

Clean Harbors Canada, Inc.

**Supporting Document No. 3  
Overview of Existing Environmental Conditions**

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# 1. Introduction

This document provides a brief description of the environmental setting of the existing Lambton landfill facility and adjacent lands. This description includes both natural and manmade features following the full definition of the "environment" as outlined in the Terms of Reference, and for the subsequent environmental assessment (EA), including:

## ➤ Environment

- Atmospheric Environment
- Geology and Hydrogeology
- Surface Water Resources
- Natural Environment
- Archaeological / Cultural Heritage Resources
- Agriculture

## ➤ Technical

- Facility Characteristics

## ➤ Socio – Economic

- Economy
- Social

It is noted that traffic is discussed separately in Supporting Document No. 4.

# 2. Environment

## 2.1 Atmospheric Environment

### Air Emissions

Local air quality is related to local land use, climate and meteorological conditions and the level of intensity of activities on the site. Information sufficient to describe the local climate and meteorological conditions is available in various publications of the federal and provincial environment departments.

Fugitive emissions of dust and other contaminants (i.e., volatile organic compounds) are the main factors determining air quality in the site vicinity. Sources of air emissions in this area include the onsite operations, and the surrounding agricultural land and practices. Agricultural practices contribute to increasing levels of

particulate matter in the air as does bare dry agricultural land during windy periods. The onsite operations contributing to air emissions include:

- the active landfill area on the north side of the property containing working cells which generally orient from east to west;
- a liquid industrial waste incinerator near the centre of the facility;
- laboratory facility building;
- AAPS pre-treatment facility building with scrubber;
- Land Disposal Restrictions (LDR) pre-treatment facility with baghouse;
- multiple fugitive emission sources that extend over a large part of the facility area; and
- possible releases from the inactive (closed) landfill area located to the south of the property.

Landfill operations result in increasing particulate matter due to activities such as vehicular traffic arriving at, moving through or leaving the site, and operations at the site including cell and berm construction, material stockpiling and material covering. Stack gases from the liquid waste incinerator are predominantly nitrogen, oxygen and carbon dioxide, and also include trace amounts of hydrocarbons and metals. The content of material accepted at the facility can also affect the air quality in the site vicinity.

### **Odour**

Some wastes accepted at the landfill have been responsible for the release of odourous contaminants. Additional odours have been acknowledged from the collection, storage and incineration of landfill leachate. The company has employed a number of mitigative and operational measures to minimize off-site odours with varying success. Additional measures are being implemented in 2009.

Surrounding agricultural land and practices can also be an odour source in the area.

### **Noise**

The area potentially subject to noise impacts from the Lambton Facility includes predominantly farmland with sparse housing. Select county roads will potentially be subject to noise impacts from vehicles travelling to the facility. The level of these impacts will depend on traffic volume, speed and operation (i.e., use of engine brakes).

The on-site operations contributing to noise emissions include:

- the landfill heavy vehicle operations in the active landfill area on the north side of the property containing working cells which generally orient from east to west;
- waste delivery trucks;

- the liquid industrial waste incinerator process and combustion air fans and exhaust stack;
- AAPS pre-treatment facility building with scrubber exhaust fan and stack; and,
- LDR pre-treatment facility baghouse exhaust fan and stack.

## 2.2 Geology and Hydrogeology

### Geology

Regionally, geology from surface to depth generally consists of over 25 meters of glacial deposits of clayey silt till with occasional interbeds of lacustrine sand, silt and clay which is underlain by shales and limestones of Upper Devonian Era. Alluvial sediments and organic deposits are locally present in creek and river valleys and wetlands.

The Lambton Facility is located in a relatively flat to gently undulating area characterized by thick clay rich sediments overlaying Palaeozoic bedrock. In the vicinity of the existing landfill operations the thickness of the overburden clay (surface level down to bedrock level) is approximately 39 to 42 m. The surgical geologic unit at the Lambton Facility is a clayey silt till (St. Joseph Till) extending to an average depth of 14 m. The upper 3 to 4 m of this overburden unit is weathered. Visible fractures are numerous in the upper 3.5 m, infrequent between 3.5 to 5 m, and rare below a depth of about 5.5 m. A grey clayey to sandy till (Black Shale Till) underlies the St. Joseph Till. This till formation is more than 11 m thick and extends downward to the bedrock contact zone. The clayey till units provide the ability to naturally sorb (adsorb and absorb) contaminants from the landfill preventing rapid downward movement to the Interface Aquifer. A discontinuous layer of silt-sand-gravel till (Basal Till) underlies the clayey till units.

