



TECHNICAL SUPPORT DOCUMENT

**Air Discharge Permit 24-3650
Air Discharge Permit Application CO-1021**

Preliminary Issued: July 24, 2024

Westlake US 2

SWCAA ID – 2237

DRAFT

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ABBREVIATIONS

List of Acronyms

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

List of Units and Measures

µg/m ³	Micrograms per cubic meter	ppmv	Parts per million by volume
µm	Micrometer (10 ⁻⁶ meter)	ppmvd	Parts per million by volume, dry
acfm	Actual cubic foot per minute	ppmw	Parts per million by weight
dscfm.....	Dry Standard cubic foot per minute	psig	Pounds per square inch, gauge
gpm	Gallon per minute	scfm	Standard cubic foot per minute
gr/dscf	Grain per dry standard cubic foot	tpy	Tons per day
ppm	Parts per million	tpy	Tons per year

List of Chemical Symbols, Formulas, and Pollutants

C ₃ H ₈	Propane	O ₃	Ozone
CH ₄	Methane	PM	Particulate Matter with an aerodynamic diameter 100 µm or less
CO	Carbon monoxide	PM ₁₀	PM with an aerodynamic diameter 10 µm or less
CO ₂	Carbon dioxide	PM _{2.5}	PM with an aerodynamic diameter 2.5 µm or less
CO ₂ e	Carbon dioxide equivalent	SO ₂	Sulfur dioxide
H ₂ S	Hydrogen sulfide	SO _x	Sulfur oxides
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act	TAP	Toxic air pollutant pursuant to Chapter 173-460 WAC
HCl	Hydrochloric acid	TSP	Total Suspended Particulate
NH ₃	Ammonia	VOC	Volatile organic compound
NO ₂	Nitrogen dioxide		
NO _x	Nitrogen oxides		
O ₂	Oxygen		

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: Westlake Chemical
Applicant Address: PO Box 865, Longview, WA 98632

Facility Name: Westlake US 2
Facility Address: 3541 Industrial Way, Longview, WA 98632

SWCAA Identification: 2237

Contact Person: Adriana Lopez

Primary Process: Chlorine manufacturing
SIC/NAICS Code: 2812: SIC description
325181: (2012) NAICS description

Facility Latitude and Longitude: 46° 07' 45.85" N
-122° 59' 21.48" W

Facility Classification: Title V Opt-out (CO) at 50% of major source threshold

2. FACILITY DESCRIPTION

Westlake US 2 (Westlake) is a membrane chlor-alkali plant located on property leased from Nippon Dynawave Packaging Company adjacent to the Longview mill site. The plant has a capacity of 220 tons per day chlorine, 250 dry tons per day sodium hydroxide (caustic soda), six tons per day hydrogen, and 20,000 gallons per day of 12.5% sodium hypochlorite (bleach). Chlorine and hydrogen can also be used to produce up to 176.4 dry tons per day of HCl.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number CO-1021 (ADP Application CO-1021) received October 25, 2019. ADP application CO-1021 was submitted to address the following:

- 3.a. Synthetic Minor Limit for Carbon Monoxide. Previously unanticipated carbon monoxide emissions were found from the hydrochloric acid synthesis units. Potential uncontrolled emissions of carbon monoxide exceed 100 tons per year. ADP application CO-1021 requests that carbon monoxide emissions be limited to 50 tons per year in accordance with SWCAA 400-091. The permittee proposes to limit emissions to this level by operating a brine acidification system.
- 3.b. Modification of Operational and Monitoring Requirements. In addition, this opportunity is being taken to update a number of operational and monitoring requirements including the following:

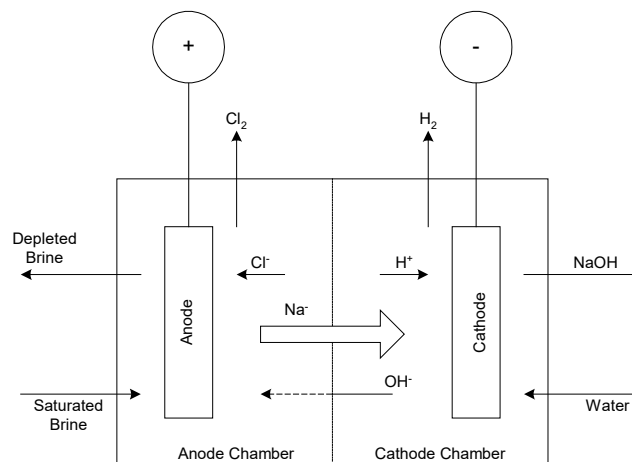
- Specify the voltage at which the conductivity readings are taken for HCl truck or railcar testing.
- Revise the leak testing for HCl tanker trucks to eliminate the 30 psig pressure test (these tanks cannot withstand 30 psig). A soap bubble or ammonia leak test will be performed for these tanks.
- When manual logging of process parameters is required by the permit, specify that such logging can be conducted once per 12-hour shift.
- Remove requirements related to the Hypo Destruct Tank. Numerous tests have indicated that this tank is not a source of pollution.
- Define excursions from process parameters that will not be treated as permit deviations. In the past, short deviations (sometimes lasting only a few seconds) have resulted in NOVs when they would not have resulted in excess emissions.

4. PROCESS DESCRIPTION

Brine Processing. Salt (NaCl) is received onsite in ships or barges. The solid salt is conveyed from the vessel by belt conveyor to the salt dissolving basin. The salt is dissolved to form raw brine by spraying with a combination of recycled depleted brine and fresh demineralized water. This brine is purified in a series of clarifiers and ion exchange columns to create ultra-pure brine. During this process sodium carbonate (Na_2CO_3) is added to precipitate calcium ion as calcium carbonate in one reactor. In a second reactor, sodium hydroxide is added to precipitate magnesium ion as magnesium hydroxide ($\text{Mg}(\text{OH})_2$).

This ultra-pure brine is stored in storage tanks.

Electrolysis. Ultra-pure brine is fed into the anode compartment of each electrolytic cell. A rectified DC current is applied to the cells. As the current passes through the cell, the dissolved ions separate. At the anode, chlorine ions are combined to form chlorine gas. At the cathode, the sodium ions react with water to produce sodium hydroxide and hydrogen gas. Demineralized water is added to the cathode chamber to control the sodium hydroxide concentration to approximately 32%.



Chlorine gas (Cl_2) exits the top of the anode chamber into a chlorine header operated at a slight vacuum. Hydrogen gas (H_2) exits the top of the cathode chamber into the hydrogen header which is operated at a slight positive pressure to prevent intrusion of air into the header where it could form an explosive environment. CO_2 is formed in the electrolyzer from carbonates in the brine. The CO_2 exits the anode chamber with the Cl_2 . Carbonates are an impurity in the brine and sodium carbonate is also added to the brine to precipitate calcium and magnesium upstream of the electrolyzer.

Depleted Brine Treatment. The depleted brine is treated to remove residual chlorine that is dissolved in the brine before the brine is reused in the system. A vacuum stripping dechlorination tower is used. The chlorine containing off-gas is then routed through the anolyte receiver to the main chlorine header for chlorine recovery. The vacuum stripped depleted brine is then pH adjusted and treated with sodium bisulfite to remove any remaining chlorine.

The dechlorinated depleted brine is then processed to remove excess sulfate ions that come with the addition of sodium bisulfite. A nano-filtration membrane is used to concentrate a sulfate rich purge stream. This purge stream is pH adjusted and sent to the mill site treatment plant.

The treated depleted brine is pumped to the salt dissolving basin to be resaturated with sodium chloride.

Sodium Hydroxide Evaporation. Dilute 32% sodium hydroxide (NaOH) which exits the electrolyzer is either sent to sodium hydroxide storage for dilution to 25% and use by the adjacent mill, fed to an evaporator to produce 50% sodium hydroxide, or used internally for brine treatment and producing sodium hypochlorite.

The sodium hydroxide evaporator is a double-effect counter-current design used to increase sodium hydroxide to 50%. Excess steam from the adjacent pulp mill is the heat source for conducting the evaporation.

Chlorine Processing. The chlorine gas exiting the electrolyzer is saturated with water. This wet chlorine gas is cooled in two heat exchangers and washed with spray water. The wet gas then passes through a wet demister to remove water droplets. Sulfuric acid (H_2SO_4) in drying towers further dries the chlorine gas. The dried chlorine gas passes through a dry demister to remove sulfuric acid droplets. The chlorine gas leaving the demister is compressed for delivery to chlorine liquefaction. This compressed chlorine gas is condensed in a primary and secondary shell and tube liquefaction condenser. Refrigerant is used on the shell side of the condensers. The liquid chlorine flows directly into rail cars. The vent gas (tail gas) from the liquefier is sent to a vent gas scrubbing tower which uses dilute sodium hydroxide to produce sodium hypochlorite or is sent to the HCl synthesis units. This tail gas is primarily Cl_2 , but includes H_2 , O_2 , N_2 , and CO_2 .

The sulfuric acid used in the chlorine drying towers absorbs water from the chlorine reducing the acid strength from 98% to 76%. This 76% sulfuric acid is sold to customers or used in the HCl Synthesis Process.

Hydrogen Processing. Hydrogen gas exiting the electrolyzer contains a significant amount of water. The hydrogen gas may be vented, or cleaned, cooled, dried and compressed prior to being sent to a

local hydrogen peroxide producer or compressed and placed in tube trailers for sale to external customers.

