TECHNICAL SUPPORT DOCUMENT

Air Discharge Permit 23-3561
Air Discharge Permit Application CL-3209

Issued: January 19, 2023

Analog Devices, Inc.

SWCAA ID – 1897

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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
CEMS..... Continuous Emission Monitoring System
CFR..... Code of Federal Regulations
EPA..... U.S. Environmental Protection Agency
EPI ..... Epitaxial
EU ..... Emission Unit
GWP..... Global Warming Potential
LAER..... Lowest achievable emission rate
LTO..... Low Temperature Oxide
MACT..... Maximum Achievable Control Technologies
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
RICE ..... Reciprocating Internal Combustion Engine
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
cfh ..... Cubic foot per hour
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
pH .....Negative log of the hydrogen ion concentration, $-\log_{10}([H^+])$
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
scf .....Standard cubic foot
scfm .....Standard cubic foot per minute
tpy.....Tons per year

List of Chemical Symbols, Formulas, and Pollutants

C_3H_8 ..... Propane
CH_4..... Methane
Cl_2 ..... Chlorine gas
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
H_2SO_4..... Sulfuric acid
HCl..... Hydrochloric acid or hydrogen chloride
HF ..... Hydrofluoric acid or hydrogen fluoride
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
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:	Analog Devices Inc.
Applicant Address:	4200 NW Pacific Rim Blvd., Camas, WA 98607
Facility Name:	Analog Devices Inc.
Facility Address:	4200 NW Pacific Rim Blvd., Camas, WA 98607
Contact Person:	Doug Moody, EHS Manager
SWCAA Identification:	1897
Primary Process:	Semiconductor Manufacturing
SIC/NAICS Code:	3674: Semiconductors and Related Devices 334413: Silicon wafers, chemically doped, manufacturing
Facility Classification:	Natural Minor

2. FACILITY DESCRIPTION

Analog Devices Inc. (ADI) is a semiconductor manufacturer that designs, manufactures, and markets analog, mixed-signal, and digital signal processing integrated circuits (ICs). The Camas facility produces six-inch wafers.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit (ADP) application number CL-3209 received August 17, 2022, which was deemed complete on November 16, 2022. ADI submitted ADP Application CL-3209 requesting the following:

- Increase VOC and toxic air pollutant emissions and modify appropriate emission limits because of production increases;
- Approval to install a new Acid Scrubber SC-5; and
- Approval to operate both Ammonia wet Scrubbers (SC-3 and SC-4) simultaneously

ADP 23-3561 will supersede ADP 21-3492 in its entirety.

4. PROCESS DESCRIPTION

4.a. Boilers. Two 12.6 MMBtu/hr boilers and one 5 MMBtu/hr boiler provide space and process heat to the buildings.

4.b. Emergency Power Generation. Two diesel-fired engine driven generators, 749 bhp and 765 bhp, can be used to generate emergency electrical power at the facility.

4.c. Wet Mask Process Area. The wet mask process area consists of process equipment that deposit or etch materials on/from the wafers and several cleaning processes. The cleaning processes use volatile organic compounds (VOC) which are exhausted uncontrolled through the solvent exhaust stack. The etch and deposition areas are exhausted through the scrubber systems as described below:

- In the poly etch system, silicon wafers are treated with small quantities of plasma-excited gases. These gases react with microscopically thin layers of polysilicon material on the wafers to selectively remove material from the wafers. Part of the gas is consumed in the process and generates reactant gases. The gases pass through the reaction chamber and is routed to the acid scrubbers.
- In the nitride etch system and plasma nitride etch system, wafers are treated with small quantities of plasma-excited gases. These gases react with thin layers of silicon nitride material on the wafers to selectively remove material from the wafers. Part of the gas is consumed in the process and generates reactant gases. The balance of the gases passes through the reaction chamber and to the acid scrubbers.
- In the plasma asher system, wafers are treated with small quantities of plasma-excited oxygen. The plasma field creates reactive oxygen that burns organic material from the surface of the wafers. Reactant gases and unused oxygen exhaust to the acid scrubbers.

In the oxide etch system wafers are treated with minute quantities of plasma-excited gases. These gases react with thin layers of silicon dioxide material on the wafers and selectively remove material from the wafers. Part of the gas is consumed in the process and generates reactant gases. The balance of the gases passes through the chamber and to the exhaust system which is routed to the acid scrubbers.

4.d. Diffusion Area. The diffusion area consists of process equipment that deposit certain materials on the wafers. The processes that involve chemical reactions and emit toxic air pollutants (TAPs) are exhausted to the scrubber system and include the following:

- In the plasma-enhanced chemical vapor deposition oxide deposition process, wafers are exposed to minute quantities of plasma-excited gases which clean both the silicon wafers and the vacuum chamber surface. Gases exhaust to the acid scrubbers.
- In the plasma-enhanced chemical vapor deposition nitride deposition process, wafers are exposed to small quantities of plasma-excited gases which react with each other to deposit microscopically thin layers of silicon nitride material on the surface of the wafers. Gases exhaust to the acid scrubbers.
- The diffusion furnaces thermally treat silicon wafers in ambient pressure tubes in the presence of moderate quantities of process gases. These gases react with the silicon wafers and grow microscopically thin layers of silicon dioxide on the wafers while performing solid-state diffusion operations within the wafers. A very small part of the gases will be consumed in the process and the balance passes from the exhaust furnace tubes and to the acid scrubbers.
- The diffusion/boron and phosphorus deposition system furnaces chemically treat wafers in ambient pressure tubes in the presence of small quantities of dopant materials. These materials react with and penetrate the silicon wafers while performing solid-

state diffusion operations within the wafer. A moderate portion of the material is consumed in the process and the balance passes from the exhaust furnace to the acid scrubbers.

- In the low-pressure chemical vapor deposition nitride process and the low-pressure vapor deposition poly process, wafers are inserted into diffusion furnace tubes maintained under a vacuum. Wafers are thermally treated in the presence of moderate quantities of process gases. These gases react with each other to deposit microscopically thin layers of silicon nitride material on the wafers. This process is exhausted to the acid scrubbers.
- In the low-pressure, chemical vapor low temperature oxide (LTO) deposition process, wafers are inserted into diffusion furnace tubes and maintained under vacuum. The wafers are thermally treated to deposit microscopically thin layers of LTO material on the wafers. The system exhausts to the acid scrubbers.

Several process wet benches used to clean and treat the wafers are also located in the diffusion area. Ammonia emissions from these wet benches are exhausted to Ammonia Scrubbers SC-3 and SC-4.

4.e. Thin Film Area. In the thin film area, a spin-on glass process emits VOCs, which will be exhausted uncontrolled through the solvent exhaust stack. The thin film area also contains a metal etch system in which wafers are exposed to plasma-excited gases which react with thin layers of metallic material to selectively remove material from the wafers. Exhaust gases are routed to Acid Scrubbers SC-1, SC-2, and SC-5 (new).

4.f. Wet Bench Cleaning. Wafers are cleaned in various acid, base, or solvent baths. These baths are vented through the acid scrubbers, ammonia scrubbers, or solvent exhausts, depending on the chemicals being used.

4.g. Ion Implant Area Epitaxial (EPI) Deposition Furnaces. This area consists of several EPI furnaces and implanters which emit TAPs.

The metal etch process is carried out in a vacuum chamber where wafers are treated with minute quantities of plasma-excited gases. These gases react with microscopically thin layers of metallic material on the wafers to selectively remove material from the wafers. The exhaust gases are routed through the acid scrubbers.

The ion implant process consists of a vacuum chamber where wafers are exposed to minute doses of very high energy ion beams to deposit precisely controlled quantities of chemical dopants onto the surface of the wafers. No chemical reactions occur but minute quantities of the dopant gases are exhausted to the acid scrubbers.

In the epitaxial deposition furnace process, wafers are inserted into an ambient pressure process chamber and exposed to moderate quantities of thermally excited gases. These gases react with each other and deposit microscopically thin layers of epitaxial silicon material onto the wafers. The gases will clean the process chamber surface, which then are routed through the EPI scrubbers.

4.h. Dry Mask Process Area. The dry mask process area contains coating and developing tools which coat the wafers with thin layers of photoresist to create a pattern on the wafer. The photoresist material contains VOCs which exhaust uncontrolled through one of two solvent exhaust stacks. The photoresist support area also contains small amounts of solvents which exhaust uncontrolled through a solvent exhaust stack.

