STATE OF COLORADO

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GCC Pueblo M2002-004 TR-12 MW Installation Report

1 message

Amy Rodrigues <aveek@gcc.com> Wed, Jul 3, 2024 at 3:35 PM
To: "Carter - DNR, Jocelyn" <jocelyn.carter@state.co.us>, "Lennberg - DNR, Patrick" <patrick.lennberg@state.co.us>
Cc: Vance Sarah <svance@gcc.com>, Landon Beck <lbeck@slrconsulting.com>

Jocelyn and Patrick,

Please see attached for the monitoring well installation report pursuant to TR-12 for GCC Rio Grande's Pueblo Plant (M-2002-004).

Let me know if you have any questions or concerns regarding this report.

Thanks,

Amy

GCC

Amy Rodrigues

Environmental Engineer

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GCC.com

2024 GCC Pueblo Plant TR-12 Monitoring Wells Installation Program Report.pdf
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2024 GCC Pueblo Plant TR-12 Monitoring Well Installation Program Report

GCC Rio Grande, Inc.

Pueblo, Colorado

Prepared by:

SLR International Corporation

Durango, CO

June 26, 2024

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Introduction

On behalf of GCC Rio Grande, Inc. (GCC), SLR International Corporation (SLR) has prepared this Monitoring Well Installation Program Report for the GCC Pueblo Plant located at 3372 Lime Road in Pueblo, Colorado (**Figure 1**). Site activities were completed in accordance with the TR-12 2024 Monitoring Well Installation Work Plan distributed by Resource Hydrogeologic Services, Inc., dated October 4, 2023.

Purpose

The purpose of the 2024 GCC Pueblo Plant Monitoring Well Installation Program was to install environmental monitoring wells to address groundwater data gaps to further characterize groundwater quality and quantity in the mined horizon and underburden to support permitting efforts of the Colorado Division of Reclamation, Mining and Safety (CDRMS) under mining permit M2002004. Existing monitoring wells at the Facility were installed in 2008, 2018 and 2021 and focus on the mined Fort Hayes Limestone member of the Niobrara Formation and the underlying Codell Sandstone member of the Carlile Shale Formation and are subject to monitoring requirements as documented in TR-11.

The work plan, as detailed in the following section, was to install ten permanent bedrock monitoring wells at five additional locations at the Pueblo Plant to increase the spatial distribution of site water quality monitoring and allow confirmation and refinement of the groundwater gradient and flow direction. This basic hydrogeologic characterization effort is expected to support future recommendations towards meeting operational and environmental monitoring goals. The wells, where saturated conditions exist, will also allow future groundwater characterization by slug testing to estimate hydraulic conductivity and storativity parameters.

The primary objective of each permanent monitoring well is to provide a dedicated access point for measuring groundwater levels and to allow the collection of groundwater samples that accurately represent groundwater conditions at the specific point of sampling. To successfully achieve this objective, it is necessary to fulfill the following criteria, which has been completed:

1. Construct each well with minimum disturbance to the geologic formation.
2. Construct each well of materials that are compatible with the anticipated geochemical and chemical environment.
3. Properly complete each well in the desired monitoring zone.
4. Adequately seal each well annulus with materials that will not interfere with the collection of representative water quality samples.
5. Sufficiently develop each well to remove any air or water introduced associated with drilling, allow well filter pack to properly re-sort, and generally ensure unobstructed flow through the well.

In addition to appropriate construction details, each monitoring well must be designed in concert with the overall goals of the monitoring program. Key factors that must be considered include the following, with specific considerations to the Pueblo Plant groundwater monitoring program italicized:

1. Intended purpose of each well – *documentation of groundwater presence, if present then documentation of water level and water quality through quarterly monitoring over time utilizing the approved and current compliance groundwater laboratory suite and*

methodologies for comparative purposes against existing Pueblo Plant monitoring wells as adopted in the Sampling and Analysis Plan (SAP), per Technical Revision TR-11.

2. Placement of each well to achieve accurate water levels and/or representative water quality samples – *proper design and installation methods to prevent groundwater from inadvertently migrating to strata above or below the target interval*.
3. Adequate well bore diameter to accommodate appropriate tools for well development, water quality sampling devices, and aquifer testing equipment – *primarily a nominal 2-inch downhole surge block for development and nominal 2-inch environmental sampling pump as needed*.
4. Surface protection at each well to assure no alteration of the structure or impairment of the data collected from the well – *locking wellhead and bollard posts as shown in the design figures which are the same as all of the existing Pueblo Plant monitoring wells*.

Monitoring Well Installation Documentation

Work was conducted by SLR to support the Pueblo Plant monitoring well installations. This included well design, materials specification, Colorado Division of Water Resources (CDWR) monitoring well permitting, drilling and completion service solicitation and coordination, coordination of underground utility locates/clearance services for drill sites, coordination of professional surveying services, as well as project coordination, as needed, with CDRMS and ongoing Pueblo Plant operations.

Monitoring Well Permitting

SLR, as the authorized agent of GCC, submitted the appropriate CDWR monitoring well permit applications (GWS-46 forms) for each planned monitoring well and obtained the corresponding permits to construct in advance of mobilization for drilling and completion activities. Following the monitoring well installation program, the required CDWR Well Construction and Yield Estimate Reports (GWS-31 forms) were submitted by SLR to CDWR, per CDWR regulations. The CDWR permit documentation can be accessed at https://dwr.state.co.us/Tools/WellPermits by using either the permit number or receipt number as the search criteria, found in **Table 1**.

Monitoring Well Locations

The TR-12 monitoring well locations were selected and completed for five areas, as shown in **Figure 1**.

