TECHNICAL SUPPORT DOCUMENT

Air Discharge Permit 24-3662
Air Discharge Permit Application CL-3272

Issued: September 18, 2024

nLIGHT, Inc.

SWCAA ID – 2119

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Southwest Clean Air Agency

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ABBREVIATIONS

List of Acronyms

ADP.....Air Discharge Permit
AP-42 .....Compilation of Emission Factors, AP-42, 5th Edition, Volume 1, Stationary Point and Area Sources – published by EPA
ASIL.....Acceptable Source Impact Level
BACT.....Best Available Control Technology
BART .....Best Available Retrofit Technology
CAM .....Compliance Assurance Monitoring
CAS#.....Chemical Abstracts Service registry number
CFR.....Code of Federal Regulations
EPA.....U.S. Environmental Protection Agency
EU .....Emission Unit
LAER.....Lowest achievable emission rate
MACT.....Maximum Achievable Control Technologies
mfr.....Manufacturer
NESHAP.....National Emission Standards for Hazardous Air Pollutants
NOV.....Notice of Violation/
NSPS.....New Source Performance Standard
PSD .....Prevention of Significant Deterioration
RACT.....Reasonably Available Control Technology
RCW .....Revised Code of Washington
SCC.....Source Classification Code
SDS .....Safety Data Sheet
SQER .....Small Quantity Emission Rate listed in WAC 173-460
Standard .....Standard conditions at a temperature of 68°F (20°C) and a pressure of 29.92 in Hg (760 mm Hg)
SWCAA .....Southwest Clean Air Agency
T-BACT .....Best Available Control Technology for toxic air pollutants
WAC .....Washington Administrative Code

List of Units and Measures

µg/m³.....Micrograms per cubic meter
µm .....Micrometer (10^{-6} meter)
acfm.....Actual cubic foot per minute
bhp.....Brake horsepower
dscfm.....Dry Standard cubic foot per minute
g/dscm.....Grams per dry Standard cubic meter
gpm .....Gallon per minute
gr/dscf .....Grain per dry standard cubic foot
hp.....Horsepower
hp-hr.....Horsepower-hour
kW.....Kilowatt
MMBtu.....Million British thermal unit
MMcf .....Million cubic feet
ppm .....Parts per million
ppmv .....Parts per million by volume
ppmvd .....Parts per million by volume, dry
ppmw.....Parts per million by weight
psig.....Pounds per square inch, gauge
rpm .....Revolution per minute
scfm.....Standard cubic foot per minute
tpy .....Tons per year

List of Chemical Symbols, Formulas, and Pollutants

C_3H_8 .....Propane
CH_4.....Methane
CO .....Carbon monoxide
CO_2.....Carbon dioxide
CO_2e.....Carbon dioxide equivalent
H_2S .....Hydrogen sulfide
HAP.....Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
HCl.....Hydrochloric acid
Hg.....Mercury
N_2O .....Nitrous oxide
NH_3 .....Ammonia
NO_2 .....Nitrogen dioxide
NO_x .....Nitrogen oxides
O_2 .....Oxygen
O_3 .....Ozone
PM.....Particulate Matter with an aerodynamic diameter 100 µm or less
PM_{10} .....PM with an aerodynamic diameter 10 µm or less
$PM_{2.5}$ .....PM with an aerodynamic diameter 2.5 µm or less
SO_2 .....Sulfur dioxide
SO_x .....Sulfur oxides
TAP .....Toxic air pollutant pursuant to Chapter 173-460 WAC
TGOC.....Total Gaseous Organic Carbon
TOC.....Total Organic Carbon
TSP.....Total Suspended Particulate
VOC .....Volatile organic compound

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

1. FACILITY IDENTIFICATION

Applicant Name:	nLIGHT, Inc.
Applicant Address:	5408 NE 88th Street, Building E Vancouver, WA 98665
Facility Name:	nLIGHT, Inc.
Facility Address:	5408 NE 88th Street, Building E Vancouver, WA 98665
SWCAA Identification:	2119
Contact Person:	Sam Jones – EHS Manager
Primary Process:	Electronic components manufacturing
SIC/NAICS Code:	3674: Semiconductors and Related Devices 334413: Semiconductor and Related Device Manufacturing
Facility Latitude and Longitude:	45° 41' 16.828" N 122° 36' 57.732" W
Facility Classification:	Natural Minor

2. FACILITY DESCRIPTION

nLIGHT, Inc. (nLIGHT) is a facility that manufactures laser diodes using 3" gallium arsenide wafers and 2" indium phosphide wafers used in industrial, defense, and medical applications. Metals and organics are deposited on the wafers and acid and solvent baths are used for cleaning. The facility began limited operation in November 2001 and began actual production in the fall of 2003.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit (ADP) application number CL-3272 dated August 14, 2024. nLIGHT submitted ADP application CL-3272 requesting the following:

- Installation of a new electrically-powered Solvac Vapor Degreaser Ultrasonic Cleaning System to clean optics with residue.

