State of Oregon Department of Environmental Quality

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
OREGON TITLE V OPERATING PERMIT
REVIEW REPORT

Eastern Region
475 NE Bellevue Dr., Suite 110
Bend, OR 97701

Source Information:

SIC	4953	NAICS	562212

Compliance and Emissions Monitoring Requirements:

Unassigned emissions	No	CEMS	No
Emission credits	No	PEMS	No
Compliance schedule	No	Ambient monitoring	No
Source test [date(s)]	10/27/18		
COMS	No		

Reporting Requirements

Annual report (due date)	2/15	Monthly report (due dates)	No
Emission fee report (due date)	2/15	Excess emissions report	Within 1 hour
SACC (due date)	2/15 and 7/30	Other reports (type)	NSPS NMOC report – 2/15
Quarterly report (due dates)	No		

Air Programs

NSPS (list subparts)	WWW, IIII	Title V	Yes
NESHAP (list subparts)	ZZZZ	ACDP (SIP)	Incorporated
CAM	No	Major HAP source	No
Regional Haze (RH)	No	Federal major source	No
Synthetic Minor (SM)	No	NSR	No
Part 68 Risk Management	No	PSD	No
CFC	No	Acid Rain	No
RACT	No		
TACT	No		

TABLE OF CONTENTS

LIST OF ABBREVIATIONS USED IN THIS REVIEW REPORT

AQMA	Air Quality Management Area
ASTM	American Society of Testing and Materials
BDT	Bone Dry Ton
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CH_4	Methane (greenhouse gas)
CMS	Continuous Monitoring System
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
COMS	Continuous Opacity Monitoring System
DEQ	Oregon Department of Environmental Quality
dscf	dry standard cubic feet
EF	Emission Factor
EPA	United States Environmental Protection Agency
EU	Emissions Unit
FCAA	Federal Clean Air Act
GHG	Greenhouse Gas
gr/dscf	grains per dry standard cubic feet
HAP	Hazardous Air Pollutant
ID	Identification Code
I&M	Inspection and Maintenance
MB	Material Balance
Mlb	1000 Pounds
MM	Million
N_2O	Nitrous Oxide (greenhouse gas)
NA	Not Applicable
NESHAP	National Emission Standard for Hazardous Air Pollutants
NO_x	Oxides of Nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	Oxygen
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
O&M	Operation and Maintenance
Pb	Lead
PCD	Pollution Control Device
PEMS	Predictive Emissions Monitoring System
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 microns in size
$PM_{2.5}$	Particulate Matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PSEL	Plant Site Emission Limit
SO_2	Sulfur Dioxide
ST	Source Test
VE	Visible Emissions
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound

INTRODUCTION

1. This is a renewal of the Oregon Title V Operating Permit issued to the Deschutes County Dept. of Solid Waste which operates the Knott Landfill Recycling and Transfer Facility. The permit was issued on August 10, 2011 and is scheduled to expire on August 1, 2016. A timely and complete application (Application Number 28252) was submitted to the Department on June 29, 2015, so the current permit remains in effect until the permit renewal is issued.

2. In accordance with OAR 340-218-0120(1)(f), this review report is intended to provide the legal and factual basis for the draft permit conditions. In most cases, the legal basis for a permit condition is included in the permit by citing the applicable regulation. In addition, the factual basis for the requirement may be the same as the legal basis. However, when the regulation is not specific and only provides general requirements, this review report is used to provide a more thorough explanation of the factual basis for the draft permit conditions.

3. On October 3, 2016, DEQ received an application (Application Number 28794) to modify the Oregon Title V Operating Permit No. 09-0040-TV-01. The minor permit modification is being included during the permitting renewal process. The modification includes replacing the existing flare with a capacity of 750 standard cubic feet per minute (scfm) with a new larger flare capable of burning up to 2000 scfm. The increased flare capacity will allow the permittee to extract, control and burn more landfill gases. The larger flare will provide increases in control capacity to minimize fugitive odors, volatile organic compounds (VOCs), and non-methane organic compound (NMOC) emissions that would otherwise be emitted as fugitive gases. The new flare is sized and designed to control all existing and future landfill gases for the life of the landfill. The permittee has requested to maintain the existing 750 scfm flare for backup purposes.

4. The following modifications were approved for the facility during the last permit term:

Date	Permit Revision or Notification	Brief Explanation
08/25/2011	NC Type 1	Purchase and use new Caterpillar 836 compactor
01/02/2013	NC Type 2	Upgrade the landfill gas collection system and increase flare capacity to 750 cfm
01/24/2013	NC Type 1	Landfill gas extraction well installation
05/25/2015	NC Type 1	Extraction for cell 6 cleanout, sump riser and recirculation manifold.

5. The following changes are being made in this permit:

New Permit Condition Number	Old Permit Condition Number	Description of Change	Reason for Change
1 - 2	1 - 2	No Changes	NA
3	3	Updated Emission units in Table 1	Removed Stirling Engine emission unit option from permit
Table 2	Table	Updated facility wide emission limits and standards	OAR revisions
4 - 5	4 - 6	Updated fugitive particulate emissions requirements and monitoring	Title V program revisions
6 - 13	7 - 14	No Changes	NA
14	--	Added NSPS requirements for emergency engine generator set	Title V program and rule adoption
15 - 16	15 -16	No Changes	NA

New Permit Condition Number	Old Permit Condition Number	Description of Change	Reason for Change
17 - 18	17	Updated grain loading emission requirements	Title V program and OAR revisions
19 - 21	18 – 20	No Changes	NA
22	22	Insignificant activity requirements updated	Title V program and OAR revisions
23	23	Updated PSELs to include $PM_{2.5}$ and GHG	Title V program and OAR revisions
24	24	Clarified calculation requirement	No substantial change
25	25	Updated emission fees	Title V program revisions
26 - 37	26 - 37	No Changes	NA
38	38	Added GHG reporting to annual report requirements	Title V program and OAR revisions
39	39	No Changes	NA
40	--	GHG reporting requirements	Title V program and OAR revisions
41 - 42	40 - 41	No Changes	NA
G1 – G29	G1 – G29	No Changes	NA

PERMITTEE IDENTIFICATION

6. Deschutes County Dept. of Solid Waste operates Knott Landfill Recycling and Transfer Facility (KLF) located at 61050 SE 27th Street in Bend, Oregon.

FACILITY DESCRIPTION

7. KLF has been actively accepting municipal solid waste since 1972 and is currently permitted by DEQ as a municipal solid waste (MSW) disposal facility (Solid Waste Permit 6). The total area of the facility is 205 acres, which includes the County's waste management operations (landfill, transfer station, hazardous waste collection and administrative offices). The facility also includes recycling and composting facilities operated by Deschutes Recycling, LLC.

   The *Site Development Plan for Knott Landfill and Recycle Center, Deschutes County, Oregon* (URS, July 31, 2003) includes an eventual increase in the facility disposal capacity to 5,070,000 tons (approximately 4.6 million megagrams (Mg)). The development and operation identified in the 2003 *Site Development Plan*, including increased capacity to above the New Source Performance Standard (NSPS) Subpart WWW threshold of 2.5 million Mg, was incorporated in Permit Addendum 4 to Solid Waste Permit No. 6 on April 3, 2008.

   The KLF has been required to comply with New Source Performance Standards (NSPS) 40 CFR Part 60 Subpart WWW Standards of performance for Municipal Solid Waste Landfills. KLF was to comply with either 40 CFR 60.752(b)(2) or calculate an annual emission rate for the non-methane organic compounds (NMOC) to demonstrate compliance with the 50 Megagram per year (Mg/yr) limit for the landfill over each of the next five years. KLF performed an initial Tier II NMOC sampling, analysis and calculation in 2008 and again in October 2013. The 2013 results showed a peak NMOC generation rate was estimated to range from 15.7 Mg/yr in 2012 to 19.8 Mg/yr in 2017, were well below the 50 Mg/yr limit.

   Deschutes County submitted a Notification of Initial Design Capacity Report to DEQ in October 2013, as required under OAR 340-238-0100 and 40 CFR 60.752(a). Deschutes County elected to recalculate the non-methane organic compound (NMOC) emission rate using a Tier 2 sampling and analysis procedure as

provided in 40 CFR 60.754(a)(3). The Tier 2 sampling showed the NMOC emission rate to be substantially lower than that calculated using EPA default methods. The site-specific NMOC concentration (C_{NMOC}) was found to be 313 ppmv (as hexane), resulting in an expected NMOC emission rate of 25.5 Mg/yr in year 2021. The application includes the specific waste disposal rate summary for the facility, including projected annual rates through year 2021. The calculated Tier 2 NMOC emission rates are provided in Appendix A (Emissions Detail Sheets).

