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February 24, 2016

Ms. Richelle Hanson, Project Manager
Land Restoration Program
Land Management Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230-1719

Re: Response Action Plan Addendum
Former Kop-Flex Facility Site, Hanover, Anne Arundel County, Maryland
Brownfield Master Inventory Number MD0286

Dear Richelle:

On behalf of EMERSUB 16 LLC, WSP USA Corp. is submitting this addendum to the Response Action Plan (RAP) for the Former Kop-Flex Facility Site located in Hanover, Maryland (Revision 2.0, dated October 2, 2015), which was approved by the Maryland Department of the Environment (MDE) on October 9, 2015. The addendum provides information on minor modifications to the following components of the hydraulic containment systems at the site:

- Deep groundwater extraction wells (RW-1D and RW-2D)
- Groundwater treatment system

The proposed modifications will facilitate the installation and operation of the remedial alternative to address the impacted groundwater at the site.

DEEP GROUNDWATER EXTRACTION WELLS

As discussed in Sections 7.4 and 9.1 of the RAP, two groundwater extraction wells will be installed in the confined portion of the Lower Patapsco aquifer along the southern site boundary. Based on observed head differences in onsite monitoring wells, there is very limited hydraulic communication across the clayey aquitard separating the deep (confined) portion of the aquifer and the overlying shallow, unconfined groundwater zone.

Given the presence of multiple water-bearing zones at the site, the design of the deep extraction wells included the installation of a permanent outer (or conductor) casing to ensure the unconfined hydrogeologic unit is hydraulically sealed off from the deeper confined portion of the aquifer. The maintenance of an adequate seal between the different groundwater zones will prevent vertical (downward) leakage of groundwater, and associated dissolved contaminants (if present), thereby maximizing the effectiveness of the groundwater extraction within the targeted aquifer zone screened by the extraction wells. A review of the historical monitoring data for the site indicates non-detect to trace concentrations of volatile organic compounds in groundwater samples collected from the shallow monitoring wells along the southern property boundary. In addition, further evaluation of the sampling data shows minimal differences in the general water quality parameters (e.g., pH, conductivity, oxidation-reduction potential, etc.) between the unconfined and confined hydrogeologic units, as shown by the box-and-whisker plots in Figure 1.

Given the overall similarity in water quality and absence of groundwater impacts in the shallow hydrogeologic unit, the placement of a permanent outer casing during the installation of the deep extraction wells to seal off the unconfined and confined zones is not considered necessary. The proposed alternative deep well construction will involve the setting of a temporary outer casing in the clayey aquitard to seal off the shallow groundwater zone during borehole advancement into the confined portion of the aquifer and subsequent well installation. Using this approach, the steps in the drilling and installation are outlined below.

- Well borehole is advanced by the coring/casing system until encountering the clayey aquitard. The 4-inch diameter core barrel is removed leaving the outer (10.5-inch diameter) drill casing seated into the confining layer.
- A larger (12-inch diameter) over-ride casing is then advanced around the 10.5-inch casing to the same or slightly greater depth, and serves as the temporary surface casing for the borehole.
- After setting of the 12-inch temporary surface casing, the seal between the casing and clayey aquitard deposits will be tested to ensure it is effective before resuming the drilling activities. Test method will involve filling the inside of the temporary casing with water and monitoring the water level over a short time period.
- Upon determination of an adequate seal with the 12-inch temporary surface casing, continue with the borehole installation to the target depth using the coring/casing system inside of the 12-inch surface casing.
- Construction of the 6-inch extraction well and co-located 1-inch piezometer, including placement of the annular fill materials (filter sand, bentonite seal and grout) occurs inside of the 10.5-inch drill casing.
- During addition of the grout seal, the 10.5-inch drill casing is removed first followed by removal of the 12-inch temporary surface casing, leaving a grout column that has been "knitted" with the borehole wall.

The alternate design for the deep wells is consistent with the Code of Maryland Administrative Regulations (COMAR), 26.04.04 – Well Construction.

A revised copy of Sheet 3 of the engineering drawing package showing the proposed construction details for deep extraction wells RW-1D and RW-2D is provided in Attachment A. Other than this design modification, the deep extraction wells will be constructed in accordance with the information provided in the MDE-approved RAP.

GROUNDWATER TREATMENT SYSTEM

Based on historical monitoring data, the dissolved oxygen (DO) content of the extracted groundwater is expected to be approximately 3.5 milligrams per liter (mg/l) (see statistical data evaluation provided in Figure 1). This concentration is less than the minimum requirement of 5 mg/l for water discharged to surface water bodies. Since the approved groundwater response action involves the discharge of treated water to Stony Run, aeration will need to be included as part of the treatment system for the response action. The proposed aeration treatment step will involve the use of a Venturi injector to aspirate ambient air into a portion of the treated water stream. A booster pump will be added to the system to ensure adequate water flow pressure through the Venturi injector. The aerated portion of the treated effluent will be combined with the main flow using a mixing nozzle, thereby increasing the oxygen levels in the treated water routed to the discharge out-fall.

The DO content of the effluent stream will be monitored at startup to demonstrate adequate aeration of the water. This will be followed by periodic testing of the treated water in accordance with the requirements of the National Pollutant Discharge Elimination System permit to be issued by MDE.

If you have any questions concerning the above modifications to the groundwater response action, please contact us at 703-709-6500.

Sincerely yours,

Robert E. Johnson
Senior Technical Manager

Steve J. Kretschman, P.E.
Vice President

REJ:kjb

cc/encl.: Erich Weissbart, U.S. Environmental Protection Agency, Region III
Mr. Stephen Clarke, Emerson Electric Co. (via electronic mail)
Christine Carney, Esquire, Emerson Electric Co. (via electronic mail)
Mr. David Neuman, Trammell Crow Company
Sheila Harvey, Esquire, Pillsbury Winthrop Shaw Pittman LLP (via electronic mail)

Figure

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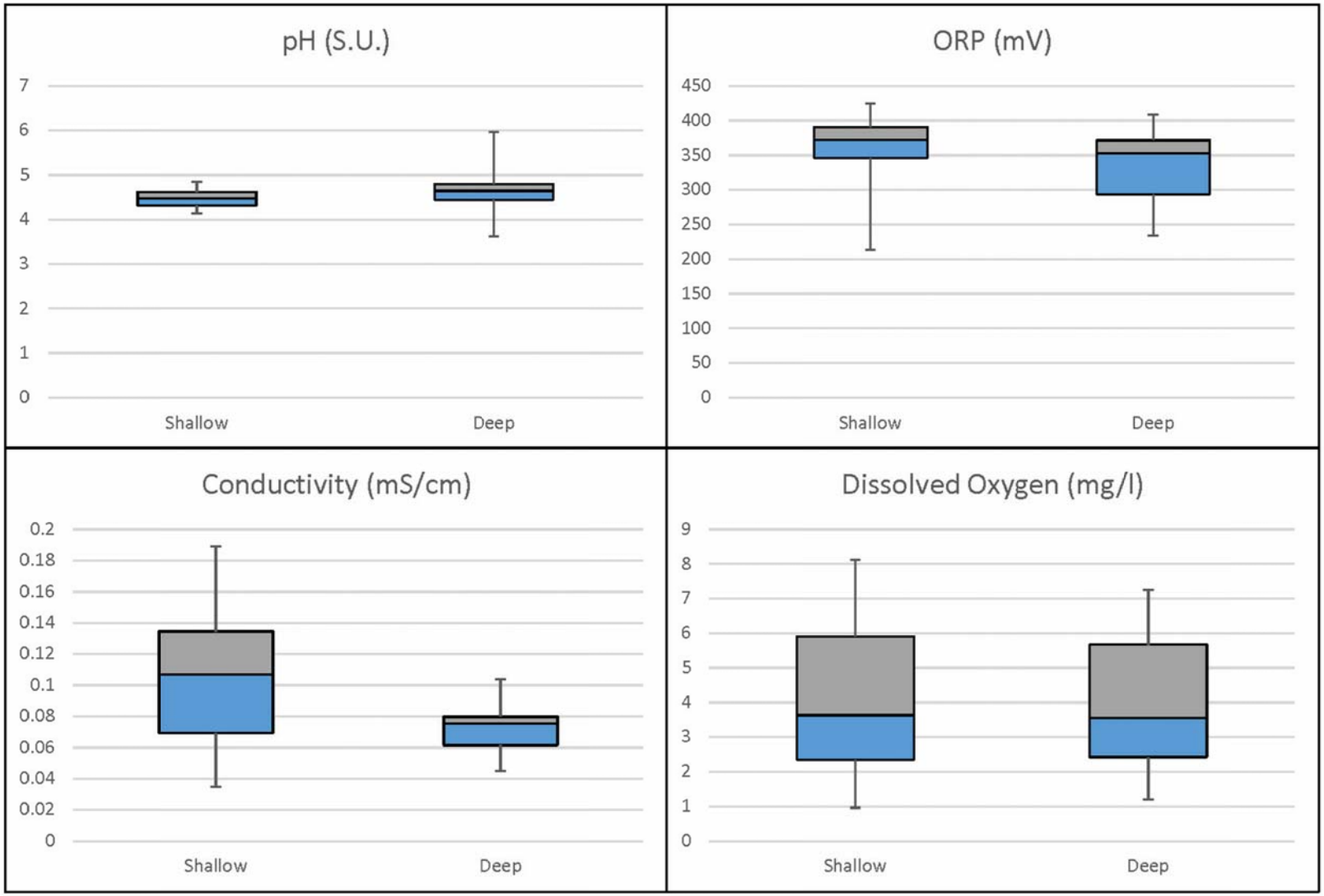

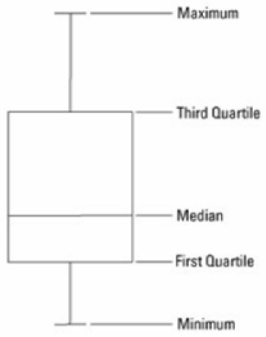

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Figure 1

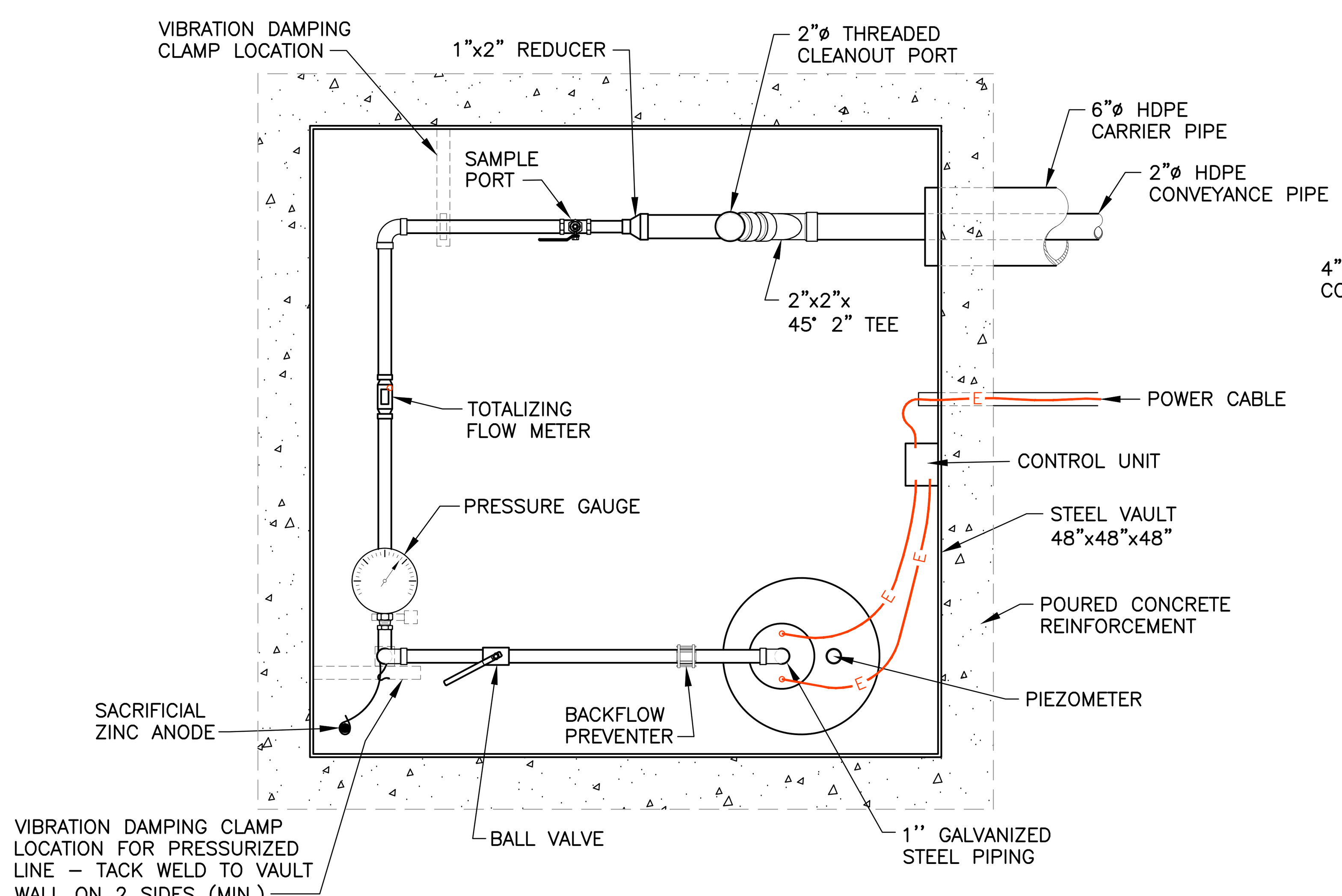
GENERAL CHEMISTRY STATISTICAL ANALYSIS

FORMER KOP-FLEX FACILITY
HANOVER, MARYLAND

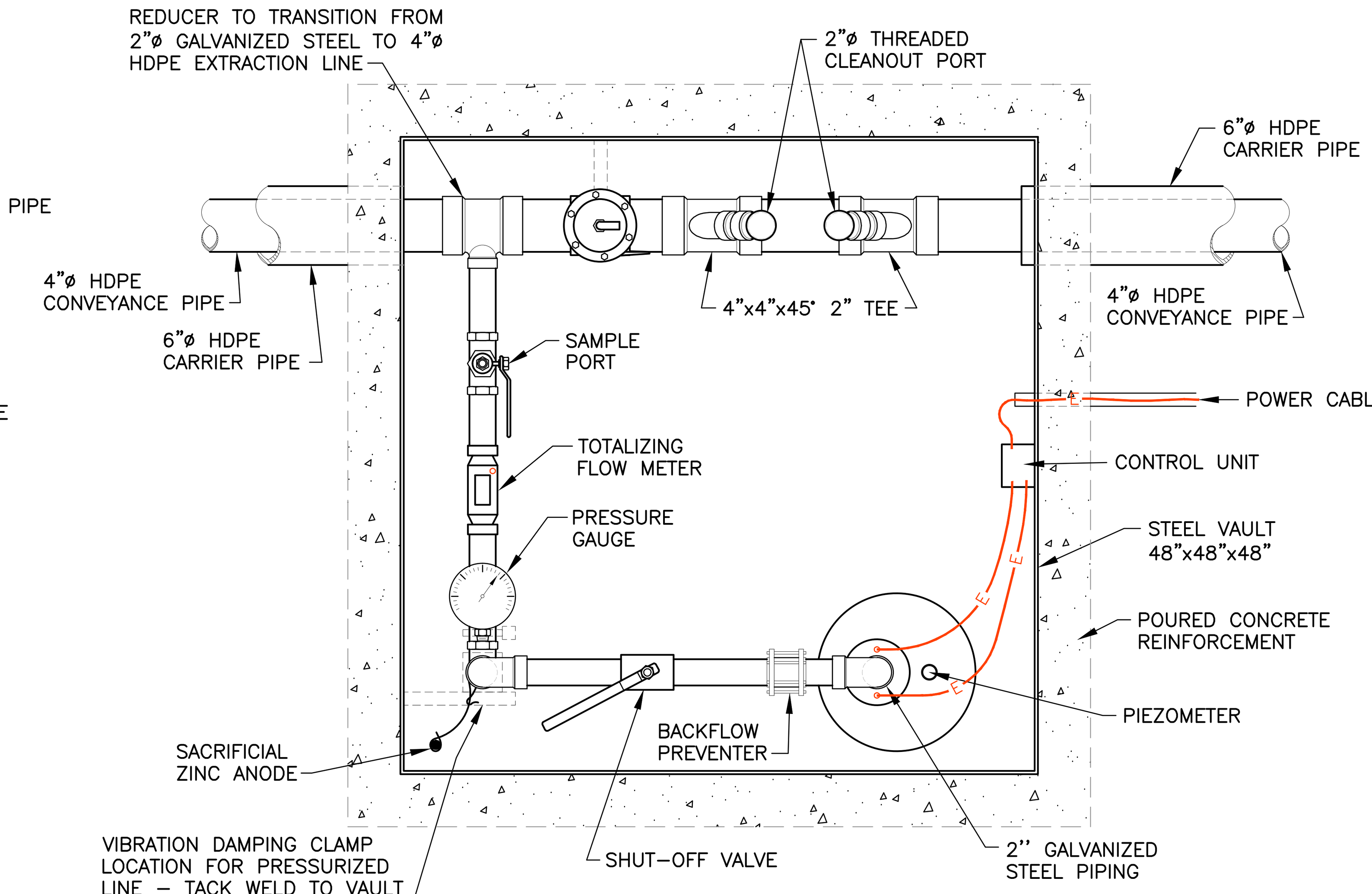
PREPARED FOR
EMERSON

Drawn By: EGC
Checked: RJW 2/1/2016
Approved:
DWG Name: 00003705-275

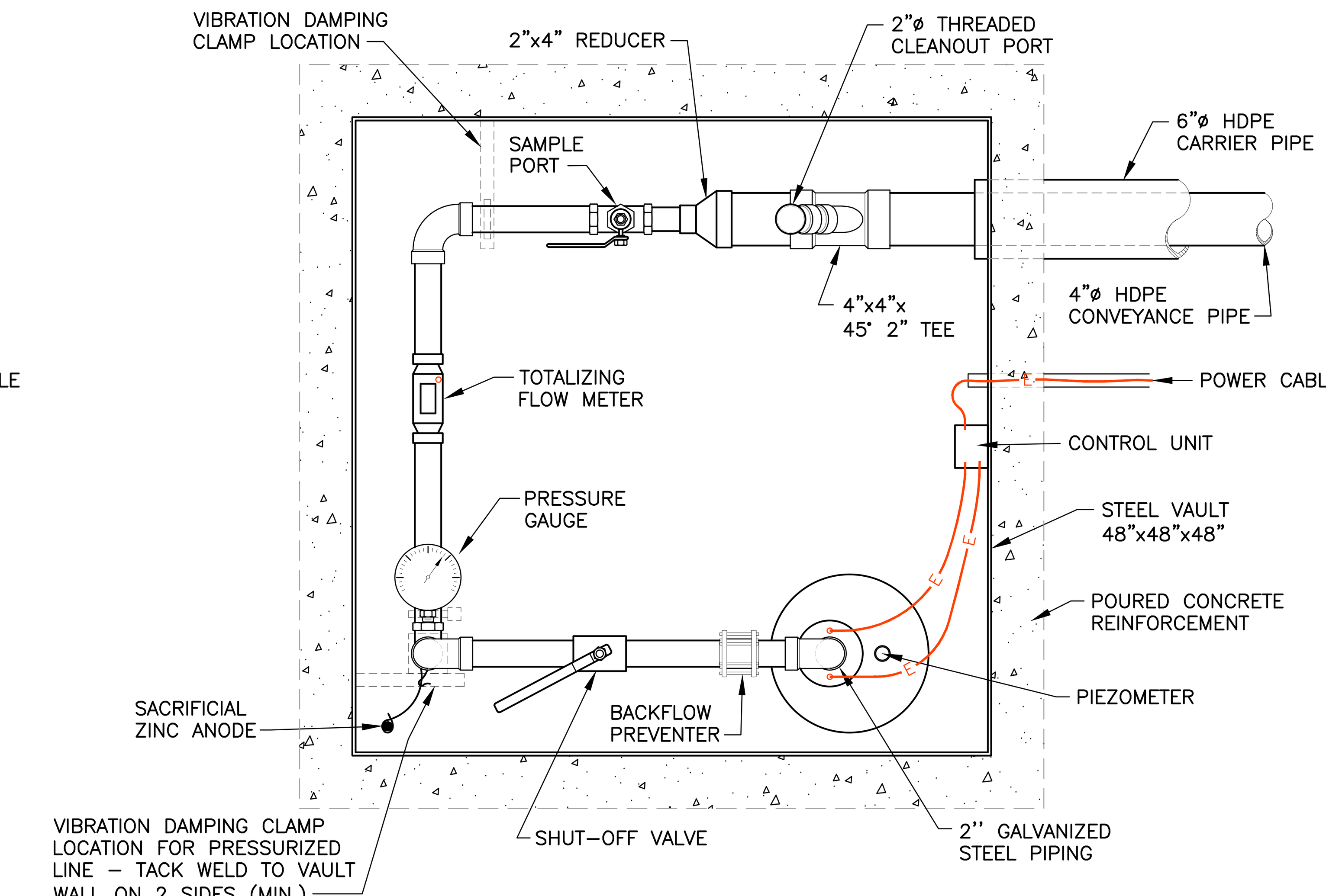
Attachment A – Revised Sheet 3 of Engineering Design Drawings



WELL VAULTS RW-1S, 2S, AND 3S



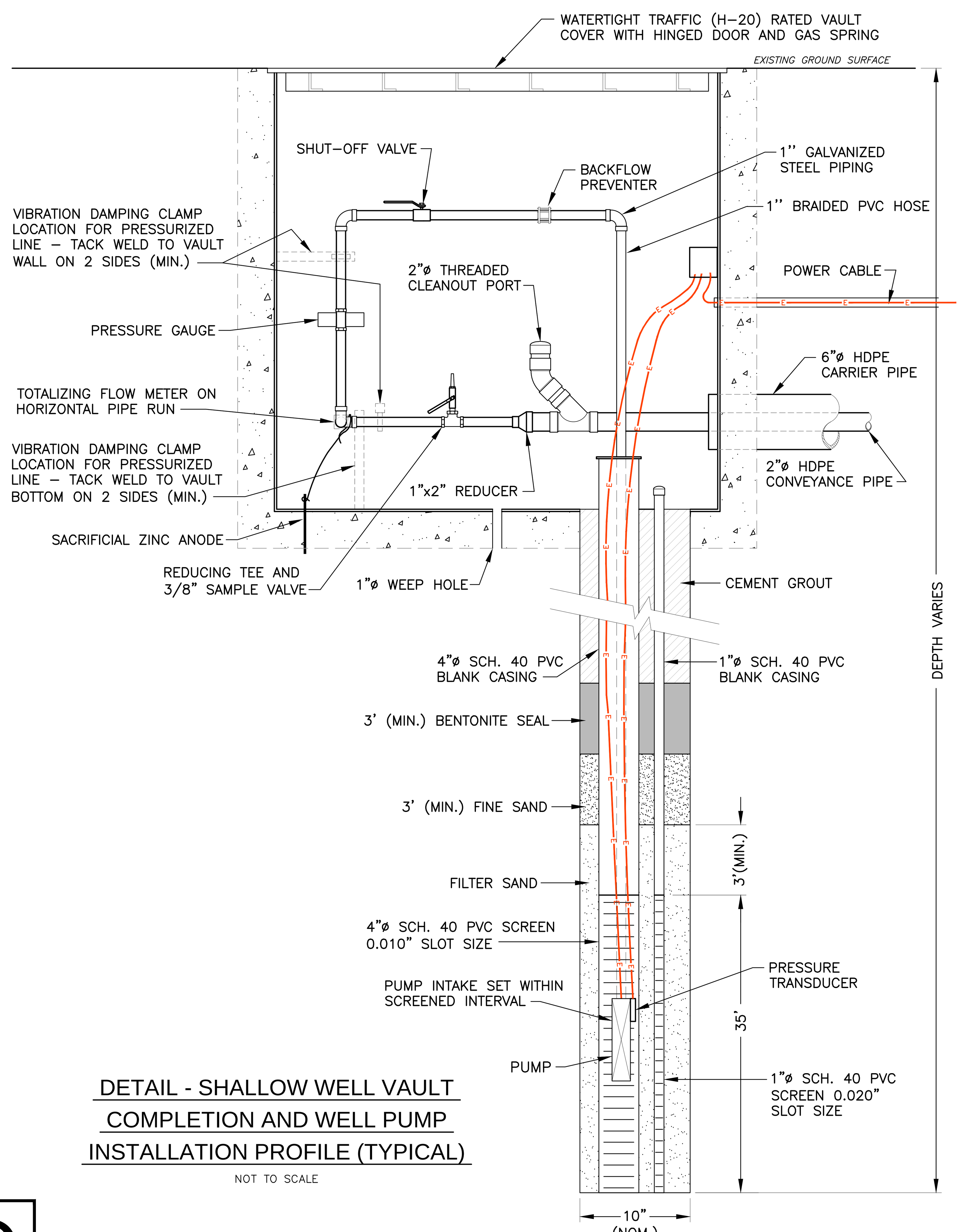
WELL VAULT RW-1D



WELL VAULT RW-2D

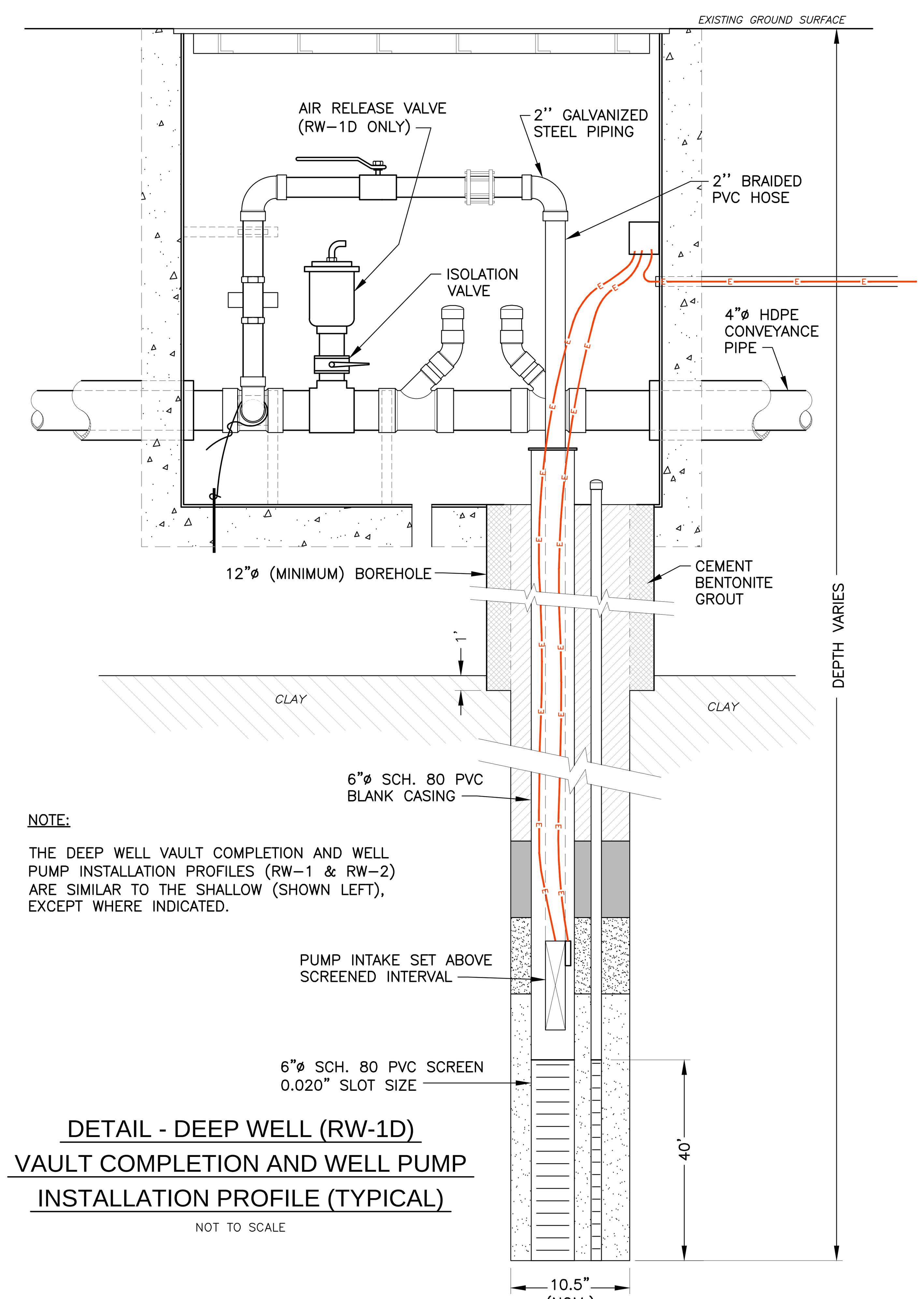
WELL VAULT COMPLETION AND WELL PUMP INSTALLATION PLAN DETAILS (TYPICAL)

NOT TO SCALE



DETAIL - SHALLOW WELL VAULT COMPLETION AND WELL PUMP INSTALLATION PROFILE (TYPICAL)

NOT TO SCALE

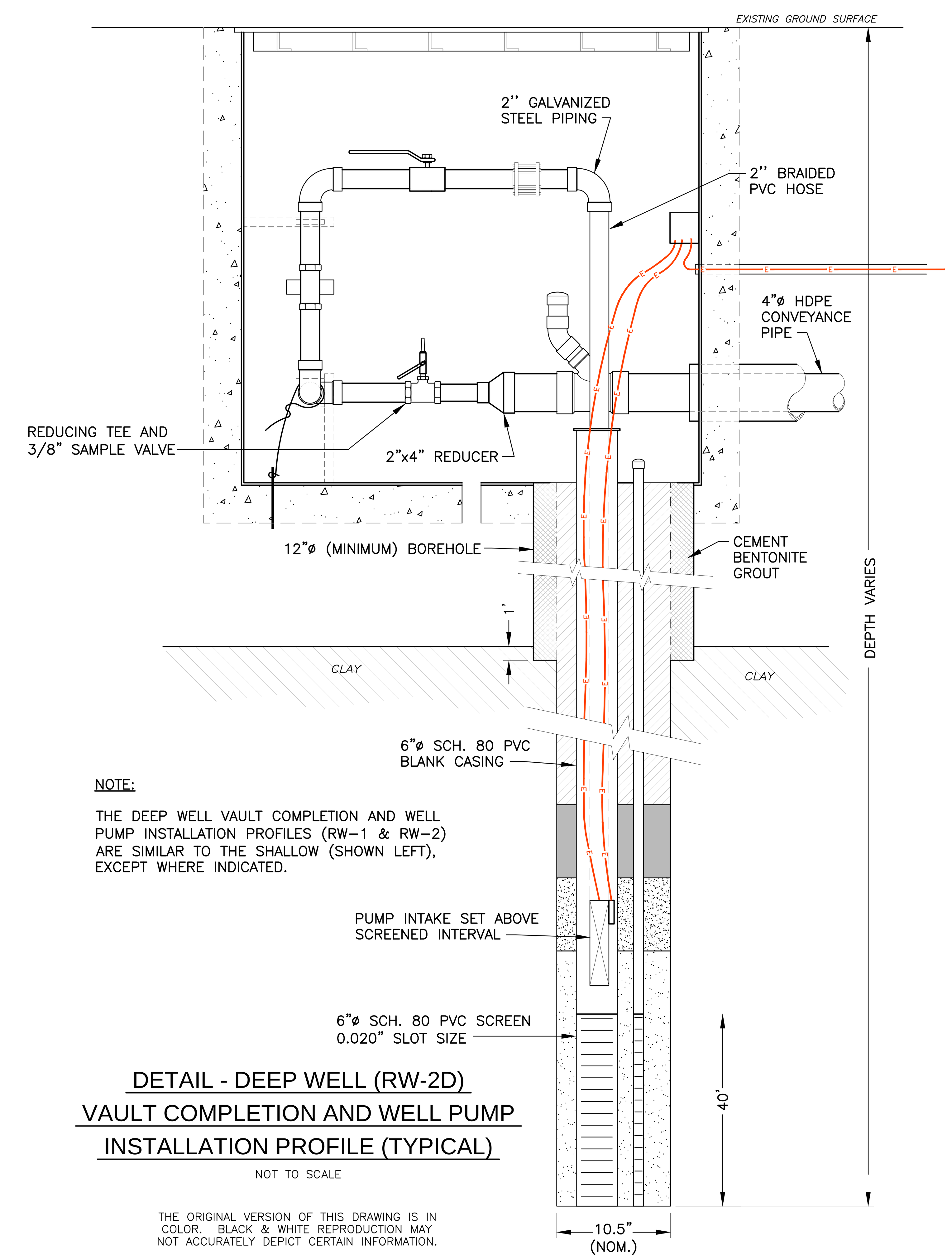


NOTE:

THE DEEP WELL VAULT COMPLETION AND WELL PUMP INSTALLATION PROFILES (RW-1 & RW-2) ARE SIMILAR TO THE SHALLOW (SHOWN LEFT), EXCEPT WHERE INDICATED.

DETAIL - DEEP WELL (RW-1D) VAULT COMPLETION AND WELL PUMP INSTALLATION PROFILE (TYPICAL)

NOT TO SCALE



NOTE:

THE DEEP WELL VAULT COMPLETION AND WELL PUMP INSTALLATION PROFILES (RW-1 & RW-2) ARE SIMILAR TO THE SHALLOW (SHOWN LEFT), EXCEPT WHERE INDICATED.

DETAIL - DEEP WELL (RW-2D) VAULT COMPLETION AND WELL PUMP INSTALLATION PROFILE (TYPICAL)

NOT TO SCALE

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REVISIONS				
REV	DESCRIPTION	Revised: / Chkd: / Appr.:	Revised: / Chkd: / Appr.:	Revised: / Chkd: / Appr.:

SEAL

STATE OF MARYLAND · STEPHEN JAMES KRETSCHMAN · 43361 · PROFESSIONAL ENGINEER

December 3, 2015

DATE

DRAWN BY	12/02/2015
CHECKED	BSK 12/03/2015
APPROVED	BSK 12/03/2015

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PUMP INSTALLATION, PIPING, WELL VAULT, AND MISCELLANEOUS DETAILS

FORMER KOP-FLEX FACILITY
HANOVER, MARYLAND

PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

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SHEET 3

Drawing Number
00003705-D48