Mitchell Environmental, P.A.

SEPTIC SYSTEM DESIGN

for

PRINCE PLACE SUBDIVISION- LOT 63

Fuquay-Varina, Harnett County, North Carolina

Submitted to:
Harnett County Health Department
307 Cornelius Harnett Blvd.
Lillington, NC 27546

Prepared for:
Triple A Homes, Inc.
PO Box 1117
Holly Springs, North Carolina 27540

Prepared by:
Scott Mitchell, PE, LSS
Adam Aycock, EI

DATE: August 23, 2022
PROJECT NO.: 4721

1501 Lakestone Village Lane, Suite 205
Fuquay-Varina, North Carolina 27526
919-669-0329

PRESSURE MANIFOLD DESIGN

Name: Triple A Homes **P.I.N. #:** 0633-76-4309 **D #:** N/A

Address: 198 Prince Place Drive **Subdiv:** Prince Place **Lot#:** 63

# of BDR: 4 **Daily Flow:** 480 **gal/day** **L.T.A.R.:** 0.300 **gal/day/sq.ft**

Septic Tank: 1000 **gals (min.)** **Pump Tank:** 1200 **gals (min.)** **Sq. Foot:** 804 **Stone Depth:** N/A (Horizontal Panel Block)

Number of Taps: 4 **Length of Trenches:** 67 **ft(See Tap Chart for Details)**

Depth of Trenches: see Harnett County Permit **Manifold Length:** 42 **in**

Manifold Diameter: 4 in sch 80pvc (minimum) **Tap Configuration: 6 in spacing** 1 **side(s) of manifold**

Supply Line: length: 85 **ft** **Diameter:** 2 **in sch 40pvc**

Friction Loss + Fitting Loss: 1.81 **ft(supply line length + 70' for fittings in pump tank)**

Design Head: 2.0 **ft** **Elevation Head:** 5.00 **ft**

Vent Hole Size: 3/16 **in** **Orifice Coefficient of Discharge:** 0.60

Orifice Coefficient of Contraction: 0.62 **Orifice Coefficient of Velocity:** 0.97

Maximum Head Supplied by Selected Pump(s) at Total Design Flowrate: 23 **ft**

Orifice / Vent Hole Flowrate: 1.99 **gpm** **Head Loss at Orifice / Vent Hole:** 1.46 **ft**

Total Head: 10.27 **ft** **Pump to Deliver:** 23.91 **gals/min at** 10.27 **ft head**

Dosing Volume: 252.59 **gals.**

Drawdown: 252.59 **gals divided by** 19 **gals/in =** 13.29 **inches**

SJE Rhombus Installer Friendly Series simplex control panel, or equivalent, required
A septic tank filter, or equal is required.
Possible pumps: **Hydromatic:** **Goulds:** **Myers:**
Zoeller: 137 **Other:**

TAP CHART

Bench Mark	0.79	is = 100.00	set at	Crawl Space door threshold			**Design Head:**	2.0	
Pump tank elev.		2.5	98.29	**Pump elev.**	93.29		**Manifold elev.**	92.84	
line	**color**	**rod read**	**Elevation**	**length**	**hole size**	**flow/tap**	**gal/day**	**trench area**	**LINE LTAR**
9	Yellow	8.95	91.84	67	1/2in SCH 80	5.48	120.00	201	0.5970
10	Pink	9.77	91.02	67	1/2in SCH 80	5.48	120.00	201	0.5970
11	Blue	10.63	90.16	67	1/2in SCH 80	5.48	120.00	201	0.5970
12	White	11.28	89.51	67	1/2in SCH 80	5.48	120.00	201	0.5970
		total	**feet =**	**268**	**gal/min =**	**21.9**		**LTAR =**	**0.3000**
% of Pipe Vol.		145		**Des. Flow**	480.00			**(ltar + 5%)**	0.3150
Dose Volume		252.59		**Pump Run=**	21.90			**(ltar W/ VPB)**	0.6000
Dose Pump Time		11.52		**Tank Gal/IN**	19			**(ltar + 5%)**	0.6300
Drawdown in Inches		13.29		**Elev. Head**	5.00				
Supply Line Length		85							

Comments:

STB - 345 - Top Seam

Approval Date: 12 - 09 - 99

Liquid Capacity 1007 Gallons

Non Traffic Rated

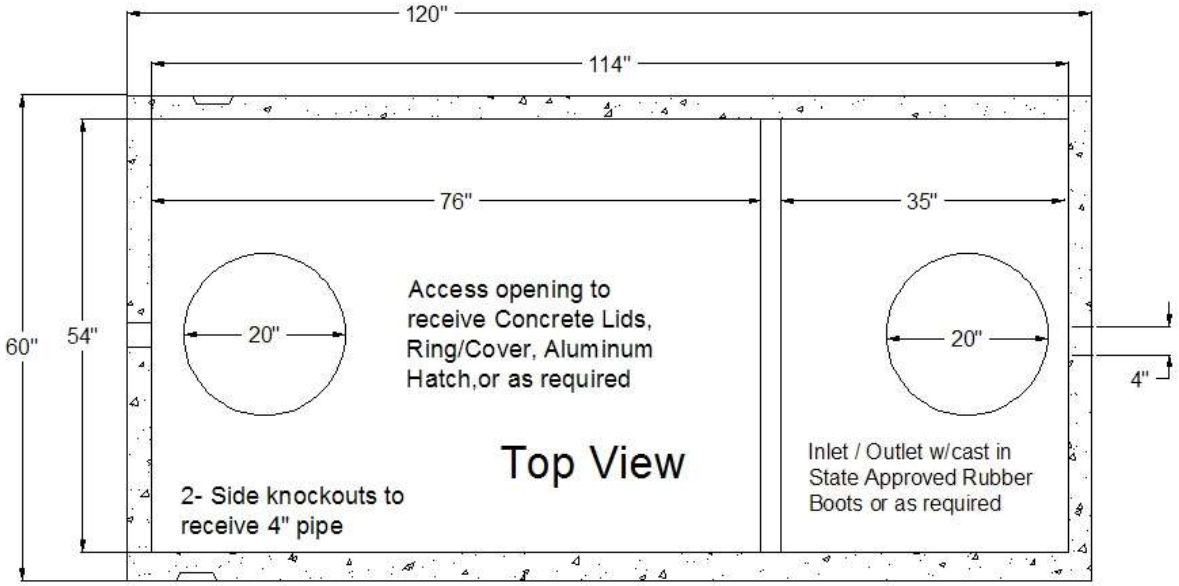
Reinforcing Schedule: # 3 Grade 60 Rebar

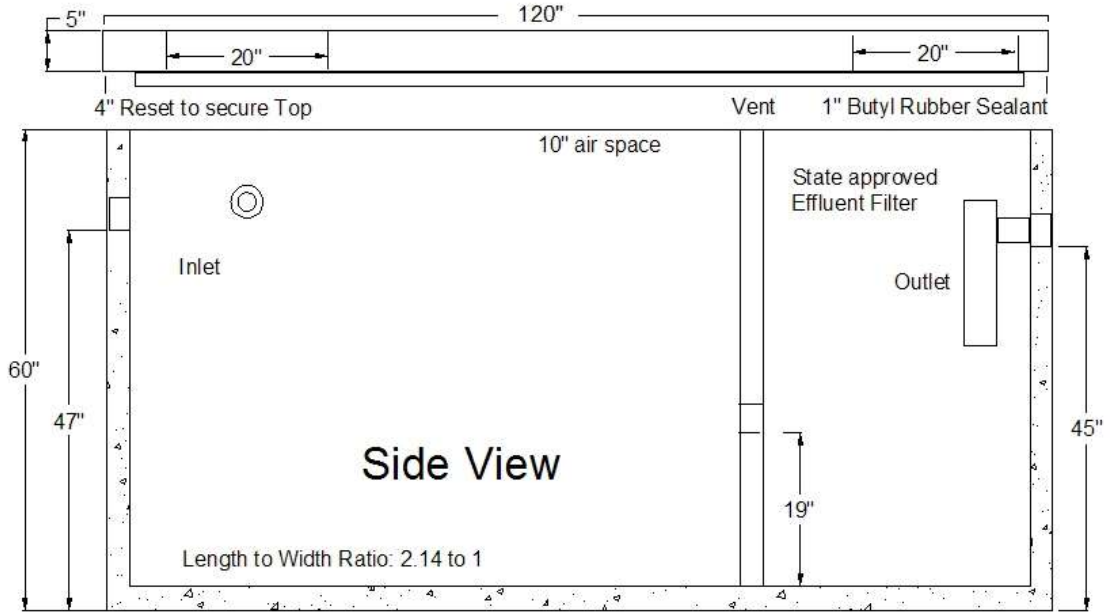
4500 PSI Concrete w/ State Approved Structural Fiber

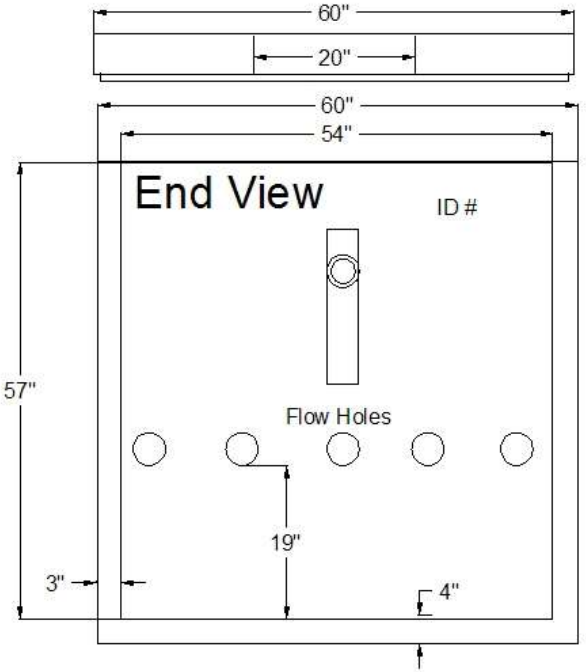
Est. Weight: 8,200 lbs.

Manufactured By:

GARNERS
Septic Tanks, Inc.
Eddie Garner, *President*
919-718-5181
121 Stanton Hill Road
Carthage, NC 28327
Fax 919-775-2229
Eddie@garnersseptictanks.com







POLYLOK™ Inc.
Innovations in Precast, Drainage & Wastewater Products
Zabel® A Division of Polylok Inc.

