



MEMORANDUM

Date: August 14, 2020

To: Patrick Lennberg, DRMS

From: Amy Eschberger, DRMS

RE: Boettcher Limestone Quarry, Permit No. M-1977-348, Technical Revision No. 11 (TR-11)
Request for Technical Review

On July 29, 2020, the Division of Reclamation, Mining and Safety (Division) received the Technical Revision No. 11 application (TR-11; see enclosed) as a corrective action response to a problem cited in the Division's inspection report sent on February 28, 2020 (see enclosed). The purpose of TR-11 is to revise the groundwater monitoring program to include a background monitoring well (MW-8), and depending on the results of water quality data collected from that well, also include a compliance monitoring well (MW-9). The decision date for TR-11 is currently set for August 28, 2020.

I am requesting your technical expertise in reviewing TR-11, specifically the following sections:

- Section 2.0 – Drilling and Well Installation
- Section 3.2 – Evaluation of MW-8

Please submit your review comments by **August 21, 2020** in the form of a Memorandum on Division letterhead.

If you have any questions, you can contact me by telephone at 303-866-3567, ext. 8129, or by email at amy.eschberger@state.co.us.

Encls: Technical Revision No. 11 (TR-11), received on July 29, 2020
Division's inspection report, sent on February 28, 2020

Cc: Jared Ebert, DRMS
Michael Cunningham, DRMS





CC

TR11

AME/mac

MINING AND SAFETY

(303) 866-3567

RECEIVED

REQUEST FOR TECHNICAL REVISION (TR) COVER SHEET

JUL 29 2020

File No.: M- **1977-348**Site Name: **Boettcher Limestone Quarry**DIVISION OF RECLAMATION
MINING & SAFETYCounty **Larimer**

TR#

(DRMS Use only)

Permittee: **Holcim (US) Inc.**

Operator (If Other than Permittee):

Permittee Representative: **Mike Toelle**

Please provide a brief description of the proposed revision:

REQUEST FOR TECHNICAL REVISION (TR-11) OF PERMIT M-1977-348: CHANGES TO**THE GROUNDWATER MONITORING NETWORK AT THE BOETTCHER QUARRY**M-1977-348
Completed!
8 Minor InfractionsTR 11
1 Violation!
AME/mac

As defined by the Minerals Rules, a Technical Revision (TR) is: "a change in the permit or application which does not have more than a minor effect upon the approved or proposed Reclamation or Environmental Protection Plan." The Division is charged with determining if the revision as submitted meets this definition. If the Division determines that the proposed revision is beyond the scope of a TR, the Division may require the submittal of a permit amendment to make the required or desired changes to the permit.

The request for a TR is not considered "filed for review" until the appropriate fee is received by the Division (as listed below by permit type). Please submit the appropriate fee with your request to expedite the review process. After the TR is submitted with the appropriate fee, the Division will determine if it is approvable within 30 days. If the Division requires additional information to approve a TR, you will be notified of specific deficiencies that will need to be addressed. If at the end of the 30 day review period there are still outstanding deficiencies, the Division must deny the TR unless the permittee requests additional time, in writing, to provide the required information.

There is no pre-defined format for the submittal of a TR; however, it is up to the permittee to provide sufficient information to the Division to approve the TR request, including updated mining and reclamation plan maps that accurately depict the changes proposed in the requested TR.

Required Fees for Technical Revision by Permit Type - Please mark the correct fee and submit it with your request for a Technical Revision.

Permit Type	Required TR Fee	Submitted (mark only one)
110c, 111, 112 construction materials, and 112 quarries	\$216	☒
112 hard rock (not DMO)	\$175	☐
110d, 112d(1, 2 or 3)	\$1006	☐

**GOLDER****TRANSMITTAL****DATE** July 28, 2020**Project No.** 20144265**TO** Amy Eschberger
Colorado Division of Reclamation, Mining
and Safety
1313 Sherman Street
Room # 215
Denver, CO 80203**FROM** Sara Harkins / Erin Hunter
EMAIL sharkins@golder.com**REQUEST FOR TECHNICAL REVISION (TR-11) OF PERMIT M-1977-348: CHANGES TO THE
GROUNDWATER MONITORING NETWORK AT THE BOETTCHER QUARRY****Select one checkbox only**☐ **Mail/Express Post**☐ **Same Day Courier**☒ **Overnight Courier** Fed Ex Standard Overnight☐ **Air Freight**☐ **Email**☐ **Enclosed**☐ **Picked Up**☐ **Hand Delivered**☐ **Other**

Quantity	Item	Description
1	Technical Memorandum – binder	Request for Technical Revision (TR-11) of Permit M-1977 348
1	Check # 100643 – enclosed in binder in the amount of \$216.00	Check

Please advise us if enclosures are not as described.**ACKNOWLEDGEMENT REQUIRED:**☒ **YES** (please email/fax to Golder) ☐ **NO**

SH/EH/cc

[https://golderassociates.sharepoint.com/sites/127556/project files/6 deliverables/techmemos/1-tm-req_tech_revison/1-tm-0/tl - amy eschberger - 28jul20.docx](https://golderassociates.sharepoint.com/sites/127556/project%20files/6%20deliverables/techmemos/1-tm-req_tech_revison/1-tm-0/tl-amy%20eschberger-28jul20.docx)**Golder Associates Inc.**
7245 W Alaska Drive, Suite 200, Lakewood, Colorado, USA 80226

T +1 303 980-0540 F +1 303 985-2080

TECHNICAL MEMORANDUM

DATE July 24, 2020

TO Amy Eschberger
Colorado Division of Reclamation, Mining and Safety

CC Mike Toelle and Travis Bennet (Holcim (US) Inc.)

FROM Sara Harkins and Joanna Moreno

Project No. 20144265

EMAIL sharkins@golder.com

REQUEST FOR TECHNICAL REVISION (TR-11) OF PERMIT M-1977-348: CHANGES TO THE GROUNDWATER MONITORING NETWORK AT THE BOETTCHER QUARRY

On behalf of Holcim (US) Inc., Golder Associates Inc. (Golder) is submitting this request for a technical revision to permit M-1977-348 to modify the groundwater monitoring program for the Boettcher Limestone Quarry (Site) located at 3060 West County Road 56, Laporte, Colorado 80535.

This technical revision was requested by the Division of Reclamation, Mining, and Safety (DRMS) in their February 28, 2020 Inspection Report. The request from the DRMS was to modify the groundwater network to include two additional monitoring wells, a background well, and a compliance well.

"By the corrective action date, the operator shall submit a Technical Revision, with the applicable fee, to revise the groundwater monitoring program to include proposed point(s) of compliance in accordance with Rule 3.1.7(6) and (7) at some distance hydrologically downgradient from the Cement Kiln Dust (CKD) disposal areas. Due to the lack of ambient groundwater quality data for the site required by Rule 3.1.7(b)(viii), the revision shall also include proposed background monitoring well(s) located outside of the CKD disposal areas and screened across similar lithological units as existing downgradient monitoring wells and the proposed compliance well(s). The information obtained from these wells will be used to evaluate protection afforded groundwater quality and compliance with groundwater standards."

Upon further conversations with the DRMS it was determined the background well will be installed and monitored, whereas the downgradient compliance well will be installed at a later date, if needed. This technical revision details:

- Proposed locations
- Drilling and well installation specification
- Monitoring and evaluation criteria
- Reporting

1.0 PROPOSED LOCATIONS

The proposed locations for both wells are shown in Figure 1. The locations are approximate and may be shifted slightly (less than 50 feet) prior to drilling. The locations were selected to be also near current access roads on the Site and will allow access using a truck mounted drill rig.

A suitable location does not exist for a hydraulically-upgradient background well that would also intercept the same geologic units as those intercepted by the existing monitoring wells. Therefore, MW-8 will be located side gradient to the north of the CKD disposal areas and on the east side of the access road. Based on information from monitoring wells MW-1 through MW-7 installed at the Site and our understanding of the Site geology, Golder anticipates that well MW-8 will be completed at depths of between approximately 230 and 270 feet.

Following monitoring at MW-8 and assessment of results, MW-9 may be installed. However, if water quality observed in MW-8 is similar to existing downgradient wells (specifically MW-4, MW-6, and MW-7), well MW-9 will not need to be installed. Instead, a demonstration can be made that the concentrations in groundwater in samples collected from existing wells reflect natural conditions. The evaluation criteria are outlined in Section 3.2. The location for MW-9 was selected because it is geologically down-dip and hydrogeologically downgradient from the CKD disposal area and the existing monitoring wells. The proposed location is the farthest downgradient location that could be identified within the permit boundary that is accessible and feasible for drilling without the need for major earthworks. Golder anticipates that well MW-9, if needed, will be completed at depths of between approximately 310 and 360 feet.

2.0 DRILLING AND WELL INSTALLATION

2.1 Utilities

Prior to drilling activities, Golder or the drilling sub-contractor will request a utility locate and Golder will file a notice of intent (NOI) to drill monitoring holes with the Colorado Division of Water Resources.

2.2 Drilling Methods

The following drilling methods will be used:

- Hollow stem auger through overburden/fill, anticipated to be no more than 30 feet.
- Air-Rotary in competent bedrock to within 10 to 30 feet of anticipated contact between the Niobrara Formation and the Codell sandstone.
- Air-Coring to contact between the Niobrara Formation and the Codell sandstone.

The reason for the switch from air rotary to air coring is to allow for better sample retrieval and more accurate identification of the lithologic contact. Collection of rock samples for analytical testing or hydrologic testing is not planned.

To the extent practical, air will be used as the drilling fluid until first groundwater is encountered. Limited water may be needed for coring and to help facilitate cutting removal. Prior to monitoring well installation, described below, the core holes will be reamed (using air-rotary methods) to an 8-inch diameter. Drilling and sampling will be performed by a qualified drilling firm, subcontracted to Golder, under the supervision of a Golder hydrogeologist/engineer.

It is assumed that excess drill cuttings will be non-hazardous and can be disposed at a nearby solid waste landfill. However, this disposal method may require sampling and chemical analysis of the cuttings prior to disposal. If necessary, the cuttings may be temporarily stockpiled on Site pending the laboratory analysis.

The Golder hydrogeologist/engineer will prepare a lithologic log of each borehole as drilling progresses. In addition to this geologic information, the Golder hydrogeologist/engineer will pay close attention to the depth at which groundwater is first encountered, if discrete intervals of saturation exist at various depths, and changes in lithology.

2.3 Well Installation

Consistent with MW-6 and MW-7, wells will be installed directly above the Niobrara-Codell contact. Since the contact will be encountered during drilling, the bottom of the borehole may need to be filled with bentonite. Coated bentonite pellets will be used and will be allowed to hydrate for a minimum of one hour prior to proceeding with the well installation.

The wells will be constructed with 4-inch diameter, flush threaded, Schedule 80 PVC screen and riser pipe, such that they can be sampled for water quality. The screen in each well will be perforated with 0.010-inch slots and may be up to 20 feet in length. Final screen lengths will be determined in the field based on geology and actual groundwater conditions observed during drilling. PVC casing will be added to the top of the screen as it is lowered in the borehole until the screen reaches the desired depth and the casing extends 2 to 3 feet above the ground surface. The annular space around the screen and end cap will be backfilled with clean, washed, well-rounded silica sand (#10-20 or equivalent). The sand pack will be tremied from the bottom of the borehole to approximately 2 feet above the top perforation. A minimum of 2 feet of medium bentonite chips or coated bentonite pellets will be fed into the annular space above the screen and filter pack to provide a seal. Grout will be placed in the annular space above the bentonite seal to within approximately 3 feet of the ground surface. The grout will be mixed and placed in accordance with the State of Colorado Division of Water Resources (DWR) Water Well Construction Rules 2 CCR 402-2.

Once the grout has cured, a protective steel casing will be placed around the PVC riser such that the bottom extends into the annular space to the top of the grout and the top rises above the PVC casing several inches. The protective casing will be equipped with a locking cover to prevent unauthorized entry and allow access for water level measurement. A concrete pad, approximately 3-foot square, sloping away from the well, will be constructed around the protective casing.

2.4 Surveying

Surveying will be performed following well construction so that groundwater elevations can be established for monitoring flow directions and calculating hydraulic gradients. Surveying activities will be performed by a licensed surveying subcontractor to Golder and will be tied into the same coordinate system used for other surveying at the Site.

