June 2025 Piezometer Installation and Monitoring of the West Fork Teanaway River (River Mile 6.85-5.1), Kittitas County, WA

Technical Report

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Background

River Mile (RM) 6.85-5.1 of the West Fork Teanaway River (WFT) in upper Kittitas County, WA is currently undergoing pre-restoration monitoring of floodplain aquifer groundwater as a collaboration between the Department of Geological Sciences at Central Washington University (CWU) and restoration project organizers Mid-Columbia Fisheries Enhancement Group (MCFEG) and Inter-Fluve. CWU is responsible for groundwater data collection during field visits from May 2025 to Spring 2026.

Seven piezometers and two stream gauges were installed in RM 6.85-5.1 from May 14-16th, 2025. Present during this construction period were Maggie Egan (CWU), Pollyanna Lind (Inter-Fluve), Tara O'Rourke (Yakama Nation, on behalf of MCFEG), Rebecca Wassel (MCFEG), Chuck (Yakama Nation), Mike McAllister (Inter-Fluve), Lisa Ely (CWU), and Carey Gazis (CWU). During this process, floodplain stratigraphy was recorded by CWU for thirteen pits dug for piezometers (7) and stratigraphy assessments (5). Installation details and initial groundwater elevations of the piezometers were also recorded by CWU.

Data loggers, HOBO Model MX20L-01, were installed in each of the seven piezometers and two stream gauges on June 6th, 2025. Data loggers were tied onto nylon, non-stretch string using two figure-8 knots to ensure security. The sampling interval was set to hourly measurements. Present during this site visit were Maggie Egan (CWU), Morgan Bucher (WDFW), William Meyer (WDFW), David (WDFW), and Seth (WDFW). Well dimensions and other parameters were measured during this field work by CWU. Manual groundwater elevations were also measured by CWU.

Purpose

This technical report serves to share data from monitoring the WFT RM 6.85-5.1 with project organizers Inter-Fluve and MCFEG. This document includes methodology, installation details of piezometers/stream gauges, and monitoring data collected by CWU over field visits since May 14th, 2025. As such, this report includes data as current as the report's publishing date.

Methodology

Floodplain Stratigraphy

At each pit, floodplain stratigraphy was described using field observations and photos with an in-frame scale. Equipment brought included an 8-meter measuring tape, stadia rod, black permanent marker, camera, and physical logbook.

A physical logbook (Rite in the Rain, waterproof, hardbound) was used to record stratigraphy observations. Field notes detailed the following stratigraphy parameters:

- Date, weather, field members present
- Pit name
- Pit coordinates and elevation
- Stratigraphic column (with depth from surface in feet/inches)
- Layer characteristics:
    - Depth started/ended
    - Sediment color
    - Sediment grain size (in Wentworth scale)
    - Sediment sorting
    - Clast density (in % estimation)
    - Clast rounding
    - Matrix composition
    - Contact boundary
- Resistance at pit bottom
    - Examples: refusal from bedrock, large cobble, or excavator extent.
- Depth to water table (using stadia rod)
- Miscellaneous observations

Piezometer and Stream Gauge Dimensions

Installed piezometer and stream gauge dimensions were measured for future groundwater elevation calculations. Equipment used included an 8-meter measuring tape, black permanent marker, and physical logbook (Rite in the Rain, waterproof, hard bound).

Piezometer

Using the 8-meter measuring tape, the following piezometer parameters were measured and recorded in the logbook:

- Piezometer name
    - Name written with permanent marker on piezometer pipe
- Pipe depth
    - i.e. internal length of well pipe; pipe rim to bedrock
- Pipe rim to ground
    - i.e. external length of well pipe; pipe rim to ground
    - Ground level marked with permanent marker on piezometer pipe
- Cap gap (calculated) ***(Fig. 1).***
    - i.e. gap between cap eyebolt and pipe rim; additional height for data logger.
    - This was calculated by subtracting Z with Y ***(Fig. 2)***:
        - Z. Cap eyebolt to cap edge (i.e. internal distance between eye bolt and edge of cap)
        - Y. Overhang of pipe cap on piezometer pipe
            - Cap overhang level marked with permanent marker on piezometer pipe to ensure consistent cap closure
- Data logger string length
    - i.e. Cap eyebolt knot to nose of data logger ***(Fig. 3).***
- Data logger serial number
- Time of data logger installation

Stream Gauge

Using the 8-meter measuring tape, the following dimensions and details were recorded in the logbook. **Note:** during data logger installation, a bolt had to be installed internally in the pipe for the data logger to hang from. ***(Fig. 4).***

- Stream gauge name
- Pipe depth
    - i.e. internal length of pipe; pipe rim to bedrock
- Pipe rim to bolt

    - i.e. internal depth from pipe rim to installed bolt
- Bolt to bedrock
    - i.e. internal depth from installed bolt to bedrock
- Data logger string length
    - i.e. bolt string knot to nose of data logger
- Data logger serial number
- Time of data logger installation

These field measurements occurred on June 6th, 2025.

Manual Water-Level Elevations

Manual water-level (MWLs) elevations were measured at each piezometer and stream gauge. Equipment brought included an electric measuring tape, a black permanent marker, and a physical logbook (Rite in the Rain, waterproof, hardbound). The following measurements were made using the electric tape and recorded in the physical logbook:

- Pipe rim to water (dec. feet)
    - i.e. internal depth from pipe rim to ground or surface water level
    - The side of pipe that measurement was taken on was marked in black permanent marker to ensure consistent future measurements.
- Time of measurement

These measurements were taken on May 15th (select piezometers), May 16th, June 6th, and July 8th, 2025.