PL-68 Effluent Filter

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:

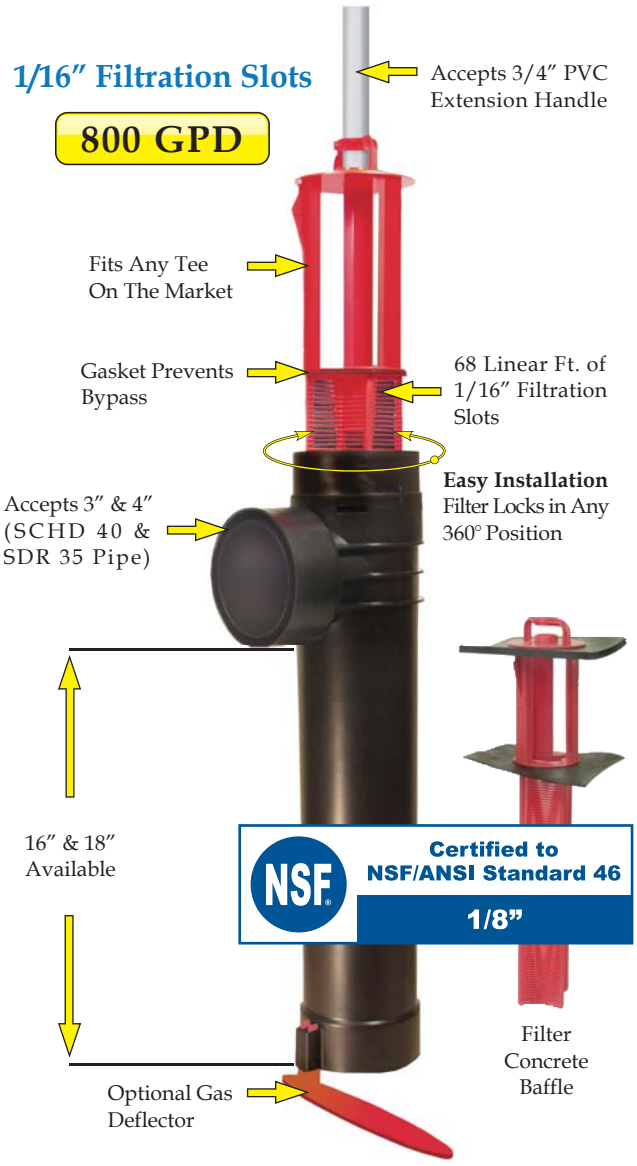
The PL-68 Effluent Filter will operate efficiently for several years under normal conditions before requiring cleaning. It is recommended that the filter be cleaned every time the tank is pumped, or at least every three years.

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

Polylok, Inc. 3 Fairfield Blvd. Wallingford, CT 06492 Toll Free: 877.765.9565 Fax: 203.284.8514 www.polylok.com

Design, Installation and Maintenance

of the

T & J Panel
Wastewater Treatment System

A Better Quality Effluent

Environmental Health Specialists
Septic Tank Installers

Updated 2021

TABLE OF CONTENTS

Introduction

Although this manual is sectioned for specific user groups, we at T&J Panel suggest you familiarize yourself with the complete manual. Please visit our website at www.TJPanel.com for more resources regarding design, installation and maintenance of T&J Panel Systems. All of the resources provided in this manual are available online to print. The most current and up-to-date version of this manual is posted on our website at www.TJPanel.com and supersedes all printed editions. For further discussion of this manual, questions about design, or other inquiries about our product, please reach out to our office at 704-924-8600.

Company Information

Office: 269 Marble Rd.
Statesville NC, 28625
Office Phone: 704-924-8600
Office Fax: 704-924-8681
Website: www.TJPanel.com
Email: Info@tjpanel.com
Brad Johnson: 704-880-7697
Brad@tjpanel.com

Installer Training

While T&J Panels does not require a product specific installer certification, it is our goal to train installers to correctly install a panel block system. If it is your first time installing, inspecting, or designing a system, please do not hesitate to reach out to us, or to ask us to include the installer training for your job. Installation training will send a company representative to your jobsite to discuss the panel block system and how to properly install them. T&J Panels recommends an installation training for each orientation of the panel block system (both horizontal and vertical). Contact our offices to schedule your install training at 704-924-8600.

SYSTEM DESIGN

The primary reason for permitting the panel block system is because of insufficient space for a conventional system. Panel block systems are included in the North Carolina Sewage Regulations [10NCAC 10A.1956 (3) (a) (ii)] [15ANCAC 18E .0905] as a modified conventional system. The panel block system should be considered when: a quality effluent may be needed, space is limited, usable soil is limited, or there are indications that at some future time space may be needed for other development. When there is a trend for added development such as additions to homes, pools or other special landscaping development, a T&J Panel System may prevent insufficient space later. As the Environmental Health Specialist who is designing a system, know that the panel block system may be an option the property owner would like to utilize if they desire continued future development of their lot.

As noted in the regulations, a PPBPS (Prefabricated, Permeable, Block Panel System) is permitted where soils are suitable, provisionally suitable, or reclassified provisionally suitable, however only one half of the nitrification area required by a conventional system is needed. This is one reason the panel block system can help to utilize the best soils available on the lot. The minimum soil depth required for vertically installed Panel Systems is 34-inches (minimum depths require 6" of suitable soil cover), whereas the minimum soil depth required for horizontally installed Panel Systems is 26-inches in a traditional trench or 18-inches if utilizing fill. Most of the concepts for laying out a panel block system are the same as for a conventional system; the biggest difference being the nitrification area needed and the quality of effluent being introduced into the ground.

T&J panels can be gravity fed, pumped to a pressure manifold or distribution box and then gravity fed into the lines, or pumped to low-pressure panel lines. When designing a pressure system, the principles of low-pressure distribution are as described in the LPP manual. There is further discussion on pressure systems on page 13 of this manual.

PPBPS Sizing in Trench Formation

A three-bedroom house with a 0.4 gpd application rate. (The first three steps are the same as for the conventional system.)

1) 120 gallons per bedroom X 3 bedrooms = 360 gallons per day design flow rate.

2) 360 gallons' flow rate / 0.4 application rate = 900 sq. ft. of conventional trench bottom.

3) 900 sq. ft. / 3 ft. wide trench = 300 linear feet of conventional system.

This conventional layout requires 2400 sq. ft. of area on the lot with another equal area of repair space for a total of 4800 sq. ft. of suitable usable area. To calculate the size of the T&J Panel system, the above calculations must be made with an additional fourth step as described in [10NCAC 10A .1956 (3) (a) (ii) (B)] for a PPBPS, (T&J Panel System).

4) 300 linear feet of conventional system X 0.5 for a horizontally or vertically installed 16inch panel block system = 150 linear feet of T&J Panel System.

A panel block system requires only a 975 sq. ft. area on the lot for the system with an equal area for repair, a total of 1,950 sq. ft. With the panel block system, the installation and repair can go into the same area as the initial area required for a conventional gravel trench system.

PPBPS Bed System Sizing

A three-bedroom house with a 0.4 gpd application rate. (The first three steps are the same as for the conventional system.)

1) 120 gallons per bedroom X 3 bedrooms = 360 gallons per day design flow rate.

2) 360 gallons' flow rate / 0.4 application rate = 900 sq. ft. of conventional trench bottom.

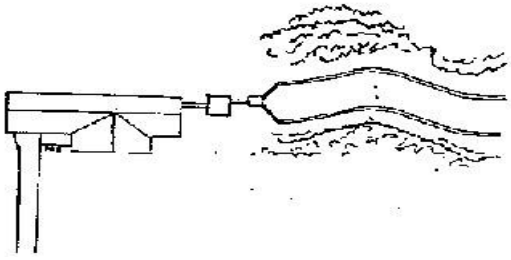
3) 900 sq. ft. x 1.5 = 1,350 sq. ft of conventional bed area needed

4) 1,350 sq. ft x 0.5 = 675 sq. ft of PPBPS bed area needed

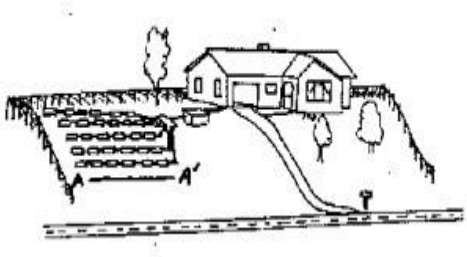
PPBPS beds are excavated in 3-foot increments up to a maximum bed width of 24 feet. Nitrification lines are placed 3 foot on center and 1.5 feet from the bed sidewalls. Bed systems will require a greater number of panels than a typical trench layout. This ensures proper distribution along with added storage and treatment capabilities. Bed systems can be considered when dealing with lots that are limited by space, topography, or other site-planning considerations and can only be used in soil group types I, II, and III per 1955(d). Design daily flow for a single bed cannot exceed 600 gallons per day. For a complete guide to the design, installation, and inspection process for a PPBPS Bed System, please refer to our T&J Panel Bed Design & Installation Manual found on our website at tjpanel.com.

Window Effect

To prevent hydraulic overload in the soil, aerial space should always be a consideration for any system. This condition is especially notable with panel block systems, as with any system that reduces the size of the aerial area drain field. The following is a simplistic example of this concept:



MOST DESIRABLE

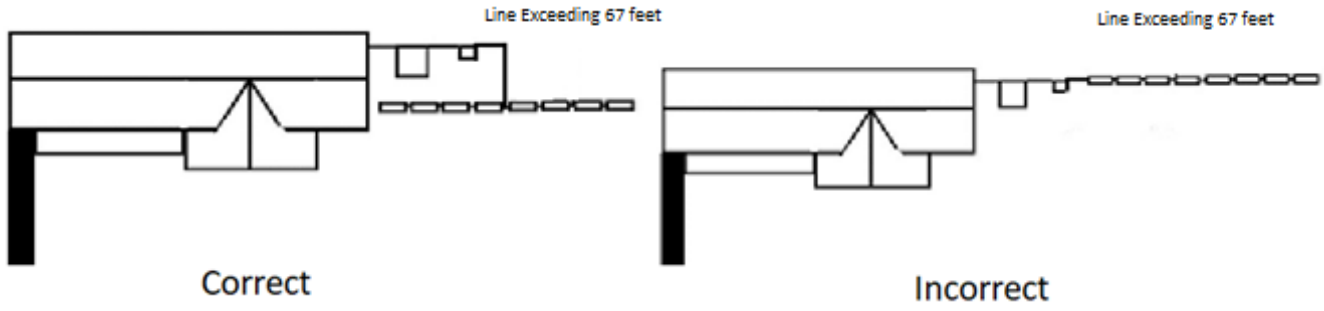


LESS DESIRABLE

While both systems have the same linear footage of trench, the second diagram is a less desirable design. The effluent must pass through the area A-A' which can cause a strain on that area and even a failure because of hydraulic overloading.

Distribution

When utilizing gravity flow on longer line lengths, consider the ability to feed the line at the center or at multiple points to provide better downline distribution. In the incorrect example below, the aerial space is good and the chance of hydraulic overloading is greatly reduced. The resulting problem lies in that a long trench fed from only one end will not give optimal downline distribution. In the correct example the long trench has been fed from the midpoint. Feeding lines from multiple points is another option to decrease the length that effluent must travel and thus provide more optimal distribution. Because the panel lines are put in as level as possible (never exceeding ¼ inch of drain line fall in 10 feet of run), the supply line will feed in both directions equally. T&J Panel recommends that no gravity line exceed 67 feet from the point of introduction. T&J Panel recommends that distribution between 68 and 85 feet long from the point of introduction utilize a pressure manifold to gravity, and distribution exceeding 85 feet long from the point of introduction utilize low-pressure distribution. (These are best practice, but not required)



Any questions regarding the optimal distribution method for your system design, please contact our office.

Calculating Panels per Trench

To calculate the number of panels needed for a given nitrification line length, the formula is **Number of Panels** = LF(linear feet) x 12/52. If the result is a decimal of .4 or lower, round down to the nearest panel (panel spacing may be slightly closer than 6 inches to fit the line length). If the result is a decimal of .5 or higher, round up (panel spacing may be slightly further than 6 inches to fit the line length). To calculate the number of panels needed for a 50-foot line, multiply 50' X 12" = 600", then divide by 52" which is 46 inches for the panel and 6 inches for the space between the panels in the trench. 600" / 52" = 11.5 panels; therefore, the 50-foot line would call for 12 panels. Ideally, the sizing of the lines should be as equal as possible with as close to the same number of panels in each trench as is practical.

