# 2016 Annual Report

January 2017

Flambeau Mining Company
4700 Daybreak Parkway
South Jordan UT  84095

**Flambeau Mining Company**
4700 Daybreak Parkway
South Jordan, UT 84095
801-204-2526

January 31, 2017

Mr. Larry Lynch
Wisconsin Department of Natural Resources
Waste & Materials Management
101 South Webster Street, GEF2
Madison, WI 53707

Dear Mr. Lynch:

The Flambeau Mining Company (Flambeau) is submitting 5 copies of the attached 2016 Annual Report pursuant to Part 1-8 of the Flambeau Mine Permit (Docket No. IH-89-14). This submittal also addresses other requirements of the Mining Permit and associated approvals.

Monitoring and evaluations conducted during 2016 continue to document that the Flambeau River remains fully protected and Flambeau remains in full compliance with its permit standards.

If you have any comments or questions regarding this submittal, please contact me at (801) 204-2526 or dave.cline@riotinto.com.

Sincerely,

Dave Cline
President – Flambeau Mining Company

## Distribution

| No. of Copies | Sent to |
|---|---|
| 5 | Larry Lynch<br>Wisconsin Department of Natural Resources<br>Waste & Materials Management<br>101 South Webster Street – GEF2<br>Madison, WI  53703 |
| 2 | Dave Cline<br>President<br>Flambeau Mining Company<br>4700 Daybreak Parkway<br>South Jordan, UT  84095 |
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| 1 | Tom Riegel, Chairperson<br>Town of Grant<br>N2937 Highway 27<br>Ladysmith, WI  54848 |
| 1 | Al Christianson, Administrator<br>City of Ladysmith<br>P. O. Box 431<br>Ladysmith, WI  54848 |
| 1 | CeCe Tesky<br>Rusk County Zoning<br>311 East Miner Avenue<br>Ladysmith, WI  54848 |
| 1 | Steve Donohue<br>Director/Associate<br>Foth Infrastructure & Environment, LLC<br>2121 Innovation Court, Suite 300<br>De Pere, WI  54115 |

**FLAMBEAU MINING COMPANY**
**2016 ANNUAL REPORT**

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## TABLES



## FIGURES



## APPENDICES

# 1 Purpose and Need

This report serves to document the work that was done at the Flambeau Mine site in 2016 and to satisfy the requirements of the Mining Permit (MP).

**Mining Permit, Part 1, Condition 8:**

> *In accordance with sec. 144.89, Stats., Flambeau shall submit a report annually to the Department summarizing the activities which took place on the mining site during the year and shall include other additional information specified in this permit and associated plan approvals.*

**Mining Permit, Part 2, Condition 4:**

> *The annual report required under sec. 144.89, Stats., shall include discussion of all modifications received during the previous year and shall include an inventory of all modifications received subsequent to permit issuance. The annual report shall also discuss deviations from the approved Mining Plan as a result of final engineering refinements of subsequent plan approvals if these deviations do not require modifications, under Part 2, Conditions 2 and 3.*

**Mining Permit, Part 2, Condition 6:**

> *Flambeau shall keep a log of all incidents, such as spills, pond overflows and embankment failure or leakage, reported to its environmental compliance staff. This log shall, at all reasonable times, be available for inspection by any duly authorized Department employee. A summary of incidents subject to various Department reporting requirements shall be included in the annual report required under sec. 144.89, Stats.*

**Mining Permit, Part 2, Condition 7 (Excerpt):**

> *The annual report required under sec. 144.89, Stats, shall include a summary of all exploration drilling activities conducted on the mining site during the previous year.*

**Mining Permit, Part 4, Condition 9:**

> *Monitoring data and results shall be submitted to the Department within 30 days after completion of the required analyses. The annual report required in this permit shall summarize the year's monitoring activities and any observed trends in the monitoring data.*

**Water Withdrawal Approval, Condition 1 (Excerpt):**

*Flambeau Mining Company shall maintain records which document the withdrawal. At a minimum, such information shall include the dates and duration of withdrawal, approximate pumping rate and approximate volume of water withdrawn. Monthly summaries shall be submitted to the department for those months in which a withdrawal occurs. This information shall be available for department review in a separate file at the Flambeau Mining Company office and shall also be summarized in the annual report submitted as a condition of the mining permit.*

The primary location of the information which fulfills the requirements of the above conditions is referenced in Table 1-1.

**Table 1-1 Location Information Key**

| Condition No. | Location of Information |
|---|---|
| MP, Part 1-8 | Sections 2 and 3 |
| WWA, Condition 1 | Section 2.6.2 |
| MP, Part 2-4 | Section 2.8 |
| MP, Part 2-6 | Section 2.10 |
| MP, Part 2-7 | Section 2.11 |
| MP, Part 4-9 | Section 4 and Appendices A and B |

# 2 2016 Summary

## 2.1 Introduction

On January 14, 1991, after an exhaustive permitting process including extensive opportunity for public input, Flambeau Mining Company (Flambeau), wholly owned by Kennecott Minerals Company, received from the Wisconsin Department of Natural Resources (Department) eleven permits to operate an open pit copper mine in Rusk County, Wisconsin. Over the life of the mine (1993 – 1997), 181,000 tons of copper, 3.3 million ounces of silver, and 334,000 ounces of gold were mined.

Backfilling of the open pit began in earnest in early 1997. Waste rock and soils were replaced to their approximate original location in the open pit. Over 30,000 tons of limestone was added to the sulfide-bearing waste rock to neutralize and buffer the groundwater as it resaturated the backfilled materials.

In 1998, the surface reclamation of the mine site began by returning the land surface to its approximate original contour. Stockpiled topsoil was spread across the site where grasslands and woodlands were created. Hydric (wetland) soils had been stockpiled as well and were used to create over ten acres of wetlands. Reclamation activities since 1998 have included seeding, plug planting, tree planting, erosion control, mowing, invasive species control, trail construction, and prescribed burning. During 2001, Flambeau completed the planting plan and submitted the Notice of Completion (NOC) to the Department. Concurrent with the submittal of the NOC, the reclaimed Flambeau Mine nature trails were opened to the public for non-motorized recreational activities. The City of Ladysmith had partnered with Flambeau to develop the four-mile nature trail system.

During 2006, monitoring of the reclaimed mine site documented the continued development of high quality native grassland, woodland and wetland communities. Ecological monitoring has documented that 272 native plant species are established on the site. Fifty-two bird species were found to be using the reclaimed mine site and 33 bird species were recorded as nesting on the site.

During 2007, Flambeau petitioned the Department for Certificate of Completion (COC). The COC process included a preconference hearing, public hearing and contested case hearing. At the contested case hearing, the parties negotiated an agreement and entered into a stipulation which was subsequently accepted by the administrative law judge and resulted in a signed order. The order granted a COC to Flambeau for 149 acres of the Flambeau Mine site that includes the backfilled pit and not including the 32-acre Industrial Outlot. Among the other aspects of the stipulation included in the Order was an agreement by Flambeau to withdraw the COC petition for the Industrial Outlot and that it would not apply for a COC for the Industrial Outlot for at least three years, a reduction of the reclamation bond to 20 percent of the $11 million bond on file with the Department at that time (maximum reduction allowed by Wisconsin law), and a commitment by Flambeau to conduct further environmental monitoring.

Between 2007 and 2012, Flambeau completed extensive monitoring as required by the 2007 COC stipulation and also supplemental monitoring on a voluntary basis.

In 2012, the former 0.9-acre Biofilter was removed and a series of infiltration basins were installed in the Industrial Outlot area in order to manage stormwater from the Industrial Outlot. In 2013, Flambeau commenced sampling in accordance with the Copper Park Business and Recreation Area Maintenance and Monitoring Plan (MMP). The MMP sampling concluded in 2015.

In 2016, work within the Industrial Outlot continued by improving stormwater management best management practices (BMPs). Monitoring activities within the Industrial Outlot and the site continued in 2016 under the Mining Permit and Individual Chapter 30 permit, IP-NO-2015-55-01907.

Throughout each phase of the project, samples have been collected from numerous monitoring wells and the Flambeau River including water quality, sediments, fish, and macroinvertebrates. Continued protection of the Flambeau River, located 140 feet from the backfilled pit, has been documented throughout the Flambeau project by extensive monitoring.

## 2.2 Groundwater Quality Assessments

Assessments of the backfill groundwater quality have been routinely performed with the most recent completed during January 2017. Further detail on groundwater quality can be found in Section 4 of this report.

## 2.3 Notice of Completion/Certificate of Completion

Data obtained during monitoring of the reclaimed vegetation during 2000 documented that Flambeau met the vegetative performance standards for NOC.

During September 2001, Flambeau submitted the NOC to the Department. In a letter dated March 8, 2002, the Department accepted Flambeau’s NOC. The four-year monitoring period prior to COC began November 19, 2001. For Flambeau to receive the COC, the performance standards were met during the final year of the four-year monitoring period. The final year of the four-year monitoring period was 2005. All performance standards were met in 2005 and again in 2006 even during extreme regional climatic conditions such as the regional drought experienced in 2005 and 2006. On January 9, 2007, Flambeau Mining Company petitioned the Department for COC.

The COC process included a preconference hearing in April, public hearing in mid-May and contested case hearing in late May 2007. The contested case portion of the process had just started when the parties began negotiating an agreement. At the hearing, the parties entered into a stipulation which was subsequently accepted by the administrative law judge and incorporated into an order. The order was signed by the judge granting a COC to Flambeau for 149 acres of the Flambeau Mine site that includes the backfilled pit and not including the 32-acre Industrial Outlot. Among the other aspects of the Stipulation included in the Order was an agreement by Flambeau to withdraw the COC petition for the Industrial Outlot and that it would not apply for a COC for the Industrial Outlot for at least three years, a reduction of the reclamation bond to 20 percent of the $11 million bond on file with the Department at that time (maximum reduction allowed by Wisconsin law), and a commitment by Flambeau to conduct further environmental monitoring.

During 2012, Flambeau completed the five-year term of environmental monitoring as agreed to in the Order's Stipulation.

## 2.4 Industrial Outlot

### 2.4.1 Reuse of Industrial Outlot Facilities

On January 8, 1998, Flambeau submitted a request for modification of the Mining Permit and Reclamation Plan. The requested modifications included modification of the final land use for 32 acres of the mining site to allow for alternative use of the on-site buildings and related ancillary facilities, railroad spur and a portion of the former Type II waste rock stockpile area by the Ladysmith Community Industrial Development Corporation (LCIDC).

On July 30, 1998, the Department approved the request for modification of the final land use for the 32 acre Industrial Outlot with the following condition: "If the portion of the site covered by the lease agreement with the LCIDC has not been put to an acceptable alternative use by the end of 2004, the site shall be reclaimed in a manner consistent with reclamation of the remainder of the mining site. Any demolition waste resulting from such reclamation shall be disposed of in a properly licensed solid waste facility."

A long-term lease agreement exists between Flambeau and the LCIDC, where the LCIDC leases a 32-acre portion of the former mine site referred as the Industrial Outlot. The 32-acre area includes the former administration building now occupied by the Ladysmith Department of Natural Resources Service Center; the former Water Treatment Plant (WTP) building now occupied by Xcel Energy and the Department; the rail spur for which the LCIDC has installed major improvements and purchased adjacent property outside of the mine project area; an approximate eight-acre area north of the former rail spur in the former Type II stockpile area now occupied by the Copper Park Equestrian Trails Trailhead; and a new wetland area constructed in 2015-2016.

During 2000, the LCIDC completed renovations on the administration building, now serving as the Department's Ladysmith Service Center, and the WTP building, now housing Xcel Energy's line maintenance shop and the Department's equipment storage area. In addition, the LCIDC constructed another building for the Department between the Service Center and the former WTP to house additional Department equipment. The Department and Xcel Energy continue to occupy the former mine buildings.

During 2003, the LCIDC submitted a request to the Department for the retention of the rail spur located east of Highway 27 as part of the communities' on-going efforts to increase industrial development. The LCIDC had committed to remove and reclaim about 200 feet of the rail spur east of Highway 27. In a letter dated June 12, 2003, the Department stated that it "…is satisfied that the portion of the rail spur east of the highway is being used for alternate purposes. Therefore, the rail spur east of Highway 27 will not need to be removed and revegetated…"

During early 2004, the Flambeau Riders, Inc. (Flambeau Riders) approached Flambeau about the possibility of developing non-motorized trails on property owned by Flambeau south of the Industrial Outlot and east and south of the Flambeau River. In addition, the Flambeau Riders inquired about using a portion of the Industrial Outlot as driveway access and as an equestrian trailhead. In documents dated May 19 and 28, 2004, Flambeau proposed to the Department an alternate use plan for Flambeau's former rail spur area west of Highway 27 and the eight-acre area north of the west rail spur area within the Industrial Outlot as a driveway and equestrian trailhead.

During 2004, a Community Advisory Group was formed to advise Kennecott Minerals on development of a land use management plan for the 2,177 acres owned by Flambeau as of year-end 2004. The Advisory Group is represented by Rusk County, City of Ladysmith, Town of Grant, Ladysmith Area Trails Association, Flambeau Riders, LCIDC and the Department's Northern Rivers Initiative. During a late December 2004 meeting, the Advisory Group agreed that the expansion of trails south of the reclaimed mine site and using a portion of the Industrial Outlot as an equestrian trailhead were acceptable and beneficial uses of the property. It was agreed to formalize the agreement with 1) a Trail Easement & License between Flambeau and the City of Ladysmith and 2) a Sublease between the LCIDC and the City of Ladysmith. Fully executed documents, Trail Easement & License and Sublease, dated January 1, 2005, are in place.

In a letter to the Department dated December 30, 2004, Flambeau provided notice that the 32-acre Industrial Outlot has met the condition of "acceptable alternative use."

The Department responded in a letter dated February 18, 2005 that the only portion of the Industrial Outlot for which an acceptable alternate use had not been designated was the section lying north of the rail spur in the area of the former Type II waste rock stockpile. The Department conceptually found the proposed use as an equestrian trail head acceptable, but required further details to review and approve the proposed construction plans.

In submittals dated March 1 and July 21, 2005, Flambeau provided to the Department drawings and detail regarding the proposed equestrian trailhead and access via Copper Park Lane. The Department provided approval for the project in a letter dated July 28, 2005.

The construction of the equestrian trailhead initiated on August 11, 2005 and was complete by September 8, 2005. The trails remain open to the public since September 2005.

### 2.4.2 Industrial Outlot Projects and Improvements

During spring 2003, Flambeau and the LCIDC agreed that the Wisconsin Department of Transportation should remove the rail crossing as part of the renovation of Highway 27 during 2004. In addition, stormwater sampling had measured copper concentrations entering the 0.9-acre Biofilter that may have been associated with the west rail spur area.

During fall 2003, the top two feet of ballast and gravel were excavated from the rail spur area west of Highway 27. Reclamation of the west rail spur area and 200 feet east of Highway 27 was completed during spring 2004.

A submittal, Rail Spur Reclamation Documentation, dated November 10, 2004, was made to the Department and included a topographic drawing showing the east and west reclaimed rail spur areas and details regarding the reclamation of the rail spur areas.

