R317-4 OWS Plan Design
PBM - Trench

Coles Cabin

Address: ~1660 S Toliver Ln Huntsville SE4 Sec23 T6N R1E SLBM
System Design #: WC-20-035-0020_8.6
Design Date: 2021 Aug 18

Installation

Site Plan

Plan Dimensions Take Precedence over the Scale shown on Plans

Take **Depth** Measurements **Down Slope**

Take All Pipe Measurements at **Invert**

Field Verify all Setback Distances, Field Dimensions, and Existing Conditions

Minimum Setback Distances

UAC § R317-4-13 Table Two

Tanks (to Foundation)	5 ft
Absorption System	5 ft
Open Water	50 ft
Groundwater Sources	50 ft

General System Requirements

Final Inspections

Health Authority May Inspect All Components in Relative Elevation Schedule before Backfilling

UAC R317-4-7 Construction and Installation

Install System in Accordance with OWS Rule and Regulatory Authority Special Requirements

Culinary Water Lines

Sleeve all Culinary Water Lines Crossing any Sewer Line in Solvent Welded Sch 40 Pipe at least Ten Feet beyond the Crossing

Use Solvent-Welded Sch 40 PVC Pipe Sewers at least Ten Feet beyond the Crossing of any Culinary Water Lines

Septic Tank Landscaping

Bring all Risers to the Surface per R317-4-6.7.F.1.a if Concrete or Asphault Blocks Access

Absorption Area Landscaping

Add Additional Absorption Area per R317-4-6.14.B.4.h if Oxygen Flow to Absorption System Is Blocked

Water Softener Backwash

Divert Salt-Type Water Softener Backwash to an Appropriate Underground Absorption Area

Orenco Warranty

Water softener backwash from a salt-type water softener plumbed into the septic tank, or AX2x unit, will **void the system's warranty**.

Special Requirements

Trench Maximum Cover

Trench Maximum Cover	≤36"

Sewers

Building and Effluent Sewer

Install Cleanouts at least every:	100 ft 135°

Driving or Parking Areas:
- Bed in 12" inch minus gravel
- 4" Sch 40 PVC Pipe or better
- If Less than 30", Insulate Pipe (≥ 2"x16" Foamboard 6" above pipe)
- Install Traffice Rated Clean Out Access

Building Sewer

SDR 35 PVC Pipe or better or per UAC § R317-4-13 Table Four	4"

Install Cleanout at Foundation

Install Ells after Cleanouts

Use 45 Degree Ells or less for all changes in direction

≥ ¼" per foot drop

Septic Tank

Septic Tank Size gallon	**≥1500**
Required Septic Tank Cover	6-36"

Water Tightness Inspection

Fill Tanks 24 hours before Inspection
Backfill when Approved

If Conditions Require Shoring, Contact Regulatory Authority and Photograph
Minimize Tank Sidewall Coverage Regulatory Authority May Require Tank Exposure during Inspection

Septic Tank Effluent Filter

Install Effluent Filter at Septic Tank Outlet

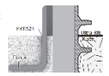
Effluent Sewer

SDR 35 PVC Pipe or better or per UAC § R317-4-13 Table Four	4"

≥ 1/8" per foot drop **with filter**

≥ ¼" per foot drop **without filter**

Tank Risers



Cast-In or Bolt Down Risers

Seal Water-tight.

Extend all Required Risers to the Surface

Pump Tanks

Pump Tank Size gallon	**≥1750**
Required Pump Tank Cover	24-48"

Flow Inducer Tower

Install the Flow Inducer Tower under the Pump Tank Distal Riser

Pump Installation

Install Pump in Flow Inducer Tower

Pump & Discharge Assembly

Install Camlock within **12"** of Riser Cover

Install Drain Hole on Bottom of Elbow Drain Hole	1/8"

Force Main

Install Force Main through the Pump Tank Outlet Opening or Riser

Drainback or Install below Frost Line	≥34"

Float Tree

Use PVC Pipe	1"

Recirculation Float Settings

Float #1, Above Tank Floor (Bottom of RSV Cage)	30"
Float #2, Above Float #1	12"
Float #3, Above Float #2	6"
Tether Lengths	2"

Discharge Float Settings

Float #1, Above Tank Floor	18"
Float #2, Above Float #1	6"
Float #3, Above Float #2	30"
Tether Lengths	2"

Orenco AX20 Units

Orenco Installer Certification

Orenco distributors will only sell or authorize installations by Orenco certified installers.