For the purposes of compliance with OAR 340-238-0100, the peak NMOC generation using equation 1 exclusively is estimated to be at 16.6 Mg/yr in 2015 to 24.3 Mg/yr in 2021. The peak NMOC generation rate using both equations 1 and 2 is estimated to be 17.6 Mg/yr in 2015 and 25.5 Mg/yr in 2021. Based on these findings, Deschutes County proposed that the facility update the NMOC generation report in five years (or as necessary), per 40 CFR 60.757(b)(1)(ii), based on updated forecast of waste rates, and an update of the NMOC concentration for the landfill, if the new waste areas are applicable for testing. Equation 1 is for landfills with a known waste acceptance rate for each year (40 CFR 60.754(a)(1)(i)) and Equation 2 is used when the waste acceptance rate is unknown (40 CFR 60.754(a)(1)(ii)).

8. **MSW Collection and Recycling Operations**

Approximately 135 acres of the 205 acre site is zoned for landfilling; the landfilling area is described in detail in the 2003 *Site Development Plan*. The additional 70 acres of non-landfill use comprises the North Development Area (NDA), which contains the office and pay booth, scales, administrative buildings, public areas for receiving and recycling (including an area for household hazardous waste collection), white goods area (for scrap metal and tires), and several storm water detention ponds. The roadways within the NDA are all paved.

KLF accepts solid waste from residential, commercial and industrial sources in Deschutes County. The solid waste that is accepted is defined in Oregon Revised Statutes (ORS) 459.05. The Recycle Center accepts and handles a variety of source separated recyclable materials. Hazardous waste is accepted at the facility, including asbestos containing materials (ACM) and household hazardous waste. Recycle and hazardous waste materials are shipped off-site to appropriate recycle contractors. Petroleum contaminated soil (PCS) accepted at the landfill is used as daily cover soil. Clean woody construction and demolition materials (C&D) and yard debris are stored and ground for hog fuel and compost, respectively. Typically, the hog fuel is shipped off-site immediately following grinding. The ground yard debris is placed in windrows, processed into compost and eventually sold.

Delivery of solid waste is by private and commercial vehicles ("Public"), refuse collection trucks ("Franchise"), and the County's onsite transfer trailers ("Transfer"). The NDA includes a waste receiving/transfer station. The transfer station accommodates private and commercial vehicles, limiting access to the active working face of the landfill to large commercial vehicles, franchise and transfer trucks.

9. **Fugitive Landfill Emissions**

Several areas within KLF have fugitive emissions, including the landfill gas, storage piles, material handling processes, and unpaved and paved roads. Heavy equipment used in the landfilling process includes the following:

- 2 landfill compactors (Cat 836H)
- 2 wheeled tractor-scrapers (Cat 623G)
- 2 track-type bulldozers (Cat D7HR)
- 3 wheel loaders (Cat 966H and 950H)
- 1 road grader (Cat 12G)
- 1 integrated tool carrier wheel loader (Cat 930H)
- 1 utility truck (Bobcat)
- 1 mini-excavator (Bobcat)

- 1 water tanker truck (International)
- 2 trucks (Freightliner)
- 2 semi-truck tractors (International)

Although the PCS and compost are expected to produce emissions of volatile organic compounds (VOC), they are not expected to have emissions of fugitive dust due to their high moisture content.

10. **Landfill Gas Collection System**

The County installed a landfill gas (LFG) collection system in 2001 to control off-site migration of LFG. The system consists of approximately 32 extraction points (extraction wells, leachate recirculation lines, clean-out lines, etc.) connected to a flare/blower unit via a header piping system. LFG is extracted from portions of the Phase 1-B area and Cells 1-46 by pulling LFG under vacuum from the extraction points through a header system to a skid mounted flare unit, where it is flared off. An industrial blower is used to pull LFG from the landfill. The blower exhausts through the flare unit where the LFG is combusted. The new blower design capacity will be to 2,000 standard cubic feet per minute (scfm). A continuous flow meter will be used to measure landfill gas to the flare on a minute average. The flare unit will be a 30-foot tall stack equipped with a flame shroud. The flame temperature is to be continuously monitored using a high-temperature thermocouple. In the event the flame is extinguished, a spark igniter is used to re-light the flame. No supplementary fuel is required. Should the methane content in the primary extraction wells drop, secondary wells will be tapped to provide additional methane. The extraction of the secondary wells will not require an increase in the blower design capacity.

11. **Landfill Gas-to-Energy System**

The County had planned to install a 43 kilowatt (kW) Stirling Engine that would have been fueled with landfill gas. The installation of the Stirling Engine in no longer being considered by Deschutes County and has been removed as an operating scenario in the Title V operating permit.

12. **Emergency Engine Generator Set**

The facility has one diesel emergency engine generator set, which is used in the event of a power failure. The emergency engine generator is Generac (SN #2092577) 389 hp, 250 KW generator that was manufactured and installed in 2007. It operates for about 30 minutes each week in non-emergency mode for readiness testing purposes.

EMISSIONS UNIT AND POLLUTION CONTROL DEVICE IDENTIFICATION

13. The emissions units at this facility are the following:

Emissions Unit (EU)	EU ID	EU Description	Pollutants Emitted	Pollution Controls
Landfill Gas	LFG-01	Landfill gas (LFG) is generated from the decomposition of solid waste placed in the landfill.	NMOC, VOC, HAPs, PM, PM_{10}, $PM_{2.5}$, NO_x, CO, & SO_2	Partial LFG collection system with flare (FLR-02)
Flares	FLR-01	Auxiliary flare that burns LFG collected from the landfill. Flare capacity is 750 scfm.		None
	FLR-02	Primary flare that burns LFG collected from the landfill. Flare capacity is 2,000 scfm.		None
Compost Piles	COM-01	Windrows of yard debris are turned approximately 1-2 times per month.	VOC	None

Emissions Unit (EU)	EU ID	EU Description	Pollutants Emitted	Pollution Controls
Petroleum Contaminated Soil	PCS-01	PCS is used as daily cover material for the landfill. PCS is used as received and not stored on site.	VOC	None
Material Handling	MH-01	Excavation, storage, recovery and deposition of cover soil (H-1); Excavation, storage, recovery and deposition of aggregate (H-2); Grading (H-3); Dirt pushing and bulldozing (H-4).	PM	Water
Unpaved Roads	UPR-01	Fugitive dust from vehicle traffic on unpaved areas of the landfill.	PM	Magnesium Chloride and Water
Paved Roads	PRD-01	Fugitive dust from vehicle traffic on paved roads.	PM	Sweeping and Road Washing

14. Categorically insignificant activities include the following

- Constituents of a chemical mixture present at less than 1% by weight of any chemical or compound regulated under OAR Chapter 340, Divisions 200 through 268, excluding Divisions 248 and 262, or less than 0.1% by weight of any carcinogen listed in the U.S. Department of Health and Human Service's Annual Report on Carcinogens when usage of the chemical mixture is less than 100,000 pounds/year
- Evaporative and tail pipe emissions from on-site motor vehicle operation
- Distillate oil, kerosene and gasoline fuel burning equipment rated at less than or equal to 0.4 million Btu/hr
- Natural gas and propane burning equipment rated at less than or equal to 2.0 million Btu/hr
- Office activities
- Janitorial activities
- Personal care activities
- Groundskeeping activities including, but not limited to building painting and road and parking lot maintenance
- Maintenance and repair shop
- Automotive repair shops or storage garages
- Air cooling or ventilating equipment not designed to remove air contaminants generated by or released from associated equipment
- Refrigeration systems with less than 50 pounds of charge of ozone depleting substances regulated under Title VI, including pressure tanks used in refrigeration systems but excluding any combustion equipment associated with such systems
- Temporary construction activities
- Accidental fires
- Air vents from air compressors
- Fire suppression
- Routine maintenance, repair and replacement such as anticipated activities most often associated with and performed during regularly scheduled equipment outages to maintain a plant and its equipment in good operating condition, including but not limited to steam cleaning, abrasive use and woodworking
- Electric motors
- Storage tanks, reservoirs, transfer and lubricating equipment used for ASTM grade distillate or residual fuels, lubricants and hydraulic fluids
- On-site storage tanks not subject to any New Source Performance Standards (NSPS), including underground storage tanks (UST), storing gasoline or diesel used exclusively for fueling of the facility's fleet of vehicles
- Natural gas, propane and liquefied petroleum gas (LPG) storage tanks and transfer equipment

- Pressurized tanks containing gaseous compounds
- Storm water settling basins
- Health, safety and emergency response activities
- Emergency generators and pumps used only during loss of primary equipment or utility service due to circumstances beyond the reasonable control of the owner or operator, or to address a power emergency as determined by the Department
- Combustion source flame safety purging on startup

EMISSION LIMITS AND STANDARDS, TESTING, MONITORING AND RECORDKEEPING

Based on the information provided in the permit application, DEQ has determined that the following requirements apply to the facility. The monitoring and recordkeeping for each requirement is discussed for each requirement/emissions unit.

