March 3, 2014

Lake Norman Yacht Club
PO Box 4600
Mooresville, North Carolina 28117

Attention: Mr. Mike Shaw

Reference: **Technical Assistance with Septic Permitting**
Lake Norman Yacht Club (LNYC) Open Pavilion and Bathhouse
Approximate 26 Acre Tract – Parcel No. 4624-99-0410
Iredell County, North Carolina
S&ME Project No. 4358-14-017

Dear Mr. Shaw:

S&ME, Inc. (S&ME) has provided technical assistance in regard to obtaining a possible septic Construction Authorization Permit for the above referenced property in Iredell County, North Carolina. The evaluation was performed in general accordance with S&ME Proposal No. 43-14-00075 dated January 23, 2014.

BACKGROUND

The referenced property is located at 297 Yacht Club Road in Iredell County, North Carolina. The purpose of the technical assistance was to assist with obtaining a septic Construction Authorization for a proposed new open air pavilion and bathhouse. Piedmont Design Associates, PA (PDAPA) is providing the site plan and the engineer design for the Fast Track septic submittal to the Iredell County Health Department (ICHD). PDAPA is also submitting the septic permit application and zoning permit. S&ME described eleven hand auger borings and flagged the proposed septic drainfield for the Fast Track submittal. We understand the design flow to the drainfield for the proposed LNYC bathhouse will be 1,700 gallons per day (gpd). The proposed primary septic area is in grass and the repair area is generally wooded. The existing pavilion and bathhouse will be demolished and the existing system should be properly abandoned per the ICHD policy. The existing bed system is located north and west of the existing bathhouse and pavilion. In conversations with Mr. Ben Aldridge of the ICHD, the two existing systems shown on the 2011 repair permit east of the existing bathhouse were thought to actually be installed at the clubhouse structure located at the opposite end of the site. Mr. Aldridge indicated he did not field verify the location of these systems in 2011. There is an existing gravel drive and well on the site as shown on the PDAPA site plan.

SUMMARY OF THE SOIL EVALUATION AND PROPOSED SEPTIC SYSTEM LAYOUT

On January 24 and February 15, 2014, Mr. Paul Penninger, S&ME Soil Scientist, visited the site and described 11 hand auger borings and flagged the proposed system and repair areas. The proposed septic lines were located by PDAPA and are shown on the site plan. The soil profiles observed at the hand auger borings generally had a clayey Bt horizon over a clay loam BC or transition horizon. (see attached soil profile descriptions). The hand auger borings in the proposed system and repair areas were described as provisionally suitable with a proposed Long Term Acceptance Rate (LTAR) of 0.3 gallons per day per square foot (gpd/ft^2). The LTAR range for a Group IV clay soil is 0.1 to 0.4 gpd/ft^2.

PDAPA is proposing a low pressure distribution system and 100 percent repair area with flow equalization. Any minor surface depressions or humps should be smoothed prior to system installation. This should be done under dry soil conditions to avoid compacting the soil at the system area. Stormwater should be diverted around the proposed system area.

This report is not an Improvement Permit or Construction Authorization and is intended only to summarize our activities that assisted you and the ICHD in permitting the referenced property. The ICHD should verify all soils and system specifications, and required setbacks before permitting and/or septic system installation. Soil evaluations and system layouts are done based on interpretations of the rules governing wastewater treatment and disposal systems and are not guarantees for site approval or future septic system performance.

CLOSURE

Thanks for the opportunity to provide technical assistance associated with septic permitting for the LNYC site. Please call if you have any questions concerning this report.

Sincerely,

S&ME, Inc.

Paul G. Penninger, LSS
Licensed Soil Scientist

Rob Willcox, LSS
Client/Project Manager

Attachments: Soil Profile Descriptions and Hand Auger Boring Locations

S:\2430 Greensboro Environmental\Projects\4358-14-017 Lake Norman Yacht Club\LNYC Septic Soil Evaluation Summary Report.doc

S&ME, INC.
SITE/SOIL EVALUATION

1/3

Project No. 4356-14-017 **Phone No.** _____ **Date:** 1-24-14
Location Long Pavilion **Pin** _____ **County:** Brunswick **Property Size** 22ac

Proposed Facility: LNG Bathouse **Water Supply:** **On-Site Well** ☒ **Evaluation:** **Auger Boring** ☒
must be reviewed **Community** ☐ **Pit** ☐
Described By: PFP - by ICHD **Public** ☐ **Cut** ☐
Weather: cdy **Antecedent Moisture** moist **Surface Water:** LN

FACTORS	PROFILE 1	PROFILE 2	PROFILE 3	PROFILE 4
Landscape Position %	L ~ 5%	L ~ 5%	L ~ 5%	L ~ 5%
Horizon Depth I	0-2	0-10	0-11	0-14
Color Munsell	gy mod	yl brn		
Texture		cl	sa	sa
Structure		wsbk		
Consistence		fr ss/sp		
Boundary				
Horizon Depth II	2-5	10-28	11-26	14-28
Color – Munsell	yl brn	yl	yl	yl brn
Texture	cl	c	c	c
Mottles			f sac	
Structure	wsbk	mfsbk	mfsbk	mfsbk
Consistence	fr ss/sp	fr s/p	fr ss/p	fr ss/sp
Boundary				
Horizon Depth III	5-25	28-48	26-48	28-48
Color – Munsell	red c	yel brn c-cl	yel brn c-cl	yel brn/red brn c
Texture				
Mottles		f-c sac	f-c sac	f-c sac
Structure	mtlsbk	wsbk	wsbk	wsbk
Consistence	fr s/p	fr ss/sp	fr ss/sp	fr ss/sp
Boundary				
Horizon Depth IV	26-48			
Color – Munsell	yel brn			
Texture	c-cl			
Mottles	f-c sac			
Structure	wsbk			
Consistence	fr ss/sp			
Boundary				
Soil Wetness	—	—	—	—
Restrictive Horizon	—	—	—	—
Saprolite	—	—	—	—
LTAR	3	3	3	3
Classification	Ps	Ps	Ps	Ps

LEGEND

LANDSCAPE POSITION

R	Ridge Interfluve
S	Shoulder
L	Linear Slope
S	Foot Slope
N	Nose Slope
H	Head Slope
Cc	Concave Slope
Cv	Convex Slope
T	Terrace
P	Flood Plain