Figure 1 - Concave cap of the piezometer. Calculations were performed to determine cap from eye bolt to piezometer rim. With help from William Meyer (WDFW).

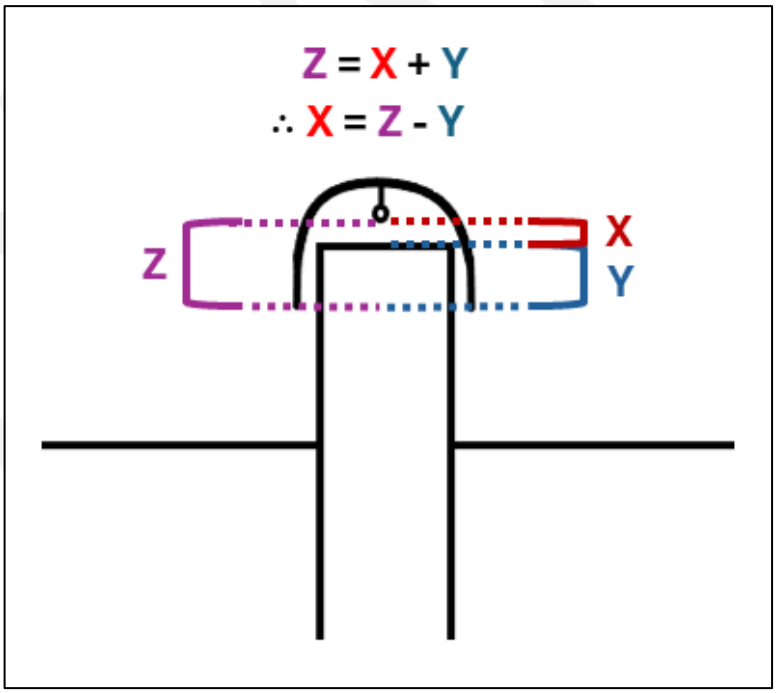


Figure 2 – Piezometer diagram of cap gap (X) calculation. Height from cap eyebolt to cap edge (Z) was subtracted with overhang of pipe cap on piezometer pipe (Y).

Figure 1 - Measurement of string from cap eyebolt to nose of HOBO data logger.

Figure 2 - Eyebolt had to be installed on stream gauge for hanging of HOBO data logger. With help from William Meyer (WDFW).

Map

Figure 5 - Map of piezometers, stream gauges, and test pits.

Results: Floodplain Stratigraphy

Stratigraphy: Piezometer 0VA

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	13	0.00	1.08	Red sandy silt; roots.
2	13	30	1.08	2.50	Subangular medium gravel; unsorted.
3	30	38	2.50	3.17	Subangular unsorted cobbles to boulders; clast-supported; matrix of brown silty sand.
4	38	43	3.17	3.58	Subangular medium gravel; unsorted.
5	43	60	3.58	5.00	Subangular unsorted cobbles to boulders; clast-supported; matrix of brown silty sand.
6	60	73	5.00	6.08	Subangular medium gravel; unsorted.
7	73	93	6.08	7.75	Subangular unsorted cobbles to boulders; clast-supported; matrix of brown silty sand.

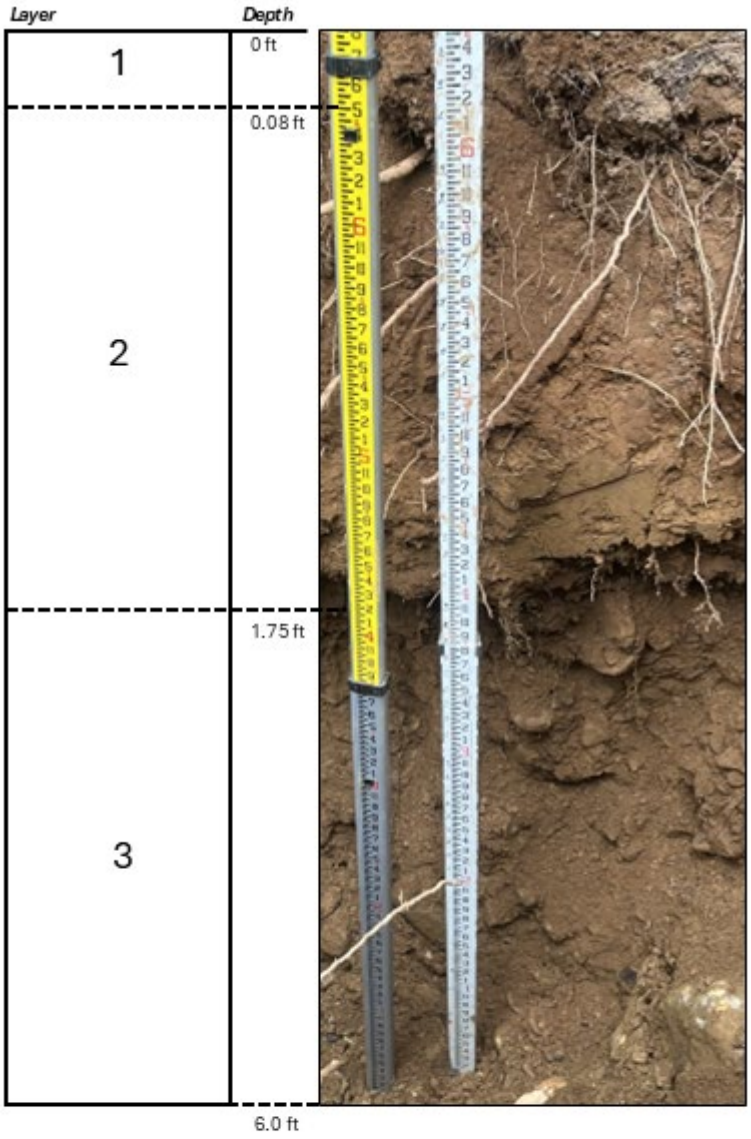
Layer	Depth
1	0 ft
2	1.08 ft
3	2.50 ft
4	3.17 ft
5	3.58 ft
6	5.0 ft
7	6.08 ft
	7.75 ft

