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Environmental

Mr. Timothy A. Cazier, P.E.
Environmental Protection Specialist
Colorado Division of Reclamation, Mining and Safety
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, Colorado 80203

Subject:
Holcim (US) Inc. Portland, Colorado
March 2015 Groundwater Monitoring Report
DRMS Permit No. M-1977-344, Technical Revision No. 6

Date:
May 20, 2015

Contact:
Chris Peters

Phone:
810.225.1905

Email:
chris.peters@arcadis-us.com

Our ref:
B0025510

Dear Mr. Cazier:

On behalf of Holcim (US) Inc. (Holcim), please find enclosed one copy of the *Final March 2015 Groundwater Monitoring Report*, which summarizes analytical results for groundwater samples collected on March 23, 2015. The March 2015 sampling results indicate that concentrations of all analytes measured in the two downgradient wells, MW-7 and MW-13, were below respective numeric protection levels.

Based on March 2015 sampling results that indicate there is no discernible impact from CKD, annual groundwater monitoring will resume unless future results require increased monitoring frequency.

Please contact me if you have any questions.

Sincerely,
ARCADIS

Christopher S. Peters, CPG
Vice President

Copies:
Derrick Dease, Holcim (US) Inc.
Lauri Yusko, ARCADIS
File

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Imagine the result

Holcim (US) Inc.

March 2015 Groundwater Monitoring Report

Florence, Colorado

May 2015

ARCADIS

Lauri Yusko, PE
Senior Environmental Engineer

Christopher S. Peters, PG
Certified Principal in Charge

March 2015 Groundwater Monitoring Report

Florence, Colorado

Prepared for:
Holcim (US) Inc.
3500 Highway 120
Florence, CO 81226
719.288.1423

Prepared by:
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1687 Cole Blvd.
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Our Ref.:
B0025510

Date:
May 2015

Table of Contents

Appendices

1. Introduction

ARCADIS was retained by Holcim (US) Inc. (Holcim) to sample the quarry groundwater monitoring wells adjacent to the cement kiln dust (CKD) and alkali bypass dust disposal area (hereafter referred to as the CKD disposal area) at the Holcim Portland Plant, located in Florence, Colorado (site). The sampling was performed to fulfill the requirements of the Colorado Division of Reclamation Mining and Safety (DRMS) as a result of a December 2007 DRMS inspection, which is discussed further in Section 1.3. The sampling was performed on March 23, 2015. This *2015 Groundwater Monitoring Report* (report) describes the procedures for measuring depth to groundwater at all quarry monitoring wells and piezometers and collecting groundwater samples at selected quarry monitoring wells, and presents the results of the groundwater depth measurements and groundwater sample laboratory analysis.

The remainder of this section presents the site location and history of the site that is relevant to groundwater quality. Section 2 describes the field activities for the measurement of groundwater levels and sampling of existing monitoring wells. Section 3 presents results for the groundwater analyses and groundwater elevation measurements. Section 4 presents the conclusions of the 2015 annual sampling event and provides any necessary recommendations. Cited references are provided in Section 5.

1.1 Site Location

The Portland Plant (plant), which manufactures Portland cement, is located at 3500 Highway 120, Florence, Colorado in Fremont County (**Figure 1**) on the southern side of the Arkansas River. The quarry that supplies the limestone for the plant used in the manufacturing process is located on the northern side of the Arkansas River. The total area of the site, including the quarry, is approximately 3,400 acres.

1.2 Site History

Cement manufacturing operations at the site began in 1897. Prior to 2001, three long, wet kilns with a combined cement production of approximately 937,000 tons per year (tpy) were in service. CKD is the waste material that was generated in the cement kiln and associated equipment. Using the wet kiln process, approximately 25,000 to 100,000 tpy of CKD was generated during the production of cement at the site (Resource Geoscience, Inc. [RGI] 1999). Historically, sludge from the nearby Fremont

Sanitation District wastewater treatment plant was added to the CKD disposal area as a daily cover. The sludge also served as a means of dust control.

In 2001, the wet kilns were replaced by a single dry kiln with a clinker capacity of 1,873,898 tpy. The dry kiln allows all of the dust generated within the kiln during the manufacturing process to be recycled within the process. However, during the production of low-alkali clinker, calcium chloride is added to the process to assist the removal of alkalis from the raw material. Some of the alkalis are removed by taking a portion of the raw material out of the process via the alkali bypass system. The "alkali bypass dust" (bypass dust) removed from the process is similar in chemistry to the CKD that had historically been disposed and is transported to the CKD disposal area in the quarry. When possible, bypass dust is sold to customers to eliminate the need for disposal on site. Alternative uses for the bypass dust must be approved by Holcim. Bypass dust is produced now at a much lower rate than CKD when the wet kiln system was in operation. From 2005 to 2014, approximately 10,000 tons of bypass dust has been placed in the CKD disposal area each year.

In 2001, with the construction of the new kiln, a pug mill was installed to add water to the bypass dust prior to transporting the bypass dust to the CKD disposal area in the quarry, in order to reduce dust emissions. With the addition of the pug mill, use of sludge from the Fremont Sanitation District wastewater treatment plant for dust control was discontinued.

The quarry is located on the northern side of the Arkansas River across from the plant. The bypass dust is currently being disposed of in a previously mined section (cut) of the limestone quarry to the south of former monitoring well MW-10. The locations of cuts previously used for CKD disposal are indicated on **Figure 2**. The bottoms of these cuts coincide with the top of the underlying Codell sandstone, which is the primary water-bearing unit in the quarry area. To prevent contact of CKD/bypass dust with this groundwater, approximately 10 feet of shale was backfilled and compacted in the bottom of these cuts prior to placement of bypass dust/CKD. Descriptions of the site geology and hydrogeology are provided in the *Groundwater Monitoring Plan* (GMP; Blasland, Bouck & Lee, Inc. [BBL] 2002).

1.3 Site Regulatory History

In Colorado, the regulatory responsibility for bypass dust/CKD disposal requirements is delegated to the DRMS. Therefore, the requirements for bypass dust/CKD management are incorporated into each facility's Mined Land Reclamation Permit.

The Portland Plant is permitted to dispose of bypass dust/CKD (although CKD is no longer generated by the plant) in the quarry under the State of Colorado Mining Permit No. M-77-344 (permit). Specific requirements for protection of groundwater are described in Rule 3.1.7(7)(i) through (viii) of the "Construction Material Rules and Regulations" (Mined Land Reclamation Board [MLRB] 2001) and the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Commission (WQCC) Regulation No. 41 "Basic Standards for Ground Water" (CDPHE 2008).

1.3.1 Baseline Groundwater Monitoring Program

On August 16, 1999, Holcim submitted a request to the Colorado DRMS for a Mine Permit Technical Revision (TR-06) to its permit for the disposal of CKD in previously mined areas at the quarry (K-S & Company 1999). TR-06 included a description of CKD disposal procedures and facilities, closure plan for the disposal areas, description of erosion control measures used at the site, discussion of CKD sampling and analysis, and description of hydrogeologic conditions at the site. The DRMS, formerly the Division of Minerals and Geology (DMG), reviewed TR-06 and responded with an initial adequacy review letter on January 18, 2000 (DMG 2000). On behalf of Holcim, K-S & Company submitted responses to DMG's adequacy review letter in May 2001 (Holnam 2001). The DMG responded with a second adequacy review letter on October 22, 2002 (DMG 2002).

ARCADIS was retained by Holcim to provide technical support for Mine Permit Technical Revision TR-06 (TR-06) to the permit. In partial fulfillment of the Colorado DRMS requirements for TR-06, a *Groundwater Monitoring Plan* (GMP) was developed for the approximately 1,330 acres included within the boundaries of the mining permit (**Figure 2**) (BBL 2002). The main purpose of the GMP was to meet the requirements of the Colorado MLRB's Construction Materials Rules and Regulations Rule 3.1.7 for the protection of existing and reasonably potential future uses of the unclassified groundwater located beneath the quarry (MLRB 2001). These requirements were triggered by the disposal of CKD into previously mined sections of the site, and the potential for leachate from CKD to adversely impact ambient groundwater quality for existing and reasonably potential future uses.

In 2004, all requirements from the DRMS's adequacy reviews were fulfilled with the submittal of the final quarter of data for monitoring well MW-10 (BBL 2004). The DRMS was to use the data from the groundwater monitoring program to establish ambient groundwater concentrations and a parameter list for future monitoring. Holcim was to

initiate annual groundwater monitoring per the GMP once the ambient groundwater concentrations and parameter list had been established by the DRMS.

The DRMS responded to the BBL 2004 report as part of a December 2007 site inspection. As a result of that site inspection, Holcim performed a site-wide monitoring event in March 2008. Subsequent to that monitoring event and further discussions with the DRMS, Holcim prepared a number of revisions to the GMP, as follows:

- November 21, 2008
- February 17, 2009
- July 7, 2010

1.3.2 November 21, 2008 Groundwater Monitoring Plan

Holcim prepared a revision to the GMP, dated November 21, 2008. The revised GMP proposed the following:

- Installation of one new monitoring well (MW-13) located hydraulically downgradient of the CKD disposal area;

- Annual monitoring of the new well plus existing monitoring wells MW-7 and MW-12; and

- Abandonment of monitoring wells MW-6, MW-8 and MW-10, because they were no longer usable and/or they no longer served any purpose in the monitoring program.

1.3.3 February 17, 2009 Groundwater Monitoring Plan

A subsequent revision to the GMP, dated February 17, 2009, proposed compliance standards for downgradient monitoring well MW-7, based upon the highest historical analyte concentrations. Those are discussed in Section 3.2. The proposed revisions to the GMP and the compliance standards were approved by the DRMS on February 24, 2009, with the condition that well MW-13 be monitored for five successive quarters to establish compliance standards for that well. A copy of the February 17, 2009 GMP from Holcim and the February 24, 2009 DRMS approval letter are included in Appendix A. The DRMS approval letter stipulated that if two or more analytical parameters in monitoring well MW-7 exceeded their respective compliance standards by more than 10%, semi-annual sampling for those parameters would be required.

In April 2009, Holcim retained ARCADIS to install one new groundwater monitoring well (MW-13) downgradient of the quarry operations, and to abandon three groundwater monitoring wells that were no longer active. Details of the field activities performed as part of the groundwater monitoring well installation and abandonments were documented in the Final *April 2009 Groundwater Monitoring Report* (ARCADIS, 2009).

Following installation in April 2009, MW-13 was sampled on a quarterly basis for five consecutive quarters at the request of the DRMS for the purpose of determining the appropriate parameters and setting compliance standards for the well. Analytical results were provided in the *March 2010 Groundwater Monitoring Report* (ARCADIS, 2010). Subsequently, MW-13 was added to the annual groundwater monitoring program in March 2011.

1.3.4 July 7, 2010 Groundwater Monitoring Plan

On July 7, 2010 Holcim proposed another revision to the GMP, including proposed compliance standards for MW-13. This GMP revision can be found in Appendix B. The DRMS responded with numeric protection levels (NPLs, previously referred to as compliance standards) for MW-13 in a letter dated November 27, 2012. This letter has been included in Appendix A. The DRMS approval letter stipulated that in addition to MW-7, if the concentrations of the parameters analyzed in MW-13 exceeded their respective NPL by more than 10%, semi-annual sampling for those parameters would commence.

1.3.5 Proposal to Remove Sodium as a Groundwater Quality Parameter

On October 20, 2014 Holcim submitted a letter to the DRMS (ARCADIS, 2014) proposing the removal of sodium as a groundwater quality parameter used to evaluate the potential impact from leaching of bypass dust/CKD. Additionally, Holcim proposed that the potassium to sodium (K:Na) ratio using a NPL of 0.5 to replace sodium as one of the primary water quality indicators of impact from the CKD landfill. Approval was received from DRMS in a letter dated February 25, 2015. The approval letter is included in Appendix A.

2. Field Activities

2.1 Groundwater Sampling

Field sampling methods and procedures described below include sample collection methods, sample handling procedures and sample chain of custody procedures. Groundwater sampling was conducted at monitoring wells MW-7, MW-12 and MW-13 (Figure 2) on March 23, 2015.

Groundwater sampling activities included measurement of the depth to groundwater and depth to well bottom at monitoring wells MW-7, MW-9, MW-11, MW-12, MW-13, DP-1, and NP-1, and at piezometers P-2 and P-3. Depth to groundwater was measured using an electronic water level indicator.

Depth to groundwater and well bottom was measured prior to purging and sampling monitoring wells MW-7, MW-12 and MW-13. Prior to collecting the groundwater samples, these monitoring wells were purged using a disposable Teflon® bailer. The unfiltered groundwater sample was collected using a disposable Teflon® bailer and placed directly into laboratory-supplied sample bottles, which were subsequently placed into a cooler with ice.

The unfiltered groundwater samples were collected in accordance with groundwater monitoring protocol set forth in the original GMP (BBL 2002) and shipped to the ACZ Laboratories, Inc. (ACZ) Facility located in Steamboat Springs, Colorado. The samples were submitted for analysis of metals (iron, manganese, potassium and sodium), total dissolved solids (TDS) and sulfate. The samples for dissolved iron, total dissolved solids and sulfate were lab filtered upon receipt. In addition, temperature, pH and specific conductivity were measured in the field.

