
2010 ANNUAL REPORT
CEDAR HILLS REGIONAL LANDFILL

JUNE 2011



King County

Department of Natural Resources and Parks
Solid Waste Division

2010 ANNUAL REPORT CEDAR HILLS REGIONAL LANDFILL

JUNE 2011

Thanks to following staff members for their contributions

Laura Belt
Craig Hislop
Tom Karston
Mike McEwen
Marilyn Monk
Tom Theno
Pam Badger

Prepared by:

Engineering Services Section
Solid Waste Division

June 1, 2011

**2010 ANNUAL REPORT
CEDAR HILLS REGIONAL LANDFILL
DISTRIBUTION LIST**

No. of Copies	Sent to
2	Bill Lasby, Supervisor Solid Waste, Rodent, and Zoonotic Disease Program Environmental Health Services Division Public Health – Seattle & King County 401 Fifth Avenue - Suite 1100 Seattle, WA 98104-1818
2	Madeline Wall, P.E. Environmental Engineer WA State Dept of Ecology Northwest Regional Office 3190 - 160th Avenue SE Bellevue, WA 98008-5452
1	Claude Williams, P.E., Engineer II Puget Sound Clean Air Agency 1904 Third Avenue – Suite 105 Seattle, WA 98101
1	Kevin Kiernan, P.E. Division Director King County Solid Waste Division 201 So. Jackson St., Suite 701 Seattle, WA 98104-3855
1	Dean Voelker Operations Manager King County Solid Waste Division 16645 – 228 th Avenue SE Maple Valley, WA 98038
1	Victor O. Okereke, Ph.D., P.E., DEE Engineering Services Manager King County Solid Waste Division 201 So. Jackson St., Suite 701 Seattle, WA 98104-3855
1	Zahid Khan, P. E. Managing Engineer King County Solid Waste Division 201 So. Jackson St., Suite 701 Seattle, WA 98104-3855
1	Laura Belt, P.E. Engineer III King County Solid Waste Division 201 So. Jackson St., Suite 701 Seattle, WA 98104-3855

TOTAL – 10

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SECTION 1 - OVERVIEW

The King County Solid Waste Division (KCSWD) owns and operates the Cedar Hills Regional Landfill (CHRLF) in eastern King County for the disposal of municipal solid waste generated in the County, exclusive of the cities of Seattle and Milton. It is a 940-acre site located at 16645 228th Avenue Southeast, off Cedar Grove Road, three miles north of Maple Valley, six miles east of the City of Renton and about four miles south of the City of Issaquah. In addition to the landfill, the site contains the closed Cedar Hills Alcohol Treatment Center, which is being redeveloped as a transitional housing facility (Passage Point); a landfill gas-to energy facility owned and operated by Bio Energy (Washington) LLC; a right-of-way for a natural gas pipeline and numerous power transmission line rights-of-way.

The Final Environmental Impact Statement and 2010 Development Plan was issued for the landfill in July 2010. The adopted Plan includes the development of an additional refuse area. The previous 1998 Plan included the development of new refuse areas through Area 7. The Department of Public Health – Seattle & King County (DPHSC) issued a conditional approval in May 2010 to begin filling Area 7 and the area began receiving waste in June 2010. Although filling operations were stopped in Area 6 in August 2010, operations are intended to resume in this refuse area in the future. Area 7 has opened and is receiving waste as of June 17, 2010.

This report includes a compilation of activity summaries and system evaluations associated with the following:

- Landfill capacity;
- Financial assurance cost estimates for closure and post-closure;
- Changes to landfill operations, and
- Environmental monitoring program, including a summary of groundwater, surface water, leachate and landfill gas monitoring results and exceedances.

This annual report is submitted pursuant to the provisions of the Washington State Criteria for Municipal Solid Waste Landfills, Operating Criteria - Annual Reports (WAC 173-351-200(11)) and the Cedar Hills Regional Landfill Operating Permit, Section XII - Reporting Requirements, Part B - Annual Report and Permit Renewal Application. The Washington Department of Ecology (WDOE) form required for submittal of this report is included in this section.

The 2011 Application for Municipal Landfill Permit Renewal form was completed and transmitted to the Washington Department of Ecology and the Department of Public Health - Seattle and King County in January 2011. This document is included in Attachment C.

SECTION 2 - FACILITY INFORMATION

Facility information can be found in the attached tonnage Annual Report.