ADP 24-3662 supersedes ADP 18-3294 in its entirety.

4. PROCESS DESCRIPTION

nLIGHT manufactures laser diodes using 3" gallium arsenide wafers and 2" indium phosphide wafers used in industrial, defense, and medical applications. Metals and organics are deposited on the wafers, and acid and solvent baths are used for cleaning.

The new vapor degreaser is used to clean optics (glass cubes) of wax after they have been removed from the wax.

Acids and solvents can evaporate from the baths when they are open to the atmosphere. The solvent emissions are exhausted directly to atmosphere. The acid emissions are vented to a packed bed scrubbing system utilizing water and enough caustic to maintain the pH between 7 and 9.

A variety of natural gas-fired equipment is used to provide space heating and cooling and to drive the humidification and dehumidification processes. Diesel-fired emergency generator sets are installed to provide emergency power.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a. Inorganic Workstations. Equipment in this category all exhaust to Scrubber SCR-1 and includes the following: fixture cleaning, ICP etcher, acid/base workstation, MTI multifab track system, rinse station, lapping/polishing work station and the plating station. Baths containing solutions of acetic acid, hydrochloric acid, hydrofluoric acid, nitric acid, phosphoric acid, sulfuric acid, hydrobromic acid, and hydrogen peroxide may be used to clean components. Six workstations contain up to four baths of each acid, the surface area of each bath is up to 0.56 square feet (9" square), the baths are at room temperature, the exhaust is maintained at 100 feet per minute across the baths, the baths will be uncovered a maximum of ten minutes per day, and the scrubber is at least 95% efficient at removal of the acids.

Scrubber SCR-1 Details: Viron scrubber model VHS-7272-FRP-18-60-S-2-H-460-3-60 horizontal cross flow scrubber designed to treat 18,000 cubic feet per minute (cfm) of gas. The scrubbing liquor recirculation rate is 140 gallons per minute (gpm) with a makeup rate of 0.5 to 10 gpm of fresh scrubbing liquor. The scrubber utilizes a 72-inch wide by 60-inch deep by 72-inch long bed of Viron 3-1/2 inch High Performance Jaeger Tri-Packs packing and an entrainment separator section consisting of a Viron mist eliminator. The scrubber is exhausted through a 36-inch diameter stack 17 feet above roof level.

5.b. MOCVD Tools and Gas Cabinet. The metal organic chemical vapor deposition (MOCVD) tools and gas cabinet can emit arsine and phosphine. A dry chemical (metal oxide) absorbent system is installed to control potential emissions of these pollutants. The absorbent canisters was replaced when the endpoint sensors detect arsine/phosphine at the location representing 90% lifetime used on Absorber 1 or 50% lifetime used on Absorber 2. The reaction with the metal oxide happens in a narrow band that travels vertically through the bed so that breakthrough is abrupt. Hydride gas flows will be terminated if system breakthrough is detected by the endpoint detectors on the absorber system or by the arsine/phosphine sensor operated downstream by the permittee. The downstream sensor has a lower detection limit of 18 ppb as arsine.

The following details of the system were provided:

Make / Model:	Cleansorb Primeline / CS200PD
Absorbent:	metal oxide
Capacity:	13,000 – 14,0000 liters of hydrides per 200-liter absorber (Each 200L canister expected to last 2-3 months) 250 standard (0°C, 1 bar) liters per minute (10 scfm)
Endpoint Detection:	Arsine (0-1 ppm) electrochemical cell operating continuously at 4 locations representing 90% lifetime of Absorber 1 100% lifetime of Absorber 1 50% lifetime of Absorber 2 100% lifetime of Absorber 2 Note that the MST electrochemical arsine cell being utilized responds to phosphine more strongly than arsine, so breakthrough of either chemical will be detected.
Configuration:	3 absorber canisters. Two 200-liter absorbers that can be configured in series or to operate with only one absorber (allowing on-line change-out of one absorber), and a single backup 25-liter absorber.