TEXTURE

s	sand
ls	loamy sand
sl	sandy loam
l	loam
si	silt
sil	silt loam
sicl	silty clay loam
cl	clay loam
scl	sandy clay loam
sc	sandy clay
sic	silty clay
c	clay

CONSISTENCE WET

Ns	non-sticky
Ss	slightly sticky
S	sticky
Vs	very sticky
Np	non-plastic
Sp	slightly plastic
P	plastic
Vp	very plastic

MOIST

vfr	Very friable
fr	friable
fi	firm
vfi	Very firm

STRUCTURE

sg	single grain
m	massive
cr	crumb
gr	granular
sab	subangular blocky
ab	angular blocky
pl	platy
pr	prismatic

S&ME, INC.
SITE/SOIL EVALUATION

4/3

Project No. 4358-14-017 **Phone No.** _____ **Date:** 3-25-14
Location LNYC Proj. **Pin** _____ **County:** Terrell **Property Size** ~26 ac

Proposed Facility: LNYC **Water Supply:** On-Site Well ☒ Community ☐ Public ☐ **Evaluation:** Auger Boring ☒ Pit ☐ Cut ☐
Described By: PFP
Weather: SNOW **Antecedent Moisture** moist/wet **Surface Water:** UN

FACTORS	PROFILE A	PROFILE B	PROFILE C	PROFILE D
Landscape Position %	L-S%	L S-10	L-S%	L-S%
Horizon Depth I	0-9	0-20	0-C	0-3
Color Munsell	10yr br	10yr br		
Texture	cl	cl	Same	
Structure	wsbk	wsbk		Same
Consistence	fr ss/ps	fr ss/ps		
Boundary				
Horizon Depth II	9-31	20-36	6-23	5-29
Color – Munsell	10yr	10yr		
Texture	C	C		
Mottles			Same	Same
Structure	mfsbk	mfsbk		
Consistence	fi sp	fi sp		
Boundary				
Horizon Depth III	31-48+	36-48	23-48	29-48
Color – Munsell	10yr 6/8	10yr 6/8		
Texture	cl	cl		
Mottles	f 5%	c 5%	Same	Same
Structure	msbk	wsbk		
Consistence	fr ss/ps	fr ssps		
				Mottled
				29-48
Boundary				
Horizon Depth IV				48+
Color – Munsell				
Texture				
Mottles				
Structure				
Consistence				
Boundary				
Soil Wetness	—	—	—	—
Restrictive Horizon	—	—	—	—
Saprolite	—	—	—	—
LTAR	3	3	3	3
Classification	PS	PS	PS	PS

LEGEND

LANDSCAPE POSITION

R	Ridge Interfluve
S	Shoulder
L	Linear Slope
FS	Foot Slope
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STRUCTURE

sg	single grain
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cr	crumb
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sbk	subangular blocky
abk	angular blocky
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S&ME, INC.
SITE/SOIL EVALUATION

Project No. 435E-14-017 **Phone No.** _____ **Date:** 2-15-14
Location LNYC [illegible] **Pin** _____ **County:** Iredell **Property Size** ~ 78 ac

Proposed Facility: LNYC BAL [illegible] **Water Supply:** On-Site Well ☒ **Evaluation:** Auger Boring ☒
Community ☐ Pit ☐
Described By: PBP Public ☐ Cut ☐
Weather: SNOW **Antecedent Moisture** moist / wet **Surface Water:** LN

FACTORS	PROFILE E	PROFILE F	PROFILE G	PROFILE
Landscape Position %	L ~5%	L ~5%	L ~5%	
Horizon Depth I	0-4	0-9		
Color Munsell	10YR 4/4			
Texture	cl-sicl	sc		
Structure	wk sbk		yellow brown	
Consistence	ss/ps		mottles 4+	
			5-30	
Boundary				
Horizon Depth II	4-30	9-30	~36"	
Color – Munsell	2.5Y 5/4		RBS	
Texture	c	sc		
Mottles				
Structure	mod sbk		Dec	
Consistence	vs/vp		USC	
Boundary				
Horizon Depth III	32-48	30-48		
Color – Munsell	mottled			
Texture	c			
Mottles	F-C 5DP	sc		
Structure	wk sbk			
Consistence	fi/sp			
Boundary				
Horizon Depth IV				
Color – Munsell				
Texture				
Mottles				
Structure				
Consistence				
Boundary				
Soil Wetness	—	—		
Restrictive Horizon	—	—		
Saprolite	—	—	1-~25	
LTAR	3	3	Dec/SAPL	2.6
Classification	B3	B3	B2	

LEGEND

LANDSCAPE POSITION

R	Ridge interfluve
S	Shoulder
L	Linear Slope
FS	Foot Slope
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H	Head Slope
Cc	Concave Slope
Cv	Convex Slope
T	Terrace
P	Flood Plain

