HULL

December 23, 2013

Mr. Blake Arthur
Division of Oil and Gas Resource Management
Ohio Department of Natural Resources
2045 Morse Road Bldg F
Columbus, Ohio 43229

RE: Request for Chief's Order to Operate; Brine Treatment and Recycling Miley Pad, Noble County, Ohio.

Dear Mr. Arthur:

Hull and Associates, Inc., (Hull), on behalf of Antero Resources (Antero) is submitting this letter and supporting documentation to request a Chief's Order approving the operation of a centralized recycle treatment facility at their Miley Well Pad Site in Noble County, Ohio.

When ODNR issued a guidance framework, dated December 13, 2013, for the 2014 forthcoming interim Order to Operate and/or the Permit by Rule to operate Waste Substance Facilities, Antero immediately began a review of their 2014 calendar year plans for treating flowback water to determine, which, if any, of these facilities might require an Order to operate from ODNR in 2014. The review resulted in the identification of the above referenced facility as potentially requiring an order to operate. The brine treatment and recycling operation is also referred to as treatment of flowback water immediately following a well completion, and it is being conducted at the Miley Pad along with simultaneous operations such as active drilling, completions and production activities. Antero's goal and standard practice is to conduct operations in full compliance and cooperation with governing authorities, and as such this application for Chief's Orders is respectfully submitted to ensure that Antero can continue to operate this facility on and after January 1, 2014.

The brine treatment and recycling operations at this facility are designed to accept brine from Antero-operated oil and gas wells located on other nearby pads. Some of the recycled brine from this treatment and recycling facility has also been used to support completions activities on Antero-operated oil and gas wells located on other nearby pads.

Enclosed with this submittal are the following documents as required under the Guidelines for Waste Substance Facilities as posted on the ONDR website dated December 18, 2013:

1. A completed and signed ODNR Application to Operate a Facility,
2. An aerial photograph of the Miley Well Pad site where the recycle treatment facility is located,
3. A description of the recycle treatment process, including:

    a. Process flow schematic
    b. Description of design flows and storage capacities, as summarized in the Shalewater Solutions Best Management Practices for Flowback and Produced Water Recycling document,
    c. Disclosure of chemical reagents and their function (in the document listed in 3b above) along with MSDS sheets,

d. Estimated volume of materials typically managed by the recycle treatment facility (in the document listed in 3b above),
e. Methods used by the facility operator to document type and volume of materials received, treated, reused, and disposed from the recycle treatment facility (in the document listed in 3b above).

Additionally, we have included drawings showing the Miley Pad site plan, the current treatment system layout, and a proposed filter press system layout should a solids dewatering process be added to economize the handling of the E&P exempt waste.

Antero and Hull are available at your convenience to answer questions you may have in reviewing this application submittal. Please contact Cheryl Green (Hull) at 614-793-8777 if you would like to schedule an informational conference call.

Sincerely,

Cheryl L. Green

Cheryl Green, P.E.
Senior Project Manager
Hull & Associates, Inc.

cc: Mr. Gerard Alberts, Antero Resources Corporation
Mr. Aaron Goddard, Antero Resources Corporation
Mr. Matthew Hammer, Hull & Associates, Inc.

Enclosures:

ONDR Application to Operate a Facility
Aerial Photograph of Miley Pad
Recycle Treatment Process Flow Schematic
Shalewater Solutions Best Management Practices for Flowback and Produced Water Recycling
MSDS Sheets (4 chemicals)
Miley Pad Shalewater Solutions Mobile Treatment #4 Drawings (2 plan sets, 4 drawings each)

APPLICATION TO OPERATE A FACILITY

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL AND GAS RESOURCES MANAGEMENT
2045 MORSE ROAD, BUILDING F-2
COLUMBUS, OHIO 43229-6693
(614) 265-6922

1. Name of Applicant: Antero Resources, Inc Phone #: (303)-357-7341
Address: 1625 17th Street Denver, CO 80202
Date: 19 DEC 2013 eMail Address: jalberts@anteroresources.com
For an Order or a Permit to Operate: ☒ Existing Facility ☐ New Facility

2. **PURPOSE OF FACILITY:** (Check all that Apply) ☐ Storage ☒ Recycling ☐ Treatment ☐ Processing ☐ Disposal

3. **TYPE OF MATERIAL:**
☒ Brine ☐ Drill Cuttings
☐ Drilling Mud ☒ Other Waste Substance (explain) **Flowback and Contaminated Storm Water**

4. **If a Business Entity, list the statutory agent and include a certified copy of their appointment:**
Name:
Address:

5. **Engineer of Record:**
Name:
Address:
Ohio Professional Engineering License Number:

6. **Address of Facility:**
Address: 21701 Windy Ridge Road Sarahsville, Ohio 43779
County: Noble
Township: Seneca
Municipal Corporation: N/A
Latitude: -81.453495
Longitude: 39.854477

7. **Write a brief description of the facility and operations:** See Attched Word Document

8. **An application for a facility order or permit shall include all the applicable information described in the *Guidelines to Operate a Facility*.** **Attach All Applicable Documents**

I, the undersigned, being first duly sworn, depose and state under penalties of law, that I am authorized to make this application, that this application was prepared by me or under my supervision and direction, and that the facts stated herein are true, correct, and complete, to the best of my knowledge.

I certify that the facility will comply with or is currently in compliance with all provisions of Chapter 1509 ORC, Chapter 1501 OAC, and all terms and conditions of orders and permits issued by the Chief, Division of Oil and Gas Resources Management.

Signature of Authorized Agent

Name (Type or Print) Alvyn A. Schopp Title Chief Administrative Officer

Sworn to and subscribed before me this the 19th day of December, 2013.

Rachel Bouchard
Notary Public
State of Colorado
My Commission Expires 04/26/2015

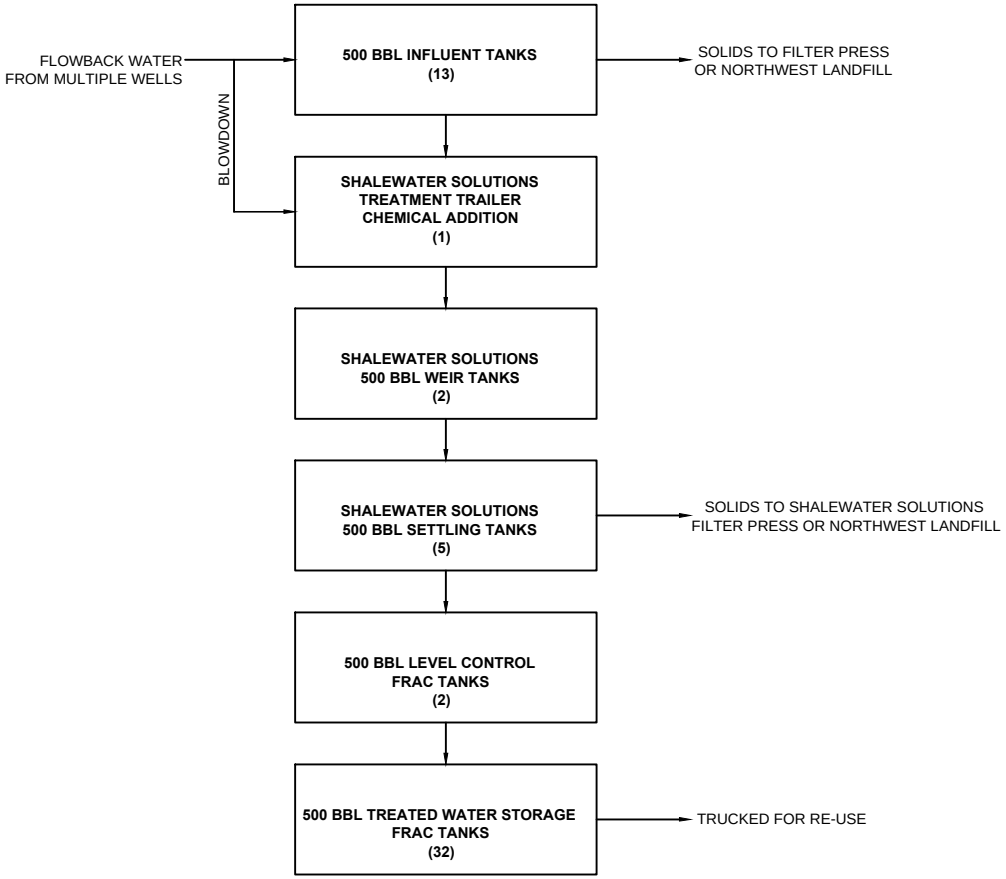
Rachel Bouchard (Notary Public)

Rachel Bouchard

04/26/2015 (Date Commission Expires)

ANTERO RESOURCES

MILEY PAD



Miley Treatment 4 Flow Diagram

SCALE:	DRAWN BY:	CHK BY:	APPRVD. BY:
NONE	J. LAFFERRE		
PLOT DATE: 19 DECEMBER 2013 - 3:38 PM	FILE NAME: C:\Users\JoshuaL\Documents\Cad Stuff\Treatment #4\Miley Pad Treatment #4 proposal.dwg		

SHALEWATER SOLUTIONS

37 GRAND MEADOWS DR.
STE 201
BRIDGEPORT, WV 26330
PH: 304.592.2794 WWW.SHALEWATER.COM

Best Management Practices for Flowback and Produced Water Recycling

The Shalewater Solutions, Inc. Flowback and Produced Water Recycling Program was developed to utilize flowback water generated by the hydraulic fracturing of natural gas wells and the production water generated by the well as feedstock. The resulting treated flowback /produced water can be stored and later mixed with freshwater to supplement the fresh water demands of Antero's well completion operations. In turn, the decreased demand for freshwater reduces truck traffic entering and exiting the well site and the surrounding roadways. In summary, the benefits of this Best Management Practice serve to reduce the cost, liability and road damage associated with trucking freshwater, and to provide for the conservation of an extremely limited resource.

