OPERATIONS REPORT

Essex-Windsor Regional Landfill

2009

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Essex – Windsor Regional Landfill Site

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2009 Annual Operations Report

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Essex-Windsor Regional Landfill Site

1. INTRODUCTION

The Essex-Windsor Regional Landfill Site is located in the south half of Lots 14, 15, and 16, Concession 7, in the Town of Essex (formerly the Township of Colchester North) at 7700 County Road 18.

The Site is licensed by the Ontario Ministry of Environment (MOE) under Provisional Certificate of Approval (CA) No. A-011101 (September 28, 1995) as amended.

The Essex-Windsor Solid Waste Authority operated the landfill during the year. Staff of the Authority manages the Site and operates the weigh scale, provides inspection services, contract administration and maintains the associated records for the Site.

1.1 Purpose

This report presents a summary of the landfill operations including development and maintenance during 2009 as per Condition 18 of the MOE CA No. A-011101 requirements.

2. WASTE QUANTITIES AND TYPES

2.1 Waste Quantities

The Essex-Windsor Regional Landfill site was officially opened to the receipt of waste on July 2nd, 1997. The site was originally licensed to accept waste from all generators of non-hazardous solid waste located in the County of Essex and City of Windsor. Subsequent amendments to the original Certificate of Approval have expanded the site service area to include the Province of Ontario. A total of 159,078.74 tonnes of waste were received during operations in 2009 compared to 195,885.12 in 2008. This represents a 19% drop in total waste being landfilled at the Essex-Windsor Regional Landfill for 2009 compared to 2008. Of the total, 159,054.90 tonnes of waste were generated from within Essex-Windsor, and 23.84 tonnes were generated from within the Municipality of Chatham-Kent.

The Essex-Windsor Solid Waste Authority has implemented a number of waste bans or restrictions at the site and as a result does not accept tires, pallets, clean old corrugated cardboard, white goods, fish offal, brush, grass or leaves for disposal. It does accept tires for recycling and wood, pallets, brush, grass and leaves for composting.

The average daily waste quantity delivered to the Site in 2009 was 525 tonnes per operating day (see Table 1 for monthly amounts). This represents a decrease of 19% when compared to the average daily waste of 645 tonnes in 2008.

TABLE 1: 2009 Monthly & Average Daily Waste Quantities

MONTH	TOTAL	DAILY AVERAGE
January	11,409.72	439
February	10,662.89	464
March	13,151.42	506
April	11,939.76	478
May	9,669.88	387
June	12,876.44	495
July	13,933.99	536
August	14,834.73	593
September	15,531.89	621
October	15,160.78	583
November	16,426.62	657
December	13,480.62	539
Total Tonnes	**159,078.74**	**525**

2.2 Special Wastes

Certain wastes require specific approval or special handling. These are classified as "special wastes", and could include such things as solid waste in barrels, asbestos, or industrial solid waste. The following table provides a detailed summary of all of the special waste received at the Regional Landfill.

Special Waste	Loads Received in 2009
Asbestos	92
Grain Dust	68
Bleaching Clay	146
Municipal Sludge	358

2.3 Waste Refusals

The Authority's weighperson, as well as contracted employees are required to question waste haulers about the nature of the wastes being disposed of, and to look for suspicious, unauthorized, or banned materials present in a load. The Authority also employs waste inspectors who are located in the active disposal area to inspect loads of waste for unacceptable material such as liquids, suspected hazardous wastes, special waste which have not been approved and waste banned from the site by the Authority. As well, wastes are inspected to ensure compliance with waste bans and regulations under the Environmental Protection Act.

If wastes of this type are brought to the Site by a licensed commercial hauler they are refused from landfilling and returned with the hauler for proper disposal or recycling. The following waste refusals took place in 2009:

TABLE 2: Waste Refused

TYPE	QUANTITY
Tires	543
Major Appliances	20
Propane Tanks	2
Air Conditioner	1
Tubs	3
Hot Water Tank	1
TOTAL	**570**

All materials were returned with their hauler for proper recycling or disposal.

2.4 Waste Types

The waste brought into the site by all haulers is classified into one of 20 waste types. Municipally delivered wastes hauled directly to the site totaled 24,710.45 tonnes, a 2% increase compared to the 24,274.70 tonnes of municipal waste received in 2008. The municipally delivered total tonnes represent 16% of the overall waste received in 2009.

Refuse brought in from Transfer Stations No. 1 & 2 represented 82,922.40 tonnes; a 21 % decrease compared to the 104,772.59 tonnes in 2008. This refuse represents 52% of the total waste received in 2009. The reader is referred to the annual reports of the Transfer Stations for details on the types of waste included in this total.

IC&I delivered refuse totaled 46,759.95 tonnes or 29% of the total tonnage. This is a 22% decrease compared to the 60,281.88 tonnes of IC&I delivered refuse received in 2008. The reduction in Transfer Station No. 1 delivered waste in 2009 can be attributed to a lengthy labour dispute that occurred in the City of Windsor.

A total of 2,990.60 tonnes of sewage sludge (2,834.17 tonnes in 2008) originating from the Towns of Amherstburg, Lakeshore, Essex, Kingsville and the City of Windsor was disposed of at the site during the year. The sludge is incorporated with the other wastes and co-disposed in the active fill area. The amount of sludge disposed of was 1.9% of the total waste stream, which is below the 2% limit contained in the Site's Certificate of Approval.

TABLE 3: Waste Material Type - 2009

		Tonnes	Percent
1	Municipally Delivered Refuse	24,615.43	15.47%
3	Municipal Del'd Clean Up	95.02	0.06%
7	Recycling Residual	728.14	0.46%
9	Trsf Ctr Bldg Residuals	116.69	0.07%
10	Municipal Construction/Demo	83.53	0.05%
14	Pollution Control Grit	186.55	0.12%
15	Municipal Del'd Sewage Sludge	2,990.60	1.88%
16	Residentially Del'd Refuse	12.09	0.01%
17	Res. Construction/Demolition	3.57	0.00%
18	Residential Shingles	0.49	0.00%
22	Charitable Organizations	0.02	0.00%
24	Nemak-DC11	111.12	0.07%
26	WAP Silica Dust	90.25	0.06%
29	WAP - Zircon Baghouse Dust	360.68	0.23%
31	IC&I Del'd Refuse	43,577.44	27.39%
32	IC&I Construction & Demolition	1,842.94	1.16%
33	IC&I Shingles	956.27	0.60%
34	IC&I Delivered Asbestos	383.30	0.24%
39	Sharps	2.21	0.00%
50	Transfer Station Refuse *	82,922.40	52.13%
		159,078.74	

3. TRAFFIC

A total of 15,698 vehicles entered the Site to dispose of waste from January to December. This is a slight increase compared to the 15,690 vehicles in 2008. The daily average

volume of waste disposal traffic, calculated using the number of working days the site was open during the year, equaled 43 waste vehicles per day.

The Traffic summary per month is shown on Table 4.

TABLE 4: Traffic Data for 2009

MONTH	WASTE	LEACHATE	ALT DAILY COVERS	COMPOST	AUTO SHREDDER FLUFF	OTHER*	TOTAL
JAN	945	0	0	15	31	0	**991**
FEB	849	0	0	1	47	33	**930**
MAR	1,023	5	11	26	42	0	**1,107**
APR	1,021	68	11	65	19	0	**1,184**
MAY	996	14	0	127	50	4	**1,191**
JUN	1,184	154	21	129	62	5	**1,555**
JUL	1,232	8	1	80	53	1	**1,375**
AUG	1,111	0	14	101	87	0	**1,313**
SEP	1,226	0	15	66	105	241	**1,653**
OCT	1,164	0	14	114	130	0	**1,422**
NOV	1,267	9	20	139	133	0	**1,568**
DEC	1,098	53	59	43	189	0	**1,442**
TOTAL	**13,116**	**311**	**166**	**906**	**948**	**284**	**15,731**

** Other – Tires (1 in 2009) and municipally delivered soil (283 in 2009)*

4. INSPECTIONS AND COMPLAINTS

4.1 Site Inspections

The Solid Waste Authority provides a full time on site supervisor at the Regional Landfill Site. One of the roles of the supervisor is to undertake a perimeter check of the Site on a daily basis to identify problems in any of the following areas: leachate springs, erosion, drainage, litter, daily cover, leachate levels, etc. As well, the supervisor is responsible for ensuring compliance with waste bans, Certificate of Approval and Regulations under the Environmental Protection Act.