TEXTURE

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MOIST

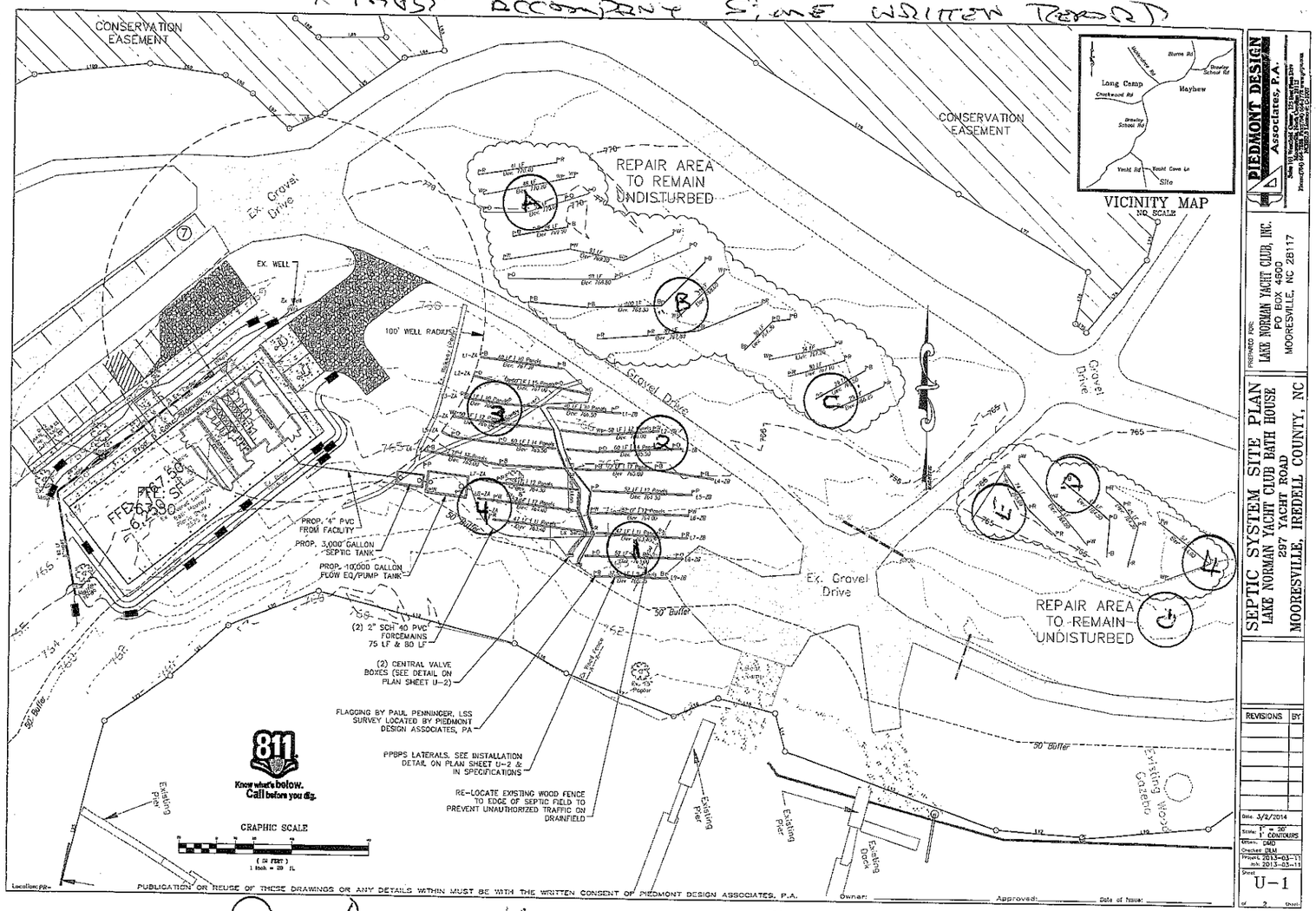
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STRUCTURE

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sbk	subangular blocky
abk	angular blocky
pl	platy
pr	prismatic

LNYC Site Visit 4358-14-017 3-3-14

* Must accompany Site Written Report



PUBLICATION OR REUSE OF THESE DRAWINGS OR ANY DETAILS WITHIN MUST BE WITH THE WRITTEN CONSENT OF PIEDMONT DESIGN ASSOCIATES, P.A.

Owner: _____ Approved: _____ Date of Issue: _____

PIEDMONT DESIGN Associates, P.A.

PREPARED FOR: LAKE NORMAN YACHT CLUB, INC. P.O. BOX 4500 MOORESVILLE, NC 28117

SEPTIC SYSTEM SITE PLAN
LAKE NORMAN YACHT CLUB BATH HOUSE
297 YACHT ROAD
MOORESVILLE, IREDELL COUNTY, NC

REVISIONS	BY

Date: 3/2/2014
Scale: 1" = 50' CONTOURS
Drawn: DMD
Checked: DLM
Project: 2013-03-11
Job: 2013-03-11
Sheet: U-1 of 2 Sheets

O = Approx. Hand Auger Borings

SPECIFICATIONS, CALCULATIONS & SUPPORTING MATERIAL

FOR A FLOW EQUALIZED

GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM USING SEPTIC

TANK, PUMP TANK AND LOW PRESSURE T&J PANEL LATERALS

TO SERVE

LAKE NORMAN YACHT CLUB BATH HOUSE

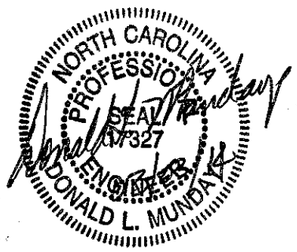
297 Yacht Road

Mooresville, Iredell County, North Carolina

March 3, 2014

Prepared for:
Lake NormanYacht Club, Inc.
PO Box 4600
297 Yacht Road
Mooresville, NC 28117
Phone: (704) 799-7243

Prepared by:
PIEDMONT DESIGN ASSOCIATES, P.A.
125 East Plaza Drive, Suite 101
Mooresville, NC 28115
Phone: 704-664-7888
Fax: 704-664-1778
NCBELS No.: C-1007



Ground Absorption Sewage Disposal System
Lake Norman Yacht Club, Mooresville, Iredell County, NC

T & J Panel System

I. NARRATIVE:

Lake Norman Yacht Club (LNYC) is proposing to tear down the existing bath house and picnic shelter and erect a new one in the same location located outside of the 50 foot setback from Lake Norman high water mark. The property is located off Yacht Road which is located off Brawley School Road in Mooresville, Iredell County, North Carolina. The system is being designed for a peak flow of 2,300 gallons per day and a flow equalized volume of 1,707.14 gallons per day. The facility is to be served by an onsite water supply source located more than 100 feet from any system component. Soils were investigated by Paul Penninger, LSS with S&ME, Inc. The Engineer is proposing to install a 3,000 gallon septic tank with effluent filter, 10,000 gallon flow equalization tank with pumps & associated appurtenances, controls and a PPBPS. The LTAR for the site has been determined to be 0.3 G/D/SF with the repair LTAR of 0.30 G/D/SF.

A pressurized Pre-fabricated Permeable Block Panel System (PPBPS) is proposed for this site due to limited available space and soil data. The panel system will function as additional pre-treatment of effluent before entering the soil. Nitrification lines (panels) are to be placed on 8' centers minimum as shown on the plan. The field will be dosed by a properly sized pump with float control. There is one primary area for the septic system. 100% repair is required on this site and area is available. Primary and repair laterals have been flagged in the field and survey located by Piedmont Design Associates, PA. These lines have been shown on the plan. Repair areas shall remain undisturbed in case of primary system failure.

These specifications address the Owner's responsibilities as well as installation instructions, components of the proposed system, and testing and operating procedures.

The septic system plan has been prepared using physical survey data collected by field survey and flagging of laterals by Soil Scientist.

The area of the nitrification field shall be barricaded to prevent the access of any vehicle or anyone not knowledgeable of septic system installation. Any disturbance within the area shall be performed by the system installer. ONLY!

