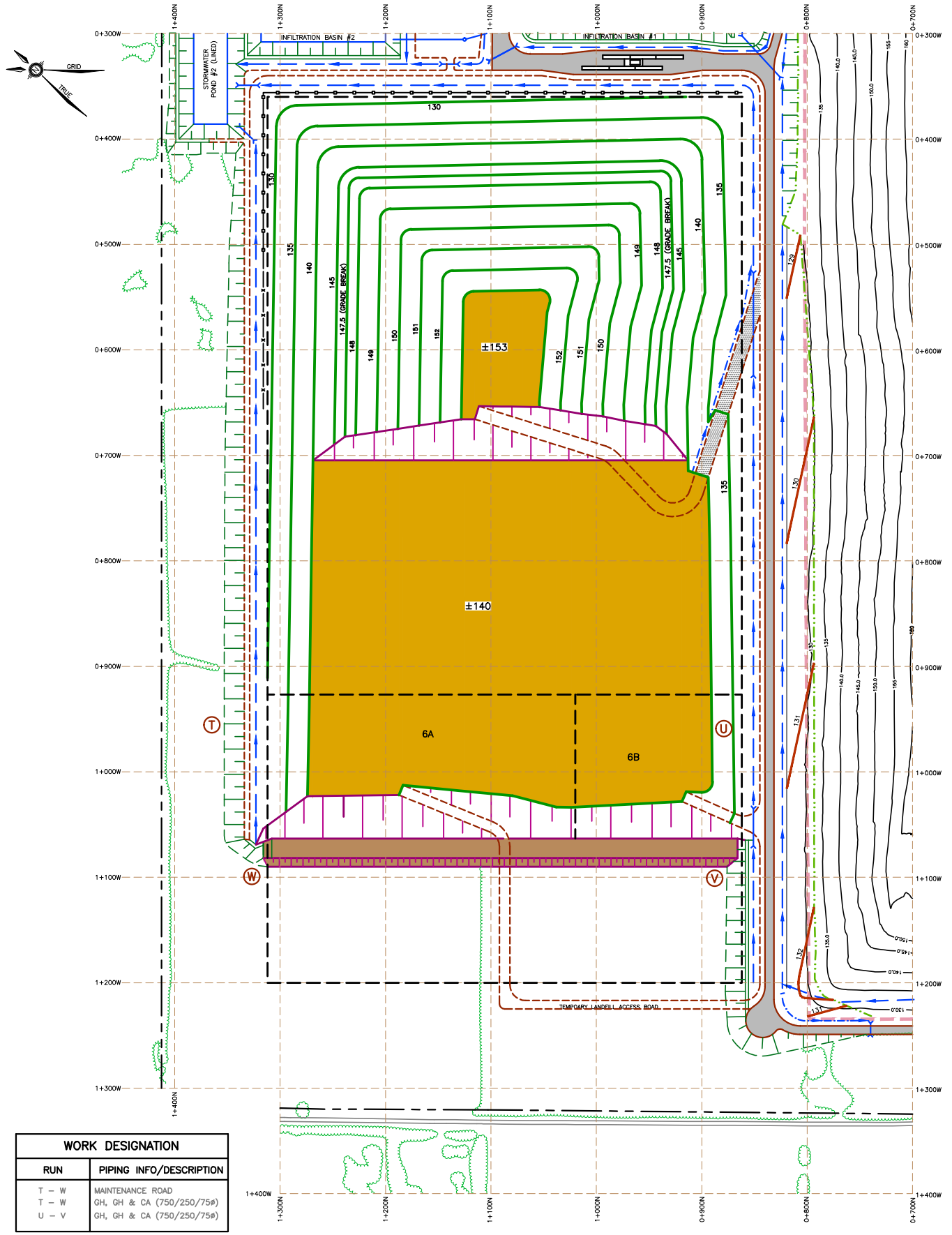
DRAWING NO. 131–19416–00 – 4–8

PHASE 5
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



WORK DESIGNATION	
RUN	PIPING INFO/DESCRIPTION
T – W	MAINTENANCE ROAD
T – W	GH, GH & CA (750/250/75ø)
U – V	GH, GH & CA (750/250/75ø)

FIGURE 4-9

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 4–9

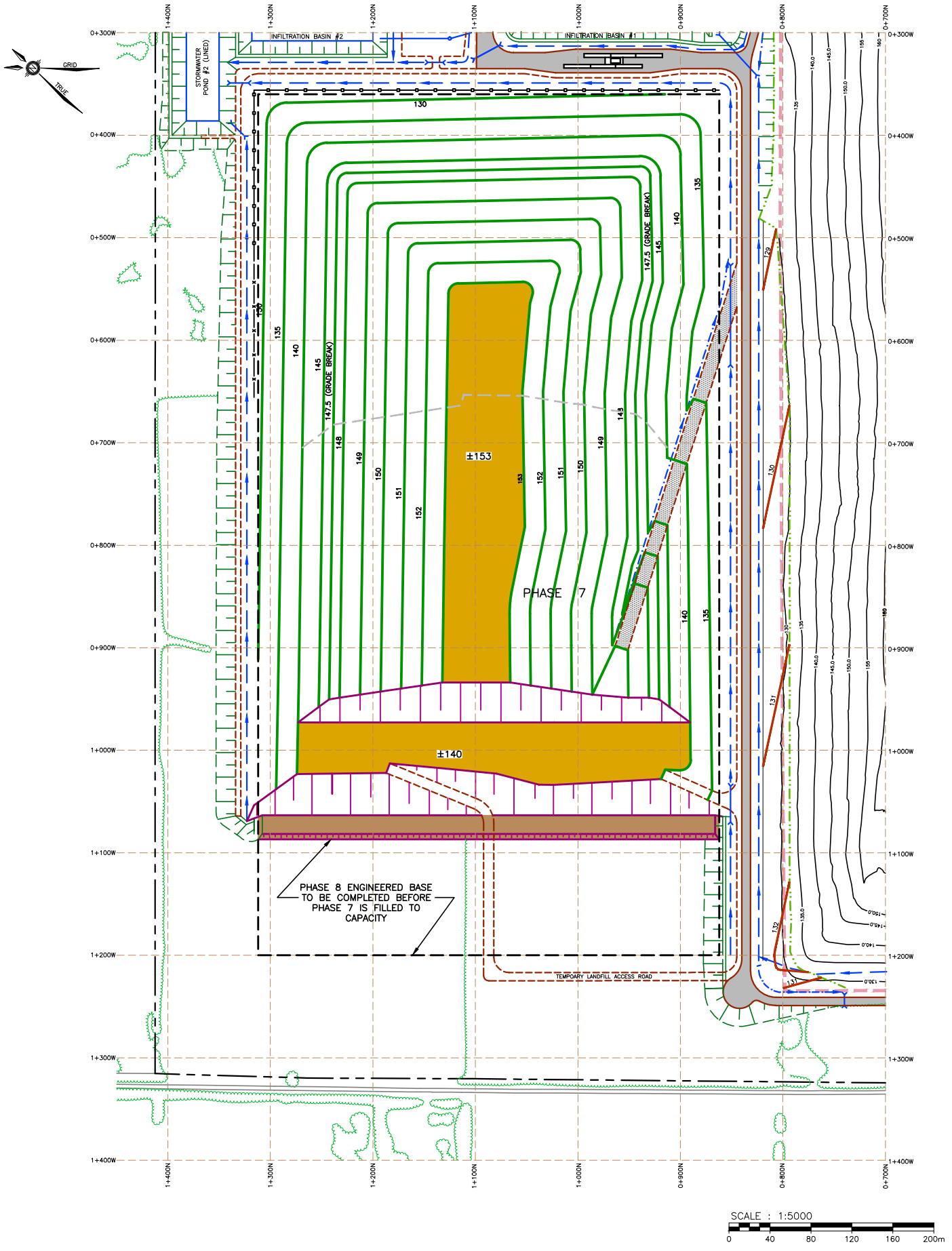
PHASE 6
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR DWG\131-19416-00-4-9.dwg Jul 08, 2014 – 10:15am



SCALE : 1:5000

0 40 80 120 160 200m

G:\2013\GS\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-4-10.dwg Jul 08, 2014 - 10:16am

FIGURE 4-10

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

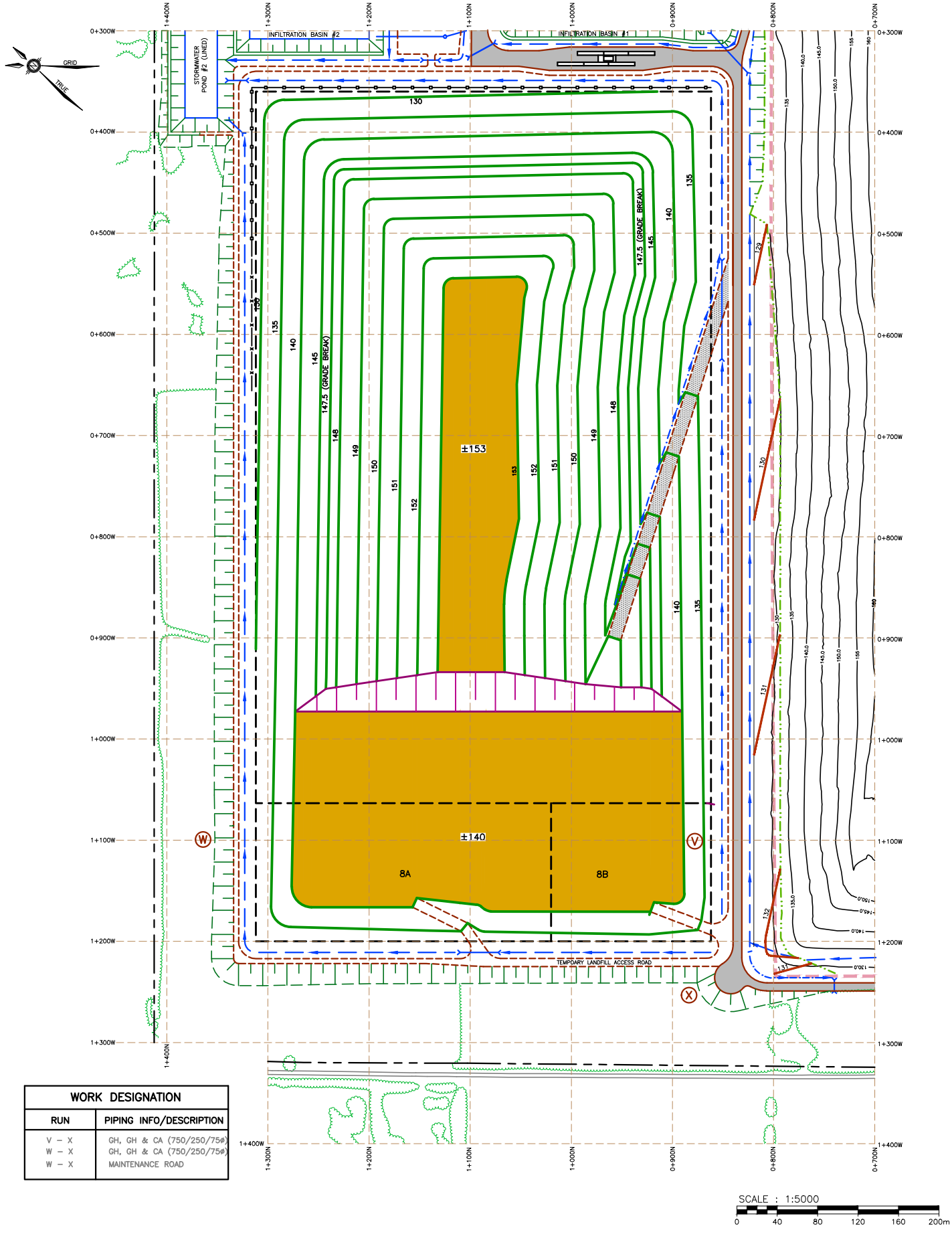
DRAWING NO. 131-19416-00 – 4-10

PHASE 7
LANDFILL DEVELOPMENT

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



WORK DESIGNATION	
RUN	PIPING INFO/DESCRIPTION
V – X	GH, GH & CA (750/250/75ø)
W – X	GH, GH & CA (750/250/75ø)
W – X	MAINTENANCE ROAD

SCALE : 1:5000

0 40 80 120 160 200m

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR DWG\131-19416-00-4-11.dwg Jul 08, 2014 - 10:18am

FIGURE 4-11

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

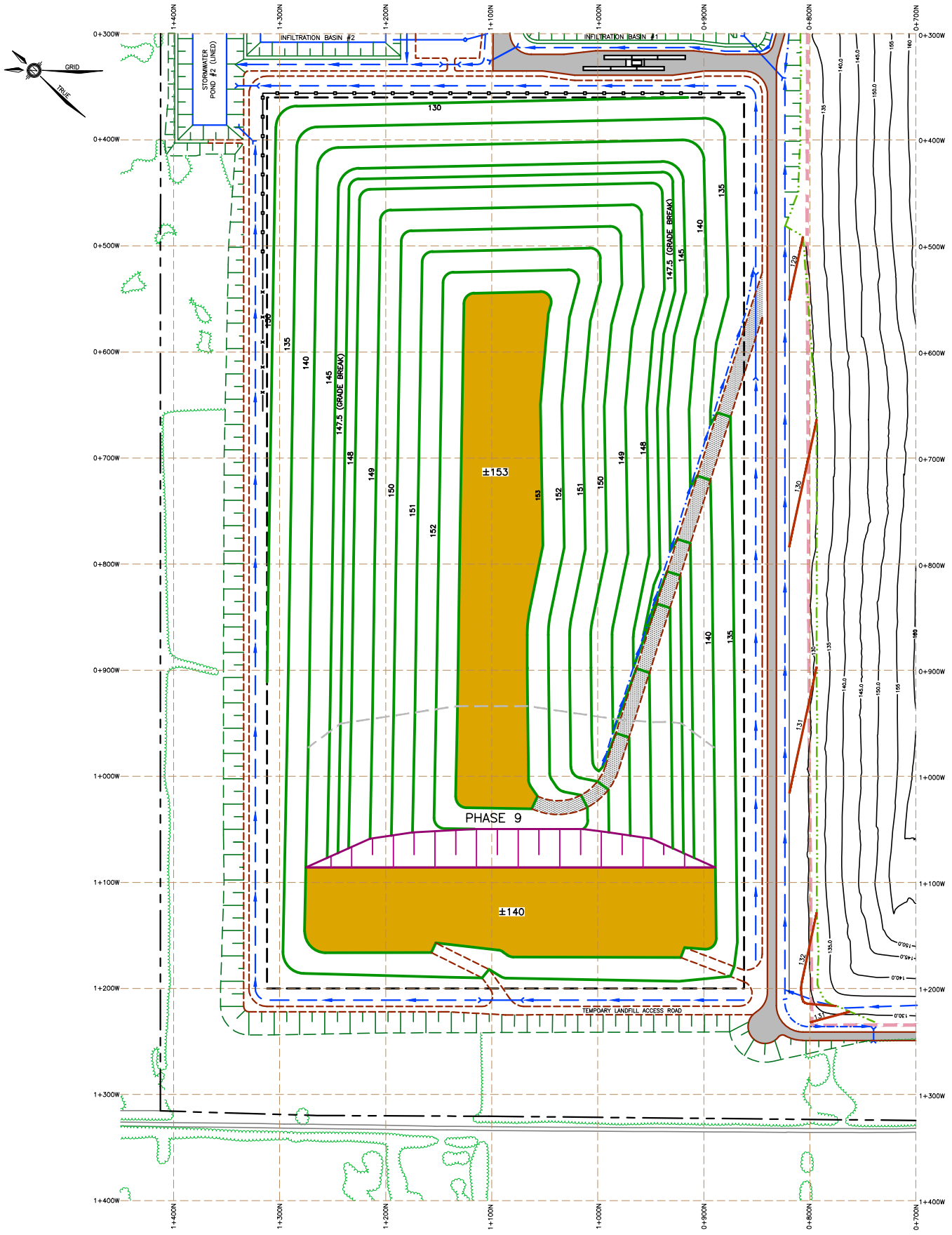
DRAWING NO. 131-19416-00 – 4-11

PHASE 8
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WM. WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



SCALE : 1:5000

0 40 80 120 160 200m

FIGURE 4-12

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

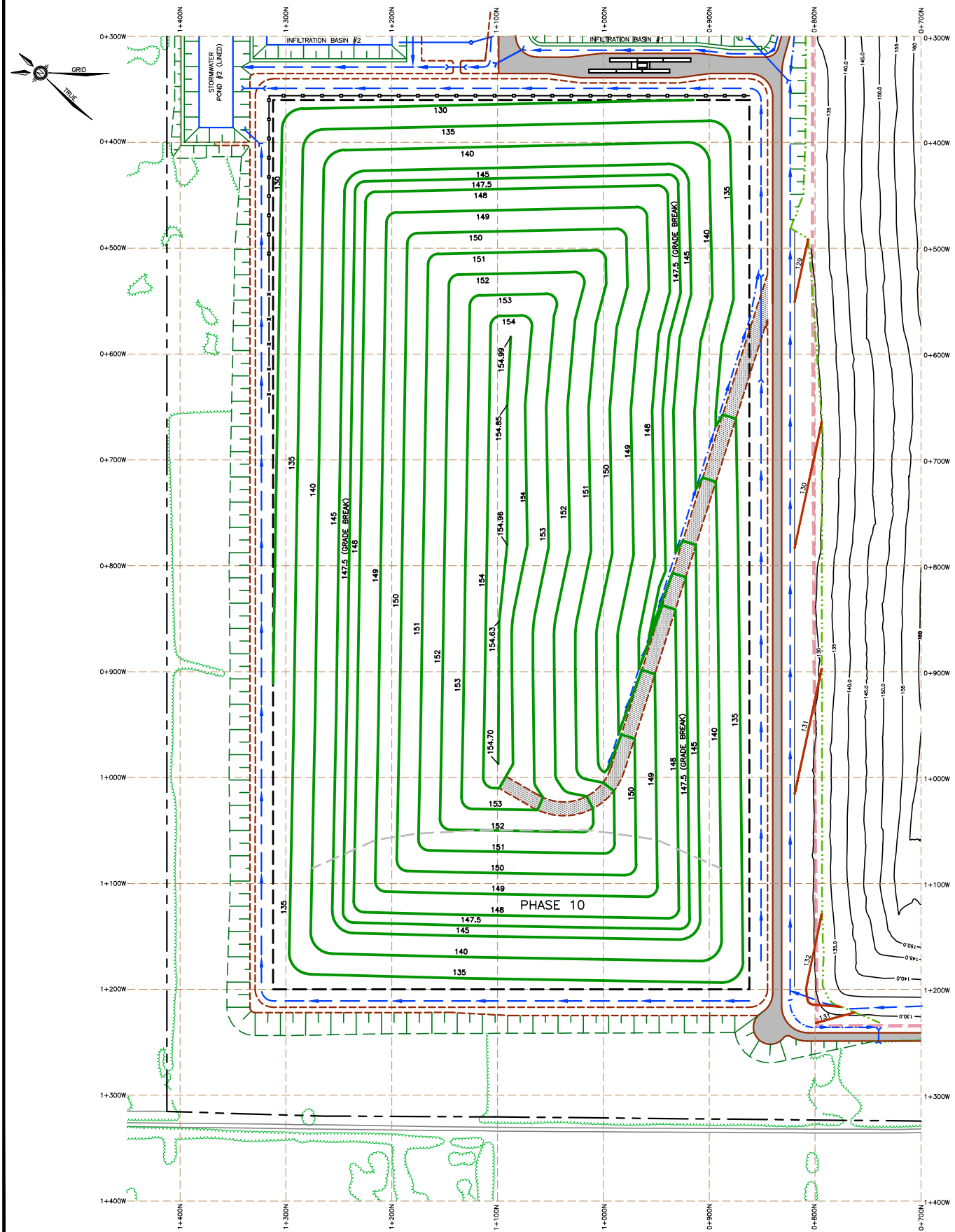
DRAWING NO. 131-19416-00 - 4-12

PHASE 9
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



SCALE : 1:5000

0 40 80 120 160 200m

G:\2013\05\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR DAO\131-19416-00-4-13.dwg Jul 08, 2014 - 10:25am

FIGURE 4-13

DWN BY: T C G
CHK BY: F C F
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 4-13

PHASE 10
LANDFILL DEVELOPMENT

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

POPLAR IRRIGATION AREA 4
2.14 Ha.
(FUTURE)

POPLAR IRRIGATION AREA 3
2.20 Ha.
(FUTURE)

POPLAR IRRIGATION AREA 5
1.87 Ha.
(FUTURE)

AREA 2
0.75 Ha.
(FUTURE)

EXISTING
POPLAR IRRIGATION AREA
2.01 Ha.