Sodium Hypochlorite Production. Sodium hypochlorite is produced in the vent gas scrubber system by the reaction of chlorine gas with dilute sodium hydroxide. A dilute sodium hydroxide stream is recirculated from the production tank to the tower. The residual alkalinity in the sodium hypochlorite solution is controlled by an oxidation reduction potential (ORP) meter. When the ORP is high, fresh sodium hydroxide is added.

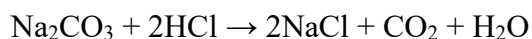
Hydrochloric Acid (HCl) Synthesis Units. Two HCl synthesis units each have a capacity of 88.2 dry standard tons per day of HCl. Hydrogen (H₂) and chlorine (Cl₂) gases from existing production are fed into the HCl synthesis burner to generate HCl gas. The HCl burner is comprised of two concentric tubes, with the chlorine flowing through the inner burner tube and hydrogen through the annulus between the inner and outer burner tubes. The gases are mixed in the burner and react exothermally to produce HCl gas. The flow of hydrogen is kept at a constant excess of 10-15% to ensure that the product and vent gas do not contain any free chlorine.

The hot HCl gas mixture is cooled in the graphite-lined combustion chamber. The gases travel up through the thin-film graphite lined absorber section where the HCl gas is absorbed into de-ionized water. The weak residual gas (containing excess H₂ and some HCl) leaving the top of the HCl Synthesis Unit, is fed into the bottom of the HCl Tail Gas Scrubber. The weak gas is scrubbed in de-ionized water, which is fed into the top scrubber section of the HCl Tail Gas Scrubber.

32-36% HCl product is transferred to storage. Three 35,000 gallon HCl storage tanks and one 10,000 gallon FRP transfer tank are used to store the HCl prior to loading. HCl is loaded into tank trucks and railcars. The HCl Loading Operations Scrubber controls emissions from loading and storage.

A cooling tower with a drift eliminator is used as part of the process.

Excess sodium carbonate (Na₂CO₃) used to precipitate calcium from the raw brine forms CO₂ in the electrolysis process. This CO₂ exits the cell room mixed with the Cl₂. When Cl₂ and H₂ streams are combined in the HCl synthesis units, the excess H₂ reduces most of the CO₂ in the Cl₂ stream to CO, resulting in CO emissions from the HCl synthesis unit scrubbers. The Cl₂ used for HCl synthesis comes from the Cl₂ tail gas stream and the compressed Cl₂. The Cl₂ tail gas stream is primarily Cl₂, but also contains the non-condensable fraction from chlorine liquefaction and is therefore enriched in CO₂. The Cl₂ tail gas could be directed to the Hypo Finishing Tower (TW-4000) to produce sodium hypochlorite (bleach) or sent to the HCl synthesis units to make HCl. CO emissions can be minimized by tightly controlling the excess carbonate used to precipitate calcium, and diverting the Cl₂ tail gas to the Hypo Finishing Tower. To further reduce the amount of CO₂ generated in the cell room, the permittee has installed a system to add hydrochloric acid upstream of a purified brine acidification tank. This will drive the following reaction:



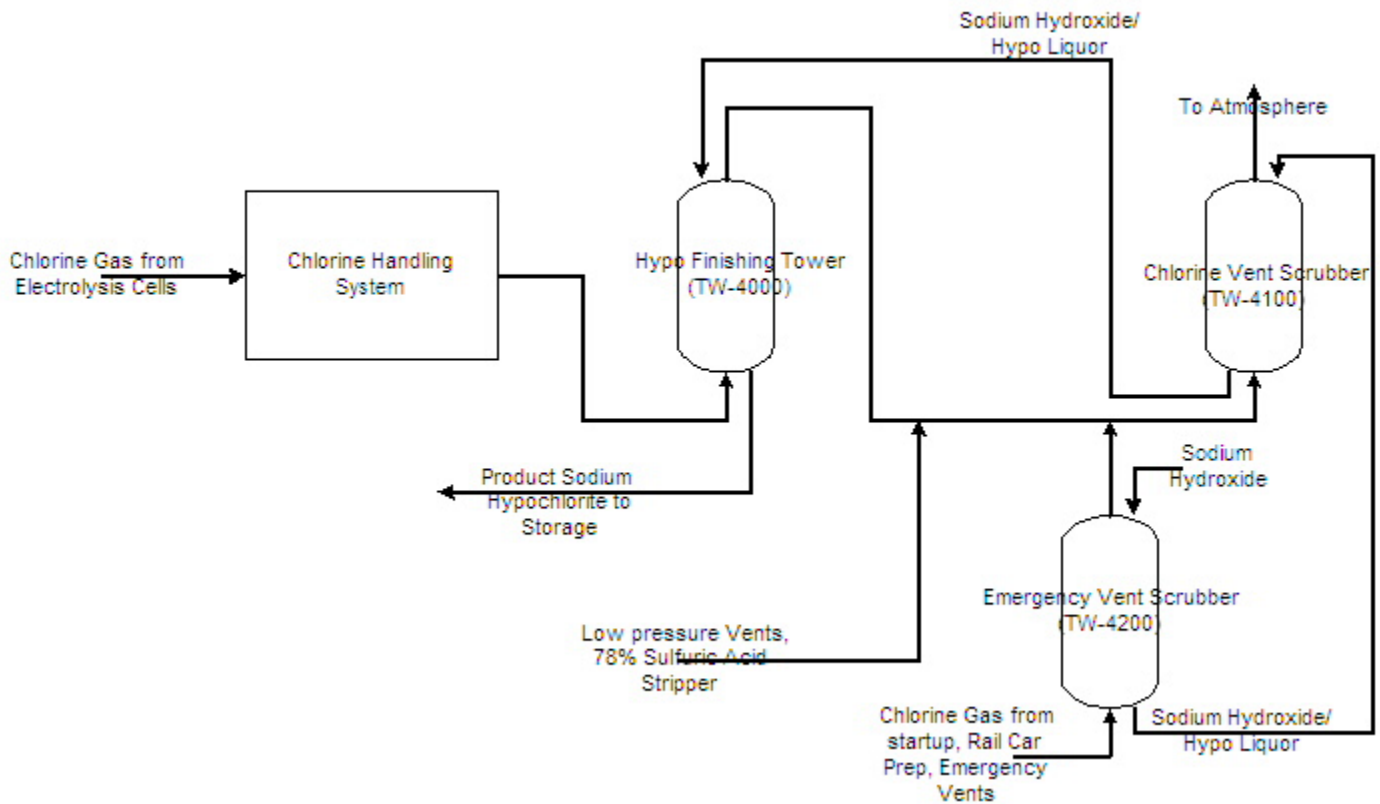
The acidified brine will be sprayed into the top of the tank with a single eductor in parallel with a

spray nozzle to provide contact with air to strip the CO₂ generated in the above reaction from the brine.

Wastewater Pretreatment. All wastewater and contact storm water collected are pumped to the pretreatment system where the pH is adjusted to between 5 and 12 by addition of sodium hydroxide or hydrochloric acid prior to pumping to the mill site wastewater treatment system.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

- 5.a. Chlor-Alkali Production - Chlorine Vent Scrubber (TW-4100) (modified). The chlorine vent scrubber was manufactured by Norcore Plastics. The scrubber is six feet in diameter and 30.5 feet in height. The scrubber contains 18 feet of Norton #2 Super Intalox Packing to control approximately 1,615 acfm of gas flow. Actual gas flows can be much lower during normal operations. 18- 22% caustic at a recirculation rate of 800 gpm is used as the scrubbing liquor. This scrubber exhausts through a 13.75 inch diameter stack at a height of 55 feet above ground level. Equipment which exhaust to this scrubber includes the Emergency Vent Scrubber, the Hypo Finishing Tower, the hypochlorite storage tanks, low pressure vents and the 76% sulfuric acid stripper. The Emergency Vent Scrubber, Hypo Finishing Tower and other process equipment are described below:



Emergency Vent Scrubber (TW-4200). The emergency vent scrubber is manufactured by Ellet Industries. The scrubber is 12.17 feet in diameter and 16 feet high. The scrubber

contains nine feet of Norton #1 Super Intalox Packing. This scrubber controls approximately 2 acfm of air flow during normal operations, 1,154 acfm during startup conditions and 1,657 acfm during an emergency. The scrubbing liquor is a 20% caustic solution. The scrubber recirculation rate is 1,600 gpm. This scrubber has an estimated efficiency between 99.92 and 99.94%. This scrubber was relocated from Elf Atochem in Portland. The scrubber is installed to capture chlorine from the process if a pressure relief device opens. This scrubber is also used during startup operations to purge non-condensable gases from the system and for relieving the pressure from returned chlorine rail cars in preparation for maintenance.

If scrubbing liquor recirculation flow is lost for any reason, a solution of 20% caustic flows from the Emergency Caustic Tank to the top of the scrubber. The Emergency Caustic Tank measures approximately 8' diameter by 13' long and is located near ground level. Motive force for flow from the Emergency Caustic Tank is provided by compressed air. Caustic flow from the Emergency Caustic flow is not expected to be a full 1,600 gallons per minute.

