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Assessment of Corrective Measures Report

for Compliance with the CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2)

Valmont Station

Public Service Company of Colorado January 31, 2024





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Abbreviation	Definition
ACM	Federal Assessment of Corrective Measures
ACMR	State Assessment of Corrective Measures Report
BTV	background threshold value
CCR	coal combustion residuals
CDPHE	Colorado Department of Public Health and Environment
COI	constituent of interest
EPA	Environmental Protection Agency
GWPS	groundwater protection standards
HMWMD	Hazardous Materials and Waste Management Division
PRB	permeable reactive barrier
PSCo	Public Service Company of Colorado
SSI	statistically significant increase
TDS	total dissolved solids
TSS	total suspended solids

Table of Abbreviations and Acronyms

1.0 Introduction

This Assessment of Corrective Measures Report (ACMR) was performed for groundwater conditions at the Public Service Company of Colorado (PSCo) Valmont Power Plant site in Boulder, Colorado (**Figure 1**). The purpose of the assessment was to identify and evaluate potential groundwater corrective measures for the landfill, showing benefits and limitations associated with each alternative. The corrective measure alternatives were evaluated with the goal of reducing groundwater concentrations to levels below the groundwater protection standards (GWPS) developed for the site (based upon CDPHE Regulation 41 Water Quality Standards per 5 CCR 1002-41).

In accordance with Appendix B6 of the Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division (HMWMD or "Division") Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, state solid waste regulations), this ACMR includes the following:

- Characterization of the nature and extent of the constituents of interest (COIs),
- Evaluation of the potential nearby receptors,
- Establishes site-specific GWPS in accordance with Appendix B7(G) of 6 CCR 1007-2,
- Evaluation of corrective measure alternatives in accordance with the criteria listed in Appendix B6 of 6 CCR 1007-2, and
- Preliminary recommendation for a corrective measure based on the alternatives assessment.

2.0 Facility Description

Valmont Station is located at 1800 North 63rd Street in Boulder, Colorado (**Figure 1**). Valmont Station was a coal-fired, steam turbine electric generating station that burned sub-bituminous, low-sulfur coal supplied by several mines in western Colorado. Coal ash was disposed in the permitted landfill located adjacent to and north of Leggett Reservoir (**Figure 2**). Valmont Station was retired from operations fueled by coal in September 2017, and power generation at Valmont is currently provided by three natural gas combustion turbines capable of generating a total of 135 megawatts.

Operation of the Valmont landfill commenced in the early 1990's in the eastern portion of the landfill in the area now known as Area B-1 (**Figure 2**). For approximately the first 5 years of the operation, fly ash and bottom ash both were conveyed from the plant to the ash impoundments as slurry, then dewatered excavated and disposed in the landfill. Because the slurried ash included fly ash, which is finer than bottom ash, even after dewatering it retained a higher moisture content than if it was only the coarser bottom ash. This combined fly/bottom ash was placed primarily in Areas B-1 and C-1, and to a lesser extent in the eastern portion of Area A-2. The ash disposal areas were prepared by first constructing starter berms by dozing soil and claystone material from the disposal area to create an earth-fill berm, and the ash was then



placed behind the berm within the cell. The landfill is located adjacent to and north of Leggett Reservoir, and the former impoundments are to the southeast of Leggett Reservoir.

In 1995, equipment was installed to collect the fly ash dry at the plant, and delivery of slurried fly ash to the impoundments ceased at that time. Bottom ash continued to be conveyed as slurry to the impoundments and was dewatered prior to excavation and transport to the landfill. The equipment installed at the plant collected fly ash in a silo and moisture conditioned the ash through a pug mill to reduce dust and improve handling and compaction of the ash. Between blading and compaction, each fly ash lift received 10 to 20 passes of the compaction equipment. After compaction, the resulting surface typically hardened due to the cementitious properties of much of the ash.

The reservoirs near the landfill were privately developed, and are owned, and operated by PSCo and have not been treated as Waters of the United States (WOUS) or state waters; they contain 'water withdrawn for use' for treatment purposes. Both ash impoundments were physically closed by final removal of all coal combustion residuals (CCR), which was completed in September 2018; completion of CCR removal was certified by a Professional Engineer. The CCR waste removed during closure was disposed in the onsite landfill. Xcel Energy has entered into a contract for the removal and beneficial reuse of the ash in the landfill. This ACMR is applicable to the Valmont Station landfill and discusses groundwater monitoring and subsequent activities required under CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2).

2.1 Recently Completed Reports & Studies

The Valmont landfill is also monitored under the U.S. Environmental Protection Agency's (EPA) 2015 Coal Combustion Residuals (CCR) Rule which establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. Under the EPA CCR Rule, groundwater at the landfill is monitored under the assessment monitoring program and an assessment of corrective measures was initiated in 2019.

In response to exceedances of assessment monitoring constituents above the groundwater standards under the CCR program, PSCo drilled additional wells, completed additional hydrogeologic investigation, and completed the *Conceptual Site Model and Assessment of Corrective Measures (ACM)* in June 2019 which was posted to PSCo's CCR public website (HDR, 2019b) and provided to CDPHE.

A groundwater flow model was initially developed for the landfill in Spring 2019 to support the federal ACM. The objective of the preliminary modeling was to simulate flow directions and potential for movement offsite therefore better understanding the potential extent of the COI plume beyond the monitoring well network. The model was significantly updated in 2021 and 2022 to expand the model boundaries and incorporate additional offsite data including from the Valmont Butte property located immediately north of the landfill and within the Boulder Creek alluvial valley north of Valmont Road. With the installation of new monitoring wells north of the

landfill and private well water level and water quality data in 2022, the model was updated and recalibrated to hydraulic head measurements.

Additional work to evaluate potential remedies has been in progress since the completion of the ACM in 2019 and a remedy selection report is anticipated to be completed by end of February 2024. Design and operational phasing plans for ash removal have been developed and will be submitted as part of an updated Engineering Design and Operations Plan (EDOP). PSCo has entered into a contract with Charah Solutions Inc., for the ash removal and beneficial reuse of the ash. Planning and permitting has been initiated for the beneficial reuse project. In addition, a geochemical feasibility study of a permeable reactive barrier (PRB) as a potential remedy to address groundwater conditions was conducted. Results of this study will be discussed further in **Section 8.3**. The pertinent studies conducted, and data obtained for both the CDPHE monitoring program and the EPA CCR Rule have been used in subsequent sections to complete this ACMR.



Figure 1. Vicinity Map for Valmont Station

2.2 State Monitoring Program Overview

Groundwater monitoring is conducted at the Valmont landfill in accordance with CDPHE Regulations (6 CCR 1007-2). The objective of the Valmont groundwater monitoring program is to evaluate groundwater quality both upgradient and downgradient of the landfill. The wells in the current groundwater monitoring network were designed and constructed for interpreting the potentiometric surface and detecting potential impacts from the landfill. Ten groundwater monitoring wells are present around the landfill to monitor conditions within the uppermost groundwater. The well locations are shown on **Figure 2**. Based on the current 2020 Groundwater Monitoring Plan (GWMP) (Xcel Energy, 2020), wells MW-5, MW-7, MW-24, and MW-25B monitor conditions upgradient of the landfill; wells MW-1, MW-2, MW-3, MW-4, and MW-6 monitor conditions downgradient of the ash disposal cells; and well MW-8 is considered cross-gradient to the western portion of the landfill. The Groundwater Monitoring Plan will be updated concurrent to this ACMR. Proposed changes to the monitoring network are provided in **Section 3.2**.

The monitoring well network was based on groundwater flow in the vicinity of the landfill. Generally, groundwater flow is from the topographic high ridge area at the northwestern portion of the landfill and flows radially out towards topographic lows and towards Leggett Reservoir. The groundwater flow beneath the landfill follows the topography and is generally to the south-southeast in the eastern portion of the landfill, to the northeast in the northeastern portion of the landfill, and to the southwest under the western portion of the landfill. Recent groundwater contour maps from 2022 sampling events are provided in **Appendix A**.

In accordance with a letter from CDPHE-HMWMD, dated March 18, 2019, the facility began groundwater assessment monitoring for the Valmont landfill due to confirmed statistically significant increases (SSIs) for selected constituents in multiple wells. PSCo began assessment monitoring at the landfill in May 2019. Based on the location of MW-5 relative to groundwater flow directions and water quality data, it is believed that MW-5 should not be used to represent background conditions. Therefore, as part of this ACMR the background threshold values (BTVs) have been updated using MW-7 and MW-24 as upgradient/background monitoring locations. The Background Statistical Analysis update and associated statistical reports are provided in **Appendix C**.

Following updates to the BTVs, data from the fall 2022 sampling event were evaluated to determine if changes in detected SSIs were observed. Monitoring well/constituent pairs with SSIs are further evaluated by comparing to the CDPHE Regulation 41 Water Quality Standards to determine COIs to be carried forward to corrective measures. Evaluation of COIs and Determination of Site-Specific GWPS are provided in **Sections 4.1 and 4.2**.



Figure 2. Valmont Station – CCR Units & Existing State Program Monitoring Well Network

3.0 Conceptual Site Model

The conceptual site model (CSM) is a narrative description identifying relevant hydrogeologic components of the local groundwater system, including all inflows and outflows, in order to identify the potential physical processes influencing groundwater flow and chemical transport. The CSM incorporates results of previous site assessment and characterization activities.

In addition to the narrative description and to corroborate the CSM, a three-dimensional (3D) hydrogeologic flow and transport model was created using geologic interpretations of well boring lithologic logs from monitoring wells and geotechnical exploratory borings. The geological model was created in Leapfrog Hydro version 2.5.2 (ARANZ Geo Limited, 2006) and can be directly translated into the numerical groundwater flow and transport model pre- and post-processing software; Groundwater Vistas Version 7, (Environmental Simulations, Inc., 2017).

An initial CSM was provided in the *Conceptual Site Model and Assessment of Corrective Measures (ACM)* in June 2019 which was posted to PSCo's CCR public website (HDR, 2019b) and provided to CDPHE. Since the completion of the 2019 ACM, additional well installation and boring logs were incorporated into the model. The updated CSM is provided in the following sections of this ACMR which incorporates elements from the 2019 ACM CSM with interpretation of the additional hydrogeological information obtained from the new monitoring wells and borings. Updated geologic cross sections through the landfill were prepared and are provided in **Appendix D-1**. The geologic interpretations presented on the cross sections are based on the subsurface conditions encountered in exploratory borings, historical descriptions of the construction of the landfill, measurements of the cover fill berms, and review of aerial photographs. Additionally, an evaluation for the Cell D landfill ash and potential for groundwater contact is provided as **Appendix D-2**.

3.1 Site Geology and Hydrogeology

Prior hydrogeologic and geotechnical investigations have been conducted at Valmont, as documented in the following reports and summarized in the text below.

- Monitoring Well Installation Report (MW-1-3) (Xcel, 2002)
- Monitoring Well Installation (MW-4-8) (APEX, 2008)
- Geotechnical Engineering Study (Kumar and Associates, Inc., 2008)
- Geotechnical Engineering Study (Kumar and Associates, Inc., 2011)
- Ground Water Monitoring Report, Fall 2014 (Xcel, 2014)
- Ash Disposal Facility Design and Operations Plan (Xcel, 2009)
- Inventory and Preliminary Classification Report, Waste Impoundments (Tetra Tech, 2013)

The ash landfill at Valmont Station is located on the southern and eastern flanks of the Valmont Butte, a mesa-like feature bounded to the north by the Valmont Dike. The butte surface consists of a thin alluvial deposit of Slocum Alluvium and the side slopes are covered with colluvial deposits similar to the Slocum. The first bedrock encountered at the site is the Pierre Shale, a



2,000-foot-thick low permeability claystone. Native colluvium is present on the undisturbed slopes adjacent to the landfill. Native pediment deposits, the Slocum Alluvium, are present on the gently-easterly sloping top of the butte, north of the landfill footprint. Approximately 2 to 10 feet of Slocum Alluvium were observed at the landfill above claystone bedrock of the Pierre Shale. Descriptions of the ash and soil fill and bedrock materials are presented below:

Ash Fill and Soil Layers: The landfill is a waste monofill. The ash has been observed to take on cementitious characteristics during compaction resulting in a very low permeability layer. The monofill contains varying mixtures of fly ash and bottom ash with intervening layers of intermediate and daily cover soil borrowed from onsite. Site borrow soil was also used for final cover in units that have been closed, and to construct the berms at the toe of slopes and between individual units. Site soil borrow areas were excavated into both colluvial and bedrock materials. Borrow material obtained from shallow excavations into colluvium and weathered claystone of the Pierre Shale formation is typically friable and readily slakes such that the process of excavation, handling, placement and compaction results in a soil-like layer. The claystone bedrock-derived material also typically had characteristics of a soil material, although some bedrock fragments up to about 1 foot in size were present.

Slocum Alluvium: The Pleistocene-age Slocum Alluvium generally consists of gravels, cobbles and occasional boulders in a silty to clayey sand matrix. According to the Geologic Map of the Niwot Quadrangle, Boulder County, Colorado (USGS, 1970), the portion of the Slocum Alluvium exposed at the top of the Valmont Butte is part of a pediment surface located approximately 110 to 130 feet above the modern stream level. Calcium carbonate is common as void fill in the matrix and as thin concretions at the bottom of cobbles and boulders.

Colluvium: The colluvium generally consists of silty to clayey sand with occasional gravel and cobbles. These soils are present on the side slopes of the Valmont Butte below the elevation of the Slocum alluvial cap. The colluvial soils are a mixture of the granular alluvium and residual weathered shale.

Bedrock: Bedrock of the Upper Cretaceous Pierre Shale underlays the ash monofill, colluvium and the alluvium at the site. This sedimentary bedrock unit is estimated to be on the order of 2,000 feet thick (USGS, 1975) in this area. The shale bedrock unit locally consists of claystone with occasional interbeds of siltstone and discontinuous thin cemented layers. The cemented layers exposed in cuts at Area D-1 generally appear to follow bedding within the claystone. Bedding was measured to dip approximately 6 to 8 degrees to the northeast. Most of the landfill ash cells are underlain with one to 10 feet of weathered shale before borings encountered the dense consolidated bedrock where blow counts often exceed 50 counts for less than six inches of penetration.

The Valmont Dike runs east to west on the northern edge of the Valmont Butte. The dike is a Paleocene-age basaltic intrusion which forms a ridge approximately 1-mile in length. Based on outcrops of basalt east and west of the dike, this indicates the overall intrusion is on the order of 2 to 3-miles in length. The dike intruded perpendicular to the bedding of the Pierre Shale. A narrow zone of metamorphic alteration of the Pierre Shale to hornfels was reported at the



contact with the dike. A discontinuity in the dike is present along Valmont Road near monitoring well MW-38B/C. This discontinuity is possibly the result of erosion of the dike followed by colluvial or erosional deposits filling in the void.

Surface water features located in the general area include Hillcrest, Leggett, and Valmont Reservoirs, diversion canals to and from the reservoir system, South Boulder Creek, Boulder Creek, and various private ponds and lakes. Hillcrest, Leggett, and Valmont Reservoirs are located to the south and east of the ash landfill. The three reservoirs are interconnected with access road causeways delineating the reservoir boundaries. A diversion canal connects South Boulder Creek with the inlet to the three reservoirs with the inlet located on the southwest side of Leggett Reservoir. South Boulder Creek is located west of the ash landfill and reservoirs at a distance of approximately 2,000 feet. A concrete spillway on the northwest side of Leggett Reservoir is the main outlet for the reservoir system which discharges into a canal that conveys surface water back to South Boulder Creek. South Boulder Creek is a tributary to Boulder Creek. Boulder Creek is located approximately 3,000 feet to the north of the ash landfill and is the primary surface water drainage feature in the general area of the site. Also located to the north of the ash landfill are multiple ponds and lakes that are man-made via various excavation activities. There are no visible surface water inlets or outlets for these surface water features. It appears surface water present in these excavations is primarily fed by groundwater.

The ash landfill at Valmont Station is located on the flanks of Valmont Butte on weathered shale above the consolidated bedrock Pierre Shale. The Pierre Shale is a claystone with interbeds of siltstone and discontinuous cemented layers of bedrock that is approximately 2,000 feet thick in this area. The thickness of weathered bedrock under the ash fill and over the consolidated bedrock varies from 5 to 15 feet. Due to the Pierre Shale thickness and low permeability, underlying formations do not receive significant recharge from above (Kumar and Associates, Inc., 2011). There is perched water beneath the landfill and coincident with the top of the Pierre Shale and the water surface of Leggett Reservoir.

According to the Colorado Geologic Service (CGS) the first regional groundwater exists at an elevation of 5,200 feet above mean sea level (AMSL) and flows north, discharging to Boulder Creek. The CGS identified the area in which the landfill is located as being an area where localized water tables may occur within fractures of consolidated materials. The monitoring wells in the topographic highs of the landfill (MW-2, MW-5, MW-7, and MW-24) indicate the water table occurs in the upper portion of the shale, at an elevation of approximately 5,248 to 5,270 feet AMSL. Further west the ground surface lowers at the property boundary and the groundwater elevation at MW-8 is lower (5,211 feet AMSL) implying westward groundwater flow between the middle of the landfill and the west side of the landfill; and the groundwater elevation is lower still (5,194 feet AMSL) at MW-16 further south along the western property boundary. The groundwater elevation in MW-1, MW-15, MW-3, MW-14, and MW-4, closest to the Leggett reservoir is between 5.207 and 5.226 feet AMSL and is consistent with the reservoir water surface as groundwater elevations were observed to decrease as the reservoir surface was lowered in 2018. The groundwater elevation at MW-6 is approximately 5,214 feet AMSL. The groundwater elevation at MW-13 in the northeast part of the landfill is approximately 5,220 feet AMSL. Therefore, the shallow groundwater flow beneath the landfill follows topography and is

radial from the topographic high. Groundwater flowing north from the topographic high is influenced by the Valmont Dike which is generally considered a low-flow or no-flow boundary. This boundary causes groundwater to divert either east or west relative to the topographic high. A discontinuity in the Valmont Dike near monitoring well MW-38B/C allows for groundwater flow to proceed to the north from the Valmont Butte area to the Boulder Creek valley. The shallow groundwater flow beneath the landfill follows the topography. Groundwater flow is generally to the south-southeast in the southeastern portion of the landfill, to the northeast in the northeastern portion of the landfill, and to the southwest at the western portion of the landfill (Appendix A), as compared with the regional, deeper water table that flows to the northwest (APEX, 2008; Xcel, 2009).

An average gradient of 0.017 feet/foot was calculated for the eastern portion of the landfill using data from monitoring wells MW-1, MW-2, MW-3, and MW-4. An average gradient of 0.068 feet/foot was calculated for the western portion of the landfill using data from monitoring wells MW-6, MW-7, and MW-8. Hydraulic conductivity values calculated from slug tests conducted at site monitoring wells are summarized in the *Conceptual Site Model and ACM* dated June 2019. The average shale hydraulic conductivity at the site is approximately 0.001 feet per day (ft/day).

3.2 Point of Compliance Monitoring

As part of this ACMR, the monitoring well network, as defined in the 2020 Monitoring Plan, and nature and extent wells were evaluated for migration of the COIs. As a result, changes to the semi-annual monitoring network are proposed to continue to monitor COIs. The monitoring wells proposed for ongoing semi-annual sampling have been designated as one of the following: Point of Compliance (POC), Upgradient/ Background, Nature and Extent (NES) wells, or water level only wells, as shown in **Table 1**. A list of monitoring wells at the facility and construction details are provided in **Appendix E** (Table E-1).

The upgradient/background monitoring wells have been revised in the associated updated GWMP (HDR, 2024) and Background Statistical Analysis (**Appendix C**). MW-5 was removed from the background data set and redesignated as a downgradient POC well and MW-25C was redesignated as a downgradient NES well. Updated BTVs have been calculated using pooled data from upgradient/background monitoring wells MW-7 and MW-24 (refer to **Appendix C** for additional information). Semi-annual sampling of these upgradient/background wells will continue.

POC wells are required by CDPHE to be installed on the facility property at the closest practicable distance hydraulically downgradient of the unit and no more than 150 meters from the waste management unit boundary, unless otherwise approved by CDPHE. The POC wells will be sampled on a semi-annual basis and will be statistically analyzed for exceedances of BTVs and GWPS. MW-2 is proposed for removal from the monitoring well network due to its location within the center of the landfill, as the well does not fit the definition of a point of compliance well per 6 CCR 1007-2.

The NES wells that are located within or near the COI plume will be monitored on a semi-annual basis for the COIs. Concentrations in these wells will be compared to the established



groundwater protection standards for the COIs (refer to **Section 4.0**) and will be evaluated for statistically significant trends.

Well I.D.	Northing	Easting	Well Total Depth (ft bgs)	2020 Monitoring Well Designation	Proposed MW Designation
MW-1	4430670.386	482404.7332	38.7	Downgradient - POC	Downgradient - POC
MW-2	4430887.374	482654.026	105	Downgradient- POC	Removal from Network
MW-3	4430758.349	482852.3567	49.4	Downgradient- POC	Downgradient - POC
MW-4	4430840.14	483138.3867	22.6	Downgradient- POC	Downgradient - POC
MW-5	4430972.90	482523.758	65.0	Upgradient/Background	Downgradient - POC
MW-6	4430677.549	482180.545	30.1	Downgradient - POC	Downgradient - POC
MW-7	4430897.269	482177.6864	65.6	Upgradient/Background	Upgradient/Background
MW-8	4430710.278	482014.6153	30.1	Crossgradient	Downgradient - POC
MW-13	4431016	482993.2	70	Water Level Only	Downgradient - POC
MW-14	4430785	483038.7	44	Water Level Only	Downgradient - POC
MW-15	4430725	482658.3	39	Water Level Only	Downgradient - POC
MW-16	4430544	482003.6	30	Water Level Only	Downgradient - NES
MW-21	4430976.3506	483190.2534	21.1	Water Level Only	Downgradient - POC
MW-24	4430901.392	482408.1	73.5	Upgradient/Background	Upgradient/Background
MW-25C*	4430981.1	481999.9	45	Upgradient	Downgradient - NES
MW-26	4430678.008	482003.2041	43	Water Level Only	Downgradient - NES
MW-27	4431006.968	482726.8792	74	Water Level Only	Downgradient - POC
MW-28	4431000.352	483090.3436	83	Water Level Only	Downgradient - POC
MW-29	4431022.218	483132.451	55	Water Level Only	Downgradient - NES
MW-30	4431114.576	483088.997	70	Water Level Only	Downgradient - NES
MW-31	4431252.799	483155.659	40	Water Level Only	Downgradient - NES
MW-32	4431334.971	483059.579	32	Water Level Only	Downgradient - NES
MW-33A	4431387.716	483104.757	22	Water Level Only	Downgradient - NES
MW-33B	4431385.991	483105.286	55	Water Level Only	Downgradient - NES
MW-34	4431406.861	483193.859	60	Water Level Only	Downgradient - NES
MW-35	4431077.896	483212.629	24	Water Level Only	Downgradient - NES
MW-36	4431431.239	483891.577	35	Water Level Only	Downgradient - NES
MW-37	4431499.943	483521.112	50	Water Level Only	Downgradient - NES
MW-38A	4431457.564	483097.164	200	Water Level Only	Downgradient - NES
MW-38B	4431459.191	483097.100	65	Water Level Only	Downgradient - NES
MW-38C	4431460.540	483097.043	29	Water Level Only	Downgradient - NES
MW-39A	4431687.751	483176.554	25	Water Level Only	Downgradient - NES

Table 1. Valmont Landfill – List of Monitoring Wells



Well I.D.	Northing	Easting	Well Total Depth (ft bgs)	2020 Monitoring Well Designation	Proposed MW Designation
MW-39B	4431687.884	483177.491	10	Water Level Only	Downgradient - NES
MW-40	4430817.514	482010.092	35	Water Level Only	Downgradient - NES
MW-41	4430626.715	481812.001	30	Water Level Only	Downgradient - NES
MW-42	4430583.733	481858.179	30	Water Level Only	Downgradient - NES
MW-43	4430657.753	481889.552	35	Water Level Only	Downgradient - NES
MW-44	4431532.97	484024.91	85	Water Level Only	Downgradient - NES
MW-45	4431354.13	483733.16	49	Water Level Only	Downgradient - NES

Table 1. Valmont Landfill – List of Monitoring Wells

Notes: *MW-25C was a replacement well for MW-25B.



Figure 3. Valmont Station – Ash Landfill, Monitoring Well Network, and Delineation Well Network

4.0 Groundwater Protection Standards

4.1 Evaluation of Constituents of Interest

Appendix C contains details on the process used for updating the background statistical analysis, with the Constituent of Interest (COI) results provided in this section. Using the historical data provided in Appendix D of the 2022 Semi-Annual Fall 2022 Groundwater Monitoring Report, Revision 1 (HDR, 2023) and comparing the data to the updated BTVs, the following constituents, shown in **Table 2**, were identified as SSI. **Table 2** also identified the monitoring wells with exceedances above the CDPHE Regulation 41 standards and a range of the values from the historical data. This list of wells for exceedances are limited to the original 2020 GWMP well network for assessment monitoring. Section 5.0 discusses the nature and extent of groundwater impacts.

Based on the historical data and the updated BTVs, the identified SSIs within the onsite certified well network for the Valmont Landfill include total alkalinity, chloride, nitrate, sulfate, arsenic, barium, boron, chromium, cobalt, iron, fluoride, lead, lithium, molybdenum, selenium, TDS, and total suspended solids (TSS). In accordance with CDPHE communication, cations, anions, and field parameters do not require statistical analysis; therefore, chloride, nitrate, and sulfate are not SSIs for remedial action and will not be treated as SSIs moving forward.

Monitoring well/constituent pairs with SSIs are further evaluated by comparing to the CDPHE Regulation 41 Water Quality Standards to determine COIs to be carried forward to corrective measures. Alkalinity, TSS, and total hardness do not have established standards. Historical data for arsenic, barium, chromium, cobalt, iron, lead, lithium, molybdenum are below the CDPHE Regulation 41 standards, and therefore are not considered COIs for remedial action.

As discussed in **Section 4.2**, the 5.0 mg/L standard for boron is determined to be the appropriate GWPS; therefore, boron is not considered to be a COI for remedial action. Also discussed in **Section 4.2**, the reported exceedances for fluoride were limited to two sample events in a single well; thus, fluoride is not considered to be a COI for remedial action. Finally, CDPHE has confirmed that the decision to remediate would not be made based on TDS, so it has been removed as a COI. These constituents will continue to be monitored as part of the semiannual monitoring program and monitored for trends.

The remaining constituent selenium will be considered a COI and carried forward for further evaluation.

uation of Constituents of Interest (COIs)										
;	Reg. 41 Human Health	Reg. 41 Domestic Drinking Water	Reg. 41 Ag. Standard	Network Wells ⁽¹⁾ exceeding Reg. 41	Conc. Range (mg/L)	COI (Yes/No)				
				N/A	N/A	No				
	0.01		0.1	None	N/A	No				
	2			None	N/A	No				
			0.75 ⁽²⁾ / 5 ⁽³⁾	MW-1 MW-2 MW-3 MW-4 MW-5 MW-8 MW-25	0.42 - 1.1 2.5 - 3.1 1.1 - 1.5 1.0 - 1.8 0.79 - 2.0 0.60 - 3.1 0.85 - 1.3	No ^(2,3)				
		250		N/A*	N/A*	No				
	0.1		0.1	None	N/A	No				
			0.05	None	N/A	No				
	4		2	MW-4	3.5 – 4.1	No ⁽⁴⁾				
		0.3	5	None	N/A	No				
	0.05		0.1	None	N/A	No				
			2.5	None	N/A	No				
	0.21			None	N/A	No				

N/A*

MW-1

MW-2

MW-3

MW-4 **MW-5**

N/A*

MW-1

MW-2

MW-3

MW-4

MW-6

MW-8

N/A

N/A*

0.0005 - 0.064

0.0005 - 0.036

0.0005 - 0.033

0.034 - 0.2660.002 - 0.032

N/A*

721 - 1,153

2,157 - 3,100

2,700 - 4,150

7,600 - 16,000

1,400 - 2,800

2,700 - 6,220

N/A

No

Yes

No

No⁽⁷⁾

No

Table 2. Eval

TSS Notes:

Constituents with SSIs

Alkalinity, Total Arsenic Barium Boron

Chloride* Chromium Cobalt Fluoride Iron Lead Lithium Molybdenum Nitrate*

Selenium

Sulfate*

TDS

-- Indicates a CDPHE Regulation 41 standard has not been established

10

0.05⁽⁵⁾

N/A

* Indicates statistical evaluation of constituent is not required by CDPHE; therefore, SSIs will not be evaluated for COIs.

925⁽⁶⁾

N/A

⁽¹⁾ Network wells from the 2020 Monitoring Plan were evaluated for exceedances above the most stringent CDPHE Regulation 41 Standards to trigger remedial action. This list does not include additional POC wells added to the network in this ACMR, or nature and extent wells evaluated as part of the nature and extent evaluation.

0.02

N/A

⁽²⁾ The boron Agricultural Standard of 0.75 mg/L is set to protect the following plants in ascending order of sensitivity: Pecan, Black Walnut, Persian (English) Walnut, Jerusalem Artichoke, Navy Bean, American Elm, Plum, Pear, Apple, Grape (Sultanina and Malaga), Kadota Fig, Persimmon, Cherry, Peach, Apricot, Thornless Blackberry, Orange, Avocado, Grapefruit, Lemon. Refer to Section 4.2 for justification of the 5.0 mg/L standard.

⁽³⁾ The boron Agricultural Standard of 5 mg/L is used when a party can demonstrate that a crop watering agricultural use of groundwater is not reasonably expected (different than a gardening or residential use). Refer to Section 4.2 for justification for this standard.

⁽⁴⁾ Refer to Section 4.2 for justification for not moving forward with fluoride as a COI.

⁽⁵⁾ Drinking water maximum contaminant level (MCL).

⁽⁶⁾ TDS standards are secondary drinking water standards. The domestic drinking water standard is 1.25 times the background concentration when background is between 500 mg/l to 10,000 mg/l.

⁽⁶⁾ TDS does exceed the secondary drinking water standard, but it is not carried forward as a COI as remedial decisions are not made based on this constituent per discussions with CDPHE.

4.2 Determination of Site-Specific GWPS

Appendix B7(G) of 6 CCR 1007-2 requires the development of GWPS to establish a clean-up standard for implementation of corrective measures. **Table 6** compares the BTVs and CDPHE Regulation 41 Standards for the COIs discussed above and establishes a site-specific GWPS for each constituent, as discussed further below.

Constituent	Unit	Updated BTV	Reg. 41 Human Health	Reg. 41 Domestic Drinking Water	Reg. 41 Agricultural Standard	Recommended GWPS
Fluoride	mg/l	0.83	4		2	4
Boron	mg/l	0.48			0.75 ⁽²⁾ / 5 ⁽³⁾	5
Selenium	mg/l	0.008	0.05 ⁽⁴⁾		0.02	0.05

Table 3. Constituents with SSIs compared to CDPHE Regulation 41 Standards

Notes: "--" indicates the standard is not established.

⁽¹⁾ Chloride, sulfate, and nitrates do not require statistical analysis, but have previously been identified as SSIs at the site. They have been included in this table for further discussion on potential onsite and/or offsite impacts.

⁽²⁾ The boron Agricultural Standard of 0.75 mg/L is set to protect the following plants in ascending order of sensitivity: Pecan, Black Walnut, Persian (English) Walnut, Jerusalem Artichoke, Navy Bean, American Elm, Plum, Pear, Apple, Grape (Sultanina and Malaga), Kadota Fig, Persimmon, Cherry, Peach, Apricot, Thornless Blackberry, Orange, Avocado, Grapefruit, Lemon.
⁽³⁾ The boron Agricultural Standard of 5 mg/L is used when a party can demonstrate that a crop watering agricultural use of groundwater is not reasonably expected (different than a gardening or residential use).

⁽⁴⁾ Drinking water maximum contaminant level (MCL).

AGRICULTURAL STANDARDS

Regarding the agricultural standards, Regulation 41 includes the following definitions:

- "Agricultural Uses" are the existing or potential future uses of groundwater for the cultivation of soil, the production of crops, and/or the raising of livestock.
- "Domestic Uses" are those existing or potential future uses of groundwater for household or family use, including, but not limited to drinking, gardening, municipal, and/or farmstead uses.

Some constituents have both an agricultural and domestic standard and boron has two agricultural standards. The definitions in Reg. 41 indicate that gardening or farmsteading are considered domestic uses, and agricultural uses implies larger scale production of crops or livestock. The residential properties north of Valmont Rd. are zoned as general industrial and there are no known activities that would fall under the definition of agricultural uses. Additionally, based on the zoning and current rural/domestic land use, future activities that may meet the agricultural use definition do not seem reasonably probable. Therefore, where there are both an agricultural and domestic standard, the domestic standard is the appropriate GWPS. Similarly, as discussed below, the boron standard of 5 mg/l is the appropriate GWPS.

FLUORIDE

Fluoride has two CDPHE Regulation 41 standards. One standard is a domestic water supply human health standard of 4.0 mg/L. The other is an agricultural standard of 2.0 mg/L. Fluoride exceedances were only observed at the on-site well MW-4 which is located in the southeast section of the landfill near the reservoir (refer to **Section 5.3**). The landfill area is currently not and will not be used for agricultural production. In addition, the properties immediately adjacent to the landfill are zoned as general industrial and based on the zoning and current rural/domestic land use are not reasonably expected to be used for agricultural purposes in the future. There are residential properties to the north of Valmont Road that have domestic water supply wells. However, as discussed above, they do not meet the definition of agricultural uses, and the only fluoride exceedance is isolated around on-site well MW-4. The groundwater samples collected from other onsite and offsite wells to the north were below the Regulation 41 standards, thus indicating fluoride is not migrating north toward the residential properties north of Valmont Rd. Given there are domestic water supply wells at these properties, the fluoride human health standard of 4.0 mg/L would be the applicable standard to use as the GWPS for both onsite and offsite.

Given the applicable GWPS of 4.0 mg/L, there have been only two reported exceedances of fluoride in MW-4, as shown in Table 4 below. Offsite monitoring locations did not have elevated fluoride concentrations. The last monitoring event that an exceedance occurred in MW-4 was in May 2021, and fluoride appears to be decreasing as of 2023 results. No statistics have been performed for this constituent as part of the State program, but it can be inferred that the lower control limit (LCL) would be below the GWPS for MW-4. Fluoride is not a COI for the federal program, which does rely on statistics for determination. Therefore, it is recommended that fluoride continue to be monitored for trends as part of the semiannual monitoring program but should not be carried forward for further evaluation as a COI.

Sample Event	Fluoride (mg/L)
May-2019	3.75
Oct-2019	4.05
May-2020	3.98
Oct-2020	3.64
May-2021	4.14
Oct-2021	3.60
Jun-2022	3.50
Oct-2022	4.00
May-2023	2.00
Nov-2023	2.90

Table 4. Groundwater Monitoring Results to date for Fluoride at MW-4

FJ

BORON

Boron has two Regulation 41 Agricultural standards. Table 3, Agricultural Standards in Reg. 41 (5 CCR 1002-41) provides a boron standard of 0.75 mg/L for a list of sensitive tree species. The associated footnote (g) states "where a party can demonstrate that a crop watering use of groundwater is not reasonably expected, the applicable standard for boron is 5.0 mg/l." Based on review of the two agricultural standards for boron, it appears that the 0.75 mg/l standard is intended to apply only to agricultural uses in the traditional sense (e.g. farming) not domestic uses (e.g., gardening). The definitions provided in Reg. 41 indicate that gardening is considered a domestic use (for which there is no boron standard), and agricultural uses refers to the production of crops. Some of the reasons why the standards differ may have to do with how much water (and fertilizer and pesticides etc.) are used for agricultural uses compared to home gardening. Additionally, crops are typically produced at a large scale and often times for consumption by others.

For the landfill site, the immediately adjacent properties and the residential properties north of Valmont Road, production agriculture is not currently a use and is not a reasonably expected potential future land use. According to the Reg. 41 criteria used to identify classifications for groundwater, in order for the lower agricultural standard of 0.75 mg/l to apply, it would need to be probable or expected, not just a possibility, that these properties could change from domestic to agricultural uses. It is reasonably probable that the residential properties could use groundwater for drinking, gardening, and/or farmstead uses. Therefore, the boron agricultural standard of 5 mg/l is the appropriate GWPS for the site. Using this standard, each groundwater sample collected from onsite and offsite monitoring wells were below the GWPS for boron; therefore, boron is not considered a COI moving forward. Furthermore, because groundwater at these properties meets the 5 mg/l agricultural standard, the properties would be considered to have unrestricted use, based upon the boron levels.

SELENIUM

Selenium has two Regulation 41 standards. One standard is a domestic water supply human health standard of 0.05 mg/L. The other is an agricultural standard of 0.02 mg/L. Similar to the discussion noted for fluoride, production agriculture is not considered to be a potential land use for the landfill and properties immediately adjacent to the landfill. Thus, the agricultural standard is not considered applicable. With the presence of domestic water supply wells on private properties to the north of the landfill, the selenium domestic water supply human health standard of 0.05 mg/L would be the applicable standard to use as the GWPS for onsite and offsite. Selenium concentrations exceeding the GWPS of 0.05 mg/L were measured in monitoring wells on the east side of the landfill extending offsite to the north. Additional details are discussed in **Section 5.3** for selenium.

5.0 Nature and Extent of Groundwater Impacts

The intent of the nature and extent evaluation is to identify the distribution of COIs in groundwater and surface water, characterize the nature and extent of distribution and the risk posed by the COIs, and determine the potential for offsite migration. Characterization of the

extent of contaminant migration is based upon the results of recent groundwater and surface sample analysis in conjunction with historical groundwater data.

5.1 Constituents of Interest Source Areas

Operation of the landfill began in 1990 in the eastern portion in the area known as B-1. For the first 5 years, commingled fly ash and bottom ash were saturated when placed in the landfill at lower elevations in Areas B-1 and C-1, and the eastern part of Area A-2 (**Figure 2**). These zones exhibit high moisture contents and are very loose. Placement of commingled ash ceased in 1995. Since that time most of the material placed at the landfill had been fly ash, and once or twice each year the bottom ash impoundments were dewatered, the bottom ash was dredged and transported to the landfill where it was placed with the fly ash.

The landfill is a waste monofill. The ash has been observed to take on cementitious characteristics during compaction resulting in a very low permeability layer. **Table 4** provides the potential pathways for groundwater impacts and likelihood for each pathway at the Valmont Landfill given operating conditions.

Potential Pathways for Impacts to Groundwater/ Recharge Sources	Potential for each Pathway at Valmont Landfill
Precipitation infiltration through the dry ash leaching metals and discharging to groundwater	Occurs on site, though precipitation would not be expected to build-up saturated conditions to drive enough transport through the compacted ash. In addition, soil covers have been in place for unused sections of the landfill. This impact would be expected to be minor. This is a potential pathway for the site.
Stormwater ponding on the surface of the ash landfill infiltrating the ash, leaching metals, and discharging to groundwater	Review of site records indicates that stormwater ponding may periodically have occurred in Cell D1 and Q1. Ponding could provide sufficient head and saturated conditions to drive pore water through the ash, leaching metals along the path and potentially impacting groundwater. This is a potential pathway for the site.
Ash in direct contact with groundwater	Borings and cross-sections from the site geologic model were completed that illustrate ash is not in contact with groundwater (Appendix D). Additionally, planned ash removal activities are anticipated to lower the groundwater surface under the entire landfill footprint.
Precipitation runoff and infiltration through fertilizer amended vegetated cover	Applicable to nitrate detections. Nitrates are not a known constituent of ash material in the landfill. Detections of nitrates are indication of fertilizer applications used in the vicinity of the landfill to promote vegetation on the soil cap and surrounding areas.

Table 5. Potential Pathways for Impacts to Groundwater at Valmont Landfill

5.2 Nature and Extent Wells

In response to the exceedances of assessment monitoring constituents under the Federal CCR Rule, additional monitoring wells were installed on and offsite to delineate the exceedances. The monitoring wells were installed in phases between 2019 and 2023. A table of well construction details (**Table E-1**) and the boring logs are provided in **Appendix E**. Groundwater sampling of these additional wells have been used to evaluate the nature and extent of the **State program COIs.** See **Section 3.2** for a list of monitoring wells onsite and a description of their use (i.e., point of compliance, nature and extent, water level only, etc.).

Seven wells (MW-20, MW-21, MW-24, MW-25, MW-26, MW-27, and MW-28) were installed in 2019 along the northwest perimeter of Valmont property to further characterize the COI plume migration at the project boundary and evaluate the difference in head pressure between the weathered bedrock and bedrock units below the landfill (**Figure 3**).

Fourteen wells (MW-29, MW-30, MW-31, MW-32, MW-33A, MW-33B, MW-34, MW-35, MW-36, MW-37, MW-38A, MW-38B, MW-38C, MW-39A and MW-39B) were installed in the northeastern section of the Valmont Station property in 2021 and 2022, some of which are off property and required landowner agreements (**Figure 3**). Prior to these wells, the groundwater model was only representative of the western side of the station property. Therefore, the wells were installed to collect geologic and hydrogeologic data on the north and northeastern region of the site, expand the groundwater flow model to the north, and delineate plume migration and constituents of interest.

Later in 2022, four wells (MW-40, MW-41, MW-42, and MW-43) were installed southwest of the Valmont Station property (**Figure 3**). These wells were installed further downgradient as perimeter wells and/or for plume characterization, some of which are off property and required landowner agreements.

In February 2023, three additional wells (MW-44, MW-45, and MW-25C) were installed. Two of the wells (MW-44 & MW-45) were installed in the northeastern section of the Valmont Station property (in the vicinity of MW-36). These wells were installed to collect additional hydrogeologic data and delineate plume migration and constituents of interest towards the northeast.

5.3 Contaminant Concentration Maps

Contaminant concentration maps, provided in **Appendix B**, have been developed using the most recent groundwater data (obtained from December 2021 to January 2023) to delineate the COIs requiring remedial action. Based on the current understanding of the site hydrogeology, water quality sampling and model simulations, groundwater impact has been identified in the eastern side of the landfill with exceedances of selenium. The following sections describe the exceedances and flow paths as observed on the concentration maps. The data used to create the concentration maps compared to the established GWPS is provided in **Appendix B** (**Table B-1**). Groundwater contours shown on the concentration maps are simulated groundwater contours from the groundwater flow model. It can be observed on the south side of Valmont Road, groundwater flow is bounded to the north by the Valmont Dike.

5.3.1 Eastern/Northeastern Area Plume:

Selenium shows exceedances in the southeast area of the landfill. The highest concentrations are observed at MW-4, located in the southern portion of the Cell B1. Groundwater flow in the eastern area of the landfill is either directed towards the reservoir, for those monitoring wells located along the edge of the reservoir, or north through a drainage area that flows north to a break in the Valmont Dike. Additional monitoring wells located onsite and offsite near the landfill were being monitored under the CCR Rule and have been used to assist in delineating the groundwater impacts on the eastern/northeastern area of the landfill. Additional information on the delineation of selenium in this area is provided below.

SELENIUM:

- Onsite monitoring wells located along the landfill boundary MW-4, MW-13, MW-14, MW-15, MW-21, MW-28, and MW-29 have elevated selenium above the CDPHE Regulation 41 Human Health standard (0.050 mg/L).
- Nature and extent monitoring wells were evaluated along the groundwater flow path toward the north. Monitoring wells MW-35 (located on Valmont property) and offsite wells MW-31, MW-32, MW-33B, MW-38C, and MW-37 have elevated selenium concentrations above the Regulation 41 standard. The exceedances are located along the topographical depression northeast of the landfill and follows groundwater flow towards Valmont Road. The monitoring wells located north of Valmont Road (MW-39A and MW-39B) did not have exceedances of Selenium.

6.0 Receptor Evaluation

These following sections discuss the relative risk or likelihood for offsite or surface water impact by groundwater containing COIs.

6.1 Reservoir

Due to the close proximity of the ash landfill to the facility reservoirs, there is the potential that COIs could be discharged to this surface water. The surface water elevation of the reservoirs (Hillcrest, Leggett, and Valmont) to the south and east of the landfill are monitored. During landfill operations, reservoir elevations have been typically maintained at an elevation of approximately 5,222 to 5,225 feet AMSL with some fluctuation. The water level in the Leggett reservoir was lowered in 2018 to assist in the clean out of the bottom ash impoundments. Seasonal fluctuations in surface water levels influence whether groundwater is discharging to the reservoirs or surface water is recharging groundwater at the site. Monitoring wells immediately adjacent to the reservoirs are more responsive to changes in surface water levels. This is depicted on **Figure 4** where monitoring wells immediately adjacent to Leggett Reservoir (MW-1, MW-3, MW-14, and MW-15) are more responsive to changes in surface water levels while monitoring wells further away from the reservoir (MW-2, MW-6, MW-16, and MW-27) have more subdued or delayed responses relative to surface water elevations. In the summer months, the reservoir level is higher in elevation than groundwater elevations in monitoring wells immediately adjacent to the reservoir (MW-1, MW-3, MW-14, and MW-15). This would indicate a period of time where surface water is recharging the groundwater. During the rest of the year,

groundwater elevations in these monitoring wells are generally higher than the surface water elevation of the reservoir. During this period of time, groundwater would be discharging to the surface water in the reservoir. Thus, a mixing zone is present in the groundwater and surface water along the boundary with Leggett and Valmont Reservoirs where potentially impacted groundwater is mixing with surface water.



Figure 4. Valmont Station – Reservoir Surface Water and Groundwater Elevations

On August 31, 2022, Leggett and Valmont Reservoirs' surface water were sampled to evaluate if monitored constituents associated with the landfill were detected in surface water samples. A background sample (Inlet [MW-20]) was collected from the surface water inlet to Leggett Reservoir. Two water samples (Reservoir [MW-4] and Reservoir [MW-15]) were collected from the reservoirs in close proximity to monitoring wells MW-4 and MW-15. Select constituents are summarized on **Table 5** comparing surface water samples from the August 2022 sampling event to groundwater concentrations measured for samples from monitoring wells MW-4 and MW-15 during the October 2022 compliance monitoring event. For most of the monitored constituents, concentrations measured from the surface water inlet (Inlet [MW-20]) were generally lower than the reservoir samples while the concentrations measured in the groundwater samples (MW-4 and MW-5) were generally higher with the exceptions of barium and pH. Barium and pH values were higher in the reservoir samples than the inlet and groundwater samples which possibly indicate another source contributing to these elevated values. Concentrations measured in the reservoir samples are generally higher than concentrations measured in the surface water inlet sample but lower than concentrations

measured in the groundwater samples. The inlet and reservoir samples had concentrations that were below Regulation 41 human health, domestic drinking water, and agricultural standards.

Constituent	Inlet (MW-20)	Reservoir (MW-4)	Reservoir (MW-15)	MW-4	MW-15
Barium (mg/L)	0.023	0.10	0.093	0.01	0.022
Boron (mg/L)	0.014J	0.26	0.19	0.98	0.62
Calcium (mg/L)	9.2	28	27	470	280
Lithium (mg/L)	<0.02	0.026	0.023	0.23	0.061
Magnesium (mg/L)	2.8	19	15	770	160
Molybdenum (mg/L)	0.00085J	0.0050	0.0037	0.012	0.002
Potassium (mg/L)	0.80	3.7	3.0	9.7J	7.7
Selenium (mg/L)	<0.005	0.00069J	0.00059J	<u>0.21</u>	<u>0.075</u>
Sodium (mg/L)	4.4	59	46	1,300	410
pH (S.U.)	6.8	8.4	8.1	7.6	7.3
Chloride (mg/L)	6.2	78	60	<u>500</u>	85
Fluoride (mg/L)	<0.5	0.62	0.49J	3.4	0.70J
Sulfate (mg/L)	7.6	55	42	<u>5,800</u>	<u>1,300</u>
Alkalinity (mg/L)	35	110	97	180	430
TDS (mg/L)	55	290	210	<u>8,900</u>	<u>2,300</u>
TSS (mg/L)	2.0J	4.4	2.4J	23	10

Notes:

J = Lab qualifier indicating result is less than the reporting limit but greater than or equal to the method detection limit, and the concentration is an approximate value.

< = Less than. Concentration is below laboratory reporting limits.

Bold and Underlined values indicate a concentration that exceeds Regulation 41 human health, domestic drinking water, or agricultural standards.

Groundwater at the southern and eastern boundaries of the landfill discharge to Leggett and Valmont Reservoirs; however, mass fluxes of COI into the reservoirs are very low based on the low hydraulic conductivities at the site as noted in **Section 3.1** and concentrations that are relatively low exceedances. Given the minor mass flux, COI concentrations are expected to be rapidly diluted by the large volumes of the reservoir. Thus, the risk to human health or environmental impact in the reservoirs would be limited. As noted in **Section 2.0**, the reservoirs are privately developed, owned, and operated by PSCo and have not been considered WOTUS or state waters. In addition, the outfall from the reservoirs, which is discussed in **Section 6.2**, is a monitored point under a National Pollutant Discharge Elimination System (NPDES) permit.

6.2 Boulder Creek

As discussed in **Section 3.1**, a diversion canal diverts water from South Boulder Creek to the reservoir system, and a separate canal provides return flow from the reservoir system to South Boulder Creek. South Boulder Creek is a tributary of Boulder Creek. As noted in **Section 6.1**, there is potential discharge of impacted groundwater to the reservoir system, however, COI concentrations are rapidly diluted due to the large volume of water in the reservoir system.

Based on surface water sampling in the reservoir conducted in August 2022, COI concentrations were below Regulation 41 groundwater standards as well as Regulation 31 surface water standards. Thus, surface water discharging into the canal diverting surface water back to South Boulder Creek does not appear to be a risk to human health or environmental impact.

There is the possibility of groundwater discharge into the return diversion canal and South Boulder Creek with groundwater that may have passed the western and southwestern boundaries of the landfill. Groundwater monitoring at delineation wells between the site and the canal and South Boulder Creek indicate COI concentrations below Regulation 41 groundwater standards. In addition, surface water from the reservoir system is recharging groundwater to the west of the Leggett Reservoir. This would provide a source of water potentially not impacted by site monitored constituents that is mixing with groundwater moving past the landfill boundary. This has the possibility of diluting COI concentrations, if any. Thus, the risk to human health or environmental impact due to groundwater discharge to these surface water bodies are limited.

Since risk is limited for impact to the diversion canal and South Boulder Creek, risk contributed by the landfill would also be low for Boulder Creek, which is located north of the landfill site. Additional surface water and groundwater inputs enter the South Boulder Creek watershed between the site and the Boulder Creek confluence. These additional inputs could further dilute COIs potentially contributed by the site.

6.3 Private Ponds

Located to the north of the ash landfill are multiple private ponds and lakes that are proximal to Boulder Creek. As mentioned in Section 3.1, these ponds and lakes are man-made from various excavation activities with no visible surface water inlets or outlets. It appears the surface water in these lakes is primarily fed by groundwater. Groundwater flows to the north from the topographic high of the site into the Boulder Creek valley. Once in the valley, groundwater generally flows to the east parallel to surface water flow in Boulder Creek. COI impacted groundwater is observed to be approaching some of these ponds northeast of the ash landfill as indicated by concentration maps included in Appendix B. Constituents exceeding GWPS in close proximity to these ponds and lakes include selenium. Monitoring wells MW-39A and MW-39B which are adjacent to ponds had concentrations of selenium below the GWPS. The ponds and lakes appear to be used for recreational use and not for consumption. Water for consumptive use appears to be provided by water supply wells in the area which is further discussed in Section 6.4. The risk to human health or environmental impact due to groundwater discharge into these private ponds and lakes appears to be low since the lakes are not used for consumption and monitored COI concentrations are below applicable health limits in groundwater immediately adjacent to the ponds.

6.4 Private Wells

In addition to the landfill monitoring well network sampling, 11 private wells offsite to the north of Valmont Road in the direction of groundwater flow were sampled between December 2021 and

October 2022 after PSCo received approvals from landowners. The area within which private wells were sampled is depicted on **Figure 5**. As soon as an exceedance of GWPS under the Federal CCR program was identified in MW-33, located near Valmont Road, PSCo initiated contact with private well owners to sample their wells and/or taps to evaluate any potential risk to these private well owners downgradient of the landfill.

The results of private well sampling did not result in exceedances of the GWPS for the COI (selenium). There are no water supply wells located between the western landfill boundary and South Boulder Creek.



Figure 5. Valmont Station – Area of Private Well Sampling

7.0 Remedial Alternatives Evaluation

Consideration of corrective measure alternatives to address CCR related groundwater impacts from the landfill is discussed in this section. Included in the sections below are descriptions of remedy evaluation criteria, shared components of all remedial alternatives, potential remedial alternatives, screening of the remedial alternatives, and a summary of additional data needs to support future remedy selection.

7.1 Evaluation Criteria

Evaluation criteria considered in the assessment of corrective measures are discussed below. Appendix B of 6 CCR 1007-2 uses 40 CFR Part 258 (Solid Waste Disposal Facility Criteria) as a reference document. Part 258 reference numbers, contained herein, are intentionally used for cross reference to the federal document.

PERFORMANCE

Factors considered for evaluating performance of a remedial alternative include the degree to which the alternative removes monitored constituents exceeding the respective GWPS from the environment; and the ability of the alternative to achieve GWPS for these constituents at point(s) of compliance.

RELIABILITY

Factors considered for evaluating the reliability of a remedial alternative include the effectiveness of engineering and institutional controls to maintain the alternative; potential need for replacement or maintenance of components of the alternative; and any other operational reliability issues that may arise for the alternative that will limit its use or effectiveness in meeting corrective action objectives.

EASE OF IMPLEMENTATION

Factors considered for evaluating ease of implementation of a remedial alternative include the degree of difficulty associated with installing or constructing the alternative given site conditions, including the need to obtain necessary access, approvals and/or permits; the availability of necessary equipment and/or specialists to implement; and the available capacity and location of treatment, storage, or disposal services needed.

POTENTIAL IMPACTS OF THE ALTERNATIVE

Factors considered for evaluating potential impacts of a remedial alternative include risks that may impact the community or environment during implementation of the alternative (e.g., due to excavation, transportation, disposal, or containment of CCR material), potential human health or environmental receptor exposure to CCR material following implementation, and cross-media impacts due to the remedial alternative implementation.

TIME REQUIRED TO BEGIN AND COMPLETE THE ALTERNATIVE

Factors considered for evaluating the time to begin and complete the remedial alternative include the time needed to completely design and implement (i.e., begin) the alternative; and the time it will take to achieve applicable GWPS at point(s) of compliance.



