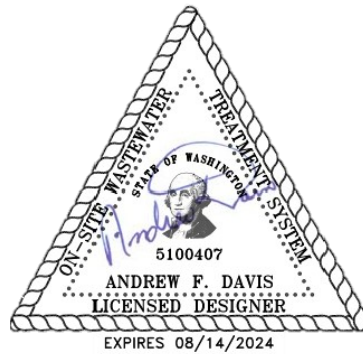


# RESIDENTIAL BOTTOMLESS SAND FILTER REPLACEMENT ON-SITE SEPTIC SYSTEM DESIGN

For the  
**Pannell Residence**  
SRHD Application #22-18184  
In  
**Newman Lake, Washington**  
Designed by



714 N Iron Bridge Way, #201  
PH: (509) 747-6790

SPOKANE, WA 99202  
FAX: (509) 747-7005

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## **DESIGN OVERVIEW**

The following design is for an existing two-bedroom single-family residence on parcel 56033.0164. The parcel occupies 0.18 acres and is located at 13214 North Peninsula Drive. The property is in flood zone AE and is on Newman Lake. The owner intends to remodel the existing home and the number of bedrooms will remain two. The exact location of a cesspool and water lines which currently serve the residence are unknown. The proposed bottomless sand filter system will replace the existing cesspool.

Two test holes on the site were evaluated by Horrocks Engineers and SRHD on April 12<sup>th</sup>, 2022 (See Appendix A for Soils Log). The test holes were composed of sandy loam, gravelly sandy loam, and gravelly loamy sand. The average acceptable test hole depth is 34” in the drainfield area.

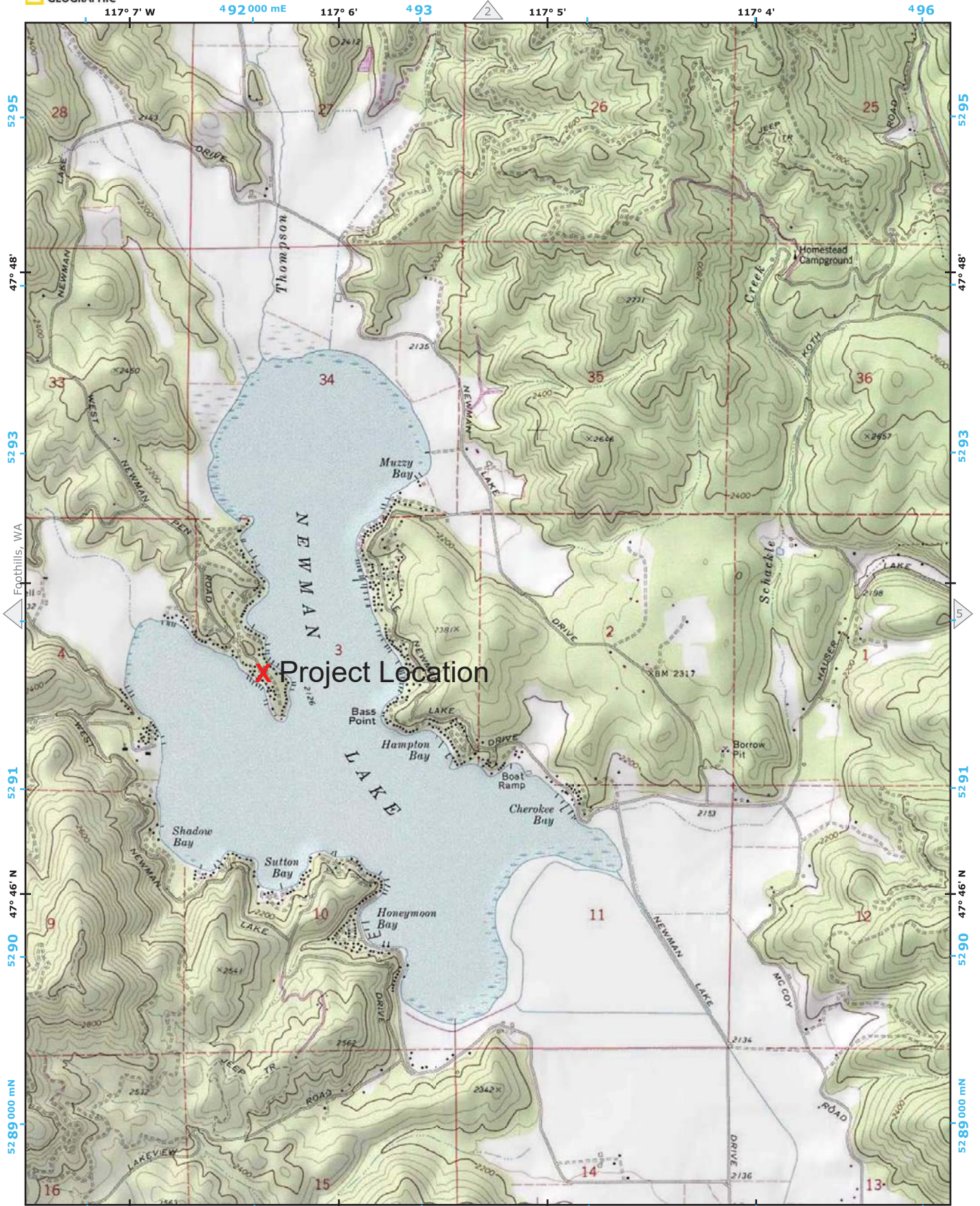
Per SRHD, the setbacks to property lines from the disposal bed and from the disposal bed to the reserve area will be reduced from 5 feet down to 2 feet.

The site is acceptable for a bottomless sand filter, which meets treatment level B. The soil loading rate will be 1.0 gpd/sf. The drainfield will be located in the area of the test holes. Herb Dollar will be installing the system.

# VICINITY MAP

## Newman Lake, WA

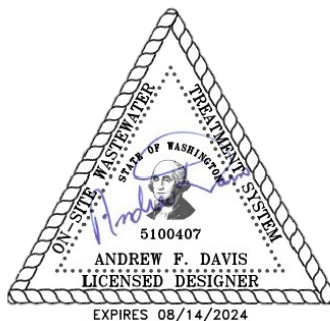
USGS 7.5' Map Series 4



NAD83/WGS84 UTM Zone 11  
© 2016 National Geographic Partners. Please refer to index map on page 1 for more details. User assumes all risk associated with the use of this map.

## GENERAL SPECIFICATIONS

1. All construction shall meet Spokane Regional Health District (SRHD) Rules and Regulations, Washington State Department of Health Standards, and Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction. Where conflicts occur, the Engineer will determine which standard takes precedence.
2. The installer shall contact the engineer for a pre-construction meeting prior to commencing construction activities at the site.
3. The system must be inspected by the Engineer and SRHD prior to backfill. All pipes, materials and components must be exposed for visual examination. The lateral orifices shall be placed in the 12:00 position for inspection. A 2 ft minimum squirt height is required. The installer shall contact the Engineer 48 hours prior to inspection, be on-site during the inspection, and assist the Engineer when requested. Water and power shall be available at the site. Pumps, floats, and controls shall be preset and trial tested prior to inspection.
4. The Engineer must approve any substitution of system piping, materials or components. The installer must submit specifications for any items for which substitution is requested.
5. The installer shall immediately inform the Engineer of any site restrictions, design conflicts, errors or omissions. Deviations from the design must be reported to the Engineer. Failure to properly inform the Engineer may result in design and construction changes at the expense of the installer. Any work or materials that are rejected by the engineer shall be replaced at the expense of the installer. Approval shall not relieve the contractor from correction of any deficiencies or failures as determined by subsequent review, testing, or inspection.
6. The installer must obtain an L&I inspection of the electrical components prior to backfill and provide documentation to the engineer.
7. The installer shall provide sand certification and quantity tabulation to the engineer upon final inspection.



**NOTE:**

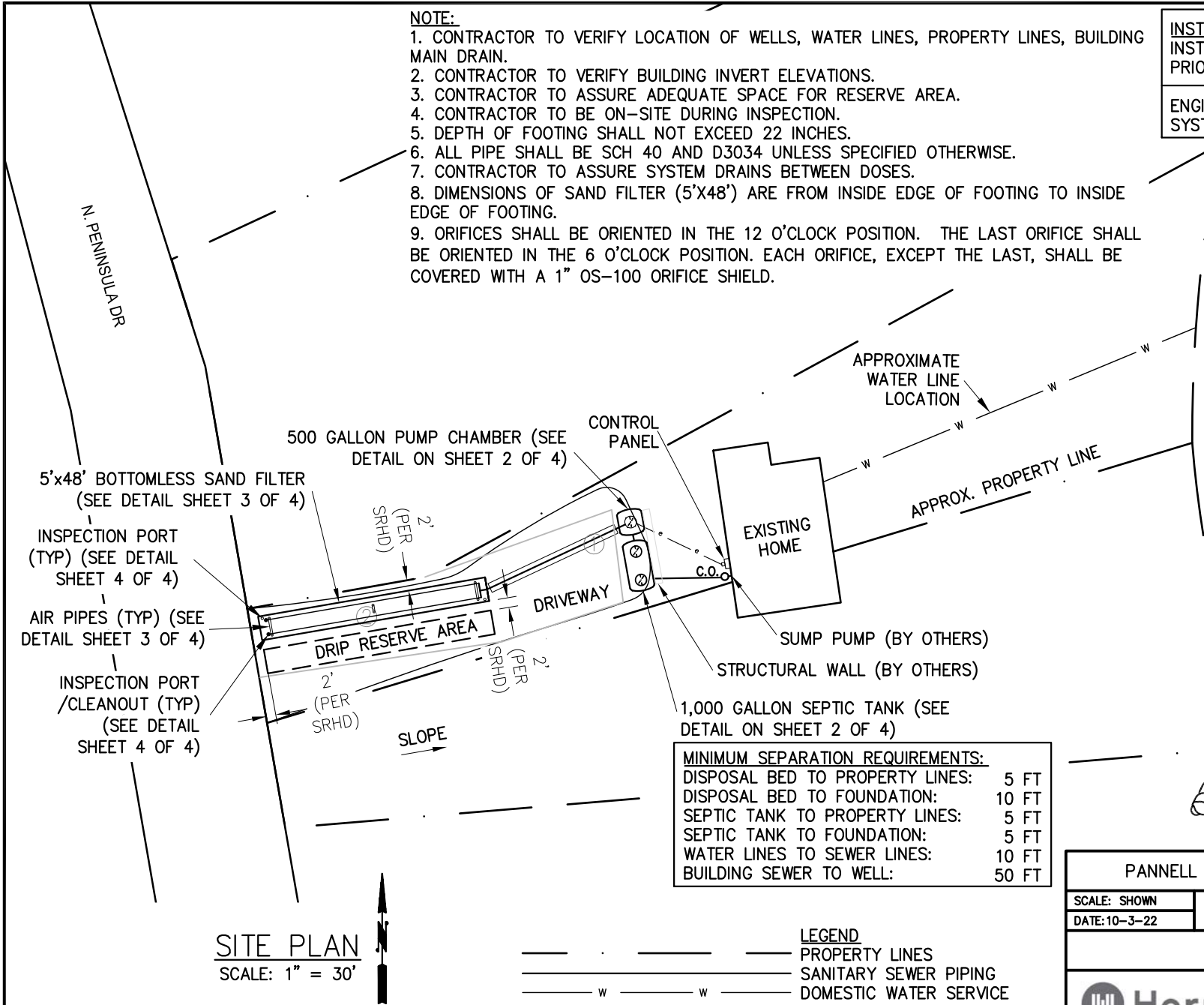
1. CONTRACTOR TO VERIFY LOCATION OF WELLS, WATER LINES, PROPERTY LINES, BUILDING MAIN DRAIN.
2. CONTRACTOR TO VERIFY BUILDING INVERT ELEVATIONS.
3. CONTRACTOR TO ASSURE ADEQUATE SPACE FOR RESERVE AREA.
4. CONTRACTOR TO BE ON-SITE DURING INSPECTION.
5. DEPTH OF FOOTING SHALL NOT EXCEED 22 INCHES.
6. ALL PIPE SHALL BE SCH 40 AND D3034 UNLESS SPECIFIED OTHERWISE.
7. CONTRACTOR TO ASSURE SYSTEM DRAINS BETWEEN DOSES.
8. DIMENSIONS OF SAND FILTER (5'x48') ARE FROM INSIDE EDGE OF FOOTING TO INSIDE EDGE OF FOOTING.
9. ORIFICES SHALL BE ORIENTED IN THE 12 O'CLOCK POSITION. THE LAST ORIFICE SHALL BE ORIENTED IN THE 6 O'CLOCK POSITION. EACH ORIFICE, EXCEPT THE LAST, SHALL BE COVERED WITH A 1" OS-100 ORIFICE SHIELD.

**INSTALLER NOTES:**

INSTALLER MUST CONTACT ENGINEER PRIOR TO BEGINNING WORK.

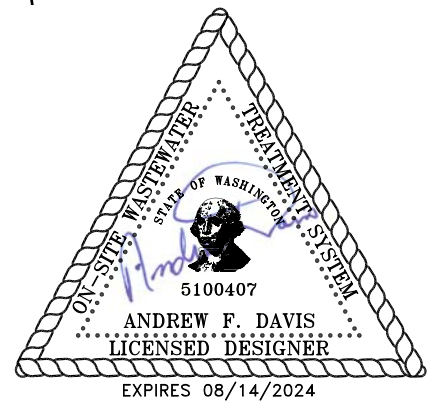
ENGINEER AND SRHD MUST INSPECT SYSTEM PRIOR TO BACKFILL.

**APPLICANT/OWNER**  
 WADE AND JULIE PANSELL  
 4204 S HOGAN ST  
 SPOKANE, WA 99203  
 13214 N. PENINSULA DRIVE  
 PARCEL #56033.0164  
 0.18 ACRES



**MINIMUM SEPARATION REQUIREMENTS:**

DISPOSAL BED TO PROPERTY LINES:	5 FT
DISPOSAL BED TO FOUNDATION:	10 FT
SEPTIC TANK TO PROPERTY LINES:	5 FT
SEPTIC TANK TO FOUNDATION:	5 FT
WATER LINES TO SEWER LINES:	10 FT
BUILDING SEWER TO WELL:	50 FT



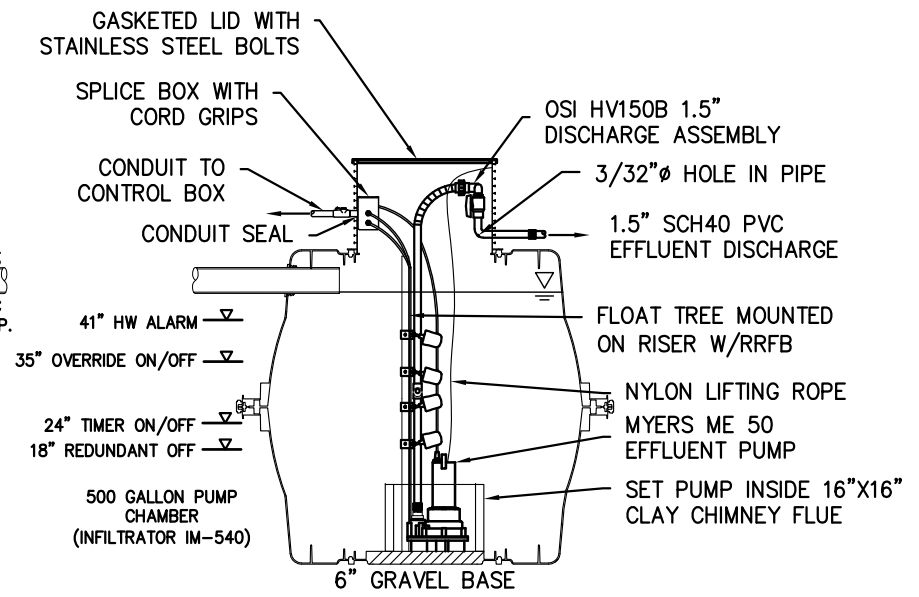
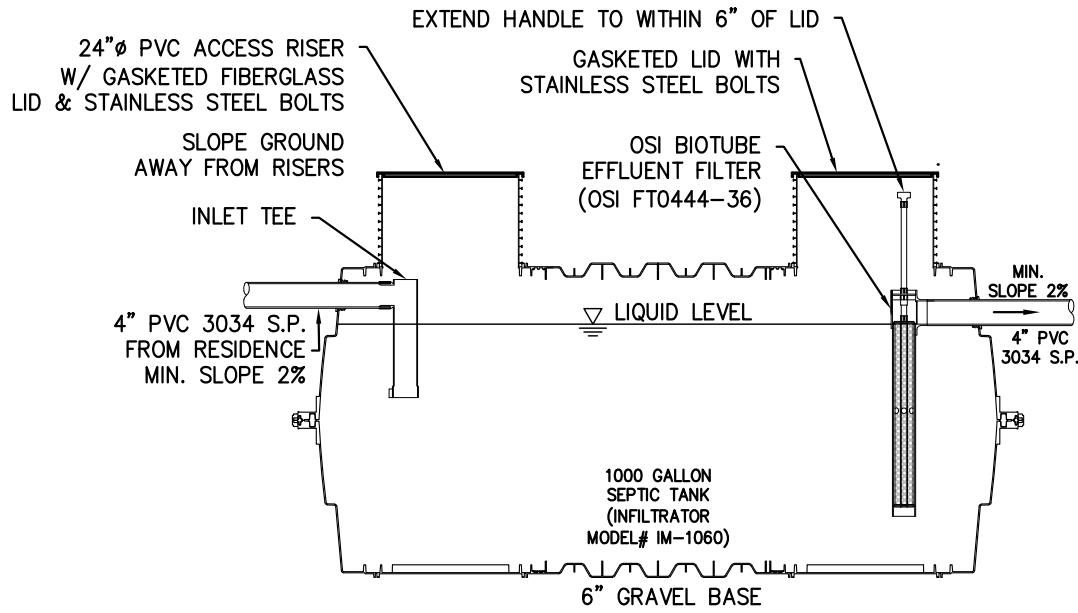
**SITE PLAN**  
 SCALE: 1" = 30'

NOTE:  
 PROPERTY LINES ARE APPROXIMATE  
 AND BASED ON OWNER INFORMATION.

**LEGEND**

— — — — —	PROPERTY LINES
— — — — —	SANITARY SEWER PIPING
— — — — —	DOMESTIC WATER SERVICE
— — — — —	WATER WELL PROTECTION AREA
— — — — —	SEPTIC RESERVE AREA
⊕	TEST HOLE LOCATION

PANSELL — 13214 N. PENINSULA DRIVE		
SCALE: SHOWN	SEPTIC SYSTEM	DRAWN BY: AFD
DATE: 10-3-22		JOB #: WA-5747-22
<b>SITE PLAN</b>		
<p>714 NORTH IRON BRIDGE WAY, STE. 201                  SPOKANE, WA, 99202 (509) 747-6790</p>		APPLICATION # 22-18184
		REV:
		DRAWING NUMBER 1 OF 4



**SEPTIC TANK & PUMP CHAMBER DETAIL**  
NO SCALE

**GENERAL NOTES:**

1. ALL PVC SEWER PIPE SHALL BE ASTM D3034 AND SCH40 UNLESS SPECIFIED OTHERWISE.
2. PROVIDE SLEEVE AROUND DRAIN OR TRANSPORT LINES UNDER ROADS OR DRIVEWAYS.
3. SLOPE PIPES TO DRAIN BETWEEN DOSES.

**NOTES:**

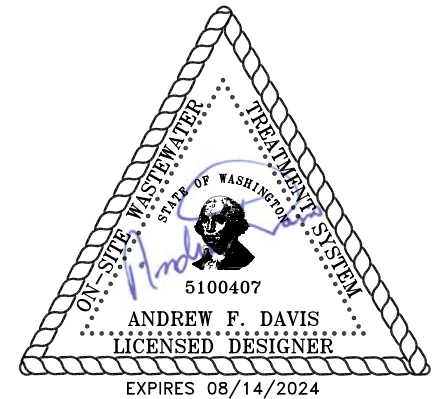
1. SLOPE TRANSPORT PIPE EVENLY TO PUMP CHAMBER.
2. PROTECT DRAINFIELD BEFORE AND AFTER CONSTRUCTION.
3. 4" PVC SEWER PIPE SHALL BE ASTM D3034 UNLESS SPECIFIED OTHERWISE.
4. PROVIDE 3 FT MIN. SPACING BETWEEN LATERALS.
5. LATERALS SHALL BE INSTALLED FLAT WITH A TOLERANCE OF  $\pm 1/2"$ .
6. DO NOT REAM OR OVERDRILL DISCHARGE ORIFICES.
7. DRAIN ROCK MUST BE WASHED OF ALL FINES AND UNCONTAMINATED BY NATIVE SOIL. THE ROCK SHALL BE HARD, ROUND AND SMOOTH AND NON-DETERIORATING. CONTACT ENGINEER FOR SOURCES OTHER THAN CENTRAL PREMIX.

**TANK NOTES:**

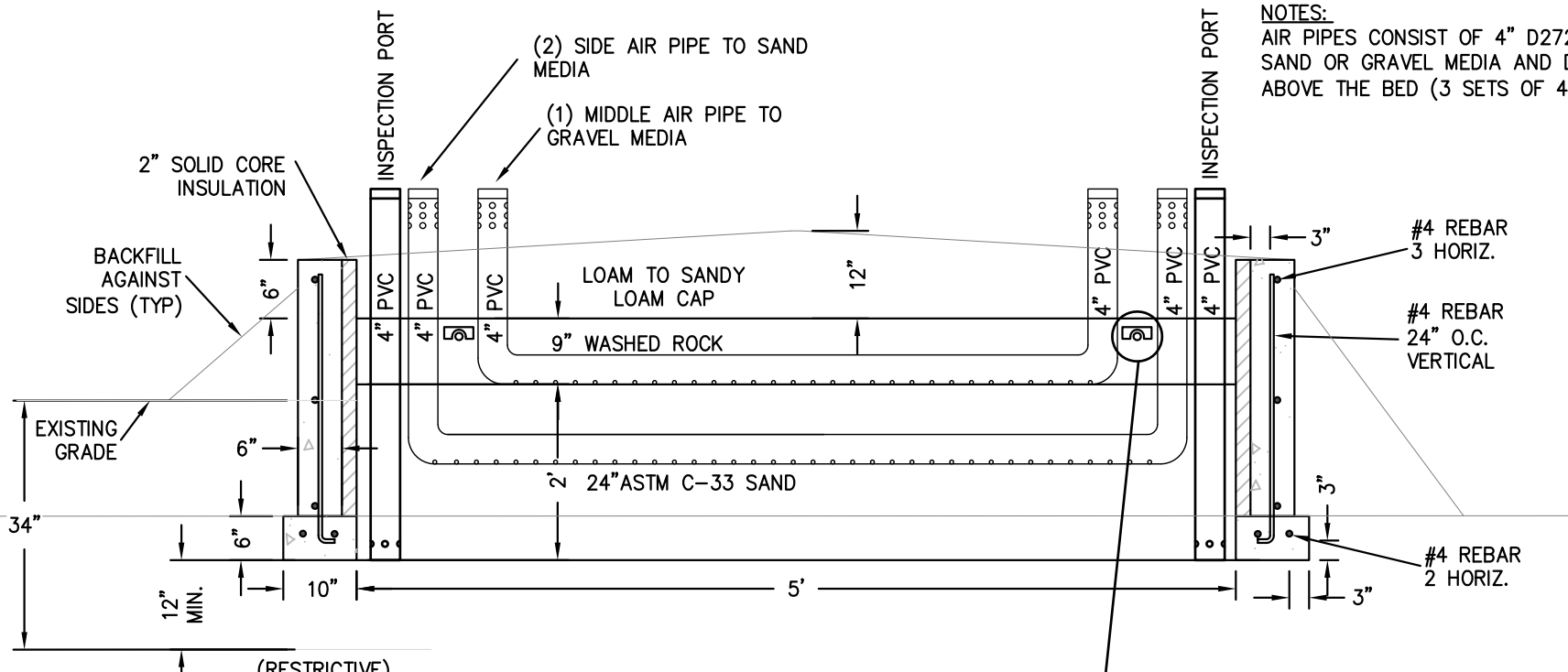
1. PROVIDE ACCESS RISERS OVER ALL COMPARTMENTS.
2. RISERS SHALL BE GROUTED TO TOP OF TANK.
3. EFFLUENT FILTER REQUIRED ON OUTLET OF SEPTIC TANK.
4. PIPE SHALL BE GROUTED AROUND INLET AND OUTLET OF TANKS.
5. MAINTAIN 5' SEPARATION FROM BUILDING FOUNDATION AND PROPERTY LINES, 10' SEPARATION FROM WATER LINES, AND 50' SEPARATION FROM WELLS.
6. INSTALL MVP-S1/2DM SERIES CONTROL PANEL ON EXTERIOR OF BUILDING OR ON A 4x4 P.T. POST NEAR PUMP CHAMBER.

(6 DOSES/DAY = 40 GAL/DOSE)  
2.89" DRAWDOWN PER DOSE

TIMED DOSING	
TIMER ON	- 1.0 MIN
TIMER OFF	- 4.0 HRS
OVERRIDE ON	- 1.4 MINS.
OVERRIDE OFF	- 4.0 HRS

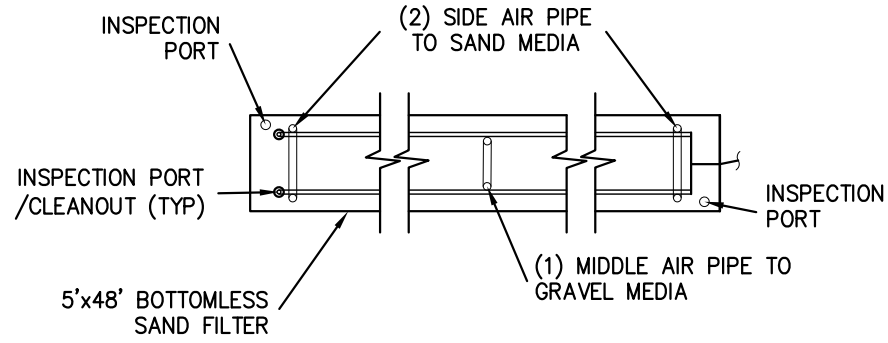


PANNELL - 13214 N. PENINSULA DRIVE		
SCALE: SHOWN	SEPTIC SYSTEM	DRAWN BY: AFD
DATE: 10-3-22		JOB #: WA-5747-22
SITE PLAN		
<p>714 NORTH IRON BRIDGE WAY, STE. 201 SPOKANE, WA, 99202 (509) 747-6790</p>	APPLICATION # 22-18184	
	REV:	DRAWING NUMBER 2 OF 4

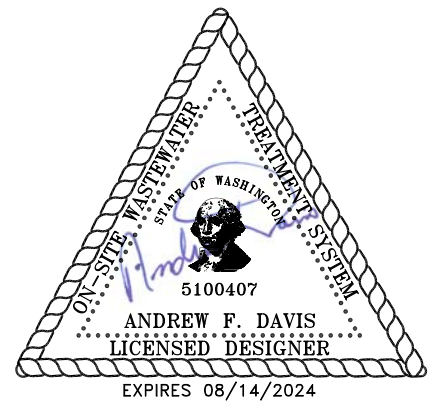
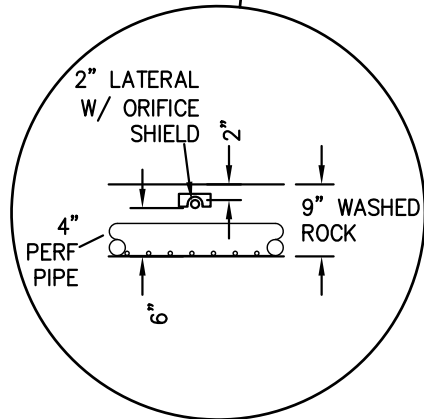


**NOTES:**  
 AIR PIPES CONSIST OF 4" D2729 PERF PIPE IN THE SAND OR GRAVEL MEDIA AND DRILLED RISER PORTS ABOVE THE BED (3 SETS OF 4 ROWS OF 1/2"Ø)

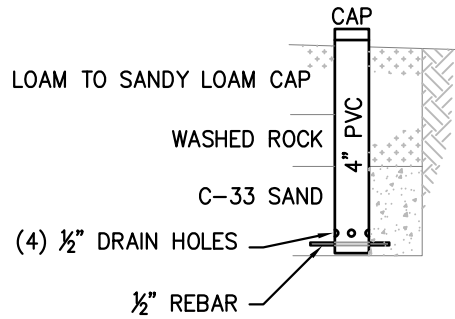
**BOTTOMLESS SAND FILTER DETAIL**  
 NO SCALE



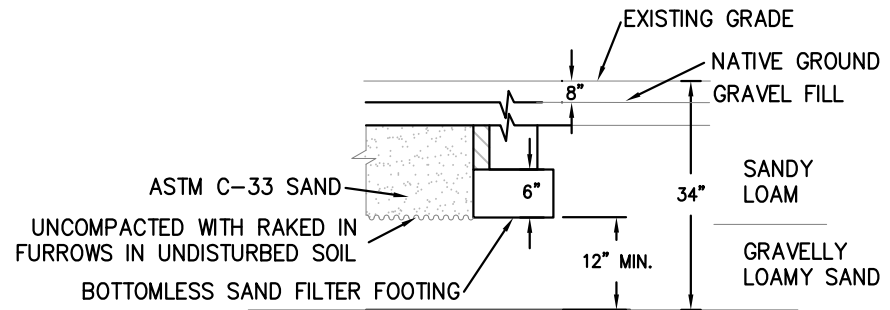
**BOTTOMLESS SAND FILTER PLAN VIEW**  
 NO SCALE



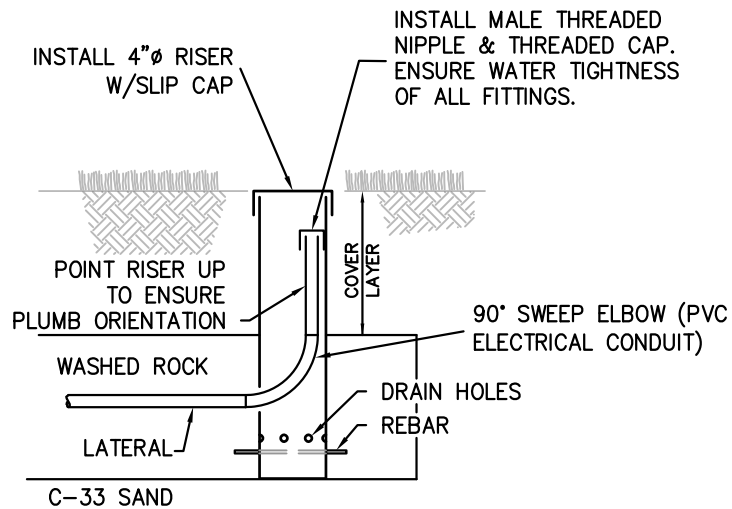
PANNEL - 13214 N. PENINSULA DRIVE		
SCALE: SHOWN	SEPTIC SYSTEM	DRAWN BY: AFD
DATE: 10-3-22		JOB #: WA-5747-22
SITE PLAN		
 714 NORTH IRON BRIDGE WAY, STE. 201 SPOKANE, WA, 99202 (509) 747-6790		APPLICATION # 22-18184
		REV:
		DRAWING NUMBER 3 OF 4



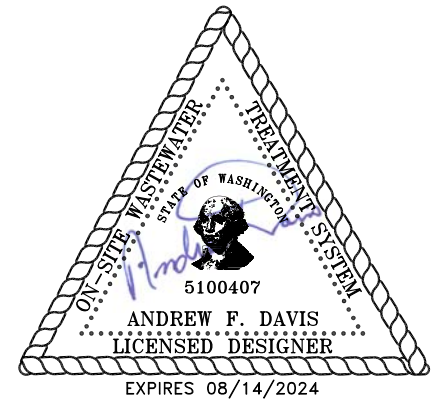
INSPECTION PORT DETAIL  
NO SCALE



(RESTRICTIVE)  
NATIVE SOIL TYPICAL CROSS SECTION  
NO SCALE



INSPECTION PORT / CLEANOUT DETAIL  
NO SCALE



PANNEL - 13214 N. PENINSULA DRIVE		
SCALE: SHOWN	SEPTIC SYSTEM	DRAWN BY: AFD
DATE: 10-3-22		JOB #: WA-5747-22
SITE PLAN		
 <b>Horrocks.</b> 714 NORTH IRON BRIDGE WAY, STE. 201 SPOKANE, WA, 99202 (509) 747-6790	APPLICATION #: 22-18184	
	REV:	DRAWING NUMBER 4 OF 4

SPOKANE REGIONAL HEALTH DISTRICT

DESIGN & CONSTRUCTION SUMMARY FOR  
REPLACEMENT SUBSURFACE DRIP TO BOTTOMLESS  
SAND FILTER SEWAGE DISPOSAL SYSTEM

I. APPLICANT AND SITE INFORMATION

Name of Applicant: Wade Pannell  
Parcel Number: 56033.0164  
Location of Property: 13214 N Peninsula Drive  
System Type: Pressure Distribution - See Plan  
System Configuration: Bottomless Sand Filter  
Parcel Size: 0.18 Acres  
Design Flow: 240 GPD  
Slope: 5 %  
Soil Type: Sandy Loam, Gravelly Sandy Loam, and Gravelly Loamy Sand etc. - See Soil Log  
Application Rate: 1.0 GPD/Sq. Ft.

