STATE OF COLORADO

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

Adequacy Review 2 / TR-11 / Boettcher Limestone Quarry / M1977-348

Moreno, Joanna <Joanna_Moreno@golder.com> Fri, Sep 4, 2020 at 1:38 PM
To: "Eschberger - DNR, Amy" <amy.eschberger@state.co.us>, "Harkins, Sara" <Sara_Harkins@golder.com>
Cc: "Mike Toelle (mike.toelle@lafargeholcim.com)" <mike.toelle@lafargeholcim.com>, "travis.bennett@lafargeholcim.com" <Travis.Bennett@lafargeholcim.com>, Patrick Lennberg - DNR <patrick.lennberg@state.co.us>, "Cunningham - DNR, Michael" <michaela.cunningham@state.co.us>

NOTE: This email chain appears to contain email from outside Golder

Hello Amy,

On behalf of Holcim (US) Inc., Golder is pleased to submit the revised request for Technical Revision (TR-11 Revision 1) for the Boettcher Limestone Quarry near La Porte, Colorado. This revision is updated in response to DRMS' Adequacy Review comments dated August 17 and 18, 2020. We are also sending you a paper copy.

Please let us know if you have any questions or difficulty opening the document.

Regards, Jo.

Joanna Moreno, PH (GW)
Groundwater Practice Leader, Associate
Golder Associates Inc.
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LinkedIn | Instagram | Facebook | Twitter

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2 attachments

image001.jpg
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20144265-1-TM-1-Request_Tech_Revision_TR11_Permit_M1977348_04SEP20.pdf
1918K

TECHNICAL MEMORANDUM

DATE September 4, 2020 **Reference No.** 20144265-REV1

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 **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 (REVISION 1)

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. This Technical Revision was revised to address DRMS adequacy review comments. Additionally, the first semi-annual 2020 monitoring results, which were not available at the time of the initial submittal, have been added to Attachment A and Attachment B. 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 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 subcontractor 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 though overburden/fill, anticipated to be no more than 30 feet. The hollow stem augers casing will remain in place during the remainder of drilling.
- Air-Rotary (open hole drilling) in competent bedrock to within 10 to 30 feet of anticipated contact between the Niobrara Formation and the Codell sandstone.
- Air-Coring (open hole drilling) 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. The volume of water, if used, will be recorded. 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 (approximately 5 feet) 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. Centralizers will be installed in the center of the screen and approximately every 50 feet below 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. Water will not be used to assist in placement of the sand pack unless conditions require the use of water. 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 annual 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. Water will not be added to the well during development and the volume of water purged will be documented. 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 and total dissolved solids (TDS) greater than 10,000 milligrams per liter (mg/L). These parameters include barium, iron, manganese, boron, selenium, uranium, fluoride, chloride, sulfate, nitrate, nitrate+nitrite, gross alpha, and TDS. It is noted gross alpha results have been consistently reported at low or negative concentrations with large uncertainty (e.g., -50 ±26 picocuries per liter (pCi/L)) and vary widely within each well and between wells. Therefore, the gross alpha results have been ineffective with regard to assessing groundwater quality and the large variability an uncertainty associated with the results will likely make any comparison to background well MW-8 inconclusive.

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 of recent results (2017-2019, following the shift to a semi-annual sampling schedule) showing the variability of barium, iron, manganese, boron, selenium, uranium, fluoride, chloride, sulfate, nitrate, nitrate+nitrite, gross alpha, and TDS 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, iron, gross alpha, 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 Documentation

Following the field program and installation for MW-8, a technical memorandum summarizing the well installation will be prepared and submitted to the DRMS within 60 days of well installation and development. The memorandum will include discussion of the field activities performed and subsurface conditions encountered or inferred. The borehole geologic logs, well installation/construction logs, and water level measurements will be presented as tables or attachments. The well installation logs will include coordinates, elevations, well installation date, well material type, well depth, screened interval, filter pack interval, bentonite seal interval, and the interpreted screened unit. 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 DWR.

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 MW-8 results by the methods described in Section 3, a field investigation summary will be prepared that present this evaluation. The field investigation summary will include an evaluation of the water quality data obtained at MW-8, a comparison of this data to water quality observed at other site wells screened at similar depths and lithology (MW-4, MW-6, and MW-7), and a discussion of whether data obtained from MW-8 indicates that concentrations of any of the parameters evaluated can be interpreted as representing natural groundwater conditions and not CKD-impacted groundwater. This evaluation will be conducted for barium, boron, chloride, fluoride, gross alpha, iron, manganese, nitrate as N, nitrate + nitrite as N, selenium, sulfate, TDS, and uranium.

If, after concentrations stabilize, 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), the field investigation summary will be submitted as a Technical Revision to the permit. In this case, the Technical Revision will specify that MW-9 will not be necessary and request that MW-6 or MW-7 be classified as the point of compliance.

If a demonstration cannot be made that the concentrations observed in MW-4, MW-6 and MW-7 are reflective of background conditions, the field investigation summary will specify a timeline for installation of MW-9 as a point of compliance well. In this case, the field investigation summary will not be submitted as a Technical Revision because MW-9 will be installed in accordance with this Technical Revision. If MW-9 is installed and 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 to evaluate whether existing and reasonably potential future uses of groundwater are protected (on the basis that BSGW or background water quality is not being exceeded) and, if so, request the discontinuation of the groundwater monitoring program.

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_revison/1-tm-1/20144265-1-tm-1-request_tech_revision_tr11_permit_m1977348_04sep20.docx

ATTACHMENTS: Figure 1 – Proposed Locations

Attachment A – Box and Whisker Plots

Attachment B – Time Series Graphs

Figure

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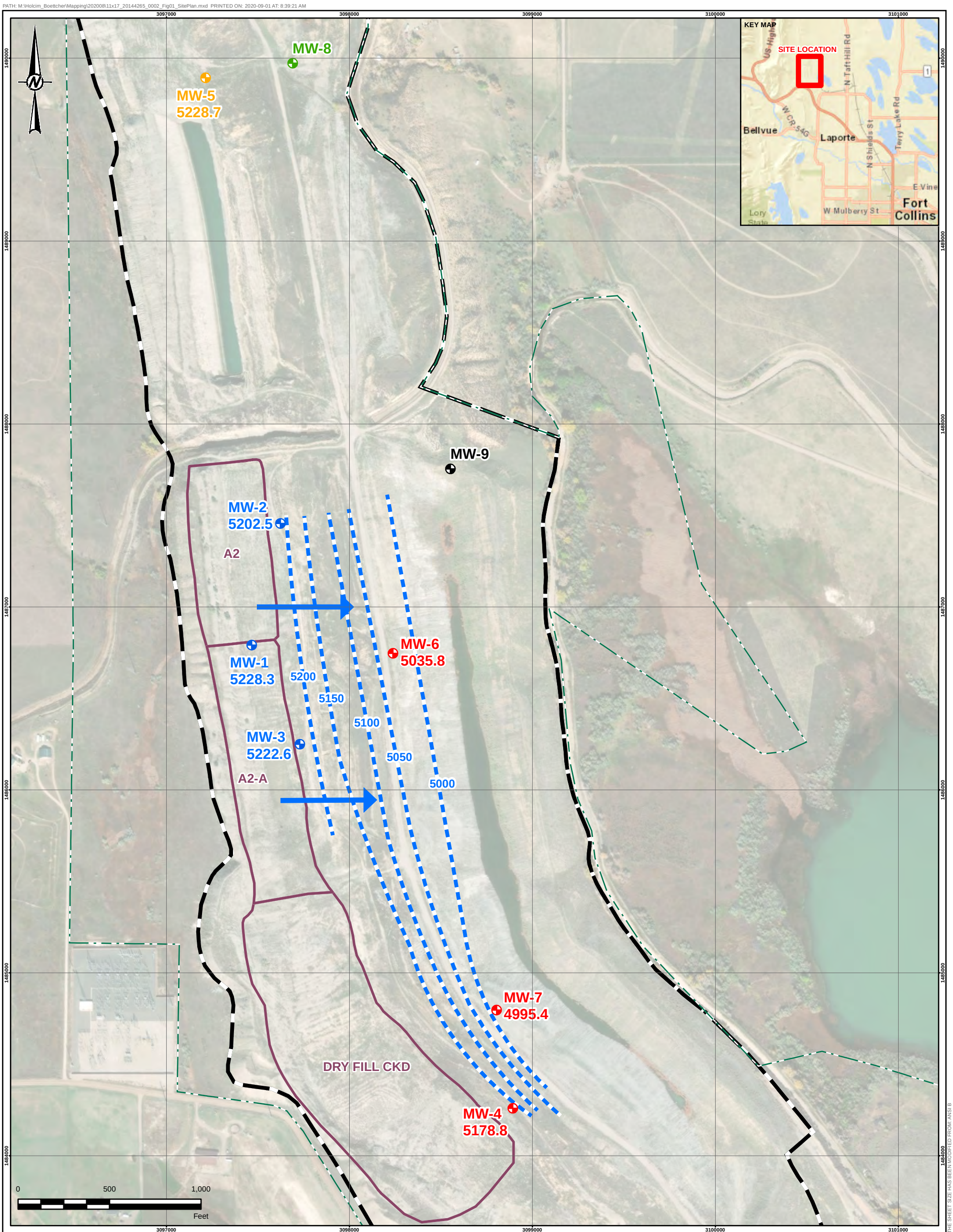

LEGEND

- MW-1 — EXISTING WELL SCREENED AT NIOBRARA / CODELL CONTACT
- MW-4 — EXISTING WELL SCREENED IN NIOBRARA
- MW-5 — EXISTING WELL SCREENED IN OVERBURDEN
- 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
- INFERRED GROUNDWATER CONTOUR (FT AMSL) GROUNDWATER ELEVATIONS MEASURED MAY 28, 2020
- APPROXIMATE GROUNDWATER FLOW DIRECTION

REV 1

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.
4. WELL TOTAL DEPTHS FOR MW-1 THROUGH MW-4 MEASURED BY GOLDER 7/30/2010 FROM THE TOP OF THE PVC WELL CASING TOP; BLS = BELOW LAND SURFACE. BOREHOLE AND WELL CONSTRUCTION LOGS WERE UNAVAILABLE FOR MW-4. INFORMATION PROVIDED FOR MW-4 WAS OBTAINED FROM A VIDEO SURVEY OF THE WELL PERFORMED ON JULY 30, 2010. MW-1 WELL CASING LIKELY EXTENDED SOMETIME AFTER CONSTRUCTION BASED ON DIFFERENCES IN DRILLED DEPTH BASED FROM BOREHOLE LOG AND TOTAL DEPTH MEASUREMENT MADE 7/30/2010; WAS REDUCED BY 0.30 FEET ON 01/10/2013 TO ENABLE CLOSING AND SECURING THE STEEL PROTECTIVE RISER LID.

CLIENT
HOLCIM (US) INC.

PROJECT
BOETTCHER LIMESTONE QUARRY
LARIMER COUNTY, COLORADO

TITLE
SITE LOCATION PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-01
DESIGNED	SAH
PREPARED	RHG
REVIEWED	JM
APPROVED	JM

PROJECT NO.
20144265.0002

FIGURE
1

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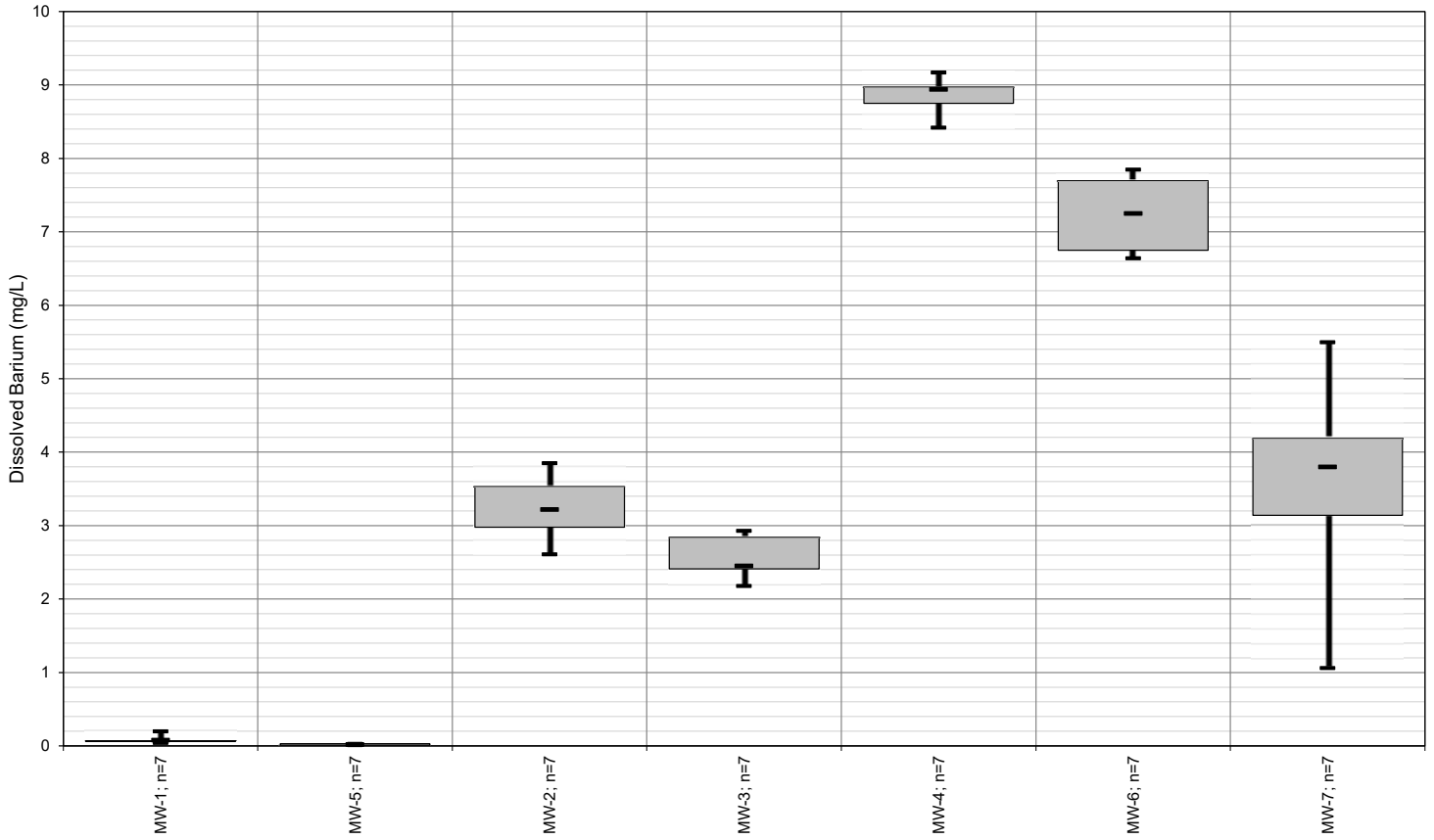
ATTACHMENT A