Two general building exhaust fans provide tool exhaust from the building. Only one fan is in operation at a time while the other is on standby. Each exhaust fan is rated at 17,500 cfm and exhausts through a 9.2 square foot outlet approximately 16 feet above roof level and 44.5 feet above ground level. Equipment exhausted by the general building exhaust system includes the gas cabinets, MOCVD Tools, CVD etch, plasma etcher, Rapid Thermal Annealer (RTA), and bench top drying ovens.

5.c. Solvent Evaporation (2 exhaust points). The solvent exhaust system collects solvent, primarily acetone, isopropyl alcohol, and methanol, vapor from tools including photo-resist coating machines, solvent workstations, and bake ovens. Six workstations each contain one isopropyl alcohol (IPA) and one acetone bath, the surface area of each bath is approximately 0.56 square feet, the exhaust is maintained at 100 feet per minute across the baths, and the baths will be uncovered a maximum of ten minutes per day. Methanol is used for cleaning parts and optics. Most of the methanol emissions come from solvent workstations operated in the same manner as the IPA and acetone workstations.

The solvent exhaust system consists of the following fans:

1. 1 fan with an exhaust rate of 1,500 cfm. (model G-HB240, s/n S1304901) The system collects vapors from the flammable chemical storage room. (identified by nLIGHT as EF-7) Exhausts through 12" diameter stack 90" above roof level, ~36' above ground level.
2. 1 fan with an exhaust rate of 10,000 cfm. (G-HB110/10-B1SW, s/n 1304901) The fan exhausts through a 2.9 square foot rectangular outlet approximately 4.5 feet above roof level and 33 feet above ground level. The system collects vapors from tools including photo-resist coating machines, solvent workstations, and bake ovens. (identified by nLIGHT as EF-6)

5.d. Caterpillar Emergency Generator Engine (Building E). The generator set provides up to 250 kW of electrical power to critical systems in the event of a power failure. Engine details are provided below:

Location:	Along the east side of the building near the southeast corner
Engine Make / Model:	Caterpillar / 3306B
Engine Serial Number:	09NR04957
Fuel:	Diesel, 19.0 gallons per hour @ full standby load
Engine Power:	382 horsepower (test data from Caterpillar)
Engine Built:	March 7, 2001
Installed:	2001
Engine Certification:	none
Stack Description:	~ 5" diameter exhausting vertically ~10' above grade with stack flow 2,175 acfm @ 994°F
Federal Regulations:	40 CFR 63 Subpart ZZZZ

5.e. Generac Emergency Generator Engine (Building D1). The generator set provides up to 50 kW of electrical power to critical systems in the event of a power failure. Engine generator set details are provided below:

Location:	Along southeast side of Building D1, 5408 NE 88th Street, Vancouver, WA 98665 ~ 45°41'18.22"N, 122°36'56.04"W
Engine Make / Model:	Generac / D3400T-Gen1
Engine Serial Number:	TP9E00018
Fuel:	Diesel
Fuel Consumption:	3.98 gallons per hour at full standby load
Horsepower Rating:	85 horsepower at full standby
Installation Date:	May 2015
Engine Built (Date):	February 2, 2015
Engine Certification:	EPA Tier 3 for stationary emergency
Generator Set Make / Model:	Generac / RD05034KDAE
Generator Set Output:	50 kW
Stack Description:	Exhausts vertically through grating on top of enclosure, ~5' above grade 448 acfm at 1,120°F
Federal Regulations:	40 CFR 60 Subpart IIII 40 CFR 63 Subpart ZZZZ

5.f. Natural Gas Fired Equipment. The following natural gas-fired equipment is used at the facility:

Unit	Heat Input Capacity (MMBtu/hr)
Make-up Air Unit 1 (MAU-1)	1.69
MAU-2	1.69
MAU-3 (not installed)	N/A
MAU-4 (new)	0.625
Air Handling Unit 10 (AHU-10)	0.54
AHU-11	0.23
Humidifiers H-1, H-2, H-3, H-4	2.4
Humidifier H-6 (new)	0.8
Dehumidifiers DH-1, DH-2	0.174
York Air Conditioners RTU-1, RTU-2	0.75
Thermal Processing Unit	0.08
Total =	**8.979**

5.g. Vapor Degreaser (new). One electrically-powered vapor degreaser ultrasonic cleaning system. The unit uses Chem-Crest SolvaClean.

Make / Model: Solvac, model S1-1010T
Exhaust: Vents through the Air Handling Unit 5 (AHU5), which is equipped with an internal HEPA filter rated to 0.3 microns.
Stack Description: AHU5 vents to a clean room and does not directly vent to the atmosphere.