Each new monitoring location consists of two wells completed in the two target intervals, in a tightly spaced straight line “twinned” configuration with surface spacing distance of approximately 20 feet. The orientation of each twinned-well location is at a bearing of approximately 45° in line with formation dip direction with the shallowest well to the southwest (upgradient) and deepest well to the northwest (downgradient). The twinned wells are staged to surround the site for monitoring needs and assessing data gaps. Wells MW-15 and MW-16 are located south and upgradient of the reclaimed mine panel one, less than 500 feet from mine panel two. Wells MW-17 and MW-18 are located 3,500 feet south and upgradient of the mine panel three. Wells MW-19 and MW-20 are located approximately 2,600 feet east/southeast and cross-gradient from the quarry. This pair of monitoring wells is downgradient of mine panel five, a panel which has yet to be developed, therefore these wells are intended to collect true water level and quality baseline data ahead of panel five development in future years. Wells MW-21 and MW-22 are located

approximately 200 feet north of the production plant footprint, which are downgradient and northeast of the quarry reclamation of mine panels one and two. Wells MW-23 and MW-24 are located at the northwest corner of the production plant footprint, which are also downgradient of both the quarry reclamation of mine panels one and two, as well cross-gradient from the production plant.

Locations were surveyed by the GCC-contracted professional surveyor, Cardinal Points Surveying, Inc. (Cardinal) of Pueblo, CO, in advance of mobilization of the drilling and completion effort. This process confirmed all planned monitoring well locations were inside of the CDRMS mine permit boundary and, in the case of the upgradient monitoring well location (MW-17/MW-18), also outside of the southwest extent of the mine panels 3 and 4. GCC committed to a 300-foot mining setback from this location to prevent future disturbance to monitoring in TR-12. A follow-up survey of the as-built monitoring wells was also conducted by Cardinal, with emphasis on high accuracy elevation to allow future reliable plotting of the potentiometric groundwater elevation data across the facility, thus providing additional data points to further characterize groundwater gradient and flow direction. For each monitoring well Cardinal surveyed both the ground surface elevation of the concrete well pad, and the top of the 2-inch PVC well casing, which is the static water level measurement point. The as-built survey data for all Pueblo Plant wells is given in **Table 1**.

Underground utility clearances were conducted prior to drilling activities at each clustered monitoring well location by Ground Penetrating Radar Systems LLC (GPRS) of Colorado Springs, CO.

Monitoring Well Design

As-built monitoring well construction information for all existing Pueblo Plant monitoring wells, including the recently constructed wells documented in this report, is given in **Table 1**. These designs, as given in the TR-12 Work Plan, followed industry standard practice with the as-built construction determined by the professional judgement of the SLR field geologist and based on site-specific conditions. Well design was industry standard 2-inch PVC monitoring wells, installed for the purpose of monitoring groundwater level and water quality of the specified intervals identified during drilling and subsurface documentation at the planned monitoring well locations. **Figure 1** shows the as-built monitoring well locations.

Borehole Drilling & Monitoring Well Installation

The field geologist from SLR directed the GCC-contracted drill crew, Environmental Works, Inc. (EWI), with respect to specific target formation depths and collected and documented geologic samples generated by sonic coring. Monitoring well installations were completed to the following specifications:

1. A 6-inch sonic bit, creating a 6-3/8-inch borehole drilled through the unconsolidated colluvium and bedrock allowing the borehole diameter to create a minimum 2-inch annulus between the borehole wall and the screen/casing per 2 CCR 402-2 State of Colorado Water Well Construction Rules, which for this project utilizing nominal 2-inch schedule 40 screen and casing was 6-3/8- inches. A 6-3/8-inch hole was drilled from surface through the Fort Hayes limestone and up to the Codell sandstone at the subject locations. From surface to total drilled depth, SLR collected and documented cuttings from the continuous sonic core produced by the drilling. The lithology encountered at each borehole is given in **Figures 2 through 11**. As no boreholes produced water that was not injected for the

sonic coring methodology during drilling of the Fort Hayes, no flow rate or water quality information could be obtained at that time. For the Fort Hayes monitoring wells, borehole drilling was then complete so well installation continued from step 3 below.

2. Sonic core with water advanced 6-3/8-inch borehole from the base of the Fort Hayes limestone into the Codell sandstone until either penetrating significant additional groundwater in the Codell or otherwise through the entire Codell sandstone member (thickness found to be 10 to 27 feet). As no boreholes produced water that was not injected for the sonic coring methodology during drilling of the Codell, no flow rate or water quality information could be obtained at that time.
3. Installed 2-inch schedule 40 PVC environmental flush joint screen (FJT) (0.020-inch factory-machined slot) from total depth to near the top of either the Fort Hayes or the Codell, as appropriate for the location, hanging in tension from a casing clamp resting on the top of the hollow-stem auger extending above ground surface. Blank FJT 2-inch schedule 40 PVC was extended from the top of the screen section to approximately 2-1/2 feet above ground surface. Stainless steel bow spring environmental centralizers were placed at the bottom and top of each screen section and then every 40 feet to surface. All tubulars and centralizers arrived at the site new, bagged and boxed.
4. Installed 10-20 silica sand pack from total depth to 3 feet above the top of the screen section via surface pour with sonic vibe, with continuous depth tagging to the level specified by the SLR geologist. Bentonite seal placement was accomplished by pouring one 5-gallon pail of 3/8-inch coated bentonite pellets via surface pour, hydrating with potable water as necessary since the boreholes were not holding water other than that added for drilling. The remaining annular seal up to ground surface for wells with an annular seal less than 40 feet from ground surface was placed by pouring 3/8-inch chip bentonite from surface, hydrating with potable water as necessary. Continuous depth tagging was employed to ensure materials bridging did not occur or if they did it was caught soon enough to remedy. For the wells with annular seals greater than 40 feet below ground surface, 100% bentonite grout was mixed to 10.2 pounds per gallon density and gravity-fed through tremie pipe for placement.
5. Installed the appropriate 5-foot length by 4-inch square locking environmental monitoring well head protector set in 3-foot by 3-foot by 4-inch-thick cement pad with 4-inch diameter by 6-foot length steel pipe protective bollards cemented in-place offset at each pad corner. Each wellhead and bollard were painted high-visibility yellow, and the wellheads have their designations painted on the front of each wellhead below the locking hasp. The well names are MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, MW-23, and MW-24.