Box and Whisker Plots



REV 1

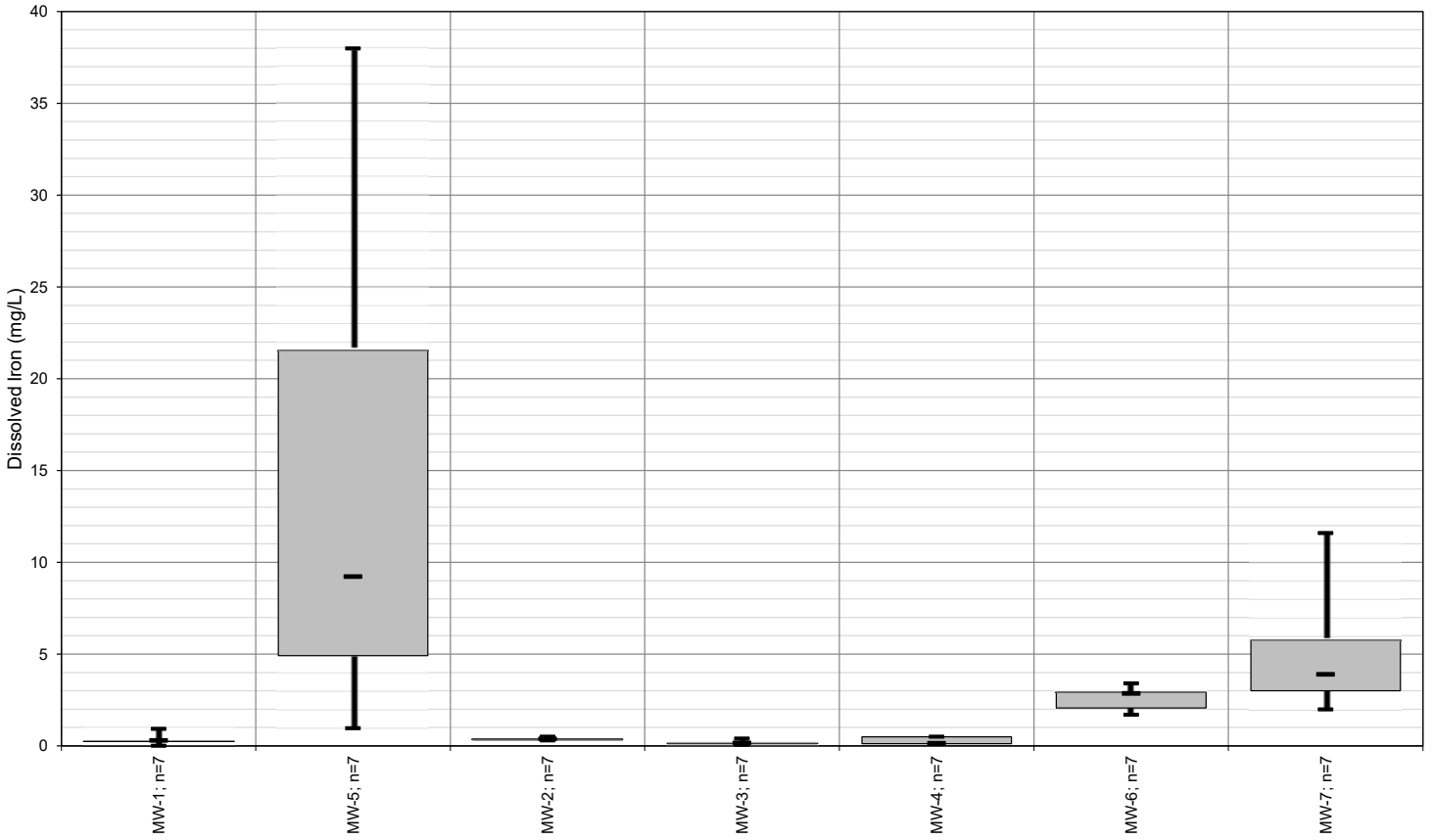
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Barium

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-1



REV 1

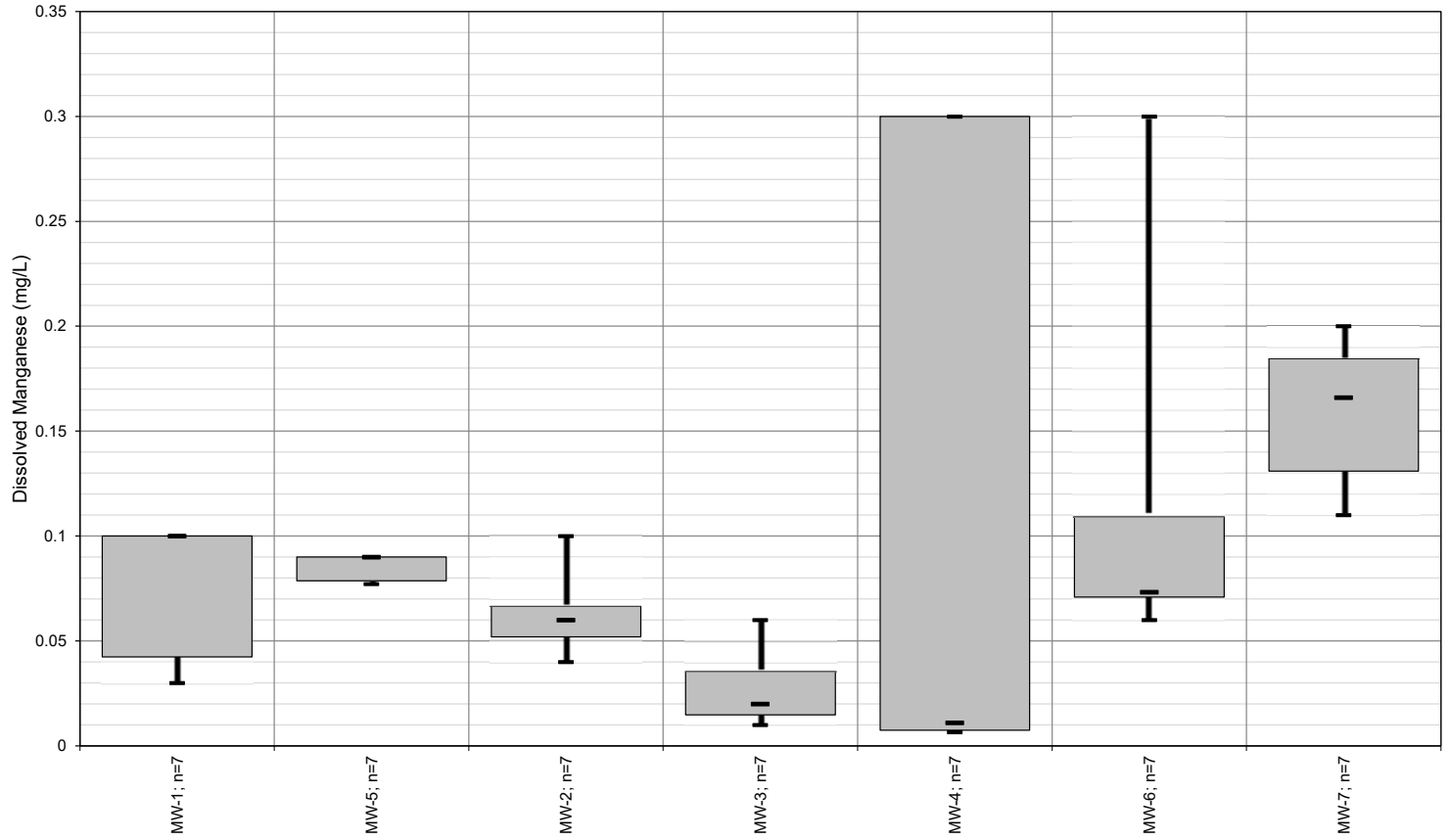
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Iron

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-2



REV 1

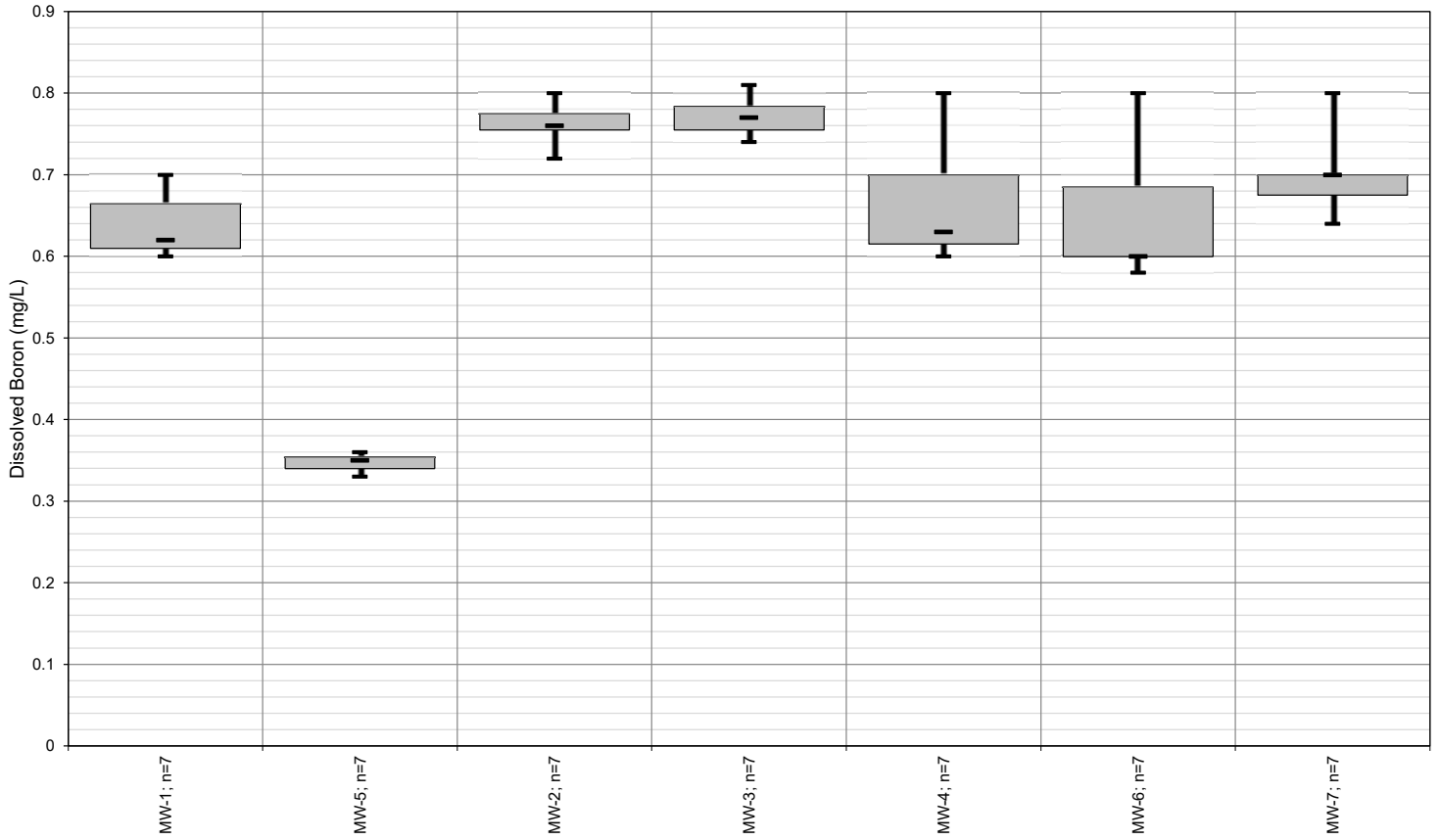
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Manganese

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-3



REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Boron

PROJECT NO.	PHASE	REV.	FIGURE
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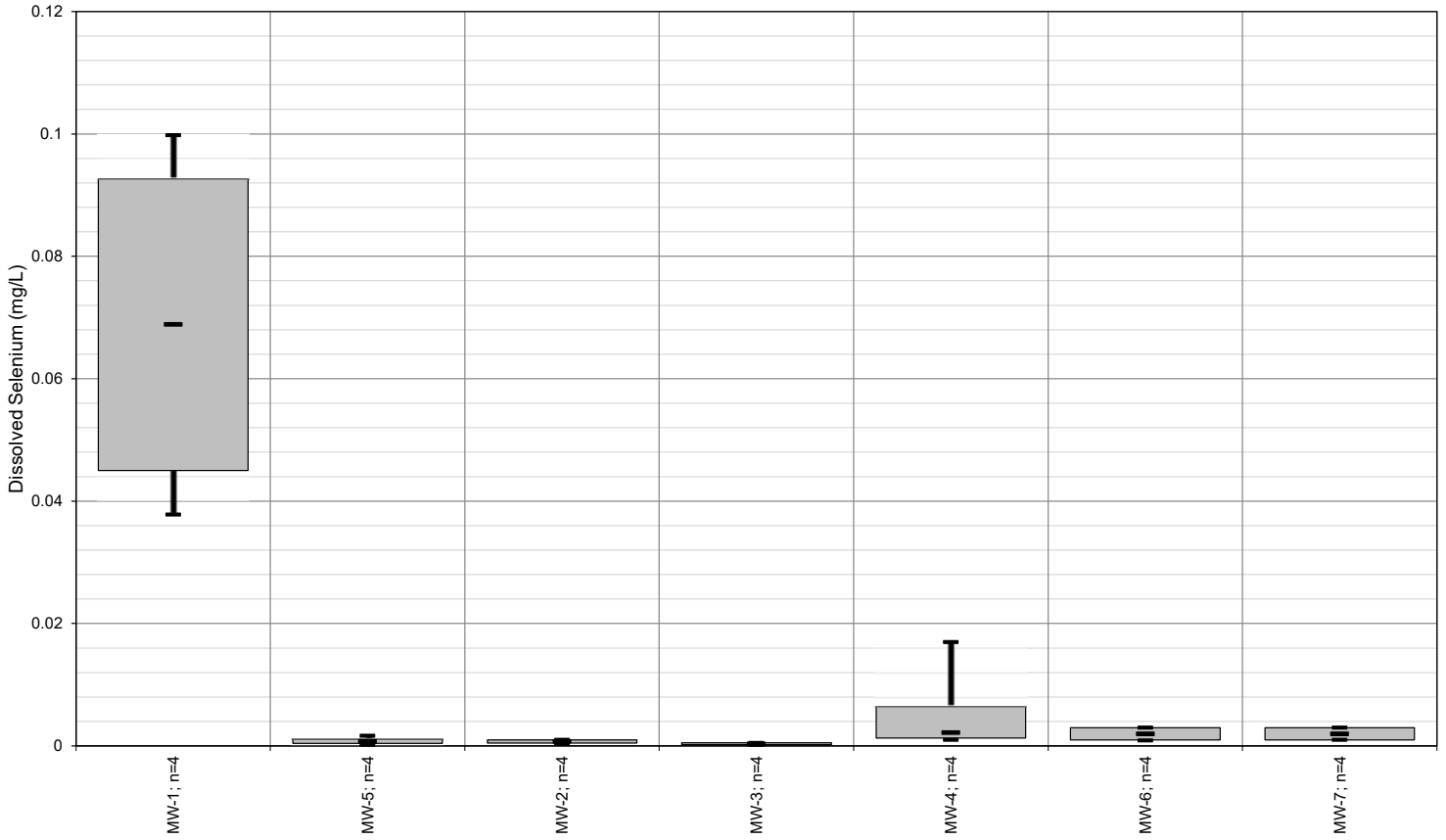

REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Selenium

PROJECT NO.	PHASE	REV.	FIGURE
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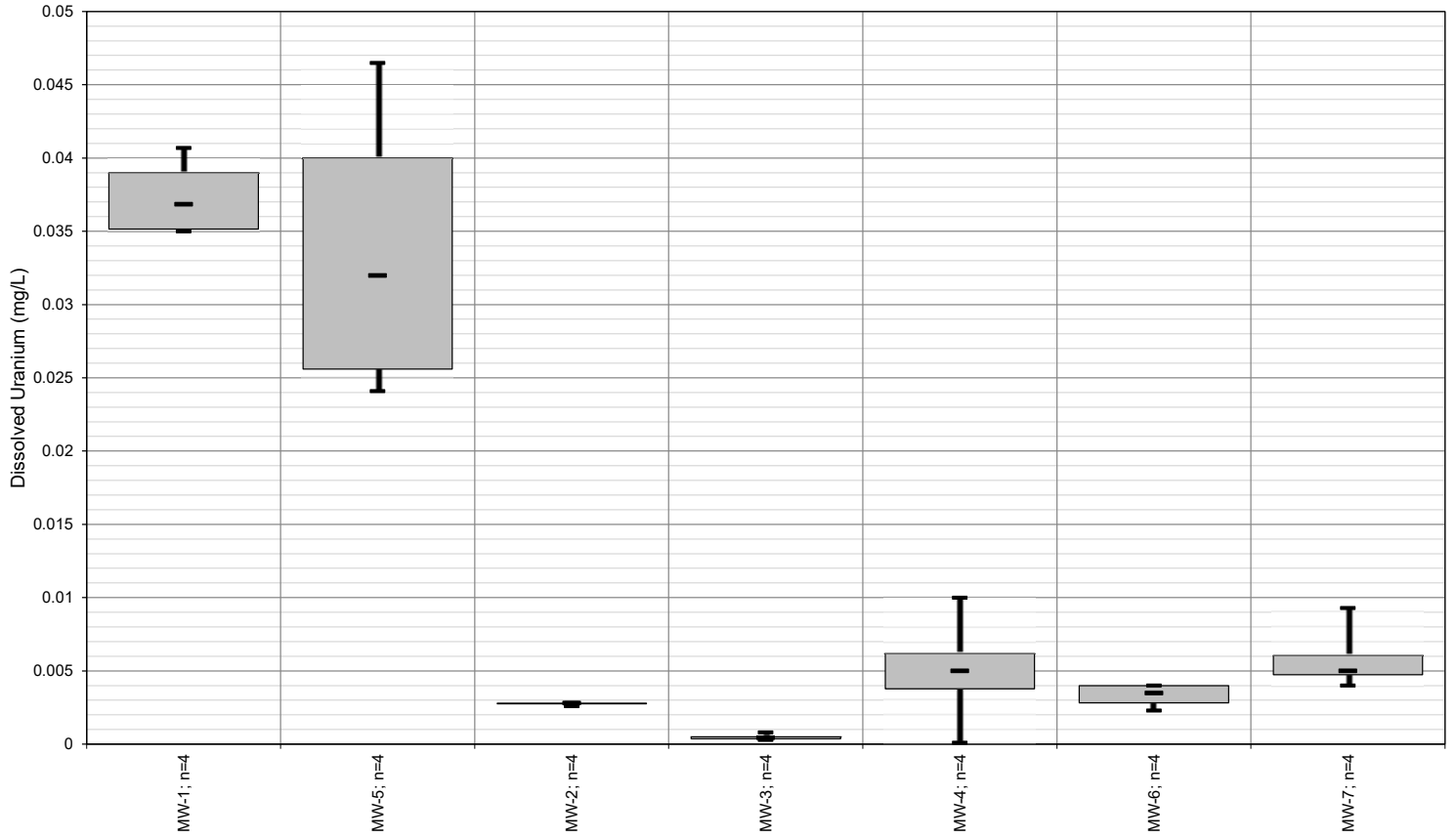

REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Dissolved Uranium

PROJECT NO.	PHASE	REV.	FIGURE
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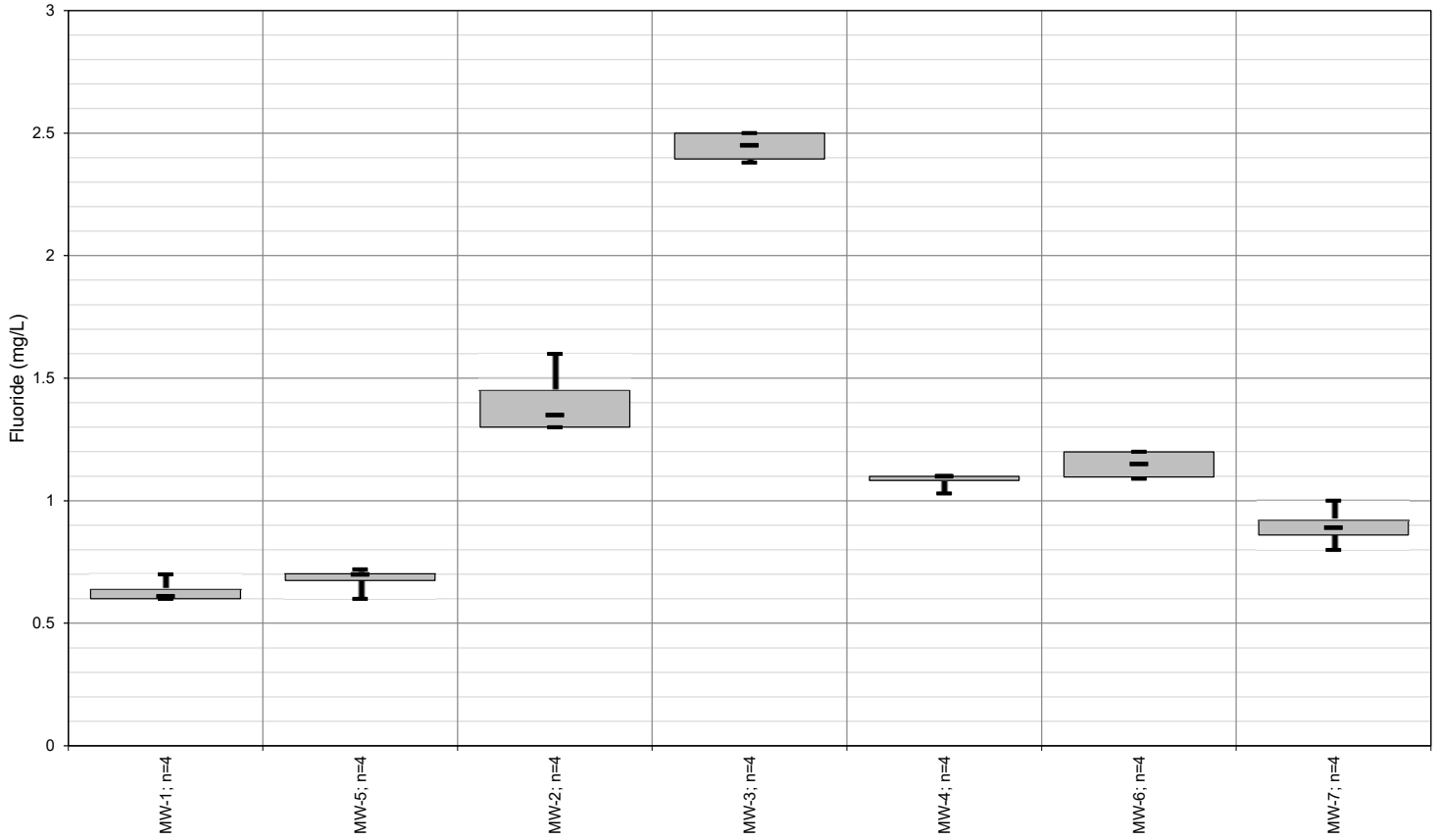

REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Fluoride

PROJECT NO.	PHASE	REV.	FIGURE
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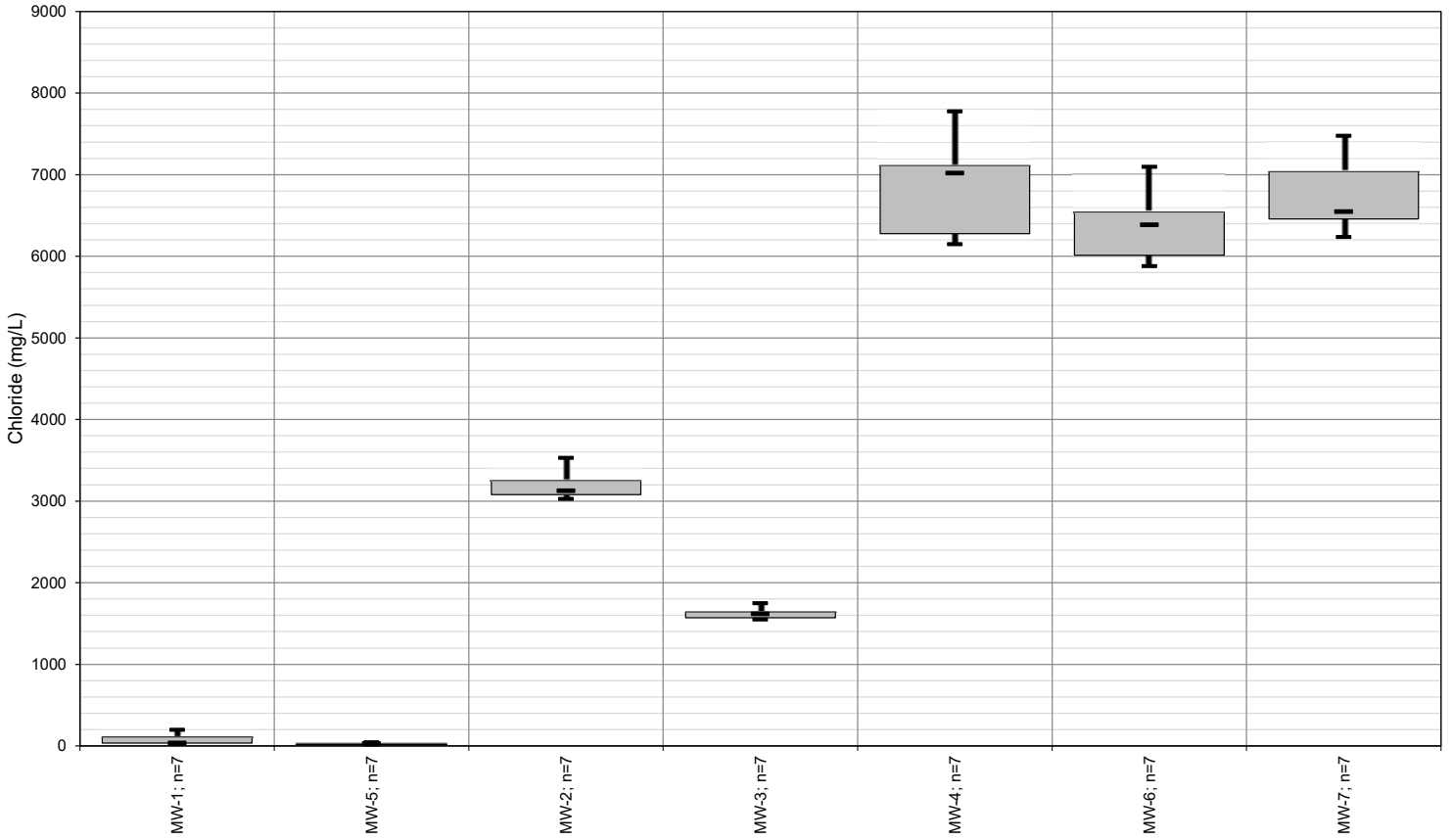

REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Chloride

PROJECT NO.	PHASE	REV.	FIGURE
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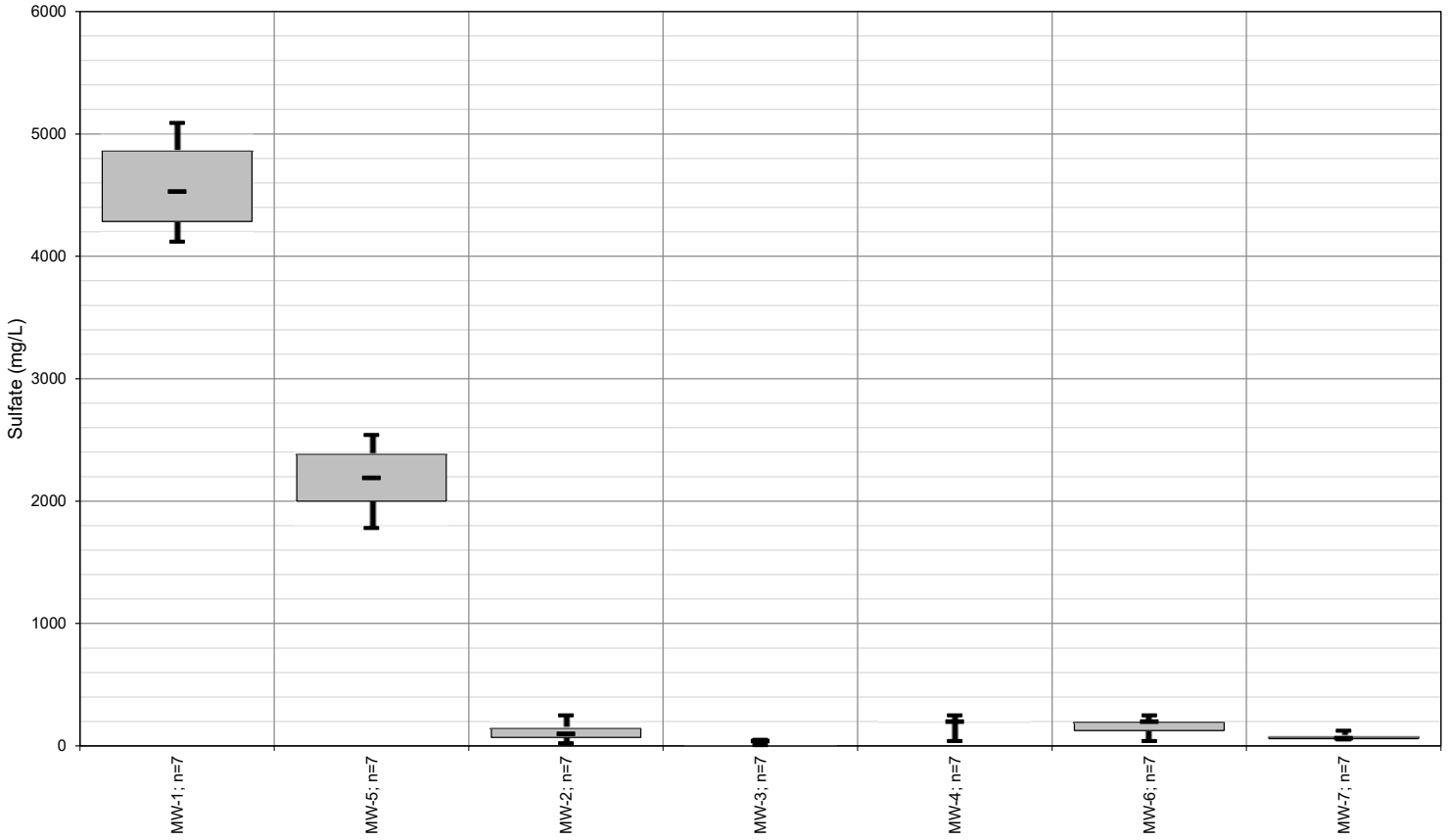
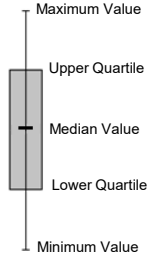




REV 1

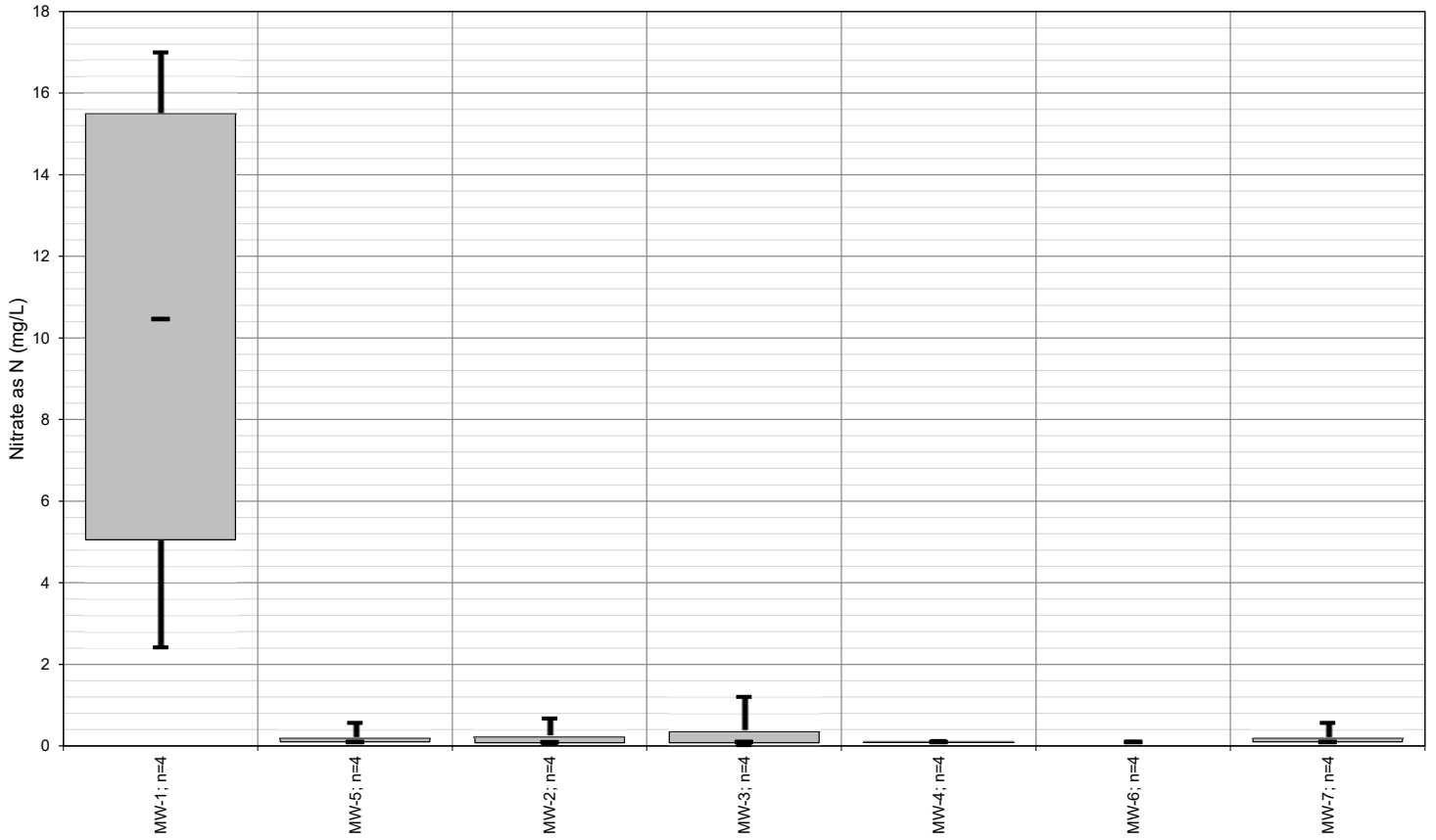
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Sulfate

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-9



REV 1

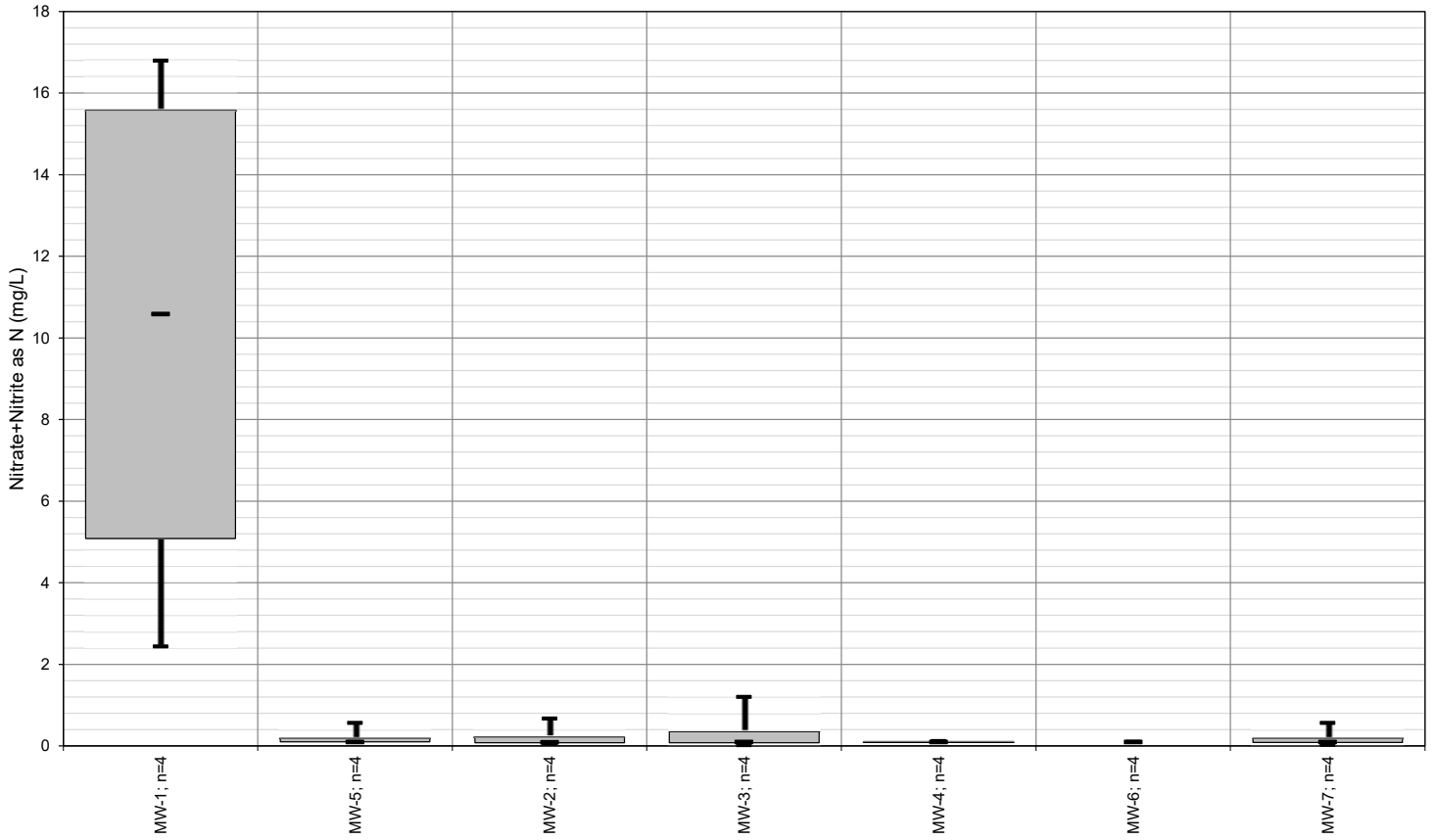
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Nitrate as N

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-10



REV 1

CLIENT
Holcim (US) Inc.

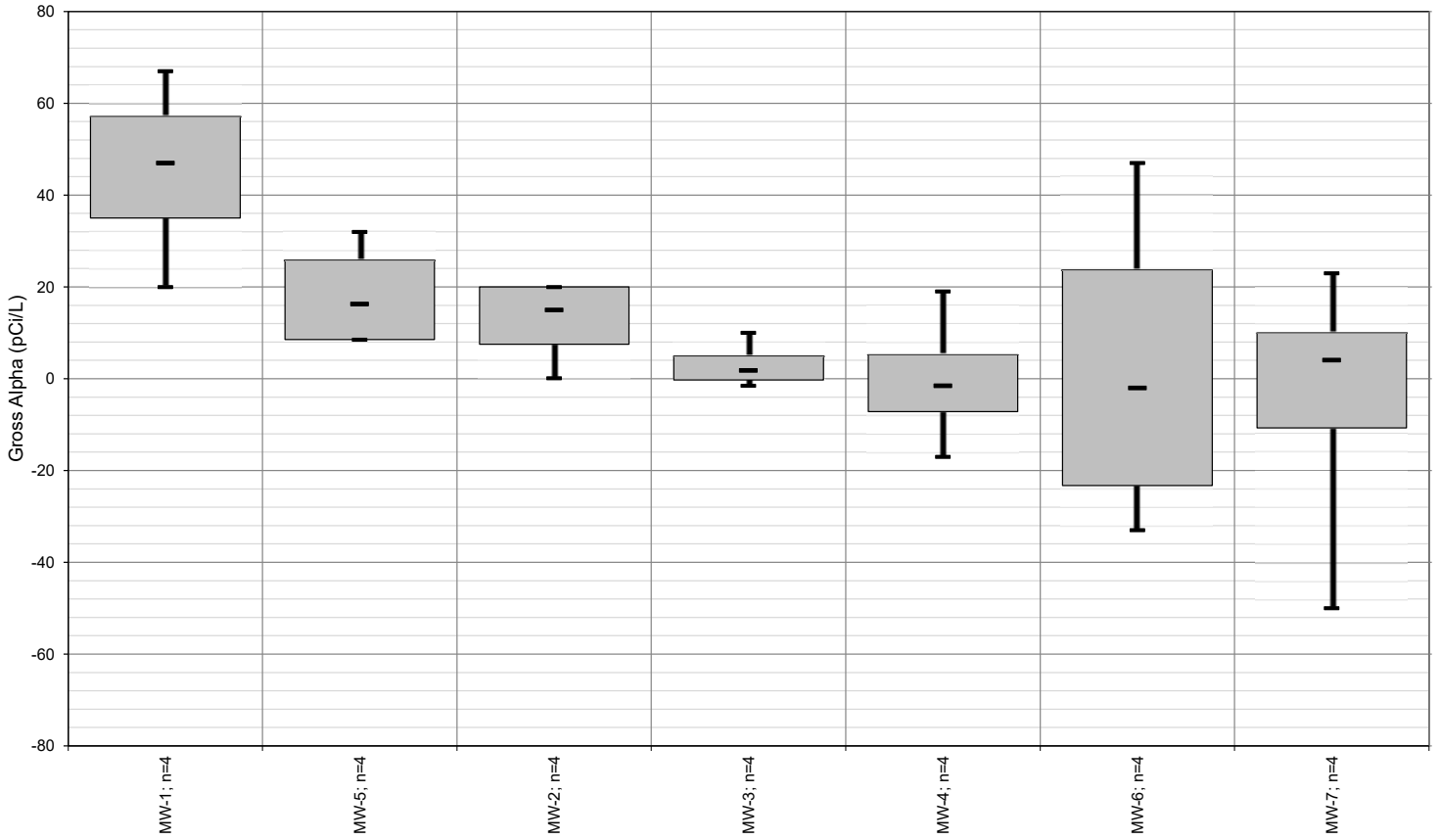
PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Nitrate+Nitrite as N