2.5 Well Development

After the grout has set for a minimum of 48 hours and there has been sufficient time for the groundwater to enter the well, the wells will be developed to improve water flow into the wells and reduce turbidity by removing fines from the screen and sand pack. Development will be conducted using a combination of surging and bailing/pumping and/or air lifting methods. During development, field parameters of pH, specific conductivity, and temperature will be measured after each casing volume removed. The wells will be developed until turbidity is reduced and field parameters have stabilized, or after five casing volumes have been removed, whichever comes first. In the event the well goes dry during purging, subsequent purging may be needed after the well is allowed to recharge.

Equipment used for well development will either be new materials (such as tubing, surge blocks, pumps, inertial foot valves or disposable bailers) or will be decontaminated using a low phosphate soap (such as Alconox) solution followed by a distilled water rinse.

It is assumed purge water will be non-hazardous and can be discharged onto the ground surface.

3.0 MONITORING AND DATA EVALUATION

3.1 Monitoring

After well installation, it is anticipated that at least six rounds of semi-annual groundwater monitoring (water level measurement and water quality sampling) will be performed. Due to the low hydraulic conductivities observed in existing monitoring wells and the responses observed post well install at MW-6 and MW-7, it is anticipated that the new wells may take considerable time (e.g., years) to stabilize and be reflective of in situ groundwater chemistry following the disturbance by drilling.

As observed in well MW-6 and MW-7 the reported values the first few years of monitoring may not be reflective of true aquifer conditions. If increasing or decreasing trends are observed, additional monitoring may be necessary to confirm that the water quality is representative of formation water. This determination will be made through visual assessment of time series graphs.

This monitoring will be conducted in accordance with the procedures outlined in the Sampling and Analysis Plan (Golder 2010). The new well monitoring events will be consistent with the monitoring events for the existing wells so that the results will be comparable. The constituents to be analyzed for this water quality sampling will be the same as currently being conducted on a semi-annual basis for the existing wells outlined in TR-9 (Golder 2018).

3.2 Evaluation of MW-8

Evaluation of parameters at MW-8 will be focused on parameters that have previously exceeded the Regulation 41- Colorado Basic Standards for Groundwater (5 CCR 1002, BSGW) at the existing site wells screened in the same formation – specifically MW-4, MW-6, and MW-7. These parameters include barium, iron, manganese, total dissolved solids (TDS), and chloride.

To evaluate the results from MW-8, an approach has been developed to determine the comparability of the new samples with the existing water quality at MW-4, MW-6, and MW-7. Two methods will be used for determining the magnitude of difference between the samples: a visual/graphical comparison and a mathematical comparison. For the visual and graphical comparison, time series of the collected data will be updated and reviewed following each sampling event and box and whisker plots will be updated.

For the mathematical approach, MW-8 will be assessed using a relative percent difference (RPD) method, treating the samples as though they are laboratory duplicates, to determine if they are likely to have been drawn from the same population. This approach was selected because it will allow for the comparison of individual data points rather than a larger minimum data set (i.e., more sampling events) utilized in other methods, in turn allowing for determination of differences on an expedited schedule. Since variability in concentrations is observed between sampling events, this comparison will be conducted for three sampling rounds once the water levels and data are stable. If at least one sampling round demonstrates the results are comparable, a demonstration can be made that the concentrations observed in MW-4, MW-6, and MW-7 are reflective of background (i.e., similar to MW-8).

RPD values will be calculated when both the MW-8 results and the mean of the recent results from MW-4, MW-6, and MW-7 were greater than 5 times the practical quantitation limit (PQL; USEPA 2017). RPDs are calculated according to the following formula:

$$\%RPD = \left| \frac{A - B}{A + B} \right| \times 200$$

Where: A is the concentration of the applicable result at MW-8; and

B is the corresponding concentration mean of recent data at MW-4, MW-6, and MW-7.

RPD values can range from 0%, indicating perfect correlation between results, to 200%, indicating a significant divergence between results. Results are considered comparable when the RPD is less than 20%, per the National Functional Guidelines for Inorganic Data Review (USEPA 2017).

The RPD is not used when results are less than 5 times the PQL for a given analyte. In that circumstance, the absolute value of the difference between the two results is calculated and the results are considered comparable when the absolute difference is less than the PQL (USEPA 2017). When one of the two results for comparison is below the PQL for a give analyte, the difference is calculated using the PQL as the value of the result that was below the PQL. No comparison is performed when both results are below the PQL.

Box and whisker plots showing the variability of barium, iron, manganese, TDS, and chloride are presented in Attachment A and time series graphs are presented in Attachment B. Large differences in the concentrations of these parameters are observed between MW-4, MW-6, and MW-7 for barium and iron, and to a lesser extent manganese. Consequently, the comparison for these parameters will be made on an individual well basis, rather than pooling data from MW-4, MW-6, and MW-7.

Box and whisker plots of recent results (2017-2019, following the shift to a semi-annual sampling schedule) showing the variability of barium, iron, manganese, TDS, and chloride are presented in Attachment B and time series graphs are presented in Attachment C. Large differences interpreted to be due to natural variability, are observed between MW-4, MW-6, and MW-7 for barium and iron, and to a lesser extent manganese. For these parameters, comparisons will be made on an individual well basis, rather than pooling data from MW-4, MW-6, and MW-7. If any of the comparisons show that the results are comparable, a demonstration can be made that the concentrations observed in MW-4, MW-6, and MW-7 are reflective of background (i.e., similar to MW-8).

3.3 Evaluation of MW-9

If installed, the data from well MW-9 will be compared to water quality standards and site background water quality. First, the data will be compared to the BSGW. If all concentrations are below the standards, a demonstration can be made that there is no off-site migration of constituents of interest. However, concentrations from well MW-9 are anticipated to be similar to MW-4, MW-6, MW-7, and MW-8, but there is a potential for higher concentrations at MW-9 due to the increased residence time for groundwater in the aquifer further downgradient to this location. Therefore, if concentrations are above the BSGW they will be compared to the background well MW-8 using the approach outline for MW-8 above, assuming its concentrations are also above the BSGW. If concentrations in MW-9 are comparable to MW-8, a demonstration can be made that the concentrations in groundwater in samples collected from MW-9 reflect natural conditions.

If neither of the above demonstrations can be made, discussions with the DRMS will be initiated about making demonstrations related to risk to potential downgradient receptors.

4.0 REPORTING

4.1 Field Investigation Summary

Following the field program, a technical memorandum summarizing the field investigation will be prepared. The report will include discussion of the field activities performed and subsurface conditions encountered or inferred. The borehole geologic logs, well installation logs, and water level measurements will be presented as tables or attachments. The geologic logs will include depths, elevations, descriptions of subsurface materials (soil and rock) encountered, and depths to groundwater. Finally, monitoring well permit applications will be filed with the Colorado Division of Water Resources.

4.2 Data Evaluation and Reporting

Monitoring results from MW-8 and MW-9 (if installed) will be presented in the semi-annual monitoring reports. Once sufficient data exist to be able to evaluate the results by the methods described in Section 3, this evaluation will also be presented in the semi-annual reports.

If a demonstration can be made that the concentrations observed in MW-4, MW-6 and MW-7 are reflective of background conditions (i.e., similar to MW-8), a technical revision to the permit will be issued that requests Site reclamation liability be released and discontinuation of the groundwater monitoring program.

If a demonstration can be made that the concentrations observed in MW-9 are below the BSGW or reflective of background (i.e., similar to MW-8), a technical revision to the permit will be issued that requests Site reclamation liability be released and discontinuation of the groundwater monitoring program.

5.0 REFERENCES

Golder, 2010, Groundwater Sampling and Analysis Plan for the Boettcher Limestone Quarry in La Porte, Colorado. Golder Associates Inc., Lakewood, Colorado, April 28, 2010.

Golder, 2018. Request for Technical Revision of Permit M-1977-348: Changes to the Groundwater Analyte list at The Boettcher Quarry Golder Associates Inc., Lakewood, Colorado, September 5, 2018.

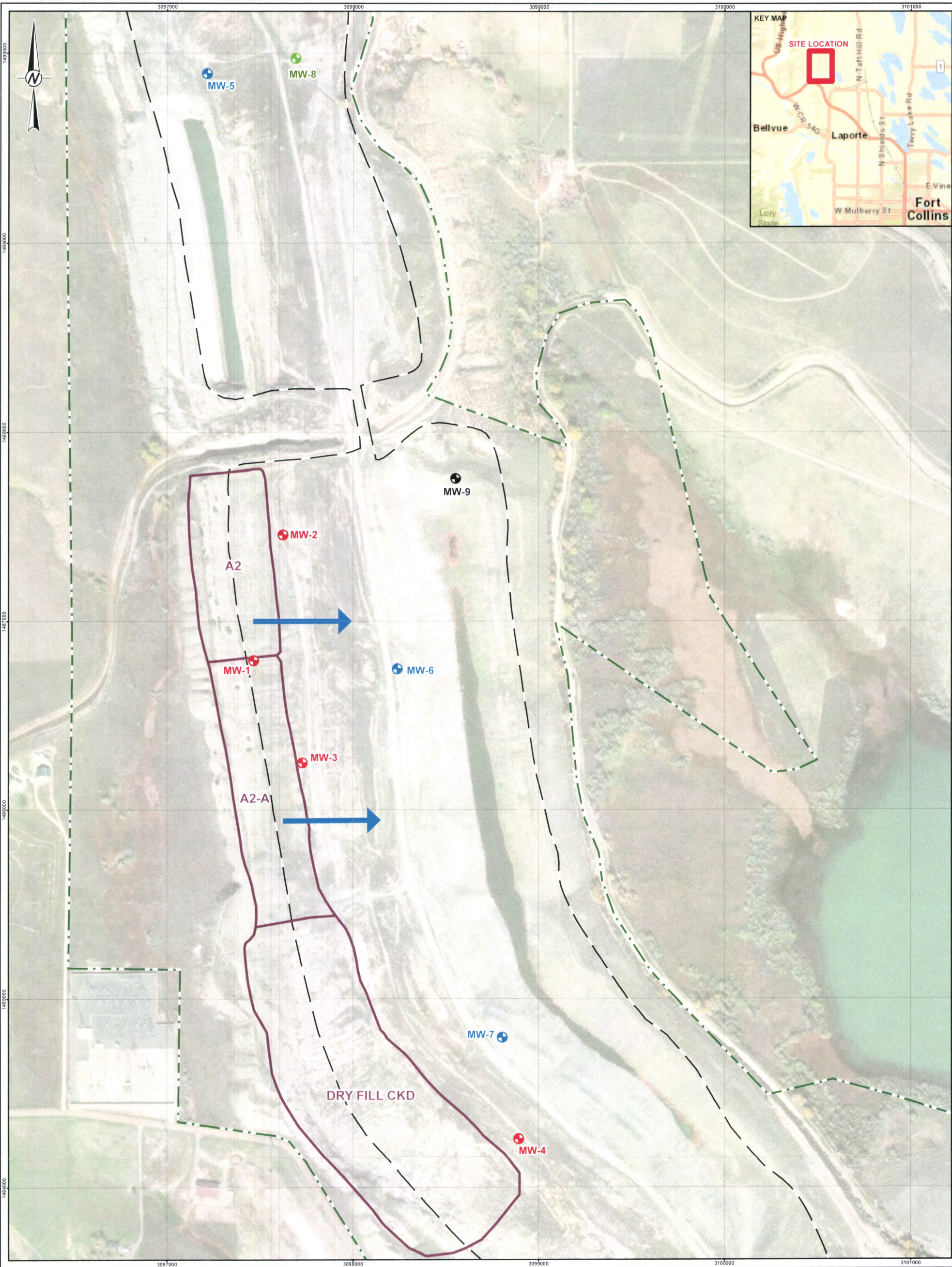
U.S. Environmental Protection Agency (USEPA), Office of Superfund Remediation and Technology Innovation, January 2017. National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001.

