

**2006**  
**GLENMORE LANDFILL ANNUAL**  
**REPORT**

Operational Certificate MR 12218  
EMS reference # E104956



June, 2007

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## EXECUTIVE SUMMARY

The purpose of this annual report is to provide information relevant to **Operational Certificate MR 12218** for the Glenmore Landfill for the year 2006. Under the provisions of the Waste Management Act and in accordance with the approved *Regional District of Central Okanagan Solid Waste Management Plan*, the City of Kelowna is authorized to manage recyclable materials and to discharge refuse to the ground at the Glenmore Landfill, located at 2105 Glenmore Road, in the City of Kelowna.

The City of Kelowna's *Comprehensive Site Development Plan* (CSDP) was used as guidance for the development and operation of the Glenmore Landfill. Section 8 of the CSDP is the basis of the operating plan and Section 9 forms the closure plan. Based on the projected waste volumes and filling plan, the landfill is expected to be operational until the year 2048. There has been no anticipated change to this estimation due to operations on site during 2006.

The population contributing to the municipal solid waste stream handled at the Glenmore Landfill in 2006 was 127,733. This population produced 116,218 tonnes of refuse that was landfilled generating a waste discharge rate of 0.91 tonnes per capita.

31,844 tonnes of waste organic materials were diverted from the waste stream at the Glenmore Landfill in 2006. This represents a 70% increase in diversion of yard waste, prunings and clean construction woodwaste over actual 2005 figures. These organic wastes were composted onsite and sold as a soil conditioner known as *Glenmore Grow*.

The gypsum ban was continued through 2006 resulting in 1368 tonnes of this product being diverted from disposal at the Glenmore Landfill. This figure represents a 133% increase over the 585 tonnes diverted in 2005.

The Central Okanagan Regional District reports that in 2006, 364.32 tonnes of recyclables were removed by contract from the drop-off depot located at the Glenmore Landfill. This number does not include the glass cullet recycled and stock-piled on site to use as a pilot for drainage medium around gas collection wells and piping.

The filling plan for 2007 will take place in a general east to west direction. Landfilling will be in the Phase 2 area until the spring of 2007 and then be moved to the Phase 1 area in April where filling will start on the former access road #1.

# MR12218 Annual Report Statistics, Data and Information

## 1. STATISTICS

**a. Landfill Location**

2105 Glenmore Road N  
Kelowna, BC V1V 2C5

**b. Discharge Quantity (tonnes):**

<u>Year</u>	<u>Amount Discharged</u>
2004	106,483 tonnes
2005	108,597 tonnes
2006	116,218 tonnes

**c. Service Population (1000s):**

<u>Year</u>	<u>Population (1000s)</u>
2004	118
2005	121
2006	128

**d. Waste Discharge Rate (tonne/capita):**

<u>Year</u>	<u>Waste Discharge Rate (tonne/capita)</u>
2004	0.90
2005	0.90
2006	0.91

**e. Authorized design volume:**

See section 2 of the Comprehensive Site Development Plan (CSDP). The CSDP can be viewed at [www.kelowna.ca](http://www.kelowna.ca) and use the following path Residents → Waste Management → Glenmore Landfill → Comprehensive Site Development Plan.

**f. Remaining Site Life and Capacity:**

See section 2, CSDP. Based on the anticipated waste generation volumes and the proposed filling plan, the landfill is expected to be operational until approximately 2048.

**g. Operation and Maintenance Expenditures**

	<u>2006</u>
Landfill Management	\$1,332,922
Waste Reduction (includes yard waste)	\$1,538,354
Scale	\$ 148,582
Landfill Gas Management	\$ 87,793
Leachate Operation	\$ 44,601
Utilities	\$ 34,320
Water Quality Testing	\$ 68,906
Other	\$ 31,420

## 2. OPERATIONAL PLAN FOR NEXT 12 MONTHS (Section 8, CSDP)

### a. Operational and Filling Plan

The landfilling will take place in a general north to south direction. Figure 8-1 of the CSDP shows the area of operations in 2005. Landfilling will be in the Phase 1 area until the spring of 2006 and then be moved to the Phase 2 area in April, 2006. Filling in the Phase 2 area will start in the south west corner as shown on the attached site plan (see *Appendix 1: Site Plan*). In February 2006, landfill gas collectors C-8, C-9 and C-10 were installed. In addition, 18 vertical gas wells were installed along these collectors.

Filling operations will proceed on the Phase 2 area to an interim elevation of 448.0 meters. The total tonnage of refuse expected is 110,800 tonnes and the total volume of airspace utilized will be 193,400 cubic meters. A small amount of refuse excavated from the Phase 2 landfill gas collection system was placed in the South West corner of phase 2 during January/February 2006. This refuse will not be added to the annual tonnage.

### b. Landfilling Method

The area method will be used to place and compact refuse in cells of approximately 6300 cubic meters. A 0.3 meter intermediate soil cover will be applied daily on the lift and alternate daily cover will be applied on the working face. Wastes will be spread in thin layers (0.6 meters or less) and compacted. Compaction will be achieved using a 836H Caterpillar landfill compactor.

### c. Glenmore Grow

The production of Glenmore Grow compost will continue on top of the intermediate cover applied in Phase 1 and temporarily in the area between Bredin Hill and Quail Ridge as shown on the attached site plan.