Oregon Administrative Rules (OAR) – State only enforceable (not included in SIP)

15. OAR 340-208-0300 prohibits nuisances and 340-208-0450 prohibits the deposition of particulate matter larger than 250 microns in size upon another person's property.

    15.a. Testing Requirements: These standards do not have emission limits so the permit does not include any testing requirements or compliance test methods.
    15.b. Monitoring requirements: Monitoring for these standards consists of maintaining a complaint log and resolving complaints.

16. OAR 340-215-0030 requires greenhouse gas emission reports annually.

Oregon Administrative Rules (OAR) – federally enforceable (included in SIP)

17. OAR 340-208-0110(2) limits visible emissions to 20% opacity. OAR 340-208-0210(1) requires the permittee to take reasonable precautions to minimize fugitive emissions. These standards apply to the entire facility.

    17.a. Testing Requirements: OAR 340-208-0210(1) includes precautionary measures that should prevent excessive visible emissions. Therefore, the permit does not require any testing.
    17.b. Monitoring Requirements: The permittee is required to visually inspect the facility at least once a week to verify that the landfill activities are not causing excess fugitive emissions. Excess fugitive emissions are defined as any visible emissions leaving the facility boundary.

18. OAR 340-222-0041 requires Plant Site Emission Limits for permitted sources. See Section 33 of this review report for a discussion of those limits and associated monitoring.

19. OAR 340-226-0130, highest and best practicable treatment and control, applies to the flare. The operation and maintenance requirements that were established for the flare in the Simple Air Contaminant Discharge Permit are incorporated into the Title V permit.

20. OAR 340-228-0210(2)(b)(B), particulate matter emission limit of 0.14 gr/dscf, applies to the flare. The operation and maintenance requirements identified in Section 19 assure compliance with this limit.

ACDP requirements: (e.g., source specific RACT, BACT, LAER, TACT, highest and best determinations)

21. ACDP Conditions 2.1, 4.1, 6.1 and 7.2 established operation and maintenance requirements, monitoring, recordkeeping and reporting for the flare. These requirements are incorporated into the Title V permit unchanged.

Federal Requirements:

22. New Source Performance Standards in OAR 340-238-0100 applies to the landfill.

23. This facility is subject to NSPS, Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills. The permittee is required to:

    23.a. Submit annual reports of the NMOC emission rate using the calculations and procedures of 40 CFR 60.754(a).
    23.b. Send the collected gas to an open flare (FLR-01 or FLR-02) that has been designed and operated in accordance with 40 CFR 60.18.
    23.c. 40 CFR 60.752((b) requires a landfill gas capture and control system, unless the NMOC emission rate is less than 50 megagrams per year. Currently, the NMOC emission rate from the Knott Landfill is less than 50 megagrams per year, so a capture and control system as specified in the NSPS is not required.

24. This facility is not subject to NSPS, 40 CFR Part 60, Subpart JJJJ – Standards of Performance for Spark Ignition Internal Combustion Engines because there are no proposed SI ICE proposed to be operated at the facility.

25. This facility is subject to NSPS, 40 CFR Part 60, Subpart IIII – Standards of Performance for an emergency stationary Compression Ignition (CI) Internal Combustion Engine (ICE) rated at 250 kW (389 hp) and installed in 2007.

26. The existing 250 kW emergency engine generator set is also subject to 40 CFR Part 63, Subpart ZZZZ, Reciprocating Internal Combustion Engine (RICE) requirements. Compliance with NSPS, Subpart IIII satisfies the compliance requirements of 40 CFR Part 63, Subpart ZZZZ.

27. 40 CFR Part 63, subpart AAAA applies to landfills larger than 2.5 million Mg and NMOC emissions greater than 50 Mg/yr. Knott Landfill is larger than 2.5 million Mg, but the NMOC emissions are less than 50 Mg/yr, so the NESHAP does not apply. The landfill is also not a major source of hazardous air pollutants (HAP).

28. The federal compliance assurance monitoring (CAM) regulations in OAR 340-212-0200 and 40 CFR Part 64 are not applicable to the Knott Landfill because pre-controlled emissions of LFG <100 tpy and there are no other controlled emissions units.

29. The federal Accidental Release Prevention requirements in 40 CFR Part 68 are not applicable because the regulated substances are not used at the facility in the quantities specified by the regulations.

30. The federal Acid Rain requirements in 40 CFR Parts 72, 74 and 75 are not applicable because Knott Landfill is not an “affected facility”.

31. The federal Greenhouse Gas Reporting requirements in 40 CFR Part 98 is applicable to the Knott Landfill.

32. As identified earlier in this Review Report, this facility has insignificant emissions units (IEUs) that include categorically insignificant activities and aggregate insignificant emissions, as defined in OAR 340-200-0020. For the most part, the standards that apply to IEUs are for opacity (20% limit) and particulate matter (0.14 gr/dscf limit). The Department does not consider it likely that IEUs could exceed an applicable emissions limit or standard because IEUs are generally equipment or activities that do not have any emission controls (e.g., small natural gas fired space heaters) and do not typically have visible emissions. Since there are no controls, no visible emissions, and the emissions are less than one ton per year, the Department does not believe that monitoring, recordkeeping or reporting is necessary for assuring compliance with the standards.

PLANT SITE EMISSION LIMITS

33. Provided below is a summary of the baseline emission rates, netting basis, plant site emission limits and emissions capacity.

Pollutant	Baseline Emission Rate (tons/yr)	Netting Basis		Plant Site Emission Limit (PSEL)		
		Previous (tons/yr)	Proposed (tons/yr)	Previous PSEL (tons/yr)	Proposed PSEL (tons/yr)	PSEL Increase (tons/yr)
PM	0	0	0	31	25	-6
PM_{10}	0	0	0	14	14	0
$PM_{2.5}$	0	NA	0	NA	9	NA
CO	0	0	0	99	99	0
NO_x	0	0	0	39	39	0
SO_2	0	0	0	39	39	0
VOC	0	0	0	39	39	0
NMOC	0	0	0	49	49	0
GHG (CO_2e)	58,124	NA	58,124	NA	84,684	NA

33.a. The baseline emission rate and the netting basis are zero because this facility was constructed after the baseline period of 1977-1978 for all pollutants other than GHG, and 2001-2010 for GHG. In addition, the source is not subject to New Source Review (NSR) for Prevention of Significant Deterioration (PSD) under OAR 340-224-0070.

33.b. For GHG, the baseline period was determined as January 2010 through December 2010. The baseline emission rate includes the calculated emissions from landfill gas losses and combustion in the flare during the baseline period. The calculation of the baseline can be reviewed in the Emissions Detail Sheets of this review report. [Definition of *baseline emission rate* in OAR 340-200-0020]

33.c. The emission basis developed with emission factors for the GHG baseline emission rate, existing netting basis, and PSELs are provided in the Emissions Detail Sheets of this review report.

33.d. The difference between the PSEL and the netting basis for GHG is not due to any physical change. The netting basis is equal to the baseline emission rate and the PSEL is based on the capacity of the emission units.

33.e. The proposed PSEL for PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOC and NMOC are equal to the Generic PSEL in accordance with OAR 340-222-0040(1).

33.f. The proposed PSEL for PM is being lowered but remains greater than the Generic PSELs. A source specific PSEL for PM is being set equal to the potential to emit in accordance with OAR 340-222-0041(2).

33.g. The PSEL is a federally enforceable limit on the potential to emit.

