TECHNICAL SUPPORT DOCUMENT

CLARK COUNTY PUBLIC WORKS
SALMON CREEK WASTEWATER MANAGEMENT SYSTEM

SWCAA ID: 1834

Air Discharge Permit SWCAA 07-2726

ADP Application CL-1753

Issued: May 13, 2008

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Southwest Clean Air Agency

TABLE OF CONTENTS

Abbreviations

ADP	Air Discharge Permit (Same as Order of Approval)
AP-42	Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency
BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
Bhp	Brake horsepower
Btu	British thermal unit
CAM	Compliance assurance monitoring (40 CFR 64)
cfh	Cubic feet per hour
CFR	Code of Federal Regulations
CO	Carbon monoxide
EPA	U.S. Environmental Protection Agency
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
kW	Kilowatt
LAER	Lowest achievable emission rate
lb/MMBtu	Pound per million British thermal units
lb/yr	Pounds per year
$lb/10^6$ scf	Pounds per million standard cubic feet
lbs	Pounds
mgd	Millions of gallons per day
MMBtu/hr	Millions of British thermal units per hour
NO_X	Nitrogen oxides
NOC	Notice of Construction application (same as Air Discharge Permit application)
PM	Particulate matter with an aerodynamic diameter less than or equal to 100 micrometers (includes both filterable particulate matter measured by EPA Method 5 that is less than 100 micrometers and condensable particulate matter measured by EPA Method 202)
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
ppmvd	Parts per million, dry volume basis
ppmvd @ X	Parts per million, dry volume basis corrected to X
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
RCW	Revised Code of Washington
scfh	Standard (68°F, 1 atmosphere) cubic feet per hour
scfm	Standard (68°F, 1 atmosphere) cubic feet per minute
SQER	Small Quantity Emission Rate listed in WAC 173-460
SO_2	Sulfur dioxide
SWCAA	Southwest Clean Air Agency
TAP	Toxic Air Pollutant pursuant to Chapter 173-460 WAC
T-BACT	Best Available Control Technology for toxic air pollutants
tpy	Tons per year
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

1. FACILITY IDENTIFICATION

Applicant Name: Clark County Public Works
Applicant Address: P.O. Box 5000, Vancouver, Washington 98668

Facility Name: Salmon Creek Wastewater Management System
Facility Address: 15100 NW McCann Road, Vancouver, Washington 98685
SWCAA Identification: 1834
Contact Person: Kay Hust – Operations Manager

Primary Process: Municipal wastewater treatment
SIC / NAICS: 4952 / 22132
Facility Classifications: BACT / natural minor

2. FACILITY DESCRIPTION

The Salmon Creek Wastewater Management System will consists of the following seven components after completion of the Phase 4 expansion:

1. The Salmon Creek Interceptor (a gravity pipeline which parallels the Salmon Creek Watershed)
2. The 36th Avenue Pump Station
3. The 36th Avenue force main pipeline
4. The Salmon Creek Treatment Plant
5. Plant outfall pipeline to the Columbia River
6. Klineline Pump Station (new)
7. Forcemain from Klineline Pump Station to Salmon Creek Treatment Plant (new)

The Salmon Creek Treatment Plant is currently a 10.3 million gallon per day (mgd, monthly average) municipal wastewater treatment plant operated by Clark County Public Works. The plant capacity will be increased to 15.0 mgd (monthly average) after completion of the Phase 4 expansion.

3. CURRENT PERMITTING ACTION

Clark County Public Works submitted Air Discharge Permit Application CL-1753 on October 18, 2006, and supplemental information on November 29, 2006, and March 4, 2008, for approval of the following changes to the facility as elements of the Phase 4 expansion:

1. Addition of a new primary clarifier, bringing the total number of primary clarifiers to four;
2. Addition of a new aeration tank and secondary clarifier to the secondary treatment system, bringing the total number of aeration tanks to six and the total number of secondary clarifiers to four;
3. Replacement of the existing Superior Boiler with a new 5.231 MMBtu/hr Hurst Boiler with improved emissions;
4. Replacement of the gas trains and burner on the existing Hurst Boiler with a new gas train and burner capable of blending digester gas and natural gas and improved emissions;
5. Installation of an odor control system for the new force main from the Klineline Pump Station that will control hydrogen sulfide emissions from the outlet of the force main by injecting chemicals at the Klineline Pump Station and treating air gathered from the force main discharge point with an activated carbon unit;
6. Installation of one 1,848 horsepower emergency generator engine at the new Klineline Pump Station;
7. Installation of an odor control system at the Klineline Pump Station that will draw 4,900 acfm of gas from the pump well and incoming sewer piping through an activated carbon unit; and
8. Installation of a new 14,710 scfh digester waste gas burner with a 15:1 turndown to reduce facilitywide natural gas consumption.

During an inspection of the facility on August 29, 2007 SWCAA staff found that the 36th Avenue Flow Augmentation Pump Engines that were ultimately installed were Caterpillar C-9 engines rather than the Cummins engines originally permitted. The installed engines are EPA Tier 2 non-road certified and meet the requirements of BACT. Clark County Public Works supplemented Air Discharge Permit Application CL-1753 with a belated request for approval to install these engines.

4. PROCESS DESCRIPTION

The Salmon Creek Treatment Plant (SCTP) is operated by the Clark County Department of Public Works. The following process description was provided by the applicant with Air Discharge Permit application CL-1753:

The existing SCTP treatment process consists of preliminary and primary treatment, secondary treatment, and disinfection. Waste-activated sludge (WAS) from secondary treatment is removed, thickened and digested anaerobically, and stored.

The SCTP has an average annual capacity of 7.9 mgd and a maximum monthly capacity of 10.3 mgd. Monitoring records for 2005 indicate that the average annual flow rate is approaching the design capacity. A detailed description of the different process units in the existing SCTP is provided in the following subsections.

Preliminary and Primary Treatment
Influent flow enters the plant headworks through a channel where grit and large solids are removed by three mechanically cleaned bar screens, one manually cleaned bar screen, and two vortex-type grit chambers. The screens and screening channels are enclosed in a building. The solids are sent to a landfill, and the wastewater flows to primary treatment.

Primary treatment consists of three rectangular primary clarifiers adjacent to the preliminary treatment facility. Primary sludge from the clarifiers is sent to the sludge blend tank, and subsequently the anaerobic digesters. Scum that floats to the top of the liquid in the primary clarifiers is removed and sent to the solids handling facility. The remaining liquid is sent to secondary treatment.

Secondary Treatment
Secondary treatment consists of aeration basins and secondary clarifiers. The wastewater is first processed in the five aeration basins to aerobically digest the organic matter. VOCs are volatilized from the wastewater during this process. The next step is secondary clarification, where more sludge precipitates out and additional scum forms on the surface. The scum is sent to the solids handling facilities. Some secondary clarifier solids, known as return activated sludge, are recycled back to the aeration basins to maintain the microbial population. The rest of the sludge is sent to the gravity belt thickener for thickening prior to digestion. The thickened solids are sent to the sludge blend tank, and subsequently the anaerobic digesters. The liquid portion is returned to the headworks.

Disinfection
A UV disinfection facility is located west of the biosolids storage pond. Wastewater from the secondary clarifiers is disinfected by UV light prior to discharge to the Columbia River.

Anaerobic Digestion
The scum from the scum concentrator tank is processed in the digesters along with the primary sludge and thickened secondary sludge. Offgas generated during anaerobic digestion is used as a source of fuel for the boilers that provide heat for the digesters and facility buildings. Excess digester gas is burned in a waste gas incinerator. The remaining solids are dewatered in a belt filter press and spread onto agricultural land. The water is sent back to the headworks.

Pump Stations
The 36th Avenue Pump Station pumps effluent uphill to the SCTP. A biofilter to control fugitive odors at the pump station and two flow augmentation engines to meet peak load demands are currently under construction. They have been permitted under Air Discharge Permit SWCAA 05-2613.

Proposed Plant—Phase 4 Expansion

The proposed Phase 4 Expansion will increase the monthly maximum capacity of the plant to 15.0 mgd. This will occur between 2007 and 2009.

Preliminary and Primary Treatment

A new primary clarifier will be added to the primary treatment bringing the total number of primary clarifiers to four.

Secondary Treatment

A new aeration tank and secondary clarifier will be added to the secondary treatment, bringing the total number of aeration tanks to six and secondary clarifiers to four.

Anaerobic Digestion

Modifications to the gas-handling system are proposed. One of the boilers will be replaced with a larger, more efficient unit. The gas train/burner of the existing boiler will be replaced. In addition, a new waste gas burner with greater capacity and "turn-down" capability will be installed.

Force Main

A new force main from the Klineline Pump Station to the SCTP will be constructed. An activated carbon unit at the force main termination will control fugitive emissions. The activated carbon unit will be located at the SCTP and designed to treat up to 2,000 cfm and remove at least 90 percent of the odor-causing pollutants. The proposed force main and carbon unit will not increase the emissions of any regulated air pollutant.

Klineline Pump Station

A carbon unit will control fugitive odors at the new pump station. The carbon unit will be designed to treat up to 4,900 cubic feet per minute (cfm) and remove at least 90 percent of the odor-causing pollutants.

A standby generator will supply emergency power.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

New or Modified Equipment

5.a 4.226 MMBtu/hr Boiler: This hot water boiler is a Hurst Boiler and Welding Company, Inc. model S1-X-101-30W, serial number FB505-30-3. The existing 3.25 MMBtu/hr Sur-Lite burner will be replaced with a Weishaupt model G7/1-D, ZDM burner. The boiler and burner combination will have a heat input capacity of 4.226 MMBtu/hr. The Weishaupt burner will fire digester gas, a blend of digester gas and natural gas, or natural gas. The boiler provides heat to the digesters. Emissions are exhausted at a height of approximately 32 feet above ground level through a 16" diameter stack. This boiler was built in 1997.

5.b 5.231 MMBtu/hr Boiler: The following details were provided for this new hot water boiler.

Make / Model:	Hurst / Series 100
Configuration:	Fire tube
Input Heat Capacity:	5.231 MMBtu/hr
Turndown Ratio:	8:1
Fuel:	digester gas, natural gas or blend of digester gas and natural gas
Burner Make / Model:	Weishaupt / G30/20
Stack Parameters:	32' above ground level, 18" diameter, ~ 300 °F

5.c New Digester Waste Gas Burner: After the Phase 4 expansion the digester gas system is estimated to be capable of producing 163,000 cubic feet of digester gas per day. The following details were provided for the new burner.

Make / Model:	Varec / 244E
Capacity:	14,710 scfh digester gas
Turn Down Ratio:	at least 15:1
Stack Parameters:	20' above ground level, 41" diameter, variable temperature
Pilot Fuel:	40 scfh of natural gas

5.d Klineline Pump Station Odor Control Unit: A new 24" diameter forcemain from the new Klineline Pump Station will move sewage to the Salmon Creek Treatment Plant. The Klineline Pump Station will employ a chemical injection system to control the formation of hydrogen sulfide in the force main that would be emitted at the headworks of the Salmon Creek Treatment Plant. The system will target a dissolved sulfide level of 0.5 mg/L. In addition, an on-site odor control system will be installed. The on-site system will draw gas from the wet well and incoming sewer line(s) and pass the gas through a carbon canister system to remove hydrogen sulfide and other odorous compounds. The following details of the system were provided:

Carbon Bed Make / Model:	Bay Products, Inc. / Deep Bed OCS – 8' diameter dual bed configuration
Gas Flow Rate:	4,900 acfm (based on expected fan operating conditions)
Carbon Bed Capacity:	7,500 acfm
Dimensions:	2 layers of carbon, 36" thick, contained in a single 8' diameter shell. Each layer treats ~ ½ of the gas stream in parallel.
Design H_2S Control:	95% of gas stream containing 3 ppm H_2S

5.e Force Main Odor Control Unit: The new force main from the Klineline Pump Station will discharge into an enclosed basin equipped with an odor control system. The odor control system will draw 2,000 acfm of gas from the enclosure around the Klineline Force Main discharge point and treat the gas with a carbon canister. The existing headworks consists of three mechanically cleaned bar screens, one manually cleaned bar screen and two vortex-type grit chambers in an enclosed building. The following details of the Force Main Odor Control Unit were provided:

Carbon Bed Make / Model:	Calgon Minotaur OC or USFilter MIDAS OCM
Gas Flow Rate:	2,000 acfm (based on expected fan operating conditions)
Dimensions:	96" diameter bed, 3' deep carbon (approximately 4,000 lbs carbon)
Design H_2S Control:	95% of gas stream containing 3 ppm H_2S

5.f Klineline Emergency Generator Engine: This emergency generator package will provide emergency electricity to the Klineline Pump Station. The following details were provided:

Make / Model:	Cummins / QSK50-G4 NR2
Engine Power:	1,848 horsepower at full standby load
Fuel Consumption Rate:	92.7 gal/hr
Generator Output:	1,250 kW
Stack Details:	Not yet available
Certification:	EPA Tier 2 certified

5.g Headworks, Clarifiers, Aeration Tanks, etc. - Fugitive Emissions: Volatile organic compounds (VOCs) and toxic air pollutants (TAPs) are volatilized from unenclosed structures, and the headworks building. When the Phase 4 Expansion is completed, the facility will include the following fugitive emission sources:

- Four primary clarifiers
- Six aeration tanks
- Four secondary clarifiers

Existing Equipment

5.h Fulton Pulse Boiler: This boiler is a Fulton Pulse Combustion model DHW-750, fired on natural gas. The boiler is equipped with Leeson burners rated at 0.75 MMBtu/hr and is used to heat the administration building. This boiler was installed in 1996.

5.i Old Digester Waste Gas Incinerator: The older digester waste gas incinerator is a Sur-Lite enclosed flare model SDF200. This unit will be used as a backup if the new Digester Waste Gas Incinerator is out of service. The waste gas incinerator measures 40" by 40" and exhausts approximately 25' above ground level. The waste gas incinerator is designed to achieve a 0.6 second retention time with an exhaust flowrate of 3,200 scfm at 1,500°F. The waste gas incinerator has an operating range of 2,960 cfh to 11,843 cfh of digester gas containing 50% to 70% methane. Up to 1,875 scfh of supplemental natural gas could be burned in the waste gas incinerator when sufficient digester gas is not available. The total heat capacity of the waste gas incinerator is 8.25 MMBtu/hr. Digester gas is only flared when the amount of gas produced exceeds the demand of the boilers.

The waste gas incinerator is used to thermally oxidize pollutants in the digester gas. The digesters are estimated to produce gas with a heating value of 600 Btu/scf. Temperature is monitored at the lowest thermocouple when the waste gas incinerator is firing at a low rate.

5.j Scum Concentrator: VOCs and odors from the scum concentrator are vented at 225 cfm to a 28" diameter Calgon activated carbon canister. The canister contains 225 pounds of carbon for odor control.

5.k Sludge Blend Tank: VOCs and odors from the sludge blend tank are vented to a biotower capable of removing 99% of H_2S emissions at concentrations greater than or equal to 10 ppmv. The biotower is capable of treating up to 1,000 cfm of vent flow with an H_2S concentration of up to 300 ppmv (100 ppmv average). The bed is sized to have a residence time of at least 7 seconds.

5.l Caterpillar Emergency Generator: This generator is a 1,500 kW Caterpillar model SR-4B powered by a Caterpillar 3516-DITA diesel engine, serial number 25Z05353. The Caterpillar diesel engine is rated at 2,168 horsepower at 1,800 rpm. This generator is used to provide emergency power to the lower portion of the plant including the UV basins, solids processing effluent pumps, electrical lighting, and etc. The generator is operated approximately once per month for 40 – 60 minutes for testing and maintenance purposes and as necessary to provide emergency power. This generator was installed in March of 1998.

5.m Onan Emergency Generator: This generator is a 250 kW Onan GenSet, model 250.0 DYB-17R/10625, serial number 0874844198. The generator is driven by a 420 horsepower Allis – Chalmers model 25000 diesel engine, serial number 25-04768. This generator was installed at the 36th Avenue Pump Station in approximately 1975. In August of 1995 it was replaced at the pump station and moved to the wastewater plant to provide emergency power for the upper plant, including general lighting, bar screens, aeration blowers, and etc. This generator is operated approximately twice per month for 40 – 60 minutes for testing and maintenance purposes and as necessary to provide emergency power.

5.n 36th Avenue Pump Station Generator: This Onan generator set provides 800 kW of electrical power and is powered by a Cummins model KTA38-G2, engine number 33128676, diesel engine, serial number 97767-16. This generator is located at, and provides emergency power for, the 36th Avenue Pump Station (located at the south end of the Salmon Creek bridge). The generator is operated approximately once per month for 40 – 60 minutes for testing and maintenance purposes and as necessary to provide emergency power. This generator was manufactured September 29, 1994 and installed in August of 1995.

5.o Flow Augmentation Pump Engine #1: This diesel engine is used to power a wastewater pump used only during high peak flows. Specific engine information is listed below:

Engine Make / Model:	Caterpillar / C-9
Engine Serial Number:	CLJ08815
Date Built:	April 6, 2005 (2005 model year)
Fuel:	Diesel
Fuel Consumption:	~14 gallons per hour at full load
Horsepower Rating:	275 bhp at 2,200 rpm
Certification:	EPA Tier 2 certified
Location:	36th Avenue Pump Station

5.p Flow Augmentation Pump Engine #2: This diesel engine is used to power a wastewater pump used only during high peak flows. Specific engine information is listed below:

Engine Make / Model:	Caterpillar / C-9
Engine Serial Number:	CLJ08815
Date Built:	April 15, 2005 (2005 model year)
Fuel:	Diesel
Fuel Consumption:	~14 gallons per hour at full load
Horsepower Rating:	275 bhp at 2,200 rpm
Certification:	EPA Tier 2 certified
Location:	36th Avenue Pump Station

5.q 36th Avenue Pump Station Ventilation: Odorous air ventilated from the 36th avenue pump station wet well and the lower section of the Salmon Creek Interceptor is treated with an in-ground biofilter. The biofilter will be comprised of compost, bark, and wood chips, peat, carbon, and other organic or inorganic materials. The biofilter will measure approximately 12' by 42' and treat up to 1,200 cfm of odorous gas. The biofilter will be designed to achieve 97% to 99% control of hydrogen sulfide emissions in the concentration ranges expected from the wet well. A rainbird model sprinkler will be installed to maintain uniform moisture content.

Equipment to be Removed in the Phase 4 Expansion

5.r Superior Boiler: This boiler is a Superior, Inc. model 3-X-260, serial number 11573, with a Sur-lite Corporation burner. The boiler is rated at 1.875 MMBtu/hr and is primarily fired on digester gas. Natural gas is used as a backup fuel. The boiler provides heat to the digesters. Emissions are exhausted at a height of approximately 58 feet through an 18" diameter stack. This boiler was built in 1992.

5.s Equipment/Activity Summary:

ID No.	Generating Equipment/Activity	# of Units	Control Equipment	# of Units
1	4.226 MMBtu/hr Boiler	1	Low-NO_X burners	1
2	5.231 MMBtu/hr Boiler	1	Low-NO_X burners	1
3	New Digester Waste Gas Burner	1	Low-NO_X design	1
4	Klineline Pump Vent	1	Klineline Pump Station Odor Control Unit (carbon adsorber system)	1
5	Force Main Discharge Vent	1	Force Main Odor Control Unit (carbon adsorber system, liquid sulfide control system)	1

ID No.	Generating Equipment/Activity	# of Units	Control Equipment	# of Units
6	Klineline Emergency Generator Engine	1	Tier 2 engine design, ultra-low sulfur diesel	N/A
7	Headworks, Clarifiers, Aeration Tanks, etc. - Fugitive Emissions	1	None	0
8	Fulton Pulse Boiler	1	None	0
9	Old Digester Waste Gas Incinerator	1	Low-NO_X design	0
10	Scum Concentrator	1	Carbon canister	1
11	Sludge Blend Tank	1	Biological packed tower	1
12	Caterpillar Emergency Generator Engine	1	Ultra-low sulfur diesel	N/A
13	Onan Emergency Generator Engine	1	Ultra-low sulfur diesel	N/A
14	36th Avenue Pump Station Generator Engine	1	Ultra-low sulfur diesel	N/A
15	Flow Augmentation Pump Engine #1	1	Tier 3 engine design, ultra-low sulfur diesel	N/A
16	Flow Augmentation Pump Engine #2	1	Tier 3 engine design, ultra-low sulfur diesel	N/A
17	36th Avenue Pump Station Ventilation	1	Biofilter	1

6. EMISSIONS DETERMINATION

6.a 4.226 MMBtu/hr Boiler: The 4.226 MMBtu/hr Boiler will be fired on both digester gas and natural gas. Potential annual emissions from the combustion of digester gas were estimated conservatively using the assumption that the boiler is operated at full rated load (4.226 MMBtu/hr) for 8,760 hours per year burning digester gas. Potential annual emissions from the combustion of natural gas were estimated conservatively using the assumption that the boiler is operated at full rated load for 8,760 hours per year burning natural gas.

Digester Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/10^6 scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.040[1]	23.7[1]	Manufacturer	1,463
Nitrogen oxides	0.039[2]	23.4[2]	Manufacturer	1,442
Volatile organic compounds	0.0054	3.2[3]	AP-42 Sec. 1.4 (7/98)	200
$PM/PM_{10}/PM_{2.5}$[4]	0.0075	4.5[3]	AP-42 Sec. 1.4 (7/98)	276
Sulfur oxides as SO_2	0.50	299	1,800 ppm H_2S in fuel	18,462

[1] Equivalent to 50 ppmvd @ 3% O_2 for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] Equivalent to 30 ppmvd @ 3% O_2 for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] The AP-42 emission factors were reduced by the ratio of the heat content of the digester gas (600 Btu/scf) to the heat content assumed in AP-42 for natural gas (1,020 Btu/scf).
[4] All particulate matter is assumed to be less than 1 μm in diameter.

Natural Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/10^6 scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.037[1]	37.7	Manufacturer	1,368
Nitrogen oxides	0.036[2]	37.1	Manufacturer	1,348
Volatile organic compounds	0.0054	5.5	AP-42 Sec. 1.4 (7/98)	200
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	7.6	AP-42 Sec. 1.4 (7/98)	276
Sulfur oxides as SO_2	0.00059	0.6	AP-42 Sec. 1.4 (7/98)	22
Benzene	$2.1*10^{-6}$	0.0021	AP-42 Sec. 1.4 (7/98)	0.1
Formaldehyde	$7.4*10^{-5}$	0.075	AP-42 Sec. 1.4 (7/98)	2.7

[1] Equivalent to 50 ppmvd @ 3% O_2
[2] Equivalent to 30 ppmvd @ 3% O_2
[3] All particulate matter is assumed to be less than 1 μm in diameter.

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

6.b 5.231 MMBtu/hr Boiler: The 5.231 MMBtu/hr Boiler will be fired on both digester gas and natural gas. Potential annual emissions from the combustion of digester gas were estimated conservatively using the assumption that the boiler burns the entire amount of digester gas that could be produced at the facility (up to 163,000 standard cubic feet per day). The boiler has the capacity to burn up to 210,000 standard cubic feet per day of digester gas. Potential annual emissions from the combustion of natural gas were estimated conservatively using the assumption that the boiler is operated at full rated load for 8,760 hours per year burning natural gas.

Digester Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/10^6 scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.040[1]	23.7[1]	Manufacturer	1,411
Nitrogen oxides	0.039[2]	23.4[2]	Manufacturer	1,391
Volatile organic compounds	0.0054	3.2[3]	AP-42 Sec. 1.4 (7/98)	192
$PM/PM_{10}/PM_{2.5}$[4]	0.0075	4.5[3]	AP-42 Sec. 1.4 (7/98)	266
Sulfur oxides as SO_2	0.50	299	1,800 ppm H_2S in fuel	17,802

[1] Equivalent to 50 ppmvd @ 3% O_2 for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] Equivalent to 30 ppmvd @ 3% O_2 for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] The AP-42 emission factors were reduced by the ratio of the heat content of the digester gas (600 Btu/scf) to the heat content assumed in AP-42 for natural gas (1,020 Btu/scf).
[4] All particulate matter is assumed to be less than 1 μm in diameter.

Natural Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/10^6 scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.037[1]	37.7	Manufacturer	1,693
Nitrogen oxides	0.036[2]	37.1	Manufacturer	1,669
Volatile organic compounds	0.0054	5.5	AP-42 Sec. 1.4 (7/98)	247
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	7.6	AP-42 Sec. 1.4 (7/98)	341
Sulfur oxides as SO_2	0.00059	0.6	AP-42 Sec. 1.4 (7/98)	27

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Benzene	$2.1*10^{-6}$	0.0021	AP-42 Sec. 1.4 (7/98)	0.1
Formaldehyde	$7.4*10^{-5}$	0.075	AP-42 Sec. 1.4 (7/98)	3.4

[1] Equivalent to 50 ppmvd @ 3% O_2
[2] Equivalent to 30 ppmvd @ 3% O_2
[3] All particulate matter is assumed to be less than 1 μm in diameter.

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

6.c Fulton Pulse Boiler: The Fulton Pulse Boiler will be fired solely on natural gas. Potential annual emissions from the combustion of natural gas were estimated conservatively using the assumption that the boiler is operated at full rated load (0.75 MMBtu/hr) for 8,760 hours per year burning natural gas.

Natural Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.088	84	AP-42 Sec. 1.4 (7/98)	541
Nitrogen oxides	0.10	100	AP-42 Sec. 1.4 (7/98)	644
Volatile organic compounds	0.0054	5.5	AP-42 Sec. 1.4 (7/98)	35
$PM/PM_{10}/PM_{2.5}$[1]	0.0075	7.6	AP-42 Sec. 1.4 (7/98)	49
Sulfur oxides as SO_2	0.00059	0.6	AP-42 Sec. 1.4 (7/98)	4
Benzene	$2.1*10^{-6}$	0.0021	AP-42 Sec. 1.4 (7/98)	0.01
Formaldehyde	$7.4*10^{-5}$	0.075	AP-42 Sec. 1.4 (7/98)	0.5

[1] All particulate matter is assumed to be less than 1 μm in diameter.

6.d Old Digester Waste Gas Incinerator: Potential emissions from the combustion of digester gas in the old digester waste gas incinerator were estimated assuming the Old Digester Waste Gas Incinerator burns the entire amount of digester gas that could be produced at the facility (up to 163,000 standard cubic feet per day). This is a conservative estimate because the system is designed so that digester gas is burned preferentially in the boilers. In addition, the Old Digester Waste Gas Incinerator will only be used as a backup when the New Digester Waste Gas Incinerator is not available. The Old Digester Waste Gas Incinerator has the capacity to burn up to 330,000 standard cubic feet per day of digester gas.

Digester Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.30	180[1]	Manufacturer	10,709
Nitrogen oxides	0.06	36[2]	Manufacturer	2,142
Volatile organic compounds	0.0054	3.24	AP-42 Sec. 1.4 (7/98)	192
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	4.47	AP-42 Sec. 1.4 (7/98)	266
Sulfur oxides as SO_2	0.14	83.1	1,800 ppm H_2S in fuel	17,802
Hydrogen sulfide		1.59[4]	Engineering Estimate	95

[1] Equivalent to the manufacturer supplied emission factor of 0.3 lb/MMBtu for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] Equivalent to the manufacturer supplied emission factor of 0.06 lb/MMBtu for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] All particulate matter is assumed to be less than 1 μm in diameter.

[4] The emission factor for hydrogen sulfide was calculated assuming that 100% of the reduced sulfur compounds in the digester gas are hydrogen sulfide, and that the Old Digester Waste Gas Incinerator provides for 99% destruction removal efficiency (DRE).

The digester waste gas incinerator may burn natural gas as a supplemental fuel to maintain a specified temperature and assure adequate destruction of digester gas. Emissions from the combustion of natural gas are expected to be small relative to emissions from the combustion of digester gas.

Potential emissions from the combustion of natural gas in the digester waste gas incinerator were estimated assuming that the digester waste gas incinerator is operated with the full design rate of supplemental natural gas (1,875 scfh) for 8,760 hours per year.

