Florida Department of Health
Onsite Nitrogen Reduction Strategies Study

Contract CORCL

TASK B.6

Installation Report for Passive Nitrogen Reduction System B-HS7

November 2013

Task B of the Florida Onsite Nitrogen Reduction Strategies Study (FOSNRS) includes performing field experiments to critically evaluate the performance of nitrogen removal technologies that were identified and pilot tested in FOSNRS Task A. To meet this objective, full scale treatment systems will be installed at various residential sites in Florida, operated on septic tank effluent under actual onsite conditions, and monitored over an extended timeframe. The Task B Quality Assurance Project Plan (Task B.5) documents the objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the home sites. This report documents the installation of a passive nitrogen reduction system at a home site in Marion County, Florida (B-HS7).

System Overview

The B-HS7 passive nitrogen reduction system (PNRS) was installed in Marion County, Florida in November 2013. It consists of adding a 300 gallon concrete pump tank, low-pressure distribution network, and a lined Stage 1 and 2 drainfield. The existing 900 gallon dual chamber septic tank will continue to provide primary treatment for the new PNRS system. Figure 1 is a plan view showing the system components and layout of the installation. The complete as-built system drawings are included in Appendix A.

Household wastewater enters the 1st chamber of the primary tank and exits the second chamber as septic tank effluent through an effluent screen. Screened effluent is directed to the pump tank which contains the pump and float switches. Pump tank contents are discharged through a low-pressure distribution network installed inside Infiltrator EQ36-LP™ chambers. The low-pressure distribution network consists of a central manifold design with (4) 33-foot long, 1.25-inch diameter perforated laterals. The perforations are 0.25-inch in diameter and spaced 3-feet off-center. Below the infiltrators, 24-inches of native soil was installed. Below the native soil, 12-inches of lignocellulosic media was installed above a 30 mil PVC liner with a 6-inch lip around the outer perimeter. Therefore, approximately 6-inches of the lignocellulosic media is saturated promoting denitrification of the nitrified effluent. The treated effluent is discharged into the soil around the perimeter of the liner. A flow schematic of the system is shown in Figure 2.

