

Memorandum

TO: Mr. Frank Pohl
County Engineer
Department of Community Development

FROM: Kendra Moon, PE
Line and Grade Civil Engineering

DATE: August 7th, 2026

RE: CBI Forest School - Dudley
Central Sewerage System and Central Water System Requests

Dear Frank,

On behalf of Congregation Beth Israel (CBI), please accept this notice of intent to establish a central sewerage system (CSS) and central water system (CWS) for the CBI Forest School on TMP 89-64 in central Albemarle County.

This request supports the conversion of the currently vacant property into an outdoor-based private school serving up to 144 students (ages 18 months through 5th grade). The site is not within the jurisdictional area for public water or sewer. Planned improvements include four classroom buildings, one central building, a guardhouse, and an outdoor pavilion.

The proposed CSS includes septic tanks serving each building, a flow equalization tank, a flow splitter, primary and reserve drainfields, and pipe connections between these components (see Appendix A). The proposed CWS includes one well, a primary water main, and service connections to all buildings (see Appendix B). Both systems will be permitted through the Virginia Department of Health (VDH).

CENTRAL SEWERAGE SYSTEM

The proposed system will handle wastewater from all facilities and includes collection, primary treatment, and disposal components. Effluent will be conveyed to individual septic tank effluent to gravity (STEG) tanks, routed to the flow equalization system, and pumped to a flow splitter, which will distribute primary-treated effluent between two primary drainfields composed of low-pressure dosed laterals (see Appendices A and B). Reserve drainfields are provided just uphill of the primary drainfields.

Number of Connections

There are 7 total connections to be made to this CSS with the follow tank capacities:

Phase 1 Proposed:

- 1 central building – (2) x 1,500 gallon tanks
- 1 guardhouse – (1) x 1,000 gallon tank
- 4 classroom buildings – (1) x 1,500 gallon tank each
- 1 outdoor pavilion – (1) x 1,500 gallon tank

Existing:

- N/A

All proposed buildings are located on TMP 89-64 and will be owned by CBI. Refer to Appendix A for a map of the proposed CSS.

CENTRAL WATER SUPPLY

The proposed CWS will include a single well, constructed in accordance with applicable public water supply standards, to provide domestic water to the site. The well will be located at the northern extent of the planned campus, upslope of the proposed facilities. The estimated water demand is 1750 gallons per day. Service laterals from each building will connect to a primary water main located along the northern maintenance access road. Please note that plan details of the water system will be provided in a follow-up attachment, but at this time we are still waiting for the test wells to be drilled. Note that a permit has been received from VDH for the initial well drilling, see Appendix C.

Number of Domestic Connections

There are 7 total domestic water lateral connections.

Phase 1 Proposed:

- 1 central building
- 1 guardhouse
- 4 classroom buildings
- 1 outdoor pavilion

Existing:

- N/A

Again, all proposed buildings are located on TMP 89-64 and will be owned by CBI. Refer to Appendix A for a map of the proposed CWS.

If you have any questions or require additional information, please do not hesitate to contact me at kmoon@line-grade.com.

Sincerely,



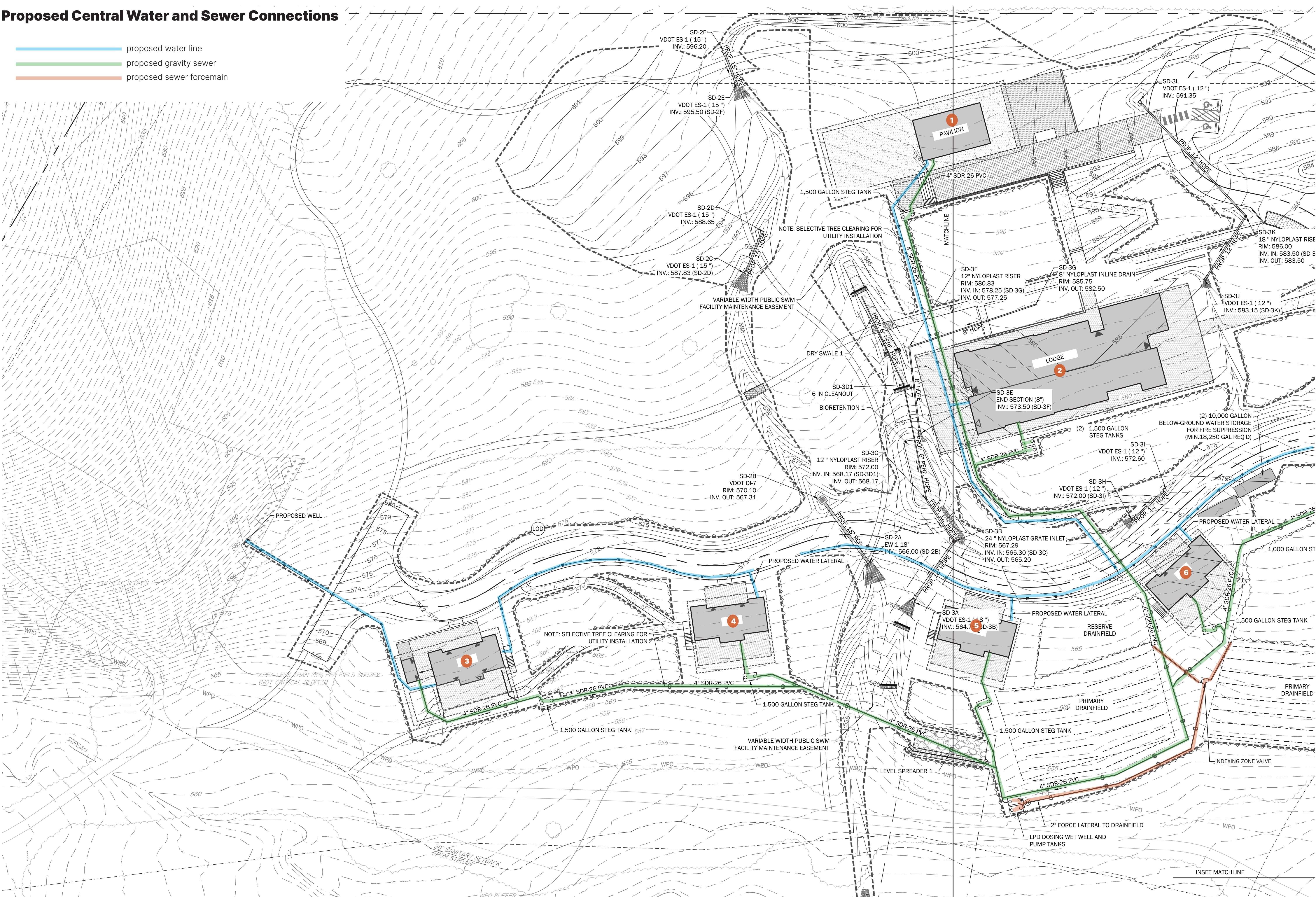
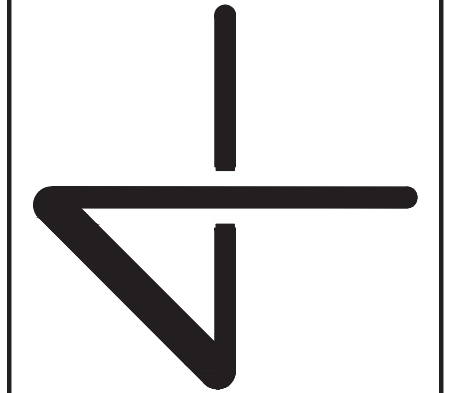
Kendra G. Moon, PE

List of Attachments:

- Appendix A: CBI Forest School Proposed Central Sewerage System
- Appendix B: CBI Forest School Sewer Design (from ODE) and VDH approval letter
- Appendix C: Well Drilling Approval (VDH ODW)

Proposed Central Water and Sewer Connections

- proposed water line
- proposed gravity sewer
- proposed sewer forcemain



UTILITY PLAN
CBI FOREST SCHOOL (SDP-2026-00003)
FINAL SITE PLAN
ALBEMARLE COUNTY, VIRGINIA

NOT FOR CONSTRUCTION



SUBMISSIONS/REVISIONS

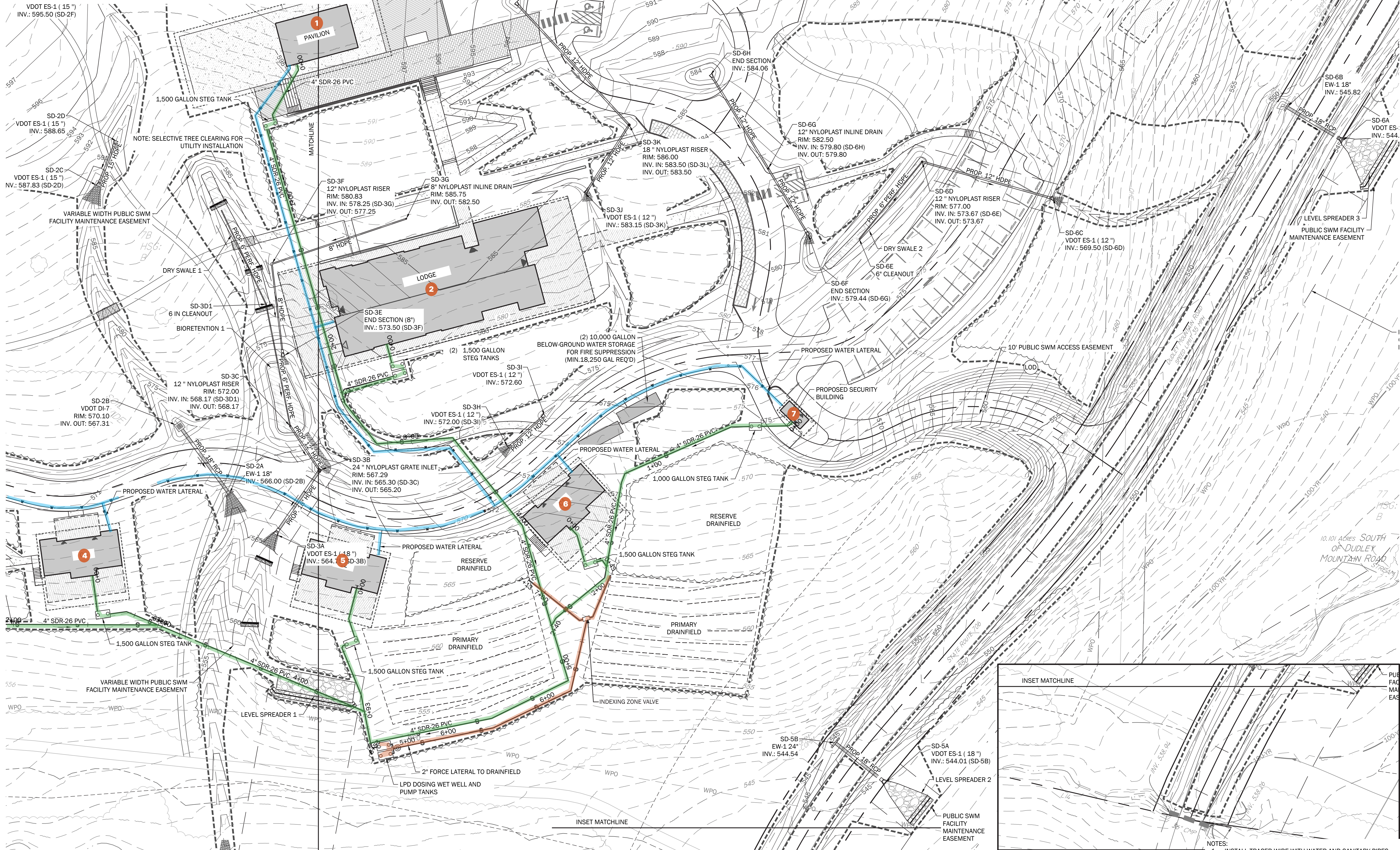
2: 08/13/2026	REVS PER COMMENTS
1: 1/19/2026	INITIAL SUBMISSION

LINE AND GRADE
Civil Engineering

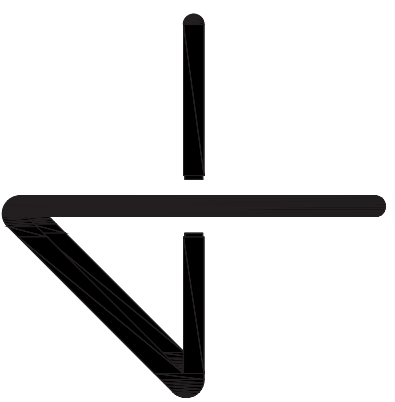
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Proposed Central Water and Sewer Connections

- proposed water line
- proposed gravity sewer
- proposed sewer forcemain



UTILITY PLAN CTD



UTILITY PLAN CTD

CBI FOREST SCHOOL (SDP-2026-00003)

FINAL SITE PLAN

ALBEMARLE COUNTY, VIRGINIA

NOT FOR CONSTRUCTION



SUBMISSIONS/REVISIONS

2: 08/13/2026
REVS PER COMMENTS

1: 1/19/2026
INITIAL SUBMISSION

LINE AND GRADE

Civil Engineering

C4.1



Albemarle County Health Department
1138 Rose Hill Drive
Charlottesville, VA 22903
(434) 972-6219 Voice
(434) 972-4310 Fax

PE Sewage Disposal System Construction Permit (AOSS)

Well and Sewage Contractors: Please notify Health Department and OSE or PE 48 hours prior to installation to arrange for inspection

April 21, 2026

Congregation Beth Israel Forest School
301 East Jefferson St
Charlottesville, VA 22902

RE: **Site Address:** TBD Dudley Mtn Rd, Charlottesville, VA 22903
 Tax Map: 89-64 (Albemarle County)
 HDID: 101-26-0114
 Design Flow: 875 GPD (Equalized)
 STE to LPD via Pump, IIB Well to Serve

APPROVED

Dear Congregation Beth Israel Forest School:

This letter and the attached drawings, specifications, and calculations (58 pages) dated **March 30, 2026**, constitute your permit to install a sewage disposal system on the property referenced above. Your application for a permit was submitted pursuant to §32.1-163.5 & 163.6 of the Code of Virginia, which requires the Health Department to accept private soil evaluations and designs from an Onsite Soil Evaluator (OSE) or a Professional Engineer working in consultation with an OSE for residential development. VDH is not required to perform a field check to verify the private evaluations of OSEs or PEs and such a field check may not have been conducted for the issuance of this permit.

The soil absorption area ("site"), sewage system design was certified by **Michael Craun, PE 036859** as substantially complying with the Board of Health's regulations (and local ordinances if the locality has authorized the local health department to accept private evaluations for compliance with local ordinances). This permit is issued in reliance upon that certification. VDH hereby recognizes that the soil and site conditions acknowledged by this permit are suitable for the installation of an onsite sewage system. The attached plat shows the approved area for the sewage disposal system; there are additional records on file with the Albemarle County Health Department pertaining to this permit, including the Site and Soil Evaluation Report. This construction permit is null and void if any substantial physical change in the soil or site conditions occurs where a sewage disposal system is to be located.

If modifications or revisions are necessary between now and when you construct your dwelling, please contact the OSE/PE who performed the evaluation and design on which this permit is based. Should revisions be necessary during construction, your contractor should consult with the OSE/PE that submitted the site evaluation or site evaluation and design. The OSE/PE is authorized to make minor adjustments in the location or design of the system at the time of construction provided adequate documentation is provided to the Albemarle County Health Department.

The OSE/PE that submitted the certified design for this permit is required to conduct a final inspection of this sewage system when it is installed and to submit an inspection report and completion statement. As the owner, you are responsible for giving reasonable notice to the OSE/PE of the need for a final inspection. If the designer is unable to perform the required inspection, you may provide an inspection report and completion statement executed by another OSE/PE. The Albemarle County Health Department is not required to inspect the installation but may perform an inspection at its sole discretion. No part of this installation shall be covered until it has been inspected by the OSE/PE as noted herein. The sewage system may not be placed into operation until you have obtained an Operation Permit from the Albemarle County Health Department.

This Construction Permit is null and void if conditions are changed from those shown on your application or if conditions are changed from those shown on the Site and Soil Evaluation Report and the attached construction drawings, specifications, and calculations. VDH may revoke or modify any permit if, at a later date, it finds that the site and soil conditions and/or design do not substantially comply with the Sewage Handling and Disposal Regulations, 12 VAC 5-610-20 et seq., or if the system would threaten public health or the environment.

This permit approval has been issued in accordance with applicable regulations based on the information and materials provided at the time of application. There may be other local, state, or federal laws or regulations that apply to the proposed construction of this onsite sewage system. The owner is responsible at all times for complying with all applicable local, state, and federal laws and regulations. This construction permit is transferrable until expired or deemed null and void. A permit transfer form may be found on the VDH website at <http://www.vdh.virginia.gov/environmental-health/gmp-2015-01-forms/>.

If you have any questions, please contact me.

This permit expires: October 21, 2027

Sincerely,

A handwritten signature in black ink, appearing to be 'B. Rice', enclosed within a large, loopy oval shape.

Brooks Rice
Environmental Health Technical Specialist
Albemarle County Health Department

Cc: Michael Craun, PE - 366 S. Linden Avenue, Waynesboro, VA 22980
Thomas Hogge, OSE - PO Box 418, Ruckersville, VA 22902

Commonwealth of Virginia

Application for: ☒ Sewage System ☐ Water Supply

Owner Julie and Jeffrey Morrill, Trustees of the Julie Alleen Barron Morrill Living Trust

Mailing Address 2222 Ambrose Commons Drive Charlottesville, VA 22903

Agent Doug Lowe

Mailing Address 1365 Crozet Ave Crozet, VA 22932

Site Address TBD Dudley Mountain Road Charlottesville, VA 22903

VDH Use only

Health Department ID# _____

Due Date _____

Phone _____

Phone _____

Fax _____

Phone 434-882-0755

Phone _____

Fax _____

Email doug@sagebuild.com

Directions to Property: From Charlottesville go South on Old Lynchburg Rd, take a right on Dudley Mountain Rd, property is on the right at .8 miles

Subdivision _____ Section _____ Block _____ Lot _____

Tax Map TM 89-64 Other Property Identification _____ Dimension/Acreage of Property 155.957 Acres

Sewage System

Type of Approval: Applicants for new construction are advised to apply for a certification letter to determine if land is suitable for a sewage system and to apply for a construction permit (valid for 18 months) **only when ready to build.**

☐ Certification Letter ☒ Construction Permit ☐ Voluntary Upgrade ☐ Repair Permit ☐ Minor Modification

Proposed Use:

Single Family Home (Number of Bedrooms _____)

Multi-Family Dwelling (Total Number of Bedrooms _____)

Other (describe) New School - 1750 GPD

Basement? ☐ Yes ☒ No

Walk-out Basement? ☐ Yes ☒ No

Fixtures in Basement ☐ Yes ☒ No

Conditional permit desired? ☐ Yes ☒ No

If yes, which conditions do you want?

☐ Reduced water flow ☐ Limited Occupancy ☐ Intermittent or seasonal use ☐ Temporary use not to exceed 1 year

Do you wish to apply for a betterment loan eligibility letter? ☐ Yes ☒ No *There is a \$50 fee for determination of eligibility.

Water Supply

Will the water supply be ☒ Public or ☐ Private?

Is the water supply ☐ Existing or ☒ Proposed?

If proposed, is this a replacement well? ☐ Yes ☒ No

If yes, will the old well be abandoned? ☐ Yes ☒ No

Will any buildings within 50' of the proposed well be termite treated? ☐ Yes ☒ No

Well Type (e.g. domestic use, agricultural, irrigation, etc.) IIB Well permitted through VDH-ODW

All Applicants

Is this property indeed to serve as your (owners) principal place of residence? ☐ Yes ☒ No

All applications must be accompanied by private sector evaluations and designs, unless a petition for VDH services is approved. Is a Petition for Service form attached? ☐ Yes ☒ No

In order for VDH to process your application for a sewage system you must attach a plat of the property and a site sketch. For water supplies, a plat of the property is recommended and a site sketch is required. The site sketch should show your property lines, actual and/or proposed buildings and the desired location of your well and/or sewage system. When the site evaluation is conducted the property lines, building location and the proposed well and sewage sites must be clearly marked and the property sufficiently visible to see the topography. I give permission to the Virginia Department of Health to enter onto the property described during normal business hours for the purpose of processing this application and to perform quality assurance checks of evaluations and designs certified by a private sector Onsite Soil Evaluator or Professional Engineer as necessary until the sewage disposal system and/or private water supply has been constructed and approved.

Sagebuild Formally LLC by M.D. Dene
Signature of Owner/Agent OWNERS REP FOR CH

3/20/26
Date

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Introduction

Congregation Beth Israel is going to build a new school at TBD Dudley Mountain Road Charlottesville, VA 22903 (TM 89-64 (155.957 acres). The previous usage of the property was an unimproved primarily wooded property.

The projected usage of the CBI Forest School includes:

- Day School for 144 Students
- Administration and teachers 29 staff
- Up to 5 School events per year with up to 300 attendees
- Future usage of pavilion for up to 200 attendees once per week

The campus will include:

- 4 Classroom Cottages
- 1 Security Check in building at the entrance
- Base Camp (Administration Building with younger student classrooms)
- Pavillion

This permit is for a Large Conventional Septic System (< 1750 gpd) serving the new school.

The water supply will be a new IIB Well NTNC Water System. The well site is currently under review by VDH-ODW.

This report includes background information, soil evaluations, and analysis for the septic system permit to support the planned activities of the school.

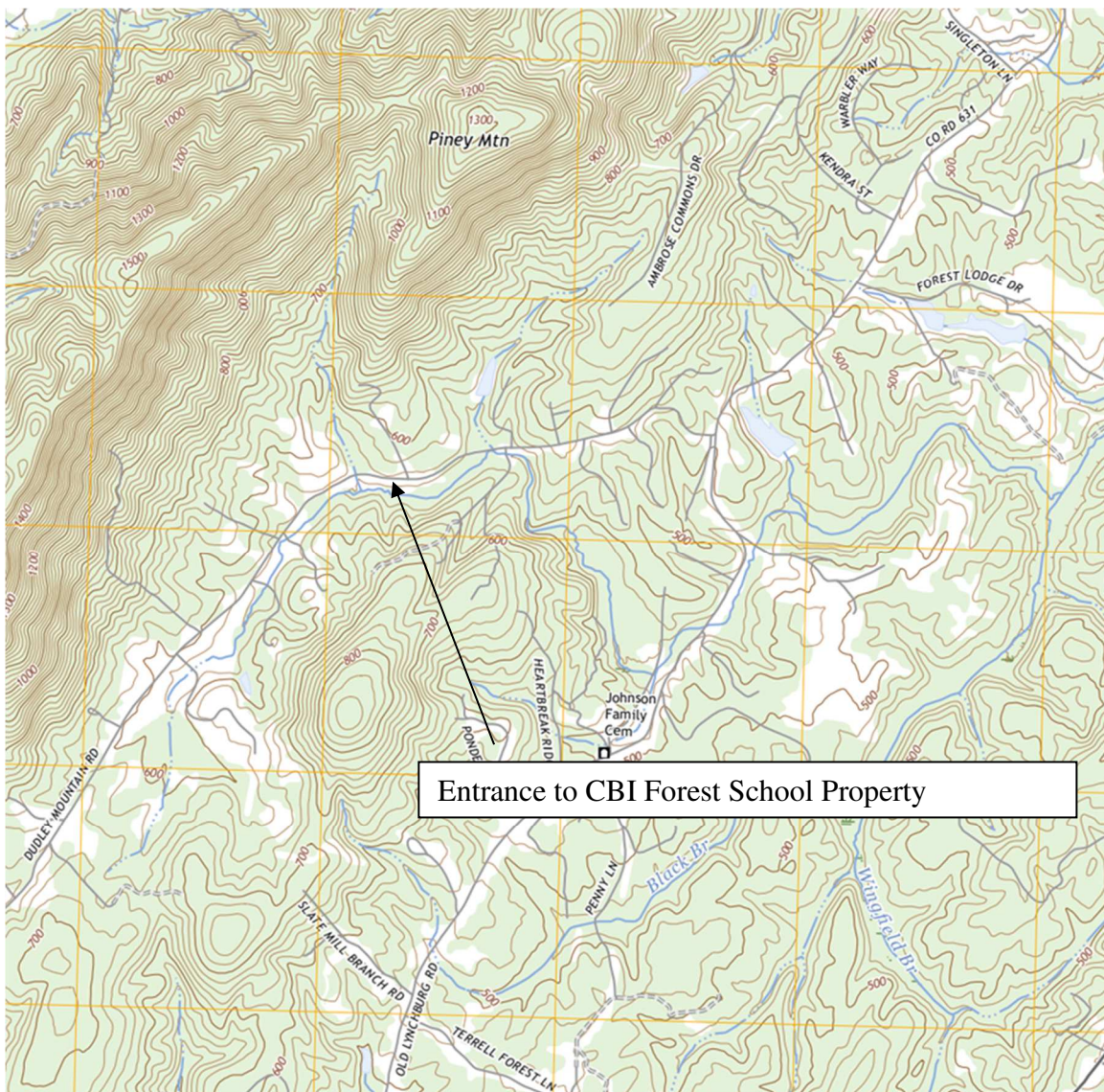
This report contains information developed by:

Michael Craun, PE
Old Dominion Engineering
366 South Linden Avenue
Waynesboro, Virginia 22980
(540) 942-5600

Tom Hogge, AOSE
Blue Ridge Soil Consulting
P O Box 418, Ruckersville, VA 24590
(434) 985-2780

Site Overview and Location

The site of the new CBI Forest School is located in Albemarle County on 155.957 acres off Dudley Mountain Road (TM 89-64). The property is .8 miles west of Old Lynchburg Road. The future school campus is to be located on a large unimproved tract of wooded land. The upper portion of the property is bounded by large wooded mountainous areas to the North, East, and West. The lower portion of the parcel is bounded by large tract residential properties. The property is primarily wooded and mountainous with a few cleared areas on the lower section. The vast majority of the property is steep slopes and is primarily located in a single watershed draining down to the west side of the property bounded by an intermittent stream.



Project Site and Surrounding Area

Design Flows and Wastewater Characterization

The facility will produce variable quantities of less than residential strength sanitary wastewater. Our basis for the water usage and wastewater strength are presented in the following tables.

Water Usage and Wastewater Strength Basis - CBI Forest School TM 89-64						
Usage	Water Usage Rates (gpd/unit)	Water Usage Estimate Basis	BOD/TSS Strength (mg/l)	BOD/TSS Strength Basis	TN Strength (mg/l)	TN Strength Basis *
Employee (staff)	13	USEPA Onsite Wastewater Treatment Systems Manual Table 3-4, Office Employees 7-16 gpd per employee	240	Similar to 12VAC 5-610-670 BOD #/Day converted to concentration - Factory and Office Building	84	Single Source Non-Medical STE
Student	10	USEPA Onsite Wastewater Treatment Systems Manual Table 3-5, School without cafeteria or showers 5-17 gpd/student	300	Similar to 12VAC 5-610-670 BOD #/Day converted to concentration - School without shower and cafeteria	84	Single Source Non-Medical STE
Assembly	3	USEPA Onsite Wastewater Treatment Systems Manual Table 3-5, Assembly Hall 2-4 gpd/seat	205	Similar to Louisiana Onsite Regulations table 1 - BOD #/Day converted to concentration - Assembly Halls	84	Single Source Non-Medical STE

* TN estimates are from WERF Influent Characteristics of Single Source Waste Streams (2004).
Single Source Non-Medical Septic Tank Effluent TN 84 mg/l

The day school operates from Monday through Friday. Total allowable occupancies are 144 students and 29 staff. There will be up to 5 school events throughout the year with up to 300 occupants. There will be assemblies of up to 200 occupants held at the pavilion in the future on Saturdays.

The peak daily overall water usage will occur during the school week with a maximum attended event.

Peak Daily Water Usage and Wastewater Strength Estimate - CBI Forest School TM 89-64							
Water Usage Activity	Number of Units	Unit Water Usage (gpd/unit)	Total Water Usage (gallons)	Estimated BOD (mg/l)	Biological Load (lbs. BOD)	Estimated TN (mg/l)	TN Load (lbs. TN)
Employee (staff)	29	13	377	240	0.8	84	0.3
Student	144	10	1,440	300	3.6	84	1.0
School Assembly	300	3	900	205	1.5	84	0.6
Total			2,717	259	5.9	84	1.9

The peak week will occur during the school year with a school event and a Saturday event (estimated at peak occupancy).

Peak Week Flow Equalized Daily Water Usage and Wastewater Strength Estimate CBI Forest School TM 89-64								
Water Usage Activity	Occupancy/Attendance	Unit Water Usage (gpd/unit)	days per week (alt - services per week)	Total Water Usage (gallons)	Estimated BOD (mg/l)	Biological Load (lbs. BOD)	Estimated TN (mg/l)	TN Load (lbs. TN)
Employee (staff)	29	13	5	1885	240	3.8	84	1.3
Student	144	10	5	7200	300	18.0	84	5.0
School Assembly	300	3	1	900	205	1.5	84	0.6
Non School Assembly	200	3	1	600	205	1.0	84	0.4
Total				10585	275	24.3	84	7.4
Flow Equalized Daily				1512	275	3.5	84	1.1

Flow equalization is being utilized prior to dispersal to keep the average daily flow to the dispersal area <1,750 gpd (including a safety factor of 15%) at 4.0 lbs BOD/day.
Maximum flow equalized flow to the drainfield is 1,750 gpd.

Design Criteria

Peak Daily Water Usage - 2717 GPD

Flow Equalized to the Design Flow - 1750 GPD

BOD/TSS Weekly Average - 275 mg/l (4.0 lbs BOD per day)

Effluent:

Flow to Drainfield < 1750 gpd (VDH Permit Amount)

BOD/TSS – Septic Tank Effluent

TN – 84 mg/l

The Septic System will be classified as a Large Septic System > 1,000 gpd and < 10,000 gpd.

The primary treatment and collection system for the school campus is a STEG System (Septic Tank Effluent Gravity). Each building will have its own septic tank with effluent filter. The septic tanks will outflow into a shared 4" SCH 40 PVC effluent sewer which will flow to a Flow Equalized Low Pressure Dispersal Pump Tank. The STEG tanks for each building will be sized for the maximum occupancy of each building (at > 2 days hydraulic detention time).

The following water usage characterizations are presented for the maximum occupancies of each building type on the school campus:

- Classroom Cottage 1- 4
 - Up to 40 students
 - Up to 4 Staff
- Security Check in Station
 - Up to 2 Staff
- Base Camp
 - Up to 19 Staff
 - Up to 35 Students
 - Up to 300 Person Event
- Pavillion
 - Up to 200 person Event

Peak Daily Water Usage for STEG Tank Sizing - CBI Forest School TM 89-64 Classroom Cottage 1- 4			
Water Usage Activity	Number of Units	Unit Water Usage (gpd/unit)	Total Water Usage (gallons)
Employee (staff)	4	13	52
Student	40	10	400
Total			452

**Peak Daily Water Usage for STEG Tank Sizing - CBI Forest School TM 89-64
Base Camp**

Water Usage Activity	Number of Units	Unit Water Usage (gpd/unit)	Total Water Usage (gallons)
Employee (staff)	19	13	247
Student	35	10	350
School Assembly	300	3	900
Total			1,497

**Peak Daily Water Usage for STEG Tank Sizing - CBI Forest School TM 89-64
Security Check In Station**

Water Usage Activity	Number of Units	Unit Water Usage (gpd/unit)	Total Water Usage (gallons)
Employee (staff)	2	13	26
Total			26

Peak Daily Water Usage for STEG Tank Sizing - CBI Forest School TM 89-64 Pavillion

Water Usage Activity	Number of Units	Unit Water Usage (gpd/unit)	Total Water Usage (gallons)
Assembly	200	3	600
Total			600

The Flow Equalized Low Pressure Dispersal Pump Tank will be used to equalize the flows to the LPD drainfields. The projected peak week usage pattern is shown in the table below (assuming peak occupancies).

Projected Peak Week Usage Pattern - CBI Forest School	
Day	Projected Usage
Monday	School and Administration
Tuesday	School and Administration
Wednesday	School and Administration
Thursday	School and Administration
Friday	School and Administration; School Event
Saturday	Non School Event
Sunday	Nothing

The minimum amount of flow equalization volume is 1,235 gallons in the table below (assuming peak week occupancies).

Flow Equalization Requirement - CBI Forest School				
Day	Peak Usage (gpd)	Effluent Flow (gpd)	Delta (gallons)	Cumulative Storage Required (gallons)
Monday	1,817	1,750	67	67
Tuesday	1,817	1,750	67	134
Wednesday	1,817	1,750	67	201
Thursday	1,817	1,750	67	268
Friday	2,717	1,750	967	1,235
Saturday	600	1,750	-1,150	85
Sunday	0	1,750	-1,750	0
Total	10,585	12,250		

Soil Series and Mapping

The soil evaluation was done by Tom Hogge, AOSE. Soil borings and backhoe pits were evaluated to a depth of approximately 84". The soil evaluation was limited to two drainfield areas. Six soil borings/backhoe pits were evaluated in Drainfield 1 and four soil borings/backhoe pits were evaluated in Drainfield 2. The drainfield areas are located in the lower section of the parcel on the west side in a pine wooded area. The slope of the Drainfield 1 is 11% and Drainfield 2 is 15%.

The dispersal area is located in the Braddock mapped soil series. Soil evaluations by Tom Hogge indicate that the soils are fairly uniform indicating a Braddock type soil. To the west and downhill of the Drainfield 1 and 2 the soils are mapped as Meadowville adjacent to the intermittent stream. See soils map on the following page.

