

**Final Well Decommissioning and Installation Plan
Remediation of Operable Unit 1 and 2
Former Harshaw Chemical Company Site – Cleveland, Ohio**

Contract No: W912P424C0002

Delivery Order No: W912P423R0019

May 2024

Prepared for:



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ATTACHMENTS

- ATTACHMENT 1 – Select Boring Logs of Existing Wells
- ATTACHMENT 2 – Well Decommissioning Form
- ATTACHMENT 3 – Example Boring Log
- ATTACHMENT 4 – Well Development Field Sheet



ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
bgs	below ground surface
COC	Constituents of Concern
CEC	Civil & Environmental Consultants Inc.
EFS	Enviro-Fix Solutions LLC
EZ	exclusion zone
ft	feet
FUSRAP	Formerly Utilized Sites Remedial Action Program
GPS	global positioning system
HCCS	Former Harshaw Chemical Company Site
ID #	identification number
LLC	Limited Liability Corporation
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OU	operable unit
PWI	Parratt Wolf Inc.
QC	Quality Control
Ra	Radium
RCRA	Resource Conservation and Recovery Act
RPP	Radiation Protection Plan
RPT	Radiation Protection Technician
SOP	Site Operations Plan
SSHP	Site Safety and Health Plan
Th	Thorium
TGM	Technical Guidance Manual
U	Uranium
UFGS	Unified Facilities Guide Specifications
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WMP	Water Management Plan




SIGNATURES


This Final Plan has been prepared by Enviro-Fix Solutions Limited Liability Corporation (EFS LLC) to describe the plan for decommissioning monitoring wells onsite and replacement of wells removed in order perform excavation activities at the Former Harshaw Chemical Company Site (HCCS) in Operable Units 1 and 2, Cleveland, Ohio, in accordance with the Unified Facilities Guide Specifications (UFGS) 33 51 39 MONITORING WELLS.

EFS is committed to providing products and services to its clients that consistently meet or exceed their requirements. This is accomplished through a clearly communicated quality objective that establishes a plan and expectations for effective management of daily site operations. All staff and subcontractors are responsible for ensuring the quality of their work meets our established Quality Control (QC) criteria. All managers and employees are responsible for continual improvement in the products and services provided, for identifying and eliminating poor work products and deliverables, and for applying appropriate QC and processes to achieve these requirements.

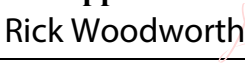
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Woodworth
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1.0 BACKGROUND INFORMATION

1.1 Introduction and Purpose

Enviro-Fix Solutions LLC (EFS) prepared this Final Well Decommissioning and Installation Plan for United States Army Corps of Engineers (USACE) under the Contract NO. W912P424C0002 and Delivery Order No. W912P423R0019, to perform the project entitled: Formerly Utilized Sites Remedial Action Program (FUSRAP), HCCS, Cleveland, OH, Remediation of Operable Unit 1 and 2.

Work implemented under this plan is based off the *Technical Approach Volume II- Remediation of Operable Unit 1 and 2 Former Harshaw Chemical Company Site* (USACE, 2023) approved by the USACE October 25, 2023. The planned site remediation includes excavation of impacted soils from previously defined areas and initial placement of excavated material onto constructed material storage cells. This Well Decommissioning and Installation Plan discusses the abandonment procedures for USACE monitoring wells no longer in use or other site monitoring wells that are necessary to remove because their location inhibits access to the Operable Unit (OU)-1 and OU-2 excavation areas. Decommission efforts will be in compliance with Ohio Environmental Protection Agency (OEPA) Chapter 9 *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (TGM, September, 2016) and UFGS 33 51 39. This plan also outlines well installation procedures to be implemented after remediation work is complete to replace any monitoring wells that were removed by USACE and are needed for BASF monitoring programs.

1.2 Geology and Hydrogeology

HCCS is located west of the Cuyahoga River. The HCCS site was used for various manufacturing operations from 1918 through the 1990s, which included the processing of uranium. The site was designated for inclusion under FUSRAP in 1999 by USACE, followed by BASF for Resource Conservation and Recovery Act (RCRA) corrective action by United States Environmental Protection Agency (USEPA) in March 2010. OU-1 is located north of Big Creek and is divided by Harvard Avenue. OU-2 is located south of Big Creek. The northern portion of the site is characterized by low relief and a gradual eastward slope toward the river. A relatively steep bank is present along the western side of the river. The land surface in the middle of the site sits approximately 10 to 15 feet (ft) higher than the river and creek channel bottoms. In the northern portion of the site, the land surface has been modified to permit the construction of buildings, with paved surfaces and drainage. All developed parcels within the site have been filled to raise the land surface elevation and limit the potential for flooding. Ponding of surface water occurs in various areas throughout the site. The southern portion of the site is mainly undeveloped. Surface water runoff from this area is controlled by drainage ditches and culverts associated with adjacent railroad tracks.

The site is underlain by up to 22 ft of unconsolidated material (i.e., overburden) over shale bedrock. The bedrock is relatively shallow beneath the central and northern part of the site and becomes deeper to the north, east, west, and south where the thickness of the unconsolidated material increases.

Depth to groundwater at the site varies seasonally. Potentiometric maps indicate that groundwater flow in the overburden generally flows from west to east across the site. Groundwater elevations ranges from 5-10 ft below ground surface (bgs) within the central portions of the site and 15-19 ft



bgs nearer the river, and elevations appear to be influenced by bedrock elevation and changes in surface water levels of Big Creek and the Cuyahoga River. Groundwater flow in OU-1 is impacted in the western section by the active extraction well system and in the western and northern portions by a belt line sewer trench.

1.3 Wells Onsite and Contamination

As a result of historical industrial use, site soil and groundwater contain varying concentrations of residual radioactive materials from previous operations and ongoing storage of materials. FUSRAP constituents of concern (COCs) for OU-1 and OU-2 soils include radium (Ra)-226, thorium (Th)-230, Th-232, and total uranium (U). Other constituents identified in site soils include nickel, chloride, and sulfate, with nickel being most prevalent. The extent of soil contamination is shown on **Figure 1 and Figure 2**, as indicated by the shaded polygons. A uranium-contaminated groundwater plume is present in OU-1, beneath and near former Building G-1. Based on historical data, the groundwater beneath OU-2 is not FUSRAP impacted. Onsite groundwater is known to be impacted with various COCs including radium, thorium, and uranium. Onsite groundwater is also known to be impacted with non-radiological constituents including cadmium, lead, lithium, manganese, and nickel with lesser concentrations of molybdenum chloride sulfate and diesel range organics. Existing wells in OU-1 and OU-2 were installed for various purposes by multiple parties, including USACE. USACE monitoring wells across OU-1 and OU-2 are to be decommissioned under this task order. Monitoring wells that were not installed by USACE and are impacted during remediation activities will be replaced at the end of site remediation. USACE has estimated remediation will impact seven (7) non-USACE monitoring wells.

2.0 WELL DECOMMISSIONING AND INSTALLATION FIELD WORK

This section outlines the activities within OU-1 North, OU-1 South, and OU-2. All activities will be conducted in accordance with this Well Decommissioning and Installation Plan and other work plans established for soil remediation at HCCS. Activities related to monitoring well installation and decommissioning are further outlined in UFGS Section 02 32 13 (Subsurface Drilling and Sampling) and 33 51 39 (Monitoring Wells) and discussed in the following subsections.

2.1 Well Decommissioning and Installation Team

The well decommissioning and installation will be completed under the direction of EFS. EFS will be supported by Civil and Environmental Consultants, Inc. (CEC) who will provide oversight with a qualified licensed Geologist, experienced in well decommissioning and installation. EFS will provide a Radiation Protection Technician (RPT) to perform radiological surveying and air monitoring. Parratt Wolf Inc. (PWI), a USACE approved drilling contractor, will provide and operate mechanical drilling equipment and will supply all materials for decommissioning/abandoning and for new well installation. PWI is an experienced and licensed driller in the state of Ohio.

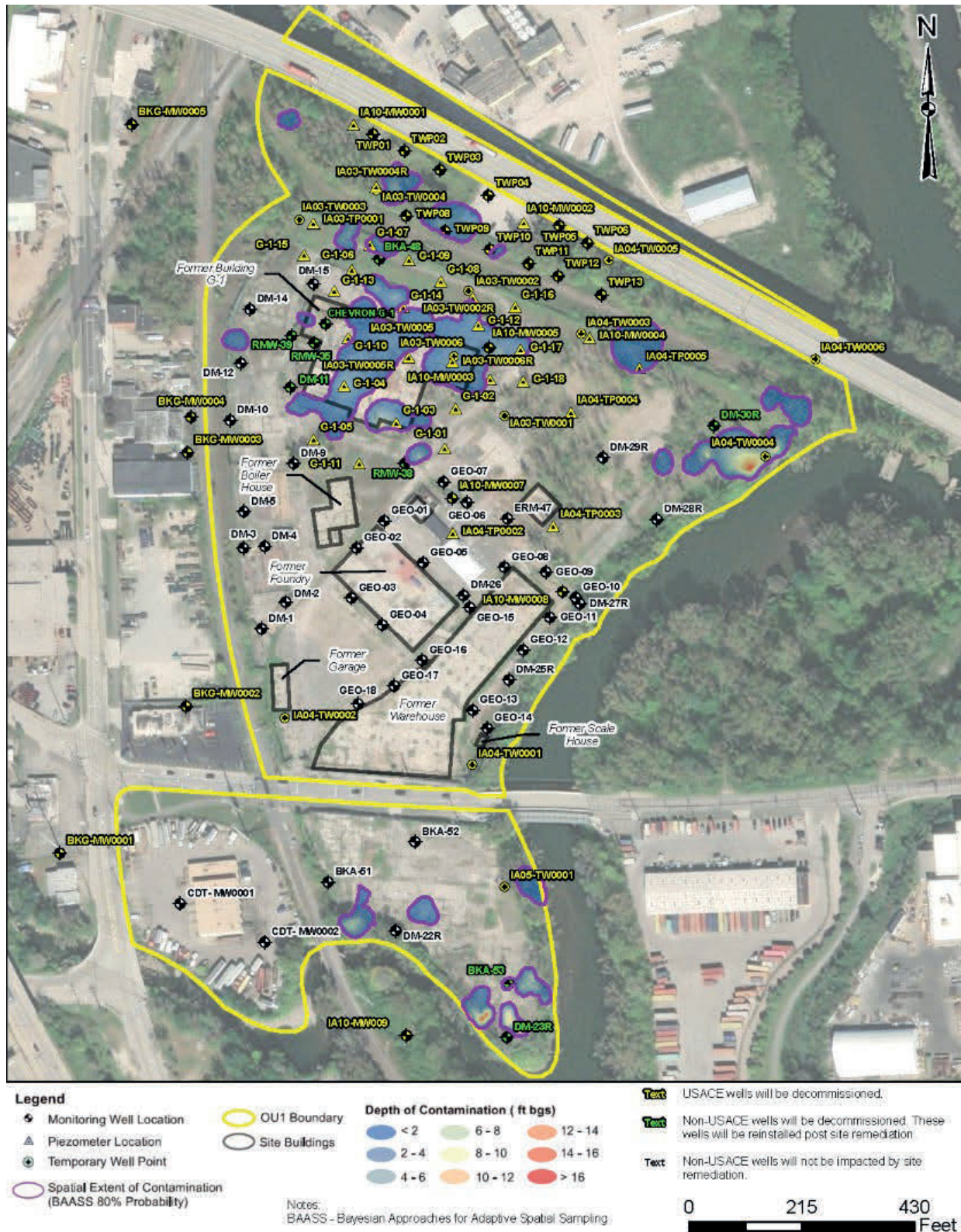


Figure 1: OU-1 Monitoring Well Locations and FUSRAP Remediation Areas

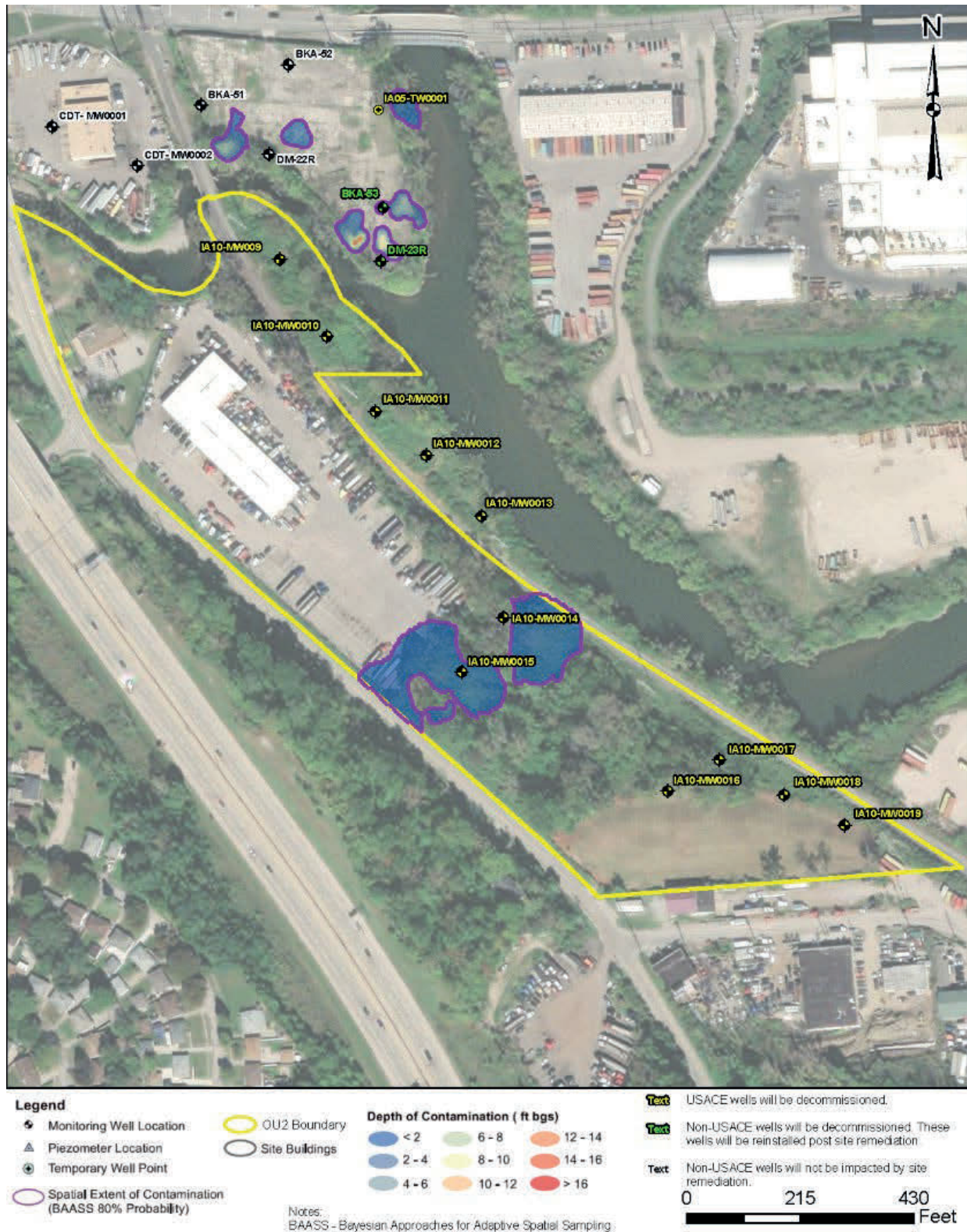


Figure 2: OU-2 Monitoring Well Locations and FUSRAP Remediation Areas



2.2 Well Locations and Current Conditions

Monitoring wells to be decommissioned were selected based on, if they were USACE-installed wells, or if their location would inhibit remediation activities. Wells to be decommissioned are identified in **Figure 1 and Figure 2** and listed in **Table 1**. Note that EFS utilized tables from the January 2023 *Section C Performance Work Statement* to identify wells that were to be decommissioned. The tables entitled “Monitoring Well Construction Information”, “Groundwater Monitoring Well Inventory”, and “New Monitoring Well Installation Summary” were used to identify the wells to be decommissioned. There are 123 locations listed between these two tables plus Chevron-G-1. EFS understands that USACE wells include locations with the following prefixes: BKG-MW00XX, IAXX-TP/TW/MW, G-1-X wells, and TWPXX. Furthermore, EFS understands that locations IA03-TP0001, IA03-TW0002R, IA03-TW0004R, IA03-TW0005R, and IA03-0006R are replacement wells, but assumes their original locations have not been decommissioned. EFS understands that all USACE wells are to be decommissioned as part of this project. EFS also understands that non-USACE wells that are within excavation footprints are to be decommissioned and later replaced as part of this project. Based on this information, EFS plans to decommission the 76 USACE wells and nine (9) non-USACE wells, for a total of 85 wells. On **Figure 1 and Figure 2**, wells that are not to be decommissioned are identified with black text with a white text outline, non-USACE wells that are to be decommissioned and later replaced are identified with a green text with a black text outline, and USACE wells that are to be decommissioned are identified with a yellow text with a black text outline.