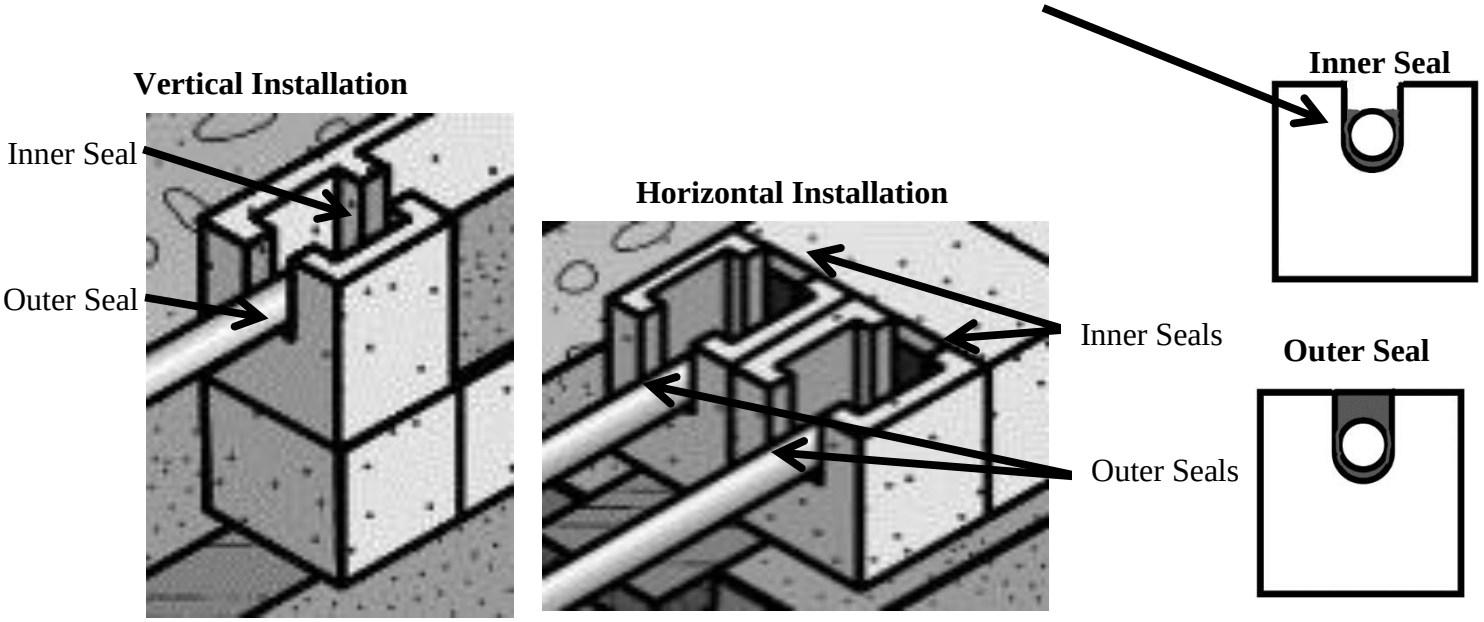
Backfill

Backfill sand shall be a clean, screened, medium-grade sand that is naturally-occurring. Acceptable sands are sands that are suitable for the production of ready-mix concrete and clean of organic debris and stone. In true Group I soils, panels can be installed directly on the trench bottom (when soil depth is limited). Additional backfill sand used during installation should meet grade and specs listed below. Sands dredged from rivers and creeks can be used, if gradation is sufficient to be blended into ready-mix concrete production. Product description includes, but is not limited to: Concrete Sand, NC-2S Sand, ASTM C-33 Sand, FA-10 Sand and Grade "A" Sand. Product suitability is important and T&J Panel, Inc. will help answer any questions.

S.A.P. Sand Alternative Product: is the geotextile fabric inside each panel for quality control and downline and horizontal distribution. (this takes the place of medium blasting sand)

Foam Sealant / Tar Seals

The drawings below illustrate the outer and inner seal. Note that while the outer seal is a complete seal, the inner seal is only up to the top of the connecting pipe. This is to allow for over flow of the effluent into the sand at peak use. These seals can be inspected by lifting the caps at the ends of the panels while inspecting the system installation. GE Foam Sealer is an approved alternative to tar for these seals. Care should be used not to glue the caps down with the use of GE Foam Sealer. When using GE Foam Sealer, special care should be used on the inner seals of the panel not to over fill or under fill this seal. The **inner** seal, if sealed off completely, will restrict the overflow reservoir.



Preparation for Installation

The Panel Block System

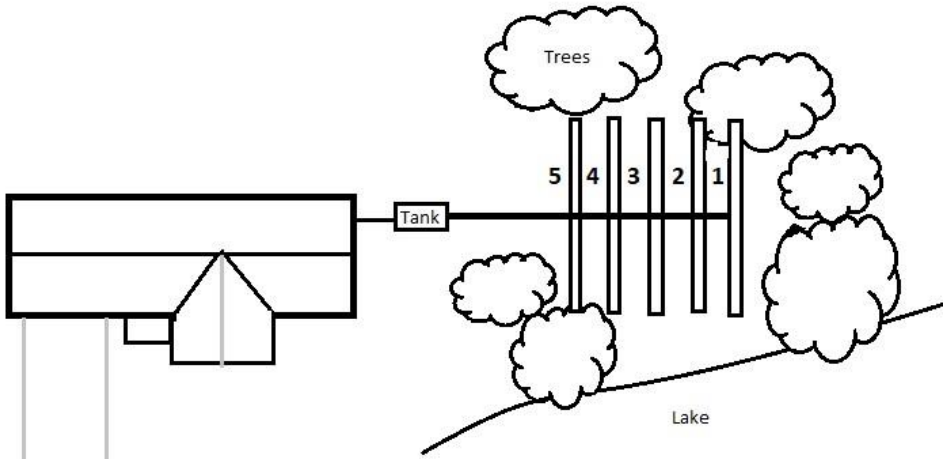
Generally, on level open land, a panel block system can be installed in about the same amount of time as a conventional system; however, traditionally, panel block systems have been installed where space and topography have restricted the use of a conventional system. For this reason, panel block system installations typically require more time. Many installers enjoy the change of working with panels, not handling gravel, and the satisfaction of knowing a better quality, long-lasting system has been installed.

Ordering Materials

T&J Panel partners with suppliers to ensure panel block systems are available statewide. Please be sure to let your supplier know what installation method you are utilizing, as this will affect the amount of materials needed for the system. For information on the distributor located closest to you, call **704-924-8600** or email **info@tjpanel.com**.

Installation Tips

Installation for multiple line systems should begin in the most confining area and be worked to the more open areas.



Above is an example of a multiple line installation. As you can see, the installation should begin with the line marked 1 and proceed to 2, 3 then 4. This procedure will greatly ease material handling and backfilling. (Note, sections of the drain lines should be left uncovered to allow for inspection of lines when area is confined and return access to lines is limited.)

Most Panel Systems are currently used due to space considerations and caution should be taken to preserve suitable soil structure and site conditions.

Below are two examples of drain lines on sloping lots. The second drawing shows the drain line going through a slope making the center of the line deeper in the ground, resulting in an undesirable situation. The first drawing shows the drain line going around the slope (on contour) keeping the trench depth and cover uniform for the entire length of the line. On slopes, care should be given to avoid cutting away valuable topsoil in an effort to make straight lines. The panel line should be installed on grade with the contour of the natural slope. Panel lines can be curved to almost any degree.

CORRECT INCORRECT

Trench Preparation

Trench grade should be established so that backfill cover will be four to six inches over the tops of the panels. (Note, on severe slopes, system depth should be adjusted to protect against breakout of effluent.) In shallow soil conditions, panel blocks may be installed at grade and require 6 inches of topsoil suited for vegetative growth be brought in. In soils containing clay as the key mineralogy, the trench side walls should be raked to bring slicked over areas back as near to original structure as possible. A light dusting of lime on the sidewalls will help restore the soils back to their original structure.

***** Please Let Your Distributor Know If You Need Vertical or Horizontal Panels*****
(This will change the amount of materials needed to complete your job)

Materials Needed for Vertical Installation

- One can of GE Foam Sealer per five panels or 3ft of half inch tar seal rope per panel
- Two feet of 2-inch SCH 40 pipe per panel (unless low pressure distribution is used). For low pressure systems, use the same linear feet as line layout of 1 ¼ or 1 ½ inch pipe. Additional pipe is needed for all supply lines.
- Same linear feet of 1x4 or 1x6 boards as total line length of system to be installed
- Bag of powder lime when in clay soil

Materials Needed for Horizontal Installation

- Three cans of GE Foam Sealer per ten panels or five feet of half inch tar seal rope per panel
- Two pieces of two foot long 1 ½ inch SCH 40 pipe per panel (unless low pressure distribution is used). For low pressure systems, use the same linear feet as line layout of 1 ¼ or 1 ½ inch pipe. Additional pipe is needed for all supply lines.
- Same linear feet of 1x6 boards as total line length of system to be installed
- Bag of powder lime when in clay soil

T&J Panels Jobsite Worksheet

Homeowner/Job Name: _____ County:

_____ Address:

_____

System Description (Distribution type, total lines, line lengths, etc.):

_____

_____

MATERIALS CHECKLIST:

_____ Vertical T&J Panels (Caps included)

_____ Horizontal T&J Panels (Caps included)

_____ GE Foam Sealer (amount varies based on installation method)

_____ Powdered Lime

_____ Entry T (per line, Horizontal Installation ONLY)

_____ AVAILABLE FOR PURCHASE FROM T&J PANEL.

_____ 2" Pipe

_____ 1 ½" Pipe

_____ 1 ¼" Pipe

_____ Fittings for Pipe

_____ Backfill Sand (Clean, Screened, Naturally-Occurring, Concrete Sand, or ASTM-C33, NC-2S, FA-10 and Grade "A" Sands)

↳ Be sure to use the correct backfill sand material. Contact our offices for backfill sand sources or with any questions regarding backfill sand material.

_____ 1x4 or 1x6 Board (Does not need to be treated)

ADDITIONAL PRODUCTS THAT MAY BE NEEDED FOR COMPLETITION:

_____ Septic Tank _____ Gallon

_____ Pump Tank _____ Gallon

_____ 4" Pipe

_____ Distribution Box

_____ Manifold _____ Taps _____ Size

_____ Install Training

_____ Tar Seal Rope (5ft. per panel)

Installation Process

Vertical Trench Installation

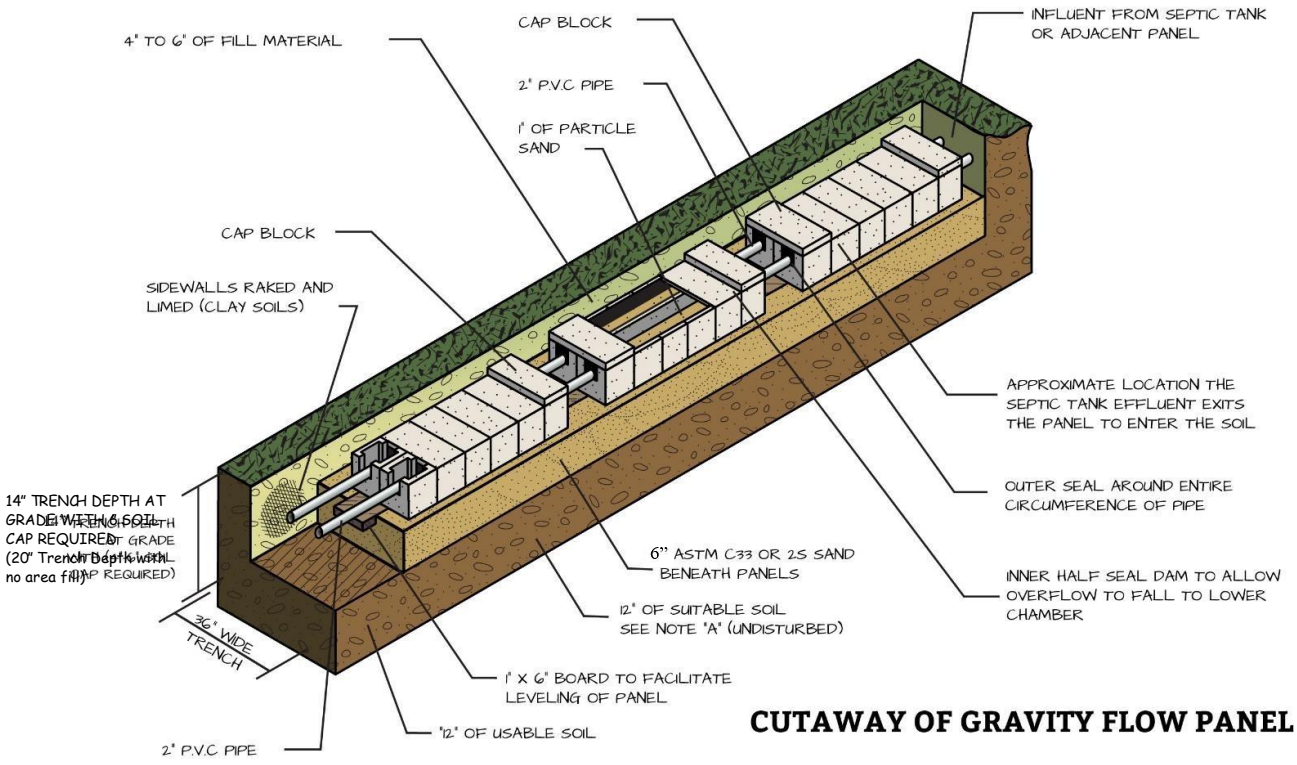
1. Start by shooting grade and marking contour of the lot
2. Using the lowest or shallowest grade on contour, add the specified trench depth
3. Dig the trench at the elevation derived, checking grade frequently.
4. Trenches should be two feet wide and spaced at least 8 foot on-center.
5. If smearing of the side walls is present (as is the case in most clay dominant mineralogy), the side walls affected should be raked to bring them back to original structure.
6. Place a 6-inch layer of appropriate backfill sand (natural, clean, screened) in the trench and level to grade.
7. Place 1x4 or 1x6 inch boards flat down the middle of the trench.
8. Check the grade of the boards by shooting the grade off the top of the boards.
9. Once grade boards have been set, panels may be set into the trench on top of the boards using equipment and a lift chain, or if need be by hand.
10. Panels can be placed about 6 inches apart. This spacing can be adjusted to ensure the correct number of panels can be placed into each nitrification line.
11. GE Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings.
12. Once the GE Foam Sealer or tar seal rope is in place, a 24-inch section of 2 inch PVC pipe (for gravity distribution, see page 13 for pressure distribution instructions) is cut to span from the middle top chamber of the first panel to the middle top chamber of the next panel.
13. Using foam sealer or tar seal rope, form a complete seal on all outer cutouts. Ensure that inner seals are partial seals that do not extend over top of the PVC pipe.
14. After completing the inner and outer seals, place a cap block on each end of the panel to cover all openings.
15. The cap block may serve as an inspection port at some later date.
16. Use the appropriate backfill sand to backfill up to the top of the panel block.
17. The system is now ready for final inspection.
18. After final inspection, a minimum of 4-6 inches soil cover is to be added over top of the panel block system.

Horizontal Trench Installation

1. Start by shooting grade and marking contour of the lot
2. Using the lowest or shallowest grade on contour, add the specified trench depth
3. Dig the trench at the elevation derived, checking grade frequently.
4. The recommended trench width for horizontal panels is three feet wide and spaced at 9 foot on center unless 8 foot on-center is required to meet setbacks. A two-foot wide trench may be used when limited by slope-correction.
5. If smearing of the side walls is present (as is the case in most clay dominant mineralogy), side walls effected should be raked to bring them back to original structure.
6. Place a 6-inch layer of appropriate backfill sand (natural, clean, screened) in the trench and level to grade. If installing in Group I soil, this 6-inch layer of sand beneath the panel is optional.
7. Place 1x6 inch boards flat down the middle of the trench.
8. Check the grade of the boards by shooting the grade off the top of the boards.
9. One grade boards have been set, panels may be set into the trench on top of the boards using equipment and a lift chain, or if need be by hand.
10. Panels can be placed about 6 inches apart. This spacing can be adjusted to ensure the correct number of panels can be placed into each nitrification line.
11. At the beginning of each line, install an Entry T (for gravity distribution) to divide the gravity flow, as close to the beginning of the first panel as possible.
12. GE Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings.
13. Once the GE Foam Sealer or tar seal rope is in place, a 24-inch section of 1 ½ inch PVC pipe (for gravity distribution, see page 13 for pressure distribution instructions) is cut to span from the middle top chamber of the first panel to the middle top chamber of the next panel.
14. Using foam sealer or tar seal rope, form a complete seal on all outer cutouts. Ensure that inner seals are partial seals that do not extend over top of the PVC pipe.
15. After completing the inner and outer seals, place a cap block on each end of the panel to cover all openings.
16. The cap block may serve as an inspection port at some later date.
17. Use the same backfill sand as used in the trench bottom to backfill up to to the top of the panel block.
18. The system is now ready for final inspection.
19. After final inspection, soil cover is to be added over top of the panel block system.

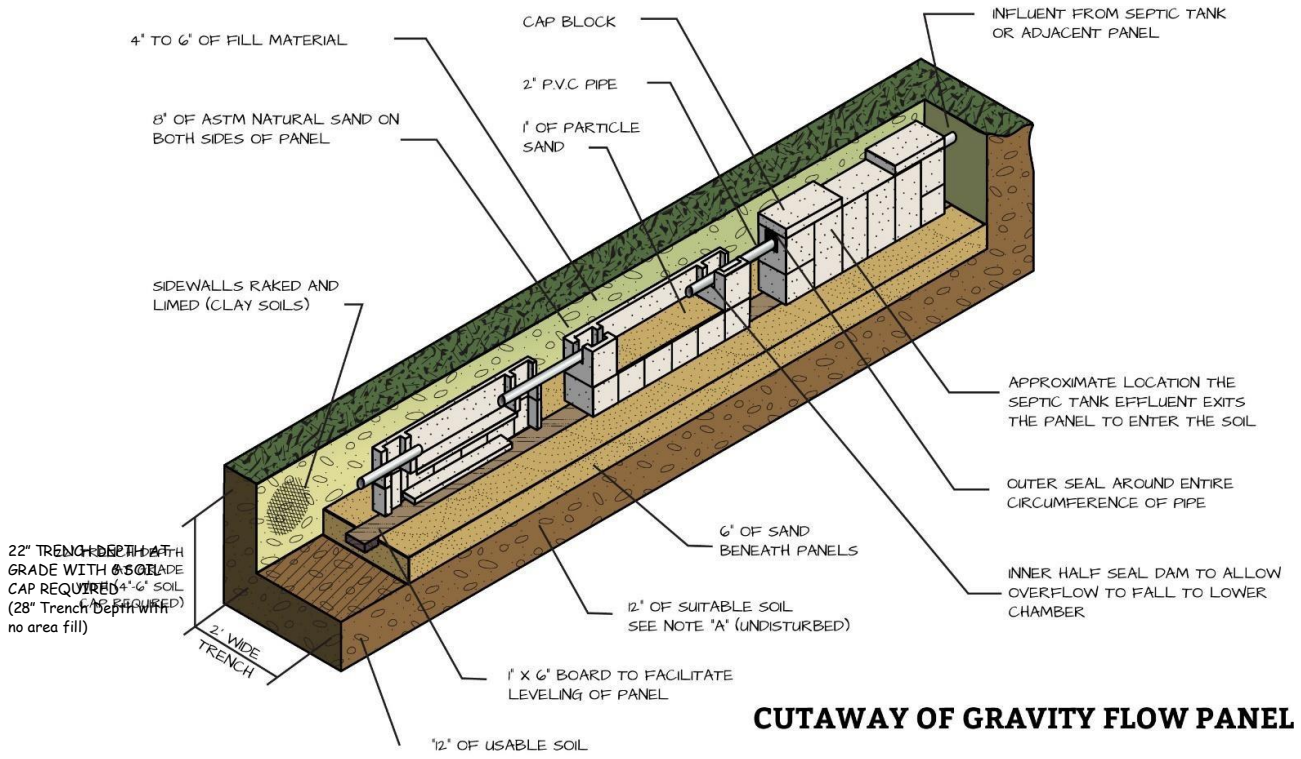
The following page provides illustrations of proper installation of vertical and horizontal panels along with all necessary components.

Isometric Drawing of a Segment of T & J Panel Horizontal Installation



CUTAWAY OF GRAVITY FLOW PANEL

Isometric Drawing of a Segment of T & J Panel Vertical Installation



CUTAWAY OF GRAVITY FLOW PANEL

Pump to Pressure Manifold Gravity Feed

When pumping to gravity feed, the vertical panel should be dosed at 3.6 gal per panel and the horizontal panel should be dosed between 3.6 gal to 7.2 gal per panel. The outer and inner seal on the first panel in each line should be a full seal. The maximum flow per tap on a vertical panel should be 12.5 gpm and 17.7 gpm on horizontal panels.

Low-Pressure Distribution

The LP Panel uses technology similar to that of Low Pressure Pipe (LPP) Systems, with the orifices discharging into the panels. The tables and distribution design described in the LPP manual, in most regards, is applicable to the pressure Panel System. The system should be used with two to four feet of head. In *both* horizontally and vertically installed pressure dosed panel systems, valves should be banked in a valve box and turn-ups should be neatly capped, covered and labeled for future service. Pump tanks should be constructed as shown in the drawing on page 14 to allow for service and repairs.

Vertical Panels with Pressure Distribution

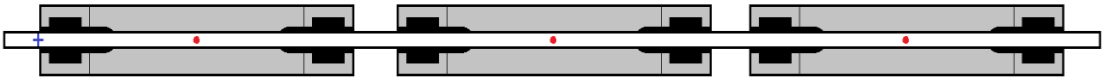
When using low pressure distribution, our recommended dosing is 3.6 gallons per panel. By dosing each panel at 3.6 gallons, the top chamber will have the optimal ratio of both effluent and freeboard, allowing for storage capacity and high oxygen content. By drilling one hole per panel in the distribution line, the total dose volume can easily be calculated by multiplying the number of panels by 3.6. As an example, for a system with 34 panels and identical orifice sizes, the total dose volume would be 122 gallons (34 X 3.6 = 122). Special care should be taken to ensure that only one hole is drilled per panel. The first and last hole of each line should be drilled at 6 o'clock (facing trench bottom) to act as weep holes, helping any residual effluent to escape the line. All holes in between should be drilled alternating from the 10 o'clock and the 2 o'clock positions on the distribution pipe, with only one hole per panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

Horizontal Panels with Pressure Distribution

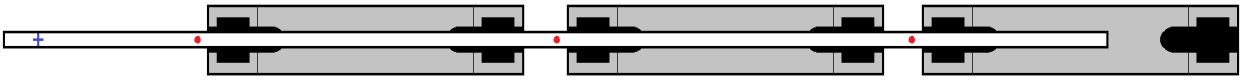
When dosing a horizontal panel with low pressure distribution, the same ideas apply. Panels will have one orifice each. For cost effectiveness, it is allowable to run a single distribution pipe per line rather than having to install two for each line (one in each chamber). We recommend the distribution line be installed in the chamber that is most uphill. The chamber without the distribution still serves its purpose of storage capacity as the panel block matrix allows for effluent permeability. The chambers without a distribution line must have a full seal of foam sealer on the outer cutout. Additional materials may be used to give structure to the foam sealer to prevent unstable seals during the curing process. As with vertical panels, calculating total dose volume for a low-pressure horizontal panel system can be achieved by multiplying total number of panels by 3.6 gallons. If a system has 34 panels and all holes are the same size, you would multiply 34 X 3.6 to get 122 gallons per dose cycle. that the effluent is pumped into the inner chambers of the panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest. The first and last hole of each line should be drilled at 6 o'clock (facing trench bottom) to act as weep holes, helping any residual effluent to escape the line. All holes in between should be drilled alternating from the 10 o'clock and the 2 o'clock positions on the distribution pipe, with only one hole per panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

Proper Hole Placement in a Low-Pressure Panel Block System

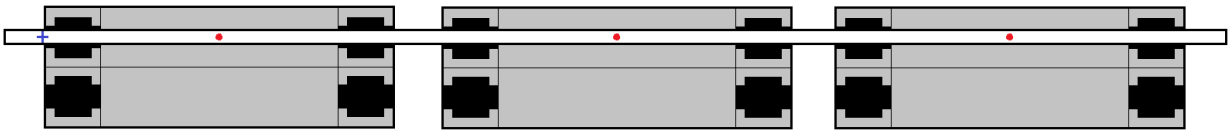
The following diagram shows how to easily drill orifices in the distribution line for a T&J Panel system utilizing low-pressure distribution.