Equipment Instructions

Follow Orenco AX20 Installation Manual NIM-ATX-AX-1

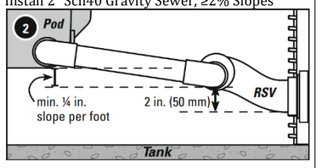
Nitrogen Return Line

Install 1" Sch40 PVC Nitrogen Return Line from Pod Drain Line to Inlet of Septic Tank
Install 1" Grommet near bottom of Inlet Riser. Anti-Siphon on Bottom Ell 1/8"

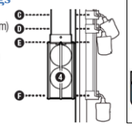
Recirculating Stinger Valve

Install RSV Quick Disconnect in Pump Tank Inlet Riser.

Install 2" Sch40 Gravity Sewer, ≥2% Slopes



RSV Settings



C Invert of inlet (initial elevation setting for High-Level Alarm)
D 2 in. (50 mm) below High-Level Alarm (initial elevation setting for Override Timer)
E 2 in. (50 mm) below Override Timer (setting for Top of RSV cage)
F 10 in. (300 mm) below top of RSV cage (initial setting for Low-Level Alarm)

Effluent Distribution

Install Distribution Box and Top Manifold

Distribution and Drop Boxes Inspection

Water Level Test Required

Distribution Device Riser

Bring Access Riser to Final Grade

Distribution Method

Install Proportional Distribution

Absorption System

Estimated Hydraulic Flow Rate	**700 gpd**
Hydraulic Loading Rate	**0.4** $(\frac{gpd}{ft^2})$
Maximum Trench Depth	**18"**

Absorption System Placement

± 20 feet Change from Approved Design

Change from Approved Design will Require Permission of Designer and Health Authority

Absorption System Excavations

Install Shallow as Possible

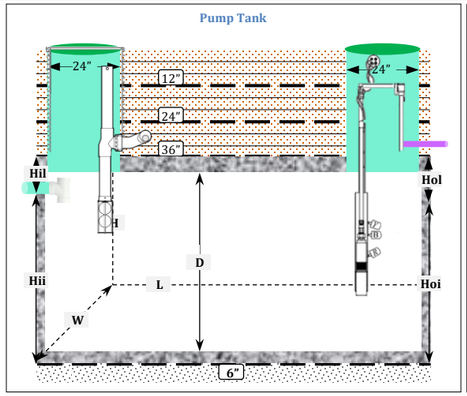
Follow Contours on Sloping Sites

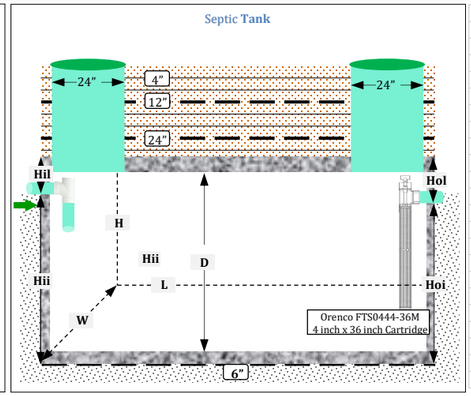
Excavate **Each** Trench or Bed Level

Trench Spacing	≥7 ft

Rake Smeared or Compacted Surfaces

Protect from Surface Runoff
Install Absorption System ASAP





Absorption System Layout

May Increase or Decrease Number of Trenches if Retain Overall LM

Pressure Distribution Will Require New Calculations

Observation Ports

Install Observation Ports on Outside Distal Corners

Diameters	4"