ØVA

Latitude: 47.29092°
Longitude: -121.00767°
Pit Depth: 93 in, 7.75 ft
Refusal: Excavator Extent
Excavation Date: 5/15/2025

Stratigraphy: Piezometer 0VB

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	1	0	0.083	Organics layer.
2	1	21	0.083	1.75	Red brown sandy silt; unconsolidated; roots.
3	21	72	1.75	6	Clast-supported; subrounded cobbles coarsen to small boulders (>180 cm) (40%) with matrix of brown medium silty sand.

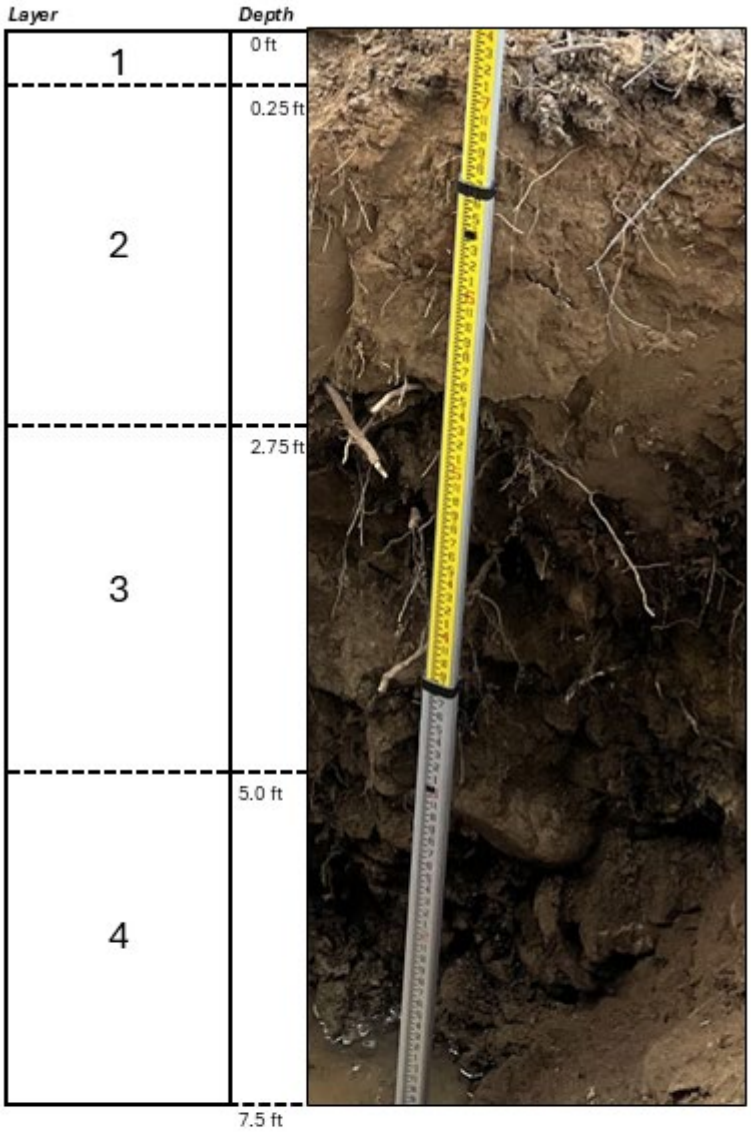


0VB

Latitude: 47.29099°
Longitude: -121.00648°
Pit Depth: 72 in, 6.0 ft
Refusal: Bedrock
Excavation Date: 5/15/2025

Stratigraphy: Piezometer 1VA

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	3	0	0.25	Organics layer.
2	3	33	0.25	2.75	Brown silty sand; roots.
3	33	60	2.75	5	Matrix-supported subrounded pebble-cobble clasts in matrix of tan silty sand.
4	60	90	5	7.5	Clast-supported subrounded boulders (>180 cm) with matrix of brown silty sand.

