TECHNICAL SUPPORT DOCUMENT

Air Discharge Permit 22-3509
Air Discharge Permit Application CO-1047

Issued: April 20, 2022

COWLITZ COUNTY HEADQUARTERS LANDFILL

SWCAA ID – 2121

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ABBREVIATIONS

List of Acronyms

ADP ..... Air Discharge Permit
AP-42 ..... Compilation of Emission Factors, AP-42, 5th Edition, Volume 1, Stationary Point and Area Sources – published by EPA
ASIL..... Acceptable Source Impact Level
BACT..... Best available control technology
BART ..... Best Available Retrofit Technology
CAM ..... Compliance Assurance Monitoring
CAS No. ..... Chemical Abstracts Service registry number
CFR..... Code of Federal Regulations
EPA..... U.S. Environmental Protection Agency
EU ..... Emission Unit
LAER..... Lowest achievable emission rate
MACT..... Maximum Achievable Control Technologies
NESHAP..... National Emission Standards for Hazardous Air Pollutants
NSPS..... New Source Performance Standard
PSD..... Prevention of Significant Deterioration
RACT..... Reasonably Available Control Technology
RCW ..... Revised Code of Washington
SQER ..... Small Quantity Emission Rate listed in WAC 173-460
Standard ..... Standard conditions at a temperature of 68°F (20°C) and a pressure of 29.92 in Hg (760 mm Hg)
SWCAA ..... Southwest Clean Air Agency
T-BACT ..... Best Available Control Technology for toxic air pollutants
WAC ..... Washington Administrative Code

List of Units and Measures

µm ..... Micrometer (10^{-6} meter)
acfm ..... Actual cubic foot per minute
lb/hr.....Pounds per hour
tpy .....Tons per year

List of Chemical Symbols, Formulas, and Pollutants

CO ..... Carbon monoxide

CO_2 ..... Carbon dioxide

CO_2e ..... Carbon dioxide equivalent

HAP ..... Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act

NO_X ..... Nitrogen oxides

O_2 ..... Oxygen

PM ..... Particulate Matter with an aerodynamic diameter 100 µm or less

PM_{10} ..... PM with an aerodynamic diameter 10 µm or less

$PM_{2.5}$ ..... PM with an aerodynamic diameter 2.5 µm or less

SO_2 ..... Sulfur dioxide

SO_X ..... Sulfur oxides

TAP ..... Toxic air pollutant pursuant to Chapter 173-460 WAC

VOC ..... Volatile organic compound

Terms not otherwise defined have the meaning assigned to them in the referenced regulations or the dictionary definition, as appropriate.

1. FACILITY IDENTIFICATION

Applicant Name:	Cowlitz County Department of Public Works
Applicant Address:	1600 South Thirteenth Avenue Kelso, WA 98626
Facility Name:	Cowlitz County Headquarters Landfill
Facility Address:	3434 South Silver Lake Road Castle Rock, WA 98611
SWCAA Identification:	2121
Contact Person:	Dan Bales
Primary Process:	Municipal and industrial solid waste landfill
SIC/NAICS Code:	4953: Refuse Systems 562212: Solid Waste Landfill
Facility Classification:	Natural Minor, subject to Title V via 40 CFR 60 Subpart WWW

2. FACILITY DESCRIPTION

The Headquarters Landfill was originally constructed in 1993 as an industrial waste landfill. The facility is permitted to cover an area of 308 acres, with additional area for ancillary facilities and has an estimated total site waste capacity of 54.8 million cubic yards. Although the projected waste quantity beginning 2018 is 490,000 tons of waste placement, the solid waste permit could allow significantly more waste placement annually. Cowlitz County noted in their draft EIS that if these higher waste placement rates occurred and increased the landfill gas generation rate above the permitted rates, a modification of the Air Discharge Permit would be necessary.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit (ADP) application number CO-1047 received February 24, 2022. ADP application CO-1047 requests the following:

- To use the former landfill generator engine (which was replaced in 2015 with the current landfill generator engine) as a backup power source for the shop and landfill office; and
- To repurpose a portable generator set as a permanent backup power source at the leachate pump house.
- Removal of references to the caustic scrubber that was removed from service in 2018.

SWCAA proposes the following modifications:

- Removal of the requirement to maintain a maximum nitrogen, oxygen at landfill gas wells, and modification of the maximum temperature of the gas at the wellhead from 55°C to 62.8°C. This change is consistent with the updates to 40 CFR 63 Subpart AAAA and the new Federal Plan applicable to this landfill (40 CFR 62 Subpart OOO).
- Removal of the requirement to submit startup, shutdown, and malfunction reports. This requirement was removed from 40 CFR 63 Subpart AAAA.
- Exempting unplanned landfill gas collection and control system outages lasting no longer than four hours per incident and 24 hours per year from the requirement to operate the system "at all times."

ADP 22-3509 will supersede ADP 15-3157R1 in its entirety.

4. PROCESS DESCRIPTION

The Headquarters Landfill was originally constructed in 1993 as an industrial waste landfill. The facility is permitted to cover an area of 308 acres, with additional area for ancillary facilities. The facility was permitted in 1992 with a capacity of 50 million cubic yards; however, Cowlitz County has estimated the planned total site waste capacity at 54.8 million cubic yards. Cowlitz County reports that the increase in the capacity estimate is primarily a result of refined engineering calculations related to slope stability. Although the projected annual waste receipt beginning 2018 is 490,000 tons of waste placement, the solid waste permit could allow significantly more waste placement annually. Cowlitz County noted in their draft EIS that if these higher waste placement rates occurred and increased the landfill gas generation rate above the permitted rates, a modification of the Air Discharge Permit would be necessary.

The facility has the ability to accept municipal solid waste, as well as the industrial waste the landfill was originally permitted for, including boiler ash, paper recycling rejects (clay binders, short fibers), pulp mill lime wastes, lime stabilized activated wastewater sludge from the Weyerhaeuser Longview facility, petroleum contaminated soils, and construction and demolition debris. The first municipal waste was placed March 13, 2014.

Wastes are received by truck. Leachate is collected on-site in ponds lined with impervious materials and is primarily pumped off-site via pipeline, with additional trucking during heavy rain events.

Landfill gas collected from vertical wells and subsurface horizontal collection piping is directed to two enclosed flares. Bottom-liner horizontal collectors and horizontal interim collectors will be installed to collect landfill gas initially in each cell. Sixty foot deep vertical landfill gas collection wells will be installed on a trial basis when the waste depth is sufficient to support this type of well. A series of horizontal surface collectors will be installed under the final cover material to capture landfill gas that migrates to the surface of the landfill. The spacing of wells, the number of wells, and the vacuum on each well will be modified as necessary to assure optimum capture of landfill gas and meet the landfill gas capture requirements of 40 CFR 60 Subpart WWW and 40 CFR 63 Subpart AAAA.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a. Landfill and Flares (existing)

These emission units (one for each enclosed flare) consist of the active and closed landfill that will eventually cover an area of 308 acres and has an estimated waste capacity of approximately 54.8 million cubic yards (net waste volume) and the landfill gas control system. The Headquarters Landfill is located in Cowlitz County, Washington, at 3434 South Silver Lake Road in Castle Rock. The landfill is approximately 10 miles northeast of Kelso, 6 miles east of Interstate 5, and 2 miles south of Silver Lake. It is in Sections 22, 23, 24, and 26 of Township 9 North, Range 1 West, Willamette Meridian.

Landfill gas collected from vertical wells and subsurface horizontal collection piping will be directed to one or more enclosed flares. Bottom-liner horizontal collectors and horizontal interim collectors will be installed to collected landfill gas initially when possible. 60' vertical landfill gas collection wells will be installed on a trial basis when the waste depth is sufficient to support this type of well. A series of horizontal surface collectors will be installed under the final cover material to capture landfill gas that migrates to the surface of the landfill. The spacing of wells, the number of wells, and the vacuum on each well will be modified as necessary to assure optimum capture of landfill gas and meet the landfill gas capture requirements of 40 CFR 60 Subpart WWW.

Fugitive dust from haul roads will be controlled by wet suppression or paving as necessary. Interim tarps will be applied to inactive areas of the landfill that are not closed. The tarps will minimize the opportunity for windblown dust during dry periods and minimize the amount of leachate generated from rainfall during wet periods. Areas of the landfill with final cover will be seeded to prevent wind erosion.

The first municipal waste was placed in the landfill March 13, 2014.

Flares
Two identical enclosed flares have been installed to burn landfill gas. This will allow the combustion of up to 2,000 scfm of landfill gas.

Make / Model:	Perennial Energy (PEI) / 30 MMBtu/hr
Capacity:	3 to 30 MMBtu/hr, 100 to 1,000 scfm with 300 to 500 Btu/ft^3 gas
Dimensions:	8' diameter x 40' high
Burner:	Stainless steel multi-port burner

Installation of the first enclosed flare was completed April 15, 2015. Installation of the second flare was completed November 16, 2017. The original shrouded flare may be retained for emergency service (does not have to be physically removed) but is not an approved emission unit and is not authorized for regular service and therefore has not been included in the permit as an emission unit.