Table 1 includes well construction details of each well, total depths, Global Positioning System (GPS) coordinates and ground surface elevations. Field work will initiate with well decommissioning in OU-1 North followed by OU-1 South and then OU-2. Any well installation will occur after soil remediation work in the vicinity has been completed. An estimated twelve (12) wells will be installed post-remediation and their locations will be defined at a later time and agreed upon with the contracting officer.

All well locations will be verified in the field prior to the start of work. In addition, total well depth and depth to water will be recorded at each location prior to decommissioning activities. Site wide utilities will be identified and marked prior to decommissioning or drilling as detailed in the *Site Operations Plan* (SOP) Section 6.3.3.

2.3 Decommission Methodology

This section outlines the methodology to be used for decommissioning of monitoring wells. Decommissioning will be performed in accordance with UFGS Section 33 51 39 and OEPA TGM. The decommission method to be employed will include removal of the casing and screen and overdrilling to remove the annular seal and filter pack. The borehole will then be pressure grouted as the drilling stem is removed. Available monitoring well construction details are summarized in **Table 1**. Boring logs available to EFS are provided in **Attachment 1**. Note that EFS does not have all the monitoring wells logs associated with each location in **Table 1** and as such, their complete construction information is not presented in this plan. Well information shown in **Table 1** should be sufficient for the proposed well decommissioning procedures.



Table 1: Monitoring Wells to be Decommissioned

Well Identification	Well Type	USACE Well?	Non-USACE Well Impacted during Construction?	Decommission?	Reinstall?	Date Installed	X Coordinate ¹	Y Coordinate ¹	TOC Elevation ²	Ground Surface Elevation ²	Total Depth (feet)	Screened Length (feet.) ³
BAK-48	Existing Pre-RI Well	NO	YES	YES	YES	NA	2191690.019	650842.7846	594.87	594.87	17	NA
BAK-51	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191592.312	649653.7464	595.76	593.18	35.5	NA
BAK-52	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191758.052	649730.4758	593.13	593.4	39	NA
BAK-53	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191937.295	649459.3179	593.4	591.16	35.5	NA
BKG-MW0001	RI Background Well	YES	NA	YES	NO	2003	2191081.118	649708.8771	592.1	592.67	16	8.5
BKG-MW0002	RI Background Well	YES	NA	YES	NO	2003	2191322.012	649989.1733	593.42	594.39	21.5	13.5
BKG-MW0003	RI Background Well	YES	NA	YES	NO	2003	2191324.767	650473.3022	591.98	592.73	26	18.5
BKG-MW0004	RI Background Well	YES	NA	YES	NO	2003	2191331.183	650541.2429	592.3	592.69	26	NA
BKG-MW0005	RI Background Well	YES	NA	YES	NO	2003	2191218.207	651099.7249	592.2	592.37	28	19.5
CDT- MW0001	NA	NO	NO	NO	NO	NA	2191310.367	649612.5176	588.09	NA	NA	NA
CDT- MW0002	NA	NO	NO	NO	NO	NA	2191471.659	649538.8447	587.21	NA	NA	NA
DM-1	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191465.836	650137.0198	596.13	593.71	19.5	12.5
DM-2	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191511.782	650188.4043	594.02	594.25	15.5	12
DM-3	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191431.176	650291.1611	594.14	594.48	12.5	10
DM-4	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191471.876	650294.5295	593.84	594.2	14.5	12
DM-5	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191432.21	650360.7255	596.36	594.13	18.17	12
DM-9	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191527.006	650452.6444	598.01	594.83	19	11
DM-10	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191405.927	650534.869	592.71	594.38	29.5	12
DM-11	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191520.52	650597.8244	595.89	593.88	25	13.5
DM-12	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191426.005	650643.803	596.13	593.93	27	12
DM-14	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191443.511	650747.0274	596.33	594.19	19	12
DM-15	Existing Pre-RI Well	NO	NO	NO	NO	1986	2191564.932	650795.4525	596.46	594.26	19	12
DM-22R	Existing Pre-RI Well	NO	NO	NO	NO	1997	2191721.351	649560.4916	594.81	592.7	35	12.5
DM-23R	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191933.531	649357.3415	593.06	590.82	35	11.5
DM-25R	Existing Pre-RI Well	NO	NO	NO	NO	1992	2191937.077	650039.9422	592.84	593.37	32	14
DM-26	Existing Pre-RI Well	NO	NO	NO	NO	1987	2191850.746	650200.8935	592.99	593.48	34	14
DM-27R	Existing Pre-RI Well	NO	NO	NO	NO	NA	2192072.44	650184.848	594.78	592.29	34	7
DM-28R	Existing Pre-RI Well	NO	NO	NO	NO	NA	2192219.274	650346.0887	595.09	592.57	34	7
DM-29R	Existing Pre-RI Well	NO	NO	NO	NO	NA	2192116.315	650463.8564	595.49	593.16	37	8
DM-30R	Existing Pre-RI Well	NO	YES	YES	YES	NA	2192328.275	650525.0467	594.91	593.02	34	8
ERM-47	Existing Pre-RI Well	NO	NO	NO	NO	1992	2191934.552	650347.5881	593.06	593.56	32.5	11.5
G-1-01	2015 RI Well	YES	NA	YES	NO	2015	2191815.055	650482.733	596.75	594.216	10	5.5
G-1-02	2015 RI Well	YES	NA	YES	NO	2015	2191835.864	650558.985	597.37	594.892	10.5	5.5
G-1-03	2015 RI Well	YES	NA	YES	NO	2015	2191722.5	650531.565	596.75	594.209	8.8	6.8
G-1-04	2015 RI Well	YES	NA	YES	NO	2015	2191623.173	650602.653	596.63	594.534	18.5	11.5
G-1-05	2015 RI Well	YES	NA	YES	NO	2015	2191565.107	650500.05	595.81	593.167	16.7	7.7



Table 1: Monitoring Wells to be Decommissioned (cont.)

Well Identification	Well Type	USACE Well?	Non-USACE Well Impacted during Construction?	Decommission?	Reinstall?	Date Installed	X Coordinate ¹	Y Coordinate ¹	TOC Elevation ²	Ground Surface Elevation ²	Total Depth (feet)	Screened Length (feet.) ³
G-1-06	2015 RI Well	YES	NA	YES	NO	2015	2191637.76	650823.537	594.39	593.115	19	12
G-1-07	2015 RI Well	YES	NA	YES	NO	2015	2191672.588	650871.667	593.58	591.245	17.7	10.9
G-1-08	2015 RI Well	YES	NA	YES	NO	2015	2191807.742	650801.436	594.76	592.375	13.8	13.8
G-1-09	2015 RI Well	YES	NA	YES	NO	2015	2191746.766	650842.154	594.23	591.707	17.9	10.9
G-1-10	2015 RI Well	YES	NA	YES	NO	2015	2191630.863	650693.474	594.66	593.925	19.5	12.8
G-1-11	2015 RI Well	YES	NA	YES	NO	2015	2191652.102	650453.953	596.81	593.837	6.3	5.3
G-1-12	2015 RI Well	YES	NA	YES	NO	2015	2191879.09	650718.32	597.06	594.716	14	7.1
G-1-13	2015 RI Well	YES	NA	YES	NO	2015	2191604.561	650783.409	596.4	594.128	17.5	10
G-1-14	2015 RI Well	YES	NA	YES	NO	2015	2191736.387	650751.841	597.42	594.88	14	7
G-1-15	2015 RI Well	YES	NA	YES	NO	2015	2191546.88	650851.927	594.82	592.512	17.8	10.8
G-1-16	2015 RI Well	YES	NA	YES	NO	2015	2191949.597	650752.915	595.48	592.956	13	6
G-1-17	2015 RI Well	YES	NA	YES	NO	2015	2191959.623	650671.607	596.47	594.397	14	7
G-1-18	2015 RI Well	YES	NA	YES	NO	2015	2191964.627	650610.958	597.17	594.67	14	7
GEO-01	NA	NO	NO	NO	NO	NA	2191699.53	650343.229	592.35	592.61	NA	NA
GEO-02	NA	NO	NO	NO	NO	NA	2191646.865	650291.104	592.53	593.15	NA	NA
GEO-03	NA	NO	NO	NO	NO	NA	2191636.931	650196.159	592.38	592.95	NA	NA
GEO-04	NA	NO	NO	NO	NO	NA	2191695.858	650144.557	592.59	593.08	NA	NA
GEO-05	NA	NO	NO	NO	NO	NA	2191773.63	650263.505	592.12	592.65	NA	NA
GEO-06	NA	NO	NO	NO	NO	NA	2191857.166	650378.04	592.44	592.92	NA	NA
GEO-07	NA	NO	NO	NO	NO	NA	2191812.516	650417.563	592.83	593.28	NA	NA
GEO-08	NA	NO	NO	NO	NO	NA	2191928.422	650254.994	592.4	592.63	NA	NA
GEO-09	NA	NO	NO	NO	NO	NA	2192007.752	650245.631	591.95	592.29	NA	NA
GEO-10	NA	NO	NO	NO	NO	NA	2192064.619	650196.633	591.72	592.02	NA	NA
GEO-11	NA	NO	NO	NO	NO	NA	2192015.341	650158.897	591.87	592.2	NA	NA
GEO-12	NA	NO	NO	NO	NO	NA	2191964.615	650096.421	592.33	592.62	NA	NA
GEO-13	NA	NO	NO	NO	NO	NA	2191868.42	649981.601	592.12	592.57	NA	NA
GEO-14	NA	NO	NO	NO	NO	NA	2191896.175	649947.136	591.61	591.87	NA	NA
GEO-15	NA	NO	NO	NO	NO	NA	2191862.443	650177.959	592.3	592.53	NA	NA
GEO-16	NA	NO	NO	NO	NO	NA	2191772.002	650076.938	592.21	592.53	NA	NA
GEO-17	NA	NO	NO	NO	NO	NA	2191718.47	650028.421	593.57	593.65	NA	NA
GEO-18	NA	NO	NO	NO	NO	NA	2191649.728	649994.046	592.44	592.52	NA	NA
IA03-TP0001^	RI Temporary Piezometer	YES	NA	YES	NO	2004	2191565.238	650911.497	593.27	591.05	21	15
IA03-TP0001	RI Temporary Piezometer	YES	NA	YES	NO	2004	2191564.450	650912.660	594.2	591.5	21.0	15
IA03-TW0001	RI Temporary Well Point	YES	NA	YES	NO	2003	2191929.070	650543.650	596.50	593.9	12.7	11.5
IA03-TW0002	RI Temporary Well Point	YES	NA	YES	NO	2003	2191860.420	650782.560	595.39	592	11.8	6.2
IA03-TW0002R	2015 RI Well	YES	NA	YES	NO	2015	2191868.345	650770.316	594.87	592.52	13.8	5.8
IA03-TW0003	RI Temporary Well Point	YES	NA	YES	NO	2003	2191537.920	650917.84	593.39	590.49	21	11.4
IA03-TW0004	RI Temporary Well Point	YES	NA	YES	NO	2003	2191684.590	650974.550	593	589.8	29	12.4
IA03-TW0004R	2015 RI Well	YES	NA	YES	NO	2015	2191684.233	650981.942	593	590.62	29.1	12.1



Table 1: Monitoring Wells to be Decommissioned (cont.)