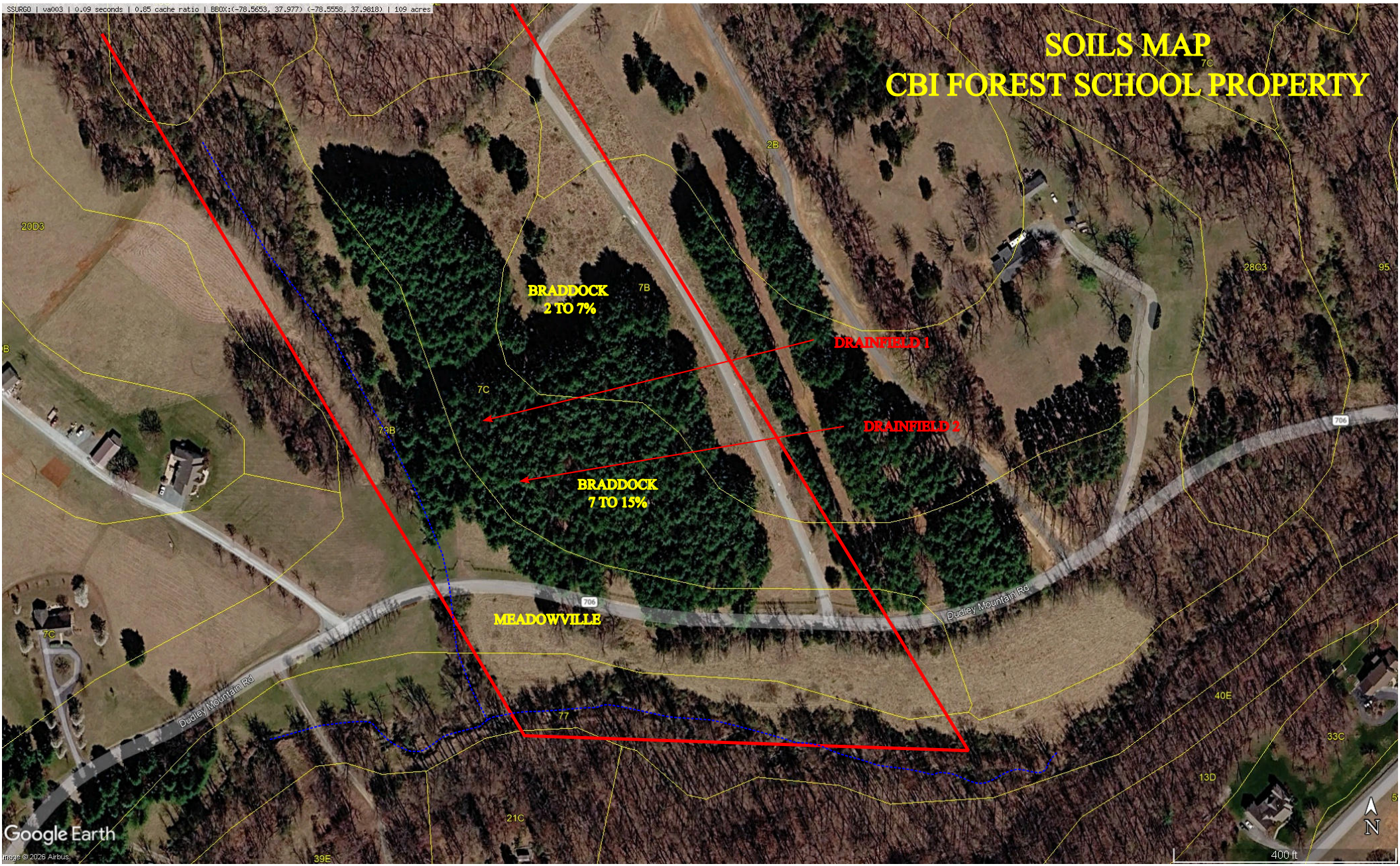
The Braddock series is described as consisting of very deep, well drained, and moderately permeable soils formed in colluvium and alluvium derived dominantly from a mixture of crystalline rocks. Braddock soils are on foot slopes of ridges and colluvial fans and adjacent high terraces.

Braddock soils solum thickness typically range from 40 to 60 inches or more. Depth to hard bedrock is more than 60 inches. Thickness of the colluvium or alluvium is quite variable and ranges from about three to more than 20 feet.

Content of rock fragments ranges from 0 to 35 percent in the A, Ap, E, BA, and BE horizons and the upper part of the Bt horizon; and from 0 to 60 percent in the lower part of the Bt horizon and the C horizon. Rock fragments consist mostly of gravel, cobbles, and stones of igneous and metamorphic rock. Flakes of mica are in some pedons.

Braddock soils are well drained; slow to moderately slow permeability in the subsoil and moderate to moderately rapid in the substratum. Runoff class is low to moderate on nearly level slopes to very high on steep slopes.

SOILS MAP CBI FOREST SCHOOL PROPERTY



Underlying Geology

The underlying geology of the site is mapped as:

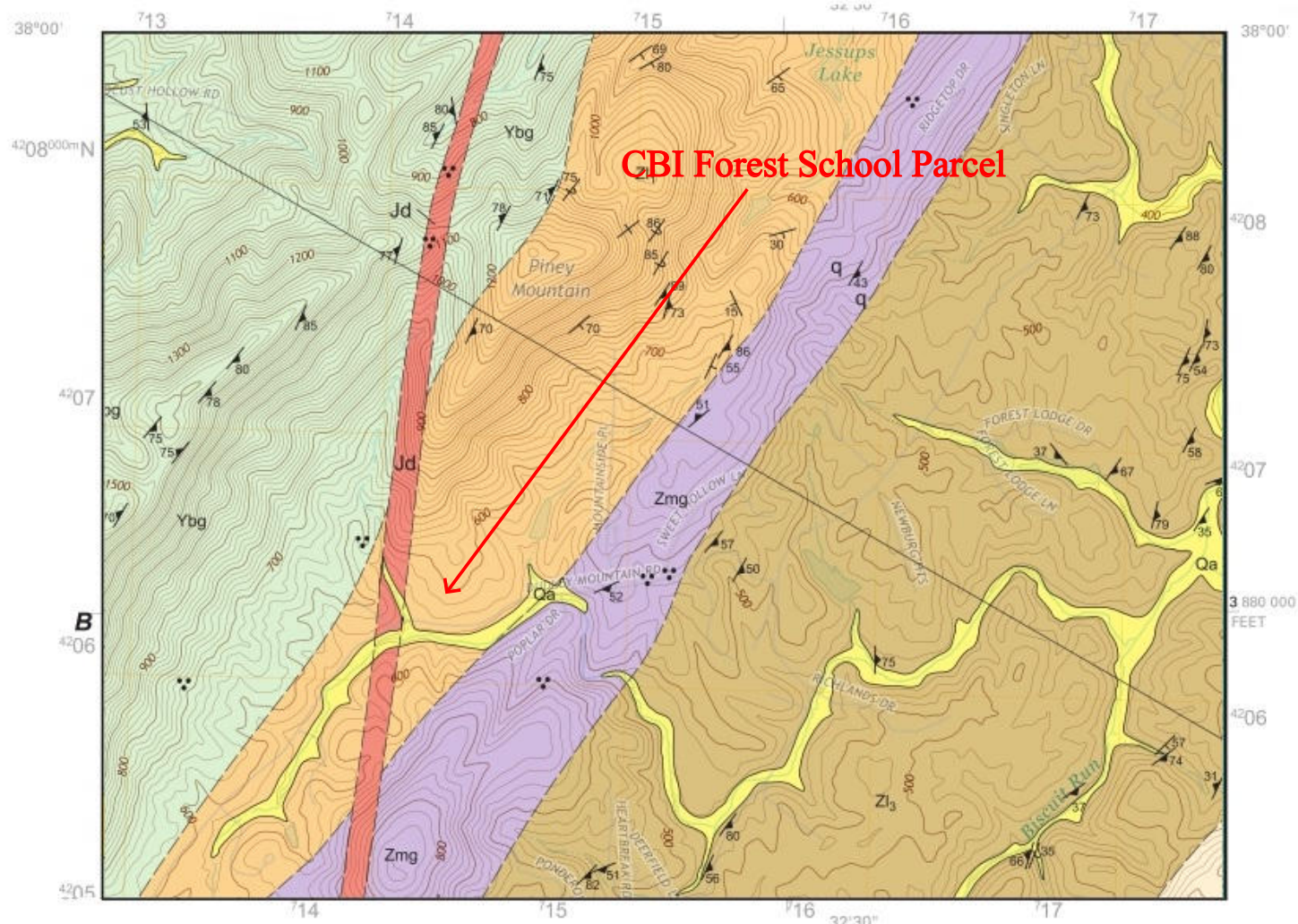
- Biotite-bearing granitoid gneiss (Ybg) – Mesoproterozoic
 - Described as a medium to coarse grained light tan to dark grey biotite-bearing granitoid gneiss, weathers to orange to dark grey. Composed of plagioclase, K-feldspar, quartz, and biotite with minor white mica, titanite, epidote, and opaque minerals. Much of the plagioclase feldspar is saussuritized, altered to epidote, sericite, and zoisite. Ranges from massive to foliated to weakly mylonite in texture. Mapped in upper elevations of the parcel.
- Composed Lynchburg Group 1 (ZL1) - Neoproterozoic
 - Describe as coarse to medium grained, light gray to tan meta-arkose to meta-arkosic wacke with minor metaconglomerate, weathers to light brown. Composed of K-feldspar, blue quartz, plagioclase feldspar, and biotite. Graded beds are present up to 2460 ft thick. Mapped as the main body of the developed area of the parcel.
- Alluvium (Qa) - Quaternary
 - Described as clay, silt, and rounded cobbles of vein quartz, greenstone, and granitoid gneiss. Occurring along drainage swales. 3-40 feet thick. Mapped as occurring along the intermittent stream on the west side of the parcel.
- Diabase (Jd) - Jurassic
 - Described as fine grained, dark gray to black, massive diabase, clinopyroxene, orthopyroxene, and opaque minerals. Occurs in northern striking dikes up to 400 feet wide. Mapped as a strike running north through the parcel.

The drainfield lies within the area on the parcel mapped as Lynchburg Group 1. See the geology map on the following page.

GEOLOGIC MAP OF THE ALBERENE QUADRANGLE, VIRGINIA

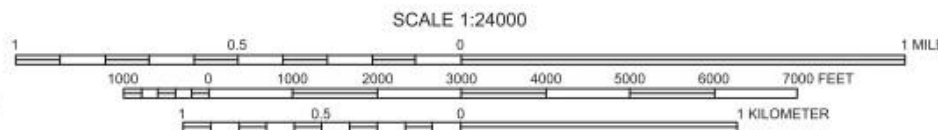
THOMAS A. JOHNSON, JOHN S. HOLLIS, CHRISTOPHER M. BAILEY, ANDREA JENSEN, MOLLY HAHN, KEVIN QUINLAN, BRENT E. OWENS, AND AARON MARSHALL

2014



Basemap, U.S. Geological Survey, 2013,
Alberene Quadrangle, Virginia

North American Datum of 1983 (NAD83)
World Geographic System of 1984 (WGS84)
Projection and 1000-meter grid: Universal
Transverse Mercator, Zone 17S
10,000-foot ticks: Virginia Coordinate system
of 1983 (south zone)



CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1988

Geology mapped from June 2011 to November 2013

An analysis of the well logs (N = 16) with similar underlying geology (Lynchburg Group) in the surrounding area per the Virginia Department of Environmental Quality Well Database indicate that the regolith of soil and saprolite extend to a depth from 10 feet to 165 feet with an average of 52.6 feet. Static water levels in the same wells ranged from 0 feet to 40 feet with an average of 27.6 feet.

The average saturated thickness of the regolith is presumed to be approximately 25.0 feet in the dispersal area.

Wells Drilled in Lynchburg Group in Vicinity of Parcel				
	WELL DEPTH (FT)	DEPTH TO BEDROCK (FT)	STATIC WATER LEVEL (FT)	YIELD AT DRILLING (GPM)
	195	92	40	40
	340	40	40	2
	360	45	36	35
	225	165	35	5
	167	37	32	22
	195	71	30	25
	110	67	30	5
	330	57	30	125
	260	38	30	1
	350	10	30	1
	165	28	25	15
	94	58	24	15
	410	40	20	7
	404	35	20	3
	291	34	20	60
	245	25	0	45
Minimum	94	10	0	1
Maximum	410	165	40	125
Average	258.8	52.6	27.6	25.4

Site and Soil Evaluation Report

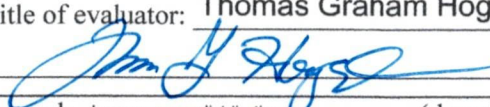
"SITE #1"

VDH Use Only
HDIN: _____

General Information

Date: 2-27-26 Albemarle County Health Department
Owner: Dudley Mountain LLC Phone: _____
Owner Address: _____
Property Address: _____
Tax Map/GPIN #: 89-64
Subdivision: _____ Section: _____ Block: _____ Lot: _____

Soil Information Summary

1. Position in landscape satisfactory: ☒ Yes ☐ No Describe landscape position: Sideslope
 2. Slope: 11 %
 3. Depth to rock/impervious strata: Max. 89+ in. Min. 84+ in. ☒ Not observed
 4. Free Water Present: ☒ Yes ☐ No Range in inches: 54" (see remarks)
 5. Depth to seasonal water table (gray mottling or gray color): _____ inches ☐ Not observed
 6. Soil percolation rate estimated: ☒ Yes ☐ No Estimated rate: 75 min/in at 36 inches depth
Texture Group: ☐ I ☒ II ☒ III ☐ IV
 7. Percolation test performed: ☐ Yes ☒ No If yes, provide additional data on percolation test results.
- Name and title of evaluator: Thomas Graham Hogge, OSE
Signature: 

☒ Site approved: Low-pressure distribution (describe dispersal area, e.g. absorption trenches) dispersing Pri-STE; Res-TL3 (proposed level of treatment at time of evaluation) to be placed at 36 (inches) depth at site designated on permit. Site provides a total of 5500 square feet of absorption area for primary and reserve (if applicable).

☐ Site disapproved: Reasons for rejection (check all that apply)

1. ☐ Position in landscape subject to flooding or periodic saturation.
2. ☐ Insufficient depth of suitable soil over hard rock.
3. ☐ Insufficient depth of suitable soil to seasonal water table.
4. ☐ Rates of absorption too slow.
5. ☐ Insufficient area of acceptable soil for required absorption area, and/or reserve area.
6. ☐ Proposed system too close to well.
7. ☐ Other (specify) _____

Date of Evaluation: 4-25-24, 2-24-26

Profile Description

SOIL EVALUATION REPORT

Property ID: Tax Map 89-64, Albemarle County

"SITE #1"

Where the local health department conducts the soil evaluation the location of profile holes may be shown on the schematic drawing on the construction permit or the sketch submitted with the application. If soil evaluations are conducted by a private Onsite Soil Evaluator or Professional Engineer, location of profile holes and sketch of the area investigated including all structural features (i.e. sewage disposal systems, wells, etc.) within 100 feet of the site and reserve site shall be shown on the reverse side of this page or prepared on a separate page and attached to this form.

☐ See application sketch ☐ See Construction Permit ☒ See sketch on reverse side or page attached to this form.

Hole #	Horizon	Depth (Inches)	Description of color, texture, etc.	Texture Group
3	A	0-6	5YR 3/4 dark reddish brown sandy clay loam	2
BORING	Bt1	6-30	10R 4/8 red, heavy but friable silty clay loam	3
	Bt2	30-64	10R 4/8 red sandy clay loam; augers with some difficulty; mottles of 10R 6/8 light red; becomes more micaceous with depth	2
	Ct	64-84	2.5YR 4/8 red saprolite; augers with some difficulty to sandy loam; with 7.5YR 4/3 & 2.5yR 6/8	2
4	A	0-5	5 YR 4/6 yellowish red sandy clay loam	2
PIT/BORING	Bt1	5-68	10 R 4/8 red, heavy clay loam; weak SBK; a few subround quartz pebbles	3
	Bt2	68-84	10 R 4/8 red, heavy clay loam; free water throughout	3
5	A	0-3	7.5 YR 4/6 strong brown loam	3
PIT/BORING	Bt1	3-26	10 R 4/6 dark yellowish brown, medium to heavy clay loam; fair SBK	2
	Bt2	26-76	10 R 4/8 red, dense, transported sandy clay loam (rounded, coarse grains); mottles of 2.5 YR 6/8 light red; weak SBK	2
	C	76-85	10YR 3/4 dark yellowish brown saprolite; augers to sandy loam with some difficulty	2
6	A	0-6	5YR 4/4 reddish brown sandy clay loam	2
BORING	Bt1	6-30	2.5YR 4/6 red silty clay loam	3
	Bt2	30-54	10R 4/6 red, heavy silty clay loam	3
	Bt3	54-89	10R 4/6 red, heavy silty clay loam with free water throughout	3
7	A	0-4	7.5 YR 4/6 strong brown loam	2
BORING	Bt1	4-32	2.5 YR 4/6 red, friable clay loam	3
	Bt2	32-84	2.5 YR 5/8 red, friable clay loam	3
8	A	0-6	10 YR 4/3 brown loam	2
PIT/BORING	Bt1	6-34	2.5 YR 4/6 red clay loam; fair SBK	3
	Bt2	34-84	10 R 4/8 red, friable clay loam; SBK	3

REMARKS: SBK stands for subangular blocky structure. All of these profiles were initially evaluated in April of 2024, and no free water was observed.

When we revisited the site in February of 2026 to do borings at each location down to 84 inches, we had recently had close to 12 inches of snow and ice that sat on the ground for weeks, followed by at least two significant rain events.

Site #12

Page 01

7 OH Use Only

DATE: _____

OWNER: CFB Dwyer

OWNER ADDRESS: _____

PROPERTY ADDRESS: _____

TAX MAP/OPINION: _____

SUBJECT: _____

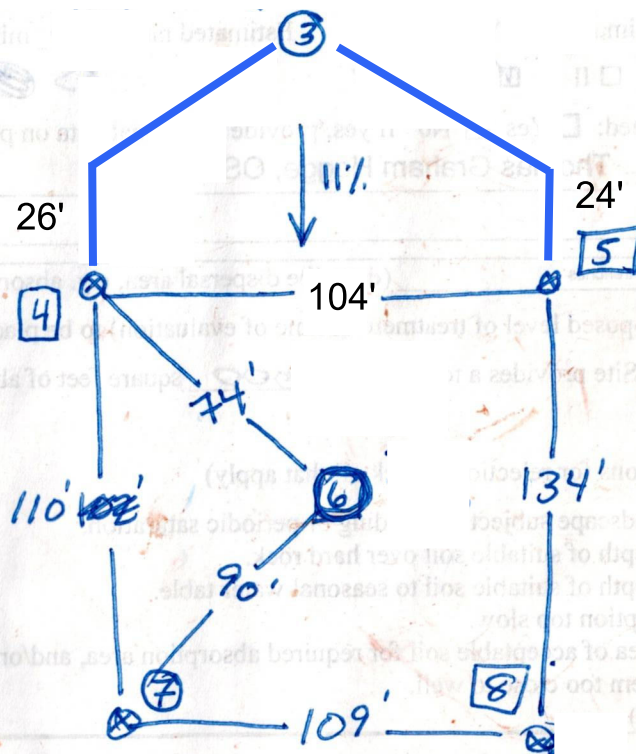
SECTION: _____

BLOCK: _____

LOCAL: _____

Soil Percolation Summary

Drainfield Site 1



Site and Soil Evaluation Report

"SITE #2"

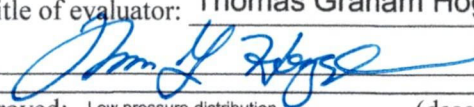
VDH Use Only

HDIN: _____

General Information

Date: 2-27-26 Albemarle County Health Department
 Owner: Dudley Mountain LLC Phone: _____
 Owner Address: _____
 Property Address: _____
 Tax Map/GPIN #: 89-64
 Subdivision: _____ Section: _____ Block: _____ Lot: _____

Soil Information Summary

1. Position in landscape satisfactory: ☒ Yes ☐ No Describe landscape position: Sideslope
 2. Slope: 15 %
 3. Depth to rock/impervious strata: Max. 100+ in. Min. 84+ in. ☒ Not observed
 4. Free Water Present: ☐ Yes ☒ No Range in inches: _____
 5. Depth to seasonal water table (gray mottling or gray color): 64 inches ☐ Not observed
 6. Soil percolation rate estimated: ☒ Yes ☐ No Estimated rate: 75 min/in at 36 inches depth
 Texture Group: ☐ I ☒ II ☐ III ☐ IV
 7. Percolation test performed: ☐ Yes ☒ No If yes, provide additional data on percolation test results.
 Name and title of evaluator: Thomas Graham Hogge, OSE
 Signature: 

☒ Site approved: Low pressure distribution (describe dispersal area, e.g. absorption trenches) dispersing
Pri-STE;Res-TL3 (proposed level of treatment at time of evaluation) to be placed at 36 (inches) depth at
 site designated on permit. Site provides a total of 3180 square feet of absorption area for primary and
 reserve (if applicable).

☐ Site disapproved: Reasons for rejection (check all that apply)

1. ☐ Position in landscape subject to flooding or periodic saturation.
2. ☐ Insufficient depth of suitable soil over hard rock.
3. ☐ Insufficient depth of suitable soil to seasonal water table.
4. ☐ Rates of absorption too slow.
5. ☐ Insufficient area of acceptable soil for required absorption area, and/or reserve area.
6. ☐ Proposed system too close to well.
7. ☐ Other (specify) _____

Date of Evaluation: 9-18-24, 2-24-26

Profile Description

SOIL EVALUATION REPORT

Property ID: Tax Map 89-64, Albemarle County

SITE #2

Where the local health department conducts the soil evaluation the location of profile holes may be shown on the schematic drawing on the construction permit or the sketch submitted with the application. If soil evaluations are conducted by a private Onsite Soil Evaluator or Professional Engineer, location of profile holes and sketch of the area investigated including all structural features (i.e. sewage disposal systems, wells, etc.) within 100 feet of the site and reserve site shall be shown on the reverse side of this page or prepared on a separate page and attached to this form.

AUGER BORINGS

- ☐ See application sketch ☐ See Construction Permit ☒ See sketch on reverse side or page attached to this form.

[illegible]

REMARKS: Site was evaluated first with borings down to about 60 inches. On 2-24-26, we revisited the site, found the original auger borings (which were still dry, after much recent snow melt and recent, significant rain), and extended the borings down to 84+ inches.

SURVEY CONTROL				
Pt #	Northing	Easting	Elevation	Descriptor
1	3879938.92667	11466087.26151	553.07	T-1
2	3879956.68674	11465952.50672	551.62	T-2
3	3879859.81769	11465575.68185	553.77	T-3
4	3879832.40984	11465368.29382	554.64	T-4
5	3879908.05733	11465123.65349	546.14	T-5

LEGEND:
C-----UNDERGROUND COMMUNICATION LINE
---OVERHEAD UTILITY LINE
x---FENCE LINE
UP = UTILITY POLE
TP = COMMUNICATION PEDESTAL
CMP = CORRUGATED METAL PIPE
MB = MAILBOX



VICINITY MAP (NTS)



TMP 89-63D
KEVIN LEE EVANS &
MELANIE ALLEN EVANS
D.B. 2246 P. 500

TMP 89-64
JULIE AILEEN BARRON MORRILL
& JEFFREY R MORRILL
INST# 202300007452

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COMMONWEALTH OF VIRGINIA
LAND SURVEYOR
CHRISTOPHER B. KEAN
LIC. NO. 2378

**DRAIN FIELD SURVEY OF
DUDLEY MOUNTAIN ROAD
TAX MAP 89-64
ALBEMARLE COUNTY, VIRGINIA**

DATE: MARCH 19, 2026
SCALE: 1" = 20'
CONTOUR INTERVAL: 1'
NAVD '88 VERTICAL DATUM
SHEET 1 OF 2

125005300_26078_DF PRO 125-0053-00

THIS TOPOGRAPHIC SURVEY OF PROPERTY
WAS COMPLETED UNDER THE DIRECT AND
RESPONSIBLE CHARGE OF THOMAS B. LINCOLN
FROM AN ACTUAL SURROUND OR AIRBORNE
SURVEY MADE UNDER MY SUPERVISION;
THAT THE IMAGERY AND/OR ORIGINAL DATA WAS
OBTAINED ON MARCH 19, 2026; AND THAT THIS PLAT,
MAP, OR DIGITAL GEOSPATIAL DATA INCLUDING
METADATA MEETS MINIMUM ACCURACY
STANDARDS UNLESS OTHERWISE NOTED.

Hydraulic Conductivity and Permeability Information

The saturated permeability (Ksat) of the dispersal area was evaluated using a Johnson Permeameter by Old Dominion Engineering.

A total of 13 tests were conducted.

- 7 KSAT Tests Conducted at approximately 36" for the Dispersal Depth (K1)
- 6 KSAT Tests Conducted Below the Dispersal Depth at 86"-103" (K2)

Individual test results are provided at the end of this section. Test locations correspond to soil boring/pit location.

The Ksat tests were conducted after a several week period of snow and rain. No free water was encountered in any ksat boring. The soils were moist and consequently the tests achieved steady state fairly rapidly. Tests were conducted for a minimum of 1 hour.

Ksat Test Methodology

Ksat test methodology followed Larry Johnson recommendations as outlined in 2019 Manual for JP-M2. Our permeameters predates this manual revision.

- Model JP-M1 permeameter constant head = 15 cm
- $H/r \geq 5$
- Water Table – Per Johnson - *“Note that the depth parameters for the test are based on the actual presence of a water table, not redoximorphic features in the soil that may indicate a seasonally high water”*. No water table was encountered in borings/pits, only indicators of a seasonal water table. Free water was not present in any ksat test boring.
- Model used – Glover Solution was used as the primary model.

Summary of Ksat results

The Ksat test results are summarized below. The test results have been tabulated and analyzed by depth for use in providing corroboration of estimated perc rates used in design and for use in mounding analysis.

Statistical summary of the data includes minimum, maximum, average, and geometric mean.

TM 89-64 Ksat at Infiltrative Surface		
Boring	Depth (inches)	ksat (cm/day)
K3A	37	1.3
K6A	36	53.1
K7A	36	55.4
K8A	37	17.6
K12A	36	48.0
K13A	36	35.4
K14A	38	28.5
Number		7.0
Median		35.4
Average		34.2
Geometric Mean		22.9

TM 89-64 Ksat below Infiltrative Surface		
Boring	Depth (inches)	ksat (cm/day)
K3B	90	102.1
K7B	88	4.1
K8B	86	26.9
K12B	92	48.7
K13B	103	2.6
K14B	95	75.5
Number		6.0
Median		37.8
Average		43.3
Geometric Mean		21.8

TM 89-64 Ksat at and below Infiltrative Surface		
Boring	Depth (inches)	ksat (cm/day)
K3A	37	1.3
K3B	90	102.1
K6A	36	53.1
K7A	36	55.4
K7B	88	4.1
K8A	37	17.6
K8B	86	26.9
K12A	36	48.0
K12B	92	48.7
K13A	36	35.4
K13B	103	2.6
K14A	38	28.5
K14B	95	75.5
Number		13.0
Median		35.4
Average		38.4
Geometric Mean		22.4

Representative Ksats for Dispersal Area

Per VDH GMP 101 the representative Ksat of the soil series is determined by taking the average of the Ksat measurements. Informal VDH policy recommends using geometric mean. The Ksat tests indicate that the soil has acceptable permeability (22.4 cm/day) for STE LPD dispersal with an equivalent perc rate faster than the estimated 75 mpi.

Hydraulic Loading Rate Justification

VDH maximum loading rate for:

- STE Pump to LPD Trench Dosing 75 mpi is .40 gpd/sqft

Old Dominion Engineering drainfield design hydraulic loading rate is less than the above.

Mounding Analytical Model

K1 and K2 – 22.4 cm/day

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 3a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 37" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 14.0 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 29.0 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 10 °C			H/r**.....: 6.1			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001308 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,235	4:00:00 PM									
3,215	4:10:00 PM	20	10.00	10.00	2.0	0.1	1.37E-05	1.2	0.02	0.04
3,185	4:24:00 PM	30	24.00	14.00	2.1	0.1	1.46E-05	1.3	0.02	0.04
3,160	4:34:00 PM	25	34.00	10.00	2.5	0.2	1.71E-05	1.5	0.02	0.05
3,140	4:43:00 PM	20	43.00	9.00	2.2	0.2	1.52E-05	1.3	0.02	0.04
3,120	4:53:00 PM	20	53.00	10.00	2.0	0.1	1.37E-05	1.2	0.02	0.04
3,095	5:03:00 PM	25	63.00	10.00	2.5	0.2	1.71E-05	1.5	0.02	0.05
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:			1.3				
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 3b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 90" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 12.7 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 27.7 cm			H: Constant height of water in the borehole				
Soil Temperature T....: 10 °C			H/r**.....: 5.8			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001308 kg/m·s			Dyn. Visc. @ T_B ..: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,000	4:00:00 PM									
850	4:10:00 PM	2,150	10.00	10.00	215.0	15.7	1.57E-03	135.7	2.23	4.45
1,930	4:10:30 PM									
470	4:18:00 PM	1,460	17.50	7.50	194.7	14.2	1.42E-03	122.9	2.02	4.03
3,260	4:19:00 PM									
1,500	4:29:00 PM	1,760	27.50	10.00	176.0	12.9	1.29E-03	111.1	1.82	3.65
300	4:36:00 PM	1,200	34.50	7.00	171.4	12.5	1.25E-03	108.2	1.78	3.55
2,950	4:36:30 PM									
1,340	4:46:30 PM	1,610	44.50	10.00	161.0	11.8	1.18E-03	101.6	1.67	3.33
530	4:51:30 PM	810	49.50	5.00	162.0	11.8	1.18E-03	102.3	1.68	3.36
3,250	4:52:30 PM									
1,630	5:02:30 PM	1,620	59.50	10.00	162.0	11.8	1.18E-03	102.3	1.68	3.36
Natural Moisture.....: moist		Consistence.....:		Enter K_{satB} Value.....:				102.1		
USDA Txt./USCS Class:		WT Depth.....: NA		Data Logger No.....:		Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:		Init. Sat. Time...: 15 min								

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 6a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 36" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 11.4 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 26.4 cm			H: Constant height of water in the borehole				
Soil Temperature T....: 13 °C			H/r**.....: 5.6			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001202 kg/m·s			Dyn. Visc. @ T_B ..: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
1,980	3:00:00 PM									
1,180	3:12:00 PM	800	12.00	12.00	66.7	4.8	4.80E-04	41.4	0.68	1.36
200	3:25:00 PM	980	25.00	13.00	75.4	5.4	5.42E-04	46.9	0.77	1.54
1,910	3:26:00 PM									
965	3:37:00 PM	945	36.00	11.00	85.9	6.2	6.18E-04	53.4	0.88	1.75
140	3:46:00 PM	825	45.00	9.00	91.7	6.6	6.60E-04	57.0	0.93	1.87
1,950	3:47:00 PM									
990	3:57:00 PM	960	55.00	10.00	96.0	6.9	6.91E-04	59.7	0.98	1.96
310	4:04:00 PM	680	62.00	7.00	97.1	7.0	6.99E-04	60.4	0.99	1.98
Natural Moisture.....: moist		Consistence.....:		Enter K_{satB} Value.....:				53.1		
USDA Txt./USCS Class:		WT Depth.....: NA		Data Logger No.....:		Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:		Init. Sat. Time...: 15 min								

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 7a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 36" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 14.0 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 29.0 cm			H: Constant height of water in the borehole				
Soil Temperature T....: 10 °C			H/r**.....: 6.1			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001308 kg/m·s			Dyn. Visc. @ T_B ..: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,250	1:00:00 PM									
2,350	1:13:00 PM	900	13.00	13.00	69.2	4.7	4.73E-04	40.9	0.67	1.34
1,260	1:26:00 PM	1,090	26.00	13.00	83.8	5.7	5.73E-04	49.5	0.81	1.62
300	1:36:00 PM	960	36.00	10.00	96.0	6.6	6.56E-04	56.7	0.93	1.86
1,960	1:37:00 PM									
270	1:53:00 PM	1,690	52.00	16.00	105.6	7.2	7.22E-04	62.4	1.02	2.05
1,570	1:54:00 PM									
425	2:04:00 PM	1,145	62.00	10.00	114.5	7.8	7.83E-04	67.6	1.11	2.22
Natural Moisture.....: moist		Consistence.....:		Enter K_{satB} Value.....:				55.4		
USDA Txt./USCS Class:		WT Depth.....: NA		Data Logger No.....:		Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:		Init. Sat. Time...: 15 min								