### Hydrogeology

Groundwater movement in the area of the Lambton Facility is generally representative of the groundwater movement within the Lambton Clay Plain. In this area there are three principal hydro-stratigraphic units from surface to depth:

1. Overburden aquitard comprised of over 25 m of clay rich till (in which the upper weathered and fractured portion of the aquitard is hydraulically active, referred to as the 'active aquitard');
2. Regional aquifer (Interface Aquifer) that consists of granular deposits at the bedrock contact, where present, and an upper few meters of fractured bedrock; and,
3. Bedrock aquitard encompassing the underlying competent bedrock.

Groundwater flow in the upper weathered portion of the overburden aquitard is dominantly horizontal, from topographic highs to adjacent lows. Below the surficial weathered zone, hydraulic gradients in the overburden are primarily downward. In the Interface Aquifer, the direction of flow in the past was influenced

by locally significant watertakings with movement occurring towards areas of extensive water use. [Note: With the expansion of the municipal water service throughout the area, the watertaking from the aquifer has ceased/decreased and water levels are recovering. It is expected that the east to west movement of groundwater that existed prior to rural development will be restored.] In the underlying bedrock aquitard, hydraulic gradients are downwards and the downward gradients have also been observed in the lower portion of the overburden aquitard.

Residents living in the area surrounding the Lambton Facility are serviced by municipal water lines. Thus, aside from a few remaining shallow wells (used for agricultural and landscaping purposes), main aquifer use has declined.

Groundwater quality in the active aquitard is spatially variable. The water is hard, enriched in sulphate and alkalinity and depleted in chloride. Water quality in the inactive aquitard is less variable than the active aquitard. In the Interface Aquifer, water is enriched in chloride and alkalinity and depleted in sulphate. Cation (positive ion) concentrations are enriched in sodium, potassium and magnesium, and depleted in calcium.

## 2.3 Surface Water Resources

### Hydrology

The Lambton Facility is located within the Lambton Clay Plain physiographic sub-region of the St. Clair Clay Plain. The area is characterized as having generally flat to gently undulating topography. The area adjacent to the existing landfill has a minor natural topographic relief of approximately one to two meters.

The existing landfill is located at the high point of the boundaries of three watersheds (Bear Creek, Perch Creek and Talfourd Creek) representing a drainage divide that is locally modified by roadside ditches. Bear Creek is a major tributary to the Sydenham River, while Talfourd and Perch Creeks are smaller creeks that drain the land immediately adjoining the St. Clair River and Lake Huron, respectively. This topographic rise extends west to east and is thought to be the bevelled crest of the Wyoming Moraine, and an associated Beach Strand.

The area to the south of the existing Lambton Facility exhibits similar physical characteristics that are common within the regional setting. The current land use consists mainly of agricultural fields and the surficial soils are predominantly thick clayey silt till, with alluvial sediment and organic materials in the local watercourses. Drainage occurs through a combination of sheet flow, tile drains, and a network of ditches that direct surface runoff in an easterly and southerly direction towards Telfer Road and Rokeby Line, respectively. In a similar manner as the existing site, surface runoff is conveyed south by a ditch along Telfer Road, which discharges into the Thornton Drain, followed by the McBean Drain and ultimately into Bear Creek. Flows in the ditches and municipal drains are intermittent except during wet weather and snowmelt conditions.

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## **Water Quality**

The Ministry of the Environment (MOE) maintains surface water quality monitoring stations at various locations in the Bear Creek watershed, which are situated along Bear and Black Creeks. The stations on Bear Creek extend from upstream of Petrolia to downstream of Brigden, with an additional station on Lower Bear Creek below Petrolia. Monitoring along Black Creek is carried out downstream of Oil Springs.

Generally, there is no appreciable difference between the average 5-day biochemical oxygen demand, nutrient and phenol concentrations throughout Bear Creek. The average metal concentrations were similar at Little Bear Creek and Black Creek (insufficient data to comment on the other stations). The annual average conductivity and chloride are greater in Black Creek (downstream of Oil Springs) than at any of the other monitoring locations.

Although regular monitoring is not also undertaken in the Telfer Road ditch, the limited data that does exist indicates that the average total suspended solids and nutrients are low and considerably lower than the average concentration in Bear Creek. The average concentrations for conductivity, chloride and phenol concentrations are greater than the average concentrations measured in Bear Creek.

There is currently no surface water quality data available for the Perch or Talfourd Creek watersheds.