II. SYSTEM INFORMATION

A. Box

Number: 1  
Width: 5 Ft. (Inside)  
Length: 48 Ft. (Inside)  
Depth of Drain Gravel: 9 In.  
Depth of Sand: 24 In.

B. TRANSPORT PIPE

From Pump Chamber to Septic Tank  
Type: Sch-40 PVC  
Length: Approximately 35 Ft.  
Diameter: 1.5 In.

C. MANIFOLD

Type: Sch-40 PVC  
Length: 3 Ft. Each Box  
Diameter: 1.5 In.  
Configuration: End Feed

D. LATERALS

Type: Sch-40 PVC  
Length: 45 Ft.  
Diameter: 1.5 In.  
Number: 2  
Separation: 3 Ft.

#### E. ORIFICES

Number Per Lateral: 23

Diameter: 3/16 In.

Spacing: 2 Ft.

Configuration: 12:00 Position, last orifice in 6:00 Position

Shield: OS-100

#### F. SEPTIC TANK AND PUMP CHAMBER

Pump Capacity Required for Total Pressure Head: 28.4 GPM

Number of Doses Per Day and Dose Quantity: 6/Day at 40 Gal.

Pump Manufacturer, Myers ME3f (0.3HP, 115V)

Pump Curve: See Attached Curve

Septic Tank Capacity: 1,000 Gal.

Pump Chamber Capacity: 500 Gal.

Depth of Cover: 12" Min.

#### G. EFFLUENT FILTER

Type: Orenco 4" dia. Biotube©, FT0444-36

Attached to S.T. outlet

## BOTTOMLESS SAND FILTER CALCULATIONS

### GENERAL INFORMATION

Number of Bedrooms: 2  
 Design Flow: 240 GPD  
 Soil Loading Rate: 1.00 GPD/SF

### SYSTEM INFORMATION

Total Area: 240 SF  
 Box Width: 5 Ft  
 Box Length: 48 Ft  
 Number of Laterals: 2

### Abbreviations:

L = Length of Pipe  
 K = Constant from Table C-3-1  
 V = Volume  
 Q = Flow  
 q = Orifice Discharge Rate  
 D = Diameter of Pipe  
 d = Diameter of Orifice

Orifice Size: d= 3/16 In.  
 Orifice Spacing: Y= 2 Ft  
 Orifices per Lateral: N= 23  
 Minimum Residual: h= 2 Ft

	L (Ft)	D (In)	K	Q (GPM)	q	# of Bends	V (Gal/Ft)	Pipe Volume (Gallons)
Transport Piping:	35.0	1.50	147.5	27.9	0.61	2	0.106	3.7
Manifold Piping:	3.0	1.50	147.5	27.9	0.61	1	0.106	0.3
Individual Lateral Piping:	45.0	1.50	147.5	14.0	0.61	0	0.106	4.8

Total Flow = 27.9 GPM + 0.5 Weep Hole Discharge rate = 28.4 GPM

### TOTAL DYNAMIC HEAD REQUIREMENTS

1.5" Dia. Discharge Assembly Loss = 2.4 Ft  
 Transport Pipe Friction Losses = 2.0 Ft  
 Manifold Pipe Friction Losses = 0.3 Ft  
 Lateral Pipe Friction Losses = 0.2 Ft  
 Minor Losses/Index Valve = 5.0 Ft  
 Minimum Residual Pressure = 2.0 Ft  
 Total Elevation Head = 1.8 Ft

Total = 13.8 Ft

### ELEVATIONS

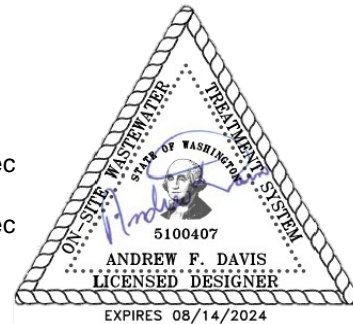
Ground at House: 2162.0 Ft  
 Ground at Pump Chamber: 2178.0 Ft  
 Ground at Bed: 2181.0 Ft  
 Tank Inlet Invert: 2182.8 Ft  
 Low Water Surface Depth: 2180.1 Ft  
 Box Height (Highest): 1.4 Ft  
 Invert at Lateral: 2181.9 Ft

Total Elevation Head: 1.8 Ft

Pump Selection: 28.4 GPM @ 13.8 Ft. Use Myers ME 3F Pump (0.3HP)

### SETTINGS

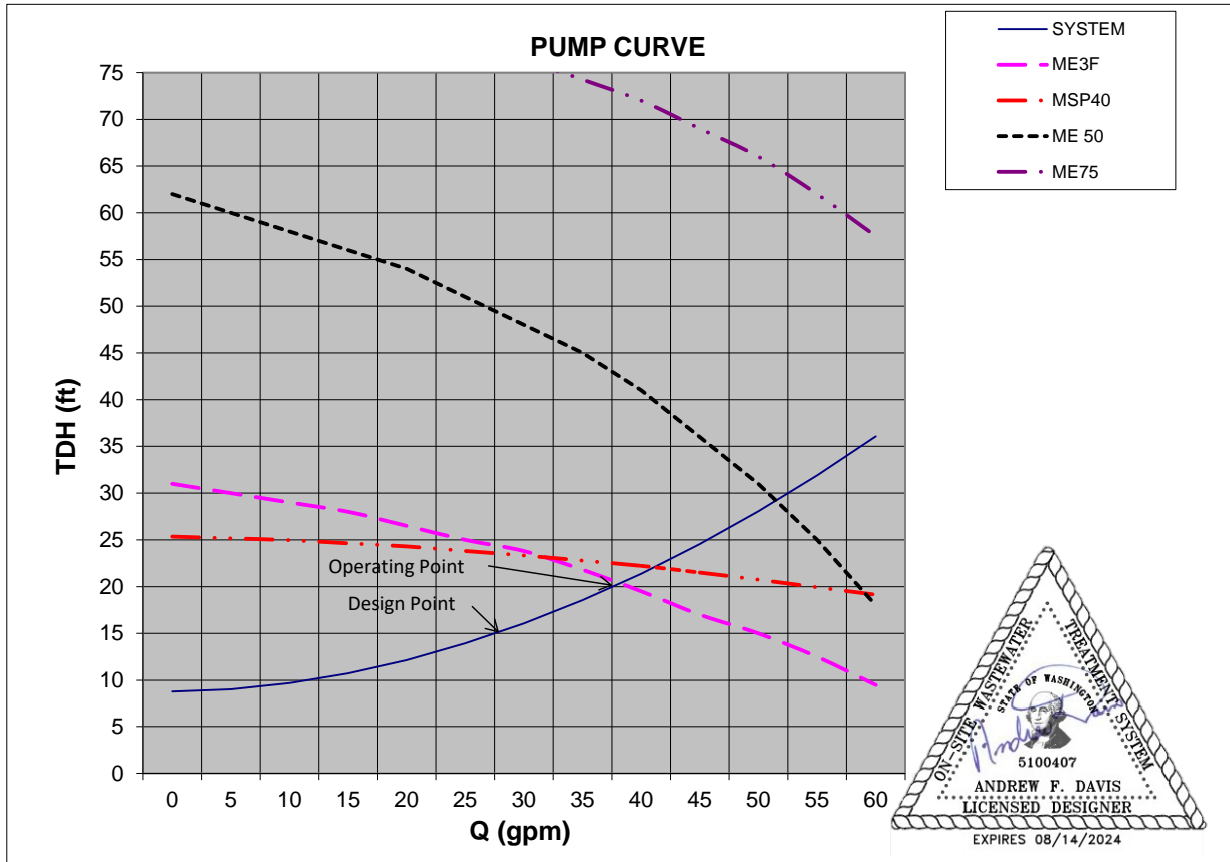
Doses per Day = 6  
 Dose Volume = 40 Gallons  
 Tank Volume = 13.8 Gal/In  
 Dose Drawdown = 2.89 In  
 Override On Time = 1.4 Mins 1 Min 24 Sec  
 Override Off Time = 4.0 Hrs  
 Dose On time = 1.0 Mins 0 Min 59 Sec  
 Dose Off Time = 4.0 Hrs



# PRESSURE DISTRIBUTION PUMP CURVE

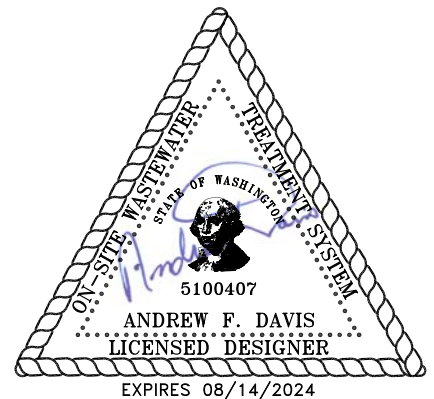
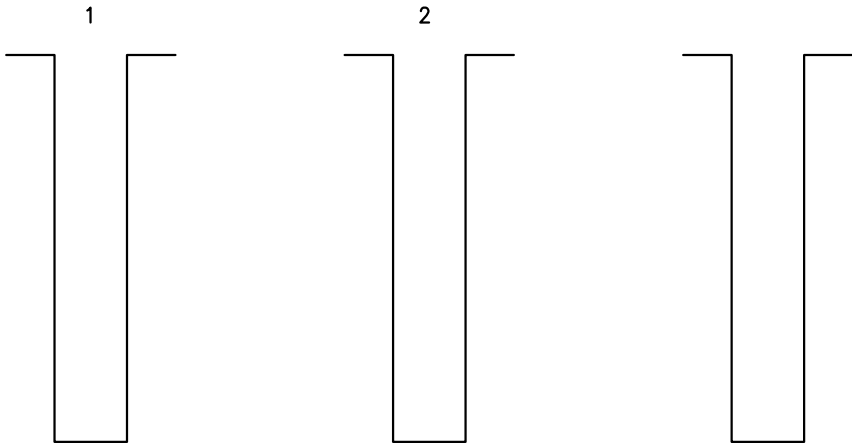
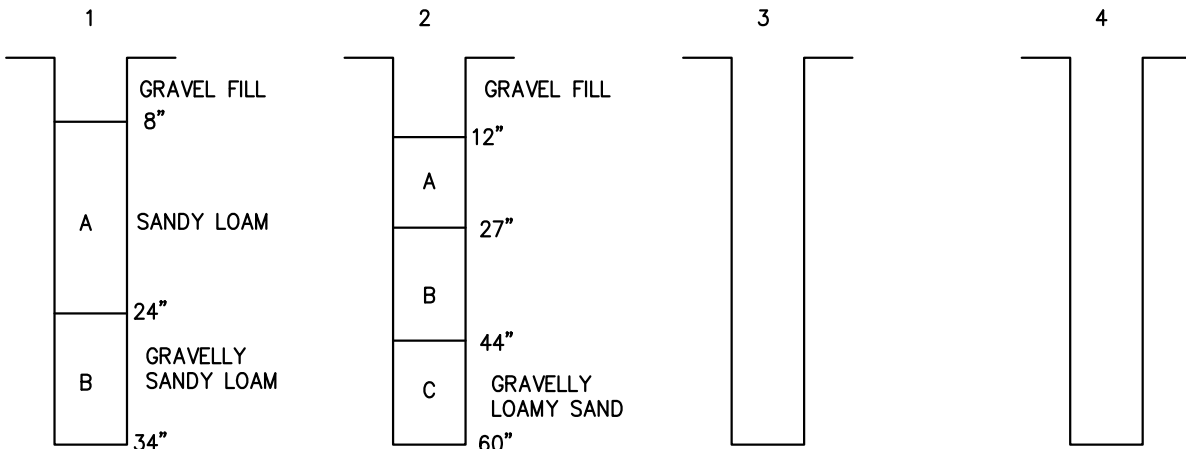
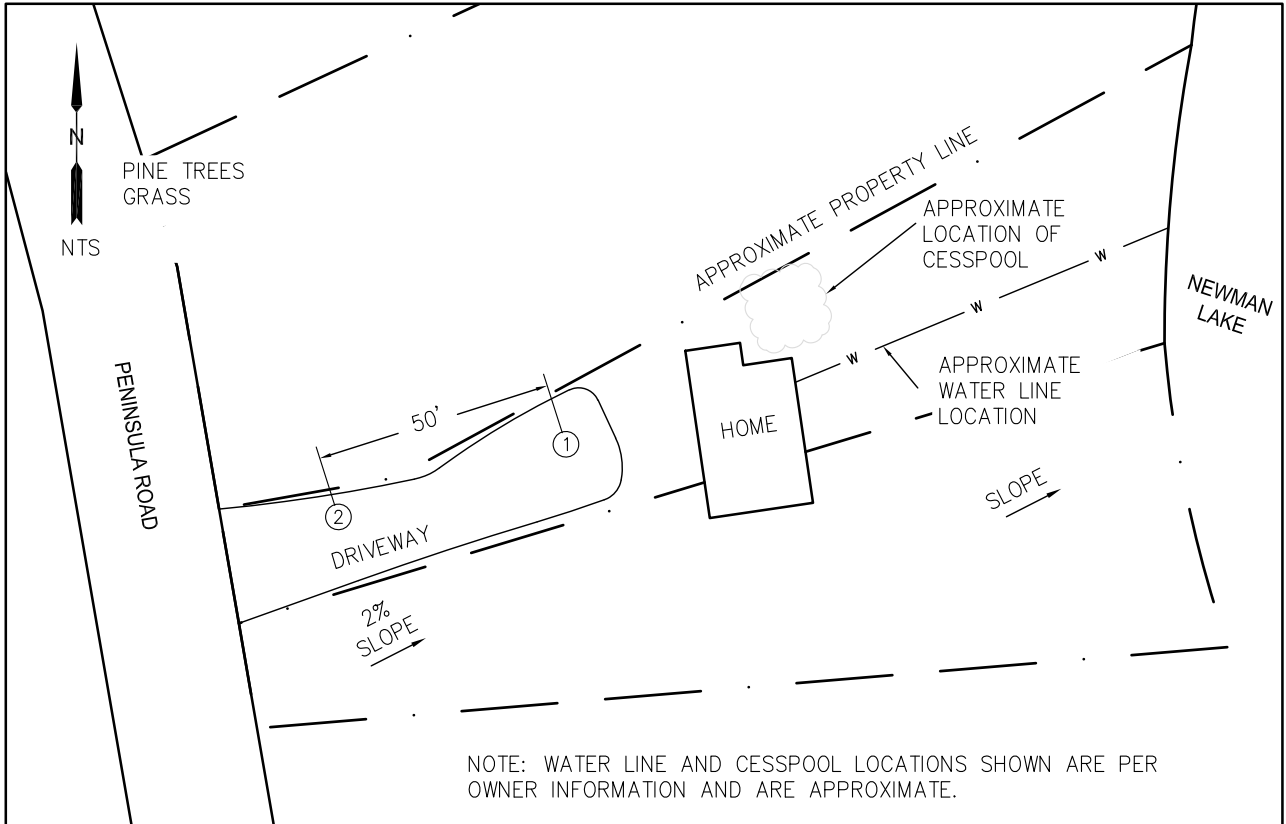
Q(gpm)	DA	Transport	Man	Lateral	EH	RH	ML	TDH	ME3F Pump Head	MSP40 Pump	ME 50 Pump Head	ME100 Pump Head
0	0.00	0.0	0.0	0.0	1.8	2.0	5.0	8.8	31	25	62	90
5	0.08	0.1	0.0	0.1	1.8	2.0	5.0	9.0	30	25	60	88
10	0.30	0.2	0.0	0.3	1.8	2.0	5.0	9.7	29	25	58	85
15	0.68	0.5	0.1	0.7	1.8	2.0	5.0	10.7	28	25	56	83
20	1.20	0.9	0.2	1.1	1.8	2.0	5.0	12.2	27	24	54	81
25	1.88	1.3	0.3	1.7	1.8	2.0	5.0	13.9	25	24	51	79
30	2.70	1.8	0.4	2.4	1.8	2.0	5.0	16.1	24	23	48	77
35	3.68	2.4	0.5	3.1	1.8	2.0	5.0	18.6	22	23	45	74
40	4.80	3.1	0.6	4.0	1.8	2.0	5.0	21.4	20	22	41	72
45	6.08	3.9	0.8	5.0	1.8	2.0	5.0	24.6	17	22	36	69
50	7.50	4.7	0.9	6.1	1.8	2.0	5.0	28.1	15	21	31	66
55	9.08	5.6	1.1	7.3	1.8	2.0	5.0	31.9	13	20	25	62
60	10.80	6.6	1.3	8.5	1.8	2.0	5.0	36.1	10	19	18	58
65	12.68	7.7	1.5	0.0	1.8	3.0	5.0	31.7		18		54
70	14.70	8.8	1.8	7.0	1.8	4.0	5.0	43.1		18		50

Design Operating Point = 28.4 GPM  
 Pump Selection: X = GPM Y = TDH



## Appendix A

### Test Hole Info & On-Site System Permit Application





# Application To Install An On-site Sewage Disposal System

Valid From 4/11/2022 To 4/11/2022

Application # 22-18184

**THIS IS NOT A PERMIT**

**Date of Application: 4/11/2022**

**System Type: Modification**

**Project Type: Holding Tank**

### **Site Information**

Address: 13214 N PENINSULA DR  
Newman Lake, WA 99025-  
Parcel: 56033.0164 Lot Size: 0.18  
L: B: Plat Name:

### **Design Professional**

ANDREW DAVIS - Designer -  
andrew.davis@horrocks.com - (509) 747-6790

### **Applicant Information**

Wade Pannell  
4204 S Hogan St  
Spokane WA 99203  
(509) 995-4292 Wpannell@Me.Com

### **Owner Information**

Wade & Julie Pannell  
4204 S Hogan St  
(None), 99203-  
(509) 995-4292 wpannell@me.com

### **System Information**

Water Supply: Newman Lake  
Dwelling Type: Residential  
Water Adequacy Review -

Comments:

If you are dissatisfied with the decision of the Health District, you may appeal to the Health Officer within TEN (10) DAYS of denial of this application.

**For Office Use Only:**

Plans Stored in Docuware

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

Plans Approved for: Gals Per Day_____ # Bedrooms_____ Tank Size_____		By:_____ Date:_____	
Building App signed off by:_____		Date:_____	
Installation Permit Issued By:_____	Date Issued:_____	<input type="checkbox"/> Mailed	<input type="checkbox"/> Emailed <input type="checkbox"/> Counter
<b>Health Officer Representative Final Operational Approval:</b>			
Approved by:_____		Approval Date:_____	
<input type="checkbox"/> Gravity - 3 yr	<input type="checkbox"/> Food - 1yr	<input type="checkbox"/> HT - 1 yr	<input type="checkbox"/> Other - 1 yr
At Final Insp: Gals Per Day_____ # Bedrooms_____ Tank Size_____		Installer:_____ Date Insp:_____	

## Appendix B

### Manufacturer Specifications

# PVC Access Risers, Lids, & Accessories

Our PVC risers, fiberglass access lids, and other tank accessories allow access to tanks without excavation. They're adaptable to virtually any tank, both new and existing. Lids and accessories fit most types of ribbed PVC pipe, including Ultra-Rib, Ultra-Corr, KOR FLO, and Perma-Loc. Preassembled PVC risers and stock pipe lengths can be purchased from Orenco. Or stock lengths can be purchased locally and cut as needed. All components are designed to work well together.



*Orenco's PVC risers, fiberglass access lids, and other accessories are superior in quality, watertight, non-corroding, and lightweight yet strong.*

## Standard Features & Benefits

- PVC risers and fiberglass access lids come in various diameters.
- PVC risers available in standard 6-in. (152-mm) increments.
- Custom risers can be cut in 1-3 in. (25-76 mm) increments, depending on riser diameter.
- PVC risers can be cast right into a concrete tank.
- PVC risers can be installed onto a concrete tank with a bolt-down kit
- Cast-in or bolt-down riser-tank adapters are available.
- PVC risers and fiberglass riser-tank adapters can be easily bonded to fiberglass tanks with a structural adhesive.
- Grade rings allow installers to stack extensions onto PVC risers in the field.
- Lids are easy to install with stainless steel, tamper-resistant bolts (wrench included) that help prevent accidental entry.
- Lids are lightweight, watertight, non-skid, and non-corroding.
- Lid insulation and carbon filter vents are available options.
- Lids can withstand 2500-lb wheel loads (1100 kg), stronger than any other lid on the market.
- While not designed for vehicular traffic, lids have a breaking point of 8000 lbs (3600 kg).
- DuraFiber lids have breaking strengths in excess of 20,000 pounds (9,000 kg).
- Lids are flat to allow placement of backyard furnishings. No unsightly domes, no tripping.
- Standard lids are an attractive green or brown and blend in with landscaping.
- Additional accessories are available for PVC risers and lids, including adhesive, pipe grommets, cord grips, splice boxes, pipe cutting and drilling tools, insulation, vents, and fiberglass brackets.

## To Order

Call your nearest Orenco Systems®, Inc. Distributor. For nearest Distributor, call Orenco at 800-348-9843, or visit [www.orenco.com](http://www.orenco.com) and click on "Distributor Locator."

### PVC Risers

Available in the following diameters: 12, 18, 24, and 30 in. (305, 460, 610, and 760 mm). Can be installed with adapters or cast into concrete tank. Lighter-duty PIP risers available in 8- and 15-in. diameters (205 and 380 mm).

### Fiberglass Lids



Standard lids (green and brown) are available in the following diameters: 12, 18, 24, 30, 36, and 48 in. (305, 460, 610, 760, 915, 1220 mm). Lighter-duty lids available in 8-, 12-, and 15-in. diameters (200, 305, 380 mm).

### Bolt-Down Kits



For fastening tank adapter to tank. Kit includes stainless steel anchor bolts and butyl sealant.

### Tank Adapters



Fiberglass RRFTA adapter fits square openings.



Available in 24- and 30-in. diameters (610 and 760 mm). Can be cast into or bolted to concrete tank.

### Riser Extension Adapters (Grade Rings)



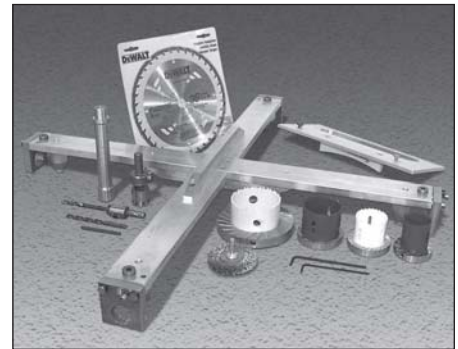
These easy-to-install adapters allow height adjustment of risers in the field.

### Lid Fasteners



Self-tapping stainless steel bolt can be used on risers with and without bolt catches. Ask us about hex-drive bits.

### Cutting Jigs and Tools



For cutting Perma-Loc, Ultra-Rib, KOR FLO, and Ultra-Corr pipe in the field and preparing pipe for grommets/lid attachment.

### Structural Adhesives

Adhesives are available for a variety of products that need bonding or sealing: PVC, ABS, fiberglass, concrete, and rubber.

Distributed By:

# Residential Biotube® Effluent Filters

## Applications

Our patented\* 4-inch (100-mm) Biotube Effluent Filters, Biotube Jr., Biotube Base Inlet Filters, and Biotube Insert Filters are ideal for residential septic tanks and have a lifetime warranty. They prevent large solids from leaving the tank, dramatically improving wastewater quality and extending the life of residential drainfields.

4-inch (100-mm) Biotube Effluent Filter



4-inch (100-mm) Biotube Jr.  
(4-inch Biotube cartridge available separately as Insert Filter)



8-inch (200-mm) Base Inlet Filter



4-inch (100-mm) Insert Filter



Orenco's superior effluent filters resist clogging better than all other brands. Our standard, full-sized 4-inch (100-mm) Biotube Effluent Filter provides maximum long-term protection in a complete package, with housing. Our 4-inch (100-mm) Biotube Jr., at half the size of our standard model, has more filtering capacity than the full-sized filters sold by other manufacturers. For low-profile tanks, there's the Base Inlet Filter. And for tanks with existing outlet tees, the Biotube Insert Filter is ideal.

\* Covered by patent numbers 5,492,635 and 4,439,323

## To Order

Call your nearest Orenco Systems®, Inc. Distributor. For nearest Distributor, call Orenco at 800-348-9843, or visit [www.orenco.com](http://www.orenco.com) and click on "Where to Buy."

## Standard Features & Benefits

- Has 5-10 times more flow area than other brands, so lasts many times longer between cleanings, increasing homeowner satisfaction
- Installs in minutes inside new or existing tanks; extendible tee handle for easy removal
- Easy to clean by simply hosing off whenever the tank needs pumping
- Removes about two-thirds of suspended solids, on average, extending drainfield life
- Corrosion-proof construction, to ensure long life
- Lifetime warranty

## Optional Features & Benefits

- Alarm available, to signal the need for cleaning
- Flow modulating discharge orifices available to limit flow rate leaving tank, mitigating surges and increasing retention time
- Custom and commercial sizes available

## Biotube Filtering Process

Effluent from the relatively clear zone of the septic tank, between the scum and sludge layers, horizontally enters the Biotube Effluent Filter. Effluent then enters the annular space between the housing and the Biotubes, utilizing the Biotubes' entire surface for filtering. Particles larger than the Biotube's mesh are prevented from leaving the tank.