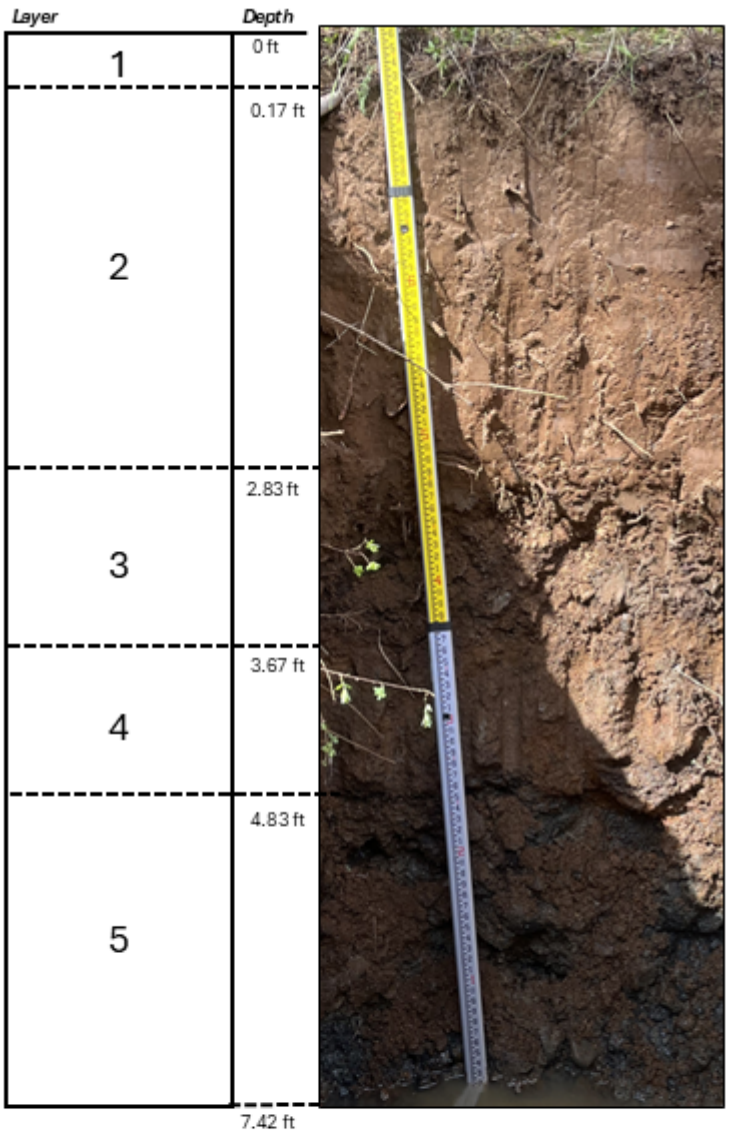


1VA

Latitude: 47.28933°
Longitude: -121.00674°
Pit Depth: 92 in, 7.5 ft
Refusal: N/A
Excavation Date: 5/14/2025

Stratigraphy: Piezometer 1VB

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	2	0.00	0.17	Organics layer.
2	2	34	0.17	2.83	Homogeneous red brown silt; roots.
3	34	44	2.83	3.67	Red brown silty clay with subangular pebbles (20%); matrix supported.
4	44	58	3.67	4.83	Homogeneous red brown silty fine sand.
5	58	89	4.83	7.42	Grey silt; consolidated.



1VB

Latitude: 47.28967°
Longitude: -121.00591°
Pit Depth: 89 in, 7.42 ft
Refusal: N/A
Excavation Date: 5/14/2025

Stratigraphy: Piezometer 1VC

LAYER	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	16	0.00	1.33	Red brown sandy silt; roots; trace angular gravel (<5%).
2	23	1.33	1.92	Clast-supported subrounded cobbles with matrix of silty sand; unsorted.
3	85	1.92	7.08	Clast-supported subangular gravel coarsens to boulders; brown sandy silt (in suspension).
4	112	7.08	9.33	Water; unable to determine. Saturated sediment; possibly unsorted subangular gravel? Matrix is in suspension, so unable to determine.

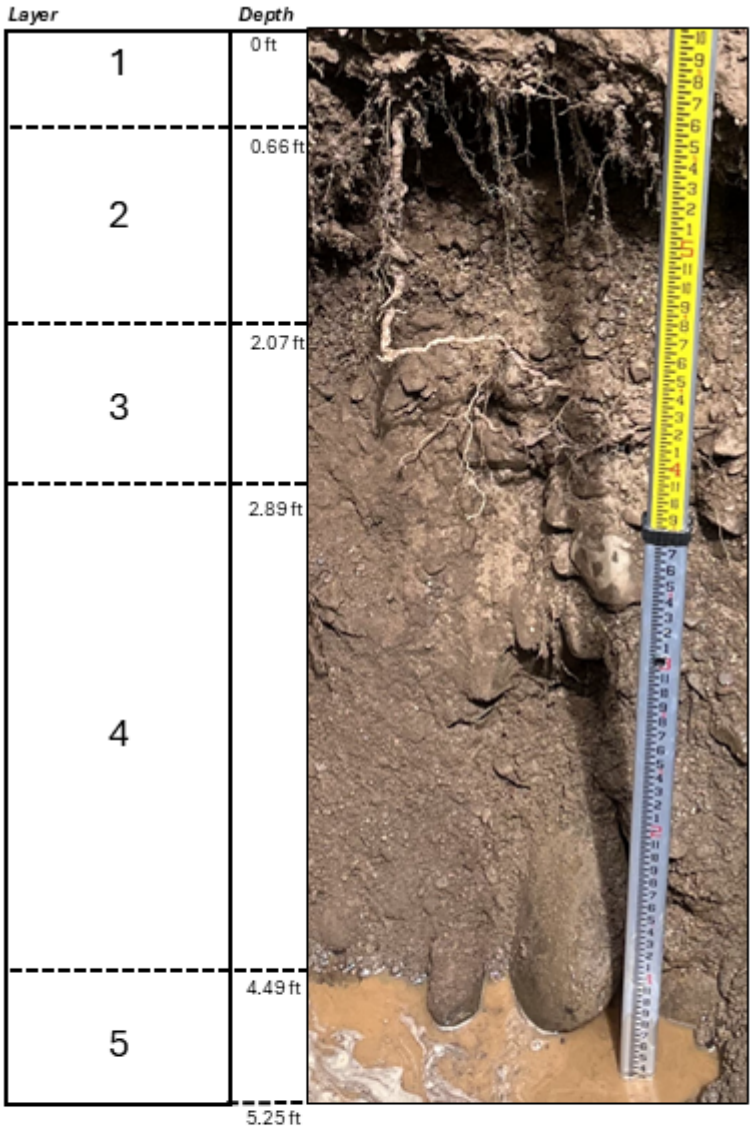
Layer	Depth
	0 ft
1	
	1.33 ft
2	
	1.92 ft
3	
	7.08 ft
4	
	9.33 ft

