September 20, 2024

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RE: 25-0008 – PDX-4 – Cleaner Air Oregon Emissions Inventory Submittal

Cleaner Air Oregon Project Engineer:

Amazon Data Services, Inc. (ADS) is submitting the attached Cleaner Air Oregon (CAO) Emission Inventory for the existing data center campus, Source Number 25-0008 (PDX-4), to the Oregon Department of Environmental Quality (Oregon DEQ) in accordance with Oregon Administrative Rule (OAR) 340-245-0030. The Air Contaminant Discharge Permit (ACDP) for this facility was issued on November 21, 2013, and is considered an existing facility because construction began prior to November 16, 2018.[1]

The enclosed inventory form and supporting documentation is prepared using best engineering estimates, process knowledge, source test data, and/or published emission factors for toxic air contaminants listed in OAR 340-247-8010, Table 1.

FACILITY DESCRIPTION

PDX-4, is located at 79539 Rippee Road in Boardman, Oregon in Morrow County. The data center houses computer systems and associated components, such as telecommunications and data storage systems which includes data communications equipment, security systems, and diesel-fueled backup power generator engines. The principal use of PDX-4 is storage, management, and dissemination of electronic data. PDX-4 operates under Standard ACDP 25-0008 and the following Standard Industrial Classification (SIC) Codes 7374: Data processing and 4911: Emergency power generation.

PDX-4 is permitted to operate 98 emergency generators to provide backup electrical power to the facility during unexpected power outages.[2] The diesel-fueled emergency backup generator engines are used in the event of a loss of power; emergency backup power is the only purpose of the generator engines. ADS periodically operates the generators for testing and maintenance to ensure adequate availability of the generators during these potential emergencies; this non-emergency use is under the scope of CAO permitting.

The generator engines are subject to the federal New Source Performance Standards (NSPS) for Compression Ignition Internal Combustion Engines (40 CFR 60 Subpart IIII) and certified to Tier 2 standards. Each generator is limited to 100 hours per year of operation for non-emergency usage, inclusive of testing and maintenance.

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[1] OAR 340-245-0020(20).

[2] While not all permitted generators are installed onsite, all permitted generators are included in this CAO evaluation.

CAO EMISSION INVENTORY METHODOLOGY

Identification of Toxic Emission Units

ADS has designated toxic emission units (TEUs) consistent with emission units identified in the ACDP renewal application. TEUs are grouped together by equipment type (e.g. Type A, Type B) because emissions and throughput are identical between the generators of the same type. A table of generator count is provided in Table 1.[3]

Table 1. Generator Inventory

Generator Type	Generator Name	Capacity	Total Count
Type A	CAT C27	750 kW	3
Type B	CAT C27	800 kW	3
Type C	CAT C32	1,000 kW	1
Type D	CAT 3516C Trans	1,825 kW	1
Type E	CAT 3516C	2,000 kW	6
Type F	CAT 3516C	2,500 kW	79
Type G	MTU 2250RXC6DT2	2,250 kW	3
Type H	CAT C18	750 kW	1
Type I	CAT 3512C	1,500 kW	1
		Total	98

ADS has identified diesel storage tanks and stored engine oil tanks as exempt TEUs pursuant to OAR 340-245-0060(3)(a) since the diesel tanks are not subject to any NSPS and are stored at ambient temperature and pressure and storage engine oil tanks/reservoirs associated with the emergency generators onsite have oil containing toxic chemicals. Form AQ523 for Categorically Exempt TEUs is included in Attachment 1.

Generator Diesel Throughput

Requested PTE and Capacity Throughput

Emergency generators are expected to operate for short periods at low or no load for biweekly readiness testing and other infrequent scheduled maintenance and testing activities throughout the year. While ADS expects the fuel usage to generally be equally distributed amongst all generators from expected operations, conservatism is proposed in determining the fuel distribution among individual generators to ensure facility-wide potential risks are adequately captured and for the flexibility in operation ADS would like to retain (e.g. facility wide fuel limit). ADS proposes the maximum daily and annual fuel throughputs are determined based on the conservative assumption that the generators will be operated at 100% load (which requires the highest fuel throughput per hour).

