Memorandum

To:	*Josephine Newton-Lund, PMP, Senior Project Manager, Environmental Branch, U.S. Army Corps of Engineers* *Shannon Smith, PE, Program Manager, Veterans Health Administration*
From:	*Nathan Smith, PMP, Senior Project Manager, CDM Federal Programs Corporation* *Neil Smith, Project Technical Leader, CDM Federal Programs Corporation*
Date:	*July 17, 2021*
Subject:	***Modification #4 to Phase 2 Field Sampling Plan*** *700 South 1600 East Tetrachloroethene Plume Superfund Site, Salt Lake City, Utah*

On behalf of the U.S. Army Corps of Engineers (USACE), CDM Federal Programs Corporation (CDM Smith) prepared this minor field modification (MFM) #4, to the Phase 2 Field Sampling Plan (FSP). Phase 2 FSP is an appendix to the Operable Unit 1 Remedial Investigation Work Plan (RIWP) (CDM Smith 2020) for the 700 South 1600 East Tetrachloroethene (PCE) Plume Site located near the George E. Wahlen Veterans Affairs Medical Center (VAMC) in Salt Lake City, Utah. This MFM #4 to the Phase 2 FSP proposes abandonment of up to 10 piezometers and replacement with shallow (near water table) groundwater monitoring wells at these locations, the installation of two additional shallow groundwater wells, and installation of shallow soil vapor monitoring probes at the new well locations (depth to groundwater permitting, greater than 5 feet below ground surface [bgs]).

The replacement of the 1-inch groundwater piezometers with 2-inch groundwater sampling points will improve the quality of the samples, as the current 1-inch piezometers were installed without an adequate annular seal, which has the potential to bias groundwater samples.

The data from the new sampling points will be used to evaluate shallow groundwater and soil vapor volatile organic compound (VOC) concentrations to define areas that may warrant further study for vapor intrusion at residential and/or commercial structures in support of data quality objective D3 (Groundwater Risk), as presented in Table 4-1 of the RIWP (CDM Smith 2020). Collection of these data will facilitate further definition of the vapor intrusion study area during this time when indoor access for sampling at residential properties is not recommended due to the coronavirus pandemic. The decision to not move forward with indoor air sampling during the 2020/2021 heating season was made collectively on December 22, 2020 during a conference call with the U.S. Environmental Protection Agency Region 8 Project Manager, the Utah Department of Environmental Quality Project Manager, and the Department of Veterans Affairs – Salt Lake City CERCLA Program Manager. Indoor air sampling will resume at a time when the work can be completed safely, in consultation with EPA and UDEQ, using appropriate precautions to protect the health of residents/building occupants and sampling personnel.

The following data will be collected and compared to screening levels (SL) developed using an approach consistent with the EPA's Risk Assessment Guidance for Superfund (Part F) (EPA, 2009). Initial SLs were previously developed for the site for soil vapor and groundwater (CH2M Hill 2015). The comparison of measured VOC concentrations to the SLs will support decisions about future vapor intrusion.

- Dissolved VOC concentrations in the shallowest aquifer interval to evaluate the distribution of VOCs in the East Side Springs area.
- Depth to shallow groundwater in the East Side Springs area.
- VOC concentrations in shallow soil vapor to evaluate the potential for VOC-impacted vapors to migrate to nearby structures.

1.0 Scope of Work

This MFM includes the rationale and description of work for abandonment of the existing temporary piezometers and replacement with groundwater monitoring wells screened in the shallow aquifer. Currently, there are 10 locations (GW-10, GW-11, GW-16, GW-20, GW-49, GW-50, GW-52, GW-53, GW-59, GW-61) where piezometers may still be present. These locations were drilled as temporary wells and a piezometer was installed during the remedial investigation (RI) of Accelerated Operable Unit 1 (AOU1) (EA Engineering, Science, and Technology [EA] 2019); however, several piezometers may have been damaged. In addition to the 10 piezometer locations, two additional monitoring wells will be installed at locations north of East High School where piezometers were not installed during the AOU1 RI. **Figure 1** shows the locations of these wells, PCE and trichloroethene (TCE) concentrations last detected, and the current estimated extent of the PCE groundwater plume based on data collected in the permanent monitoring well network. Location and construction information for the piezometers and the proposed replacement monitoring wells is presented in **Table 1**.

As presented on **Figure 1** and in **Table 2**, concentrations of PCE at these locations ranged from 1.1 µg/L to 60 µg/L at GW-49 and GW-11, respectively, during 2019 sampling events. Piezometer GW-49 does not warrant replacement because it is located adjacent to MW-17S with a similar screen interval. A monitoring well will be installed at the former location of grab groundwater sample GW-27 along the north side of East High School. A monitoring well (RG-11) is also planned for installation north of East High School along Douglas Street.

2.0 Piezometer Replacement and Groundwater Monitoring Well Installation

At each existing piezometer location, the boring will be hand-augured or cleared using a hydrovac to a minimum of 5 feet bgs prior to overdrilling. A direct-push technology (DPT) drill rig with 6-inch or 8-inch hollow stem auger capability will be used to overdrill each boring to its maximum depth, as presented in Table 1. The new boring locations will be drilled with DPT to collect cores for lithologic logging then augered to create the annulus for the well installation. Drill cuttings and DPT cores from the borings will be logged, as described in Section 3.2 of the FSP (CDM Smith 2020). Soil from the borings will be screened for the presence of VOCs using a photoionization detector (PID). All soil will be containerized and stored in the investigation-derived waste (IDW) storage area.

After completion of the borehole and review of the lithology from drill cuttings, existing boring logs, and PID screening, the soil boring will be completed as a single 2-inch groundwater monitoring well. A 0.010-slot screened interval will be installed at similar intervals where the current piezometers are screened unless geologic observations suggest the interval should be modified. If possible, the screen intervals will be extended to encounter the shallowest groundwater. The filter pack will be constructed using 10/20 silica sand and will extend approximately 2 feet above the top of the screened interval. Monitoring well construction will be completed in accordance with CDM Smith SOP 4-4 and the general well construction diagram presented on **Figure 2**. Soil vapor monitoring points will be installed at a depth of approximately 5 feet bgs at boreholes where groundwater is present deeper than 10 feet bgs. The soil vapor monitoring point will consist of 6-inch-long, double-woven, stainless-steel wire screens (0.0057-inch pore) with Swagelok fittings connected to 0.25-inch, outer-diameter, Teflon-lined tubing to the ground surface. The soil vapor probes will be installed within approximately 1 foot of 10/20 filter pack sand. Each location will be completed at the surface with a flush-mounted manhole vault.

The monitoring wells will be developed to remove fine grain sediment and to verify the monitoring well is connected to the aquifer according to CDM Smith SOP 4-3 and the methods described in Section 3.2 of the FSP (CDM Smith 2020). This task will lag a minimum of 48 hours behind completion of the well. A minimum volume will be calculated prior to pumping, and the wells will be purged until the minimum volume is removed from the well and parameter stabilization occurs and turbidity requirements are met. The development water will be handled as IDW.

The new monitoring wells will be sampled during the next groundwater monitoring event occurring in 2021, as described in the FSP (CDM Smith 2020). The new wells will be sampled using the attached procedures for HydraSleeve samplers (**Attachment 1**) and analyzed for VOCs using EPA method 8260C. Geochemical parameters and 1,4-dioxane will not be analyzed in the new wells, as geochemical parameters and 1,4-dioxane are unlikely to be a concern for vapor intrusion and 1,4-dioxane has not been detected in the existing shallow monitoring wells in the East Side Springs area during recent sampling events. HydraSleeve samplers will be 30 inches in length and will be installed within 1-2 feet of the bottom of the well such that when retrieved they sample water from approximately the center of the well screen or the center of the water column for wells that are not fully submerged.

Soil vapor sampling at the newly installed vapor points will be completed as soon as practical after installation, but a minimum of 48 hours after installation, according to CDM Smith SOP 1-8 and the procedures described in Section 3.10 of the FSP (CDM Smith 2020).

3.0 References

CDM Smith. 2020. *Phase 2 Remedial Investigation Work Plan, Operable Unit 1, 700 South 1600 East PCE Plume, Salt Lake City, Utah*. Prepared for U.S. Army Corps of Engineers.

CH2M Hill. 2015. *Vapor Intrusion Screening Levels and Removal Action Levels, 700 South 1600 East PCE Plume, Salt Lake City, Utah.* Prepared for the U.S. Department of Veterans Affairs. July 17.

EA Engineering, Science, and Technology, Inc. (EA). 2019. *700 South 1600 East PCE Plume AOU-1: East Side Springs Remedial Investigation Report*. Prepared for the U.S. Department of Veterans Affairs. February.

Figures

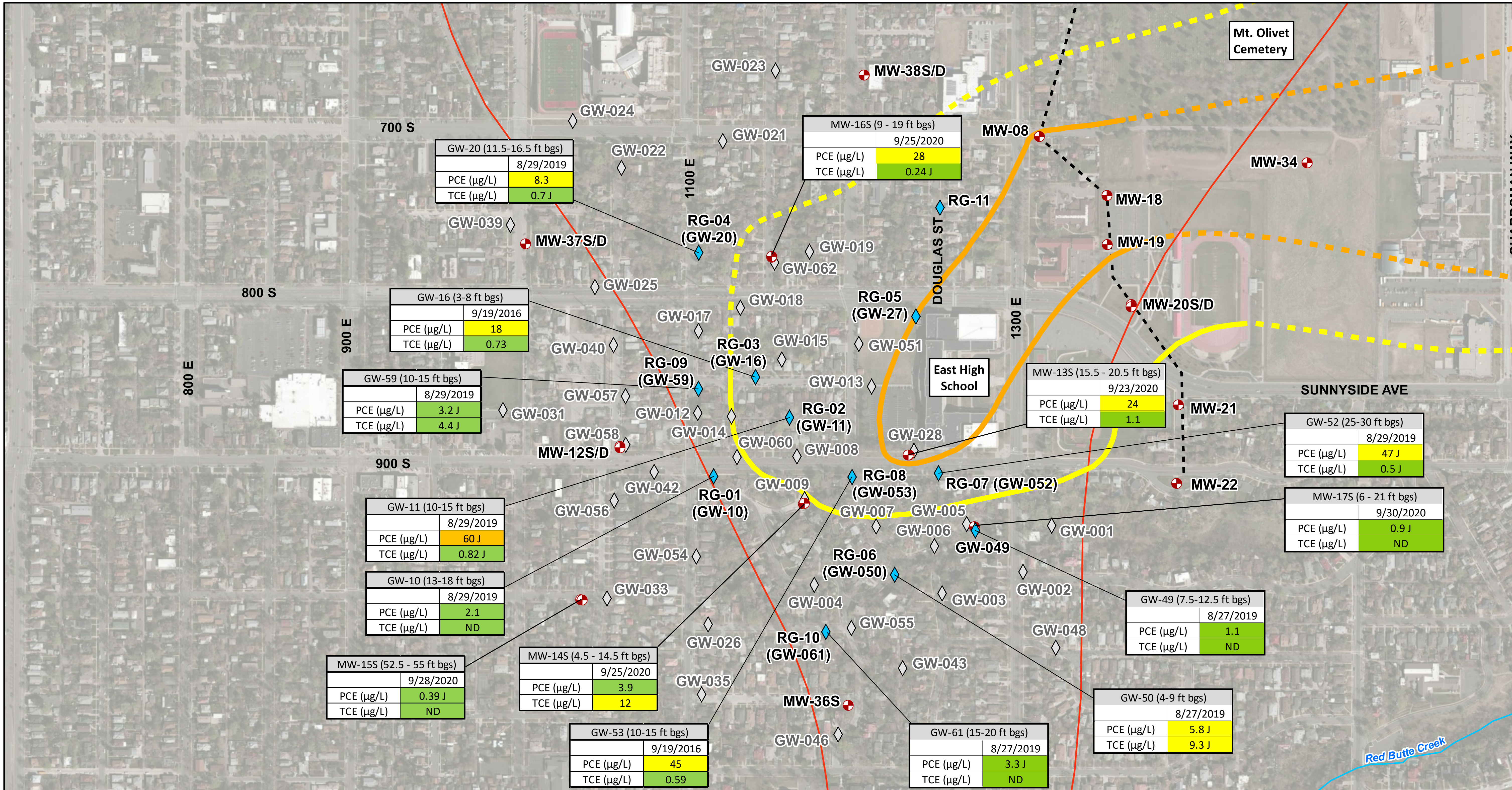
Figure 1	East Side Springs Monitoring Well Installation
Figure 2	Monitoring Well Construction Diagram

Tables

Table 1	East Side Springs Monitoring Well Installation
Table 2	Results from Temporary Piezometers in AOU-1, 700 South 1600 East PCE Plume Site

Attachments

Attachment 1	HydraSleeve Field Manual



Legend

- Piezometer
- Grab GW Location
- Monitoring Well
- Monitoring Well Transect Line
- Red Butte Creek
- Fault Line

PCE and TCE Concentrations (µg/L)

- = < 5 µg/L
- = 5 - 50 µg/L
- = > 50 µg/L

PCE Contours

- 5 µg/L
- 50 µg/L

Dashed Line - Inferred Extent

Notes

1. Plume contours were developed using Leapfrog 3-dimensional visualization software to interpolate data from the Q3 2020 groundwater sampling event. The contours represent a top-down view of the 3-dimensional extent of the plume as interpreted in the Leapfrog software.

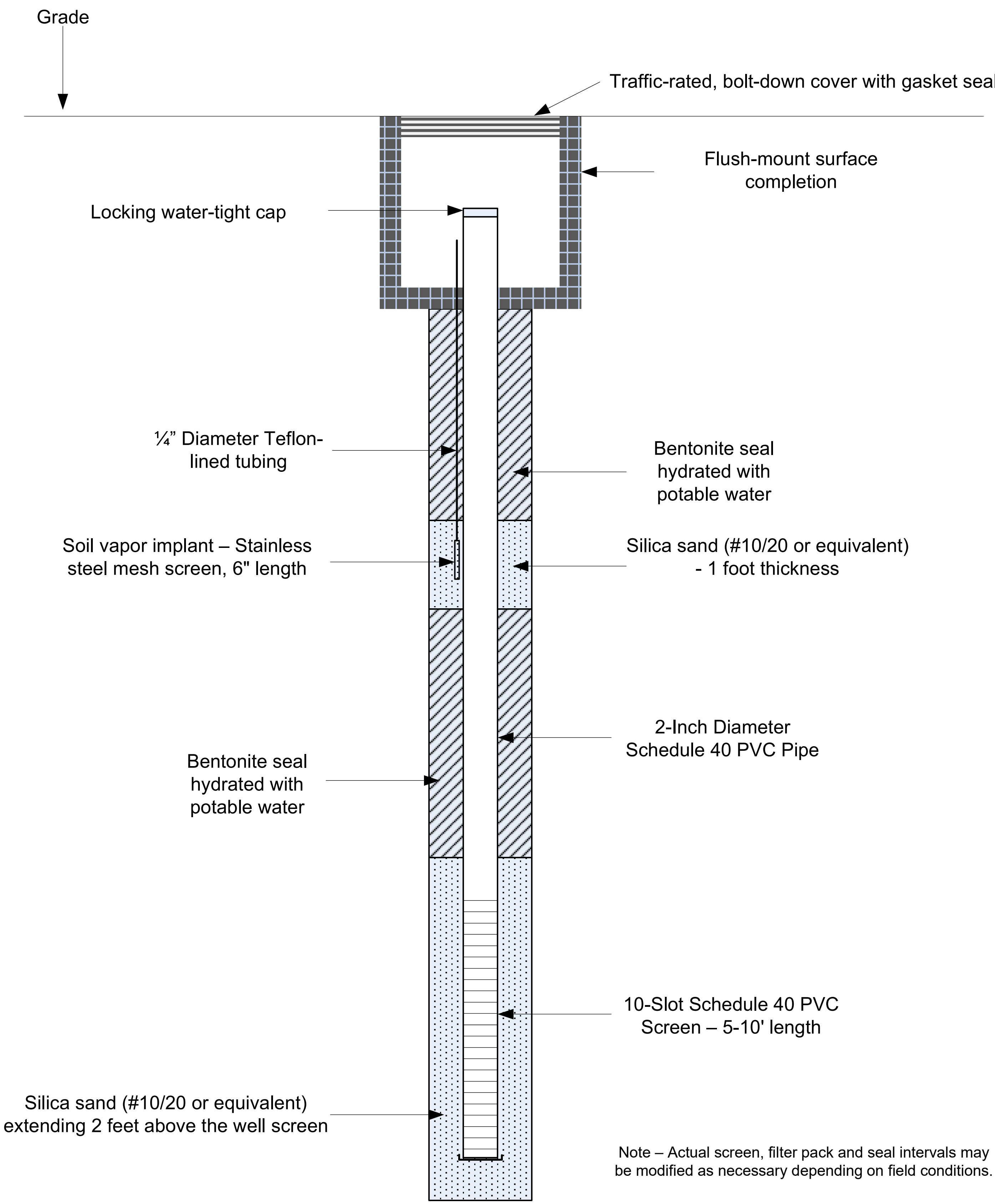
OU = operable unit
PCE = tetrachloroethene
TCE = trichloroethene
µg/L = micrograms per liter
J = Result is estimated
ND = Analyte was not detected

RG-01 (GW-10) Replacement Monitoring Well (Piezometer)

Figure 1
East Side Springs
Monitoring Well Installation

CDM Smith

OU1 700 South 1600 East PCE Plume
Salt Lake City, Utah



Note – Actual screen, filter pack and seal intervals may be modified as necessary depending on field conditions.

CDM Smith	700 South 1600 East PCE Plume Salt Lake City, Utah	**Figure 2** Monitoring Well Construction Diagram (not to scale)

Table 1

East Side Springs Monitoring Well Installation

Location ID	Latitude	Longitude	Well Construction[1]					Elevation top of Casing (ft amsl)[2]	Average Depth to Groundwater Measured in 2016 (ft bgs)[2]	Rationale
			Water Level[3] (ft bgs)	Screen Start (ft bgs)	Screen End (ft bgs)	Well Depth (ft bgs)	Soil Vapor probe (ft bgs)			
RG-01 (GW-10)	40.74962306	-111.8591304	12.5	8	18	20	5	4382.52	12.96	GW-10 can be used to delineate the western toe of plume in shallow groundwater, west of MW-14S/D and upgradient of the mapped fault location. Results indicated PCE below MCLs during previous sampling. Piezometer was destroyed after sampling in 2019.
RG-02 (GW-11)	40.75039971	-111.8578266	2.75	5	15	15	-	4437.77	2.76	GW-11 historically had elevated PCE concentrations (60 µg/L in August 2019) and can aid in evaluating VOC concentrations within areas of concern for VI.
RG-03 (GW-16)	40.7509268	-111.858418	1.9	3	8	10	-	4422.96	1.8	GW-16 was not located in 2019, however, elevated PCE concentrations were observed in 2016 and can aid in evaluating VOC concentrations within areas of concern for VI.
RG-04 (GW-20)	40.75255563	-111.859405	11.5	11.5	16.5	20	5	4417.16	11.52	GW-20 is useful for delineation of the northern and northwestern extent of the shallow groundwater plume west of MW-16S/D.
RG-05 (GW-27)	Not completed as permanent		20.23	20	30	30	5	4493.18	20.23	GW-027 will be installed on the north side of East High School. The AOU-1 investigation did not complete this as a piezometer location.
GW-49	40.74892918	-111.8546166	7.5	7.5	12.5	15	-	4465.84	7.46	Do not recommend replacement. Location and screen interval in close proximity to MW-17S.
RG-06 (GW-50)	40.74834345	-111.8560044	2.5	4	9	10	-	4445.12	2.53	GW-50 is useful for evaluation of VOC concentrations in the shallow groundwater in the southern portion of the ESS area. GW-050 exceeded MCLs for PCE and TCE, and contained higher concentrations of TCE than PCE.
RG-07 (GW-52)	40.74967759	-111.8552539	22.8	20	30	30	5	4490.6	22.93	GW-52 historically had elevated PCE concentrations (47 mg/L in August 2019) and is useful to aid in delineating VOC concentrations within areas of concern for VI.
RG-08 (GW-53)	40.74962314	-111.8567461	10.8	10	20	15	5	4459.05	10.86	GW-53 historically had elevated PCE concentrations (45 mg/L in August 2019), and is located immediately upgradient of springs in the MW-14S/D area.
RG-09 (GW-59)	40.75077039	-111.8593992	8.5	5	15	15	-	4385.84	7.74	GW-59 can be used to delineate the western toe of plume in shallow groundwater upgradient of the mapped fault location. Results indicated PCE below MCLs during previous sampling.
RG-10 (GW-61)	40.74759888	-111.8580427	11.8	10	20	20	5	4399.8	11.94	GW-61 is useful for delineating the VOC plume in the shallow groundwater in the southern portion of the ESS area. GW-061 was below MCLs for PCE and TCE during previous sampling.
RG-11	TBD	TBD	-	20 [4]	30 [4]	30 [4]	5	-	-	GW-63 will be useful for delineating the VOC plume in the shallow groundwater in the area north of East High School.

Notes

[1] Proposed Screen depths
[2] OU-1 fn RI Report_Final-02-22-19_vol 01 of 19 EA_022219 Table 6-2, pages 203-205
[3] OU-1 fn RI Report_Final-02-22-19_vol 01 of 19 EA_022219 boring logs
[4] Anticipated depth
Grey shading indicates piezometers that are not recommended for replacement
RG-01 (GW-10) Monitoring Well name (piezometer name)

ESS = East Side Springs
MCL = maximum contaminant level
mg/L = milligram per liter
PCE = tetrachloroethene
TCE = trichloroethene
VI = vapor intrusion
VOC = volatile organic compound

Table 2
Results From Temporary Piezometers in AOU-1
700 South 1600 East PCE Plume Site

Sample Location		GW-10		GW-11		GW-16		GW-20		GW-49	
Date Collected		8/29/2019		8/29/2019		9/19/2016		8/29/2019		8/27/2019	
Matrix		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
Screen Depth (feet below ground surface)		13-18		10-15		3-8		11.5-16.5		7.5-12.5	
Parameter	**Units**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**
Volatile Organic Compounds -SW8260C											
Chloromethane	µg/L	< 1	U	< 1	U	< 0.5	U	0.32	J	< 1	U
1,1,2-Trichloro-1,2,2-Triflouroethane	µg/L	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U
Acetone	µg/L	45		8.8	J	< 5	U	< 10	U	< 10	U
Carbon disulfide	µg/L	< 1	U	< 1	U	< 0.5	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	< 1	U	0.43	J	0.3	J	< 1	U	< 1	U
Chloroform	µg/L	< 1	U	1.9	J	1.7		0.77	J	1.2	
1,1,1-Trichloroethane	µg/L	< 1	U	1.9	J	0.26	J	< 1	U	< 1	U
Trichloroethene	µg/L	< 1	U	0.82	J	0.73		0.7	J	< 1	U
Tetrachloroethene	µg/L	2.1		60	J	18		8.3		1.1	

Notes:
µg/L = micrograms per liter
Q = Qualifier
Conc. = Concentration
Only detections are reported where at least one analyte was detected in the sample group.

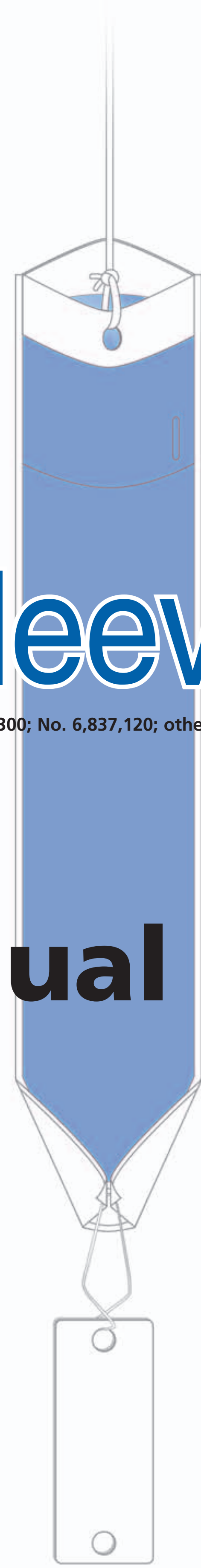
Qualifiers:
J = Estimated: The analyte was positively identified, the quanitation is an estimation
U = Not detected at the detection limit

Table 2
Results From Temporary Piezometers in AOU-1
700 South 1600 East PCE Plume Site

Sample Location		GW-50		GW-52		GW-53		GW-59		GW-61	
Date Collected		**8/27/2019**		**8/29/2019**		**9/19/2016**		**8/29/2019**		**8/27/2019**	
Matrix		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**	
Screen Depth (feet below ground surface)		**4-9**		**25-30**		**10-15**		**10-15**		**15-20**	
Parameter	**Units**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**	**Conc.**	**Q**
Volatile Organic Compounds -SW8260C											
Chloromethane	µg/L	0.49	J	0.35	J	< 0.5	U	< 1	U	0.45	J
1,1,2-Trichloro-1,2,2-Triflouroethane	µg/L	< 1	U	< 1	U	< 0.5	U	0.31	J	< 1	U
Acetone	µg/L	< 10	U	< 10	U	< 5	U	< 10	U	< 1	U
Carbon disulfide	µg/L	0.39	J	< 1	U	< 0.5	U	< 1	U	< 1	U
cis-1,2-Dichloroethene	µg/L	1.8	J	< 1	U	0.22	J	3.3	J	< 1	U
Chloroform	µg/L	< 1	U	2.2	J	1.9		< 1	U	< 1	U
1,1,1-Trichloroethane	µg/L	< 1	U	< 1	U	0.75		< 1	U	< 1	U
Trichloroethene	µg/L	9.3	J	0.5	J	0.59		4.4	J	< 1	U
Tetrachloroethene	µg/L	5.8	J	47	J	45		3.2	J	3.3	J

Notes:
µg/L = micrograms per liter
Q = Qualifier
Conc. = Concentration
Only detections are reported where at least one analyte was detected in the sample group.

Qualifiers:
J = Estimated: The analyte was positively identified, the quanitation is an estimation
U = Not detected at the detection limit



HYDRASleeve

Simple by Design

US Patents No. 6,481,300; No. 6,837,120; others pending

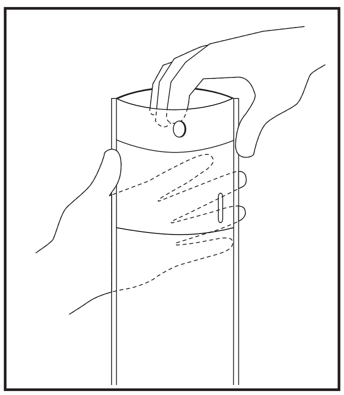
Field Manual

Introduction

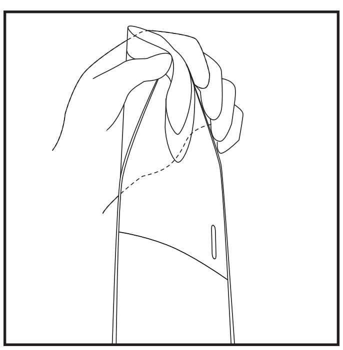
The HydraSleeve groundwater sampler can be used to collect a representative sample for most physical and chemical parameters without purging the well. It collects a whole water sample from a user-defined interval (typically within the well screen), without mixing fluid from other intervals. One or more HydraSleeves are placed within the screened interval of the monitoring well, and a period of time is allocated for the well to re-equilibrate. Hours to months later, the sealed HydraSleeve can be activated for sample collection. When activated, HydraSleeve collects a sample with no drawdown and minimal agitation or displacement of the water column. Once the sampler is full, the one-way reed valve collapses, preventing mixing of extraneous, non-representative fluid during recovery.

Assembly

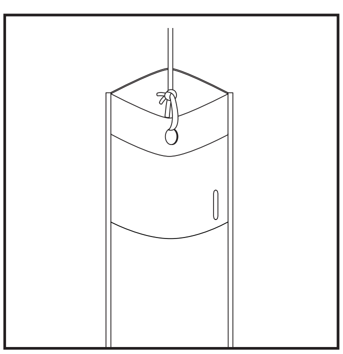
Assembling the HydraSleeve is simple, and can be done by one person in the field, taking only a minute or two.



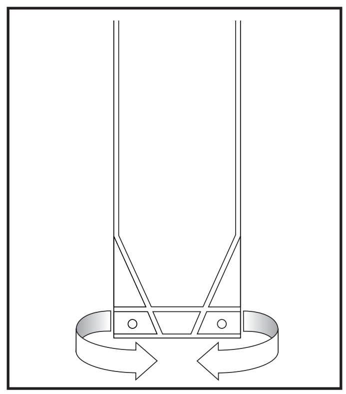
1 Remove HydraSleeve from package and grasp top to “pop” open.



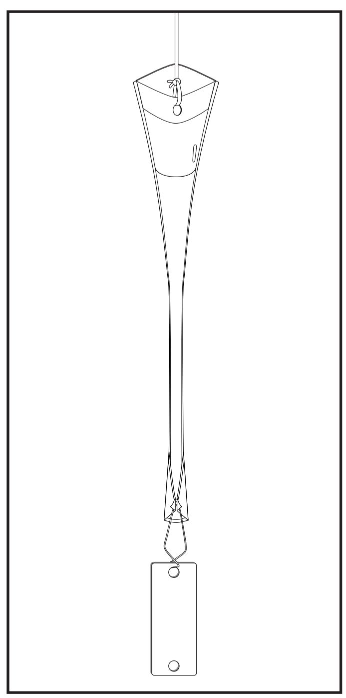
2 Squeeze side fins together at top to bend reinforcing strips outward.



3 Attach line to hole at top of HydraSleeve.



4 Fold the two holes at bottom of HydraSleeve together and attach weight



5 Sampler is ready to insert into the well.

Placing the HydraSleeve(s)

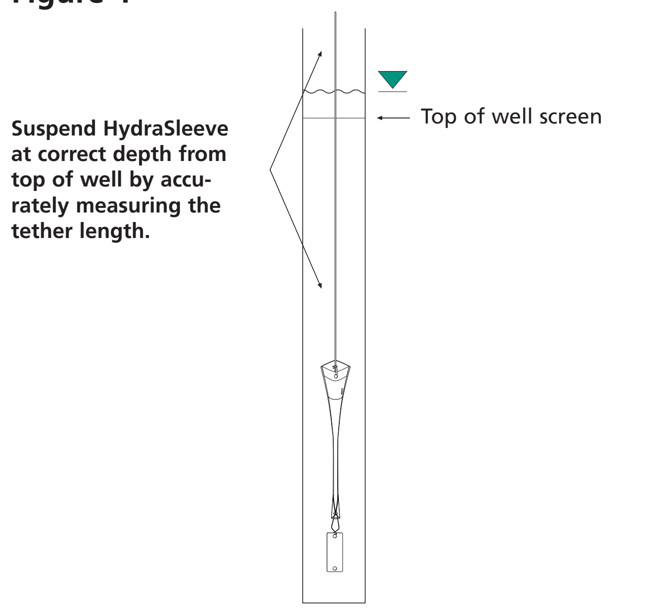
To collect a representative groundwater sample without purging, the well must be allowed time to re-equilibrate after placement of the sampler. When any device is lowered into a well, some mixing of the water column occurs. The diameter of the device and its shape greatly affect the degree of mixing. The flat cross-section of the empty HydraSleeve minimizes the disturbance to the water column as the sampler is lowered into position, reducing the time needed for the well to return to equilibrium.

There are three basic methods for holding a HydraSleeve in position as the well equilibrates.

TOP DOWN DEPLOYMENT (Figure 1)
Measure the correct amount of suspension line needed to "hang" the top of the HydraSleeve(s) at the desired sampling depth (in most cases, this will be at the bottom of the sampling zone). The upper end of the tether can be connected to the well cap to suspend the HydraSleeve at the correct depth until activated for sampling.

Note: For deep settings, it may be difficult to accurately measure long segments of suspension line in the field. Factory prepared, custom suspension line and attachment points can be provided.

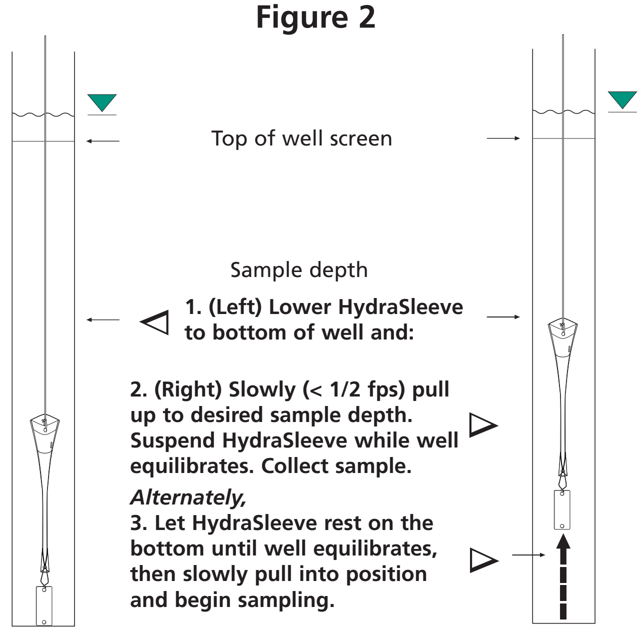
Figure 1



BOTTOM DEPLOYMENT (Figure 2)
Sound the well to determine the exact depth. Lower the weighted HydraSleeve into the well and let it touch the bottom. Very slowly (less than 1/2 foot per second) raise the sampler to the point where the check valve is at the depth the sample is to be collected. Attach the suspension line to the top of the well to suspend it at this depth. (It is often easier to measure a few feet from the bottom of the well up to the sample point, than it is to measure many feet from the top of the well down.)

Alternately, the sampler can be left on the bottom until the well re-equilibrates. For sampling, it can be very slowly pulled (< 1/2 fps) to sampling depth, then activated (see "Sample Collection," p. 6) to collect the sample, and retrieved to the surface.

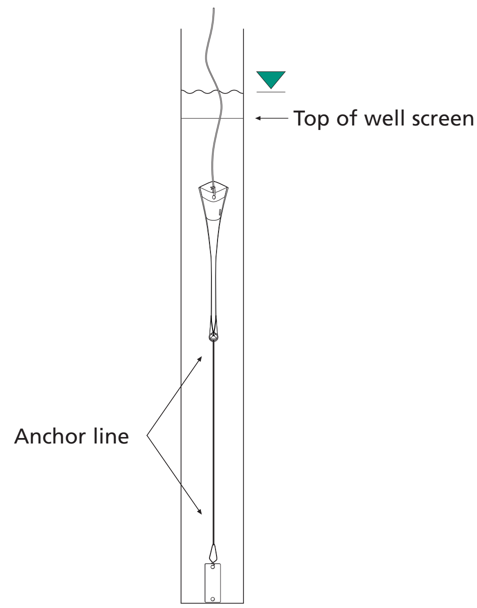
Figure 2



BOTTOM ANCHOR (Figure 3)

Determine the exact depth of the well. Calculate the distance from the bottom of the well to the desired sampling depth. Attach an appropriate length anchor line between the weight and the bottom of the sampler and lower the assembly until the weight rests on the bottom of the well, allowing the top of the sampler to float at the correct sampling depth.