4.i. Dry Mask Support Areas. In addition to the process areas, there are several rooms/processes used in support of the fab process. This includes some cleaning areas, a satellite storage room, solvent room, and waste storage. Emissions are collected but are not controlled from these processes.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a. Boiler #1. This Bryan boiler provides space heat to the facility and is equipped with flue-gas recirculation. This boiler's exhaust is ducted into a common stack with the other two boilers with an induced draft air source common to the room.

Boiler Manufacturer:	Bryan
Installation Year:	2010 (new burner)
Model Number:	RW1260-FDG
Serial Number:	77816
Heat Rate:	12.6 MMBtu/hr
Burner Manufacturer:	Power Flame Inc.
Burner Model Number:	CM9A-G(O)-30
Stack Diameter:	2′ 7‴ (combined stack)
Stack Height:	47′ (combined stack)
Stack Flow:	2,240 acfm (EPA Method 19)
Stack Temperature:	315 °F
Initial Test:	12/12/1996

5.b. Boiler #2. This Bryan boiler provides space heat to the facility and is equipped with flue-gas recirculation. This boiler's exhaust is ducted into a common stack with the other two boilers with an induced draft air source common to the room.

Boiler Manufacturer:	Bryan
Installation Year:	2010 (new burner)
Model Number:	RW1260-FDG
Serial Number:	77799
Heat Rate:	12.6 MMBtu/hr
Burner Manufacturer:	Power Flame Inc.
Burner Model Number:	CM9A-G(O)-30
Stack Diameter:	2′ 7″ (combined stack)
Stack Height:	47′ (combined stack)
Stack Flow:	2,240 acfm (EPA Method 19)

Stack Temperature:	315 °F
Initial Test:	12/12/1996

5.c. Boiler #3. This Bryan boiler "Flexible Water Tube" RV series is equipped with a Gordon Piatt low-NO_x burner having a variable turndown ratio (4:1 and 10:1 with and without induced flue gas recirculation, respectively). This boiler's exhaust is ducted into a common stack with the other two boilers with an induced draft air source common to the room.

Boiler Manufacturer:	Bryan, "Flexible Water Tube" RV series
Model Number:	RV500-W-FDG-LX
Serial Number:	92058
Heat Rate:	5.0 MMBtu/hr
Burner Manufacturer:	Ponder
Burner Model Number:	N/A
Stack Diameter:	2′ 7″ (combined stack)
Stack Height:	47′ (combined stack)
Stack Flow:	850 acfm
Stack Temperature:	415 °F
Initial Test:	Not required to be tested

5.d. Emergency Generator Engine #1. This Caterpillar generator set engine provides emergency backup power to the facility.

Engine Make:	Caterpillar
Engine Model:	3412
Engine Serial Number:	81Z18367
Engine Output Rating:	749 bhp at 1800 rpm
Manufacture Date:	2001
Certification:	Not Tier Certified
Fuel Consumption:	40.4 gal/hr at full standby load
Generator Rating:	500 kW
Generator Make:	Caterpillar
Generator Serial Number:	81222434
Exhaust Flow Rate:	1,227 dscfm
Stack Height:	12′ from ground
Stack Diameter:	8″
Stack Temperature:	1,187 °F
Initial Test:	Not required to be tested

5.e. Emergency Generator Engine #2. This Caterpillar generator set engine provides emergency backup power to the facility.

Engine Make:	Caterpillar
Engine Model:	3456
Engine Serial Number:	7WG02331
Engine Output Rating:	765 bhp at 1,800 rpm

Manufacture Date:	2004
Certification:	Not Tier Certified
Fuel Consumption:	36.3 gal/hr at full standby load
Generator Rating:	500 kW
Generator Make:	Caterpillar
Generator Serial Number:	CER01125
Exhaust Flow Rate:	1,384 acfm
Stack Height:	10′ from ground
Stack Diameter:	8″
Stack Temperature:	980 °F
Initial Test:	Not required to be tested

5.f. Wet Mask Process Area, Wet Bench Cleaning, Diffusion Area, and Thin Film Area. Emissions generated through the acid and metal etching processes are vented through two acid scrubbers.

Acid Scrubber SC-1. This Harrington scrubber has two pumps operating in a lead/lag configuration maintain the recirculation water flow rate at 540–675 gpm. The scrubber contains five feet of 3½″ thick polypro packing material and a T-125 sine shape mist eliminator. This scrubber is located on the roof.

Model Number:	ECH-915-5LB
Scrubber Type:	Horizontal cross flow
Stack Diameter:	60″
Stack Height:	47′
Stack Flow:	65,000 acfm
Initial Test:	12/12/1996

Acid Scrubber SC-2. This Harrington scrubber operates with a recirculation water flow rate of 750 gpm and a makeup flow rate of 22.5 gpm. The scrubber contains five feet of 3½″ thick polypro packing material and a T-120 sine wave blade mist eliminator. This scrubber is located on the roof.

Model Number:	ECH 1015-5LB
Scrubber Type:	Horizontal cross flow
Stack Diameter:	60″
Stack Height:	47′
Stack Flow:	75,000 acfm
Initial Test:	3/11/2005

Acid Scrubber SC-5 (new). This Verantis scrubber operates with a minimum recirculation water flow rate of 430 gpm and a makeup flow rate of 15 gpm. The scrubber contains six feet of No. 3 TypeK Tellerette polypro packing material and a cheveron mist eliminator. This scrubber is located on the roof.

Model Number:	HRP-129-132
Scrubber Type:	Horizontal cross flow
Stack Diameter:	60″
Stack Height:	47′
Stack Flow:	75,000 acfm
Initial Test:	TBD

5.g. Wet Bench Cleaning Area. Emissions from the wet bench area, consisting mostly of ammonia, are vented to two ammonia scrubbers.

Ammonia Scrubber SC-3. This Harrington scrubber is pH adjusted using a solution of 1–2% sulfuric acid (H_2SO_4). The scrubber has a design air flow rate of 4,000 acfm. The overall dimensions of the unit are 131″ in length, 67″ in height and 55″ in width. The scrubber contains five feet of 3½″ thick polypro packing material and a T-125 sine wave shape mist eliminator. The scrubber recirculating system maintains the scrubber liquor flow rate at 30 gpm. This scrubber is located on the roof.

Model Number:	ECH3
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	14⅛″
Stack Height:	47′
Stack Flow:	1,680 acfm
Initial Test:	12/12/1996

Ammonia Scrubber SC-4. This Harrington scrubber is designed to control 6,000 acfm of air flow using H_2SO_4 for pH control. The scrubber will operate with a liquor recirculation flow rate of 60 gpm and a make-up water flow rate of 2 gpm. The overall dimensions of the unit are 138″ in length, 74″ in height and 65″ in width. The scrubber will contain five feet of 3½″ thick polypro packing material and a T-125 sine shape mist eliminator.

Model Number:	ECH 34-5LB
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	TBD
Stack Height:	47′
Stack Flow:	6,000 acfm
Initial Test:	Not tested

5.h. Ion Implant Area EPI Deposition Furnaces. Eight EPI Deposition Furnaces are in operation, SC-A through SC-H.

EPI Scrubber SC-A. EPI Deposition Furnace #W-515 is controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber operates with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	1657-C
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	5/22-23/2000

EPI scrubber SC-B. EPI Deposition Furnace #W-513 is controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber operates with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	1655-C
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	6/10/1997

EPI scrubber SC-C. EPI Deposition Furnace #W-514 is controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber operates with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	1656-C
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	6/9/1997

EPI scrubber SC-D. EPI Deposition Furnace #W-1003 is controlled by a Chemical Equipment Technology (CET), Inc. Jupiter 2 Series (m/n CET-J2) scrubber that is 20″ by 24″ by 60″ in height with recirculation water flow rate of 26 gpm and a makeup flow rate of 1.5 gpm. This scrubber is located on the roof.

Model Number:	CET-J2
Serial Number:	Unknown

Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	4/10/2001

EPI scrubber SC-E. EPI Deposition Furnace #W-1005 is controlled by a CET Jupiter 2 Series (m/n CET-J2) scrubber that is 20″ by 24″ by 60″ in height with recirculation water flow rate of 26 gpm and a makeup flow rate of 1.5 gpm. This scrubber is located on the roof.