5.b. Landfill Emergency Generation Engine (existing)
The emergency generator engine supplies electrical power to the facility in the event of a power outage. Engine and generator details are listed below:

Location:	Northeast of the Rail Transfer Facility in electrical transformer enclosure. ~ 46°15'2.39"N, 122°46'40.57"W
Installed (date):	2015
Engine Make / Model:	Cummins / QSB7-G5 NR3
Engine Serial Number:	73824703
Engine Built:	2015
Engine Horsepower:	303 bhp at full standby load this application

Generator Make / Model:	Cummins / 200DSGAE
Generator Serial Number:	D150816405
Generator Capacity:	200 kW
Exhaust Description:	Exhausts vertically at ~1,428 cfm @ 949°F through 4" diameter stack, ~7' above grade
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.c. Shop Emergency Generation Engine (new)

The emergency generator engine supplies electrical power to the office and shop in the event of a power outage. This engine was previously used to power equipment at the landfill, prior to being replaced by the current Landfill Emergency Generator Engine. Engine and generator details are listed below:

Location:	Outside the NE corner of the main shop building ~46°14'50.94"N, 122°47'16.30"W
Installed (date):	Originally at landfill in 1993, moved to this location ~2021
Engine Make / Model:	Cummins / 6CT8.3-G
Engine Serial Number:	44900145
Engine Built:	July 28, 1993 (engine date is listed as "19930728")
Engine Horsepower:	207 bhp
Generator Make / Model:	Onan / 125DGEA
Generator Serial Number:	H930515624
Generator Capacity:	125 kW
Exhaust Description:	Exhausts vertically at through 4″ diameter stack, ~7′ above grade.
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.d. Pump House Emergency Generation Engine (new)

The Pump House Emergency Generator supplies electrical power to the leachate pump house in the event of a power outage. This generator was previously used to power equipment at the shop area as needed. This generator is mounted on a trailer but expected to remain at the pump house permanently. Engine and generator details are listed below:

Location:	Outside the south side of the pump house ~ 46°15'4.98"N, 122°46'44.33"W
Installed (date):	~2021 (moved from the shop area)
Engine Make / Model:	Caterpillar / 3114 (a separate tag reads 3116DI, however the s/n prefix (5JG) matches a 3114 engine.
Engine Serial Number:	5JG00258
Engine Built:	~1988 (based on Cowlitz County records, no indication on engine tag)
Engine Horsepower:	109 bhp
Generator Make / Model:	Caterpillar / Unknown
Generator Serial Number:	Unknown
Generator Capacity:	Unknown

Exhaust Description: Exhausts vertically at through ~4″ diameter stack, ~7′ above grade.
Applicable Federal Regulations: 40 CFR 63 Subpart ZZZZ

5.e. Leachate Ponds (existing)
Leachate is sent to two ponds lined with impervious materials, one primary and one backup. Leachate is continuously removed from the ponds via pipeline. Excess leachate may also be removed by truck when the pipeline capacity is exceeded. Leachate down a turbulent chute into the ponds to improve aeration. Active aeration measures can be added if necessary to maintain aerobic conditions.

5.f. Equipment/Activity Summary.

ID No.	Equipment/Activity	Control Equipment/Measure
1	Landfill (active and closed areas) – 30 MMBtu/hr enclosed flare (Flare #1)	Enclosed flare
2	Landfill (active and closed areas) – 30 MMBtu/hr enclosed flare (Flare #2)	Enclosed flare
3	Landfill Emergency Generator Engine (303 bhp Cummins / QSB7-G5 NR3)	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage) EPA Tier 3 design
4	Shop Emergency Generator Engine (207 bhp Cummins / 6CT8.3-G)	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage)
5	Pump House Emergency Generator Engine (109 bhp Caterpillar / 3114)	Ultra low sulfur diesel (≤ 0.0015% S) Limited operation - (≤ 100 hr/yr + emergency usage)
6	Leachate Ponds	Aerators or air diffusers

6. EMISSIONS DETERMINATION

Unless otherwise specified by SWCAA, actual emissions must be determined using the specified input parameter listed for each emission unit and the following hierarchy of methodologies:
(a) Continuous emissions monitoring system (CEMS) data;
(b) Source emissions test data (EPA reference method). When source emissions test data conflicts with CEMS data for the time period of a source test, source test data must be used;
(c) Source emissions test data (other test method); and
(d) Emission factors or methodology provided in this TSD.

6.a. Landfill. Emissions from the landfill consist primarily of emissions from the combustion of landfill gas, and fugitive landfill gas that diffuses from the surface of the landfill. The magnitude of emissions will be directly related to the amount of landfill gas generated and captured. Published estimates of landfill gas capture rates range from (65% - 90%) for

municipal waste landfills, and SWCAA expects that the landfill gas capture rate for this landfill is likely to be in the high end of this range because:

1. The industrial waste fraction of the waste proposed for this landfill packs much tighter than municipal solid waste and is likely to provide a more efficient barrier to fugitive gas migration; and
2. This landfill will be designed to capture landfill gas and must comply with the federal standards found in 40 CFR 60 Subpart WWW that require regular monitoring of the landfill gas surface for methane and mitigation whenever a significant amount of methane is detected.

However, to be conservative, SWCAA has utilized the 75% capture rate suggested by the applicant for the purposes of the permit review. This is also the default suggested by EPA in AP-42 Section 2.4 (10/08). SWCAA has assumed a 95% capture efficiency for areas of the landfill that only contain industrial waste based on the following:

1. The landfill gas historically generated at this facility from industrial waste is highly odorous (up to 3% H_2S by volume), and when the landfill gas collection system is operating there have been few areas of the landfill where hydrogen sulfide odor was noticeable.
2. This is a limited purpose landfill consisting of waste materials that pack much tighter than municipal solid waste and is likely to provide a more efficient gas cap of the landfill.

The total amount of landfill gas generated at any specific time depends on the quantity of waste, the methane generation potential of the waste, and the rate at which the waste degrades. The original landfill gas generation rate was calculated using EPA's Landfill Gas Emissions Model (LandGEM) that relies on the following first order decomposition rate equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10}\right) e^{-kt_{ij}}$$

Where: k = the methane generator rate ($year^{-1}$)
L_o = methane generation potential (m^3/Mg of waste)

The value of L_o depends on the type of waste placed in the landfill. Cowlitz County provided a value of 90 m^3/Mg for the municipal solid waste based on a study performed for Cowlitz County's Tennant Way landfill in 2009 and typical values for municipal solid waste. The value of L_o for the industrial waste fraction was estimated from laboratory testing of deink sludge, wastewater treatment solids, and auto shredder fluff historically placed in this landfill. The testing report by K.L. Mathison, B.Sc, and I.R. Flemming, Ph.D., P.Eng. dated January 21, 2013 provided the basis for the applicant's original calculation of an average L_o value of 27 m^3/Mg for the industrial waste placed in this landfill.

Values for the methane generation rate, the rate at which the material will degrade, must be estimated after considering the types of waste that will be in the landfill and the conditions those wastes will experience. For example, food waste would be expected to degrade much more rapidly than waste wood. Wet waste would be expected to degrade much more rapidly than relatively dry waste. The applicant originally selected a k value of 0.04 $year^{-1}$ for the municipal solid waste, which is a default value referenced by EPA's LandGEM model. The applicant selected a lower value of 0.015 $year^{-1}$ for the industrial waste based on the fact that historical landfill gas generation has been limited at this landfill to areas where non-standard putrescible wastes were placed.

SWCAA believes it would be more appropriate to use a more conservative value of 0.04 $year^{-1}$ for the industrial waste as well based on the following:

1. Landfill gas has been generated very quickly (a matter of weeks or months) after placement of putrescible wastes mixed with industrial wastes at this facility.
2. Deink sludge and wastewater treatment solids make up a large percentage of the degradable fraction of the industrial wastes. Deink solids on their own probably lack critical nutrients for biological degradation; however, it consists of finely ground paper fibers that will likely degrade rapidly when supplied those nutrients from municipal solid waste leachate. Wastewater treatment solids would degrade very rapidly given the correct pH. Past practice has been to lime-stabilize the wastewater treatment solids prior to shipment to the landfill to prevent degradation and the resulting odor. This may not be true in the future both because there is no requirement to accept only the same high pH industrial waste and because the pH may be reduced significantly when mixed with municipal solid waste. Also, municipal solid waste leachate may be acidic and could reduce the pH of this material sufficiently to enable bacterial activity in this material. In addition, raising the pH of municipal solid waste is a commonly recognized method of enhancing methane production from municipal solid waste landfills when methanogenesis has been inhibited by the low pH that develops as the waste degrades. The buffering action of lime-stabilized waste when mixed with acidic MSW leachate could potentially result in enhanced gas generation. However, the applicant notes that the pH of the leachate at the Cowlitz County Landfill at around 7.5 was not that different from the pH of the Headquarters Landfill at around 8.0 in late 2013 / early 2014 before municipal waste was placed in the Headquarters Landfill.
3. The applicant assumed that the industrial fraction is less degradable than municipal solid waste based on the fact that little landfill gas has been generated at the facility in the past. Significant gas generation has only been experienced since placement of two unusual wastes in Cell 3 (Foster Farms and Cosmopolis Mill waste) in 2005/2006. However, since the initial gas generation event in 2006, more landfill gas has been generated than could be accounted for by the degradable fraction of these wastes, indicating that placement of this waste may have resulted in gas generation from other regular waste streams that have remained inert in other areas of the landfill.

SWCAA also considers the fact that municipal solid waste will be placed on top of existing industrial waste that to date has not generated significant amounts of landfill gas. There is the possibility that municipal solid waste leachate flowing down through the landfill will initiate landfill gas generation in some of this waste, resulting in a more rapid rise in landfill gas generation than otherwise predicted by the model.