Natural Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.30	306[1]	Manufacturer	5,026
Nitrogen oxides	0.06	61.2[2]	Manufacturer	1,005
Volatile organic compounds	0.0054	5.5	AP-42 Sec. 1.4 (7/98)	90
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	7.6	AP-42 Sec. 1.4 (7/98)	125
Sulfur oxides as SO_2	0.00059	0.6	AP-42 Sec. 1.4 (7/98)	10
Benzene	$2.1*10^{-6}$	0.0021	AP-42 Sec. 1.4 (7/98)	0.03
Formaldehyde	$7.4*10^{-5}$	0.075	AP-42 Sec. 1.4 (7/98)	1.2

[1] Equivalent to the manufacturer supplied emission factor of 0.3 lb/MMBtu for natural gas with a heat content of 1,020 Btu/scf.
[2] Equivalent to the manufacturer supplied emission factor of 0.06 lb/MMBtu for natural gas with a heat content of 1,020 Btu/scf.
[3] All particulate matter is assumed to be less than 1 μm in diameter.

In the future, emissions from the combustion of digester gas will be calculated using emission factors from the most recent source test and the total quantity of digester gas combusted in the waste gas incinerator except where source test data is not available. Where source test data is not available for a specific pollutant, the relevant emission factor identified above shall be used to calculate annual emissions from the combustion of digester gas. Emissions from the combustion of natural gas will be calculated using the natural gas emission factors identified above unless new and better information is obtained through source testing.

6.e New Digester Waste Gas Burner: Potential emissions from the combustion of digester gas in the new digester waste gas burner were estimated by assuming that the New Digester Waste Gas Burner combusts the entire amount of digester gas that could be produced at the facility (up to 163,000 standard cubic feet per day). This is a conservative estimate because the system is designed so that digester gas is burned preferentially in the boilers. The New Digester Waste Gas Burner will have the capacity to burn up to 348,000 standard cubic feet per day of digester gas.

Digester Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.30	180[1]	Manufacturer	10,709
Nitrogen oxides	0.06	36[2]	Manufacturer	2,142
Volatile organic compounds	0.0054	3.24	AP-42 Sec. 1.4 (7/98)	192
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	4.47	AP-42 Sec. 1.4 (7/98)	266
Sulfur oxides as SO_2	0.14	83.1	1,800 ppm H_2S in fuel	17,802
Hydrogen sulfide		1.59[4]	Design Requirement	95

[1] Equivalent to the manufacturer supplied emission factor of 0.3 lb/MMBtu for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] Equivalent to the manufacturer supplied emission factor of 0.06 lb/MMBtu for digester gas that is 60.8% methane, 39.2% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] All particulate matter is assumed to be less than 1 μm in diameter.
[4] The emission factor for hydrogen sulfide was calculated assuming that 100% of the reduced sulfur compounds in the digester gas are hydrogen sulfide, and that the New Digester Waste Gas Burner provides for 99% destruction removal efficiency (DRE).

The digester waste gas burner may burn natural gas as a supplemental fuel to maintain a specified temperature and assure adequate destruction of digester gas. Emissions from the combustion of natural gas are expected to be small relative to emissions from the combustion of digester gas.

Potential emissions from the combustion of natural gas in the digester waste gas burner were estimated assuming that the digester waste gas burner is operated with an amount of natural gas equal to the minimum firing rate of the burner (15:1 turndown at 14,710 scfh = 981 scfh) for 8,760 hours per year.

Natural Gas Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor ($lb/10^6$ scf)	Emission Factor Source	Annual Emissions (lb/yr)
Carbon monoxide	0.30	306[1]	Manufacturer	2,629
Nitrogen oxides	0.06	61.2[2]	Manufacturer	526
Volatile organic compounds	0.0054	5.5	AP-42 Sec. 1.4 (7/98)	47
$PM/PM_{10}/PM_{2.5}$[3]	0.0075	7.6	AP-42 Sec. 1.4 (7/98)	65
Sulfur oxides as SO_2	0.00059	0.6	AP-42 Sec. 1.4 (7/98)	5
Benzene	$2.1*10^{-6}$	0.0021	AP-42 Sec. 1.4 (7/98)	0.02
Formaldehyde	$7.4*10^{-5}$	0.075	AP-42 Sec. 1.4 (7/98)	0.6

[1] Equivalent to the manufacturer supplied emission factor of 0.3 lb/MMBtu for natural gas with a heat content of 1,020 Btu/scf.
[2] Equivalent to the manufacturer supplied emission factor of 0.06 lb/MMBtu for natural gas with a heat content of 1,020 Btu/scf.
[3] All particulate matter is assumed to be less than 1 μm in diameter.

In the future, emissions from the combustion of digester gas will be calculated using emission factors from the most recent source test and the total quantity of digester gas combusted in the waste gas burner except where source test data is not available. Where source test data is not available for a specific pollutant, the relevant emission factor identified above shall be used to calculate annual emissions from the combustion of digester gas. Emissions from the combustion of natural gas will be calculated using the natural gas emission factors identified above unless new and better information is obtained through source testing.

6.f Headworks, Clarifiers, Aeration Tanks, etc. - Fugitive Emissions: Fugitive emissions consist of volatile organic compounds (VOCs) volatilized from wastewater processing that are vented directly to the ambient air. Some of these VOCs are also toxic air pollutants (TAPs) listed in WAC 173-460 and/or hazardous air pollutants (HAPs) listed in Section 112 of the Federal Clean Air Act Amendments of 1990. Annual emissions were calculated using the assumption that the facility will treat 11.41 mgd on an annual average (this was the design basis presented in Air Discharge Permit Application CL-1753).

HAP and TAP emissions were calculated using emission factors calculated from a Bay Area Sewage Toxics Emissions (BASTE) computer model run by the applicant. With the exception of xylenes, the chemical input data came from the applicant's 2005 Annual Pretreatment Report. Xylenes were not measured for this report. Inlet xylenes concentration was estimated from Air Discharge Permit Application CL-1292 (84 μg/L).

Pollutant	CAS #	HAP/TAP Class	Emission Factor (lb/10^6 gal)	Emission Factor Source	Annual Emissions (lb/yr)
Hydrogen sulfide	7783-06-4	TAP B	0.339	BASTE[1]	1,410
Methyl mercaptan	74-93-1	TAP B	0.0279	BASTE[1]	116
Acetone	64-67-1	TAP B	0.00432		18
Chloroform	67-66-3	HAP / TAP A	0.00552	BASTE[1]	23
Cresol (m)	108-39-4	HAP / TAP B	0.000216	BASTE[1]	0.9
Dichlorobenzene (1,4) (p)	106-46-7	HAP / TAP A	0.000456	BASTE[1]	1.9
Phenol	108-95-2	HAP / TAP B	0.000096	BASTE[1]	0.4
Phthalic acid	84-66-2	not a HAP or TAP	0.0113	BASTE[1]	47
Toluene	108-88-3	HAP / TAP B	0.00168	BASTE[1]	7
Xylenes	1330-20-7	HAP / TAP B	0.00204	BASTE[1]	8.5
Total VOCs			0.903	SCAQMD JEIP[2]	3,760
Total HAPs	42 lb/yr				
Total TAPs	1,586 lb/yr				

[1] Bay Area Sewage Toxic Emissions computer model.
[2] South Coast Air Quality Management District Joint Emission Inventory Program (October, 1993).

In the future, emissions will be calculated using the emission factors identified above unless new emission factors are provided from new emissions models or wastewater sampling.

6.g Scum Concentrator: The Scum Concentrator could be a significant source of nuisance odors if not properly controlled with a carbon canister. Emissions are expected to be so low as to be practically unquantifiable downstream of the control equipment.

6.h Sludge Blend Tank: The Sludge Blend Tank could be a significant source of nuisance odors if not properly controlled with the biological packed tower. Potential emissions of hydrogen sulfide were calculated using the assumption that the tank exhausts at a rate of 1,000 cfm, the exhaust contains 100 ppm of hydrogen sulfide, and the biological packed tower provides for only 97% control of hydrogen sulfide emissions.

Pollutant	lb/hr	Maximum Potential Emissions (lb/yr)
Hydrogen sulfide	0.016	139

6.i Caterpillar Emergency Generator Engine: The Caterpillar Emergency Generator Engine will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming that the engine is operated a maximum of 200 hours per year at full standby load (2,150.7 horsepower). A mass balance was used to calculate sulfur oxides emissions assuming the engine burns 107.5 gallons per hour (7,000 Btu/hp-hr), the fuel has a sulfur content of 0.0015% by weight, and all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	10.04 lb/hr	Caterpillar	2,008
Nitrogen oxides	59.27 lb/hr	Caterpillar	11,854
Volatile organic compounds	1.13 lb/hr	Caterpillar	226
$PM/PM_{10}/PM_{2.5}$[1]	0.75 lb/hr	Caterpillar	150
Sulfur oxides as SO_2	0.77 lb/hr	Mass Balance	5

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.j 36th Avenue Pump Station Emergency Generator Engine: The 36th Avenue Pump Station Emergency Generator Engine will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming that the engine is operated a maximum of 200 hours per year at full rated load (1,200 horsepower). A mass balance was used to calculate sulfur oxides emissions using the rated fuel consumption for the engine (59.4 gallons per hour), a fuel sulfur content of 0.0015% by weight, and the assumption that all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	3.44 lb/hr	Cummins	688
Nitrogen oxides	33.07 lb/hr	Cummins	6,614
Volatile organic compounds	0.26 lb/hr	Cummins	53
$PM/PM_{10}/PM_{2.5}$[1]	0.26 lb/hr	Cummins	53
Sulfur oxides as SO_2	0.43 lb/hr	Mass Balance	3

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.k Onan Emergency Generator Engine: The Onan Emergency Generator Engine will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming that the engine is operated a maximum of 200 hours per year at full standby load (420 horsepower). A mass balance was used to calculate sulfur oxides emissions assuming the engine burns 21.0 gallons per hour (7,000 Btu/hp-hr), the fuel has a sulfur content of 0.0015% by weight, and all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor (lb/hp-hr)	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	0.00668	AP-42 Table 3.3-1 (10/96)	561
Nitrogen oxides	0.031	AP-42 Table 3.3-1 (10/96)	2,604
Volatile organic compounds	0.00247	AP-42 Table 3.3-1 (10/96)	207
$PM/PM_{10}/PM_{2.5}$[1]	0.0022	AP-42 Table 3.3-1 (10/96)	185
Sulfur oxides as SO_2	0.00036	Mass Balance	1

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.l Flow Augmentation Pump Engine #1: Flow Augmentation Pump Engine #1 will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming

that the engine is operated a maximum of 200 hours per year at full rated load (275 horsepower). A mass balance was used to calculate sulfur oxides emissions using the rated fuel consumption for the engine (14 gallons per hour), a fuel sulfur content of 0.0015% by weight, and the assumption that all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	0.65 lb/hr	Caterpillar	130
Nitrogen oxides	3.56 lb/hr	Caterpillar	712
Volatile organic compounds	0.12 lb/hr	Caterpillar	24
$PM/PM_{10}/PM_{2.5}$[1]	0.98 lb/hr	Caterpillar	16
Sulfur oxides as SO_2	0.003 lb/hr	Mass Balance	1

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.m Flow Augmentation Pump Engine #2: Flow Augmentation Pump Engine #2 will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming that the engine is operated a maximum of 200 hours per year at full rated load (275 horsepower). A mass balance was used to calculate sulfur oxides emissions using the rated fuel consumption for the engine (14 gallons per hour), a fuel sulfur content of 0.0015% by weight, and the assumption that all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	0.65 lb/hr	Caterpillar	130
Nitrogen oxides	3.56 lb/hr	Caterpillar	712
Volatile organic compounds	0.12 lb/hr	Caterpillar	24
$PM/PM_{10}/PM_{2.5}$[1]	0.98 lb/hr	Caterpillar	16
Sulfur oxides as SO_2	0.003 lb/hr	Mass Balance	1

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.n Klineline Emergency Generator Engine: The Klineline Emergency Generator Engine will be fired on road-grade #2 diesel (or better) containing 0.0015% or less sulfur by weight. Maximum potential emissions were calculated assuming that the engine is operated a maximum of 100 hours per year at full standby load (1,848 horsepower). A mass balance was used to calculate sulfur oxides emissions using the rated fuel consumption for the engine (92.7 gallons per hour), a fuel sulfur content of 0.0015% by weight, and the assumption that all fuel sulfur is converted to sulfur oxides.

Pollutant	Emission Factor	Emission Factor Source	Maximum Potential Emissions (lb/yr)
Carbon monoxide	1.83 lb/hr	Cummins – Full Standby	183
Nitrogen oxides	21.19 lb/hr	Cummins – Full Standby	2,119
Volatile organic compounds	0.24 lb/hr	Cummins – Full Standby	24
$PM/PM_{10}/PM_{2.5}$[1]	0.16 lb/hr	Cummins – Full Standby	16
Sulfur oxides as SO_2	0.02 lb/hr	Mass Balance	2

[1] All particulate matter is assumed to have an aerodynamic diameter of 1 μm or less.

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

6.o 36th Avenue Pump Station Ventilation: Gases vented from the 36th Avenue Pump Station could be a significant source of nuisance odors if not properly controlled with a biofilter as proposed. Emissions are expected to be so low as to be practically unquantifiable downstream of the control equipment.

6.p Klineline Pump Station Vent –Klineline Pump Station Odor Control Unit: The Klineline Pump Station Odor Control Unit will treat 4,900 scfm of gas drawn from the wet well and incoming sewage piping with a carbon canister. The canister will be designed to provide for 95% control of H_2S at a design inlet concentration of 3 ppmv. Potential annual emissions of hydrogen sulfide were calculated using the assumption that the system treats 4,900 cfm of tainted gas 8,760 hours per year, the incoming gas contains 3 ppmv H_2S, and the carbon canister captures 95% of the incoming H_2S.

Pollutant	lb/hr	Maximum Potential Emissions (lb/yr)
Hydrogen sulfide	0.0039	34

6.q Force Main Vent - Force Main Odor Control Unit: The Force Main Odor Control Unit will treat 2,000 scfm of gas drawn from an enclosed area surround the force main discharge with a carbon canister. The canister will be designed to provide for 95% control of H_2S at a design inlet concentration of 3 ppmv. Potential annual emissions of hydrogen sulfide were calculated using the assumption that the system treats 2,000 cfm of tainted gas 8,760 hours per year, the incoming gas contains 3 ppmv H_2S, and the carbon canister captures 95% of the incoming H_2S.

Pollutant	lb/hr	Maximum Potential Emissions (lb/yr)
Hydrogen sulfide	0.0016	14

6.r Facilitywide Potential Emissions Summary: Facilitywide potential emissions from the combustion of digester gas are limited by the digester gas production capability of the facility. The digester gas combustion capacity of equipment at this facility far exceeds the digester gas production capability. Facilitywide potential emissions were calculated assuming that some digester gas is burned in both the Old Digester Waste Gas Incinerator and the New Digester Waste Gas Burner, and none is burned in any of the boilers.

Pollutant	Potential Annual Emissions (tpy)
Volatile organic compounds	2.57
Nitrogen oxides	15.97
Carbon monoxide	12.83
Particulate matter	0.78
PM_{10}	0.78
$PM_{2.5}$	0.78
Sulfur oxides as sulfur dioxide	8.94
Toxic Air Pollutants	0.84
Hazardous Air Pollutants	0.07

7. REGULATIONS AND EMISSION STANDARDS

Regulations 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 regulations, codes, or requirements listed below.

7.a Title 40 Code of Federal Regulations (40 CFR) 63.1580 et seq "Subpart VVV – National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works" established HAP emission control requirements for wastewater plants that are themselves a major source of hazardous air pollutants or are located at a major source of hazardous air pollutants. This facility is not a major source of hazardous air pollutants and is not located at a major source of hazardous air pollutants, therefore this facility is not subject to this regulation.

7.b Title 40 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 required. The new Klineline emergency generators will be affected sources because they will be manufactured after the April 1, 2006 applicability date.

7.c Revised Code of Washington (RCW) 70.94.141 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 70.94] 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.

7.d RCW 70.94.152 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 Order of Approval (Air Discharge Permit) for installation and establishment of an air contaminant source.

7.e Washington Administrative Code (WAC) 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.

7.f WAC 173-470 "Ambient Air Quality Standards for Particulate Matter" establishes ambient air quality standards for total suspended particulate matter and for particulate matter smaller than 10 microns (PM_{10}), which may not be exceeded more than one day per year.

7.g WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide" establishes ambient air quality standards for carbon monoxide, ozone, and nitrogen dioxide in the ambient air, which shall not be exceeded.

7.h 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, sulfur dioxide, concealment and masking, and fugitive dust.

7.i SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit shall 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.

7.j SWCAA 400-040 (2) "Fallout" requires that no emission of particulate matter from any source 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 on which the material is deposited.

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

7.l SWCAA 400-040(4) "Odors" requires that any person who shall cause or allow the generation of any odor from any source, which may unreasonably interfere with any other property owner's use and enjoyment of their property must use recognized good practices and procedures to reduce these odors to a reasonable minimum.

7.m SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.

7.n SWCAA 400-091 "Voluntary Limits on Emissions" allows sources to request voluntary limits on emissions and potential to emit by submittal of an Air Discharge Permit application as provided in SWCAA 400-109. Upon completing review of the application, SWCAA shall issue a Regulatory Order that reduces the source's potential to emit to an amount agreed upon between SWCAA and the permittee. The permittee has agreed to a voluntary limit of 8.94 tons per year sulfur dioxide (facilitywide). At a more thorough review of BACT is warranted if sulfur dioxide emissions exceed this limitation.

7.o SWCAA 400-110 "New Source Review" requires that an Air Discharge Permit application be filed with SWCAA prior to the establishment of any new source, emission unit, or modification and that an Air Discharge Permit be issued prior to establishment of the new source, emission unit, or modification.

7.p SWCAA 400-111 "Requirements for Sources in a Maintenance Plan Area" requires that no approval to construct or alter an air contaminant source shall 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) Emissions will be minimized to the extent that the new source will not exceed emission levels or other requirements provided in the maintenance plan;
(3) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
(4) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
(5) 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.

This facility is within the Portland/Vancouver Maintenance Plan Area, and therefore is subject to this regulation.

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

The proposed equipment and control systems have been evaluated to determine if they meet the requirements of Best Available Control Technology (BACT) and Best Available Control Technology for toxics (T-BACT) for the types and amounts of air contaminants emitted by the processes and equipment as described below:

New BACT Determinations

8.a BACT Determination – 4.226 MMBtu/hr Boiler and 5.231 MMBtu/hr Boiler: The applicant proposed to replace the burners in the existing 3.25 MMBtu/hr Hurst Boiler with 4.226 MMBtu/hr burners (the boiler will be renamed the 4.226 MMBtu/hr Boiler) and install and a new 5.231 MMBtu/hr Boiler so that they could both burn a blend of digester gas and natural gas. The applicant's BACT analysis indicated that the lowest emissions guarantee available for a burner system that could burn a mixture of digester gas and natural gas at varying mixture levels limits NO_X emissions to 30 ppmvd @ 3% O_2 and CO emissions to 50 ppmvd @ 3% O_2. Lower emission burners (e.g. 9 or 20 ppm NO_X @ 3% O_2) were not capable of burning the blend of digester gas and natural gas. To produce lower emission concentrations the boilers would need to be equipped with dual gas trains, one burning natural gas, one burning digester gas. The applicant has explained that this configuration (which is currently in use at the facility)

would result in greater overall emissions because much of the digester gas would be diverted from the boilers to the New Digester Waste Gas Burner (depending on gas pressures) and natural gas would be used to replace the diverted digester gas.

SWCAA concurs with the applicant's analysis that the proposed emission rates meet the requirements of BACT for the 4.226 MMBtu/hr Boiler and the 5.231 MMBtu/hr Boiler at this facility.

8.b BACT Determination – New Digester Waste Gas Burner: The applicant has proposed to utilize a waste gas burner that will limit NO_X emissions to 0.06 lb/MMBtu or less and CO emissions to 0.30 lb/MMBtu or less while providing for 98% or better destruction of volatile organic compounds and 99% or better destruction of hydrogen sulfide. There are fully enclosed flares available that can provide an equivalent level of volatile organic compound control but with lower levels of carbon monoxide or nitrogen oxides emissions. For example, John Zinc's ZULE enclosed flare promises to achieve NO_X emissions of 0.025 lb/MMBtu and CO emissions of 0.06 lb/MMBtu when burning natural gas. A significant downside of the ZULE and other fully enclosed flares is the limited amount of "turn-down." The applicant estimates that the differences in available turn-down would result in the need to burn approximately 25,000 therms of additional natural gas in the fully enclosed flare, at an estimated cost of over $30,000 per year.

In a letter dated February 23, 2007, the applicant provided a BACT analysis comparing the cost-effectiveness of the proposed waste gas burner with John Zinc's ZULE flare. The ZULE flare could emit as much as 0.4 tons per year less NO_X and 6.9 tons per year less carbon monoxide when running at full capacity all year as compared with the Varec 244E waste gas burner. The difference would be much less if the flares are operated as expected, with most digester gas burned in the boilers. The applicant supplied an evaluation of the annualized cost differences using the procedure in EPA's Air Pollution Control Cost Manual – Sixth Edition (EPA 452/B-02-001) Section 3.2 Chapter 1 – Flares. The result of the analysis indicated that the Varec 244E waste gas burner could provide an annualized savings of approximately $128,000 per year. The applicant proposes that this savings alone is enough to justify the potential increase in emissions. SWCAA concurs.

SWCAA has expressed some concern that because the Varec 244E waste gas burner is not fully enclosed and draws in ambient air through a series of annular openings, that areas near the annual walls could be significantly colder than interior areas of the burner. In these colder areas, destruction efficiency could be significantly reduced relative to the destruction efficiency at the center of the flare, with a corresponding increase in carbon monoxide emissions. It is SWCAA's understanding that previous testing of the Varec 244E may have only determined emission concentrations at the center of the burner exhaust. However, SWCAA will approve installation of the Varec 244E because the manufacturer has guaranteed to achieve 0.06 lb/MMBtu NO_X and 0.30 lb/MMBtu CO and because the Old Digester Waste Gas Incinerator will be retained as a backup unit in the event that the Varec 244E flare fails to meet the guaranteed emission levels.

8.c BACT Determination – Klineline Pump Station Odor Control Unit and Force Main Odor Control Unit: The applicant has proposed to control odors from the Klineline Pump Station and the discharge of the force main with carbon beds designed to capture hydrogen sulfide and additives to prevent the formation of hydrogen sulfide in the force main. These systems will reduce the hydrogen sulfide concentration by 95% when the inlet concentration is less than 10 ppm and by 99% when the inlet concentration is 10 ppm or more. This level of control meets or exceeds the level of control provided by a biofilter, biotower or liquid-phase scrubber. SWCAA concurs that this level of control meets the requirements of BACT at this facility.

8.d BACT Determination – Klineline Emergency Generator Engine: Available control measures for diesel engines include ultra-low sulfur fuel and add-on control equipment such as selective catalytic reduction units. Add-on control equipment will not be economically feasible because the engine will be operated only for short periods of time for testing, maintenance, and to provide emergency electricity during a power interruption. In addition, because the engine will normally be operated only for short periods of time, the stable operating temperature required for operation of add-on control equipment is not likely to be achieved.

The use of modern diesel-fired internal combustion engine design (meeting EPA's relevant Tier emission standard (Tier 2 for this engine), ultra-low sulfur diesel fuel (≤ 0.0015% sulfur by weight), limitation of visible emissions to 5% opacity or less, and limitation of engine operation to maintenance checks, readiness testing and as necessary to provide emergency electricity during power interruptions has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from these engines.

8.e BACT Determination – Flow Augmentation Pump Engines: Available control measures for diesel engines include low sulfur fuel and add-on control equipment such as selective catalytic reduction units. Add-on control equipment are not economically feasible because the engines will be operated only for short periods of time for testing, maintenance, and to provide pump capacity during peak flow periods. In addition, because the engines will normally be operated only for short periods of time, the stable operating temperature required for operation of add-on control equipment is not likely to be achieved.

The use of modern diesel-fired internal combustion engine design (meeting EPA's Tier 2 or Tier 3 emission limits for off-road diesel engines), ultra-low sulfur diesel fuel (≤ 0.0015% sulfur by weight), limitation of visible emissions to 5% opacity or less, and limitation of engine operation to testing, maintenance and to provide supplemental pump capacity during peak flow periods (≤ 200 hours per year) has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from the flow augmentation pump engines.

BACT Determinations from Air Discharge Permit 05-2613

8.f BACT Determination – Sludge Blend Tank: The level of odor control provided by the proposed biological packed tower is equivalent to the level of control provided through the use of activated carbon, and is expected to be the top choice in a "top-down" BACT analysis.

8.g BACT Determination – Flow Augmentation Pump Engines: Note that Caterpillar engines were installed in place of the Cummins engines for which the BACT analysis that follows was written: Available control measures for diesel engines include low sulfur fuel and add-on control equipment such as selective catalytic reduction units. Add-on control equipment are not economically feasible because the engines will be operated only for short periods of time for testing, maintenance, and to provide pump capacity during peak flow periods. In addition, because the engines will normally be operated only for short periods of time, the stable operating temperature required for operation of add-on control equipment is not likely to be achieved.

The use of modern diesel-fired internal combustion engine design (meeting EPA's Tier 2 or Tier 3 emission limits for off-road diesel engines), low-sulfur diesel fuel (≤ 0.05% sulfur by weight), limitation of visible emissions to 5% opacity or less, and limitation of engine operation to testing, maintenance and to provide supplemental pump capacity during peak flow periods (≤ 200 hours per year) has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from the flow augmentation pump engines.

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

8.i Compliance Assurance Monitoring (CAM): CAM is not applicable to any emission unit at this facility because this facility is not a major source required to obtain a Part 70 or 71 permit.

9. AMBIENT IMPACT ANALYSIS

With the exception of formaldehyde from increased digester gas combustion, no increase in toxic air pollutant emissions will exceed the applicable Small Quantity Emission Rate (SQER) listed in WAC 173-460. For toxic air pollutants with an increase

of less than the applicable SQER, toxic impacts are presumed to be not significant. In addition, the applicant identified an increase of 0.1 lb/yr of PAH from increased digester gas combustion and 0.05 lb/yr of PAH from operation of the new Klineline Emergency Generator Engine. WAC 173-460-050(4)(c) requires that PAH emissions be modeled as benzo(a)pyrene for comparison with the acceptable source impact level (ASIL) in WAC 173-460-150(3). The applicant modeled the ambient impact of increased formaldehyde and PAH emissions using the ISC3 model. Model results are compared to the applicable ASIL in the table below:

Pollutant	**Modeled Incremental Increase in Ambient Concentrations (µg/m^3)**	**ASIL (µg/m^3)**
Formaldehyde	0.026 (annual average)	0.077 (annual average)
PAH	0.00007 (annual average)	0.00048 (annual average)

As indicated in the table, incremental increases of both pollutants were well below their respective acceptable source impact levels.

For this analysis, the Salmon Creek Treatment Plant and the Klineline Pump Station were treated as separate sources because they are located several miles apart and their radii of impact will not intersect. Although SWCAA and the source aggregate these facilities for the convenience and the purposes of local New Source Review, they are not the same source for the purposes of the SQERs listed in WAC 173-460. Increased emissions of combustion products (nitrogen oxides, carbon monoxide, sulfur oxides, particulate matter, and volatile organic compounds) are all at or below 9 tons per year per pollutant. At these emission rates, no significant adverse ambient air quality impact is anticipated.

Conclusions

9.a Operation of the Salmon Creek Wastewater Management System as proposed in ADP Application CL-1753 will not cause the ambient air quality standards established by Title 40 Code of Federal Regulations Part 50 (40 CFR 50), "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.b The Salmon Creek Wastewater Management System proposed in ADP Application CL-1753, if properly installed and maintained, 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."

9.c Operation of the Salmon Creek Wastewater Management System as proposed in ADP Application CL-1753 will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants," WAC 173-470 "Ambient Air Quality Standards for Particulate Matter," WAC 173-474 "Ambient Air Quality Standards for Sulfur Oxides," and WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide" to be violated.

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue Air Discharge Permit SWCAA 07-2726 in response to ADP Application CL-1753. Air Discharge Permit SWCAA 07-2726 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

10.a General Basis: Approval conditions for equipment affected by this permitting action incorporate the operating schemes proposed by the permittee in the Air Discharge Permit application.

10.b Emission Limits: The short-term emission limits for the New Digester Waste Gas Burner, 4.226 MMBtu/hr Boiler, 5.231 MMBtu/hr Boiler, Klineline Pump Station Odor Control Unit, and Force Main Odor Control Unit were established at the emission levels that represented BACT. With the exception of sulfur dioxide, annual emissions for each of these emission units were calculated based on 8,760 hours of operation at the maximum

short-term emission level. Where the digester gas combustion capacity of the equipment exceeded the digester gas generation capacity, sulfur dioxide emissions were limited to the maximum potential emissions identified in Section 6. Additional review of hydrogen sulfide or sulfur dioxide control options may be appropriate at greater sulfur dioxide emission rates.