Model Number:	CET-J2
Serial Number:	J1933
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	4/10/2001

EPI scrubber SC-F. EPI Deposition Furnace #W-1008 is controlled by a CET Jupiter 2 Series (m/n CET-J2) scrubber that is 20″ by 24″ by 60″ in height with recirculation water flow rate of 26 gpm and a makeup flow rate of 1.5 gpm. This scrubber is located on the roof.

Model Number:	CET J-2
Serial Number:	J1933A
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	8/28/2001

EPI scrubber SC-G. EPI Deposition Furnace #W-1012 is controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber operates with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	Unknown
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)

Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	9/22/2009

EPI scrubber SC-H. EPI Deposition Furnace #W-1016 is controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber operates with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	1081-C
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	2/25/2015

EPI scrubber SC-I. EPI Deposition Furnace #W-1026 will be controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber will operate with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	TBD
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm
Exhaust Temperature:	65 °F
Initial Test:	3/2/2022

EPI scrubber SC-J. EPI Deposition Furnace #W-1027 will be controlled by an Airgard Cyclone scrubber that consists of an initial spray chamber followed by a second spray chamber and a final packed column. It is 24½″ by 32½″ by 90½″ in height. The scrubber will operate with a recirculation water flow rate of 17 gpm, a makeup flow rate of 1.5 gpm, and is located on the roof.

Model Number:	Touchstone Cyclone
Serial Number:	TBD
Scrubber Type:	Horizontal cross flow packed column
Stack Diameter:	2″
Stack Height:	47′ (horizontal tee)
Stack Flow:	21 acfm

Exhaust Temperature: 65 °F
Initial Test: Not tested

5.i. Wet Bench Cleaning and Dry Mask Area – Phase I. Heat and solvent from the Phase I Fab dry mask area are exhausted, uncontrolled, to the roof at a maximum of 30,800 acfm through a 3′ diameter stack, Dry Mask Solvent Exhaust Stack EXF-7, at approximately 47′ above ground level.

5.j. Wet Bench Cleaning and Dry Mask Area – Phase II. Heat and solvent from the Phase II Fab dry mask area are exhausted, uncontrolled, to the roof at a maximum of 30,815 acfm through a 3′ diameter stack, Dry Mask Solvent Exhaust Stack EXF-9, at approximately 47′ above ground level.

5.k. Wet Bench Cleaning and Dry Mask Support Areas. Heat and solvent from the dry mask support areas, including the Line Maintenance shop, Quality Assurance, and Backgrind areas, are exhausted, uncontrolled, to the roof at a maximum of 5,530 acfm through a 12″ diameter stack, Dry Mask Solvent Exhaust Stack EXF-8, at approximately 47′ above ground level.

5.l. Equipment/Activity Summary.

EU No.	Generating Equipment/Activity	Control Equipment
1	Boiler #1 – Bryan (m/n RW1260)	Low NO_x burner
2	Boiler #2 – Bryan (m/n RW1260)	Low NO_x burner
3	Boiler #3 – Bryan (m/n RV500-W)	Low NO_x burner
4	Emergency Generator Engine #1 – Caterpillar (m/n 3412), 749 bhp	Ultra-low sulfur fuel (15 ppmw S)
5	Emergency Generator Engine#2 – Caterpillar (m/n 3456 ATAAC), 765 bhp	Ultra-low sulfur fuel (15 ppmw S)
6	Wet Mask Process Area, Wet Bench Cleaning, Diffusion Area and Thin Film Area	Acid Scrubber SC-1 – Harrington
7	Wet Mask Process Area, Wet Bench Cleaning, Diffusion Area and Thin Film Area	Acid Scrubber SC-2 – Harrington
8	Wet Bench Cleaning	Ammonia Scrubber SC-3 – Harrington
9	Wet Bench Cleaning	Ammonia Scrubber SC-4 – Harrington
10	Wet Mask Process Area, Wet Bench Cleaning, Diffusion Area, and Thin Film Area	Acid Scrubber SC-5 – Verantis (m/n HRP-129-132)
11	EPI Deposition Furnace #W-515	EPI Scrubber SC-A – Airgard
12	EPI Deposition Furnace #W-513	EPI Scrubber SC-B – Airgard

EU No.	Generating Equipment/Activity	Control Equipment
13	EPI Deposition Furnace #W-514	EPI Scrubber SC-C – Airgard
14	EPI Deposition Furnace #W-1003	EPI Scrubber SC-D – CET
15	EPI Deposition Furnace #W-1005	EPI Scrubber SC-E – CET
16	EPI Deposition Furnace #W-1008	EPI Scrubber SC-F – CET
17	EPI Deposition Furnace #W-1012	EPI Scrubber SC-G – Airgard
18	EPI Deposition Furnace #W-1016	EPI Scrubber SC-H – Airgard
19	EPI Deposition Furnace #W-1026	EPI Scrubber SC-I – Airgard
20	EPI Deposition Furnace #W-1027	EPI Scrubber SC-J – Airgard
21	Wet Bench Cleaning and Dry Mask Area, Phase I	None
22	Wet Bench Cleaning and Dry Mask Area, Phase II	None
23	Wet Bench Cleaning and Dry Mask Support Areas	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 (or other test method); and
(d) Emission factors or methodology provided in this TSD

6.a. Boilers #1 and #2. Emission factors for the two 12.6 MMBtu/hr Bryan boilers are based on emission guarantees from the vendor for NO_x and CO and EPA emission factors for the other pollutants.

Boilers #1 and #2

Pollutant	Emission Factors lb/MMBtu	Emission Factors lb/hr [a]	Emissions ton/yr [b]	Source
NO_x	0.0304	0.383	1.678	Mfr Guarantee (25 ppm)
CO	0.037	0.466	2.042	Mfr Guarantee (50 ppm)
VOC	0.00539	0.0679	0.297	AP-42 §1.4 (7/1998)
SO_2	5.88×10^{-4}	0.00741	0.0325	AP-42 §1.4 (7/1998)
PM	0.00754	0.0939	0.411	AP-42 §1.4 (7/1998)
PM_{10}	0.00754	0.0939	0.411	Assumed equal to PM
$PM_{2.5}$	0.00745	0.0939	0.411	Assumed equal to PM

Boilers #1 and #2

Pollutant	Emission Factors lb/MMBtu	Emission Factors lb/hr [a]	Emissions ton/yr [b]	Source
benzene [71-43-2]	2.06×10^{-6}	2.60×10^{-5}	0.00011	AP-42 §1.4 (7/1998)
formaldehyde [50-00-0]	7.35×10^{-5}	0.000926	0.0041	AP-42 §1.4 (7/1998)
CO_2e	117.1	1,480.	6,463.	40 CFR 98 [c]

[a] The calculation assumes a maximum fuel rate of 12.6 MMBtu/hr for each boiler.
[b] PTE assumes 8,760 hr/yr operation.
[c] The CO_2e emission factor is derived from 40 CFR 98 Subpart C (12/9/2016) with base factors of 117.0 lb/MMBtu CO_2, 0.05512 lb/MMBtu CH_4, and 0.0657 lb/MMBtu N_2O, including by the greenhouse warming potential (GWP) multipliers of CO_2=1, CH_4=25, and N_2O=298 and fuel heat content of 1,026 Btu/scf.

Emissions must be determined by the fuel usage multiplied by the emission factors above unless new emission factors are developed through source testing. Any alternate emission calculation methodologies must be accepted or specified by SWCAA.

6.b. Boiler #3. Emission factors for the 5.0 MMBtu/hr Bryan boiler are based on emission guarantees from the vendor for NO_x and CO and EPA emission factors for the other pollutants.