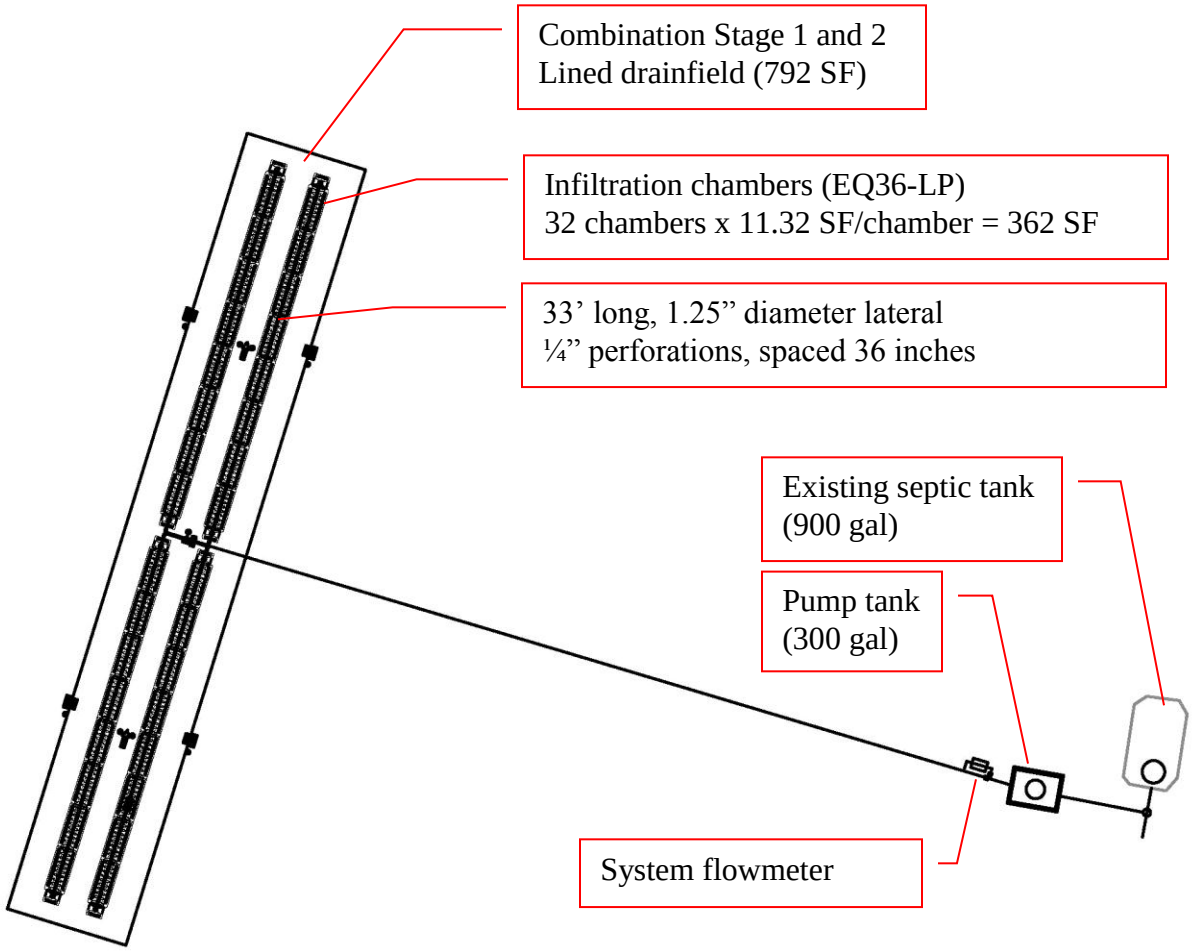


Figure 1
Plan view of B-HS7 PNRS layout installed in Marion county

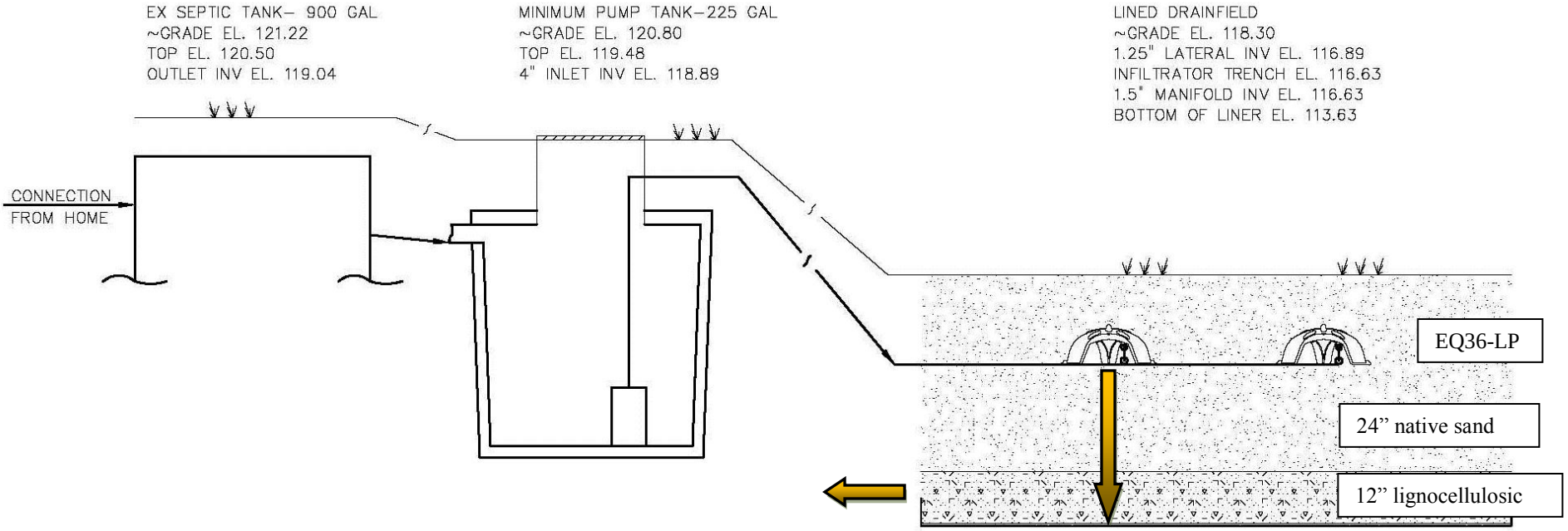


Figure 2
Flow Schematic of B-HS7 PNRS installed in Marion county

Installation

Installation of the system commenced November 13, 2013 and was completed on November 18, 2013. As previously discussed, the existing 900 gallon septic tank will continue to provide primary treatment. An access riser was installed above the second chamber of the primary tank (Figure 3) to allow for ease in maintenance of the existing outlet effluent screen. A two-way valve (Bull Run™) (Figure 4) was installed following the septic tank outlet to allow the flow to either be completely directed to the new passive system (to the pump tank) or to the existing drainfield. A riser pipe was installed to grade over the valve, so that the valve can be turned after installation is complete. The valve is turned with a wrench on a rod which is long enough to reach within the riser installed.

Figure 3
Primary tank access riser and cover

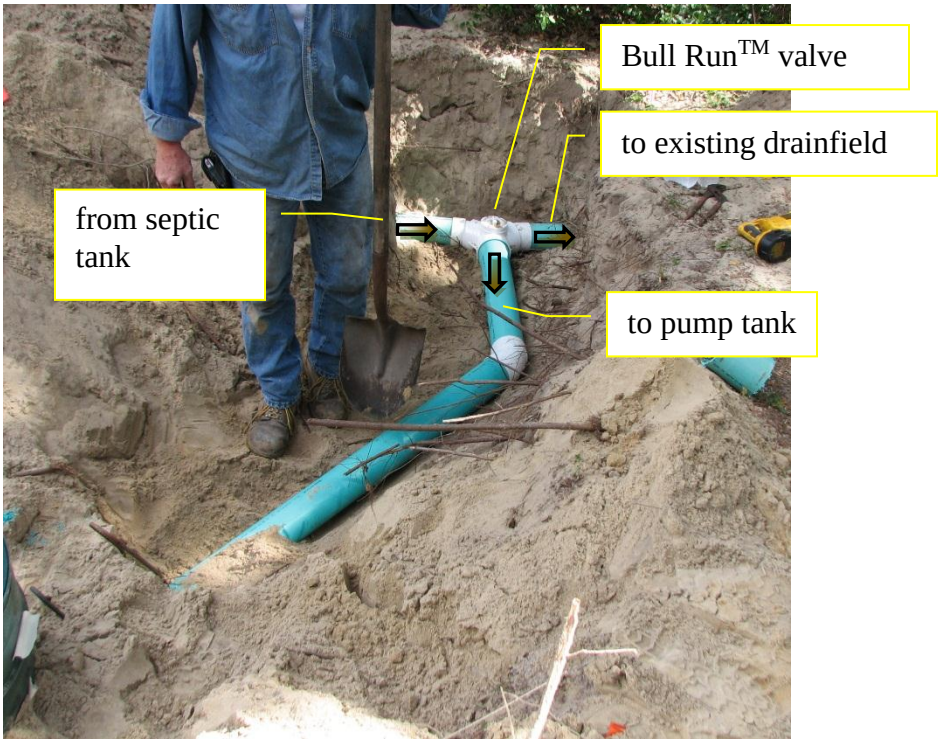


Figure 4
Bull Run™ valve

The remaining passive nitrogen reduction system components were installed (Table 1).

Table 1
Passive Nitrogen Reduction System Components

	Tank Volume (gal)	Surface Area (ft^2)	Media
Primary Tank	900		none
Pump Tank	300	12	none
Lined Drainfield Area		11' x 72' (792)	• 24" native sand • 12" lignocellulosic

The 300 gallon concrete pump tank was installed downgradient of the primary tank (Figure 5). The standard outlet pipe connection was plugged since the pump discharge pipe was installed through the riser. A Liberty LE51A-2 submersible pump was installed (Figure 6). One wide-angle piggyback float switch attached to the pump controls the effluent level in the pump tank. The height of the float is adjustable to calibrate a target dose volume. An additional float switch is connected to an audible/visual alarm (Figure 7) installed next to the power meter box to alarm for a high water level in the pump tank (pump failure). One inline flowmeter was installed following the pump discharge (Figure 8) with a bypass for maintenance/cleaning of the flowmeter.

Figure 5
Pump tank (300 gallon)

Figure 6
Submersible Liberty pump

Figure 7
High water level alarm

Figure 8
PNRS system flowmeter

The new treatment drainfield area was prepared for the 30 mil PVC liner installation (Figure 9). The liner was installed with a 6 inch lip around the outside perimeter. Above the liner, approximately a ½-inch sand layer (Figure 9) was installed to protect the liner during construction. Above the liner a 12-inch layer of lignocellulosic media, a blended urban waste wood from Wood Resource Recovery, Ocala, FL, was installed (Figure 9). Monitoring equipment surrounding the liner lip and inside the lignocellulosic media were installed (Figure 10). The various types of monitoring equipment installed

include: stainless steel drivepoints, stainless steel suction lysimeters and ceramic cup suction lysimeters (Figure 11). To separate the top of the lignocellulosic media and bottom of the native sand layer a plastic mesh screen (1/16-inch) was installed above the lignocellulosic media (Figure 10). Following placement of the plastic mesh screen, a 24-inch native sand layer was installed (Figure 12). Ceramic cup suction lysimeters were installed above the mesh screen to represent water quality just after downward passage through the sand layer.