As discussed in Section 2.4.3, during 2006, the remaining gravel parking lot area around the buildings was asphalted and the drainage swale was lined with rocks.

The Flambeau Riders have been making improvements to the equestrian trailhead since 2005. The trailhead improvements include an information kiosk, split rail fence, trees and horse hitching tie lines. During 2011, two concrete manure bunkers were installed by the Flambeau Riders.

Pursuant to discussions with the Department in 2010, the Copper Park Business and Recreation Area Work Plan was submitted to the Department in May 2011. During October and November 2011, Flambeau constructed an infiltration basin in the west portion of the Industrial Outlot. Construction of the North and East Infiltration Basins began in March 2012 and was completed in April 2012. The Copper Park Business and Recreation Area Construction Documentation Report was submitted to the Department on January 31, 2013.

Between spring 2013 and spring of 2015 efforts were undertaken to determine a long-term sustainable stormwater management solution for the Industrial Outlot due to the fact that infiltration basins were not functioning as intended. In May 2015, the Copper Park Business and Recreation Area Work Plan Supplement (Work Plan Supplement) was submitted to the Department and the required permits were applied for at the same time. Construction activities described in the Work Plan Supplement began in the fall of 2015 and were completed in June 2016. Work activities were documented in the *Copper Park Business and Recreation Area Supplement Construction Documentation Report* submitted to the Department on November 16, 2016. Vegetation requirements were met and erosion control best management Practices (BMPs) were removed in September 2016. The project was determined to be complete on September 23, 2016 and tracking for qualifying storm events to complete surface water monitoring commenced. The surface water monitoring plan was defined in the September 24, 2015 WDNR correspondence, *Flambeau Mine Surface Water Monitoring Plan* and is being completed under Department permit (IP-NO-2015-55-01907).

### 2.4.3 Intermittent Stream C

The Flambeau Mine remains committed to the protection of water quality in the Flambeau River. Since final reclamation in 1999, Flambeau has continued its monitoring of water quality in the Flambeau River as well as surface runoff into the Flambeau River. This monitoring indicates that the water quality of the Flambeau River remains fully protected.

Surface water sampling in 2016 proceeded as described in section2.4.4 in accordance with the monitoring plan approved by the Department under permit (IP-NO-2015-55-01907).

Also, surface water samples were voluntarily collected and analyzed from the Flambeau River in the spring and fall of 2016. Consistent with previous years' results, the monitoring results document that the Flambeau River remains protected.

## 2.5 Community Involvement

Flambeau's involvement with the surrounding communities has included promotion of community activities, partnering with community groups, economic development, promoting tourism, enhancing communication, restoration projects, providing educational opportunities, and maintaining an open door policy.

A summary of community activities in 2016 is provided below:

- Flambeau's partnership with the City of Ladysmith and Flambeau Riders, Inc. allowed continued access to the non-motorized multi-use recreational trails in 2016. These trails, the Copper Park Equestrian Trails and Trailhead, were opened to the public in September 2005. On September 24, 2016, Flambeau partnered with Flambeau Riders, Inc. and hosted the annual Rusk County "Leaf It To Rusk" horseback riding event at the Copper Park Equestrian Trails and Trailhead. In the fall of 2016, Flambeau helped the Flambeau Riders improve trail map signage along the equestrian trail system.

- The Reclaimed Flambeau Mine nature recreation trails were open to the public for the $15^{th}$ year. On October 15, 2016, Flambeau partnered with Kids and Mentors Outdoors (KAMO) to promote and host a guided educational "moonlit hike" of the Reclaimed Flambeau Mine Nature Trails for local youth and families. Due to inclement weather, this event was cancelled.

- Flambeau sponsored and hosted a bird species count as part of the statewide Great Wisconsin Birdathon on May 14 and 16, 2016. Seventy six species were observed along the Reclaimed Flambeau Mine Nature Trails, Copper Park Equestrian Trails, and Sisters Farm Trails. Funds raised were donated to eight statewide bird conservation groups.

- During 2016, geocaching continues to be enjoyed on the reclaimed mine site. Geocache sites can be searched out along the Reclaimed Flambeau Mine Nature Trails, Copper Park Equestrian Trails, and Sisters Farm Trails. Details on geocache sites can be found at www.geocaching.com.

- Flambeau partnered with the Rusk Area Art Alliance (RAAA) and the Writer's Exchange to create a calendar showcasing artwork and poetry from local artists and writers. The 2016 calendar was themed "Birds of the Reclaimed Flambeau Mine" and artwork represented bird species that use the mine site during some portion of the year. Original pieces were displayed in the Rusk County Library from September through December.

- Flambeau continued its open-door policy and upon request conducted tours of the mine site in 2016. In conjunction with Al Christianson, representing the City of Ladysmith, Flambeau hosted a community group from Tamarack, Minnesota, on August 4, 2016. Along with a tour of the mine site, Flambeau and Mr. Christianson conducted a presentation describing the history of the Flambeau Mine and its relationship with the local community.

## 2.6 Water Management

### 2.6.1 Precipitation Runoff

Since 2000, the reclaimed mine site surface remains stabilized by vegetative growth and there is minimal evidence of erosion. Aerial photographs (color and infrared) taken during September 2012 document surface stabilization of the reclaimed mine site.

Flambeau River water quality samples were voluntarily collected upstream and downstream from the reclaimed mine site during 2016. Comparing analytical results, there was no notable difference between downstream and upstream samples and this further confirms that the reclaimed site is stable and functioning as designed. A summary of Flambeau River water quality results is found in Appendix B.

### 2.6.2 River Water Withdrawal

On May 5, 1998, the Department approved Flambeau's application to withdraw water from the Flambeau River for use on site. The Department's approval requires submittal of monthly summaries for months during which a withdrawal occurs. When the irrigation pump system operates it is powered with a portable generator since electrical supply had been removed during 2001. During 2016, no water was withdrawn from the Flambeau River.

Wetland 1 is located immediately west of the reclaimed mine site. With the backfilling of the open pit being complete in 1997, the hydrogeologic system has equilibrated, and Wetland 1 has been documented to be notably moister with groundwater seeps again flowing.

During 2016, Flambeau continued to monitor the staff gauge within Wetland 1 and maintain the ability to add mitigation water to the wetland. Mitigation water was not added during 2016 as was also the case between 2002 and 2014.

## 2.7 2016 Milestones

The following is a summary of significant milestones throughout the year:

**Table 2-1 2016 Milestones**

| Milestone | Month |
|---|---|
| Final completion of construction activities per the Work Plan Supplement | June 2016 |
| Establishment of vegetation and removal of erosion control BMPs | September 2016 |
| Commencement of the surface water monitoring plan | September 2016 |

## 2.8 Modifications & Deviations

Condition 2-4 in the Mine Permit requires an inventory of deviations and modifications to the Permit received subsequent to permit issuance. Activities during 2016 were consistent with permits, approved plans, and modifications received subsequent to permit issuance. During 2016, there were no modifications or deviations to the Permit.

## 2.9 Construction Reports

Work activities completed under the *Copper Park Business and Recreation Area Work Plan Supplement* were documented in the *Copper Park Business and Recreation Area Supplement Construction Documentation Report* submitted to the Department on November 16, 2016.

## 2.10 Incident Log

Mine Permit Condition 2-6 requires a log of all incidents such as spills, pond overflow, embankment failure or leakage. This log is maintained on-site and is available for inspection. Spills are reported in accordance with Wis. Adm. Code ch. NR 706, CERCLA Reportable Quantities and SARA Section 302 Extremely Hazardous Substances Reportable Quantities.

During 2016, there were no reportable or recordable incidents that occurred on the reclaimed Flambeau Mine site.

## 2.11 Drill Holes

Mine Permit Condition 2-7 requires a summary of all exploration drilling activities conducted on the mine site during the previous year. No exploration drilling activities were conducted on the reclaimed mine site during 2016.

# 3 Reclamation Activities

Upon receipt of the COC, on May 31, 2007, for the 149-acre Reclaimed Flambeau Mine Nature Area, Flambeau has met the requirements for reclamation within the nature area.

There were no on site reclamation activities undertaken during 2016, and thus, no reports were submitted.

## 3.1 Other Activities

Also reported are post-COC management activities during 2016 within the Reclaimed Flambeau Mine Nature Area that included mowing grass trails and routine inspections.

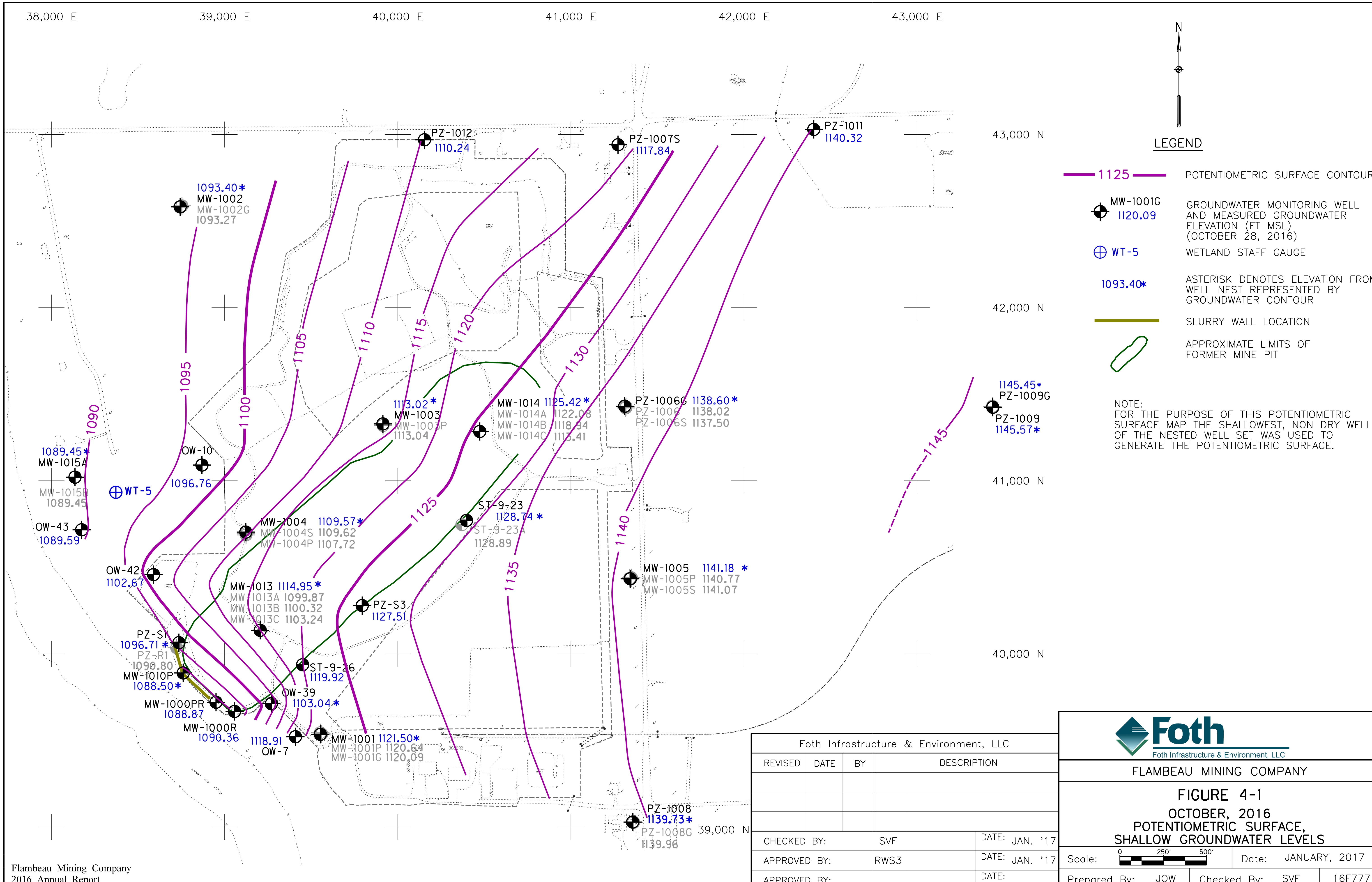
# 4 Site Monitoring

Environmental monitoring at the Reclaimed Flambeau Mine, during 2016, included assessing the quality of groundwater and backfill pore water. All data obtained during environmental monitoring continues to show that Flambeau remains in compliance with all permit standards and the Flambeau River remains fully protected.

## 4.1 Groundwater Quality Sampling and Analysis

Quarterly groundwater monitoring was performed in accordance with descriptions provided in the Updated Monitoring Plan (July 1991), the Quality Assurance Project Plan (February 2015), and the Local Agreement. As a result of regulatory changes with respect to arsenic in groundwater, the Department requested that Flambeau consider analyzing groundwater samples for arsenic on a quarterly basis. In a letter dated August 5, 2004, Flambeau notified the Department that arsenic will be included in the quarterly monitoring program. Results of the 2016 monitoring were submitted to the Department Mine Reclamation Unit on June 7, 2016, August 11, 2016, September 19, 2016, and January 11, 2017. Those reports are incorporated by reference.

Figure 4-1 shows the groundwater potentiometric surface using data obtained during 2016. The map was generated using the shallowest measured water levels, and thus represents shallow groundwater flow in the native formations and in the replaced till and sandstone in the backfilled pit footprint. The potentiometric surface shows a direction of regional shallow groundwater flow to the west-northwest toward the Flambeau River. Figure 4-2 shows the potentiometric surface using the lowest water level for nested wells, where available, and the water levels for the B completion in the backfill monitor wells. Beyond the pit footprint, the groundwater levels generally mimic the shallow groundwater conditions. Within the pit backfill, the surface reflects a general direction of groundwater flow in the backfilled Type I and Type II stockpile materials along the axis of the pit toward the Flambeau River. Figure 4-3 shows hydraulic head in cross section along the axis of the pit. The cross section is interpreted to show predominantly horizontal flow in the backfilled Type I and Type II stockpile materials but with a downward hydraulic gradient at the eastern pit area and an upward hydraulic gradient with convergent groundwater flow near the Flambeau River. These observations are consistent with previous, post-mining years.

