NEUTRALIZATION PLAN

23% FLUOROSILICIC ACID

STOLTHAVEN NEW ORLEANS L.L.C.
2444 ENGLISH TURN ROAD
BRAITHWAITE, LOUISIANA

prepared by:

Team Comprising Representatives From
Enviro-One, CTEH and Stolthaven

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1.0 Introduction

Stolthaven Terminals operates a bulk liquid storage terminal located at mile marker 80 on the Mississippi River. At the request of the COPT, the terminal has developed a plan to safely neutralize approximately 500,000 gallons of 23% Fluorosilicic Acid (FSA).

Material Safety Data Sheets (MSDS) for FSA, and 50% sodium hydroxide meeting the requirements of 29 CFR 1910.1200 (g) are included in Appendix A. The MSDS's include information on the physical and chemical characteristics of FSA, sodium hydroxide with safety information. The MSDSs includes toxicity information, permissible exposure limits, physical, reactivity, corrosivity, thermal and chemical stability. Chemical characteristics may vary from source to source due to varying experimental temperatures and pressures.

2.0 General Information

The main objective of this neutralization plan is to ensure the treatment through onsite neutralization of approximately 500,000 gallons of 23% fluorosilicic acid stored at the Stolthaven New Orleans facility. The plan identifies the methods to be utilized and the treatment technologies employed to safely and efficiently handle the material.

Emergency notification procedures are in place to manage all potential areas of concern that may occur during the treatment phase of the project.

3.0 Safety

The safety of all personnel working at the Stolthaven facility is of paramount concern to the management team of Stolthaven New Orleans. At no time will production rates or time constraints become an issue where the safety of the workers could be jeopardized.

3.1 Personnel Safety and Protection Clothing

An exclusion zone will be established within 25 feet of the batch treatment systems. All personnel entering this exclusion zone during neutralization will be required to wear level "C" protective clothing. Level "C" protective clothing includes splash suit, gloves, hardhat, chemical resistant safety boots or safety boots with latex over boots and air purifying respirator. Although hydrogen fluoride (HF) gas is not expected to evolve during the neutralization, air monitoring will be conducted to detect its presence. The OSHA Permissible Exposure Level (PEL) (8 hour Time Weighted Average (TWA)) is 3 ppm. Should HF be detected above 50% of PEL (1.5 ppm) in the vapor space above the reaction treatment tank, the acid flow will be immediately stopped. Personnel monitoring the neutralization process will be stationed upwind of the treatment tanks. If necessary, an emergency response team suited in Level "B" protection will enter the treatment area, identify and correct the system upset.

After the successful completion of the first two treatment tank neutralization operations, the level of protective clothing will be reviewed based upon the HF air monitoring readings.

As part of the Terminal's Management of Change (MOC) process the following will be conducted prior to commencement of any batch treatment process.

- MOC Equipment Change (Batch Neutralization)
- Communication of Change (MOC/Process Safety Information)
- Pre-startup Safety Review (PSSR)
- JSA (job safety analysis)

4.0 Bench Tests

Several laboratory and field batch treatment tests have been conducted to identify the appropriate formula for neutralization of the FSA while not generating any hydrogen fluoride detections. The "batch tests" were conducted to gather data to ascertain any difficulties that may arise during the batch treatment operations. All bench tests simulated the batch treatment scale operation. In the first bench test, FSA was metered into a carbon steel drum containing about 5 gallons of 50% sodium hydroxide through a subsurface injection system. During the batch test, continuous air monitoring for hydrogen fluoride was performed to help evaluate the optimum process flow rates without hydrogen fluoride. FSA was added to the sodium hydroxide at various rates of delivery, beginning at a rate of 2.3 gallons per day. The first field bench test was halted after neutralizing ten gallons of FSA and the solids collected in two thirds of the test drum. Based on the test data, the treatment system will generate heat in the 140 to 150 degree F range, but no hydrogen fluoride was liberated if the pH was maintained above 7.5.

Several laboratory tests were conducted utilizing numerous different concentrations of sodium hydroxide and FSA. The results of the tests were used as a basis for the initial concentration to be used in the batch test process.

5.0 Process Information – FSA Neutralization

5.1 Stoichiometry

After consultation with numerous representatives from several companies experienced in handling FSA, the following summary of the stoichiometry is provided:

Quantity of FSA	500,000 gallons
Density of FSA	10.2 lbs/gal
Quantity of 50% Sodium Hydroxide	229,000 gallons
Density of 50% Sodium Hydroxide	12.5 lbs /gal
Volume of Neutralization Batch Tank	21,000 gallons
Target pH	8.0 – 8.5
Temperature Range	120-150 degrees F

The quantity of sodium hydroxide to neutralize the total volume of FSA in storage at the facility to a pH range of 8.0 to 8.5 is estimated to be approximately 250,000 gallons.

5.2 Process Overview

A series of four 21,000 gallon batch treatment tanks will be positioned adjacent to Equalization Tank-1 in the facility wastewater treatment plant. One batch treatment tank will be set up as a spare and can be used for temporary storage of the neutralized FSA. Each treatment tank will be filled with approximately 4000 gallons of 50% sodium hydroxide and 1000 gallons of water to provide a 40% volumetric solution of sodium hydroxide. Circulation will be established on each tank. Three lined acid tank trailers will be used to deliver the acid to the neutralization area. Each trailer will be loaded to a predetermined quantity on the truck rack using a weigh scale. An inline stainless steel flow meter will be used to determine the gallons per minute flow rate to the neutralization tanks.

Temperature, pH, acid feed rate, HF in the vapor space and circulation will be monitored continuously during the treatment process. Mixing of the sodium hydroxide solution will begin immediately after sodium hydroxide is discharged into the treatment tank and will be maintained during the treatment process. FSA will be injected subsurface into the sodium hydroxide solution at a beginning rate of 5 gallons per minute with the potential of increase during the treatment.

Once the pH of the treatment tank solution is reduced to 9, the flow of FSA into the treatment tank will be reduced. FSA flow will be stopped if the pH drops below 8.

Monitoring for hydrogen fluoride evolution will be accomplished during the batch treatment process utilizing colorimetric tubes and/or direct reading instrumentation.

A process flow diagram and plot plan are provided in Appendix D. The plot plan provides an overview of the area used to conduct neutralization.

5.3 Treatment System

The batch treatment system designed for the neutralization of the FSA has been designed to provide the highest level of safety for the workers as well as the environment. The treatment tanks for the neutralization operation are 21,000 gallon open top, carbon steel tanks with multiple neoprene fitted butterfly valves on the front and rear for fluid loading and unloading. The tanks will be placed in the treatment area and have adequate secondary containment. Each tank will be certified per the LDEQ Hazardous Waste Regulation.

The rear tank valve will be connected to a steel sludge pump utilizing 4-inch transfer hoses. The pump will then be connected to the header leading to a clarifier located in the wastewater treatment plant. Sodium hydroxide will be trucked to the facility by common carriers and placed in each of the 3 batch treatment tanks. FSA will be loaded into an acid transport truck at the facility truck rack and moved on plant roadways to the treatment area. The FSA will be metered into the treatment tank through a 2-inch polyethylene transfer hose fitted with a process valve to allow for throttling and positive closure by the system operator. Temperature, pH, circulation and HF level in the vapor space will be monitored by the system

operator at the top of the treatment tank. All starting and stopping operations will be initiated by the system operator. A process monitoring log sheet is provided in Appendix C.

5.4 Sodium Hydroxide Feed System

The sodium hydroxide will be trucked to the facility by tank trailer and be discharged to the batch treatment tank using differential pressure created by pressurizing the tank trailer with compressed air. Once the sodium hydroxide solution has been discharged to the treatment tank, an amount of water will be added reducing the sodium hydroxide to the determined concentration. The solution in the treatment tank will be mixed with a pump and circulation loop having a maximum flow rate of 1800 gpm to attain consistency of the sodium hydroxide solution throughout the treatment tank. The heat of reaction, sodium hydroxide and water, will increase the solution temperature to approximately 110 to 120 degrees Fahrenheit. The treatment solution will be aerated for 30 minutes to allow the generated heat to dissipate prior to introducing any FSA.