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 7b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 88" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 12.0 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 27.0 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 8 °C			H/r**.....: 5.7			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001386 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2,020	1:00:00 PM									
1,960	1:10:00 PM	60	10.00	10.00	6.0	0.5	4.82E-05	4.2	0.07	0.14
1,900	1:20:00 PM	60	20.00	10.00	6.0	0.5	4.82E-05	4.2	0.07	0.14
1,850	1:30:00 PM	50	30.00	10.00	5.0	0.4	4.02E-05	3.5	0.06	0.11
1,790	1:40:00 PM	60	40.00	10.00	6.0	0.5	4.82E-05	4.2	0.07	0.14
1,730	1:50:00 PM	60	50.00	10.00	6.0	0.5	4.82E-05	4.2	0.07	0.14
1,670	2:00:00 PM	60	60.00	10.00	6.0	0.5	4.82E-05	4.2	0.07	0.14
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					4.1		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 8a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 37" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 12.7 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 27.7 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 11 °C			H/r**.....: 5.8			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001271 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,290	2:00:00 PM									
3,050	2:10:00 PM	240	10.00	10.00	24.0	1.7	1.70E-04	14.7	0.24	0.48
2,800	2:20:00 PM	250	20.00	10.00	25.0	1.8	1.77E-04	15.3	0.25	0.50
2,530	2:30:00 PM	270	30.00	10.00	27.0	1.9	1.92E-04	16.6	0.27	0.54
2,250	2:40:00 PM	280	40.00	10.00	28.0	2.0	1.99E-04	17.2	0.28	0.56
1,820	2:53:00 PM	430	53.00	13.00	33.1	2.3	2.35E-04	20.3	0.33	0.67
1,540	3:01:00 PM	280	61.00	8.00	35.0	2.5	2.48E-04	21.5	0.35	0.70
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					17.6		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 8b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 86" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 10.2 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 25.2 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 8 °C			H/r**.....: 5.3			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001386 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,220	2:00:00 PM									
2,745	2:10:00 PM	475	10.00	10.00	47.5	4.2	4.24E-04	36.6	0.60	1.20
2,390	2:20:00 PM	355	20.00	10.00	35.5	3.2	3.17E-04	27.4	0.45	0.90
2,050	2:30:00 PM	340	30.00	10.00	34.0	3.0	3.03E-04	26.2	0.43	0.86
1,620	2:42:00 PM	430	42.00	12.00	35.8	3.2	3.20E-04	27.6	0.45	0.91
1,280	2:52:00 PM	340	52.00	10.00	34.0	3.0	3.03E-04	26.2	0.43	0.86
965	3:01:00 PM	315	61.00	9.00	35.0	3.1	3.12E-04	27.0	0.44	0.88
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					26.9		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 12a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 36" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 10.2 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 25.2 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 13 °C			H/r**.....: 5.3			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001202 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,210	12:00:00 PM									
2,580	12:11:00 PM	630	11.00	11.00	57.3	4.4	4.43E-04	38.3	0.63	1.26
1,985	12:21:00 PM	595	21.00	10.00	59.5	4.6	4.60E-04	39.8	0.65	1.30
1,200	12:32:00 PM	785	32.00	11.00	71.4	5.5	5.52E-04	47.7	0.78	1.56
200	12:44:30 PM	1,000	44.50	12.50	80.0	6.2	6.19E-04	53.5	0.88	1.75
2,450	12:45:00 PM									
270	1:09:00 PM	2,180	68.50	24.00	90.8	7.0	7.03E-04	60.7	1.00	1.99
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					48.0		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 12b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 92" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 12.7 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 27.7 cm			H: Constant height of water in the borehole				
Soil Temperature T....: 10 °C			H/r**.....: 5.8			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001308 kg/m·s			Dyn. Visc. @ T_B ..: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
1,910	12:00:00 PM									
1,340	12:06:00 PM	570	6.00	6.00	95.0	6.9	6.94E-04	60.0	0.98	1.97
890	12:13:00 PM	450	13.00	7.00	64.3	4.7	4.70E-04	40.6	0.67	1.33
2,000	12:14:00 PM									
1,440	12:22:00 PM	560	21.00	8.00	70.0	5.1	5.11E-04	44.2	0.72	1.45
1,000	12:28:00 PM	440	27.00	6.00	73.3	5.4	5.36E-04	46.3	0.76	1.52
1,980	12:29:00 PM									
1,565	12:34:00 PM	415	32.00	5.00	83.0	6.1	6.06E-04	52.4	0.86	1.72
800	12:44:00 PM	765	42.00	10.00	76.5	5.6	5.59E-04	48.3	0.79	1.58
200	12:51:30 PM	600	49.50	7.50	80.0	5.8	5.84E-04	50.5	0.83	1.66
1,990	12:53:00 PM									
1,430	1:00:00 PM	560	56.50	7.00	80.0	5.8	5.84E-04	50.5	0.83	1.66
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					48.7		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 13a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 36" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 14.0 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 29.0 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 11 °C			H/r**.....: 6.1			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001271 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,100	11:00:00 AM									
2,520	11:10:00 AM	580	10.00	10.00	58.0	3.9	3.85E-04	33.3	0.55	1.09
1,970	11:20:00 AM	550	20.00	10.00	55.0	3.7	3.65E-04	31.6	0.52	1.04
1,370	11:30:00 AM	600	30.00	10.00	60.0	4.0	3.99E-04	34.4	0.56	1.13
710	11:40:00 AM	660	40.00	10.00	66.0	4.4	4.38E-04	37.9	0.62	1.24
15	11:50:00 AM	695	50.00	10.00	69.5	4.6	4.62E-04	39.9	0.65	1.31
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					35.4		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

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Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 13b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 103" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 14.0 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 29.0 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 8 °C			H/r**.....: 6.1			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001386 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2,005	11:00:00 AM									
1,950	11:13:00 AM	55	13.00	13.00	4.2	0.3	3.06E-05	2.6	0.04	0.09
1,905	11:23:00 AM	45	23.00	10.00	4.5	0.3	3.26E-05	2.8	0.05	0.09
1,860	11:33:00 AM	45	33.00	10.00	4.5	0.3	3.26E-05	2.8	0.05	0.09
1,820	11:43:00 AM	40	43.00	10.00	4.0	0.3	2.90E-05	2.5	0.04	0.08
1,780	11:54:00 AM	40	54.00	11.00	3.6	0.3	2.63E-05	2.3	0.04	0.07
1,725	12:07:00 PM	55	67.00	13.00	4.2	0.3	3.06E-05	2.6	0.04	0.09
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					2.6		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 14a			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 38" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 10.2 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 25.2 cm			H: Constant height of water in the borehole				
Soil Temperature T...: 11 °C			H/r**.....: 5.3			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001271 kg/m·s			Dyn. Visc. @ T_B ...: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
3,220	10:00:00 AM									
2,940	10:10:00 AM	280	10.00	10.00	28.0	2.3	2.29E-04	19.8	0.32	0.65
2,600	10:20:00 AM	340	20.00	10.00	34.0	2.8	2.78E-04	24.0	0.39	0.79
2,220	10:30:00 AM	380	30.00	10.00	38.0	3.1	3.11E-04	26.9	0.44	0.88
1,735	10:41:00 AM	485	41.00	11.00	44.1	3.6	3.61E-04	31.2	0.51	1.02
1,250	10:51:00 AM	485	51.00	10.00	48.5	4.0	3.97E-04	34.3	0.56	1.12
760	11:01:00 AM	490	61.00	10.00	49.0	4.0	4.01E-04	34.6	0.57	1.14
Natural Moisture.....: moist	Consistence.....:		Enter K_{satB} Value.....:					28.5		
USDA Txt./USCS Class:	WT Depth.....: NA		Data Logger No.....:			Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:	Init. Sat. Time...: 15 min									

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Constant-Head Borehole Permeameter Test			Solution: R. E. Glover (Deep WT or Impermeable Layer)			File Name.....:				
Project Name.....: CBI Forest School			Boring No.....: 14b			Solution and Terminology (R. E. Glover solution)*				
Project No.....:			Investigators.....: MFC			$K_{sat} = Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Basic Glover solution]				
Project Location.....: TM 89-64			Date.....: 3/6/26			$K_{satB} = QV[\sinh^{-1}(H/r) - (r^2/H^2+1)^{-5} + r/H]/(2\pi H^2)$ [Temp.-corrected]				
Boring Depth.....: 95" (Specify units)			WCU Base Ht. h: 15.0 cm***			K_{satB} : Saturated Hydraulic Conduct. @ base Tmp. T_B °C: 20				
Boring Diameter.....: 9.50 cm			WCU Susp. Ht. S: 10.2 cm			Q: Rate of flow of water from the borehole				
Boring Radius r.....: 4.75 cm			Const. Wtr. Ht. H: 25.2 cm			H: Constant height of water in the borehole				
Soil Temperature T....: 8 °C			H/r**.....: 5.3			r: Radius of the cylindrical borehole				
Dyn. Visc. @ T.....: 0.001386 kg/m·s			Dyn. Visc. @ T_B ..: 0.001003 kg/m·s			V: Dynamic viscosity of water @ T °C/Dyn. Visc. of water @ T_B °C				
Reservoir Volume (ml)	Time (12 hr) (h:mm:ss A/P)	Volume Out (ml)	Elapsed Time		Flow Rate (ml/min)	----- K_{satB} Equivalent Values -----				
			Total (min)	Interval (min)		(µm/sec)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
1,800	10:00:00 AM									
780	10:10:00 AM	1,020	10.00	10.00	102.0	9.1	9.10E-04	78.6	1.29	2.58
20	10:18:00 AM	760	18.00	8.00	95.0	8.5	8.47E-04	73.2	1.20	2.40
1,990	10:18:30 AM									
820	10:30:00 AM	1,170	29.50	11.50	101.7	9.1	9.07E-04	78.4	1.29	2.57
50	10:38:00 AM	770	37.50	8.00	96.3	8.6	8.58E-04	74.2	1.22	2.43
1,960	10:39:00 AM									
960	10:49:00 AM	1,000	47.50	10.00	100.0	8.9	8.92E-04	77.1	1.26	2.53
40	10:58:30 AM	920	57.00	9.50	96.8	8.6	8.64E-04	74.6	1.22	2.45
Natural Moisture.....: moist		Consistence.....:		Enter K_{satB} Value.....:				75.5		
USDA Txt./USCS Class:		WT Depth.....: NA		Data Logger No.....:		Note: K_B is determined by visually analyzing the Flow Rate vs Elapsed Time Graph and averaging the the results for the final three to five stabilized values.				
Struct./% Pass. #200..:		Init. Sat. Time...: 15 min								

*Glover, R. E. 1953. Flow from a test-hole located above groundwater level. pp. 69-71. in: Theory and Problems of Water Percolation. (C. N. Zanger. ed.). USBR. The Cond. for this solution exists when the Dist. from the bottom of the BH to the WT or an imperm. layer is $\geq 2X$ the depth of the water in the BH. **H/r ≥ 5 to ≤ 10 . ***JP-M1: h = 15cm, WCU-3 (3" Dia.): h = 10cm, WCU-2 (2" Dia.) h = 17cm. © Johnson Perm., LLC. 5/17/2018

Treatment and Dispersal System Calculations

STEG Tanks

Classroom Cottages 1-4

Peak Daily Flow = 452 gpd

STEG Tank Size = 1,500 gallon

Detention Time = $1,500 \text{ gallon} \div 452 \text{ gpd} = 3.3 \text{ days}$

Effluent filter (Orenco Biotube Effluent Filter) will be connected to the outlet of the tank.

Projected BOD removal is 50%.

Base Camp

Peak Daily Flow = 1497 gpd

STEG Tank Size = 2 x 1,500 gallon

Detention Time = $3,000 \text{ gallon} \div 1497 \text{ gpd} = 2.0 \text{ days}$

Effluent filter (Orenco Biotube Effluent Filter) will be connected to the outlet of the second tank in series.

Projected BOD removal is 50%.

Security Check In Station

Peak Daily Flow = 26 gpd

STEG Tank Size = 1,000 gallon

Detention Time = $1,000 \text{ gallon} \div 26 \text{ gpd} = 38.5 \text{ days}$

Effluent filter (Orenco Biotube Effluent Filter) will be connected to the outlet of the tank.

Projected BOD removal is 50%.

Pavillion

Peak Daily Flow = 600 gpd

STEG Tank Size = 1,500 gallon

Detention Time = $1,500 \text{ gallon} \div 600 \text{ gpd} = 2.5 \text{ days}$

Effluent filter (Orenco Biotube Effluent Filter) will be connected to the outlet of the tank.

Projected BOD removal is 50%.

Total Nitrogen Attenuation

Dispersal Area Watershed Dilution – See Nitrogen Dilution Calculation in Drainfield Watershed

Treatment Level

Effluent Quality - STE
Effluent Dispersal – LPD

Reserve Effluent Quality – TL3
Reserve Effluent Dispersal – LPD

Project: TM 89-64

Drainfield Area: Primary **Drainfield 1**

Distribution Method: Pump to LPD

Effluent Quality: STE

Design Basis		
A.	Estimated Percolation Rate	75 @ 36"
B.	Trench Bottom Area	.365 gpd/sqft
	Basis	Table 5.4 .40 gpd/sqft for pump to LPD dosed STE
C.	Water Usage (GPD)	875 gpd
Area Calculations		
D.	Length of Trench (ft.)	50
	Length Available (ft.)	109-104
E.	Width of Trench (ft.)	3
F.	Number of Trenches	8+8 Butterflied
G.	Center to Center Spacing (ft.)	9
H.	Width Required (ft.)	66
	Width of Available Area (ft.)	136-158
I.	Total Square Footage Required (sqft)	2187.5
J.	Square Footage in Design (sqft)	2400
K.	Reserve Requirement (%)	100
	Reserve Design – See Drainfield 1 and 2 Reserve Calculations (118%)	
Notes:		
Reduction allowed in area with substituted system		Yes ☐ No ☒
Lift pump required in basement		Yes ☐ No ☒
EZFLO SUBSTITUTION NOT ALLOWED		

Project: TM 89-64

Drainfield Area: Reserve **Drainfield 1**

Distribution Method: Pump to LPD

Effluent Quality: TL3

Design Basis		
A.	Estimated Percolation Rate	65 @ 36"
B.	Trench Bottom Area	.72 gpd/sqft
	Basis	Table 5.4 .72 gpd/sqft for pump to LPD dosed STE
C.	Water Usage (GPD)	1512 gpd
Area Calculations		
D.	Length of Trench (ft.)	8+8 x 50
	Length Available (ft.)	104
E.	Width of Trench (ft.)	3
F.	Number of Trenches	7+7 (butterflied)
G.	Center to Center Spacing (ft.)	9
H.	Width Required (ft.)	129*
	Width of Available Area (ft.)	136-158
I.	Total Square Footage Required (sqft)	2100
J.	Square Footage in Design (sqft)	2100
K.	Reserve Requirement (%)	100
	Reserve Design – 86% reserve area available in this area	
Notes:		
Reduction allowed in area with substituted system		Yes ☐ No ☒
Lift pump required in basement		Yes ☐ No ☒
EZFLO SUBSTITUTION NOT ALLOWED		
* Primary and Reserve		

Project: TM 89-64

Drainfield Area: Primary **Drainfield 2**

Distribution Method: Pump to LPD

Effluent Quality: STE

Design Basis		
A.	Estimated Percolation Rate	75 @ 36"
B.	Trench Bottom Area	.365 gpd/sqft
	Basis	Table 5.4 .40 gpd/sqft for pump to LPD dosed STE
C.	Water Usage (GPD)	875 gpd
Area Calculations		
D.	Length of Trench (ft.)	50+50
	Length Available (ft.)	72-112
E.	Width of Trench (ft.)	3
F.	Number of Trenches	8+8 Butterflied
G.	Center to Center Spacing (ft.)	9
H.	Width Required (ft.)	66
	Width of Available Area (ft.)	67-105
I.	Total Square Footage Required (sqft)	2187.5
J.	Square Footage in Design (sqft)	2400
K.	Reserve Requirement (%)	100
	Reserve Design – See Drainfield 1 and 2 Reserve Calculations (118%)	
Notes:		
Reduction allowed in area with substituted system		Yes ☐ No ☒
Lift pump required in basement		Yes ☐ No ☒
EZFLO SUBSTITUTION NOT ALLOWED		

Project: TM 89-64

Drainfield Area: Reserve **Drainfield 2**

Distribution Method: Pump to LPD

Effluent Quality: TL3

Design Basis		
A.	Estimated Percolation Rate	75 @ 36"
B.	Trench Bottom Area	.72 gpd/sqft
	Basis	Table 5.4 .72 gpd/sqft for pump to LPD dosed TL3
C.	Water Usage (GPD)	560 gpd
Area Calculations		
D.	Length of Trench (ft.)	65
	Length Available (ft.)	86-72
E.	Width of Trench (ft.)	3
F.	Number of Trenches	4
G.	Center to Center Spacing (ft.)	9
H.	Width Required (ft.)	102*
	Width of Available Area (ft.)	105
I.	Total Square Footage Required (sqft)	780
J.	Square Footage in Design (sqft)	780
K.	Reserve Requirement (%)	100
	Reserve Design – 32% reserve available in this area	
Notes:		
Reduction allowed in area with substituted system		Yes ☐ No ☒
Lift pump required in basement		Yes ☐ No ☒
EZFLO SUBSTITUTION NOT ALLOWED		
* Primary and Reserve		

LPD Calculations

Low Pressure Distribution

- LPD Pressure Pipe - 1.25" SCH 40 PVC
- Manifold Piping – 2" SCH 40 PVC
- Hole Size - 3/16"
- Hole Spacing - 5' on center
- Trench Length: 50'
- Trench Width 36"

Use 4 zones

Each Zone

- 8 laterals
- 400 lnft
- 1200 sqft
- 10 holes per lateral
- 80 holes per zone

Maximum Dosing = 2" depth in trench

- Zone 1-4 = 1200 SQFT x 2" x 1'/12" x 7.48 gal/ft³ x .45 = 673.25 gallons

Zone 1-4 Lateral Flow Calculations

Flow in one hole - Use 3/16" holes – 4' Distal Head

$$Q = CdA\sqrt{2gh}$$

$$Q = .61 \left(\frac{\pi}{4} \right) \left(\frac{\frac{3}{16}}{12^7} \right)^2 \sqrt{2(32.2)(4)}$$

$$Q = .00188 \frac{ft^3}{sec} \frac{gal}{min} = .8426 gpm$$

Zone 1-4 – 8 Laterals = 10 holes each Lateral

$$Q = \left(10 \frac{holes}{lpdlateral} \right) \left(.8426 \frac{gal}{min per hole} \right) = 8.426 \frac{gal}{min per lpdlateral}$$

Zone 1-4 – 80 holes each Zone

$$Q = \left(80 \frac{holes}{lpdzone} \right) \left(.8426 \frac{gal}{min per hole} \right) = 67.4083 \frac{gal}{min per lpdzone}$$

Permitted Dosing volume

7 to 10 times volume in LPD laterals

Volume in LPD laterals

Zone 1-4 - Total Lateral Length = 400'

$$volume = 400' \left[\left(\frac{\pi}{4} \right) \left(\frac{1.38''}{12''/'} \right)^2 \right] \left(7.48 \frac{gal}{ft^3} \right) = 31.1 gal$$

Dose volume between 217.6 gallons and 311 gallons

Flow Variation in Orifices in LPD Laterals								
Line segment	Orifice number	Q (gpm)	Segment Length (ft)	C	Pipe Nominal Diameter (in)	Head Loss (ft)	Head at orifice (ft)	Flow at orifice (GPM)
1	1	8.43	2.5	150	1.36	0.028	4.200	0.86
2	2	7.58	5	150	1.36	0.047	4.172	0.86
3	3	6.74	5	150	1.36	0.038	4.125	0.86
4	4	5.90	5	150	1.36	0.029	4.087	0.85
5	5	5.06	5	150	1.36	0.022	4.058	0.85
6	6	4.21	5	150	1.36	0.016	4.036	0.85
7	7	3.37	5	150	1.36	0.010	4.020	0.84
8	8	2.53	5	150	1.36	0.006	4.010	0.84
9	9	1.69	5	150	1.36	0.003	4.004	0.84
10	10	0.84	5	150	1.36	0.001	4.001	0.84
11		0.00	2.5	150	1.36	0	4	
							Min	0.843
							Max	0.863
							Flow variation in orifices	2.5%

Head Loss- Zone 1-4

From	To	Length	Appurtenances	Equivalent length	ID	C	Area	Q	V	HL	
pump tank	LPD field	275	97	372	2.067	150	0.0233	67.41	6.44	25.822	
Lateral 1	Lateral 2	9	23.5	32.5	2.067	150	0.0233	58.98	5.64	1.762	
Lateral 2	Lateral 3	9	23.5	32.5	2.067	150	0.0233	50.56	4.83	1.325	
Lateral 3	Lateral 4	9	23.5	32.5	2.067	150	0.0233	42.13	4.03	0.946	
Lateral 4	Lateral 5	9	23.5	32.5	2.067	150	0.0233	33.70	3.22	0.626	
Lateral 5	Lateral 6	9	23.5	32.5	2.067	150	0.0233	25.28	2.42	0.368	
Lateral 6	Lateral 7	9	23.5	32.5	2.067	150	0.0233	16.85	1.61	0.174	
Lateral 7	Lateral 8	9	23.5	32.5	2.067	150	0.0233	8.42	0.81	0.048	
								total HL		31.070	ft
								Elevation change from pump to top lateral		23	ft
								Zone Valve Head Loss	5	11.55	ft
								5 feet above top lateral		5	ft
										70.6	ft
										67.4	GPM

Pump requires 70.6 GPM @ 67.4 ft

Champion CPSTEP2022 Effluent Pump 75 gpm @ 76 ft

LPD Dosing Pump Tank

2 x 1500 gallon + 4' Diameter Wet Well
 $2 \times 26.1 \text{ gpi} + 7.83 \text{ gpi} = 60.1 \text{ gpi}$

Wet Well Liquid Depth = 77"
Pump Height = 16"
Duplex Pumps

High Level Alarm Float = 64"
Over Ride Timer On/Off = 44"
Timer On/Off = 20"
Redundant Off = 16"

Required storage above alarm float $6 \text{ hr} \times 1 \text{ d}/24 \text{ hr} \times 2,717 \text{ GPD} = 679.25 \text{ gallons} = 11.3"$

Provided Storage above Alarm Float = 13" = 781.3 Gallons

Minimum Required Flow Equalization Volume = 1,235 Gallons
Provided Flow Equalization Volume = 44" = 2,644 gallons

Flow Equalization Timer Settings

Required LPD Dosing Volume = between 217.6 gallons and 311 gallons
Provided Dose = 291.67 Gallons @ 6 Times per day

LPD Dose Pump Rate @ 4' Distal Head = 67.4 gpm

Dosing Timing:
Pump On = 4:20 min on (291.67 gallons)
Pump Off = 3:56 hr off (6 doses per day)

Verify with drawdown test after LPD balancing to design distal head

Every pump tested in water to ensure pump meets performance curve.



FEATURES/BENEFITS

PERFORMANCE

Heads up to 124' TDH
Flows up to 122 GPM

MOTOR (Single Phase)

High efficient, 115v or 230v, oil filled, permanent split capacitor motor with upper and lower ball bearings and thermal overload protection

- Constant bearing lubrication
- Maximum motor cooling
- Runs cooler and lasts longer
- Internal overload protection
- Quiet operation

- Fasteners and shaft made from rugged, corrosion resistant stainless steel

MOTOR (3 Phase)

230v or 460v, requires control panel

SEAL DESIGN

Single, mechanical, oil filled chamber
- Optional double seal series models available that provides additional protection and moisture sensing capabilities
- Optional seal failure feature that will alert you when the seal has failed

IMPELLER DESIGN

1 or 2 vane cast iron impeller

- Designed to help reduce clogging by foreign material

POWER CORD

Sealed entry quick disconnect power cords

- Prevents water from entering the motor housing through a cut cord
- Easy to replace in the field
- Available in lengths up to 100'

SWITCH

Piggy-back switch design (Single Phase)

- Defective switches can be diagnosed over the phone
- Pump can be operated manually or supplied with other piggy-back switches
- Switch can be replaced without having to replace the pump

APPLICATIONS

Dewatering, septic systems, residential and commercial developments, elevator pits and STEP systems



1/2-2 HP high head effluent pumps that handle up to 3/4" solids with 2" discharge

PERFORMANCE CURVE



Nitrogen Dilution Analysis

5 mg/l TN Limit at the Project Boundary

Per 12VAC5-613-90b TN concentration at project boundary shall be less than 5 mg/l. Per GMP 156 appendix C dilution may be used to demonstrate compliance with this limit. There is 122.6 acre watershed area available to be used for dilution (shown on the following graphic). Drainfields 1 and 2 sit at the base of the watershed. Development is restricted in the watershed area due to critical slopes.

Nitrogen Dilution – Utilizing the Drainfield Area Watershed

Project:	CBI Forest School		
Tax Map	TM 89-64		
Pervious Watershed Area Within the parcel boundary used for Dilution	122.60	acres	
Rainfall	40	inches	
Nitrate Calculation Table			
Rainfall (inches)	40		
Rainfall Infiltration (R) (inches)	20		
Dilution Area (D) (acres)	122.60		
Rainwater Infiltration Dilution (I) (gpd per acre yr)	181,448.0		
Hydraulic Loading Rate (gpd)	1,750.0		
Total Nitrogen at Compliance Point (In Situ)	84.0		
Nitrogen Concentration at the Aquifer (mg/l)	0.8		

Nitrogen Dilution - Minimum Watershed Area Required

The minimum amount of watershed area required for dilution to maintain less than 5 mg/l TN at the project boundary is only 19 acres.

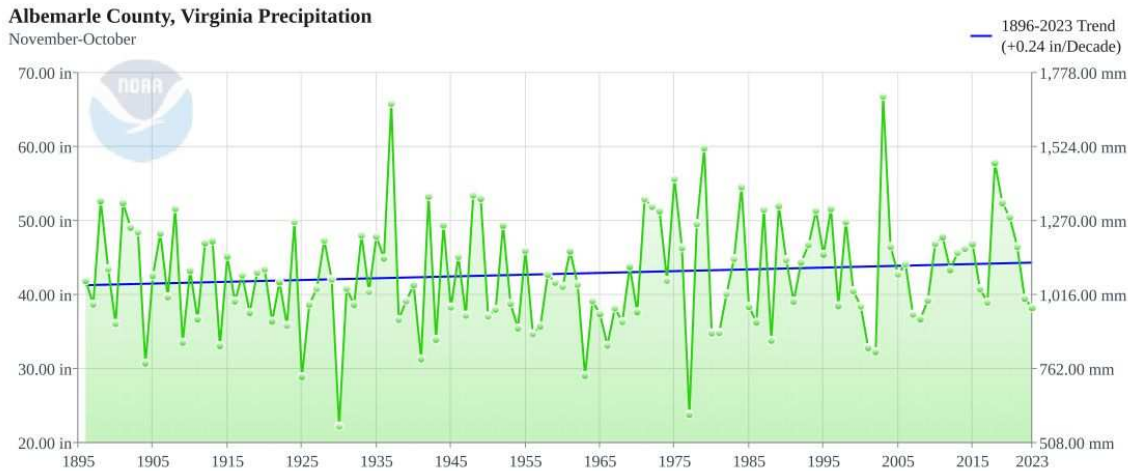
Project:	CBI Forest School		
Tax Map	TM 89-64		
Pervious Watershed Area Within the parcel boundary used for Dilution	19.00	acres	
Rainfall	40	inches	
Nitrate Calculation Table			
Rainfall (inches)			40
Rainfall Infiltration (R) (inches)			20
Dilution Area (D) (acres)			19.00
Rainwater Infiltration Dilution (I) (gpd per acre yr)			28,120.0
Hydraulic Loading Rate (gpd)			1,750.0
Total Nitrogen at Compliance Point (In Situ)			84.0
Nitrogen Concentration at the Aquifer (mg/l)			4.9

Calculation Summary

The following illustrates the above spreadsheet's calculation methods.

Rainfall

Historical precipitation data was taken from NOAA Precipitation Summary for Albemarle County (November 1895 to October 2023). Trend line indicates > 40 inches per year historically. 40 inches per year was used for the analysis.



$$R = .5 \times \text{Average Rainfall}$$

$$I = R \times D \times 74$$

Equivalent Nitrate Loading Rate

Design water usage was used with no reduction.

Treated Nitrogen Concentration

Septic Tank Effluent TN effluent concentration was estimated 84 mg/l (no removal in primary treatment).

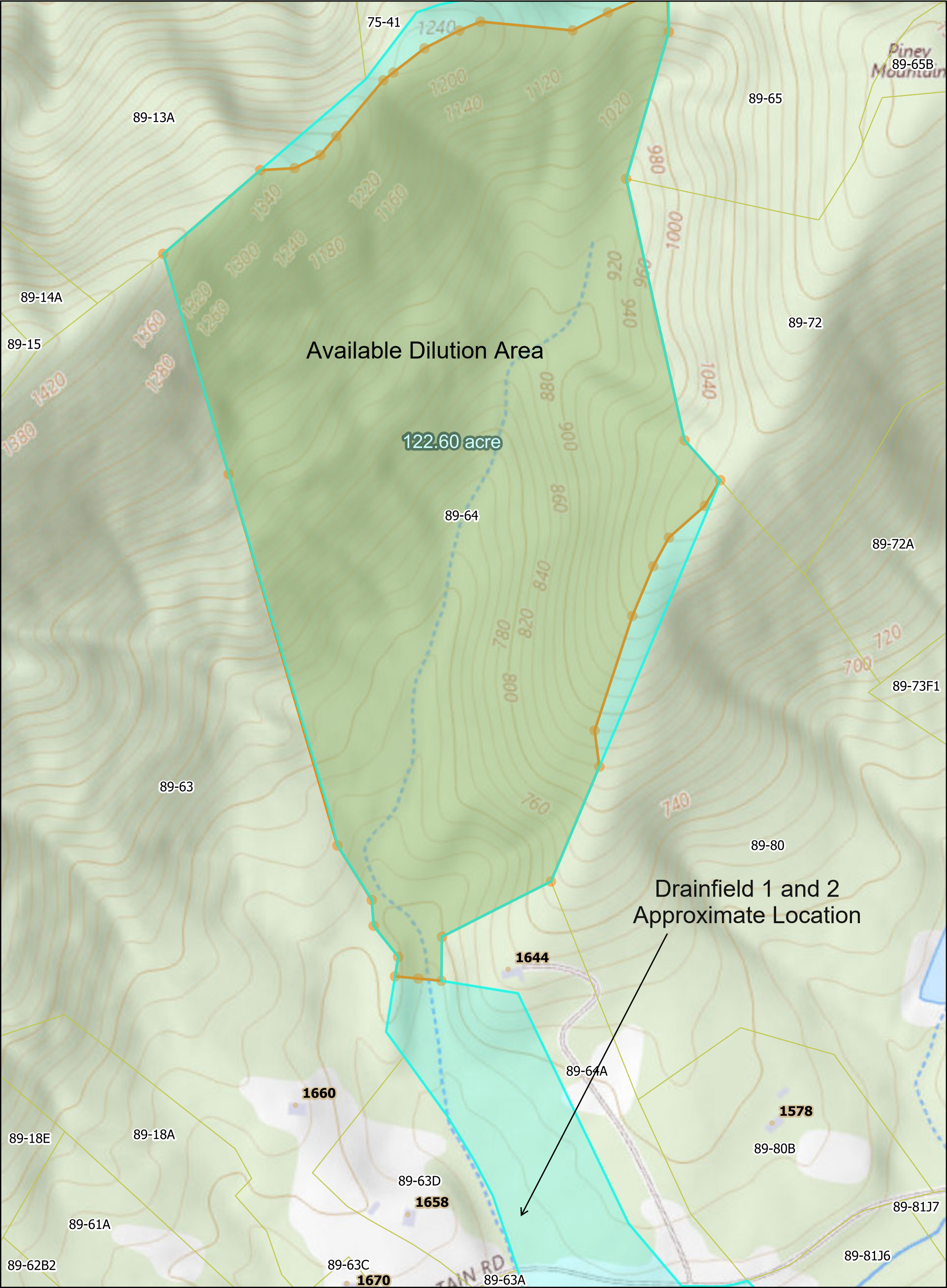
Trench Dispersal Uptake

TN uptake due to trench dispersal was estimated as 0%.

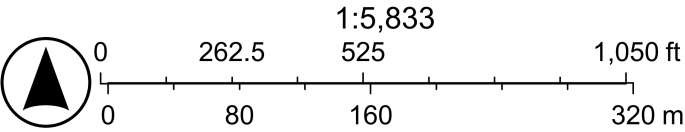
Nitrogen Concentration at Aquifer

$$\left[\frac{Q}{Q + I} \right] \times [TN_{\text{effluent}}] = TN_{\text{aquifer}}$$

CBI Forest School Watershed



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USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data;

Groundwater Mounding Analysis

There is approximately .61 acres available for dispersal of septic tank effluent in two areas within the property. The landscape allows dispersal of the effluent in two hydrologically separate areas. This allows for decreased linear loading rates due to longer contours in these identified sub drainfield areas.

Hydraulic conductivities were measured at 36"-38" and 86"-103". The ksat test results show faster permeability than the estimated perc rate and consistency throughout the depths tested. The mounding analysis was done considering the representative saturated hydraulic conductivity value:

- Geometric Mean of all tests at or below the infiltrative surface

The depth of the regolith, depth to water table, and depth to bedrock were obtained from a well log analysis from similar geologic formation wells in VADEQ Well Database.

Groundwater Mounding Baseline Criteria:

DFZ1/2 to DFZ3/4

Slope: > 10%

Drainfield Installation Depth - 36" (LPD Trench)

Depth of Vadose Zone: 27.6 feet

Aquifer Thickness: 25.0 feet

B/Z Ratio:

- DFZ3/4 - $B/Z < 1$
- DFZ1/2 - $B/Z > 1$

Analytical Method: Mounding VDH Case 3, Equations 5 and 6 with $N=2 - B/Z$ or $N=1$

The results of the mounding analysis are shown on the following two pages in tabular format.

The analytical model indicates that the mounding will not occur in DFZ1/2 or DFZ3/4.

The results of the mounding analysis are shown on the following page in tabular format.