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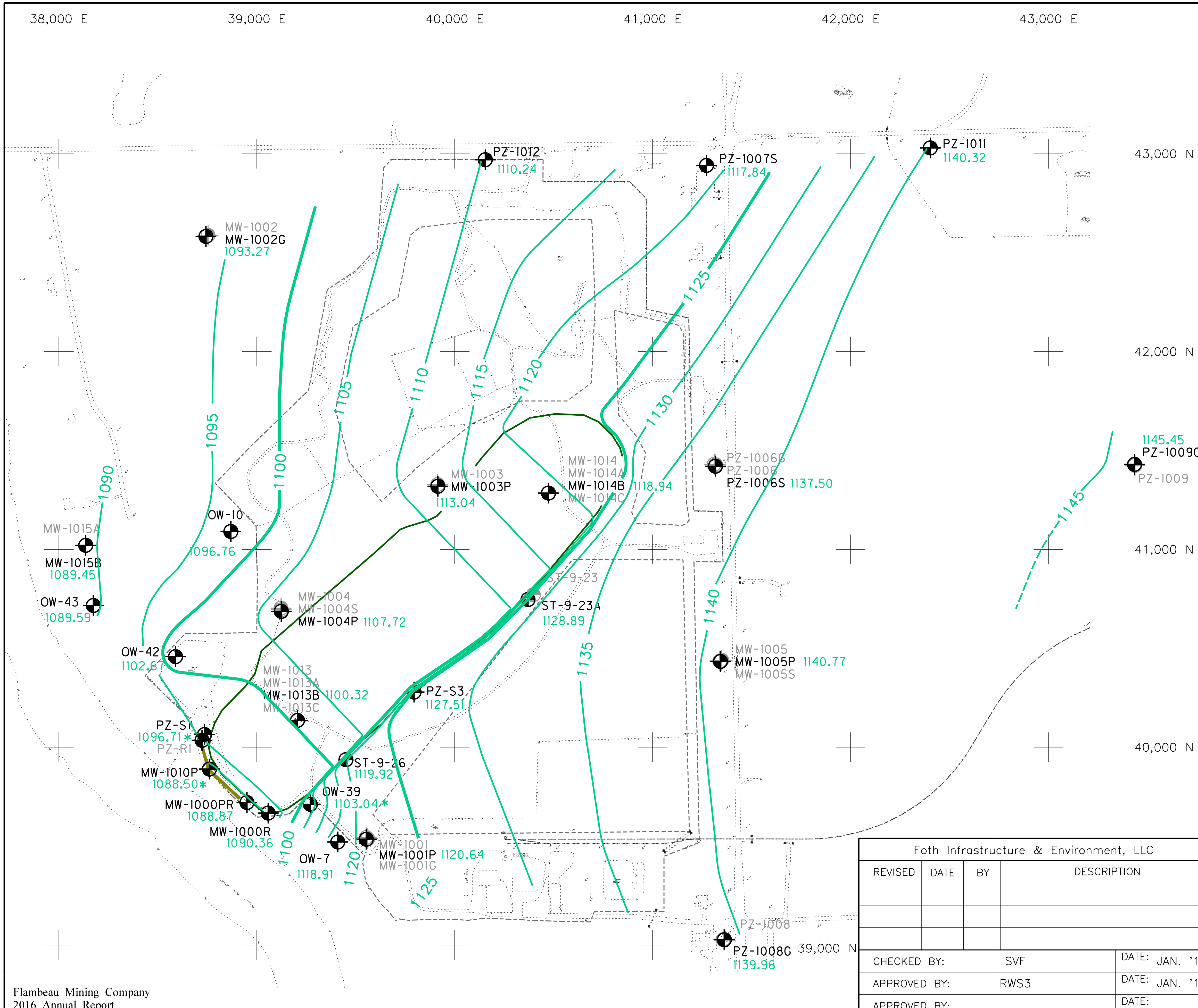


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LEGEND

1120 — POTENTIOMETRIC SURFACE CONTOUR

MW-1002G 1093.27 — GROUNDWATER MONITORING WELL AND MEASURED GROUNDWATER ELEVATION (FT MSL) (OCTOBER 28, 2016)

SLURRY WALL LOCATION

APPROXIMATE LIMITS OF FORMER MINE PIT

NOTE:

1. "B-WELLS" IN THE BACKFILLED PIT AND DEEPER WELLS IN AREAS WITH WELL NESTS OUTSIDE OF THE BACKFILLED PIT WERE USED.

Foth Infrastructure & Environment, LLC

| REVISED | DATE | BY | DESCRIPTION |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| CHECKED BY: | SVF | DATE: | JAN. '17 |
| APPROVED BY: | RWS3 | DATE: | JAN. '17 |
| APPROVED BY: | | DATE: | |

Foth
Foth Infrastructure & Environment, LLC

FLAMBEAU MINING COMPANY

FIGURE 4-2

OCTOBER, 2016 POTENTIOMETRIC SURFACE WELLS SCREENED AT MID-DEPTHS

| | | | |
|---|---|---|---|
| Scale: 0 250' 500' | | Date: | JANUARY, 2017 |
| Prepared By: JOW | Checked By: SVF | | 16F777 |

Flambeau Mining Company
2016 Annual Report

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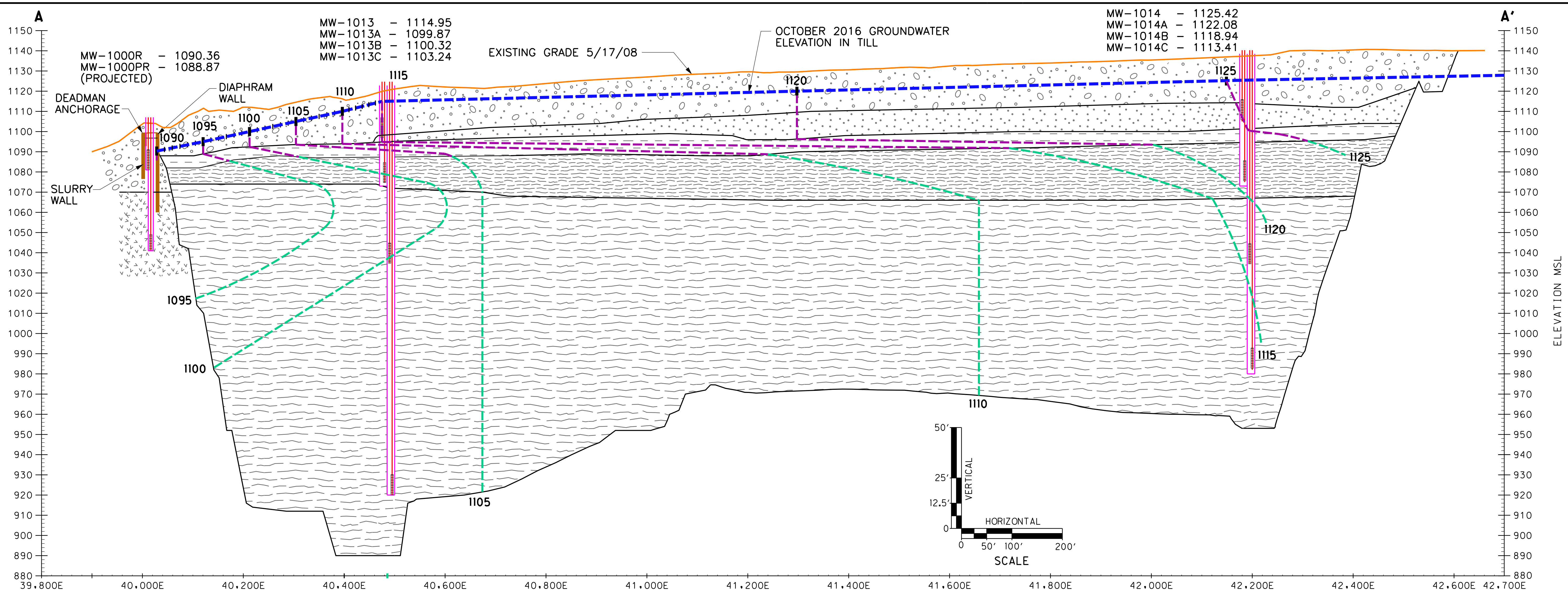
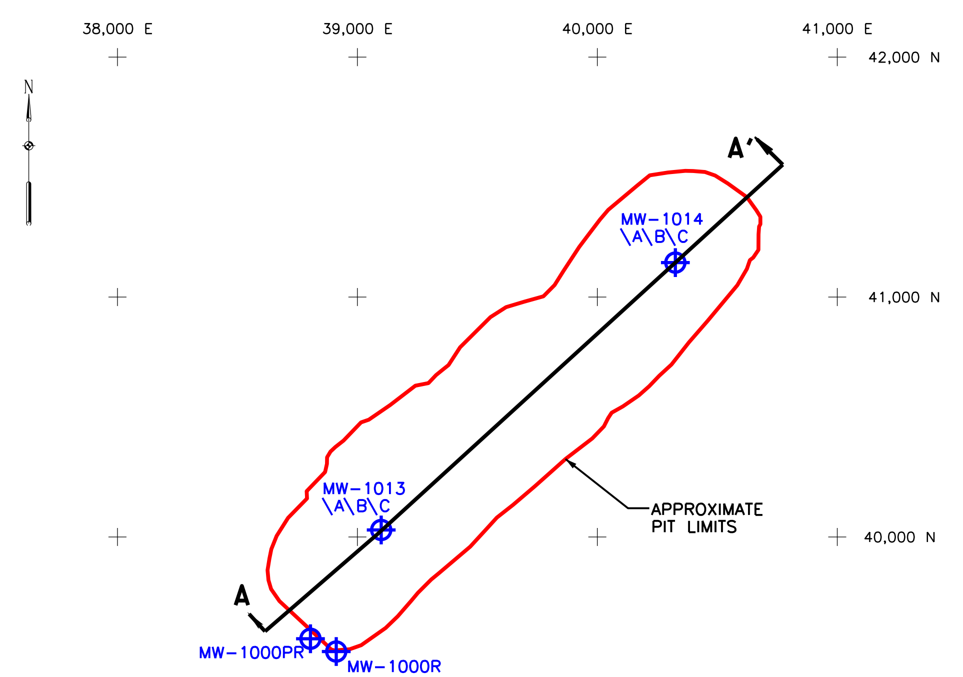



# MINE PIT COORDINATES
# SECTION A - A'




CROSS SECTION LOCATION MAP

SCALE: 1'' = 600'

## LEGEND

- TILL
- SANDSTONE
- SAPROLITE
- TYPE I MATERIAL
- TYPE II MATERIAL
- PRECAMBRIAN
- WATER TABLE
- GROUNDWATER EQUIPOTENTIAL LINE IN TYPE 1 AND II BACKFILL
- GROUNDWATER EQUIPOTENTIAL LINE IN SHALLOW FLOW SYSTEM

Foth Infrastructure & Environment, LLC

| REVISED | DATE | BY | DESCRIPTION |
|---|---|---|---|
| | | | |
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| CHECKED BY: | SVF | DATE: | JAN. '17 |
| APPROVED BY: | RWS3 | DATE: | JAN. '17 |
| APPROVED BY: | | DATE: | |

Foth Infrastructure & Environment, LLC

FLAMBEAU MINING COMPANY

## FIGURE 4-3
## MINE PIT CROSS SECTION A - A' WITH IN-PIT GROUNDWATER MONITORING WELLS

| | | | |
|---|---|---|---|
| Scale: SEE BAR SCALE | | Date: JANUARY, 2017 | |
| Prepared By: JOW | Checked By: SVF | 16F777 | |



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## 4.2 Backfilled Pit Water Quality Assessment

The porewater chemistry of the backfill placed in the reclaimed Flambeau mine has been monitored since February 1999 through sample collection from groundwater wells completed in the backfilled areas. The 2016 evaluation was completed by Foth and is included as Appendix A.

There were no significant changes in porewater chemistry in the backfilled pit during 2016 compared to 2015. The 2016 data show continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) and fluctuations in concentrations that are within the ranges observed in previous years of monitoring or no change. Specific observations include:

- Alkalinity concentrations are stable or within historical ranges, though generally above background concentrations.

- Redox potentials measured for the 2016 samples are generally within or lower than ranges observed in previous years.

- Manganese concentrations continue to be generally stable or decreasing slowly at most wells. Some fluctuation in concentrations is observed in the shallower wells in the MW-1014 nest. Stable concentrations for manganese appear to have been reached for the deepest wells (MW-1013C and MW-1014C).

- Iron concentrations are stable and less than background levels for most wells with the exceptions of MW-1013, MW-1013C, and MW-1014C. Iron concentrations at MW-1013 are higher than background and have fluctuated from an annual average of 6.25 mg/L in 2012 to a peak in annual average concentrations of 13.5 mg/L in 2013 and decreasing to 3.2 mg/L in 2015 and 3.6 in 2016. Iron concentrations in MW-1013C have increased slightly over the last few years and remain above background. Iron concentrations at MW-1014C, initially decreasing, have been generally stable since 2010 at levels above background.

- Consistent with previous evaluations, geochemical modeling indicates that conditions of equilibrium or near-equilibrium with respect to calcite and gypsum are prevalent for wells that sample porewater from limestone-amended backfill. Additionally, conditions of equilibrium to supersaturation with respect to rhodochrosite and siderite also occur for these wells in the limestone-amended backfill, with the exception of samples collected from MW-1014A since 2009, which are undersaturated with respect to rhodochrosite.

- Consistent with previous results, historic decreasing trends for manganese, iron, and sulfate suggest there may be a slow rinse out of easily solubilized constituents by inflow of background groundwater at the upgradient location of the MW-1014 well nest. Concentrations of sulfate, manganese, and iron in the deep wells have been relatively stable over the last few years.

### 4.2.1 Trend Analysis

A detailed analysis of statistical trends occurring in the groundwater and surface water data was performed. The complete trend memorandum is included in the memorandum in Appendix B.

A detailed analysis of statistical trends occurring in the groundwater and surface water data was performed. Statistical tests evaluated long-term trends occurring during the post-mining period (October 1997 to the present) and short-term trends for the most recent five years. Historical trend graphs of the data are also presented.

The majority of the trends with notable concentration changes occur in the quarterly groundwater monitoring parameters. A general discussion of the trend results for each well nest is provided in Section 3 above. The changes in the results of the statistical trend tests from the 2015 Annual Report include the following:

- Arsenic in MW-1000PR has increased since 2013, while copper in MW-1000PR and alkalinity in MW-1000R have followed decreasing trends over this time. Both remain within variation levels reported historically.

- TDS in MW-1002 and MW-1002G has increased since 2013. Concentrations remain within variation levels observed during the pre-mining period.

- Hardness, TDS and conductivity in MW-1005 have increasing trends since 2013. Historical maximums were observed during the last two sampling events for TDS and conductivity within this well. Also, the annual parameters of barium, calcium, chloride, magnesium, sodium had an increased concentration level during the latest sampling event in MW-1005. The increase in these parameters may be due to application of road salt on State Highway 27, which is proximal to the well location. Additional contributing factors may include rising water levels and evaporative concentration effects.

No statistically significant trends were observed in the surface water monitoring results.

## 4.3 Wetland Monitoring

During 2016, Flambeau monitored wetland surface flows.

In accordance with Section 3.1.4.3 of the Updated Monitoring Plan, Flambeau continued to monitor water level measurements at least three times per year (spring, summer, and fall) in Wetland 1.

### 4.3.1 Wetland Surface Flows

In May 2001, Flambeau submitted a Wetland Area Hydrographic Assessment, prepared by Foth & Van Dyke, evaluating the wetland water elevations and recommending cessation of monitoring of wetland surface water elevations, with the exception of Wetland 1, in accordance with the Updated Monitoring Plan. Based upon the Wetland Area Hydrographic Assessment, Flambeau requested the Department's approval of cessation of monitoring wetland surface water elevations for Wetlands 5C, 6C, 7, and 10A. During April 2002, the Department concurred with Flambeau's request to decrease the extent of wetland water level monitoring.