GCC contracted Environmental Works Inc. (EWI) to complete the proposed drilling by sonic coring. SLR field personnel oversaw drilling activities in conjunction with EWI to determine suitable borehole depths based on proposed well screening zones, observe field conditions, and ensure health and safety policies were followed. Boreholes at the 5 locations were grouped in pairs to target different geological units with a minimal distance between pairs, while still being spaced to prevent any groundwater from migrating between paired wells. SLR personnel logged the loose soil and rock core in accordance with standard hydrogeologic logging of water well boreholes and boxed select sections of core at the request of GCC. Before drilling began, SLR personnel reviewed a site-specific Health & Safety Plan with the EWI drilling team. Drilling kickoff occurred March 18th and all wells were completed by April 16th. SLR personnel and EWI were offsite for a one-week break interval from March 29th to April 5th. The as-built construction summary data, including location survey at ground surface and top of PVC casing for all wells is

given in **Table 1**. The as-built monitoring well construction diagrams for each well are presented in **Figures 2 through 11**. Photos of all twinned monitoring well locations are provided as **Figures 12 through 16**.

Monitoring Well Development

All new wet Pueblo Plant monitoring wells were developed. MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, MW-23, and MW-24 were developed in April 2024. Well development was conducted by SLR for about 2 weeks following curing of annular bentonite seals and surface cement pad. Standard monitoring well development procedures were followed utilizing nominal 2-inch surge block with foot valve driven by a wellhead inertial pump (Waterra Hydrolift II) on new HDPE tubing to remove fines and properly distribute the annular filter pack. Water quality field parameters were monitored by the SLR field geologist during this process with emphasis in monitoring and reduction of turbidity over time as fine-grained materials generated during the drilling process are removed through the wellbore. The field parameters recorded during the developments are given in **Table 2**. As all Pueblo Plant monitoring wells can be considered low-yield, groundwater production by development exceeded the sustainable yield for each well. As a result, the wells required addition of potable water to help flush the fine-grained materials from the well bores at surface. Care was taken to not introduce too much potable water that would escape into the screened formations and potentially dilute near-term water quality. As such, the monitoring well development process was performed with sufficient time in advance of initial compliance groundwater monitoring conducted in June 2024.

Following development, all wet wells were documented to have significantly improved turbidity, with “hard-tag” total depth measurements. This indicated no sediment remained in the wellbores.

Tables

2024 GCC Pueblo Plant TR-12 Monitoring Well Installation Program Report

GCC Rio Grande, Inc.

Table 1. GCC Pueblo Plant existing monitoring well construction data, TR-12 wells & prior.

Monitoring Well ID	Year Installed	CDWR Receipt Number	CDWR Permit Number	UTM NAD 83 Zone 13N Easting (meters)	UTM NAD 83 Zone 13N Northing (meters)	Elevation - Top of PVC Casing - Water Level Measuring Point (ft)	Elevation - Ground Surface at Wellhead Cement Pad (ft)	Well Diameter (in)	Well Casing Material	Measured Total Well Completion Depth (ft bgs)	Screened Interval (ft bgs)	Screened Filter Pack Interval (ft bgs)	Screened Interval Formation
MW-5	2008	3632233	278490	533304.305	4217575.554	4966.65	4964.39	2	SCH 40 PVC	25.00	9.0-24.0	8.0-25.0	Colluvium/Unconsolidated
MW-6	2018	3690376A	312701	533308.582	4217579.756	5064.14	5061.62	2	SCH 40 PVC	56.40	30.9-56.4	28.0-56.7	Fort Hayes Limestone
MW-7	2018	3690376B	312702	534710.190	4219189.212	5063.75	5061.09	2	SCH 40 PVC	56.10	30.6-56.1	27.5-57.0	Fort Hayes Limestone
MW-8	2020	3696266	316170	534714.843	4219193.313	5062.90	5060.74	2	SCH 40 PVC	63.10	58.1-62.9	57.0-64.3	Codell Sandstone
MW-9	2021	10013525	323005	535148.659	4221153.094	5256.09	5253.97	2	SCH 40 PVC	40.30	30.0-40.0	20.9-42.0	Codell Sandstone
MW-10	2021	10013526	323006	535153.271	4221157.369	5255.82	5253.60	2	SCH 40 PVC	80.30	50.0-80.0	47.0-81.5	Blue Hills Shale
MW-11	2021	10013527	323007	534405.485	4219710.530	5084.30	5082.09	2	SCH 40 PVC	70.00	39.6-69.6	36.6-70.6	Fort Hayes Limestone
MW-12	2021	10013528	323008	534407.927	4219719.209	5083.94	5081.64	2	SCH 40 PVC	86.50	76.2-86.2	73.1-86.6	Codell Sandstone
MW-13	2021	10013529	323009	534401.520	4219714.939	4990.11	4987.93	2	SCH 40 PVC	175.33	135.0-175.0	135.0-175.0	Fort Hayes Limestone
MW-14	2021	10013530	323010	535242.397	4221415.851	4989.92	4987.81	2	SCH 40 PVC	205.33	190.0-205.0	187.0-206.0	Codell Sandstone
MW-15	2024	10033774	333345	533405.797	4219231.442	5155.74	5153.11	2	SCH 40 PVC	36.14	16.0-36.0	14.5-36.5	Fort Hayes Limestone
MW-16	2024	10033775	333346	533410.777	4219235.737	5155.12	5152.49	2	SCH 40 PVC	75.37	45.8-75.8	42.0-76.0	Codell Sandstone
MW-17	2024	10033776	333347	533144.818	4218072.413	5267.33	5264.73	2	SCH 40 PVC	26.56	6.3-26.3	5.0-27.5	Fort Hayes Limestone
MW-18	2024	10033777	333348	533150.361	4218074.375	5267.53	5264.83	2	SCH 40 PVC	55.74	35.9-55.9	33.5-56.1	Codell Sandstone
MW-19	2024	10033778	333349	535236.924	4218770.962	5089.05	5086.47	2	SCH 40 PVC	75.01	35.0-75.0	32.5-75.5	Fort Hayes Limestone
MW-20	2024	10033779	333350	535243.187	4218773.826	5088.59	5085.91	2	SCH 40 PVC	97.40	88.0-98.0	85.0-100.6	Codell Sandstone
MW-21	2024	10033780	333351	534755.392	4220461.612	5019.10	5016.47	2	SCH 40 PVC	124.88	80.0-125.0	77.0-126.0	Fort Hayes Limestone
MW-22	2024	10033781	333352	534761.339	4220466.186	5019.14	5016.39	2	SCH 40 PVC	155.15	135.0-155.0	132.0-156.0	Codell Sandstone
MW-23	2024	10033782	333353	534187.416	4220480.399	5033.40	5030.70	2	SCH 40 PVC	80.00	44.9-79.9	41.9-80.16	Fort Hayes Limestone
MW-24	2024	10033783	333354	534191.851	4220483.163	5033.31	5030.60	2	SCH 40 PVC	113.00	93.0-113.0	90.0-115.6	Codell Sandstone