SDR35 PVC or better

Component Access

Install 10" Round Valve Covers for all 4" Pipe

Chambered Trenches

Minimum Length of Trenches **408 ft**

Standard Chamber Criteria

Type A IAPMO Standard Chambers
Advanced Drainage Systems
Arc36 Chambers

Infiltrator Systems Inc.
Quick4 Standard Chamber

D-Box-Chamber Effluent Inlet

Use **Top Port** of End Cap or Side Port Coupler

Place Gravel or Equivalent below Effluent Inlet

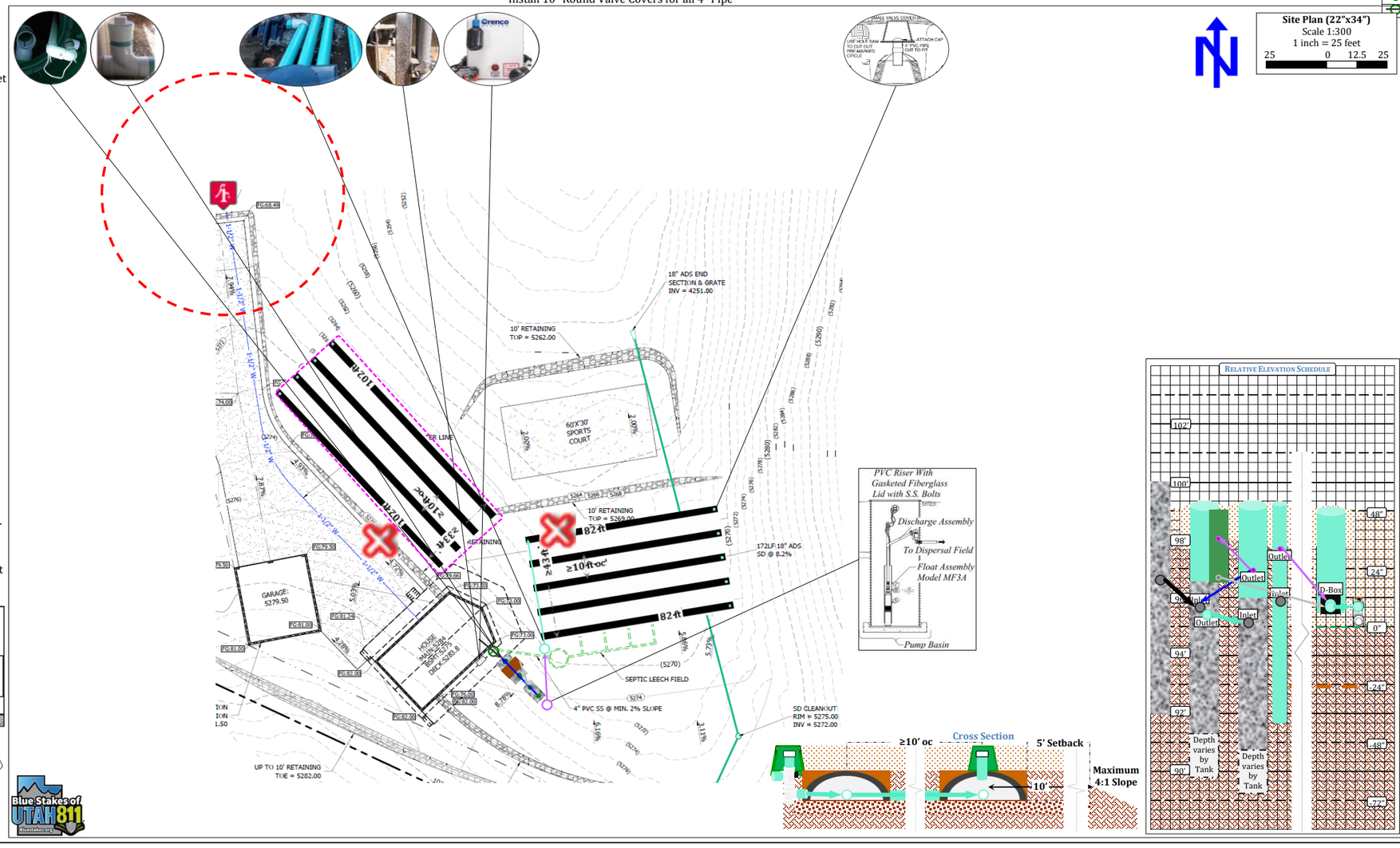
Side Port Coupler and End Cap

All measurements in inches

Tank	L	W	H	Hii	Hil	Hoi	Hol	Drop	D	Wall	Floor	Lid	Gallons gpi	Gallons ES
Orenco - DCPD - Sutherlin Oregon														
M1000G	96	96	61	51.3	10	48	13	3.3	61	0.3	0.3	0.3	20.0	220
M1500G	105	105	72	61.0	11	59	13	2.0	72	0.3	0.3	0.3	25.0	288
Roth - RMT - HDPE - Syracuse New York														
1000 gallon	118	62	51	43	8	40	11	3.0	51	0.5	0.5	0.5	25.0	190
1250 gallon	148	62	51	43	8	40	11	3.0	51	0.5	0.5	0.5	31.3	210
1500 gallon	177	62	51	43	8	40	11	3.0	51	0.5	0.5	0.5	37.5	231
Oldcastle - Concrete - Ogden Utah														
1000 gallon	139	67	53	41	12	38	15	3	61	4	5	5	32.6	326
1250 gallon	139	67	61	49	12	46	15	3	51	4	5	5	32.6	326
1500 gallon	139	67	67	55	12	52	15	3	57	4	5	5	32.6	326
Duracrete - Concrete - Salt Lake City Utah														
1000 gallon	112	56	70	55	15	51.5	18.5	3.5	61	3	4	5	22.9	309
1250 gallon	126	60	70	55	15	52.5	17.5	2.5	61	3	4	5	28.1	351
1500 gallon	130	68	68	55	13	51.5	16.5	3.5	59	3	4	5	33.3	383
1750 gallon	127	66	75.5	63.5	12	61	14.5	2.5	66.5	3	4	5	31.4	298
2500 gallon	151	80	82	68	14	65.5	16.5	2.5	72	4	5	5	44.6	513
Norwesco - Low Profile - HDPE - Tooele Utah														
1000 gallon	127	60	51	43	8	40.0	11.0	3.0	51	0.3	0.3	0.3	21.3	149
1250 gallon	157	60	51	43	8	40.0	11.0	3.0	51	0.3	0.3	0.3	26.0	182
1500 gallon	157	69	51	43	8	40.0	11.0	3.0	51	0.3	0.3	0.3	31.9	223

Key

- Potable Water
- Replacement Area
- Horizontal Setbacks
- GPZ
- Soil Test Pit
- Cover Soil
- Original Grade
- Undisturbed Native Soil
- Self-Compacting Gravel
- Building Sewer
- Septic/Pump Tank
- Effluent Sewer
- Control Panel
- Nitrogen Removal
- PBM
- Force Main
- Two Inch Gravity Sewer