In accordance with Section 3.1.4.3 of the Updated Monitoring Plan, Flambeau monitored water level measurements three times per year (spring, summer, and fall). Water levels in Wetland 1 (Staff Gauge WT-5) were measured three times during 2016: spring, summer, and fall. Standing water at the staff gauge was observed during spring and summer.

Measurements from Wetland 1 are provided in Appendix B. Figure 4-1 shows the staff gauge location. A request to end the required monitoring and reporting in Wetland 1 is being evaluated and will be submitted independently.

### 4.4 Surface Water Monitoring

Surface water monitoring commenced after completion of the Work Plan Supplement activities on September 23, 2016. Sampling was conducted in accordance with the September 24, 2015 Flambeau Mining Company Surface Water Monitoring Plan. Surface water samples, were collected at two locations (SW-C9, and SW-C1) as shown on Figure 2-1. There was one qualifying storm event after commencement of monitoring, on October 17, 2016. Surface water was collected from these locations and was sent to Pace Analytical Service, Inc. (Pace) (Green Bay, WI). Pace is a state-certified laboratories. Samples were analyzed for the following parameters:

- Hardness, total
- Copper, total
- Zinc, total
- Total Suspended Solids (TSS), total

Surface water sampling results were provided to the Department on January 11, 2017.

### 4.5 Surface Subsidence

Pursuant to Section 3.1.7 of the Updated Monitoring Plan (July 1991), with 2008 being the tenth year after reclamation activities were performed in the area of the pit, a review of the surface topography in the area of the pit was performed in 2008.

The results of the 2008 subsidence analysis indicated a general increase of 0.6 feet. These results were consistent with the results of the review of the surface topography in the area of the pit completed in 2001 when the general subsidence across the site was less than a half a foot which is within the accuracy of the mapping technique and the largest settlement observed in isolated areas by mapping was 1.5 feet.

Subsequent subsidence surveys are to occur in the twentieth (2018) and fortieth (2038) year after reclamation activities in the area of the pit are completed.

<u>Aerial Photography (Color and Infrared)</u>

In accordance with Section 3.1.6 of the Updated Monitoring Plan (July 1991), aerial and color infrared photography was completed in the late summer for four consecutive years following completion of closure and will continue every five years throughout the long-term care and maintenance period to monitor success of revegetation.

In the November 7, 2002 submittal of the 2002 Aerial and Color Infrared Photography, Flambeau requested a reduction of the area of coverage for the photography based upon the substantial rebound of groundwater around the reclaimed mine site. Flambeau proposed that the photography cover the reclaimed mine site and 500 feet beyond the site's perimeter including the area of Wetland 1. In a letter dated July 9, 2003, the Department authorized Flambeau to reduce the breadth of the aerial and color infrared photography as requested.

Year 2005 was the fourth year of the four consecutive years for aerial and color infrared photography since the submittal of the NOC in 2001. Aerial and color infrared photography was completed on August 3, 2006 for a fifth additional year and these results were presented in the 2006 Annual Reclamation Report.

With the long-term care phase of the Flambeau project beginning with the May 2007 COC, aerial and color infrared photography will be conducted every five years. The first of the long-term care phase aerial and color infrared photography occurred in 2012. The results were presented in the 2012 Annual Report. Subsequent aerial and color infrared photography will occur in 2017, 2022, 2027, 2032, 2037, 2042, and 2047.

### 4.6 Other Activities

Supplement Work Plan activities were completed as summarized in Section 2.4.2.

## REFERENCES


| | |
|---|---|
| Copper Park Business and Recreation Area Supplement Construction Documentation Report | November 2016 |
| 2015 Annual Report | January 2016 |
| Copper Park Business and Recreation Area Work Plan Supplement | May 2015 |
| Quality Assurance Project Plan | February 2015 |
| 2014 Annual Report | January 2015 |
| 2013 Annual Report | January 2014 |
| Copper Park Business and Recreation Area Maintenance and Monitoring Plan | February 2013 |
| 2012 Annual Report | January 2013 |
| Copper Park Business and Recreation Area Construction Documentation Report | January 2013 |
| 2012 Annual Reclamation Report | November 2012 |
| 2011 Annual Report | January 2012 |
| 2011 Annual Reclamation Report | November 2011 |
| Copper Park Business and Recreation Area Work Plan | May 2011 |
| 2010 Annual Report | January 2011 |
| 2010 Annual Reclamation Report | November 2010 |
| 2009 Annual Report | February 2010 |
| 2009 Annual Reclamation Report | November 2009 |
| 2008 Annual Report | January 2009 |
| 2008 Annual Reclamation Report | November 2008 |
| 2008 Monitoring Results and Copper Park Lane Work Plan | October 2008 |
| 2007 Annual Report | January 2008 |
| COC Stipulation Monitoring Work Plan | December 2007 |
| Quality Assurance Project Plan – Stipulation Monitoring Work Plan QAPP for the Flambeau Mine | December 2007 |
| 2007 Annual Reclamation Report | November 2007 |
| Stipulation and Order | May 2007 |
| 2006 Annual Report | January 2007 |
| Biofilter Management Plan | January 2007 |
| 2006 Annual Reclamation Report | November 2006 |
| Construction Documentation Report – Flambeau Industrial Outlot | September 2006 |

| | |
|---|---|
| 2005 Annual Report | January 2006 |
| 2005 Annual Reclamation Report | November 2005 |
| 2004 Annual Reclamation Report | November 2004 |
| 2001 Annual Reclamation Report | November 2001 |
| 2000 Annual Report | January 2001 |
| Revised Mining Permit Quality Assurance/Quality Control Plan | August 1991 |
| Updated Monitoring Plan | July 1991 |
| Mining Permit | January 1991 |
| Operational Phase and Long Term Care Quality Assurance Plan | November 1993 |
| Mine Permit Application | December 1989 |
| Local Agreement | August 1988 |

## SUBMITTALS

| DOCUMENT | DATE | SUBMITTEE |
|---|---|---|
| **Section 2.0 Operating Activities** | | |
| 2016 Annual Report | January 2017 | Larry Lynch (2) |
| **Section 4.0 Site Monitoring** | | |
| Environmental Monitoring (First Quarter 2016), Groundwater | June 2016 | Phil Fauble (1) |
| Environmental Monitoring (Second Quarter 2016), Groundwater | August 2016 | Phil Fauble (1) |
| Environmental Monitoring (Third Quarter 2016), Groundwater | September 2016 | Phil Fauble (1) |
| Environmental Monitoring (Fourth Quarter 2016), Groundwater | January 2017 | Larry Lynch (2) |
| Fall 2016 Surface Water Analytical Report | January 2017 | Larry Lynch (2) |

1. Wisconsin Department of Natural Resources
   Division of Air & Waste
   Waste & Materials Management

2. Wisconsin Department of Natural Resources
   Division of Environmental Management
   Waste & Materials Management
   Hazardous Waste Prevention and Management Section

# Appendix A

# Backfilled Pit Water Quality Assessment

**Green Bay Location**

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January 31, 2017

TO: Dave Cline, Flambeau Mining Company

CC: Steve Donohue, Foth Infrastructure & Environment, LLC
Sharon Kozicki, Foth Infrastructure & Environment, LLC

FR: Allison Haus, Foth Infrastructure & Environment, LLC
Rich Schowengerdt, Foth Infrastructure & Environment, LLC

RE: Flambeau Mine Backfilled Pit – 2016 Monitoring Results
Flambeau Mining Company

# 1.0 Introduction

## 1.1 Background

The porewater chemistry of the backfill placed in the mined out Flambeau pit has been monitored since February 1999 through sample collection from groundwater wells completed in the backfilled areas. SRK Consulting, Inc. (SRK) reviewed the sampling results annually from 1999 through 2009 to assess geochemical interactions between the groundwater and the backfill (e.g., SRK, 2010). Interralogic, Inc. (Interralogic) conducted the reviews and assessment from 2010 through 2013 (e.g., Interralogic, 2014). Golder Associates Inc. (Golder) was contracted to perform the 2014 and 2015 reviews and assessments from a geochemical perspective. Foth Infrastructure & Environment, LLC (Foth) reviewed and assessed geochemistry in 2016.

This technical memorandum summarizes Golder's review and assessment of monitoring results for 2016. The text and format established in reports for previous reviews and assessments by SRK, Interralogic and Golder have been retained to the extent possible in order to maintain consistency.

## 1.2 Summary of Previous Results from 2015

The results of the review and assessment for the 2015 monitoring period (Golder, 2016) are summarized here within.

There were no significant changes in porewater chemistry in the backfilled pit during 2015 compared to 2014. The 2015 data show continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) or fluctuations in concentrations that are within the ranges observed in previous years of monitoring or no change. Specific observations made for the 2015 data included:

- Alkalinity concentrations were above background concentrations, but stable or within historical ranges.

- Redox potentials measured for the 2015 samples we are generally within or lower than ranges observed in previous years.

- Manganese concentrations continued to be generally stable or decreasing slowly at most wells. Some fluctuation in concentrations were observed in the shallower wells in the MW-1014 nest. Stable concentrations for manganese appear to have been reached for the deepest wells (MW-1013C and MW-1014C).

- Iron concentrations were generally constant and similar to what was reported in previous years, and less than background at most wells except MW-1013, MW-1013C and MW-1014C. Iron concentrations at MW1013 fluctuate above background. Iron concentrations at MW-1013C have increased slightly over the last few years and remain above background. Iron concentrations at MW-1014C since 2010 have been generally stable above background.

- Geochemical modeling indicates that conditions of equilibrium or near-equilibrium with respect to calcite and gypsum are prevalent for wells that sample porewater from limestone-amended backfill; conditions of equilibrium to supersaturation with respect to rhodochrosite and siderite also occur.

- Historically observed decreasing trends for manganese, iron, and sulfate suggest that there may be a slow rinse out of readily solubilized constituents by inflow of background groundwater at the upgradient location of the MW-1014 well nest. Concentrations of sulfate, manganese, and iron in the deep wells have been relatively consistent over the last few years.

## 2.0 Summary Data Collected in 2016

Quarterly groundwater monitoring was performed in accordance with descriptions provided in the Updated Monitoring Plan (July 1991), the Quality Assurance Project Plan (February 2015), and the Local Agreement. The wells sampled in 2016 for this evaluation include the MW-1013 nest, which includes MW-1013, MW-1013A, MW-1013B, and MW-1013C, and the MW-1014 nest, which includes MW-1014, MW-1014A, MW-1014B, and MW-1014C. The MW-1014 nest is located upgradient of the MW-1013 nest and both nests are completed in backfill materials. The wells in each nest are located at approximately the same location but completed at different depths. The background well MW-1005P, which is located upgradient of the backfill, was also sampled for this evaluation.

The routine monitoring program for the backfill groundwater is given in Table 1. The quarterly sampling events with the reduced list of analyses occurred in March, May, June, and October 2016. The annual sampling program with the extended analyte list was completed in June 2016. The analytical results of the monitoring program for the wells located in the backfilled pit area (MW-1013 and MW-1014 nests) and the background well (MW-1005P) are provided in Attachment 1.

## 3.0 Results and Discussion

### 3.1 Alkalinity Trends

Concentration trends for alkalinity are shown in Figure B-6a for the MW-1013 well nest and in Figure B-7a for the MW-1014 well nest. The alkalinity concentrations measured in 2016 are consistent with the results from previous years for both well nests, indicating overall stable conditions in these wells.

Background conditions are indicated by the data for well MW-1005P (provided on Figure B-6a and Figure B-7a). Alkalinity concentrations in MW-1013A, MW-1013B, and MW-1013C remained elevated above background levels during 2016, as has been observed in previous years (Figure B-6a). Wells MW-1013A, MW-1013B, and MW-1013C sample porewater from limestone-amended backfill material; hence, the high alkalinity values are most likely due to reactions with the limestone. As discussed in Section 3.2, these wells also show elevated $CO_2$(g) levels relative to ambient atmospheric $CO_2$(g) values and relative to the groundwater in background well MW-1005P as a result of past limestone dissolution and subsequent trapping of at least a portion of the produced $CO_2$(g) (Table 2). Well MW-1013, which samples porewater from the replaced till, also has a higher alkalinity concentration than background (MW-1005P) and similar to MW-1013B and MW-1013C (Figure B-6a). These observations for the MW-1013 well nest in 2016 are similar to those made in previous annual monitoring reports.

Alkalinity concentrations in wells MW-1014A, MW-1014B, and MW-1014C, which also sample porewater from limestone-amended waste rock in the backfilled pit, were also higher than background levels during 2016, consistent with concentrations from previous years (Figure B-7a). Alkalinity values in MW-1014A appear to have peaked in 2007 at 560 mg/L as $CaCO_3$ and have declined slightly since that time and now appear stabilized between approximately 400 to 500 mg/L as $CaCO_3$. Alkalinity concentrations in MW-1014B have followed a trend similar to MW-1014A, with a peak of 620 mg/L as $CaCO_3$ in October 2004 and a similar range of stable concentrations as MW-1014A from 2012 to 2016. Alkalinity values in MW-1014C have shown a decreasing trend since 1999 and ranged from 260 to 280 mg/L as $CaCO_3$ in 2013 and 2014, and from approximately 250 to 275 mg/L $CaCO_3$ in 2015 and 2016. The results for the last three years suggest stabilization at values slightly above or slowly approaching background concentrations. Alkalinity concentrations for MW-1014, which samples porewater from the upper sandstone backfill layer, remained below background concentrations during 2016, also similar to observations in previous years.

### 3.2 Carbon Dioxide Partial Pressure Trends

Previous annual reports have established that limestone amendments to the waste rock during backfilling neutralized the acidity in the waste rock that may have remained from oxidation processes that occurred when the waste rock was stockpiled above ground during the period of active mining operations. Consistent with these reactions, the neutralization reactions resulted in elevated $CO_2$(g) levels in the porewater of the backfilled waste rock relative to atmospheric $CO_2$(g) values and relative to background groundwater (MW-1005P) based on geochemical equilibrium modeling results (Table 2).

The previously observed trends of elevated $CO_2$(g) in the porewater continued during 2016 for both the MW-1013 well nest and MW-1014 well nest (Figure A-1), with elevated partial pressures of $CO_2$(g) calculated in reference to those for the background well (MW-1005P) (Table 2). The $CO_2$(g) partial pressures determined for 2016 by PHREEQC calculations are generally within the ranges calculated for past monitoring years.

An upward trend in background partial pressures of $CO_2$(g) for MW-1005P was observed between 2008 and about 2012. Subsequent calculated $CO_2$(g) partial pressures exhibit a slight decrease, and 2016 partial pressures are closer to 2006 levels and fall within the historic range (Figure A-1).

The $CO_2$(g) partial pressures shown in Figure A-1 were calculated with the geochemical model PHREEQC (Parkhurst and Appelo, 1999) using the measured groundwater chemical compositions from the annual (June) samples with the detailed analyte list. In 2016, the geochemical model calculations were conducted with the laboratory-measured alkalinity values and field-measured values for pH, temperature, and redox potential. Consistent with previous modeling, the Wateq4f.dat database provided with PHREEQC was applied. There is a potential for some loss of $CO_2$(g) by degassing during sample collection and analysis because the samples are collected from the monitoring wells at depth (i.e., under a hydrostatic pressure greater than atmospheric conditions) and then brought to the surface resulting in depressurization. Degassing loss of $CO_2$(g) during sample collection and analysis would cause the pH to increase, which in turn, would affect the calculation of $CO_2$(g) partial pressure. The potential for this effect to occur during sampling has been noted in previous monitoring reports (e.g., SRK, 2010).