Site Configurations and Impacts

The treatment recycle facility located at the Antero Resources Miley Pad in Noble County, Ohio is capable of treating up to 12,000 barrels per day (bpd) which is equivalent to a design capacity of 504,000 gallons per day (gpd). It is anticipated that a flow of 100,000 barrels per month (4,200,000 gallons per month) will be processed at this facility. Approximately 1 ton of wet sludge is generated per 1000 barrels of flow treated, which is equivalent to about 100 tons per month at the anticipated flow. If a dewatering process is added, the quantity of sludge disposed could be greatly reduced. Otherwise, the sludge is solidified with fly ash and sent to the WMI Northwest Landfill in Parkersburg, West Virginia.

The treatment facility associated with the Shalewater Solutions, Inc. Flowback and Produced Water Recycling Program will receive flowback from Antero drilling sites via trucks which will transfer the flowback into one of thirteen (13) 500 barrel influent storage tanks. The recycle treatment facility consists of a bank of transfer pumps properly contained, a Shalewater Solutions treatment trailer, two(2) 500 barrel Shalewater Solutions weir tanks, four(4) 500 barrel Shalewater Solutions settling tanks, two(2) 500 barrel level control frac tanks, two(2) 500 barrel sludge frac tanks, and thirty two(32) 500 barrel effluent storage frac tanks. Refer to the attached Miley Treatment 4 Flow Diagram.

The system consists of all closed top tanks. All thief hatches will remain closed for odor control. Containment will be prepared and partially in place before the treatment facility arrives on site and will consist of a raised barrier encompassing the treatment area. The containment will be covered with rig mats and house all pumps, trailers, frac tanks, light plants; and all hose connections associated with the treatment facility will be done inside of the containment. In addition, containment will be installed in form of a "splash guard" at the discharge of the facility to protect from accidental spills from transferring treated water from the facility to trucks. All containment will be closed and welded to provide a 360 degree barrier to protect from spills and leaks after all trailers, tanks, and associated components are installed and in place for the treatment facility. Periodic maintenance of the containment will be done in the form of inspection of the containment material for tears or areas that may present future problems and shall be promptly addressed. Disposal of excess water accumulation from rain events and possible contributing spills will either be pumped and reintroduced into the recycle treatment facility, or a truck equipped with a vacuum pump will withdraw and dispose of the excess water at an approved facility.

Fueling and filling of fluids for the pumps, generators, and light plants will be conducted within the containment for protection of accidental spills and leaks. If fuel, motor oil, engine coolant, etc. must be stored on site, a designated area will be determined and containment will be constructed to protect against accidental spills and leaks. Filling of chemicals for the chemical treatment trailer will be conducted within the containment, and if chemicals must be stored on site a designated area will be determined and containment will be constructed to protect against accidental spills and leaks.

Material Safety Data Sheets (MSDS) on all chemicals present in the chemical treatment trailer and chemical storage will be located in the chemical treatment trailer. A spill kit and a minimum of two (2) fire extinguishers will be present on site at all times. Copies of the MSDS sheets are included with this submittal.

Process Description: Refer to the attached Flow Diagram

1. Flowback/produced water is returned from drilling sites for recycle. All trucks hauling flowback /produced water will be tracked through Shalewater Solution's Trucking App for real time tracking, and will be manifested with Shalewater Solution's digital manifest. The returned fluids are deposited into enclosed influent storage tanks to allow for immediate solids settling.
2. The fluid is then pumped through a series of static mixers and treatment chemistry is added through a series of injection quills. All chemical injection is performed within the confines of the Shalewater Solutions treatment trailer, where dosages are closely monitored and optimized. The following sequence details the chemical additions:
    a) Shaleclear Utica is injected first to aid in coagulation of suspended particles.
    b) pH is then altered by addition of Caustic Soda to bring the solution to the proper end point for coagulation and re-use.
    c) Shalefloc is added to the flow to assist in growing particle size and aid in clarification.
    d) Finally, the injection of an oxidizing biocide (12.5% sodium hypochlorite) is completed, post settling, to maintain biological control of the treated product fluid
3. Following the chemical addition process, the treated fluid is run through a series of baffled weir and settling tanks to allow for solids settling and removal. The weir tanks are designed to minimize carryover of heavy solids and/or floating oil /gas prior to the settling tanks where additional clarification occurs to remove solids from the final treated fluid.
4. Level control tanks are utilized to control the hydraulic gradient line in the settling tanks.
5. Settled Solids are removed from the settling tanks on a routine basis and currently disposed as liquid sludge at WMI Northwest Landfill.
    a) Further dewatering of the settled solids may be accomplished with the addition of a Shalewater Solutions Filter Press. Removal of the precipitated solids results in nearly 100% removal of all turbidity in the treated fluid. Shalewater Solution's Dewatering Process produces a sludge cake that would be hauled to WMI Northwest Landfill for disposal.
6. The treated fluid is stored in enclosed tanks for blending and reuse on the next Antero well site. All trucks hauling effluent are tracked through Shalewater Solution's Trucking App.

MATERIAL SAFETY DATA SHEET

DATE PREPARED: 8/1/13
MSDS No: ShaleClear Utica
ShaleClear Utica

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: **ShaleClear Utica**

MANUFACTURER:

Shalewater Solutions
37 Grande Meadows Drive
Suite 201
Bridgeport, WV 26330
Ph: (855) 463-7224
www.shalewater.com

24 HR. EMERGENCY TELEPHONE NUMBERS:

Emergency Phone 800-535-5053

NFPA Rating		HMIS Rating	
HEALTH:	3	HEALTH:	3
FLAMMABILITY:	0	FLAMMABILITY:	0
REACTIVITY:	0	REACTIVITY:	0

EMERGENCY OVERVIEW

Corrosive Liquid! Clear colorless to yellow liquid with no appreciable odor. May cause skin and eye irritation that can become severe on prolonged contact. May be harmful if swallowed. Inhalation of spray or mist may irritate respiratory tract.

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2. COMPOSITION/INFORMATION ON INGREDIENTS

	wt.%	CAS Registry #
Ferric Chloride	<50	7705-08-0

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)

	EXPOSURE LIMITS		
	OSHA PEL	ACGIH TLV	Supplier
Ferric Chloride	Not Established	1mg/m3	

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3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

IMMEDIATE CONCERNS:

DANGER! Corrosive. Causes burns to any area of contact. Harmful if inhaled. Harmful if swallowed.

POTENTIAL HEALTH EFFECTS

EYES:

Will produce immediate irritation, can result in burns.

SKIN:
May cause irritation and burns.

INGESTION:
Immediate destruction to esophageal linings.

INHALATION:
Vapors are irritating. Breathing high concentrations will cause immediate irritation of breathing passages.

CARCINOGENICITY: None

4. FIRST AID MEASURES

EYES:
Immediately flush eyes with plenty of water for at least 15 minutes. Get immediate medical attention.

SKIN:
Remove contaminated clothing and flush skin with soap and water. Get medical attention if irritation develops. Thoroughly wash or discard clothing and shoes before reuse.

INGESTION:
If swallowed, DO NOT INDUCE VOMITING. Never give anything by mouth to an unconscious person. Get medical attention immediately.

INHALATION:
Remove to fresh air. Give artificial respiration, if necessary and get medical attention.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:
Not Combustible

EXPLOSION HAZARDS:
Contact with many metals will liberate hydrogen gas that can form an explosive environment.

FIRE FIGHTING PROCEDURES:
Wear self-contained breathing apparatus .

FLASH POINT: Not Available
AUTOIGNITION: Not Available
FLAMMABILITY LIMITS: Not Available

6. ACCIDENTAL RELEASE MEASURES

GENERAL PROCEDURES:
Avoid skin contact. Keep upwind. Neutralize with appropriate material and place in suitable container for proper disposal. Flush neutralized residues with water to sanitary sewer.

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7. HANDLING AND STORAGE

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Local and/or mechanical exhaust to maintain exposure below P.E.L.

PERSONAL PROTECTION

EYES AND FACE:
Chemical goggles

SKIN:
Neoprene boots, gloves, apron- as appropriate to prevent skin contact.

RESPIRATORY:
NIOSH/MSHA approved filter type mask for dusts, fumes and mists as needed to maintain P.E.L.