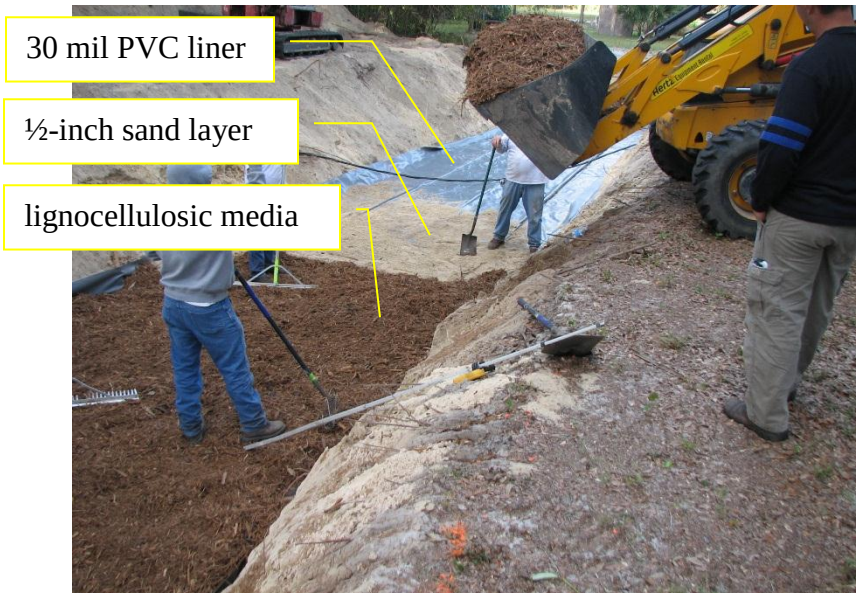


Figure 9
Lined area

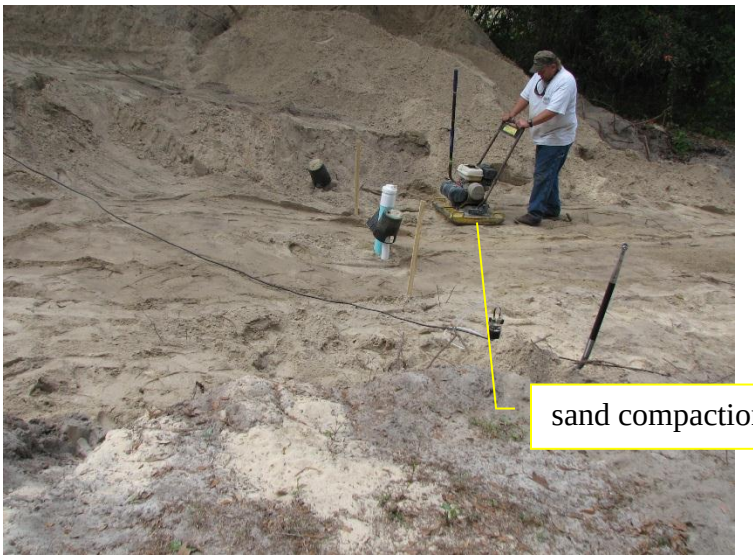
Figure 10
Lignocellulosic media monitoring equipment

stainless steel drivepoint

stainless steel suction lysimeter

ceramic suction lysimeter

Figure 11
Lignocellulosic media monitoring equipment



sand compaction

Figure 12
Native sand media

The 2"D pipe downstream of the flowmeter is reduced to 1.5"D in the center manifold of the low pressure distribution network (Figure 13). The manifold is connected to 4 laterals of perforated pipe (Figure 13) which distribute septic tank effluent over native sand inside Infiltrator EQ36-LP™ low profile chambers. The laterals were installed using pressure dosing pipe supports, so that a wet pressure test could be conducted (Figure 14) prior to installing the chambers over the laterals. Following the wet pressure test, the Infiltrator EQ36-LP™ low profile chambers were installed (Figure 15). Above the chambers, 12-inches of native sand cover (Figure 16) was installed to support wheel loads of 16,000 lbs per axle per the manufacturer. This will allow the homeowner to continue to operate a small tractor in the area. Hay and grass seed mix was placed above the sand (Figure 17).

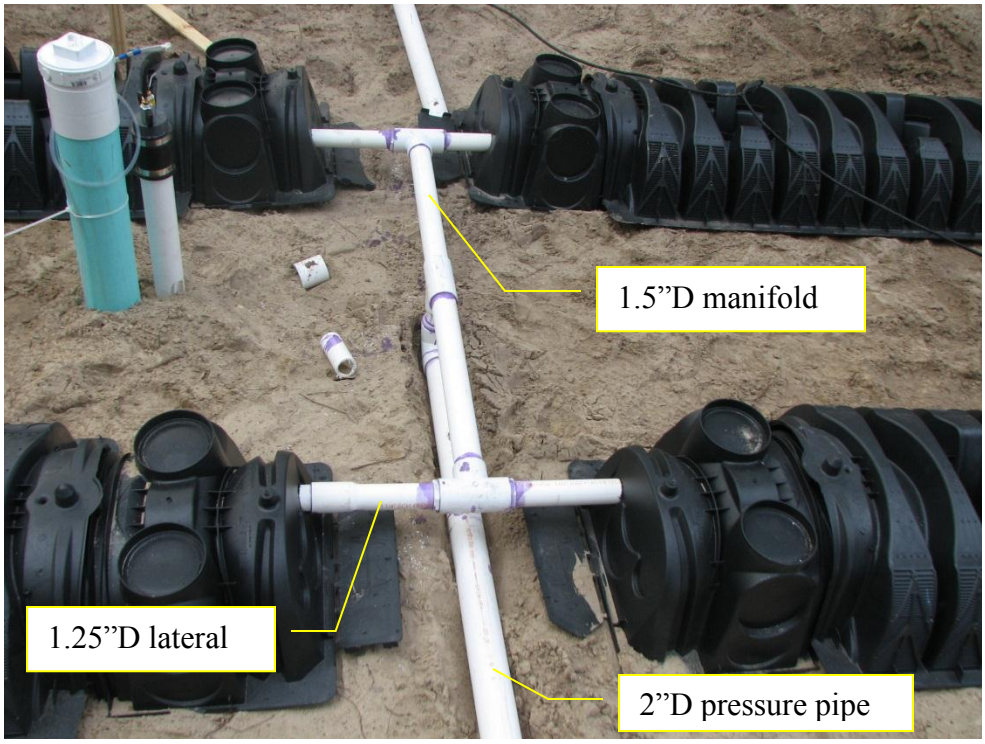


Figure 13
Center manifold of low pressure distribution network

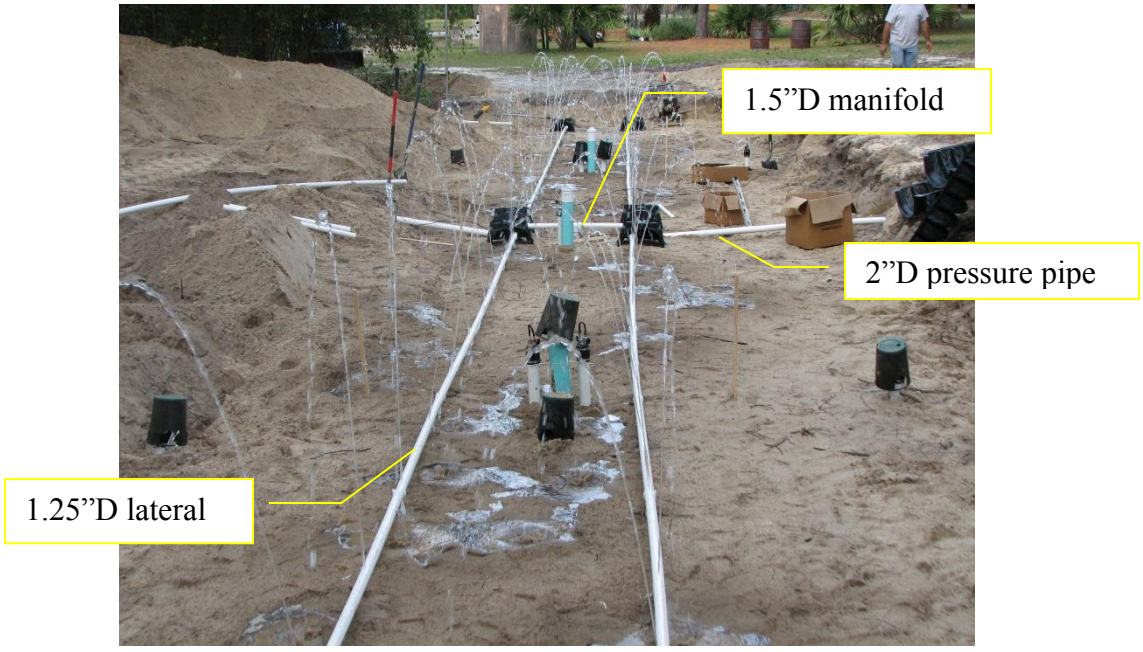


Figure 14
Wet pressure test

Figure 15
Infiltrator chambers

Figure 16
Sand cover

Figure 17
Hay and grass seed mix

Estimated Cost

The final construction cost for the installed system was $13,836.66 as detailed in Appendix B.