2.2 Field Observations

In general, disposable bailers were used to purge three well volumes in each well before collecting a water sample. However due to the slow recharge in MW-7 it was not possible to purge three well volumes from MW-7 within a reasonable period of time. MW-7 was purged dry and left to recharge prior to collecting the sample. The field water quality parameters in wells MW-12 and MW-13, including temperature, pH and specific conductivity were stable (i.e., less than a 10 percent change between readings) after three well volumes and samples were subsequently collected from each well using the disposable bailer. One duplicate sample was collected from MW-12.

3. Results

3.1 Groundwater Elevations and Flow Characteristics

Measured depths to the groundwater surface (**Table 1**) have been used to develop groundwater elevation contours (**Figure 2**). The water table is encountered in the Codell Sandstone Member of the Carlile Formation (RGI 1999), which underlies the quarried rock. All of the monitoring wells are screened in the Codell Sandstone. The groundwater flow pattern is similar to what has been observed in the past.

Groundwater generally flows south toward the Arkansas River, which is the major groundwater discharge zone in the area, as reported by previous investigators (i.e., BBL 2002, RGI 1999).

Based upon an average measured horizontal groundwater gradient of 0.02 feet per foot (ft/ft), a reported Codell Sandstone hydraulic conductivity of approximately $4.5x10^{-6}$ centimeters per second (cm/sec; RGI 1999), and a range of effective porosities for sandstone of five to 30 percent (Freeze and Cherry 1979), the resulting groundwater velocity is 0.3 to 1.9 feet per year (ft/yr). The resulting groundwater velocity when including wells NP-1 and DP-1 in the average hydraulic gradient calculation, is 0.3 to 2.0 ft/yr. This range is the same as reported in 2014 and similar to previously reported values by RGI (1999) and previous groundwater monitoring reports for this site prepared by ARCADIS.

3.2 Analytical Results

Laboratory analyses of the 2015 groundwater samples were conducted at ACZ's Steamboat Springs, Colorado facility. Results of the laboratory analyses are provided in Table 2. The Laboratory Analytical Results Report is provided as Appendix D. Historical groundwater quality data are provided in Appendix E (updated with results through 2015).

Concentrations of metals and other constituents measured in groundwater at well MW-7 were compared to the NPLs proposed in the GMP presented to the DRMS in February 2009, and the K:Na ratio NPL (0.5) recently approved by the DRMS (see Section 1.3.5) . No analytes measured at MW-7 exceeded their respective NPLs.

In addition to MW-7, groundwater monitoring wells MW-12 (upgradient well) and MW-13 (compliance well) were sampled as part of the annual groundwater monitoring program. Analytical results are presented in **Table 2**.

As discussed in Section 1.3.4 of this report, the DRMS set NPLs for MW-13 in a letter dated November 27, 2012. All analytes measured at MW-13 were below their respective NPLs.

Time series graphs of the K:Na ratio, TDS, sulfate, and manganese for MW-7, MW-12, and MW-13 were prepared (**Figures 3, 4, 5, and 6**, respectively) to evaluate potential impacts of CKD disposal to the groundwater.

In general, the graphs indicate that manganese concentrations in MW-7, MW-12, and MW-13 have continued to decrease over time. The graphs also indicate that TDS and sulfate concentrations in MW-7 are generally decreasing through time. TDS concentrations in MW-12 and MW-13 appear to be stable to slightly decreasing. The graphs show that sulfate concentrations in MW-12 and MW-13 are generally stable. The concentrations of analytes found in monitoring well MW-12, which is considered the background well, from the March 2015 sampling event (**Table 2** and **Figures 4, 5, and 6**) remain higher than the wells installed downgradient of the CKD.

As mentioned in Section 1.3.5, sodium was removed as a groundwater quality parameter and replaced with a K:Na ratio of 0.5 as the NPL following the approval from DRMS. As shown in **Table 2** and on **Figure 3**, the K:Na ratio in all monitoring wells continues to be generally less than 0.10, indicating that there is no discernible impact from the CKD disposal area.

Based on March 2015 sampling results that indicate there is no discernible impact from the CKD disposal area and no parameters exceeded their NPLs, ARCADIS recommends that groundwater monitoring continue on an annual basis.

4. Conclusions and Recommendations

Based on the information presented in this report, we have concluded the following:

- For the March 2015 groundwater sampling event, concentrations of all analytes in measured in the two downgradient wells, MW-7 and MW-13, were below the NPLs.

- The March 2015 results at well MW-7 appear to be similar to the March 2014 results for manganese, TDS, and sulfate. The K:Na ratio remains low in this well.

- Generally stable or decreasing trends for manganese, TDS, sulfate, and K:Na ratios continue to be observed in well MW-13.

- Groundwater flow is to the south and velocity is 0.3 to 2 ft/yr, which is consistent with historical data. In addition, groundwater elevations and interpreted flow direction are similar to previous sample rounds.

Based on March 2015 sampling results that indicate there is no discernible impact from CKD, ARCADIS recommends that groundwater monitoring continue on an annual basis.

5. References

ARCADIS, 2009. Final April 2009 Groundwater Monitoring Report, Portland, Florence, Colorado. Prepared for Holcim (US) Inc., Florence, Colorado. July.

ARCADIS, 2010. March 2010 Groundwater Monitoring Report, Florence, Colorado. Prepared for Holcim (US) Inc., Florence, Colorado. July.

ARCADIS, 2014. Proposal to Remove Sodium as a Groundwater Quality Parameter, DRMS Permit No. M-1977-344, Technical Revision No. 6. Prepared for Holcim (US) Inc., Portland, Colorado. August.

Blasland, Bouck & Lee, Inc., 2002. Groundwater Monitoring Plan, Holcim (US) Inc., Portland Plant, Florence, Colorado. Prepared for Holcim (US) Inc., Florence, Colorado. December.

Colorado Department of Public Health and Environment, 2008. Water Quality Control Commission Regulation No. 41 The Basic Standards for Groundwater. Adopted January 5, 1987.Mined Land Reclamation Board, 2001. Construction Material Rules and Regulations. Resource Geoscience, Inc., 1999. Hydrogeologic Assessment Holnam, Inc., Portland, Colorado. Prepared for Holnam, Inc., Florence, Colorado. January 27, 1999.

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Tables

Table 1
March 2015 Depth to Groundwater Measurements and Groundwater Elevations

Holcim (US) Inc.
Florence, Colorado

Well Number	Well Diameter (inches)	TOC Elevation (ft amsl)	Depth to GW March 2015 (ft btoc)	Depth to Well Bottom March 2015 (ft btoc)	GW Elevation March 2015 (ft amsl)	Total Depth (ft bgs)	Screened Interval (ft bgs)
MW-7	4	5056.26	25.53	50.30	5030.73	47	17-42
MW-9	4	5121.90	7.53	45.55	5114.37	42	17-37
MW-11	2	5095.87	54.12	105.65	5041.75	103	58-103
MW-12	2	5254.04	96.91	150.30	5157.13	148	103-148
MW-13	2	5040.00	15.95	31.95	5024.05	30	15-30
P-2	1.5	5079.46	4.28	29.05	5075.18	36	31-36
P-3	1.5	5063.28	26.75	39.45	5036.53	37	32-37
DP-1	2	5069.70	9.02	36.50	5060.68	34	24-34
NP-1	2	5147.40	42.58	73.50	5104.82	70	60-70

Notes:
ft amsl - Feet above mean sea level.
ft bgs - Feet below ground surface.
ft btoc - Feet below top of casing.
GW - Groundwater.
MW - Monitoring well.
NA - Not available.
P - Piezometer.
TOC - Top of casing.
Groundwater levels measured on March 23, 2015

Table 2
March 2015 Field and Analytical Results

Holcim (US) Inc.
Florence, Colorado

Analyte	Units	MW-7 NPLs	March 2015 Analytical Results								MW-13 NPLs
			MW-7		MW-12		MW-12 DUP		MW-13		
Field Parameters											
pH	std. units	6.5-8.5[a]	7.63		6.74		--		6.98		NA
Specific Conductivity	mS/cm	NA	2.672		3.893		--		3.714		NA
Temperature	°C	NA	14.2		14.10		--		14.10		NA
Laboratory Results											
Total dissolved solids	mg/L	3918	2010		3910		3870		3540		4026
Sulfate	mg/L	2080	1020		2390		2340		2030		2200
Iron (total)	mg/L	NA	2.37		Nan		Nan		Nan		NA
Iron (dissolved)	mg/L	4.5	<0.04	U	0.74		0.54		<0.04	U	0.13
Manganese (dissolved)	mg/L	0.88	<0.01	U	0.55		0.55		<0.01	U	0.3
Potassium (dissolved)	mg/L	17	11		12.6		12.6		8.4		13
Sodium (dissolved) [1]	mg/L	NA	247		131		130		156		274
K:Na ratio	mg/L	0.5	0.045		0.096		0.097		0.054		0.5

Notes:

NPLs - numeric protection levels issued by Division of Reclamation, Mining and Safety

Bolded values - NPL exceeded

[1] - Sodium was removed as a groundwater quality parameter and replaced with a potassium to sodium (K:Na) ratio per Division of - Reclamation, Mining and Safety approval letter dated February 25, 2015.

K - potassium

Na - sodium

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.

B - Analyte concentration detected at a value between Method Detection Limit and Practical Quantitation Limit. The associated value is an estimated quantity.

NA - Not applicable.

Nan - Not Analyzed

[a]MCL source: Table 2 Secondary Drinking Water Standards, Regulation 41.

MCL - Maximum concentration limit.

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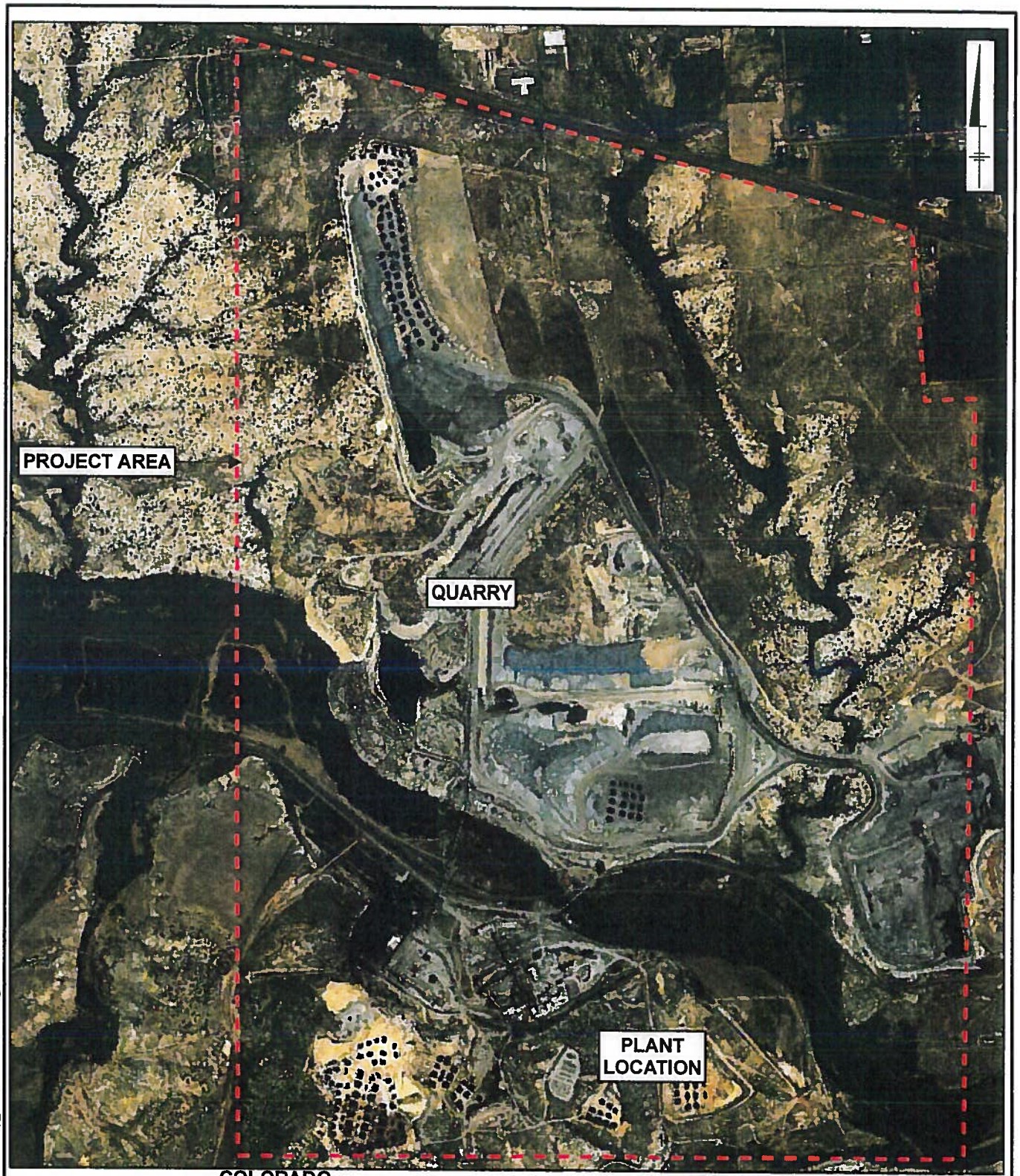
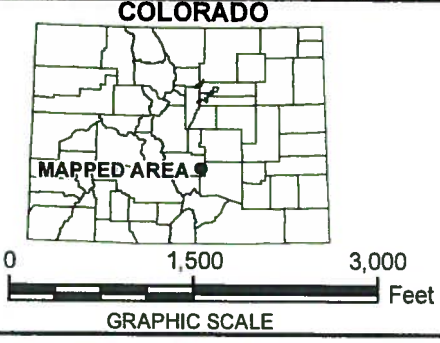
Figures