CBI Forest School

Mounding Calculations for Primary Drainfields

Case 4 - Equations 5 and 6, slopes greater than 10%

K1 - Geometric Mean - All Ksat Measured at and Below the Infiltrative Surface

Parameter	LPD Trenches		Notes
	DFZ1/2	DFZ3/4	
$H_{0calc-1}$ (ft)	-1.83	-3.81	Solved by Quadratic Equation
$H_{0calc-2}$ (ft)	-54.12	-54.26	
L_c (ft)	66	66	
L_f (ft)	103	103	
Q (gpd)	875	875	
J (ft ³ /day)	117.0	117.0	1750 gpd
L_d (ft)	54.1	53.8	
w (ft)	25.0	25.0	
a	1.56	1.56	
DF Depth (ft)	3.00	3.00	
Depth to Bedrock (ft)	52.60	52.60	Obtained from Well Logs Analysis
Vadose Zone Depth (ft)	27.60	27.60	Obtained from Well Logs Analysis
Local Topographic High Elevation (ft)	619.0	608.0	From Survey, Siteplan, and GIS
Average Drainfield Elevation (ft)	559.3	558.6	From Survey, Siteplan, and GIS
B	59.70	49.40	
Z	49.6	49.6	
B/Z	1.2	1.0	
N	1.00	1.00	
S	0.11	0.15	From Survey and Siteplan
K1 (cm/day)	22.4	22.4	Geometric Mean KSAT Rate from All Tests Below Infiltrative Surface
k1 (ft/day)	0.73	0.73	

System Specifications

VDH Use Only

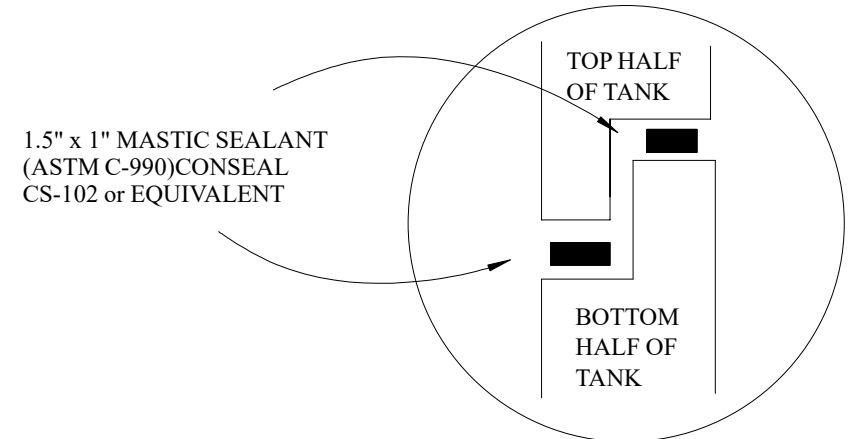
HDIN: _____

Application Information	
Name: <u>Congregation Beth Israel Forest School</u>	Address: <u>301 East Jefferson Street, Charlottesville, VA 22902</u>
Phone: _____	
Location Information	
Tax Map/GPIN #: <u>TM 89-64</u>	Property Address: <u>TBD Dudley Mountain Road Charlottesville, VA 22903</u>
Subdivision: _____	Section: _____ Block: _____ Lot: _____
Directions: <u>From Charlottesville go South on Old Lynchburg Rd, take a right on Dudley Mountain Rd, property is on the right at .8 miles</u>	
General Information	
Property Type (e.g. residential): <u>Commercial</u>	Number of Bedrooms: <u>n/a</u>
Daily Flow: <u>1750</u> gpd	Conditions: <u>none</u>
Notes: _____	
Sewer Line	
Diameter: <u>4</u> in. Material: <u>SCH 40 PVC</u> (or equivalent) Notes: _____	
Pretreatment Unit(s)	
Treatment Level: <u>STE</u>	Septic Tank Capacity: <u>11,500</u> gallons
Number of Septic Tanks <u>7</u>	Size of Septic Tank(s) <u>1000 + 7x1500</u> gallons
Per the Sewage Handling and Disposal Regulations, check which option(s) chosen:	
☐ Septic tank with inspection port ☒ Septic tank with effluent filter ☐ Reduced maintenance septic tank	
Secondary treatment device(s), if applicable: _____	
Notes: <u>see supplemental calculations</u>	
Conveyance Line	Distribution Method and Header Lines
Conveyance Method: <u>pressure</u>	Distribution Method: <u>Pressure</u>
If pumping, include pump specifications sheet.	No. of boxes: <u>NA</u> No. of outlets: <u>NA</u>
Material: <u>SCH 40 PVC</u> Diameter: <u>2"</u>	Surge or splitter box required: ☐ Yes ☒ No
Notes: <u>see supplemental calculations</u>	Header Line Material: <u>2" SCH 40 PVC</u>
Percolation Lines/Absorption Area	
Dispersal Method (e.g. laterals, pad, mound): <u>low pressure distribution laterals</u>	
If using pressure dispersal (e.g. drip), include pressure dispersal specifications sheet.	
No. of laterals/pads: <u>32</u> Length of lateral(s)/pad(s): <u>50</u> ft. Width of lateral(s)/pad(s): <u>36</u> in.	
Center to center spacing: <u>9</u> ft. Installation depth: <u>36</u> in. Aggregate depth: <u>12</u> in.	
Size/Type of Aggregate: <u>12" of 1/2" to 3/4" diameter Aggregate per VDH SHDR 2000</u> Lateral/pad slope: <u>0</u> in. per <u>50</u> ft.	
Reserve Area Provided: <u>100+</u> % Notes: <u>see supplemental calculations and design</u>	

Please Note: _____	

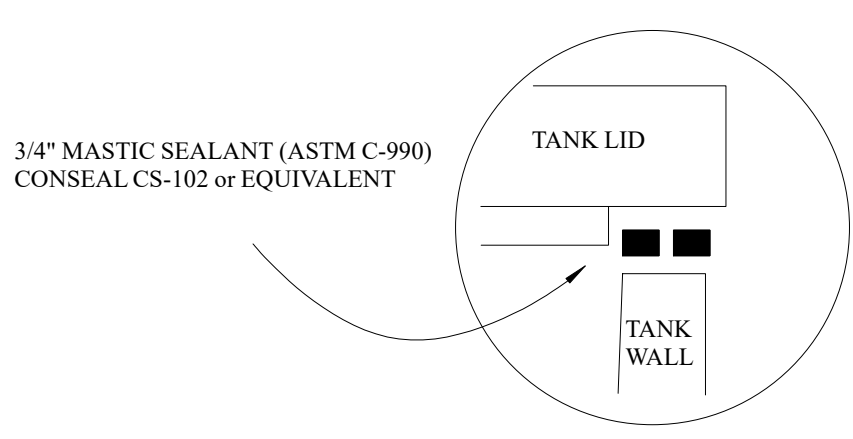
<div>CBI FOREST SCHOOL - NEW SEPTIC SYSTEM</div> <div>Septic System Specifications</div> <div><div>This plan is being submitted under provision 32.1-163.6 of the code of Virginia and does not pose a greater risk of malfunction as defined in the SHDR 350 than current regulatory designs.</div><div>General<div><div>1. Plans and Specifications (SDS1-SDS5) are the official Virginia Department of Health (VDH) approved Sewage Disposal Construction Permit Set (HDID: Pending). Old Dominion Engineering (ODE) is the engineer of record for this VDH permit. Any deviations from the approved permit affecting setbacks, capacity, hydraulic conditions, operating units, the functioning of treatment processes, or the effluent quality delivered, must be approved of by the engineer of record and VDH before any changes are made. Revisions to the approved permit may be required.</div><div>2. Installation of the septic system shall be in accordance with VDH Sewage Handling and Disposal Regulations and the approved Sewage Disposal Construction Permit.</div><div>3. Contractor shall be properly licensed by VA DPOR for installing onsite wastewater treatment and dispersal systems in Virginia. Proof must be provided to Engineer prior to working on any component of the system.</div><div>4. Submittals of all materials used in the installation must be provided to the engineer for approval prior to installation. Substitution requests will be evaluated and those that meet an as equal standard mayl be approved. Modifications or substitutions to the specified equipment or layout must be approved by the Engineer prior to purchasing equipment, supplies, or installation.</div><div>5. The contractor shall inspect the site prior to submitting an estimate to the owner. Any potential conflicts should be reported to the engineer. By submitting an estimate, the contractor indicates that he has investigated the site and has found no discrepancies with the plans and specifications.</div><div>6. If site conditions vary contact the Engineer. If adverse subsurface conditions are encountered (rock, groundwater, utilities, etc.) contact the engineer. Notify "MISS Utility" and Owners for underground utility location prior to excavation.</div><div>7. Installation of components shall be in accordance to manufacturer recommended installation procedures unless changed in writing by the home office of the manufacturer. Where the foregoing standards, recommendations, and specifications are conflicting, said conflicts shall be brought to the attention of the Engineer.</div><div>8. Contractor to provide training to CBI Forest School (CBIFS) Maintenance and Operation Staff on Septic System Components and their operation.</div></div><div>Inspection Requirements<div>Old Dominion Engineering (ODE) will go over the Sewage Disposal Construction Permit inspection requirements with the contractor at the preconstruction conference to include:<div><div>• Onsite preconstruction conference before starting installation of the system.</div><div>• Inspections by the Engineer prior to backfilling components of the septic system.</div><div>• Contractor shall commission septic system to verify that all floats, pumps, and pipe joints are functioning prior to the commissioning inspection. Prior to commissioning inspection, all foreign matter shall be removed from the grease trap(s), septic tank(s), pump station(s) and all unit(s).</div><div>• Commissioning Inspection - The contractor shall have at least 36" of water above the Timer On/Off float for commissioning inspection to allow for adequate testing and calibration of the LPD fields and pumps (additional water may be necessary). Contractor shall have adequate personnel at the commission inspection to make LPD Field adjustments and calibrations as required. The Engineer will adjust panel settings based upon the results of the pump testing.</div><div>• The Engineer is responsible for certifying the substantial compliance of the installation to VDH. The contractor shall submit a copy of the VDH completion statement to the Engineer prior to release of the Engineer's certification to VDH.</div></div></div><div>Operation and Maintenance<div><div>1. The contractor shall provide to the Engineer the installation instructions of all approved substituted components.</div><div>2. The contractor shall provide to the Engineer all warranties and manufacturer information and operation and maintenance manuals for all components before an operation permit can be issued.</div><div>3. The owner is required to hire a licensed operator for this onsite wastewater treatment and dispersal system. The owner is required to record a document provided by VDH which specifies the requirement for operation and maintenance before an operation permit can be issued.</div><div>4. The onsite wastewater treatment system requires a start up period in which more frequent monitoring and sampling may be required.</div></div><div>Piping - Gravity Sewer/Effluent Main/Force Main<div><div>1. Schedule 40 PVC pipe shall be type 1, grade 1, plain end conforming to ASTM D 1784 and ASTM 1785 with solvent weld joints and fittings. Fittings – Tees, wyes, or other miscellaneous fittings shall be of the same material and type as the gravity sewer or pressure sewer.</div><div>2. Schedule 80 PVC pipe shall conform to ASTM 1785 with solvent weld joints. Fittings – Tees, wyes, or other miscellaneous fittings shall be of the same material and type as the gravity sewer or pressure sewer.</div><div>3. Separation of water mains and sewer mains/manhole shall be 10' horizontally measured edge to edge. Sewer lines, force mains, and tanks shall be a minimum 50' from wells. Water lines shall cross 18" above the crown of sewer lines. Where horizontal or vertical separation cannot be obtained the sewer shall be constructed of AWWA approved water pipe and pressure tested to 30 PSI in place without leakage prior to backfilling. Water lines passing under sewer lines must have 18" horizontal separation.</div><div>4. Gravity sewers laterals prior to primary settling shall be 4" SCH 40 PVC and have a minimum slope of 1 ¼" per 10'. Cleanouts within 10' of building and every 50' (if applicable).</div><div>5. Effluent mains after primary settling shall be 4" SCH 40 and have a slope of 6" per 100' minimum.</div><div>6. Force main shall be 2" SCH 40 PVC Pipe (HDPE SDR11 with substitution request). Nineties shall have a concrete force block.</div><div>7. Installation of piping and fittings shall be installed in accordance to manufacturer recommended installation procedures unless changed in writing by the home office of the manufacturer are provided to the Engineer.</div></div></div></div></div></div></div>	<div>Precast Concrete Wet Well Manhole<div><div>1. 4" Diameter Pre-Cast Reinforced Concrete Manholes ASTM C 478 - Hanson Pipe and Products, Inc., Americast, or approved equal. Flat top lids shall be used for wet well manhole. The manhole and all seams must be water proof. Minimum 5" thick walls.</div><div>2. Manhole bedding shall be 8" #68 stone. Tank shall be backfilled in layers with sufficient compaction (> 95% compaction) to avoid settling. Backfill material shall be free of debris and large stones.</div><div>3. Riser, Frame, and Lid<div><div>a. Parking or driveway - H20 load rated cast iron riser and lid with concrete riser extension. The riser shall be flush with the final grade and covered at the surface with a lockable, watertight lid. The risers shall be 30" in diameter.</div><div>b. Non traffic rate - 30" Diameter – Riser to be 30" ADS N-12 Dual Wall Corrugated HDPE Pipe with bolted on tank adapter. Riser Lid shall be Orenco DuraFiber FLD Access Lids (FLD 30G). This assembly is on the Wet Well.</div><div>c. The risers shall be 2" above final grade and covered at the surface with a lockable (stainless steel screws), watertight lid.</div></div></div><div>4. Integrally Cast Concrete Manhole Connectors (flexible boot) ASTM C 923 - A-LOK Products, Inc. – Z-LOK Connector, NPC, Inc. - Kor-N-Seal, or approved equal.</div><div>5. Pipe Penetrations (Below Normal Water Level – Hydraulic Link) – Garlock Link Seal EPDM Modular Seal Model S-316 (LS-300-S-316-10) for 4" SCH 40 PVC Pipe with OD 4.5" and a core drilled or precast hole with diameter 6". Installation per manufacturers recommendations.</div><div>6. Grout - Preco Industries, LTD – Preco-Patch, Master-Flow – 713 Grout, or approved equal.</div><div>7. Butyl Resin Sealers - Concrete Products Supply Co. - CPS-210 or Concrete Sealants, Inc. CS-102 or approved equal.</div><div>8. Penetrations below typical water level shall be bedded in 6" pack of bentonite.</div></div><div>Concrete Tanks - Treatment and Dispersal System<div><div>1. Concrete tanks shall be Hanover Precast, Wrights Ready Mix, Concrete Pipe and Precast, or approved equivalent. Tanks shall be 5000 psi reinforced concrete.<div><div>a. Gallons per inch used in setting float elevations etc. were derived from Hanover precast tanks at 26.13 gallons per inch. Engineer will provide adjusted float heights based upon actual tank approved for use.</div><div>b. No poly tank substitutions allowed.</div></div></div><div>2. All seams shall be waterproof.</div><div>3. Structural certification of tank design shall be provided to the engineer.</div><div>4. The contractor shall provide tank dimensions to Engineer with submittal.</div><div>5. Pipe Penetrations (Above Normal Water Level) - Closed in Boot Seals ASTM C-923, C-1227, and C1644-06. Polylok or Cast-A-Seal or approved equal.</div><div>6. Pipe Penetrations (Below Normal Water Level – Hydraulic Link) – Garlock Link Seal EPDM Modular Seal Model S-316 (LS-300-S-316-10) for 4" SCH 40 PVC Pipe with OD 4.5" and a core drilled or precast hole with diameter 6". Installation per manufacturers recommendations.</div><div>7. Penetrations below typical water level shall be bedded in 6" pack of bentonite.</div><div>8. Butyl Resin Sealers - ASTM C-990 - ConSeal CS 102 or approved equivalent.</div><div>9. Grout - Preco Industries, LTD – Preco-Patch, Master-Flow – 713 Grout, or approved equivalent.</div><div>10. Tank bedding shall be 8" #68 stone. Tank shall be backfilled in layers with sufficient compaction (> 95% compaction) to avoid settling. Backfill material shall be free of debris and large stones.</div><div>11. Riser, Frame, and Lid<div><div>a. Parking or driveway - H20 load rated cast iron riser and lid with concrete riser extension. The riser shall be flush with the final grade and covered at the surface with a lockable, watertight lid. The risers shall be 24" in diameter.</div><div>b. Non traffic rate<div><div>i. 24" Diameter – Riser to be IPEX Ultra-Rib PVC Pipe with Orenco PRTA24-2 cast in place tank adapter. Riser Lids shall be Orenco DuraFiber FLD Access Lids (FLD 24G). This assembly is on all septic and pump storage tanks (inlet and outlet).</div><div>ii. The risers shall be 2" above final grade and covered at the surface with a lockable (stainless steel screws), watertight lid.</div></div></div></div></div></div></div></div>	<div>LPD Dosing Pumps and Control Panel<div><div>1. Pumps – Effluent submersible pumps (2 each). Pump shall deliver 75 gpm @ 76 ft.<div><div>a. Champion Pump – CPSTEP2022(M) (230 v, 1 ph, 14.8 amps, Manual) Effluent Submersible Pump</div></div></div><div>2. The pumps will be controlled with a duplex alternating pump controller and shall have a PLC capable of controlling the pumps by either demand dose or timing and sequencing of pump cycles. The PLC shall log pump operating hours, pump faults, pump 1 and 2 cycle counter and run time, and float counter for all floats. Panel shall be housed in a lockable NEMA 4x panel box. Internal motor contactor and circuit breaker required. Alarm to be audiovisual. Motor control shall have a manual over ride switch. High level alarm shall have a time delay function. Floats to be supplied by panel manufacturer.<div><div>a. Orenco MVP DAX 2 DM HT SA</div></div></div><div>3. Control panel shall be mounted adjacent to the Wet Well<div><div>a. All float and pump electrical connections shall be made outside of the tank in a NEMA 4x waterproof junction box with terminal strip</div><div>b. Junction box to be mounted under control panel on panel board.</div><div>c. Conduit shall be sealed with on hardening sealant to minimize sewage gas migration.</div></div></div><div>4. Control panel should be set to alternate doses between pumps<div><div>a. Pump 1 Lead Select - Off</div><div>b. Pump 2 Lead Select - Off</div></div></div><div>5. High Level Alarm and Lag Pump shall be operated by the same float. Minimum Run Time is 2 minutes</div><div>6. Pump Failure Alternation – (PFailAlt) – set to on. When a pump failure occurs, the panel will automatically switch to the other pump and notify through alarm.</div><div>7. Panel Settings<div><div>a. Time Dose = On</div><div>b. High Level Alarm Delay = 10 minutes</div><div>c. Timer 1 On/Off - 1,750 gpd - 6 doses per day – 291.67 gal per dose – 67.4 gpm<div><div>i. 4:20 min on, 3:56 hours off</div></div></div><div>d. Timer 2 On/Off - 1,750 gpd - 6 doses per day – 291.67 gal per dose – 67.4 gpm<div><div>i. 4:20 min on, 3:56 hours off</div></div></div></div></div><div>8. Floats<div><div>a. Redundant Off/Low Level Alarm - 16"</div><div>b. Timer On/Off - 20"</div><div>c. Override Timer ON/Off – 44"</div><div>d. High Level Alarm/Lag Pump Enabled – 66"<div><div>i. Floats measured from Wet Well floor</div><div>ii. Floats to be Orenco Signal Rated Floats (Type P)</div><div>iii. Floats to be installed on a 1" PVC float tree secured to the riser.</div><div>iv. Floats shall be attached to the float pole with an easily adjustable float collar. Orenco Float Collar (MFCOLLAR 1")</div><div>v. Neatly coil up extra float wiring – DO NOT CUT. Float wires shall be permanently labeled in the tank, junction box, and control panel.</div></div></div></div></div></div><div>LPD Drainfield<div><div>1. DO NOT INSTALL DURING WET, ICY, OR SNOWY WEATHER</div><div>2. DO NOT INSTALL WHEN DRAINFIELD IS WET.</div><div>3. Indexing Zone Valve – Krain 6404-RCW with P8003050 Stem/Disk Assmble (Standard Heavy)<div><div>a. Valve box shall be 30" in diameter ADS N-12 Dual Wall Corrugated HDPE Pipe with a 30" Orenco DuraFiber FLD Access Lid (FLD30G)</div></div></div><div>4. Install on contour (confirm layout with engineer on preconstruction conference)</div><div>5. Zones - 4</div><div>6. 32 trenches (8 trenches per zone)</div><div>7. 3 foot wide trench</div><div>8. 50' long (1,600 LNFT Total - 400 LNFT per zone). No fall in trenches.</div><div>9. 9 foot on center minimum</div><div>10. 12" of gravel (TOTAL). GRAVEL TO BE COVERED WITH FILTER FABRIC.<div><div>a. NO substituted systems</div></div></div><div>11. 36" deep trench</div><div>12. 4' of head in each lateral.</div><div>13. Piping shall be 1 ¼" SCH 40 PVC. Holes - 3/16" diameter shall be drilled longitudinally every 5'. The first hole is to be drilled 2.5' from the start. Laterals are to be 50' long and installed level with the holes downward.</div><div>14. Throttling valves shall be 1 ¼" SCH 40 PVC Ball Valve installed on each lateral in a 7" valve box</div><div>15. Risers pipes shall be installed at the end of each pipe with a slip to male threaded fitting and female threaded cap in a 7" valve box.</div><div>16. Manifold<div><div>a. Laterals 1 to 8 – 2" SCH 40 PVC</div><div>b. Laterals 9 to 16 – 2" SCH 40 PVC</div><div>c. Laterals 17 to 24 – 2" SCH 40 PVC</div><div>d. Laterals 25 to 32 – 2" SCH 40 PVC</div></div></div><div>17. Miscellaneous<div><div>a. Valve boxes for VB1 and VB2 shall be 7" diameter valve boxes Rain Bird VB-7RND with PVC pipe for valve box extender for valve access as needed.</div></div></div><div>18. The low pressure laterals will require adjustment to equalize pressures in all laterals. This will require the installation of temporary risers (1 ¼" in diameter) to 4 feet above the low pressure lateral distal end SCH 40 PVC 90 invert. After pressure equalization, the contractor will have to remove the temporary risers and install permanent risers, caps, and valve boxes. The contractor can propose alternate ways of balancing the system at the preconstruction conference.</div></div><div>End of Specifications</div></div></div>	<div><div><div>CBI FOREST SCHOOL</div><div>NEW SEPTIC SYSTEM</div></div><div><div>CBI Forest School</div><div>TBD Dudley Mountain Road, Charlottesville, VA 22903</div><div>TM 89-64</div><div>155.957 Acres</div><div>Albemarle County</div></div><div><div>Contact:</div><div>Congregation Beth Israel Forest School</div><div>ATTN: Jill Abbey Clark</div><div>301 East Jefferson Street Charlottesville, VA 22902</div></div><div><div>System Name: CBI Forest School</div><div>County: Albemarle</div></div><div><div>1,750 gallon per day system</div><div>Effluent Quality - STE</div></div><div><div>Primary Treatment - STEG Tanks with Effluent Filters</div><div>Flow Equalized LPD Dose Pump Tank</div><div>4' Wet Well with 2 X 1,500 Gallon Tanks and Duplex Pumps</div><div>4,800 SQFT LPD Trenches in 4 zones (75 mpi at 36")</div></div></div>	<div><div><div><div>VDH REVIEW SET</div><div>NOT FOR CONSTRUCTION</div></div><div><div>VDH HDID: PENDING</div><div>DATED: PENDING</div></div><div>1326013</div></div><div><div><div>SPECIFICATIONS</div><div>CBI FOREST SCHOOL</div><div>NEW SEPTIC SYSTEM</div></div><div><div><div>COMMONWEALTH OF VIRGINIA</div><div></div><div>PROFESSIONAL ENGINEER</div></div></div><div><div><div>Old Dominion Engineering</div><div>366 S Linden Avenue Waynesboro, Virginia 22980</div><div>(540) 942-5600 ode@olddominionengineering.com</div></div><div><div>3/30/26</div><div>SDS1</div></div></div></div></div>
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1 MID SEAM TANK JOINT DETAIL
SECTION VIEW

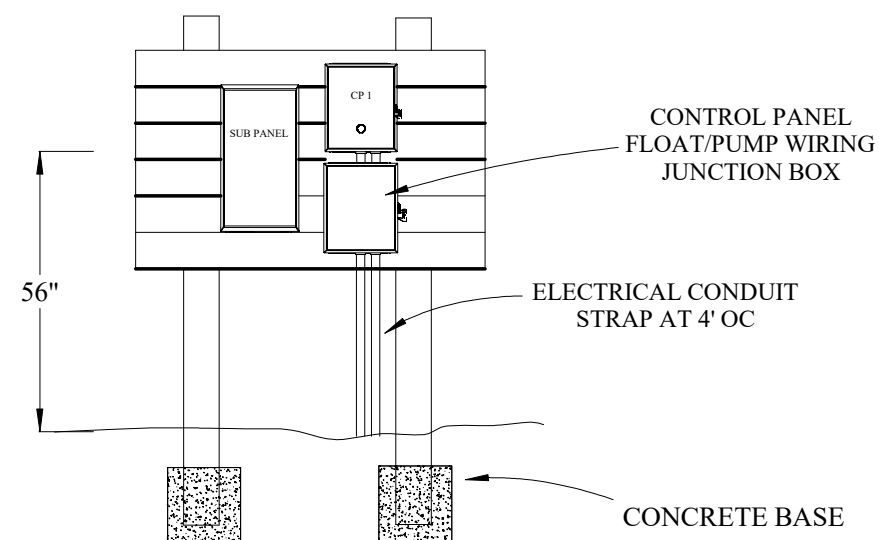
Not To Scale



2 TOP SEAM TANK JOINT DETAIL
SECTION VIEW

Not To Scale

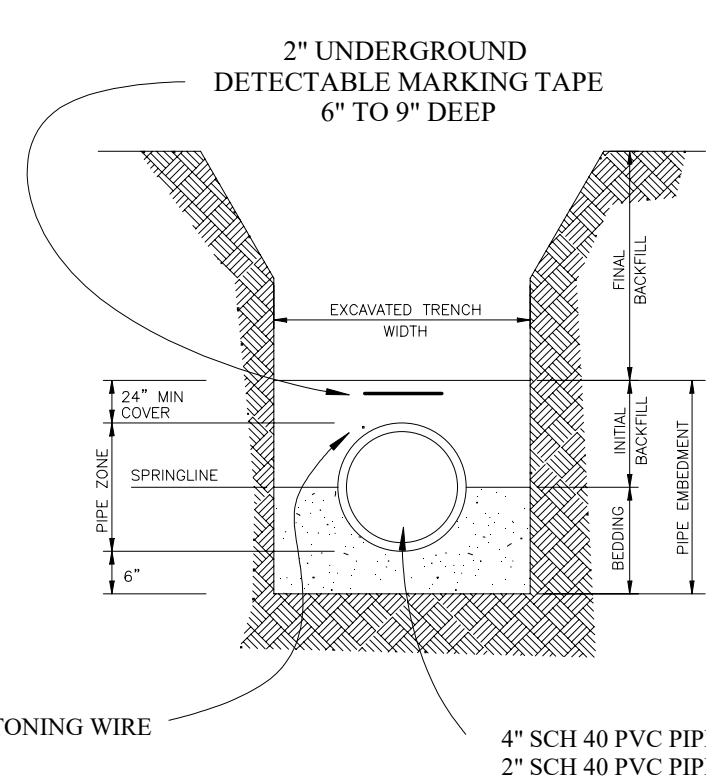
CONTROL PANEL NUMBERING
CPI - DUPLEX PUMP TIME DOSE CONTROLS



- NOTES:
1. SEAL JUNCTION BOX INLET CONDUIT WITH NON-HARDENING CONDUIT SEAL
 2. LABEL WIRING IN CONTROL PANEL, JUNCTION BOX, AND PUMP WET WELL
 3. USE STANDARDIZED WIRE COLORS
 4. PANEL TO BE INSTALLED ADJACENT TO WET WELL
 5. PROVIDE LOCK FOR PANEL
 6. STABLE CONTROL PANEL SUPPORT UNISTRUT ASSEMBLY, CONCRETE PANEL POST OR APPROVED EQUIVALENT

3 CONTROL PANEL LAYOUT
ELEVATION VIEW

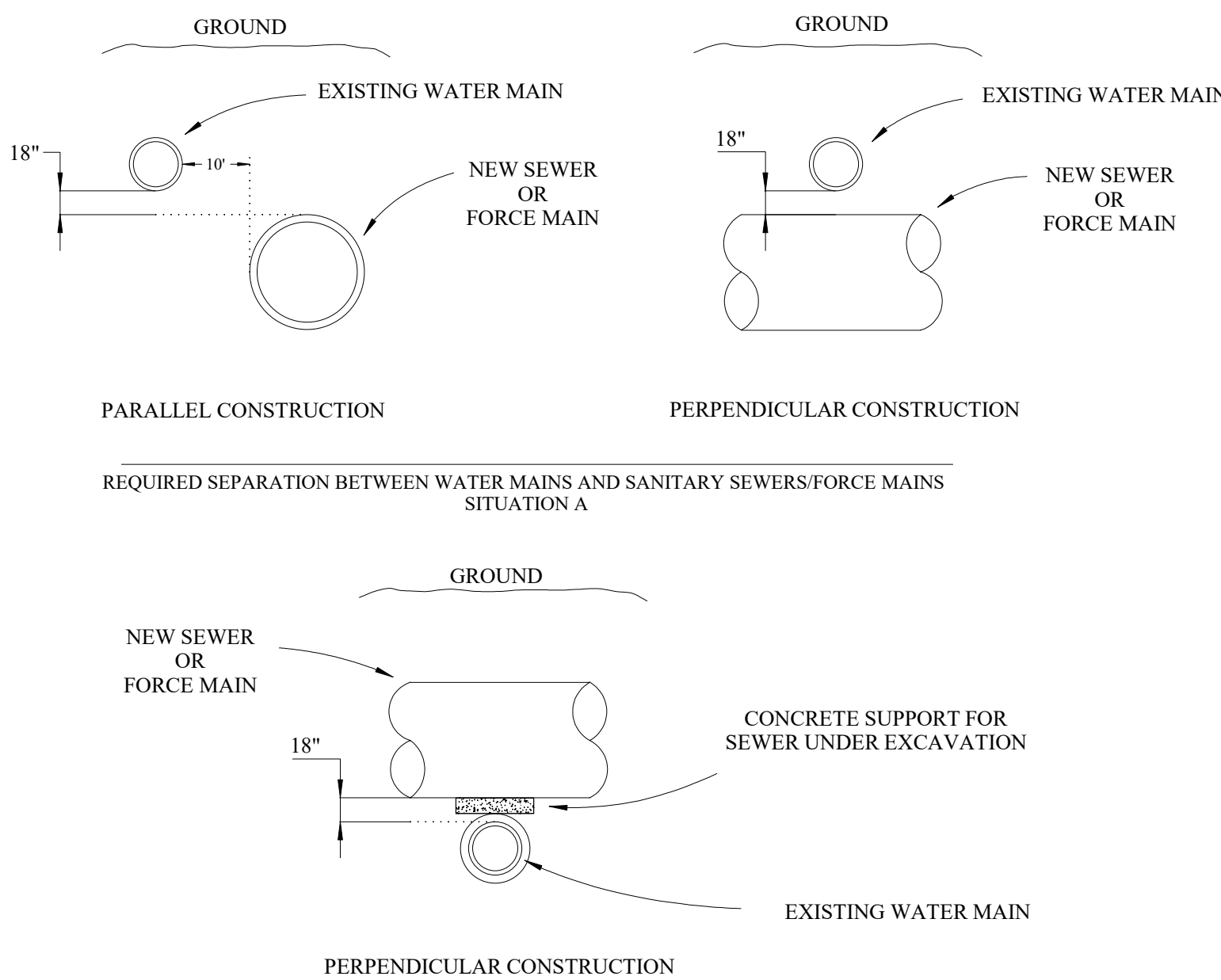
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- NOTES:
1. BEDDING AND INITIAL BACKFILL - SELECT CLEAN FILL
 2. FINAL BACKFILL - SELECT CLEAN FILL

4 PIPE TRENCH DETAIL
SECTION VIEW

Not To Scale

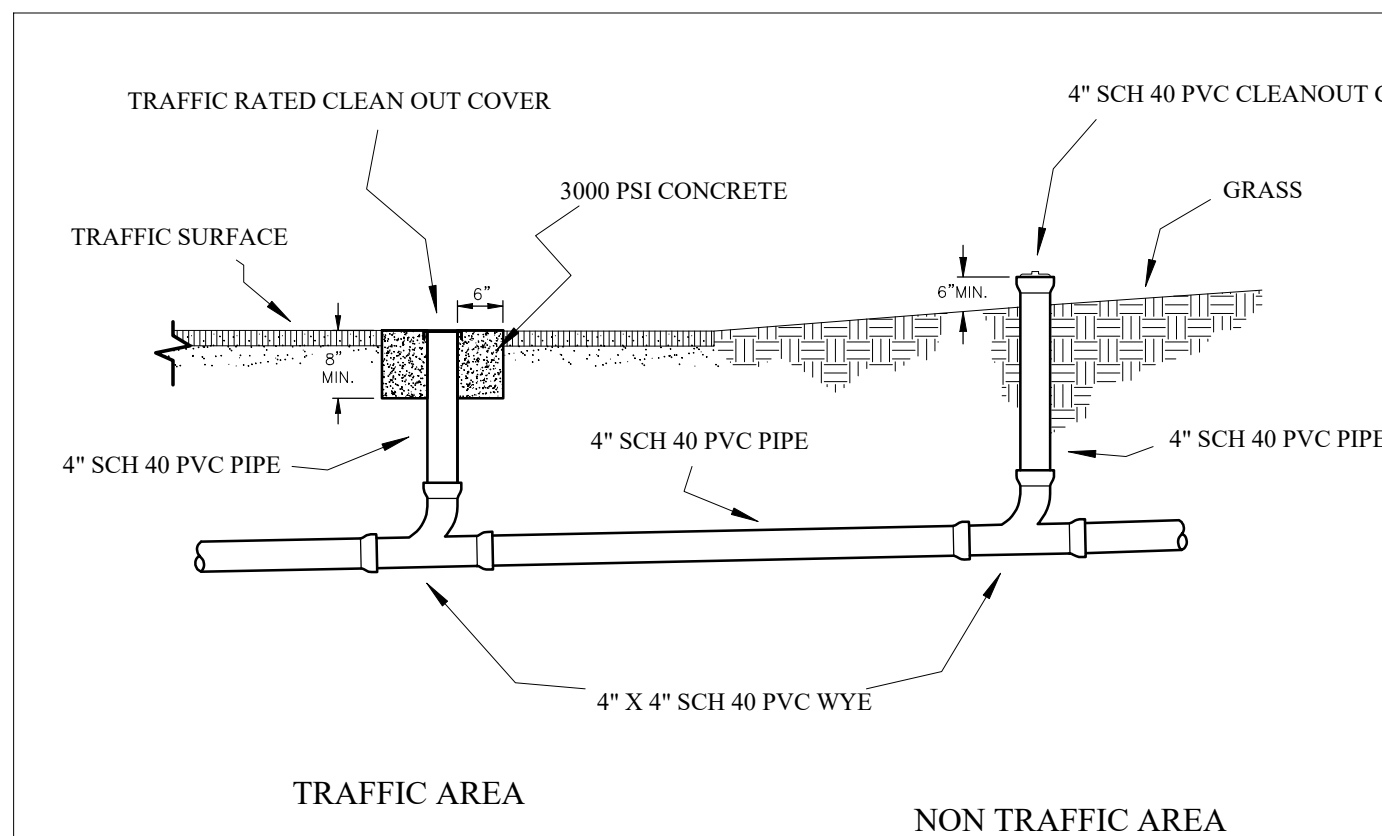


- NOTES:
1. SEWER PIPE JOINT AT LEAST 10' FROM WATER PIPE

SPECIAL REQUIREMENTS WHEN REQUIRED SEPARATION BETWEEN WATER MAINS AND SANITARY SEWERS/FORCE MAINS CANNOT BE MET

5 WATER AND SEWER PIPE SEPARATION REQUIREMENTS
SCHEMATIC VIEW

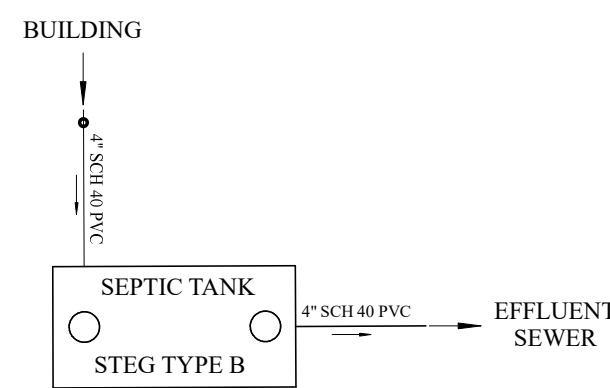
Not To Scale



- NOTES:
1. TRAFFIC RATED CLEANOUTS REQUIRED IN PAVING AND SIDEWALK
 2. CLEANOUTS LOCATED AT THE BUILDING AND EVERY 50'
 3. SEWER LATERALS ARE 4" SCH 40 PVC WITH MINIMUM SLOPE OF 1/4" PER 10'
 4. EFFLUENT SEWER IS 4" SCH 40 PVC WITH MINIMUM SLOPE OF 6" PER 100'. SUPPLEMENTAL CLEANOUTS AS INDICATED ON SITE PLAN