SIGNIFICANT EMISSION RATE

34. The PSELs for PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOC and NMOC are not greater than the netting basis by more than the significant emission rate. The increase in GHG emissions over the netting basis is less than the significant emission rate. The PSEL for PM has been lowered by 6 tons from the previous PSEL but remains one ton more than the significant emission rate. An Air Quality Analysis is not required for PM since there is not a state or National Ambient Air Quality Standard promulgated for this pollutant. Thus, no further air quality analysis is required.

HAZARDOUS AIR POLLUTANTS

35. A major source is a facility that has the potential to emit 10 tons/yr or more of any single HAP or 25 tons/yr or more of combined HAPs. This source is not a major source of hazardous air pollutants. According to the Emissions Detail Sheets, the estimated maximum potential to emit of combined HAPs is 7.4 tons per year.

GENERAL BACKGROUND INFORMATION

36. Knott Landfill Recycling and Transfer Facility is currently regulated by a Solid Waste Permit with the Department.

37. This source is located in an area that is in attainment for all pollutants.

38. This source is located within 100 kilometers (62 miles) of the following Class I air quality protection areas: Mt. Jefferson, Mt. Washington, Three Sisters Wilderness Area and Diamond Peak.

COMPLIANCE HISTORY

39. The facility was inspected on the following dates during the last permit term:

Inspection Date	Results of Inspection	Department Actions
03/01/2016	Inspection - In Compliance	No Action Necessary
06/25/2014		
05/31/2012		

Enforcement Date	Enforcement Action	Department Actions
09/20/2013	Warning Letter WL-BND-2013-0128	Excess Emission reported late. Corrective actions taken to ensure compliance with future reporting.
03/19/2012	Warning Letter WL-BND-2012-0024	Deviations in semi-annual report. Corrective actions taken to ensure compliance with future monitoring and reporting requirements.
10/28/2016	Warning Letter WL-BND-2016-1991	Exceeding the 12-month rolling PSEL for PM. Monthly PM emission calculations to be corrected in the renewed permit.

SOURCE TEST RESULTS

The permittee conducted testing to determine the average NMOC concentration of the landfill gas. Testing was conducted in accordance with the procedures in 40 CFR 60.754. The average NMOC concentration (C_{NMOC}) was found to be 313 ppmv (as hexane). The permit includes a requirement to conduct the NMOC testing again by October 27, 2018.

PUBLIC NOTICE

40. This permit was placed on public notice from **Nov. 13, 2016** to **Dec. 19, 2016**. No comments were received in response to the public notice an no changes have been made to the permit. A proposed permit will be sent to EPA for a 45 day review period. DEQ may request and EPA may agree to an expedited review of 5 days if there were no substantive or adverse comments during the comment period.

If EPA does not object in writing, any person may petition the EPA within 60 days after the expiration of EPA's 45-day review period to make such objection. Any such petition must be based only on objections to the permit that were raised with reasonable specificity during the public comment period provided for in OAR 340-218-0210, unless the petitioner demonstrates it was impracticable to raise such objections within such period, or unless the grounds for such objection arose after such period.

APPENDIX A - EMISSIONS DETAIL SHEETS

Uncontrolled Landfill Gas (40 CFR 60.754(1))

$$M_{NMOC} = \sum 2kLoM_i(e^{-kt_i})(C_{NMOC})(3.6x10^{-9}) \quad \text{(eq. 40 CFR 60.754(a)(1)(i))}$$

Where:

Lo = Methane generation potential: 170 m/Mg
k = Methane generation rate: 0.02 $year^{-1}$
M = waste acceptance rate (Mg/yr):
I = year (1 through 31)
t = age of landfill
C_{NMOC} = NMOC concentration: 313 ppmv (as Hexane)

Year	Acceptance Rates		Age of Layer	Total M_{NMOC}	Total M_{NMOC}	VOC	HAPs	H_2S
	tpy	Mg/yr	Years	Mg/yr	tpy			
1972 to 1983			38	1.39	1.5	1.5	0.6	0.09
1984	33447	30342	37	1.50	1.7	1.6	0.6	0.10
1985	35826	32501	36	1.62	1.8	1.8	0.7	0.11
1986	36175	32817	35	1.7	1.9	1.9	0.7	0.11
1987	36665	33262	34	1.87	2.1	2.1	0.8	0.12
1988	40929	37130	33	2.02	2.2	2.2	0.9	0.13
1989	45969	41702	32	2.19	2.4	2.4	0.9	0.14
1990	53115	48185	31	2.39	2.6	2.6	1.0	0.16
1991	46091	41813	30	2.56	2.8	2.8	1.1	0.17
1992	54182	49153	29	2.77	3.1	3.0	1.2	0.18
1993	68570	62205	28	3.05	3.4	3.3	1.3	0.20
1994	68394	62046	27	3.32	3.7	3.7	1.4	0.22
1995	75887	68843	26	3.64	4.0	4.0	1.6	0.24
1996	78379	71104	25	3.97	4.4	4.4	1.7	0.26
1997	95746	86859	24	4.38	4.8	4.8	1.9	0.28
1998	104200	94528	23	4.84	5.3	5.3	2.1	0.31
1999	113132	102631	22	5.34	5.9	5.9	2.3	0.35
2000	113331	102812	21	5.86	6.5	6.4	2.5	0.38
2001	115022	104346	20	6.40	7.1	7.0	2.7	0.42
2002	135531	122951	19	7.04	7.8	7.7	3.0	0.46
2003	143745	130403	18	7.74	8.5	8.5	3.3	0.50
2004	162012	146974	17	8.54	9.4	9.4	3.7	0.56
2005	168336	152711	16	9.39	10.4	10.3	4.0	0.61
2006	186574	169256	15	10.35	11.4	11.4	4.4	0.67
2007	172295	156303	14	11.26	12.4	12.4	4.8	0.73
2008	141714	128560	13	12.02	13.2	13.2	5.2	0.78
2009	116697	105865	12	12.65	13.9	13.9	5.4	0.82
2010	114309	103699	11	13.29	14.7	14.6	5.7	0.86
2011	110509	100252	10	13.92	15.3	15.3	6.0	0.91
2012	112860	102384	9	14.58	16.1	16.0	6.2	0.95
2013	119265	108195	8	15.28	16.8	16.8	6.6	0.99
2014	130618	118494	7	16.07	17.7	17.7	6.9	1.05
2015	144983	131526	6	16.96	18.7	18.6	7.3	1.10
2016	156454	141932	5	17.95	19.8	19.7	7.7	1.17
2017	168970	153287	4	19.03	21.0	20.9	8.2	1.24
2018	182488	165549	3	20.23	22.3	22.2	8.7	1.32
2019	197087	178793	2	21.54	23.7	23.7	9.2	1.40
2020	212854	193097	1	22.99	25.3	25.3	9.9	1.50
2021	229882	208545	0	24.59	27.1	27.0	10.5	1.60

Landfill Gas Emissions with Flare (tons per year)

Facility Operations	NMOC	VOC(1)	HAPs	H_2S
	(tons/yr)			
2021 Total Potential LFG emissions generated (tpy):	27.108	27.027	10.545	1.599
LFG Collection and Flare Loading Rates(2) (tpy):	19.743	19.683	5.273	0.798
Flare emissions (tpy):	0.454	0.453	0.121	0.018
LFG remaining uncontrolled/fugitive emissions (tpy):	7.819	7.796	5.393	0.820

(1) VOCs emissions are estimated to be 99.7% of NMOC, AP-42 Table 2.4-1 Municipal Solid Waste Landfills.
(2) The potential to emit for the pollutants listed above are minimized when combusting the maximum volume of landfill gas at the flare. Conversely, the potential to emit is at the highest when combusting landfill gas at lower flow rates at the flare. The above emissions were calculated to determine the maximum annual potential to emit for these pollutants. Therefore, the lowest operating flow rate of 1000 scfm was used at the flare to determine the potential to emit. See operating scenarios for the flare emission calculations for additional information.

Flare Emissions (AP-42, Section 2.4)

There are two operating scenarios that were used in calculating the maximum potential emissions at the flare and the landfill. These operating scenarios are discussed below:

The first operating scenario is when the flare operates at the lowest operating flow rate of 1000 scfm. Volatile organic compounds (VOCs) and non-methane organic compounds (NMOCs) are emitted at higher fugitive levels when lower landfill gases are collected, controlled and burned at the flare. Therefore, the lowest flare flow rate of 1000 scfm was used to calculate the maximum potential emissions for VOC and NMOC.