[https://golderassociates.sharepoint.com/sites/127556/project files/6 deliverables/techmemos/1-tm-req_tech_revision/1-tm-0/20144265-1-tm-a-request_tech_revision_tr11_permit_m1977348_24july20.docx](https://golderassociates.sharepoint.com/sites/127556/project%20files/6%20deliverables/techmemos/1-tm-req_tech_revision/1-tm-0/20144265-1-tm-a-request_tech_revision_tr11_permit_m1977348_24july20.docx)

ATTACHMENTS: Figure 1 – Proposed Locations

Attachment A - Box and Whisker Plots

Attachment B – Time Series Graphs



- LEGEND**
- MW-1** PRE-2012 MONITORING WELL
 - MW-6** MONITORING WELL INSTALLED 2012
 - MW-8** PROPOSED BACKGROUND MONITORING WELL (APPROXIMATE LOCATION)
 - MW-9** TENTATIVE FUTURE COMPLIANCE MONITORING WELL (APPROXIMATE LOCATION)
 - APPROXIMATE CKD DISPOSAL AREA BOUNDARY
 - AMENDED PERMIT BOUNDARY
 - PROPERTY BOUNDARY
 - APPROXIMATE GROUNDWATER FLOW DIRECTION

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	2020-07-20
DESIGNED	SAH
PREPARED	KJC
REVIEWED	JLM
APPROVED	JLM

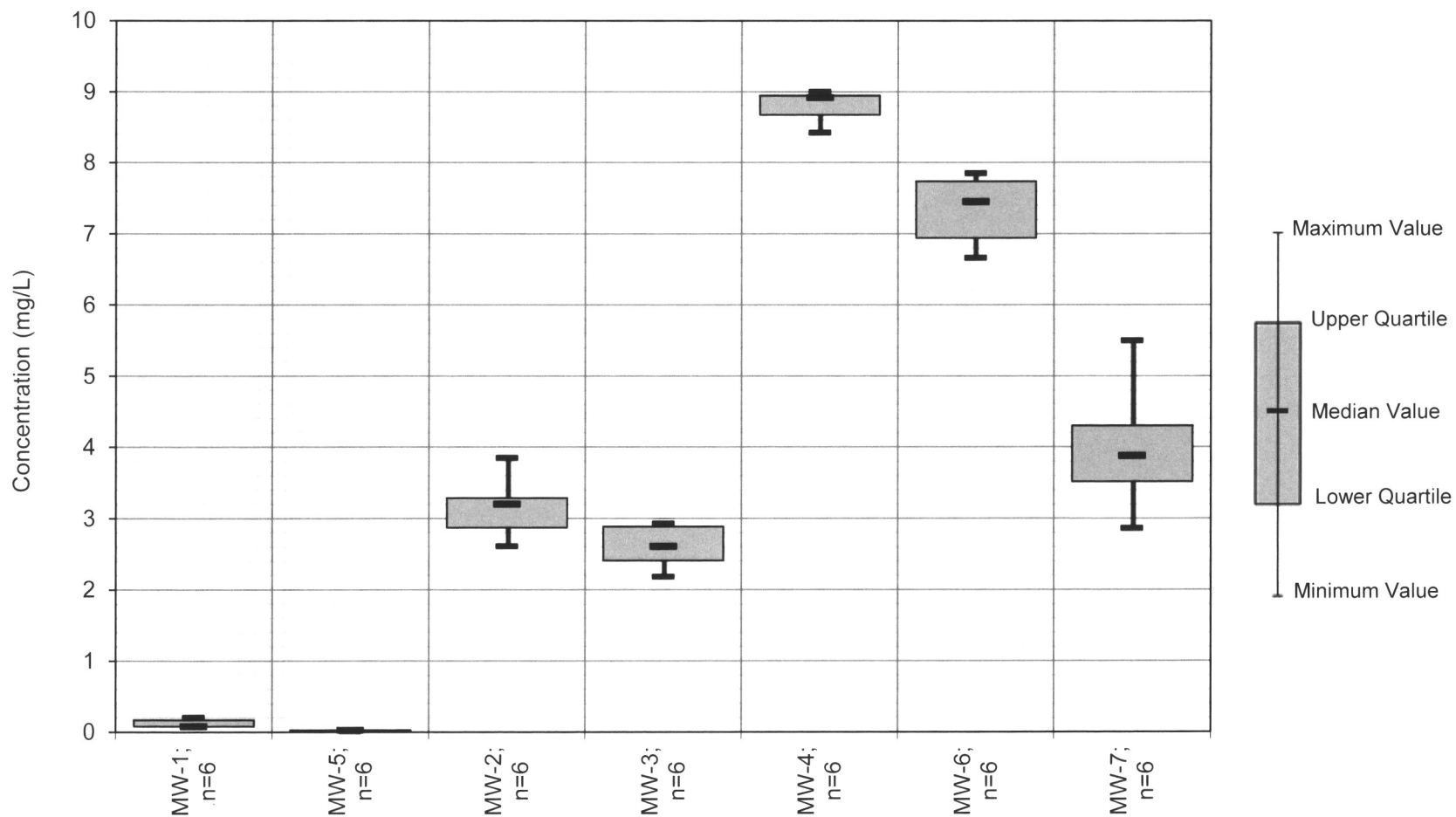
PROJECT NO.
20144265.0002

FIGURE

1

APPENDIX A

Box and Whisker Plots

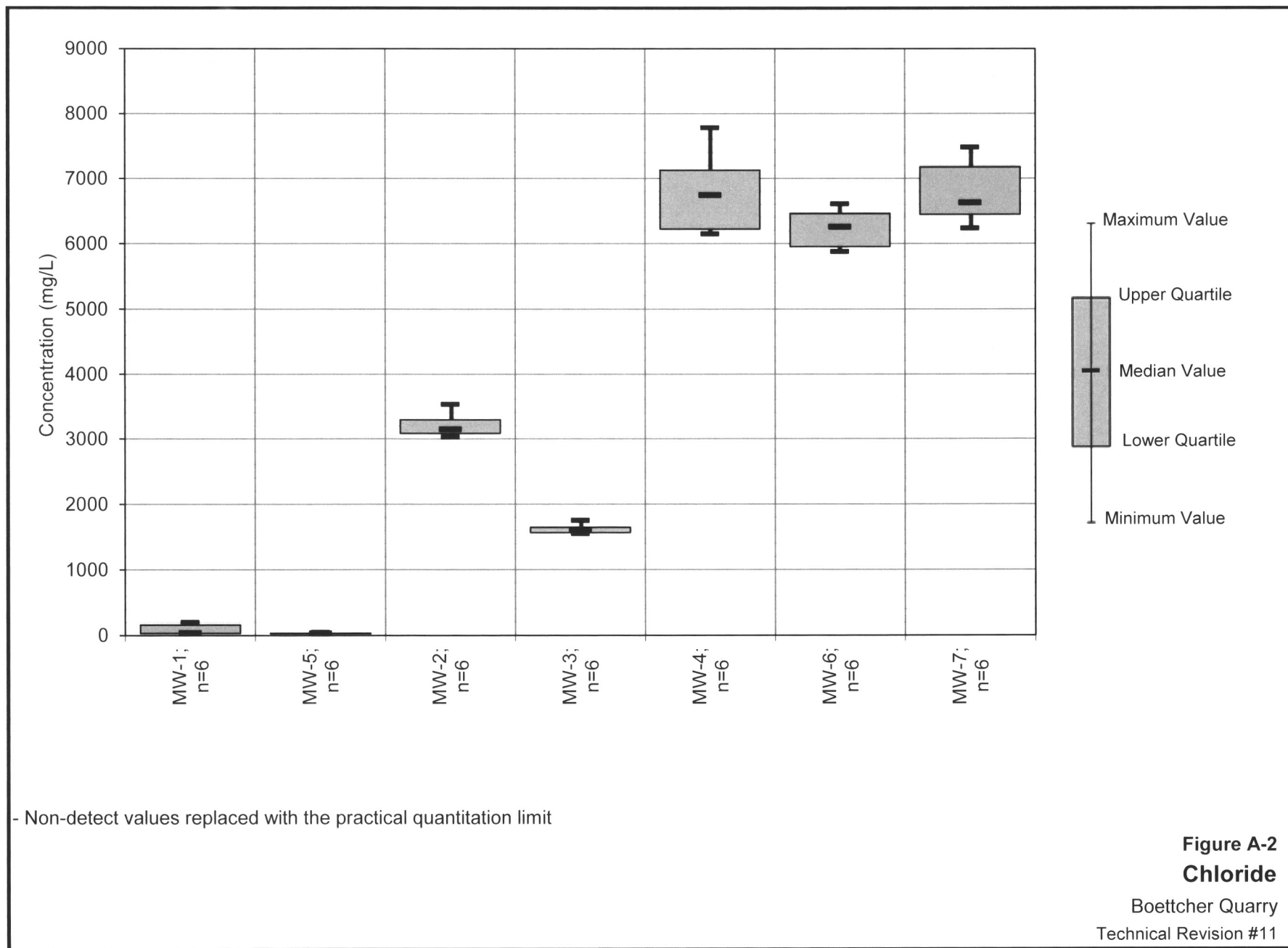


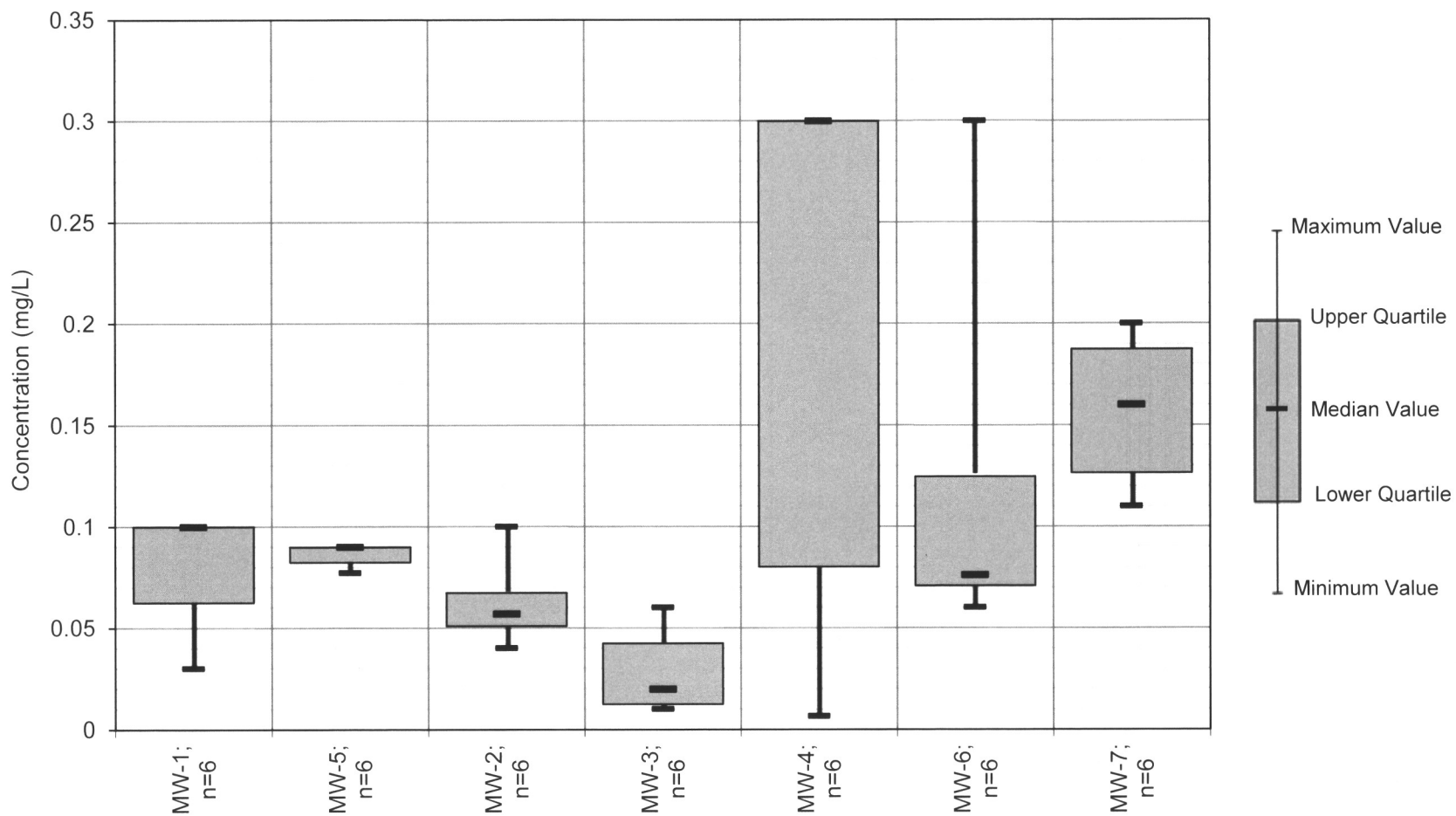
- Non-detect values replaced with the practical quantitation limit