The applicant defined the following two waste acceptance scenarios:

	Base Case		Maximum Case	
Year	**Industrial Waste Acceptance (tons)**	**Municipal Solid Waste Acceptance (tons)**	**Industrial Waste Acceptance (tons)**	**Municipal Solid Waste Acceptance (tons)**
2013	280,000	20,000	280,000	20,000
2014	280,000	120,000	280,000	120,000
2015	280,000	120,000	280,000	120,000
2016	280,000	120,000	280,000	120,000
2017	280,000	120,000	280,000	120,000
2018 on	360,000	130,000	447,222[1]	252,778[1]

[1] Based on a February 28, 2013 memo from Cal Palmer (Energy and Environment, LLC), the anticipated maximum case long-term annual flow is in the range of 600,000 – 700,000 tons per year. Larger waste flows (e.g. up to the 1,000,000 tons per year identified in Weyerhaeuser's current permit) could occur for short periods of time in response to unique waste-generating events.

Only the "base case" is currently expected and the applicant suggested that this is the scenario that should be used for permitting purposes. The applicant indicated that a new Air Discharge Permit would be envisioned prior to operating under a significantly higher waste acceptance scenario.

The following landfill gas generation rate estimate table was originally calculated using LandGEM, the base case waste acceptance scenario, a L_o of 27 m^3/Mg for industrial solid waste, a L_o of 90 m^3/Mg for municipal solid waste, and a k of 0.04 $year^{-1}$ for both wastes. However, the landfill has experienced much higher landfill gas flows recently than indicated by the model results shown below. This could be related to one or several factors in the waste causing faster degradation. If the waste is degrading faster than initially expected, the peak landfill gas generation rates will be reached much sooner, but the overall amount of gas generated over the lifetime of the landfill may not change.

Potential emissions in response to ADP Application CO-977 were calculated on an assumption that up to 2,000 cfm of landfill gas could be captured and flared at a capture rate of 75%. Therefore, the total generation rate would be 2,000 cfm / 0.75 = 2,667 scfm.

Original Landfill Gas Flow Model Results

Year	Landfill Gas Flow (dscfm)
2013	470
2014	496
2015	565
2016	634
2017	697
2018	758
2019	831
2020	901
2021	969
2022	1,033
2023	1,096
2024	1,156
2025	1,213
2026	1,268
2027	1,321
2028	1,372
2029	1,421
2030	1,468
2031	1,514
2032	1,557
2033	1,599
2034	1,639
2035	1,678
2036	1,715
2037	1,750
2038	1,784
2039	1,817
2040	1,849
2041	1,879
2042	1,908
2043	1,936
2044	1,963
2045	1,989
2046	2,014
2047	2,038
2048	2,060
2049	2,082
2050	**2,104**

For permitting purposes SWCAA assumed potential emissions were calculated on an assumption that up to 2,000 cfm of landfill gas could be captured at flared at a capture rate of 75%. Therefore, the total generation rate would be 2,000 cfm / 0.75 = 2,667 scfm.

Landfill Gas Flaring - Combustion Products + Residual VOC, H_2S (both flares combined)

Gas heat content =	485	Btu/scf	Landfill Gas Capture Efficiency =	75%	
MSW Gas Flow Rate =	1,838	scfm	MSW H_2S Content (annual) =	32	ppm
Non-MSW Gas Flow Rate =	162	scfm	Non-MSW H_2S Content (annual) =	600	ppm
Average gas flow rate to flare =	2,000	scfm	Weighted Average H_2S Content (annual)	445	ppm
Total heat content =	58.20	MMBtu/hr	H_2S Destruction Efficiency =	99%	
Gas Consumption =	1,051.20	MMscf/yr			
Flare Exhaust Flow @ 3% O_2 =	10,956	dscfm	Chloride Content =	74	ppmvd (DRAFT AP-42 Sec. 1.4)
Assumed Methane Content =	50%				

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	44	0.06	29.10	3.49	15.29	PEI Flare Factor / BACT
CO	122	0.10	48.50	5.82	25.49	BACT
VOC (as hexane)	20	0.0505	24.50	2.94	12.88	Permit Limit / BACT
SO_X as SO_2		0.1525	73.97	8.88	38.88	Permit Limit / NAAQS
Total PM		0.0175	8.50	1.02	4.47	DRAFT AP-42 Sec. 1.4 (10/08)
PM_{10}		0.0175	8.50	1.02	4.47	DRAFT AP-42 Sec. 1.4 (10/08)
$PM_{2.5}$		0.0175	8.50	1.02	4.47	DRAFT AP-42 Sec. 1.4 (10/08)
Hydrogen Sulfide (H_2S)		0.0008	0.39	0.05	0.21	T-BACT
HCl		0.0144	7.00	0.84	3.68	DRAFT AP-42 Sec. 1.4 (10/08)

Biogas Heat Content =	485	Btu/scf (40 CFR 98 - General Combustion)			
CO_2 Content =	50%		Destruction Efficiency =	99%	(40 CFR 98.343(c))

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	
CO_2 - Combustion	52.07	1	114.79	55,675	29,263	40 CFR 98
CO_2 - in Biogas		1			30,008	mass balance
CH_4		25			2,728	assumes 100% operation
N_2O	0.00063	298	0.414	200.74	106	40 CFR 98
Total GHG - CO_2e	52.07063		115.209	55,876	62,104	

Landfill Gas Venting (Fugitive Emissions)

Estimated vent rate = 667 scfm

CH_4 oxidation fraction = 10% 40 CFR 98 Table HH-4

Pollutant	Uncontrolled ppmvd	Emission Factor lb/MMscf	tpy	Emission Factor Souce
CO	24	1.7	0.31	BACT
NMOC (as hexane)	838	187.4	32.83	DRAFT AP-42 Sec. 1.4 (10/08)
VOC (as hexane)	835	186.7	32.72	DRAFT AP-42 Table 2.4-1 (10/08)
Hydrogen sulfide (H_2S)	78	6.9	1.21	(32 ppm from MSW, 600 ppm non-MSW)
CH_4	500,000	18,685	3,273	
CO_2	500,000	62,802	11,002	

Municipal solid waste landfill gas typically contains a large number of chemicals, many of which are listed as Toxic Air Pollutants in WAC 173-460. Some of these chemicals are created by microbial activity and some of the chemicals are volatilized from materials placed in the landfill. With the exception of hydrogen sulfide, SWCAA used EPA emission factors for municipal solid waste from draft AP-42 Section 2.4-13 (10/08) to estimate emissions of these chemicals. This is a conservative assumption, because many of these chemicals will not be emitted from industrial wastes envisioned for this facility.

The applicant has assumed that the hydrogen sulfide concentration in the landfill gas will ultimately trend from relatively high values currently to the average value for municipal solid waste (32 ppm). Today's hydrogen sulfide values indicate a significant drop from the 30,000 ppm measured in early 2007. However, for the purposes of conducting a conservative impact assessment, SWCAA reviewed a scenario where the industrial waste contributed a higher concentration of hydrogen sulfide than the municipal solid waste. At an ultimate landfill gas generation rate of 2,667 scfm and 75% capture, the average hydrogen sulfide concentration would need to be no more than 88 ppm to assure compliance with the hydrogen sulfide emission limit which was established to assure compliance with the Acceptable Source Impact Level in WAC 173-460 (as in effect August 21, 1998).

6.b. Landfill Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Landfill Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	303	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	14.5	gal/hr (Cummins)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	4.58	3.06	0.31	Cummins
CO	0.19	0.13	0.013	Cummins
VOC	0.03	0.020	0.0020	Cummins
SO_X as SO_2		0.0031	0.0003	Mass Balance
PM	0.02	0.013	0.0013	Cummins
PM_{10}	0.02	0.013	0.0013	Cummins
$PM_{2.5}$	0.02	0.013	0.0013	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	23	33	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.03	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.08	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	33	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.c. Shop Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Shop Emergency Generator Engine

Hours of Operation =	200.0	hours
Power Output =	207	horsepower
Assume Effiicency =	7,000	Btu/hp-hr
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Ra	10.5	gal/hr (calculated)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.031	6.42	0.64	AP-42 Table 3.3-2 (10/96)
CO	0.00668	1.38	0.138	AP-42 Table 3.3-2 (10/96)
VOC	0.0025141	0.52	0.052	AP-42 Table 3.3-2 (10/96)
SO_X as SO_2	3.243E-07	0.0023	0.00023	Mass Balance
PM	0.0022	0.46	0.046	AP-42 Table 3.3-2 (10/96)
PM_{10}	0.0022	0.46	0.046	AP-42 Table 3.3-2 (10/96)
$PM_{2.5}$	0.0022	0.46	0.046	AP-42 Table 3.3-2 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	23	24	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.02	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.06	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	24	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing

6.d. Pump House Emergency Generator Engine. Potential annual emissions from the combustion of ultra-low sulfur diesel (≤0.0015% sulfur by weight) were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Pump House Emergency Generator Engine