ANNUAL REPORT MUNICIPAL SOLID WASTE LANDFILL

FACILITY NAME: Cedar Hills Regional Landfill	CALENDAR YEAR OF REPORT: 2010	PERMIT NUMBER: PR0015736	FACILITY ID: FA0012050
FACILITY LOCATION (street address): 16645 228 th Ave. SE Maple Valley, WA	COUNTY: King		
FACILITY CONTACT (name): Kevin Kiernan, Division Director, Solid Waste Division	FACILITY PHONE: 206-296-4490		
FACILITY CONTACT MAILING ADDRESS (if different): 201 S. Jackson St, Suite 701 Seattle, WA 98104-3855	FACILITY CONTACT PHONE (if different): 206-296-4385	FACILITY CONTACT EMAIL: Kevin.kiernan@kingcounty.gov	
Did you operate in <u>2010</u> ? <input checked="" type="checkbox"/> Yes <i>If yes, proceed to next section and complete the form.</i> <input type="checkbox"/> No <i>If no, answer the following questions, sign and date the last page, and submit. This completes your reporting obligations.</i> When did you stop operations? _____ Do you plan to restart? <input type="checkbox"/> No <input type="checkbox"/> Yes When? _____			
AMOUNTS AND TYPES OF WASTE DISPOSED PER YEAR			
PLEASE CHECK IF DISPOSED	AMOUNT DISPOSED		
	Please check: <input type="checkbox"/> Cubic Yards or <input checked="" type="checkbox"/> Tons		
<input checked="" type="checkbox"/> Municipal/Commercial Solid Waste	826,700		
<input type="checkbox"/> Construction/Demolition Waste			
<input type="checkbox"/> Yard Waste (disposed)			
<input type="checkbox"/> Food Processing Waste (disposed)			
<input type="checkbox"/> Landclearing Debris			
<input checked="" type="checkbox"/> Industrial Waste	224		
<input type="checkbox"/> Inert Waste			
<input type="checkbox"/> Wood Waste			
<input type="checkbox"/> Ash (other than special incinerator ash)			
<input type="checkbox"/> Dredged Materials			
<input type="checkbox"/> Sewage Sludge			
<input checked="" type="checkbox"/> Asbestos			
<input checked="" type="checkbox"/> Petroleum Contaminated Soils	6		
<input checked="" type="checkbox"/> Other Contaminated Soils - includes dry vector waste (street sweepings)	124		
<input type="checkbox"/> Tires (disposed)			
<input checked="" type="checkbox"/> Medical Waste	0.6		
<input checked="" type="checkbox"/> Other (specify): WWTP grit, decanted vector solids, containerized liquids.	1,252		
<input checked="" type="checkbox"/> Other (specify): Oversized materials, dead animals, wastes requiring Certificates of Destruction, other misc. waste	2,575		
Total	830,912		

DID YOU RECEIVE MATERIALS FOR RECYCLING? Yes (Please specify on pages 3-4.) No

ADDITIONAL INFORMATION (please check if attached):

- Attach results of ground water monitoring in accordance with WAC 173-351-415(1) Quarterly groundwater monitoring results are submitted to Public Health, Seattle and King County with copies to WDOE. Most recent report was submitted January, 2009. Annual report submitted under separate cover
- Attach applicable financial assurance information in accordance with WAC 173-351-600. Included in CHRLF annual report submitted under separate cover

Are you open to the public? Yes No

Tip fees (Attach schedule if available):
Enclosed

REMAINING PERMITTED CAPACITY:

In tons: Approx 15,165,000 tons

Estimated Date of Closure: 2024 or when filled

Are you planning an expansion this year?

Yes No

ENERGY RECOVERY FROM LANDFILL:

Power Produced Annually 489,255 MMBTU kilowatt-hours

(Energy produced by converting landfill gas to pipeline-quality natural gas at facility owned and operated by Bio Energy (Washington) LLC. Facility delivers gas via pipeline to Puget Sound Energy's natural gas-fired power plants.) Some landfill gas is also converted to electricity for use by BEW onsite.

During the reporting year, were there any changes in your management practices that would impact your operations?

- No Yes (specify) Started filling in Area 7 of the landfill. Used mattresses for alternative daily cover for the first lift of the new area. Site Development Plan recommendations approved by County Council, extending capacity and lifetime of landfill.

Are there any new solid waste activities planned at your site for this calendar year? No Yes (specify) _____

Planned start date: _____

DID YOU RECEIVE MATERIALS FOR DISPOSAL FROM?	WHERE FROM?	TYPE OF WASTE	ESTIMATE AMOUNT
			<input type="checkbox"/> Tons or <input type="checkbox"/> Cubic yards
Out of County? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Out of State? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Out of Country? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

NOTE: Please ONLY fill in this chart if you collected materials for RECYCLING or COMPOSTING

AMOUNTS AND TYPES OF MATERIALS COLLECTED FOR RECYCLING OR COMPOSTING

PLEASE CHECK IF RECEIVED FOR RECYCLING or COMPOSTING	COMMERCIAL Please check: <input type="checkbox"/> Cubic Yards/Year or <input checked="" type="checkbox"/> Scaled Tons/Year	RESIDENTIAL Please check: <input type="checkbox"/> Cubic Yards/Year or <input checked="" type="checkbox"/> Scaled Tons/Year	TOTAL AMOUNT RECEIVED Please check: <input type="checkbox"/> Cubic Yards/Year or <input checked="" type="checkbox"/> Scaled Tons/Year
<input type="checkbox"/> Newspaper			
<input type="checkbox"/> Corrugated Paper			
<input type="checkbox"/> Mixed Waste Paper			
<input type="checkbox"/> Container Glass			
<input type="checkbox"/> PET Plastics			
<input type="checkbox"/> HDPE Plastics			
<input type="checkbox"/> LDPE Plastics			
<input type="checkbox"/> Other Recyclable Plastics			
<input type="checkbox"/> Aluminum Cans			
<input type="checkbox"/> Tin Cans			
<input type="checkbox"/> Ferrous Metals (iron, steel)			
<input type="checkbox"/> Nonferrous Metals (excluding aluminum cans)			
<input checked="" type="checkbox"/> Appliances (white goods)	0.41	6.39	6.80
<input checked="" type="checkbox"/> Electronics (computers, CPUs, hard drives)	0.12	1.86	1.98
<input type="checkbox"/> Electronics (monitors, TVs)			
<input type="checkbox"/> Tires (collected)			
<input type="checkbox"/> Asphalt			
<input type="checkbox"/> Concrete			
<input type="checkbox"/> Construction/Demolition			
<input type="checkbox"/> Wood Waste			
<input type="checkbox"/> Landclearing Debris			
<input type="checkbox"/> Yard Debris			
<input type="checkbox"/> Food/Food Scraps			
<input type="checkbox"/> Textiles (rags, clothing)			
<input type="checkbox"/> Co-Mingled Recyclables (specify):			
<input type="checkbox"/> Other (specify):			
Total	0.53	8.25	8.78