- Pump Station
- Pump to Gravity Device
- Barrier Material
- Standard Drain Media
- Scarified Soil
- Headworks Box
- Subsurface Drip Irrigation
- Chambered Trenches
- Observation Ports
- Round Valve Box
- Sewer Cleanouts



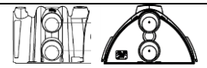
Site Plan (22"x34")
Scale 1:300
1 inch = 25 feet
25 0 12.5 25

Blue Stakes of Utah 811

Coles Cabin

Address: ~1660 S Toliver Ln Huntsville
System Design #: WC-20-035-0020_8.6
Design Date: 2021 Aug 18

Shupe Environmental Solutions Inc
Mailing Address: P. O. Box 199, Huntsville, Utah 84317
Carl R Shupe 801-814-3036 cshupe001@gmail.com
DOPL Licensed Environmental Health Scientist 5630685-2001
DWQ Certified Onsite Wastewater Level 3 00464-OSP-3
DOPL Licensed Contractor 12011279-5501



Frazier-Tee-Chamber Effluent Inlet

Use **Bottom Port** of End Cap or Side Port Coupler

Chamber Effluent Outlet

Use **Bottom Port** of End Cap or Side Port Coupler

Chamber Installation

Follow Manufacturer's Recommedations
Walk-in Soil Cover over Sidewall Louvers

Standard Trenches

Minimum Length of Trenches	**408 ft**

Drain Media Criteria

UAC §§ R317-4-2.34	
Effective size	¾ - 2½"
Maximum #10 (or 2 mm) Sieve	2 %
Drain Media Minimum Depth	
Under Pipe	6"
Over Pipe	2"
Distribution Pipe	4"

per UAC § R317-4-13 Table 4
Five o'clock and seven o'clock rows of ½" round holes at ~6" intervals

Barrier Material (UAC §§ R317-4-2.7)

Use Filter Fabric	≥4 oz/yd²
or Compacted Straw	≥2"

Trench Cover

Top Soil Preferred

Backfill Slightly Mounded	2-3"

Subsurface Drip System Details

Absorption System Placement

± 20 ft Change from Approved Design

Absorption System Excavations

Installation Depth	6-10"
Preferred	8"

Excavate Each Line Level, Follow Contours
1 ft Minimum Line Spacing
± 1" Excavation & Pipe Tolerance

Protect from Surface Runoff

Rake Smeared or Compacted Surfaces

Backfill Slightly Mounded	3-4"

to Offset Settling and
to Divert Surface Water
Use Top Soil

Scarification

Scarify Effective Absorption Area Level
Order of Preference:
- Chisel Teeth Mounted to Backhoe;
- Chisel Plow (Spring Tooth Plow);
- Backhoe Bucket with Short Teeth.