### Model Codes for Ordering

#### 4-inch (100-mm) Biotube Filter (standard)

FT   04 44 - 36 -

Flow modulator and float switch bracket options:  
Blank = no options selected  
M = flow modulation plate installed  
A = float switch bracket installed

Cartridge height, in. (mm):  
28 = 28 (711), standard  
36 = 36 (914), standard

Filter housing height, in. (mm):  
36 = 36 (914), standard  
44 = 44 (1118), standard

4-in. (100-mm) filter diameter

Outlet tee:

W = fits Type 3034 outlet tee  
S = fits Schedule 40 outlet tee

Filter mesh option:

Blank = 1/8-in. (3-mm) filter mesh  
P = 1/16-in. (1.6-mm) filter mesh

Biotube® effluent filter

#### 8-inch (200-mm) Biotube Filter (base inlet model)

FT   22 - 14 B

Float switch bracket and overflow plate options:  
Blank = no options selected  
A = float switch elbow installed  
FSO = overflow plate installed

Base inlet model

Cartridge height, in. (mm):  
14 = 14 (356), standard

Filter housing height, in. (mm):  
22 = 22 (558), standard

Filter diameter, in. (mm):  
08 = 8 (200)  
12 = 12 (300)

Filter mesh option:

Blank = 1/8-in. (3-mm) filter mesh  
P = 1/16-in. (1.6-mm) filter mesh

Biotube® effluent filter

#### 4-inch (100-mm) Biotube Jr. (includes cartridge and housing)

FT J   04 18

Flow modulator and float switch bracket options:  
Blank = no options selected  
M = flow modulation plate installed  
A = float switch bracket installed

4.5-in. (457-mm) cartridge height

4-in. (100-mm) filter diameter

Outlet tee:

W = fits Type 3034 outlet tee  
S = fits Schedule 40 outlet tee

Filter mesh option:

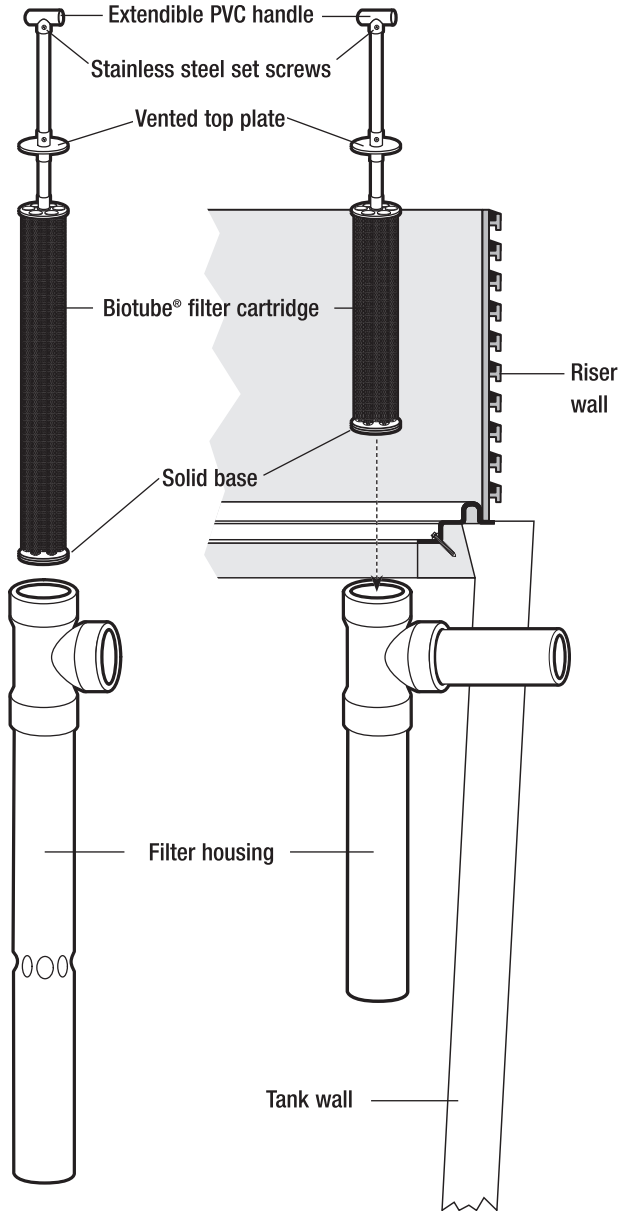
Blank = 1/8-in. (3-mm) filter mesh  
P = 1/16-in. (1.6-mm) filter mesh

Junior series

Biotube® effluent filter

#### 4-inch (100-mm) Biotube Effluent Filter

#### 4-inch (100-mm) Biotube Jr.



#### 4-inch (100-mm) Biotube Filter Insert (cartridge only)

FT i  0418 -  -

For customized options (e.g., NC indicates North Carolina regions)

W = fits 3034 outlet pipe  
S = fits schedule 40 outlet pipe

Cartridge height (inches)

Indicates filter diameter (inches)

P = 1/16" filtration  
Blank = 1/8" filtration

Insert series

Biotube effluent filter series

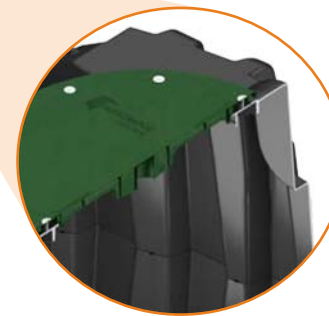
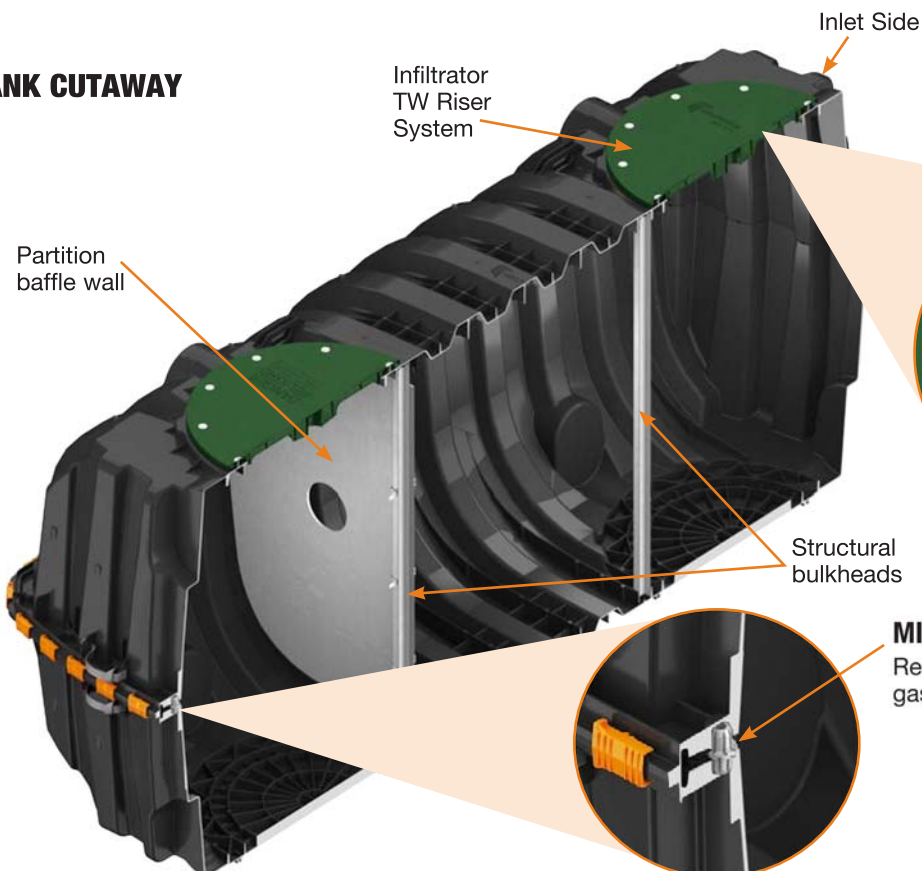


### Features & Benefits

- Strong injection molded polypropylene construction
- Lightweight plastic construction and inboard lifting lugs allow for easy delivery and handling
- Integral heavy-duty green lids that interconnect with TW™ risers and pipe riser solutions
- Structurally reinforced access ports eliminate distortion during installation and pump-outs
- Reinforced structural ribbing and fiberglass bulkheads offer additional strength
- Can be installed with 6" to 48" of cover
- Can be pumped dry during pump-outs
- Suitable for use as a septic tank, pump tank, or rainwater (non-potable) tank
- No special water filling requirements are necessary
- The tank may be backfilled with suitable native soil. See installation instructions for guidance.

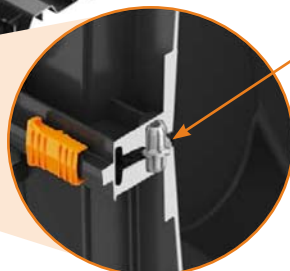
The Infiltrator IM-1060 is a lightweight strong and durable septic tank. This watertight tank design is offered with Infiltrator's line of custom-fit risers and heavy-duty lids. Infiltrator injection molded tanks provide a revolutionary improvement in plastic septic tank design, offering long-term exceptional strength and watertightness.

### TANK CUTAWAY



### HEAVY DUTY LID CUTAWAY

Reinforced 24" structural access port



### MID-SEAM CUTAWAY

Reinforced water tight mid-seam gasketed connection

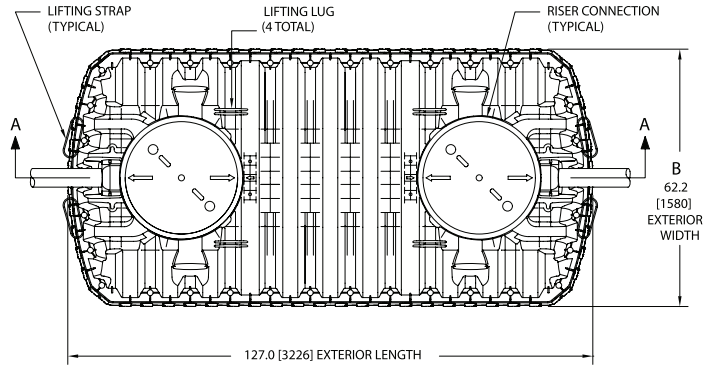
# IM-1060 General Specifications and Illustrations

The IM-1060 is an injection molded two piece mid-seam plastic tank. The IM-1060 injection molded plastic design allows for a mid-seam joint that has precise dimensions for accepting an engineered EPDM gasket. Infiltrator's gasket design utilizes technology from the water industry to deliver proven means of maintaining a watertight seal. The two-piece design is permanently fastened using a series of non-corrosive plastic alignment dowels and locking seam clips. The IM-1060 is assembled and sold through a network of certified Infiltrator distributors.

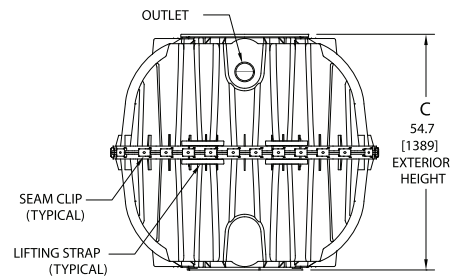
**Must be backfilled and installed in accordance with Infiltrator Water Technologies, Infiltrator IM-Series Septic Tank General Installation Instructions and for shallow ground water conditions reference the Infiltrator IM-Series Tank Buoyancy Control Guidance.**

Please visit [www.infiltratorwater.com/images/pdf/ManualsGuides/TANK01.pdf](http://www.infiltratorwater.com/images/pdf/ManualsGuides/TANK01.pdf) for the latest information.

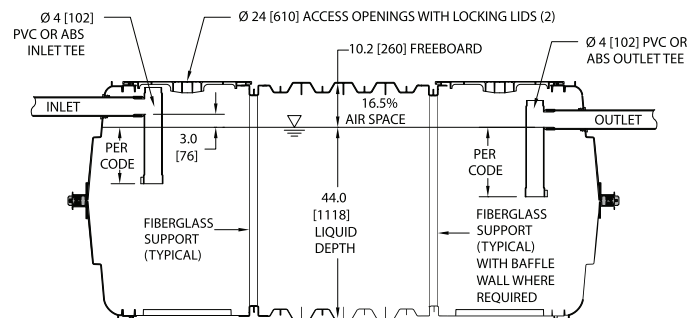
IM-1060	
Working Capacity	1094 gal (4141 L)
Total Capacity	1287 gal (4872 L)
Airspace	16.5%
Length	127" (3226 mm)
Width	62.2" (1580 mm)
Length-to-Width Ratio	2.3 to 1
Height	54.7" (1389 mm)
Liquid Level	44" (1118 mm)
Invert Drop	3" (76 mm)
Fiberglass Supports	2
Compartments	1 or 2
Maximum Burial Depth	48" (1219 mm)
Minimum Burial Depth	6" (152 mm)
Maximum Pipe Diameter	6" (152 mm)
Weight	320 lbs (145 kg)



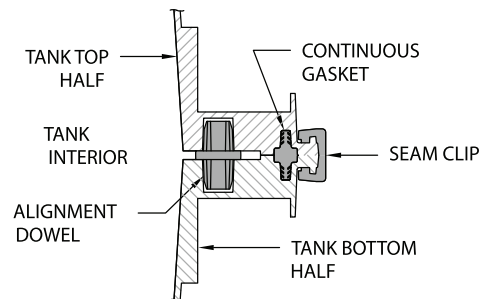
**TOP VIEW**



**END VIEW**



**SIDE VIEW**



**MID-HEIGHT SEAM SECTION**



4 Business Park Road  
P.O. Box 768  
Old Saybrook, CT 06475  
860-577-7000 • Fax 860-577-7001  
**1-800-221-4436**  
[www.infiltratorwater.com](http://www.infiltratorwater.com)

U.S. Patents: 4,759,661; 5,017,041; 5,156,488; 5,336,017; 5,401,116; 5,401,459; 5,511,903; 5,716,163; 5,588,778; 5,839,844 Canadian Patents: 1,329,959; 2,004,564 Other patents pending. Infiltrator, Equalizer, Quick4, and SideWinder are registered trademarks of Infiltrator Water Technologies. Infiltrator is a registered trademark in France. Infiltrator Water Technologies is a registered trademark in Mexico. Contour, MicroLeaching, PolyTuff, ChamberSpacer, MultiPort, PosiLock, QuickCut, QuickPlay, SnapLock and StraightLock are trademarks of Infiltrator Water Technologies. PolyLok is a trademark of PolyLok, Inc. TUF-TITE is a registered trademark of TUF-TITE, INC. Ultra-Rib is a trademark of IPEX Inc.

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IM02 1116

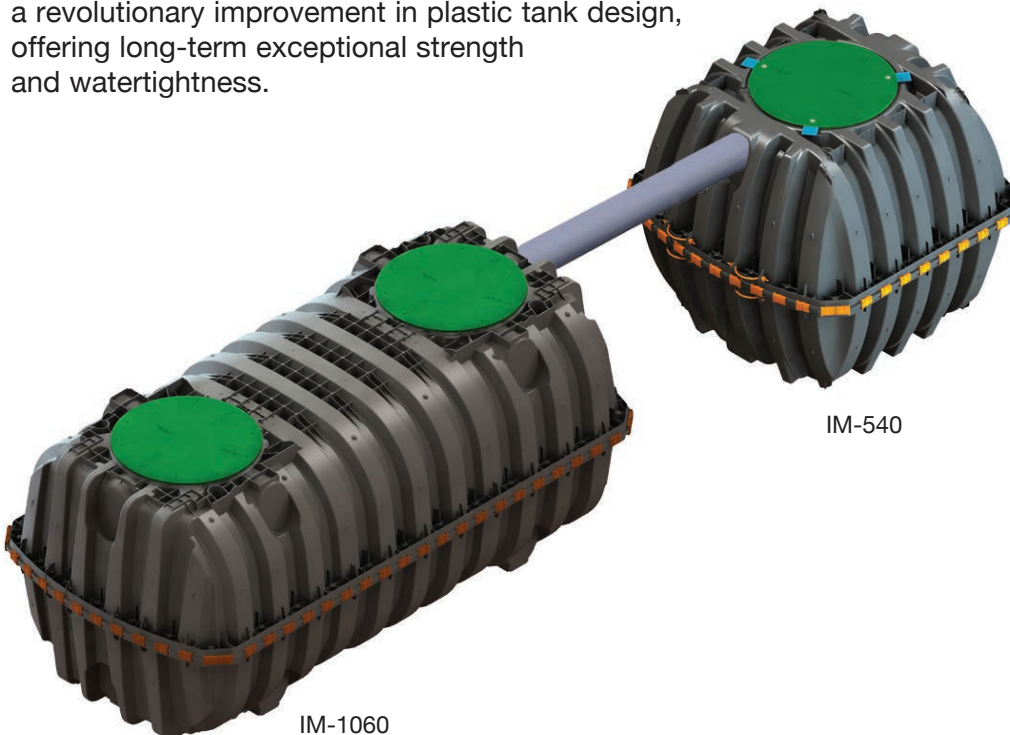
**Contact Infiltrator Water Technologies' Technical Services Department for assistance at 1-800-221-4436**



Reinforced watertight mid-seam gasketed connection

■ **Lightweight strong and durable septic/pump tank, making it optimal for use in-series with other tanks**

This watertight tank design is offered with Infiltrator's line of custom-fit risers and heavy-duty lids. Infiltrator injection molded tanks provide a revolutionary improvement in plastic tank design, offering long-term exceptional strength and watertightness.



IM-1060

IM-540

### Applications

**Retrofit:** The IM-540 can increase the volume of an existing septic tank.

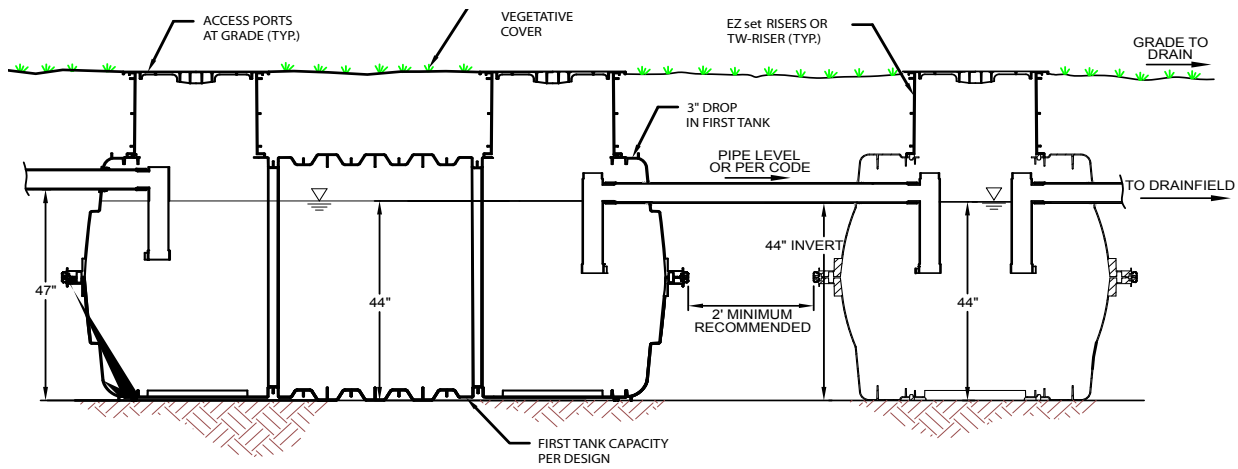
**New:** Use the IM-540 in new in-series installations with another tank.

**Trash/Pump-Tank:** Ideally-sized for use as a trash-tank or pump tank.

### Features & Benefits

- Strong injection molded polypropylene construction
- Lightweight plastic construction and inboard lifting lugs allow for easy delivery and handling
- Integral heavy-duty green lids that interconnect with TW™ risers and pipe riser solutions
- Structurally reinforced access ports eliminate distortion during installation and pump-outs
- Reinforced structural ribbing offers additional strength
- Can be installed with 6" to 48" of cover
- Can be pumped dry during pump-outs
- No special water filling requirements are necessary
- The tank may be backfilled with suitable native soil. See installation instructions for guidance.

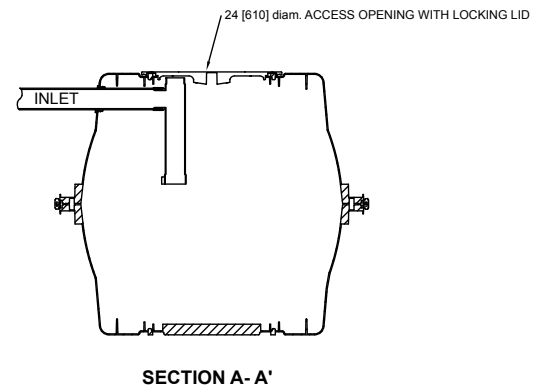
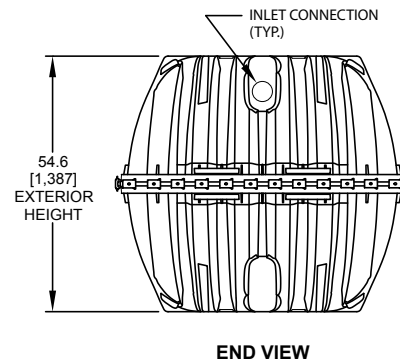
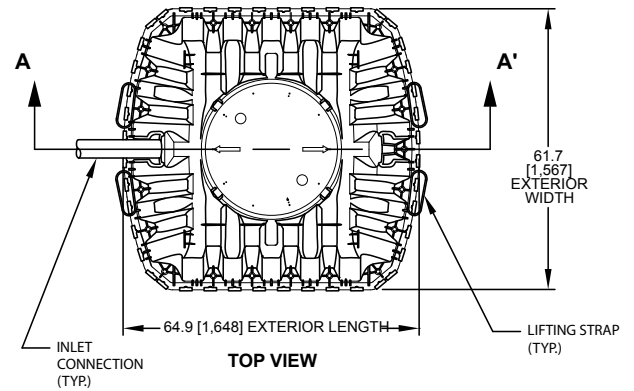




The IM-540 is an injection molded two piece mid-seam plastic tank. The injection molded plastic design allows for a mid-seam joint that has precise dimensions for accepting an engineered EPDM gasket. Infiltrator's gasket design utilizes technology from the water industry to deliver proven means of maintaining a watertight seal. The two-piece design is permanently fastened using a series of non-corrosive plastic alignment dowels and locking seam clips. The IM-540 is assembled and sold through a network of certified Infiltrator distributors.

**Must be backfilled and installed in accordance with Infiltrator Water Technologies, Infiltrator IM-Series Septic Tank General Installation Instructions and for shallow ground water conditions reference the Infiltrator IM-Series Tank Buoyancy Control Guidance.**

Please visit [www.infiltratorwater.com/images/pdf/ManualsGuides/TANK01.pdf](http://www.infiltratorwater.com/images/pdf/ManualsGuides/TANK01.pdf) for the latest information.



IM-540	
Working Capacity	475 gal (1799 L)
Total Capacity	552 gal (2089 L)
Airspace	16.2%
Length	64.9" (1648 mm)
Width	61.7" (1567 mm)
Height	54.6" (1387 mm)
Liquid Level	44" (1118 mm)
Compartments	1
Maximum Burial Depth	48" (1219 mm)
Minimum Burial Depth	6" (152 mm)
Maximum Pipe Diameter	4" (100 mm)
Weight	169 lbs (77 kg)



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U.S. Patents: 4,759,661; 5,017,041; 5,156,488; 5,336,017; 5,401,116; 5,401,459; 5,511,903; 5,716,163; 5,588,778; 5,839,844 Canadian Patents: 1,329,959; 2,004,564 Other patents pending. Infiltrator, Equalizer, Quick4, and SideWinder are registered trademarks of Infiltrator Water Technologies. Infiltrator is a registered trademark in France. Infiltrator Water Technologies is a registered trademark in Mexico. Contour, MicroLeaching, PolyTuff, ChamberSpacer, MultiPort, PosiLock, QuickCut, QuickPlay, SnapLock and StraightLock are trademarks of Infiltrator Water Technologies. PolyLok is a trademark of PolyLok, Inc. TUF-TITE is a registered trademark of TUF-TITE, INC. Ultra-Rib is a trademark of IPEX Inc.

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IM19 1116

**Contact Infiltrator Water Technologies' Technical Services Department for assistance at 1-800-221-4436**



ME3F



ME3H



**MYERS<sup>®</sup>**  
**ME3 SERIES**  
**HIGH HEAD (ME3H) AND HIGH FLOW (ME3F)**  
**SUBMERSIBLE EFFLUENT PUMPS**

# MYERS® ME3 SERIES

The MYERS ME3 series are rugged 1/3 hp effluent pumps designed for demanding effluent pumping jobs where dependability is a must. The ME3 is constructed of only the highest quality corrosion resistant materials – like cast iron, stainless steel and engineered thermoplastics – to provide many years of service in the harsh effluent environment. The ME3 is available with a recessed impeller for high-head applications or an enclosed impeller for high-flow applications – both will pass a full 3/4" spherical solid. The ME3 is available in automatic models with piggyback mechanical float switch or manual models for use with external controls. For more information, call your MYERS distributor today or the MYERS Ohio sales office at 419-289-6898.

## ADVANTAGES BY DESIGN

**DURABLE MOTOR WILL DELIVER MANY YEAR OF RELIABLE SERVICE.**

- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected, shaded pole motor eliminates starting switches and relays which are prone to fail.
- Heavy cast iron motor housing and volute case dissipate heat, allow motor to run cooler for extended life.

**THE ME3 IS ENGINEERED FOR MANY YEARS OF MAINTENANCE-FREE OPERATION.**

- Field tested, wide angle, mercury-free mechanical float switch for maximum draw down. (Automatic piggyback models only).
- Automatic pump models can be operated manually by unplugging piggyback switch and plugging pump directly into outlet.
- Passes a full 3/4" solid.



ME3F



ME3H

## PRODUCT CAPABILITIES

Capacities To	ME3H	36 gpm	136 lpm
	ME3F	66 gpm	250 lpm
Heads to	ME3H	36 ft.	11.0 m
	ME3F	32 ft.	9.75 m
Solids Handling Capacity		3/4 in.	19 mm
Liquids Handling	domestic effluent and drain water		
Intermittent Liquid Temp.		up to 140°F	up to 60°C
Available Motors	1/3 hp, 1550 rpm shaded pole, oil-filled 115V, 11.5 amps, 1Ø, 60 Hz 230V, 5.8 amps, 1Ø, 60 Hz		
Third Party Approvals	UL, CSA		
Acceptable pH Range	6 – 9		
Specific Gravity	.9 – 1.1		
Viscosity	28 – 35 SSU		
Discharge, NPT		1 1/2 in.	50.8 mm
Min. Sump Dia.	Simplex	24 in.	60.1 cm
	Duplex	36 in.	91.4 cm

## CONSTRUCTION MATERIALS

Motor Housing	cast iron, Class 30, ASTM A48	
Impeller, engineered thermoplastic	ME3H	recessed
	ME3F	enclosed
Impeller Wear Ring (ME3F)	304 SST	
Volute	cast iron, Class 30, ASTM A48	
Volute Sealing Ring (ME3F)	Buna-N	
Power Cord	16/3 SJTW/SJTW-A	
Mechanical Shaft Seals	carbon and ceramic	
Fasteners	300 Series SST	

**MECHANICAL FLOAT SWITCH**  
Mercury-free, 90° angle operation.  
(Piggyback models only)

**POWER CORD**  
Quick-disconnect watertight fitting.

**OVERLOAD SWITCH**  
Built-in to protect against over current  
and over temperature conditions.

**MOTOR HOUSING**  
Heavy cast iron for  
efficient heat transfer.

**THRUST WASHER,  
SLEEVE BEARINGS**  
Enhance smooth  
operation and extend pump life.

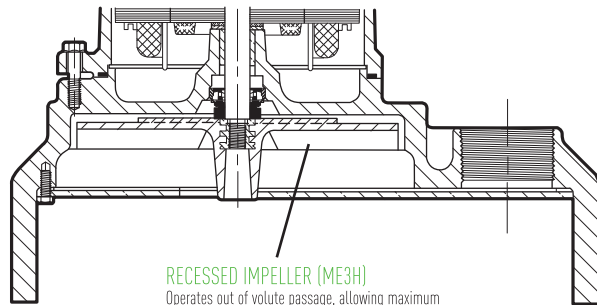
**1/3 HP MOTOR**  
1550 RPM, 60 Hz, shaded pole design elimi-  
nates starting switch or relay mechanism.  
Pressed in place and oil-filled for best  
alignment and heat transfer.

**VOLUTE CASE**  
Cast iron 1-1/2" discharge. Open design  
allows unobstructed passage of 3/4" solids.

**VOLUTE/IMPELLER  
SEAL RING (ME3F)**  
Maintains high efficiency and reduces  
recirculation, replaceable.

**MECHANICAL SHAFT SEAL**  
Carbon and ceramic faces. Body is  
stationary; prevents string or trash from  
winding on seal.

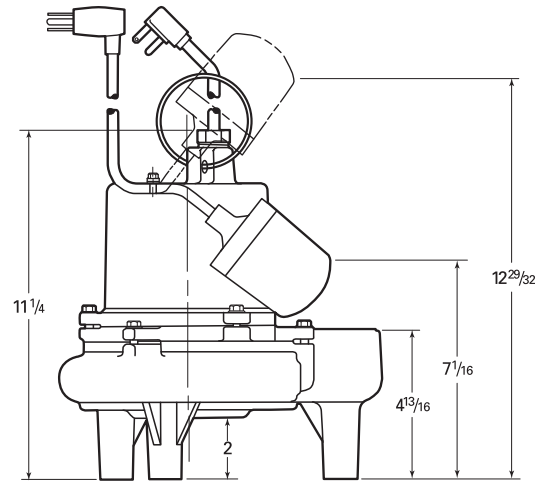
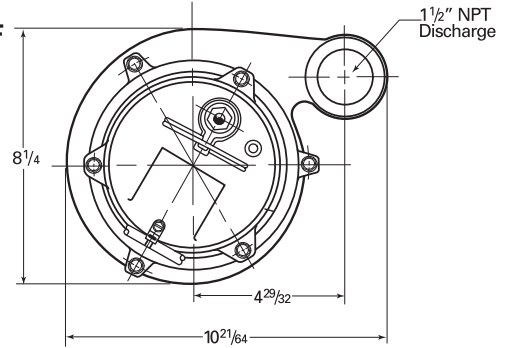
**ENCLOSED TWO VANE  
IMPELLER (ME3F)**



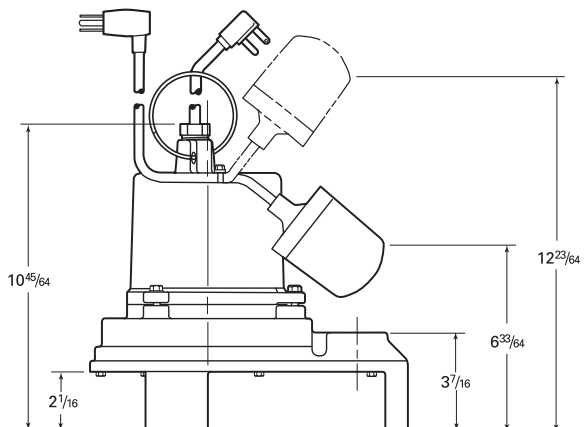
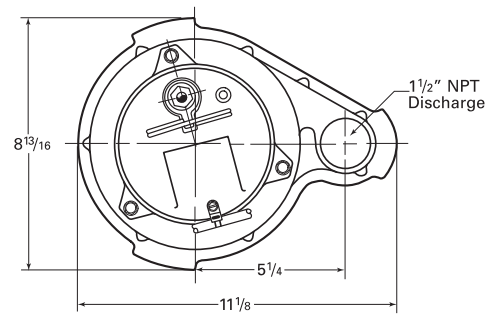
**RECESSED IMPELLER (ME3H)**  
Operates out of volute passage, allowing maximum  
flow of liquids and solids up to 3/4" diameter.