SECTION 3 - LANDFILL CAPACITY ANALYSIS AND LANDFILL DEVELOPMENT STATUS

3.1 - Capacity Analysis

The current Operating Permit for the CHRLF limits the maximum elevation to 788 feet mean sea level (msl) and airspace capacity is calculated based on the maximum elevation. Attachment A provides an analysis of landfill capacity used and the remaining capacity at the site. Results of the analysis are summarized in Tables 1 and 2. Additional capacity included in Table 2 is anticipated based on observed settlement in Area 5 and extrapolated to Areas 6 and 7. Additional capacity available from recoverable cover soils is not included in this analysis.

Table 1 – AIRSPACE CAPACITY

Waste Disposal Area	Airspace Capacity at Permitted Elevation ¹ (cubic yards)	Remaining Airspace Capacity (cubic yards)
Area 5	8,394,846	818,783 ²
Area 6	6,767,143	644,571 ²
Area 7	8,818,887	8,370,358 ²
Total Remaining Airspace Capacity		9,833,712
1. Per the current operating permit. 2. Remaining airspace capacity based on interpolation of the April 11, 2011 aerial photography compared with the final grading plan for Areas 5, 6 and 7. In the 2009 Annual Report the Area 6 Remaining Airspace Capacity value was listed in tons and is corrected to cubic yards here.		

Table 2 – ESTIMATED OPERATING LIFE

Waste Disposal Area	Remaining Airspace Capacity (cubic yards)	Estimated Airspace Capacity with Settlement¹ (cubic yards)	Remaining Operating Life (years)
Area 5	818,783	860,000	0.75 ²
Area 6	644,571	654,000	0.57 ²
Area 7	8,370,358	8,495,913	7.41 ²
Area 8	8,500,000 ⁴	8,627,500	6.5 ³
Estimated Remaining Airspace Capacity & Life		18,637,413	15.23
1. Settlement estimates are based on Area 5 observations. 2. Through 2018 the Operating Life is based on refuse being placed at 1500 pounds per cubic yard and an average of 860,000 tons per year. 3. From 2019 to 2026 the Operating Life is based on refuse being placed at 1500 pounds per cubic yard and an average of 990,000 tons per year. 4. Area 8 airspace capacity from the Final Environmental Impact Statement 2010 Site Development Plan.			

3.2 - Landfill Development Status

The development status of the landfill is summarized in Table 3. Closed Areas are refuse Areas closed in accordance with pertinent regulatory requirements and not currently scheduled to receive additional waste. The Area 5 top surface has an interim cover that will be maintained until the completion of the last remaining lift.

Table 3 – STATUS OF LANDFILL AREAS¹

Landfill Area	Closed Area Size (acres)	Open Area Size (acres)
Main Hill	84.4	0.0
Southeast Pit	9.6	0.0
South Solid Waste Area	30.6	0.0
Central Pit	5.5	0.0
Area 2/3	22.2	0.0
Area 4	60.4	0.0
Area 5	9.2 ² 37.1 ³	31.4
Area 6	25.18 ² 37.4 ³	30.1
Area 7	0.00	55.5
Area 8	Not Developed	Not Developed
1. Areas are net final cover plan view surfaces or as otherwise noted. 2. Final cover surface area. 3. Interim final cover surface area.		

SECTION 4 - FINANCIAL ASSURANCE ANALYSIS

The KCSWD maintains a landfill reserve fund (LRF) account for closure, post-closure, and corrective action in accordance with WAC 173-351-600. The LRF receives monthly transfers from the KCSWD operating fund, which obtains about 94% of its revenue each year from customers paying the waste disposal fee for MSW brought into the KCSWD solid waste system. The transfer amount is set annually and varies based on KCSWD future plans. In 2011, KCSWD has proposed a new rate, which is currently under review by the King County Council. The current estimate for the LRF contribution for 2012, \$8.26 per ton, may be modified after further review by King County auditors. Historically we have used a uniform 3% discount rate for each year until landfill closure. A potential policy shift would vary this rate each future year, and use the values provided by the King County Forecast Council, which was created in 2007. At this point, these numbers are lower than the historical 3%.

The LRF rate of \$8.26/ton currently proposed for 2012 is based on:

- [a] The current tonnage forecast.
- [b] A 3% discount rate on any monies invested over any future years in the fund.
- [c] The projected costs in each future year, for Closure, New Area Development, and Facility Improvements.
- [d] The assumption that we stop receiving waste in June of 2025, and complete final closure in 2027.
- [e] The prediction that we will require, at the completion of final closure, \$1,815,714 per year, if there is zero future inflation, to maintain the landfill for 30 years, and that this can be achieved with a trust fund of about \$35,500,000 as of December 2027.