Notes:
Coordinates based off state plane grid/NAD83 Colorado South. Vertical datum based on NAVD88.
All wells constructed of 2-inch schedule 40 flush-joint PVC casing and screen.

Table 2. GCC Pueblo Plant monitoring well development data, TR-12 wells.

Monitoring Well ID	Year Installed	Date Developed	Development Methodology	Development Field Sample Temperature (C)	Development Field Sample pH (S.U.)	Development Field Sample Specific Conductance (µS/cm)	Development Field Sample Oxygen Reduction Potential (mV)	Development Field Sample Dissolved Oxygen (mg/L)	Development Field Sample Turbidity (NTU)	Total Well Completion Depth (ft bgs)	Screened Interval (ft bgs)	Screened Interval Formation
MW-15	2024	4/28/24-4/29/24	Waterra Hydrolift II	19.5	8.09	429.5	333.6	7.6	190	38.92	16.0-36.0	Fort Hayes Limestone
MW-16	2024	4/28/2024	Waterra Hydrolift II	15.3	8.43	440.0	108.1	8.5	260	78.64	45.8-75.8	Codell Sandstone
MW-17*	2024	4/26/24-4/28/24	Waterra Hydrolift II	NA-diluted	NA-diluted	NA-diluted	NA-diluted	NA-diluted	NA-diluted	29.42	6.3-26.3	Fort Hayes Limestone
MW-18	2024	4/25/2024	Waterra Hydrolift II	16.7	8.00	463.3	266.3	7.6	230	58.61	35.95-55.95	Codell Sandstone
MW-19	2024	4/26/2024	Waterra Hydrolift II	15.6	8.17	1751.0	19.7	6.7	70	77.05	35.0-75.0	Fort Hayes Limestone
MW-20	2024	4/25/2024	Waterra Hydrolift II	22.0	8.34	435.8	150.4	7.3	270	100.07	88.0-98.0	Codell Sandstone
MW-21	2024	4/22/24-4/23/24	Waterra Hydrolift II	15.6	8.22	3177.0	-50.0	2.0	157	127.48	80.0-125.0	Fort Hayes Limestone
MW-22	2024	4/22/24-4/23/24	Waterra Hydrolift II	18.6	8.48	434.1	74.2	7.8	33	157.85	135.0-155.0	Codell Sandstone
MW-23	2024	4/24/24-4/25/24	Waterra Hydrolift II	19.7	8.11	420.3	133.9	8.0	140	81.36	44.9-79.9	Fort Hayes Limestone
MW-24	2024	4/23/24-4/24/24	Waterra Hydrolift II	26.1	8.25	423.6	130.9	7.1	40	115.75	93.0-113.0	Codell Sandstone

*Well dry at time of development; wellbore and filter pack developed entirely with added potable water so field parameters not representative of the screened formation.

All wells constructed of 2-inch schedule 40 PVC

Figures

2024 GCC Pueblo Plant TR-12 Monitoring Well Installation Program Report

GCC Rio Grande, Inc.

Figure 1. GCC Pueblo monitoring well location map.

