



CONSULTING ENGINEERS
& SCIENTISTS

REPORT

ODOUR SOURCE SUMMARY OTTAWA LANDFILL OTTAWA, ONTARIO

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SUBMITTED TO: **Greg Davis**
Ottawa District Office
Ministry of the Environment
2430 Don Reid Drive
Ottawa, Ontario K1H 1E1

cc: Paul Kehoe – Area Supervisor

SUBMITTED BY: **RWDI AIR Inc.**
Consulting Engineers & Scientists
650 Woodlawn Road West
Guelph, Ontario N1K 1B8

P: (519) 823-1311

F: (519) 823-1316

Project Scientist: Sarah Pellatt, B.Sc.
Project Manager: Colin Welburn, M.Eng., P.Eng.
Project Director: John DeYoe. B.A.

TABLE OF CONTENTS

1.	DESCRIPTION OF REPORT / SCOPE.....	1
2.	ASSESSMENT OF ODOUR SOURCES.....	1
3.	DESCRIPTION OF ODOUR SOURCES	2
3.1	Landfill Gas / Garbage Odours.....	3
3.1.1	Working Face of Landfill.....	3
3.1.2	Landfill Active Face Area.....	3
3.1.3	Landfill Interim Cover Area	4
3.1.4	Landfill Final Cover Area.....	4
3.1.5	Public Waste Drop-Off Areas.....	4
3.1.6	Landfill Gas Well Installation.....	5
3.1.7	Trenching	6
3.1.8	Cracks/Fissures in Landfill Cap.....	6
3.2	Leachate Odours	7
3.2.1	Leachate Pumphouse	7
3.2.2	Leachate Cleanout Manholes.....	8
3.2.3	Leachate Seepage.....	8
3.3	Contaminated Soil Odours.....	9
3.3.1	Contaminated Soil.....	9
3.4	Compost Odours	9
3.4.1	Composted Biosolids Spreading.....	9
3.5	Miscellaneous Odours.....	10
3.5.1	Diesel Generator	10
4.	RANKING OF ODOUR SOURCES.....	10
4.1	Diesel Generator	11
4.2	Contaminated Soil.....	12
4.3	Leachate	12
4.4	Composted Biosolids Spreading.....	12
4.5	Landfill Gas / Garbage Odours.....	13
5.	RECOMMENDED MEASURES TO ACHIEVE AND MAINTAIN COMPLIANCE WITH RESPECT TO SECTION 14 OF THE EPA	15
5.1	Landfill Gas / Garbage Odours.....	15
5.1.1	Working Face of Landfill.....	15
5.1.2	Landfill Active Face Area.....	15
5.1.3	Landfill Interim Cover Area	15
5.1.4	Landfill Final Cover Area.....	16
5.1.5	Public Waste Drop-Off Areas.....	16
5.1.6	Landfill Gas Well Installation.....	16
5.1.7	Trenching	17
5.1.8	Cracks/Fissures in Landfill Cap.....	17

TABLE OF CONTENTS - CONTINUED

5.2	Leachate Odours	17
5.2.1	Leachate Pumphouse	17
5.2.2	Leachate Cleanout Manholes	17
5.2.3	Leachate Seepage.....	18
5.3	Contaminated Soil Odours.....	18
5.3.1	Contaminated Soil.....	18
5.4	Compost Odours	18
5.4.1	Composted Biosolids Spreading.....	18
5.4.2	Diesel Generator	19

1. DESCRIPTION OF REPORT / SCOPE

This odour sources survey report has been prepared in response to the requirements of Provincial Officer's Order Number 5830-6Z2PPW, issued on May 11, 2007 by Provincial Officer Greg Davis. This report fulfills the requirements of Item No. 3 of this order, which states:

“By no later than June 29, 2007, submit to the issuing Provincial Officer an Odour Sources Survey Report with respect to the WMCC Landfill Site. The report shall be prepared by the Qualified Person as a result of the Qualified Person evaluating all potential sources of odour at the WMCC Landfill Site that may be discharged to the natural environment and which cause or are likely to cause adverse effects and shall include but not necessarily be limited to:

- a) a description and ranking of the odour sources;
- b) a description of recommended measures to achieve and maintain compliance with Section 14 of the Environmental Protection Act with respect to each source of odour discharges.