II. LOCATION:

Travel south on Brawley School Road toward the Point Subdivision. Go around traffic circle and continue on Brawley School Road. Turn left onto Yacht Road. Property will be on left hand side of the road. Contact Engineer for gate code. Upon entry into the site, turn left and proposed building will be on the right.

III. REFERENCE MATERIAL:

(1) DESIGN AND INSTALLATION (Manual)
OF LOW PRESSURE PIPE WASTE WATER TREATMENT SYSTEMS
By: Craig Cogger; Bobby L. Carlisle; Dennis Osborne; Ed Holland
Published by: UNC Sea Grant College Pub. UNC-SC-82-03, May, 1982.

(2) LAWS AND RULES FOR GROUND ABSORPTION SEWAGE DISPOSAL SYSTEMS.
SECTION .1956 OF THE N.C. Administrative Code: Title 10 Health
Services; Environmental Health; Subchapter 10a; Sanitation.
Published by: N.C. Dept. of Human Resources; July 1, 1982.
Paragraph .1956 (a)(ii)(B).

(3) EPA 625/1-80-012 Design Manual Onsite Wastewater Treatment and Disposal System Oct.,1980; Chapter 7.

(6) Carefully backfill manifold trenches to finish grade with clean, debris free earth (no stone or roots).

(7) Leave absorption area with a raked surface, ready for grassing.

(8) The installation contractor shall stabilize the area of construction by planting and seeding with Kentucky 31 tall fescue and shall keep the planted area watered and mulched until such time that a hardy stand of grass is established. (See Seeding Specification.)

(9) SEPTIC TANK The septic tank shall consist of a 3,000-gallon capacity, reinforced, precast concrete tank with full baffle and shall have easy access to each chamber from ground level for checking and pumping. The first chamber of the septic tank shall consist 2/3 to 3/4 of the volume of the total tank and the baffle shall contain a horizontal opening across the tank at about midway its height. The outlet of the tank shall have an effluent filter as specified herein. Locate the septic tank at such height as to provide approximately 8" of cover soil over top of the tank. The tank shall have a DHHS approved access with lid over the filter.

(10) SLOTTED-FILTER A Polylok model PL-525 effluent filter, with 1/16" infiltration shall be installed in the outlet tee in the septic tank. Filter shall be installed on a slotted 4" PVC stand pipe that extends to the bottom of the tank as shown on plan sheet U-2. The filter shall be manufactured by Polylok or state approved equal, sized for the unreduced daily flow. Polylok Inc. 3 Fairfield Blvd., Wallingford, CT 06492, 888-765-9565, sales@polylok.com

(11) PUMP TANK shall consist of a 10,000-gallon capacity, reinforced, precast concrete tank without baffle. Access shall be provided for entry into the tank directly over the pump location with a 30" diameter or larger opening and 24" riser and lid on inlet side. Both risers and lids shall be installed 6" above final grade or as called for on the plan. Tank risers and lids shall be NCDHHS approved. The tank shall be supplied by a manufacturer approved by DHHS and bear the manufacturer's serial number. The tank shall be positioned to allow gravity flow of the effluent from the septic tank.

(12) TANK TESTING
All tanks shall be tested for water tightness by an approved method such as 24-hour water tightness test with maximum allowable leakage not to exceed ½ inch per 24 hours or vacuum test. Testing shall begin after the water level in the tank has stabilized. Any leaking shall be corrected and the tanks retested.

Once testing of the tank has been completed, the tank shall be backfilled in lifts with well compacted, debris free earth to a level, which directs surface water away from the tanks. Tank access holes shall be installed and grouted watertight and the earth raked smooth for grassing. Grade over the tank shall be sloped to prevent surface water from entering the tank through the access. Test shall be completed under the direct supervision of the local health department.

(13) PIPING All piping and fittings shall be Schedule 40 PVC except LPP piping in the panels shall be PR160 PVC. Glue for all PVC pipe joints shall be as recommended by the pipe manufacturer.

(14) PUMP The submerged pump shall be Goulds 3885 Series Model WE0712 as manufactured by Goulds Pump Co., or equal, 3/4 hp, 230v/1ph; capable of pumping 55.50 G/M at a 32.48' TDH.

(15) PUMP CONTROL PANEL: The pump shall be powered by a time dose duplex control panel. Panel shall be mounted 36" or more above grade and readily accessible. The unit shall be as manufactured by Infiltrator or Engineer approved equal. Control panel shall be model IPC-D01 or approved equal. The control panel shall be provided factory pre-wired and tested

the outlet pipe for lifting the pump in and out of the chamber. (The PVC outlet pipe is too fragile to support the pump.)

The pump outlet pipe should be connected to the supply manifold with a threaded PVC union (or dresser coupling) to allow quick removal. A check valve shall also be installed in the supply line (within the pump chamber). If effluent will be pumped down hill, a 3/16" siphon-breaker hole must be drilled in the bottom of the supply line before it leaves the pump tank. This breaks any vacuum in the system and prevents the inadvertent siphoning of effluent out of the tank. This hole is very important.

(21) ELECTRICAL CONNECTIONS: The pump and high water alarm must be placed on separate electrical circuit breakers. (If the pump circuit fails, the alarm must still be able to operate.) Follow the manufacturers' recommendations for the proper fuses or circuit-breakers. All electrical connections must be made outside the pumping chamber. Power cords from the pumps and controls shall extend to a NEMA 4X approved outdoor control panel mounted outside of the pumping chamber. There are to be no junction boxes inside the tank. Power and control conductors shall be conveyed through 2" conduit with Seal-off(s).

Wiring between the pumping chamber and the house should meet State and local code requirements. Conductors from the tank to the control panel shall be conveyed through 2-inch diameter conduit with duct seal or seal-offs.

(22) A "WARNING SIGN" shall be located on the side of the building to inform the owner of what action to take in case the "High Water Alarm" is activated. This sign shall contain the name, address and emergency telephone number of the person to contract immediately upon malfunction of the system.

(23) PROPER OPERATION CHECK: After all components have been installed and connected, the system should be checked for proper operation. With electrical power turned off, fill the pumping chamber with water from a garden hose (or allow effluent to accumulate) until the liquid rises to half of pump tank. Turn on the electrical power. The alarm light should turn on and the pump should start operating. The alarm light should go off when the liquid level falls below the set pressure level on the control panel. The pump should turn off when the liquid reaches the pump off setting on the control panel. Be sure the pump is still completely submerged.