Hypo Finishing Tower (TW-4000, HFS). The Hypo Finishing Tower is manufactured by Astro Met Corp. The tower is used for the production of 12.5% sodium hypochlorite by reacting sodium hydroxide and chlorine. The tower is three feet in diameter and 34 feet high and contains 15.17 feet of 1" PVDF (Kynar) Tri-Pack. The scrubbing liquor is 0.5 - 1.0% caustic recirculated at a rate of 120 gpm through the system. The airflow to this unit is approximately 420 acfm. This tower has a removal efficiency of 99.99%. Equipment which exhaust to this tower includes the secondary chlorine liquefier and the rail car chlorine liquefier.

Brine Acidification Process. The permittee has installed a brine acidification process to remove carbonate from the purified brine. HCl is added to the purified brine upstream of the a storage tank. The acidified solution is sprayed into the top of the storage tank with two eductors (one during periods of low production rates). The purpose of the eductors will be to contact the acidified solution with air to strip CO₂ from the brine solution. The pH of the purified brine solution will be monitored downstream of the storage tank. The driving force for reducing the Na₂CO₃ to NaCl and CO₂, and removing the CO₂, will be the level of acidification (using the pH as a control), and the amount of stripping (using the pressure at the inlet to the eductor and spray nozzle as a control).

- 5.b. Hydrochloric Acid (HCl) Synthesis Unit #1 (TW-8500) (existing). The HCl Synthesis Unit is an SGL Carbon Group, HCl Synthesis Unit Type 91-970, capable of producing 88.2 dry standard tons per day of HCl. Gasses generated in the HCl burner, including excess H₂ and some HCl is further processed by the HCl Tail Gas Scrubber #1 (TW-8550). This scrubber is an SGL Carbon Group, Vent Gas Scrubber DN 500/DN 700 two stage scrubber and operates at a rate of approximately 100 scfm. The scrubber is 32.7 inches in diameter and 31.0 feet in height. The scrubber contains 6.6 feet of Raschig Rings packing (lower stage) followed by 9.3 feet of Mellapack packing (upper stage) and 0.8 feet of Pall rings (upper stage demister). In the upper stage of the HCl Tail Gas Scrubber, deionized water is fed once through at a rate of at least 0.61 lb water per lb HCl solution produced. In the

lower stage, dilute acid is re-circulated at 30 gpm through a heat exchanger back to the top of the lower stage.

The unit was designed with an alarm on low flow of fresh deionized water to the tail gas scrubber, and in 2016 the logic was modified to trip the unit on a low flow alarm.

HCl Synthesis Unit #1 and associated HCl Tail Gas Scrubber #1 are located outside near the Cell Room Building. HCl Tail Gas Scrubber #1 exhausts at a maximum flow rate of 110 scfm and approximately 70 °F through an 8" diameter stack 90' above ground level and 50' above the Cell Room Building.

- 5.c. Hydrochloric Acid (HCl) Synthesis Unit #2 (TW-8600) (existing). HCl Synthesis Unit #2 is an SGL Carbon Group, HCl Synthesis Unit Type 91-970, capable of producing 88.2 dry standard tons per day of HCl. Gasses generated in the HCl burner, including excess H₂ and some HCl is further processed by HCl Tail Gas Scrubber #2 (TW-8650). This scrubber is an SGL Carbon Group, Vent Gas Scrubber DN 500/300 two stage scrubber and operates at a rate of approximately 90 scfm. The scrubber is 24 inches in diameter and 31.0 feet in height. The scrubber contains 6 feet of DIABON 2" Raschig Rings packing (lower stage) followed by 9 feet of polypropylene packing (upper stage) and 0.5 feet of 1" Pall rings (upper stage demister). In the upper stage of the HCl Tail Gas Scrubber, deionized water is fed once through at a rate of at least 0.61 lb water per lb HCl solution produced. In the lower stage, deionized water is re-circulated at 25 gpm through a heat exchanger back to the top of the lower stage.

The unit was designed with an alarm on low flow of fresh deionized water to the tail gas scrubber, and in 2016 the logic was modified to trip the unit on a low flow alarm.

HCl Synthesis Unit #2 and associated HCl Tail Gas Scrubber #2 are located outside next to HCl Synthesis Unit #1 and near the Cell Room Building. HCl Tail Gas Scrubber #2 exhausts at a maximum flow rate of 90 scfm and approximately 70 °F through a 4" diameter stack 90' above ground level and 50' above the Cell Room Building

- 5.d. HCl Loading Operations (existing). HCl is loaded into railcars and tanker trucks. One truck loading rack and three railcar loading racks are located at the facility. One loading arm is located at each loading rack. Two pumps are available for loading both railcars and trucks. Each pump has a pumping capacity of 200 gpm for a total capacity of 400 gpm. Emissions from HCl loading operations are vented to the HCl Loading Operations Scrubber (TW-8150). Emissions from the HCl storage tanks vent directly to the HCl Loading Operations Scrubber (TW-8150). The HCl Loading Operations Scrubber is a custom designed scrubber 3.67 feet in diameter with 18 feet of packing 3" polypropylene Super Intalox Saddles. 1.5 ft³ of 3" by 1" Tellerette packing is used to remove mist. Scrubbing liquor is recirculated at a rate of 100 gpm. Sodium hydroxide is added from the plant utility header via an automatic control valve that opens when pH is low (as measured by probes). Sodium hydroxide is added as necessary to maintain a pH above 10. Two pH probes are utilized to provide redundancy. Based on information from the packing manufacturer this scrubber has a 99.97% removal efficiency for once through water at a

rate of 100 gpm. Two recirculation pumps are located in parallel, each capable of generating a recirculation rate of just over 100 gpm when scaling and pump wear are minimal. Five storage tanks also exhaust to this scrubber and are described below:

Tank ID	T-8100A	T-8100B	T-8100C	T-8300	T-8600
Contents	36% HCl	36% HCl	36% HCl	18% HCl	36% HCl Transfer
Max Working Capacity (gallons)	22,500	34,500	33,000	3,600	6,700
Diameter (ft)	12	14	14	8	10
Height (ft)	28	30	30	10	12
Roof Type	Fixed Dome	Fixed Dome	Fixed Dome	Fixed Dome	Fixed Dome
Construction Material	FRP	FRP	FRP	FRP	FRP
Number of Walls	Single	Single	Single	Single	Single
Exterior Shell Color	White	White	White	White	White
Exterior Roof Color	White	White	White	White	White
Heated (Yes/No)	No	No	No	No	No
Insulated (Yes/No)	No	No	No	No	No
Tank Location	Outside	Outside	Outside	Outside	Outside
Construction Year	1989	2005	2008	2004	2008

During the connecting and disconnecting of a truck or railcar an eductor (SP-8150) is used to pull any otherwise fugitive vapors to the HCl scrubber. A vapor-tight connection can be made to railcars and displaced vapors are pushed into the HCl scrubber. The eductor may need to be operated during the entire truck loading process because they are top-loaded and a vapor-tight seal is not assured. Water used to drive the eductor is also directed to the HCl scrubber and serves as makeup water. This eductor is a Schutte & Koerting Ejector Venturi Gas Scrubber type 7010. The eductor is 4" in diameter and utilizes fresh once through water at 3.8 gpm and 80 psig. The eductor has a capacity of 74 cfm.

The HCl Loading Operations Scrubber is located outside and exhausts at a maximum flow rate of 88 scfm and approximately 70°F through a 12" diameter stack 34' above ground level and 14' above the nearest building.

- 5.e. Salt Handling System (existing). Salt is offloaded from the ship using multiple buckets to raise the salt onto the ship's unloading belt conveyor. The ship's belt conveyor then transports the salt to a feed hopper on the dock, which feeds the PPG radial stacker belt conveyor. The salt is transferred to outdoor storage piles where a depleted brine/fresh demineralized water solution is applied.
- 5.f. General Plant Cooling Tower (V-7100) (existing). A GEA Rainey Corporation cooling tower model number CMDR12 460-DH-90 U-PS5/3 with drift eliminator with a designed flow rate of 8,000 gpm and a drift standard specification of 0.002% is used for cooling

various process streams. The cooling tower is equipped with drift eliminator baffles to reduce the amount of fine mist leaving the tower.

