

Florida Onsite Sewage Nitrogen Reduction Strategies Study

ACCEPTANCE OF SYSTEM OWNERSHIP AND RESPONSIBILITY

FDOH Permit Numbers: 59-S2- [REDACTED]

Location (City/County): Longwood, Florida; Seminole County

Property ID #: [REDACTED]

In July, 2013 an experimental onsite wastewater treatment system was installed at [REDACTED] Longwood, Florida 32779 as part of the Florida Department of Health Onsite Sewage Nitrogen Reduction Strategies Study. As outlined in the agreement between Hazen and Sawyer, P.C. and [REDACTED] Hazen and Sawyer has to date been responsible for permitting, construction, modifications, operation, maintenance, monitoring, and inspections of this experimental nitrogen reduction system over an 18 month study period. This study period has now ended. As indicated in the agreement, Hazen and Sawyer is responsible for transferring ownership and responsibility for the experimental system at study termination, or removal of the system if desired by the homeowner. This agreement documents the decision by the homeowner and replaces the previous homeowner agreement.

OWNER: I (We) [REDACTED] hereby do agree to the transfer of complete ownership and operational responsibilities for the referenced FDOH permitted experimental system, and agree to accept all conditions and responsibilities of the permit. I hereby release FDOH and Hazen and Sawyer, P.C. from any and all responsibility or liability for the performance or non-performance of this system after the date this acceptance of system agreement is signed by both parties below.

OWNER: I (We) \_\_\_\_\_ hereby do not agree to the transfer of complete ownership and operational responsibilities for the referenced FDOH permitted experimental system, and wish the system to be restored to its original condition.

**HOMEOWNER**

By:

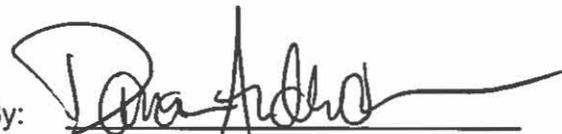
[REDACTED]

Date:

5/6/15

**HAZEN AND SAWYER, P.C.**  
10002 Princess Palm Avenue  
Registry One, Suite 200  
Tampa, FL 33619

By:

  
Damann L. Anderson

Title: Vice President

Date:

5/6/15

# OPERATION & MAINTENANCE (O&M) MANUAL

## Experimental Two Stage Biofiltration Passive Nitrogen Reduction System

████████████████████ Longwood, FL



I \_\_\_\_\_ understand the concepts in this manual and received training in proper service of the system.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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## 1.0 Introduction

This Operation and Maintenance (O&M) Manual describes the procedures that should be followed for proper operation and maintenance of the two-stage biofiltration passive nitrogen reduction system (PNRS) installed as part of the Florida Onsite Sewage Nitrogen Reduction Strategies Study (FOSNRS) at [REDACTED] Longwood, Florida 32779. The nitrogen reducing onsite treatment system for the single family residence was installed in June 2013.

## 2.0 System Components and Operation

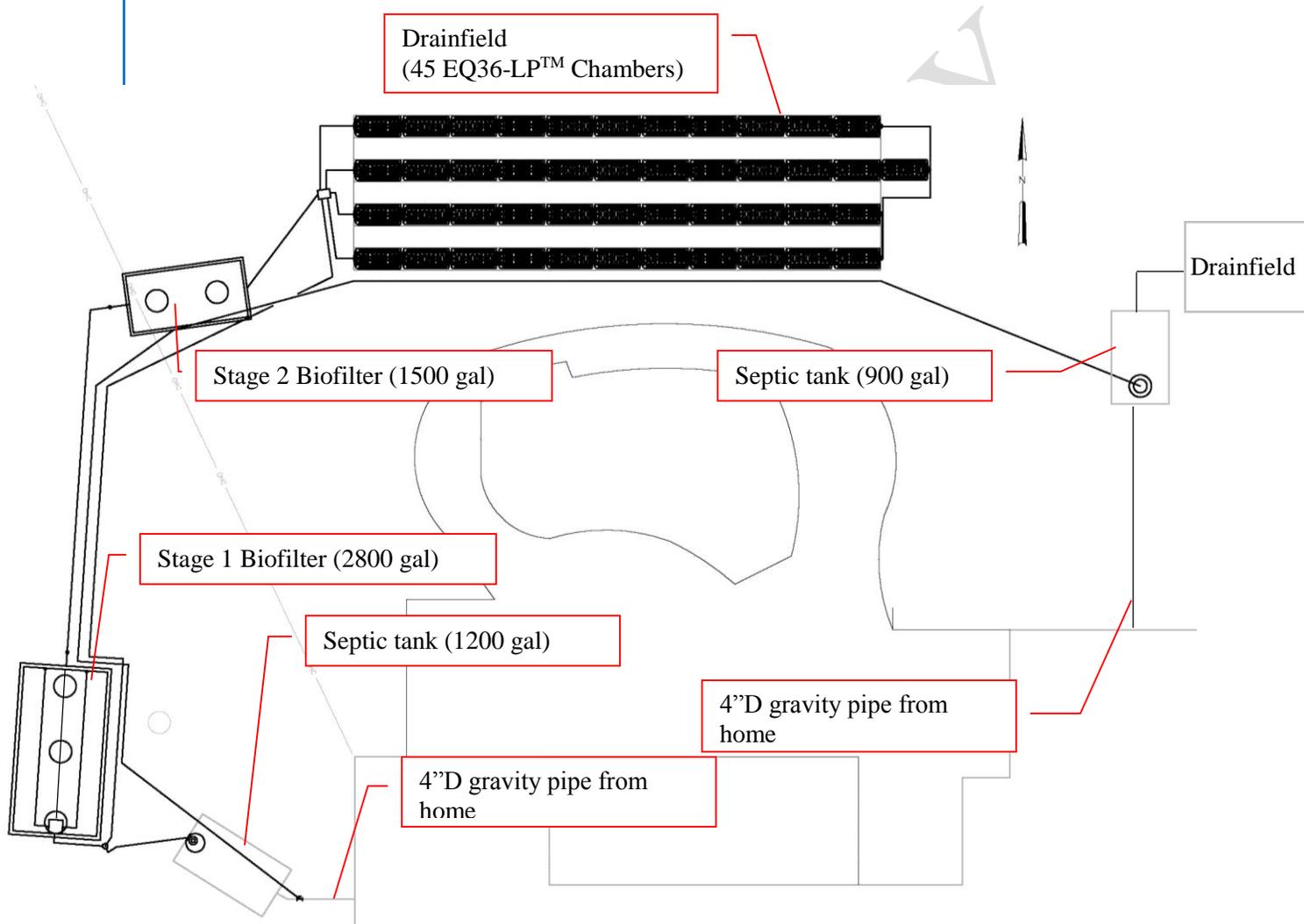
The two-stage PNRS system is configured as illustrated in Figure 1. A flow schematic of the system is shown in Figure 2. The complete as-built system drawings are included in the attached Appendix A.

The two-stage PNRS system operates on a two-step process for nitrogen reduction. The first step is called nitrification, where most nitrogen is converted from organic and ammonia forms to nitrate,  $\text{NO}_3$ . This step requires oxygen and is completed in the Stage 1 biofilter, which is a completely drained, unsaturated tank filled with expanded clay porous media. The media pores are air filled, and as the septic tank effluent (STE) percolates through this media the biological process of nitrification occurs in which ammonia is oxidized to nitrite and nitrite is oxidized to nitrate. The second step in the process train is called denitrification, where most of the nitrate that is formed in the first step is converted to nitrogen gas. This step requires the absence of free oxygen and is completed in the Stage 2 biofilter, which is a saturated tank filled with lignocellulosic (wood product) media in the first chamber and elemental sulfur media in the second chamber of the tank. The media pores are filled with water, and as the Stage 1 effluent percolates through this media the biological process of denitrification occurs in which nitrate is reduced to nitrogen gas.

Prior to the installation of the PNRS, the property had two existing onsite sewage treatment and disposal systems. The pre-existing 1,200 gallon concrete septic tank, located on the west side of the property, provides primary treatment as part of the gravity PNRS system. The pre-existing 900 gallon septic tank, located on the northeast side of the property, was converted to a lift station during the study period. Raw sewage was pumped from the 900 gallon lift station to the head end of the PNRS. However upon study completion, the lift station was re-connected to the pre-existing drainfield, and the pump was disconnected.

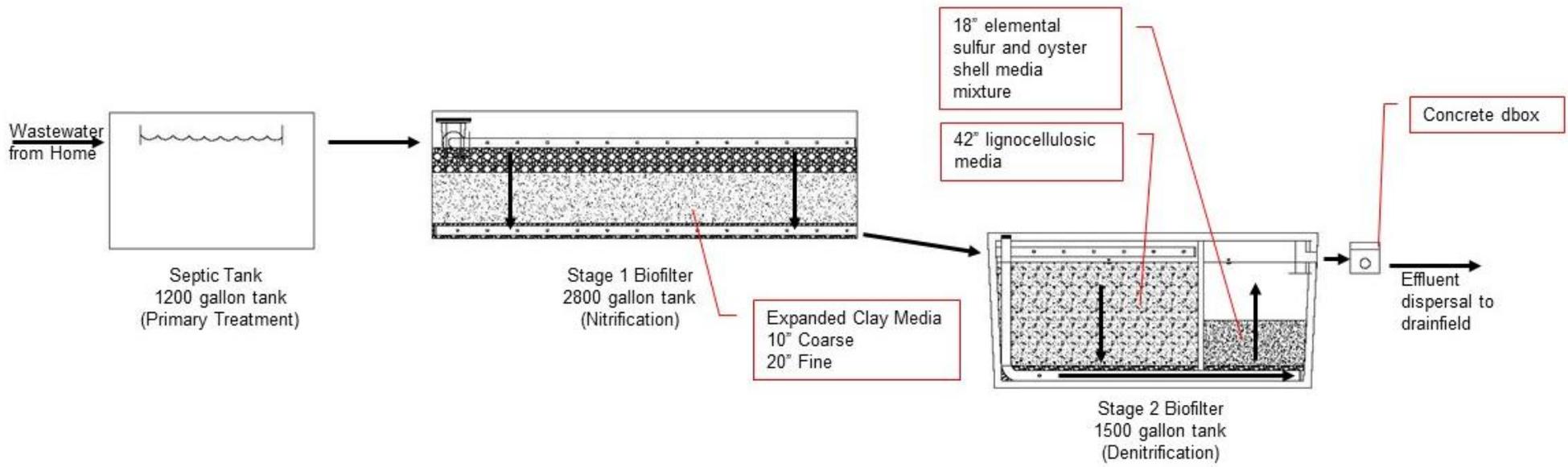
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Therefore in the final configuration, the passive nitrogen reduction system consists of the 1,200 gallon septic tank, two treatment tanks and a drainfield. The B-HS4 PNRS tankage includes a 2,800 gallon concrete tank that houses a Stage 1 unsaturated media biofilter and a 1,500 gallon two chamber concrete tank that houses a Stage 2 saturated media biofilter. The treated effluent from the Stage 2 biofilter is discharged into the soil via a drainfield (EQ36-LP™ chambers) which is a trench geometry.