OTHER USE PRECAUTIONS:
Safety shower and eye wash stations should be easily accessible.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Odor: Mild odor
Appearance: Red/Orange Liquid
pH: <1
Percent Volatile (by weight): 55
Vapor Pressure: Not Available
Boiling Point: 225ºF/107ºC
Melting Point: Not Determined
Solubility in Water: Complete
Evaporation Rate: ~1
Specific Gravity: 1.27 @ 20°C (water=1)
Vapor Density: >1

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10. STABILITY AND REACTIVITY

STABLE: Yes

HAZARDOUS POLYMERIZATION: No

CONDITIONS TO AVOID:
Temperatures >200°F/93°C

HAZARDOUS DECOMPOSITION:
Hydrogen chloride.

INCOMPATIBLE MATERIALS:
Rapidly corrodes most metals. Avoid contact with nylon, aluminum, copper, steel and stainless steel.

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11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY:
IARC: Not Listed
NTP: Not Listed
OSHA: Not Listed

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12. ECOLOGICAL INFORMATION

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13. DISPOSAL CONSIDERATIONS

GENERAL COMMENTS:
Corrosive. Dispose of in accordance with all local, state and federal regulations.

HAZARDOUS WASTE: Yes
Number: D002

EMPTY CONTAINERS:
Empty containers may contain residuals. Thoroughly clean, then offer for recycling, reuse, or disposal in accordance with all regulations.

MATERIAL SAFETY DATA SHEET

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
Shipping Name: Ferric Chloride, Solution
Hazard Class: 8 (corrosive material)
NA/UN Number: UN2582
Packing Group: III
Non-Bulk Shipping Name: Ferric chloride, solution, 8, UN2582, PG III
Bulk Shipping Name: Ferric chloride, solution, 8, UN2582, PG III, RQ (if 2,380lbs or more in one package.)

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

313 Reportable Ingredients: No chemicals are reportable under SARA section 313.

16. OTHER INFORMATION

Approval date: 5/22/13

NFPA CODES
Fire: 0 Health: 3 Reactivity: 0

MANUFACTURER DISCLAIMER:
This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of manufacturer. The data on this sheet relates only to the specific material designated herein. Manufacturer assumes no legal responsibility for use or reliance upon this data.

MATERIAL SAFETY DATA SHEET

DATE PREPARED: 11/27/2012
MSDS: ShaleFloc
ShaleFloc

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: **ShaleFloc**

MANUFACTURER:

Shalewater Solutions
37 Grande Meadows Drive
Suite 201
Bridgeport, WV 26330
Ph: (855) 463-7224
www.shalewater.com

24 HR. EMERGENCY TELEPHONE NUMBERS:

Emergency Phone 800-535-5053

2. COMPOSITION/INFORMATION ON INGREDIENTS

	wt.%	CAS Registry #
Anionic water-soluble polymer in emulsion		33

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

IMMEDIATE CONCERNS:

Spills produce extremely slippery surfaces.

4. FIRST AID MEASURES

EYES:

Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation, consult a physician.

SKIN:

Wash off immediately with soap and plenty of water. In case of persistent skin irritation, consult a physician.

INGESTION:

The product is not considered toxic based on studies on laboratory animals.

INHALATION:

Move to fresh air.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:
Water, water spray, foam, carbon dioxide (C02), dry powder.

FIRE FIGHTING PROCEDURES:
Spills produce extremely slippery surfaces.

FIRE FIGHTING EQUIPMENT:
No special protective equipment required.

AUTOIGNITION TEMPERATURE:
Does not ignite.

FLASHPOINT:
Does not flash.

6. ACCIDENTAL RELEASE MEASURES

ENVIRONMENTAL PRECAUTIONS:
WATER SPILL:
Do not contaminate water.

GENERAL PROCEDURES:
DO NOT FLUSH WITH WATER. Dam up. Soak up with inert absorbent material. If liquid has been spilled in large quantities clean up promptly by scoop or vacuum. Keep in suitable and closed containers for disposal. AFTER CLEANING, flush away traces with water.

COMMENTS:
No special personal precautions required.

7. HANDLING AND STORAGE

HANDLING**:**
Avoid contact with skin and eyes. When preparing the working solution ensure there is adequate ventilation. When using do not smoke.

STORAGE:
Keep in a dry, cool place (0-30 degrees C). When preparing the working solution ensure there is adequate ventilation. Freezing will affect the physical condition and may damage the material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

PERSONAL PROTECTION
EYES AND FACE:
Safety glasses with side shields. Do not wear contact lenses.

SKIN:
Chemical resistant apron or protective suit if splashing or contact with solution is likely.

RESPIRATORY:
In cases of insufficient ventilation wear suitable respiratory equipment.

PROTECTIVE CLOTHING:
Wear rubber gloves.

WORK HYGIENIC PRACTICES:
Wash hands before breaks and at immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor: Aliphatic
Appearance: viscous liquid
Color: milky
Vapor Pressure: 0.002 at 20ºC
Melting Point: Not applicable

COMMENTS:
pH: 6-8@5 g/L
Water Solubility: See Technical Bulletin
Density: See Technical Bulletin

10. STABILITY AND REACTIVITY

STABILITY:
Product is stable. No hazardous polymerization will occur. Oxidizing agents may cause exothermic reactions.

HAZARDOUS DECOMPOSITION:
Thermal decomposition may produce nitrogen oxides (NOx), carbon oxides (COx).

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:
May cause eye irritation with susceptible persons.

SKIN EFFECTS:
May cause skin irritation with susceptible persons.

ACUTE:
Skin: This product is not expected to be toxic in contact with the skin.
Ingestion: LD50/oral/rat>5000 mg/kg
Inhalation: This product is not expected to be toxic by inhalation.

SENSITIZATION:
This product is not expected to be sensitizing.

SUBCHRONIC:
Prolonged skin contact may defat the skin and produce dermatitis.

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION:
Fish: LC50/Danio rerio/96 hr >100 mg/L (OECD 203) (Based on the toxicity of the components using the Conventional Method.)
Algae: IC50/Scenedesmus subspicatis/72 h r >100 mg/L (OECD 201)(Based on the toxicity of the components using the Conventional Method.)
Daphnia: EC50/Daphnia magna/48 hr > 100 mg/L (OECD 202)(Based on the toxicity of the components using the Conventional Method.)

DISTRIBUTION:
This product is not expected to bioaccumulate.

COMMENTS:
Not readily biodegradable. This product is rapidly eliminated from the aquatic medium through irreversible adsorption onto suspended matter and dissolved organics.

13. DISPOSAL CONSIDERATIONS

PRODUCT DISPOSAL:
In accordance with all federal, state and local regulations.

EMPTY CONTAINER:

Rinse empty containers with water and use the rinse water to prepare the working solution. Can be landfilled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

SPECIAL SHIPPING NOTES:
Not regulated by: DOT, IATA, IMDG.

15. REGULATORY INFORMATION

UNITED STATES

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA Regulatory: Hazardous waste number: Not applicable
TSCA Status: All components of this product are on the TSCA and DSL inventories.

RCRA STATUS:
Not a hazardous waste.

STATE REGULATIONS

PROPOSITION 65 STATEMENT:
The following statement is made in order to comply with the CA Safe Drinking Water and Toxic Enforcement Act of 1986. This product contains a chemical known to the State of California to cause cancer: residual acrylamide.

GENERAL COMMENTS:
Reportable Quantity (40 CFR 302): Not applicable

COMMENTS:
Threshold planning quantity (40 CFR 355): Not applicable

16. OTHER INFORMATION

Approval date: 11/27/2012

NFPA CODES
Fire: 1 Health: 1 Reactivity: 0

HMIS CODES
Fire: 1 Health: 1 Reactivity: 0

MATERIAL SAFETY DATA SHEET

MANUFACTURER DISCLAIMER:

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of manufacturer. The data on this sheet relates only to the specific material designated herein. Manufacturer assumes no legal responsibility for use or reliance upon this data.

Material Safety Data Sheet

Revision Issued: 2/23/2012 Supercedes: 11/30/2009 First Issued: 12/12/1986

Section I - Chemical Product And Company Identification

Product Name: Sodium Hydroxide 10-50% Liquid

CAS Number: 1310-73-2 HBCC MSDS No. CC12000

HILL BROTHERS Chemical Co.

1675 NORTH MAIN STREET • ORANGE, CALIFORNIA 92867-3499
(714) 998-8800 • FAX: (714) 998-6310
http://hillbrothers.com

1675 No. Main Street, Orange, California 92867
Telephone No: 714-998-8800 | Outside Calif: 800-821-7234
Chemtrec: 800-424-9300

Section II - Composition/Information On Ingredients

			Exposure Limits (TWAs) in Air		
Chemical Name	CAS Number	%	ACGIH TLV	OSHA PEL	STEL
Sodium Hydroxide	1310-73-2	10-50	2 mg/m³	2 mg/m³	N/A

Section III - Hazard Identification

Routes of Exposure: Sodium hydroxide can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

Summary of Acute Health Hazards

Ingestion: Corrosive! Swallowing sodium hydroxide may cause severe burns of the mouth, throat, esophagus, and stomach. Death may result. Severe scarring of the throat may occur on recovery after swallowing sodium hydroxide. Symptoms may include sneezing, bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appear days after exposure. An increased number of esophageal cancer cases have been reported to occur in individuals who have scarring of the esophagus from swallowing sodium hydroxide.