EXISTING POPLAR IRRIGATION AREA 1
4.19 Ha.

UPGRADE EXISTING ROAD TO WASTE PROCESSING AND TRANSFER FACILITY

WEST LIMIT OF HDPE LINED LANDFILL BASE

EXISTING LANDFILL

LEACHATE TREATMENT PLANT

EXISTING PURGE WELL SYSTEM FORCEMAIN

LEACHATE FORCEMAIN TO OTTAWA SANITARY SEWER SYSTEM

WILLIAM MOONEY ROAD

CARP ROAD

HIGHWAY #417

SCALE : 1:4000
0 40 80 120 160m

G:\2013\05\13-401 – Environmental\131–19416–00 – Ottawa Landfill Expansion\DRAWINGS FOR DAO\131–19416–00–4–14.dwg Jul 08, 2014 – 10:25am

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL: 519-376-1612 | FAX: 519-376-8686 | WWW.WSPGROUP.COM

WASTE MANAGEMENT

SITE DEVELOPEMENT - SOUTH

WEST CARLETON
ENVIRONMENTAL CENTRE

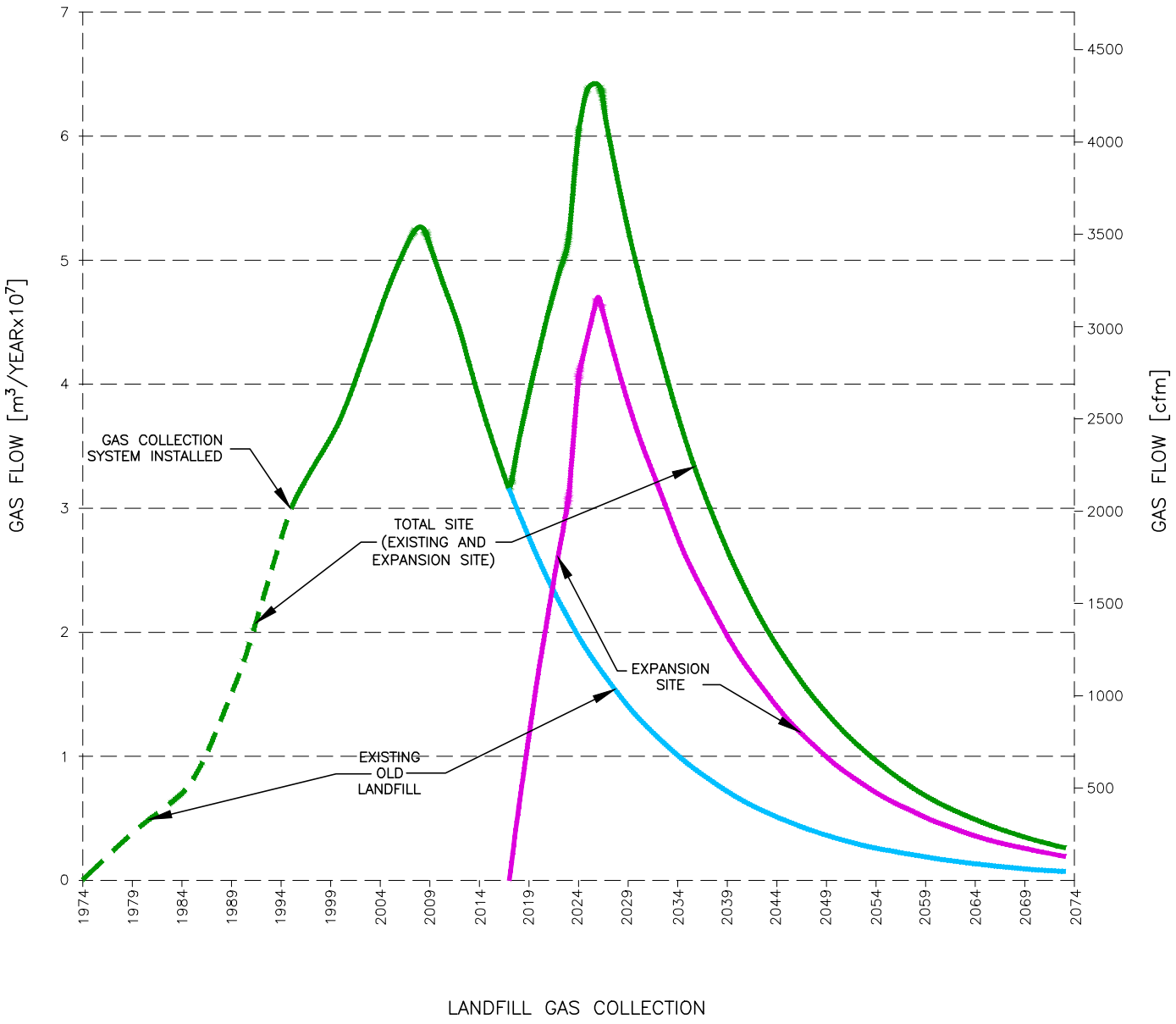
DWN BY: T C G
CHK BY: F C F

DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 4–14

FIGURE
4-14



LANDFILL GAS COLLECTION

FIGURE 5-1

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: N T S

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 5–1

LANDFILL GAS COLLECTION

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

TRUE GRID

1+200W 1+100W 1+000W 0+900W 0+800W 0+700W 0+600W 0+500W 0+400W 0+300W 0+200W

1+400N 1+300N 1+200N 1+100N 1+000N 0+900N 0+800N

TEE BRANCH C/L 126.93
BFV5
TEE BRANCH C/L 124.77
TEE BRANCH C/L 125.90
TEE BRANCH C/L 123.18
TEE BRANCH C/L 122.91
TEE BRANCH C/L 123.66

HP5 INV 127.30
INV 123.82 CDC6
INV 125.92 HP6
INV 122.20 CDC7
INV 124.30 HP7
BFV6

GH 750/250
GRAVEL
H74 H75 H76 H73 H72 H71 H70 H69 H68 H67 H66 H65 H64 H63 H62 H61 H60 H59 H58 H57 H56 H55 H54 H53 H52 H51 H50 H49 H48 H47
H24 H25 H27 H26 H28 H29 H30 H31 H32 H33 H34 H35 H36 H37 H38 H39 H40 H41 H42 H43 H44 H45 H46
H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 H19 H20 H21 H22 H23
H77 H78 H79 H80 H81 H82 H83 H84 H85 H86 H87 H88 H89 H90 H91 H92 H93 H94 H95 H96 H97 H98 H99 H100 H101 H102 H103 H104 H105 H106

HGC 150

135 140 145 147.5 148 150 152 154 147.5 145 140 135 147.5 145 148 150 152 154 150 148 147.5 145 140 135

14000 40000 20000 (Typ) 32000 (typ) 55000 48000

3:1 4:1 3:1 Max 4:1 Max

STORMWATER POND #2
INFILTRATION BASIN #2
INFILTRATION BASIN #1
STORMWATER POND #1
LAURYSEN BUILDING MAINTENANCE BUILDING
GRAVEL YARD
ACCESS ROAD (PAVED)
SCALE HOUSE
SCALE (2)
OVERFLOW
MH
ST 300
SS 300

CDC8 INV 121.65
HP8 INV 124.35
TEE BRANCH C/L 124.53
CDC9 INV 122.91
TEE BRANCH C/L 124.83
HP9 INV 125.61
BFV2
CDC1 INV 124.00
TO BLOWER BUILDING REFER TO FIGURE 4-2

INV 125.54 CDC5
TEE BRANCH C/L 126.87
HP4 INV 128.24
BFV4
TEE BRANCH C/L 127.46
CDC4 INV 126.68
HP3 INV 129.38
45° BEND (Typ)

CDC3 INV 126.50
HP2 INV 128.60
BFV3
CDC2 INV 125.30
HP1 INV 127.40
BFV1 INV 124.34

TEE BRANCH C/L 128.43
TEE BRANCH C/L 127.63
TEE BRANCH C/L 127.79
TEE BRANCH C/L 126.07
TEE BRANCH C/L 127.29
TEE BRANCH C/L 125.56

132 131 130 129

132.5 135.0 137.5 130 132.5 135 137.5 140.0 142.5 145.0 147.5 135 140 145

FROM UPHILL VERTICAL GAS WELLS
FROM HORIZONTAL GAS WELL SYSTEM
VALVE CHAMBER
GH 750

SCALE : 1:3000
0 50 100 150m

PIPING INDEX :

- GH — 750/250ø GAS HEADER PIPE
- 150ø LATERAL
- 150ø SUBHEADER
- 200ø SUBHEADER
- 250ø SUBHEADER
- 300ø SUBHEADER
- HGC — 150ø HORIZONTAL PERFORATED GAS COLLECTOR
- 250ø LEACHATE COLLECTOR PERFORATED
- 250ø LEACHATE COLLECTOR SOLID

- HP7 HIGH POINT
- BFV2 750ø BUTTERFLY ISOLATION VALVE
- CDC7 CONDENSATE DRAIN CHAMBER
- CONDENSATE DRAINAGE DIRECTION
- VERTICAL GAS WELL
- HORIZONTAL SYSTEM GAS WELL
- ISOLATION VALVE IN CHAMBER
- ISOLATION VALVE BURIED

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8098 | WWW.WSPGROUP.COM

WASTE MANAGEMENT

LANDFILL GAS COLLECTION HEADER AND WELL SYSTEM

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: F C F

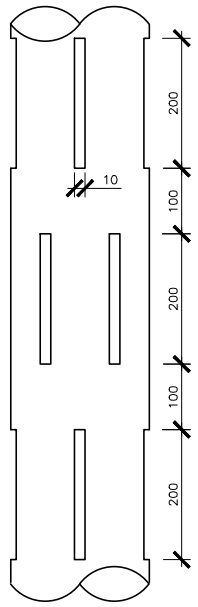
DATE: JULY 2014
SCALE: SEE BAR SCALE

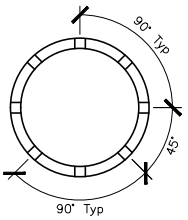
WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 5-2

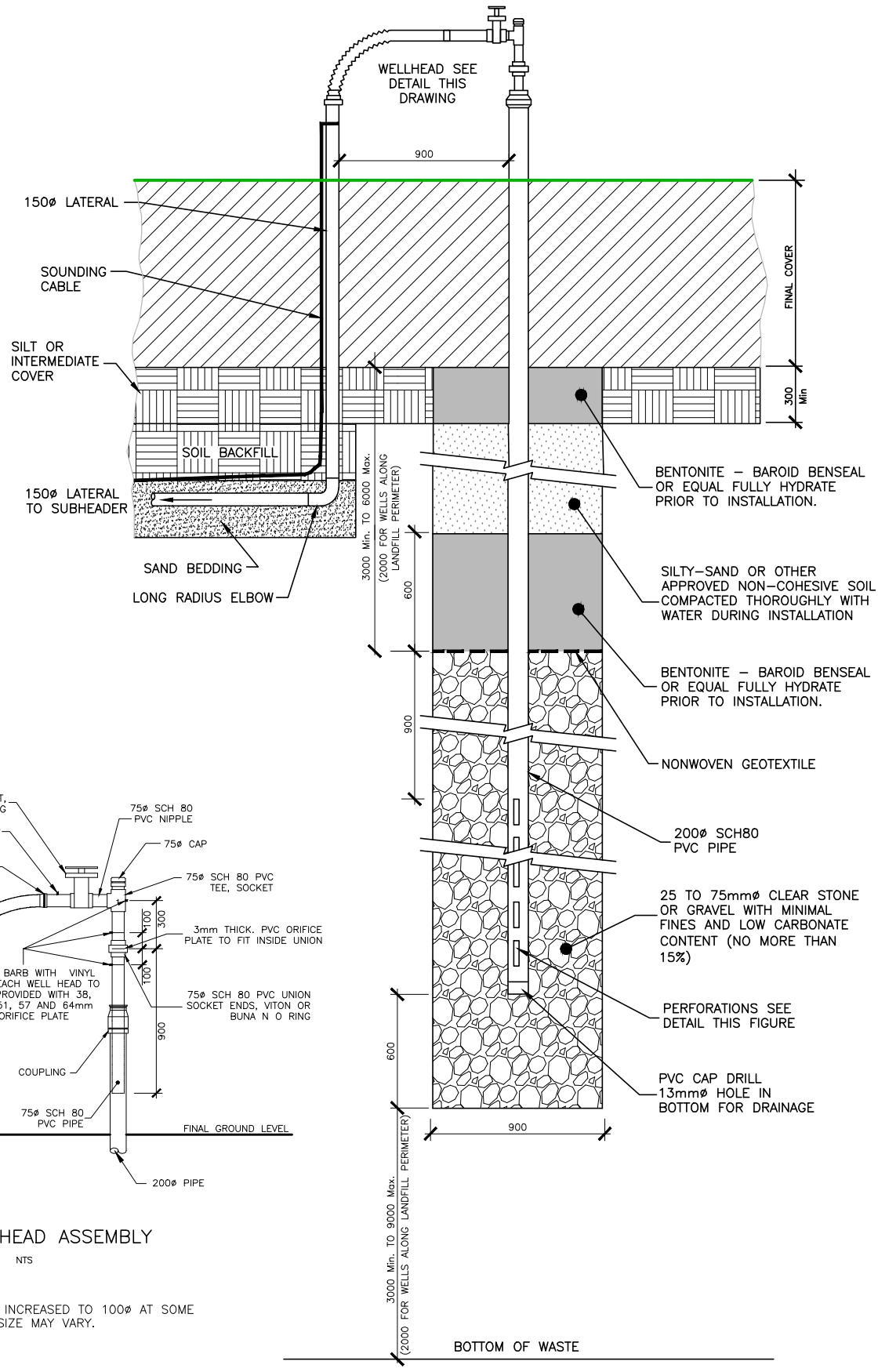
FIGURE 5-2

G:\2013\05\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-5-2.dwg Jul 08, 2014 - 10:32am





PERFORATION DETAIL



TYPICAL WELL HEAD ASSEMBLY

NTS

NOTE :

WELL HEAD ASSEMBLY MAY BE INCREASED TO 100ø AT SOME LOCATIONS. IN AND OUT PIPE SIZE MAY VARY.

FIGURE 5-3

DWN BY: T C G DATE: JULY 2014
CHK BY: P S B SCALE: N T S

WASTE MANAGEMENT OF CANADA CORP.

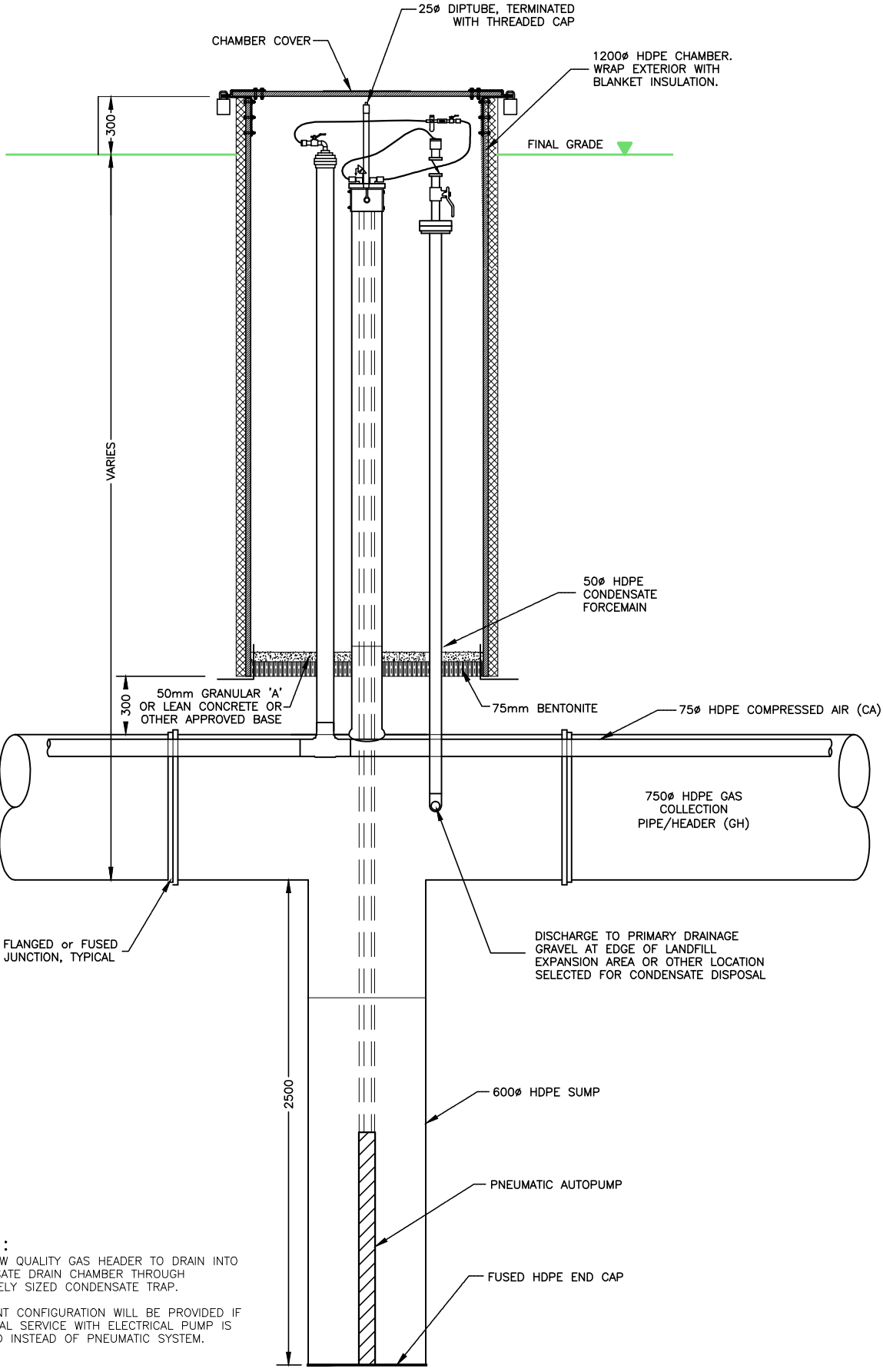
DRAWING NO. 131–19416–00 – 5–3

TYPICAL VERTICAL GAS WELL

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8068 | WWW.WSPGROUP.COM



NOTES :

1. 250ø LOW QUALITY GAS HEADER TO DRAIN INTO CONDENSATE DRAIN CHAMBER THROUGH ADEQUATELY SIZED CONDENSATE TRAP.
2. DIFFERENT CONFIGURATION WILL BE PROVIDED IF ELECTRICAL SERVICE WITH ELECTRICAL PUMP IS SELECTED INSTEAD OF PNEUMATIC SYSTEM.