**Figure 1**  
**Plan view of System Layout**

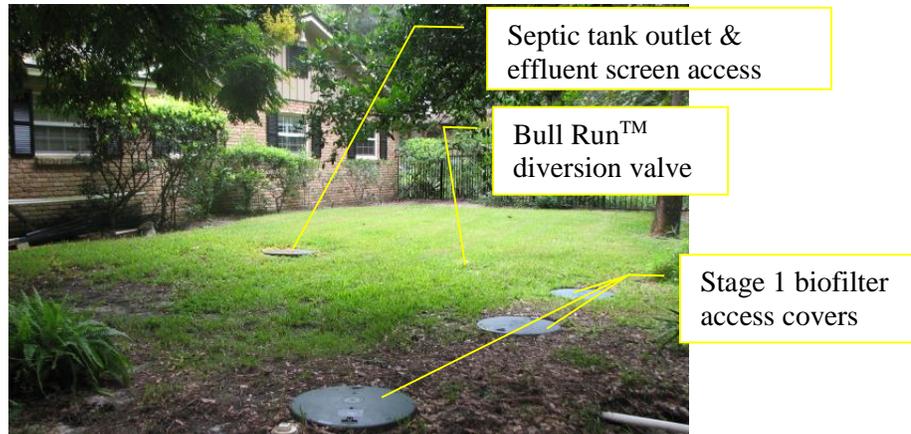
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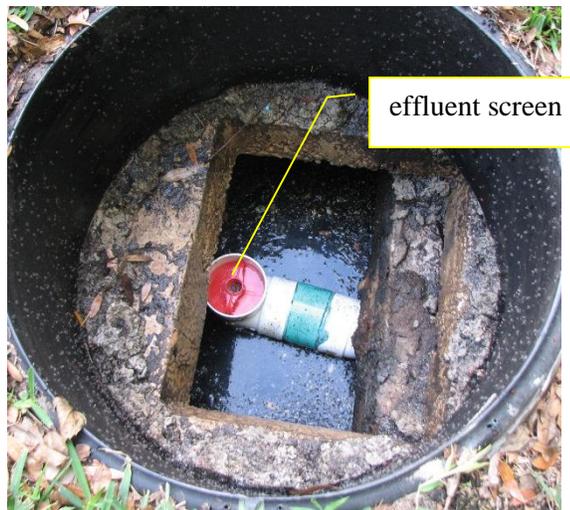
**Figure 2  
PNRS Flow Schematic**

## 2.1 Primary (septic) tanks

**Primary Tank 1200 gallon:** The primary (septic) tank that is part of the PNRS system is a 1,200 gallon concrete tank with a plastic manhole cover for access (Figure 3). The sewer pipe from the house was plumbed into the 4”D (diameter) inlet. Household wastewater enters the septic tank and exits as septic tank effluent (STE) through an effluent screen into the Stage 1 distribution box. The effluent screen is a Polylok™, PL-68 (Figure 4).



**Figure 3**  
**1,200 gallon, primary (septic) tank access**



**Figure 4**  
**Primary (septic) tank effluent screen**

**Primary Tank 900 gallon:** The second primary (septic) tank, that is not part of the PNRS system, is a 900 gallon concrete tank with two plastic manhole covers for access (Figure 5). The sewer pipe from the home is plumbed into the 4”D (diameter) inlet. Household wastewater enters the septic tank and exits as septic tank effluent (STE) through an effluent screen into a drainfield. The effluent screen is a Polylok™, PL-68 (Figure 5).



**Figure 5**  
**Second 900 gallon primary (septic) tank**

### 2.1.1 Primary (septic) tank maintenance

**Primary (Septic) Tanks:** The EPA recommends that the septic tank should be pumped at least every 3 to 5 years (EPA, 2002), depending on use and solids build-up. This can be handled by a licensed septic system contractor or the maintenance provider for the system.

**Effluent Screen:** The effluent screens are Polylok™, PL-68 (see Appendix B) and will require annual maintenance. The effluent screen is removed from the outlet tee by grabbing the red handle at the top and twisting up (Figure 6). The effluent screen should be cleaned with a hose, inside the tank, to remove any solids captured on the screen.

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**Figure 6**  
**Effluent screen removal**

## 2.2 Stage 1 biofilter

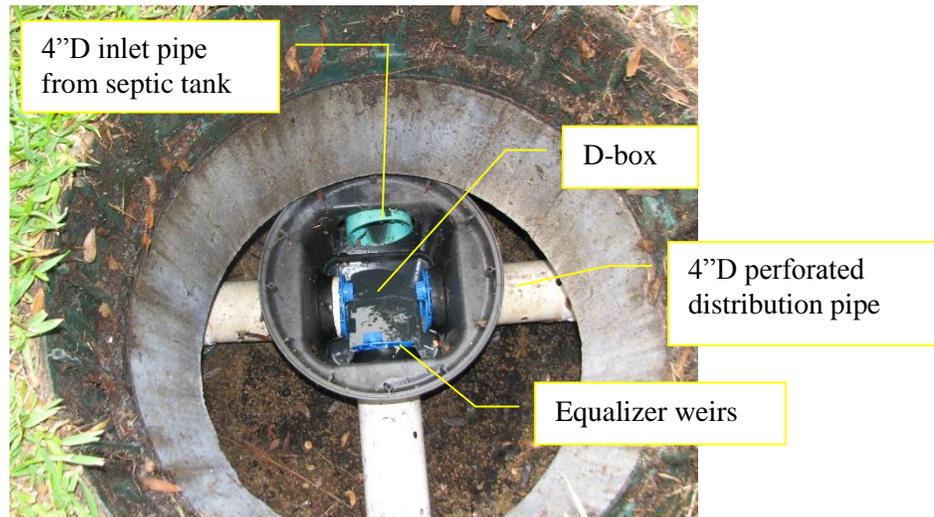
The Stage 1 biofilter is a 2800 gallon concrete tank with three plastic manhole covers for access (Figure 7). The purpose of this tank is to hold the Stage 1 expanded clay media. The 4”D influent pipe, connected to the primary (septic) tank discharge (gravity flow), discharges into a distribution box which flows to three 4”D perforated pipes across the top of the expanded clay media (Figure 8). The distribution box includes three Polylok equalizer™ weirs to allow for the adjustment of the flow split (Figure 8). Below the influent distribution network is 10-inches of coarse (1/4 Riverlite™) expanded clay media overlying 20-inches of finer (3/16 Riverlite™) expanded clay media. The 4”D underdrain pipe (perforated) with gravel surrounding was installed along the centerline of the bottom of the tank for effluent collection. The 4”D outlet of the pipe is located near the bottom of the tank to allow for unsaturated operation.

In the two-stage biofilter process, a first stage unsaturated biofilter is followed in series by a second stage biofilter operated in a water saturated mode. Septic tank effluent will be applied to the top of the first stage media, resulting in a downward percolation of wastewater over and through the media biofilter bed. The unsaturated pore spaces in the first stage media will allow air to reach microorganisms attached to the media surfaces, enabling aerobic biochemical reactions to occur. The significant target reactions are aerobic oxidation (by microorganisms that oxidize organic material and reduce

biochemical oxygen demand), hydrolysis and ammonification (releasing ammonia), and nitrification (biochemical conversion of ammonia to nitrate and nitrite). Of particular interest are the organic and ammonia nitrogen concentrations in first stage effluent (which should be low), as well as nitrate and nitrite (which should be high).



**Figure 7**  
**Stage 1 biofilter access**



**Figure 8**  
**Stage 1 biofilter dbox**

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### **2.2.1 Stage 1 biofilter maintenance**

The Stage 1 biofilter should be checked regularly. Clogging of the filter surface can occur (a black biomat will form) which will slow infiltration. If the surface remains ponded between doses, insufficient aeration of the media will occur, lowering the effluent quality and life of the system. If the filter surface remains ponded between doses, the filter should be taken out of service (see Section 2.5 diversion valve) for rejuvenation.

Resting and raking of the surface are some applicable rejuvenation techniques. Raking may be sufficient to break up the clogged surface to allow continued loading, but raking combined with 3 or 4 months resting should prolong filter runs. Eventually, however, removal of some of the surficial expanded clay may be necessary.

The dbx should be checked for debris and equalized flow between the three distribution pipes. In addition the 4”D distribution pipe along the top of the media should be checked for level placement on the pipe supports.

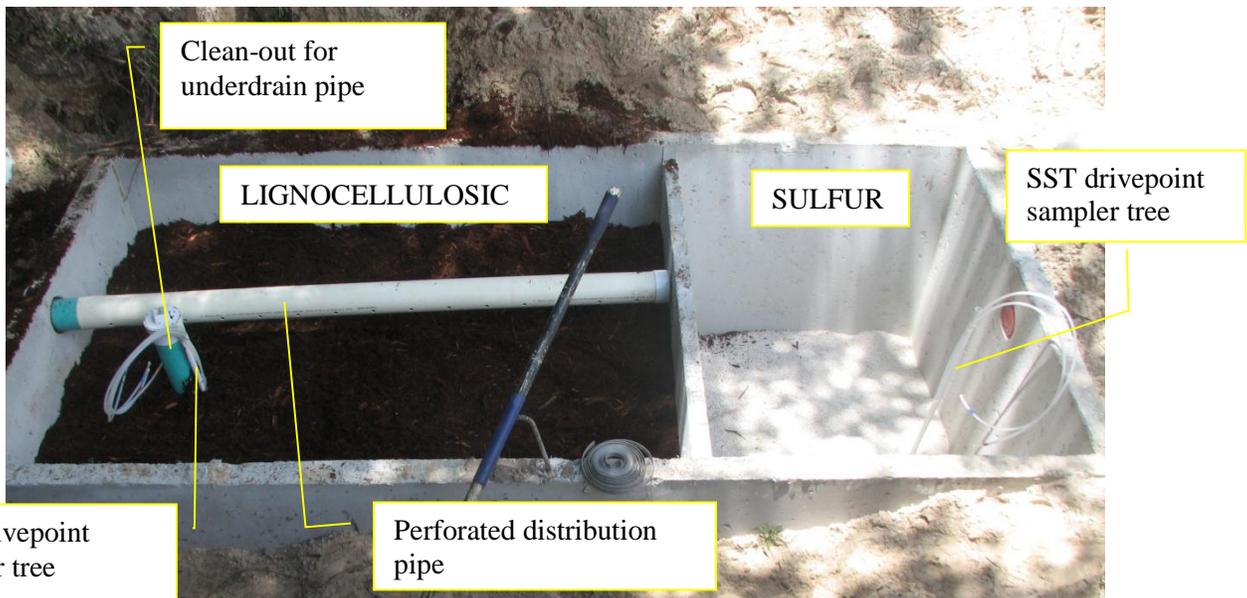
### **2.3 Stage 2 biofilter**

The Stage 2 biofilter is a 1,500 gallon two-chamber concrete tank with two plastic manhole covers for access (Figure 9). The purpose of this tank is to hold the Stage 2 lignocellulosic and sulfur media (Figure 10). The 4”D Stage 1 biofilter outlet pipe is connected to the Stage 2 biofilter tank inlet which distributes Stage 1 effluent over the lignocellulosic media within the first chamber of the Stage 2 biofilter (Figure 11). The effluent flows downward through 42-inches of lignocellulosic media (a blended urban waste wood from Mother’s Organics, Inc., Thonotosassa, FL) within the first chamber and upward through 18-inches of a mixture of 90% elemental sulfur (99% pastille-shaped elemental sulfur GreenSun™ ES-99) and 10% oyster shell media (Remington Feed) within the second chamber (Figure 12).

A 4”D perforated underdrain pipe with gravel surrounding was installed along the centerline of the bottom of the tank for transfer from the first chamber to the second chamber. Stainless steel drivepoint sampler trees (Figure 10) are installed within both chambers for vertical profile sampling. A 4”D tee was installed at the outlet of the tank. The 4”D outlet is connected to the distribution box to the drainfield.