Annual NO_X and CO emissions from the Klineline Emergency Generator Engine were limited to the quantity of emissions anticipated from operation of the engine for 100 hours per year for maintenance checks and readiness testing using the emission factors supplied in Section 6. As discussed in Section 8, these emission limits meet the requirements of BACT.

10.c Operating Limits and Requirements: Only ultra-low sulfur (15 ppm or less) fuel may be purchased for any of the diesel emergency generator engines (new and existing). Existing engines could have retained their existing 500 ppm sulfur limit, however for ease of compliance and consistency the applicant requested that all engines be subject to the new fuel requirement.

Consistent with 40 CFR 60 Subpart IIII, except for emergency operation, the Klineline Emergency Generator Engine may only operate 100 hours or less per year for maintenance and readiness testing. This limitation also assures that emissions from the generator will be below a threshold where additional control equipment would be necessary to meet the requirements of BACT.

To minimize the local impact on ambient air quality, all new exhaust stacks must be oriented vertically and may not utilize a rain-cap or other device that interferes with vertical dispersion.

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

The Permit requires the permittee to determine the amount of digester gas and natural gas burned by unit (boilers and waste gas incinerators/burners). This can be done by directly measuring fuel flow with a gas meter or by estimating fuel consumption through the use of operating records and engineering judgment. Fuel consumption by individual units must be determined to complete the annual emissions inventory.

10.e Emission Monitoring and Testing Requirements: See Section 12 of this Technical Support Document.

10.f Reporting: The permit requires reporting of the annual air emissions inventory, and reporting of the data necessary to develop the inventory. Excess emissions must be reported immediately in order to qualify for relief from monetary penalty in accordance with SWCAA 400-107. In addition, deviations from permit conditions must be reported within 30 days of discovery in accordance with the SWCAA 400-107 requirement for excess emissions. A more aggressive reporting schedule would have been required if the facility had a higher potential to impact ambient air quality.

Because this facility has the potential to generate nuisance odors, and because nuisance odors may be an indicator of improper equipment operation, the Permit requires forwarding of all odor complaints to SWCAA within three days of receipt. This helps assure that complaints and equipment breakdowns are addressed in a timely manner.

Results of boiler performance monitoring must be submitted within 15 days of test completion. The test report is relatively simple and can be completed on-site during testing. No more than 15 days will be necessary to submit the report to SWCAA.

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

11.a Startup and Shutdown Provisions: Pursuant to SWCAA 400-081 "Startup 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 startup or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during startup or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during startup or shutdown.

The diesel 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.

11.b Alternate Operating Scenarios: SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. Because the 5.231 MMBtu/hr Boiler and the 4.226 MMBtu/hr Boiler may be fired on natural gas, digester gas, or a blend of natural gas and digester gas, the permit limitations presume the worst-case emissions from these fuels. In addition, as discussed in section 8, the nitrogen oxides limitation was 30 ppmvd @ 3% O_2 rather than 9 ppmvd @ 3% O_2 to accommodate the blending of digester and natural gas.

11.c Pollution Prevention Measures: SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures other than the control measures identified in the permit were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

Source emissions testing of the New Digester Waste Gas Burner and the Old Digester Waste Gas Incinerator was required every 60 calendar months with the exception that if the Old Digester Waste Gas Incinerator is operated infrequently (or not at all), source emissions testing of that unit may be delayed until 10,000,000 cubic feet of digester gas has been burned (equivalent to approximately 30 days of operation at full capacity). This is a compromise between the need for SWCAA to periodically assess the operation of the unit if it is utilized periodically, and the cost of performing a source emissions test.

During testing of the New Digester Waste Gas Burner and the Old Digester Waste Gas Incinerator, the composition of the raw digester gas must be determined in order to develop a fuel factor for use with EPA Method 19. This is necessary to accurately calculate outlet emissions in units of lb/MMBtu and assess compliance with the permit limits. Due to the extremely low velocity and high temperature of the exhaust, exhaust gas flowrate is difficult to accurately measure, therefore EPA Method 19 methodology must be used to calculate emissions in units of lb/MMBtu and demonstrate compliance with the permit limits.

Source emissions testing of the 5.231 MMBtu/hr boiler must be conducted initially and at least once every 120 calendar months because potential emissions from this boiler are significant enough to justify the expense of source emissions testing. Source emissions testing of the 4.226 MMBtu/hr boiler was nor required because potential emissions from that unit were considered too small to warrant such testing.

Performance monitoring of the 5.231 MMBtu/hr Boiler and the 4.226 MMBtu/hr Boiler with a combustion analyzer or equivalent is required at least annually. In SWCAA's experience this testing is relatively inexpensive compared to the quantity of emissions that can be prevented by this procedure. It is unlikely that boiler emissions will degrade rapidly enough that more frequent testing is necessary to prevent an exceedance of the permitted emission limits.

Due to the nature and quantity of air pollutant emissions from the emergency generator engines and the fact that post-combustion controls are not utilized, performance monitoring and/or testing requirements were not established for the emergency generator engines.

The hydrogen sulfide content of the digester gas must be measured monthly to enable calculation of sulfur dioxide emissions from the emission units burning digester gas. SWCAA expects that twelve annual samples collected during monthly sampling will provide a reasonable representation of average total sulfur in the digester gas.

The Permit requires that the hydrogen sulfide content of the gas being vented from the Klineline Pump Station Odor Control Unit and the Force Main Odor Control Unit be measured monthly with a colorimetric detector tube or equivalent. SWCAA expects that this schedule will provide a reasonable assurance that the carbon is replaced before degrading to the point where excess emissions or nuisance odor would be emitted.

13. FACILITY HISTORY

13.a General History: Construction of the original Salmon Creek Treatment Plant was completed in 1976. The original facility was designed to treat 2 mgd average annual daily flow (ADF). In 1989 an expansion of the plant was completed, bringing the capacity of the plant to 3.1 mgd ADF. In 1993 an expansion of the plant was completed, bringing the capacity of the plant to 4.5 mgd ADF. In 1995 an expansion of the plant was completed, bringing the capacity of the plant to 5.7 mgd ADF. Expansion to the current plant capacity of 10.3 mgd (monthly average) ADF was completed in 1999.

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

Order/Permit Number	Application #	Date Issued	Description
92-1472	CL-954	12-22-92	Consent Order for installation of anaerobic digester, heater (primarily fired on digester gas), excess digester gas waste gas incinerator, aeration basin to bring capacity to 4.5 mdg ADF.
97-2053	CL-1292	10-23-97	Installation of headworks, three primary clarifiers, one aeration basin, one secondary clarifier, one gravity belt thickener, two conventional digesters, Hurst hot water boiler, enclosed waste gas incinerator (replacing existing flare), two belt filter presses, and covered biosolids storage holding bays to bring plant capacity to 10.3 mgd ADF.
97-2053R1	CL-1563	8-7-02	Modification of minimum waste gas incinerator temperature limit consistent with source test results and establishment of limitations for three existing emergency generators.
05-2613	CL-1689	6-8-05	Replacement of sludge blend tank and installation of an odor control unit on the sludge blend tank, installation of two diesel-fired flow augmentation pumps and a odor control biofilter at the 36th Avenue Pump Station, and modification of the emission limits for the existing Hurst and Superior boilers.

Bold font indicates that the Order or Air Discharge Permit was superceded or will no longer be in effect when Air Discharge Permit 07-2726 becomes fully effective.

14. PUBLIC INVOLVEMENT

14.a Public Notice for Air Discharge Permit Application CL-1753: Public notice for Air Discharge Permit Application CL-1753 was published on the SWCAA internet website for a minimum of (15) days beginning on October 19, 2006.

14.b Public/Applicant Comment for Air Discharge Permit Application CL-1753: A draft Air Discharge Permit was issued on May 11, 2007. A copy of the draft Air Discharge Permit and the associated Technical Support Document was published on SWCAA's website on May 15, 2007. The public comment period remained open until receipt of notification from the Permittee on April 25, 2008 that all equipment parameters have been finalized.

During the public comment period the Permittee provided the following equipment updates:

1. During an inspection of the facility on August 29, 2007 SWCAA staff found that the 36th Avenue Flow Augmentation Pump Engines that were ultimately installed were Caterpillar C-9 engines rather than the Cummins engines originally permitted. The installed engines are EPA Tier 2 non-road certified and meet the requirements of BACT. Clark County Public Works supplemented Air Discharge Permit Application CL-1753 with a belated request for approval to install these engines.
2. The proposed 5.25 MMBtu/hr Hot Water Boiler will actually be rated at 5.231 MMBtu/hr. SWCAA modified the emission limits accordingly.
3. The existing Hurst Boiler will be modified to a heat input capacity of 4.226 MMBtu/hr rather than the 3.25 MMBtu/hr rate originally indicated in the permit application and the draft Air Discharge Permit. SWCAA modified the emission limits accordingly.
4. The New Digester Waste Gas Burner will have the capacity to burn 14,710 scfm rather than the 14,500 scfm originally indicated in the permit application and the Draft Air Discharge Permit. SWCAA modified the emission limits accordingly.
5. The make, model, and specific emission characteristics of the Klineline Emergency Generator engine.

14.c State Environmental Policy Act: A Determination of Nonsignificance (DNS) was issued for the expansion of the Salmon Creek Treatment Plant by Clark County, Washington on December 6, 2004. A Determination of Nonsignificance (DNS) was issued for the installation of the Klineline Pump Station by Clark County, Washington on December 3, 2004.

TECHNICAL SUPPORT DOCUMENT

CITY OF CAMAS PUBLIC WORKS – WASTEWATER SYSTEM

SWCAA ID: 2076

Air Discharge Permit SWCAA 19-3328

ADP Application CL-3065

Issued: March 13, 2019

Prepared By: Clint Lamoreaux
Air Quality Engineer
Southwest Clean Air Agency

TABLE OF CONTENTS

Abbreviations

ADP	Air Discharge Permit (Same as Order of Approval)
AP-42	Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency
BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
Btu	British thermal unit
CAM	Compliance assurance monitoring (40 CFR 64)
cfm	Cubic feet per minute
CFR	Code of Federal Regulations
CO	Carbon monoxide
CO_2e	Carbon dioxide equivalent as defined in 40 CFR 98
EPA	U.S. Environmental Protection Agency
gr/dscf	Grains per dry standard cubic foot (68 °F, 1 atmosphere)
g/hp-hr	Grams of pollutant per horsepower per hour
g/kW-hr	Grams of pollutant per kilowatt per hour
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
LAER	Lowest achievable emission rate
lb/MMBtu	Pound per million British thermal units
lb/yr	Pounds per year
lbs	Pounds
mgd	Millions of gallons per day
MMBtu/hr	Millions of British thermal units per hour
NO_X	Nitrogen oxides
NOC	Notice of Construction application (same as Air Discharge Permit application)
PM	Total particulate matter (includes both filterable particulate matter measured by EPA Method 5 and condensable particulate matter measured by EPA Method 202)
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
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 as in effect August 21, 1998
SO_2	Sulfur dioxide
SWCAA	Southwest Clean Air Agency
TAP	Toxic Air Pollutant listed in WAC 173-460 as in effect August 21, 1998
T-BACT	Best Available Control Technology for toxic air pollutants
tpy	Tons per year
µg/L	Micrograms per liter
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

1. FACILITY IDENTIFICATION

Applicant Name: City of Camas
Applicant Address: 1620 SE 8th Avenue, Camas, Washington 98607

Facility Name: City of Camas Public Works - Wastewater System
Facility Address: Varies – main treatment plant at 1129 SE Polk Street, Camas, Washington
SWCAA Identification: 2076
Contact Person: Mr. Robert Busch

Primary Process: Wastewater treatment
SIC / NAICS: 4952 / 22132
Facility Classifications: BACT / natural minor

2. FACILITY DESCRIPTION

The City of Camas Wastewater Treatment System (Camas Wastewater) collects and treats wastewater for the City of Camas, Washington. The collection system utilizes 27 lift stations equipped with emergency generators to drive pumps in the event of a power outage. Wastewater is processed through the level of secondary treatment with the use of fine screens, primary clarifiers, aeration basins, secondary clarifiers, filtration, and ultraviolet disinfection. Sludge is treated using a gravity thickener, dewatering centrifuge and anaerobic digesters followed by drying to a Class A standard that enables the dried material to be given to the public. A soil biofilter system is used to control odors from the covered headworks, gravity thickener, plant drain lift station, septage receiving station and solids handling facility. A soil biofilter is used to control odors from storage tanks, dryer building, digester building and plant drain lift station number 2. Odor control stations are located at a number of lift stations and one force main to gravity sewer transition.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number CL-3065 (ADP Application CL-3065) received November 8, 2018. ADP application CL-3065 requests approval of the following

- 1 new diesel-fired emergency generator engine at the Goodwin Road Lift Station
- 1 new odor control unit (carbon adsorber) at the Goodwin Road Lift Station
- 1 existing odor control unit (biofilter) at the 232nd Avenue Lift Station
- 1 existing odor control unit (biofilter) at the Leadbetter Road Lift Station
- 1 existing odor control unit (biofilter) at a remote location (~2213 NE Birch Street)

In addition, the applicant has request that all air quality requirements, including those for the emergency generator engines at the Leadbetter Road Lift Station (SUN-170), and the 232nd Avenue Lift Station (SUN-171) be consolidated in the new Air Discharge Permit.

4. PROCESS DESCRIPTION

The City of Camas Wastewater Treatment System (Camas Wastewater) collects and treats wastewater for the City of Camas, Washington. The collection system utilizes 27 lift stations equipped with emergency generators to drive pumps in the event of a power outage and two emergency generators at the wastewater treatment plant. Wastewater is processed through the level of secondary treatment with the use of fine screens, primary clarifiers, aeration basins, secondary clarifiers, filtration, and ultraviolet disinfection. Sludge is treated using a gravity thickener, dewatering centrifuge and anaerobic digesters followed by drying to a Class A standard that enables the dried material to be given to the public. A soil biofilter system is used to control odors from the covered headworks, gravity thickener, plant drain lift station, septage receiving station and solids handling facility. A second soil biofilter has been installed to control odors from storage tanks, dryer building, digester building and plant drain lift station number 2. Odor control stations are located at a number of lift stations and one force main to gravity sewer transition.

Digester gas is burned in a boiler that heats the anaerobic digesters, a biosolids dryer, and a waste gas burner. The boiler and biosolids dryer may also be fired, or co-fired with, natural gas. An iron sponge style digester gas scrubber is used to remove hydrogen sulfide from the digester gas prior to combustion.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

New or Modified Equipment:

5.a Goodwin Road Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Goodwin Road Lift Station. Specific engine and generator information is listed below:

Address:	~2305 NE Goodwin Road, Camas, WA
Engine Make / Model:	Cummins / QSB5-G5
Engine Serial Number:	To be determined
Engine Manufactured:	To be determined
Fuel:	Diesel
Horsepower Rating:	176 (advertised – engine alone), 140 bhp at full standby in this genset
Certification:	EPA Tier 3
Generator Set Make / Model:	Cummins / C80D6C
Generator Set Output:	80 kW
Installed:	December 2018
Stack Description:	Exhausts vertically at 764 acfm, 769°F, approximately 82" above grade (6" slab, 18" fuel tank, 58" enclosure)

5.b Odor Control Stations. Odor control equipment is located at sites where air is withdrawn or vented from sewers or lift stations. Odor control stations include the following:

Identification	Location	Foul Air Source	Description / Features
Goodwin Road Lift Station Odor Control Unit (new)	~2305 NE Goodwin Road 45°38'23.16"N, 122°27'19.51"W	Treats air from lift station	ECS Environmental Solutions model V1 with top-mounted fan, carbon adsorber utilizing ECS Sulfadsorb-HC carbon (0.3 g H_2S / cc carbon). 250 cfm @ 6" w.c.
232nd Avenue Lift Station Biofilter (new)	850 NE 232nd Ave. 45°37'39.83"N, 122°26'6.25"W	Treats air from lift station	Biorem Biosorbens engineered media, 600 scfm, 9' x 9' x 67 1/8" deep media Pre-humidified air stream and surface irrigation.
Leadbetter Road Lift Station Biofilter (new)	~850 401 SE Leadbetter Road 45° 36' 50.292" N, 122° 24' 51.624" W	Treats air from lift station	Biorem Biosorbens engineered media, 600 scfm, 9' x 9' x 67 1/8" deep media Pre-humidified air stream and surface irrigation.
Remote Odor Control Station Biofilter (new)	~2213 NE Birch Street ~ 45°35'46.00"N, 122°24'28.88"W	Treats air drawn from force main to gravity sewer transition	Biorem Biosorbens engineered media, 400 scfm, 9' x 9' x 67 1/8" deep media Pre-humidified air stream and surface irrigation.
Grand Ridge Lift Station Odor Control Unit (existing)	4822 SE Grand Ridge Drive	Treats air from lift station	55-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.

Identification	Location	Foul Air Source	Description / Features
Winchester Hills #2 Lift Station Odor Control Unit (existing)	19320 SE 42nd Street	Treats air from lift station wet well	55-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.
Lacamas Meadows PRD Lift Station Odor Control Unit (existing)	Lacamas Meadows PRD Lift Station	Treats air from lift station wet well	55-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.
Stone Leaf Lift Station Odor Control Unit (existing)	5713 NW 26th Avenue	Treats air from lift station wet well	55-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.
Hills at Round Lake Lift Station Odor Control Unit (existing)	2100 N Woodburn Dr.	Treats air from lift station wet well	100-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.
Fisher Lift Station Odor Control Unit (existing)	5870 NW 38th Ave.	Treats air from lift station wet well	100-gallon drum carbon adsorber with top-mounted fan drawn air from the fully-enclosed well.

Existing Equipment:

5.c Wastewater Treatment System. Specific wastewater treatment system information is listed below:

Wastewater System	Phase I
Maximum Monthly Average Capacity:	6.1 mgd
Design Annual Average Capacity:	5.32 mgd
Treatment Level:	Secondary
Disinfection Method:	Ultraviolet

Equipment associated with the facility:

- Headworks
- Grit cyclones
- Two primary clarifiers
- Three aeration basins
- Three secondary clarifiers
- Two anaerobic digesters (estimated maximum gas production of 0.688 MMBtu/hr in 2025 (annual avg.))
- Digester building
- Two biofilters (described in detail below)
- One boiler to supply heat to the anaerobic digesters (described in detail below)
- One waste gas burner flare to burn off digester gas not combusted by boiler or biosolids drying system (described in detail below)
- One digested sludge holding tank
- Biosolids drying system (described in detail below)
- Plant drain lift stations numbers 1& 2
- Waste activated sludge storage tank – holds aerobic sludge prior to thickening and anaerobic digestion

- Gravity thickener
- Centrate storage tank – holds centrate from the centrifuge process for the digested sludge. Centrate is then be metered to the aeration basins during low flow periods.
- Septage storage tank – used to store septage received by truck until metered into the system.
- Digester gas hydrogen sulfide scrubber (new)

Biofilter #1 Information

Make:	Bohn Biofilter Corporation
Dimensions:	5' deep with 36" biofilter media depth, ~80' long, 47' wide
Air Flow:	3,600 cfm
Treats Air From:	Headworks, gravity thickener, plant drain lift station, septage receiving station and solids handling facility
Chloroform Control:	Estimated to provide 25% capture and 10% destruction of chloroform emissions
H_2S Control:	Estimated to provide 70% capture and 90% destruction of hydrogen sulfide emissions

To keep the biofilter moist and biologically active, a surface sprinkler system is installed to add moisture to the biofilter as necessary.

Biofilter #2 Information

Make:	Bohn Biofilter Corporation
Dimensions:	6' deep, with 48" biofilter media depth, 80' long, 20' wide
Air Flow:	4,400 cfm (designed for empty bed residence time of ~90 seconds)
Treats Air From:	160 cfm from centrate storage tank, 430 cfm from waste activated sludge storage tank, 110 cfm from septage storage tank, 2,900 cfm from dryer building (~2,800 cfm of which is vented from the condenser/scrubber treating air exhausted from the direct-contact dryer), 700 cfm from the digester building, 100 cfm from the plant drain lift station #2
Odor Control:	No significant H_2S or other TAP emission is anticipated from any of the sources controlled by Biofilter #2; the unit is used exclusively to control odors from these sources.

To keep the biofilter moist and biologically active, a surface sprinkler system is installed to add moisture to the biofilter as necessary and a ductwork mist sprayer moistens air being exhausted to the biofilter.

5.d Digester Gas Scrubber. Hydrogen sulfide is scrubbed from the digester gas using an iron sponge scrubber system. The system consists of a primary and secondary scrubbing vessel. The secondary vessel will only be used when scrubbing media in the primary vessel is being regenerated. The scrubbing media consists of wood chips impregnated with iron oxide. Digester gas is passed through the media and hydrogen sulfide is converted to iron sulfide:

$$Fe_2O_3 + H_2O + 3H_2S \rightarrow Fe_2S_3 + 4H_2O$$

During regeneration the scrubbing vessel is flooded with water and air is pumped through the vessel to re-oxidize the iron:

$$2Fe_2S_3 + 3O_2 + 2H_2O \rightarrow 2Fe_2O_3 + 2H_2O + 6S$$

The media may be regenerated several times before it is spent. The regeneration reaction is exothermic and must be conducted with the vessel flooded with water to prevent the media from igniting.

The primary scrubbing vessel contains 784 cubic feet of media in a 12' diameter vessel. The secondary scrubbing vessel contains 12 cubic feet of media in a 2' diameter vessel. The system is designed to provide 94% control of H_2S emissions at a maximum flow rate of 49,400 cubic feet per day of digester gas with an inlet concentration of 8,300 ppm.

5.e Boiler. The boiler provides heat to the anaerobic digesters.

Make / Model:	Burnham / 4F-50, model 78
Burner:	Power Flame / LNICR1-GG-10
Heat Input Capacity:	0.653 MMBtu/hr
Fuel:	Digester gas, natural gas, or combination of digester gas and natural gas
Heat Input Capacity:	0.653 MMBtu/hr
Turndown Ratio:	3:1
Fuel:	digester gas, natural gas or blend of digester gas and natural gas
Stack Parameters:	Exhausts vertically ~25' above ground level, ~8" diameter

5.f Biosolids Dryer. Gas from the biosolids dryer is vented to Biofilter #2 (described above) for odor control after passing through a particulate pre-filter and a condenser/scrubber to provide appropriate moisture. The following description was provided by the applicant with Air Discharge Permit application CL-1887:

> *The digested biosolids from the anaerobic digesters will be dewatered to 20% solids using the existing centrifuge and transferred to the biosolids drying system where the biosolids will be dried to 90% solids. The dewatered biosolids will be deposited on a moving conveyor belt in the dryer dehydration chamber and the dried solids will drop to a screw conveyor and be transported to the biosolids storage area for land application. The drying system will utilize a direct fired burner to burn a blend of digester gas and natural gas at a maximum ratio of digester gas to natural gas of 4:1 as a thermal source for heating the biosolids. The burner can also utilize exclusively natural gas when digester gas is unavailable. The air from the dehydration chamber will be recycled and reheated and a portion of the recycle air will be exhausted. The exhaust air will be treated in a packed tower condenser/scrubber followed by treatment in the new biofilter (Biofilter #2).*

The following equipment details were provided:

Burner Make / Model:	Maxon / KINEDIZER LE (low NO_X < 30 ppmvd @ 3% O_2)
Burner Capacity:	0.700 MMBtu/hr – 2.310 MMBtu/hr

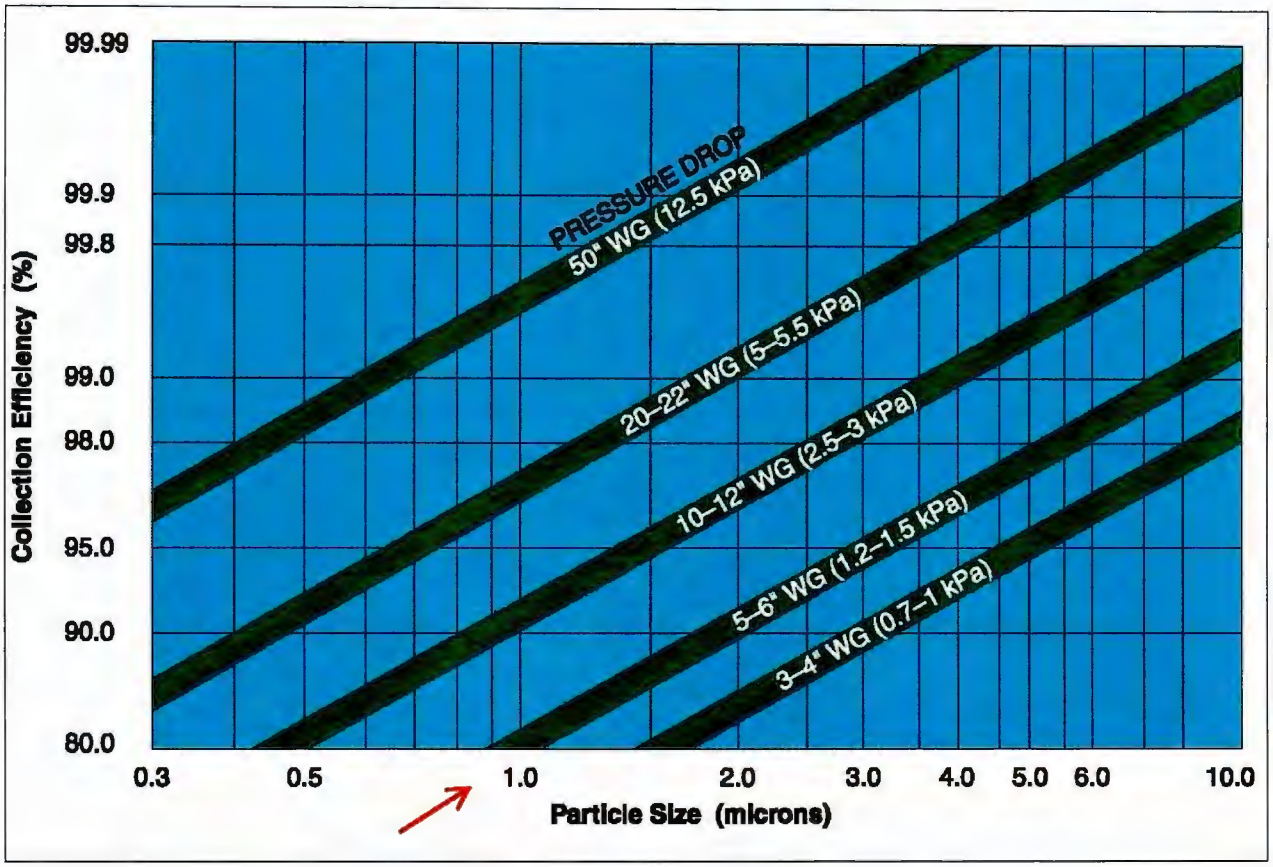
Condenser / Scrubber Details:

Make / Model:	Andritz / BDS 0 75
Description:	Includes water spray and two tray-type contactors followed by mist eliminators in a counterflow arrangement.