COSTS OF REMEDIAL IMPLEMENTATION

Cost criteria considers capital investment needed to design and construct the remedial alternative and long-term operations, maintenance, and monitoring until the remedial alternative achieves applicable GWPS at point(s) of compliance.

INSTITUTIONAL REQUIREMENTS

Institutional requirements can vary from site to site and technology to technology. State, local, or site-specific requirements (e.g., permits), or other environmental or public health requirements, that could substantially affect construction or implementation of the remedy are considered.

7.2 Shared Components of Remedial Alternatives

PSCo is planning for removal of all CCR from the landfill cells Q, A, B, and C for beneficial reuse; therefore, each alternative described below includes source removal of CCR from these cells. Cell D will remain in place and will receive rejected materials not suited for beneficial reuse from cells Q, A, B, and C throughout the removal activities. Cell D will be final closed with an engineered cover in compliance with Sections 3.5.2 and 3.5.3 of 6 CCR 1007-2. Central to the implementation of groundwater response actions at the site is the use of adaptive management. An adaptive management process will be implemented to support evaluation of the effect of source control on the groundwater plume and continually evaluate and improve groundwater response actions to maximize the effectiveness of the cleanup.

Adaptive site management is a systematic and iterative management approach that can be used to expedite the remediation of complex sites. The goal of the approach is to create a framework of structured and continuous planning, implementation, and assessment processes that accommodate new information and changing site conditions to develop effective and efficient cleanup approaches for achieving remedial objectives.

An adaptive management approach is being implemented at this site due to the high potential for change following source control and during groundwater remedy implementation. These changes are driven by uncertainties specific to the impact of CCR source removal on the hydrogeology and groundwater chemistry in the plume. As discussed in Section 6.3, COIs have been observed both on and offsite; however, the potential for impact to downgradient receptors is considered low. CCR source removal activities are anticipated to reduce loading and result in reduction of COI concentrations in groundwater; however additional data will be needed after source removal to better understand these effects and evaluate if additional remedy components are needed to address groundwater. Recognizing these uncertainties, an adaptive management strategy will be focused on a phased approach for data collection, source control, and groundwater remedy implementation that will allow for continual plume management. remedy performance evaluation, and improvements. In the initial phase, offsite groundwater plume characterization and source removal activities will be prioritized. As offsite plume characterization is completed, the groundwater remedy will be selected and implemented, focusing on managing plume migration and mitigating potential human and environmental exposures. As these activities are implemented, groundwater conditions will continue to be monitored and results interpreted. Based on the analysis of these activities, additional data

collection needs will be identified, and corrective measure adjustments will be made as necessary, leading to continuous remedy performance improvement.

As part of the remedy selection, the adaptive management strategy will be further defined, the strategy will identify remediation milestones that consider groundwater concentrations of COIs at strategically selected monitoring well locations at specified points in time. Monitoring and remedy performance data will be compared to milestones throughout the monitoring process and progress reports will describe a decision process for assessing corrective actions and the need for performance improvement.

7.3 Groundwater Remedial Alternatives Evaluation

This section presents remedial alternatives and presents an evaluation in accordance with 40 CFR 258.56 to address COIs at the site. **Table 9** provides a summary of each potential alternative compared to the evaluation criteria. In addition to the summary descriptions in **Table 9**, a numerical ranking of 1 to 3 was assigned to each criterion for each alternative based on HDR's understanding of each alternative and site-specific conditions (1 indicates least favorable and 3 is most favorable). Evaluation of each potential alternative and a summary of the results are presented below.

In addition to the evaluation criteria required for an ACMR (described in **Section 8.1**), the remedy alternatives determined to be viable for the site were also evaluated considering the following remedial selection standards from 40 CFR 258.57(b):

- Be protective of human health and the environment;
- Attain groundwater protection standard(s) pursuant to 40 CFR 258.55 (G) and (H);
- Control the source(s) of releases to reduce or eliminate, to the maximum extent practicable, further releases of constituents referenced in 40 CFR 258.55 into the environment that may pose a threat to human health or the environment; and
- Comply with standards for management of wastes as specified in 40 CFR 258.58(D).

A cross-check summary for how each alternative compares to these remedial selection standards is included in **Table 10**.

7.3.1 Monitored Natural Attenuation

Monitored natural attenuation (MNA) refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to GWPS within a time frame that is reasonable compared to that offered by other more active methods. Natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater (USEPA, 1999). Attenuation mechanisms for inorganic constituents can include physical (e.g., dilution, dispersion, flushing, and related processes) or biological/chemical (e.g., adsorption, sorption, (co-)precipitation) processes (EPRI 2015a; USEPA 2015).

Understanding the performance and reliability of MNA requires a detailed understanding of hydrogeologic conditions and a monitoring and assessment program. While model predictions can simulate long-term attenuation using soil-water partitioning coefficients to estimate adsorption, natural conditions will dictate how COIs migrate and how much is diluted or immobilized. Empirical data are good indicators of natural attenuation mechanisms, but long-term groundwater monitoring is required (EPRI, 2015; USEPA, 1999, 2007a, b).

To assess potential performance and reliability of MNA at a site, the USEPA has established a tiered lines of evidence approach where information is collected as necessary to identify attenuation mechanisms at the site, the capacity for attenuation, and the estimated time to achieve remediation objectives. The four tiers to establish whether MNA may be successfully implemented for inorganics at a given site are summarized below (USEPA, 2015):

- Tier 1: Demonstration that COIs in groundwater are delineated and stable.
- Tier 2: Determination of the mechanisms and rates of attenuation.
- Tier 3: Determination of the aquifer capacity to attenuate the mass of constituents and the stability of the immobilized constituents is sufficient to resist re-mobilization.
- Tier 4: Design of a performance monitoring program based on the mechanisms of attenuation and establishment of contingency remedies tailored to site-specific conditions should MNA not perform adequately.

MNA is well-accepted by state and federal regulators as an appropriate mitigation factor that should be considered when evaluating passive and active remedial options (USEPA, 1999, 2007a, b).

Site Considerations: Concentrations of COIs present in groundwater on and offsite are relatively low. It is anticipated that through source removal, COI concentrations will reduce further and in turn improve the effectiveness and reliability of MNA and the timeframe to achieve GWPS for each COI at the point(s) of compliance.

MNA is easy and efficient to implement. Attenuation processes are likely to be more physical than chemical at Valmont given chemical attenuation is not typically as prominent in fractured rock. As appropriate, the existing groundwater monitoring well network can be used to conduct monitoring so the timeframe to implement is the most expeditious of all alternatives. Although this remedy can be quickly implemented, based on site conditions (i.e., aquifer capacity and groundwater velocity), the timeframe to achieve GWPS at the points(s) of compliance can take many years or even decades to complete.

Based on this evaluation, specifically the low concentrations of COIs, pending source removal, and reducing conditions present in the aquifer, MNA is carried forward for additional evaluation with additional data needs to support remedy selection as discussed in **Section 8.5**.

7.3.2 Hydraulic Containment and Treatment (Pump and Treat)

Hydraulic containment, or pump and treat (P&T) is the use of groundwater extraction to capture and control the migration of impacted groundwater. P&T is often considered a viable remedial technology, it has been used to address metals-contaminated groundwater for decades at many sites. The approach consists of using extraction wells and/or trenches to capture groundwater for ex-situ treatment prior to being discharged to a receiving water body, reinjection to the aquifer, or beneficial reuse. P&T can be employed as a stand-alone remedy, in combination with another remedial alternatives, or as an interim measure to provide hydraulic containment and prevent migration of constituents toward a potential receptor.

Site Considerations: The performance and effectiveness of this technology is based on the ability to design and install extraction wells to capture the contaminated groundwater, a treatment technology that can effectively remove contaminants from the extracted groundwater, and a long-term monitoring program. Groundwater evaluations conducted to date identify a low conductivity, fractured bedrock (shale) aquifer. The geology impacts how groundwater can effectively be extracted from the subsurface. Both trench configurations and groundwater extraction well techniques were evaluated to remove groundwater from the subsurface. A trench strategy would require collection trenches, at a minimum, on the northeast and west sides of the landfill, to collect contaminated groundwater migrating from the source as well as one or more trenches to collect and treat offsite impacted groundwater northeast of the landfill. This strategy would be difficult to implement, require significant access and utility coordination, and would take a long time to implement. Conversely, groundwater extraction wells could be strategically installed in and around the landfill, landfill boundary and throughout the groundwater plume to collect and treat groundwater where there are higher concentrations of COIs. Although groundwater extraction wells may have a small radius of influence and thus require more wells to contain the impacted groundwater, extraction wells would be easier to implement and require less access, land disturbance, and utility coordination.

Once groundwater is collected, reliability of P&T is heavily reliant on performance of the above ground treatment system to remove contaminants from groundwater. The contaminants at the site, can be easily removed from extracted groundwater using chemical or physical processes. Supplemental treatment such as settling prior to reverse osmosis will be likely given the high total dissolved solids in groundwater at the site.

Considering the use of extraction wells and above groundwater treatment, the ease of implementation is impacted by the constraints to install the wells, piping, and treatment systems. With ongoing source removal, it is anticipated that there may be space constraints to install the system. The location of the system and treatment processes will be developed during design.

In addition to the extraction and treatment, as needed, treated water will require discharge. Discharge methods such as surface water discharge, reinjection, evaporation, or reuse of the treated water will be evaluated during design and will need to consider water rights limitations at the site.



Although reliability of a P&T system is generally high, it will have higher operation and maintenance (O&M) costs due to the reliance on system performance and upkeep until remediation objectives are met. Installing system components offsite may be challenging from an access and negotiations standpoint.

Based on this evaluation, specifically the effectiveness and reliability of the P&T technology, P&T is carried forward for additional evaluation with additional data needs to support remedy selection as discussed in **Section 8.5**.

7.3.3 In-Situ Treatment by Permeable Reactive Barrier

In-situ groundwater treatment includes the introduction of amendments to the subsurface to reduce, oxidize, or immobilize COIs present at the site. A permeable reactive barrier (PRB) technology generally consists of emplacing a permeable subsurface "wall" with reactive media for removal of COIs as groundwater passes through it.

Using a trenching approach, a trench or trenches are excavated through the saturated zone perpendicular to the direction of groundwater flow and keyed into a low permeability underlying barrier to groundwater movement such as bedrock (consolidated shale at Valmont). The trench is then backfilled with reactive material while maintaining a transmissivity greater than the surrounding subsurface so that groundwater continues to flow through, rather than around the PRB. Reactive material may be media that adsorbs COIs or forms precipitates with COIs to reduce concentrations. A PRB can involve the use of multiple types of reactive material depending on COIs and groundwater quality.

Site Considerations: At the site, trenching will be required through approximately 10 to 40 feet of weathered bedrock (shale) depending on the location of the PRB(s) as impacted groundwater at the site is in weathered bedrock. Based on the current understanding of the groundwater plume, PRBs may be considered on the northeast and west sides of the landfill to treat contaminated groundwater leaving the landfill. As PRBs have been shown to effectively treat arsenic and other inorganics in groundwater, geochemical laboratory bench testing was performed in 2021 and 2022 to evaluate potential reactive media for a PRB using site-specific groundwater and soil from adjacent to the source. The bench testing was performed in three phases and with multiple combinations of reactive media based on site-specific groundwater guality and results in prior test phases. Combinations of reagents MetaFix I-7A, Geoform, and ZVI were used for testing in Phase 1 to adsorb and precipitate COIs from groundwater. Phase 2 was performed using the treated groundwater from Phase 1 and adding biochar and activated carbon as reactive media for polishing treatment. Biochar proved to be more effective than activated carbon, but not all COIs were treated to below GWPS. To further evaluate the potential use of biochar for in-situ treatment, Phase 3 was performed using site groundwater and several commercially available biochar products for treatment of COIs. Overall, the bench test results indicated the media tested did not reduce all COIs in groundwater near the source area to below GWPS. However, results of the geochemical bench tests can be utilized when exploring other remedy options in the future.
From a physical perspective, space onsite is limited for construction of a PRB between the downgradient edge of the landfill and adjacent downgradient property, which could limit the feasibility of PRB implementation onsite. In addition, one or more PRBs to collect and treat offsite groundwater north of the northeast corner of the landfill would be needed. An offsite PRB (or PRBs) would require access and significant temporary disturbance, which also limits the utility of a PRB. This strategy would be difficult to implement, require significant access and utility coordination, and would take a long time to implement.

Based on the geochemical bench test results, space limitations for a PRB (or PRBs), the estimated time for a PRB to treat impacted groundwater offsite, and high costs, a PRB (or PRBs) is not a viable groundwater corrective measure for the site.

7.3.4 Slurry Wall

Hydraulic barrier by slurry wall is a proven technology for groundwater cutoff or controlling groundwater given proper site conditions (i.e., site geology, depth to low permeability key-in layer). Constructing a slurry wall includes excavating a narrow trench or trenches and injecting a high slump slurry that when solidified forms an impermeable cutoff wall. The slurry wall would be keyed into the top of a low permeability underlying barrier to groundwater movement such as bedrock. The slurry is typically a combination of the excavated trench soils, bentonite, and other potential additives. The slurry mixture forms into a material similar to a soft, clayey soil. This method typically results in a cutoff wall with a permeability ranging from 1×10^{-6} to 1×10^{-8} cm/sec.

With a funnel-and-gate system, slurry walls could be used to channel the contaminant plume into a gate that contains reactive material (i.e., a PRB). The funnels are non-permeable (e.g., slurry wall), and the simplest design consists of a single gate (PRB) with walls extending from both sides. The main advantage of the funnel-and-gate system is that a smaller reactive zone (PRB) can be used to treat the groundwater, thereby, potentially reducing costs.

Site Considerations: With source control (CCR removal) planned, the effectiveness of a slurry wall (or slurry walls) around the landfill would be limited and short-lived. Although slurry walls are generally a reliable vertical barrier for cutting off groundwater flow, treatment of downgradient groundwater is not the primary objective and pump and treat (or another alternative such as a PRB with funnel and gate system) would be required to achieve remediation objectives downgradient of the wall.

Similar to a PRB, trenching will be required through approximately 10 to 40 feet of weathered bedrock (shale) depending on the location of the slurry wall. The same space limitations mentioned above for installation of a PRB (or PRBs) applies to installation of a slurry wall. Managing groundwater upgradient of the wall will also be required in the overall remedial strategy due to expected mounding. Additionally, a cutoff wall can change groundwater flow patterns which can affect other aspects of groundwater corrective action.

A slurry wall will not be carried forward as a stand-alone remedial alternative at Valmont; however, a slurry wall could be used in combination with other remedial alternatives if needed to achieve remediation objectives. Other measures (MNA and P&T without a slurry wall) are



considered more cost effective, easier to implement, and have more potential to achieve remediation objectives in a reasonable timeframe.

7.4 Summary of Remedial Alternatives Evaluation

Following consideration of evaluation criteria for each alternative in **Section 8.3**, this section presents the recommended groundwater remedial alternatives to be considered and evaluated further to support remedy selection.

As stated in **Section 7.2**, a common component to these alternatives is the removal of Cells Q, A, B, and C at the landfill. The ash removal will occur first from these locations where the groundwater impacts are the greatest. Combined with partial source removal, the following remedial alternatives were retained for further evaluation and potential remedy selection:

- Hydraulic containment and treatment (pump and treat)
- MNA

Hydraulic containment and treatment and source removal will be considered the primary remedial alternative. MNA will continue to be evaluated to determine if and how it can be applied to enhance the remedy as part of an adaptive management strategy at the site.

As discussed above, an adaptive management strategy will be implemented at the site focused on continual plume management, remedy performance evaluation, and improvements. As data collection, source control, and groundwater remedial activities are implemented, groundwater conditions will continue to be monitored and results interpreted. Additional data collection needs will be identified and corrective measure adjustments will be made as necessary to achieve remediation objectives within a reasonable time frame.

Remedial Alternative	Description	Performance	Reliability	Ease of Implementation	Potential Impacts of the Alternative	Time to Implement Alternative	Time to Achieve GWPS at Compliance Points	Cost of Remedial Implementation	Institutional Requirements	Overall Score	Screening Outcome
Monitored Natural Attenuation (MNA)	MNA relies on natural attenuation processes to achieve remediation objectives within a reasonable time period at lower cost relative to more active methods. Depending on site- specific conditions, MNA can effectively reduce dissolved concentrations of inorganic constituents in groundwater through sorption, mineral precipitation, or oxidation- reduction reactions. Regular monitoring of select groundwater monitoring wells for specific parameters is required to ensure COI concentrations in groundwater are attenuating over time. Dilution from recharge to shallow groundwater, mineral precipitation, and COI adsorption will occur over time, thus reducing COI concentrations through attenuation.	Attenuation processes are likely to be more physical than chemical. Chemical attenuation is not typically as prominent in fractured rock. Source control will improve mass balance in the aquifer and can provide buffer capacity for attenuation processes.	Under appropriate aquifer conditions, MNA is reliable and can be used as either a stand-alone corrective measure or in combination with other technologies.	Easily implementable but requires additional upfront data and documentation to confirm attenuation capacity is sufficient to meet GWPS within a reasonable time frame. Existing groundwater monitoring network can be used for MNA performance monitoring.	None. MNA relies on natural processes in the aquifer matrix to reduce COIs in groundwater without additional site disturbance.	18 - 24 months Monitoring infrastructure is largely already in place. Demonstrating attenuation mechanisms and capacity can be time consuming and take up to 24 months, especially given offsite access requirements for the Butte property.	>25 years Following source control and pending tiered MNA evaluation, MNA may be successful within a reasonable time frame. Routine groundwater monitoring will be used to verify COI concentrations in groundwater are stable or decreasing over time.	\$1-2MM	May require environmental covenant or deed restrictions where groundwater is above GWPS.	16	Retained for further analysis.
	Remedy Evaluation Score (1-3):	1	1	3	3	2	1	3	2		
Hydraulic Containment and Treatment (Pump and Treat)	Hydraulic containment (or pump and treat, P&T) is the use of groundwater extraction to induce a hydraulic gradient for capture or control of impacted groundwater. Extraction wells and/or trenches can be used to capture groundwater for ex-situ treatment prior to being discharged to a receiving water feature, reinjection to the aquifer, evaporation, or reuse. Groundwater extraction is applicable as a means of hydraulic control in the site geology.	P&T is proven to actively provide hydraulic control and reduce constituents in groundwater. Additional assessment activities are needed to assess potential performance of P&T, including performing pump tests capture zone analysis, and flow model simulations for optimization Aquifer recharge (via treatment discharge) combined with P&T could improve cleanup time.	Pump and treat is generally a reliable hydraulic containment and treatment technology. System operations and maintenance is key to providing optimal performance and uptime. Assuming access is provided and cultural resources are mitigated, there is sufficient access for installation of extraction wells onsite and offsite. The location of a treatment system will likely need to be onsite. Source removal activities will need to be considered when locating an onsite treatment system.	Design and installation of P&T system is required. Extraction wells will be limited to outside the landfill footprint until after source control. Due to very low well yield and groundwater velocity, capture zone is anticipated to be minimal, resulting in a larger number of wells for capture and/or longer time to meet performance criteria everywhere in the plume.	Infrastructure to be located offsite (Butte property). Access and allowance of extraction infrastructure on the Butte property will need to be resolved. Water rights should be considered depending on treatment and discharge.	12 - 18 months If required, permit approval for selected discharge method of treated water could extend implementation time frame.	>10 years Can be implemented concurrently with source control to expedite groundwater remediation.	\$8-12MM	May require environmental covenant or deed restrictions where groundwater is above GWPS.	19	Retained for further analysis.
	Remedy Evaluation Score (1-3):	2	3	2	2	3	3	2	2		

Table 7. Summary of Potential Groundwater Remedial Alternatives Evaluation (All Alternatives Include Source Removal as Primary Component)

 Table 7.
 Summary of Potential Groundwater Remedial Alternatives Evaluation (All Alternatives Include Source Removal as Primary Component)

Remedial Alternative	Description	Performance	Reliability	Ease of Implementation	Potential Impacts of the Alternative	Time to Implement Alternative	Time to Achieve GWPS at Compliance Points	Cost of Remedial Implementation	Institutional Requirements	Overall Score	Screening Outcome
In-Situ Treatment by Permeable Reactive Barrier (PRB)	Permeable reactive barrier (PRB) technology generally consists of emplacing a permeable subsurface "wall" constructed with reactive media for removal of COIs as groundwater passes through it. A PRB typically targets the saturated zone perpendicular to the direction of impacted groundwater flow and is keyed into an underlying barrier to groundwater movement such as bedrock. A PRB can involve the use of multiple types of reactive material depending on site COIs and groundwater quality. Example reagents for Valmont include zero valent iron (ZVI) and ZVI-carbon to sorb arsenic or selenium, and biochar or Carus MMO II to precipitate lithium.	Laboratory bench testing was performed in 2021 and 2022 to evaluate potential reactive media for a PRB using site-specific groundwater and soil from adjacent to the source. Bench test results indicated the media tested did not reduce all COIs in groundwater near the source area to below GWPS. However, the results of the geochemical bench tests can be utilized when exploring other remedy options.	Considering the site's low conductivity aquifer, until pilot testing is performed at the site, uncertainty remains with estimating a reasonable time frame for remediation. Loss of reactivity over time may require re- installation of PRB media depending on the remedy duration.	Trenching in weathered bedrock at the site will increase the difficulty of installation. Based on the CSM (i.e., extent of COIs in groundwater), multiple PRBs would be required to remediate impacted groundwater. Bench testing performed with site groundwater also indicates a two- phase PRB would be needed to remediate groundwater depending on the COIs present in specific areas of the site.	Construction of a PRB would be required offsite (Butte property). Access and allowance of construction on the Butte property will need to be resolved. Addition of reagents or adjustment of pH/redox conditions may mobilize other contaminants in groundwater.	12 to 24 months Time to implement will largely depend on final location(s) and configuration(s). Additional bench tests and pilot testing required for design could extend the estimated time to implement.	>25 years Depending on the number and location of PRBs used to treat the offsite groundwater, attenuation mechanisms need to be understood to estimate a reasonable time frame for achieving remediation objectives. If installed to treat impacted groundwater onsite, the time to achieve GWPS downgradient of a PRB is anticipated to be relatively quick.	\$45-100MM Highly dependent on final location and configuration of PRB(s).	May require environmental covenant or deed restrictions where groundwater is above GWPS.	11	Not retained for further analysis as a primary remedy alternative.
	Remedy Evaluation Score (1-3):	1	1	1	2	2	1	1	2		
Slurry Wall	A slurry wall approach can provide a barrier to groundwater flow to prevent future migration of dissolved constituents in groundwater. In general, a slurry wall keyed into the top of bedrock would be designed to provide containment and combined with groundwater extraction (P&T) for hydraulic control and treatment. A slurry wall could also be combined with a PRB in the form a "funnel and gate" system.	Hydraulic barrier by slurry wall is a proven technology for groundwater cutoff given proper site conditions (i.e., site geology, depth to low permeability key-in layer). However, additional means for groundwater treatment (combined with PRB for funnel and gate system) or groundwater extraction and treatment (P&T) would be required to achieve remediation objectives.	Reliability of a slurry wall for hydraulic containment and treatment may also be dependent on managing the groundwater upgradient of the wall.	Similar to installing a PRB, trenching in weathered bedrock at the site will increase the difficulty of installation. Once installed, P&T infrastructure will be required for management and treatment of groundwater, thus the same implementation considerations described above apply to this alternative. Long- term O&M will be	A slurry wall can change groundwater flow patterns which can affect other aspects of groundwater corrective action.	12 to 24 months Time to implement will largely depend on pre-design investigation activities and the final configuration of the wall. Construction and trenching through weathered bedrock could extend the estimated time to implement.	>10 years Remedy completion is dependent on combined alternative that provides hydraulic control and treatment (P&T or PRB).	\$10-15MM Additional cost for combined remedy alternative is not included in this estimated cost.	May require environmental covenant or deed restrictions where groundwater is above GWPS.	12	Not retained for further analysis as a primary remedy alternative; however, a slurry wall could be used in combination with other remedy alternatives if needed to achieve remediation objectives
				required for the P&T system.							objectives.

Notes:

Numerical ranking of 1, 2, or 3 was assigned to each criterion for each alternative based on HDR's understanding of each alternative and site-specific conditions, 1 indicates least favorable and 3 is most favorable. Costs provided are Class 5 estimates.

Remedy Alternative	Remedy Selection Standards [40 CFR 258.57(b)]:	Standards Met by Remedy? (Y/N)
	Protective of human health and the environment	Y
	Attain groundwater protection standard(s)	Y
Monitored Natural Attenuation (MNA)	Control the source(s) of releases to reduce or eliminate, to the maximum extent practicable	Y
, , , , , , , , , , , , , , , , , , ,	Removal of released constituents that may pose a threat to human health and the environment	Y
	Comply with standards for management of wastes as specified in 40 CFR 258.58(D)	Y
	Protective of human health and the environment	Y
Hydraulic	Attain groundwater protection standard(s)	Y
Containment and Treatment (Pump	Control the source(s) of releases to reduce or eliminate, to the maximum extent practicable	Y
and Treat)	Removal of released constituents that may pose a threat to human health and the environment	Y
	Comply with standards for management of wastes as specified in 40 CFR 258.58(D)	Y
	Protective of human health and the environment	Y
In-Situ Treatment by	Attain groundwater protection standard(s)	Y
Permeable Reactive	Control the source(s) of releases to reduce or eliminate, to the maximum extent practicable	Y
Barrier (PRB)	Removal of released constituents that may pose a threat to human health and the environment	Ν
	Comply with standards for management of wastes as specified in 40 CFR 258.58(D)	Y
	Protective of human health and the environment	Y
	Attain groundwater protection standard(s)	Y
Slurry Wall	Control the source(s) of releases to reduce or eliminate, to the maximum extent practicable	Y
	Removal of released constituents that may pose a threat to human health and the environment	Ν
	Comply with standards for management of wastes as specified in 40 CFR 258.58(D)	Ν

Table 8. Cross-Check Summary of Remedy Alternatives and Remedy Selection Standards Under 40 CFR 258.57(b)

7.5 Additional Data Needs

Additional data and analysis will be required to perform a thorough site-specific evaluation of the potential groundwater remedies retained in **Section 8.4** prior to implementation. Priority will be given to fill data gaps for the retained remedial alternatives to support remedy selection under the CCR Rule program. The following provides a summary of additional data needs for each potential remedial alternative and to support design following remedy selection.

Hydraulic Containment and Treatment (Pump and Treat)

The following data collection activities are needed to further evaluate the application of hydraulic containment and treatment and inform remedy selection:

- Pump/aquifer test(s) will be used to determine sustainable yield and potential capture zone for extraction wells. The pump test was performed within the area of contamination, which is primarily under the landfill and offsite to the north of the northeast corner of the landfill (the Butte property). Access from the Butte property owner was obtained for the offsite pump test activities.
- Evaluate water rights and other water use considerations to determine if infiltration/aquifer recharge versus discharge to surface water will be the preferred approach for managing treated water.

Pump tests were conducted in the northeast plume on the Butte property in 2023, the results are currently being evaluated as part of the remedy selection process under the CCR Rule program. PSCo also initiated evaluation of water rights and permitting in 2023 to support the remedy selection process under the CCR Rule program. This evaluation is ongoing, but based on initial discussions it is anticipated that work will be able to proceed in parallel with water rights permitting and potential augmentation activities.

Monitored Natural Attenuation

Soil and groundwater sample collection specific to evaluating MNA in accordance with the USEPA Tiered Approach for MNA of Inorganics (USEPA, 2015) has been collected and data evaluation is underway. To initiate MNA evaluation, the following site-specific data collection and analysis has been performed at the site:

- Contaminant concentrations in aquifer solids
- Groundwater chemistry and quality data for preliminary evaluation of contaminant degradation (e.g., Eh/pH, ferrous iron and sulfide, total iron, aluminum, manganese, major cations and anions, total organic carbon or alkalinity)
- Subsurface mineralogy (i.e., clay mineralogy, Fe-Mn-Al oxides, carbonate minerals, and sulfides).
- Selected aquifer solids characterization analyses such as X-ray diffraction (XRD), cation exchange capacity (CEC), acid volatile sulfide (AVS) / simultaneously extracted metals (SEM), or sequential extraction procedures (SEP), based on COIs.

-)?

• Batch attenuation testing (chemical extractions to determine probable range of Kd values that suggest attenuation is taking place for COIs).

Collection of the data described above is currently underway. The initial MNA evaluation will be performed as the data and analyses are completed.

8.0 Estimated Schedule

A general conceptual schedule for evaluating additional information to support remedy selection through remedy implementation for corrective actions at Valmont is provided below on **Table 9**. Source removal will begin in 2025 with removal targeted for areas of anticipated greatest impact (Cells B and Q).

Action	Estimated Completion Date
MNA Evaluation (data collection and initial analysis)	Present – May 2024
Remedy Selection	February 2024
Sourcing for Design and Implementation (i.e., Initiation of Remedy)	Q2 2024
Remedy Design	Q3 2024
Remedy Implementation (Field Installation of remedial infrastructure)	Q4 2024 – Q1 2025
Source Removal	2025 through 2037

Table 9. Estimated Remedial Schedule



9.0 References

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Appendix A Potentiometric Surface & Concentration Maps







Figure A-2. Valmont Station – Groundwater Contours October 2022



Figure A-3. Valmont Station – Northeast Area Groundwater Contours December 2022

Appendix B COI Concentration Map: Selenium



EXCEEDING GPS

FC

VALMONT POWER STATION, BOULDER COUNTY, CO

Appendix C Updated Background Statistical Analysis

FX

Updated Background Statistical Analysis

for Compliance with the CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2)

Valmont Station

Public Service Company of Colorado

January 2024



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Attachment 9. Assessment Monitoring UPL Table
Attachment 10. Unfiltered UTLs

Attachment 11. Filtered UTLs

1.0 Introduction

The statistical analysis for the Valmont landfill pertains to samples collected from background monitoring wells MW-7 and MW-24 between May 2008 and October 2022 for the detection and assessment monitoring constituents agreed upon with CDPHE. The purpose of the statistical analysis is to develop background threshold values (BTVs) per constituent of interest. Upper prediction limits or upper tolerance limits are used to define the BTVs depending on the compliance phase. Upper prediction limits (UPLs) from background samples are used for the purpose of detecting statistically significant increases (SSIs) during either detection monitoring or assessment monitoring phases. Upper tolerance limits (UTLs) from the same background samples are used to represent groundwater protection standards (GWPS) in situations where there is no maximum contamination limit (MCL) for a constituent of interest or if the UTL is larger than the MCL.

Specifically, Appendix B7(G) of 6 CCR 1007-2 requires the development of GWPS to establish a clean-up standard for implementation of corrective measures. When background concentrations are higher than the health-based standards, the BTVs may be used for the GWPS. The Unified Guidance recommends the upper tolerance limit (UTL) to represent the background concentration for this purpose. The limits can be considered as statistically equivalent BTVs to a MCL or other health-based numbers. Tolerance intervals represent a range where a proportion of the population is expected at a given confidence level. For this update, a 95 percent confidence level is assumed. The development of GWPS is provided in **Section 5.0**.

Prior to estimating the BTVs, a preliminary data analysis using statistical methods such as sample means, medians and standard deviations, tests for sample distributions, statistical outliers, autocorrelation, seasonality, spatial variability, and trends over time are conducted to confirm if all observed concentrations are representative of field conditions. Details of statistical output tables and supporting charts are found in **Attachments 1-7.** Computations for the BTVs are found in **Attachments 8-11**.

HDR developed upper prediction limits (UPLs) (i.e., parametric, or nonparametric) for each detection monitoring and assessment monitoring constituent based on the frequency of non-detect values and whether the background data for that constituent exhibited a normal, lognormal, gamma, or nonparametric distribution.

Prior to development of UPLs, the data is evaluated using descriptive statistics and graphical analysis. Descriptive statistics are developed per constituent from the data pooled from the background monitoring wells. The purpose of the descriptive analysis is to characterize data and assess quality of information. The following descriptive statistics will be produced.

- Sample size
- Number of detects
- Percentage of detects
- Number of non-detectsPercentage of non-detects

- Mean
- Median
- Minimum
- Maximum
- Standard deviation

- Number of distinct observations
- Number of distinct method detection limits (MDLs)
- Range of collection period in months: Difference between last sampling date and first sampling date
- Coefficient of variation
- Skewness
- Kurtosis

Graphical analysis provides visual clues as to whether the period of record is reflective of a steady-state baseline period. The graphs are evaluated to determine if all data can be incorporated into analysis or if older historical data may need to be dropped (multiple detection limits over time may affect usability of the data). Outliers and seasonality can also be visually detected. Further statistical tests will need to be conducted to confirm assumptions from visual inspections.

2.0 Outliers

Outliers are values that are not representative of the population from which they are sampled. The data sets were screened for outliers using the Dixon test or Rosner test; the Dixon test is used for sample sizes smaller than 25 and the Rosner test is used for sample sizes 25 and above. Both tests are conducted with non-detects excluded and using a significance level of 1 percent. Detailed results of the outlier analysis are provided in **Appendix C**.

Quality control conducted on the sampling protocols and laboratory results did not indicate reasons for the noted concentration of the outliers on the dates they were sampled. No unusual weather or anthropogenic activity occurred which could explain the higher concentrations.

As requested by CDPHE, **Table 1** tracks data outliers, either in background or verification samples, that have been removed from the database, so that if the data are later confirmed to be valid, the data points in question can be incorporated into updated BTVs or used in identification of SSIs, depending on the well location. As the sample size is small, from a statistical perspective, the variability in the concentrations of these constituents will change as additional samples are obtained, approaching the true underlying variability of concentrations in groundwater in the vicinity of the background well. The distributions for constituents flagged in the outlier tests will continue to be monitored as sampling events are added to the background data set. A detailed summary of the outlier analysis is provided in **Appendix C**.

Well ID	Constituent	Date of Collection	Concentration (mg/L)	Basis for Identification	Action Taken
MW-7	Barium	5/20/2008	0.102	First sample from well. 5x higher than the average background detections.	Removed from background data set.
MW-7	Boron	5/20/2008	1.21	First sample from well. 4x higher than the average background detections.	Removed from background data set.

Well ID	Constituent	Date of Collection	Concentration (mg/L)	Basis for Identification	Action Taken
MW-7	Iron	5/20/2008	4.96	First sample from well. 15x higher than the average background detections.	Removed from background data set.
MW-7	Sodium	5/20/2008	314	First sample from well. 3x higher than the average background detections.	Removed from background data set.
MW-7	Sulfate	5/20/2008	427	First sample from well. 4x higher than the average background detections.	Removed from background data set.
MW-7	TDS	5/20/2008	1,181	First sample from well. 2x higher than the average background detections.	Removed from background data set.
MW-7	Chloride	05/14/2013	200	4x higher than the average background detections.	Removed from background data set.
MW-7	Sulfate	05/14/2013	780	7x higher than the average background detections.	Removed from background data set.
MW-24	Iron	10/14/2021	12.2	15x higher than the average background detections.	Removed from background data set.

Table 1. Statistical Outlier Tracking – Background Wells

3.0 Distribution

Since many tests make an explicit assumption concerning the distribution represented by the sample data, the form and exact type of distribution must be checked using a goodness-of-fit (GOF) test. A goodness-of-fit test assesses how closely the observed sample data resemble a proposed distributional model. The best goodness-of-fit tests attempt to assess whether the sample data closely resemble the tails of the candidate distributional model. The models under consideration for water quality samples are normal, lognormal, or gamma distributions. For purposes of estimating background concentration levels, nonparametric methods will be used on data sets with less than four detected values or more than 50 percent non-detects.

When multiple distributions can appropriately fit the data, a determining factor is the level of sample skewness. When sample sets have symmetric to mild skewness and multiple distributions fit the data at the 5 percent level of significance, use of the normal distribution is recommended. Sample sets with moderate or higher skewness levels are better described by a skewed distribution such as the gamma or lognormal distributions.

The constituents monitored under the semiannual state monitoring program and requiring statistical analysis were evaluated and fit to the following distributions:

- Parametric (Normal): nitrate
- Parametric (Log-Normal): boron, selenium
- Parametric (Gamma): total alkalinity, cobalt, fluoride, lithium
- Non-Parametric: antimony, arsenic, barium, beryllium, cadmium, chloride, chromium, iron, lead, molybdenum, nitrite, silver, sulfate, thallium, total dissolved solids (TDS)

As approved by the CDPHE during recent communications (email dated April 27, 2023) and a response letter to previous groundwater reports (dated November 30, 2022), the following changes are being made to the monitoring program and will be reflected in an updated SMP:

- Cations (calcium, magnesium, potassium, and sodium), anions (carbonate, bicarbonate, chloride, sulfate, nitrate, and nitrite), or field parameters (pH, specific conductivity, temperature, and total organic carbon) do not require statistical analysis and therefore will not be included in the evaluation of constituents of interest (COIs) in the Assessment of Corrective Measures Report (ACMR). Prior to this communication, SSIs were identified for chloride, sulfate, and nitrates. Discussion of these parameters will be provided in the ACMR.
- Radium and mercury are no longer required to be analyzed under the state monitoring program and will not be included in the evaluation of COIs for the ACMR. Historical data indicates that radium and mercury have not been detected at levels exceeding BTVs or the Regulation 41 standards.

4.0 Seasonality

Temporal variability in groundwater samples can be due to seasonal effects (i.e., seasonality) or temporal effects (i.e., autocorrelation or trends). Changes in season as evidenced from varying temperatures and precipitation could be a reason why a series of water quality constituent samples exhibit serial correlation. These changes impact water quality constituents in a predictable and cyclical manner over the months. The study of water quality changes over time is focused on the ability to discern true trend through regression analysis amidst the cyclical nature of the data or its "seasonality". Appendix B3(H) of 6 CCR 1007-2 requires, if necessary, the statistical method must include procedures to control or correct for seasonal as well as temporal correlation in the data.

Constituents are analyzed for seasonality using the Kruskal-Wallis, ANOVA, and logtransformed ANOVA tests. The sample sizes per season do not allow for accurate statistical analysis of seasonality; a minimum of eight samples per sampled season is recommended to test for seasonal differences but at least twenty samples per season are recommended to deseasonalize the data. Constituents will be analyzed for seasonality as additional sampling is conducted to determine if samples are affected by seasonality.

5.0 Serial Correlation

Sources for serial correlation in water samples can be due to seasonal effects or temporal effects related to the timing of the sample collections. Trend analysis using regression techniques of a water quality constituent sampled over time is confounded if the data exhibits serial correlation. The regression errors from adjacent observations may be correlated. For example, if the residual from a given month's observation is high, then it is likely that the residual from the next month's observation will also be high. The same logic follows for low residuals giving rise to other low residuals. This type of correlation is referred to as serial correlation.

Serial correlation or autocorrelation occurs when values of a single variable data set are correlated over successive (i.e., lagged) time intervals. A minimum of at least 50 sampling events is recommended for autocorrelation tests to perform well using conventional estimators when assessing the test statistic's probability value. The autocorrelation function test is run at the 1 percent level of significance to flag constituents for further investigation. Constituents will be analyzed for autocorrelation as additional sampling is conducted.

6.0 Trends

The samples from background wells represent water quality conditions exhibiting natural variability and unaffected by anthropogenic activities. As such, the measurements taken at regular intervals over time (three or more years) are expected to demonstrate a steady or stationary time series. Provided the data has more than 50 percent detected observations, the data from the background wells are tested to determine whether trends exist (values steadily increasing or steadily decreasing). Depending on whether the data follow parametric or non-parametric distributions), one of the following linear regression tests is selected:

- Maximum Likelihood Estimation (MLE) Regression (parametric, with or without NDs)
- Mann-Kendall (non-parametric, with or without NDs, 1 distinct value for MDL)

For parametric tests, the "Slope" column contains the MLE slope on a log-linear scale with respect to time (measured in days), and the "p-value" column contains the p-value associated with that slope. For nonparametric tests, the "Slope" column contains the Theil-Sen slope estimator, and the "p-value" column contains the p-value from the Mann-Kendall test. The "Trend" column indicates upward or downward trends when the p-value is below 1%.

Results for detected trends are reported in **Table 2**. At the 1% significance level, upward trends were identified for chloride, iron, and selenium; downward trends were identified for total alkalinity, calcium, total hardness, and magnesium. These constituents will continue to be monitored for trends as more samples are collected. A summary of the trend analysis is provided in **Appendix C**.

Constituent	Unit	n	No. BDL	% BDL	Method	Slope	<i>p</i> -value	Trend
Alkalinity, Total	mg/l	36	0	0%	Lognormal MLE	-0.0000531	0.000	Ļ
Calcium	mg/l	36	0	0%	Lognormal MLE	-0.0000455	0.003	\downarrow
Chloride	mg/l	35	0	0%	МК	0.00197	0.000	Î
Hardness (as CaCO ₃)	mg/l	36	0	0%	Lognormal MLE	-0.0000535	0.000	Ļ
Iron	mg/l	35	9	25%	МК	0.0000407	0.001	î
Magnesium	mg/l	36	0	0%	МК	-0.00135	0.006	Ļ
Selenium	mg/l	36	4	11%	Lognormal MLE	0.000162	0.005	Ť

Table 2. Trend tests at the 1% significance level - Landfill

7.0 Updated Background Threshold Values

Background threshold values (BTVs) were statistically calculated for future use in evaluating whether downgradient samples exhibit statistically significant increases (SSIs) during detection monitoring. The BTVs are the UPLs of the background data. The number of verification samples and the significance levels associated with each UPL are chosen such that the site-wide false positive rate over all comparisons is no more than 10 percent and such that the power of each test exceeds the EPA Reference Power Curve (ERPC) at either 3 standard deviations above background, 4 standard deviations above background, or both.

For constituents that do not have any detected values, the maximum method detection limit (MDL) is chosen as the BTV. **Table 3** contains the calculated UPLs for detection and assessment monitoring constituents at the landfill and compares to the previous UPLs (i.e., BTVs). Identified SSIs and COIs are discussed in the ACMR.

Constituent	Unit	n	No. BDL	% BDL	Recommended distribution	Updated BTVs
Detection Monit	toring Co	nstituer	nts		•	
Alkalinity, Total	mg/l	36	0	0%	Gamma	438
Arsenic	mg/l	36	25	69%	Nonparametric	0.00545
Barium	mg/l	36	0	0%	Nonparametric	0.140
Beryllium	mg/l	22	17	77%	Nonparametric	0.0005
Boron	mg/l	36	1	3%	Gamma	0.48
Cadmium	mg/l	36	30	83%	Nonparametric	0.0020
Chromium	mg/l	36	27	75%	Nonparametric	0.007
Hardness (as CaCO3)	mg/l	36	0	0%	Normal	332
Iron	mg/l	36	9	25%	Nonparametric	5.0
Lead	mg/l	36	20	56%	Nonparametric	0.019
Selenium	mg/l	36	4	11%	Lognormal	0.008
Silver	mg/l	36	36	100%	Nonparametric	0.010
TDS	mg/l	36	0	0%	Nonparametric	740
Assessment Mo	onitoring	Constit	uents			
Antimony	mg/l	14	14	100%	Nonparametric	0.0050
Cobalt	mg/l	14	5	36%	Gamma	0.0020
Fluoride	mg/l	14	0	0%	Gamma	0.83
Lithium	mg/l	14	0	0%	Gamma	0.053
Molybdenum	mg/l	14	0	0%	Nonparametric	0.011
Thallium	mg/l	14	14	100%	Nonparametric	0.0010

Table 3. Background threshold values for detection monitoring – Landfill

Attachment 1

Unfiltered Detection Monitoring UPLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 UPLs for Detection Monitoring

								N	ormal	Lo		hormal Gamma		nma	Nonpara metric Average U		rage UPL by Distribution		Log Maxim SD		Nonparametric UPL Specification ¹		etric UPL cation ¹	Parame	tric UPL Specif	ication ²	No. of Verification				
ID Dates	Dates	State Program Group	Constituent	Units	n NDs	% NDs	Unique Ob	UPL P	KM UPL		ROS KI	M UPL UP	L RO		Rank- based UPL	Normal	Lognor mal	Gamma	nparamet	laximun	Maximun um of Detect Dete cts	t of Distributions Fit (based on detected data) F ct Dete cts	Recommended Distribution	Retests Rank	α	Retests	к	α	Samples ³ UPL	Notes	
2_101	2008-05-20 to 2022-10-12	2 DM	Alkalinity, Total (as CaCO	(3) mg/L 3	36 0	0%	6 2	4 431	1	440		4	138		426	431	440	438	426	426	426 0.120	Gamma; Lognormal; Normal	Gamma	3 1	0.00151	2	2.32	0.0140	1	438	
2_103	2008-05-20 to 2022-10-12	2 DM	Arsenic	mg/L 3	36 25	69%	6 1	6	0.00427	0.	00714 0	.00481		0.00452	0.0500	0.00427	0.00598	0.00452	0.0500	0.0500	0.00545 0.876	Gamma; Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.00545	a, d
2_104	2008-05-20 to 2022-10-12	2 DM	Barium	mg/L 3	36 0	0%	6 2	3 0.0936	5 (0.105		0.09	975		0.137	0.0936	0.105	0.0975	0.137	0.137	0.137 0.597	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.137	
2_105	2015-05-12 to 2022-10-12	2 DM	Beryllium	mg/L 2	22 17	77%	6	9	0.000851		0.0	000821		0.000785	0.000500	0.000851	0.000821	0.000785	0.000500	0.00134	0.00134 0.815	Gamma; Lognormal	Nonparametric	4 2	0.00455	2	2.50	0.0116	3	0.000500	a
2 106	2008-05-20 to 2022-10-12	2 DM	Boron	mg/L 3	36 1	3%	6 2	15	0.727		0.713	0.710	0.7	703 0.699	1.21	0.727	0.712	0.701	1.21	1.21	1.21 0.345	Lognormal	Lognormal	3 1	0.00151	2	2.32	0.0140	1	0.712	
2 107	2008-05-20 to 2022-10-12	2 DM	Cadmium	mg/L 3	36 30	83%	6	7	0.00177		0	0.00174		0.00174	0.00500	0.00177	0.00174	0.00174	0.00500	0.00500	0.00200 0.449	Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.00200	a, d
2_108	2008-05-20 to 2022-10-12	2 DM	Calcium	mg/L 3	36 0	0%	6 2	1 67.2	2	71.8		7	0.3		68.2	67.2	71.8	70.3	68.2	68.2	68.2 0.17	Normal	Normal	3 1	0.00151	2	2.32	0.0140	1	67.2	
2_109	2008-05-20 to 2022-10-12	2 DM	Chloride (as CI)	mg/L 3	36 0	0%	6 2	126	3	118		1	19		200	126	118	119	200	200	200 0.312	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	200	
2_110	2008-05-20 to 2022-10-12	2 DM	Chromium, Total	mg/L 3	36 27	75%	6 1	2	0.00439	0.	00586 0	0.00430		0.00426	0.0250	0.00439	0.00508	0.00426	0.0250	0.0250	0.00677 0.670	Gamma; Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.00677	a, d
2_113	2008-05-20 to 2022-10-12	2 DM	Hardness (as CACO3)	mg/L 3	36 0	0%	6 1	9 332	2	354		3	147		340	332	354	347	340	340	340 0.172	Normal	Normal	3 1	0.00151	2	2.32	0.0140	1	332	
2_114	2008-05-20 to 2022-10-12	2 DM	Iron	mg/L 3	36 9	25%	6 2	16	6.22		18.4	11.3		7.99	12.2	6.22	14.9	7.99	12.2	12.2	12.2 1.66	Lognormal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	12.2	
2 115	2008-05-20 to 2022-10-12	2 DM	Lead	mg/L 3	36 20	56%	6 2	2	0.0102	0	0.0222	0.0233		0.0151	0.0187	0.0102	0.0228	0.0151	0.0187	0.0187	0.0187 1.32	Gamma; Lognormal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.0187	3
2 117	2008-05-20 to 2022-10-12	2 DM	Magnesium	mg/L 3	36 0	0%	6 1	8 40.5	5	43.1		4	2.3		44.6	40.5	43.1	42.3	44.6	44.6	44.6 0.184	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	44.6	
2 120	2009-05-19 to 2014-10-07	DM	Nitrate + Nitrite (as N)	mg/L 1	12 0	0%	6 1	2							5.30				5.30	5.30	5.30	Normal	Nonparametric	5 1	0.00214	3	2.12	0.0325	2	5.30	
2 121	2008-05-20 to 2022-10-12	2 DM	Nitrogen, Nitrate (as N)	mg/L 3	36 1	3%	6 3	16	9.47			25.7		15.5	8.47	9.47	25.7	15.5	8.47	8.47	8.47 0.863	Normal	Normal	3 1	0.00151	2	2.32	0.0140	1	9.47	
2_122	2008-05-20 to 2022-10-12	2 DM	Nitrogen, Nitrite (as N)	mg/L 3	36 35	97%	6	4							0.200				0.200	0.200	0.0410		Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.0410	a, c, d
2_123	2020-05-12 to 2022-10-12	2 DM	Potassium	mg/L 1	12 0	0%	6 1	0 5.28	3	5.23		5	.25		5.82	5.28	5.23	5.25	5.82	5.82	5.82 0.148	Nonparametric	Nonparametric	5 1	0.00214	3	2.12	0.0325	4	5.82	
2_127	2008-05-20 to 2022-10-12	2 DM	Selenium	mg/L 3	36 4	11%	6 2	4	0.00584	0.	00757 0	0.00773	0.008	682 0.00691	0.00600	0.00584	0.00765	0.00687	0.00600	0.00600	0.00600 0.542	Lognormal	Lognormal	3 1	0.00151	2	2.32	0.0140	1	0.00765	
2_128	2008-05-20 to 2022-10-12	2 DM	Silver	mg/L 3	36 36	100%	6	6							0.0100				0.0100	0.0100			Nonparametric	3 1	0.00151	2	2.32	0.0140	2	0.0100	a, b, c
2_129	2008-05-20 to 2022-10-12	2 DM	Sodium	mg/L 3	36 0	0%	6 2	2 225	5	224		2	23		314	225	224	223	314	314	314 0.206	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	314	
2_130	2008-05-20 to 2022-10-12	2 DM	Sulfate (as SO4)	mg/L 3	36 0	0%	6 2	9 424	1	324		3	45		780	424	324	345	780	780	780 0.448	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	780	
2 132	2008-05-20 to 2022-10-12	2 DM	Total Dissolved Solids	mg/L 3	36 0	0%	6 2	8 861	1	832		8	38		1,181	861	832	838	1,181	1,181	1,181 0.144	Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	1,181	
2 133	2008-05-20 to 2022-10-12	2 DM	Total Suspended Solids	mg/L 3	36 20	56%	6 1	5	310		916	258		248	543	310	587	248	543	543	543 1.50	Gamma; Lognormal	Nonparametric	3 1	0.00151	2	2.32	0.0140	2	543	a

Notes
a: Nonparametric methods were used since the percent below MDL is greater than 50%.
b: Constituent is 100% non-detects so the maximum detection Imit is chosen as the BTV. Double Quantification Rule (DDR) is recommended for determining if an exceedance has occurred.
c: Maximum detected value was chosen as the UPL as the number of detects is less than 4.
d: Sample contains MDLs that are greater than the maximum detect value.

¹ The number of releases and the rank of the order statistic for nonparametric UPLs are chosen such that the confidence level does not exceed the per-constituent faise positive rate of 0.04778, and such that the test power exceeds the EPA Reference Power Curver (EPAC) at either 3 standard deviations (SD) above background, 4 SDs above background, or both. The maximum per-constituent faise positive rate is computed based on a site-wide faise positive rate of 10% subdivided across 21 constituents. Tartioper varies by sample size, rate is poted back for all samples sizes in the data dangings the EPRC.

² The number of relates and the value of the Kadora are chosen such that the confidence level does not exceed the pertest false positive rate of 0.000684, and such that the test power exceeds the ERPC at either 3 SDs above background, 4 SDs above background, 4 SDs above background, 4 SDs above background, 4 SDs above background, a both. The maximum pertest false positive rate is computed based on a sile-wide false positive rate of 10% subdivided across 21 constituents and 7 downgradent wells. Test power varies by sample size, and a politier background, as an exceeds the ERPC.

³ The number of verification samples is equal to (*m* - 1), where *m* represents the number of releasts in a 1-ofm releasting plan. For each row, if the recommended distribution is parametric then the value in this column is based on the number of releasts under a parametric UPL specification. Otherwise, it is based on the number of releasts and a specification.