## DIMENSIONS

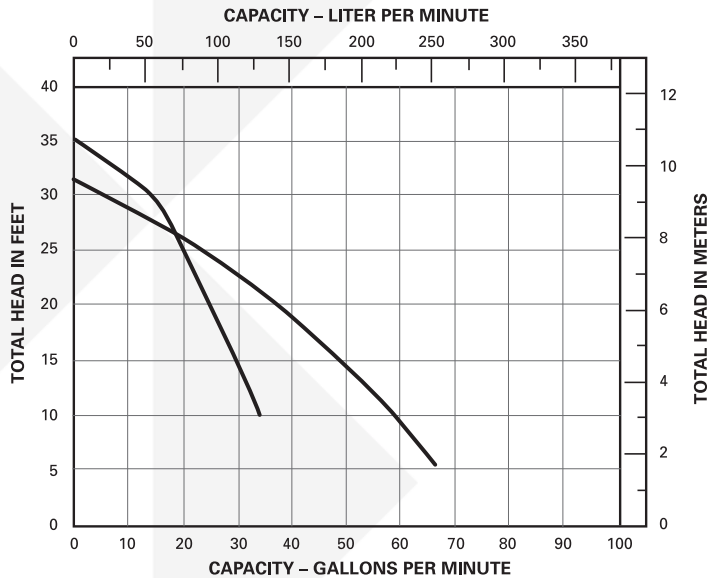
**ME3F**



**ME3H**



## PUMP PERFORMANCE



## SPECIFICATIONS

**EFFLUENT PUMPS** – Pump(s) shall be F. E. MYERS ME3F / ME3H series sump pumps selected in accordance with the following design criteria:

Number of Pumps:	_____
Primary Design Flow:	_____
Primary Design Head:	_____
Minimum Shut-off Head:	<u>36'</u>
Motor Horsepower:	<u>1/3</u>
Motor Speed:	<u>1550 RPM</u>
Electrical:	<u>115 Volts, 1 Ph, 60 Hz or</u> <u>230 Volts, 1 Ph, 60 Hz</u>

**PUMP** – The pump shall be designed to handle septic tank effluent and be capable of passing 3/4 inch spherical solids. The pump shall be capable of handling liquids with temperatures to 140°F intermittently.

**MOTOR** – The pump motor shall be of the submersible type rated 1/3 hp at 1550 RPM and shall be for \_\_\_\_\_ 115 volts or \_\_\_\_\_ 230 volts single phase, 60 cycles. Single phase motor shall be of the shaded pole type with no relays or starting switches. Stator winding shall be of the open type with Class A insulation rated for 105°C maximum operating temperature. The winding housing shall be filled with clean dielectric oil to lubricate bearings and seals, and transfer heat from the windings to the outer shell. The motor winding assembly shall be pressed into the stator housing for best alignment and heat transfer.

The motor shall be capable of operating over the full range of the performance curve without overloading the motor and causing any objectionable noise or vibration. The motor shall have two bearings to support the rotor; an upper sleeve bearing to accommodate radial loads and a lower sleeve bearing with thrust pad to take thrust and radial loads.

A heat sensor thermostat and overload shall be attached to the top end of the motor windings and shall be wired in series with the windings to stop the motor if the motor winding temperature reaches 221°F. The overload thermostat shall reset automatically when the motor cools to a safe operating temperature.

**POWER CORD** – The motor power cord shall be \_\_\_\_\_ 10 or \_\_\_\_\_ 20 feet SJTW type. The cord shall have a molded compression grommet to insulate electrical connections. The grommet shall thread into the motor housing to provide a positive seal and to prevent leaking of liquid into the motor housing. The sealing grommet shall provide strain relief for the power cord assembly.

**OPTIONAL CONTROL SWITCH** – The effluent pump shall be controlled by an optional piggyback float switch. The float switch shall be of the mechanical, non-mercury type and be capable of directly controlling the pump motor without the need for an external control panel.

**SHAFT SEAL** – The motor shall be protected by a rotating mechanical shaft seal. The seals shall have carbon and ceramic seal faces lapped to a tolerance of one light band. Metal parts and springs for seals shall be 300 series stainless steel.

**PUMP IMPELLER (ME3F)** – The pump impeller shall be of the two vane enclosed type. The impeller shall be constructed of engineered thermoplastic. A stainless steel wear ring shall be molded into the neck of the impeller to provide a sealing surface. A replaceable Buna-N sealing cup shall effect a seal between the volute and impeller in order to maintain high efficiency and prevent recirculation.

**PUMP IMPELLER (ME3H)** – The pump impeller shall be of the recessed type. The impeller shall be constructed of engineered thermoplastic.

**PUMP AND MOTOR CASTINGS** – The motor housing castings shall be of high tensile strength Class 30 gray cast iron. The pump shall be painted with waterborne hybrid acrylic/alkyd paint. This custom engineered, quick dry paint shall provide superior levels of corrosion and chemical protection.

**PUMP CASE** – The pump case shall be a high efficiency volute design capable of passing 3/4 inch spherical solids. The pump volute shall be constructed of Class 30 gray cast iron.

**FASTENERS** – All exposed fasteners shall be of 300 series stainless steel.



740 EAST 9TH STREET,  
ASHLAND, OHIO 44805  
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,  
ONTARIO, CANADA N2G 4W5  
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# MVP-Simplex Control Panel

## Applications

The MVP-Simplex control panel has a dual-mode feature, making it ideal for both timed- and demand-dosing in single-pump systems. All MVPs include an easy-to-use, programmable logic unit that incorporates many timing and logic functions, such as multiple timing intervals to adjust for changing flow conditions and a built-in elapsed time meter and counter.



*Easy to set, accurate, and surprisingly affordable, the MVP brings intelligent control technology to the water and wastewater handling industries.*

## Standard Features & Benefits

- Eight inputs and four outputs
- Simple setting instructions are easy to remember; parameters have understandable abbreviations
- Intervals as long as 99 hours can be set with an accuracy of  $\pm 1\%$
- Programmable for timed or on-demand dosing
- For timed dosing, multiple timer intervals (normal timer, override timer) can be set to accommodate varying flow conditions
- Large, backlit LCD display is easy to read
- Built-in programming keys allow reprogramming in the field without a portable computer
- Ability to use one model of float for all functions simplifies installation
- UL 508 listed in US and Canada
- Complete instructions and diagrams come with panel and are affixed to the inside, for in-field reference
- Three-year limited warranty

## Standard Features for System Maintenance

- Totalized and resettable data for:
  - Elapsed pump run times
  - Pump cycle counts
  - Low-and high-level alarms
  - Overrides (timed-dose mode only)
  - Power failures
- Different alarm/light signals for different alarm conditions; alarm screen activates when an alarm condition occurs and the alarm type, start time, and date are reported automatically
- Redundant off feature as standard
- Automatic reactivation of silenced alarm (when problem is not corrected) prevents system failure
- 120 V output for remote alarm activation as standard
- Float status screen with error notification and float position indication
- Timed delays on float inputs prevent chattering and pump burnout (over)

## To Order

Call your nearest Orenco Systems®, Inc. Distributor. For nearest Distributor, call Orenco at 800-348-9843, or visit [www.orenco.com](http://www.orenco.com) and click on "Where to Buy."

**Optional Features & Benefits\***

- Removable EEPROM card for reprogramming the panel in the shop or in the field
- UL698A (Intrinsically Safe listing) for use in hazardous locations
- Self-regulating anticondensation heater (which radiates additional wattage as temperature drops)
- Pump run light to indicate that the pump is currently activated
- Power light to indicate that the control panel is energized
- Surge arrestor to reduce problems caused by power surges and spikes

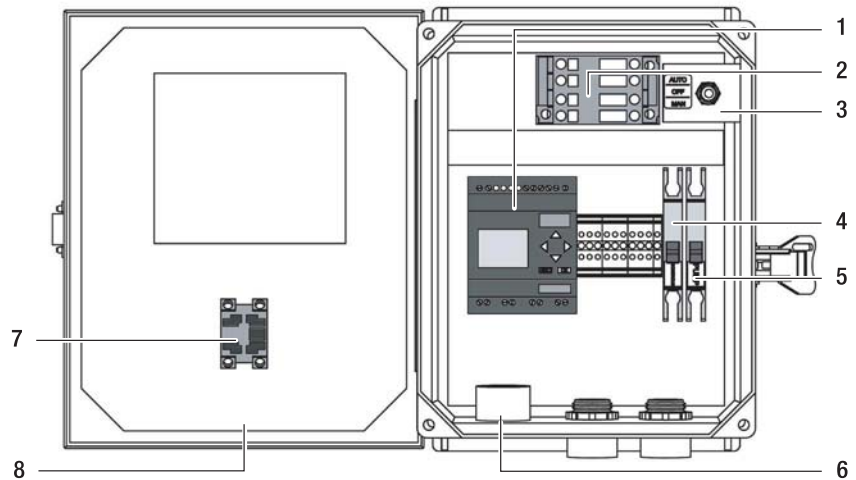
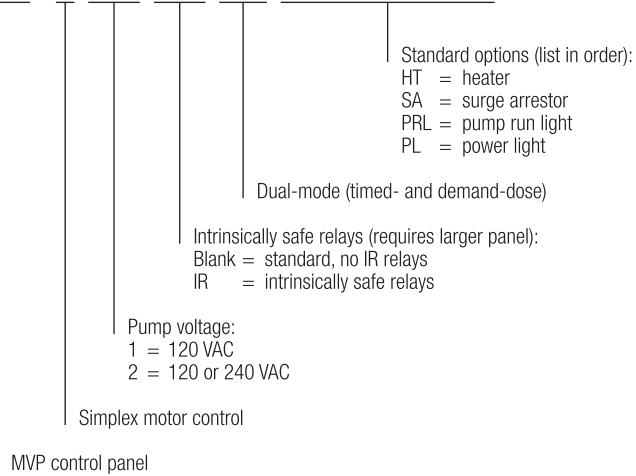
\*Additional options available on a custom basis. Contact Orenco Controls for more information.

**Standard Models**

MVP-S1DM, MVP-S2DM

**Model Code for Ordering**

MVP - S 2   DM  



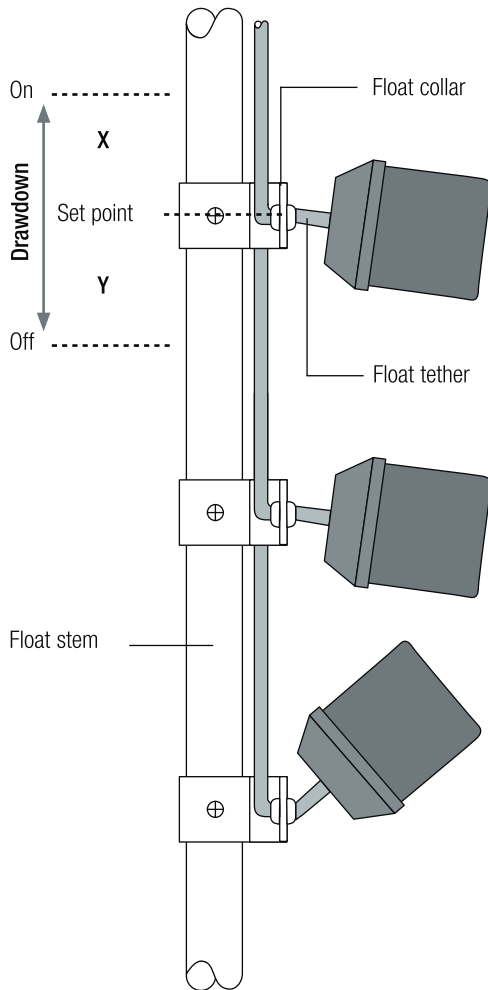
- |                             |                         |
|-----------------------------|-------------------------|
| 1. Programmable Logic Unit  | 5. Pump Circuit Breaker |
| 2. Motor-Start Contactor    | 6. Audible Alarm        |
| 3. Toggle Switch            | 7. Visual Alarm         |
| 4. Controls Circuit Breaker | 8. Panel Enclosure      |



# Float Switch Assemblies

## Applications

Float switches are used to signal liquid level positions for alarm and pump control applications. Orenco float switch assemblies can be mounted in pump vaults, effluent screens, pump basins, and risers.



The "On" and "Off" positions describe normally open floats.  
For normally closed floats, the functions are reversed.

## Materials of Construction

Float housing	Impact-resistant, noncorrosive polypropylene for use in liquids up to 140° F (60° C)
Float cord	Flexible, 2-conductor (UL, CSA) SJOW; CPE cord jacket with EPDM insulated conductors
Float collar	ABS

## General

All models listed are UL listed and CSA certified for use in water or sewage. Non-mercury float switches (models B, C, N, and P) are used where components containing mercury are prohibited.

Float switches are typically ordered in assemblies that include one or more switches mounted on a 1-inch PVC float stem. ABS float collars are used to provide secure mounting that is easily adjustable.

Normally-open "P" float switches have a blue cap for easy identification; normally-closed "N" float switches have a red cap.

## Standard Models

B, C, G, N, P

## Product Code Diagram

MF 3 PN - 45 FS -

Cord length option:  
Blank = 10 ft (3 m), standard  
20 = 20 ft (6 m)  
30 = 30 ft (9 m)  
50 = 50 ft (15 m)

Application:

- FS = field set
- FTL = elbow-style (base-inlet filters only)
- PB = pump basin
- V = pump vault (standard float settings)
- STEP = Standard float settings for STEP
- STEPRO = Standard float settings for STEP with redundant off
- SVCOM = Standard float settings for VCOM simplex

Float stem length:

- Blank = no float stem (floats and collars only)
- 19, 21, 27, 33, 37, 39, 45, 51, 57, 66 = stem length, in.
- 5, 11 = stem length, in. (for elbow-style float brackets)

Float switch models (listed in order from the top of the float stem down):  
B, C, G, N, P

Number of float switches (when using multiples of the same float switch model):  
Blank = no multiples of the same float switch model

Float switch assembly

### Note:

When ordering float switch assemblies, remember to list float switches from the top of the float stem down. An "MF3PN-" product code indicates one "P" switch at the top of the stem, one "B" in the middle of the stem, and one "N" switch at the bottom of the stem; an "MF2PN-" indicates "P" switches at the top and middle of the stem, and one "N" switch at the bottom of the stem.

## Signal- and Motor-Rated Float Switch Matrix

Float	State <sup>1</sup>	Type	IR <sup>2</sup>	Volts	Amps	hp	Tether	X	Y	Drawdown <sup>3</sup>
<b>Signal-rated mechanical floats<sup>4</sup> (for control switch applications)</b>										
P Model <sup>a</sup>	Normally open	Mechanical	Yes	n/a	n/a	n/a	2.00 in.	1.50 in.	0.50 in.	2.00 in.
N Model <sup>a</sup>	Normally closed	Mechanical	Yes	n/a	n/a	n/a	2.00 in.	1.50 in.	0.50 in.	2.00 in.
<b>Motor-rated floats<sup>4</sup> (for pump switch applications)</b>										
B Model	Normally open	Mechanical	No	120V	13A	1/2 hp	2.00 in. <sup>b</sup>	2.50 in.	1.50 in.	4.00 in.
				240V	13A	1 hp	3.00 in.	3.00 in.	1.50 in.	4.50 in.
							4.00 in.	3.25 in.	1.50 in.	4.75 in.
C Model	Normally open	Mechanical	No	120V	13A	1/2 hp	2.00 in.	3.00 in.	2.50 in.	5.50 in.
				240V	15A	2 hp	3.00 in. <sup>b</sup>	3.50 in.	3.00 in.	6.50 in.
							4.00 in.	4.00 in.	3.50 in.	7.50 in.
							5.00 in.	4.50 in.	4.00 in.	8.50 in.
G Model	Normally open	Mercury	Yes	120V	15A	3/4 hp	2.00 in.	1.50 in.	3.00 in.	4.50 in.
				240V	15A	2 hp	3.00 in. <sup>b</sup>	1.75 in.	3.00 in.	4.75 in.
							4.00 in.	2.00 in.	3.50 in.	5.50 in.

a. Suitable for use with VCOM and MVP.

b. Standard tether length

## Notes

### <sup>1</sup> State: normally open or normally closed

The default state of a float — normally open or normally closed — refers to the contact positions in the float when the float is resting (down). Float switches have an internal contact. The terms “normally open” (N/O) and “normally closed” (N/C) refer to the state of the float switch contact in the down position. A normally open float switch has an open contact (off) in the down position and a normally closed float switch has a closed contact (on) in the down position. Different panel functions require different types of float switches. Most applications require float switches that are normally open. One notable exception is the redundant off and low-level alarm function that requires a normally closed float switch, except with MVP and VCOM panels.

### <sup>2</sup> IR (intrinsically safe relay)

Approved for use with intrinsically safe, Class I, Division 1 applications, where reliable float switch operation with very low current is required.

### <sup>3</sup> Drawdown

Drawdown (in inches) refers to the difference in liquid level between a float switch's activation and deactivation points. Drawdown can be altered by adjusting the tether length of the float switch cord. When selecting float switches, keep in mind that any float switch that can directly start and stop a pump (one that has no motor contactor in the control panel) should have a drawdown capability, to avoid rapid cycling of the pump.

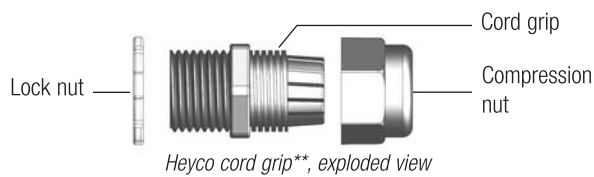
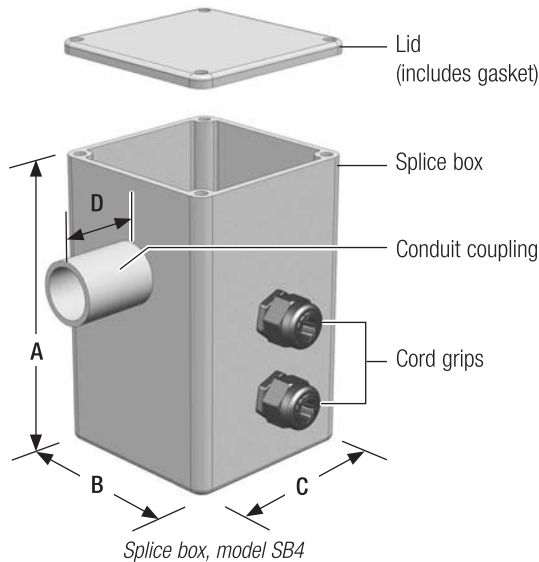
### <sup>4</sup> Signal-rated or motor-rated

Every float has a maximum amount of current it can handle. Exceeding these limits may cause premature failure. Signal-rated or “control” floats are used to activate pump control panels and alarms. Only low-amperage signals pass through these float switches, hence the float switch is “signal-rated.” All Orenco panels that use motor contactors can use signal-rated float switches. In some systems, a float switch is used to directly start and stop a pump. In this application, the current that is running the pump passes through the float switch as well, and the float switch must be “motor-rated.” In most instances, a motor-rated float switch can be used as a signal float switch.

# Internal Splice Boxes

## Applications

Orenco® internal splice boxes\* are used in risers to house spliced wire connections between an electrical control panel and such equipment as effluent pumps and float switches. They conform to UL 514C, CSA C22.2 No. 85 1968, and meet UL Type 4X rating. Cord grips can withstand temperatures of up to 212° F (100° C). Standard ½-in. (13-mm) cord grips can accommodate round cord diameters from 0.17 to 0.47 in. (4.3 to 12 mm). Large ¾-in. (19-mm) cord grips can accommodate round cord diameters from 0.45 to 0.70 in. (11 to 18 mm). Cord grips are also available to accommodate single- and three-phase CE-rated 1.5 × 3 flat cords.



## General

Orenco splice boxes come standard with one to six watertight cord grips. Included are waterproof wire nuts, a sealing gasket, and four stainless steel lid screws.

Splice boxes also come standard with ½-in. (13-mm) cord grips and a 1½-in. (41-mm) long conduit coupling. Large ¾-in. (19-mm) cord grips and 3¼-in. (83-mm) long conduit couplings (for square or round concrete risers) are available.

## Standard Models

SB1, SB2, SB3, SB4, SB5, SB6.

## Nomenclature

**SB** **5**

Options:

- A = Splice box factory-installed
- LN = 3¼-in. (83 mm) conduit coupling, round concrete risers
- C = 3¼-in. (83 mm) conduit coupling, square concrete risers
- G = cord grip, ¾-in. (19 mm)
- CE = cord grip for CE-rated 1.5 × 3 flat cable, 50 Hz

Number of cord grips:  
1, 2, 3, 4, 5, or 6

Splice box

## Materials of Construction

Lid	PVC per ASTM D-1784
Splice box	PVC per ASTM D-1784
Conduit coupling	PVC per ASTM D-1784
Cord grip	Nylon
Lock nut	Stainless steel
Sealing gasket (not shown)	Proprietary elastomer
Lid screws (not shown)	Stainless steel

## Specifications

Model	SB1	SB2	SB3	SB4	SB5	SB6
A, in. (mm)	6¼ (159)	6¼ (159)	6¼ (159)	6¼ (159)	6¼ (159)	6¼ (159)
B, in. (mm)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)
C, in. (mm)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)
D, standard size, in. (mm)	1½ (41)	1½ (41)	1½ (41)	1½ (41)	1½ (41)	1½ (41)
Conduit diameter, nominal, in. (DN)	¾ (20)	¾ (20)	¾ (20)	¾ (20)	1 (25)	1 (25)
Number of cord grips	1	2	3	4	5	6

\*For information on Orenco® external splice boxes, see NTD-SBEX-1, External Splice Boxes

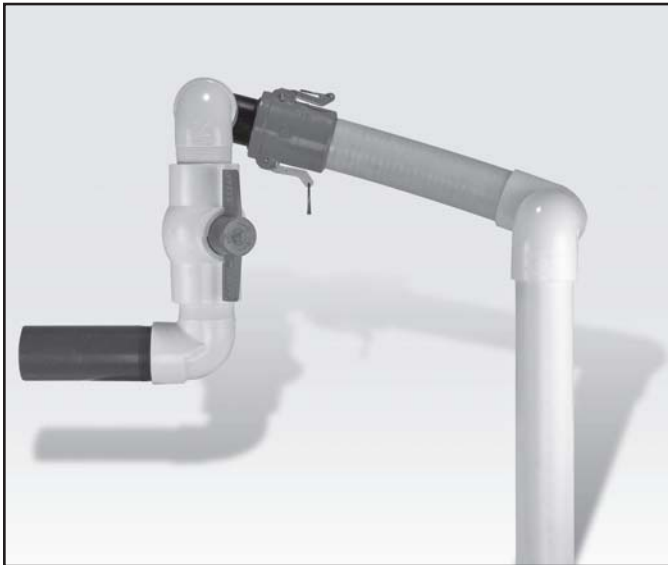
\*\*Cord grips are listed under UL file number E-51579 and CSA file number LR-93876

# Discharge Assemblies

## Applications

Orenco Discharge Assemblies are used to convey effluent from a pump to the exterior of a riser or pump basin. They come in the following configurations:

- High head, for use with submersible turbine pumps
- Low head, for use with common effluent pumps
- Drainback, for use with shallowly buried tanks and transport lines in cold climates
- Two additional applications are available:
- The cold weather kit coupled with a high-head discharge assembly is intended for use with deeply buried tanks and transport lines in cold weather
- The external flex extension is recommended for installations where tank settling may occur to avoid line breakage during settling.



High head style shown with optional quick-disconnect

## General

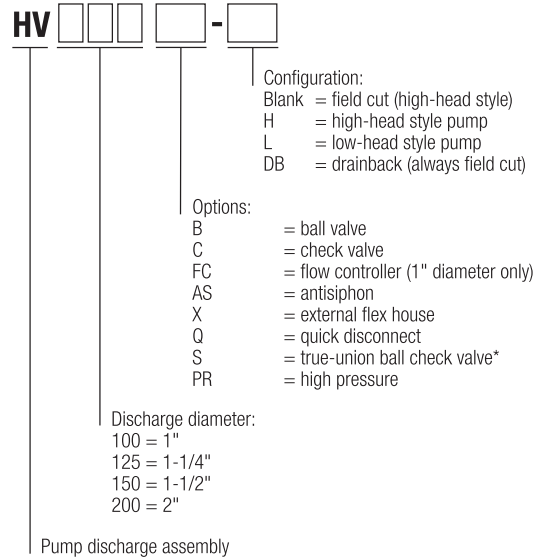
Orenco Discharge Assemblies are corrosion-resistant and adjustable for a proper fit. Discharge assemblies are composed of PVC valves and flexible hose that simplify installation and maintenance. The flexible hose damps vibrations from the pump and allows for easy installation. Cam-style quick-disconnect fittings are available on all configurations. All parts are either solvent welded or threaded and sealed with Teflon® paste.

Teflon® is a registered trademark of DuPont.

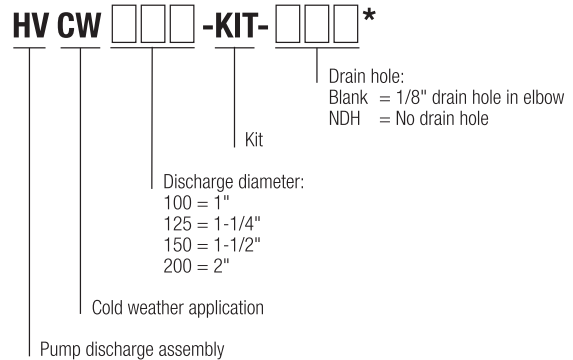
## Standard Models

HV100, HV125, HV150, HV200

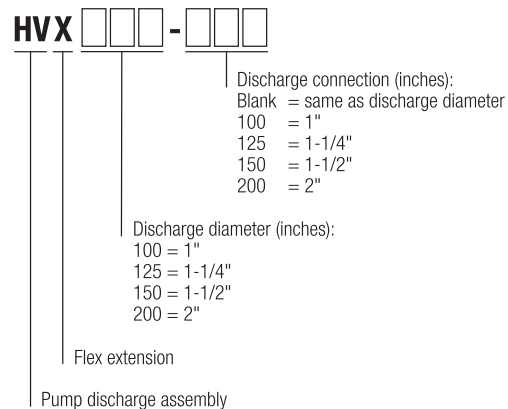
## Product Code Diagram



\* Available for 1-1/2" discharge only

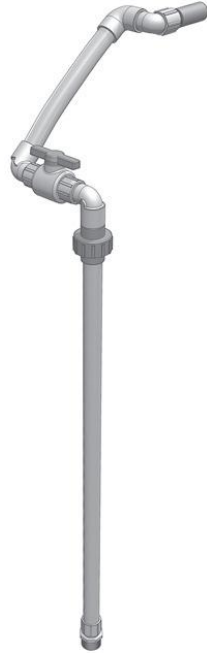


\* Always ordered with high head discharge assembly





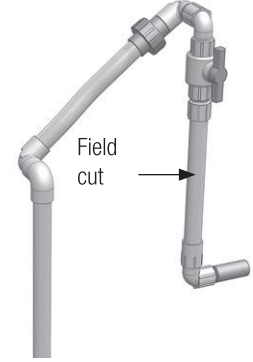
High head style



Drainback style



Low head style



High head style with cold weather kit installed

Field cut →



Cold weather kit



External flex extension

## Component Working Pressure Ratings

True union ball check valve	200 psi (14 bar) at 73° F (23° C)
All other valves	150 psi (10 bar) at 73° F (23° C)
Unions	150 psi (10 bar) at 73° F (23° C)

## Materials of Construction

Component	Material
Anti-siphon valve	Schedule 40 PVC
Ball valve	Schedule 40 PVC
Check valve	Schedule 40 PVC
Pipe and fittings	Schedule 40 PVC
Flexible hose	PVC
External flex hose	PVC
Flow control disc	Schedule 80 PVC
Gate valve	Schedule 80 PVC
Unions	Schedule 80 PVC
High-pressure flex hose	Special elastomer compound

## Hose Specifications

Thickness and working pressures at 73° F (23° C)

Flexible hoses	Size (U.S. Nominal)	Wall thickness	Working pressure	Bursting pressure
(standard and external)	1 in.	0.11 in. (2.8 mm)	100 psi (7 bar)	355 psi (24 bar)
	1.25 in.	0.13 in. (3.3 mm)	80 psi (6 bar)	250 psi (17 bar)
	1.5 in.	0.13 in. (3.3 mm)	65 psi (4 bar)	200 psi (14 bar)
	2 in.	0.16 in. (4.1 mm)	60 psi (4 bar)	175 psi (12 bar)
Flexible hoses	Size (U.S. Nominal)	Wall thickness	Working pressure	Bursting pressure
(high-pressure)	1 in.	0.235 in. (6.0 mm)	250 psi (17 bar)	N/A
	1.25 in.	0.24 in. (6.1 mm)	250 psi (17 bar)	N/A
	1.5 in.	0.24 in. (6.1 mm)	250 psi (17 bar)	N/A
	2 in.	0.22 in. (5.6 mm)	200 psi (14 bar)	N/A

## Miscellaneous Onsite Wastewater Products

### Ball Valves (VLT)

PVC ball valves are used for shutting off flow to a distribution line. All sizes are available with either slip fit or threaded connections.