1VC

Latitude: 47.28903°
Longitude: -121.00560°
Pit Depth: 112 in, 9.33 ft
Refusal: Excavator Extent
Excavation Date: 5/15/2025

Stratigraphy: Piezometer 2VA

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0.00	7.87	0.00	0.66	Clast-supported subrounded pebbles with brown silt matrix (30%); roots.
2	7.87	24.80	0.66	2.07	Clast-supported angular gravel (40%) with brown silt matrix.
3	24.80	34.65	2.07	2.89	Brown silty sand matrix with subrounded cobbles (~30%), coarsens to boulders; gradational boundary.
4	34.65	53.94	2.89	4.49	Clast-supported subrounded boulders (~40%).
5	53.94	62.99	4.49	5.25	Water; unable to determine.

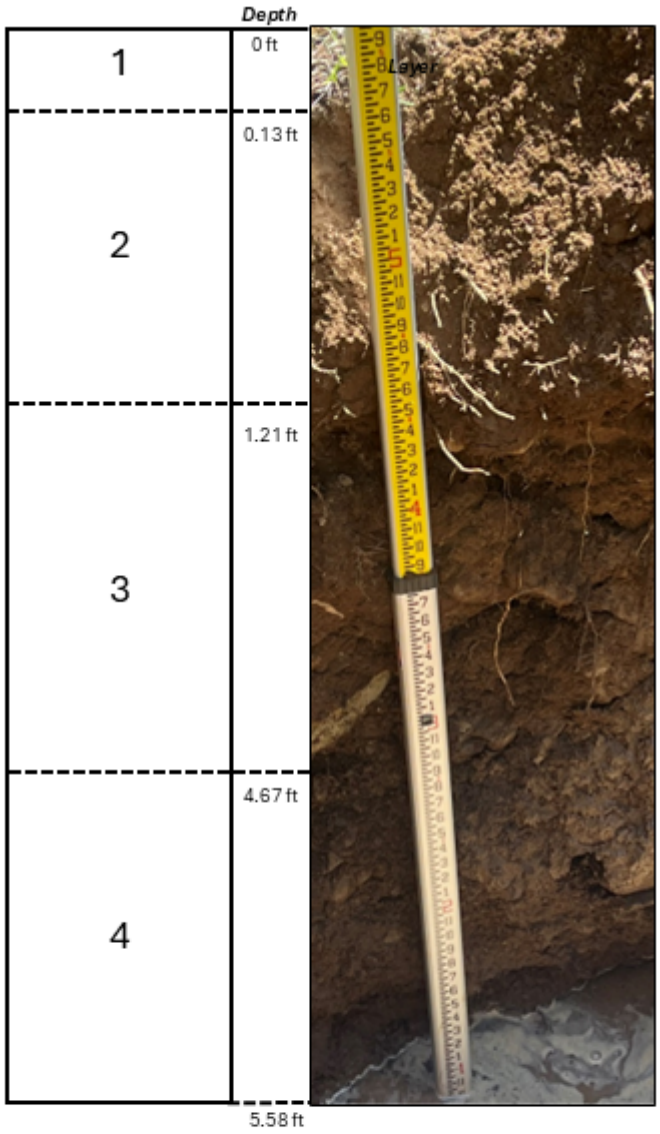


2VA

Latitude: 47.28480°
Longitude: -121.00126°
Pit Depth: 63 in, 5.25 ft
Refusal: Bedrock
Excavation Date: 5/14/2025

Stratigraphy: Piezometer 2VB

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	1.5	0.00	0.13	Organics layer.
2	1.5	14.5	0.13	1.21	Brown silt; trace fine gravel; roots.
3	14.5	56	1.21	4.67	Clast-supported subrounded boulders (>180 cm) with matrix of brown silty loam.
4	56	67	4.67	5.58	Water; unable to determine.