FIGURE 5-4

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: 1 : 30

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 5-4

TYPICAL
CONDENSATE DRAIN CHAMBER

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

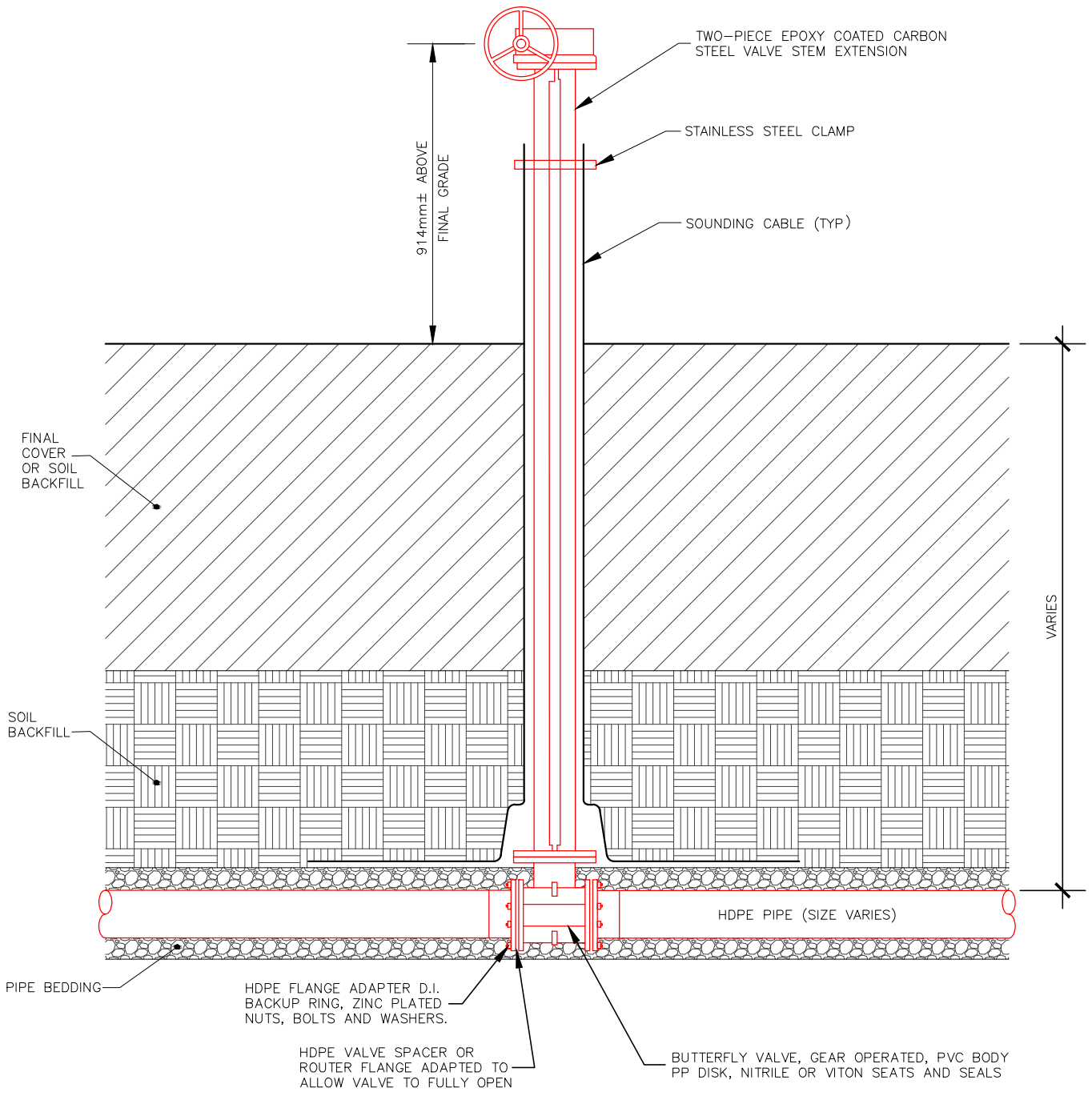


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FIGURE 5-5

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 5–5

TYPICAL
ISOLATION VALVE DETAIL

WEST CARLETON
ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7812 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

NOTES

1. ALL PIPE TO HAVE A MINIMUM SLOPE OF 1% AND PREFERABLY 3 TO 5% TOWARDS CONDENSATE PUMP STATIONS OR DRAINS

2. ONE BUTT FUSED COUPLING TO BE PLACED NEXT TO EACH TEE TO FACILITATE PROPER INSTALLATION AND PREVENT DAMAGE TO FITTINGS (IF REQUIRED).

3. IN LIEU OF BUTT FUSED FITTINGS ELECTRO FUSED FITTINGS WILL BE ACCEPTABLE.

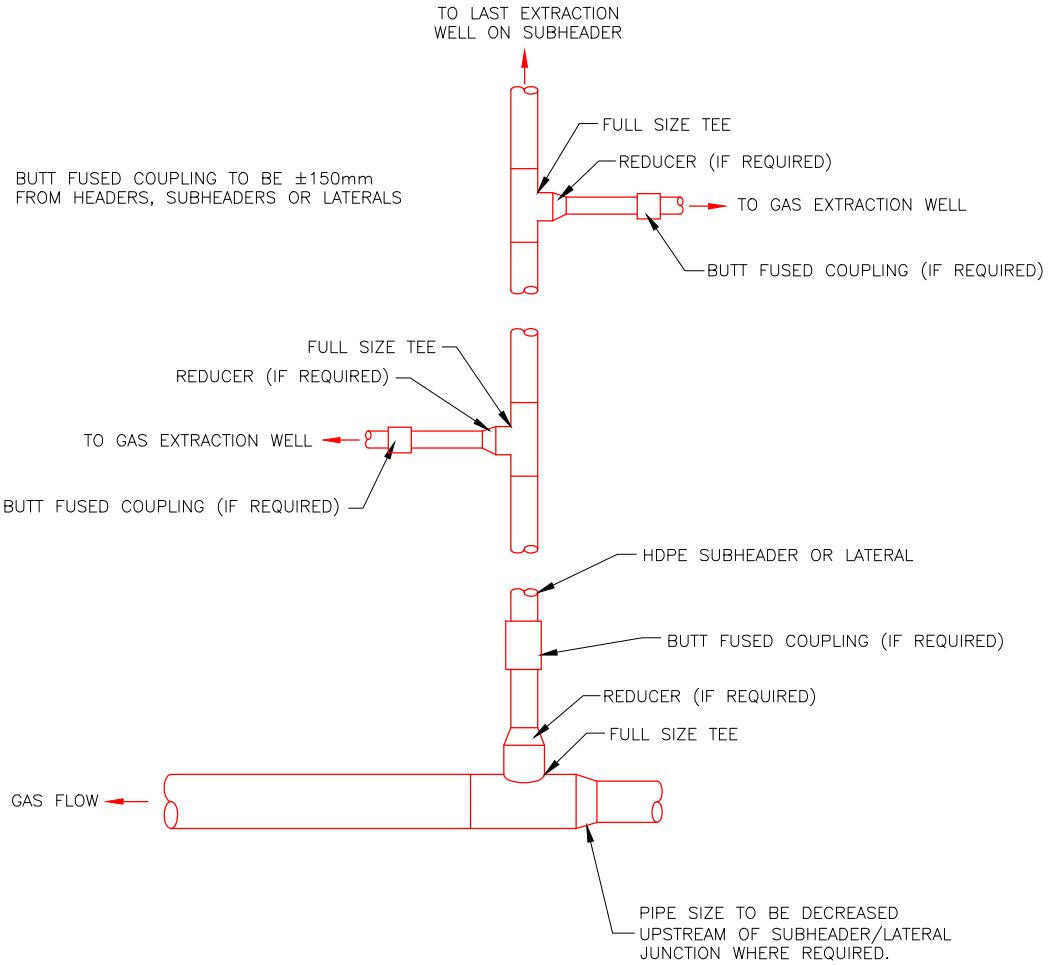

FIGURE 5-6

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 5–6

TYPICAL HEADER/ SUBHEADER/LATERAL JUNCTION

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

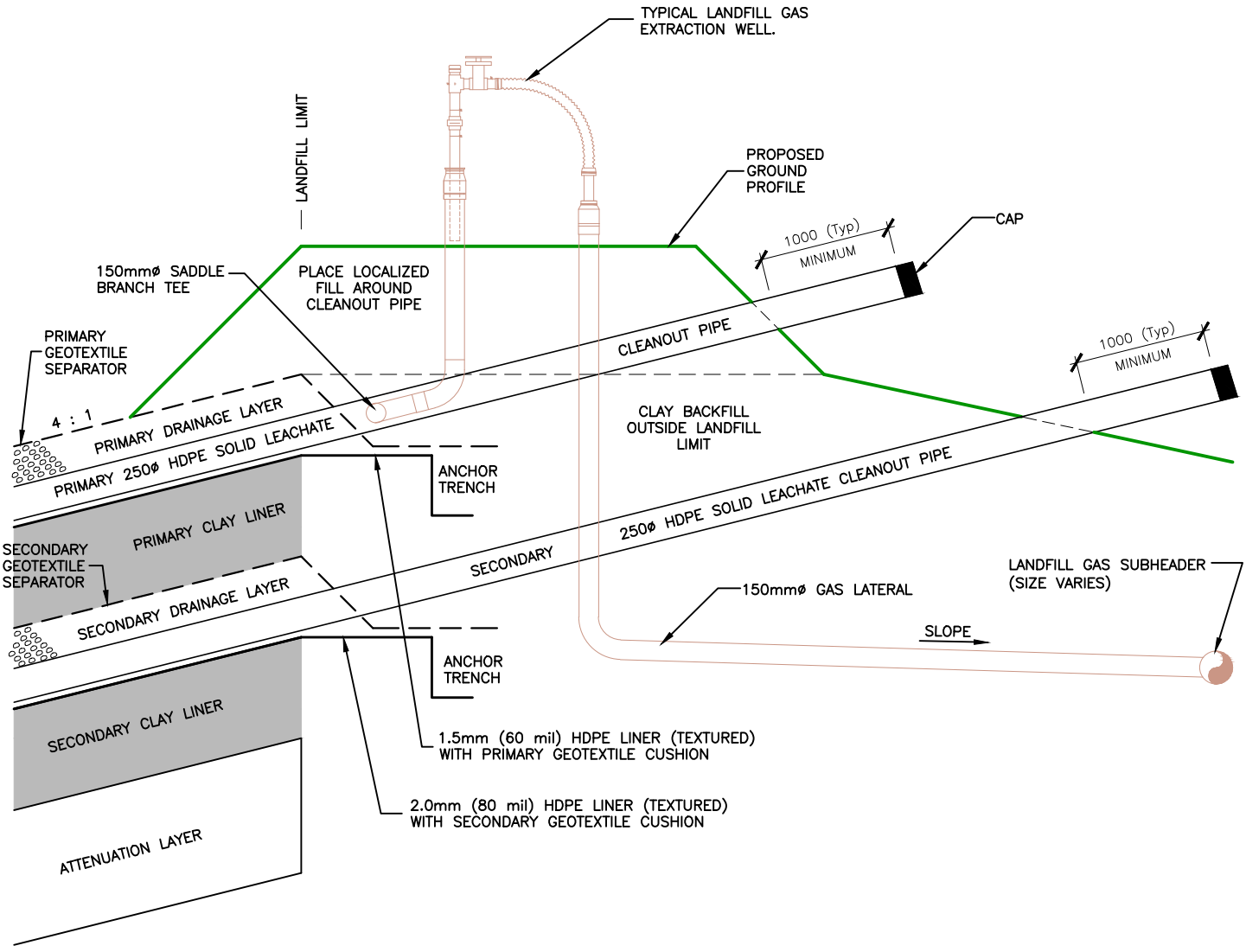

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FIGURE 5-7

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

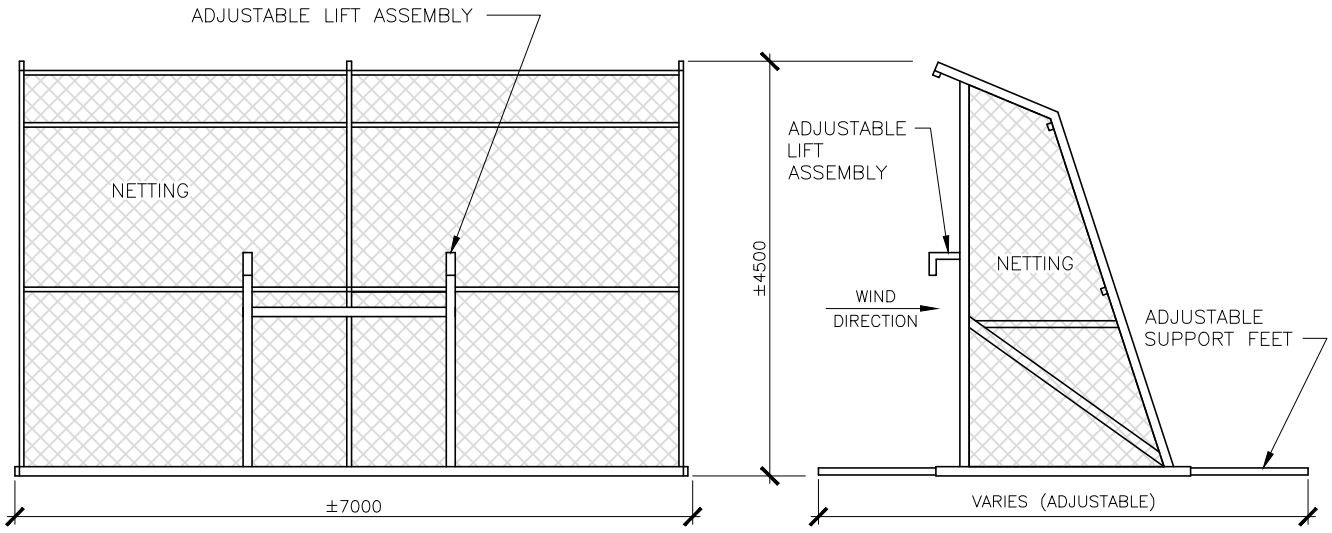
DRAWING NO. 131-19416-00 - 5-7

LEACHATE CLEANOUT DETAIL

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

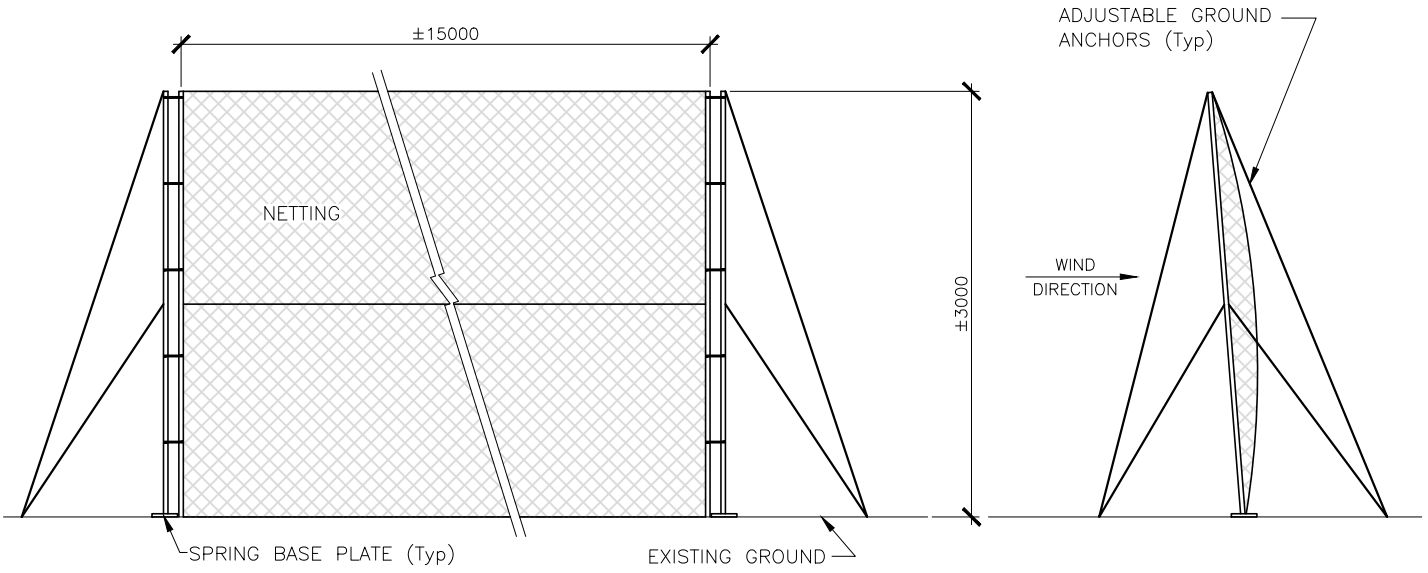


FRONT VIEW

END VIEW

PORTABLE LITTER FENCE

N T S



FRONT VIEW

END VIEW

MOVEABLE LITTER FENCE

N T S

G:\2013\03\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-7-1.dwg Jul 08, 2014 - 10:42am

FIGURE 7-1

DWN BY: T C G
CHK BY: P S B

DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

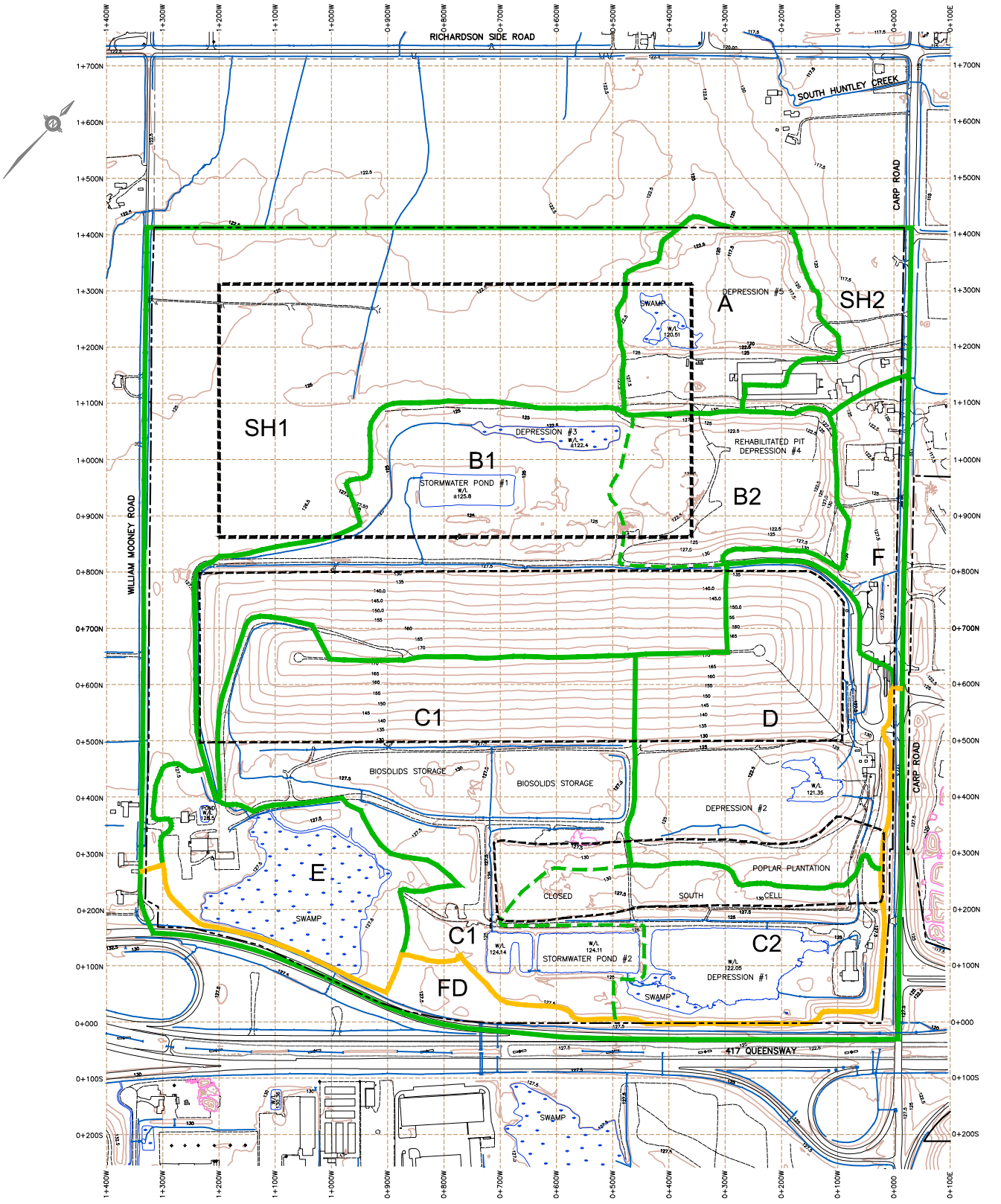
DRAWING NO. 131-19416-00 – 7-1

MOVEABLE LITTER BARRIERS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



LEGEND :

- LIMIT OF DRAINAGE AREA
- LIMIT OF SUBCATCHMENT AREA
- DIVISION BETWEEN FEEDMILL AND SOUTH HUNTLEY CREEK WATERSHEDS
- PROPOSED LANDFILL LIMIT
- WASTE MANAGEMENT OF CANADA PROPERTY LIMIT
- EXISTING LANDFILL LIMIT
- EXISTING GROUND CONTOURS

SCALE :1:10.000:

0 80 160 240 320 400m

FIGURE 8-1

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 8-1

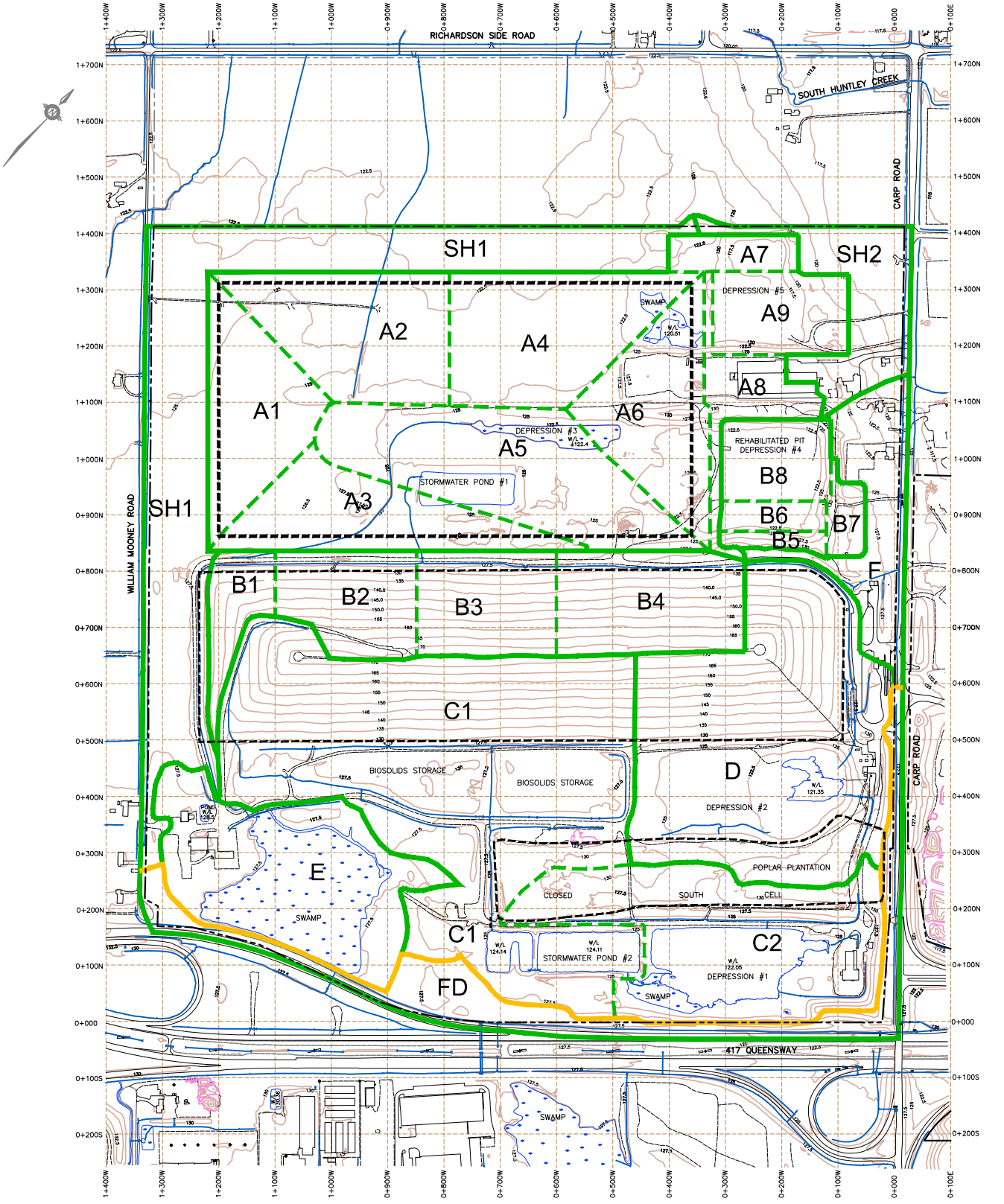
PRE-DEVELOPMENT DRAINAGE AREAS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

G:\2013\05\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR DAO\131-19416-00-8-1.dwg Jul 08, 2014 - 10:43am



LEGEND :

- LIMIT OF DRAINAGE AREA
- LIMIT OF SUBCATCHMENT AREA
- DIVISION BETWEEN FEEDMILL AND SOUTH HUNTLEY CREEK WATERSHEDS
- PROPOSED LANDFILL LIMIT
- WASTE MANAGEMENT OF CANADA PROPERTY LIMIT
- EXISTING LANDFILL LIMIT
- EXISTING GROUND CONTOURS

SCALE :1:10.000:

0 80 160 240 320 400m

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-8-2.dwg Jul 08, 2014 – 10:48am

FIGURE 8-2

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

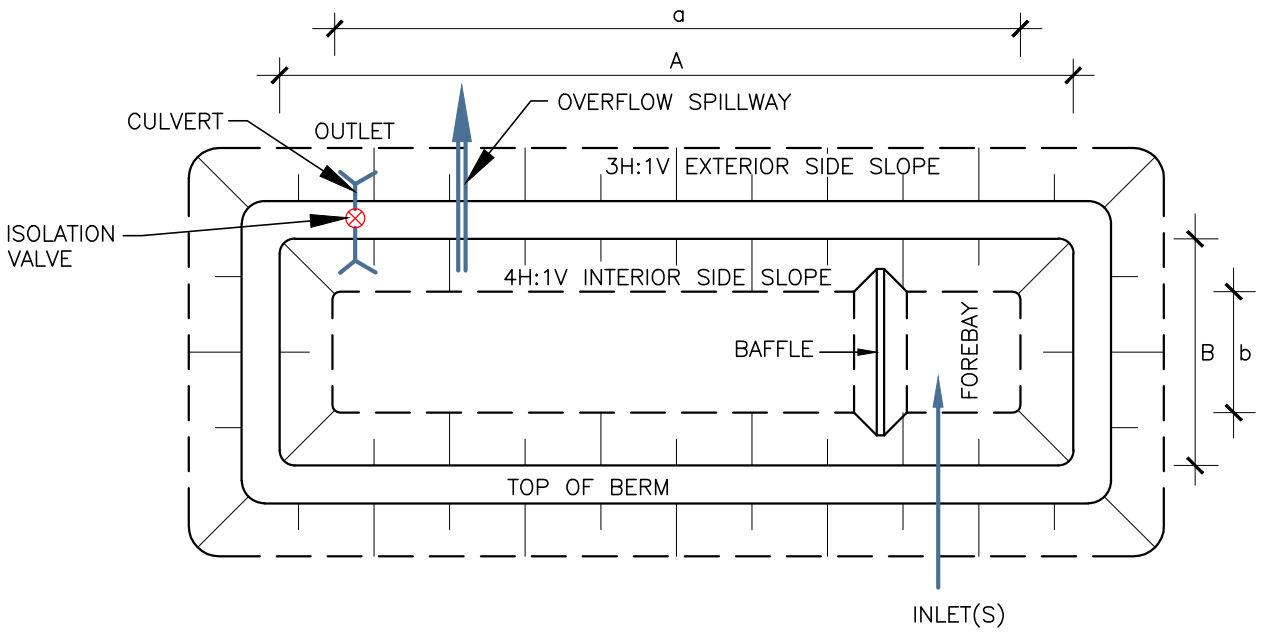
DRAWING NO. 131–19416–00 – 8–2

POST-DEVELOPMENT DRAINAGE AREAS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



STORMWATER POND SCHEMATIC

SCALE: NTS

POND #	1	2
BOTTOM ELEVATION (m)	124.00	122.80
TOP OF BERM ELEVATION (m)	VARIES 126.75 – 129.00	VARIES 126.30 – 126.80
OUTLET PIPE NOMINAL ø (mm)	300	350
OUTLET INVERT UPSTREAM (m)	124.60	123.40
OUTLET INVERT DOWNSTREAM (m)	124.50	123.30
OVERFLOW SPILLWAY ELEVATION (m)	125.85	125.40
OVERFLOW SPILLWAY BOTTOM WIDTH (m)	3.0	6.0
a (m)	150	200
A (m)	184	228
b (m)	26	32
B (m)	51	62

NOTE :

ACTUAL INLET/OUTLET CONFIGURATION MAY VARY FROM THIS SHOWN HEREIN.

FIGURE 8-3

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

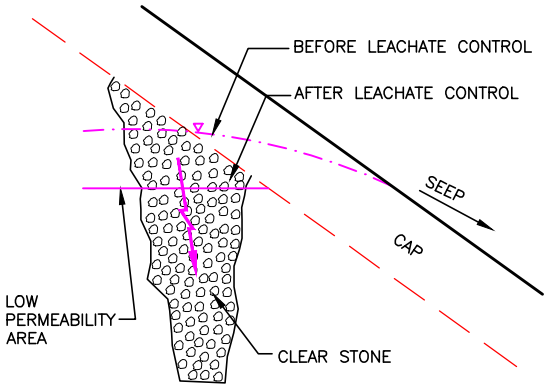
DRAWING NO. 131–19416–00 – 8–3

STORMWATER POND SCHEMATIC

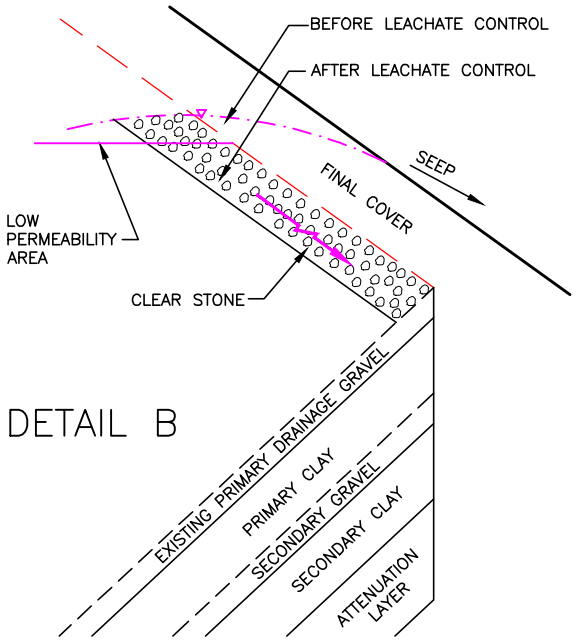
WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

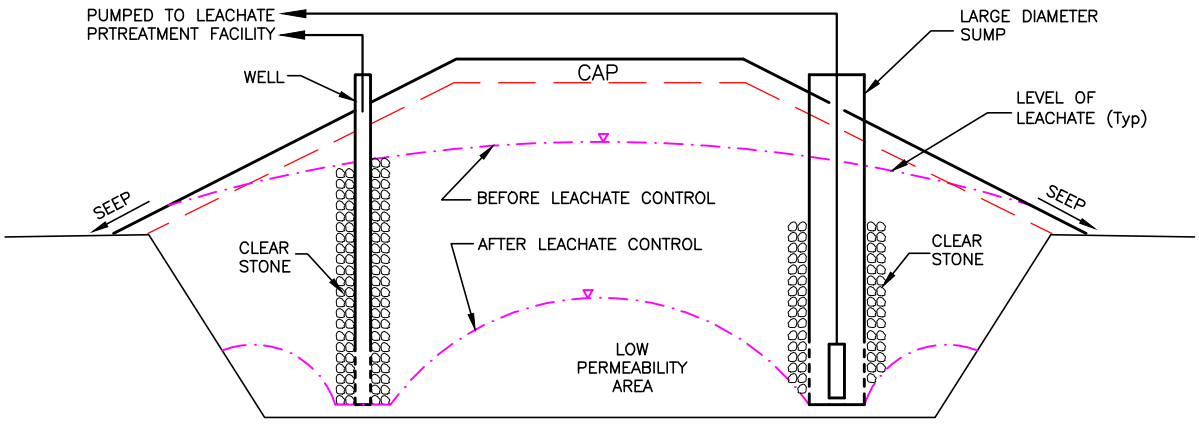
WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM



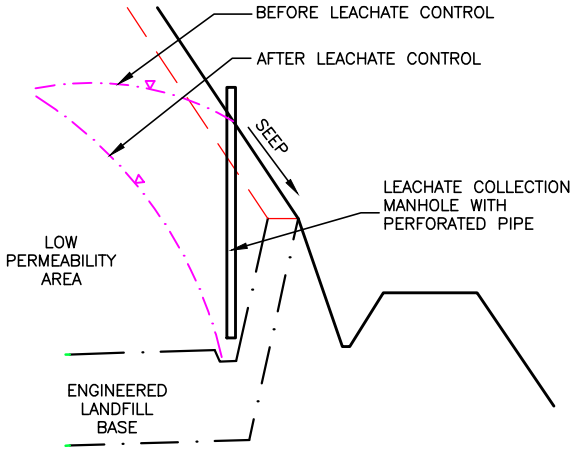
DETAIL A

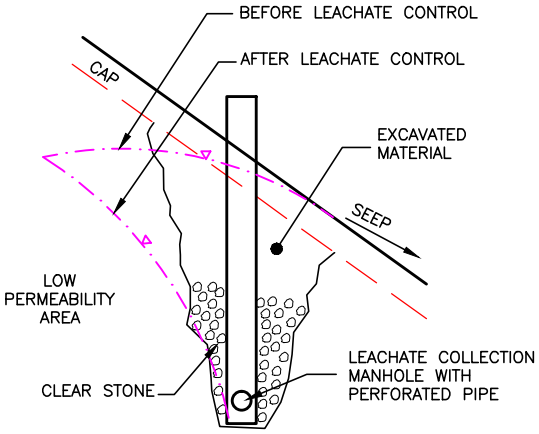


DETAIL B



DETAIL C





DETAIL D

G:\2013\GS\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR DWG\131-19416-00-9-1.dwg Jul 08, 2014 - 10:50am

FIGURE 9-1

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 9-1

LEACHATE SEEP CONTROL SCHEMATIC DETAILS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8006 | WWW.WSPGROUP.COM

Tables

TABLE 4-1
SUMMARY OF VOLUMES, PHASES 1 TO 10
WM - WCEC LANDFILL EXPANSION

#	Item	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Phase 9	Phase 10	TOTAL
1.	Waste Area Each New Cell (ha)	7.06	6.15	6.13	0	6.15	6.15	0	6.16	0	0	37.8
2.	Final Cover Area (ha)	2.85	1.09	1.47	8.75	1.87	0.94	7.43	2.50	4.90	6.58	38.38
3.	Waste & Daily Cover (m^3)	679,500	753,500	751,100	776,400	705,200	666,700	882,000	669,100	379,600	235,800	6,498,900
4.	Final Cover (1 m thick) (m^3)	28,500	10,900	14,700	87,500	18,700	9,400	74,300	25,000	49,000	65,800	383,800
5.	Gross Volume (waste, daily cover, final cover) (m^3)	708,000	764,400	765,800	863,900	723,900	676,100	956,300	694,100	428,600	301,600	6,882,700
6.	Daily Cover (@15% of waste & daily cover) (m^3)	101,900	113,000	112,700	116,500	105,800	100,000	132,300	100,400	56,900	35,400	974,900
7.	Net Waste Volume (m^3)	577,600	640,500	638,400	659,900	599,400	566,700	749,700	568,700	322,700	200,400	5,524,000
8.	Waste (@725 kg/m^3 density) (t)	418,760	464,360	462,840	478,430	434,570	410,860	543,530	412,300	233,960	145,290	4,004,900
9.	Primary Clay Liner (m^3)	57,000	46,100	46,000	0	46,100	46,100	0	42,200	0	0	283,500
10.	Secondary Clay Liner (m^3)	60,000	46,100	46,000	0	46,100	46,100	0	39,200	0	0	283,500
11.	Primary Drainage Layer (m^3)	23,100	19,300	19,300	0	19,300	19,300	0	18,500	0	0	118,800
12.	Secondary Drainage Layer (m^3)	24,400	19,400	19,400	0	19,400	19,400	0	17,300	0	0	119,300
13.	Attenuation Layer (m^3)	81,900	61,500	61,300	0	61,500	61,500	0	50,300	0	0	378,000
14.	Engineered Landfill Base (Liners, Drainage Layers and Attenuation Layer) (m^3)	246,400	192,400	192,000	0	192,400	192,400	0	167,500	0	0	1,183,100
15.	Primary HDPE Liner (ha)	7.67	6.29	6.28	0	6.30	6.29	0	5.94	0	0	38.77
16.	Secondary HDPE Liner (ha)	8.08	6.29	6.28	0	6.30	6.29	0	5.53	0	0	38.77
17.	Primary Geotextile Cushion (ha)	7.58	6.29	6.28	0	6.30	6.29	0	6.03	0	0	38.77
18.	Secondary Geotextile Cushion (ha)	7.99	6.29	6.28	0	6.30	6.29	0	5.62	0	0	38.77
19.	Geotextile Separator (top and bottom) (ha)	16.39	12.95	12.92	0	12.96	12.95	0	11.19	0	0	79.36
20.	Landfill Footprint Subgrade Preparation - Cut (m^3)	125,500 (3)	51,300	28,000	0	20,700	18,600	0	4,800	0	0	248,900
21.	Landfill Footprint Subgrade Preparation - Fill (m^3) (2)	38,100 (3)	10,200	19,700	0	15,400	9,800	0	25,200	0	0	118,400
22.	Road Corridors - Cut (m^3)	56,900 (3)	0	0	0	0	0	0	0	0	0	56,900
23.	Road Corridors - Fill (m^3) (1)(2)	345,700 (3)	18,100	22,800	0	20,700	21,200	0	104,100	0	0	532,600
24.	Pond/Infiltration Basin Area - Cut (m^3)	86,600 (3)	0	0	0	0	0	0	0	0	0	86,600
25.	Pond/Infiltration Basin Area - Fill (m^3) (2)	326,100 (3)	0	0	0	0	0	0	0	0	0	326,100

(1) Includes imported granular road fill material and pavement.

(2) Does not include topsoil to be stripped.

(3) Includes loose fill (± 109,700 m^3) which must be removed from rehabitated, old Dibbley Pit (Depression #4)

(4) Fill and cut balance for Items 20 - 25 results in material deficit of 584,700 m^3.

Table 4-2
Alternate Daily Cover (ADC)

Type	Grain Size	Limitations	Operational Requirements
Contaminated soil special waste		150 mm minimum thickness.	Can mix with certain other ADC materials.
Polyethylene tarps or geoextile blankets	NA	On daily cell side slopes. Use soil on top of daily cell.	Remove within 72 hrs.
Foam Products – open or closed cell foams (e.g. Allied, Rusmar)		On daily cell side slopes. Use soil on top of daily cell.	Do not apply if 40% chance of precipitation in 8 hours. Cover with new waste within 72 hours.
Cementitious materials (i.e. posi shell, Pro-Guard, ConCover)		Use on side slopes, 6 mm minimum thickness. Use soil on top of daily cell.	Cover with new waste within 72 hours. Water may be problematic in winter temperatures.
Processed Green Material (e.g. compost, sawdust, wood chips, ground wood, processed C&D wood, dewatered paper sludge), blown straw	95% < 300 mm 50% < 150 mm	150 mm minimum thickness.	Cover within 3 months exposure. No significant gypsum board in processed C&D waste (<3% by weight).
Tire shred		< 300 mm and 50% < 150 length. 150 mm minimum thickness.	Use on interior slopes to prevent run-off to storm water ditches. Place soil over waste once per week to reduce fire hazard.
Slag, foundry sands, sand blast grit, or dredge spoils		Same as “special waste”, TCLP test required. 150 mm minimum thickness.	Monitor dust if nuisance. Add moisture if required.
Auto shredder residue (auto fluff)		150 mm minimum thickness.	
Glass aggregate	Crush to 9.5 mm minus	150 mm minimum thickness.	Can mix with tire shred, soil or processed C&D.
Industrial residuals and dry filter cake		150 mm thickness. TCLP test required. Max MC (wet) 60%.	
Crushed concrete, brick, aggregate, spent refractory brick		TCLP test required for refractory brick, 150 mm thickness.	
Shingles (asphalt or fibreglas)	95% < 300 mm 50% < 150 mm	150 mm minimum thickness	

Table 5-1
Landfill Gas Collection

Year	Waste Input[7] [tonne]	Existing Site Gas Collected [cfm]	Existing and Expansion Site Total Gas Collected [cfm]	Existing and Expansion Site Total Gas Collected [m^3/year x 10^7]
1974	57610	0	0	0.00
1975	57610	58	58	0.09
1980	57610	297	297	0.44
1985	127564	526	526	0.78
1990	259170	1140	1140	1.70
1995	217664	2011 (1)	2011	2.99
2000	258174	2495	2495	3.71
2005	379998	3233	3233	4.81
2008	109648	3547 (3)	3547	5.28
2010	73110	3281 (2)	3281	4.88
2011	48500	3140	3140	4.67
2012		2982	2982	4.44
2013		2786	2786	4.15
2014		2603	2603	3.87
2015		2432	2432	3.62
2016		2272	2272	3.38
2017	400000	2123	2123	3.16
2018	400000	1983	2388	3.55
2019	400000	1853	2636	3.92
2020	400000	1731	2868	4.27
2021	400000	1617	3085	4.59
2022	400000	1511	3287	4.89
2023	400000	1412	3476	5.17
2024	400000	1319	4057	6.04
2025	400000	1232	4196	6.24
2026	400000	1151	4325 (4)	6.44
2027		1075	4041	6.01
2028		1005	3775	5.62
2029		939	3527	5.25
2030		877	3295	4.90
2035		624	2345	3.49
2040		444	1669	2.48
2045		316	1188	1.77
2050		225	846	1.26
2055		160	602	0.90
2060		114	428	0.64
2065		81	305	0.45
2070		58	217	0.32
2073		47	177	0.26

Notes:

(1) Gas system installed mid 1990's. Figures before that date are hypothetical only.
(2) Additional gas wells and "beanie cap" installed.
(3) Max Gas Existing Site
(4) Max Gas Existing and Expansion Site
(5) 1 x 10^7 m^3/year = 672 cfm
(6) Gas collection efficiency 85%
(7) Waste excludes special waste or cover.