6 PVC SEWER PIPING CLEANOUT
SECTION VIEW

Not To Scale



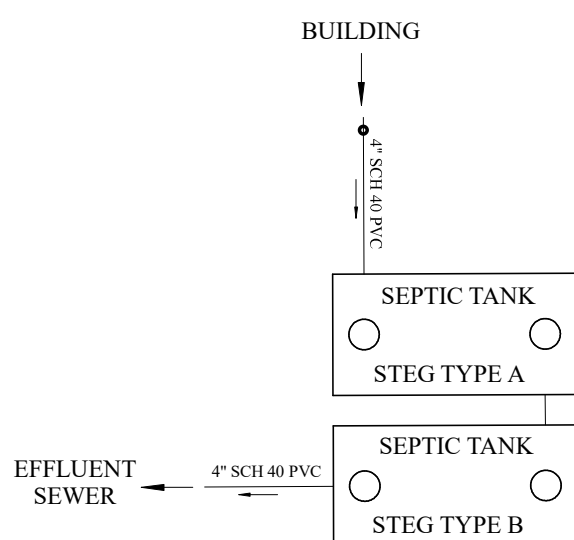
BUILDING	SEPTIC TANK VOLUME	NUMBER
SECURITY	1,000 GALLONS	1
PAVILLION	1,500 GALLONS	1
CLASSROOM COTTAGE 1-4	1,500 GALLONS	1

- NOTES:
1. INLET PER VDH SEWAGE DISPOSAL AND HANDLING REGULATIONS
 2. MID SEAM CONCRETE (TOP SEAM ALLOWED)
 3. HANOVER PRECAST, CP&P, WRIGHT'S READY MIX, OR APPROVED EQUAL
 4. 24" LOCKABLE RISER ON INLET/OUTLET END OF TANK
 5. EFFLUENT FILTER ON OUTLET - ORENCO PSC0621-18

7 STEG TANK LAYOUT 1
TOP VIEW

ONE TANK LAYOUT

Not To Scale



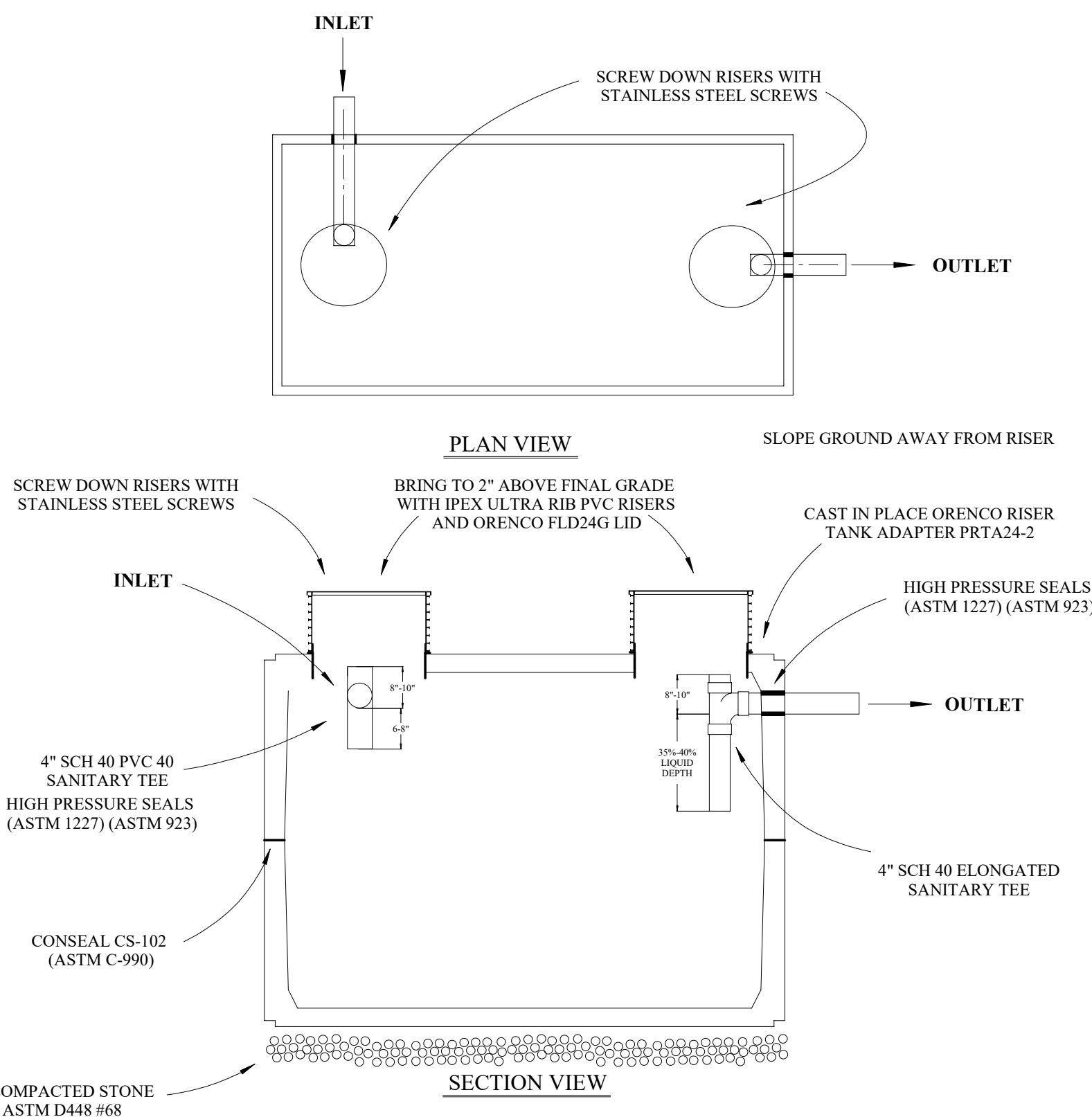
BUILDING	SEPTIC TANK VOLUME	NUMBER
BASE CAMP	1,500 GALLONS	2

- NOTES:
1. INLET/OUTLET PER VDH SEWAGE DISPOSAL AND HANDLING REGULATIONS
 2. MID SEAM CONCRETE (TOP SEAM ALLOWED)
 3. HANOVER PRECAST, CP&P, WRIGHT'S READY MIX, OR APPROVED EQUAL
 4. 24" LOCKABLE RISER ON INLET/OUTLET END OF TANK
 5. EFFLUENT FILTER ON OUTLET - ORENCO PSC0621-18

8 STEG TANK LAYOUT 2
TOP VIEW

TWO TANK LAYOUT

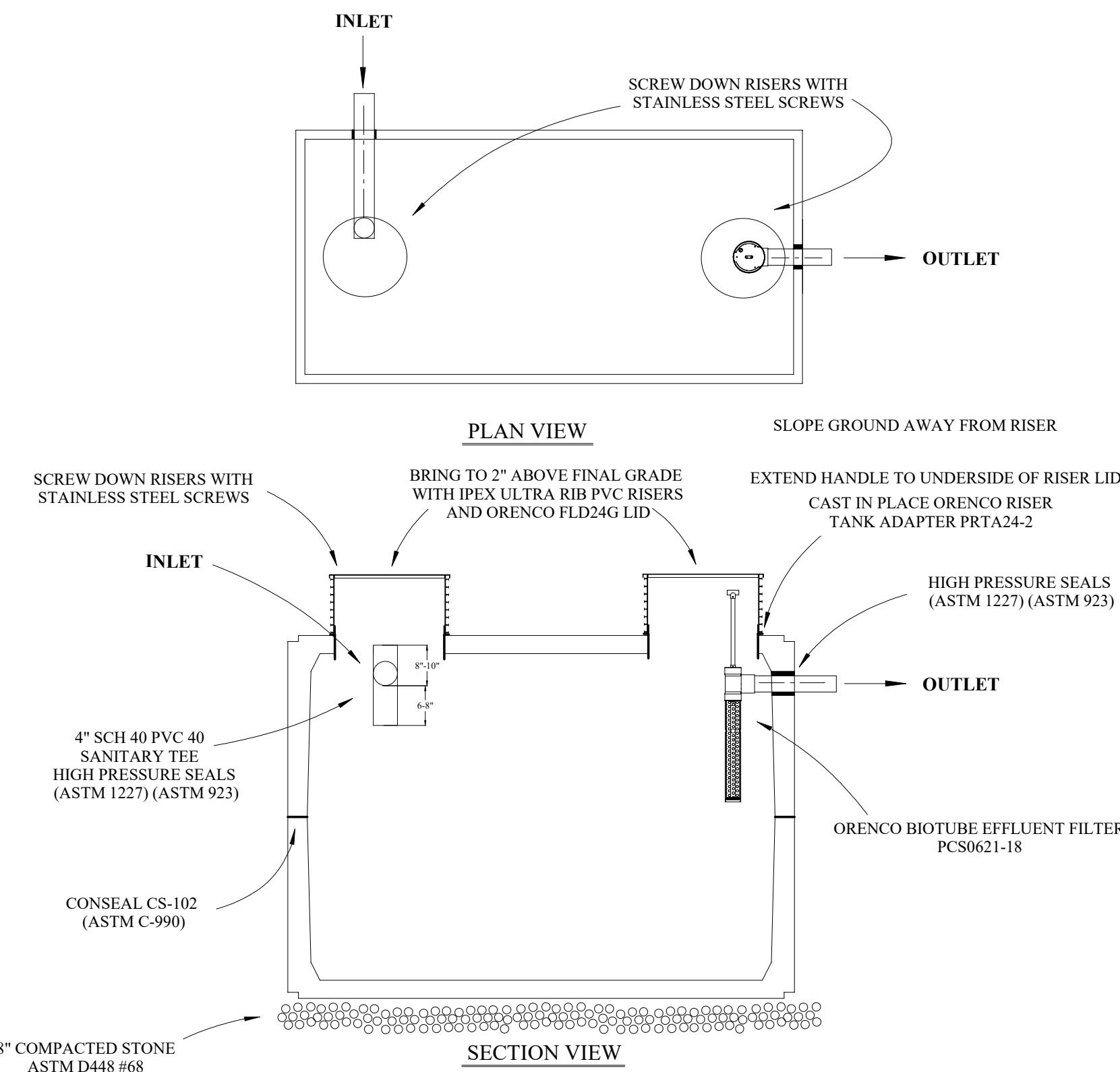
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- NOTES:
1. MID SEAM OR TOP SEAM TANKS ALLOWED
 2. INLET/OUTLET PER VDH SEWAGE DISPOSAL AND HANDLING REGULATIONS
 3. 1" TO 2" FALL FROM INVERT IN TO INVERT OUT OF TANK PIPING
 4. INLET/ OUTLET PIPING WITH 4" BOOT SEAL MEETING ASTM 1227 AND 923
 5. 24" DIAMETER ULTR-RIB IPEX RISER AND ORENCO DURAFIBER FLD ACCESS LID (FLD24G) ON INLET AND OUTLET
 6. TANK BURIAL TO NOT EXCEED PRECASTER RATING
 7. IF TANK IS LOCATED IN PAVEMENT/DRIVE IT MUST BE H20 LOAD RATED WITH CAST IRON RISER/LID.

9 SEPTIC TANK TYPE A
SECTION VIEW/TOP VIEW 1500 GALLON MID SEAM CONCRETE TANK

Not To Scale



- NOTES:
1. MID SEAM OR TOP SEAM TANKS ALLOWED
 2. INLET PER VDH SEWAGE DISPOSAL AND HANDLING REGULATIONS
 3. OUTLET WITH ORENCO PCS BIOTUBE EFFLUENT FILTER (PSC0621-18)
 4. 1" TO 2" FALL FROM INVERT IN TO INVERT OUT OF TANK PIPING
 5. INLET/OUTLET PIPING WITH 4" BOOT SEAL MEETING ASTM 1227 AND 923
 6. 24" DIAMETER ULTR-RIB IPEX RISER AND ORENCO DURAFIBER FLD ACCESS LID (FLD24G) ON INLET AND OUTLET
 7. TANK BURIAL TO NOT EXCEED PRECASTER RATING
 8. IF TANK IS LOCATED IN PAVEMENT/DRIVE IT MUST BE H20 LOAD RATED WITH CAST IRON RISER/LID.

10 SEPTIC TANK TYPE B
SECTION VIEW/TOP VIEW 1000/1500 GALLON MID SEAM CONCRETE TANK

Not To Scale

VDH REVIEW SET
NOT FOR CONSTRUCTION

VDH HDID: PENDING
DATED: PENDING

1326013

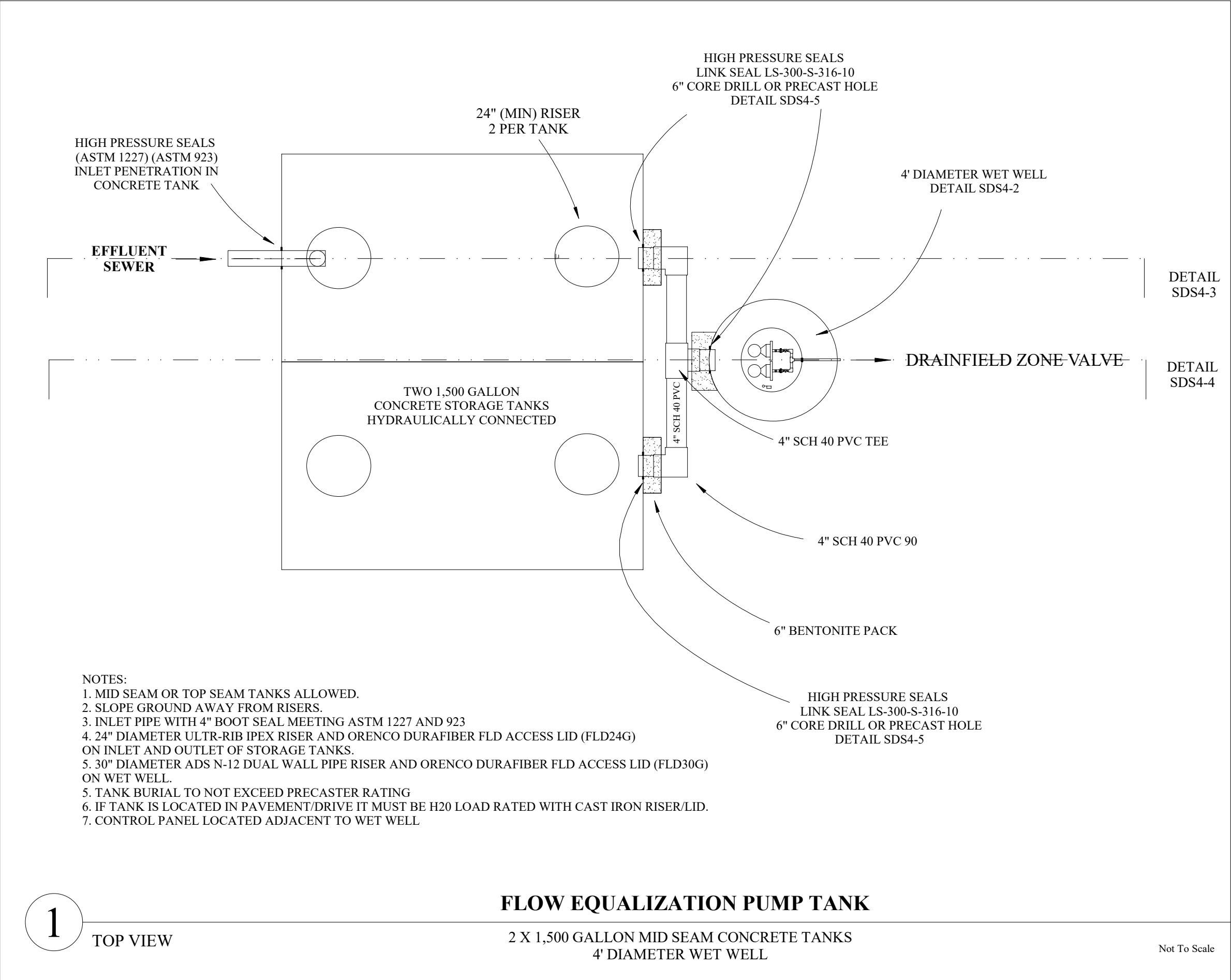
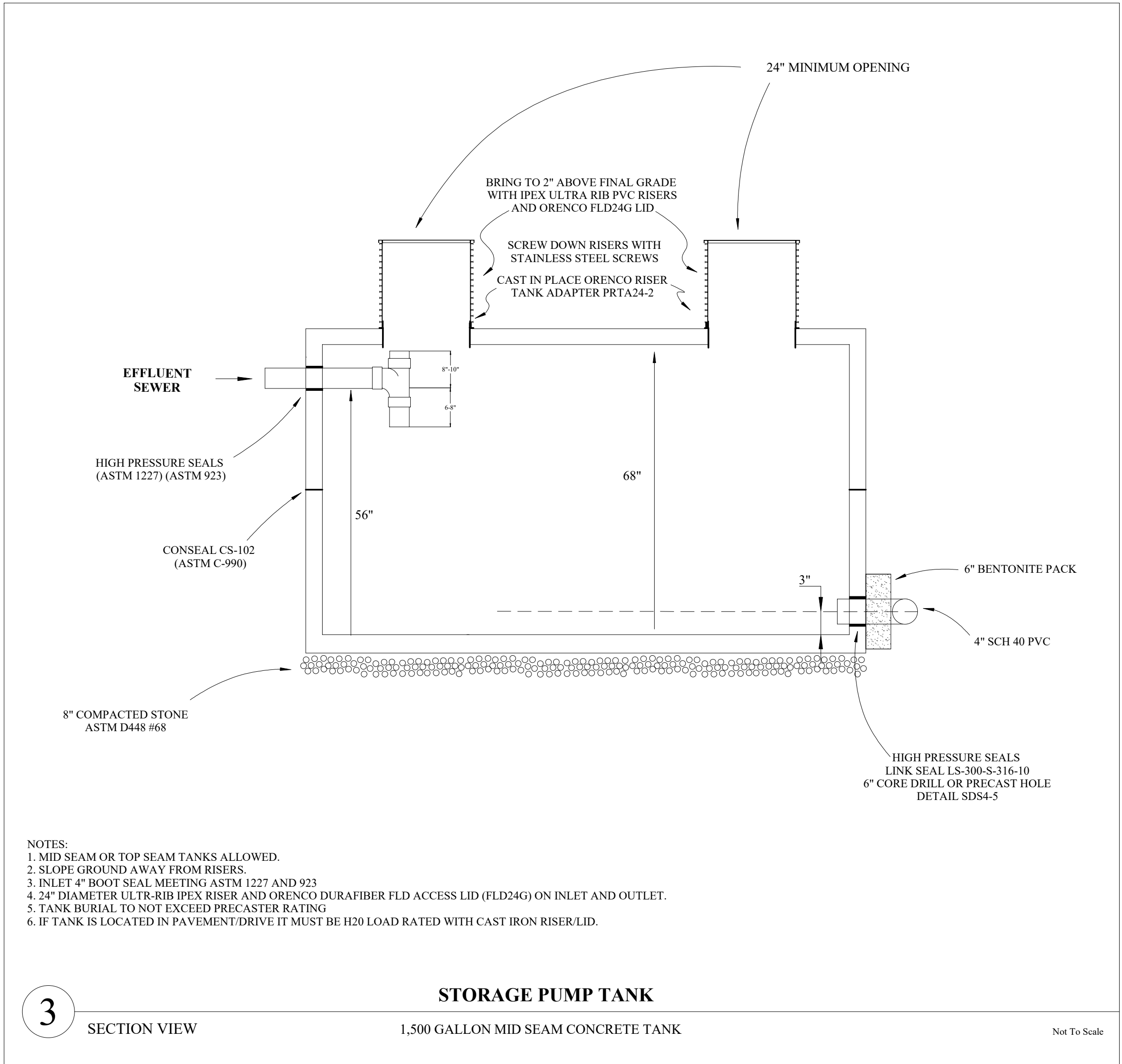
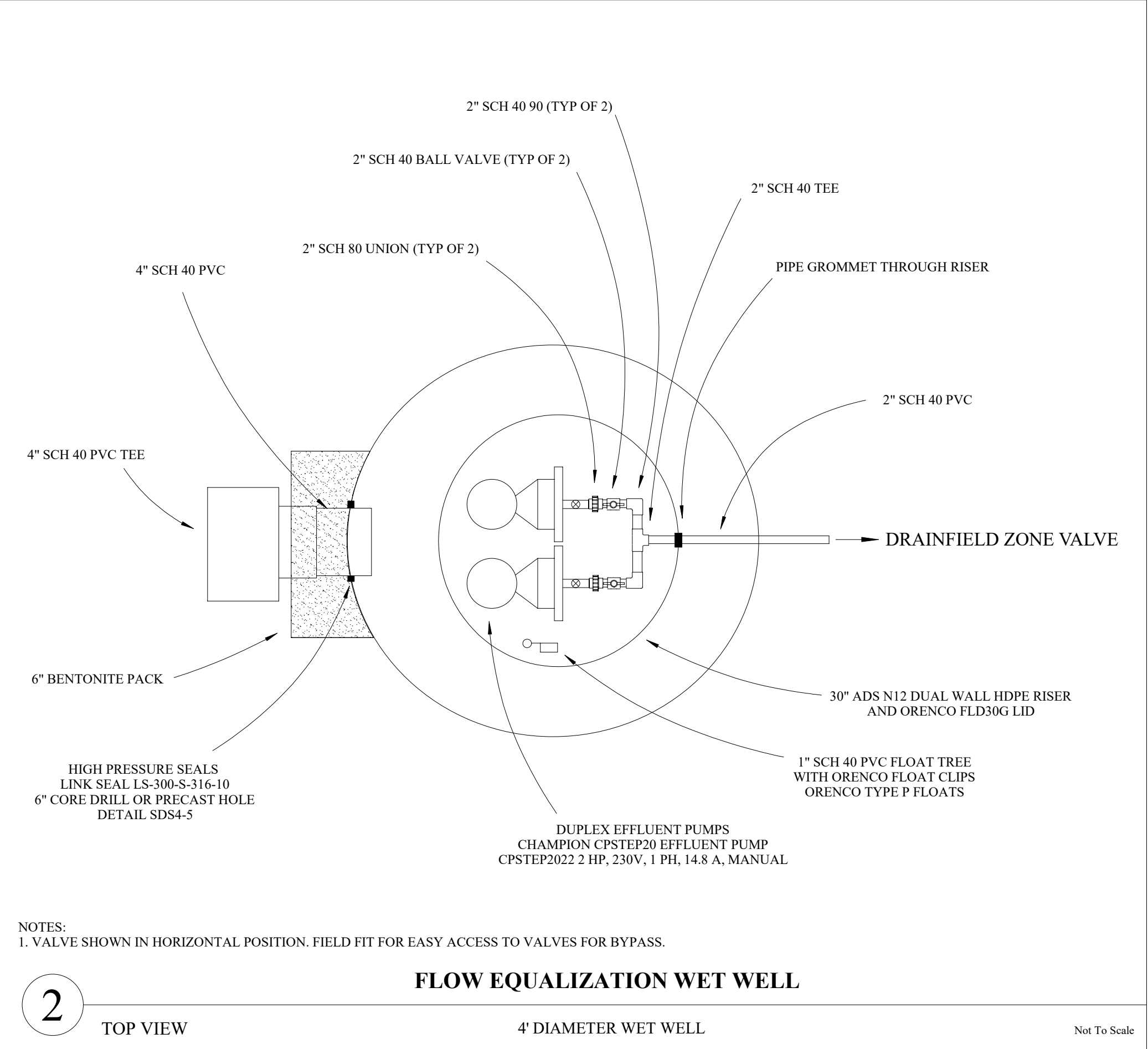
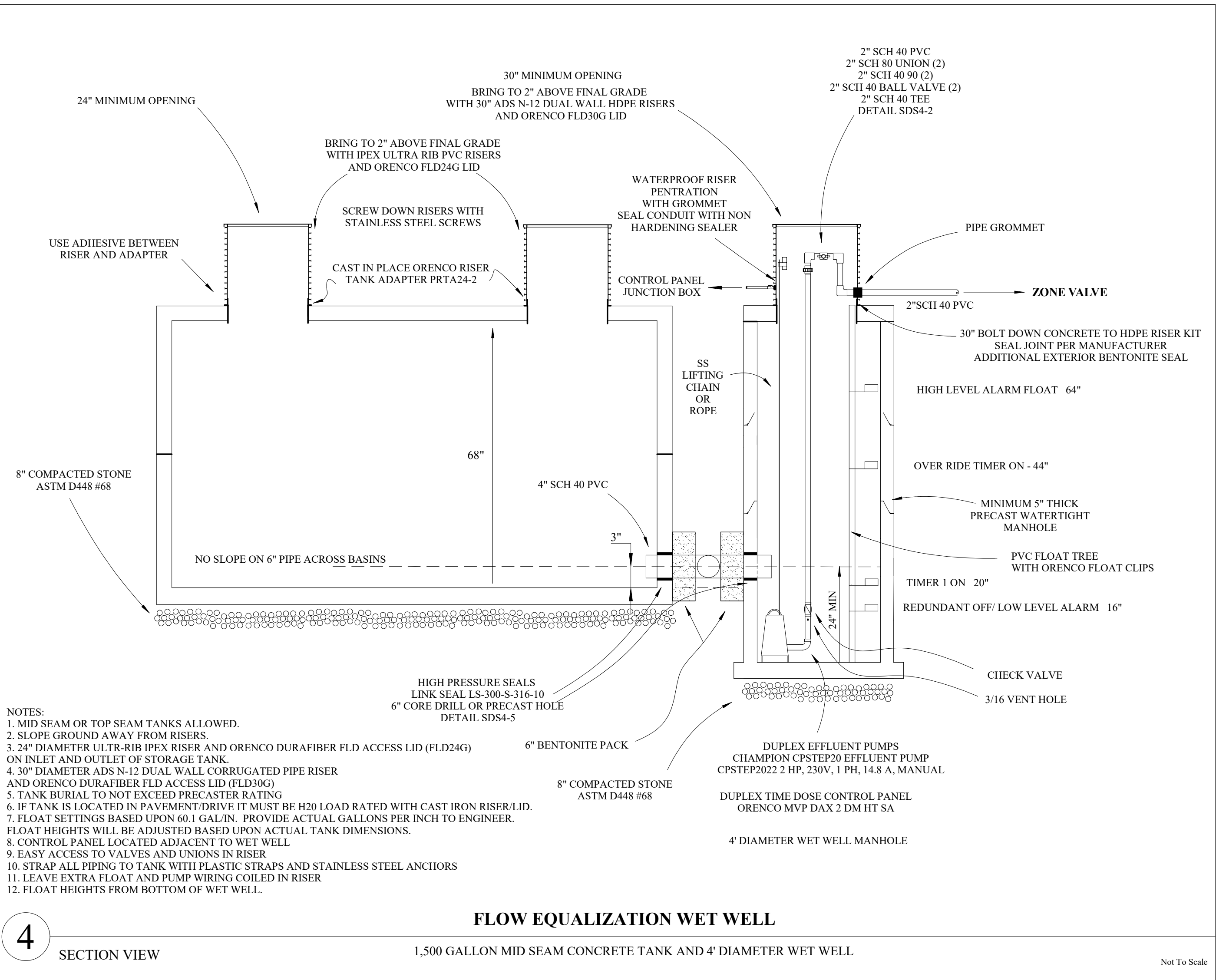
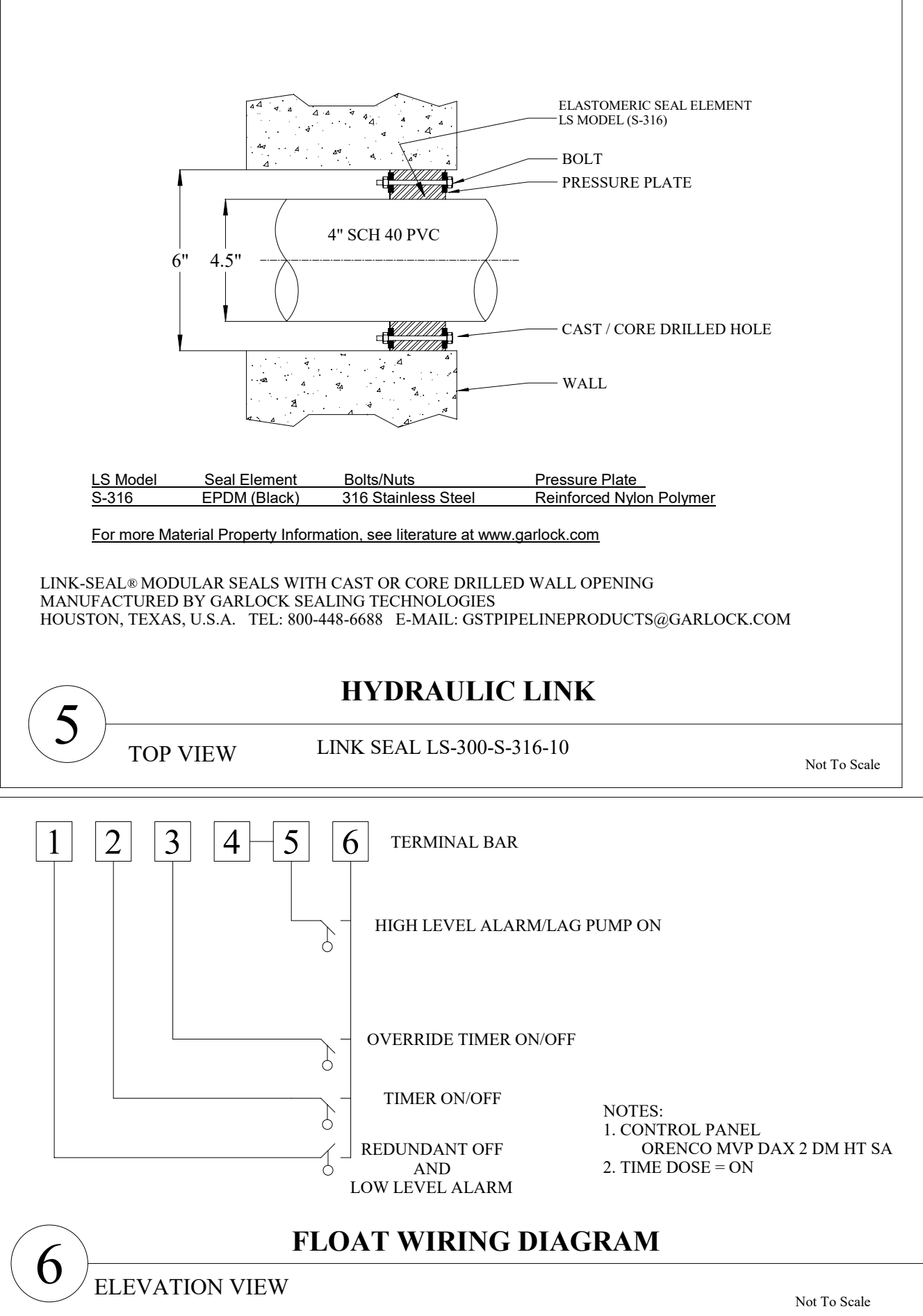
SEPTIC SYSTEM DETAILS 1
CBI FOREST SCHOOL
NEW SEPTIC SYSTEM



Old Dominion Engineering
366 S Linden Avenue Waynesboro, Virginia 22980
(540) 942-5600 ode@olddominionengineering.com