Figure 3



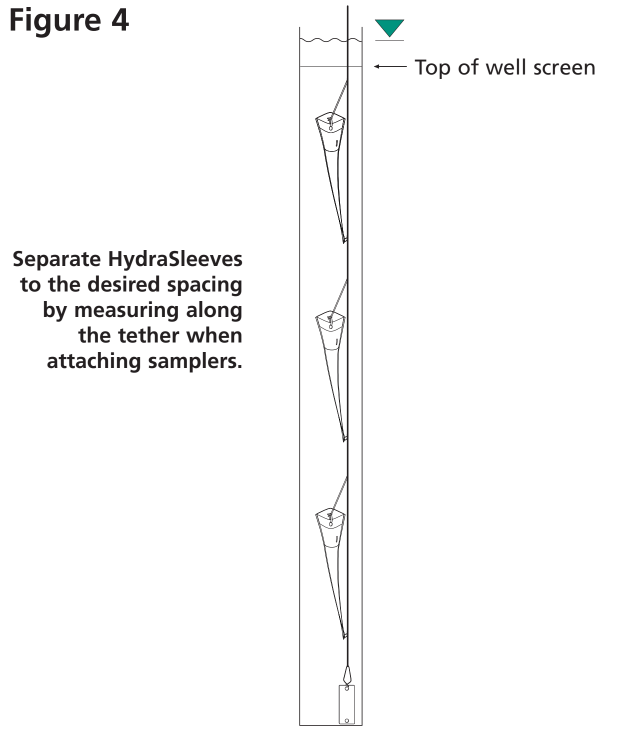
Multiple Interval Deployment

There are two basic methods for placing multiple HydraSleeves in a well to collect samples from different levels simultaneously.

ATTACHED TO A SINGLE TETHER (Figure 4)

To use 3 or more samplers simultaneously, we recommend attaching them all to a tether for support to prevent the sampling string from pulling apart. The weight is attached to a single length of suspension line and allowed to rest on the bottom of the well. The top and bottom of each HydraSleeve are attached to the tether at the desired sample intervals. Cable tie or stainless steel clips (supplied) work well for attaching the HydraSleeves to the line. Simply push one end of the clip between strands of the rope at the desired point before attaching the clip to the HydraSleeve.

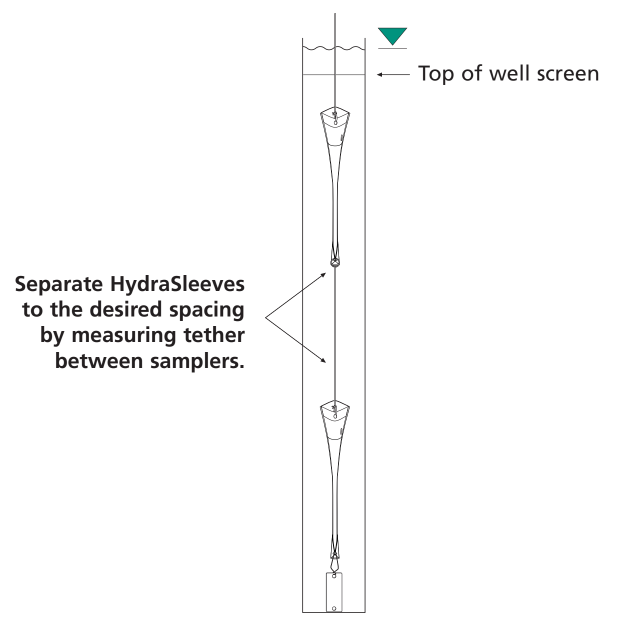
Figure 4



ATTACHED END TO END (Figure 5)

To place 2 or 3 stacked HydraSleeves for vertical profiling, use one of the methods described above to locate the bottom sampler. Attach the bottom of the top sampler to the top of the following HydraSleeve(s) with a carefully measured length of suspension cable. Connect the weight to the bottom sampler. Note: if many HydraSleeves are attached to a tether, more weight may be required than with a single sampler.

Figure 5



Sample Collection

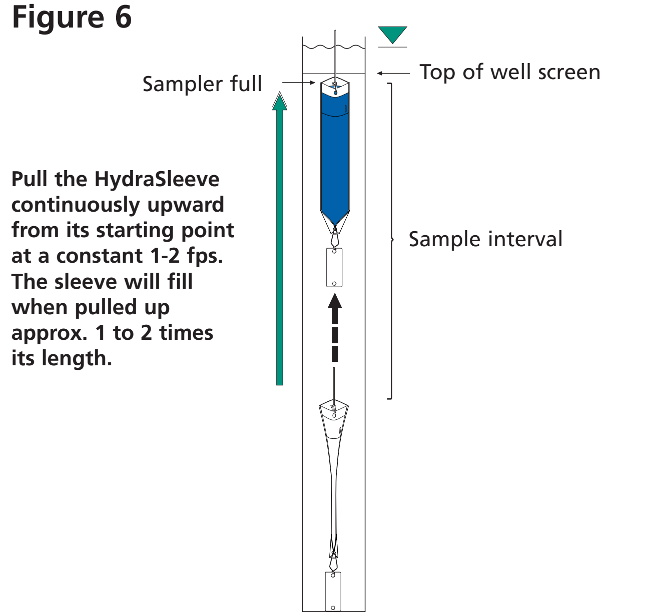
The HydraSleeve must move upward at a rate of one foot per second or faster (about the speed a bailer is usually pulled upward) for water to pass through the check valve into the sample sleeve. The total upward distance the check valve must travel to fill the sample sleeve is about 1 to 2 times the length of the sampler. For example, a 24-inch HydraSleeve needs a total upward movement of 24 to no more than 48 inches to fill. The upward motion can be accomplished using one long continuous pull, several short strokes, or any combination that moves the check valve the required distance in the open position. A special technique is used for sampling low-yield wells.

CONTINUOUS PULL (Figure 6)

Pull the HydraSleeve continuously upward from its starting point at a constant 1 to 2 feet per second until full. This method usually provides the least turbid samples and is analogous to coring the water column from the bottom up.

Note: When using this method, the screen interval should be long enough so the sampler fills before exiting the top of the screen.