System Start-up

The system was started up November 19, 2013, when all flow was diverted to the new passive system. Preliminary sampling will begin in December to monitor nitrification.

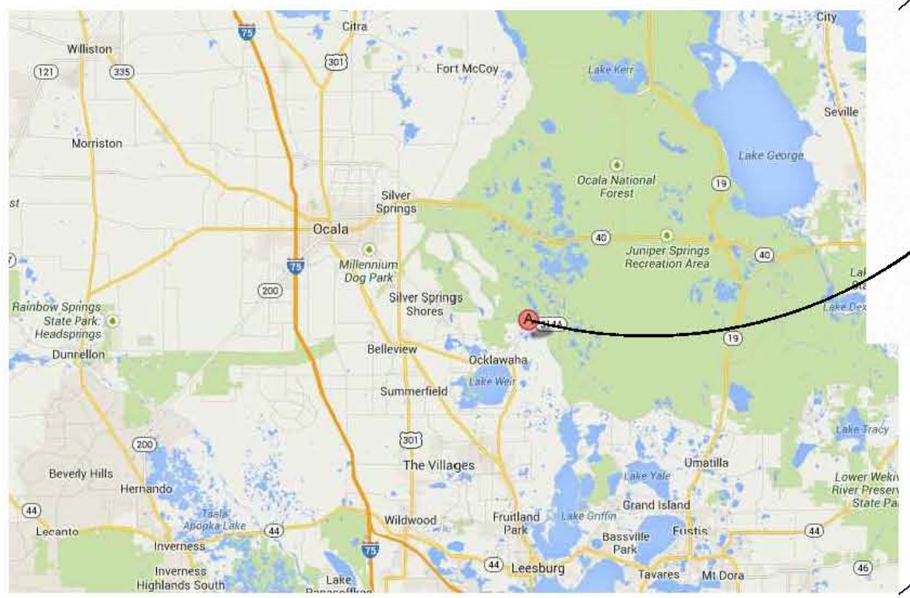
APPENDIX A

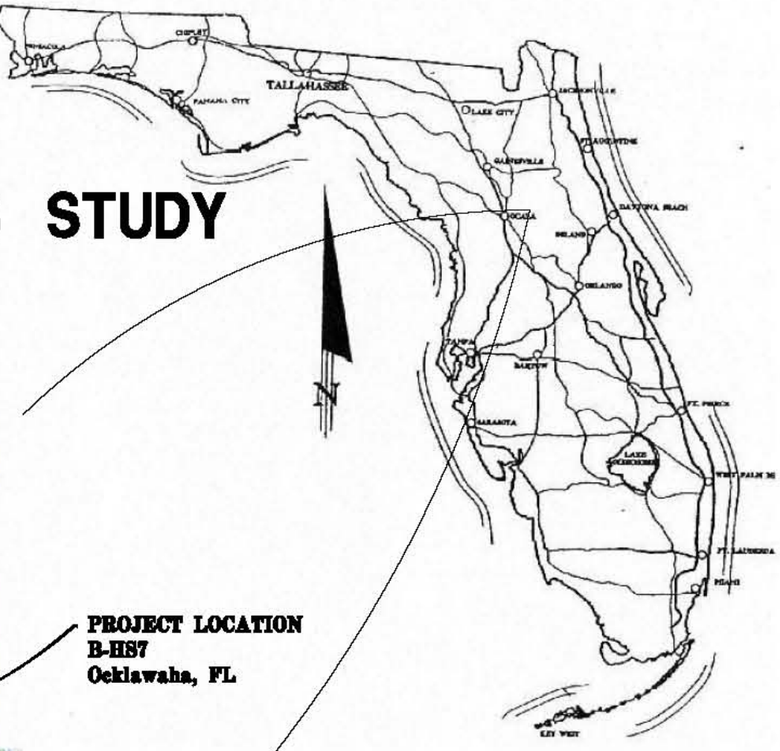
RECORD DRAWINGS

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY
B-HS7 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	CROSS SECTIONS
5	C-4	SYSTEM FLOW DIAGRAM
6	C-5	MONITORING NETWORK





LOCATION MAP

N.T.S.

NOTICE

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IN ASSOCIATION WITH

OTIS ENVIRONMENTAL CONSULTANTS, LLC

AET
Applied Environmental Technology

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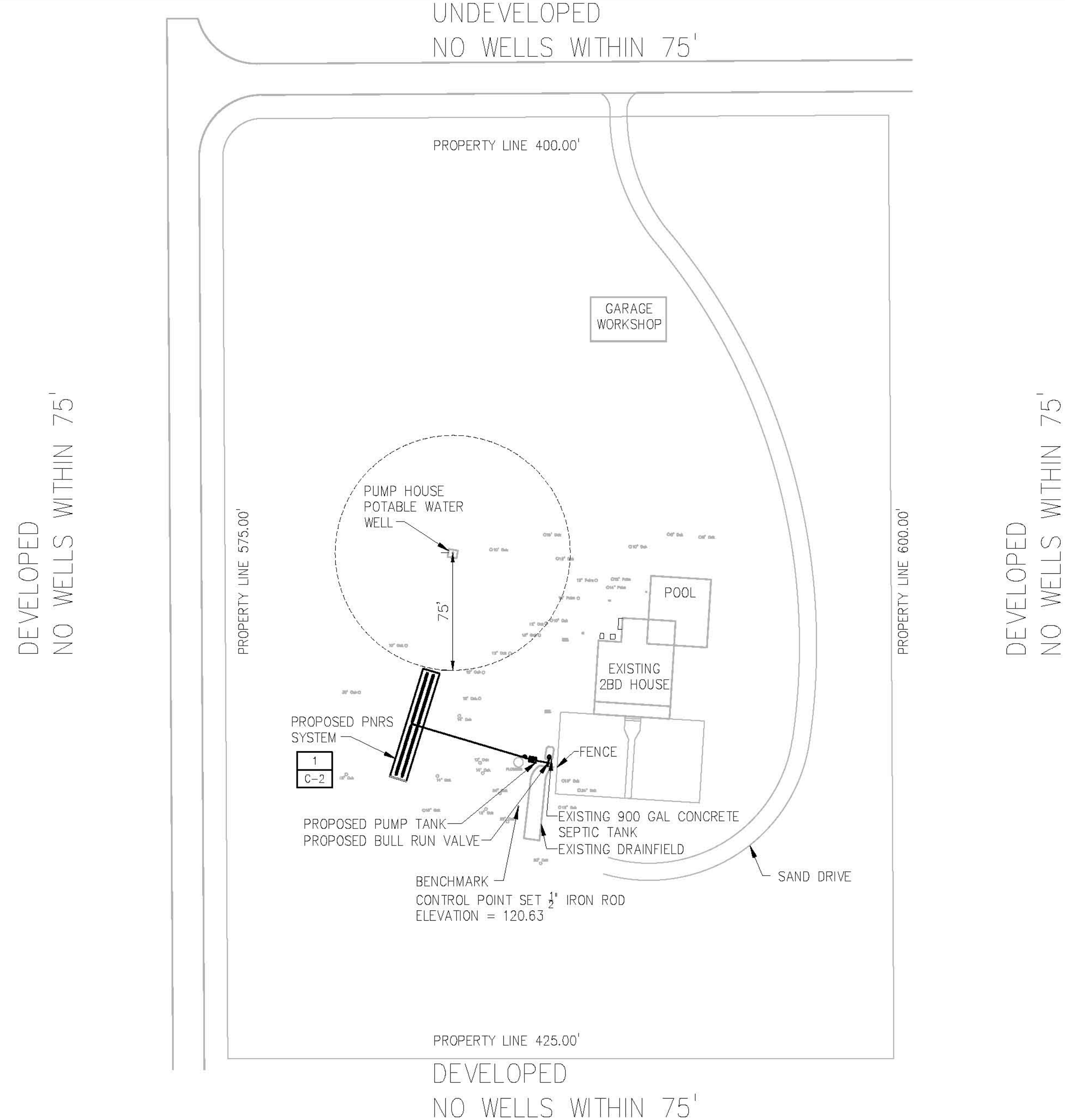
(850)-245-4070