- 5.g. Caustic Evaporation Cooling Tower (V-7120) (existing). A Baltimore Air Coil cooling tower model number 3872C with drift eliminator with a designed flow rate of 1,200 gpm and a drift standard specification of 0.001% is used for cooling the HCl Synthesis Units. The cooling tower is equipped with drift eliminator baffles to reduce the amount of fine mist leaving the tower.
- 5.h. Insignificant Emission Units (modified). The following pieces of facility equipment have been determined to have insignificant emissions, and are not registered as emission units:
- Hypo Destruction Tank
 - Miscellaneous Storage Tanks. Additional storage tanks at the facility which exhaust to atmosphere include the following:

Tank ID	Type	Contents	Max Working Capacity (gallons)	Diameter (feet)	Height (feet)	Construction Date
R-1100	Dome	Brine	20,000	12	24.5	1990
R-1110	Flat	Brine	16,000	12	20	1990
R-1120	Flat	Brine	16,000	12	20	1990
T-1210	Dome	Flocculent	250	3.5	4	1997
T-1260	Open	Sodium Carbonate/Water	1,500	6	8	1976
T-1300	Open	Brine	350,000	65	14.5	1956
T-1310	Open	Brine	350,000	65	14.5	1956
T-1520A, B	Dome	Brine	150,000	30	30	1989
T-1540	Open	Filter Aid/Water	800	5	6	1990
T-1550	Open	Filter Aid/Water	2,300	7	8	1990
T-1700A,B	Dome	Brine	150,000	30	30	1956
T-1840	Dome	Brine	150,000	30	30	2015
T-1850	Dome	Brine	70,000	20	30	1990
T-1880	Dome	29% Sodium Bisulfite	10,000	12	12	1998
T-4450	Dome	Sodium Hypochlorite	11,000	12	14	1990
T-4400A	Dome	Sodium Hypochlorite	34,000	14	30	1989
T-4400B	Dome	Sodium Hypochlorite	34,000	14	30	2005
T-5100	Dome	32% NaOH	720,000	64	30	1974
T-5450	Flat	50% NaOH	1500	6	7.51	1990
T-1650-1100	Dome	50% NaOH	440,000	50	30	1966
T-1650-1105	Dome	50% NaOH	440,000	50	30	1966
T-1650-1110	Dome	50% NaOH	960,000	67.5	36	1978
T-1650-1160	Dome	50% NaOH	440,000	50	30	1966
T-1650-1170	Dome	25% NaOH	150,000	30	30	1970

Tank ID	Type	Contents	Max Working Capacity (gallons)	Diameter (feet)	Height (feet)	Construction Date
T-1650-1140	Dome	25% NaOH	150,000	30	30	1975
T-7420	Dome	Water	150,000	30	30	1955
T-7500	Dome	Wastewater	34,000	14	30	1989
T-7510	Dome	Wastewater	34,000	14	30	2017

5.i. Equipment/Activity Summary.

ID No.	Equipment/Activity	Control Equipment/Measure
1	Chlor-Alkali Production (220 tpd Cl ₂ , 250 tpd NaOH)	Emergency Vent Scrubber and Hypo Finishing Tower which exhaust to the Chlorine Vent Scrubber
2	Hydrochloric Acid Synthesis Unit #1 (SGL Carbon Group, 88.2 tpd)	HCl Tail Gas Scrubber #1 (for HCl), brine acidification (for CO)
3	Hydrochloric Acid Synthesis Unit #2 (SGL Carbon Group, 88.2 tpd)	HCl Tail Gas Scrubber #2 (for HCl), brine acidification (for CO)
4	Hydrochloric Acid Loading Operations (railcar and truck loading, 400 gpm)	HCl Loading Operations Scrubber and Eductor
5	Salt Handling System	Water suppression
6	General Plant Cooling Tower (8,000 gpm)	Drift eliminator
7	Caustic Evaporation Cooling Tower (1,200 gpm)	Drift eliminator

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:

- Continuous emissions monitoring system (CEMS) data;
- 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;
- Source emissions test data (other test method); and
- 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. Chlor-Alkali Production (Chlorine Vent Scrubber TW-4100). The permittee provided estimated chlorine emissions based on the uncontrolled emission rate from process

equipment, from process knowledge of other chlor-alkali facilities, and an engineering material balance for the system and the height of the transfer unit provided by the packing manufacturer. Emissions were calculated during both full hypo production and average hypo production. The table below shows estimated emissions during both scenarios.

<u>Scenario</u>	<u>Full Hypo Production</u>	<u>Average Hypo Production</u>
Scrubber Air Flow (lbmol/hr)	227.6 ¹	15.3
Chlorine Emissions (lb/hr)	6.47×10^{-4}	5.55×10^{-4}
Chlorine Concentration (ppm)	0.04	0.5

¹ This flowrate reflects startup conditions with the emergency vent scrubber controlling system purge

As shown in the above table, the chlorine concentration during full hypo production will be very low due to the high scrubber air flow rate. This low concentration will be very difficult to demonstrate compliance with due to the high detection limit of chlorine test methods. In addition, in order to allow for short term fluctuations in the chlorine concentration, SWCAA set a chlorine emission limit of 1.0 ppm on a one-hour average and an annual limit of 142 lb/yr. Actual emissions from this scrubber will be calculated based on emission test data and hours of operation.

6.b. Hydrochloric Acid (HCl) Synthesis Unit #1.

HCl Synthesis Unit #1				
Flow Rate =			110 scfm	
Annual Operation =			8,760 hours	
CO ₂ to CO Conversion Rate =			90% (molar basis)	
Pollutant	ppmvd	lb/hr	lb/yr	Emission Factor Source
HCl	10	0.0062	55	BACT
Cl ₂	1	0.0012	11	BACT
Pollutant	ppmvd	lb/hr	tpy	Emission Factor Source
CO (controlled)	41,705	20.00	50.00	Permit Limit (BACT and opt-out)
CO ₂ (controlled)	4,171	3.14	8.73	90% conversion of CO ₂ to CO

Potential emissions of HCl and Cl₂ were estimated based on the vendor guaranteed outlet concentrations, a maximum air flow rate of 110 scfm, and 8,760 hours per year of operation. Actual emissions of HCl and Cl₂ will be calculated from source emission test results and operational data.

The results of the most recent source emissions testing at the HCl Synthesis Unit exhaust may be used to determine demonstrate a less than 100% conversion rate of CO₂ to CO in the HCl Synthesis Units.

Carbon monoxide emissions must be determined using a material balance approach. The permittee must determine the maximum amount of carbon (measured as Na₂CO₃) in the purified brine fed to the electrolyzers at the maximum purified brine pH and the minimum purified brine storage tank eductor pressure. This maximum carbonate level must be used when the total carbon content of the brine is not measured directly. The permittee may assume that all carbonate in the brine is emitted as carbon monoxide from the HCl Synthesis Units. Alternatively, the permittee may add the following refinements to this calculation:

- (a) The results of the most recent source emissions testing at the HCl Synthesis Units may be used to determine the conversion rate of CO₂ to CO in the HCl Synthesis Units. Where this option is utilized, the results from testing at the highest H₂ to Cl₂ ratio must be used.

- (b) The amount of CO₂ in the mixed chlorine feed to the Hydrochloric Acid Synthesis Units may be calculated from the carbon content of the brine entering the electrolyzer (as determined above) and process operating data (e.g. total and liquefied chlorine production, tail gas production, amount of each chlorine stream used for HCl production). When the tail gas is used for HCl synthesis, the amount and concentration of CO₂ in the chlorine liquefaction tail gas must be calculated with the assumption that all CO₂ not accounted for the in liquefied chlorine ends up in the tail gas.

An example calculation is shown below:

$$\text{CO} \frac{\text{lb}}{\text{hr}} = \text{brine flow} \left(\frac{\text{liters}}{\text{minute}} \right) * \text{Na}_2\text{CO}_3 \left(\frac{\text{grams}}{\text{liter}} \right) * \left(\frac{28 \text{ g CO}}{106 \text{ g Na}_2\text{CO}_3} \right) * \left(\frac{60 \text{ min}}{\text{hr}} \right) * \left(\frac{1 \text{ lb}}{453.6 \text{ grams}} \right) * 90\% \text{ conversion}$$

6.c. Hydrochloric Acid (HCl) Synthesis Unit #2.

HCl Synthesis Unit #2				
Flow Rate =		90 scfm		
Annual Operation =		8,760 hours		
CO ₂ to CO Conversion:		90% (molar basis)		
Pollutant	ppmvd	lb/hr	lb/yr	Emission Factor Source
HCl	10	0.0051	45	BACT
Cl ₂	1	0.0010	9	BACT
Pollutant	ppmvd	lb/hr	tpy	Emission Factor Source
CO (controlled)	50,973	20.00	50.00	Permit Limit (BACT and opt-out)
CO ₂ (controlled)	5,097	3.14	8.73	90% conversion of CO ₂ to CO

Potential emissions of HCl and Cl₂ were estimated based on the vendor guaranteed outlet concentrations, a maximum air flow rate of 90 scfm, and 8,760 hours per year of operation. Actual emissions of HCl and Cl₂ will be calculated from source emission test results and operational data.

Carbon monoxide emissions must be determined using a material balance approach. The permittee must determine the maximum amount of carbon (measured as Na₂CO₃) in the purified brine fed to the electrolyzers at the maximum purified brine pH and the minimum purified brine storage tank eductor pressure. This maximum carbonate level must be used when the total carbon content of the brine is not measured directly. The permittee may assume that all carbonate in the brine is emitted as carbon monoxide from the HCl Synthesis Units. Alternatively, the permittee may add the following refinements to this calculation:

- (a) The results of the most recent source emissions testing at the HCl Synthesis Units may be used to determine the conversion rate of CO₂ to CO in the HCl Synthesis Units. Where this option is utilized, the results from testing at the highest H₂ to Cl₂ ratio must be used.
- (b) The amount of CO₂ in the mixed chlorine feed to the Hydrochloric Acid Synthesis Units may be calculated from the carbon content of the brine entering the electrolyzer (as determined above) and process operating data (e.g. total and liquefied chlorine production, tail gas production, amount of each chlorine stream used for HCl production). The amount and concentration of CO₂ in the chlorine liquefaction tail gas must be calculated with the assumption that all CO₂ not accounted for the in liquefied chlorine ends up in the tail gas.