4.2 Complaints

A formal complaint reporting procedure is in place at the Site. There were no complaints received during 2009.

Anyone wishing to register a complaint may do so by calling the Essex-Windsor Solid Waste Authority at 1-800-563-3377 or by calling the Landfill site at (519) 776-7941.

4.3 Accidents, Fires and Incidents

There were no accidents that impacted landfilling operations in 2009. On April 18, 2009 the 836 Landfill Compactor caught fire and burned, causing extensive damage to the unit. A replacement compactor was brought in to replace the damaged unit until it could be repaired. The cause of the fire was not determined.

5. SITE DEVELOPMENT AND MAINTENANCE

5.1 Disposal Operations

Waste disposal operations (operating of heavy machinery) at the site were performed by Jeff Shepley Excavating Ltd., under contract with the Essex-Windsor Solid Waste Authority. The work performed includes the placement and compaction of waste; the placement of daily, intermediate and final cover and maintenance of access roads. Staff of the Essex-Windsor Solid Waste Authority carried out litter control, dust control, sweeping roads and general maintenance.

5.2 Disposal Areas

The Essex-Windsor Regional Landfill site is 123 hectares in size with a waste footprint of 58 hectares. The disposal area is divided into five cells. The design capacity and area of the waste cells are as follows:

TABLE 5: Capacity of Disposal Areas

CELL	AREA (ha)	TOTAL VOLUME *	WASTE MASS ▹(Tonnes)
1	14.4	1,707,000 m^3	784,000
2	11.4	2,834,000 m^3	1,360,000
3	10.0	2,675,000 m^3	1,284,000
4	10.6	2,969,000 m^3	1,427,000
5	11.6	2,615,000 m^3	1,245,000
TOTAL SITE	**58.0 ha**	**12,800,000 m^3**	**6,100,000**

* Total volume is calculated based on measurement from top of the leachate collection system to final contours including 1.0 meter of final cover, daily and interim cover. ▹ Based on a compaction rate of 600 kilograms/m^3

TABLE 6: Waste Cell Refuse Tonnage to Date

YEAR	CELL 1	CELL 2	CELL 3	CELL 4	CELL 5
1997	83,970				
1998	180,363				
1999	188,298				
2000	193,513				
2001	226,426				
2002	80,859	150,120			
2003	0	272,974			
2004	56,514	221,646			
2005	43,873	152,801			
2006	19,930	168,526			
2007	5,789	180,003			
2008	92,032	103,852			
2009	41,274	117,804			
TOTAL:	**1,212,841**	**1,367,726**			

Cell 1 of the Essex-Windsor Regional Landfill was opened to the receipt of waste in July 1997 and as of December 31st, 2009 has approximately 1,212,841 tonnes of waste in-situ. Cell 1 was originally designed to accommodate the disposal of 784,000 tonnes of waste; however as a result of a number of staff initiatives (1999 mining project, larger landfill compactor and alternative daily cover) the original design capacity for Cell 1 has been

significantly increased. Cell 2 of the Essex Regional Landfill was opened to the receipt of waste in 2006 and as of December 31, 2009 has approximately 1,367,726 tonnes of waste in-situ. Cell 2 was originally designed to accommodate the disposal of 1,360,000 tonnes of waste.

5.3 Waste Disposal Methods

The ramp method of landfilling was employed at the Regional Landfill during operations in 2009. Wastes were deposited at the bottom or top of the ramp and pushed upwards or downwards in a lift over the operating face. The contract with the heavy equipment operator specifies that the lift shall be a maximum height of 3 metres, that the ramp slope is to be 5:1, and that the layer of waste, prior to compaction should not exceed .45 metres. The Contractor was noted as generally complying with these requirements during the year. The waste is spread using a D8 bulldozer and is then compacted using a Caterpillar 836C Landfill compactor.

5.4 Site Maintenance

Staff of the Essex-Windsor Solid Waste Authority carried out the day to day maintenance of the site. This included, but was not limited to, the cleaning and sweeping of roads, litter control, dust control and the maintenance of the leachate collection system.

There are 18 litter control units stationed at the site. The portable litter control units are used in conjunction with the permanent litter control fence surrounding Cell 1 and the northern portion of Cell 2 to control the movement of litter on the site. The units are 10 metres long by 5 metres high with a wire mesh type fence attached to them. The units are mounted on skids that permit easy relocation using the heavy equipment at the site. The units are moved frequently to coincide with wind direction and have assisted greatly in controlling the movement of litter away from the disposal area.

The removal and control of mud from the road is accomplished through the use of several pieces of equipment. A water truck combined with a front end loader (F.E.L.) and a truck wheel wash are used in various combinations and have all but eliminated the tracking of mud off the site.

Dust control for 2009 was accomplished by using a 3,800 imperial gallon water truck equipped with spray bars. During the dry periods, water was applied to the tipping face area and roads to control dust.

5.5 Vegetation and Cover

In order to promote a thicker and healthier growth of grass on top of the waste cells, two major grass cuts were completed in 2009. By cutting the grass more often weed patches do not get a chance to germinate and the grass is allowed to reestablish itself in poor growth areas. A healthy, thick grass growth reduces erosion, surface water infiltration and cell cap desiccation. Preliminary inspection results suggest that the regular cutting of the grass has resulted in a much thicker healthier growth of grass.

No significant tree plantings were carried out in 2009.

Daily, intermediate and final cover was applied as required to interior and exterior landfill cell slopes throughout 2009. The south slope of Cell 2 had approximately 8,700 m^2 of intermediate and 3,450 m^2 of final cover applied. The east slope of Cell 2 had 8,200 m^2 of intermediate cover put down. For Cell 1 approximately 4,500 m^2 of intermediate cover was applied to its west slope along with 9,200 m^2 of final cover.

After placing final cover on the exterior slopes of Cell 1&2 approximately 12,250 m^2 of slope was top soiled and seeded.

5.6 Roads

A water truck and a front-end loader, owned by EWSWA, were utilized as required to clean County Road 18 and internal access road at the Regional Site. The Authority carried out daily and monthly road patrols on access routes to the site. It also carried out road patrols on local municipal roads that surround the site for illegally dumped waste and waste that may have fallen off of trucks on the way to the site.

The roads patrolled include County Road 18 from County Road 23 to Coulter Sideroad, County Road 23 from Highway 3 to Highway 18, Ferris Sideroad from Concession Road 8 to County Road 18, McCormick Sideroad from County Road 18 to Concession Road 6, Coulter Sideroad from Concession Road 8 to Concession Road 6, Concession Road 8 between the Coulter and Ferris Sideroads, Concession Road 6 between the Coulter and McCormick Sideroads.

Material picked up from the road patrols was brought to the landfill for proper disposal and the wood and brush was placed on the compost pad for later chipping. In 2009 the illegal dumping of waste around the site continued to be minimal.