As wax-coated parts (glass cubes) are lowered into the cleaner, solvent condenses onto the parts, rinsing them. Ultrasonics create vapor bubbles in the liquid which generate high pressure jets of solvent when they implode, and it is this action which helps remove particulates at a submicron level. A final rinse takes place in solvent vapors as the parts are removed from the process tank. Solvent remaining on the parts volatizes and drops back into the tank when moved into the Freeboard Zone, located just above the Vapor Zone.

5.h. Equipment/Activity Summary.

ID No.	Equipment/Activity	Control Equipment/Measure
1	Six (6) Inorganic Workstations	Scrubber SCR-1
2	Various MOCVD Tools	Absorbent canister system
3	Solvent Exhaust #1	Solvent baths covered when not in use
4	Solvent Exhaust #2	Solvent baths covered when not in use

ID No.	Equipment/Activity	Control Equipment/Measure
5	Caterpillar Emergency Generator Engine (Building E)	Ultra-low sulfur diesel (≤ 0.0015% S). Limited operation - (≤ 100 hr/yr + emergency usage)
6	Generac Emergency Generator Engine (Building D1)	Ultra-low sulfur diesel (≤ 0.0015% S). Limited operation - (≤ 100 hr/yr + emergency usage) EPA Tier 3 design
7	Natural Gas-Fired Equipment	Ultra-low sulfur fuel (natural gas)
8	Solvac Vapor Degreaser	None

6. EMISSIONS DETERMINATION

Unless otherwise specified by SWCAA, actual emissions must be determined using the specified input parameter listed for each emission unit and the following hierarchy of methodologies:

(a) Continuous emissions monitoring system (CEMS) data;
(b) Source emissions test data (EPA reference method). When source emissions test data conflicts with CEMS data for the time period of a source test, source test data must be used;
(c) Source emissions test data (other test method); and
(d) Emission factors or methodology provided in this TSD.

Nothing precludes the use, including the exclusive use of any credible evidence or information relevant to identifying or quantifying emissions if methods identified above, in the ADP, or elsewhere in this TSD have not provided adequate quantification of actual emissions.

6.a. Inorganic Workstations. SWCAA estimated emissions from the acid workstations which will be exhausted to the scrubbers based on the following equation: $Q = 5.10x10^{-6} * U^{0.78} * Pv * Mw^{0.67} * Ap^{0.94}$ where Q is the emission rate in grams per second, U is the wind speed in meters per second, Pv is the vapor pressure in Pascal, Mw is the molecular weight and Ap is the surface area in square meters. Each of the six workstations could contain up to four baths of each acid, the surface area of each bath could be up to 0.56 square feet (9" square), the baths will be at room temperature, exhaust will be maintained at 100 feet per minute, the baths will be uncovered a maximum of ten minutes per day, and the scrubber will be 95% efficient at removal of the acids.

Inorganic Workstations

Haz Mat Release Equation:

$Q=5.10x10^{-6} \times U^{0.78} \times Pv \times Mw^{0.67} \times Ap^{0.94}$

Pollutant	Bath Wt %	Mw Mol Wt (g/gmol)	Pv Vap Press (Pa)	Q E Rate (g/s)	Air Flow (ft/min)	Emissions (lb/yr)
Acetic acid	100	60.1	1,467	0.00428	100	2.5
Hydrochloric acid	37	36.5	36,930	0.07715	100	44.7
Hydrofluoric acid	50	20	2,000	0.00279	100	1.6
Nitric acid	69	63	548	0.00165	100	1.0
Phosphoric acid	85	98	285	0.00116	100	0.7
Sulfuric acid	98	98.1	0.0121	4.9E-08	100	2.8E-05

6.b. MOCVD Tools and Gas Cabinet. Potential emission of arsine and phosphine were calculated using an assumption that all the equipment was used 8,760 hours per year, with a total exhaust rate of 100 liters per minute (3.5 cubic feet per minute) combined for the two reactors at the guaranteed maximum concentrations of arsine and phosphine provided by the control device manufacturer at the end of the canister life (50 ppb arsine, 0.3 ppm phosphine). Actual emission concentrations are expected to be far below these concentrations until near the end of the canister life, because emissions rise exponentially when canister breakthrough is approached.

Source	Exhaust Flow (cfm)	Emission Concentration ppm*	Annual Operation (hours)	Emissions lb/hr	Emissions lb/yr
Arsine	3.53	0.050	8,760	2.1E-06	0.019
Phosphine	3.53	0.3	8,760	5.6E-06	0.05

6.c. Solvent Exhausts #1 and #2. Emissions of solvents (acetone, isopropyl alcohol, and methanol) have been estimated from a material balance with the assumption that all solvent purchased but not accounted for in waste streams evaporated to the ambient air. If the composition of a mixed waste solvent waste stream is not known, the permittee may assume that the solvent ratios in the waste are the same as the purchased solvent ratios unless otherwise directed by SWCAA.