Inhalation: Severe Irritant. Effects from inhalation of the dusts, mists, or spray will vary from mild irritation to destructive burns depending on the severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.

Skin: Corrosive! Contact of the skin may cause skin irritation and, with greater exposure, severe burns with scarring.

Eyes: Corrosive! Sodium hydroxide is destructive to eye tissues on contact, will cause severe burns that result in damage to the eyes and even blindness. Contact lenses should not be worn when working with this chemical.

Summary of Chronic Health Hazards: The chronic local effect may consist of multiple areas of superficial destruction of the skin or of primary irritant dermatitis. Similarly, inhalation of dust, spray, or mist may result in varying degrees of irritation or damage to the respiratory tract tissues and an increased susceptibility to respiratory illness. Effects may be delayed.

Signs and Symptoms of Exposure: A physician should be contacted if anyone

develops any signs or symptoms and suspects that they are caused by exposure to sodium hydroxide.

Effects of Overexposure: Sodium hydroxide is a strong alkali and is corrosive to any tissue with which it comes in contact.

Medical Conditions Generally Aggravated by Exposure: Sodium hydroxide is a respiratory irritant. Persons with pre-existing skin disorders or eye problems or impaired pulmonary function may be at increased risk from exposure, and should have limited exposure to this material.

Note to Physicians: Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the uses of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

Section IV - First Aid Measures

Ingestion: Do Not Induce Vomiting. If the person is conscious, give him large quantities of water immediately to dilute the sodium hydroxide. Do not attempt to make the exposed person vomit. DO NOT INDUCE VOMITING! GET MEDICAL ATTENTION IMMEDIATELY.

Inhalation: Move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. If breathing is difficult, give oxygen. Keep the affected person warm and at rest. GET MEDICAL ATTENTION IMMEDIATELY.

Skin: Immediately flush contaminated skin with water. If large areas of the body are contaminated or if clothing is penetrated, immediately use safety shower, removing clothing while under the shower. Flush exposed areas with large amounts of water for at least 15 minutes. GET MEDICAL ATTENTION IMMEDIATELY. Wash clothing before reuse.

Eyes: Immediately flush eyes with a directed stream of water for at least 15 minutes. Forcibly hold eyelids apart to ensure complete irrigation of all eye and lid tissue. Washing eyes within 1 minute is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY. Contact lenses should not be worn when working with this chemical.

Section V - Fire Fighting Measures

Flash Point: Not combustible **Autoignition Temperature:** Not combustible

Lower Explosive Limit: N/A **Upper Explosive Limit:** N/A

Unusual Fire and Explosion Hazards: Not combustible but solid form in contact with moisture or water may generate sufficient heat to ignite combustible materials. Contact with some metals can generate hydrogen gas. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Vapors may be heavier than air.

Extinguishing Media: Foam, carbon dioxide, or dry chemicals may be used where this product is stored. Adding water to caustic solution generates large amounts of heat. Do NOT get water inside containers.

Special Firefighting Procedures: This product is not combustible. Full protective clothing and self-contained breathing apparatus should be worn in areas where product is stored.

Section VI - Accidental Release Measures

Leaks should be stopped. Spills should be contained and cleaned up immediately. Spills should be removed by using a vacuum truck. Neutralize remaining traces of material with any dilute inorganic acid such as hydrochloric, sulfuric, nitric, phosphoric, or acetic acid. The spill area should then be flushed with water, followed by liberal covering of sodium bicarbonate. All clean-up material should be removed and placed in approved containers, labeled and stored in a safe place to await proper treatment or disposal. Spills on areas other than pavement (dirt or sand) may be handled by removing the affected soils and placing in approved containers. Avoid runoff into storm sewers and ditches which lead to waterways. Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.

Section VII - Handling and Storage

Prevent possible eye and skin contact by wearing protective clothing and equipment. Storage tanks must be vented and diked. Store drums of sodium hydroxide separate from acids, metals and explosives. Provide adequate drainage. When diluting, use agitation and add concentrated sodium hydroxide to water at a controlled rate to control heat of dilution and to avoid splattering. Do not add water to sodium hydroxide. Do not store with aluminum or magnesium. Store above 60°F (16°C) to prevent freezing.

Other Precautions: Sodium hydroxide reacts with reducing sugars such as fructose, lactose, maltose, galactose, levulose, and arabinose to form carbon monoxide. While the potential for worker exposure to carbon monoxide may be small, a potential does exist during cleaning of certain dairy and possibly other industry equipment. Carbon monoxide gas can form upon contact with food and beverage products in enclosed spaces and can cause death. Follow appropriate tank entry procedures.

Special Mixing and Handling Instructions: Considerable heat is generated when water is added to sodium hydroxide; therefore, when making solutions always add the sodium hydroxide to the water with constant stirring. The water should always be lukewarm (80° - 100° F). Never start with hot or cold water. If sodium hydroxide becomes concentrated in one area, or if added too rapidly, or if added to hot or cold water, a rapid temperature increase can result in dangerous boiling and/or spattering or may cause an immediate violent eruption.

Section VIII - Exposure Controls/Personal Protection

Respiratory Protection: Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration or by the National Institute for Occupational Safety and Health.

Ventilation: Ventilation is not usually required for sodium hydroxide solutions. Avoid creation of mist or spray. If present wear appropriate safety clothing and provide local exhaust systems. Where carbon monoxide may be generated, special ventilation may be required.

Protective Clothing: Employees should be provided with and required to use impervious clothing, gloves, face shield (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with solutions

of sodium hydroxide. Materials suggested for use are natural rubber, butyl rubber, neoprene, or vinyl.

Eye Protection: Employees should be provided with and required to use dust- and splash-proof safety goggles where there is any possibility of sodium hydroxide contacting the eyes. Contact lenses should not be worn when working with this chemical.

Other Protective Clothing or Equipment: Eyewash stations and safety showers must be available in the immediate work area for emergency use.

Work/Hygienic Practices: Avoid contact with the skin and avoid breathing dust or mist. Do not eat, drink, or smoke in work area. Wash hands before eating, drinking, or using toilet facilities. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.

Section IX - Physical and Chemical Properties

Physical State: Liquid **pH:** 14.0

% of Solution	10%	25%	30%	33%	36%	50%
Boiling Point(°F):	217	234	242	245	253	288

Melting Point/Range: -10°C to 12°C **Molecular Weight:** 40.00 (dry basis)

Appearance/Color/Odor: Clear to slightly gray liquid with no odor

Solubility in Water: Complete **Vapor Pressure(mmHg):** 1.5 to 1.6 @ 20°C; 68°F

% of Solution	10%	25%	30%	33%	36%	50%
Specific Gravity(Water=1)@20°C:	1.109	1.252	1.328	1.363	1.397	1.525

% of Solution	10	25	30	33	36	50
% Volatiles	90	75	70	67	64	50

Vapor Density(Air=1): N/A

% of Solution	10%	25%	30%	33%	36%	50%
Freezing Point (°F):	10	-13.9	36	44	58	54

How to detect this compound: Sampling and analyses may be performed by collection of sodium hydroxide in a glass bubbler containing hydrochloric acid, followed by subsequent titration. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure sodium hydroxide may be used.

Section X - Stability and Reactivity

Stability: Stable **Hazardous Polymerization:** Will not occur

Conditions to Avoid: Overheating in storage accelerates corrosion.

Materials to Avoid: Contact with water, acids, flammable liquids, and organic halogen compounds, especially trichloroethylene, may cause fires and explosions. Contact with metals such as aluminum, tin, and zinc and alloys containing these metals cause formation of flammable hydrogen gas. Contact with nitromethane and other similar nitro compounds cause formation of shock-sensitive salts. Contact with water releases heat which can result in boiling and splattering. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon

monoxide.

Hazardous Decomposition Products: None

Section XI - Toxicological Information

Sodium hydroxide is a strong alkali; the mist, dust and solutions cause severe injury to the eyes, mucous membranes, and skin. Although inhalation is usually of secondary importance in industrial exposures, the effects from the dust or mist will vary from mild irritation of the nose at 2 mg/m³ to severe pneumonitis, depending on the severity of exposure. The greatest industrial hazard is rapid tissue destruction of eyes or skin upon contact with either the solid or with concentrated solutions. Contact with the eyes causes disintegration and sloughing of conjunctival and corneal epithelium, corneal opacification, marked edema, and ulceration; after 7 to 13 days either gradual recovery begins, or there is progression of ulceration and corneal opacification. Complications of severe eye burns are symblepharon (adhesion of the lid to the eyeball) with overgrowth of the cornea by a vascularized membrane, progressive or recurrent corneal ulceration, and permanent corneal opacification. On the skin, solutions of 25 to 50% cause the sensation of irritation within about 3 minutes; with solutions of 4%, this does not occur until after several hours. If not removed from the skin, severe burns with deep ulceration will occur; exposure to the dust or mist may cause multiple small burns, with temporary loss of hair. Ingestion produces severe pain in the esophagus and stomach, corrosion of the lips, mouth, tongue, and pharynx and the vomiting of large pieces of mucosa; cases of squamous cell carcinoma of the esophagus have occurred with latent periods of 12 to 42 years after ingestion; these cancers may have been sequelae of tissue destruction and possibly scar formation rather than from a direct carcinogenic action of sodium hydroxide itself. Sodium hydroxide: irritation data: skin, rabbit: 500 mg/24H; severe; eye rabbit: 50 ug/24H severe. Investigated as a mutagen.