(24) PRESSURE HEAD ADJUSTMENT: The pressure head must be adjusted to match that specified in the design. The pressure head is measured, as the height liquid will rise above the turn-up elbow when the pump is running. To adjust the head:

(a) Glue a 4' length of pipe (preferably clear) to a threaded adapter that will screw onto the turn-up adapters. (Call this the "test tube".)
(b) Replace the turn-up cap with the "test tube".
(c) Turn the power on to allow liquid to rise in the "test tube".
(d) Adjust the ball valve at the head of each lateral, located in the valve box adjacent the zone, until the effluent reaches the desired height in the "test tube". Remember to include the distance below the ground surface to the lateral line when measuring the height. The pressure head should be 3' for each line. This is the height above the lateral the liquid should be in the temporary "test tube". Continue to adjust valves until all "test tubes" have an equal amount of liquid.

(25) FINAL LANDSCAPING: After the T&J System is installed and accepted by the LHD, the following should be checked to insure that the system will not be overloaded with excess rain water and run off:

(a) The distribution field is shaped to shed rainwater and is free of low area.
(b) Gutter and downspout drains are directed away from the system.

DESIGN SPECIFICATIONS - T & J PANEL SYSTEM

Lake Norman Yacht Club
Mooresville, Iredell County, NC

Daily design waste flow:	2,300 G/D (Flow EQ: 1,707.14 G/D)
Septic tank size:	3,000 gal. (2 compartment)
Septic tank filter:	Polylok Model PL-525 filter
Pumping tank size:	10,000 gal.
Effluent loading rate:	0.30 G/D/SF (0.30 G/D/SF Repair)
Total linear feet & diameter:	949 ft. of 1-1/4" dia. PVC of laterals and T&J 16" high panels (allow 4.33 ft per panel) Does not include from valve to panel line
Total length & diameter of supply manifold:	75 LF 2" Dia. SCH 40 PVC (Zone A) 80 LF 2" Dia. SCH 40 PVC (Zone B)
Number of panels:	219 (111 Zone A | 108 Zone B)
Hole size:	5/32"
Hole spacing:	1 hole per panel
Total number of holes:	219 (111 Zone A | 108 Zone B)
Flow per hole at 3' head	0.50 G/M
Flow rate through the system:	109.50 G/M Total 55.5 G/M Zone A | 54.0 G/M Zone B
Flow rate per subfield:	55.5 G/M (Worst Case)
Static head:	12.55' (Worst Case)
Operation head:	3.0'
Friction head:	16.93' (Worst Case)
Total head:	32.48' (Worst Case)
Pump requirements:	55.50 G/M at 32.48' TDH use Goulds 3885 Series Model WE0712 3/4 HP, 230 V, 1 PH
Force main filter:	(2) GAG Sim/Tech Filters w/Socks
Dosing volume:	288.42 Gallons (Zone A) 280.63 Gallons (Zone B)
Dose Volume per Panel:	2.60 Gallons per Panel
Depth of water pumped per dose:	2.31 Inches (Zone A) 2.25 (Zone B)
Pump run per dose:	5.2 min.
Check valve:	yes
Siphon break hole:	yes

CALCULATIONS FOR A FLOW EQUALIZED GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM USING SEPTIC TANK, PUMP TANK AND LOW PRESSURE T&J PANEL LATERALS TO SERVE LAKE NORMAN YACHT CLUB BATH HOUSE

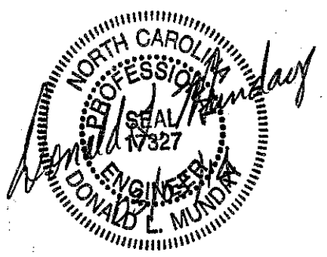
297 Yacht Road

Mooresville, Iredell County, North Carolina

March 3, 2014

Prepared for:
Lake NormanYacht Club, Inc.
PO Box 4600
297 Yacht Road
Mooresville, NC 28117
Phone: (704) 799-7243

Prepared by:
PIEDMONT DESIGN ASSOCIATES, P.A.
125 East Plaza Drive, Suite 101
Mooresville, NC 28115
Phone: 704-664-7888
Fax: 704-664-1778
NCBELS No.: C-1007



PIEDMONT DESIGN ASSOCIATES, P.A.
Suite 101 Westfield Center
125 East Plaza Drive
Mooresville, North Carolina 28115-8812
Telephone (704) 664-7888 Fax (704) 664-1778

Engineering
Surveying
Planning

Project: **Lake Norman Yacht Club, Iredell Co., North Carolina**
Job No. 2013-03-11-EC Date: 03/03/2014 Revision Date: 03/03/2014

No of Members	200.00	Persons
Assumed LTAR	0.30	G/D/SF
Flow per Member	10.00	per 15A NCAC .1900
DDF	1,707.14	G/D (Flow EQ)
	1,896.83	LF Conventional
	1,422.62	LF Chambers
	948.41	LF Panel Block

25% Reduction Laterals (Infiltrator Gravelless Chambers or equal)
50% Reduction T&J Panels

FLOW EQUALIZATION

Saturday	2,000	1,707.14	292.86	Peak Weekend
Sunday	2,000	1,707.14	585.71	Peak Weekend
Monday	2,300	1,707.14	1,178.57	Camp
Tuesday	2,300	1,707.14	1,771.43	Camp
Wednesday	2,300	1,707.14	2,364.29	Camp
Thursday	2,300	1,707.14	2,957.14	Camp
Friday	2,300	1,707.14	3,550.00	Camp
Saturday	2,000	1,707.14	3,842.86	Camp
Sunday	2,000	1,707.14	4,135.71	Peak Weekend
Monday	2,000	1,707.14	4,428.57	Peak Weekend
Tuesday	600	1,707.14	3,321.43	Normal Use
Wednesday	600	1,707.14	2,214.29	Normal Use
Thursday	600	1,707.14	1,107.14	Normal Use
Friday	600	1,707.14	0.00	Normal Use
	23,900	Gallons per 2 Weeks		
	1,707.14	Gal./Day (Flow EQ Volume)		

Camp Week

200.00	Camp Persons
30.00	Volunteers
230.00	Total
10.00	Gal/Day/Camper
2,300.00	Gal./Day

Peak Weekend

200.00	Members
10.00	G/D/Member
2,000.00	DDF (Peak)

Normal Use: 60 Persons @ 10 G/D = 600 G/D

Septic Tanks Sizing for Flow EQ

Septic Tank	2,300.00	Gallons
	2,850.00	Gallons
Therefore, use	3,000.00	Gallon Tank