5.7 Erosion Control and Drainage

Several small washouts were repaired as required. A number of areas which experienced minor erosion during the winter months were repaired in 2009. A number of drainage projects were also carried out in 2009. Leachate and surface water containment berms were constructed as required to control surface water and leachate run on and run off in and around the landfill tipping area. In addition a 120 metre long clay berm complete with 8-inch "Big O" down spouts was constructed at the tops of Cell 1 and 2 south and west slopes to control surface water run off. The clay berm is designed to direct surface water precipitation from the top sections of the outside slopes of the landfill into the "Big O" drainage pipe which transfers the water to the bottom of the slope with little or no erosion.

5.8 Volume Analysis and Compaction

Monthly compaction surveys of the waste landfilled at the Essex-Windsor Regional Landfill were carried out in 2009 as per the Certificate of Approval condition 2.14. The weight and volume quantities used to calculate monthly compaction are based on landfill weigh scale records for waste material only and monthly volume surveys. (Refer to Table 7 – Monthly Waste Compaction for 2009)

TABLE 7: Monthly Waste Compaction for 2009

MONTH	VOLUME CONSUMED M^3	WASTE LANDFILLED TONNES	WASTE COMPACTION TONNES ~~KG~~ / M^3
January	12,205	8,049	.659
February	16,991	11,912	.701
March	18,439	14,070	.763
April	19,302	13,879	.719
May	-	-	-
June	25,836	19,414	.751
July	20,044	13,175	.657
August	20,414	14,272	.699
September	27,151	19,902	.733
October	30,923	18,806	.608
November	23,358	13,592	.582
December	20,250	12,007	.593

The compaction surveys were completed by Essex-Windsor Solid Waste Authority staff.

5.9 Landfill Volume Consumption

The approved landfill volume not including final cover at the commencement of landfilling for the Essex-Windsor Regional Landfill was 12,200,000 m^3. Based on the 2009 annual landfill survey completed by Essex-Windsor Solid Waste Authority Staff, the total volume consumed in 2009 as a result of all landfilling activities was approximately 235,704 m^3. At the end of 2009 the approximate total volume remaining for the disposal of waste, daily and interim cover was estimated to be 8,816,202 m^3. (Refer to Table 8)

TABLE 8: Annual Landfill Volume Consumption

YEAR	LANDFILL VOLUME CONSUMED M^3	LANDFILL REMAINING VOLUME M^3
—	—	12,200,000
1997	129,186	12,070,815
1998	238,261	11,832,555
1999	213,490	11,619,065
2000	244,643	11,374,422
2001	291,037	11,083,386
2002	296,508	10,786,878
2003	358,704	10,428,174
2004	377,422	10,050,752
2005	275,841	9,774,911
2006	248,952	9,525,959
2007	238,136	9,287,823
2008	235,156	9,052,606
2009	235,704	8,816,902
Total	**3,383,040**	

5.10 Cell Development

There was no Cell development work carried out in 2009.

6. GAS MANAGEMENT

The Essex-Windsor Regional Landfill gas management system consists of a number of programs established throughout the Landfill site designed to reduce landfill gas emissions.

6.1 Passive Solar Flares

In 2000 three passive solar flares were installed, two on the West Cell and a third one on top of Cell 1. The existing monitoring programs do not allow for calculating gas quality or quantity but for much of 2009 two of the passive flares were observed burning off gas on a continual basis. The third flare located on the east side of the West Cell has been observed burning off landfill gas on a more intermittent basis. In June of 2009 the passive solar flare was removed from Cell 1 prior to landfilling.

6.2 Vacuum Flare

In early 2001, the Authority embarked on a full scale pilot bioreactor program in Cell 1 of the Regional Landfill. The project called for the installation of horizontal gas collection

trenches and pipes which are designed to be connected to a candle stick flare and an 8-hp blower. In June of 2002, the flare was commissioned. The vacuum flare was operated from June 2002 until approximately December 2008 when the flare was decommissioned.

6.3 Regional Landfill Gas Collection System

The Authority entered into a Landfill Gas Agreement with Integrated Gas Recovery Services Inc. on February 1, 2005. The Agreement required Integrated Gas Recovery Services Inc. to market the energy or other by-products of the landfill gas generated by the Regional Landfill. In return the Agreement provides that Integrated Gas Recovery Services Inc. will pay the Authority a royalty of the gross sales of the energy or other by-products of the landfill gas.

In mid to late 2008, Integrated Gas Recovery Services Inc. oversaw drilling and construction of the Landfill Gas collection, capture and recovery project at the Regional Landfill. Twenty one gas extraction wells were installed as part of the initial installation. A small expansion took place in 2009, in which four additional wells were installed.

Fulltime operation of the system began January 21st, 2009 using a portable candlestick flare and a network of above ground, corrugated HDPE pipe ("Big O"). During the few weeks of operation the system ran at a CH_4 concentration of approximately 44% by volume, and an average flow of 360 standard cubic feet per minute. Between January 28th and February 2nd, manholes 1, 2, and 6 were added to the system. The first few months of operation required additional well-field balancing because the gas concentrations and quantities in the landfill had not yet reached a steady state of production.

On May 4th, 2009, Integrated Gas Recovery Services Inc. supervised a methane destruction test for the candlestick flare. RWDI Air Inc. was retained to perform the stack testing, analysis and reporting. Results of the stack test indicated that the candlestick flare was capable of a destruction efficiency in the range of 80% to 99% destruction with an average of 88% under normal operating conditions. Based on this analysis, Integrated Gas Recovery Services Inc. opted to install a permanent enclosed flare with a high destruction efficiency in the range of 97% to 99.9%.

Construction related to the installation of the enclosed flare began in June 2009. On June 1st, Genivar Consultants LP (formerly Jagger Hims Ltd.) performed a geotechnical

investigation for the construction of the flare stack foundation and on June 4th the concrete pad was poured by DeRose Contracting. The conversion from candlestick flare to the enclosed flare was completed by June 24th, and operation of the enclosed flare commenced on June 25th. The gas collection system was not operational between June 16th and June 24th while construction of the flare compound took place.

Typical maintenance of the gas collection system was required for the remainder of the year including the connection of an additional manhole, a bi-reactor line in September, and calibration of the analyzer in December. Additional maintenance was typically required during winter months including drainage or ice removal in the "Big O" pipe, and reinforcing connections of the above ground pipe after wind created breaks.

In 2009, the gas collection system was operational between January 21st and December 31st with minimal shutdowns with the exception of the upgrade to an enclosed flare in June. The flare ran at an average flow 571.3 cubic feet per minute in 2009 with an average gas concentration of 46.3% methane by volume. More detailed numbers can be found in Table 9.

Of the twenty-five wells installed, twenty-one wells were connected (not necessarily open for collection) to the piping system and available for gas collection for the majority of the year. By December 2009, twenty-three of the wells were connected of which twelve wells were great gas providers, six were satisfactory, five were poor gas providers and two remained unconnected. As well, two of the five poor gas providers had decreased significantly over 2009 and the manholes no longer provided the high flows that they did in early 2009.

Integrated Gas Recovery Services Inc. proposes to install a system to collect landfill gas generated by the landfill and operate a Landfill Gas Electric Generating Facility on the Essex-Windsor Regional Landfill property. The gas collection system will be made up of 132 vertical landfill collection wells and associated lateral and sub-lateral piping, which will direct gas to a ring style header pipe surrounding the Landfill property. The header pipe will terminate in a blower building located on the west side of the landfill. The blower building will house a 4.24 megawatt (MW) Landfill Gas Electric Generating Facility which will consist of up to four internal combustion reciprocating engines each direct coupled to a 1.060 MW generator (genset). The landfill gas collection system is

proposed to be installed using a phased approach in conjunction with fill activities. The proposed system will operate the gensets 24 hours per day, 365 days per year and a proposed enclosed flare will act as a standby landfill gas control combustion device.