Boiler #3

Pollutant	Emission Factors lb/MMBtu	Emission Factors lb/hr [a]	Emissions ton/yr [b]	Source
NO_x	0.0364	0.459	0.797	Mfr Guarantee (30 ppm)
CO	0.0370	0.466	0.810	Mfr Guarantee (50 ppm)
VOC	0.00539	0.0679	0.118	AP-42 §1.4 (7/1998)
SO_2	5.88×10^{-4}	0.00294	0.0129	AP-42 §1.4 (7/1998)
PM	0.00745	0.0939	0.163	AP-42 §1.4 (7/1998)
PM_{10}	0.00745	0.0939	0.163	Assumed equal to PM
$PM_{2.5}$	0.00745	0.037	0.163	Assumed equal to PM
benzene [71-43-2]	2.06×10^{-6}	1.10×10^{-5}	4.5×10^{-5}	AP-42 §1.4 (7/1998)
formaldehyde [50-00-0]	7.35×10^{-5}	0.00037	0.0016	AP-42 §1.4 (7/1998)
CO_2e	117.1	585.5	2,564.	40 CFR 98 [c]

[a] The calculation assumes a maximum fuel rate of 12.6 MMBtu/hr for each boiler.
[b] PTE assumes 8,760 hr/yr operation.
[c] The CO_2e emission factor is derived from 40 CFR 98 Subpart C (12/9/2016) with base factors of 117.0 lb/MMBtu CO_2, 0.05512 lb/MMBtu CH_4, and 0.0657 lb/MMBtu N_2O, including by the greenhouse warming potential (GWP) multipliers of CO_2=1, CH_4=25, and N_2O=298 and fuel heat content of 1,026 Btu/scf.

Emissions must be determined by the fuel usage multiplied by the emission factors above unless new emission factors are developed through source testing. Any alternate emission calculation methodologies must be accepted or specified by SWCAA.

6.c. Emergency Generator Engines. Emission factors are based on source testing of similar units at 100% load. The sulfur dioxide emission factor is determined using maximum fuel rate (40.4 gal/hr and 36.3 gal/hr for engine #1 and #2, respectively), 15 ppmw sulfur in the fuel that is 100% converted to SO_2, and 7.05 lb/gal fuel oil density.

Emergency Engine #1

Pollutant	Emission Factors lb/hr	Emissions tpy [a]	Source
NO_x	14.57	1.457	Manufacturer Data
CO	0.55	0.055	Manufacturer Data
VOC	0.060	0.0060	Manufacturer Data
SO_2	0.00872	0.00085	Mass Balance [b]
PM	0.68	0.068	Manufacturer Data
PM_{10}	0.68	0.068	Assumed equal to PM
$PM_{2.5}$	0.68	0.068	Assumed equal to PM
CO_2e	925.6	92.55	40 CFR 98 [c]

[a] PTE assumes 40.4 gal/hr fuel rate and 200 hr/yr operation.
[b] The calculation assumes that the fuel oil properties are 15 ppmw S, 7.206 lb/gal density, and 137,000 Btu/gal.
[c] The CO_2e emission factor for fuel oil is derived from 40 CFR 98 Subpart C (12/9/2016) with base factors of 163.1 lb/MMBtu CO_2, 0.1653 lb/MMBtu CH_4, and 0.3942 lb/MMBtu N_2O, including the GWP multipliers of CO_2=1, CH_4=25, and N_2O=298 and a fuel heat content of 0.138 MMBtu/gal.

Emergency Engine #2

Pollutant	Emission Factors lb/hr	Emissions tpy [a]	Source
NO_x	10.23	1.023	Manufacturer Data
CO	0.81	0.081	Manufacturer Data
VOC	0.10	0.010	Manufacturer Data
SO_2	0.00784	0.00079	Mass Balance [b]
PM	0.070	0.0070	Manufacturer Data
PM_{10}	0.070	0.0070	Assumed equal to PM
$PM_{2.5}$	0.070	0.0070	Assumed equal to PM
CO_2e	831.6	83.15	40 CFR 98 [c]

[a] PTE assumes 36.4 gal/hr fuel rate and 200 hr/yr operation.
[b] The calculation assumes that the fuel oil properties are 15 ppmw S, 7.206 lb/gal density, and 137,000 Btu/gal.
[c] The CO_2e emission factor for fuel oil is derived from 40 CFR 98 Subpart C (12/9/2016) with base factors of 163.1 lb/MMBtu CO_2, 0.1653 lb/MMBtu CH_4, and 0.3942 lb/MMBtu N_2O, including the GWP multipliers of CO_2=1, CH_4=25, and N_2O=298 and a fuel heat content of 0.138 MMBtu/gal.

Emissions must be determined by hours of operation multiplied by the emission factors above unless new emission factors are developed through source testing. Any alternate emission calculation methodologies must be accepted or specified by SWCAA.

6.d. Wet Mask Process Area, Diffusion Area, and Thin Film Area. These areas are vented through Acid Scrubbers SC-1, SC-2, and SC-5. The following emission factors and hours of operation are used to determine maximum emissions:

Acid Scrubber SC-1

Pollutant	Emission Conc. ppm	Emission Rates lb/hr [a]	Emissions ton/yr [b]	Source
hydrogen chloride [7647-01-0]	1.1	0.406	2.26	Permit Limit
hydrogen fluoride [7664-39-3]	2.5	0.506	1.85	Permit Limit

[a] Maximum design flow rate is 65,000 acfm.
[b] Assumes that the unit is operating at maximum flow for 8,760 hr/yr.

Acid Scrubber SC-2

Pollutant	Emission Conc. ppm	Emission Rates lb/hr [a]	Emissions ton/yr [b]	Source
hydrogen chloride [7647-01-0]	1.1	0.343	2.60	Permit Limit
hydrogen fluoride [7664-39-3]	2.5	0.584	2.13	Permit Limit

[a] Maximum design flow rate is 75,000 acfm.
[b] Assumes that the unit is operating at maximum flow for 8,760 hr/yr.

Acid Scrubber SC-5

Pollutant	Emission Conc. ppm	Emission Rates lb/hr [a]	Emissions ton/yr [b]	Source
hydrogen chloride [7647-01-0]	1.1	0.343	2.60	Permit Limit
hydrogen fluoride [7664-39-3]	2.5	0.584	2.13	Permit Limit

[a] Maximum design flow rate is 75,000 acfm.
[b] Assumes that the unit is operating at maximum flow for 8,760 hr/yr.

Emissions of the above-listed pollutants must be determined by the hours of operation multiplied by the emission factors above unless new emission factors are developed through source testing. Any alternate emission calculation methodologies are accepted or specified by SWCAA.

Because not all pollutants are source tested, other pollutant emissions must be determined by using mass balance and the specified manufacturer control efficiency. For those pollutants that were not identified by the manufacturer, no control efficiency is assumed. The following lists the expected pollutants to be emitted through the Acid Scrubbers and the specified manufacturer control efficiencies:

Pollutant [CAS Nr]	Type	Scrubber Control Efficiency	PTE lb/yr [a]
acetic acid [64-19-7]	TAP	27%	59.64
ammonia [7664-41-7] [b]	TAP	0%	4,549.42
antimony compounds, as Sb	HAP/TAP	—	0.02
antimony trioxide, as Sb [1309-64-4]	HAP/TAP	0%	0.02
boron trifluoride [7637-07-2]	TAP	85%	0.00
chlorine [7782-50-5] [c]	HAP/TAP	0%	1,111.09
diborane [19287-45-7]	TAP	0%	0.00
glycol ethers	HAP/TAP	0%	837.00
ethylene glycol [107-21-1]	HAP/TAP	0%	837.00
hydrobromic acid [10035-10-6]	TAP	90%	30.81
hydrogen peroxide [7722-84-1]	TAP	99%	1.36
nitric acid [7697-37-2]	TAP	99%	0.55
nitrogen trifluoride [7783-54-2]	TAP	0%	57.19
phosphine [7803-51-2]	HAP/TAP	0%	0.00
phosphoric acid [7664-38-2]	TAP	99%	6.17
phosphorus oxychloride [10025-87-3]	TAP	99%	0.00
silane [7803-62-5]	TAP	0%	2,036
Silicon dioxide [7631-86-9]	TAP	0%	659.26
sulfuric acid [7664-93-9]	TAP	99%	25.69
sodium hydroxide [1310-73-2]	TAP	80%	0.00
sulfur hexafluoride [2551-62-4]	TAP	0%	752.00
tetraethyl orthosilicate [78-10-4]	TAP	0%	0.00
tungsten compounds, as W	TAP	—	0.00
tungsten hexafluoride, as W [7440-33-7]	TAP	0%	0.00 [d]

[a] Based on 2018 actual rates with a 75% growth factor. A value of zero indicates that the facility may have emitted the pollutant in the past but has not done so in the past 10 years.
[b] Based on 2018 actual rates with a 75% growth factor, adjusted by historical wastewater and waste removal rates.
[c] PTE based on permitted limit, not actual usage.