[3] The Type G generators included in the current expired permit were not replaced onsite by Type E generators. Some of the proposed Type F generators were downgraded to Type E generators (2,500 kW to 2,000 kW generators) as allowed by permit conditions. Type H and Type I were installed via Notice of Construction.

Potential annual diesel throughput for each generator type is the minimum between the following:

- Non-emergency facility-wide fuel use – calculated assuming all generators are operated the same number of hours per year at maximum capacity and remain within the PSEL limits, and
- The maximum hourly fuel throughput multiplied by the NSPS annual limitation of 100 hours/year for each individual source type.[4]

Example calculation for all three permitted Type A generators:

$$53.60\ \frac{gal}{hr * gen} * 100\ \frac{hrs}{yr} * 3\ gens = 16{,}080\ \frac{gal}{yr}$$

Generators are expected to operate with no daily restriction for non-emergency purposes. ADS has evaluated historical operations across several of their other facilities in Oregon and determined facility-wide operations have not exceeded 20,000 gallons in a month. This is a very conservative estimate of potential fuel throughput on a daily basis for non-emergency operations. ADS would like to request a similar permit condition to other recently permitted ADS facilities that are new under the CAO program (e.g. Source Number 25-0063, Conditions 2.8.b and 6.3 and Source Number 30-0121 Condition 9.2) and resulted in the acute non-cancer risk to be below one. Source risk limits or permit conditions would allow the facility to record and report monthly diesel consumed for non-emergency purposes. Based on the other facility permits, if 20,000 gallons of diesel fuel for non-emergency purposes is exceeded for the campus in a single month, the facility would be required to verify daily throughput has not exceeded this level of consumption.[5]

As such, potential daily throughput is calculated as the minimum value between:

- Maximum hourly fuel throughput multiplied by 24 hours/day for each individual source type, and
- 20,000 gallons per day.

Actual Throughput

Actual annual throughput for each generator type is determined by summing the annual non-emergency fuel throughput from individual generators. The total throughput matches the reported throughput in the 2023 Annual Report.

Actual daily throughput is reflective of the maximum monthly emissions during 2023.[6] This is determined for each generator type by summing the monthly fuel throughput for each generator type for each month. The maximum month for each generator type is conservatively used to incorporate all different testing scenarios that may occur. While it is typical for each generator to undergo biweekly testing, there are additional infrequent maintenance events that can occur throughout the year. Additionally, because fuel is tracked on a monthly basis pursuant to Permit Condition 7.1, and ADS would like to continue this practice, it would be inappropriate to estimate daily operations from this data.

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[4] 40 CFR 60.4210 (f)(2).

[5] Daily throughput information is available but requires manual review of individual sources. ADS does not currently have functionality to sum specific days across the facility or generator type. Therefore, review of daily maximum would be a time-intensive process.

[6] ADS has used this for the daily throughput basis to reflect requested permit conditions as consistent with other permitted facilities under the CAO program. Source Number 25-0063, Conditions 2.8.b and 6.3 and Source Number 30-0121 Condition 9.2. Data is available on a daily basis but requires manual summation and review to determine the maximum daily operations.

Emission Factor Determination

Emission factors for generators are determined from source test results and emission factors recommended by Oregon DEQ.[7] All emission factors and emission calculations are provided in Attachment 1.

Type F: CAT 3516C 2,500 kW Generator

Stack testing for diesel particulate matter (DPM), metals, and polycyclic aromatic hydrocarbons (PAHs) was completed on September 21, 23-24, and 27-29, 2021 at the ADS site 25-0059 on the CAT 3516C 2,500 kW generator at less than 10% load and greater than 90% load. Oregon DEQ provided CAO approved emission factors in the January 14, 2022, Source Test Review Report Memorandum at each load level. ADS has applied a safety factor by increasing the DEQ CAO approved results by two standard deviations or using the maximum single run, whichever is higher, for all pollutants detected.[8] If all runs show non-detect, there are no potential emissions from this pollutant.[9] The maximum emission factor between the two load levels was used.[10]

CAT completed stack testing for the CAT 3516C 2,500 kW generators at their testing facility on March 5-8, 2019 for several pollutants. Stack testing was completed at 10%, 25%, 50%, 75%, and 100% load. Formaldehyde was not tested during the 2021 stack test, so the result from the 2019 stack test is used for this pollutant only. The same method described above is used to determine the formaldehyde emission factor.