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-11

PATH: https://goldenassociates.sharepoint.com/sites/127556/Project Files/6 Deliverables/TechMemos/1-TM-Req_Tech_Revison/1-TM-1/Attachment A | FILE NAME: Attachment A.stm



REV 1

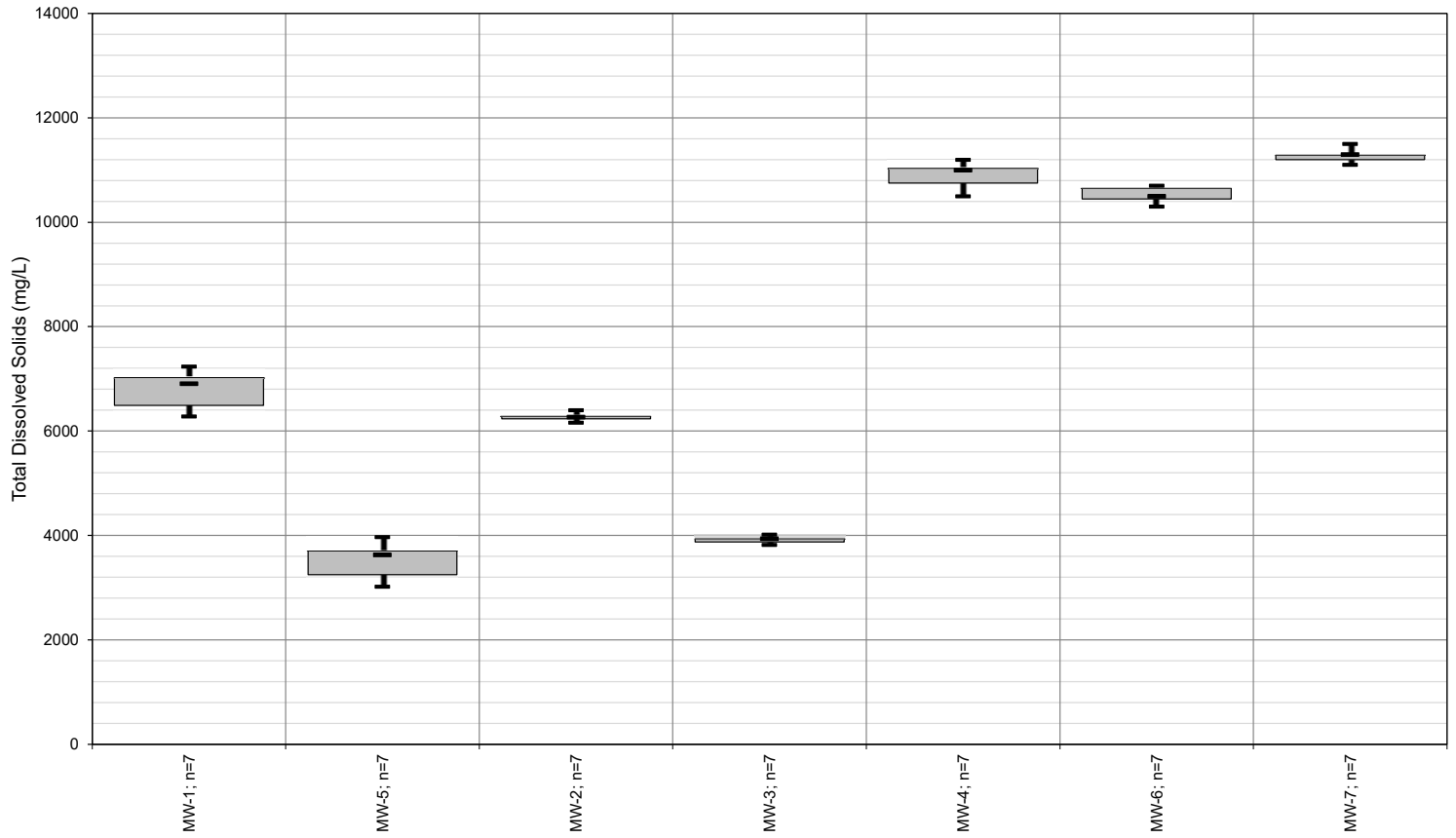
CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

CONSULTANT
GOLDER

TITLE
Gross Alpha

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-12



REV 1

CLIENT
Holcim (US) Inc.

PROJECT
Boettcher Quarry (TR-11)

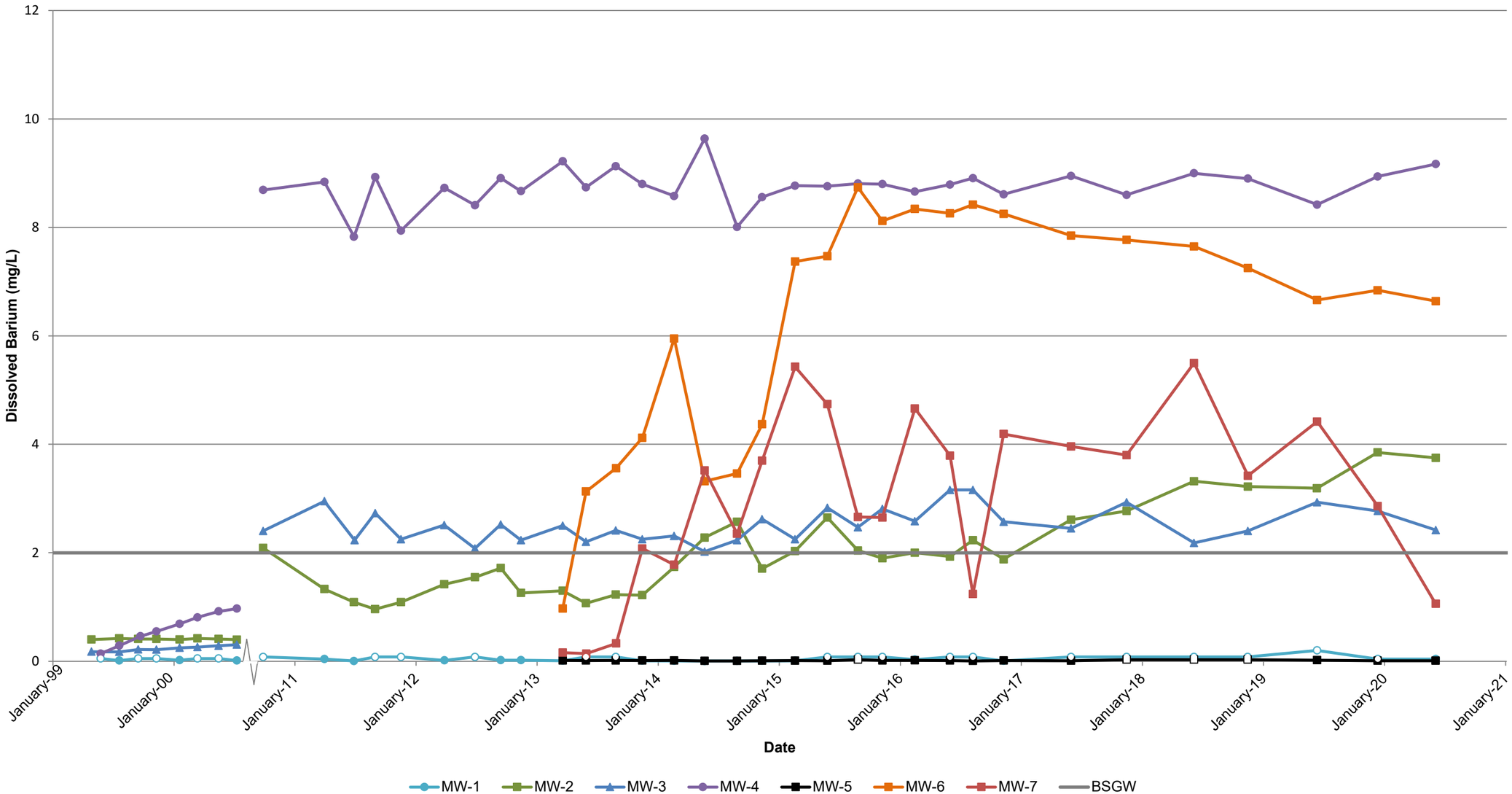
CONSULTANT
GOLDER

TITLE
Total Dissolved Solids

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002		A-13

ATTACHMENT B

Time Series Graphs



Notes:
-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.

REV 1

CLIENT: Holcim (US) Inc.

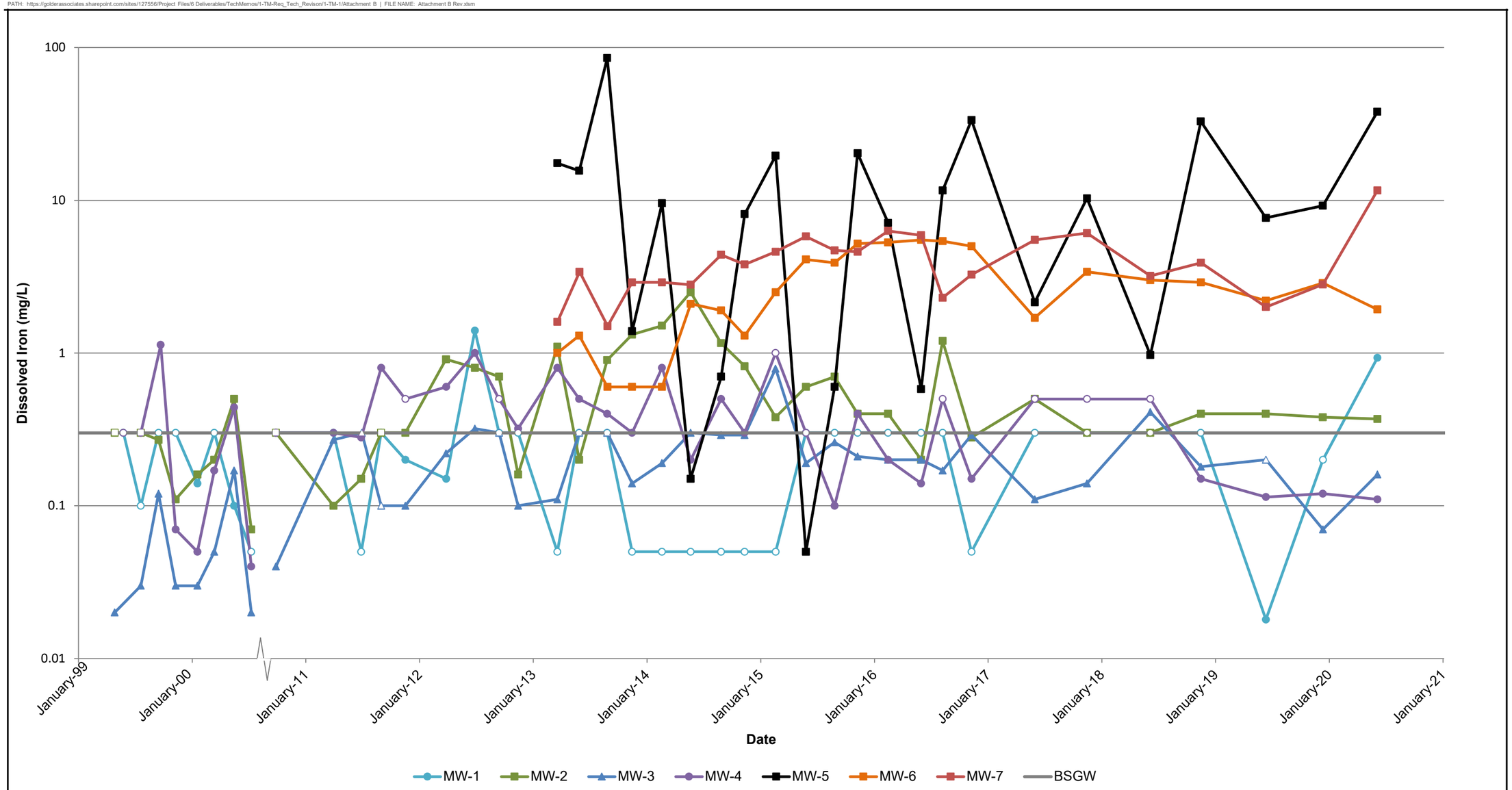
PROJECT: Boettcher Quarry (TR-11)

CONSULTANT: GOLDER

TITLE: Dissolved Barium

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-1

PATH: https://golderassociates.sharepoint.com/sites/127556/Project Files/6 Deliverables/TechMemos/1-TM-Req_Tech_Revison/1-TM-1/Attachment B | FILE NAME: Attachment B Rev.xlsm



Notes:
-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.