Dellinger Precast STB-164 or
Approved Equal

Septic Tank Sizing Calculations

600 G/D to 1,500 G/D
V = 1.17Q + 500
1,500 G/D to 4,500 G/D
V = 0.75Q + 1,125
4,500 G/D and up
V = Q

V = Tank Volume
Q = Design Flow

Pump/Flow EQ Tank Sizing

Pump submergence Volume	2,243.91	Gallons	18.00	Inches
Dose Volume	288.42	Gallons	2.31	Inches
Equalization Volume	4,428.57	Gallons	35.52	Inches
Emer. Storage Volume (highest daily flow)	2,300.00	Gallons	18.45	Inches
	9,261	**Gallons**	**74.29**	**Inches**
Gal./Inch in Pump Tank	124.66	Gallons (10,000 Gallons - PT-551)		

Interior Tank Dimensions

Length	Width	
240	120	In
20.00	10.00	Ft

	Zone A		Zone B	
No. of Panels	111.00	Panels	108.00	Panels
Orifice Size	5/32	Inch	5/32	Inch
Operating Head	3.00	Ft	3.00	Ft
Static Head	12.55	Ft	11.75	Ft
Flow per Panel	0.50	G/M	0.50	G/M
Zone Percentage Size	50.68%		49.32%	
Daily Flow to Zone	865.26	Gallons	841.88	Gallons
Doses per Day	3.00		3.00	
Max Dose Volume/Panel	3.60	Gal./Panel	3.60	Gal./Panel
Max Dose Volume/Zone	399.60	Gallons	388.80	Gallons
Actual Dose Volume/Zone	288.42	Gallons	280.63	Gallons
Actual Dose Volume/Panel	2.60	Gallons	2.60	Gallons
Pump Run Time	5.20	Min./Dose	5.20	Min./Dose
Drawdown	2.31	Inches	2.25	Inches
FM Size to Manifold	2.00	Inch	2.00	Inch
FM Length to Manifold	75.00	LF	80.00	LF

Zone A

Friction & Minor Loss Calculations for 2" Force Main and 1.25" Supply Laterals					
	Friction Loss	Pipe Length	No of	Q	Pipe I.D.
Pipe Run	(Feet)	(Feet)	Panels	(GPM)	(Inches)
Line 1	0.99	178	10	5	1.38
Line 2	1.81	175	14	7	1.38
Line 3	0.57	124	9	4.5	1.38
Line 4	0.96	124	12	6	1.38
Line 5	1.25	121	14	7	1.38
Line 6	1.84	124	17	8.5	1.38
Line 7	0.69	89	12	6	1.38
Line 8	0.61	78	12	6	1.38
Line 9	0.40	61	11	5.5	1.38
2" Supply Force Main	5.00	75		55.5	2.067
Total Friction & Minor Loss	16.93	Feet			
Total Dynamic Head	32.48	Feet	(Static HD + Friction HD + Oper. HD)		
Pump Required	**55.50**	G/M at	**32.48**	TDH	

Use Goulds 3885 Series Model WE071512 or Engineer Approved Equal

Zone B

Friction & Minor Loss Calculations for 2" Force Main and 1.25" Supply Laterals					
	Friction Loss	Pipe Length	No of	Q	Pipe I.D.
Pipe Run	(Feet)	(Feet)	Panels	(GPM)	(Inches)
Line 1	0.59	130	9	4.5	1.38
Line 2	0.97	125	12	6	1.38
Line 3	1.29	125	14	7	1.38
Line 4	1.65	125	17	8.5	1.38
Line 5	0.72	92	12	6	1.38
Line 6	0.63	81	12	6	1.38
Line 7	0.44	66	11	5.5	1.38
Line 8	0.44	57	12	6	1.38
Line 9	0.22	48	9	4.5	1.38
2" Supply Force Main	5.06	80		54.0	2.067
Total Friction & Minor Loss	14.66	Feet			
Total Dynamic Head	29.41	Feet	(Static HD + Friction HD + Oper. HD)		
Pump Required	**54.00**	G/M at	**29.41**	TDH	

Use Goulds 3885 Series Model WE071512 or Engineer Approved Equal

Tank Anti-Floatation Calculations

Tank Dimensions & Antifloatation: 3,000 Gallon Septic Tank Dimensions (Dellinger Precast Company)

Outer Length	14.00	Ft.	STB-164	
Inner Length	12.79	Ft.		
Outer Width	6.50	Ft.		
Inner Width	5.38	Ft.		
Outer Height	8.00	Ft.		
Inner Height	6.83	Ft.		
Wt. of Water Displaced	45,427.20	Lbs.		*Outer Length x Outer Width x Outer Length x 62.4 Lb/CF (Wt of Water)*
Wt of Tank	15,925.00	Lbs.	*Top & Bottom*	*Outer Length x Outer Width x 150 Lb/CF x 2 (Top & Bottom) x Slab Thickness*
	6,198.05	Lbs.	*Ends*	*Inner Width x Inner Height x 150 Lb/CF x 2 (Ends) x Wall Thickness*
	18,900.00	Lbs.	*Sides*	*Outer Height x Outer Length x 150 Lb/CF x 2 (Sides) x Wall Thickness*
	1,489.32	Lb	*Baffle*	*Inner Width x (Inner Height-3 Inches) x 150 Lb/CF x x Wall Thickness*
	42,512.37	Lbs.	*Total Tank Wt.*	*Sum Above four*
Wt. of Overburden	10,920.00	Lbs.	@ 12" of Cover	*Outer Length x Outer Width x 120 Lb/CF (Saturated Soil Wt) x Soil Thickness*
Total	53,432.37	Lbs.		*Sum of Total Tank Wt. & Soil Overburden*

Water	45,427.20	<	53,432.37	Tank

Tank Dimensions & Antifloatation: 10,000 Gallon Pump Tank Dimensions (Dellinger Precast Company)