Figure A-1
Dissolved Barium

Boettcher Quarry
Technical Revision #11

Golder Associates



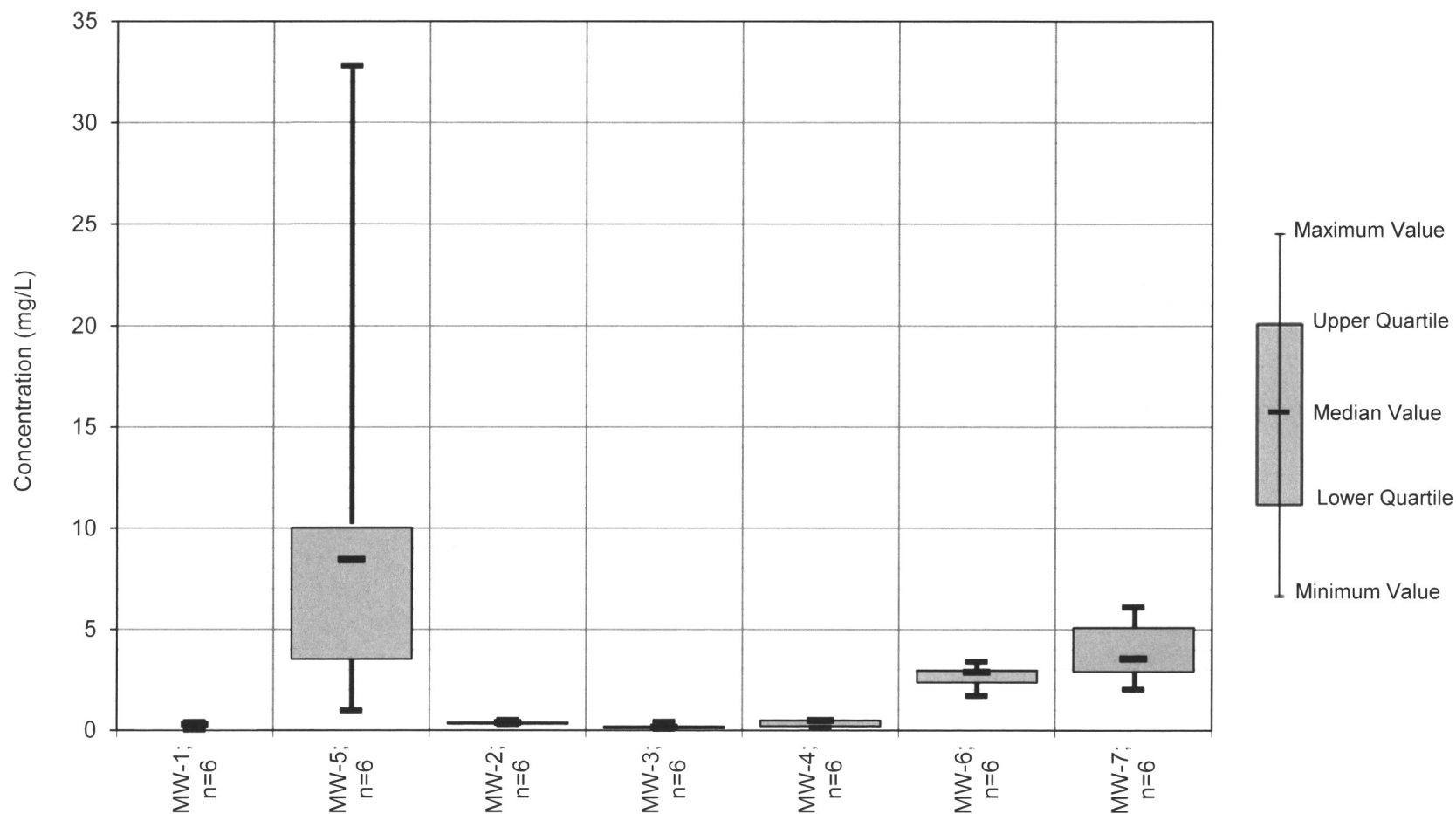


- Non-detect values replaced with the practical quantitation limit

Figure A-4
Dissolved Manganese

Boettcher Quarry
Technical Revision #11

Golder Associates

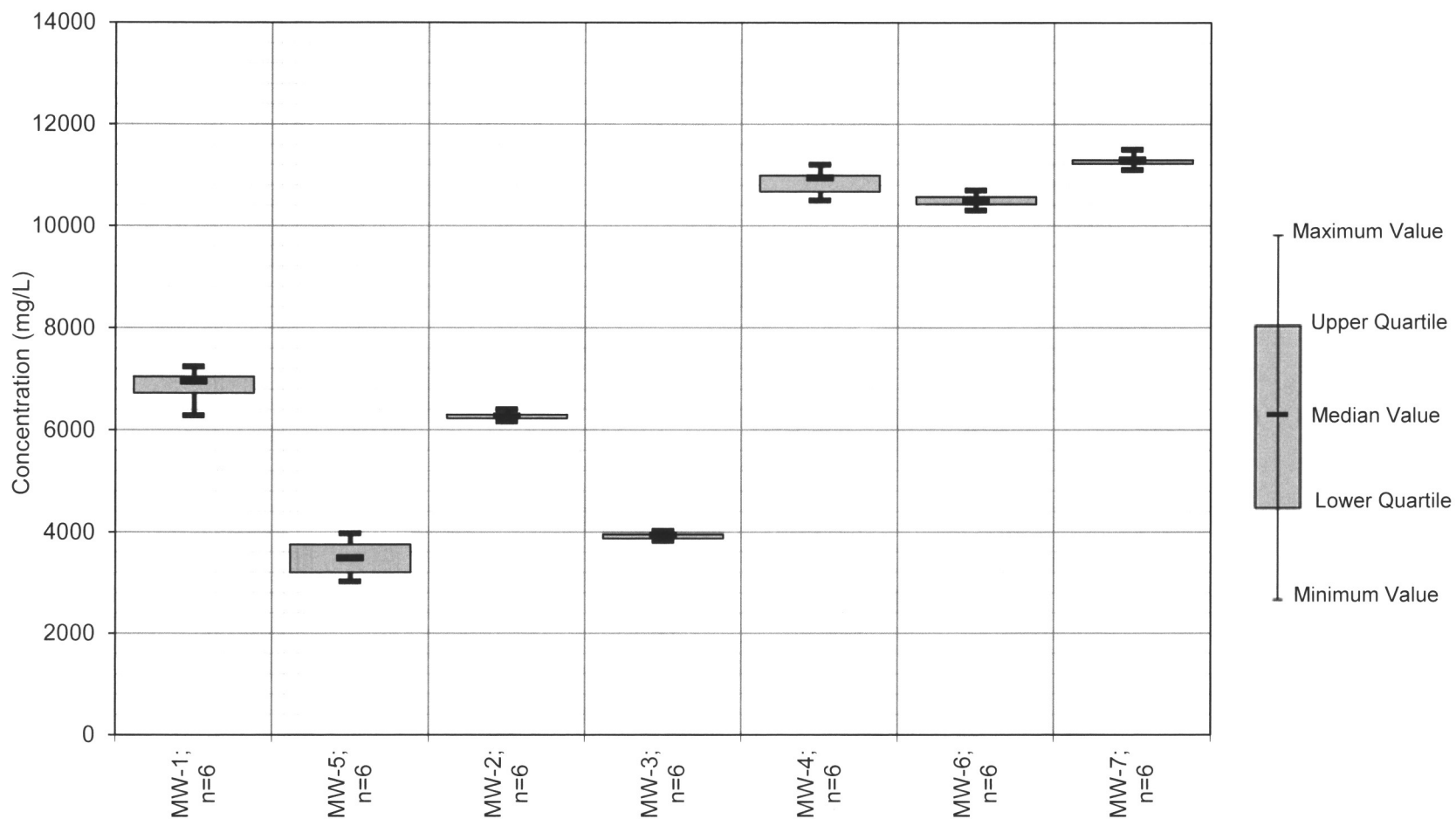


- Non-detect values replaced with the practical quantitation limit

Figure A-3
Dissolved Iron

Boettcher Quarry
Technical Revision #11

Golder Associates



- Non-detect values replaced with the practical quantitation limit

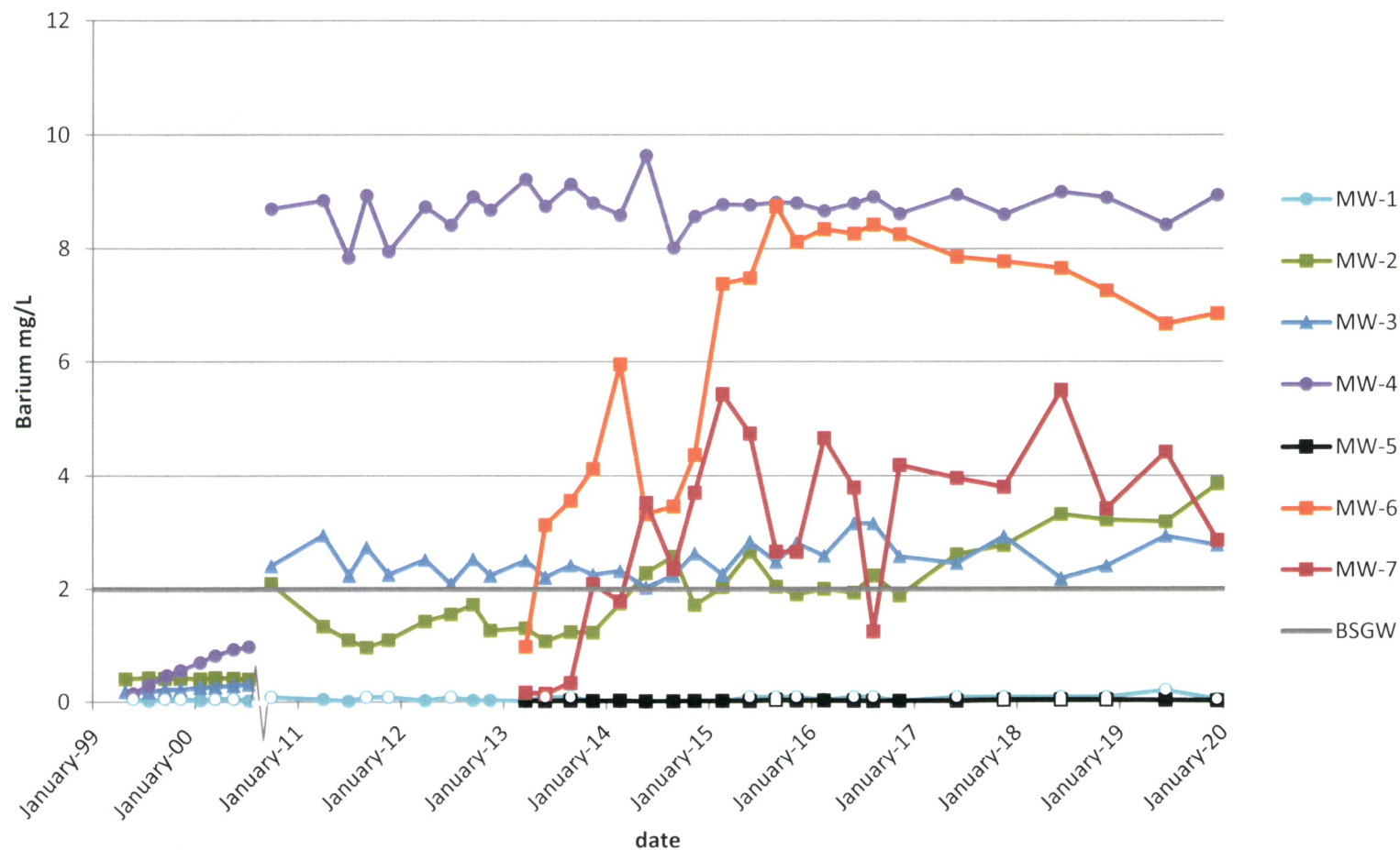
Figure A-5
Total Dissolved Solids

Boettcher Quarry
Technical Revision #11

Golder Associates

APPENDIX B

Time Series Graphs

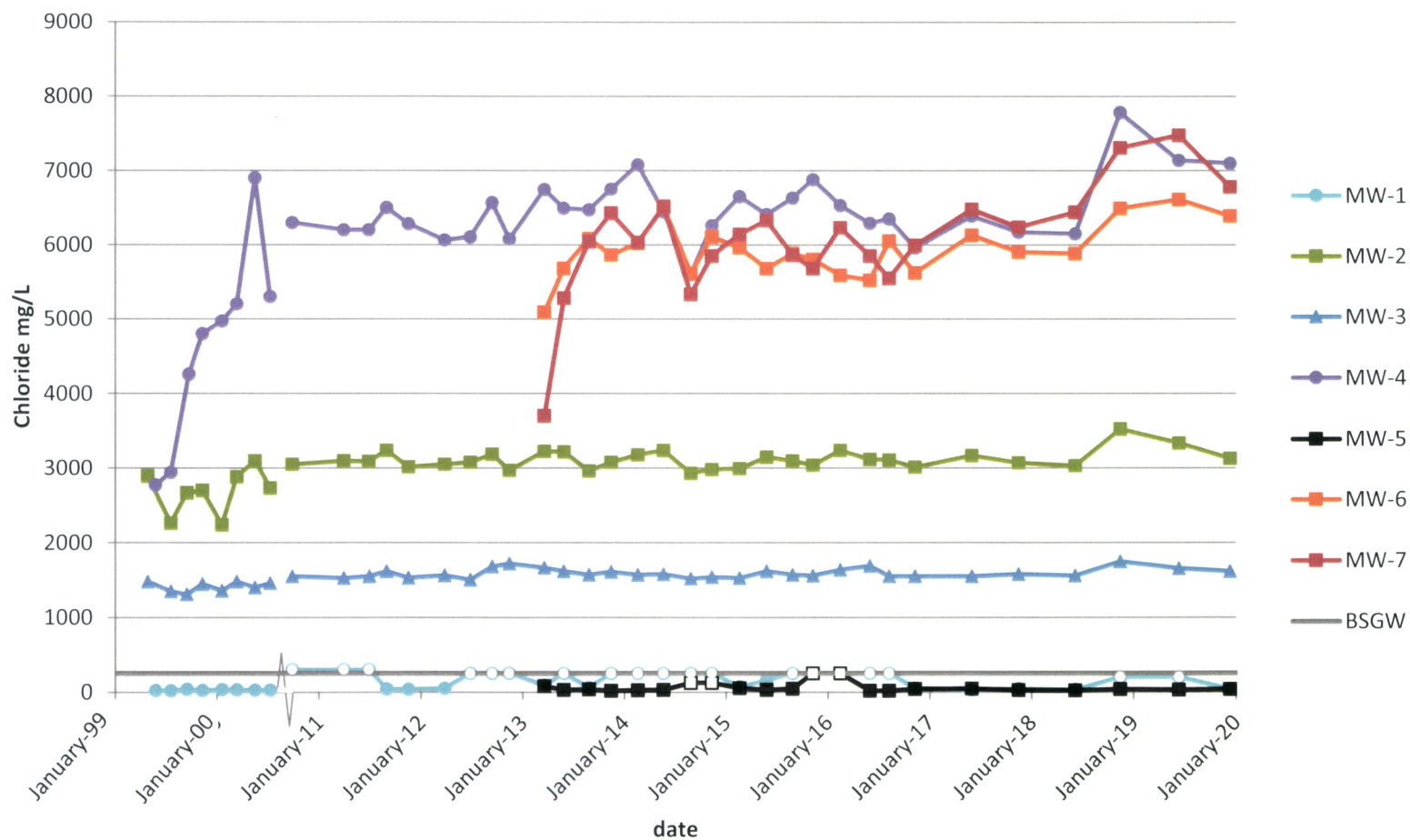