5.5 Acid Feed System

The FSA from tanks C15-16, E12.5-10and E12.5-7 will be loaded into acid tank trailers parked on a custody transfer quality weigh scale in the facility truck loading bay. The FSA will be loaded through the facility piping system and moved to the treatment area on facility roads. Once the tank trailer is spotted at the appropriate batch treatment tank, a 2-inch stainless steel flow meter and crosslink polyethylene transfer hose will be connected to the tank trailer outlet. The discharge end of the crosslink polyethylene hose will be connected to a 2-inch stainless steel block valve located on the transfer pipe, which is in turn submerged in the sodium hydroxide solution. The FSA will be transferred to the treatment tank using differential pressure created by pressurizing the tank trailer with compressed air. Approximately 20 psig of regulated air pressure will be used to offload the FSA. The acid feed rate and level in the neutralization rate will be monitored continuously.

5.6 Treatment Tank Monitoring

During the FSA treatment in the batch tanks, constant monitoring of the vapor space of the reactor will be performed. The parameters for the constant treatment system operations are as follows:

- Temperature: 120 – 150 degrees F
- pH: 8.0 – 14
- Hydrogen Fluoride: < 1.5 parts per million (PPM)
- FSA Feed Rate: 5- 20 gpm (will decrease or increase depending on process conditions.
- Neutralization Reactor Circulation Rate: 1800 gpm

If during the operation of any of the 3 batch treatment systems the parameters described above are exceeded, the respective batch process tank will be shut down. The Neutralization Team

will adjust and or stop flow to the batch process and identify the reason for exceeding the parameter and implement corrective measures.

5.6 Clarification/Solids Removal

A clarifier certified for Hazardous Waste Service will be used to separate the supernatant liquid from the solids. The Supernatant liquids will gravity flow into a Hazardous Waste Certified Transportation Tank. The liquid accumulated in the Transportation Tank will be loaded in Tank Trucks, manifested and transported to a permitted hazardous waste disposal facility for disposal. The solids will accumulate in the bottom section of the clarifier where they will be transferred to a vacuum box using a positive displacement pump. The solids in the vacuum box will be manifested and transported to a permitted disposal site for disposal. If necessary, polymer can be added to enhance separation of the solids from the supernatant. The maximum transfer rate to the clarifier is 120 gpm. The clarifier requires head pressure to operate properly. Approximately 2 treatment batches are required before it can begin operation.

6.0 Operational Timeline

Time	Objective
1400	Load each treatment tank (F-1, F-2 and F-3) with approximately 4000 gallons of 50% sodium hydroxide and 1000 gallons of water. Start air sparger and or circulation (2 hours)
1400	Load three trucks of FSA and deliver to the neutralization area (1.5 hours)
1600-1630	Connect FSA trailers to treatment tank F-1, F-2 and F-3. Start circulation pump and begin and metering acid into F-1, F-2 and F-3 at a controlled rate (15 to 20 gpm) while monitoring pH and temperature. Air monitoring will be conducted during neutralization. This step is expected to take approximately 4 hours to complete. An air sparger may be used for cooling if it does not cause hydrogen fluoride emissions.
2000-2030	Disconnect FSA trailers from F-1, F-2 and F-3. FSA trailers return to the truck loading rack for reloading. Start air spargers on F-1, F-2 and F-3
2100	Load FSA trailers at truck loading rack and return to the neutralization area (1.5 hours).
2300	Connect FSA trailers to treatment tank F-1, F-2 and F-3. Begin metering acid into F-1, F-2 and F-3 at a controlled rate (15 to 20 gpm) while monitoring pH and temperature. Air monitoring will be conducted during neutralization. This step is expected to take approximately 4 hours to complete. An air sparger may be used for cooling if it does not cause hydrogen fluoride emissions.
0300	Disconnect FSA trailers from F-1, F-2 and F-3. FSA trailers return to the truck loading rack for reloading.
330	Empty FSA trailers moved from staging area

0400	Transfer contents of F-1 to clarifier for solids settling (2 hours)
0530	Pump supernatant liquid from top of clarifier to temporary storage tank in the wastewater treatment plant
0700	Transfer solids from clarifier to vacuum box (1 hour)
0800	Transfer contents of F-2 to clarifier for solids settling (2 hour)
1000	Pump supernatant liquid from top of clarifier to temporary storage tank in the wastewater treatment plant
1100	Transfer solids from clarifier to vacuum box (1 hour)
1200	Transfer contents of F-3 to clarifier for solids settling (2 hours)
1400	Pump supernatant liquid from top of clarifier to temporary storage tank in the wastewater treatment plan
1500	Transfer solids from clarifier to vacuum box (1 hour)

Note: Times are approximate and subject to change. Process will be documented on Log Sheets in Appendix "D"

7.0 Tank Trailer Loading

Stolthaven will load all FSA tank trailers vehicles in the same manner as any other product loaded on transportation vehicles. The tank trailers will enter the plant through the main entrance and proceed to the Truck Loading Rack. Once the truck is parked on the scale at the appropriate Truck Loading Bay, Stolthaven personnel will verify that the trailer is clean or containing a residue of previous fluorosilicic acid loads.

Stolthaven personnel will perform all required inspections in Level D protective clothing. Once the inspections are complete, Stolthaven personnel will don appropriate protective clothing and load the fluorosilicic acid in the tank trailer. Upon completion of the loading operation, the transportation vehicle will be inspected with the driver to ensure the vehicle is within transportation specifications. The secondary inspection will include:

- Visually inspecting the internal and external valves for leakage
- Tightness of all manways
- 4-Placards on the trailer
- Grounding cable removed
- Transfer hoses secured
- Notate the total weight in FSA loaded

The tank trailer will then depart the Loading Rack and proceed to the treatment area for processing in the treatment system.

8.0 Emergency Procedures

The following actions to be taken if the neutralization process becomes uncontrollable:

1. Immediately stop flow of acid to tank.
2. Use Fire monitors on fog pattern to knock down any vapors formed.
3. Notify NRC, State Police, USCG and Plaquemines Parish OEP
4. All storm water outfalls will be closed to ensure no migration off site.
5. Additional sodium hydroxide pumped into batch treatment tank
6. Continuously monitor temperature, pH and HF levels.

9.0 Environmental

9.1 RCRA

The terminal shall comply with the generator requirements of the hazardous waste regulations LAC 33:V.1101-1125. The terminal have had discussions with the LDEQ regarding any potential issues with neutralizing this material under the elementary neutralization exemption provided in the hazardous waste regulations. They agree that the terminal may neutralize the acid under this exemption. A notification letter is being sent to the LDEQ regarding his matter.

9.2 Waste Disposal Options

The solids removed from the clarifier will be considered non-hazardous waste. Analytical testing (refer to appendix I) supports the non-hazardous waste classification. However, the liquid (supernatant) that leaves the clarifier will be classified as a characteristic toxic waste (D004) due to arsenic. The arsenic is inherent to the FSA manufacturing process. Hence, the supernatant shall be disposed of at a hazardous waste facility. Profiles are being prepared and sent to each perspective disposal site.

Per LAC 33:V.305.C, the facility is exempt from hazardous waste permitting because the characteristic waste is treated in an elementary neutralization unit as defined in LAC 33.V.109. Therefore, the system is exempt from TSD standards. However, the terminal will comply with the generator requirements in the TSD regulations.