In the picture above, we see that the distribution line has been run through the full number of panel blocks for a given trench length. The goal is to drill the orifices close to the middle of the panel (23 inches from the end of the panel). The red circles indicate the ideal location for the distribution orifices. By marking a cross where the distribution line enters the first panel in the line, it is easy to keep track of orientation for drilling holes at the appropriate angles. This mark will also help give a reference point as to where the distribution pipe should be reset to after all holes are drilled.

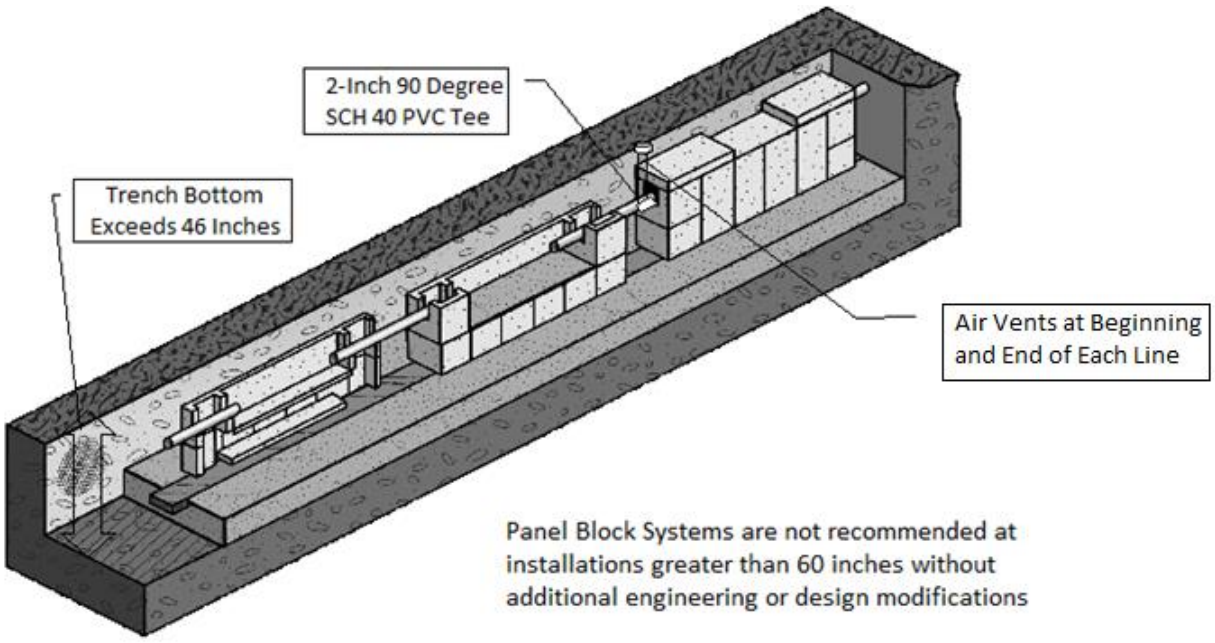


Once the orientation mark has been made, the distribution pipe can be pulled outward just over 23 inches. This allows for each orifice to be drilled just in front of the corresponding panel. After drilling all holes at the proper angles as mentioned in the previous section, the distribution pipe can be returned to its proper location by aligning the blue cross with the front side of the first panel block. The same process applies for a horizontal installation, with only one side of panel receiving the distribution line as shown below.



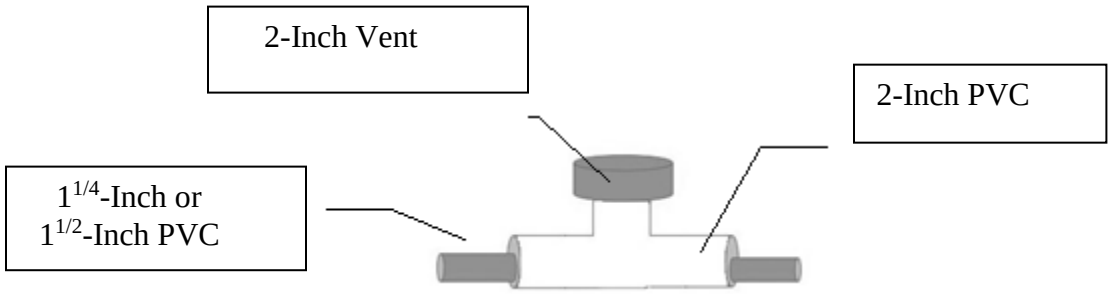
Deep Installation of Panel Block Systems

Utilize these specifications for ventilation when Trench Bottom *exceeds* 46-inches. In certain situations, there are more desirable soil conditions deeper in the soil profile. On these sites, Panel Systems can still be utilized, with proper ventilation to the system. Air vents are used with Panel Systems to allow the chambers within the Panel to receive the air needed for treatment. Air vents should be installed as designed.



Gravity Flow Installation: Air vents should be placed at the beginning and end of each line to provide adequate oxygen content. For vertical panels, cut the 24-inch long, 2-inch PVC pipe in half, then reconnect with a 2-inch 90-Degree SCH 40 Tee. Extend the 2-inch Tee up to ground surface to allow ventilation. For horizontal panels, follow the same procedure on one side of the panel block and utilize 1 ½-inch PVC. Air vents should come to or just below finish grade and housed neatly in something such as an irrigation box/cover for protection.

Vertical Panel Deep LP Installation (Low Pressure Pipe): Insert your $1^{1/4}$-inch or 1 ½-inch into a 2inch PVC "sleeve" that spans from one inner chamber of a panel to the next. Connect a 2-inch 90 Degree SCH 40 Tee to this "sleeve" halfway between one panel and the next. Extend the 2-inch Tee up to ground surface to allow ventilation.



Horizontal Panel Deep LP Installation

For deep horizontal installations, venting can be supplied to the side of the panels not being utilized by the distribution line. 2-foot sections of 1 ½-inch SCH 40 PVC can be used to connect the panels from inner chamber to inner chamber. At the beginning and end of each line of panels, connect a 1 ½- inch SCH 40 Tee and extend the vent line to ground surface to allow for ventilation. The diagram below illustrates this configuration.

Installing Panels in DeepTrenches with Additional Backfill Sand

An alternative to using ventilation when installing panels into deep trenches is to utilize additional backfill sand underneath the panel blocks. This method is achieved by excavating the trench bottom to the desired depth and backfilling with naturally occurring sand (typically C-33 or 2S sand). Panels can then be installed on top of the sand and placed higher in the soil profile, providing adequate oxygen content to the system while allowing effluent to travel down through the sand and into suitable soil structures. Using this procedure, panels can then be installed without the need for additional venting. A major advantage of utilizing this installation method is the significant increase in storage capacity and treatment provided by the increased amount of natural sand. Another distinct advantage of utilizing this method is that after backfilling with additional sand, installation of the panels is much easier than it would be when installing deeper in the soil profile. The additional sand does come with an additional cost which should be considered when looking to utilize this process. If trench bottoms exceed 60 inches this would be the desired method for deep installation. It is important when covering a system that the material used is of suitable structure.

Final Inspection

The following list are key points that an inspector should look for when issuing a completion permit:

1) Were panels installed horizontally or vertically, according to the permit?
2) Are the proper number of panels for each line installed?
3) Is the depth of the panels within guidelines?
4) Are drain lines level or less than ¼ inch fall in ten feet?
5) Have seals been properly constructed?
6) Was the proper foam sealer (GE) or tar seal rope used to construct the seals?
7) Was the proper sand used in the trench backfill?
   Is the sand clean? (i.e. free of debris, large organics, leaves, etc.)
   Has the sand been screened? (to a medium-grade, not too fine, free of large rocks)
   Is the sand naturally-occurring? (i.e. from a river, creek, sand pit, etc., not manufactured)
8) If in soils where clay is present, were the sidewalls raked and limed?

For Pumped Systems

9) Have pump size, head pressure and dose cycle been properly sized and set?
   Set dose cycle for 3.6 gallons per panel with pressure distribution
   Set dose cycle at 3.6 gallons per vertical panel and 3.6 to 7.2 gallons per horizontal panel when pumping to pressure manifold and gravity feeding.

10) Record field data on operations permit.

Design Resources

Please feel free to contact a member of T&J Panel with any design, installation or maintenance questions related to an LP Panel or Pressure Manifold system
Here you will find a pressure head table to help in flow design of your LP Panel system. These numbers are a guide to help you in selecting the right flow for your system. We have found that in most systems the 5/32" and 3/16" hole at 2 to 4 feet of head pressure works the best in giving a pump cycle of more than 5 minutes and keeps the same maximum top chamber flow load as sited on the previous page.