Other Generator Types

DPM is measured in Oregon using Oregon Method 5. The emission factor included in the manufacturer's specifications for generator engines uses Method 1065 to determine particulate matter (PM) emissions. The Method 1065 test methods are not functionally equivalent to Oregon Method 5 test methods for PM emissions. Oregon DEQ has suggested that in the absence of specific stationary source stack test data using Oregon Method 5 that using a factor of manufacturer's particulate matter plus measured hydrocarbon (HC) is the best available information. This method is expected to overrepresent potential DPM emissions.

For the DPM emission factor ADS has used the lesser of the following values:

- The Oregon DEQ approved emission factor of 23.38 lbs/gal for DPM for large generators (or those greater than 560 kW) based on stack test data in Oregon available in 2022.[11]
  - Unless the emission factor for PM from the manufacturer is higher than the Oregon DEQ value (e.g. Type H), then the option below is selected.

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[7] Cold start emissions are not calculated as part of this inventory but will be part of the emissions assessed for risk.

[8] In cases where some of the runs show non-detect for a given pollutant, the maximum single run may be higher than the DEQ CAO approved results plus two standard deviations. CAO approved emission factors for non-detects are reported as half the limit.

[9] Appendix G of Recommended Procedures for Toxic Air Contaminant Health Risk Assessments, by Oregon DEQ, October 2022.

[10] This stack test evaluation and emission factor determination method for the CAT 3516C 2,500 kW generators was used in the CAO Risk Assessment for Source Numbers 25-0063 and 30-0121.

[11] Stack test data was delivered in April 2022 by Oregon DEQ via Freedom of Information Act (FOIA). A letter containing statistical analysis and emission factor determination strategy was submitted to J.R. Giska (Oregen DEQ) on May 3, 2022. Approval of the proposed methodology was granted via letter from J.R. Giska on August 15, 2022.

- The maximum calculated manufacturer supplied PM + HC at any load. Additionally, if manufacturer data is only supplied at the 100% load level (e.g. Type G) and is less than the Oregon DEQ approved factor, then the Oregon DEQ approved factor is conservatively used because PM emissions are expected to be higher at lower load levels.

ADS is using published emission factors as specified in Oregon DEQ Combustion Emission Factor Search Tool for Toxics Reporting. The factors for "Diesel Internal Combustion" are applied appropriately to each generator based on size and Tier. The emission factors are a combination of recent source test data from Oregon facilities, and California's South Coast Air Quality Monitoring District AB2588 table B-2 for Internal diesel combustion engines.

The following attachments are included as a part of this submission:

- Attachment 1:
  - CAO Emissions Inventory (AQ520) with references:
    - Table of emission factors grouped by source type.
    - Table of PSEL showing expected non-emergency fuel throughput.
  - Categorically Exempt TEUs (AQ523)
- Attachment 2:
  - Facility Plot Plan
  - Process Flow Diagram

If you have any questions or comments about the information presented in this letter, please do not hesitate to call me at 309.360.9610 or Beth Ryder at 458.206.6770.

Sincerely,

Amazon Data Services, Inc.