REV 1

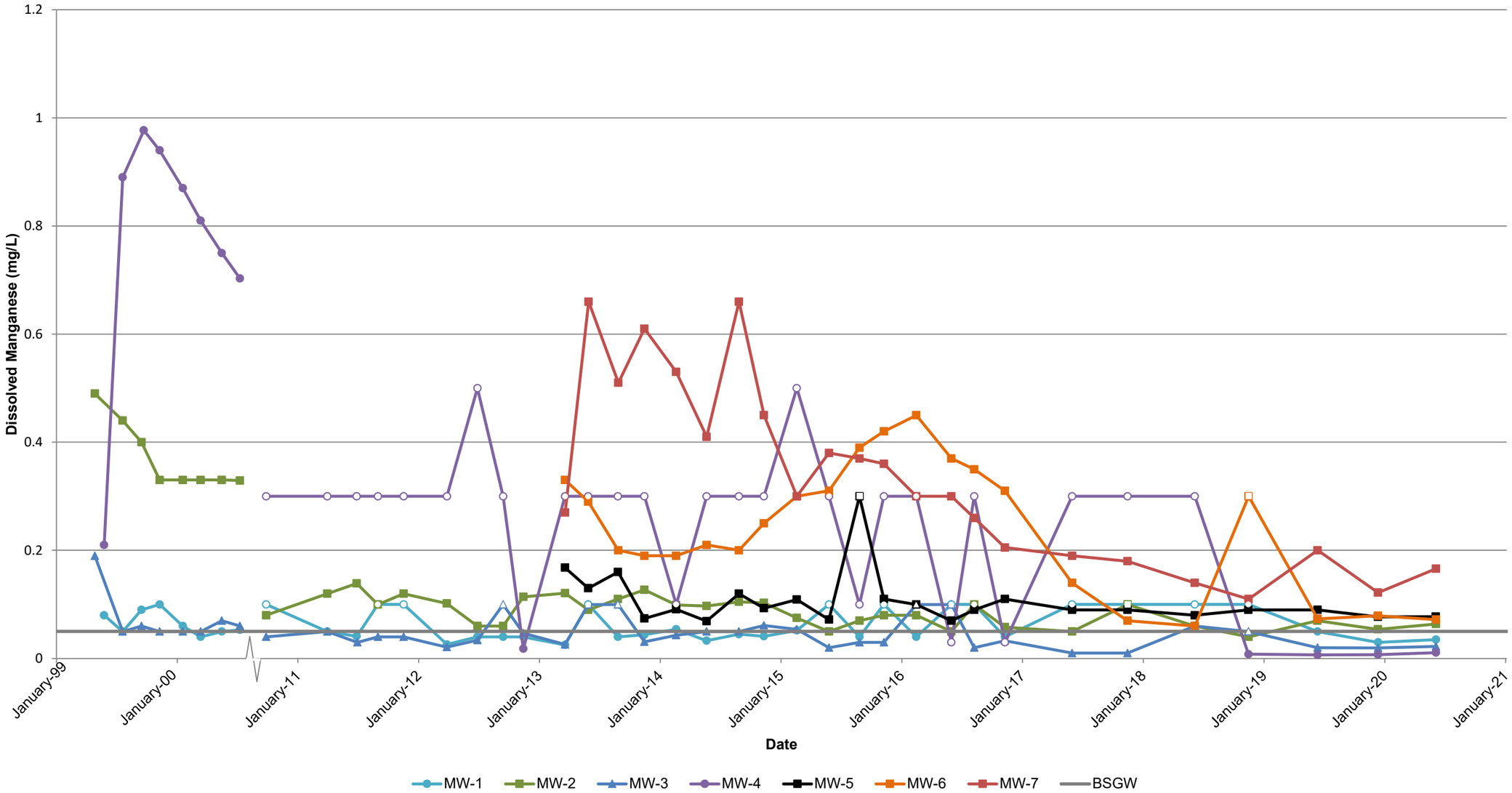
CLIENT: Holcim (US) Inc.

PROJECT: Boettcher Quarry (TR-11)

CONSULTANT: GOLDER

TITLE: Dissolved Iron

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-2



Notes:
-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.

REV 1

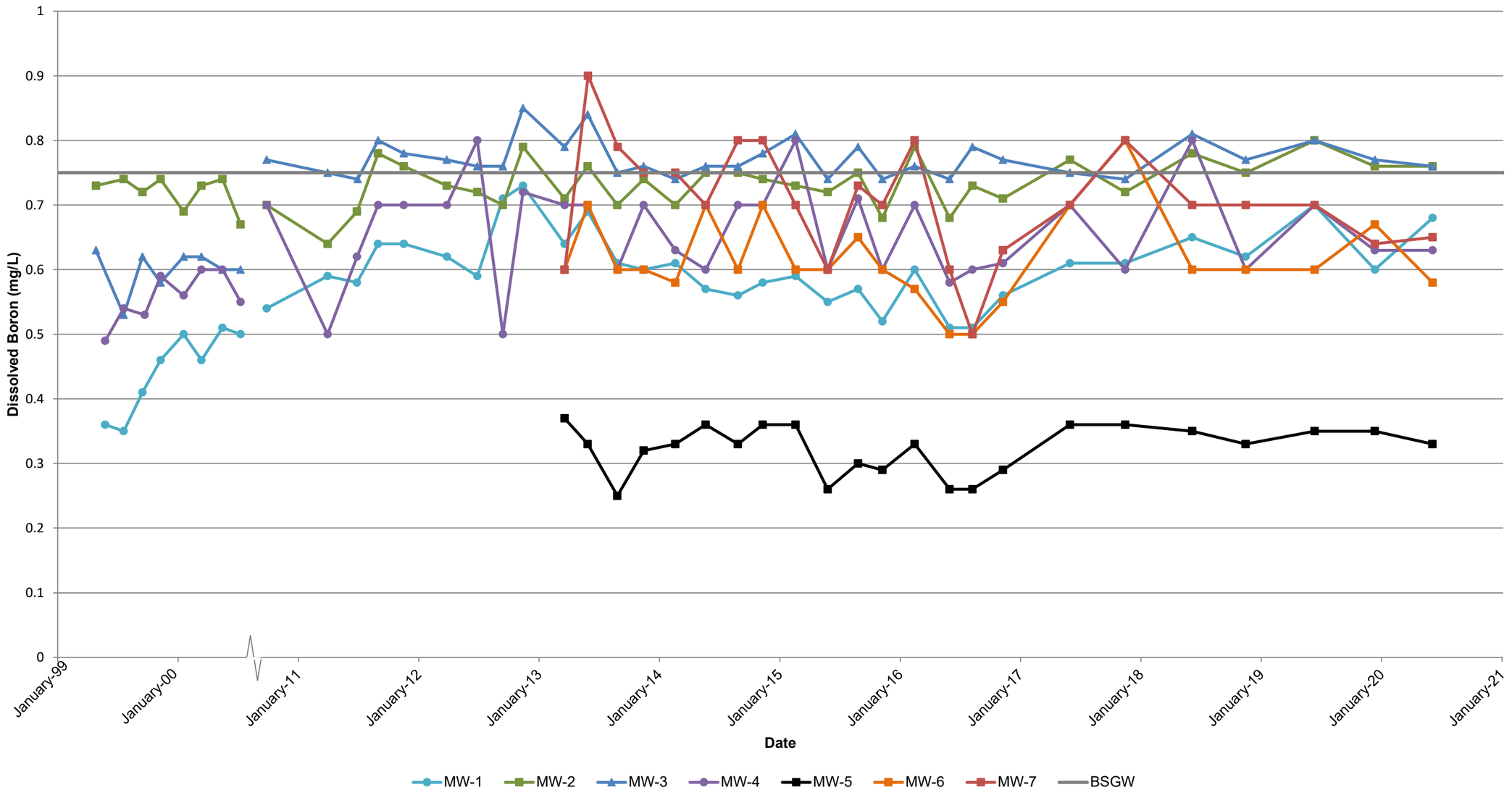
CLIENT: Holcim (US) Inc.

PROJECT: Boettcher Quarry (TR-11)

CONSULTANT: GOLDER

TITLE: Dissolved Manganese

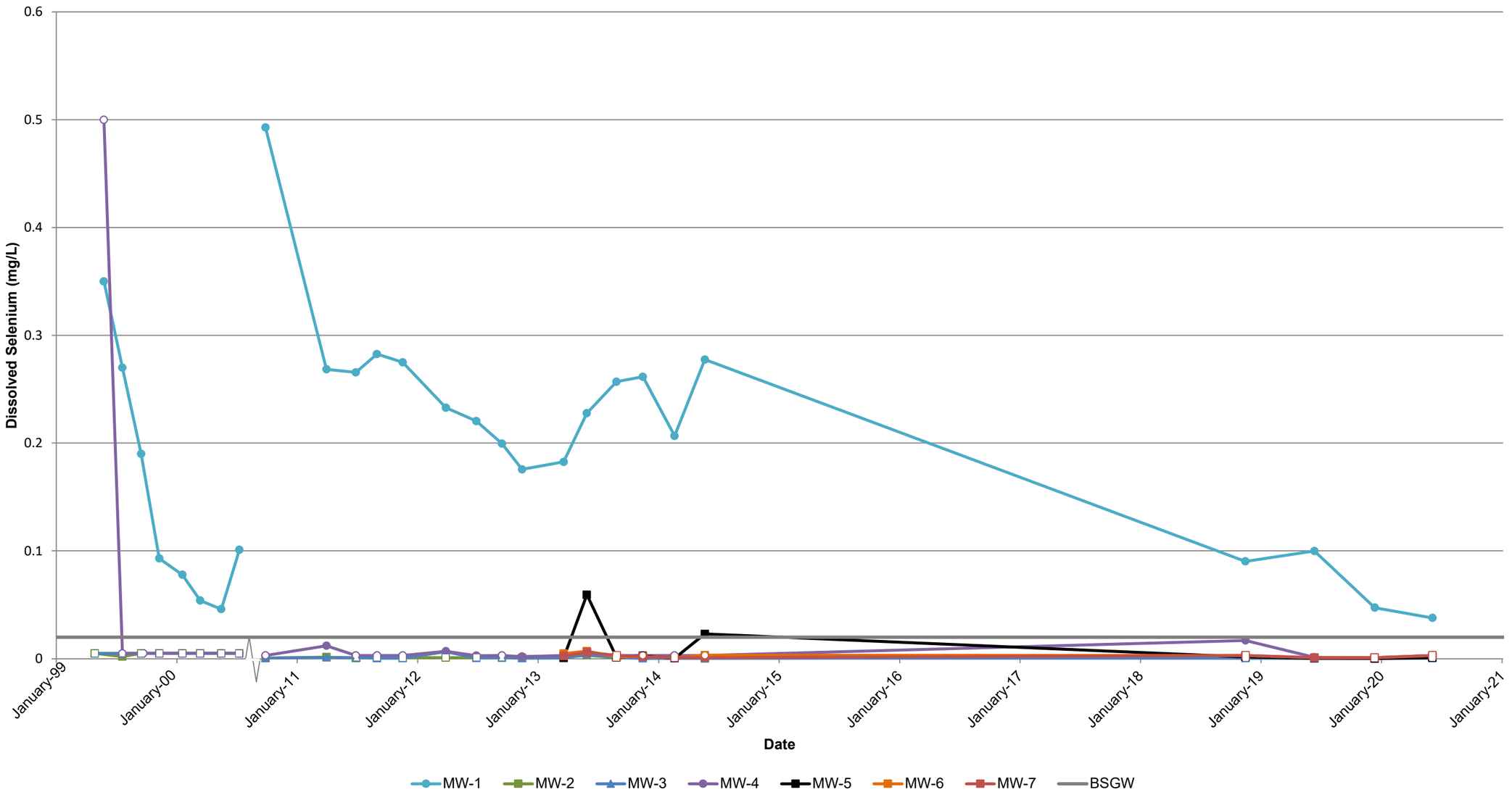
PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-3



Notes:
-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.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Dissolved Boron
PROJECT NO.: 20144265	PHASE: 002
REV.: DRAFT	FIGURE: B-4

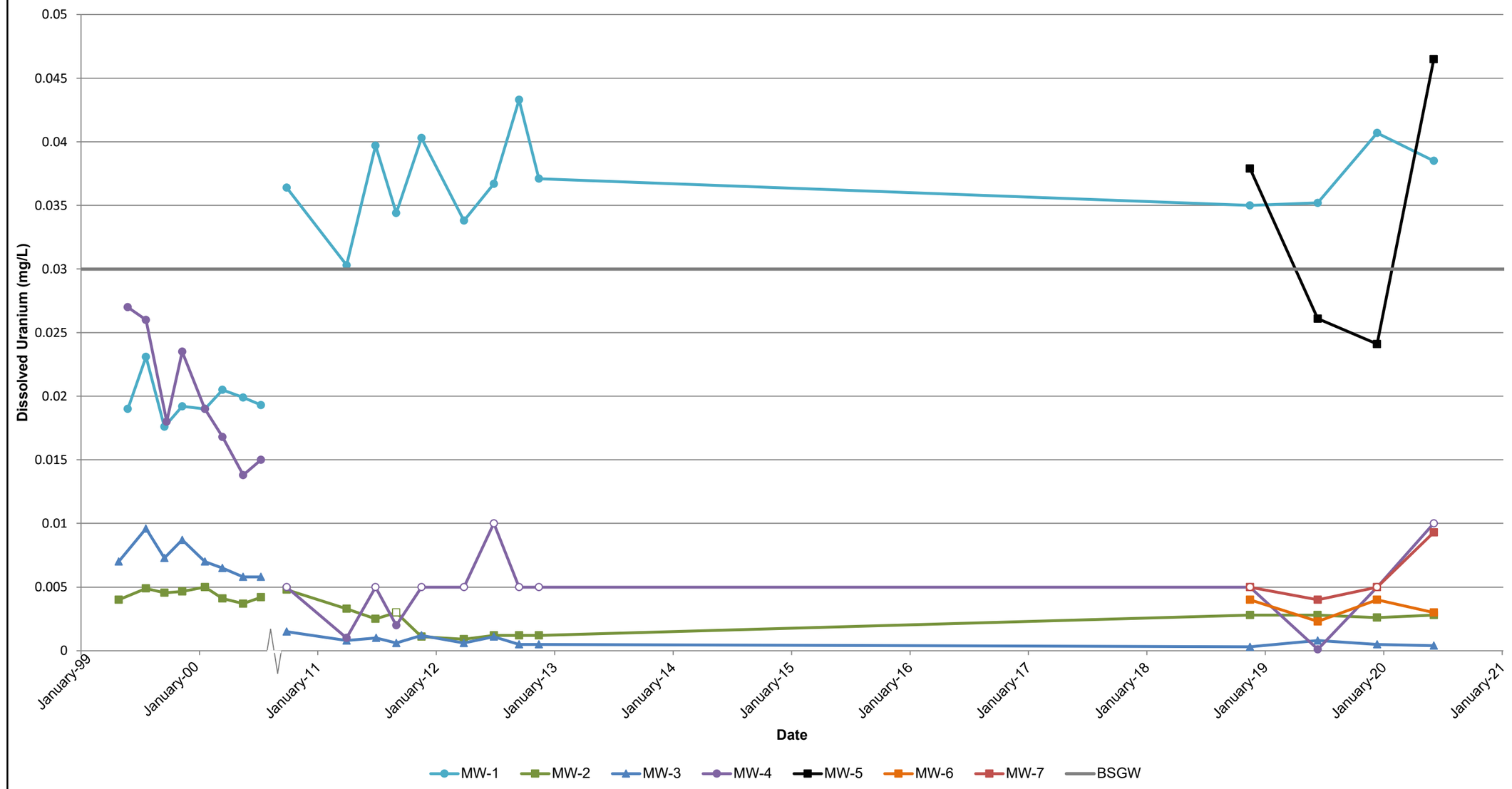


Notes:
-Non-detect values plotted with an open symbol at the practical quantitation limit
-Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW) Minimum of Table 1- Table 4.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Dissolved Selenium