An example calculation is shown below:

$$\text{CO} \frac{\text{lb}}{\text{hr}} = \text{brine flow} \left(\frac{\text{liters}}{\text{minute}} \right) * \text{Na}_2\text{CO}_3 \left(\frac{\text{grams}}{\text{liter}} \right) * \left(\frac{28 \text{ g CO}}{106 \text{ g Na}_2\text{CO}_3} \right) * \left(\frac{60 \text{ min}}{\text{hr}} \right) \\ * \left(\frac{1 \text{ lb}}{453.6 \text{ grams}} \right) * 90\% \text{ conversion}$$

- 6.d. HCl Loading Operations. The HCl Loading scrubber controls emissions from both HCl loading and five HCl storage tanks.

Tank ID	Contents	Partial Pressure (psia)	Total Tank (lb/yr)
T-8100A	36% HCl	2.04	63 ¹
T-8100B	36% HCl	2.04	43 ¹
T-8100C	36% HCl	2.04	63 ¹
T-8600	36% HCl Product	2.04	10,313
T-8300	18% HCl	0.0004	0.80 ¹
Total			10,483

¹ Only standing losses calculated because vent header returns vapors to Tank T-8600

Emissions from the HCl Loading Operations Scrubber were calculated assuming a scrubber efficiency of 99.97% based on engineering calculations and the inlet HCl rate based on AP-42 calculations for organic liquid storage tanks as follows:

Process	Tank Venting	HCl Loading	Eductor Emissions	Total
Scrubber Inlet (lb/hr)	1.2	1.25	63	
Scrubber Efficiency (%)	99.97	99.97	99.97	
Scrubber Outlet (lb/hr)	0.00036	0.000375	0.0189	
Operation (hr/yr)	8,760	3,200	680	
Outlet Emissions (lb/yr)	3.15	1.2	12.85	17.21

Annual emissions will be estimated to be 17.2 lb/yr unless HCl production is significantly reduced or test data is generated. The facility can produce up to 178,850 tons of 36% HCl solution per year; yielding an emission factor of 9.62×10^{-5} pounds HCl per ton of 36% solution loaded.

2 Synthesis Units * 88.2 tons per day each * 365 days per year *(100 g solution / 36 g HCl)
= 178,850 tons

17.21 pounds per year / 178,850 tons per year = 9.62×10^{-5} pounds HCl per ton of 36% solution loaded

- 6.e. Salt Handling System.

Salt Transfer. PM emissions from the salt conveying system were estimated using EPA's AP-42 Section 13.2.4 "Aggregate Handling and Storage Piles" equation (1) as follows:

$$E = Nk(0.0032)*(U/5)^{1.3}/(M/2)^{1.4}$$

Where:

k = particle size multiplier of 1.0 for PM, 0.35 for PM₁₀ and 0.053 for PM_{2.5}

U = mean wind speed of 8 mph

M = moisture content of 2.5% for salt

N = Number of transfers. (two for salt conveying)

Salt Storage. PM emissions from wind erosion from the salt piles were estimated based on the Federal CAA Toolbox "Coal Piles/Coal Handling" equation. The average amount of salt stored is estimated at 33,500 tons based on historical averages from 2007 through March 2011. A control efficiency of 90% was used because the salt piles are sprayed with de-ionized water and dilute brine solutions which create a crust on the surface of the pile. The equation is as follows:

$$AE_i = Q*EF_{PM}*C_i(1-CE/100)$$

Where:

AE_i = annual emissions (lb/yr)

Q = Material stored estimated at 33,500 tons

EF_{PM} = Particulate matter emission factor of 0.01 (based on a silt content of 0.0005%)

C_i = Chemical i mass speciation (1.0 for PM)

CE = Control efficiency of 90% for continuous water application

All PM was conservatively estimated to be PM₁₀. The ratio of PM₁₀ to PM_{2.5} was assumed to be the same as for salt handling (0.35 to 0.053).

Bulldozer Operations. Emissions from bulldozer operations in the salt pile were estimated to be insignificant. A bulldozer is used infrequently for the movement of salt within the salt storage area. PM emissions from bulldozer operations at the salt pile were estimated based on AP-42 Section 11.9 "Western Surface Coal Mining" Table 11.9-1 as follows:

$$EF (PM) = 5.7*s^{1.2}/M^{1.3} \quad EF (PM_{10}) = 0.75* EF (PM)$$

Where:

EF = emission factor (lb/hr)

s = material silt content of 0.0005% for salt

M = moisture content of 2.5% for salt

The equation resulted in emission factors of 0.000189 lb PM/hr. Based on an estimated bulldozer operation of 400 hours per year, annual emissions from bulldozing would be 0.075 lb PM/year.

Salt Handling			
<u>Salt Transfers</u>			
Moisture Content =	2.5%		
Wind Speed (mph)=	8 mph		
Total Salt Transferred =	174,000 tons		
Number of Transfers =	2		
Emission Point	PM	PM ₁₀	PM _{2.5}
k factor =	1.0	0.35	0.053
Salt Transfer Emission Factor (lb/ton	8.63E-03	3.02E-03	4.57E-04
Salt Transfer Emissions (tons/yr) =	0.75	0.26	0.04
* Calculated using equation (1) from AP-42 Section 13.2-4 (11/06)			
<u>Wind Erosion of Salt Piles</u>			
Average Quantity of Salt Stored =	33,500 tons		
Crust Spray Efficiency =	90%		
Emission Factor (0.0005% Silt)	0.010 lb/ton (from SWCAA 04-2557R4)		
	PM	PM ₁₀	PM _{2.5}
Salt Wind Erosion (tons/yr) =	0.017	0.017	0.0025

6.f. General Plant Cooling Tower. Emissions from the cooling tower were estimated based on EPA's AP-42 Section 13.4 "Wet Cooling Towers" guidance which states that a conservatively high PM₁₀ emission factor can be obtained by multiplying the total liquid drift factor by the total dissolved solids fraction in the circulating water. Information from the manufacturer indicates that the maximum drift rate of the drift eliminator is less than 0.002% of the circulating water rate. A total dissolved solids content of 420 ppm and a cooling water flow rate of 8,000 gpm results in an emission rate of 295 lb PM/year. All PM is assumed to be PM₁₀ and PM_{2.5}.

General Plant Cooling Tower			
Drift Rate =	0.0020%		
Hours of Operation =	8,760 hours		
Makeup Water TDS =	420 ppmw		
Recirculation Flow =	480,000 gallons per hour		
	lb/hr	lb/yr	tpy
PM	0.034	295	0.15
PM ₁₀	0.034	295	0.15
PM _{2.5}	0.034	295	0.15

- 6.g. Caustic Evaporation Cooling Tower (T-7120). Emissions from the cooling tower were estimated based on EPA's AP-42 Section 13.4 "Wet Cooling Towers" guidance which states that a conservatively high PM₁₀ emission factor can be obtained by multiplying the total liquid drift factor by the total dissolved solids fraction in the circulating water. Information from the manufacturer indicates that the maximum drift rate of the drift eliminator is less than 0.001% of the circulating water rate. A total dissolved solids content of 420 ppm and a cooling water flow rate of 1,200 gpm results in an emission rate of 22 lb PM/year. All PM is assumed to be PM₁₀ and PM_{2.5}.

Caustic Evaporation Cooling Tower			
Drift Rate =	0.0010%		
Hours of Operation =	8,760 hours		
Makeup Water TDS =	420 ppmw		
Recirculation Flow =	72,000 gallons per hour		
	lb/hr	lb/yr	tpy
PM	0.0025	22	0.011
PM ₁₀	0.0025	22	0.011
PM _{2.5}	0.0025	22	0.011

- 6.h. Miscellaneous Storage Tanks. As shown in Table 5-2, the storage tanks do not contain any volatile organic compounds and the majority of the tanks do not contain any hazardous or toxic air pollutants. Emissions from the storage of sodium hydroxide will be negligible. Emissions from Tank T-1880 which contains a 29% sodium bisulfite solution were calculated using AP-42 Section 7.1 "Organic Liquid Storage Tanks" equations, a vapor pressure of 0.015 psia from the Safety Data Sheet which is conservative estimate because this vapor pressure likely also contains water, and three tank turnovers per year. Working loss emissions during tank filling were estimated at 0.16 lbs/yr and standing emissions were estimated to be 1.4 lbs/yr for a total tank emission estimate of 1.5 lbs/yr. The small quantity emission rate (SQER) for sodium bisulfite is 1,750 lb/yr.
- 6.i. Emissions Summary

Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
NO _x	0	0
CO ¹	50.00	-85.63
VOC	0	0
SO ₂	0	0
Lead	0	0
PM	0.93	0
PM ₁₀	0.44	0

Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
PM _{2.5}	0.20	0
CO ₂ /CO _{2e}	~ 200	Not quantified
NH ₃	0	0
H ₂ S	0	0
O ₃	0	0

Toxic/Hazardous Air Pollutant	Potential to Emit (tpy)	Project Impact (tpy)
Chlorine [7782-50-5]	0.081	0
Hydrochloric acid [7647-01-0]	0.058	0

¹ Note that CO emissions are a function of the conversion of CO₂ to CO. Depending on where the majority of the tail gas is used (tail gas is enriched in CO₂), most of the CO could be emitted from a single HCl synthesis unit even when both HCl synthesis units are operating at the same capacity.