5.g Biosolids Conveying. Dried boisolids is separated from the drying airstream via airlock and conveyed using four conveyors to the biosolids storage area. Conveying the dried biosolids has the potential to produce dust. As an additional safety measure against dust explosion, a venturi scrubber is installed to draw air from the enclosed conveyor to prevent the possibility of a dust explosion. The following scrubber details were provided:

Scrubber Make / Model:	Monroe Dual Throat Air Scrubber
Scrubber Design:	adjustable venturi utilizing single-pass water
Design Air Flow:	2,800 cfm at 5" w.c. pressure drop across the venturi throat
Performance:	Estimated to provide > 99% control of 10 μm particles, as low as 80% of 1.0 μm particles (see graph below)
Water Source:	"Plant water" – filtered and chlorinated treated effluent
Stack Description:	Exhausts vertically 12' 5" above grade, through ~7.5" diameter stack at ~ 60 °F

EFFICIENCY GUIDE **MONROE ENVIRONMENTAL**



5.h Waste Gas Burner. The Waste Gas Burner is a flare used to burn digester gas that is not utilized by either the Boiler or the Boisolids Dryer. Annual digester gas production and heat requirements were provided in the following table by the applicant for the design year 2025:

Average Annual Digester Gas Production	688,000 Btu/hr
Average Annual Boiler Heat Requirement	341,000 Btu/hr
Average Annual Dryer Heat Requirement	666,000 Btu/hr

As indicated by the table, annual heat requirements exceed the gas production by the anaerobic digester, however variations in heat needs and gas production will cause the digester gas production to exceed the heat requirements at times. The applicant has assumed that up to 20% of the digester gas produced will need to be flared (0.1376 MMBtu/hr or 3.8 cfm). The following equipment details were available:

Flare Make / Model:	Varec 244W – 3"
Style:	Shrouded candle-stick
Capacity:	193 cfm
Pilot Description:	Utilizes biogas (no added propane or supplemental fuel)
Exhaust Description:	9' above grade

5.i Equipment Building Emergency Generator Engine. The equipment building emergency generator is used to provide emergency electrical power at the Equipment Building. Specific engine and generator information is listed below:

Address:	1129 SE Polk Street (Treatment Plant)
Engine Make:	Volvo Penta
Engine Model:	TAD1030GE
Engine Serial Number:	2100309143
Generator Set Make:	Katolight
Generator Set Model:	D250FRV4
Generator Set Output:	250 kW
Generator Set Serial Number:	WA519476 57795
Fuel:	Diesel
Fuel Consumption:	19.2 gallons per hour at full standby load
Horsepower Rating:	393 bhp
Manufactured:	Not stamped on tag
Installed:	~1999 or 2000
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.j UV Building Emergency Generator Engine. The UV building emergency generator is used to provide emergency electrical power at the UV Building. Specific engine and generator information is listed below:

Address:	1129 SE Polk Street (Treatment Plant)
Engine Make:	Volvo Penta
Engine Model:	TAD1030GE
Engine Serial Number:	2100309362
Generator Set Make:	Katolight
Generator Set Model:	D250FRV4
Generator Set Output:	250 kW
Generator Set Serial Number:	WA519507 57789
Fuel:	Diesel
Fuel Consumption:	19.2 gallons per hour at full standby load
Horsepower Rating:	393 bhp
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.k Main Lift Station Emergency Generator Engine. The Main Lift Station emergency generator is used to provide emergency electrical power at the Main Lift Station. Specific engine and generator information is listed below:

Address:	Third Avenue and Dallas Street
Engine Make:	Volvo Penta
Engine Model:	TAD1030G
Engine Serial Number:	2100309146
Generator Set Make:	Katolight
Generator Set Model:	D250FRV4
Generator Set Output:	250 kW
Generator Set Serial Number:	WA519439 57793
Fuel:	Diesel
Fuel Consumption:	19.2 gallons per hour at full standby load
Horsepower Rating:	393 bhp
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.l Oak Park Lift Station Emergency Generator Engine. The Oak Park Lift Station emergency generator is used to provide emergency electrical power at the Oak Park Lift Station. Specific engine and generator information is listed below:

Address:	Corner of 9th Avenue and SE Polk Street (Oak Park)
Engine Make:	John Deere
Engine Model:	4045DF150D
Engine Serial Number:	PE4045D041220
Generator Set Make:	Katolight
Generator Set Model:	D40FJJ4
Generator Set Output:	40 kW
Generator Set Serial Number:	LM642036 57800
Fuel:	Diesel
Fuel Consumption:	3.6 gallons per hour at full standby load
Horsepower Rating:	71 bhp @ 1,800 rpm

Certified to meet EPA 1999 model year non-road standards (Tier 1)
Applicable Federal Regulations: 40 CFR 63 Subpart ZZZZ

5.m Lacamas Creek Lift Station Emergency Generator Engine. The Lacamas Creek Lift Station emergency generator is used to provide emergency electrical power at the Lacamas Lift Station. Specific engine and generator information is listed below:

Address:	SE corner of East First and NE 3rd Avenue
Engine Make:	General Motors
Engine Model:	GM-7.4 Liter
Engine Serial Number:	6292020299
Generator Set Make:	Katolight
Generator Set Model:	N70FJG4
Generator Set Output:	70 kW
Generator Set Serial Number:	LM642061 56524
Cycle:	4-Stroke, lean-burn
Fuel:	Natural Gas
Fuel Consumption:	1,000 scfh (~1.0 MMBtu/hr)
Horsepower Rating:	88 bhp
Manufactured:	(11-23-98 stamped on engine, may not be date)
Installed:	~1998
Stack Height:	Discharges out side of building at ~6'
Stack Diameter:	~4"

Applicable Federal Regulations: 40 CFR 63 Subpart ZZZZ

5.n Crown View Lift Station Emergency Generator Engine. The Crown View Lift Station emergency generator is used to provide emergency electrical power at the Crown View Lift Station. Specific engine and generator information is listed below:

Address:	222 NW Ivy Lane
Engine Make:	General Motors
Engine Model:	GM-7.4 Liter
Engine Serial Number:	GM12551869-7yd (unable to confirm on-site)
Generator Make:	Generac
Generator Model:	97A 0036-S
Generator Output:	70 kW
Generator Serial Number:	2032654

Cycle:	4-Stroke, lean-burn
Fuel:	Natural Gas
Fuel Consumption:	1,000 scfh (~1.0 MMBtu/hr)
Horsepower Rating:	88 bhp
Manufactured:	stamped 2-28-97 on engine block (could not confirm that this is mfg date)
Installed:	~1996 or 1997
Stack Height:	(2) stacks at approximately 5'
Stack Diameter:	2" vertical
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.o One Stop Sewer Lift Station Emergency Generator Engine. The One Stop Sewer Lift Station emergency generator is used to provide emergency electrical power at the One Stop Sewer Lift Station. Specific engine and generator information is listed below:

Address:	NE 2nd and SE Yale
Engine Make:	Perkins
Engine Model:	Unable to determine (Engine Family N 440)
Engine List*Serial Number:	AG51040*U619928L
Generator Set Make:	Caterpillar
Generator Set Model:	Olympian D30P3
Generator Set Output:	30 kW
Generator Set Number:	OLY00000HNPF03250, also have S/N 157934/15 listed
Fuel:	Diesel
Fuel Consumption:	3.34 gallons per hour at full standby load
Horsepower Rating:	70.5 bhp
Manufactured:	2004
Installed:	2004
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.p South Prune Hill Park Lift Station Emergency Generator Engine. The South Prune Hill Park Lift Station emergency generator is used to provide emergency electrical power at the South Prune Hill Park Lift Station. Specific engine and generator information is listed below:

Address:	NW 6th Place (near 2301 NW 6th Place)
Engine Make:	Perkins
Engine Model:	Unable to Determine
Engine List*Serial Number:	AG50845*U506027H
Generator Set Make:	Caterpillar
Generator Set Model:	Olympian D40P3
Generator Set Output:	40 kW
Generator Set Number:	OLY00000TNPF00756
Fuel:	Diesel
Fuel Consumption:	3.78 gallons per hour at full standby load
Horsepower Rating:	72.8 bhp
Manufactured:	2001
Installed:	September 2001
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.q West Camas Lift Station Emergency Generator Engine. The West Camas Lift Station emergency generator is used to provide emergency electrical power at the West Camas Lift Station. Specific engine and generator information is listed below:

Address:	NW 6th Place near 1530 Norwood Road
Engine Make:	Perkins
Engine Model:	Unable to Determine
Engine List*Serial Number:	YB50852*U77???? (last few numbers underneath bolted-on equipment)
Generator Set Make:	Caterpillar
Generator Set Model:	Olympian D90P1
Generator Set Output:	90.9 kW
Generator Set Number:	OLY00000LNPS00481
Fuel:	Diesel
Fuel Consumption:	7.15 gallons per hour at full rated load (standby)
Horsepower Rating:	149.8
Manufactured:	2001
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.r Prune Hill Park Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Prune Hill Park Lift station. Specific engine and generator information is listed below:

Address:	3404 NW Sierra Drive
Engine Make:	Hercules Engines, Inc.
Engine Model:	G1600
Engine Serial Number:	4936017
Engine Manufactured:	Not available
Fuel:	Propane
Fuel Consumption:	Not available
Horsepower Rating:	Not available
Generator Set Make:	Katolight
Generator Set Model:	N23FJH4
Generator Set Output:	23 kW
Generator Set Serial Number:	LM179816 E-42087
Installed:	Not available
Stack Description:	~5.5' tall, vertical, ~2" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.s Lacamas Shores Park Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Lacamas Shores Lift Station. Specific engine and generator information is listed below:

Address:	6230 NW El Rey Drive
Engine Make:	Hercules, Inc.
Engine Model:	G3400
Engine Serial Number:	LP3336793 G3400X392
Engine Manufactured:	Unknown
Fuel:	Natural Gas
Fuel Consumption:	Not available
Horsepower Rating:	Not available
Generator Set Make:	Katolight
Generator Set Model:	N45FJH4
Generator Set Output:	45 kW
Generator Set Serial Number:	LM279861
Installed:	Not available
Stack Description:	~6' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.t Lacamas Meadows PRD Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Lacamas Creek PRD Lift Station. Specific engine and generator information is listed below:

Address:	3263 NW 45th Avenue
Engine Make / Model:	Cummins / 4BT3.9-G4
Engine Serial Number:	46594584
Engine Manufactured:	March 17, 2006
Fuel:	Diesel
Fuel Consumption:	Not available
Horsepower Rating:	99
Generator Set Make:	Cummins
Generator Set Model:	DGCB-5754907
Generator Set Output:	60 kW
Generator Set Serial Number:	CO60896436
Installed:	2007
Stack Description:	~7' tall, vertical, ~3" diameter
Notes:	Carbon adsorber on-site
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.u Larkspur Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Larkspur Lift Station. Specific engine and generator information is listed below:

Address:	6162 NW Larkspur Street
Engine Make / Model:	Cummins / 4BT3.9-G4
Engine Serial Number:	46544714
Engine Manufactured:	October 24, 2005
Fuel:	Diesel
Fuel Consumption:	Not available
Horsepower Rating:	99
Generator Set Make / Model:	Cummins / DGCB-5742885
Generator Set Serial Number:	K050850772
Generator Set Output:	60 kW
Installed:	2006
Stack Description:	~7' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.v Two Creeks #1 (aka Camas Meadows) Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Two Creeks #1 Lift Station. Specific engine and generator information is listed below:

Address:	Adjacent Golf Course
Engine Make / Model:	Cummins / 4BTA3.9-G3
Engine Serial Number:	46574295
Engine Manufactured:	January 21, 2006
Fuel:	Diesel
Fuel Consumption:	Not available
Horsepower Rating:	130
Generator Set Make / Model:	Cummins / DGCG-5748283
Generator Set Serial Number:	AO60877459
Generator Set Output:	80 kW

Installed:	2006
Stack Description:	~7' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.w Two Creeks #2 Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Two Creeks #2 Lift Station. Specific engine and generator information is listed below:

Address:	Adjacent Golf Course (have to cross golf course to get to)
Engine Make / Model:	Cummins / B3.3-G1
Engine Serial Number:	68039386
Engine Manufactured:	August 1, 2005
Fuel:	Diesel
Fuel Consumption:	Not available
Horsepower Rating:	56
Generator Set Make / Model:	Cummins / DDGD-5746801
Generator Set Serial Number:	LO50869178
Generator Set Output:	35 kW
Installed:	~2006
Stack Description:	~7' tall, vertical, ~3" diameter
Notes:	Engine is EPA Tier 1 certified, but EPA Tier 2 is required for nonroad engines of this size in model year 2004
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.x Sunningdale Gardens #1 Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Sunningdale Gardens #1 Lift Station. Specific engine and generator information is listed below:

Address:	4043 NW Dahlia LP
Engine Make / Model:	Hercules Engines, Inc. / G1600 (4-cylinder)
Engine Serial Number:	M04938255
Fuel:	Natural gas
Fuel Consumption:	Not available
Horsepower Rating:	Not available
Generator Set Make / Model:	Katolight / L20FRH4
Generator Set Serial Number:	LM197542 E-4444L
Generator Set Output:	20 kW
Manufactured:	Not available
Installed:	Not available
Stack Description:	~5.5' tall, vertical, ~2" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.y Parker Estates Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Parker Estates Lift Station. The engine used at this site was originally sited at the Brady Road Lift Station until that station was re-built in 2007. Specific engine and generator information is listed below:

Address:	3436 NW Parker Street
Engine Make / Model:	Hercules Engines, Inc. / G3400
Engine Serial Number:	AD170006 E-42078 (2007 and earlier)
Engine Serial Number:	388721G2400X412 (after 2007 - engine transferred from Brady Rd. ~ 2007)
Engine Serial Number:	KJ3336677 G3400TX401 (2007 and earlier)
Fuel:	Natural gas
Fuel Consumption:	Not available

Horsepower Rating:	Not available
Generator Set Make / Model:	Katolight / L55FRH4 (after 2007 - engine transferred from Brady Rd.)
Generator Set Make / Model:	Katolight / N65FRH4 (2007 and earlier)
Generator Set Serial Number:	LM195838 E-44281 (after 2007 - transferred from Brady Rd.)
Generator Set Serial Number:	unknown (after 2007- transferred from Brady Rd.
Generator Set Output:	65 kW (2007 and earlier)
Generator Set Output:	45 kW (after 2007 – transferred from Brady Rd.)
Manufactured:	Not available
Installed:	Not available
Stack Description:	~6' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.z Stone Leaf Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Parker Estates Lift Station. Specific engine and generator information is listed below:

Address:	5713 NW 26th Avenue
Engine Make / Model:	Perkins England / 2326/1500
Engine Serial Number:	AH51042*U634533L
Engine Manufactured:	model year 2004
Fuel:	Diesel
Fuel Consumption:	Not available
Horsepower Rating:	Not available
Generator Set Make / Model:	Caterpillar / Olympian D50P3
Generator Set Serial Number:	OLY00000CNPF04007
Generator Set Output:	50 kW
Installed:	~2006
Stack Description:	~6' tall, vertical, ~3" diameter
Notes:	Has carbon adsorption system on-site
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.aa Winchester Hills #1 Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Winchester Hills #1 Lift Station. Specific engine and generator information is listed below:

Address:	19617 SE 34th Street
Engine Make / Model:	Ford / LSG-8751-6005-A (4-stroke rich-burn)
Engine Serial Number:	19489 R-06-RH
Engine Manufactured:	Not available
Fuel:	Natural gas
Fuel Consumption:	Not available
Horsepower Rating:	67
Generator Set Make / Model:	Kohler / 50RZ272
Generator Set Serial Number:	392742
Generator Set Output:	55 kW
Installed:	Not available
Stack Description:	~5' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.bb Winchester Hills #2 Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Winchester Hills #2 Lift Station. Specific engine and generator information is listed below:

Address:	19320 SE 42nd Street
Engine Make / Model:	Ford / CSG-649I-6005-F
Engine Serial Number:	26689-1-04-98
Engine Manufactured:	July 31, 1998
Fuel:	Natural gas
Fuel Consumption:	Not available
Horsepower Rating:	66
Generator Set Make / Model:	Kohler / 30RZ72
Generator Set Serial Number:	604089
Generator Set Output:	30 kW
Installed:	Not available
Stack Description:	~4' tall, vertical, ~3" diameter
Notes:	Carbon adsorber on site.
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.cc Hillshire Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Hillshire Lift Station. Specific engine and generator information is listed below:

Address:	2032 NW Artz Court
Engine Make / Model:	Perkins England / 2320/1500
Engine Serial Number:	AG51040*U636671L
Engine Manufactured:	2004 model year
Fuel:	diesel
Fuel Consumption:	Not available
Horsepower Rating:	Not available
Generator Set Make / Model:	Caterpillar / D40P3
Generator Set Serial Number:	OLY00000ENPF04061
Generator Set Output:	40 kW
Installed:	2004 or later
Stack Description:	~6' tall, vertical, ~3" diameter
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.dd Grand Ridge Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Grand Ridge Lift Station. Specific engine and generator information is listed below:

Address:	4822 SE Grand Ridge Drive
Engine Make / Model:	Ford / CSG-6491-6005-F
Engine Serial Number:	22716 S-24-RH
Engine Manufactured:	Not available
Fuel:	Natural gas
Fuel Consumption:	Not available
Horsepower Rating:	66 (based on rating of same Ford engine in other installations)
Generator Set Make / Model:	Kohler / 30RZ72
Generator Set Serial Number:	Label was behind equipment
Generator Set Output:	30 kW
Installed:	Not available
Stack Description:	~4.5' tall, vertical, ~4" diameter
Notes:	Carbon adsorber on site.
Applicable Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.ee Brady Road Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Brady Road Lift Station. Specific engine and generator information is listed below:

Address:	919 NW Brady Road
Engine Make / Model:	Cummins / 6BT5.9-G6
Engine Serial Number:	To be determined
Engine Manufactured:	September 2006
Fuel:	Diesel
Fuel Consumption:	7.5 gallons per hour
Horsepower Rating:	170 (full standby)
Generator Set Make / Model:	Cummins / DGDB
Generator Set Serial Number:	To be determined
Generator Set Output:	100 kW
Installed:	To be determined
Stack Description:	800 cfm, 1,060 deg. F, vertically oriented – diameter and height to be determined
Notes:	This generator set replaced a generator set previously at this site that was moved to the Parker Estates Lift Station. The new engine is EPA Tier 2 certified.
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.ff Hunters Ridge Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Hunters Ridge Lift Station. Specific engine and generator information is listed below:

Address:	2021 NW 17th Ave
Engine Make / Model:	Cummins / 4BT3.9-G4
Engine Serial Number:	46663065
Engine Manufactured:	September 12, 2006
Fuel:	Diesel
Fuel Consumption:	4.7
Horsepower Rating:	99
Generator Set Make / Model:	Cummins / DGDB-5774892
Generator Set Serial Number:	I060970835
Generator Set Output:	60kW
Installed:	~ November 20, 2006
Stack Description:	~3" diameter, exhausted vertically, ~6' above ground level, 505 acfm, 925°F
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.gg NW 38th (Fisher) Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the 38th Street Lift Station. Specific engine and generator information is listed below:

Address:	5870 NW 38th Avenue, Camas, WA
Engine Make / Model:	Cummins/ QSB5-G3 NR3
Engine Serial Number:	73142949
Engine Manufactured:	October 5, 2010
Fuel:	Diesel
Horsepower Rating:	103 hp at full standby
Certification:	EPA Tier 3
Generator Set Make:	Cummins
Generator Set Output:	60 kW
Installed:	~ February 2011

Stack Description:	Exhausts vertically at 665 acfm, 778°F, approximately 6.5' above grade, 3" diameter
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.hh Hills at Round Lake (HARL) Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the 38th Street Lift Station. Specific engine and generator information is listed below:

Address:	2100 N. Woodburn Drive, Camas, WA
Engine Make / Model:	Cummins/ QSB5-G3 NR3
Engine Serial Number:	Not provided
Engine Manufactured:	Not provided
Fuel:	Diesel
Horsepower Rating:	103 hp at full standby
Certification:	EPA Tier 3
Generator Set Make:	Cummins
Generator Set Output:	60 kW
Installed:	August – November 2012
Stack Description:	Exhausts vertically at 665 acfm, 778°F, approximately 6.5' above grade, 3" diameter
Notes:	Carbon adsorber on site.
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.ii Leadbetter Road Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the Leadbetter Road Lift Station. Specific engine and generator information is listed below:

Location:	Leadbetter Road Lift Station ~401 SE Leadbetter Road, Camas, WA
Engine Make / Model:	John Deere / 6068HF285
Engine Serial Number:	To be determined
Fuel:	Diesel
Fuel Consumption:	11.7 gallons per hour at full standby load
Horsepower Rating:	237 bhp
Installation Date:	To be determined
Engine Built (Date):	To be determined
Engine Certification:	EPA Tier 3 for stationary emergency engines
Generator Set Make / Model:	Kohler / 150REOZJF
Generator Set Output:	150 kW
Stack Description:	3.86" diameter, exhausting vertically ~6' above grade. Stack flow 1,197 acfm at 950°F
Notes:	Biofilter on site.
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.jj 232nd Avenue Lift Station Emergency Generator Engine. This emergency generator is used to provide emergency electrical power at the 232nd Avenue Lift Station. Specific engine and generator information is listed below:

Location:	232nd Avenue Lift Station 850 NE 232nd Ave, Camas, WA

Engine Make / Model:	John Deere / 4045HF285H
Engine Serial Number:	To be determined
Fuel:	Diesel
Fuel Consumption:	6.9 gallons per hour at full standby load
Horsepower Rating:	133 bhp
Installation Date:	Expected 2018
Engine Built (Date):	2017
Engine Certification:	EPA Tier 3 for stationary emergency engines
Generator Set Make / Model:	Kohler / 80REOZJF
Generator Set Output:	80 kW
Stack Description:	3.86" diameter, exhausting vertically ~6' above grade. Stack flow 679 acfm at 1,074°F
Notes:	Biofilter on site.
Applicable Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.kk Other. Natural gas fired space heaters are used to heat some buildings at the wastewater treatment plant.

5.ll Equipment/Activity Summary.

ID No.	Generating Equipment/Activity	# of Units	Control Equipment	# of Units
1	Wastewater Treatment	1	Biofilter #1	1
2	Centrate Tank, WAS Storage Tank, Septage Storage Tank, Dryer Building, Digester Building, Plant Drain Lift Stations No. 1& 2	6	Biofilter #2	1
3	Boiler	1	Low-NO_X burners, Digester Gas Scrubber	1
4	Biosolids Dryer	1	Particulate prefilter, Condenser/Scrubber, Biofilter #2 in series, Digester Gas Scrubber	4
5	Waste Gas Burner	1	Digester Gas Scrubber	1
6	Biosolids Conveying	1	Venturi scrubber	1
7	Equipment Building Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
8	UV Building Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
9	Main Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
10	Oak Park Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
11	Lacamas Creek Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
12	Crown View Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A

ID No.	Generating Equipment/Activity	# of Units	Control Equipment	# of Units
13	One Stop Sewer Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
14	South Prune Hill Park Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
15	West Camas Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
16	Prune Hill Park Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (propane) Limited operation (≤ 100 hr/yr + emergency)	N/A
17	Lacamas Shores Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
18	Lacamas Meadows PRD Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
19	Larkspur Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
20	Two Creeks #1 (Camas Meadows) Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
21	Two Creeks #2 Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
22	Sunningdale Gardens #1 Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
23	Parker Estates Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
24	Stone Leaf Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
25	Winchester Hills #1 Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
26	Winchester Hills #2 Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
27	Hillshire Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A
28	Grand Ridge Lift Station Emergency Generator Engine	1	Low-sulfur, low-ash fuel (natural gas) Limited operation (≤ 100 hr/yr + emergency)	N/A
29	Brady Road Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 2 certified	N/A
30	Hunters Ridge Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency)	N/A

ID No.	Generating Equipment/Activity	# of Units	Control Equipment	# of Units
31	NW 38th (Fisher) Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 3 certified	N/A
32	Hills at Round Lake (HARL) Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 3 certified	N/A
33	Leadbetter Road Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 3 certified	N/A
34	232nd Avenue Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 3 certified	N/A
35	Goodwin Road Lift Station Emergency Generator Engine	1	Ultra-low sulfur diesel (≤ 0.0015% S) Limited operation (≤ 100 hr/yr + emergency) EPA Tier 3 certified	N/A
36	Odor Control Stations	~10	Biofilters, carbon beds	~10

6. EMISSIONS DETERMINATION

6.a Wastewater Treatment Plant. The wastewater treatment plant is a potential source of hydrogen sulfide and chloroform emissions. Emissions of these pollutants and other volatile compounds from wastewater treatment plants depend on the concentration of each compound in the influent wastewater and the specific configuration of the facility. With this data a computer model can be run to predict emissions of specific pollutants from the facility. A computer model has not been run for this facility; therefore, emissions were estimated using a mass balance approach. With the mass balance approach, any pollutant mass lost between the influent and effluent is assumed to be emitted from the plant (no digestion). For chloroform, SWCAA has assumed that the effluent concentration is 0.3 µg/L when chloroform is not detected and the detection limit is greater than 0.3 µg/L. This effluent level is based on the BASTE model run by the City of Vancouver Westside Wastewater Treatment Plant.

Pollutant	Assumed Capture Efficiency of Biofilter	Assumed Destruction Efficiency of Biofilter
Hydrogen Sulfide	70%	90%
Chloroform	25%	10%
Volatile Organic Compounds	0%	0%

Pollutant	Assumed Influent Concentration (µg/L)	Assumed Effluent Concentration (µg/L)	Maximum Potential Emissions (lb/yr)
Hydrogen Sulfide	100	0.0	687[1]
Chloroform	1.2[2]	0.30	18.9[2]
Volatile Organic Compounds	108	0.0	2,000[1]

[1] These are permit limits based on the maximum design flow of 6.1 mgd (maximum monthly average). Note that this level did not change with Phase II improvements. The VOC calculation based on an influent VOC content of 108 µg/L matches the emission factor of 0.903 lb VOC emitted per MMgal of wastewater processed from the South Coast Air Quality Management District Joint Emission Inventory Program (October, 1993). This value was also used to estimate VOC emissions from the Salmon Creek Wastewater Treatment Plant.

[2] This is a permit limit based on the design flow of 5.30 mgd (annual average) and the average chloroform measured in influent wastewater samples for 2008 (note that one non-detect value at 1.3 µg/L was assumed to be a concentration of 1.3/2 = 0.65 µg/L). Design for Phase I was 3.77 mgd (annual average).

6.b Boiler. The Boiler is fired on both digester gas and natural gas. Potential annual emissions from the combustion of digester gas were estimated conservatively using the assumption that the boiler is operated at full rated load (0.653 MMBtu/hr) for 8,760 hours per year, firing 100% digester gas. Potential annual emissions from the combustion of natural gas were estimated conservatively using the assumption that the boiler is operated at full rated load for 8,760 hours per year burning natural gas.

Boiler - Digester Gas

Maximum H_2S Content (hourly) 500 ppm
Maximum H_2S Content (annual) 500 ppm

Heat Rate = 0.653 MMBtu/hr
Gas Heat Content = 600 Btu/scf for AP-42 and BACT emission factors
Gas Heat Content = 655 Btu/scf for 40 CFR 98 GHG emission factors
Fuel Consumption = 9.53 MMscf/yr

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	30	0.039	23.12	0.025	0.11	BACT Limitation
CO	50	0.039	23.46	0.026	0.11	BACT Limitation
VOC		0.0054	3.24	0.0035	0.015	AP-42 Sec. 1.4 (7/98)
SO_X as SO_2 (annual)		0.1385	83.12	0.090	0.40	Based on tests as Salmon Creek
PM		0.0075	4.47	0.0049	0.021	AP-42 Sec. 1.4 (7/98)
PM_{10}		0.0075	4.47	0.0049	0.021	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$		0.0075	4.47	0.0049	0.021	AP-42 Sec. 1.4 (7/98)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	52.07	1	114.79	75,191	3.3E+02	Biogenic emissions not counted
CH_4	0.001	25	0.055	36.10	1.6E-01	40 CFR 98
N_2O	0.0001	298	0.066	43.03	1.9E-01	40 CFR 98
Total GHG - CO_2e	52.0711		114.916	75,270	328.7	

[1] The CO emission factor is equivalent to 50 ppmvd @ 3% O_2 for digester gas that is 60% methane, 40% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] The NO_X emission factor is equivalent to 30 ppmvd @ 3% O_2 for digester gas that is 60% methane, 40% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] The AP-42 emission factors for VOC and PM were reduced by the ratio of the heat content of the digester gas (600 Btu/scf) to the heat content assumed in AP-42 for natural gas (1,020 Btu/scf).
[4] All particulate matter is assumed to be less than 1 µm in diameter.

Boiler - Natural Gas

Heat Rate =	0.653	MMBtu/hr
Gas Heat Content =	1,020	Btu/scf for AP-42 and BACT emission factors
Gas Heat Content =	1,026	Btu/scf for 40 CFR 98 GHG emission factors
Fuel Consumption =	5.61	MMscf/yr

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	30	0.036	37.1	0.024	0.10	BACT Limitation
CO	50	0.037	37.7	0.024	0.11	BACT Limitation
VOC		0.0054	5.5	0.0035	0.015	AP-42 Sec. 1.4 (7/98)
PM		0.0075	7.6	0.0049	0.021	AP-42 Sec. 1.4 (7/98)
PM_{10}		0.0075	7.6	0.0049	0.021	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$		0.0075	7.6	0.0049	0.021	AP-42 Sec. 1.4 (7/98)
Benzene		2.06E-06	0.0021	1.3E-06	5.9E-06	AP-42 Sec. 1.4 (7/98)
Formaldehyde		7.35E-05	0.075	4.8E-05	2.1E-04	AP-42 Sec. 1.4 (7/98)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.06	1	116.98	120,019	335	40 CFR 98
CH_4	0.001	25	0.055	56.55	1.6E-01	40 CFR 98
N_2O	0.0001	298	0.066	67.41	1.9E-01	40 CFR 98
Total GHG - CO_2e	53.0611		117.098	120,143	335	

[1] All particulate matter is assumed to be less than 1 μm in diameter.