## 3.3 pH Trends

The elevated $CO_2(g)$ levels have persisted in the pore water of the waste rock probably due to slow rates of loss through the overlying backfill material and continued dissolution of calcite. Carbon dioxide forms a weak acid; hence porewater samples from zones with the highest $CO_2(g)$ partial pressures tend to have lower pH values than porewater from zones with comparatively lower $CO_2(g)$ partial pressures (Figure B-6c and Figure B-7c for well nests MW-1013 and MW-1014, respectively). Within the backfilled pit, the elevated $CO_2(g)$ levels relative to that of the background well (MW-1005P) have resulted in pH values generally between 6.0 to 7.0 in the amended backfill (MW-1013 and MW-1014 well nests) compared to a range of 6.6 to 7.4 observed in the background well (MW-1005P) since 1999 where $CO_2(g)$ levels are much lower (Figure B-6c and Figure B-7c).

In general, there were no significant changes in pH values of the monitoring well samples during 2016 compared to previous years. Following a decrease in pH measured at MW-1014 in 2014, which corresponded with a higher calculated $CO_2(g)$ partial pressure in MW-1014 for the 2014 sample, pH values in 2015 and 2016 have returned to the values similar to the previous, pre-2014 range, from 6.3 to 6.6, following a decrease in 2014 to 6.0.

## 3.4 Major Ions

The ionic charge balances of the 2016 annual samples were calculated by spreadsheet from the laboratory results and also checked with the PHREEQC geochemical model. The results of the PHREEQC calculation, which were consistent with the spreadsheet calculation, are shown in Table 3. All nine samples had ionic charge balances within plus or minus 10%. Typically, charge imbalances less than 10% are considered to provide a reliable indication of chemical composition for geochemical modeling and assessment (Alpers and Nordstrom, 1999). Thus, the analytical data for 2016 are considered suitable for use in geochemical modeling and related interpretation of water quality trends for this report.

The classification of the groundwater types based on major cations and anions remain the same as reported in previous annual reports. The chemical composition MW-1005P upgradient of the backfill falls into the Ca-Mg-HCO3 classification, as does MW-1013. The chemical compositions for MW-1013A and MW-1014 fall into Ca-Mg-HCO3-SO4 classification. The chemical compositions for all the other wells (MW-1013B, MW-1013C, MW-1014A, MW-1014B, and MW-1014C) are classified as Ca-Mg-$HCO_3$-$SO_4$ waters.

The geochemical model PHREEQC was used as described in Section 3.2 to calculate saturation indices for mineral phases that are potential solubility controlling phases in the porewater of the backfill. The geochemical model calculations were conducted with the laboratory-measured alkalinity values and field- measured values for pH, temperature, and redox potential. The saturation index for a mineral does not indicate the abundance of the mineral nor does it account for any kinetic constraints that may prevent the mineral from forming or dissolving. However, the values of the saturation indices, in combination with information on the backfill mineralogy, provide useful information for determining the potential water-rock reactions most likely to be affecting water chemistry. They are also useful for interpreting causes of trends or changes in water quality trends.

The saturation indices obtained from the PHREEQC calculations are given in Table 4 using the data for the detailed analyte list from the June 2016 samples. Time series charts showing trends in saturation indices for each monitoring well are provided on Figure A-2 through Figure A-6. Complete sets of input data and results from the PHREEQC model calculations for the 2015 water quality data are included in Attachment 1.

Saturation indices for calcite for porewater in most backfilled areas that were amended with limestone are generally near zero (MW-1013B, MW-1013C, MW-1014A, and MW-1014B), indicating a condition of approximate equilibrium with calcite. This result is consistent with observations in previous years and is due to the presence of limestone, which is comprised primarily of calcite, in the amended waste rock. The results imply that there is a reservoir of acid neutralization capacity in the form of limestone remaining in the waste rock. Dissolution of the calcite is also the most likely reason for the elevated $CO_2(g)$ levels found in the porewater in the limestone-amended portions of the backfilled pit (Section 3.2). The porewater in the till (MW-1013 – Figure A-2) and sandstone (MW-1014 – Figure A-4) layers of the backfilled pit, which were not amended with limestone, are undersaturated with respect to calcite solubility (saturation index values of -0.7 and -1.3 respectively). Wells MW-1013A and MW-1014C, both of which had lower alkalinity concentrations relative to the other deep wells in their respective well nests are near-equilibrium with respect to calcite (saturation indices of -0.5 and -0.5 in 2016, respectively, consistent with previous years). These wells had similar conditions of calcite solubility equilibrium as the background well (MW-1005P – Figure A-2), located upgradient of the limestone amended backfill, which has a saturation index of -0.4 for 2016.

Other carbonate minerals indicated to be at near-equilibrium conditions by the geochemical modeling are siderite (iron carbonate – MW-1013, MW-1013C, MW-1014C, and MW-1005P) and rhodochrosite (manganese carbonate – MW-1013, MW-1013A, MW-1013B, MW-1013C, MW-1014, MW-1014B, MW-1014C, and MW-1005P). In general, through time, the siderite saturation indices tend to be variable due to fluctuations in measured redox potentials that are used to speciate dissolved iron. The rhodochrosite saturation indices are less variable than siderite. Rhodochrosite solubility may partially limit dissolved manganese concentrations, although it is relatively soluble under the groundwater conditions; further discussion is provided in Section 3.6.

Conditions of near-equilibrium with respect to gypsum solubility continued in 2016 for porewater sampled from selected wells completed in limestone-amended waste rock (MW-1013B, MW-1013C, MW-1014A, and MW-1014B). The gypsum likely formed due to acid neutralization reactions with the calcite in the limestone.

There are no significant changes in major ion chemistry in 2016 compared to previous years. Overall, consistent with the measured pH values and alkalinity concentrations, the conditions of equilibrium with calcite and gypsum indicate that acidity that had previously been present in the backfill has been neutralized and there is excess acid neutralizing capacity in the backfilled waste rock in the form of the limestone amendments. This observation is consistent with conclusions made in previous annual reports.

### 3.5 Redox

Time trends for measured redox potentials are shown on Figure B-6d and Figure B-7d for the MW-1013 and MW-1014 wells nests, respectively. The values for the background well MW-1005P are included in both for comparison. The redox potentials in the MW-1013 well nest in 2016 varied throughout the year, but were generally within the ranges reported in previous years, with the exception of MW-1013B (Figure B-6d). Redox potentials for MW-1013B decreased from 2013 until 2015; measurements in 2016 were similar to those in 2015, and close to 120 mV throughout the year.

The redox potentials in 2016 for wells in the MW-1014 well nest were similar to the range of redox potentials measured in 2014 and 2015 (Figure B-7d). Redox potentials in 2016 in background well MW-1005P were also consistent with measurements from 2015.

### 3.6 Manganese and Iron

Time trends for manganese concentrations at the MW-1013 and MW-1014 well nests are shown on Figure B-6b and Figure B-7b, respectively. Annual average concentrations of manganese are provided in Table 5.

For manganese, wells in the MW-1013 well nest (MW-1013, MW-1013A, MW-1013B, and MW-1013C) showed no significant changes in 2015, with concentrations generally within the range of concentrations for previous years (Figure B-7b). The manganese concentrations in these wells appear to be relatively stable. For example at MW-1013B, the average annual manganese concentration was 30,900 µg/L in 2016 (Table 5) and variability throughout the year similar to that observed in previous years (Figure B-6b).

Manganese concentrations in the MW-1014 nest (MW-1014, MW-1014A, MW-1014B, and MW-1014C) demonstrate varying trends (Figure B-7b). For MW-1014A, MW-1014B, and MW-1014C, a gradual decreasing trend in manganese concentrations was observed prior to 2010, with relatively consistent manganese concentrations since this time, though manganese concentrations in MW-1014A have fluctuated at relatively low values (between 10 and 400 µg/L) since 2012. At MW-1014, following an increase in manganese concentrations in 2010, values have fluctuated between 455 and 3,700 µg/L; the 2016 manganese concentrations were within this range.

Saturation indices for rhodochrosite (Table 3 and Figures A-2 through A-6) in 2016 show that conditions of oversaturation to near-equilibrium exist in the wells of the MW-1013 nest, as described in Section 3.4. This result is the same as observed for previous years. More variability is seen in the calculated rhodochrosite saturation indices for the MW-1014 nest. Well MW-1014, MW-1014B and MW-1014C remain near-equilibrium and stable, whereas MW-1014A is undersaturated and continues to decrease. The rhodochrosite oversaturation to near-equilibrium conditions in the MW-1013 nest and in MW-1014, MW-1014B, and MW-1014C indicate that rhodochrosite solubility may have a partial limiting effect on manganese concentrations, depending on pH and $CO_2$(g) partial pressure.

Time trends for iron concentrations at the MW-1013 and MW-1014 well nests are shown on Figure B-6b and Figure B-7b, respectively. Annual average concentrations of iron are provided in Table 5. Iron concentrations measured in 2016 at MW-1013A and MW-1013B remained at low concentrations (<0.5 mg/L) that are similar to or are less than the range observed for the background well MW-1005P (Figure B-6b and Figure B-7b). Iron concentrations at MW-1013 and MW-1013C had annual averages of 3.60 and 13.88 mg/L, respectively, in and range of concentrations for the quarterly samples during 2016 for the MW-1013 well nest are similar to those for previous years (Figure 20).

Iron concentrations for most wells in the MW-1014 nest, with the exception of MW-1014C, measured during 2016 remained lower than those measured for the background well MW-1005P. This is consistent with measurements in previous years (Figure B-7b). Iron concentrations at MW-1014C may have reached stable values following a slow decline in concentrations from 1999 through 2009 (Figure B-7b).

The geochemical modeling results indicate that, under the measured redox conditions, the iron mineral potentially affecting iron concentrations is siderite. Conditions of siderite oversaturation occur at MW-1013C (Figure A-4) and MW-1014C (Figure A-6). Both of these wells also show high partial pressures of $CO_2$(g) which, depending on the fluctuating iron concentrations and redox conditions, result in conditions of near saturation to oversaturation with respect to siderite solubility. These conditions are similar to those observed in previous years. Near-equilibrium with siderite also is calculated for MW-1013, MW-1013C, and background well MW-1005P (Figure A-2) in 2016. These conditions are also within the range observed in previous years for these wells.

Consistent with previous years (Interralogic 2014, Golder 2016), manganese and iron concentrations in the deep wells of the MW-1014 nest (MW-1014B and MW-1014C) have generally shown a slow downward trend with time (Figure B-6b and Figure B-7b), although the rate of decrease has slowed in recent years and appears to have reached nearly constant values. The rates of decrease in manganese and iron at MW-1014C approximately parallel the rate of decline in sulfate (Figure B-6c and Figure B-7c, respectively). The concentrations of manganese, iron, and sulfate in the upgradient background groundwater in well MW-1005P are much lower than those observed in the wells located in the backfilled pit. The decreasing concentrations of sulfate, manganese, and iron observed for the MW-1014 nest may be caused by a slow process of dilution and displacement of backfill pore water by inflowing natural groundwater. This effect is not seen at the MW-1013 well nest. However, the effects of inflowing groundwater would be expected to be more pronounced and occur earlier at the MW-1014 nest because it is located in an upgradient position relative to the MW-1013 nest and therefore more likely to show an earlier influence from groundwater inflow.

## 4.0 Conclusions

There were no significant changes in porewater chemistry in the backfilled pit during 2016 compared to 2015. The 2016 data show continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) and fluctuations in concentrations that are within the ranges observed in previous years of monitoring or no change. Specific observations include:

- Alkalinity concentrations are stable or within historical ranges, though generally above background concentrations.

- Redox potentials measured for the 2016 samples are generally within or lower than ranges observed in previous years.

- Manganese concentrations continue to be generally stable or decreasing slowly at most wells. Some fluctuation in concentrations is observed in the shallower wells in the MW-1014 nest. Stable concentrations for manganese appear to have been reached for the deepest wells (MW-1013C and MW-1014C).

- Iron concentrations are stable and less than background levels for most wells with the exceptions of MW-1013, MW-1013C, and MW-1014C. Iron concentrations at MW-1013 are higher than background and have fluctuated from an annual average of 6.25 mg/L in 2012 to a peak in annual average concentrations of 13.5 mg/L in 2013 and decreasing to 3.2 mg/L in 2015 and 3.6 in 2016. Iron concentrations in MW-1013C have increased slightly over the last few years and remain above background. Iron concentrations at MW-1014C, initially decreasing, have been generally stable since 2010 at levels above background.

- Consistent with previous evaluations, geochemical modeling indicates that conditions of equilibrium or near-equilibrium with respect to calcite and gypsum are prevalent for wells that sample porewater from limestone-amended backfill. Additionally, conditions of equilibrium to supersaturation with respect to rhodochrosite and siderite also occur for these wells in the limestone-amended backfill, with the exception of samples collected from MW-1014A since 2009, which are undersaturated with respect to rhodochrosite.

- Consistent with previous results, historic decreasing trends for manganese, iron, and sulfate suggest there may be a slow rinse out of easily solubilized constituents by inflow of background groundwater at the upgradient location of the MW-1014 well nest. Concentrations of sulfate, manganese, and iron in the deep wells have been relatively stable over the last few years.

## 5.0 Recommendations

The porewater in the backfilled pit area appears to have reached a condition of near constant concentrations, particularly for the deeper wells. Continued groundwater monitoring in and around the backfilled pit from the MW-1013 and MW-1014 well nests as well as the background well MW-1005P on an annual basis is recommended. Quarterly samples for the limited suite of water quality parameters can be discontinued given consistent concentration ranges throughout the year and relatively stable concentration trends. An annual sampling program would be sufficient to identify changes in water quality because the historical record provides information that is sufficient to determine if significant changes are taking place given that there will always be some amount of year-to-year variability. An annual monitoring event was previously recommended by SRK (2010), Interralogic (2011, 2012, 2013, and 2014), and Golder (2015, 2016). An annual event should include all the parameters in the detailed list that are part of the annual sampling program currently being followed. An annual review of the data should be included in the project's annual report to determine if the conclusions reached in this memorandum and previous reviews remain valid.