The above list of pollutants is not exhaustive and occasionally ADI may emit pollutants not on this list after notification to SWCAA. In such cases a demonstration that the emissions are below the appropriate SQER is required or a modification to the ADP, as appropriate.

6.e. Wet Bench Cleaning. The wet bench cleaning areas are controlled by Ammonia Scrubber SC-3 and Ammonia Scrubber SC-4. The following emission factors and hours of operation are used to determine maximum emissions:

Ammonia Scrubbers

Pollutant	Emission Conc. ppm	Emission Rate lb/hr [a]	PTE ton/yr [b]	Source
Ammonia Scrubber SC-3				
ammonia [7664-41-7]	3.0	0.0318	0.175	Permit Limit
Ammonia Scrubber SC-4				
ammonia [7664-41-7]	3.0	0.0318	0.175	Permit Limit

[a] Maximum design flow rate for Ammonia Scrubber SC-3 is 4,000 acfm. It is assumed for PTE purposes that Ammonia Scrubber SC-4 will have the same flow.
[b] PTE assumes that the units are operating at maximum flow for 8,760 hr/yr.

The above emission factors or source test data and hours of operation must be used to calculate annual emissions for the above pollutants unless alternate factors are otherwise accepted by SWCAA.

Because not all pollutants are source tested, other pollutant emissions must be determined by using mass balance and the specified manufacturer control efficiency. For those pollutants that were not identified by the manufacturer, no control efficiency is assumed. The primary pollutant emitted other than Ammonia is HF, which is present in various solutions used in the wet bench cleaning area. Emissions of HF from Ammonia scrubbers have been accounted for in the site-wide estimates, which is based on historical test data.

6.f. EPI Deposition Furnaces. The furnaces are controlled by individual scrubbers. The following emission factors and hours of operation are used to determine maximum emissions:

EPI Scrubbers

Pollutant	Emission Conc. ppm	Emission Rate lb/hr [a]	Emissions ton/yr [b]	Source
EPI Scrubbers SC-A through SC-J, each				
hydrogen chloride [7647-01-0]	2.5	0.000298	0.0020	Permit Limit

[a] Maximum design flow rates for the EPI Scrubbers are 21 acfm.
[b] Assumes that the units are operating at maximum flow for 8,760 hr/yr.

Emissions of the above-listed pollutants must be determined by the hours of operation multiplied by the emission factors above unless new emission factors are developed through source testing. Any alternate emission calculation methodologies are accepted or specified by SWCAA.

Because not all pollutants are source tested, other pollutant emissions must be determined by using mass balance and the specified manufacturer control efficiency. For those pollutants that were not identified by the manufacturer, no control efficiency is assumed. The following lists the expected pollutants to be emitted through the EPI Scrubbers and the specified manufacturer control efficiencies:

Pollutant [CAS Nr]	Type	Scrubber Control Efficiency	Emissions lb/yr *
acetone [67-64-1]	TAP	0%	438.07
arsine [7784-42-1]	HAP/TAP	0%	6.08
diborane [19287-45-7]	TAP	0%	0.55
germanium tetrahydride [7782-65-2]	TAP	0%	0.00
hydrogen chloride [7647-01-0]	HAP/TAP	98%	0.77
phosphine [7803-51-2]	HAP/TAP	0%	4.71

* Based on 2018 actual rates with a 75% growth factor, adjusted by historical wastewater and waste removal rates.

The above list of pollutants is not exhaustive and occasionally ADI may emit pollutants not on this list after notification to SWCAA. In such cases a demonstration that the emissions are below the specific SQER is required or a modification to the ADP, as appropriate.

6.g. Dry Mask Areas (Phase I and II) and Dry Mask Support Area. These areas are vented through three stacks; the emissions are not controlled. Emissions of VOC and TAPs are determined using mass balance principles.

Pollutant [CAS Nr]	Type	Emissions lb/yr [a]
VOC	—	115,360
acrylic acid [79-10-7]	HAP/TAP	0.00
aluminum oxide [1344-28-1]	TAP	55.93
boric oxide [1303-86-2]	TAP	194.33
n-amyl acetate [628-63-7]	TAP	62.20
n-butyl acetate [123-86-4]	TAP	104.05
n-butanol [71-36-3]	TAP	17.41
catechol [120-80-9]	HAP/TAP	113.67
cresol [1319-77-3]	HAP/TAP	12.44
1,4-dioxane [123-91-1]	HAP/TAP	31.09
ethanol [64-17-5]	TAP	50.50
ethanolamine [141-43-5]	TAP	1,224.40
isopropanol [67-63-0]	TAP	18,654.81

Pollutant [CAS Nr]	Type	Emissions lb/yr [a]
methanol [67-56-1]	HAP/TAP	10.47
methyl n-amyl ketone [110-43-0]	TAP	2,681.48
tetraethyl-orthosilicate [78-10-4]	TAP	178.62

[a] Based on 2018 actual rates with a 75% growth factor. A value of zero indicates that the facility may have emitted the pollutant in the past but has not done so in the period reviewed.
[b] PTE based on permitted limit, not actual usage.

Mass balance must be used to calculate annual emissions for the above pollutants. Any alternate emission calculation methodologies are accepted or specified by SWCAA.

6.h. Emissions Summary. The following assumptions were used to determine facility-wide anticipated maximum emissions:

- Boilers #1, #2, and #3 operated 8,760 hr/yr at the maximum operating rate;
- Emergency Generator Engines #1 and #2 operated 200 hr/yr at the maximum operating rate;
- All of the scrubbers operated for 8,760 hr/yr, each;
- For TAPs and HAPs, it is assumed that the Acid Scrubbers, Ammonia Scrubbers, EPI Scrubbers, Dry Mask Areas (Phase I and II), and Dry Mask Support Areas, emitted at the levels specified in Section 6.

Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
NO_x	6.633 tpy	—
CO	5.030 tpy	—
VOC	58.41 tpy	+26.162 tpy
SO_2	0.093 tpy	—
Lead	Not Applicable	—
PM	1.063 tpy	—
PM_{10}	1.063 tpy	—
$PM_{2.5}$	1.063 tpy	—
CO_2e	15,778 tpy	—
NH_3	2.304 tpy	+0.513 tpy
H_2S	Not Applicable	—
O_3	Not Applicable	—

Toxic Air Pollutant [CAS Nr]	Type	Potential to Emit (lb/yr)	Project Impact (lb/yr)
acetic acid [64-19-7]	TAP	59.64 lb/yr	-1,384.01 lb/yr
acetone [67-64-1]	TAP	438.07 lb/yr	-1,501.33 lb/yr
acrylic acid [79-10-7]	HAP/TAP	0.00 lb/yr	-0.22 lb/yr