Table 5-2
Landfill Gas System Quantities

Phase	Landfill Gas System Piping									Landfill Gas System Well Heads						
	Headers		Subheaders				Laterals	Solid/ Perforated Horizontal System Piping		Vertical System		Horizontal System # of Well Heads [1]	Leachate Collection System # of Well Heads [1]	Condensate Drain Chamber [1]	Isolation Valve in Chamber [1]	Isolation Valve Buried [1]
	750 mm diameter [m]	250 mm diameter [m]	300 mm diameter [m]	250 mm diameter [m]	200 mm diameter [m]	150 mm diameter [m]	150 mm diameter [m]	150 mm diameter [m]	Number of runs [1]	# of Extraction Wells [1]	Overall Length of Wells [m]					
1	1460	1460	11	148	364	275	331	746	2	10	66	4	10	5	4	4
2	245	245	11	179	211	359	108	1493	4	3	20	8	10	1	2	--
3	310	310	122	88	304	382	57	1450	4	5	36	8	10	1	2	--
4	--	--	--	130	328	--	1205	--	--	33	602	--	--	--	--	--
5	260	260	11	186	212	301	70	1932	5	3	21	10	8	--	2	1
6	270	270	11	222	163	360	12	1561	4	2	14	8	10	2	2	1
7	--	--	280	139	173	--	1116	--	--	31	565	--	--	--	--	--
8	779	779	--	62	302	431	351	1577	4	11	73	8	12	2	4	1
9	--	--	--	103	209	--	672	--	--	16	286	--	--	--	--	--
10	--	--	76	--	479	--	1030	--	--	30	591	--	--	--	--	--
Total	**3324**	**3324**	**522**	**1257**	**2745**	**2108**	**4952**	**8759**	**23**	**144**	**2274**	**46**	**60**	**11**	**16**	**7**

TABLE 6-1
HISTORIC LEACHATE FLOWS
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Leachate Pumped to City of Ottawa Sanitary Sewer															
Year	Blended Total (Purge Wells and Raw Leachate)				Purge Well System				Existing Landfill - Raw Leachate						
	Flow		Max/Min Flow	Month of Max/Min Flow	Flow		Max/Min Flow	Month of Max/Min Flow	Flow		Max/Min Flow	Month of Max/Min Flow	Poplar Disposal (May to Oct)	Total Flow (Poplar and Pumped to Ottawa Sewer)	
	[m^3/day]	[m^3/year]	[m^3/day]		[m^3/day]	[m^3/year]	[m^3/day]		[m^3/day]	[m^3/year]	[m^3/day]		[m^3/year]	[m^3/day]	[m^3/year]
2009[(1)]	656	239,440	748 / 535	June / Jan	590	215,350	673 / 481	June / Jan	66	24,090	75 / 53	Jun / Jan	N/A	N/A	N/A
2011	703	256,460	815 / 562	Apr / Dec	650	237,337	715 / 526	Apr / Dec	52	19,123	100 / 20	Apr / Feb	4,678	65	23,801
2012	507	185,676	656 / 383	July / Dec	469	171,362	613 / 383	July / Dec	39	14,314	57 / 25	Aug / May	6,536	57	20,850
2013	518	189,048	820 / 355	July / Feb	457	166,732	707 / 315	Jul / Feb	61	22,316	113 / 40	Jul / Feb	12,962	97	35,278

Notes:
(1) Based on Reference 15 and shown in Appendix 6-A.
(2) Data based on WM records unless noted otherwise.

TABLE 6-2
PHASING ANALYSIS FOR LEACHATE QUANTITIES
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Phase	Waste Footprint Area [ha]	Cap or Partial Cap in Place at End of Phase		Interim Covered Area		Active - Daily Covered Area		Expansion Leachate Quantity Generated[1] [m^3/yr]	Existing Landfill Leachate Generated[2] [m^3/yr]	Total Leachate Generated (expansion and existing site)	
		Size [ha]	Leachate Quantity [m^3/yr]	Size [ha]	Leachate Quantity [m^3/yr]	Size [ha]	Leachate Quantity [m^3/yr]			[m^3/yr]	[L/s]
1	7.06	2.69	4,035	0.37	833	4.0	10,000	14,868	24,660	39,528	1.25
2	13.21	3.72	5,580	5.49	12,253	4.0	10,000	27,933	24,660	52,593	1.67
3	19.34	5.13	7,695	10.21	22,973	4.0	10,000	40,668	24,660	65,328	2.07
4	19.34	13.88	20,820	1.46	3,285	4.0	10,000	34,105	24,660	58,765	1.86
5	25.49	15.69	23,535	5.8	13,050	4.0	10,000	46,585	24,660	71,245	2.26
6	31.64	16.57	24,855	11.07	24,907	4.0	10,000	59,762	24,660	84,422	2.67
7	31.64	24.00	36,000	3.64	8,190	4.0	10,000	54,190	24,660	78,850	2.50
8	37.80	26.35	39,575	7.45	16,763	4.0	10,000	66,288	24,660	90,948	2.88
9	37.80	31.24	46,860	2.56	5,760	4.0	10,000	62,620	24,660	87,280	2.77
10	37.80	37.80	56,700	0	0	0	0	56,700	24,660	81,360	2.57

Notes:

1. Assumes 0.25 m/yr infiltration on active - daily covered area; 0.225 m/yr infiltration on interim covered area and 0.15 m/yr infiltration on capped or partially capped area.
2. Leachate generation based on 0.3 m/yr over 8.22 ha lined cell.

TABLE 7-1
EQUIPMENT REQUIREMENTS - SITE OPERATION
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Item	WCEC Site
Site Intake of Residential/ICI Waste	**1,000 to 2,000 t/d**
Working Face	2 - Compactors 2 - Dozers
Daily Cover and Capping	2 - Articulated Trucks 1 - Excavator
Road Maintenance	1 - Grader
Other Equipment	1 - Tracked Loader 1 - Portable Air Compressor 1 - Portable Pressure Washer 1 - Utility Tractor with sweeper attachment, rear mounted scraper blade and bush hog-type mower 1 - Portable Electric Generator and Lighting Plant; 1 - Roll-off Truck, complete with roll-off bins 1 - Road Sweeper with Water Flush System 1 - Portable 100-mm Diesel Water Pump 1 - 3/4 tonne 4 x 4 Pickup Truck, complete with hydraulic-operated snow plough and diesel fuel tank and pump 1 - Loader 1 - Portable Wood Crusher / Screener - periodic only 1 - Wood tub Grinder, 1 - Chipper - periodic only Other auxiliary equipment, such as pickup trucks, maintenance equipment, steam jennies, welders, small tools, portable diesel generator for variable use and portable construction pumps, and power road sweeper attachment for farm tractor.

TABLE 8-1
DRAINAGE AREA CHARACTERISTICS, PRE-DEVELOPMENT CONDITIONS
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Drainage Area		Size [ha]		Time of Concentration (Tc) [1] [min]	Runoff Coefficient C		Rational Method Peak Flow Q_{100} [m^3/s]	Remarks
A		10.08		19	0.29		1.01	No outlet.
B	B1	39.47	29.41	35	0.32	0.34	2.30	No outlet.
	B2		10.06	10		0.25	1.34	No outlet.
C	C1	45.19	31.69	25	0.29	0.32	2.92	No outlet.
	C2		13.50	12		0.22	1.40	No outlet.
D		21.34		16	0.34		2.82	No outlet.
E		11.50		29	0.25		0.83	No outlet.
F		5.80		11	0.34		0.99	No outlet. Drains off-site to Huntley Quarry
SH	SH1	47.12	41.35	-	0.25	0.23	-	Multiple outlets to South Huntley Creek
	SH2		5.77	18		0.36	0.75	
FD		7.79		38	0.31		0.52	Drains to Feedmill Creek
TOTAL		**188.29**		**-**	**0.29**		**-**	

Notes:

(1) Tc established using Kirpich Method

TABLE 8-2
DRAINAGE AREA CHARACTERISTICS, POST-DEVELOPMENT CONDITIONS
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Drainage Area		Size [ha]		Time of Concentration (Tc) [3] [min]		Runoff Coefficient C		Soil/Land Use Curve Number CN (AMC II)		Rational Method Peak Flow Q_{100} [m^3/s]		Remarks	
A	A1	51.66	5.75	32[1]	15	0.432	0.433	80.9	80.9	5.31[1]	1.01	No outlet	
	A2		7.59		15		0.435		81.2		1.34		
	A3		6.3		19		0.459		82.1		1.00		
	A4		7.74		19		0.435		81.1		1.17		
	A5		10.27		17		0.44		81.6		1.69		
	A6		6.25		15		0.45		81.4		1.14		
	A7		1.5		-		0.5		85		-		No concentrated flow
	A8		2.8		18		0.561		85.7		0.57		
	A9		3.46		-		0.16		70		-		No concentrated flow
B	B1	22.58	2.11	31[2]	11	0.398	0.412	79.1	79.6	2.13[2]	0.44	No outlet	
	B2		4.28		12		0.418		79.7		0.84		
	B3		4.67		14		0.42		79.9		0.84		
	B4		6.1		15		0.439		80.5		1.09		
	B5		0.64		6		0.24		72		0.12		
	B6		1.03		-		0.5		85		-		No concentrated flow
	B7		0.94		6		0.606		86.2		0.43		
	B8		2.81		-		0.16		70		-		No concentrated flow
C	C1	45.19	31.69	25		0.29	0.32	-		2.91		No outlet. No change.	
	C2		13.5	12			0.22	-		1.40		No outlet. No change.	
D		20.83		16		0.34		-		2.75		No outlet. No change.	
E		11.50		29		0.25		-		0.83		No outlet. No change.	
F		5.24		11		0.38		-		0.99		No outlet. No flow increase.	
SH	SH1	23.50	18.44	-		0.27	0.25	-		-		Multiple outlets. Drainage area reduced by 55%. Flow lower than under pre-development conditions.	
	SH2		5.06	18			0.36	-		0.66		Flow lower than under pre-development conditions.	
FD		7.79		38		0.31		-		0.52		No change.	
TOTAL		**188.29**		**-**		**0.35**		**-**		**-**			

Notes:

(1) Tc and Q_{100} at Pond 2

(2) Tc and Q_{100} at Pond 1

(3) Tc established using Kirpich Method

TABLE 8-3
HYDROLOGIC MODELLING RESULTS - STORMWATER PONDS (24-HR SCS II STORM)
WM - WEST CARLETON ENVIRONMENTAL CENTRE

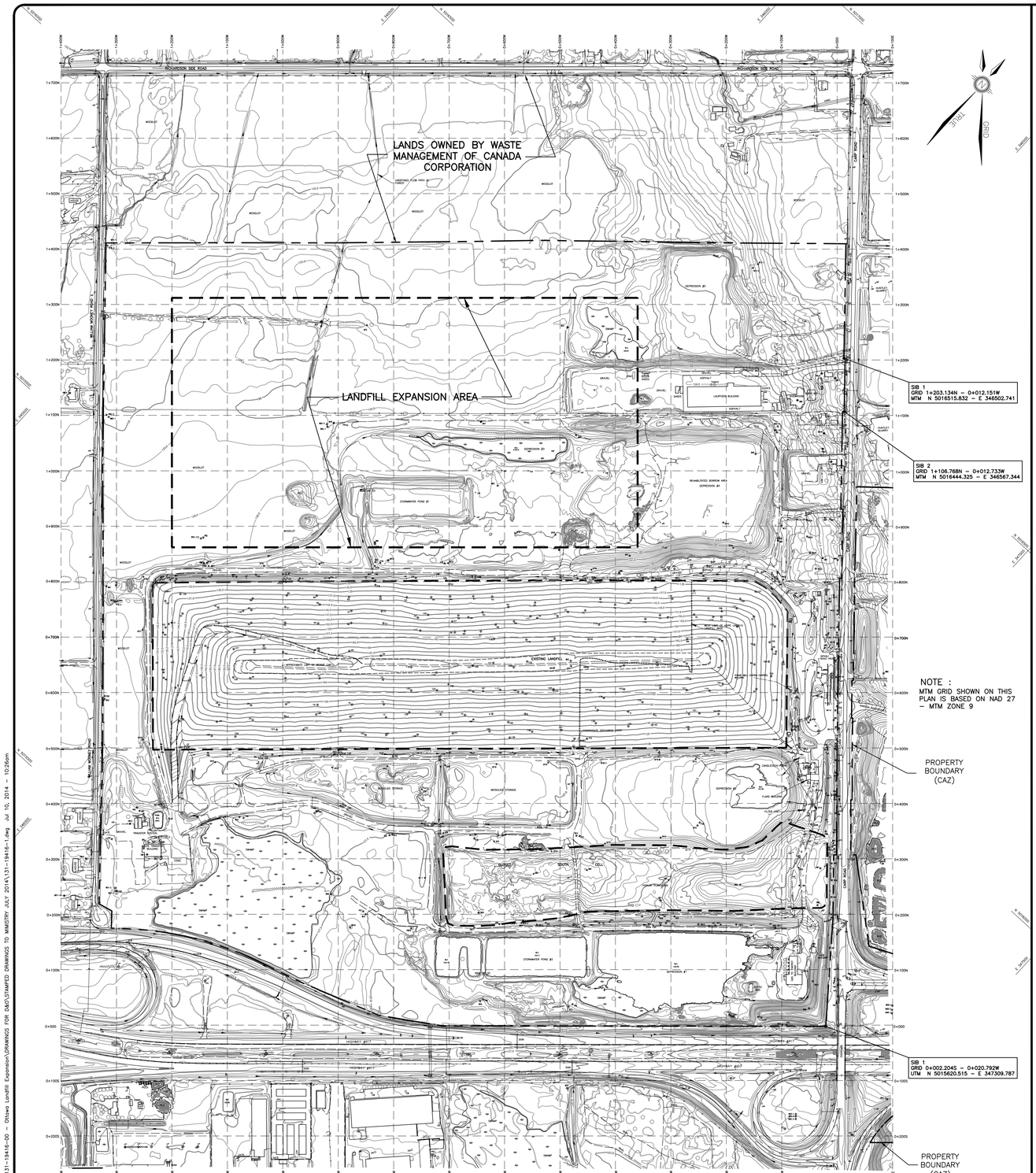
Storm	Rainfall Depth [mm]	Post Development Conditions									
		Rainfall Volume [m^3]	Pond Peak Inflow [m^3/s]	Rational Method Pond Peak Inflow [m^3/s]	Runoff Volume [m^3]	Calculated Runoff Coefficient (6) / (3)	Peak Pond Outflow [m^3/s]	Maximum Water Level [mASL]	Maximum Water Storage excluding PWPV [m^3]	Total Pond Water Storage [m^3]	Draining Time After Storm [hr]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Drainage Area A (Pond #2) - 48.2 ha, Normal Water Level - 123.4 m, Permanent Water Pool Volume (PWPV) - 4,200 m^3											
1:2 yr	48.2	23,232	1.50	2.06	7,024	0.302	0.10	123.87	3,845	8,045	23
1:5 yr	63.8	30,752	2.94	2.65	12,177	0.396	0.15	124.25	7,247	11,447	31
1:10 yr	74.2	35,764	4.01	3.04	15,954	0.446	0.18	124.53	9,917	14,117	35
1:25 yr	87.3	41,206	5.46	3.88	20,988	0.509	0.22	124.88	13,609	17,809	40
1:50 yr	97.0	46,754	6.57	4.66	24,866	0.532	0.24	125.15	16,534	20,734	44
1:100 yr	106.6	51,381	7.71	5.31	28,805	0.561	0.26	125.40	19,543	23,743	48
Drainage Area B - (Pond #1) - 19.77 ha, Normal Water Level - 124.60 m, Permanent Water Pool Volume (PWPV) - 2,598 m^3											
1:2 yr	48.2	9,529	0.51	0.83	2,606	0.273	0.04	124.88	1,369	3,967	11
1:5 yr	63.8	12,613	1.07	1.06	4,617	0.366	0.08	125.08	2,444	5,042	14
1:10 yr	74.2	14,669	1.49	1.22	6,106	0.416	0.10	125.25	3,391	5,989	17
1:25 yr	87.3	17,259	2.08	1.55	8,104	0.469	0.12	125.47	4,720	7,318	20
1:50 yr	97.0	19,177	2.54	1.87	9,651	0.503	0.13	125.64	5,784	8,382	23
1:100 yr	106.6	21,075	3.00	2.13	11,226	0.533	0.15	125.81	6,890	9,488	25

TABLE 8-4
HYDROLOGIC MODELLING RESULTS - INFILTRATION BASINS (24-HR SCS II STORM)
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Storm	Post-Development Conditions				
	Runoff Volume [m^3]	Maximum Water Level [mASL]	Maximum Water Storage [m^3]	Draining Time After Upstream Pond Empties [hr]	Capacity Up to Emergency Overflow Level [m^3]
(1)	(2)	(3)	(4)	(5)	(6)
Drainage Area A - Infiltration Basin 2 - Bottom 122.00, Overflow Spillway Level - 123.60 mASL					
1:2 yr	7,084	122.05	1,348	5	
1:5 yr	12,448	122.16	3,997	7	
1:10 yr	16,399	122.25	6,381	13	43,592
1:25 yr	21,680	122.38	9,827	24	
1:50 yr	25,760	122.48	12,612	32	
1:100 yr	29,909	122.59	15,530	40	
Drainage Area B - Infiltration Basin 1 - Bottom 123.00 - Overflow Storm Sewer Invert - 124.30 mASL					
1:2 yr	2,728	123.03	525	8	
1:5 yr	4,921	123.06	1,165	9	
1:10 yr	6,558	123.11	2,040	10	25,242
1:25 yr	8,767	123.18	3,370	15	
1:50 yr	10,484	123.24	4,484	18	
1:100 yr	12,238	123.31	5,669	23	

Note: Constant infiltration rate 12 mm/hr

Drawings



NOTE :
MTM GRID SHOWN ON THIS PLAN IS BASED ON NAD 27 – MTM ZONE 9

B.M. ELEV. 131.412 (GEODETIC)
TOP OF SIB AT GRID COORDINATES 0+012.50W, 0+500N SOUTH OF LANDFILL EXIT GATE

OVERALL SITE PLAN

NOTE :
1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON AERIAL PHOTOGRAPHY MAPPING BY BASE MAPPING LIMITED DATED NOVEMBER 04, 2013 AND ON HISTORIC SITE SURVEYS BY WSP.