The second operating scenario is when the flare operates at the highest operating flow rate of 2000 scfm. The pollutants: NO_x, CO, SO_2, PM, PM_{10} and $PM_{2.5}$ are emitted at their maximum potential levels when the highest operating volume of extracted landfill gases collected, controlled and burned at the flare. Therefore, the highest flare flow rate of 2000 scfm was used to calculate the maximum potential emission for these criteria pollutants.

The following two equations were used in calculating flare emissions for the operating scenarios:

$$E_x = (EF_x /1{,}000{,}000)* Q_{CH4} * 60* H *(1 \text{ ton}/2{,}000 \text{ lb})$$

or

$$E_x = (Cx/1{,}000{,}000 * MW_x / K) * Q_{LFG} * 60* H * (1 - CE) * (1 \text{ ton}/2{,}000 \text{ lb})$$

Where:

E_x = Emission rate for pollutant x (ton/year)
Q_{CH4} = Methane flow rate (scfm)
Q_{LFG} = Flare gas flow rate (scfm)
H = Operating hours (hrs/yr)
EF_x = Emission factor for pollutant x (lb/MMscf CH_4)
C_x = Concentration of pollutant x in LFG (ppmvd)
MW_x = Molecular weight of pollutant x
K = Molar volume at standard conditions (359.05 dscf/lb-mole)
CE = Control efficiency (percent)

Operating Scenario One:

Throughputs:

Maximum LFG flow rate to flare: 1000 scfm
Methane fraction in LFG: 51 percent (AP-42, Section 2.4.4.1 draft 10/08 and LandGEM)
Methane flow rate: 510 scfm
Annual Operation: 8760 hours per year
Flare Control efficiency: 97.7 percent (AP-42, Section 2.4, Table 2.4-3 draft 10/08)

Potential to Emit at Operating Scenario One:

Pollutant	EF	C_x	MW_x	Flare (FLR-02)		Notes:
				Loading	Emissions	
	lb/MMscf CH_4	ppmvd		tons/yr		
VOC	---	312	---	19.68	0.45	AP42 Table 2.4-1 VOCs are 99.7% of NMOC
NMOC	---	313	86.19	19.74	0.45	10/2013 source testing report (40 CFR 60.754(a)(3))
HAPs	---	---	---	5.27	0.12	Speciated flare loading and emission estimates from AP-42, Table 2.4-1 draft 10/08 (see AP-42 table below)
H_2S	---	32	34.08	0.80	0.02	

Operating Scenario Two:

Throughputs:

Maximum LFG flow rate to flare: 2000 scfm
Methane fraction in LFG: 51 percent (AP-42, Section 2.4.4.1 draft 10/08 and LandGEM)
Methane flow rate: 1020 scfm
Annual Operation: 8760 hours per year
Flare Control efficiency: 97.7 percent (AP-42, Section 2.4, Table 2.4-3 draft 10/08)

Potential to Emit at Operating Scenario Two:

Pollutant	EF	C_x	MW_x	Flare (FLR-02) Emissions	Notes:
	lb/MMscf CH_4	ppmvd		tons/yr	
PM	15	---	---	4.02	(AP-42, Section 2.4, Table 2.4-4 draft 10/08)
PM_{10}	15	---	---	4.02	
$PM_{2.5}$	15	---	---	4.02	
NO_x	39	---	---	10.45	
CO	46	---	---	12.33	
SO_2	---	47	64	4.40	AP-42 default sulfur concentration

For calculating the individual and speciated hazardous air pollutants the following throughputs were used:

Throughputs:

Maximum LFG flow rate to flare: 1000 scfm
Methane fraction in LFG: 51 percent (AP-42, Section 2.4.4.1 draft 10/08 and LandGEM)
Methane flow rate: 510 scfm
Annual Operation: 8760 hours per year
Flare Control efficiency: 97.7 percent (AP-42, Section 2.4, Table 2.4-3 draft 10/08)

Flare - Individual HAPs & Speciated NMOC Flare Loading and Emissions (AP-42, Table 2.4-1 draft 10/08)

Compounds	HAP	C_x (ppmvd)	Molecular Weight	Flare Loading	Flare Emissions
				(lb/yr)	
NMOC (as hexane)		131 [a]	86.18	39486.74	908.19
VOC		[b]	NA	39368.28	905.47
1,1,1-Trichloroethane	X	2.43E-01	133.4	47.45	1.09
1,1,2,2-Tetrachloroethane	X	5.35E-01	167.85	131.45	3.02
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	X	3.49E-03	260.76	1.33	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)		6.72E-02	187.37	18.43	0.42
1,1,2-Trichloroethane	X	1.58E-01	133.4	30.85	0.71
1,1-Dichloroethane	X	2.08E+00	98.96	301.32	6.93
1,1-Dichloroethene (1,1-Dichloroethylene)	X	1.60E-01	96.94	22.71	0.52
1,2,3-Trimethylbenzene		3.59E-01	120.19	63.16	1.45
1,2,4-Trichlorobenzene	X	5.51E-03	181.45	1.46	0.03
1,2,4-Trimethylbenzene		1.37E+00	120.19	241.04	5.54
1,2-Dibromoethane (Ethylenedibromide)	X	8.00E-04	187.86	0.22	0.01
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)		1.06E-01	170.92	26.52	0.61
1,2-Dichloroethane (Ethylenedichloride)	X	1.59E-01	98.96	23.03	0.53
1,2-Dichloroethene		1.14E+01	96.94	1617.74	37.21
1,2-Dichloropropane	X	5.20E-02	12.99	0.99	0.02
1,2-Diethylbenzene		1.99E-02	134.22	3.91	0.09
1,3,5-Trimethylbenzene		6.23E-01	120.19	109.61	2.52
1,3-Butadiene (Vinyl ethylene)	X	1.66E-01	54.09	13.14	0.30
1,3-Diethylbenzene		6.55E-02	134.22	12.87	0.30
1,4-Diethylbenzene		2.62E-01	134.22	51.48	1.18
1,4-Dioxane (1,4-Diethylenedioxide)	X	8.29E-03	8.11	9.8E-02	2.3E-03
1-Butene / 2-Methylbutene		1.22E+00	70.13	125.25	2.88
1-Butene / 2-Methylpropene		1.10E+00	56.11	90.35	2.08
1-Ethyl-4-methylbenzene (4-Ethyltoluene)		9.89E-01	120.19	174.01	4.00
1-Ethyl-4-methylbenzene (4-Ethyltoluene) + 1,3,5-Trimethylbenzene		5.79E-01	120.19	101.87	2.34
1-Heptene		6.25E-01	98.19	89.84	2.07
1-Hexene / 2-Methyl-1-pentene		8.88E-02	84.16	10.94	0.25
1-Methylcyclohexene		2.27E-02	96.17	3.20	0.07
1-Methylcyclopentene		2.52E-02	82.14	3.03	0.07
1-Pentene		2.20E-01	70.13	22.59	0.52
1-Propanethiol (n-Propyl mercaptan)		1.25E-01	76.16	13.94	0.32
2,2,3-Trimethylbutane		9.19E-03	100.2	1.35	0.03
2,2,4-Trimethylpentane	X	6.14E-01	114.23	102.67	2.36
2,2,5-Trimethylhexane		1.56E-01	128.26	29.29	0.67
2,2-Dimethylbutane		1.56E-01	86.18	19.68	0.45
2,2-Dimethylpentane		6.08E-02	100.2	8.92	0.21
2,2-Dimethylpropane		2.74E-02	72.15	2.89	0.07