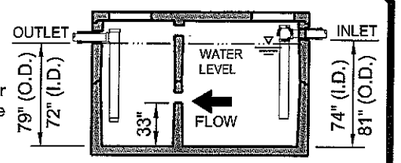
Outer Length	21.33	Ft.	PT-551	
Inner Length	20.00	Ft.		
Outer Width	11.33	Ft.		
Inner Width	10.00	Ft.		
Outer Height	9.50	Ft.		
Inner Height	7.92	Ft.		
Wt. of Water Displaced	143,325.87	Lbs.		*Outer Length x Outer Width x Outer Length x 62.4 Lb/CF (Wt of Water)*
Wt of Tank	54,400.00	Lbs.	*Top & Bottom*	*Outer Length x Outer Width x 150 Lb/CF x 2 (Top & Bottom) x Slab Thickness*
	15,833.33	Lbs.	*Ends*	*Inner Width x Inner Height x 150 Lb/CF x 2 (Ends) x Wall Thickness*
	40,533.33	Lbs.	*Sides*	*Outer Height x Outer Length x 150 Lb/CF x 2 (Sides) x Wall Thickness*
	5,562.50	Lb	*Baffle*	*Inner Width x (Inner Height-3 Inches) x 150 Lb/CF x x Wall Thickness*
	116,329.17	Lbs.	*Total Tank Wt.*	*Sum Above three*
Wt. of Overburden	29,013.33	Lbs.	@ 12" of Cover	*Outer Length x Outer Width x 120 Lb/CF (Saturated Soil Wt) x Soil Thickness*
Total	145,342.50	Lbs.		*Sum of Total Tank Wt. & Soil Overburden*

Water	143,325.87	<	145,342.50	Tank

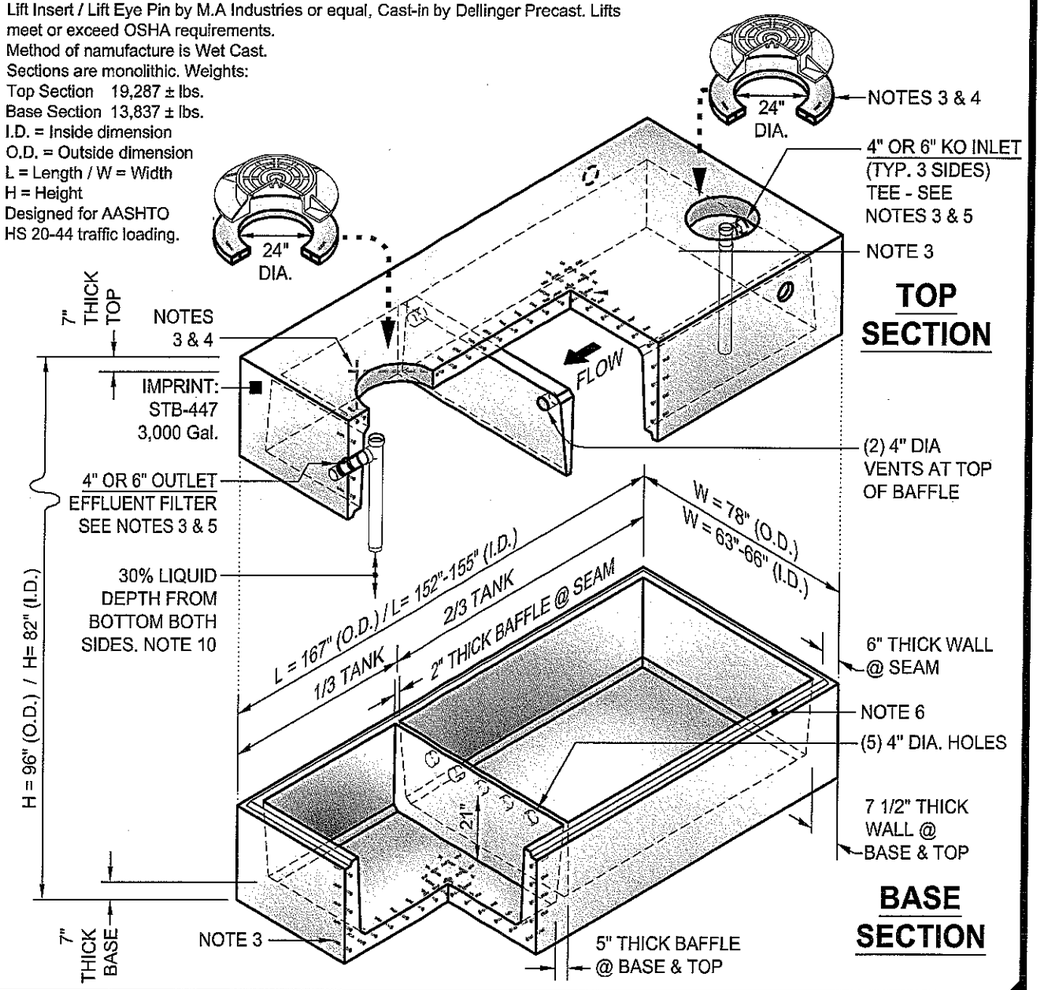
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GENERAL NOTES:

1. Design specifications conform to latest ASTM C1227 specifications "Precast Concrete Water and Wastewater Structures"
2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design to conform to the requirements of ASTM C890 specifications for "Structural Design Loading for Water and Wastewater Structures" and shall utilize grade 60 re-bars conforming to the requirements of ASTM A615 or WWF conforming to the requirements of ASTM A185 or both. Place Additional reinforcing at all openings.
4. Cast Iron casting with 24" dia. access in top section per NCDOT standards or as otherwise specified. Supplied by either Dellinger Precast or customer. To be field adjusted using approved methods by contractor.
5. Pipe penetration locations as per job requirements. Pipe inlet and outlet locations to have PSX Direct Drive boots or equal. Pipe Inlet locaions (typical 3 sides) to be knock out pannels. Effluent Filter supplied by Dellinger. Inlet Tee & Pipe supplied by contractor.
6. Joints to be sealed with ConSeal CS102. butyl rubber joint sealant or equal. Sealant meets or exceeds the requirements of latest federal specification SS-S-0021(210-A), AASHTO M-198B, and ASTM C-990-91.
7. Lift Insert / Lift Eye Pin by M.A Industries or equal, Cast-in by Dellinger Precast. Lifts meet or exceed OSHA requirements.
8. Method of namufacture is Wet Cast.
9. Sections are monolithic. Weights:
   Top Section 19,287 ± lbs.
   Base Section 13,837 ± lbs.
10. I.D. = Inside dimension
    O.D. = Outside dimension
    L = Length / W = Width
    H = Height
11. Designed for AASHTO HS 20-44 traffic loading.