2. ASSESSMENT OF ODOUR SOURCES

A site visit was conducted at the Ottawa Landfill facility by Colin Welburn and Sarah Pellatt between the hours of 1 pm and 5 pm on June 19, 2007. Both RWDI staff members have completed odour detection threshold testing, in accordance with ASTM E679-91, using 1-butanol as the odour standard. Both individuals were found to be within the acceptable range representative of the “normal” odour detection limits. Both individuals have been to the landfill site many times and are very familiar with operations at the landfill.

The site visit was conducted on a warm, sunny day with strong, gusty winds. The meteorological conditions, as recorded by the on-site meteorological station, during this period are outlined below:

- Wind speed: 17 kilometres/hour;
- Wind direction: South Southwest;
- Ambient temperature: 27 °C;
- Barometric Pressure: 109.3 kilopascals and falling; and,
- Relative Humidity: 66%.

The barometric pressure was falling during this period, which is expected to increase the emission of landfill gas from the mound, and thus increase the emission of any corresponding odours. The strong winds, however, will serve to increase the dilution of the odorous substances in the ambient air at the fence line. This is far less of an issue at locations near the odour sources and did not impair the ability of the two observers to rank the odour intensity of the sources at the site.

3. DESCRIPTION OF ODOUR SOURCES

Under normal operating conditions, solid waste landfills have the potential to produce odours from several areas, including:

- Various areas on the landfill mound;
- The leachate collection system;
- The use of contaminated soils and compost as cover materials; and,
- The diesel generator.

Not all of the aforementioned sources produce the same types of odour.

3.1 Landfill Gas / Garbage Odours

Landfill gas and garbage odours can arise from several sources on-site. These sources are described individually in the following section. Although these sources are described individually, their effects will be cumulative. That is, any detectable landfill gas or garbage odours are likely a result of a combination of these sources.

During the site visit, on June 19th 2007, landfill gas odours were detected by RWDI staff in the vicinity of the public waste drop off area, near the property line along Carp Road. This location was downwind of the landfill during the site visit. In addition to normal landfill operations, drilling of new landfill gas extraction wells was occurring on the northwest face of the landfill (parallel to Richardson Side Road) during this time.

3.1.1 Working Face of Landfill

The landfill working face is the area where active landfilling is occurring, i.e., where daily waste received at the landfill is being deposited. The majority of activity at the landfill will occur in this area. Cover material is not applied to the working face until landfilling is completed at the end of the working day.

Odour emissions from the working face are expected to occur from both the handling of the fresh (i.e., non-decomposed) waste material as well as releases of landfill gas occurring through the working face.

3.1.2 Landfill Active Face Area

The landfill active face area surrounds the working face. The active face includes areas where landfilling has recently occurred and areas where landfilling will be occurring in the near future. The active face area has only a thin (approximately 6 inch) layer of cover soil material.

Odours from the active face area result from the release of landfill gas through the surface of the landfill.

3.1.3 Landfill Interim Cover Area

The interim cover area is the portion of the landfill where waste is no longer being deposited but final cover (i.e., clay cap) has not yet been applied. The interim cover in this area consists of an additional six inches of cover material (soil) in addition to the cover that has been applied in the active face stage.

Odours from the interim cover area result from the release of landfill gas through the surface of the landfill. The presence of the thicker layer of cover material, in relation to the active face area, may assist in the reduction of odourous emissions of landfill gas.

3.1.4 Landfill Final Cover Area

The final cover area is the portion of the landfill where waste is no longer being deposited. This area is characterized by the presence of a clay landfill cap and landfill gas collection wells.

Odours from the final cover area result from the release of landfill gas through the surface of the landfill. The landfill gas collection wells in the final cover area of the landfill serve to extract the landfill gas from the mound, thus reducing the amount of landfill gas available to escape through the surface of the mound and cause odour emissions. In addition, the clay cap limits the ability of the landfill gas to be released through the surface of the landfill.

3.1.5 Public Waste Drop-Off Areas

The Ottawa Landfill has a public waste drop off area located in the northern corner of the site, adjacent to Carp Road.

The public waste drop off area has traditionally had very little odour impact. The majority of waste typically received in this area consists of yard waste and construction waste, which have a very low odour potential. However, from time to time odourous waste may find its way into the drop off bins, causing the containers to generate odours. During the site visit, no strong odours were detected from the public waste drop off area.