HOLCIM (US) INC.
PORTLAND PLANT, FLORENCE, COLORADO
MARCH 2015
GROUNDWATER MONITORING REPORT

SITE LOCATION MAP

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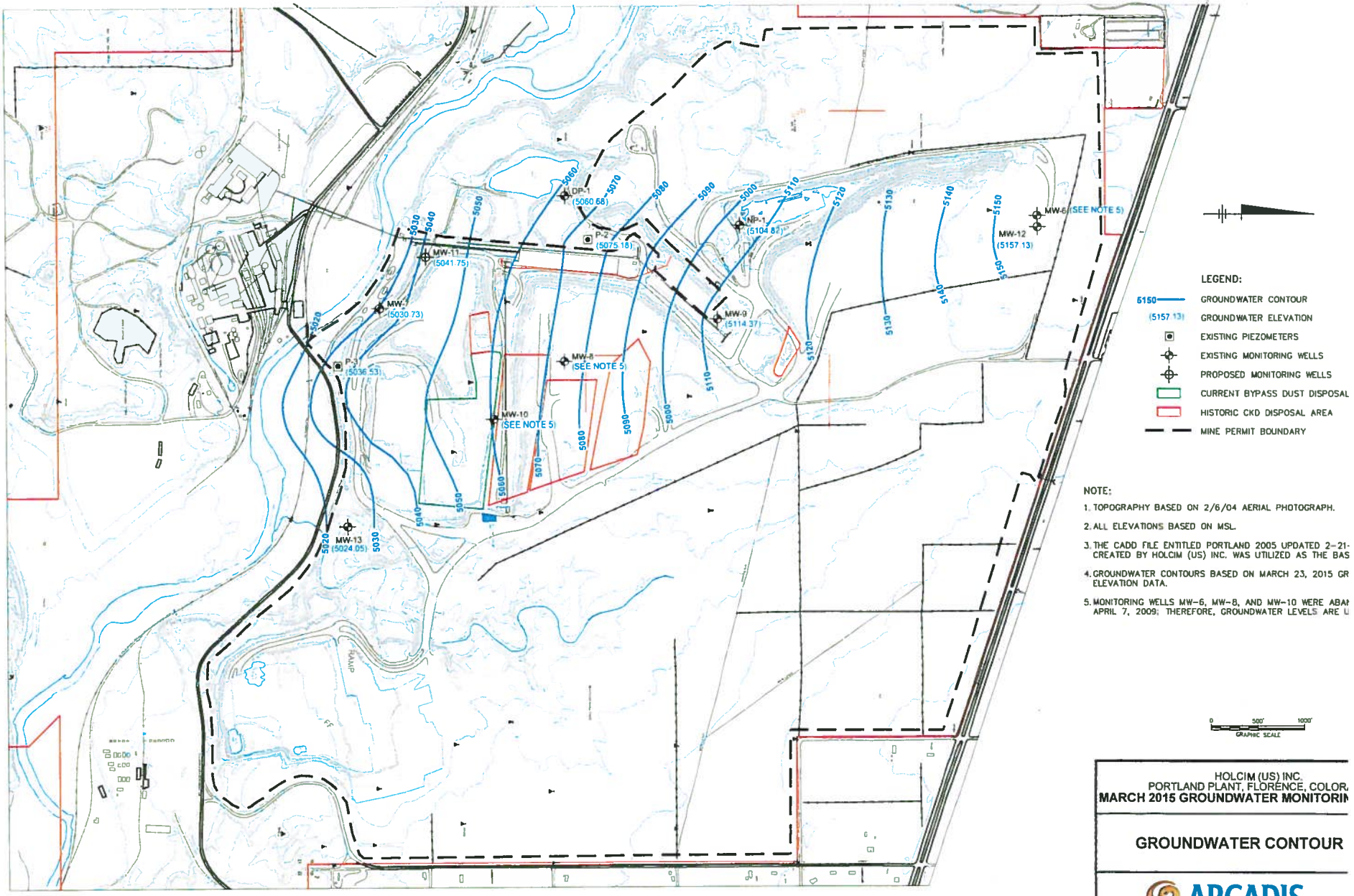
FIGURE
1

CITY: SYR DIV/GROUP: AIT DB: KES PM: HO
Holcim (B0025510.2013.00002)
Q:\Holcim\FlorenceCO\GW\MonitoringReport\mxd\SiteMap_2011.mxd - 5/16/2011 @ 8:20:03 AM



NOTE:

1. TOPOGRAPHY BASED ON 2/6/04 AERIAL PHOTOGRAPH.
2. ALL ELEVATIONS BASED ON MSL.
3. THE CADD FILE ENTITLED PORTLAND 2005 UPDATED 2-21- CREATED BY HOLCIM (US) INC. WAS UTILIZED AS THE BAS
4. GROUNDWATER CONTOURS BASED ON MARCH 23, 2015 GR ELEVATION DATA.
5. MONITORING WELLS MW-6, MW-8, AND MW-10 WERE ABAI APRIL 7, 2009; THEREFORE, GROUNDWATER LEVELS ARE U

HOLCIM (US) INC.
PORTLAND PLANT, FLORENCE, COLOR
MARCH 2015 GROUNDWATER MONITORIN

GROUNDWATER CONTOUR

ARCADIS

Figure 3
Potassium to Sodium Ratio Time Series Graph
Holcim (US) Inc.
Florence, CO