Section XII - Ecological Information

N/A

Section XIII - Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements. Do not flush to sewer.

Section XIV - Transport Information

DOT Proper Shipping Name: Sodium Hydroxide, Solution
DOT Hazard Class/ I.D. No.: 8, UN1824, II

Section XV - Regulatory Information

Reportable Quantity: 1000 Pounds (454 Kilograms)
NIOSH: 10 mg/m³ IDLH
NFPA Rating: Health - 3; Flammability - 0; Instability - 1
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme
Carcinogenicity Lists: No **NTP:** No **IARC Monograph:** No **OSHA Regulated:** Yes

Maximum use level for Sodium Hydroxide under NSF/ANSI Standard 60

25% Liquid Caustic Soda	Maximum use	200 mg/L
30% Liquid Caustic Soda	Maximum use	167 mg/L
33% Liquid Caustic Soda	Maximum use	152 mg/L
50% Liquid Caustic Soda	Maximum use	100 mg/L

Section XVI - Other Information

Synonyms/Common Names: Sodium Hydroxide; Soda Lye; Lye; Caustic Soda
Chemical Family/Type: Alkali
Change Since Last Revision: Sections: XV
IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 CFR 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, **Hill Brothers Chemical Company** makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.

HASA 12.5% SODIUM HYPOCHLORITE SOLUTION

Material Safety Data Sheet

12.5% Sodium Hypochlorite Cl2 mix with WATER

Emergency 24 Hour Telephone: **CHEMTREC 800.424.9300**

Corporate Headquarter: Hasa Inc.
23119 Drayton Street
Saugus, California 91350
Telephone • 661.259.5848
Fax • 661.259.1538

HASA 12.5% SODIUM HYPOCHLORITE SOLUTION
Material Safety Data Sheet (MSDS No. 106)

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1	**Product Identification:**		
	1.1.1	**Product Name:**	HASA 12.5% SODIUM HYPOCHLORITE SOLUTION
	1.1.2	**CAS #** (Chemical Abstracts Service)**:**	7681-52-9
	1.1.3	**RTECS** (Registry of Toxic Effects of Chemical Substances)**:**	NH3486300
	1.1.4	**EINECS** (European Inventory of Existing Commercial Substances)**:**	231-668-3
	1.1.5	**EC Number:**	231-668-3
	1.1.6	**Synonym:**	Bleach, Hypo, Hypochlorite, Liquid Chlorine Solution
	1.1.7	**Chemical Name:**	Sodium Hypochlorite
	1.1.8	**Chemical Formula:**	NaOCl
1.2	**Recommended Uses:**		Manufacturing use product.
1.3	**Company Identification:**		Hasa Inc. 23119 Drayton Street Saugus, California 91350
1.4	**Emergency Telephone Number:**		**CHEMTREC** 1-800-424-9300 (24 hour)
1.5	**Non-Emergency Assistance:**		661-259-5848 (8 AM – 5 PM PST / PDT)

SECTION 2: EMERGENCY OVERVIEW and HAZARD IDENTIFICATION

2.1	**Emergency Overview.**	**DANGER. CORROSIVE.** Causes eye damage. Harmful if swallowed or absorbed through skin. Do not get in eyes, on skin, or on clothing. Wear safety glasses or goggles or face shield, protective clothing, and rubber gloves when handling this product. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse. Avoid breathing vapors. Vacate poorly ventilated areas as soon as possible. Do not return until strong odors have dissipated.
2.2	**Routes of Entry:**	Eyes, skin absorption, inhalation, ingestion.
2.3	**Short Term Exposure:**	
2.3.1	**Eyes:**	Causes serious eye irritation. Blurred vision. May cause impairment of vision and corneal damage.
2.3.2	**Skin:**	May cause skin irritation and/or dermatitis. Prolonged skin exposure may cause destruction of the dermis with impairment of the skin to regenerate at site of contact.
2.3.3	**Inhalation:**	Accidental mixing with other chemicals or decomposition of sodium hypochlorite vapor is irritating to the respiratory system.
2.3.4	**Ingestion:**	Ingestion of high concentrations may cause injuries to gastrointestinal tract, liver, kidneys and central nervous system. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
2.3.5	**Aggravated Medical Conditions:**	Asthma, heart disease, respiratory disorders.
2.4	**Long Term Exposure:**	Based on the toxicity profile and exposure scenarios for sodium hypochlorite, EPA concludes that the risks from chronic and sub-chronic exposure to low levels of this pesticide are minimal and without consequence to human health.

SECTION 3: COMPOSITION INFORMATION ON INGREDIENTS

	Ingredient	Synonyms	CAS No.	Approx. Wt.%
3.1	Sodium Hypochlorite	Bleach	7681-52-9	12.5%
3.2	Sodium Hydroxide	Caustic Soda	1310-73-2	0.2%

SECTION 4: FIRST AID MEASURES

4.1	**IF IN EYES**	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
4.2	**IF ON SKIN OR CLOTHING**	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
4.3	**IF INHALED**	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.
4.4	**IF SWALLOWED**	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.

HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-424-9300 for emergency medical treatment information.

NOTE TO PHYSICIAN

Probable mucosal damage may contraindicate the use of gastric lavage.

SECTION 5: FIRE FIGHTING MEASURES

5.1	**Flash Point:**	Not applicable.
5.2	**Flammability:**	Nonflammable and noncombustible.
5.3	**Auto-Ignition Temperature:**	Not applicable.
5.4	**Products of Combustion:**	Not pertinent.
5.5	**Fire Hazards:**	May decompose, generating irritating chlorine gas.
5.6	**Explosion Hazards:**	Not explosive.
5.7	**Fire Fighting Media and Instructions:**	
5.7.1	**Extinguishing Media:**	Use extinguishing measures appropriate to local circumstances and the surrounding environment.
5.7.2	**Small Fires:**	Use carbon dioxide, or water spray.
5.7.3	**Large Fires:**	Use flooding quantities of water as fog.
5.8	**Special Remarks on Fire Hazards:**	Do not use Mono Ammonium Phosphate (MAP) fire extinguishers. Such use may cause explosion with release of toxic gases.

SECTION 6: ACCIDENTAL RELEASE MEASURES		
6.1	**Small Spill:**	In case of spill, flood area where spill has occurred with large quantities of water. With permission from local authorities, diluted product may be flushed to a sanitary sewer. Product may also be absorbed with sand or diatomaceous earth. Absorbed products must be disposed of in accordance with applicable Federal, State, and/or local regulations. Contact Hasa Inc. for guidance.
6.2	**Large Spill:**	If possible without personal risk, stop leak. Try to prevent the materials from entering drains, waterways, or sewers. Absorb with sand, diatomaceous earth or similar products and dispose of in accordance with local regulations. Call Hasa Inc. for advice.

SECTION 7: HANDLING AND STORAGE		
7.1	**Handling:**	• Avoid contact with skin or eyes. • Do not ingest. • Avoid inhalation of vapor or mist. • Wear protective equipment if necessary. • Mix only with water in accordance with label directions. • Mixing this product with ammonia, acids, detergents, etc or with organic materials, e.g. feces, urine, etc. will release chlorine gas, which is irritating to eyes, lungs, and mucous membranes.
7.2	**Hygiene Measures:**	• Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. • While handling this product, avoid eating, drinking or smoking.
7.3	**Storage:**	• Do not freeze. • Store in a cool, shaded outdoor area. • Inside storage should be in a cool, dry, well-ventilated area. • To maintain hypochlorite strength, do not store in direct or heated indoor areas. • Keep in original vented container. • Keep container closed when not in use. • Do not store adjacent to chemicals that may react if spillage occurs. • If closed containers become heated, vent to release decomposition products (mainly oxygen under normal decomposition).