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. Title 40 Code of Federal Regulations (CFR) 63.8180 et seq. (Subpart IIII) "National Emission Standards for Hazardous Air Pollutants: Mercury Emissions from Mercury Chlor-Alkali Plants" applies to mercury cell chlor-alkali plants. This facility is a membrane chlor-alkali plant and is therefore not subject to this subpart.
- 7.b. 40 CFR 63.8980 et seq. (Subpart NNNNN) "National Emission Standards for Hazardous Air Pollutants: Hydrochloric Acid Production" applies to HCl production facilities located at or part of a major source of HAP. This facility is not a major source of HAP emissions. In addition, an HCl production facility is not subject to this subpart if it produces HCl through the direct synthesis of hydrogen and chlorine and is part of a chlor-alkali facility.
- 7.c. 40 CFR 68 "Chemical Accident Prevention Provisions" requires affected stationary sources to compile and submit a risk management plan, as provided in Sections 68.150 to 68.185. Applicability is determined by the type and quantity of material stored at the facility. This

facility is subject to this regulation because it stores greater than the threshold amount of certain chemicals. The facility submitted a risk management plan to EPA on July 7, 2006.

- 7.d. 40 CFR 70 "State Operating Permit Programs" requires facilities with site emissions of any 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. This facility has opted to limit emissions of CO to levels below the Title V thresholds so as to remain exempt from the provisions of Title V.
- 7.e. 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.
- 7.f. 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.
- 7.g. WAC 173-401 "Operating Permit Regulation" requires all major sources and other sources as defined in WAC 173-401-200(17) to obtain an operating permit. This regulation defines "Major source" as any stationary source (or any grouping of stationary sources) that are located on one or more contiguous or adjacent properties, and are under common control of the same person (or persons under common control) belonging to a single major industrial grouping..." Since the facility is located on property leased from a paper mill adjacent to the same paper mill, it is necessary to demonstrate that this facility is a separate facility from the mill and does not need to be included in the operating permit program. Although the mill and this facility are clearly not the same corporation, past EPA guidance has resulted in a broader definition of common control. In a September 18, 1995 from EPA Region VII to the Iowa Department of Natural Resources, EPA provides a list of "screening" questions to establish whether common control exists between two facilities. These questions are outlined below:
- (1) Do the facilities share common workforces, plant managers, security forces, corporate executive officers, or board of executives? Westlake US 2 and the mill do not share any personnel between the two facilities.
 - (2) Do the facilities share equipment, other property, or pollution control equipment? What does the contract specify with regard to pollution control responsibilities of the contractee? Can the managing entity of one facility make decisions that affect pollution control at the other facility? The two facilities do not share pollution control equipment.
 - (3) Do the facilities share common payroll activities, employee benefits, health plans, retirement funds, insurance coverage, or other administrative functions? The two facilities do not share any of these criteria.

- (4) Do the facilities share intermediates, products, byproducts, or other manufacturing equipment? Can the new source purchase raw materials from and sell products or byproducts to other customers? What are the contractual arrangements for providing goods and services? The mill may purchase caustic soda and bleach from Westlake US 2. The mill supplies steam to Westlake US 2. In addition, wastewater from Westlake US 2 is released to mill's wastewater treatment facility.
- (5) Who accepts the responsibility for compliance with air quality control requirements? What about for violations of the requirements? Westlake US 2 accepts all responsibility for its facility.
- (6) What is the dependency of one facility on the other? If one shuts down, what are the limitations on the other to pursue outside business interests? Westlake US 2's site was previously occupied by an earlier chlor-alkali facility. There was a gap of several years between the shutdown of the previous facility and the startup of Westlake US 2, during which time the adjacent mill continued to operate and purchase its materials from other sources. Therefore, the mill is not dependent upon Westlake US 2 for operation. Westlake US 2 receives steam from the mill and sends its wastewater to the mill for further treatment. Westlake US 2 would need to make process changes in order to operate if these options were not available.
- (7) Does one operation support the operation of the other? What are the financial arrangements between the two entities? Currently there is no contractual arrangement between Westlake US 2 and the mill, and the majority of Westlake US 2's product does not go to the mill. However, it is possible that this would change in the future.

With issuance of Air Discharge Permit 24-3650 SWCAA will consider Westlake US 2 to be a minor facility that is not a support facility to any other facility. The Permit requires Westlake US 2 to provide SWCAA with the percentage of product provided to its top three customers so that SWCAA can be assured that Westlake US 2 remains an independent facility.

- 7.h. WAC 173-401-300(7) "Federally Enforceable Limits" provides that any source with the potential to emit exceeding the tonnage thresholds defined in WAC 173-401-200(18) can be exempted from the requirement to obtain an Operating Permit when federally enforceable conditions are established which limit that source's potential to emit to levels below the relevant tonnage thresholds. The permittee has agreed to emission limitations, control requirements, and the appropriate monitoring to assure that emissions of carbon monoxide are less than 100 tons per year to remain exempt from the requirements to obtain an Air Operation Permit.
- 7.i. WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.
- 7.j. WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM₁₀, PM_{2.5}, lead, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide in the ambient air, which shall not be exceeded.

- 7.k. SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.
- 7.l. SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit shall exceed twenty percent opacity for more than three minutes in any one hour at the emission point, or within a reasonable distance of the emission point.
- 7.m. SWCAA 400-040(2) "Fallout" requires that no emission of particulate matter from any source shall 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.
- 7.n. SWCAA 400-040(3) "Fugitive Emissions" requires that reasonable precautions be taken to prevent the fugitive release of air contaminants to the atmosphere.
- 7.o. 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.
- 7.p. SWCAA 400-091 "Voluntary Limits on Emissions" allows sources to request voluntary limits on emissions and potential to emit by submittal of an ADP application as provided in SWCAA 400-109. Upon completing review of the application, SWCAA shall issue a Regulatory Order that reduces the source's potential to emit to an amount agreed upon between SWCAA and the permittee. The permittee has agreed to emission limitations, control requirements, and the appropriate monitoring to assure that emissions of carbon monoxide are less than 100 tons per year to remain exempt from the requirements to obtain an Air Operation Permit.
- 7.q. SWCAA 400-109 "Air Discharge Permit Applications" requires that an air discharge permit application be submitted for all new installations, modifications, changes, or alterations to process and emission control equipment consistent with the definition of "new source". Sources wishing to modify existing permit terms may submit an Air Discharge Permit application to request such changes. An air discharge permit must be issued, or written confirmation of exempt status must be received, before beginning any actual construction, or implementing any other modification, change, or alteration of existing equipment, processes, or permits.
- 7.r. SWCAA 400-110 "New Source Review" requires that an Air Discharge Permit be issued by SWCAA prior to establishment of the new source, emission unit, or modification.

7.s. SWCAA 400-113 "Requirements for New Sources in Attainment or Nonclassifiable Areas" requires that no approval to construct or alter an air contaminant source 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) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
- (3) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
- (4) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

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

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

New BACT Determination(s)

8.a. New BACT Determination – CO from HCl Synthesis Units. Excess sodium carbonate used to precipitate calcium from the raw brine forms CO₂ in the electrolysis process. This CO₂ exists the cell room mixed with the Cl₂. When Cl₂ and H₂ streams are combined in the HCl synthesis units, the excess H₂ reduces most of the CO₂ in the Cl₂ stream to CO, resulting in CO emissions from the HCl synthesis unit scrubbers. CO may be controlled by minimizing or eliminating excess carbonate from the brine, minimizing, removing, or eliminating CO₂ from the Cl₂ stream, or controlling CO in the exhaust of the HCl synthesis units.

The permittee reviewed the following eight potential control options:

Control Option	Notes	% Reduction	Cost Effectiveness (\$/ton)
Bicarbonate Feed Controls	Installation of auto-titration equipment to enable more precise measurement of excess carbonate, enabling the use of lower excess carbonate and therefore lower CO ₂ production.	20%	\$381
Burner and Tail Gas Controls	Reduction in burner operation, and exclusive use of purified Cl ₂ (no tail gas or raw Cl ₂)	40%	\$17,227
Brine Pretreatment	Acidification of the incoming brine to liberate CO ₂ from Na ₂ CO ₃ in the brine upstream of electrolysis.	~50% - 90%	\$1,170

Control Option	Notes	% Reduction	Cost Effectiveness (\$/ton)
Regenerative Thermal Oxidizer	Generally higher capital but lower operating cost compared to direct thermal oxidation.	98%	\$4,438
Direct-fired Thermal Oxidizer	Direct-fired oxidation of the exhaust stream.	99%	\$5,331
Catalytic Oxidizer	Catalytic oxidation of the exhaust stream.	95%	\$5,704
Pressure Swing Adsorption	Vendor indicated they had no experience in this application. Considered technically infeasible.		N/A
Flares	The applicant considered this option infeasible due to the safety risk inherent in the use of a flare with a vent stream primarily consisting of H ₂ in a facility containing other H ₂ streams and vents.		N/A
Biological Oxidation	No data indicating CO would be effectively controlled in this manner. Considered technically infeasible.		N/A

In this case SWCAA considered the threshold for BACT cost-effectiveness for carbon monoxide to be much lower than for other criteria air pollutants due primarily to the fact that carbon monoxide is much less toxic. For example, the 1-hour NAAQS for CO is 3,500 times higher than for NO₂, and 467 times higher than SO₂. There are no ambient carbon monoxide concerns in this area that need to be considered and modeling indicates that at the proposed emission rates the facility will have a negligible impact on ambient air quality (well below the PSD Significant Impact Levels).