LEGEND – EXISTING :
(APPLICABLE TO 1:2000 SCALE DRAWINGS)

- APPROXIMATE LIMIT OF EXISTING LANDFILL
- 125 EXISTING GROUND CONTOURS 2.5m INTERVALS
- EXISTING GROUND CONTOURS 0.5m INTERVALS
- TREE LINE
- WASTE MANAGEMENT OF CANADA CORPORATION LANDFILL SITE BOUNDARY
- PAVED ROAD
- GRAVEL ROAD
- TRAIL
- GUIDE RAIL
- WALL/BARRIER
- FENCE LINE
- 450/150/75 DH LANDFILL GAS PIPING (COMMON TRENCH)
- 75(x1) CONDENSATE LINE (SIZE AND # OF PIPES)
- A AIR INJECTION LINE
- 200/50 L LEACHATE COLLECTION PIPE – SOLID/FORCEMAIN/PURGE WELL SYSTEM FORCEMAIN
- LEACHATE FORCEMAIN IN COMMON TRENCH
- LEACHATE COLLECTION PIPE – PERFORATED
- W WATERMAIN
- SA SANITARY SEWER/FORCEMAIN
- ST STORM SEWER
- NG NATURAL GAS
- 100(X2) E ELECTRICAL POWER/CONTROL LINE (SIZE AND # OF CONDUITS)
- PL POPLAR IRRIGATION FORCEMAIN
- PF POPLAR IRRIGATION FLUSHING RETURN MAIN
- PL POPLAR IRRIGATION LATERAL
- T TELEPHONE LINE
- DITCH/SWALE/WATERCOURSE
- CULVERT
- TR GROUND MOUNTED TRANSFORMER
- HP HYDRO POLE WITH GUY WIRE
- HP HYDRO POLE
- HPLS HYDRO POLE LAMP STANDARD
- HPT HYDRO POLE WITH TRANSFORMER
- LP LAMP POST
- LPT LAMP POST WITH TRAFFIC LIGHT
- TL TRAFFIC LIGHT
- HH ELECTRICAL HANDHOLE
- TLCP TRAFFIC LIGHT CONTROL PANEL
- DCB DOUBLE CATCH BASIN
- CB SINGLE CATCH BASIN
- VC VALVE CHAMBER
- CDMH CLEANOUT MANHOLE
- MH MANHOLE
- UN UNIDENTIFIED BURIED STRUCTURE
- DH DRY HYDRANT
- EP/VDT VALVE OPERATOR/DRAIN TRAP
- EP VALVE OPERATOR
- CPS CONDENSATE PUMPING STATION
- COMH CONDENSATE MANHOLE
- V ISOLATION VALVE
- 157 GAS COLLECTION WELL (WITHIN WASTE FOOTPRINT)
- GF GAS COLLECTION WELL (OUTSIDE WASTE FOOTPRINT)
- PCT PUMPED CONDENSATE TRAP
- DT DRAIN TRAP
- PT PROPANE TANK
- PS PUMPING STATION
- CO CLEANOUT
- BH GEOTECHNICAL BOREHOLE
- OBSERVATION/MONITORING WELL
- GP/GM GAS PROBE/MONITOR
- IW AIR INJECTION WELL
- PW PURGE WELL
- CONC CONCRETE PAD
- SIGN
- SWAMP
- RIP RAP
- GATE
- ISOLATED TREE/BRUSH

LEGEND – PROPOSED :
(APPLICABLE TO 1:2000 SCALE DRAWINGS)

- LIMIT OF LANDFILL EXPANSION
- 152 PROPOSED CONTOURS (SURFACE AS DESCRIBED)
- DITCH/SWALE
- DITCH/SWALE RIP RAP LINED
- PAVED ROAD
- GRAVEL ROAD
- TOE OF SLOPE
- ST STORM SEWER
- L LEACHATE COLLECTION PIPE – SOLID
- L LEACHATE COLLECTION PIPE – PERFORATED
- PROPERTY LINE WITH CHAINLINK FENCE 1.8m HIGH
- LITTER FENCE 10m HIGH
- LITTER FENCE 3m HIGH
- CULVERT
- 138.88 ELEVATION AT LANDFILL LIMIT AS DESIGNATED ON DRAWING
- 128.29 C/L OF DITCH INVERT ELEVATION
- <27.60 C/L OF ROAD ELEVATION
- +127.50 SPOT ELEVATION
- LEACHATE COLLECTION PIPE CLEANOUTS
- SC STORMCEPTOR
- V ISOLATION VALVE UNIT
- DI DITCH INLET
- MH MANHOLE

ABBREVIATIONS :
(APPLICABLE TO 1:2000 SCALE DRAWINGS)

PS	PUMPING STATION
CSP	CORUGATED STEEL PIPE

DRAWING INDEX

DATE	DESCRIPTION
	REVISION / ISSUE

LICENSED PROFESSIONAL ENGINEER
P.S. BRODZIKOWSKI
PROVINCE OF ONTARIO
Jul 15/14
Seal not valid unless signed & dated

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OWEN SOUND (ONTARIO) CANADA N4K 6W2
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WM WASTE MANAGEMENT

OVERALL SITE PLAN
LEGEND AND DRAWING INDEX

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 1

DRAWING 1

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\STAMPED DRAWINGS TO MMSTRY JULY 2014\131-19416-2.dwg Aug 07, 2014 – 8:55am

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DRAWING 2

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 2

EXISTING CONDITIONS - NORTH

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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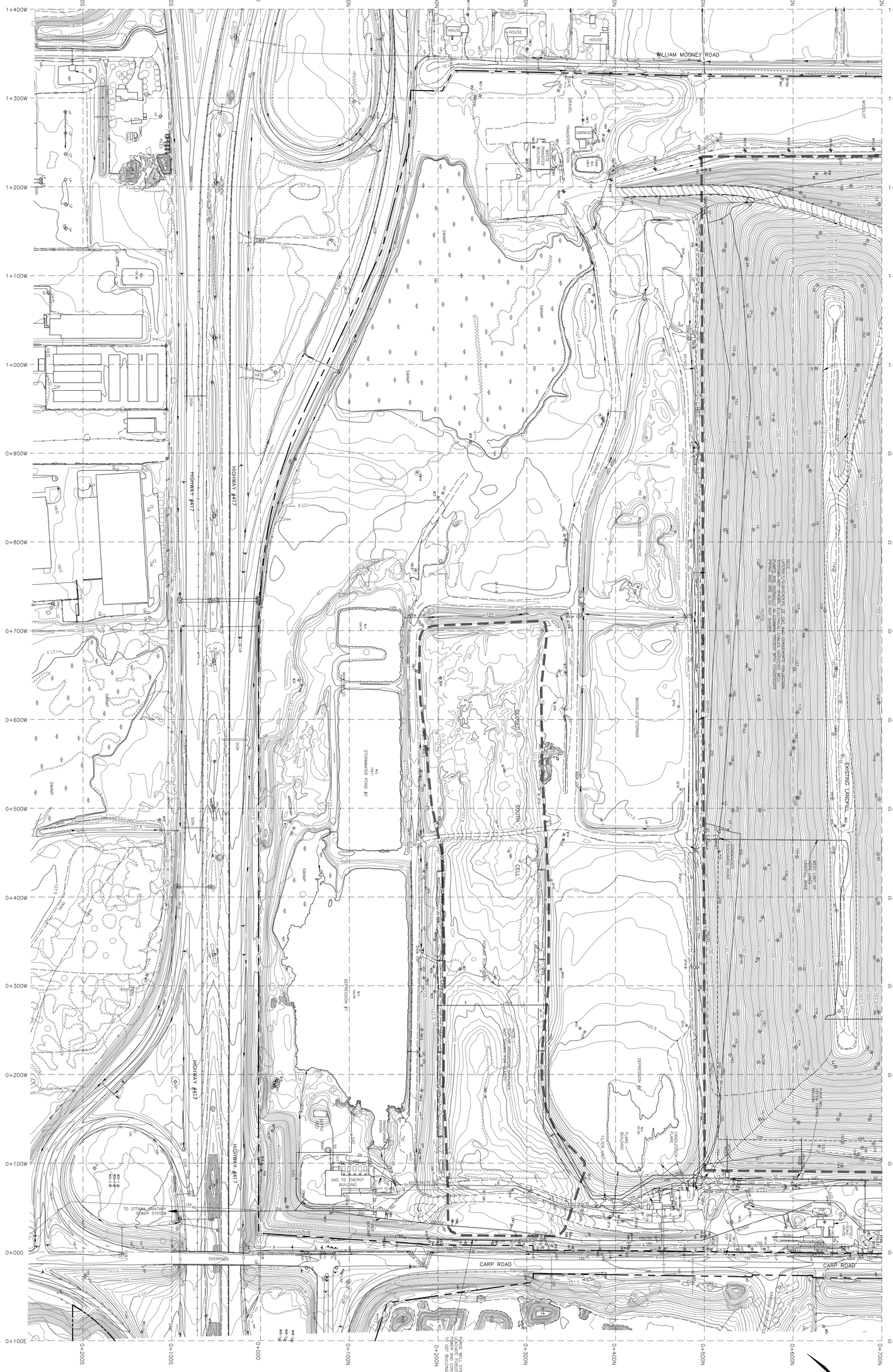

REVISION / ISSUE	DESCRIPTION	DATE

Seal not valid unless signed & dated

DRAWING 3

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 3

EXISTING CONDITIONS SOUTH

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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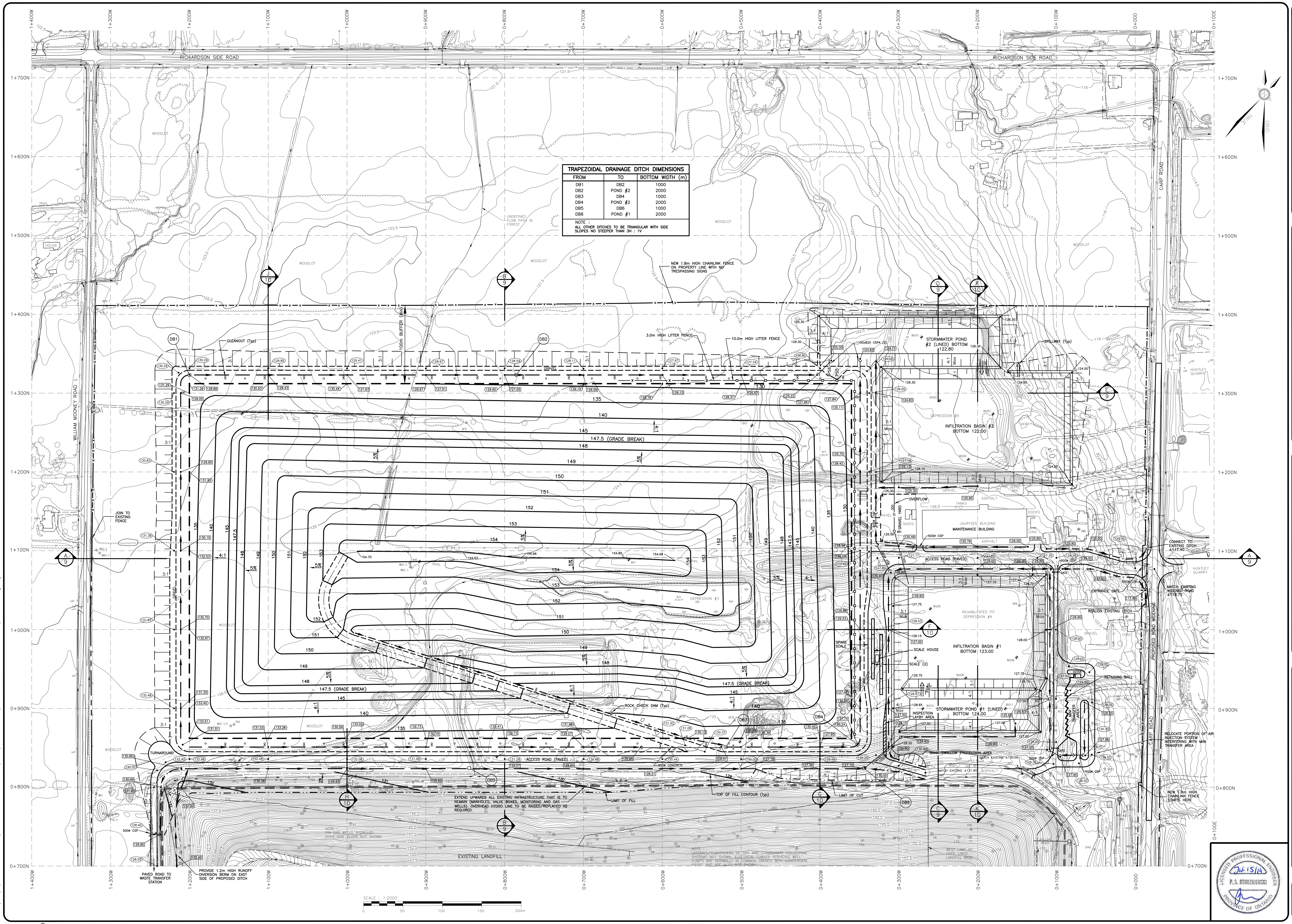

RICHARDSON SIDE ROAD
WILLIAM MOONEY ROAD
CARP ROAD
WOODLOT
UNDEFINED FLOW PATH IN FOREST
NEW 1.8m HIGH CHAINLINK FENCE ON PROPERTY LINE WITH NO TRESPASSING SIGNS
3.0m HIGH LITTER FENCE
10.0m HIGH LITTER FENCE
100m BUFFER
CLEANOUT (Typ)
STORMWATER POND #2 (LINED) BOTTOM 122.80
INFILTRATION BASIN #2 BOTTOM 122.00
SPILLWAY (Typ)
HUNTLEY QUARRY
147.5 (GRADE BREAK)
LAURYSEN BUILDING
MAINTENANCE BUILDING
ACCESS ROAD (PAVED)
ENTRANCE GATE
REHABILITATED PIT DEPRESSION #4
INFILTRATION BASIN #1 BOTTOM 123.00
SCALE HOUSE
SCALE (2)
INSPECTION LAYBY AREA
STORMWATER POND #1 (LINED) BOTTOM 124.00
BANK SWALLOW PROTECTION AREA
ROCK CHECK DAM (Typ)
TURNAROUND
JOIN TO EXISTING FENCE
CONNECT TO EXISTING DITCH
MATCH EXISTING WIDENED ROAD
REALIGN EXISTING DITCH
RETAINING WALL
PROPOSED ROAD WIDENING
RELOCATE PORTION OF AIR INJECTION SYSTEM INTERFERING WITH MINI TRANSFER AREA
NEW 1.8m HIGH CHAINLINK FENCE STARTS HERE
EXTEND UPWARDS ALL EXISTING INFRASTRUCTURE THAT IS TO REMAIN (MANHOLES, VALVE BOXES, MONITORING AND GAS WELLS). OVERHEAD HYDRO LINE TO BE RAISED/REPLACED AS REQUIRED.
LIMIT OF FILL
TOP OF FILL CONTOUR (Typ)
LIMIT OF CUT
EXISTING LANDFILL
PAVED ROAD TO WASTE TRANSFER STATION
PROVIDE 1.2m HIGH RUNOFF DIVERSION BERM ON EAST SIDE OF PROPOSED DITCH
SCALE : 1:2000

TRAPEZOIDAL DRAINAGE DITCH DIMENSIONS

FROM	TO	BOTTOM WIDTH (m)
DB1	DB2	1000
DB2	POND #2	2000
DB3	DB4	1000
DB4	POND #2	2000
DB5	DB6	1000
DB6	POND #1	2000

NOTE :
ALL OTHER DITCHES TO BE TRIANGULAR WITH SIDE SLOPES NO STEEPER THAN 3H : 1V

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WASTE MANAGEMENT

PROPOSED FINAL LANDFILL CONTOURS

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G DATE: JULY 2014
CHK BY: P S B SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 4

DRAWING 4

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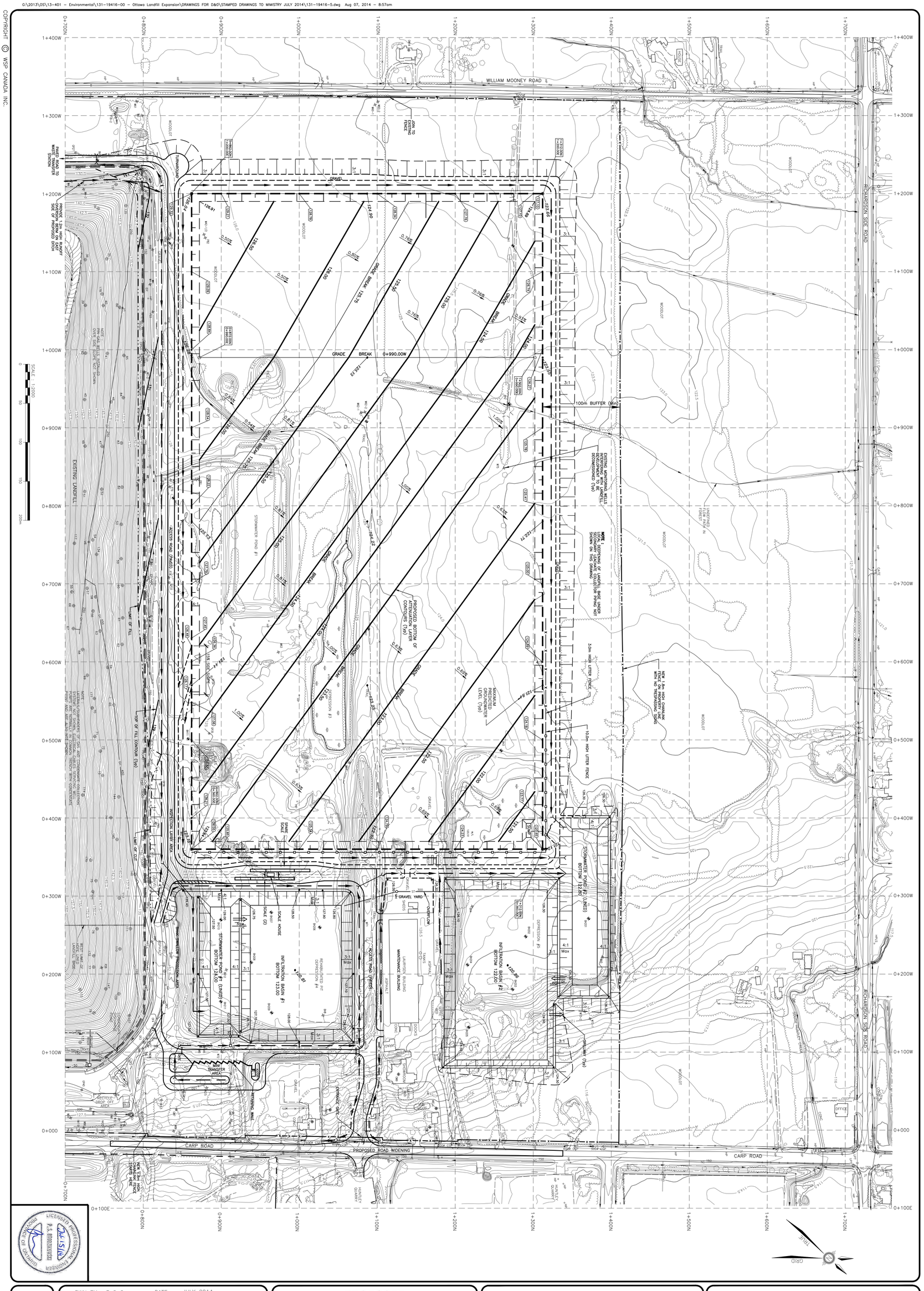

DRAWING 5	DWN BY: T C G CHK BY: P S B	DATE: JULY 2014 SCALE: SEE BAR SCALE	PROPOSED BOTTOM OF ATTENUATION LAYER
WASTE MANAGEMENT OF CANADA CORPORATION			WEST CARLETON ENVIRONMENTAL CENTRE
DRAWING NO. 131-19416-00 - 5			WASTE MANAGEMENT

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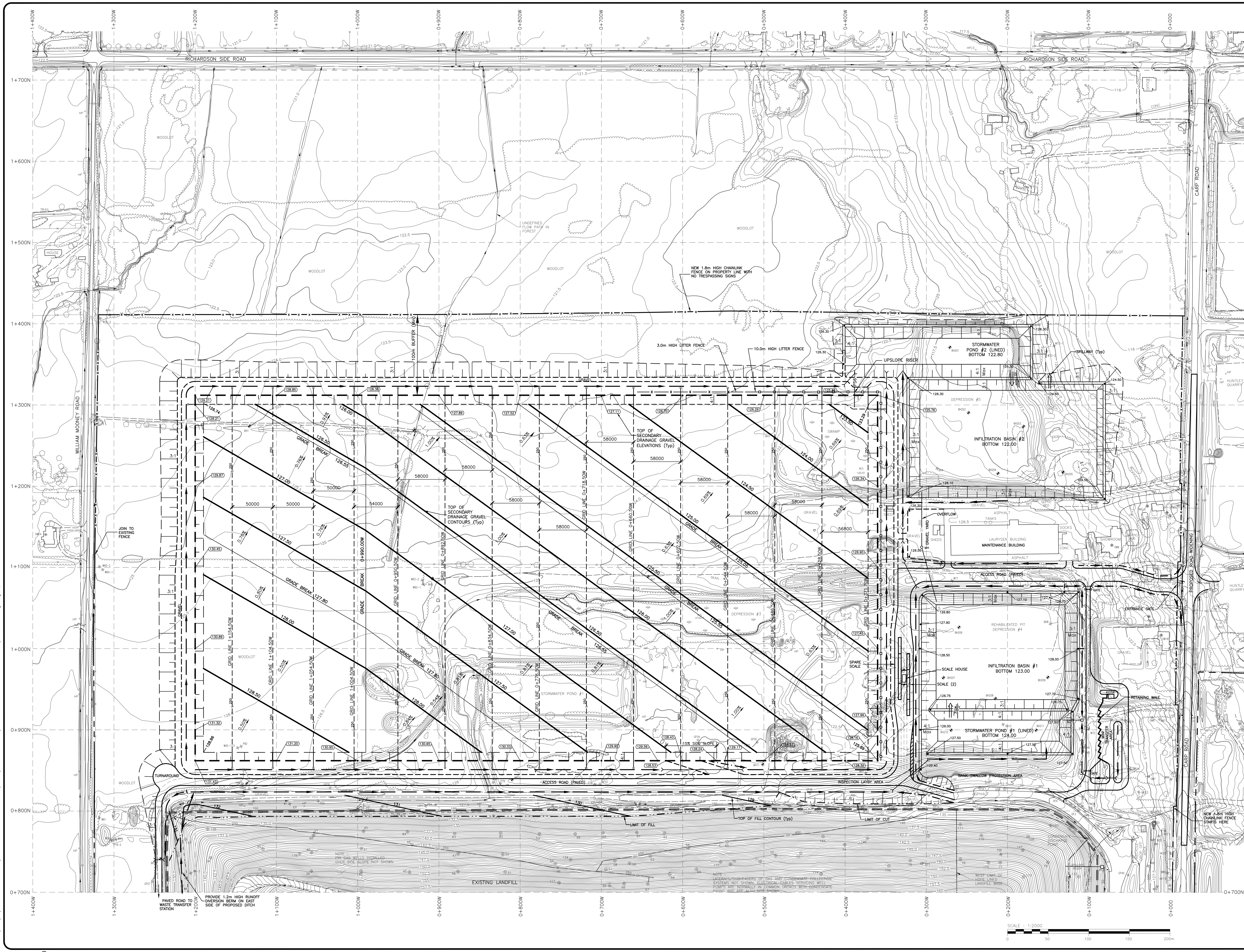