In 2010, the KCSWD reviewed the costs included in the post closure maintenance plan and updated the costs based on changes to operations, as reported in the 2009 Annual Report. In 2011, the KCSWD is planning to conduct a more extensive review of the post closure cost estimates. Detailed estimates of post closure maintenance costs are included in Attachment B and summarized in Table 4 below.

Table 4 – POST CLOSURE MAINTENANCE COST ESTIMATES

Annual Post-Closure Maintenance (PCM) Cost	\$ 1,815,174 (2010\$)
Discount Rate	3.0%
PCM Period	30 years
Present Value (Year 0 = 2027) (Set aside value shown in Attachment B).	\$ 35,578,212

SECTION 5 - WASTE DISPOSAL QUANTITIES

The CHRLF received about 2,300 tons of municipal solid waste a day in 2010. Detailed information can be found on the tonnage Annual Report in Section 2.

SECTION 6 - SUMMARY OF 2010 GROUNDWATER, SURFACE WATER, LEACHATE AND LANDFILL GAS MONITORING RESULTS AND 2011 PROPOSED ENVIRONMENTAL MONITORING PROGRAM

6.1 - Summary 2010 Groundwater Monitoring Program

Groundwater monitoring is conducted in accordance with WAC 173-351-410 and reported here in compliance with WAC 173-351-415(1). A summary of groundwater data collected during the reporting year is presented in Appendix IV of Attachment D.

The Groundwater Monitoring Program is described in Section 6.2 of the May 2004 CHRLF Hydrogeologic Report and in Attachment D of this annual report. The program includes wells used for water level monitoring and for geochemical sampling. Thirty nine (39) groundwater monitoring wells are used for geochemical sampling in the regional aquifer, and nine (9) for monitoring the perched saturated zones. Eleven (11) additional wells in the perched zone are monitored only for groundwater elevations. Detection monitoring wells are located down-gradient of, or lateral to, waste placement areas. Background characterization wells are located up-gradient of waste placement areas.

6.2 - Summary Surface Water Monitoring Program

The surface water monitoring program is described in Section 6.1 of the May 2004 CHRLF Hydrogeologic Report. The goals of this program include the following elements:

- Detect changes in water quality;
- Verify the effectiveness of leachate management facilities in controlling leachate discharges to surface water;
- Monitor the effectiveness of Best Management Practices (BMPs) and the Storm Water Pollution Prevention Plan (SWPPP); and
- Evaluate compliance with the Industrial Stormwater General Permit.

Surface water quality criteria are established in WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington. Surface water quality is monitored at twelve (12) strategic locations around the landfill. Surface water samples are collected monthly for characterization, and to determine compliance with water quality standards. CHRLF is also covered by the State Industrial Stormwater General Permit (ISWGP) which establishes monitoring requirements and benchmark values for several parameters. The three discharge locations are monitored quarterly for compliance with the ISWGP. Permit compliance monitoring locations are at SW-N4 at the north end of the landfill, SW-GS1 at the south end and SW-SL3 at the discharge of the bioswale along 228th Avenue Southeast. Field and analytical surface water data is included in Appendix IV of Attachment D.

6.3 - Summary Leachate Monitoring Program

Leachate is analyzed for characterization and permit compliance. Leachate is sampled monthly at four stations for characterization and every other week at the Leachate Effluent Pump Station

discharge point for compliance with permit conditions. Leachate characterization is a critical component of detection monitoring, enabling the assessment of the potential for, and possible consequences of, groundwater contamination by leachate. Leachate characterization also serves to assess pretreatment needs prior to discharge and to evaluate the effectiveness of pretreatment. Characterization analyses include all analytes that groundwater is analyzed for plus several analytes specifically related to wastewater characterization and treatment. Permit compliance samples are analyzed for metals concentrations to monitor compliance with discharge permit requirements and to calculate loadings.

Self-monitoring discharge permit reports are generated monthly and submitted to the King County Wastewater Treatment Division. Field and analytical leachate data for 2010 is included in Appendix IV of Attachment D.

6.4 - Summary Landfill Gas Monitoring Program

Landfill gas (LFG) monitoring is performed in accordance with provisions of WAC 173-351-200(4). A network of LFG monitoring probes has been installed at strategic locations and elevation intervals below the ground surface to measure LFG composition and pressure (see Attachment E). In general, there are two categories (defined by function) of probes at the CHRLF. Migration Monitoring Probes are primarily intended to verify that methane concentrations at the property boundary are not exceeding the lower explosive limit (LEL) for methane (typically 5 percent, by volume) and whether subsurface LFG is migrating into surrounding native soils. Interior LFG Monitoring Probes are used to evaluate the performance of the LFG collection system and will indicate if any operational adjustments to the system are required.

Monitoring Probe Network: The installation history of the LFG monitoring probes at the CHRLF was described in the 2005 CHRLF Annual Report. The probes are either single or multiple completion probes. Information on the location, elevation, and installation date, and a description of each probe is provided in the Monitoring Plan included in Attachment E.

Parameters typically measured at the LFG monitoring probes include methane, oxygen and carbon dioxide concentrations and static pressure. Monitoring has been performed monthly through October of 2009 and is now performed quarterly. Monitoring data results are included in Attachment E. Results from LFG migration monitoring for 2010 indicate one exceedance of the LEL for methane was detected at the perimeter of the CHRLF. This LEL exceedance were reported to regulators and landfill gas operators. Operators assess and adjust the collection system to regain compliance.