- Non-detect values plotted with an open symbol at the practical quantitation limit
- Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW), minimum of Table 1- Table 4.

Figure B-1
Dissolved Barium

Boettcher Quarry
Technical Revision #11

Golder Associates

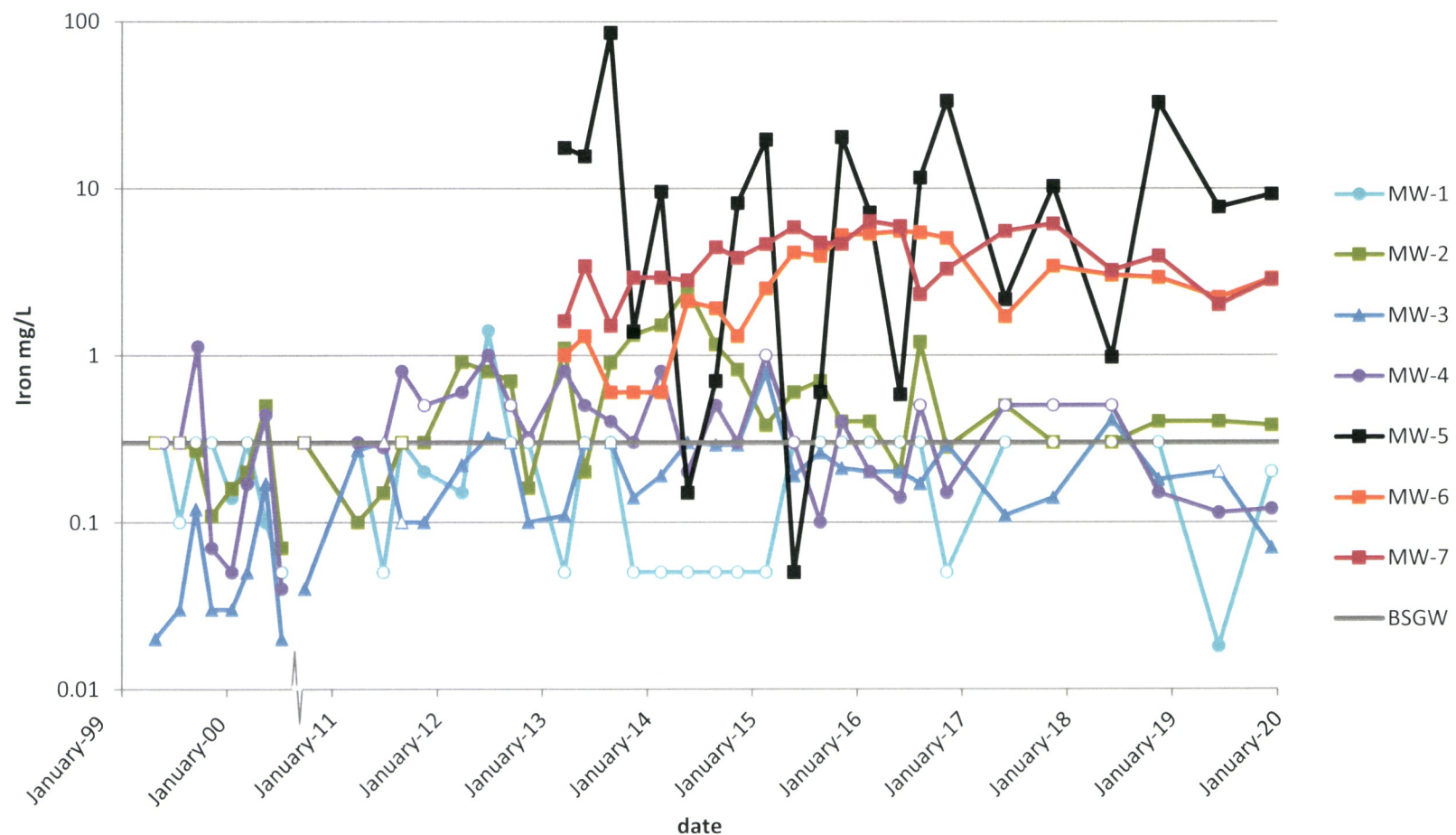


- Non-detect values plotted with an open symbol at the practical quantitation limit
 - Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW), minimum of Table 1- Table 4.

**Figure B-2
Chloride**

Boettcher Quarry
 Technical Revision #11

Golder Associates

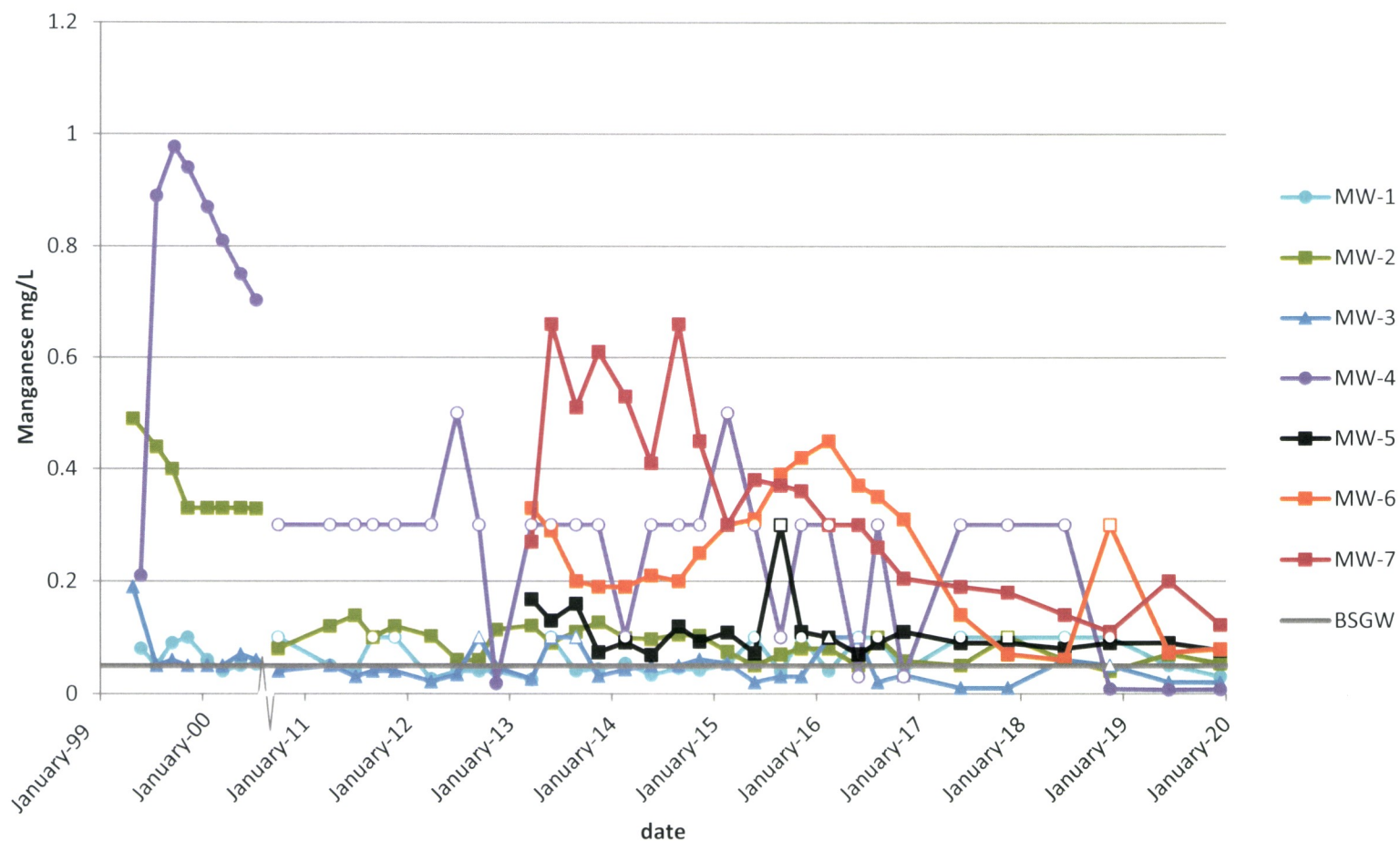


- Non-detect values plotted with an open symbol at the practical quantitation limit
- Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW), minimum of Table 1- Table 4.