Well Identification	Well Type	USACE Well?	Non-USACE Well Impacted during Construction?	Decommission?	Reinstall?	Date Installed	X Coordinate ¹	Y Coordinate ¹	TOC Elevation ²	Ground Surface Elevation ²	Total Depth (feet)	Screened Length (feet.) ³
IA03-TW0005	RI Temporary Well Point	YES	NA	YES	NO	2003	2191736.910	650685.070	NA	596	9.1	NA
IA03-TW0005R	2015 RI Well	YES	NA	YES	NO	2015	2191746.243	650656.562	596.67	594.23	10.0	6.2
IA03-TW0006	RI Temporary Well Point	YES	NA	YES	NO	2003	2191832.860	650657.070	NA	596	11.6	NA
IA03-TW0006R	2015 RI Well	YES	NA	YES	NO	2015	2191829.735	650648.195	596.67	594.39	10.5	5.6
IA04-TP0002	RI Temporary Piezometer	YES	NA	YES	NO	2004	2191830.514	650320.905	595.74	595.74	26	13
IA04-TP0003	RI Temporary Piezometer	YES	NA	YES	NO	2004	2192021.811	650334.472	595.39	595.39	36	15
IA04-TP0004	RI Temporary Piezometer	YES	NA	YES	NO	2004	2192055.729	650551.547	595.2	595.2	23.5	15
IA04-TP0005	RI Temporary Piezometer	YES	NA	YES	NO	2004	2192185.974	650635.664	594.47	594.47	38	15
IA04-TW0001	RI Temporary Well Point	YES	NA	YES	NO	2003	2191867.547	649878.02	595.16	592.71	38.4	10.9
IA04-TW0002	RI Temporary Well Point	YES	NA	YES	NO	2003	2191510.294	649967.139	593.59	591.86	23.5	11.7
IA04-TW0003	RI Temporary Well Point	YES	NA	YES	NO	2003	2192075.239	650700.562	596.03	592.94	15.3	11.3
IA04-TW0004	RI Temporary Well Point	YES	NA	YES	NO	2003	2192426.352	650466.22	594.44	591.22	35.3	14.5
IA04-TW0005	RI Temporary Well Point	YES	NA	YES	NO	2003	2192127.987	650840.906	593.23	590.24	25	12.4
IA04-TW0006	RI Temporary Well Point	YES	NA	YES	NO	2003	2192521.622	650652.209	589.71	586.35	32.9	12.2
IA05-TW0001	RI Temporary Well Point	YES	NA	YES	NO	2003	2191929.224	649644.711	598.64	593.16	37.8	13.3
IA10-MW0001	RI On-site Well	YES	NA	YES	NO	2003	2191641.114	651100.6759	593.86	591.61	30	19.5
IA10-MW0002	RI On-site Well	YES	NA	YES	NO	2003	2191965.681	650913.4608	595.72	593.69	32.6	19.9
IA10-MW0003	RI On-site Well	YES	NA	YES	NO	2003	2191901.556	650614.3214	597.98	595.55	14	6.5
IA10-MW0004	RI On-site Well	YES	NA	YES	NO	2003	2192091.074	650693.7417	595.88	593.54	19.5	11.5
IA10-MW0005	NA	YES	NA	YES	NO	NA	2191899.568	650673.73	594.83	594.89	NA	NA
IA10-MW0007	NA	YES	NA	YES	NO	NA	2191829.073	650386.123	592.95	593.64	NA	NA
IA10-MW0008	NA	YES	NA	YES	NO	NA	2192039.542	650207.812	592.57	592.85	NA	NA
IA10-MW0009	NA	YES	NA	YES	NO	NA	2191741.764	649360.876	586.74	584.61	NA	NA
IA10-MW0010	NA	YES	NA	YES	NO	NA	2191831.108	649214.641	586.6	584.15	NA	NA
IA10-MW0011	NA	YES	NA	YES	NO	NA	2191923.092	649071.907	591.43	589.33	NA	NA
IA10-MW0012	NA	YES	NA	YES	NO	NA	2192019.337	648988.702	583.7	581.5	NA	NA
IA10-MW0013	NA	YES	NA	YES	NO	NA	2192123.942	648873.419	586.09	583.64	NA	NA
IA10-MW0014	NA	YES	NA	YES	NO	NA	2192165.914	648681.275	597.25	594.91	NA	NA
IA10-MW0015	NA	YES	NA	YES	NO	NA	2192086.654	648578.025	598.56	596.26	NA	NA
IA10-MW0016	NA	YES	NA	YES	NO	NA	2192477.454	648351.821	594.71	592.03	NA	NA
IA10-MW0017	NA	YES	NA	YES	NO	NA	2192575.225	648411.023	595.48	590.77	NA	NA
IA10-MW0018	NA	YES	NA	YES	NO	NA	2192698.014	648344.493	592.21	590.05	NA	NA
IA10-MW0019	NA	YES	NA	YES	NO	NA	2192812.298	648287.03	597.19	594.79	NA	NA
TWP01	NA	YES	NA	YES	NO	NA	2191678.193	651081.229	591.94	590.96	29	15
TWP02	NA	YES	NA	YES	NO	NA	2191738.224	651049.098	592.76	590.58	29.5	15
TWP03	NA	YES	NA	YES	NO	NA	2191806.201	651012.973	592.92	590.37	30	15
TWP04	NA	YES	NA	YES	NO	NA	2191898.04	650964.762	593.42	590.6	30	15
TWP05	NA	YES	NA	YES	NO	NA	2192033.133	650906.735	593.39	591.34	30	15
TWP06	NA	YES	NA	YES	NO	NA	2192086.882	650873.568	593.07	590.97	28	15



Table 1: Monitoring Wells to be Decommissioned (cont.)

Well Identification	Well Type	USACE Well?	Non-USACE Well Impacted during Construction?	Decommission?	Reinstall?	Date Installed	X Coordinate ¹	Y Coordinate ¹	TOC Elevation ²	Ground Surface Elevation ²	Total Depth (feet)	Screened Length (feet.) ³
TWP08	NA	YES	NA	YES	NO	NA	2191741.419	650925	592.61	589.953	28.5	15
TWP09	NA	YES	NA	YES	NO	NA	2191815.387	650896.308	591.28	589.747	27.5	15
TWP10	NA	YES	NA	YES	NO	NA	2191901.02	650860.912	593.17	589.765	25	15
TWP11	NA	YES	NA	YES	NO	NA	2191974.811	650833.904	591.05	589.989	21.5	10
TWP12	NA	YES	NA	YES	NO	NA	2192031.112	650810.222	593.22	589.948	20	10
TWP13	NA	YES	NA	YES	NO	NA	2192113.608	650774.418	591.46	590.606	19	10
RMW-35	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191566.090	650682.820	596.44	594.65	18	10
RMW-38	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191739.010	650453.120	596.76	594.55	22	13
RMW-39	Existing Pre-RI Well	NO	YES	YES	YES	1997	2191523.350	650696.530	595.93	593.78	19	NA
CHEVRON-G-1	NA	NO	YES	YES	YES	NA	NA	NA	NA	NA	NA	NA
Summary Count		76	9	85	9							

Notes:

¹ Coordinate system: Ohio State Plane, North Zone 3401, NAD83, Feet² Vertical datum: NGVD88 AMSL = above mean sea level; bgs = below ground surface; ft = feet³ Screened interval is marked by the top and bottom of the sandpack.⁴ 2009 RI Report Table "Groundwater Monitoring Well Inventory" contains Northing, Eastings, Ground Surface Elevation, and Top of PVC Elevation for IA03-TP0001 different than RI Report Table "New Monitoring Well Installation Summary". Data from the "New Monitoring Well Installation Summary" is what is shown in the table.

NA - not applicable or unknown



2.3.1 Well Casing Removal Procedures

Monitoring wells are to be inspected and their condition documented prior to decommissioning. Objects or obstacles (i.e. pumps, tubing, monitoring equipment, pressure gauges etc.) will be removed prior to decommissioning activities. Inner and outer well casings along with concrete pads are to be removed as part of decommission procedures. The specific procedure for removing the outer protective casing at each monitoring well will depend on the casing construction and the selected decommissioning method. The variety of protective casings at the Harshaw site inhibits the development of a universal removal procedure; however, it is preferred to simply break up the concrete seal surrounding the casing and jack or hoist the protective casing. Inner casings will be removed via overdrilling methods where a hollow stem auger will drill around the inner PVC casing as a guide before pulling the casing. If encountered, inner steel monitoring well casings will be removed approximately five ft bgs or the frost line. Waste handling and disposal will be consistent with the methods and procedures outlined in Section 2.5 of this Work Plan.

2.3.2 Well Sealing and Grouting

Successful well decommissioning depends on the proper grout mixture and placement in order to produce a continuous seal and eliminate the potential for vertical groundwater migration within the former well and its borehole. The grout mixture should be installed using a tremie pipe as the drilling stem is removed. The tremie will be a pipe, hose, or tube that extends from the grout supply to the bottom of the monitoring well, to ensure the grout is delivered through the water column, without mixing with the water. Grout should be applied in one continuous procedure to prevent grout segregation, dilution, and bridging. The tremie pipe should be in constant contact with the grout mixture to prevent air from entering the pipe, creating air pockets within the borehole. The borehole should be sealed from bottom to the frost line (approximately two to three feet from the surface). Grout will be added, as needed, as each section of down-hole tooling is removed in order to keep the grout level between zero and five ft bgs. If the grout level drops excessively below grade, the selected grouting method will be reevaluated. The overflowing grout should be regularly evaluated as it reaches the surface. When the observed material is similar to that being pumped in, this stage of the sealing is considered complete.

Standard grout mixtures to be used include Type 1 Portland cement and 4 percent bentonite by weight. To produce a standard grout mixture with a bentonite content of 4 percent by weight, the mixture will be formulated according to the following proportions:

Standard Grout Mixture

- One 94-pound bag of Type I Portland cement
- 3.9 pounds of powdered bentonite
- 7.8 gallons of potable water

None of the monitoring wells identified for decommissioning were constructed with screens that transect multiple groundwater zones. However, if a monitoring well with this construction is encountered, more water may be used to penetrate the sand pack. A standard grout mixture will be used unless subsurface conditions warrant use of a special grout mixture. A special grout mixture is a quick-setting mixture, used to prevent the loss of an excessive amounts of grout. To produce



an alternate grout mixture with a bentonite content of 4 percent by weight, the mixture will be formulated according to the following proportions:

Alternate Grout Mixture

- One 94-pound bag of Type I Portland cement
- 3.9 pounds of powdered bentonite
- 1 pound calcium chloride
- 6.0 to 7.8 gallons of water (depending on desired thickness)

Prior to mixing, for either a standard or alternate grout mixture, the required volume of grout to fill the borehole will be calculated by EFS and PWI. The grout will be mixed either manually or mechanically until the mixture is homogenous enough for pumping.

Groundwater in OU-1 North, OU-1 South, and OU-2 is suspected to be contaminated based upon historic sampling results. Therefore, groundwater displaced during the grouting process will be containerized, collected, stored, treated, and potentially discharged in accordance with the Water Management Plan (WMP).

After grouting is complete, the area will be monitored to determine if settling has occurred and if additional applications of grout are necessary. Should enough settling occur that the grout falls below five ft bgs, more grout will be added.

2.3.3 Completion of Borehole and Final Surface Seal

The grout at each former well location will be inspected 24 hours after installation to check for settling; grout will be added as needed then checked again before topping with any surface materials. After decommissioning is complete, final coordinates will be captured with a GPS unit. Additionally, ferrous metal marker and a fabricated utility marking will be installed at grade at all locations following decommissioning for visibility and identification purposes.

Photos before and after well decommissioning will be collected at each well location for documentation. Field notes and well decommissioning forms will include volume/weight of materials used at each well location and be included in final deliverables to USACE. An example of the form to be completed in the field is provided in **Attachment 2**. In addition, Ohio well decommission form (DNR 7810.12e) will be filled out submitted by PWI online to Ohio Department of Natural Resources (ODNR). Copies of DNR 7810.12e will be included in final deliverables to USACE in accordance with UFGS 33 51 39 Section 3.6.3.

2.3.4 Well Decommissioning / Abandonment Report

EFS will prepare a draft letter report to the contracting officer within 14 days after the completion of the field work. The letter report will include the following information:

- Narrative, summarizing field activities including decommissioning methods used, field measurements, approximate volume of grout used at each location, and waste material handling (if applicable)
- Figures showing the decommissioned/ abandoned well locations



- Attachments, including ODNr form 7810.12e for each abandoned well location

2.4 Well Installation Methodology

An estimated 12 non-USACE monitoring wells (10 in OU-1 and 2 in OU-2) are anticipated to be impacted during remediation and require replacement. This section outlines the methodology and materials to be used to install replacement monitoring wells. These procedures are in accordance with UFGS Section 33 51 39.

Drilling activities and equipment will be brought to the site by PWI. PWI will provide equipment needed to install twelve monitoring wells to approximately 15 ft bgs. Such equipment may include but are not limited to: drill rig, hand tools, rods, spoons, etc.

CEC will provide an experienced geologist to oversee drilling operations and log subsurface material for well logs in conjunction with a qualified RPT provided by EFS. The EFS technician will oversee radiological screenings throughout the entire subsurface investigation per the Radiation Protection Plan (RPP).

2.4.1 Drilling Methods

PWI will install the monitoring wells with CEC oversight. Drilling will be performed in accordance with UFGS Section 02 32 13. Drilling methods will be completed in accordance with engineer manual (EM)-1110-1-1906, American Society for Testing and Materials (ASTM) D1452/1452M (2016) and ASTM D1586/ D1586M, procedures detailed in this Plan, and as directed by the Contracting Officer. The CEC field scientist will observe the drill cuttings at the surface and record material descriptions on the boring log, similar to the example shown in **Attachment 3**. Monitoring wells will be installed using a rig equipped with 4.25-inch hollow-stem augers. Each monitoring well will be installed in reasonable proximity to the original location in order to provide similar groundwater elevation data. In general, the augers will be advanced to a depth corresponding to 5 feet below the water table. Soil cuttings generated during monitoring well installation activities will be placed in dump trailers and taken offsite for disposal. See Section 2.5 for more information.

2.4.2 Well Installation Procedures

Monitoring wells will be installed in accordance with UFGS Section 33 51 39 and EM-1110-1-4000. The CEC field scientist will oversee well installation and record depths and descriptions on their boring log under the *Well Diagram* section, similar to the example shown in **Attachment 3**.

Personnel installing the monitoring well must wear clean cotton or surgical gloves while handling the assembly outside of the exclusion zone. Well casings, screens, plugs and caps must be decontaminated prior to delivery by the manufacturer and certified clean. Materials must be handled in such a manner as to ensure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation. Note all monitoring well riser and screen materials must be cleaned prior to installation. See Section 2.6 for more information.

2.4.3 Well Construction Materials

A sketch of monitoring well construction is shown in **Figure 3**. Monitoring wells will be constructed through the hollow-stem augers with 2-inch inside diameter ASTM F480, Type 1, Grade 1, polyvinyl chloride (PVC) Schedule 40 pipe with flush threaded joint fittings. Well screen will be 5-ft or 10-ft lengths of 0.010-inch, machine-slotted well screen that conform ASTM D1785.



The slots will be even in width, length, and separation. Appropriate fittings will be used to conform to ASTM F480, i.e. flush thread male by female. The bottom section of the screen will have a watertight seal by means of a flush threaded end cap of the same material as the well screen, within 6 inches of the open portion of the screen. Final well screen lengths will be selected based on the construction of the previous monitoring well being replaced.

After the screen and well casing have been concentrically installed in the borehole, a filter pack will be constructed around the screen by filling the entire space between the screen and the wall of the borehole over the screened interval, according to EPA 600-4-89-034 and ASTM D5092. The well casing must be capped during filter pack placement. The filter pack will consist of clean, durable, well-rounded, and washed quartz or granite with less than 5 percent non-siliceous material. The filter pack will not contain organic matter or friable materials and allow free flow of water in the well while preventing the infiltration of aquifer materials. The filter pack will be installed using a tremie pipe with an inside nominal diameter of no less than 1 inch, to the bottom of the annulus between the hole and well. The tremie pipe will be cleaned with high pressure hot water/steam prior to each use. The tremie pipe will be arranged such that water and filter pack material are fed at uniform rates as the filter pack material fills the well annulus from the bottom up. The tremie pipe will be raised at a rate that will keep the bottom of the pipe no more than 5 feet above the top of the surface of the filter pack level, and no more than 2 feet below the surface of the filter pack level at all times. The filter pack will be placed such that the entire annular space between the screen and casing assembly and the outside wall of the borehole is filled. Placement of the sand pack will be confirmed with frequent depth measurements collected via weighted measuring tape inside the annulus during tremie pipe retraction. The weighted measuring tape will be lowered slowly into well until the weight reaches the top of the sand pack and the line slackens. The tape will then be partially withdrawn until the weight is upright. Observe the depth measurement on the weighted tape. Confirm the depth by raising and lowering the tape several times. Continue this process until the sand reaches the desired depth. The sand pack will extend from the base of the borehole to approximately 2-ft above the top of the well screen.

After sand pack installation, coated bentonite pellets will be installed to approximately two-feet above the sand pack. Bentonite pellets can be poured into the borehole from the surface. In order to provide accurate measurement of bentonite pellet thickness in the annulus, the pellet seal will be tamped during measurement. Bentonite pellets will be placed in lifts of 6 inches to 1 foot with each lift allowed to hydrate for a minimum of 30 minutes prior to placing the next lift. If the pellets are not placed in lifts, a minimum hydration time of three hours, will be allowed unless the manufacturer recommends a longer hydration time. A weighted tape will be used via a method similar to that described above to ensure the material is placed at the desired depth.

The remaining annulus will be filled with a non-shrinking cement grout placed in one continuous operation above the bentonite seal to the frost line. Grout injection will be in accordance with ASTM D5092. Grout will be installed via a tremie pipe from the bottom up. If the annulus length is less than 15 feet and without fluids the grout may be poured or pumped. Grout will be allowed to cure a minimum of 48 hours before any well development operations.