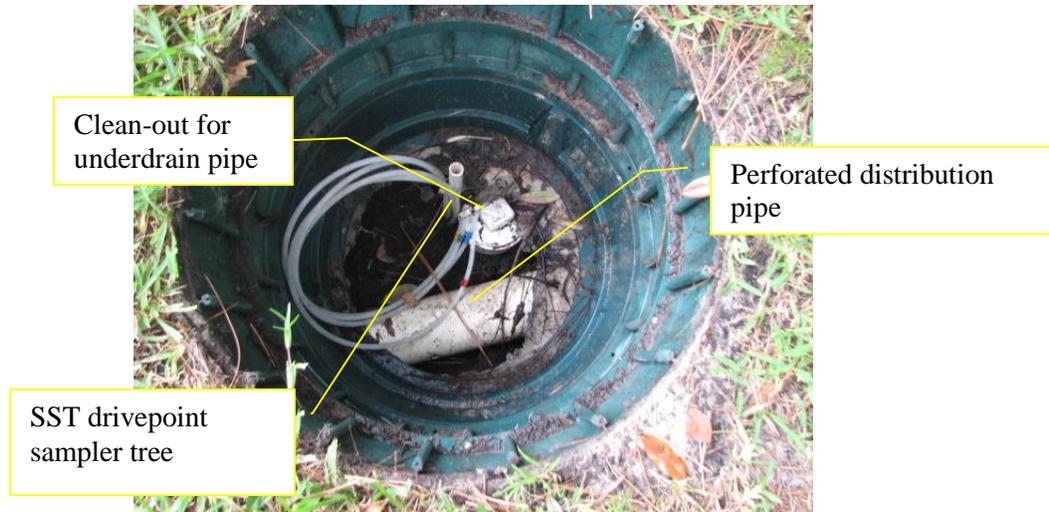


**Figure 9**  
**Stage 2 biofilter access**

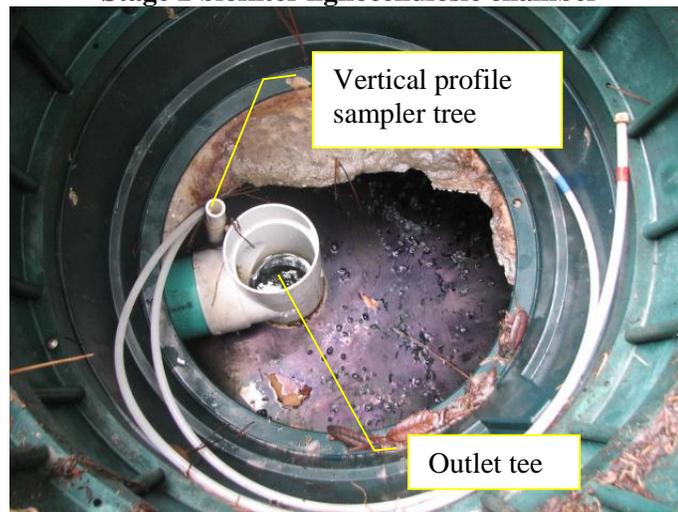


**Figure 10**  
**Stage 2 biofilter media during installation**

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**Figure 11**  
**Stage 2 biofilter lignocellulosic chamber**



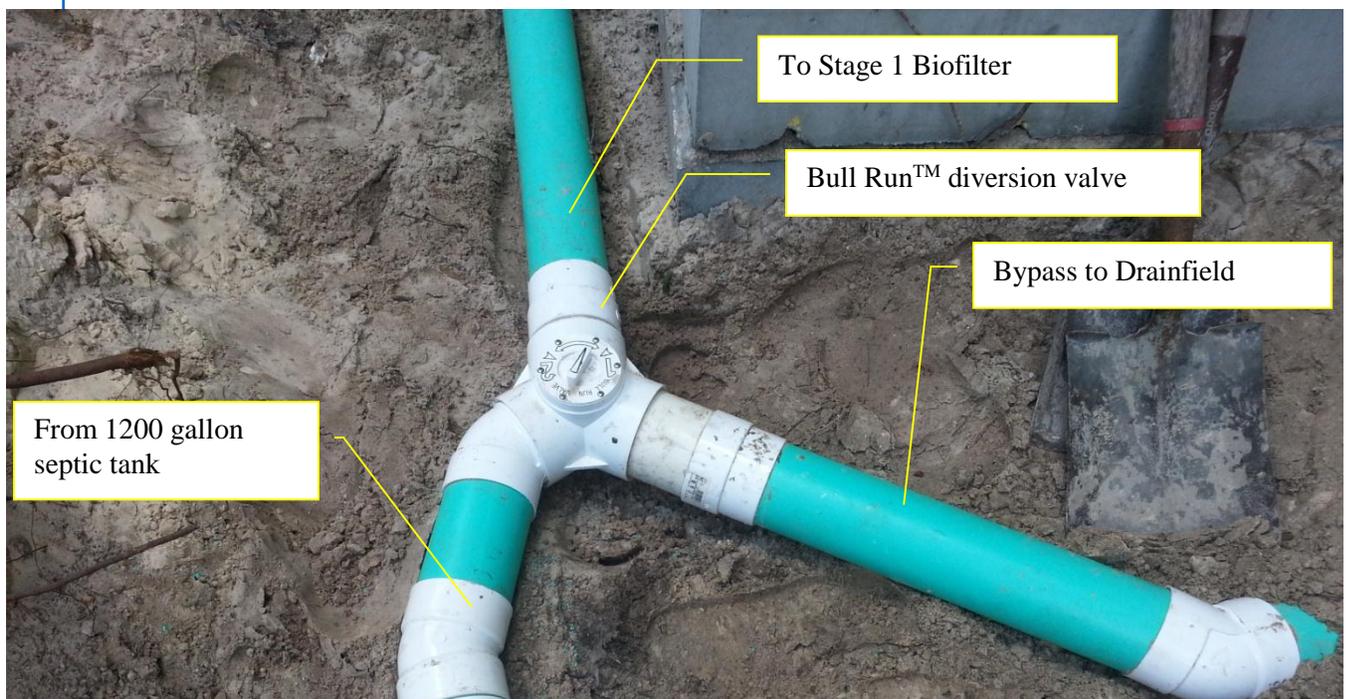
**Figure 12**  
**Stage 2 biofilter sulfur chamber**

### 2.3.1 Stage 2 biofilter maintenance

The Stage 2 biofilter should require little maintenance. The reactive media (lignocellulosic and sulfur) is eventually consumed and must be replenished. Also the water level within the tank should be checked. A water level higher than the outlet pipe invert may indicate a problem in the drainfield.

## 2.4 Bull Run™ diversion valve

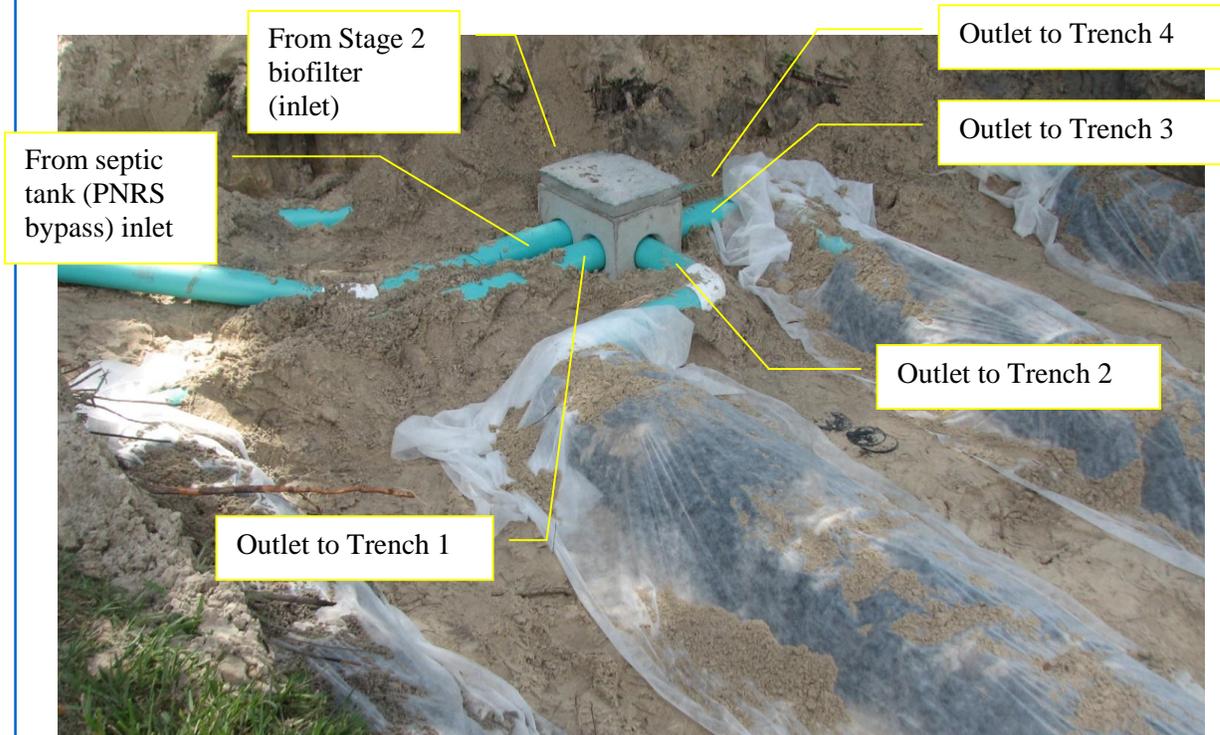
A Bull Run™ diversion valve (Figure 13) was installed following the septic tank outlet to allow the flow to either be completely directed to the new PNRS (to the Stage 1 biofilter dbox) or to the drainfield distribution box. A riser pipe was installed to grade over the diversion valve, so that the valve can be turned after installation is complete (see Figure 3). The diversion valve is turned with a wrench on a rod which is long enough to reach with the riser installed. The diversion valve should be switched to the drainfield in the event of an emergency (power failure, etc.).



**Figure 13**  
**Diversion valve for PNRS bypass**

## 2.5 Drainfield

The Stage 2 biofilter effluent is discharged into the soil via a new drainfield. The effluent is split between four low-profile Infiltrator chamber trenches by a concrete distribution box (Figure 14). Three of the trenches have 11 chambers and one trench has 12 chambers (see Figure 1).



**Figure 14**  
**Drainfield distribution box**

### **3.0 Maintenance and Monitoring**

The treatment system is passive and requires little maintenance. Performance verification and monitoring should be performed routinely, as required by permitting agencies. The lignocellulosic and sulfur media are reactive and therefore must be replenished. The media life is currently estimated as 20+ years of operation. Media replacement can be easily performed through the access manholes illustrated in Figure 9. The various media sources and MSDS sheets are provided in Appendix C.