3.1.6 Landfill Gas Well Installation

The installation of a new landfill gas collection well involves drilling into the landfill mound, installing the well casing, backfilling material around the casing, and connecting the well to the landfill gas collection system.

At the Ottawa Landfill, current operating practices limit the number of wells drilled to two per day. Backfilling is performed as soon as possible once the casing has been installed. The well is capped with a *Bentonite* seal. The well casing is loosely covered overnight and then capped and connected to the landfill gas collection system the next day.

The process of drilling into the mound causes odours from two sources – the exposure of partially decomposed waste and the release of landfill gas from the mound. Since the landfill gas wells are being installed in areas where landfilling has been completed, a significant amount of landfill gas is expected to be in these areas. Drilling into the landfill opens a conduit for this landfill gas to escape directly into the atmosphere. During the site visit, RWDI staff inspected a well that had been installed that day. The benonite seal was checked, and no leaks were found. Some landfill gas was found to be escaping around the temporary well cover. When the cover was removed, a strong current of landfill gas could be felt escaping through the wellhead.

3.1.7 Trenching

The process of trenching involves digging a shallow trench into the side of the landfill to install trenching and promote proper leachate drainage. Once the installation is complete, the trench is backfilled with the removed waste and the cover material is replaced. Trenching activity can correct and prevent seepage of leachate through the landfill cap.

As with well installation, the process of trenching produces odours from two sources – the exposure of partially decomposed waste and the release of landfill gas from the mound. Trenching through the landfill cover, especially the final clay cover, opens a conduit for this landfill gas to escape directly into the atmosphere. During the site visit, a trench was observed in a partial stage of construction. RWDI staff did not enter the trenching area, due to safety concerns. Landfill gas odours were detected in the vicinity of the trench, however, the relative contribution of the trench could not be determined, due to the odour contributions from surrounding sources, such as nearby landfill gas well installation and landfill mound emissions.

3.1.8 Cracks/Fissures in Landfill Cap

The final cover of the landfill includes a clay cap, which limits the migration of landfill gas through the surface of the landfill. However, cracks and fissures can form in this clay layer, allowing landfill gas to pass through unchecked. These cracks and fissures can form for a variety of reasons, including the effect of freeze/thaw cycles, erosion due to surface water run off, and heavy equipment operating on the capped area.

No large cracks were observed on the portion of the landfill visited by RWDI staff during the site visit. However, Waste Management has recently conducted a Emissions Survey to identify and map “hotspots” where landfill gas is escaping from the landfill. An area of leachate seepage (see below) was noted by RWDI staff. Bubbles were present in some portions of the seepage area, indicating that landfill gas is also escaping through the cap at these points.

3.2 Leachate Odours

Leachate produces a strong, unpleasant odour that is distinct from the landfill gas odours. Leachate odours can arise from several sources on-site. These sources are described individually in the following section. Although these sources are described individually, their effects will be cumulative. That is, any detectable leachate odours are likely a result of a combination of these sources.

During the site visit, on June 19th 2007, ambient leachate odours were not detected by RWDI staff. During an additional site visit on June 27th 2007, RWDI staff noted some leachate odours near the pumphouse, however, the leachate odours were less dominant than the landfill gas odours overall.

3.2.1 Leachate Pumphouse

The leachate pumphouse is located near the northeastern corner of the site. This building houses the equipment controlling the leachate removal from the landfill. Leachate contaminated water collected from the landfill is sent through a venturi scrubber. Once it has passed through the scrubber, the leachate contaminated water is sent to the municipal sewage treatment plant. The exhaust gases from the scrubber are sent through a cyclone and then vented outside through a gooseneck stack located on the northwest corner of the pumphouse building.

Air emissions from the majority of the leachate handling equipment within the pumphouse are contained; therefore, odours from these sources are not expected to be significant. The scrubber exhaust emissions, on the other hand, are expected to exhibit a strong leachate odour. During a subsequent site visit on June 27th 2007, leachate odours were detected downwind of the pumphouse exhaust stack, however, these odours were not dominant in comparison to the landfill gas odours pervasive on-site.