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1	**Engineering Controls:**		Local exhaust ventilation to maintain levels below STEL (Short Term Exposure Limit) of 1 ppm as chlorine.	
8.2	**Personal Protection:**			
	8.2.1	**Eye / Face Protection:**	Wear safety glasses, goggles, or face shield to prevent eye contact.	
	8.2.2	**Skin Protection:**	Wear appropriate chemical resistant protective clothing and chemical resistant gloves to prevent skin contact. Butyl rubber, Neoprene, or Nitrile Gloves should be worn when handling this material. Wear chemical resistant clothing such as a rubber apron when splashing may occur. Rinse immediately if skin is contaminated. Remove contaminated clothing promptly and wash before reuse. Clean protective equipment before reuse.	
	8.2.3	**Respiratory Protection:**	Avoid breathing vapor or mist. When airborne exposure limits are exceeded (see below), use NIOSH approved respiratory protection equipment appropriate to the material and/or its components. Full facepiece equipment is recommended and, if used, replaces need for face shield and chemical goggles. For emergency and other conditions where exposure limit may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus.	
	8.2.4	**Other Safety Equipment:**	Eye wash facility and emergency shower should be in close proximity.	
8.3	**Exposure Limits:**		**Sodium Hypochlorite**	**Chlorine***
	8.3.1	**AIHA** (American Industrial Hygiene Association) / **WEEL** (Workplace Environmental Exposure Level guides) 2010	2 mg/m^3: 15 minute. (Short-term time weighted average)	Not established
	8.3.2	**ACGIH** (American Conference of Governmental Industrial Hygienists) **TWA** (Time Weighted Average)	Not established.	0.5 ppm
	8.3.3	**ACGIH STEL** (Short Term Exposure Limit)	Not established.	1 ppm
	8.3.4	**OSHA PEL** (Permisible Exposure Limit)	Not established.	0.5 ppm
	8.3.5	**ACGIH** Ceiling	Not established.	Not established
	8.3.6	**NIOSH** (National Institute for Occupational Safety & Health) **IDLH** (Immediate Danger to Life & Health)	Not established.	10 ppm
	8.3.7	**OSHA STEL** (Short Term Exposure Limit)	Not established.	1 ppm as Cl_2
	8.3.8	**NIOSH** (15 min. ceiling)	Not established.	0.5 ppm

** Chlorine is unlikely to be present as a decomposition product, but may be present in incidents of accidental mixing with other chemicals.*

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1	**Physical State and Appearance:**	Liquid with pale yellow color.
9.2	**Odor:**	Bleach
9.3	**Odor Threshold:**	Not applicable.
9.4	**pH** (1% solution)**:**	11.2 – 11.4
9.5	**Boiling Point:**	Not applicable. Decomposes @ 110°C (230°F)
9.6	**Melting Point:**	Not applicable.
9.7	**Freezing Point:**	-23.3°C (-10°F)
9.8	**Evaporation Rate** (BuAc=1)**:**	Not available.
9.9	**Flammable Limits:**	Not applicable.
9.10	**Vapor Pressure:**	12.1 mm Hg @ 20°C (68°F)
9.11	**Vapor Density:** (Air=1)	2.61
9.12	**Relative Density or Specific Gravity** (H_2O=1)**:**	1.2 g/mL or 10 lb/gallon @ 20°C (68°F)
9.13	**Solubility in Water:**	Mixes infinitely with water.
9.14	**Partition Coefficient: n-octanol / water:**	Not applicable.
9.15	**Viscosity:**	1.75 - 2.50 centipoises (varies with temperature)
9.16	**Volatility:**	Not applicable.
9.17	**Molecular Weight:**	74.5 g/mole
9.18	**Water / Oil Distribution Coefficient:**	Not applicable.
9.19	**Dispersion Properties:**	Not applicable.

SECTION 10: STABILITY AND REACTIVITY

10.1	**Stability:**	Stable under normal conditions of storage, handling, and use.
10.2	**Instability / Decomposition Temperature:**	All bleach decomposition is dependant on temperature. For any given temperature, the higher the strength, the faster it decomposes. In summary, for every 10°C increase in storage temperature, the sodium hypo-chlorite will decompose at an increased rate factor of approximately 3.5.
10.3	**Conditions of Instability:**	High heat, ultraviolet light.
10.4	**Incompatibility with Various Substances:**	Oxidizing agents, acids, nitrogen containing organics, metals, iron, copper, nickel, cobalt, organic materials, and ammonia.
10.5	**Corrosivity:**	Corrosive to eyes and skin.
10.6	**Special Remarks on Reactivity:**	Rate of decomposition increases with heat. May develop chlorine if mixed with acidic solutions.
10.7	**Special Remarks on Corrosivity:**	None.
10.8	**Hazardous Polymerization:**	Will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1	**Routes of Entry:**	Eyes, skin, ingestion, dermal absorption.
11.2	**Acute Toxicity:**	
	11.2.1 **Oral Toxicity** (LD_{50}):	3-5 g/kg (rat)
	11.2.2 **Dermal Toxicity** (LD_{50}):	>10 g/kg (rabbit)
	11.2.3 **Primary Eye Irritation:**	Corrosive
	11.2.4 **Primary Skin Irritation:**	Corrosive
	11.2.5 **Acute Inhalation Toxicity** (LC_{50})	No data available.
11.3	**Chronic Effects (Human Risk Assessment):**	Based on the toxicity profile and exposure scenarios for sodium hypochlorite, EPA concludes that the risks from chronic and subchronic exposure to low levels of these pesticides are minimal and without consequence to human health.
11.4	**Tolerance Requirement:**	Exempt (EPA document "Index to Pesticide Chemical Names, Part 180 Tolerance Information, and Food and Feed Commodities (by Commodity)" July 2010

SECTION 12: ECOLOGICAL INFORMATION

12.1	**Ecotoxicity:**	Sodium hypochlorite is low in toxicity to avian wildlife, but it is highly toxic to freshwater fish and invertebrates.
12.1.1	**Freshwater Fish Toxicity:**	Atlantic Herring (clupea harengus) LC_{50} = 0.033 - 0.097 mg//l/96 hr, flow through bioassay (pH: 8) Shiner Perch (cymatogaster aggregata) LC_{50} = 0.045 - 0.098 mg/l/96 hr, flow through bioassay (pH: 8) Three Spine Stickleback (gasterosteus aculeatus) LC_{50} = 0.141 - 0.193 mg/l/96 hr, flow through bioassay (pH: 8) Pink Salmon (oncorhynchus gorbuscha) LC_{50} = 0.023 - 0.052 mg/l/96 hr, flow through bioassay (pH: 8) Coho Salmon (oncorhynchus kisutch) LC_{50} = 0.026 - 0.038 mg/l/96 hr, flow through bioassay (pH: 8) English Sole (parophrys vetulus) LC_{50} = 0.044 - 0.144 mg/l/96 hr, flow through bioassay (pH: 8) Fat Head Minnow (pimephales promelas) LC_{50} = 0.22 - 0.62 mg/l/96 hr, flow through bioassay (pH: 7)
12.1.2	**Invertebrate Toxicity:**	Water Flea (ceriodaphnia sp. 0) LC_{50} = 0.006 mg/l/24 hr Water Flea (daphnia magna) LC_{50} = 0.07 - 0.7 mg/l/24 hr Water Flea (daphnia magna) LC_{50} = 2.1 mg/l/96 hr Fresh Water Shrimp (gammarus fasciatus) LC_{50} = 0.4 mg/l/96 hr No common name (nitocra spinipes) LC_{50} = 0.40 mg/l/96 hr Grass Shrimp (palaemonetes pugio) LC_{50} = 0.52 mg/l/96 hr
12.2	**Persistence:**	No data available.
12.3	**Environmental Fate:**	In fresh water, sodium hypochlorite breaks down rapidly into non-toxic compounds when exposed to sunlight. In seawater, chlorine levels decline rapidly; however, hypobromite (which is acutely toxic to aquatic organisms) is formed. EPA believes that the risk of acute exposure to aquatic organisms is sufficiently mitigated by precautionary labeling and National Pollutant Discharge Elimination System (NPDES) permit requirements.
12.4	**Bioconcentration:**	This material is not expected to bioconcentrate in organisms.
12.5	**Biodegradation:**	This material is inorganic and not subject to biodegradation.

SECTION 13: DISPOSAL CONSIDERATIONS

Do not contaminate food or feed by storage, disposal, or cleaning of equipment. Product or rinsates that cannot be used should be diluted with water before disposal in a sanitary sewer. This product can be neutralized with sodium bisulfite, sodium thiosulfate, sodium sulfite. Do not confuse these products with sulfates or bisulfates. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination system (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not contaminate water containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA. Dispose of in accordance with all applicable local, County, State, and Federal regulations.

SECTION 14: TRANSPORT INFORMATION

14.1	**Inside containers 1.3 gallons or less.**	
14.1.1	**DOT Classification:**	Consumer Commodity.
14.1.2	**DOT Hazard Class:**	ORM-D.
14.1.3	**Marking:**	Consumer Commodity, ORM-D.
14.1.4	**Marine Pollutant:**	Not listed in Appendix B of the Hazardous Material Table.
14.1.5	**Deposit Container Returns:**	RESIDUE: LAST CONTAINED CONSUMER COMMODITY ORM-D, PGIII."
14.2	**Inside containers or single containers exceeding 1.3 gallons.**	
14.2.1	**DOT Classification:**	Hypochlorite Solutions.
14.2.2	**DOT Hazard Class:**	8, UN1791, P.G. III.
14.2.3	**Label:**	Corrosive 8.
14.2.4	**Deposit Container Returns:**	RESIDUE: LAST CONTAINED, UN 1791, HYPOCHLORITE SOLUTIONS, 8, PGIII,
14.3	**Reportable Quantity (RQ):**	100 lb (45.4 kg) or 80 gallons (based on 12.5% active ingredient)

14.4 **Materials of Trade (MOT) Exceptions.** Under certain conditions, spa and pool maintenance chemicals may be loaded into pool service and builders trucks and shipped as a MOT, not subject to DOT regulations. A MOT means a hazardous material, other than a hazardous waste, that is carried on a motor vehicle – by a private motor carrier in direct support of his/her principal business that is other than transportation by motor vehicle.