Rotary tilling is prohibited.

Depth of Scarification	**6"**

Protect Scarified Soil from **Any Water** Event

Scarification Inspection

Soil Preparation before Fill Placement

Control Panel

Install Control Panel within Sight of Pump Access Riser

Maximum Conduit from Riser	**60 ft**
Place on 12 Gauge Strut Bar or better	
Separation from Dwelling	**≥0.5"**

Packed Bed Media

Splice Box Wiring

Wire	16 Gauge
Use Terminal Link	#1-2
Float #1 (On/Off)	#2
Float #2 (Override)	#3
Float #3 (Alarm)	#4
Common	#5
Wire	12 Gauge
Pump Hot	#6
Pump Neutral	#7

AX40 Pod Recirculating Pump Settings

Minimum Recirculation Ratio	
Engineered	4:1
Verify PDR = Design PDR	30 gpm

Override Float Settings

Forward HFR =	**1200**	**gpd**
Filter Application Rate =	30.0	gpd/ft²
Min Reqd Surface Area =	40.0	ft²
AX20-RT =	20.0	ft²

AX20-RT Pod

Dose (cycle)	Cycles (day)	Cycling Rate	gpd	Ratio
26.6	288	5.0	7661	5.4 :1
26.6	225	6.4	5985	4.0 :1

Pump On Time = DV / PDR	
= 26.6 gal / 60 gpm =	27 sec
Pump Off Time	5:57 min

On/Off Float Settings

Certified Service Provider to determine based on Occupancy or Actual HFR.

Pump On Time = DV / PDR	
= 20 gal / 60 gpm =	20 sec
Pump Off Time	19:40 min

SDS Pump Settings

See Design Sheet

Feasibility and Plan Review

PBM - Trench

Address: ~1660 S Toliver Ln Huntsville
System Design #: WC-20-035-0020_8.6
Design Date: 2021 Aug 18

Est Hydraulic Flow Rate

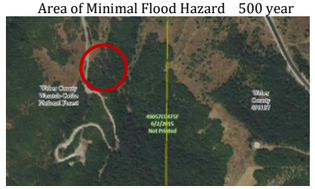
Residential Use **700 gpd**
five bedrooms,
finished basement,
twelve people maximum sustained use

Feasibility Assessment Record

Hydraulic Loading Rate (HLR)	**0.4** $(\frac{gpd}{ft^2})$
Soil Profile	see WMHD
Max Absorption Trench Depth	**18"**
Maximum Groundwater Design per WMHD	48"
Absorption Area Max Ground Slope	≤9%

Flood Plain Zones

Flood Plain Zone	See Map
FEMA Designation	Zone X
Area of Minimal Flood Hazard	500 year



Key

- Flood Plain Zone
- Absorption Area
- Groundwater Protection Zone 2
- Non-Public Water Supply
- 100 foot Groundwater Protection Zone
- Soil Test Pit

Plan Review and Permitting

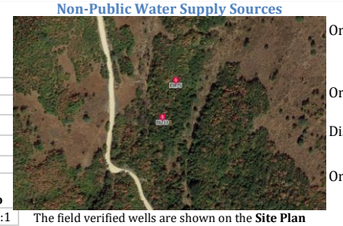
Wastewater Type	Domestic
Water Supply	
Application	Attached
Soil Pit Location	see WMHD

Lot Size and Dimensions

See Site Plan

Groundwater Protection Zones

Non-Public Water Supply Sources



The field verified wells are shown on the **Site Plan**

Design Requirements

Sewer & Septic Tank Details

Inlet Riser

Orenco:	
PRTA24, Tank Adapter	24"
PRTA24BDKIT, Bolt Down Kit or Cast-In	
FLD24G, DuraFiber™ Access Lid	24"
RR24xx	**As needed**
Ultra-Rib™ Access Riser	