Annual 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 Biosolids Dryer. The Biosolids Dryer is fired on both digester gas and natural gas. Potential annual emissions from the combustion of digester gas were estimated conservatively using the assumption that the unit is operated for 8,760 hours per year, firing all of the available digester gas. Potential annual emissions from the combustion of natural gas were estimated conservatively using the assumption that the boiler is operated at full rated load for 8,760 hours per year burning natural gas. The maximum emission scenario occurs when as much digester gas as possible is burned and the remainder of the heat input is provided by natural gas. Up to 0.688 MMBtu/hr of digester gas (10.04 MMscf/yr) is available from the digesters.

Biosolids Dryer - Digester Gas

Maximum H_2S Content = 500 ppm
Condenser/Scrubber/Biofilter Control = 50%

Heat Rate = 2.31 MMBtu/hr
Gas Heat Content = 600 Btu/scf for AP-42 and BACT emission factors
Gas Heat Content = 655 Btu/scf for 40 CFR 98 GHG emission factors
Fuel Consumption = 10.04 MMscf/yr

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	30	0.039	23.12	0.089	0.12	BACT Limitation
CO	50	0.039	23.46	0.090	0.12	BACT Limitation
VOC		0.0054	3.24	0.012	0.016	AP-42 Sec. 1.4 (7/98)
SO_X as SO_2 (annual)		0.0693	41.56	0.160	0.209	Based on tests as Salmon Creek
PM		0.0075	4.47	0.017	0.022	AP-42 Sec. 1.4 (7/98)
PM_{10}		0.0075	4.47	0.017	0.022	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$		0.0075	4.47	0.017	0.022	AP-42 Sec. 1.4 (7/98)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	52.07	1	114.79	75,191	3.8E+02	40 CFR 98
CH_4	0.001	25	0.055	36.10	1.8E-01	40 CFR 98
N_2O	0.0001	298	0.066	43.03	2.2E-01	40 CFR 98
Total GHG - CO_2e	52.0711		114.916	75,270	378	

[1] The CO emission factor is equivalent to 50 ppmvd @ 3% O_2 for digester gas that is 60% methane, 40% carbon dioxide, and has a heat content of 600 Btu/scf.
[2] The NO_X emission factor is equivalent to 30 ppmvd @ 3% O_2 for digester gas that is 60% methane, 40% carbon dioxide, and has a heat content of 600 Btu/scf.
[3] The AP-42 emission factors for VOC and PM (lb/MMscf) were reduced by the ratio of the heat content of the digester gas (600 Btu/scf) to the heat content assumed in AP-42 for natural gas (1,020 Btu/scf).
[4] All particulate matter is assumed to be less than 1 μm in diameter.

Biosolids Dryer - Natural Gas

Heat Rate = 2.31 MMBtu/hr
Gas Heat Content = 1,020 Btu/scf for AP-42 and BACT emission factors
Gas Heat Content = 1,026 Btu/scf for 40 CFR 98 GHG emission factors
Fuel Consumption = 13.93 MMscf/yr

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	30	0.036	37.1	0.084	0.26	BACT Limitation
CO	50	0.037	37.7	0.085	0.26	BACT Limitation
VOC		0.0054	5.5	0.012	0.038	AP-42 Sec. 1.4 (7/98)
PM		0.0075	7.6	0.017	0.053	AP-42 Sec. 1.4 (7/98)
PM_{10}		0.0075	7.6	0.017	0.053	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$		0.0075	7.6	0.017	0.053	AP-42 Sec. 1.4 (7/98)
Benzene		2.06E-06	0.0021	4.8E-06	1.5E-05	AP-42 Sec. 1.4 (7/98)
Formaldehyde		7.35E-05	0.075	1.7E-04	5.2E-04	AP-42 Sec. 1.4 (7/98)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.06	1	116.98	120,019	836	40 CFR 98
CH_4	0.001	25	0.055	56.55	3.9E-01	40 CFR 98
N_2O	0.0001	298	0.066	67.41	4.7E-01	40 CFR 98
Total GHG - CO_2e	53.0611		117.098	120,143	837	

[1] All particulate matter is assumed to be less than 1 µm in diameter.

Annual 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 Waste Gas Burner. The Waste Gas Burner is fueled solely on digester gas (digester gas is used to run the pilot). The annual heat requirements for the Boiler and Biosolids Dryer exceed the gas production by the anaerobic digester, however variations in heat needs and gas production causes the digester gas production to exceed the heat requirements at times. The applicant has assumed that up to 20% of the digester gas produced will need to be flared (0.1376 MMBtu/hr or 3.8 cfm, annual average).

Waste Gas Burner

Gas Heat Content =	600	Btu/scf for BACT and AP-42 emission factors			
Gas Heat Content =	655	Btu/scf for 40 CFR 98 GHG emission factors			
Gas Consumption Rate	11,580	scfh (flare design)			
Total heat release =	6.9	MMBtu/hr			
Gas Consumption =	2.01	MMscf/yr	Maximum H_2S Content (annual) =		500 ppm

Pollutant	ppmvd @ 3% O_2	Emission Factor lb/MMBtu	Emission Factor lb/MMscf	lb/hr	tpy	EF Souce
NO_X	47	0.06	36	0.42	0.036	SWCAA
CO	895	0.70	420	4.86	0.42	SWCAA
VOC		0.0054	3.24	0.037	0.0032	AP-42 Sec. 1.4 (7/98)
SO_X as SO_2 (annual)		0.1385	83.12	0.96	0.083	Material balance
PM		0.0075	4.47	0.052	0.0045	AP-42 Sec. 1.4 (7/98)
PM_{10}		0.0075	4.47	0.052	0.0045	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$		0.0075	4.47	0.052	0.0045	AP-42 Sec. 1.4 (7/98)
Hydrogen Sulfide (H_2S)		0.0007	0.44	0.0051	0.00044	99% DRE by burner

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	52.07	1	114.79	75,191	7.6E+01	40 CFR 98
CH_4	0.001	25	0.055	36.10	3.6E-02	40 CFR 98
N_2O	0.0001	298	0.066	43.03	4.3E-02	40 CFR 98
Total GHG - CO_2e	52.0711		114.916	75,270	76	

[1] The AP-42 factor for CO emissions from an open flare in AP-42 Table 13.5.1 (9/91) is 0.37 lb/MMBtu. SWCAA's experience with open flares burning digester gas indicate that CO emissions are likely much higher and believes an emission factor of 0.70 lb/MMBtu is more accurate for this shrouded digester gas flare.

[2] All particulate matter is assumed to have an aerodynamic diameter of 1 µm or less. No visible emissions have been observed on any of the several occasions that SWCAA has observed this flare.

6.e Biosolids Conveying. Emissions from this activity consist of particulate matter exhausted out of the Monroe Dual Throat venturi scrubber. Potential annual emissions were calculated with the assumption that the equipment will operate at full rated capacity (2,800 scfm) for 8,760 hours per year and emit at a concentration of no more than 0.005 gr/dscf.

Biosolids Conveying

Source	flow scfm	gr/dscf	Hours of Operation	$PM/PM_{10}/PM_{2.5}$ lb/hr	lb/yr	tpy
Venturi scrubber exhaust	2,800	0.005	8,760	0.12	1,051	0.53

6.f Equipment Building 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.

Equipment Building Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	393	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	19.2	gal/hr
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	0.01089	4.28	0.43	Katolite Information Sheet
CO	0.00086	0.34	0.034	Katolite Information Sheet
VOC	0.00024	0.10	0.010	Katolite Information Sheet
SO_X as SO_2		0.0042	0.00042	Mass Balance
PM	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
PM_{10}	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
$PM_{2.5}$	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	43	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.04	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.10	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	43	

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.g UV Building 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.

UV Building Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	393	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	19.2	gal/hr
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	0.01089	4.28	0.43	Katolite Information Sheet
CO	0.00086	0.34	0.034	Katolite Information Sheet
VOC	0.00024	0.10	0.010	Katolite Information Sheet
SO_X as SO_2		0.0042	0.00042	Mass Balance
PM	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
PM_{10}	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
$PM_{2.5}$	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	43	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.04	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.10	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	43	

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.h Main Lift Station 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.

Main Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	393	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	19.2	gal/hr
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	0.01089	4.28	0.43	Katolite Information Sheet
CO	0.00086	0.34	0.034	Katolite Information Sheet
VOC	0.00024	0.10	0.010	Katolite Information Sheet
SO_X as SO_2		0.0042	0.00042	Mass Balance
PM	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
PM_{10}	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)
$PM_{2.5}$	0.0022	0.86	0.086	AP-42 Table 3.3-1 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	43	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.04	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.10	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	43	

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.i Oak Park Lift Station 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.

Oak Park Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	71	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.6	gal/hr
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	0.01325	0.94	0.09	Manufacturer
CO	0.005291	0.38	0.038	Manufacturer
VOC	0.000132	0.0094	0.0009	Manufacturer
SO_X as SO_2		0.0008	0.00008	Mass Balance
PM	0.000794	0.056	0.006	Manufacturer
PM_{10}	0.000794	0.056	0.006	Manufacturer
$PM_{2.5}$	0.000794	0.056	0.006	Manufacturer

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	8	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	8	

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.j Lacamas Creek Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Lacamas Creek Lift Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	88	bhp
Max fuel consumption =	1.0	MMBtu/hr natural gas
Natural Gas Heat Value	1,028	Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X		4.65	0.90	180	0.09	Katolight
CO		34.8	6.75	1,350	0.68	Katolight
VOC		0.9	0.17	35	0.017	Katolight
SO_X as SO_2	0.0005882		0.00059	0.12	0.000059	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		8.4E-03	1.7	8.4E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		5.1E-03	1.0	5.1E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		4.4E-04	0.09	4.4E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		4.0E-05	0.01	4.0E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		2.5E-03	0.50	2.5E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		4.1E-04	0.08	4.1E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		1.8E-04	0.04	1.8E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	12	40 CFR 98
CH_4	0.001	25	0.055	56.66	0.006	40 CFR 98
N_2O	0.0001	298	0.066	67.54	0.007	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	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.k Crown View Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Crown View Pump Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	88	bhp
Max fuel consumption =	1.0	MMBtu/hr natural gas
Natural Gas Heat Value	1,028	Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X		4.65	0.90	180	0.090	Katolight
CO		34.8	6.75	1,350	0.68	Katolight
VOC		0.9	0.17	35	0.017	Katolight
SO_X as SO_2	0.0005882		0.00059	0.12	0.000059	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.010	2.0	0.0010	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		8.4E-03	1.7	8.4E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		5.1E-03	1.0	5.1E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		4.4E-04	0.088	4.4E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		4.0E-05	0.008	4.0E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		2.5E-03	0.50	2.5E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		4.1E-04	0.082	4.1E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		1.8E-04	0.04	1.8E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	12	40 CFR 98
CH_4	0.001	25	0.055	56.66	0.006	40 CFR 98
N_2O	0.0001	298	0.066	67.54	0.007	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	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.

6.1 One Stop Sewer Lift Station 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.

One Stop Sewer Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	70.5	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.34	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/kW*hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	12.0	0.0197	1.39	0.14	Caterpillar
CO	0.8	0.00132	0.09	0.0093	Caterpillar
VOC	0.8	0.00132	0.093	0.0093	Caterpillar
SO_X as SO_2			0.00072	0.000072	Mass Balance
PM		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)
PM_{10}		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)
$PM_{2.5}$		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	8	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	8	

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.m South Prune Hill Park Lift Station 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.

South Prune Hill Park Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	72.8	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.78	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/kW*hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	12.0	0.0197	1.44	0.14	Caterpillar
CO	0.8	0.00132	0.096	0.0096	Caterpillar
VOC	0.8	0.00132	0.096	0.0096	Caterpillar
SO_X as SO_2			0.00082	0.000082	Mass Balance
PM		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)
PM_{10}		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)
$PM_{2.5}$		0.0022	0.16	0.016	AP-42 Sec. 3.3 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	9	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	9	

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.n West Camas Lift Station 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.

West Camas Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	149.8	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	7.15	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/kW*hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	11.0	0.0181	2.71	0.27	Caterpillar
CO	3.5	0.0058	0.86	0.086	Caterpillar
VOC	1.5	0.0025	0.37	0.037	Caterpillar
SO_X as SO_2			0.0015	0.00015	Mass Balance
PM		0.0022	0.330	0.033	AP-42 Sec. 3.3 (10/96)
PM_{10}		0.0022	0.330	0.033	AP-42 Sec. 3.3 (10/96)
$PM_{2.5}$		0.0022	0.330	0.033	AP-42 Sec. 3.3 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	16	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.016	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.039	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	16	

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.o Prune Hill Park Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of propane were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Prune Hill Park Lift Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	34.5	horsepower
Max fuel consumption =	0.3	MMBtu/hr propane (estimated)
Propane sulfur content =	254	ppmv
Propane heat content =	2,520	Btu/cf @ 60 F
Propane sulfur content =	2.66E-04	lb-moles S / MMBtu
Propane Gas Heat Value =	0.091	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor lb/MMBtu	lb/hr	lb/yr	tpy	Source
NO_X	4.08	1.41	282	0.14	AP-42 Sec 3.2 (7/00)
CO	0.317	0.11	22	0.011	AP-42 Sec 3.2 (7/00)
VOC	0.118	0.041	8	0.0041	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	1.70E-02	0.0059	1.17	0.00059	AP-42 Sec 3.2 (7/00)
PM	0.0099871	0.0034	0.7	0.00034	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871	0.0034	0.7	0.00034	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871	0.0034	0.7	0.00034	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	2.9E-03	5.8E-01	2.9E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	1.8E-03	3.5E-01	1.8E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	1.5E-04	3.0E-02	1.5E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	1.4E-05	2.7E-03	1.4E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	8.6E-04	1.7E-01	8.6E-05	AP-42 Sec 3.2 (7/00)
Toluene	0.000408	1.4E-04	2.8E-02	1.4E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184	6.3E-05	1.3E-02	6.3E-06	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	61.46	1	135.50	12	5	40 CFR 98
CH_4	0.001	25	0.055	0.0050	0.0019	40 CFR 98 for nat. gas
N_2O	0.0001	298	0.066	0.0060	0.0023	40 CFR 98 for nat. gas
Total GHG - CO_2e	61.4611		135.617	12	5	

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.p Lacamas Shores Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Lacamas Shores Lift Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	67.5	bhp (estimated)
Max fuel consumption =	0.68	MMBtu/hr natural gas (estimated)
Natural Gas Heat Value	1,028	Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X	4.08		2.75	551	0.28	AP-42 Sec 3.2 (7/00)
CO	0.317		0.21	43	0.021	AP-42 Sec 3.2 (7/00)
VOC	0.118		0.080	16	0.0080	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882		0.00040	0.08	0.000040	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		5.6E-03	1.1E+00	5.6E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		3.5E-03	6.9E-01	3.5E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		3.0E-04	5.9E-02	3.0E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		2.7E-05	5.4E-03	2.7E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		1.7E-03	3.4E-01	1.7E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		2.8E-04	5.5E-02	2.8E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		1.2E-04	2.5E-02	1.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	8	40 CFR 98
CH_4	0.001	298	0.657	675.37	0.044	40 CFR 98
N_2O	0.0001	310	0.068	70.26	0.005	40 CFR 98
Total GHG - CO_2e	53.0211		117.614	120,908	8	

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.q Lacamas Meadows PRD Lift Station 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.

Lacamas Meadows PRD Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	99	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	4.7	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	9.2	0.0202	2.00	0.20	Cummins
CO	1.19	0.0026	0.26	0.026	Cummins
VOC	0.31	0.00068	0.068	0.0068	Cummins
SO_X as SO_2			0.0010	0.00010	Mass Balance
PM	0.16	0.00035	0.035	0.0035	Cummins
PM_{10}	0.16	0.00035	0.035	0.0035	Cummins
$PM_{2.5}$	0.16	0.00035	0.035	0.0035	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	11	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	11	

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.r Larkspur Lift Station 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.

Larkspur Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	99	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	4.7	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	9.2	0.0202	2.00	0.20	Cummins
CO	1.19	0.0026	0.26	0.026	Cummins
VOC	0.31	0.00068	0.068	0.0068	Cummins
SO_X as SO_2			0.0010	0.00010	Mass Balance
PM	0.16	0.00035	0.035	0.0035	Cummins
PM_{10}	0.16	0.00035	0.035	0.0035	Cummins
$PM_{2.5}$	0.16	0.00035	0.035	0.0035	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	11	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	11	

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.s Two Creeks #1 (aka Camas Meadows) Lift Station 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.

Two Creeks #1 (aka Camas Meadows) Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	130	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	6.3	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	6.86	0.0151	1.97	0.20	Cummins
CO	2.10	0.0046	0.60	0.060	Cummins
VOC	0.22	0.00049	0.063	0.0063	Cummins
SO_X as SO_2			0.0014	0.00014	Mass Balance
PM	0.42	0.00093	0.12	0.012	Cummins
PM_{10}	0.42	0.00093	0.12	0.012	Cummins
$PM_{2.5}$	0.42	0.00093	0.12	0.012	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	14	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	14	

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.t Two Creeks #2 Lift Station 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.

Two Creeks #2 Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	56	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	2.8	gal/hr (estimated)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	6.90	0.0152	0.85	0.085	Tier 1
CO		0.00668	0.37	0.037	AP-42 Table 3.3-1 (10/96)
VOC		0.002514	0.14	0.014	AP-42 Table 3.3-1 (10/96)
SO_X as SO_2			0.00061	0.000061	Mass Balance
PM		0.0022	0.12	0.012	AP-42 Table 3.3-1 (10/96)
PM_{10}		0.0022	0.12	0.012	AP-42 Table 3.3-1 (10/96)
$PM_{2.5}$		0.0022	0.12	0.012	AP-42 Table 3.3-1 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	6	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	6	

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.u Sunningdale Gardens #1 Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Sunningdale Gardens #1 Lift Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	30	bhp (estimated)
Max fuel consumption =	0.30	MMBtu/hr natural gas (estimated)
Natural Gas Heat Value	1,028	Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X	4.08		1.22	245	0.12	AP-42 Sec 3.2 (7/00)
CO	0.317		0.10	19	0.010	AP-42 Sec 3.2 (7/00)
VOC	0.118		0.035	7	0.0035	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882		0.00018	0.04	0.000018	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.0030	0.6	0.00030	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.0030	0.6	0.00030	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.0030	0.6	0.00030	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		2.5E-03	5.0E-01	2.5E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		1.5E-03	3.1E-01	1.5E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		1.3E-04	2.6E-02	1.3E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		1.2E-05	2.4E-03	1.2E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		7.5E-04	1.5E-01	7.5E-05	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		1.2E-04	2.4E-02	1.2E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		5.5E-05	1.1E-02	5.5E-06	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	4	40 CFR 98
CH_4	0.001	25	0.055	56.66	0.002	40 CFR 98
N_2O	0.0001	298	0.066	67.54	0.002	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	4	

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.v Parker Estates Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Parker Estates Lift Station Emergency Generator Engine

Hours of operation = 200 hours
Rated horsepower = 67.5 bhp (estimated)
Max fuel consumption = 0.68 MMBtu/hr natural gas (estimated)
Natural Gas Heat Value 1,028 Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	lb/hr	lb/yr	tpy	Source
NO_X	4.08	2.75	551	0.28	AP-42 Sec 3.2 (7/00)
CO	0.317	0.21	43	0.021	AP-42 Sec 3.2 (7/00)
VOC	0.118	0.080	16	0.0080	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882	0.00040	0.08	0.000040	AP-42 Sec 3.2 (7/00)
PM	0.0099871	0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871	0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871	0.0067	1.3	0.00067	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836	5.6E-03	1.1E+00	5.6E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514	3.5E-03	6.9E-01	3.5E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044	3.0E-04	5.9E-02	3.0E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397	2.7E-05	5.4E-03	2.7E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025	1.7E-03	3.4E-01	1.7E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408	2.8E-04	5.5E-02	2.8E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184	1.2E-04	2.5E-02	1.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	8	40 CFR 98
CH_4	0.001	25	0.055	56.66	0.004	40 CFR 98
N_2O	0.0001	298	0.066	67.54	0.004	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	8	

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.w Stone Leaf Lift Station 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.

Stone Leaf Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	75.0	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.75	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/kW*hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	12.0	0.0197	1.48	0.15	Perkins Engines Company
CO	0.8	0.0013	0.10	0.010	Perkins Engines Company
VOC	0.8	0.0013	0.099	0.0099	Perkins Engines Company
SO_X as SO_2			0.00081	0.000081	Mass Balance
PM		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)
PM_{10}		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)
$PM_{2.5}$		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	8	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	8	

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.x Winchester Hills #1 Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Winchester Hills #1 Lift Station Emergency Generator Engine

Hours of operation =	200 hours
Rated horsepower =	67 bhp
Max fuel consumption =	0.67 MMBtu/hr natural gas (estimated)
Natural Gas Heat Value	1,028 Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X	2.21		1.48	296	0.15	AP-42 Sec 3.2 (7/00)
CO	3.72		2.49	498	0.25	AP-42 Sec 3.2 (7/00)
VOC	0.0296		0.020	4	0.0020	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882		0.00039	0.08	0.000039	AP-42 Sec 3.2 (7/00)
PM	0.01941		0.013	2.6	0.0013	AP-42 Sec 3.2 (7/00)
PM_{10}	0.01941		0.013	2.6	0.0013	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.01941		0.013	2.6	0.0013	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0		0.0E+00	0.0E+00	0.0E+00	AP-42 Sec 3.2 (7/00)
Acrolein	0		0.0E+00	0.0E+00	0.0E+00	AP-42 Sec 3.2 (7/00)
Benzene	0.00158		1.1E-03	2.1E-01	1.1E-04	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0		0.0E+00	0.0E+00	0.0E+00	AP-42 Sec 3.2 (7/00)
Methanol	0		0.0E+00	0.0E+00	0.0E+00	AP-42 Sec 3.2 (7/00)
Toluene	0.000558		3.7E-04	7.5E-02	3.7E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000195		1.3E-04	2.6E-02	1.3E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	8	40 CFR 98
CH_4	0.001	25	0.055	56.66	3.7E-03	40 CFR 98
N_2O	0.0001	298	0.066	67.54	4.4E-03	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	8	

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.y Winchester Hills #2 Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Winchester Hills #2 Lift Station Emergency Generator Engine

Hours of operation = 200 hours
Rated horsepower = 66 bhp
Max fuel consumption = 0.66 MMBtu/hr natural gas (estimated)
Natural Gas Heat Value 1,028 Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X	4.08		2.69	539	0.27	AP-42 Sec 3.2 (7/00)
CO	0.317		0.21	42	0.021	AP-42 Sec 3.2 (7/00)
VOC	0.118		0.078	16	0.0078	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882		0.00039	0.08	0.000039	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		5.5E-03	1.1E+00	5.5E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		3.4E-03	6.8E-01	3.4E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		2.9E-04	5.8E-02	2.9E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		2.6E-05	5.2E-03	2.6E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		1.7E-03	3.3E-01	1.7E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		2.7E-04	5.4E-02	2.7E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		1.2E-04	2.4E-02	1.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	8	40 CFR 98
CH_4	0.001	25	0.055	56.66	3.6E-03	40 CFR 98
N_2O	0.0001	298	0.066	67.54	4.3E-03	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	8	

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.z Hillshire Lift Station 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.

Hillshire Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	75.0	horsepower (estimated)
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.75	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/kW*hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	8.45	0.0139	1.04	0.10	Perkins Engines Company
CO	2.65	0.0044	0.33	0.033	Perkins Engines Company
VOC	1.05	0.0017	0.13	0.013	Perkins Engines Company
SO_X as SO_2			0.00081	0.000081	Mass Balance
PM		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)
PM_{10}		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)
$PM_{2.5}$		0.0022	0.17	0.017	AP-42 Sec. 3.3 (10/96)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	8	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	0.02	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	8	

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.aa Grand Ridge Lift Station Emergency Generator Engine. Potential annual emissions from the combustion of natural gas were calculated with the assumption that the equipment will operate at full load for up to 200 hours per year.

Grand Ridge Lift Station Emergency Generator Engine

Hours of operation =	200	hours
Rated horsepower =	66	bhp
Max fuel consumption =	0.66	MMBtu/hr natural gas (estimated)
Natural Gas Heat Value	1,028	Btu/scf for 40 CFR 98 GHG emission factors

Pollutant	Emission Factor lb/MMBtu	Emission Factor g/bhp-hr	lb/hr	lb/yr	tpy	Source
NO_X	4.08		2.69	539	0.27	AP-42 Sec 3.2 (7/00)
CO	0.317		0.21	42	0.021	AP-42 Sec 3.2 (7/00)
VOC	0.118		0.078	16	0.0078	AP-42 Sec 3.2 (7/00)
SO_X as SO_2	0.0005882		0.00039	0.08	0.000039	AP-42 Sec 3.2 (7/00)
PM	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
PM_{10}	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
$PM_{2.5}$	0.0099871		0.0066	1.3	0.00066	AP-42 Sec 3.2 (7/00)
Acetaldehyde	0.00836		5.5E-03	1.1E+00	5.5E-04	AP-42 Sec 3.2 (7/00)
Acrolein	0.00514		3.4E-03	6.8E-01	3.4E-04	AP-42 Sec 3.2 (7/00)
Benzene	0.00044		2.9E-04	5.8E-02	2.9E-05	AP-42 Sec 3.2 (7/00)
Ethylbenzene	0.0000397		2.6E-05	5.2E-03	2.6E-06	AP-42 Sec 3.2 (7/00)
Methanol	0.0025		1.7E-03	3.3E-01	1.7E-04	AP-42 Sec 3.2 (7/00)
Toluene	0.000408		2.7E-04	5.4E-02	2.7E-05	AP-42 Sec 3.2 (7/00)
Xylene	0.000184		1.2E-04	2.4E-02	1.2E-05	AP-42 Sec 3.2 (7/00)

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	8	40 CFR 98
CH_4	0.001	25	0.055	56.66	3.6E-03	40 CFR 98
N_2O	0.0001	298	0.066	67.54	4.3E-03	40 CFR 98
Total GHG - CO_2e	53.0211		117.010	120,286	8	

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.bb Brady Road Lift Station 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.

Brady Road Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	170	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	7.5	gal/hr (from Cummins, 100% standby)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	4.90	0.0108	1.84	0.18	Tier 2
CO	3.70	0.0082	1.39	0.14	Tier 2
VOC		0.002514	0.427	0.043	AP-42 Table 3.3-1 (10/96)
SO_X as SO_2			0.0016	0.00016	Mass Balance
PM	0.22	0.0005	0.082	0.0082	Tier 2
PM_{10}	0.22	0.0005	0.082	0.0082	Tier 2
$PM_{2.5}$	0.22	0.0005	0.082	0.0082	Tier 2

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	17	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	0.04	40 CFR 98
Total GHG - CO_2e	73.9636		163.613	23	17	

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.cc Hunter's Ridge Lift Station 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.

Hunter's Ridge Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	99	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	5	gal/hr (from Cummins, 100% standby)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	9.16	0.0202	2.00	0.20	Cummins
CO	1.19	0.0026	0.26	0.026	Cummins
VOC	0.31	0.0007	0.068	0.0068	Cummins
SO_X as SO_2			0.0011	0.00011	Mass Balance
PM	0.16	0.0004	0.035	0.0035	Cummins
PM_{10}	0.16	0.0004	0.035	0.0035	Cummins
$PM_{2.5}$	0.16	0.0004	0.035	0.0035	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	11	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	11	

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.dd NW 38th (aka Fisher) Lift Station 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.

NW 38th (aka Fisher) Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	103	horsepower (full standby)
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	5.7	gal/hr (from Cummins, 100% standby)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	2.37	0.0052	0.54	0.054	Cummins
CO	0.50	0.0011	0.11	0.011	Cummins
VOC	0.04	0.000088	0.0091	0.00091	Cummins
SO_X as SO_2			0.0012	0.00012	Mass Balance
PM	0.06	0.00013	0.014	0.0014	Cummins
PM_{10}	0.06	0.00013	0.014	0.0014	Cummins
$PM_{2.5}$	0.06	0.00013	0.014	0.0014	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	13	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	13	

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.ee Hills at Round Lake (aka HARL) Lift Station 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.