### **4.0 Inspection Checklist**

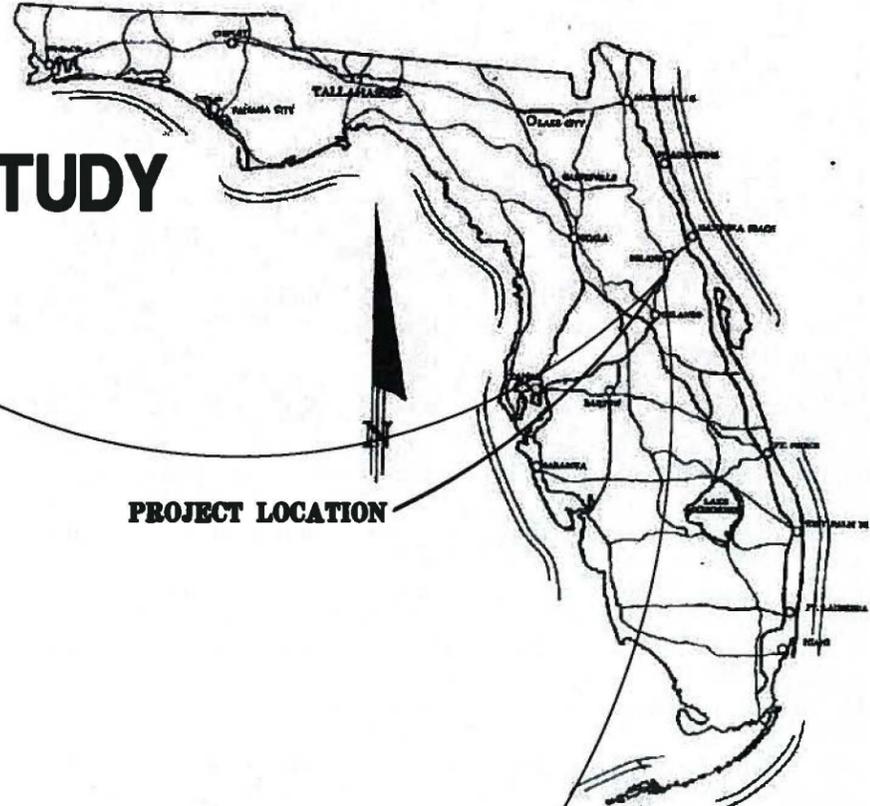
The following is a checklist of information that should be gathered during system inspection.

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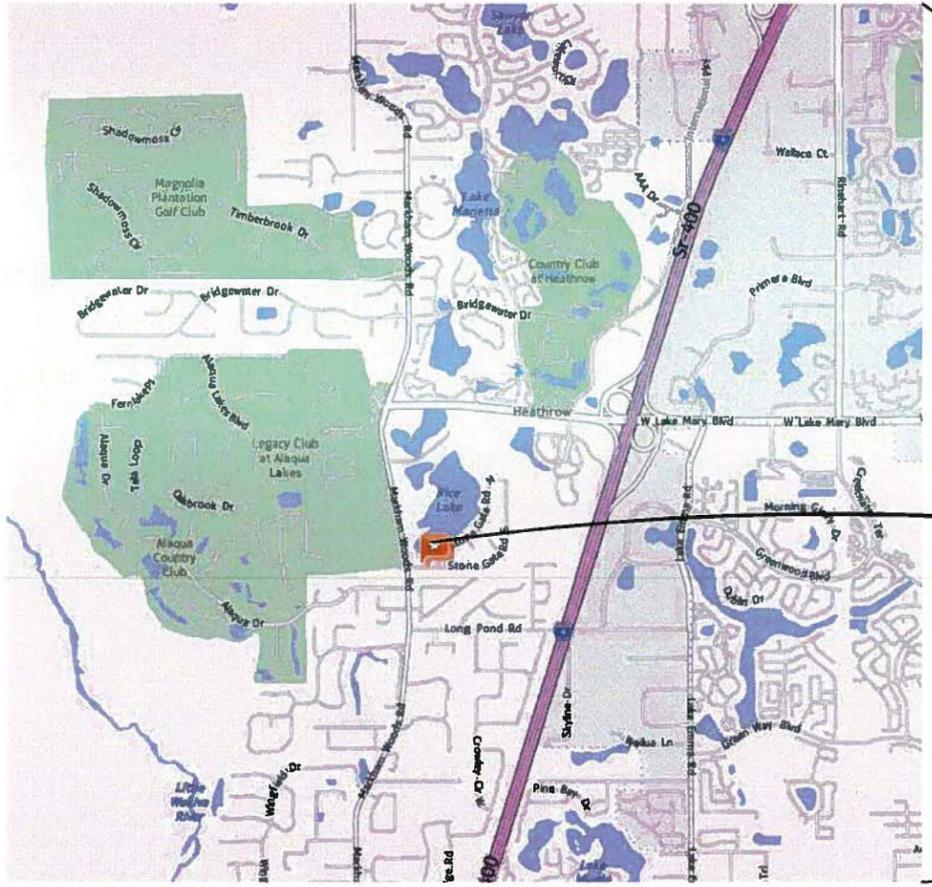
APPENDIX A  
RECORD DRAWINGS

# FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY B-HS4 RECORD DRAWINGS



### LIST OF DRAWINGS

SHEET COUNT	SHEET NUMBER	SHEET TITLE
GENERAL		
1	G-1	COVER SHEET AND INDEX OF DRAWINGS
CIVIL		
2	C-1	SITE PLAN
3	C-2	PROPOSED SYSTEM LAYOUT
4	C-3	STAGE 1 AND 2 BIOFILTER CROSS SECTIONS
5	C-4	NOT USED
6	C-5	SYSTEM FLOW DIAGRAM



LOCATION MAP  
N.T.S.



**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

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Tampa, Florida 33619  
Certificate of Authorization Number: 2771

FLORIDA DEPARTMENT OF HEALTH  
4052 BALD CYPRESS WAY, BIN A08  
TALLAHASSEE, FLORIDA 32399-1713  
(850)-245-4070

IN ASSOCIATION WITH

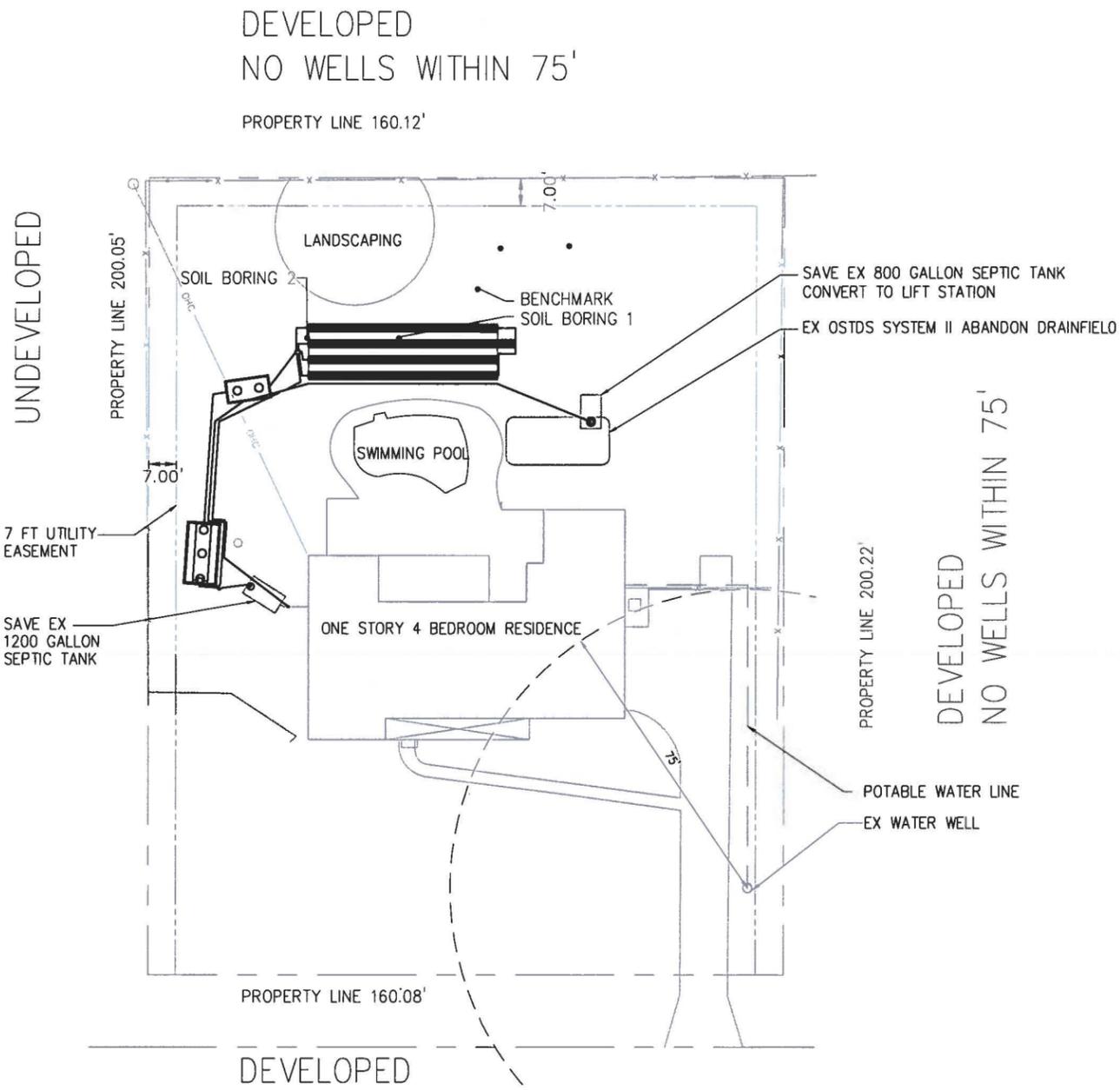


OTIS  
ENVIRONMENTAL  
CONSULTANTS, LLC

**AET**  
Applied Environmental Technology

**NOTICE**

THESE "RECORD DRAWINGS" REPRESENT THE FINAL "AS BUILT" CONDITIONS OF THE CONSTRUCTION PROJECT BASED UPON FIELD OBSERVATION AND SUPPORTING PROJECT RECORDS. UNLESS OTHERWISE NOTED ON THE DRAWINGS, WORK SHOWN AS PROPOSED OR TENTATIVE HAS BEEN COMPLETED, AND DIMENSIONS SHOWN AS PROPOSED OR TENTATIVE ARE FINAL. NOTES DIRECTING THE CONTRACTOR TO PERFORM SPECIFIC TASKS REMAIN ON THE DRAWINGS AS A RECORD OF CONSTRUCTION ACTIVITIES.

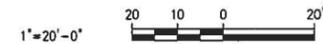


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**PROPOSED SITE PLAN**

1"=20'



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DESIGNED	JEH
DRAWN	CMS
CHECKED	DBS
PROJ. ENGR.	JME
DLA	
APPROVED	

*Josefin Edeback*  
7/23/13

JOSEFIN EDEBACK-HIRST  
Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Florida Professional Engineer's Registration Number: 69835

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Tampa, Florida 33619  
Certificate of Authorization Number: 2771



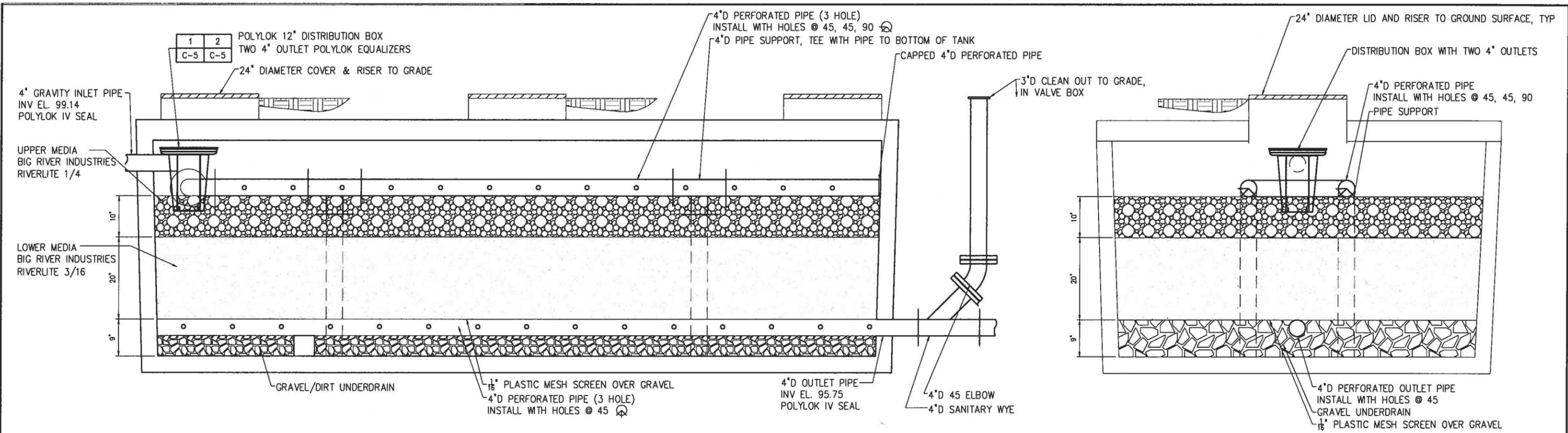
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4052 BALD CYPRESS WAY, BIN A08  
TALLAHASSEE, FL 32399-1713  
(850)-245-4070