RICHARDSON SIDE ROAD
WILLIAM MOONEY ROAD
CARP ROAD
WOODLOT
UNDEFINED FLOW PATH IN FOREST
NEW 1.8m HIGH CHAINLINK FENCE ON PROPERTY LINE WITH NO TRESPASSING SIGNS
3.0m HIGH LITTER FENCE
10.0m HIGH LITTER FENCE
100m BUFFER
UPSLOPE RISER
SPILLWAY (Typ)
STORMWATER POND #2 (LINED) BOTTOM 122.80
DEPRESSION #5
INFILTRATION BASIN #2 BOTTOM 122.00
HUNTLEY QUARRY
TOP OF SECONDARY DRAINAGE GRAVEL ELEVATIONS (Typ)
TOP OF SECONDARY DRAINAGE GRAVEL CONTOURS (Typ)
GRADE BREAK
JOIN TO EXISTING FENCE
OVERFLOW
GRAVEL YARD
LAURYSEN BUILDING
MAINTENANCE BUILDING
SHOWROOM
ACCESS ROAD (PAVED)
ENTRANCE GATE
PROPOSED ROAD WIDENING
DEPRESSION #3
REHABILITATED PIT DEPRESSION #4
INFILTRATION BASIN #1 BOTTOM 123.00
SPARE SCALE
SCALE HOUSE
SCALE (2)
STORMWATER POND #1
STORMWATER POND #1 (LINED) BOTTOM 124.00
RETAINING WALL
BANK SWALLOW PROTECTION AREA
INSPECTION LAYBY AREA
TURNAROUND
LIMIT OF FILL
TOP OF FILL CONTOUR (Typ)
LIMIT OF CUT
NEW 1.8m HIGH CHAINLINK FENCE STARTS HERE
EXISTING LANDFILL
PAVED ROAD TO WASTE TRANSFER STATION
PROVIDE 1.2m HIGH RUNOFF DIVERSION BERM ON EAST SIDE OF PROPOSED DITCH
SCALE : 1:2000
TRUE
GRID

G:\2013\GS\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\STAMPED DRAWINGS TO MINISTRY JULY 2014\131-19416-6.dwg Aug 07, 2014 – 8:59pm

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WASTE MANAGEMENT

PROPOSED TOP OF SECONDARY DRAINAGE GRAVEL LAYER

WEST CARLETON ENVIRONMENTAL CENTRE

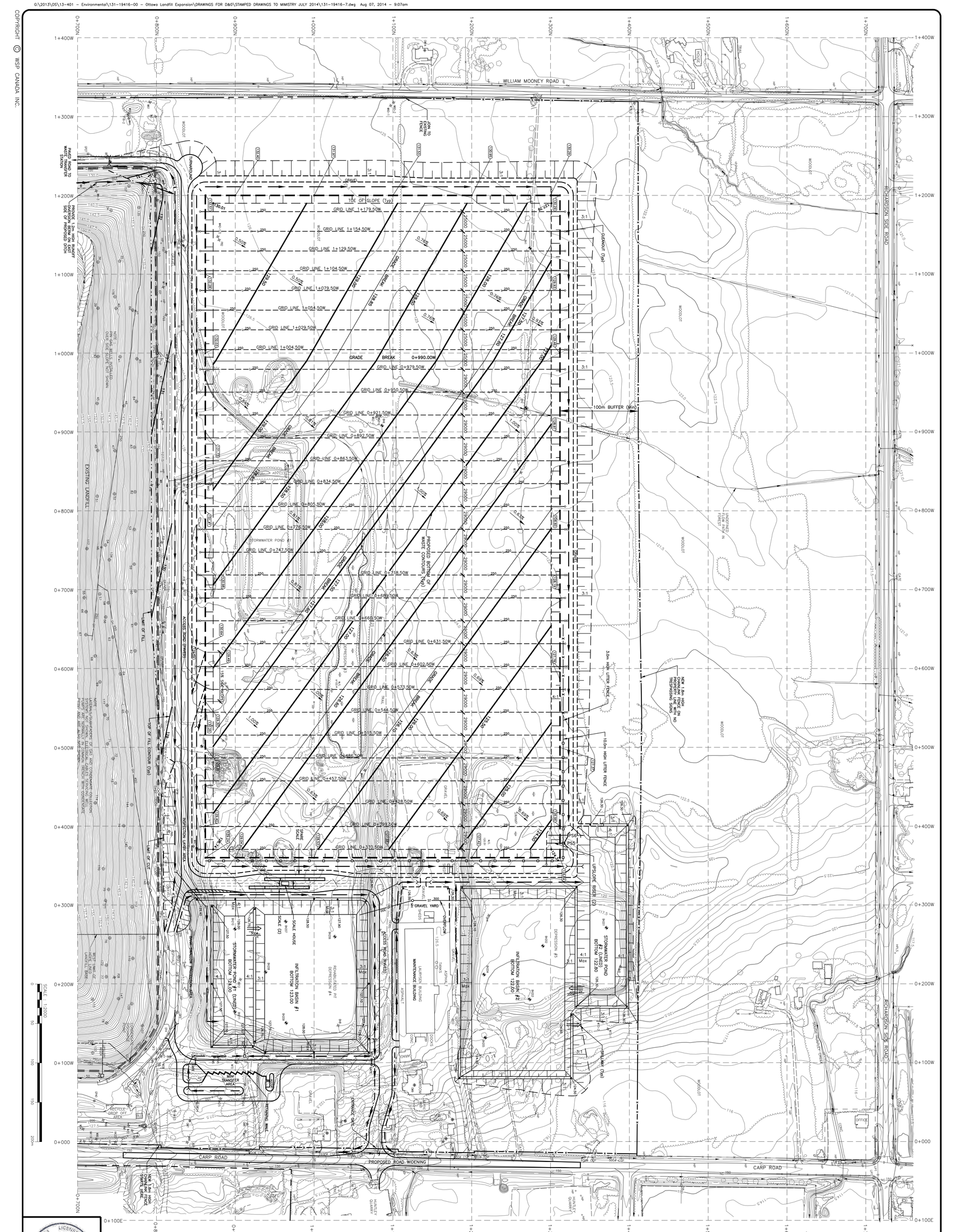
DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 6

DRAWING 6

LICENSED PROFESSIONAL ENGINEER P. S. BRODZIKOWSKI PROVINCE OF ONTARIO



DRAWING 7	DWN BY: T C G CHK BY: P S B	DATE: JULY 2014 SCALE: SEE BAR SCALE
WASTE MANAGEMENT OF CANADA CORPORATION		
DRAWING NO. 131-19416-00 - 7		

PROPOSED BOTTOM OF WASTE CONTOURS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
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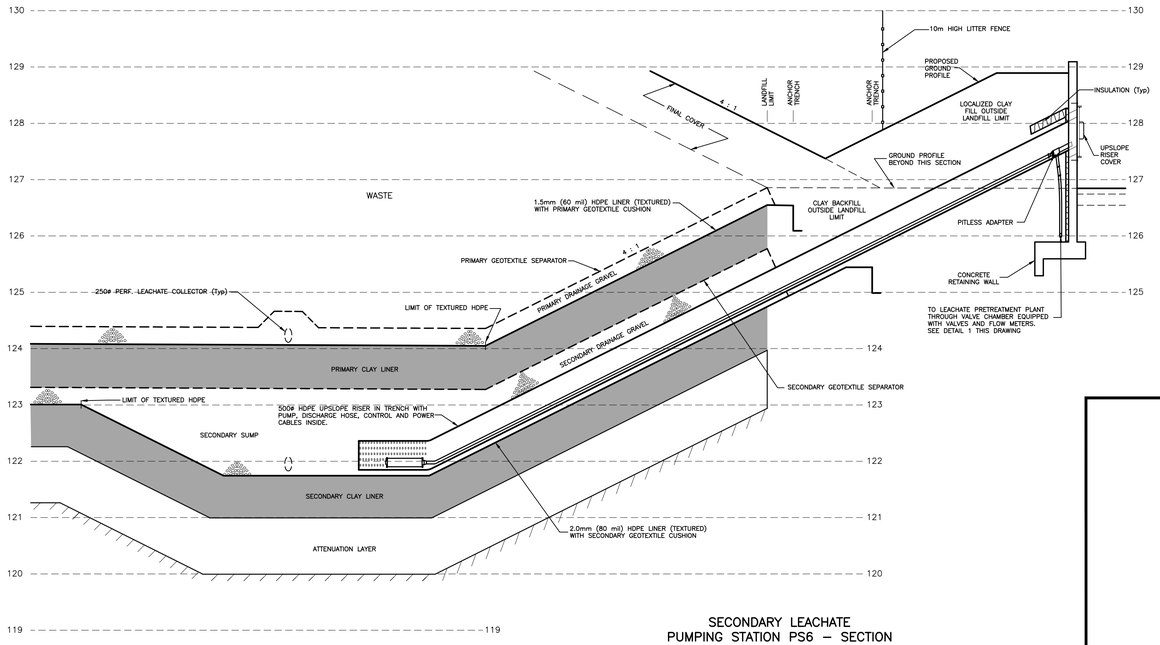
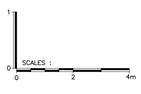
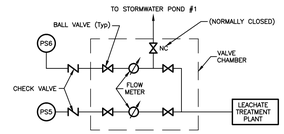


SECONDARY LEACHATE
PUMPING STATION PS6 – SECTION

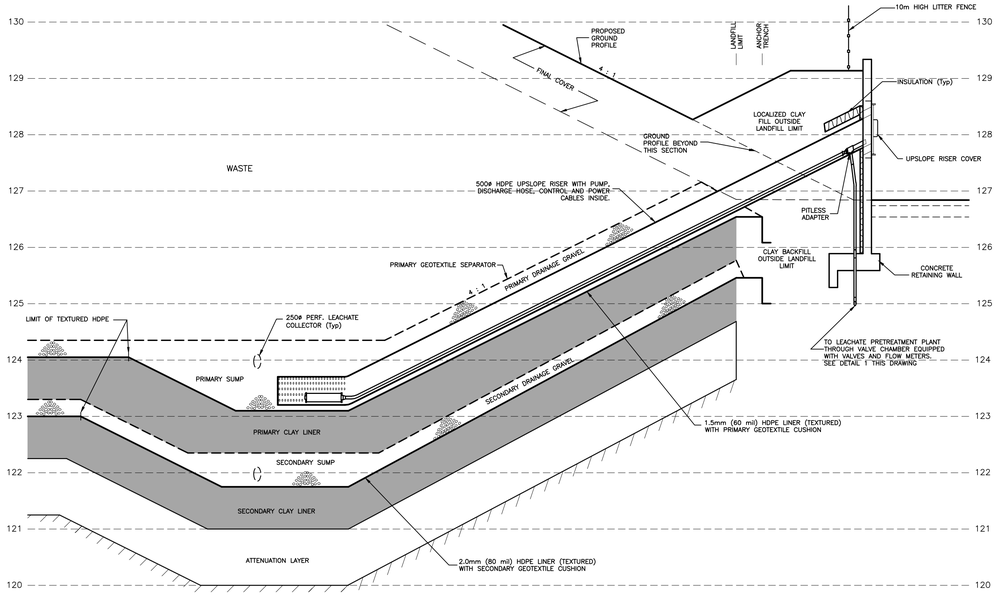
SCALES :
1:100 HORIZONTAL
1:50 VERTICAL





VALVE CHAMBER SCHEMATIC
DETAIL '1'

N T S

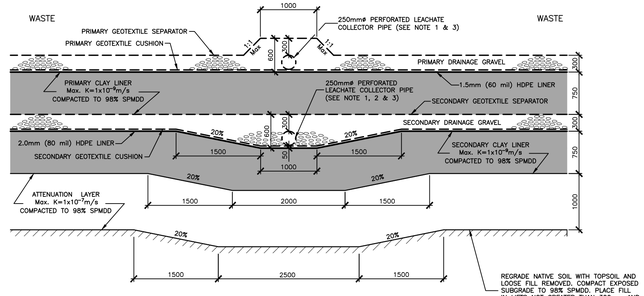


PRIMARY LEACHATE
PUMPING STATION PS5 – SECTION

SCALES :
1:100 HORIZONTAL
1:50 VERTICAL

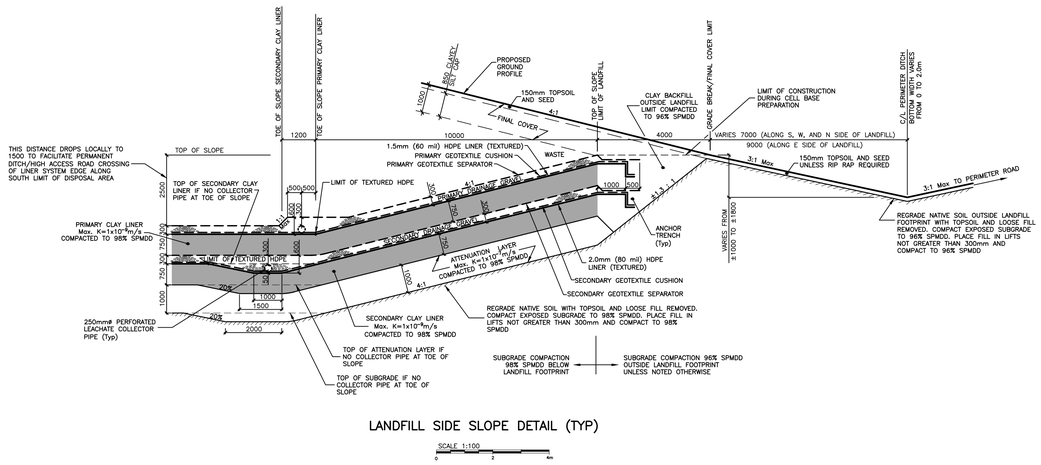
NOTES :

1. PERFORATED LEACHATE COLLECTION PIPE TO BE 250mmø HDPE DR9 WITH 25mmø PERFORATIONS AT 45, 135, 225 AND 315', SPACED EVERY 300mm.
2. SECONDARY LEACHATE COLLECTOR TO BE INSTALLED UNDER EVERY SECOND PRIMARY LEACHATE COLLECTOR RUN
3. INSTALL 5mmø (3/16") CONTINUOUS (NO SPLICE) STAINLESS STEEL PULL CABLE (POLY COATED) INSIDE LEACHATE COLLECTOR PIPING RUNNING IN NORTH–SOUTH DIRECTION.
4. BOTTOM OF ATTENUATION LAYER TO BE AT OR ABOVE PREDICTED MAXIMUM SHALLOW GROUNDWATER LEVEL.



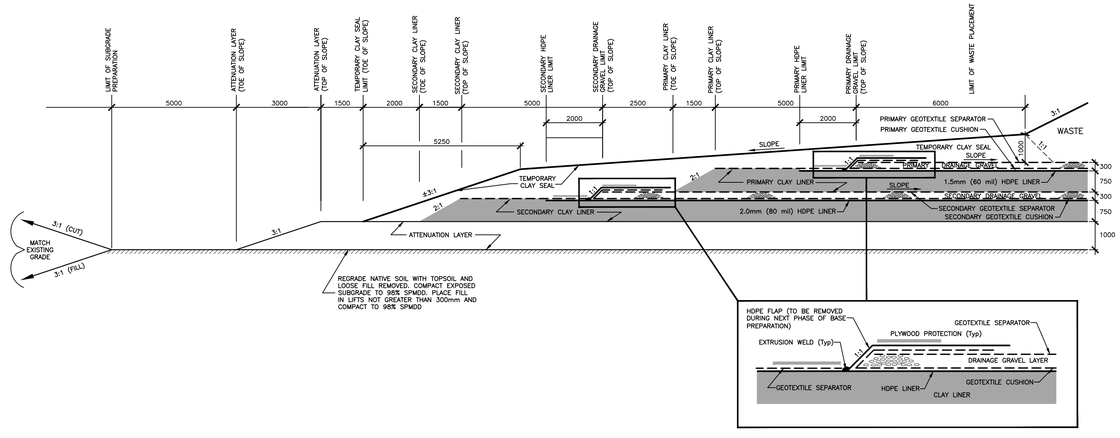
LANDFILL BASE DETAIL

SCALE 1:50



LANDFILL SIDE SLOPE DETAIL (TYP)

SCALE 1:100



TEMPORARY CLAY SEAL/CELL EXTENSION DETAIL (TYPICAL)

SCALE 1:100

DATE	DESCRIPTION
	REVISION / ISSUE

LICENSED PROFESSIONAL ENGINEER
P.S. GRODZIKOWSKI
PROVINCE OF ONTARIO
Jul 15/14
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WASTE MANAGEMENT