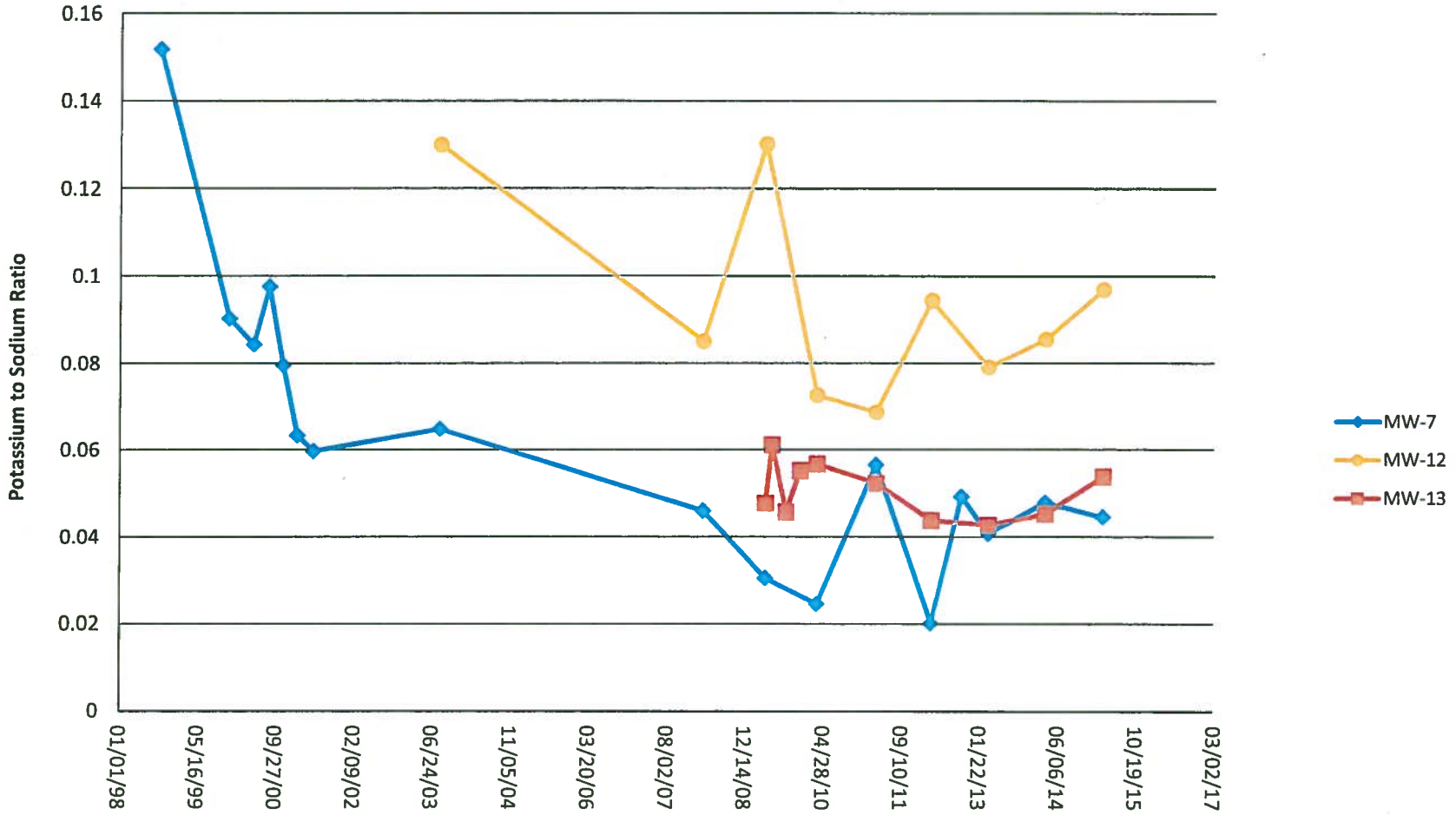


Figure 4
Total Dissolved Solids Time Series Graph
Holcim (US) Inc.
Florence, CO

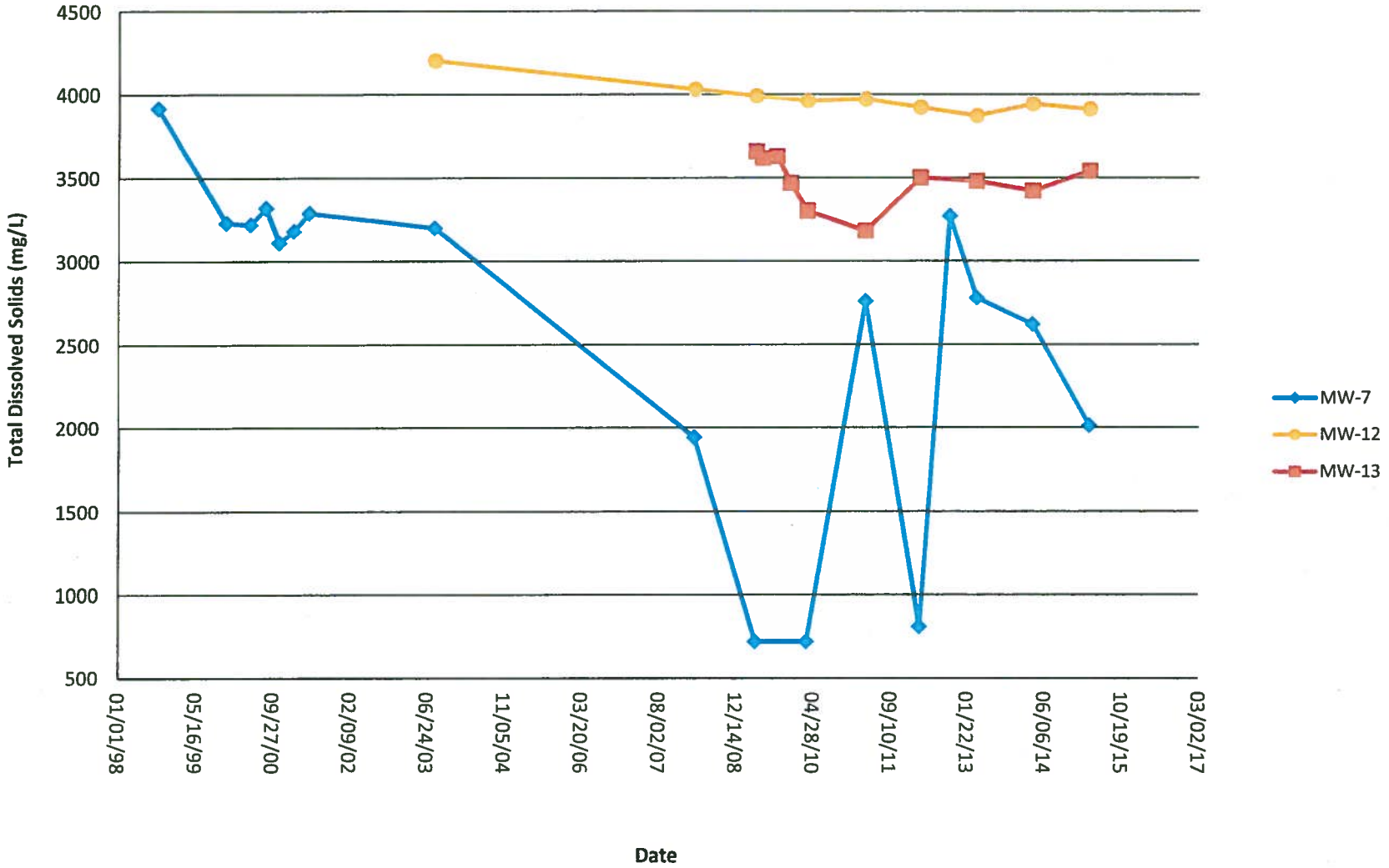


Figure 5
Sulfate Time Series Graph
Holcim (US) Inc.
Florence, CO

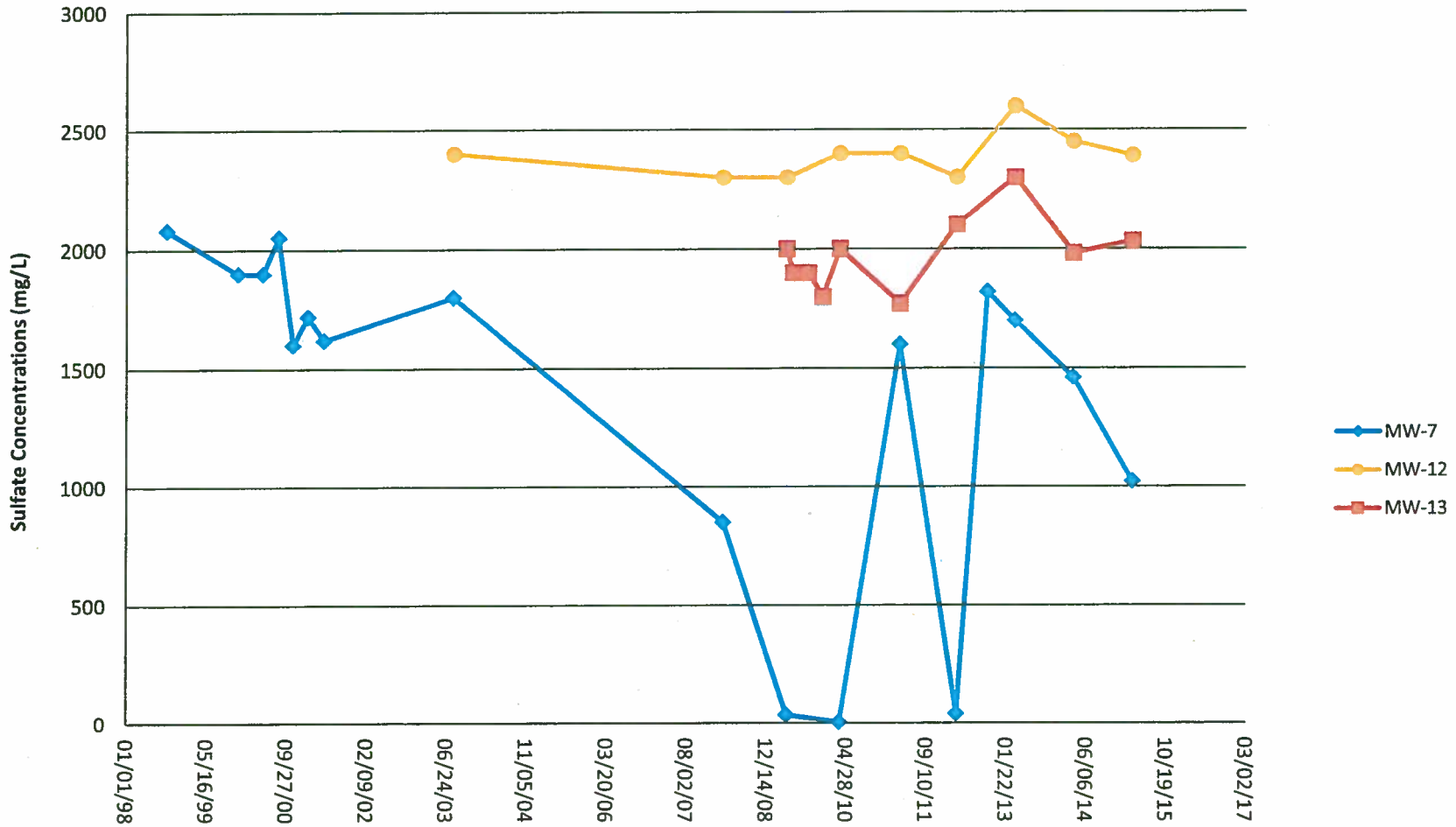
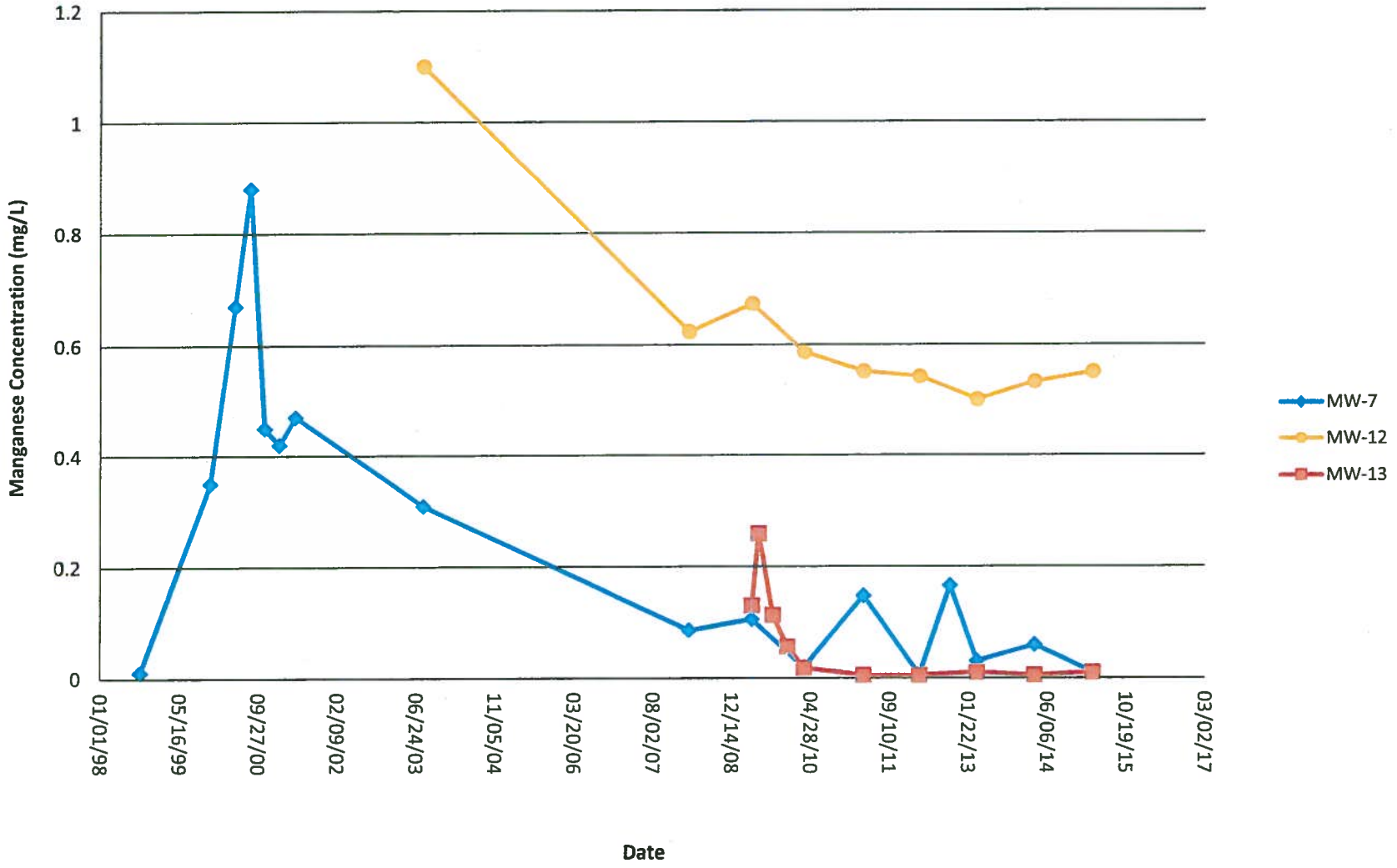


Figure 6
Manganese Time Series Graph
Holcim (US) Inc.
Florence, CO



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Appendix A

Proposed NPLs Letter and DRMS Approval Letter

Portland Plant

Holcim

Holcim (US) Inc.
3500 Highway 120
Florence, CO 81226

Phone 719 784 6325
Fax 719 784 3470
www.holcim.com/us

February 17, 2009

Mr. Berhan Keffelew
Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

Re: Proposed Groundwater Monitoring Plan, DRMS Permit M-1977-344

Dear Mr. Keffelew,

The purpose of this groundwater monitoring plan (GMP) is to fulfill the requirements of Technical Revision #6 (TR-06) to the Division of Mining, Reclamation and Safety Permit M-1977-344. This permit is for the Holcim (US) Portland Plant quarry located adjacent to the cement plant in Florence, Colorado.

The quarry is located on the north side of the Arkansas River. Groundwater in the area flows in a generally southerly direction toward the river. See Figure 2 attached from the March 2008 Groundwater Monitoring Report.

Holcim proposes annual sampling of the following monitoring wells:

- MW-12 - Background well located in the north end of the quarry.
- MW-7 - Compliance well located in the southwest side of the quarry.
- MW-13* - Compliance well to be located in the south side of the quarry in close proximity to Piezometer P-3 near the entrance to the quarry.

* Note, this well is proposed to be drilled in April 2009 and will be a 2" ID Schedule 40 PVC well approximately 50 feet in depth.

In addition, Holcim will continue monitoring water level in wells P-2, P-3, MW-9, and MW-11.

Holcim proposes abandoning the following wells:

- MW-6 - this well is located next to MW12 and is thus redundant and unnecessary.
- MW-8 - this well is located in an area that will be reclaimed, i.e. buried, in 2009.
- MW-10 - this well is too shallow to provide useful data.

The wells will be abandoned in accordance with Colorado rules and regulations governing well abandonment.

Holcim proposes monitoring for the following parameters:

- Total Dissolved Solids (TDS)
- Sulfate (SO4)
- Potassium (K)
- Sodium (Na)
- Iron (Fe)
- Manganese (Mn)

In addition, the following field parameters will be recorded.

- pH
- specific conductance
- temperature

Proposed standards are shown in table below.

TABLE 1 – PROPOSED STANDARDS

Parameter	Units	MW-7 Compliance[1]	MW-13 Compliance[2]
Total Dissolved Solids (TDS)	mg/L	3,918	TBD
Sulfate (SO4)	mg/L	2,080	TBD
Potassium (K)	mg/L	17	TBD
Sodium (Na)	mg/L	226	TBD
Iron (Fe)	mg/L	4.5	TBD
Manganese (Mn)	mg/L	0.88	TBD

[1] MW-7 Standards set based on nine (9) rounds of historical sampling.
[2] MW-13 Standards will be set based on sampling to be conducted in 2009-2010.

If you have any questions, please do not hesitate to call me at (719) 784-1118.

Sincerely,

Joel Bolduc
Environmental Manager

STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX: (303) 832-8106

COLORADO DIVISION OF RECLAMATION MINING & SAFETY

February 24, 2009

Mr. Joel Bolduc
Holcim, (US) Inc
3500 Highway 120
Florence, CO 81226

Re: Proposed Groundwater Monitoring Plan, DRMS Permit # M-1977-344 Portland Cement Plant.

Dear Mr. Joel

To fulfill the requirements of Technical Revision # 6, for permit # M-1977-344, Portland Cement quarry and plant, ground water monitoring plan, the Division sets the following monitoring and compliance wells . The site is located in Fremont County, North side of the Arkansas River. Groundwater flows in the area in a southerly direction towards the river.

Holcim will sample MW-7 WELL Compliance well, annually for the following parameters.

Total Dissolved Solids (TDS)	3,918 MG/L
Sulfate (SO4)	2,080 MG/L
Potassium (K)	17 MG/L
Sodium (Na)	226 MG/L
Iron (Fe)	4.5 MG/L
Manganese (Mn)	0.88 MG/L

In addition Holcium will drill in April 2009, compliance well MW-13 near the entrance to the quarry and will provide five quarters of data, so the Division will determine the appropriate parameters for the well. and set compliance parameters. In addition to MW-7, Holcim will also monitor MW-12, as a background well and provide the same parameters as MW-7 on an annual basis. When two consecutive parameters are exceeded more than 10%, during the reporting year for compliance well MV-7, Holcim will increase the frequency of monitoring to bi-yearly. If the upward trend continues, Holcim will submit an explanation and provide a remedial plan.

If you have questions, please contact me at 302 866-3567 xt 8129.

Sincerely,

Berhan Keffelew

STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX: (303) 832-8106

November 27, 2012

Joe Lamanna
Holcim (US), Inc.
3500 Highway 120
Florence, CO 81226

Re: Portland Limestone Quarry, Permit No. M-1977-344, Revised Groundwater Monitoring Plan

Mr. Lamanna:

The Division of Reclamation, Mining and Safety (DRMS) has reviewed your proposed standards for MW-13 (reference Holcim letter to DRMS dated July 7, 2010). The data collected from MW-13 is intended to supplement data collected from MW-7. The DRMS approved numeric protection levels (NPLs) for MW-7 on February 24, 2009.