EFS assumes all wells will have approximately 2.5-ft casing stick-up above the ground surface. Each well pipe will be capped with an expandable plug and equipped with a bolt-down 6-in diameter locking steel protective casing cover installed within a concrete pad at the ground surface. The concrete pad will be sloped away from the well and will conform to ASTM C387/C387M



normal weight, normal strength concrete. The dry materials will be combined with potable water and mixed in an approved mixer or container until uniform in consistency and color. Water use will be limited to the minimum amount possible. The top of the protective outer steel casing will extend a minimum of 6 inches above the top of the PVC well casing cap. The protective outer steel casing will be placed in cement grout and extend below the depth of the frost line. A ¼ inch diameter weep hole will be drilling into the protective outer casing, 3 inches above the ground surface. The annular space between the protective outer casing and the inner PVC well casing will be filled with pea gravel or coarse sand to just below the level of the cap on the well casing.

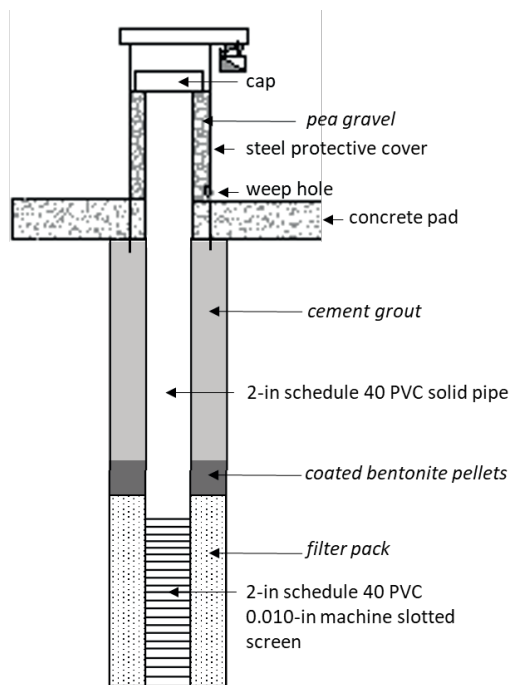


Figure 3: Example of Monitoring Well Construction

A corrosion resistant metal tag will be affixed to the exterior and interior of the protective cover. If a well is located in a concrete paved area, the well identification tag will be affixed to the concrete with four hammer set nails. The metal tag will be stamped with the U.S. Army Corps of Engineers well identification number, elevation of the highest point on the rim of the well casing or riser pipe, elevation of the ground surface at the well, well coordinates, date of well installation, and the top of the protective casing elevation in feet.

The well will be clearly marked and secured to avoid unauthorized access and tampering. Words "MONITORING WELL" will be written on the well head cover as well as a sign reading: "WELL IS FOR MONITORING AND IS NOT SAFE FOR DRINKING." The stamped metal identification tag will include the following:

- DO NOT DISTURB
- ID #:
- Date:



- Installed By:
- Total Depth:
- Screened Interval:
- TOC Elevation:
- Other: (*as applicable*)
- For Information Call (*site contact person*)

The CEC field scientist will oversee the well construction and record observations and depths on their boring log under the *Well Diagram* section, similar to the example shown in **Attachment 3**.

2.4.4 Monitoring Well Survey

Following installation, a survey marker will be added to each well along the north side of the PVC riser using a permanent black marker. The survey marker will be added to document the desired point of measurement for the survey and for future water level measurements. Each monitoring well will be surveyed for the geographic location and elevation of the ground surface and top of PVC casing at each monitoring well. Elevation measurements will be collected using survey-grade equipment to measure the top of the outer steel casing, the top of the inner PVC casing, and ground surface relative to an existing benchmark. Geographic coordinates will be measured using a hand-held GPS device. Monitoring well survey information will be recorded at the top of the final boring logs (**Attachment 3**).

2.4.5 Well Development Methods

Monitoring well development will be completed in accordance with the methods outlined in the Chapter 8 of the OEPA TGM's *Monitoring Well Development, Maintenance, and Redevelopment* (2009) and EM 1110-1-4000 – *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites* "for Well Development Criteria. Within 7 days of completion of each well, but no sooner than 48 hours after cement grouting is completed, and after approval from the Contracting Officer, well development will begin. Each monitoring well will be developed in stages using a combination of hand purging using new disposable polyethylene bailers and rope and by pumping until development water flows clear and a minimum of three well volumes have been removed. At such time, EFS will collect field parameter readings (pH, temperature, specific conductance, and turbidity) in accordance with EM 1110-1-4000. Well purging will continue as necessary and field readings will be collected until the following criteria are met:

- Stabilization is complete when variation between three consecutive measurements is less than or equal to:
 - 0.2 pH units
 - 1 degree Fahrenheit
 - 3 percent change in specific conductance
 - 10 mV ORP
 - 10 percent DO and turbidity
- Well water is clear to the unaided eye
- Sediment thickness remaining in the well is less than 1 percent of the screen length (i.e. less than 0.1 ft. for a 10-ft. screen)



- Minimum removal of three times the standing water volume in the well (to include the well screen and casing plus saturated annulus, assuming 30 percent annular porosity)

Purged groundwater will be containerized, collected, stored, treated, and potentially discharged in accordance with the WMP. Well development information will be recorded on field, similar to the example shown in **Attachment 4** and summarized on the final boring logs.

2.4.6 Documentation and Records

Boring logs, well logs and other field records will be prepared as described below.

2.4.6.1 Boring Logs and Field Records

Drilling logs will be prepared by a qualified field geologist/engineer in accordance with the UFGS Section 02 32 13 and ASTM Standards. Drilling logs and field records are to follow items A through R in sub-section 3.12 of UFGS Section 02 32 13. Dimensions and coordinates will be noted on logs where applicable. Boring Logs and Well Construction diagrams will be provided on a form similar to that shown in **Attachment 3**. Well development field records will include items A through M in sub-section 3.4.6.1 of UFGS Section 33 51 39. Well development readings will be recorded on a form similar to the one shown in **Attachment 4**.

2.4.6.2 Locational Information

Geospatial data will be recorded in accordance with UFGS 01 35 13.43 10 as shown on **Attachment 3**. All monitoring well locations will be documented using global positioning system (GPS) equipment. Monitoring well coordinates and borehole/well dimensions will be noted on the associated logs. Surveyed ground elevations and top of PVC elevation will also be included on the boring logs.

2.4.6.3 Well Installation Report

A Well Installation Report will be submitted to the Contracting Officer within 30 calendar days after the completion of well installation field work. This report will include the following information:

- Narrative Section
 - Purpose and Scope
 - Summary of Activities
- Figures
 - New Well Locations
- Tables
 - Well Construction Summary
- Attachments
 - Boring logs (Consistent with USFS Section 02 32 00, **Attachment 3**)
 - Well Installation Diagrams (**Attachment 3**)
 - Well Development Records (**Attachment 4**)
 - Photographs



2.5 Waste Management

Waste management will be completed in accordance with the Waste Management, Transportation and Disposal Plan. All waste generated during decommissioning activities will be collected for disposal offsite. Assumed debris to be generated from decommissioning activities includes protective stick-up casings, PVC well casings, concrete pads, and protective bollards. All investigative derived waste (IDW) will be disposed of in dump trailers, combined with contaminated soil, and taken offsite for disposal.

Staging of IDW will be in an area coordinated by EFS and acceptable to USACE. USACE will be responsible for signing manifests and/or bills of lading associated offsite disposal of IDW.

Any contaminated water will be containerized, collected, stored, treated, and potentially discharged in accordance with the WMP.

2.6 Decontamination Procedures and Prevention

Drilling/sampling equipment (i.e. Vehicles, drill rods, and tools) must be cleaned prior to arrival on site. Equipment or tools containing soil, grease or other contaminants is prohibited. Additionally, down-hole equipment (e.g. augers, rods, samplers, and spoons) will be decontaminated prior to arrival on site and between sample locations. The drill rig, drill rods, drill bits, augers, temporary casing, tremie pipes, grout pumping lines, and other associated equipment will be cleaned at each monitoring well location.

For well installation locations, the new well screen and well casing will be cleaned with high-pressure hot water and detergent cleaning solution immediately prior to installation in the well. The use of factory sealed (plastic wrapped) screen and well casing does not waive this requirement for pre-installation cleaning.

Equipment decontamination procedures detailed in the RPP are summarized below. Any equipment used in an exclusion zone (EZ) will be decontaminated at the excavation area by removing all loose soil. Subsequent decontamination will be performed as necessary until verified clean, and may include:

- Washing and/or wiping until visibly clean,
- Low pressure, non-phosphate, detergent wash with wiping.

A conditional release survey will be completed at the excavation area prior to moving the equipment to the next work location on site. Small tools and other equipment (i.e., field meters, etc.) will be wrapped in plastic prior to being moved between contaminated areas of the site and will be decontaminated prior to being moved to un-contaminated areas of the site or off site. All equipment will be decontaminated and surveyed in accordance with requirements of the Contamination Control Plan and UFGS 01 35 13.43 10 Section 3.1.6. As much equipment as possible will be dedicated for single use for the duration of the project and, upon final release, will be surveyed and verified in conformance with the site unrestricted release in accordance with the RPP. Disposable materials used for the subsurface investigation will be containerized on site in the area of the former G-1 building and in accordance with the RPP.



2.7 Worker Health and Safety Monitoring

Worker health and safety monitoring will be performed in accordance with the approved project RPP, and the Accident Prevention Plan (APP) / Site Safety and Health Plan (SSHP)

3.0 SCHEDULE

Monitoring Well decommissioning is scheduled to occur in the mobilization and initial site work phase, prior to beginning excavation activities. Well decommissioning activities are anticipated to take approximately three weeks to complete, depending on weather conditions and subcontractor availability. EFS will provide a draft Well Decommissioning Report to the Contracting Officer approximately 14 days after field activities are complete. Well installation activities are anticipated to occur after remediation earthwork is completed in each affected area. A draft Well Installation Report will be provided to the Contracting Officer within 30 days after the completion of the final well installation.



ATTACHMENT 1

Select Boring Logs of Existing Wells

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

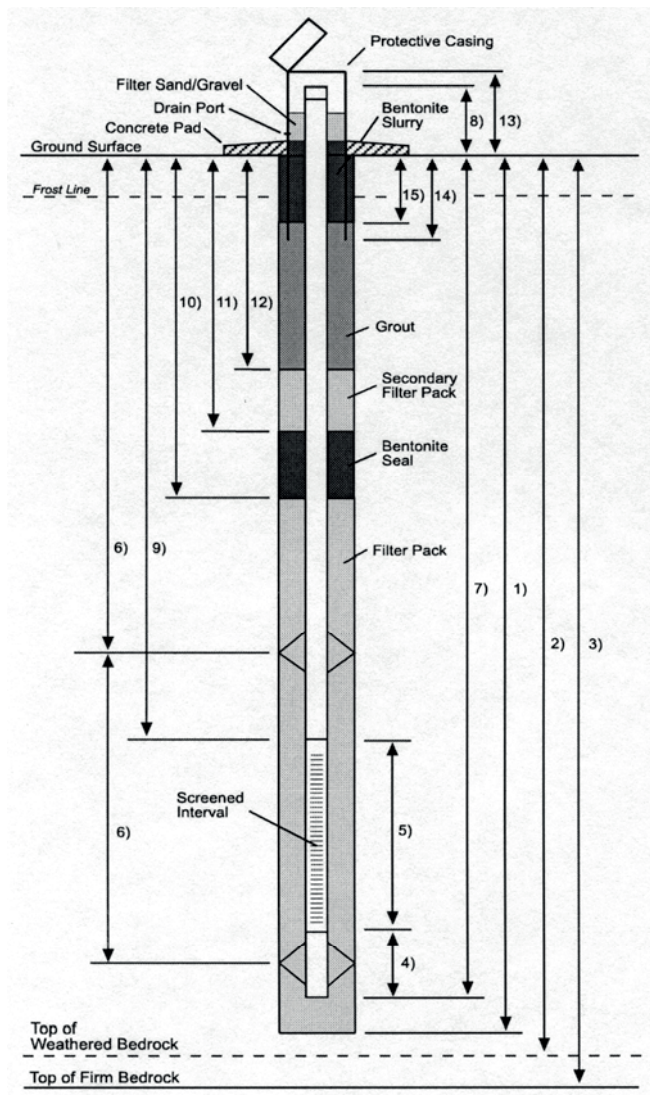
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-1

Location: Southeast of former Building G-1 in gravel driveway

Date Installed: 4/27/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 10.2 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 8.8 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 10.0 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 5.0 Ft. BGS

10) Depth to Top of Filter Pack: 4.5 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 3.5 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 3.5 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: G-1-2

Location: East of former Building G-1 along fenceline

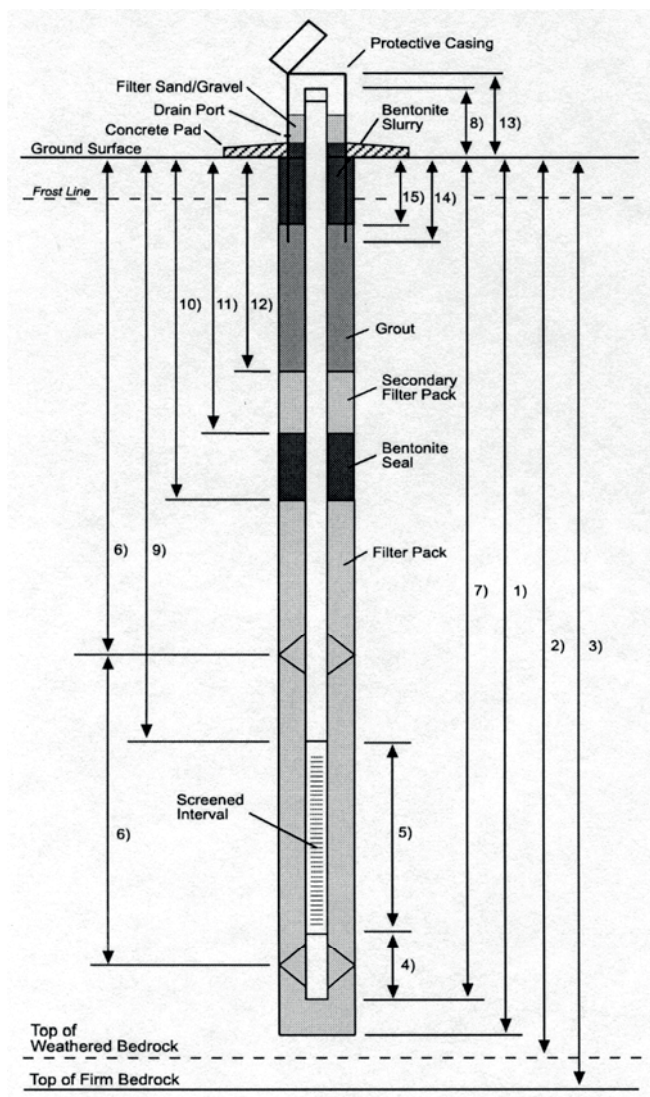
Date Installed: 4/28/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 10.7 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 10.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 5' (1), 5' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 10.5 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 5.0 Ft. BGS

10) Depth to Top of Filter Pack: 4.5 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 0.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 0.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

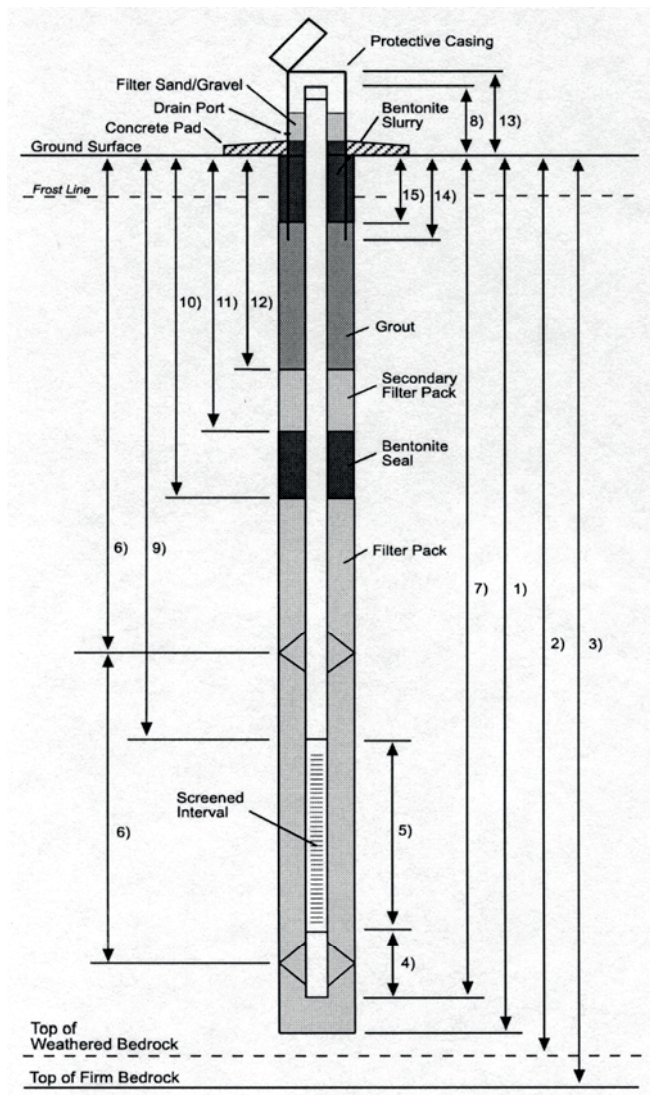
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-3

Location: Southeast corner of former Building G-1 concrete pad

Date Installed: 4/21/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 9.2 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 6.0 3) Firm: 7.0

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 5' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 8.8 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 3.8 Ft. BGS

10) Depth to Top of Filter Pack: 2.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 0.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 0.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA (in building concrete pad) Ft.