Hours of Operation =	200.0	hours
Power Output =	109	horsepower
Assume Effiicency =	7,000	Btu/hp-hr
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Ra	5.5	gal/hr (calculated)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	0.031	3.38	0.34	AP-42 Table 3.3-2 (10/96)
CO	0.00668	0.73	0.073	AP-42 Table 3.3-2 (10/96)
VOC	0.0025141	0.27	0.027	AP-42 Table 3.3-2 (10/96)
SO_X as SO_2	1.708E-07	0.0012	0.00012	Mass Balance
PM	0.0022	0.24	0.024	AP-42 Table 3.3-2 (10/96)
PM_{10}	0.0022	0.24	0.024	AP-42 Table 3.3-2 (10/96)
$PM_{2.5}$	0.0022	0.24	0.024	AP-42 Table 3.3-2 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	Emission Factor Source
CO_2	73.96	1	163.05	23	12	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.01	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.03	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	12	

Emissions must be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing

6.e. Leachate Ponds. Emissions and odors from leachate ponds can be significant if the leachate is not properly managed. If properly managed to maintain leachate aerobic in accordance with the permit requirements, emissions from the leachate ponds will be negligible. The permit requires that the concentration of dissolved oxygen in the leachate holding pond be at least 1.5 parts per million (mg/L)

6.f. Emissions Summary

Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
NO_X	16.58	0.98
CO	26.02	0.21
VOC	45.68	0.08
SO_2	38.88	0.00035
PM	4.54	0.070
PM_{10}	4.54	0.070
$PM_{2.5}$	5.54	0.070
CO_2/CO_2e	154,979	36

Toxic/Hazardous Air Pollutant	Potential to Emit (lbs)	Project Impact (lbs)
Chromium [7740-47-3] (Assumed to be Cr^{+3} for regulatory purposes)	0.073	0.073
Hexavalent Chromium and Compounds [no CAS #]	0.0029	0.0029
Nickel [7440-02-0]	0.18	0.18
Zinc Oxide [1314-13-2]	1.32	1.32

7. REGULATIONS AND EMISSION STANDARDS

Regulations have been established for the control of emissions of air pollutants to the ambient air. Regulations applicable to the proposed facility that have been used to evaluate the acceptability of the proposed facility and establish emission limits and control requirements include, but are not limited to, the following regulations, codes, or requirements. These items establish maximum emissions limits that could be allowed and are not to be exceeded for new or existing facilities. More stringent limits are established in this ADP consistent with implementation of Best Available Control Technology (BACT):

7.a. Title 40 Code of Federal Regulations (40 CFR) 60.7 "Notification and Record Keeping" requires that notification shall be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup of equipment subject to New Source Performance Standards. The landfill is subject to 40 CFR 60 Subpart WWW and therefore also subject to the general notification and recordkeeping requirements of Part 60.

7.b. 40 CFR 60.8 "Performance Tests" requires that emission tests be conducted according to test methods approved in advance by the permitting authority and a copy of the results be submitted to the permitting authority. An initial performance test of the landfill gas flare(s)

must be conducted within 180 days of startup. The source testing detailed by Appendix A of the Air Discharge Permit satisfies this requirement. Note however that in accordance with 40 CFR 60.675(f) the initial annual report, which includes the results of the initial performance test, must be submitted within 180 days of installation and startup of the collection and control system.

7.c. 40 CFR 60.750 et seq. Subpart WWW "Standards of Performance for Municipal Solid Waste Landfills" establishes NMOC control requirements, testing, monitoring, recordkeeping and reporting requirements for municipal solid waste landfills that commenced construction, reconstruction or modification on or after May 30, 1991. The Cowlitz County Headquarters Landfill is an affected facility for the purposes of this regulation. Affected facilities with a design capacity greater than or equal to 2.5 million megagrams and 2.5 million cubic meters are subject to Title V permitting requirements. This facility has a design capacity of approximately 54.8 million cubic yards (41.9 million cubic meters); therefore, this facility is required to obtain a Title V Air Operating Permit.

7.d. 40 CFR 62.16710 et seq. Subpart OOO "Federal Plan Requirements for Municipal Solid Waste Landfills That Commenced Construction On or Before July 17, 2014 and Have Not Been Modified or Reconstructed Since July 17, 2014" establishes requirements that are primarily consistent with 40 CFR 60 Subpart WWW and 40 CFR 63 Subpart AAAA. A state plan was not submitted that would cover this facility; therefore, the federal plan applies to this facility. As of the issuance of ADP 22-3509, SWCAA has not adopted this federal plan nor entered into an agreement with EPA to enforce the federal plan.

7.e. 40 CFR Part 63.1930 et seq. Subpart AAAA "National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills" applies to municipal waste landfills subject to 40 CFR 60 Subpart WWW. Subpart AAAA requires compliance with 40 CFR 60 Subpart WWW and establishes additional requirements including:

(1) A requirement to report deviations (deviations are defined in 40 CFR 63.1965) in a timely manner. [40 CFR 63.1980(a)]

(2) A requirement to prepare and implement a plan to control toxic air emissions during startup, shutdown and malfunction of the landfill gas collection and control system(s). [40 CFR 63.1960] EPA has provided guidance on how to prepare a startup, shutdown and malfunction plan at http://www.epa.gov/ttn/atw/landfill/lndfillpg.html.

(3) A requirement to report any deviations from the startup, shutdown, and malfunction plan in a semi-annual report and within 2 working days after commencing such action, followed by a letter within 7 days after the event. [40 CFR 63.10(d)(5) and Table 1 to Subpart AAAA]

(4) A requirement to submit compliance reports semi-annually (as opposed to annually in 40 CFR 60 Subpart WWW). [40 CFR 63.1980(a)]

7.f. Title 40 Code of Federal Regulations (CFR) Part 60.4200 et seq. "Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" requires that new diesel engines meet specific emission standards at the point of manufacture and during operation. In addition, maximum fuel sulfur contents are specified

and minimum maintenance standards are established. The Landfill Emergency Generator Engine is an affected source because it was manufactured after the relevant applicability date (April 1, 2006). For affected emergency engines, the following is required:

(1) Owners or operators must comply with the emission standards as specified in §60.4205, for all pollutants. [40 CFR 60.4205]

(2) For engines with less than 30 liters of displacement per cylinder, owners or operators must use diesel fuel with a maximum sulfur content of 15 ppm and a minimum cetane index of 40 or a maximum aromatic content of 35 percent. [40 CFR 60.4207(b)]

(3) Owners or operators must operate and maintain each stationary CI internal combustion engine and control device according to the manufacturer's written instructions. In addition, owners and operators may only change those settings that are permitted by the manufacturer; and [40 CFR 60.4211(a)]

(4) Emergency engines may be operated for maintenance checks and readiness testing, provided that the tests are recommended by federal, state or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that federal, state, or local standards require maintenance and testing of emergency ICE beyond 100 hours per calendar year. [40 CFR 60.4211(f)(2)(i)]

7.g. 40 CFR 63.6580 et seq. (Subpart ZZZZ) "National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines" establishes national emission limitations and operating limitations for HAP emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. All of the emergency generator engine are affected sources under this regulation. A stationary rice located at an area source of HAP emissions is new if construction was commenced on or after June 12, 2006. The Emergency Generator Engine is "new" for the purposes of this rule because it was built after June 12, 2006. A new stationary RICE at an area source must comply with Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart IIII for compression ignition engines or 40 CFR 60 Subpart JJJJ for spark ignition engines. The Landfill Emergency Generator Engine is a new diesel engine at an area HAP source, therefore compliance with 40 CFR 60 Subpart IIII constitutes compliance with 40 CFR 63 Subpart ZZZZ. The Shop Emergency Generator Engine and the Pump House Emergency Generator Engine are existing engines under this regulation.

7.h. 40 CFR Part 70 "State Operating Permit Programs" requires affected facilities to have a permit to operate that assures compliance by the source with all applicable requirements. This facility is an affected source because it is an affected facility under 40 CFR 60 Subpart WWW with a design capacity in excess of 2.5 million megagrams and 2.5 million cubic meters.

7.i. Revised Code of Washington (RCW) 70A.15.2040 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention,

abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such orders as may be necessary to effectuate the purposes of the Washington Clean Air Act (RCW 70A.15) and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 Ex. Sess. This law applies to the facility.

7.j. RCW 70A.15.2210 provides for the inclusion of conditions of operation as are reasonably necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing an ADP for installation and establishment of an air contaminant source. This law applies to the facility.

7.k. Washington Administrative Code (WAC) 173-460 "Controls for New Sources of Toxic Air Pollutants" (as in effect August 21, 1998) requires Best Available Control Technology (BACT) for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety. The facility emits Toxic Air Pollutants (TAPs); therefore, this regulation applies to the facility.

7.l. WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM_{10}, $PM_{2.5}$, lead, SO_2, NO_X, ozone, and CO in the ambient air, which must not be exceeded. The facility emits PM_{10}, $PM_{2.5}$, SO_X, NO_X, and CO; therefore, certain sections of this regulation apply. The facility does not emit lead; therefore, the lead regulation section does not apply.

7.m. SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, SO_2, concealment and masking, and fugitive dust. This regulation applies to the facility.

7.n. SWCAA 400-040(1) "Visible Emissions" requires that emissions of an air contaminant from any emissions unit must not exceed twenty percent opacity for more than three minutes in any one hour at the emission point, or within a reasonable distance of the emission point. This regulation applies to the facility.

7.o. SWCAA 400-040(2) "Fallout" requires that emissions of PM from any source must not be deposited beyond the property under direct control of the owner(s) or operator(s) of the source in sufficient quantity to interfere unreasonably with the use and enjoyment of the property upon which the material is deposited. This regulation applies to the facility.