TABLE 9: Landfill Monthly Flare Data 2009

MONTH 2009	AVG FLOW (SCFM)	AVG CH_4 (%)	OPERATION TIME (HRS)	OPERATION TIME (% OF MTH)	VOL OF GAS (SCF)	VOL OF CH_4 (SCF)
January	360.4	43.8	141.6	96.3	5,702,824	2,497,837
February	612.0	48.0	657.8	97.9	24,665,793	11,839,580
March	721.0	48.3	731.0	98.3	32,206,005	15,555,500
April	668.0	50.1	633.2	87.9	28,836,702	14,447,187
May	676.0	45.0	629.4	84.5	30,169,152	13,576,118
June	507.8	42.3	406.8	80.7	17,171,062	7,263,359
July	552.0	42.9	614.7	85.4	23,847,376	10,230,524
August	486.0	47.3	539.0	72.4	21,680,446	10,254,850
September	533.0	42.9	616.7	85.7	23,028,674	9,879,301
October	637.0	44.8	644.2	86.6	28,416,237	12,730,474
November	585.0	48.1	625.9	86.9	25,256,592	12,148,420
December	517.0	52.5	614.2	82.6	22,337,631	11,727,256
TOTALS	571.3	19.6	6,854.5	87	283,318,494	132,150,406

SCFM=Standard Cubic Feet per Minute, CH_4=Methane, SCF=Standard Cubic Feet

7. LEACHATE MANAGEMENT

A perimeter leachate collection system and a leachate underdrain system are in place at the Site. The system was constructed in six phases. Phase I, which surrounds the east cell of the former Landfill Site No. 1 (now Cell 1 of the Regional Landfill), was installed beginning in August 1990 and became functional in October 1990, although it was not completed until March 1991. The leachate catchment area for Phase I was originally 13.8 hectares.

The catchment area was reduced to 12.76 ha in 1997 with the development of the Regional Landfill and further reduced to 9.76 ha as a result of the 1998 Landfill Mining project.

Phase II, which surrounded the former west cell of Landfill Site No.1, was installed between January and March 1993. This phase of the collection system became operational in April 1993. The leachate catchment area for Phase II is 5.76 hectares.

In 1997 the development of Cell 1 of the Essex-Windsor Regional Landfill led to the expansion of the former Area 1 (Phase III). The southern section of Cell 1 was excavated down to a depth of 10 metres below the existing site grade and extended approximately

100 metres to the south. A leachate collection underdrain system, consisting of a series of parallel perforated pipes, was installed at the base of the new landfill cell. A new pump station was installed in order to permit the leachate to be pumped out of the cell for treatment. This phase of the leachate underdrain system became functional in September 1998.

Later in September of 1998, the southern section of Cell 1 was expanded further when an additional 3 hectare area just north of the original Cell 1 excavation was developed (Phase IV). This area was also excavated down to a depth of 10 metres below existing grade and extended approximately 100 metres to the north. This portion of the leachate underdrain system was activated in 1999. The Cell 1 Leachate Underdrain System has a total catchment area of approximately 6 hectares.

Phase V of the leachate collection system was installed during the construction of Cell 2 North in the winter of 2002 and became operational on June 6th, 2002. Phase V consists of 4.95 hectares of leachate underdrain system, only 2.70 ha of which was activated during 2002. In 2003 the remaining 2.25 ha area was activated so that landfilling activities could be carried out in this section of Cell 2. This section of the Landfill, like all the newly constructed areas of the Landfill was also excavated down to a depth of 10 meters below existing grade and consists of a series of parallel perforated pipes designed to collect and convey the leachate to a series of pumps.

Phase VI of the leachate collection system was installed during the construction of Cell 2 South in 2004. Phase VI consists of 5.45 hectares of leachate underdrain system, 4.13 ha of which was activated during 2005. This section of the Landfill was also excavated down to a depth of approximately 10 meters below existing grade and consists of a series of parallel perforated pipes designed to collect and convey the leachate to a series of pumps.

The entire leachate collection system is drained/pumped to one of three leachate collection ponds on the west side of the site. The leachate is either collected by tanker truck from the ponds and taken to the Lou Romano Pollution Control Plant, located in the City of Windsor, for treatment or land applied/re-circulated on site, depending on the time of year and the annual quantity of leachate produced.

7.1 Leachate Quantities

The leachate management system in place at the Regional Landfill does not permit the calculation of precipitation based leachate generation rates, as has been the practice since 1991 at the former Landfill Site No. 1. At the former Landfill Site No. 1 there was minimal leachate storage capacity, so leachate had to be removed as it was generated. This provided accurate generation statistics.

The leachate collection system at the Essex-Windsor Regional Landfill is operated to remove leachate from the system to prevent leachate mounding in the waste. It also prevents ground water contamination; however, leachate is now stored on site, in lined leachate ponds, in order to maximize the utilization of leachate land application and recirculation systems and to provide for hydraulic and organic equalization of the leachate prior to hauling it to a pollution control plant for treatment.

By the end of 1999 there was a combined storage capacity of 23,400 m^3 in three ponds, the south, east and west ponds. Two 5-HP aerators are installed in the south pond and one 5-HP aerator was installed in each of the west and east ponds. The aerators help control odours while at the same time reducing B.O.D. (Biochemical Oxygen Demand) levels in the leachate.

Leachate generated at the Essex-Windsor Regional Landfill is managed or treated via a number of different leachate treatment technologies. These include hauling leachate off site to an approved sewage treatment facility, re-circulating leachate into existing landfilled waste or land applying leachate to a vegetative ecosystem.

In 2009, the various leachate management systems both on and off the site managed 23,397.70 m^3 of leachate, a decrease of 41% compared with the 39,379.2 m^3 in 2008. The quantities of leachate in 2009 are shown in Table 10.

TABLE 10: Leachate Management Summary

MONTH 2009	TRUCKED OFF SITE	LEACHATE LAND TREATMENT	CELL 1 LAND TREATMENT	CELL 1 BIO-REACTOR	WEST CELL LAND TREATMENT	WEST CELL RE-CIRCULATION	TOTAL (M^3)
January	—	—	—	—	—	338.07	*338.07*
February	—	—	—	—	—	416.07	*416.07*
March	207.83	—	—	—	—	741.78	*949.61*
April	2,871.40	—	—	—	—	205.90	*3,077.30*
May	582.64	455.00	—	—	440.00	0	*1,477.64*
June	6,234.19	612.00	—	—	689.00	0	*7,535.19*
July	336.83	1,578.00	—	—	1,735.00	0	*3,649.83*
August	—	403.00	—	—	581.00	0	*984.00*
September	—	665.00	—	—	656.00	112.70	*1,433.70*
October	—	60.00	—	—	30.00	526.97	*616.97*
November	357.75	—	—	—	—	265.73	*623.48*
December	2,160.68	—	—	—	—	135.16	*2,295.85*
2009 Totals	12,751.32	3,773.00	0.00	0.00	4,131.00	2,742.38	23,397.7
2008 Totals	*29,698.92*	*3,878.00*	*675.20*	*0.00*	*2,518.58*	*2,608.53*	***39,379.2***
2007 Totals	*28,044.46*	*0.00*	*2,780.14*	*1,479.87*	*5,797.00*	*1,411.91*	***39,513.4***

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7.2 Leachate Quality

Leachate is produced primarily from the percolation of incident precipitation into the refuse. See Table 11 on page 30 for 2009 precipitation data. Processes within the refuse degrade the quality of the percolating water, creating the leachate. The chemical characteristics of the leachate can vary within the refuse, depending on various factors, such as refuse composition and age; refuse hydraulic conductivity, leachate residence time, and the leachate flow regime.