3.2.2 Leachate Cleanout Manholes

Two leachate cleanout manholes are located at the facility, one located at the northern portion of the landfill and one located at the southern portion of the landfill. These manholes are used for removing and cleaning debris that may accumulate inside the leachate collection system.

Both leachate cleanout manholes are fitted with a solid metal plate to prevent emissions. The southern manhole has been sealed, while the plate on the northern manhole can be manually removed. The northern manhole was investigated by RWDI staff during the site visit on June 19th 2007. When the metal plate was in place, only minimal leachate odours could be detected when standing next to the manhole. When the metal plate was removed, strong leachate odours were detected.

3.2.3 Leachate Seepage

Leachate seepage occurs when leachate “breaks through” the cover of the landfill and pools on the surface. Leachate seepage can occur due to poor drainage, cracks and fissures in the landfill cap, or blockage of the leachate collection system.

Leachate seepage has the potential to cause strong odour impacts. The pooling of leachate on the surface allows the leachate odours to mix with the ambient air and potentially travel offsite. During the site visit on June 19th, RWDI staff observed an area of leachate seepage. Although some leachate odours were noted in the area, these odours were dominated by the landfill gas odours also present. It must be noted that landfill gas was observed to be bubbling through the leachate seepage pool and that trenching and gas well drilling activities were occurring in the immediate vicinity at the time.

3.3 Contaminated Soil Odours

3.3.1 Contaminated Soil

The Ottawa Landfill receives contaminated soil from off-site locations for use as daily cover. The majority of this soil is petroleum fuel-contaminated and contains fuel-related VOCs such as benzene and other light aromatic compounds.

Although individual shipments of contaminated soil can vary widely in composition, in general, the soil does emit a mild fuel-like odour. The contaminated soil stockpile is located on the northwest side of the landfill, well removed from the property line. During the site visit, no contaminated soil odours were detected at the property line.

3.4 Compost Odours

3.4.1 Composted Biosolids Spreading

Composted biosolids are spread on top of the clay cover to facilitate vegetative growth on the landfill mound. These composted biosolids are obtained from on-site stockpiles. No new biosolid materials are currently accepted at the site, instead, the on-site stockpiles contain material that was accepted in approximately 1999.

Composted biosolids had been spread on the mound prior to the site visit on June 19th. The compost had been applied on the portion of the landfill nearest to Carp Road. The compost had a distinct odour, similar to ammonia/fertilizer that could be detected at the property line along Carp Road.

3.5 Miscellaneous Odours

3.5.1 Diesel Generator

A diesel generator has been installed on-site to provide supplementary power. This generator has been placed in an enclosure, located near the property line along Carp Road.

Diesel generators have the potential to produce odourous substances in their exhaust gas stream. During the site visit, a distinct odour was detectable surrounding the generator enclosure. However, this odour was not detectable at the nearest property line of the facility.

4. RANKING OF ODOUR SOURCES

The significant odour sources, as identified in the previous section, were assigned a ranking, in terms of odour detectability, expected odour frequency, and potential for odour annoyance. For those sources whose emissions had previously been quantified as part of the baseline odour report issued by RWDI in January 2005, the emission rates are summarized below. These emission rates are presented as odour flux rates, in terms of odour units emitted per square meter of landfill surface per second.

Table 1: Summary of Odour Emission Rates and Sources of Data

Odour Source	Emission Rate (OU/m²/s)	Source of Data
Working Face	0.907	90 th percentile of odour emissions measured at Britannia Landfill and Trail Road Landfill
Active Face	0.0356	MOE Landfill Gas Interim Guideline
Interim Cover Area	0.0356	MOE Landfill Gas Interim Guideline
Final Cover Area	0.0107	MOE Landfill Gas Interim Guideline
Contaminated Soil	0.17	Ridge Landfill

The following section presents the ranking of odour sources from the Ottawa Landfill site. These sources are listed in ascending order, that is, the odour sources that are deemed least likely to create a nuisance impact are listed first, and the odour sources that are deemed most likely to create a nuisance impact are listed last.

4.1 Diesel Generator

The diesel generator produces a distinct odour, which would not act cumulatively with the landfill gas or other odours on-site. Based on RWDI's site visit, odours from the diesel generator were generally not detectable at the property line. The diesel generator does not represent a significant odour source on-site.