3/30/26

SDS3



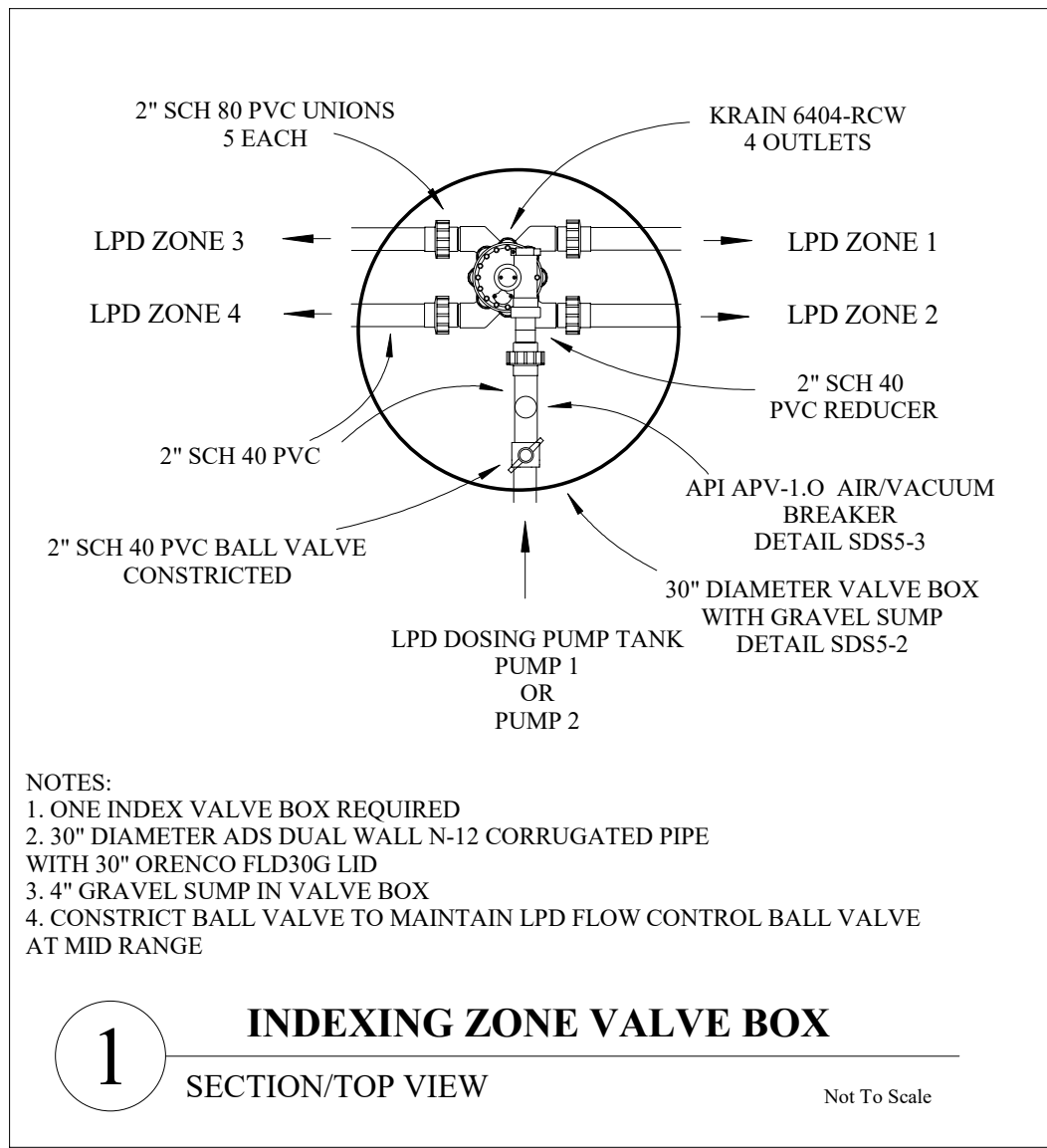
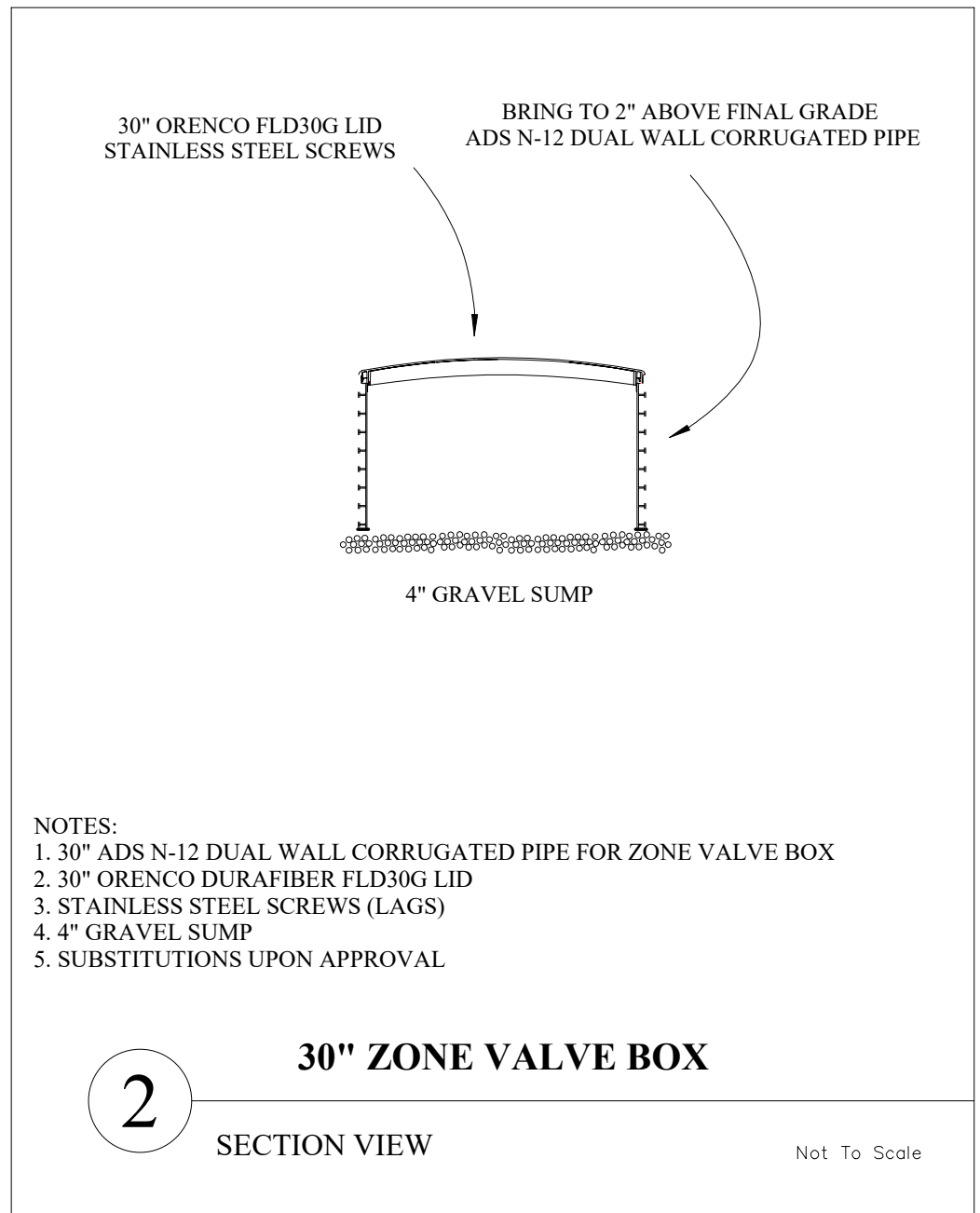
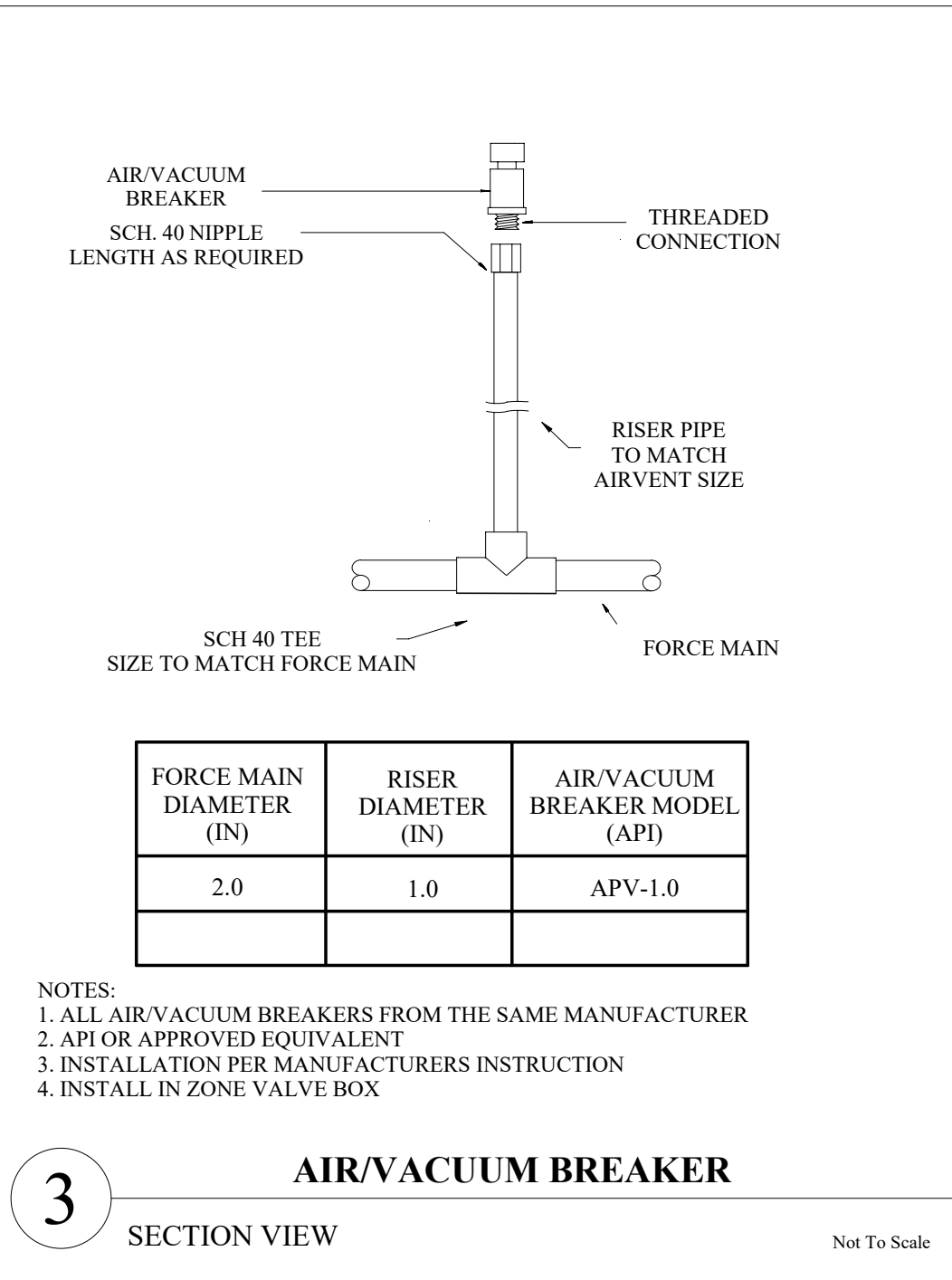
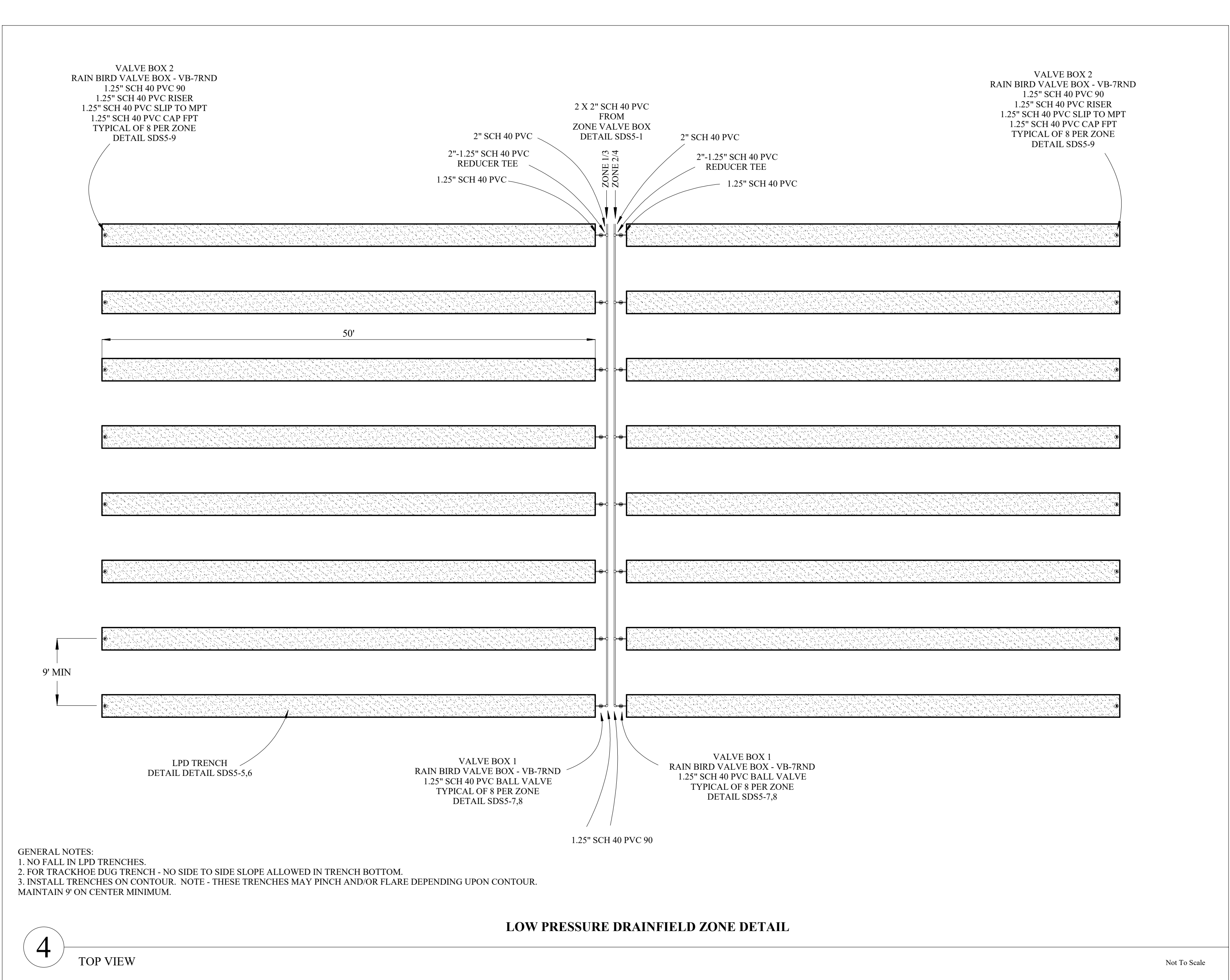
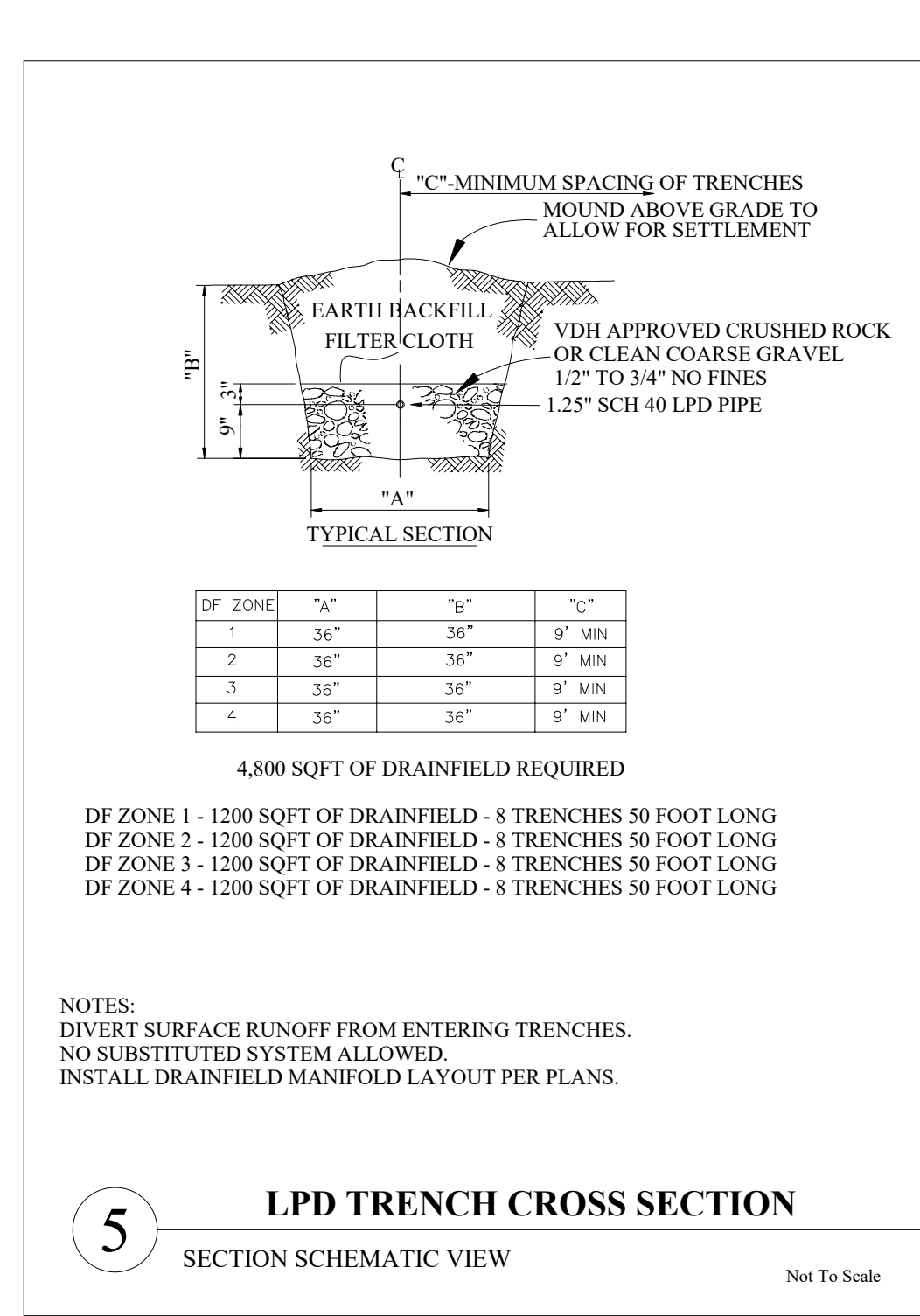
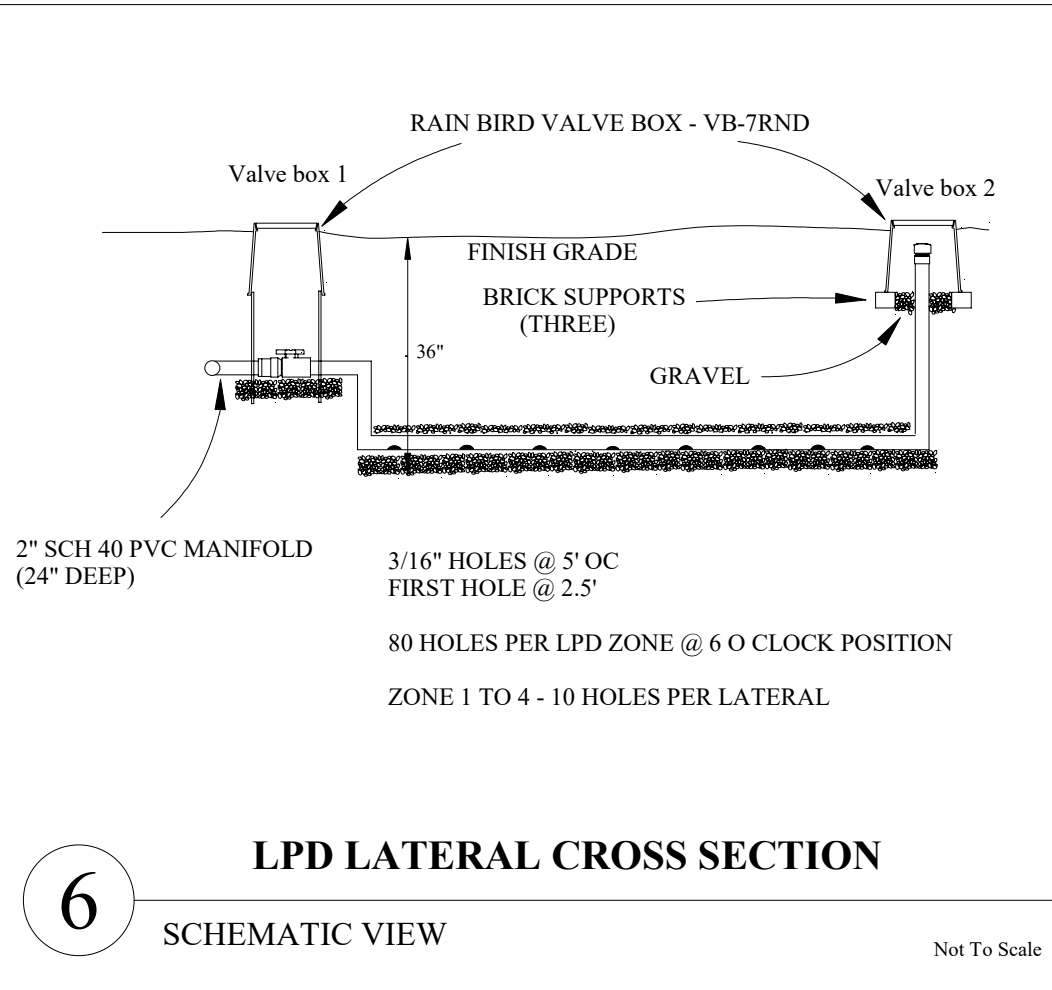
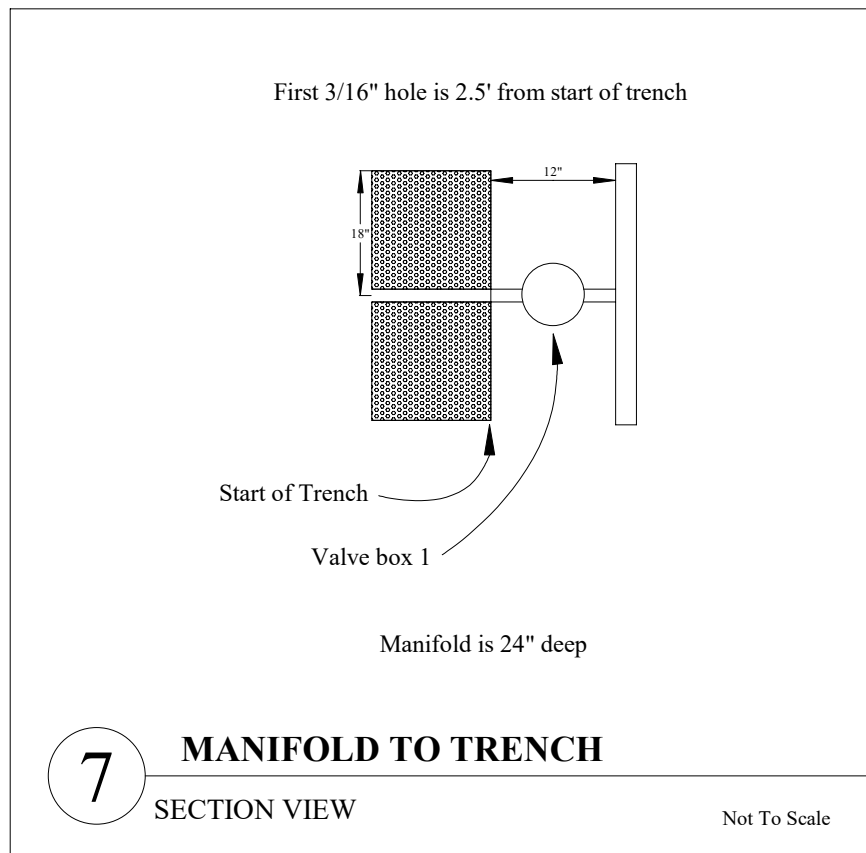
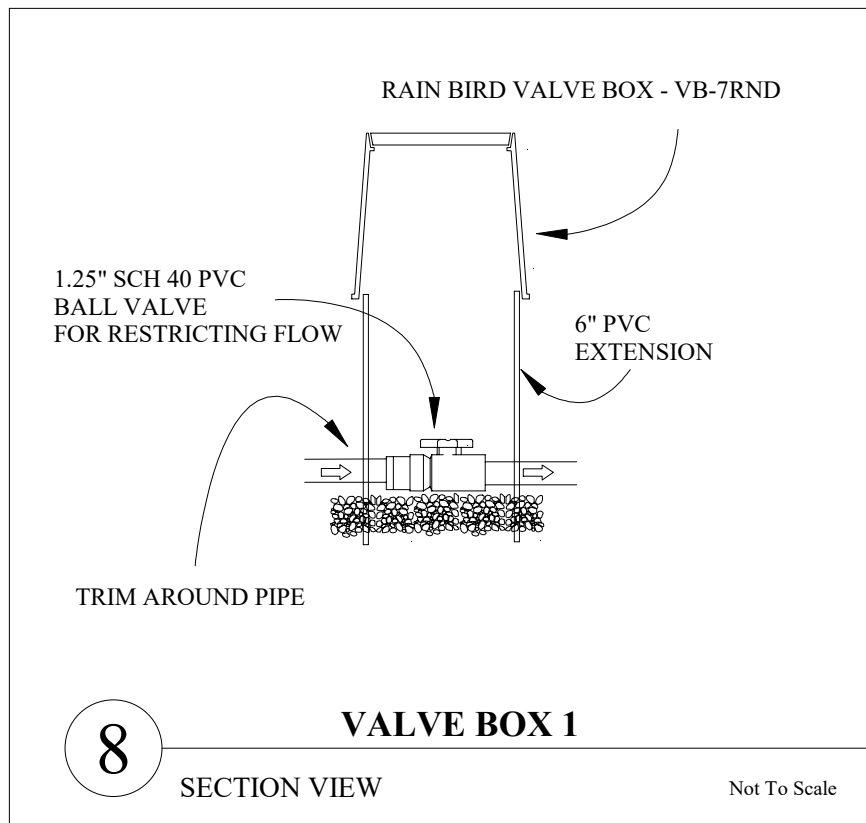
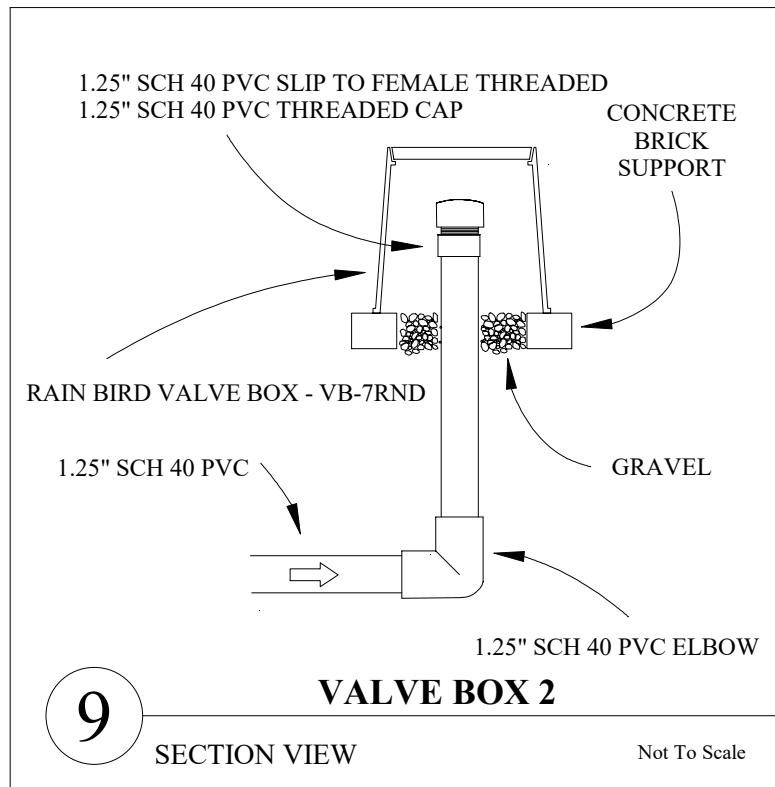
VDH REVIEW SET NOT FOR CONSTRUCTION	VDH HDID: PENDING DATED: PENDING	1326013
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DISPERSAL SYSTEM DETAILS 1
CBI FOREST SCHOOL
NEW SEPTIC SYSTEM



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3/30/26
SDS4



VDH REVIEW SET
NOT FOR CONSTRUCTION

VDH HDD: PENDING
DATED: PENDING

1326013

DISPERSAL SYSTEM DETAILS 2
CBI FOREST SCHOOL
NEW SEPTIC SYSTEM



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3/30/26
SDS5

Operation/Maintenance Manual

Sewage Disposal System Design

March 30, 2026

CBI Forest School

TBD Dudley Mountain Road, Charlottesville, VA 22903

TM 89-64

155.957 Acres

Albemarle County

Contact:

Congregation Beth Israel Forest School

301 East Jefferson Street Charlottesville, VA 22902

Contents:

Operational Checklists

Installation/Operation/Maintenance Manuals

- Orenco Biotube Effluent Filter (PSCS0621-18)
- Orenco MVP-DAX 2 DM HT SA Panel – Time Dose
- Orenco Floats Type P
- Champion Effluent Pump CPSTEP2022

VDH Completion Statement (To be added at completion)

Old Dominion Engineering

366 S. Linden Avenue

Waynesboro, VA 22980

(540) 942-5600

Email: ode@olddominionengineering.com



12VAC5-613-140. Owner responsibilities.

It is the owner's responsibility to do the following:

1. Have the AOSS operated and maintained by an operator;
2. Have an operator visit the AOSS at the frequency required by this chapter;
3. Have an operator collect any samples required by this chapter;
4. Keep a copy of the log provided by the operator on the property where the AOSS is located in electronic or hard copy form, make the log available to the department upon request, and make a reasonable effort to transfer the log to any future owner;
5. Follow the O&M manual and keep a copy of the O&M manual in electronic or hard copy form for the AOSS on the property where the AOSS is located, make the O&M manual available to the department upon request, and make a reasonable effort to transfer the O&M manual to any future owner; and
6. Comply with the onsite sewage system requirements contained in local ordinances adopted pursuant to the Chesapeake Bay Preservation Act (§ 10.1-2100 et seq. of the Code of Virginia) and the Chesapeake Bay Preservation Area Designation and Management Regulations (9VAC10-20) when an AOSS is located within a Chesapeake Bay Preservation Area.

The owner of each AOSS shall have that AOSS visited by an operator in accordance with Table 4.

Table 4
Minimum Operator Visit Frequency for AOSSs up to 40,000 GPD

Avg. Daily Flow	Initial Visit	Regular visits following initial visit
≤ 1,000 GPD	Within 180 calendar days of the issuance of the operation permit	Every 12 months
> 1,000 GPD to 10,000 GPD	First week of actual operation	Quarterly
>10,000 GPD to 40,000 GPD	First week of actual operation	Monthly

12VAC5-613-120. Operator responsibilities.

A. Whenever an operator performs a visit that is required by this chapter or observes a reportable incident, he shall document the results of that visit in accordance with 12VAC5-613-190 or as otherwise specified in the operation permit.

B. Whenever an operator performs a visit that is required by this chapter, he shall do so in such a manner as to accomplish the various responsibilities and assessments required by this chapter through visual or other observations and through laboratory and field tests that are required by this chapter or that he deems appropriate.

C. Each operator shall keep an electronic or hard copy log for each AOSS for which he is responsible. The operator shall provide a copy of the log to the owner. In addition, the operator shall make the log available to the department upon request. At a minimum, the operator shall record the following items in the log:

1. Results of all testing and sampling;
2. Reportable incidents;
3. Maintenance, corrective actions, and repair activities that are performed other than for reportable incidents;
4. Recommendations for repair and replacement of system components;
5. Sludge or solids removal; and
6. The date reports were given to the owner.

D. When performing activities pursuant to a visit that is required by this chapter, the operator is responsible for the entire AOSS, including treatment components and soil treatment area components and the operator shall follow the approved O&M manual.