Samples of the leachate are collected for analysis from two locations within the leachate collection system as part of the groundwater monitoring program and the environmental monitoring programs for the various leachate land treatment systems. The samples collected from Pump Station 1 (PS1) reflect the leachate being generated by the waste in Cell 1 and Cell 2 of the Regional Landfill while the samples from Pump Station 3 (PS3) reflect the leachate being generated by the waste in the West Cell of the former Essex County Landfill Site No. 1.

Pumping stations PS1 and PS3 were sampled on April 27 and August 18, 2009, for laboratory analyses. Analyses included general chemical parameters, volatile organic compounds (EPA Method 624), and semi-volatile compounds (EPA Method 625). Also, as part of the Leachate Management Program, a sample was collected from PS3 on October 6, 2009, for general chemical parameters.

As a component of the quality assurance/quality control (QA/QC) program, a field-prepared blind duplicate sample was collected for each monitoring event: 1) PS DUP from PS1 was analyzed during April; 2) PS DUP from PS3 was analyzed during August; and 3) PS DUP from PS3 during October. In general, for the sampling events most chemical concentrations for the duplicate samples were similar to the original results, within 20% relative percent difference (RPD). Where concentrations were detected at less than or equal to five times the method reporting limit (MRL), they differed by less than or equal to the MRL. An exception for the April 2009 sampling event included aluminum and an exception for the August 2009 sampling event included chemical oxygen demand (COD). An internal laboratory data quality review indicated that the reported values were accurate as presented.

Internal laboratory measures, including process blanks and percent recoveries of analyses were completed. Tested constituents within the laboratory process blanks were not detected at concentrations greater than the MRL with the exception of bis (2-ethylhexyl) phthalate for the August 2009 sampling event. An internal laboratory DQR indicated that the reported values were accurate as presented. The concentration is less than two times the MRL and does not affect the interpretation of other samples' analytical organic results. The favourable correlation of duplicate results to the original samples, in addition to acceptable internal laboratory results, suggests that the reported chemical results are representative of actual conditions and may be interpreted with confidence.

General chemical results are comparable to the historic findings for the leachate collector systems. The elevated MRL's for select parameters for the leachate from PS1 and PS3 in April, August, and October represent dilution adjustments as a result of matrix interferences. Consistent with historic observations, chemical constituents were generally detected during 2009 at greater concentrations within PS1 than within PS3.

The following organic parameters were detected at concentrations greater than their respective laboratory MRL within the leachate from 1) PS1: 1,4-dichlorobenzene, benzene, ethylbenzene, m/pxylene, o-xylene, styrene, toluene, bis(2-ethylhexyl)phthalate, and vinyl chloride; and 2) from PS3: bis(2-ethylhexyl)phthalate.

In summary, most organic parameters detected within the leachate collector systems during 2009 were historically detected. Chemical concentrations within the two (2)

leachate collector systems vary spatially and temporally. More organic chemicals occur and at greater concentrations within the leachate of Cells 1 and 2 (PS1) relative to the West Cell of former Landfill Site No. 1 (PS3). This chemical pattern is consistent with the observed trend since 1999. Also consistent with historic findings, chemical concentrations continue to fluctuate over the long-term. The leachate chemical characteristics are generally typical of leachate quality in other municipal solid waste landfills in southern Ontario.

7.3 Leachate System Maintenance

Condition 15.2 of the Certificate of Approval A-011101 for the site requires that the leachate collection system be flushed and cleaned at least once every two years. Benko Sewer Systems Ltd. carried out the work in 2008. There were no significant problems detected with the system. The system is scheduled to be flushed and cleaned out again in 2010.

Pump station repairs and preventative maintenance was carried out as required during 2009. This included but was not limited to the following:

- Regular inspection and adjustments of the pumps as required,
- The removal and power washing of pumps,
- The painting and cleaning of electrical panels,
- Replacing damaged pumps with spare pumps as required,
- Adjusting floats as required and trouble shooting electrical problems as required.

7.4 Leachate Springs and Stains

A leachate stain is defined as a discolouration of the soil that extends no more than 1 metre from its source. A leachate spring is defined as an active movement of leachate that extends beyond 1 metre from its source.

For 2009 three springs were identified and repaired. During March 17-19, 2009 a spring was identified in Cell 1, west slope; April 13, 2009 a spring on Cell 2 south and April 14, 2009 a spring on Cell 1 west slope. Repairs consisted of excavating into the refuse at the

spring location to develop an adequate hydraulic connection within the refuse. The areas were then filled in and capped with clean compacted clay soil.

There was one stain identified on November 19, 2009. Surface clay was removed and virgin clay brought in to seal the area.

7.5 Leachate Land Treatment System (LTS)

In 1992 the Ministry of the Environment approved a four-year experimental program for the land treatment of leachate at Landfill Site No. 1. In September of 1995 an amendment to the C of A was received from the Ministry of the Environment lifting the four-year experimental requirement. This allowed for the continuation of the system until such time that the land's ability to treat the leachate has been exhausted or when the land is required for other uses.

The current delivery system network configuration consists of 99 impact sprinklers, which apply leachate across 1.0 ha, and 72 subsurface drip irrigation laterals, which apply leachate to 0.8 ha.

In 2009 the LTS was operated from May 11th to October 28th over 171 days. During this period approximately 3,773 m^3 of leachate was applied. This represents an application rate of 1.2 mm/day. During the application period, precipitation averaged 2.0 mm/day. Therefore, the total calculated irrigation rate to the LTS during the 2009 irrigation season was approximately 3.2 mm/day which is notably less than the allowable 10mm/day.

7.6 West Cell Land Treatment and Recirculation System (LTRS)

Condition 21 of the Certificate of Approval A011101 dated January 12th, 1996 authorizes operation of the West Cell Leachate Land Treatment and Recirculation System (LTRS). The LTRS integrates leachate land treatment technology with leachate recirculation to dispose of leachate and accelerate the rate of landfill stabilization. Recirculation of leachate into the West Cell occurs by way of drip irrigation laterals that distribute leachate through 20 sand-filled trench reservoirs constructed into the waste below the cap. The land treatment delivery network is comprised of twelve distribution laterals supplying leachate to 120 impact sprinklers.

The land treatment component of the LRTS was operated from May 11th to October 28th, 2009 over 171 days. During this period, about 4,131 m^3 of leachate was applied to the

land treatment area which represents an approximate application rate of 1.0 mm/day. As discussed previously, an additional 2.0 mm/day of precipitation fell onto the LTRS. Therefore the total calculated irrigation rate to the LTRS during the 2009 irrigation season was approximately 3.0 mm/day, which is notably less than the allowable 10 mm/day.

7.7 Cell 1 Land Treatment System

Condition 21, which was added to Certificate of Approval A-011101 on January 25th, 2000, authorizes operation of the Cell 1 Leachate Treatment System (C1-LTS). The Cell 1 leachate treatment area was added in 2000. The area is slightly less than a hectare in surface area and was situated on the landfill area designated as Cell 1. The C1-LTS employed the same spray technology as the other leachate and treatment systems located on site. It was comprised of one block containing 8 laterals supplying leachate to a total of 60 impact sprinklers.

The C1-LTS was decommissioned on June 16th, 2008 to recover air space for landfilling. It was therefore not operated during 2009.

7.8 Cell 1 Bio-Reactor

The CA No. A-011101 was amended again on October 31st, 2000 to authorize operation of the Cell 1 Bio-Reactor. This full scale, pilot project was constructed in the southern portion of Cell 1 and commenced operation in March of 2001. The system was a multilevel leachate recirculation network with each level comprised of horizontal infiltration trenches constructed within the refuse to provide equitable leachate distribution for the purpose of enhancing waste biodegradation. A gas management system had also been installed with the leachate delivery network for the purpose of extracting and combusting landfill gas generated from the facility.

The delivery system network configuration consisted of three levels of drip irrigation laterals that distribute leachate through sand filled trench reservoirs constructed into the waste. The spacing between the levels was about 10 meters. Each level was made up of approximately 16 trenches with an average of 2,408 emitters per level.