DETAILS AND SECTIONS

WEST CARLETON ENVIRONMENTAL CENTRE

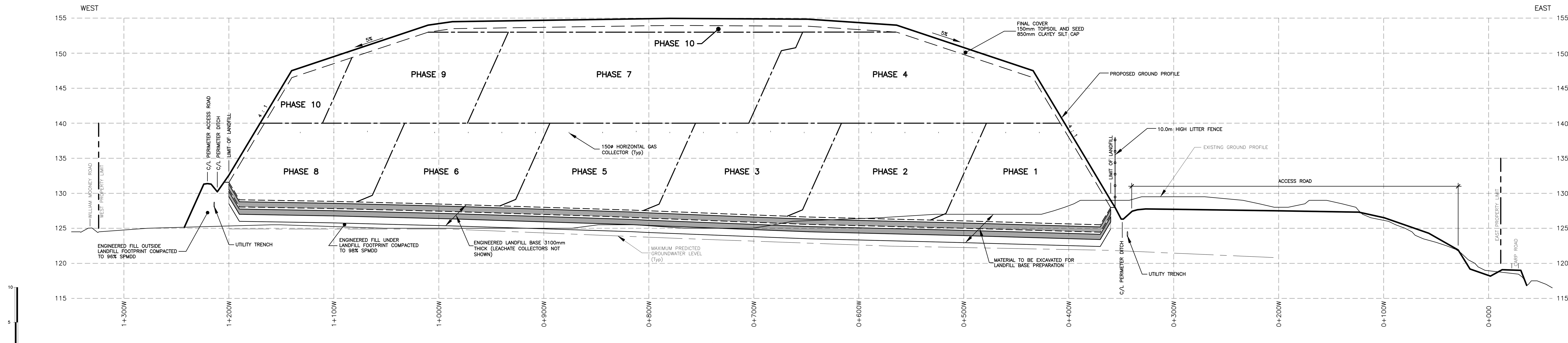
DWN BY: T C G
CHK BY: P S B

DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 8

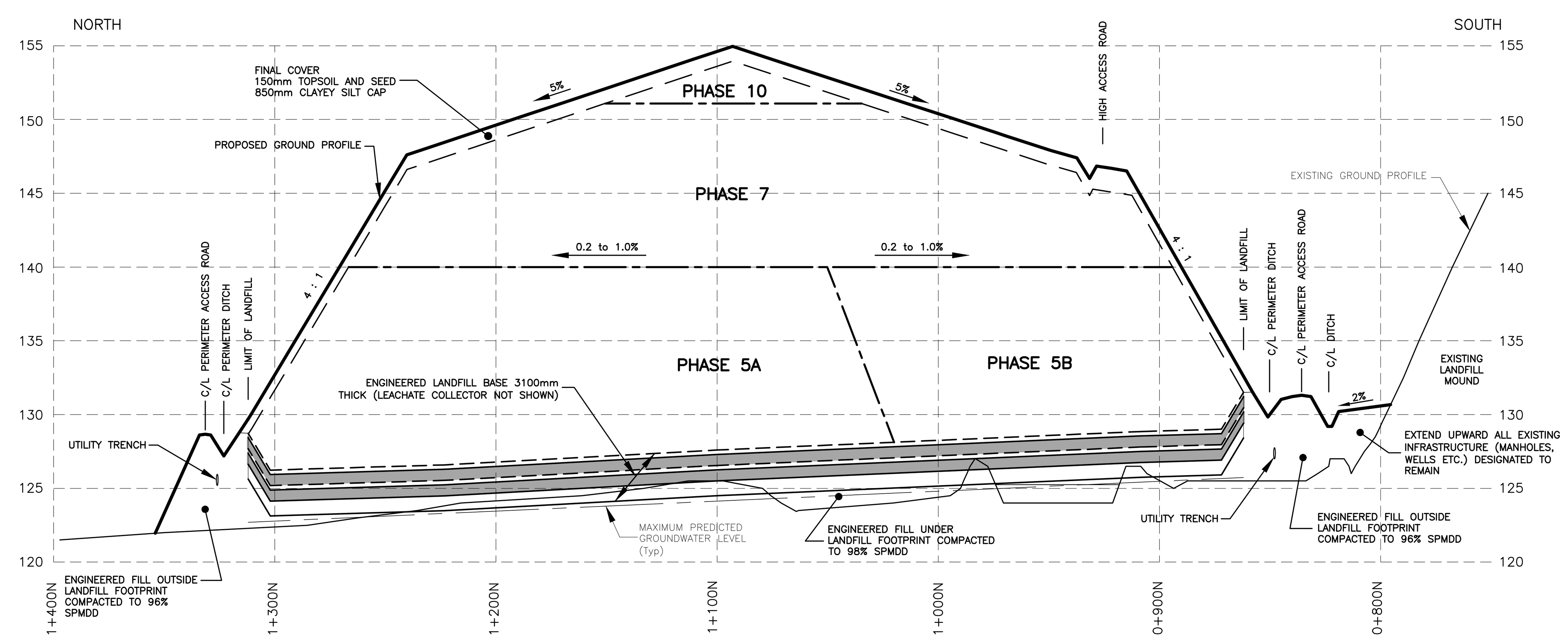
DRAWING 8



SECTION A / 4

GRID LINE 1+090N

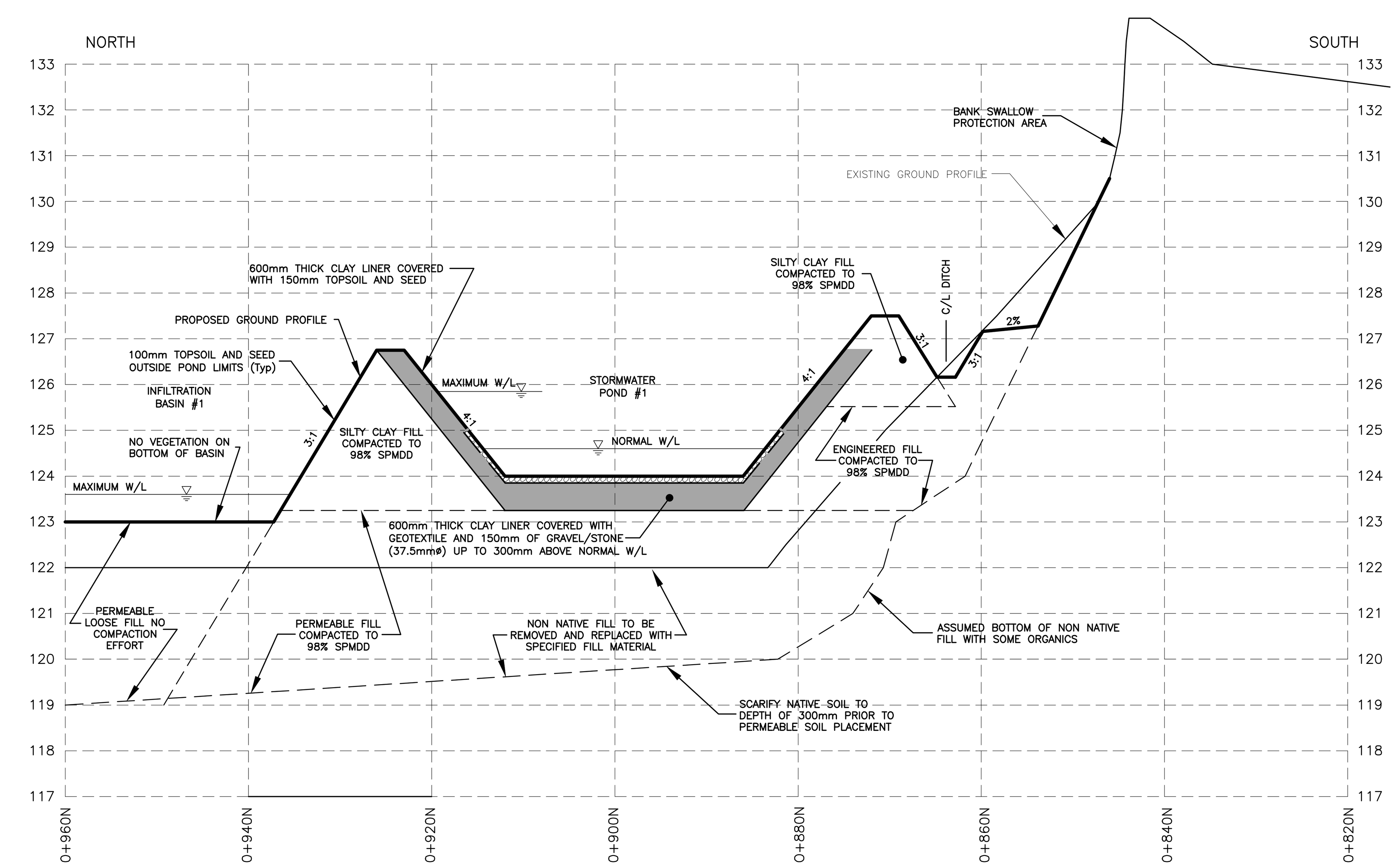
SCALES
1 : 2000 HORIZONTAL
1 : 300 VERTICAL



SECTION B / 4

GRID LINE 0+800W

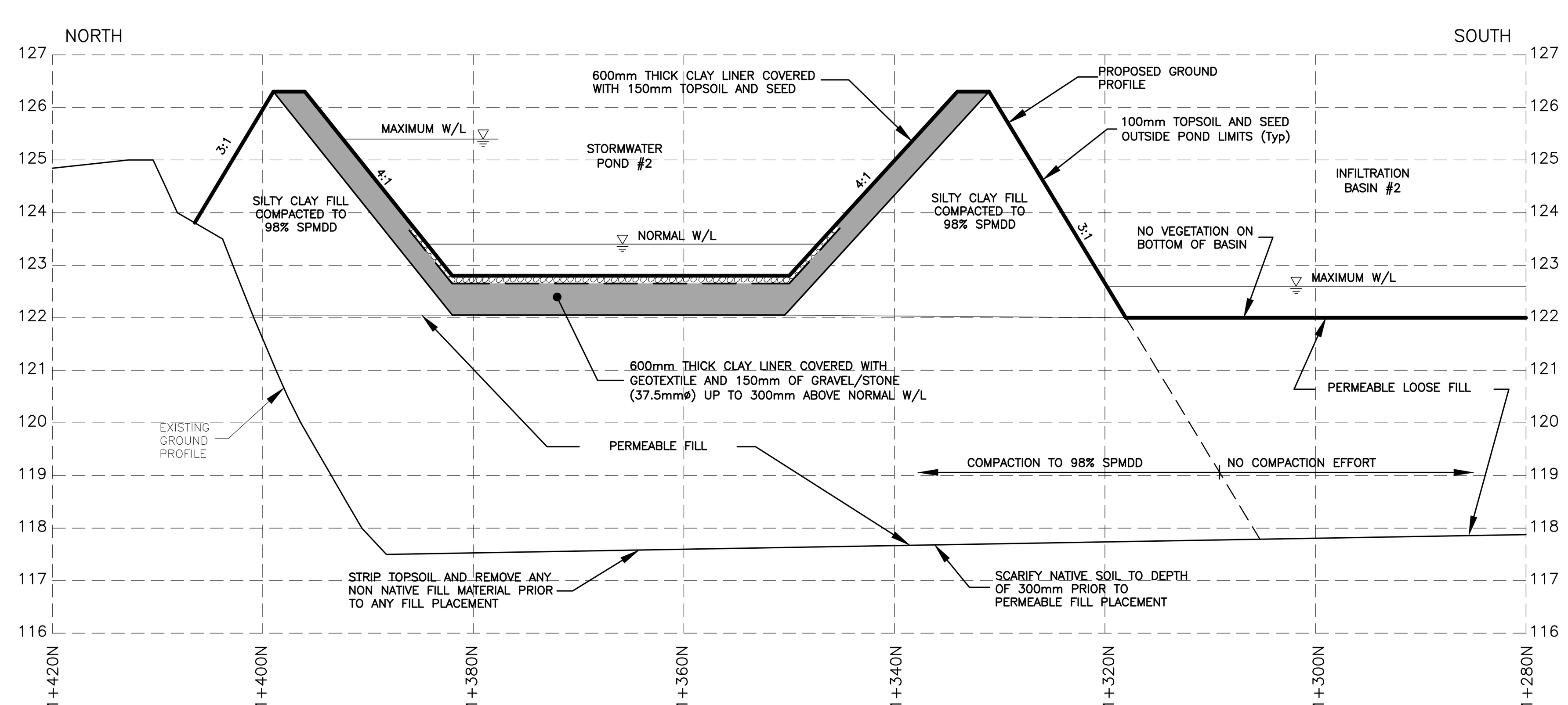
SCALES
1 : 2000 HORIZONTAL
1 : 300 VERTICAL



SECTION C / 4

GRID LINE 0+250W

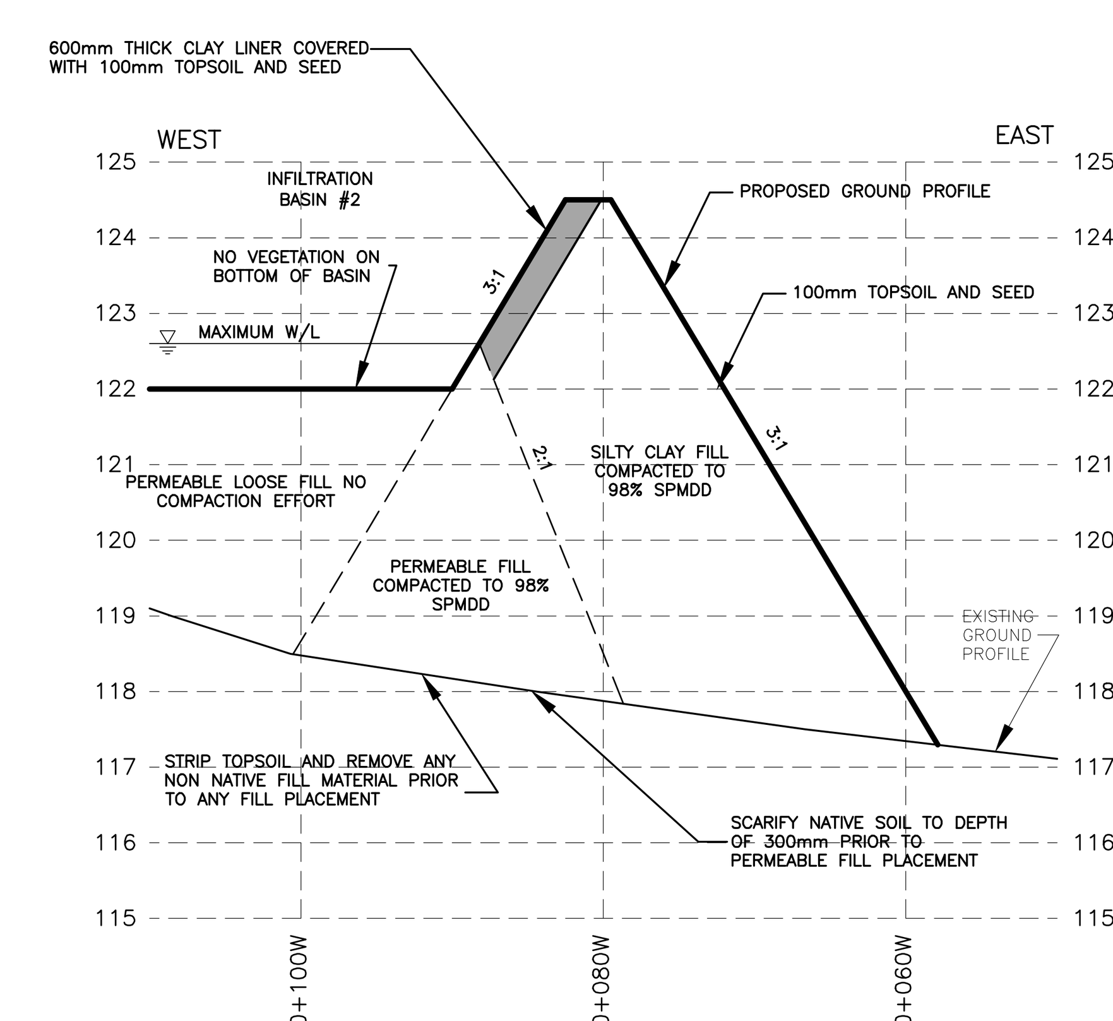
SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL



SECTION D / 4

GRID LINE 0+250W

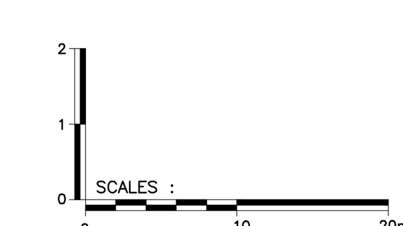
SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL



SECTION E / 4

GRID LINE 1+300N

SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL



DATE	DESCRIPTION
	REVISION / ISSUE

LICENSED PROFESSIONAL ENGINEER
P. S. BRODZIKOWSKI
PROVINCE OF ONTARIO
Jul 15/14

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WSP
101-1450 1st AVENUE W
OWEN SOUND (ONTARIO) CANADA N4K 6W2
TEL.: 519-376-7612 | FAX: 519-376-8008 | WWW.WSPGROUP.COM

WASTE MANAGEMENT

SECTIONS

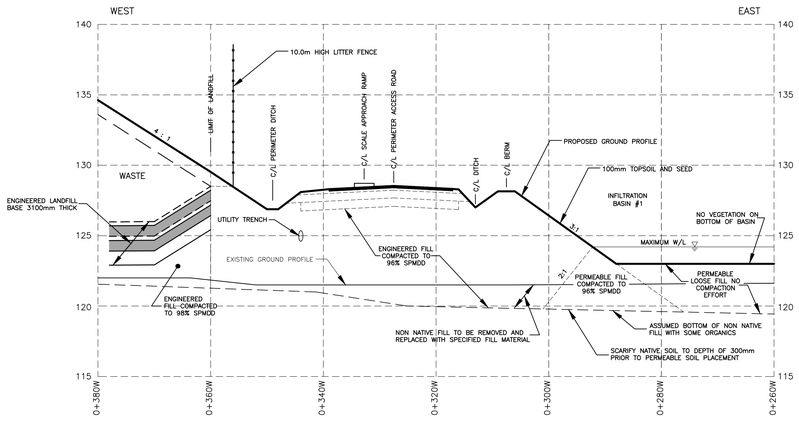
WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT OF CANADA CORPORATION

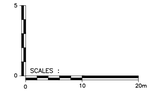
DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

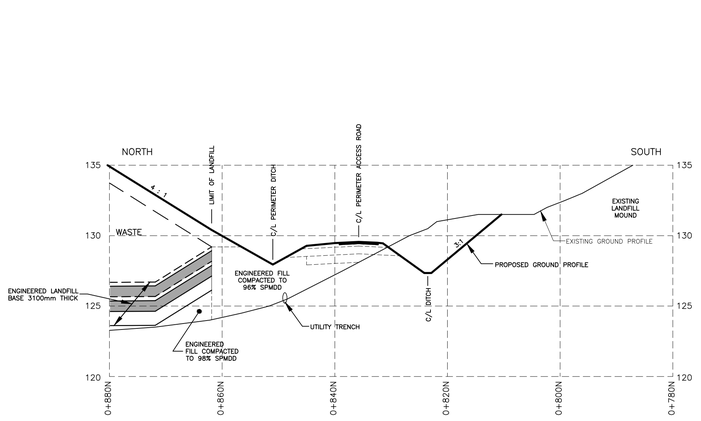
DRAWING NO. 131-19416-00 - 9

DRAWING 9

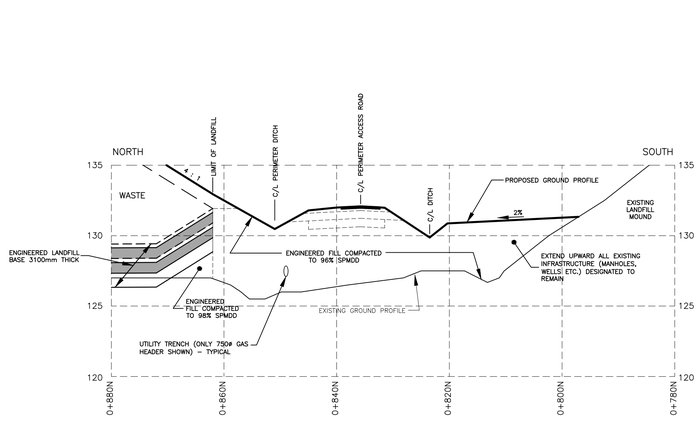


SECTION F
GRID LINE 1+000N
SCALES
1 : 500 HORIZONTAL
1 : 200 VERTICAL

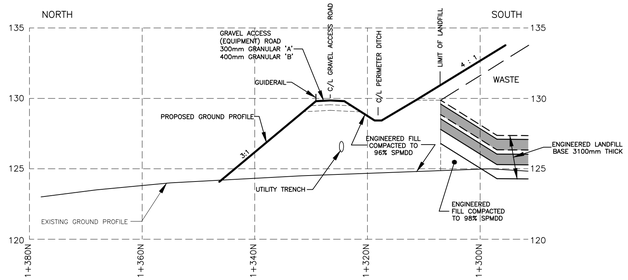




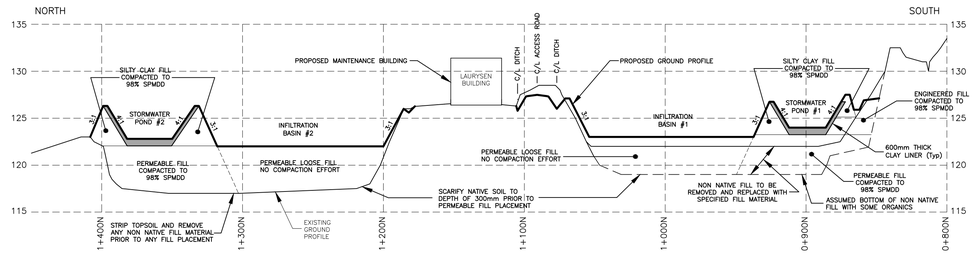
SECTION G
GRID LINE 0+400W
SCALES
1 : 500 HORIZONTAL
1 : 200 VERTICAL



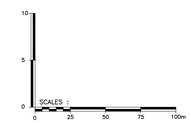
SECTION H
GRID LINE 1+000W
SCALES
1 : 500 HORIZONTAL
1 : 200 VERTICAL

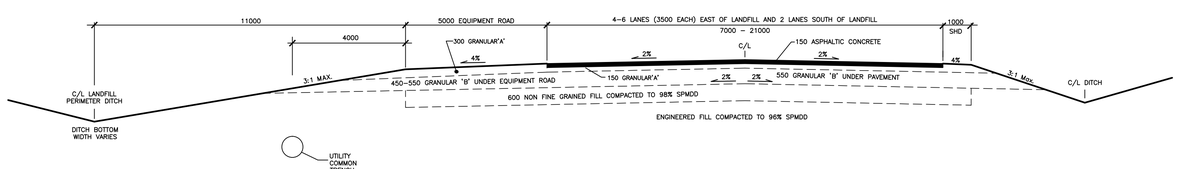


SECTION J
GRID LINE 1+100W
SCALES
1 : 500 HORIZONTAL
1 : 200 VERTICAL

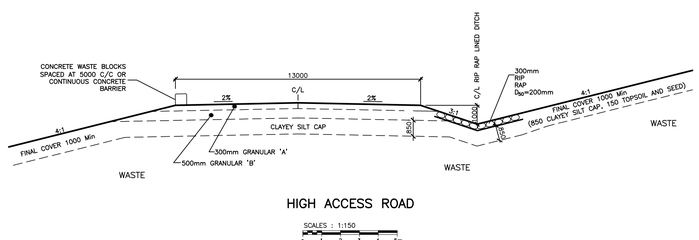


SECTION K
GRID LINE 0+200W
SCALES
1 : 2000 HORIZONTAL
1 : 300 VERTICAL



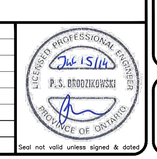


PERIMETER LANDFILL ACCESS ROAD DETAIL



HIGH ACCESS ROAD

DATE	DESCRIPTION
	REVISION / ISSUE



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WASTE MANAGEMENT

SECTIONS

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 10

DRAWING 10

G:\2013\GS\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR D&O\STAMPED DRAWINGS TO MINISTRY JULY 2014\131-19416-10.dwg Jul 09, 2014 - 11:54am