The past approach of estimating solvent evaporation from workstations using a hazardous materials release equation was probably underestimating solvent emissions due to the large number of approximations inherent in the equation and in some cases the use of boiling solvent.

Potential annual emissions of each solvent were estimated at approximately twice the amount emitted in years 2013-2017 as calculated using a material balance approach. This emission level will also be the permit limit for each of these pollutants.

Pollutant	**lb/yr**
Acetone	3,000
Isopropyl Alcohol	3,000
Methanol	1,000

6.d. Caterpillar Emergency Generator Engine (Building E). 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.

Caterpillar Emergency Generator Engine (Building E)

Hours of Operation =	200	hours
Power Output =	382	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	19.0	gallons per hour (from Caterpillar)
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	4.29	0.43	Caterpillar
CO	0.95	0.095	Caterpillar
VOC	0.12	0.012	Caterpillar
SO_X as SO_2	0.0041	0.00041	Mass Balance
PM	0.11	0.011	Caterpillar
PM_{10}	0.11	0.011	Caterpillar
$PM_{2.5}$	0.11	0.011	Caterpillar

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	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	

6.e. Generac Emergency Generator Engine (Building D1). 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.

Generac Emergency Generator Engine (Building D1)

Hours of Operation =	200	hours
Power Output =	85	horsepower
Diesel Density =	7.206	pounds per gallon
Fuel Sulfur Content =	0.0015	% by weight
Fuel Consumption Rate =	3.98	gal/hr
Fuel Heat Content =	0.138	MMBtu/gal (for use with GHG factors from 40 CFR 98)

Pollutant	Emission Factor g/(kW-hr)	Emissions lb/hr	Emissions tpy	Emission Factor Source
NO_X	3.5	0.49	0.05	EPA Certification Test
CO	3.50	0.49	0.049	EPA Certification Test
VOC	0.19	0.027	0.0027	EPA Certification Test
SO_X as SO_2		0.00086	0.000086	Mass Balance
PM	0.15	0.021	0.0021	EPA Certification Test
PM_{10}	0.15	0.021	0.0021	EPA Certification Test
$PM_{2.5}$	0.15	0.021	0.0021	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	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	74.0		163.6	23	9	

6.f. Natural Gas Fired Equipment. Potential annual emissions from the combustion of natural gas facility-wide were calculated with the assumption that the natural gas fired equipment will operate at full capacity for 8,760 hours per year.

Natural Gas Fired Equipment

Heat Input Rating =	8.979	MMBtu/hr
Natural Gas Geat Content =	1,020	Btu/scf (for criteria pollutant emission factors)
Natural Gas Heat Content =	1,028	Btu/scf (for 40 CFR 98 GHG emission factors)
Annual Fuel Consumption =	78,656	MMBtu/yr

Pollutant	Emission Factor lb/MMBtu	Emissions lb/hr	Emissions lb/yr	Emissions tpy	Emission Factor Source
NO_X	0.0980	0.88	7,711	3.86	AP-42 Sec. 1.4 (7/98)
CO	0.0824	0.74	6,478	3.24	AP-42 Sec. 1.4 (7/98)
VOC	0.0054	0.05	424	0.21	AP-42 Sec. 1.4 (7/98)
SO_X as SO_2	0.0006	5.3E-03	46	0.023	AP-42 Sec. 1.4 (7/98)
PM (total)	0.0075	0.07	586	0.29	AP-42 Sec. 1.4 (7/98)
PM_{10}	0.0075	0.07	586	0.29	AP-42 Sec. 1.4 (7/98)
$PM_{2.5}$	0.0075	0.07	586	0.29	AP-42 Sec. 1.4 (7/98)
Benzene	2.06E-06	1.8E-05	1.6E-01	8.1E-05	AP-42 Sec. 1.4 (7/98)
Formaldehyde	7.35E-05	6.6E-04	5.8E+00	2.9E-03	AP-42 Sec. 1.4 (7/98)

Greenhouse Gases	kg/MMBtu	GWP	lb/MMBtu	lb/MMscf	tpy, CO_2e	Emission Factor Source
CO_2	53.02	1	116.89	120,162	4,597	40 CFR 98
CH_4	0.001	21	0.046	47.59	1.82	40 CFR 98
N_2O	0.0001	310	0.068	70.26	2.69	40 CFR 98
Total GHG - CO_2e	53.0211		117.004	120,280	4,602	

6.g. Solvac Vapor Degreaser (new). Potential annual emissions from the vapor degreaser were calculated with the assumption that the solvent evaporation rate while running is 0.0039 gal/hr and zero in standby mode. The density and VOC content of the Chem-Crest SolvaClean solvent is 10.57 lb/gallon, each.