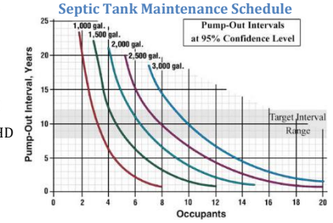
Outlet Riser

Orenco:	
PRTA24, Tank Adapter	24"
PRTA24BDKIT, Bolt Down Kit or Cast-In	
FLD24G, DuraFiber™ Access Lid	24"
RR24xx	**As needed**
Ultra-Rib™ Access Riser	

Effluent Filter Required

Orenco FTS0444-36, 4" x 36" Cartridge

Septic Tank Maintenance Schedule



Pump Tank Details

Inlet Riser

Orenco:	
PRTA24, Tank Adapter	24"
PRTA24BDKIT, Bolt Down Kit or Cast-In	
FLD24G, DuraFiber™ Access Lid	24"
RR24xx	**As needed**
Ultra-Rib™ Access Riser	

Outlet Riser

Orenco:	
PRTA24, Tank Adapter	24"
PRTA24BDKIT, Bolt Down Kit or Cast-In	
FLD24G, DuraFiber™ Access Lid	24"
RR24xx**+SX+12**	**As needed**
Ultra-Rib™ Access Riser	

Orenco Equipment Purchase

Richard Jex, P.E., LEHS
435-753-2051, office
435-757-4905, mobile
richard@jexenvironmental.com
PO Box 3603, Logan, UT 84323

Non-Pressurized Discharge Chamber Details

Pump Basin

Orenco PB24xx+FI+SX+15,	
Diameter	24"
Height	**78"**
Grommets	
Inlet	4"
Outlet	1.25"
Orenco FLD24GI2	
DuraFiber™ Access Lid	24"

Flow Inducer Tower

Orenco UFI-4, Universal Flow Inducer	
Minimum Height	72"

High Head Effluent Pump

Orenco PF300511-CLK, 30 gpm Pump	
0.5 hp, 1Φ, 115 V, 11.8 Amps, 60 Hz	
Discharge Diameter	1.25"

Pump Discharge Assembly

Orenco Q1250S, Quick Disconnect (Q)	1.25"
Custom Built Discharge Assembly	

Pump Floats

Orenco MF1P-CLK, ClickTight	
P Model – Open – w/collar	3

Pump Junction and Conduit

Orenco CLK3-60	60 ft
ClickTight Splice, Float Switches	3
Electrical Conduit	
Diameter	1"

Pressure Distribution Piping

Force Main Diameter	1.25"
Ball Valves	1.25"

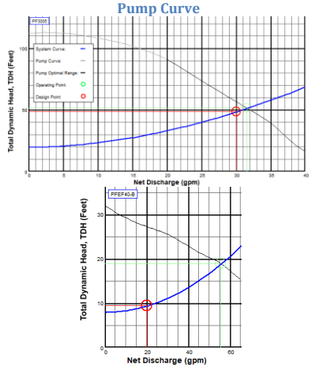
Hydraulic Calculations, 200' x 20'

Pump Selection for a Non-Pressurized System

200' 1.25" Force Main / 20' Vertical

Parameters		
Discharge Assembly Size	1.25	inches
Transport Length	200	feet
Transport Pipe Class	40	
Transport Line Size	1.25	inches
Distributing Valve Model	None	
Max Elevation Lift	20	feet
Design Flow Rate	30	gpm
Flow Meter	None	inches
'Add-on' Friction Losses	0	feet
Calculations		
Transport Velocity	6.5	fps
Frictional Head Losses		
Loss through Discharge	6.3	feet
Loss in Transport	22.2	feet
Loss through Valve	0.0	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	0.0	feet
Pipe Volumes		
Vol of Transport Line	15.5	gals
Minimum Pump Requirements		
Design Flow Rate	30.0	gpm
Total Dynamic Head	48.5	feet

Pump Curve



Absorption Trench System Details

Absorption Trenches

Sizing Criteria

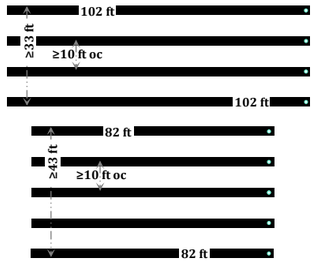
Effective Absorption Area (E_{AA}) = $\frac{HFR}{HLR}$
= 700 gpd / 0.4 $(\frac{gpd}{ft^2})$ = 1750 ft²