## **2.4 Natural Environment**

### **Terrestrial Ecosystems**

Lambton County is characterized by intensive cultivation where only a small percentage (about 5%) of natural habitat remains, mostly in the form of isolated woodlots. The majority of the existing Clean Harbours site that is not in active landfill, consists of disturbed cultural meadow vegetation that has regenerated from former agriculture or landfill related disturbances. Two small woodlots occur on site: one in the southeast corner (about 6 ha) and another (about 3 ha) in the southwest corner. Both woodlots consist of mature fresh-moist deciduous forest largely co-dominated by Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus americana*), Shagbark Hickory (*Carya ovata*) and Bur Oak (*Quercus macrocarpa*). Many other tree species are represented in the canopy. There is also a rich vernal ground flora present. Both woodlots contain seasonally flooded sloughs of swamp dominated by Swamp Maple (*Acer X freemanni*). The largest swamp unit occurs in the northeast portion of the southeast woodlot. The woodlot on the southeast corner of the Facility is known to include a number of the nationally and provincially Endangered Butternut (*Juglans cinerea*) trees.

Prior to the development of the existing landfill, the two on-site woodlots were part of the larger deciduous woodlot that lies to the south. That woodlot immediately to the south is rather narrow, aligned east – west and is a contiguous block of approximately 16 ha. It too is a mix of closed canopy deciduous swamp and fresh-moist deciduous forest.

The wildlife species found in this part of Lambton County are primarily opportunistic species capable of using small remnant natural areas and tolerating human disturbances. The small isolated woodlot fragments in the area provide abundant edge habitat. The majority of bird and mammal species use small woodlots, edge and/or field habitats. Portions of the on-site woodlots, particularly the sloughs, provide potential habitat for amphibians.

Aside from woodlots to the south of the property, the Facility itself is surrounded mainly by agricultural land. The area immediately surrounding the site is mostly designated as Agricultural with the exception of woodlots located at the south end of the property, which are designated as Hazard and Environmental Protection. Hazard and Environmental Protection areas include natural areas that could include significant natural features, such as wetlands and woodlands and areas that are subject to flooding and/or instability due to erosion and excessive slopes.

Within 5 km of the site, two Environmentally Significant Areas (ESA) occur: Burton Drain Woodlot and Bear Creek Woodlot. There is also one non-provincially significant wetland associated with the Burton Drain Woodlot. A 1979 ESA report on Lambton County identifies a 'Special Area' along Burton Drain. A locally significant Area of Natural Scientific Interest (ANSI) is found, known as Colinville Woods.

### **Aquatic Ecosystems**

The existing Lambton Facility is drained by three systems. The south half of the area (and most of the Facility) is drained by the Burton and MacDonald Drains (which are part of the Bear Creek system), the northeast corner is drained by Perch Creek, and the northwest corner is drained by Talfourd Creek. Watercourses in the area typically have 'no flow' conditions annually from June to September and the benthic community is representative of oxygen depleted and unstable environments. Brooke Sticklebacks and Johnny Darters have previously been observed in the Bear Creek drainage system.

The on-site stormwater management ponds have limited vegetation on their side slopes and consequently the ponds do not provide good aquatic habitat.

The 2008 Clean Harbours Annual Monitoring Report indicates that the on-site equalization basin has a benthic community low in richness and density. In turn, the low invertebrate biomass will limit the fish population surviving in the pond. The low richness of benthic organisms is likely attributed to the lack of suitable substrate and the limited food source available in the Basin. The organisms present are generally found in environments with low oxygen concentrations. Previous sightings of fish in the Basin have included goldfish, sunfish, bullhead, catfish suckers, pike, carp and rock bass. No fish were caught using traditional angling methods according to the 2007 and 2008 monitoring reports; however the presence of several fish feeding on the surface of the water was observed. Hundreds of both large and small fish can typically be observed in warmer weather.

Aquatic Species at Risk (federal) are known to reside several kilometers downstream of the facility in Bear Creek (North Sydenham River). These are comprised of both Special Concern fish species and Schedule 1 (Endangered or Threatened) freshwater mussels.

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## 2.5 Archaeological / Cultural Heritage Resources

The proposed landfilling areas will be assessed for archaeological potential and for the presence of aboveground cultural heritage resources, as part of the environmental assessment.

No archaeological sites have been registered within 2 kilometres of the Lambton Facility. A review of the general physiography of the area suggests that it has low potential for the identification of Aboriginal archaeological sites. However, local nineteenth century land use suggests that the area has potential for the identification of Euro-Canadian archaeological sites.