7.p. SWCAA 400-040(3) "Fugitive Emissions" requires that reasonable precautions be taken to prevent the fugitive release of air contaminants to the atmosphere. This regulation applies to the facility.

7.q. SWCAA 400-040(4) "Odors" requires any source which generates odors that may unreasonably interfere with any other property owner's use and enjoyment of their property

to use recognized good practice and procedures to reduce these odors to a reasonable minimum. This regulation applies to the facility.

7.r. SWCAA 400-109 "Air Discharge Permit Applications" requires that an ADP application be submitted for all new installations, modifications, changes, or alterations to process and emission control equipment consistent with the definition of "new source." Sources wishing to modify existing permit terms may submit an ADP application to request such changes. An ADP must be issued, or written confirmation of exempt status must be received, before beginning any actual construction, or implementing any other modification, change, or alteration of existing equipment, processes, or permits. This regulation applies to the facility.

7.s. SWCAA 400-110 "New Source Review" requires that SWCAA issue an ADP in response to an ADP application prior to establishment of the new source, emission unit, or modification. The new units meet the definition of a new source; therefore, this regulation applies to the facility.

7.t. SWCAA 400-113 "Requirements for New Sources in Attainment or Nonclassifiable Areas" requires that no approval to construct or alter an air contaminant source will be granted unless it is evidenced that:

(1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;
(2) BACT will be employed for all air contaminants to be emitted by the proposed equipment;
(3) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
(4) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

8. RACT/BACT/BART/LAER/PSD/CAM DETERMINATIONS

The proposed equipment and control systems incorporate BACT for the types and amounts of air contaminants emitted by the processes as described below:

8.a. BACT Determination – Emergency Generator Engines (new). Available control measures for older diesel-fired emergency generator sets include replacement of the engine with a newer (cleaner) model, the use of ultra-low sulfur fuel and add-on control equipment such as selective catalytic reduction (SCR) units, diesel particulate filters, and oxidation catalysts. Because these engines are for emergency use only, operation will be limited, resulting in relatively small annual emissions, and therefore none of the control options would be cost-effective. Due to the rural nature of the site, the exposure to the public is reduced compared to an urban environment. For these reasons, SWCAA has determined that the following represents BACT for these engines at this site:

1. Limiting operation to 100 hours per year for maintenance checks and readiness testing and as needed for emergency use; and

2. Requiring the use of ultra-low sulfur diesel fuel.

Pre-Existing BACT Determinations

8.b. BACT Determination – Increased Landfill Gas Flow and SO_2 Emissions (SWCAA 15-3157R1). The landfill gas collection and control equipment and techniques are unchanged and the discussion of BACT in Section 8.c. below remains relevant except that the applicant proposes to significantly increase SO_2 emissions. Under the new proposal, potential SO_2 emissions would increase from 6.31 tons per year to 38.88 tons per year. The new SO_2 emission rate is based on a flare inlet H_2S concentration of 445 ppm. This relatively high level H_2S concentration will be a relatively short-term maximum due to the historical placement of a large quantity of industrial waste sludge. To prevent a future occurrence of such high H_2S concentrations in the landfill gas, placement of such sludges has been limited by the Air Discharge Permit.

Additional scrubbing of the H_2S from the landfill gas remains the most cost-effective method of reducing SO_2 emissions. As discussed in 8.c below, a caustic scrubber remains the most cost-effective H_2S scrubbing option in this instance. The cost of operation, fresh sodium hydroxide, and hauling of spent liquor represent most of the scrubbing costs. Based on the average 2011 H_2S concentration (690-2,600 ppm) and flow (73-121 scfm), the cost of scrubbing was approximately $23,000 per ton of SO_2 emissions prevented without accounting for capital costs or liquor disposal costs. Because H_2S concentrations have been reduced from the 2011 levels and must continue to drop to achieve the H_2S emission limit, the cost-effectiveness of caustic scrubbing will continue to exceed $23,000 per ton. SWCAA concludes that scrubbing H_2S from the landfill gas exceeds the requirements of BACT and is only required as necessary to assure compliance with ambient air quality standards.

8.c. BACT Determination – Emergency Generator Engine (SWCAA 15-3157). Available control measures for new diesel engines include engine design, the use of ultra-low sulfur fuel and add-on control equipment such as selective catalytic reduction (SCR) units and oxidation catalysts. SWCAA believes that SCR is not feasible for this unit based on a combination of cost and practicality (most operation will be short-term and intermittent). SWCAA received pricing for an oxidation catalyst for a Caterpillar 3412 at $3,500 per bank of cylinders in 2010. This relatively small engine would need only a single unit. Assuming a total installed cost of $5,000, a control efficiency of 40% for CO, 70% for VOCs, and 25% for PM (the guarantees), an 8% cost of capital and 5 year equipment life, the multi-pollutant cost-effectiveness is over $200,000 per ton because the engine is a relatively minor source of CO, VOC and PM emissions. Based on this analysis, SWCAA had determined that the use of an oxidation catalyst is not a cost-effective control device for this unit.

The use of modern diesel-fired engine design meeting the applicable EPA emission standard for the new engine (EPA Tier 2 is required, EPA Tier 3 was provided in this case), the use of ultra-low sulfur diesel fuel ($\leq$ 0.0015% sulfur by weight), limitation of visible emissions to 5% opacity or less, and limitation of engine operation has been determined to

meet the requirements of BACT for the types and quantities of air contaminants emitted. The use of ultra-low sulfur fuel is also required by 40 CFR 60 Subpart IIII for the new engine.

8.d. BACT Determination – Landfill Gas Collection and Control (SWCAA 13-3068). The landfill gas collection and treatment system proposed by the applicant consists of a system of vertical wells and subsurface horizontal collection piping that will be directed to one or more enclosed flares. The effectiveness of the system depends on both the collection efficiency and the efficiency of the control system.

Collection System

The collection system will be "active", meaning that blowers will be used to draw landfill gas out of the landfill from a system of horizontal and vertical collectors. Horizontal collection piping will be laid at the bottom of the cells and under various lifts. The horizontal and vertical spacing of these collectors will be determined by the Permittee. This will enable the earliest ability to draw landfill gas away from the surface where the gas would otherwise be emitted. Additional interim collectors will be installed to intersect tire-shred leachate drain channels. Surface collectors will be placed just below the cover material at final grade to capture any additional landfill gas that migrates towards the surface of closed cells. The spacing of collectors will be modified as necessary based on well collection yields and surface emission monitoring. This is necessary because the permeability of the waste must be determined experimentally and can change over time. Each collector will have fittings allowing individual modification of the vacuum to maximum collection efficiency. To SWCAA's knowledge this system will provide the highest level of gas collection available and therefore meets the requirements of BACT.

Potential emission control systems consist of scrubbers or other equipment to remove pollutants from the landfill gas prior to combustion, and the combustors themselves (e.g. boilers, engines, flares, or turbines). Any combustion unit will emit products of combustion and any unburned pollutants in the landfill gas, therefore the BACT analysis consists of evaluating the possibility of pre-combustion control and the efficiency of the combustor.

SO_2 Emission Control

SO_2 will be generated from combustion of reduced sulfur compounds (dominated by H_2S) in the landfill gas. Air Discharge Permit 08-2772 required the use of a caustic scrubber to remove at least 80% of the hydrogen sulfide from the landfill gas prior to combustion. A caustic scrubber was determined to be the most cost-effective method of removing hydrogen sulfide to prevent SO_2 emissions. Weyerhaeuser's BACT analysis submitted June 28, 2007 for this SO_2 control project considered various types of wet scrubbers using caustic scrubbing liquor, wet scrubbers paired with carbon adsorption, wet scrubbers using solvent liquor, iron sponge technology, redox scrubbers, and wet scrubbing of SO_2 downstream of a combustor. The use of SO_2 control technology was necessary both to maintain compliance with Washington state SO_2 emission standards at the flare and to meet the requirements of BACT when the landfill gas contained very high levels of hydrogen sulfide (~17,000 ppm at the time of analysis). Because the concentration of hydrogen

sulfide in the landfill gas has dropped substantially, the cost-effectiveness of a caustic scrubber has dropped as well as the potential impact on ambient SO_2 concentrations.

The Air Discharge Permit will limit SO_2 emissions to 1.44 pounds per hour to protect the National Ambient Air Quality Standards (NAAQS) for SO_2. Based on 2011 operating costs for the existing caustic scrubber, the scrubber operating cost is approximately $23,000 per ton of SO_2 emissions prevented at this emission level. This value is conservative because capital costs and scrubbing liquor disposal costs are not included. As the landfill gas flow increases and the H_2S concentration decreases, operation of the scrubber will be less cost-effective. Based on this analysis the use of a scrubber or other method to remove H_2S prior to combustion is not a cost-effective BACT measure and is not necessary to protect ambient air quality when the SO_2 emission limit can be achieved without H_2S control.

Combustion Unit

For both safety and environmental mitigation the landfill gas will be combusted at the site. At this time energy recovery is not proposed by the applicant, so the use of boilers, engines, or turbines as combustion devices was not reviewed. Of the various flare types available, only one (a low-emission "ZULE" enclosed flare by John Zinc) would operate with lower emissions than the PEI enclosed flare proposed by the applicant, therefore only these two options were compared.