**FLORIDA DEPARTMENT OF HEALTH**  
FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY  
**FOSNRS SITE B-HS4**  
**SITE PLAN**

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.	DATE	JUNE 2013
	H & S JOB NUMBER	44237-001
	CONTRACT NUMBER	CORCL
	DRAWING NUMBER	C-1

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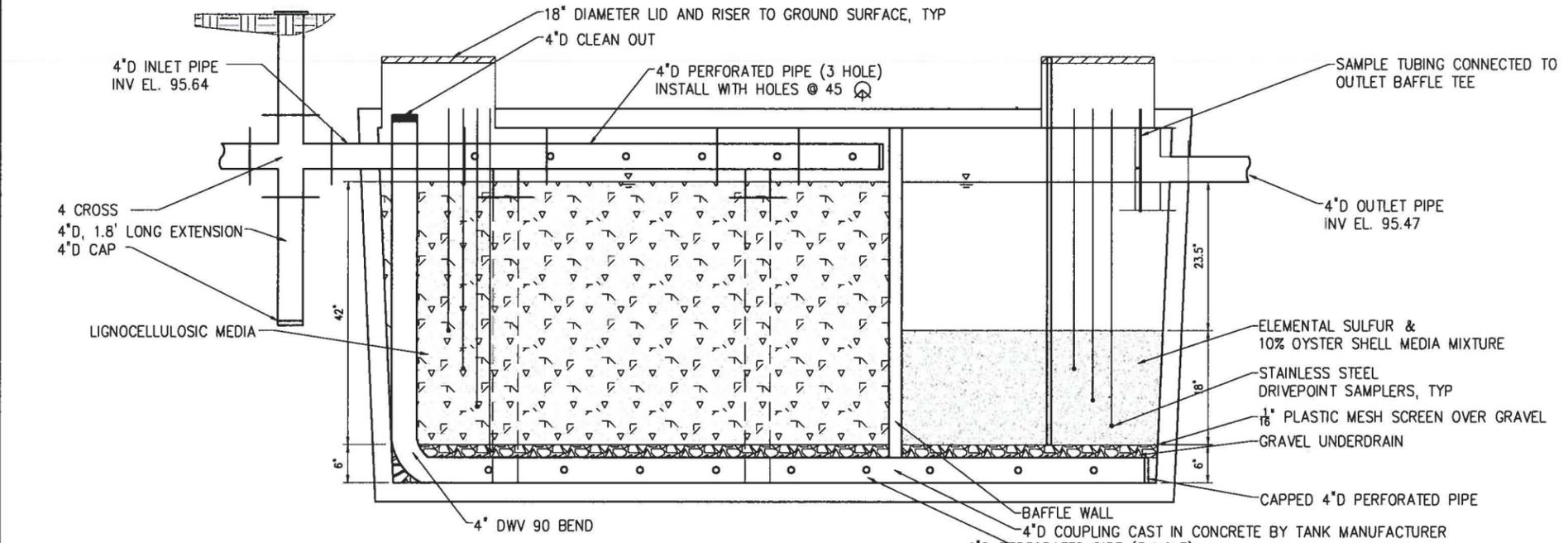


STAGE 1 BIOFILTER - 2800 GAL TANK

SECTION A  
1' = 1' C-2

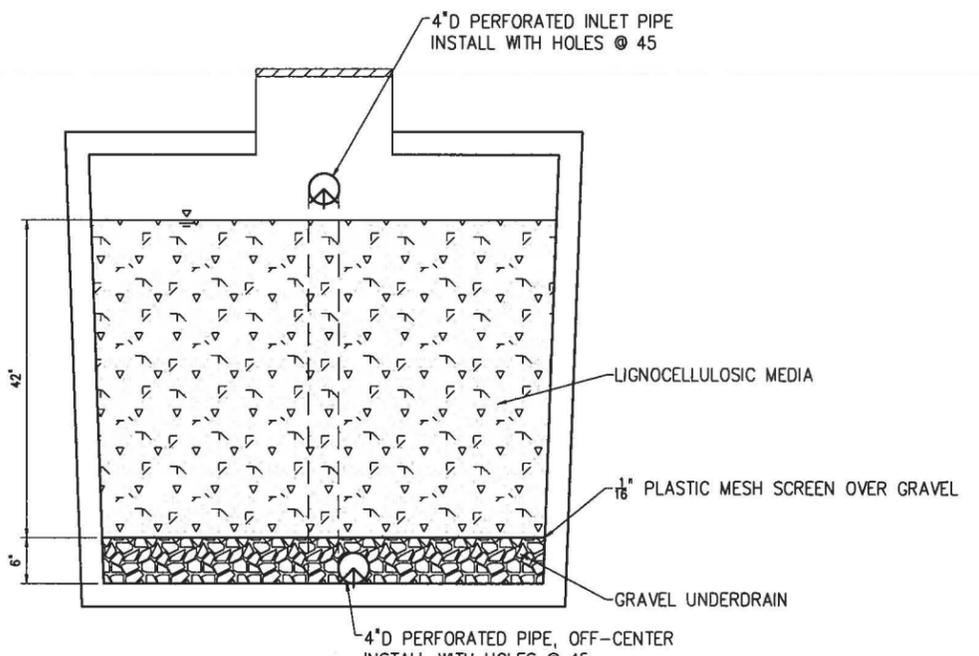
STAGE 1 BIOFILTER - 2800 GAL TANK

SECTION B  
1' = 1' C-2



STAGE 2 BIOFILTER - 1500 GAL TANK

SECTION C  
1' = 1' C-2



STAGE 2 BIOFILTER - 1500 GAL TANK

SECTION D  
1' = 1' C-2



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NO.	ISSUED FOR	DATE	BY	APPROVED
4	RECORD DRAWINGS	06/13	JEH	
3	REVISED PER RFI NO. 2	05/13	JEH	
2	REVISED PER RFI NO. 1	05/13	JEH	
1	PERMIT DOCUMENTS	03/13	JEH	

DESIGNED	JEH
DRAWN	CMS
CHECKED	DBS
PROJ. ENGR.	JME
DLA	
APPROVED	

JOSEFIN EDEBACK-HIRST  
Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Florida Professional Engineer's Registration Number: 69835

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FOSNRS SITE B-HS4  
STAGE 1 AND 2 BIOFILTER CROSS SECTIONS

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.	DATE JUNE 2013
	H & S JOB NUMBER 44237-001
	CONTRACT NUMBER CORCL
	DRAWING NUMBER C-3

PLOT DATE: 7/19/2013 4:52 PM BY: JERUSALEM

PLOT DATE: 7/19/2013 4:52 PM BY: JERUSALEM



APPENDIX B  
EFFLUENT SCREEN

**PL-68 Filter and Tee**

PL-68 is much more than just an effluent filter. The housing can also be used as an inlet baffle (tee) or an outlet baffle. The housing is designed to accept Polylok’s snap in gas deflector to deflect gas bubbles away from the tee and to keep the solids in the tank.

**Features:**

- Offers 68 linear feet of 1/16” filter slots, which significantly extends time between cleaning.
- Accepts 3/4” PVC handle.
- Locks in any 360° position when used with PL-68 Tee.
- PL-68 Housing can be used as an inlet or outlet tee.
- Gasket prevents bypass.

**PL-68 Installation:**

Ideal for residential waste flows up to 800 gallons per day (GPD). Easily installs in any new or existing 4” outlet tee.

1. Locate the outlet of the septic tank.
2. Remove the tank cover and pump tank if necessary.
3. Glue the filter housing to the outlet pipe, or use a Polylok Extend & Lok if not enough pipe exists.
4. Insert the PL-68 filter into tee.
5. Replace and secure the septic tank cover.

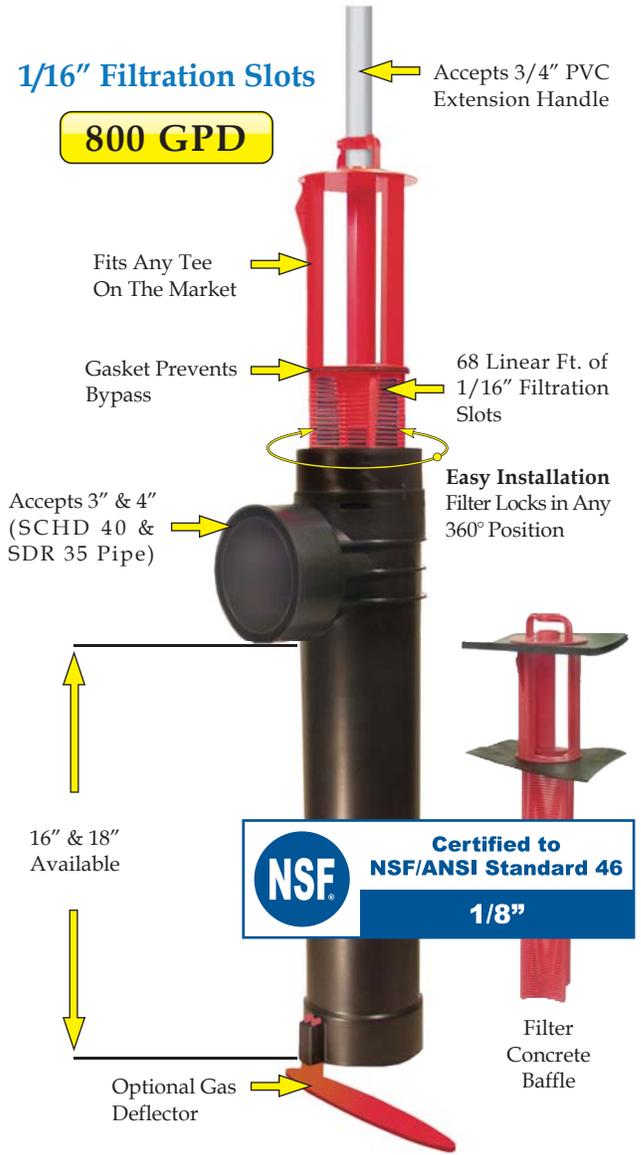
**PL-68 Maintenance:**

The PL-68 Effluent Filter will operate efficiently for several years under normal conditions before requiring cleaning. It is recommended that the filter be cleaned every time the tank is pumped, or at least every three years.

1. Do not use plumbing when filter is removed.
2. Pull PL-68 out of the tee.
3. Hose off filter over the septic tank. Make sure all solids fall back into septic tank.
4. Insert filter back into tee/housing.