Hills at Round Lake (aka HARL) Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	103	horsepower (full standby)
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	5.7	gal/hr (from Cummins, 100% standby)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/hp-hr	Emission Factor lb/hp-hr	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	2.37	0.0052	0.54	0.054	Cummins
CO	0.50	0.0011	0.11	0.011	Cummins
VOC	0.04	0.0001	0.0091	0.00091	Cummins
SO_X as SO_2			0.0012	0.00012	Mass Balance
PM	0.06	0.0001	0.014	0.0014	Cummins
PM_{10}	0.06	0.0001	0.014	0.0014	Cummins
$PM_{2.5}$	0.06	0.0001	0.014	0.0014	Cummins

Greenhouse Gases	kg/MMBtu	GWP	CO_2e lb/MMBtu	CO_2e lb/gallon	tpy, CO_2e	
CO_2	73.96	1	163.05	23	13	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	13	

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.ff Leadbetter Road Lift Station 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.

Leadbetter Road Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	237	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	11.7	gal/hr
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	2.54	1.32	0.13	EPA Certification Test
CO	0.97	0.51	0.051	EPA Certification Test
VOC	0.13	0.070	0.0070	EPA Certification Test
SO_X as SO_2		0.0025	0.00025	Mass Balance
PM	0.13	0.070	0.0070	EPA Certification Test
PM_{10}	0.13	0.070	0.0070	EPA Certification Test
$PM_{2.5}$	0.13	0.070	0.0070	EPA Certification Test

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	26	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	0.06	40 CFR 98
Total GHG - CO_2e	74.0		163.6	23	26	

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.gg 232nd Avenue Lift Station 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.

232nd Avenue Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	133	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	6.9	gal/hr
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	2.59	0.76	0.076	EPA Certification Test
CO	0.82	0.24	0.024	EPA Certification Test
VOC	0.13	0.039	0.0039	EPA Certification Test
SO_X as SO_2		0.0015	0.00015	Mass Balance
PM	0.10	0.03	0.0031	EPA Certification Test
PM_{10}	0.10	0.03	0.0031	EPA Certification Test
$PM_{2.5}$	0.10	0.03	0.0031	EPA Certification Test

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	16	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	0.04	40 CFR 98
Total GHG - CO_2e	74.0		163.6	23	16	

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.hh Goodwin Road Lift Station 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.

Goodwin Road Lift Station Emergency Generator Engine

Hours of Operation =	200	hours
Power Output =	140	horsepower in this configuration - engine rated at 176 hp
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	7.3	gal/hr
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	3.16	0.98	0.098	Cummins
CO	0.30	0.093	0.0093	Cummins
VOC	0.02	0.0062	0.00062	Cummins
SO_X as SO_2		0.0016	0.00016	Mass Balance
PM	0.04	0.012	0.0012	Cummins
PM_{10}	0.04	0.012	0.0012	Cummins
$PM_{2.5}$	0.04	0.012	0.0012	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	16	40 CFR 98
CH_4	0.003	25	0.165	0.023	0.017	40 CFR 98
N_2O	0.0006	298	0.394	0.054	0.040	40 CFR 98
Total GHG - CO_2e	74.0		163.6	23	16	

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.ii Facility-Wide Potential Emissions (PTE) Summary. The facility-wide PTE was calculated with the assumption that the quantity of digester gas for the Boiler and Biosolids Dryer is not limited. The primary effect of this assumption is that the PTE for SO_2 is somewhat conservative.

Pollutant	Annual Emissions (tpy)
Nitrogen oxides	5.86
Carbon monoxide	3.33
Volatile organic compounds	1.23
Sulfur oxides as sulfur dioxide	0.43[1]
Particulate matter	1.05
PM_{10}	1.05
$PM_{2.5}$	1.05
Toxic Air Pollutants	0.32
Hazardous Air Pollutants	0.02
CO_2e (includes biogenic)	1,995

[1] Potential SO_2 emissions from the combustion of digester gas in the three emission units is less than the sum of the individual potentials to emit of these three units because the plantwide digester gas production capability is limited to approximately 0.688 MMBtu/hr. Maximum potential emissions from the combustion of digester gas (0.42 tons per year) was calculated by assuming that all digester gas is burned in units that do not have any SO_2 emission control (Boiler and Waste Gas Burner). Exhaust from the Biosolids Dryer passes through a wet scrubber and biofilter.

Pollutant	CAS Number	Pollutant Category	Potential Emissions (lbs/yr)
Acetaldehyde	75-07-0	HAP/TAP	8.9
Acrolein	107-02-8	HAP/TAP	5.5
Benzene	71-43-2	HAP/TAP	0.7
Chloroform	67-66-3	HAP/TAP	18.9
Ethylbenzene	100-41-4	HAP/TAP	0.04
Formaldehyde	50-00-0	HAP/TAP	1.5
Hydrogen Sulfide	7783-06-4	TAP	598
Methanol	67-56-1	HAP/TAP	2.7
Toluene	108-88-3	HAP/TAP	0.5
Xylene	1330-20-7	HAP/TAP	0.2

7. REGULATIONS AND EMISSION STANDARDS

Regulations 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 regulations, codes, or requirements listed below.

7.a Title 40 Code of Federal Regulations (40 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 Brady Road Lift Station Emergency Generator Engine, the Hunter's Ridge Lift Station Emergency Generator Engine, the NW 38th Lift Station Emergency Generator Engine, the Hills at Round Lake Lift Station Emergency Generator Engine, Leadbetter Road Lift Station, 232nd Avenue Lift Station, and Goodwin Road Lift Station are affected sources under this regulation. It should be noted that because the Hunter's Ridge Lift Station Emergency Generator Engine was produced after

April 1, 2006, but is a 2006 model year engine (manufactured September 12, 2006), no emission standards apply to the engine (emission standards apply to emergency engines beginning with the 2007 model year). For applicable emergency engines, the owner or operator is required to:

(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 cetane index of 40 or a maximum aromatic content of 35 percent. [40 CFR 60.4207(b)]

(2) 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)]

(3) 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.b 40 CFR 63.1580 et seq. "Subpart VVV – National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works" established HAP emission control requirements for wastewater plants that are themselves a major source of hazardous air pollutants or are located at a major source of hazardous air pollutants. This facility is not a major source of hazardous air pollutants and is not located at a major source of hazardous air pollutants; therefore this facility is not subject to this regulation.

7.c Title 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 engines addressed by this permitting action are affected sources under this regulation. For area sources, an engine is "existing" if construction was commenced before 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 emergency generator engines at the Brady Road Lift Station, Hunter's Ridge Lift Station, NW 38th Lift Station, Hills at Round Lake Lift Station, Leadbetter Road Lift Station, 232nd Avenue Lift Station, and Goodwin Road Lift Station are new diesel engines at an area source; therefore, compliance with 40 CFR 60 Subpart IIII constitutes compliance with 40 CFR 63 Subpart ZZZZ for these engines. The remainder of the engines are existing engines at an area source. For existing emergency engines at an area source, the owner or operator is required to:

(1) Change oil and filter every 500 hours of operation or annually, whichever comes first except as allowed by 40 CFR 63.6625(i). [40 CFR 63.6603(a) and Table 2d(4)(a)]

(2) Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. [40 CFR 63.6603(a) and Table 2d(4)(b)]

(3) Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary. [40 CFR 63.6603(a) and Table 2d(4)(c)]

(4) Operate and maintain the stationary RICE and after-treatment control device (if any) according to the manufacturer's emission-related written instructions or develop a maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions. [40 CFR 63.6625(e)]

(5) Install a non-resettable hour meter if one is not already installed. [40 CFR 63.6625(f)]

(6) Minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes. [40 CFR 63.6625(h)]

(7) Report each instance in which the owner did not meet each operating limitation. [40 CFR 63.6640(b)]

(8) Limit operation of the engine to emergency use and maintenance checks and readiness testing. Operation for maintenance checks and readiness testing may be conducted only to the extent that the tests are recommended by Federal, State or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Operation for maintenance checks and readiness testing is limited to 100 hours per year. [40 CFR 63.6640(f)(1)(ii)]

(9) Record the occurrence and duration of each malfunction of operation (i.e., process equipment). [40 CFR 63.6655(a)(2)]

(10) Record maintenance conducted on the engine in order to demonstrate that the engine was operated and maintained according to the applicable maintenance plan. [40 CFR 63.6655(e)]

(11) Record the hours of operation of the engine by use of a non-resettable hour meter. The owner or operator must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation. [40 CFR 63.6655(e)]

Enforcement of this regulation has not been delegated from EPA to SWCAA and the requirements from this regulation have not been included in the Air Discharge Permit.

7.d Revised Code of Washington (RCW) 70.94.141 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 70.94] 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.

7.e RCW 70.94.152 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 Order of Approval (Air Discharge Permit) for installation and establishment of an air contaminant source.

7.f Washington Administrative Code (WAC) 173-460 "Controls for New Sources of Toxic Air Pollutants" (as in effect February 14, 1994) requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.

7.g WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM_{10}, $PM_{2.5}$, lead, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide in the ambient air, which shall not be exceeded.

7.h 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, sulfur dioxide, concealment and masking, and fugitive dust.

7.i SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit shall 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.

7.j SWCAA 400-040(4) "Odors" requires that any person who shall cause or allow the generation of any odor from any source, which may unreasonably interfere with any other property owner's use and enjoyment of their property use recognized good practices and procedures to reduce these odors to a reasonable minimum.

7.k SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.

7.l SWCAA 400-109 "Air Discharge Permit Applications" requires that an air discharge permit 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 Air Discharge Permit application to request such changes. An air discharge permit 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.

7.m SWCAA 400-110 "New Source Review" requires that an Air Discharge Permit be issued by SWCAA prior to establishment of the new source, emission unit, or modification.

7.n SWCAA 400-111 "Requirements for Sources in a Maintenance Plan Area" requires that no approval to construct or alter an air contaminant source shall 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) Emissions will be minimized to the extent that the new source will not exceed emission levels or other requirements provided in the maintenance plan;
(3) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
(4) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
(5) 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.

The Camas Wastewater System is within the Portland/Vancouver Maintenance Plan Area, and therefore is subject to this regulation.

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

The proposed equipment and control systems have been evaluated to determine if they meet the requirements of Best Available Control Technology (BACT) and Best Available Control Technology for toxics (T-BACT) for the types and amounts of air contaminants emitted by the processes and equipment as described below:

New BACT Determinations

8.a BACT Determination – Goodwin Road Lift Station Emergency Generator Engine. 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 has found that an oxidation catalyst is not a cost-effective control for CO, VOC, and PM for relatively small emergency engines.

The use of modern diesel-fired engine design meeting the relevant EPA emission standard for the new engine as applicable, 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 "new" engines.

Older BACT Determinations

8.b BACT Determination – Control of SO_2 from Combustion of Digester Gas (SWCAA 13-3073). Hydrogen sulfide (H_2S) in the digester gas forms sulfur dioxide upon combustion. Sulfur dioxide emissions may be controlled by scrubbing the resulting flue gas, or by removing H_2S from the digester gas. The applicant's proposal to install an iron-sponge scrubber

to remove 94% of the H_2S from the digester gas would be the top choice in a top-down BACT analysis therefore no other control options were reviewed. The permit requires regeneration or replacement of the scrubbing media when the outlet concentration exceeds 500 ppmvd. Alternatively, a control efficiency across the scrubber could have been imposed, but this would have necessitated more monitoring and increased permit complexity than was reasonable for a total potential emission rate of 0.42 tons per year.

8.c BACT Determination – NW 38th Lift Station and Hills at Round Lake Lift Station Emergency Generator Engines (SWCAA 13-3073). 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 these units 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. These relatively small engines 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 units would all have a multi-pollutant cost-effectiveness of over $200,000 per ton. Based on this analysis, SWCAA believes that the use of an oxidation catalyst is not a cost-effective control device for these unit.

The use of modern diesel-fired engine design meeting the appropriate EPA emission standard where applicable (EPA Tier 3 in this case), the use of ultra-low sulfur diesel fuel ($\leq$ 0.0015% sulfur by weight), limitation of visible emissions to 10% 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.

8.d BACT Determination – Boiler (SWCAA 09-2904). The proposed boiler will utilize a low emission burner capable of maintaining emissions at or below 30 ppmvd NO_X @ 3% O_2 and 50 ppmvd CO @ 3% O_2. SWCAA believes that this would be the top choice in a formal BACT analysis for burners of this size capable of burning natural gas, digester gas, and mixtures of both natural gas and digester gas.

8.e BACT Determination – SO_2 From Combustion of Digester Gas (SWCAA 09-2904). The most cost-effective means of controlling SO_2 emissions from the combustion of hydrogen sulfide in the digester gas is to scrub H_2S from the digester gas prior to combustion. Assuming an installed cost of $110,000 (provided by Weyerhaeuser for their caustic landfill gas scrubbing system of comparable size in ADP Application CO-830), a caustic cost of $1.60 per pound of H_2S removed, $20,000 in annual operating and maintenance costs, an 8% cost of capital, a 10 year equipment life and a scrubbing control efficiency of 80%, the cost-effectiveness of this control option is over $33,000 per ton. This is not a cost-effective control option, therefore no such controls were required.

8.f BACT Determination – Biosolids Dryer (SWCAA 09-2904). The Biosolids Dryer will utilize a low emission burner capable of maintaining emissions at or below 30 ppmvd NO_X @ 3% O_2 and 50 ppmvd CO @ 3% O_2. SWCAA believes that this would be the top choice in a formal BACT analysis for burners of this size capable of burning natural gas, digester gas, and mixtures of natural gas and digester gas. Potential emissions of odor and particulate matter (if significant) will be controlled by the condenser/scrubber and Biofilter #2. SWCAA believes that the use of these emission controls would be the top choice in a top-down BACT analysis. Inspections of Biofilter #1 (a similar unit by the same manufacturer) at this facility had shown that the biofilter is capable of eliminating foul wastewater odors.

8.g BACT Determination – Waste Gas Burner (SWCAA 09-2904). The applicant proposed the use of a 3" open shrouded candlestick style flare capable of using digester gas to run the pilot light. The flare has a very high turndown ratio, and the capability to burn very low flows of digester gas. It should be noted that for this application, the average expected gas flow to the flare is only 3.8 cfm (0.14 MMBtu/hr). At these rates, and the relatively high variability of the waste gas flow, enclosed flares (which would be expected to provide lower CO and VOC emissions) are not a practical option. An enclosed flare would need to be capable of combusting the maximum waste gas production (estimated at 53 cfm, 1.91 MMBtu/hr). Most enclosed flares have a maximum turndown ratio of 5:1 (the lowest I have found in the literature has a turndown of 10:1 but can only achieve this high turndown in high flow applications), meaning that if a unit could be sized perfectly to this application, it would need at least 1.91/5 – 0.14 = 0.25 MMBtu/hr of assist gas on average to

operate. This would cost a significant amount of money and offset any emission concentration improvement provided by the enclosed flare. More elaborate gas combustion systems utilizing storage or other means of overcoming these technical difficulties are not believed to be practical on such a small scale, therefore SWCAA has determined that the proposed waste gas burner meets the requirements of BACT for this installation.

8.h BACT Determination – Biosolids Conveying (SWCAA 09-2904). Based on discussions with the equipment suppliers and system designers (Andritz Separation and Gray and Osborne), SWCAA believes that the use of the proposed Monroe Dual Throat Air Scrubber will meet an exhaust concentration of 0.005 gr/dscf. SWCAA's understanding is based upon the following:

1. An inlet total dust loading estimate of 0.15 gr/dscf was based upon measurements taken in the vicinity of conveyor transfer points at a similar installation.
2. The inlet dust loading of 0.15 gr/dscf is total PM (would most likely include a great deal of PM exceeding PM_{10} in size).
3. The venturi scrubber will provide a very high level of control (exceeding 99%) for PM_{10}^{+}.
4. 1,000 cfm of the 2,800 cfm vent stream will be drawn from a biosolids cooling system where cool air is drawn through large sized material at ~ 100 ft/min and is not expected to generate a high concentration of dust.
5. Assuming a 0.15 gr/dscf inlet loading, the scrubber would provide for an outlet concentration of 0.005 gr/dscf (a 96.7% control efficiency) at the design 5" w.c. pressure drop if the average particle size was approximately 3.5 µm. The average particle size is most likely much larger than 3.5 µm.

In addition, although fabric filtration can be used in this application, the venturi scrubber is preferred because there is no possibility of a dust explosion as there would be with the use of a baghouse. Because the proposed venturi scrubber will meet a top level of control and is the preferred equipment from a safety standpoint, SWCAA has determined that the proposed venturi scrubber meets the requirements of BACT.

8.i BACT Determinations – Diesel-Fired Emergency Generator Engines (permitted in 2007 and later) (SWCAA 07-2741 & 09-2904). Available control measures for diesel engines include low sulfur fuel and add-on control equipment such as selective catalytic reduction units. Add-on control equipment is not economically or technically feasible because the engines will be operated only for short periods of time for readiness testing, maintenance, and to provide emergency electricity. Because the engines will normally be operated only for short periods of time, the stable operating temperature required for operation of add-on control equipment will not be achieved.

The use of modern diesel-fired internal combustion engine design, ultra-low sulfur diesel fuel ($\leq$ 0.0015% sulfur by weight), limitation of visible emissions to 10% opacity or less, and limitation of engine/generator operation to testing, maintenance and to provide emergency electricity ($\leq$ 200 hours per year total operation) was determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from the emergency generator engines.

8.j BACT Determinations – Natural Gas and Propane Fired Emergency Generator Engines (SWCAA 07-2741 & 05-2598). Available control measures for natural gas and propane fired engines include add-on catalytic units. Add-on control equipment is not economically or technically feasible because the engines will be operated only for short periods of time for readiness testing, maintenance, and to provide emergency electricity. Because the engines will normally be operated only for short periods of time, the stable operating temperature required for operation of add-on control equipment will not be achieved.

The use of modern internal combustion engine design, low-sulfur fuel (pipeline natural gas or propane), limitation of visible emissions to 0% opacity or less, and limitation of engine operation to maintenance checks, readiness testing and as necessary to provide emergency electricity during power interruptions has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from these engines

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

8.l Compliance Assurance Monitoring (CAM). CAM is not applicable to any emission unit at this facility because this facility is not a major source required to obtain a Part 70 or 71 permit.

9. AMBIENT IMPACT ANALYSIS

No increase in toxic air pollutant emissions will exceed the applicable Small Quantity Emission Rate (SQER) listed in WAC 173-460 (as in effect February 14, 1994), therefore toxic impacts are presumed to be below regulatory concern. Emissions of combustion products (nitrogen oxides, carbon monoxide, sulfur oxides, particulate matter, and volatile organic compounds) are all at or below 0.7 tons per year each by any single unit and the emission sources are widely spaced. At these emission rates, no significant adverse ambient air quality impact is anticipated.

Conclusions

9.a Operation of the wastewater treatment system, solids handling system, emergency generator engines, and odor control stations as proposed in ADP Application CL-3065 and previous applications in accordance with the Air Discharge Permit will not cause the ambient air quality standards established by Title 40 Code of Federal Regulations Part 50 (40 CFR 50), "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.b The wastewater treatment system, solids handling system, emergency generator engines, and odor control stations proposed in ADP Application CL-3065 and previous applications, if properly installed and maintained, 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."

9.c Operation of the wastewater treatment system, solids handling system, emergency generator engines, and odor control stations as proposed in ADP application CL-3065 and previous applications in accordance with the Air Discharge Permit will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants," (as in effect February 14, 1994) or WAC 173-476 "Ambient Air Quality Standards" to be violated.

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue Air Discharge Permit SWCAA 19-3328 in response to ADP Application CL-3065. Air Discharge Permit SWCAA 19-3328 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

10.a General Basis. Approval conditions for equipment affected by this permitting action incorporate the operating schemes proposed by the permittee in the Air Discharge Permit application.

10.b Emission Limits. Annual emission limits for the emergency engines were removed because the permit limits operation to maintenance checks, readiness testing and as necessary to provide emergency power or pumping. Visual emissions from the diesel-fired emergency generator engines were limited to 10% opacity (older engines) and 5% opacity (newest engine). Visible emissions from the natural gas and propane fired equipment were limited to 0% opacity. Greater opacity levels would only be expected from a unit in need of servicing.

Annual emissions from the Boiler, Biosolids Dryer, and Waste Gas Burner were set equal to the potential to emit for each unit as indicated in Section 6. As indicated in Section 8, these emission limits meet the requirements of BACT. The sulfur dioxide limit for the Biosolids Dryer assumes a 50% control factor for the combination of the two-stage condenser/scrubber and the biofilter. No testing is required to verify this assumption because it is extremely conservative.

10.c Operating Limits and Requirements. The only fuels evaluated for use in the engines were propane, natural gas and road-grade diesel, therefore operation on other, potentially dirtier, fuels was prohibited. As discussed in Section 8, BACT for the diesel engines requires use of ultra-low sulfur fuel oil. The permit allows the use of "#2 fuel oil or better." In this case, "or better" includes road-grade diesel fuel with a lower sulfur content, biodiesel, and mixtures of biodiesel and road-grade diesel.

Requirements to maintain Biofilter #1 and the associated gas collection system in good working order, and especially to maintain the biofilter moist at all times, were carried through from Air Discharge Permit 00-2299 and expanded to cover the newer biofilter (Biofilter #2). Excessive growth of plants with long roots on the biofilter can cause channeling, therefore appropriate measures must be taken to control the growth of such plants. Subsidence of the biofilter material or noticeable odor from the biofilter could indicate a maintenance or operational problem.

The efficiency of a venturi scrubber is strongly related to the pressure drop across the venturi. To assure the unit is operating properly, a minimum pressure drop of 5" w.c. was established. This value is consistent with the design assumptions for this unit.

Specific odor control requirements were added for the Grand Ridge Lift Station in Air Discharge Permit 13-3073 because this station has a history of odor complaints. The carbon bed control system is the first control technology applied to this site that has demonstrated the ability to provide adequate odor control. When SWCAA first visited this site in response to odor complaints a biofilter was being used to control odors. The biofilter was later replaced by an ozone contactor. The ozone contactor was replaced by the current carbon bed.

10.d Monitoring and Recordkeeping. Sufficient monitoring and recordkeeping was established to document compliance with the annual emission limits and provide for general requirements (e.g. excess emission reporting, annual emission inventory submission). Emissions from the wastewater treatment plant were limited on a rolling 12-month total basis, therefore monthly records of wastewater throughput were required. Wastewater testing for chloroform, hydrogen sulfide, and volatile organic compounds is required annually to assure that gradual changes in wastewater characteristics are reflected in the emissions inventory.

Emissions from the emergency generator engines were limited on an annual basis, therefore reporting of the total number of hours each engine operated was required only once for each calendar year.

Monitoring of the differential pressure across Biofilter #2 is required during a weekly inspection of the unit. Biofilter #2 could be subject to particulate matter emissions from the Biosolids Dryer. If particulate matter from the Biosolids Dryer get past the condenser/scrubber to the biofilter, increased pressure drop might be noticeable in time to take corrective action and prevent a failure of the system.

Monitoring of the differential pressure across the throat of the Biosolids Conveying venturi scrubber was required weekly because the control efficiency is directly related to the differential pressure across the venturi throat. A weekly differential pressure check should be adequate to identify operational changes such as a weakening blower.

The permit requires the permittee to determine the amount of natural gas and digester gas burned by individual units. This can be accomplished by direct measurement with a gas meter or by estimating fuel consumption through the use of operating records and engineering judgment. Fuel use must be apportioned between each emissions unit to complete the annual emissions inventory.

10.e Emission Monitoring and Testing Requirements. See Section 12.

10.f Reporting. The permit requires reporting of the annual air emissions inventory, and reporting of the data necessary to develop the inventory (amount of wastewater treated, results of wastewater sampling, results of digester gas H_2S sampling, natural gas and digester gas consumption by the Boiler, Biosolids Dryer, and Waste Gas Burner, hours

of operation for each emergency generator and biosolids conveying). Excess emissions must be reported as soon as possible in order to qualify for relief from monetary penalty in accordance with SWCAA 400-107. In addition, deviations from permit conditions must be reported within 30 days of discovery in accordance with the SWCAA 400-107 requirement for excess emissions.

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

11.a Startup and Shutdown Provisions. Pursuant to SWCAA 400-081 "Startup 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 startup or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during startup or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during startup or shutdown.

The diesel fired emergency generator engines may exhibit excess opacity upon startup. Accordingly, the opacity limit identified in this permit is not applicable during the startup period defined in the permit.

11.b Alternate Operating Scenarios. SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. Because the Boiler and Biosolids Dryer may be fired on natural gas, digester gas, or a blend of natural gas and digester gas, the permit limitations presume the worst-case emissions from these fuels. In addition, as discussed in section 8, the nitrogen oxides limitation was 30 ppmvd @ 3% O_2 rather than a lower level (e.g. 9-20 ppmvd @ 3% O_2) to accommodate the blending of digester and natural gas.

11.c Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures other than the control measures identified in the permit were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

Because the emergency generator engines are permitted only for intermittent use, no add-on control devices are required to comply with the emission limits, and total potential emissions are relatively minor, no initial or periodic emission testing was required of the emergency generator engines.

Three samples of the influent wastewater must be collected each year to measure potential chloroform, hydrogen sulfide, and volatile organic compound emissions using a material balance approach. This level of testing provides adequate assurance of compliance with the emission limits for the wastewater treatment plant. More frequent testing is not warranted for this size of facility. The hydrogen sulfide test method was revised in Air Discharge Permit 13-3073 to Method 4500-S^2-Sulfide from *Standard Methods for the Examination of Water and Wastewater* which provides a methodology for determining un-ionized hydrogen sulfide concentrations. This is the only published method found with a procedure for determining dissolved H_2S in the wastewater that might be emitted from the wastewater plant. Ionized forms of H_2S or other sulfide forms will not be stripped from the wastewater. All other methods found by SWCAA appear to measure sulfide fractions that include other sulfide forms.

Performance monitoring of the Boiler with a combustion analyzer or equivalent is required at least annually. In SWCAA's experience this monitoring is relatively inexpensive compared to the quantity of emissions that can be prevented by this procedure. It is unlikely that emissions will degrade rapidly enough that more frequent monitoring is necessary to maintain proper operation. Potential emissions from this boiler are too small to warrant imposing more sophisticated source emissions testing procedures. Similar emission testing was not required for the Biosolids Dryer because sampling would be complicated by the fact that the exhaust will be very dilute (~18.3% O_2) and will have a very high moisture content.

13. HISTORY

13.a Previous Approvals. The following permits have been issued for this facility:

Permit Number	Application #	Date Issued	Description
00-2268	CL-1439	5-4-2000	Installation of four new emergency generators (two at the WWTP, one at Oak Park Lift Station, one at Main Sewage Lift Station).
00-2299	CL-1474	8-31-2000	Expansion of WWTP, installation of biofilter for pollutant/odor control.
05-2598	CL-1685	4-19-2005	Addition of previously unpermitted emergency generator engines located at Lift stations (Lacamas Lift Station, Crown View Lift Station, One Stop Sewer Lift Station, South Prune Hill Park Lift Station, and the West Camas Lift Station).
07-2741	CL-1779	8-21-2007	Approval for new Crown Road Booster Station and 15 additional emergency generator engines at Lift stations that had either been recently constructed or recently transferred to the wastewater department for maintenance purposes.
09-2846	CL-1861	1-15-2009	Approval of an emergency generator engine at the Hunter's Ridge Lift Station.
09-2904	CL-1887	12-10-2009	Phase II improvements to WWTP including new anaerobic digestion system, biosolids drying, second biofilter.
13-3073	CL-1984	10-17-2013	Installation of digester gas H_2S scrubbing system, NW 38th Lift Station Emergency Generator Engine, and Hills at Round Lake Lift Station Emergency Generator Engine
SUN-170	SUN-170	5-11-2018	Installation of Leadbetter Road Lift Station Emergency Generator Engine.
SUN-171	SUN-171	5-11-2018	Installation of 232nd Avenue Lift Station Emergency Generator Engine.

Bold font indicates that the Air Discharge Permit was superceded or will no longer be in effect upon issuance of Air Discharge Permit 19-3328.

14. PUBLIC INVOLVEMENT

14.a Public Notice for Air Discharge Permit Application CL-3065. Public notice for Air Discharge Permit Application CL-3065 was published on the SWCAA internet website for a minimum of 15 days beginning on November 9, 2018.

14.b Public/Applicant Comment for Air Discharge Permit Application CL-3065. SWCAA did not receive formal comments, a comment period request, or any other inquiry from the public or the applicant regarding this Air Discharge Permit application. Therefore, no public comment period was provided for this permitting action.