Figure B-3
Dissolved Iron

Boettcher Quarry
Technical Revision #11

Golder Associates

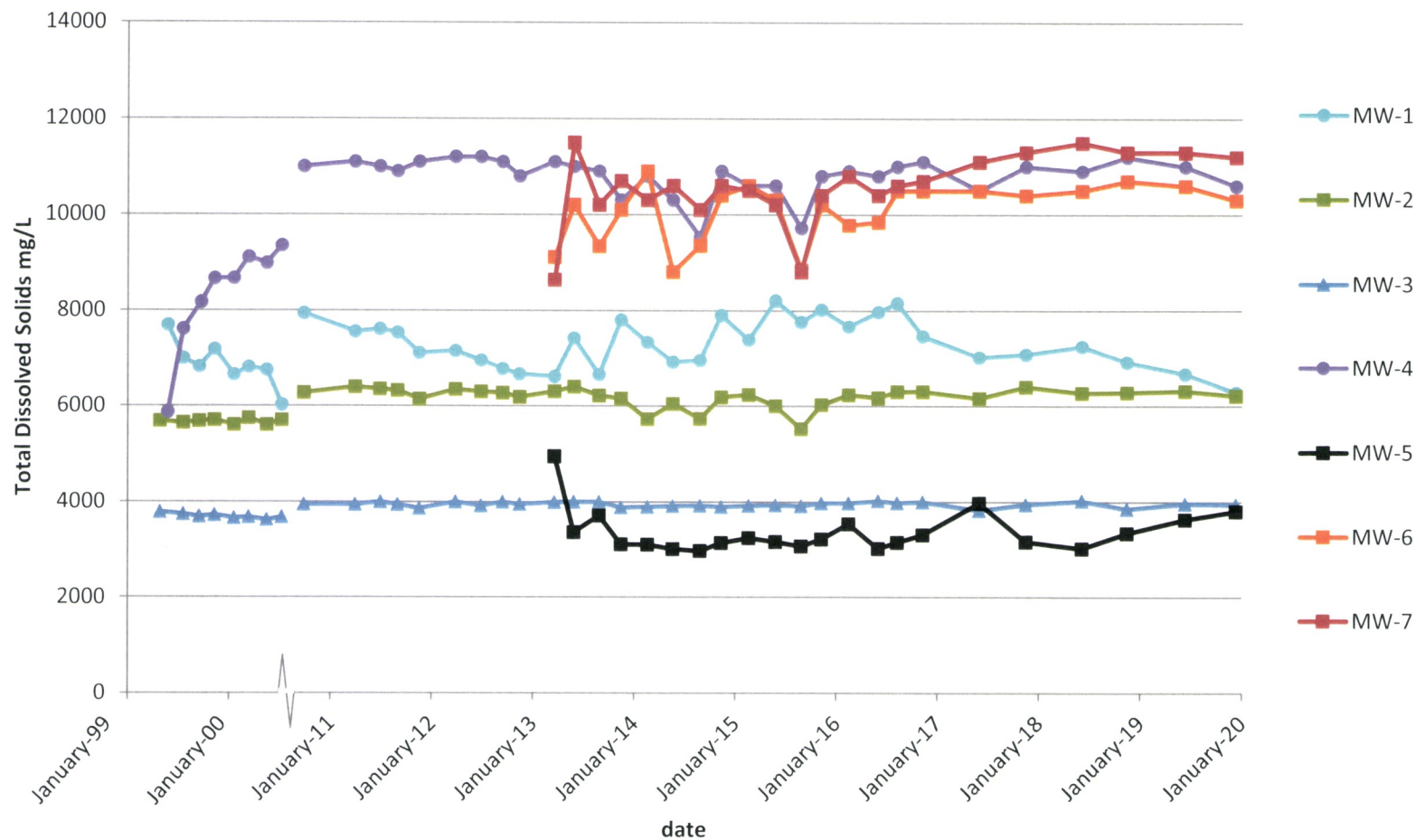


- Non-detect values plotted with an open symbol at the practical quantitation limit
- Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW), minimum of Table 1- Table 4.

Figure B-4
Dissolved Manganese

Boettcher Quarry
Technical Revision #11

Golder Associates



- Non-detect values plotted with an open symbol at the practical quantitation limit
- Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW), minimum of Table 1- Table 4.

Figure B-5
Total Dissolved Solids

Boettcher Quarry
Technical Revision #11

Golder Associates



MINERALS PROGRAM INSPECTION REPORT
PHONE: (303) 866-3567

The Division of Reclamation, Mining and Safety has conducted an inspection of the mining operation noted below. This report documents observations concerning compliance with the terms of the permit and applicable rules and regulations of the Mined Land Reclamation Board.

MINE NAME: Boettcher Limestone Quarry	MINE/PROSPECTING ID#: M-1977-348	MINERAL: Limestone (general)	COUNTY: Larimer
INSPECTION TYPE: Monitoring	INSPECTOR(S): Amy Eschberger, Patrick Lennberg, Michael Cunningham, and Russ Means	INSP. DATE: January 30, 2020	INSP. TIME: 10:30
OPERATOR: Holcim (US) Inc.	OPERATOR REPRESENTATIVE: Travis Bennett and Mike Toelle	TYPE OF OPERATION: 112c - Construction Regular Operation	

REASON FOR INSPECTION: Normal I&E Program	BOND CALCULATION TYPE: None	BOND AMOUNT: \$2,518,261.30
DATE OF COMPLAINT: NA	POST INSP. CONTACTS: None	JOINT INSP. AGENCY: None
WEATHER: Clear	INSPECTOR'S SIGNATURE: 	SIGNATURE DATE: February 28, 2020

The following inspection topics were identified as having Problems or Possible Violations. OPERATORS SHOULD READ THE FOLLOWING PAGES CAREFULLY IN ORDER TO ASSURE COMPLIANCE WITH THE TERMS OF THE PERMIT AND APPLICABLE RULES AND REGULATIONS. If a Possible Violation is indicated, you will be notified under separate cover as to when the Mined Land Reclamation Board will consider possible enforcement action.

INSPECTION TOPIC: Hydrologic Balance

PROBLEM #1: The Division has no evidence the operator has a valid well permit, substitute water supply plan, or approved water augmentation plan for the exposed groundwater and/or impounded runoff observed at the site. This is a problem pursuant to C.R.S. 34-32.5-116(4)(h) and Rule 3.1.6(1)(a) which require the operator to comply with applicable Colorado water laws and regulations governing injury to existing water rights.

CORRECTIVE ACTIONS: By the corrective action date, the operator shall demonstrate the operation is in compliance with the Office of the State Engineer (SEO), show evidence the operator is taking measures to bring the site into compliance with the SEO, or backfill the pits to at least two feet above the water surface. If, by the corrective action date, the operator has not submitted the required corrective action, the reclamation bond for the site will need to be re-evaluated to include costs for backfilling the ponded water.

CORRECTIVE ACTION DUE DATE: April 28, 2020

INSPECTION TOPIC: Hydrologic Balance

PROBLEM #2: The groundwater monitoring data for the site shows several parameters exceeding Table Value Standards set by the Water Quality Control Commission's (WQCC) Regulation No. 41, which apply to this

unclassified area. This is a problem pursuant to C.R.S. 34-32.5-116(4)(h) and Rule 3.1.6(1)(b), which require disturbances to the prevailing hydrologic balance of the affected land and of the surrounding area and to the quantity and quality of water in surface and groundwater systems both during and after the mining operation and during reclamation be minimized, including compliance with applicable federal and Colorado water quality laws and regulations such as statewide water quality standards and site-specific classifications and standards adopted by the WQCC.

CORRECTIVE ACTIONS: By the corrective action date, the operator shall submit a Technical Revision, with the applicable fee, to revise the groundwater monitoring program to include proposed point(s) of compliance in accordance with Rule 3.1.7(6) and (7) at some distance hydrologically downgradient from the Cement Kiln Dust (CKD) disposal areas. Due to the lack of ambient groundwater quality data for the site required by Rule 3.1.7(b)(viii), the revision shall also include proposed background monitoring well(s) located outside of the CKD disposal areas and screened across similar lithological units as existing downgradient monitoring wells and the proposed compliance well(s). The information obtained from these wells will be used to evaluate protection afforded groundwater quality and compliance with groundwater standards.

CORRECTIVE ACTION DUE DATE: April 28, 2020

OBSERVATIONS

This inspection of the Boettcher Limestone Quarry (Permit No. M-1977-348) was conducted by Amy Eschberger, Patrick Lennberg, Michael Cunningham, and Russ Means of the Division of Reclamation, Mining and Safety (Division). The operator was represented by Mike Toelle and Travis Bennett during the inspection. The site is located approximately 1.5 miles north of LaPorte, CO in Larimer County. The site can be accessed from the south off County Road 21C. **Photos 1-26** taken during the inspection are included with this report.

Operation Summary:

This is a 112c operation permitted for 862 acres (see enclosed Google Earth images of the site) to mine limestone for use in the operator's nearby cement plant. Pre-law mining activities occurred at the site. A dragline was used to remove the material in stratigraphic layers or bands defined by their chemical characteristics. This mining method left a series of deep, elongated pits at the site oriented generally north-south. Salvaged overburden was piled along the edges of the pits.

Cement kiln dust (CKD) was generated on site during operations that occurred from the early 1900s through 2002. According to the operator, disposal of CKD in mined out portions of the quarry occurred from 1980 through 2002 (in the southern half of the site). CKD was initially placed in the Dry Fill CKD area. Per the Division's approval of Technical Revision No. 3 (TR-3) in 1999, CKD disposal was to be limited to the A2 areas, located north of the Dry Fill CKD area. Approximately 140,000 cubic yards of CKD was placed in the A2 disposal areas between 1999 and 2002. Mining and plant operations ceased at the site in 2002. The site has been in various stages of reclamation since that time.

The approved post-mining land use for the site is dry rangeland. The reclamation plan calls for grading disturbed land to slope gradients of 2H:1V or flatter, replacing up to 8 inches of topsoil, and seeding the land with a native grass seed mixture. The CKD disposal areas are to be covered with a minimum of 1.5 feet of overburden, graded for positive drainage, covered with 6-12 inches of growth medium, and seeded with the same grass seed mixture. Pre-law disturbed areas, including overburden stockpiles and previously mined A-band pits in the western portion of the permit area, will not require reclamation grading and revegetation if they are not re-disturbed by the operation. The access road that runs generally north-south across the site will remain.

It should be noted, the Division approved Technical Revision No. 8 (TR-8) on February 16, 2018 to allow geotechnical investigations to be conducted at the site to support the proposed realignment of Hwy 287 (through the permit area) as part of the Glade Reservoir Project. The approved reclamation plan for the site does not include the proposed highway realignment project. Therefore, prior to commencing with any construction activities associated with this project (beyond what was approved in TR-8), the operator will need to submit the appropriate permit revision to revise the reclamation plan and map accordingly.

Reclamation Status:

All reclamation earthwork has been completed at the site. The final slope configurations of the elongated strip pits appear to be stable. Additionally, reclamation vegetation is establishing well across the site, especially in the northern half of the permit area. Portions of the pre-law overburden stockpiles stored along the western edge of the permit area and the eastern pit walls of the pre-law A-pits located in the western portion of the permit area, have slopes steeper than 2H:1V with little to no vegetative cover. Because these areas were not re-disturbed by the operation, they will not require reclamation. Much of the site has been reclaimed in accordance with the approved reclamation plan and could be released if not for the hydrologic balance issues described below. The northern portion of the permit area (north of the pits with ponded water) could be released from the

permit area at this time.

After the inspection, on February 24, 2020, an Acreage Reduction request (AR-4) was filed with our Office to release the northern 411 acres from the permit area. This request is currently under review by the Division. The 15-day public comment period for AR-4 will close on March 12, 2020.

Hydrologic Balance (Ponded Water):

The Division observed water ponded in three of the pits located along the western edge of the permit area (Ponds A, B3, and B) and in two of the pits located along the eastern edge of the permit area (Ponds 2 and C). The operator estimates the ponded water in the pits to be approximately 15 feet deep. Pond B2 located in the western portion of the permit area was dry during the inspection. The Division of Water Resources (DWR) requires operators to ensure water is not retained on site for more than 72 hours, unless an augmentation plan approved by water court is obtained. An augmentation plan must also be obtained for any exposed groundwater, unless an exemption has been approved by DWR.