- Schedule 40 PVC Type II body
- EPDM O-ring
- Pre-loaded stem seal
- Slip fit or threaded connections available for all sizes
- ½-inch, ¾-inch, 1-inch, 1¼-inch, 1½-inch, and 2-inch NPS sizes available

#### Sample Product Codes\*

- VLT1000S — PVC ball valve, 1-inch (25-mm), slip fit
- VLT1000T — PVC ball valve, 1-inch (25-mm), threaded
- VLT1500S — PVC ball valve, 1½-inch (40-mm), slip fit
- VLT1500T — PVC ball valve, 1½-inch (40-mm), threaded
- VLT2000S — PVC ball valve, 2-inch (50-mm), slip fit
- VLT2000T — PVC ball valve, 2-inch (50-mm), threaded

### True Union Ball Valves (VTU)

True union ball valves combine the features of a PVC union and ball valve into one component.

- Schedule 80 PVC construction
- EPDM O-rings
- 1-inch, 1¼-inch, 1½-inch, 2-inch, 3-inch, and 4-inch NPS sizes available
- Includes slip fit and threaded connections in 1-inch through 2-inch sizes
- Available with slip fit or threaded connections in 3-inch and 4-inch sizes

#### Sample Product Codes\*

- VTU1000 — true union ball valve, 1-inch (25-mm), slip fit and threaded connections
- VTU1250 — true union ball valve, 1¼-inch (32-mm), slip fit and threaded connections
- VTU1500 — true union ball valve, 1½-inch (40-mm), slip fit and threaded connections
- VTU2000 — true union ball valve, 2-inch (50-mm), slip fit and threaded connections
- VTU4000S — true union ball valve, 4-inch (100-mm), slip fit

\* For the full range of available product options, contact your local Orenco Distributor or Orenco.



Ball Valve



True Union Ball Valve

## Miscellaneous Onsite Wastewater Products

### Check Valves (KSC)

Check valves prevent backflow in a system, providing minimal resistance to normal flow but only requiring ½ lb (0.2 kg) back pressure for complete closure.

- Schedule 40 high-impact PVC Type II body (per ASTM D-1785)
- EPDM swing gate
- 1-inch, 1¼-inch, 1½-inch, 2-inch, 3-inch, and 4-inch NPS sizes available
- Slip fit or threaded connections available for all sizes

### Sample Product Codes\*

- KSC1000S — check valve, 1-inch (25-mm), slip fit
- KSC1000T — check valve, 1-inch (25-mm), threaded
- KSC1250S — check valve, 1¼-inch (32-mm), slip fit
- KSC1250T — check valve, 1¼-inch (32-mm), threaded
- KSC2000S — check valve, 2-inch (50-mm), slip fit
- KSC2000T — check valve, 2-inch (50-mm), threaded

\* For the full range of available product options, contact your local Orenco Distributor or Orenco.



Check Valve



**Chimney Block Thimble**

17x8x21

Sp



**Clay Flue Liner**

1 foot sections - 8x12

Also Available: 12x12 12x16

16x16



**Pre-Cast Chimney Cap**

17x4x21 & 17x4x17

C



**Round Clay Thimble**

1 foot sections

6" or 8"

Funk Air Control  
Slider Air Control  
Brick Vents  
Ash Dumps

Steel Clean Out Doors  
Air Tight Clean Out Doors  
Adjustable Metal Thimbles



## ASTM D3034/IB PVC Gravity Sewer Pipe | Gasketed Integral Bell

NAPCO's ASTM D3034 Gasketed Integral Bell PVC Pipe product line is manufactured to meet the needs of modern municipal waste water systems, storm water drainage systems, and other non-pressure applications. With top quality raw materials and modern processing technology, our ASTM D3034 pipe meets all industry standards in addition to our own rigorous quality control requirements.

Our D3034 pipe utilizes Rieber style gaskets throughout the entire product offering to create a leak-free joint.



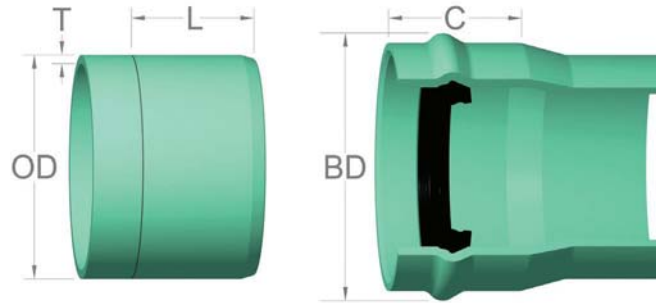
Short Form Specification	
<b>Pipe Standard:</b>	ASTM D3034
<b>Diameter Std.:</b>	PSM
<b>Nominal Sizes:</b>	4", 6", 8", 10", 12", 15"
<b>Dimension Ratios &amp; Pipe Stiffness:</b>	SDR 35 – 46 psi SDR 26 – 115 psi SDR 23.5 – 153 psi
<b>Pressure Ratings:</b>	Not rated for pressure applications
<b>Lay Length:</b>	14' or 20'
<b>Color:</b>	Green
<b>Pipe Compound:</b>	ASTM D1784 Cell Class 12454 or 12364
<b>Pipe Options:</b>	Solid Wall 2 Hole Perforated 3 Hole Perforated
<b>Pipe Joint Std.:</b>	ASTM D3212
<b>Max. Angular Joint Deflection:‡</b>	1°
<b>Gasket Standard:</b>	ASTM F477
<b>Gasket Material Offerings:</b>	Standard – SBR Optional – NBR or EPDM
<b>Certifications:</b>	IAPMO Uniform Plumbing Code*
<b>Installation Std.:</b>	ASTM D2321

\*IAPMO Uniform Plumbing Code listed products must be requested at time of order.  
‡See Installation Guide for more information.





## ASTM D3034/IB PVC Gravity Sewer Pipe | Gasketed Integral Bell



D3034/IB PIPE DIMENSIONS & PERFORMANCE								
Nom. Size	Outside Diameter (OD)	SDR	Pipe Stiffness (psi)	Min. Wall Thickness (T)	Internal Diameter (ID)	Approx. Bell Diameter (BD)	Bell Depth (C)	Insertion Mark (L)
4"	4.215	35	46	0.120	3.975	5.000	3.750	3.125
		26	115	0.162	3.891			
		23.5	153	0.178	3.859			
6"	6.275	35	46	0.180	5.915	7.375	4.625	4.000
		26	115	0.241	5.793			
		23.5	153	0.265	5.745			
8"	8.400	35	46	0.240	7.920	9.625	5.250	4.125
		26	115	0.323	7.754			
10"	10.500	35	46	0.300	9.900	12.250	5.875	5.125
		26	115	0.404	9.692			
12"	12.500	35	46	0.360	11.780	14.375	6.500	5.375
		26	115	0.481	11.538			
15"	15.300	35	46	0.437	14.426	17.500	7.750	7.375
		26	115	0.588	14.125			

**Notes:**

1. These dimensions are for estimating purposes only. All dimensions are in inches unless otherwise specified.
2. SDR = Standard Dimension Ratio
3. ASTM Pressure Rating @ 73°F and includes 2:1 safety factor.
4. Internal diameter calculated using nominal outside diameter and minimum wall thickness.
5. Dimension given for Approx. Bell Diameter (BD) is for highest pressure rating.



# ASTM D1785/D2665 Sch. 40 PVC Pressure/DWV Pipe ASTM D1785 Sch. 80 PVC Pressure Pipe | Solvent Weld

NAPCO's ASTM D1785 Solvent Weld PVC Pipe product line is manufactured to meet the needs of residential, commercial, & industrial plumbing systems, and other pressure applications. With top quality raw materials and modern processing technology, our ASTM D1785 pipe meets all industry standards in addition to our own rigorous quality control standards.

For sizes 1¼" and larger, our ASTM D1785 Schedule 40 pipe is also dual rated to ASTM D2665 for DWV applications. This gives the designer, installer, and end user the flexibility of one product for two distinct applications. NAPCO produces ASTM D1785 Solvent Weld pipe in both solid wall and various perforated styles.



Short Form Specification		
<b>Pipe Standard:</b>	ASTM D1785 & ASTM D2665** Sch. 40	ASTM D1785 Sch. 80
<b>Applications:</b>	Water DWV**	Water
<b>Diameter Std.:</b>	Iron Pipe Size (IPS)	
<b>Nominal Sizes:</b>	½", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 24"	
<b>Pressure Ratings:</b>	See Next Page	
<b>Length:</b>	10' or 20'	
<b>Color:</b>	White	Gray
<b>Pipe Compound:</b>	ASTM D1784 Cell Class 12454	
<b>Pipe Joint Std.:</b>	ASTM D2672	
<b>Pipe Options:</b>	Solid Wall Plain End (M x M) Solid Wall Bell End (M x F) 2 Hole Perforated Bell End (M x F) 3 Hole Perforated Bell End (M x F)	
<b>Gasket Standard:</b>	ASTM F477	
<b>Certifications:</b>	NSF 14 & NSF 61 IAPMO Uniform Plumbing Code*	
<b>Installation Std.:</b>	ASTM D2774 & ASTM D2855	

\*IAPMO Uniform Plumbing Code listed products must be requested at time of order.  
\*\*Sizes ½", ¾", 1" & 5" are not included in the ASTM D2665 DWV pipe standard.



### USE OF PVC PIPE IN EXHAUST SYSTEMS

**WARNING:** Failure to follow these instructions exactly could result in serious injury, death, or property damage.

**WARNING:** Flue gas temperature should not exceed 140° Fahrenheit. PVC pipe exposed to temperatures higher than 140° Fahrenheit may melt or change shape, resulting in leakage of exhaust fumes and property damage.

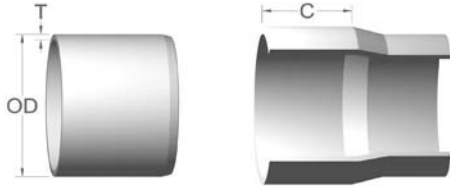
**WARNING CARBON MONOXIDE POISONING HAZARD:** Vent pipe must be properly installed in accordance with all local and national plumbing and HVAC installation standards and codes.

NAPCO assumes no responsibility for equipment installed in violation of any code or regulation.



# ASTM D1785/D2665 Sch. 40 PVC Pressure/DWV Pipe

## ASTM D1785 Sch. 80 PVC Pressure Pipe | Solvent Weld



**Notes:**

1. These dimensions are for estimating purposes only. All dimensions are in inches unless otherwise specified.
2. ASTM Pressure Rating @ 73°F and includes 2:1 safety factor.
3. Internal diameter calculated using nominal outside diameter and minimum wall thickness.

**D1785 PIPE DIMENSIONS & PERFORMANCE**

Nominal Size	Outside Diameter (OD)	Class	Pressure Rating (psi)	Min. Wall Thickness (T1)	Internal Diameter (ID)	Approx. Bell Diameter in. [mm]	Bell Depth (C)
½"	0.840	Sch. 40	600	0.109	0.622	1.086 [27.6]	1.750
		Sch. 80	850	0.147	0.546	1.162 [29.5]	
¾"	1.050	Sch. 40	480	0.113	0.824	1.304 [33.1]	2.500
		Sch. 80	690	0.154	0.742	1.386 [35.2]	
1"	1.315	Sch. 40	450	0.133	1.049	1.611 [40.9]	2.500
		Sch. 80	630	0.179	0.957	1.704 [43.3]	
1¼"	1.660	Sch. 40	370	0.140	1.380	1.970 [50.0]	2.500
		Sch. 80	520	0.191	1.278	2.075 [52.7]	
1½"	1.900	Sch. 40	330	0.145	1.610	2.222 [56.4]	2.500
		Sch. 80	470	0.200	1.500	2.336 [59.3]	
2"	2.375	Sch. 40	280	0.154	2.067	2.715 [69.0]	3.250
		Sch. 80	400	0.218	1.939	2.849 [72.4]	
2½"	2.875	Sch. 40	300	0.203	2.469	3.319 [84.3]	3.500
		Sch. 80	420	0.276	2.323	3.474 [88.2]	
3"	3.500	Sch. 40	260	0.216	3.068	3.974 [100.9]	4.250
		Sch. 80	370	0.300	2.900	4.152 [105.5]	
4"	4.500	Sch. 40	220	0.237	4.026	5.020 [127.5]	5.500
		Sch. 80	320	0.337	3.826	5.232 [132.9]	
5"	5.563	Sch. 40	190	0.258	5.047	6.129 [155.7]	6.000
		Sch. 80	290	0.375	4.813	6.377 [162.0]	
6"	6.625	Sch. 40	180	0.280	6.065	7.241 [183.9]	7.000
		Sch. 80	280	0.432	5.761	7.563 [192.1]	
8"	8.625	Sch. 40	160	0.322	7.981	9.338 [237.2]	7.500
		Sch. 80	250	0.500	7.625	9.715 [246.8]	
10"	10.750	Sch. 40	140	0.365	10.020	11.555 [293.5]	8.500
		Sch. 80	230	0.593	9.564	12.038 [305.8]	
12"	12.750	Sch. 40	130	0.406	11.938	13.643 [346.5]	10.000
		Sch. 80	230	0.687	11.376	14.238 [361.6]	
14"	14.000	Sch. 40	130	0.437	13.126	14.962 [380.0]	10.000
		Sch. 80	220	0.750	12.500	15.625 [396.9]	
16"	16.000	Sch. 40	130	0.500	15.000	17.105 [434.5]	10.000
		Sch. 80	220	0.843	14.314	17.832 [452.9]	
18"	18.000	Sch. 40	130	0.562	16.876	19.246 [488.8]	12.000
20"	20.000	Sch. 40	120	0.593	18.814	21.322 [541.6]	12.000
24"	24.000	Sch. 40	120	0.687	22.626	25.531 [648.5]	12.000

## Appendix C

### Operations & Maintenance Information

## OPERATIONS AND MAINTENANCE MANUAL

### TABLE OF CONTENTS

- A. The ten essentials for all on-site sewage treatment systems
- B. Pressure distribution systems
- C. Bottomless Sand Filter
- D. Specific to this system

#### **A. The Ten Essentials For All Septic Systems:**

1. ***Practice water conservation.*** The more wastewater you produce, the more the soil must treat and dispose of. By reducing and balancing your use, you can extend the life of the drainfield, decrease the possibility of system failure, and avoid costly repairs.
  - a. ***To reduce your water use:***
    1. Use water-saving devices.
    2. Repair leaky faucets and plumbing fixtures.
    3. Reduce toilet reservoir volume or flow.
    4. Take shorter showers.
    5. Take baths with a partially-filled tub.
    6. Wash only full loads of dishes and laundry.
2. ***Keep accurate records.*** Know where your septic tank system is and keep a diagram of its location. Records of its size and location may be available at your local health district agency. It is also wise to keep a record of maintenance on the system. These records will be helpful if problems occur, and will be valuable to the next owner of your home.
3. ***Inspect your system once each year.*** Check the sludge and scum levels inside your septic tank to assure that the layers of solids are not within the “early warning” levels. Also check the tank to see if the baffles or tees are in good condition. Periodically inspect the drainfield and downslope areas for odors, wet spots, or surfacing sewage. If your drainfield has inspection pipes or monitoring ports, check them to see if there is a liquid level continually over 6 inches. This may be an early indication of a problem.
4. ***Pump out your tank when needed.*** Don't wait until you have a problem. Routine pumping can prevent failures, such as clogging of the drainfield and sewage backup into the home. Using a garbage disposal will increase the amount of solids entering the septic tank, requiring more frequent pumping.
5. ***Never flush harmful materials into the septic tank.*** Grease, cooking oils, newspaper, paper towels, rags, coffee grounds, sanitary napkins, and cigarettes cannot easily decompose in the tank. Chemicals such as solvents, oils, paint and pesticides are harmful to the system's proper operation and may pollute the groundwater. Septic tank additives are not necessary for the proper functioning of a septic tank, nor do they reduce the need for routine pumping. For information on the proper disposal of household hazardous waste, call the Recycle Hotline, 1-800-RECYCLE.
6. ***Keep all runoff away from your system.*** Water from surfaces such as roofs, driveways, or patios should be diverted away from the septic tank and drainfield area. Soil over your system should be slightly mounded to help surface water runoff.

7. ***Protect your system from damage.*** Keep traffic, such as vehicles, heavy equipment, or livestock off your drainfield or replacement area. The pressure can compact the soil or damage pipes. Before you plant a garden, construct a building, or install a pool, check on the location of your system and replacement area.
8. ***Landscape your system properly.*** Don't place impermeable materials over your drainfield or replacement area. Materials such as concrete or plastic reduce evaporation and the supply of air to the soil for proper effluent treatment. They can also hinder getting to the system for pumping, inspection, or repair. Grass is the best cover for your system.
9. ***Never enter any septic tank.*** Poisonous gases or the lack of air can be fatal. Any work to the tank should be done from the outside.
10. ***Check with the Health District for help with system problems.*** Although some malfunctions may require complete drainfield replacement, many problems can be corrected with a minimum amount of cost and effort.

**B. Pressure distribution systems:**

1. General system function, operational expectations, owner responsibility: In addition to the 10 essentials for all septic systems mentioned above, pressure distribution systems must be monitored and maintained at a frequency commensurate with the site, soil, system complexity, and use patterns. At a minimum, it is strongly recommended that the items listed below be inspected and/or serviced at six months and then yearly, after the system is put into use. Refer to the system "as-built" drawing for initial readings and settings.
2. Evaluate drainfield area for:
  - a. Indications of surfacing effluent.
  - b. Appropriate vegetation, landscaping impacts, ponds, etc.
  - c. Absence of heavy traffic.
  - d. Inappropriate building.
  - e. Impervious materials or surfaces.
  - f. Abnormal settling or erosion.
3. Evaluate laterals for:
  - a. Residual pressure at the distal ends. Confirm that it is the same as those recorded on as-built. If not the same, laterals and orifices need to be cleaned. (The final inspection by the Health District typically involves a measurement of orifice squirt heights all along the laterals before the system is buried. After the system is buried and put into use, an alternate method of checking residual pressure while the pump is running is to attach a clear plastic pipe or hose to the end of the lateral. The true residual pressure head is measured from the top of the lateral pipe to the top of the water column in the clear pipe.)
  - b. Equal flows in each lateral.
  - c. Need for cleaning. Clean laterals and orifices as necessary.
  - d. Measure pump run time and inches of drawdown per dose in the pump chamber. Compare with time recorded on as-built. If not the same, evaluate the system for improperly set timer control, float switches, clogged laterals, plugged orifices.
  - e. Test alarms for proper functioning (high and low liquid level).

4. Evaluate septic tank and pump chamber for:
  - a. Sludge and scum accumulations; have all chambers pumped by a certified pumper when sludge and scum thickness total 1/3 of the depth of tank. Typical criteria are 12 inches or less from the top of the sludge to the bottom of the outlet tee or baffle, and 3 inches or less from the bottom of the scum mat to the bottom of the outlet tee or baffle.
  - b. Clogging, damage, and proper placement of outlet effluent screen or basket screen containing the pump and float switches. Clean each time it is inspected or as needed to avoid clogging.
  - c. Signs of leaking in tanks and risers. Repair or replace if necessary.
  - d. Risers and lids being above grade and having lids that are secure.
  - e. Proper functioning of floats. Movement should not be restricted. Floats should be positioned correctly and provide positive instrumentation signals. Adjust and repair as necessary.
  
5. Repair and maintenance records:
  - a. For repairs to the system, contact the Health District for permit requirements.
  - b. For routine maintenance, the homeowner is responsible for keeping records of all inspections and maintenance.
  
6. Specifications of all electrical and mechanical components:
  - a. Included in this design report and users manual are the specifications for the electrical and mechanical equipment specified for your project.

7.

**Important Names and Phone Numbers:**

Project Designer: Andrew Davis, L.S.I.T  
Horrocks Engineers  
714 N. Iron Bridge Way, Ste. #201  
Spokane, WA 99202  
(509) 747-6790

Health District: Spokane Regional Health District  
1101 W. College Ave, #402  
Spokane, WA 99201  
(509) 324-4560

Installer: Herb Dollar  
H & R Complete Inc  
6411 N. Lynden Rd  
Otis Orchards, WA 99027  
(509) 228-9955

Supplier: Wilbert Precast  
2215 E Brooklyn Ave  
Spokane, WA 99217  
(800) 888-4573

Applicant: Wade Pannell  
4204 S Hogan St  
Spokane, WA 99203  
(509) 995-4292

C. **Bottomless Sand Filter:**

1. General system function, operational expectations, owner responsibility:
  - a. In addition to the 10 essentials for all septic systems mentioned above, as well as the pressure distribution system O & M requirements, sand-lined trench or bed systems (anything over three feet wide is typically considered a bed) have certain additional requirements.
  - b. There are three main differences between a conventional pressure distribution system and a sand-lined trench system: a) the presence of a two-foot thick layer of, typically, a certified ASTM C-33 sand beneath, and sometimes around the sides of, the gravel-filled or gravelless absorption bed, b) timed dosing, and c) additional monitoring ports. These are further described below:
    1. C-33 sand is a medium-coarse sand mixture used to replace excessively permeable soils and provide a finer-textured filter media, or to “reach” through restrictive soils such as clay to more acceptable soils below the restrictive layer. There are no particular maintenance requirements for the sand filter, unless you observe ponding of effluent through a monitoring port (see the discussion below). However, many years down the road, the sand’s capacity to maintain a “steady state” may be exceeded due a number of factors, such as the type of use, chemicals or other materials flushed into the system, and the volume of wastewater being generated by the users. Thus, if the sand becomes oversaturated or overloaded with too much biochemical demand, it may need to be replaced. There are certain requirements about how and where to dispose or utilize the discarded sand media, so contact the Health District before proceeding with this.
    2. Timed dosing is required for all sand-lined trench systems, while demand dosing is allowed for conventional pressure distribution. However, timed dosing is a good idea for all pressure distribution systems for the following reason: it evenly spaces the doses throughout a 24-hour period, thus allowing the absorption field to rest and recover between each dose cycle. When the system is first put into use, the installer sets the timer in the control panel for particular “on” and “off” times. When flow into the pump chamber from the septic tank is sufficient to raise and actuate the timer on-off float switch, the timing cycle kicks in and tells the pump when to turn on and off. If wastewater generation drops because of vacations or long periods of absence, the timer on-off float eventually drops, turns the timer off, and no more pumping occurs until wastewater is again generated in sufficient quantities.
    3. Monitoring ports allow the user or service provider to visually inspect conditions at the bottom of the drainfield, get a “heads up” on imminent problems, and thereby take corrective action to extend drainfield life. Check these ports at least once a year to see if there is a liquid level continually over 6 inches. If you do see such ponding, you should probably reduce water use in the house, fix leaky plumbing, use more environmentally friendly laundry, dishwashing, and other cleaning products, or take other corrective measures.

**D. Specific to this system:**

1. This system has a HydroTek Automatic Distributing Valve Assembly. These valves are mechanically operated and sequentially redirect the pump's flow to multiple zones. Valve actuation is accomplished by a combination of pressure and flow. Effluent must be of good quality to prevent fouling of valve operation. The ideal location for the valve is at the high point in the system. An inlet ball valve and a section of clear pipe and union for each outlet are provided for a complete assembly. If the assembly is not working properly, the clear sections can be observed. The valve should rotate through each zone sequentially with each dose of the system.

**Annual  
Maintenance Log / Reporting Form**

Date: \_\_\_\_\_  
Inspectors Name: \_\_\_\_\_  
Owner's Name: \_\_\_\_\_  
Address of System: \_\_\_\_\_  
\_\_\_\_\_

Circle the appropriate answer, or fill in blank.

---

1. Clean Septic Tank Effluent Filter. Condition: Functioning Plugged
2. Check Primary Compartment of Septic Tank for sludge accumulation. Time for periodic pumping of septic tank? Y or N
3. Inspect drainfield for surfacing, green spots or irregularities. Adequate: Y or N
4. View lateral trench floor through inspection ports. Ponding: Y or N
5. Inspection Notes: \_\_\_\_\_

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# **METRO ENGINEERING, INC.**

*Civil Engineering and Project Management Services*

November 14, 2024

**Corey Smith, AICP**  
**Spokane County Planning Department**  
1026 West Broadway  
Spokane, WA 99260

**RE: Pannell Residence**  
**13214 N. Peninsula Drive**  
**Parcel # 56033.0164**

Corey:

There is a septic system designed for the proposed residence at the above referenced location. The septic system will be a sand lined pressure bed. A copy of the design plan, approved by Spokane Regional Health District, is attached.

We are submitting this document to meet the Shoreline Master Program requirements as stated within the code, adopted by the Spokane County Commissioner's Resolution 14-0605A. Resolution 14-0605A-Item 4 conditions will be met with the following:

The drainfield will be located at the farthest feasible distance landward of the residence and not less than 125 feet measured horizontally landward from the ordinary high-water mark, at the closest point. See attached site plan.

The proposed drainfield is located within the shoreline jurisdiction and must demonstrate a minimum discharge concentration of 1 mg/liter or less of phosphorus.

Monitoring Program: *Level of phosphorus concentration in the septic tank effluent*

1. Effluent samples are to be taken from the 500-gallon pump chamber. The access shall be thru the riser over the pump. (See the attached site plan for location)
2. The samples must be taken monthly until the 1 mg/liter total phosphorus concentration or less threshold is met.
3. Once testing demonstrates the total phosphorus concentration threshold is met, it can be done annually. The annual testing shall continue for the life of the system to show it is functioning and being properly maintained. If a sample exceeds the threshold, an additional sample shall be tested within the next 30 days. If the subsequent sample also exceeds the threshold, it is the Owner's responsibility to present a plan to the Spokane County Building and Planning Department for the correction of the system failure.
4. The water quality tests must be performed by a Washington State Department of Ecology accredited laboratory, with results provided to Spokane County Building and Planning within 30 days of the laboratory analysis. All sample reports are maintained by the Spokane County Building and Planning Department.

Operation and Maintenance: *Additional requirements to the standard Sand Lined Pressure Bed operation and maintenance. See Septic System O&M Manual.*

1. The Homeowner shall minimize or eliminate the use of all soaps containing phosphate (which are banned in Spokane County).
2. If concentration levels of phosphorus appear to be increasing to unacceptable limits, the septic tank may need to be pumped out more frequently to eliminate the buildup of solid phase phosphorus concentrations.

The Monitoring Program and O&M requirements shall be incorporated into the final design documents for the septic system.

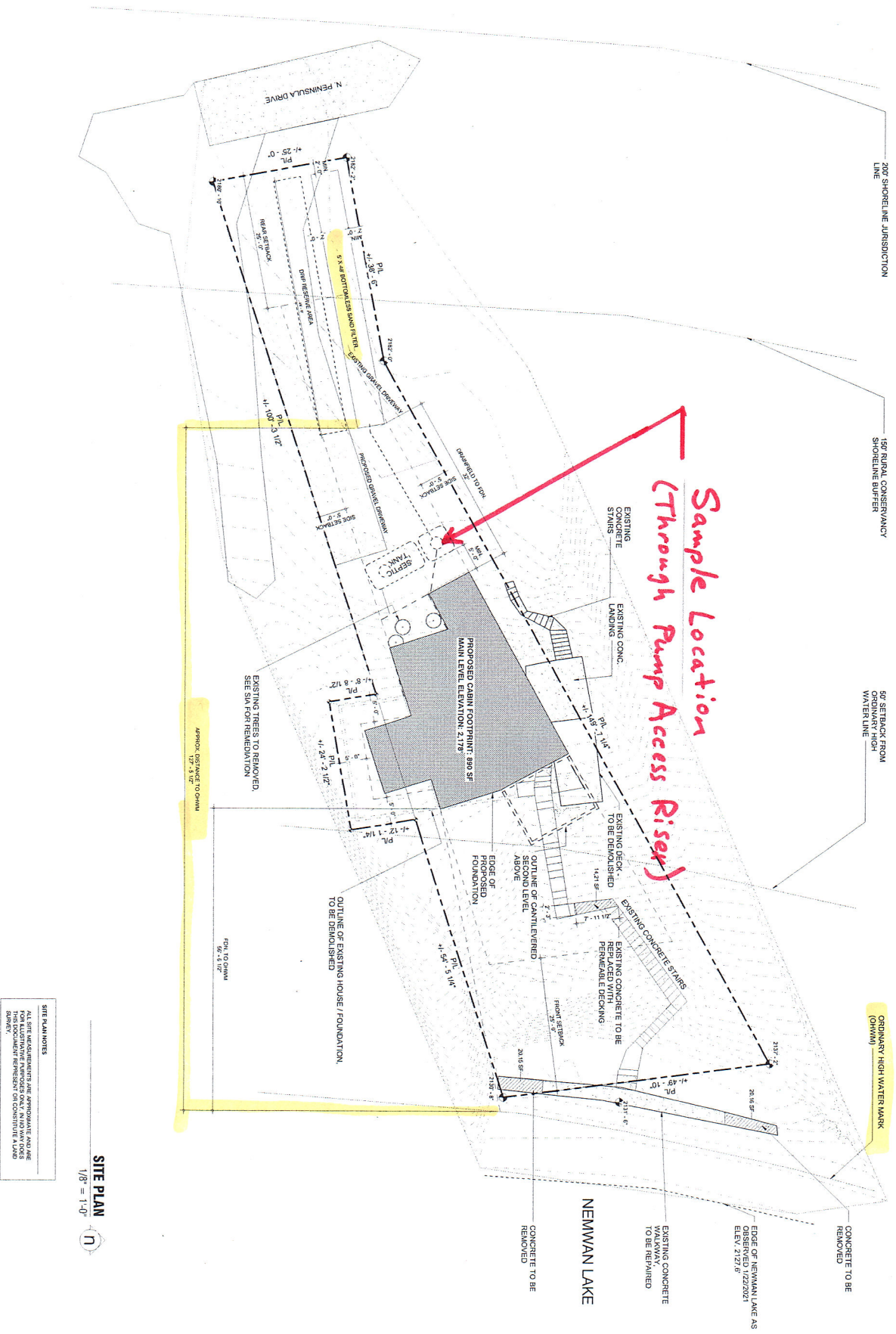
Please contact me if you have any questions.