Toxic Air Pollutant [CAS Nr]	Type	Potential to Emit (lb/yr)	Project Impact (lb/yr)
ammonia [7664-41-7]	TAP	4,607.50 lb/yr	+1,033.97 lb/yr
n-amyl acetate [628-63-7]	TAP	62.20 lb/yr	+52.42 lb/yr
antimony compounds, as Sb		0.02 lb/yr	-0.24 lb/yr
antimony trioxide, as Sb [1309-64-4]	HAP/TAP	0.02 lb/yr	-0.24 lb/yr
arsine [7784-42-1]	HAP/TAP	6.08 lb/yr	+2.92 lb/yr
benzene [71-43-2]	HAP/TAP	0.54 lb/yr	No change
boron trifluoride [7637-07-2]	TAP	0.00 lb/yr	-1.26 lb/yr
n-butyl acetate [123-86-4]	TAP	104.05 lb/yr	-23.02 lb/yr
n-butyl alcohol [71-36-3]	TAP	17.41 lb/yr	-13.73 lb/yr
catechol [120-80-9]	HAP/TAP	113.67 lb/yr	-18.84 lb/yr
chlorine [7782-50-5]	HAP/TAP	1,111.09 lb/yr	-2,668.91 lb/yr
cresol (all isomers) [1319-77-3]	HAP/TAP	12.44 lb/yr	+9.18 lb/yr
diborane [19287-45-7]	TAP	0.55 lb/yr	-5.72 lb/yr
1,4-dioxane [123-91-1]	HAP/TAP	31.09 lb/yr	21.61 lb/yr
ethanol [64-17-5]	TAP	50.50 lb/yr	-29.57 lb/yr
ethanolamine [141-43-5]	TAP	1,224.40 lb/yr	-138.06 lb/yr
glycol ethers	HAP/TAP	837.00 lb/yr	+552.42 lb/yr
ethylene glycol, as glycol ethers [107-21-1]	HAP/TAP	837.00 lb/yr	+552.42 lb/yr
formaldehyde [50-00-0]	TAP	19.45 lb/yr	No change
germanium tetrahydride [7782-65-2]	TAP	0.00 lb/yr	No change
hydrogen bromide [10035-10-6]	HAP/TAP	30.81 lb/yr	+26.13 lb/yr
hydrogen chloride [7647-01-0]	HAP/TAP	9,756.00 lb/yr	No change
hydrogen fluoride [7664-39-3]	HAP/TAP	7,955.00 lb/yr	No change
ammonium fluoride, as HF [12125-01-8]	HAP/TAP	0.00 lb/yr	No change
nitrogen trifluoride, as HF [7783-54-2]	HAP/TAP	57.19 lb/yr	+57.19 lb/yr
hydrogen peroxide [7722-84-1]	TAP	1.36 lb/yr	+1.28 lb/yr
isopropanol [67-63-0]	TAP	18,654.81 lb/yr	-1,912.45 lb/yr
methanol [110-43-0]	HAP/TAP	10.47 lb/yr	+10.47 lb/yr
methyl n-amyl ketone [110-43-0]	TAP	2,681.48 lb/yr	+613.81 lb/yr
nitric acid [7697-37-2]	TAP	0.55 lb/yr	+0.05 lb/yr
phosphine [7803-51-2]	HAP/TAP	4.71 lb/yr	-19.67 lb/yr
phosphoric acid [7664-38-2]	TAP	6.17 lb/yr	+4.38 lb/yr
phosphorus oxychloride [10025-87-3]	TAP	0.00 lb/yr	-2.66 lb/yr
potassium hydroxide [1310-58-3]	TAP	0.00 lb/yr	-0.04 lb/yr
silane [7803-62-5]	TAP	2,036.00 lb/yr	+735.76 lb/yr

Toxic Air Pollutant [CAS Nr]	Type	Potential to Emit (lb/yr)	Project Impact (lb/yr)
silicon dioxide [7631-86-9]	TAP	659.26 lb/yr	+659.26 lb/yr
sulfuric acid [7664-93-9]	TAP	25.69 yr	+25.60 lb/yr
sodium hydroxide [1310-73-2]	TAP	0.00 lb/yr	0.00 lb/yr
sulfur hexafluoride [2551-62-4]	TAP	752.40 lb/yr	-183.60 lb/yr
tetraethyl orthosilicate [78-10-4]	TAP	178.62 lb/yr	+85.86 lb/yr
tungsten compounds, as W	TAP	0.00 lb/yr	0.00 lb/yr
tungsten hexafluoride, as W [7440-33-7]	TAP	0.00 lb/yr	0.00 lb/yr

Note that while every effort has been made as to the accuracy of these estimates, there is some inherit variability based on historical and future operations that may change these values. All have been evaluated against the respective SQER or ASIL. Emissions listed as zero represent chemicals for which the facility has had emissions in the past but did not emit in the past three years.

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 60.7 "Notification and Recordkeeping" requires that notification be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup. The initial notification required by 40 CFR 60 Subpart Dc has been completed; therefore §60.7 no longer applies to Boilers #1 and #2.

7.b. 40 CFR 60.8 "Performance Tests" requires that emission tests be conducted according to test methods approved in advance by the permitting authority and a copy of the results be submitted to the permitting authority. The initial performance test required by 40 CFR 60 Subpart Dc has been completed; therefore §60.8 no longer applies to Boilers #1 and #2.

7.c. 40 CFR 60 Subpart Dc "Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units" applies to any steam generating unit with a heat input greater than or equal to 10 MMBtu/hr, but less than or equal to 100 MMBtu/hr constructed, modified, or reconstructed after June 9, 1989. Boilers #1 and #2 were constructed after June 9, 1989 and are greater than 10 MMBtu/hr, but Boiler #3 does not meet the heat input threshold; therefore, this regulation applies to Boilers #1 and #2.

7.d. 40 CFR 63.7 "Performance testing requirements" requires that notification be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup. The existing emergency generator engines are subject to 40 CFR 63 Subpart ZZZZ but are not subject to any numerical emission standards in Tables 1b, 2b, or 2d; therefore §63.7 does not apply to the emergency generator engines.

7.e. 40 CFR 63.9 "Notification Requirements" requires that notification be submitted to SWCAA, the delegated authority, for initial startup. The existing emergency generator engines are subject to 40 CFR 63 Subpart ZZZZ but are not subject to the notification requirements of §§63.7(b) and (c), 63.8(e), (f)(4), and (f)(6), 63.9(b)–(e), (g), and (h) per §63.6645(a)(5); therefore §63.9 does not apply to the emergency generator engines.

7.f. 40 CFR 63 Subpart ZZZZ [§63.6580 *et seq*] "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 existing emergency generator engines are CI ICE configurations used in emergency situations; therefore, this regulation applies to the existing engines. For existing emergency engines at an area source, the owner or operator is required to:

- Change oil and filter every 500 hours of operation or annually, whichever comes first except as allowed by 40 CFR 63.6625(i);
- Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first;
- Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary;
- 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;
- Install a non-resettable hour meter if one is not already installed. [40 CFR 63.6625(f)]
- 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;
- Report each instance in which the owner did not meet each operating limitation;
- 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;
- Record the occurrence and duration of each malfunction of operation (i.e., process equipment);
- Record maintenance conducted on the engine in order to demonstrate that the engine was operated and maintained according to the applicable maintenance plan; and

- 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.

There may be other requirements under the Subpart that apply to the facility that are not specified above.

7.g. 40 CFR 63 Subpart JJJJJJ [§63.11193 et seq] "National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources" establishes national emission limitations and operating limitations for HAP emitted from boilers fired on specific fuels at area sources. The boilers only burn natural gas and are specifically exempted; therefore, this regulation does not apply to the boilers.

7.h. 40 CFR 68 "Chemical Accident Prevention Provisions" requires affected stationary sources to compile and submit a risk management plan, as provided in §§68.150–68.185. Applicability is determined by the type and quantity of material stored at the facility. The Respondent's facility will not utilize any substance that meets the listed thresholds; therefore, this regulation does not apply to this facility.

7.i. 40 CFR 70 "State Operating Permit Programs" requires facilities with site emissions of any regulated air pollutant greater than 100 tpy, any single hazardous air pollutant greater than 10 tpy, and/or any aggregate combination of hazardous air pollutants greater than 25 tpy to obtain a Title V permit. The facility does not have the potential to emit above any of the major facility thresholds; therefore, this regulation does not apply to the facility.

7.j. 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 is applicable to the facility.

7.k. 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 is applicable to the facility.

7.l. WAC 173-401 "Operating Permit Regulation" requires all major sources and other sources as defined in WAC 173-401-300 to obtain an operating permit. This regulation is not applicable because this source is not a potential major source and does not meet the applicability criteria set forth in WAC 173-401-300. The facility does not emit any criteria pollutants or HAP above major thresholds; therefore, this regulation does not apply to the facility.

7.m. 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. This facility emits TAPS; therefore, this regulation applies to the facility.

7.n. WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM_{10}, $PM_{2.5}$, lead, SO_2, NO_x, O_3, 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. This facility does not emit lead; therefore, the lead standard does not apply.

7.o. WAC 173-481 "Ambient Air Quality and Environmental Standards for Fluorides" establishes fluoride standards for the protection of livestock and vegetation. If fluoride impacts or damage occur, monitoring and corrective actions may be required, by request, of the WA State Department of Ecology (WDOE) to demonstrate compliance with the ambient action levels. To date, no request by WDOE has been made. Note that this regulation is not triggered by new source review. The nearest public land use area (Grass Valley Park, to the northeast) is approximately 1,230 m from the facility and the nearest agricultural area (to the north near Leghtonburg Park and Warman Lake) is approximately 4,500 m from the facility. Based on modeling, the maximum 24-hour HF ambient concentration at the fence line was determined to be 5.3 $\mu g/m^3$. Based on the modeled results, no adverse impact to these areas is anticipated. However, this regulation may become future applicable.