Attachment 2

Filtered Detection Monitoring UPLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022

								N	ormal	Lognormal		Gamma		Nonpara metric	Average UPL by Distribution		tion	Maxim		Log		Nonparan Specifi	netric UPL cation ¹	Parametric UPL Specification ²			No. of Verification			
ID	Dates	State Program Group	Constituent	Units	n NDs	% NDs	Unique Obs.	UPL	KM UPL	UPL ROS		JPL ROS	KM UPL	Rank- based M UPL	iormal	Lognor mal	Gamma i	nparamel	Detect	Detect s	Recommended Distribution	Retests Rank	α	Retests	к	α	Samples ³	UPL	Notes	
2_101	2008-05-20 to 2022-10-12	2 DM	Alkalinity, Total (as CaCO3	i) mg/L	36 0	0%	24	4 431		440		438		426	431	440	438	426	426	426	0.120 Gamma; Lognormal; Normal	Gamma	3 1	0.00151	2	2.32	0.0140		1 438	
2_103	2008-05-20 to 2022-10-12	2 DM	Arsenic	mg/L	36 25	69%	16	3	0.00427	0.00714	0.00481		0.00452	0.0500	0.00427	0.00598	0.00452	0.0500	0.0500	0.00545	0.876 Gamma; Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.00545 a	a, d
2_104	2008-10-14 to 2022-10-12	2 DM I	Barium	mg/L	35 0	0%	22	2 0.0860	0	.0921	0.	.0869		0.137	0.0860	0.0921	0.0869	0.137	0.137	0.137	0.558 Nonparametric	Nonparametric	3 1	0.00164	2	2.33	0.0139		2 0.137	
2_105	2015-05-12 to 2022-10-12	2 DM 1	Beryllium	mg/L	22 17	77%		9	0.000851		0.000821		0.000785	0.000500	000851 0	0.000821 0	.000785	0.000500	0.00134	0.00134	0.815 Gamma; Lognormal	Nonparametric	4 2	0.00455	2	2.50	0.0116		3 0.000500 a	a
2 106	2008-10-14 to 2022-10-12	2 DM 1	Boron	mg/L	35 1	3%	24	4	0.498	0.569	0.569	0.5	44 0.543	1.00	0.498	0.569	0.543	1.00	1.00	0.480	0.261 Gamma; Lognormal; Normal	Gamma	3 1	0.00164	2	2.33	0.0139		1 0.480 c	d
2 107	2008-05-20 to 2022-10-12	2 DM	Cadmium	mg/L	36 30	83%	1	7	0.00177		0.00174		0.00174	0.00500	0.00177	0.00174	0.00174	0.00500	0.00500	0.00200	0.449 Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.00200 a	a, d
2_108	2008-05-20 to 2022-10-12	2 DM	Calcium	mg/L	36 0	0%	21	1 67.2		71.8		70.3		68.2	67.2	71.8	70.3	68.2	68.2	68.2	0.171 Normal	Normal	3 1	0.00151	2	2.32	0.0140		1 67.2	
2_109	2008-05-20 to 2022-10-12	2 DM	Chloride (as CI)	mg/L	35 0	0%	26	5 92.6		94.1		93.6		92.6	92.6	94.1	93.6	92.6	92.6	92.6	0.230 Nonparametric	Nonparametric	3 1	0.00164	2	2.33	0.0139		2 92.6	
2_110	2008-05-20 to 2022-10-12	2 DM	Chromium, Total	mg/L	36 27	75%	12	2	0.00439	0.0058	0.00430		0.00426	0.0250	0.00439	0.00508	0.00426	0.0250	0.0250	0.00677	0.670 Gamma; Lognormal; Normal	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.00677 a	a, d
2_113	2008-05-20 to 2022-10-12	2 DM 1	Hardness (as CACO3)	mg/L	36 0	0%	19	9 332		354		347		340	332	354	347	340	340	340	0.172 Normal	Normal	3 1	0.00151	2	2.32	0.0140		1 332	
2_114	2008-05-20 to 2022-10-12	2 DM 1	Iron	mg/L	35 9	25%	25	5	3.54	11.8	7.59		5.15	4.96	3.54	9.67	5.15	4.96	4.96	4.96	1.53 Lognormal	Nonparametric	3 1	0.00164	2	2.33	0.0139		2 4.96	
2_115	2008-05-20 to 2022-10-12	2 DM 1	Lead	mg/L	36 20	56%	22	2	0.0102	0.0223	0.0233		0.0151	0.0187	0.0102	0.0228	0.0151	0.0187	0.0187	0.0187	1.32 Gamma; Lognormal	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.0187 a	a
2 117	2008-05-20 to 2022-10-12	2 DM 1	Magnesium	mg/L	36 0	0%	18	8 40.5		43.1		42.3		44.6	40.5	43.1	42.3	44.6	44.6	44.6	0.184 Nonparametric	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 44.6	
2 120	2009-05-19 to 2014-10-0	7 DM 1	Nitrate + Nitrite (as N)	mg/L	12 0	0%	12	2						5.30				5.30	5.30	5.30	Normal	Nonparametric	5 1	0.00214	3	2.12	0.0325		2 5.30	
2 121	2008-05-20 to 2022-10-12	2 DM 1	Nitrogen, Nitrate (as N)	mg/L	36 1	3%	36	5	9.47		25.7		15.5	8.47	9.47	25.7	15.5	8.47	8.47	8.47	0.863 Normal	Normal	3 1	0.00151	2	2.32	0.0140		1 9.47	
2_122	2008-05-20 to 2022-10-12	2 DM 1	Nitrogen, Nitrite (as N)	mg/L	36 35	97%	4	4						0.200				0.200	0.200	0.0410		Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.0410 a	a, c, d
2_123	2020-05-12 to 2022-10-12	2 DM 1	Potassium	mg/L	12 0	0%	10	5.28		5.23		5.25		5.82	5.28	5.23	5.25	5.82	5.82	5.82	0.148 Nonparametric	Nonparametric	5 1	0.00214	3	2.12	0.0325		4 5.82	
2_127	2008-05-20 to 2022-10-12	2 DM 3	Selenium	mg/L	36 4	11%	24	4	0.00584	0.00757	0.00773	0.006	82 0.00691	0.00600	0.00584	0.00765	0.00687	0.00600	0.00600	0.00600	0.542 Lognormal	Lognormal	3 1	0.00151	2	2.32	0.0140		1 0.00765	
2_128	2008-05-20 to 2022-10-12	2 DM 3	Silver	mg/L	36 36	100%	. 6	3						0.0100				0.0100	0.0100)		Nonparametric	3 1	0.00151	2	2.32	0.0140		2 0.0100 #	a, b, c
2_129	2008-10-14 to 2022-10-12	2 DM 3	Sodium	mg/L	35 0	0%	21	1 185		194		191		180	185	194	191	180	180	180	0.154 Gamma; Lognormal; Normal	Gamma	3 1	0.00164	2	2.33	0.0139		1 191	
2_130	2008-10-14 to 2022-10-12	2 DM 3	Sulfate (as SO4)	mg/L	34 0	0%	27	7 161		165		164		180	161	165	164	180	180	180	0.199 Nonparametric	Nonparametric	3 1	0.00178	2	2.34	0.0138		2 180	
2 132	2008-10-14 to 2022-10-12	2 DM	Total Dissolved Solids	mg/L	35 0	0%	27	7 708		711		710		740	706	711	710	740	740	740 0	0.0852 Nonparametric	Nonparametric	3 1	0.00164	2	2.33	0.0139		2 740	
2 133	2008-05-20 to 2022-10-12	2 DM	Total Suspended Solids	mg/L	36 20	56%	15	5	310	916	258		248	543	310	587	248	543	543	543	1.50 Gamma; Lognormal	Nonparametric	3 1	0.00151	2	2.32	0.0140		2 543 a	a

Notes
a: Nonparametric methods were used since the percent below MDL is greater than 50%.
b: Constituent is 100% non-detects so the maximum detection Imit is chosen as the BTV. Double Quantification Rule (DDR) is recommended for determining if an exceedance has occurred.
c: Maximum detected value was chosen as the UPL as the number of detects is less than 4.
d: Sample contains MDLs that are greater than the maximum detect value.

¹ The number of releases and the rank of the order statistic for nonparametric UPLs are chosen such that the confidence level does not exceed the per-constituent faise positive rate of 0.04778, and such that the test power exceeds the EPA Reference Power Curver (EPAC) at either 3 standard deviations (SD) above background, 4 SDs above background, or both. The maximum per-constituent faise positive rate is computed based on a site-wide faise positive rate of 10% subdivided across 21 constituents. Tartioper varies by sample size, rate is poted back for all samples sizes in the data dangings the EPRC.

² The number of relations and the value of the K factor are chosen such that the confidence level does not exceed the per-test faite positive rate of 000584, and such that be lest power exceeds the ERPC at either 3 SDs above background, or 50x background, or 50x background, or 50x background, and such that be lest power varies by sample size, and is plotted below for all sample sizes in the data allongside the ERPC.

³ The number of verification samples is equal to (*m* - 1), where *m* represents the number of releasts in a 1-ofm releasting plan. For each row, if the recommended distribution is parametric then the value in this column is based on the number of releasts under a parametric UPL specification. Otherwise, it is based on the number of releasts and a specification.



Attachment 3

Unfiltered Assessment Monitoring UPLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 UPLs for Assessment Monitoring

	ID Dates	s	tate Program Group	Constituent	Units n	NDs 9	6 NDs I	Unique Obs.	No	rmal	L	ognormal	Gamma		P	lonparametric	Av	Average UPL by Distribution			Maximu	Maximum Detect	Log SD of Detects	Distributions Fit (based on detected data)	Recommended Distribution	Nonparametric UPL Specification ¹		E UPL on ¹	Parametric UPL Specification ²	No. of Verification Samples	UPL	Notes
									UPL	KM UPL	UPL R	OS UPL KM UPL	UPL	ROS UPL K	KM UPL R	ank-based UPL	Normal L	ognormal	Gamma No	onparametric			Detects			Retests	Rank	α	Retests K a			
1_	_102 2019-05-28 to 202	22-10-12 A	м	Antimony	mg/L 14	1 14	100%	1								0.00500				0.00500	0.0050	0			Nonparametric	4	4 17	0.00432	2 2.37 0.019	3 3	0.0050	J0 a, b, c
1_	_111 2019-05-28 to 202	22-10-12 A	м	Cobalt	mg/L 14	1 5	36%	9		0.00202		0.00267 0.00199			0.00197	0.00254	0.00202	0.00233	0.00197	0.00254	0.0025	4 0.00254	0.43	34 Gamma; Lognormal	Gamma	4	4 17	0.00432	2 2.37 0.019	3 1	0.0019	<i>3</i> 7
1	112 2019-05-28 to 202	22-10-12 A	м	Fluoride	mg/L 14	1 0	0%	13	0.784		0.854		0.831			0.660	0.784	0.854	0.831	0.660	0.66	0 0.660	0.20	9 Gamma; Lognormal; Normal	Gamma	4	4 17	0.00432	2 2.37 0.019	3 1	1 0.83	31
1	116 2019-05-28 to 202	22-10-12 A	м	Lithium	mg/L 14	1 0	0%	11	0.0522		0.0531		0.0529			0.0510	0.0522	0.0531	0.0529	0.0510	0.051	0 0.0510	0.11	2 Gamma; Lognormal; Normal	Gamma	4	4 17	0.00432	2 2.37 0.019	3 1	1 0.052	29
1_	_118 2019-05-28 to 202	22-10-12 A	M	Mercury	mg/L 14	4 14	100%	1								0.000200				0.000200	0.00020	0			Nonparametric	4	4 17	0.00432	2 2.37 0.019	3 3	3 0.00020	J0 a, b, c
1_	_119 2019-05-28 to 202	22-10-12 A	м	Molybdenum	mg/L 14	1 0	0%	14	0.0117	(0.0149		0.0136			0.0110	0.0117	0.0149	0.0136	0.0110	0.011	0 0.0110	0.49	97 Nonparametric	Nonparametric	4	4 17	0.00432	2 2.37 0.019	3 3	3 0.011	10
1_	_124 2019-05-28 to 202	22-10-12 A	м	Radium-226	pCi/L 14	1 0	0%	14	1.23		1.52		1.36			1.30	1.23	1.52	1.36	1.30	1.3	0 1.30	0.71	13 Lognormal	Lognormal	4	4 17	0.00432	2 2.37 0.019	3 1	1 1.5	<i>i</i> 2
1_	_125 2019-05-28 to 202	22-10-12 A	м	Radium-226+228	pCi/L 14	1 0	0%	14	4.37		8.11		5.95			4.50	4.37	8.11	5.95	4.50	4.50	0 4.50	0.82	28 Gamma; Lognormal; Normal	Gamma	4	4 17	0.00432	2 2.37 0.019	3 1	1 5.9	J5
1	126 2019-05-28 to 207	22-10-12 A	м	Radium-228	pCi/L 14	1 0	0%	14	3.55		13.7		6.28			3.20	3.55	13.7	6.28	3.20	3.20	0 3.20	1.2	6 Gamma; Lognormal; Normal	Gamma	4	4 17	0.00432	2 2.37 0.019	3 1	1 6.2	28
100																						-				_	A	other states of the				

Carne

- EPPC

Note a Nonparametric methods were used since the percent below MDL is greater than 50%. b: Constituent is 100% non-detects so the maximum detection limit is chosen as the BTV. Double Quantification Rule (DQR) is recommended for determining if an exceedance has occurred. c: Maximum detected value was chosen as the UFL as the number of detects is less than 4.

¹ The number of releasts and the rank of the order statistic for nonparametric UPLs are chosen such that the confidence level does not exceed the per-constituent take positive rate of 0.014338, and such that the test power exceeds the EPA Reference Power Curve (ERPC) at ether 3 standard deviations (SD) above background, 4 SDs above background, or both. The maximum per-constituent take positive rate is computed based on a sile-wide faile positive rate of 10% subdivided across 7 constituents. Test power varies by sample size, and is plotted below for all asongoids the ERPC.
² The number of releasts and the value of the K factor are chosen such that the confidence level does not exceed the per-test faile positive rate is computed based on a sile-wide faile positive rate of 10% subdivided across 7 constituents and 7 downgradient wells. Test power varies by sample size, and is plotted below for all sample sizes in the cata alongide the ERPC.

³ The number of verification samples is equal to (m - 1), where m represents the number of releasts in a 1-dm releasting plan. For each row, if the recommended distribution is parametric then the value in this column is based on the number of releasts under a parametric UPL specification. Otherwise, it is based on the number of releasts under a nonparametric specification.



Attachment 4

Filtered Assessment Monitoring UPLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022

ID	Dates	State Program G	roup Constituent	Units	n NDs	% ND:	s Unique Obs	N	lormal		Lognormal	Gamma		Nonparametric		c Average UPL by Distril		by Distrib	oution	Maximu	Maximum Detect	Log SD of	Distributions Fit (based on detected data)	Recommended Distribution	Nonparametric UPL Specification ¹		PL Parametric UPL Specification ²		No. of Verification Samples ³	UPL	Notes
								UPL	KM UPL	UPL	ROS UPL KM UPL	UPL F	ROS UPL	KM UPL Ran	k-based UPL	Normal L	ognormal	Samma No	onparametric			Detects			Retests	Rank	a Retests	Κα			
1_10	2 2019-05-28 to 2022-	10-12 AM	Antimony	mg/L	14 14	1009	× ·	1							0.00500				0.00500	0.00500	0			Nonparametric	4	1 0.0	0432 2	2.37 0.0193	3	0.00500	a, b, c
1_11	11 2019-05-28 to 2022-	10-12 AM	Cobalt	mg/L	14 5	369	16 1	9	0.00202		0.00267 0.00199			0.00197	0.00254	0.00202	0.00233	0.00197	0.00254	0.00254	4 0.00254	0.434	4 Gamma; Lognormal	Gamma	4	1 0.0	0432 2	2.37 0.0193	1	0.00197	1 1
1.1	12 2019-05-28 to 2022-	10-12 AM	Fluoride	mg/L	14 0	09	% 1:	3 0.784	4	0.854		0.831			0.660	0.784	0.854	0.831	0.660	0.660	0 0.660	0.20	9 Gamma; Lognormal; Normal	Gamma	4	1 0.0	0432 2	2.37 0.0193	1	0.831	
1.1	16 2019-05-28 to 2022-	10-12 AM	Lithium	mg/L	14 0	09	% 1 [.]	1 0.0522	2	0.0531		0.0529			0.0510	0.0522	0.0531	0.0529	0.0510	0.0510	0 0.0510	0.11	2 Gamma; Lognormal; Normal	Gamma	4	1 0.0	0432 2	2.37 0.0193	1	0.0529	,
1_11	18 2019-05-28 to 2022-	10-12 AM	Mercury	mg/L	14 14	1009	× ·	1							0.000200				0.000200	0.000200	0			Nonparametric	4	1 0.0	0432 2	2.37 0.0193	3	0.000200	/a, b, c
1_11	19 2019-05-28 to 2022-	10-12 AM	Molybdenum	mg/L	14 0	09	No 14	4 0.0117	7	0.0149		0.0136			0.0110	0.0117	0.0149	0.0136	0.0110	0.0110	0 0.0110	0.49	7 Nonparametric	Nonparametric	4	1 0.0	0432 2	2.37 0.0193	3	0.0110	1
1_13	24 2019-05-28 to 2022-	10-12 AM	Radium-226	pCi/L	14 0	09	No 14	4 1.23	3	1.52		1.36			1.30	1.23	1.52	1.36	1.30	1.30	0 1.30	0.71	3 Lognormal	Lognormal	4	1 0.0	0432 2	2.37 0.0193	1	1.52	1
1_13	25 2019-05-28 to 2022-	10-12 AM	Radium-226+22	8 pCi/L	14 0	09	No 14	4 4.37	7	8.11		5.95			4.50	4.37	8.11	5.95	4.50	4.50	0 4.50	0.82	8 Gamma; Lognormal; Normal	Gamma	4	1 0.0	0432 2	2.37 0.0193	1	5.95	1
1_13	26 2019-05-28 to 2022-	10-12 AM	Radium-228	pCi/L	14 0	09	No 14	4 3.55	5	13.7		6.28			3.20	3.55	13.7	6.28	3.20	3.20	0 3.20	1.2	6 Gamma; Lognormal; Normal	Gamma	4	1 0.0	0432 2	2.37 0.0193	1	6.28	1
1 13	31 2019-05-28 to 2022-	10-12 AM	Thallium	mg/L	14 14	100%	%	1							0.00100				0.00100	0.00100	0			Nonparametric	4	1 0.0	0432 2	2.37 0.0193	3	0.00100	a, b, c

Notes a: Nonparametric methods were used since the percent below MDL is greater than 50%. b: Constituent is 100% non-detects so the maximum detection limit is chosen as the BTV. Double Quantification Rule (DQR) is recommended for determining if an exceedance has occurred. c: Maximum detected value was chosen as the UFL as the number of detects is less than 4. d: Sample continue that the than the maximum detect value.

¹ The number of releasts and the rank of the order statistic for nonparametric UPLs are chosen such that the confidence level does not exceed the per-constituent take positive rate of 0.014338, and such that the test power exceeds the EPA Reference Power Curve (ERPC) at ether 3 standard deviations (SD) above background, 4 SDs above background, or both. The maximum per-constituent take positive rate is computed based on a sile-wide faile positive rate of 10% subdivided across 7 constituents. Test power varies by sample size, and is plotted below for all asongoids the ERPC.
² The number of releasts and the value of the K factor are chosen such that the confidence level does not exceed the per-test faile positive rate is computed based on a sile-wide faile positive rate of 10% subdivided across 7 constituents and 7 downgradient wells. Test power varies by sample size, and is plotted below for all sample sizes in the cata alongide the ERPC.

³ The number of verification samples is equal to/m - 1), where m represents the number of retests in a 1-ofm retesting plan. For each row, if the recommended distribution is parametric then the value in this column is based on the number of retests under a parametric UPL specification. Otherwise, it is based on the number of retests under a nonparametric specification.



Attachment 5 Unfiltered Plots

AM: Antimony, MW-7 & MW-24

ID: 1_102



Histogram





Boxplot





Well

AM: Cobalt, MW-7 & MW-24

ID: 1_111






Well

MW-7 (n = 8)





Trend Regression: Piecewise Linear-Linear

Cobalt, MW-7 & MW-24 (mg/L)



AM: Fluoride, MW-7 & MW-24

ID: 1_112



01/01/22

01/01/20



Boxplot Fluoride, MW-7 & MW-24 (mg/L)





Well









Trend Regression: Piecewise Linear-Linear

AM: Lithium, MW-7 & MW-24



Scatter Plot by Well





Boxplot Lithium, MW-7 & MW-24 (mg/L)





Boxplot by Well









AM: Mercury, MW-7 & MW-24



Histogram





Boxplot





Well

AM: Molybdenum, MW-7 & MW-24



Scatter Plot by Well Molybdenum, MW-7 & MW-24 (mg/L)





Boxplot

Molybdenum, MW-7 & MW-24 (mg/L)





Boxplot by Well









AM: Radium-226, MW-7 & MW-24















AM: Radium-226+228, MW-7 & MW-24

ID: 1_125

Scatter Plot

Radium-226+228, MW-7 & MW-24 (pCi/L)



Scatter Plot by Well

Radium-226+228, MW-7 & MW-24 (pCi/L)





Boxplot by Season

Radium-226+228, MW-7 & MW-24 (pCi/L)



Radium-226+228, MW-7 & MW-24 (pCi/L)



Normal Q-Q plot









AM: Radium-228, MW-7 & MW-24

ID: 1_126

Scatter Plot





Scatter Plot by Well




Boxplot by Season

Radium-228, MW-7 & MW-24 (pCi/L)



Boxplot by Well





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



01/01/22



01/01/21

Date

0

01/01/20

AM: Thallium, MW-7 & MW-24

ID: 1_131



Histogram





Boxplot





Well

DM: Alkalinity, Total (as CaCO3), MW-7 & MW-24

ID: 2_101



Scatter Plot by Well





Boxplot



Boxplot by Season

Alkalinity, Total (as CaCO3), MW-7 & MW-24 (mg/L)



Boxplot by Well





Gamma Q-Q plot





Trend Regression: Piecewise Linear-Linear



DM: Arsenic, MW-7 & MW-24



Histogram Arsenic, MW-7 & MW-24 (mg/L) Percentage of Total Frequency 60% Distributions 40% - Density 20% 0% 0.00 0.02 0.01 0.03 0.04 0.05 Value

Boxplot Arsenic, MW-7 & MW-24 (mg/L)







FC



FC



DM: Barium, MW-7 & MW-24



Scatter Plot by Well













Trend Regression: Piecewise Linear-Linear

DM: Beryllium, MW-7 & MW-24



Histogram Beryllium, MW-7 & MW-24 (mg/L) 40% Percentage of Total Frequency 30% Distributions - Density 20% 10% 0% 0.0000 0.0005 0.0010 Value Boxplot Beryllium, MW-7 & MW-24 (mg/L) . 0.0010 -Data Type Detect • Value Outlier Type 0.0005 Major 0.0000 -





Well

(n = 16)

MW - 24(n = 6)



FC



DM: Boron, MW-7 & MW-24





Valmont SP ・ノく Upgradient Wells MW-7 and MW-24 as of October 2022



Well



FC



Trend Regression: Piecewise Linear-Linear-Linear Boron, MW-7 & MW-24 (mg/L)



DM: Cadmium, MW-7 & MW-24




Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Boxplot by Season





-)7



Cadmium, MW-7 & MW-24 (mg/L) 0.006 0.004 Data Type Value Detect Non-detect 0.002 01/01/10 01/01/15 01/01/20 Date

Trend Regression: Piecewise Linear-Linear

DM: Calcium, MW-7 & MW-24



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Boxplot by Well







Calcium, MW-7 & MW-24 (mg/L) 70 60 Value Data Type 50 Detect 40 30 01/01/15 01/01/10 01/01/20 Date

Trend Regression: Piecewise Linear-Linear

DM: Chloride (as Cl), MW-7 & MW-24

ID: 2_109



Chloride (as Cl), MW-7 & MW-24 (mg/L)



Scatter Plot by Well





Boxplot by Season

Chloride (as Cl), MW-7 & MW-24 (mg/L)



Boxplot by Well









Chloride (as Cl), MW-7 & MW-24 (mg/L)



DM: Chromium, Total, MW-7 & MW-24



Scatter Plot by Well









FC





DM: Hardness (as CACO3), MW-7 & MW-24



Scatter Plot by Well







Boxplot by Season

Hardness (as CACO3), MW-7 & MW-24 (mg/L)



Boxplot by Well

Hardness (as CACO3), MW-7 & MW-24 (mg/L)







Trend Regression: Piecewise Linear-Linear

Hardness (as CACO3), MW-7 & MW-24 (mg/L)



DM: Iron, MW-7 & MW-24





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Well



Date



Date

DM: Lead, MW-7 & MW-24







Well



-DS







DM: Magnesium, MW-7 & MW-24



Scatter Plot by Well






Boxplot by Well



Normal Q-Q plot



01/01/15 Date 01/01/20

01/01/10



Trend Regression: Piecewise Linear-Linear

DM: Nitrate + Nitrite (as N), MW-7 & MW-24

ID: 2_120

Scatter Plot

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Scatter Plot by Well



Histogram



Boxplot

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)





Boxplot by Season

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





DM: Nitrogen, Nitrate (as N), MW-7 & MW-24

ID: 2_121







Boxplot Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)



Boxplot by Season

Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)







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FSS

DM: Nitrogen, Nitrite (as N), MW-7 & MW-24

ID: 2_122

Scatter Plot

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)



Scatter Plot by Well

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)





Boxplot by Season

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)





DM: Potassium, MW-7 & MW-24

ID: 2_123

Scatter Plot



Scatter Plot by Well

Potassium, MW-7 & MW-24 (mg/L)





Boxplot by Season

Potassium, MW-7 & MW-24 (mg/L)







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07/01/20

01/01/21

07/01/21

Date

01/01/22

07/01/22



DM: Selenium, MW-7 & MW-24

ID: 2_127



Boxplot Selenium, MW-7 & MW-24 (mg/L)









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Trend Regression: Piecewise Linear-Linear





DM: Silver, MW-7 & MW-24

ID: 2_128





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Boxplot by Season



DM: Sodium, MW-7 & MW-24

ID: 2_129



Date

Histogram Sodium, MW-7 & MW-24 (mg/L) 30% Percentage of Total Frequency 20% Distributions - Density 10% 0% 150 100 200 250 300 Value Boxplot Sodium, MW-7 & MW-24 (mg/L) • 300 Outlier Type 250 Major • Value 500 Minor •

200 -Data Type • Detect Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022






Trend Regression: Piecewise Linear-Linear Sodium, MW-7 & MW-24 (mg/L)



DM: Sulfate (as SO4), MW-7 & MW-24

ID: 2_130









Well

MW-7(n = 30)

MW-24

(n = 6)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

Sulfate (as SO4), MW-7 & MW-24 (mg/L)





Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-7 & MW-24 (mg/L)



DM: Total Dissolved Solids, MW-7 & MW-24

ID: 2_132



Scatter Plot by Well







Boxplot by Well









DM: Total Suspended Solids, MW-7 & MW-24

ID: 2_133



Scatter Plot by Well

Total Suspended Solids, MW-7 & MW-24 (mg/L)





FSS

Boxplot by Season

Total Suspended Solids, MW-7 & MW-24 (mg/L)



Boxplot by Well

Total Suspended Solids, MW-7 & MW-24 (mg/L)



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



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Attachment 6 Filtered Plots

AM: Antimony, MW-7 & MW-24

ID: 1_102



Histogram





Boxplot





Well

AM: Cobalt, MW-7 & MW-24

ID: 1_111





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Well

MW-7 (n = 8)





Trend Regression: Piecewise Linear-Linear

Cobalt, MW-7 & MW-24 (mg/L)



AM: Fluoride, MW-7 & MW-24

ID: 1_112



01/01/22

01/01/20



Boxplot Fluoride, MW-7 & MW-24 (mg/L)





Well

(n = 8)

Valmont SP トノく Upgradient Wells MW-7 and MW-24 as of October 2022



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022







Trend Regression: Piecewise Linear-Linear

AM: Lithium, MW-7 & MW-24

ID: 1_116



Scatter Plot by Well





Boxplot Lithium, MW-7 & MW-24 (mg/L)





Boxplot by Well





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022




AM: Mercury, MW-7 & MW-24

ID: 1_118



Histogram





Boxplot





Well

AM: Molybdenum, MW-7 & MW-24

ID: 1_119



Scatter Plot by Well Molybdenum, MW-7 & MW-24 (mg/L)





Boxplot

Molybdenum, MW-7 & MW-24 (mg/L)





Boxplot by Well





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





AM: Radium-226, MW-7 & MW-24

ID: 1_124









Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022







AM: Radium-226+228, MW-7 & MW-24

ID: 1_125

Scatter Plot

Radium-226+228, MW-7 & MW-24 (pCi/L)



Scatter Plot by Well

Radium-226+228, MW-7 & MW-24 (pCi/L)





Boxplot by Season

Radium-226+228, MW-7 & MW-24 (pCi/L)





Normal Q-Q plot





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





AM: Radium-228, MW-7 & MW-24

ID: 1_126

Scatter Plot





Scatter Plot by Well





FJS

Boxplot by Season

Radium-228, MW-7 & MW-24 (pCi/L)



Boxplot by Well





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



01/01/22



01/01/21

Date

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01/01/20

AM: Thallium, MW-7 & MW-24

ID: 1_131



Histogram





Boxplot





Well

DM: Alkalinity, Total (as CaCO3), MW-7 & MW-24

ID: 2_101



Scatter Plot by Well





Boxplot



Boxplot by Season

Alkalinity, Total (as CaCO3), MW-7 & MW-24 (mg/L)



Boxplot by Well





Gamma Q-Q plot





Trend Regression: Piecewise Linear-Linear



DM: Arsenic, MW-7 & MW-24

ID: 2_103


Histogram Arsenic, MW-7 & MW-24 (mg/L) Percentage of Total Frequency 60% Distributions 40% - Density 20% 0% 0.00 0.02 0.01 0.03 0.04 0.05 Value Boxplot

Arsenic, MW-7 & MW-24 (mg/L)







FC



FC



DM: Barium, MW-7 & MW-24



Scatter Plot by Well







Well



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DM: Beryllium, MW-7 & MW-24



Histogram Beryllium, MW-7 & MW-24 (mg/L) 40% Percentage of Total Frequency 30% Distributions - Density 20% 10% 0% 0.0000 0.0005 0.0010 Value Boxplot Beryllium, MW-7 & MW-24 (mg/L) . 0.0010 -Data Type Detect • Value Outlier Type 0.0005 Major 0.0000 -







FC



DM: Boron, MW-7 & MW-24











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DM: Cadmium, MW-7 & MW-24





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



MŴ-7 (n = 30)



0.001

MW–24 (n = 6)

Well



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Cadmium, MW-7 & MW-24 (mg/L) 0.006 0.004 Data Type Value Detect Non-detect 0.002 01/01/10 01/01/15 01/01/20 Date

Trend Regression: Piecewise Linear-Linear

DM: Calcium, MW-7 & MW-24



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Boxplot by Well







Calcium, MW-7 & MW-24 (mg/L) 70 60 Value Data Type 50 Detect 40 30 01/01/15 01/01/10 01/01/20 Date

Trend Regression: Piecewise Linear-Linear

DM: Chloride (as Cl), MW-7 & MW-24





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Boxplot by Season

Chloride (as Cl), MW-7 & MW-24 (mg/L)



Boxplot by Well

Chloride (as CI), MW-7 & MW-24 (mg/L)









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DM: Chromium, Total, MW-7 & MW-24



Scatter Plot by Well









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DM: Hardness (as CACO3), MW-7 & MW-24



Scatter Plot by Well







Boxplot by Season

Hardness (as CACO3), MW-7 & MW-24 (mg/L)



Boxplot by Well

Hardness (as CACO3), MW-7 & MW-24 (mg/L)







Trend Regression: Piecewise Linear-Linear

Hardness (as CACO3), MW-7 & MW-24 (mg/L)



DM: Iron, MW-7 & MW-24

ID: 2_114

Scatter Plot

Iron, MW-7 & MW-24 (mg/L)





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





Trend Regression: Mann-Kendall/Theil-Sen Estimate







Trend Regression: Piecewise Linear-Linear

Iron, MW-7 & MW-24 (mg/L)



DM: Lead, MW-7 & MW-24







Well



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DM: Magnesium, MW-7 & MW-24



Scatter Plot by Well







Boxplot by Well



Normal Q-Q plot



01/01/15 Date 01/01/20

01/01/10



Trend Regression: Piecewise Linear-Linear

DM: Nitrate + Nitrite (as N), MW-7 & MW-24

ID: 2_120

Scatter Plot

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Scatter Plot by Well



Histogram



Boxplot

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)





Boxplot by Season

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrate + Nitrite (as N), MW-7 & MW-24 (mg/L)



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





DM: Nitrogen, Nitrate (as N), MW-7 & MW-24







Boxplot Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)



Boxplot by Season

Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrogen, Nitrate (as N), MW-7 & MW-24 (mg/L)







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FSS
DM: Nitrogen, Nitrite (as N), MW-7 & MW-24

ID: 2_122

Scatter Plot

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)



Scatter Plot by Well

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)





Boxplot by Season

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)



Boxplot by Well

Nitrogen, Nitrite (as N), MW-7 & MW-24 (mg/L)





DM: Potassium, MW-7 & MW-24

ID: 2_123

Scatter Plot



Scatter Plot by Well

Potassium, MW-7 & MW-24 (mg/L)





Boxplot by Season

Potassium, MW-7 & MW-24 (mg/L)







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07/01/20

01/01/21

07/01/21

Date

01/01/22

07/01/22



DM: Selenium, MW-7 & MW-24

ID: 2_127



Boxplot Selenium, MW-7 & MW-24 (mg/L)









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Trend Regression: Piecewise Linear-Linear





DM: Silver, MW-7 & MW-24

ID: 2_128







Well

Boxplot by Season



DM: Sodium, MW-7 & MW-24

ID: 2_129





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Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Boxplot by Well





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022





Trend Regression: Piecewise Linear-Linear





DM: Sulfate (as SO4), MW-7 & MW-24

ID: 2_130



Scatter Plot by Well

Sulfate (as SO4), MW-7 & MW-24 (mg/L)





Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022

Boxplot by Season

Sulfate (as SO4), MW-7 & MW-24 (mg/L)



Boxplot by Well





Date



Trend Regression: Piecewise Linear-Linear





DM: Total Dissolved Solids, MW-7 & MW-24

ID: 2_132



Scatter Plot by Well







Boxplot by Well





Date



Trend Regression: Piecewise Linear-Linear





DM: Total Suspended Solids, MW-7 & MW-24

ID: 2_133



Scatter Plot by Well

Total Suspended Solids, MW-7 & MW-24 (mg/L)




Boxplot by Season

Total Suspended Solids, MW-7 & MW-24 (mg/L)



Boxplot by Well

Total Suspended Solids, MW-7 & MW-24 (mg/L)



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022



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Attachment 7 Filtered Tables

Table 1: Summary Statistics, Non-Detects Included

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_102	MW-7 & MW-24	АМ	Antimony	mg/L	14	14	100%	2019-05-28 to 2022-10-12		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	2019-05-28 to 2022-10-12	Gamma; Lognormal	Gamma	0.000811	0.000675	0.000500	0.00254	0.000530	0.653	0.000259	3.03	10.2
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.531	0.495	0.350	0.660	0.107	0.201	0.163	-0.143	-1.31
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.0410	0.0401	0.0360	0.0510	0.00473	0.115	0.00459	0.801	-0.208
1_118	MW-7 & MW-24	AM	Mercury	mg/L	14	14	100%	2019-05-28 to 2022-10-12		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Nonparametric	Nonparametric	0.00519	0.00332	0.00280	0.0110	0.00275	0.530	0.000696	0.905	-0.462
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Lognormal	Lognormal	0.373	0.255	0.110	1.30	0.361	0.969	0.119	2.13	3.59
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	1.53	1.24	0.240	4.50	1.20	0.785	0.867	1.37	1.68
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	1.16	0.940	0.0300	3.20	1.01	0.876	0.785	1.02	0.0156
1_131	MW-7 & MW-24	AM	Thallium	mg/L	14	14	100%	2019-05-28 to 2022-10-12		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	336	330	277	426	41.0	0.122	43.7	0.542	-0.391
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Nonparametric	0.0139	0.00190	0.000500	0.0500	0.0212	1.52	0.00207	1.18	-0.611
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	0.0302	0.0210	0.00680	0.137	0.0240	0.794	0.00444	3.00	11.1
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	2015-05-12 to 2022-10-12	Gamma; Lognormal	Nonparametric	0.000222	0.000100	0.0000500	0.00134	0.000281	1.27	0.0000741	3.28	12.6
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	2008-10-14 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.341	0.330	0.160	1.00	0.137	0.402	0.0741	3.27	15.6
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	2008-05-20 to 2022-10-12	Lognormal; Normal	Nonparametric	0.00160	0.000640	0.000500	0.00500	0.00155	0.967	0.000207	1.41	0.819
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Normal	Normal	48.9	50.0	28.0	68.2	7.89	0.161	4.44	-0.211	1.04
2_109	MW-7 & MW-24	DM	Chloride (as CI)	mg/L	35	0	0%	2008-05-20 to 2022-10-12	Nonparametric	Nonparametric	56.7	50.0	45.3	92.6	15.4	0.271	4.15	1.74	1.32
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Nonparametric	0.00423	0.00500	0.00100	0.0250	0.00398	0.941	0	4.16	22
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Normal	Normal	241	250	150	340	39.4	0.164	25.2	-0.198	0.564
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	2008-05-20 to 2022-10-12	Lognormal	Nonparametric	0.675	0.144	0.0300	4.96	1.25	1.85	0.139	2.48	5.51
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	2008-05-20 to 2022-10-12	Gamma; Lognormal	Nonparametric	0.00288	0.00200	0.000100	0.0187	0.00351	1.22	0.00222	2.91	11.3
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Nonparametric	Nonparametric	28.6	29.0	19.0	44.6	5.13	0.179	2.52	0.330	1.90
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	2009-05-19 to 2014-10-07	Normal	Normal	3.15	3.05	0	5.30	1.51	0.479	1.33	-0.510	0.399
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	2008-05-20 to 2022-10-12	Normal	Normal	3.90	4.05	0.200	8.47	2.44	0.625	3.39	0.0263	-1.28
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	2008-05-20 to 2022-10-12		Nonparametric	0.103	0.100	0.0410	0.200	0.0575	0.561	0.0741	0.842	-0.685
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	2020-05-12 to 2022-10-12	Nonparametric	Nonparametric	3.87	3.70	3.40	5.82	0.666	0.172	0.222	2.69	7.71
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	2008-05-20 to 2022-10-12	Lognormal	Lognormal	0.00285	0.00212	0.000940	0.00600	0.00151	0.528	0.00141	0.490	-1.20
2_128	MW-7 & MW-24	DM	Silver	mg/L	36	36	100%	2008-05-20 to 2022-10-12		Nonparametric	0.00159	0.000500	0.000100	0.0100	0.00221	1.39	0.000593	2.05	4.89
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	137	140	95.0	180	20.3	0.148	14.8	-0.143	0.0433
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	106	99.8	80.7	180	23.7	0.223	15.0	1.64	2.50
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	585	570	480	740	51.8	0.0886	29.6	1.20	1.92
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	2008-05-20 to 2022-10-12	Gamma; Lognormal	Nonparametric	48.4	10.0	5.00	543	115	2.37	0	3.62	13

^a Non-detects are excluded from goodness-of-fit tests.

Table 2: Summary Statistics, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	2019-05-28 to 2022-10-12	Gamma; Lognormal	Gamma	0.000983	0.000810	0.000600	0.00254	0.000602	0.612	0.000237	2.68	7.53
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.531	0.495	0.350	0.660	0.107	0.201	0.163	-0.143	-1.31
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.0410	0.0401	0.0360	0.0510	0.00473	0.115	0.00459	0.801	-0.208
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	2019-05-28 to 2022-10-12	Nonparametric	Nonparametric	0.00519	0.00332	0.00280	0.0110	0.00275	0.530	0.000696	0.905	-0.462
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Lognormal	Lognormal	0.373	0.255	0.110	1.30	0.361	0.969	0.119	2.13	3.59
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	1.53	1.24	0.240	4.50	1.20	0.785	0.867	1.37	1.68
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	2019-05-28 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	1.16	0.940	0.0300	3.20	1.01	0.876	0.785	1.02	0.0156
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	336	330	277	426	41.0	0.122	43.7	0.542	-0.391
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Nonparametric	0.00204	0.00140	0.000500	0.00545	0.00175	0.859	0.00124	1.19	0.343
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	0.0302	0.0210	0.00680	0.137	0.0240	0.794	0.00444	3.00	11.1
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	2015-05-12 to 2022-10-12	Gamma; Lognormal	Nonparametric	0.000496	0.000350	0.000170	0.00134	0.000483	0.974	0.000222	1.99	4.10
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	2008-10-14 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	0.322	0.325	0.160	0.480	0.0769	0.239	0.0667	-0.163	-0.132
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	2008-05-20 to 2022-10-12	Lognormal; Normal	Nonparametric	0.00145	0.00150	0.000780	0.00200	0.000608	0.420	0.000741	-0.0546	-3.17
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Normal	Normal	48.9	50.0	28.0	68.2	7.89	0.161	4.44	-0.211	1.04
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	2008-05-20 to 2022-10-12	Nonparametric	Nonparametric	56.7	50.0	45.3	92.6	15.4	0.271	4.15	1.74	1.32
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	2008-05-20 to 2022-10-12	Gamma; Lognormal; Normal	Nonparametric	0.00237	0.00161	0.00101	0.00677	0.00192	0.811	0.000800	1.84	3.22
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Normal	Normal	241	250	150	340	39.4	0.164	25.2	-0.198	0.564
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	2008-05-20 to 2022-10-12	Lognormal	Nonparametric	0.891	0.260	0.0300	4.96	1.39	1.56	0.304	2.02	3.23
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	2008-05-20 to 2022-10-12	Gamma; Lognormal	Nonparametric	0.00382	0.00195	0.000100	0.0187	0.00478	1.25	0.00195	2.26	5.92
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	2008-05-20 to 2022-10-12	Nonparametric	Nonparametric	28.6	29.0	19.0	44.6	5.13	0.179	2.52	0.330	1.90
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	2009-05-19 to 2014-10-07	Normal	Normal	3.15	3.05	0	5.30	1.51	0.479	1.33	-0.510	0.399
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	2008-05-20 to 2022-10-12	Normal	Normal	4.00	4.11	0.410	8.47	2.39	0.596	3.39	0.00409	-1.26
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	2008-05-20 to 2022-10-12		Nonparametric	0.0410	0.0410	0.0410	0.0410	NA	NA	0	NA	NA
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	2020-05-12 to 2022-10-12	Nonparametric	Nonparametric	3.87	3.70	3.40	5.82	0.666	0.172	0.222	2.69	7.71
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	2008-05-20 to 2022-10-12	Lognormal	Lognormal	0.00265	0.00210	0.000940	0.00600	0.00144	0.544	0.00111	0.758	-0.678
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Gamma; Lognormal; Normal	Gamma	137	140	95.0	180	20.3	0.148	14.8	-0.143	0.0433
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	106	99.8	80.7	180	23.7	0.223	15.0	1.64	2.50
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	2008-10-14 to 2022-10-12	Nonparametric	Nonparametric	585	570	480	740	51.8	0.0886	29.6	1.20	1.92
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	2008-05-20 to 2022-10-12	Gamma; Lognormal	Nonparametric	97.3	21.0	5.00	543	162	1.66	23	2.21	4.08

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

									Nor	mal			Logn	ormal			Gar	mma				
								S	-W	Lilli	efors	S	S-W	Lilli	efors		K-S		A-D			
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution								
1_102	MW-7 & MW-24	AM	Antimony	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	0.614	0.000	0.345	0.003	0.774	0.010	0.248	0.115	0.272	0.05 <= p < 0.10	1.080	< 0.01	0.434	Gamma; Lognormal	Gamma
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	0.891	0.083	0.186	0.212	0.892	0.088	0.180	0.251	0.191	>= 0.10	0.665	0.05 <= p < 0.10	0.209	Gamma; Lognormal; Normal	Gamma
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	0.898	0.106	0.180	0.253	0.909	0.150	0.179	0.262	0.182	>= 0.10	0.514	>= 0.10	0.112	Gamma; Lognormal; Normal	Gamma
1_118	MW-7 & MW-24	AM	Mercury	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	0.811	0.007	0.313	0.001	0.822	0.010	0.299	0.001	0.315	< 0.01	1.218	< 0.01	0.497	Nonparametric	Nonparametric
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	0.649	0.000	0.349	0.000	0.884	0.066	0.195	0.157	0.251	0.01 <= p < 0.05	1.169	< 0.01	0.713	Lognormal	Lognormal
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	0.877	0.052	0.194	0.165	0.984	0.991	0.088	0.994	0.096	>= 0.10	0.138	>= 0.10	0.828	Gamma; Lognormal; Normal	Gamma
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	0.878	0.054	0.190	0.185	0.916	0.193	0.149	0.540	0.095	>= 0.10	0.172	>= 0.10	1.258	Gamma; Lognormal; Normal	Gamma
1_131	MW-7 & MW-24	AM	Thallium	mg/L	14	14	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	0.952	0.123	0.097	0.530	0.965	0.295	0.078	0.845	0.083	>= 0.10	0.326	>= 0.10	0.120	Gamma; Lognormal; Normal	Gamma
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	0.822	0.018	0.191	0.318	0.904	0.209	0.208	0.205	0.208	>= 0.10	0.474	>= 0.10	0.876	Gamma; Lognormal; Normal	Nonparametric
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	0.621	0.000	0.316	0.000	0.842	0.000	0.247	0.000	0.283	< 0.01	3.299	< 0.01	0.558	Nonparametric	Nonparametric
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	0.739	0.024	0.363	0.030	0.905	0.440	0.235	0.484	0.286	>= 0.10	0.466	>= 0.10	0.815	Gamma; Lognormal	Nonparametric
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	0.986	0.928	0.075	0.895	0.945	0.089	0.116	0.294	0.097	>= 0.10	0.391	>= 0.10	0.261	Gamma; Lognormal; Normal	Gamma
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	0.751	0.020	0.318	0.058	0.781	0.039	0.316	0.062	0.338	0.01 <= p < 0.05	0.800	0.01 <= p < 0.05	0.449	Lognormal; Normal	Nonparametric
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	0.954	0.141	0.154	0.030	0.922	0.014	0.189	0.002	0.177	< 0.01	0.984	0.01 <= p < 0.05	0.171	Normal	Normal
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	0.623	0.000	0.365	0.000	0.669	0.000	0.329	0.000	0.344	< 0.01	5.488	< 0.01	0.230	Nonparametric	Nonparametric
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	0.756	0.006	0.242	0.133	0.874	0.135	0.222	0.224	0.228	>= 0.10	0.635	0.05 <= p < 0.10	0.670	Gamma; Lognormal; Normal	Nonparametric
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	0.948	0.087	0.159	0.022	0.923	0.015	0.191	0.002	0.181	< 0.01	1.220	< 0.01	0.172	Normal	Normal
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	0.650	0.000	0.335	0.000	0.949	0.221	0.135	0.254	0.222	< 0.01	1.192	< 0.01	1.528	Lognormal	Nonparametric
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	0.728	0.000	0.248	0.010	0.969	0.825	0.123	0.744	0.130	>= 0.10	0.354	>= 0.10	1.324	Gamma; Lognormal	Nonparametric
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	0.890	0.002	0.202	0.001	0.886	0.001	0.237	0.000	0.225	< 0.01	1.925	< 0.01	0.184	Nonparametric	Nonparametric
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	0.961	0.793	0.133	0.809	NA	NA	NA	NA	NA		NA		NA	Normal	Normal
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	0.945	0.077	0.109	0.361	0.881	0.001	0.167	0.014	0.152	0.01 <= p < 0.05	1.008	0.01 <= p < 0.05	0.863	Normal	Normal
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	0.631	0.000	0.363	0.000	0.687	0.001	0.339	0.000	0.348	< 0.01	1.616	< 0.01	0.148	Nonparametric	Nonparametric
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	0.882	0.002	0.247	0.000	0.939	0.072	0.157	0.044	0.192	< 0.01	0.937	0.01 <= p < 0.05	0.542	Lognormal	Lognormal
2_128	MW-7 & MW-24	DM	Silver	mg/L	36	36	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	0.970	0.435	0.132	0.124	0.951	0.125	0.161	0.022	0.150	0.01 <= p < 0.05	0.605	>= 0.10	0.154	Gamma; Lognormal; Normal	Gamma
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	0.824	0.000	0.195	0.002	0.890	0.003	0.165	0.020	0.175	< 0.01	1.447	< 0.01	0.199	Nonparametric	Nonparametric
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	0.876	0.001	0.229	0.000	0.901	0.004	0.211	0.000	0.217	< 0.01	1.681	< 0.01	0.085	Nonparametric	Nonparametric
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	0.619	0.000	0.322	0.000	0.922	0.184	0.154	0.390	0.213	0.05 <= p < 0.10	0.981	0.01 <= p < 0.05	1.499	Gamma; Lognormal	Nonparametric

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 4: Autocorrelation Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	-0.177	0.533	
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	-0.318	0.187	
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	-0.003	0.991	
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	-0.436	0.070	
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	-0.273	0.258	
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	-0.053	0.827	
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	0.129	0.593	
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	0.588	0.000	***
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	0.011	0.968	
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	0.013	0.937	
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	-0.322	0.341	
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	-0.036	0.829	
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	0.520	0.107	
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	0.207	0.196	
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	0.050	0.758	
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	-0.180	0.527	
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	0.265	0.097	
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	0.015	0.936	
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	-0.217	0.343	
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	0.256	0.110	
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	0.447	0.080	
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	0.158	0.331	
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	NA	NA	
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	-0.014	0.957	
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	-0.037	0.828	
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	-0.194	0.232	
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	0.029	0.858	
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	0.229	0.157	
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	-0.253	0.267	

*** p < 0.001, ** p < 0.01, * p < 0.05



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022

Table 5: Outlier Counts by Date

Date	Count
2008-05-20	1
2008-10-14	1
2009-05-19	1
2015-09-29	1
2020-05-12	3
2020-10-14	3
2021-05-17	3
2021-10-14	8
2022-06-17	3
2022-10-12	3

 Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Dilution	Value
1_111	MW-24	AM	Cobalt	mg/L	14	5	36%	9	2021-10-14	1	0.00254
1_124	MW-24	AM	Radium-226	pCi/L	14	0	0%	14	2021-10-14	1	1.30
2_104	MW-24	DM	Barium	mg/L	35	0	0%	35	2021-10-14	1	0.137
2_104	MW-24	DM	Barium	mg/L	35	0	0%	35	2020-05-12	1	0.0670
2_104	MW-7	DM	Barium	mg/L	35	0	0%	35	2008-10-14	1	0.0650
2_104	MW-24	DM	Barium	mg/L	35	0	0%	35	2020-10-14	1	0.0580
2_104	MW-24	DM	Barium	mg/L	35	0	0%	35	2021-05-17	1	0.0548
2_104	MW-24	DM	Barium	mg/L	35	0	0%	35	2022-10-12	NA	0.0535
2_104	MW-7	DM	Barium	mg/L	35	0	0%	35	2022-06-17	NA	0.0497
2_104	MW-7	DM	Barium	mg/L	35	0	0%	35	2015-09-29	1	0.00680
2_104	MW-7	DM	Barium	mg/L	35	0	0%	35	2009-05-19	1	0.0330
2_105	MW-24	DM	Beryllium	mg/L	22	17	77%	5	2021-10-14	1	0.00134
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2022-10-12	NA	92.6
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2020-10-14	1	92.0
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2022-06-17	NA	90.9
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2020-05-12	1	90.1
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2021-10-14	1	87.7
2_109	MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	35	2021-05-17	1	83.8
2_114	MW-7	DM	Iron	mg/L	35	9	25%	26	2008-05-20	1	4.96
2_114	MW-24	DM	Iron	mg/L	35	9	25%	26	2021-05-17	1	4.43
2_114	MW-24	DM	Iron	mg/L	35	9	25%	26	2020-05-12	1	3.50
2_114	MW-24	DM	Iron	mg/L	35	9	25%	26	2022-10-12	NA	1.97
2_114	MW-7	DM	Iron	mg/L	35	9	25%	26	2022-06-17	NA	1.95
2_114	MW-24	DM	Iron	mg/L	35	9	25%	26	2020-10-14	1	1.70
2_115	MW-24	DM	Lead	mg/L	36	20	56%	16	2021-10-14	1	0.0187
2_123	MW-24	DM	Potassium	mg/L	12	0	0%	12	2021-10-14	1	5.82
2_133	MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	16	2021-10-14	1	543



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022

Table 7: Seasonality Tests

										Full									Without Non-De	etects			
							Sample S	Size				p-Value				Sample S	Size				p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA	Log ANOVA		Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA	Log ANOVA	
1_102	MW-7 & MW-24	AM	Antimony	mg/L	100%	5	2	7	14	NA	NA	0.441	0.441	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	36%	5	2	7	14	0.715	NA	0.783	0.809	NA	3	1	5	9	0.329	NA	0.883	0.875	NA
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	0%	5	2	7	14	0.686	NA	0.827	0.788	NA	5	2	7	14	0.686	NA	0.827	0.788	NA
1_116	MW-7 & MW-24	AM	Lithium	mg/L	0%	5	2	7	14	0.935	NA	0.975	0.987	NA	5	2	7	14	0.935	NA	0.975	0.987	NA
1_118	MW-7 & MW-24	AM	Mercury	mg/L	100%	5	2	7	14	NA	NA	0.441	0.441	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	0%	5	2	7	14	0.839	NA	0.979	0.998	NA	5	2	7	14	0.839	NA	0.979	0.998	NA
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	0%	5	2	7	14	0.306	NA	0.824	0.588	NA	5	2	7	14	0.306	NA	0.824	0.588	NA
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	0%	5	2	7	14	0.186	NA	0.205	0.241	NA	5	2	7	14	0.186	NA	0.205	0.241	NA
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	0%	5	2	7	14	0.169	NA	0.047	* 0.286	NA	5	2	7	14	0.169	NA	0.047	* 0.286	NA
1_131	MW-7 & MW-24	AM	Thallium	mg/L	100%	5	2	7	14	NA	NA	0.441	0.441	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	0%	16	2	18	36	0.737	NA	0.717	0.725	NA	16	2	18	36	0.737	NA	0.717	0.725	NA
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	69%	16	2	18	36	0.507	NA	0.668	0.565	NA	6	1	4	11	0.744	NA	0.903	0.925	NA
2_104	MW-7 & MW-24	DM	Barium	mg/L	0%	15	2	18	35	0.897	NA	0.781	0.927	NA	15	2	18	35	0.897	NA	0.781	0.927	NA
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	77%	9	2	11	22	0.705	NA	0.586	0.625	NA	2	0	3	5	0.564	NA	0.735	0.939	NA
2_106	MW-7 & MW-24	DM	Boron	mg/L	3%	15	2	18	35	0.980	NA	0.823	0.876	NA	15	2	17	34	0.887	NA	0.956	0.974	NA
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	83%	16	2	18	36	0.406	NA	0.587	0.460	NA	3	0	3	6	0.487	NA	0.511	0.504	NA
2_108	MW-7 & MW-24	DM	Calcium	mg/L	0%	16	2	18	36	0.901	NA	0.735	0.702	NA	16	2	18	36	0.901	NA	0.735	0.702	NA
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	0%	15	2	18	35	0.357	NA	0.391	0.395	NA	15	2	18	35	0.357	NA	0.391	0.395	NA
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	75%	16	2	18	36	0.082	NA	0.308	0.065	NA	4	1	4	9	0.753	NA	0.750	0.723	NA
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	0%	16	2	18	36	0.784	NA	0.710	0.682	NA	16	2	18	36	0.784	NA	0.710	0.682	NA
2_114	MW-7 & MW-24	DM	Iron	mg/L	25%	16	2	17	35	0.593	NA	0.383	0.547	NA	12	2	12	26	0.866	NA	0.429	0.781	NA
2_115	MW-7 & MW-24	DM	Lead	mg/L	56%	16	2	18	36	0.835	NA	0.782	0.774	NA	7	1	8	16	0.863	NA	0.882	0.899	NA
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	0%	16	2	18	36	0.687	NA	0.691	0.672	NA	16	2	18	36	0.687	NA	0.691	0.672	NA
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	0%	6	0	6	12	0.631	NA	0.566	NA	NA	6	0	6	12	0.631	NA	0.566	NA	NA
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	3%	16	2	18	36	0.881	NA	0.924	0.689	NA	15	2	18	35	0.883	NA	0.867	0.737	NA
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	97%	16	2	18	36	0.561	NA	0.721	0.690	NA	0	1	0	1	NA	NA	NA	NA	NA
2_123	MW-7 & MW-24	DM	Potassium	mg/L	0%	4	2	6	12	0.473	NA	0.675	0.660	NA	4	2	6	12	0.473	NA	0.675	0.660	NA
2_127	MW-7 & MW-24	DM	Selenium	mg/L	11%	16	2	18	36	0.892	NA	0.773	0.979	NA	14	2	16	32	0.967	NA	0.903	0.996	NA
2_128	MW-7 & MW-24	DM	Silver	mg/L	100%	16	2	18	36	0.299	NA	0.629	0.312	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_129	MW-7 & MW-24	DM	Sodium	mg/L	0%	15	2	18	35	0.422	NA	0.682	0.654	NA	15	2	18	35	0.422	NA	0.682	0.654	NA
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	0%	14	2	18	34	0.648	NA	0.719	0.719	NA	14	2	18	34	0.648	NA	0.719	0.719	NA
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	0%	15	2	18	35	0.293	NA	0.351	0.346	NA	15	2	18	35	0.293	NA	0.351	0.346	NA
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	56%	16	2	18	36	0.665	NA	0.987	0.706	NA	7	1	8	16	0.562	NA	0.985	0.715	NA