Sincerely,  
*Metro Engineering, Inc.*

Joel G. Lee, P.E.  
Principal Engineer

cc: Taylor Stevens; Uptic Studios  
Project File





Sample Location  
(Through Pump Access Risers)

**SITE EXPLANATIONS**  
 ALL SITE EXPLANATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY. IN NO WAY DOES THIS PLAN CONSTITUTE A PROFESSIONAL ENGINEERING OR ARCHITECTURAL PLAN.

**SITE PLAN**  
 1/8" = 1'-0"  
 N

PERMIT SET 08.20.24

**A1.1**  
 SITE PLAN

**PROJECT:**  
**NEWMAN LAKE CABIN**  
 13214 N PENINSULA DRIVE  
 NEWMAN LAKE, WA 99025  
 PARCEL # 56033.0164

NO.	DESCRIPTION	DATE

**[us]**  
 architecture + design

**ipit studios**  
 1000 8th St. S. 3rd Fl.  
 Tacoma, WA 98402

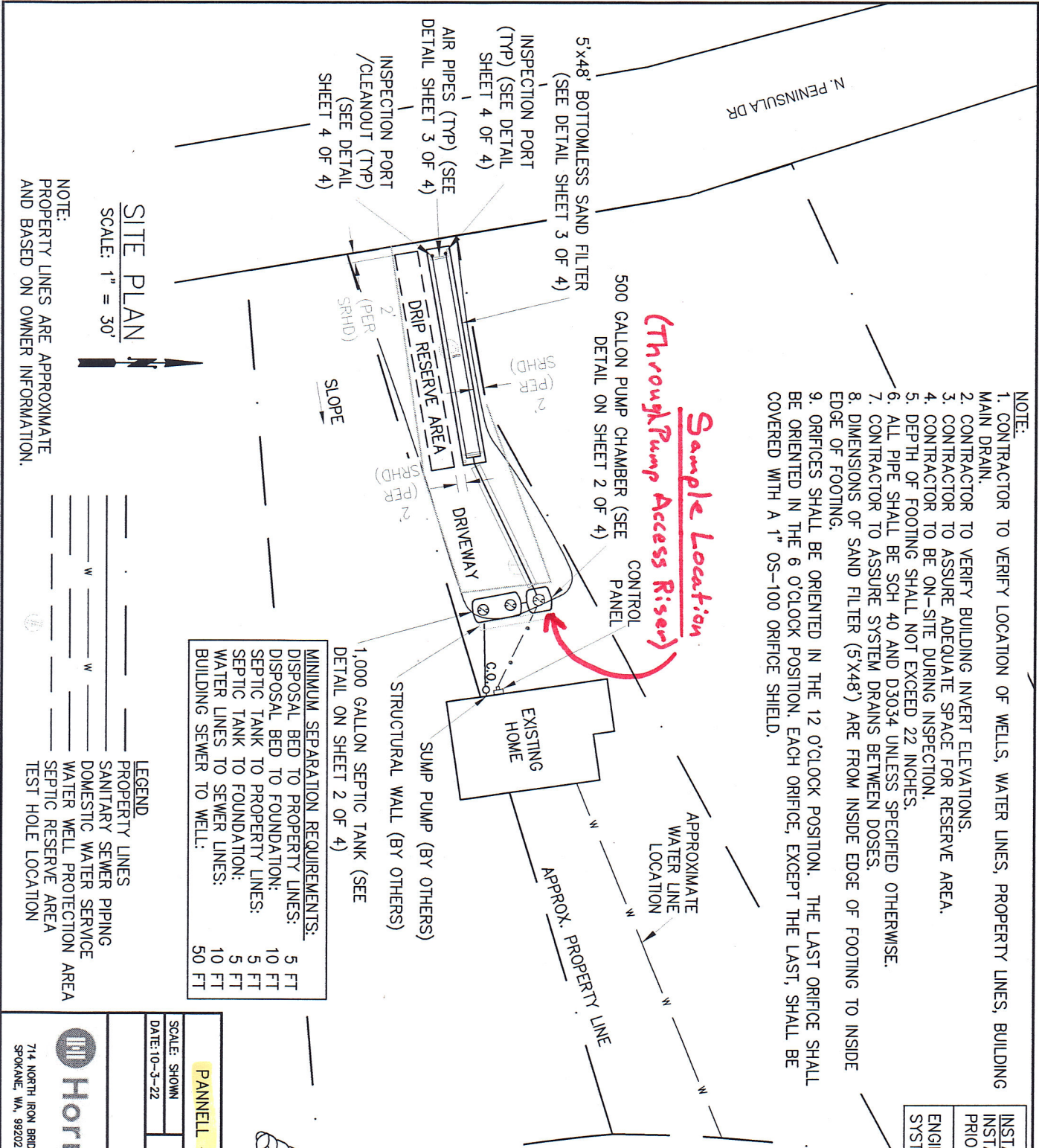
- NOTE:
1. CONTRACTOR TO VERIFY LOCATION OF WELLS, WATER LINES, PROPERTY LINES, BUILDING MAIN DRAIN.
  2. CONTRACTOR TO VERIFY BUILDING INVERT ELEVATIONS.
  3. CONTRACTOR TO ASSURE ADEQUATE SPACE FOR RESERVE AREA.
  4. CONTRACTOR TO BE ON-SITE DURING INSPECTION.
  5. DEPTH OF FOOTING SHALL NOT EXCEED 22 INCHES.
  6. ALL PIPE SHALL BE SCH 40 AND D303.4 UNLESS SPECIFIED OTHERWISE.
  7. CONTRACTOR TO ASSURE SYSTEM DRAINS BETWEEN DORES.
  8. DIMENSIONS OF SAND FILTER (5'x48') ARE FROM INSIDE EDGE OF FOOTING TO INSIDE EDGE OF FOOTING.
  9. ORIFICES SHALL BE ORIENTED IN THE 12 O'CLOCK POSITION. THE LAST ORIFICE SHALL BE ORIENTED IN THE 6 O'CLOCK POSITION. EACH ORIFICE, EXCEPT THE LAST, SHALL BE COVERED WITH A 1" OS-100 ORIFICE SHIELD.

INSTALLER NOTES:  
 INSTALLER MUST CONTACT ENGINEER PRIOR TO BEGINNING WORK.  
 ENGINEER AND SRHD MUST INSPECT SYSTEM PRIOR TO BACKFILL.

*Sample Location*  
*(Through Pump Access Risers)*

APPLICANT/OWNER  
 WADE AND JULE PANNELL  
 4204 S HOGAN ST  
 SPOKANE, WA 99203

13214 N. PENINSULA DRIVE  
 PARCEL #56033.0164  
 0.18 ACRES



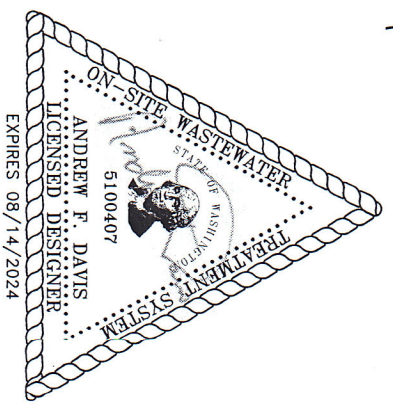
MINIMUM SEPARATION REQUIREMENTS:  
 DISPOSAL BED TO PROPERTY LINES: 5 FT  
 DISPOSAL BED TO FOUNDATION: 10 FT  
 SEPTIC TANK TO PROPERTY LINES: 5 FT  
 SEPTIC TANK TO FOUNDATION: 5 FT  
 WATER LINES TO SEWER LINES: 10 FT  
 BUILDING SEWER TO WELL: 50 FT

SITE PLAN  
 SCALE: 1" = 30'

NOTE:  
 PROPERTY LINES ARE APPROXIMATE  
 AND BASED ON OWNER INFORMATION.

LEGEND

PROPERTY LINES	PROPERTY LINES
SANITARY SEWER PIPING	SANITARY SEWER PIPING
DOMESTIC WATER SERVICE	DOMESTIC WATER SERVICE
WATER WELL PROTECTION AREA	WATER WELL PROTECTION AREA
SEPTIC RESERVE AREA	SEPTIC RESERVE AREA
TEST HOLE LOCATION	TEST HOLE LOCATION



PANNELL - 13214 N. PENINSULA DRIVE	
SCALE: SHOWN	DATE: 10-3-22
SEPTIC SYSTEM	JOB # W-5747-22
DRAWN BY AFD	
SITE PLAN	
APPLICATION #	22-18184
REV:	
DRAWING NUMBER	1 OF 4

Horrocks.  
 714 NORTH IRON BRIDGE WAY, STE. 201  
 SPOKANE, WA, 99202 (509) 747-6790

**SHEET INDEX**

- C1.0 COVER
- C2.0 TESC PLAN
- C3.0 GRADING AND DRAINAGE

**PANNELL DRAINAGE DESIGN  
FOR  
UPTIC STUDIOS**

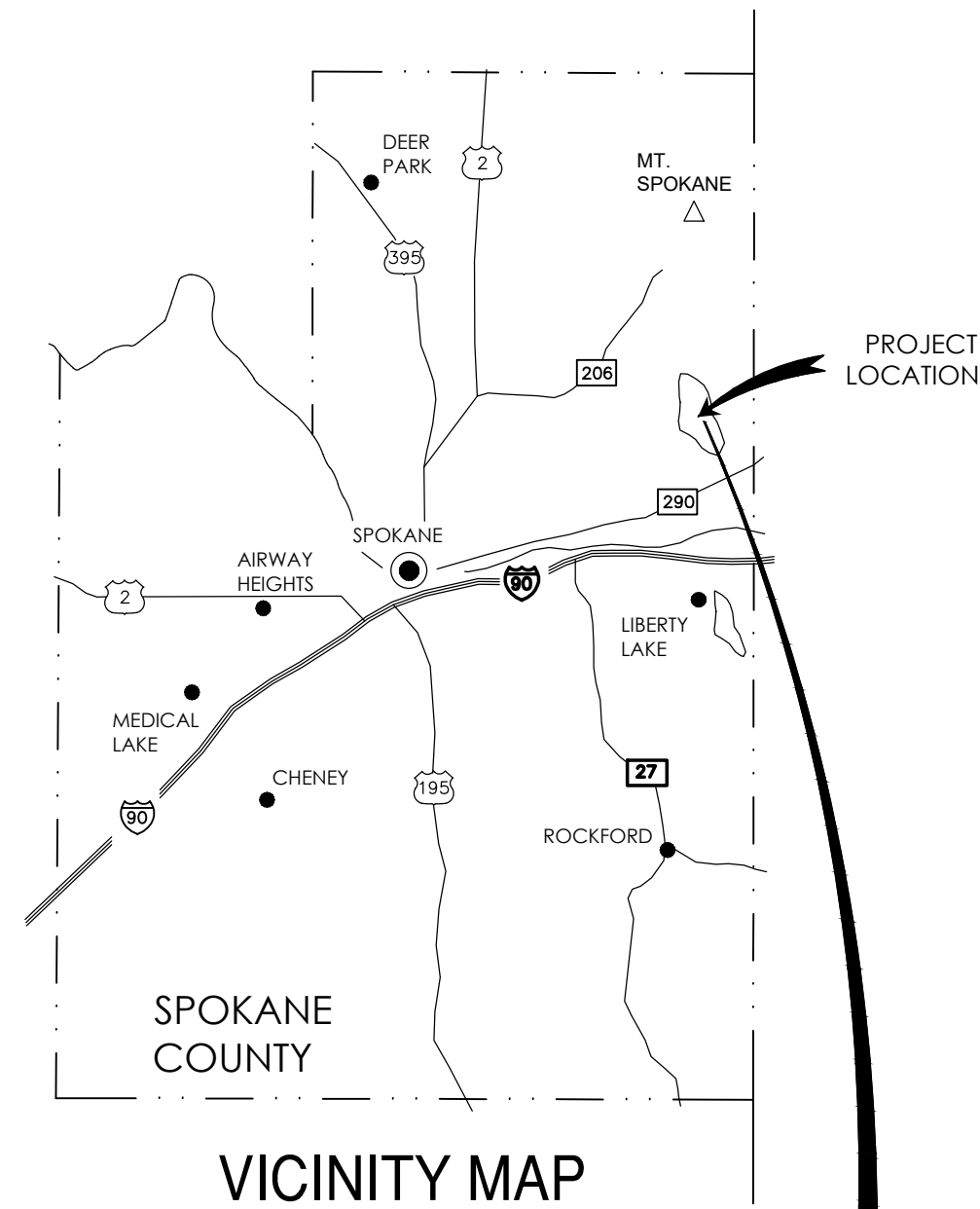
13214 N PENINSULA DR  
NEWMAN LAKE, WA 99025  
PARCEL #56033.0164

**PROJECT CONTACTS**

<b>OWNER/ APPLICANT</b>	UPTIC STUDIOS CONTACT: MATTHEW COLLINS 402 E SPRAGUE AVE PH: (509) 850-3698	<b>PROJECT ENGINEER</b>	HORROCKS TYSON LARSON, P.E. PH: (509) 747-6790
<b>SPOKANE COUNTY</b>	PLANNING AND BUILDING DEPARTMENT PH: (509) 477-3675		
	PERMITTING CONTACT: CHRISTINE FIDLER PH: (509) 477-7240		
	PUBLIC WORKS DEPARTMENT CONTACT: JEREMY GRATZ PH: (509) 477-7264		



WASHINGTON



**VICINITY MAP**  
NOT TO SCALE



**LOCATION MAP**  
NOT TO SCALE

**EXISTING LEGEND**

- ⊙ = SANITARY SEWER MANHOLE
- ⊗ = WATER VALVE
- ⊕ = CLEAN OUT
- = UTILITY POLE
- ← = GUY ANCHOR
- TR = TELEPHONE RISER
- ⊠ = SIGN
- ⊠EBX = ELECTRIC BOX
- (1639) --- = CONTOUR (EXISTING MINOR)
- (1640) --- = CONTOUR (EXISTING MAJOR)
- SS = EX SANITARY SEWER LINE
- E = BURIED UTILITY LINE
- OU = OVERHEAD UTILITY LINE
- ▭ = ASPHALT
- ▭ = CONCRETE
- ▭ = BUILDING

**PROPOSED LEGEND**

- I.E. = INVERT ELEVATION
- FS = FINISH SURFACE
- G.B. = GRADE BREAK
- ⊙ = TEMPORARY BENCHMARK
- 1639 --- = CONTOUR (PROPOSED MINOR)
- 1640 --- = CONTOUR (PROPOSED MAJOR)
- G.B. = GRADE BREAK
- F.L. = FLOWLINE
- ← = SLOPE ARROW
- ▭ = PROPOSED GRAVEL
- ▭ = PROPOSED ASPHALT
- ▭ = PROPOSED BUILDING
- ▭ = PROPOSED CONCRETE

**GENERAL NOTES**

- ALL METHODS AND MATERIALS SHALL COMPLY WITH THE LATEST EDITIONS OF THE INTERNATIONAL BUILDING CODE, THE WASHINGTON STATE DOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, THE SPOKANE COUNTY STANDARDS FOR ROAD & SEWER CONSTRUCTION, APWA, AWWA, AND ALL OTHER APPLICABLE LOCAL, STATE AND FEDERAL CODES, RULES AND REGULATIONS.
- THE CONTRACTOR SHALL HAVE A RESPONSIBLE PARTY WHO SHALL HAVE THE AUTHORITY TO REPRESENT AND ACT FOR THE CONTRACTOR AT THE JOB SITE DURING ALL WORKING HOURS. A COMPLETE SET OF APPROVED PLANS IS REQUIRED ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
- CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ALL MATERIALS REQUIRED FOR CONSTRUCTION OF THE IMPROVEMENTS SHOWN IN THIS PLAN SET.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING TWO DAYS NOTICE TO THE ENGINEER PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES.
- CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AT THE PROJECT SITE BEFORE BEGINNING WORK AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
- IF THE CONTRACTOR DISCOVERS ANY DISCREPANCIES BETWEEN THE PLANS AND EXISTING CONDITIONS ENCOUNTERED, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE DESIGN ENGINEER, AT HORROCKS ENGINEERS, (509) 747-6790, AND THE SITE/PROJECT INSPECTING ENGINEER OR HIS REPRESENTATIVE.
- ALL SURVEY MONUMENTS AND PROPERTY CORNERS SHALL BE PROTECTED DURING CONSTRUCTION. THE CONTRACTOR SHALL RETAIN THE SERVICES OF A LAND SURVEYOR LICENSED IN THE STATE OF WASHINGTON, AT THE CONTRACTOR'S EXPENSE, TO REPLACE ALL DISTURBED OR DAMAGED MONUMENTS AND PROPERTY CORNERS. THE CONTRACTOR IS RESPONSIBLE FOR THE FILING OF PERMITS FOR MONUMENT REMOVAL AND REPLACEMENT WITH THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES, AS REQUIRED BY WAC-120-070.
- UNLESS OTHERWISE INDICATED, ALL DISTURBED AREAS SHALL BE RETURNED TO THE EQUIVALENT OF THEIR PRE-CONSTRUCTION CONDITION.
- THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY EROSION AND SEDIMENTATION CONTROL FACILITIES AS REQUIRED TO PREVENT EROSION AND TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT LEAVE THE CONSTRUCTION SITE.
- ALL DISTURBED SOIL AREAS SHALL BE SEEDED OR STABILIZED BY APPROVED METHODS FOR PREVENTION OF ON-SITE EROSION AFTER THE COMPLETION OF EACH CONSTRUCTION ACTIVITY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL OF ALL TRAFFIC CONTROL. TRAFFIC CONTROL FOR IN-STREET WORK SHALL BE IN ACCORDANCE WITH LOCAL AND STATE REGULATIONS AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
- CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL OF SHORING AND BRACING NECESSARY TO PROTECT WORKERS, EXISTING BUILDINGS, STREETS, WALKWAYS, UTILITIES AND OTHER IMPROVEMENTS AND EXCAVATIONS AGAINST LOSS OF GROUND OF CAVING EMBANKMENTS.
- SLOPE OF FINISHED GRADE SHALL BE CONSTANT BETWEEN CONTOURS OR SPOT ELEVATIONS SHOWN.
- UNDERGROUND UTILITY LOCATIONS USED IN THE PREPARATION OF THESE DRAWINGS WERE FURNISHED BY OTHERS. HORROCKS ENGINEERS ASSUMES NO RESPONSIBILITY FOR THEIR COMPLETENESS AND ACCURACY.
- ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION, DEPTH, SIZE, TYPE AND CONDITION OF UTILITIES SHOWN ON THESE DRAWINGS AND TO HAVE AN APPROVED LOCATING SERVICE LOCATE AND IDENTIFY THE UTILITIES WITHIN THE CONSTRUCTION AREA.
- PRIOR TO SITE CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR LOCATING UNDERGROUND UTILITIES. CALL THE UNDERGROUND UTILITY LOCATION SERVICE AT 811 BEFORE YOU DIG.
- ALL APPROVED DEVIATIONS FROM THESE PLANS SHALL BE RECORDED ON A SET OF AS-BUILT DRAWINGS WHICH SHALL BE SUBMITTED TO THE ENGINEER OF RECORD PRIOR TO PROJECT COMPLETION AND ACCEPTANCE.
- EXISTING UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE AND SHALL BE INSPECTED BY THE ENGINEER OF RECORD.
- CONTRACTOR SHALL RETAIN THE SERVICES OF A PROFESSIONAL LAND SURVEYOR FOR CONSTRUCTION STAKING AND AS-BUILT DATA COLLECTION.
- PIPE LENGTHS SHOWN ON PLANS ARE APPROXIMATE AND MAY CHANGE DUE TO FIELD CONDITIONS. LENGTHS INDICATE NEAT LINE HORIZONTAL DISTANCES.
- CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS REQUIRED FOR CONSTRUCTION IDENTIFIED ON THESE PLANS PRIOR TO CONSTRUCTION.
- THE CONTRACTOR IS REQUIRED TO PROVIDE ALL NECESSARY COMPACTION AND MATERIALS TESTING.
- THE CONTRACTOR IS REQUIRED TO MAINTAIN VEHICULAR AND PEDESTRIAN ACCESS TO ALL BUSINESSES AND RESIDENCES DURING CONSTRUCTION THAT ARE AFFECTED BY THE PROJECT.



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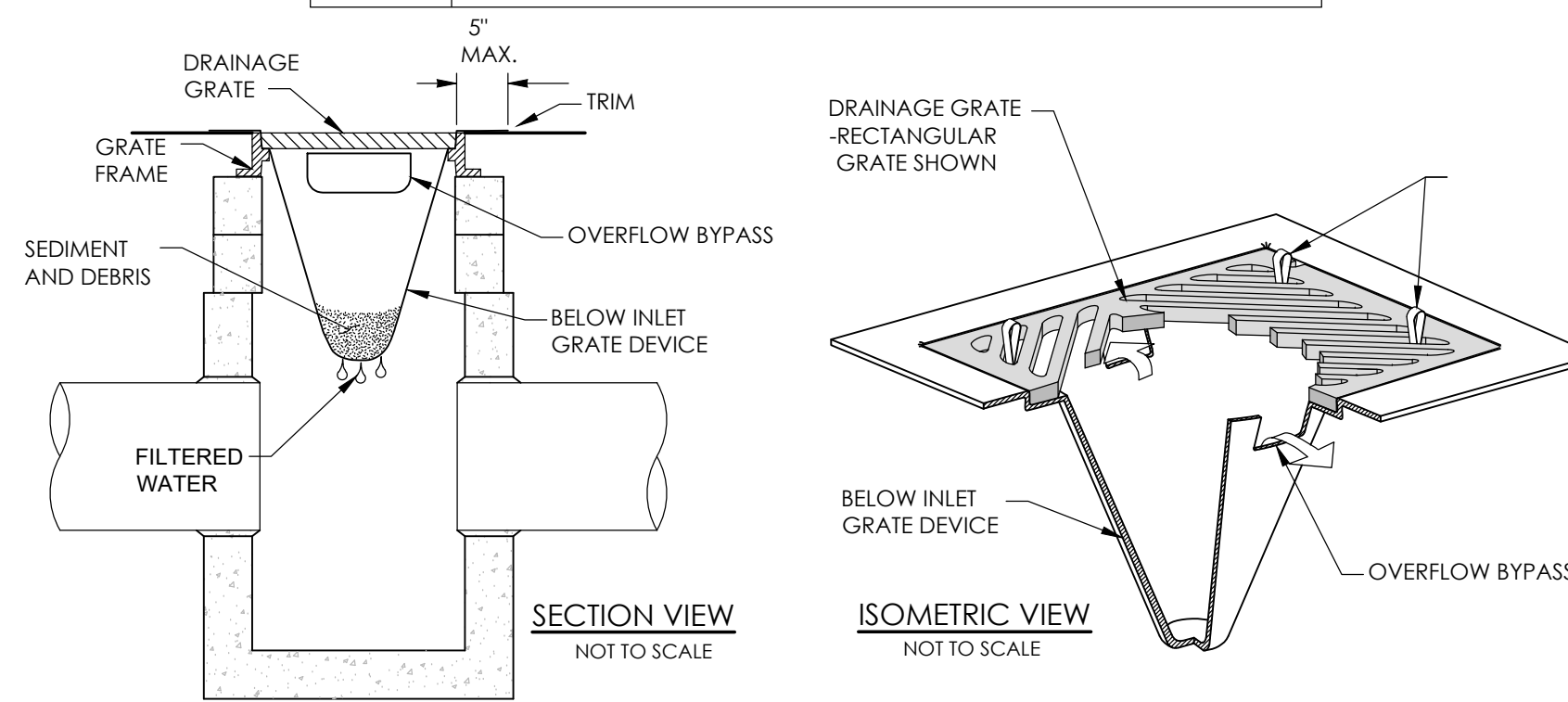
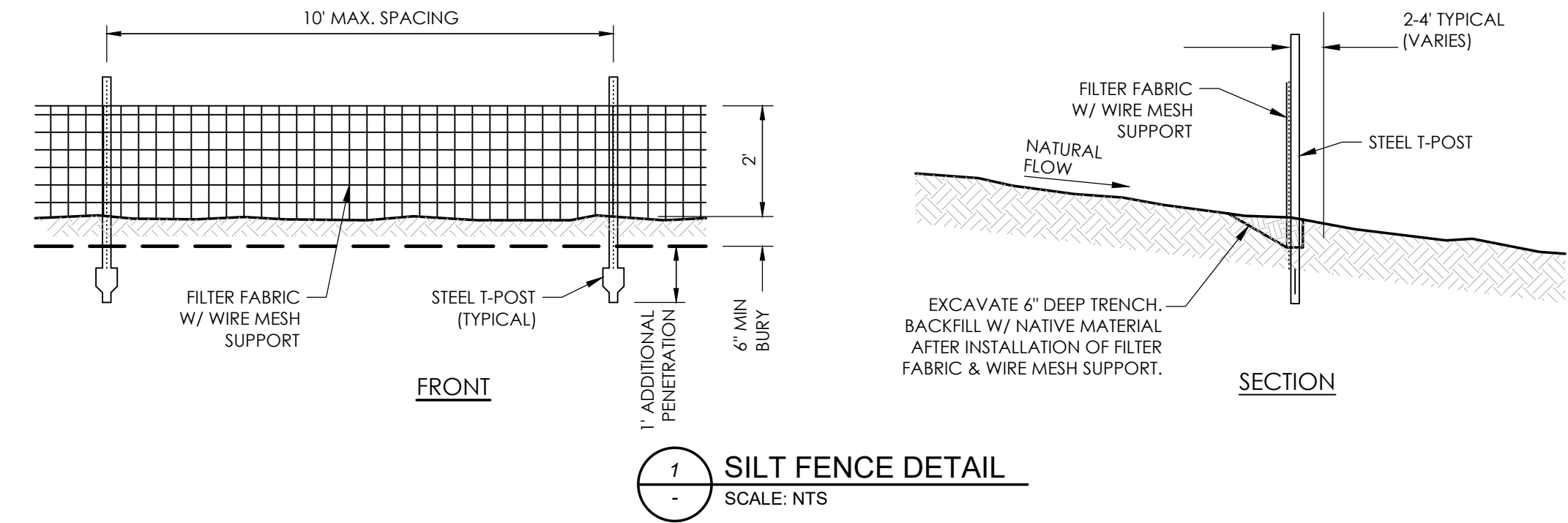
**PANNELL DRAINAGE DESIGN  
NEWMAN LAKE,  
SPOKANE COUNTY, WASHINGTON**