Control Option	**NO_X (lb/MMBtu)**	**CO (lb/MMBtu)**	**Notes**
Low-NO_X Enclosed Flare (ZULE)	0.025	0.06	500 cfm capacity with 5:1 turndown Capital Cost of $260,000 per flare
Proposed PEI Enclosed Flare	0.06	0.2[1]	1,000 cfm capacity with 10:1 turndown Capital Cost of $250,000 per flare

[1] The enclosed landfill flares at the existing Cowlitz County Landfill and the Centralia Landfill operate in compliance with permit limits of 0.10 lb/MMBtu CO. SWCAA believes that a CO emission limit of 0.10 lb/MMBtu for an enclosed flare is the minimum BACT level in this case because a properly designed enclosed flare, including flares at similar facilities, have easily met this level. The proposed flare would have a retention time of well over 1 second at 13.5% O_2 and the maximum landfill gas flowrate of 1,000 cfm, therefore CO emissions are expected to be minimal.

Drawback to the use of the ZULE flare include:

- Lower capacity (two ZULE flares would need to be installed for every one PEI flare)
- Higher operating electricity usage
- Higher capital cost

Based only on the difference in electrical and capital costs, using a 4% cost of capital and a 30 year equipment life, the ZULE flare would result in reduced NO_X emissions at a cost

of approximately $7,000 per ton. For this analysis an electrical cost of $0.074/kW was used and it was assumed that the PEI flare utilizes 50 bhp of blower capacity at 1,000 cfm and the ZULE flare utilizes 40 bhp of blower capacity at 500 cfm. If the flares are eventually used as backup to energy recovery equipment, the cost per ton of pollutant reduced rises accordingly. SWCAA is unaware of any landfill gas applications of the ZULE flare except when LAER emission levels were required. Considering the uncertainty regarding the future landfill gas generation rate, uncertainty with respect to how long the flares would be the primary control device, and the additional cost of a flare meeting the ZULE level of emissions, SWCAA concurs with the applicant that the proposed PEI flare will meet the requirements of BACT.

8.e. Prevention of Significant Deterioration (PSD) Applicability Determination. This permitting action will not result in a potential increase in emissions equal to or greater than the PSD thresholds. Therefore, PSD review is not applicable to this action.

With respect to past permitting actions, the pollutant that comes the closest to any major source threshold is greenhouse gases. EPA's "Deferral Rule" (Federal Register /Vol. 76, No. 139 /Wednesday, July 20, 2011) deferred biogenic CO_2 emissions from determinations of major source thresholds until July 21, 2014. Biogenic CO_2 emissions at this source include the CO_2 fraction of the fugitive landfill gas and the CO_2 emissions from combustion of the landfill gas. However, the United States Court of Appeals for the District of Columbia vacated the "Deferral Rule" on July 12, 2013 (No. 11-1101 Center for Biological Diversity, Et Al., v. Environmental Protection Agency and Lisa Perez Jackson); therefore, at the time of issuance of SWCAA 13-3068, all non-fugitive greenhouse gases needed to be counted when determining if the source is subject to PSD permitting. Since that time, the U.S. Supreme Court has ruled that a source is not required to obtain a PSD or Title V permit solely because the source emits, or has the potential to emit GHGs above the applicable major source thresholds.

On June 23, 2014, the U.S. Supreme Court issued its decision in Utility Air Regulatory Group v. EPA, 134 S. Ct. 2427 (2014) ("UARG"). The Court held that EPA may not treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit. The Court also held that PSD permits that are otherwise required (based on emissions of other pollutants) may continue to require limitations on GHG emissions based on the application of Best Available Control Technology (BACT). In accordance with the Supreme Court decision, on April 10, 2015, the D.C. Circuit issued an amended judgment in Coalition for Responsible Regulation, Inc. v. EPA, Nos. 09-1322, 10-073, 10-1092 and 10-1167 (D.C. Cir. April 10, 2015), which, among other things, vacated the PSD and Title V regulations under review in that case to the extent that they require a stationary source to obtain a PSD or Title V permit solely because the source emits or has the potential to emit GHGs above the applicable major source thresholds. The D.C. Circuit also directed EPA to consider whether any further revisions to its regulations are appropriate in light of UARG, and if so, to undertake to make such revisions. In response to the Supreme Court decision and the D.C. Circuit's amended judgment, the EPA has undertaken various actions to explain the next steps in

GHG permitting and also conduct rulemaking action to make the appropriate revisions to the PSD and operating permit rules.

The public comment period on EPA's proposal to amend the PSD and Title V rules closed December 16, 2016 (Federal Register / Vol. 81, No. 223 / Friday, November 18, 2016). No final action has yet been taken.

Fugitive emissions are "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening" [40 CFR 52.21]. In the definition of major stationary source in 40 CFR 52.21 fugitive emissions "shall not be included in determining for any of the purposes of this section whether it is a major stationary source, unless the source belongs to one of the following categories…" Landfills are not included in any of the listed categories. However, most of the landfill gas is collected and burned and therefore is not considered fugitive.

EPA's October 21, 1994, memorandum "Classification of Emissions from Landfills for NSR Applicability Purposes" from John S. Seitz concluded that collected landfill gas should not be considered fugitive because it can be (and is regularly) collected. The memo went on to say: "To quantify the amount of landfill gas which could otherwise be collected at a proposed landfill for NSR applicability purposes, the air pollution control authority should assume the use of a collection system which has been designed to maximize, to the greatest extent possible, the capture of air pollutants from the landfill." This is stated more clearly in a December 1995 EPA Document (EPA-453/R-94-021) Air Emissions from Municipal Solid Waste Landfills – Background Information for Final Standards and Guidelines where EPA writes: "…Fugitive emissions are not included in determining whether the 250 tons/yr threshold is exceeded, but collectable emissions must be included. Because this NSPS and EG have found collection systems to be feasible, most landfill emissions are considered collectable for PSD purposes."

In a May 4, 1999 response to a Title V petition for the Roosevelt Regional Landfill the EPA discussed comparing non-fugitive VOC emissions to the PSD major source threshold: "EPA has carefully considered the Petitioner's claim that the Roosevelt Landfill is a major source of VOC emissions. The permitting authority, in consultation with EPA, calculated total VOCs for the Roosevelt Landfill by using a published emission factor for non-methane organic compound ("NMOC") emissions from MSW landfills. The resulting estimate of non-fugitive emissions was less than 250 tons per year."

Because the amount of landfill gas that is emitted fugitively can vary, we must determine what percentage of the landfill gas must be considered non-fugitive for determining PSD applicability. This is important, because a well-designed and operated landfill gas collection system will still result in a large percentage of the greenhouse gases (expressed as CO_2e) being emitted as fugitive emissions from the landfill surface, in part because the global warming potential of methane, which makes up approximately 50% of the fugitive emissions by volume, is 25 for regulatory purposes.

This issue has been previously addressed in Washington. From the Statement of Basis for Air Operating Permit 08-AQ-C090 First Revision for Roosevelt Regional Landfill "Ecology has received guidance from EPA on the topic of fugitive emissions at landfills. EPA has stated that a "well designed collection system," as required by the Standards of Performance for Municipal Solid Waste Landfills (NSPS), is capable of collecting approximately 75% of the MSW landfill emissions. That means that approximately 75% of MSW landfill emissions could reasonably pass through a stack, chimney, vent, or other functionally equivalent opening so are non-fugitive; approximately 25% of MSW landfill emissions are fugitive."

Estimated non-fugitive greenhouse gas emission estimates fall short of the 100,000 tpy CO_2e major source threshold.

8.f. Compliance Assurance Monitoring (CAM) Applicability Determination. CAM is not applicable to any emission unit at this facility because, although this facility is required to obtain a Part 70 permit, this facility is not a major source. If the facility was a major source, potential VOC emissions from the landfill would be reviewed against the CAM applicability criteria. 40 CFR 60 Subpart WWW requirements for monitoring of the landfill gas flares would presumably provide a reasonable assurance of compliance with the applicable VOC emission limits, therefore application of CAM would not be likely to result in any new requirements.

9. AMBIENT IMPACT ANALYSIS

Dispersion modeling using EPA's AERMOD modeling program (version 16216r) was used by the applicant to estimate the ambient impact of flare and fugitive emissions from the landfill. Three years of meteorological data from Weyerheauser's Longview facility, upper air data from Salem NWS, and hourly NWS surface data from Portland were used in the analysis. Background concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$ and SO_2 were added to the model results before comparing with the applicable ambient air quality standards. Emissions of nine toxic air pollutants were modeled because emissions of those pollutants may exceed the applicable small quantity emission rate listed in WAC 173-460 (as in effect February 14, 1994). Note that the applicant compared the model results to the most recent version of WAC 173-460 published in 2009 rather than the version current adopted by SWCAA. For these nine toxic air pollutants the emission limit established in the permit differed significantly from the modeled values, so the model results were scaled to the permitted emission limits to assure compliance with the Acceptable Source Impact Levels for each pollutant.

A flare exhaust flow of 44,008 acfm at an exit temperature of 1,400°F was modeled. The initial source test indicated that flare temperature was reached at an oxygen concentration of ~17%. At full capacity (30 MMBtu/hr of landfill gas) and 17% O_2 the flare exhaust rate would be approximately 95,000 acfm, therefore the model results are expected to be appropriately conservative.

Results of the modeling scaled to the maximum emission rates presented in Section 6 are presented in the following tables.