The Cell 1 Bio-Reactor was not operated during 2009.

7.9 Environmental Monitoring of Leachate Land Treatment Systems

As required by the Ministry of the Environment, a detailed environmental monitoring and data collection program was conducted for the LTS and the LTRS through the 2009 operating period.

The 2009 Monitoring Program was completed in accordance with the recommendation detailed in the 2006 Annual Report completed by Cuthill Scientific as received by the Landfill Liaison Committee. Technical information is maintained on file.

Genivar Consultants LP Consultants LP attended the Landfill on several dates during the year to collect soil, groundwater and vegetation samples as required. A preliminary review of the data indicates that the findings were generally consistent with historical data. Based on the findings presented in Genivar Consultants LP's 2009 Annual Report, Regional Landfill Leachate Management Program, dated February 2010, the following conclusions and recommendations are noted:

Detailed groundwater level and quality monitoring was completed around the landfill site perimeter, including areas downgradient of the on-site leachate treatment areas. Findings are presented in the 2009 Annual Monitoring Program Summary for the Regional Landfill Site. In summary, groundwater quality showed no detectable effects from the operation of the leachate land treatment areas.

The following conclusions are based on the results of the 2009 Monitoring Program for the LMP at the Regional Landfill Site.

- During 2009, 2,742.39 m^3 of leachate was recirculated within the waste of the West Cell. In addition, almost 7,904 m^3 of leachate was disposed on the land application areas for the Land Treatment System (LTS) located south of the West Cell and the West Cell (LTRS).

- Leachate levels within the waste were not affected by leachate recirculation or land application. Therefore, operation of the land treatment areas does not generate additional leachate.

- Operation of the Leachate Management Program (LMP) in 2009 did not affect groundwater quality at the landfill site property boundary.

- Surface water quality was also not affected by operation of the LMP in 2009.

- Soil chemical results continued to show variable heavy metal concentrations with depth. One exception in 2009 was within the LTS south of the West Cell where heavy metal concentrations may naturally be greater with depth as a result of soil weathering. Shallow (0.15m in depth) soil quality typically showed the greatest effect from chloride, boron, and SAR, but concentrations generally decreased with depth based on test results at 0.6 m, 0.9 m, and 1.25 m below grade.

- Soil quality within the LTS south of the West Cell varied between 2008 and 2009, with no consistent increase in heavy metal concentrations in the shallow soil (0.15 m depth) that could be attributed to the leachate application in 2009. However, quality at greater depths (0.60 m and 1.25 m) generally showed an increase in heavy metal concentrations from 2008 and 2009.

- Soil quality typically satisfied the target guidelines established to maintain a suitable growing media. Therefore, leachate land application should continue in 2010.

- Within the soil of the LTS and LTRS, chloride concentrations typically decreased from 2008 to 2009, for each depth tested.

- Vegetation monitoring indicated that metal concentrations in vegetation in the spray and subsurface trickle area decreased slightly compared to the 2008 concentrations, with a few exceptions. No detrimental effect to vegetation as a result of leachate application was identified in 2009.

- No notable canary grass was apparent in areas sampled within the LTS or the Environmental Area.
- Combustible gas continued to be generated from the waste within the West Cell.

It is recommended that the LMP continue to be operated in 2010 and that the 2010 Monitoring Program be implemented with the recommended improvements listed in Section 4.0 of Genivar Consultants LP's report. In addition, regular maintenance of the land application areas of the LMP is recommended, and should include the following.

- Regular cutting of the grasses.
- Enhancement of the reed canary grass should be completed.
- A program to complete the removal of invasive species should be undertaken.
- The monitor seals, well screens, integrity, and well casing for each gas monitoring well included in the LMP monitoring program should be assessed in 2010.

8. MONITORING PROGRAMS

The Certificate of Approval requires that a number of additional monitoring programs be carried out at the Essex-Windsor Regional Landfill. These include monitoring of the ground and surface water, precipitation, gas and woodlot monitoring. In September of 2003 Provisional Certificate of Approval A011101 was amended to reflect the recommended monitoring changes submitted by Jagger Hims Limited (now Genivar Consultants LP), for the Essex-Windsor Regional Landfill in their annual monitoring reports dated 1999, 2000, 2001 and 2002.

The most significant changes were that Condition 18.1 (Monthly Operations Reports) was amended from monthly to annual submissions and further, Condition 18.2 (Annual Monitoring Reports) was amended from annual to biennial submissions. This meant that

only an Annual Operations Report and Biennial Monitoring Report would now be required.

Each of the programs carried out in 2009 is described in more detail in the following sections.

8.1 Surface Water Monitoring

The 2009 surface water sampling programs consisted of the following:

- Collection of samples from five surface water monitoring locations was taken following a 'precipitation' event. A precipitation event is when 30mm or more of precipitation is received within a continuous 24 hour period.
- Collection of sediment sampling from five surface water monitoring locations once per year.
- Monthly monitoring of surface water quality within the West Stormwater Monitoring Pond.

Surface water quality was monitored within the West Stormwater Management Pond on a monthly basis during 2009 by Genivar Consultants LP on January 6, February 3, March 17, April 27, May 13, June 3, July 8, August 18, September 16, October 1, November 5, and December 14. No field chemistry data (temperature, pH, conductivity, and turbidity) were collected during January, February, and December 2009 when the pond was frozen.

Precipitation, in the form of rain and snow, is monitored at the landfill by the Authority. Monitoring of precipitation commenced in January 1991. The precipitation summary indicates that the total annual precipitation at the landfill in 2009 is within the historic range since 1991.

The first precipitation event exceeding the 30 mm criteria occurred on February 11, 2009 (51.6 mm). Surface water samples were collected on February 12, 2009, at each of the required monitoring stations SW2, SW3, SW8, SW9, and SW12. The second precipitation event exceeding the 30 mm criteria occurred on June 19, 2009 (42.5 mm), and samples were collected from SW2, SW3, and SW12, whereas stations SW8 and SW9

were dry. Despite a precipitation event exceeding the 30 mm criteria on August 28, 2009, the required surface water monitoring stations were observed to exhibit no flow conditions or were dry during monitoring. Therefore, no precipitation event surface water samples were collected for the third quarter. No precipitation events greater than 30 mm within 24 hours occurred during the fourth quarter of 2009.

Within the surface water total ammonia (SW2 and SW12) and phenols (SW12) were detected at elevated concentrations during the February 11, 2009 precipitation event. The phenols concentration within the surface water at SW12 (0.003 mg/L) exceeded the PWQO for phenols of 0.001 mg/L. To confirm the elevated concentrations, the laboratory was requested to review its internal quality control information. On March 6, 2009, the laboratory indicated that the presented concentrations for total ammonia and phenols in the February 25, 2009, report of analysis were accurate as presented according to the laboratory's data quality review process.

On March 9, 2009, the Authority was notified of the phenols and total ammonia concentrations detected within the surface water at SW12. The Authority closed the discharge pipe for the West Stormwater Management Pond (SW12) to prevent off-site discharge. Genivar Consultants LP was instructed to sample the surface water within the West Stormwater Management Pond exiting the site (SW12), as well as downstream of the site (SW2) in the County Road 18 ditch. The discharge pipe for the Stormwater Management Pond was temporarily opened to complete the sampling.

The laboratory results from the March 9, 2009, verification monitoring event indicated that the select parameters of concern from the February 12, 2009, monitoring event continued to be detected or exceeded the PWQO, where relevant.