The DRMS determines NPLs based on the five quarters of monitoring data initially collected from a proposed monitoring well, not from nearby or upgradient wells. The selected NPL is typically the larger of two values: 110 percent of the maximum concentration of a constituent of interest observed during the five quarters of monitoring; or the mean observed concentration of the constituent plus two standard deviations. Based on the five quarters of data provided by Holcim for MW-13, the DRMS has determined the following NPLs are appropriate:

Parameter	NPL for MW-13		Previously Approved NPL for MW-7
Total Dissolved Solids (TDS)	4,026 mg/ℓ	*	3,918 mg/ℓ
Sulfate (SO_4)	2,200 mg/ℓ	*	2,080 mg/ℓ
Potassium (K)	13 mg/ℓ	*‡	17 mg/ℓ
Sodium (Na)	274 mg/ℓ	*	226 mg/ℓ
Iron (Fe – dissolved)	0.13 mg/ℓ	‡	4.5 mg/ℓ
Manganese (Mn - dissolved	0.30 mg/ℓ	‡	0.88 mg/ℓ

* 110% of maximum observed value
‡ Mean observed value plus 2 standard deviations

Holcim will continue to monitor MW-12 (background) and MW-7 (west compliance well), and provide results for the above parameters on an annual basis. When observed parameters in MW-7 and/or MW-13 (east compliance well) exceed the NPL by more than 10 percent, Holcim will increase the monitoring frequency to semi-annually.

Because both MW-7 sodium and iron concentrations were observed above their respective NPLs in March 2012, the DRMS acknowledges that Holcim has committed to sampling MW-7 semi-annually and expects to see results from the second 2012 sampling event as soon as Holcim receives these results.

Sincerely,

Timothy A. Cazier, P.E.
Environmental Protection Specialist

Enclosure

cc: Tom Kaldenbach, DRMS
Berhan Keffelew, DRMS

MW-13 - Compliance Well												
	Apr-09	Jun-09	Sep-09	Dec-09	Mar-10	Mean	Max	110% Max‡	Std Dev	Mean + 2 SD		Holcim Proposed Std.*
TDS	3660	3620	3630	3470	3300	**3536**	**3660**	**4026**	**151.10**	3838.2		**4372**
Sulfate	2000	1900	1900	1800	2000	**1920**	**2000**	**2200**	**83.67**	2087.3		**2585**
Fe	0.04	0.07	0.02	0.02	0.11	**0.052**	**0.11**	0.12	**0.04**	**0.13**		**12**
Mn (diss)	0.13	0.26	0.113	0.056	0.018	**0.1154**	**0.26**	0.29	**0.09**	**0.30**		**0.69**
K (diss)	11.9	11.8	10.3	11	9.3	**10.86**	**11.90**	**13**	**1.09**	**13**		**17.0**
Na (diss)	249	193	225	199	164	**206**	**249**	**274**	**32.37**	270.7		**274**
pH	7.99	7.01	6.95	7	7.24	**7.238**	7.99	8.79	**0.44**	8.1		**?**

‡ 110% of Max MW-13 Results (DRMS Std)

* 110% of average background well results from 2009-2010

350 = DRMS NPL

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

February 25, 2015

Mr. Joe Lamanna
Holcim (US) Inc.
3500 Highway 120
Florence, CO 81226

Re: Portland Limestone Quarry, Permit No. M-1977-344;
Technical Revision Approval, Revision No. TR-10

Dear Mr. Lamanna:

On February 25, 2015 the Division of Reclamation, Mining and Safety approved the Technical Revision application submitted to the Division on October 20, 2014, addressing the following:

> *Proposal to remove sodium as groundwater quality parameter and replace with a K:Na ratio using 0.5 as a numeric protection limit.*

The terms of the Technical Revision No. 10 approved by the Division are hereby incorporated into Permit No. M-1977-344. All other conditions and requirements of Permit No. M-1977-344 remain in full force and effect.

The Division has reviewed this change for impacts to the financial warranty and has determined that this change does not require an increase to the current reclamation liability.

If you have any questions or need further information, please contact me at (303)866-3567 x8169.

Sincerely,

Timothy A. Cazier, P.E.
Environmental Protection Specialist

ec: Tom Kaldenbach, DRMS
Amy Eschberger, DRMS
DRMS file
Chris Peters, ARCADIS

ARCADIS

Appendix B

Proposed Groundwater Monitoring Plan

Portland Plant

Holcim

Holcim (US) Inc.
3500 Highway 120
Florence, CO 81226

Phone 719 784 6325
Fax 719 784 3470
www.holcim.com/us

July 7, 2010

Mr. Berhan Keffelew
Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

Re: Proposed Groundwater Monitoring Plan, DRMS Permit M-1977-344

Dear Mr. Keffelew,

The purpose of this groundwater monitoring plan (GMP) is to fulfill the requirements of Technical Revision #6 (TR-06) to the Division of Mining, Reclamation and Safety Permit M-1977-344. This permit is for the Holcim (US) Portland Plant quarry located adjacent to the cement plant in Florence, Colorado. The quarry is located on the north side of the Arkansas River. Groundwater in the area flows in a generally southerly direction toward the river.

Holcim proposes annual sampling of the following monitoring wells:

- MW-12 - Background well located in the north end of the quarry.
- MW-7 - Compliance well located in the southwest area of the quarry (approximately ¼ mile inside the quarry main entrance).
- MW-13 - Compliance well located in the southeast area of the quarry, approximately 100 feet north west of the intersection of State Highway 120 and Bear Creek (approximately ¼ mile east of the main quarry entrance).

In addition, Holcim will continue monitoring water level in wells P-2, P-3, MW-9, and MW-11.

Holcim proposes monitoring for the following parameters:

- Total Dissolved Solids (TDS)
- Sulfate (SO4)
- Potassium (K)
- Sodium (Na)
- Iron (Fe)
- Manganese (Mn)

In addition, the following field parameters will be recorded.

- pH
- specific conductance
- temperature

Existing and proposed standards are shown in the table below.

TABLE 1 – EXISTING AND PROPOSED STANDARDS

Parameter	Units	MW-7 Existing Standards[1]	MW-13 Proposed Standards[2]	MW-13 Maximum[3]	MW-12 Background[4]
Total Dissolved Solids	mg/L	3,918	4,372	3,660	3,975
Sulfate (SO4)	mg/L	2,080	2,585	2,000	2,350
Potassium (K)	mg/L	17	17	12	12
Sodium (Na)	mg/L	226	274	249	171
Iron (Fe)	mg/L	4.5	0.19	0.11	0.17
Manganese (Mn)	mg/L	0.88	0.69	0.26	0.63

[1] MW-7 Standards set based on nine rounds of historical sampling, standards approved in 2009.
[2] MW-13 Proposed Standards are 110% of the Maximum value obtained during 2009-2010 testing or 110% of the average of the background well, whichever is greater.
[3] MW-13 Maximum is the maximum result obtained during five quarters of testing 2009-2010.
[4] MW-12 Background is the average of the results obtained in 2009 and 2010.

If you have any questions, please do not hesitate to call me at (719) 288-1427.

Sincerely,

Joel Bolduc
Environmental Manager

ARCADIS

Appendix C

Groundwater Sampling Forms

ARCADIS

GROUNDWATER SAMPLING FORM

Page ___ of ___

Project No. B0025510.2015.00001 Well ID MW-7 Date 3/23/15

Project Name/Location HOLCIM Weather SUNNY · 53°F

Measuring Pt. Description TOC Screen Setting (ft-bmp) ___ Casing Diameter (in.) 4 Well Material X PVC ___ SS

Static Water Level (ft-bmp) 25.53 Total Depth (ft-bmp) 50.30 Water Column/ Gallons in Well ___

MP Elevation ___ Pump Intake (ft-bmp) ___ Purge Method: bladder ___ Centrifugal ___ Submersible ___ Other ___ Sample Method BAILER

Pump On/Off ___ Volumes Purged ___

Sample Time: Label 12:45 Start ___ End ___ Replicate/ Code No. ___ Sampled by DJ RUDER

* 9:55 PRE-PURGE SAMPLE * SALINITY

	Time	Minutes Elapsed	Rate (gpm) (mL/min)	Depth to Water (ft)	Gallons Purged	pH	Cond. (uMhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox ppt (mV)	Appearance Color	Appearance Odor	SP COND µs/cm
*	9:55	0	—	25.53	0	7.53	1869	LOW	1.26	14.0	1.22	CLEAR	NONE	2367
	10:05	10	—	—	8	7.69	1842	LOW	1.02	14.0	1.21	LT CLY	FAINT	2334
	10:15	20	—	—	16	7.75	1827	LOW	1.19	14.2	1.34	"	"	2304
	10:25	30	—	—	24	7.65	2121	MED	1.39	14.4	1.42	GRY	"	2667
DRY	10:36	35	—	—	22	7.63	2124	HIGH	1.41	14.2	1.39	GRY	"	2672
	* WELL DRY - ALLOW TO RECHARGE *													
	12:45	—	—	39.34	—	SAMPLE								

Constituents Sampled	Container	Number	Preservative

Well Casing Volumes

Gallons/Foot: 1" = 0.04; 1.25" = 0.06; 1.5" = 0.09; 2" = 0.16; 2.5" = 0.25; 3" = 0.37; 3.5" = 0.50; 4" = 0.65; 6" = 1.47

Well Information

Well Location: ___ Well Locked at Arrival: (Yes) / No

Condition of Well: ___ Well Locked at Departure: (Yes) / No

Well Completion: Flush Mount / (Stick Up) Key Number To Well: ___

ARCADIS

GROUNDWATER SAMPLING FORM

Page ___ of ___

Project No. B0025510.2015.00001 Well ID MW-12 Date 3/23/15

Project Name/Location HOLCIM Weather SUNNY - 60°F

Measuring Pt. Description TOC Screen Setting (ft-bmp) ___ Casing Diameter (in.) 2 Well Material X PVC ___ SS

Static Water Level (ft-bmp) 96.91 Total Depth (ft-bmp) 150.30 Water Column/ Gallons in Well ___

MP Elevation ___ Pump Intake (ft-bmp) ___ Purge Method: bladder ___ Centrifugal ___ Submersible ___ Other ___ Sample Method BAILER

Pump On/Off ___ Volumes Purged ___

Sample Time: Label 11:45 Start ___ End ___ Replicate/ Code No. (DUPLICATE-1) Sampled by DJ RUBER

SALWTR

Time	Minutes Elapsed	Rate (gpm) (mL/min)	Depth to Water (ft)	Gallons Purged	pH	Cond. (µMhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox ppt (mV)	Appearance Color	Appearance Odor	SP COND µs/cm
11:00	0	—	96.91	0	6.67	3145	LGW	1.93	14.2	2.11	CLEAR	NONE	3959
11:15	15	—	—	9	6.70	3042	"	1.39	14.2	2.03	TAN	"	3900
11:30	30	—	—	18	6.72	3083	MED	1.34	14.2	2.06	"	"	3896
11:45	45	—	—	27	6.74	3085	"	1.36	14.1	2.09	"	"	3893

3/23/15

Constituents Sampled	Container	Number	Preservative

Well Casing Volumes

Gallons/Foot					
	1" = 0.04	1.5" = 0.09	2.5" = 0.25	3.5" = 0.50	6" = 1.47
	1.25" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	

Well Information

Well Location: ___ Well Locked at Arrival: (Yes) / No

Condition of Well: ___ Well Locked at Departure: (Yes) / No

Well Completion: Flush Mount / (Stick Up) Key Number To Well: ___

ARCADIS

GROUNDWATER SAMPLING FORM

Page ___ of ___

Project No. B0025510.2015.00001 Well ID MW-13

Date 3/23/15

Project Name/Location HOLCIM

Weather SUNNY, 60°F

Measuring Pt. Description TOC

Screen Setting (ft-bmp) ___

Casing Diameter (in.) 2

Well Material X PVC ___ SS

Static Water Level (ft-bmp) 15.95

Total Depth (ft-bmp) 31.95

Water Column/ Gallons in Well ___

MP Elevation ___

Pump Intake (ft-bmp) ___

Purge Method: bladder ___ Centrifugal ___ Submersible ___ Other ___

Sample Method BAILER

Pump On/Off ___

Volumes Purged ___

Sample Time: Label 12:20 Start ___ End ___

Replicate/ Code No. ___

Sampled by DJ RUDER

Time	Minutes Elapsed	Rate (gpm) (mL/min)	Depth to Water (ft)	Gallons Purged	pH	Cond. (µMhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox (mV)	Salinity ppt	Appearance Color	Appearance Odor	SP COND µs/cm³
12:00	0	—	15.95	0	6.91	2951	LOW	1.77	14.2		1.97	CLEAR	NONE	3715
12:06	6	—	—	5.5	6.97	2930	MED	1.38	14.1		1.96	TAN	"	3701
12:12	12	—	—	11	6.97	2938	"	1.23	14.1		1.97	"	"	3713
12:20	20	—	—	16	6.98	2941	"	1.26	14.1		1.97	"	"	3714

3/23/15

Constituents Sampled	Container	Number	Preservative

Well Casing Volumes

Gallons/Foot: 1" = 0.04; 1.25" = 0.06; 1.5" = 0.09; 2" = 0.16; 2.5" = 0.26; 3" = 0.37; 3.5" = 0.50; 4" = 0.65; 6" = 1.47

Well Information

Well Location: ___

Condition of Well: ___

Well Completion: Flush Mount / Stick Up

Well Locked at Arrival: Yes / No

Well Locked at Departure: Yes / No

Key Number To Well: ___

ARCADIS

Appendix D

Laboratory Analytical Results Report

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

Analytical Report

April 03, 2015

Report to:
Lauri Yusko
ARCADIS
1687 Cole Blvd.
Suite 200
Lakewood, CO 80401

cc: Treck Hohman

Bill to:
Accounts Payable
ARCADIS
630 Plaza Drive
Suite 600
Highlands Ranch, CO 80129

Project ID: B0025510.2015.00001
ACZ Project ID: L23452

Lauri Yusko:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 25, 2015. This project has been assigned to ACZ's project number, L23452. 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 L23452. 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 September 30, 2015. 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.

Sue Webber has reviewed and approved this report.

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

Inorganic Analytical Results

ARCADIS
Project ID: B0025510.2015.00001
Sample ID: MW-7 PRE-PURGE

ACZ Sample ID: ***L23452-01***
Date Sampled: *03/23/15 09:55*
Date Received: *03/25/15*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Sodium, dissolved	M200.7 ICP	1	248		*	mg/L	0.2	1	03/31/15 13:31	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Chloride	SM4500Cl-E	10	78			mg/L	5	20	04/02/15 13:35	bsu
Lab Filtration (0.45um filter)	SOPWC050	1							04/02/15 12:22	enb
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							03/26/15 13:54	mfm

ARCADIS
Project ID: B0025510.2015.00001
Sample ID: MW-7

ACZ Sample ID: ***L23452-02***
Date Sampled: *03/23/15 12:45*
Date Received: *03/25/15*
Sample Matrix: *Ground Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP								03/27/15 12:12	aeb

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	2	135		*	mg/L	0.2	1	03/31/15 13:34	jjc
Iron, dissolved	M200.7 ICP	2		U		mg/L	0.04	0.1	03/31/15 13:34	jjc
Iron, total	M200.7 ICP	1	2.37			mg/L	0.02	0.05	03/28/15 15:05	aeb
Magnesium, dissolved	M200.7 ICP	2	144		*	mg/L	0.4	2	03/31/15 13:34	jjc
Manganese, dissolved	M200.7 ICP	2		U		mg/L	0.01	0.05	03/31/15 13:34	jjc
Potassium, dissolved	M200.7 ICP	2	11			mg/L	0.4	2	03/31/15 13:34	jjc
Sodium, dissolved	M200.7 ICP	2	247		*	mg/L	0.4	2	03/31/15 13:34	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	460			mg/L	2	20	03/30/15 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Total Alkalinity		1	460		*	mg/L	2	20	03/30/15 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-4.8			%			04/03/15 10:54	calc
Sum of Anions			33			meq/L			04/03/15 10:54	calc
Sum of Cations			30			meq/L			04/03/15 10:54	calc
Chloride	SM4500Cl-E	1	70.1			mg/L	0.5	2	04/02/15 13:26	bsu
Hardness as CaCO3	SM2340B - Calculation		930			mg/L	2	8	04/03/15 10:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/02/15 12:24	enb
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							03/26/15 13:54	mfm
Residue, Filterable (TDS) @180C	SM2540C	1	2010			mg/L	10	20	03/27/15 14:33	abd
Sulfate	D516-02/-07 - Turbidimetric	50	1020		*	mg/L	50	250	04/02/15 15:28	bsu
TDS (calculated)	Calculation		1910			mg/L			04/03/15 10:54	calc
TDS (ratio - measured/calculated)	Calculation		1.05						04/03/15 10:54	calc

ARCADIS
Project ID: B0025510.2015.00001
Sample ID: MW-12

ACZ Sample ID: ***L23452-03***
Date Sampled: *03/23/15 11:45*
Date Received: *03/25/15*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	2	499		*	mg/L	0.2	1	03/31/15 13:37	jjc
Iron, dissolved	M200.7 ICP	2	0.74			mg/L	0.04	0.1	03/31/15 13:37	jjc
Magnesium, dissolved	M200.7 ICP	2	302		*	mg/L	0.4	2	03/31/15 13:37	jjc
Manganese, dissolved	M200.7 ICP	2	0.55			mg/L	0.01	0.05	03/31/15 13:37	jjc
Potassium, dissolved	M200.7 ICP	2	12.6			mg/L	0.4	2	03/31/15 13:37	jjc
Sodium, dissolved	M200.7 ICP	2	131		*	mg/L	0.4	2	03/31/15 13:37	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	348			mg/L	2	20	03/30/15 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Total Alkalinity		1	348		*	mg/L	2	20	03/30/15 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.8			%			04/03/15 10:54	calc
Sum of Anions			58			meq/L			04/03/15 10:54	calc
Sum of Cations			56			meq/L			04/03/15 10:54	calc
Chloride	SM4500Cl-E	1	31.6			mg/L	0.5	2	04/02/15 13:26	bsu
Hardness as CaCO3	SM2340B - Calculation		2490			mg/L	2	8	04/03/15 10:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/02/15 12:26	enb
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							03/26/15 13:54	mfm
Residue, Filterable (TDS) @180C	SM2540C	1	3910			mg/L	10	20	03/27/15 14:34	abd
Sulfate	D516-02/-07 - Turbidimetric	120	2390		*	mg/L	120	600	04/02/15 16:04	bsu
TDS (calculated)	Calculation		3580			mg/L			04/03/15 10:54	calc
TDS (ratio - measured/calculated)	Calculation		1.09						04/03/15 10:54	calc

ARCADIS
Project ID: B0025510.2015.00001
Sample ID: MW-13

ACZ Sample ID: ***L23452-04***
Date Sampled: *03/23/15 12:20*
Date Received: *03/25/15*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	2	513		*	mg/L	0.2	1	03/31/15 13:46	jjc
Iron, dissolved	M200.7 ICP	2		U		mg/L	0.04	0.1	03/31/15 13:46	jjc
Magnesium, dissolved	M200.7 ICP	2	219		*	mg/L	0.4	2	03/31/15 13:46	jjc
Manganese, dissolved	M200.7 ICP	2		U		mg/L	0.01	0.05	03/31/15 13:46	jjc
Potassium, dissolved	M200.7 ICP	2	8.4			mg/L	0.4	2	03/31/15 13:46	jjc
Sodium, dissolved	M200.7 ICP	2	156		*	mg/L	0.4	2	03/31/15 13:46	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	332			mg/L	2	20	03/30/15 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Total Alkalinity		1	332		*	mg/L	2	20	03/30/15 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.0			%			04/03/15 10:54	calc
Sum of Anions			50			meq/L			04/03/15 10:54	calc
Sum of Cations			51			meq/L			04/03/15 10:54	calc
Chloride	SM4500Cl-E	1	29			mg/L	0.5	2	04/02/15 13:27	bsu
Hardness as CaCO3	SM2340B - Calculation		2180			mg/L	2	8	04/03/15 10:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/02/15 12:28	enb
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							03/26/15 13:54	mfm
Residue, Filterable (TDS) @180C	SM2540C	1	3540			mg/L	10	20	03/27/15 14:36	abd
Sulfate	D516-02/-07 - Turbidimetric	120	2030		*	mg/L	120	600	04/02/15 16:06	bsu
TDS (calculated)	Calculation		3160			mg/L			04/03/15 10:54	calc
TDS (ratio - measured/calculated)	Calculation		1.12						04/03/15 10:54	calc

ARCADIS
Project ID: B0025510.2015.00001
Sample ID: DUPLICATE-1

ACZ Sample ID: ***L23452-05***
Date Sampled: *03/23/15 00:00*
Date Received: *03/25/15*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	2	503		*	mg/L	0.2	1	03/31/15 13:50	jjc
Iron, dissolved	M200.7 ICP	2	0.54			mg/L	0.04	0.1	03/31/15 13:50	jjc
Magnesium, dissolved	M200.7 ICP	2	303		*	mg/L	0.4	2	03/31/15 13:50	jjc
Manganese, dissolved	M200.7 ICP	2	0.55			mg/L	0.01	0.05	03/31/15 13:50	jjc
Potassium, dissolved	M200.7 ICP	2	12.6			mg/L	0.4	2	03/31/15 13:50	jjc
Sodium, dissolved	M200.7 ICP	2	130		*	mg/L	0.4	2	03/31/15 13:50	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	346			mg/L	2	20	03/30/15 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/30/15 0:00	abd
Total Alkalinity		1	346		*	mg/L	2	20	03/30/15 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.9			%			04/03/15 10:54	calc
Sum of Anions			57			meq/L			04/03/15 10:54	calc
Sum of Cations			56			meq/L			04/03/15 10:54	calc
Chloride	SM4500Cl-E	1	32.2			mg/L	0.5	2	04/02/15 13:27	bsu
Hardness as CaCO3	SM2340B - Calculation		2500			mg/L	2	8	04/03/15 10:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/02/15 12:30	enb
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							03/26/15 13:54	mfm
Residue, Filterable (TDS) @180C	SM2540C	1	3870			mg/L	10	20	03/27/15 14:38	abd
Sulfate	D516-02/-07 - Turbidimetric	120	2340		*	mg/L	120	600	04/02/15 16:07	bsu
TDS (calculated)	Calculation		3530			mg/L			04/03/15 10:54	calc
TDS (ratio - measured/calculated)	Calculation		1.10						04/03/15 10:54	calc

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

Inorganic Reference

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: http://www.acz.com/public/extquallist.pdf

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ACZ Project ID: ***L23452***

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381165													
WG381165PBW1	PBW	03/30/15 14:56				U	mg/L		-20	20			
WG381165LCSW3	LCSW	03/30/15 15:13	WC150318-8	820		817	mg/L	100	90	110			
WG381165LCSW6	LCSW	03/30/15 17:56	WC150318-8	820		833	mg/L	102	90	110			
WG381165PBW2	PBW	03/30/15 18:02				U	mg/L		-20	20			
L23452-02DUP	DUP	03/30/15 19:38			460	443	mg/L				4	20	
L23466-02DUP	DUP	03/30/15 21:16			178	190	mg/L				7	20	
WG381165LCSW9	LCSW	03/30/15 21:33	WC150318-8	820		820	mg/L	100	90	110			
WG381165PBW3	PBW	03/30/15 21:40				U	mg/L		-20	20			
WG381165LCSW12	LCSW	03/31/15 1:11	WC150318-8	820		835	mg/L	102	90	110			
WG381165PBW4	PBW	03/31/15 1:18				U	mg/L		-20	20			
WG381165LCSW15	LCSW	03/31/15 4:50	WC150318-8	820		842	mg/L	103	90	110			

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	100		99.58	mg/L	100	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.3	0.3			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	67.98862		67.72	mg/L	100	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	67.98862	272	327.7	mg/L	82	85	115			M3
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	67.98862	272	328.2	mg/L	83	85	115	0	20	M3

Chloride SM4500Cl-E

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381371													
WG381371ICB	ICB	04/02/15 10:09				U	mg/L		-1.5	1.5			
WG381371ICV	ICV	04/02/15 10:09	WI141103-1	54.835		57.45	mg/L	105	90	110			
WG381371LFB2	LFB	04/02/15 11:06	WI141209-1	30		30.75	mg/L	103	90	110			
WG381371LFB1	LFB	04/02/15 13:26	WI141209-1	30		32.16	mg/L	107	90	110			
L23416-01AS	AS	04/02/15 13:26	WI141209-1	600	50	681	mg/L	105	90	110			
L23432-01DUP	DUP	04/02/15 13:26			61.9	61.03	mg/L				1	20	

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	2		1.981	mg/L	99	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.06	0.06			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	1.0001		1.026	mg/L	103	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	1.0001	.19	1.154	mg/L	96	85	115			
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	1.0001	.19	1.161	mg/L	97	85	115	1	20	

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ACZ Project ID: *L23452*

Iron, total M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381115													
WG381115ICV	ICV	03/28/15 13:55	II150227-2	2		1.984	mg/L	99	95	105			
WG381115ICB	ICB	03/28/15 14:01				U	mg/L		-0.06	0.06			
WG381059LRB	LRB	03/28/15 14:14				U	mg/L		-0.044	0.044			
WG381059LFB	LFB	03/28/15 14:17	II150325-4	1.0001		1.022	mg/L	102	85	115			
L23456-03LFM	LFM	03/28/15 15:17	II150325-4	1.0001	.29	1.345	mg/L	105	70	130			
L23456-03LFMD	LFMD	03/28/15 15:21	II150325-4	1.0001	.29	1.339	mg/L	105	70	130	0	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	100		100.78	mg/L	101	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.6	0.6			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	50.00339		48.74	mg/L	97	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	50.00339	286	325.9	mg/L	80	85	115			M3
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	50.00339	286	326.9	mg/L	82	85	115	0	20	M3

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	2		1.9955	mg/L	100	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.015	0.015			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	.499		.5026	mg/L	101	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	.499	.435	.9051	mg/L	94	85	115			
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	.499	.435	.9091	mg/L	95	85	115	0	20	

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	20		19.67	mg/L	98	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.6	0.6			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	99.93386		94.6	mg/L	95	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	99.93386	4.8	101.5	mg/L	97	85	115			
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	99.93386	4.8	101.9	mg/L	97	85	115	0	20	

Residue, Filterable (TDS) @180C SM2540C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381092													
WG381092PBW	PBW	03/27/15 14:20				U	mg/L		-20	20			
WG381092LCSW	LCSW	03/27/15 14:21	PCN48319	260		260	mg/L	100	80	120			
L23452-03DUP	DUP	03/27/15 14:35			3910	3850	mg/L				2	10	
L23526-01DUP	DUP	03/27/15 14:49			774	762	mg/L				2	10	

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ACZ Project ID: ***L23452***

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381197													
WG381197ICV	ICV	03/31/15 12:50	II150318-3	100		97.81	mg/L	98	95	105			
WG381197ICB	ICB	03/31/15 12:56				U	mg/L		-0.6	0.6			
WG381197LFB	LFB	03/31/15 13:08	II150325-4	100.0188		94.65	mg/L	95	85	115			
L23438-01AS	AS	03/31/15 13:15	II150325-4	100.0188	976	1023	mg/L	47	85	115			M3
L23438-01ASD	ASD	03/31/15 13:18	II150325-4	100.0188	976	1032	mg/L	56	85	115	1	20	M3

Sulfate D516-02/-07 - Turbidimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381394													
WG381394ICB	ICB	04/02/15 15:07				U	mg/L		-3	3			
WG381394ICV	ICV	04/02/15 15:07	WI150324-10	20		19.9	mg/L	100	90	110			
WG381394LFB	LFB	04/02/15 15:16	WI150302-1	10.01		9.8	mg/L	98	90	110			
L23452-03DUP	DUP	04/02/15 16:06			2390	2350	mg/L				2	20	
L23452-04AS	AS	04/02/15 16:06	SO4TURB	10.0000008	2030	1950	mg/L	-800	90	110			M3

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Inorganic Extended Qualifier Report

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ACZ Project ID: ***L23452***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L23452-01	WG381197	Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
L23452-02	WG381197	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381394	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381165	Total Alkalinity	SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
L23452-03	WG381197	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381394	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381165	Total Alkalinity	SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
L23452-04	WG381197	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381394	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381165	Total Alkalinity	SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.

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Inorganic Extended Qualifier Report

ARCADIS

ACZ Project ID: ***L23452***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L23452-05	WG381197	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381394	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381165	Total Alkalinity	SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.

No certification qualifiers associated with this analysis

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

Sample Receipt

ARCADIS
B0025510.2015.00001

ACZ Project ID: L23452
Date Received: 03/25/2015 10:13
Received By: ddp
Date Printed: 3/25/2015

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody 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 complete and accurate?	X		
7) Were any changes made to the Chain of Custody 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 match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits?	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		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
4367	1.1	13	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

L23452

CHAIN of CUSTODY

Report to:

Name: LAURI YUSKO	Address: 1687 COLE BLVD. SUITE 200 LAKEWOOD, CO. 80401
Company: ARCADIS-US	
E-mail: LAURI.YUSKO@ARCADIS-US.COM	Telephone: (303) 231-9115

Copy of Report to:

Name: TRECK HOHMAN	E-mail: TRECK.HOHMAN@ARCADIS-US.COM
Company: ARCADIS-US	Telephone: (720) 344-3255

Invoice to:

Name: ACCOUNTS PAYABLE	Address: 630 PLAZA DR. SUITE 100 HIGHLANDS RANCH, CO. 80129
Company: ARCADIS-US	
E-mail:	Telephone: (720) 344-3500

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? PLEASE CONTACT LAURI YUSKO — YES [ ] NO [X]

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 [X]

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

Sampler's Name: DJ RUDER Sampler's Site Information State CO Zip code 81226 Time Zone MT

*Sampler's Signature: [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 #: HOLCIM

PO#: B00255 10.2015.00001

Reporting state for compliance testing: COLORADO

Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	1-MW-7	2-MW-7	3-MW-12	4-MW-13	5-DUPLICATE			
MW-7 PRE-PURGE	3/23/15 9:55	GW	2	X							
MW-7	3/23/15 12:45	GW	4		X						
MW-12	3/23/15 11:45	GW	3			X					
MW-13	3/23/15 12:20	GW	3				X				
DUPLICATE-1	3/23/15 —	GW	3					X			

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

REMARKS

* ALL NECESSARY FILTERING AND PRESERVATIVES DONE BY ACZ.

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

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
[signature]	3/23/15 18:20	[signature]	3/25/15 10:13

L23452 Chain of Custody

L23452-150403 4106

White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.

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

Bottle Order Packing List

Account: ARCADIS/ARCADIS
Bottle Order: BO33055

Bill to Account: Bill to ACZ
Ship Date Requested: 03/11/2015
Request Placed at: 03/10/2015 10:08
Service Requested: UPS Ground

Sampling supplies

PACK	Qty	ACZ ID	Type	Description
☐	2	COC	Chain of Custody	Chain of Custody, 1 for 10 samples.
☐	2	SEAL	Custody Seal	Custody seals for cooler, two for each cooler.
☐	1	RETURN	Return Address	Return Address label, one for each cooler.
☐	15	LABELS	Sample Labels	ACZ supplied labels for sample containers

ACZ Coolers

PACK	Qty	ACZ ID	Size	Weight	UPS Tracking Number
☐	1	4367	Large	10	1Z8101300375045750

Quote number: 1-MW-7
Sample Quantity: 1 ☐

#1 - MW-7
ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
☐	1	GREEN	125 ML	Filtered/Nitric	Metals (dissolved except ICPMS) - This is a filtered sample. Completely fill container.
☐	1	WHITE	250 ML	Filtered	Wet chemistry (dissolved) - This is a filtered sample. Completely fill container.

Quote number: 2-MW-7
Sample Quantity: 1 ☐

#2 - MW-7
ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
☐	1	GREEN	125 ML	Filtered/Nitric	Metals (dissolved except ICPMS) - This is a filtered sample. Completely fill container.
☐	1	RAW	500 ML	Raw	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.
☐	1	RED	250 ML	Raw/Nitric	Metals (total except ICPMS) - Do not overfill as there is Nitric Acid in the bottle.
☐	1	WHITE	250 ML	Filtered	Wet chemistry (dissolved) - This is a filtered sample. Completely fill container.

Prepared By/Date: _____ _____

SW

ACZ Laboratories, Inc.

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

Bottle Order Packing List

Account: ARCADIS/ARCADIS
Bottle Order: BO33055

Bill to Account: Bill to ACZ
Ship Date Requested: 03/11/2015
Request Placed at: 03/10/2015 10:08
Service Requested: UPS Ground

Quote number: 3-MW-12
Sample Quantity: 1

#3 - MW-12
ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
	1	GREEN	125 ML	Filtered/Nitric	Metals (dissolved except ICPMS) - This is a filtered sample. Completely fill container.
	1	RAW	500 ML	Raw	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.
	1	WHITE	250 ML	Filtered	Wet chemistry (dissolved) - This is a filtered sample. Completely fill container.

Quote number: 4-MW-13
Sample Quantity: 1

#4 - MW-13
ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
	1	GREEN	125 ML	Filtered/Nitric	Metals (dissolved except ICPMS) - This is a filtered sample. Completely fill container.
	1	RAW	500 ML	Raw	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.
	1	WHITE	250 ML	Filtered	Wet chemistry (dissolved) - This is a filtered sample. Completely fill container.

Quote number: 5-DUPLICATE
Sample Quantity: 1

#5 - Duplicate
ACZ is responsible for necessary sample filtering

PACK	Qty	Type	Size	Filter/Raw/Preserve	Instructions
	1	GREEN	125 ML	Filtered/Nitric	Metals (dissolved except ICPMS) - This is a filtered sample. Completely fill container.
	1	RAW	500 ML	Raw	Wet Chemistry (analyses that do not require preservative or filtration) - Completely fill container.
	1	WHITE	250 ML	Filtered	Wet chemistry (dissolved) - This is a filtered sample. Completely fill container.

Prepared By/Date: _____

SW

ARCADIS

Appendix E

Historical Groundwater Monitoring Data (Tables E.1 through E.4)

Table E.1
Historical Groundwater Analytical Results from 1998 to 2001

Holcim (US) Inc.
Florence, CO

Analyte	9/11/1998		11/30/1999		5/5/2000			8/11/2000			11/7/2000			2/8/2001			5/21/2001			
Field Parameters	**MW-6**	**MW-7**	**MW-6**	**MW-7**	**MW-7**	**MW-8**	**MW-9**	**MW-7**	**MW-8**	**MW-9**	**MW-7**	**MW-8**	**MW-9**	**MW-7**	**MW-8**	**MW-9**	**MW-7**	**MW-8**	**MW-9**	**MW-10**
pH(pH units)	6.93	6.94	7.09	6.65	7.26	7.4	7.34	6.7	6.69	6.68	6.65	6.78	6.74	6.95	6.98	6.94	6.72	6.86	6.84	6.77
Conductivity (umhos)	1450	1520	3500	4170	3030	2850	3010	3310	3340	3840	3040	3320	3690	3290	3480	2420	3180	3580	3650	3740
Temperature (°F)	60	62	59	59	65.4	62	62.3	65.1	68.3	76.3	58.8	58.5	62	59	54.9	55.2	63.7	57.4	63.2	58.5
Laboratory Results																				
pH(pH units)	6.98	7	7.61	7.31	7.45	7.8	7.7	6.9	7.1	7	6.9	7	6.9	7	7.2	7.2	7.1	7	7.1	7
Conductivity (umhos)	3120	2750	4080	3390	3490	3380	3680	3330	3290	3520	3090	3110	3360	3310	3260	3490	3270	3170	3470	3380
Total Dissolved Solids	3229	3918	3660	3230	3220	3200	3560	3320	3310	3630	3110	3120	3480	3180	3320	3640	3290	3310	3630	3460
Chloride	29.7	32.6	57.9	26.5	29.4	28	33.4	25.9	27.6	31.5	27.2	26.5	30.6	27.6	27.7	31	28.1	26.4	30.1	28
Sulfate	1880	2080	2200	1900	1900	2300	2500	2050	2120	2330	1600 c	1670 c	1840 c	1720 c	1810 c	2040 c	1620 c	1800 c	1990 c	1740 c
Alkalinity	334	268	440	310	3280 b	2400 b	2840 b	312	221	256	333	224	254	331	288	259	337	270	268	399
Carbonate	0	0	1 U	1 U	1 U	1 U	1 U	5 U	5 U	5 U	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bicarbonate	419	326	537	378	4000 b	2930 b	3460 b	312	221	256	333	224	254	331	288	259	337	270	268	399
Fluoride	1.4	1.6	0.9	0.8	0.8	1.1	1.1	0.98	1.2	1.4	0.83	1	1.3	0.8	0.95	1.2	0.91	1.2	1.3	0.89
Ammonia-N	0.05 U	0.05 U	0.88	0.52	1.17	0.44	0.67	0.9	0.45	0.64	0.72	0.53	0.71	0.36	0.57	0.14	0.6	0.49	0.35	0.7
Nitrate	2.3	0.4	2.24	0.05 U	0.05 U	0.05 U	0.05 U	0.1 U	0.2	0.1 U	0.1 U	0.2	0.15	0.1 U	0.1 U	0.12	0.1 U	0.1 U	0.13	12.5 Q
Potassium	11	17	15	13	15.6	9.7	9.2	16	9.9	10	12.8	9.2	9.3	11.2	8.1	8.6	11.1	9	7.7	22.7
Sodium	188	112	315	144	185	131	134	164	164	143	161	158	136	177	200	148	186	173	135	198
Arsenic	0.005 U	0.005 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony	0.2 U	0.2 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Barium	0.1 U	0.1 U	0.44	0.05	0.02	0.03	0.02	0.018	0.028	0.022	0.023	0.021	0.018	0.02	0.028	0.017	0.021	0.02	0.013	0.019
Beryllium	0.01 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cadmium	0.01 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexavalent Chromium	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Lead	0.005 U	0.005 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Mercury	0.005 U	0.005 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.019	0.036	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Selenium	0.005 U	0.005 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.005 U	0.019	0.005 U	0.0052	0.012	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.077
Silver	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Thallium	0.1 U	0.1 U	0.1 U	0.1 U	0.12	0.14	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aluminum	0.53	0.56	6.52	1.6	0.54	0.05	0.05 U	0.1 U	0.1 U	0.1 U	0.18	0.1 U	0.1 U	0.1 U	0.2	0.1 U	0.14	0.1 U	0.1 U	0.1 U
Iron	0.05 U	0.05 U	5.45	2.14	1.69	0.03	0.36	3.6	0.69	1.2	1.5	1.7	0.9	1.1	1.6	0.54	2.9	2.3	0.67	2.7
Magnanese	0.01 U	0.01 U	0.11	0.35	0.67	0.21	0.5	0.88	0.9	0.9	0.45	0.47	0.65	0.42	0.54	0.62	0.47	0.41	0.66	0.32
Magnesium	26.3	39.6	276	177	185	178	225	210	192	242	193	186	244	180	170	234	187	176	224	199
Calcium	198	379	333	457	456	495	517	491	480	503	467	490	538	417	422	491	437	455	477	436

Table E-2
Groundwater Quality Data for Monitoring Wells MW-6 through MW-12 - 2003 through 2004

Holcim (US) Inc.
Florence, CO

Analyte		8/7/2003 - 8/8/2003							1/16/2004	4/9/2004	7/9/2004
Field Parameters	**MCL**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-10**	**MW-11**	**MW-12**	**MW-10**	**MW-10**	**MW-10**
pH (std. units)	6.5-8.5[b]	6.9	7.2	7.1	7.4	7.4	7.5	7.2	6.6	7.7	6.7
Conductivity (µs/cm)	NA	3430	2260	2470	2620	2950	3070	3450	4650	4000	3530
Temperature (°C)	NA	21	18	18	18	21	23	22	11	13	22
Laboratory Results	**MCL**										
pH (std. units)	6.5-8.5[b]	6.8	7.0	7.2	7.1	7.1	7.2	7.0	6.8	6.8	7.1
Conductivity (µs/cm)	NA	3900 J	3200 J	3100 J	3400 J	3200 J	3300 J	3800 J	3800 J	4200	3900 J
Total Dissolved Solids	1.5 x bkg	4400	3200	3300	3600	3300	3500	4200	4000	3800 J	3400
Chloride	250[b]	37.0 J	25 J	26.0 J	28.0	27 J	28 J	37 J	22 J	19 J	27 J
Sulfate	250[b]	**2500** J,Q	**1800** J,Q	**1800** J,Q	**2100** J,Q	**1800** J,Q	**2100** J,Q	**2400** J,Q	**2300** J,Q	**2200** Q	**2000** J,Q
Alkalinity	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5.0 U	5.0 U	5.0 U
Hardness, as $CaCO_3$	NA	2800	1900	1900	2300	1900	1900	2500	2800	2400	2000
Fluoride	2.0[c]	0.57 J	0.89 J	1.2 J	1.5 J	0.9 J	1.1 J	**4.4** J	0.73	0.68 J	0.74 J
Ammonia	NA	0.1 U	0.31	0.74	0.60	0.56	0.37	0.28	0.10 U	0.10 U	0.10
Nitrate as N	10.0[a]	2.9	0.1 U	0.005 B	0.015 B	6.8	0.063	0.002 U	**100**	**84**	28 Q
Nitrite	3.3[e]	NA	NA	NA	NA	NA	NA	NA	0.15	0.58 Q	0.041
Potassium	NA	16	11	8.9	9.1	22	26	26	28	26	23
Sodium	NA	130	170	170	130	180	200	200	130 J	130	210 J
Arsenic	0.05[a]	0.006	0.0017 B	0.0016 B	0.005 U	0.0048 B	0.0035 B	0.0035 B	0.016	0.013	0.0028 B
Antimony	0.006[a]	0.002 U	0.00005 B	0.0012 B	0.00063 B	0.000097 B	0.0011 B	0.0029	0.00037 B, J	0.00033 B	0.00021 B
Barium	2.0[a]	0.011 J	0.034 J	0.024 J	0.017 J	0.02 J	0.048 J	0.099 J	0.028	0.026 J	0.016
Beryllium	0.004[a]	*0.005* U	*0.005* U	*0.005* U	*0.005* U	*0.005* U	*0.005* U	*0.005* U	*0.0050* U	*0.0050* U	*0.00066* B
Cadmium	0.005[a]	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00036 B	0.0050 U	0.0050 U	0.0050 U
Chromium	0.01[c]	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.012**	**0.017**	0.010 U	0.010 U	0.010 U
Lead	0.05[a]	0.0002 B	0.0012	0.00043 B	0.00018 B	0.00041 B	0.0015	0.0052	0.00099 B	0.00031 B	0.00013 B
Mercury	0.002[a]	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.1[a]	0.054	0.04 U	0.019 B	0.013 B	0.013 B	0.032 B	0.071	0.017 B	0.010 B	0.018 B
Selenium	0.02[c]	**0.32**	0.0015 B	0.0055	0.002 B	**0.21**	**0.021**	0.0086	**0.77**	**0.76**	**0.20**
Silver	0.05[a]	0.001 U	0.000019 B	0.001 U	0.001 U	0.001 U	0.00003 B	0.000078 B	0.000020 B	0.000036 B	0.0010 U
Thallium	0.002[a]	0.00032 B,J	0.001	0.000076 B,J	0.000032 B,J	0.000074 B,J	0.000088 B,J	0.00015 B,J	0.00016 B	0.00016 BJ	0.00017 B
Vanadium	0.1[c]	0.005 U	0.003 B	0.005 U	0.005 U	0.005 U	0.003 B	0.011	0.0022 B	0.0050 U	0.0050 U
Zinc	2.0[c]	0.027	0.0087 B	0.0083 B	0.0058 B	0.007300 B	0.016	0.027	0.016	0.011	0.0065 B,J
Aluminum	5.0[c]	0.17 J	1.1 J	0.2 J	0.078 B,J	0.25 J	2.6 J	**11** J	0.21 J	0.12	0.046 B,J
Iron	0.3[b]	0.061 B	**4.5**	**1.7**	**0.32**	**1.0**	**2.1**	**8.50**	**0.35**	0.19	0.021 B
Manganese	0.05[b]	0.0046 B	**0.31**	**0.29**	**0.61**	**0.18**	**0.2**	**1.1**	**0.082**	**0.053**	**0.12**
Magnesium	NA	400	190	180	250	210	200	330	290	260	210
Calcium	NA	480	440	450	500	430	430	470	650	540 L	450 J

Note:

U - indicates that the analyte was analyzed for but not detected. Detection limit is numeric value shown.

Q - indicates elevated reporting limit due to high analyte level.

All units are in mg/L unless noted otherwise.

NA indicates not available.

Bolded values=MCL exceeded, italicized values=reporting limit greater than MC

B - Estimated result. Result is less than the reporting limit.

a) MCL source: Table 1 Human Health Standards, Regulation 41.

b) MCL source: Table 2 Secondary Drinking Water Standards, Regulation 41.

c) MCL source: Table 3 Agricultural Standards for Groundwater, Regulation 41.

d) MCL for nitrate is 10.0 mg/L as N

e) MCL for nitrite is 1.0 mg/L as N

J - Method blank contamination. The associated method blank contains the target analyte at a reportable level.

Table E-3
Groundwater Quality Data for Monitoring Wells MW-7 through MW-13 2008 through 2010
Holcim (US) Inc.
Florence, CO

Analyte		Mar-08					MW-7 Compliance	Apr-09			Jun-09	Sep-09	Dec-09	Mar-10		
Field Parameters	MCL	MW-7	MW-8	MW-9	MW-11	MW-12	Standards	MW-7	MW-12	MW-13	MW-13	MW-13	MW-13	MW-7	MW-12	MW-13
pH (std. units)	6.5-8.5[b]	7.95	6.97	6.96	7.11	6.93	6.5-8.5[a]	**9.21**	7.63	7.99	7.01	6.95	7.00	8.41	7.12	7.24
Conductivity (mS/cm)	NA	2058	3095	3361	3204	3764	NA	1.109	3.231	2.900	3.215	2.934	2.7	1.309	3.974	3.300
Temperature (°C)	NA	17.63	15.61	17.33	18.80	18.72	NA	17.3	20.9	14.3	16.9	13.1	13.90	16.4	15.8	13.2
Laboratory Results																
Alkalinity	NA	458	352	239	198	348	NA	581	331	379	409	--	--	--	--	--
Chloride	250[b]	37	31	33	37	36	NA	42	36	29	29	--	--	--	--	--
Fluoride	2.0[c]	0.80	0.9	1.1	0.7	**3.4**	NA	1.1	**3.6**	0.8	0.9	--	--	--	--	--
Hardness, as $CaCO_3$	NA	961	1830	2110	1960	2540	NA	148	2620	2140	2140	--	--	--	--	--
Nitrate as N	10.0[a]	0.03 B	0.04 B	0.16	0.24	0.06 B	NA	0.05 B	0.05 B	0.08 B	0.08 B	--	--	--	--	--
Nitrogen, ammonia	NA	0.98	0.75	0.15 B	0.31 B	0.74	NA	1.23	0.27 B	0.28 B	<0.05	--	--	--	--	--
Total Dissolved Solids	1.5 x bkg	1940	3190	3570	3410	4030	3918	720	3990	3660	3620	3,630	3,470	720	3960	3300
Sulfate	250[b]	**850**	**1730**	**1840**	**1980**	**2300**	2080	35	**2300**	**2000**	**1900**	**1,900**	**1,800**	4 B	2400	2000
Aluminum (total)	5.0[c]	**5.97**	0.17 B	1.17	3.11	**21.70**	NA	**9.26**	**23.1**	**7.36**	**9.85**	--	--	--	--	--
Arsenic (total)	0.05[a]	0.0027	0.0010 B	0.001 U	0.0009 B	0.0033	NA	0.0027	0.006	0.005	0.003 B	--	--	--	--	--
Calcium (dissolved)	NA	202	438	458	439	477	NA	24.2	488	492	491	--	--	--	--	--
Calcium (total)	NA	206	444	458	439	474	NA	46.1	525	539	524	--	--	--	--	--
Iron	0.3[b]	**4.18**	**0.54**	**1.85**	**3.17**	**14.40**	4.5	0.02 U	0.08	0.04 B	0.07	<0.02	<0.02	0.78	0.25	0.11
Magnesium (dissolved)	NA	111	178	235	209	329	NA	21.4	341	222	221	--	--	--	--	--
Magnesium (total)	NA	112	180	232	208	323	NA	26.5	726	225	195	--	--	--	--	--
Manganese (total)	0.05[b]	**0.085**	**0.196**	**0.317**	**0.324**	**0.623**	0.88	0.105	**0.673**	**0.13**	**0.26**	**0.113**	**0.056**	0.019 B	0.586	0.018 B
Potassium (total)	NA	10.4	10.9	9.3	13.0	18.8	17	7.2	20.3	11.9	11.8	10.3	11.0	5.6	13.5	9.3
Selenium (total)	0.02[c]	0.0005	0.0007	0.0005 B	0.0030	0.0023	0.02[d]	0.0008	0.0027	**0.139**	**0.0335**	--	--	--	--	--
Sodium (total)	NA	226	207	199	209	221	226	**236**	156	249	193	225	199	**228**	186	164

Notes:

All units are in mg/L unless noted otherwise.

Bolded values - Screening level exceeded.

B - Analyte concentration detected at a value between Method Detection Limit and Pratical Quantitation Limit.

bkg - Background.

MCL - Maximum concentration limit.

NA - Not available.

U - The analyte was analyzed for, but not detected. Detection limit is numeric value shown.

Multiple screening levels present in some instances due to proposed background standardsfor MW-7

[a]DRMS-approved compliance standards for MW-7.

[b]MCL source: Table 1 Human Health Standards, Regulation 41.

[c]MCL source: Table 2 Secondary Drinking Water Standards, Regulation 41.

[d]MCL source: Table 3 Agricultural Standards for Groundwater, Regulation 41.

[e]MCL source: Table 4 TDS Water Quality Standards, Regulation 41.

Table E-4
Groundwater Quality Data for Monitoring Wells MW-7, MW-12 and MW-13
2011 through 2015
Holcim (US) Inc.
Florence, CO

Analyte	MW-7	March 2011 Analytical Results			March 2012 Analytical Results			Sept-2012	March 2013 Analytical Results			March 2014 Analytical Results			March 2015 Analytical Results				MW-13
Field Parameters	NPLs	MW-7	MW-12	MW-13	MW-7	MW-12	MW-13	MW-7	MW-7	MW-12	MW-13	MW-7	MW-12	MW-13	MW-7	MW-12	MW-12 DUP	MW-13	NPLs
pH (std. units)	6.5-8.5*	7.98	6.87	7.03	7.60	6.81	6.95	7.31	7.57	6.80	7.07	7.55	6.74	7.02	7.63	6.74	--	6.98	Nan
Specific Conductivity (mS/cm)	NA	1.427	3.686	3.287	1.7	4.0	3.7	3.3	3.280	3.899	3.559	2.792	3.946	3.673	2.672	3.893	--	3.714	Nan
Temperature (°C)	NA	14.0	15.8	14.6	14.2	14.0	14.0	14.7	14.2	13.96	14.17	14.0	13.60	14.00	14.2	14.10	--	14.10	Nan
Laboratory Results																			
Total dissolved solids	3918	2760	3970	3180	810	3910	3500	3270	2780	3870	3480	2620	3940	3420	2010	3910	3870	3540	4026
Sulfate	2080	1600	2400	1770	39	2300	2100	1820	1700	2600	**2300**	1460	2450	1980	1020	2390	2340	2030	2200
Iron (total)	4.5	4.28	Nan	Nan	**13.8**	Nan	Nan	**9.9**	4.26	Nan	Nan	**3.45**	Nan	Nan	**2.37**	Nan	Nan	Nan	Nan
Iron (dissolved)	NA	U	0.99	U	U	0.19	0.04 B	0.09 B	0.10	0.34	U	0.04 B	1.14	U	<0.040 U	0.74	0.54	<0.040 U	0.13
Manganese (dissolved)	0.88	0.147	0.551	U	U	0.54	U	0.165	0.03 B	0.50	U	0.059	0.532	U	<0.01 U	0.550	0.550	<0.01 U	0.3
Potassium (dissolved)	17	13.1	13.8	8.9	5.2	13.6	8.9	12.3	12.1	12.8	8.6	12.1	12.5	8.2	11	12.6	12.6	8.4	13
Sodium (dissolved) [1]	NA	231	201	170	258	145	203	250	297	162	201	253	147	181	247	131	130	156	274

Notes:

All units are in mg/L unless noted otherwise.

Bolded values - Screening level exceeded.

[1] - Sodium removed from list of compliance standards in 2015 per Division of Reclamation, Mining and Safety approval letter dated February 25, 2015.

B - Analyte concentration detected at a value between Method Detection Limit and Pratical Quantitation Limit.

bkg - Background.

MCL - Maximum concentration limit.

NA - Not applicable

Nan - Not Analyzed

NPLs - numeric protection levels issued by Division of Reclamation, Mining and Safety

U - The analyte was aNanlyzed for, but not detected. Detection limit is numeric value shown.

Multiple screening levels present in some instances due to proposed background standardsfor MW-7

*DRMS-approved compliance standards for MW-7

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