7.p. 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. The facility is subject to this regulation.

7.q. SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit is allowed to exceed twenty percent (20%) opacity for more than three (3) minutes in any one hour at the emission point, or within a reasonable distance of the emission point. The facility is subject to this regulation.

7.r. SWCAA 400-040(2) "Fallout" requires that no emission of PM from any source is allowed to 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. The facility is subject to this regulation.

7.s. SWCAA 400-040(3) "Fugitive Emissions" requires that reasonable precautions be taken to prevent the fugitive release of air contaminants to the atmosphere. The facility is subject to this regulation.

7.t. 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. The facility is subject to this regulation.

7.u. SWCAA 400-040(6) "Sulfur Dioxide" requires that no person is allowed to emit a gas containing in excess of 1,000 ppmvd 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.

7.v. SWCAA 400-040(8) "Fugitive Dust Sources" requires that reasonable precautions be taken to prevent fugitive dust from becoming airborne and minimize emissions. The facility is subject to this regulation.

7.w. 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/dscm (0.1 gr/dscf) of exhaust gas at standard conditions. The facility has combustion units; therefore, this regulation applies.

7.x. SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing general process units not emit PM in excess of 0.23 g/dscm (0.1 gr/dscf) of exhaust gas. The facility has general process units; therefore, this regulation applies.

7.y. SWCAA 400-110 "New Source Review" requires that an ADP Application be filed with SWCAA, and an ADP be issued by SWCAA, prior to establishment of the new source, emission unit, or modification. The new burner in Boiler #3 meets the definition of a new source; therefore, this regulation applies.

7.z. 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) 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 facility is in a maintenance plan area; therefore, this regulation applies.

8. BACT/PSD/CAM DETERMINATIONS

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

8.a. BACT Determination – Boilers #1 and #2. BACT reviews previously performed by SWCAA for natural gas fired boilers between 10–15 MMBtu/hr have resulted in emission levels of 9–12 ppm NO_x and 50 ppm CO, however boilers of this size typically have a turn-down ratio of 4:1 or less. Ultra-low NO_x burners are not currently available with a 10:1 turn-down ratio. The lowest emitting boiler burner with a 10:1 turn-down ratio is 25 ppm NO_x and 50 ppm CO. The use of a natural gas fired boiler equipped with a low NO_x burner and internal flue gas recirculation to achieve 25 ppm NO_x and 50 ppm CO meets the requirements of BACT for Boilers #1 and #2.

8.b. BACT Determination – Boiler #3. The use of a natural gas fired boiler equipped with a low NO_x burner and internal flue gas recirculation to achieve 30 ppm NO_x and 50 ppm CO meets the requirements of BACT for Boiler #3. Potential emissions for this unit are unchanged for previous permit actions.

8.c. BACT Determination – Acid Scrubbers. The use of scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from wet mask, diffusion, and thin film areas.

8.d. BACT Determination – Ammonia Scrubbers. The use of scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from wet bench cleaning.

8.e. BACT Determination – EPI Scrubbers. The use of scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from the epitaxial deposition furnaces.

8.f. BACT Determination – Emergency Generator Engines. The use of modern internal combustion engine design, ultra-low sulfur (15 ppmw sulfur) fuel oil, limitation of visible emissions to 5% opacity or less, and limitation of engine operation to testing and actual power interruptions has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from the emergency generator engines at this facility.

8.g. BACT Determination – VOCs. A BACT analysis was performed by ADI in 1995, in which they determined that installing control equipment to reduce VOC emissions did not meet cost effectiveness criteria. Options considered at that time were carbon adsorption and thermal incineration. Potential VOC emissions have since increased from 14 tons per year to 59 tons per year. ADI is currently considering voluntarily installing controls and is evaluating alternatives and gathering cost data. An updated BACT analysis will be submitted as part of this permitting action.

8.h. 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.i. 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 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 impact to the ambient air is anticipated. ADP Application CL-3209 proposed an increase of VOC emissions by 27.3 tpy, which is below the significance threshold established in WAC 173-400-710. This facility is not major for any pollutant.

9.b. Toxic Air Pollutant Review. ADI has proposed in ADP Application CL-3209 to increase emissions of TAPs and HAPs, based on credible demonstration of production increases at the facility. Most of the TAP emission increases were below the SQER listed in WAC 173-460 and therefore no adverse impact to the ambient air is anticipated. Previously approved BACT measures at the facility will limit emissions of Class A and B toxic air pollutants to below the applicable Small Quantity Emission Rates (SQER).

For those pollutants that exceed the SQER, or are otherwise of potential interest, are discussed below:

Chlorine. Under the current permitting action potential chlorine emissions were calculated to be 1,111 lb/year. Chlorine is a class B TAP with an SQER of 175 lb/year and an ASIL of 5.00 µg/m³ as a 24-hour average. The increase was from 400 lb/yr to 1,111 lb/year. Since the SQER was exceeded, modeling was performed to demonstrate compliance with the ASIL. ADI modeled the emissions entirely through each of the scrubbers and compared the worst case for each of the three scrubbers (one proposed and two existing) to ASIL. Using AERSCREEN version 21112 and assuming .0105 g/s a 60-ich diameter stack, 47 feet above ground level, and a flow of 75,000 acfm, the maximum annual concentration was determined to be 3.70 µg/m³, 75% of the ASIL.

Hydrogen Fluoride. Under ADP 95-1765R1, ADI (as Linear Technology Corporation) requested an increase in the emission limit for hydrogen fluoride (HF) above the SQER. HF is classified as a Class B toxic air pollutant with an SQER of 175 lb/yr and an ASIL value of 8.7 µg/m³ as a 24-hour average. The increase was from 175 lb/yr to 9,724 lb/yr. Since the SQER was exceeded, modeling was performed to demonstrate compliance with the ASIL. A conservative approach was used assuming all the HF emissions were exhausted through one acid scrubber exhaust stack. Based on an emission rate of 1.11 lb/hr, a stack diameter of 68 inches (actual stack diameter has been measured at 61 inches) and a stack height of 47 feet above ground level, the maximum 24-hour HF ambient concen-

tration at the fence line was determined to be 5.3 µg/m³, which is less than the ASIL. Therefore, no adverse impact to the ambient air was anticipated.

Hydrogen Chloride. Under ADP 95-1765R1, ADI (as Linear Technology Corporation) requested an increase in the emission limit for hydrogen chloride (HCl) above the SQER. HCl is classified as a Class B toxic air pollutant with an SQER of 175 lb/yr and an ASIL value of 7.0 µg/m³ as a 24-hour average. The increase was from 175 lb/yr to 7,955 lb/yr. Since the SQER was exceeded, modeling was performed to demonstrate compliance with the ASIL. A conservative approach was used assuming all the HF emissions were exhausted through one acid scrubber exhaust stack. Based on an emission rate of 0.908 lb/hr, a stack diameter of 68 inches (actual stack diameter has been measured at 61 inches) and a stack height of 47 feet above ground level, the maximum 24-hour HF ambient concentration at the fence line was determined to be 4.3 µg/m³, which is less than the ASIL. Therefore, no adverse impact to the ambient air was anticipated.

1,4-Dioxane. In the current permitting action, potential 1,4-dioxane emissions were calculated to be 31.1 lb/yr. This chemical is a Class A carcinogenic TAP with an SQER of 10 lb/yr and an ASIL of 0.030 µg/m³ as an annual average. Since the potential emissions were more the SQER, modeling was performed to demonstrate compliance with the ASIL. Conservatively all the 1,4-dioxane was assumed to be emitted from dry mask exhaust stack EX-7 and EX-9. Using AERSCREEN version 21112, and inputs of 0.000342 (EX-9) and 0.000085 g/s (EX7), a 36-inch diameter stack, 47 feet above ground level, and flows of 22,304 acfm (EX7) and 16,000 acfm (EX9), the maximum annual concentration at the fence line was determined to be 0.030 µg/m³, which is less than the ASIL. Therefore, no adverse impact to the ambient air was anticipated.

Ethanolamine. Ethanolamine is classified as a Class B toxic air pollutant with an SQER of 1,750 lb/yr and an ASIL value of 25 µg/m³ as a 24-hour average. Based on the calculations presented in the current permitting action, maximum ethanolamine emissions are expected to be 1,013 lb/yr, which is 58% of the SQER. No adverse impact to the ambient air was anticipated, but the situation may need to be reviewed should emissions increase in the future.