Compounds	HAP	C_x (ppmvd)	Molecular Weight	Flare Loading	Flare Emissions
				(lb/yr)	
2,3,4-Trimethylpentane		3.12E-01	114.23	52.17	1.20
2,3-Dimethylbutane		1.67E-01	86.18	21.07	0.48
2,3-Dimethylpentane		3.10E-01	100.2	45.47	1.05
2,4-Dimethylhexane		2.22E-01	114.23	37.12	0.85
2,4-Dimethylpentane		1.00E-01	100.2	14.67	0.34
2,5-Dimethylhexane		1.66E-01	114.23	27.76	0.64
2,5-Dimethylthiophene		6.44E-02	112.19	10.58	0.24
2-Butanone (Methyl ethyl ketone)	X	4.01E+00	72.11	423.29	9.74
2-Ethyl-1-butene		1.77E-02	84.16	2.18	0.05
2-Ethylthiophene		6.29E-02	112.19	10.33	0.24
2-Ethyltoluene		3.23E-01	120.19	56.83	1.31
2-Hexanone (Methyl butyl ketone)		6.13E-01	100.16	89.88	2.07
2-Methyl-1-butene		1.79E-01	70.13	18.38	0.42
2-Methyl-1-propanethiol (Isobutylmercaptan)		1.70E-01	90.19	22.44	0.52
2-Methyl-2-butene		3.03E-01	70.13	31.11	0.72
2-Methyl-2-propanethiol (tert-Butylmercaptan)		3.25E-01	90.19	42.91	0.99
2-Methylbutane		2.26E+00	72.15	238.70	5.49
2-Methylheptane		7.16E-01	114.23	119.73	2.75
2-Methylhexane		8.16E-01	100.2	119.69	2.75
2-Methylpentane		6.88E-01	86.18	86.80	2.00
2-Propanol (Isopropyl alcohol)		1.80E+00	60.1	158.36	3.64
3,6-Dimethyloctane		7.85E-01	142.28	163.50	3.76
3-Ethyltoluene		7.80E-01	120.19	137.23	3.16
3-Methyl-1-pentene		6.99E-03	84.16	0.86	0.02
3-Methylheptane		7.63E-01	114.23	127.59	2.93
3-Methylhexane		1.13E+00	100.2	165.75	3.81
3-Methylpentane		7.40E-01	86.18	93.36	2.15
3-Methylthiophene		9.25E-02	98.17	13.29	0.31
4-Methyl-1-pentene		2.33E-02	84.16	2.87	0.07
4-Methyl-2-pentanone (MIBK)	X	8.83E-01	100.16	129.47	2.98
4-Methylheptane		2.49E-01	114.23	41.64	0.96
Acetaldehyde	X	7.74E-02	44.05	4.99	0.11
Acetone		6.70E+00	58.08	569.64	13.10
Acetonitrile		5.56E-01	41.05	33.41	0.77
Acrylonitrile	X	BDL	53.06	0.00	0.00
Benzene	X	2.40E+00	78.11	274.42	6.31
Benzyl chloride	X	1.81E-02	126.58	3.35	0.08
Bromodichloromethane		8.78E-03	163.83	2.11	0.05
Bromomethane (Methyl bromide)	X	2.10E-02	94.94	2.92	0.07
Butane		6.22E+00	58.12	529.20	12.17
Carbon disulfide	X	1.47E-01	76.14	16.38	0.38
Carbon monoxide		2.44E+01	28.01	1000.47	23.01
Carbon tetrachloride	X	7.98E-03	153.82	1.80	0.04
Carbon tetrafluoride (Freon 14)		1.51E-01	88	19.45	0.45
Carbonyl sulfide (Carbonoxysulfide)	X	1.22E-01	60.08	10.73	0.25
Chlorobenzene	X	4.84E-01	112.56	79.75	1.83
Chlorodifluoromethane (Freon 22)		7.96E-01	86.47	100.76	2.32
Chloroethane (Ethyl chloride)	X	3.95E+00	64.51	373.01	8.58
Chloromethane (Methyl chloride)	X	2.44E-01	50.49	18.03	0.41

Compounds	HAP	C_x (ppmvd)	Molecular Weight	Flare Loading	Flare Emissions
				(lb/yr)	
cis-1,2-Dichloroethene		1.24E+00	96.94	175.96	4.05
cis-1,2-Dimethylcyclohexane		8.10E-02	112.21	13.31	0.31
cis-1,3-Dichloropropene		3.03E-03	110.97	0.49	0.01
cis-1,3-Dimethylcyclohexane		5.01E-01	112.21	82.29	1.89
cis-1,4-Dimethylcyclohexane/trans-1,3-Dimethylcyclohexane		2.48E-01	112.21	40.74	0.94
cis-2-Butene		1.05E-01	56.11	8.62	0.20
cis-2-Heptene		2.45E-02	98.19	3.52	0.08
cis-2-Hexene		1.72E-02	84.16	2.12	0.05
cis-2-Octene		2.20E-01	112.21	36.14	0.83
cis-2-Pentene		4.79E-02	70.13	4.92	0.11
cis-3-Methyl-2-pentene		1.79E-02	84.16	2.21	0.05
Cyclohexane		1.01E+00	84.16	124.43	2.86
Cyclohexene		1.84E-02	82.14	2.21	0.05
Cyclopentane		2.21E-02	70.13	2.27	0.05
Cyclopentene		1.21E-02	68.12	1.21	0.03
Decane		3.80E+00	142.28	791.46	18.20
Dibromochloromethane		1.51E-02	208.28	4.60	0.11
Dibromomethane (Methylenedibromide)		8.35E-04	173.84	0.21	0.00
Dichlorobenzene	X	9.40E-01	147	202.28	4.65
Dichlorodifluoromethane (Freon 12)		1.18E+00	120.91	208.85	4.80
Dichloromethane (Methylenechloride)	X	6.15E+00	84.93	764.60	17.59
Diethyl sulfide		8.62E-02	90.19	11.38	0.26
Dimethyl disulfide		1.37E-01	94.2	18.89	0.43
Dimethyl sulfide		5.66E+00	62.14	514.86	11.84
Dodecane (n-Dodecane)		2.21E-01	170.33	55.10	1.27
Ethane		9.05E+00	30.07	398.37	9.16
Ethanol		2.30E-01	46.07	15.51	0.36
Ethyl acetate		1.88E+00	88.11	242.48	5.58
Ethyl mercaptan (Ethanediol)		1.98E-01	62.14	18.01	0.41
Ethyl methyl sulfide		3.67E-02	76.16	4.09	0.09
Ethylbenzene	X	4.86E+00	106.17	755.33	17.37
Formaldehyde	X	1.17E-02	30.03	0.51	0.01
Heptane		1.34E+00	100.2	196.55	4.52
Hexane	X	3.10E+00	86.18	391.08	8.99
Hydrogen sulfide		3.20E+01	34.08	1596.43	36.72
Indane (2,3-Dihydroindene)		6.66E-02	34.08	3.32	0.08
Isobutane (2-Methylpropane)		8.16E+00	58.12	694.25	15.97
Isobutylbenzene		4.07E-02	134.22	8.00	0.18
Isoprene (2-Methyl-1,3-butadiene)		1.65E-02	68.12	1.65	0.04
Isopropyl mercaptan		1.75E-01	76.16	19.51	0.45
Isopropylbenzene (Cumene)	X	4.30E-01	120.19	75.65	1.74
Mercury (total)	X	1.22E-04	200.59	3.6E-02	8.2E-04
Mercury (elemental)	X	7.70E-05	200.59	2.3E-02	5.2E-04
Mercury (monomethyl)	X	3.84E-07	216.63	1.2E-04	2.8E-06
Mercury (dimethyl)	X	2.53E-06	258.71	9.6E-04	2.2E-05
Methanethiol (Methyl mercaptan)		1.37E+00	48.11	96.48	2.22
Methyl tert-butyl ether (MTBE)	X	1.18E-01	88.15	15.23	0.35
Methylcyclohexane		1.29E+00	98.19	185.42	4.26
Methylcyclopentane		6.50E-01	84.16	80.08	1.84