To qualify as a MOT, the hazardous material must fit into any one of the following classes or divisions (but not limited to) Corrosive Materials (Class 8) or Consumer Commodities (ORM-D).

Quantity Limit for MOT:

- For Corrosive Materials (Class 8) that belongs to Packing Group II or III, or is a consumer commodity (ORM-D) – the maximum amount of material in each package is 30 kg (66 lbs) for solids, or 30 L (8 gal) for liquids.
- The aggregate gross weight of all MOTs on a motor vehicle may not exceed 200 kg (440 pounds).

Packaging requirement:

- Packagings must be leak tight for liquids and gases, sift proof for solids, and be securely closed, secured against shifting, and protected against damage.
- Each material must be packaged in the manufacturer's original packaging, or a packaging of equal or greater strength and integrity.
- Outer packagings are not required for receptacles (e.g., cans and bottles) that are secured against shifting in cages, carts, bins, boxes or compartments.

Hazard communication:

- A non-bulk packaging other than a cylinder (including a receptacle transported without an outer packaging) must be marked with a common name or proper shipping name to identify the material it contains, including the letters "RQ" if it contains a reportable quantity of a hazardous substance.
- The operator of a motor vehicle that contains a material of trade must be informed of the presence of the hazardous material (including whether the package contains a reportable quantity) and must be informed of the requirements of 49 CFR §173.6.

Other exceptions: A MOT may be transported on a motor vehicle under the provisions of 49 CFR §173.6 (e) with other hazardous materials without affecting its eligibility for these exceptions.

The MOTs regulations do not require:

- shipping papers;
- emergency response information;
- placarding; or
- formal training or retention of training records.

This information is not intended to convey all specific regulatory or operational requirements / information relating to this product. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

SECTION 15: REGULATORY INFORMATION

15.1 U.S. Regulations:

15.1.1	**OSHA HAZCOM** (Hazard Communication)	This material is considered hazardous under the HAZCOM Standard (29 CFR 1910.1200)
15.1.2	**OSHA PSM** (Process Safety Management)	Not regulated under PSM Standard (29 CFR 1910.119)
15.1.3	**EPA FIFRA** (Federal Insecticide, Fungicide and Rodenticide Act)	EPA Reg. No. :10897-22 (Registered pesticide under 40 CFR 152.10)
15.1.4	**EPA TSCA** (Toxic Substance Control Act)	All components are listed or exempted. TSCA 12(b): This product is not subject to export notification.
15.1.5	**EPA CERCLA** (Comprehensive Environmental Response, Compensation, and Liability Act)	Reportable Quantity (RQ): 45.4 kg (100 lbs) or 80 gallons (based on 12.5% active ingredient).
15.1.6	**EPA RMP** (Risk Management Plan)	Not listed. (40 CFR 68.130)

15.2 State of California Regulations:

15.2.1 **Safe Drinking Water and Toxic Enforcement Act of 1986 [Proposition 65, California only]:** Small quantities – less than 100 ppm (parts per million) – of impurities, including bromates, may be found in all chlorinating products, including this product. Bromates are derived from bromides, which are present in sodium chloride (table salt) from which chlorine is manufactured. Additional small quantities of bromates may be generated during the disinfection process. Bromates are known by the State of California to cause cancer when administered by the oral (drinking or ingesting) route. Read and follow label directions and use care when handling or using this product. The US Environmental Protection Agency has established a maximum contaminant level (MCL) for bromates in drinking water at 10 ppb (parts per billion). Application of this product in accordance with label directions at use dilution will not exceed this level.
This warning is provided pursuant to Proposition 65, Chapter 6.6 of the California Health and Safety Code, which requires the Governor of California to publish a list of chemicals "known to the state to cause cancer or reproductive toxicity." This list is compiled in accordance with the procedures established under the proposition, and can be obtained on the internet from California's Office of Environmental Health Hazard Assessment at http://www.oehha.ca.gov.

15.2.2	**CDPR** (California Department of Pesticide Regulation)	Registration No: 10897-22-AA
15.2.3	**CalARP** (California Accidental Release Prevention Program)	Not regulated.

15.3 Canada Regulations:

15.3.1	**WHMIS** (Workplace Hazardous Materials Information System)	• Classification: E (Corrosive Materials) • Health Effects Criteria Met by this Chemical: ▪ E - Corrosive to skin ▪ E - TDG class 8 - corrosive substance • Ingredient Disclosure List: Included for disclosure at 1% or greater.
15.3.2	**DSL** (Domestic Substances List)	All components of this product are on the DSL.

15.4 International Inventory:

15.4.1	**AICS** (Australian Inventory of Chemical Substances)	On inventory or in compliance with inventory.
15.4.2	**KECI** (Korean Existing Chemicals Inventory)	On inventory or in compliance with inventory.
15.4.3	**PICCS** (Philippine Inventory of Chemicals and Chemical Substances)	On inventory or in compliance with inventory.
15.4.4	**IECSC** (Inventory of Existing Chemical Substances in China)	On inventory or in compliance with inventory.
15.4.5	**NZIoC** (New Zealand Inventory of Chemicals)	On inventory or in compliance with inventory.

SECTION 16: OTHER INFORMATION

16.1	**HMIS III** (Hazardous Materials Identification System):	
16.1.1	HEALTH	2
16.1.2	FLAMMABILITY	0
16.1.3	PHYSICAL HAZARD	1
16.1.4	**PERSONAL PROTECTION**	See Section 8.
16.2	**NFPA 704** (National Fire Protection Association):	
16.2.1	**HEALTH**	**2**
16.2.2	**FLAMMABILITY**	**0**
16.2.3	**INSTABILITY**	**0**
16.2.4	**SPECIAL**	**None**

16.3	**International Fire Code / International Building Code:**	Irritant.
16.4	**ANSI** (American National Standards Institute):	
16.4.1	**Hazardous Industrial Chemicals -** MSDS-Preparation:	Complies with **ANSI Z400.1 – 2004.**
16.4.2	**Hazardous Industrial Chemicals -** Precautionary Labeling:	Complies with **ANSI Z129.1 – 2006.**
16.5	**GHS** (Globally Harmonized System)**:**	
16.5.1	**Classification:**	Skin Corrosion / Irritation (Category 1). Serious Eye damage / Eye Irritation (Category 1)
16.5.2	**Symbol:**	
16.5.3	**Signal Word:**	Danger.
16.5.4	**Hazard Statement:**	Causes severe skin burns and eye damage.

Note: The information contained herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge and belief. NO WARRANTY OR GUARANTEE, express or implied, is made regarding the product performance, product stability, or as to any other condition of use, handling, transportation, and storage. Customer use, handling, transportation, and storage may involve additional safety and/or performance considerations. Our technical personnel will be happy to respond to questions regarding safe handling, storage, transportation, and use procedures. The safe handling, storage, transportation, and use procedures remain the sole responsibility of the customer. No suggestions for handling, storage, transportation, or use are intended as or to be construed as recommendations which may infringe on any existing patents or violate any Federal, State, and/or local law and/or regulation, ordinance, standard, etc. This Material Data Safety Sheet has been prepared by HASA, Inc. staff from test reports and other information available in the public domain.

Sheet	Desctription
1	Cover
2	Site Plan
3	Plant Layout
4	Proposed Layout

Miley Pad
Shalewater Solutions Mobile Treatment #4, 12,000 bbl/daily capacity
Latitude 39°51'16"
Longitude 81°27'12"

Seal

SCALE:	DRAWN BY:	CHK BY:	APPRVD. BY:
NONE	J. LAFFERRE		

PLOT DATE: 19 DECEMBER 2013 - 3:04 PM

SHALEWATER SOLUTIONS

37 GRAND MEADOWS DR.
STE 201
BRIDGEPORT, WV 26330
PH: 304.592.2794 WWW.SHALEWATER.COM

Post Construction Delineation
Miley Tank Farm
Noble County, OH

N

Co Rd 44/Windy Ridge Rd.

Tile Drain

DP 1

PSS Wetland
(Extends Beyond AOI)

DP 2

OHS-285/Sarahsville Rd.

Co Rd 44/Windy Ridge Rd.

Pre Construction PEM Wetland
(0.005 AC)

Tank Pad

DP 3

DP 4

Constructed Channel
(Pond Discharge)

Stream 1
RPW - Intermittent
(UNT of North Fork Buffalo Creek)

Abandoned Channel

Notes:
1. Post construction delineation performed by AllStar Ecology,LLC on 05/08/2012.
2. Background 2007 OSIP Orthophoto.