**Related Products:**

PL-68 Filter Concrete Baffle  
 Extend & Lok™



**Extend & Lok™**  
 Easily installs into existing tanks.



Spacer Bushing  
 4” SCHD 40 to SDR 35



Spacer Bushing  
 4” SCHD 40 to 110mm Pipe



2” Extender

APPENDIX C  
MEDIA

## **SOURCES OF MEDIA**

### **STAGE 1 (EXPANDED CLAY)**

Big River Industries  
Sales Rep: Mark Towle  
3600 Mansell Road  
Suite 575  
Alpharetta, GA 30022  
407-538-0590  
toll free 1-800-324-5483  
mark.towle@oldcastleapg.com

### **STAGE 2 (WOOD)**

Mothers Organics  
Contact: Steve Magriby  
6727 CR 579  
Seffner, FL 33584  
Phone 813-628-0600 FAX 813-628-0664  
steve.mothersorganics@gmail.com

### **STAGE 2 (SULFUR)**

Southern Agricultural Insecticides, Inc.  
Contact: Darrin Diem  
7400 Bayshore Road  
Rubonia, FL 34221  
(941) 722-3285 Office (941) 723-2974 Fax  
darrin.diem@southernag.com.

### **STAGE 2 (OYSTER SHELL MIXED WITH SULFUR)**

Shell's Feed & Garden Supply  
9513 Nebraska Ave.  
Tampa, FL 33612  
813-932-9775  
Email: customerservice@shellsfeed.com



## GRAVELITE® - LIGHTWEIGHT AGGREGATE

Big River Industries, Inc. produces an expanded clay lightweight aggregate at its Erwinville, Louisiana plant. The aggregate is sold under the trade name "GRAVELITE".

GRAVELITE expanded clay lightweight aggregate is structural grade aggregate for use in ready-mixed concrete products, as well as asphalt paving and geotechnical engineering projects. The aggregate is produced by mining clay from deposits found on plant property and calcining the clay at a temperature of approximately 2000 degrees Fahrenheit in rotary kilns. The resulting lightweight aggregate is graded to conform to the requirements of ASTM C-330, Specification for Lightweight Aggregate for Structural concrete, and ASTM C-331, Specification for Lightweight Aggregate for Concrete Masonry Units. In addition, special gradations are available upon request.



The Erwinville plant is the original facility of Big River Industries, having opened in 1948. At that time, it consisted of one rotary kiln, 8 feet in diameter and 160 feet long, with a rated capacity of 150,000 cubic yards per year. Today, the plant, which is situated on 660 acres owned by Big River Industries, has four kilns, each 8 foot in diameter and 160 feet long, and a rated capacity of more than 600,000 cubic yards annually.



GRAVELITE expanded clay lightweight aggregate is available throughout the eastern two-thirds of the United States, portions of Canada, and Mexico. The aggregate is shipped from the Erwinville plant via rail, truck and barge. It has been used extensively for structural lightweight concrete and concrete masonry in Louisiana, Florida, Minnesota and the metropolitan Chicago area. Recent structural lightweight concrete project locations include Grand Rapids, Michigan and Cleveland, Ohio.

PHYSICAL PROPERTIES	GRAVELITE	SPECIFICATIONS (ASTM C 330)
Unit Weight, Dry Loose, lb/ft <sup>3</sup>  ASTM C 330 Coarse Aggregate, ½ In. to .4 Standard Fineness  Modulus, 6.3  ASTM C 330 Fine Aggregate, No. 4 to 0 Standard Fineness Modulus, 3.1	34 to 37        44 to 48	55, max        70, max
Organic Impurities, ASTM C 40	Lighter than Standard	Standard or Lighter
Staining Index, ASTM C 641	Very Light	Less than "heavy stain"

Loss on Ignition, ASTM C 114	< 1 %	5 %, max
Drying Shrinkage	< 0.07 %	0.07 %, max
Popouts, ASTM C 151	None	None



Big River Industries, Inc.  
 3700 Mansell Road  
 Suite 250  
 Alpharetta, GA 30022  
 1-800-342-LITE

GRAVELITE expanded clay lightweight aggregate is made by Big River Industries, Inc. to conform to the requirements of ASTM C33, *Standard Specification for Lightweight Aggregates for Structural Concrete*. GRAVELITE is classified in the category "expanded shale, clay or slate", and therefore must comply with the most stringent requirements of the specification. GRAVELITE® is a registered trademark of Big River Industries, Inc.



Big River Industries, Inc.

## Material Safety Data Sheet

This complies with OSHA'S Hazard Communication Standard 29 CFR 1910.1200

<b>IDENTITY (As used on Label and List)</b> Expanded Clay Lightweight Aggregate (CAS # 68334-37-2)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
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### Section I

<b>Manufacturer's Name</b> BIG RIVER INDUSTRIES, INC	<b>Emergency Telephone Number</b> (225) 627-4242
<b>Address (Number, Street, City, State, and ZIP Code)</b> P. O. Box 190	<b>Telephone Number for Information</b> (225) 627-4242
Erwinville, LA 70729	<b>Date Prepared</b> 01/05/04
	<b>Signature of Preparer (optional)</b>

### Section II – Hazard Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
SiO <sub>2</sub> SILICON DIOXIDE (CAS # 14808-60-7)		10*		64.60
Fe <sub>2</sub> O <sub>3</sub> FERRIC OXIDE (CAS # 1309-37-1)		10*		6.55
Al <sub>2</sub> O <sub>3</sub> ALUMINUM OXIDE (CAS # 1344-28-1)		10*		20.57
CaO CALCIUM OXIDE (CAS # 1305-78-8)		3*		0.84
MgO MAGNESIUM OXIDE (CAS # 1309-48-4)		10*		2.91
* Milligrams per cubic meter (Mg/M <sup>3</sup> )				

### Section III – Physical/Chemical Characteristics

<b>Boiling Point</b>	N/A	<b>Specific Gravity (H<sub>2</sub>O = 1)</b>	1.32 (SSD)
<b>Vapor Pressure (mm Hg.)</b>	N/A	<b>Melting Point</b>	2100 F
<b>Vapor Density (AIR = 1)</b>	N/A	<b>Evaporation Rate (Butyl Acetate = 1)</b>	Not Available
<b>Solubility in Water</b> N/A			
<b>Appearance and Odor</b> Reddish, brown angular with no odor			

### Section IV – Fire and Explosion Hazard Data

<b>Flash Point (Method Used)</b> N/A	<b>Flammable Limits</b> N/A	<b>LEL</b> N/A	<b>UEL</b> N/A
<b>Extinguishing Media</b> N/A			
<b>Special Fire Fighting Procedures</b> N/A			
<b>Unusual Fire and Explosion Hazards</b> None known			

### Section V – Reactivity Data

<b>Stability</b>	Unstable		<b>Conditions to Avoid</b> None Known
	Stable	X	
<b>Incompatibility (Materials to Avoid)</b> None Known			
<b>Hazardous Decomposition or Byproducts</b> None Known			
<b>Hazardous Polymerization</b>	May Occur		<b>Conditions to Avoid</b> None Known
	Will Not Occur	X	

## Section VI – Health Hazard Data

<b>Route(s) of Entry:</b>	<b>Inhalation?</b> X	<b>Skin?</b> X	<b>Ingestion?</b> X
<b>Health Hazards (Acute and Chronic)</b> Exposure to dust may irritate respiratory system, eyes and skin			
<b>Carcinogenicity:</b> No	<b>NTP?</b> No	<b>IARC Monographs?</b> No	<b>OSHA Regulated?</b> No
<b>Signs and Symptoms of Exposure</b> Irritated eyes from dust, difficulty in breathing, irritated skin.			
<b>Medical Conditions Generally Aggravated by Exposure</b> Respiratory system, irritated eyes or open wounds.			
<b>Emergency and First Aid Procedures</b> Eyes-Flush with running water. Dust Inhalation-Move to fresh air. Skin-Wash with soap and water. Contact physician if irritation persists.			

## Section VII – Precautions for Safe Handling and Use

<b>Steps to Be Taken in Case Material is Released or Spilled</b> Spilled material may generate dust. Wetting will help reduce dust levels. Respiratory protective equipment may be necessary.
<b>Waste Disposal Method</b> Pickup and reuse clean material. Dispose of waste material in accordance with applicable federal, state and local regulations.
<b>Precautions to be Taken in Handling and Storing</b> Respirable dust may be generated during processing, handling or storage. Control measures as outlined in section VIII should be followed.

<b>Other Precautions</b>	None Known

**Section VIII – Control Measures**

<b>Respiratory Protection</b> ( <i>Specify Type</i> ) NIOSH – MSHA Approved Dust Respirators		
<b>Ventilation</b>	<b>Local Exhaust</b> X	<b>Special</b> N/A
	<b>Mechanical</b> ( <i>General</i> ) X	<b>Other</b> N/A
<b>Protective Gloves</b> Recommended but not required		<b>Eye Protection</b> Safety glasses with side shields
<b>Other Protective Clothing or Equipment</b> Long sleeves and trousers recommended, but not required.		
<b>Work/Hygienic Practices</b> Wash exposed skin with soap and water. Wash work cloths as necessary.		

# MATERIAL SAFETY DATA SHEET

## SECTION I: IDENTIFICATION OF PRODUCT

COMPANY: **Diversity Technologies Corp.** DATE: Apr. 1, 2002  
**8750 – 53<sup>rd</sup> Ave.** PHONE: 780-468-4064  
**Edmonton, AB T6E 5G2** FAX: 780-469-1899

PRODUCT NAME: **SAWDUST**

PRODUCT USE: Oil well drilling fluid additive  
CHEMICAL FAMILY: Wood by-product CAS #: None

### WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

WHMIS CLASSIFICATION: Not a controlled product under WHMIS.  
WORKPLACE HAZARD: Not applicable.

### TRANSPORTATION OF DANGEROUS GOODS (TDG)

PROPER SHIPPING NAME: Not regulated under TDG  
TDG CLASSIFICATION: Not applicable  
UN NUMBER (PIN): Not applicable  
PACKING GROUP: Not applicable

## SECTION II: HAZARDOUS INGREDIENTS

<u>INGREDIENT</u>	<u>PERCENT</u>	<u>CAS NUMBER</u>	<u>LD<sub>50</sub>Oral-Rat</u>	<u>LC<sub>50</sub>Inhal-Rat</u>	<u>ACGIH-TLV</u>
Contains no WHMIS controlled ingredients					

## SECTION III: HEALTH HAZARDS

ROUTE OF ENTRY:  EYE CONTACT  SKIN  INHALATION  INGESTION  
EYE CONTACT: Mechanical irritant.  
SKIN CONTACT: No effects expected. Abrasion may occur with prolonged contact.  
INGESTION: No toxic effects expected.  
INHALATION: Possible irritation of nasal passages, throat and bronchial passages.  
People with existing respiratory problems should avoid wood dust.  
CARCINOGENICTY: Not applicable  
TERATOGENICITY: Not applicable  
REPRODUCTIVE TOXICITY: Not applicable  
MUTAGENICTY: Not applicable



INCOMPATIBILITY (CONDITIONS TO AVOID):	Incompatible with oxidizers. Avoid open flames and high temperatures.
CONDITIONS OF REACTIVITY:	Contact with strong oxidizers. May undergo autoignition at high temperatures.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition will result in the following: Water, carbon dioxide, formic acid, acetic acid, carbon monoxide, methane, wood coal and aldehydes.
HAZARDOUS POLYMERIZATION:	WILL NOT OCCUR [XX] MAY OCCUR [ ]

### SECTION VIII: PREVENTATIVE MEASURES

#### SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Suggest NIOSH approved dust mask. OEL = 5 mg/m <sup>3</sup> for non-allergenic wood dust.
VENTILATION:	General mechanical sufficient for normal conditions of use.
PROTECTIVE GLOVES:	Suggest PVC or rubber.
EYE PROTECTION:	Suggest goggles.
OTHER PROTECTIVE EQUIPMENT (Specify):	Long-sleeve shirt and coveralls. Ensure eye wash station and emergency shower available.

### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Eye and respiratory protection suggested when handling this material. Store in a cool dry area away from incompatibles and open flames.

### STEPS TO BE TAKEN IN CASE THE MATERIAL IS SPILLED OR RELEASED

Wear suitable protective equipment. Eliminate ignition sources. Sweep up and collect uncontaminated material for repackaging. Sweep up and collect contaminated material in approved containers for disposal.

### WASTE DISPOSAL METHOD

Dispose/incinerate in accordance with all federal, provincial and local regulations. It is the responsibility of the user to determine if material meets the criteria of hazardous waste at the time of disposal.

### SECTION IX: PREPARATION

THE INFORMATION CONTAINED HEREIN IS GIVEN IN GOOD FAITH, BUT NO WARRANTY EXPRESSED OR IMPLIED, IS MADE.

DATE ISSUED:	April 1, 2002	BY:	Product safety committee
SUPERSEDES:	March 29, 1999		

**Diversity Technologies Corp. is the parent company of  
Canamara-United Supply Ltd., Hollimex Products Ltd. and Canamara SDS**

# MATERIAL SAFETY DATA SHEET

## WOOD DUST

Company Name, Address

**TRADE NAME:** Wood Dust  
**SYNONYMS:** None  
**CAS. NO.:** None  
**DESCRIPTION:** Particles generated by any manual or mechanical cutting or abrasion process performed on wood.

### PHYSICAL DATA

Boiling Point .....Not Applicable  
Specific Gravity.....Variable  
(Dependent on wood species and moisture content).  
Vapor Density.....Not Applicable  
% Volatiles by Volume.....Not Applicable  
Melting Point.....Not Applicable  
Vapor Pressure.....Not Applicable  
Solubility in H<sub>2</sub>O (% by wt.).....Insoluble  
Evaporation Rate -  
(Butyl Acetate=1).....Not Applicable  
pH.....Not Applicable  
Appearance & Odor.....Light to dark colored  
granular solid  
Color and odor are dependent on the wood species and time since dust was generated.

### FIRE & EXPLOSION DATA

Flash Point.....Not Applicable  
Autoignition Temperature.....Variable  
(typically 400-500°F)  
Explosive Limits in Air.....40 grams/m<sup>3</sup> (LEL)  
Extinguishing Media.....Water, CO<sub>2</sub>, Sand  
Special Fire Fighting  
Procedures.....Wet down with water  
Wet down wood dust to reduce likelihood of ignition or dispersion of dust into the air.  
Remove burned or wet dust to open area after fire is extinguished.  
Unusual Fire &  
Explosion Hazard.....Strong to severe  
explosion hazard  
(if wood dust "cloud" contacts an ignition source)

### HEALTH EFFECTS DATA

Exposure Limit.....ACGIH TLV<sup>(R)</sup>:  
TWA - 5.0 mg/m<sup>3</sup>;

STEL<sub>(15 min.)</sub> - 10 mg/m<sup>3</sup> (softwood)  
TWA - 1.0 mg/m<sup>3</sup>;  
(certain hardwoods such as beech and oak)  
OSHA PEL: TWA (see Footnote 1) -  
(total dust) - 15.0 mg/m<sup>3</sup>

(respirable factor) - 5.0 mg/m<sup>3</sup>  
Skin & Eye Contact.....Eye Irritation &  
Allergic Contact  
Dermatitis  
(Wood dust can cause eye irritation.  
Various species of wood dust can elicit allergic contact dermatitis in sensitized individuals)

Ingestion.....Not Applicable  
Skin Absorption.....Not known to occur  
Inhalation.....May cause:  
nasal dryness, irritation & obstruction.  
Coughing, wheezing, & sneezing: sinusitis & prolonged colds have also been reported.

Chronic Effects.....May cause:  
Wood Dust, depending on species, may cause dermatitis on prolonged repetitive contact; may cause respiratory sensitization and/or irritation. IARC classifies wood dust as a carcinogen to humans (Group 1). This classification is based primarily on IARC's evaluation of increased risk in the occurrence of adenocarcinomas of the nasal cavities and paranasal sinuses associated with exposure to wood dust. IARC did not find sufficient evidence to associate cancers of the oropharynx, hypopharynx, lung, lymphatic and hematopoietic systems, stomach, colon, or rectum with exposure to wood dust.

### REACTIVITY DATA

Conditions Contributing  
to Instability.....Stable  
(under normal Conditions)  
Incompatibility.....Avoid Contact with:

oxidizing agents, drying oils and flame. Product may ignite at temperatures in excess of 400° F.

**Hazardous Decomposition**

Products.....Thermal-oxidative degradation of wood produces: irritating & toxic fumes and gases, including CO, aldehydes and organic acids.

**Conditions Contributing to**

Polymerization.....Not Applicable

## PRECAUTIONS AND SAFE HANDLING

Eye Contact.....Avoid

Skin Contact.....Avoid:  
Repeated or Prolonged Contact with Skin. Careful bathing and Clean clothes are indicated after exposure.

Inhalation.....Avoid:  
Prolonged or Repeated breathing of Wood Dust in Air.

Oxidizing agents and drying oils.....Avoid contact

Open flame.....Avoid

## GENERALLY APPLICABLE CONTROL MEASURES

Ventilation.....Provide:  
adequate general and local exhaust ventilation to maintain healthful working conditions.

Safety Equipment.....Wear goggles or safety glasses.  
Other protective equipment such as gloves and approved dust respirators may be needed depending upon dust conditions.

## EMERGENCY AND FIRST AID PROCEDURES

Eyes.....Flush with water to remove dust particles. If irritation persists, get medical attention.

Skin.....Get Medical advice  
If a rash or persistent irritation or dermatitis occur, get medical advice where applicable before returning to work where wood dust is present.

Inhalation.....Remove to fresh air.  
If persistent irritation, severe coughing, breathing difficulties occur, get medical advice before returning to work where wood dust is present.

Ingestion..... Not Applicable

## SPILL/LEAK CLEAN-UP PROCEDURES

Recovery or Disposal.....Clean-up:  
Sweep or vacuum spills for recovery or disposal; avoid creating dust conditions. Provide good ventilation where dust conditions may occur. Place recovered wood dust in a container for proper disposal.

### FOOTNOTE

**Footnote 1:** In AFL-CIO v. OSHA 965 F. 2d 962 (11th Cir. 1992), the court overturned OSHA's 1989 Air Contaminants Rule, including the specific PELs for wood dust that OSHA had established at that time. The 1989 PELs were: TWA - 5.0 mg/m<sup>3</sup>; STEL (15 MIN.) - 10.0 mg/m<sup>3</sup> (ALL SOFT AND HARD WOODS, EXCEPT WESTERN RED CEDAR); WESTERN RED CEDAR: TWA - 2.5 mg/m<sup>3</sup>. Wood dust is now officially regulated as an organic dust under the Particulates Not Otherwise Regulated (PNOR) or Inert or Nuisance Dust categories at PELs noted under Health Effects Information section of this MSDS. However, a number of states have incorporated provisions of the 1989 standard in their state plans.

### IMPORTANT

The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification. There is no warranty of any kind, express or implied, concerning the accuracy or completeness of the information and data herein. The supplier of this form will not be liable for claims relating to any party's use of or reliance on information and data contained herein regardless of whether it is claimed that the information and data are inaccurate, incomplete or otherwise misleading.



# Sawdust & Shavings

## Material Safety Data Sheet

**Product Name:** Screened Sawdust, Screened Shavings

### SECTION I--DIVISION AND LOCATION

Pioneer Sawdust  
621 Fulton Street  
Salt Lake City, Utah 84104  
Telephone: (801) 972-4432

### SECTION II--HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Ingredients in Product: Kiln Dried White Pine Wood  
Chemical Name and Synonyms: Cellulosic Wood Fibre  
Chemical Family: Cellulose  
Molecular Formula: Complex

### SECTION III--PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: N/A  
Vapor Pressure: N/A  
Vapor Density: N/A  
Solubility in Water: Insoluble  
Specific Gravity: (WATER = 1): <1  
Melting Point: N/A  
Evaporation Rate: N/A  
Appearance: Yellowish particles of wood/sawdust  
Odor: None to typical wood smell

### SECTION IV--FIRE AND EXPLOSION DATA

Flash Point: N/A  
Flammable Limits: Slight when exposed to flames  
Extinguishing Media: Drychemical, Waterspray, Foam  
Special Fire Fighting Procedures: None  
Unusual Fire and Explosion Hazards: Avoid CO2 blast. Spontaneous heating possible. Avoid hot, humid storage. Do not disperse in air, as this could lead to dust explosion.

### SECTION V--REACTIVITY DATA

Stability: Stable  
Incompatibility (Material to Avoid): Strong oxidizing agents  
Hazardous Decomposition or By-products: Unknown  
Hazardous Polymerization: Will not occur

### SECTION VI--HEALTH HAZARD DATA

Permissible Concentrations (AIR): Unknown  
Effects of Overexposure: Allergies, dermatitis (skin irritation)  
Toxicological Properties: Unknown

### EMERGENCY FIRST AID PROCEDURES

Eyes: Flush with large amounts of water, consult an eye physician  
Skin Contact: Wipe off excess, wash with soap and water  
Inhalation: Remove from area  
If Swallowed: Call physician immediately

**TEL**  
(801) 972-4432  
Toll Free: (800) 962-7632

**FAX**  
(801) 975-7076

**EMAIL**  
info@pioneersawdust.com

**Salt Lake City, UT**  
**Headquarters/Distribution Center**  
621 Fulton Street  
Salt Lake City, UT 84104-4327  
PO Box 27861  
Salt Lake City, UT 84127-0861

**San Leandro, CA**  
**DMS Warehouse**  
1956 Williams Street  
San Leandro, CA 94577

www.pioneersawdust.com



**FOR OVER 100 YEARS WE HAVE RECYCLED WOOD WASTE TO PRODUCE QUALITY PRODUCTS**

No trees are fallen to supply us with our sawdust. We recycle clean wood waste to produce our sawdust, shavings and sweeping compounds.



#### **SECTION VII--PRECAUTIONS FOR SAFE HANDLING AND USE**

Procedures for Clean-up: Handle as normal solid waste. Scoop up and place in waste container, vacuum, or wet clean.

Waste Disposal Method: Waste material can be buried in an approved landfill or handled as inert waste in accordance with Federal, State, and Local Environmental Regulations

#### **SECTION VIII--SPECIAL PROTECTION INFORMATION**

Ventilation Type Required (Local, Mechanical, Special): Use adequate ventilation in volume to keep dust concentration below TLV (5mg/m<sup>3</sup>).

Respiratory Protection: NIOSH approved Dust to Mist Respirator

Eye Protection: Safety glasses or goggles

Other Protective Equipment: N/A

#### **SECTION IX--SPECIAL PRECAUTIONS**

Precautions to be Taken in Handling and Storing: Store dry at ambient temperature. Avoid moisture.

Other Precautions: None

.....

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

.....

Preparer: Duncan H. Brockbank

Original Date: 12/04/85 (by Norman L. Brockbank)

Revision Date:

Supersedes:

## GUARANTEED ANALYSIS

Sulfur (S) ..... 99.5%

*Plant nutrients derived from elemental sulfur.*

### PRODUCT DESCRIPTION

**GreenSun® ES99** is a pastille-shaped form of elemental sulfur which is formulated using new and improved methods as compared to other conventional granulation methods. This material is formed from pure molten sulfur, is very easy to handle, and has a low dust content (<0.5%) allowing for maximum safety during industrial handling processes. Because of its superior quality, **GreenSun® ES99** is uniquely adapted for a wide array of industrial applications, including but not limited to steel making, mining, fruit processing, pulp and paper, and other industries that require sulfur.