Protective Post Type/Configuration: NA (in building concrete pad)

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

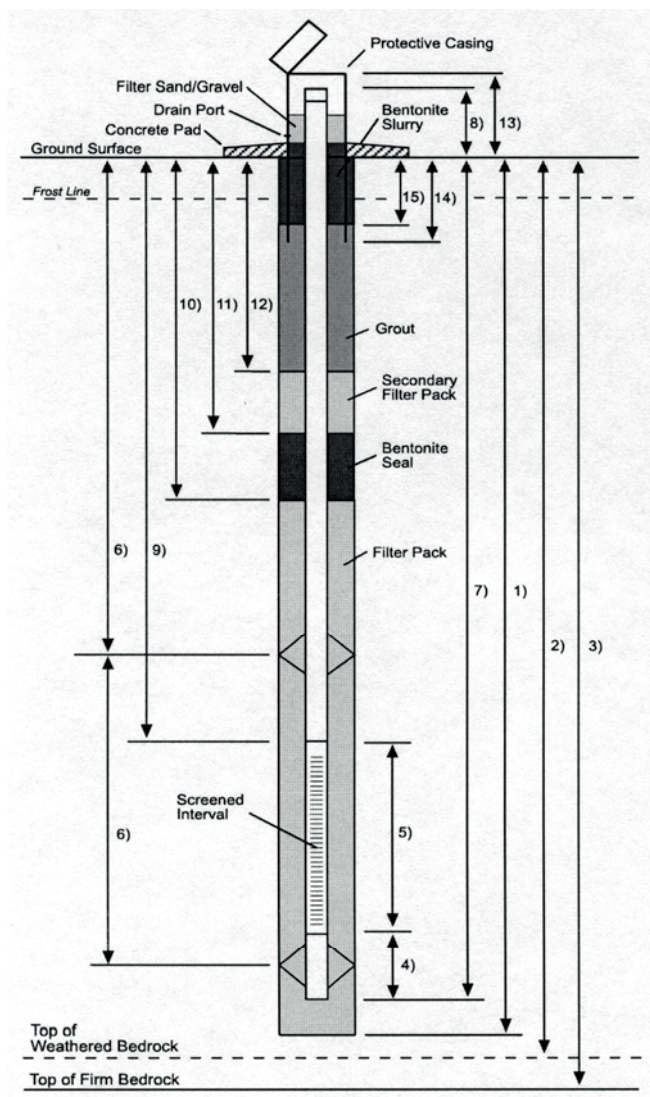
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-4

Location: Southwest portion of former Building G-1 concrete pad

Date Installed: 4/20/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 19.0 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 18.5 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 9.6 Ft.

Total Screen Casing Length: 10.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 18.5 Ft. BGS

8) Casing Stickup: 2.1 Ft. AGS

9) Depth to Top of Screen: 8.5 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 4.6 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 4.6 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA (in building concrete pad) Ft.

Protective Post Type/Configuration: NA (in building concrete pad)

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

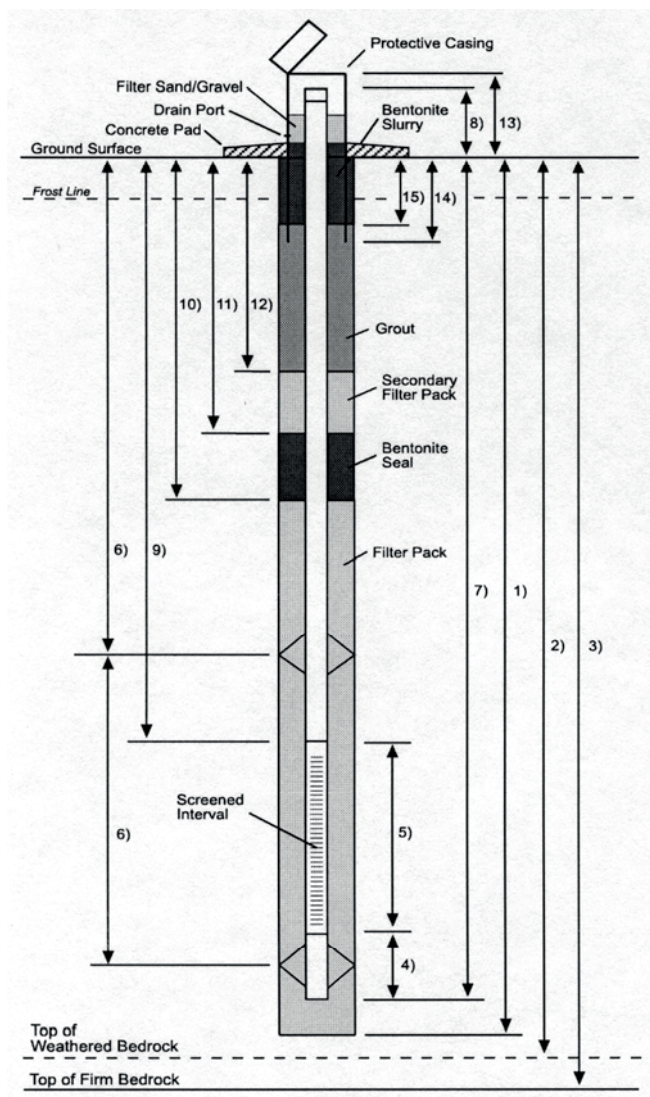
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-5

Location: South of former Building G-1 and north of Boiler House

Date Installed: 2/10/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 17.2 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 15.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' (1); 5' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 16.7 Ft. BGS

8) Casing Stickup: 2.6 Ft. AGS

9) Depth to Top of Screen: 11.7 Ft. BGS

10) Depth to Top of Filter Pack: 9.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 7.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 7.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

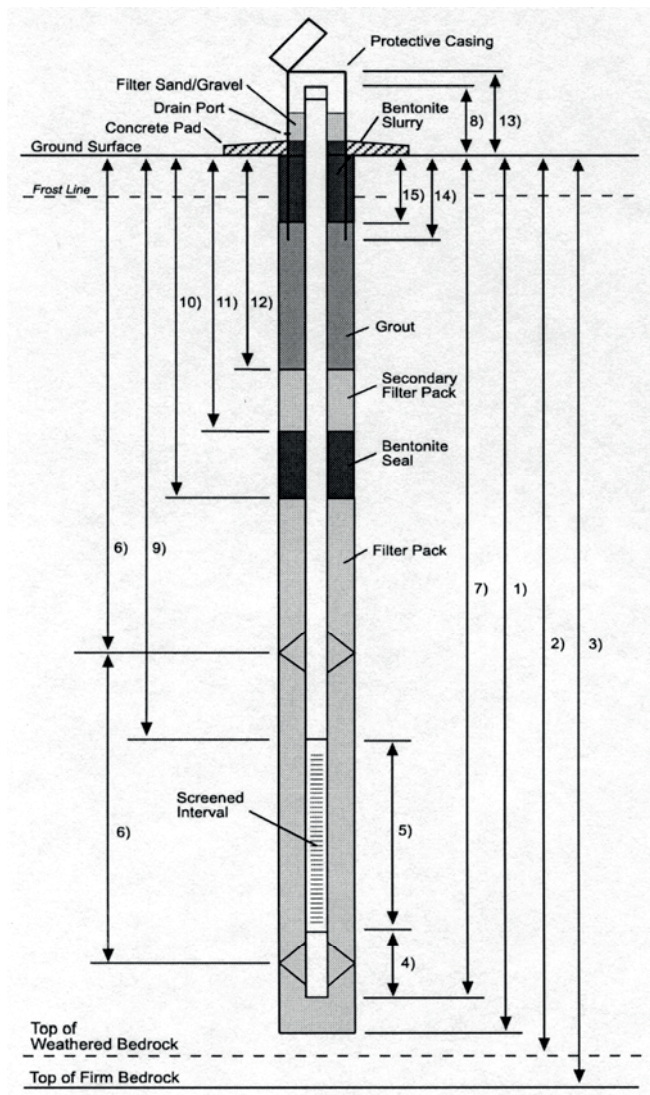
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-6

Location: North of former Building G-1 along former Building G-2 fenceline

Date Installed: 4/28/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 19.5 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 18.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 9.6 Ft.

Total Screen Casing Length: 10.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 19.0 Ft. BGS

8) Casing Stickup: 1.3 Ft. AGS

9) Depth to Top of Screen: 9.0 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

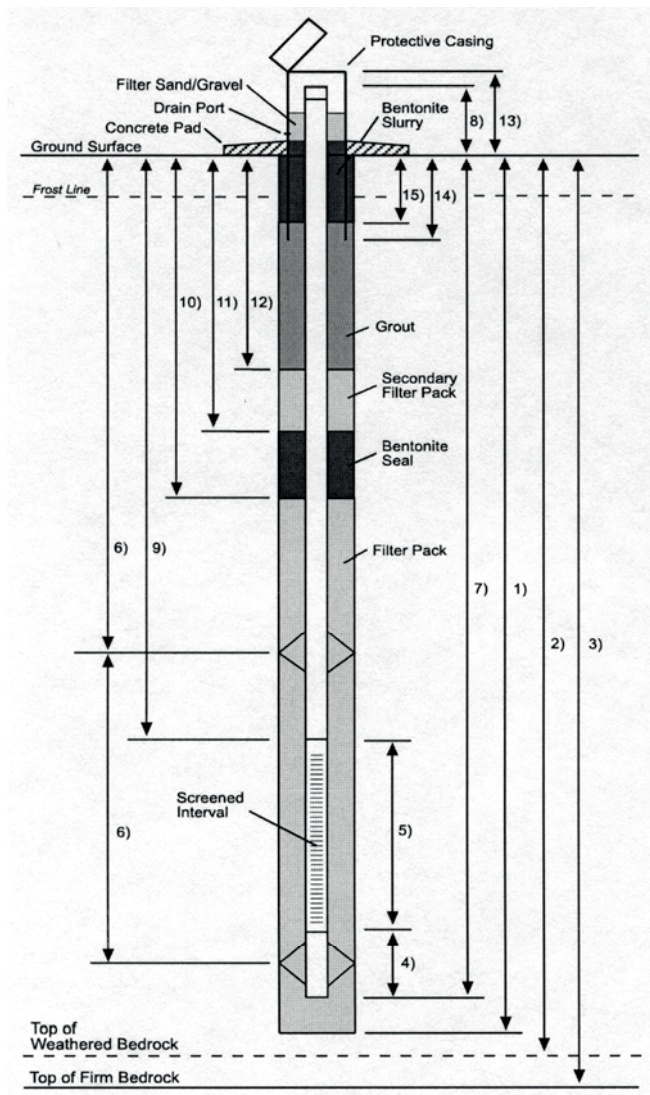
Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



Well/Piezometer ID: G-1-7

Location: North of former Building G-1 along property fenceline

Date Installed: 2/6/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

1) Borehole Depth: 18.1 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 17.5 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 9.6 Ft.

Total Screen Casing Length: 10.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 17.7 Ft. BGS

8) Casing Stickup: 2.3 Ft. AGS

9) Depth to Top of Screen: 7.7 Ft. BGS

10) Depth to Top of Filter Pack: 6.8 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: G-1-8

Location: North of former Building G-1 along gravel road

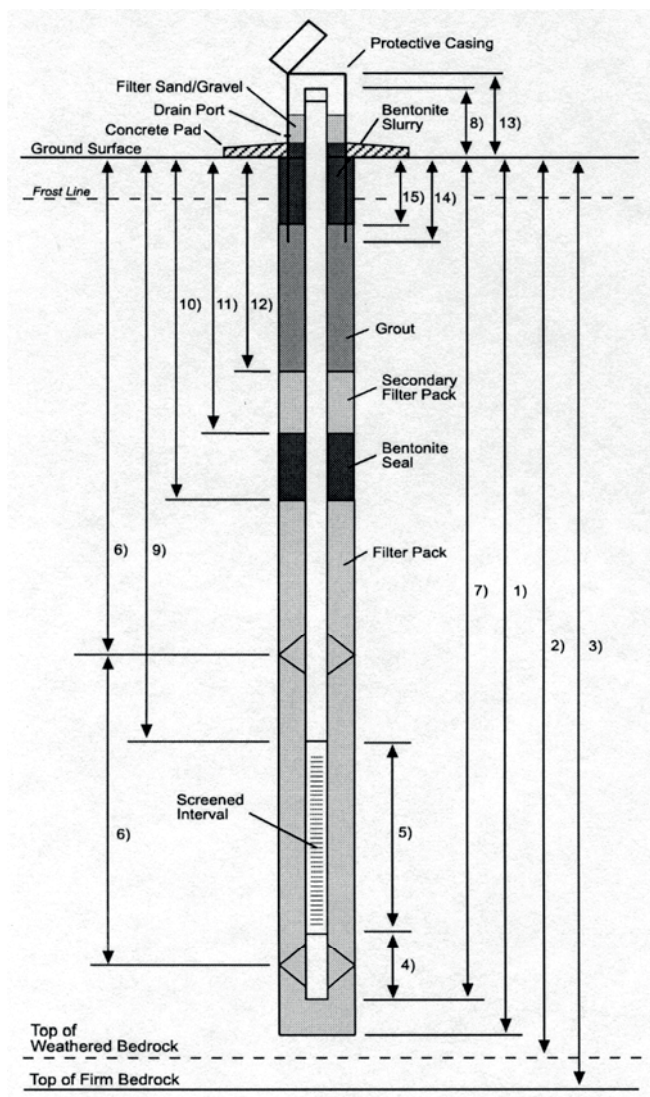
Date Installed: 2/5/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 14.0 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 11.0 3) Firm: 14.0