14.c State Environmental Policy Act (SEPA). The City of Camas issued a Determination of Nonsignificance for the Northshore Sewer Transmission System (SEPA 16-16) on October 13, 2016. This determination covers all of the new equipment addressed by this permitting action (modification of the Goodwin Road Lift Station, the new Leadbetter Road Lift Station, the new 232nd Avenue Lift Station, and the new "Remote" Odor Control Station).

Massachusetts Department of Environmental Protection (MassDEP)
Top Case Best Available Control Technology (BACT) Guidelines
for Anaerobic Digester Biogas to Electricity Facilities

This information is maintained by the MassDEP, Bureau of Air and Waste, Air Pollution Control Program, and is subject to change. The following Top Case BACT guidelines for anaerobic digester biogas-to-electricity systems in non-major air contaminant-emitting projects were previously issued separately.

For a particular air contaminant subject to BACT under a Prevention of Significant Deterioration (PSD) permit, or Lowest Acheivable Emission Rate (LAER) under 310 CMR 7.00 Appendix A, Emission Offsets and Nonattainment Review, collectively termed Major New Source Review, the Top Case Guidelines do not apply. PSD BACT and Appendix A LAER must be analyzed on a case-by-case basis.

This Guidance is published for informational purposes only. Use of the applicable Top Case BACT emissions limitations contained herein may preclude the need for applicants to prepare and submit a "top-down BACT analysis" for MassDEP's review, and will streamline the Air Quality permitting process for both the applicants and MassDEP. Applicants should note that BACT requirements for any new or modified air contaminants source are subject to change through the MassDEP 310 CMR 7.02 Air Quality Plan Approval (permitting) procedures. Please contact the MassDEP Regional Office that regulates your facility should you have any questions related to these Top Case BACT guidelines.

Please be aware that, in addition to BACT requirements, federal NSPS, MACT and/or GACT requirements may also apply pursuant to 40 CFR Parts 60, 61 and 63.

Massachusetts Department of Environmental Protection
November 21, 2017

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS FOR COMMERCIAL (NON-FARM) FACILITIES

For air emissions from commercial anaerobic digester-gas-to-electricity (AD) operations (involving internal combustion engines and flares) located in Massachusetts performing anaerobic digestion of source-separated organic (SSO) (and other digestible) material

Source Type	Fuel	Pollutant	Emission Limitations (lb/MW-hr)
IC Engines	Biomass Digester Gas	NOx	0.50
		CO	0.60
		PM 2.5/ PM10	0.030
		CO_2	1000 See Note 4
		VOC	0.30
		SO_2	0.50
		H_2S	See Note 5

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS FOR COMMERCIAL (NON-FARM) FACILITIES

For air emissions from commercial anaerobic digester-gas-to-electricity (AD) operations (involving internal combustion engines and flares) located in Massachusetts performing anaerobic digestion of source-separated organic (SSO) (and other digestible) material

Source Type	Fuel	Pollutant	Emission Limitations (lb/1000 scfm gas flared)
Flares See Note 2	Biomass Digester Gas	NOx	2.70
		CO	13.70
		PM 10/ PM2.5	0.15
		CO_2	7105
		VOC	0.55
		SO_2	See Note 5
		H_2S	See Note 5

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
FOR COMMERCIAL (NON-FARM) FACILITIES

For air emissions from commercial anaerobic digester-gas-to-electricity (AD) operations
(involving internal combustion engines and flares) located in
Massachusetts performing anaerobic digestion of source-separated organic (SSO) (and other digestible) material

Key Abbreviations:

lbs/hr = pounds per hour
NOx = nitrogen oxides
CO = carbon monoxide
CO_2 = carbon dioxide
PM10 = particulate matter 10.0 microns or less
PM 2.5 = particulate matter 2.5 microns or less
VOC = volatile organic compounds
SO_2 = sulfur dioxide
H_2S = hydrogen sulfide
lb/MW-hr = pounds per megawatt hour output
scfm = standard cubic feet per minute

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS FOR COMMERCIAL (NON-FARM) FACILITIES

For air emissions from commercial anaerobic digester-gas-to-electricity (AD) operations (involving internal combustion engines and flares) located in Massachusetts performing anaerobic digestion of source-separated organic (SSO) (and other digestible) material

Notes

1. This policy applies to either any commercial AD facility digesting/processing SSO or any AD facility with an electrical output capacity of greater than 500 kilowatts (kw).

2. All digester gas generating sources shall be totally enclosed and vented to either the IC engine or "back-up" flare. All sources with odor potential shall be controlled to prevent nuisance odor conditions. SSO, and any other material to be digested, shall be delivered to the facility in a completely sealed manner; and shall be pumped from the delivery trucks to the digestion system in a closed loop manner.

3. Back-up flares must be utility flare design with the flame shielded such that there is no exposed flame. Emission limits in Table are "not to be exceeded" values. MassDEP will set individual flare limits on a case-by-case basis, depending upon actual flare rating and inlet gas flow rate.

4. Facility-wide CO_2 caps are undefined for this source category. The CO_2 emission limit for the engine is based upon CO2 emissions resulting from combustion of methane only.

5. H_2S emissions are regulated by restricting the inlet H_2S emissions to the IC engine and flare to less than or equal to 200 ppm. SO_2 emissions are based upon 99.5 percent oxidation of 200 ppm H_2S inlet emissions to the IC engine and flare.

6. MassDEP will set individual facility-wide limits on a case-by-case basis depending upon actual engine and flare ratings.

TOP-CASE BEST AVAILABLE CONTROL TECHNOLOGY (BACT) GUIDANCE
for farm-based facilities with generation greater than 500 kW but less than 1,000 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Source Type	Fuel	Pollutant	Emission Limitation (g/bhp-hr)
Reciprocating internal combustion engine-generator set or sets totaling less than 1,000 kW rated electric power output at the facility	Manure and source-separated organic waste digester gas	NO_x	0.6
		CO	0.13
		$PM_{2.5}/PM_{10}$	0.02
		VOC	0.10
		SO_2	See note 3

TOP-CASE BEST AVAILABLE CONTROL TECHNOLOGY (BACT) GUIDANCE
for farm-based facilities with generation greater than 500 kW but less than 1,000 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Notes

1. All digester gas generating sources shall be totally enclosed and vented to either the engine or "back-up" flare. All sources with odor potential shall be controlled to prevent nuisance odor conditions
2. The Permittee shall equip engine exhaust with an oxidation catalyst designed to reduce CO and VOC emissions by 95 and 85 percent or greater, respectively.
3. The Permittee shall treat digester gas to maintain H_2S concentration not to exceed 200 ppm, daily average. Permitted SO_2 emissions shall be calculated based upon 99.5 percent oxidation of 200 ppm H_2S inlet emissions to the engine and flare.
4. The Permittee shall provide an enclosed flare or flares rated at 100 percent of the design digester gas flow rate and energy content. The Permittee shall operate flares so as to minimize visible emissions.
5. Nominal facility potential-to-emit is less than 10 tons NO_x per year.
6. The engine-generator set shall be located in a noise suppression enclosure or building with equivalent noise mitigation.

Key Abbreviations:

g/hp-hr	=	grams per horsepower-hour
NO_x	=	nitrogen oxides
CO	=	carbon monoxide
PM_{10}	=	particulate matter with aerodynamic particle diameter less than or equal to 10.0 microns, including condensibles
$PM_{2.5}$	=	particulate matter with aerodynamic particle diameter less than or equal to 2.5 microns, including condensibles
VOC	=	volatile organic compounds
SO_2	=	sulfur dioxide
H_2S	=	hydrogen sulfide
kW	=	kilowatt
ppm	=	parts per million

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
for farm-based facilities with generation not to exceed 500 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Source Type	Fuel	Pollutant	Emission Limitations (lb/MW-hr)
IC Engines ≤ 500 kW	Biomass Digester Gas	NOx	2
		CO	6
		PM 2.5/ PM10	0.001
		CO_2	1900 See Note 3
		VOC	3.4
		SO_2	3.4
		H_2S	See Note 4

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
for farm-based facilities with generation not to exceed 500 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Source Type	Fuel	Pollutant	Emission Limitations (lb/hr)
Flares ≤ 350 scfm See Note 2	Biomass Digester Gas	NOx	0.9
		CO	4.7
		PM 10/ PM2.5	0.05
		CO_2	2450
		VOC	0.18
		SO_2	See Note 4
		H_2S	See Note 4

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
for farm-based facilities with generation not to exceed 500 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Source Type	Fuel	Pollutant	Maximum Emissions (tons per 12 month rolling period)
Facility-wide See Note 5	Biomass Digester Gas	NOx	5.0
		CO	13.0
		PM10/ PM2.5	0.018
		CO_2	See Note 3
		VOC	7.3
		SO_2	1.6
		H_2S	See Note 4

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
for farm-based facilities with generation not to exceed 500 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Key Abbreviations:

lbs/hr = pounds per hour
NOx = nitrogen oxides
CO = carbon monoxide
CO_2 = carbon dioxide
PM10 = particulate matter 10.0 microns or less
PM 2.5 = particulate matter 2.5 microns or less
VOC = volatile organic compounds
SO_2 = sulfur dioxide
H_2S = hydrogen sulfide
kW = kilowatt
lb/MW-hr = pounds per megawatt hour output
scfm = standard cubic feet per minute
ppm = parts per million
$\leq$ = less than or equal to

CURRENT BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS
for farm-based facilities with generation not to exceed 500 kW

For air emissions from digester-gas-to-electricity operations (including internal combustion engines and flares) at Massachusetts farms engaged in "agriculture" or "farming" as defined in M.G.L. c. 128, section 1A, managing manure waste through anaerobic digestion or anaerobic digestion of manure with other, source-separated organic material

Notes

1. All digester gas generating sources shall be totally enclosed and vented to either the IC engine or "back-up" flare. All sources with odor potential shall be controlled to prevent nuisance odor conditions.

2. Back-up flares must be utility flare design with the flame shielded such that there is no exposed flame. Emission limits in Table are "not to be exceeded" values. MassDEP will set individual flare limits on a case-by-case basis, depending upon actual flare rating and inlet gas flow rate.

3. Facility-wide CO_2 caps are undefined for this source category. The CO_2 emission limit for the engine is based upon CO2 emissions resulting from combustion of methane only.

4. H_2S emissions are regulated by restricting the inlet H_2S emissions to the IC engine and flare to less than or equal to 200 ppm. SO_2 emissions are based upon 99.5 percent oxidation of 200 ppm H_2S inlet emissions to the IC engine and flare.

5. Facility-wide limits include engine and flare only and are "not to be exceeded" values. MassDEP will set individual facility-wide limits on a case-by-case basis depending upon actual engine and flare ratings.

Village Green Maine, LLC
Cumberland County
Brunswick, Maine
A-1086-71-A-N (SM)

Departmental

Findings of Fact and Order
Air Emission License

FINDINGS OF FACT

After review of the air emissions license application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A., §344 and §590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

Village Green Maine, LLC (Village Green) submitted an air emission application to construct and operate a new anaerobic digester/energy production facility. This facility generates biogas which will be used in a combined heat and power (CHP) unit to produce electric power and heat. The facility will be located on Orion Street, Brunswick Landing of the former Brunswick Naval Air Station.

B. Emission Equipment

The following equipment is addressed in this air emission license:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (scfm)	Fuel Type	Pollution Control Equipment	Stack #
CHP #1 (1 MW Gen-set)	9.7	295 scfm 163 scfm	digester gas, natural gas	Fuel and Air Filters	1
Boiler #1	1.6	25.9 scfm	natural gas	none	2

Process Equipment

Emissions Unit ID	Equipment Type	Production Rate	Pollution Control Equipment
AD #1	Anaerobic Digester	Feed to produce gas at Max capacity of CHP	CHP or Flare

C. Application Classification

A new source is considered a major source based on whether or not expected emissions exceed the "Significant Emission Levels" as defined in the Department's regulations. The emissions for the new source are determined by the maximum future license allowed emissions, as follows:

Pollutant	Max. Future License (TPY)	Sig. Level
PM	2.2	100
PM_{10}	2.2	100
SO_2	10.2	100
NO_x	14.9	100
CO	31.6	100
VOC	10.0	50
CO_2e	<100,000	100,000

The Department has determined Village Green is a minor source and the application has been processed through *Major and Minor Source Air Emission License Regulations*, 06-096 CMR 115 (as amended). Taking into account the proposed pollution control equipment, the facility is licensed below the major source thresholds and is considered a synthetic minor.

D. Regulatory Overview

Provided in this section is a summary of State and Federal air regulations that apply to the Village Green facility. Village Green has designed a facility and selected specific equipment that will achieve compliance with these State and Federal air regulations.

Maine Air Regulations

The proposed Project has been reviewed for potential applicability to the following MEDEP Bureau of Air Quality:

06-096 CMR 101 Visible Emission Regulation

This rule establishes opacity limitations for emissions from several categories of air contaminant sources.

The CHP #1 and AD#1 are subject to Section (2)(B)(1)(f), which limits visible emissions from any fuel burning equipment not specifically listed in the Section to an opacity of 30 percent on a six (6) minute block average basis, except for no more than two (2) six (6) minute block averages in a 3-hour period. The BACT limit is more stringent.

06-096 CMR 103 Fuel Burning Equipment Particulate Emission Standard

This rule applies to all fuel burning equipment that has a rated heat input capacity of 3 MMBtu per hour or greater. CHP #1 is considered a new source since an application for licensure is being submitted after December 22, 1982. Specifically, the CHP unit will comply with Section 2(B)(4)(a), which establishes a PM limit of 0.30 lb/MMBtu for units with a heat input capacity less than 50 MMBtu/hr. The BACT limit is more stringent.

06-096 CMR 104 Incinerator Particulate Matter Standard

This rule establishes a limitation on the amount of particulate matter allowed to be emitted from each of several categories and sizes of incinerators and a limitation on the opacity of emissions from all incinerators. CHP #1 and AD #1 are not subject to this rule because the anaerobic digester is not an incinerator. 06-096 CMR 100 defines incinerator to mean "any device, apparatus or equipment used for destroying, reducing or salvaging by fire or heat any material or substance." The digester processes the organic sludge to create biogas which will be burned in the CHP to produce electric power.

06-096 CMR 115 Major and Minor Source Air Emission License Regulations

This rule specifies who must obtain an air emission license, describes the information an applicant must submit for a license, and describes the standards and criteria that must be complied with during and following the air licensing process. For minor sources such as Village Green, 06-096 CMR 115 serves as a minor operating licensing program and a pre-construction license review program.

06-096 CMR 121 Emission Limits and Emission Testing of Resource Recovery Facilities

This rule establishes stack emission limitations, operating practices, compliance and performance testing, and reporting and recordkeeping requirements for all new, existing, and modified resource recovery facilities. The Village Green digester process is not subject to this rule because it is not a resource recovery facility. The definitions in 40 CFR Part 60 Subparts Cb, Eb, and BBBB are

incorporated by reference and municipal solid waste is defined in these Subparts to mean "household, commercial/retail, or institutional waste…Household, commercial/retail, and institutional waste does not include used oil; sewage sludge…" The sludge feeding into Village Green and the proposed AD do not meet the definition of municipal solid waste since it is comprised solely of sewage sludge and organic wastes.

06-096 CMR 137 Emission Statements

This rule establishes requirements for the reporting of pollutant emissions from stationary sources of air pollution. Village Green is not subject to this regulation because it will be licensed to below the ton per year reporting thresholds.

Federal Air Regulations

New Source Performance Standards (NSPS)

This program is codified in 40 CFR Part 60 and is referred to as the NSPS program. There are numerous categories of emission sources for which a specific NSPS subpart applies. The paragraphs below present a description of the NSPS Subparts that are relevant to Village Green and discuss the applicability of each.

Subpart Dc

Subpart Dc, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units applies to new, modified and reconstructed steam generating units with a maximum design heat input capacity of 100 MMBtu/hr or less, but greater than or equal to 10 MMBtu/hr. Subpart Dc defines steam generating unit as "*a device that combusts any fuel and produces steam or heats water or heats any heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters as defined in this subpart.*" The CHP is rated at 9.7 MMBtu/hr and therefore is below the 10 MMBtu/hr threshold. The facility is not subject to 40 CFR Part 60 Subpart Dc.

Subpart LLLL

Subpart LLLL, Standards of Performance for New Sewage Sludge Incineration (SSI) Units applies to units commencing construction after October 14, 2010 or modification after September 21, 2011. Village Green is not subject to this rule because it is not an SSI unit and it is not proposed to be located at a wastewater treatment plant. An SSI unit is defined to mean "an incineration unit combusting sewage sludge for the purpose of reducing the volume of the sewage sludge by removing combustible matter." Village Green is not an SSI unit because it is not incinerating sludge, the anaerobic digester will process the organic wastes to create biogas which will then be burned in the CHP unit to produce electric power.

Subpart JJJJ

CHP #1 is subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*. The applicability for this engine is under the category of engines manufactured on or after July 1, 2008 with a maximum engine power greater than 500 hp manufactured (§60.4230(a)(4)(iii)). Owners of these units are required to purchase an engine certified to the standards of Subpart JJJJ, Table 1 (manufacturer certification is acceptable).

Subparts Ea, Eb, Cb, AAAA, BBBB

Subparts Ea, Eb, Cb, AAAA, and BBBB provide New Source Performance Standards for small and large, new and existing municipal waste combustion units. CHP #1 and AD#1 are not subject to these Subparts because they do not burn municipal waste as defined by the rules. Municipal solid waste is defined to mean "household, commercial/retail, or institutional waste…Household, commercial/retail, and institutional waste does not include used oil; sewage sludge…" The biosolids feeding the Village Green anaerobic digester do not meet the definition of municipal solid waste since it is comprised solely of sewage sludge and organic wastes.

National Emission Standards for Hazardous Air Pollutants

In the late 1970s, amendments to the CAA authorized EPA to require national standards for hazardous air pollutants (HAPs) at levels that would ensure the protection of the public health with an ample margin of safety and to prevent any significant and adverse environmental effects, which may reasonably be anticipated, on wildlife, aquatic life, or other natural resources. The passage of 1990 amendments renewed emphasis on controlling emissions of HAPS on the federal level but it changed the approach to regulating HAPs based on two types of emission standards: maximum achievable control technologies (MACTs) and generally available control technologies (GACTs). A list of 189 compounds was provided by the Congress to be controlled by EPA as HAPs. This program is codified in 40 CFR Part 63 and is referred to as the NESHAP program or as MACT Standards. There are numerous categories of emission sources for which a specific NESHAP subpart applies. The paragraphs below present a description of the NESHAP applicability of this emissions source.

Subpart JJJJJJ

Subpart JJJJJJ, *National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers at Area Sources* applies to all new, reconstructed and existing boilers within three subcategories (coal, biomass and oil) located at an area source of hazardous air pollutants. The Village Green

AD #1 and CHP #1 are not subject to this rule because they are not "boilers" as defined by the rule. Village Green's potential to emit is less than 10 TPY of a single HAP and 25 TPY of all HAP combined and is therefore an area source for HAP. Subpart JJJJJJ defines boiler to mean "an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam or hot water." Because AD#1 and CHP#1 are not boilers, they are not subject to Subpart JJJJJJ.

Village Green will operate a small natural gas fired heater rated at 1.6 MMBtu/hr. Subpart JJJJJJ is not applicable to units firing gas, hot water heaters, temporary boilers, residential boilers, etc.

Subpart ZZZZ

CHP #1 is also subject to 40 CFR Part 63, Subpart ZZZZ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines*. The generator is considered new stationary reciprocating internal combustion engines at an area HAP source (construction commenced on or after June 12, 2006); however, since the unit is subject to 40 CFR Part 60, Subpart JJJJ there are no further requirements under 40 CFR Part 60, Subpart ZZZZ (§63.6590(c)(1)).

Subpart E

40 CFR Part 61 - Subpart E - National Emission Standard for Mercury. Subpart E applies to stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. Village Green is not subject to this rule because it does not meet the definition of a sludge dryer as defined by the rule. Subpart E defines sludge dryer to mean "a device used to reduce the moisture content of sludge by heating to temperatures above 150°F directly with combustion gases." The Village Green AD #1 and CHP #1 are not subject to this rule because they are not incinerating sludge.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

Project Overview

Village Green proposes to install and operate an Anaerobic Digester/Energy Production Facility near the southerly end of the airport tarmac at Brunswick Landing. The proposed facility will include an anaerobic digester designed to anaerobically digest a mixture of organics to produce electricity, and stabilized digestate. The facility will receive by truck both solids and liquid feeds to be processed in the digester. Feeds will be transferred directly to tanks/containers, be contained in equipment or buildings at all times, and will not be stored or processed outside. The feeds will include wastewater treatment plant sludge, septage, Fats, Oils & Grease (FOG), food waste, and other organic wastes. The anaerobic digestion process will include the creation of biogas that will be burned in a Combined Heat and Power unit (CHP) to produce electric power for sale. The system is designed to produce a stabilized digestate which will be pasteurized (or time & temperature per DEP rule) to meet CLASS A biosolids classification. This digestate will be dewatered with the liquid fraction being sent to the Brunswick Sewer District (BSD) through the existing Brunswick Landing sewer infrastructure and the solids fraction being managed by a company licensed to handle or dispose of the digestate solids.

CHP #1 will be able to use both digester gas and natural gas as a fuel. Digester gas will be the primary fuel with natural gas used as a secondary fuel to maximize electricity generation and to run the generator at capacity. The air license uses the maximum fuel rate that the CHP #1 is designed for to allow flexibility in how the unit is used.

The proposed anaerobic digester system will be designed and supplied primarily by Quasar Energy Group. This process will be permitted as a solid waste processing facility under the Maine Solid Waste Management Rules.

The facility includes the following components:

1. Liquids receiving area with in-ground 12,000 gallon concrete receiving tank
2. Solids receiving hopper, with a grinder and macerator
3. 230,000 gallon biomass equalization tankage
4. 75,000 gallon dilution tank
5. 75,000 gallon pasteurization tank
6. 850,000 gallon main digester tank & gas dome

7. Heat Exchanger
8. CHP unit (Combined Heat and Power)
9. Desulfurization Blower
10. H_2S/gas drying (Desulfurization using ferrous sulfate)
11. Gas flare
12. Controls module/monitoring system
13. Process piping
14. Process electrical
15. Biofilter designed and operated to handle odors from solids module and receiving tank
16. Start-up boiler – A start-up boiler will be used for start-up of the digester system to bring the system up to temperature. This boiler will fire natural gas and will be approximately 1.6 MMBtu/hr.

Biogas production and use

1. **Main Digester Tank and Gas Dome**

The digester tank is an insulated, bolted, steel tank with a working volume of 850,000 gallons. Four side-entry prop mixers prevent layer formation of the material, ensuring a consistent mix of feedstock and bacteria in the digester tank. The conditioned biomass from the tank system is fed into the digester tank at a turbulence zone created by the mixer to minimize the time required to obtain a complete mix.

The vapor space of all of the liquid storage tanks on site are connected to the top of the digester tank to allow any digester gas formed in these tanks to be collected and handled in a common system. (The only exception to this is the liquid receiving tank which is tied to the biofilter for odor control and is emptied as soon as deliveries are made to get the material into the process as soon as possible.)

The digester tank allows methanogenic bacteria to convert organic biomass into biogas. Some of the waste heat from the engine is used to maintain the digestate temperature in the tank. The digestate is held at approximately 100°F via a sludge to water heat exchanger.

Gas storage in the digester tank will be accomplished with a double membrane roof system ("Gas Dome"). The inner membrane, which inflates as biogas is produced in the system, is supported by biogas pressure. The outer membrane is supported by a blower with a consistent amount of outside air introduced to maintain constant pressure levels. Safe pressure levels are maintained by a combined pressure and vacuum relief valve mounted to the digester tank.

A small amount of air is injected into the vapor space of the digester tank which biologically converts most of the hydrogen sulfide (H_2S) to sulfate (SO_4).

The digester tank gas space is connected to the combined heat and power unit which is designed to use all of the digester gas generated. It also has a connection to the emergency flare should the CHP unit be off-line sufficiently long that the digester gas storage fills and gas must be flared. The tank also has a second emergency relief valve which will discharge the gas to the atmosphere in the case that both the CHP unit and the flare are not operating. This second emergency relief valve protects the tank integrity in an extreme situation which is not expected to occur.

2. **H_2S/Gas Drying**

Biogas is passed through a desulphurization reactor filled with media impregnated with ferrous sulfate. The hydrogen sulfide (H_2S) gas reacts with the ferrous sulfate effectively removing the H_2S from the gas stream. Subsequently, in the CHP unit, the gas passes through a filter and the dew point is lowered via a gas chiller, which reduces the moisture content in the biogas. The amount of H_2S generated in the digester can vary greatly with the feed and conditions. The system uses a hydrogen sulfide monitor to determine the H_2S level in the treated digester gas and to determine when the desulphurization media may need to be replaced. The H_2S level in the gas will be reduced to level less than 800 ppm H_2S and generally less than 200 ppm H_2S prior to the CHP unit.

3. **CHP #1**

Biogas will be used as the primary fuel in a CHP where electricity is produced. The system monitors the methane level of the biogas before it is burned. Electricity in excess of the plant's requirements is metered in to the electrical distribution grid. In order to maximize energy production, natural gas may be used as a secondary fuel when there is insufficient digester gas produced to run the generator at capacity.

Heat from the water jacket and exhaust is used to maintain temperature in the digester and is available as a local heat source (heat loop to non-digester facilities is outside the scope of the construction project). Through electrical generation and thermal recovery, the anticipated efficiency is approximately 85%. CHP #1 is rated at 1000 kW continuous duty and 1475 BHP. The generator includes a gas particulate filter as well as an after cooler filter. The exhaust temperature is 957°F.

4. **Flare**

Whenever biogas is being generated beyond what can be held in the digester tank when the generator is off-line or is generated in excess of the needs of the CHP unit, the biogas will be burned by the flare. Pressure in the gas dome controls flare ignition and run time. The flare is designed to burn 150% of the expected biogas volume or 333 standard cubic feet per minute (scfm) biogas. The flame from this flare will be semi-enclosed. The flare does not have a pilot; the flare will be ignited electronically.

B. Anaerobic Digester and Combined Heat & Power (BACT))

BACT Analysis for PM/PM_{10} emissions

The options for controlling particulate matter from generators include add-on controls and good operating practices. The AD #1 system includes gas cleaning using a particulate filter to remove particulate matter from the biogas prior to combustion. CHP #1 has its own fuel and air filters which further remove particulates and improve engine performance and reliability. These filters, the inherent combustion efficiencies of a new unit, and good operating practices are proposed as BACT. The emission factors obtained from the San Diego Air Pollution Control District were used for estimating the PM/PM_{10} emissions based on the volume of digester gas and natural gas. Due to economic considerations, add-on controls for the exhaust were not considered BACT. Therefore the standard filters and good engine performance is BACT for particulate.

BACT Analysis for SO_2 emissions

Sulfur Dioxide forms from the oxidation of the sulfur contained in the fuel when it is burned in the generator. Very low levels of sulfur is contained in natural gas, therefore the use of natural gas when fired is considered BACT. When firing biogas, the anaerobic digestion process does not produce sulfur dioxide directly, however, it does produce hydrogen sulfide and possibly other reduced sulfur compounds from the digestion of feedstock containing sulfur compounds. It is estimated, based on the anticipated feedstock, that the anaerobic digestion process has the capacity to produce as much as 3000 ppm of hydrogen sulfide.

Sulfides in the digester gas will be oxidized to SO_2 when it is burned in CHP #1. There are several methods for reducing the level of hydrogen sulfide in the digester gas prior to burning the digester gas including biological removal of hydrogen sulfide in the digester head space, addition of ferric chloride to the digesters and use of ferrous sulfate desulfurization unit. While it is possible to use an aqueous scrubber system to remove SO_2 from an exhaust stream from a burner system, this is not typically done for generator exhaust since there are

other efficient, cost effective options for sulfur removal before burning the gas. Exhaust scrubber systems were not considered further.

Biological removal followed by an ferrous sulfate desulfurization unit for removing hydrogen sulfide from the digester gas is proposed as BACT for SO_2. Biological removal involves injecting a small amount of air into the head space of the anaerobic digester. This air allows micro-organisms to develop in the headspace of the tank which biologically convert the hydrogen sulfide to sulfate (SO_4) which is not volatile and returns to the digester liquid effluent. Once the digester gas leaves the digester vessel it is treated in a H_2S Scrubber Unit which is filled with media impregnated with ferrous sulfate. The hydrogen sulfide gas reacts with the ferrous sulfate removing it from the gas stream. The hydrogen sulfide concentration is expected to generally be below 200 ppm after this treatment, however due to the variable nature of the feedstock and anaerobic digestion, levels as high a 800 ppm are possible.