ELEVATION



TOP SECTION

BASE SECTION

DELLINGER PRECAST

3,000 Gallon (Mid Seam) SEPTIC TANK (HS 20-44)

Scale: Not To Scale
Revision Date: February 2008
Detail # ST-3,000-HS20

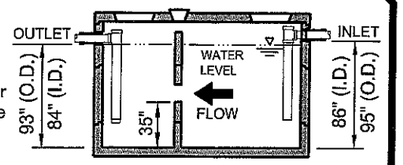
4531 North Hwy 16 ▪ Denver, N.C. 28037 ▪ Phone: 800-948-1666 ▪ 704-483-2868 ▪ Fax: 704-483-2363

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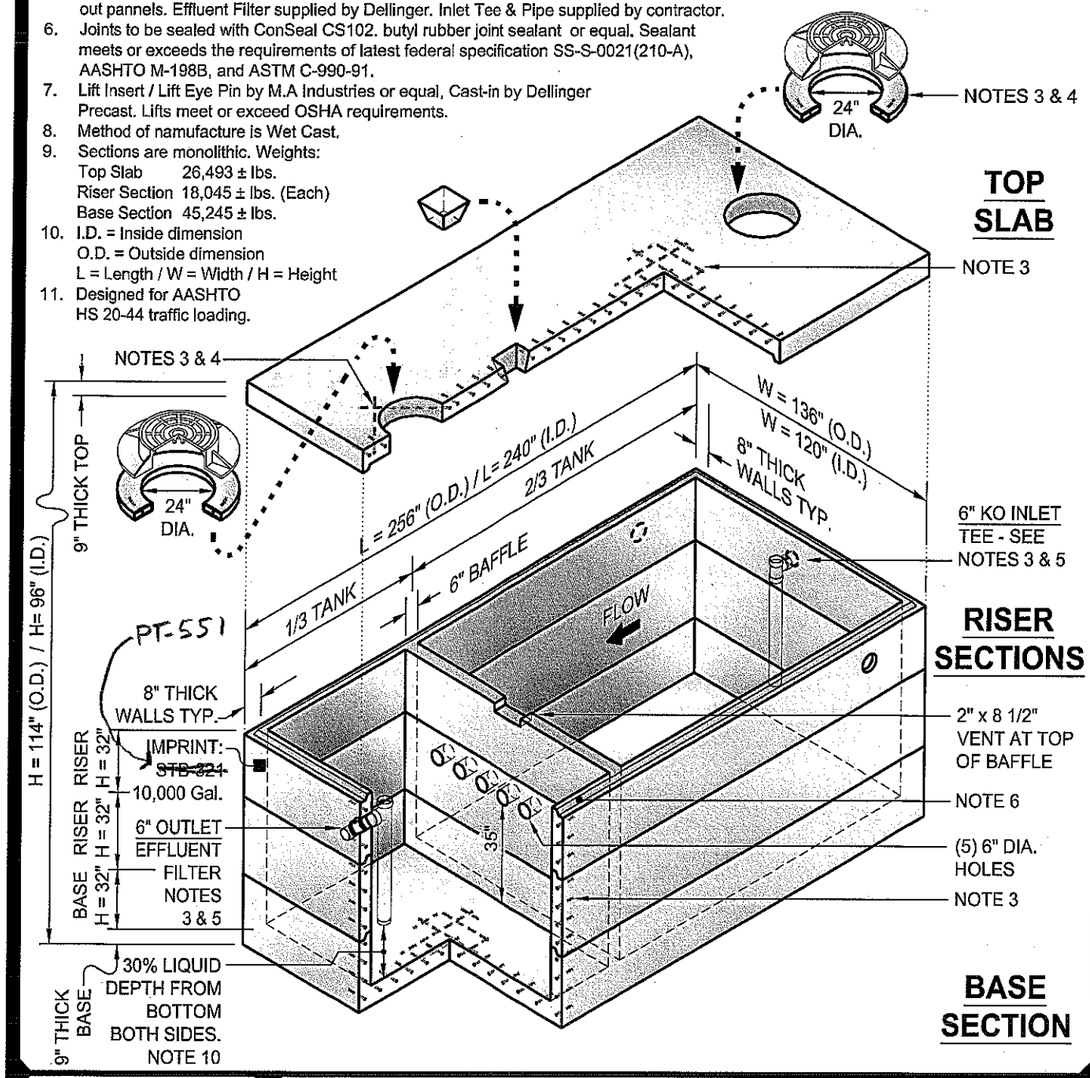
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GENERAL NOTES:

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design to conform to the requirements of ASTM C890 specifications for "Structural Design Loading for Water and Wastewater Structures" and shall utilize grade 60 re-bars conforming to the requirements of ASTM A615 or WWF conforming to the requirements of ASTM A185 or both. Place Additional reinforcing at all openings.
4. Cast Iron casting with 24" dia. access in top section per NCDOT standards or as otherwise specified. Supplied by either Dellinger Precast or customer. To be field adjusted using approved methods by contractor.
5. Pipe penetration locations as per job requirements. Pipe inlet and outlet locations to have PSX Direct Drive boots or equal. Pipe Inlet locaions (typical 3 sides) to be knock out pannels. Effluent Filter supplied by Dellinger. Inlet Tee & Pipe supplied by contractor.
6. Joints to be sealed with ConSeal CS102. butyl rubber joint sealant or equal. Sealant meets or exceeds the requirements of latest federal specification SS-S-0021(210-A), AASHTO M-198B, and ASTM C-990-91.
7. Lift Insert / Lift Eye Pin by M.A Industries or equal, Cast-in by Dellinger Precast. Lifts meet or exceed OSHA requirements.
8. Method of namufacture is Wet Cast.
9. Sections are monolithic. Weights:
   Top Slab 26,493 ± lbs.
   Riser Section 18,045 ± lbs. (Each)
   Base Section 45,245 ± lbs.
10. I.D. = Inside dimension
    O.D. = Outside dimension
    L = Length / W = Width / H = Height
11. Designed for AASHTO HS 20-44 traffic loading.



ELEVATION



DELLINGER ~~PRECAST~~

10,000 Gallon (Multi Seam) Pump ~~SEPTIC~~ TANK (HS 20-44)

Scale: Not To Scale
Revision Date: February 2008
Detail # ST-10,000-HS20

4531 North Hwy 16 ▪ Denver, N.C. 28037 ▪ Phone: 800-948-1666 ▪ 704-483-2868 ▪ Fax: 704-483-2363

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