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 13.8 Ft. BGS

8) Casing Stickup: 2.4 Ft. AGS

9) Depth to Top of Screen: 8.8 Ft. BGS

10) Depth to Top of Filter Pack: 7.5 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.8 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.8 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015
Driller: TTL Associates, Inc.
Geologist: J. DeVaughn, HGL

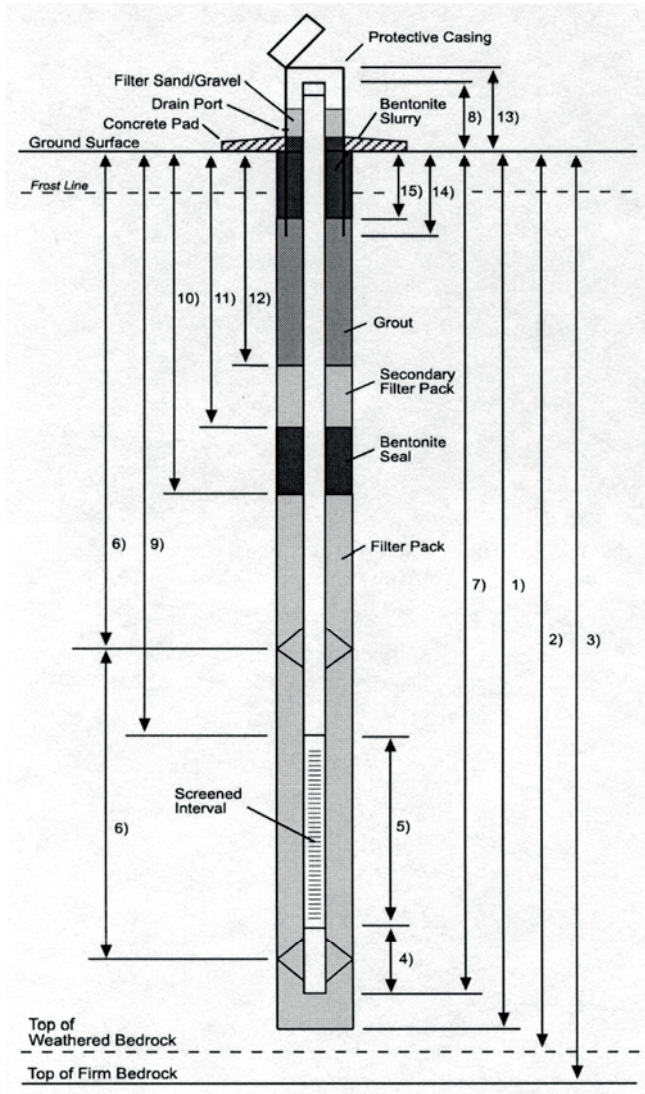
Note: All depths measured to nearest 0.1' below ground surface (BGS).
Depth to water measured to nearest 0.01' below top of riser casing (BTOC).
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-9

Location: North of former Building G-1 along property fenceline

Date Installed: 2/6/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth:	<u>18.3</u>	Ft. BGS	Borehole Diameter:	<u>8.25</u>	In.
Depth to Bedrock (Ft. BGS)	<u>2</u>	2) Weathered:	<u>16.0</u>	3) Firm:	<u>17.5</u>
Riser Casing Type:	<u>PVC</u>	Riser Casing Joint Type:	<u>Flush thread</u>		
Riser Casing Specifications:	Schedule:	<u>40</u>	OD:	<u>2.4</u>	In. ID: <u>2</u> In.
Screen Casing Type:	<u>PVC</u>	Screen Slot Size:	<u>0.01</u>	In.	
Screen Casing Specifications:	Schedule:	<u>40</u>	OD:	<u>2.4</u>	In. ID: <u>2</u> In.
Bottom Cap Type:	<u>PVC</u>				
Bottom Cap Specifications:	Schedule:	<u>40</u>	Length:	<u>0.3</u>	Ft.
Bottom of Screen Casing to Slots:	<u>0.2</u>	Ft.			
4) Bottom of Well to Slots:	<u>0.5</u>	Ft.			
5) Screened Interval Length:	<u>9.6</u>	Ft.			
Total Screen Casing Length:	<u>10.0</u>	Ft.			
Riser Casing Lengths (listed from bottom upward):			<u>10' partial (1)</u>		

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 17.9 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 7.9 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015
Driller: TTL Associates, Inc.
Geologist: J. DeVaughn, HGL

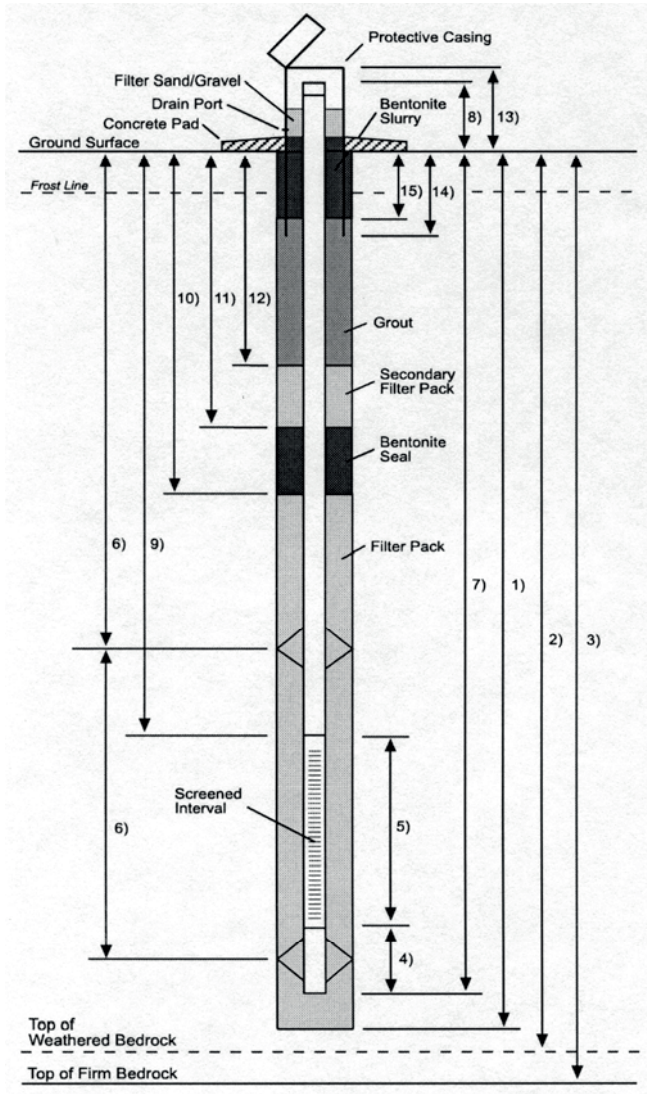
Note: All depths measured to nearest 0.1' below ground surface (BGS).
Depth to water measured to nearest 0.01' below top of riser casing (BTOC).
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-10

Location: Northwest portion of former Building G-1 concrete pad

Date Installed: 4/21/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth:	<u>20.0</u>	Ft. BGS	Borehole Diameter:	<u>8.25</u>	In.
Depth to Bedrock (Ft. BGS)	<u>20.0</u>		2) Weathered:	<u>19.0</u>	
			3) Firm:	<u>NA</u>	
Riser Casing Type:	<u>PVC</u>		Riser Casing Joint Type:	<u>Flush thread</u>	
Riser Casing Specifications:		Schedule:	<u>40</u>	OD:	<u>2.4</u> In.
				ID:	<u>2</u> In.
Screen Casing Type:	<u>PVC</u>		Screen Slot Size:	<u>0.01</u>	In.
Screen Casing Specifications:		Schedule:	<u>40</u>	OD:	<u>2.4</u> In.
				ID:	<u>2</u> In.
Bottom Cap Type:	<u>PVC</u>				
Bottom Cap Specifications:		Schedule:	<u>40</u>	Length:	<u>0.3</u> Ft.
Bottom of Screen Casing to Slots:	<u>0.2</u>	Ft.			
4) Bottom of Well to Slots:	<u>0.5</u>	Ft.			
5) Screened Interval Length:	<u>9.6</u>	Ft.			
Total Screen Casing Length:	<u>10.0</u>	Ft.			
Riser Casing Lengths (listed from bottom upward):	<u>10' partial (1)</u>				

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 19.5 Ft. BGS

8) Casing Stickup: 0.7 Ft. AGS

9) Depth to Top of Screen: 9.5 Ft. BGS

10) Depth to Top of Filter Pack: 6.7 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 4.9 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 4.9 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: G-1-11

Location: Northeast of Boiler House

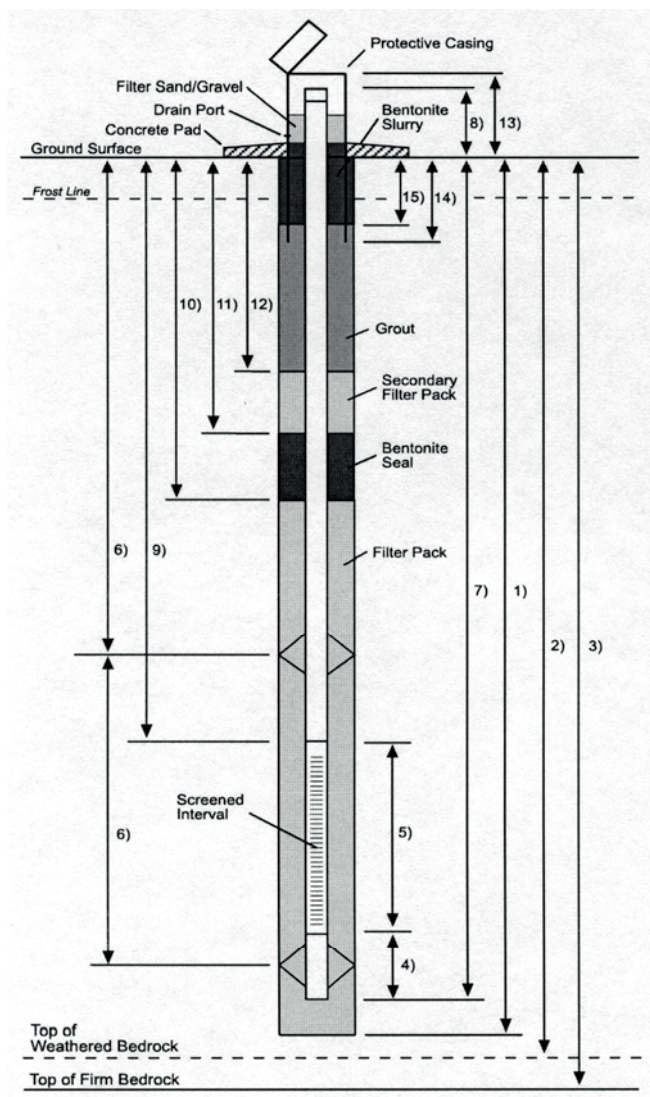
Date Installed: 2/9/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 6.4 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 4.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 3.8 Ft.

Total Screen Casing Length: 4.0 Ft.

Riser Casing Lengths (listed from bottom upward): 5' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 6.3 Ft. BGS

8) Casing Stickup: 3.0 Ft. AGS

9) Depth to Top of Screen: 2.3 Ft. BGS

10) Depth to Top of Filter Pack: 1.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 0.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 0.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: Modified screen length/construction due to shallow bedrock.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

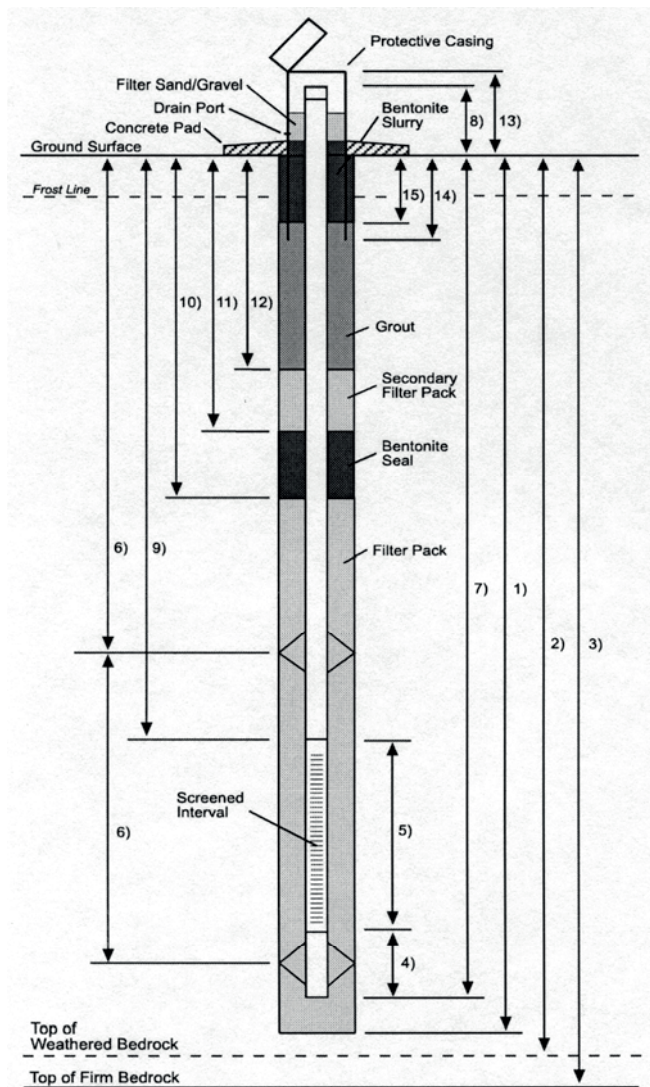
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-12

Location: Northeast of former Building G-1 inside Building G-2 fenceline

Date Installed: 4/28/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 14.5 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS)	2) Weathered:	12.5	3) Firm:	NA
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Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 14.0 Ft. BGS

8) Casing Stickup:	2.3	Ft. AGS
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9) Depth to Top of Screen: 9.0 Ft. BGS

10) Depth to Top of Filter Pack: 6.9 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 4.9 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 4.9 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: Time:

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout	NA	Ft. BGS
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Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