Compounds	HAP	C_x (ppmvd)	Molecular Weight	Flare Loading	Flare Emissions
				(lb/yr)	
Naphthalene	X	1.07E-01	128.17	20.08	0.46
n-Butylbenzene		6.80E-02	134.22	13.36	0.31
Nonane		2.37E+00	128.26	444.98	10.23
n-Propylbenzene (Propylbenzene)		4.13E-01	120.19	72.66	1.67
Octane		1.08E+00	114.23	180.59	4.15
p-Cymene(1-Methyl-4-lsopropylbenzene)		3.58E+00	134.22	703.40	16.18
Pentane		4.46E+00	72.15	471.06	10.83
Propane		1.55E+01	44.1	1000.62	23.01
Propene		3.32E+00	42.08	204.51	4.70
Propyne		3.80E-02	40.06	2.23	0.05
sec-Butylbenzene		6.75E-02	134.22	13.26	0.31
Styrene (Vinylbenzene)	X	4.11E-01	104.15	62.66	1.44
Tetrachloroethylene (Perchloroethylene)	X	2.03E+00	165.83	492.79	11.33
Tetrahydrofuran (Diethylene oxide)		9.69E-01	72.11	102.29	2.35
Thiophene		3.49E-01	84.14	42.99	0.99
Toluene (Methyl benzene)	X	2.95E+01	92.14	3978.97	91.52
trans-1,2-Dichloroethene		2.87E-02	96.94	4.07	0.09
trans-1,2-Dimethylcyclohexane		4.04E-01	112.21	66.36	1.53
trans-1,3-Dichloropropene		9.43E-03	110.97	1.53	0.04
trans-1,4-Dimethylcyclohexane		2.05E-01	112.21	33.67	0.77
trans-2-Butene		1.04E-01	56.11	8.54	0.20
trans-2-Heptene		2.50E-03	98.19	0.36	0.01
trans-2-Hexene		2.06E-02	84.16	2.54	0.06
trans-2-Octene		2.41E-01	112.21	39.59	0.91
trans-2-Pentene		3.47E-02	70.13	3.56	0.08
trans-3-Methyl-2-pentene		1.55E-02	84.16	1.91	0.04
Tribromomethane (Bromoform)	X	1.24E-02	252.73	4.59	0.11
Trichloroethylene (Trichloroethene)	X	8.28E-01	131.39	159.25	3.66
Trichlorofluoromethane (Freon 11)		2.48E-01	137.37	49.87	1.15
Trichloromethane (Chloroform)	X	7.08E-02	119.38	12.37	0.28
Undecane		1.67E+00	156.31	382.12	8.79
Vinyl acetate	X	2.48E-01	86.09	31.25	0.72
Vinyl chloride (Chloroethene)	X	1.42E+00	62.5	129.92	2.99
Xylenes (o-, m-, p-, mixtures)	X	9.23E+00	106.17	1434.51	32.99
Total Hazardous Air Pollutants [c] (HAPs) (tons/yr) using AP-42 Table 2.4-1				5.27	0.121
Total NMOC [a] (tons/yr)				19.74	0.454
Total VOC [b] (tons/yr)				19.68	0.453
Total H_2S [d] (ton/yr)		32	34.08	0.80	0.02

NOTE: This is not an all-inclusive list of potential LFG constituents, only those for which test data were available at multiple sites (AP-42 Section 2.4).

a – The measured NMOC at 313 ppmvd is used based on the October 2013 source testing results per the tier 2 sampling and analysis procedures provided in 40 CFR 60.754(a)(3).

b - Total VOC is calculated as 99.7% of the actual NMOC, based on AP-42 Table 2.4-1 Municipal Solid Waste Landfills.

c - The HAPs Loading Rate to the flare is calculated to be 38.9% based on the total speciated flare loading rate for HAPs and the Total NMOC Loading Rate (ton/yr) - sum of speciated compounds.

d - The H_2S Loading Rate to the flare is calculated to be 5.9% based on the H_2S flare loading rate and the Total NMOC Loading Rate (ton/yr) - sum of speciated compounds.

Compost Pile Emissions

Volatile Organic Compounds (VOCs)

E = EF x M/2000

Where:

E = VOC emissions (tpy)
EF = VOC emission factor
1.78 lb/ton of material (SCAQMD, table 2-3 Windrow Emission Factors in the Technical Assessment for Proposed Rule1133, March, 2002 and Final Staff Report for Proposed Rule 1133, 1133.1, and 1133.2, January 2003)
M = material throughput (tons/yr)
23,000 cubic yards in 2008
1,000 lb/cubic yard
16,787 tons in 2016
1.34 growth factor
22,495future projected ton/yr

Emissions (E) = 20.0 tons/yr of VOC

Petroleum Contaminated Soil (PCS) Emissions

Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs)

E = EF x M/2000

Where:

E = VOC and HAP emissions (tpy)
EF = VOC/HAP emission factor
0.25 lb/ton of material (factor in Columbia Ridge Landfill estimate based on sample 2008 PCS disposal documentation at Knot Landfill. Assume all VOCs are HAPs.
M = material throughput (tons/yr)
15,000 tons per year

Emissions (E) = 1.88 tons/yr of HAPs/VOCs

Material Handling Emissions

Cover soil (H-1) and aggregate (H-2) PM, PM_{10}, and $PM_{2.5}$

AP-42, Section 13.2.4

$E = k * 0.0032 * [(U/5)^{1.3}/(M/2)^{1.4}]$ EQ:

Where:

EF = emission factor (lb/VMT)
k = aerodynamic particle size multiplier (AP-42, section 13.2.4)
0.74 cover soil and aggregate for PM
0.35 cover soil and aggregate for PM_{10}
0.053 cover soil and aggregate for $PM_{2.5}$
U = mean wind speed (6.4 mph)
M = material moisture content (%)
4.8% for cover soil (H-1)
0.7% for aggregate (H-2)

Emission Factors derived from Equation in AP-42, Section 13.2.4:

Material	PM	PM_{10}	$PM_{2.5}$
	(pounds/ton)		
H-1 Cover Soil	0.0009582	0.0004532	$6.86x10^{-5}$
H-2 Aggregate	0.0141925	0.0067127	0.0010165

Facility Operations:

Operational Information	H-1	H-2	H-1&2
Number of Processes	4	4	
MSW (tons/yr)	189912	189912	
Ration agg/soil	1	0.08	
Soil/MSW (yd^3/ton)	0.9445	0.9445	
Material (yd^3/yr)	179372	14350	
Density (lb/yd^3)	1854	1854	
Throughput (tons/yr)	166278	13302	
Control (5)	69	0	
PM emissions (tpy)	0.10	0.38	0.48
PM_{10} emissions (tpy)	0.05	0.18	0.23
$PM_{2.5}$ emissions (tpy)	0.007	0.027	0.034

Grading Processes (H-3) PM, PM_{10} and $PM_{2.5}$
AP-42, Section 11.9.2

$E_{TSP} = 0.040 * S^{2.5}$ Table 11.9-1 Grading
$E_{PM15} = 0.051 * S^2$
$E_{PM10} = 0.6 * E_{PM15}$
$E_{PM2.5} = 0.031 * E_{PM15}$

Where: S = 7.1 mph mean wind speed (mph)

Emission Factors derived from Equations in AP-42, Section 11.9.2:

Pollutant	Emission Factor (lb/VMT)
PM	5.4
PM_{10}	1.5
$PM_{2.5}$	0.08

Facility Operations:

Equipment hours (hours/year)	13,500 hours
Usage factor (%)	0.4 %
Throughput (VMT/yr)	383.4 VMT/yr
Control (%) *	61 %

* watering - SCAQMD Table XI-A; construction activities (4/07)

Total Potential Emissions:

Pollutant	Grading Processes H-3
PM	0.40
PM_{10}	0.12
$PM_{2.5}$	0.01

Miscellaneous Handling Processes (H-4) PM, PM_{10}, and $PM_{2.5}$
SCAQMD, CDEQA Handbook Table A9-9-F, Dirt Pushing or Bulldozing Operations

$$EF = 0.45 * 2.2046 * (G^{1.5}/H^{1.4})$$

Where:
EF emission factor (lb/hr)
G = 7.5% Silt Content (%)
H = 12% moisture Content (%)

Emission Factors (Ratio of PM/PM10 = 2.11 (AP-42, section 13.2.4 k ratio)):

Pollutant	Emission Factor (lb/hour)
PM	1.33
PM_{10}	0.63
$PM_{2.5}$	0.088

Facility Operations:

Equipment hours (hours/year)	13500 hours
Usage factor (%)	50
Throughput (hours/yr)	6750 hrs/yr
Control (%) *	61 %

* watering - SCAQMD Table XI-A; construction activities (4/07)

Emissions:

Pollutant	Grading Processes H-3 (tons/yr)
PM	1.75
PM_{10}	0.83
$PM_{2.5}$	0.12

Unpaved Road Emission Calculations
AP-42, Section 13.2.2

$$EF = k * (s/12)^a * (W/3)^b * (365-p)/365$$ EQs: (1.a.) and (2) combined

Where:
EF =emission factor (lb/VMT)
k = empirical constant (AP-42, table 13.2.2-2, industrial roads)
s = surface material silt content (%) (AP-42, table 13.2.2-1, MSW disposal routes, mean value)
a = empirical constant (AP-42, table 13.2.2-2, industrial roads)
b = silt empirical constant (AP-42, table 13.2.2-2, industrial roads)

Pollutant	Empirical Constant Values			
	k	s	a	b
PM	4.9	6.4	0.7	0.45
PM_{10}	1.5		0.9	
$PM_{2.5}$	0.15		0.9	

W = mean vehicle weight:

Type	Vehicle Type and Weight			
	Public	Franchise	Transfer	Various
	Mean Vehicle Weight (tons)			
Loaded	4.25	23.44	37.22	24.56
Unloaded	3.7	15.8	24	10

P = Number of days with =>0.01 inch of precipitation: 78.3 days
(monthly mean and extremes, Bend 1971-2000, http://www.ocs.orst.edulpub_ftp/climate_data/mme2/mme0694.html)

Emission Factors derived from Equations in AP-42, Section 13.2.2.