Vapor Degreaser				
Gallons per year		10.0	gal/yr	
Pounds per year		105.7	lb/yr	
VOC pounds per year		105.7	lb/yr	
Toxic Air Pollutant	CAS #	Percentage	Emissions (lb/yr)	SQER (lb/day)
trans-Dichloroethylene	156-60-5	80	84.56	60

6.h. Emissions Summary

Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
NO_x	4.33	--
CO	3.38	--
VOC	2.28	0.042
SO_2	0.02	--
PM	0.31	--
PM_{10}	0.31	--
$PM_{2.5}$	0.31	--
TAPs	3.53	0.042
HAPs	0.53	--
CO_2/CO_2e	4,654	--

Toxic/Hazardous Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
Acetic acid	1.2E-03	--
Acetone	1.5E+00	--
Arsine	9.4E-06	--
Benzene	8.1E-05	--
trans-Dichloroethylene	4.1E-02	4.2E-02
Formaldehyde	2.9E-03	--
Hydrochloric acid	2.2E-02	--
Hydrofluoric acid	8.1E-04	--
Isopropyl alcohol	1.5E+00	--
Methanol	5.0E-01	--
Nitric acid	4.8E-04	--
Phosphine	2.5E-05	--

Toxic/Hazardous Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
Phosphoric acid	3.3E-04	--
Potassium hydroxide	Negligible	--
Sulfuric acid	1.4E-08	--

7. REGULATIONS AND EMISSION STANDARDS

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

7.a. 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. This regulation establishes emission standards, hours limitations, and maximum fuel sulfur content for "emergency" engines. The Caterpillar Emergency Generator Engine (Building E) is not an affected source because it was manufactured before the relevant applicability date (April 1, 2006). The Generac Emergency Generator Engine is an affected source.

7.b. 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. The Emergency Generator Engines are affected sources under this regulation. For the purposes of this regulation, the Caterpillar Emergency Generator Engine (Building E) is an "existing" unit and the Generac Emergency Generator Engine is a "new" unit. 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. 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.c. Revised Code of Washington (RCW) 70A.15.2040 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement, and control of air pollution within its jurisdiction. An air pollution control authority may issue such orders as may be necessary to effectuate the purposes of the Washington Clean Air Act (RCW 70A.15) and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess. This law applies to the facility.

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

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

The facility emits TAPs; therefore, this regulation applies to the facility.

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

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

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

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

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

7.k. SWCAA 400-040(4) "Odors" requires any source which generates odors that may unreasonably interfere with any other property owner's use and enjoyment of their property to use recognized good practice and procedures to reduce these odors to a reasonable minimum. This source must be managed properly to maintain compliance with this regulation. This regulation applies to the facility.

7.l. SWCAA 400-040(5) "Emissions Detrimental to Persons or Property" prohibits the emission of any air contaminant from any "source" if it is detrimental to the health, safety, or welfare of any person, or causes damage to property or business. Some of the coating materials utilized at this facility contain compounds that are not TAPs under WAC 173-460, however can be harmful if inhaled. If no filtration is used, the ambient impact could exceed the relevant worker health thresholds for these compounds.

7.m. SWCAA 400-040(6) "Sulfur Dioxide" requires that no person is allowed to emit a gas containing in excess of 1,000 ppmd of SO_2, corrected to 7% O_2 or 12% CO_2 as required by the applicable emission standard for combustion sources.

The facility emits SO_2; therefore, this regulation applies to the facility.

7.n. SWCAA 400-040(8) "Fugitive Dust Sources" requires that reasonable precautions be taken to prevent fugitive dust from becoming airborne and to minimize emissions. This regulation applies to the facility.

7.o. SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met, and that no person is allowed to cause or permit the emission of PM from any combustion or incineration unit in excess of 0.23 g/Nm^3_{dry} (0.1 gr/dscf) of exhaust gas at standard conditions.

The facility has combustion units; therefore, this regulation applies to the facility.

7.p. SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing general process units do not emit PM in excess of 0.23 g/Nm^3_{dry} (0.1 gr/dscf) of exhaust gas. The facility has general process units; therefore, this regulation applies to the facility.