A supplemental sample for the Storm Water Management Pond was collected on March 17, 2009, by the Authority and tested in the laboratory for the primary parameter of concern, phenols. The March 17, 2009 laboratory results for phenols were of acceptable quality for off-site discharge. As a precautionary measure, a verification sample was collected on March 23, 2009 by the Authority to confirm the acceptable phenols concentration detected on March 17, 2009. The March 23, 2009 phenols concentration was also acceptable. Therefore, on March 27, 2009 the discharge valve for the West

Stormwater Management Pond was re-opened as a result of the favourable verification laboratory results.

Reported chloride concentrations, the primary leachate indicator parameter, at each surface water monitoring station for each of the monitoring events were within historic ranges and were less than the Predictive Monitoring Program Control Limits for both flow routes. Furthermore, on February 12, 2009, the concentration of chloride in surface water discharging from the West Stormwater Management Pond (SW12) was less than at upstream station SW9 located within the County Road 18 ditch. Therefore, a landfill leachate effect on surface water quality was not apparent for the February 12, 2009 sampling event.

Potential sources of the temporary elevated phenols concentrations detected include road trafficking from site operations, natural effects from freeze/thaw (ice cover/melt effects of the pond, as well as precipitation volume/intensity patterns. As a precautionary measure, the Authority has modified its operations to limit road traffic from the waste footprint to minimize the potential of phenols effects in the surface water as a result of operation practices.

It is noted that as a due diligence measure the Authority completed sampling of the discharge from the Stormwater Management Pond during April 2009. For the parameters of concern noted above, concentrations were within historic ranges and were less than the Monitoring Program Control Limits.

During the second quarter, detected parameter concentrations within the surface water were consistent with historical results and did not exceed the Predictive Monitoring Program Control Limits, except for select metals along both flow routes. Reported chloride concentrations, the primary leachate indicator parameter, were within historic ranges and were less than the Predictive Monitoring Program Control Limits for both flow routes. The data indicate that sediment loading (turbidity) related to soil erosion from overland flow continued to occur and affected surface water quality at each monitoring station.

In summary, a landfill leachate effect on surface water quality was not identified during 2009. The Authority should continue to implement operational modification(s) to

minimize road traffic from the waste footprint on internal roads. Continued monitoring was recommended.

8.2 Sediment Sampling

Sediment samples were collected from within the sediment traps at monitoring locations SW2, SW3, SW8, SW9, and SW12 on April 27, 2009. Part of the sediment QA/QC program involves the collection of a field-prepared duplicate sample, which was obtained from SW3 (SED DUP).

The Sediment Standards were typically exceeded for copper and nickel at the upstream and downstream monitoring stations. Occasional exceedances also occurred for cadmium, chromium, iron and zinc at upstream and downstream stations. Parameter concentrations typically increased in a downstream direction. No concentrations were detected greater than the Sever Effect Level (SEL). The Natural Background Limits (NBL's) are exceeded for some parameters at the downstream and upstream monitoring stations.

The 2009 sediment chemical results are generally consistent with historic results. Most concentrations of indicator parameters satisfy the Predictive Sediments Monitoring Program Standards as presented in the 2007/2008 Biennial Monitoring Program Report, except for copper at SW12; the exceedance was consistent with historic concentrations.

8.3 Ground Water Monitoring

All routine ground water monitoring in 2009 was carried out by Genivar Consultants LP.

The 2009 ground water monitoring program consisted of the following:

- Measurement of ground water levels at 85 monitoring locations.
- Collection of samples twice per year from 25 ground water monitors in the Shallow Ground Water System and 5 ground water monitors in the Upper Sand Ground Water System.
- Annual ground water monitoring from 21 monitors in the Middle Aquitard, 10 in the Lower Sand Ground Water System, 3 in the lower Aquitard, 24 from the Upper Aquitard and 8 from the Bedrock Aquifer.

Groundwater sampling in 2009 was completed at the required monitoring wells between April 21st and April 27th, 2009 for the spring monitoring event and between October 5th and October 7th for the fall monitoring event.

The 2009 groundwater chemical results were generally consistent with historic results. Most concentration of indicator parameters satisfied the Predictive Groundwater Monitoring Program Standards as presented in the 2007/2008 Biennial Monitoring Program Report except for some select parameters. These predictive standard exceedances were typically consistent with the historic concentrations and occurred in both upgradient and downgradient monitors. In summary, a landfill leachate effect on groundwater quality was not detected.

8.4 Weather Monitoring

A complete weather station is located at the Regional Landfill. It collects wind speed and direction, temperature and precipitation measurements. The wind information is used to direct litter control operations and to assist in investigating odour complaints.

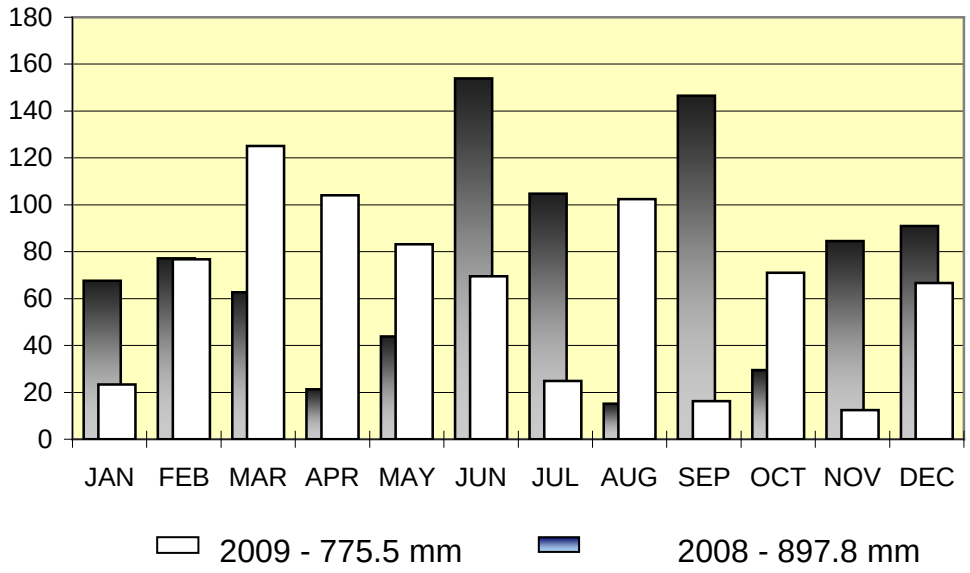
The information obtained through precipitation measuring is used to facilitate the surface water sampling program carried out at the site, and to calculate the appropriate application rate for the leachate land application/recirculation systems.

The total amount of precipitation received at the Landfill in 2009 was 775.5 mm. This is a 15.5% decrease compared to the 897.8 mm received in 2008. The monthly precipitation rates are shown in Table 11 and Figure 1.

TABLE 11: Precipitation 2009

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
23.3	76.8	125.1	104.1	83.2	69.5	24.8	102.4	16.3	71.0	12.4	66.6	775.5 mm

FIGURE 1: Precipitation Monitoring 2009/2008 Comparison



8.5 Leachate Level Monitoring

Monthly leachate level monitoring was conducted throughout the year on all maintenance holes and the pump stations on the perimeter leachate collector system and all refuse monitors. The leachate collector system is typically operated with either off-site leachate haulage or on-site land treatment/recirculation to maintain gravity drainage of the collector system. Leachate elevations within the perimeter collector system are typically maintained below the surrounding shallow groundwater elevations to maintain groundwater movement toward the Landfill.

8.6 Gas Monitoring

Gas monitoring for total ionizable and combustible vapours from select leachate and groundwater monitoring wells was completed by Genivar Consultants LP on January 6, February 3, April 27, October 6, November 5, and December 14, 2009.

Combustible gas was detected within the waste at Monitor 36-I at 42% of the lower explosive limit (LEL) during the January event, at 73% of the LEL during the February event, at 0.1% of the LEL during the April event, and at 37% of the LEL during the December event. These values represent a potential health and safety concern in proximity to Monitor 36-I. Ionizable organic vapours were not detected during 2009.