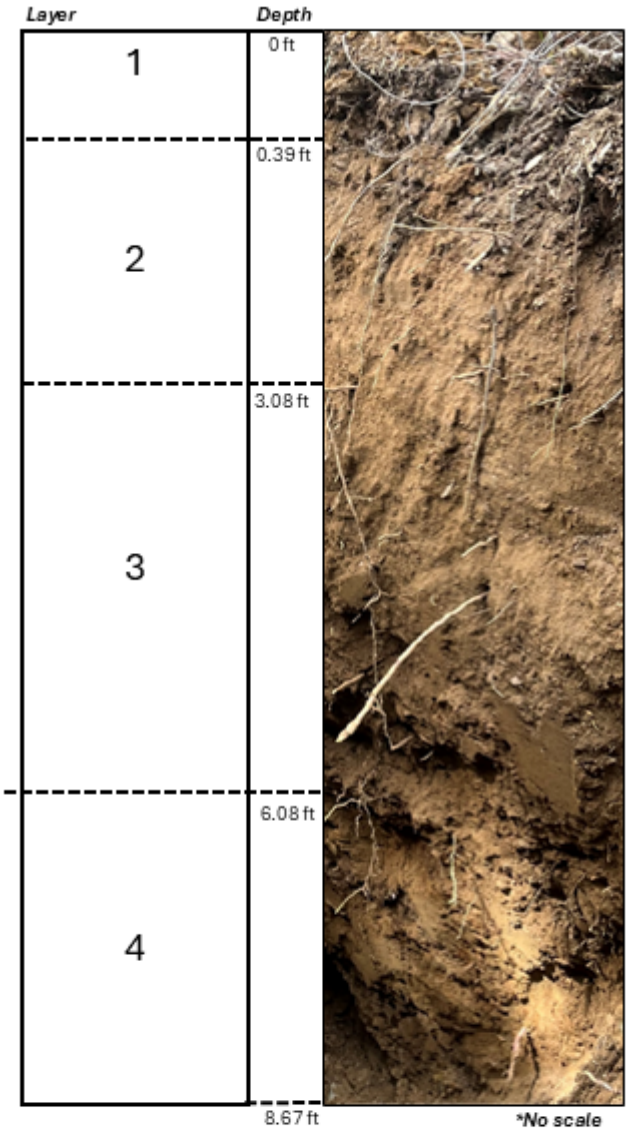


2VB

Latitude: 47.28473°
Longitude: -121.0074°
Pit Depth: 67 in, 5.58 ft
Refusal: Resistance
Excavation Date: 5/14/2025

Stratigraphy: Test Pit 1

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	4.7	0.00	0.39	Organics layer.
2	4.7	37	0.39	3.08	Brown red silt loam with subrounded trace pebbles; roots.
3	37	73	3.08	6.08	Brown red silt loam with subrounded pebbles (~10%).
4	73	104	6.08	8.67	Matrix-supported subrounded boulders and pebbles with tan sandy silt matrix; unsorted.
5	104	104	8.67	8.67	Grey silt; consolidated.

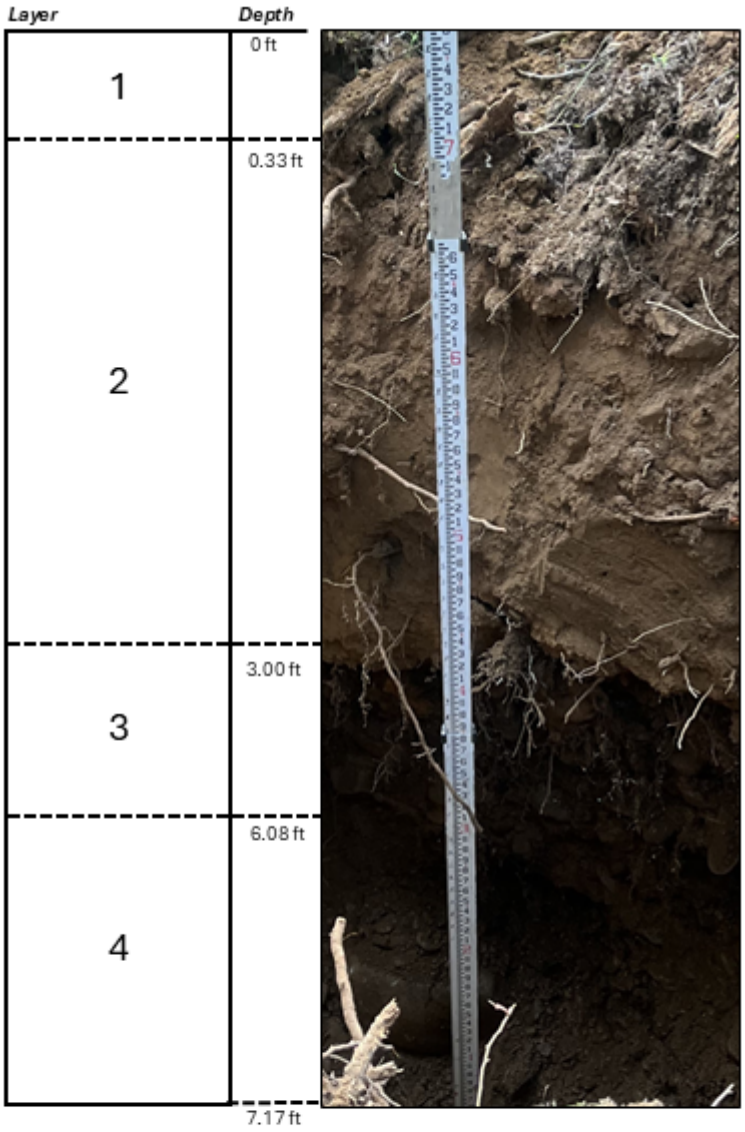


TP1

Latitude: N/A
Longitude: N/A
Pit Depth: 104 in, 8.67 ft
Refusal: Resistance
Excavation Date: 5/15/2025

Stratigraphy: Test Pit 7

LAYER	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	4	0.00	0.33	Organics layer.
2	36	0.33	3.00	Brown-orange sandy silt with trace subrounded pebbles; roots.
3	72	3.00	6.00	Clast-supported subrounded cobbles with brown sandy silt matrix; coarsens to boulders; gradational boundary.
4	86	6.00	7.17	Clast-supported subrounded boulders.