Statutory Authority

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 22903

Service provided on: Date: _____ Time: _____ Project #: _____

Service provided by: Company: _____ Employee: _____

Date of last service/inspection: _____ by: ☐ ODE ☐ Other: _____

1. Surface water management	1. ☐ Acceptable ☐ Unacceptable
a. Is surface water effectively managed/diverted away from the site. Yes ____ No ____	
b. Is surface water effectively diverted away from system and components. Yes ____ No ____	
c. Evaluate the presence of odor within 10 ft of perimeter of the system: ☐ None ☐ Mild ☐ Strong ☐ Sour ☐ Chemical	
d. Source of odor, if present: _____	
e. Are the system components free from settling or erosion. Yes ____ No ____	
2. Subsurface water management (LGMI)	2. ☐ Acceptable ☐ Unacceptable ☐ N/A
a. Type: ☐ Gravity ☐ Pump ☐ None present	
b. Outlet open to drainage. Yes ____ No ____	
c. Rodent guard on outlet. Yes ____ No ____	
d. Sump pump working. Yes ____ No ____	
e. Outlet for sump pump discharge. Yes ____ No ____	
3. System encroachment	3. ☐ Acceptable ☐ Unacceptable
a. Is the system free from encroachment. Yes ____ No ____	
☐ Driveways ☐ Utility easements ☐ Patios ☐ Decks ☐ Livestock	
☐ Gardening ☐ Vehicular traffic ☐ Construction ☐ Pets ☐ Other: _____	
b. Is the reserve area free from encroachment. Yes ____ No ____	
☐ Driveways ☐ Utility easements ☐ Patios ☐ Decks ☐ Livestock	
☐ Gardening ☐ Vehicular traffic ☐ Construction ☐ Pets ☐ Other: _____	
4. Vegetation and soils	4. ☐ Acceptable ☐ Unacceptable
a. Trees in distribution field. Yes ____ No ____	
Type(s): _____	
Location(s): _____	
b. Excessive vegetation. Yes ____ No ____	
Location(s): _____	
c. Uneven vegetation. Yes ____ No ____	
Location(s): _____	
d. Poor vegetation. Yes ____ No ____	
Location(s): _____	
Soil fertility and salinity sampling (if required). Yes ____ No ____	
5. Groundwater monitoring wells (if applicable)	5. ☐ Acceptable ☐ Unacceptable ☐ N/A
a. Present. Yes ____ No ____	
b. Wells accessible. Yes ____ No ____	
c. Wells intact. Yes ____ No ____	
d. Wells properly protected. Yes ____ No ____	
e. Labels and tags in place. Yes ____ No ____	
Groundwater sampling (if required). Yes ____ No ____	
6. Corrective Action Required: _____	

7. Photographs Taken? (Attach to report if yes) Yes ____ No ____	

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 229031. Type/Description: **Septic Tanks (STEG System)**

2. Conditions at the tank

- a. Evaluate presence of odor within 10 ft of perimeter of system:

☐ None ☐ Mild ☐ Strong ☐ Chemical ☐ Sour

- b. Source of odor, if present: _____

3. Tank description

- a. Material:
- Concrete – Mid Seam**

- b. Capacity:
- 1000 Gallon and 1500 Gallon Tanks**

- c. Compartmented:
- No**

- d. Capacities for compartmented system: 1) _____ gal 2) _____ gal

4. Tank access

- a. Access location:
- Inlet/Outlet**

- b. Located at grade.
- Yes**

- c. If 'No', how deep is lid buried. _____

- d. Evidence of infiltration in risers. Yes _____ No _____

- e. Lids securely fastened. Yes _____ No _____

- f. Lid in operable condition. Yes _____ No _____

5. Alarm(s)

- a. Alarm(s) present. Yes _____ No _____

- b. Audio alarm operational. N.A. _____ Yes _____ No _____

- c. Visual alarm operational. N.A. _____ Yes _____ No _____

- d. Remote telemetry operational. N.A. _____ Yes _____ No _____

- e. Electronic monitoring operational. N.A. _____ Yes _____ No _____

6. Current tank operating conditions

- a. Liquid level relative to outlet: _____ in

☐ At ☐ Above ☐ Below

- b. Maximum liquid level of tank (invert of inlet pipe): _____ in

- c. Height at which alarm is activated as measured from invert of inlet: _____ in

- d. Evidence liquid level has been higher. Yes _____ No _____

- e. Evidence liquid level dropped without pumping. Yes _____ No _____

- f. Evidence of continuous inflow. Yes _____ No _____

- g. Date of last pump out: _____

- h. Presence of flocculant in clear zone. Yes _____ No _____

- i. Evaluation of layers in tank:

NOTES

- 2.
- ☐
- Acceptable
-
- ☐
- Unacceptable

- 4.
- ☐
- Acceptable
-
- ☐
- Unacceptable

- 5.
- ☐
- Acceptable
-
- ☐
- Unacceptable
-
- ☐
- N/A

- 6.
- ☐
- Acceptable
-
- ☐
- Unacceptable

Tank Number	Scum (in)		Clear Zone (in)		Sludge (in)		Odor	Other
	Depth	Color*	Depth	Color	Depth	Color		
Base Camp T1								1500 gal
Base Camp T2								1500 gal
Pavillion								1500 gal
Guard House								1000 gal
Classroom Cottage 1								1500 gal
Classroom Cottage 2								1500 gal
Classroom Cottage 3								1500 gal
Classroom Cottage 4								1500 gal

*Color Choices: ☐ Clear ☐ Flocced ☐ Milky ☐ Muddy ☐ Grainy
☐ Black ☐ Brown ☐ Mustard ☐ Gray ☐ White

7. Tank pumping recommended. Yes____No____

8. Baffles currently structurally sound. Yes____No____

a. Inlet baffle in place. Yes____No____

b. Outlet baffle in place. Yes____No____

c. Compartment baffle in place. N.A.____ Yes____No____

d. Effluent Filter **Orengo PSCS0621-18**

e. Is Filter accessible from ground surface. Yes____No____

f. If Filter, percent plugged: _____%

g. Was Filter cleaned. Yes____No____

9. Tank structural condition (evaluate if tank pumped): N.A.____

a. Appears to be watertight (no visual leaks). Yes____No____

b. Rebar exposed. Yes____No____

c. Corrosion present. Yes____No____

d. Spalling present. Yes____No____

e. Cracks present. Yes____No____

f. Root intrusion. Yes____No____

g. Deflection noted. N.A.____ Yes____No____

10. Contractor responsible for pumping: _____

a. Gal removed:_____ Date:_____

11. Lab samples collected for monitoring. Yes____No____

Types of analysis:_____

12. Corrective Actions Required. Yes____No____

8. ☐ Acceptable
☐ Unacceptable

9. ☐ Acceptable
☐ Unacceptable

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 22903

1. Type: **LPD Dose Pump Tank****NOTES**

2. Conditions at the pump tank

- a. Evaluate presence of odor within 10 feet of perimeter of system:
☐ None ☐ Mild ☐ Strong ☐ Chemical ☐ Sour

b. Source of odor, if present: _____

3. Tank description

- a. Material: **Concrete Mid Seam**
 b. Capacity: **2 X 1500 Gallons + 4' Diam Wet Well**
 c. Operational depth: **77 in**
 d. Gallons per inch (GPI): **26.13 x 2 + 7.83 = 60.1**

4. Tank access

- a. Access location: **Ionlet/Outlet**
 b. Located at grade. Yes____No____
 c. If 'No', how deep is lid buried. _____
 d. Risers on tank. Yes____No____
 e. Evidence of infiltration in risers. Yes____No____
 f. Lids securely fastened. Yes____No____
 g. Lid in operable condition. Yes____No____

5. Current tank operating conditions

- a. Liquid level relative to outlet: _____ in
☐ At ☐ Above ☐ Below
 b. Maximum liquid level of tank (invert of inlet pipe): _____ in.
 c. Height at which alarm is activated as measured from top of maximum liquid level: _____ in
 d. Evidence liquid level has been higher. Yes____No____
 e. Evidence liquid level dropped without pumping. Yes____No____
 f. Evidence of continuous inflow. Yes____No____
 g. Date of last pumpout: _____

6. Pump

- a. Pull chain or rope present. Yes____No____

7. Discharge assembly:

- a. Backflow prevention (check valve) present. Yes____No____
 b. Quick disconnect present. Yes____No____
 c. Isolation valve present. Yes____No____
 d. Inline filters present. Yes____No____

8. Electrical components sealed and watertight. N.A.____ Yes____No____

9. Tank structural condition (evaluate if tank pumped): N.A.____

- a. Appears to be watertight (no visual leaks). Yes____No____
 b. Rebar exposed. Yes____No____
 c. Corrosion present. Yes____No____
 d. Spalling present. Yes____No____
 e. Cracks present. Yes____No____
 f. Root intrusion. Yes____No____

10. Solids accumulation:

Tank	Scum (in)	Sludge (in)	Odor	Color	Other
1					1500 gal
2					1500 gal
Wet Well					600 gal

11. Tank pumping recommended. Yes____No____

12. Contractor responsible for pumping: _____

a. Gal removed: _____ Date: _____

13. Lab samples collected for monitoring. Yes____No____

Types of analysis: _____

2. ☐ Acceptable
☐ Unacceptable3. ☐ Acceptable
☐ Unacceptable4. ☐ Acceptable
☐ Unacceptable5. ☐ Acceptable
☐ Unacceptable6. ☐ Acceptable
☐ Unacceptable7. ☐ Acceptable
☐ Unacceptable8. ☐ Acceptable
☐ Unacceptable9. ☐ Acceptable
☐ Unacceptable

Operational Checklist: Time Dose Pump

Page ____ of ____

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 22903

Pump Type: **Champion Effluent Pump – CPSTEP2022**

1. Controls : **Orenco MVP DAX 2 DM HT SA**

- Is enclosure watertight. Yes____No____
- Alarm test switch working properly. Yes____No____
- At time of inspection, timer was set at: "On"____
"Off"____
- At time of inspection, control switch (HAND-OFF-AUTO) was set at:
"Hand/Manual"____
"Off"____
"Auto"____
- If timer was changed from above, new setting is: "On"____
"Off"____

f. Panel Readings:

	Reading (this)	Reading (last)	Difference	N.A.
Float Status				
Pump Cycles				
Pump Run Time				
High Level Alarm				
Low Level alarm				
Override Cycles				
Timer Float Events				
Power Faults				
Time in Service				

Calculate Average cycles/day:

- Pump Cycles (this) - Pump Cycles (last) = _____
- {Time in Service (this) hrs - Time in Service (last) hrs} ÷ 24 = _____
- a ÷ b = _____ [CPD]

- ☐ Acceptable
☐ Unacceptable

- ☐ Acceptable
☐ Unacceptable

- ☐ Acceptable
☐ Unacceptable

2. Pump

- Pump operating properly. Yes____No____
- Type of pump: **Submersible Effluent**
- Amps measured: _____amps
- Voltage measured: _____volts
- Pump turns on/turns off. Yes____No____

3. Water level sensors

- Type of water level sensor: **Floats**
- Pump sensors functioning properly. Yes____No____
- Alarm sensor operating audible and visible alarms. Yes____No____

4. Sensor settings:

Sensor Number*	Function	Operational	Set At:		Secured
			Inches**	Datum	
1	Redundant Off	Yes____No____	16		Yes____No____
2	Timer 1 On/Off	Yes____No____	20		Yes____No____
3	Timer 2 On/Off	Yes____No____	44		Yes____No____
4	High Level Alarm/Lag On	Yes____No____	64		Yes____No____
5		Yes____No____			Yes____No____

*(Designate starting from bottom of tank)

** Measurements are taken from a fixed point ("Datum") near the surface or bottom of float tree in inches)

5. Pump delivery rate (PDR) (measured)

- Pump Off_____ - Pump On _____ = _____in
- GPI: _____

Operational Checklist: Time Dose Pump

Page ____ of ____

- c. Verified pump run time: _____ min
(_____ In x _____ GPI) ÷ Pump run time (min) = _____ (GPM)
6. Dose volume (DV) (from timer setting)
a. Pump delivery rate: _____ GPM (from Item 5)
b. Verified pump run time: _____ min
_____ GPM x _____ min/cycle = _____ (DV[Gal/ cycle])
7. Total gallons (from elapsed time meter)
a. [_____ (PTR) - _____ (LTR)] x _____ (GPM) = _____ Total Gal
OR Total gallons (from event/cycle counter)
[_____ (PCR) - _____ (LCR)] x _____ (DV) = _____ Total Gal
8. Gallons per day (GPD)
_____ Total gal ÷ _____ No of days = _____ Gal./Day (GPD)

CPD: cycles per day

DV: dose volume

ETM: elapsed time meter

GPD: gallons per day

GPI: gallons per inch

GPM: gallons per minute

HAND-OFF-AUTO: Hand-Off-Auto Switch

LCR: last cycle reading

LTR: last time reading

PCR: present cycle reading

PDR: pump delivery rate

PTR: present time reading

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 22903

1. Effluent quality: **STE**

Type of low-pressure drainfield: **Low-Pressure Trenches**

NOTES

2. Conditions at the LPD

- a. Topography: Sloping: 11-15 % slope
- b. Evaluate presence of odor within 10 ft of perimeter of system:
☐ None ☐ Mild ☐ Strong ☐ Chemical ☐ Sour
- c. Source of odor, if present: _____
- d. Indications of leaks around/above system. Yes____No____
- e. Vegetation appropriate. Yes____No____
- f. Excessive vegetative growth. Yes____No____
- g. Vegetation adequately maintained. Yes____No____
- h. Preventing accessibility for maintenance. Yes____No____

- 2. ☐ Acceptable
- ☐ Unacceptable

3. Supply line

- a. Line drains freely. Yes____No____
- b. Ponding or saturation present along parts of the supply line. N/A____Yes____No____
- c. Air relief(s) valve operating. N/A____Yes____No____

- 3. ☐ Acceptable
- ☐ Unacceptable

4. Switching valves

- a. Switching valve present. Yes____No____
- b. Type of valve: **KRAIN 6404 RCW**
- c. Operating properly. Yes____No____
- d. Action taken if not: _____
- e. Laterals/zones in operation: _____

- 4. ☐ Acceptable
- ☐ Unacceptable

Operational Checklist: Low Pressure Drainfield

5. Soil treatment area information:

[illegible]

Operational Checklist: Low Pressure Drainfield

Page ____ of ____

6. Orifices

a. Position: **6 o'clock**

b. Orifices cleaned. Yes____No____

c. Method: ☐ Hydrojetted ☐ Bottlebrushed

☐ Flushed ☐ Other:_____

7. Elevated system: N/A_____

a. Surfacing effluent present. Yes____No____

8. Lab samples collected for monitoring. Yes____No____

Types of analysis:_____

6. ☐ Acceptable

☐ Unacceptable

7. ☐ Acceptable

☐ Unacceptable

System: CBI Forest School TM 89-64 TBD Dudley Mountain Rd Charlottesville, VA 22903

Effluent Testing Location: **LPD Dose Pump Tank**

1. Operational Testing

- a. pH: _____
- b. Temp: _____
- c. DO: _____
- d. Turbidity: _____

2. Lab samples collected for monitoring. Yes____No____

Types of analysis:

BOD Yes____No____

3. Sample frequency:

BOD – Optional

3. Effluent Limits:

Average Flow < 1750 gpd

STE (BOD<220 mg/l)

1. ☐ Acceptable
☐ Unacceptable

2. ☐ Acceptable
☐ Unacceptable

Installation/Operation/Maintenance Manuals

The following equipment installation, operation, maintenance, and service manuals can be found on the listed websites.

Installation/Operation/Maintenance/Service Manuals

- Orenco Biotube Effluent Filter (PSCS0621-18)- www.orenco.com
- Orenco MVP-DAX 2 DM HT SA Panel – Time Dose – www.orenco.com
- Orenco Floats Type P - www.orenco.com
- Champion Effluent Pump CPSTEP2022 - www.championpump.com



COMMONWEALTH of VIRGINIA

DEPARTMENT OF HEALTH
OFFICE OF DRINKING WATER
Lexington Field Office

131 Walker Street
Lexington, VA 24450
Phone: 540-463-7136

SUBJECT: Albemarle County
Waterworks: CBI Forest School
PWSID No: 2003000 (pending)

June 3, 2026

Sent via Electronic Mail

Doug Lowe
CBI Forest School
1365 Crozet Avenue
Crozet, VA 22932

Dear Mr. Lowe:

This letter provides the results of our March 17, 2026, inspection of the proposed well site to serve the CBI Forest School located at 1648 Dudley Mountain Road, performed by Ken Di Guilio, Environmental Health Technical Specialist. In accordance with the *Waterworks Regulations*, the following well sites are tentatively approved by the Virginia Department of Health, Office of Drinking Water (ODW) for the construction of a well(s) to be utilized as a public drinking water supply:

Site 1 (WL001) & Site 2 (WL002)

The approval of the well sites listed above expires 12 months from the date of this letter and is subject to the conditions described in the attached Well Site Approval Conditions Forms. This approval is limited to well drilling, casing, grouting, and testing of the well. If drilling of any wells listed above has not commenced by the expiration date, a re-inspection of the well sites is required.

Upon receipt of the required documentation and after plans and specifications have been approved, a Construction Permit will be issued by the State Health Commissioner in accordance with the *Waterworks Regulations*. Construction of the waterworks facilities shall not be started until the construction permit has been issued.

Some counties require a local well-drilling permit and have other requirements that are in addition to those outlined in this letter or required by the Virginia *Waterworks Regulations*, and it is your responsibility to comply with the local requirements. Please contact the county health department and planning/zoning office before drilling the well.

Doug Lowe
Page 2 of 2

SUBJECT: Albemarle County
Waterworks: CBI Forest School
PWSID No: 2003000 (pending)

Waterworks wells must be constructed by a Water Well Systems Provider certified by the Virginia Department of Professional and Occupational Regulation (DPOR). You may confirm licensure status by contacting DPOR or using the search tool on DPOR's website at the following address:
<http://www.dpor.virginia.gov/LicenseLookup/>.

Construction and development of waterworks wells must follow specific procedures. Please refer to the conditions below and our website at <https://www.vdh.virginia.gov/drinking-water/permits-and-design/well-development-procedures/> for details.

A Preliminary Source Water Assessment (PreSWA) has been compiled for the proposed wells. Attached you will find inventory, maps and summaries of land use and potential sources of contamination within the assessment area of the proposed wells. Please take the time to review this information and contact our office if you have any questions or corrections. This information may be used to generate a Source Water Protection Plan if desired. For assistance developing a Source Water Protection Plan, please contact sourcewater@vdh.virginia.gov.

Upon request, an electronic version of the Preliminary Source Water Assessment information may be emailed to you. If you or your consultant has GIS software, we can also provide a geodatabase to facilitate further work with the data. To learn more about our Source Water Assessment and Protection Programs, as well as eligibility for assistance and funding opportunities to implement source water protection measures, we encourage you to visit our website at the following address: <https://www.vdh.virginia.gov/drinking-water/source-water-programs/source-water-assessment-program/>.

If you have any questions, please contact Ken Di Guilio, Environmental Health Technical Specialist, at ken.diguilio@vdh.virginia.gov or (540) 784-6432.

Sincerely,


boxSIGN 1J7R39R9-18WL7KL2

Steven J. Kvech, PE
Engineering Field Director

SJK/KD/kk/260602-5

Attachments:

Well Approval Conditions Form
Preliminary Source Water Assessments

cc: Mike Craun, Old Dominion Engineering
Blue Ridge Health District
Albemarle County Executive
Albemarle County Building Official

WELL APPROVAL CONDITIONS FORM

Approved Well Sites		WL001	WL002		
Location:	Latitude:	37.98095	37.98075		
	Longitude:	-78.56254	-78.56279		
	Marked:	Pink/Blue Flag	Pink/Blue Flag		
Well Construction Class:	Class II				
Approval Expiration Date:	June 3, 2027 If drilling of the well(s) has not commenced by this date, re-inspection of the well site(s) is required.				
Well Location and Well Lot:	Minimum distance of 50 feet between the well and all potential sources of contamination, property lines, and rights-of-way or easements on the property. Refer to <i>Waterworks Regulations</i> Sections 12VAC5-590-840 D & E. See attached maps for each proposed site.				
	The well lot must be graded as necessary to divert surface run-off from the well and to prevent ponding on the well lot.				
	The well must be located higher than the 100-year flood elevation or a lower elevation may be considered if it can be adequately shown that the well can be protected from flooding.				
Grouting:	Use neat cement grout, in accordance with <i>Waterworks Regulations</i> Section 12VAC5-590-840 G 5. Notify this office of the date and time that the well will be grouted. Provide this information as soon as possible so that a member of our staff may be present during grouting.				
Well Yield and Drawdown Test:	A yield and drawdown test must be run for at least <ul style="list-style-type: none"> • 48 hours. ODW recommends the pumping rate be controlled throughout the test to maximize the production from the well and to produce a stabilized pump water level for at least the last 6 hours of the yield test. Immediately following the yield and drawdown test the water level recovery in the well should be recorded for no less than 6 hours or until the well returns to its static water level, whichever occurs first. If water is discharged into streams during pumping tests, please contact the Department of Environmental Quality Regional Office to determine if a discharge permit is required.				
Simultaneous Testing Required:	Not Applicable				

Required Bacteriological, Chemical, Physical and Radiological Sampling:	<p>A series of twenty bacteriological samples must be collected from the well discharge and submitted to a certified laboratory (DCLS or private laboratory) in order to determine the bacteriological quality of the raw groundwater.</p> <p>One bacteriological sample should be collected at minimum thirty-minute intervals during the last ten hours of the yield and drawdown test.</p>
	<p>Water samples must be collected and analyzed for nitrate + nitrite (combined) and nitrite-N. It is recommended that samples be analyzed for inorganic contaminants and metals also, to determine if water will result in objectionable taste, odor, color, or cause corrosion or calcium build up.</p>
Submittals Required for Review Prior to Issuance of Construction Permit:	<p>Uniform Water Well Completion Report (Form GW-2) and schematic drawing(s) of well construction.</p>
	<p>Well yield, drawdown, and recovery test results.</p>
	<p>Results of required bacteriological and chemical sampling (if not reported directly by laboratory).</p>
	<p>Construction permit application.</p>
	<p>Final construction plans and specifications, including design calculations, prepared by a licensed professional engineer. A Preliminary Engineering Report may be required prior to submission of final construction documents.</p>

PWSID: 2003000

Source ID: WL001

Facility: WL001

Waterworks: CBI Forest School

Swap Zone 1

Date: 4/23/2026

TINWSF_IS: 0.0

Jurisdiction: Albemarle

District:



All data is collected from multiple agencies using various collection methods. VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only. Map is projected in NAD_1983_Lambert_Conformal_Conic, scale and distances are approximate.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

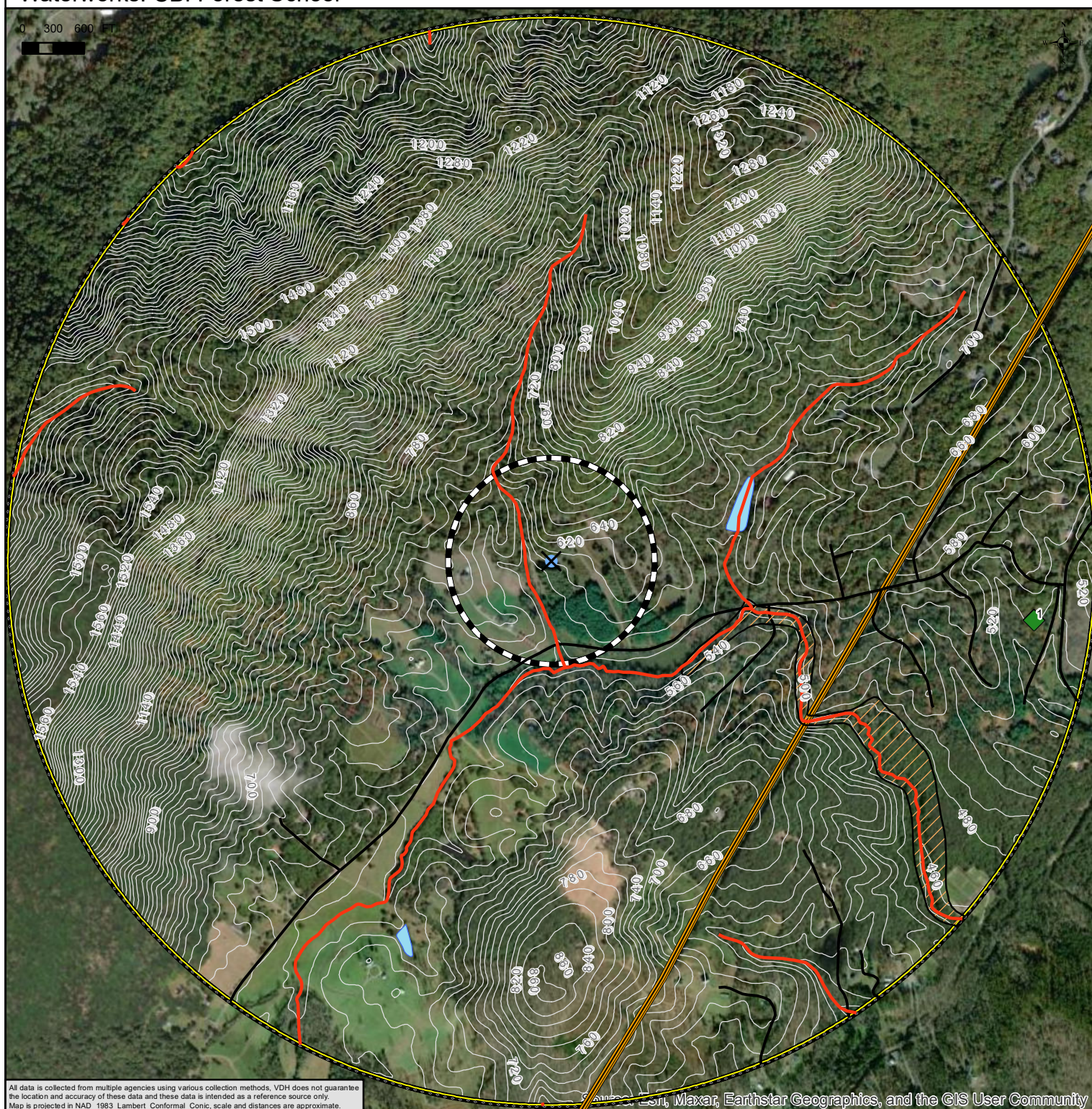


- | | | | | | | |
|--------------------|-------------|-------------------|--------------|-------------------------|----------------------------------|----------------------|
| Source | 500 Year | Other PSC | Marinas | Petroleum Tank - Active | Rails | Impaired Waterbodies |
| Intake | Streams | Mines - Other | Landfills | Petroleum Tank - Closed | Petroleum Pipeline | Karst Area |
| Well | Contours | Mines - Abandoned | Industrial | Boat Ramps | Natural Gas Pipeline | |
| GUDIS | Waterbodies | Mines - Active | Hospitals | Airports | Electric Power Transmission Line | |
| Floodplains | | Injection Wells | RCRA | Oil Gas Wells | Zone 1 | |
| 100 Year | | Tire Piles | Golf Courses | Impaired Streams | Zone 2 | |
| | | Superfund | NPDES | Roads | | |

Waterworks: CBI Forest School

Date: 4/23/2026

District:



All data is collected from multiple agencies using various collection methods, VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only.
Map is projected in NAD 1983 Lambert Conformal Conic, scale and distances are approximate.



- | | | | | | | | | | | | | | |
|--------------------|----------|--|-----------------|--|-------------------|--|--------------|--|-------------------------|--|----------------------------------|--|----------------------|
| | Source | | 500 Year | | Other PSC | | Marinas | | Petroleum Tank - Active | | Rails | | Impaired Waterbodies |
| | Intake | | Streams | | Mines - Other | | Landfills | | Petroleum Tank - Closed | | Petroleum Pipeline | | Karst Area |
| | Well | | Contours | | Mines - Abandoned | | Industrial | | Boat Ramps | | Natural Gas Pipeline | | |
| | GUDIS | | Waterbodies | | Mines - Active | | Hospitals | | Airports | | Electric Power Transmission Line | | |
| Floodplains | | | Injection Wells | | Tire Piles | | RCRA | | Oil Gas Wells | | Impaired Streams | | Zone 1 |
| | 100 Year | | Superfund | | NPDES | | Golf Courses | | Roads | | Zone 2 | | |

PWSID: 2003000

Source ID: WL001

Facility: WL001

Waterworks: CBI Forest School

SWAP Zone 2 Land Use

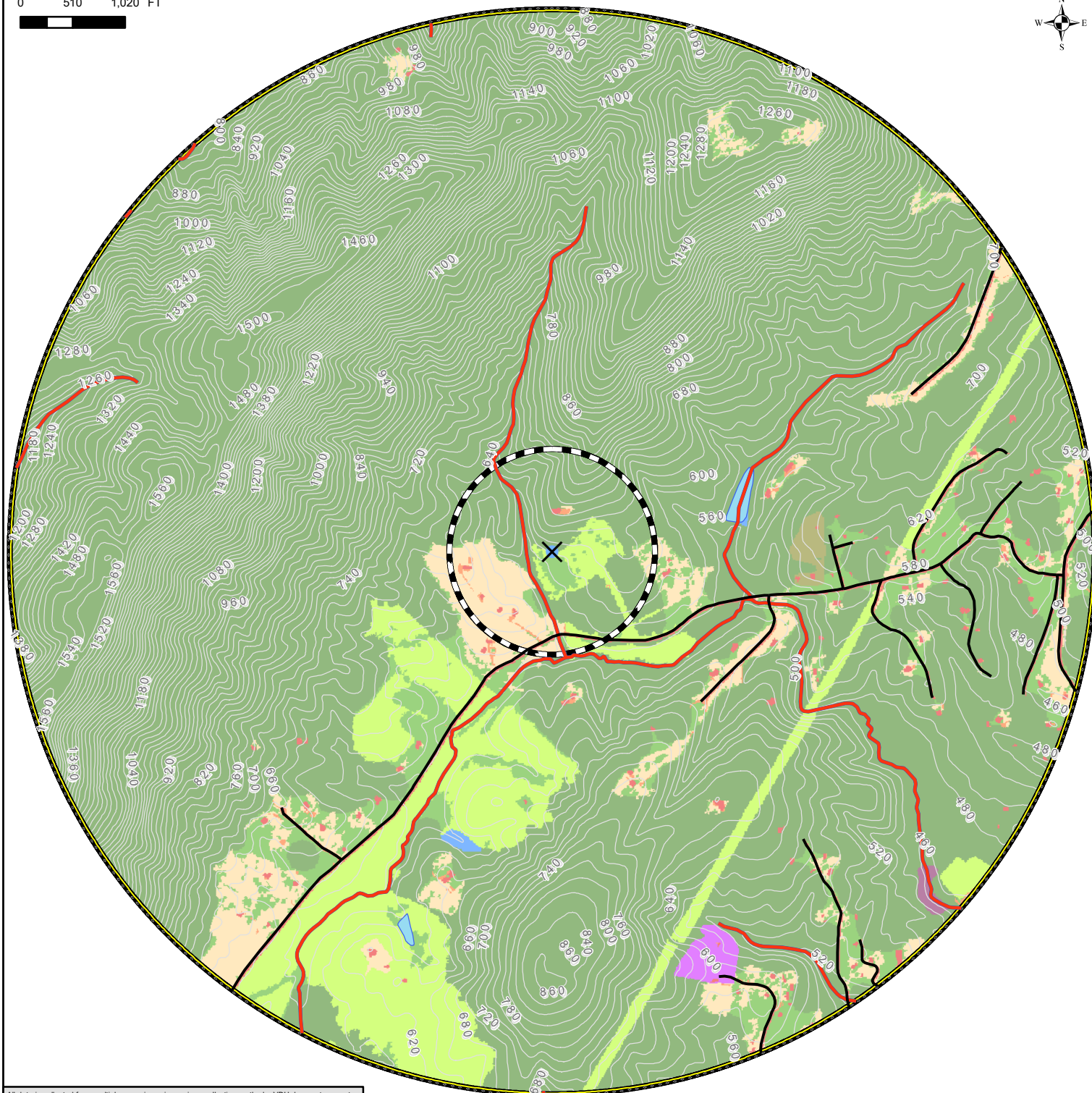
Date: 4/23/2026

TINWSF_IS: 0.0

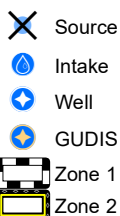
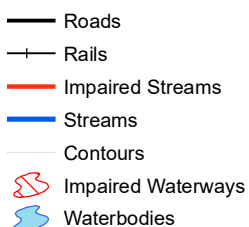
Jurisdiction: Albemarle

District:

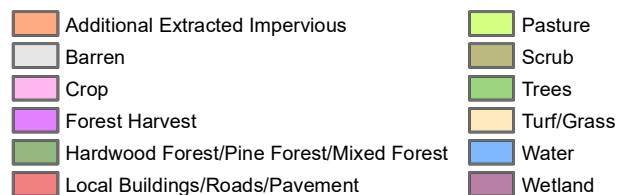
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All data is collected from multiple agencies using various collection methods. VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only. Map is projected in NAD_1983_Lambert_Conformal_Conic, scale and distances are approximate.