4.2 Contaminated Soil

The contaminated soil also produces a distinct odour, which would not act cumulatively with the landfill gas or other odours on-site. Although individual shipments of contaminated soil can vary in terms of odour intensity, the distance of the soil stockpiles from the property line will help to mitigate the effects of any particularly odours soils. Based on RWDI's site visit, odours from the contaminated soil were generally not detectable at the property line. The contaminated soil does not represent a dominant odour source on-site.

4.3 Leachate

Leachate has a strong, unpleasant odour. There is a great potential for off-site impacts from leachate odours, however, the current system works to limit leachate odours. Although leachate odours were detected at various locations on-site, leachate odours were dominated by compost and landfill gas odours at the time of the site visit. As a minimum, current practises must be maintained to ensure that leachate odours do not cause off-site impacts. The leachate currently does not represent a dominant odour source on-site, however, due to the odourous nature of the leachate, these sources have the potential to cause off-site odour impacts if operations at the facility change.

4.4 Composted Biosolids Spreading

The spreading of composted biosolids presented a strong odour that was detectable off-site. The odour from this source can be characterized as an ammonia/fertilizer smell, similar to odours experienced from farming activities in the area. Although the compost odours were strong and detectable off-site, they are less likely to result in nuisance impacts because of their ubiquitous nature. This specific source has not been examined quantitatively in previous studies, however, the material is a prime organic resource when used as cover soil and should not remain buried inside the landfill. Further, the impacts from the spreading of this material are short lived and do not represent any health impact.

4.5 Landfill Gas / Garbage Odours

The landfill gas / garbage odours represent the dominant odour sources on-site. Odours of this type are the most likely to be causing adverse off-site impacts. Landfill gas has a strong, unpleasant odour, which is distinct from other odour sources on-site and in the vicinity of the landfill.

The sources of landfill gas and garbage odours are ranked individually, below. These sources are listed in the order of least likely to cause off-site impacts to most likely to cause off-site impacts.

Public Waste Drop-Off Area

The public waste drop-off area contains minimal odourous material. In addition, the waste has short residence time in area; therefore, no significant waste decomposition will be occurring in this location.

Final Cover Area

The final cover area is characterized by the presence of a clay cap on the surface of the landfill, which prevents migration of landfill gas through the landfill surface. In addition, the final cover area contains landfill gas extraction wells, which reduces the amount of landfill gas available to be emitted from the landfill. Although landfill gas odours from the final cover area will contribute to any off-site impacts, the contribution from this area would generally be less than other portions of the landfill.

Active Face and Interim Cover Areas

The active face and interim cover areas are characterized by the presence of soil-type cover material. These areas do not have landfill gas collection systems in place. The active face and interim cover areas are expected to release more landfill gas, and thus more odour, than the final cover area. The odour emissions from the active face and interim cover areas will be somewhat reduced due to the presence of the cover soil.

Working Face

The working face is the area where landfilling is actively occurring. During the operating hours of the landfill, cover material is not present on the working face. Therefore, the working face does not provide any barrier to escaping landfill gas. In addition, handling of new garbage material occurs in this area. Overall, the working face is expected to have the highest odour emission rate (per square meter) for any normal operating condition sources.

Landfill Gas Well Installation Trenching Cracks/Fissures in Landfill Cap

Landfill gas well installation, trenching activities, and cracks and fissures in the landfill cap are all odour sources that are not necessarily representative of normal operating conditions on-site. Instead, these activities represent upset conditions that may only occur periodically. However, these upset conditions represent the on-site odour sources that are the most likely to cause adverse impacts. When these upset conditions occur in the older, capped areas of the landfill, they remove the barrier to escaping landfill gas. Since the capped areas tend to cover the older areas of garbage, the landfill gas production in these areas is relatively high. Since the areas surrounding the well, trench, or crack/fissure will still have their clay cap in place, landfill gas from surrounding areas will be drawn towards the opening in the cap, represented by these upset conditions.

5. RECOMMENDED MEASURES TO ACHIEVE AND MAINTAIN COMPLIANCE WITH RESPECT TO SECTION 14 OF THE EPA

The following section outlines potential mitigation options, listed on a source-by-source basis, which can be applied to achieve and maintain compliance with respect to Section 14 of the Environmental Protection Act. We have not gone through detailed mitigation measures with Waste Management at this time because many of these mitigation practises have operational constraints that will have to be reviewed in detail with Waste Management.