S. Shri Vani

Shri Vani Sripada, Senior Air Quality Engineer

Attachments

cc: JR Giska, Oregon DEQ
Ania Loyd, Oregon DEQ
Tracy Drouin, Oregon DEQ
Owen Rudloff, Oregon DEQ
Garrett Koehler, Amazon Data Services, Inc.
Shannon Moore, Amazon Data Services, Inc.
Doka Bui, Amazon Data Services, Inc.
Darren Wilton, Amazon Data Services, Inc.
Beth Ryder, Trinity Consultants

ATTACHMENT 1

CAO Air Quality Forms and References

AQ520 – Submitted Electronically

AQ523

Form AQ523

CATEGORICALLY EXEMPT TOXICS EMISSIONS UNITS **ANSWER SHEET**

Facility name: PDX-4 Permit Number: 25-0008

Indicate which of the following categorically exempt activities occur at this facility by checking the appropriate columns below. Submit this form electronically with your Cleaner Air Oregon (CAO) Emissions Inventory AQ520 form to meet the reporting requirements in OAR 340-245-0040(4)(a)(A) for categorically exempt Toxics Emissions Units (TEUs). This form is the complete list of categorically exempt TEUs, which can be found in the division 245 rules under OAR 340-245-0060(3)(b).

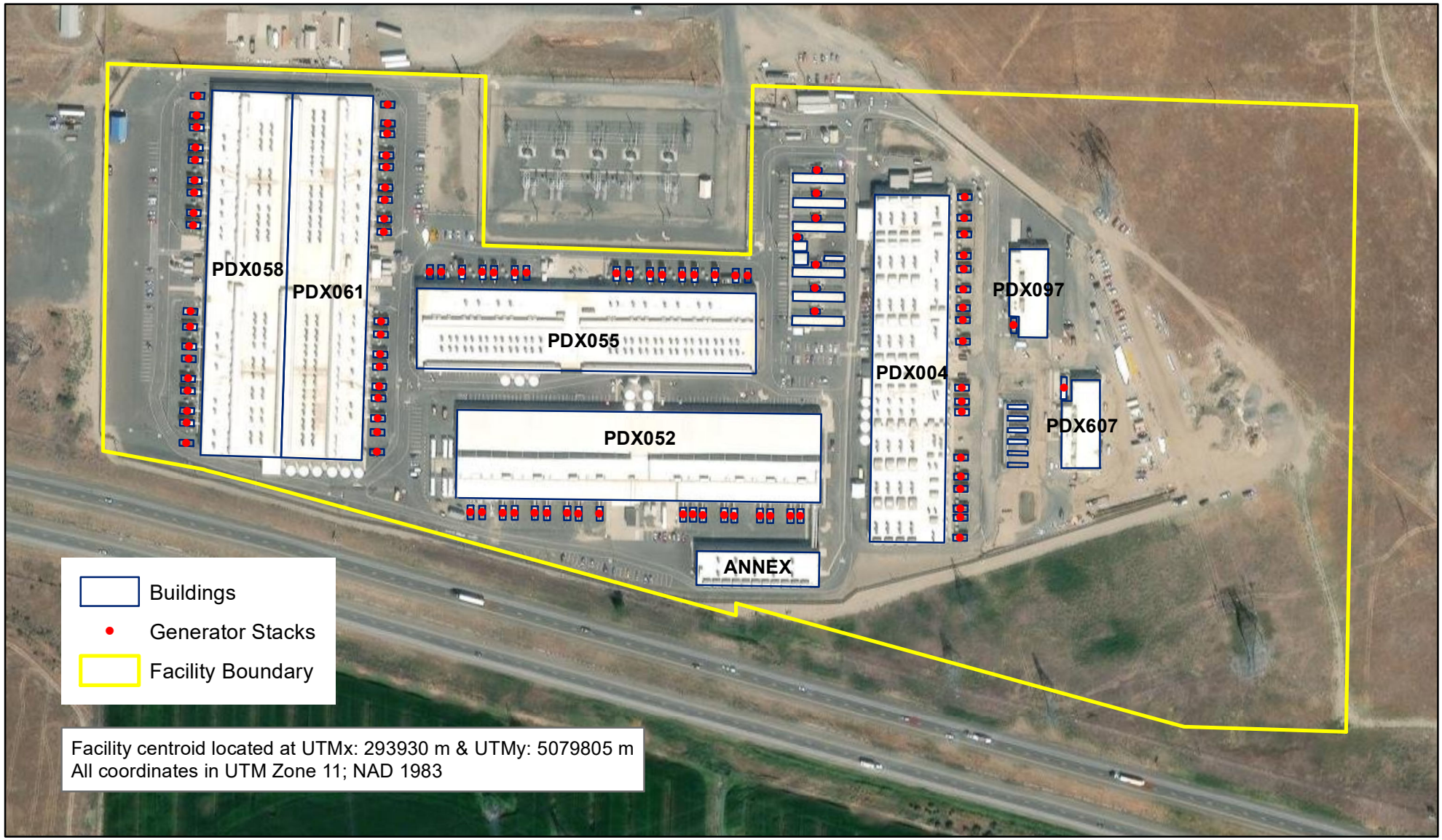
Yes	No	Categorically Exempt TEU Activities
☑	☐	Evaporative and tail pipe emissions from on-site motor vehicle operation.