### PHYSICAL PROPERTIES

Density	76 lbs/ft <sup>3</sup>
Granule Size	SGN 260
Color	Bright yellow
Fines content at manuf.	<0.5%
Impurities (carbon, ash)	<0.05%
Angle of repose	29 degrees

### GENERAL APPLICATION AND USE RECOMMENDATIONS

**GreenSun® ES99** is an excellent choice for industrial processes that require burning sulfur. Recommendations vary as to each individual industrial use and application.

### HANDLING AND STORAGE

**GreenSun® ES99** should be stored and blended (if applicable) in a well-ventilated location to minimize accumulation of dust. Always use stringent dust control procedures to prevent a concentration of flammable dust from reaching a spark or flame source. **GreenSun® ES99** should not be blended or stored with strong oxidizing agents. Avoid the use of augers due to fracturing of the material. Avoid inhalation of dust if possible. Avoid contact with skin and eyes. Wear proper protective equipment when handling. Dispose of used bags in accordance with local, state, and federal regulations.

**KEEP OUT OF REACH OF CHILDREN.**



**WARNING:** This product contains substances known to the State of California to cause cancer, birth defects, or other reproductive harm.

**CONDITIONS OF SALE:** CoreAgri, LLC (Company) warrants that this product conforms to the chemical description of the label and is reasonably fit for the purposes stated on the label when used in accordance with the directions under normal use. This warranty does not extend to the use of this product contrary to label instruction, or under abnormal use conditions, or under conditions not reasonably foreseen by the Company.

**THE COMPANY DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF FITNESS OR MERCHANTABILITY. THE COMPANY SHALL NOT BE LIABLE FOR CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, AND THE COMPANY'S SOLE LIABILITY AND BUYER'S AND USER'S EXCLUSIVE REMEDY SHALL BE LIMITED TO THE REFUND OF THE PURCHASE PRICE. BUYER AND SELLER ACKNOWLEDGE AND ASSUME ALL RISKS AND LIABILITY RESULTING FROM HANDLING, STORAGE AND USE OF THIS PRODUCT. THE COMPANY DOES NOT AUTHORIZE ANY AGENT OR REPRESENTATIVE TO MAKE ANY OTHER WARRANTY, GUARANTEE OR REPRESENTATION CONCERNING THIS PRODUCT.**

**NOTICE:** Information about the components of this fertilizer material may be obtained by writing to CoreAgri, LLC, PO Box 1027, Arroyo Grande, CA 93421 and giving the lot number which is found on the container.

F1741



Manufactured by:  
**COREAGRI, LLC**  
PO Box 1027  
Arroyo Grande, CA 93421  
800•385•4715  
[www.coreagri.com](http://www.coreagri.com)

**NET WEIGHT: 50 POUNDS (22.68 KG)**

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# MATERIAL SAFETY DATA SHEET

## SECTION 1. PRODUCT AND COMPANY INFORMATION

**Trade Name (as labeled):** CoreSulphur ES99

**Common Name:** Elemental Sulfur 99.5%

**Manufactured By:** CoreSulphur, Inc.  
PO Box 1027  
Arroyo Grande, CA 93421

**Business Phone:** (805) 202-4371

**Emergency Phone:** INFOTRAC – (800) 535-5053

**Date of Preparation:** December, 2009  
Updated September, 2011

## SECTION 2. COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical Name	CAS #	Exposure Limits In Air	
		ACGIH TVL (ppm)	OSHA PEL (ppm)
Sulfur	7704-34-9	NA	NA
NE = Not Established		NA = Not Available	

## SECTION 3. EMERGENCY/HAZARDS OVERVIEW

**Emergency Overview:** Bright yellow colored, free flowing pastille with a possible slight sulfur odor. Dust may cause mild irritation. Sulfur trioxide fumes at temperatures above 1067 °F. Not D.O.T. regulated.

**Symptoms Of Over Exposure:**

**Eyes:** Sulfur dust may cause severe irritation with prolonged exposure.  
**Skin:** Prolonged or repeated exposure to sulfur dust may cause skin irritation.  
**Inhalation:** Sulfur dust may cause breathing difficulties and irritation of mucous membranes.  
**Ingestion:** Solid sulfur can be digested in fairly large amounts without injury.  
**Injection:** Not possible.

## SECTION 4. FIRST-AID MEASURES

<b><u>If Inhaled:</u></b>	Remove to fresh air. If breathing becomes difficult, contact a medical physician. Give artificial respiration if victim is not breathing and obtain immediate medical attention.
<b><u>If Ingested:</u></b>	Seek Medical Attention. Do not induce vomiting unless directed to do so by a medical professional. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. If vomiting occurs, keep head lower than hips to prevent introduction of fluid into the lungs.

<b><u>In Case Of Skin Contact:</u></b>	Wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Seek medical attention if skin becomes irritated.
<b><u>In Case Of Eye Contact:</u></b>	Flush immediately with water for at least 15 minutes, lifting the upper and lower eyelids occasionally. Call a physician if eye irritation persists.
Victims of chemical exposure and all rescuers must be taken for medical attention. Take a copy of label and MSDS to physician or health professional with victim.	

## SECTION 5. FIRE-FIGHTING MEASURES

<b>Flash Point:</b>	Pure liquid sulfur, 370 °F. Impure liquid sulfur, 428 °F.
<b>LEL Flammable Limits:</b>	35 gm/m <sup>3</sup> .
<b>UEL Flammable Limits:</b>	1400 gm/m <sup>3</sup> .
<b>Auto Ignition Temperature:</b>	Dust Clouds, 374 °F.
<b>Extinguishing Media:</b>	Use any standard agent suitable for surrounding structural fire or for other chemicals that may be involved. Fine water sprays and/or dry chemical agent. CO <sub>2</sub> , dry chemicals, or sand.
<b>Fire Extinguishing Media to Avoid:</b>	Hoses and extinguishers with pressure streams should be avoided where solid sulfur is dusty or where it may create a further hazard by raising more dust clouds.
<b>Unusual Fire And Explosion Hazards:</b>	Sulfur trioxide fumes at temperatures above 1067 °F. Dust suspended in air is readily ignited by flame, static electricity, or friction spark. Every reasonable step must be taken to minimize dust formation. Dust tight casings should be equipped with explosion relief vents. Sparkless electrical equipment is recommended. Handling equipment must be grounded or bonded to avoid static electricity. Keep away from sources of flame or sparks. Detailed recommendations in Manufacturing Chemists Association SD-74 and National Safety Council 612 Bulletins covering "Sulfur" should be followed when handling GreenSun ES 99.5%.
<b>Special Firefighting Procedures:</b>	Wear positive pressure, self-contained breathing apparatus (SCBA) and goggles. Avoid exposure to smoke or fumes.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Spill And Leak Response:** Pick up dry spills by scooping, shoveling, or vacuuming and place into containers for reuse or disposal. The minimum personal protective equipment should include rubber gloves, rubber apron, and chemical goggles. Gas masks or SCBA gear may be required. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Keep material out of sewers, storm drains, and surface waters. Comply with all applicable government regulations on spill reporting, handling, and waste disposal. For landfill disposal, mix with limestone 3 times the weight of sulfur.

## SECTION 7. STORAGE AND HANDLING

**Storage Practices:** Store in a cool (above 40 °F), dry, well-ventilated area away from incompatible materials. Solid becomes corrosive to metals when stored wet. Product will physically break down when exposed to moisture.

**Handling Practices:** Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Wash with soap and water after handling.

**Work/Hygiene Practices:** Avoid getting chemicals ON YOU or IN YOU. Wash hands with soap and water after handling chemicals. Do not eat or drink around or while handling chemicals. Keep out of reach of children.

## SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Ventilation/Engineering Controls:** Use of local exhaust is recommended at product transfer points and where dusty conditions exist.

**Respiratory Protection:** For normal product handling, use any NIOSH approved air-purifying dust respirator. For extremely dusty conditions, a full facepiece purifying particulate respirator is recommended.

**Eye Protection:** Chemical dust/splash goggles or full-face shield to prevent eye contact. As a general rule, contact lenses should not be worn when working with chemicals because they contribute to the severity of an eye injury.

**Hand Protection:** Wear cotton or canvas protective glove to prevent contact. Rubber gloves may be used if product may become wet or moist.

**Body Protection:** Use body protection appropriate for task. Chemical-resistant coveralls and rubber aprons are generally acceptable.

**Other Protective Measures:** An eyewash and safety shower should be nearby and ready for use.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b><u>Appearance:</u></b>	Bright yellow colored pastille.	<b><u>Boiling Point:</u></b>	832 °F.
<b><u>Odor:</u></b>	May have slight sulfur odor.	<b><u>Crystallization Point:</u></b>	NA.
<b><u>pH:</u></b>	Neutral when dry.	<b><u>Freezing Point:</u></b>	246 °F.
<b><u>Water Solubility:</u></b>	Insoluble	<b><u>Vapor Pressure:</u></b>	Solid, less than 0.0001 mm. hg at 68 °F
<b><u>Density:</u></b>	76 lbs/ft <sup>3</sup> .	<b><u>Vapor Density (air = 1):</u></b>	>1.
<b><u>Specific Gravity (H<sub>2</sub>O = 1):</u></b>	Solid, 2.07 gm/ml		NA = Not Available.

## SECTION 10. STABILITY AND REACTIVITY

**Stability:** Stable.

**Conditions To Avoid:** Fire and dust explosions.

**Incompatibility:** Alkaline materials, or mixtures with chlorates, nitrates, or other oxidizing agents.

**Hazardous Polymerization:** Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

**Toxicity Data:** NA.

**Acute Effects:**

**Eyes:** Mild irritant. May cause redness, tearing and/or burning.

**Skin:** Mild irritant, especially with prolonged exposure or when in contact with moisture.

**Ingestion:** Nausea and upset stomach

**Inhalation:** Moderate irritation of nose and throat from dust. May cause dry coughing, wheezing, chest tightness, and burning of mucous membranes.

**Chronic Effects:** None known.

## SECTION 12. ECOLOGICAL INFORMATION

**Environmental Stability:** Sulfur, is stable in the environment. Its transport in the environment depends upon the exact compound, the pH, the soil type, and the salinity. All work practices should be aimed at eliminating environmental contamination.

## SECTION 13. DISPOSAL CONSIDERATIONS

Do not contaminate lakes, streams, ponds, estuaries, oceans, or other waters by discharge of waste effluents or equipment rinsate. Dispose of waste effluents according to federal, state, and local regulations. For landfill disposal, mix with limestone 3 times the weight of sulfur.

## SECTION 14. TRANSPORTATION INFORMATION

This product is not regulated per CFR 49 (Special Provisions 172.102 pt 30)

## SECTION 15. REGULATORY INFORMATION

**SARA Reporting Requirements:** This material does not contain toxic chemicals subject to reporting requirements of Section 313, Title III of the Superfund Amendments and Reauthorization Act of 1986.

**California Proposition 65:** WARNING. This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

## SECTION 16. OTHER INFORMATION

The information and recommendations herein are taken from data contained in independent, industry recognized references including NIOSH, OSHA, ANSI, and NFPA. This information is, as of date listed above, true and accurate to the best of CoreSulphur, Inc. knowledge. It is intended for use by persons possessing technical knowledge and at their own discretion and risk. Since actual use is beyond our control, no guarantee, express or implied, and no liability is assumed by CoreSulphur, Inc. in conjunction with the use of this information. Actual conditions of use and handling may require consideration of information other than, or in addition to, that which is provided herein.