Flow Chart of Various Orifices and Pressure Heads

FLOW CHART OF VARIOUS ORIFICES AND HEAD PRESSURES

Head Pressure Ft.	Orifice Size 3/32" .094"	1/8" .125"	**5/32" .156"**	**3/16" .188"**	7/32" .219"	1/4" .250"	9/32" .281"	5/16" .313"	11/32" .344"	3/8" .375"
2.0	.15	.26	**.41**	**.59**	.80	1.04	1.32	1.63	1.97	2.34
2.1	.15	.27	**.42**	**.60**	.82	1.07	1.35	1.67	2.02	2.40
2.2	.15	.27	**.43**	**.61**	.84	1.09	1.38	1.71	2.07	2.46
2.3	.16	.28	**.44**	**.63**	.86	1.12	1.41	1.75	2.11	2.51
2.4	.16	.29	**.46**	**.64**	.87	1.14	1.44	1.78	2.16	2.57
2.5	.16	.29	**.46**	**.66**	.89	1.17	1.47	1.82	2.20	2.62
2.6	.17	.30	**.46**	**.67**	.91	1.19	1.5	1.86	2.25	2.67
2.7	.17	.30	**.47**	**.68**	.93	1.21	1.53	1.89	2.29	2.72
2.8	.17	.31	**.48**	**.69**	.94	1.23	1.56	1.93	2.33	2.77
2.9	.18	.31	**.49**	**.71**	.96	1.25	1.59	1.96	2.37	2.82
3.0	.18	.32	**.50**	**.72**	.98	1.28	1.62	1.99	2.41	2.87
3.1	.18	.32	**.51**	**.73**	.99	1.3	1.64	2.03	2.45	2.92
3.2	.19	.33	**.51**	**.74**	1.01	1.32	1.67	2.06	2.49	2.97
3.3	.19	.33	**.52**	**.75**	1.02	1.34	1.69	2.09	2.53	3.01
3.4	.19	.34	**.53**	**.76**	1.04	1.36	1.72	2.12	2.57	3.06
3.5	.19	.34	**.54**	**.78**	1.06	1.38	1.74	2.15	2.61	3.10
3.6	.20	.35	**.55**	**.79**	1.07	1.40	1.77	2.18	2.64	3.15
3.7	.20	.35	**.55**	**80**	1.09	1.42	1.79	2.21	2.68	3.19
3.8	.20	.36	**.56**	**.81**	1.10	1.44	1.82	2.24	2.72	3.23
3.9	.20	.36	**.57**	**.82**	1.11	1.46	1.84	2.27	2.75	3.27
4.0	.21	.37	**.58**	**.83**	1.13	1.47	1.87	2.30	2.79	3.32

GPM

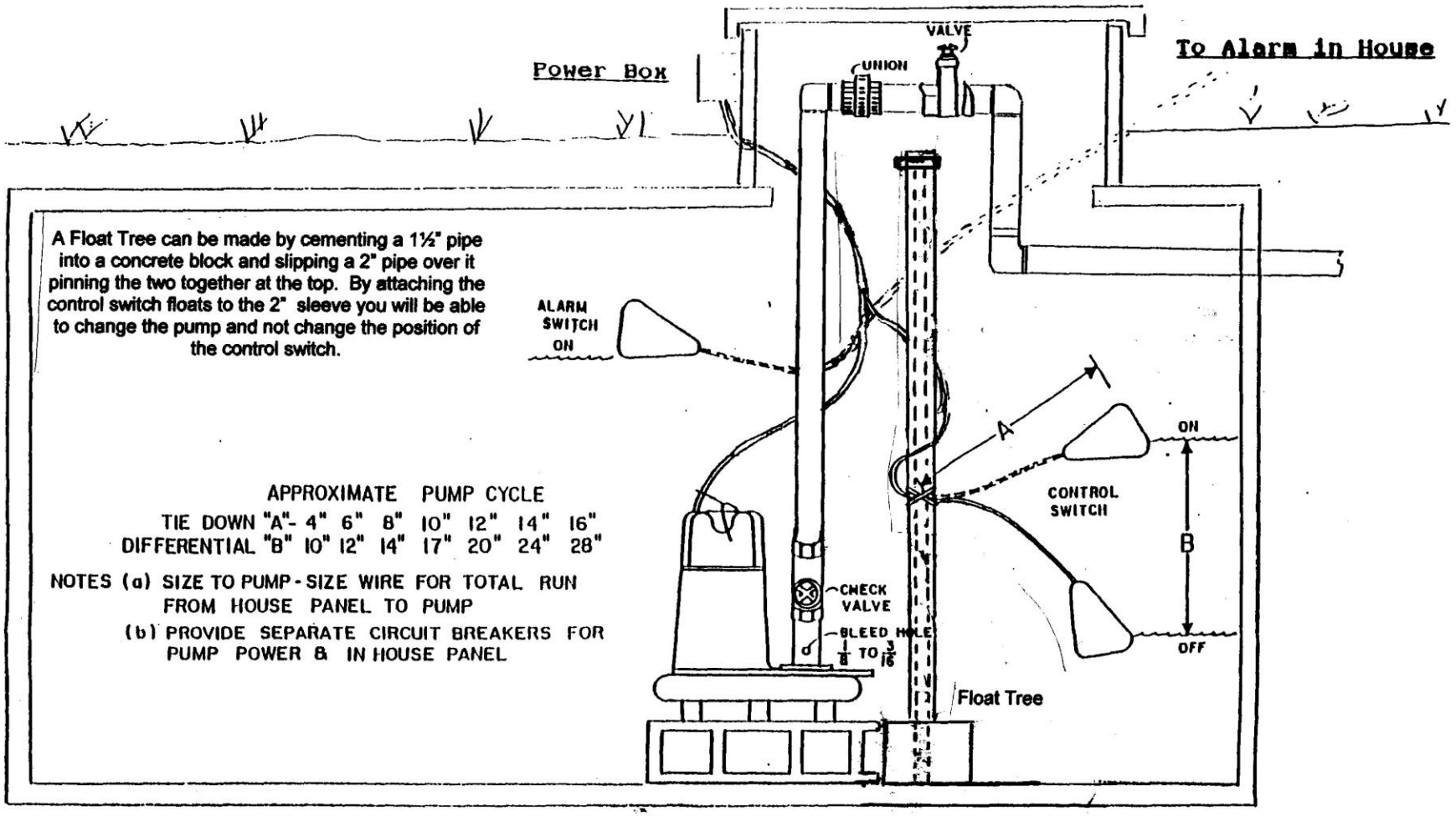
This chart will assist you in determining the proper tap sizes when you have to pump to a pressure manifold in a gravity system.

PRESSURE MANIFOLD TAP FLOW

Head	SCH 40		Tap Diameter	SCH 80	
Pressure ft.	1/2" 0.622	3/4" 0.824		1/2" 0.546	3/4" 0.742
2.0	7.11	12.50		5.48	10.10
2.1	7.29	12.80		5.62	10.40
2.2	7.46	13.10		5.75	10.60
2.3	7.63	13.40		5.88	10.90
2.4	7.79	13.70		6.00	11.10
2.5	7.95	14.00		6.13	11.30
2.6	8.11	14.20		6.25	11.50
2.7	8.26	14.50		6.37	11.80
2.8	8.62	14.80	**Gallons**	6.48	12.00
2.9	8.36	15.00	**per minute**	6.60	12.20
3.0	8.71	15.30		6.71	12.40
3.1	8.86	15.50		6.82	12.60
3.2	9.00	15.80		6.93	12.80
3.3	9.14	16.00		7.04	13.00
3.4	9.27	16.30		7.15	13.20
3.5	9.41	16.50		7.25	13.40
3.6	9.54	16.70		7.35	13.60
3.7	9.67	17.00		7.45	13.80
3.8	9.80	17.20		7.55	14.00
3.9	9.93	17.40		7.65	14.10
4.0	10.10	17.70		7.75	14.30

Below is a chart to aid in head selection due to friction loss in PVC pipe. In calculating friction, be sure to add 20% for loss in fittings. In the chart below, friction loss is per 100 feet of pipe. The head created by friction loss is added to the elevation head of lift from the bottom of the pump tank to the top of the highest turn-up.

Flow GPM	**Pipe Diameter**					
	1"	1 1/4"	1 1/2"	2"	3"	4"
		Friction Loss (100ft)				
1	.07					
2	.28	.07				
3	.60	.16	.07			
4	1.01	.25	.12			
5	1.52	.39	.18			
6	2.14	.55	.25	.07		
7	2.89	.76	.36	.10		
8	3.63	.97	.46	.14		
9	4.57	1.21	.58	.17		
10	5.5	1.46	.70	.21		
11		1.77	.84	.25		
12		2.09	1.01	.30	.07	
13		2.42	1.17	.35	.08	
14		2.74	1.33	.39	.09	
15		3.06	1.45	.44	.10	
16		3.49	1.65	.50	.11	
17		3.93	1.86	.56	.12	
18		4.37	2.07	.62	.16	
19		4.81	2.28	.68	.23	
20		5.23	2.46	.74	.30	
25			3.75	1.10	.39	
30			5.22	1.54	.48	
35				2.05	.58	.07
40				2.62	.81	.09
45				3.27	1.08	.12
50				3.98	1.38	.16
60					1.73	.21
70					2.09	.28
80						.37
90						.46
100						.55


Power Box
VALVE
UNION
To Alarm in House
A Float Tree can be made by cementing a 1½" pipe into a concrete block and slipping a 2" pipe over it pinning the two together at the top. By attaching the control switch floats to the 2" sleeve you will be able to change the pump and not change the position of the control switch.
ALARM SWITCH ON
A
ON
CONTROL SWITCH
B
OFF
APPROXIMATE PUMP CYCLE
TIE DOWN "A"- 4" 6" 8" 10" 12" 14" 16"
DIFFERENTIAL "B" 10" 12" 14" 17" 20" 24" 28"
NOTES (a) SIZE TO PUMP - SIZE WIRE FOR TOTAL RUN FROM HOUSE PANEL TO PUMP
(b) PROVIDE SEPARATE CIRCUIT BREAKERS FOR PUMP POWER & IN HOUSE PANEL
CHECK VALVE
BLEED HOLE 1/8 TO 3/16
Float Tree

Frequently Asked Questions

Q: **Can I Use Vertical and Horizontal Panels in the same system to overcome certain site or soil conditions?**
A: **YES**. Both styles are interchangeable can be used in combination.

Q: How do I calculate the amount of backfill sand for my drainfield?
A: To calculate the amount of backfill sand needed, use the equation: **LF x .17 = Tons Needed;** where LF is total linear feet of nitrification line.

Q: When designing a T&J Panel System, do lines need to be designed to certain lengths in order to make panels fit properly with 6-inch spacing between them?
A: NO, panels can be utilized in whatever line lengths are necessary for the design of a system. Spacing between the panels can be adjusted in order to make them fit into any given line length, so long as the proper number of panels are installed in that line.

Q: Does the Horizontal Panel system use more sand due to its 3-foot trench?
A: No, the cubic volume remains the same as Vertical Panel systems even though it is a 2-foot trench due to the lower trench profile.

Q: Should I consider a wider trench when installing a Vertical Panel System?
A: No, a 2-foot trench is vital in the distribution of effluent to the side walls and is key to keeping the aerobic treatment needed for breakdown.

Q: Why do Panel Block Systems have the longest lifespan on average of any system on the market:
A: The successful longevity of our system is primarily due to the fact that the storage capacity is **3X** that of a conventional system all while pretreating effluent and preserving the soil itself. This hydraulically allows the soil to accept effluent longer and in a much smaller footprint.

Q: What type of boards are used for installation and that are their purpose?
A: Any 1x4 or 1x6 board will work. Boards do not have to be treated because it will actually fossilize in the trench over time. The purpose of this board is for maintaining the level at time of installation.

Q: Do I need a certification from T&J Panels to be able to install the system?
A: No, you do not need a certification from T&J Panels to be able to install the system, but we recommend and install training from one our company representatives for your first-time installation.

Q: Why should I consider a Panel System?
A: You may consider using a panel system if you want a system with longevity, if you have future site needs (ex. pools, additional bedrooms, landscaping needs), to maximize your development potential, or if you value having a more environmentally friendly option.

T & J Panel Wastewater Treatment System

269 Marble Road
Statesville, NC 28625

Office: **704-924-8600**
Fax: **704-924-8681**

Website**: www.tjpanel.com**
Email: **info@tjpanel.com**

Limited Warranty:

The structural integrity of each T&J Panel, when installed in accordance with manufacturer's instructions, is warranted against defective materials and workmanship for one year from date of manufacture. Should a defect appear within the warranty period, purchaser must inform T&J Panel System of the defect before the warranty expires. T&J Panel System will supply a replacement unit. T&J Panel System's liability specifically excludes the cost of removal and/or installation of the panels. There are no other warranties with respect to the units, including no warranties of merchantability or of fitness for a particular purpose. The warranty does not extend to incidental, consequential, special or indirect damages. The company shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other loss or expense incurred by buyer. Specifically excluded from warranty coverage are: Damage to the panels due to ordinary wear and tear; alteration, accident, misuse, abuse or neglect of the panels; the panels being subjected to stresses greater than those prescribed in the installation instructions; the placement by buyer of improper materials into buyer's system; or any other event, not caused by the company. Furthermore, in no event shall the company be responsible for any loss or damage to the buyer, the panels or any third party resulting from its installation or shipment. Buyer shall be solely responsible for ensuring that installation of the system is completed in accordance with all applicable laws, codes, rules and regulations. Any alteration of this warranty must be noted as "Warranty" in writing by the company.