6.5 - Proposed Environmental Monitoring Program for 2011

At this time no changes are proposed to the environmental monitoring program for 2011. The proposed environmental monitoring program is to continue as in 2010.

SECTION 7 - SUMMARY OF LANDFILL PERSONNEL TRAINING PROGRAM

The KCSWD implements a Landfill Training Program that ensures that landfill personnel comply with the Certification requirements of WAC 173-300-060. Employees with earned SWANA Landfill Certification as Manager of Landfill Operations (MOLO) are listed below in Table 5.

Table 5 – 2010 MOLO CERTIFIED STAFF

NAME	TITLE	DATE OF CERTIFICATION
John Hills	Lead Equipment Operator	Certified until 10/7/2011
Lenny Kuzaro	Lead Equipment Operator	Certified until 2013
Mark Knauss	Transportation Supervisor	Certified until 10/7/2011
Mike McEwen	Engineer II	6/16/2008 (Sharon has no info)
Thea Severn	Planning and Communications Manager	Recertified through 3/31/2012
Dean Voelker	Landfill Operations Manager	4/6/2006; Recertified through 4/6/2012
Nigel White	Transportation Supervisor	Certified until 6/28/2013
Clinton Christine	Transfer Station Operator	Certified until 2013
CJ Sprague	Transfer Station Operator	Recertification is due
Alan Duncan	Transportation Supervisor	Recertification is due
Steve Smith	Shop Supervisor	Certified until 2013
Wally Grant	Senior Landfill Gas Operator	Certified until 2013

SECTION 8 - EVALUATION REPORTS

8.1 - Summary of Emergency or Corrective Actions Taken in 2010

No emergency or corrective actions were required during the reporting year in response to groundwater, surface water or leachate monitoring.

8.2 - Evaluation of Surface and Groundwater Monitoring Data

8.2.1 - Surface Water Monitoring Data

Monitoring Station SW-N4 monitors discharges to Issaquah Creek. According to WAC 173-201A-600 (Table 602), the creek is part of the Water Resource Inventory Area (WRIA) 8 – Cedar/Sammamish system, which is designated for “non-core Salmon/Trout Aquatic use”. The applicable water quality standards are outlined in WAC 173-201A-200.

Monitoring Station SW-SL3 monitors discharges to a series of roadside ditches that discharge to the Cedar River. Most of the storm water infiltrates along Cedar Grove Road. The Cedar River is also in WRIA 8 and the same standards referenced above apply.

Monitoring Station SW–GS1 monitors discharges to a designated King County wetland with palustrine forested, palustrine open water, and palustrine emergent wetland classes. The wetland does not discharge to any fresh waters of the State nor does it contain key aquatic life uses defined in WAC 173-201A-200(1)(a). According to procedures for applying water quality criteria (WAC 173-201A-260 (3)(i)), the antidegradation policies appropriate to maintain and protect this wetland are the Tier I provisions defined in WAC 173-201A-301 and expanded upon in WAC 173-201A-310. The provisions in Tier I do not include specific chemical numerical limits. The beneficial uses of this wetland include groundwater exchange and stormwater attenuation. The KCSWD historically has implemented Best Management Practices at the CHRLF which maintains the quality of the wetland necessary to support these beneficial uses.

Pursuant to these provisions and as indicated in Table 6 of this Annual Report, exceedances at SW – SL3 were as follows: turbidity, fecal coliform, ammonia, dissolved oxygen, copper and lead, and for SW-GS1 the exceedances were for turbidity, ammonia, fecal coliform, dissolved oxygen, copper, lead and iron. Monitoring station SW-N4 had exceedances for ammonia, fecal coliform, dissolved oxygen, copper, lead and zinc. Following exceedances of the Industrial Stormwater General Permit benchmarks, KCSWD Engineering and Operations inspect the site to determine the source of the exceedance. Identified failures of control systems are promptly corrected. These exceedances are in bold in Table 6.

See Appendix IV of Attachment D for the related surface water monitoring data.

Groundwater data evaluation constitutes the main text of Attachment D.

Table 6 – SUMMARY OF SURFACE WATER QUALITY CRITERIA EXCEEDANCES

Parameter	Units	Sampling Location	Sample Date	Sample Value	Regulatory Limit	Regulation
Fecal Coliforms	(CFU/100mL)	SW-GS1	12/17/2009	150	100	SSWC
		SW-GS1	5/10/2010	660	100	SSWC
		SW-GS1	9/21/2010	350	100	SSWC, FA, FC
		SW-GS1	10/26/2010	610	100	SSWC, FA, FC
		SW-N4	12/17/2009	210	100	SSWC
		SW-SL3	9/1/2010	6400	100	SSWC, FA, FC
		SW-SL3	9/21/2010	140	100	SSWC
		SW-SL3	10/26/2010	630	100	SSWC, FA, FC
Turbidity (Field)	(NTU)	SW-GS1	12/17/2009	21.8	5 over bkgrd	SSWC
		SW-GS1	1/28/2010	7.58	5 over bkgrd	SSWC
		SW-GS1	3/8/2010	11.7	5 over bkgrd	SSWC
		SW-GS1	3/11/2010	7.6	5 over bkgrd	SSWC
		SW-GS1	4/15/2010	5.78	5 over bkgrd	SSWC
		SW-GS1	5/10/2010	23.2	5 over bkgrd	SSWC
		SW-GS1	6/7/2010	25.6	5 over bkgrd	SSWC, ISWGP
		SW-GS1	7/15/2010	10.5	5 over bkgrd	SSWC
		SW-GS1	9/21/2010	21	5 over bkgrd	SSWC
		SW-SL3	9/1/2010	20.6	5 over bkgrd	SSWC
		SW-GS1	10/26/2010	36.4	5 over bkgrd	SSWC, ISWGP
		SW-GS1	11/18/2010	13.6	5 over bkgrd	SSWC
SW-GS1	11/30/2010	196	5 over bkgrd	SSWC, ISWGP		