### d. Controls

- *Litter* will be controlled by compaction of the waste and minimizing the working face. Fencing for litter control will be placed around the fill area.
- *Dust control* will continue by applying water and seeding of exposed areas.
- *Vector control* will continue by using a combination of distress calls, eagle eyes and daily cover.
- *Mud and dust control* for internal roads will be accomplished through the construction and maintenance of all-weather access roads to the working face. Crushed shale will be used as a pad at the tipping area.

### e. Heavy Equipment Utilized for Landfill Operations

- Caterpillar 836H Landfill Compactor
- CMI 375-E Trashmaster
- Volvo L120 E Front End Loader
- John Deere 850-C Dozer
- Komatsu 200 Excavator
- 3100 International Roll-off bin truck

**f. Landfill Personnel**

- 6 Equipment Operators
- 5 Landfill Attendants
- 3 Landfill Technicians
- 1 full time and 2 part time Scale Operators
- 1 Supervisor.

### 3. DATA AND INFORMATION

**a. Waste Reduction Accomplishments**

- ***Material Diverted From Landfill***

<u>Year</u>	<u>Material Diverted</u>
2004	17,040 tonnes
2005	19,153 tonnes
2006	31,884 tonnes

Most of the material was organics such as yard waste, prunings and clean construction woodwaste. These organic wastes are composted onsite and sold as soil conditioner known as Glenmore Grow

- ***Recycled Drywall***

A ban on gypsum in 2005 resulted in a 650% increase in the amount of drywall recycled over 2004 amounts for a total of 585 tonnes in 2005. 1368 tonnes of gypsum recycled in 2006 amounted to a further 133% increase over 2005 figures.

**b. Leachate Discharged to Waste Water Treatment Facility (WWTF)**

<u>Year</u>	<u>Quantity Discharged</u>
2004	14,533 m <sup>3</sup>
2005	12,926 m <sup>3</sup>
2006	11,848m <sup>3</sup>

Appendix 2 details the quality (including nutrient, metals and VOC's) of the leachate sent to the Waste Water Treatment facility.

**c. Leachate Recirculation Program**

The consulting team of CH2M Hill is currently completing the Leachate Recirculation Feasibility study to determine the risks and possibility of using the existing landfill gas collectors to circulate leachate.

**d. Groundwater**

- ***Monitoring Wells Water Quality and Quality Control***

Appendix 3 (Groundwater Monitoring Wells Dissolved Metals) and Appendix 4 (VOC (EPA 624) Well Assessments) provides details of the water quality of the various wells as well as quality control information. Additional QC information from outside labs is available upon request.

- ***New Monitoring Wells***

No new monitoring wells were installed in 2006.

- **Groundwater Elevations**

Groundwater well elevations are recorded a minimum bimonthly and detailed well elevations are kept on file at the Glenmore Landfill and are available for viewing. The well elevations change in response to a number of factors including:

- Drought conditions
- Pumping leachate to the Waste Water Treatment Facility
- Landfill compaction

**e. Hydrogeological Review**

The *Water Quality and Hydrological Review* of the Landfill (completed by CH2M Hill, November 2004) reviewed existing information and data to develop an understanding of the hydrogeological setting across the site and develop recommendations on the monitoring program.

The main conclusions of the review found that groundwater flows from the northeast to the southwest across the landfill. A water quality assessment indicated that there is a slight risk for impacted groundwater beneath the landfill and that a detailed monitoring program can provide necessary information to set up the long term monitoring program.

There is preload material in place at the northeast corner of the landfill where a dam and surface water management pond will be constructed. Settlement monitoring of that material continued throughout 2005 and 2006. Dam construction is anticipated in 2008.

**f. Landfill Gas Review**

Horizontal landfill gas collectors were installed in accordance with Phase 1 Landfill Gas Management System Technical Specifications as prepared by consulting engineers CH2MHill. Gas utilization has resulted in the form of a 30 kilowatt Micro Turbine power generating station that is tied into the main manifold of the gas collection system. The Microturbine enclosure was upgraded to include a total of three units with one being a spare. The Microturbine's ran for 2509 hrs for 2006 and consumed 1881700 scf of Landfill gas. Power production was restricted due to upgrades to main power lines by Fortis during the late summer and fall. Our large capacity blower flare station has consumed 20593470 scf of landfill gas for 2006. Consumption total for 2006 was 22475170 scf of Landfill gas, or 227.553 tonnes CH<sub>4</sub>, or 4778.599 CO<sub>2</sub> e. (CO<sub>2</sub> is defined as a greenhouse gas damaging to the environment. CH<sub>4</sub> is 21 times as damaging as the equivalent amount of CO<sub>2</sub>. The damaging effects of greenhouse gases are compared with the effects of CO<sub>2</sub> and reported in CO<sub>2</sub> equivalents {e}). Perimeter testing and now grid testing are included in site analysis.

**g. Vegetation analysis**

Observations of vegetation at the landfill perimeter were conducted monthly. There were no visible indications of adverse effects on plants due to leachate or landfill gas migrating to the root zones.

**Financial Security**

Section 11 and table 11.2 of CSDP details costs. The City of Kelowna bases its financial systems upon 10 year capital plans, revenue generation and on a 20 year Official Community Plan (growth).

As in years previous our excess revenues were deposited into a reserve fund that will be used to develop leachate, landfill gas, and water management systems as well as cover the cost of landfill closure and post closure.

**4. LIST OF APPENDICIES**

1. Growth Statistics (attached excel file)

## **APPENDIX 1**

### **GROWTH STATISTICS**

# LANDFILL GROWTH GRAPH