5.1 Landfill Gas / Garbage Odours

5.1.1 Working Face of Landfill

- All efforts should be made to reduce the size of the working face to as small as is practically possible.
- Temporary cover should be placed on the working face as soon as possible at the end of each day.

5.1.2 Landfill Active Face Area

- The active face areas should be kept to a minimum size.
- Where exposed refuse is visible in the active face area, additional cover material should be applied to the exposed refuse.

5.1.3 Landfill Interim Cover Area

- The interim cover area should be converted to final cover area as soon as possible once landfilling is completed.

5.1.4 Landfill Final Cover Area

- The landfill gas collection and flaring system should be expanded as much as possible to minimize the amount of odourous landfill gas that escapes through the surface of the mound.
- Existing landfill gas collection wells should be inspected regularly to ensure that no leaks are occurring in the piping, wellhead, or seal around the base of the well.

5.1.5 Public Waste Drop-Off Areas

- Personnel working at the public waste drop off area should verbally report any bins or containers that are pungently odourous to the Site Foreperson. Bins containing pungent material should be emptied as soon as possible.
- All bins should be monitored and emptied on a regular basis.

5.1.6 Landfill Gas Well Installation

- The number of landfill gas wells drilled or open at any given time should be minimized.
- Well casing installation and backfilling should be conducted as soon as possible once drilling has been completed.
- New landfill gas wells should be tied into the landfill gas collection system as soon as possible once installed.
- The seal surrounding new landfill gas wells should be leak checked shortly after installation.
- Landfill gas well installation should be avoided on days with low wind speeds and/or low barometric pressures.
- When wind conditions blowing towards nearby residential areas exist or are forecasted, the landfill gas well installation should be delayed until more favourable wind conditions exist.

5.1.7 Trenching

- The size of trench open at any one time should be minimized.
- The trenched area should be covered overnight
- Trenching activity should be avoided on days with low wind speeds and/or low barometric pressures.
- When wind conditions blowing towards nearby residential areas exist or are forecast, the trenching activities should be delayed until more favourable wind conditions exist.

5.1.8 Cracks/Fissures in Landfill Cap

- Routine monitoring and inspection of the landfill cap should be conducted to identify any fissures, cracks, or erosion of the soil.
- Once identified, any cracks, fissures, or erosion areas should be repaired as soon as possible.
- The areas requiring repair should be covered with clay, compacted, and then covered with topsoil.

5.2 Leachate Odours

5.2.1 Leachate Pumphouse

- Odourous gasses from the leachate stripper should be ducted to the flare for odour destruction.

5.2.2 Leachate Cleanout Manholes

- The manholes should be sealed and placed under negative pressure. The collected leachate gas should be ducted to the flare for destruction
- The manholes should not be cleaned out or opened during days with with low wind speeds and/or low barometric pressures.

- The manholes should not be cleaned out or opened when the winds are blowing towards residential areas or directly towards the nearest property line (especially in the case of the northern manhole which is located near to the property line along Carp Road).

5.2.3 Leachate Seepage

- The landfill should be monitored regularly to identify areas of poor drainage/ leachate seepage
- Leachate seepage areas should be corrected as soon as possible through trenching or other means.

5.3 Contaminated Soil Odours

5.3.1 Contaminated Soil

- Contaminated soil stockpiles should be located as far as practical from the property line of the facility.
- Contaminated soil shipments should be monitored and any highly odorous loads should be covered as soon as possible.

5.4 Compost Odours

5.4.1 Composted Biosolids Spreading

- Biosolids should be checked to ensure that the material has been well composted prior to spreading on the landfill.
- The amount of composted biosolids spread onto the landfill at any one time should be regulated.
- Composted biosolids spreading should be avoided on days with low wind speeds and/or low barometric pressures.

- When wind conditions blowing towards nearby residential areas exist or are forecast, the spreading activities should be delayed until more favourable wind conditions exist.

5.4.2 Diesel Generator

- The diesel generator did not appear to produce detectable odours at the property line. At this time, no further mitigation is required to reduce odours from the diesel generator at the Ottawa Landfill.