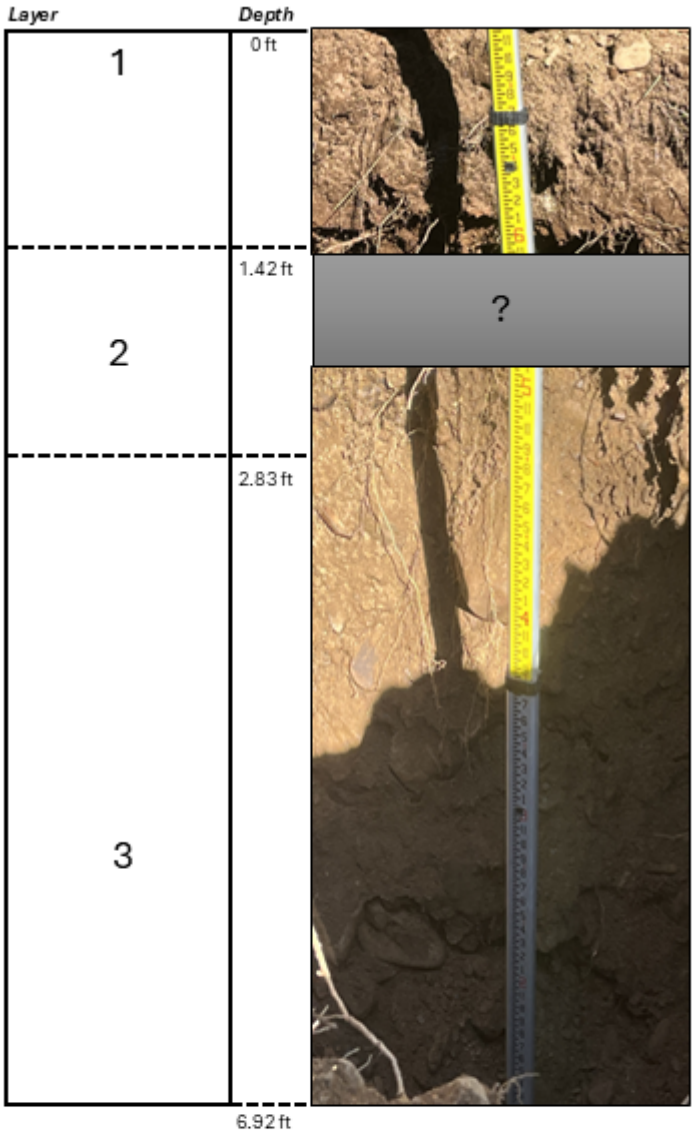


TP7

Latitude: 47.28707°
Longitude: -121.00381°
Pit Depth: 86 in, 7.17 ft
Refusal: Resistance
Excavation Date: 5/15/2025

Stratigraphy: Test Pit 8

LAYER	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	17	0.00	1.42	Homogeneous red sandy silt; roots.
2	34	1.42	2.83	Clast-supported subrounded pebbles with brown red silt matrix; unsorted.
3	83	2.83	6.92	Clast-supported subrounded pebbles coarsen to boulders with brown silty coarse sand matrix; unsorted.



TP8

Latitude: 47.2867°
Longitude: -121.00315°
Pit Depth: 83 in, 6.92 ft
Refusal: Resistance
Excavation Date: 5/15/2025

Stratigraphy: Test Pit 9

LAYER	DEPTH FROM (in)	DEPTH TO (in)	DEPTH FROM (dec. ft.)	DEPTH TO (dec. ft.)	DESCRIPTION
1	0	2.7	0.0	0.2	Organics layer.
2	2.7	7	0.2	0.6	Clast-supported subangular pebbles coarsen to subrounded cobbles with brown sandy silt matrix.
3	7	17	0.6	1.4	Clast-supported gravel with brown sandy silt matrix; unsorted.
4	17	78	1.4	6.5	Subrounded cobbles coarsen to boulders with matrix coarsening from silt to sandy silt.