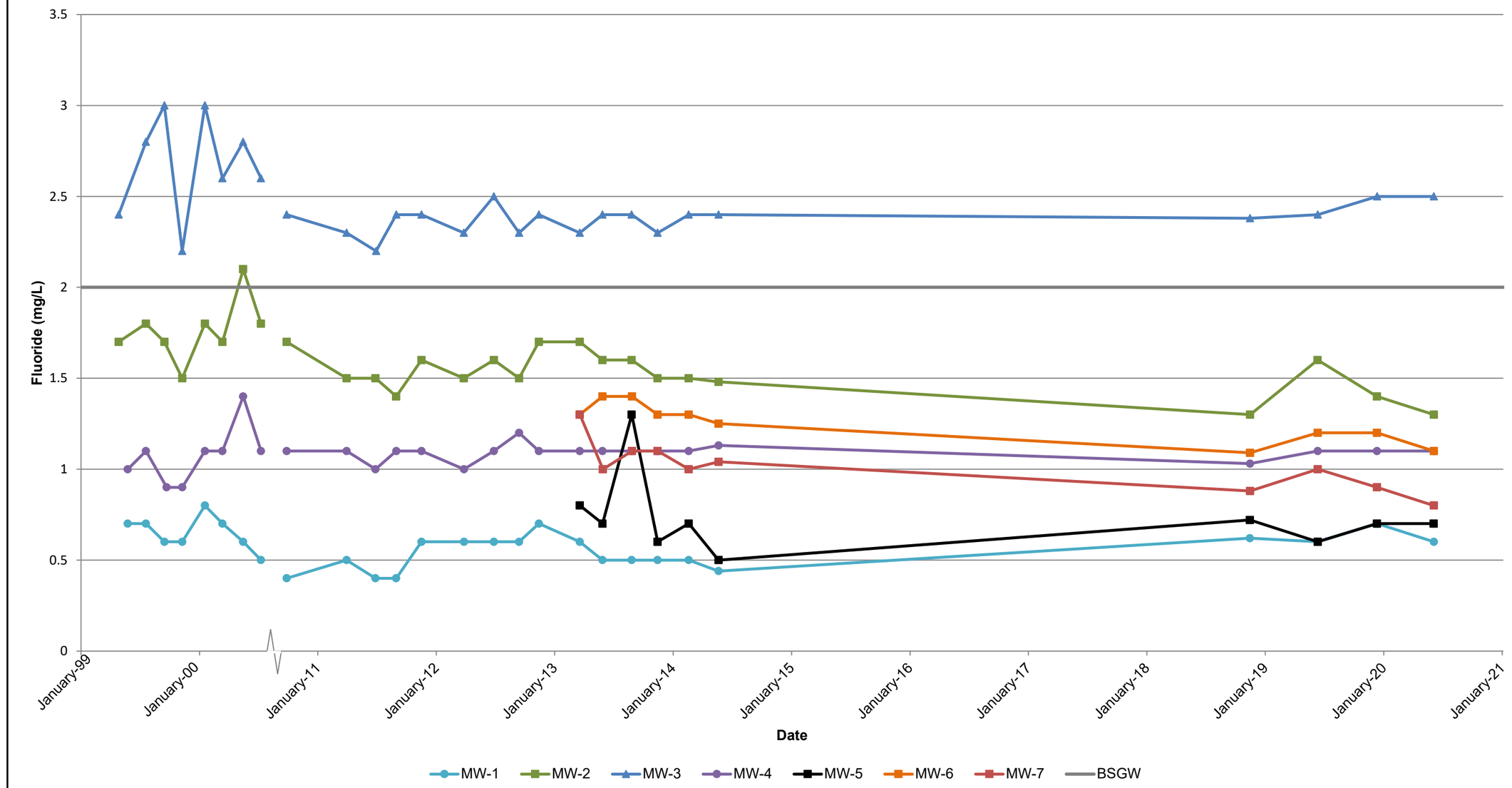
PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-5



Notes:
-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.

REV 1

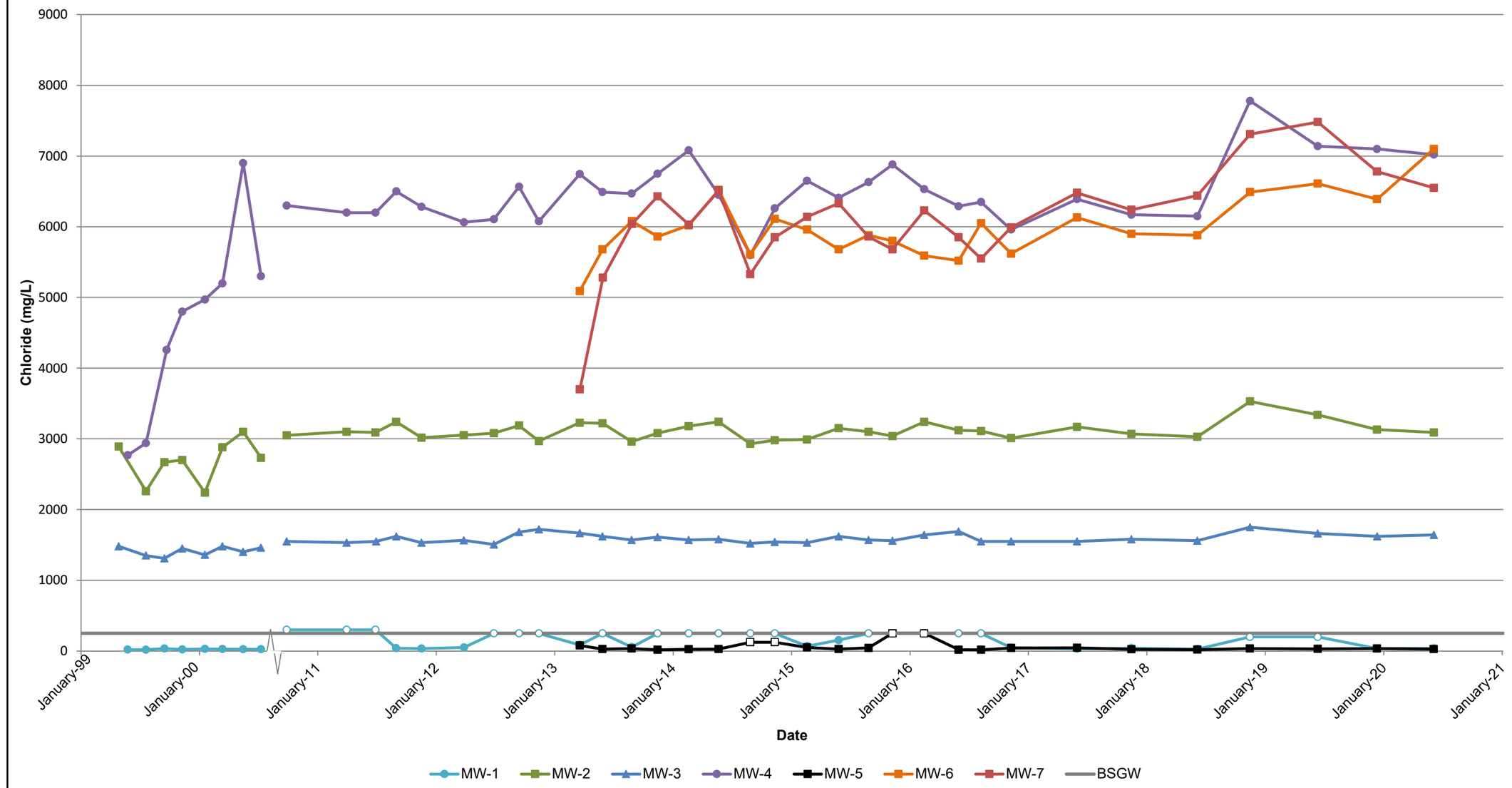
CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Dissolved Uranium
PROJECT NO.: 20144265	PHASE: 002
REV.: DRAFT	FIGURE: B-6



Notes:
-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.

REV 1

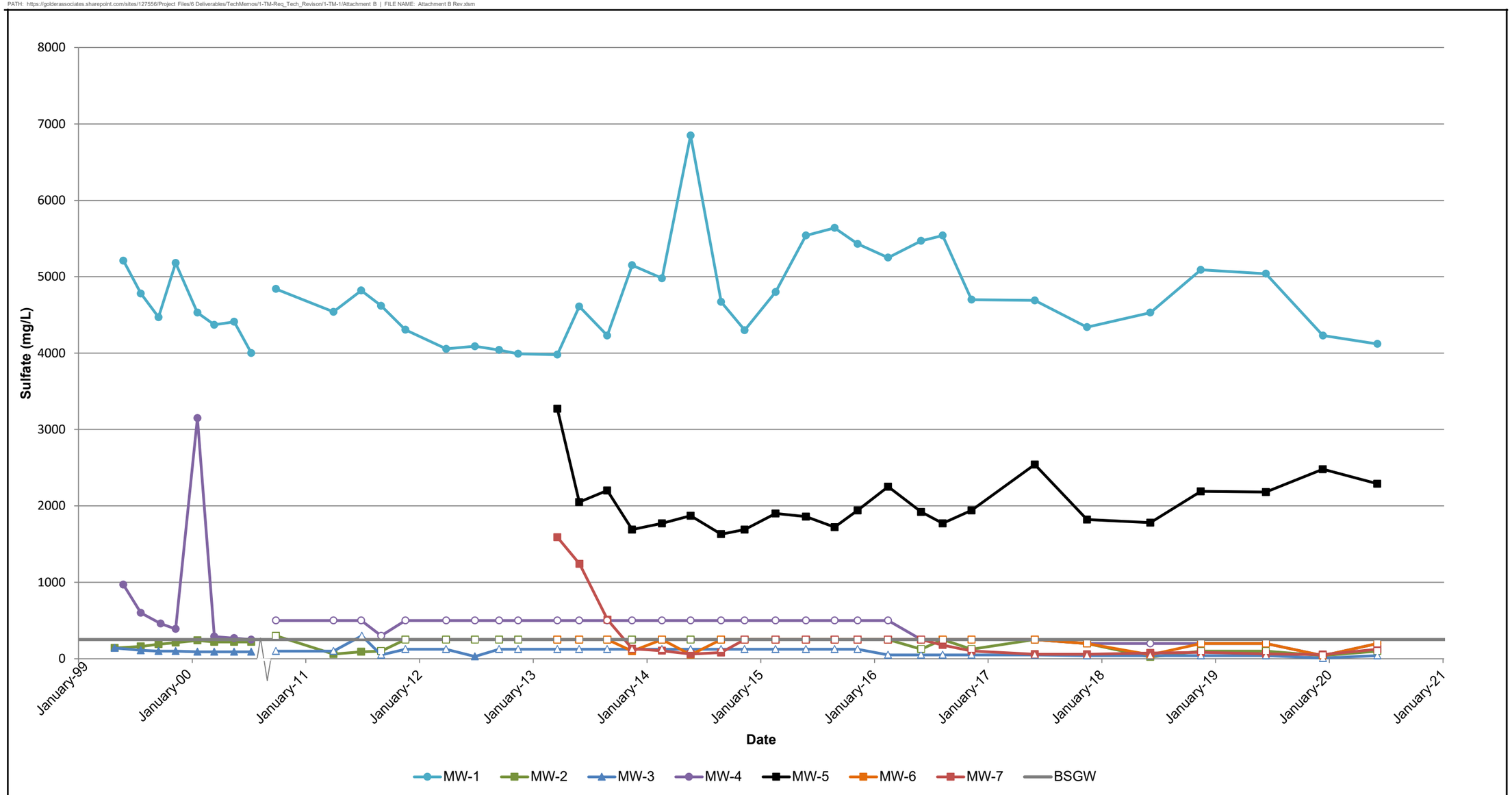
CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Fluoride
PROJECT NO.: 20144265	PHASE: 002
REV.: DRAFT	FIGURE: B-7



Notes:
-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.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Chloride
PROJECT NO.: 20144265	PHASE: 002
REV.: DRAFT	FIGURE: B-8



Notes:
-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.

REV 1

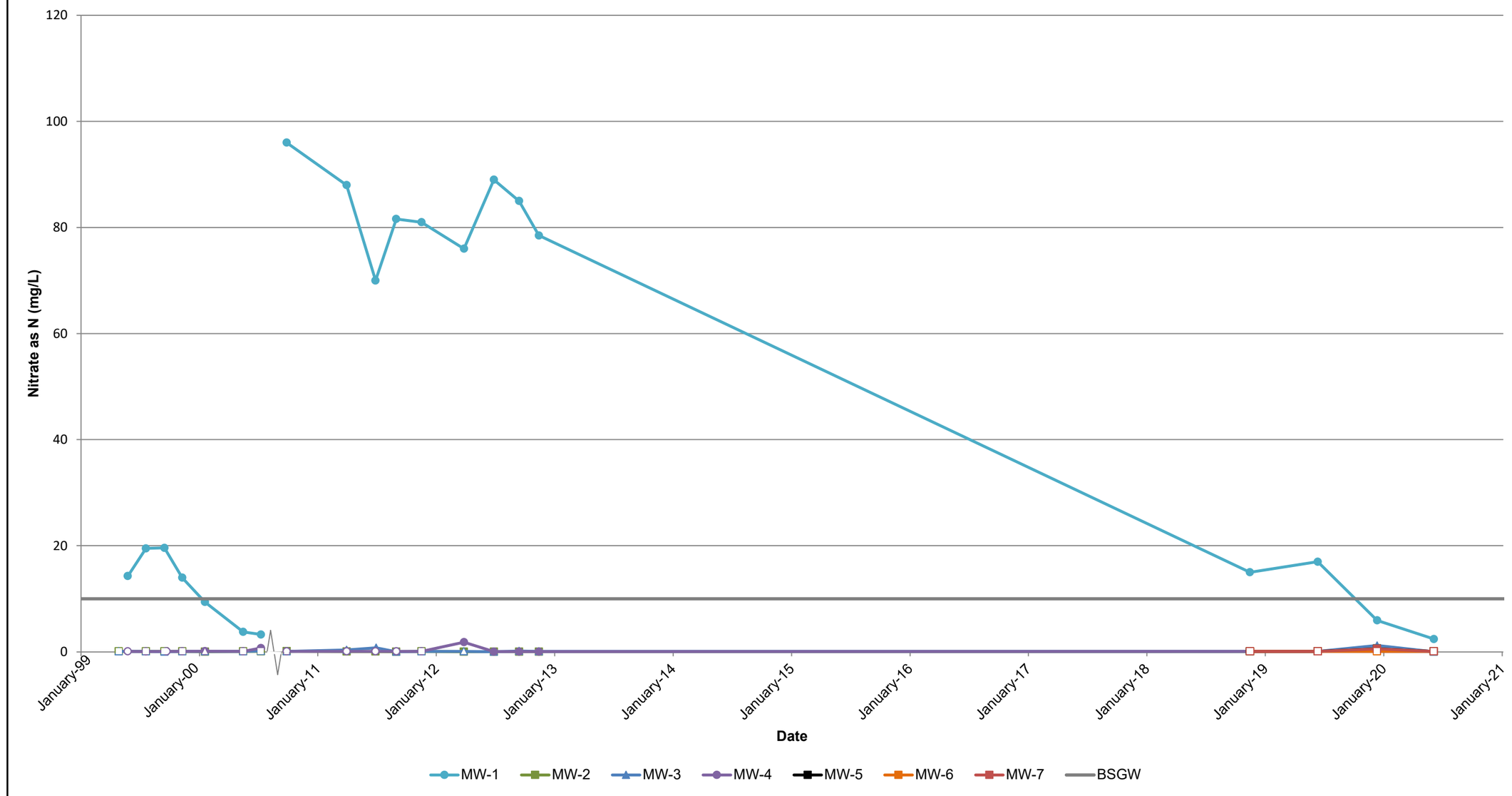
CLIENT: Holcim (US) Inc.