Reduction Factor (Packed Bed Media) 0.7
E_{AA} x RF = 1750 ft² x 0.7 = **1225 ft²**
Width of Media (W_M) = **3 ft**
Length of Media (L_M) = $\frac{E_{AA}}{W_M}$
= 1225 ft² / 3 ft= **408 ft**

Standard Trench

Chambered Trenches

Sizing Criteria
Reduction Factor (None) 1.0
L_M x RF = 408 ft x 1.0 = **408 ft**



Disclaimer

Due to the variability of: site soils; wastewater; the personnel that conduct feasibility studies and review plans; building construction; and, OWS system installation, this design is not intended to be a guarantee or warranty, expressed or implied, regarding the future adequacy, performance, or condition of any installed system. The designer liability is limited to the value paid for this plan.

The drawings, plans, models, designs, specifications, reports, photographs, computer software, surveys, calculations and other data, including computer print-outs, contained in this Plan are the property of the designer. The Plan is made available for ~1660 S Toliver Ln Huntsville. The Plan may not be copied, reproduced, or distributed in any way or for any purpose without the consent of the designer.

The designer reserves the right to revise this document and to make changes in content as needed or as required by the local regulatory authority without obligation on the part of the designer to provide notification of such revision or change. The installer shall confirm they have the most current revision of this plan.

The designer is not responsible for the results of any changes to this plan without approval by the designer and the local health department. Any deviations shall be coordinated with the designer and local health department prior to proceeding with the related work concerning the deviation.

This design assumes installer experience or competency with the system shown herein. The designer shall not be held liable for any errors, omissions, or deficiencies in any form by the installer.

The installer shall read the notes and details in this plan.

All third party information provided including any plot plans, site plans, geographic maps, health department requirements and statements, is "as is" without any guarantee, representation, condition or warranty of any kind, either express, implied, or statutory.

Any location of utilities shown on this plan are approximate. The installer shall call the Blue Stakes utility locating company, 1-800-662-4111, for field location marking before excavating.

Orenco AX40 Pod Details

Hydraulic Flow Rate	700 gpd

AdvanTex Textile Filter Criteria

Media	AdvanTex
Hydraulic Loading Rate ≤	30 $(\frac{gpd}{ft^2})$
Effective Application Area	**40 ft²**
≥ $\frac{HFR}{HLR}$ = 700 gpd / 30 $(\frac{gpd}{ft^2})$	

AdvanTex AX20 Textile Filter Pod

Orenco AX20 Series MODE3A-SX	
Advantex AX20 Textile Filter	Two
Treatment Mode	MODE3B
Pump Discharge, N Reduction	
Orifice Flow Rate	0.43 gpm
Orifices	68 (AX20)

Flow Splitter

Orenco RSV3Q	
Recirculating Splitter Valve	3"

RSV Settings

- **C** Invert of inlet (initial elevation setting for High-Level Alarm)
- **D** 2 in. (50 mm) below High-Level Alarm (initial elevation setting for Override Timer)
- **E** 2 in. (50 mm) below Override Timer (setting for Top of RSV cage)
- **F** 10 in. (300 mm) below top of RSV cage (initial setting for Low-Level Alarm)

Pressure Distribution Details

Flow Inducer Tower

Orenco UFI-4, Universal Flow Inducer	
Minimum Height	84"

High Head Effluent Pump

Orenco PF500511-CLK, 50 gpm Pump	
0.5 hp, 1Φ, 115 V, 12.1 Amps, 60 Hz	
Discharge Diameter	2"

Pump Discharge Assembly

Orenco Q2000S, Quick Disconnect (Q)	2"
Custom Built Discharge Assembly	

Pump Floats

Orenco MF1P-CLK, ClickTight	
P Model – Open – w/collar	3

Pump Junction and Conduit

Orenco CLK3-60	60 ft
ClickTight Splice, Float Switches	3
Electrical Conduit	
Diameter	≥0.75"

Pump Control Panel

Consult Orenco Distributor for Appropriate Panel	
Power Sources	2

Building Power Panel
Wired for Generator or Equivalent