Conclusions

9.c. Modifications proposed in ADP Application CL-3209, will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.d. Modifications proposed in ADP Application CL-3209, 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.

9.e. The modifications, as proposed in ADP Application CL-3209, can be implemented without causing a violation of 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 decided to issue ADP 23-3561 in response to ADP Application CL-3209. ADP 23-3561 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

10.a. Supersession of Previous Permits. ADP 23-3561 supersedes ADP 21-3492 in its entirety.

10.b. Emission Limits. The emission limit for the new acid scrubber was established at the same level as the scrubbers that had previously been approved. Previously SO_2 emissions were reduced from the emergency generator engines because of the phase-out of low sulfur fuel oil to ultra-low sulfur fuel oil.

10.c. Operating Limits and Requirements. Operation limits from previous permitting actions were brought forward. Most scrubber parameters are averaged over 15-min and are in line with previously approved scrubbers.

10.d. Monitoring and Recordkeeping Requirements. No new monitoring or recordkeeping requirements were included as part of this permitting action. Consistent with previous permitting actions, 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 were included with this permitting action.

10.e. Emission Monitoring and Testing Requirements. Previously established monitoring and testing requirements were included, with a few exceptions. The new scrubbers will be tested within 90 days of initial operation, and then will follow the same testing schedule as other scrubbers of the same type.

10.f. Reporting Requirements. No new reporting requirements were included as part of this permitting action. Previously established reporting requirements were included.

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.

To SWCAA's knowledge, this facility can comply with all applicable standards during startup and shutdown.

Emergency Generator Engines. Visible emissions from the emergency generator engines are limited to 5% opacity or less during normal operation. However, the engines are 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 engine exhaust during start-up periods. Startup is defined as the period from when the engine is started and the twenty (20) minutes thereafter. The engines are subject to a maximum of 20% opacity at all other times per SWCAA 400-040(1).

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 potential 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

12.a. Emission Testing Requirements – Boilers. The Boilers are only approved to burn natural gas. Testing is required every five (5) years no later than the end of February. Tests may be performed up to three months prior (no earlier than December 1) and still meet this requirement; the testing date does not reset to a different month The boilers have been initially tested per the following:

EU No.	Description	Process/Operation	Pollutants Tested	Initial Test
1	Boiler #1	Natural gas	NO_x, CO	12/12/1996
2	Boiler #2	Natural gas	NO_x, CO	12/12/1996

12.b. Emission Testing Requirements – Acid Scrubbers. Both Acid Scrubber SC-1 and Acid Scrubber SC-2 have been tested multiple times and acid scrubber SC-5 will be tested upon startup. There is some possibility that ammonia may be exhausted through these scrubbers with an undetermined control efficiency, so a requirement to test for ammonia is included. No limit was established because at this time, it is unclear as to the potential rate. Ammonia emission would be added to the facility total. Because the SQER from chlorine is exceeded, a test for chlorine was added. A requirement to test for visible emissions was added in the current permitting action, due to the possibility of ammonium chloride, or another ammonium compound, particulate being emitted. Testing is required

every five (5) years no later than the end of September. Tests may be performed up to three months prior (no earlier than July 1) and still meet this requirement; the testing date does not reset to a different month The acid scrubbers have been initially tested per the following:

EU No.	Description	Process/Operation	Pollutants Tested	Initial Test
6	Acid Scrubber SC-1	Normal Operation	ammonia, HF, HCl, Cl_2	12/12/1996
7	Acid Scrubber SC-2	Normal Operation	ammonia, HF, HCl, Cl_2	3/11/2005
10	Acid Scrubber SC-5	Normal Operation	ammonia, HF, HCl, Cl_2	Not Yet Tested

12.c. Emission Testing Requirements – Ammonia Scrubbers. Ammonia Scrubber SC-3 has been tested many times. Ammonia Scrubber SC-4 has not yet been tested. There is some possibility that acid gases may be exhausted through these scrubbers with an undetermined control efficiency, so a requirement to test for acid gases is included. A requirement to test for visible emissions was added due to the possibility of ammonium chloride, or another ammonium compound, particulate being emitted. Testing is required every five (5) years no later than the end of September. Tests may be performed up to three months prior (no earlier than July 1) and still meet this requirement; the testing date does not reset to a different month. The acid scrubbers have been initially tested per the following:

EU No.	Description	Process/Operation	Pollutants Tested	Initial Test
8	Ammonia Scrubber SC-3	Normal Operation	ammonia, HF, HCl, Cl_2	12/12/1996
9	Ammonia Scrubber SC-4	Normal Operation	ammonia, HF, HCl, Cl_2	Not Yet Tested

12.d. Emission Testing Requirements – EPI Scrubbers. All the installed EPI scrubbers have been tested at least twice. No changes to the testing procedure were proposed. The EPI Scrubbers have been initially tested per the following:

EU No.	Description	Process/Operation	Pollutant Tested	Initial Test
11	EPI Scrubber SC-A	Normal Operation	HCl	5/22/2000
12	EPI Scrubber SC-B	Normal Operation	HCl	6/9/1996
13	EPI Scrubber SC-C	Normal Operation	HCl	6/9/1996
14	EPI Scrubber SC-D	Normal Operation	HCl	4/10/2001
15	EPI Scrubber SC-E	Normal Operation	HCl	4/10/2001
16	EPI Scrubber SC-F	Normal Operation	HCl	8/28/2001
17	EPI Scrubber SC-G	Normal Operation	HCl	9/21/2009
18	EPI Scrubber SC-H	Normal Operation	HCl	2/25/2015
19	EPI Scrubber SC-I	Normal Operation	HCl	3/2/2022
20	EPI Scrubber SC-J	Normal Operation	HCl	Not Tested

13. FACILITY HISTORY

13.a. General History. The facility, known previously as Linear Technology Corporation, was constructed from 1995 to 1996 with production beginning in August 1996.

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

Permit	Application	Date Issued	Description
21-3492	CL-3146	12/17/2021	Increase VOC and toxic air pollutant emission limits because of production increases and approval to install two new epitaxial scrubbers.
17-3220	CL-2092	4/20/2017	Replacement of CET scrubbers with Airgard scrubbers, modify the minimum recirculation flowrate for the scrubbers, change the averaging period for monitoring parameters
13-3065	CL-1989	7/25/2013	Approval to install and operate new burner for Boiler #3. Superseded by 17-3220.
95-1765R6	CL-1930	12/6/2010	Modification of stack height requirements. Superseded by 13-3065.
95-1765R5	CL-1902	2/17/2010	Replacement of burners on Boiler #1 and Boiler #2. Superseded by 95-1765R6.
95-1765R4	CL-1770	5/18/2007	Modified scrubbers for EPI scrubbers SC-G through SC-L and modified emission testing schedule. Superseded by 95-1765R5.
95-1765R3	CL-1719	5/17/2006	Approval of an emergency generator engine and other operating parameter modifications. Superseded by 95-1765R4.
95-1765R2	CL-1663	9/20/2004	Modification of previously approved but not installed control equipment Superseded by 95-1765R3.
95-1765R1	CL-1500	1/14/2004	Modification of the emission limits established in ADP 95-1765 and modification of the phase II equipment. Superseded by 95-1765R2.
95-1765	CL-1122	1/29/1996	Installation of a semiconductor manufacturing facility including emission limits for phase I and future phase II. Superseded by 95-1765R1.

13.c. Compliance History. The following compliance issues in the past five (5) years have been identified for this facility:

NOV	Date	Violation
10428	2/16/2021	Exceedance of the facility-wide VOC limit. A Notice to Correct was issued.
6168	4/27/2020	Failure to conduct emission monitoring of Boiler #3. A Notice to Correct was issued.

14. PUBLIC INVOLVEMENT OPPORTUNITY

14.a. Public Notice for ADP Application CL-3209. Public notice for ADP Application CL-3209 was published on the SWCAA internet website for a minimum of fifteen (15) days beginning on August 18, 2022.

14.b. Public/Applicant Comment for ADP Application CL-3209. SWCAA did not receive specific comments, a comment period request, or any other inquiry from the public or the applicant regarding ADP Application CL-3209; 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 23-003. An Environmental Impact Statement is not required under RCW 43.21C.030(2)(c).