Layer	Depth
	0 ft
1	
	0.2 ft
2	
	0.6 ft
3	
	1.4 ft
4	
	6.5 ft

TP9

Latitude: 47.28452°
Longitude: -121.0052°
Pit Depth: 78 in, 7.17 ft
Refusal: Bedrock
Excavation Date: 5/15/2025

Results: Piezometer and Stream Data Logger Installation Information

NAME	LATITUDE (°)	LONGITUDE (°)	HOBO SERIAL #	HOBO INSTALLATION DATE	HOBO INSTALLATION TIME
0VA	47.29092	-121.00767	22305031	6/6/2025	11:51 AM
0VB	47.29099	-121.00648	22305046	6/6/2025	11:01 AM
0C	47.29115	-121.0085	22305044	6/6/2025	12:40
1VA	47.28933	-121.00674	22305042	6/6/2025	13:45
1VB	47.28967	-121.00591	22305050	6/6/2025	13:25
1VC	47.28903	-121.00560	22305032	6/6/2025	14:06
2VA	47.28480	-121.00126	22305039	6/6/2025	15:06
2VB	47.28473	-121.0074	22305045	6/6/2025	15:20
2C	47.28442	-121.00101	22305047	6/6/2025	14:40

Results: Piezometer and Stream Gauge Dimensions

Dimensions: Piezometers

NAME	LATITUDE (°)	LONGITUDE (°)	PIEZO PIPE LENGTH (in)	PIEZO RIM TO GROUND (in)	PIEZO CAP: EYE BOLT TO CAP EDGE (in)	PIEZO CAP: CAP EDGE OVERLAP ON PIPE (in)	PIEZO CAP: GAP BETWEEN EYE BOLT AND PIEZO RIM (in)	PIEZO STRING LENGTH (BOLT TO HOBO NOSE) (in)
0VA	47.29092	-121.00767	119.92	25.47	2.17	1.46	0.71	118.11
0VB	47.29099	-121.00648	95.12	19.72	2.09	1.46	0.63	92.68
1VA	47.28933	-121.00674	118.98	32.36	2.13	1.54	0.59	115.55
1VB	47.28967	-121.00591	119.37	34.61	2.13	1.57	0.55	115.79
1VC	47.28903	-121.00560	119.29	14.41	2.17	1.57	0.59	114.92
2VA	47.28480	-121.00126	90.83	25.16	2.20	1.81	0.39	87.76
2VB	47.28483	-121.00072	91.89	24.88	2.32	1.73	0.59	93.82

Dimensions: Stream Gauges

NAME	LATITUDE (°)	LONGITUDE (°)	PIPE LENGTH (IN)	PIPE RIM TO BOLT (IN)	PIPE BOLT TO GROUND (IN)	HOBO STRING LENGTH (BOLT TO HOBO NOSE) (IN)
0C	47.29115	-121.0085	60.24	0.79	59.37	54.49
2C	47.28442	-121.00101	60.00	0.75	59.17	57.64

Results: Manual Water-Level Elevations

MWL: Piezometer 0VA

DATE	TIME	RIM TO GROUNDWATER (dec. feet)
5/15/2025	4:36 PM	DRY
5/16/2025	11:16 AM	DRY
6/6/2025	11:45 AM	DRY
7/8/2025	10:55 AM	DRY

MWL: Piezometer 0VB

DATE	TIME	RIM TO GROUNDWATER (dec. feet)	NOTE
5/15/2025	4:09 PM	7.7	DAY OF WELL INSTALL; RIM WAS CUT BY 65.2 CM NEXT DAY (25.7 IN). ORIGINAL MEASUREMENT: 9.84 DEC FT; CORRECTED MEASUREMENT: 7.7 DEC. FT.
5/16/2025	11:12 AM	7.68	
6/6/2025	10:59 AM	7.84	
7/8/2025	10:49 AM	DRY	

MWL: Stream Gauge 0C

DATE	TIME	RIM TO GROUNDWATER (dec. feet)
5/16/2025	11:47 AM	3.16
6/6/2025	12:38 PM	3.49
7/8/2025	11:01 AM	3.9

MWL: Piezometer 1VA

DATE	TIME	RIM TO GROUNDWATER (dec. feet)	NOTE
5/14/2025	12:33 PM	8.9	TIME OF INSTALL
5/15/2025	10:46 AM	9.13	
5/16/2025	10:12 AM	9.12	
6/6/2025	1:48 PM	9.39	
7/8/2025	11:24 AM	9.7	

MWL: Piezometer 1VB

DATE	TIME	RIM TO GROUNDWATER (dec. feet)	NOTE
5/14/2025	12:40 PM	6.36	TIME OF WELL INSTALL
5/15/2025	11:00 AM	6.41	
5/16/2025	10:53 AM	6.43	
6/6/2025	1:25 PM	6.75	
7/8/2025	11:13 AM	7.07	

MWL: Piezometer 1VC

DATE	TIME	RIM TO GROUNDWATER (dec. feet)
5/16/2025	10:34 AM	6.01
6/6/2025	2:06 PM	6.39
7/8/2025	11:33 AM	7.19

MWL: Piezometer 2VA

DATE	TIME	RIM TO GROUNDWATER (dec. feet)	NOTE
5/15/2025	2:58 PM	6.91	TIME OF WELL INSTALL
5/16/2025	9:31 AM	7.01	
6/6/2025	3:04 PM	DRY	
7/8/2025	12:09 PM	7.48	MUD

MWL: Piezometer 2VB

DATE	TIME	RIM TO GROUNDWATER (dec. feet)	NOTE
5/14/2025	-	-	NONE TAKEN DUE TO WATER PONDING AT INSTALL.
5/16/2025	9:15 AM	6.39	
6/6/2025	3:23 PM	7.61	MUD, not groundwater
7/8/2025	12:14 PM	DRY	MUD

MWL: Stream Gauge 2C

DATE	TIME	RIM TO GROUNDWATER (dec. feet)
5/16/2025	9:52 AM	4.39
6/6/2025	2:38 PM	4.64
7/8/2025	12:22 PM	4.85