Pollutant	Vehicle Type			
	Public	Franchise	Transfer	Various
	(Pounds/Vehicle Miles Traveled)			
PM	2.81	5.77	7.05	5.45
PM_{10}	0.76	1.56	1.90	1.47
$PM_{2.5}$	0.08	0.16	0.19	0.15

Facility Operations:

Operational Information	Vehicle Type			
	Public	Franchise	Transfer	Various
Distance (miles/trip or mph)	0	1	1	15
2008 trips/year or hours/year	77897	16583	2202	13500
Growth factor or usage factor	1.34	1.34	1.34	14
Throughput (VMT/yr)	0	22221	2951	28350
Control 1 (dust suppressant)	84	84	84	84
Control 2 (water)	55	55	55	55

Unpaved Road Emissions

Pollutant	Public	Franchise	Transfer	Various	Total
	(tons/year)				
PM	0.00	4.62	0.75	5.56	10.93
PM_{10}	0.00	1.25	0.20	1.50	2.95
$PM_{2.5}$	0.00	0.12	0.02	0.15	0.30

Paved Road Emission Calculations

AP-42, Section 13.2.1 (January 2011)

$$EF = [k\ (sL)^{0.91} * (W)^{1.02}](1-P/4N) \qquad EQ\ (2)$$

Where:

EF =emission factor (lb/VMT)
k = particle size multiplier
0.011 PM (AP-42, Table 13.2.1-1)
0.0022 PM10 (AP-42, Table 13.2.1-1)
0.00054 PM2.5 (AP-42, Table 13.2.1-1)

sL = silt loading (g/m^3): 1.36 g/m^3 (engineering estimate, low range AP-42, Table 13.2.1-3)

W = mean vehicle weight (see unpaved road worksheet)
3.975 tons, public vehicles
19.62 tons, franchise vehicles
30.61 tons, transfer vehicles

P = Number of days with =>0.01 inch of precipitation: 78.3 days
N = one year averaging period of 365 days

Emission Factors Derived from EQ 2. (lb/VMT):

Pollutant	Vehicle Type		
	Public	Franchise	Transfer
	(Pounds/Vehicle Miles Traveled)		
PM	0.056	0.2868	0.451
PM_{10}	0.011	0.057	0.090
$PM_{2.5}$	0.003	0.014	0.022

Facility Operations:

Operational Information	Vehicle Type		
	Public	Franchise	Transfer
distance (miles/trip)	2.18	1.43	0
trips/yr	77897	16583	2045
growth factor	1.34	1.34	1.34
throughput (VMT/yr)	227553	31776	0
control (sweeping)	42.5	42.5	42.5

Paved Road Emissions

Pollutant	Public	Franchise	Transfer	Total
	(tons/year)			
PM	3.68	2.62	0.00	6.30
PM_{10}	0.74	0.52	0.00	1.26
$PM_{2.5}$	0.18	0.13	0.00	0.31

Total Hazardous Air Pollutants (HAPs):

Emission Unit	HAPs (tons/yr)
Landfill gas (LFG-01)	5.39
Flare (FLR-02)	0.12
Petroleum contaminated soil (PCS-01)	1.88
Total HAPs (tons/yr):	7.39

Total Potential Emissions:

Emission Unit	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC	NMOC	GHG
	(tons/year)								
Landfill Gas (LFG-01)							7.80	7.82	51,612
Flare (FLR-02)	4.02	4.02	4.02	4.40	10.45	12.33	0.45	0.45	30,316
Compost piles (COM-01)							20.02		
Petroleum contaminated soil (PCS-01)							1.88		
Material Handling (MH-01) H-1	0.10	0.05	0.01						
Material Handling (MH-01) H-2	0.38	0.18	0.03						
Material Handling (MH-01) H-3	0.40	0.12	0.01						
Material Handling (MH-01) H-4	1.75	0.83	0.12						
Unpaved roads (UPR-01)	10.9	2.95	0.30						
Paved roads (PRD-01)	6.30	1.26	0.31						
Aggregate Insignificant	1	1	1	1	1	1	1.00		2,756
Total Emissions	24.9	10.4	5.8	5.4	11.5	13.3	31.1	8.3	84,684
Plant Site Emission Limits (PSELs)	25	14	9	39	39	99	39	49	84,684

The maximum potential emissions for VOC and NMOC were calculated using the lowest operating flow rates of 1000 scfm to the flare (FLR-01) for an entire year.
The maximum potential emissions for PM, PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO were calculated using highest operating flow rates of 2000 scfm to the flare (FLR-01) for an entire year.
The proposed PSELs for PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOC and NMOC are set equal to the Generic PSEL in accordance with OAR 340-222-0040(1). The PSELs for PM and GHG are set their potential to emit.

Fugitive Emissions Factors	PM	PM_{10}	$PM_{2.5}$
	lb/ton waste accepted		
*Projected average waste acceptance = 191,289 tons	0.21	0.06	0.01

*Projected average waste acceptance weight was calculated from 2016 through 2021. The ratio of fugitive particulates to annual waste acceptance was calculated by: Taking the sum of all fugitive emissions (lbs/yr) and dividing by the average waste acceptance to obtain the pounds of fugitive particulates generated per ton of waste accepted by the landfill.

Greenhouse Gas (GHG CO_{2e}) Total Potential Emissions

GHG CO_2e - Landfill Gas Fugitive Emissions:

Emission Source	2021 Emissions	
EPA LandGEM - CO_2	19,693	tons/yr
EPA LandGEM - CH_4	7,470	

Pollutants	Operating Parameter		Emission Factor		Emissions
			GWP	Emission Factor Reference	tons/yr
Fugitive - CO_2	4,923	tons/yr	1	EPA 40 CFR Part 98, Subpart C	4,923
Fugitive - CH_4	1,868		25		46,689
Total Fugitives From Landfill GHG CO_2e Emissions:					**51,612**

1. Assumes 25% of the landfill gas generated in 2021 is lost to the atmosphere as a fugitive gas.
2. GWP – Global Warming Potential

GHG CO_2e - Flare (FLR-02) Emissions:

Emission Source	2021 Emissions			
EPA LandGEM - CO_2	19,693	tons/yr		
EPA LandGEM - CH_4	1.016E+7	m^3/yr	344.7	MMcf/yr

Pollutants	Operating Parameter		Emission Factor			Emissions
			EF	EF Units	Emission Factor Reference	tons/yr
Flare (LFG-01) CO_2	14,768	tons/yr	1	GWP	EPA 40 CFR Part 98, Subpart C	14,768
Flare (LFG-01) CH_4	258.5	MMcf/yr	60.14	tons/MMscf		15,547
Total Landfill Flare GHG CO_2e Emissions:						**30,316**

1. Assumes 75% of the landfill gas generated in 2021 is collected and sent to the LFG-02 flare.
2. GWP – Global Warming Potential

GHG CO_2e Baseline Emission Calculations:

Year	GHG CO_2e Emissions	
	Metric Tonnes	Short Tons
2010	**52,729**	**58,124**
2009	51,085	56,312
2008	48,839	53,836
2007	45,850	50,541
2006	42,476	46,822
2005	39,449	43,485
2004	36,505	40,240
2003	33,917	37,387
2002	31,465	34,684
2001	29,430	32,441
2000	27,392	30,195

GHG CO_2e baseline calculations were based on LandGEM data assuming the following:

1. Assumes 25% of all landfill gas generated for each year was lost to the atmosphere as a fugitive gas, and
2. Assumes 75% of all landfill gas generated for each year was collected and sent to the LFG-01 flare for combustion.