PROPOSED SITE PLAN

1"=40'

1"=40'-0" 40 20 0 40'

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NO.	ISSUED FOR	DATE	BY
2	RECORD DRAWINGS	12/13	JEH
1	PERMIT DOCUMENTS	10/13	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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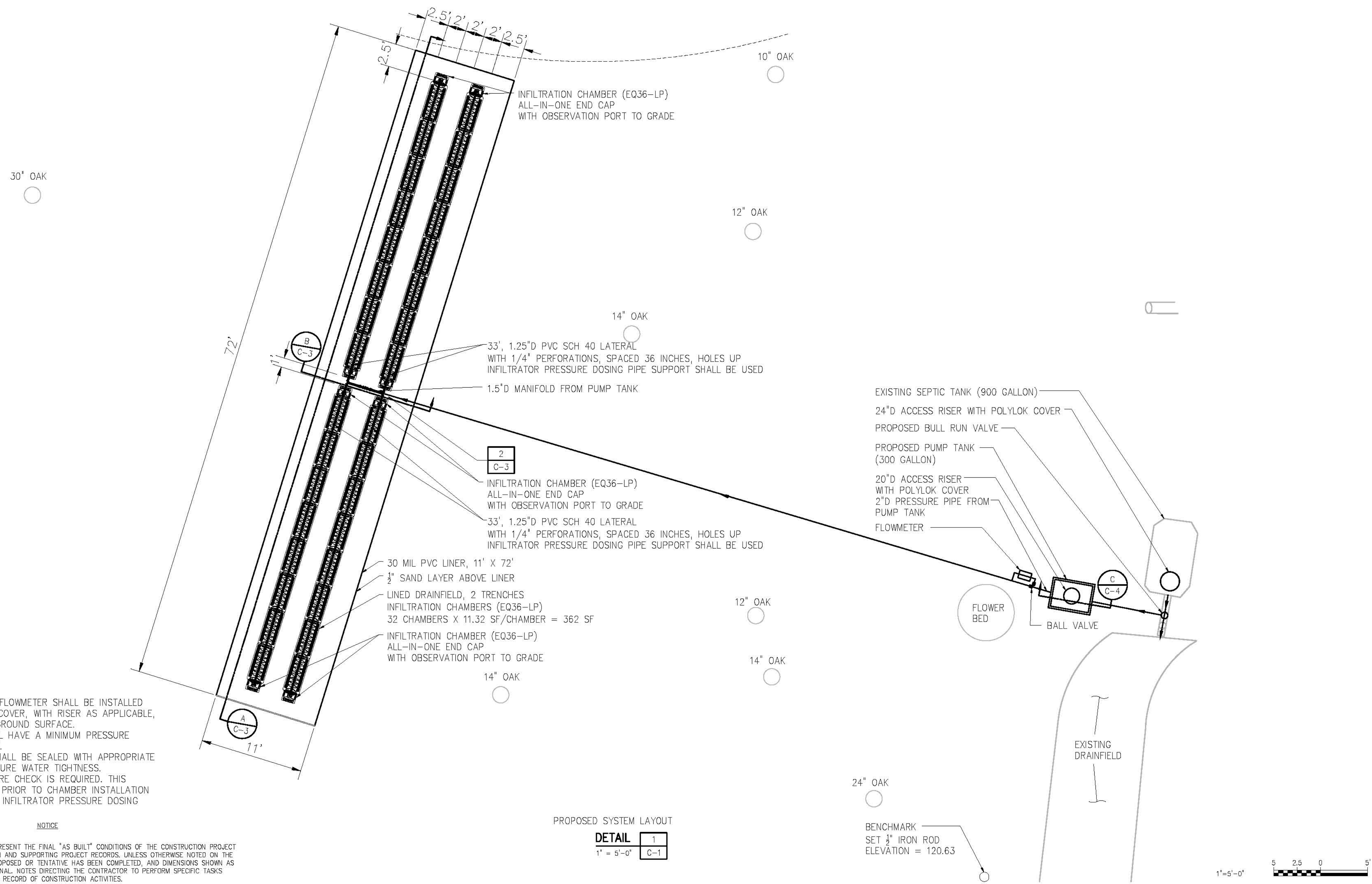
FLORIDA DEPARTMENT OF HEALTH
FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATIGIES STUDY

FOSNRS SITE B-HS7
SITE PLAN

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.

DATE DECEMBER 2013
H & S JOB NUMBER 44237-001
CONTRACT NUMBER CORCL
DRAWING NUMBER C-1

PLOT DATE: 12/9/2013 3:41 PM BY: JEDEBACK



NOTES:

1. ALL VALVES AND FLOWMETER SHALL BE INSTALLED WITH VALVE BOX COVER, WITH RISER AS APPLICABLE, FOR ACCESS AT GROUND SURFACE.
2. ALL VALVES SHALL HAVE A MINIMUM PRESSURE RATING OF 90 PSI.
3. ALL TANK LIDS SHALL BE SEALED WITH APPROPRIATE SEALANTS TO ENSURE WATER TIGHTNESS.
4. WET-RUN PRESSURE CHECK IS REQUIRED. THIS SHOULD BE DONE PRIOR TO CHAMBER INSTALLATION WITH THE USE OF INFILTRATOR PRESSURE DOSING PIPE SUPPORT.

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PROPOSED SYSTEM LAYOUT

DETAIL 1 / C-1
1" = 5'-0"