The Division cited a problem for the ponded water in its last inspection report, sent to the operator on June 7, 2018. The Division approved a series of extension requests for this corrective action, the last of which gave a corrective action date of April 5, 2019. At that time, the operator indicated they had agreed to the terms of a long-term water lease agreement with the City of Greeley, which their Board would consider at its February 20, 2019 meeting. Assuming the Board agreed with the terms of the lease, the operator would begin drafting an augmentation plan for submittal to DWR. The Division has received no further information on this matter since the last extension request was approved in February of 2019.

During the current inspection, the operator indicated a proposed plan for augmentation for the site was sent to DWR approximately two weeks ago, and the operator is awaiting their response. The Division has not received any documentation proving the plan for augmentation was submitted to DWR.

A problem is cited in this report (see page 1) for the ponded water on site pursuant to C.R.S. 34-32.5-116(4)(h) and Rule 3.1.6(1)(a) which require the operator to comply with applicable Colorado water laws and regulations governing injury to existing water rights. The operator will need to demonstrate the operation is in compliance with the Office of the State Engineer (SEO), show evidence the operator is taking measures to bring the site into compliance with the SEO, or backfill the pits to at least two feet above the water surface. If, by the corrective action date, the operator has not submitted the required corrective action, the reclamation bond for the site will need to be re-evaluated to include costs for backfilling the ponded water.

Hydrologic Balance (Groundwater Monitoring Program):

The operation monitors groundwater at the site from a total of seven monitoring wells (MW-1 – MW-7), with all but one (MW-5) located near or downgradient of the CKD disposal areas in the southern portion of the permit area. MW-5 was installed in overburden outside (and north) of the CKD disposal areas. The Division collected GPS data for all well locations during the inspection (see enclosed Google Earth images of site). All wells were properly secured with padlocks. It should be noted, the concrete apron around well MW-1 is elevated above the ground by approximately 8 inches. Depending on the competence of the surface seal of the well, having the apron raised above the ground surface could allow water to migrate down the casing and into the well. Therefore, the Division recommends the operator install a proper concrete apron around well MW-1.

Monitoring wells MW-1 – MW-4 were installed in 1998 and 1999. Monitoring wells MW-5 – MW-7 were installed in late 2012. A total of 8 (bi-monthly) groundwater monitoring samples were collected from wells MW-

1 – MW-4 for the period of April/May of 1999 through July of 2000. After the July 2000 sampling event, approximately 10 years passed before these wells were sampled again, in September of 2010. Somewhat regular sampling of these wells picked back up in March of 2011. The three additional monitoring wells installed in 2012 (MW-5 – MW-7) have been regularly monitored since 2013. The required monitoring (and reporting) frequency for the groundwater program was reduced from quarterly to semi-annually through Technical Revision No. 7 (TR-7), approved in 2016. This was to allow for complete recharge between sampling events, so that true independent measurements are collected based on groundwater equilibrium conditions.

The available groundwater monitoring data does not show consistent sampling for all parameters. While some of these inconsistencies are not explained in the permit record, the inconsistencies that occurred after August of 2014 can be attributed to the Division's approval of Technical Revision No. 6 (TR-6), which reduced the required monitoring parameters for the site. In 2018, the Division required the operator to expand the sampling suite to include all applicable parameters from the Table Value Standards established by the WQCC's Regulation No. 41, and to begin comparing parameter values to the most restrictive Table Value Standards rather than to any calculated values that may have been used previously. These changes were approved in Technical Revision No. 9 (TR-9) on October 26, 2018. Two (semi-annual) sampling events have occurred at the site since TR-9 was approved.

Since the last inspection, the Division has had on-going discussions with the operator and the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD) regarding the groundwater monitoring program for this unclassified area, including the application of WQCC's Regulation No. 41.5(C)(6) to the site. Per this regulation, sites with unclassified groundwater shall maintain groundwater quality at whichever is less restrictive: existing ambient quality as of January 31, 1994, or that quality which meets the most stringent criteria set forth in Tables 1 through 4 of "The Basic Standards for Ground Water" (Table Value Standards). The Division, as an implementing agency, is authorized to exercise its best professional judgement as to what constitutes adequate information to determine or estimate existing ambient quality, taking into account the location, sampling data, and quality of all available data. Data generated subsequent to January 31, 1994 shall be presumed to be representative of existing quality as of January 31, 1994, if the available information indicates that there have been no new or increased sources of groundwater contamination initiated in the area in question subsequent to that date.

The operator submitted Technical Revision No. 10 (TR-10) on March 5, 2019 to provide information that would allow ambient conditions to be established for the site based on groundwater monitoring data generated subsequent to January 31, 1994. Through the adequacy review process for TR-10, the Division identified deficiencies in the information presented which the operator was unable to adequately address. The operator requested withdrawal of TR-10 on December 13, 2019.

The following facts must be considered regarding groundwater quality conditions at the site:

- 1) Groundwater sampled from the site shows exceedances of WQCC's Table Value Standards for the following parameters: Arsenic, Barium, Boron, Chloride, Fluoride, Gross Alpha, Iron, Manganese, Nitrate as N, Nitrate + Nitrite as N, Selenium, Sulfate, Thallium, Uranium, and TDS > 10,000 mg/L (no background TDS available).
- 2) The operator was unable to adequately demonstrate (through TR-10) existing groundwater quality at the site is representative of ambient conditions.
- 3) Rule 3.1.7(6)(a) states in order to evaluate protection afforded groundwater quality, comply with groundwater standards, or to demonstrate compliance with permit conditions established by the Division

to protect groundwater quality, one or more points of compliance shall be established. Section (i) of this Rule specifies where the WQCC has not established standards, any permit condition established by the Division to protect groundwater quality shall be demonstrated to be met at points of compliance or as specified in the approved permit.

- 4) Rule 3.1.7(7)(b) states if groundwater monitoring is required, the operator shall include the following information as part of a permit application or permit modification to an existing permit:
- (i) a map that accurately locates all proposed groundwater sample points and any locations that are proposed as a point of compliance;
 - (ii) the method of monitoring well completion where monitoring wells are required;
 - (iii) method of sampling, frequency of sampling and reporting to the Office;
 - (iv) parameters analyzed, water quality analysis methods, and quality control and quality assurance methods;
 - (v) formations, aquifers or strata to be sampled;
 - (vi) identify the potential sources of groundwater contamination that will be monitored by each point of compliance monitoring point;
 - (vii) a time-schedule for implementation; and
 - (viii) ambient groundwater quality data sufficient to characterize potentially impacted groundwater quality.
- 5) The groundwater monitoring program for the site does not include points of compliance or ambient groundwater quality data.
- 6) In order for the Division to evaluate protection afforded groundwater quality and compliance with groundwater standards, point(s) of compliance must be established at the site.
- 7) In lieu of ambient groundwater quality data, adequate background well(s) must also be established at the site.

A problem is cited in this report (see pages 1 and 2) pursuant to C.R.S. 34-32.5-116(4)(h) and Rule 3.1.6(1)(b), which require disturbances to the prevailing hydrologic balance of the affected land and of the surrounding area and to the quantity and quality of water in surface and groundwater systems both during and after the mining operation and during reclamation be minimized, including compliance with applicable federal and Colorado water quality laws and regulations such as statewide water quality standards and site-specific classifications and standards adopted by the WQCC.

The operator will need to submit a Technical Revision (see enclosed form), with the applicable fee, to revise the groundwater monitoring program to include proposed point(s) of compliance in accordance with Rule 3.1.7(6) and (7) at some distance hydrologically downgradient from the Cement Kiln Dust (CKD) disposal areas. Due to the lack of ambient groundwater quality data for the site required by Rule 3.1.7(b)(viii), the revision shall also include proposed background monitoring well(s) located outside of the CKD disposal areas and screened across

similar lithological units as existing downgradient monitoring wells and the proposed compliance well(s). The information obtained from these wells will be used to evaluate protection afforded groundwater quality and compliance with groundwater standards.

This concludes the report.

Any questions or comments regarding this inspection report should be forwarded to Amy Eschberger at the Colorado Division of Reclamation, Mining and Safety, 1313 Sherman Street, Room 215, Denver, CO 80203, via telephone at 303-866-3567, ext. 8129, or via email at amy.eschberger@state.co.us.

PHOTOGRAPHS



Photo 1. View looking south from northern permit boundary across reclaimed northern portion of permit area.



Photo 2. View looking southwest across reclaimed northern portion of permit area.



Photo 3. View looking west across reclaimed northern portion of permit area.



Photo 4. View looking west across reclaimed northern portion of permit area, showing pre-law western slope (indicated) which was not re-disturbed by the operation and therefore does not require reclamation.



Photo 5. View looking west across reclaimed northern portion of permit area. Note herd of pronghorn present on site, in background (circled).



Photo 6. View looking west across reclaimed northern portion of permit area.



Photo 7. View looking west across Pond A located in western portion of permit area, west of main access road. Note this pit was holding water during the inspection.



Photo 8. View looking southeast across Pond 2 located in eastern portion of permit area, east of main access road. Note this pit was holding water during the inspection.



Photo 9. View looking north across Pond B3 located in western portion of permit area, west of main access road. Note this pit was holding water during the inspection.



Photo 10. View looking south across Pond B2 located in western portion of permit area, west of main access road. Note this pit was dry during the inspection.



Photo 11. View looking northeast across Pond C located in eastern portion of permit area, east of main access road. Note this pit was holding water during the inspection.



Photo 12. View looking west at Poudre Valley Canal which crosses southern portion of permit area, separating CKD disposal areas to the south from rest of permit area.



Photo 13. View looking south across Pond B located in western portion of permit area, west of main access road. Note this pit was holding water during the inspection.



Photo 14. View looking south, showing monitoring well MW-5 located outside of CKD disposal areas, just north of Pond B. The well cap was secured with a padlock.



Photo 15. View looking east, showing monitoring well MW-2 located at northeastern edge of A2 CKD disposal area. The well cap was secured with a padlock.



Photo 16. View looking northwest, showing monitoring well MW-1 located within A2-CKD disposal area, on top of small overburden mound (circled).



Photo 17. View looking south, showing monitoring well MW-1 located within A2-A CKD disposal area on top of small overburden mound. The well cap was secured with a padlock. However, the concrete apron around the well was elevated ~ 8 inches off the ground which could allow water to migrate down the casing and into the well. This needs to be repaired.



Photo 18. View looking south across reclaimed A2-A CKD disposal area (from top of mound with monitoring well MW-1).



Photo 19. View looking northeast, showing monitoring well MW-3 located at eastern edge of A2-A CKD disposal area. The well cap was secured with a padlock.



Photo 20. View looking northwest across southern portion of reclaimed A2-A CKD disposal area. Note pre-law overburden stockpile along western edge of pit (at left).



Photo 21. View looking northwest across northern portion of reclaimed Dry Fill CKD disposal area. Note surface of Dry Fill CKD disposal area ~30-40 feet higher than surface of A2-A CKD disposal area (indicated in background).



Photo 22. View looking south across central portion of reclaimed Dry Fill CKD disposal area.



Photo 23. View looking north, showing monitoring well MW-4 located southeast of Dry Fill CKD disposal area. The well cap was secured with a padlock.



Photo 24. View looking southeast from top of Dry Fill CKD disposal area, showing monitoring well MW-4 (circled) located downgradient from this disposal area.



Photo 25. View looking south, showing monitoring well MW-7 located east of Dry Fill CKD disposal area, near main access road. The well cap was secured with a padlock.



Photo 26. View looking south, showing monitoring well MW-6 located east of A2-A CKD disposal area, near main access road. The well cap was secured with a padlock.