Parameter	Units	Sampling Location	Sample Date	Sample Value	Regulatory Limit	Regulation
		SW-SL3	10/26/2010	8.7	5 over bkgrd	SSWC
		SW-SL3	10/28/2010	7.62	5 over bkgrd	SSWC
		SW-SL3	11/17/2010	20.4	5 over bkgrd	SSWC
		SW-SL3	11/18/2010	16.9	5 over bkgrd	SSWC
		SW-SL3	11/30/2010	17.8	5 over bkgrd	SSWC
		SW-SL3	12/20/2010	6.53	5 over bkgrd	SSWC
Dissolved Oxygen	(mg/L)	SW-GS1	7/15/2010	7.67	min 8 mg/L	SSWC
		SW-N4	6/8/2010	7.41	min 8 mg/L	SSWC
		SW-SL3	6/7/2010	7.02	min 8 mg/L	SSWC
		SW-SL3	6/14/2010	7.05	min 8 mg/L	SSWC
		SW-SL3	9/21/2010	6.16	min 8 mg/L	SSWC
Ammonia	(mg/L)	SW-GS1	12/17/2009	0.012 T	0.0013	SSWC, FC
		SW-GS1	7/15/2010	0.0262	0.0082	SSWC, FC
		SW-GS1	9/21/2010	0.02	0.0097	SSWC, FC
		SW-N4	12/17/2009	0.0402	0.0085	SSWC, FC
		SW-N4	1/21/2010	0.0986	0.003	SSWA, SSWC, FA, FC
		SW-N4	2/22/2010	0.0583	0.0073	SSWC, FC
		SW-N4	3/9/2010	0.0573	0.0031	SSWA, SSWC, FA, FC
		SW-N4	3/11/2010	0.0712	0.0254	SSWC, FC
		SW-N4	12/17/2009	0.0402	0.0085	SSWC, FC
		SW-N4	4/13/2010	0.0516	0.0062	SSWC, FC
		SW-N4	5/5/2010	0.0633	0.0117	SSWC, FC
		SW-N4	5/11/2010	0.0546	0.0037	SSWC, FC
		SW-N4	6/8/2010	0.0376	0.0099	SSWC, FC
		SW-N4	7/13/2010	0.01	0.004	SSWC, FC
		SW-N4	9/21/2010	0.0772	0.0711	SSWC
		SW-N4	10/27/2010	0.112	0.00594	SSWA, SSWC, FA, FC
		SW-N4	11/18/2010	0.0835	0.00533	SSWA, SSWC, FA, FC
		SW-N4	11/30/2010	0.0484	0.01544	SSWC, FC
		SW-N4	12/16/2010	0.0562	0.00178	SSWA, SSWC, FA, FC
		SW-SL3	9/1/2010	0.01	0.0019	SSWC, FC
		SW-SL3	9/21/2010	0.01	0.0058	SSWC, FC
		SW-SL3	12/20/2010	0.015 T	0.00505	SSWC, FC
		SW-SL3	12/22/2010	0.0205	0.00263	SSWC, FC
Copper	(mg/L)	SW-GS1	10/26/2010	0.00851	0.00724	SSWC, FC
		SW-N4	12/17/2009	0.00862	0.0074	SSWC, FC
		SW-N4	1/21/2010	0.0108	0.0059	SSWA, SSWC, FA, FC
		SW-N4	2/22/2010	0.00708	0.0063	SSWC, FC
		SW-N4	3/9/2010	0.00714	0.00695	SSWC
		SW-N4	4/13/2010	0.00785	0.0068	SSWC, FC
		SW-N4	5/11/2010	0.0089	0.007	SSWC, FC
		SW-N4	6/8/2010	0.01	0.0071	SSWC, FC

Parameter	Units	Sampling Location	Sample Date	Sample Value	Regulatory Limit	Regulation
		SW-N4	10/27/2010	0.0118	0.00741	SSWA, SSWC, FA, FC
		SW-N4	11/18/2010	0.00933	0.00747	SSWC, FC
		SW-N4	12/16/2010	0.0171	0.00492	SSWA, SSWC, FA, FC, ISWGP
		SW-SL3	10/26/2010	0.0067	0.00648	SSWC
		SW-SL3	12/20/2010	0.00888	0.00607	SSWA, SSWC, FC
Iron	(mg/L)	SW-SG1	7/15/2010	1.28	1	FC
		SW-SG1	9/21/2010	2.29	1	FC
		SW-GS1	10/26/2010	1.7	1	FC
Lead	(mg/L)	SW-GS1	12/17/2009	0.00178	0.001	SSWC, FC
		SW-GS1	5/10/2010	0.00214	0.0015	SSWC, FC
		SW-N4	12/17/2009	0.00135	0.0013	SSWC
		SW-SL3	10/26/2010	0.00117	0.00109	SSWC
		SW-SL3	11/18/2010	0.00166	0.00134	SSWC
Zinc	(mg/L)	SW-N4	12/16/2010	0.0502	0.04563	SSWA, SSWC, FC
FC = Federal Chronic Surface Water Criteria						
FA = Federal Acute Surface Water Criteria						
SSWC = State Chronic Surface Water Criteria						
SSWA = State Acute Surface Water Criteria						
ISWGP = Industrial Stormwater General Permit Benchmark						
T = Estimated Value						
Total Metals:						