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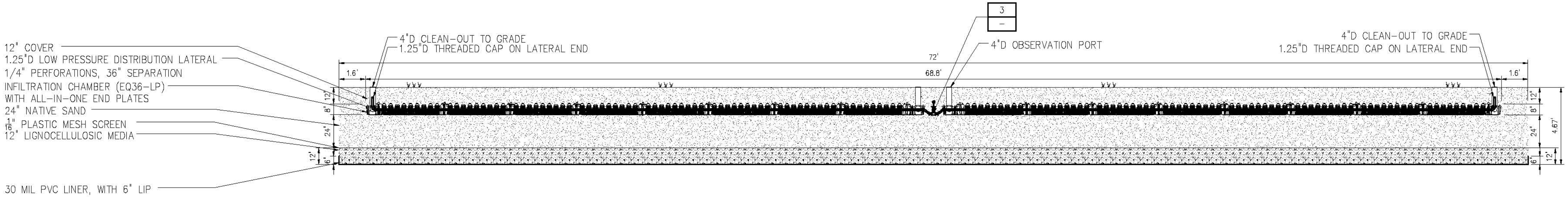
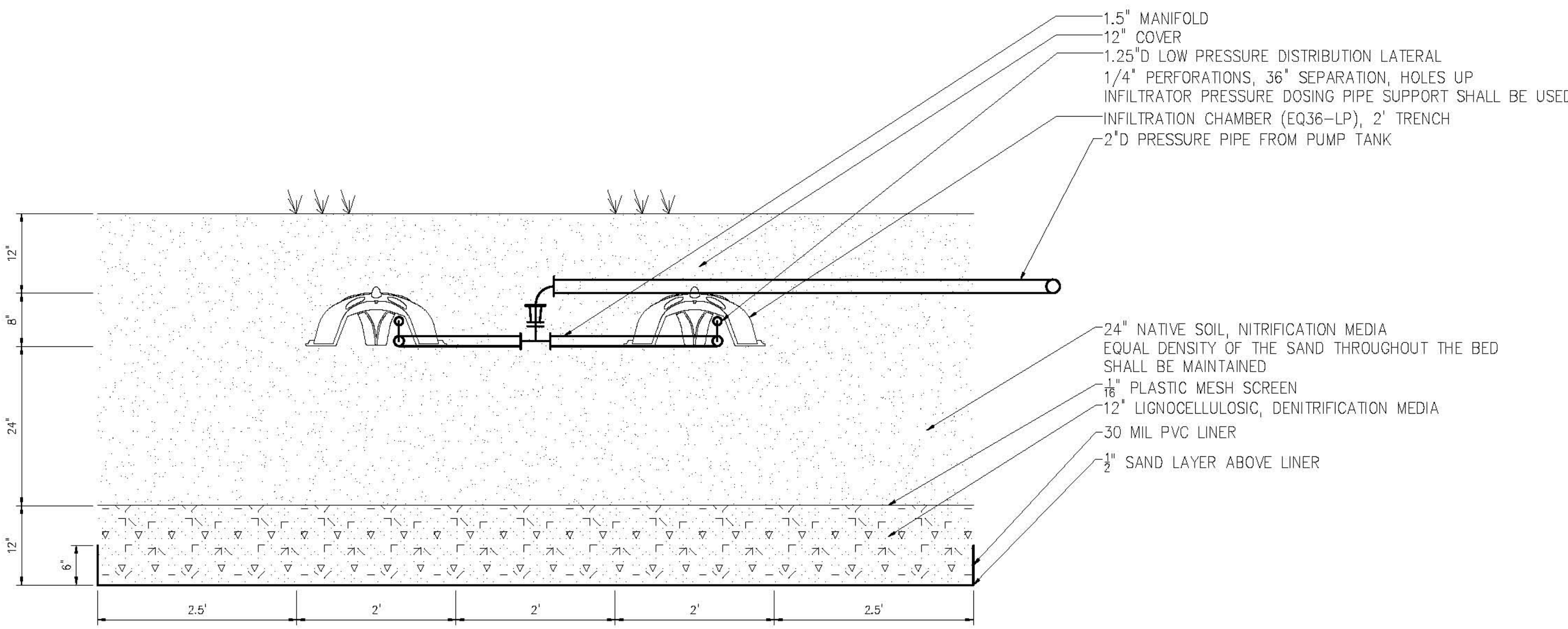


LINED DRAINFIELD

SECTION A / C-2

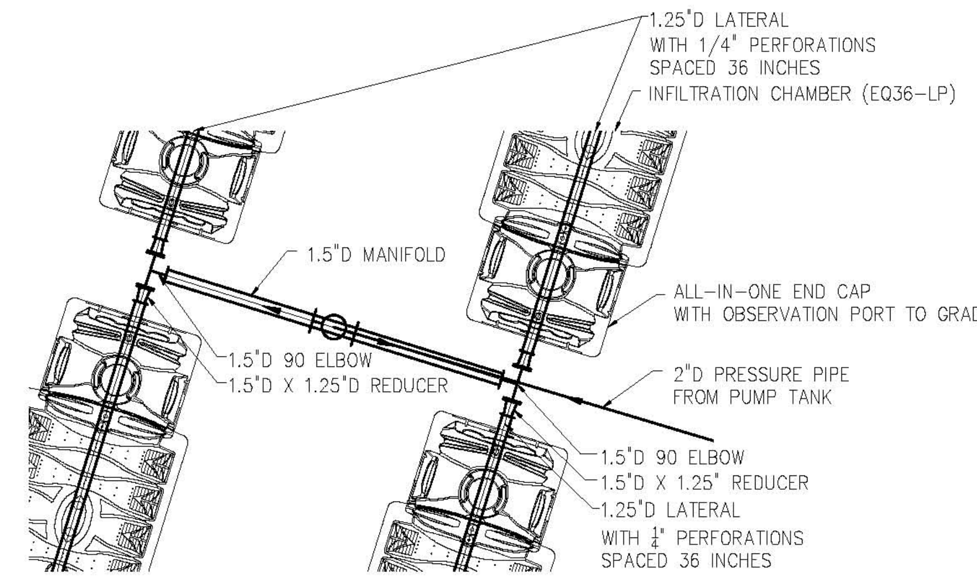
1" = 3'



LINED DRAINFIELD

SECTION B / C-2

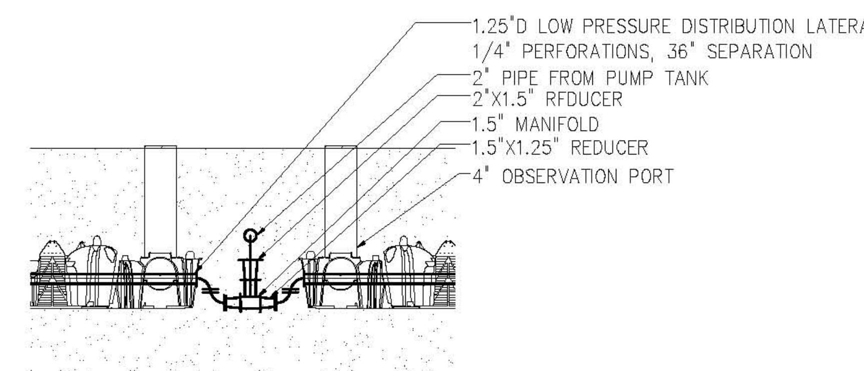
1" = 1'



CENTRAL MANIFOLD DISTRIBUTION NETWORK

DETAIL 2 / C-2

1" = 1'-0"



CENTRAL MANIFOLD DISTRIBUTION NETWORK

DETAIL 3 / –

1" = 1'-0"

1"=3'-0" — 3' 1.5 0 3'

1"=1'-0" — 12" 6 0 1'

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FOSNRS SITE B-HS7
CROSS SECTIONS

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.