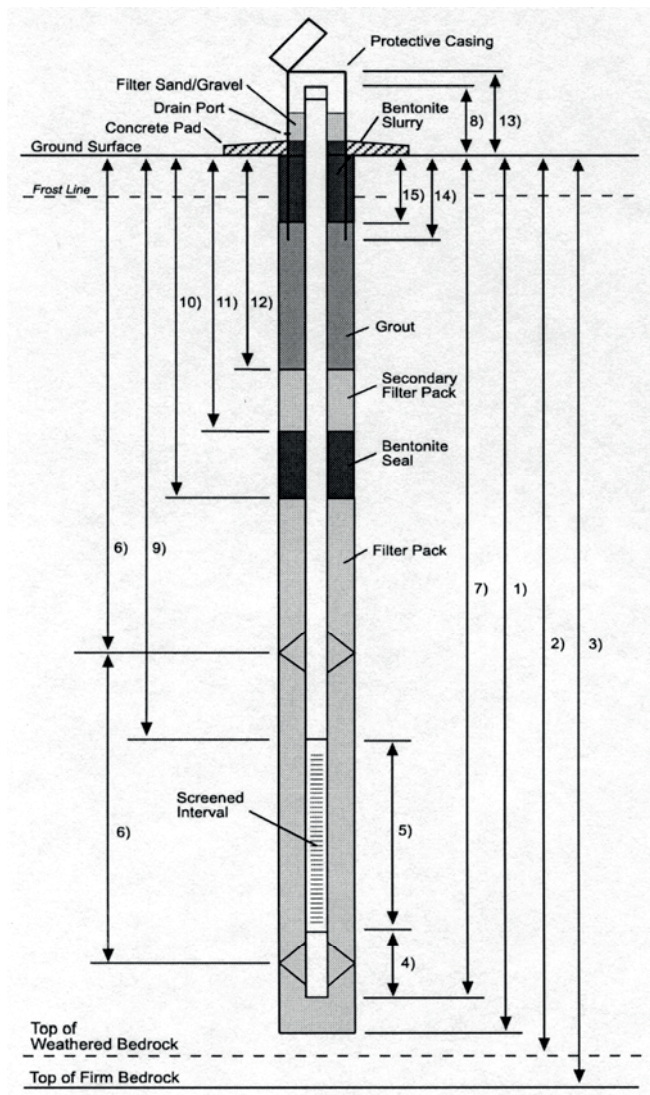
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-14

Location: North of former Building G-1 in center of Building G-2 pad

Date Installed: 4/22/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 14.5 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 13.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 14.0 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 9.0 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: 4/22/2015 Time: NA

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

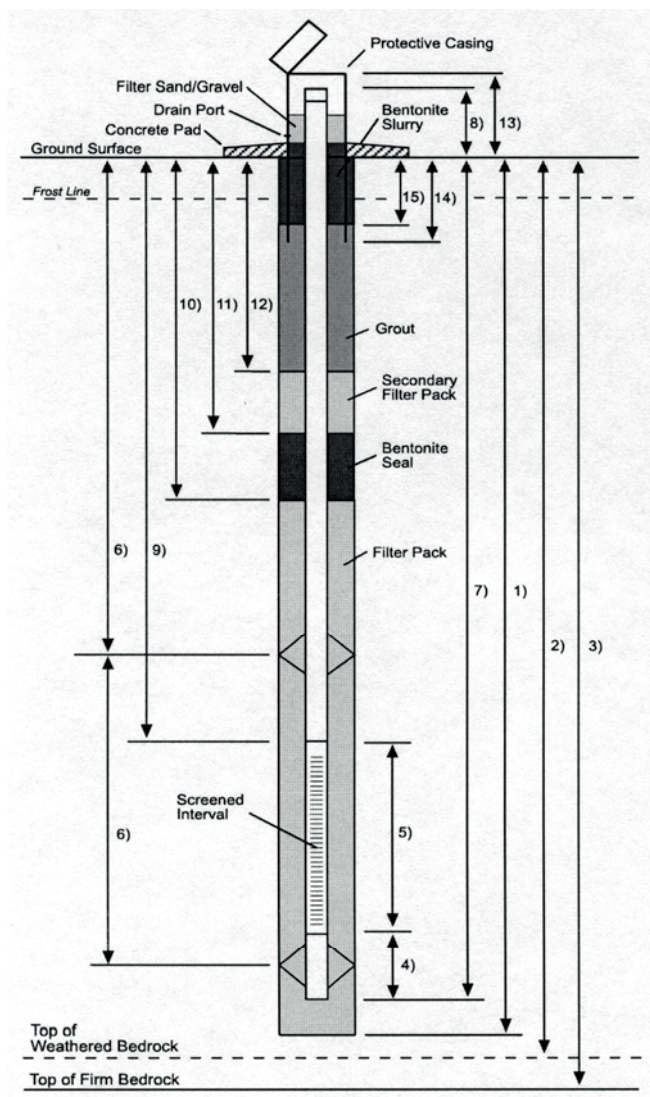
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-15

Location: Northwest of former Building G-1 inside property fence

Date Installed: 2/9/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 18.4 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 17.5 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 9.6 Ft.

Total Screen Casing Length: 10.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 17.8 Ft. BGS

8) Casing Stickup: 2.3 Ft. AGS

9) Depth to Top of Screen: 7.8 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: G-1-16

Location: Northeast of former Building G-1 inside property fence

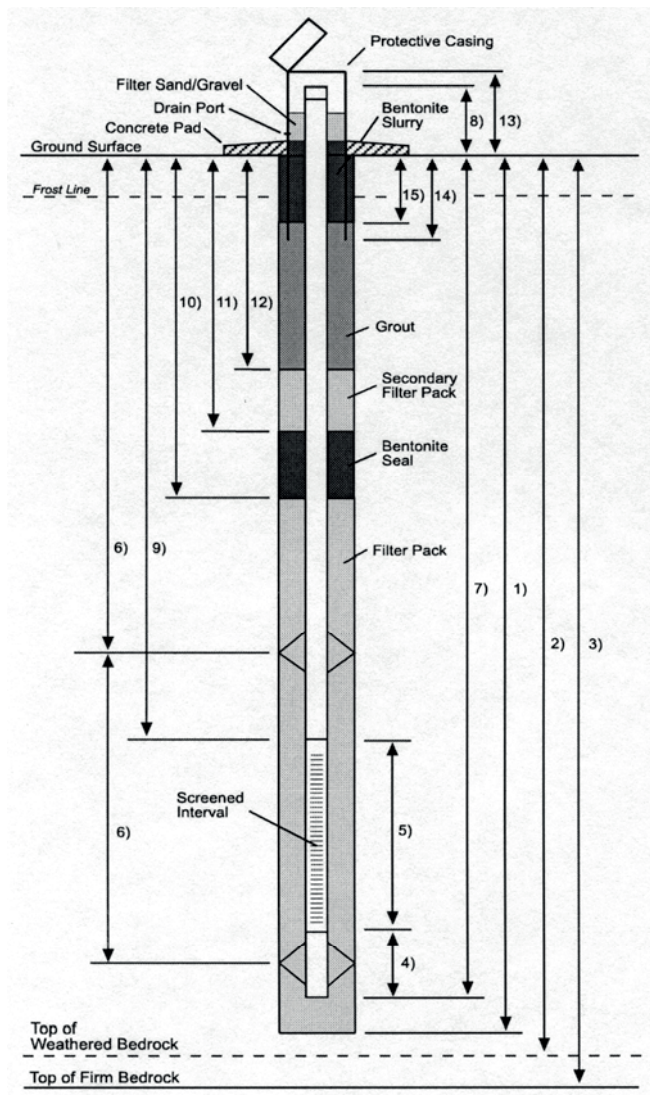
Date Installed: 4/22/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 13.5 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 12.5 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 13.0 Ft. BGS

8) Casing Stickup: 2.5 Ft. AGS

9) Depth to Top of Screen: 8.0 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: NA

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA Ft.

Protective Post Type/Configuration: No surface completion, temporary installation

Comments: _____

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

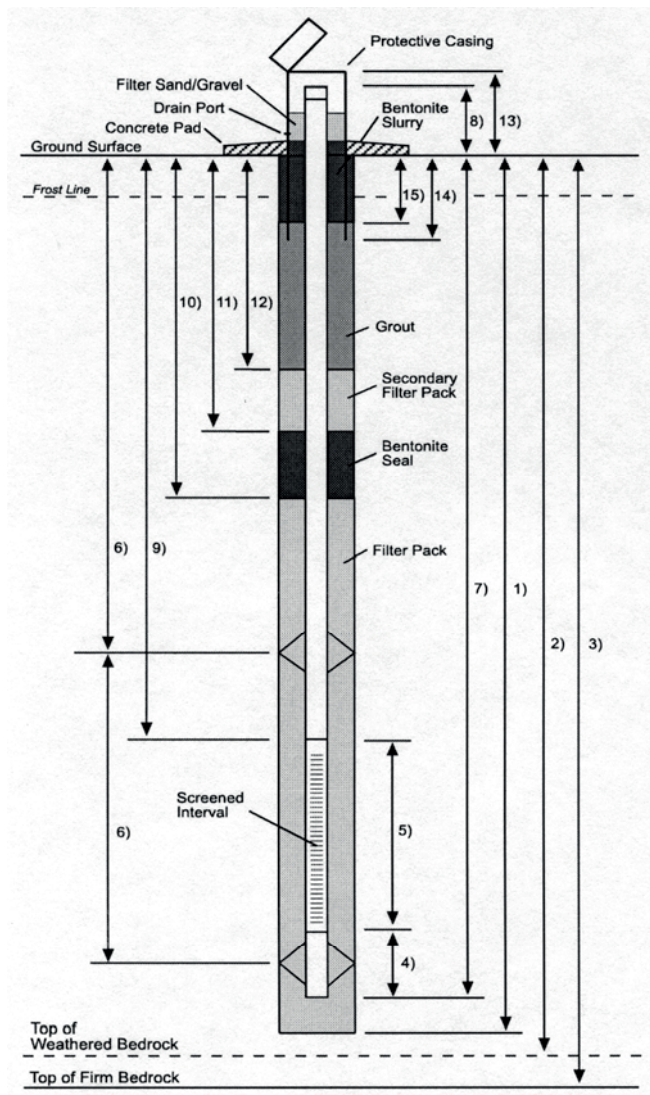
Stickup measured to nearest 0.1' above ground surface (AGS).

Well/Piezometer ID: G-1-17

Location: Northeast of former Building G-1 in gravel driveway

Date Installed: 4/27/2015

Start Time: NA Hrs. Complete Time: NA Hrs.



1) Borehole Depth: 14.1 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 13.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 14.0 Ft. BGS

8) Casing Stickup: 2.1 Ft. AGS

9) Depth to Top of Screen: 9.0 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: G-1-18

Location: East of former Building G-1 in gravel driveway

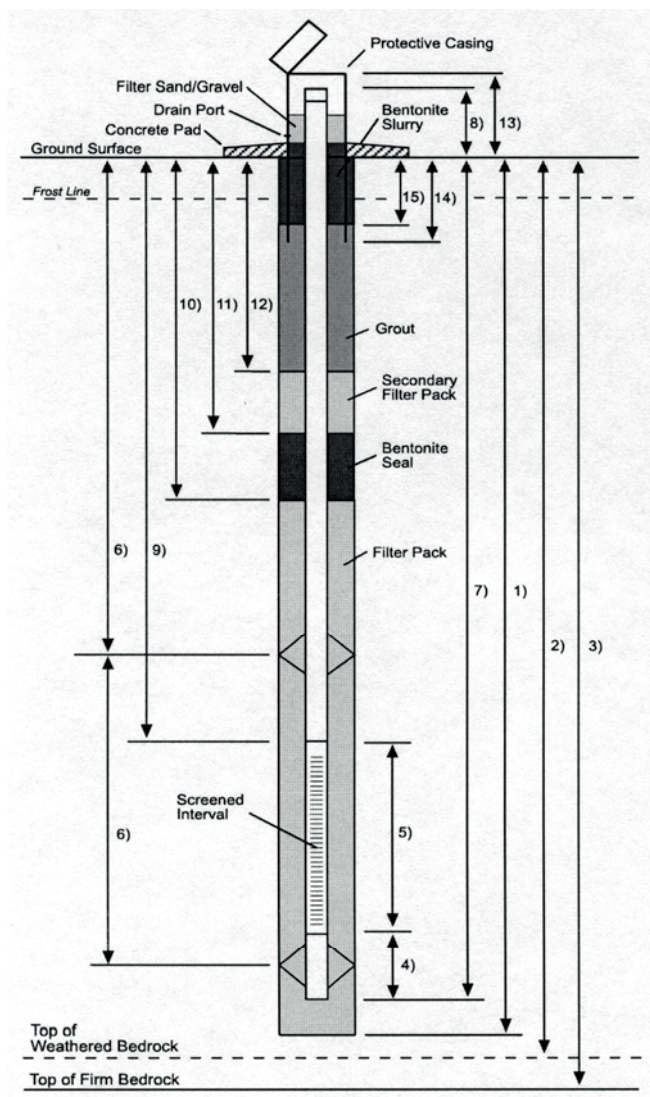
Date Installed: 4/27/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 14.3 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 13.8 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 14.0 Ft. BGS

8) Casing Stickup: 2.1 Ft. AGS

9) Depth to Top of Screen: 9.0 Ft. BGS

10) Depth to Top of Filter Pack: 7.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 5.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 5.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: IA03-TW0002R

Location: Adjacent to existing temporary well point IA03-TW0002

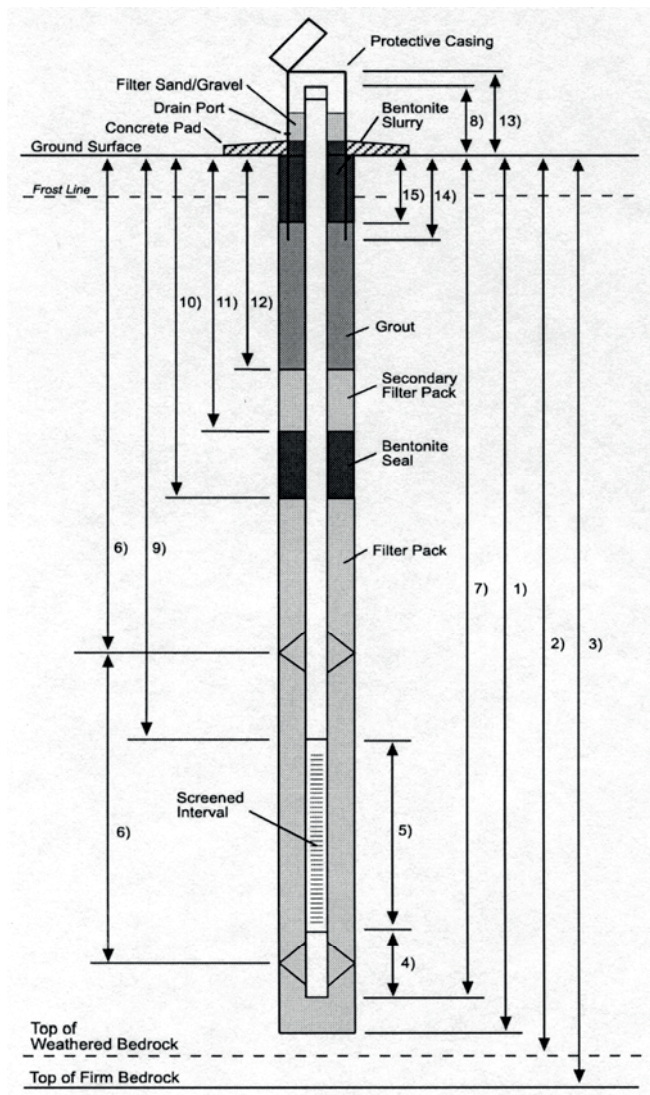
Date Installed: 2/5/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 14.4 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 11.5 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 13.8 Ft. BGS

8) Casing Stickup: 2.3 Ft. AGS

9) Depth to Top of Screen: 8.8 Ft. BGS

10) Depth to Top of Filter Pack: 8.0 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 6.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 6.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.