8.2.2 - Groundwater Monitoring Data

The CHRLF site can be characterized hydrogeologically as having no significant seasonal variation in horizontal groundwater flow paths. Horizontal gradients are influenced by infiltrating precipitation in the recharge area. Vertical hydraulic gradients in the southern area are demonstrated by head differences in adjacent wells screened at different depths. Additional hydrogeologic characterization is ongoing to further delineate regional aquifer flow and to refine and streamline the detection monitoring network to ensure adequacy and eliminate redundancy. An extensive list of chemical analytes and field parameters are determined and the results evaluated by a variety of graphical and statistical methods. The groundwater data analyses presented in Attachment D describes onsite groundwater elevations, flow direction, and velocity. Further evaluation of groundwater quality, variations in chemical concentrations over time, and possible impacts to groundwater quality by surface activities are also completed.

Up-gradient groundwater quality, especially in wells nearest the recharge zone, is profoundly affected by conditions and activities that have occurred on the adjoining Queen City Farm property. Up-gradient quality manifests a high degree of spatial variation and temporal trends, which are not unexpected, given the recharge area history which includes hazardous waste disposal, National Priorities Listing under Superfund, site investigations and remediation activities. Down-gradient groundwater quality also manifests a high degree of spatial variation and temporal trends. Much as responses of water level increases are dampened with distance

from the source, so are the concentrations of many analytes attenuated by processes such as dispersion dilution, sorption, and degradation as groundwater flows beneath the landfill.

Analytes exceeding State Groundwater Criteria (WAC 173-200-040 Table 1) or Federal Primary drinking water standards (40 CFR Part 141) and regularly detected in up-gradient wells include arsenic, and the chlorinated volatile organic compounds (CVOC) trichloroethene and vinyl chloride. Arsenic is also regularly detected in down-gradient samples; however, trichloroethene and vinyl chloride are not.

These data indicate that the CHRLF is acting as an attenuation zone for up-gradient CVOC impacts from up-gradient sources such as the Queen City Farms Superfund site, reducing concentrations along the groundwater flowpath.

Additional analytes exceeding secondary standards are iron and manganese and pH. Secondary standards are non-mandatory Federal guidelines regarding aesthetic (taste, odor, or color) or cosmetic (causing tooth or skin discoloration) effects. Exceedances of these secondary standards occurred in both up-gradient and down-gradient wells. Exceedences are reported in quarterly reports.

Impacts from past landfilling practices have previously been recognized in several wells in the East Main Hill Perched Zone (MW-30A and MW-47) and the South Solid Waste Area Perched Zone (decommissioned wells MW-39, MW-42S and MW-42D; current well MW-101). Site improvements and engineered facilities have been effective in moderating the impacts to water quality, resulting in declining trends for most contaminants in these perched zone wells.

Investigations are underway to further evaluate residual perched zone impacts and the integrity and effectiveness of engineered facilities in closed, unlined landfill areas.

The Regional Aquifer is the first continuously saturated zone beneath the landfill and serves as the earliest path for detection monitoring. Groundwater flowing onto the CHRLF site is of a highly variable character spatially and temporally. A majority of the perimeter wells are up-gradient to waste placement.

8.3 - Evaluation of Gas Monitoring Data

See Attachment E for LFG probe monitoring data. According to WAC 173-351-200 (4) (a), the concentration of methane gas generated by the facility shall not; exceed 25 percent of the lower explosive limit (LEL) for methane in facility structures (excluding gas control or recovery system components), exceed the LEL for methane at the facility property boundary or beyond, or exceed 100 parts per million (ppm) by volume of methane in off-site structures.

The LFG compliance monitoring probes (LFG migration monitoring probes) are located along the perimeter of the landfill as shown in Attachment E. The rest of the probes are used to monitor LFG levels in the interior of the landfill and for transitional evaluation of LFG collection and extraction-specific facilities.

There was one abnormal LFG detection in the LFG migration monitoring probes in 2010. This occurred in GP-34A in on October 15 with methane at 35.9%, carbon dioxide at 12.9% and oxygen at 2.1%, all concentrations by volume. GP-34A is a shallow completion, 7.5 feet below ground surface and yields detectable methane infrequently. The LFG control system was adjusted in response to this exceedance, which did not reoccur in the subsequent quarter.

8.4 - Evaluation of Leachate Monitoring Data and Volumes Generated

8.4.1 - Leachate Volumes

The recorded volumes of leachate discharged from the leachate aeration basins via the Leachate Effluent Pump Station (LEPS) are indicated in Table 7. The actual leachate volume generated within the landfill is not measured directly.