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 8: Spatial Variability Tests

									Fi	ıll								Without No	on-Dete	ects			
						Sa	mple Size)			p-Value	•			Sa	mple Size				p-Value	•		
ID	Well	Constituent Type	Constituent	Unit	% NDs	MW-24	MW-7	Total	Kruskal-Wallis		ANOVA		Log ANOVA		MW-24	MW-7	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
1_102	MW-7 & MW-24	AM	Antimony	mg/L	100%	6	8	14	NA		0.408		0.408		NA	NA	NA	NA		NA		NA	
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	36%	6	8	14	0.074		0.103		0.066		5	4	9	0.176		0.266		0.215	
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	0%	6	8	14	0.002	**	0.000	***	0.000	***	6	8	14	0.002	**	0.000	***	0.000	***
1_116	MW-7 & MW-24	AM	Lithium	mg/L	0%	6	8	14	0.559		0.436		0.441		6	8	14	0.559		0.436		0.441	
1_118	MW-7 & MW-24	AM	Mercury	mg/L	100%	6	8	14	NA		0.408		0.408		NA	NA	NA	NA		NA		NA	
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	0%	6	8	14	0.053		0.011	*	0.009	**	6	8	14	0.053		0.011	*	0.009	**
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	0%	6	8	14	0.197		0.087		0.124		6	8	14	0.197		0.087		0.124	
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	0%	6	8	14	0.439		0.224		0.537		6	8	14	0.439		0.224		0.537	
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	0%	6	8	14	0.699		0.403		0.900		6	8	14	0.699		0.403		0.900	
1_131	MW-7 & MW-24	AM	Thallium	mg/L	100%	6	8	14	NA		0.408		0.408		NA	NA	NA	NA		NA		NA	
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	0%	6	30	36	0.005	**	0.008	**	0.006	**	6	30	36	0.005	**	0.008	**	0.006	**
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	69%	6	30	36	0.914		0.146		0.468		5	6	11	0.045	*	0.227		0.062	
2_104	MW-7 & MW-24	DM	Barium	mg/L	0%	6	29	35	0.011	*	0.000	***	0.000	***	6	29	35	0.011	*	0.000	***	0.000	***
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	77%	6	16	22	0.032	*	0.029	*	0.015	*	5	0	5	NA		NA		NA	
2_106	MW-7 & MW-24	DM	Boron	mg/L	3%	6	29	35	0.357		0.844		0.518		6	28	34	0.278		0.305		0.251	
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	83%	6	30	36	0.014	*	0.055		0.017	*	0	6	6	NA		NA		NA	
2_108	MW-7 & MW-24	DM	Calcium	mg/L	0%	6	30	36	0.010	*	0.008	**	0.008	**	6	30	36	0.010	*	0.008	**	0.008	**
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	0%	6	29	35	0.000	***	0.000	***	0.000	***	6	29	35	0.000	***	0.000	***	0.000	***
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	75%	6	30	36	0.048	*	0.221		0.033	*	4	5	9	0.462		0.341		0.335	
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	0%	6	30	36	0.007	**	0.005	**	0.005	**	6	30	36	0.007	**	0.005	**	0.005	**
2_114	MW-7 & MW-24	DM	Iron	mg/L	25%	5	30	35	0.007	**	0.001	***	0.001	***	5	21	26	0.025	*	0.006	**	0.006	**
2_115	MW-7 & MW-24	DM	Lead	mg/L	56%	6	30	36	0.066		0.010	*	0.054		5	11	16	0.027	*	0.048	*	0.028	*
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	0%	6	30	36	0.011	*	0.009	**	0.005	**	6	30	36	0.011	*	0.009	**	0.005	**
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	0%	0	12	12	NA		NA		NA		0	12	12	NA		NA		NA	
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	3%	6	30	36	0.001	***	0.000	***	0.000	***	6	29	35	0.000	***	0.000	***	0.000	***
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	97%	6	30	36	0.002	**	0.010	**	0.002	**	1	0	1	NA		NA		NA	
2_123	MW-7 & MW-24	DM	Potassium	mg/L	0%	6	6	12	0.810		0.288		0.297		6	6	12	0.810		0.288		0.297	
2_127	MW-7 & MW-24	DM	Selenium	mg/L	11%	6	30	36	0.269		0.194		0.311		6	26	32	0.468		0.325		0.490	
2_128	MW-7 & MW-24	DM	Silver	mg/L	100%	6	30	36	0.005	**	0.069		0.004	**	NA	NA	NA	NA		NA		NA	
2_129	MW-7 & MW-24	DM	Sodium	mg/L	0%	6	29	35	0.010	*	0.017	*	0.022	*	6	29	35	0.010	*	0.017	*	0.022	*
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	0%	6	28	34	0.222		0.225		0.212		6	28	34	0.222		0.225		0.212	
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	0%	6	29	35	0.393		0.966		0.897		6	29	35	0.393		0.966		0.897	
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	56%	6	30	36	0.000	***	0.000	***	0.000	***	6	10	16	0.002	**	0.006	**	0.000	***

*** p < 0.001, ** p < 0.01, * p < 0.05





Table 9: Trend Tests: Lognormal MLE and MK

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Туре	Method	Slope	p-value	Trend
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	Parametric	Lognormal MLE	0.000151	0.740	\leftrightarrow
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	Parametric	Lognormal MLE	0.0000302	0.828	\leftrightarrow
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	Parametric	Lognormal MLE	0.0000446	0.543	\leftrightarrow
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	Nonparametric	МК	-0.000000163	0.912	\leftrightarrow
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	Parametric	Lognormal MLE	-0.000113	0.811	\leftrightarrow
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	Parametric	Lognormal MLE	0.000435	0.418	\leftrightarrow
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	Parametric	Lognormal MLE	0.000294	0.724	\leftrightarrow
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	Parametric	Lognormal MLE	-0.0000531	0.000	\downarrow
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	Nonparametric	МК	0	0.977	\leftrightarrow
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	Parametric	Lognormal MLE	-0.0000416	0.132	\leftrightarrow
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	Parametric	Lognormal MLE	-0.0000455	0.003	\downarrow
2_109	MW-7 & MW-24	DM	Chloride (as CI)	mg/L	35	0	0%	Nonparametric	МК	0.00197	0.000	↑
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	Parametric	Lognormal MLE	-0.0000535	0.000	\downarrow
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	Nonparametric	МК	0.0000407	0.001	↑
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	Nonparametric	МК	-0.00135	0.006	\downarrow
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	Parametric	Lognormal MLE	0.0000999	0.303	\leftrightarrow
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	Nonparametric	МК	-0.000221	0.531	\leftrightarrow
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	Parametric	Lognormal MLE	0.000162	0.005	¢
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	Parametric	Lognormal MLE	-0.0000115	0.466	\leftrightarrow
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	Nonparametric	МК	-0.00187	0.241	\leftrightarrow
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	Nonparametric	МК	0	0.955	\leftrightarrow

Table 10: Trend Tests: Piecewise Linear-Linear

								L	ine 1		Line	2				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_111	MW-7 & MW-24	AM	Cobalt	mg/L	14	5	36%	0.00000108	0.165	\leftrightarrow	-0.00000230	0.113	\leftrightarrow	2021-10-13	0.345	\leftrightarrow
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	0.000166	0.899	\leftrightarrow	-0.0000110	0.923	\leftrightarrow	2020-05-11	0.023	\leftrightarrow
1_116	MW-7 & MW-24	AM	Lithium	mg/L	14	0	0%	0.0000116	0.024	\leftrightarrow	-0.0000296	0.407	\leftrightarrow	2021-12-02	0.478	\leftrightarrow
1_119	MW-7 & MW-24	AM	Molybdenum	mg/L	14	0	0%	0.00000197	0.577	\leftrightarrow	-0.00000668	0.809	\leftrightarrow	2022-01-15	0.045	\leftrightarrow
1_124	MW-7 & MW-24	AM	Radium-226	pCi/L	14	0	0%	0.000542	0.337	\leftrightarrow	-0.00129	0.223	\leftrightarrow	2021-10-13	0.213	\leftrightarrow
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	0.00210	0.035	\leftrightarrow	-0.225	0.376	\leftrightarrow	2022-09-30	0.432	\leftrightarrow
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	0.00192	0.019	\leftrightarrow	-0.228	0.263	\leftrightarrow	2022-10-01	0.498	\leftrightarrow
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	-0.0397	0.000	Ļ	-0.00556	0.334	\leftrightarrow	2014-10-06	0.671	\leftrightarrow
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	0.0000250	0.009	↑	-0.0000123	0.001	\downarrow	2013-05-14	0.401	\leftrightarrow
2_104	MW-7 & MW-24	DM	Barium	mg/L	35	0	0%	-0.0000110	0.175	\leftrightarrow	0.0000154	0.017	\leftrightarrow	2015-09-28	0.238	\leftrightarrow
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	0.000000634	0.499	\leftrightarrow	-0.000000550	0.834	\leftrightarrow	2021-10-14	0.049	\leftrightarrow
2_106	MW-7 & MW-24	DM	Boron	mg/L	35	1	3%	-0.00190	0.001	Ļ	-0.00000549	0.567	\leftrightarrow	2009-09-05	0.679	\leftrightarrow
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	-0.000000618	0.001	Ļ	-0.0000000000555	1.000	\leftrightarrow	2021-04-14	0.411	\leftrightarrow
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	-0.0107	0.009	Ļ	0.0000408	0.972	\leftrightarrow	2012-11-18	0.410	\leftrightarrow
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	0.000538	0.878	\leftrightarrow	0.0110	0.017	\leftrightarrow	2016-09-26	0.385	\leftrightarrow

(Table continues on next page)



Valmont SP Upgradient Wells MW-7 and MW-24 as of October 2022

Table 10: Trend Tests: Piecewise Linear-Linear (continued)

								L	ine 1		Line	2				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	-0.0000152	0.278	\leftrightarrow	-0.000000430	0.310	\leftrightarrow	2009-10-21	0.263	\leftrightarrow
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	-0.0315	0.001	\downarrow	0.00748	0.430	\leftrightarrow	2016-05-02	0.459	\leftrightarrow
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	-0.0155	0.107	\leftrightarrow	0.000338	0.004	↑	2009-03-14	0.449	\leftrightarrow
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	-0.000000811	0.256	\leftrightarrow	0.00000191	0.366	\leftrightarrow	2018-07-20	0.065	\leftrightarrow
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	-0.0155	0.026	\leftrightarrow	-0.000769	0.136	\leftrightarrow	2010-07-15	0.483	\leftrightarrow
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	0.00408	0.199	\leftrightarrow	0.00159	0.017	\leftrightarrow	2010-09-27	0.819	\leftrightarrow
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	0.00203	0.000	1	-0.00190	0.007	\downarrow	2016-10-17	0.443	\leftrightarrow
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	-0.0000401	0.000	\downarrow	0.0000294	0.175	\leftrightarrow	2019-11-28	0.854	\leftrightarrow
2_123	MW-7 & MW-24	DM	Potassium	mg/L	12	0	0%	0.00136	0.296	\leftrightarrow	-0.00251	0.687	\leftrightarrow	2021-10-14	0.229	\leftrightarrow
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	-0.00000537	0.026	\leftrightarrow	0.00000362	0.045	\leftrightarrow	2010-05-31	0.287	\leftrightarrow
2_128	MW-7 & MW-24	DM	Silver	mg/L	36	36	100%	0.000000467	0.305	\leftrightarrow	-0.00000198	0.028	\leftrightarrow	2017-05-22	0.287	\leftrightarrow
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	-0.00580	0.126	\leftrightarrow	0.0179	0.272	\leftrightarrow	2019-05-28	0.109	\leftrightarrow
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	0.00302	0.564	\leftrightarrow	-0.00976	0.502	\leftrightarrow	2018-05-09	0.036	\leftrightarrow
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	-0.124	0.172	\leftrightarrow	0.00708	0.317	\leftrightarrow	2011-01-09	0.145	\leftrightarrow
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	0.00379	0.873	\leftrightarrow	0.0695	0.224	\leftrightarrow	2018-02-26	0.159	\leftrightarrow

Table 11: Trend Tests: Piecewise Linear-Linear

								L	ine 1		L	ine 2		L	ine 3				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Sq
1_112	MW-7 & MW-24	AM	Fluoride	mg/L	14	0	0%	0.0000571	0.761	\leftrightarrow	-0.000240	0.646	\leftrightarrow	0.0317	0.308	\leftrightarrow	2021-09-25	2022-10-05	
1_125	MW-7 & MW-24	AM	Radium-226+228	pCi/L	14	0	0%	-0.00444	0.698	\leftrightarrow	0.00319	0.031	\leftrightarrow	-0.225	0.385	\leftrightarrow	2020-01-30	2022-09-28	
1_126	MW-7 & MW-24	AM	Radium-228	pCi/L	14	0	0%	-0.000354	0.836	\leftrightarrow	0.00963	0.090	\leftrightarrow	-0.0173	0.030	\leftrightarrow	2021-05-02	2022-04-10	
2_101	MW-7 & MW-24	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	-0.0626	0.071	\leftrightarrow	-0.0171	0.003	\downarrow	0.0235	0.438	\leftrightarrow	2011-05-09	2020-09-08	
2_103	MW-7 & MW-24	DM	Arsenic	mg/L	36	25	69%	0.0000262	0.000	↑	-0.000146	0.005	\downarrow	0.00000562	0.197	\leftrightarrow	2015-04-30	2016-07-08	
2_105	MW-7 & MW-24	DM	Beryllium	mg/L	22	17	77%	-0.000000254	0.307	\leftrightarrow	0.000000460	0.168	\leftrightarrow	-0.00000104	0.684	\leftrightarrow	2019-01-22	2021-10-14	
2_107	MW-7 & MW-24	DM	Cadmium	mg/L	36	30	83%	0.0000130	0.260	\leftrightarrow	-0.0000174	0.113	\leftrightarrow	-0.000000496	0.002	Ļ	2009-03-25	2009-10-22	
2_108	MW-7 & MW-24	DM	Calcium	mg/L	36	0	0%	-0.00743	0.000	\downarrow	0.0109	0.478	\leftrightarrow	-0.00298	0.426	\leftrightarrow	2016-05-03	2018-08-29	
2_109	MW-7 & MW-24	DM	Chloride (as Cl)	mg/L	35	0	0%	0.00109	0.695	\leftrightarrow	0.0202	0.181	\leftrightarrow	0.00201	0.931	\leftrightarrow	2018-04-26	2020-10-14	
2_110	MW-7 & MW-24	DM	Chromium, Total	mg/L	36	27	75%	-0.0000193	0.038	\leftrightarrow	0.00000378	0.422	\leftrightarrow	-0.00000109	0.102	\leftrightarrow	2009-12-31	2013-01-05	
2_113	MW-7 & MW-24	DM	Hardness (as CACO3)	mg/L	36	0	0%	-0.0365	0.000	\downarrow	0.0401	0.322	\leftrightarrow	-0.0142	0.499	\leftrightarrow	2016-05-02	2018-11-09	
2_114	MW-7 & MW-24	DM	Iron	mg/L	35	9	25%	-0.0144	0.138	\leftrightarrow	0.000140	0.603	\leftrightarrow	0.000653	0.150	\leftrightarrow	2009-03-14	2017-07-22	
2_115	MW-7 & MW-24	DM	Lead	mg/L	36	20	56%	-0.00000962	0.274	\leftrightarrow	0.00000677	0.208	\leftrightarrow	-0.00000747	0.431	\leftrightarrow	2010-05-16	2021-10-13	
2_117	MW-7 & MW-24	DM	Magnesium	mg/L	36	0	0%	-0.0356	0.342	\leftrightarrow	-0.00255	0.079	\leftrightarrow	0.000276	0.817	\leftrightarrow	2009-03-25	2016-05-02	
2_120	MW-7 & MW-24	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	0.0141	0.068	\leftrightarrow	0.000914	0.482	\leftrightarrow	0.00268	0.075	\leftrightarrow	2009-10-23	2012-07-05	
2_121	MW-7 & MW-24	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	0.00154	0.000	1	-0.0138	0.055	\leftrightarrow	0.00210	0.414	\leftrightarrow	2019-09-20	2020-10-13	
2_122	MW-7 & MW-24	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	-0.0000602	0.000	\downarrow	-0.0000256	0.000	\downarrow	0.0000569	0.146	\leftrightarrow	2013-05-14	2021-03-30	
2_127	MW-7 & MW-24	DM	Selenium	mg/L	36	4	11%	-0.00000431	0.003	↓	0.00000159	0.048	\leftrightarrow	-0.00000308	0.492	\leftrightarrow	2011-05-28	2016-05-03	
2_128	MW-7 & MW-24	DM	Silver	mg/L	36	36	100%	0.00000645	0.158	\leftrightarrow	-0.00000367	0.103	\leftrightarrow	0.000000445	0.850	\leftrightarrow	2017-08-10	2020-06-10	
2_129	MW-7 & MW-24	DM	Sodium	mg/L	35	0	0%	-0.00680	0.076	\leftrightarrow	0.0461	0.244	\leftrightarrow	-0.0306	0.581	\leftrightarrow	2019-10-07	2021-07-16	

(Table continues on next page)



quared	Overall Trend
0.175	\leftrightarrow
0.539	\leftrightarrow
0.662	\leftrightarrow
0.686	\leftrightarrow
0.709	\leftrightarrow
0.214	\leftrightarrow
0.504	\leftrightarrow
0.457	\leftrightarrow
0.394	\leftrightarrow
0.318	\leftrightarrow
0.497	\leftrightarrow
0.469	\leftrightarrow
0.175	\leftrightarrow
0.521	\leftrightarrow
0.882	\leftrightarrow
0.513	\leftrightarrow
0.879	\leftrightarrow
0.381	\leftrightarrow
0.340	\leftrightarrow
0.163	\leftrightarrow

Table 11: Trend Tests: Piecewise Linear-Linear (continued)

							_	L	ine 1			Line 2		Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
2_130	MW-7 & MW-24	DM	Sulfate (as SO4)	mg/L	34	0	0%	-0.0946	0.557	\leftrightarrow	0.00190	0.569	\leftrightarrow	-0.175	0.422	\leftrightarrow	2009-10-21	2022-06-14	0.096	\leftrightarrow
2_132	MW-7 & MW-24	DM	Total Dissolved Solids	mg/L	35	0	0%	-0.108	0.045	\leftrightarrow	0.0518	0.151	\leftrightarrow	-0.0128	0.459	\leftrightarrow	2012-02-21	2016-05-03	0.233	\leftrightarrow
2_133	MW-7 & MW-24	DM	Total Suspended Solids	mg/L	36	20	56%	0.00225	0.886	\leftrightarrow	0.437	0.016	\leftrightarrow	-0.721	0.398	\leftrightarrow	2020-03-26	2021-10-14	0.401	\leftrightarrow



Attachment 8 Detection Monitoring UPL Table

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 UPLs for Detection Monitoring

ID	Dates	State Program Group	Constituent	Units	n	NDs	% NDs	Maxim um Detect	Recommended Distribution	UPL	Notes
2_101	2008-05-20 to 2022-10-12	DM	Alkalinity, Total (as CaCO3)	mg/L	36	0	0%	426	Gamma	438	
2_103	2008-05-20 to 2022-10-12	DM	Arsenic	mg/L	36	25	69%	0.0055	Nonparametric	0.00545	a, d
2_104	2008-10-14 to 2022-10-12	DM	Barium	mg/L	35	0	0%	0.14	Nonparametric	0.14	
2_105	2015-05-12 to 2022-10-12	DM	Beryllium	mg/L	22	17	77%	0.0013	Nonparametric	0.0005	а
2_106	2008-10-14 to 2022-10-12	DM	Boron	mg/L	35	1	3%	0.5	Gamma	0.48	d
2_107	2008-05-20 to 2022-10-12	DM	Cadmium	mg/L	36	30	83%	0.0020	Nonparametric	0.0020	a, d
2_108	2008-05-20 to 2022-10-12	DM	Calcium	mg/L	36	0	0%	68	Normal	67	
2_109	2008-05-20 to 2022-10-12	DM	Chloride (as Cl)	mg/L	35	0	0%	93	Nonparametric	93	
2_110	2008-05-20 to 2022-10-12	DM	Chromium, Total	mg/L	36	27	75%	0.0068	Nonparametric	0.007	a, d
2_113	2008-05-20 to 2022-10-12	DM	Hardness (as CACO3)	mg/L	36	0	0%	340	Normal	332	
2_114	2008-05-20 to 2022-10-12	DM	Iron	mg/L	35	9	25%	5	Nonparametric	5.0	
2_115	2008-05-20 to 2022-10-12	DM	Lead	mg/L	36	20	56%	0.019	Nonparametric	0.019	а
2_117	2008-05-20 to 2022-10-12	DM	Magnesium	mg/L	36	0	0%	45	Nonparametric	45	
2_120	2009-05-19 to 2014-10-07	DM	Nitrate + Nitrite (as N)	mg/L	12	0	0%	5.3	Nonparametric	5.3	
2_121	2008-05-20 to 2022-10-12	DM	Nitrogen, Nitrate (as N)	mg/L	36	1	3%	8.470	Normal	9.472	
2_122	2008-05-20 to 2022-10-12	DM	Nitrogen, Nitrite (as N)	mg/L	36	35	97%	0.0	Nonparametric	0.041	a, c, d
2_123	2020-05-12 to 2022-10-12	DM	Potassium	mg/L	12	0	0%	5.8200	Nonparametric	5.8200	
2_127	2008-05-20 to 2022-10-12	DM	Selenium	mg/L	36	4	11%	0.0	Lognormal	0.008	
2_128	2008-05-20 to 2022-10-12	DM	Silver	mg/L	36	36	100%		Nonparametric	0.010	a, b, c
2_129	2008-10-14 to 2022-10-12	DM	Sodium	mg/L	35	0	0%	180	Gamma	191	
2_130	2008-10-14 to 2022-10-12	DM	Sulfate (as SO4)	mg/L	34	0	0%	180	Nonparametric	180	
2_132	2008-10-14 to 2022-10-12	DM	Total Dissolved Solids	mg/L	35	0	0%	740	Nonparametric	740	
2_133	2008-05-20 to 2022-10-12	DM	Total Suspended Solids	mg/L	36	20	56%	543	Nonparametric	543	а

Notes

a: Nonparametric methods were used since the percent below MDL is greater than 50%.

b: Constituent is 100% non-detects so the maximum detection limit is chosen as the BTV. Double

c: Maximum detected value was chosen as the UPL as the number of detects is less than 4.

d: Sample contains MDLs that are greater than the maximum detect value.

Attachment 9

Assessment Monitoring UPL Table

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 UPLs for Assessment Monitoring

ID	Dates	State Program Group	Constituent	Units	n	NDs	% NDs	Maximum Detect	Recommended Distribution	UPL	Notes
1_102	2019-05-28 to 2022-10-12	AM	Antimony	mg/L	14	14	100%		Nonparametric	0.0050	a, b, c
1_111	2019-05-28 to 2022-10-12	AM	Cobalt	mg/L	14	5	36%	0.0025	Gamma	0.0020	
1_112	2019-05-28 to 2022-10-12	AM	Fluoride	mg/L	14	0	0%	0.66	Gamma	0.83	
1_116	2019-05-28 to 2022-10-12	AM	Lithium	mg/L	14	0	0%	0.051	Gamma	0.053	
1_118	2019-05-28 to 2022-10-12	AM	Mercury	mg/L	14	14	100%		Nonparametric	0.00020	a, b, c
1_119	2019-05-28 to 2022-10-12	AM	Molybdenum	mg/L	14	0	0%	0.011	Nonparametric	0.011	
1_124	2019-05-28 to 2022-10-12	AM	Radium-226	pCi/L	14	0	0%	1.3	Lognormal	1.5	
1_125	2019-05-28 to 2022-10-12	AM	Radium-226+228	pCi/L	14	0	0%	4.5	Gamma	5.9	
1_126	2019-05-28 to 2022-10-12	AM	Radium-228	pCi/L	14	0	0%	3.2	Gamma	6.3	
1_131	2019-05-28 to 2022-10-12	AM	Thallium	mg/L	14	14	100%		Nonparametric	0.0010	a, b, c

Notes

a: Nonparametric methods were used since the percent below MDL is greater than 50%.

b: Constituent is 100% non-detects so the maximum detection limit is chosen as the BTV. Double Quantification Rule (DQR) is recommended for determining if an exceeda

c: Maximum detected value was chosen as the UPL as the number of detects is less than 4.

d: Sample contains MDLs that are greater than the maximum detect value.

Attachment 10 Unfiltered UTLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 95-95 UTLs

10	Deter	State Deserve Course	Constituent	Unite		D- 0/ MD-	r un luis eu Normal Lognormal Gamma Nonparametric		Average UPL by Distribution			Mandanum	Maulanum Datast	Lon CD of Delegie	Distributions Fit (beaud on detected data)	Recommended Distribution	UTI Note											
10	Dates	State Program Group	Constituent	Units		75 75 1405	Unique Obs.	L KM UTL	MLE UTL	UTL	ROS UTL	KM UTL	MLE UTL U	TL ROS UTL	KMUTL	MLE UTL	Rank-based UTL	Normal	Lognormal	Gamma	Nonparametric	maximum	maximum betect	Log ab of betects	Distributions Fit (based on detected data)	Recommended Distribution	OIL NOIDS	e .
1_100	2 2019-05-28 to 2022-10-12	AM	Antimony	mg/L	14	14 1	1															0.00500				Nonparametric	0.00500 a, b, c	
1_11	2019-05-28 to 2022-10-12	AM	Cobalt	mg/L	14	5 0.35714	9	0.0021	5 0.00246	5	0.00310	0.00221	0.00304		0.00215	0.00277	0.00254	0.00230	0.00278	0.00215	0.00254	0.00254	0.00254	0.43428134	Gamma; Lognormal	Gamma	0.00215	
1 11:	2 2019-05-28 to 2022-10-12	AM	Fluoride	mg/L	14	0 0	13 0	810		0.900			0	.870			0.660	0.810	0.900	0.870	0.660	0.660	0.660	0.209165897	Gamma; Lognormal; Normal	Gamma	0.870	
1_11	3 2019-05-28 to 2022-10-12	AM	Lithium	mg/L	14	0 0	11 0.0	1534		0.0546			0.0	1543			0.0510	0.0534	0.0546	0.0543	0.0510	0.0510	0.0510	0.111894262	Gamma; Lognormal; Normal	Gamma	0.0543	
1 11	8 2019-05-28 to 2022-10-12	AM	Mercury	mg/L	14	14 1	1															0.000200				Nonparametric	0.000200 a, b, c	
1_11	2019-05-28 to 2022-10-12	AM	Molybdenum	mg/L	14	0 0	14 0.0	124		0.0169			0.0	150			0.0110	0.0124	0.0169	0.0150	0.0110	0.0110	0.0110	0.4974671	Nonparametric	Nonparametric	0.0110	
1_12	2019-05-28 to 2022-10-12	AM	Radium-226	pCi/L	14	0 0	14	1.32		1.81				1.55			1.30	1.32	1.81	1.55	1.30	1.30	1.30	0.712633743	Lognormal	Lognormal	1.81	
1 12	5 2019-05-28 to 2022-10-12	AM	Radium-226+2	2 pCi/L	14	0 0	14	4.67		9.95				6.80			4.50	4.67	9.95	6.80	4.50	4.50	4.50	0.82794937	Gamma; Lognormal; Normal	Gamma	6.80	
1_12	3 2019-05-28 to 2022-10-12	AM	Radium-228	pCi/L	14	0 0	14	3.80		18.7				7.41			3.20	3.80	18.7	7.41	3.20	3.20	3.20	1.25822886	Gamma; Lognormal; Normal	Gamma	7.41	
1 13	2019-05-28 to 2022-10-12	AM	Thallium	mg/L	14	14 1	1															0.00100				Nonparametric	0.00100 a, b, c	
2_10	2008-05-20 to 2022-10-12	DM	Alkalinity, Tota	il (mg/L	36	0 0	24	424		432				430			426	424	432	430	426	426	426	0.12001223	Gamma; Lognormal; Normal	Gamma	430	
2_10	3 2008-05-20 to 2022-10-12	DM	Arsenic	mg/L	36	25 0.69444	16	0.0040	6 0.00506		0.00592	0.00425	0.00734		0.00409	0.00637	0.0500	0.00456	0.00584	0.00409	0.0500	0.0500	0.00545	0.875673684	Gamma; Lognormal; Normal	Nonparametric	0.0500 a, d	
2 10	2008-05-20 to 2022-10-12	DM	Barium	mg/L	36	0 0	23 0.0	1893		0.0948			0.0	1902			0.137	0.0893	0.0948	0.0902	0.137	0.137	0.137	0.597399984	Nonparametric	Nonparametric	0.137	
2_10	5 2015-05-12 to 2022-10-12	DM	Beryllium	mg/L	22	17 0.77273	9	0.00081	0 0.00128			0.000716	0.00346		0.000701	0.00269	0.00134	0.00105	0.00209	0.000701	0.00134	0.00134	0.00134	0.815223543	Gamma; Lognormal	Nonparametric	0.00134 a	
2 10	3 2008-05-20 to 2022-10-12	DM	Boron	mg/L	36	1 0.02778	25	0.70	0 0.705	5	0.675	0.672	0.675	0.669	0.666	0.669	1.21	0.703	0.674	0.668	1.21	1.21	1.21	0.344511893	Lognormal	Lognormal	0.674	
2_10	2008-05-20 to 2022-10-12	DM	Cadmium	mg/L	36	30 0.83333	7	0.0017	0 0.00254			0.00161	0.00359		0.00163	0.00330	0.00500	0.00212	0.00260	0.00163	0.00500	0.00500	0.00200	0.449291984	Lognormal; Normal	Nonparametric	0.00500 a, d	
2 10	3 2008-05-20 to 2022-10-12	DM	Calcium	mg/L	36	0 0	21	85.9		69.8				68.6			68.2	65.9	69.8	68.6	68.2	68.2	68.2	0.17133193	Normal	Normal	65.9	
2 10	2008-05-20 to 2022-10-12	DM	Chloride (as Cl	I) mg/L	36	0 0	27	122		112				114			200	122	112	114	200	200	200	0.312052946	Nonparametric	Nonparametric	200	
2_11	2008-05-20 to 2022-10-12	DM	Chromium, Tot	tal mg/L	36	27 0.75	12	0.0041	9 0.00526		0.00521	0.00397	0.00539		0.00398	0.00528	0.0250	0.00473	0.00486	0.00398	0.0250	0.0250	0.00677	0.670311499	Gamma; Lognormal; Normal	Nonparametric	0.0250 a, d	
2 11:	8 2008-05-20 to 2022-10-12	DM	Hardness (as (C/ mg/L	36	0 0	19	326		344				338			340	326	344	338	340	340	340	0.172241209	Normal	Normal	326	
2_11	2008-05-20 to 2022-10-12	DM	Iron	mg/L	36	9 0.25	26	5.8	5 6.35		13.2	8.45	13.0		6.46	8.49	12.2	6.10	11.5	6.46	12.2	12.2	12.2	1.65900581	Lognormal	Nonparametric	12.2	
2 11	5 2008-05-20 to 2022-10-12	DM	Lead	mg/L	36	20 0.55556	22	0.0095	8 0.0117		0.0171	0.0178	0.0198		0.0125	0.0153	0.0187	0.0107	0.0183	0.0125	0.0187	0.0187	0.0187	1.324031310	Gamma; Lognormal	Nonparametric	0.0187 a	
2 11	2008-05-20 to 2022-10-12	DM	Magnesium	mg/L	36	0 0	18	39.7		41.9				41.2			44.6	39.7	41.9	41.2	44.6	44.6	44.6	0.183654838	Nonparametric	Nonparametric	44.6	
2_12	2009-05-19 to 2014-10-07	DM	Nitrate + Nitrite	e (mg/L	12	0 0	12										5.30				5.30	5.30	5.30		Normal	Nonparametric	5.30	
2 12	2008-05-20 to 2022-10-12	DM	Nitrogen, Nitra	te mg/L	36	1 0.02778	36	9.0	8 9.17			22.0	23.0		14.1	14.5	8.47	9.13	22.5	14.1	8.47	8.47	8.47	0.863362993	Normal	Normal	9.13	
2_12	2 2008-05-20 to 2022-10-12	DM	Nitrogen, Nitrit	e mg/L	36	35 0.97222	4															0.200	0.0410			Nonparametric	0.0410 a, c, d	
2 12	3 2020-05-12 to 2022-10-12	DM	Potassium	mg/L	12	0 0	10	5.69		5.73			1	5.72			5.82	5.69	5.73	5.72	5.82	5.82	5.82	0.147667909	Nonparametric	Nonparametric	5.82	
2 12	2008-05-20 to 2022-10-12	DM	Selenium	mg/L	36	4 0.11111	24	0.0056	0.00564		0.00696	0.00709	0.00705	0.00638	0.00646	0.00645	0.00600	0.00562	0.00703	0.00642	0.00600	0.00600	0.00600	0.54235853	Lognormal	Lognormal	0.00703	
2 12	3 2008-05-20 to 2022-10-12	DM	Silver	mg/L	36	36 1	6															0.0100				Nonparametric	0.0100 a, b, c	
2 12	2008-05-20 to 2022-10-12	DM	Sodium	mg/L	36	0 0	22	219		217				216			314	219	217	216	314	314	314	0.20605628	Nonparametric	Nonparametric	314	/III -
2_13	2008-05-20 to 2022-10-12	DM	Sulfate (as SO	4) mg/L	36	0 0	29	404		301				322			780	404	301	322	780	780	780	0.448454874	Nonparametric	Nonparametric	780	
2 13	2 2008-05-20 to 2022-10-12	DM	Total Dissolver	d : mg/L	36	0 0	28	843		812				819			1,181	843	812	819	1,181	1,181	1,181	0.14445052	Nonparametric	Nonparametric	1,181	
2_13	2008-05-20 to 2022-10-12	DM	Total Suspend	ec mg/L	36	20 0.55556	15	29	2 361	·	632	208	527		207	449	543	329	455	207	543	543	543	1.498885018	Gamma; Lognormal	Nonparametric	543 a	

Nexe Nexe Nexe Construction of the second back size in another the proton MOL is greater than 50%. In Construction is 100% non-detects as the maximum detection limit is chosen as the BTV. Double Quantification Rule (DQR) is recommended for determining if an exceedance has occurred. C Maximum detection who are schosen as the UTL as the number of detects is its Star 4. d Sample contains MDLs that are greater than the maximum deted value.

Attachment 11 Filtered UTLs

Valmont State Program W-7 & W-24 (pooled) as of October 14, 2022 95-95 UTLs

10	Deter	State Deserve Course	Constituent	Unite		D- 0/ MD-	r un luis eu Normal Lognormal Gamma Nonparametric		Average UPL by Distribution			Mandanum	Maulanum Datast	Law CD of Delegate	Distributions Fit (beand on detected data)	Recommended Distribution	UTI Note											
10	Dates	State Program Group	Constituent	Units		75 75 1405	Unique Obs.	L KM UTL	MLE UTL	UTL	ROS UTL	KM UTL	MLE UTL U	TL ROS UTL	KMUTL	MLE UTL	Rank-based UTL	Normal	Lognormal	Gamma	Nonparametric	maximum	maximum betect	Log ab of betects	Distributions Fit (based on detected data)	Recommended Distribution	OIL NOIDS	e .
1_100	2 2019-05-28 to 2022-10-12	AM	Antimony	mg/L	14	14 1	1															0.00500				Nonparametric	0.00500 a, b, c	
1_11	2019-05-28 to 2022-10-12	AM	Cobalt	mg/L	14	5 0.35714	9	0.0021	5 0.00246	5	0.00310	0.00221	0.00304		0.00215	0.00277	0.00254	0.00230	0.00278	0.00215	0.00254	0.00254	0.00254	0.43428134	Gamma; Lognormal	Gamma	0.00215	
1 11:	2 2019-05-28 to 2022-10-12	AM	Fluoride	mg/L	14	0 0	13 0	810		0.900			0	.870			0.660	0.810	0.900	0.870	0.660	0.660	0.660	0.209165897	Gamma; Lognormal; Normal	Gamma	0.870	
1_11	3 2019-05-28 to 2022-10-12	AM	Lithium	mg/L	14	0 0	11 0.0	1534		0.0546			0.0	1543			0.0510	0.0534	0.0546	0.0543	0.0510	0.0510	0.0510	0.111894262	Gamma; Lognormal; Normal	Gamma	0.0543	
1 11	8 2019-05-28 to 2022-10-12	AM	Mercury	mg/L	14	14 1	1															0.000200				Nonparametric	0.000200 a, b, c	
1_11	2019-05-28 to 2022-10-12	AM	Molybdenum	mg/L	14	0 0	14 0.0	124		0.0169			0.0	150			0.0110	0.0124	0.0169	0.0150	0.0110	0.0110	0.0110	0.4974671	Nonparametric	Nonparametric	0.0110	
1_12	2019-05-28 to 2022-10-12	AM	Radium-226	pCi/L	14	0 0	14	1.32		1.81				1.55			1.30	1.32	1.81	1.55	1.30	1.30	1.30	0.712633743	Lognormal	Lognormal	1.81	
1 12	5 2019-05-28 to 2022-10-12	AM	Radium-226+2	2 pCi/L	14	0 0	14	4.67		9.95				6.80			4.50	4.67	9.95	6.80	4.50	4.50	4.50	0.82794937	Gamma; Lognormal; Normal	Gamma	6.80	
1_12	3 2019-05-28 to 2022-10-12	AM	Radium-228	pCi/L	14	0 0	14	3.80		18.7				7.41			3.20	3.80	18.7	7.41	3.20	3.20	3.20	1.25822886	Gamma; Lognormal; Normal	Gamma	7.41	
1 13	2019-05-28 to 2022-10-12	AM	Thallium	mg/L	14	14 1	1															0.00100				Nonparametric	0.00100 a, b, c	
2_10	2008-05-20 to 2022-10-12	DM	Alkalinity, Tota	il (mg/L	36	0 0	24	424		432				430			426	424	432	430	426	426	426	0.12001223	Gamma; Lognormal; Normal	Gamma	430	
2_10	3 2008-05-20 to 2022-10-12	DM	Arsenic	mg/L	36	25 0.69444	16	0.0040	6 0.00506		0.00592	0.00425	0.00734		0.00409	0.00637	0.0500	0.00456	0.00584	0.00409	0.0500	0.0500	0.00545	0.875673684	Gamma; Lognormal; Normal	Nonparametric	0.0500 a, d	
2 10	2008-05-20 to 2022-10-12	DM	Barium	mg/L	36	0 0	23 0.0	1893		0.0948			0.0	1902			0.137	0.0893	0.0948	0.0902	0.137	0.137	0.137	0.597399984	Nonparametric	Nonparametric	0.137	
2_10	5 2015-05-12 to 2022-10-12	DM	Beryllium	mg/L	22	17 0.77273	9	0.00081	0 0.00128			0.000716	0.00346		0.000701	0.00269	0.00134	0.00105	0.00209	0.000701	0.00134	0.00134	0.00134	0.815223543	Gamma; Lognormal	Nonparametric	0.00134 a	
2 10	3 2008-05-20 to 2022-10-12	DM	Boron	mg/L	36	1 0.02778	25	0.70	0 0.705	5	0.675	0.672	0.675	0.669	0.666	0.669	1.21	0.703	0.674	0.668	1.21	1.21	1.21	0.344511893	Lognormal	Lognormal	0.674	
2_10	2008-05-20 to 2022-10-12	DM	Cadmium	mg/L	36	30 0.83333	7	0.0017	0 0.00254			0.00161	0.00359		0.00163	0.00330	0.00500	0.00212	0.00260	0.00163	0.00500	0.00500	0.00200	0.449291984	Lognormal; Normal	Nonparametric	0.00500 a, d	
2 10	3 2008-05-20 to 2022-10-12	DM	Calcium	mg/L	36	0 0	21	85.9		69.8				68.6			68.2	65.9	69.8	68.6	68.2	68.2	68.2	0.17133193	Normal	Normal	65.9	
2 10	2008-05-20 to 2022-10-12	DM	Chloride (as Cl	I) mg/L	36	0 0	27	122		112				114			200	122	112	114	200	200	200	0.312052946	Nonparametric	Nonparametric	200	
2_11	2008-05-20 to 2022-10-12	DM	Chromium, Tot	tal mg/L	36	27 0.75	12	0.0041	9 0.00526		0.00521	0.00397	0.00539		0.00398	0.00528	0.0250	0.00473	0.00486	0.00398	0.0250	0.0250	0.00677	0.670311499	Gamma; Lognormal; Normal	Nonparametric	0.0250 a, d	
2 11:	8 2008-05-20 to 2022-10-12	DM	Hardness (as (C/ mg/L	36	0 0	19	326		344				338			340	326	344	338	340	340	340	0.172241209	Normal	Normal	326	
2_11	2008-05-20 to 2022-10-12	DM	Iron	mg/L	36	9 0.25	26	5.8	5 6.35		13.2	8.45	13.0		6.46	8.49	12.2	6.10	11.5	6.46	12.2	12.2	12.2	1.65900581	Lognormal	Nonparametric	12.2	
2 11	5 2008-05-20 to 2022-10-12	DM	Lead	mg/L	36	20 0.55556	22	0.0095	8 0.0117		0.0171	0.0178	0.0198		0.0125	0.0153	0.0187	0.0107	0.0183	0.0125	0.0187	0.0187	0.0187	1.324031310	Gamma; Lognormal	Nonparametric	0.0187 a	
2 11	2008-05-20 to 2022-10-12	DM	Magnesium	mg/L	36	0 0	18	39.7		41.9				41.2			44.6	39.7	41.9	41.2	44.6	44.6	44.6	0.183654838	Nonparametric	Nonparametric	44.6	
2_12	2009-05-19 to 2014-10-07	DM	Nitrate + Nitrite	e (mg/L	12	0 0	12										5.30				5.30	5.30	5.30		Normal	Nonparametric	5.30	
2 12	2008-05-20 to 2022-10-12	DM	Nitrogen, Nitra	te mg/L	36	1 0.02778	36	9.0	8 9.17			22.0	23.0		14.1	14.5	8.47	9.13	22.5	14.1	8.47	8.47	8.47	0.863362993	Normal	Normal	9.13	
2_12	2 2008-05-20 to 2022-10-12	DM	Nitrogen, Nitrit	e mg/L	36	35 0.97222	4															0.200	0.0410			Nonparametric	0.0410 a, c, d	
2 12	3 2020-05-12 to 2022-10-12	DM	Potassium	mg/L	12	0 0	10	5.69		5.73			1	5.72			5.82	5.69	5.73	5.72	5.82	5.82	5.82	0.147667909	Nonparametric	Nonparametric	5.82	
2 12	2008-05-20 to 2022-10-12	DM	Selenium	mg/L	36	4 0.11111	24	0.0056	0.00564		0.00696	0.00709	0.00705	0.00638	0.00646	0.00645	0.00600	0.00562	0.00703	0.00642	0.00600	0.00600	0.00600	0.54235853	Lognormal	Lognormal	0.00703	
2 12	3 2008-05-20 to 2022-10-12	DM	Silver	mg/L	36	36 1	6															0.0100				Nonparametric	0.0100 a, b, c	
2 12	2008-05-20 to 2022-10-12	DM	Sodium	mg/L	36	0 0	22	219		217				216			314	219	217	216	314	314	314	0.20605628	Nonparametric	Nonparametric	314	/III -
2_13	2008-05-20 to 2022-10-12	DM	Sulfate (as SO	4) mg/L	36	0 0	29	404		301				322			780	404	301	322	780	780	780	0.448454874	Nonparametric	Nonparametric	780	
2 13	2 2008-05-20 to 2022-10-12	DM	Total Dissolver	d : mg/L	36	0 0	28	843		812				819			1,181	843	812	819	1,181	1,181	1,181	0.14445052	Nonparametric	Nonparametric	1,181	
2_13	2008-05-20 to 2022-10-12	DM	Total Suspend	ec mg/L	36	20 0.55556	15	29	2 361	·	632	208	527		207	449	543	329	455	207	543	543	543	1.498885018	Gamma; Lognormal	Nonparametric	543 a	

Nexe Nexe Nexe Construction of the second back size in another the proton MOL is greater than 50%. In Construction is 100% non-detects as the maximum detection limit is chosen as the BTV. Double Quantification Rule (DQR) is recommended for determining if an exceedance has occurred. C Maximum detection who are schosen as the UTL as the number of detects is its Star 4. d Sample contains MDLs that are greater than the maximum deted value.

Appendix D-1 Geologic Cross Sections



PATH: IVEGW-INFILGISP01IGIS_PRIME12015/15-115_XCEL_CORE_SAMPLING_TESTING_(WALTHER)IMAP_DOCS/VALMONT_VB_EXPANSION/PLUME_MAPS/VALMONT_EXPDOMAIN_2023_NOPRIVWELLS_BASEMAP_STATEACM_OBS.MXD - USER: NROSSMAN - DATE: 4/27/2023

VALMONT POWER STATION, BOULDER COUNTY, CO



W-E Section through MW-7, Looking North

W Ε and it All of the second secon and the second s 4 8 -ar 8°NN n's Т Bedrock Clay Fill Sandy Silt Silt (Lower) Weathered bedrock Ash Vertical exaggeration: 5x 0ft 1000ft

W-E Section through MW-8, Looking North



N-S Section through Cell Q, Looking East



N-S Section through MW-2, Looking East



Appendix D-2 Cell D Landfill Ash/Groundwater Contact Evaluation

Memo

Date: Thursday, November 09, 2023

To: Jennifer McCarter, Xcel Energy

From: Matt Rohr, HDR, Inc.

Valmont Station Landfill

Subject: Cell D Landfill Ash/Groundwater Contact Evaluation

The U.S. Environmental Protection Agency's (EPA's) final Coal Combustion Residuals (CCR) Rule establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. Valmont Station, located in Boulder, Colorado, has three CCR units subject to the CCR Rule: the ash landfill and two former bottom ash impoundments. PSCo completed an assessment of corrective measures for the landfill and is continuing a more detailed evaluation of select corrective measures in anticipation of an upcoming remedy selection.

One of the proposed remedies that will be selected by PSCo for Valmont Landfill is source removal of the landfill ash. Through an agreement with Charah LLC (Contractor), PSCo plans to permanently close the majority of cells at the landfill by removing the ash. Charah anticipates beginning to excavate the coal ash from the landfill in early 2025 for processing and sale into the local ready-mix concrete market. This will result in complete CCR removal from landfill cells A, B, C and Q (Figure 1). Based on previous field studies, the Contractor anticipates that approximately 15% of the total material in those cells will not be suitable for processing and beneficial use (ie. 'reject' material). The rejected material will be placed in Cell D in accordance with the landfill's Engineering Design and Operating Plan (EDOP) approved by Colorado Public Health and Environment (CDPHE). The ash currently located in Cell D and the rejected material will remain in place and a final cover system will be designed and installed in accordance with 40 CFR 257.102(d) of the CCR Rule. Because Cell D of the landfill is proposed to remain in place with a final cover system, the objective of this memorandum is to document the evaluation completed to assess the potential for ash to be in contact with groundwater under Cell D. As a result of that evaluation, PSCo found that groundwater is not in contact with Cell D ash based on 2022-2023 groundwater measurements.

PSCo completed the following tasks for the evaluation:

- 15 borings drilled through Cell D of the landfill to establish the ash bottom and log any wet ash conditions
- Updated the 3-dimensional geologic model with the confirmed cell D ash bottom elevations
- Compared ash bottom to the observed groundwater surface
- Reviewed the boring logs for wet ash conditions
- Reviewed historic groundwater elevations in the vicinity of Cell D

Installed additional piezometer adjacent to existing MW-2 on the southern perimeter of Cell



Figure 1. Valmont Landfill. Complete ash removal will occur from cells A, B, C, and Q. Cell D will remain in place with a final cover system.

Boring Completion

In June 2021, five borings were drilled in Cell D, identified as D-1 through D-5, shown on **Figure 2**. In October 2022, an additional ten borings were drilled in Cell D, identified as D-6 through D-15, also shown on **Figure 2**. Review of available as-built maps of Cell D identified some discrepancy in the ash bottom elevation in a few locations between different engineering maps. Therefore, the purpose of the borings was to confirm the bottom of ash elevations and identify ash moisture condition. The borings were drilled via sonic rig in June 2021 and via hollow-stem auger during October 2022. The borings were drilled to the bottom of the ash, as confirmed by drilling at least a couple of feet into the native material below the landfill. The borings were backfilled with bentonite.

The boring logs are attached as **Appendix A**. The drilling locations were focused in the area of the landfill cell where the as-built engineering design drawings appeared to conflict between maps, which also coincided with the lowest elevation area of the landfill and therefore was an appropriate area to drill more borings.

The focus of the drilling was to identify the lowest ash elevation with the intent of comparing the ash placement relative to the groundwater, as described in a later section. All but one of the borings identified the lowest ash elevation to be approximately 5,260 feet amsl or higher. One boring, D-6, identified a localized area with a lower ash bottom elevation of 5,258 feet amsl.



Figure 2. Valmont Landfill Cell D boring locations with bottom of ash elevations, monitoring wells in the vicinity around Cell D, and cross section lines.

Geologic Model Update

The boring data was reviewed and input into the existing 3-D Leapfrog Geologic Model for the site. With updated bottom ash elevations for Cell D, the geologic model was updated. **Figure 3** displays a cross section through Cell D exported from the geologic model. The different colors of the model represent different lithologies, and the grey material represents the ash of Cell D. As described above, the lowest ash elevation for the majority of the cell is 5,260 and higher elevation.

A groundwater surface was developed from the October 2022 sample event. PZ-1 drilled in November 2022 and its February 2023 water level date was also included. The groundwater surface was mapped from water elevations observed at wells that surround the Cell D, including well locations displayed on **Figure 2**: MW-2, MW-5, MW-13, MW-22, MW-24, and MW-27. This 2022/2023 surface was input into the geologic model for comparison to the Cell D ash bottom in 3-D. The 2022-2023 groundwater surface was well below the bottom of ash in Cell D. The minimum vertical distance between Cell D ash and this groundwater surface was 6.6 feet of separation. This separation is displayed on the **Figure 3** cross section (displayed as the lightbut water surface). The water table at this point in time is between 6.6 and 28 feet beneath the bottom of ash at the 15 borings in Cell D. This finding is consistent with the dry ash conditions observed in the bottom of all but one of the ash borings. The next section describes the review of the log ash moisture conditions.

FJS



Figure 3. Cross section A-A' through Landfill Cell D (groundwater surface mapped from water level observations from 2018/2019 and 2022/2023)

Note: exported from the 3-D Leapfrog Geologic Model. The cross section runs east-west and faces north. Boring locations are displayed, along with lithology.

Reviewed Boring Logs for Wet Ash Conditions

Seven ash borings (out of 15) from Cell D had one limited interval of "wet" ash logged during drilling. The boring intervals with "wet" ash logged are shown in **Table 1**. The presence of dry material below the wet ash interval would not be expected if the ash were wet from contact with groundwater. Therefore, in addition to the wet ash interval, Table 1 shows the interval logged below the wet ash. The wet ash intervals were all found to be at elevations above the water table and therefore are not associated with groundwater. In addition, these wet ash "pockets" are in each case isolated horizontally (nearby borings did not also have wet ash at similar elevations) and isolated vertically (dry conditions were noted below the wet ash, except for boring D-14 where "dry to wet" ash exists above wet clay). Because the isolated pockets of "wet" ash are vertically separated from the water table they likely represent isolated and perched pockets of infiltrated stormwater that are not connected to the groundwater beneath the landfill. Based on the visual evaluation of the moisture content in combination with the limited extent, these pockets do not have sufficient pore water to allow for the pore water to be extracted by pumping. There is limited potential for the water in these "pockets" to move

vertically and intercept the groundwater because the isolated pockets are of limited volume and would have to migrate vertically through low permeability ash and/or clay to reach the water table.

Table 1. Ash boring logs with wet ash intervals											
Boring	Depth Interval*	Moisture Note on Log	Material	Notes regarding interpretation of potential for groundwater to be the cause of the moisture							
D 1	15-19	wet	ash	Dry conditions							
D-1	19-40	dry	clay	below wet							
D 5	20-22.5	wet	ash	Dry conditions							
D-3	22.5-30	dry	clay	below wet							
D_7	34-36	wet	ash	Dry conditions							
D-1	36-39	dry	clay	below wet							
D_8	18-26	wet	ash	Dry conditions							
D-0	26-34	dry	ash	below wet							
D-10	22-33	wet	ash	Dry conditions							
D-10	33-42	dry	ash	below wet							
D 14	23-38	wet	ash	Only boring with wet conditions at							
D-14	38-44	wet	clay	the bottom of the boring							
D 15	11-20	wet	ash	Dry conditions							
D-15	20-27	dry	ash	below wet							

*Only wet ash intervals included from boring logs along with the logged interval below the wet ash.

Historic Groundwater Elevations in the Vicinity of Cell D

While the evaluation found that groundwater is not in contact with Cell D ash based on 2022-2023 groundwater measurements, PSCo also reviewed available historic groundwater fluctuations. **Figure 4** displays all groundwater elevation data over time for wells in the vicinity of Cell D. A review of the historic fluctuation measured in well MW-2, the closest well to Cell D and located on the southern edge of Cell D, shows groundwater elevation in MW-2 appeared to rise in 2018 and again in spring 2021. Historic groundwater elevation fluctuations in the vicinity of the cell were reviewed and groundwater in one well (MW-2 - deep well) near Cell D was higher than the ash bottom only 2 times in 20 years. Adding together the number of groundwater level measurements from the wells closest to the Cell D (MW-2, MW-5, MW-24, and MW-27), only 6.9 percent of the measured dates had levels above the lowest measured ash elevation at one borehole (D-6). As described below in the Summary, while historic fluctuations were reviewed, this is not necessarily an indication of the future. PSCo intends to remove the ash from the other
landfill cells, which will lower the topography around Cell D and the water table is anticipated to decline as a result.

Using the 2018 data from MW-2 and wells surrounding Cell D (that were installed and had data in 2018), another groundwater surface was created for 2018/2019 and added to the 3-D geologic model. The 2018/2019 groundwater surface is displayed in the **Figure 3** cross section (dark blue line) and illustrates a lack of separation between ash and the groundwater surface. Another cross-section view is provided in **Figure 5** (the cross-section location is shown in **Figure 2**).

While this could be interpreted as potential for ash in contact with groundwater, this is not likely the case for the reasons discussed below. Monitoring well MW-2 is screened deep in the bedrock, approximately 105 feet below the surface in the Pierre Shale, as displayed in the B-B' cross section in Figure 5. Well MW-2 is an older well, installed in 2002, and according to the boring log and well installation report, the subsurface appeared dry throughout the full boring depth during drilling to 105 feet and the well screen depth (90-105 feet below surface) was chosen based on a more regional potential water table. All of the recent core drilling at Valmont has increased the understanding of the weathered shale, shale, and groundwater. The weathered shale presents as dry during drilling but typically produces groundwater post-drilling when left open. Therefore, in October 2022 PSCo installed piezometer PZ-1 adjacent to MW-2 at a shallower depth, completed in the weathered shale unit below the landfill to compare measured groundwater levels between the weathered shale (PZ-1) and shale (MW-2). The piezometer location adjacent to MW-2 is displayed in Figure 2 and the depth, as compared to well MW-2, is displayed in cross section B-B' in **Figure 5**. The groundwater elevation measured in PZ-1 is at least 3 feet lower than in well MW-2 (Figure 4). Wells screened across the water table or with screens close to the water table have a more accurate measurement of the groundwater elevation than wells that are much deeper than the water table. Because the PZ-1 screen is shallower and closer to the bottom of the ash and closer to the water table than the MW-2 screen, the PZ-1 data is a better representation of the uppermost water table elevations under the landfill (Figure 5). The observed water level in MW-2 likely reflects the hydraulic head at the deeper screened interval in this well, resulting in an artificially high water level that is not likely representative of the weathered shale. Using the relationship of observed water levels between PZ-1 and MW-2 in 2023, if PZ-1 had been present in 2018, it would likely have reflected a lower groundwater elevation in 2018 (e.g., from a hypothetical PZ-1 in 2018), and potentially separation between the bottom of ash and the water table in the weathered shale.



Figure 4. Hydrograph for wells and piezometers in the vicinity of Cell D (with rainfall in inches per month and the average and lowest bottom of ash elevations)



Figure 5. Cross section B-B' through Landfill Cell D showing the screened intervals of MW-2 and PZ-1 (groundwater surface mapped from water level observations from 2018/2019 and 2022/2023)

Summary

The following are a summary of the actions and observations from the Cell D ash/groundwater investigation:

- 15 borings were drilled through the landfill to establish the ash bottom and log any wet ash conditions.
- The 3-D geologic model was updated to reflect more accurate Cell D landfill bottom elevations.
- The ash bottom was compared to the recent (2022/2023) observed groundwater surface, and groundwater is not in contact with Cell D ash (>6.6 feet below Cell D).

- The boring logs were reviewed to evaluate any logged intervals of wet ash. Intervals of wet ash were determined to be isolated pockets.
- Historic groundwater elevation fluctuations in the vicinity of the cell were reviewed and groundwater in one well (MW-2 - deep well) near Cell D was higher than the ash bottom only 2 times in 20 years. PZ-1 was installed in 2022 at a shallower depth in the weathered shale, which is more representative of groundwater conditions under the landfill. PZ-1 will continue to be monitored at the landfill in the future.

PSCo intends to remove the ash from the other landfill cells, which will change (lower) the topography around Cell D. Following ash removal operations, PSCo will cap and cover Cell D. This ash removal from all other cells will change the groundwater surface under the entire landfill footprint and the water table is anticipated to decline as a result. Given the existing condition under the landfill with separation between the ash and groundwater, and the anticipated water table decline, PSCo will continue to monitor groundwater around Cell D using all of the wells and PZ-1 and will implement an adaptive management approach. If groundwater levels rise and there is potential for contact with ash, PSCo will initiate remedial planning activities, which will include an evaluation of potential remedial alternatives followed by selection and implementation.

APPENDIX A

BORING LOGS

	0	2		HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 761-9130)			D-1 PAGE 1 OF 1
CLIEN	т <u>Хс</u>	el En	ergy	/					PROJECT NAME Valmont Station
PROJE	ECT N	UMB	ER	10227700					PROJECT LOCATION Boulder, CO
DATE	STAF	RTED	06	6/05/21	c	OMPL	ETED	06/05/21	LOCATION _ 1253236.399 N 3082945.083 E
DRILL	ING C	ONT	RAC	CTOR Cas	cade				GROUND ELEVATION _5300 ft HOLE DIAMETER _4
DRILL	ING N	IETH	OD	Sonic					GROUND WATER LEVELS:
LOGG	ED B	Υ <u>Ε</u> .	Mu	noz	_ CH	IECK	ED BY	·	<u> </u>
NOTE	s								
o DEPTH (ft)	SAMPLE TYPE NUMBER		KECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG			MATERIAL DESCRIPTION
 5 					ML			SANDY SILT (ML), ver dry, clayey at 5-7ft bgs	y dark gray to brownish olive, soft to medium stiff, low plasticity, (Bottom Ash Fill)
 <u>10</u>		5 1	00			-	<u>10.0</u>	SILT (ML), black, stiff,	non plastic, dry, (Fly Ash)
 _ 15		1	00		ML	-	15.0	SILT (ML), black, stiff.	non plastic, wet. (Fly Ash)
 					ML		19.0		
		1	00					LEAN CLAY (CL), light structure (Residuum)	olive brown, stiff, medium plasticity, dry, laminated, relict shale
 30	CINCS	1	00		CL				
			0						
 40	SONIC	1	00				40.0		

)	k	2	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 761-913(0		D-2 PAGE 1 OF 1
CLIEN	т_х	cel E	nergy	/				PROJECT NAME Valmont Station
PROJ		NUM	BER	10227700				PROJECT LOCATION Boulder, CO
DATE	STA	RTE	D _06	6/05/21	_ co	OMPLE	TED _06/05/21	LOCATION _ 1253433.61 N 3083231.205 E
DRILL	ING	CON	TRAC	CTOR Cas	cade			GROUND ELEVATION _5286 ft HOLE DIAMETER _4
DRILL	ING	мет	HOD	Sonic				GROUND WATER LEVELS:
LOGG	GED E	BY _	E. Mu	noz	_ Cł	HECKE	D BY	
NOTE	S					1		
o DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
		SONIC	100		CL		SILTY LEAN CLAY (Cl pieces of melt glass an	L), black, medium stiff, low plasticity, moist, sand to gravel sized d unburned coal (Bottom Ash)
 15		SONIC	100		CL ML		LEAN CLAY (CL), dark gravel sized pieces of r 13.5 SILT (ML), dark gray, s alluvium (Fly Ash)	s yellowish brown, medium stiff, low plasticity, moist, some melt glass and unburned coal (Bottom Ash)
 20		SONIC	100		CL		SILTY LEAN CLAY (CI sand and gravel sized i	L), black, soft to medium stiff, low plasticity, dry to moist, some melt glass and unburned coal (Fly Ash)
 25		SUNIC	100		CL		21.5 LEAN CLAY (CL), blac moist, some sand and	k to dark grayish brown, medium stiff to stiff, low plasticity, gravel (Ash)
 30		SONIC	100				SILTY LEAN CLAY (Cl moist, mottled, trace sa (Bottom Ash)	L), dark gray with brownish olive, medium stiff, low plasticity, and and gravel sized pieces of melt glass and unburned coal
 35		SONIC	100		CL			
 40		SONIC	100		CL		37.5 LEAN CLAY (CL), light structure (Residuum) 40.0	olive brown, stiff, low plasticity, dry, laminated, with relict shale

Bottom of borehole at 40.0 feet.

	5	2	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	3108 -761-913	0		D-3 PAGE 1 OF 1
CLIEN	T Xcel I	Energ	v				PROJECT NAME Valmont Station
PROJ		/IBER	, 102 <u>27700</u>)			PROJECT LOCATION Boulder, CO
DATE	STARTE	-D Of	6/05/21	C(OMPLE	TED 06/05/21	LOCATION 1253283.61 N 3083239.539 E
DRILL		NTRA(CTOR Cas	 s <u>cade</u>			GROUND ELEVATION 5288 ft HOLE DIAMETER _4
DRILL	ING MET	rhod	Sonic				GROUND WATER LEVELS:
LOGO	ED BY _	<u>E. M</u>	inoz	_ Cł	HECKE	D BY	
NOTE	S						
DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
	<u> </u>			CL		LEAN CLAY (CL), black gravel sized pieces of n Bottom Ash)	< and brownish olive, stiff, low plasticity, dry, with sand and nelt glass and unburned coal (Mixture of Native Clay and
 <u>10</u>	SON	100		CL		7.5 SILTY LEAN CLAY (CL gravel sized pieces of n	.), dark gray, medium stiff, low plasticity, moist, with sand and nelt glass and unburned coal (Ash)
 	SONIC	80		CL		LEAN CLAY (CL), black sandy, with gravel sized	with dark yellowish brown, stiff, low plasticity, moist, silty to pieces of melt glass and unburned coal (Ash)
				CL		LEAN CLAY (CL), olive gravel sized pieces of n (Mixture of Bottom Ash	brown, stiff, medium plasticity, moist, with gravel, 17.5-18ft: nelt glass and unburned coal, 18-20ft alluvial rounded gravel and Native Fill)
	SONIC	100		CL		SILTY LEAN CLAY (CL (Residuum)	.), light olive brown, stiff, low plasticity, dry, relict shale structure
	<u> </u>		. <u> </u>				Bottom of borehole at 25.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	108)			D-4 PAGE 1 OF 1
	IT Xcel	Energy	у				PROJECT NAME Valmont Station	
PROJ		IBER	10227700)			PROJECT LOCATION Boulder, CO	
DATE	STARTE	ED _06	6/05/21	_ C	OMPLE	TED 06/05/21	LOCATION 1253231.904 N 3083247.117 E	
DRILI	LING CO	NTRAG	CTOR Cas	scade			GROUND ELEVATION 5286 ft HOLE DIAMET	ER <u>4</u>
	LING ME		Sonic				_ GROUND WATER LEVELS:	
	S		1102	_ 0				
	ш	%						
Ξ	ТҮР ER	RY 9	UE) UE)	က်	₽ Ţ			
(ft)	PLE UMB	OVE		S.C	LOC		MATERIAL DESCRIPTION	
	SAM NI	REC	-öz		Ū			
0	N N					SILTY SAND (SM), bro	own, loose, dry, poorly graded, fine to coarse grained, with	
	υ					rounded gravel and col	bbles (Fill)	
	SON	50		SM				
	Ŭ.					0.5		
	RC R	100				LEAN CLAY (CL), light	olive brown, stiff, low plasticity, dry to moist, relict shale	
	SOI	100		CL		structure (Residuum)		
10	Ň					10.0		

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 -761-9130	D		D-5 PAGE 1 OF 1
CLIEN	ιт_	Xcel I	Energy	1				PROJECT NAME Valmont Station
PROJ	EC		IBER	10227700)			PROJECT LOCATION Boulder, CO
DATE	E ST	ARTE	D 06	6/05/21	_ co	OMPLE	ETED	
DRILL	LIN	G COI	NTRAC	TOR Cas	scade			GROUND ELEVATION <u>5284 ft</u> HOLE DIAMETER <u>4</u>
DRILL	LIN	G MET	THOD	Sonic				GROUND WATER LEVELS:
LOGO	GED	BY _	E. Mu	noz	_ Cł	HECKE	ED BY	∠ 6/5/2021 _Perched water in ash 20.00 ft / Elev 5264.00 ft
NOTE	S_					1		
o DEPTH (ft)	SAMDI E TVDE	NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
					SM		25	SILTY SAND (SM), light yellowish brown, loose, dry, fine grained, with gravel and cobbles (Fill)
					CL		4.5	SILTY LEAN CLAY (CL), dark gray with olive yellow, stiff, low plasticity, moist, mottled, (Ash-Clay Mixture)
5		NIC	100		CL		4.5	LEAN CLAY (CL), light olive brown, stiff, low plasticity, moist to dry, (Fill)
		so	100				7.0	SILT (ML), black, soft, non plastic, dry, (Ash)
10 		SONIC	80		ML	-	20.0	SILT (ML) black soft non plastic moist to wet (Ash)
					ML		22.5	LEAN CLAY (CL), yellowish brown, stiff, low plasticity, moist to dry, relict shale
 	*****	SONIC	100		CL			
	Ø Ø						30.0	
	on M							Bottom of borehole at 30.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	108 -761-9130)	D-6 PAGE 1 OF 1
	T Xcel	Energ	У			PROJECT NAME Valmont Station
PROJ		IBER	10227700)		PROJECT LOCATION Boulder, CO
DATE	STARTE	D 10	0/24/22	_ co	OMPL	TED _10/24/22 LOCATION _ 14537289.59 N 1583495 E
DRILL	ING CO	NTRA	CTOR Site	e Serv	ices	GROUND ELEVATION 5299 ft HOLE DIAMETER 2
DRILL	ING ME	THOD	Geoprobe	e / SS	A	GROUND WATER LEVELS:
LOGO	SED BY _	Joe V	Vilch	_ Cł	IECK	D BY
NOTE	S					
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
				SM		SILTY SAND (SM), dark yellowish brown, loose, non plastic, dry, 70% sand, 30% fines, well graded, with trace gravel
	Н В	100				
						(Ash)
 _ <u>10</u> 			-	ML		15.0
						SILT (ML), black, moist, 10% sand, 90% fines, fine to medium grained, slightly
				ML		conesive, (ASII)
20				<u></u>	$\left \left \right \right $	19.0 SILT (ML) black dry 10% sand 90% fines, fine to medium grained, slightly cohesive
 				ML		(Ash)
						SILT (ML), black, low plasticity, moist, 10% sand, 90% fines, fine to medium grained, cohesive, (Ash)
 40				ML		42.0
				CL		LEAN CLAY (CL), dark grayish brown, low plasticity, dry, 10% sand, 90% fines, fine grained 49.0 Bottom of borehole at 49.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	3108 -761-9131	D	D-7 PAGE 1 OF 1
CLIEN	T Xcel	Energ	у			PROJECT NAME Valmont Station
PROJ	ECT NUN	IBER	10227700)		PROJECT LOCATION Boulder, CO
DATE	STARTE	ED _1()/24/22	_ C	OMPLE	TED _10/24/22 LOCATION _14537215 N 1583495 E
DRILL	ING CO	NTRA	CTOR Site	e Serv	ices	GROUND ELEVATION 5302 ft HOLE DIAMETER 2
DRILL		THOD	Geoprobe	e / SS	A	GROUND WATER LEVELS:
	SED BY	Joe v	VIICN	_ 0	HECK	D BY
	<u>ш</u>	%				
HL ()	E T Y	ERY	NTS	C.S.	UHC OHC	
DEF (f	MPLE	COV	BLC	U.S.	GRAF	MATERIAL DESCRIPTION
0	SAI	RE	05			
				SM		SILTY SAND (SM), pale brown, loose, non plastic, dry, 80% sand, 20% fines, fine grained, noncohesive
	<u>н</u>	50				SILT WITH SAND (ML), very dark brown, dry, 20% sand, 80% fines, fine grained,
						some small chunks of charcoal (<1 cm), (Ash)
5						
10						
				L		12.0
						SILT WITH SAND (ML), black, dry to moist, 20% sand, 80% fines, fine grained, some clumping at 23', (Ash)
15						
				ML		
20						
$\begin{bmatrix} 1 \\ - \end{bmatrix}$						
25				<u></u>	$\left \left \right \right $	SILT WITH SAND (ML), black, dry to moist, 20% sand, 80% fines, fine grained, (Ash)
				ML		
╞╶┤						
┠┤						34.0
35				ML	1	SILT WITH SAND (ML), dark brown, saturated, 20% sand, 80% fines, fine grained, (Ash)
┠┤				<u> </u>	$\left \left \right \right $	36.0 SILT (ML), very dark gray, soft, low plasticity, dry 10% sand 90% fines, fine grained
╞╶┤				ML		cohesive
						39.0
						Bottom of borehole at 39.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	:108 -761-913()		D-8 PAGE 1 OF 1
	T Xcel	Energ	у				PROJECT NAME Valmont Station
PROJI	ECT NUN	IBER	10227700)			PROJECT LOCATION Boulder, CO
DATE	STARTE	ED _1()/25/22	_ C	OMPLE	TED 10/25/22	LOCATION 14537134.21 N 1583495 E
DRILL	ING CO	NTRA	CTOR Site	e Serv	ices		GROUND ELEVATION 5299 ft HOLE DIAMETER 2
DRILL		THOD	Geoprobe	e / SS.	A		GROUND WATER LEVELS:
	GED BY _	Joe V	Vilch	_ Cł	HECKE	D BY	
Η,	E TYPE BER	ERY %	NTS LUE)	S.S.	UH0		
(ff)		OVE	BLO	J.S.C	LO		MATERIAL DESCRIPTION
	SAN	REC	02		G		
				SM		SILTY SAND (SM), pin grained, trace subangu	ikish gray, very soft, non plastic, dry, 70% sand, 30% fines, fine ilar sand
	<u></u> В	85				LEAN CLAY SILT (CL- fines, fine grained, (As	ML), very dark gray, stiff, low plasticity, dry, 10% sand, 90% h)
5							
10				CL-			
_ 15							
				L			MI) was dade any stiff low shorts to shorts a 400/ south
						90% fines, fine grained	INE), very dark gray, stiff, low plasticity, saturated, 10% sand, I, clumping of ash
$\begin{bmatrix} 1 \end{bmatrix}$				CL-			
25							
				L			M) von dok grov stiff low plasticity dry 100/ acrd 000/
┣ ┥						fines, fine grained, (As	יויו <i>ב,, יפ</i> וץ ממוג עומץ, גנווו, וטע piasticity, dry, דט% sand, 90% h)
30				CL-			
				<u> </u>			CL) brown medium stiff medium plasticity 30% cand 70%
35						fines, fine grained, coh	esive
				CL			
╞╶┤							
		<u> </u>	<u> </u>		<u> </u>	39.0	Bottom of borehole at 39.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 -761-9130	0	D-9 PAGE 1 OF 1
	T Xcel	Energ	y			PROJECT NAME Valmont Station
PROJ	ECT NUM	IBER	10227700			PROJECT LOCATION Boulder, CO
DATE	E STARTE	ED _1()/24/22	_ co	ompli	TED 10/24/22 LOCATION 14537305.29 N 1583646 E
DRIL	LING COI	NTRA	CTOR Site	e Serv	ices	GROUND ELEVATION 5298 ft HOLE DIAMETER 2
DRIL	LING ME	THOD	Geoprobe	e / SS	A	GROUND WATER LEVELS:
LOG	GED BY	Joe V	Vilch	_ Cł	HECKE	D BY
NOTE	ES					
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
				SM		SILTY SAND (SM), dark yellowish brown, non plastic, dry, 70% sand, 30% fines, fine to medium grained, noncohesive
		75				3.0 SILT WITH SAND (ML), black, stiff, low plasticity, dry, 20% sand, 80% fines, fine grained, slightly cohesive, (Ash)
 20	-					
 <u></u> 						38.0
40						SILT (ML), dark yellowish brown, 10% sand, 90% fines, fine grained, cohesive
	-			ML		
						44.0
						Bottom of borehole at 44.0 feet.

	5	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	108 -761-913()		D-10 PAGE 1 OF 1
	IT Xcel	Energ	у			F	PROJECT NAME Valmont Station
PROJ	ECT NUN	IBER	10227700			F	PROJECT LOCATION Boulder, CO
DATE	STARTE	ED _1(0/25/22	_ co	OMPLE	TED _10/25/22 L	OCATION 14537157.9 N 1583657.5 E
DRILI	LING COI	NTRA	CTOR Site	e Serv	ices	0	GROUND ELEVATION 5301 ft HOLE DIAMETER 2
DRILI	LING ME	THOD	Geoprobe	e / SS.	۹	(GROUND WATER LEVELS:
	GED BY _	Joe V	Vilch	_ Cł	IECKE	D BY	
NOTE	<u> </u>						
г	ER	۲۲ %	_si⊕	ഗ	₽		
EPT (ft)	- BIR	OVEI		S.C.	KAPH LOG		MATERIAL DESCRIPTION
	SAMF	SEC(۳٥ź) D	Ю		
0		-				SILTY SAND (SM) light	brown medium stiff low plasticity dry 70% sand 30% fines
				SM	h	2.0 fine grained, slightly cohe	
		90				grained, slightly cohesive	L), black, low plasticity, dry, 30% sand, 70% fines, fine
			-				
10							
				CL-			
				ML			
20							
						22.0	
						LEAN CLAY SILT (CL-M	L), black, low plasticity, saturated, 30% sand, 70% fines, fine
						granica, oraniping of dorr	
				CL-			
30							
				L		33.0	
						LEAN CLAY SILT (CL-M grained, (Ash)	L), black, low plasticity, dry, 30% sand, 70% fines, fine
				CL-			
40							
						40.0	
				––- 		LEAN CLAY (CL), dark g	rayish brown, soft, medium plasticity, dry, 10% sand, 90%
					<i>\/////</i>	44.0_ tines, tine grained, cohes	Bottom of borehole at 44.0 feet.

	5	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 761-913	0	D-11 PAGE 1 OF 1
CLIEN	IT Xcel I	Energ	/			PROJECT NAME Valmont Station
PROJ	ECT NUN	IBER	10227700			PROJECT LOCATION Boulder, CO
DATE	STARTE	D _1()/26/22	_ C	OMPLE	TED 10/26/22 LOCATION 14537305.63 N 1583747 E
DRILI		NTRA	CTOR Site	Serv	ices	GROUND ELEVATION 5298 ft HOLE DIAMETER 2
DRILI	LING MET	rhod	Geoprobe	e / SS	A	GROUND WATER LEVELS:
LOGO	GED BY _	Joe V	/ilch	_ CI	HECKE	D BY
NOTE	ES					
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
	DP	80		SM		SILTY SAND (SM), brownish yellow, loose, non plastic, dry, 80% sand, 20% fines, fine to medium grained, trace gravel
 				ML		 SILT (ML), black, low plasticity, dry, 10% sand, 90% fines, fine grained, slightly cohesive, (Ash) SILT (ML), black, low plasticity, dry, 10% sand, 90% fines, fine grained, slightly cohesive, (Ash)
						24.0 Bottom of borehole at 24.0 feet.

)	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	t 3108 -761-913	D	D-12 PAGE 1 OF 1
CLIEN	T Xcel	Energ	у			PROJECT NAME Valmont Station
PROJI	ECT NUN	IBER	10227700)		PROJECT LOCATION Boulder, CO
DATE	STARTE	ED _1(0/25/22	_ C	OMPLE	LOCATION 14537218.38 N 1583748 E
DRILL	ING CO	NTRA	CTOR Site	e Serv	ices	GROUND ELEVATION _5300 ft HOLE DIAMETER _2
DRILL		THOD	Geoprobe	e / SS	A	GROUND WATER LEVELS:
	ED BY	Joe V	VIICh	_ C	HECKE	D BY
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
				SM		SILTY SAND (SM), yellowish brown, medium stiff, non plastic, dry, 80% sand, 20% fines, fine to medium grained, slightly cohesive, trace coarse sand
	đ	75	-			SAND LEAN CLAY (CL-ML), black, soft, low plasticity, dry, 20% sand, 80% fines, fine to medium grained, cohesive, (Ash)
 				CL- ML CL		41.0 LEAN CLAY (CL), brown, very soft, medium plasticity, dry, 10% sand, 90% fines, fine grained, cohesive 41.0 Bottom of borehole at 44.0 feet
				CL		LEAN CLAY (CL), brown, very soft, medium plasticity, dry, 10% sand, 90% fines, fine grained, cohesive 44.0 Bottom of borehole at 44.0 feet.

	5	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 -761-913()		D-13 PAGE 1 OF 1
	T Xcel	Energ	y				PROJECT NAME Valmont Station
PROJ	ECT NUN	IBER	10227700				PROJECT LOCATION Boulder, CO
DATE	E STARTE	ED _1()/25/22	_ co	OMPLE	ETED 10/25/22	LOCATION _ 14537142 N 1583748 E
DRILI	LING COI	NTRA	CTOR Site	e Serv	ices		GROUND ELEVATION _5300 ft HOLE DIAMETER _2
DRILI	LING ME	THOD	Geoprobe	e / SS	A		GROUND WATER LEVELS:
LOGO	GED BY	Joe V	Vilch	_ Cł	HECKE	ED BY	_
NOTE	=s						
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
				SM		SILTY SAND (SM), 20% fines, fine grain	light yellowish brown, medium dense, non plastic, dry, 80% sand, ned, slightly cohesive, trace coarse sand
 	В	108				SANDY SILT (ML), grained, (Ash)	black, medium stiff, low plasticity, dry, 20% sand, 80% fines, fine
				ML		37.0 LEAN CLAY (CL), d 90% fines, fine grain 39.0	rark grayish brown, very stiff, medium plasticity, dry, 10% sand, ned, cohesive

Bottom of borehole at 39.0 feet.

	5	S	HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734	108)	D-14 PAGE 1 OF 1					
	T Xcell	Energy	/			PROJECT NAME Valmont Station					
PROJI		IBER	10227700			PROJECT LOCATION Boulder, CO					
DATE	STARTE	ED _10)/26/22	_ co	OMPLE	TED 10/26/22 LOCATION 14537257.26 N 1583857.104 E					
DRILL	ING CO	NTRAG	CTOR Site	e Serv	ices	GROUND ELEVATION 5298 ft HOLE DIAMETER 2					
DRILL	ING ME	THOD	Geoprobe	e / SS	A	GROUND WATER LEVELS:					
LOGO	SED BY	Joe V	/ilch	_ Cł	IECKE	D BY					
NOTE	s										
	T ∠ PE	۲ %	LS JE)	vi	<u></u> ⊇						
(ft)	LE J MBE	VEF	LOW /ALL	S.C.S	APH OG	MATERIAL DESCRIPTION					
	AMF NU	SECC	(NCB	, <u> </u>	ю_						
0	0 	Ľ.				CILITY SAND (SM) light vallowish brown, modium stiff non plastic, dry 70% cond					
				SM		2.0 30% fines, fine grained, slightly cohesive					
	B	100				SANDY SILT (ML), very dark brown, medium stiff, low plasticity, dry, 20% sand, 80% fines, fine grained, slightly cohesive					
				ML							
				<u></u>		8.0					
10						cohesive, (Ash)					
				CL							
20											
				L		23.0					
						LEAN CLAY (CL), black, loose, low plasticity, dry to wet, 10% sand, 90% fines, fine grained, moistens with depth, (Ash)					
30											
				CL							
						38.0					
40						LEAN CLAY (CL), dark yellowish brown, soft, medium plasticity, saturated, 10% sand, 90% fines, fine grained					
				CL							
					/////	44.0 Bottom of borehole at 44.0 feet					

	0	R		HDR, Inc. 5405 Data Court Ann Arbor, MI 48 Telephone: 734-	108 -761-9130)		D-15 PAGE 1 OF 1
CLIEN	IT Xa	el En	nergy	/				PROJECT NAME Valmont Station
PROJ	ECT N	UMB	ER	10227700				PROJECT LOCATION Boulder, CO
DATE	STAF	RTED	_10	/24/22	_ co	OMPL	LE	ED 10/24/22 LOCATION 14537205.74 N 1583362.85 E
DRILL	LING (ONT	RAC	TOR Site	e Serv	ices		GROUND ELEVATION _5300 ft HOLE DIAMETER _2
DRILL	LING N	/ETH	IOD	Geoprobe	e / SS/	۹		GROUND WATER LEVELS:
LOGO	GED B	Y _Jo	oe W	/ilch	_ Cł	IECK	٢EI) BY
NOTE	S							
DEPTH (ff) (ff) SAMPLE TYPE NUMBER RECOVERY % BLOW COUNTS (N VALUE) U.S.C.S. GRAPHIC LOG							۲ С С	MATERIAL DESCRIPTION
					SM			SILTY SAND (SM), yellowish brown, loose, non plastic, dry, 70% sand, 30% fines, fine to medium grained, trace gravel
								.0
		5 8	80					SANDY SILT (ML), black, non plastic, dry, 10% sand, 90% fines, fine grained, trace gravel, (Ash)
5					м			
		5 4	50					.0
						1		SANDY SILT (ML), black, non plastic, dry, 10% sand, 90% fines, fine grained, some
10					ML			
10								10
								SANDY SILT (ML), black, low plasticity, dry to saturated, 100% fines, fine grained,
		5 1	00					slightly conesive, increasing moisture content
		-						
15		-			м			
20						$\left \right $		0.0 SANDY SILT (ML) black low plasticity dry to moist 100% fines fine grained low
								moisture, some clumps of ash
					ML			
25								
╞╶┥								
┠╶┤					L			
╞╶┥								SILT WITH SAND (ML), very dark grayish brown, low plasticity, dry, 20% sand, 80% fines, fine to medium grained
					ML			
30								0.0

Appendix E Well Construction Details and Boring Logs

Table E-1. Monitoring Well Construction												
Well I D	Northing	Easting	Elevation TOC (ft)	Well Total Depth (ft bgs)	Screen Interval (ft bgs)	Well Stickup (ft)	Well Type	Well Permit Number				
Wen i.b.	(UTM :	13N Meter)										
MW-1	4430670.386	482404.7332	5234.27	38.7	28.5-38.5	2.6	2-inch PVC	257834				
MW-2	4430887.374	482654.026	5289.56	105	90-105	2.2	2-inch PVC	257835				
MW-3	4430758.349	482852.3567	5233.52	49.4	39.2-49.2	2.8	2-inch PVC	257836				
MW-4	4430840.14	483138.3867	5237.21	22.6	12.5-22.5	1.9	2-inch PVC	275212				
MW-5	4430972.90	482523.758	5292.10	65.0	50-65	2.2	2-inch PVC	275213				
MW-6	4430677.549	482180.545	5235.23	30.1	15-30	1.75	2-inch PVC	275214				
MW-7	4430897.269	482177.6864	5299.46	65.6	50.5-65.5	2.5	2-inch PVC	275215				
MW-8	4430710.278	482014.6153	5234.97	30.1	15-30	2.3	2-inch PVC	275216				
MW-13	4431016	482993.2	5279.18	70	59-69	2.74	2-inch PVC	315824				
MW-14	4430785	483038.7	5230.89	44	33-43	2.51	2-inch PVC	315825				
MW-15	4430725	482658.3	5229.08	39	29-39	2.70	2-inch PVC	315826				
MW-16	4430544	482003.6	5217.17	30	19-29	2.64	2-inch PVC	315827				
MW-21	4430976.3506	483190.2534	5236.21	21.1	12.1-21.1	2.57	2-inch PVC	MH-59175				
MW-24	4430901.392	482408.1	5295.50	73.5	53-73	2.59	2-inch PVC	MH-59175				
MW-25C*	4430981.1	481999.9	5249.47	45	25-45		2-inch PVC	NA				
MW-26	4430678.008	482003.2041	5227.74	43	17-37	2.45	2-inch PVC	MH-59814				
MW-27	4431006.968	482726.8792	5290.37	74	40-55	2.35	2-inch PVC	MH-59813				
MW-28	4431000.352	483090.3436	5274.23	83	65-83	2.20	2-inch PVC	MH-59813				
MW-29	4431022.218	483132.451	5237.31	55	35-55	2.13	2-inch PVC	NA				
MW-30	4431114.576	483088.997	5231.08	70	50-70	2.17	2-inch PVC	NA				
MW-31	4431252.799	483155.659	5215.40	40	20-40	2.09	2-inch PVC	NA				
MW-32	4431334.971	483059.579	5217.05	32	22-32	2.05	2-inch PVC	NA				

Table E-1. Monitoring Well Construction											
Well I D	Northing	Easting	Elevation TOC (ft)	Well Total Depth (ft bgs)	Screen Interval (ft bgs)	Well Stickup (ft)	Well Type	Well Permit Number			
Wen I.D.	(UTM 1	13N Meter)									
MW-33A	4431387.716	483104.757	5199.27	22	12-22 (Weathered shale)	2.17	2-inch PVC	NA			
MW-33B	4431385.991	483105.286	5199.62	55	35-55 (Shale)	2.19	2-inch PVC	NA			
MW-34	4431406.861	483193.859	5232.27	60	40-60	2.14	2-inch PVC	NA			
MW-35	4431077.896	483212.629	5234.11	24	14-24	2.11	2-inch PVC	NA			
MW-36	4431431.239	483891.577	5209.48	35	25-35	2.12	2-inch PVC	NA			
MW-37	4431499.943	483521.112	5204.74	50	30-50	2.08	2-inch PVC	NA			
MW-38A	4431457.564	483097.164	5186.08	200	175-200 (shale)	2.68	2-inch PVC	NA			
MW-38B	4431459.191	483097.100	5185.59	65	45-65 (shale)	2.40	2-inch PVC	NA			
MW-38C	4431460.540	483097.043	5185.81	29	19-29 (Weathered shale)	2.62	2-inch PVC	NA			
MW-39A	4431687.751	483176.554	5153.61	25	15-25 (Weathered shale)	2.67	2-inch PVC	NA			
MW-39B	4431687.884	483177.491	5153.43	10	5-10 (Alluvial)	2.97	2-inch PVC	NA			
MW-40	4430817.514	482010.092	5249.653	35	15-30	0.79	2-inch PVC	NA			
MW-41	4430626.715	481812.001	5202.332	30	12-22	-0.18	2-inch PVC	NA			
MW-42	4430583.733	481858.179	5204.729	30	15-25	-0.45	2-inch PVC	NA			
MW-43	4430657.753	481889.552	5217.427	35	21-31	-0.37	2-inch PVC	NA			
MW-44	4431532.97	484024.91	5199.775	85	50-70	2.56	2-inch PVC	NA			
MW-45	4431354.13	483733.16	5186.237	49	35-45	2.59	2-inch PVC	NA			

Notes:

bgs = below ground surface

TOC = top of casing

AMSL = above mean sea level

NA = not available yet, permits pending or permit applications in progress

* Horizontal and vertical survey information is scheduled for measurement for monitoring well MW-25C. The information will be incorporated into the table following measurement and review.



Boring Log

Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services D	Drilling, LLC		
Boring No.		Location		Drilling Rig Ty	pe and Drilling Method		
MW-9		Valmont S	station	CME-75	Hollow Stem Auger (6-inch diame	ter)	
Sample No.	Blow Count	(feet)		Descripti	ion (USCS)	Elevation (feet)	Remarks
0-0.5' bgs 5-5.5' bgs	5, 8, 8, 9	5	Fill: Dark brown Dark yellow-ish	10YR 3/3; Sandy silt brown 10YR 4/4; Silt	with gravel (ML) y clay (ML) with trace gravel; moist		
10-10.5' bgs	1, 2 4, 9	10	Brown 10YR 5/3	3; Silty clay (ML); we	t		Depth to water ~10' bgs
	6, 1, 0	15 —					
18-19' bgs; MW-9: 18'4"-18'8"	1, 8, 24	20	Brown 10YR 5/3	3; Clay (CL) dense, w	eathered bedrock; wet		clay at 18' bgs. soil sample (MW-9: 18'4"- 18'8") submitted for geotech analysis
25-25.5' bgs	Not recorded	25	Brown 10YR 5/:	3; Clay (CL) dense, w	eathered Pierre Shale; wet		
		30					
		35					
		40					
		45					
					Logged By:	Drilled/Sampled	By:
Total Denth (feet	•)	Water Lev	rel (feet)		Justin Bills	Josh Eckhoff	Cy.
	7	After Drill	ing: H	lours After:	Date Started:	Date Completed	:
26		8.23' btoc	7	2	10/30/2015	10/30/2015	



Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services D	Prilling, LLC		
Boring No.		Location		Drilling Rig Ty	pe and Drilling Method		
MW-10		Valmont S	tation	CME-75	Hollow Stem Auger (6-inch diame	ter)	r
Sample No.	Blow Count	Depth (feet)		Descripti	on (USCS)	Elevation (feet)	Remarks
5-5.5' bgs	5, 8, 9, 11	5	Grayish brown 1 Brown 10YB 5/	0YR 5/2; Silt with sor	ne fine sands (ML); stiff; moist		<25% recovery
10-10.5' bgs	2, 4, 5, 6	-	Brown 10YR 5/	 Clayey silt with graves Clayey silt with traces 	e graval (ML); moist		soil sample (MW-10, 15-
16-16.5' bgs	Not recorded	15 — —	BIOWN TO TK 3/.	, Clayey sin with frac	e graver (ML), moist		16') collected but not submitted for geotech analysis
19-19.3' 5gs MW-10 20'4"- 20'8"	Not recorded	20 — — 25 —	Brown 10YR 5/.	s; Clayey silt (ML); w 3; Clayey silt (ML), w	et eathered Pierr Shale; wet		soil sample (MW-10: 20'4"-20'8") submitted for geotech analysis
		30 — 35 —					
		50	1			1	
					Logged By:	Drilled/Sampled	By:
Total Depth (feet) Water Le			vel (feet)		Justin Bills	Josh Eckhoff	
		After Drill	ing: H	lours After:	Date Started:	Date Completed	:
21		8.68' btoc	7	2	11/2/2015	11/2/2015	



Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services D	Drilling, LLC		
Boring No.		Location	•	Drilling Rig Ty	pe and Drilling Method		
MW-11		Valmont S	tation	CME-75	Hollow Stem Auger (6-inch diame	eter)	
Sample No	Blow Count	Depth		Descript	ion (USCS)	Elevation (feet)	Remarks
Sample No.	Blow Count	(feet)		Descripti		Elevation (leet)	Remarks
2-2.5' below ground surface (bgs)			Brown 10YR 4/2	3; Silt (ML), rootlets;	trace gravel; moist		
	2, 17, 22, 12	5	4-6' bgs no recov	very			4-6' bgs no recovery
10.5-11' bgs	0, 13, 6	10	Dark grayish bro <1"; moist	own 10YR 4/2; Clayey	v silt, mostly silt (ML); trace gravels		9-11' bgs 50% recovery Depth to water ~10' bgs
14.5-15.5' bgs	Not recorded	15	Brown 10YR 4/.	3; Clayey silt, mostly	silt (ML); some gravel; moist		50% recovery soil sample 14.5-15.5' bgs collected but not submitted for geotech analysis
17-17.5' bgs MW-11:18'4"-18'8'	Not recorded	20	Very dark gray 1	0YR 3/1; Clayey silt	(ML); rootlets; moist		soil sample MW-11: 18'4"- 18'8" submitted for geotech analysis
							depth to Pierre Shale ~21- 24' bgs
24-24.5' bgs	Not recorded	25	Brown 10YR 5/3	3; Clayey, weathered	Pierre Shale (ML); wet		
		30					
		35					
		40					
		45					
		_					
		50					
		50					
					Logged By:	Drilled/Sampled	By:
Total Depth (feet	:)	Water Lev	el (feet)		Justin Bills	Josh Eckhoff	
		After Drill	ing: H	lours After:	Date Started:	Date Completed	:
25.5		9.91' btoc	2	4	11/2/2015	11/2/2015	



Project Name			Project No.	Drilling Compa	any		
Xcel CCR			266180-006	Site Services D	Prilling, LLC		
Boring No.		Location		Drilling Rig Ty	pe and Drilling Method		
MW-12		Valmont S	Station	CME-75	Hollow Stem Auger (6-inch diame	ter)	1
Sample No.	Blow Count	Depth (feet)		Descripti	on (USCS)	Elevation (feet)	Remarks
0-2' bgs		-	Fill: Dark brown	10YR 3/3; Sandy silt	with gravel (ML); moist		
5-5.5' bgs	38, 24, 32	5	Dark gray 10YR ·	4/1; Fine silty sand (S	SM); moist		<25% recovery, cobbles prevented recovery
9' bgs 10-10.5' bgs 11' bgs	01, 4, 15	10	Brown 10YR 5/3 Black 10YR 2/1;	; Clayey silty (ML), t Clayey silt, trace gra	race gravel; moist vel (ML); moist		Depth to water ~11' bgs
MW-12: 15'4"- 15'8" 01, 44, 65 -			Very dark gray 10	0YR 3/1; Clayey silt s	some fine sand (ML); wet		soil sample (MW-12: 15'4"-15'8") submitted for geotech analysis
	01, 15, 22	20	no recovery 19-2	1' bgs			no recovery 19-21' bgs
	Not recorded	25 — 30 —	Brown 10YR 5/3	; Clay (CL), weathere	ed Pierre Shale, shale fragments; wet		total boring sample depth 26' bgs
		35 —					
		40					
		50					
				1	Logged By:	Drilled/Sampled	By:
Total Depth (feet) Water Le			vel (feet)		Justin Bills	Josh Eckhoff	
		After Drill	ing: Ho	ours After:	Date Started:	Date Completed	:
26		9.03' btoc	24	Ļ	11/2/2015	11/2/2015	

Boring Log

Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services D	Prilling, LLC		
Boring No.		Location		Drilling Rig Ty	pe and Drilling Method		
MW-13	1	Valmont S	itation	CME-55	Hollow Stem Auger (4.25-inch dian	neter)	
Sample No.	Blow Count	(feet)		Descripti	ion (USCS)	Elevation (feet)	Remarks
		5	SM: silty sand noncohesive	with few gravel, 2.5Y 7	/2 light gray, dry, medium dense,		
	17, 26		ML: silt with s	and, 2.5Y 4/1 dark gray	r, mottled with 2.5Y 6/2 light brownish		Potholed to 8' bgs with hydrovac
	29, 40	-	gray, dry, hard ML, SP: intert	, noncohesive, thinly be bedded layers of material	dded, oxidized I described above and the following: SP		
	23, 26		fine sand, 2.5Y dense, bedded	7 6/ light yellowish brow	vn, mottled with 2.5Y 6/1 gray, dry, very		
	10, <i>32</i> 50/1	20	ML, SP: same	as adove			
	17, 44 50/3	25	ML, SP: same	as above, significant oxi	idation		
	20, 32 50/2 30		ML, SP: same	as above			
	22, 38 50/5	35	SP, ML: intert sand, 2.5Y 6/3 Silt: ML silt w plasticity, heav	edded sand and siit laye light yellowish brown, ith fine sand, 2.5Y 6/1 g ry oxidation	rs (weathered snale). Sand: SP me dry, very dense, bedded, noncohesive. gray, dry hard, noncohesive with low		
	50/1	40	SP, ML: same	as above, fissile, few lay	vers of plasticity		
	14, 34 50/6	45 <u> </u>	SP, ML: same	as above			
	18, 38 50/2	50	SP, ML: same clay	as above, some thin clay	layers with medium plasticity, CL lean		
	18, 50/5	55	SP, ML: same	as above			
	27, 50/1 60		SP, ML: same	as above, color darkened	d, G1 4/10Y dark greenish gray		
38, 50/2		65 — — —	ML: shale bed	rock: silt with trace fine hinly nedded, fissile	sand, 2.5Y 4/1 dark gray, dry, hard,		
	.,	70		,			•
Total Derth #	4)	Water	(o) (feet)		Logged By:	Drilled/Sampled	By:
rotal Depth (fee	u)	After Drill	ing:	Hours After:	Date Started:	Date Completed	:
70		65.29 btoc	-	120	7/11/2018	7/12/2018	

Boring Log

Project Name			Project No.	Drilling Comp	any			
Xcel CCR			266180-006	Site Services I	Drilling, LLC			
Boring No.		Location		Drilling Rig Ty	/pe and Drilling Method			
MW-14		Valmont S	tation	CME-55	Hollow Stem Auger (4.25-inch dian	meter)	I	
Sample No.	Blow Count	Depth (feet)		Descript	ion (USCS)	Elevation (feet)	Remarks	
		_	SW: well grad	ed sand with gravel, dry	/, 2.5Y 6/1 gray, medium dense,			
			indirediredired					
			-					
		5 —	-					
							Potholed to 8' bys with	
						hydrovac		
	9, 17		ML: silt with s	and (fine), 2.5Y 5/2 gra	wish brown, dense, dry, bedded,			
	22, 33	10	noncohesive, o	oxidized				
		10						
			-					
			-					
	12, 19	_	ML: same as a	bove, very dense				
	25, 42	15	+					
	11, 24		CL: interbedde	ed layers of silt/clay and	find sand, CL sandy lean clay, 10YR			
	29, 50/4		6/6 brownish y	ellow, very dense, dry,	bedded, medium plasticity, cohesive,			
20 —		20	oxidezed					
			-					
	14, 16	_	ML: silt with s	and (fine), 10YR 5/1 gr	ay, very dense, dry, bedded,			
	20, 23	25 —	noncohesive, o	oxideized, some thin col	nesive units			
	16 40						Noted water mark on SS	
	50/4	_	noncohesive, 1	a shale: silt with sand, 2 aminated, oxidized	.5 Y 5/1 gray, very dense, moist,		at 29' bgs	
		30	†					
	27, 50/4	_	ML: weathered	d shale: silt with sand, 2 hinly bedded, some lam	2.5Y 5/1 gray, very dense, moist, inations oxidized	y, very dense, moist, xidized		
		35 —	noneonesive, t	miny bedded, some fam	inations, oxidized			
	28, 50/2		ML: weathere	d shale: silt, 2.5Y 5/1 gr	ay, very dense, moist, noncohesive,			
	,002	40	laminated, oxi	dized	·			
		40	Ī					
	32/50/4		ML: weathere	d shale: same as above				
			-				Boring terminated at 44'	
	45 —		l T				050	
	-							
-								
	-							
- 50								
		- 50						
					Logged By:	Drilled/Sampled	By:	
Total Depth (feet) Water Le			rel (feet)	Hours After	N. Hanrahan Date Started:	Site Service		
44		14.03 btoc		144	7/10/2018	7/11/2018		
		0100		1				

Boring Log

Project Name			Project No.	Drilling Com	pany		
Xcel CCR			266180-006	Site Services	Drilling, LLC		
Boring No.		Location		Drilling Rig 1	Type and Drilling Method		
MW-15		Valmont S	tation	CME-55	Hollow Stem Auger (4.25-inch dian	neter)	
Sample No.	Blow Count	Depth (feet)		Descrip	otion (USCS)	Elevation (feet)	Remarks
		_	ML: silt, 2.5Y	4/1 dark reddish gray,	loose, dry, organics (soil)		
		_	SP: poorly grac brown, dry, me	led medium sand with dium dense noncohes	little fines, 2.5Y 6/3 light yellowish ive		
		5					
		_					Potholed to 8' bgs with
	15.00		SD: poorly oros	lad fine cond with two			
	15, 28 38, 50/5	10	dry, very dense	SP: poorly graded fine sand with trace fines, 2.5Y 6/4 light yellowish brown, dry, very dense, noncohesive, oxidized, thinly bedded			
	19, 40 50/4	15	SP: same as ab	ove, more dense and t	ïssile		
		_					
	19, 50/6 20 -			and (fine), 10YR 5/6 xidized, bedded	yellowish brown, very dense, moist,		
	26, 50/4	25	ML: same as a	bove, thinly bedded, n	noist, 2.5Y 6/2 light brownish gray		
	32, 50/5	30	ML: same as a	bove, thinly bedded, n	noist		
	50/6	35	ML: weathered noncohesive, th gray	I shale: silt with fine s hinly bedded, oxidized	and, 2.5Y 6/1 gray, moist, very dense, l, mottled with 2.5Y 6/2 light brownish		
	50/1 40			rock: silt, 2.5Y 5/1 gra d with 2.5Y 6/4 light	ay, moist, hard, noncohesive, thinly yellowish brown		
		45	+				
	1	50	1			I	I
					Logged By:	Drilled/Sampled	By:
Total Depth (fee	t)	Water Lev	el (feet)		N. Hanrahan	Site Service	
	-	After Drilli	ng:	Hours After:	Date Started:	Date Completed	:
39		18.15 btoc		168	7/9/2018	7/10/2018	

Boring Log

Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services D	Drilling, LLC		
Boring No. Location				Drilling Rig Ty	pe and Drilling Method		
MW-16		Valmont S	station	CME-55	Hollow Stem Auger (4.25-inch dian	meter)	
Sample No.	Blow Count	Depth (feet)		Descripti	ion (USCS)	Elevation (feet)	Remarks
	10, 12	5	SP: poorly grac dry, medium de SP: poorly grac	led medium sand with l ense, noncohesive ded fine sand, 2.5Y 5/4	little fines, 2.5Y 5/4 light olive brown, light olive brown, dense, dry,		Potholed to 8' bgs with hydrovac
	18, 29 50/6		noncohesive, o ML/SP: weathe noncohesive, o	xidized ered shale with SP poor xidized, thinly bedded.			
	50/1.5	20	light yellowish ML/SP: same a	brown as above, no mottling			
	50/2	25	ML: weathered noncohesive, th	I shale: silt with fine san	nd, 2.5Y 5/1 gray, hard, dry,		
	50/1	30	ML: shale rock	: same as above		\bigtriangledown	
		35					
		40	1			1	
					Logged By:	Drilled/Sampled	By:
Total Depth (feet) Water Lev		el (feet) N. Hanrahan		N. Hanrahan	Site Service		
Afte		After Drill	ing:	: Hours After: Date Started:		Date Completed:	
29		29.76 btoc		192	7/9/2018	7/9/2018	

Boring Log

Project Name			Project No.	Drilling Compa	Drilling Company				
Xcel CCR			266180-006	Site Services D	Drilling, LLC				
Boring No. Location				Drilling Rig Ty	pe and Drilling Method				
MW-17		Valmont S	tation	CME-55	Hollow Stem Auger (4.25-inch dian	meter)			
Sample No.	Blow Count	Depth (feet)		Descripti	on (USCS)	Elevation (feet)	Remarks		
			SP: poorly grac dry, medium de	ded medium sand with f ense, noncohesive	ew fines, 2.5Y 6/2 light brownish gray,				
	2, 3	5	CL: sandy clea	n clay, 10YR 8/2 very p	vale brown, medium dense, moist,		Potholed to 8' bgs with hydrovac		
	4, 9	10	cohesive			\bigtriangledown			
	2, 5 5, 5	15	SP: poorly grac olive brown, m mica-muscovit	led fine sand with few f ioist to wet, medium de e	ïnes and some gravel, 2.5Y 5/4 light nse, cohesive, low plasticity, fignificant				
	3, 6 8, 10	20	SP: poorly grac mottled with 2	led fine sand with silt, v .5Y 4/1 light gray, medi	wet, 2.5Y 6/4 light yellowish brown, um dense, cohesive				
	8, 27 50/5	25	SP: poorly grac noncohesive, n	ded fine sand, moist, de nottled with 2.5Y 6/1 gr	nse, 2.5Y 5/3 light olive brown, ay				
18, 50/6 30		ML: weathered noncohesive, tl	l shale: silt with sand, w hinly bedded	ret, 2.5Y 5/1 gray, very dense,					
		35							
40									
					Logged By:	Drilled/Sampled	By:		
Total Depth (feet) Water Lev		Water Lev	el (feet)		N. Hanrahan	Site Service			
· · ·		After Drilli	ng:	Hours After:	Date Started:	Date Completed	:		
29		12.91 btoc		192	2 7/6/2018 7/9/2018				

Boring Log

1				t No. Drilling Company				
Xcel CCR			266180-006	Site Services I	Site Services Drilling, LLC			
Boring No. Location				Drilling Rig Ty	Drilling Rig Type and Drilling Method			
MW-18	I	Valmont S	tation	CME-55	Hollow Stem Auger (4.25-inch dian	neter)	I	
Sample No.	Blow Count	Depth (feet)		Descript	ion (USCS)	Elevation (feet)	Remarks	
			SP: poorly graa dry, medium d	ded medium sand with f	few fines, 2.5Y 6/2 light brownish gray,			
	1, 1 2, 2	10	SP: poorly grac organics SP: same as ab	ded medium sand with t	trace fines, G1 4/10Y dark greenish gray, s grayish brown		Potholed to 8' bgs with hydrovac Abrupt color change at 10' bgs	
	2, 4 6, 7	15 <u> </u>	SP: poorly grac moist, medium	P: poorly graded medium sand with trace fines, 10YR 5/4 yellowish brown, noist, medium dense, oxidation		\bigtriangledown		
	4, 11 16, 31	20	SP: same as ab	oove, dry, 5Y 6/3 pale ol	olive, bedded, dense			
	10, 42 50/4	25 —	SP: same as ab	SP: same as above, very dense, few cohesive layers, low plasticity				
	19, 50/5	30	SP: same as ab	юче				
50/6 - SF 35 - de		SP: poorly graa dense, noncoh	ded medium sand with t esive	trace fines, 5Y 5/2 olive gray, dry, very				
	21, 50/1 40 ML: weathered thinly bedded		d shale: silt with sand, 5	le: silt with sand, 5Y 5/1 gray, dry, hard, noncohesive,				
	50/3	45	ML: shale rock: 5Y 5/1 gray, dry, hard, thinly bedded					
		50						
Total Denth (feet)		Water Low	el (feet)		Logged By:	Drilled/Sampled	By:	
rotal Depth (ree	9	After Drilli	ng:	Hours After:	IN. Hanranan Site Service		:	
49		16.21 btoc	-	72	7/6/2018	7/6/2018		

Project Name			Project No.	Drilling Comp	any		
Xcel CCR			266180-006	Site Services I	Drilling, LLC		
Boring No. Location				Drilling Rig Ty	pe and Drilling Method		
MW-19 Valmont S			Station	CME-55	Hollow Stem Auger (4.25-inch dia	meter)	
Sample No.	Blow Count	Depth (feet)		Descript	ion (USCS)	Elevation (feet)	Remarks
		- - - 5	SP: poorly grade medium dense, r	ed medium sand with se noncohesive	ome fines, 10YR 5/2 grayish brown, dry,		Potholed to 8' bgs with hydrovac
	1, 3 5, 6	10	SP: poorly grade brown, moist, m SP: same as abo	ed medium san with tra edium dense we, color changed to G	ce grave and fines, 10YR 3/3 dark		Abrupt change in color Mottling goes from bro to light gray
	9, 36 50/5	15 — -	SP: poorly grade olive brown, dry	ed medium sand with tr , dense, noncohesive			
	50/5	20	SP: same as abo	we, no cobbles			Some slate chunks came up in the auger cuttings
	22, 50/1	25	SP: poorly grade brown, dry, dens plasticity	ed medium sand with tr se, very platy, Fe staini			
	26, 50/2	30	SP: same as abo	ve			
	50/3	35	SP: poorly grade dense, noncohes	ed medium sand with tr ive	ace fines, 2.5Y 7/4 plae brown, dry		
	50/6	40	SP: same as abo	we, but color changed t	o 2.5Y 7/2 light gray		
	50/2	45	ML: weathered s noncohesive with	shale: silt with sand, m h some clay layers	oist, 2.5Y 6/1 gray, hard, fissile,		While taking 44' SS, last show in hole, over drilled to retrieve
	50/2	50 <u>-</u>	ML: same as ab	ove			
		55					
		- 00					
					Logged By:	Drilled/Sampled	By:
Total Depth (feet	t)	Water Le	vel (feet) ling:	Hours After	N. Hanrahan Date Started:	Site Service	
49		10 90 144	y.	72	7/5/2018	7/6/2019	•
49 10.80 btoc		7	12	//3/2018	//0/2018		

Boring Log

Xect CCR Zericity 200 Size Service: Drilling: LLC Boring No. Usation CME 55 Holdow Stem Auger (1.25-linch diameter) Sample No. Blow Court [See Service: Drilling: LLC Sample No. Sample No. [See Service: Drilling: LLC Sample No. Sample No. [See Service: Drilling: LLC Sample No. Sample No. [See Service: Drilling: LLC Sample No. [See Service: Drilling: LLC Product No. Samport yendowan due of the wat sample stand and the fire and: 2.5Y 6	Project Name			Project No.	Drilling Comp	any		
Boring No. MW-20 Location Value Diriting Rig Type and Diriting Method (CME-53 Holew Stein Auger (4 25-tach diameter) Sample No. Blow Court Depth (feet) Description (USC3) Elevation (feet) Remarks Simple No. Blow Court Depth (feet) Description (USC3) Elevation (feet) Remarks Simple No. Blow Court Depth (feet) Description (USC3) Elevation (feet) Remarks Simple No. Blow Court Depth (feet) Description (USC3) Elevation (feet) Remarks Simple No. Blow Court Depth (feet) Description (USC3) Elevation (feet) Production Simple (feet) Production (feet) Production Simple (feet) Production Simin (feet)	Xcel CCR			266180-006	Site Services I	Drilling, LLC		
NW-20 Valuent Station CME:55 Hollow Stem Auger (4.25 inch disurcer) Sample No. Blow Court Description (USCS) Elevation (deel Remarks 5	Boring No.		Location		Drilling Rig Ty	vpe and Drilling Method		
Sample No. Blow Count Description (USCS) Elevation (feet) Remarks Sign product medium and with free fires, 10YR 62 light bownish gray, day, medium and with fine said, 2.5Y 64 light yellowish Producted to 8" bgs with bydroxe Producted to 8" bgs with bydroxe 12, 29 50 10 SP: poorly graded medium and with fine said, 2.5Y 64 light yellowish Producted to 8" bgs with bydroxe 50 10 SP: poorly graded medium to fine said, 2.5Y 64 light yellowish Producted to 8" bgs with bydroxe 50 10 SP: poorly graded medium to fine said, 2.5Y 64 light yellowish Producted to 8" bgs with bydroxe 50 10 SP: same as above SP: same as above Producted to 8" bgs with bydroxe 50 20 SP: same as above but wet SP: same as above but wet Solected SS # 27 bgs 50 35 SP: same as above but wet Solected SS # 27 bgs Split-spoor brackeded context, wordstative models, solected wet Split-spoor brackeded context, solected SS # 27 bgs 50 40 ML: same as above ML: same as above Split-spoor bracked context, solected SS # 27 bgs 50 40 ML: same as above ML: same as above Split-spoor bracked context, solected	MW-20		Valmont S	tation	h CME-55 Hollow Stem Auger (4.25-inch diam		neter)	
SP SP poolty graded medium and with few fines, 10YR 6/2 light brownish gray, dy, medium does, noncohoive Probability of the second dy, medium and with few fines, 10YR 6/2 light brownish gray, dy, medium does, noncohoive Probability of the second dy, medium does, noncohoive 50 12, 29 10 SP poolly graded medium and with fine and, 2.5Y 6/4 light yellowish tream, dry, dense, noncohoive, shinly bedded, coldation, fissile Probability of the second dy, medium does, noncohoive, the second dy, medium does, noncohoive, studied and discond disc	Sample No.	Blow Count	Depth (feet)		Descript	ion (USCS)	Elevation (feet)	Remarks
SP: poorly graded medium and with five fines, 10YR 62 light brownish gray, dy, medium dene, macohesive Policiel to 5" bgs with hydroxe S1: SP: poorly graded medium and with five sund, 2.5Y 64 light yellowish hydroxe Policiel to 5" bgs with hydroxe S0: 10 SP: poorly graded medium and with five sund, 2.5Y 64 light yellowish hydroxe Policiel to 5" bgs with hydroxe S0: 10 SP: poorly graded medium to fise sand, 2.5Y 64 light yellowish brown, dry, wry dense, noncohesive, oxidation Policiel to 5" bgs with hydroxe S0: 20 SP: same as above SP: same as above S0:1 25 SP: same as above Policiel to 5" bgs with hydroxe S0:1 30 SP: same as above but wet Policiel to 5" bgs S0:1 30 SP: same as above SP: same as above S0:1 30 SP: same as above but wet SP: same as above S0:1 30 SP: same as above SP: same as above S0:1 35 ML: same si above SP: same as above S0:1 35 ML: same si above SP: same as above S0:1 35 ML: same si above SP: same as above S0:1 35 ML: same si above SP: same as above S0:1 30 SP: same as above SP: same as above S0:1 50 SP:			(,					
12, 20 30 SP: poorly graded medium and with fires and, 2.5Y 64 light yellowish brown, dry, drss, enserchesive, thinly bedded, oxidation, fissile Peduded to SF bgs with hydroxe 50/6 10 SP: poorly graded medium to fire and, 2.5Y 64 light yellowish brown, dry, wry drase, noncohesive, thinly bedded, oxidation, fissile Peduded to SF bgs with hydroxe 50/6 10 SP: poorly graded medium to fire and, 2.5Y 64 light yellowish brown, dry, wry drase, noncohesive, oxidation Peduded to SF bgs with hydroxe 50/6 20 SP: same as above Set String as above 50/1 25 SP: same as above but wet Set String as above but wet 50/1 30 SP: same as above but wet Set String as above but wet 50/1 30 SP: same as above Set String as above but wet 50/1 30 SP: same as above but wet Set String as above but wet 50/1 31 SP: same as above Set String as above 50/1 32 Set same as above Set String as above 50/1 33 Set same as above Set String as above 50/1 34 ML: same as above Set String as above 50/1 35 Set String as above Set String as above 50/1 50 Set String as above Set String as above 50/1 50 <			-	SP: poorly grad	lad madium sand with t			
12, 29 SP poorly graded medium and with fine and 2.5 Y 64 light yellowish brown, dry, ense, noncolessive, thinly bedded, oxidation, fissile Pedoeled to S* bes with hydroxe 50:6 10 SP poorly graded medium on fine sand. 2.5 Y 64 light yellowish brown, dry, very draw, noncolessive, oxidation Pedoeled to S* bes with hydroxe 50:6 15 SP poorly graded medium to fine sand. 2.5 Y 64 light yellowish brown, dry, very draw, noncolessive, oxidation Pedoeled to S* bes with hydroxe 50:6 20 SP same as above Set Same as above 50:1 25 SP same as above but wet Pensity increased according to driller, cellected SS @ 27 bps 50:1 20 SP same as above but wet Set Same as above but wet 50:1 20 SP same as above but wet Set Same as above but wet 50:1 35 SP same as above but wet Set Same as above but wet 50:1 36 M: very weathered stude, stiff oxidation, moist, very thinky bedded, 10VR 54 Set				dry, medium de	ense, noncohesive	ew lines, 101 K 0/2 light brownish gray,		
12. 29 50.6 10 SP poorty graded medium and with fine sand, 2.5Y 64 light yellowish brown, dry, dree, noncohesive, thinly bedded, oxitation, fissile Pediolod to S' bgs with hydroxe: 50.6 15 SP poorty graded medium to fine sand, 2.5Y 64 light yellowish brown, dry, very dense, noncohesive, utilation Pediolod to S' bgs with hydroxe: 50.6 20 SP: same as above Benetity in oriented according to athler, southerd SS @ 27 bgs 50.1 25 SP: same as above Benetity in oriented according to athler, southerd SS @ 27 bgs 50.1 25 SP: same as above but wet Benetity in oriented according to athler, southerd SS @ 27 bgs 50.1 35 SP: same as above but wet SP: same as above but wet 50.1 35 Hill: Very weathered shale, stiff cristiantion, moist, very thinly bedded, 10YR 54 50.1 35 Hill: Very weathered shale, stiff cristiantion, moist, very thinly bedded, 10YR 54 50.1 35 Hill: Shale: GI 4m dark gray, moist, hard, fissile, thinly bedded, noncohesive use above 50.1 40 Hill: Shale: GI 4m dark gray, moist, hard, fissile, thinly bedded, noncohesive use above 50 50 50								
12, 29 3			-					
12, 29 10 Probability graded medium and with fine and 2.5Y 64 light yellowish hydroxs: Probability Steps with hydroxs: 506 10 58: poorly graded medium to fine sand. 2.5Y 64 light yellowish brown, dry, very dense, noncohesive, usidation Probability for the second s			5	Ī				
12.29 SP: poorly graded medium and with fine and, 2.5Y 64 light yellowish brown, dry, dense, noncohesive, thinly bedded, oxidation, fissile hydroxe: 3016 10 SP: poorly graded medium to fine and, 2.5Y 64 light yellowish brown, dry, dense, noncohesive, oxidation SP: poorly graded medium to fine and, 2.5Y 64 light yellowish brown, dry, see a above SP: same as above 5016 20 SP: same as above SP: same as above SP: same as above 5011 25 SP: same as above but wet SP: same as above but wet SP: same as above but wet 5011 30 SP: same as above but wet SP: same as above but wet SP: same as above but wet 5011 30 SP: same as above but wet SP: same as above but wet SP: same as above but wet 5011 30 SP: same as above but wet SP: same as above but wet SP: same as above but wet 5011 30 SP: same as above ML: same as above SP: same as above but wet 5011 31 SP: same as above SP: same as above but wet SP: same as above 5011 32 SP: same as above SP: same as above SP: same as above 5011 35 SP: same as above SP: same as above SP: same as above 5011 30 SP: same as above SP: same as above SP: same as above <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Potholed to 8' bgs with</td></t<>								Potholed to 8' bgs with
12, 20 SP: poorly graded medium said with fire said. 2.5Y 6/4 light yellowish 50/6 10 50/6 15 50/6 15 50/6 15 50/6 15 50/6 20 50/6 20 50/1 25 50/1 25 50/1 25 50/1 25 50/1 25 50/1 25 50/1 25 50/1 25 50/1 25 50/1 30 50/1 30 50/2 5P: same as above 50/1 30 50/1 35 50/1 36 50/1 36 50/1 36 50/1 36 50/1 36 50/1 36 50/1 36 50/1 36 50/1 37 50/1 36 50/1 37 50/1 36 50/1 37 50/1 38 50/1 39 50/1 37 50/1 38 50/1 50								hydrovac
50/6 10 0000, it y, delse, noncollesive, nimity deded, 0.04adulti, itsue 50/6 15 SP: poorfy graded medium to fine sund. 2.5Y 6/4 light yellowish brown, dry, very dense, noncobesive, oxidation 50/6 20 SP: same as above 50/1 25 SP: same as above 50/1 25 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1 40 ML: same as above 40 ML: same as above Split-spoon bracketed 50 40 Split-spoon bracketed 50 50 50 50 50 50 50 50 Split-spoon bracketed 50 Split-spoon bra		12, 29	_	SP: poorly grad	led medium sand with i	fine sand, 2.5Y 6/4 light yellowish		
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S06 15 SP: poorly graded medium to fine sand, 2.5Y 6/4 light yellowish brown, dry, very dense, noncohesive, oxidation Image: SP: same as above very dense, noncohesive, oxidation S06 20 SP: same as above Image: SP: same as above S071 25 SP: same as above but wet S071 30 MI: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 S071 35 MI: same as above MI: same as above MI: Stale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive S076 40 MI: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive S07 50 Total Depth (fm)				-				
S0r6 15			-	SP: poorly grad	lad madium to fina can	d 2.5V 6/4 light vallowish brown dry		
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S016 20 SP: same as above Density increased according to driller, collected SS @ 27 bgs S011 25 SP: same as above but wet Collected SS @ 27 bgs S011 30 SP: same as above but wet Collected SS @ 27 bgs S011.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 54 Split-spoon bracketed contact between weathered shale. stiff oxidation, moist, hard, fissile, thinly bedded, noncohesive S016 40 ML: same as above Split-spoon bracketed contact between weathered shale. stiff oxidation, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. stiff oxidation, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. stiff oxidation S016 40 ML: same as above Split-spoon bracketed contact between weathered shale. Stiff oxidation, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. Stiff oxidation S016 40 ML: same as above Split-spoon bracketed contact between weathered shale. Stiff oxidation Split-spoon bracketed contact between weathered shale. Stiff oxidation S016 40 Split-spoon bracketed contact between tweathered shale. Stiff oxidation Split-spoon bracketed contact between tweathered shale. Stiff oxidation S01 50 50 Split-spoon bracketed contact between tweathered shale. Stiff oxidation Split-spoon bracketed			-	-				
506 20 - SP: same as above								
50/6 20				-				
S00 20		50/6		SP: same as ab	ove			
50/1 25 SP: same as above 50/1 50/1 50/1 30 50/1 30 50/1 30 50/1 30 50/1.5 35 50/1.5 35 50/1.5 35 9 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 54 9 ML: same as above 50/6 40 45 45 50 40 45 50 50 50 50 50		50/0	20	br : baine as as				
50/1 25 SP: same as above 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1 30 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/1.5 35 yellowish brown, noncohesive 50/6 40 ML: same as above 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive 45 1 50 40								
50/1 25 SP: same as above 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/6 40 ML: same as above 45 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale. 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale.								
50/1 25 SP: same as above 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1 30 SP: same as above but wet 50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/1.5 35 WL: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/1.5 35 WL: same as above 50/6 40 ML: same as above 40 ML: Same as above 50/6 40 45 - 50 -			-					
S0/1 SP: same as above but wet Density increased according to driller, collected SS @ 27 bgs S0/1 30 SP: same as above but wet collected SS @ 27 bgs S0/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 Split-spoon bracketer S0/1.5 35 ML: same as above ML: same as above Split-spoon bracketer S0/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketer s0/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketer s0 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketer s0 50 50 50 Split-spoon bracketer Split-spoon bracketer		50/1		SP: same as ab	ove			
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50/1 30 - SP: same as above but wet solution collected SS @ 27 bgs 50/1.5 35 - ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 yellowish brown, noncohesive Split-spoon bracketed contact between weathered shale. 50/6 40 - ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. 50/6 40 - - - 45 - - - 50 - - -		50/1		SP: same as ab	ove but wet			Density increased
50/1 30 SP: same as above but wet Conclude 35 @ 27 ogs 50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 yellowish brown, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale. 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. 50/6 40 45 Split-spoon bracketed contact between weathered shale. 50 50 40 Split-spoon bracketed contact between weathered shale.								according to driller,
50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 50/1.5 35 WL: same as above 50/6 40 ML: shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive 40 40 45 45 50 45 50 45 50 50		50/1	30	SP: same as above but wet			conected 55 @ 27 bgs	
50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 yellowish brown, noncohesive Split-spoon bracketed contact between weathered shale. 50/6 40 ML: same as above Split-spoon bracketed contact between weathered shale. 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale. 50/6 40 45 45 45 45 45 50 50 Logged By: 50 Yeter Level (feet)								
S0/1.5 35 - ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 yellowish brown, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale. S0/6 40 - ML: same as above Split-spoon bracketed contact between weathered shale. GI 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale. 40 - - - - - 45 - - - - - 50 - - - - - 50 - - - - - - 50 - - - - - - - 50 - - - - - - - - 50 -				-				
50/1.5 35 ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 yellowish brown, noncohesive Split-spoon bracketed contact between weathered shale and bedrock shale. 50/6 40 ML: same as above Split-spoon bracketed contact between weathered shale and bedrock shale. 50/6 40 ML: same as above Split-spoon bracketed contact between weathered shale and bedrock shale. 50/6 40 HI: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Weathered shale and bedrock shale. 45 - - - - 50 - - - - 50 - - - - 45 - - - - 50 - - - - 50 - - - - 50 - - - - 50 - - - - 50 - - - - 50 - - - - 50 - - - - 50 - <td< td=""><td></td><td></td><td> _</td><td></td><td></td><td></td><td></td><td></td></td<>			_					
50/1.5 35 ML: very weathered shale, still oxidation, moist, very thinly bedded, 10 Y R 5/4 50/6 40 ML: same as above 50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive 40 45 45 50								
50/6 ML: same as above Split-spoon bracketec 50/6 40 ML: Shale: GI 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketec 40 45 45 45 45 50 50		50/1.5	35 —	vellowish brow	ML: very weathered shale, stiff oxidation, moist, very thinly bedded, 10YR 5/4 vellowish brown, noncohesive			
50/6 40 ML: same as above Split-spoon bracketer contact between weathered shale and bedrock shale. 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive Split-spoon bracketer contact between weathered shale and bedrock shale. 45 45 50 50								
50/6 40 ML: same as above Split-spoon bracketec 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive weathered shale and bedrock shale. 45 - 45 - 50 -								
50/6 40 ML: Shale: G1 4/n dark gray, moist, hard, fissile, thinly bedded, noncohesive contact between weathered shale and bedrock shale. 40 41 45 45 45 45 45 45 45 50 50 50 50		50/6 40		ML como os o	hova			Split-spoon bracketed
Jobb 40 Image: Construction of the second s				ML: Shale: G1	4/n dark gray, moist, h	ard, fissile, thinly bedded, noncohesive		contact between
45 - 50 Logged By: Drilled/Sampled By: Site Service					<i>a</i> ,,, ,,	···· , ·· · , · · · · · · · · · · · · ·		weathered shale and bedrock shale
Image: state of the state o								ocurorit share.
Image: state of the state o								
45 - 50 - 50 - Total Depth (feet) Water Level (feet) N. Hangban Site Service								
Total Depth (feet) Water Level (feet) N. Hanraban Site Service			15					
Total Depth (feet) Water Level (feet) N. Hanraban Drilled/Sampled By:			45	Ι				
Total Depth (feet) Water Level (feet) N. Hanraban Drilled/Sampled By:								
Logged By: Drilled/Sampled By: Total Depth (feet) N. Hanraban								
50 Image: State of the stat			È –					
Logged By: Drilled/Sampled By: Total Depth (feet) N. Hanrahan Site Service			50					
Total Denth (feet) N Hanrahan Site Service						Logged By:	Drilled/Sampled	By:
IN FRANKRING I STELLESELLEEL UN FRANKRING LAUC ACTVIC	Total Dopth (foot)		Water Low	al (feet)		N Hanrahan	Site Carries	
After Drilling: Hours After: Date Started: Date Completed:	i Star Deptir (reet	1	After Drilli	ng:	Hours After:	Date Started:	Date Completed	:
39.5 12.15 btoc 96 7/5/2018 7/5/2018	39.5		12.15 btoc	-	96	7/5/2018	7/5/2018	

FJ

Boring Log

Project Name		Project No.	Drilling Company						
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC					
Boring No.	Location		Drilling Rig Type and Drilling Method						
MW-21	Valmont S	Station	tation CME-55 Hollow Stem Auger (8-inch diameter) with Continuous Sampler						
Sample No.	Depth (feet)		Description (U	Description (USCS) Elevation (feet) Remarks					
VAL-MW21-9		0-1: CL, Silty CLA 1-4: SM, Silty fine 4-6: CL, Silty CLA brown. 6-31: CL, CLAY w plasticity, moist, 2 increases with dept 31-34: Sh, SHALE	Y, moist, 10YR 4/4 dark SAND, loose, moist, 10Y Y with some fine sand, so <i>i</i> th fragments of weak, fri 5Y 5/2 grayish brown (we th. Moist to 19ft, clay dry dry	yellowish brown. R 6/4 light yellowish brown. off, moist, 10YR 5/6 yellowish able, fissile shale, stiff, low eathered bedrock). Shale fraction but shale moist 19-31 ft. Sley 1 5/N gray (bedrock).		Weathered shale sample			
				Logged/Sampled By:	Drilled By:				
Total Depth (fee	Water Lev	vel (feet)		Emily Munoz	Site Services Drilling, LLC				
	After Drill	ing: Hou	urs After:	Date Started:	Date Comple	ted:			
34	8.82 (stati	c) 13d	l, 6h (static)	1/8/2019	1/8/2019				
FJS

Boring Log

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drillin	g, LLC		
Boring No.	Location	-	Drilling Rig Type ar	d Drilling Method		
MW-22	Valmont S	tation	CME-55	Hollow Stem Auger (8-incl	h diameter) with Cor	tinuous Sampler
Sample No.	Depth (feet)		Description (USCS)	Elevation (feet)	Remarks
	_	0-1: CL, Silty	CLAY, moist, 10 YR 5/4 yell	owish brown.		
	_	1-8.5: ML, SIL	T, soft, moist, Gley 1 3/N ver	y dark gray (ash) with lenses of	f	
VAL-MW22-3	_	clay, 2.5 Y 6/4	light yellowish brown.			
	_					
	5 —					
	_					
VAL-MW22-8						
VAL-WI W 22-0	-	8.5-15: ML, SI	LT soft, moist, Gley 1 2.5/N	black (ash).		
			•			
	10	1				
	_					
VAL-MW22-13						
	15 —	15-22 5 [.] As ab	ove wet			
		15 22.5. HS ub	ove, wet.			
VAL-MW22-18						
	20					
			TAT7 1.1 11. 1.4			
VAL-MW22-23		22-23.5: CL, C 23 5-38 5 MI	SILT soft moist Glev 1 4/N	UYR 5/3 Drown. J dark gray (ash)		
		23.3-36.3, WIL	, 5111, 5011, 110131, Oley 1 4/1	(dark gray (asir).		
	25 —					
	_	1				
VAL-MW22-28	_					
	30 —					
	-					
VAL-MW22-33						
	-	ĺ				
	35	[
	55					
				Longod/Complet Du		
Total Denth (fee	Water Lev	rel (feet)		Logged/Sampled By: Emily Munoz Site Services Drilling LLC		rilling LLC
. etai Doptii (ioo	After Drill	ing:	Hours After:	Date Started:	Date Complete	d:
83.5	Still rising	5		1/3/2019	1/4/2019	
	. 0			•	•	



Page 2 of 3

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC		
Boring No.	Location		Drilling Rig Type an	d Drilling Method		
MW-22	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	meter) with Co	ntinuous Sampler
Sample No.	(feet)		Description (l	JSCS)	(feet)	Remarks
Sample No. VAL-MW22-38 VAL-MW22-43 VAL-MW22-47	Jepun (foot) 40 40 40 40 40 40 40 40 40 60 60 65	23.5-38.5: ML, \$ 38.5-47: As abov 47-48.5: CL, Silv 48.5-57.5: CL, Silv brown. Shale we 57.5-73.5: As ab	Description (U SILT, soft, moist, Gley 1 4/N ve, wet. ty CLAY with some shale fr Silty CLAY with shale fragm eak, friable, fissile, 10 YR 5/	JSCS) I dark gray (ash). agments, dry, 10 YR 5/4 yellowish ents, dry, 2.5 Y 5/4 light olive 2 very dark grayish brown.	(foot)	Remarks
	70					
				Logged/Sampled By:	Drilled Bv:	
Total Depth (feet	Water Lev	el (feet)		Emily Munoz	Site Services I	Drilling, LLC
	After Drilli	ng: H	lours After:	Date Started:	Date Complet	ed:
83.5	Still rising			1/3/2019	1/4/2019	



Page 3 of 3

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC		
Boring No.	Location	•	Drilling Rig Type an	d Drilling Method		
MW-22	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	umeter) with Co	ntinuous Sampler
Sample No.	(foot)		Description (USCS)	(foot)	Remarks
		57.5-73.5: As abo	ove, moist.			
		73.5-78.5: CL, Cl	LAY with friable, fissile, w			
	75 —		ing), 5 1 5/2 dark onve gr	ay.		
		78.5-82.5: Sh. SH	IALE weak, with soft clay	wet 2.5 Y 3/2 very dark gravish		
	-	brown.	11 1222, Weak, White Sole endy	, ((0), 210 1 0, 2 (0) j dain grajion		
	80 —					
		f				
		82.5-83.5: Sh, SH	IALE, medium-strong, fissi	ile, moist, Gley 1 3/N very dark		
		gray.				
	85		BORING TERMINATED			
	_					
	90 —					
	95					
	_					
	_					
	100 —					
	-					
	105 —					
				Logged/Sampled By:	Drilled By:	
Total Depth (fee	Water Lev	rel (feet)		Emily Munoz	Site Services I	Drilling, LLC
92.5	After Drilli	ing: Ho	ours After:		Date Complet	ea:
05.5	Sun rising			1/5/2019	1/4/2019	

FJ

Boring Log

Project Name		Project No.	Drilling Compa	ny			
Xcel/PSCo CCR		10025968-58	3 Site Services D	rilling, LLC			
Boring No.	Location	-	Drilling Rig Ty	be and Drilling Method			
MW-23	Valmont S	Station	CME-55	Hollow Stem Auger (8-inch dia	meter) with C	ontinuous Sampler	
Sample No.	Depth (feet)		Descript	ion (USCS)	Elevation (feet)	Remarks	
VAL-MW23-3	-	0-1: CL, Silty 1-4.5: ML, SII trace gravel, 2 4.5-6: ML, SII	CLAY, moist, 2.5 Y 5/4 LT, moist, Gley 1 4/N da .5Y 4/4 olive brown. LT, moist, Gley 1 2.5/N 1	light olive brown. rk gray (ash), lens of silty SAND with plack (ash). Bottom 6" CLAY with trace		Ash sample	
VAL-MW23-8	5 <u> </u>	shale fragmen 6-18.5: ML, S brown clay at	ts, medium stiff, 2.5 Y 5 ILT, moist, Gley 1 2.5/N 9 ft.	⁽⁴ light olive brown. black (ash), lens of 2.5 Y 5/6 light olive		Ash sample	
VAL-MW23-13						Ash sample	
VAL-MW23-18 VAL-MW23-19	20	18.5-19.5: As 19.5-22.5: CL plasticity, 2.5	above, wet. , CLAY with some shale Y 5/4 light olive brown.	fragments, moist, stiff, low to medium		Ash sample Wet ash sample	
VAL-MW23-23		22.5-23.5: ML 23.5-33.5: ML of 2.5 Y 5/4 li	2, SILT, dry, Gley 1 5/N 2, SILT, moist, Gley 1 3/J ght olive brown CLAY a	gray (ash). N very dark gray (ash) with 2-inch lens t 30ft.		Ash sample	
VAL-MW23-28	30					Ash sample	
VAL-MW23-33	35	33.5-35: ML,	SILT, moist, Gley 1 5/N	gray (ash)		Ash sample	
			Continue	a next page.		l	
Logged/Sampled By:					Drilled By: Site Services Drilling, LLC		
103.5	After Drill Dry	ing:	Hours After: 19	Date Started: 1/4/2019	Date Comple 1/7/2019	ted:	



Page 2 of 3

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drillin	ng, LLC		
Boring No.	Location		Drilling Rig Type a	nd Drilling Method		
MW-23	Valmont S	tation	CME-55	CME-55 Hollow Stem Auger (8-inch diameter) with Continuous Sa		
Sample No.	(feet)		Description	(USCS)	(feet)	Remarks
		35-46: ML, SII	LT, wet, Gley 1 4/N very dar	k gray (ash).		
VAL-MW23-38						Ash & wet ash samples
	40 —					
VAL-MW23-43						Ash & wet ash samples
	_					
	45 —					
		46 49 5 CL C	T A X	- shale for some the door 2.5 X.5/C		
	_	light olive brov	vn with lenses of Glev 1 5/N	grav (weathered bedrock)		
	_	8		8		
	_	48 5-63 5 [.] CI	CLAY with shale fragments	dry stiff low to medium		
	50 —	plasticity, 2.5	7 5/4 light olive brown with	lenses of 2.5 Y 5/1 gray (weathered		
		bedrock).	C			
	_	ł				
		ł				
	55 —					
	_					
	_					
	60					
		63.5-86.5: Sh-0	CL, Shale, weak, friable, fiss	ile, 2.5 Y 5/1 gray with interstitial		
	65 —	CLAY, low to a	medium plasticity, dry, 2.5 Y	7 5/4 light olive brown (weathered		
		bedrock).				
	_					
	70 —					
						l
				Logged/Sampled Bv:	Drilled Bv:	
Total Depth (feet	Water Lev	el (feet)		Emily Munoz	Site Services Drilling LLC	
	After Drilli	ing:	Hours After:	Date Started:	Date Completed:	
103.5	Dry		19	1/4/2019	1/7/2019	



Page 3 of 3

Project Name		Project No.	Drilling Company					
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC				
Boring No.	Location		Drilling Rig Type an	Drilling Rig Type and Drilling Method				
MW-23	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	ameter) with Co	ntinuous Sampler		
Sample No.	(feet)		Description (JSCS)	(feet)	Remarks		
		63.5-86.5: As at 86.5-103.5: Sh, (water added du	SHALE, weak to medium-st ring drilling), Gley 1 5/N gra	rong, friable, fissile, moist to wet ay (bedrock).				
	105		BORING TERMINATED	AT 103.5 FT BGS				
				Logged/Sampled Bv:	Drilled By:			
Total Depth (feet	Water Lev	el (feet)		Emily Munoz		Site Services Drilling, LLC		
	After Drilli	ng: H	lours After:	Date Started:	Date Completed:			
103.5	Dry	- 1	9	1/4/2019	1/7/2019			



Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC		
Boring No.	Location		Drilling Rig Type an	d Drilling Method		
MW-24	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch	diameter) with Co	ntinuous Sampler
Sample No.	Depth (feet)		Description (ISCS)	Elevation (feet)	Remarks
	5	0-3.5: CL, Silty brown. 3.5-7.5: SM, Sil loose, 2.5 Y 5/4 7.5-39: CL, Silt brown. Shale fr	CLAY with some gravel and ty fine to coarse SAND with light olive brown. y CLAY with shale fragments agments gradually increase w	cobbles, moist, 10 YR 3/3 dark some gravel and cobbles, dry, s, dry, 2.5 Y 6/4 light yellowish ith depth (weathered bedrock).		
	15					
	20					
	25					
	30					
	35 —					
				Logged/Sampled By: Drilled By:		
Total Depth (fee	Water Lev	el (feet)		Emily Munoz	Site Services I	Drilling, LLC
	After Drilling: Hours		Hours After:	Date Started:	Date Complet	ed:

Page 2 of 3

Project Name		Project No.	Drilling Company				
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC			
Boring No.	Location		Drilling Rig Type an	d Drilling Method			
MW-24	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	meter) with Co	ntinuous Sampler	
Sample No.	(feet)		Description (JSCS)	(feet)	Remarks	
VAL-MW24-48 VAL-MW24-52	40	7.5-39: As abov 39-45: Sh: SHA olive gray. 45-47.5: CH: CI grayish brown. 47.5-50: Sh: SH 50-52.5: CL: Sil drilling), 5 Y 4/4 52.5-55: As abo 55-57.5: ML/CL plasticity, dry, 5 57.5-72.5: Sh: S 4/1 dark gray.	E. LE, friable, fissile, weathered LE, friable, fissile, weathered LAY, moist, stiff, medium to ALE, dry, strong, 5 Y 6/2 lig ty CLAY with shale fragmen 4 light olive brown. ve but 5 Y 5/4 light olive bro <i>::</i> Interbedded SILT, dry, 5 Y Y 5/4 olive. HALE, weak to medium-stro		Weathered shale sample Weathered shale sample		
Total Dowth #	Matari	al (fa at)		Logged/Sampled By:	Drilled By:		
I otal Depth (feet	Water Lev	ei (teet)	1	Emily Munoz	Site Services Drilling, LLC		
	After Drilli	ng:	Iours After:	Date Started:	Date Complet	ted:	
					ļ		



Page 3 of 3

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	, LLC		
Boring No.	Location		Drilling Rig Type an	d Drilling Method		
MW-24	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	meter) with Cor	ntinuous Sampler
Sample No.	Depth		Description (l	JSCS)		Remarks
	(TAAT)	57.5-72.5: As above			Heati	
		В	ORING TERMINATED	AT 72.5 FT BGS.		
	/5					
	-					
	80					
	_					
	_					
	_					
	05					
	85	1				
	00					
	90					
	_					
	_					
	95					
	_					
	_					
	100					
	_					
	_					
	_					
	105 —					
			Logged/Sampled By:	Drilled By:		
Total Denth (fee	1Water Lev	el (feet)		Emily Munoz	Site Services F	Drilling LLC
	After Drilli		rs After	Date Started:	Started: Date Completed:	
72.5	39.13			12/26/2018	12/27/2018	~~.
12.3	57.15	24		12/20/2010	12/2//2010	

FJ

Boring Log

Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC		
Boring No.	Location		Drilling Rig Type an	d Drilling Method		
MW-25 old	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	ameter) with Con	tinuous Sampler
Sample No.	Depth (feet)		Description (l	JSCS)	Elevation (feet)	Remarks
	5 10 10 15 20 25 30 35	0-0.5: CL, Silty C 0.5-3: CL, Silty C brown. 3-4: SW, Well gra 4-8.5: CL, Silty C 8.5-13: CL, Silty yellowish brown. 13-16: ML/CL, C 2.5 Y 5/3 light oli 16-18: Sh, SHAL	LAY with trace gravel, mo LAY with shale fragments. aded fine to coarse SAND v LAY with shale fragments. CLAY with some fine sand layey SILT/Silty CLAY wi ve brown (weathered bedro E, strong, moist to wet, 2.5 BORING TERMINATED	 ist, 2.5 Y 4/4 olive brown. , low moist to dry, 2.5 Y 4/4 olive with some gravel, moist. , moist, 2.5 Y 4/3 olive brown I, moist to wet, 10 YR 3/4 dark th shale fragments, moist to wet, ock). Y 6/1 gray (bedrock). AT 18 FT BGS. 		
				Logged/Sampled By:	Drilled By:	
Total Depth (fee	Water Lev	vel (feet)		Emily Munoz	Site Services D	rilling, LLC
· · ·	After Drill	ing: Ho	ours After:	Date Started:	Date Complete	d:
18	Dry	24		1/14/2019	1/14/2019	



Project Name		Project No.	Drilling Company			
Xcel/PSCo CCR		10025968-58	Site Services Drilling	g, LLC		
Boring No.	Location	-	Drilling Rig Type an	d Drilling Method		
MW-25 new	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch diameter) with Continuous Sampler		
Sample No.	Depth (feet)		Description (l	JSCS)	Elevation (feet)	Remarks
VAL-MW25-8		0-8: CL, Silty CLA 5/4 light olive brow 8-10: ML, Clayey 3 4/4 dark yellowish 10-24.5: Sh-CL, W bedding planes and 24.5-28: Sh, SHALE 28-58: Sh, SHALE	Y with trace shale fragme on (weathered bedrock). SILT with some fine sand, brown to 10 YR 5/4 yello feak friable, fissile SHALJ fractures, dry, 2.5 Y 5/2 E, moist, friable, fissile, we , moist, fissile, medium-st	mts and rootlets at top, dry, 2.5 Y , moist, dense, grades from 10 YR wish brown. E with interstitial CLAY in grayish brown. weak, 5 Y 5/1 gray (bedrock).		weathered shale sample
				Logged/Sampled Bv:	Drilled Bv:	
Total Depth (feet	Water Lev	el (feet)		Emily Munoz	Site Services Drilling, LLC	
Dopan (100	After Drill	ing: Ho	urs After:	Date Started:	Date Completed:	
58	57.69	99	(not static)	2/13/2019	2/14/2019	



Page 2 of 2

Project Name		Project No.	Drilling Company					
Xcel/PSCo CCR		10025968-58	Site Services Drillin	g, LLC				
Boring No.	Location	-	Drilling Rig Type ar	nd Drilling Method				
MW-25 new	Valmont S	tation	CME-55	Hollow Stem Auger (8-inch dia	ameter) with Co	ntinuous Sampler		
Sample No.	(foot)		Description (USCS)	(foot)	Remarks		
		28-58: Sh, SHAI	LE, moist, fissile, medium-s	stong, Gley 1 5/N gray (bedrock).				
	. <u> </u>							
	40 —							
	1							
	45]						
	43							
	50							
		1						
	55							
	33							
			AUGER REFUSAL A	T 58 FT BGS.				
	60 —							
	0.5							
	1							
	70 —							
	μ	<u>.</u>			· · · · ·			
				Logged/Sampled By:	Drilled By:			
Total Depth (feet	Water Lev	rel (feet)		Emily Munoz	Site Services I	Drilling, LLC		
59	After Drilli	ing: H	ours After:	Date Started:	Date Complete	ed:		
38	57.69	9	9 (not static)	2/13/2019	2/14/2019			

)	2	HDR						MW-25C PAGE 1 OF 2
CLIEN PROJE DATE DRILL DRILL LOGG	T <u>Xcel</u> ECT NUI START ING CO ING ME ED BY	Energy MBER ED <u>02</u> NTRA(THOD K. Ma	y <u>10279387</u> 2/15/23 00: 2/15/23 00: 2/15/20 00: 2/15/20000000000000000000000000000000000	00 C(kota D NX Cl	OMPLE Drilling	TED <u>02/16/23 00:00</u>	PROJECT NAME Valmont Station PROJECT LOCATION Boulder, CO WELL LOCATION GROUND ELEVATION GROUND WATER LEVELS: AFTER DRILLING	_ HOLE DIAME	TER _7.625
NOTE	s				1				
DEPTH (ft)	MUMBER TYPE (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)					MA	TERIAL DESCRIPTION	V Casing	/ELL DIAGRAM Type: 2-in Sch 40 PVC
5	AU	100		CL		SANDY LEAN CL plasticity, fine gra	AY (CL), yellowish brown, high ned, cohesive, plant matter present		
	с С	92		SM		SILTY SAND WIT medium dense, lo 7.0 some silt, trace gi	H GRAVEL (SM), pale olive, loose to w plasticity, dry, fine to medium grained, avel, non-cohesive		
	С	100		SM		SILTY SAND WIT plasticity, dry, fine silt, trace gravel, r	H GRAVEL (SM), pale olive, firm, low to medium grained, some clay, some non-cohesive		
10	8	67				10.0 LEAN CLAY (CL)	pale olive, firm, low plasticity, dry, fine		
 _ 15_	ž	60		CL		grained, cohesive			■Bentonite (Seal)
 20	XN	100				17.5 LEAN CLAY (CL) grained, iron oxide bedding planes	, pale olive, firm, low plasticity, dry, fine e staining, staining along fractures and		
	XN	100		CL		25.0			
 	XN	100	l			SHALE, highly we gray to olive gray, fractures and lam	eathered to moderately weathered, dark iron oxide staining, oxidation staining in inations, blocky structure		
 35	XN	100				SANDSTONE, un layering present, l	weathered, dark gray, no staining, olocky structure		Filter Pack (10/20 Silica

)	S	HDR				MW-25C PAGE 2 OF 2					
CLIEN	T Xcel	Energy	/			PROJECT NAME Valmont Station						
PROJE		BER	10279387			PROJECT LOCATION Boulder, CO	PROJECT LOCATION Boulder, CO					
(ff) 35	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM					
 40	XN	100				SANDSTONE, unweathered, dark gray, no staining, layering present, blocky structure <i>(continued)</i>	\Sand) Screen Interval (0.010")					
- – - – - – 45	XN	100										
- – - – - – 50	XN	100										
 	NX	100				F5 0						
						Bottom of borehole at 55.0 feet.						

Project Name			Project No.	Drilling Compar	ny		
Xcel PSCo CO	CR		10025968	Dakota Drilling,	Inc.		
Boring No.		Location Valmont S	tation	Drilling Rig Typ	e and Drilling Method Hollow Stem Auger/ Air Rotary	(8"/5")	
NIW-20		Depth					Damarka
Sample No.	Blow Count	(feet)		Description	n (05C5)	Elevation (leet)	Remarks
1		0	Potholed (Hydr	rovac)		5225.79	Upper 20' HAS, 8" Auger
2			Topsoil (slough	n) top 12" with silty clay v	vith coarse sand and trace gravel;	5217.79	
2		8 _	rootlets top 4";	2.5Y 4/3 olive brown; mo	oist	5216 70	
4		9	Weathered shall Weathered shall	le, med strong, friable, fis	sile; iron stained; 2.5Y 4/3; dry to	5215.79	
		10	slight moisture				
5		15	Shale, less wear	thered, med strong, friable	e, fissile; 2.5Y 4/2 dark grayish	5210 70	
			brown; moist. I	ron staining and evaporite	e recrystallization in bedding planes	5210.79	
6			Shale with clay	and staining in fractures	and bedding planes; med strong,	5205.79	Switch to NX wireline at 20';
		20	friable, fissile;	2.5Y 4//2 dark grayish bro	own; wet		water added to core;
7		21.5	Shale, strong, la	aminated to thinly bedded	l, gley 1 5/N gray; wet	5204.29	Lower 23' air rotary; 5-5.5" borehole
8		23	Shale, strong, la greenish grav	aminated to thinly bedded	l; moist; gley 1 3/10Y very dark	5202.79	
9		28	SAA; moist; in	creasing moisture 31-33 f	t; nearly vertical fracture	5197.79	
10		33	SAA; moist to	wet; saturated on fracture	s and some bedding planes	5192.79	
11		38	SAA; wet; satu	rated on fresh breaks		5187.79	Water bearing zone in competent shale
		43	Boring termina	ted at 43 ft bgs		5182.79	
		_					
		_					
		_					
						<u> </u>	<u> </u>
					Logged By:	Drilled/Sampled	By:
Total Depth (1	eet)	Water Leve	el (feet)	Hours After	Jacob Moorman	Dakota Drilling,	Inc.
43		17.4 hos	ອ.	48	7/29/2019	7/29/2019	•
L.2							

Project Name	1		Project No.	Drilling Compar	у			
Xcel PSCo CO Boring No	CR	Location	10025968	Dakota Drilling,	Dakota Drilling, Inc.			
MW-27		Valmont S	tation	Diedrich D-120	Hollow Stem Auger/ Air Rotary	(8"/5")		
Sample No.	Blow Count	Depth		Description	n (USCS)	Elevation (feet)	Remarks	
1		(feet)	Clavey silt with	, and trace gravel and re	otlate: 10VP 1/2 brown: dry (tancail)	5288.4		
1		- ⁰	Clayey shi whi	i sand, trace graver, and to	ottets, 101K 4/5 brown, dry (topson)	5200.4		
		_						
2		5	Silty fine to coadry to 10ft, mo	arse sand with gravel, sub- ist at 11ft (fill)	angular; 10YR 8/2 very pale brown;	5283.4	Split spoon at 5' (12" drive)	
3		11	Silty clay; low-	med plasticity, soft; 2.5Y	5/4 light olive brown; moist	5277.4		
		_						
4		15	Weathered sha clay (as above)	le; weak, fissile, friable, 2. ; moist	5Y 5/2 grayish brown with interstitial	5273.4		
		-						
		_					Switch to NX wireline and air rotary at 35'	
5		39	SAA; moist, w	et in some fractures and be	edding planes	5249.4		
6		47	SAA, wet			5241.4	Wet in fresh breaks 47-49 ft	
7		49	Weathered sha staining; moist	le; weak to medium strong , wet on some fractures at	; 2.5Y 5/2 grayish brown with iron 54-55ft	5239.4	Wet in fresh breaks 54-55ft; moist in fresh breaks elsewhere	
		-						
8		59	Weathered sha	le; medium strong; 5Y 5/1	grey with iron staining; moist	5229.4	Wet in fresh breaks 59-60ft and at 68ft; remainder moist	
		_					Heavily fractured 64-69ft	
9		69	Weathered sha wet on fresh br	le; medium strong; 2.5Y 4 eak at 70'	/2 dark grayish brown; moist except	5219.4		
10		71	Shale; strong; u greenish black;	unweathered; few fractures	s with iron staining, gley 1 2.5/1	5217.4		
11		74	Boring termina	tted at 74 ft bgs		5214.4		
		1			Longod Dyg		Pro .	
Total Depth (4	feet)	Water Lev	el (feet)		Logged By: Jacob Moorman	Dakota Drilling	ру: Inc	
	eelj	After Drilli	ng:	Hours After:	Date Started:	Date Completed	inc.	
74		37.65'		48	7/31/2019	7/31/2019		

Project Name	•		Project No.	Drilling Co	ompany		
Xcel PSCo C	CR		10025968	Dakota Dr	illing, Inc.		
Boring No.		Location		Drilling Ri	g Type and Drilling Method		
MW-28		Valmont S	Station	Diedrich I	D-120 Hollow Stem Auger/ Air Rotary (8	3"/5")	1
Sample No.	Blow Count	Depth (feet)		Desc	cription (USCS)	Elevation (feet)	Remarks
1		0	Silty fine to coa	arse sand with grav	vel; subrounded; 10YR 7/3 very pale brown;	5269.24	
			dry (fill)				
							Split spoon 5-7ft
2		6	Silty clay; stiff,	low-medium plas	ticity; 10YR 5/3 brown; dry	5263.24	
			C1		- distant 10VD C/4 light collection have	5250.24	
3		10	Clayey silt with	trage cond: soft, low pl	asticity; 10 Y R 6/4 light yellowish brown; dry	5259.24	Continuous sampler 10-31.5ft
4		12	Silty clay with	im stiff low plasti	aity: 10 VP 3/6 dark vallowish brown: dry	5257.24	
6 15			Clayev silt tra	a fine sand: soft 1	low plasticity: color grades from 7 5VP 7/4	5255.24	
6 15 -			pink to 7.5YR	4/6 strong brown;	dry	3234.24	
7		20.5	Silty clay; stiff,	medium plasticity	; color grades from 10YR 5/4 yellowish	5248.74	
			brown to 10YF	4/2 dark grayish	brown with white mottling; dry (highly		
8		25	weathered shall Weathered shall	e) le: weak, friable, fi	issile: 2.5Y 5/3 light olive brown: dry	5244 24	
0		25		,			
9		28	Weathered shall	le; weak, friable, fi	issile; 2.5Y 5/1 gray to SAA; dry	5241.24	
10		30	SAA; dry			5239.24	
11		31.5	Weathered sha	le; weak, fissile, fr	iable; 5Y 5/1 gray; moist	5237.74	NX wireline core starting at 31.5ft
12		33	Weathered shall	le; medium strong,	, laminated to thinly bedded, heavily	5236.24	Ŭ
			fractured; 5Y 4	/1 dark gray with	iron staining; moist		
13		38	SAA; wet along	g fractures but mo	ist in fresh breaks	5231.24	
			SAA: moist			5226.24	Duillon noted water at 47,48 (not
14		43	SAA; moist			3220.24	recovered)
		_					
15		48	SAA; moist			5221.24	
			1				
16		53	SAA; moist			5216.24	
17		58	SAA; moist			5211.24	
			1				
18		63	Weathered shall	le; medium strong,	, laminated to thinly bedded, heavily	5206.24	Continue drilling 8/12/2019 at 13:10
			fractured; 5Y 4	/1 dark gray with	iron staining; moist		
			1				
19		68	SAA			5201.24	
20		73	Weathered shall	le, some clay; med	lium strong, laminated to thinly bedded,	5196.24	
			grav with iron s	ed, evaporite recry staining: moist	stallization in bedding planes; 5 Y 4/1 dark		
				6,			
		83	Boring termina	ted at 83ft		5186.24	
					Loggod By:		
Total Danth (fe et)	Motoriti	(a) (fa - 4)		Loggeu By:	Delteta D. '11'	і ру і
i otal Depth (Total Depth (feet) Water Le			Hours After	Date Started:	Dakota Drilling,	шс. i :
83		67.85'		48	8/2/2019	8/12/2019	
00		57.05		10	0/2/2017	0/12/2017	

)	S	HDR, Inc. 9781 S Meridian Englewood, CO	Blvd, Suit 80112	e 400		MW-29 PAGE 1 OF 2		
CLIE	NT .	Xcel I	Energy	/			PROJECT NAME Valmont Station			
PROJ	EC	t nun	IBER	10022770	0		PROJECT LOCATION Boulder, CO	PROJECT LOCATION Boulder, CO		
DATE	E ST	TARTE	D _09	9/02/21 00:0	<u>00</u> CC	OMPLE	TED _09/07/21 00:00 WELL LOCATION _ 14537489.7 N 1585079.659	E		
DRIL	LIN	G COI	NTRAG	CTOR Dat	kota D	rilling	GROUND ELEVATION 5242 ft HOLE	DIAMETER 5		
DRIL	LIN	G MET	rhod	HSA/AR			GROUND WATER LEVELS:			
LOG	GE	DBY_	E. Mu	inoz	_ Cł	IECKE	D BY AFTER DRILLING _21.40 ft / Elev 5220.60	ft Pre-development		
NOT	ES									
o DEPTH (ft)		SAMPLE I YFE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM		
	M	ŝS	100		CL		SILTY LEAN CLAY (CL), brown, stiff, low plasticity, dry,			
	Д	0				<u> </u> 	LEAN CLAY (CL), grayish brown, very stiff, low plasticity,			
	X	SS	83				dry, residuum fill			
	$\left(\right)$	()								
5	Å	S	100		CL					
		Ŋ					3.0			
		∢					SHALE, highly weathered, gray, dry, iron oxide staining,			
10							fractures)			
						<u> </u>				
		~				<u> </u>				
	11	RO	85							
						<u> </u>				
15	H									
						<u> </u>				
	11	S	100							
	11	ш				<u> </u>				
20	11						20.0			
	Π					<u> </u>	SHALE, highly weathered, grayish brown, damp, iron			
						<u> </u>	recrystallization and iron staining)			
		RC	100							
						<u> </u>				
25	Ц					İ—				
						E-				
	11	U.	100							
		R	100			<u> </u>				
20						<u> -</u>				
- 30	H									
						<u> </u>				
		RC	100							
						<u> </u>				
35							35.0			
							(Continued Next Page)			



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CLIENT Xcel Energy
PROJECT NUMBER 100227700

PROJECT NAME Valmont Station

PROJE	ECT NUM	BER	10022770	0		PROJECT LOCATION Boulder, CO	
(ft) (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 40	RC	100		-		SHALE, moderately weathered, dark gray, wet, iron oxide staining, weak, clayey, fractured (with evaporite recrystallization)	
 45	RC	100		-			
 50	RC	100		-			
 55	RC	100		-		SHALE, moderately weathered, very dark gray, wet, iron oxide staining, weak, clayey, heavily fractured (with evaporite deposits)	
 60	RC	100			56.0 	SILTSTONE, moderately weathered, brown, wet, iron • oxide staining, strong mudstone with weak clay zones with evaporite deposits above and below/ SHALE, moderately weathered, black, wet, iron oxide staining, weak, clayey, fractured (including high angle fractures)	
 65	RC	100		-	 		
						NOTES: Water came up to 20'; however, cores did not show significant moisture until 33'. Constructed well to maximize contact with observed wet fractures in weathered shale. Bottom of borehole at 65.0 feet.	





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PROJECT NAME Valmont Station CLIENT Xcel Energy PROJECT NUMBER 100227700 PROJECT LOCATION Boulder, CO SAMPLE TYPE NUMBER % BLOW COUNTS (N VALUE) GRAPHIC LOG RECOVERY U.S.C.S. DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM 35 SHALE, slightly weathered, black, damp, iron oxide staining, medium-strong, fractured (low-angle, with evaporite recrystallization) (continued) RC 100 40 40.0 SHALE, slightly weathered, very dark gray, damp, iron oxide staining, strong, one mid-high angle fracture zone with iron staining at 43-44 ft bgs RC 100 44.0 SHALE, unweathered, very dark gray, damp, strong, 45 unfractured RC 100 50 ∇ RC 100 55 55.0 SHALE, unweathered, black, damp to wet, strong with some weak clayey zones, fracture zone with one iron stained fracture at 60' NOTES: Drilled to 45' on 9/7, left open overnight. Borehole dry in morning.Continued to 55' (11' into unweathered shale) and monitored WL. Water collected in well overnight and slowly rose to ~51' by 9/16 (not static but rate of change slowing).Drilled to 70' on 9/16 and set well to capture 60 observed fracture zone and moist shale 50-70'. 80 100 65 RC 100 70 70 0 Bottom of borehole at 70.0 feet.





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CLIEN PRO.II	T <u>Xcel</u>	Energy	/ 10022770	0		PROJECT NAME Valmont Station PROJECT I OCATION Boulder CO	
-	R Y PE	× ×	ς Ω Ξ	<i>(i</i>)	<u>_</u>		
(#) 35	SAMPLE T NUMBE	RECOVER	BLOW COUNT (N VALU	U.S.C.S	GRAPHI LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 40	RC	100				SHALE, highly weathered, dark gray, damp, iron oxide staining, very weak, clayey, heavily fractured (with evaporite deposits) <i>(continued)</i>	
 45	RC	100				SHALE, slightly weathered, black, damp, iron oxide staining, medium strong, fractured (medium- to high-angle with evaporite deposits and iron-stained alteration zones)	
 50	RC	100				5.0 SHALE, unweathered, black, damp, strong with few weak clayey zones, few fractures (appear coring-induced) with no iron oxide or evaporite deposits, no alteration zones	
 55	RC	100				5.0	
						NOTES: Not producing much water during drilling. Left borehole open overnight and water came up to ~14' by morning. Set well based on water level and observed moisture in cores. Note that the screen and filter pack includes units logged as weathered shale and residuum; residuum is the completely weathered endpoint of the weathered shale. Bottom of borehole at 55.0 feet.	



(Continued Next Page)

)	S	HDR, Inc. 9781 S Meridian Englewood, CO	Blvd, Suit 80112	te 400		MW-32 PAGE 2 OF 2
CLIEN	T Xcel	Energ	у			PROJECT NAME Valmont Station	
PROJ		IBER	10022770	0		PROJECT LOCATION Boulder, CO	
5 DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 40	RC	100				SHALE, unweathered, very dark gray, damp, strong, unfractured <i>(continued)</i> 40.0	
						NOTES: Allowed water level to equilibrate overnight prior to setting well, rose to ~21.5'. Set well to span saturated weathered	

shale. Bottom of borehole at 40.0 feet.







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CLIEN	T Xcel I	Energy	1			PROJECT NAME Valmont Station	
PROJE		IBER .	10022770	0		PROJECT LOCATION Boulder, CO	
(ff) 35	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 40	RC	100				SHALE, unweathered, dark gray, damp, very strong, no native fractures or clayey zones (coring induced fractures present) <i>(continued)</i>	
- – - – - – _ –	RC	100					
 <u>50</u>	RC	100					
- – - – - – 55	RC	100			55	0	
						NOTES: Set well to isolate any water present in shale from uppermost water in weathered shale unit (MW-33A) Bottom of borehole at 55.0 feet.	





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CLIEN	T Xcel	Energy	y			PROJECT NAME Valmont Station	
PROJ	ECT NUM	IBER	10022770	0		PROJECT LOCATION Boulder, CO	
2 DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 40	RC	100				SHALE, highly weathered, grayish brown, wet, iron oxide staining, weak, clayey, fractured (with evaporite deposits) <i>(continued)</i>	
 45	RC	100				45.0	
 50	RC	100				SHALE, highly weathered, very dark gray, damp, iron oxide staining, weak, clayey, fractured (with evaporite deposits), zone of slightly weathered strong mudstone at 54' and slightly weathered strong shale at 69.5' NOTES: Drilled to 25' on 9/13, free water in cores and on drill	
 55	RC	100	1			string to about 12'. Water level rose in borehole to 12' overnight. Continued to 75' to look for unweathered shale contact, none found. 75' was cutoff due to time and material constraints. Completed well 9/15 to capture water in upper weathered shale.	
 60	RC	100					
 65	RC	100					
 70	RC	100					
 75	RC	100				75.0	

)	S	HDR, Inc. 369 Inverness Pk Englewood, CO 8	wy, Suite 80112	325			PA	MW-36 AGE 1 OF 3
CLIEN	T Xcel	Energy	,				PROJECT NAME Valmont Station		
PROJE	ECT NUN	IBER .					PROJECT LOCATION Boulder, CO		
DATE	STARTI	ED 04	4/04/22 00:0	<u>00</u> C	OMPLE	TED 04/06/22 00:00	WELL LOCATION		
DRILL	ING CO	NTRAC	CTOR Dak	ota Dr	illing		GROUND ELEVATION	HOLE DIAMETER	5
DRILL	ING ME	THOD	HSA/AR				_ GROUND WATER LEVELS:		
LOGO	GED BY	E. Mu	noz	_ C	HECKE	D BY	AFTER DRILLING		
NOTE	S				1				
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATEF	RIAL DESCRIPTION	WELL	DIAGRAM Casing Type: 2-in 3ch 40 PVC
				CL		SILTY LEAN CLAY (CL moist, some rootlets (To), dark brown, soft, low plasticity, opsoil)		
 _ 5	AU					LEAN CLAY (CL), light moist, sample highly dis	olive brown, soft, medium plasticity, turbed, shale fragments present		
 10	S	23		CL					
 	S	40				11.0 SHALE, highly weather iron-stained, moist (low)	ed, dark grayish brown, weak, clayey, (Weathered Shale)		
- 10	X	100	20-50		T	SHALE, highly weather	ed, grayish brown, weak, clayey,		
						fractured zone at 18.5ft	(Weathered Shale)		
	ž	100							
			-	<u> </u>	<u> </u>	19.0			
 	XN	100				medium-strong, clayey, and altered zones along	heavily fractured with iron staining fractures, wet		
25			1						
	XN	100							
 	X	100							10-20 Washed Silica Sand 0.010" Slot
35									

(Continued Next Page)



HDR, Inc. 369 Inverness Pkwy, Suite 325 Englewood, CO 80112

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PROJECT NAME Valmont Station CLIENT Xcel Energy **PROJECT NUMBER** PROJECT LOCATION Boulder, CO SAMPLE TYPE NUMBER % BLOW COUNTS (N VALUE) GRAPHIC LOG U.S.C.S. RECOVERY DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM 35 SHALE, highly weathered, gravish brown, weak to • medium-strong, clayey, heavily fractured with iron staining ž 100 and altered zones along fractures, wet (continued) 39.0 SHALE, highly weathered, grayish brown with very dark gray, medium-strong with weak clayey zones along fractures and some bedding planes, heavily fractured with iron-staining, 40 evaporites at 42 ft, wet ž 90 45 SHALE, moderately weathered to highly weathered, dark gray with gray, medium-strong with weak clayey zones along fractures and some bedding planes, fractured with iron ž 100 staining and evaporite deposits, wet, heavily altered zone with nodule at 44.5 ft 49.0 SHALE, highly weathered, yellowish brown to gray, weak, 50 clayey, heavily fractured with iron staining, evaporite deposits at 53-54ft. wet ž 100 55 56.0 SHALE, moderately weathered to slightly weathered, ž 100 greenish black, medium-strong with weak clayey zones along fractures and some bedding planes, iron staining and evaporite deposits, wet 60 ž 100 <u>64.0</u> SHALE, moderately weathered, grayish black to dark grayish 65 gray, weak to medium-strong, clayey, fractured with iron staining and evaporite deposits, wet, heavily altered zone with iron concretions at 71ft ž 100 70 ž 100 74.0 (Continued Next Page)



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WELL DIAGRAM

CLIENT Xcel Energy PROJECT NAME Valmont Station PROJECT NUMBER PROJECT LOCATION Boulder, CO SAMPLE TYPE NUMBER % GRAPHIC LOG BLOW COUNTS (N VALUE) RECOVERY U.S.C.S. DEPTH (ft) MATERIAL DESCRIPTION SHALE, moderately weathered, greenish black, weak, clayey, fractured with iron staining and evaporite deposits, wet, interval of strong slightly weathered shale with claystone nodules and evaporite deposits at 74.5 to 76 ft *(continued)* ž 100 79.0 SHALE, slightly weathered, black, medium-strong, few iron-stained low-angle fractures, moist <u>81.5</u> ž 100 SHALE, unweathered, black, medium-strong, one iron-stained fracture at 86ft, moist ž 90 89.0 Bottom of borehole at 89.0 feet.

	C	S	HDR, Inc. 369 Inverness Pkwy, Suite 325 Englewood, CO 80112						MW-37 PAGE 1 OF 2	
CLIENT Xcel Energy							PROJECT NAME Valmont Station			
PROJE		BER .					PROJECT LOCATION Boulder, CO	PROJECT LOCATION Boulder, CO		
DATE STARTED _04/06/22 00:00 COMPLETED _04/07/22 00:00							WELL LOCATION			
DRILLING CONTRACTOR Dakota Drilling							GROUND ELEVATION	_ HOLE DI	AMETER <u>5</u>	
DRILLING METHOD HSA/AR							GROUND WATER LEVELS:			
LOGG	ED BY	D. Ra	у	_ C	HECKE	DBY E. Munoz	AFTER DRILLING			
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	МАТ	ERIAL DESCRIPTION		WELL DIAGRAM	
	- CL SILTY LEAN CLAY (CL), light brown, soft, low plasticity, moist, some organics and rootlets (Topsoil)									
	Ì					LEAN CLAY (CL), oli	ve brown, stiff, medium plasticity, moist,			
						shale fragments, sam	ple highly disturbed (Residuum)			
5				CL						
						SHALE, highly weath	ered, grayish brown to very dark grayish			
	ы В	25				brown, weak, clayey, moist (Weathered Sh	heavily fractured with iron staining, ale)			
	I					·				
10	ll S	100	50							
	¥	48								
	2									
15	_		-							
					- <u> </u>					
	×	47								
	ź	47								
_ 20			-							
	ž	67								
25		<u> </u>								
					- <u> </u>					
	×	75								
	Z									
 30					<u> </u>	30.0				
			1			SHALE, unweathered	I to slightly weathered, black, strong,			
						deposits and little to n	to iron staining, some fractures			
	XX	87				SIICKENSIGEG, WET AIOP	ig mactures and some bedding planes			
35							(Continued Nevt Page)			


10-20 Washed Silica Sand 0.010" Slot

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ROJE		JMBER				PROJECT LOCATION Boulder, CO	
(ff)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
- - - 40	×N	100				SHALE, unweathered to slightly weathered, black, strong, laminated, fractured with evaporite and sulfide mineral deposits and little to no iron staining, some fractures slickensided, wet along fractures and some bedding planes (continued)	10-20 Wa
45	×z	100					0.010" Sk
- - 50	×	100					
- - 55_	Ň	100					
- - 60	XN	100					
- - 65	X	100	-				
- - - 70	XN	100			70	.0	

)	S	HDR, Inc. 369 Inverness Pk Englewood, CO 8	wy, Suite 30112	325				MW-38A PAGE 1 OF 4	
CLIEN	T Xcel	Energy	,				PROJECT NAME Valmont Station			
PROJ		IBER _					PROJECT LOCATION Boulder, CO			
DATE	STARTI	ED 06	6/13/22 00:0	<u>)0</u> C(OMPLE	TED _06/17/22 00:00	WELL LOCATION			
DRILI		NTRAC	TOR Dak	ota Dr	illing		GROUND ELEVATION	HOLE DI	AMETER 8	
DRILI	LING ME	THOD	HSA/AR				GROUND WATER LEVELS:			
LOGO	GED BY	E. Mu	noz	_ CI	HECKE	D BY	AFTER DRILLING			
NOTE	S	1		1						
o DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERI	AL DESCRIPTION		WELL DIAGRAM Casing Type: 2-in Sch 40 PVC	
	AU			CL		SILTY LEAN CLAY (CL), plasticity, moist to dry, so	dark grayish brown, soft, low me rootlets (Topsoil)			
				<u> </u>		SILTY SAND (SM), brow	n, loose, moist to dry, poorly graded,			
		100	10-10	-		fine grained, trace coarse boulders at 11-14 ft (Alluv	sand, and fine gravel, basalt <i>i</i> ium)			
	l g	25								
10				SM						
	AU					14.0				
	× \$	100	50		<u> </u>	dry (Weathered Shale)	i, brown, weak, clayey, iron-stained,			
	◄				<u> </u>					
	X	100		 		SHALE, moderately weat 22.0 medium-strong, clayey, h iron-stained, moist (Weat SHALE, slightly weathere	hered, dark gray, weak to ghly fractured (slickensided at 21ft), hered Shale)			
						moderately fractured, iror	-stained, moist (Weathered Shale)			
	XN	100				weak, clayey, fractured, in fractures and bedding pla	non-stained, moist to wet along some nes (Weathered Shale)			
30	XN	100				29.5 SHALE, unweathered, ve 31ft (iron-stained) and 32 polished/slickensided), m (Bedrock)	ry dark gray, strong, fractures at .5-34ft (no staining, oist (low) with moist to wet fractures			
	X	100				35.0 SHALE, unweathered, ve weak clayey zones, fractu staining), wet (Bedrock)	ry dark gray to black, strong with red (polished/slickensided, no iron			
	XN	100								
	XX	100								
50										
		•	•				(Continued Next Page)			



CLIENT Xcel E

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DBO JECT NAME Volmont Stati

CLIEN		_nergy					
PROJ		IBER _		1	1	PROJECT LOCATION _Boulder, CO	[
G DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	XN	100				SHALE, unweathered, very dark gray to black, strong with weak clayey zones, fractured (polished/slickensided, no iron staining), wet (Bedrock) <i>(continued)</i>	
	XN	100					
60	XN	100					
	XN	100					
	XN	100					
	XN	100					
	XN	100					
	XN	100					
90	XN	100					
	XN	100					
_ 100 _	XN	100					



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CLIENT Xcel Energy

PROJECT NAME Valmont Station

PROJE	ЕСТ	NUM	BER _				PROJECT LOCATION Boulder, CO				
DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM			
 110							SHALE, unweathered, very dark gray to black, strong with weak clayey zones, fractured (polished/slickensided, no iron staining), wet (Bedrock) <i>(continued)</i>				
		X	100								
		X	100								
		XX	100								
		X	100								
		XX	100								
		XX	100				Evaporites in some fractures below this depth				
 	0	R					Lost recovery due to broken bit				
 		XZ	23				Poor recovery due to heavily fractured strong shale				
	0	NR					No recovery due to plugged tooling. Bedding planes show more tilt (~20-30 degrees)				
 160		X	100								
		X	100								



PAGE 4 OF 4

WELL DIAGRAM

10/20 Silica Sand

0.010-in Slot

CLIENT Xcel Energy PROJECT NAME Valmont Station PROJECT NUMBER PROJECT LOCATION Boulder, CO SAMPLE TYPE NUMBER % BLOW COUNTS (N VALUE) GRAPHIC LOG RECOVERY U.S.C.S. DEPTH (ft) MATERIAL DESCRIPTION SHALE, unweathered, very dark gray to black, strong with weak clayey zones, fractured (polished/slickensided, no iron staining), wet (Bedrock) (continued) ž 90 170 ž 100 Heavily fractured, wet, weak clayey zones washed out of sample ž 100 180 ž 100 ž 88 Very strong, no weak zones, fractures at 190-191ft and 199ft, bedding planes nearer horizontal (~5 degrees) 190 ž 100 ž 100 Ř 200 200.0 Bottom of borehole at 200.0 feet.



(Continued Next Page)





CLIEN	T Xcel E	Energy				PROJECT NAME Valmont Station				
PROJE		BER				PROJECT LOCATION Boulder, CO				
(ft) 22	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM			
	XX	92				SHALE, unweathered, black, strong with weak and fractured zones, wet along weak and fractured zones (Bedrock)				
 _ 40 _	X	100								
 45	XN	75				Sulfide mineral on fracture				
- – - – - – 50	XN	100								
	XN	88					10/20 Silica			
	XN	100					Sand 0.010-in Slot			
60 	XX	100								
65) R					65.0				
						Bottom of borehole at 65.0 feet.				



-);	2	HDR, Inc. 369 Inverness Pkw Englewood, CO 80	/y, Suite :	325		MW-38C PAGE 2 OF 2
					PROJECT NAME Valmont Station	
(II) SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	100				SHALE, slightly weathered to moderately weathered, black, medium-strong with weak clayey zones, iron staining on some bedding planes and fractures, wet (Weathered Shale) (<i>continued</i>)	
					Bottom of borehole at 39.0 feet.	



FR HDR		MW-39B PAGE 1 OF 1			
CLIENT Xcel Energy		PROJECT NAME Valmont Station			
PROJECT NUMBER		PROJECT LOCATION Boulder, CO			
DATE STARTED _ 08/12/22 00:0	00 COMPLETED 08/12/22 00:00	WELL LOCATION			
DRILLING CONTRACTOR Dak	kota Drilling	GROUND ELEVATION HOLE DIAMETER 8			
DRILLING METHOD HSA/AR		GROUND WATER LEVELS:			
NOTES Screen set in wet allu	CHECKED BY	AFTER DRILLING			
 DEPTH (ff) (ff) SAMPLE TYPE NUMBER RECOVERY % RECOVERY % RELOW RELOW NALUE) 	CC S: C: S:	IAL DESCRIPTION WELL DIAGRAM			
	CH FAT CLAY WITH SANI with reddish orange, so moist, fine to coarse gr 2.5 iron oxide staining	D (CH), dark brownish gray mottled ft to medium stiff, high plasticity, ained, some gravel, trace roots, 			
$\overline{5}$ $\overline{2}$ 0	SW	WITH GRAVEL (SW), light medium dense, non plastic, moist ne finer silt/clay particles with 10/20 silica sand (filter pack) Screen interval			

)	S	HDR					MW-40 PAGE 1 OF 1
	T Xcel	Energy	V				PROJECT NAME Valmont Station	
PROJE		/BER	10227700)			PROJECT LOCATION Boulder, CO	
DATE	START	ED 12	2/14/22 00:0	00 C (OMPLE	TED 12/15/22 00:00	WELL LOCATION	
DRILL	ING CO		CTOR Dal	kota D	orillina		GROUND ELEVATION	HOLE DIAMETER 8
DRILL	ING ME	THOD	HSA/NX/	AR	0		GROUND WATER LEVELS:	
LOGG	ED BY	K. Ma	lone	C	HECKE	D BY	AFTER DRILLING	
NOTE	S Tem	porary	monitoring	well ((dry)			
	Ц	%						
o DEPTH (ft)	SAMPLE TYF NUMBER	RECOVERY	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATER	IAL DESCRIPTION	WELL DIAGRAM
	AU	0		sw		GRAVELLY SAND (SV loose, non plastic, dry, organics	V), pale brown to pale orange, very fine to medium grained, trace	
5				CL-		CLAYEY SILT (CL-ML), light gray to yellowish gray, soft	
	U U U	100		ML.		6.5 to stiff, low plasticity, d LEAN CLAY (CL), light hard, low plasticity, dry	ry olive gray to olive gray, very stiff to , iron oxide staining, some	
 10				CL		evaporites		
	XN	100				SHALE, highly weathe blocky structure, brittle evaporite vein deposits	red, olive, iron oxide staining, , weak to medium strong, some s, trace mica	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
 _ 15 _	_			L		15.0		
	XN	100				blocky structure, brittle evaporite vein deposits	aunerea, onve, iron oxide staining, , weak to medium strong, some s, trace mica	
20								
	XN	100						Filter pack (sand) Screen interval (0.010")
25					⊨_			
 30	XN	100		 		26.5 SHALE, slightly weather medium strong to stror	ered, black, dry, blocky structure, ig, trace oxidation	
 35	XN	83				SHALE, unweathered, no fractures (competer 35.0	black, dry, no staining, very strong, t bedrock)	Borehole collapse during air rotary



LIENT ROJE DATE DRILLI DRILLI	CT NUM STARTE ING CO ING ME ED BY	Energy MBER ED 12 NTRAC THOD K. Ma	HDR <u>10227700</u> <u>2/27/22 00:</u> CTOR <u>Dal</u> <u>HSA/NX/</u> Ilone) 00 C(kota D AR CI	DMPLET brilling HECKED	PROJECT NAME Valmont Station PROJECT LOCATION Boulder, CO D 12/27/22 00:00 WELL LOCATION GROUND ELEVATION GROUND WATER LEVELS: BY AFTER DRILLING	HOLE DIAMETER <u>8</u>
(#)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	AU	0		CL		SANDY LEAN CLAY (CL), light olive brown to olive, soft, low plasticity, moist, fine to medium grained, trace coarse sand	
	22	53		CL SW CH		SANDY LEAN CLAY (CL), dark grayish brown to dark yellowish brown, soft, low plasticity, moist, fine to medium grained, trace coarse sand SAND (SW), grayish black, non plastic, moist, fine to medium grained, some silt, trace gravel, hydrocarbon redor, hydrocarbon staining, compact FAT CLAY (CH), gray, firm to stiff, high plasticity, moist,	— — — — ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
- - 5	CC	42		sw		FAT CLAY (CH), light olive brown to olive, firm to stiff, high plasticity, moist, trace gravel SAND (SW), pale olive to yellow, loose, non plastic, dry, fine to medium grained, some gravel, trace cobbles	
- - -)	XN	100				SHALE, highly weathered to moderately weathered, bedded, yellowish red to light brown, blocky structure, medium strong, some oxidation staining, moisture in fractures	Filter pack
- - - 5	XN	100				5 5	Screen interval (0.010")
- - - 2	XX	97				SHALE, unweathered, reddish brown, dry, very strong, no fractures (competent bedrock)	Borehole collapse during air rotary

)	S	HDR				MW-43 PAGE 1 OF 2
CLIEN PROJI DATE DRILL DRILL	T <u>Xcel</u> ECT NUM STARTI LING CO LING ME	Energ MBER ED <u>1</u> 2 NTRA THOD	y _10227700 2/28/22 00: 2/28/22 00: 2/28/28/22 00: 2/28/22 00: 2/28/22 00: 2/28/20 0000000000000000000000000000000) 00 C((ota D	OMPLE Drilling	PROJECT NAME Value PROJECT LOCATION _E TED _12/28/22 00:00 WELL LOCATION _ GROUND ELEVATION _ GROUND WATER LEVEL	Boulder, CO HOLE DIAMETER 8
	SED BY	K. Ma	alone	CI	HECKE	D BY AFTER DRILLING	
DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 	AU	0		sc		CLAYEY SAND (SC), dark grayish brown to dark yellowish brown, loose, low plasticity, dry, fine to grained, some gravel, trace cobbles	coarse
 	S	33		SC		CLAYEY SAND (SC), dark grayish brown to dark yellowish brown, loose, low plasticity, dry, fine to grained, some gravel, and cobbles FAT CLAY (CH), dark grayish brown to dark yello brown, soft, high plasticity CLAYEY SAND (SC), dark grayish brown to dark yellowish brown, loose, low plasticity, dry, fine to	medium wish/ coarse
	S	53		CL		grained, some gravel, trace cobbles, calcite mine from 9.5 to 10.0 ft <u>12.0</u> LEAN CLAY (CL), light olive brown to olive, stiff to stiff, low plasticity, dry	o very
	ž	100				SHALE, highly weathered, reddish brown to brow oxide staining, tough, blocky structure, water in fr	n, iron actures
	X	100				SHALE, highly weathered to moderately weathere reddish brown to brown, iron oxide staining, tough structure, water in fractures	ad, a, blocky
 30	XN	100		 		SHALE, moderately weathered, yellowish red to li brown, iron oxide staining, tough, blocky structure 27.0 in fractures SHALE, slightly weathered, yellowish red to light iron oxide staining, tough, blocky structure, water fractures	ght , water brown, in Filter pack (sand) Screen interval (0.010")
 35	XX	100				32.0 SHALE, unweathered, yellowish red to light brown staining, very strong, non-fractured (competent be 35.0	h, dry, no edrock) Borehole collapse during air

)7	2	HDR						MW-43 PAGE 2 OF 2
CLIENT	Xcel E	nerav					PROJECT NAME Valmont	Station	
PROJEC		BER _	10227700				PROJECT LOCATION Bou	Ilder, CO	
DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATER	IAL DESCRIPTION		WELL DIAGRAM
									rotary

)	2	HDR				MW-44 PAGE 1 OF 3
CLIEN PROJE	T <u>Xcel</u> ECT NUI	Energ IBER	y <u>10279387</u> 2/13/23.00:	, 00. C		PROJECT NAME Valmont Station PROJECT LOCATION Boulder, CO WELL LOCATION	
DRILL DRILL LOGG NOTE	ING CO ING ME ED BY	NTRA THOD K. Ma	CTOR _Dal	kota D NX Cl	Drilling HECKE	GROUND ELEVATION HOLE D GROUND WATER LEVELS: DBY AFTER DRILLING	iameter <u>7.625</u>
DEPTH (ft)	DEPTH (ff) SAMPLE TYPE NUMBER RECOVERY %		BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	AU	100		SP		POORLY GRADED SAND (SP), brownish yellow, loose, low plasticity, dry, fine grained, some clay, trace silt, non-cohesive	
	с С	100	-	CL		5.3 7.0 LEAN CLAY (CL), yellowish brown, very stiff, low	
	¦¦ S	50		CL		LEAN CLAY (CL), yellowish brown mottled with light brownish gray, very stiff, low plasticity, dry, fine grained, iron oxide staining, residuum, calcification staining,	
 _ 15	NX AI	97				LO.0. cohesive	
 20	XN	100					
 25	XN	100		CL			■Bentonite (Seal)
 30	XN	100					
	XN	100		CL		34 <u>.0</u>	

⁽Continued Next Page)

)	2	HDR				MW-44 PAGE 2 OF 3
CLIEN	T Xcel	Energy	/			PROJECT NAME Valmont Station	
PROJE		IBER	10279387		I	PROJECT LOCATION Boulder, CO	1
(ff) 22 22 23	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 	XN	100		CL		LEAN CLAY (CL), yellowish brown mottled with light brownish gray, firm, low plasticity, dry, fine grained, iron oxide staining, residuum, oxidation staining only on bedding planes, cohesive, with some shale lenses <i>(continued)</i>	
 	XN	100				43.8	
 	XN	100		CL		brownish gray, firm, low plasticity, dry, fine grained, iron oxide staining, residuum, oxidation staining only on bedding planes, cohesive, with shale chunks	
<u>50</u> 55	XN	100					
 60	XN	100				59.5	Filter Pack (10/20 Silica
- – - – - – - –	XN	100				damp, iron oxide staining, moisture in fractures	Sand) Screen Interval (0.010")
 70	XN	100				67.5 SHALE, moderately weathered, dark gray to reddish gray, damp, no staining, calcite layers along fractures	
 75	XN	100				SHALE, sligntly weathered, dark gray to reddish gray, damp, iron oxide staining, calcite layers along fractures	

(Continued Next Page)

)	S	HDR				MW-44 PAGE 3 OF 3
CLIEN	IT Xcel	Energy	/			PROJECT NAME Valmont Station	
PROJ	ECT NUN	IBER	10279387			PROJECT LOCATION Boulder, CO	
2 DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 80	XN	100				SHALE, slightly weathered, dark gray to reddish gray, damp, iron oxide staining, calcite layers along fractures <i>(continued)</i> 80.0	
 85	XN	100				SHALE, unweathered, dark gray	

)	S	HDR				MW-45 PAGE 1 OF 2
CLIEN PROJE	T <u>Xcel</u>	Energy //BER	y 10279387	,		PROJECT NAME Valmont Station PROJECT LOCATION Boulder, CO	
DATE DRILL DRILL LOGG NOTE	START	ED <u>03</u> NTRAG THOD J. Wil	8/06/23 00: CTOR _Dal _HSA/AR/ ch, K. Malc	00 CC kota D NX one Cl	OMPLE Drilling HECKE	Image: Second state of the second s	E DIAMETER <u>7.625</u>
DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM Casing Type: 2-in Sch 40 PVC
				CL		LEAN CLAY WITH SAND (CL), very dark brown, medium plasticity, dry, fine grained, trace gravel, cohesive	
	AU	100		CL		GRAVELLY LEAN CLAY WITH SAND (CL), dark brown, low plasticity, dry, angular, fine grained, slightly cohesive	
5	С С С	100		ML		GRAVELLY SILT WITH SAND (ML), black, very hard, dry, fine grained, some sand, brittle shards, shale, lithified	
	8	100				LEAN CLAY (CL) black very hard dry fine grained iron	
 	X	100				oxide staining, more lithified, less sand	
 	XN	100		UL			[◀] Bentonite (Seal)
 	XN	100		CL		LEAN CLAY (CL), black, very hard, moist, fine grained, iron oxide staining, more lithified, less sand, moisture in cracks	
	X	100				7.0	
				CL		LEAN CLAY (CL), black, very hard, moist, fine grained, no staining, more lithified, less sand, moisture in cracks	
 	XN	100				SHALE, moderately weathered, black, damp, iron oxide staining, oxidation staining in fractures	
 35							

)	S	HDR				MW-45 PAGE 2 OF 2			
CLIEN	T Xcel	Energy	/			PROJECT NAME Valmont Station				
PROJE		BER	10279387		PROJECT LOCATION Boulder, CO					
Sc DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM			
	NX	100		-		SHALE, moderately weathered, black, damp, iron oxide staining, oxidation staining in fractures <i>(continued)</i> 37.5 SHALE, highly weathered, black, wet, iron oxide staining, 39.0 some clay lenses				
 	XN	100			· · · · · · · · · · · · · · · · · · ·	SHALE, moderately weathered to slightly weathered, dark gray to olive gray, dry, iron oxide staining, blocky structure	Filter Pack (10/20 Silica Sand) Screen Interval (0.010")			
 	XN	100				SHALE, unweathered, dark gray, dry, no staining, blocky structure				








































































Form No. OFF GWS-25 COL 818 Ce	ICE OF THE S ORADO DIVIS	STATE ENGI SION OF WA man St., Denver, Colo	NEER TER RE	SOUF	RCES		
(303) 8	36-3581		<u>-</u> .				EXST
		WELL PERM		R	299970		
APPLICANT		DIV. 1	WD6	DES.	BASIN	MD	
				APPRO BOULD SE	VED WELL L ER COUNTY 1/4 NW 1	OCATION	26 15 P M
1800 N 63R	VICE COMPANY O	F COLORADO		DISTAN			
BOULDER,	CO 80302-			2605 F	t. from North t. from West	Section I Section	Line Line
(303) 571-73	340			UTM C	OORDINATE	S (Meters,Zon	<u>e:13,NAD83)</u>
PERMIT TO USE A				Easting	: 482959	Northing:	4430214
	ISSUANCE C	OF THIS PERMIT	DOES NOT <u>S OF APPR</u>	CONFE	R A WATER I	RIGHT	
1) This well shall be	used in such a way as to a	cause no material inju right or preclude apoti	iry to existing v	vater rights.	The issuance o	of this permit does	not ensure that
2) The construction of been granted by the	of this well shall be in com the State Board of Examin	pliance with the Wate ers of Water Well Cor	r Well Constru struction and	ction Rules	2 CCR 402-2, u Itation Contractor	nless approval of rs in accordance	a variance has with Rule 18.
3) Approved pursuar and/or water qual	t to CRS 37-92-602(3)(b) ty sampling.	(I) for uses as describ	ed in CRS 37-	92-602(1)(f)). Use of this we	Il is limited to mo	nitoring water levels
4) Approved for the u	se of an existing well ack	nowledged for constru	uction under m	onitoring ha	ble notice MH-54	576, and known a	is MW-12.
(5) This well must be kept capped and I	equipped with a locking c ocked at all times except	during sampling or me	well contamina easuring.	tion or poss	sible hazards as a	an open well. I h	e well must be
6) Records of water Water Resources	evel measurements and v upon request.	water quality analyses	shall be maint	ained by th	e well owner and	I submitted to the	Division of
7) Upon conclusion of Rules. A Well Ab	if the monitoring program andonment Report must b	the well owner shall p be completed and sub	olug this well in mitted to the D	accordanc ivision of V	e with Rule 16 of /ater Resources	the Water Well 0 within 60 days of	Construction plugging.
8) The owner shall m necessary means	ark the well in a conspicu and precautions to prese	ious place with the we rve these markings.	ell permit numb	er and nam	e of aquifer as a	ppropriate, and s	hall take
9) This well must hav Water Well Const	e been constructed by or ruction Rules.	under the supervision	n of a licensed	well driller (or other authorize	ed individual acco	rding to the
10) This well must be NOTE: Issuance of pursuant to Rule 1 shall not be conver monitoring well, re NOTICE: This per coordinate values by filing a written of (See Section 24-4	10) This well must be located not more than 200 feet from the location specified on this permit. NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.) NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.)						
APPROVED DG2 Receipt No. 367275	State Engineer	DATE ISSUED	01-25-2016	 3	By EXPIRATI	ON DATE	<u>271</u> W/A

Form No. **GWS-25**

OFFICE OF THE STATE ENGINEER COLORADO DIVISION OF WATER RESOURCES

(303) 866-358	_					EXST
	ſ	WELL PERM		R 299969	-	-
APPLICANT		DIV. 1	WD6	DES. BASIN	MD	
PUBLIC SERVICE 1800 N 63RD ST BOULDER, CO 8 (303) 571-7340 PERMIT TO USE AN EXI	ECOMPANY OF (0302- STING WELL	COLORADO		APPROVED WEL BOULDER COUN SE 1/4 NW Township 1 N R DISTANCES FRC 2325 Ft. from No 1650 Ft. from We UTM COORDINA Easting: 482871	L LOCATION ITY 1/4 Section ange 70 W Six M SECTION LIN rth Section est Section TES (Meters, Zog Northing:	26 (th P.M. <u>NES</u> Line Line he:13,NAD83) 4430300
	ISSUANCE OF	THIS PERMIT	DOES NOT	CONFER A WATE	RRIGHT	
		CONDITION	<u>S OF APPR</u>	OVAL		
1) This well shall be used in	such a way as to cau	ise no material inju	ry to existing w	ater rights. The issuan	ce of this permit doe	s not ensure that
 The construction of this v been granted by the State 	ell shall be in complia Board of Examiners	ance with the Wate of Water Well Cor	r Well Construction and F	ction Rules 2 CCR 402- Pump Installation Contra	2, unless approval o actors in accordance	f a variance has with Rule 18.
 Approved pursuant to CF and/or water quality sample 	S 37-92-602(3)(b)(l) f bling.	or uses as describ	ed in CRS 37-9	2-602(1)(f). Use of this	well is limited to mo	onitoring water levels
Approved for the use of a	n existing well acknow	wledged for constru	uction under mo	onitoring hole notice MH	I-54576, and known	as MW-11.
5) This well must be equipp kept capped and locked a	ed with a locking cap at all times except dur	or seal to prevent v ing sampling or me	well contaminat easuring.	ion or possible hazards	as an open well. Th	ne well must be
6) Records of water level m Water Resources upon re	easurements and wate	er quality analyses	shall be maint	ained by the well owner	and submitted to the	e Division of
7) Upon conclusion of the m Rules. A Well Abandonn	onitoring program the nent Report must be o	e well owner shall p completed and sub	lug this well in mitted to the Di	accordance with Rule 1 vision of Water Resour	6 of the Water Well ces within 60 days o	Construction f plugging.
8) The owner shall mark the necessary means and pre- necessary means and pre-	ecautions to preserve	s place with the we these markings.	ill permit numbe	er and name of aquiter a	as appropriate, and s	shall take
 This well must have been Water Well Construction 	constructed by or un Rules.	der the supervision	n of a licensed n	well driller or other auth	orized individual acc	ording to the
 This well must be located NOTE: Issuance of this p pursuant to Rule 14.2 of shall not be converted to monitoring well, recovery NOTICE: This permit has coordinate values provide by filing a written request (See Section 24-4-104 th 	not more than 200 fe ermit does not guarar he Water Well Constr a production well. (U well for remediation of been approved subje ed with the permit app with this office within rough 106, C.R.S.)	et from the locatio ntee that this well of ruction Rules (2 CC pon obtaining a pe of the aquifer, or a of ect to the following lication. You are h sixty (60) days of t	n specified on t can be converte CR 402-2), mor rmit from the S dewatering syst changes: The of hereby notified t the date of issu	his permit. d to a production well u litoring holes constructe tate Engineer, a monito tem for dewatering the distances from section t hat you have the right t ance, pursuant to the S	nder a future permit. Id pursuant to a mon- ring hole may be con- aquifer.) ines were calculated o appeal the issuance tate Administrative F	Additionally, itoring hole notice werted to a from UTM e of this permit, Procedures Act.
APPROVED	$\overline{\mathcal{D}}$	1.1.1	6	M	Burgard	

APPROVED DG2

Receipt No. 3672751C

State Engineer

DATE ISSUED 01-25-2016

By EXPIRATION DATE

Kuauici

A

Form GWS	No. 5-25	OFFICE OF THE S COLORADO DIVIS 818 Centennial Bldg., 1313 Sher (303) 866-3581	STATE ENGINEER SION OF WATER RE man St., Denver, Colorado 80203	SOURCES	EVOT
					EX51
			WELL PERMIT NUMBE	R 299968	
APPI	<u>ICANT</u>		DIV. 1 WD6	DES. BASIN	MD
	PUBI 1800 BOUI (303)	IC SERVICE COMPANY C N 63RD ST DER, CO 80302- 571-7340	OF COLORADO	APPROVED WELL LC BOULDER COUNTY SE 1/4 NW 1/ Township 1 N Range DISTANCES FROM S 2475 Ft. from North 1400 Ft. from West UTM COORDINATES	DCATION 4 Section 26 e 70 W Sixth P.M. SECTION LINES Section Line Section Line 6 (Meters,Zone:13,NAD83)
PERI	<u>MIT TO</u>	USE AN EXISTING WELL			
		ISSUANCE (CONDITIONS OF APPR	CONFER A WATER R	IGHT
1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	This well no injury The cons been gran Approved This well kept capp Records of Water Re Upon cor Rules. A The owne necessar This well Water We This well NOTE: Is pursuant shall not i monitorin NOTICE: coordinat by filing a (See Sec	shall be used in such a way as to will occur to another vested water truction of this well shall be in con- need by the State Board of Examin pursuant to CRS 37-92-602(3)(b) iter quality sampling. for the use of an existing well act must be equipped with a locking of each and locked at all times except of water level measurements and sources upon request. clusion of the monitoring program Well Abandonment Report must er shall mark the well in a conspice y means and precautions to prese must have been constructed by o eall Construction Rules. must be located not more than 20 suance of this permit does not gu to Rule 14.2 of the Water Well Co- be converted to a production well. g well, recovery well for remediati This permit has been approved s e values provided with the permit written request with this office wi tion 24-4-104 through 106, C.R.S.	cause no material injury to existing w right or preclude another owner of a inpliance with the Water Well Constru- ters of Water Well Construction and F (I) for uses as described in CRS 37-9 (I) for uses as described in I) avater quality analyses shall be maint to the well owner shall plug this well in be completed and submitted to the D uous place with the well permit number over these markings. In under the supervision of a licensed in arantee that this well can be converted instruction Rules (2 CCR 402-2), more (Upon obtaining a permit from the S on of the aquifer, or a dewatering sys- ubject to the following changes: The G application. You are hereby notified this is in sixty (60) days of the date of issue)	ater rights. The issuance of vested water right from seekic ction Rules 2 CCR 402-2, un Pump Installation Contractors 22-602(1)(f). Use of this well onitoring hole notice MH-545 ion or possible hazards as a ained by the well owner and a accordance with Rule 16 of t vision of Water Resources we ar and name of aquifer as ap well driller or other authorized this permit. d to a production well under itoring holes constructed put tate Engineer, a monitoring the tem for dewatering the aquife distances from section lines w that you have the right to app ance, pursuant to the State A	this permit does not ensure that ng relief in a civil court action. less approval of a variance has i in accordance with Rule 18. is limited to monitoring water levels 76, and known as MW-10. n open well. The well must be submitted to the Division of the Water Well Construction <i>i</i> thin 60 days of plugging. propriate, and shall take d individual according to the a future permit. Additionally, rsuant to a monitoring hole notice tole may be converted to a ar.) were calculated from UTM peal the issuance of this permit, Administrative Procedures Act.
APP DG2	ROVED	State Engineer	Die Wele	By By	Juanicit

Receipt No. 3672751B

DATE ISSUED 01-25-2016

BY EXPIRATION DATE NA

Form N GWS-2	 OFFICE OF THE \$ COLORADO DIVI\$ 818 Centennial Bldg., 1313 Sher (303) 866-3581 	STATE ENG SION OF WA	INEER ATER RES orado 80203	SOURCES		EVOT
			·· ··-			EX51
		WELL PER	MIT NUMBER	299967		
APPLIC	ANT	DIV. 1	WD6	DES. BASIN	MD	
	PUBLIC SERVICE COMPANY C 1800 N 63RD ST BOULDER, CO 80302-)F COLORADO		APPROVED WELL BOULDER COUNT NE 1/4 SW Township 1 N Ra DISTANCES FROM 2425 Ft. from Sou 1795 Ft. from Wes	<u>LOCATION</u> Y 1/4 Section Inge 70 W Si <u>VI SECTION LI</u> th Section st Section	26 xth P.M. <u>NES</u> Line
	(303) 571-7340			UTM COORDINAT	ES (Meters,Zo	ne:13,NAD83)
PERMIT	TO USE AN EXISTING WELL			Easting: 482916	Northing	: 4430134
	ISSUANCE C	of this permit <u>condition</u>	DOES NOT (CONFER A WATER DVAL	RIGHT	
1) Th no	is well shall be used in such a way as to injury will occur to another vested water	cause no material inj right or preclude ano	ury to existing wa ther owner of a v	iter rights. The issuance ested water right from se	e of this permit doe beking relief in a ci	es not ensure that ivil court action.
2) The	e construction of this well shall be in con en granted by the State Board of Examir	npliance with the Wat hers of Water Well Co	er Well Construction and P	tion Rules 2 CCR 402-2 ump Installation Contract	, unless approval o tors in accordance	of a variance has e with Rule 18.
3) Ap an	proved pursuant to CRS 37-92-602(3)(b) d/or water quality sampling.	(I) for uses as descri	bed in CRS 37-92	2-602(1)(f). Use of this v	well is limited to m	onitoring water levels
4) Ap	proved for the use of an existing well kno	own as MW-9 .				
5) Th kej	is well must be equipped with a locking o ot capped and locked at all times except	ap or seal to prevent during sampling or π	well contamination easuring.	on or possible hazards a	is an open well. T	he well must be
6) Re Wa	cords of water level measurements and ater Resources upon request.	water quality analyse	s shall be mainta	ined by the well owner a	ind submitted to th	e Division of
7) Up Ru	on conclusion of the monitoring program les. A Well Abandonment Report must	i the well owner shall be completed and su	plug this well in a bmitted to the Div	iccordance with Rule 16 vision of Water Resource	of the Water Well es within 60 days (Construction of plugging.
8) The	e owner shall mark the well in a conspice cessary means and precautions to prese	uous place with the w erve these markings.	ell permit numbe	r and name of aquifer as	appropriate, and	shall take

- 9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit. 10)

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

NOTICE: This permit has been approved subject to the following changes: The distances from section lines were calculated from UTM coordinate values provided with the permit application. In addition MH-54576 was not referenced on this permit since it is not located in the NE1/4 of the SW1/4 of Sec. 26, Twp. 1 N, Rng. 70 W, 6th P.M. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.)

APPROVED DG2

Did	Glob
State Engineer	

Receipt No. 3672751A

01-<u>25-2016</u> DATE ISSUED

manicia By EXPIRATION DATE



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315824-

RECEIPT NUMBER 3

3689664A

ORIGINAL PERMIT APPLICANT(S)	ATION	
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1 Designated Basin: Management District	Water District: 6 N/A
	County: Parcel Name:	BOULDER N/A
AUTHORIZED AGENT	Physical Address:	N/A
HDR ENGINEERING INC (WALTHER, RICHARD)	SE 1/4 SW 1/4 Section	n 23 Township 1.0 N Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 482993.0 Northing: 4431016.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-13.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

RECEIPT NUMBER 3689664A

Sutation

Issued By ANITIA ARCHULETA



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315825-

RECEIPT NUMBER

3689664B

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION		
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1	Water Dis	
a catego interesta a constante a manaterizzante en este este este este este este est	Designated Basin:	N/A	

Water Division: 1Water District: 6Designated Basin:N/AManagement District:N/ACounty:BOULDERParcel Name:N/APhysical Address:N/ANE 1/4 NW 1/4 Section 26 Township 1.0 N Range 70.0 W Sixth P.M.

AUTHORIZED AGENT

HDR ENGINEERING INC (WALTHER, RICHARD)

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 483039.0 Northing: 4430785.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- 3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-14.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

RECEIPT NUMBER 3689664B

Sutation

Issued By ANITIA ARCHULETA



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315826-

RECEIPT NUMBER 3

3689664C

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION				
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1 Designated Basin: Management District: County: Parcel Name:	Water District: 6 N/A N/A BOULDER N/A			
AUTHORIZED AGENT	Physical Address:	N/A			
HDR ENGINEERING INC (WALTHER, RICHARD)	NW 1/4 NW 1/4 Section 26 Township 1.0 N Range 70.0 W Sixth P.M.				
	UTM COORDINATES (Meters, Zone: 13, NAD83)				
	Easting: 482658.0	Northing:	4430725.0		
PERMIT TO CONSTRUCT A NEW WELL					
ISSUANCE OF T	THIS PERMIT DOES NOT CONFER	A WATER RIGHT			

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-15.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

RECEIPT NUMBER 3689664C

Sutation

Issued By ANITIA ARCHULETA



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315827-

RECEIPT NUMBER 3

3689664D

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION		
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1	Water District:	6
and subtractions and superior super-	Designated Basin:	N/A	
	Management District:	N/A	
	County:	BOULDER	

AUTHORIZED AGENT

HDR ENGINEERING INC (WALTHER, RICHARD)

SE 1/4 NE 1/4 Section 27 Township 1.0 N Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

N/A

N/A

Easting: 482004.0 Northing: 4430544.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

Parcel Name:

Physical Address:

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-16.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

WELL PERMIT NUMBER 315827-

RECEIPT NUMBER 3689664D

Sutation

Issued By ANITIA ARCHULETA



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315828-

RECEIPT NUMBER 36

3689664E

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION			
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1	Water District:	6	
a data a hada a na na hada na h	Designated Basin:	N/A		
	Management District:	N/A		
	County:	BOULDER		
	Parcel Name:	N/A		

AUTHORIZED AGENT

HDR ENGINEERING INC (WALTHER, RICHARD)

SE 1/4 NE 1/4 Section 27 Township 1.0 N Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

N/A

Easting: 482286.0 Northing: 4430257.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

Physical Address:

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-17.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

RECEIPT NUMBER 3689664E

Sutation

Issued By ANITIA ARCHULETA



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315829-

RECEIPT NUMBER 3

3689664F

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION		
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1	Water	
and state of the s	Bards and Bards	617.6	

Water Division: 1Water District: 6Designated Basin:N/AManagement District:N/ACounty:BOULDERParcel Name:N/APhysical Address:N/A

AUTHORIZED AGENT

HDR ENGINEERING INC (WALTHER, RICHARD)

SE 1/4 NE 1/4 Section 27 Township 1.0 N Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 482306.0 Northing: 4430207.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-18.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)
WELL PERMIT NUMBER 315829-

RECEIPT NUMBER 3689664F

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 11/21/2019 Expiration Date: 11/21/2021



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315830-

RECEIPT NUMBER 3

3689664G

ORIGINAL PERMIT APPLICANT(S)	APPROVED WELL LOCATION					
PUBLIC SERVICE COMPANY OF COLORADO	Water Division: 1	Water District:	6			
	Designated Basin:	N/A				
	County:	BOULDER				

AUTHORIZED AGENT

HDR ENGINEERING INC (WALTHER, RICHARD)

NE 1/4 SE 1/4 Section 27 Township 1.0 N Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

N/A

N/A

Easting: 482340.0 Northing: 4430170.0

PERMIT TO CONSTRUCT A NEW WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

Parcel Name:

Physical Address:

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling. This well is known as MW-19.
- 4) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 6) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 7) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 8) This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.
- 9) A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.
- 10) This well shall be constructed not more than 200 feet from the location specified on this pennit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

NOTE: This permit will expire on the expiration date unless the well is constructed by that date. A Well Construction and Yield Estimate Report (GWS-31) must be submitted to the Division of Water Resources to verify the well has been constructed. An extension of the expiration date may be available. Contact the DWR for additional information or refer to the extension request form (GWS-64) available at: http://www.water.state.co.us

RECEIPT NUMBER 3689664G

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 11/21/2019 Expiration Date: 11/21/2021



Division of Water Resources

Department of Natural Resources

WELL PERMIT NUMBER 321100-

RECEIPT NUMBER

1.7							
OR	GINAL PERMIT APPLICANT(S)	APPROVED	WELL LOC	ATION			
PUB JEN	LIC SERVICE COMPANY OF COLORADO (MCCARTER, NIFER)	Water Divis Designated Manageme County: Parcel Nam	ion: 1 Basin: nt District: ne:	Water Distric N/A N/A BOULDER N/A	t: 6		
		Physical Ad	ldress:	1800 N 63RE	ST BOULDER, CO 80302		
HDR	THORIZED AGENT	NE 1/4 SE	1/4 Section	27 Township	1.0 N Range 70.0 W Sixth P.M.		
UPA		UTM COOR	DINATES (Meters, Zone:	13, NAD83)		
		Easting:	482320.5	Northing:	4430191.6		
PER	RMIT TO USE AN EXISTING WELL						
1	ISSUANCE OF THIS	PERMIT DOES N	OT CONFER	A WATER RIGHT	C		
i)	This well shall be used in such a way as to cause r ensure that no injury will occur to another vested relief in a civil court action.	no material inju I water right or	approval ary to existin preclude an	ig water rights. Iother owner of	The issuance of this permit does not a vested water right from seeking		
2)	The construction of this well shall be in compliand variance has been granted by the State Board of I accordance with Rule 18.	ce with the Wa Examiners of W	ter Well Con ater Well Co	struction Rules	2 CCR 402-2, unless approval of a Pump Installation Contractors in		
3)	Approved pursuant to CRS 37-92-602(3)(b)(l) for u monitoring water levels and/or water quality sam	ses as describe pling.	d in CRS 37-	92-602(1)(f). Us	e of this well is limited to		
4)	Approved for the use of an existing well known as	MW-19B.					
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to prevent except during	well contar sampling or	nination or poss measuring.	ible hazards as an open well. The		
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analyses	s shall be ma	intained by the	well owner and submitted to the		
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner shall nust be comple	plug this we ted and sub	ell in accordance mitted to the D	e with Rule 16 of the Water Well ivision of Water Resources within 60		
8)	The owner shall mark the well in a conspicuous lo shall take necessary means and precautions to pre	cation with the	e well permi arkings.	t number and na	ame of aquifer as appropriate, and		
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervisio	n of a licens	ed well driller o	or other authorized individual		
10)	This well must be located not more than 200 feet	from the locat	ion specifie	d on this permit	6		
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this well (Well Construction to a production g well, recovery	can be conve on Rules (2 (on well. (Up y well for re	erted to a produ CCR 402-2), mor on obtaining a p mediation of th	iction well under a future permit. itoring holes constructed pursuant ermit from the State Engineer, a e aquifer, or a dewatering system		
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	t to the following change: The PLSS coordinate values provided with the perm taken from the Well Construction Report provided. You are hereby notified th is permit, by filing a written request with this office within sixty (60) days of strative Procedures Act. (See Section 24-4-104 through 106, C.R.S.)					
	NOTICE - Construction of this well may have occu Construction Rules (2 CCR 402-2). Issuance of this contractor of responsibility or liability for any vio contractor may be contacted by the Chief Well In	rred without pr s permit does n lations that ma spector regardi	oper notice ot relieve th y have occu ing alleged y	or permit, as re ne well owner a rred. The well iolations.	quired by the Water Well nd/or their well construction owner and/or their well construction		

RECEIPT NUMBER 10010122

Sutiality

Issued By ANITIA ARCHULETA

Date Issued: 3/23/2021



Division of Water Resources Department of Natural Resources

WELL PERMIT NUMBER 315831-

RECEIPT NUMBER

3689664H

OR	IGINAL PERMIT APPLICANT(S)	APPROVE	WELL LOC	ATION			
PUB	LIC SERVICE COMPANY OF COLORADO	Water Divi Designate Managem County: Parcel Nat	sion: 1 d Basin: ent District: me:	Water District: 6 N/A BOULDER N/A			
AU	THORIZED AGENT	Physical A	ddress:	N/A			
HDF	ENGINEERING INC (WALTHER, RICHARD)	NW 1/4 S	N 1/4 Sectio	n 26 Township	1.0 N Range 70.0 W Sixth P.M.		
		UTM COORDINATES (Meters, Zone: 13, NAD83)					
		Easting:	482377.0	Northing:	4430156.0		
PE	RMIT TO CONSTRUCT A NEW WELL						
1	ISSUANCE OF T	HIS PERMIT DOES	NOT CONFER	A WATER RIGHT			
1)	This well shall be used in such a way as to can ensure that no injury will occur to another ve relief in a civil court action.	use no material inj ested water right o	jury to existir r preclude an	ng water rights. Nother owner of a	The issuance of this permit does not a vested water right from seeking		
Z)	The construction of this well shall be in comp variance has been granted by the State Board	liance with the W	ater Well Con Vater Well Co	struction Rules instruction and P	2 CCR 402-2, unless approval of a fump installation Contractors in		

accordance with Rule 18. Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to 3) monitoring water levels and/or water quality sampling. This well is known as MW-20.

This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The 4) well must be kept capped and locked at all times except during sampling or measuring.

Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the 5) Division of Water Resources upon request.

Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well 6) Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.

The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and 7) shall take necessary means and precautions to preserve these markings.

This well must be constructed by or under the supervision of a licensed well driller or other authorized individual according to 8) the Water Well Construction Rules. If non-standard construction is anticipated, a variance request must be submitted in accordance with Rule 18 and approved prior to well construction.

A Well Construction and Yield Estimate Report (Form GWS-31), including lithologic log must be submitted by the individual 9) authorized to construct the well. For non-standard construction, the report must include an as-built drawing showing details such as depth, casing, perforated zones, and a description of the grouting type and interval.