Protective Post Type/Configuration: Steel bollards/concrete-filled

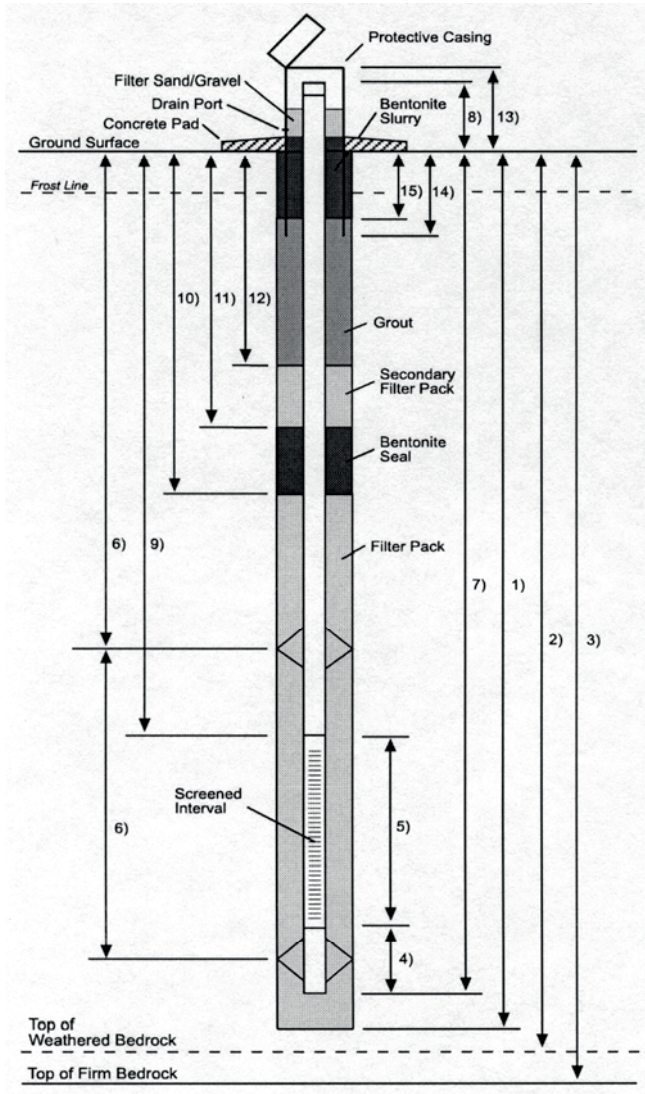
Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015
 Driller: TTL Associates, Inc.
 Geologist: J. DeVaughn, HGL

Well/Piezometer ID: IA03-TW0004R
 Location: Adjacent to existing temporary well point IA03-TW0004
 Date Installed: 2/4/2015
 Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).
 Depth to water measured to nearest 0.01' below top of riser casing (BTOC).
 Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 30.0 Ft. BGS Borehole Diameter: 8.25 In.
 Depth to Bedrock (Ft. BGS) 2) Weathered: 29.0 3) Firm: NA
 Riser Casing Type: PVC Riser Casing Joint Type: Flush thread
 Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.
 Screen Casing Type: PVC Screen Slot Size: 0.01 In.
 Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.
 Bottom Cap Type: PVC
 Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.
 Bottom of Screen Casing to Slots: 0.2 Ft.
 4) Bottom of Well to Slots: 0.5 Ft.
 5) Screened Interval Length: 9.6 Ft.
 Total Screen Casing Length: 10.0 Ft.
 Riser Casing Lengths (listed from bottom upward): 10' (2); 5' partial (1)

Centralizer Type: NA
 6) Depths to Centralizers: NA Ft. BGS
 7) Total Depth of Well: 29.1 Ft. BGS
 8) Casing Stickup: 2.4 Ft. AGS
 9) Depth to Top of Screen: 19.1 Ft. BGS
 10) Depth to Top of Filter Pack: 17.0 Ft. BGS
 Filter Pack Material Type: Global #5
 11) Depth to Top of Seal: 15.0 Ft. BGS
 Seal Material Type: Pel Plug Pellets
 12) Depth to Top of Secondary Filter Pack: NA Ft. BGS
 Secondary Filter Pack Material Type: NA
 Total Grout Thickness: 15.0 Ft.
 Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement
 Borehole Sump Material Type: Filter pack sand
 Depth to Water: NA BMP Date: _____ Time: _____
 Protective Casing Type: Steel
 13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS
 14) Depth to Bottom of Protective Casing: NA Ft. BGS
 15) Depth to Top of Grout NA Ft. BGS
 Protective Casing Drain Port Size/Location: NA
 Concrete Pad Thickness/Extent: Approximately 4" thick; 2' x 2' square pad Ft.
 Protective Post Type/Configuration: Steel bollards/concrete-filled

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: IA03-TW0005R

Location: Adjacent to existing temporary well point IA03-TW0005

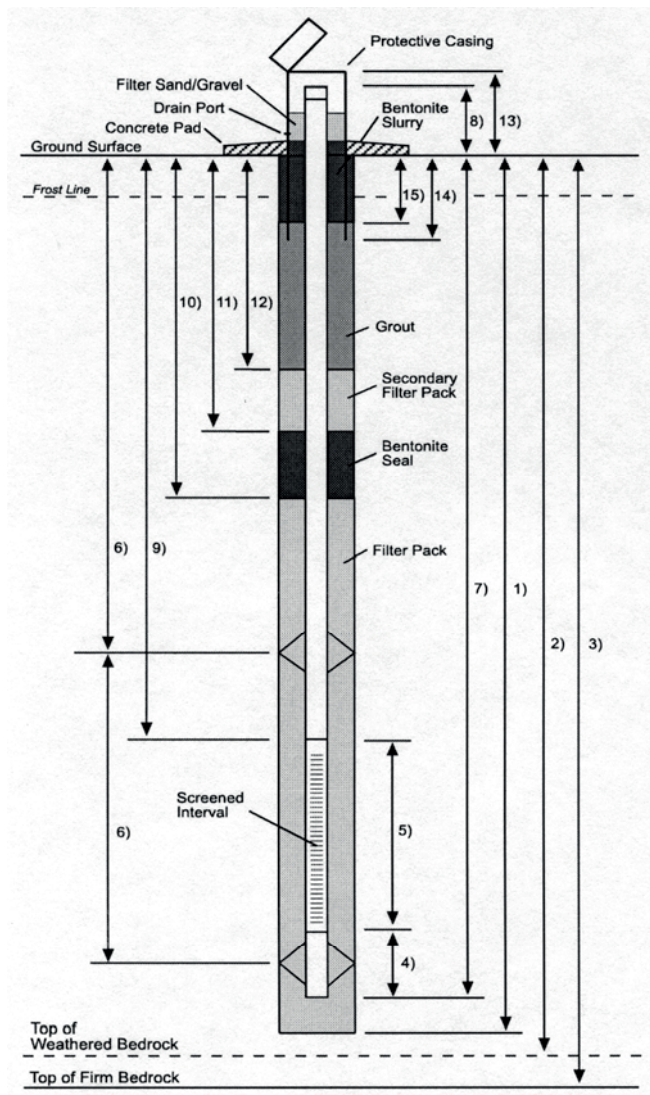
Date Installed: 5/12/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 10.0 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 8.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 10.0 Ft. BGS

8) Casing Stickup: 2.4 Ft. AGS

9) Depth to Top of Screen: 5.0 Ft. BGS

10) Depth to Top of Filter Pack: 3.8 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 0.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 0.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA (in building concrete pad) Ft.

Protective Post Type/Configuration: NA (in building concrete pad)

Comments: Filter sand installed within protective casing for drop recovery.

MONITORING WELL CONSTRUCTION DIAGRAM - STICKUP COMPLETION

Project: Harshaw Groundwater Investigation 2015

Driller: TTL Associates, Inc.

Geologist: J. DeVaughn, HGL

Well/Piezometer ID: IA03-TW0006R

Location: Adjacent to existing temporary well point IA03-TW0006

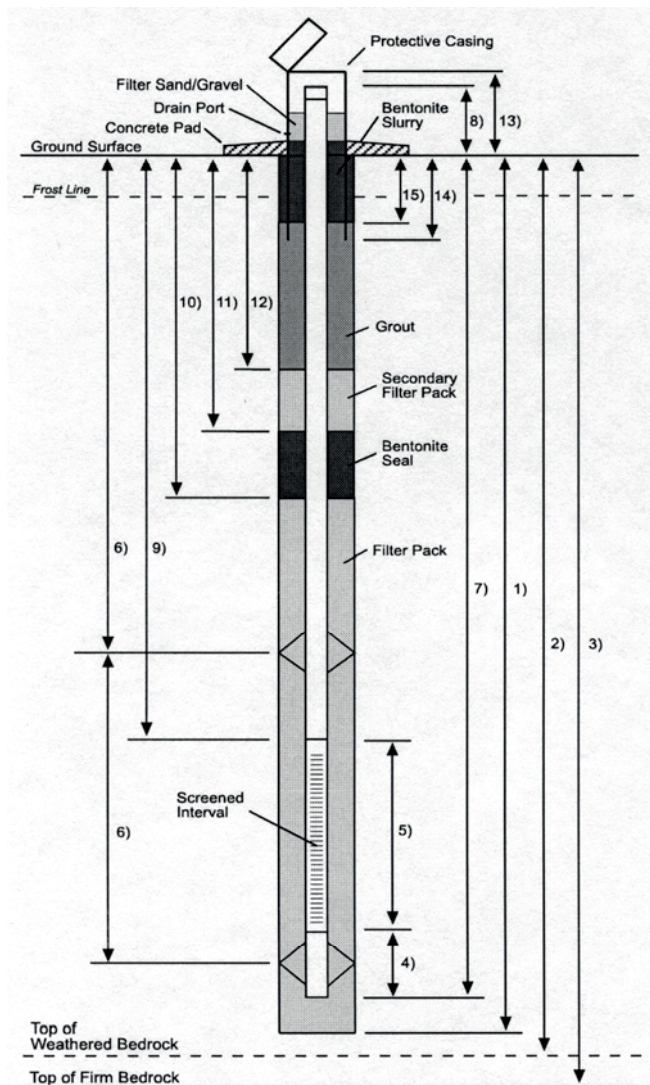
Date Installed: 5/12/2015

Start Time: NA Hrs. Complete Time: NA Hrs.

Note: All depths measured to nearest 0.1' below ground surface (BGS).

Depth to water measured to nearest 0.01' below top of riser casing (BTOC).

Stickup measured to nearest 0.1' above ground surface (AGS).



1) Borehole Depth: 11.0 Ft. BGS Borehole Diameter: 8.25 In.

Depth to Bedrock (Ft. BGS) 2) Weathered: 11.0 3) Firm: NA

Riser Casing Type: PVC Riser Casing Joint Type: Flush thread

Riser Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Screen Casing Type: PVC Screen Slot Size: 0.01 In.

Screen Casing Specifications: Schedule: 40 OD: 2.4 In. ID: 2 In.

Bottom Cap Type: PVC

Bottom Cap Specifications: Schedule: 40 Length: 0.3 Ft.

Bottom of Screen Casing to Slots: 0.2 Ft.

4) Bottom of Well to Slots: 0.5 Ft.

5) Screened Interval Length: 4.6 Ft.

Total Screen Casing Length: 5.0 Ft.

Riser Casing Lengths (listed from bottom upward): 10' partial (1)

Centralizer Type: NA

6) Depths to Centralizers: NA Ft. BGS

7) Total Depth of Well: 10.5 Ft. BGS

8) Casing Stickup: 2.3 Ft. AGS

9) Depth to Top of Screen: 5.5 Ft. BGS

10) Depth to Top of Filter Pack: 4.9 Ft. BGS

Filter Pack Material Type: Global #5

11) Depth to Top of Seal: 0.0 Ft. BGS

Seal Material Type: Pel Plug Pellets

12) Depth to Top of Secondary Filter Pack: NA Ft. BGS

Secondary Filter Pack Material Type: NA

Total Grout Thickness: 0.0 Ft.

Grout Material Type/Composition: Benseal Gel/St. Mary's Type I Portland cement

Borehole Sump Material Type: Filter pack sand

Depth to Water: NA BMP Date: _____ Time: _____

Protective Casing Type: Steel

13) Height of Protective Casing Top (excluding cap/cover): NA Ft. AGS

14) Depth to Bottom of Protective Casing: NA Ft. BGS

15) Depth to Top of Grout NA Ft. BGS

Protective Casing Drain Port Size/Location: NA

Concrete Pad Thickness/Extent: NA (in building concrete pad) Ft.

Protective Post Type/Configuration: NA (in building concrete pad)

Comments: Filter sand installed within protective casing for drop recovery.



ATTACHMENT 2
Well Decommissioning Form



WELL ABANDONMENT FORM

CONTRACTOR/AGENT:

REGISTRATION/ID No.:

DATE:

TYPE OF SITE OR PROGRAM:

ABANDONED WELL NO/ID:

WELL REPLACED:

REPLACEMENT ID:

DATE OF ABANDONMENT:

DATE OF REPLACEMENT:

1. **WELL LOCATION:** (Show sketch on back of this form).

Municipality:

County:

Location:

2. **OWNER AND ADDRESS:**

WELL DIAGRAM

3. **TOPOGRAPHY:**

4. **USE OF WELL:**

5. **DEPTH OF WELL:**

DIAMETER OF WELL:

6. **AMOUNT OF CASING REMOVED:**

Length:

Diameter:

Length:

Diameter:

7. **SEALING MATERIALS:**

neat cement

sand cement

Bags cement

Gal. water

OTHER MATERIALS AND AMOUNTS:

8. **METHOD OF MATERIAL PLACEMENT:**

9. **CERTIFICATION:** We hereby certify that this well abandonment record is true and exact, and was accomplished on ____ day of the month of, ____, with our active participation and that we are qualified to participate in such abandonment actions.

1. Signature of Participant:	2. Signature of Participant:
Date:	Date:
Address:	Address:



ATTACHMENT 3

Example Boring Log



Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

MONITORING WELL NUMBER MW-1

PAGE 1 OF 1

CLIENT	Client	PROJECT NAME	CEC Example Project
PROJECT NUMBER	Example Log	PROJECT LOCATION	Site
DATE STARTED		DATE COMPLETED	
CEC FIELD REPRESENTATIVE		REVIEWED BY	
GROUND ELEVATION		CASING ELEVATION	
LATITUDE		LONGITUDE	
DRILLING CONTRACTOR		DRILLER	
DRILLING METHOD		BACKFILL	
BOREHOLE DIAMETER		CORE SIZE	
MONITORING EQUIPMENT		OUTER CASING	
WELL INSTALLED		WELL STICKUP	
DEVELOPMENT METHOD		WELL KEY	
RESULTS		NOTES	
YIELD			

WATER LEVELS

- | | |
|---|---|
| <input type="checkbox"/> At Time of Drilling: | <input type="checkbox"/> Temporary Well: |
| <input type="checkbox"/> End of Drilling: | <input type="checkbox"/> Permanent Well : |
| <input type="checkbox"/> After Drilling: | |


NA - Not Available; bgs - below ground surface; amsl - above mean sea level

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft)	RECOVERY %	WELL DIAGRAM
0			0		
5			-10		
10			-20		
15			-30		
20			-40		
25			-50		
30			-60		
35			-70		
40			-80		
45			-90		
50			-100		
55					
60					
65					
70					
75					
80					
85					
90					
95					
100					



ATTACHMENT 4
Well Development Field Sheet

WELL DEVELOPMENT FIELD DATA SHEET

Job No:	Well No:	Well Diam. (in):	Well Volume:	 Civil & Environmental Consultants, Inc.
Site Name:	Initial Static Water Level:	Depth to Top of Screen:		
Developers:	Initial Total Depth:	Screen Length (ft.):		
Material:	Weather:	Handling of Purged Fluids:		

General Comments on well Condition:

[illegible]

FINAL NOTES

Final Total Depth:	Total Volume Removed:	Comments: