STATE OF COLORADO

Eschberger - DNR, Amy <amy.eschberger@state.co.us>

MW-8 Installation /Boettcher Limestone Quarry / M1977-348

Harkins, Sara <Sara_Harkins@golder.com> Fri, Feb 19, 2021 at 3:32 PM
To: "Eschberger - DNR, Amy" <amy.eschberger@state.co.us>
Cc: Mike Toelle <mike.toelle@lafargeholcim.com>, "travis.bennett@lafargeholcim.com" <Travis.Bennett@lafargeholcim.com>, "Moreno, Joanna" <Joanna_Moreno@golder.com>, "Hall, Tricia" <Tricia_Hall@golder.com>, "McClain, Mark" <Mark_McClain@golder.com>

Hello Amy,

On behalf of Holcim, please see the attached technical memorandum detailing the drilling and installation of well MW-8 at the Boettcher Limestone Quarry near La Porte, Colorado.

A paper copy is also being mailed.

Please let us know if you have any questions.

Thanks,

Sara

Sara Harkins, PG(WY)
Senior Geologist/Geochemist

Golder Associates Inc.
2121 Abbott Road, Suite 100, Anchorage, Alaska, USA 99507
T: +1 907 344-6001 | **D:** +1 (907) 865-2532 | **golder.com**
LinkedIn | Facebook | Twitter

Work Safe, Home Safe

2 attachments

image001.jpg
13K

20378105-0-TM-A-MW8_Monitoring_19FFEB21.pdf
2789K

TECHNICAL MEMORANDUM

DATE February 19, 2021 **Reference No.** 20378105-1-TM-0

TO Amy Eschberger
Colorado Division of Reclamation, Mining and Safety

CC Michael Toelle and Travis Bennett (Holcim (US) Inc.)

FROM Sara Harkins, Joanna Moreno, Tricia Hall **EMAIL sara_harkins@golder.com**

HOLCIM BOETTCHER QUARRY MW-8 MONITORING WELL INSTALLATION FIELD REPORT

On behalf of Holcim (US) Inc., Golder Associates Inc. (Golder) is providing a field summary for the newly installed well associated with the groundwater monitoring network at the Boettcher Limestone Quarry (Site) located at 3060 West County Road 56, Laporte, Colorado 80535. The new background well MW-8 was installed side-gradient to the north of the CKD disposal areas and on the east side of the access road (Figure 1). The side-gradient location was selected instead of a directly upgradient location because a suitable location does not exist upgradient of the CKD disposal areas that would intercept the same geologic units as the existing Site monitoring wells. Well MW-8 was installed in accordance with the plan described in Technical Revision #11 (TR-11) of Permit M-1977-348. Activities associated with the drilling, installation, development, surveying, and permitting of the well occurred between November 11, 2020 and February 4, 2021.

1.0 DRILLING ACTIVITIES

Drilling Engineers, Inc. was subcontracted to Golder to drill and install MW-8. Drilling began on November 11, 2020 and the borehole was finished to total depth on November 13, 2020. Based on previous drilling activities at the Site, the target interval for screening MW-8 was approximately five feet above the contact of the Upper Cretaceous Niobrara Formation and the underlying Codell Sandstone, which is the uppermost, Middle Cretaceous member of the Carlile Formation.

1.1 Drilling Methods

Three drilling methods were used to complete the MW-8 borehole: hollow stem auger, air-rotary, and air-coring. Hollow stem auger drilling was used from the surface until 15 feet below ground surface (ft bgs) through two feet of overburden and 13 feet of bedrock. Air-rotary drilling was employed from 15 ft bgs to 165 ft bgs. Air-coring was used from 165 ft bgs to 235 ft bgs. The switch to air-coring ensured a higher-quality sample with which to identify the Niobrara – Codell contact, above which MW-8 was screened. The Niobrara – Codell contact was observed at 230 ft bgs.

No water was added during drilling. Upon identifying the Niobrara – Codell contact, the borehole was reamed to eight inches in diameter to a depth of 229 ft bgs. The borehole was allowed to collapse from 229 ft bgs to 235 ft bgs.

Golder Associates Inc.
7245 W Alaska Drive, Suite 200, Lakewood, Colorado, USA 80226 T: +1 303 980-0540 F: +1 303 985-2080

1.2 Borehole Logging

A Golder hydrogeologist was on Site during drilling activities and documented drilling conditions and sample observations. The borehole log for MW-8 (Attachment A) includes the following pieces of information:

- Lithologies
  - Soil was classified following the Unified Soil Classification System (USCS)
  - Rock type was classified following the Dunham classification scheme for carbonates
- Soil or rock color identified by the Munsell color chart
- Moisture content (dry, moist, wet)
- Rock induration, sedimentary structures, fractures (if visible during air-coring)
- Driller observations
- Drilling methods

Until air-coring was used at 165 ft bgs, lithologic descriptions were based on auger cuttings and air-rotary cuttings. Bedrock was encountered at 2 ft bgs based on driller observation with silt and gravel overburden. Generally, the auger cuttings and air-rotary cuttings indicated medium gray to light olive gray calcareous shale and limestone[1].

A shallow zone of groundwater was encountered at approximately 115 ft bgs. A sample of this water was collected from the open borehole and submitted for laboratory testing, results are provided in Attachment B. Significant water entered the borehole from this shallow zone, and deeper observations of groundwater occurrences were not possible due to the water infilling from the upper groundwater zone.

Air-coring was used from 165 ft bgs to 235 ft bgs, and no water was added to circulate cuttings. Recovery was poor from approximately 165 ft bgs to 206 ft bgs due to significant mechanical fracturing. Short runs were used in this interval to prevent the core from falling out of the core barrel. Bedrock lithology was predominantly medium light gray, well indurated massive limestone with varying amounts of lamination and bioturbation, few intervals of wackestone and more fossiliferous limestone were observed. Pyrite mineralization was observed primarily along bedding surfaces. Subvertical joints were observed between 208 ft bgs and 215 ft bgs. A distinct transition at 215 ft bgs from the overlying medium light gray massive limestone to very light gray, very well indurated massive limestone with sand-filled burrows, rip-up clasts, and stylolites are indicative of the interval directly above the Niobrara – Codell contact. The Niobrara – Codell contact was observed at 230 ft bgs. The Codell Sandstone was characterized as a medium light gray, subrounded, well-sorted, very fine – fine grained sandstone dominated by quartz and black lithics. The Codell was heavily bioturbated from 230 ft bgs to 232 ft bgs with a distinct salt and pepper appearance from 232 ft bgs to 235 ft bgs.

[1] Limestone terminology has been used to describe observed Niobrara Formation to maintain consistency with previous core descriptions completed at the Holcim Boettcher Quarry. Core described in the field as a calcareous mudstone (micrite equivalent) which reflects the USGS (1988) Laporte Quadrangle description of the two members of the Niobrara Formation, the Smoky Hill Shale Member and the Fort Hays Limestone Member.

2.0 MONITORING WELL INSTALLATION

The borehole total drilled depth reached 235 ft bgs to confirm the Niobrara – Codell contact at 230 ft bgs. Therefore, per the work plan a screen interval of 206 ft bgs to 226 ft bgs was selected. The borehole was reamed to 229 ft bgs, just above the Niobrara – Codell contact. Two feet of coated bentonite tablets were used to backfill the borehole from 227 ft bgs to 229 ft bgs to create a seal at the bottom of the borehole, and prior to proceeding with well construction the bentonite was allowed to hydrate for approximately an hour. Above the bentonite seal, from 226 ft bgs to 227 ft bgs, sand (10/20 fraction) was placed (Attachment C).

The well was constructed with 4-inch diameter, flush-threaded, Schedule 80 PVC screen and riser pipe. The 20-feet long screen was perforated with 0.010-inch slots. PVC casing was added to the top of the screen as it was lowered into the borehole. The screen interval spans 205.6 ft bgs to 225.6 ft bgs. A centralizer was placed in the center of the screen, and then centralizers were placed approximately every 50 feet above that point. The filter pack extends from 202.1 ft bgs to 227 ft bgs with a bentonite seal above the filter pack from 199.3 ft bgs to 202.1 ft bgs followed by grout to approximately 1 ft bgs. Additional bentonite was added on top of the grout to bring the annular space material up to grade. The PVC riser extends 3 feet above the ground surface and is protected with a locked protective steel casing. A 3 x 3 concrete pad was constructed around the protective casing.

2.1 Monitoring Well Development

MW-8 was developed on November 24, 2020, six days after grout was poured. The water level was drawn down using a stainless steel bailer to just above the top of the screen prior to surging the screen by rapidly lowering and raising the full bailer. After surging, the well was purged dry using the bailer. In total, approximately 125 gallons of water were purged from the well. Per TR-11, the purge water was discharged on the ground surface. Water quality parameters were collected approximately every half casing volume, and parameters appeared stable with pH fluctuating around 8.5 standard unit (SU) and specific conductivity ranging from approximately 4,200 – 4,900 microSiemens/cm (Attachment D). Turbidity was initially low and became moderate as development progressed. It is likely the water from the shallow saturated groundwater zone encountered at approximately 115 ft bgs flowed into the open borehole and a localized area surrounding the borehole. Groundwater recharge was monitored for an hour after the well was bailed dry and only a few inches of recharge was observed.

A second development was completed on December 7, 2020, detailed in Attachment D. Approximately 13 gallons of water were purged from the well using a disposable bailer until the well was bailed dry, and water quality parameters were recorded throughout development. Generally, water quality parameters showed pH stabilizing at 8.34 SU, specific conductivity stabilizing at 13,136 microSiemens/cm, and turbidity increasing throughout development. The purged groundwater was gray in color with a slight sulfur odor. The increase in conductivity from the initial development indicates the initial development was effective at removing a portion of the water from the shallow groundwater zone that entered the borehole and a localized area surrounding the borehole.

The depth to groundwater recorded before the initial development did not reflect the screened interval due to groundwater from the shallow saturated groundwater zone present in the borehole and well prior to development. Depth to groundwater as recorded before the second development and subsequent groundwater sampling, which will be discussed briefly in Section 3.0, are presented in Table 1. The December 7, 2020 groundwater measurement was recorded 13 days after the initial development, while the December 14, 2020 measurement

was recorded seven days after the second development. The slow recharge observed in MW-8 and multiple well developments occurring over just several weeks likely means that stable groundwater conditions have not yet been observed.

Table 1: MW-8 Groundwater Measurements

Measurement Date	Depth to Groundwater (ft btoc[1])	Groundwater Elevation (ft amsl[2])
12/7/2020	218.6	5031.9
12/14/2020	223.7	5026.8

Notes:
[1] ft btoc: :feet below top of casing
[2] ft amsl: feet above mean sea level

2.2 Surveying

The well was surveyed by Souder, Miller & Associates on January 13, 2021. The ground and top of casing elevations were collected and the points processed. The groundwater elevations presented in Table 1 were calculated from the top of casing measurements.

2.3 Permitting

The Notice of Intent to install MW-8 was submitted to the Colorado Division of Water Resources on November 3, 2020 prior to beginning well installation under MH-61351. The GWS-46 Monitoring Well Construction Permit and GWS-31 Well Construction and Yield Estimate Report are provided as Attachment E and were delivered to the Colorado DWR on February 4, 2021.

3.0 SUMMARY

Activities associated with the drilling, installation, development, survey, and permitting of well MW-8 occurred between November 2020 and February 2021. The well is located side-gradient of the CKD disposal areas to capture background groundwater conditions at the Site as the DRMS requested in their February 28, 2020 Inspection Report. MW-8 has been developed twice and the initial groundwater sampling at this location took place on December 14, 2020. The groundwater analytical results will be presented in a future submittal detailing the Site-wide second semi-annual 2020 groundwater sampling event. MW-8 will be sampled on the same schedule as the other seven Site wells as part of the Holcim Boettcher Quarry groundwater monitoring program.

Golder Associates Inc.

Tricia Hall
Staff Hydrogeologist

Sara Harkins
Senior Geologist/Geochemist, Project Manager

Joanna Moreno
Groundwater Practice Leader, Associate

SH/JM/mp

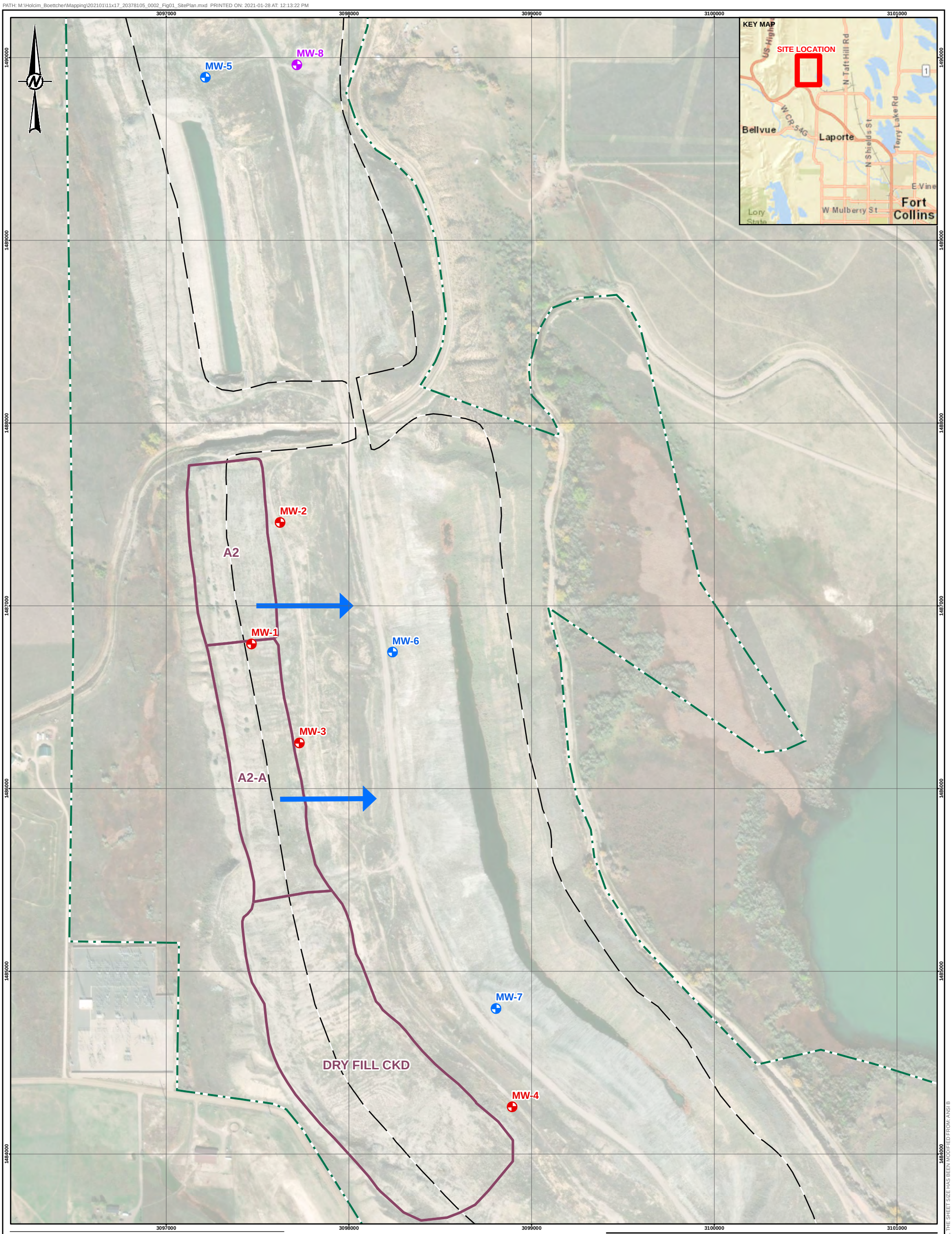
Appendices: Figure 1: Site Location Plan
Attachment A: MW-8 Borehole Log
Attachment B: Borehole Water Sample Results
Attachment C: Monitoring Well Construction Diagram
Attachment D: Monitoring Well Development Forms
Attachment E: Monitoring Well Construction Permit

https://golderassociates.sharepoint.com/sites/135208/project files/6 deliverables/techmemos/1-tm-monitoring_well_installation/1-tm-0/20378105-0-tm-a-mw8_monitoring_19ffeb21.docx

FIGURES

Figure 1: Site Location Plan

PATH: M:\Holcim_Boettcher\Mapping\202101\11x17_20378105_0002_Fig01_SitePlan.mxd PRINTED ON: 2021-01-28 AT: 12:13:22 PM



LEGEND

- MW-1 PRE-2012 MONITORING WELL
- MW-6 MONITORING WELL INSTALLED 2012
- MW-8 MONITORING WELL INSTALLED 2020
- APPROXIMATE CKD DISPOSAL AREA BOUNDARY
- AMENDED PERMIT BOUNDARY
- PROPERTY BOUNDARY
- APPROXIMATE GROUNDWATER FLOW DIRECTION

0 500 1,000
Feet

NOTES

1. PROPERTY AND PERMIT BOUNDARIES PROVIDED BY HOLCIM (US) INC.
2. COORDINATE SYSTEM: NAD83 STATE PLANE COLORADO NORTH (US FT).
3. AERIAL IMAGERY: ESRI BASEMAPS, DIGITAL GLOBE. IMAGERY CAPTURED OCTOBER 2017.

CLIENT
HOLCIM (US) INC.

PROJECT
BOETTCHER LIMESTONE QUARRY
LARIMER COUNTY, COLORADO

TITLE
SITE LOCATION PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-28
DESIGNED	SAH
PREPARED	KJC
REVIEWED	SAH
APPROVED	RSM

PROJECT NO.
20378105.0002

FIGURE
1

ATTACHMENT A

MW-8 Borehole Log

PROJECT: Holcim Boettcher Quarry 2020 Well Installation
PROJECT NUMBER: 20378105

RECORD OF BORING **MW-8**

LOCATION: MW-8

COORDINATES: N: 1,489,961.5 E: 3,097,714.4

GROUND SURFACE ELEVATION: 5,247.5 ft

DRILL RIG: CME-75

PROJECTION: UTM Zone 13

INCLINATION: -90°

DATUM: North Zone State Plane NAD 83

DRILLING METHOD: HSA, air rotary, and air-coring

HORIZONTAL UNITS: feet

DATE STARTED: 11/11/20 10:00

TOTAL DEPTH: 235 ft

DATE COMPLETED: 11/13/20 13:30

BOTTOM ELEVATION: 5,012.5 ft

DRILL FLUIDS: none

HOLE DIAMETER: 8 inches

DRILL LUBRICANTS: air

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY DESCRIPTION	GRAPHIC LOG	ELEV. / DEPTH (ft)	MATERIAL TYPE	COMMENTS
0.0	5245	0.0 - 2.0 Light olive gray (5Y 5/2) SILT with gravel (< 2 in), dry, no odor		5245.5 2.0	ML	Cuttings collected and observed every 5 ft during HSA and air-rotary Continue with HSA into bedrock at 2 ft bgs - drillers feel bedrock at 2 ft bgs - NIOBRARA FORMATION -
5.0	5240	2.0 - 15.0 Cuttings similar to above			Limestone	
10.0	5235	Light brownish gray (5YR 6/1), limestone, dry, no odor				Drilling becomes more difficult at 12 ft bgs, switch to air-rotary at 15 ft bgs
15.0	5230	15.0 - 20.0 Medium gray (N5), limestone and calcareous shale, dry, no odor		5232.5 15.0 5227.5 20.0	Limestone	
20.0	5225	20.0 - 115.0 Light olive gray (5YR 6/1), limestone and calcareous shale, dry, no odor				
25.0	5220					
30.0	5215					
35.0	5210					
40.0	5205					
45.0	5200					
50.0	5195					
55.0	5190					
60.0	5185				Limestone	
65.0	5180					Drilling becomes more difficult at 65 ft - harder material
70.0	5175					
75.0	5170					
80.0	5165					
85.0	5160					
90.0	5155					
95.0	5150					
100.0						

Log continued on next page

BOETTCHER HOLCIM_2020_MW8.GPJ GNPP.GDT 2/8/21

GOLDER

DRILLING CONTRACTOR: Drilling Engineers
DRILLER: Sean

GEOLOGIST: T. Hall
CHECKED: S. Harkins
DATE: 2/5/2021

PROJECT: Holcim Boettcher Quarry 2020 Well Installation
PROJECT NUMBER: 20378105

LOCATION: MW-8

RECORD OF BORING **MW-8**

COORDINATES: N: 1,489,961.5 E: 3,097,714.4
GROUND SURFACE ELEVATION: 5,247.5 ft

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY DESCRIPTION	ELEV. / DEPTH (ft)	MATERIAL TYPE	COMMENTS
100.0	5145	20.0 - 115.0 Light olive gray (5YR 6/1), limestone and calcareous shale, dry, no odor		Limestone	
105.0	5140				
110.0	5135				
115.0			5132.5 115.0		
	5130	115.0 - 120.0 Light olive gray (5Y 5/2), limestone and calcareous shale, wet, no odor		Limestone	Water dripping out of air hose
120.0			5127.5 120.0		
	5125	120.0 - 165.0 Light olive gray (5Y 5/2), limestone and calcareous shale, moist, no odor			
125.0	5120				
130.0	5115				
135.0	5110				
140.0	5105			Limestone	
145.0	5100				
150.0	5095				
155.0	5090				
160.0	5085				
165.0			5082.5 165.0		
	5080	165.0 - 168.0 Medium light gray (N6), wackestone, well indurated, trace pyrite, moderately spaced bedding plane fractures, weathered bedding planes	5079.5 168.0	Wackestone	Switch to air-coring at 165 ft
170.0	5075	168.0 - 178.0 Medium light gray (N6), fossiliferous limestone, well indurated, slightly laminated at 169 ft, minor bioturbation, pyrite along weathered bedding planes, moderately spaced bedding plane fractures		Limestone	
175.0	5070		5069.5 178.0		Poor recovery likely due to mechanical fracturing
180.0	5065	178.0 - 206.0 Medium light gray (N6), limestone, well indurated, massive, slightly laminated, trace pyrite alteration, becomes more bioturbated at 183 ft with few very fine sandstone lenses			
185.0	5060				
190.0	5055			Limestone	
195.0	5050				Poor recovery, mechanical fracturing may be causing core to fall out of core barrel
200.0	5045				
205.0			5041.5 206.0	Limestone	
	5040	206.0 - 208.0 Medium light gray (N6), fossiliferous limestone, very well indurated, bioturbated, slightly laminated, massive	5039.5 208.0		
210.0	5035			Limestone	
215.0		208.0 - 215.0 Medium light gray (N6), limestone, well indurated, few bedding plane fractures with subvertical joints at 208 and 212 ft, slightly weathered bedding planes, very fine sandstone lenses 213 - 214 ft	5032.5 215.0		
	5030			Limestone	
220.0	5025				
225.0					

Log continued on next page

DRILLING CONTRACTOR: Drilling Engineers
DRILLER: Sean

GEOLOGIST: T. Hall
CHECKED: S. Harkins
DATE: 2/5/2021

PROJECT: Holcim Boettcher Quarry 2020 Well Installation
PROJECT NUMBER: 20378105

LOCATION: MW-8

RECORD OF BORING **MW-8**

COORDINATES: N: 1,489,961.5 E: 3,097,714.4
GROUND SURFACE ELEVATION: 5,247.5 ft

DEPTH (ft)	ELEVATION (ft)	LITHOLOGY DESCRIPTION	GRAPHIC LOG	ELEV. / DEPTH (ft)	MATERIAL TYPE	COMMENTS
225.0	5020	215.0 - 230.0 Very light gray (N8) with medium gray (N5) intervals, limestone, very well indurated, massive, very fine grained sand-infilled burrows, rip up clasts and styolites beginning at 220 ft		5017.5 230.0	Limestone Sandstone	- CODELL SANDSTONE -
230.0	5015			5012.5		
235.0		230.0 - 235.0 - CODELL SANDSTONE - Medium light gray (N8), very fine to fine grained sandstone, subrounded, well sorted, quartz and black lithics, heavily bioturbated from 230 - 232 ft, salt and pepper appearance from 232 - 235 ft **Boring completed at 235 ft.**		235.0		**Boring completed at 235 ft.**
240.0						
245.0						
250.0						
255.0						
260.0						
265.0						
270.0						
275.0						
280.0						
285.0						
290.0						
295.0						
300.0						
305.0						
310.0						
315.0						
320.0						
325.0						
330.0						
335.0						
340.0						
345.0						
350.0						

GOLDER

DRILLING CONTRACTOR: Drilling Engineers
DRILLER: Sean

GEOLOGIST: T. Hall
CHECKED: S. Harkins
DATE: 2/5/2021

ATTACHMENT B

Borehole Water Sample Results

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

December 04, 2020

Report to:
Sara Harkins
Golder Associates
44 Union Blvd., Suite 300
Lakewood, CO 80228

cc: Tricia Hall

Bill to:
Accounts Payable
Golder Associates
7245 W Alaska Dr Suite 200
Lakewood, CO 80226

Project ID: 20378105
ACZ Project ID: L62895

Sara Harkins:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on November 17, 2020. This project has been assigned to ACZ's project number, L62895. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L62895. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 03, 2021. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Golder Associates

December 04, 2020

Project ID: 20378105
ACZ Project ID: L62895

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 1 groundwater sample from Golder Associates on November 17, 2020. The sample was received in good condition. Upon receipt, the sample custodian removed the sample from the cooler, inspected the contents, and logged the sample into ACZ's computerized Laboratory Information Management System (LIMS). The sample was assigned ACZ LIMS project number L62895. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

This sample was analyzed for inorganic, radiochemistry parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. (DE) Applies to: L62895-01/CYANIDE

Sample required dilution for testing positive for sulfide. Sample diluted until no positive indication on lead acetate test strip. Sample may contain cyanide.

Golder Associates
Project ID: 20378105
Sample ID: B-8

ACZ Sample ID: ***L62895-01***
Date Sampled: *11/16/20 08:30*
Date Received: *11/17/20*
Sample Matrix: *Groundwater*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.8 ICP-MS	1	0.243			mg/L	0.005	0.015	11/19/20 16:21	mfm
Antimony, dissolved	M200.8 ICP-MS	1	<0.0004	U		mg/L	0.0004	0.002	11/19/20 16:21	mfm
Arsenic, dissolved	M200.8 ICP-MS	20	0.0450			mg/L	0.004	0.02	11/23/20 13:50	bsu
Barium, dissolved	M200.8 ICP-MS	1	0.177			mg/L	0.0005	0.0025	11/19/20 16:21	mfm
Beryllium, dissolved	M200.8 ICP-MS	1	<0.00008	U	*	mg/L	0.00008	0.00025	11/19/20 16:21	mfm
Boron, dissolved	M200.7 ICP	1	0.702			mg/L	0.02	0.1	11/20/20 22:05	jlw
Cadmium, dissolved	M200.8 ICP-MS	1	0.000075	B		mg/L	0.00005	0.00025	11/19/20 16:21	mfm
Calcium, dissolved	M200.7 ICP	1	28.4			mg/L	0.1	0.5	11/20/20 22:05	jlw
Chromium, dissolved	M200.8 ICP-MS	20	0.0167	B	*	mg/L	0.01	0.04	11/23/20 13:50	bsu
Cobalt, dissolved	M200.8 ICP-MS	1	0.000158	B		mg/L	0.00005	0.00025	11/19/20 16:21	mfm
Copper, dissolved	M200.8 ICP-MS	20	0.0192	B	*	mg/L	0.016	0.04	11/23/20 13:50	bsu
Iron, dissolved	M200.7 ICP	1	1.59			mg/L	0.06	0.15	11/20/20 22:05	jlw
Lead, dissolved	M200.8 ICP-MS	20	0.00329	B	*	mg/L	0.002	0.01	11/23/20 13:50	bsu
Lithium, dissolved	M200.7 ICP	1	0.428			mg/L	0.008	0.04	11/20/20 22:05	jlw
Magnesium, dissolved	M200.7 ICP	1	2.10			mg/L	0.2	1	11/20/20 22:05	jlw
Manganese, dissolved	M200.8 ICP-MS	1	0.0370			mg/L	0.0004	0.002	11/19/20 16:21	mfm
Mercury, dissolved	M245.1 CVAA	1	<0.0002	U	*	mg/L	0.0002	0.001	11/24/20 12:37	llr
Molybdenum, dissolved	M200.8 ICP-MS	1	0.00075			mg/L	0.0002	0.0005	11/19/20 16:21	mfm
Nickel, dissolved	M200.8 ICP-MS	1	0.0138			mg/L	0.0004	0.001	11/19/20 16:21	mfm
Potassium, dissolved	M200.7 ICP	1	3.79			mg/L	0.2	1	11/20/20 22:05	jlw
Selenium, dissolved	M200.8 ICP-MS	100	0.115			mg/L	0.01	0.025	11/24/20 20:26	bsu
Silver, dissolved	M200.8 ICP-MS	100	<0.01	U	*	mg/L	0.01	0.05	11/24/20 20:26	bsu
Sodium, dissolved	M200.7 ICP	1	996			mg/L	0.2	1	11/20/20 22:05	jlw
Thallium, dissolved	M200.8 ICP-MS	2	<0.0001	U		mg/L	0.0001	0.0005	12/02/20 9:48	bsu
Uranium, dissolved	M200.8 ICP-MS	20	0.00600	B	*	mg/L	0.002	0.01	11/23/20 13:50	bsu
Vanadium, dissolved	M200.8 ICP-MS	1	0.00209			mg/L	0.0005	0.002	11/19/20 16:21	mfm
Zinc, dissolved	M200.8 ICP-MS	1	0.0111	B		mg/L	0.006	0.015	11/19/20 16:21	mfm

Golder Associates
Project ID: 20378105
Sample ID: B-8

ACZ Sample ID: ***L62895-01***
Date Sampled: *11/16/20 08:30*
Date Received: *11/17/20*
Sample Matrix: *Groundwater*

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	1400			mg/L	2	20	11/20/20 0:00	mlh
Carbonate as CaCO3		1	19.6	B		mg/L	2	20	11/20/20 0:00	mlh
Hydroxide as CaCO3		1	<2	U		mg/L	2	20	11/20/20 0:00	mlh
Total Alkalinity		1	1420		*	mg/L	2	20	11/20/20 0:00	mlh
Chloride	M300.0 - Ion Chromatography	10	440		*	mg/L	4	20	11/25/20 16:13	mss2
Cyanide, Free	D6888-09/OIA-1677-09	100	<0.3	U	*	mg/L	0.3	1	11/18/20 12:18	rbt
Fluoride	SM4500F-C	20	4.39	B	*	mg/L	2.2	7	11/19/20 22:46	eep
Nitrate as N, dissolved	Calculation: NO3NO2 minus NO2		<0.02	UH		mg/L	0.02	0.1	12/04/20 0:00	calc
Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1	0.080	BH	*	mg/L	0.02	0.1	11/21/20 21:09	pjb
Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1	0.072		*	mg/L	0.01	0.05	11/17/20 23:19	pjb
pH (lab)	SM4500H+ B									
pH		1	8.8	H	*	units	0.1	0.1	11/20/20 0:00	mlh
pH measured at		1	21.4			C	0.1	0.1	11/20/20 0:00	mlh
Residue, Filterable (TDS) @180C	SM2540C	2	3010			mg/L	40	80	11/19/20 13:38	scd
Sulfate	M300.0 - Ion Chromatography	10	333		*	mg/L	4	20	11/25/20 16:13	mss2

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510050													
WG510050PBW1	PBW	11/20/20 16:40				U	mg/L		-20	20			
WG510050LCSW3	LCSW	11/20/20 16:59	WC201119-1	820.0001		821.6	mg/L	100	90	110			
WG510050LCSW6	LCSW	11/20/20 19:17	WC201119-1	820.0001		831.7	mg/L	101	90	110			
WG510050PBW2	PBW	11/20/20 19:26				10.5	mg/L		-20	20			
L62914-03DUP	DUP	11/20/20 21:23			148	163	mg/L				10	20	
WG510050LCSW9	LCSW	11/20/20 23:13	WC201119-1	820.0001		822.9	mg/L	100	90	110			
WG510050PBW3	PBW	11/20/20 23:22				9.7	mg/L		-20	20			
WG510050LCSW12	LCSW	11/21/20 2:12	WC201119-1	820.0001		803	mg/L	98	90	110			
WG510050PBW4	PBW	11/21/20 2:22				11.1	mg/L		-20	20			
WG510050LCSW15	LCSW	11/21/20 6:22	WC201119-1	820.0001		817	mg/L	100	90	110			

Aluminum, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.1		.1029	mg/L	103	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.011	0.011			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.050065		.0478	mg/L	95	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.050065	.0105	.0542	mg/L	87	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.050065	.0105	.0531	mg/L	85	70	130	2	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.02004		.02076	mg/L	104	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00088	0.00088			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.01		.00885	mg/L	89	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.01	.00051	.00897	mg/L	85	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.01	.00051	.00941	mg/L	89	70	130	5	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510118													
WG510118ICV	ICV	11/23/20 12:56	MS201021-2	.05		.05003	mg/L	100	90	110			
WG510118ICB	ICB	11/23/20 12:57				U	mg/L		-0.00044	0.00044			
WG510118LFB	LFB	11/23/20 12:59	MS201117-2	.05005		.04898	mg/L	98	85	115			
L62923-01AS	AS	11/23/20 13:43	MS201117-2	.05005	U	.05425	mg/L	108	70	130			
L62923-01ASD	ASD	11/23/20 13:45	MS201117-2	.05005	U	.05589	mg/L	112	70	130	3	20	

Barium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.04955	mg/L	99	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.0011	0.0011			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.049985		.04697	mg/L	94	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.049985	.0412	.08766	mg/L	93	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.049985	.0412	.08675	mg/L	91	70	130	1	20	

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.048393	mg/L	97	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.000176	0.000176			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.05005		.046691	mg/L	93	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.05005	U	.048738	mg/L	97	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.05005	U	.047721	mg/L	95	70	130	2	20	

Boron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	2		1.996	mg/L	100	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.06	0.06			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	.5005		.499	mg/L	100	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	.5005	.277	.761	mg/L	97	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	.5005	.277	.771	mg/L	99	85	115	1	20	

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.050449	mg/L	101	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00011	0.00011			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.05005		.04711	mg/L	94	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.05005	.000061	.046779	mg/L	93	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.05005	.000061	.046912	mg/L	94	70	130	0	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	100		99.53	mg/L	100	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.3	0.3			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	68.0028		67.65	mg/L	99	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	68.0028	54.6	120.6	mg/L	97	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	68.0028	54.6	121.4	mg/L	98	85	115	1	20	

Chloride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509837													
WG509837ICV	ICV	11/20/20 13:32	WI201116-10	20.02		20.01	mg/L	100	90	110			
WG509837ICB	ICB	11/20/20 13:50				U	mg/L		-0.4	0.4			
WG510206													
WG510206LFB2	LFB	11/25/20 0:32	WI201018-4	30		31.61	mg/L	105	90	110			
L62866-07DUP	DUP	11/25/20 1:08			U	U	mg/L				0	20	RA
L62892-01AS	AS	11/25/20 2:20	WI201018-4	300	88.2	400.43	mg/L	104	90	110			
WG510206LFB1	LFB	11/25/20 11:26	WI201018-4	30		32.09	mg/L	107	90	110			

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Chromium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510118													
WG510118ICV	ICV	11/23/20 12:56	MS201021-2	.05		.05228	mg/L	105	90	110			
WG510118ICB	ICB	11/23/20 12:57				U	mg/L		-0.0011	0.0011			
WG510118LFB	LFB	11/23/20 12:59	MS201117-2	.05		.04896	mg/L	98	85	115			
L62923-01AS	AS	11/23/20 13:43	MS201117-2	.05	U	.05258	mg/L	105	70	130			
L62923-01ASD	ASD	11/23/20 13:45	MS201117-2	.05	U	.05424	mg/L	108	70	130	3	20	

Cobalt, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.053479	mg/L	107	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00011	0.00011			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.05005		.048858	mg/L	98	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.05005	.000475	.047723	mg/L	94	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.05005	.000475	.046898	mg/L	93	70	130	2	20	

Copper, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510118													
WG510118ICV	ICV	11/23/20 12:56	MS201021-2	.05		.05155	mg/L	103	90	110			
WG510118ICB	ICB	11/23/20 12:57				U	mg/L		-0.00176	0.00176			
WG510118LFB	LFB	11/23/20 12:59	MS201117-2	.05		.04893	mg/L	98	85	115			
L62923-01AS	AS	11/23/20 13:43	MS201117-2	.05	U	.05235	mg/L	105	70	130			
L62923-01ASD	ASD	11/23/20 13:45	MS201117-2	.05	U	.05348	mg/L	107	70	130	2	20	

Cyanide, Free D6888-09/OIA-1677-09

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509814													
WG509814ICV	ICV	11/18/20 11:32	WI201114-4	.3		.2827	mg/L	94	90	110			
WG509814ICB	ICB	11/18/20 11:34				U	mg/L		-0.003	0.003			
WG509814LFB	LFB	11/18/20 11:38	WI201114-5	.1		.0978	mg/L	98	90	110			
L62824-01AS	AS	11/18/20 12:12	WI201114-5	.1	U	.1035	mg/L	104	90	110			
L62824-01ASD	ASD	11/18/20 12:14	WI201114-5	.1	U	.0939	mg/L	94	90	110	10	20	

Fluoride SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509974													
WG509974ICV	ICV	11/19/20 18:14	WC201113-7	2.002		2.05	mg/L	102	90	110			
WG509974ICB	ICB	11/19/20 18:22				U	mg/L		-0.33	0.33			
WG509974LFB1	LFB	11/19/20 18:29	WC200511-1	5		5.24	mg/L	105	90	110			
L62907-01AS	AS	11/19/20 23:06	WC200511-1	5	.22	4.66	mg/L	89	90	110			MA
L62907-01ASD	ASD	11/19/20 23:10	WC200511-1	5	.22	4.77	mg/L	91	90	110	2	20	
WG509974LFB3	LFB	11/19/20 23:13	WC200511-1	5		5.14	mg/L	103	90	110			

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	2		1.966	mg/L	98	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.18	0.18			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	1.0018		.959	mg/L	96	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	1.0018	U	.977	mg/L	98	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	1.0018	U	.985	mg/L	98	85	115	1	20	

Lead, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510118													
WG510118ICV	ICV	11/23/20 12:56	MS201021-2	.05		.052	mg/L	104	90	110			
WG510118ICB	ICB	11/23/20 12:57				U	mg/L		-0.00022	0.00022			
WG510118LFB	LFB	11/23/20 12:59	MS201117-2	.05005		.04996	mg/L	100	85	115			
L62923-01AS	AS	11/23/20 13:43	MS201117-2	.05005	U	.05254	mg/L	105	70	130			
L62923-01ASD	ASD	11/23/20 13:45	MS201117-2	.05005	U	.05365	mg/L	107	70	130	2	20	

Lithium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	2		1.974	mg/L	99	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.024	0.024			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	.997		.9728	mg/L	98	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	.997	.0573	1.028	mg/L	97	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	.997	.0573	.9948	mg/L	94	85	115	3	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	100		100.48	mg/L	100	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.6	0.6			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	50.00226		49.23	mg/L	98	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	50.00226	32	80.45	mg/L	97	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	50.00226	32	81.23	mg/L	98	85	115	1	20	

Manganese, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.05195	mg/L	104	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00088	0.00088			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.0499		.04881	mg/L	98	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.0499	.0221	.06687	mg/L	90	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.0499	.0221	.06582	mg/L	88	70	130	2	20	

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510086													
WG510086ICV	ICV	11/24/20 12:09	HG201109-2	.005		.00491	mg/L	98	95	105			
WG510086ICB	ICB	11/24/20 12:10				U	mg/L		-0.0002	0.0002			
WG510086LRB	LRB	11/24/20 12:12				U	mg/L		-0.00044	0.00044			
WG510086LFB	LFB	11/24/20 12:13	HG201116-3	.002002		.0018	mg/L	90	85	115			
L62866-06LFM	LFM	11/24/20 12:34	HG201116-3	.002002	U	.00169	mg/L	84	85	115			MA
L62866-06LFMD	LFMD	11/24/20 12:35	HG201116-3	.002002	U	.0018	mg/L	90	85	115	6	20	

Molybdenum, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.01992		.01943	mg/L	98	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00044	0.00044			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.0501		.04541	mg/L	91	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.0501	.00485	.05345	mg/L	97	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.0501	.00485	.05313	mg/L	96	70	130	1	20	

Nickel, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.0515	mg/L	103	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.00088	0.00088			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.05		.04858	mg/L	97	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.05	.00372	.04798	mg/L	89	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.05	.00372	.0471	mg/L	87	70	130	2	20	

Nitrate/Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510067													
WG510067ICV	ICV	11/21/20 19:27	WI201117-3	2.416		2.411	mg/L	100	90	110			
WG510067ICB	ICB	11/21/20 19:28				U	mg/L		-0.02	0.02			
WG510068													
WG510068LFB	LFB	11/21/20 20:51	WI201001-11	2		1.868	mg/L	93	90	110			
L62890-05AS	AS	11/21/20 20:58	WI201001-11	2	.408	2.359	mg/L	98	90	110			
L62890-06DUP	DUP	11/21/20 21:01			.977	.983	mg/L				1	20	

Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509809													
WG509809ICV	ICV	11/17/20 22:55	WI201117-3	.609		.611	mg/L	100	90	110			
WG509809ICB	ICB	11/17/20 22:57				U	mg/L		-0.01	0.01			
WG509809LFB	LFB	11/17/20 23:00	WI201001-11	1		1.002	mg/L	100	90	110			
L62890-01AS	AS	11/17/20 23:03	WI201001-11	1	.029	1.019	mg/L	99	90	110			
L62890-02DUP	DUP	11/17/20 23:05			.092	.09	mg/L				2	20	RA

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

pH (lab) SM4500H+ B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510050													
WG510050LCSW1	LCSW	11/20/20 16:44	PCN60577	6		6	units	100	5.9	6.1			
WG510050LCSW4	LCSW	11/20/20 19:03	PCN60577	6		6	units	100	5.9	6.1			
L62914-03DUP	DUP	11/20/20 21:23			8.4	8.4	units				0	20	
WG510050LCSW7	LCSW	11/20/20 22:57	PCN60577	6		6	units	100	5.9	6.1			
WG510050LCSW10	LCSW	11/21/20 1:58	PCN60577	6		6.1	units	102	5.9	6.1			
WG510050LCSW13	LCSW	11/21/20 6:07	PCN60577	6		6.1	units	102	5.9	6.1			

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	20		19.91	mg/L	100	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.6	0.6			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	99.96847		97.62	mg/L	98	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	99.96847	12.3	110.2	mg/L	98	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	99.96847	12.3	110.8	mg/L	99	85	115	1	20	

Residue, Filterable (TDS) @180C SM2540C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509948													
WG509948PBW	PBW	11/19/20 12:50				U	mg/L		-20	20			
WG509948LCSW	LCSW	11/19/20 12:53	PCN62453	1000		1006	mg/L	101	80	120			
L62904-04DUP	DUP	11/19/20 14:10			4410	4432	mg/L				0	10	

Selenium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510226													
WG510226ICV	ICV	11/24/20 19:27	MS201021-2	.05		.05154	mg/L	103	90	110			
WG510226ICB	ICB	11/24/20 19:29				U	mg/L		-0.00022	0.00022			
WG510226LFB	LFB	11/24/20 19:31	MS201117-2	.05		.04478	mg/L	90	85	115			
L62927-01AS	AS	11/24/20 19:36	MS201117-2	.05	.00019	.04779	mg/L	95	70	130			
L62927-01ASD	ASD	11/24/20 19:38	MS201117-2	.05	.00019	.04892	mg/L	97	70	130	2	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510226													
WG510226ICV	ICV	11/24/20 19:27	MS201021-2	.02004		.01987	mg/L	99	90	110			
WG510226ICB	ICB	11/24/20 19:29				U	mg/L		-0.00022	0.00022			
WG510226LFB	LFB	11/24/20 19:31	MS201117-2	.01002		.0085	mg/L	85	85	115			
L62927-01AS	AS	11/24/20 19:36	MS201117-2	.01002	U	.00792	mg/L	79	70	130			
L62927-01ASD	ASD	11/24/20 19:38	MS201117-2	.01002	U	.008	mg/L	80	70	130	1	20	

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510008													
WG510008ICV	ICV	11/20/20 20:19	II201113-1	100		99.35	mg/L	99	95	105			
WG510008ICB	ICB	11/20/20 20:25				U	mg/L		-0.6	0.6			
WG510008LFB	LFB	11/20/20 20:38	II201112-3	100.0141		96.89	mg/L	97	85	115			
L62892-01AS	AS	11/20/20 21:59	II201112-3	100.0141	104	194.9	mg/L	91	85	115			
L62892-01ASD	ASD	11/20/20 22:02	II201112-3	100.0141	104	197.2	mg/L	93	85	115	1	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509837													
WG509837ICV	ICV	11/20/20 13:32	WI201116-10	50		51.86	mg/L	104	90	110			
WG509837ICB	ICB	11/20/20 13:50				U	mg/L		-0.4	0.4			
WG510206													
WG510206LFB2	LFB	11/25/20 0:32	WI201018-4	30		31.9	mg/L	106	90	110			
L62866-07DUP	DUP	11/25/20 1:08			U	U	mg/L				0	20	RA
L62892-01AS	AS	11/25/20 2:20	WI201018-4	300	248	562.21	mg/L	105	90	110			
WG510206LFB1	LFB	11/25/20 11:26	WI201018-4	30		31.99	mg/L	107	90	110			

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510541													
WG510541ICV	ICV	12/02/20 9:42	MS201021-2	.05		.050946	mg/L	102	90	110			
WG510541ICB	ICB	12/02/20 9:43				U	mg/L		-0.00011	0.00011			
WG510541LFB	LFB	12/02/20 9:46	MS201117-2	.0501		.045877	mg/L	92	85	115			
L62895-01AS	AS	12/02/20 9:49	MS201117-2	.1002	U	.083636	mg/L	83	70	130			
L62895-01ASD	ASD	12/02/20 9:51	MS201117-2	.1002	U	.087211	mg/L	87	70	130	4	20	

Uranium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG510118													
WG510118ICV	ICV	11/23/20 12:56	MS201021-2	.05		.05016	mg/L	100	90	110			
WG510118ICB	ICB	11/23/20 12:57				U	mg/L		-0.00022	0.00022			
WG510118LFB	LFB	11/23/20 12:59	MS201117-2	.05		.04988	mg/L	100	85	115			
L62923-01AS	AS	11/23/20 13:43	MS201117-2	.05	.00028	.05292	mg/L	105	70	130			
L62923-01ASD	ASD	11/23/20 13:45	MS201117-2	.05	.00028	.05348	mg/L	106	70	130	1	20	

Vanadium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.05047	mg/L	101	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.0011	0.0011			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.05		.04837	mg/L	97	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.05	U	.04922	mg/L	98	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.05	U	.04829	mg/L	97	70	130	2	20	

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Zinc, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG509956													
WG509956ICV	ICV	11/19/20 15:28	MS201021-2	.05		.0504	mg/L	101	90	110			
WG509956ICB	ICB	11/19/20 15:30				U	mg/L		-0.0132	0.0132			
WG509956LFB	LFB	11/19/20 15:31	MS201117-2	.050075		.0496	mg/L	99	85	115			
L62880-02AS	AS	11/19/20 16:16	MS201117-2	.050075	.0651	.1122	mg/L	94	70	130			
L62880-02ASD	ASD	11/19/20 16:18	MS201117-2	.050075	.0651	.1111	mg/L	92	70	130	1	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Golder Associates

ACZ Project ID: ***L62895***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L62895-01	WG509956	Beryllium, dissolved	M200.8 ICP-MS	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
	WG510206	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG510118	Chromium, dissolved	M200.8 ICP-MS	DD	Sample required dilution due to matrix color or odor.
		Copper, dissolved	M200.8 ICP-MS	DD	Sample required dilution due to matrix color or odor.
	WG509814	Cyanide, Free	D6888-09/OIA-1677-09	DE	Sample required dilution. See Case Narrative.
	WG509974	Fluoride	SM4500F-C	DD	Sample required dilution due to matrix color or odor.
			SM4500F-C	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG510118	Lead, dissolved	M200.8 ICP-MS	DD	Sample required dilution due to matrix color or odor.
	WG510086	Mercury, dissolved	M245.1 CVAA	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG510068	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	HE	Analysis performed past holding time. Method holding time is less than or equal to 7 days and sample was received with less than half of the holding time remaining (refer to item C5 of ACZ's Terms & Conditions).
	WG509809	Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG510050	pH	SM4500H+ B	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
	WG510226	Silver, dissolved	M200.8 ICP-MS	D1	Sample required dilution due to matrix.
			M200.8 ICP-MS	DD	Sample required dilution due to matrix color or odor.
	WG510206	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG510050	Total Alkalinity	SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
	WG510118	Uranium, dissolved	M200.8 ICP-MS	DD	Sample required dilution due to matrix color or odor.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

Golder Associates
Project ID: 20378105
Sample ID: B-8
Locator:

ACZ Sample ID: ***L62895-01***
Date Sampled: *11/16/20 8:30*
Date Received: *11/17/20*
Sample Matrix: *Groundwater*

Gross Alpha & Beta, dissolved
M900.0

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha	12/01/20 0:33		3.6	8.9	29	pCi/L	*	fdw/tjr
Gross Beta	12/01/20 0:33		9.3	11	38	pCi/L	*	fdw/tjr

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Error(+/-)	Calculated sample specific uncertainty
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
LCL	Lower Control Limit, in % (except for LCSS, mg/Kg)
LLD	Calculated sample specific Lower Limit of Detection
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RER	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
UCL	Upper Control Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

DUP	Sample Duplicate	*MS/MSD*	Matrix Spike/Matrix Spike Duplicate
LCSS	Laboratory Control Sample - Soil	*PBS*	Prep Blank - Soil
LCSW	Laboratory Control Sample - Water	*PBW*	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.

Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

(1)	Solid matrices are reported on a dry weight basis.
(2)	Preparation method: "Method" indicates preparation defined in analytical method.
(3)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

Golder Associates

ACZ Project ID: ***L62895***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alpha M900.0 **Units:** pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG510121																
WG510121PBW	PBW	12/01/20						-.1	0.63	0.94			1.88			
WG510121LCSWA	LCSW	12/01/20	PCN62436	66.67				72	5.9	1.1	108	67	144			
L62717-04DUP	DUP-RPD	12/01/20			6.4	3.7	3	6.7	3.8	3				5	20	
L62781-01MSA	MS	12/01/20	PCN62436	123.46	1.8	2.7	10	68	11	26	54	67	144			M2
L62895-01DUP	DUP-RPD	12/01/20			3.6	8.9	29	7.9	10	36				75	20	RG
L62895-01DUP	DUP-RER	12/01/20			3.6	8.9	29	7.9	10	36				0.32	2	

Beta M900.0 **Units:** pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG510121																
WG510121PBW	PBW	12/01/20						1.6	1.8	1.8			3.6			
WG510121LCSWB	LCSW	12/01/20	RC200602-10	66.6				64	4.1	1.7	96	82	122			
L62717-04DUP	DUP-RPD	12/01/20			8.5	3.3	3	7.8	3.4	3.1				9	20	
L62895-01DUP	DUP-RPD	12/01/20			9.3	11	38	4.4	11	28				72	20	RG
L62895-01DUP	DUP-RER	12/01/20			9.3	11	38	4.4	11	28				0.31	2	
L62895-01MSB	MS	12/01/20	RC200602-10	399.6	9.3	11	38	390	26	35	95	82	122			

RadChem Extended Qualifier Report

Golder Associates

ACZ Project ID: ***L62895***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L62895-01	WG510121	Gross Alpha	M900.0	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M900.0	RG	Sample concentration is less than 5x LLD; RPD was not used for data validation. Replicate Error Ratio (RER) is less than 2. Precision judged to be in control.
		Gross Beta	M900.0	RG	Sample concentration is less than 5x LLD; RPD was not used for data validation. Replicate Error Ratio (RER) is less than 2. Precision judged to be in control.

Certification Qualifiers

Golder Associates

ACZ Project ID: ***L62895***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates
20378105

ACZ Project ID: L62895
Date Received: 11/17/2020 11:22
Received By:
Date Printed: 11/18/2020

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
6008	1.1	<=6.0	15	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Golder Associates
20378105

ACZ Project ID: L62895
Date Received: 11/17/2020 11:22
Received By:
Date Printed: 11/18/2020

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L62895

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Sara Harkins
Company: Golder Associates
E-mail: Sara_Harkins@golder.com
Address: 4453, 2121 Abbott Rd, Ste 100 Anchorage, AK 99507
Telephone:

Copy of Report to:

Name: Tricia Hall
Company: Golder Associates
E-mail: tricia_hall@golder.com
Telephone:

Invoice to:

Name: Same as Report to
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES Ø NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [ ]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: T. Hall **Sampler's Site Information** **State** CO **Zip code** 80535 **Time Zone** MT

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: B046271
PO#: 20378105
Reporting state for compliance testing: CO
Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Metals	Rads	Cyanide	Wet Chem (Total)	Wet-chem (Diss)			
B-8	11/16/20 0830	GW	5	X	X	X	X	X			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

metals, rads, + dissolved wet chem field filtered

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Tricia Hall	11/16/20 1532		
		Dem 11/17/20	11:22

L62895 Chain of Custod

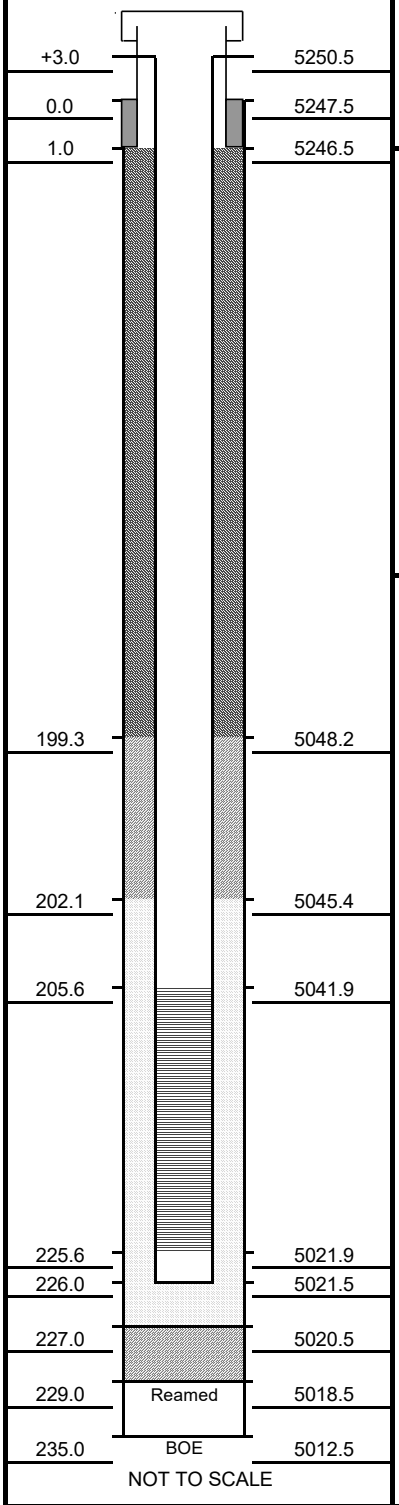
ATTACHMENT C

Monitoring Well Construction Diagram

MONITORING WELL CONSTRUCTION SUMMARY

Site Location: Laporte, CO
Project Number: 20378105
Survey Coordinates: E: 3097714.38
UTM Z13 NAD83 N: 1489961.45

Well No. MW-8
Boring No. X-Ref: B-8
Elevation Ground Level 5247.5 ft
Top of Casing 5250.5 ft



Drilling Summary

Total Depth: 235.0 ft
Borehole Diameter: 8.0 in
Casing Stickup Height: 3.0 ft
Driller: Sean (Drilling Engineers)

Rig: CME-75
Bits(s): HQ3, HAS, Tri-cone

Drilling Fluid: Air

Protective Casing: Locking steel casing

Well Design and Specifications

Basis: Feet
Casing String(s): C = Casing, S = Screen

Depth	String(s)	Elevation
+3.0 - 205.6	C2	surface - 5041.85
205.6 - 225.6	S1	5041.85 - 5021.9
225.6 - 226	C1	5021.9 - 5021.45

Casing: C1 Silt Trap
C2 Schedule 80 PVC Casing
4-inch outside diameter

Screen: S1 20 ft Screen, Schedule 80 PVC
0.010 inch slot size, 4-inch
outer diameter

Filter Pack: 10/20 fraction sand (12 bags)
202.1- 227 ft bgs

Grout Seal: Quikcrete Portland Cement
1 - 199.3 ft bgs

Bentonite Seal: Cetco Coated bentonite
1/4-inch tablets. Lower seal 227-229 ft bgs
Upper seal 199.3-202.1 ft bgs

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
pour bentonite seal	11/18	850	11/18	900
hydrate bentonite seal	11/18	900	11/18	945
sand	11/18	950	11/18	1005
screen install	11/18	1005	11/18	1010
casing install	11/18	1010	11/18	1045
pour filter pack	11/18	1056	11/18	1300
pour bentonite and hydrate	11/18	1305	11/18	1400
mix and pour grout	11/18	1400	11/19	915
surface completion	11/24	1200	11/24	1320

all dates are 2020

Comments

1. Borehole drilled to 235 ft bgs
2. Reamed to 8 inches above 229 ft bgs
3. TD measured at 229 ft bgs prior to install
4. Centralizers placed in the middle of the screen and then approximately every 50 ft above that point

Comments

Supervised by: T. Hall

GOLDER

ATTACHMENT D

Monitoring Well Development Forms

GOLDER

WELL DEVELOPMENT/PURGING FORM

Project Ref: MW-8 Well Installation **Project No.: 20378105**

Location

MW-8

Monitored By: T. Hall Date 11/24/2020 Time 8:30

Well Piezometer Data

(*circle one*)

Depth of Well (from ground)	226	feet
Depth of Water (from ground)	34.5	feet
Radius of Casing	4.0	inches
		feet
Casing Volume		cubic feet
	125	gallons

Development / Purging Discharge Data

Purging Method: Metal Bailer

Start Purging Date 11/24/2020 Time ~ 8:00

Stop Purging Date 11/24/2020 Time 10:59

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (µS/cm)	Turbidity (NTU)	Water Level (ft bgs)	Appearance of Water and Comments
11/24/2020	8:45	~20	12.8	8.41	4,291	low		229 ft btoc is bottom
11/24/2020	9:06	~30	12.8	8.51	4,322	low		Sulfur odor, clear
11/24/2020	9:12	~40	12.8	8.57	4,329	low		
11/24/2020	9:17	~50	12.9	8.52	4,313	low		
11/24/2020	9:28	~60	12.5	8.61	4,308	low		
11/24/2020	9:37	~70	13.1	8.56	4,289	low		
11/24/2020	9:54	~80	13.0	8.39	4,631	mod		Soapy and gray
11/24/2020	10:06	~90	13.2	8.46	4,530	mod		Start to surge screen
11/24/2020	10:20	~100	13.3	8.43	4,639	mod		
11/24/2020	10:32	~110	13.2	8.43	4,689	mod		
11/24/2020	10:45	~120	13.4	8.51	4,858	mod		
11/24/2020	10:59	~125	Dry					
11/24/2020	11:15	-					228.5	Observing recharge
11/24/2020	11:30	-					228.2	Observing recharge
11/24/2020	11:45	-					228.1	Observing recharge
11/24/2020	12:00	-					228.05	Observing recharge

Comments: Discharge volumes approximate

GOLDER

WELL DEVELOPMENT/PURGING FORM

Project Ref: MW-8 Well Installation **Project No.: 20378105**

Location

MW-8

Monitored By: T. Hall Date 12/7/2020 Time 1010

Well Piezometer Data

(*circle one*)

Depth of Well (from top of PVC)	229	feet
Depth of Water (from top of PVC)	218.58	feet
Radius of Casing	4	inches
		feet
Casing Volume		cubic feet
	1.2	gallons

Development / Purging Discharge Data

Purging Method: disposable, dedicated bailer

Start Purging Date 12/7/2020 Time 1015

Stop Purging Date 12/7/2020 Time 1122

Monitoring

Date	Time	Volume Discharge (gals)	Temp (°C)	pH	Spec.Cond. (µS/cm)	Turbidity (NTU)	Water Level (ft bgs)	Appearance of Water and Comments
12/7/2020	1040	2	13.6	8.33	11,903	Low		
12/7/2020	1056	5	13.8	8.41	12,280	Low		
12/7/2020	1106	8	14.2	8.33	12,821	Low		slightly more gray sediment
12/7/2020	1117	11	14.1	8.34	13,136	Mod		slight sulfur odor
12/7/2020	1122	Bailed dry at approx. 13 gallons; soapy w/ sulfur odor (Mod)						

Comments: Discharge volumes approximate

ATTACHMENT E

Monitoring Well Construction Permit

GOLDER

TRANSMITTAL

DATE February 3, 2021

Project No. 20378105

TO Office of the State Engineer
State of Colorado
1313 Sherman St.
Room 821
Denver, CO 80203

FROM Golder Associates

EMAIL tricia_hall@golder.com

WELL CONSTRUCTION PERMIT APPLICATION MATERIALS AND WELL CONSTRUCTION AND YEILD ESTIMATE REPORT FOR HOLCIM BOETTCHER QUARRY MONITORING WELL INSTALLATION

Select one checkbox only

- ☑ **Mail/Express Post**
- ☐ **Same Day Courier** _____
- ☐ **Overnight Courier** _____
- ☐ **Air Freight** _____
- ☐ **Email** _____
- ☐ **Enclosed**
- ☐ **Picked Up**
- ☐ **Hand Delivered**
- ☐ **Other** _____

Quantity	Item	Description
1	Form No. GWS-31	Well Construction and Yield Estimate Report
1	Form No. GWS-46	Monitoring/Observation Water Well Permit Application
1	Well permit application fee	$100 check for one new monitoring well

Notes

Please advise us if enclosures are not as described.