10.0 Air Modeling

Air Modeling Data is provided in Appendix E. This modeling data was prepared for the original larger batch reactor.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	HFS
Chemical Name:	Fluorisilicic Acid
Chemical Family:	Inorganic acid
Synonyms/Brands:	Fluosilicic acid, hydrofluorosilicic acid
Chemical Formula:	H_2SiF_6
Primary Use:	MunicipalWater Treatment
Responsible Party:	Mosaic Phosphates 100 South Saunders Road, Suite 300 Lake Forest, Il 60045
Non-Emergency Technical Contact:	8:00am – 4:00pm Central Time USA, Mon - Fri: 800-944-6610 or 847-739-1432

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Number:
For Chemical Emergencies:
Spill, Leak, Fire or Accident
Call CHEMTREC
North America: 800-424-9300
Others: 703-527-3887 (collect)

Health Hazards:	Corrosive. Causes nose, throat and lung irritation. Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Wear appropriate personal protective equipment. Keep container tightly closed. Use ventilation adequate to keep exposures below recommended limits (see Section 2).
Physical Hazards:	Contact with water may generate toxic, irritating and corrosive gases. Avoid contact with water. Keep container tightly closed.
Physical Form:	Liquid
Appearance:	Colorless to pale yellow
Odor:	Pungent, irritating

NFPA HAZARD CLASS		HMIS HAZARD CLASS	
Health:	3 (High)	Health:	3 (High)
Flammability:	1 (Slight)	Flammability:	1 (Slight)
Instability:	1 (Slight)	Reactivity:	1 (Slight)
Special Hazard:	None	PPE:	Section 8

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	% Weight	Exposure Guideline		
		Limits	Agency	Type
Fluorosilicic Acid* CAS No. 16961-83-4	23-26	2.5mg/m^3 (as F)	OSHA	8 hr. TWA
		2.5mg/m^3 (as F)	ACGIH	8 hr. TWA
		250 mg F/ m^3	NIOSH	IDLH**
		2.5 mg/m3	MSHA	8 hr. TWA
Water CAS No. 7732-18-5	74-77	None		

Notes:

*A biological threshold limit of 2 mg of F/l in urine collected at the end of the work shift is recommended to prevent development of fluorosis. An increase of 1 mg F/l in urine over an 8-hour shift reportedly corresponds to a time-weighted average exposure of 0.5 mg F/m^3 Because the concentration of some determinants can change rapidly, the specimen collection time (sampling time) is very important and must be observed and recorded carefully. For fluorides, a sample should be taken prior to the shift and as soon as possible after exposure ceases (ACGIH, 2002).

** IDLH = Immediately Dangerous to Life or Health. The IDLH is a condition that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death; immediate or delayed permanent adverse health effects; or prevent escape from such environment. The purpose of establishing an IDLH exposure concentration is to ensure the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment. OSHA has not established its own set of IDLH values, but is relying on the 1990 recommended IDLH values listed in the *NIOSH Pocket Guide to Chemical Hazards* for enforcement purposes.

State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies for further information.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS	
Eye:	Corrosive. Contact may cause severe irritation, eye burns, and permanent eye damage.
Skin:	Corrosive. Contact may cause severe irritation, skin burns, and permanent skin damage. No information regarding skin absorption, however, corrosivity of material suggests significant absorption may occur following skin damage.
Inhalation (Breathing):	Corrosive. Harmful if inhaled. May cause severe irritation and burns of the nose, throat, and respiratory tract.
Ingestion (Swallowing):	Corrosive and highly toxic. Harmful or fatal if swallowed. May cause severe irritation and burns of the mouth, throat and digestive tract.
Signs and Symptoms:	Effects of overexposure may include severe irritation and burns of the mouth, nose, throat, respiratory and digestive tract, coughing, pulmonary edema (accumulation of fluids in the lungs) and numbness around the lips. Onset of symptoms may be delayed
Cancer:	Inadequate data available to evaluate the cancer hazard of this material.
Target Organs:	No data available for this material (see Other Comments below).
Developmental:	No data available for this material
Other Comments:	Prolonged or repeated overexposure to fluoride compounds may cause fluorosis. Fluorosis is characterized by skeletal changes, consisting of osteosclerosis (hardening or abnormal density of bone) and osteomalcia (softening of bones) and by mottled discoloration of the enamel of teeth (if exposure occurs during enamel formation). Symptoms may include bone and joint pain and limited range of motion.
Pre-Existing Medical Conditions:	Conditions aggravated by exposure may include skin and respiratory (asthma-like) disorders.

4. FIRST AID MEASURES

Eye:	Immediately move victim away from exposure and into fresh air. If irritation or redness develops, flush eyes with clean water and seek immediate medical attention. For direct contact, immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. It is recommended that flushing continue until patient is examined by an ophthalmologist or emergency room physician.
Skin:	Immediately flush affected area(s) with large amounts of water for at least 15 minutes while removing contaminated shoes, clothing, and constrictive jewelry. If skin surface is damaged, apply a clean dressing and seek immediate medical attention. If skin surface is not damaged, cleanse the affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek immediate medical attention.
Inhalation (Breathing):	Any personnel in area should wear a NIOSH approved air supplied acid suit. Immediately move victim away from exposure and into fresh air. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.
Ingestion (Swallowing):	***Do not induce Vomiting. Corrosive material. Acid burns. *** If victim has any breathing difficulties, call for emergency help immediately. If victim is conscious and alert, immediately rinse mouth with water and dilute the ingested material by giving one glass of milk or water to drink; ½ glass to children under 5. Call a physician or poison center. If possible, do not leave victim unattended.
Note to Physicians:	Delayed pulmonary edema may occur following inhalation. Keep patient under medical observation for at least 24 hours. This material is corrosive and may cause acid burns, including gastroesophageal perforation. Late complications of severe acid burns include esophageal, gastric or pyloric strictures and stenosis.

6. FIRE FIGHTING MEASURES

Flammable Properties:	Flash Point—Not applicable OSHA Flammability Class—Not applicable LEL/UEL (% by volume in air at 1 atm)—Not available Autoignition Temperature- Not applicable
Unusual Fire & Explosion Hazards:	Closed containers exposed to extreme heat can rupture due to pressure buildup.
Extinguishing Media:	Use extinguishing agent suitable for type of surrounding fire.
Fire Fighting Instructions:	Contact with excessive heat can generate toxic gases of hydrogen fluoride. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear and a self-contained breathing apparatus. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

6. ACCIDENTAL RELEASE MEASURES

- Stay upwind and away from spill/release.
- Notify persons downwind of spill / release.
- For a small spill, isolate immediate hazard area and keep unauthorized personnel out.
- Avoid skin contact.
- Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8).
- Prevent spilled material from entering sewers, storm drains, other unauthorized confined treatment drainage systems. Dike far ahead of spill for later recovery or disposal.

Notify fire authorities and appropriate federal, state, and local agencies (see Section 15).

7. HANDLING AND STORAGE

Handling:	Do not enter confined spaces such as tanks or pits without following proper entry procedures such as 29 CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 2 and 8). Use good personal hygiene practice.

Storage:	Protect containers from physical damage. Store in cool, dry, well-ventilated area. Store only in approved containers. Keep away from any incompatible material (see Section 10). Avoid storage in glass or stoneware containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:	If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Emergency flushing facilities, such as safety eyewashes and showers, which meet the requirements of ANSI Z358.1 (latest edition), should be provided in the immediate work area.
Personal Protective Equipment (PPE)	
Respiratory:	A NIOSH approved air-purifying respirator with Type 95 particulate filter may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2). If hydrogen fluoride is present, a NIOSH approved air-purifying respirator with full face hydrogen fluoride cartridge may be used. Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a positive pressure air-supplied respirator if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.
Skin:	Wear appropriate gloves with low permeability to the specific material being handled to prevent skin contact, possible irritation and absorption. Consult manufacturer's literature for information on actual permeation rates. Depending on conditions of use, an apron and/or arm covers may be necessary.
Eye/Face:	The use of a face shield and/or chemical goggles to safeguard against potential eye contact, irritation or injury is recommended. Wear a face mask that provides both splash and impact protection for face and eyes when using respiratory protection described above.
Other PPE:	Eye wash and quick-drench shower facilities should be available in the work are. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Flash Point:	Not applicable
Flammable/ Explosive Limits (% by volume in air):	Not available
Autoignition Temperature:	Not applicable
Appearance:	Colorless to pale yellow
Physical State:	Liquid
Odor:	Pungent, irritating
Molecular Weight of Pure Material:	144.1
PH, 1% solution:	1.2
Vapor Pressure:	24 mm Hg @ 25°C (77°F)
Vapor Density (air=1):	Not applicable
Boiling Point:	222°F
Freezing/Melting Point:	4°F
Solubility in Water:	Complete
Specific Gravity:	1.2
Volatility:	100% volatile
Bulk Density:	10.2 lbs/gal

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable under proper conditions of storage and handling.
Conditions to Avoid:	Toxic and corrosive gas or fumes can be released on heating.
Incompatible Materials:	Avoid contact with strong oxidizing agents, strong alkalis, glass and ceramics. Some metals will react with solutions of the acid to form explosive hydrogen gas.
Hazardous Decomposition Products:	When heated to decomposition (222°F) it emits highly toxic and corrosive fumes of hydrogen fluoride, silicon tetra-fluoride and hydrogen gas.
Hazardous Polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Fluorosilicic acid:	Rats oral LD50 - 430 mg/kg. Guinea pig oral LD50- 200 mg/kg

	No definitive information available on skin absorption, inhalation, carcinogenicity, mutagenicity, target organs or developmental toxicity.