Table 7 – LEACHATE DISCHARGE DATA AND EXCEEDANCES FOR 2009 and 2010

Month	2010 Monthly Flow (million gallons)	2010 Number of Exceedances	2009 Monthly Flow (million gallons)	2009 Number of Exceedances
January	26.38	0	32.307	0
February	12.36	0	6.58	0
March	17.33	0	17.386	0
April	15.22	0	16.775	0
May	14.17	0	10.216	0
June	21.04	0	4.356	0
July	4.14	0	1.658	0
August	5.25	0	2.708	0
September	10.22	0	7.361	0
October	13.96	0	20.098	0
November	25.27	0	36.546	0
December	34.09	0	16.17	0
Total Discharged	199.42	0	172.161	0
Average. Monthly Discharge	16.62	0	14.347	0

Pursuant to the Industrial Waste Discharge Permit No. 7842-01, the Daily Maximum Discharge rate from the Leachate Effluent Pump Station (LEPS) is 3,500,000 gallons per day (gpd) or 3.5 million gallons per day (MGD). The Permit allows for periodic exceedance of this limit when weather conditions make it necessary. There were no exceedances of the daily limit in 2010.

8.4.2 - Leachate Monitoring Data

A statistical summary of the leachate monitoring data is included as Appendix F of Attachment D.

8.5 - Topographical Mapping and Landfill Settlement

See Attachment F for a current topographic map of the site and final grade plan of the active landfill area. Aerial topographic surveys are completed twice per year to enable the computation of the landfill airspace consumption rate and remaining capacity. Airspace utilization factors for the last ten years are summarized in Table 8.

8.5.1 - Area 5

Area 5 is permitted as a 14 lift landfill cell. As of August 10, 2005, lifts 1 through 12 had been completed and lift 13 was partially completed before operations were transitioned to Area 6. Interim cover was constructed over the top surface and settlement monitoring points were established.

8.5.2 - Area 6

Filling operations in Area 6 began on August 10, 2005 and were suspended on August 27, 2010. Area 6 is permitted as a 14 lift landfill cell. Lifts 9 and 10 were filled as a single thirty foot lift. Area 6 will have interim cover constructed over the top surface with settlement monitoring points in 2011.

8.5.3 - Area 7

Filling operations in Area 7 began on June 17, 2010. It is permitted as a seven lift cell with each lift being thirty feet.

Table 8 – LANDFILL AIRSPACE UTILIZATION FACTORS

Year	Tonnage¹	Total Airspace Consumed (cy)	Airspace Utilization Short Term Density (AUSTD) (lb/cy)	Average Soil Usage (cy/day)	Average Soil / Tonnage Ratio (cy/ton)	Average Soil / Airspace (cy/cy)
2006	998,871	1,564,508	1,277	486	0.178	0.113
2007	1,010,377	1,454,689	1,389	449	0.162	0.113
2008	930,617	1,270,613	1,465	481	0.189	0.138
2009	867,482	957,538	1,812	506	0.213	0.193
2010	830,909	1,183,488	1,404	507	0.223	0.156

The airspace utilization short term density (AUSTD) in 2006 was variable due primarily to the impact of materials added from the Shoreline Transfer Station construction project. The higher AUSTD from 2007 through 2009 is due to sustained use of alternative daily cover, rock recovery, improved compaction practices, utilizing 30 foot lifts and settlement. To protect the Area 7 cell liner Operations reduced the compaction effort on the first lift during the transition. This resulted in a lower AUSTD for 2010.

8.5.4 - Settlement

Settlement monitoring at CHRLF was started in 1992 and by 2005 seven monitoring locations had been established. More stations were added in 2007 while others were abandoned as a result of operational impacts. The effective total number of stations is currently nine. The monitoring locations, elevations and settlement data are included in Attachment F.

Annual settlement, which is dependent on refuse thickness and time, has varied from 0.28% to 3.79% of the refuse thickness. Total settlement at all stations was variable. It is anticipated that landfill settlement will continue, with older refuse areas settling at a comparatively slower rate than newer refuse areas.

SECTION 9 - CERTIFICATION

Annual Report and Groundwater Evaluation Certification

I certify in accordance with the requirements of WAC 173-351-400(c) (3), that the contents of Attachment D – Groundwater Evaluation of this document were prepared under my direction or supervision under a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Where applicable, some specific and related hydrogeologic portions have been duly certified by the responsible groundwater scientist. Based on my inquiry of the person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Name: Dr. Victor O. Okereke, P.E., DEE	Title: Manager, Engineering Services	Date: June 10, 2011
Mailing Address: Solid Waste Division Department of Natural Resources & Parks 201 South Jackson Street, Suite 701 Seattle, WA 98104-3855		Telephone Number: 206-296-4422
Signature: 		

SECTION 10 - ATTACHMENTS

Attachment A - Remaining Capacity Analysis

Attachment B - Financial Assurance Estimates

Attachment C - Waste Disposal Quantities & Fees

- Disposal Fees

Attachment D - Groundwater Data Evaluation

- Appendix I Potentiometric Groundwater Surface Maps and Groundwater Velocity Calculations
- Appendix II Time-Concentration Plots
- Appendix III Trilinear Diagrams and Ion Balance Calculations
- Appendix IV Field and Analytical Data

Attachment E - Landfill Gas Probe Monitoring Program Information

Attachment F - Landfill topography, final grades for Areas 5, 6 and 7, settlement monitoring stations and graphs of settlement data points with lines and best fit curves