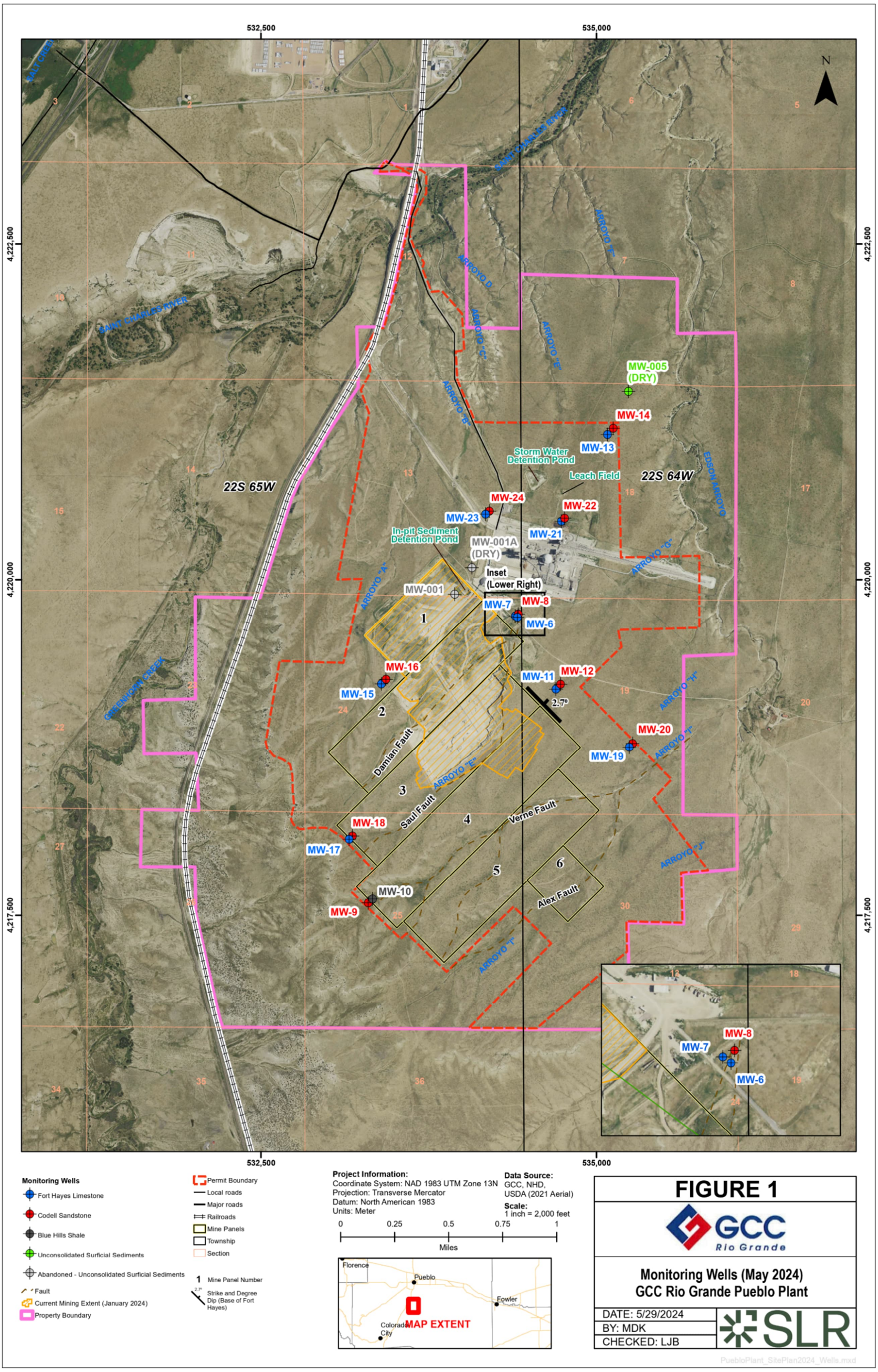

Figure 2. GCC Pueblo MW-15 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 4/14/24 **COMPLETED** 4/14/24 **GROUND ELEVATION (FT)** 5153.11 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4219231.442 **EASTING** 533405.797
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5155.74
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 32.99
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
	60		***SILT,*** *moderate yellowish brown (10 YR 5/4), moist, loose.*	Enviroplug 3/8" bentonite chips (0.0' to 14.5' bgs)
			@1.5 ft: silt becomes dry.	
10				2" Sch 40 PVC riser (-2.63' to 16.15' bgs)
	60		***LIMESTONE,*** *light gray (N7), dry, very hard, iron staining in fractures, some thin interbedded dark gray (N5) shale.*	
			@12.0 ft: 1' thick bed of highly weathered limestone.	
	100		*@16.0 ft: shell fragments observed.*	SS bow-spring type centralizer
20				#10-20 silica sand (14.5' to 36.5' bgs)
	80		*@25.0 ft: iron nodules up to 0.25" in diameter.*	2" Sch 40 0.020" slotted screen (16.15' to 36.15' bgs)
30				
	80			
	60		***SANDSTONE,*** *dark gray (N7) to grayish black (N3), interbedded shale, dry, hard.*	Endcap (36.15' to 36.35' bgs)
				Enviroplug 3/8" bentonite chips (36.5' to 37.0' bgs)

REMARKS

Boring completed at 37.0 feet.
Centralizer placements (BGS): 16.0', 36.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/28/2024 - 4/29/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 34.8 FT BGS.
Above surface well design: PVC stick-up: 2.63" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 3. GCC Pueblo MW-16 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 4/13/24 **COMPLETED** 4/13/24 **GROUND ELEVATION (FT)** 5152.49 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4219235.737 **EASTING** 533410.777
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5155.12
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 71.06
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
10	70		***SILT,*** *moderate yellowish brown (10 YR 5/4), moist, very loose.*	SS bow-spring type centralizer
	94		*@2.0 ft: silt becomes dry at depth.*	
20	10		*@10.0 ft: 10'-15' washout; lack of recovery.*	Enviroplug 3/8" bentonite chips (0.0' to 38.0' bgs)
	100		***LIMESTONE,*** *light gray (N7), interbedded dark gray (N5) shale up to 1" thick, dry, very hard, iron staining observed in fractures.*	
30	76			2" Sch 40 PVC riser (-2.63' to 45.4' bgs)
	92		*@30.0 ft: 30'-40' low recovery; likely washed out shale beds.*	
40	50			3/8" Pel-Plug bentonite pellets (38.0' to 42.8' bgs)
50	40		***SANDSTONE,*** *dark gray (N3) to grayish black (N2), interbedded shale, dry, hard, no reaction to HCl.*	
	100		*@42.0 ft: low recovery; likely washed out shale beds.*	#10-20 silica sand (42.8' to 76.0' bgs)
60	50		*@51.0ft: low recovery, likely washed out shale beds.*	
70	98			2" Sch 40 0.020" slotted screen (45.4' to 75.4' bgs)
	100			Endcap (75.4' to 75.6' bgs)

REMARKS

Boring completed at 76.0 feet.
Centralizer placements (bgs): 5.8', 45.8', 75.8'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/28/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 74.8 FT BGS.
Above surface well design: PVC stick-up: 2.63" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 4. GCC Pueblo MW-17 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 4/11/24 **COMPLETED** 4/11/24 **GROUND ELEVATION (FT)** 5264.73 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4218072.413 **EASTING** 533144.818
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5267.33
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 26.45
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION
0	90		***SILT WITH GRAVEL,*** *moderate yellowish brown (10 YR 5/4) silt, little fine to coarse subangular limestone gravels up to 1" in diameter, dry, loose texture.*
5	90		***LIMESTONE,*** *light gray (N7), dry, hard, highly fractured with iron staining observed in the fractures.* *@3.5 ft: 1.5' of highly weathered limestone.*
10	80		
15	76		
20	90		*@20.0 ft: trace iron nodules up to 1" in diameter.*
25	96		
30			***SHALE,*** *black (N1), little dark gray (N3) to medium gray (N5) sandstone interbedding observed, moist, hard texture, iron staining.*

WELL DIAGRAM

- Enviroplug 3/8" bentonite chips (0.0' to 5.0' bgs)
- 2" Sch 40 PVC riser (-2.60' to 6.6' bgs)
- SS bow-spring type centralizer
- #10-20 silica sand (5.0' to 27.5' bgs)
- 2" Sch 40 0.020" slot screen (6.6' to 26.6' bgs)
- Endcap (26.6' to 26.8' bgs)
- Enviroplug 3/8" bentonite chips (27.5' to 31.6' bgs)

REMARKS

Boring completed at 31.6 feet.
Centralizer placements (bgs): 6.3', 26.3'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/26/2024 - 4/28/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 26.1 FT BGS.
Above surface well design: PVC stick-up: 2.60" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 5. GCC Pueblo MW-18 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 4/10/24 **COMPLETED** 4/11/24 **GROUND ELEVATION (FT)** 5264.83 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4218074.375 **EASTING** 533150.361
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5267.53
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 35.27
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION
0			
	88		***SILT WITH GRAVEL,*** *moderate yellowish brown (10 YR 5/4), little fine to coarse subangular limestone gravels up to 1" in diameter, moist, loose texture.* *@2.0 ft: silt becomes dry.*
	88		***LIMESTONE,*** *light gray (N7), dry, hard, highly fractured with iron staining observed in fractures, mostly pulverized by drilling.* *@3.5 ft: 1.5' of highly weathered limestone.*
10			
	92		
	80		
20			
	60		
	100		
30			
	80		***SHALE,*** *dark gray (N3), dry, soft, strong reaction to HCl.*
			SANDSTONE, *dark gray (N3) to medium gray (N5), interbedded dark gray (N3) to black (N1) soft shale beds up to 2.5" in thickness, yellowish dark orange (10 YR 6/6) iron staining, no reaction to HCl.*
	96		
40			*@39.0 ft: no more iron staining observed.*
	96		
	100		
50			
	91.6		

WELL DIAGRAM

- Enviroplug bentonite grout (0.0' to 30.0' bgs)
- 2" Sch 40 PVC riser (-2.70' to 35.7' bgs)
- Enviroplug 3/8" bentonite chips (30.0' to 33.5' bgs)
- SS bow-spring type centralizer
- 2" Sch 40 0.020" slot screen (35.7' to 55.7' bgs)
- #10-20 silica sand (33.5' to 56.1' bgs)
- Endcap (55.7' to 55.9' bgs)

REMARKS

Boring completed at 56.15 feet.
Centralizer placements (bgs): 35.95', 55.95'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/25/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 55.1 FT BGS.
Above surface well design: PVC stick-up: 2.70" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 6. GCC Pueblo MW-19 lithology and well completion diagram.

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MW-19
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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 4/8/24 **COMPLETED** 4/8/24 **GROUND ELEVATION (FT)** 5086.47 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4218770.962 **EASTING** 535236.924
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5089.05
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 9.67
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
	36		***SILT,*** *moderate yellowish brown (10 YR 5/4), few very fine to medium-grained sand, few fine to coarse subangular limestone gravel.*	
10	60			
	88		***GRAVEL WITH SILT,*** *fine to coarse subangular limestone gravels up to 1" in diameter, little silt, little very fine to medium-grained sand.*	Enviroplug bentonite grout (0.0' to 29.0' bgs)
	60		***SILT,*** *moderate yellowish brown (10 YR 5/4), dry, stiff.*	
20				2" Sch 40 PVC riser (-2.58' to 35.0' bgs)
	0		*@20.0 ft: washed out, no recovery.*	
	80		*@25.0 ft: silt becomes very dense.*	
30			***LIMESTONE,*** *light gray (N7), interbedding dark gray (N3) shale, trace crystalline pyrite up to 0.5" in diameter, very hard, shell fragments.*	Pel-Plug 3/8" bentonite pellets (29.0' to 32.5' bgs)
	92		*@32.0 ft: ~1' thick shale bed.*	SS bow-spring type centralizer
40			*@35.0 ft: sparse, green staining observed.*	
	90			2" Sch 40 0.020" slot screen (35.0' to 75.0' bgs)
50				#10-20 silica sand (32.5' to 75.5' bgs)
	90			
60				
	78			
70				
	96			Endcap (75.0' to 75.2' bgs)

REMARKS

Boring completed at 75.5 feet.
Centralizer placements (bgs): 35.0', 75.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/26/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 74.0 FT BGS.
Above surface well design: PVC stick-up: 2.58" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 7. GCC Pueblo MW-20 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 3/27/24 **COMPLETED** 3/28/24 **GROUND ELEVATION (FT)** 5085.91 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4218773.826 **EASTING** 535243.187
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5088.59
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 40.14
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
	50		***SILT,*** *moderate yellowish brown (10 YR 5/4), little very fine to medium grained sands, little fine to coarse subangular limestone gravels, dry, loose, weathered.*	
10	60		***GRAVEL,*** *fine to medium subangular limestone gravels, little silt and sands, well-graded, dry.*	SS bow-spring type centralizer
	90			
20	80		***SILT,*** *moderate yellowish brown (10 YR 5/4), dry, stiff.*	Enviroplug bentonite grout (0.0' to 81.6' bgs)
30	65			2" Sch 40 PVC riser (-2.68' to 87.3' bgs)
	95		***LIMESTONE,*** *light gray (N7), shale interbedding, strong reaction to HCl, fractures.* *@31.0 ft: iron staining observed in fractures.* *@33.0 ft: ~1' grayish black (N2) shale bed; soft.* *@36.0 ft: shell fragments observed.*	
40				
50	90		*@42.0 ft: crystalline pyrite cluster observed.*	
60	90			
70	90			
80	90			
	65		***SANDSTONE,*** *dark gray (N3), very fine grained sands, hard, no reaction to HCl.* *@80.0 ft: ~5' of interbedding shale.*	Enviroplug 3/8" bentonite chips (81.6' to 85.0' bgs)
90				
	100			#10-20 silica sand (85.0' to 100.6' bgs)
				2" Sch 40 0.020" slot screen (87.3' to 97.3' bgs)
100	90		***SHALE,*** *Shale, grayish black (N2), soft.*	Endcap (97.3' to 97.5' bgs)

REMARKS

Boring completed at 100.6 feet.
Centralizer placements (bgs): 8.0', 48.0', 88.0', 98.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/25/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 96.8 FT BGS.
Above surface well design: PVC stick-up: 2.68" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 8. GCC Pueblo MW-21 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 3/26/24 **COMPLETED** 3/26/24 **GROUND ELEVATION (FT)** 5016.47 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4220461.612 **EASTING** 534755.392
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5019.10
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 40.72
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
10	40		***SILT,*** *moderate yellowish brown (10 YR 5/4), moist, strong reaction to HCl.*	
20	50		*@6.0 ft: silt becomes dry.*	
30	40			
40	66			
50	95		***SHALE,*** *grayish black (N2), dry, faint kerogen odor, hard, strong reaction to HCl.*	
60	95		*@56.0 ft: shale becomes very hard.*	
70	90		*@60.0 ft: moderate reaction to HCl.*	
80	80		***LIMESTONE,*** *light gray (N7), dry, hard, interbedded shale.*	
90	90		*@76.0 ft: 0.5' thick shale bed.*	
100	90		*@80.0 ft: shale interbedding.*	
110	90		*@85.0 ft: 0.5' thick shale bed.*	
120	100		*@87.0 ft: 1.0' thick shale bed.*	
	90		*@96.0 ft: some green staining observed.*	

WELL DIAGRAM:
- Enviroplug bentonite grout (0.0' to 74.0' bgs)
- 2" Sch 40 PVC riser (-2.63' to 79.6' bgs)
- SS bow-spring type centralizer
- Pel-Plug 3/8" bentonite pellets (74.0' to 77.0' bgs)
- #10-20 silica sand (77.0' to 126.0' bgs)
- 2" Sch 40 0.020" slot screen (79.6' to 124.6' bgs)
- Endcap (124.6' to 124.8' bgs)

REMARKS

Boring completed at 126.0 feet.
Centralizer placements (bgs): 40.0', 80.0', 125.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/22/2024 - 4/23/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 124.4 FT BGS.
Above surface well design: PVC stick-up: 2.63" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 9. GCC Pueblo MW-22 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 3/23/24 **COMPLETED** 3/24/24 **GROUND ELEVATION (FT)** 5016.39 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4220466.186 **EASTING** 534761.339
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5019.14
DRILLING EQUIPMENT Boart LS450 **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 133.29
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION
0			
10	25		***SILT,*** *moderate yellowish brown (10 YR 5/4), moist, stiff, strong reaction with HCl.*
			@8.0 ft: silt becomes dry at depth.
20	90		
	90		
30	95		
40	90		***SHALE,*** *grayish black (N2), dry, faint kerogen odor, hard, strong reaction to HCl.*
50	90		
60	100		
	100		*@55.0 ft: Shale becomes very hard; moderate reaction with HCl.*
70	100		*@65.0 ft: trace pyrite observed; shell fragments observed.*
80	100		***LIMESTONE,*** *light gray (N7), dry, very hard, shale interbedding, trace crystalline pyrite.*
90	100		*@85.5 ft: ~1.0' thick shale bed; shale interbedding absent past depth.*
			@87.0 ft: ~1.5' thick shale bed.
100	75		
	100		
110	100		
			@108.5 ft: ~0.6' thick shale bed.
120	90		
130	100		
			SANDSTONE, *dark gray (N3), very hard, no reaction to HCl.*
140	100		
150	100		
	100		
	100		

WELL DIAGRAM
- SS bow-spring type centralizer
- Enviroplug bentonite grout (0.0' to 128.0' bgs)
- 2" Sch 40 PVC riser (-2.75' to 134.8' bgs)
- Pel-Plug 3/8" bentonite pellets (128.0' to 132.0' bgs)
- #10/20 silica sand (132.0' to 156.0' bgs)
- 2" Sch 40 0.020" slot screen (134.8' to 154.8' bgs)
- Endcap (154.8' to 155.0' bgs)