When Your Problem In On-site Is:

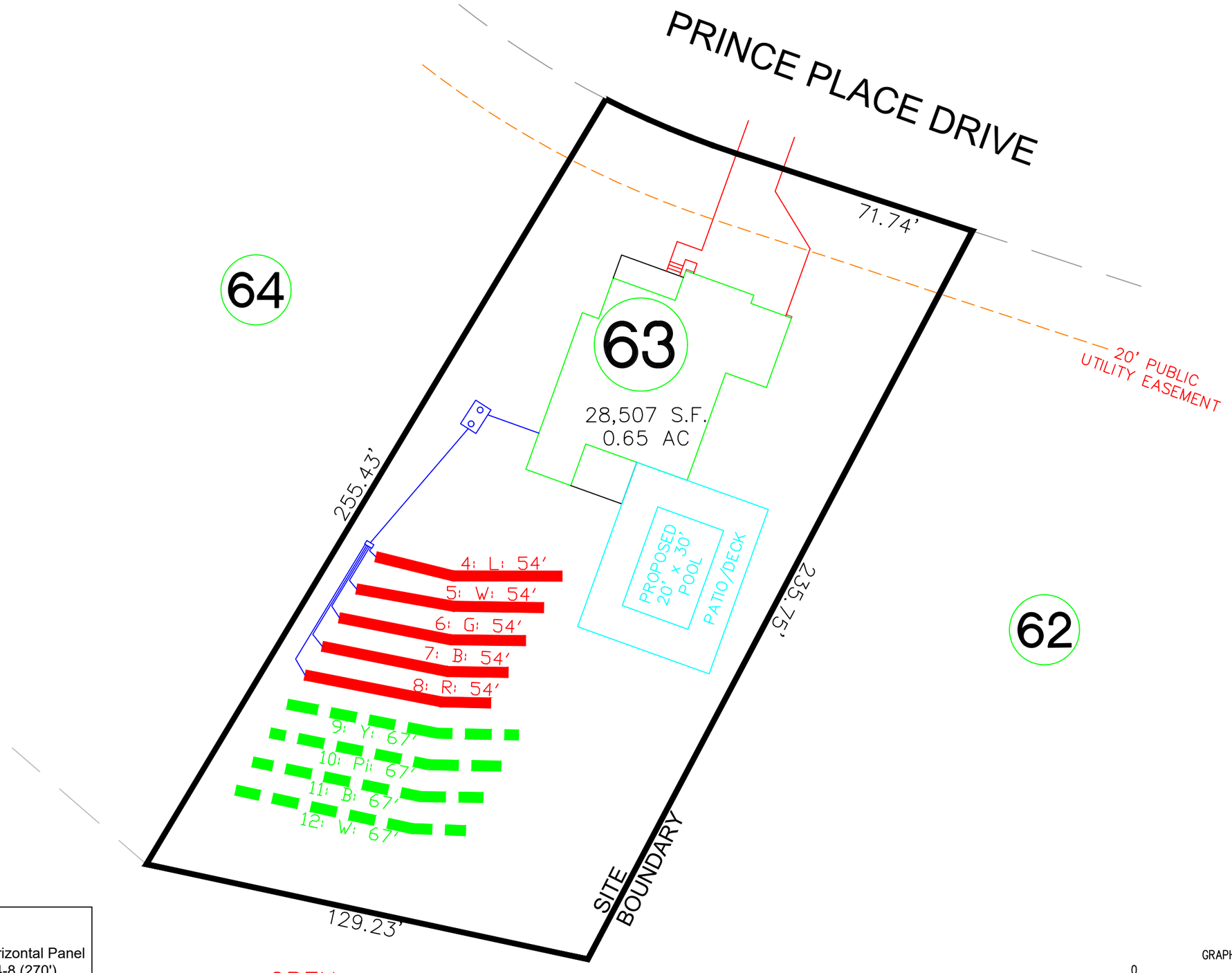
Topography and Vegetation

Special Landscaping Needs

Future Site Needs

Limited Suitable Area

Then consider a better quality effluent with T & J Panel



4-Bedroom
LTAR: 0.3 gpd/ft^2
Initial: Gravity-to-Horizontal Panel
Block utilizing lines 4-8 (270')
Repair: Pump-to-Horizontal Panel
Block utilizing lines 9-12 (268')

REVISION NO.	DATE
Original Submittal	August 23, 2022
Revision 1	-----
Revision 2	-----
Revision 3	-----
Master Set	-----

SHEET NUMBER
1 of 5

Prince Place
Lot 63
Overall Septic

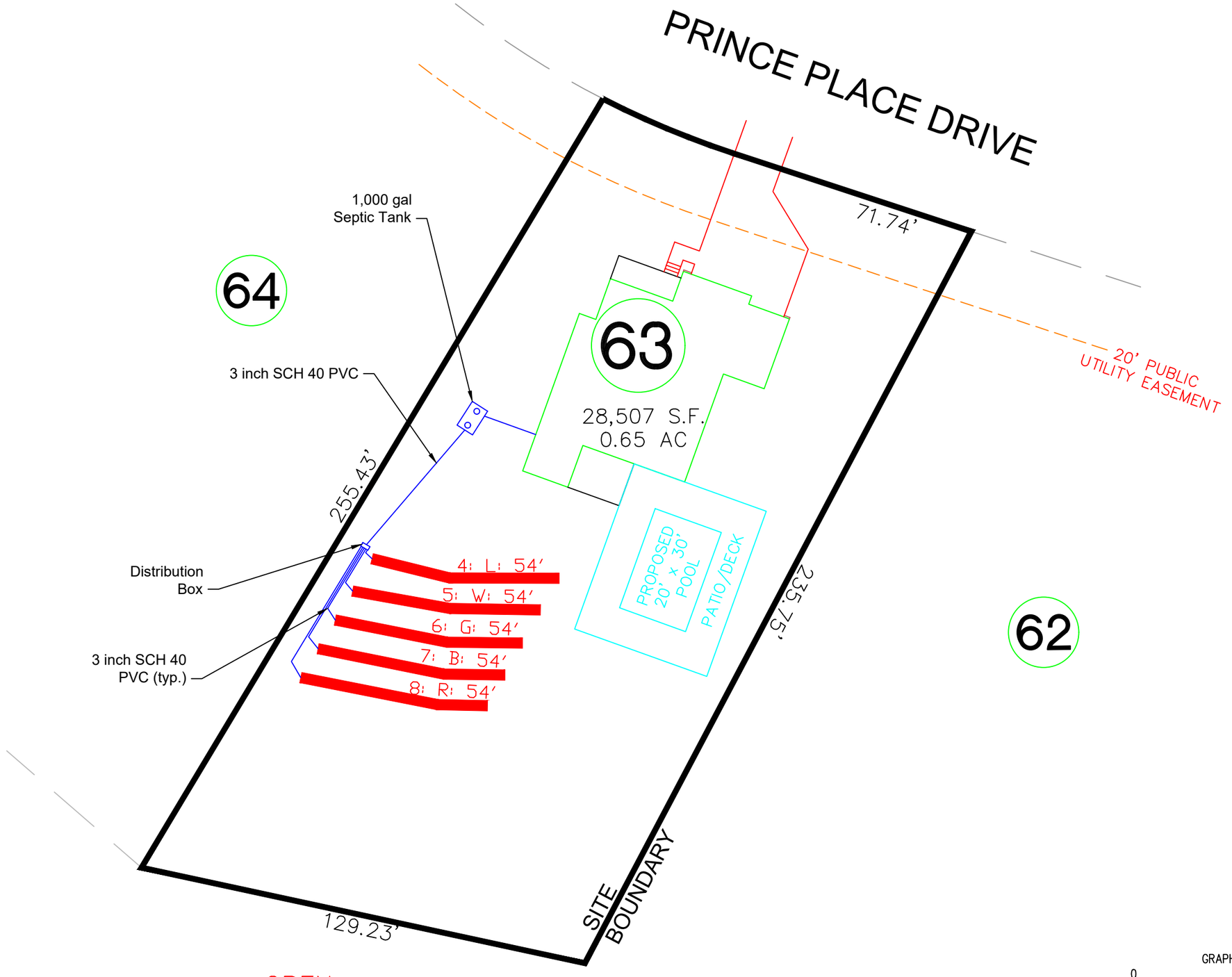
PREPARED FOR : Triple A Homes
PO Box 1117
Holly Springs, NC 27540

DATE : August 23, 2022

DESIGNER CONTACT:
ADAM AYCOCK, EI

DRAWN BY:
ADAM AYCOCK, EI

MITCHELL ENVIRONMENTAL, PA
C-2911
1501 LAKESTONE VILLAGE LANE
SUITE 205
FUQUAY VARINA, NC 27526



SHEET NUMBER
2 of 5

Prince Place
Lot 63
Initial Nitrification Field

REVISION NO.	DATE
Original Submittal	August 23, 2022
Revision 1	-----
Revision 2	-----
Revision 3	-----
Master Set	-----

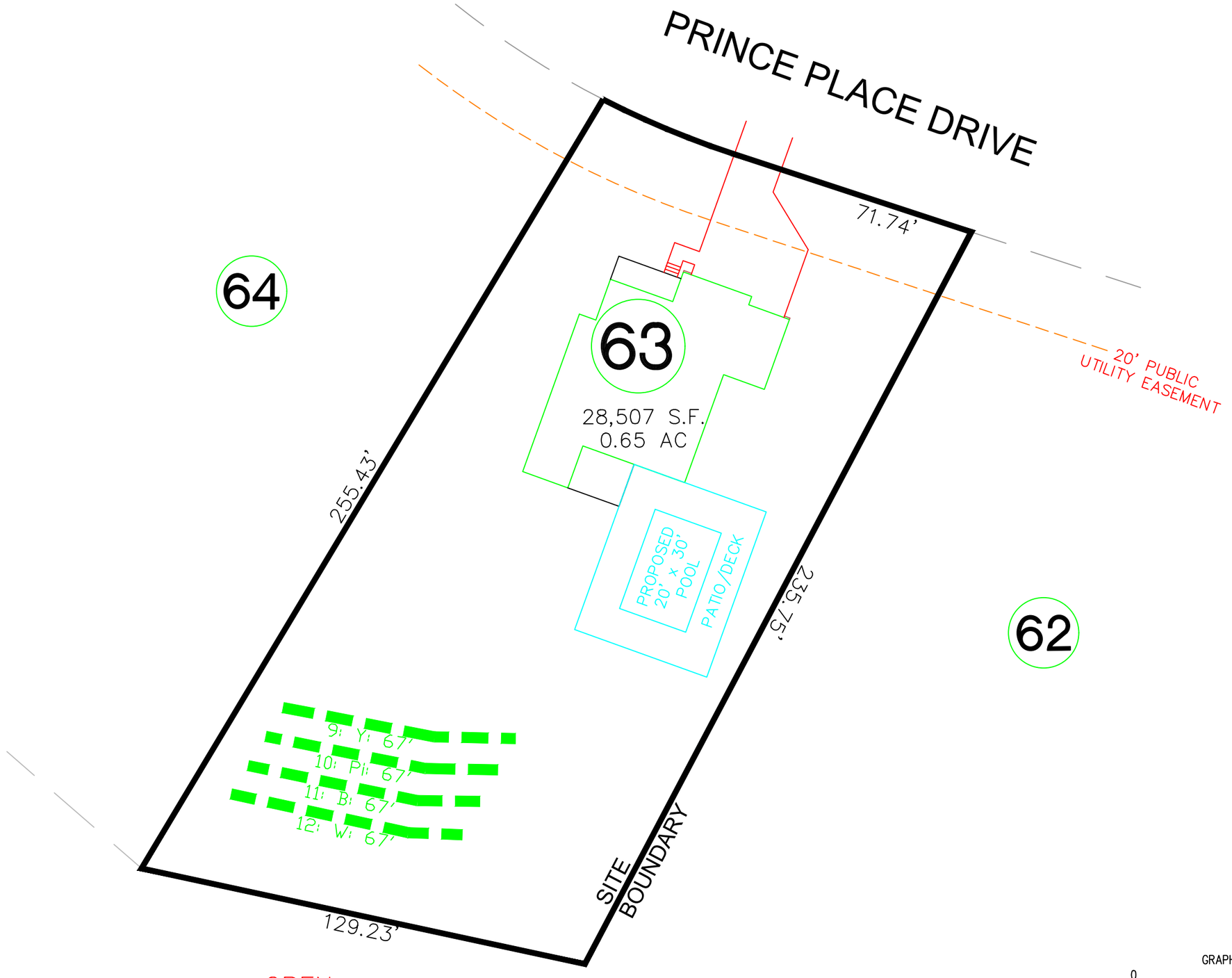
PREPARED FOR : Triple A Homes
PO Box 1117
Holly Springs, NC 27540