☐	☑	Distillate oil, kerosene, gasoline, natural gas or propane burning equipment, provided the aggregate expected actual emissions of the equipment identified does not exceed the de minimis level for any regulated pollutant, based on the expected maximum annual operation of the equipment. If a source's expected emissions from all such equipment exceed the de minimis levels, then the source may identify a subgroup of such equipment as categorically exempt with the remainder not designated as an exempt TEU. The following equipment may never be included as part of the exempt TEU: A. Any individual distillate oil, kerosene or gasoline burning equipment with a rating greater than 0.4 million Btu/hour; and B. Any individual natural gas or propane burning equipment with a rating greater than 2.0 million Btu/hour.
☑	☐	Distillate oil, kerosene, gasoline, natural gas or propane burning equipment brought on site for six months or less for maintenance, construction or similar purposes, such as but not limited to generators, pumps, hot water pressure washers and space heaters, provided that any such equipment that performs the same function as the permanent equipment, must be operated within the source's existing PSEL.
☑	☐	Office activities.
☐	☑	Food service activities.
☑	☐	Janitorial activities.
☑	☐	Personal care activities.
☑	☐	Grounds keeping activities, including, but not limited to building painting and road and parking lot maintenance.
☐	☑	On-site laundry activities.
☐	☑	On-site recreation facilities.
☑	☐	Instrument calibration.
☐	☑	Automotive storage garages.