The permittee proposed that bicarbonate feed controls with an emission limit of 80 tons per year are BACT for this application. All other technically feasible options were not considered cost-effective. SWCAA concurs. However, the permittee has proposed to use brine pretreatment with an emission limit of 50 tons per year, an option that is beyond BACT, to insure they are able to safely maintain CO emissions below the applicable thresholds without the potential that they would need to waste tail gas which could still contain a relatively high concentration of CO₂ with the bicarbonate feed control option.

Note that SWCAA and the applicant could not identify any other similar facility that has installed carbon monoxide emission controls.

Previous BACT Determination(s)

- 8.b. BACT Determination – HCl Synthesis Unit #1 and #2. The use of a two stage scrubber with once through water as the scrubber liquor in the final scrubber stage has been determined to meet T-BACT for the types and quantities of HCl emitted from the process. The scrubbers will reduce HCl by 99.9998%. Although SWCAA has typically established outlet concentration limits for HCl scrubbers at 1 ppm, a long-term outlet concentration of 10 ppm has been established for these scrubbers. Typical HCl scrubbers use caustic to achieve lower HCl outlet concentrations however the scrubber liquor will be used to produce the 36% HCl product and caustic would contaminate the final product. Although several pH adjusted scrubbers are already operating onsite, this stream is composed primarily of hydrogen and if mixed with an oxygen stream will result in a potentially explosive atmosphere therefore it is not practical to further treat the exhaust in one of the existing scrubbers.
- 8.c. BACT Determination – HCl Loading Operations. The use of a pH controlled scrubber has been determined to meet T-BACT for the types and quantities of HCl emitted from HCl loading operations.
- 8.d. BACT Determination – Chlorine Handling System. The use of pH controlled scrubbers has been determined to meet BACT and T-BACT for the types and quantities of chlorine emitted from chlorine production.
- 8.e. BACT Determination – Acid Storage Tanks. The use of an acid scrubber with once through water has been determined to meet BACT and T-BACT for the types and quantities of acids emitted the acid storage tanks.
- 8.f. BACT Determination – Salt Handling System. The salt handling system consists of salt unloading and salt storage. Water spray is used as a control method for particulate matter from the salt storage piles. The salt pile is sprayed with a de-ionized water and dilute brine solution. This wetting of the salt pile creates a crust on the surface of the pile that significantly reduces particulate matter emissions. Therefore, the use of water spray and pre-washed salt is considered BACT for the types and quantities of particulate matter from the salt piles.
- Observations of actual salt unloading operations at similar facilities have not resulted in the creation of any visible emissions. In addition, the estimated emissions from salt unloading of 17 lb/yr is not significant enough to warrant any additional pollution control equipment. The use of pre-washed salt has been determined to meet BACT for the types and quantities of particulate matter from the salt unloading.
- 8.g. BACT Determination – Cooling Tower. The use of a cooling tower with a drift eliminator has been determined to meet BACT for the types and quantities of PM emitted from the cooling tower.
- 8.h. BACT Determination – Miscellaneous Storage Tanks. Emission estimates from the miscellaneous storage tanks at the facility are negligible. Good operating practice has been

determined to meet BACT and T-BACT for the types and quantities of HAPs emitted from the miscellaneous storage tanks.

PSD / CAM Determinations

- 8.i. 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.j. 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

The applicant modeled the maximum impact of up to 3.137 g/s (24.9 lb/hr) of carbon monoxide emissions using EPA's AERMOD version 15081 dispersion model using a single year (2000) of meteorological data from the Weyerhaeuser meteorological station that was located approximately 1 km from the site. The model predicted the following maximum concentrations:

Averaging Period	Model Maximum Predicted Impact $\mu\text{g}/\text{m}^3$	PSD Significant Impact Level $\mu\text{g}/\text{m}^3$	Predicted Background¹	Ambient Air Quality Standard
1-hour	804 (0.7 ppm)	2,000 (1.7 ppm)	1.22 ppm	35 ppm
8-hour	324 (0.3 ppm)	500 (0.4 ppm)	0.87 ppm	9 ppm

¹ Predicted background is from NW Airquest based on data from 2014-2017.

The permit limits carbon monoxide emissions to 20 lb/hr for at least 90% of the operating hours, during which the ambient impacts will be below the PSD significant impact levels. Maximum uncontrolled emissions are on the order of 53 lb/hr which would also not cause or contribute to a violation of the ambient air quality standards. Based on these modeled results, emissions of carbon monoxide will not have a significant adverse impact on ambient air quality.

Conclusions

- 9.a. Operation of the HCl Synthesis Units as proposed in ADP Application CO-1021, will not cause the ambient air quality requirements of 40 CFR 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.
- 9.b. Operation of the HCl Synthesis Units as proposed in ADP Application CO-1021, 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.c. Operation of the HCl Synthesis Units as proposed in ADP Application CO-1021, 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 24-3650 in response to ADP application CO-1021. ADP 24-3650 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

- 10.a. Supersession of Previous Permits. ADP 24-3650 supersedes ADP 04-2557R4 in its entirety. Compliance will be determined under this ADP, not previously superseded ADPs.
- 10.b. Emission Limits. The applicant requested a 50 ton per year carbon monoxide limit for the hydrochloric acid synthesis units. Potential uncontrolled emissions exceed 100 tons per year, therefore this represents a "synthetic minor" limitation that maintains emissions below the 100 ton per year threshold for the Air Operating Permit Program (Title V) and the Prevention of Significant Deterioration (PSD) program. Along with this limit is an hourly limit of 20 pounds per hour from each unit and combined. These limits meet both the requirements of BACT and are below a level where emissions would have a significant impact on ambient air quality. Based on a material balance review of the process, these levels are achievable with the proposed brine acidification process.
- 10.c. Operational Limits and Requirements. The scrubber parameter requirements apply during all plant operation when a gas stream is exhausted to a specific scrubber, including startup, shutdown and malfunction. Since the HCl Loading Operations Scrubber also controls breathing losses from the HCl tanks, the requirements apply whenever product is stored in these tanks.

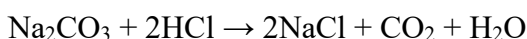
HCl Loading Conductivity Testing. The permit contains a condition requiring a conductivity test to confirm the integrity of the rubber liner on each truck or railcar loaded with HCl. This test is conducted in accordance with The Chlorine Institute Pamphlet 98 "Recommended Practices for Handling Hydrochloric Acid in Tank Cars". This requirement was made more specific in SWCAA 24-3650 to specify that the "2.9" limit is in units of mA.

Chlorine Railcar Leak Testing. The permit contains a requirement to utilize ammonia to detect chlorine leaks from railcars loaded with chlorine. A chlorine leak will react with the ammonia forming a visible white solid ammonium chloride particulate that would look like smoke. This requirement was modified in SWCAA 24-3650 to allow for the use of ammonia vapor. The permittee has indicated that the use of ammonia vapor is preferable over ammonia spray to minimize corrosion or deposition on the fittings being checked.

Pressure Testing of HCl Trucks and Railcars. SWCAA 04-2557R4 contained a requirement to pressure test each truck and railcar loaded with hydrochloric acid to at least 30 psig after loading. The permittee has indicated that trucks cannot be tested to this pressure. The requirement was modified such that the leak check procedure for trucks uses

either a bubble test or ammonia (in the same manner as chlorine railcar leak testing) but does not include the high-pressure test. The vapor pressure of 37% HCl is approximately 150 mm Hg at 20°C; therefore, there will be enough pressure in the tank that a soap bubble test on fittings would reveal significant leaks.

Brine pH and Eductor Pressure. When the brine is acidified with HCl, CO₂ is liberated from Na₂CO₃:



As the CO₂ leaves the brine solution the pH rises, and if there is residual Na₂CO₃, the pH will be alkaline (>7.0). If all the acid could be added in an instant and the solution pH measured before the reaction above started and CO₂ left the solution, then initial pH would be an important metric. In practice the initial pH will be changing as acid is added, the reaction proceeds, and CO₂ is removed from the solution, so establishing an initial pH limitation is not practical. In the brine the equilibrium between CO₂/H₂CO₃, HCO₃⁻ and CO₃²⁻ varies by pH such that at a pH of 7.0 less than 20% of the carbon is in the form of CO₂, while at a pH of 6.0 approximately 70% is in the form of CO₂. In the equilibrium reaction H₂O + CO₂ ↔ H₂CO₃, the vast majority of the carbon is in the form of CO₂. The more acidic the solution is, the stronger the driving force to form CO₂ that can be stripped from the brine. Theoretically it would seem that at any pH less than 7.0, all of the carbonate could ultimately be removed from the solution, however the amount of time and stripping required would increase exponentially as the pH approached 7.0, therefore the pH must be maintained somewhat more acidic in practice.

A "final" pH limit (downstream of acidification and air stripping), beginning at <6.0 was established to assure that enough acid was added to push the reaction towards CO₂ evolution. The amount of carbon actually removed by the proposed configuration at a specific pH will be unknown until testing is conducted after construction. After startup of the new equipment, the pH limit can be modified based on the results of carbonate testing.