Maximum Predicted Impacts Outside Landfill Boundary (Maximum Flow Scenario) – Criteria Pollutants

Pollutant	Averaging Time	Ambient Impact ($\mu g/m^3$)	Assumed Background ($\mu g/m^3$)[1]	Total Ambient Concentration ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_X	1-hr	57.81	65.17	122.98	188
	Annual	0.96	17.55	18.51	100
CO	1-hr	97.20	2,520	2,617.0	40,000
	8-hr	25.70	2,151	2,177.2	10,000
PM_{10}	24-hr	2.44	42	44.44	150
$PM_{2.5}$	24-hr	2.44	18.1	20.54	35
	Annual	0.24	6.0	6.25	15
SO_X as SO_2	1-hour	139.58	16.71	156.29	196
	3-hour	64.88	16.71	81.59	1,300
	24-hour	25.59	7.8	31.39	365
	Annual	2.33	2.13	4.46	80

Maximum Predicted Impacts Outside Landfill Boundary (Maximum Flow Scenario) – Toxic Air Pollutants

Pollutant	Averaging Time	Ambient Impact ($\mu g/m^3$)	Assumed Background ($\mu g/m^3$)[1]	Total Ambient Concentration ($\mu g/m^3$)	ASIL ($\mu g/m^3$)
1,2-Dibromoethane (Ethylene dibromide)	Annual	0.00011	0	0.00011	0.0045
1,2-Dichloroethane (Ethylene dichloride)	Annual	0.0018	0	0.0018	0.038
1,3-Butadiene (Vinyl ethylene)	Annual	0.0011	0	0.0011	0.0036
Benzene	Annual	0.022	0	0.022	0.12
Dichloromethane (Methylene chloride)	Annual	0.062	0	0.062	0.56
Hydrogen sulfide	24-hour	0.9	0	0.9	0.9
Trichloroethylene (Trichloroethene)	Annual	0.013	0	0.013	0.59
Vinyl chloride (Chloroethene)	Annual	0.011	0	0.011	0.012
Hydrogen chloride	24-hour	3.4	0	3.4	7

The results of the modeling indicate that maximum potential emissions from the landfill flare and fugitive landfill gas emissions will not result in an exceedance of any applicable standard.

SWCAA modeled the maximum potential impact from the pump engines using EPA's AERMOD version 21112. The results of the model indicated that the maximum impact of the engines would not cause an exceedance of any NAAQS or applicable ASIL.

Conclusions

9.c. Operation of the emergency generator engines as proposed in ADP application CO-1047 will not cause the ambient air quality standards established by 40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.d. Operation of the emergency generator engines as proposed in ADP application CO-1047 and in accordance with the Air Discharge Permit will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants," (in effect August 21, 1998) or WAC 173-476 "Ambient Air Quality Standards" to be violated.

9.e. The emergency generator engines proposed in ADP application CO-1047 can be operated without causing a violation of the applicable emission standards, which include the limits established under SWCAA 400-040 "General Standards for Maximum Emissions."

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue ADP 22-3509 in response to ADP application CO-1047. ADP 22-3509 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards, as discussed below.

10.a. Supersession of Previous Permits. This Air Discharge Permit will supersede Air Discharge Permit 15-3157R1 in its entirety.

10.b. Emission Limits.

Sulfur Dioxide from the Flares. The sulfur dioxide emission limits for the flares was established in units of pounds per hour at a level deemed protective of the 1-hour National Ambient Air Quality Standard for sulfur dioxide. The 1-hour standard, established in 2010, is the most stringent of the four applicable ambient air quality standards for sulfur dioxide. If the 1-hour standard is met, the other standards (3-hour, 24-hour, and annual standards) are met by a very wide margin. The limits were established at a level where the maximum SO_2 impact, including background, would not exceed 80% of the 1-hour ambient air quality standard. The 20% margin allows for changes in background SO_2 concentrations not under the control of the applicant.

Toxic Air Pollutants. The ambient impact of any pollutant with emissions that exceeded the Small Quantity Emission Rate (SQER) listed in WAC 173-460 (as in effect February 14, 1994) was estimated using the applicant's AERMOD dispersion modeling results. The model results were used to scale the ambient impact of those pollutants to the permitted emission rates.

Although in most cases emissions of toxic air pollutants that exceeded the SQER are not expected to cause an ambient impact approaching the Acceptable Source Impact Level listed in WAC 173-460, a permit limit equal to 150% of the estimated emissions of each of those was established for each pollutant other than hydrogen sulfide that assured compliance. This accounts for the relatively high level of variability expected in landfill gas compositions while assuring compliance with the ASILs. In some cases this resulted in a reduction in the permitted emission limit from SWCAA 15-3157. SWCAA believes that emissions of these pollutants in excess of the permitted levels should warrant further investigation even when not exceeding an ASIL to determine if those emissions could be reduced in a cost-effective manner.

The hydrogen sulfide limits were set at a level less than 150% of the calculated potential emissions because the more stringent restriction was necessary to demonstrate compliance with the ASIL. At a 2,000 scfm flaring rate and 75% capture rate without scrubbing, the H_2S content of the landfill gas would need to be no more than 88 ppm to comply with the 7.6 pounds per day and 1.40 tons per year limit necessary to assure compliance with the ASIL. This limit applies to H_2S generated due to the placement of waste after the facility began accepting municipal solid waste in March 13, 2014.

These limits are conservative because they do not account for the oxidation (destruction) of any of these pollutants as they pass through the top layers of landfill cover. Depending on the conditions in the top layer, a significant fraction of many of these toxic air pollutants may be destroyed as they diffuse through the landfill cover (the landfill cover acts as a crude biofilter).

Emergency Generator Engines. In lieu of annual emission limits for specific pollutants (e.g., NO_X and CO), operation was limited to maintenance checks, readiness testing, and use during emergencies.

10.c. Operational Limits and Requirements. The only fuel evaluated for use in the Emergency Generator Engines was road-grade diesel; therefore, operation on other, potentially dirtier, fuels was prohibited. As discussed in Section 8, BACT requires the use of ultra-low sulfur ($\leq$ 0.0015% S by weight) diesel. The permit allows the use of "#2 diesel or better." In this case "or better" includes road-grade diesel fuel with lower sulfur content, biodiesel, and mixtures of biodiesel and road-grade diesel that meet the definition of "diesel" and contain no more than 0.0015% sulfur by weight.

To minimize the impact of emissions on ambient air quality, the exhaust from the emergency generator engines is required to be exhausted vertically. Any device that obstructs or prevents vertical discharge (such as a traditional rain cap) is prohibited. This is good engineering practice and is required by SWCAA 400-200(1).

The requirements found in 40 CFR 60 Subpart WWW were written into the Air Discharge Permit as BACT measures. These requirements are sufficient to ensure proper operation of the landfill gas collection system.

The requirements for the gas collection and control system were established to implement good air pollution control practice for the system. The system must be managed to collect as much landfill gas as possible because landfill gas that is not captured results in significant emissions of hydrogen sulfide and smaller amounts of other toxic air pollutants. The combustion emissions from flaring of this landfill gas are preferred because these emissions have a much lower impact on human health and the environment.

To maximize controls and minimize potential fugitive emissions, the landfill gas collection and control system must be in operation at all times except as necessary to perform required maintenance or safety checks. Safety checks may be necessary before re-starting the flare after an automated shutdown due to an alarm. An automated shutdown may be initiated to prevent a dangerous situation or damage to equipment; therefore, the manufacturer recommends the system be checked by facility personnel prior to restarting. In most cases it is expected that the flare can be re-started within two hours after an automated shutdown during non-business hours and more quickly when staff is already on-site if no maintenance is necessary.

A limited exception was added in Air Discharge Permit 22-3509 allowing for short (less than 4 hours) unplanned outages. This exception was added to address the fact that various types of mechanical failures can be expected infrequently even with a well-run system, and the impact of such a short outage is expected to be small. The H_2S concentration in the landfill gas has dropped significantly (from over 17,000 ppm in 2015 to ~100 ppm at the end of 2020), reducing the impact of such outages. The primary landfill gas pollutants are products of anaerobic decomposition. These gases will migrate towards the surface when the landfill gas collection system is not operating. SWCAA assumed that the bulk of the landfill gas emissions at the surface would be dominated by a pressure gradient (i.e., anaerobic decomposition products are emitted to the atmosphere primarily when sufficient volume is generated to "push" to the surface rather than by diffusing through gases in surface layers). If this is the case, a four hour outage could cause of to 0.6 feet of vertical gas migration in a 20 acre landfill area generating 1,000 scfm of landfill gas with a 50% porosity. Very conservative values were used for this estimation. Since this top layer of the landfill will be aerobic while the landfill remains uncapped, this duration of outage is unlikely to result in significant emissions of anaerobic landfill gas.

The permit places limits on the acceptance of certain wastes that could affect air emissions or the operation of the landfill gas collection system. Regulated asbestos containing materials are prohibited because the Permittee did not propose to accept such wastes and the landfill gas collection system design and permit conditions would otherwise need to be modified to accommodate such wastes. Non-friable (unregulated) asbestos containing material may be accepted because there is negligible risk of this material generating airborne fibers in extraction wells or during waste placement. Chicken feathers and significant amount of gypsum were prohibited because both materials have demonstrated in the past the ability to cause significant releases of hydrogen sulfide very quickly after placement. (Other wastes could be prohibited if they result in excess emissions or significant nuisance odors. An example could be a waste sludge with a high sulfur content and high level of biological activity that results in high levels of unmitigated H_2S

emissions. It may be necessary to treat (e.g. lime stabilize) such materials prior to placement or not accept such wastes. At this time the Permittee has elected to contractually require generators of such sludges to lime stabilize the waste prior to delivery for disposal, and to reject any such wastes not properly stabilized.