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

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

7.s. SWCAA 400-111 "Requirements for Sources in a Maintenance Plan Area" requires that no approval to construct or alter an air contaminant source will be granted unless it is evidenced that:

(1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;
(2) 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) BACT 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 facility is located in a maintenance plan area; therefore, this regulation applies to the facility.

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

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

New BACT Determination

8.a. BACT Determination – Vapor Degreaser. The proposed vapor degreaser does not have any direct emission points and uses a small amount of solvent annually. This operation meets the requirements of BACT for the types and quantities of emissions from the vapor degreaser.

Previous BACT Determinations

8.b. BACT Determination – MOCVD Tools and Gas Cabinet (ADP 18-3294). The use of the proposed dry absorbent system to control emissions of arsine and phosphine will provide a high level of emission control, reducing potential emissions to well below the relevant Small Quantity Emission Rates listed in WAC 173-460. The absorbent reacts with the arsine and phosphine producing a solid product in an irreversible reaction. Unless system breakthrough occurs, emissions through the system should be negligible. This system will not have the combustion-related emissions inherent with the thermal oxidizer system that it replaces. In addition, it will not rely on a scrubber system to control emissions of arsenic pentoxide and phosphoric acid or require scrubbing water treatment. Based on SWCAA's review the proposed dry absorbent system would be the top choice in a top-down BACT analysis and meets the requirements of BACT.

8.c. BACT Determination – Increased Solvent Emission Limit (ADP 18-3294). Many options exist to control solvent emissions. SWCAA reviewed the estimated cost of controlling emissions of acetone, isopropyl alcohol, and methanol using various oxidation technologies using EPA's Air Pollution Control Cost Estimation Spreadsheet (2018). The calculations used the extreme assumption that all emissions occurred during a period of only 100 hours per year. This methodology minimizes the operational cost impacts. All oxidation control options exceeded $11,000 per ton of pollutant controlled, therefore SWCAA concluded that oxidation was not a cost-effective control option for these pollutants.

At the emission limits provided in the Air Discharge Permit, SWCAA believes that no additional emission controls are necessary to meet the requirements of BACT.

8.d. BACT Determination – Make-up Air Handling Unit (MAU-4) and Humidifier (H-6) (ADP 12-2998). The use of natural gas meets the requirements of BACT for these units at this facility. These units are not equipped with low-emission burners because such burners are not available for these units with the turn-down capability necessary to support operations.

8.e. RACT Statement – Diesel Fuel Emergency Generator Engine (ADP 12-2998). Because diesel containing no more than 15 ppm sulfur is widely available and not significantly more expensive than diesel containing up to 500 ppm sulfur, the use of diesel meeting this specification is required to meet the intent of the RACT requirements. The use of lower sulfur diesel will minimize SO_2 and PM emissions from the engine.

8.f. BACT Determination – MOCVD Tools and Gas Cabinet – (ADP 01-2368). The use of a thermal processing unit meets the requirements of Best Available Control Technology (BACT) and T-BACT to control the kinds and amounts of air contaminants, including toxic air pollutants, emitted from the Respondent's processes. Note that Air Discharge Permit 18-3294 approves replacement of the thermal processing unit with the absorbent system described in 8.a.

8.g. BACT Determination – MOCVD Tools and Gas Cabinet, Inorganic Workstations (ADP 01-2368). The use of pH-controlled scrubbers meets the requirements of BACT and T-BACT to control the kinds and amounts of air contaminants sent to these units, including toxic air pollutants, emitted from the Respondent's processes.

8.h. BACT Determination – Natural Gas Fired Equipment (ADP 01-2368). The use of natural gas has been determined to meet BACT for space heating/cooling and humidification/dehumidification processes.

8.i. BACT Determination – Emergency Generator Engine (ADP 01-2368). Limited use of the emergency diesel generator of less than 500 hours per year utilizing low sulfur (<0.05% by weight) diesel fuel, and modern engine design has been determined to meet BACT for the types and quantities of emissions from this equipment.

PSD / CAM Determinations

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

8.k. Compliance Assurance Monitoring (CAM) Applicability Determination. CAM is not applicable to any emission unit at this facility because it is not a major source and is not required to obtain a Part 70 (Title V) permit.

9. AMBIENT IMPACT ANALYSIS

9.a. Criteria Air Pollutant Review. Emissions of NO_x, CO, PM, VOC (as a precursor to O_3), and SO_2 are emitted at levels where no adverse ambient air quality impact is anticipated.

9.b. Toxic Air Pollutant Review. Based on the emission calculations in accordance with Section 6 for the emission units and activities described in ADP application CL-3272, none of the estimated emission rates exceed the Small Quantity Emission Rate (SQER) specified in WAC 173-460; therefore, no adverse ambient air quality impact is anticipated.