An eductor in parallel with a spray nozzle will be installed to entrain air with the brine at the top of the purified brine storage tank. It is expected that these eductors will be the primary method of stripping CO₂ from the brine, and the pressure, and hence the amount of air entrained, is modifiable. Unless additional air sparging is added, a minimum eductor pressure will be the only other modifiable parameter for which modeling is required to assure compliance with the permitted emission limit. The minimum eductor pressure will be established based on the results of carbonate testing after construction.

- 10.d. Monitoring and Recordkeeping Requirements. Sufficient monitoring and recordkeeping was established to document compliance with the annual emission limits and provide for general requirements (e.g. excess emission reporting, annual emission inventory submission), and assist in the compliance assessment during on-site inspections. Records of maintenance activities and the results of periodic inspections conducted by facility personnel are required because they are valuable tools for regulatory inspectors and plant

personnel. In addition, these records can be used to determine appropriate operating and maintenance requirements in a future permitting action.

The maximum amount of CO that can be generated in the HCl Synthesis Units is dependent on the amount of carbonate and CO₂ in the brine entering the electrolyzer. This in turn will be dependent on the pH of the brine and the amount of stripping that takes place. The amount of stripping will be primarily controlled by the eductor and spray nozzle that feed the purified brine storage tank. By monitoring these two parameters continuously and correlating these parameters with weekly, then monthly, measurements of total carbon in the brine entering the electrolyzer we will be able to determine how much CO can be generated.

- 10.e. Emission Monitoring and Testing Requirements. See Section 12.
- 10.f. Reporting. The permit requires reporting of the annual air emissions inventory and reporting of the data necessary to develop the inventory. Excess emissions must be reported immediately in order to qualify for relief from monetary penalty in accordance with SWCAA 400-107. In addition, prompt reporting was required because it allows for accurate investigation into the cause of the event and prevention of similar future incidents.

Reporting the annual weight percentage of total product (chlorine, caustic soda, hydrogen, and bleach) sent to the top three customers for the previous calendar year on a 100% chemical basis will be used to verify that no common control exists between the permittee's facility and the adjacent mill.

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.

- 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 accommodated by 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, no additional measures were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

- 12.a. Emission Testing Requirements – HCl Synthesis Units. Cl₂ emissions would only be expected if the H₂ to Cl₂ molar ratio was less than 1.0 or somehow there were poor mixing of H₂ and Cl₂. Any deviation from the target H₂ to Cl₂ ratio should be detected by process instrumentation, and any Cl₂ emissions should be detected by the Cl₂ monitor at the stack. All source emission tests to-date have demonstrated compliance with the HCl and Cl₂ emissions limits by a wide margin, and the scrubbing ability is expected to remain constant. Therefore, sampling once every two calendar years for HCl and Cl₂ is expected to provide a reasonable assurance of compliance with the HCl and Cl₂ permit limits.

Carbon monoxide sampling is required annually. The primary purpose of the sampling is to measure the ratio of CO to CO₂ in the stack gas, thereby determining the CO₂ conversion rate in each unit. This data is used as an input to the CO emissions calculations.

Because the exhaust stream is primarily H₂ and the exhaust velocity is relatively low, measurement of exhaust flow using traditional pitot tubes is not practical. A highly sensitive vane anemometer has been found to provide the best results.

- 12.b. Emission Testing Requirements – Chlorine Vent Scrubber (TW-4100). All testing to date has demonstrated compliance by a wide margin and the scrubbing efficiency is expected to remain constant, therefore annual testing is expected to provide a reasonable assurance with the Cl₂ emission limit. During normal operation the exhaust flow may be low enough that measuring velocity pressure with a pitot tube may not be practical, therefore an option to utilize a vane anemometer was added. Measurement of the stack gas dry molecular weight was added (rather than assuming the molecular weight of ambient air) because this stream is likely to contain a ratio of N₂ to O₂ different from ambient air. Initial submittal materials for this facility indicate that the gas could be approximately 56% N₂ and 44% O₂.
- 12.c. Emission Testing Requirements – HCl Loading Operations. Emissions from HCl loading operations are too small to warrant periodic testing as a permit requirement. In addition, emission will be difficult to measure due to the extremely low concentration expected.
- 12.d. Emission Testing Requirements – Hypo Destruction Tank (T-4450). Cl₂ testing of this unit was discontinued because no testing to date has indicated significant Cl₂ emissions and SWCAA is not aware of any mechanism that would produce significant Cl₂ emissions from this process.

13. FACILITY HISTORY

- 13.a. General History. This facility began operation as a chlor-alkali plant on July 20, 2006 as Equa-Chlor, LLC. HCl Synthesis Unit #1 began operation in 2009. The facility was purchased by PPG May 1, 2011. HCl Synthesis Unit #2 began operation in 2012. On January 28, 2013 the facility was sold and began operating as Eagle US 2, a subsidiary of Axial Corporation. Axial was purchased by Westlake Chemical Corporation on August 31, 2016.
- 13.b. Previous Permitting Actions. The following past permitting actions have been taken by SWCAA for this facility:

Permit	Application	Date Issued	Description
04-2557	CO-772	August 17, 2004	Approved installation and operation of a new chlor-alkali plant.
04-2557R1	CO-819	February 27, 2007	Modification of scrubber liquor flow rates for Hypo Finishing Tower, Chlorine Vent Scrubber, Emergency Vent Scrubber, removal of ORP limit for Hypo Finishing Tower, modification of cooling tower make/model.
04-2557R2	CO-858	December 31, 2008	Installation of Hydrochloric Acid Synthesis Unit #1, modification of Hypo Storage Tank Exhaust (T-4500A/B), installation of Sodium Hypochlorite Destruction Tank (T-4450).
04-2557R3	CO-908	May 18, 2011	Increase in salt handling throughput and emission limit.
04-2557R4	CO-914	February 15, 2012	Installation of Hydrochloric Acid Synthesis Unit #2.

Bold font indicates that the Permit or approval was superseded or will no longer be in effect when Air Discharge Permit 24-3650 becomes fully effective.

- 13.c. Compliance History. The following compliance issues have been identified for this facility within the past five years:

NOV	Date	Violation
10631	11/18/2022	Fugitive HCl from railcar after liquid loading line and vapor return line were swapped.
10629	7/8/2022	Cl ₂ fugitive release when wastewater from HASA, Inc. containing bleach was sent directly to wastewater, instead of a brine tank because that tank was out of service at the time, where it contacted low pH wastewater, releasing Cl ₂ gas.
10122	7/26/2021	Loss of recirculation flow in the Emergency Vent Scrubber for 4 minutes and 7 seconds. There were no emergency vents, startups, or other chlorine discharges to the Emergency Vent Scrubber during this incident, therefore this incident did not result in excess emissions.
10120	6/8/2021	A controller failure caused by a firmware error in an input/output card ultimately caused a variety of equipment to shut down, causing depleted brine containing dissolved Cl ₂ to overflow Tanks T-2300A/B, and a fugitive release of up to 2.1 lbs of Cl ₂ . A firmware update was available to correct the underlying error, but the update had not been installed.
10117	3/4/2021	Estimated 99.3 pounds of Cl ₂ released from HCl Synthesis Unit #2 when a nitrogen valve failed, ultimately reducing the amount of H ₂ sent to the HCl burner, allowing the Cl ₂ to H ₂ ratio to drop below stoichiometric and causing the excess Cl ₂ to be emitted from the stack of the tail gas scrubber. Notice of Correction issued.
10116	3/4/2021	Total of 3 minutes 45 seconds of reduced or zero recirculation flow in HCl Loading Operations Scrubber. All incidents related to a failing recirculation pump motor.
10114	1/27/2021	Excess Cl ₂ was detected during a source test. Determined to be caused by inadequate purging of the N ₂ from the H ₂ line prior to startup immediately before the test.

NOV	Date	Violation
10111	1/14/2020	An operator opened a stack valve to vent excess H ₂ , reducing the hydrogen header pressure to HCl Synthesis Unit #1. This caused the H ₂ :Cl ₂ stoichiometric ratio to drop below 1, and the unreacted Cl ₂ was discharged through the stack. The stack valve was opened because N ₂ purge air was introduced to the system, making it appear that the H ₂ pressure was too high. An H ₂ pressure switch should have tripped the unit, preventing this incident. This switch has reportedly been repaired to prevent recurrence. A Cl ₂ monitor at the stack detected Cl ₂ gas and shut down the unit at 4:01:30 p.m., 3 minutes after the H ₂ pressure began to drop. Determined to be unavoidable.
10110	1/14/2020	HCl Loading Operations Scrubber flow dropped below required 100 gpm for ~18 seconds during loading. The low flow value was reportedly due to an operator opening a manual caustic addition valve, momentarily impacting the recirculation pump suction. The cause of the low pH value that resulted in the need to add caustic manually was not identified. No penalty assessed.

All of the above NOVs have been fully resolved.

14. PUBLIC INVOLVEMENT OPPORTUNITY

- 14.a. Public Notice for ADP Application CO-1021. Public notice for Air Discharge Permit Application CO-1021 was published on the SWCAA internet website for a minimum of 15 days beginning on November 14, 2019.
- 14.b. Public/Applicant Comment for ADP Application CO-1021. A thirty (30) day public comment period will be provided for this permitting action pursuant to SWCAA 400-171(3).
- 14.c. State Environmental Policy Act. SWCAA issued Determination of Non-Significance 24-025 on July 24, 2024, for this project.