Despite the reduction in combustible gas concentrations that is expected from atmospheric venting and dispersion, access to the waste footprint (closed or open) should be restricted to adequately-trained site personnel. Concentrations adjacent to the waste footprint do not present an immediate health and safety concern to on-site structures.

8.7 Other Monitoring Programs

Water level monitoring is carried out on all leachate monitors on-site and all ground water monitors both on-site and off-site, on a quarterly basis. The measurements are taken in conjunction with the leachate level monitoring program to aid in the interpretation of the regional groundwater flow relative to fluctuations in the hydraulic head.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based on the results of the 2009 Monitoring Programs conducted by Genivar Consultants LP for groundwater, sediment sampling and surface water.

- The 2009 monitoring program was completed as approved. Liquid levels and chemical results are acceptable for inclusion into the historic database and may be interpreted in detail as part of the 2009/2010 Biennial Monitoring Report.

- Generally, groundwater elevations during 2009 are consistent with the historic database. Consistent with past findings, the local shallow flow system slopes in a southerly to southwesterly direction. This pattern is modified in the vicinity of the leachate collector systems, leachate mounds within the waste cells; waste underdrains the main portion of Cell1 and all of Cell 2, perimeter soil berms, land treatment areas, and soil excavations across the landfill property.

- Three leachate springs and one leachate stain were detected and remediated in 2009. No surface water quality effects were detected.

- The leachate chemical characteristics are generally typical of leachate quality within other municipal solid waste landfills in southern Ontario. Most organic parameters detected within the leachate collector system during 2009 were historically detected.

- Groundwater chemical results during 2009 are generally consistent with historic results and continue to document naturally poor groundwater quality. Chemical concentrations generally comply with Guideline B-7 criteria, with exceedances located both upgradient and downgradient of the existing waste. Organics were not detected in groundwater samples at the locations tested during 2009. In summary, a landfill leachate effect on groundwater quality was not detected.

- Within the shallow flow system, chloride concentrations at Monitor 59-II increased into 2009. The chloride concentrations at Monitor 59-II should be assessed in detail during the next regularly scheduled groundwater monitoring event in April 2010. If chloride concentrations continue to remain elevated or increase, it is recommended the clayey soil backfill over the collector system for the West Cell to the south of Monitor 59-III be visually assessed for staining indicative of leachate. Also the clear drainage stone around the above collector pipe should be assessed for sufficient thickness and clogging.

- The chloride concentrations at Monitor 41-I should be assessed in detail during the next regularly scheduled event in April 2010.

- The surface water parameter concentrations from the precipitation events during 2009 were consistent with historic results and do not exceed the Predictive Monitoring Program Control Limits, except for select metals along both flow routes, as well as the total ammonia and phenols concentration detected at the outlet of the West Stormwater Management Pond (SW12) in January 2009. As discussed in detail in Section 5.0 of the Monitoring Report, upon notification of the pond water quality, the Authority closed the sluice gate thereby stopping discharge. After assessing that the elevated total ammonia and phenols concentrations were not landfill leachate related and confirmation of acceptable water quality on March 17 and 23, 2009, the sluice gate was reopened permitting the pond to discharge. No

landfill leachate effects were apparent for surface water quality during 2009.

- The Sediment Standards were occasionally exceeded for select parameters at the upstream and downstream monitoring stations. Parameter concentrations typically increased in a downstream direction. No concentrations were detected greater than the Severe Effect Level (SEL). A landfill leachate effect on the sediment quality was not detected.

- Combustible gas was detected within leachate Monitor 36-I at concentrations that represent a potential health and safety concern. Access to the waste footprint (closed and open) should be restricted to adequately-trained site personnel. Concentrations adjacent to the waste footprint do not present an immediate health and safety concern to on-site structures.

Annual Operations Reports and Biennial Monitoring Reports will continue to assess the potential for effects of landfill operations on the surrounding groundwater and surface water resources, characterize leachate quality, and evaluate the need to implement remedial measures.

8.8 Woodlot Monitoring

Condition 16.2 of the Certificate of Approval requires that a woodlot monitoring program be implemented for the on site Central and Eastern Woodlots. The monitoring program was to be carried out for a minimum of three years, at which time the program was to be evaluated and modified accordingly. To this end, Mr. Gerry Waldron, M.Sc., Consulting Ecologist, was awarded a three year contract to carry out the necessary work.

The purpose of the woodlot monitoring program was to establish several permanent sample plots and develop a database over a three year period in order to monitor the long term health of the onsite woodlots.

Over the past 12 years, detailed monitoring of the Central and Eastern woodlots for the Regional Landfill has been carried out a total of eight seasons. The studies completed during September 1996 through September 1998, established benchmark conditions prior

to any landfill activities being carried out in the vicinity of the Central woodlot. For 1999 through 2002, detailed monitoring was discontinued since the woodlots had remained virtually unchanged over the previous three monitoring seasons. Provided no significant changes were made to the surrounding water table, surface or internal drainage, previous monitoring indicated that the woodlots would continue to prosper.

In 2002, the northern portions of Cells 2 and 3 were developed as a waste cell and borrow pit respectively. As the excavation of these cells had the potential of affecting the drainage pattern for the Central woodlot, the woodlot monitoring program was re-established in 2003 and ended in October 2007. These subsequent monitoring reports concluded that with the exception of tree mortality due to Dutch Elm Disease and the Emerald Ash Borer, the health of the woodlots continued to remain virtually unchanged.

Based on these observations, the Consulting Ecologist, noted that as of September 2007, the landfill operations have not impacted the health of the two woodlots over the past 12 years and further, there was no reason to believe that the development of the landfill would have any adverse impacts on the woodlots as long as landfilling activities were confined to the waste footprint and not the buffer zones located south and west of these woodlots. Mr. Waldron went on to conclude that provided the buffer lands remain undisturbed, there was no need to carry out any additional monitoring of the Central and Eastern woodlots of the Regional Landfill.

In November 2008, the Landfill Liaison Committee approved a staff recommendation that the formal woodlot monitoring program for the Essex-Windsor Regional Landfill be concluded and further, that the woodlots be visually examined on an annual basis and if unjustifiable stress and decline of the woodlot trees is observed, then the monitoring program be reestablished.

A visual inspection was completed on September 8th, 2009 and aside from the ongoing tree mortality attributed to Dutch Elm Disease and the Emerald Ash Borer, the woodlots appear to be thriving.

8.9 Aquatic Biology Monitoring

Condition 16.4 of the Certificate of Approval, requires that an Aquatic Biology Monitoring program be implemented for the on-site storm water management pond. The

original intention of the monitoring program was to establish representative background conditions prior to the discharge of treated leachate and to monitor any impact from the operation of a leachate treatment facility following its establishment. To date, seven years of background conditions have been documented.

In February 2004, the Landfill Liaison Committee approved the staff recommendation that the monitoring program be discontinued until either an onsite leachate treatment facility is constructed and discharges treated leachate to the stormwater management pond or the monthly pond chemistry results indicate the pond is being adversely affected as a result of landfill operations.

Ralph C. Reiser,
MANAGER, WASTE DISPOSAL

Eli Maodus
ACTING GENERAL MANAGER

Report prepared by: **Margaret Shires,** Administrative Assistant

APPENDIX ➲ A

2009 Annual Report
Regional Landfill Leachate Management Program

Genivar Consultants LP

(Under Separate Cover)

APPENDIX ➲ B

Essex-Windsor Regional Landfill Site
2009 Annual Monitoring Program Summary

Genivar Consultants LP

(under separate cover)

APPENDIX ➲ C

Essex-Windsor Regional Landfill
Site Plan

(modified to fit report page size)