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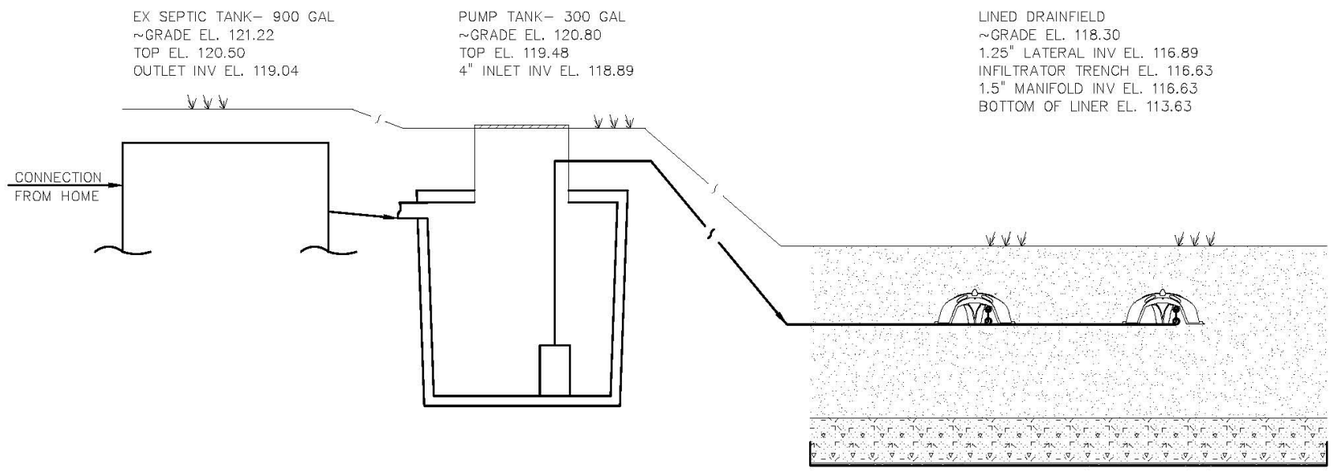

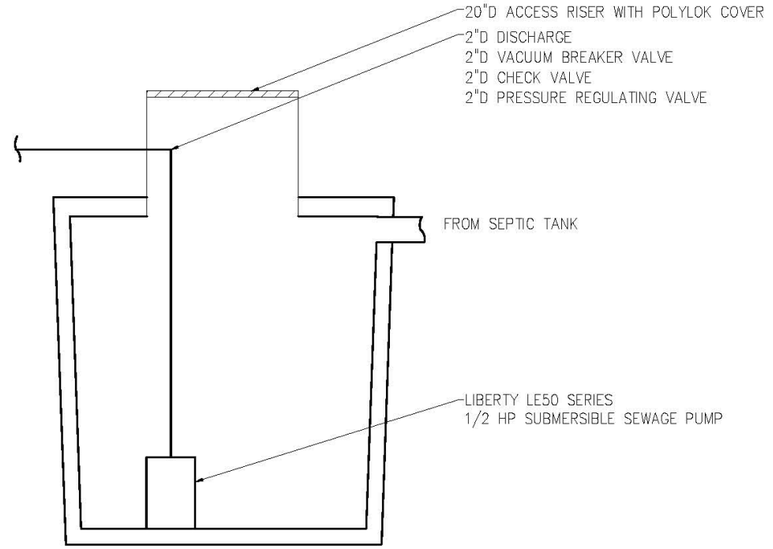

PUMP TANK (300 GALLON)

SECTION C / C-2

1" = 1'

1"=1'–0"

12" 6 0 1'

DESIGN CALCULATIONS

A. FLOW CALCULATIONS

NUMBER OF BEDROOMS = 2
BUILDING AREA = 2112 SF
F.A.C. MINIMUM DESIGN FLOW = 300 GPD

B. TREATMENT DESIGN

TRENCH ABSORPTION SURFACE, SAND = 0.80 GAL/SF–DAY = 375 SF
INFILTRATOR CHAMBERS EQ36–LP = 32 CHAMBERS X 11.32 SF/CHAMBER = 362 SF
LOW PRESSURE DISTRIBUTION = 4, 33 FT LATERALS
LINED AREA = 11' X 72' = 792 SF

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FOSNRS SITE B–HS7
SYSTEM FLOW DIAGRAM

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.

DATE DECEMBER 2013
H & S JOB NUMBER 44237-001
CONTRACT NUMBER CORCL
DRAWING NUMBER C-4

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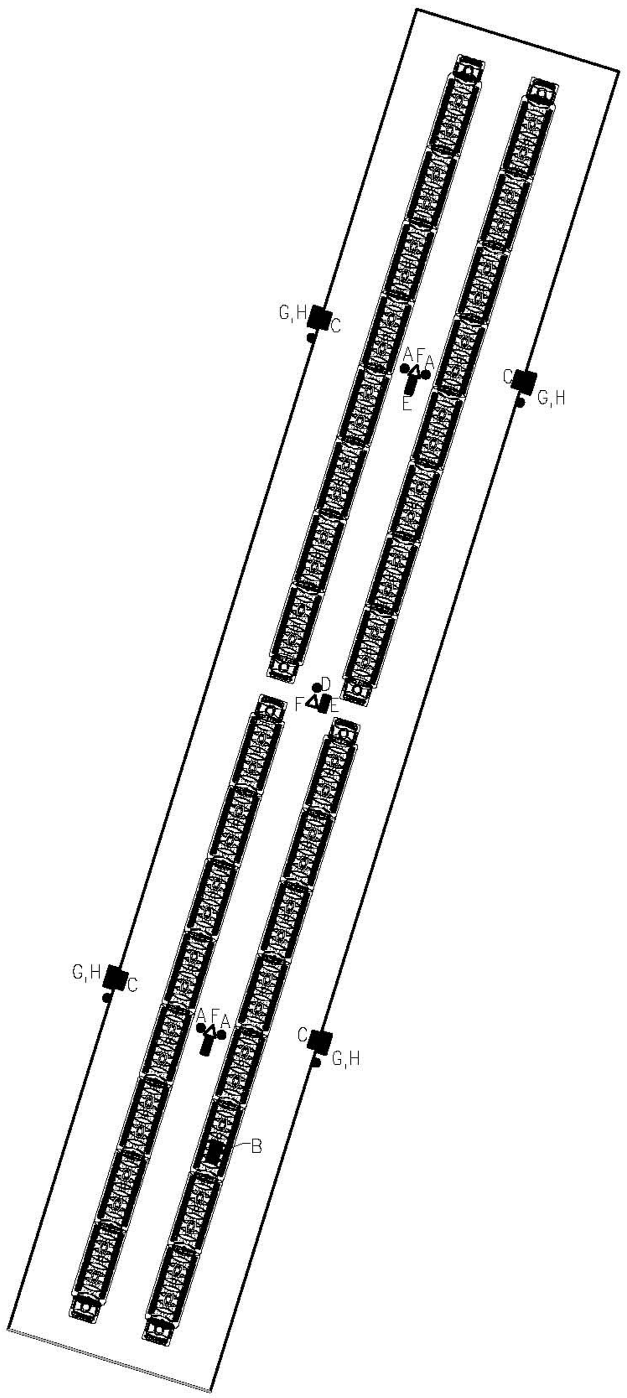
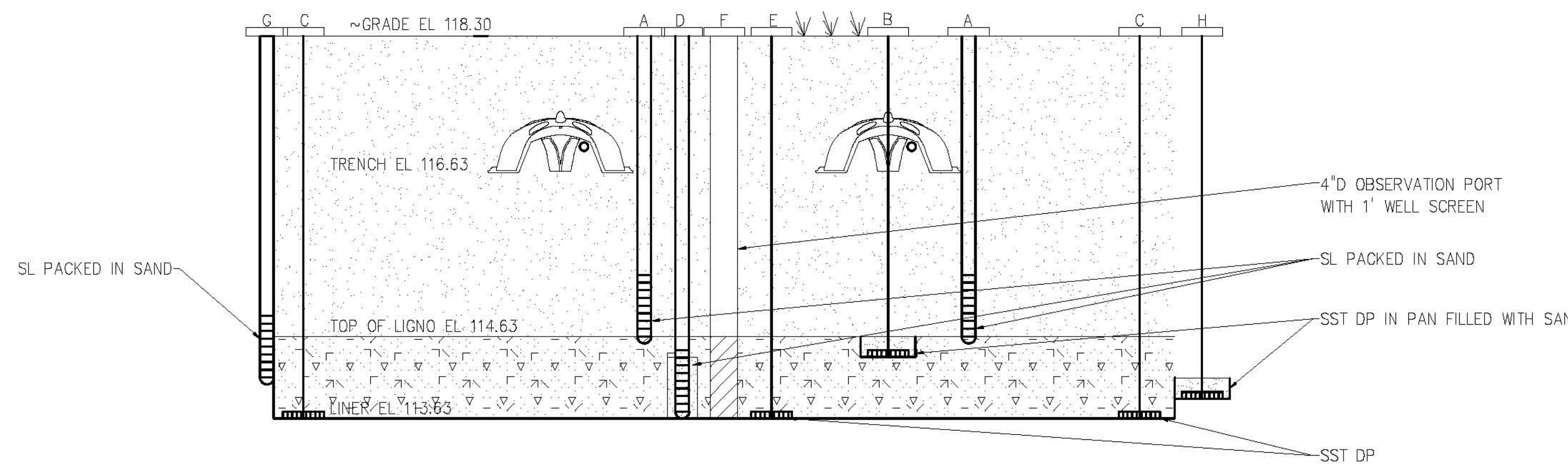