Both the air injection method and the iron sponge (similar to ferrous sulfate) have been used alone as BACT for SO_2 at other facilities in Maine. To meet BACT, Village Green will install and operate the ferrous sulfate desulfurization technology to limit the hydrogen sulfide concentration to less than 800 ppm (2.3 lb of SO_2/hr when operating on digester gas).

BACT Analysis for NOx emissions

There are many options for controlling NOx emissions from an internal combustion engine including combustion controls to limit NOx formation, Ignition Timing Retard, lean burn combustion, combustion of biogas, selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR)

Using biogas fuel can be considered as part of a NOx emissions reduction control. Digester gas is approximately 60% carbon dioxide which causes peak engine temperatures to be reduced, thereby minimizing NOx formation. Using as much digester gas as can be produced for power production is proposed as an element of BACT for NOx.

Lean burn combustion engines are designed to be operated at high excess air levels resulting in lower combustion temperature and therefore lower NOx emissions. Lean burn combustion simultaneously minimizes emissions of NOx along with PM, CO, and VOC. Lean burn combustion is widely accepted as BACT.

Ignition timing retard delays the ignition timing to minimize peak combustion temperature. NOx formation can be reduced, but CO and PM emissions potentially increase, along with a decrease in engine performance and operational stability. Ignition timing retard delays is not BACT for this engine.

Derating or limiting the engine capacity to less than full power reduces NOx formation by reducing cylinder pressures and temperatures. Derating is also not BACT to reduce NOx for this engine due to the loss of income from power production.

SCR is an add-on control system which uses urea or ammonia injection and a catalyst to react with the NOx in the flue gas to form water and nitrogen. SCR catalysts are in use in some diesel fueled engines but are not generally used for biogas fueled engines due to the potential for poisoning of the catalyst by compounds found in the digester gas. In several California Air Districts, use of SCR in landfill gas fueled engines is experimental and there are no known stable, long-term operations using SCR on similar digester gas systems in practice. Therefore, SCR is not considered a feasible technology for this application.

SNCR is an add-on control which also uses ammonia or urea injection but without a catalyst. The reaction required the injection point at specific temperature (1600°F to 2100°F), which is above the expected exhaust temperature of 957°F for the proposed generator, therefore SNCR is not considered a feasible technology for this application.

The use of digester gas as the primary fuel, using a lean burn engine, and good operating, combustion and maintenance practices are considered BACT for NOx.

BACT Analysis for CO emissions

The options for controlling carbon monoxide emissions from the generator include good combustion control of a lean burn engine, good operating practice and an add-on oxidation catalyst. Add-on oxidation catalyst was not considered. The inherent combustion efficiency of a new lean burn generator and good operating practices are proposed as BACT for carbon monoxide.

BACT Analysis for VOC emissions

The options for controlling volatile organic compounds (VOC) emissions from the generator include good combustion control of a lean burn engine, good operating practice and an add-on oxidation catalyst. Add-on oxidation catalyst was not economically feasible. The inherent combustion efficiency of a new lean burn generator and good operating practices are considered BACT for VOCs and have been considered BACT at other Maine facilities. It should be noted that the generator data sheet lists VOC emissions as <0.7 g/bHPh for non-methane hydrocarbons (NMHC). The supplier of the equipment has indicated that there are no NMHC in the biogas. An emissions factor of 0.7 g/bHPh was used for calculating the VOC emissions.

Summary

Village Green's anaerobic digester facility plans to generate digester gas in an aerobic digester vessel and burn this digester gas in a generator to produce electricity. In order to maximize the production of power, Village Green plans to burn natural gas in the generator when there is insufficient digester gas to run the generator at capacity.

The following control options are proposed as BACT for the Village Green anaerobic digester facility:

General: Proper operation and good combustion and maintenance practices

PM/PM_{10}:	Fuel and Air Filters, efficiency of a new unit
SO_2:	Injection of air into the top of the digester, ferrous sulfate desulfurization.
NOx:	Lean burn engine, use of digester gas
CO:	Good combustion practices, lean burn engine
VOC:	Good combustion practices, lean burn engine

The BACT analysis for the project is based on a baseline generator operating at full capacity using 295 SCFM digester gas or 163 SCFM of natural gas and use of the digester gas and natural gas in a generator to produce power.

SUMMARY OF EMISSIONS

Pollutant	**Estimated Controlled Emissions**	
	Natural Gas	Digester Gas
PM / PM_{10}	0.1 lb/hr 0.4 tpy	0.5 lb/hr 2.1 tpy
SO_2	0.1 lb/hr 0.4 tpy	2.3 lb/hr 10 tpy
NOx	3.3 lb/hr 14 tpy	4.3 lb/hr 18.6 tpy
CO	7.1 lb/hr 31 tpy	7.1 lb/hr 31 tpy
VOC	2.3 lb/hr 9.9 tpy	2.3 lb/hr 9.9 tpy

Proper operation and good combustion and maintenance practices minimize emissions for all pollutants. Village Green will maintain the anaerobic digester and generator in accordance with the manufacturers' written instruction for proper operation and maintenance.

Visible Emissions

Visible emissions from the stack for CHP #1 shall not exceed 10% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period.

Periodic Monitoring

Village Green shall keep records of the hours of operation of CHP #1 unit on a 12- month rolling total basis.

To monitor the performance of the ferrous sulfate media, Village Green will operate a hydrogen sulfide monitor to determine the H_2S level in the treated digester gas (after the desulfurization unit) and to determine when the desulfurization media may need to be replaced. The media in the desulfurization unit shall be replaced when the monitor shows breakthrough of H_2S (greater than 500 ppm). Records shall be maintained of the monitor results and dates of when the media is replaced.

Compliance with the emission requirements in 40 CFR Part 60, Subpart JJJJ shall be demonstrated by certification from the manufacturer or an initial performance test and subsequent tests every 8760 hours or 3 years, whichever comes first, if a manufacturer certification is unavailable.

Operational Monitoring for Control Technologies

The following table outlines the operational monitor for the control technology selected as BACT (scrubber) so that the facility may demonstrate ongoing compliance with BACT limits when it operates. Based on the design of Village Green, the following monitor will be used to ensure the proper operation of the control device described in the BACT analysis.

Control Device	Operational Monitor
H_2S/Gas Scrubber (ferrous sulfate desulfurization unit)	H_2S monitor

Following startup of the facility and based on the results of initial stack testing, Village Green will define the thresholds corresponding to the required level of

emissions control. Compliance with the emission requirements for SO_2, NOx, and VOC shall be demonstrated by an initial performance test.

C. Digester Flare

The digester flare is rated at 150% of the expected biogas volume or 333 scfm biogas (approximately 15 MMBtu/hr). The flare will be utilized as a back-up combustion device when biogas cannot be combusted in the engine due to equipment downtime, malfunction, or other scenarios in which the biogas would otherwise be vented.

BACT is proposed to be the use of the flare for control of digester gases when the gases are not able to be fired in CHP #1.

The BACT emission limits for the flare were based on the following emission factors provided by the San Diego Air Pollution Control District (http://www.sdapcd.org/toxics/emissions/combgas/combgas.html) for the flare burner and "fuel" SO_2 and NOx generated from oxidizing the ammonia and hydrogen sulfide in the fuel :

PM/PM_{10} – 0.02 lb/MMBtu (0.3 lb/hr)
SO_2 – 2.0 lb/$MMft^3$ (0.1 lb/hr) + 8.9 lb/hr = 9.0 lb/hr
NO_X – 48.0 lb/$MMft^3$ (1.0 lb/hr) + 1.1 lb/hr = 2.1 lb/hr
CO – 1.8 lb/$MMft^3$ (0.1 lb/hr)
VOC – 12.10 lb/$MMft^3$ (0.3 lb/hr)
Opacity – Visible emissions from the flare shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period.

Periodic Monitoring

Village Green shall maintain a log documenting the hours of flare operation.

D. BACT for the natural gas fired heater (Boiler #1)

Village Green will operate a boiler which will be used for start-up of the digester system to bring the system up to temperature. This boiler will combust natural gas and will be rated with a maximum heat input of 1.6 MMBtu/hr.

NOx, SO2, CO, PM, and VOC

NOx control techniques are generally organized into two separate groups: combustion controls, and post-combustion controls. Combustion controls affect the combustion conditions to minimize the formation of NOx, while post-

combustion controls remove NOx after it has formed. Add-on pollution control equipment is not economically viable, therefore Village Green will meet BACT for NOx emissions using the boiler's existing combustion controls.

Emissions of SO_2, CO, PM and VOC from small natural gas fired boilers/heaters are generally very low. Emission control equipment is not economically practical. Village Green will meet BACT for these pollutants through the use of the boiler's existing combustion controls.

1. BACT Findings

The BACT emission limits for Boiler #1 were based on the following:

PM/PM_{10} – 0.05 lb/MMBtu based on 06-096 CMR 115, BACT
SO_2 – 0.6 lb/MMscf: AP-42, Table 1.4-2 (dated 7/98)
NO_X – 100 lb/MMscf: AP-42, Table 1.4-1 (dated 7/98)
CO – 84 lb/MMscf: AP-42, Table 1.4-1 (dated 7/98)
VOC – 5.5 lb/MMscf: AP-42, Table 1.4-2 (dated 7/98)
Opacity – Visible emissions from Boiler #1 firing natural gas shall not exceed 10% opacity on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. 06-096 CMR 115, BACT

The BACT emission limits for the boiler are the following:

Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.1	0.1	0.1	0.2	0.2	0.1

Visible emissions from Boiler #1 shall not exceed 10% opacity on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period.

2. Periodic Monitoring

Village Green operating the boiler at maximum capacity for 8760 hours per year results in emissions of each pollutant to less than 1 ton per year. Therefore, no fuel limit or periodic monitoring for fuel use is needed for this particular unit.

3. 40 CFR Part 63 Subpart JJJJJJ

The natural gas fired heater is not subject to the National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources (40 CFR Part 63 Subpart JJJJJJ).

E. Fugitive Emissions

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed an opacity of 20%, except for no more than five (5) minutes in any 1-hour period. Compliance shall be determined by an aggregate of the individual fifteen (15)-second opacity observations which exceed 20% in any one (1) hour.

F. General Process Emissions

Visible emissions from any general process source shall not exceed an opacity of 20% on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 1-hour period.

G. Annual Emissions

Potential emissions from the CHP #1 and the AD#1 depend on the characteristics of the biosolids feedstock which is highly variable. Potential emissions for NOx, CO, SO_2, PM and VOC were calculated using estimates supplied by Village Green and the design engineering firm for the digester gas characteristics. Assumptions were included based on experience with similar systems using best engineering judgment. Annual uncontrolled emissions assume an annual operating schedule of 8760 hours per year and digester gas generation rate of 295 scfm (capacity of the generator). Controlled emissions include the use of an H_2S scrubber and a fabric filter as described in the BACT analysis.

Village Green shall be restricted to the following annual emissions, calculated with the process operating 8760 hrs/year, based on a 12 month rolling total:

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	**PM_{10}**	**SO_2**	**NO_x**	**CO**	**VOC**
CHP #1 and AD#1	**2.1**	**2.1**	**10.1**	**18.6**	**31.0**	**9.9**
Boiler #1	**0.1**	**0.1**	**0.1**	**0.7**	**0.6**	**0.1**
Total TPY	**2.2**	**2.2**	**10.2**	**19.3**	**31.6**	**10.0**

Hazardous Air Pollutants (HAP)

Through this air emission license, Village Green's HAP emissions are limited/capped at 9.9 TPY for a single HAP and 14.9 TPY for all HAP combined.

Greenhouse Gases

Greenhouse gases are considered regulated pollutants as of January 2, 2011, through 'Tailoring' revisions made to EPA's *Approval and Promulgation of Implementation Plans,* 40 CFR Part 52, Subpart A, §52.21 Prevention of Significant Deterioration of Air Quality rule. Greenhouse gases, as defined in 06-096 CMR 100 (as amended), are the aggregate group of the following gases: Carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. For licensing purposes, greenhouse gases (GHG) are calculated and reported as carbon dioxide equivalents (CO_2e).

Based on the facility's fuel use limit(s), the worst case emission factors from AP-42, IPCC (Intergovernmental Panel on Climate Change), and *Mandatory Greenhouse Gas Reporting*, 40 CFR Part 98, and the global warming potentials contained in 40 CFR Part 98, Village Green is below the major source threshold of 100,000 tons of CO_2e per year. Therefore, no additional licensing requirements are needed to address GHG emissions at this time.

III. AMBIENT AIR QUALITY ANALYSIS

According to 06-096 CMR 115, the level of air quality analyses required for a minor new source shall be determined on a case-by case basis. Based on the information available in the file, and the similarity to existing sources, Maine Ambient Air Quality Standards (MAAQS) will not be violated by this source.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-1086-71-A-N subject to the following conditions.

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

STANDARD CONDITIONS

(1) Employees and authorized representatives of the Department shall be allowed access to the licensee's premises during business hours, or any time during which any emissions units are in operation, and at such other times as the Department deems necessary for the purpose of performing tests, collecting samples, conducting inspections, or examining and copying records relating to emissions (38 M.R.S.A. §347-C).

(2) The licensee shall acquire a new or amended air emission license prior to commencing construction of a modification, unless specifically provided for in Chapter 115. [06-096 CMR 115]

(3) Approval to construct shall become invalid if the source has not commenced construction within eighteen (18) months after receipt of such approval or if construction is discontinued for a period of eighteen (18) months or more. The Department may extend this time period upon a satisfactory showing that an extension is justified, but may condition such extension upon a review of either the control technology analysis or the ambient air quality standards analysis, or both. [06-096 CMR 115]

(4) The licensee shall establish and maintain a continuing program of best management practices for suppression of fugitive particulate matter during any period of construction, reconstruction, or operation which may result in fugitive dust, and shall submit a description of the program to the Department upon request. [06-096 CMR 115]

(5) The licensee shall pay the annual air emission license fee to the Department, calculated pursuant to Title 38 M.R.S.A. §353. [06-096 CMR 115]

(6) The license does not convey any property rights of any sort, or any exclusive privilege. [06-096 CMR 115]

(7) The licensee shall maintain and operate all emission units and air pollution systems required by the air emission license in a manner consistent with good air pollution control practice for minimizing emissions. [06-096 CMR 115]

(8) The licensee shall maintain sufficient records to accurately document compliance with emission standards and license conditions and shall maintain such records

for a minimum of six (6) years. The records shall be submitted to the Department upon written request. [06-096 CMR 115]

(9) The licensee shall comply with all terms and conditions of the air emission license. The filing of an appeal by the licensee, the notification of planned changes or anticipated noncompliance by the licensee, or the filing of an application by the licensee for a renewal of a license or amendment shall not stay any condition of the license. [06-096 CMR 115]

(10) The licensee may not use as a defense in an enforcement action that the disruption, cessation, or reduction of licensed operations would have been necessary in order to maintain compliance with the conditions of the air emission license. [06-096 CMR 115]

(11) In accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department, the licensee shall:

A. perform stack testing to demonstrate compliance with the applicable emission standards under circumstances representative of the facility's normal process and operating conditions:
   1. within sixty (60) calendar days of receipt of a notification to test from the Department or EPA, if visible emissions, equipment operating parameters, staff inspection, air monitoring or other cause indicate to the Department that equipment may be operating out of compliance with emission standards or license conditions; or
   2. pursuant to any other requirement of this license to perform stack testing.

B. install or make provisions to install test ports that meet the criteria of 40 CFR Part 60, Appendix A, and test platforms, if necessary, and other accommodations necessary to allow emission testing; and

C. submit a written report to the Department within thirty (30) days from date of test completion.

[06-096 CMR 115]

(12) If the results of a stack test performed under circumstances representative of the facility's normal process and operating conditions indicate emissions in excess of the applicable standards, then:

A. within thirty (30) days following receipt of such test results, the licensee shall re-test the non-complying emission source under circumstances representative of the facility's normal process and operating conditions and in accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department; and

B. the days of violation shall be presumed to include the date of stack test and each and every day of operation thereafter until compliance is demonstrated under normal and representative process and operating conditions, except to

the extent that the facility can prove to the satisfaction of the Department that there were intervening days during which no violation occurred or that the violation was not continuing in nature; and

C. the licensee may, upon the approval of the Department following the successful demonstration of compliance at alternative load conditions, operate under such alternative load conditions on an interim basis prior to a demonstration of compliance under normal and representative process and operating conditions. [06-096 CMR 115]

(13) Notwithstanding any other provisions in the State Implementation Plan approved by the EPA or Section 114(a) of the CAA, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of any statute, regulation, or Part 70 license requirement. [06-096 CMR 115]

(14) The licensee shall maintain records of malfunctions, failures, downtime, and any other similar change in operation of air pollution control systems or the emissions unit itself that would affect emission and that is not consistent with the terms and conditions of the air emission license. The licensee shall notify the Department within two (2) days or the next state working day, whichever is later, of such occasions where such changes result in an increase of emissions. The licensee shall report all excess emissions in the units of the applicable emission limitation. [06-096 CMR 115]

(15) Upon written request from the Department, the licensee shall establish and maintain such records, make such reports, install, use and maintain such monitoring equipment, sample such emissions (in accordance with such methods, at such locations, at such intervals, and in such a manner as the Department shall prescribe), and provide other information as the Department may reasonably require to determine the licensee's compliance status. [06-096 CMR 115]

SPECIFIC CONDITIONS

(16) **CHP #1 and AD#1**

A. The Village Green Anaerobic Digester (AD #1) and power generation system shall be limited to processing up to 295 scfm biogas in the CHP unit measured by the quantity of power produced. [06-096 CMR 115, BACT]

B. Emissions from the CHP #1 and AD#1 shall not exceed the following [06-096 CMR 115, BACT]:

When firing/operating on Natural gas:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.1	0.1	0.1	3.3	7.1	2.3

When firing/operating on Digester gas:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.5	0.5	2.3	4.3	7.1	2.3

C. Visible emissions from the stack for CHP #1 shall not exceed 10% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period.
[06-096 CMR 115, BACT]

D. The stack for the CHP #1 shall be a minimum of 20 feet in height above ground level. [06-096 CMR 115, BACT]

E. Village Green shall keep records of the hours of operation of CHP #1 and AD #1 on a monthly and 12 month rolling total basis. The units shall be maintained and operated according to the manufacturer's emission-related instructions and records shall be kept of conducted maintenance. [06-096 CMR 115, BACT]

F. Village Green shall install and operate an desulfurization unit to reduce H_2S emissions from the AD#1 which will be measured by a H2S monitor. The media in the desulfurization unit shall be replaced when the test results show breakthrough of H_2S (over 500 ppm). Records shall be maintained of monitor results and dates of when the media is replaced. [06-096 CMR 115, BACT]

G. Village Green shall perform an initial performance stack test to determine NOx, SO2, and VOC emissions within 180 days after start-up. Compliance with the emission requirements for NOx, SO2, and VOC shall be demonstrated by an initial performance test. [06-096 CMR 115, BACT]

H. NSPS, 40 CFR Part 60, Subpart JJJJ
Village Green shall meet all applicable requirements of 40 CFR Part 60, Subpart JJJJ for CHP #1, including:

1. CHP #1 shall be maintained and operated according to the manufacturer's emission-related written instructions and records shall be kept of

conducted maintenance. [40 CFR §60.4243, 40 CFR §60.4245, and 06-096 CMR 115, BACT]

2. CHP #1 is subject to emission requirements set forth in 40 CFR 60, Subpart JJJJ. Compliance with these emission requirements shall be demonstrated by certification from the manufacturer or an initial performance test and subsequent tests every 8760 hours or 3 years, whichever comes first, if a manufacturer certification is unavailable. [40 CFR §60.4233 and Table 1, and 40 CFR §60.4245]

I. The following monitor shall be used to ensure the proper operation of the control device:

Control Device	Operational Monitor
H_2S/Gas Scrubber (desulfurization unit)	H_2S monitor

Following startup of the facility and based on the results of initial stack testing, Village Green shall define the thresholds corresponding to the required level of emissions control. Village Green shall maintain records of all maintenance, repair, and calibration activity for the operational monitor. [06-096 CMR 115, BACT]

(17) **Boiler #1**

A. Boiler #1 (1.6 MMBtu/hr) shall fire natural gas. [06-096 CMR 115, BACT]

B. Emissions from Boiler #1 shall not exceed the following [06-096 CMR 115, BACT]:

Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.1	0.1	0.1	0.2	0.2	0.1

C. Visible emissions from the boiler stack shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. [06-096 CMR 101, BACT]

(18) **Flare**

A. The Flare (15 MMBtu/hr) shall fire biogas and shall only be operated when AD #1 is in operation and CHP #1 is offline or unable to combust all of the biogas. [06-096 CMR 115, BACT]

C. Emissions from the Flare shall not exceed the following:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.02	06-096 CMR 115, BACT

D. Emissions from the Flare shall not exceed the following [06-096 CMR 115, BACT]:

PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
0.3	0.3	9.0	2.1	0.1	0.3

E. Visible emissions from the flare shall not exceed an opacity of 10% on a 6 minute block average basis, except for no more than one (1) six (6) minute block average in a 3 hour period. [06-096 CMR 115, BACT]

F. A log recording the reason, date, time, and duration of flare operations shall be maintained. [06-096 CMR 115, BACT]

(19) **Fugitive Emissions**

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed an opacity of 20%, except for no more than five (5) minutes in any 1-hour period. Compliance shall be determined by an aggregate of the individual fifteen (15)-second opacity observations which exceed 20% in any one (1) hour. [06-096 CMR 101]

(20) **General Process Sources**

Visible emissions from any general process source shall not exceed an opacity of 20% on a six (6) minute block average basis, except for no more than one (1) six (6) minute block average in a 1-hour period. [06-096 CMR 101]

(21) **Operational Monitor**

The operational monitor listed in Condition (16)(I) must record accurate and reliable data. If the operational monitor is recording accurate and reliable data less than 90% of the source operating time within any quarter of the calendar year, the Department may initiate enforcement action and may include in that enforcement action any period of time that the operational monitor was not recording accurate and reliable data during that quarter unless the licensee can demonstrate to the satisfaction of the Department that the failure of the system to

record accurate and reliable data was due to the performance of established quality assurance and quality control procedures or unavoidable malfunctions. The monitor shall be maintained in accordance with manufacturer specifications. [06-096 CMR 115, BPT]

(22) **Malfunction and Breakdown**
Village Green shall notify the Department within 48 hours and submit a report to the Department on a quarterly basis if a malfunction or breakdown in any component causes a violation of any emission standard (38 M.R.S.A. §605).

DONE AND DATED IN AUGUSTA, MAINE THIS 13 DAY OF January , 2014.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Marc Allen Robert Cone for
PATRICIA W. AHO, COMMISSIONER

The term of this license shall be ten (10) years from the signature date above.

[Note: If a complete renewal application, as determined by the Department, is submitted prior to expiration of this license, then pursuant to Title 5 MRSA §10002, all terms and conditions of the license shall remain in effect until the Department takes final action on the renewal of the license.]

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: June 6, 2013
Date of application acceptance: June 20, 2013

Date filed with the Board of Environmental Protection:

Filed
JAN 15 2014
State of Maine
Board of Environmental Protection

This Order prepared by Edwin Cousins, Bureau of Air Quality

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	***Boiler or Water Heater - Landfill or Digester Gas***	Revision:	***2***
		Document #:	***17.5.1***
Class:	***All***	Date:	***04/21/93***

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *n/d* 2.*Automatic combustion air control and retention time $\geq$0.3 sec. at $\geq$1600^{o}F*	1. *n/d* 2. *BAAQMD Approved Design and Operation*[b]
NOx	1. *20 ppm @ 3% O_2, Dry*[b] 2. *40 ppm @ 3% O_2, Dry*[b,c]	1. *Selective Non-Catalytic Reduction (SNCR) Technologies listed below*[b] 2. *Low NO_2, Burners + Flue Gas Recirculation + Reduced Air Preheat*[b]
SO_2	1. *n/s* 2. *n/d*	1.*Spray Dryer + Baghouse; or Fuel Gas Pretreatment System*[a] 2. *n/d*
CO	1. *n/d* 2. *100 ppmv @ 3% O_2 Dry*[b,c]	1. *n/d* 2. *Good Combustion Practice in Minimal Gas Bypassing in Furnace*[a]
PM_{10}	1. *n/s* 2. *n/s*	1. *Baghouse or Electrostatic Precipitator* 2. *Fuel Gas Filter*
NPOC	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*

References

b. BAAQMD
c. County of Los Angeles Sanitation District

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0; 10-03-2008 Rev. 1; 12-02-2016 Rev. 2

2-1-2019 Rev. 3

Equipment or Process: Boiler

	Criteria Pollutants					
Subcategory/Rating/ Size	**VOC**	**NOx[1]**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Natural Gas Fired, > 2 and < 20 MMBtu/HR		Compliance with SCAQMD Rules 1146 or 1146.1[2] (12-02-2016)	Natural Gas (10-20-2000)	≤50 ppmvd for firetube type, ≤ 100 ppmvd for watertube type, corrected to 3% O_2 (04-10-98)	Natural Gas (04-10-98)	
Propane Fired, > 2 and < 20 MMBtu/HR		≤ 12 ppmvd corrected to 3% O_2[2] (10-20-2000)		≤50 ppmvd for firetube type, ≤ 100 ppmvd for watertube type, corrected to 3% O_2 (04-10-98)		
Natural Gas or Propane Fired, ≥ 20 and < 75 MM Btu/HR		Compliance with SCAQMD Rule 1146 (2-1-2019)	Natural Gas (10-20-2000)	Same as above. (04-10-98)	Natural Gas (04-10-98)	With Add-On Controls: ≤ 5 ppmvd NH3, corrected to 3% O2 ≤ 1 ppmvd ozone, corrected to 3% O2 (10-20-2000)
Natural Gas or Propane Fired, ≥ 75 MM Btu/HR		Compliance with SCAQMD Rule 1146 (12-02-2016)	Natural Gas (10-20-2000)	Same as above. (04-10-98)	Natural Gas (04-10-98)	With Add-On Controls: ≤ 5 ppmvd NH3, corrected to 3% O2 ≤ 1 ppmvd ozone, corrected to 3% O2 (10-20-2000)

* Means those facilities that are minor facilities as defined by Rule 1302 - Definitions

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

	Criteria Pollutants					
Subcategory/Rating/ Size	**VOC**	**NOx[1]**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Oil Fired[3]		Compliance with SCAQMD Rule 1146 or 1146.1 (10-20-2000)	Fuel Sulfur Content ≤ 0.0015% by weight (10-03-2008)	≤ 50 ppmvd for firetube type ≤ 100 ppmvd for watertube type, corrected to 3% O_2 (04-10-98)		
Atmospheric Unit, ≥ 2 and ≤ 10 MMBtu/HR		Compliance with SCAQMD Rules 1146 and 1146.1 (12-02-2016)		Compliance with SCAQMD Rules 1146 and 1146.1 (12-02-2016)		
Landfill Gas Fired, < 75 MMBTU/Hr		Compliance with SCAQMD Rules 1146 and 1146.1 (12-02-2016)		≤ 100 ppmvd at 3% O_2 dry. (04-10-98)	≤ 0.1 gr/scf at 12% CO_2 (Rule 409) (04-10-98)	
Digester Gas Fired, < 75 MMBTU/Hr		Compliance with SCAQMD Rules 1146 and 1146.1 (12-02-2016)		≤ 100 ppmvd at 3% O_2 dry. (04-10-98)	≤ 0.1 gr/scf at 12% CO_2 (Rule 409) (04-10-98)	

1) Electric utility boilers, refinery boilers rated >40 MMBtu/hr and sulfur plant reaction boilers rated ≥5 MMBtu/hr are excluded; and there are exceptions for low-use boilers and boilers that met a 12-ppm limit prior to 9/5/08. Applicants are advised to review these rules for further details.

2) A higher NOx limit may be allowed for facilities required to have a standby fuel, where use of a clean standby fuel is not possible and an ultra low-NOx burner is not available.

3) See Clean Fuels Policy in Part C of the BACT Guidelines. Oil firing is only allowed as a standby fuel, and where use of a clean standby fuel is not possible.

* Means those facilities that are minor facilities as defined by Rule 1302 - Definitions