ACKNOWLEDGEMENT REQUIRED:
☐ YES (please email/fax to Golder) ☐ NO

https://golderassociates.sharepoint.com/sites/135208/project files/5 technical work/well permits/permit materials for submittal/well_permit_transmittal.docx

Golder Associates Inc.
7245 W Alaska Drive, Suite 200, Lakewood, Colorado, USA 80226
T: +1 303 980-0540 F: +1 303 985-2080

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313 SHERMAN ST., Ste 821, DENVER CO 80203
Phone: (303) 866-3581 dwrpermitsonline@state.co.us

Office Use Only

Form GWS-46 (01/2020)

MONITORING/OBSERVATION Water Well Permit Application

Review instructions on reverse side prior to completing form.
The form must be typed, completed online or in black or blue ink.

1. Well Owner Information

Name of well owner: Holcim (US)

Mailing address: 3500 US Highway 120

City	State	Zip code
Florence	CO	801226

Telephone #	E-Mail (If filing online it is required)
719-288-1402	mike.toelle@lafargeholcim.com

2. Type Of Application (check applicable boxes)

- ☐ Use existing well
- ☐ Replacement for existing monitoring well: Permit no.:
- ■ Construct new well
- ☐ Other:

3. Refer To (if applicable)

Monitoring hole acknowledgment	Well name or #
MH- 61351	MW-8

4. Location Of Proposed Well (Important! See Instructions)

County: Larimer

SW 1/4 of the NW 1/4

Section	Township	N or S	Range	E or W	Principal Meridian
8	8	☒ N ☐ S	69	☐ E ☒ W	6th

Distance of well from section lines (section lines are typically not property lines)

2,084.19 Ft. from ☒ N ☐ S 1,218.41 Ft. from ☐ E ☒ W

For replacement wells only – distance and direction from old well to new well

feet direction

Well location address (Include City, State, Zip) ☐ Check if well address is same as Item 1.

MV27+R5 Laporte, Colorado 80535

Optional: GPS well location information in UTM format
You must check GPS unit for required settings as follows:

Format must be UTM
☐ Zone 12 or ☐ Zone 13
Units must be Meters
Datum must be NAD83
Unit must be set to true north
Was GPS unit checked for above? ☐ YES

Easting _____

Northing _____

Remember to set Datum to NAD83

5. Property Owner Information

Name of property owner: Holcim (US)

Mailing address: 3500 US Highway 120

City	State	Zip Code
Florence	CO	801226

Telephone #: 719-288-1402

6. Use Of Well

Use of this well is limited to monitoring water levels and/or water quality sampling

7. Well Data (proposed)

Total **depth**	Aquifer
226 feet	

8. Consultant Information (if applicable)

Name of contact person: Tricia Hall

Company name: Golder Associates Inc.

Mailing address: 7245 W Alaska Dr., Suite 200

City	State	Zip Code
Lakewood	CO	80226

Telephone #: 303-980-0540

9. Proposed Well Driller License #(optional):

10. Name of Well Owner or Authorized Agent

The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.

Sign or enter full name here	Date (mm/dd/yyyy)
Tricia Hall	01/29/2021

If signing print name. Print title if other than land owner.

Tricia Hall, Staff Hydrogeologist at Golder Associates

Office Use Only

USGS map name	DWR map no.	Surface elev.

Receipt area only

DIV _____ WD _____ BA _____ MD _____

MONITORING/OBSERVATION WELL PERMIT APPLICATION INSTRUCTIONS

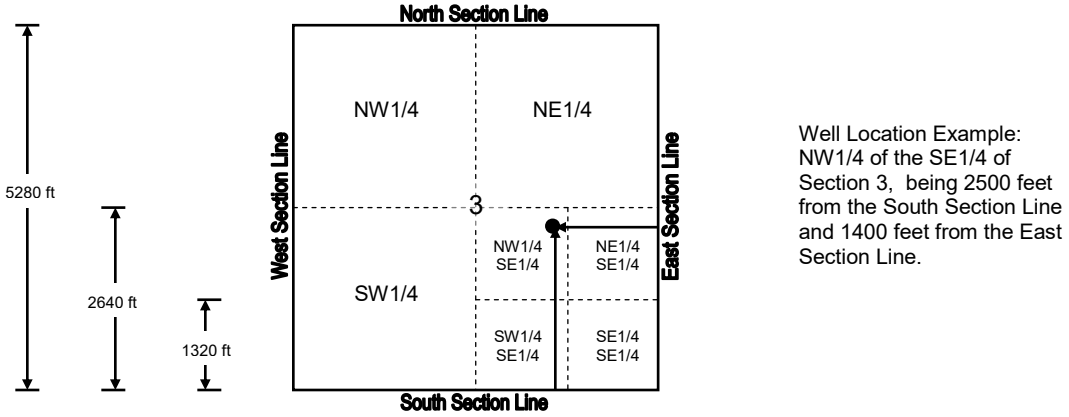
Applications must be computer generated on-line, typewritten or printed in BLACK or BLUE INK. ALL ITEMS in the application must be completed. Incomplete applications may be returned for more information. Applications are evaluated in chronological order. Please allow approximately six weeks for processing. 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

FEES: 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 (dwr.colorado.gov) 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 **must** 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 **must** 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 dwr.colorado.gov for general information.

Form No. GWS-31 02/2017	**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 dwr.colorado.gov and dwrpermitsonline@state.co.us	For Office Use Only

1. Well Permit Number: MH-61351 **Receipt Number:**

2. Owner's Well Designation: Monitoring Well

3. Well Owner Name: Holcim (US) Inc.

4. Well Location Street Address: MV27 + R5 Laporte, Colorado 80535

5. As Built GPS Well Location (required): ☐ Zone 12 ☒ Zone 13 Easting: 3097714.0 Northing: 1489961.45

6. Legal Well Location: SW 1/4, NW 1/4, Sec., 8 Twp. 8 ☒ N or S ☐, Range 69 ☐ E or W ☒, 6th P.M.

County: Larimer

Subdivision: _____, Lot ____, Block _____, Filing (Unit) _____

7. Ground Surface Elevation: 5247.45 feet **Date Completed:** 11/24/2020 **Drilling Method:** HSA/Air-Rotary/Air-coring

8. Completed Aquifer Name : _____ **Total Depth:** 235 feet **Depth Completed:** 226 feet

9. Advance Notification: Was Notification Required Prior to Construction? ☒ Yes ☐ No, Date Notification Given: 11/06/2020

10. Aquifer Type: (Check one) ☐ Type I (One Confining Layer) ☐ Type I (Multiple Confining Layers) ☐ Laramie-Fox Hills ☒ Type II (Not overlain by Type III) ☐ Type II (Overlain by Type III) ☐ Type III (alluvial/colluvial)

11. Geologic Log:

Depth	Type	Grain Size	Color	Water Loc.
0 - 2 ft	unconsolidated	silt	l. olive gray	
2 - 15 ft	limestone	clay	brown-gray	
15 - 20 ft	limestone	clay	med. gray	
20 - 115 ft	limestone	clay	l. olive gray	
115 - 165 ft	limestone	clay	l. olive gray	wet 115 ft
165 - 215 ft	limestone	clay	med l. gray	
215 - 230 ft	limestone	clay	very l. gray	
220 - 235 ft	sandstone	sand	med. l. gray	

Remarks:

12. Hole Diameter (in.)

	From (ft)	To (ft)
8	0	229

13. Plain Casing

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
4	Sch 80	.337	0	206

Perforated Casing Screen Slot Size (in): 0.010

OD (in)	Kind	Wall Size (in)	From (ft)	To (ft)
4	Sch 80	.337	206	226

14. Filter Pack:

Material: sand

Size: 10/20

Interval: 202-227

15. Packer Placement:

Type: _____

Depth: _____

16. Grouting Record

Material	Amount	Density	Interval	Method
portland cement			1 - 199 ft	tremie
coated bentonite			199 - 202 ft	pour
coated bentonite			227 - 229 ft	pour

17. Disinfection: Type None Amt. Used

18. Well Yield Estimate Data: ☐ Check box if Test Data is submitted on Form Number GWS-39, Well Yield Test Report

Well Yield Estimate Method: _____

Static Level: 5,250.54 ft amsl

Date/Time measured: 12/7/2020 0915

Estimated Yield (gpm) _____

Estimate Length (hrs) _____

Remarks: No well yield estimate data collected

19. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402 2. The filing of a document that contains false statements is a violation of section 37 91 108(1)(e), C.R.S., and is punishable by fines up to $1,000 and/or revocation of the contracting license. If filing online the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4.

Company Name:	Email:	Phone w/area code:	License Number:
Golder Associates, Inc.	mike.toelle@lafargeholcim.com	(303) 980-0540	N/A

Mailing Address: 7245 W Alaska Dr., Lakewood, CO 80226

Sign (or enter name if filing online)	Print Name and Title	Date:
Tricia Hall	Tricia Hall, Staff Hydrogeologist	01/29/2021

GWS-31
02/2017

INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in **BLACK OR BLUE INK** 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 Form Submittal, Payment Options, & Fee Schedule. You may also save, print and email the completed form to: dwrpermitsonline@state.co.us

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).
11. 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 dwrpermitsonline@state.co.us

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 dwr.colorado.gov for general information, forms, online filing instructions and access to state rules and statutes.