GENERAL INSPECTION TOPICS

The following list identifies the environmental and permit parameters inspected and gives a categorical evaluation of each

(AR) RECORDS----- <u>N</u>	(FN) FINANCIAL WARRANTY----- <u>N</u>	(RD) ROADS----- <u>Y</u>
(HB) HYDROLOGIC BALANCE----- (2) <u>PBs</u>	(BG) BACKFILL & GRADING----- <u>Y</u>	(EX) EXPLOSIVES----- <u>N</u>
(PW) PROCESSING WASTE/TAILING---- <u>N</u>	(SF) PROCESSING FACILITIES----- <u>N</u>	(TS) TOPSOIL----- <u>N</u>
(MP) GENL MINE PLAN COMPLIANCE- <u>Y</u>	(FW) FISH & WILDLIFE----- <u>N</u>	(RV) REVEGETATION---- <u>Y</u>
(SM) SIGNS AND MARKERS----- <u>Y</u>	(SP) STORM WATER MGT PLAN---- <u>N</u>	(RS) RECL PLAN/COMP-- <u>Y</u>
(ES) OVERBURDEN/DEV. WASTE----- <u>N</u>	(SC) EROSION/SEDIMENTATION--- <u>Y</u>	(ST) STIPULATIONS----- <u>N</u>
(AT) ACID OR TOXIC MATERIALS----- <u>N</u>	(OD) OFF-SITE DAMAGE----- <u>N</u>	

Y = Inspected and found in compliance / N = Not inspected / NA = Not applicable to this operation / PB = Problem cited / PV = Possible violation cited

Inspection Contact Address

Travis Bennett
Holcim (US) Inc.
14500 CR 1550
Ada, OK 74820

Encls: Google Earth image of site showing entire approved permit area
Google Earth image of site showing closer view of southern portion of site where groundwater monitoring wells and CKD disposal areas are located
Technical Revision form

EC: Travis Bennett, Holcim (US) Inc. at: travis.bennett@lafargeholcim.com
Mike Toelle, Holcim (US) Inc. at: mike.toelle@lafargeholcim.com
Sara Harkins, Golder Associates, Inc. at: sara_harkins@golder.com
Patrick Lennberg, DRMS at: patrick.lennberg@state.co.us
Michael Cunningham, DRMS at: michaela.cunningham@state.co.us
Russ Means, DRMS at: russ.means@state.co.us

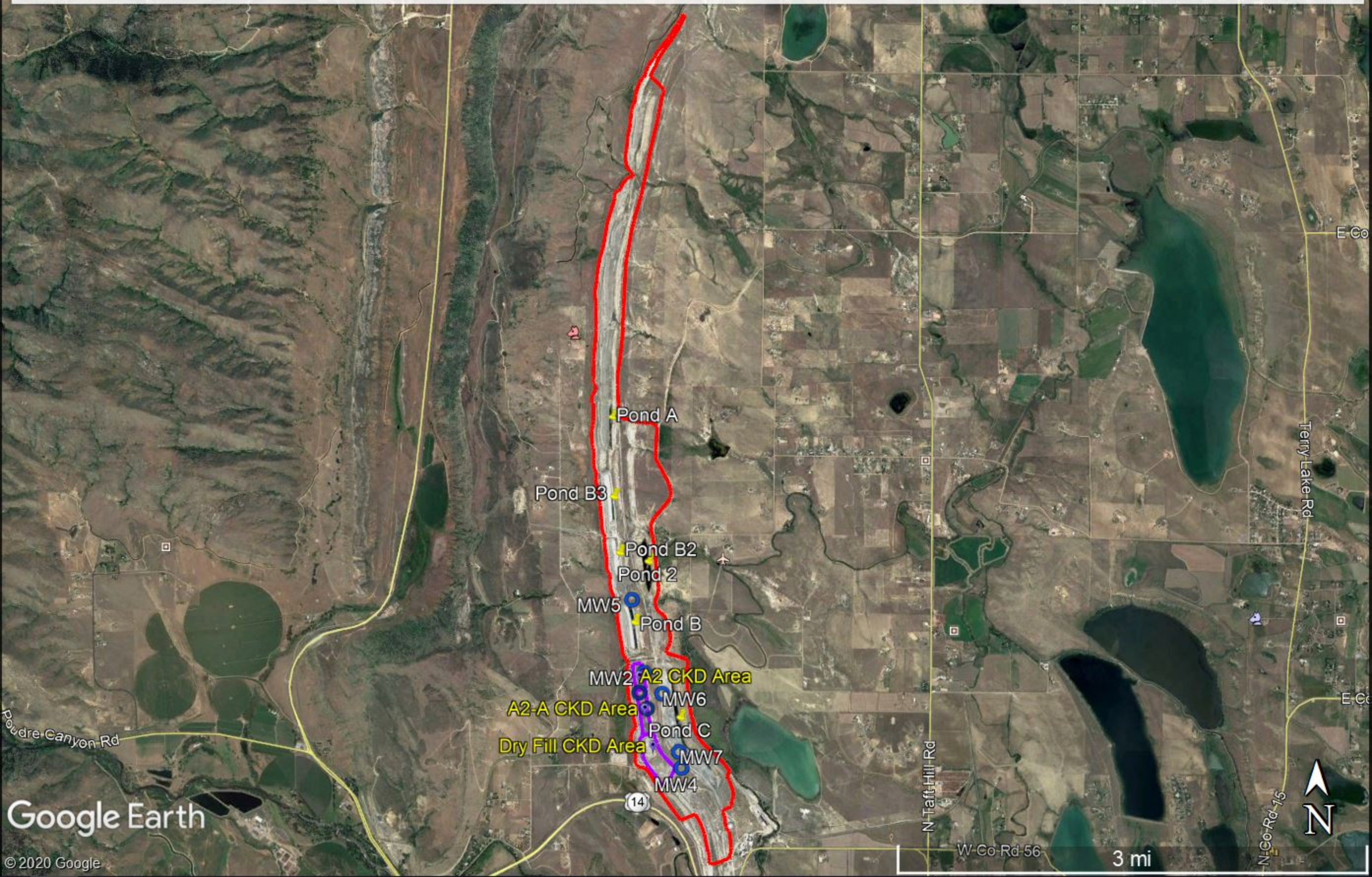
M1977-348 / Boettcher Limestone Quarry / Holcim (US) Inc. (Image data from 7/17/2019)

Red Outline = 862 acres = Approved permit area (location approximated based on approved permit maps)

Purple Outline = Approximate location of CKD disposal areas (labeled A2, A2-A, and Dry Fill)

Blue Circles = Location of groundwater monitoring wells (MW-1 through MW-7)

Yellow Thumbtacks = Labeled ponds



M1977-348 / Boettcher Limestone Quarry / Holcim (US) Inc. (Image data from 7/17/2019)

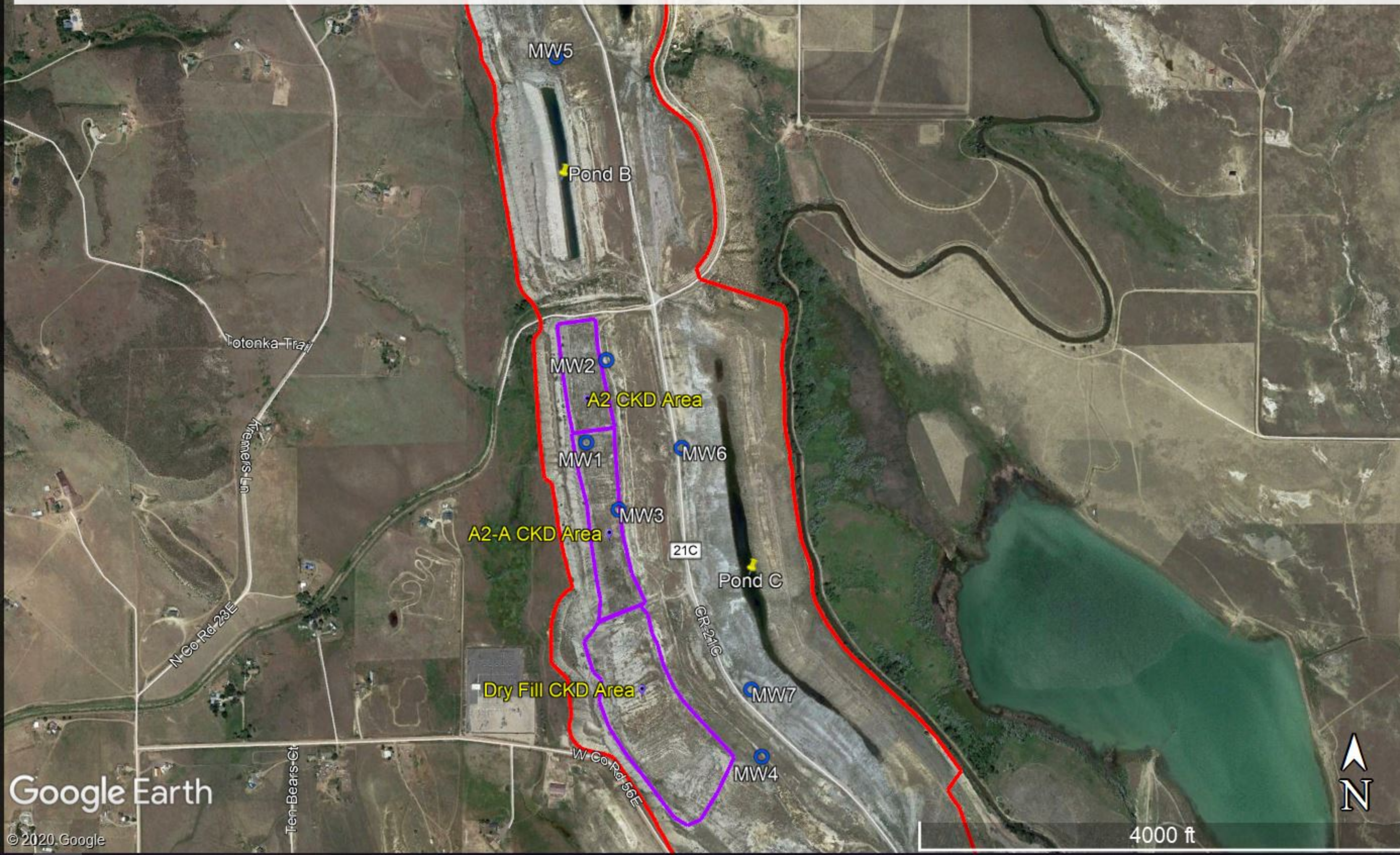
Closer view of southern portion of site where groundwater monitoring wells and CKD disposal areas are located.

Red Outline = 862 acres = Approved permit area (location approximated based on approved permit maps)

Purple Outline = Approximate location of CKD disposal areas (labeled A2, A2-A, and Dry Fill)

Blue Circles = Location of groundwater monitoring wells (MW-1 through MW-7)

Yellow Thumbtacks = Labeled ponds





COLORADO DIVISION OF RECLAMATION, MINING AND SAFETY

1313 Sherman Street, Room 215, Denver, Colorado 80203 ph(303) 866-3567

REQUEST FOR TECHNICAL REVISION (TR) COVER SHEET

File No.: M- _____ Site Name: _____

County _____ TR# _____ (DRMS Use only)

Permittee: _____

Operator (If Other than Permittee): _____

Permittee Representative: _____

Please provide a brief description of the proposed revision: _____

As defined by the Minerals Rules, a Technical Revision (TR) is: “a change in the permit or application which does not have more than a minor effect upon the approved or proposed Reclamation or Environmental Protection Plan.” The Division is charged with determining if the revision as submitted meets this definition. If the Division determines that the proposed revision is beyond the scope of a TR, the Division may require the submittal of a permit amendment to make the required or desired changes to the permit.

The request for a TR is not considered “filed for review” until the appropriate fee is received by the Division (as listed below by permit type). Please submit the appropriate fee with your request to expedite the review process. After the TR is submitted with the appropriate fee, the Division will determine if it is approvable within 30 days. If the Division requires additional information to approve a TR, you will be notified of specific deficiencies that will need to be addressed. If at the end of the 30 day review period there are still outstanding deficiencies, the Division must deny the TR unless the permittee requests additional time, in writing, to provide the required information.

There is no pre-defined format for the submittal of a TR; however, it is up to the permittee to provide sufficient information to the Division to approve the TR request, including updated mining and reclamation plan maps that accurately depict the changes proposed in the requested TR.

Required Fees for Technical Revision by Permit Type - Please mark the correct fee and submit it with your request for a Technical Revision.

<u>Permit Type</u>	<u>Required TR Fee</u>	<u>Submitted</u> (mark only one)
110c, 111, 112 construction materials, and 112 quarries	\$216	☐
112 hard rock (not DMO)	\$175	☐
110d, 112d(1, 2 or 3)	\$1006	☐