12. ECOLOGICAL INFORMATION

Ecotoxicity:	No information available.
BOD and COD:	No information available.

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, is not a RCRA "listed" hazardous waste. If the liquid waste has a pH of less than 2, this product would be considered as a "characteristic" hazardous waste (corrosive – D002) under 40 CFR 261.22. Use which results in chemical or physical change or contamination may subject it to regulation as a listed hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

14. TRANSPORT INFORMATION

Hazard Class or Division:	**United States DOT (Domestic Only):** Proper Shipping Name – Fluorosilicic Acid Hazard Class – 8 (Corrosive) Package Group – II Identification Number–UN1778 Special Provisions – A6, A7, B2, B15, N3, T12, T27 – These provisions are related to special packaging (see 49 CFR172. Other DOT Requirements: The maximum quantity that may be transported in one package on cargo planes is 30 L. The maximum quantity that may be transported in one package on passenger planes and passenger railcars is 1 L. **United States DOT/IMO (International):** Proper Shipping Name: -- Fluorosilicic Acid Hazard Class – 8 (Corrosive) Package Group – II Identification Number – UN 17778 Reportable Quantity: None **Canada TDG:** Proper Shipping Name – Fluorosilicic Acid Hazard Class – 8 (corrosive) Identification Number – UN 17778 Packing Group/Risk Group - II The maximum quantity that may be transported in one package on passenger planes and passenger railcars is 1 L.

15. REGULATORY INFORMATION

CERCLA	Not designated as a hazardous substance. No Reportable Quantity (RQ) is listed.
RCRA:	Not a listed hazardous waste. May be a characteristic hazardous waste (see

	Section 13).
SARA Title III:	SARA 313: Not Listed
	SARA 311/312: Acute, Chronic, Reactive
	SARA 302/304: Not listed
CWA:	Not listed as a Hazardous Substance, Priority Pollutant or Toxic Pollutant under the Clean Water Act
CAA: [Section 112(r)]	Not listed as a Hazardous Air Pollutant, or Class 1 or Class 2 Ozone depletors.
TSCA:	Fluorosilicic acid is listed in the TSCA inventory.
OSHA: (29 CFR 1910.119)	Fluorosilicic acid is not regulated as a toxic "highly hazardous chemical" under OSHA's Process Safety Management standard.
Proposition 65: (CA Health & Safety Code Section 25249.5)	The ingredients in this product are not known to contain substances that are known to the State of California to cause cancer and/or reproductive harm.
Florida:	Not listed as a toxic substance by the state of Florida.
NTP, IARC, OSHA:	None of the components present in this material at concentrations equal to or greater than 0.1% by weight are listed by IARC, NTP or OSHA as a carcinogen.
Canada DSL/NDSL:	Fluorosilicic acid is listed on the DSL NDSL: No
WHMIS:	This MSDS has been prepared according to the hazard criteria of the Controlled Product Regulations (CPR) and the MSDS contains all of the information required by the CPR. WHMIS Classification: Class D, Division 1, Subdivision B – Toxic Material/Acute Lethality Class E – Corrosive Material

16 OTHER INFORMATION

The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** This information and product are furnished on the condition that the person receiving them shall make his own determination as to suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

MATERIAL SAFETY DATA SHEET

Sodium Hydroxide Solution, 50%

HOUSTON OFFICE
700 Louisiana Street, Suite 4300
Houston, Texas 77002
U.S. • 1-800-423-4117

MONTREAL OFFICE
630 Blvd. René Lévesque West, 31st Floor
Montreal, Quebec H3B 1S6
Canada • (514) 397-6100

Product Name: Sodium Hydroxide Solution, 50%
CAS#: 1310-73-2
MSDS Code: NaOH(50)-E
Major Update: 11/10/99
Minor Update: 05/04/01
Synonyms: Caustic soda liquid 50%, Soda lye, Lye, Liquid Caustic, Sodium Hydrate
Product Use: Neutralizing agent, Industrial cleaner, pulping and bleaching, soap manufacturing

Emergency Contacts (24 hr.)

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL

U.S.: 1-800-424-9300 – CHEMTREC
Canada: (613) 996-6666 – CANUTEC

Hazardous Ingredient(s)	% (w/w)	ACGIH	CAS NO.
Sodium Hydroxide	49 – 51	2 mg/m^3 (ceiling)	1310-73-2

Emergency Overview: Odorless, clear, non-volatile liquid. EXTREMELY CORROSIVE! Causes severe burns on contact. Can cause blindness, permanent scarring and death. Aerosols can cause lung injury – effects may be delayed. Highly reactive. Can react violently with water and numerous commonly encountered materials, generating enough heat to ignite nearby combustible materials. Contact with many organic and inorganic chemicals may cause fire or explosion. Reacts with some metals to liberate hydrogen gas, which can form explosive mixtures with air. Will not burn. Toxic to aquatic organisms. Read the entire MSDS for a more thorough evaluation of the hazards.

Potential Health Effects:

Inhalation: Sodium hydroxide does not readily form a vapor and inhalation exposure is likely to occur as an aerosol. Due to its corrosive nature, sodium hydroxide aerosols could cause pulmonary edema (severe, life-threatening lung injury). The development of pulmonary edema may be delayed up to 48 hours after exposure. The early symptoms of pulmonary edema include shortness of breath and tightness in the chest.

Waste Disposal Methods: Dispose of waste material at an approved waste treatment/disposal facility, in accordance with applicable regulations. Do not dispose of waste with normal garbage or to sewer systems.

Note
- Clean-up material may be a RCRA Hazardous Waste on disposal.
- Spills are subject to CERCLA reporting requirements; RQ = 1000 lbs. (454 Kg).

Precautions: Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled. Wear appropriate Personal Protection Equipment. Product is NOT compatible with cloth and leather. People working with this chemical should be properly trained regarding its hazards and its safe use.

Handling Procedures and Equipment: Use smallest possible amounts in designated areas with adequate ventilation. Keep containers closed when not in use. Empty containers may contain hazardous residues. Avoid generating mists. Transfer solutions using equipment, which is corrosion-resistant. Cautiously, transfer into sturdy containers made of compatible materials. Never return contaminated material to its original container. Considerable heat is generated when diluted with water. Proper handling procedures must be followed to prevent vigorous boiling, splattering or violent eruption of the diluted solution. Never add water to a caustic. **ALWAYS ADD CAUSTIC TO WATER** and provide agitation. When mixing with water, stir small amounts in slowly. Use cold water to prevent excessive heat generation.

Storage Requirements: Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use and when empty. Protect from damage. Store away from incompatible materials such as strong acids, nitroaromatic, nitroparaffinic or organohalogen compounds. See Section 10 for incompatibles. Use corrosion-resistant structural materials and lighting and ventilation systems in the storage area. Containers made of nickel alloys are preferred. Steel containers are acceptable if temperatures are not elevated. Nickel is the preferred metal for handling this product. Plastics or plastic-lined steel, or FRP tanks of derakane vinyl ester resin may be suitable. Container contents may develop pressure after prolonged storage. Drums may need to be vented. Trained personnel should only perform venting.

Storage Temperatures: Avoid freezing. Do not expose sealed containers to temperatures above 40°C (104°F).

PREVENTIVE MEASURES

Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. The most effective measures are the total enclosure of processes and the mechanization of handling procedures to prevent all personal contact.

PERSONAL PROTECTIVE EQUIPMENT

Maintain eye wash fountain and quick-drench facilities in work area. Detailed requirements for personal protective equipment should be established on a site-specific basis.

Eye Protection: Wear full face-shield and chemical safety goggles when there is potential for contact.

Skin Protection: Wear appropriate personal protective clothing to prevent skin contact.

Guidelines for sodium hydroxide solutions, 30-70%:

RECOMMENDED (resistance to breakthrough longer than 8 hours): Butyl rubber; natural rubber, neoprene, nitrile rubber, polyethylene, polyvinyl chloride, Teflon(TM), Viton(TM), Saranex(TM), 4H(TM), Barricade(TM), CPF 3(TM), Responder(TM), Trelichem HPS(TM), Tychem 10000(TM).

NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): Polyvinyl alcohol.