PROJECT: Boettcher Quarry (TR-11)

CONSULTANT: GOLDER

TITLE: Sulfate

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-9

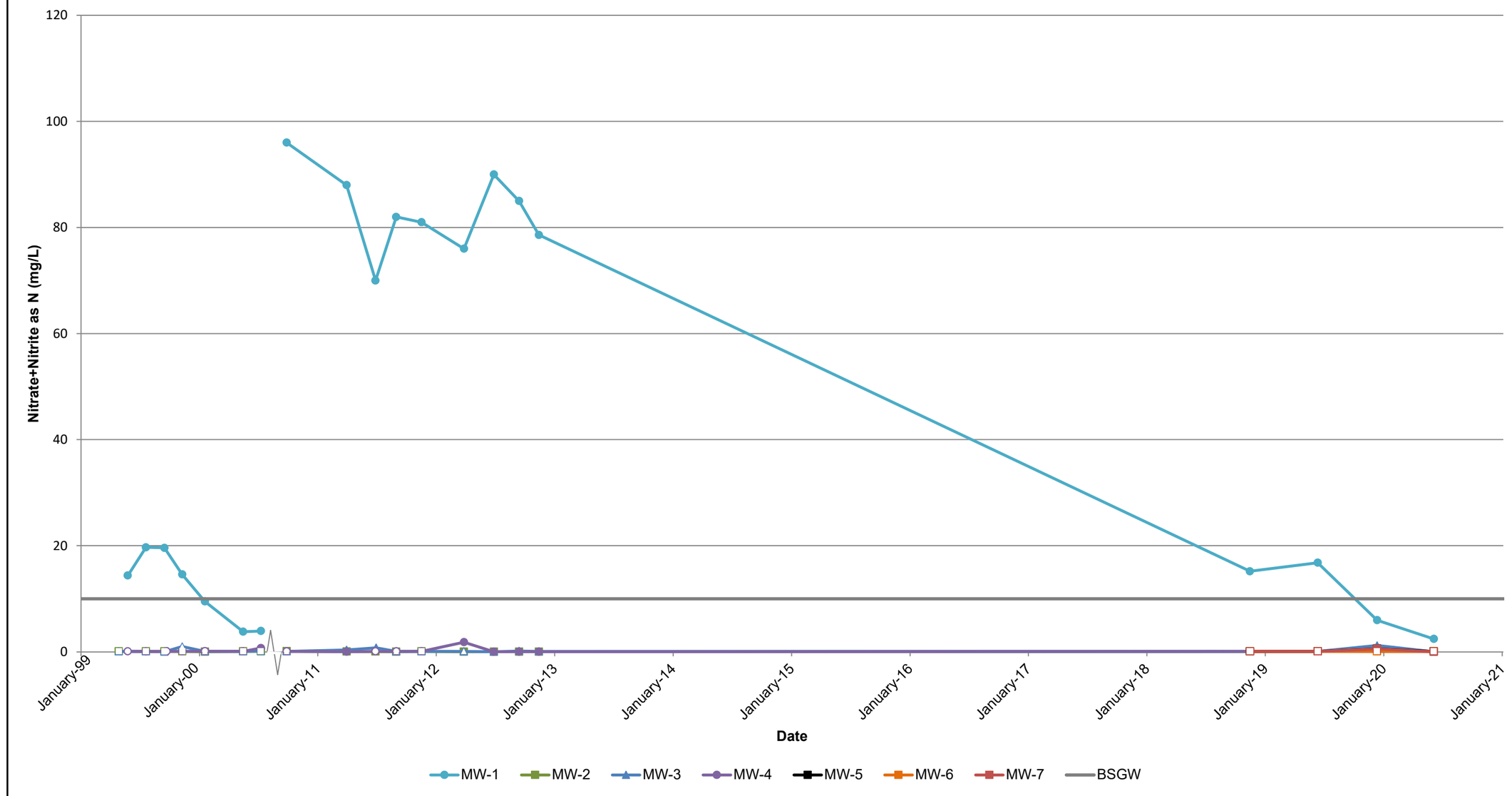


Notes:
-Non-detect values plotted with an open symbol at the practical quantitation limit
-Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW) Minimum of Table 1- Table 4.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Nitrate as N

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-10

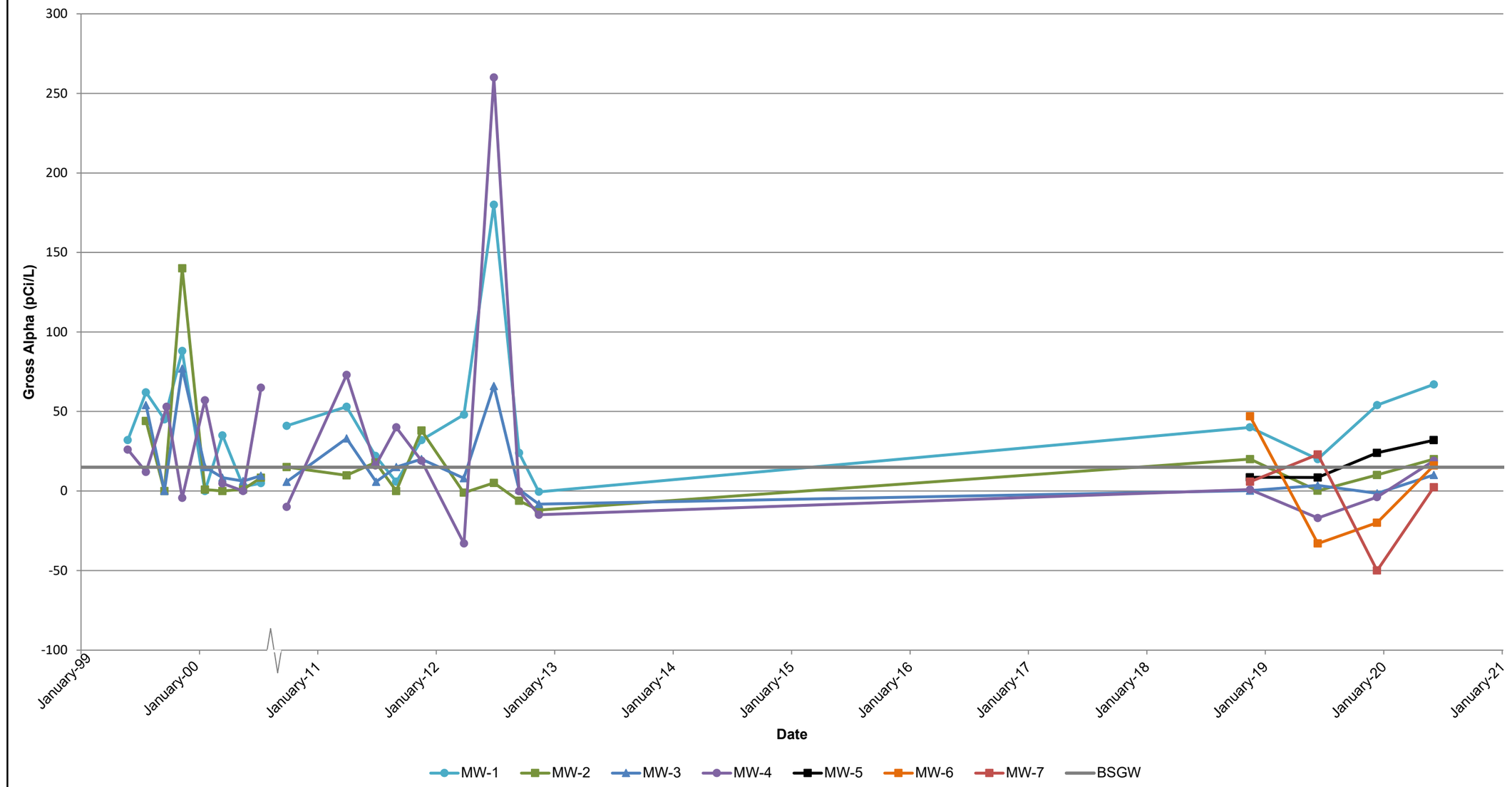


Notes:
-Non-detect values plotted with an open symbol at the practical quantitation limit
-Water Quality Control Commission Regulation No. 41, The Basic Standards for Groundwater (BSGW) Minimum of Table 1- Table 4.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Nitrate+Nitrite as N

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-11



Notes:
-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.

REV 1

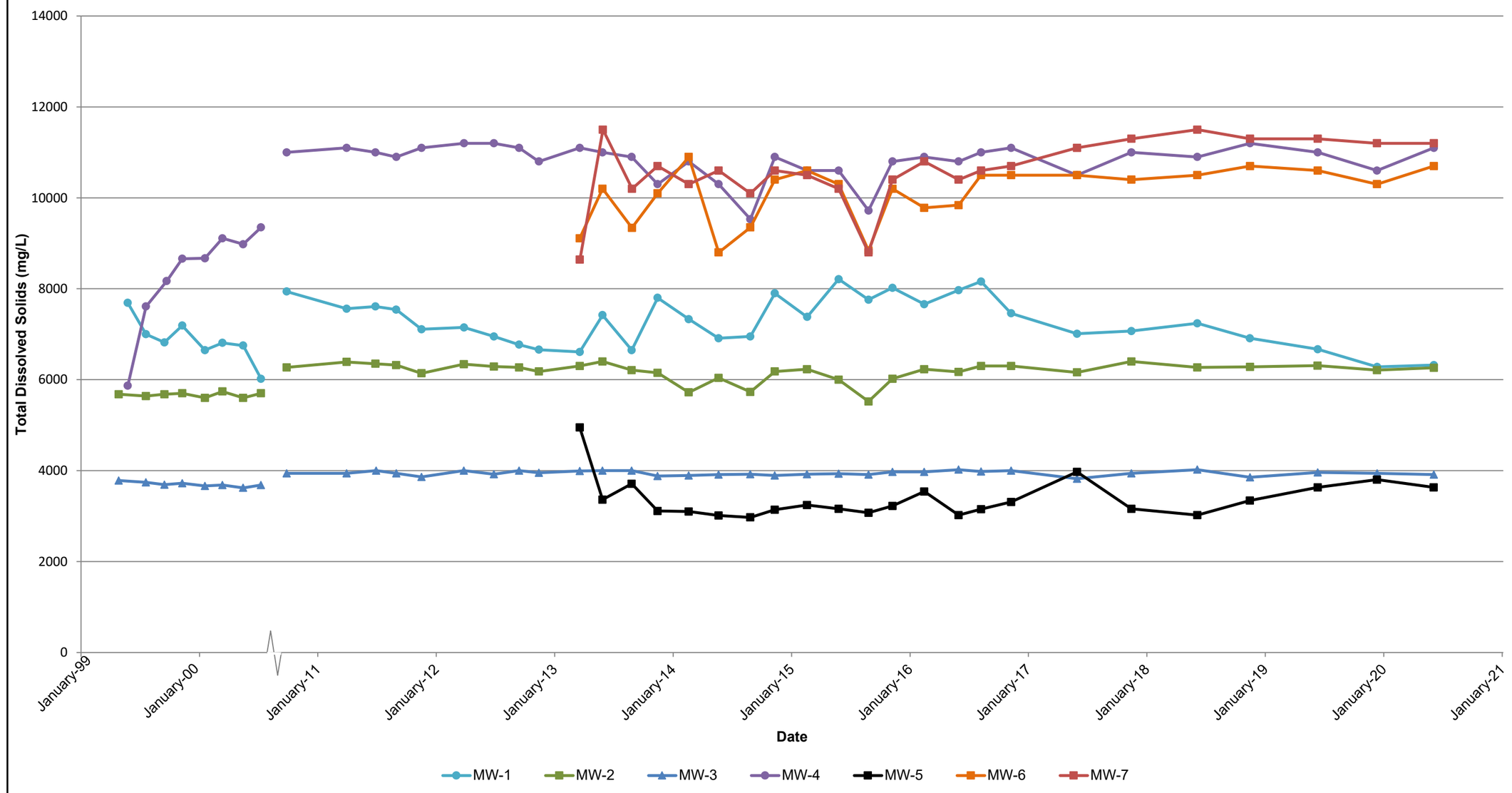
CLIENT: Holcim (US) Inc.

PROJECT: Boettcher Quarry (TR-11)

CONSULTANT: GOLDER

TITLE: Gross Alpha

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-12



Notes:
-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.

REV 1

CLIENT: Holcim (US) Inc.	PROJECT: Boettcher Quarry (TR-11)
CONSULTANT: GOLDER	TITLE: Total Dissolved Solids

PROJECT NO.	PHASE	REV.	FIGURE
20144265	002	DRAFT	B-13