Conclusions

9.c. Construction and operation of the vapor degreaser, as proposed in ADP application CL-3272, will not cause the ambient air quality requirements of 40 CFR 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.d. Construction and operation of the vapor degreaser, as proposed in ADP application CL-3272, will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" or WAC 173-476 "Ambient Air Quality Standards" to be violated.

9.e. The vapor degreaser, as proposed in ADP application CL-3272, will not violate emission standards for sources as established under SWCAA General Regulations Sections 400-040 "General Standards for Maximum Emissions," 400-050 "Emission Standards for Combustion and Incineration Units," and 400-060 "Emission Standards for General Process Units."

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue ADP 24-3662 in response to ADP application CL-3272. ADP 24-3662 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards, as discussed below.

10.a. Supersession of Previous Permits. ADP 24-3662 supersedes ADP 18-3294 in its entirety. Compliance will be determined under this ADP, not previously superseded ADPs. Existing approval conditions for units not affected by this project have been carried forward unchanged.

10.b. Emission Limits. Facility-wide emission limits are based on the sum of the emission limits for approved equipment calculated in Section 6 of this TSD.

Visible emissions from the vapor degreaser systems have been limited to zero percent opacity, consistent with proper operation.

10.c. Operational Limits and Requirements. Requirements for the facility were carried forward from ADP 18-3294.

The vapor degreaser must not exceed a specified usage per year.

10.d. Monitoring and Recordkeeping Requirements. ADP 24-3662 establishes monitoring and recordkeeping requirements sufficient to document compliance with applicable emission

limits, ensure proper operation of approved equipment, and provide for compliance with generally applicable requirements.

10.e. Reporting Requirements. ADP 24-3662 establishes general reporting requirements for annual air emissions, upset conditions, and excess emissions. Specific reporting requirements are established for hours operated, fuel consumption, and material throughput.

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

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

Emergency Generator. Visible emissions from the emergency generator engines are limited to 5% opacity or less during normal operation. However, the engine is not capable of reliably limiting visible emissions to less than 5% opacity until the engine achieves normal operating temperature. Therefore, the 5% opacity limit does not apply to the generator exhaust during start-up periods.

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

11.c. Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures were identified by either the permittee or SWCAA separate or in addition to those measures required under BACT considerations. Therefore, none were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

No emission monitoring or testing requirements are established as part of this permitting action.

13. FACILITY HISTORY

13.a. Previous Permitting Actions. The following past permitting actions have been taken by SWCAA for this facility:

Permit / Order #	Application #	Date Issued	Description
01-2368	CL-1507	July 30, 2001	Initial installation of laser diode manufacturing facility.
SUN-6 Denial	SUN-6	September 9, 2011	Denied because proposed humidifier (H-6) did not meet the NO_X standard for use of SUN.
SUN-6 Denial	SUN-7	September 9, 2011	Denied because proposed make-up air handling unit (MAU-4) did not meet the NO_X standard for use of SUN.
12-2998	CL-1952	January 10, 2012	Approval to utilize one new natural gas fired make-up air handling unit (MAU-4) and one new natural gas fired humidifier (H-6).
SUN-081 Approval	SUN-081	May 19, 2015	Approval of Generac Emergency Generator Engine (Building D1)
18-3294	CL-3033	August 1, 2018	To clarify emissions determinations and to replace the Zenith thermal oxidizer for controlling phosphine and arsine from metal organic chemical vapor deposition tools with a canister-based dry adsorbent technology. Superseded ADP 12-2998 and SUN-081.

Bold font indicates that the approval, Order, or ADP has been superseded.

13.b. Compliance History. A search of source records on file at SWCAA did not identify any previous or outstanding compliance issues over the past five (5) years.

14. PUBLIC INVOLVEMENT OPPORTUNITY

14.a. Public Notice for ADP Application CL-3272. Public notice for ADP application CL-3272 was published on the SWCAA website for a minimum of fifteen (15) days beginning on August 14, 2024.

14.b. Public/Applicant Comment for ADP Application CL-3272. SWCAA did not receive specific comments, a comment period request, or any other inquiry from the public or the applicant regarding ADP application CL-3272. Therefore, no public comment period was provided for this permitting action.

14.c. State Environmental Policy Act. After review of the SEPA Checklist for this project, SWCAA has determined that the project does not have a probable significant impact on

the environment and has issued Determination of Non-Significance 24-034 An Environmental Impact Statement is not required under RCW 43.21C.030(2)(c).