REMARKS

Boring completed at 156.0 feet.
Centralizer placements (bgs): 15.0', 55.0', 95.0', 135.0', 155.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/22/2024 - 4/23/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 153.7 FT BGS.
Above surface well design: PVC stick-up: 2.75" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 10. GCC Pueblo MW-23 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 3/21/24 **COMPLETED** 3/22/24 **GROUND ELEVATION (FT)** 5030.70 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4220480.399 **EASTING** 534187.416
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5033.40
DRILLING EQUIPMENT Geoprobe 8250L **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 54.10
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
10	60		***SILT,*** *moderate yellowish brown (10 YR 5/4), fine grained sands, trace fine to coarse subangular to subrounded limestone gravels at surface, moist at surface, dry starting at ~3' depth, stiff.* *@3.0 ft: silt becomes dry.*	SS bow-spring type centralizer
20	100			Enviroplug bentonite grout (0.0' to 38.4' bgs)
	80			
30	100		***SILT WITH SHALE,*** *pale yellowish orange (10 YR 8/6) to moderate yellowish brown (10 YR 5/4) silt, grayish black (N2) shale, dry, stiff.*	2" Sch 40 PVC riser (-2.70' to 44.9' bgs)
40	65		***SILT WITH SHALE,*** *moderate yellowish brown (10 YR 5/4) silt, some shale beds, dry, calcareous.*	
			LIMESTONE, *light gray (N7), dry, very hard, sparse ~0.5' thick shale interbedding.*	Pel-Plug 3/8" bentonite pellets (38.4' to 41.9' bgs)
50	92			
	100		*@45.0 ft: green mineral staining observed.*	
60	100			#10-20 silica sand (41.9' to 80.2' bgs)
			@57.5 ft: ~1.0' thick grayish black (N2) shale bed.	
70	100			2" Sch 40 0.020" slot screen (44.9' to 79.9' bgs)
	100		*@68.0 ft: trace crystalline pyrite observed.*	
80	100			
	100			Endcap (79.9' to 80.1' bgs)

REMARKS

Boring completed at 80.16 feet.
Centralizer placements (bgs): 4.9', 44.9', 79.9'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/24/2024 - 4/25/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 79.0 FT BGS.
Above surface well design: PVC stick-up: 2.70" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 11. GCC Pueblo MW-24 lithology and well completion diagram.

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CLIENT GCC Rio Grande, Inc. **PROJECT NAME** GCC Rio Grande Pueblo Plant
PROJECT NUMBER 123.22032.00002 **PROJECT LOCATION** Pueblo, CO
DATE STARTED 3/19/24 **COMPLETED** 3/20/24 **GROUND ELEVATION (FT)** 5030.60 **HOLE SIZE (IN)** 6-3/8
DRILLING CONTRACTOR Environmental Works, Inc. **NORTHING** 4220483.163 **EASTING** 534191.851
DRILLING METHOD Sonic Core **TOC PVC ELEVATION (FT)** 5033.31
DRILLING EQUIPMENT Geoprobe 8250L **DEPTH TO WATER POST-DEVELOPMENT (FT BGS)** 77.95
LOGGED BY C. Blackburn **CHECKED BY** L. Beck **SAMPLING METHOD** 4" ID Sonic Core Barrel

DEPTH (ft bgs)	RECOVERY %	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0				
10	50		***SILT,*** *moderate yellowish brown (10 YR 5/4), little fine grained sand, moist, loose, fine to coarse subangular to subrounded limestone gravels at surface.*	
20	50		*@2.0 ft: Silt becomes dry and stiff.*	SS bow-spring type centralizer
30	40		***SILTSTONE,*** *light gray (N7) siltstone, medium gray (N5) interbedded shale, calcareous, dry.*	
40	35		***LIMESTONE,*** *light gray (N7) to medium gray (N5), interbedded shale, dry, hard.*	Enviroplug bentonite grout (0.0' to 86.5' bgs)
50	70		*@40.0 ft: Interbedded shale thinning; iron staining observed in fractures.*	2" Sch 40 PVC riser (-2.71' to 92.9' bgs)
60	80		*@53.0 ft: 1' thick grayish black (N2) shale interbed.*	
70	80		*@59.4 ft: 0.5' thick black (N1) shale interbed.*	
	100		*@66.0 ft: 1' thick grayish black (N2) shale interbed.*	
	80		*@70.0 ft: trace green staining observed.*	
	100		*@73.0 ft: trace pyrite observed.*	
80	100		*@78.5 ft: 0.3' black (N1) shale interbed.*	
90	55		***SHALE,*** *grayish black (N2), dry, soft, no reaction to HCl.*	Pel-Plug 3/8" bentonite pellets (86.5' to 90.0' bgs)
100	45		***SANDSTONE,*** *dark gray (N3), very fine grained sands, dry.*	#10-20 silica sand (90.0' to 115.6' bgs)
110	50			2" Sch 40 0.020" slot screen (92.9' to 112.9' bgs)
				Endcap (112.9' to 113.1' bgs)

REMARKS

Boring completed at 115.6 feet.
Centralizer placements (bgs): 13.0', 53.0', 93.0', 113.0'.
Sonic coring utilized potable water.
All bentonite pellets, grout, and chips were hydrated by potable water.
Well developed with Waterra Hydrolift 2 inertial pump and surge block on new polyethylene tubing on 4/23/2024 - 4/24/2024.
Dedicated Sample Champ SS 12V low-flow electric submersible stainless steel environmental groundwater sampling pump installed on 3/8" X 1/2" HDPE tubing with intake at 112.5 FT BGS.
Above surface well design: PVC stick-up: 2.71" steel locking 4" x 5' well protector, 3' x 3' x 4" concrete well pad, 4" x 6 steel pipe concreted in-place guard posts (4) with 3' stick-up.

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Figure 12. GCC Pueblo MW-15 & MW-16 surface completions looking east/northeast. MW-15 nearest, MW-16 furthest.

Figure 13. GCC Pueblo MW-17 & MW-18 surface completions looking southeast. MW-18 nearest, MW-17 furthest.

Figure 14. GCC Pueblo MW-19 & MW-20 surface completions looking south. MW-20 nearest, MW-19 furthest.

Figure 15. GCC Pueblo MW-21 & MW-22 surface completions looking east. MW-21 nearest, MW-22 furthest.

Figure 16: GCC Pueblo MW-23 & MW-24 surface completions looking east/northeast. MW-23 nearest, MW-24 furthest.