PROPOSED MONITORING NETWORK

DETAIL 1
1" = 5'-0" C-1

- ● 2"D SUCTION LYSIMETER (SL) PACKED IN SAND
- ▬ 6"L STAINLESS STEEL DRIVEPOINT (SST DP)
- ▭ 6"L STAINLESS STEEL DRIVEPOINT (SST DP) IN PAN
- △ 4"D OBSERVATION PORT



ID	MONITORING NETWORK SUMMARY	BOTTOM ELEV
	STE	
	(1) PUMP TANK	
	STAGE 1, NITRIFICATION	
	CENTER OF EACH TRENCH	
A	(4) SL PACKED IN SAND	114.63
B	(1) SST DP & LY IN PAN PACKED WITH SAND	114.38
	STAGE 2, DENITRIFICATION	
	CENTER OF EACH TRENCH	
C	(4) SST DP	113.63
	CENTER OF LINED AREA	
D	(1) SL PACKED IN SAND	113.63
E	(3) SST DP	113.63
F	(3) OBSERVATION PORT TO LINER	113.63
	TREATED EFFLUENT	
	OUTSIDE LINER	
G	(4) SL	114.13
H	(4) SST DP & LY IN PAN PACKED WITH SAND	113.88

1"=5'-0" 5 2.5 0 5'

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FOSNRS SITE B-HS7
MONITORING NETWORK

THE SCALE BAR SHOWN BELOW MEASURES ONE INCH LONG ON THE ORIGINAL DRAWING.

DATE DECEMBER 2013
H & S JOB NUMBER 44237-001
CONTRACT NUMBER CORCL
DRAWING NUMBER C-5

PLOT DATE: 12/9/2013 3:41 PM BY: JEDEBACK

APPENDIX B

CONSTRUCTION COSTS

HAZEN AND SAWYER
Environmental Engineers & Scientists

PROJECT: **FOSNRS Study Field Site Installation B-HS7**
CLIENT: **FDOH**

TOTAL **$ 13,836.66**

ITEM NO.	DESCRIPTION	ENGINEER OR CONTRACTOR SUPPLIED	QUANTITY	UNIT	UNIT PRICE	TOTAL
Existing STE Tank						$ 221.32
1	24"D access cover with riser installed on existing septic tank above outlet screen	Contractor	1	EA	$ 63.54	$ 63.54
2	Bull run valve installation and 4"D pipe to pump tank	Contractor	1	LS	$ 86.25	$ 86.25
3	Bull run valve	Engineer	1	EA	$ 71.53	$ 71.53
New Pump Tank						$ 2,333.32
4	Minimum 225 gallon pump tank with 20"D access cover with riser	Contractor	1	LS	$ 508.30	$ 508.30
5	Install Liberty LE50 pump and floats, plumb discharge pipe	Contractor	1	LS	$ 317.69	$ 317.69
6	Electrical service for pump and pump runtime meter, audio and visual alarm	Contractor	1	LS	$ 287.50	$ 287.50
7	Mini power meter	Engineer	1	LS	$ 293.99	$ 293.99
8	Electrician	Contractor	1	LS	$ 250.00	$ 250.00
9	Vacuum breaker valve, check valve, pressure regulating valve on pump discharge	Contractor	1	LS	$ 48.88	$ 48.88
10	Install flowmeter and bypass (2 ball valves)	Contractor	1	LS	$ 86.25	$ 86.25
11	Flowmeter	Engineer	1	LS	$ 521.62	$ 521.62
12	2"D Sch 40 pressure pipe	Contractor	1	LS	$ 19.09	$ 19.09
Stage 1 and 2 Combination Lined Area						$ 3,680.04
13	1.5"D Sch 40 pressure manifold pipe	Contractor	1	LS	$ 50.83	$ 50.83
14	1.25"D Sch 40 pressure pipe, 33 ft length laterals with 1/4 inch perforations, with 3 ft spacing	Contractor	1	LS	$ 81.33	$ 81.33
15	1.25"D lateral Infiltrator pressure pipe support stakes	Contractor	1	LS	$ 97.75	$ 97.75
16	Wet - run pressure check	Contractor	1	LS	$ 86.25	$ 86.25
17	Infiltrator chambers EQ36-LP	Contractor	32	EA	$ 21.28	$ 680.80
18	Infiltrator all-in-one end caps with observation ports to grade	Contractor	8	LS	$ 28.35	$ 226.78
19	Installation of native sand nitrification media (24" layer)	Contractor	1	LS	$ 287.50	$ 287.50
20	Installation of plastic mesh screen	Contractor	1	LS	$ 86.25	$ 86.25
21	Plastic mesh screen	Engineer	1	LS	$ 364.58	$ 364.58
22	Installation of lignocellulosic denitrification media (12" layer)	Contractor	1	LS	$ 201.25	$ 201.25
23	Lignocellulosic media	Engineer	1	LS	$ 671.50	$ 671.50
24	Installation of 30 mil PVC liner 11' x 72' area with 6 inch lip	Contractor	1	LS	$ 230.00	$ 230.00
25	PVC liner	Engineer	1	LS	$ 557.72	$ 557.72
26	Installation of 1/2" layer of sand above liner	Contractor	1	LS	$ 57.50	$ 57.50
Miscellaneous						$ 5,288.76
27	Labor (8 hr day onsite)	Contractor	3	EA	$ 1,713.00	$ 4,282.51
28	Mobilization	Contractor	2	EA	$ 460.00	$ 920.00
29	Hay and Bahia Argentine seed mix	Contractor	1	EA	$86.25	$ 86.25
Monitoring Equipment						$ 1,473.22
30	Household water meter	Engineer	1	LS	$ 176.50	$ 176.50
31	Installation of household water meter	Engineer	1	LS	$ 97.00	$ 97.00
32	Suction lysimeters	Engineer	9	EA	$ 65.00	$ 585.01
33	SST drivepoints	Engineer	12	EA	$ 32.64	$ 391.62
34	Pans	Engineer	1	LS	$ 24.43	$ 24.43
35	monitoring equipment covers	Engineer	1	LS	$ 89.11	$ 89.11
36	Installation of monitoring devices	Contractor	1	LS	$ 57.50	$ 57.50
37	Observation ports with 1' of well screen to liner	Contractor	1	EA	$ 52.05	$ 52.05