## 6.0 References


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# Tables

# Table 1
## Summary of Routine Groundwater Monitoring Parameters

| Parameter | Units | Quarterly Samples | Annual Sample |
|---|---|---|---|
| Alkalinity | mg/L as $CaCO_3$ | X | X |
| As | µg/L | X | X |
| Ba | µg/L | | X |
| Cd | µg/L | | X |
| Ca | mg/L | | X |
| Cl | mg/L | | X |
| Cr | µg/L | | X |
| Cu | mg/L | X | X |
| Hardness | mg/L | X | X |
| Fe | mg/L | X | X |
| Pb | µg/L | | X |
| Mg | mg/L | | X |
| Mn | µg/L | X | X |
| Hg | µg/L | | X |
| Field pH | s.u. | X | X |
| Laboratory pH | s.u. | X | X |
| K | mg/L | | X |
| Se | µg/L | | X |
| Ag | µg/L | | X |
| Na | mg/L | | X |
| TDS | mg/L | X | X |
| Sulfate | mg/L | X | X |
| Zn | µg/L | | X |
| Field Conductivity | µmhos/cm | X | X |
| Redox Potential | mV | X | X |
| Groundwater Elevation | feet | X | X |

Abbreviations:
mg/L = milligrams per liter
mg/L as $CaCO_3$ = milligrams per liter as calcium carbonate
mV = millivolts
s.u. = standard units
µg/L = micrograms per liter
µmhos/cm = micromhos per centimeter

Prepared by: BEB1
Checked by: HLH

Table 2

Estimates of Carbon Dioxide Gas in Equilibrium with Annual Samples

| Well | Sample Date | pH | Alkalinity (mg $CaCO_3$/L) | Temperature (°C) | $pCO_2$ (atm) | Log10 $pCO_2$ (atm) | $CO_2$(g) Over-saturation[1] (atm/atm) | $CO_2$(g) Over-saturation[2] (atm/atm) |
|---|---|---|---|---|---|---|---|---|
| MW-1013 | Jun-16 | 6.11 | 589 | 9.2 | 0.42 | -0.38 | 1318 | 21.4 |
| MW-1013A | Jun-16 | 6.58 | 358 | 6.6 | 0.09 | -1.07 | 269 | 4.4 |
| MW-1013B | Jun-16 | 6.16 | 574 | 9.7 | 0.32 | -0.49 | 1023 | 16.6 |
| MW-1013C | Jun-16 | 6.41 | 499 | 10.1 | 0.16 | -0.79 | 513 | 8.3 |
| MW-1014 | Jun-16 | 6.28 | 162 | 8.4 | 0.08 | -1.1 | 251 | 4.1 |
| MW-1014A | Jun-16 | 6.51 | 473 | 8.9 | 0.13 | -0.9 | 398 | 6.5 |
| MW-1014B | Jun-16 | 6.38 | 469 | 8.8 | 0.16 | -0.79 | 513 | 8.3 |
| MW-1014C | Jun-16 | 6.58 | 272 | 9.5 | 0.07 | -1.18 | 209 | 3.4 |
| MW-1005P | Jun-16 | 7.08 | 241 | 9.8 | 0.02 | -1.71 | 62 | 1.0 |
| MW-1013 | Jun-15 | 6.09 | 610 | 11.25 | 0.46 | -0.34 | 1440 | 24.1 |
| MW-1013A | Jun-15 | 6.56 | 340 | 9.42 | 0.09 | -1.06 | 274 | 4.6 |
| MW-1013B | Jun-15 | 6.2 | 590 | 9.61 | 0.3 | -0.52 | 956 | 16 |
| MW-1013C | Jun-15 | 6.38 | 500 | 9.61 | 0.17 | -0.77 | 541 | 9 |
| MW-1014 | Jun-15 | 6.4 | 180 | 11.2 | 0.07 | -1.16 | 221 | 3.7 |
| MW-1014A | Jun-15 | 6.51 | 450 | 9.53 | 0.12 | -0.92 | 379 | 6.3 |
| MW-1014B | Jun-15 | 6.28 | 480 | 8.99 | 0.21 | -0.68 | 659 | 11 |
| MW-1014C | Jun-15 | 6.57 | 270 | 9.77 | 0.07 | -1.17 | 212 | 3.6 |
| MW-1005P | Jun-15 | 7.09 | 240 | 9.54 | 0.02 | -1.72 | 60 | 1 |
| MW-1013 | Jun-14 | 6.13 | 660 | 9.27 | 0.44 | -0.36 | 1391 | 22 |
| MW-1013A | Jun-14 | 6.58 | 340 | 10.56 | 0.08 | -1.08 | 253 | 4 |
| MW-1013B | Jun-14 | 6.31 | 530 | 10.11 | 0.21 | -0.67 | 664 | 10.5 |
| MW-1013C | Jun-14 | 6.38 | 510 | 10.28 | 0.18 | -0.75 | 569 | 9 |
| MW-1014 | Jun-14 | 5.97 | 140 | 8.32 | 0.14 | -0.85 | 443 | 7 |
| MW-1014A | Jun-14 | 6.42 | 430 | 7.4 | 0.14 | -0.86 | 443 | 7 |
| MW-1014B | Jun-14 | 6.21 | 480 | 9.68 | 0.25 | -0.6 | 791 | 12.5 |
| MW-1014C | Jun-14 | 6.5 | 270 | 35.7 | 0.11 | -0.95 | 348 | 5.5 |
| MW-1005P | Jun-14 | 7.05 | 230 | 8.84 | 0.02 | -1.71 | 63 | 1 |
| MW-1013 | Jun-13 | 6.11 | 560 | 10.2 | 0.39 | -0.41 | 1233 | 19.5 |
| MW-1013A | Jun-13 | 6.64 | 320 | 11.9 | 0.07 | -1.16 | 221 | 3.5 |
| MW-1013B | Jun-13 | 6.18 | 510 | 11.5 | 0.28 | -0.55 | 885 | 14 |
| MW-1013C | Jun-13 | 6.39 | 530 | 14.1 | 0.19 | -0.73 | 601 | 9.5 |
| MW-1014 | Jun-13 | 6.49 | 150 | 10.1 | 0.05 | -1.33 | 158 | 2.5 |
| MW-1014A | Jun-13 | 6.58 | 430 | 10.5 | 0.1 | -1.01 | 316 | 5 |
| MW-1014B | Jun-13 | 6.3 | 460 | 10.7 | 0.19 | -0.72 | 601 | 9.5 |
| MW-1014C | Jun-13 | 6.62 | 270 | 11.9 | 0.06 | -1.21 | 190 | 3 |
| MW-1005P | Jun-13 | 7.1 | 220 | 10.3 | 0.02 | -1.77 | 63 | 1 |
| MW-1013 | Jun-12 | 6.1 | 610 | 10.8 | 0.45 | -0.35 | 1413 | 15 |
| MW-1013A | Jun-12 | 6.62 | 340 | 13.2 | 0.08 | -1.1 | 251 | 2.7 |
| MW-1013B | Jun-12 | 6.17 | 580 | 12.6 | 0.33 | -0.48 | 1047 | 11 |
| MW-1013C | Jun-12 | 6.38 | 560 | 13.7 | 0.2 | -0.7 | 631 | 6.7 |
| MW-1014 | Jun-12 | 6.35 | 170 | 10.5 | 0.07 | -1.13 | 234 | 2.3 |
| MW-1014A | Jun-12 | 6.56 | 500 | 11.7 | 0.12 | -0.91 | 389 | 4 |
| MW-1014B | Jun-12 | 6.33 | 470 | 12 | 0.19 | -0.72 | 603 | 6.3 |
| MW-1014C | Jun-12 | 6.6 | 290 | 14.3 | 0.07 | -1.15 | 224 | 2.3 |
| MW-1005P | Jun-12 | 6.97 | 250 | 13.1 | 0.03 | -1.57 | 85 | 1 |
| MW-1013 | Jul-11 | 6.1 | 660 | 15 | 0.5 | -0.3 | 1593 | 16.7 |
| MW-1013A | Jul-11 | 6.55 | 350 | 14.6 | 0.1 | -1.01 | 307 | 3.3 |
| MW-1013B | Jul-11 | 6.14 | 620 | 15.6 | 0.39 | -0.41 | 1237 | 13 |
| MW-1013C | Jul-11 | 6.38 | 520 | 16.4 | 0.19 | -0.72 | 605 | 6.3 |
| MW-1014 | Jul-11 | 6.23 | 170 | 11.8 | 0.1 | -1.02 | 304 | 3.3 |
| MW-1014A | Jul-11 | 6.5 | 500 | 14.3 | 0.14 | -0.84 | 455 | 4.7 |
| MW-1014B | Jul-11 | 6.33 | 550 | 14.8 | 0.23 | -0.64 | 721 | 7.7 |
| MW-1014C | Jul-11 | 6.53 | 290 | 14.5 | 0.08 | -1.08 | 264 | 2.7 |
| MW-1005P | Jul-11 | 6.97 | 250 | 11.6 | 0.03 | -1.58 | 84 | 1 |
| MW-1013 | Jun-10 | 6.18 | 590 | 11.2 | 0.36 | -0.44 | 1139 | 18 |
| MW-1013A | Jun-10 | 6.65 | 350 | 13.2 | 0.08 | -1.12 | 241 | 4 |

| Well | Sample Date | pH | Alkalinity (mg $CaCO_3$/L) | Temperature (°C) | $pCO_2$ (atm) | Log10 $pCO_2$ (atm) | $CO_2$(g) Over-saturation[1] (atm/atm) | $CO_2$(g) Over-saturation[2] (atm/atm) |
|---|---|---|---|---|---|---|---|---|
| MW-1013B | Jun-10 | 6.22 | 690 | 12.6 | 0.35 | -0.46 | 1108 | 17.5 |
| MW-1013C | Jun-10 | 6.37 | 620 | 14.1 | 0.23 | -0.64 | 728 | 11.5 |
| MW-1014 | Jun-10 | 6.44 | 190 | 12.5 | 0.07 | -1.17 | 216 | 3.5 |
| MW-1014A | Jun-10 | 6.59 | 510 | 12.1 | 0.12 | -0.93 | 370 | 6 |
| MW-1014B | Jun-10 | 6.37 | 550 | 13.1 | 0.2 | -0.69 | 645 | 10 |
| MW-1014C | Jun-10 | 6.52 | 310 | 13.5 | 0.09 | -1.04 | 287 | 4.5 |
| MW-1005P | Jun-10 | 7.01 | 240 | 12.7 | 0.02 | -1.62 | 75 | 1 |
| MW-1013 | Jun-09 | 6.11 | 580 | 11.3 | 0.084 | -1.08 | 266 | 4.9 |
| MW-1013A | Jun-09 | 6.61 | 320 | 12.8 | 0.22 | -0.66 | 696 | 12.9 |
| MW-1013B | Jun-09 | 6.17 | 580 | 12 | 0.13 | -0.89 | 411 | 7.6 |
| MW-1013C | Jun-09 | 6.35 | 550 | 14.2 | 0.3 | -0.52 | 949 | 17.6 |
| MW-1014 | Jun-09 | 6.34 | 170 | 11.6 | 0.06 | -1.22 | 190 | 3.5 |
| MW-1014A | Jun-09 | 6.54 | 500 | 11 | 0.22 | -0.66 | 696 | 12.9 |
| MW-1014B | Jun-09 | 6.33 | 510 | 11.2 | 0.25 | -0.6 | 791 | 14.7 |
| MW-1014C | Jun-09 | 6.59 | 300 | 13.8 | 0.13 | -0.89 | 411 | 7.6 |
| MW-1005P | Jun-09 | 7.09 | 240 | 12.9 | 0.017 | -1.77 | 54 | 1 |
| MW-1013 | Jun-08 | 6.2 | 470 | 11.9 | 0.2 | -0.7 | 632 | 20 |
| MW-1013A | Jun-08 | 6.6 | 340 | 12.6 | 0.045 | -1.35 | 142 | 4.5 |
| MW-1013B | Jun-08 | 6.2 | 550 | 12 | 0.22 | -0.66 | 696 | 22 |
| MW-1013C | Jun-08 | 6.4 | 480 | 14.3 | 0.07 | -1.15 | 221 | 7 |
| MW-1014 | Jun-08 | 6.3 | 160 | 11.7 | 0.051 | -1.29 | 161 | 5.1 |
| MW-1014A | Jun-08 | 6.6 | 530 | 11.2 | 0.088 | -1.06 | 278 | 8.8 |
| MW-1014B | Jun-08 | 6.4 | 580 | 12.6 | 0.13 | -0.89 | 411 | 13 |
| MW-1014C | Jun-08 | 6.5 | 280 | 14.9 | 0.043 | -1.37 | 136 | 4.3 |
| MW-1005P | Jun-08 | 7.2 | 250 | 11.8 | 0.01 | -2 | 32 | 1 |
| MW-1013 | Jun-07 | 6.1 | 610 | 11.4 | 0.23 | -0.64 | 727 | 20.9 |
| MW-1013A | Jun-07 | 6.6 | 360 | 13.2 | 0.047 | -1.33 | 149 | 4.3 |
| MW-1013B | Jun-07 | 6.2 | 620 | 12.4 | 0.18 | -0.74 | 569 | 16.4 |
| MW-1013C | Jun-07 | 6.4 | 590 | 14.2 | 0.11 | -0.96 | 348 | 10 |
| MW-1014 | Jun-07 | 6.4 | 180 | 13.4 | 0.034 | -1.47 | 108 | 3.1 |
| MW-1014A | Jun-07 | 6.5 | 490 | 13.1 | 0.065 | -1.19 | 206 | 5.9 |
| MW-1014B | Jun-07 | 6.3 | 570 | ND | 0.12 | -0.92 | 379 | 10.9 |
| MW-1014C | Jun-07 | 6.6 | 360 | 16.5 | 0.057 | -1.24 | 180 | 5.2 |
| MW-1005P | Jun-07 | 7 | 260 | 12.1 | 0.011 | -1.96 | 35 | 1 |
| MW-1013 | Jul-06 | 6.05 | 520 | 13 | 0.2 | -0.7 | 632 | 12.5 |
| MW-1013A | Jul-06 | 6.52 | 320 | 13.2 | 0.057 | -1.24 | 180 | 3.6 |
| MW-1013B | Jul-06 | 6.17 | 610 | 13.6 | 0.23 | -0.64 | 727 | 14.4 |
| MW-1013C | Jul-06 | 6.09 | 520 | 14.7 | 0.14 | -0.85 | 443 | 8.8 |
| MW-1014 | Jul-06 | 6.54 | 170 | 12.1 | 0.04 | -1.4 | 126 | 2.5 |
| MW-1014A | Jul-06 | 6.62 | 450 | 12.8 | 0.088 | -1.06 | 278 | 5.5 |
| MW-1014B | Jul-06 | 6.41 | 520 | 13.7 | 0.17 | -0.77 | 538 | 10.6 |
| MW-1014C | Jul-06 | 6.55 | 350 | 13 | 0.072 | -1.14 | 228 | 4.5 |
| MW-1005P | Jul-06 | 6.59 | 240 | 14.7 | 0.016 | -1.8 | 51 | 1 |
| MW-1013B | Jul-05 | 6.4 | 640 | 15.8 | 0.31 | -0.51 | 980 | 22.1 |
| MW-1013C | Jul-05 | 6.6 | 510 | 14.1 | 0.14 | -0.85 | 443 | 10 |
| MW-1014A | Jul-05 | 6.8 | 500 | 14.1 | 0.11 | -0.96 | 348 | 7.9 |
| MW-1014B | Jul-05 | 6.5 | 570 | 15 | 0.26 | -0.59 | 822 | 18.6 |
| MW-1014C | Jul-05 | 6.9 | 350 | 15 | 0.092 | -1.04 | 291 | 6.6 |
| MW-1005P | Jul-05 | 7.4 | 240 | 13.3 | 0.014 | -1.85 | 44 | 1 |
| MW-1013B | Jul-04 | 6.1 | 550 | 13.3 | 0.16 | -0.8 | 506 | 16 |
| MW-1013C | Jul-04 | 6.2 | 520 | 14.9 | 0.14 | -0.85 | 443 | 14 |
| MW-1014A | Jul-04 | 6.7 | 440 | 17.1 | 0.073 | -1.14 | 231 | 7.3 |
| MW-1014B | Jul-04 | 6.3 | 450 | 14.3 | 0.23 | -0.64 | 727 | 23 |
| MW-1014C | Jul-04 | 6.4 | 300 | 15.5 | 0.094 | -1.03 | 297 | 9.4 |
| MW-1005P | Jul-04 | 7 | 240 | 11.4 | 0.01 | -2 | 32 | 1 |
| MW-1013B | Jul-03 | 6.25 | 620 | 14.9 | 0.16 | -0.8 | 506 | 16 |
| MW-1013C | Jul-03 | 6.32 | 500 | 14.6 | 0.14 | -0.85 | 443 | 14 |
| MW-1014A | Jul-03 | 6.62 | 420 | 13.6 | 0.073 | -1.14 | 231 | 7.3 |
| MW-1014B | Jul-03 | 6.28 | 530 | 12.6 | 0.23 | -0.64 | 727 | 23 |
| MW-1014C | Jul-03 | 6.43 | 340 | 13 | 0.094 | -1.03 | 297 | 9.4 |