This well shall be constructed not more than 200 feet from the location specified on this pennit. 10)

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

NOTE: This permit will expire on the expiration date unless the well is constructed by that date. A Well Construction and Yield Estimate Report (GWS-31) must be submitted to the Division of Water Resources to verify the well has been constructed. An extension of the expiration date may be available. Contact the DWR for additional information or refer to the extension request form (GWS-64) available at: http://www.water.state.co.us

RECEIPT NUMBER 3689664H

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 11/21/2019 Expiration Date: 11/21/2021



Division of Water Resources

Department of Natural Resources

WELL PERMIT NUMBER 320929-

RECEIPT NUMBER 100

1.								
ORI	GINAL PERMIT APPLICANT(S)	APPROVE	D WELL LOC	ATION				
PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER)		Water Division: 1 Designated Basin: Management District: County: Parcel Name:		Water District N/A N/A BOULDER N/A	t: 6			
		Physical A	ddress:	1800 N 63RD ST BOULDER, CO 80302				
AU		NW 1/4 N	E 1/4 Section	n 26 Township	1.0 N Range 70.0 W Sixth P.M.			
TUDA	INC (NELYES, MOLLI)	UTM COORDINATES (Meters, Zone: 13, NAD83)						
		Easting:	483190.2	Northing:	4430976.3			
PER	MIT TO USE AN EXISTING WELL							
1	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT				
1)	This well shall be used in such a way as to cause re- ensure that no injury will occur to another vested relief in a civil court action.	no material in I water right o	jury to existir or preclude an	ng water rights. Nother owner of	The issuance of this permit does not a vested water right from seeking			
2)	The construction of this well shall be in compliand variance has been granted by the State Board of E accordance with Rule 18.	ce with the W Examiners of V	/ater Well Con Water Well Co	struction Rules Instruction and P	2 CCR 402-2, unless approval of a Pump Installation Contractors in			
3)	Approved pursuant to CRS 37-92-602(3)(b)(I) for u monitoring water levels and/or water quality sam	ses as describ pling.	ed in CRS 37-	92-602(1)(f). Use	e of this well is limited to			
4)	Approved for the use of an existing well acknowle MW-21.	edged for cons	struction unde	er monitoring ho	le notice 59175-MH, and known as			
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to preve except durin	nt well contar g sampling or	mination or possi measuring.	ible hazards as an open well. The			
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analys	es shall be ma	aintained by the	well owner and submitted to the			
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report n days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the Di	with Rule 16 of the Water Well vision of Water Resources within 60			
8)	The owner shall mark the well in a conspicuous lo shall take necessary means and precautions to pre-	cation with t eserve these i	he well permi narkings.	t number and na	me of aquifer as appropriate, and			
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervision	ion of a licens	ed well driller o	r other authorized individual			
10)	This well must be located not more than 200 feet	from the loca	ation specifie	d on this permit.				
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Well Construct to a product g well, recove	l can be conve tion Rules (2 (tion well, (Up any well for re	erted to a produ CCR 402-2), mon on obtaining a p mediation of the	ction well under a future permit. itoring holes constructed pursuant ermit from the State Engineer, a e aquifer, or a dewatering system			
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	o the followin en from the V permit, by fili ative Procedu	ig change: The Vell Construct ng a written r res Act. (See	e PLSS coordinat tion Report provi request with this Section 24-4-104	e values provided with the permit ided. You are hereby notified that office within sixty (60) days of the through 106, C.R.S.)			

WELL PERMIT NUMBER 320929-

RECEIPT NUMBER 10010123

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 3/11/2021



COLORADO Division of Water Resources

WELL PERMIT NUMBER 321101-

RECEIPT NUMBER 10010124

OR	GINAL PERMIT APPLICANT(S)	APPROVE	D WELL LOC	ATION			
PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER)		Water Division: 1 Designated Basin: Management District: County: Parcel Name:		Water District N/A N/A BOULDER N/A	: 6		
		Physical A	Address:	1800 N 63RD	ST BOULDER, CO 80302		
HDR	INC (REEVES MOLLY)	NW 1/4 N	W 1/4 Sectio	n 26 Township	1.0 N Range 70.0 W Sixth P.M.		
C.P.C.		UTM COO	RDINATES (A	Meters, Zone: 1	13, NAD83)		
		Easting:	482408.1	Northing:	4430901.3		
PER	MIT TO USE AN EXISTING WELL						
	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT			
ų.	This well shall be used in such a way as to cause re- ensure that no injury will occur to another vested relief in a civil court action.	no material in I water right o	ijury to existir or preclude an	ng water rights. Nother owner of a	The issuance of this permit does not a vested water right from seeking		
2)	The construction of this well shall be in compliand variance has been granted by the State Board of F accordance with Rule 18.	ce with the W Examiners of V	/ater Well Con Water Well Co	struction Rules i instruction and P	2 CCR 402-2, unless approval of a Pump Installation Contractors in		
3)	Approved pursuant to CRS 37-92-602(3)(b)(I) for u monitoring water levels and/or water quality sam	ses as describ pling.	ed in CRS 37-	92-602(1)(f). Use	e of this well is limited to		
4)	Approved for the use of an existing well known as	MW-24.					
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to prever except during	nt well contar g sampling or	nination or possi measuring.	ble hazards as an open well. The		
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analyses shall be maintained by the well owner and submitted to the					
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the Di	with Rule 16 of the Water Well vision of Water Resources within 60		
8)	The owner shall mark the well in a conspicuous lo shall take necessary means and precautions to pre	cation with the serve these r	he well permi markings.	t number and na	me of aquifer as appropriate, and		
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervisi	ion of a licens	ed well driller o	r other authorized individual		
10)	This well must be located not more than 200 feet	from the loca	ation specifier	d on this permit.	5		
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Vell Construct I to a product g well, recove	l can be conve tion Rules (2 (tion well. (Up ery well for re	erted to a produ CCR 402-2), mon on obtaining a p mediation of the	ction well under a future permit. itoring holes constructed pursuant ermit from the State Engineer, a aquifer, or a dewatering system		
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	o the followin en from the V permit, by fili ative Procedu	e values provided with the permit ided. You are hereby notified that office within sixty (60) days of the through 106, C.R.S.)				
	NOTICE - Construction of this well may have occur Construction Rules (2 CCR 402-2). Issuance of this contractor of responsibility or liability for any vio contractor may be contacted by the Chief Well In	urred without proper notice or permit, as required by the Water Well his permit does not relieve the well owner and/or their well construction olations that may have occurred. The well owner and/or their well constr inspector regarding alleged violations.					

RECEIPT NUMBER 10010124

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 3/23/2021



Division of Water Resources

Department of Natural Resources

WELL PERMIT NUMBER 320930-

RECEIPT NUMBER 1001

1.5	· action of the second second							
OR	GINAL PERMIT APPLICANT(S)	APPROVE	D WELL LOC	ATION				
PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER) AUTHORIZED AGENT HDR INC (REEVES MOLLY)		Water Div Designate Managem County: Parcel Na Physical A NE 1/4 NE	Water Division: 1 Designated Basin: Management District: County: Parcel Name: Physical Address: NE 1/4 NE 1/4 Section		t: 6 D ST BOULDER, CO 80302 1.0 N Range 70.0 W Sixth P.M.			
HDR	(INC (REEVES, MOLLY)	UTM COORDINATES (Meters, Zone: 13, NAD83)						
		Easting:	482003.2	Northing:	4430997.4			
PE	MIT TO USE AN EXISTING WELL							
1	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT	r			
1)	This well shall be used in such a way as to cause a ensure that no injury will occur to another vested relief in a civil court action.	no material in I water right o	ijury to existir or preclude an	ng water rights. Nother owner of	The issuance of this permit does not a vested water right from seeking			
2)	The construction of this well shall be in compliand variance has been granted by the State Board of I accordance with Rule 18.	ce with the W Examiners of Y	/ater Well Con Water Well Co	struction Rules	2 CCR 402-2, unless approval of a Pump Installation Contractors in			
3)	Approved pursuant to CRS 37-92-602(3)(b)(I) for u monitoring water levels and/or water quality sam	ises as describ Ipling.	ed in CRS 37-	92-602(1)(f). Us	e of this well is limited to			
4)	Approved for the use of an existing well acknowle MW-25B.	edged for construction under monitoring hole notice 59170-MH, and known as						
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to preve except durin	nt well contar g sampling or	nination or poss measuring.	ible hazards as an open well. The			
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analys	es shall be ma	intained by the	well owner and submitted to the			
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the D	e with Rule 16 of the Water Well ivision of Water Resources within 60			
8)	The owner shall mark the well in a conspicuous to shall take necessary means and precautions to pre-	cation with t eserve these	he well permi markings.	t number and n	ame of aquifer as appropriate, and			
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervis	ion of a licens	ed well driller (or other authorized individual			
10)	This well must be located not more than 200 feet	from the loc	ation specified	d on this permit	L/			
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Well Construc to a product g well, recove	l can be conve tion Rules (2 (tion well. (Upp ery well for re	erted to a produ CCR 402-2), mor on obtaining a p mediation of th	action well under a future permit. hitoring holes constructed pursuant permit from the State Engineer, a be aquifer, or a dewatering system			
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	o the followin en from the \ permit, by fili ative Procedu	ng change: The Well Construct Ing a written r Ires Act. (See	e PLSS coordination Report prov equest with thi Section 24-4-10	te values provided with the permit rided. You are hereby notified that s office within sixty (60) days of the 4 through 106, C.R.S.)			

WELL PERMIT NUMBER 320930-

RECEIPT NUMBER 10010125

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 3/11/2021



Division of Water Resources

Department of Natural Resources

WELL PERMIT NUMBER 320931-

RECEIPT NUMBER

1.5	The partners of the second second					_	
ORIGINAL PERMIT APPLICANT(S) PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER) AUTHORIZED AGENT HDR INC (REEVES, MOLLY)		Water Division: 1 Designated Basin: Management District: County: Parcel Name: Physical Address: NE 1/4 NE 1/4 Section UTM COORDINATES (N Easting: 482003.0		ATION Water District: 6 N/A N/A BOULDER N/A 1800 N 63RD ST BOULDER, CO 80302 127 Township 1.0 N Range 70.0 W Sixth Meters, Zone: 13, NAD83) Northing: 4430678.0			
PER	MIT TO USE AN EXISTING WELL						
	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT	1		
1)	This well shall be used in such a way as to cause resure that no injury will occur to another vested relief in a civil court action.	no material in Water right o	ijury to existir or preclude an	ng water rights. Nother owner of	The issuance of this permit does a vested water right from seeking	not g	
2)	The construction of this well shall be in compliant variance has been granted by the State Board of F accordance with Rule 18.	ce with the W Examiners of V	/ater Well Con Water Well Co	struction Rules	2 CCR 402-2, unless approval of a Pump Installation Contractors in	a	
3)	Approved pursuant to CRS 37-92-602(3)(b)(I) for u monitoring water levels and/or water quality same	ses as describ pling.	ed in CRS 37-	92-602(1)(f). Us	e of this well is limited to		
4)	Approved for the use of an existing well acknowle MW-26.	edged for construction under monitoring hole notice 59814-MH, and known as					
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to prever except during	nt well contan g sampling or	nination or poss measuring.	ible hazards as an open well. The	2	
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analys	es shall be ma	intained by the	well owner and submitted to the	2	
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the D	with Rule 16 of the Water Well ivision of Water Resources within	60	
8)	The owner shall mark the well in a conspicuous lo shall take necessary means and precautions to pre-	cation with these in	he well permi markings.	t number and na	me of aquifer as appropriate, an	d	
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervisi	ion of a licens	ed well driller o	r other authorized individual		
10)	This well must be located not more than 200 feet	from the loca	ation specified	d on this permit			
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Vell Construc 1 to a product 3 well, recove	l can be conve tion Rules (2 (tion well. (Upo any well for re	erted to a produ CCR 402-2), mor on obtaining a p mediation of the	ction well under a future permit. itoring holes constructed pursuar ermit from the State Engineer, a e aquifer, or a dewatering system	ot n	
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	o the followin en from the V permit, by fili ative Procedu	ig change: The Vell Construct ng a written r res Act. (See 1	e PLSS coordinat ion Report prov equest with this Section 24-4-104	e values provided with the permi ided. You are hereby notified that office within sixty (60) days of t through 106, C.R.S.)	it at the	

WELL PERMIT NUMBER 320931-

RECEIPT NUMBER 10010126

Sutiality

Issued By ANITIA ARCHULETA

Date Issued: 3/11/2021



Division of Water Resources

WELL PERMIT NUMBER 320932-

RECEIPT NUMBER 100

1		_							
ORI	GINAL PERMIT APPLICANT(S)	APPROVE	D WELL LOC	ATION					
PUB	PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER)		Water Division: 1 Designated Basin: Management District: County: Parcel Name:		: 6				
		Physical A	Address:	1800 N 63RD	ST BOULDER, CO 80302				
AU	THORIZED AGENT	NW 1/4 N	W 1/4 Sectio	n 26 Township	1.0 N Range 70.0 W Sixth P.M.				
TUK	INC (NEE YES, MOLLI)	UTM COORDINATES (Meters, Zone: 13, NAD83)							
			482727.0	Northing:	4431007.0				
PER	MIT TO USE AN EXISTING WELL								
	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT					
1)	This well shall be used in such a way as to cause a ensure that no injury will occur to another vested relief in a civil court action.	no material in I water right o	ijury to existir or preclude an	ng water rights. Nother owner of	The issuance of this permit does not a vested water right from seeking				
2)	The construction of this well shall be in compliant variance has been granted by the State Board of I accordance with Rule 18.	ce with the W Examiners of N	/ater Well Con Water Well Co	struction Rules Instruction and P	2 CCR 402-2, unless approval of a Pump Installation Contractors in				
3)	Approved pursuant to CRS 37-92-602(3)(b)(I) for u monitoring water levels and/or water quality same	ses as describ pling.	ed in CRS 37-	92-602(1)(f). Usi	e of this well is limited to				
4)	Approved for the use of an existing well acknowle MW-27.	edged for cons	struction unde	er monitoring ho	le notice 59813-MH, and known as				
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to preve except durin	nt well contar g sampling or	nination or possi measuring.	ble hazards as an open well. The				
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analys	es shall be ma	intained by the	well owner and submitted to the				
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the Di	with Rule 16 of the Water Well vision of Water Resources within 60				
8)	The owner shall mark the well in a conspicuous to shall take necessary means and precautions to pre-	cation with t eserve these i	he well permi markings.	t number and na	me of aquifer as appropriate, and				
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervision	ion of a licens	ed well driller o	r other authorized individual				
10)	This well must be located not more than 200 feet	from the loca	ation specifie	d on this permit.					
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Well Construc to a product g well, recove	l can be conve tion Rules (2 (tion well. (Up ery well for re	erted to a produ CCR 402-2), mon on obtaining a p mediation of the	ction well under a future permit. itoring holes constructed pursuant ermit from the State Engineer, a e aquifer, or a dewatering system				
2	NOTICE: This permit has been approved subject to application were not used the UTMs were taken for have the right to appeal the issuance of this perm of issuance, pursuant to the State Administrative	o the followin rom the Well hit, by filing a Procedures A	ig change: The Construction written requi ct. (See Section	e PLSS coordinat Report provided. est with this offi on 24-4-104 thro	e values provided with the permit . You are hereby notified that you ce within sixty (60) days of the date ugh 106, C.R.S.)				

WELL PERMIT NUMBER 320932-

RECEIPT NUMBER 10010127

Sutation

Issued By ANITIA ARCHULETA

Date Issued: 3/11/2021



Division of Water Resources

Department of Natural Resources

WELL PERMIT NUMBER 320933-

RECEIPT NUMBER 100

1.								
OR	GINAL PERMIT APPLICANT(S)	APPROVE	D WELL LOC	ATION				
PUBLIC SERVICE COMPANY OF COLORADO (MCCARTER, JENNIFER)		Water Division: 1 Designated Basin: Management District: County: Parcel Name: Physical Address:		Water District: 6 N/A N/A BOULDER N/A 1800 N 63RD ST BOULDER, CO 80302				
HDR	INC (REEVES, MOLLY)	NE 1/4 NV	V 1/4 Section	1 26 Township	1.0 N Range 70.0 W Sixth P.M.			
C.P.C.		UTM COORDINATES (Meters, Zone: 13, NAD83)						
		Easting:	483090.0	Northing:	4431000.0			
PEF	MIT TO USE AN EXISTING WELL							
1	ISSUANCE OF THIS	PERMIT DOES	NOT CONFER	A WATER RIGHT				
ų.	This well shall be used in such a way as to cause re- ensure that no injury will occur to another vested relief in a civil court action.	no material in I water right o	ijury to existir or preclude an	ng water rights. Nother owner of	The issuance of this permit does no a vested water right from seeking			
2)	The construction of this well shall be in compliand variance has been granted by the State Board of F accordance with Rule 18.	ce with the W Examiners of V	/ater Well Con Water Well Co	struction Rules	2 CCR 402-2, unless approval of a Pump Installation Contractors in			
3)	Approved pursuant to CRS 37-92-602(3)(b)(l) for u monitoring water levels and/or water quality sam	ses as describ pling.	ed in CRS 37-	92-602(1)(f). Us	e of this well is limited to			
4)	Approved for the use of an existing well acknowle MW-28.	edged for construction under monitoring hole notice 59813-MH, and known as						
5)	This well must be equipped with a locking cap or well must be kept capped and locked at all times	seal to preven except during	nt well contar g sampling or	nination or poss measuring.	ible hazards as an open well. The			
6)	Records of water level measurements and water of Division of Water Resources upon request.	quality analys	es shall be ma	intained by the	well owner and submitted to the			
7)	Upon conclusion of the monitoring program the w Construction Rules. A Well Abandonment Report r days of plugging.	ell owner sha nust be comp	ll plug this we leted and sub	ell in accordance mitted to the Di	with Rule 16 of the Water Well vision of Water Resources within 60			
8)	The owner shall mark the well in a conspicuous lo shall take necessary means and precautions to pre-	cation with these r	he well permi markings.	t number and na	me of aquifer as appropriate, and			
9)	This well must have been constructed by or under according to the Water Well Construction Rules.	the supervisi	ion of a licens	ed well driller o	r other authorized individual			
10)	This well must be located not more than 200 feet	from the loca	ation specified	d on this permit.				
	NOTE: Issuance of this permit does not guarantee Additionally, pursuant to Rule 14.2 of the Water V to a monitoring hole notice shall not be converted monitoring hole may be converted to a monitoring for dewatering the aquifer.)	that this wel Well Construc to a product g well, recove	l can be conve tion Rules (2 (tion well, (Upp any well for re	erted to a produ CCR 402-2), mon on obtaining a p mediation of the	ction well under a future permit. itoring holes constructed pursuant ermit from the State Engineer, a e aquifer, or a dewatering system			
	NOTICE: This permit has been approved subject to application were not used and the UTMs were tak you have the right to appeal the issuance of this p date of issuance, pursuant to the State Administra	o the followin en from the V permit, by fili ative Procedu	ig change: The Vell Construct ng a written r res Act. (See	e PLSS coordinat ion Report provi equest with this Section 24-4-104	e values provided with the permit ided. You are hereby notified that office within sixty (60) days of the through 106, C.R.S.)			

WELL PERMIT NUMBER 320933-

RECEIPT NUMBER 10010128

Sutiality

Issued By ANITIA ARCHULETA

Date Issued: 3/11/2021

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
02/2017	1313	Sherman St., коо dwr.colora <u>do.gov</u>	m 821, Denv and dw <u>rper</u>	/er, CO 8020 mitsonl <u>ine@</u>	3 303.866.3 state.co <u>.us</u>	581				
1 Well Permit	Number		Receipt N	lumher						
2. Owner's We	Il Designation:		Necerperi							
3 Well Owner	Name:						\neg			
4 Well Locatio	on Street Address	•								
5. 5g 6i ThGPS	Well Location ff	• Vei IfYXI: Zone	e 17 🗌 Zon	e 13 Easting	y•	Northing:				
6. Legal Well L	ocation: 1	/4. 1/4, S	ec	Twp. ,	N or S	. Range		E or	w,	P.M.
County:		·, ,		· · · P ⁻ <u>· · · ·</u>		,	<u> </u>		··· <u> </u>	
Subdivision:					, Lot	_, Block		—, Filir	ng (Unit)	
7. Ground Sur	face Elevation:	feet	Date Comp	oleted:		Drilling Met	hod: <u>H</u>	Iollow Stem	Auger/ Air Rot	ary
8. Completed	Aquifer Name : _		To	otal Depth:	f	eet Der	oth Co	mpleted:		feet
9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
10. Aquifer Ty	'pe:	(One Confining Lay	yer)		Nultiple Cont	fining Layers)		_aramie-H	Fox Hills	_
(Check one	е) 🔄 Туре II	(Not overlain by I	Type III)	Туре II (Overlain by	Type III)		Type III (a	alluvial/coll	uvial)
11. Geologic I	_og:				וע 12. Hole ויע	iameter (1n.)		From	n (ft)	To (ft)
Depth	Туре	Grain Size	Color	Water Loc.			_			
l		───					_			
		┞────┼─				•				
		├ ───┼─			13. Plain Ca	asing			-	To (ft)
		├ ───┼─			OD (1n)	Kind	Wall Si	ize (1n)	From (ft)	10 (11)
		├ ───┼─								
		┨────┤─								
		┠────┣								
		├ ───┼─			-	10.1				
		┞────┼─			Pertorate	ed Casing Sci	reen Sl	ot Size (i	n):	T_{2} (ft)
					OD (1n)	Kind	Wall Si	ize (1n)	From (IT)	10 (11)
		┞────┼─								
		├ ───┼─			4. Eilton D	-1 .			Discome	4 .
		┼───┼─	ł		14. Filter P	аск:		15. Раске — —	er Placemei	nt:
		───			Material			Туре		
		┝────┝			Size					
		├ ─── ├			Interval			Depth		,
		┟────┟─			16. Groutin	g Record	-	•.		
					Material	Amount	Dei	nsity	Interval	Method
Remarks:										
	-									
17. Disintection	on: Type			11 Trat Dat	Amt. Used		1 - 10	C14/C 20	··· · · · · · -	- · Damout
18. Well Mela	Estimate Data:			x if lest Dat	a is sudmitte	d on form ini	Imper	GW2-39,	Well Mela I	est Report
Well Mela	Estimate Method:		<u> </u>							
Static Leve	l:		—— ľ	Estimated r	ield (gpm)					
Date/Time	measured:		/	Estimate Ler	ngth (hrs)					
Remarks:										
19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
filing online) and	certified in accordan	ce with Rule 17.4 of	the Water Wel	ll Construction	Rules, 2 CCR 4	102 2. The filin	g of a d	ocument tl	hat contains fa	alse
statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
the state Enginee	f considers the entry		actor s name			/.4.			-	
Company Name	2:	Er	mail:			Phone w/are	ea code	2:	License Nu	mber:
Mailing Address	5:									
Sign (or enter r	name if filing onlin	ie)	Print Name	e and Title					Date:	

INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

	COLORADO DIVISION OF WATER RESOURCES						Office Use Only Form GWS-46 (01/2020					
1313 SHERMA	N ST., Ste	821, DEN	VER CO	, 80203								
Phone: (303) 8	66-3581			dwrperm	nitsonline@state.co.us	-						
MONITC	RING	OBSE	ERVA	TION								
Water W	/ell Pe	rmit A	pplic	catio	n							
Review instruc	ctions on r	everse sid	le prior t	o compl	eting form.							
1 Well Owr	ner Inforr	nation	u onnine		ick of blue link.	-						
Name of well owner		nation				6. Use Of Well						
						and/or water gu	ality samplir	าต	wate	el levels		
Mailing address												
						7. Well Data (pro	posed)	Aquifor				
City State Zip code					feet	Aquilei						
							leet					
Telephone # E-Mail (If filing online it is required)					8. Consultant In	formation (if	[*] applicable)					
						Name of contact person						
2. Type Of Application (check applicable boxes)												
Use existing	g well	🗌 Repl	acement	for exist	ing monitoring well:	Company name						
Construct n	ew well	Pern	nit no ·									
Other:						Mailing address						
3. Refer To	(if applica	able)						1	1			
Monitoring hole ack	nowledgment		Well name	e or #		City		State	Zip C	ode		
MH-	MH-											
4. Location Of Proposed Well (Important! See Instructions)					Telephone #							
County				1/4 of	tha 1/4	0. Drepeed We		noo #/antia				
0	T					9. Proposed We		ense #(opuc	Agon	•		
Section	Township	NorS	Range	E or W	Principal Meridian	10. Name of we		Authonizeu	муеп	L		
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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
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9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
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19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
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statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
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INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

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DEPARTMENT OF NATURAL RESOURCES 1313 SHERMAN ST., Ste 821, DENVER CO 80203											
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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
02/2017	1213	dwr.colorado.gov								
1. Well Permit	Lt Number:		Receipt N	Jumber:						
2. Owner's We	ell Designation:						\neg			
3. Well Owner	Name:									
4. Well Locatio	on Street Address									
5. 5a 6i]`hGPS	S Well Location ff	Yei lfYXL: Zon	e 12 🗌 Zon	e 13 Easting	g:	Northing:				
6. Legal Well L	Location: 1	/4,	bec.,	Twp,	N or S	, Range		E or	·W_,	P.M.
County: Subdivision:					, Lot	_, Block		, Filir	 ng (Unit)	
7 Ground Sur	face Flevation:	feet	Date Com	nleted:		Drilling Met	hod:	Hollow Stem	Auger/Air Rot	arv
8. Completed	Aquifer Name :		T(otal Depth:	fr	eet Dei	nth Cc	moleted	•	feet
9. Advance No	tification: Was N	otification Requir	ed Prior to (onstruction	? ☐ Yes ☐	No. Date N	Jotific:	ation Give	• >n:	
10. Aquifer Ty		One Confining La	ver)		Multiple Conf	fining Lavers)		l aramie-l	Fox Hills	
(Check one		(Not overlain by	Tvne III)		(Overlain by)	Tvne III)			alluvial/coll	uvial)
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					Interval			Depth		·
					16. Groutin	g Record				
					Material	Amount	De	ensity	Interval	Method
Remarks:		<u> </u>		L	1			-		
					<u> </u>					
17. Disinfection	on: Type				Amt. Use	d				
18. Well Yield	Estimate Data:		Check bo	x if Test Dat	a is submitte	- d on Form Ni	umber	GWS-39,	Well Yield 1	est Report
Well Yield	Estimate Method:			A 11 1 200 - 1.1	u 10 00.01112		di i	C , (C ,		
Static Leve	<u></u>			Fstimated Y	ield (gnm)					
			— I	Ectimatela	nette (Spiii)					
Date/ I line	measurea:			EStimate Lei	ngun (ms)					
Remarks:										
19. I have read t	the statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docu	ment is sig	ned (or name	entered if
filing online) and	certified in accordance	Ce with Kule 17.4 or	the Water wei	Il Construction	I Rules, Z UUK 4	402.2. The film	ig of a c	Jocument u	hat contains is	alse
the State Enginee	or considers the entry	of the licensed cont	, and is puttishe ractor's name	to be complia	nce with Rule 1	17 4		Contracting	g ucense. In i	ling online
	f considers are energy		Tactor 3 nume	to be comprise		7.4.				
Company Name	e:	E	mail:			Phone w/are	ea cod	e:	License Nu	mber:
		<u></u>								
Mailing Address	s:									
Sign (or enter r	name if filing onlin	ne)	Print Name	e and Title					Date:	
	-									

INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

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DEPARTMENT OF NATURAL RESOURCES 1313 SHERMAN ST., Ste 821, DENVER CO 80203											
Phone: (303) 866-3581 <u>dwrpermitsonline@state.co.us</u>						-					
MONITORING/OBSERVATION											
Water W	/ell Pe	rmit A	pplic	catio	n						
Review instru	ctions on r	everse sid	le prior t	o compl	eting form.						
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Mailing address								-9			
						7. Well Data (pro	oposed)	Aquifor			
City		Sta	te	Zip code			feet	Aquilei			
							1001				
Telephone #			E-Mail (If	filing online	it is required)	8. Consultant In	formation (if	[*] applicable)			
						Name of contact person					
2. Type Of	Applicati	on (cheo	ck appli	cable b	oxes)						
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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
02/2017	1213	dwr.colorado.gov								
1. Well Permit	Lt Number:		Receipt N	Jumber:						
2. Owner's We	ell Designation:						\neg			
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INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
02/2017	1213	dwr.colorado.gov								
1. Well Permit	Lt Number:		Receipt N	Jumber:						
2. Owner's We	ell Designation:						\neg			
3. Well Owner	Name:									
4. Well Locatio	on Street Address									
5. 5a 6i]`hGPS	S Well Location ff	Yei lfYXL: Zon	e 12 🗌 Zon	e 13 Easting	g:	Northing:				
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County: Subdivision:					, Lot	_, Block		, Filir	 ng (Unit)	
7 Ground Sur	face Flevation:	feet	Date Com	nleted:		Drilling Met	hod:	Hollow Stem	Auger/Air Rot	arv
8. Completed	Aquifer Name :		T(otal Depth:	fr	eet Dei	nth Cc	moleted	•	feet
9. Advance No	tification: Was N	otification Requir	ed Prior to (onstruction	? ☐ Yes ☐	No. Date N	Jotific:	ation Give	• >n:	
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					16. Groutin	g Record				
					Material	Amount	De	ensity	Interval	Method
Remarks:		<u> </u>		L	1			-		
					<u> </u>					
17. Disinfection	on: Type				Amt. Use	d				
18. Well Yield	Estimate Data:		Check bo	x if Test Dat	a is submitte	- d on Form Ni	umber	GWS-39,	Well Yield 1	est Report
Well Yield	Estimate Method:			A 11 1 200 - 1.1	u 10 00.01112		di i	C , (C ,		
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Date/ I line	measurea:			EStimate Lei	ngun (ms)					
Remarks:										
19. I have read t	the statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docu	ment is sig	ned (or name	entered if
filing online) and	certified in accordance	Ce with Kule 17.4 or	the Water wei	Il Construction	I Rules, Z UUK 4	402 2. The film	ig of a c	Jocument u	hat contains is	alse
the State Enginee	or considers the entry	of the licensed cont	, and is puttishe ractor's name	to be complia	nce with Rule 1	17 4		Contracting	g ucense. In i	ling online
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Sign (or enter r	name if filing onlin	ne)	Print Name	e and Title					Date:	
	-									
This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
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9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
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19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
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statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
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This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
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1 Well Permit	Number		Receipt N	lumher						
2. Owner's We	Il Designation:		Necerperi							
3 Well Owner	Name:						\neg			
4 Well Locatio	on Street Address	•								
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6. Legal Well L	ocation: 1	/4. 1/4, S	ec	Twp. ,	N or S	. Range		E or	w,	P.M.
County:		·, ,		· · · P ⁻ <u>· · · ·</u>		,	<u> </u>		··· <u> </u>	
Subdivision:					, Lot	_, Block		—, Filir	ng (Unit)	
7. Ground Sur	face Elevation:	feet	Date Comp	oleted:		Drilling Met	hod: <u>H</u>	Iollow Stem	Auger/ Air Rot	ary
8. Completed	Aquifer Name : _		To	otal Depth:	f	eet Der	oth Co	mpleted:		feet
9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
10. Aquifer Ty	'pe:	(One Confining Lay	yer)		Nultiple Cont	fining Layers)		_aramie-H	Fox Hills	_
(Check one	е) 🔄 Туре II	(Not overlain by I	Type III)	Туре II (Overlain by	Type III)		Type III (a	alluvial/coll	uvial)
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Remarks:										
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Date/Time	measured:		/	Estimate Ler	ngth (hrs)					
Remarks:										
19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
filing online) and	certified in accordan	ce with Rule 17.4 of	the Water Wel	ll Construction	Rules, 2 CCR 4	102 2. The filin	g of a d	ocument tl	hat contains fa	alse
statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
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Company Name	2:	Er	mail:			Phone w/are	ea code	2:	License Nu	mber:
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Sign (or enter r	name if filing onlin	ie)	Print Name	e and Title					Date:	

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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1313 SHERMA	N ST., Ste	821, DEN	VER CO	, 80203						
Phone: (303) 8	66-3581			dwrperm	nitsonline@state.co.us	-				
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						Use of this well	is limited to	monitoring	wate	or lovels
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Mailing address								-9		
						7. Well Data (pro	posed)	Aquifor		
City		Sta	te	Zip code			feet	Aquilei		
							leet			
Telephone #			E-Mail (If	filing online	it is required)	8. Consultant In	formation (if	[*] applicable)		
						Name of contact person				
2. Type Of	Applicati	on (cheo	ck appli	cable b	oxes)					
Use existing	g well	🗌 Repl	acement	for exist	ing monitoring well:	Company name				
Construct n	ew well	Pern	nit no ·							
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3. Refer To	(if applica	able)						1	1	
Monitoring hole ack	nowledgment		Well name	e or #		City		State	Zip C	ode
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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
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County:		·, ,		· · · P ⁻ <u>· · · ·</u>		,	<u> </u>		··· <u> </u>	
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7. Ground Sur	face Elevation:	feet	Date Comp	oleted:		Drilling Met	hod: <u>H</u>	Iollow Stem	Auger/ Air Rot	ary
8. Completed	Aquifer Name : _		To	otal Depth:	f	eet Der	oth Co	mpleted:		feet
9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
10. Aquifer Ty	'pe:	(One Confining Lay	yer)		Nultiple Cont	fining Layers)		_aramie-H	Fox Hills	_
(Check one	е) 🔄 Туре II	(Not overlain by I	Type III)	Туре II (Overlain by	Type III)		Type III (a	alluvial/coll	uvial)
11. Geologic I	_og:				וע 12. Hole ויע	iameter (1n.)		From	n (ft)	To (ft)
Depth	Туре	Grain Size	Color	Water Loc.			_			
l		───					_			
		┞────┼─				•				
		├ ───┼─			13. Plain Ca	asing			-	To (ft)
		├ ───┼─			OD (1n)	Kind	Wall Si	ize (1n)	From (ft)	10 (11)
		├ ───┼─								
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		├ ───┼─			-	10.1				
		┞────┼─			Pertorate	ed Casing Sci	reen Sl	ot Size (i	n):	T_{2} (ft)
					OD (1n)	Kind	Wall Si	ize (1n)	From (IT)	10 (11)
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		├ ───┼─			4. Eilton D	-1 .			Discome	4 .
		┼───┼─	 		14. Filter P	аск:		15. Раске — —	er Placemei	nt:
		───			Material			Туре		
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		├ ─── ├			Interval			Depth		,
		───			16. Groutin	g Record	-	•.		
					Material	Amount	Dei	nsity	Interval	Method
Remarks:										
	-									
17. Disintection	on: Type			11 Trat Dat	Amt. Used		1 - 10	C14/C 20	··· · · · · · -	- · Damout
18. Well Mela	Estimate Data:			x if lest Dat	a is sudmitte	d on form ini	Imper	GW2-39,	Well Mela I	est Report
Well Mela	Estimate Method:		<u> </u>							
Static Leve	l:		—— ľ	Estimated r	ield (gpm)					
Date/Time	measured:		/	Estimate Ler	ngth (hrs)					
Remarks:										
19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
filing online) and	certified in accordan	ce with Rule 17.4 of	the Water Wel	ll Construction	Rules, 2 CCR 4	102 2. The filin	g of a d	ocument tl	hat contains fa	alse
statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
the state Enginee	f considers the entry		actor s name			/.4.			-	
Company Name	2:	Er	mail:			Phone w/are	ea code	2:	License Nu	mber:
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Sign (or enter r	name if filing onlin	ie)	Print Name	e and Title					Date:	

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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1313 SHERMA	N ST., Ste	821, DEN	VER CO	, 80203						
Phone: (303) 8	66-3581			dwrperm	nitsonline@state.co.us	-				
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Review instruc	ctions on r	everse sid	le prior t	o compl	eting form.					
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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
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8. Completed	Aquifer Name : _		To	otal Depth:	f	eet Der	oth Co	mpleted:		feet
9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
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19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
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statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
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This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No.	٧	VELL CONSTRUCT State of Colorad	ION AND YI do, Office o	ELD ESTIMA of the State E	TE REPORT			For	Office Use C	Dnly
02/2017	1313	Sherman St., Roor	n 821, Denv	ver, CO 8020	3 303.866.3	581				
02/2017			anu <u>umper</u>		<u>state.co.us</u>					
1. Well Permit	Number:		Receipt N	lumber:						
2. Owner's We	Il Designation:									
3. Well Owner	Name:									
4. Well Locatio	on Street Address	•								
5. 5g'6i]`h'GPS	Well Location ff	Yei JfYXŁ: Zone	12 <u>Zon</u>	e 13 Easting	g:	Northing:				
6. Legal Well L	ocation: 1/	/4,1/4, Se	ec.,	Twp. <u>,</u>	N or S	, Range	,	E or	W,	P.M.
County: Subdivision:					, Lot	_, Block		—, Filir	ng (Unit)	
7. Ground Sur	face Elevation:	feet	Date Com	pleted:		Drilling Met	hod: _	Hollow Stem	Auger/ Air Rot	ary
8. Completed	Aquifer Name:_		Τα	otal Depth: _	fe	eet De j	oth Co	mpleted:		feet
9. Advance No	tification: Was No	otification Require	d Prior to C	Construction	? 🗌 Yes 🗌	No, Date N	lotifica	ation Give	en:	
10. Aquifer Ty	pe: Type I	One Confining Lay	er)	Type I (/	Multiple Conf	ining Layers)		Laramie-F	Fox Hills	
(Check one	e) 🗌 Type II	(Not overlain by T	ype III)	Type II (Overlain by	Type III)		Type III (a	alluvial/coll	uvial)
11. Geologic I	_og:				12. Hole Di	iameter (in.)		From	n (ft)	To (ft)
Depth	Туре	Grain Size	Color	Water Loc.		. ,			· · /	()
							-			
							-			
					13 Plain Ca	sing		-		
					OD (in)	Kind	W-11 C	izo (in)	From (ft)	To (ft)
						KING	wall 5	ize (iii)	FIOIII (IL)	10 (10)
					Perforate	ed Casing SC	reen S	lot Size (i	in): 0.010	
					OD (in)	Kind	Wall S	ize (in)	From (ft)	To (ft)
					14 Filtor D		I	15 Dack	or Blacomor	
					14. Filler P	ack.		TJ. FACKE	er Flacemer	π.
					Material			туре		
					Size					
					Interval			Depth		
					16. Groutin	g Record				
					Material	Amount	De	ensity	Interval	Method
Remarks:										
17. Disinfectio	on: Type				Amt. Use	d				
18 Well Vield	Estimate Data:		Check bo	v if Test Dat	a is submitte	d on Form Ni	ımher	GWS-39	Well Yield T	est Report
Woll Viold	Estimate Mothod:	L		x II TCSC Dat			linder	0115 57,	wett neta i	cst hepoit
				Fatimated V	ield (an me)					
Static Leve	l:			Estimated f	ieta (gpm)					
Date/Time	measured:			Estimate Lei	ngth (hrs)					
Remarks:										
19. I have read t	he statements made	herein and know the o	contents ther	eof, and they a	are true to my	knowledge. Th	is docu	ment is sig	ned (or name o	entered if
filing online) and	certified in accordan	ce with Rule 17.4 of t	he Water We	ll Construction	Rules, 2 CCR 4	102 2. The filin	g of a c	locument t	hat contains fa	alse
statements is a vi	olation of section 37	91 108(1)(e), C.R.S.,	and is punish	able by fines u	p to \$1,000 and	d/or revocation	of the	contracting	g license. If fi	iling online
the State Enginee	r considers the entry	of the licensed contra	actor's name	to be complia	nce with Rule 1	7.4.				
Company Name	<u>.</u>	Fm	nail:			Phone w/are	a cod	e:	License Nu	mber:
company name		` ''						~•		
Mailing Address										
Sign (or enter r	name it filing onlin	e)	Print Name	e and Title					Date:	

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	VELL CONSTRUCT State of Colora	ION AND YII	ELD ESTIMA	TE REPORT	E01		For	Office Use (Dnly
02/2017	1313	Sherman St., коо dwr.colora <u>do.gov</u>	m 821, Denv and dw <u>rper</u>	/er, CO 8020 mitsonl <u>ine@</u>	3 303.866.3 state.co <u>.us</u>	581				
1 Well Permit	Number		Receipt N	lumher						
2. Owner's We	Il Designation:		Necerperi							
3 Well Owner	Name:						\neg			
4 Well Locatio	on Street Address	•								
5. 5g 6i ThGPS	Well Location ff	• Vei IfYXI: Zone	e 17 🗌 Zon	e 13 Easting	y•	Northing:				
6. Legal Well L	ocation: 1	/4. 1/4, S	ec	Twp. ,	N or S	. Range		E or	w,	P.M.
County:		·, ,		· · · P ⁻ <u>· · · ·</u>		,	<u> </u>		··· <u> </u>	
Subdivision:					, Lot	_, Block		—, Filir	ng (Unit)	
7. Ground Sur	face Elevation:	feet	Date Comp	oleted:		Drilling Met	hod: <u>H</u>	Iollow Stem	Auger/ Air Rot	ary
8. Completed	Aquifer Name : _		To	otal Depth:	f	eet Der	oth Co	mpleted:		feet
9. Advance No	tification: Was N	otification Require	ed Prior to C	onstruction	Yes	No, Date N	lotifica	tion Give	en:	
10. Aquifer Ty	'pe:	(One Confining Lay	yer)		Nultiple Cont	fining Layers)		_aramie-H	Fox Hills	_
(Check one	е) 🔄 Туре II	(Not overlain by I	Type III)	Туре II (Overlain by	Type III)		Type III (a	alluvial/coll	uvial)
11. Geologic I	_og:				וע 12. Hole ויע	iameter (1n.)		From	n (ft)	To (ft)
Depth	Туре	Grain Size	Color	Water Loc.			_			
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		├ ───┼─			13. Plain Ca	asing			-	To (ft)
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		┠────┣								
		├ ───┼─			-	10.1				
		┞────┼─			Perforate	ed Casing Sci	reen Sl	ot Size (i	n):	T_{2} (ft)
					OD (1n)	Kind	Wall Si	ize (1n)	From (IT)	10 (11)
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		├ ───┼─			4. Eilton D	-1 .			Discome	4 .
		┼───┼─	ł		14. Filter P	аск:		15. Раске — —	er Placemei	nt:
		───			Material			Туре		
		┝────┝			Size					
		├ ─── ├			Interval			Depth		,
		┟────┟─			16. Groutin	g Record	-	•.		
					Material	Amount	Dei	nsity	Interval	Method
Remarks:										
	-									
17. Disintection	on: Type			11 Trat Dat	Amt. Used		1 - 10	C14/C 20	··· · · · · · -	- · Damout
18. Well Mela	Estimate Data:			x if lest Dat	a is sudmitte	d on form ini	Imper	GW2-39,	Well Mela I	est Report
Well Mela	Estimate Method:		<u> </u>							
Static Leve	l:		—— ľ	Estimated r	ield (gpm)					
Date/Time	measured:		/	Estimate Ler	ngth (hrs)					
Remarks:										
19. I have read t	he statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docur	nent is sig	ned (or name	entered if
filing online) and	certified in accordan	ce with Rule 17.4 of	the Water Wel	ll Construction	Rules, 2 CCR 4	102 2. The filin	g of a d	ocument tl	hat contains fa	alse
statements is a vi	olation of section 37	91 108(1)(e), C.K.S.,	and is punisha	able by fines u	p to \$1,000 and	d/or revocation م م	of the	contracting	glicense. IT T	iling online
the state Enginee	f considers the entry		actor s name			/.4.			-	
Company Name	2:	Er	mail:			Phone w/are	ea code	2:	License Nu	mber:
Mailing Address	5:									
Sign (or enter r	name if filing onlin	ie)	Print Name	e and Title					Date:	

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

DEDADTMENT		F WAIER		RUES		Office Use Only Form GWS-46 (01/2020					
DEPARTMENT OF NATURAL RESOURCES 1313 SHERMAN ST., Ste 821, DENVER CO 80203											
Phone: (303) 866-3581 <u>dwrpermitsonline@state.co.us</u>						-					
MONITORING/OBSERVATION											
Water W	/ell Pe	rmit A	pplic	catio	n						
Review instru	ctions on r	everse sid	le prior t	o compl	eting form.						
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Name of well owner		nation				6. Use Of Well					
						Use of this well	is limited to	monitoring	wate	or lovels	
						and/or water gu	ality samplir	าต	wate	el levels	
Mailing address								-9			
						7. Well Data (pro	oposed)	Aquifor			
City		Sta	te	Zip code			feet	Aquilei			
							1001				
Telephone #			E-Mail (If	filing online	it is required)	8. Consultant In	formation (if	[*] applicable)			
						Name of contact person					
2. Type Of	Applicati	on (cheo	ck appli	cable b	oxes)						
Use existing	g well	🗌 Repl	acement	for exist	ing monitoring well:	Company name					
Construct n	ew well	Pern	nit no.:								
Other:						Mailing address					
3. Refer To	(if applica	able)						<u>г</u>	-		
Monitoring hole ack	nowledgment		Well name	e or #		City		State	Zip C	ode	
MH-						Talankana #					
4. Location	Of Prop	osed We	ell (Imp	ortant	See Instructions)	l elephone #					
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Section	Township	N er S	Bongo	E or W	Dringing Maridian	10 Name of We		uthorized	Δαen	+	
Section Township N or S Range E or W Principal Meridian						10. Name of Well Owner or Authorized Agent					
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Section	·					The making of false s degree, which is pun	statements herei ishable as a clas	n constitutes p s 1 misdemea	ərjury iı nor pur	n the second suant to C.R.S.	
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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
02/2017	1213	dwr.colorado.gov								
1. Well Permit	Lt Number:		Receipt N	Jumber:						
2. Owner's We	ell Designation:						\neg			
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4. Well Locatio	on Street Address									
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County: Subdivision:					, Lot	_, Block		, Filir	 ng (Unit)	
7 Ground Sur	face Flevation:	feet	Date Com	nleted:		Drilling Met	hod:	Hollow Stem	Auger/Air Rot	arv
8. Completed	Aquifer Name :		T(otal Depth:	fr	eet Dei	nth Cc	moleted	•	feet
9. Advance No	tification: Was N	otification Requir	ed Prior to (onstruction	? ☐ Yes ☐	No. Date N	Jotific:	ation Give	• >n:	
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					Material	Amount	De	ensity	Interval	Method
Remarks:		<u> </u>		L	1			-		
					<u> </u>					
17. Disinfection	on: Type				Amt. Use	d				
18. Well Yield	Estimate Data:		Check bo	x if Test Dat	a is submitte	- d on Form Ni	umber	GWS-39,	Well Yield 1	est Report
Well Yield	Estimate Method:			A 11 1 200 - 1.1	u 10 00.01112		di i	C , (C ,		
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Date/ I line	measurea:			EStimate Lei	ngun (ms)					
Remarks:										
19. I have read t	the statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docu	ment is sig	ned (or name	entered if
filing online) and	certified in accordance	Ce with Kule 17.4 or	the Water wei	Il Construction	I Rules, Z UUK 4	402 2. The film	ig of a c	Jocument u	hat contains is	alse
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Sign (or enter r	name if filing onlin	ne)	Print Name	e and Title					Date:	
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This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

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DEPARTMENT OF NATURAL RESOURCES 1313 SHERMAN ST., Ste 821, DENVER CO 80203											
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Use existing	g well	🗌 Repl	acement	for exist	ing monitoring well:	Company name					
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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
02/2017	1213	dwr.colorado.gov								
1. Well Permit	Lt Number:		Receipt N	Jumber:						
2. Owner's We	ell Designation:						\neg			
3. Well Owner	Name:									
4. Well Locatio	on Street Address									
5. 5a 6i]`hGPS	S Well Location ff	Yei lfYXL: Zon	e 12 🗌 Zon	e 13 Easting	g:	Northing:				
6. Legal Well L	Location: 1	/4,	bec.,	Twp,	N or S	, Range		E or	·W_,	P.M.
County: Subdivision:					, Lot	_, Block		, Filir	 ng (Unit)	
7 Ground Sur	face Flevation:	feet	Date Com	nleted:		Drilling Met	hod:	Hollow Stem	Auger/Air Rot	arv
8. Completed	Aquifer Name :		T(otal Depth:	fr	eet Dei	nth Cc	moleted	•	feet
9. Advance No	tification: Was N	otification Requir	ed Prior to (onstruction	? ☐ Yes ☐	No. Date N	Jotific:	ation Give	• •n:	
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					16. Groutin	g Record				
					Material	Amount	De	ensity	Interval	Method
Remarks:		<u> </u>		L	1			-		
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17. Disinfection	on: Type				Amt. Use	d				
18. Well Yield	Estimate Data:		Check bo	x if Test Dat	a is submitte	- d on Form Ni	umber	GWS-39,	Well Yield 1	est Report
Well Yield	Estimate Method:			A 11 1 200 - 1.1	u 10 00.01112		di i	C , (C ,		
Static Leve	<u></u>			Fstimated Y	ield (gnm)					
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Remarks:										
19. I have read t	the statements made	herein and know the	contents there	eof, and they a	are true to my	knowledge. Th	is docu	ment is sig	ned (or name	entered if
filing online) and	certified in accordance	Ce with Kule 17.4 or	the Water wei	Il Construction	I Rules, Z UUK 4	402 2. The film	ig of a c	Jocument u	hat contains is	alse
the State Enginee	or considers the entry	of the licensed cont	, and is puttishe	to be complia	nce with Rule 1	17 4		Contracting	g ucense. In i	ling online
	f considers are energy		Tactor 3 nume	to be comprise		7.4.				
Company Name	e:	E	mail:			Phone w/are	ea cod	e:	License Nu	mber:
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Mailing Address	s:									
Sign (or enter r	name if filing onlin	ne)	Print Name	e and Title					Date:	
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This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

DEDADTMENT		F WAIER		RUES		Office Use Only Form GWS-46 (01/2020					
DEPARTMENT OF NATURAL RESOURCES 1313 SHERMAN ST., Ste 821, DENVER CO 80203											
Phone: (303) 866-3581 <u>dwrpermitsonline@state.co.us</u>						-					
MONITORING/OBSERVATION											
Water W	/ell Pe	rmit A	pplic	catio	n						
Review instru	ctions on r	everse sid	le prior t	o compl	eting form.						
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						7. Well Data (pro	oposed)	Aquifor			
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							1001				
Telephone #			E-Mail (If	filing online	it is required)	8. Consultant In	formation (if	[*] applicable)			
						Name of contact person					
2. Type Of	Applicati	on (cheo	ck appli	cable b	oxes)						
Use existing	g well	🗌 Repl	acement	for exist	ing monitoring well:	Company name					
Construct n	ew well	Pern	nit no.:								
Other:						Mailing address					
3. Refer To	(if applica	able)						<u>г</u>	-		
Monitoring hole ack	nowledgment		Well name	e or #		City		State	Zip C	ode	
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Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	1313	WELL CONSTRUCT State of Colora		For	Office Use (Dnly				
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1. Well Permit	Lt Number:		Receipt N	Jumber:						
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9. Advance No	tification: Was N	otification Requir	ed Prior to (onstruction	? ☐ Yes ☐	No. Date N	Jotific:	ation Give	• >n:	
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filing online) and	certified in accordance	Ce with Kule 17.4 or	the Water wei	Il Construction	I Rules, Z UUK 4	402 2. The film	ig of a c	Jocument u	hat contains is	alse
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INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.

Form No. GWS-31	WELL CONSTRUCTION AND YIELD ESTIMATE REPORT State of Colorado, Office of the State Engineer 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581							For	Office Use (Dnly
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INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see the <u>Form Submittal, Payment Options, & Fee Schedule</u>. You may also save, print and email the completed form to: <u>dwrpermitsonline@state.co.us</u>

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aquifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See https://dwr.colorado.gov/services/well-construction-inspection for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:
 Type sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.

Rule 17.4 Certification - Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to <u>dwrpermitsonline@state.co.us</u>

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at <u>dwr.colorado.gov</u> for general information, forms, online filing instructions and access to state rules and statutes.

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MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. This form may be reproduced by photocopying or computer generation. Reproductions must retain margins and print quality of the original form. If filing online, see online filing instructions for further information. You may also save, print, scan and email the completed form to: dwrpermitsonline@state.co.us

<u>FEES</u>: This application must be submitted with a \$100 filing fee. (The fee for an application to replace or deepen an existing permitted monitoring/observation well is \$100 for locations outside Designated Ground Water Basins, and \$60 inside Designated Ground Water Basins.) Fees are nonrefundable. Please visit our website (<u>dwr.colorado.gov</u>) for acceptable payment information or contact DWR at (303) 866-3581.

USES: This form (GWS-46) is to be used when applying for a permit where the only uses are monitoring of water levels and/or water quality sampling. For well construction criteria refer to the Colorado Water Well Construction Rules, 2CCR 402-2. A copy of the Rules may be obtained from any Division of Water Resources Office for a fee of \$5, or you may access them online on our website (dwr.colorado.gov)

ITEM INSTRUCTIONS: (numbers correspond with those on the front of this form)

- 1. Provide the name of the well owner and the mailing address where all correspondence will be sent.
- 2. Check and complete all boxes that apply.
- 3. Provide the MH number assigned by the Division of Water Resources in response to the notice of intent to construct a monitoring/observation well. Complete the well name if the structure has a name or identifying number.
- 4. If applying for a permit to construct a new well, you <u>must</u> provide the county, section #, township, range and principal meridian. You do not need to provide the ¼ of the ¼ section designation, distances from section lines or an optional GPS location (UTM coordinates). If a permit is issued and a well constructed, the authorized individual will be required to provide an accurate GPS location (UTM coordinates) of the "as-built" well location. If applying for a permit to use an existing well you <u>must</u> provide the well location information stated above, as well as either a GPS location (UTM coordinates) of the existing well site, or distances from section lines (including the ¼ of the ¼ section designation) as follows: In a typical case, a township is comprised of 36 sections, with each section ideally one mile square, or 5,280 feet on each side. Sections are further divided into quarter sections. Each ¼ Section is 2,640 feet by 2,640 feet and comprises 160 acres. Each ¼ section can be further divided into additional quarters. Each ¼ of the ¼ Section is 1,320 feet by 1,320 feet and comprises 40 acres. The distances are measured from the section lines. In the following example, the well is located 2,500 feet from the South Section line and 1,400 feet from the East Section line:



Well Location Example: NW1/4 of the SE1/4 of Section 3, being 2500 feet from the South Section Line and 1400 feet from the East Section Line.

If providing a GPS location (UTM coordinates), the required GPS unit settings must be as indicated on this form. Colorado contains two UTM zones (12 & 13). Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone. Provide the property address of the well location if one exists. If it is the same as the mailing address, check the box next to the well location address.

- 5. Provide property owner information.
- 6. Use of this well is limited to monitoring water levels and/or water quality sampling only.
- 7. The actual or anticipated total depth must be provided. Provide the name of the aquifer in which the well will be completed.
- 8. Provide consultant information (if applicable). Note: A consultant may sign this application on behalf of their client.
- 9. Monitoring/observation wells must be constructed by a Colorado licensed well construction contractor or authorized individual, as defined in the Well Construction Rules, 2CCR 402-2. Only a licensed contractor may construct any monitoring/observation well that penetrates a confining layer, or, is to be converted into a future production well. The well must be constructed in compliance with the Well Construction Rules, unless a variance has been approved allowing an alternative construction design.
- 10. The individual signing the application or entering their name (and title if applicable) must be the applicant or an officer of the corporation/company/ agency identified as the applicant, their attorney or consultant. An authorized agent may also sign the application, if a letter signed by the applicant or their attorney is submitted with the application authorizing that agent to sign or enter their name on the applicant's behalf. Payment must be received via phone, fax or mail prior to processing the application. If filing online please call the Records Section at 303.866.3581 to pay via credit card. IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to the CDWR web site at <u>dwr.colorado.gov</u> for general information.