No properties located within or adjacent to the study area have been designated under the *Ontario Heritage Act* or have been previously listed on a municipal heritage inventory. A protected pioneer cemetery is located within the Lambton Facility property. This pioneer cemetery is commemorated by a historical plaque. It dates to the mid 19th century and is associated with the Providence Methodist Church, which stood at the intersection of Telfer Road and Petrolia Line from 1848 to 1927. The adjacent roadscape, with its narrow road right-of-way and shoulders and vegetative screening is evocative of the surrounding area's 19th century land use development.

## 2.6 Agriculture

Agriculture is the second largest sector next to refining and chemical in the Sarnia-Lambton region. Lambton County includes 4% of all census farms in Ontario including 11% of oilseed and grain farms, 6% of hog farms and 4% of poultry and egg farms. Major field crops in Lambton County include winter wheat, soybeans and corn (12, 11 and 7 % of Ontario, respectively). The Lambton Facility is located within the Township of St. Clair which historically has had a strong agricultural base. The area within a 3 km radius of the Facility has maintained a rural population without other significant industrial or commercial development although industrial areas exist to the immediate west near Sarnia.

Farmland in the area has a reasonably high agricultural capability and includes clay-type soils well suited to crop production after drainage is established. Field crops include winter wheat, soybeans, corn, sugar beets and hay. A small, landscape-type, operation with a greenhouse is located across the road, west of the Facility entrance. Farm livestock within a 3 km radius of the Facility includes beef, hogs, poultry and horses. Several vacant barns that may be suitable for housing livestock are also present. Trends in the area indicate a shift to off-farm work and part-time farming involving cash crop production and generally low-intensity livestock production.

## 3. Technical

### 3.1 Facility Characteristics

The existing landfill occupies a total fill area of approximately 56 hectares including historic filling areas. The current active filling operation takes place on approximately a 13 hectare area. A buffer area established around the perimeter of the Lambton Facility is not used for waste disposal, and contains drainage ditches, surface water reservoirs, access roads and stockpiles of clay and topsoil. Undeveloped buffer lands and berms separate the landfill operation from surrounding properties.

Initially the Lambton landfill was developed by backfilling shallow (5 to 10 m) pits located in the area of the existing central processing facility (i.e., Cells A through I). Subsequently disposal proceeded in discrete cells ranging in depth between 9 m and 18 m which were backfilled with waste to grade and capped with 1 m of clay (i.e., Cells 1 through 11). The landfill excavation approach was later modified, introducing a continuous trench to a depth of 18.3 m. The trench was backfilled progressively with waste to just below grade and capped to grade (i.e., Cells 12 through 15). Due to approval delay, the cap on a number of older cells was stripped and waste placed above grade to an average height of 2.5 m (i.e., above Cells A,B,C,D, 1,2,3,14 and 15). The 'entombment concept' of landfilling was then introduced at the site, which involves isolation of waste below the near surface weathered zone in which active groundwater movement occurs. A clay cap with a thickness of 6.1 m was placed (i.e., Cells 16 and 17).

The landfill is currently constructed (i.e., Cell 18) in accordance with the shallow entombment design concept. This landfill design is based on a progressive trench and fill technique. A trench is excavated using conventional excavation and earth moving equipment to a depth of approximately 18 meters below ground surface and 150 meters wide. Waste is placed to grade in portions of currently active Cell 18. A five meter clay cap of native, unweathered clay till is then placed over the waste. The overall thickness of the cap includes un-compacted clay till over the finished, compacted portion. This clay cap ensures the waste is effectively entombed in clay till with a low hydraulic conductivity.

Leachate generated from the waste is managed through natural attenuation. Leachate generation is controlled through the continuous covering of placed waste to prevent infiltration, and through the collection of contaminated runoff in the active working area. Contaminated runoff, collected in sumps installed in the base of the excavation in advance of the waste face, is pumped to a leachate collection reservoir. From the reservoir it is pumped to the on-site liquid waste incinerator for management.

Surface runoff generated by the active portion of the landfill is collected and conveyed by a series of drains, ditches, and swales to a number of reservoirs, and is ultimately treated and processed by an on-site incinerator. Runoff generated on the remainder of the site is collected through a series of internal surface water collection ditches and directed to a main reservoir. The surface water is then directed to a physical/chemical treatment plant prior to being discharged to the Telfer Road ditch, which flows south into the above-noted municipal drain followed by Bear Creek. As a result of modifications to the topography and

local drainage conditions made to facilitate landfill operations, no site runoff is directed to either the Talfourd or Perch Creek watersheds.