Respiratory Protection:
Up To 10 mg/m^3: Supplied Air Respirator (SAR) operated in a continuous-flow mode, eye protection needed; or full-facepiece respirator with high-efficiency particulate filter(s); or powered air- purifying respirator with dust and mist filter(s), eye protection needed; or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SAR; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SAR.

ESCAPE: Full-facepiece respirator with high-efficiency particulate filter(s); or escape-type SCBA.

EXPOSURE GUIDELINES

PRODUCT: Sodium hydroxide:

ACGIH Ceiling Exposure Limit (TLV-C)	2 mg/m^3
OSHA PEL	2 mg/m^3
NIOSH IDLH	10 mg/m^3

Alternate Name(s)	Caustic soda liquid 50%, Soda lye, Lye, Liquid Caustic, Sodium Hydrate
Chemical Name	Sodium hydroxide
Chemical Family	Alkali hydroxide
Molecular Formula	NaOH
Molecular Weight	40.01
Appearance	Clear-to-slightly turbid liquid
Odor	Odorless
pH	14.0 (Aqueous solution: 5%)
Vapor Pressure	0.2 kPa (1.5 mm Hg) at 20 °C(68°F) (50% solution)
Vapor Density (Air = 1)	Not applicable
Boiling Point	140 °C (284 °F) (50% solution)
Freezing Point	12 °C (53.6 °F) (50% solution)
Solubility (Water)	Soluble in all proportions
Specific Gravity	1.53 (50% solution) 15.5 °C (60°F)
Evaporation Rate	Not applicable
Viscosity (cp):	78.3 at 20 °C(68°F)
Bulk Density (lbs/cu ft):	95.5

Chemical Stability: Stable at room temperature. Sodium hydroxide rapidly absorbs carbon dioxide from the air, forming sodium carbonate.

Hazardous Decomposition Products: Thermal decomposition: sodium oxide

Conditions to Avoid: Water. Keep away from incompatibles.

Incompatibility with other Substances: Sodium hydroxide reacts vigorously, violently or explosively with many organic and inorganic chemicals, such as strong acids, nitroaromatic, nitroparaffin and organohalogen compounds, glycols and organic peroxides. Reacts violently with water generating significant heat and dangerously spattering corrosive sodium hydroxide. Violently polymerizes acetaldehyde, acrolein or acrylonitrile. Produces flammable and explosive hydrogen gas if it reacts with sodium tetrahydroborate or metals, such as aluminum, tin, or zinc. Can form spontaneously flammable chemicals upon contact with 1,2-dichloroethylene, trichloroethylene or tetrachloroethane. Can produce carbon monoxide upon contact with solutions of sugars, such as fructose, lactose and maltose.

Corrosivity to Metals: Corrosive to aluminum, tin, zinc, copper, brass and bronze. Corrosive to steel at elevated temperatures above 40°C(104°F).

Stability and Reactivity Comments: Slowly attacks glass at room temperature.

Hazardous Polymerization: Will not occur. However, it can induce hazardous polymerization of acetaldehyde, acrolein, and acrylonitrile.

[redacted]

TOXICOLOGICAL DATA:

Toxicological Data: Sodium hydroxide
Toxicity data: LD_{Lo} oral rabbit 500 mg /kg ; LD_{50} intraperitoneal mouse 40 mg/kg
Irritation data: 500 mg/24 hour(s) skin-rabbit severe; 400 µg eyes-rabbit mild; 1 percent eyes-rabbit severe;

Mutagenicity: There is no evidence of mutagenic potential.

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Teratogenicity and Fetotoxicity: No information is available and no adverse teratogenic/ embryotoxic effects are anticipated.

Synergistic Materials: None known

[redacted]

Ecotoxicological Information: LC_{100} Cyprinus Carpio 180 ppm/24 hr @ 25°C (77°F)
TLm mosquito fish 125 ppm/96 hr (fresh water); TLm Bluegill 99 mg/L/48 hr (tap water)

Persistence and Degradation: Degrades readily by reacting with natural carbon dioxide in the air. Does not bioaccumulate.

[redacted]

Review federal, state and local government requirements prior to disposal.

Do not dispose of waste with normal garbage, or to sewer systems.

Whatever cannot be saved for recovery or recycling, including containers should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options.

RCRA: Test waste material for corrosivity, D002, prior to disposal.

SECTION 14 - TRANSPORTATION INFORMATION

	TDG	DOT
Shipping Name	Sodium hydroxide, solution	Sodium hydroxide, solution
Hazard Class/Division	8: Corrosive 9.2*	8: Corrosive
Identification No. Packing Group:	UN1824 II	UN1824 II
	Regulated Limit – 50 Kg	RQ= 1000 lbs

**NOTE: Classification 9.2 applies if regulated limit is exceeded.*

IATA/ICAO Class: 8

Transportation Emergency Telephone Number: U.S. 1-800-424-9300 – Chemtrec
Canada (613) 996-6666 – Canutec

SECTION 15 - REGULATORY INFORMATION

OSHA Classification: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

SARA Regulations sections 313 and 40 CFR 372: N

SARA Hazard Categories, SARA SECTIONS 311/312 (40CFR370.21):
ACUTE: Y
CHRONIC: N
FIRE: N
REACTIVE: Y
SUDDEN RELEASE: N
OSHA PROCESS SAFETY (29CFR1910.119): N

CERCLA SECTION 103 (40CFR302.4): Y
Reportable Quantity (RQ) under CERCLA: 1000 lb. (454 kg)

TSCA Inventory Status: Y

Other Regulations/Legislation which apply to this product:
Right-to-Know/Disclosure Lists: Illinois, Massachusetts, New Jersey, Pennsylvania,

California Proposition 65: N

This product does not contain nor is it manufactured with ozone depleting substances.

Canadian Classification

This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS (Material Safety Data Sheet) contains all the information required by the CPR.

Controlled Products Regulations (WHMIS) Classification: E: Corrosive

CEPA / Canadian Domestic Substances List (DSL): Y

WHMIS Ingredient Disclosure List: Meets criteria for disclosure at 1% or greater.

EINECS Number: 215-185-5

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and PIONEER will not be liable for any damages, losses, injuries or consequential damages that may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

National Fire Protection Association (NFPA) Rating
Hazardous Materials Identification System (HMIS) Rating

	NFPA	HMIS
HEALTH	3	3
FIRE	0	0
REACTIVITY	1	1

4 = Extreme/Severe
3 = High/Serious
2 = Moderate
1 = Slight
0 = Minimum
W = Water Reactive

REFERENCES:

1. Chemlist, STN Database, Chemical Abstract Service, 1999
2. "CHEMINFO", through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, (Aug 1999).
3. DOSE, Royal Society of Chemistry, Aug 27, 1999.
4. HSDB- Hazardous Substances Data Bank, CCOHS, May 1999
5. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, Entry Update/May 1999.
6. "1999 Threshold Limit Values and Biological Exposure Indices", American Conference of Government Industrial Hygienists, 1999.
7. Merck, 11th Edition, 1989

LEGEND:

ACGIH - American Conference of Governmental Industrial Hygienists
ANSI - American National Standards Institute
CAS # - Chemical Abstracts Service Registry Number
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
DOT - Department of Transportation
EINECS - European Inventory of Existing Commercial Chemical Substances.
IDLH - Immediately Dangerous to Life and Health
LC_{50} - The concentration of material in air expected to kill 50% of a group of test animals
LD_{50} - Lethal Dose expected to kill 50% of a group of test animals
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Association
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
RQ - Reportable Quantity

SBR - Styrene butadiene rubber
STEL - Short Term Exposure Limit
TDG - Transportation of Dangerous Goods Act/Regulations
TLm - Threshold Limit
TSCA - Toxic Substances Control Act
TWA - Time-Weighted Average
WHMIS - Workplace Hazardous Material Information System

Prepared by: PIONEER
(905) 403-2745

OLIN CHEMICALS -- CAUSTIC SODA SOLUTION - SODIUM HYDROXIDE SOLUTION
MATERIAL SAFETY DATA SHEET
NSN: 6810013119756
Manufacturer's CAGE: 0E059
Part No. Indicator: A
Part Number/Trade Name: CAUSTIC SODA SOLUTION

See also

General Information

Item Name: SODIUM HYDROXIDE SOLUTION
Company's Name: OLIN CHEMICALS
Company's Street: RIVER ROAD
Company's P. O. Box: 28
Company's City: MCINTOSH
Company's State: AL
Company's Country: US
Company's Zip Code: 36553
Company's Emerg Ph #: 205-944-2231
Company's Info Ph #: 205-944-2231
Distributor/Vendor # 1: OLIN CORP CHEMICALS GROUP (203-356-3449)
Distributor/Vendor # 1 Cage: 53084
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 007
Status: SE
Date MSDS Prepared: 21JAN93
Safety Data Review Date: 31DEC94
Supply Item Manager: CX
MSDS Serial Number: BKN2R
Specification Number: NOT APPLICABLE
Hazard Characteristic Code: C2
Unit Of Issue: GL
Unit Of Issue Container Qty: BULK

Ingredients/Identity Information

Proprietary: NO
Ingredient: SODIUM HYDROXIDE (SARA III)
Ingredient Sequence Number: 01
Percent: 45-50
NIOSH (RTECS) Number: WB4900000
CAS Number: 1310-73-2
OSHA PEL: 2 MG/M3
ACGIH TLV: C 2 MG/M3; 9293
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR VISCOUS LIQUID.
Boiling Point: 266F,130C
Melting Point: UNKNOWN
Vapor Pressure (MM Hg/70 F): 17.5
Specific Gravity: 1.482-1.530
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: COMPLETE
pH: 13
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Extinguishing Media: NONCOMBUSTIBLE, USE WATER TO COOL CONTAINERS.
Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. EVACUATE AREA. COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire And Expl Hazrds: COMBUSTION OR HEAT OF FIRE MAY PRODUCE HAZARDOUS DECOMPOSITION PRODUCTS AND VAPORS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF IGNITION
Materials To Avoid: STRONG OXIDIZING AGENTS AND STRONG ACIDS.
Hazardous Decomp Products: CARBON DIOXIDE GAS & CORROSIVE CAUSTIC SODA.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE.

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT) IS 2.8 GM/KG
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CORROSIVE LIQUID. INHALATION OF VAPORS MAY IRRITATE NOSE, THROAT & LUNG. INGESTION-MAY IRRITATE AND CAUSE BURNS OF MOUTH, ESOPHAGUS & STOMACH. SKIN-SEVERE BURNS. EYE-SEVERE BURNS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE OF THE CHEMICALS IN THIS PRODUCT IS LISTED BY IARC, NTP OR OSHA AS A CARCINOGEN.
Signs/Symptoms Of Overexp: SKIN, EYE, NOSE, THROAT & LUNG IRRITATION/ BURNS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: SKIN-WASH WITH PLENTY OF WATER. EYE-FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION. INGESTION-DRINK LARGE QUANTITIES OF WATER, OR FRUIT JUICE. DO NOT INDUCE VOMITING. INHALATION-REMOVE TO FRESH AIR. IN ALL CASES, GET MEDICAL ATTENTION.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: DIKE AND SOAK WITH A NEUTRAL MATERIAL. VACUUM UP OR NEUTRALIZE AND ABSORB WITH COMMERCIAL ABSORBENTS AND TRANSFER INTO DISPOSAL CONTAINERS. FLUSH RESIDUE WITH DILUTE SOLUTION OF ACID, FOLLOWED BY PLENTY OF WATER.
Neutralizing Agent: DILUTE SOLUTION OF ACID
Waste Disposal Method: IF PERMITTED BY APPLICABLE DISPOSAL REGULATIONS, BURY IN A SOLID WASTE LANDFILL OR NEUTRALIZE AS FOLLOWS: DILUTE WITH WATER THEN NEUTRALIZE WITH ACID. DISPOSE OF WASTE BY AN APPROVED CONTRACTOR.
Precautions-Handling/Storing: STORE IN A COOL, DRY AREA AWAY FROM ACIDS. PROLONGED STORAGE MAY CAUSE PRODUCT TO PRECIPITATE DOWN.
Other Precautions: AVOID EYE CONTACT OR PROLONGED SKIN CONTACT. WHEN DISSOLVINGOR DILUTING ADD TO WATER SLOWLY WITH CAUTION & WITH STIRRING;

SOLUTION GETS HOT.

Control Measures

Respiratory Protection: WHERE REQUIRED, USE A RESPIRATOR APPROVED BY NIOSH FOR DUST AND MIST.
Ventilation: LOCAL EXHAUST TO MAINTAIN AIR CONCENTRATION BELOW 2 MG/M3.
Protective Gloves: RUBBER, PVC, OR NEOPRENE
Eye Protection: CHEMICAL SAFETY GLASSES.
Other Protective Equipment: WEAR RUBBER BOOTS AND APRON. EYEWASH AND SAFETY SHOWER IS RECOMMENDED.
Work Hygienic Practices: WASH HANDS BEFORE AND AFTER USE.
Suppl. Safety & Health Data: NONE

Transportation Data

Trans Data Review Date: 94365
DOT PSN Code: NGY
DOT Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
DOT Class: 8
DOT ID Number: UN1824
DOT Pack Group: II
DOT Label: CORROSIVE
IMO PSN Code: NTB
IMO Proper Shipping Name: SODIUM HYDROXIDE, SOLUTION
IMO Regulations Page Number: 8226
IMO UN Number: 1824
IMO UN Class: 0
IMO Subsidiary Risk Label: --
IATA PSN Code: WST
IATA UN ID Number: 1824
IATA Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: WST
AFI Prop. Shipping Name: SODIUM HYDROXIDE, SOLUTION
AFI Class: 8
AFI ID Number: UN1824
AFI Pack Group: II
AFI Special Prov: N34
AFI Basic Pac Ref: 12-5
Additional Trans Data: REPORTABLE QUANTITY: 1000 LBS. PER 49 CFR 172.101

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 31DEC94
MFR Label Number: UNKNOWN
Label Status: F
Common Name: CAUSTIC SODA SOLUTION
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X

Fire Hazard-None: X
Reactivity Hazard-Slight: X
Special Hazard Precautions: CORROSIVE LIQUID. INHALATION OF VAPORS MAY IRRITATE NOSE, THROAT & LUNG. INGESTION-MAY IRRITATE AND CAUSE BURNS OF MOUTH, ESOPHAGUS & STOMACH. SKIN-SEVERE BURNS. EYE-SEVERE BURNS. STORE IN A COOL, DRY AREA AWAY FROM ACIDS. PROLONGED STORAGE MAY CAUSE PRODUCT TO PRECIPITATE DOWN. FIRST AID: SKIN-WASH WITH PLENTY OF WATER. EYE-FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION. INGESTION-DRINK LARGE QUANTITIES OF WATER, OR FRUIT JUICE. DO NOT INDUCE VOMITING. INHALATION-REMOVE TO FRESH AIR. IN ALL CASES, GET MEDICAL ATTENTION.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: OLIN CHEMICALS
Label Street: RIVER ROAD
Label P.O. Box: 28
Label City: MCINTOSH
Label State: AL
Label Zip Code: 36553
Label Country: US
Label Emergency Number: 205-944-2231

APPENDIX "B"

Stoichiometry

Fluorosilicic Acid
Sodium Hydroxide

APPENDIX "A"

Material Safety Data Sheets

Fluorosilicic Acid

Sodium Hydroxide

APPENDIX "B"

Stoichiometry

Fluorosilicic Acid
Sodium Hydroxide

APPENDIX "C"