Land Use



POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: Albemarle

PWSID: 2003000

Source ID: WL001

Facility: WL001

Waterworks: CBI Forest School

Facility Type	Zone 1 Count	Zone 2 Count	Total
Closed Storage Tank Release	0	1	1
Sum	0	1	1

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER					
Potential Sources of Contamination Inventory					
County/City: Albemarle		Waterworks: CBI Forest School		PWSID: 2003000	Source ID: WL001 Facility: WL001
Evaluated by:		Date:		Reviewed by: Date:	
Map ID	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.89	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Gillespie Residence	1912 Lynchburg Dr Charlottesville VA 22903

Virginia Department of Health, Office of Drinking Water
Source Water Assessment Program Typical Contaminants Compendium (Rev. December 2015)

Land Use	Typical Contaminants ^{1,2,3}	Contaminant Types
COMMERCIAL / INDUSTRIAL		
Auction lots	Livestock sewage wastes; nitrates; phosphates; coliform and noncoliform bacteria; giardia, viruses; total dissolved solids	Inorganics
Automotive Body shops/repair shops	Waste oils; solvents; acids; paints; automotive wastes ⁴ ; miscellaneous cutting oils	Inorganics, SOCs, VOCs
Car washes	Soaps; detergents, waxes; miscellaneous chemicals	
Gas stations	oils; solvents; gasoline, diesel, miscellaneous wastes, lead	
Boat Services/repair/refinishing	Diesel fuels; oil; septage from boat waste disposal area; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes ⁴	Inorganics, SOCs, VOCs
Cement / concrete plants	Diesel fuels; solvents; oils; miscellaneous wastes	Inorganics, SOCs, VOCs
Dry cleaners	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methyl chloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)	VOCs
Electrical/electronic manufacturing	Cyanides; metal sludges; caustic (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene chloride; perchloroethylene; trichloroethane; acetone; methanol; toluene; PCBs	Inorganics, SOCs, VOCs
Food processing / Animal Slaughtering	Nitrates; salts; phosphorus; miscellaneous food wastes; chlorine; ammonia; ethylene glycol	Inorganics, Microbial, VOCs, SOCs
Funeral homes and Mortuaries	External corporeal wash water, internal body fluids, as well as residual arterial embalming chemicals (formaldehyde, phenol, and methanol)	Inorganics, Microbial, SOCs, VOCs
Furniture repair/manufacturing	Paints; solvents; degreasing and solvent recovery sludges; lacquers; sealants	Inorganics, SOCs, VOCs
Hardware/lumber/parts stores	Hazardous chemical products in inventories; heating oil and fork lift fuel from storage tanks; wood-staining and treating products such as creosote; paints; thinners; lacquers; varnishes	Inorganics, SOCs, VOCs
Home manufacturing	Solvents; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy wastes; miscellaneous chemical wastes	Inorganics, SOCs, VOCs
Hospitals/Research laboratories	X-ray developers and fixers ⁸ ; infectious wastes; radiological biological wastes, disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants; (quaternary ammonia, hexachlorophene, peroxides, chlorhexidine, bleach); and miscellaneous chemical wastes.	Inorganics, Microbial, RADs, SOCs, VOCs
Junk/scrap/salvage yards	Automotive wastes ⁴ ; PCB contaminated wastes; any wastes from businesses ⁶ and households ⁷ ; oils; lead	Inorganics, SOCs, VOCs
Machine shops	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (tetrachloroethylene); metal marking fluids; mold-release agents	Inorganics, SOCs, VOCs
Medical/vet offices	X-ray developers and fixers ⁸ ; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; variable miscellaneous chemicals	Inorganics, Microbial, RADs, SOCs, VOCs
Metal plating/finishing/ fabricating	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid; boric acid; paint wastes; heavy metals; plating wastes; oils; solvents	Inorganics, SOCs, VOCs
Military installations	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility and operation ⁹ ; diesel fuels; jet fuels; solvents; paints; waste oils; heavy metals; radioactive wastes	Inorganics, RADs, SOCs, VOCs

Virginia Department of Health, Office of Drinking Water
Source Water Assessment Program Typical Contaminants Compendium (Rev. December 2015)

Office buildings/complexes	Building wastes ⁶ ; lawn and garden maintenance chemicals ⁵ ; gasoline; motor oil	Inorganics, SOCs, VOCs
Parking lots/malls	Hydrocarbons; heavy metals; building wastes ⁶	Inorganics, SOCs, VOCs
Pharmaceutical	TSS, oil & grease, fecal coliform, volatile organic compounds, nonconventional pollutants.	Microbial, SOCs, VOCs
Photo processing, print shop	Ethanol, isopropanol, ethylene glycol, xylene, toluene, cyclohexanone, petroleum products, volatile organic compounds, lead, chromium, silver, cadmium, and barium,	Inorganics, SOCs, VOCs
Textiles	Scouring alkali waste, oils, surfactants, lubricants, dye, bleaching (hydrogen peroxide, sodium hypochlorite, sodium chlorite, sulfur dioxide), caustic soda, salts	Inorganics, SOCs
Wood preserving/treating	Wood preservatives; creosote, pentachlorophenol, arsenic, dioxin.	Dioxin, Inorganics, SOCs
Wood/pulp/paper processing and mills	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals ⁹ ; organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide; treated wood residue (copper quinolate, mercury, sodium azide); tanner gas; paint sludges; solvents; creosote; coating and gluing wastes, dioxin.	Dioxin, Inorganics, SOCs
Chemical Processing / Storage		
Above/Below ground storage tanks	Heating oil; diesel fuel; gasoline; other chemicals	Inorganics, SOCs, VOCs
Chemical/petroleum processing/storage	Hazardous chemicals; solvents; hydrocarbons; heavy metals; asphalt	Inorganics, SOCs, VOCs
Coal Gasification Facility	Gas loss, leaching of residual products found in ash residue in the spent gasification cavity (calcium, sodium, sulfate, bicarbonate, metals), condensed liquids (BTEX, phenolic compounds, Polycyclic aromatic hydrocarbons (PAHs) and heterocyclic compounds.	Inorganics, SOCs, VOCs
Pesticide / Herbicide / Fertilizer Manufacture / Distribution / Storage	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility.	Inorganics, SOCs, VOCs
Plastics/synthetics producers	Solvents; oils; miscellaneous organic and inorganics (phenols, resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.	Inorganics, SOCs, VOCs
Disposal		
Solid Waste Collection / Transfer Site	Wide variety of contaminants depending on the historical use. Anthropogenic waste (toxic metals, hydrocarbons, chlorinated hydrocarbons, surfactant-derived compounds, phthalates, pharmaceutical chemicals. Biological waste (ammonia, dissolved organic carbon, aliphatic compounds, phenols, derivatives of abietic acid)	Inorganics, Microbial, SOCs, VOCs
Hazardous Waste Recovery Facility / Waste Transfer / Storage / Disposal and Superfund Sites	Wide variety of contaminants depending on historical use.	Inorganics, Microbial, RADs, SOCs, VOCs
Resource Extraction		
Shale Gas extraction / Coalbed methane extractions / Tight sands hydraulic fracturing	Total dissolved solids, fracturing fluid additives: acids, biocides, gel agents, clay stabilizers, corrosion inhibitors, pH adjusting agents, scale inhibitors, surfactants; metals, naturally occurring radioactive materials.	Inorganics, RADs, SOCs, VOCs
Mines/gravel pits	Mine spills or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides; metals; acids; minerals sulfides; other hazardous and nonhazardous chemicals ⁹	Inorganics, RADs, VOCs
NON-INDUSTRIAL		
Golf courses	Fertilizers ¹² ; herbicides ¹¹ ; pesticides for controlling mosquitoes, ticks, ants, gypsy moths, and other pests ⁵	Inorganics, SOCs, VOCs
Transportation		

Virginia Department of Health, Office of Drinking Water
Source Water Assessment Program Typical Contaminants Compendium (Rev. December 2015)

Airports (maintenance/fueling areas)	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes; ⁴ heating oil; building wastes ⁶	VOCs
Barge and Vessel Traffic	Fuel, miscellaneous wastes; oil; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Boat ramps and marinas	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴ ; deicing products; variable transported materials	Inorganics, SOCs, VOCs
Fleet / trucking / bus terminals	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴	Inorganics, SOCs, VOCs
Primary Roadways / Truck Terminals	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴ ; deicing products; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Railroad tracks / yards / maintenance / fueling areas	Diesel fuel; herbicides for rights-of-way ¹¹ ; creosote from preserving wood ties; solvents; paints; waste oils	Inorganics, Microbial, RADs, SOCs, VOCs
Agriculture		
Crop and Fodder Production/ Specialty Crop Production/Nursery	Pesticides, herbicides, fertilizers, nitrates.	Inorganics, SOCs, VOCs
Pasture (Grazing)/Confined Animal Feeding Operations/Aquaculture	Nutrients: nitrogen, ammonia, and phosphorus; organic matter; pathogens; parasites, bacteria, and viruses; solid matter; pesticides and hormones; antibiotics, metals	Inorganics, Microbial
Land Disposal		
Cemetery	Microbiological contaminants including <i>Staphylococcus spp.</i> , <i>Bacillus spp.</i> , <i>Enterobacteriaceae spp.</i> , fecal streptococci, <i>Clostridium spp.</i> , <i>Helicobacter pylori</i> , enteroviruses, rotavirus, calicivirus; arsenic, mercury, formaldehyde, copper, lead, zinc.	Inorganics, Microbial, SOCs
Injection wells/drywells/sumps	Stormwater runoff; spilled liquids; used oils; antifreeze; gasoline; solvents; other petroleum products; pesticides ¹¹ ; and a wide variety	Inorganics, Microbial, RADs, SOCs, VOCs
Landfills/dumps (active and closed)	Leachate; organic and inorganic chemical contaminants; waste from households ⁷ and businesses ⁶ ; nitrates; oils; metals; solvents; sludge	Inorganics, Microbial, SOCs, VOCs
Septic systems	Nitrates; septage; Cryptosporidium; Giardia; coliform ¹⁰ and noncoliform bacteria; viruses; drain cleaners; solvents; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides; ^{5,13} paints; paint thinner; swimming pool chemicals; ¹⁴ septic tank/cesspool cleaner chemicals ¹⁵ ; elevated levels of chloride, sulfate, calcium, magnesium, potassium, and phosphate; other household hazardous wastes ⁷	Inorganics, Microbial
Utilities		
Urban stormwater management infrastructure	TSS, pesticides and fertilizers, animal waste, metals, oil and grease/hydrocarbons, bacteria and viruses, nitrogen and phosphorus ,	Inorganics, Microbial, SOCs, VOCs
Utility stations/maintenance areas	PCBs from transformers and capacitors; oils; solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way	Dioxin, SOCs
Wastewater treatment facilities	Municipal wastewater; sludge ¹⁶ ; treatment chemicals ¹⁷ ; nitrates; heavy metals; coliform ¹⁰ and noncoliform bacteria; nonhazardous wastes ¹⁶	Inorganics, Microbial, SOCs, VOCs

NOTES

¹ This table lists the most common wastes, but not all potential wastes. For example, it is not possible to list all potential contaminants contained in stormwater runoff or from military installations.

² In general, water contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial

Virginia Department of Health, Office of Drinking Water
Source Water Assessment Program Typical Contaminants Compendium (Rev. December 2015)

drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the contaminants list in this table are used and managed properly, environmental contamination is not likely to occur.

³ Contaminants can reach water bodies from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

⁴Automobile wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

⁵ Common pesticides used for lawn and garden maintenance (i.e., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; chlorpyrifos; diazinon; benomyl; captan; dicofol; and methoxychlor.

⁶ Common wastes from public and commercial buildings include automotive wastes; and residues from cleaning products that may contain chemicals such as xlenols, glycol esters, isopropanol, 1,1,1-trichloroethane, sulfonates, chlorinated phenols, and cresols.

⁷ Household hazardous wastes are common household products which contain a wide variety of toxic or hazardous.

⁸ X-ray developers and fixers may contain reclaimable silver, glutaraldehyde, hydroquinone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

⁹ The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the Clean Water Act; certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) generated by businesses.

¹⁰ Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of drinking water supplies.

¹¹ Pesticides include herbicides, insecticides, rodenticides, fungicides and avicides. EPA has registered approximately 50,000 different pesticide products for use in the United States. Many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine, which EPA classifies as moderately toxic (class 3) and slightly toxic (class 4) materials, respectively

¹² The EPA National Pesticides Survey found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.

¹³ Common household pesticides for controlling pests such as ants, termites, bees, wasps, flies, cockroaches, silverfish, mites, ticks, fleas, worm, rates, and mice can contain active ingredients include naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.

¹⁴ Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.

¹⁵ Septic tank/cesspool cleaners include synthetic organic chemicals such as 1,1,1 trichloroethane, tetrachloroethylene, carbon tetrachloride, and methylene chloride.

¹⁶ Municipal wastewater treatment sludge can contain organic matter, nitrates; inorganic salts, heavy metals; coliform and noncoliform bacteria; and viruses.

¹⁷ Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, carbon, and silica; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

PWSID: 2003000

Source ID: WL002

Facility: WL002

Waterworks: CBI Forest School

Swap Zone 1

Date: 4/23/2026

TINWSF_IS: 0.0

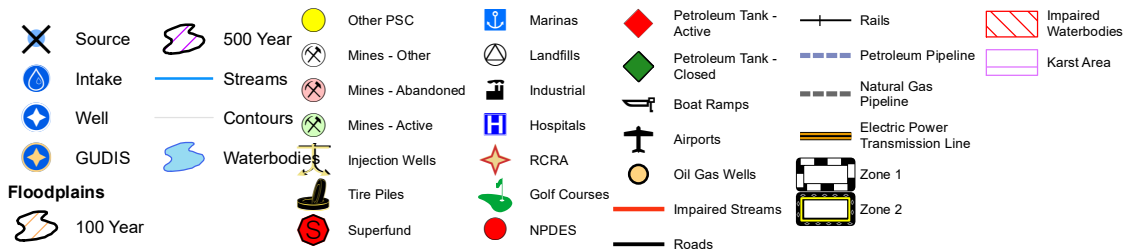
Jurisdiction: Albemarle

District:



All data is collected from multiple agencies using various collection methods. VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only. Map is projected in NAD_1983_Lambert_Conformal_Conic, scale and distances are approximate.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



PWSID: 2003000
Source ID: WL002

SWAP Zone 2

Date: 4/23/2026

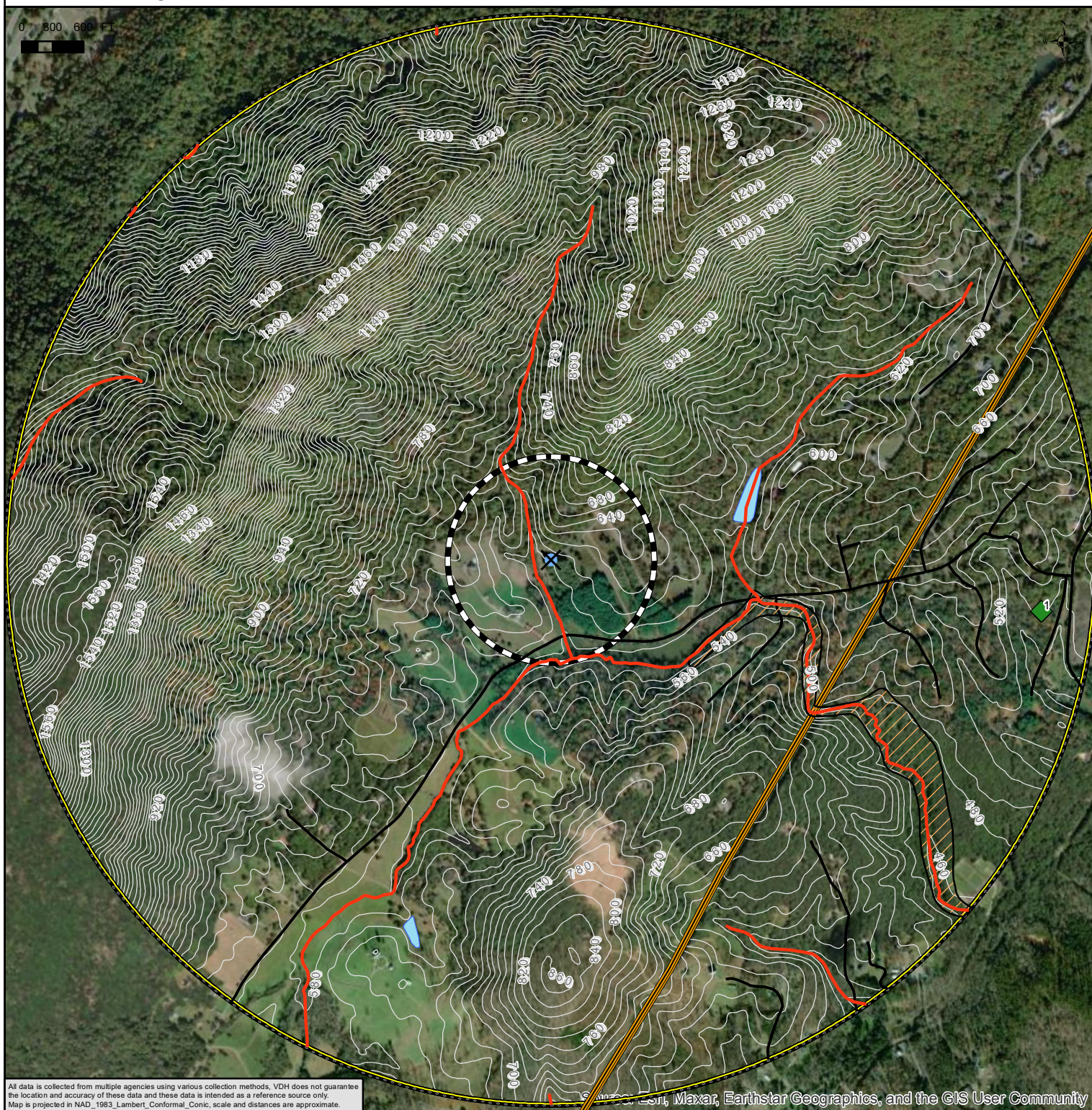
Facility: WL002

Waterworks: CBI Forest School

TINWSF_IS: 0.0

Jurisdiction: Albemarle

District:



- | | | | | | | |
|--------------------|-------------|-------------------|--------------|-------------------------|----------------------------------|----------------------|
| Source | 500 Year | Other PSC | Marinas | Petroleum Tank - Active | Rails | Impaired Waterbodies |
| Intake | Streams | Mines - Other | Landfills | Petroleum Tank - Closed | Petroleum Pipeline | Karst Area |
| Well | Contours | Mines - Abandoned | Industrial | Boat Ramps | Natural Gas Pipeline | |
| GUDIS | Waterbodies | Mines - Active | Hospitals | Airports | Electric Power Transmission Line | |
| Floodplains | | Injection Wells | RCRA | Oil Gas Wells | Zone 1 | |
| 100 Year | | Tire Piles | Golf Courses | Impaired Streams | Zone 2 | |
| | | Superfund | NPDES | Roads | | |

PWSID: 2003000

Source ID: WL002

Facility: WL002

Waterworks: CBI Forest School

SWAP Zone 2 Land Use

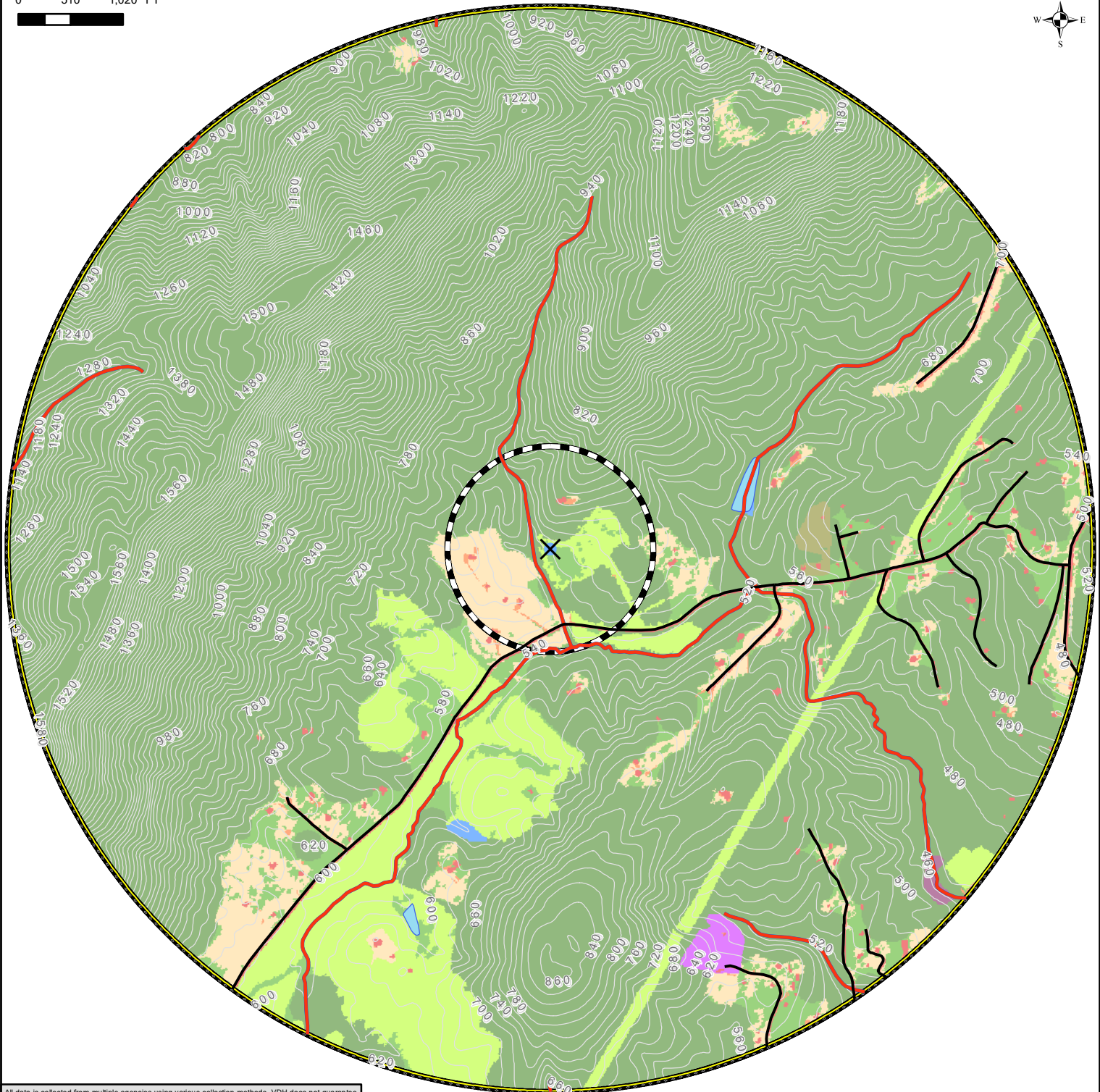
Date: 4/23/2026

TINWSF_IS: 0.0

Jurisdiction: Albemarle

District:

0 510 1,020 FT



All data is collected from multiple agencies using various collection methods. VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only. Map is projected in NAD_1983_Lambert_Conformal_Conic, scale and distances are approximate.



- Source
- Intake
- Well
- GUDIS
- Zone 1
- Zone 2

- Roads
- Rails
- Impaired Streams
- Streams
- Contours
- Impaired Waterways
- Waterbodies

Land Use

- Additional Extracted Impervious
- Barren
- Crop
- Forest Harvest
- Hardwood Forest/Pine Forest/Mixed Forest
- Local Buildings/Roads/Pavement
- Pasture
- Scrub
- Trees
- Turf/Grass
- Water
- Wetland

POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: Albemarle

PWSID: 2003000

Source ID: WL002

Facility: WL002

Waterworks: CBI Forest School

Facility Type	Zone 1 Count	Zone 2 Count	Total
Closed Storage Tank Release	0	1	1
Sum	0	1	1

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER					
Potential Sources of Contamination Inventory					
County/City: Albemarle		Waterworks: CBI Forest School		PWSID: 2003000	Source ID: WL002 Facility: WL002
Evaluated by:		Date:		Reviewed by: Date:	
Map ID	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.90	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Gillespie Residence	1912 Lynchburg Dr Charlottesville VA 22903

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Land Use	Typical Contaminants ^{1,2,3}	Contaminant Types
COMMERCIAL / INDUSTRIAL		
Auction lots	Livestock sewage wastes; nitrates; phosphates; coliform and noncoliform bacteria; giardia, viruses; total dissolved solids	Inorganics
Automotive Body shops/repair shops	Waste oils; solvents; acids; paints; automotive wastes ⁴ ; miscellaneous cutting oils	Inorganics, SOCs, VOCs
Car washes	Soaps; detergents, waxes; miscellaneous chemicals	
Gas stations	oils; solvents; gasoline, diesel, miscellaneous wastes, lead	
Boat Services/repair/refinishing	Diesel fuels; oil; septage from boat waste disposal area; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes ⁴	Inorganics, SOCs, VOCs
Cement / concrete plants	Diesel fuels; solvents; oils; miscellaneous wastes	Inorganics, SOCs, VOCs
Dry cleaners	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methyl chloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)	VOCs
Electrical/electronic manufacturing	Cyanides; metal sludges; caustic (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene chloride; perchloroethylene; trichloroethane; acetone; methanol; toluene; PCBs	Inorganics, SOCs, VOCs
Food processing / Animal Slaughtering	Nitrates; salts; phosphorus; miscellaneous food wastes; chlorine; ammonia; ethylene glycol	Inorganics, Microbial, VOCs, SOCs
Funeral homes and Mortuaries	External corporeal wash water, internal body fluids, as well as residual arterial embalming chemicals (formaldehyde, phenol, and methanol)	Inorganics, Microbial, SOCs, VOCs
Furniture repair/manufacturing	Paints; solvents; degreasing and solvent recovery sludges; lacquers; sealants	Inorganics, SOCs, VOCs
Hardware/lumber/parts stores	Hazardous chemical products in inventories; heating oil and fork lift fuel from storage tanks; wood-staining and treating products such as creosote; paints; thinners; lacquers; varnishes	Inorganics, SOCs, VOCs
Home manufacturing	Solvents; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy wastes; miscellaneous chemical wastes	Inorganics, SOCs, VOCs
Hospitals/Research laboratories	X-ray developers and fixers ⁸ ; infectious wastes; radiological biological wastes, disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants; (quaternary ammonia, hexachlorophene, peroxides, chlorhexidine, bleach); and miscellaneous chemical wastes.	Inorganics, Microbial, RADs, SOCs, VOCs
Junk/scrap/salvage yards	Automotive wastes ⁴ ; PCB contaminated wastes; any wastes from businesses ⁶ and households ⁷ ; oils; lead	Inorganics, SOCs, VOCs
Machine shops	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (tetrachloroethylene); metal marking fluids; mold-release agents	Inorganics, SOCs, VOCs
Medical/vet offices	X-ray developers and fixers ⁸ ; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; variable miscellaneous chemicals	Inorganics, Microbial, RADs, SOCs, VOCs
Metal plating/finishing/ fabricating	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid; boric acid; paint wastes; heavy metals; plating wastes; oils; solvents	Inorganics, SOCs, VOCs
Military installations	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility and operation ⁹ ; diesel fuels; jet fuels; solvents; paints; waste oils; heavy metals; radioactive wastes	Inorganics, RADs, SOCs, VOCs

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Office buildings/complexes	Building wastes ⁶ ; lawn and garden maintenance chemicals ⁵ ; gasoline; motor oil	Inorganics, SOC, VOCs
Parking lots/malls	Hydrocarbons; heavy metals; building wastes ⁶	Inorganics, SOC, VOCs
Pharmaceutical	TSS, oil & grease, fecal coliform, volatile organic compounds, nonconventional pollutants.	Microbial, SOC, VOCs
Photo processing, print shop	Ethanol, isopropanol, ethylene glycol, xylene, toluene, cyclohexanone, petroleum products, volatile organic compounds, lead, chromium, silver, cadmium, and barium,	Inorganics, SOC, VOCs
Textiles	Scouring alkali waste, oils, surfactants, lubricants, dye, bleaching (hydrogen peroxide, sodium hypochlorite, sodium chlorite, sulfur dioxide), caustic soda, salts	Inorganics, SOC
Wood preserving/treating	Wood preservatives; creosote, pentachlorophenol, arsenic, dioxin.	Dioxin, Inorganics, SOC
Wood/pulp/paper processing and mills	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals ⁹ ; organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide; treated wood residue (copper quinolate, mercury, sodium azide); tanner gas; paint sludges; solvents; creosote; coating and gluing wastes, dioxin.	Dioxin, Inorganics, SOC
Chemical Processing / Storage		
Above/Below ground storage tanks	Heating oil; diesel fuel; gasoline; other chemicals	Inorganics, SOC, VOCs
Chemical/petroleum processing/storage	Hazardous chemicals; solvents; hydrocarbons; heavy metals; asphalt	Inorganics, SOC, VOCs
Coal Gasification Facility	Gas loss, leaching of residual products found in ash residue in the spent gasification cavity (calcium, sodium, sulfate, bicarbonate, metals), condensed liquids (BTEX, phenolic compounds, Polycyclic aromatic hydrocarbons (PAHs) and heterocyclic compounds.	Inorganics, SOC, VOCs
Pesticide / Herbicide / Fertilizer Manufacture / Distribution / Storage	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility.	Inorganics, SOC, VOCs
Plastics/synthetics producers	Solvents; oils; miscellaneous organic and inorganics (phenols, resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.	Inorganics, SOC, VOCs
Disposal		
Solid Waste Collection / Transfer Site	Wide variety of contaminants depending on the historical use. Anthropogenic waste (toxic metals, hydrocarbons, chlorinated hydrocarbons, surfactant-derived compounds, phthalates, pharmaceutical chemicals. Biological waste (ammonia, dissolved organic carbon, aliphatic compounds, phenols, derivatives of abietic acid)	Inorganics, Microbial, SOC, VOCs
Hazardous Waste Recovery Facility / Waste Transfer / Storage / Disposal and Superfund Sites	Wide variety of contaminants depending on historical use.	Inorganics, Microbial, RADs, SOC, VOCs
Resource Extraction		
Shale Gas extraction / Coalbed methane extractions / Tight sands hydraulic fracturing	Total dissolved solids, fracturing fluid additives: acids, biocides, gel agents, clay stabilizers, corrosion inhibitors, pH adjusting agents, scale inhibitors, surfactants; metals, naturally occurring radioactive materials.	Inorganics, RADs, SOC, VOCs
Mines/gravel pits	Mine spills or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides; metals; acids; minerals sulfides; other hazardous and nonhazardous chemicals ⁹	Inorganics, RADs, VOCs
NON-INDUSTRIAL		
Golf courses	Fertilizers ¹² ; herbicides ¹¹ ; pesticides for controlling mosquitoes, ticks, ants, gypsy moths, and other pests ⁵	Inorganics, SOC, VOCs
Transportation		

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Airports (maintenance/fueling areas)	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes; ⁴ heating oil; building wastes ⁶	VOCs
Barge and Vessel Traffic	Fuel, miscellaneous wastes; oil; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Boat ramps and marinas	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴ ; deicing products; variable transported materials	Inorganics, SOCs, VOCs
Fleet / trucking / bus terminals	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴	Inorganics, SOCs, VOCs
Primary Roadways / Truck Terminals	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁴ ; deicing products; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Railroad tracks / yards / maintenance / fueling areas	Diesel fuel; herbicides for rights-of-way ¹¹ ; creosote from preserving wood ties; solvents; paints; waste oils	Inorganics, Microbial, RADs, SOCs, VOCs
Agriculture		
Crop and Fodder Production/ Specialty Crop Production/Nursery	Pesticides, herbicides, fertilizers, nitrates.	Inorganics, SOCs, VOCs
Pasture (Grazing)/Confined Animal Feeding Operations/Aquaculture	Nutrients: nitrogen, ammonia, and phosphorus; organic matter; pathogens; parasites, bacteria, and viruses; solid matter; pesticides and hormones; antibiotics, metals	Inorganics, Microbial
Land Disposal		
Cemetery	Microbiological contaminants including <i>Staphylococcus spp.</i> , <i>Bacillus spp.</i> , <i>Enterobacteriaceae spp.</i> , fecal streptococci, <i>Clostridium spp.</i> , <i>Helicobacter pylori</i> , enteroviruses, rotavirus, calicivirus; arsenic, mercury, formaldehyde, copper, lead, zinc.	Inorganics, Microbial, SOCs
Injection wells/drywells/sumps	Stormwater runoff; spilled liquids; used oils; antifreeze; gasoline; solvents; other petroleum products; pesticides ¹¹ ; and a wide variety	Inorganics, Microbial, RADs, SOCs, VOCs
Landfills/dumps (active and closed)	Leachate; organic and inorganic chemical contaminants; waste from households ⁷ and businesses ⁶ ; nitrates; oils; metals; solvents; sludge	Inorganics, Microbial, SOCs, VOCs
Septic systems	Nitrates; septage; Cryptosporidium; Giardia; coliform ¹⁰ and noncoliform bacteria; viruses; drain cleaners; solvents; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides; ^{5,13} paints; paint thinner; swimming pool chemicals; ¹⁴ septic tank/cesspool cleaner chemicals ¹⁵ ; elevated levels of chloride, sulfate, calcium, magnesium, potassium, and phosphate; other household hazardous wastes ⁷	Inorganics, Microbial
Utilities		
Urban stormwater management infrastructure	TSS, pesticides and fertilizers, animal waste, metals, oil and grease/hydrocarbons, bacteria and viruses, nitrogen and phosphorus ,	Inorganics, Microbial, SOCs, VOCs
Utility stations/maintenance areas	PCBs from transformers and capacitors; oils; solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way	Dioxin, SOCs
Wastewater treatment facilities	Municipal wastewater; sludge ¹⁶ ; treatment chemicals ¹⁷ ; nitrates; heavy metals; coliform ¹⁰ and noncoliform bacteria; nonhazardous wastes ¹⁶	Inorganics, Microbial, SOCs, VOCs

NOTES

¹ This table lists the most common wastes, but not all potential wastes. For example, it is not possible to list all potential contaminants contained in stormwater runoff or from military installations.

² In general, water contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial

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drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the contaminants list in this table are used and managed properly, environmental contamination is not likely to occur.

³ Contaminants can reach water bodies from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

⁴Automobile wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

⁵ Common pesticides used for lawn and garden maintenance (i.e., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; chlorpyrifos; diazinon; benomyl; captan; dicofol; and methoxychlor.

⁶ Common wastes from public and commercial buildings include automotive wastes; and residues from cleaning products that may contain chemicals such as xlenols, glycol esters, isopropanol, 1,1,1-trichloroethane, sulfonates, chlorinated phenols, and cresols.

⁷ Household hazardous wastes are common household products which contain a wide variety of toxic or hazardous.

⁸ X-ray developers and fixers may contain reclaimable silver, glutaraldehyde, hydroquinone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

⁹ The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the Clean Water Act; certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) generated by businesses.

¹⁰ Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of drinking water supplies.

¹¹ Pesticides include herbicides, insecticides, rodenticides, fungicides and avicides. EPA has registered approximately 50,000 different pesticide products for use in the United States. Many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine, which EPA classifies as moderately toxic (class 3) and slightly toxic (class 4) materials, respectively

¹² The EPA National Pesticides Survey found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.

¹³ Common household pesticides for controlling pests such as ants, termites, bees, wasps, flies, cockroaches, silverfish, mites, ticks, fleas, worm, rates, and mice can contain active ingredients include naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.

¹⁴ Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.

¹⁵ Septic tank/cesspool cleaners include synthetic organic chemicals such as 1,1,1 trichloroethane, tetrachloroethylene, carbon tetrachloride, and methylene chloride.

¹⁶ Municipal wastewater treatment sludge can contain organic matter, nitrates; inorganic salts, heavy metals; coliform and noncoliform bacteria; and viruses.

¹⁷ Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, carbon, and silica; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.