Figure 6

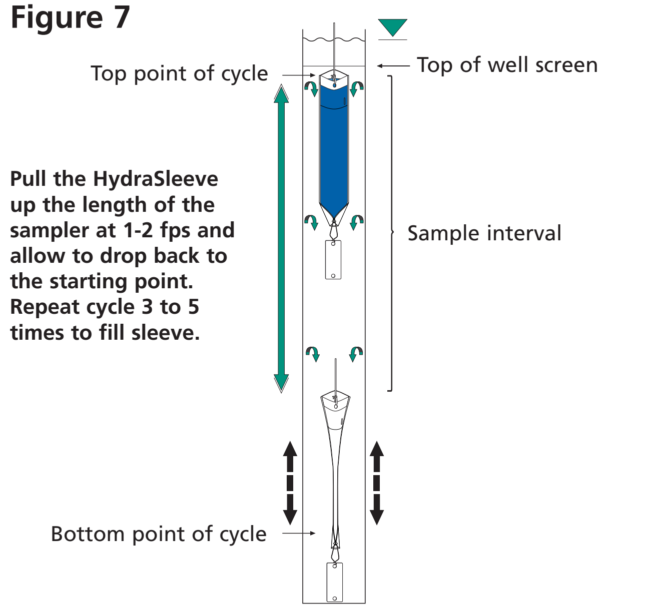


SHORT STROKES (Figure 7)

Pull the sampler upward at about 1 to 2 feet per second for the length of the sampler and let it drop back to the starting point. Repeat the cycle 3 to 5 times.

This method provides a shorter sampling interval than the continuous pull method (above), and usually reduces the turbidity levels of the sample below that of numerous rapid, short cycles (below). The sample comes from between the top of the cycle and the bottom of the sampler at its lowest point.

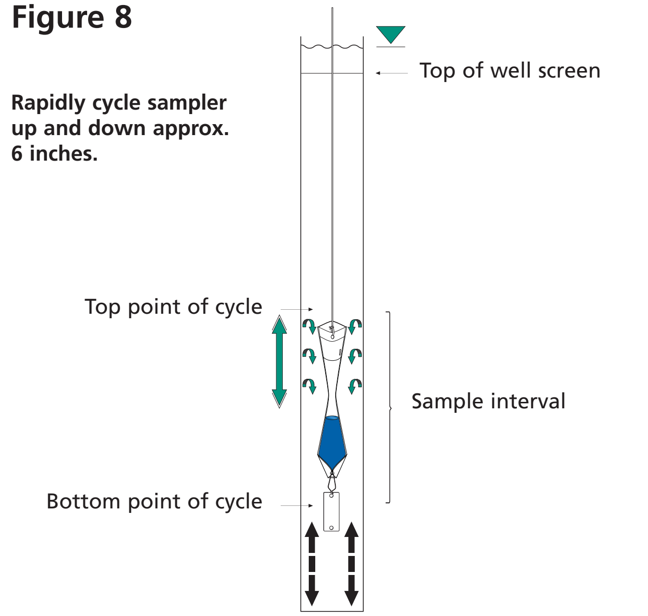
Figure 7



RAPID, SHORT CYCLES (Figure 8)

Cycle the HydraSleeve up and down using rapid, short strokes (6-inch cycle at a minimum of 1 cycle per second) 5 to 8 times. This method provides the shortest sampling interval. Dye studies have shown that when using this method the sample flows into the check valve from along the length of the sampler and immediately above the check valve. The sample interval is from the bottom the sampler at its lowest point in the cycle to the top of the check valve at the peak of the cycle.

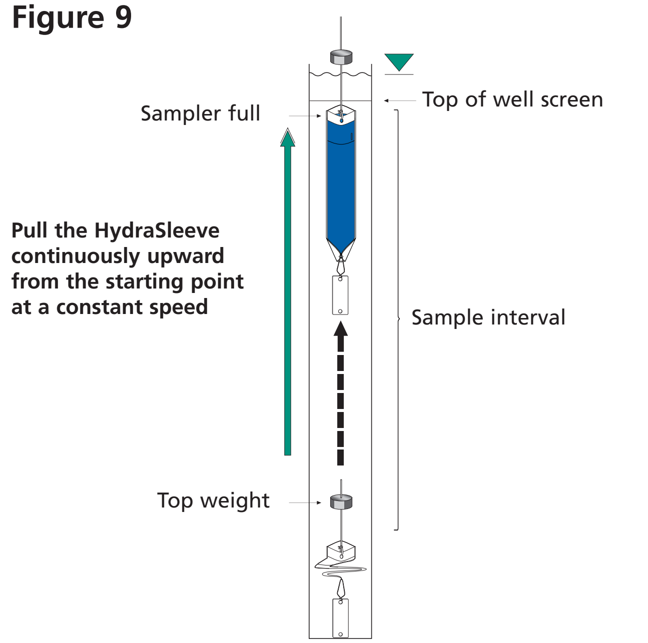
Figure 8



SAMPLING LOW-YIELD WELLS (Figure 9)

HydraSleeve provides the best available technology for sampling low yield wells. When pulled upward after the well re-equilibrates, the HydraSleeve will collect a water core from the top of the sampler to about its own length above that point. The sample is collected with no drawdown in the well and minimal sample agitation. An optional top weight can be attached to compress the sampler in the bottom of the well if needed for an extremely short water column. With a top weight, the check valve is pushed down to within a foot of the bottom of the well.

Figure 9



Sample Discharge

The best way to remove a sample from the HydraSleeve with the least amount of aeration and agitation is with the short plastic discharge tube (included).

First, squeeze the full sampler just below the top to expel water resting above the flexible check valve. (Photo 1, top left)

Then, push the pointed discharge tube through the outer polyethylene sleeve about 3-4 inches below the white reinforcing strips. (Photo 2, middle left)

Discharge the sample into the desired container. (Photo 3, bottom left)

Raising and lowering the bottom of the sampler or pinching the sample sleeve just below the discharge tube will control the flow of the sample. The sample sleeve can also be squeezed, forcing fluid up through the discharge tube, similar to squeezing a tube of toothpaste. With a little practice, and using a flat surface to set the sample containers on, HydraSleeve sampling becomes a one-person operation.