Process Monitoring Log Sheet

STOLTHAVEN NEW ORLEANS LLC

FSA Neutralization
Daily Log for Monitoring the Neutralization Process

Batch Recipe

Frac No. Frac No.: Frac No.: Frac No.4

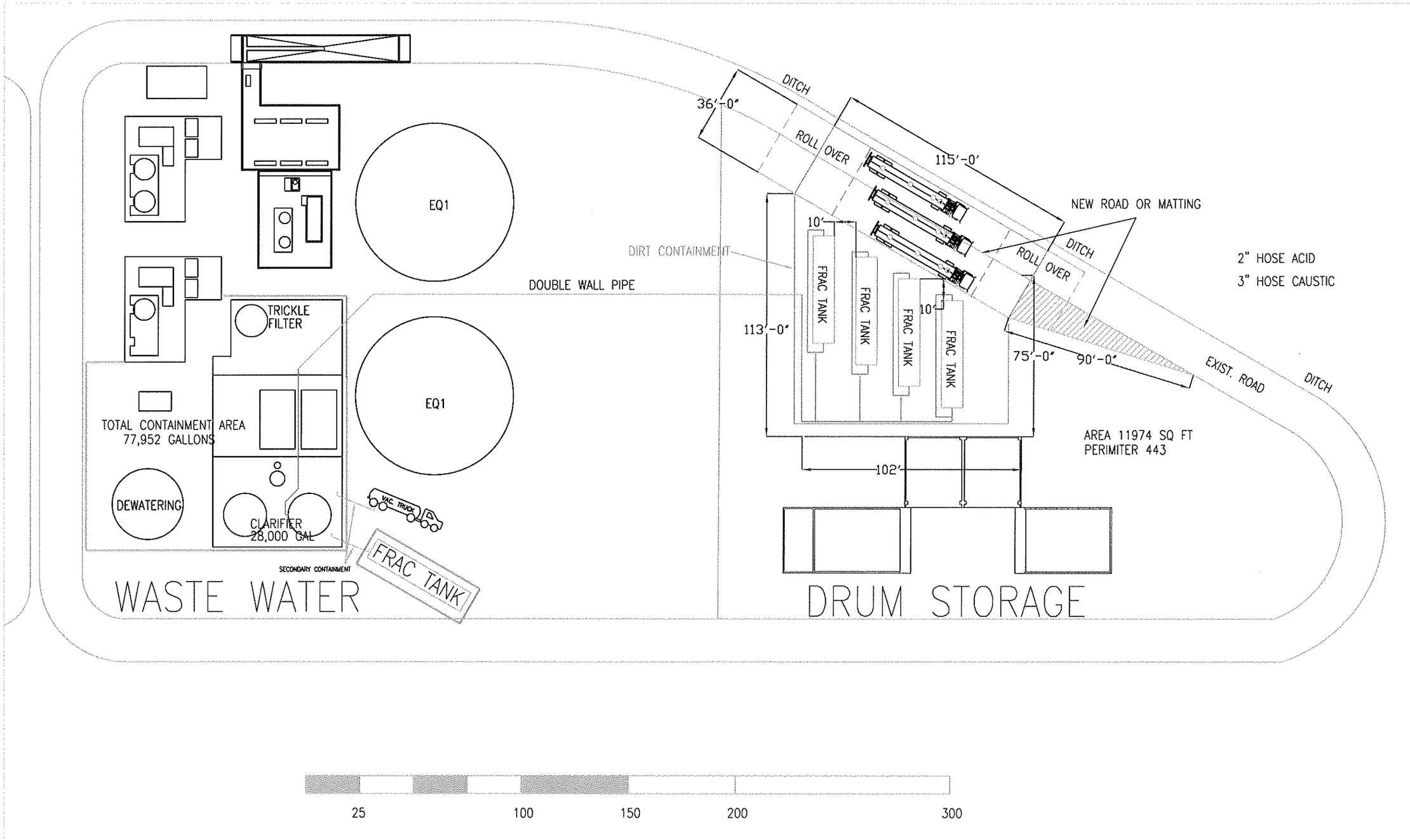
Caustic, gallons
Water, gallons

Month_____ Date_____

Operating Parameter	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	Hour 10	Hour 11	Hour 12
FSA Feed Rate, gpm												
pH in Neutralizer												
pH Clarifier Feed												
Circulation Rate, gpm												
HF in Vapor Space												
Temperture in Neutralizer, deg F												
Air Sparger Rate, scfh												
Clarifier blanket, ft												
Polymer to clarifier, ppm												
Treated FSA to Frac Tank, gpm												
Clarifier underflow rate to vac box, gpm												
Sample to Vac Box												
Sample to Frac Tank												
Copments/Observations:												

APPENDIX "D"

Treatment System Design Information
Plot Plan of Treatment Area



REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING TITLE

GENERAL NOTES

REVISIONS

NO	DATE	BY	DESCRIPTION

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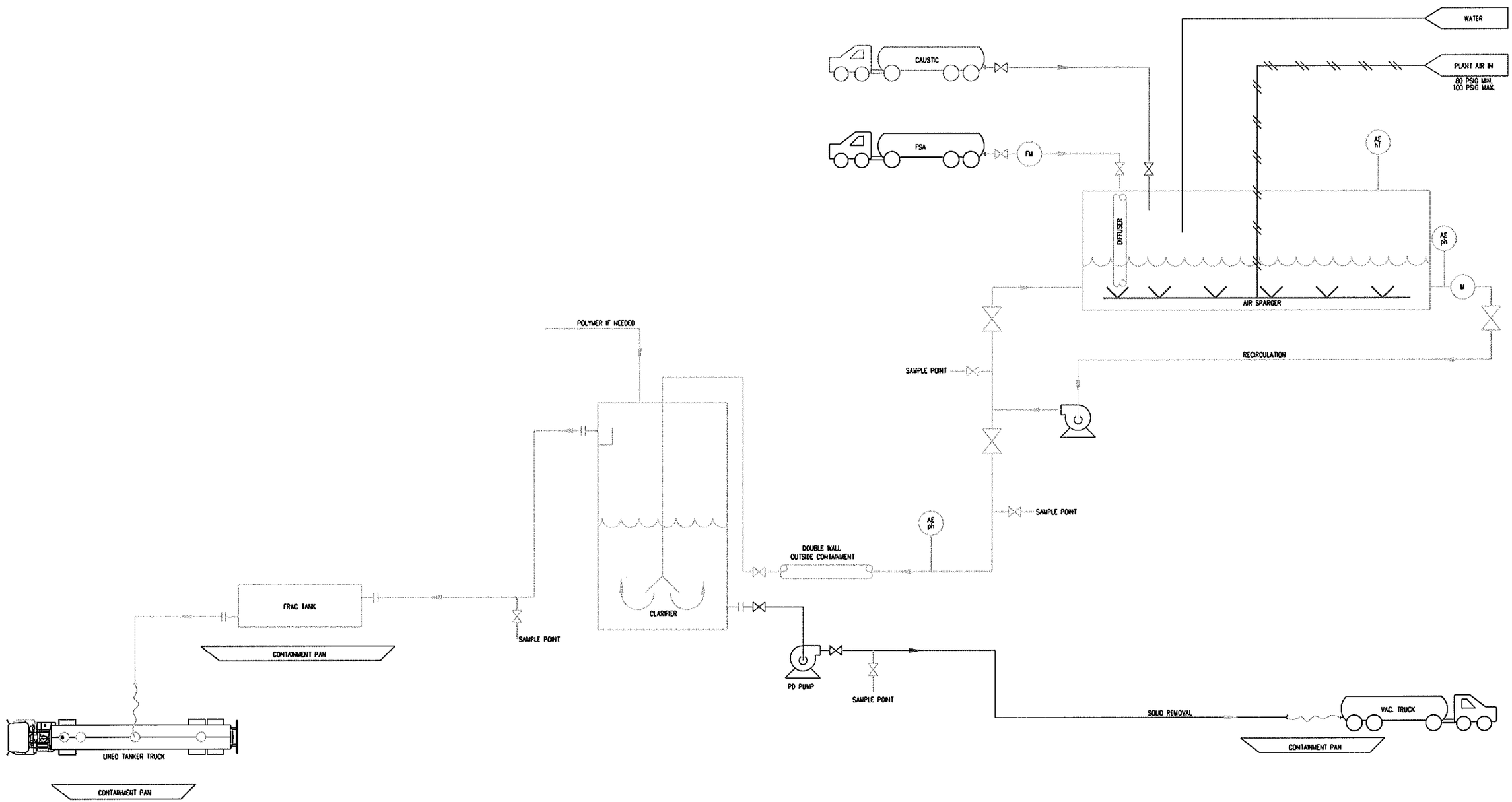
JOB TITLE

1st LINE
2nd LINE



REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING TITLE

GENERAL NOTES

REVISIONS			
NO	DATE	BY	DESCRIPTION

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JOB TITLE

1st LINE
2nd LINE

SHEET 1 OF 1

APPENDIX "E"

CTEH Air Modeling

CTEH Center for Toxicology and Environmental Health, L.L.C.
615 W. Markham Street Little Rock, AR 72201 Phone: 501.614.2834 Fax: 501 614.2835 www.cteh.com

Appendix E

Air Modeling plan

Stolthaven New Orleans LLC.