DESIGNED JAH	DATE 3/13/2024	PROJECT NO. WA-9338-24
DRAWN JAH	DATE 3/13/2024	DRAWING NO.
CHECKED TML	DATE 3/13/2024	C1.0

# EROSION AND SEDIMENT CONTROL NOTES

1. THE FOLLOWING CONSTRUCTION SEQUENCE SHALL BE FOLLOWED IN ORDER TO BEST MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENTATION CONTROL PROBLEMS:
  - a. CLEAR AND GRUB SUFFICIENTLY FOR INSTALLATION OF TEMPORARY ESC BMP'S;
  - b. INSTALL TEMPORARY ESC BMP'S, CONSTRUCTING SEDIMENT TRAPPING BMP'S AS ONE OF THE FIRST STEPS PRIOR TO GRADING;
  - c. CLEAR, GRUB AND ROUGH GRADE FOR ROADS, TEMPORARY ACCESS POINTS AND UTILITY LOCATIONS;
  - d. STABILIZE ROADWAY APPROACHES AND TEMPORARY ACCESS POINTS WITH THE APPROPRIATE CONSTRUCTION ENTRY BMP;
  - e. CLEAR, GRUB AND GRADE INDIVIDUAL LOTS OR GROUPS OF LOTS;
  - f. TEMPORARILY STABILIZE, THROUGH RE-VEGETATION OR OTHER APPROPRIATE BMP'S, LOTS OR GROUPS OF LOTS IN SITUATIONS WHERE SUBSTANTIAL CUT OR FILL SLOPES ARE A RESULT OF THE SITE GRADING;
  - g. CONSTRUCT ROADS, BUILDINGS, PERMANENT STORMWATER FACILITIES (I.E. INLETS, PONDS, UIC FACILITIES, ETC.);
  - h. PROTECT ALL PERMANENT STORMWATER FACILITIES UTILIZING THE APPROPRIATE BMP'S;
  - i. INSTALL PERMANENT ESC CONTROLS, WHEN APPLICABLE; AND
  - j. REMOVE TEMPORARY ESC CONTROLS WHEN:
    - j.a. PERMANENT ESC CONTROLS, WHEN APPLICABLE, HAVE BEEN COMPLETELY INSTALLED;
    - j.b. ALL LAND-DISTURBING ACTIVITIES THAT HAVE THE POTENTIAL TO CAUSE EROSION OR SEDIMENTATION PROBLEMS HAVE CEASED; AND,
    - j.c. VEGETATION HAS BEEN ESTABLISHED IN THE AREAS NOTED AS REQUIRING VEGETATION ON THE ACCEPTED ESC PLAN ON FILE WITH THE LOCAL JURISDICTION.
2. INSPECT ALL ROADWAYS, AT THE END OF EACH DAY, ADJACENT TO THE CONSTRUCTION ACCESS ROUTE. IF IT IS EVIDENT THAT SEDIMENT HAS BEEN TRACKED OFF SITE AND/OR BEYOND THE ROADWAY APPROACH, CLEANING IS REQUIRED.
3. IF SEDIMENT REMOVAL IS NECESSARY PRIOR TO STREET WASHING, IT SHALL BE REMOVED BY SHOVELING OR PICKUP SWEEPING AND TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA.
4. IF STREET WASHING IS REQUIRED TO CLEAN SEDIMENT TRACKED OFF SITE, ONCE SEDIMENT HAS BEEN REMOVED, STREET WASH WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ON-SITE OR OTHERWISE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO WATERS OF THE STATE.
5. RESTORE CONSTRUCTION ACCESS ROUTE EQUAL TO OR BETTER THAN THE PRE-CONSTRUCTION CONDITION.
6. RETAIN THE DUFF LAYER, NATIVE TOPSOIL, AND NATURAL VEGETATION IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICAL.
7. INSPECT SEDIMENT CONTROL BMP'S WEEKLY AT A MINIMUM, DAILY DURING A STORM EVENT, AND AFTER ANY DISCHARGE FROM THE SITE (STORMWATER OR NON-STORMWATER), THE INSPECTION FREQUENCY MAY BE REDUCED TO ONCE A MONTH IF THE SITE IS STABILIZED AND INACTIVE.
8. CONTROL FUGITIVE DUST FROM CONSTRUCTION ACTIVITY IN ACCORDANCE WITH THE STATE AND/OR LOCAL AIR QUALITY CONTROL AUTHORITIES WITH JURISDICTION OVER THE PROJECT AREA.
9. STABILIZE EXPOSED UNWORKED SOILS (INCLUDING STOCKPILES), WHETHER AT FINAL GRADE OR NOT, WITHIN 10 DAYS DURING THE REGIONAL DRY SEASON (JULY 1 THROUGH SEPTEMBER 30) AND WITHIN 5 DAYS DURING THE REGIONAL WET SEASON (OCTOBER 1 THROUGH JUNE 30). SOILS MUST BE STABILIZED AT THE END OF A SHIFT BEFORE A HOLIDAY WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. THIS TIME LIMIT MAY ONLY BE ADJUSTED BY A LOCAL JURISDICTION WITH A "QUALIFIED LOCAL PROGRAM," IF IT CAN BE DEMONSTRATED THAT THE RECENT PRECIPITATION JUSTIFIES A DIFFERENT STANDARD AND MEETS THE REQUIREMENTS SET FORTH IN THE CONSTRUCTION STORMWATER GENERAL PERMIT.
10. PROTECT INLETS, DRYWELLS, CATCH BASINS AND OTHER STORMWATER MANAGEMENT FACILITIES FROM SEDIMENT, WHETHER OR NOT FACILITIES ARE OPERABLE.
11. KEEP ROADS ADJACENT TO INLETS CLEAN.
12. INSPECT INLETS WEEKLY AT A MINIMUM AND DAILY DURING STORM EVENTS.
13. CONSTRUCT STORMWATER CONTROL FACILITIES (DETENTION/RETENTION STORAGE POND OR SWALES) BEFORE GRADING BEGINS. THESE FACILITIES SHALL BE OPERATIONAL BEFORE THE CONSTRUCTION OF IMPERVIOUS SITE IMPROVEMENTS.
14. STOCKPILE MATERIALS (SUCH AS TOPSOIL) ON SITE, KEEPING OFF OF ROADWAY AND SIDEWALKS.
15. COVER, CONTAIN AND PROTECT ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCT, AND NON-INERT WASTES PRESENT ON SITE FROM VANDALISM (SEE CHAPTER 173-304 WAC FOR THE DEFINITION OF INERT WASTE), USE SECONDARY CONTAINMENT FOR ON-SITE FUELING TANKS.
16. CONDUCT MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM REPAIRS, SOLVENT AND DE-GREASING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES THAT MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CLEAN ALL CONTAMINATED SURFACES IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. IF RAINING OVER EQUIPMENT OR VEHICLE, PERFORM EMERGENCY REPAIRS ON SITE USING TEMPORARY PLASTIC BENEATH THE VEHICLE.
17. CONDUCT APPLICATION OF AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, IN SUCH A MANNER, AND AT APPLICATION RATES, THAT INHIBITS THE LOSS OF CHEMICALS INTO STORMWATER RUNOFF FACILITIES. AMEND MANUFACTURER'S RECOMMENDED APPLICATION RATES AND PROCEDURES TO MEET THIS REQUIREMENT, IF NECESSARY.
18. INSPECT ON A REGULAR BASIS (AT A MINIMUM WEEKLY, AND DAILY DURING/AFTER A RUNOFF PRODUCING STORM EVENT) AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL BMP'S TO ENSURE SUCCESSFUL PERFORMANCE OF THE BMP'S. NOTE THAT INLET PROTECTION DEVICES SHALL BE CLEANED OR REMOVED AND REPLACED BEFORE SIX INCHES OF SEDIMENT CAN ACCUMULATE.
19. REMOVE TEMPORARY ESC BMP'S WITHIN 30 DAYS AFTER THE TEMPORARY BMP'S ARE NO LONGER NEEDED. PERMANENTLY STABILIZE AREAS THAT ARE DISTURBED DURING THE REMOVAL PROCESS.

TESC AND DEMO KEY NOTES	
ITEM No.	DESCRIPTION
1	BMP C101E: PRESERVING NATURAL VEGETATION
2	BMP C105E: STABILIZED CONSTRUCTION ACCESS
3	CLEARING AND GRUBING
4	REMOVAL OF EXISTING CONCRETE.
5	REMOVAL OF EXISTING BUILDING.
6	BMP C233E: SILT FENCE
7	BMP120E: TEMPORARY OR PERMENT SEEDING
8	BMP T5.30: BIOINFILTRATION SWALE. SEE SHEET C3.0 FOR DIMENSIONS
9	BMP C220E: INLET PROTECTION



- NOTES:
1. SIZE THE BELOW INLET GRATE DEVICE (BIGD) FOR THE STORM WATER STRUCTURE IT WILL SERVICE.
  2. THE BIGD SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS).
  3. THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BIGD WITHOUT SPILLING THE COLLECTED MATERIAL.
  4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(15).

2 - STORM DRAIN INLET PROTECTION DETAIL  
SCALE: NTS

# PERMANENT SEEDING NOTES

## LOCATIONS TO BE APPLIED:

1. GRADED, FINAL GRADED OR CLEARED AREAS WHERE PERMANENT VEGETATIVE COVER IS NEEDED TO ESTABLISH THE SOIL.
2. AREAS WHICH WILL NOT BE BROUGHT TO FINAL GRADE FOR A YEAR OR MORE.
3. VEGETATION-LINED CHANNELS, DRAINAGE SWALES AND AS SHOWN ON THE PLANS.

PROVIDE FRESH, CLEAN NEW CROP SEED COMPLYING WITH TOLERANCE FOR PURITY AND GERMINATION ESTABLISHED BY OFFICIAL SEED ANALYSTS OF NORTH AMERICA. PROVIDE SEED MIXTURE COMPOSED OF GRASS SPECIES AND NATIVE SPECIES AT PERCENTAGES AS FOLLOWS:

GRASS SEED: FRESH, CLEAN, DRY, NEW CROP SEED COMPLYING WITH THE ASSOCIATION OF OFFICIAL ANALYSTS' "RULES FOR TESTING SEEDS" FOR PURITY AND GERMINATION TOLERANCE. PROVIDE THE FOLLOWING EROSION SEED MIX FOR THE HYDROSEEDING: CREEPING RED FESCUE, 30%, CHEWINGS FESCUE, 30%, HARD FESCUE, 25%, SHEEP FESCUE, 15%. SEED SHALL BE APPLIED TO FLAT GROUND AT A MINIMUM RATE OF 40 POUNDS PER ACRE.

ALL SEEDING OF SLOPES SHALL BE DONE IN ACCORDANCE WITH W.S.D.O.T. STANDARD SPECIFICATIONS.

PERMANENT SEEDING SHALL OCCUR BETWEEN THE DATES OF SEPTEMBER 1 TO APRIL 30. ANY AREAS THAT ARE NOT SEEDDED AND ARE EXPOSED FOR MORE THAN 10 DAYS SHALL HAVE A TEMPORARY CONTROL BLANKET, OR MULCH. MULCHING OPERATIONS SHALL BE PER W.S.D.O.T. SPECIFICATIONS SECTION 8-01.3(2).



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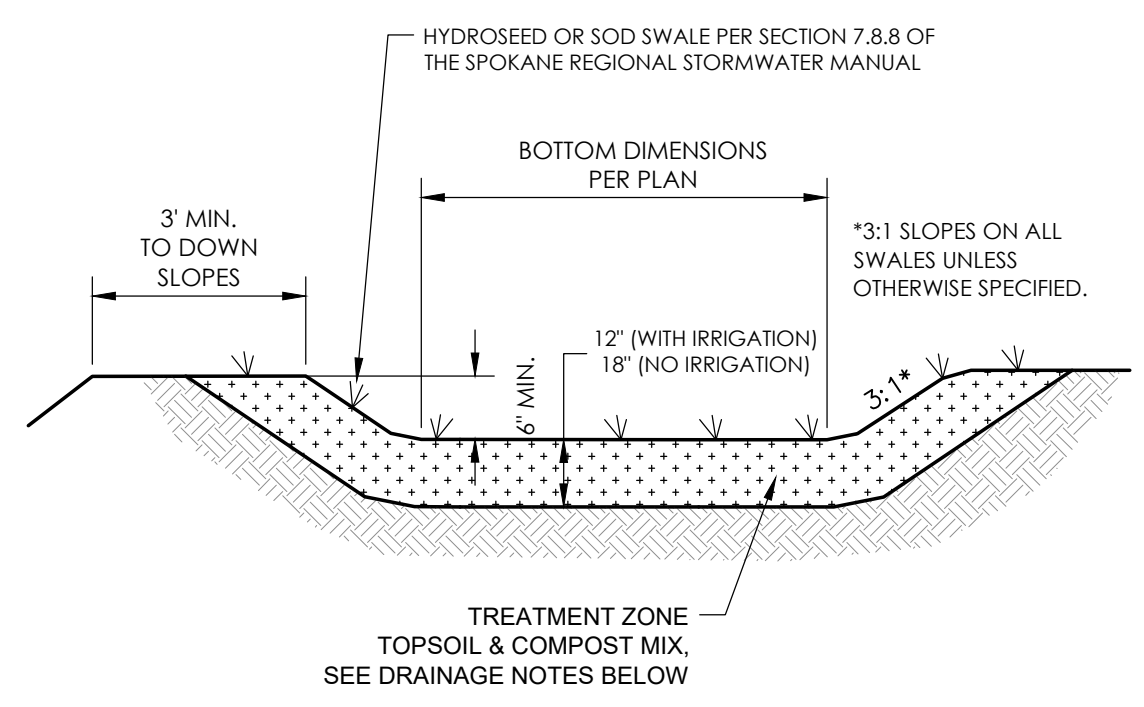
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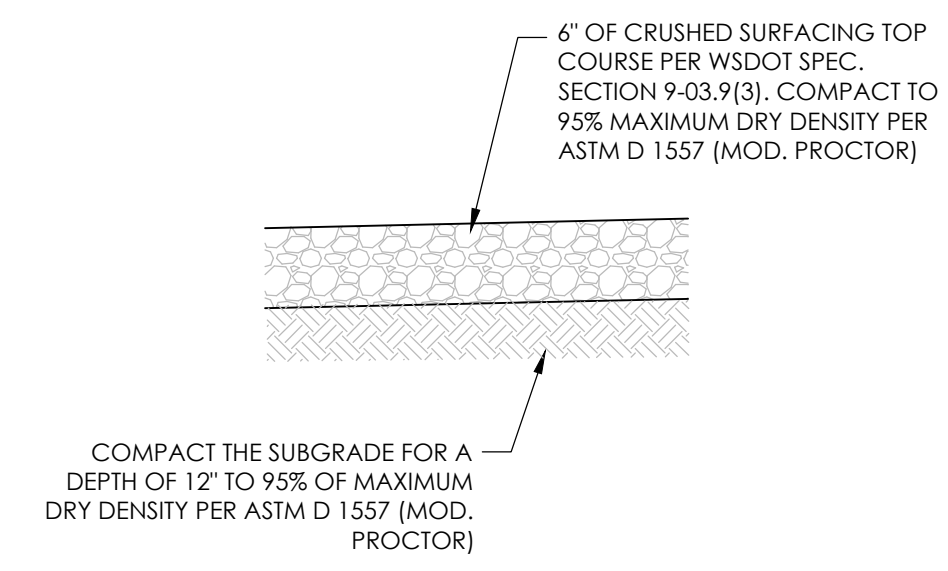
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SITE KEY NOTES	
ITEM No.	DESCRIPTION
1	PROPOSED GRAVEL DRIVEWAY PER DETAIL 2 ON THIS SHEET.
2	PROPOSED BIOINFILTRATION SWALE PER DETAIL 1 ON THIS SHEET.
3	PROPOSED NYOPLAST CATCH BASIN SEE CATCH BASIN TABLE FOR DETAILS.
4	PROPOSED 4" SDR 35 PVC STORM DRAIN PIPE.
5	PROPOSED STORM DRAIN CLEANOUT.
6	PROPOSED DETENTION SWALE PER DETAIL 3 ON THIS SHEET.

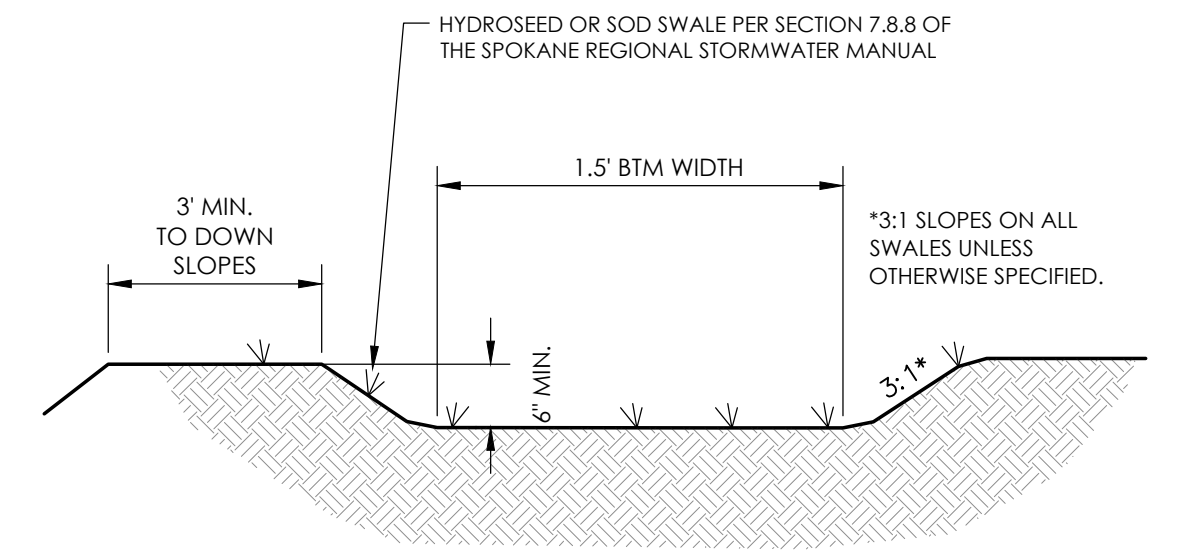
CATCH BASIN TABLE						
LABEL	DIA.	RIM ELEV.	INLET SIZE	INLET ELEV.	OUTLET SIZE	OUTLET ELEV.
CB1	18"	2179.70	NA	NA	4"	2177.20
CB2	18"	2133.50	4"	2132.0	NA	NA



1 BIO-INFILTRATION SWALE DETAIL  
SCALE: NTS



2 GRAVEL DRIVEWAY SECTION  
SCALE: NTS



3 DETENTION SWALE DETAIL  
SCALE: NTS

- UNLINED POND AND BIO-INFILTRATION SWALE BOTTOMS ARE EXPECTED TO INFILTRATE VIA THE POND FLOOR, AND THEREFORE, SHALL NOT BE HEAVILY COMPACTED; EQUIPMENT TRAFFIC SHALL BE MINIMIZED ON THE POND BOTTOMS. THE FACILITY SUB-GRADE SHALL BE A MEDIUM- TO WELL- DRAINING MATERIAL, WITH A MINIMUM THICKNESS OF 48 INCHES AND A MINIMUM INFILTRATION RATE OF 0.15 IN/HR. THE FACILITY SHALL DRAIN WITHIN 72 HOURS OF A STORM EVENT. IF THE POND ALSO SERVES AS A WATER QUALITY TREATMENT FACILITY, THE TREATMENT ZONE (SOD AND TREATMENT SOIL) SHALL BE A MEDIUM- TO WELL-DRAINING MATERIAL, WITH A MINIMUM INFILTRATION RATE OF 0.25-0.50 IN/HR. SCARIFY THE FINISH GRADE OF THE POND BOTTOM PRIOR TO HYDROSEEDING/SODDING. TESTING THAT VERIFIES SUBGRADE MINIMUM INFILTRATION RATE MAY BE REQUIRED BY THE LOCAL JURISDICTION PRIOR TO CONSTRUCTION CERTIFICATION TO ENSURE ADEQUATE DRAINAGE. INFILTRATIVE TESTING OF THE TREATMENT ZONE IS ONLY REQUIRED IF SOILS OTHER THAN SILTY LOAM OR LOAMY SOILS ARE PROPOSED.
- ORGANIC MATTER CONTENT OF TREATMENT ZONE SOILS SHALL BE AT LEAST 2%, BY WEIGHT. THE AVERAGE CATION EXCHANGE CAPACITY SHALL BE AT LEAST 15 MILLIEQUIVALENTS PER 100 GRAMS.
- THE SWALE BOTTOM AND SIDE SLOPES SHALL BE SODDED OR HYDROSEEDDED IN A TIMELY MANNER, TAKING INTO ACCOUNT THE CURRENT SEASON, AND IRRIGATED AS NECESSARY. SWALES WITHOUT IRRIGATION SHALL CONTAIN DROUGHT-TOLERANT DRYLAND GRASS.
- IF DURING FINAL INSPECTION, IT IS FOUND THAT THE CONSTRUCTED POND OR SWALE DOES NOT CONFORM TO THE ACCEPTED DESIGN, THE SYSTEM SHALL BE RECONSTRUCTED SO THAT IT DOES COMPLY.

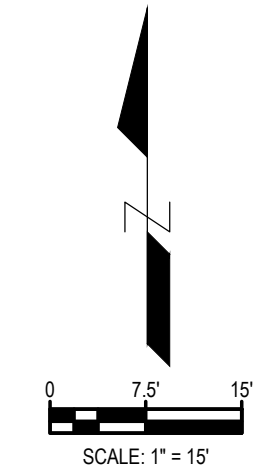
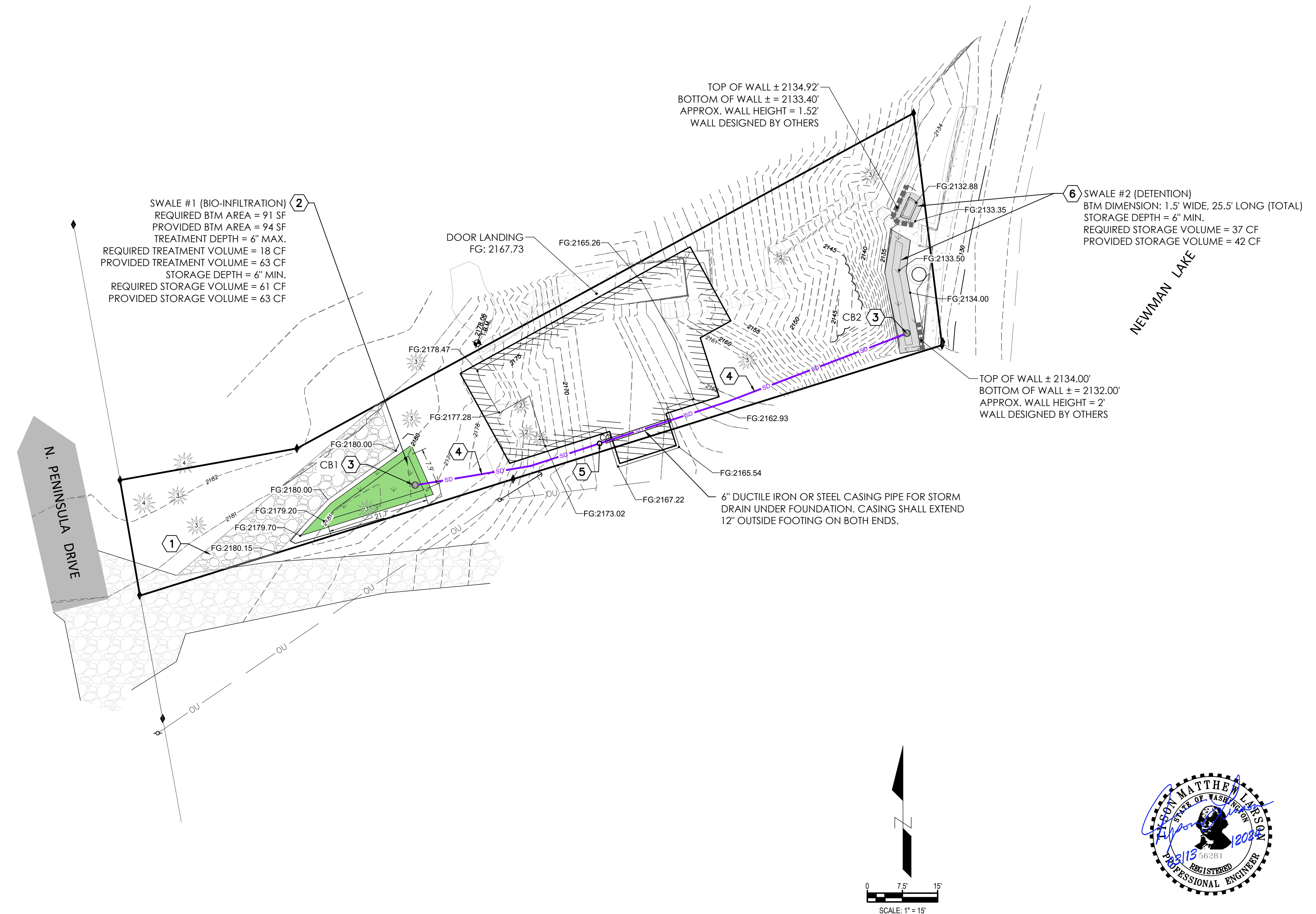
TABLE 6-1  
BIO-INFILTRATION SWALE DESIGN CRITERIA

Criteria	Design Requirement
Treatment Zone Infiltration Rate (vegetated cover and treatment layer) <sup>1</sup>	Between 0.25 and 0.50 inches/hour
Subgrade Infiltration Rate <sup>2,3</sup>	At least 0.15 inches/hour and facility must completely drain within 72 hours
Average Cation Exchange Capacity	At least 15 milliequivalents/100 grams
Organic Matter Content	At least 2% by weight

<sup>1</sup> Sand and coarser soils are not suitable to be used as top soils when treatment is required.  
<sup>2</sup> An infiltration test (for example, a single-ring infiltrometer test) demonstrating the facility's conformance to the infiltration rate criteria may be required prior to construction certification.  
<sup>3</sup> The 48-inch layer of infiltrative subgrade soils must meet the geotechnical recommendations as per the requirements found in Chapter 4.

**GRADING NOTE**

ALL CUT AND FILL SLOPES SHALL BE NO STEEPER THAN 2H:1V UNLESS IN ROCK OR APPROVED BY A LICENSED GEOTECHNICAL ENGINEER.



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SPOKANE COUNTY, WASHINGTON

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DRAWN	DATE	DRAWING NO.
JAH	3/13/2024	
CHECKED	DATE	
TML	3/13/2024	C3.0

# DRAINAGE REPORT

## PANNELL DRAINAGE DESIGN

13214 N PENINSULA DR  
NEWMAN, WA 99025

PARCEL # 56033.0164  
SPOKANE COUNTY



MARCH 13, 2024

PROJECT NO. WA-9338-24



# Horrocks.

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## FIGURES

Figure 1 .....	Pre-Development Basin Map
Figure 2 .....	Post-Development Basin Map

## APPENDICES

Appendix A.....	Rational Method Calculations
Appendix B .....	Stormwater Treatment Calculations
Appendix C .....	Swale Volume Calculations
Appendix D.....	NRCS Web Soil Survey Data



## 1.0 PROJECT DESCRIPTION

The Pannell Drainage project is located at 13214 N Peninsula Drive, on parcel 56033.0164. The project consists of demolishing the existing cabin and constructing a new cabin and drainage facilities. Construction will alter existing on-site drainage patterns. Stormwater from new Pollutant Generating Impervious Surfaces (PGIS) will flow into swales for treatment prior to disposal through infiltration. Site stormwater has been analyzed according to the Spokane Regional Stormwater Manual (SRSM) as required by Spokane County. The project's total disturbed area is approximately 0.14 acres.

## 2.0 GEOTECHNICAL INFORMATION

A geotechnical evaluation report has not been prepared for the site. The site contains Micapeak-Rock Outcrop according to the NRCS Web Soil Survey. See Appendix D for soil data. The soil is classified as hydrologic soil group C. An infiltration rate of 0.05 in/hr was assumed based on the recommendation from SRSM section 5.3.4.

## 3.0 PRE-DEVELOPMENT BASIN INFORMATION

**Figure 1** shows the pre-development conditions and drainage basin, Basin 0. The proposed improvement area consists of one predevelopment basin. The predevelopment drainage basin consists of existing trees, shrubs, and grass. The predevelopment basin flows to the east side of the property, where it proceeds to discharge into Newman Lake.

The Basin 0 pre-development flowrate was calculated using the Rational Method. The existing cabin and stairs were excluded from the pre-development flow calculations, and the runoff coefficient for lawns with heavy soils was applied to the entire basin. See onsite basin characteristics in **Appendix A** for details.

## 4.0 POST-DEVELOPMENT BASIN INFORMATION

**Figure 2** shows the post-development drainage basins. The developed site includes two basins, Basin 1 and Basin 2.

Basin 1 will consist of existing vegetation/natural landscape, a proposed detention swale, and the proposed building roof. Stormwater from the developed Basin 1 will be captured in a detention swale at the bottom of the existing slope, before the runoff discharges into Newman Lake. The increase in runoff created by the proposed building roof, in addition to the existing slope runoff, will be mitigated by the detention swale. The swale is sized to store the additional runoff from the 25-year, 24-hour duration storm, assuming a maximum release rate equal to the 25-year pre-development flow rate of Basin 0.

Basin 2 will consist of a proposed gravel driveway, existing vegetation/natural landscape, and a bio-infiltration swale. Stormwater from the developed Basin 1 will be routed into the bio-infiltration swale for treatment and disposal through infiltration. A catch basin and outlet pipe will be installed in the swale to provide an emergency overflow, and connected to a second catch basin at the bottom of the existing slope near the southeast corner of the property. The stormwater will "bubble up" out of the catch basin, into the lower detention swale, and then flow into Newman Lake.



## 5.0 CRITICAL AREAS

The site is in an Erodible Soil Area and is a priority habitat for white-tail deer and moose. Stormwater from proposed PGIS will be treated before infiltrating. The site has a rural conservancy shoreline designation.

## 6.0 DOWN GRADIENT ANALYSIS

The site is in a hilly area on a narrow peninsula and there are no existing public stormwater facilities or natural drainage ways nearby to discharge into. The proposed infiltration facilities are designed to fully contain and infiltrate the 10-year design storm, and proposed detention facilities are designed to mitigate the 25-year design storm, according to SRSM requirements. The site drains into Newman Lake, so no adverse down gradient stormwater impacts are anticipated.

## 7.0 METHODOLOGY

Bowstring calculations have been prepared for the 25-year design storm for Basin 1, and the 10-year design storm for Basin 2, in accordance with SRSM sections 2.2.4 and 2.2.5 to size infiltration or detention swales. A summary of calculations prepared to size the swales is included in Table 1 below. Refer to Figure 2 for a basin map. Full calculations are included in Appendix A.

Table 1 – Stormwater Disposal Calculation Summary						
		Swale Depth (ft)	Design Outflow Rate (cfs)	Basin Peak Flow (cfs)	Required Storage (cf)	Provided Storage (cf)
25-yr Storm	Basin 1	0.5	0.06	0.14	37	42
10-yr Storm	Basin 2	0.5	0.0001	0.03	61	63

## 8.0 WATER QUALITY TREATMENT

All runoff from proposed PGIS will be treated in accordance with SRSM section 2.2.3. All roof runoff will infiltrate or be routed into the proposed detention swale without flowing over any other PGIS, so roof runoff was not included in the treatment volume calculations.

Stormwater treatment calculations per section 6.7.1 of the SRSM are attached as Appendix B. The swales will consist of one-foot depth topsoil meeting the requirements of the SRSM. Equations 6-1b and 6-1d have been used to size the bioinfiltration swales. Table 2 summarizes the required and provided treatment volume for the post-development drainage basins. Refer to Figure 2 for a basin map.