Sampling and analysis of the treated surface water is carried out prior to discharge to the Telfer Road ditch. The average total suspended solids, total phosphorus and nitrate concentrations are generally less than both Bear Creek and in the Telfer ditch. The 5-day biochemical oxygen demand was low and generally about the same as Bear Creek. While the average conductivity and chloride in the surface water effluent was higher than in Bear Creek and the Telfer ditch, these differences are not statistically significantly.

A number of other integrated waste management services and facilities are operational at the Lambton Facility. These other facilities are shown on Figure 1 and include:

- a liquid industrial waste incinerator near the centre of the facility;
- laboratory facility building;
- AAPS pre-treatment facility building;
- Land Disposal Restrictions (LDR) pre-treatment facility;
- Waste water treatment facility;
- Vehicle and equipment maintenance;
- Administrative offices and weigh scale; and,
- Household hazardous waste drop off depot.

## 4. Socio-Economic

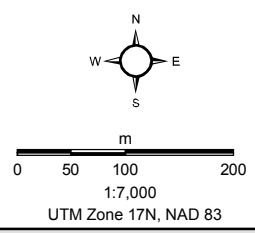
### 4.1 Economy


According to Statistics Canada, Lambton County experienced slight positive population growth between 2001 and 2006, increasing by 1% from 126,971 to 128,204. The St. Clair Township population remained virtually unchanged over this period, decreasing from 14,659 to 14,649.

The employment sector in Lambton County has remained relatively consistent over the years with the primary sector remaining the Service Industries. In 2006, the Business and Other Services sectors accounted for 36 percent of the employment followed by Manufacturing and Retail Trade sectors.



Basemapping from Ontario Ministry of Natural Resources  
 Orthophotography: 2006



**Legend**  
 Existing Lambton Facility

Clean Harbors  
**Lambton Facility  
 Site Infrastructure**  
 October 2009  
 Project 111471

Figure 1

**Table 4-1 Lambton County Total Experienced Labour Force by Industry**

Industry	Sector Employment
Other Services	20%
Business Services	16%
Manufacturing	15%
Retail Trade	11%
Health Care and Social Services	11%
Construction	8%
Agriculture and Other Resource-based Industries	7%
Educational Services	6%
Finance and Real Estate	4%
Wholesale Trade	3%

Notes: Statistics Canada 2006 Census Data

## 4.2 Social

The St. Clair Township Official Plan conforms to the County of Lambton Official Plan. According to the St. Clair Township Official Plan, the existing Lambton Facility property is identified as a waste disposal site and designated as Type Three Industrial. The area immediately surrounding the site is mostly designated as Agricultural with the exception of woodlots located at the south end of the property, which are designated as Hazard and Environmental Protection.

Historically, the primary land use in this area has been agricultural. Over time, larger farms have become pre-dominant in the area and more residents have found urban employment in Sarnia or Corunna.

St. Clair Township is generally flat, lacking topographical relief almost completely. The sky dominates the area with a strong horizon line broken intermittently by tree masses, barns, silos, telephone poles and other vertical elements. The Facility is generally only visible when in the immediate vicinity due to the presence of the on-site incinerator stack and the earth berms that eliminate viewing of the on-site activities. Natural features within the immediate area surrounding the Facility include woodlots that line the southern end of the Facility and the property on the southwestern side of the facility.

Residents in the community surrounding the Lambton Facility have historically been active in issues concerning its operations. Prior to 1997 concerned residents met to discuss activities at the Facility and acted as a liaison committee. As a condition of the approval for Cell 18, Clean Harbors developed the Good Neighbour Program in 1997. This program was developed with input from the liaison committee and consisted of five major components including the formation of a new Community Liaison and Advisory Committee (CLAC), complaint response procedures, property value protection and special compensation, damage claims resolution and a community fund. Due to the nature of its operation, Clean Harbors does periodically receive complaints related to the landfill operation as well as other operations located at the facility. Each complaint is investigated, actions taken when applicable, and the complainant is advised of the action taken. Complaints received at the Facility are also reported to the Ministry of the Environment and discussed at CLAC meetings. Clean Harbors has an open door approach to resolving any issues or complaints raised by its neighbours. Site tours are also encouraged as well as one-on-one sessions to answer individual concerns in the hope of maintaining open communication.

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## 5. Sources

Clean Harbours Annual Landfill Report, 2007 and 2008.

Environmental Assessment, Landfill Service Continuation Volume 1: EA Document 3 – Site Assessment Report, April 1996 (Section 3.3) pg. 3-16, 3-347, agriculture, geology, surface water, biology, noise, visual.

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Statistics Canada, 2006 Census Data, <http://www.statscan.ca>.