Gypsum is primarily found in wallboard from manufacturing of wallboard, and from construction and demolition activities. To assure that only incidental amounts of gypsum are accepted at the landfill, Cowlitz County has committed to:

1. Operate a gypsum recycling program at the transfer station(s).
2. Reject "rich" loads of gypsum from new construction at the landfill.
3. Only accept construction and demolition debris fines from material recovery facilities processing construction and demolition debris if the operator has a written program and observed effectiveness in drywall removal to an incidental level prior to screening.
4. Reject demolition debris loads that contain more than an incidental level of gypsum based on a visual observation.

One of the two existing leachate ponds will be operated to supply leachate to the pipeline, which will convey leachate from the landfill to the Three Rivers Regional Wastewater Treatment Plant. A minimum dissolved oxygen concentration was established for the leachate pond at an achievable level that will assure than anaerobic metabolism is negligible. Under aerobic conditions the ponds will not be a source of significant emissions or odor. Leachate currently generated at the facility is not a significant source of odors or emissions. It is expected that the leachate will gradually become more active and have a greater potential to generate odors and emissions (if anaerobic) as the amount of municipal solid waste in the landfill increases. The Permit requires monitoring of the leachate dissolved oxygen level and maintaining an oxygen concentration of at least 1.5 mg/L.

Monitoring of the conditions at individual gas collection points is included in this section because these monitoring requirements are paired with corrective actions.

The requirement to maintain a Startup Shutdown and Malfunction (SSM) plan was removed from the permit consistent with changes EPA made to 40 CFR 63 Subpart AAAA since issuance of ADP 15-3157R1. SWCAA has not found the formal plan useful in preventing or responding to permit deviations. The Permittee already has parallel obligations to take reasonable precautions to prevent and minimize the impact of deviations from permit conditions both in the permit, SWCAA regulations, and Subpart AAAA.

The requirement to maintain oxygen and nitrogen levels below specific concentrations was removed. This change is consistent with the updates to 40 CFR 63 Subpart AAAA and the new Federal Plan applicable to this landfill (40 CFR 62 Subpart OOO). The landfill gas temperature limit was also raised slightly from 55°C to 62.8°C. These changes may allow for slightly more aggressive landfill gas collection without additional risk of a landfill fire or inhibiting methanogenic bacteria.

10.d. Monitoring and Recordkeeping Requirements. Sufficient monitoring and recordkeeping was established to document compliance with the VOC and TAP emission limits, and provide for general requirements (e.g. upset reporting, annual emission inventory submission).

Quarterly monitoring of the landfill surface for methane was required in accordance with 40 CFR 60 Subpart WWW to assure that the gas collection system is operating effectively. Corrective action is required if a methane concentration of 500 ppm or more above background is measured at the landfill surface.

The temperature of the flare(s) and the presence of a flame in the flare(s) must be monitored continuously to assure that unburned landfill gas is not exhaust through the flare(s).

The Permittee is required to record each occurrence of maintenance and repairs to applicable equipment so that SWCAA and the Permittee can assure that the equipment is being maintained properly and evaluate whether emission factors remain valid.

10.e. Reporting Requirements. Specific reporting deadlines were established for each reporting requirement. The submittal date refers to the earlier of the date the report is delivered to SWCAA or the postmarked date if sent through the US Post Office.

40 CFR 60 Subpart WWW requires reporting of all periods in which the flare system was not operating for more than one hour or the landfill gas collection system was not operating for more than 5 days. Because such incidents could lead to excess odor or toxic air pollutant emissions, SWCAA modified this requirement to require reporting of all outages.

The permit requires reporting of the annual air emissions inventory, and reporting of the data necessary to develop the emission inventory. Upset conditions with the potential to cause excess emissions must be reported immediately in order to qualify for relief from penalty in accordance with SWCAA 400-107 for unavoidable exceedances. In addition, prompt reporting allows for prompt and accurate investigation into the cause of the event and the prevention of similar future incidents.

11. START-UP AND SHUTDOWN/ALTERNATIVE OPERATING SCENARIOS/POLLUTION PREVENTION

11.a. Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown," technology-based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

The emergency generator engines may exhibit excess opacity upon startup. Accordingly, the opacity limit for these engines is not applicable during the startup period defined in the permit.

Effective September 28, 2021, the startup, shutdown, and malfunction (SSM) plan required by 40 CFR 63 Subpart AAAA no longer applies, therefore the reporting requirement for the SSM plan (formerly Condition 11 of Air Discharge Permit 15-3157R1) was removed. The permittee remains obligated to report any permit deviations, which include any unplanned outage longer than 4 hours per incident or 24 hours per year, and any excess emissions. The permittee also remains obligated to report all outages during the calendar year (for any purpose or duration) with the annual report.

11.b. Alternate Operating Scenarios. SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. The Permittee did not propose or identify any applicable alternate operating scenarios. Therefore, none were included in the approval conditions.

11.c. Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. The permit requires measures to maximize the capture of landfill gas and control combustion emissions in accordance with BACT. Additional measures for the control of SO_2 emissions from the combustion of landfill gas are discussed in Section 8.

12. EMISSION MONITORING AND TESTING

Initial and periodic source emissions testing of the landfill gas at the inlet and outlet of the flares(s) was required to quantify emissions, determine the compliance status of the facility, and meet the performance testing requirements of 40 CFR 60 Subpart WWW.

Carbon monoxide, VOC, and visual emission from the flare(s) must be measured at the lowest operating temperature because the lower operating temperature is the worst-case emission scenario for these pollutants. In addition, the flare(s) must also be tested for NO_X at the highest operating temperature to assure that increases in thermal NO_X generation anticipated at the higher temperature does not cause the permit limit to be exceeded. EPA Compendium Method TO-15 is required at both the flare inlet and outlet to quantify volatile organic toxic air pollutants. All of the volatile organic toxic air pollutants with a specific limit in the Air Discharge Permit are target analytes of EPA Compendium Method TO-15. Total sulfur compounds in the landfill gas are to be measured by ASTM Method D5504 to determine total sulfur dioxide emission from the flare. Hydrogen sulfide is specified separately for comparison with the hydrogen sulfide emission limit.

A gas chromatograph / mass spectroscopy scan is required to tentatively identify the 10 VOC compounds that appear to be in greatest abundance in the landfill gas. This data is a screening tool to help determine if there are any major organic constituents that warrant additional scrutiny and because this information may provide additional data regarding processes in the landfill.

13. FACILITY HISTORY

13.a. General History. The landfill was originally constructed in 1993. Significant landfill gas generation was first discovered in 2006 in an active portion of Cell 3. A candlestick flare was installed on November 3, 2006 to control these landfill gas emissions. On June 14, 2007 a caustic scrubber was operational to scrub H_2S upstream of a shrouded 4" diameter candlestick flare. The facility began accepting municipal solid waste on March 13, 2014. Use of the caustic scrubber was discontinued in 2018 due to declining H_2S levels in the landfill gas.

13.b. Previous Approvals/Permits/Orders. The following approvals, Permits, and Orders have been issued for this facility:

Permit / Order #	Application #	Date Issued	Description
01-2345	CO-482	4-12-2001	Consent Order requiring Weyerhaeuser to submit an Air Discharge Permit application when significant landfill gas generation is detected.
07-2730	N/A	6-7-2007	Consent Order establishing a timeline for implementation of landfill gas control system for Cell 3.
08-2772	CO-830	6-11-2008	Air Discharge Permit and approval conditions for operation of an existing landfill gas collection and treatment system consisting of a caustic scrubber and shrouded candle-stick flare.
13-3068	CO-916	2-3-2014	Approval to accept municipal solid waste and install necessary gas collection and control system utilizing enclosed flare(s).
15-3157	CO-957	12-8-2017	Approval of a replacement diesel-fired emergency generator engine and miscellaneous minor permit modifications.
15-3157R1	CO-977	1-23-2018	Approval for increased emissions from the flares to account for a higher than expected landfill gas generation rate, and an increase in the SO_2 emission limit from the flares to account for a higher than expected initial H_2S concentration in the landfill gas.

Bold font indicates that the Order or Air Discharge Permit will have been superceded or will no longer be in effect when Air Discharge Permit 22-3509 is issued.

14. PUBLIC INVOLVEMENT OPPORTUNITY

14.a. Public Notice for ADP Application CO-1047. Public notice for ADP application CO-1047 was published on the SWCAA website for a minimum of 15 days, beginning on February 25, 2022.

14.b. Public/Applicant Comment for ADP Application CO-1047. SWCAA did not receive specific comments, a comment period request, or any other inquiry from the public or the applicant regarding ADP application CO-1047. Therefore, no public comment period was provided for this permitting action.

14.c. State Environmental Policy Act. Cowlitz County issued SEPA Addendum No. 1 (17-10-3913) to the Cowlitz County Headquarters Landfill Final Environmental Impact Statement on October 25, 2017, for the latest physical modifications at the landfill. Cowlitz County determined that repurposing of the two emergency generators was within the scope of the original SEPA determination for this facility (see mail from Greta Holmstrom dated June 3, 2021).