Table 2: Stormwater Treatment Calculation Summary			
	Treatment Volume		Treatment Depth (ft)
	Required (cf)	Provided (cf)	
Basin 1	0	42	0.5
Basin 2	18	63	0.5



## **9.0 OPERATIONS & MAINTENANCE**

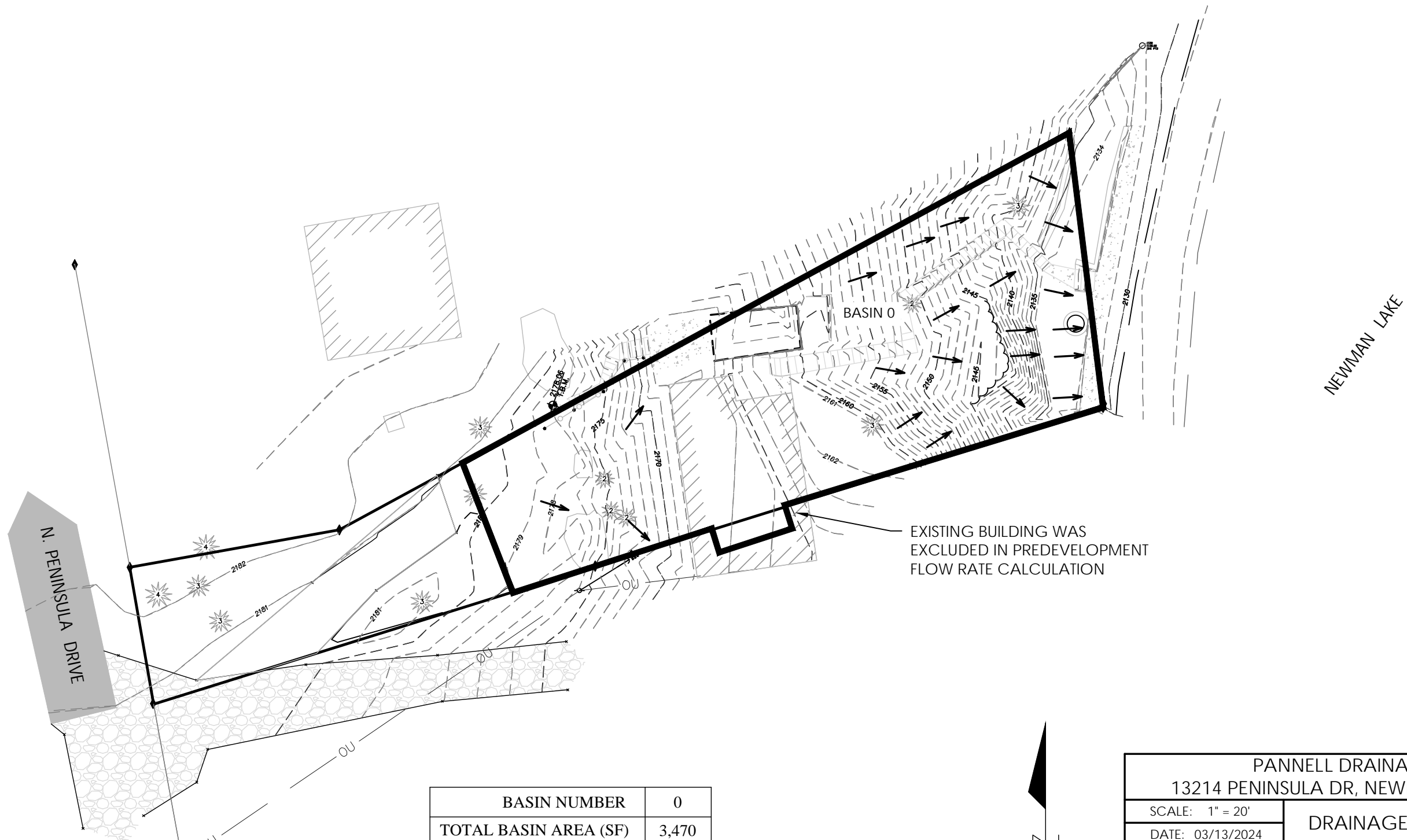
The proposed facilities will have little requirements for operations and maintenance. Catch basins and storm drain pipes will need to be visually inspected and cleaned as necessary. Swales will need to be visually inspected and mowed as necessary, and vegetation must be maintained for proper treatment efficiency.




# FIGURES

**FIGURE 1 – PRE-DEVELOPMENT BASIN MAP**

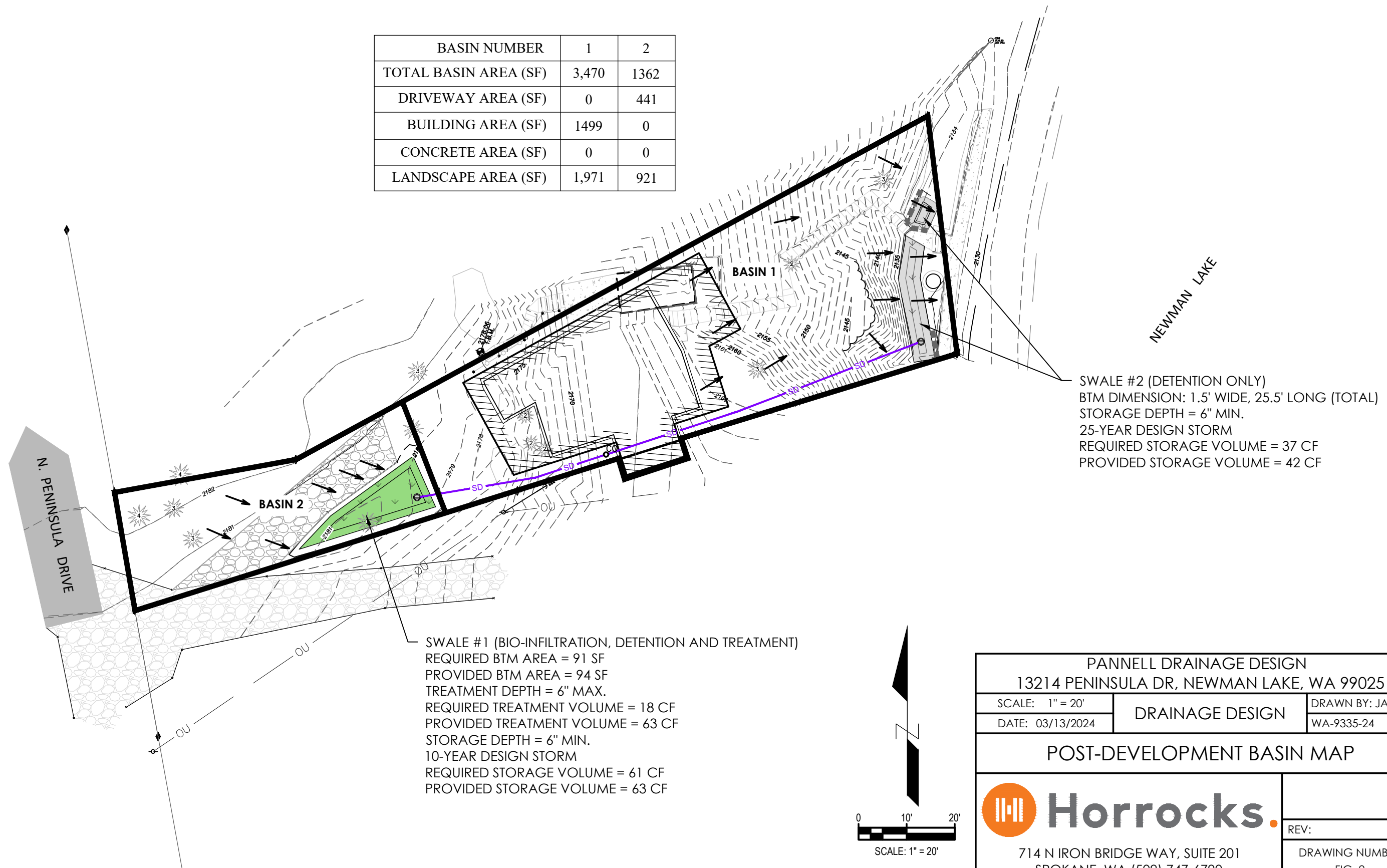
**FIGURE 2 – POST-DEVELOPMENT BASIN MAP**



BASIN NUMBER	0
TOTAL BASIN AREA (SF)	3,470
ASPHALT AREA (SF)	0
BUILDING AREA (SF)	0
CONCRETE AREA (SF)	0
LANDSCAPE AREA (SF)	3,470


PANNELL DRAINAGE DESIGN		
13214 PENINSULA DR, NEWMAN LAKE, WA 99025		
SCALE: 1" = 20'	DRAINAGE DESIGN	DRAWN BY: JAH
DATE: 03/13/2024		WA-9335-24
PRE-DEVELOPMENT BASIN MAP		
 714 N IRON BRIDGE WAY, SUITE 201 SPOKANE, WA (509) 747-6790		REV:
		DRAWING NUMBER FIG. 1

BASIN NUMBER	1	2
TOTAL BASIN AREA (SF)	3,470	1362
DRIVEWAY AREA (SF)	0	441
BUILDING AREA (SF)	1499	0
CONCRETE AREA (SF)	0	0
LANDSCAPE AREA (SF)	1,971	921



SWALE #2 (DETENTION ONLY)  
 BTM DIMENSION: 1.5' WIDE, 25.5' LONG (TOTAL)  
 STORAGE DEPTH = 6" MIN.  
 25-YEAR DESIGN STORM  
 REQUIRED STORAGE VOLUME = 37 CF  
 PROVIDED STORAGE VOLUME = 42 CF

SWALE #1 (BIO-INFILTRATION, DETENTION AND TREATMENT)  
 REQUIRED BTM AREA = 91 SF  
 PROVIDED BTM AREA = 94 SF  
 TREATMENT DEPTH = 6" MAX.  
 REQUIRED TREATMENT VOLUME = 18 CF  
 PROVIDED TREATMENT VOLUME = 63 CF  
 STORAGE DEPTH = 6" MIN.  
 10-YEAR DESIGN STORM  
 REQUIRED STORAGE VOLUME = 61 CF  
 PROVIDED STORAGE VOLUME = 63 CF

PANNELL DRAINAGE DESIGN		
13214 PENINSULA DR, NEWMAN LAKE, WA 99025		
SCALE: 1" = 20'	DRAINAGE DESIGN	DRAWN BY: JAH
DATE: 03/13/2024		WA-9335-24
POST-DEVELOPMENT BASIN MAP		
 714 N IRON BRIDGE WAY, SUITE 201 SPOKANE, WA (509) 747-6790		REV:
		DRAWING NUMBER FIG. 2



# APPENDIX A

## RATIONAL METHOD CALCULATIONS



Project: Pannell Drainage Design  
 Job No.: WA-9338-24  
 Date: 3/13/2024  
 Engineer: Joseph Hoerner, EIT

**ONSITE BASIN CHARACTERISTICS**

DESIGN STORM = **25-Year**

**POST-DEVELOPED CONDITION  
 RATIONAL METHOD**

Basin	Total Basin Area		Basin Areas									a	b	b
			Existing Asphalt	Proposed Asphalt	Existing Concrete	Proposed Concrete	Existing Roof/Bldg	Proposed Roof/Bldg	Existing Gravel	Proposed Gravel	Undeveloped/Landscaping	Rational Method Weighted Runoff Coefficient "C"	25-Year Peak Flow (cfs)	25-Year Storage (cf)
	(sf)	(acre)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)			
0	3,470	0.080	0	0	0	0	0	0	0	0	3,470	0.22	0.06	145
1	3,470	0.080	0	0	0	0	0	1,499	0	0	1,971	0.51	0.14	37
2	1,362	0.031	0	0	0	0	0	0	0	441	921	0.31	0.03	71

**NOTES:**

- a Runoff Coefficients, "C": (Table 5.5 - SRSM)
  - 0.22 Lawns, Heavy Soil (rolling)
  - 0.90 Roofs/Buildings
  - 0.90 Drives and Sidewalks
  - 0.50 Gravel
  - 0.90 Pavement
- b From Rational Method Calculations



# RATIONAL FORMULA 25-Year Storm Event

Project: Pannell Drainage Design

Job No.: WA-9338-24

Date: March 13, 2024

Engineer: Joseph Hoerner, EIT

BASIN: 0

TOTAL AREA: **3,470** s.f.      **0.080** Acres  
Street Impervious: **0** s.f.      **0.000** Acres  
Runoff Coefficient, C: **0.22** (Weighted C from TABLE 1, BASIN CHARACTERISTICS)

Design Storm: **25-Year**      m= 9.09  
n= 0.626

## COMBINED AREA:

Overland Flow, L: 95 ft      Elev 1=  
K: 1200      Elev 2=  
Slope, S: 0.1000 ft/ft  
Overland Tc= **0.25** min

---

Channel Flow, L: 0 ft  
K: 0  
Slope, S: 0.0000 ft/ft  
Channel Tc= **0.00** min

---

Gutter Flow, L: 396 ft  
K: 1200  
Slope, S: 8.0000 ft/ft  
Gutter Tc= **0.12** min

---

Pipe Flow, L: 0 ft  
K: 0  
Slope, S: 0.0000 ft/ft  
Pipe Tc= **0.00** min

---

Combined Area Tc= **5.00** min      (5 minute minimum per Section 5.5.2)  
10-Yr Storm Intensity, I= **3.32** in / hr

Combined Area Peak Flow, Qc= **0.06** cfs

## STREET AREA ONLY:

Runoff Coefficient, C= 0.90  
Street & Drive Area, A= **0.000** acre      Q= C \* I \* A  
25-Yr Storm Intensity, I= **3.32** in / hr  
Tc= 5.00 min

Street Only Peak Flow, Qs= **0.00** cfs

---

---

**Design Peak Flow, Q= 0.06** cfs





Project: Pannell Drainage Design  
 Job No.: WA-9338-24  
 Date: 3/13/2024  
 Engineer: Joseph Hoerner, EIT

**ONSITE BASIN CHARACTERISTICS**

DESIGN STORM = **10-Year**

**POST-DEVELOPED CONDITION  
 RATIONAL METHOD**

Basin	Total Basin Area		Basin Areas									a	b	b
			Existing Asphalt	Proposed Asphalt	Existing Concrete	Proposed Concrete	Existing Roof/Bldg	Proposed Roof/Bldg	Existing Gravel	Proposed Gravel	Undeveloped/Landscaping	Rational Method Weighted Runoff Coefficient "C"	10-Year Peak Flow (cfs)	10-Year Storage (cf)
	(sf)	(acre)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)			
0	3,470	0.080	0	0	0	0	0	0	0	0	3,470	0.22	0.05	126
1	3,470	0.080	0	0	0	0	0	1,499	0	0	1,971	0.51	0.11	29
2	1,362	0.031	0	0	0	0	0	0	0	441	921	0.31	0.03	61

**NOTES:**

- a Runoff Coefficients, "C": (Table 5.5 - SRSM)
  - 0.22 Lawns, Heavy Soil (rolling)
  - 0.90 Roofs/Buildings
  - 0.90 Drives and Sidewalks
  - 0.50 Gravel
  - 0.90 Pavement
- b From Rational Method Calculations



### RATIONAL FORMULA 10-Year Storm Event

Project: **Pannell Drainage Design**  
 Job No.: **WA-9338-24**  
 Date: **March 13, 2024**  
 Engineer: **Joseph Hoerner, EIT**

BASIN: **2**

TOTAL AREA: **1,362** s.f. **0.031** Acres  
 Street Impervious: **0** s.f. **0.000** Acres  
 Runoff Coefficient, C: **0.31** (Weighted C from TABLE 1, BASIN CHARACTERISTICS)

Design Storm: **10-Year** m= 6.98  
 n= 0.609

#### COMBINED AREA:

Overland Flow, L: 50 ft Elev 1= 100  
 K: 1200 Elev 2= 99  
 Slope, S: 0.0200 ft/ft  
 Overland Tc= **0.29** min

Channel Flow, L: 0 ft  
 K:  
 Slope, S: ft/ft  
 Channel Tc= **0.00** min

Gutter Flow, L: 0 ft  
 K:  
 Slope, S: ft/ft  
 Gutter Tc= **0.00** min

Pipe Flow, L: 0 ft  
 K:  
 Slope, S: ft/ft  
 Pipe Tc= **0.00** min

Combined Area Tc= **5.00** min (5 minute minimum per Section 5.5.2)  
 10-Yr Storm Intensity, I= **2.62** in / hr

Combined Area Peak Flow, Qc= **0.03** cfs

#### STREET AREA ONLY:

Runoff Coefficient, C= 0.90  
 Street & Drive Area, A= **0.000** acre Q= C \* I \* A  
 10-Yr Storm Intensity, I= **2.62** in / hr  
 Tc= 5.00 min

Street Only Peak Flow, Qs= **0.00** cfs

**Design Peak Flow, Q= 0.03** cfs

### BOWSTRING METHOD 10-Year Storm Event

BASIN: **2**

Time Increment: 5 min  
 Tc: **5.00** min  
 Outflow: **0.00** cfs  
 Total Area: **0.03** acres  
 "C" Factor **0.31**  
 Area \* "C" **0.010**

#### Outflow rate calculation:

0.05 in/hr Per treatment soil  
 0.00000 cfs/sf IR in feet per second  
 91 sf Swale bottom area  
 0.0001 cfs IR x btm area

@ Tc

1	2	3	4	5	6	7
Time (min)	Time (sec)	Intensity (in / hr)	Q (cfs)	Volume In (cf)	Volume Out (cf)	Storage (cf)
5.00	300	2.62	0.03	10	0	10
5	300	2.62	0.03	10	0.03159722	10
10	600	1.72	0.02	12	0.06319444	12
15	900	1.34	0.01	13	0.09479167	13
20	1200	1.13	0.01	14	0.12638889	14
25	1500	0.98	0.01	15	0.15798611	15
30	1800	0.88	0.01	16	0.18958333	16
35	2100	0.80	0.01	17	0.22118056	17
40	2400	0.74	0.01	18	0.25277778	18
45	2700	0.69	0.01	19	0.284375	18
50	3000	0.64	0.01	19	0.31597222	19
100	6000	0.42	0.00	25	0.63194444	24
300	18000	0.22	0.00	38	1.89583333	36
600	36000	0.14	0.00	50	3.79166667	46
800	48000	0.12	0.00	56	5.05555556	51
900	54000	0.11	0.00	58	5.6875	53
1000	60000	0.10	0.00	61	6.31944444	54
1100	66000	0.10	0.00	63	6.95138889	56
1200	72000	0.09	0.00	65	7.58333333	58
1300	78000	0.09	0.00	67	8.21527778	59
1440	86400	0.08	0.00	70	9.1	61

**Volume Required, V= 61 cf**



# APPENDIX B

## STORMWATER TREATMENT CALCULATIONS



Project: Pannell Drainage Design

Job No.: WA-9338-24

Date: 3/13/2024

Engineer: Joseph Hoerner, EIT

### STORMWATER TREATMENT CALCULATIONS

Post-Developed Condition:	Basin 1
PGIS:	
Asphalt/Concrete Area =	<input type="text" value="0"/> SF
Other PGIS =	<input type="text" value="0"/> SF
Calculations:	
$V = 1815 \cdot AP^{1.53}$ (equation 6-1b)	
$A = (\text{Total PGIS}) / 43,560 =$	<input type="text" value="0.000"/> Acres
$P = 1$ for Spokane Area	
$V = 1815 \cdot A =$	<input type="text" value="0"/> CF
Treat:	<b>0 Cubic Feet in 0.5' depth</b>



Project: Pannell Drainage Design

Job No.: WA-9338-24

Date: 3/13/2024

Engineer: Joseph Hoerner, EIT

### STORMWATER TREATMENT CALCULATIONS

Post-Developed Condition:	Basin 2
<u>PGIS:</u>	
Asphalt/Concrete/Gravel Area =	441 SF
Other PGIS =	0 SF
<u>Calculations:</u>	
V = 1815*AP <sup>1.53</sup> (equation 6-1b)	
A = (Total PGIS) / 43,560 =	0.010 Acres
P = 1 for Spokane Area	
V = 1815*A =	18 CF
Treat:	18 Cubic Feet in 0.5' depth



# APPENDIX C

## SWALE VOLUME CALCULATIONS



Project: Pannell Drainage Design  
 Job No.: WA-9338-24  
 Date: 3/13/2024  
 Engineer: Joseph Hoerner, EIT

**SWALE VOLUME CALCULATIONS**

Post-Developed Condition: Basin 1							
Bottom Width =		1.5	ft	25-Year Post-Dev Volume =		37	cf
Bottom Length =		25.5	ft	Treatment Volume =		0	cf
Side Slopes =		3	H : 1V				
Design Parameter	Storage Depth (ft)	Top Width (ft)	Top Length (ft)	Provided Vol. (cf)	Required Vol. (cf)	Volume Check	Bottom Area (sf)
Treatment	0.5	4.5	28.5	42	≥ 0	OK	38.25
Detention	0.5	4.5	28.5	42	≥ 37	OK	
<b>Provide:</b>	<b>1.5' Wide x 25.5' Long x 6" Deep Swale or Equivalent</b>						



Project: Pannell Drainage Design  
 Job No.: WA-9338-24  
 Date: 3/13/2024  
 Engineer: Joseph Hoerner, EIT

**SWALE VOLUME CALCULATIONS**

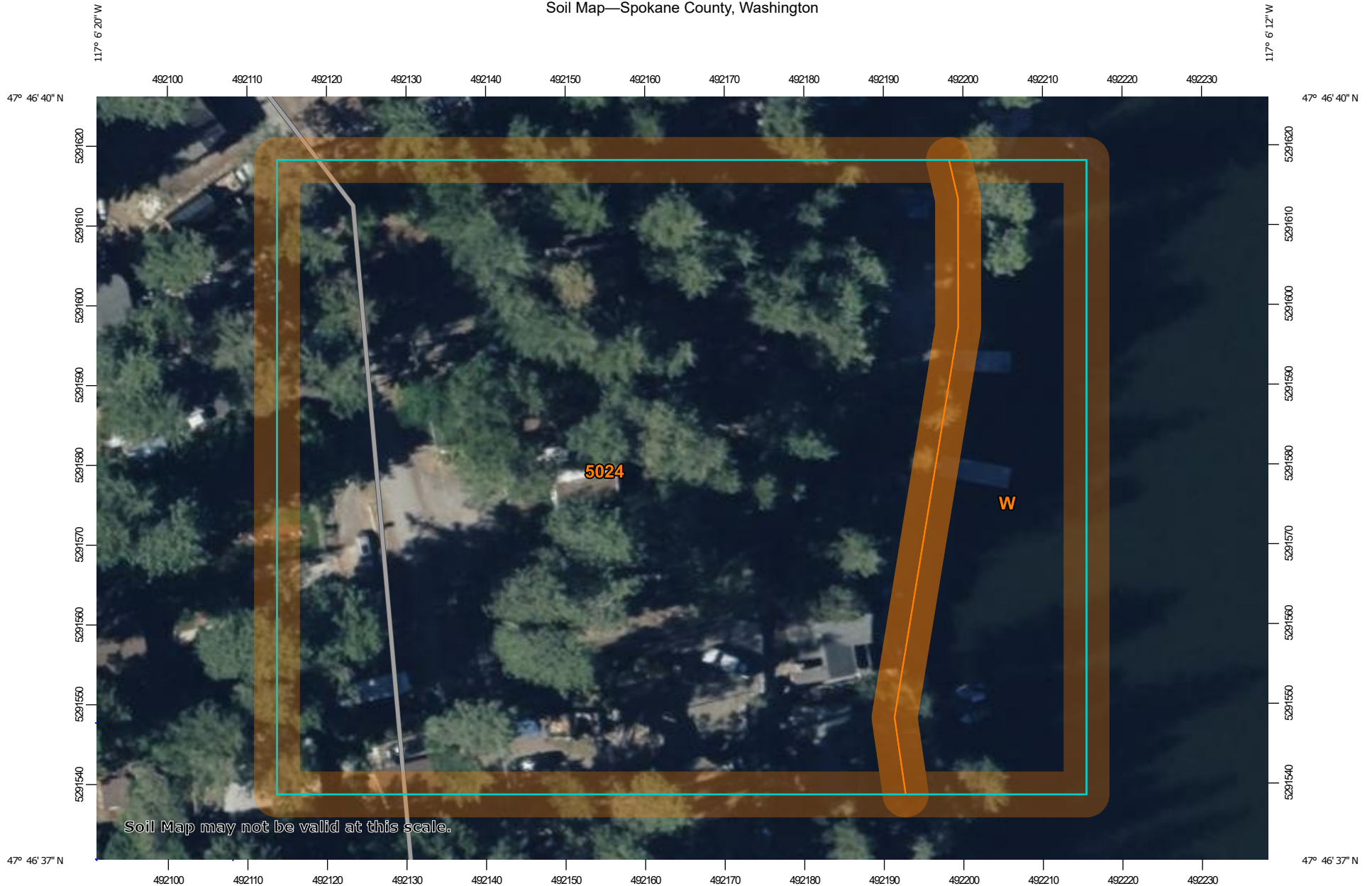
Post-Developed Condition: Basin 2							
Bottom Width =		7 ft		10-Year Post-Dev Volume =		61 cf	
Bottom Length =		13 ft		Treatment Volume =		18 cf	
Side Slopes =		3 H : 1V					
Design Parameter	Storage Depth (ft)	Top Width (ft)	Top Length (ft)	Provided Vol. (cf)	Required Vol. (cf)	Volume Check	Bottom Area (sf)
Treatment	0.5	10.0	16.0	63	≥ 18	OK	91
Detention	0.5	10.0	16.0	63	≥ 61	OK	
<b>Provide:</b>	<b>7' Wide x 13' Long x 6" Deep Swale or Equivalent</b>						



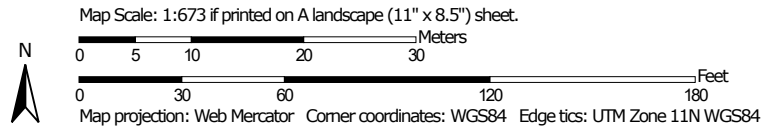
# APPENDIX D

## NRCS WEB SOIL SURVEY DATA

Soil Map—Spokane County, Washington




Soil Map may not be valid at this scale.





## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

**Warning:** Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Spokane County, Washington

Survey Area Data: Version 15, Aug 28, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 7, 2022—Aug 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5024	Micapeak-Rock outcrop complex, 15 to 30 percent slopes	1.6	80.8%
W	Water	0.4	19.2%
<b>Totals for Area of Interest</b>		<b>2.0</b>	<b>100.0%</b>

## Spokane County, Washington

### 5024—Micapeak-Rock outcrop complex, 15 to 30 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2x1z8

*Elevation:* 1,720 to 3,850 feet

*Mean annual precipitation:* 19 to 27 inches

*Mean annual air temperature:* 42 to 50 degrees F

*Frost-free period:* 90 to 130 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Micapeak and similar soils:* 55 percent

*Rock outcrop:* 20 percent

*Minor components:* 25 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Micapeak

##### Setting

*Landform:* Hills, ridges

*Landform position (two-dimensional):* Shoulder, backslope, summit

*Landform position (three-dimensional):* Side slope, interfluvium

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Volcanic ash and loess mixed with colluvium and residuum weathered from metamorphic rock and/or granite

##### Typical profile

*O<sub>i</sub> - 0 to 1 inches:* slightly decomposed plant material

*A - 1 to 7 inches:* gravelly ashy loam

*Bw<sub>1</sub> - 7 to 13 inches:* gravelly ashy loam

*Bw<sub>2</sub> - 13 to 22 inches:* gravelly loam

*BC<sub>t</sub> - 22 to 33 inches:* gravelly loam

*C - 33 to 39 inches:* gravelly sandy loam

*Cr - 39 to 49 inches:* bedrock

##### Properties and qualities

*Slope:* 15 to 30 percent

*Depth to restrictive feature:* 21 to 41 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting layer to transmit water*

*(K<sub>sat</sub>):* Moderately high to high (0.71 to 2.13 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Low (about 5.3 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* C  
*Ecological site:* F043AY546ID - Warm-Frigid, Xeric, Unglaciaded, Loamy, Hills, Mountains and Canyons, Mixed ash Surface Douglas fir / mallow ninebark - common snowberry  
*Other vegetative classification:* Douglas-fir/ninebark (CN260)  
*Hydric soil rating:* No

### **Description of Rock Outcrop**

#### **Typical profile**

*R - 0 to 60 inches:* bedrock

#### **Properties and qualities**

*Slope:* 15 to 30 percent  
*Depth to restrictive feature:* 0 inches to lithic bedrock

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8  
*Hydric soil rating:* No

### **Minor Components**

#### **Quinnamose**

*Percent of map unit:* 10 percent  
*Landform:* Hills  
*Landform position (two-dimensional):* Backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Other vegetative classification:* grand fir/ninebark (CN506)  
*Hydric soil rating:* No

#### **Lenz**

*Percent of map unit:* 5 percent  
*Landform:* Hills  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Other vegetative classification:* ponderosa pine/common snowberry (CN170)  
*Hydric soil rating:* No

#### **Spokane**

*Percent of map unit:* 5 percent  
*Landform:* Hills  
*Landform position (two-dimensional):* Shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex

*Other vegetative classification:* ponderosa pine/common snowberry  
(CN170)

*Hydric soil rating:* No

**Brevco**

*Percent of map unit:* 5 percent

*Landform:* Hills

*Landform position (two-dimensional):* Summit, shoulder

*Landform position (three-dimensional):* Nose slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Other vegetative classification:* Douglas-fir/ninebark (CN260)

*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: Spokane County, Washington

Survey Area Data: Version 15, Aug 28, 2023