100 50 0 100 200

SCALE: 1" = 100'

Map created June18, 2012

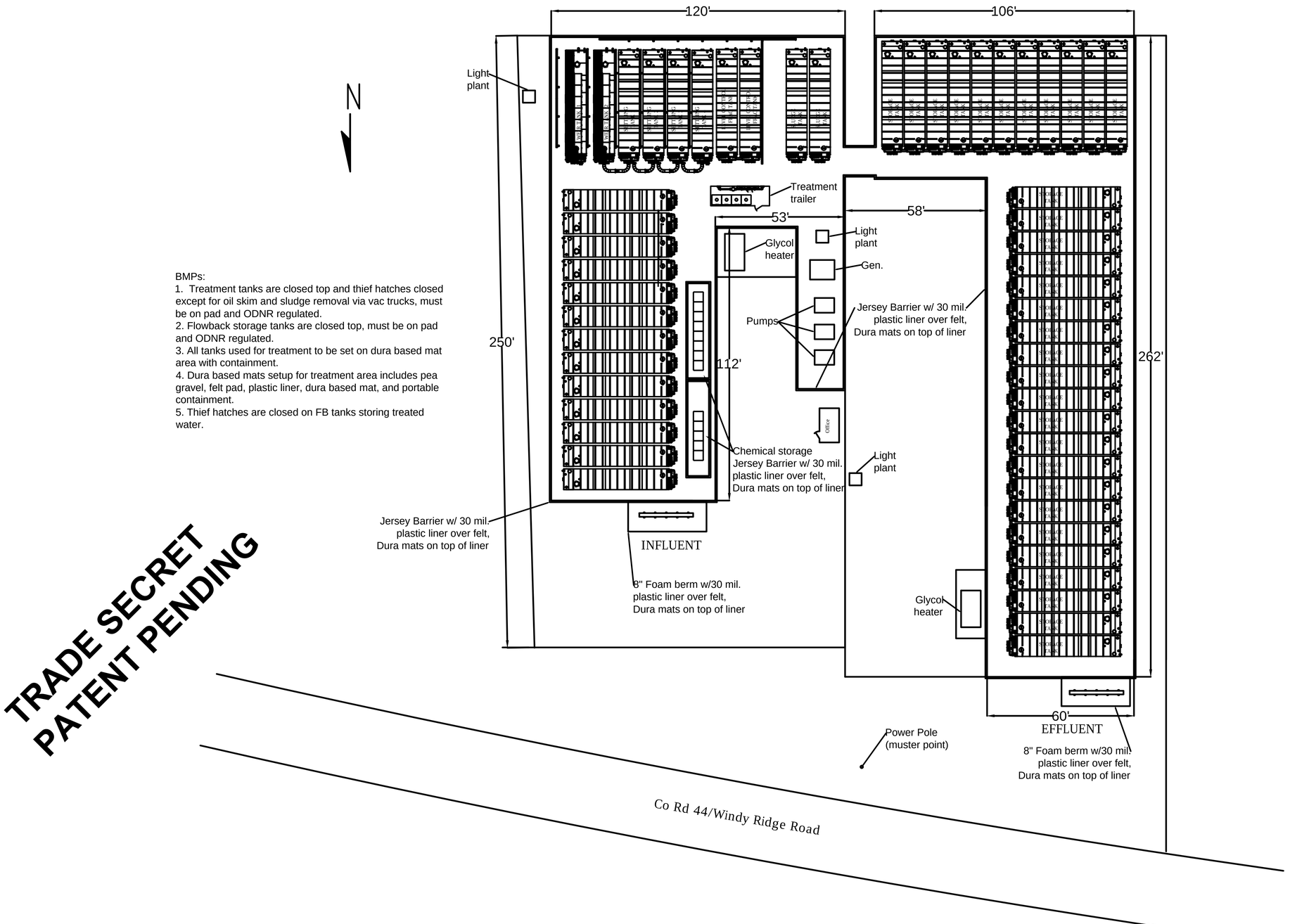
LEGEND

- Area of Interest
- PSS Wetlands
- Tank Pad
- RPW-Intermittent
- Additional Disturbance
- PEM Wetland

Prepared for ANTERO RESOURCES APPALACHIAN CORPORATION by:

AllStar Ecology LLC
Natural Resource Specialists

1580 McKinney Cave Road
Reedsville, WV 26547



BMPs:
1. Treatment tanks are closed top and thief hatches closed except for oil skim and sludge removal via vac trucks, must be on pad and ODNR regulated.
2. Flowback storage tanks are closed top, must be on pad and ODNR regulated.
3. All tanks used for treatment to be set on dura based mat area with containment.
4. Dura based mats setup for treatment area includes pea gravel, felt pad, plastic liner, dura based mat, and portable containment.
5. Thief hatches are closed on FB tanks storing treated water.

TRADE SECRET
PATENT PENDING

Miley Pad Treatment 4 Layout

SCALE:	DRAWN BY:	CHK BY:	APPRVD. BY:
NONE	J. LAFFERRE		

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FILE NAME: C:\Users\JoshuaL\Documents\Cad Stuff\Treatment #4\Miley Pad Treatment #4 layout.dwg

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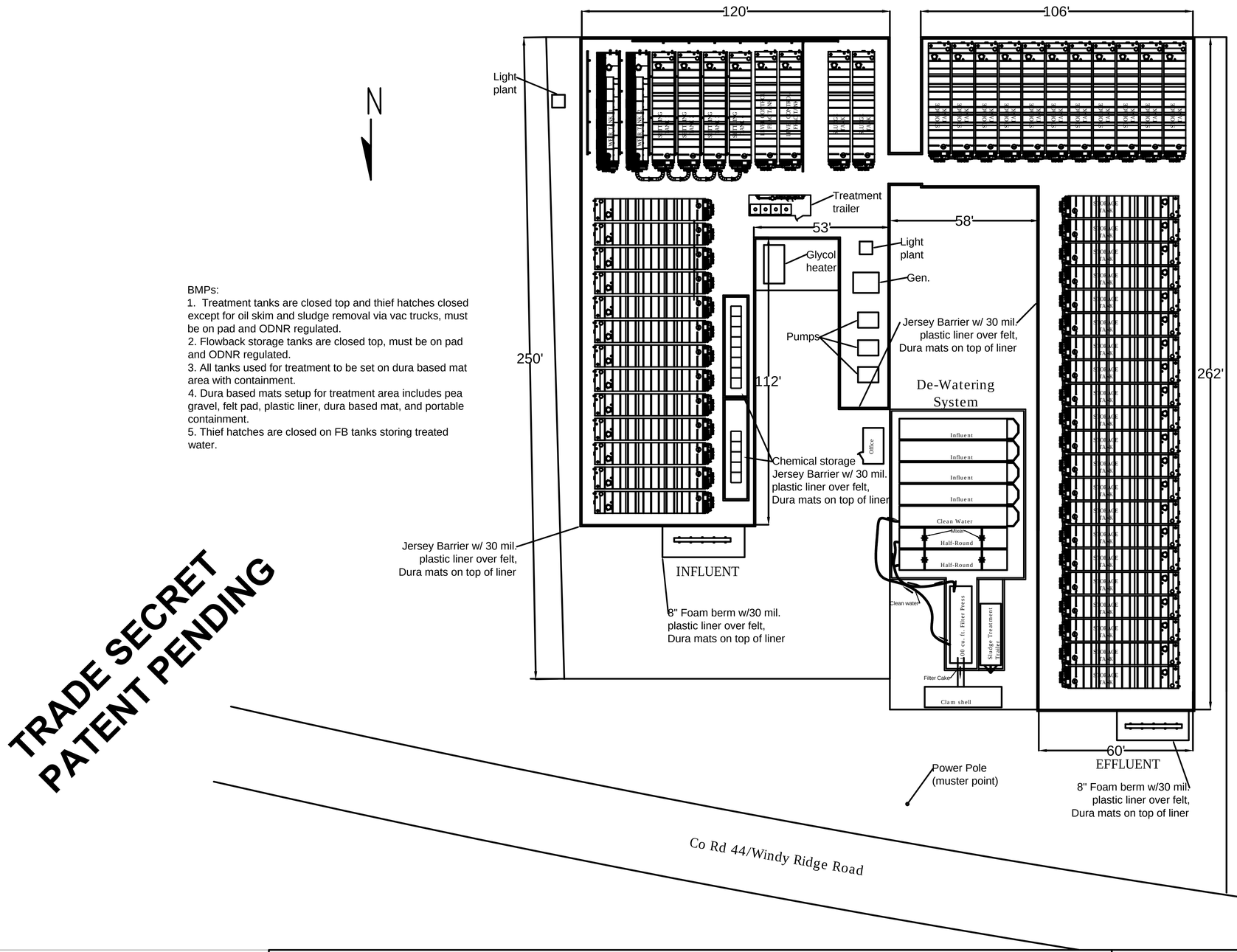

TRADE SECRET
PATENT PENDING

Miley Pad Treatment 4
Proposed Layout

SCALE:	DRAWN BY:	CHK BY:	APPRVD. BY:
NONE	J. LAFFERRE		
PLOT DATE: 19 DECEMBER 2013 - 3:29 PM	FILE NAME: C:\Users\JoshuaL\Documents\Cad Stuff\Treatment #4\Miley Pad Treatment #4 proposal.dwg		

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