DATE : August 23, 2022

DESIGNER CONTACT:
ADAM AYCOCK, EI

DRAWN BY:
ADAM AYCOCK, EI

MITCHELL ENVIRONMENTAL, PA
C-2911
1501 LAKESTONE VILLAGE LANE
SUITE 205
FUQUAY VARINA, NC 27526



SHEET NUMBER	3 of 5

Prince Place
Lot 63
Repair Nitrification Field

REVISION NO.	DATE
Original Submittal	August 23, 2022
Revision 1	-----
Revision 2	-----
Revision 3	-----
Master Set	-----

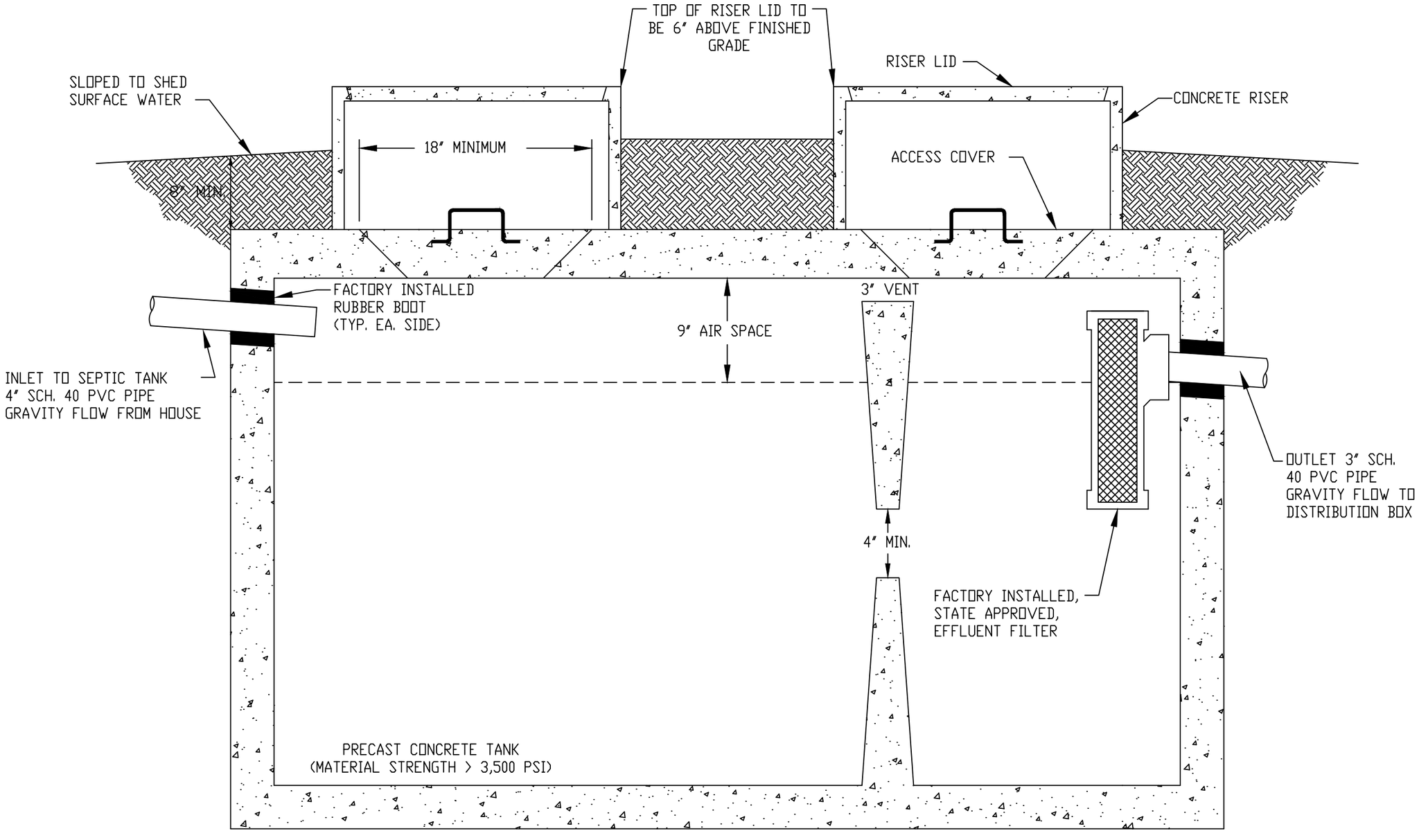
PREPARED FOR : Triple A Homes
PO Box 1117
Holly Springs, NC 27540

DATE : August 23, 2022

DESIGNER CONTACT:
ADAM AYCOCK, EI

DRAWN BY:
ADAM AYCOCK, EI

MITCHELL ENVIRONMENTAL, PA
C-2911
1501 LAKESTONE VILLAGE LANE
SUITE 205
FUQUAY VARINA, NC 27526



1,000 GALLON SEPTIC TANK

SEPTIC TANK DETAIL

N.T.S.

SHEET NUMBER 4 of 5

Prince Place
Lot 63
Septic Tank Detail

REVISION NO.	DATE
Original Submittal	August 23, 2022
Revision 1	-----
Revision 2	-----
Revision 3	-----
Master Set	-----

PREPARED FOR : Triple A Homes
PO Box 1117
Holly Springs, NC 27540

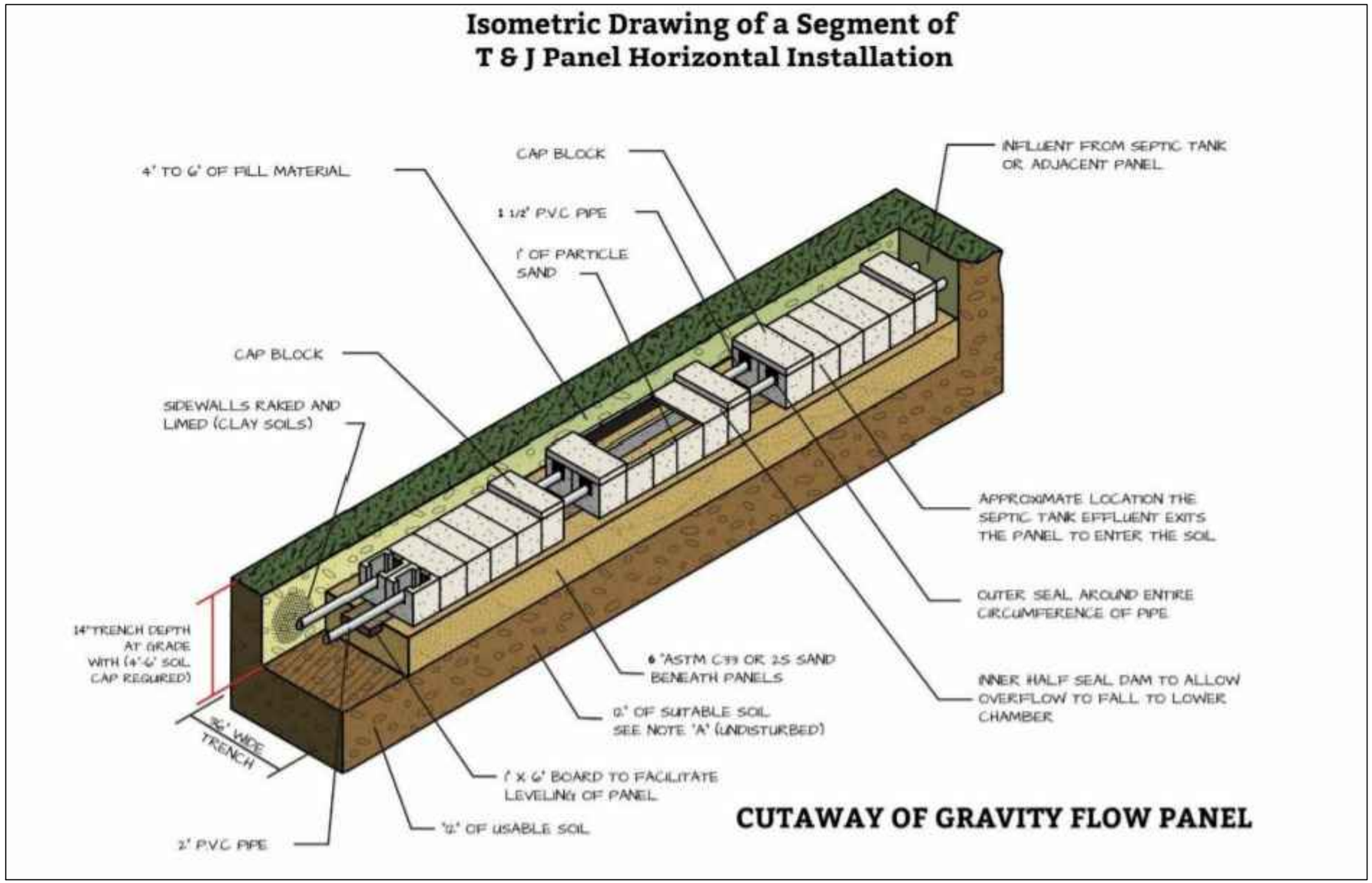
DATE : August 23, 2022

DESIGNER CONTACT:
ADAM AYCOCK, EI

DRAWN BY:
ADAM AYCOCK, EI

MITCHELL ENVIRONMENTAL, PA
C-2911
1501 LAKESTONE VILLAGE LANE
SUITE 205
FUQUAY VARINA, NC 27526

Trench Width = 36 Inches
Trench Depth = See Harnett County permit



SHEET NUMBER
5 of 5

Prince Place
Lot 63
Trench Detail

REVISION NO.	DATE
Original Submittal	August 23, 2022
Revision 1	-----
Revision 2	-----
Revision 3	-----
Master Set	-----

PREPARED FOR : Triple A Homes
PO Box 1117
Holly Springs, NC 27540

DATE : August 23, 2022

DESIGNER CONTACT:
T & J Panel

DRAWN BY:
T & J Panel

MITCHELL ENVIRONMENTAL, PA
C-2911
1501 LAKESTONE VILLAGE LANE
SUITE 205
FUQUAY VARINA, NC 27526