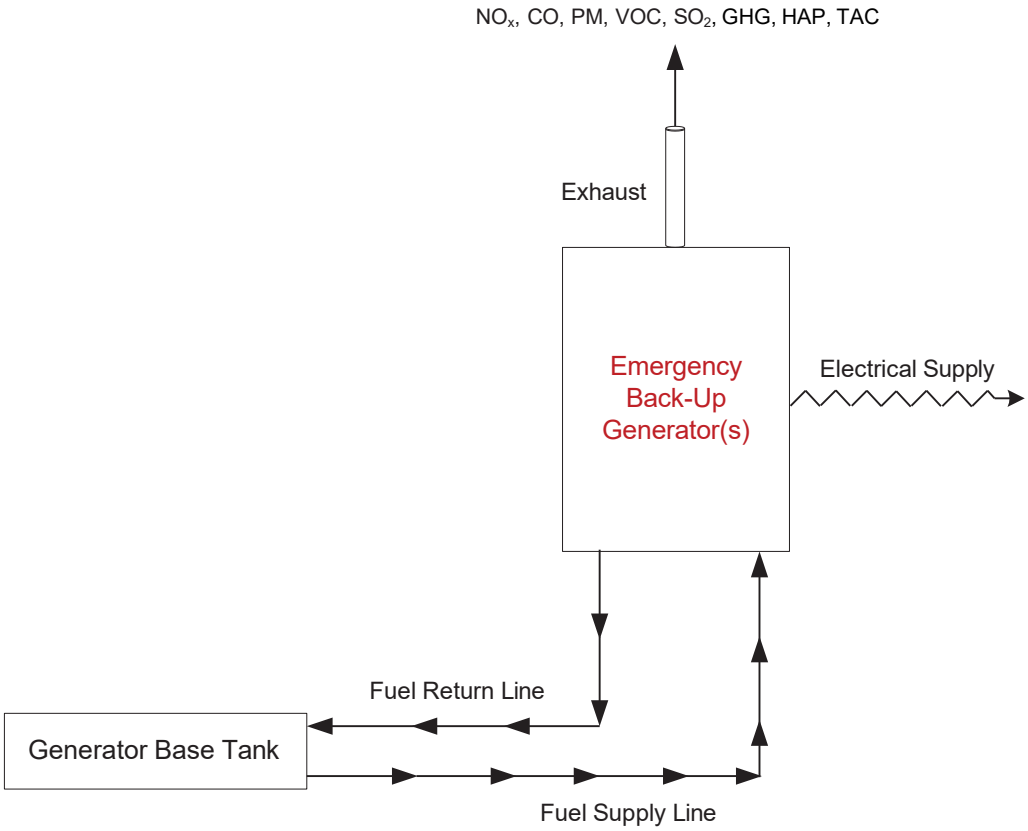
☑	☐	Refrigeration systems with less than 50 pounds of charge of ozone depleting substances regulated under Title VI, including pressure tanks used in refrigeration systems but excluding any combustion equipment associated with such systems.
☑	☐	Temporary construction activities.
☐	☑	Warehouse activities.
☑	☐	Accidental fires and fire suppression.
☑	☐	Air vents from compressors.
☑	☐	Air purification systems.
☐	☑	Continuous emissions monitoring lines.
☑	☐	Demineralized water tanks.
☑	☐	Pre-treatment of municipal water, including use of deionized water purification systems.
☐	☑	Electrical charging stations.
☐	☑	Fire brigade training.
☐	☑	Instrument air dryers and distribution.
☐	☑	Fully enclosed process raw water filtration systems.
☑	☐	Electric motors.
☑	☐	Pressurized tanks containing gaseous compounds that do not contain toxic air contaminants.
☐	☑	Vacuum sheet stacker vents.
☑	☐	Emissions from wastewater discharges to publicly owned treatment works (POTW) provided the source is authorized to discharge to the POTW, not including on-site wastewater treatment and/or holding facilities.
☐	☑	Log ponds.
☑	☐	Stormwater settling basins.
☐	☑	Paved roads and paved parking lots within an urban growth boundary.
☑	☐	Hazardous air pollutant emissions in fugitive dust from paved and unpaved roads except for those sources that have processes or activities that contribute to the deposition and entrainment of hazardous air pollutants from surface soils.
☑	☐	Health, safety, and emergency response activities.
☐	☑	Non-diesel, compression ignition emergency generators* and pumps used only during loss of primary equipment or utility service due to circumstances beyond the

		reasonable control of the owner or operator, or to address a power emergency, provided that the aggregate horsepower rating of all stationary emergency generator and pump engines is not more than 3,000 horsepower. If the aggregate horsepower rating of all the stationary emergency generator and pump engines is more than 3,000 horsepower, then no emergency generators and pumps at the source may be considered categorically exempt. ***All spark ignition engines remain exempt.**
☐	☑	Non-contact steam vents and leaks and safety and relief valves for boiler steam distribution systems.
☐	☑	Non-contact steam condensate flash tanks.
☐	☑	Non-contact steam vents on condensate receivers, deaerators and similar equipment.
☐	☑	Boiler blowdown tanks.
☐	☑	Ash piles maintained in a wetted condition and associated handling systems and activities.

Attachment 2

Facility Plot Plan & Process Flow Diagram


PDX058
PDX061
PDX055
PDX052
PDX004
PDX097
PDX607
ANNEX
Buildings
Generator Stacks
Facility Boundary
Facility centroid located at UTMx: 293930 m & UTMy: 5079805 m
All coordinates in UTM Zone 11; NAD 1983



PDX-4
Morrow County, OR

Process Flow Diagram
Emergency Back-up Generator