Braithwaite, LA

Prepared By:

Center for Toxicology and Environmental Health, L.L.C.
5120 North Shore Blvd
Little Rock, AR 72118
501-801-8500
www.CTEH.com

April 1, 2008

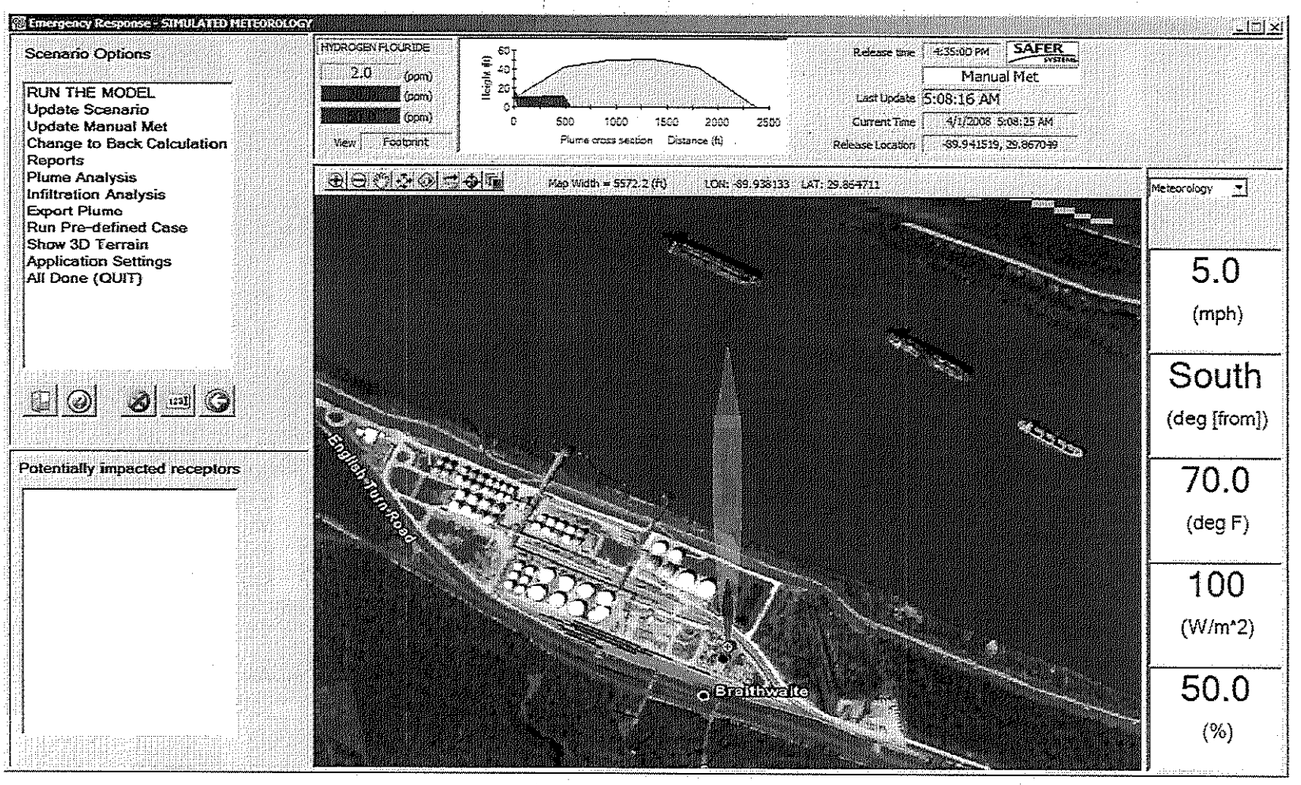
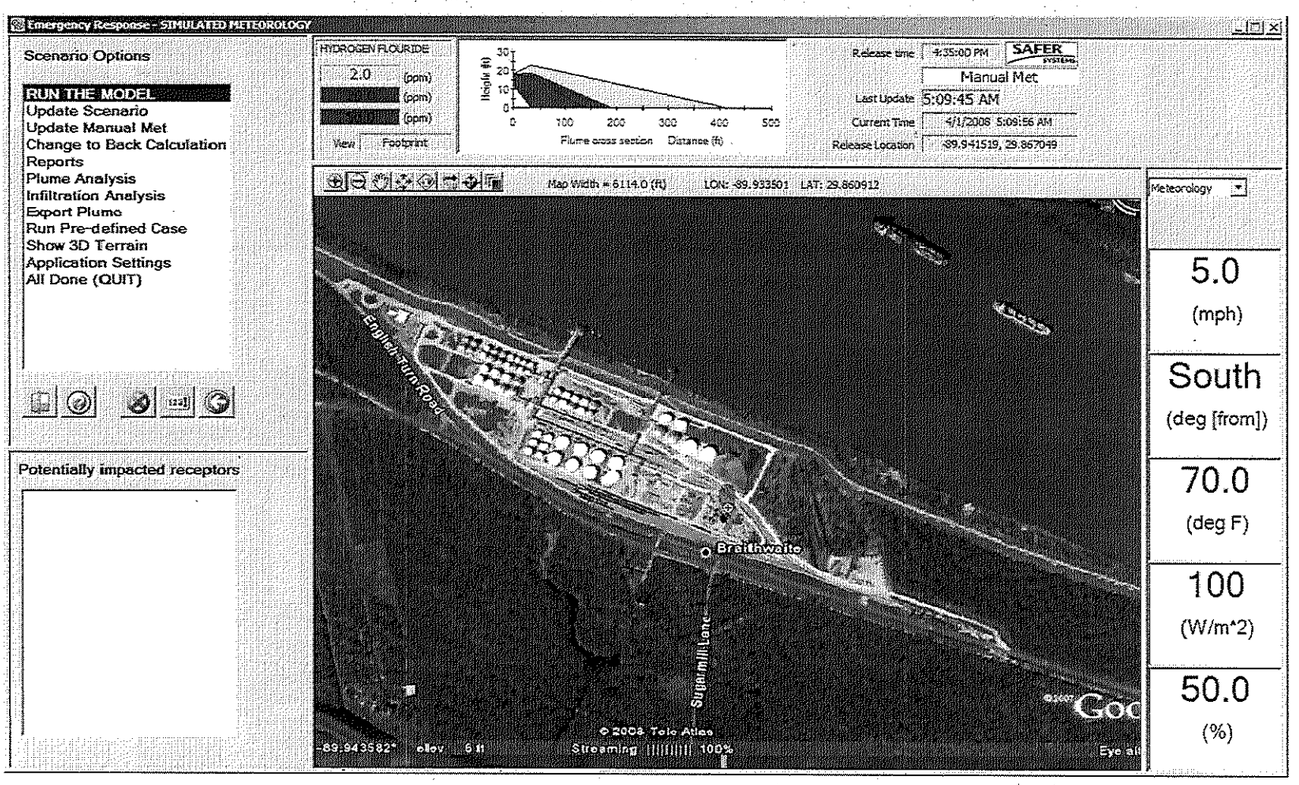
1.0 Introduction and Purpose

As indicated in the stoichiometry section of this plan, the neutralization of FSA with sodium hydroxide has potential to generate hydrogen fluoride (HF). However, for the reaction that generates HF to occur, the pH of the solution would have to drop well below the neutral pH of 7. As also mention in the stoichiometry section, FSA will be added to a 50% solution of sodium hydroxide which has a high pH. As the acid is added to the sodium hydroxide solution, the resulting solution will be thoroughly mixed to ensure complete reaction of the FSA with the excess sodium hydroxide. By maintaining an excess of sodium hydroxide and a pH greater than 8, the generation of HF is precluded.

However, in the event of a failure that allowed the pH to be lowered to a point a detectable amount of HF is generated and released, the following model to predict the fate of the HF is provided. There are several events that are assumed to occur in order for HF to be generated. The assumptions are that the FSA flow rate exceeds the capacity of the sodium hydroxide and this condition exists until 1% of the total volume of the FSA reacts to liberate HF. Again, this is a scenario highly unlikely to occur and takes into account no engineering controls or mitigation efforts.

See figures below.

Worst-case air modeling during NIGHTTIME meteorological conditions. Assume one percent of HF escapes caustic solution.



Worst-case air modeling during DAYTIME meteorological conditions. Assume one percent of HF escapes caustic solution.