| Well | Sample Date | pH | Alkalinity (mg $CaCO_3$/L) | Temperature (°C) | $pCO_2$ (atm) | Log10 $pCO_2$ (atm) | $CO_2$(g) Over-saturation[1] (atm/atm) | $CO_2$(g) Over-saturation[2] (atm/atm) |
|---|---|---|---|---|---|---|---|---|
| MW-1005P | Jul-03 | 7.11 | 240 | 13.4 | 0.01 | -2 | 32 | 1 |
| MW-1013B | Jul-02 | 6.37 | 690 | 16.1 | 0.11 | -0.96 | 348 | 11 |
| MW-1013C | Jul-02 | 6.43 | 520 | 16.5 | 0.079 | -1.1 | 250 | 7.9 |
| MW-1014A | Jul-02 | 6.49 | 460 | 15.1 | 0.056 | -1.25 | 177 | 5.6 |
| MW-1014B | Jul-02 | 6.25 | 550 | 14.1 | 0.1 | -1 | 316 | 10 |
| MW-1014C | Jul-02 | 6.6 | 350 | 17.2 | 0.053 | -1.28 | 168 | 5.3 |
| MW-1005P | Jul-02 | 7.19 | 250 | 13.6 | 0.01 | -2 | 32 | 1 |
| MW-1013B | Apr-01 | 6 | 530 | 14 | 0.14 | -0.85 | 443 | 17.5 |
| MW-1013C | Apr-01 | 6.3 | 440 | 13.8 | 0.092 | -1.04 | 291 | 11.5 |
| MW-1014A | Apr-01 | 6.3 | 430 | 12.1 | 0.063 | -1.2 | 199 | 7.9 |
| MW-1014B | Apr-01 | 6.1 | 520 | 13.5 | 0.17 | -0.77 | 538 | 21.3 |
| MW-1014C | Apr-01 | 6.2 | 330 | 12.8 | 0.077 | -1.11 | 243 | 9.6 |
| MW-1005P | Apr-01 | 6.7 | 240 | 12.8 | 0.008 | -2.1 | 25 | 1 |
| MW-1013B | Apr-00 | 6.63 | 520 | 8.7 | 0.14 | -0.85 | 443 | 10.8 |
| MW-1013C | Apr-00 | 6.73 | 460 | 8.5 | 0.1 | -1 | 316 | 7.7 |
| MW-1014A | Apr-00 | 6.87 | 390 | 11.2 | 0.055 | -1.26 | 174 | 4.2 |
| MW-1014B | Apr-00 | 6.43 | 480 | 14.2 | 0.21 | -0.68 | 664 | 16.2 |
| MW-1014C | Apr-00 | 6.65 | 320 | 11.9 | 0.071 | -1.15 | 225 | 5.5 |
| MW-1005P | Apr-00 | 7.27 | 250 | 6.4 | 0.013 | -1.89 | 41 | 1 |

Notes:

Prepared by: BEB1
Checked by: ASH1

[1] Oversaturation relative to atmospheric $CO_2$(g) at $10^{-3.5}$ atm

[2] Multiple of $CO_2$(g) for background well MW-1005P

Pre-2014 values are as reported in Interralogic (2014).

2014 and 2015 values are as reported in Golder (2016)

Abbreviations:

°C = degrees Celsius
atm = atmosphere
atm/atm = atmosphere per atmosphere
mg/L as $CaCO_3$ = milligrams per liter as calcium carbonate

# Table 3
## Charge Balances of June 2016 Annual Samples Calculated in PHREEQC

| Sample | Charge Balance (%)[1] |
|---|---|
| MW-1005P | 1.78 |
| MW-1013 | 0.43 |
| MW-1013A | 2.79 |
| MW-1013B | -1.59 |
| MW-1013C | -2.39 |
| MW-1014 | 0.24 |
| MW-1014A | -1.23 |
| MW-1014B | -2.59 |
| MW-1014C | -2.1 |

Note:

[1] Charge balance = 100 * (Cations-|Anions|)/(Cations+|Anions|)

Abbreviations:

% = percent

Prepared by: ASH1
Checked by: HLH

Table 4

Saturation Indices for Secondary Minerals Determined with PHREEQC

| Date | Monitoring Well | T (°C) | pH | pE | Calcite/Aragonite | Gypsum | Ferrihydrite | Siderite | Rhodochrosite |
|---|---|---|---|---|---|---|---|---|---|
| June-16 | MW-1013 | 9.2 | 6.11 | 0.9 | -0.67/-0.82 | -2.06 | -4.00 | -0.54 | 0.89 |
| June-16 | MW-1013A | 6.6 | 6.58 | 0.7 | -0.52/-0.67 | -1.18 | -3.63 | -1.14 | 0.4 |
| June-16 | MW-1013B | 9.7 | 6.16 | 2.4 | -0.29/-0.44 | -0.03 | -4.09 | -2.28 | 0.79 |
| June-16 | MW-1013C | 10.1 | 6.41 | 0.9 | -0.11/-0.27 | -0.07 | -2.42 | 0.38 | 0.52 |
| June-16 | MW-1014 | 8.4 | 6.28 | 2.2 | -1.28/-1.44 | -1.52 | -4.34 | -3.01 | -0.53 |
| June-16 | MW-1014A | 8.9 | 6.51 | 2.2 | -0.20/-0.36 | -0.37 | -3.75 | -2.50 | -1.32 |
| June-16 | MW-1014B | 8.8 | 6.38 | 2.3 | -0.21/-0.37 | -0.15 | -4.15 | -2.77 | 0.48 |
| June-16 | MW-1014C | 9.5 | 6.58 | 0.7 | -0.53/-0.69 | -1.08 | -2.26 | 0.10 | -0.11 |
| June-16 | MW-1005P | 9.8 | 7.08 | 0.5 | -0.40/-0.55 | -3.35 | -1.63 | -0.10 | -0.92 |
| June-15 | MW-1013 | 11.3 | 6.09 | 1.3 | -0.61/-0.76 | -2.02 | -3.61 | -0.52 | 0.97 |
| June-15 | MW-1013A | 9.4 | 6.56 | 1.5 | -0.55/-0.70 | -1.19 | -3.63 | -1.85 | 0.41 |
| June-15 | MW-1013B | 9.6 | 6.2 | 2.2 | -0.20/-0.36 | -0.03 | -3.91 | -1.94 | 0.94 |
| June-15 | MW-1013C | 9.6 | 6.38 | 1 | -0.12/-0.27 | -0.04 | -2.32 | 0.38 | 0.57 |
| June-15 | MW-1014 | 11.2 | 6.4 | 2.3 | -1.10/-1.26 | -1.45 | -3.59 | -2.55 | -0.24 |
| June-15 | MW-1014A | 9.5 | 6.51 | 2.5 | -0.20/-0.35 | -0.35 | -2.57 | -1.65 | -1.52 |
| June-15 | MW-1014B | 9 | 6.28 | 2.7 | -0.26/-0.42 | -0.11 | -3.18 | -1.92 | 0.51 |
| June-15 | MW-1014C | 9.8 | 6.57 | 0.5 | -0.53/-0.69 | -1.1 | -2.48 | 0.12 | -0.05 |
| June-15 | MW-1005P | 9.5 | 7.09 | 0.6 | -0.41/-0.56 | -3.26 | -1.46 | 0.03 | -0.88 |
| June-14 | MW-1013 | 9.3 | 6.13 | 0.6 | -0.60/-0.75 | -1.93 | -3.76 | 0 | 0.96 |
| June-14 | MW-1013A | 10.6 | 6.58 | 0.7 | -0.48/-0.63 | -1.15 | -4.16 | -1.62 | 0.28 |
| June-14 | MW-1013B | 10.1 | 6.31 | 5.1 | -0.14/-0.30 | -0.01 | -0.48 | -1.74 | 1.04 |
| June-14 | MW-1013C | 10.3 | 6.38 | 2.8 | -0.11/-0.26 | -0.03 | -0.55 | 0.39 | 0.54 |
| June-14 | MW-1014 | 8.3 | 5.97 | 2.2 | -1.66/-1.82 | -1.57 | -4.97 | -3.11 | -0.79 |
| June-14 | MW-1014A | 7.4 | 6.42 | 2.2 | -0.37/-0.53 | -0.37 | -3.96 | -2.49 | -1.89 |
| June-14 | MW-1014B | 9.7 | 6.21 | 2.2 | -0.35/-0.50 | -0.13 | -4.52 | -2.67 | 0.37 |
| June-14 | MW-1014C | 35.7 | 6.5 | 0.6 | -0.25/-0.38 | -1.16 | -2.01 | 0.44 | 0.19 |
| June-14 | MW-1005P | 8.8 | 7.05 | -0.6 | -0.45/-0.61 | -3.24 | -2.83 | -0.12 | -0.8 |
| June-13 | MW-1013 | 10.2 | 6.11 | 0.8 | -0.63/-0.79 | -2 | -3.11 | 0.42 | 0.92 |
| June-13 | MW-1013A | 11.9 | 6.64 | 0.8 | -0.43/-0.58 | -1.14 | -3.64 | -1.43 | 0.35 |
| June-13 | MW-1013B | 11.5 | 6.18 | 1.7 | -0.27/-0.43 | -0.02 | -4.51 | -2.09 | 0.62 |
| June-13 | MW-1013C | 14.1 | 6.39 | 1.6 | -0.04/-0.19 | -0.06 | -1.58 | 0.51 | 0.62 |
| June-13 | MW-1014 | 10.1 | 6.49 | 1 | -1.06/-1.21 | -1.51 | -4.69 | -2.65 | -0.19 |
| June-13 | MW-1014A | 10.5 | 6.58 | 1.4 | -0.16/-0.32 | -0.36 | -4.25 | -2.4 | -2.04 |
| June-13 | MW-1014B | 10.7 | 6.3 | 1.6 | -0.26/-0.41 | -0.12 | -4.21 | -2 | 0.57 |
| June-13 | MW-1014C | 11.9 | 6.62 | 1.1 | -0.43/-0.58 | -1.08 | -1.73 | 0.22 | 0.03 |
| June-13 | MW-1005P | 10.3 | 7.1 | 1.7 | -1.77/-0.39 | -3.16 | -1.15 | -0.81 | -0.7 |
| June-12 | MW-1013 | 10.8 | 6.1 | 2.5 | -0.63/-0.79 | -1.9 | -2.05 | -0.2 | 0.87 |
| June-12 | MW-1013A | 13.2 | 6.62 | 3 | -0.43/-0.58 | -1.22 | -1.86 | -1.79 | 0.42 |
| June-12 | MW-1013B | 12.6 | 6.17 | 6.1 | -0.22/-0.38 | -0.03 | -0.8 | -2.75 | 0.94 |
| June-12 | MW-1013C | 13.7 | 6.38 | 0.7 | -0.04/-0.2 | -0.09 | -2.65 | 0.38 | 0.63 |
| June-12 | MW-1014 | 10.5 | 6.35 | 5.3 | -1.16/-1.32 | -1.5 | -0.84 | -2.75 | -0.48 |
| June-12 | MW-1014A | 11.7 | 6.56 | 5.1 | -0.11/-0.26 | -0.44 | -0.3 | -2.04 | -0.61 |
| June-12 | MW-1014B | 12 | 6.33 | 2.6 | -0.22/-0.37 | -0.16 | -3.83 | -2.62 | 0.56 |
| June-12 | MW-1014C | 14.3 | 6.6 | 1 | -0.41/-0.56 | -1.11 | -1.86 | 0.22 | 0.09 |
| June-12 | MW-1005P | 13.1 | 6.97 | -0.7 | -0.44/-0.6 | -3.26 | -2.89 | 0.06 | -0.96 |
| July-11 | MW-1013 | 15 | 6.1 | 1.7 | -0.52/-0.67 | -1.85 | -2.94 | -0.24 | 0.97 |
| July-11 | MW-1013A | 14.6 | 6.55 | 1.8 | -0.45/-0.61 | -1.32 | -2.6 | -1.18 | 0.3 |
| July-11 | MW-1013B | 15.6 | 6.14 | 4.3 | -0.18/-0.33 | -0.04 | -1.59 | -1.65 | 0.99 |
| July-11 | MW-1013C | 16.4 | 6.38 | 0.8 | -0.02/-0.17 | -0.06 | -2.48 | 0.43 | 0.63 |
| July-11 | MW-1014 | 11.8 | 6.23 | 2.9 | -1.27/-1.42 | -1.5 | -3.06 | -2.33 | -0.5 |
| July-11 | MW-1014A | 14.3 | 6.5 | 2.8 | -0.14/-0.29 | -0.4 | -2.14 | -1.47 | -1.11 |
| July-11 | MW-1014B | 14.8 | 6.33 | 2.9 | -0.11/-0.27 | -0.17 | -2.5 | -1.6 | 0.65 |
| July-11 | MW-1014C | 14.5 | 6.53 | 1 | -0.48/-0.63 | -1.09 | -1.98 | 0.18 | -0.03 |
| July-11 | MW-1005P | 11.6 | 6.97 | -0.2 | -0.47/-0.63 | -3.27 | -2.45 | 0.03 | -0.94 |
| June-10 | MW-1013 | 11.2 | 6.2 | 1.7 | -0.56/-0.71 | -1.78 | -2.84 | -0.32 | 0.97 |
| June-10 | MW-1013A | 13.2 | 6.7 | 1.8 | -0.41/-0.57 | -1.29 | -2.69 | -1.43 | 0.33 |
| June-10 | MW-1013B | 12.6 | 6.2 | 4.3 | -0.08/-0.23 | -0.11 | -1.93 | -2.06 | 1.1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| June-10 | MW-1013C | 14.1 | 6.4 | 0.8 | -0.03/-0.18 | -0.08 | -2.7 | 0.33 | 0.64 |
| June-10 | MW-1014 | 12.5 | 6.4 | 2.9 | -1.01/-1.17 | -1.45 | -2.39 | -2.03 | -1.3 |
| June-10 | MW-1014A | 12.1 | 6.6 | 2.8 | -0.07/-0.22 | -0.37 | -2.27 | -1.75 | -1.04 |
| June-10 | MW-1014B | 13.1 | 6.4 | 2.9 | -0.06/-0.21 | -0.24 | -2.78 | -1.94 | 0.73 |
| June-10 | MW-1014C | 13.5 | 6.5 | 1 | -0.5/-0.65 | -1.14 | -2.06 | 0.15 | -0.02 |
| June-10 | MW-1005P | 12.7 | 7 | -0.2 | -0.5/-0.66 | -3.32 | -3.11 | -0.72 | -1.06 |
| June-09 | MW-1013 | 11.3 | 6.1 | 1.5 | -0.67/-0.83 | -1.73 | -2.93 | 0.21 | 0.85 |
| June-09 | MW-1013A | 12.8 | 6.6 | 1.6 | -0.48/-0.63 | -1.19 | -3.3 | 0.15 | 0.25 |
| June-09 | MW-1013B | 10.7 | 6.2 | 3.8 | -0.21/-0.37 | -0.04 | -2.85 | -0.04 | 0.73 |
| June-09 | MW-1013C | 12.6 | 6.4 | 0.6 | -0.09/-0.25 | -0.05 | -2.77 | -1.78 | 0.6 |
| June-09 | MW-1014 | 11.6 | 6.3 | 3 | -1.22/-1.38 | -1.37 | -3.04 | -2.32 | -1.13 |
| June-09 | MW-1014A | 11 | 6.3 | 2.9 | -0.41/-0.56 | -0.4 | -2.74 | 0.31 | -1.15 |
| June-09 | MW-1014B | 11.2 | 6.3 | 3.6 | -0.21/-0.36 | -0.14 | -2.72 | -2.4 | 0.63 |
| June-09 | MW-1014C | 11.2 | 6.6 | 0.9 | -0.45/-0.61 | -1.01 | -2 | -1.66 | 0.01 |
| June-09 | MW-1005P | 12.9 | 7.1 | -0.1 | -0.37/-0.52 | -3.3 | -1.99 | -2.26 | -0.85 |
| June-08 | MW-1013 | 11.9 | 6.2 | 1.5 | -0.5/-0.65 | -1.64 | -2.4 | 0.45 | 1.04 |
| June-08 | MW-1013A | 12.6 | 6.6 | 1.6 | -0.14/-0.3 | -1 | -1.8 | 0.35 | 0.61 |
| June-08 | MW-1013B | 12 | 6.2 | 3.7 | -0.08/-0.23 | -0.02 | -1.38 | -0.04 | 0.89 |
| June-08 | MW-1013C | 14.3 | 6.4 | 0.6 | 0.32/0.17 | -0.03 | -1.52 | -0.69 | 0.99 |
| June-08 | MW-1014 | 11.7 | 6.3 | 2.8 | -1.06/-1.21 | -1.41 | -3.43 | -1.2 | -0.59 |
| June-08 | MW-1014A | 11.2 | 6.6 | 2.8 | 0.09/-0.07 | -0.39 | -1.04 | 0.71 | 0.4 |
| June-08 | MW-1014B | 12.6 | 6.4 | 3.4 | 0.05/-0.10 | -0.14 | -1.2 | -3.1 | 0.89 |
| June-08 | MW-1014C | 14.9 | 6.5 | 0.9 | -0.23/-0.38 | -1.07 | -1.38 | -0.78 | 0.25 |
| June-08 | MW-1005P | 11.8 | 7.2 | -0.1 | -0.1/-0.26 | -3.27 | -1.38 | -1.03 | -0.59 |
| June-07 | MW-1013 | 11.4 | 6.1 | 1.5 | -0.65/-0.81 | -1.64 | -2.71 | 0.2 | 0.88 |
| June-07 | MW-1013A | 13.2 | 6.6 | 1.8 | -0.5/-0.65 | -1.28 | -2.47 | -1.06 | -0.05 |
| June-07 | MW-1013B | 12.4 | 6.2 | 3.8 | -0.2/-0.35 | -0.02 | -1.82 | -1.49 | 0.76 |
| June-07 | MW-1013C | 14.2 | 6.4 | 1.3 | -0.05/-0.21 | -0.02 | -2.13 | 0.36 | 0.61 |
| June-07 | MW-1014 | 13.4 | 6.4 | 3.3 | -1.07/-1.23 | -1.32 | -1.43 | -1.47 | -1.05 |
| June-07 | MW-1014A | 13.1 | 6.5 | 3.2 | -0.19/-0.35 | -0.35 | -1.45 | -1.2 | -0.47 |
| June-07 | MW-1014B | NA | 6.3 | 3.5 | -0.18/-0.34 | -0.11 | -1.83 | -1.4 | 0.67 |
| June-07 | MW-1014C | 16.5 | 6.6 | 0.9 | -0.35/-0.51 | -0.96 | -1.97 | 0.31 | 0.11 |
| June-07 | MW-1005P | 12.1 | 7 | 0.1 | -0.45/-0.6 | -4.25 | 2.49 | -0.68 | -0.93 |
| July-06 | MW-1013 | 13 | 6.4 | 2.9 | -0.36/-0.51 | -1.69 | -0.74 | 0.07 | 1.13 |
| July-06 | MW-1013A | 13.2 | 6.7 | 2.7 | -0.39/-0.54 | -1.17 | -1.03 | -0.8 | 0.18 |
| July-06 | MW-1013B | 13.6 | 6.4 | 4.2 | 0.00/-0.15 | -0.04 | -0.72 | -1.12 | 1.2 |
| July-06 | MW-1013C | 14.7 | 6.7 | 0.9 | 0.25/0.10 | -0.05 | -1.69 | 0.05 | 0.92 |
| July-06 | MW-1014 | 12.1 | 6.6 | 2.9 | -0.89/-1.04 | -1.32 | -1.02 | -1.11 | -0.37 |
| July-06 | MW-1014A | 12.8 | 6.7 | 3.2 | -0.05/-0.2 | -0.38 | -0.8 | -0.88 | 0.03 |
| July-06 | MW-1014B | 13.7 | 6.4 | 3.8 | -0.1/-0.25 | -0.16 | -0.97 | -1.09 | 0.75 |
| July-06 | MW-1014C | 13 | 6.6 | 1.1 | -0.31/-0.46 | -1.01 | -1.63 | 0.39 | 0.18 |
| July-06 | MW-1005P | 14.7 | 7.1 | 0 | -0.35/-0.5 | -3.3 | -2.1 | -0.12 | -0.7 |
| July-05 | MW-1013B | 15.8 | 6.4 | 4 | 0.04/-0.11 | 0.01 | -0.76 | -1.11 | 1.24 |
| July-05 | MW-1013C | 14.1 | 6.6 | 0.3 | 0.08/-0.07 | -0.01 | -2.47 | 0.4 | 0.79 |
| July-05 | MW-1014A | 14.1 | 6.8 | 4.7 | 0.11/-0.05 | -0.35 | 1.18 | -0.76 | 0.16 |
| July-05 | MW-1014B | 15 | 6.5 | 5.2 | 0.05/-0.10 | -0.06 | 0.77 | -1.05 | 0.95 |
| July-05 | MW-1014C | 15 | 6.9 | 1 | -0.04/-0.19 | -0.9 | -0.76 | 0.69 | 0.46 |
| July-05 | MW-1005P | 13.3 | 7.4 | -0.02 | -0.08/-0.23 | -3.23 | -1.8 | -0.47 | -0.53 |
| July-04 | MW-1013B | 13.3 | 6.3 | 3.2 | -0.06/-0.21 | -0.03 | -1.77 | -1.18 | 0.96 |
| July-04 | MW-1013C | 14.9 | 6.5 | 0.8 | 0.09/-0.06 | -0.11 | -2.35 | 0.35 | 0.76 |
| July-04 | MW-1014A | 17.1 | 6.7 | 2.9 | 0.04/-0.11 | 0.39 | -0.8 | -0.69 | 0.27 |
| July-04 | MW-1014B | 14.3 | 6.4 | 3.2 | -0.11/-0.26 | -0.15 | -1.52 | -1.15 | 0.79 |
| July-04 | MW-1014C | 15.5 | 6.6 | 0.5 | -0.32/-0.47 | -0.92 | -2.13 | 0.42 | 0.2 |
| July-04 | MW-1005P | 11.4 | 7.2 | -0.1 | -0.25/-0.4 | -3.25 | -2.11 | -0.21 | -0.63 |
| July-03 | MW-1013B | 14.9 | 6.8 | 3.5 | 0.49/0.34 | -0.02 | 0.18 | -0.4 | 1.67 |
| July-03 | MW-1013C | 14.6 | 6.5 | 0.5 | 0.06/-0.09 | -0.03 | -2.9 | 0.07 | 0.71 |
| July-03 | MW-1014A | 12 | 6.6 | 3.5 | -0.1/-0.26 | -0.34 | -0.46 | -0.75 | 0.53 |
| July-03 | MW-1014B | 12.6 | 6.2 | 4.2 | -0.3/-0.45 | -0.11 | -1.23 | -1.4 | 0.63 |
| July-03 | MW-1014C | 13 | 6.6 | 0.7 | -0.26/-0.41 | -0.83 | -1.94 | 0.48 | 0.25 |
| July-03 | MW-1005P | 13.4 | 7 | -0.1 | -0.41/-0.56 | -3.25 | -2.24 | 0.02 | -0.88 |
| July-02 | MW-1013B | 16.1 | 6.4 | 3.5 | 0.14/-0.01 | -0.08 | -1 | -0.7 | 1.32 |
| July-02 | MW-1013C | 16.5 | 6.4 | 0.9 | 0.05/-0.10 | -0.08 | -2.68 | 0.04 | 0.71 |
| July-02 | MW-1014A | 15.1 | 6.5 | 3.1 | -0.07/-0.22 | -0.37 | -1.2 | -0.86 | 0.6 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| July-02 | MW-1014B | 14.1 | 6.3 | 4.3 | -0.16/-0.31 | -0.1 | -1.27 | -1.59 | 0.8 |
| July-02 | MW-1014C | 17.2 | 6.6 | 0.8 | -0.17/-0.32 | -0.84 | -1.71 | 0.61 | 0.34 |
| July-02 | MW-1005P | 13.6 | 7.2 | 0.5 | -0.23/-0.38 | -2.97 | -2.12 | -0.74 | -0.71 |
| October-01 | MW-1013B | 14.4 | 6.1 | 3.4 | -0.3/-0.45 | -0.04 | -1.99 | -1.1 | 0.9 |
| October-01 | MW-1013C | 12.6 | 6.2 | 0.4 | -0.33/-0.48 | -0.05 | -4.11 | -0.47 | 0.32 |
| October-01 | MW-1014A | 14.3 | 6.3 | 2.6 | -0.38/-0.53 | -0.36 | -1.76 | -0.56 | 0.33 |
| October-01 | MW-1014B | 13.4 | 6.1 | 3.7 | -0.4/-0.55 | -0.08 | -2.35 | -1.178 | 0.59 |
| October-01 | MW-1014C | 12.2 | 6.2 | 0.9 | -0.68/-0.83 | -0.75 | -2.91 | 0.13 | -0.1 |
| July-01 | MW-1005P[5] | 9.9 | 6.6 | 0.1 | -0.86/-1.01 | -2.98 | -3.52 | -0.59 | -1.28 |
| April-01 | MW-1013B[1] | 8.7 | 6.6 | 4.1 | 0.24/0.08 | -0.03 | -0.23 | -1.01 | 1.36 |
| April-01 | MW-1013C[2] | 8.5 | 6.7 | 3.1 | 0.15/0.00 | -0.01 | -0.08 | -0.25 | 0.73 |
| April-01 | MW-1014A | 11.2 | 6.9 | 2.9 | 0.13/-0.02 | -0.36 | -0.23 | -0.49 | 0.91 |
| April-01 | MW-1014B[3] | 14.2 | 6.4 | 5.1 | -0.02/-0.17 | -0.07 | -0.34 | -1.16 | 0.99 |
| April-01 | MW-1014C | 11.9 | 6.7 | 1.6 | -0.02/0.17 | -0.64 | -0.82 | 0.76 | 0.49 |
| April-01 | MW-1005P[4] | 15.9 | 6.9 | 1.1 | -0.37/-0.52 | -2.83 | -2.66 | -1.24 | -1 |

Notes:

Prepared by: HLH

Checked by: ASH1

[1] April 2000 data with sulfate adjusted upwards to 1500 mg/L to improve ion balance.

[2] April 2000 data with calcium adjusted upwards to 290 mg/L to improve ion balance.

[3] In the April 2000 data, the iron detection limit was anomalously high (0.15 mg/L). In the PHREEQC runs, the iron concentration was set to 0.06 mg/L, as measured in other samples from this well.

[4] Combination of analytical data from the July 1999 sample with Eh and alkalinity data from the April 2000 sample.

[5] July 2001 data

Pre-2014 values are as reported in Interralogic (2014).

2014 and 2015 values are as reported in Golder (2016)

Mineral formulas: Calcite – $CaCO_3$; Aragonite – $CaCO_3$; Gypsum – $CaSO_4 \cdot 2H_2O$; Ferrihydrite – $Fe(OH)_3$(am); Siderite – $FeCO_3$; Rhodochrosite – $MnCO_3$

Abbreviations

°C = degrees Celcius

mg/L = milligrams per liter

T = temperature

## Table 5

## Summary of Annual Average[1] Dissolved Manganese and Iron Concentrations in the Backfilled Pit Area

| Manganese (µg/L) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **MW-1005P** | **MW-1013** | **MW-1013A** | **MW-1013B** | **MW-1013C** | **MW-1014** | **MW-1014A** | **MW-1014B** | **MW-1014C** |
| **1999** | 47.25 | - | - | 28,000 | 7,450 | - | - | 23,000 | 4,200 |
| **2000** | 60 | - | - | 32,750 | 7,925 | - | 7,000 | 21,000 | 3,375 |
| **2001** | 41.75 | - | - | 36,000 | 8,600 | - | 6,150 | 18,750 | 2,975 |
| **2002** | 43.75 | - | - | 36,250 | 9,400 | - | 5,900 | 17,750 | 2,625 |
| **2003** | 77.25 | - | - | 36,250 | 9,625 | - | 4,275 | 17,750 | 2,425 |
| **2004** | 60.75 | - | - | 32,500 | 9,650 | - | 2,670 | 16,360 | 2,244 |
| **2005** | 56.5 | - | - | 33,750 | 10,375 | - | 1,725 | 16,000 | 2,175 |
| **2006** | 60 | 21,750 | 2,725 | 26,500 | 10,375 | 1,030 | 1,455 | 13,750 | 2,000 |
| **2007** | 62.25 | 23,750 | 1,800 | 26,500 | 10,750 | 700 | 808 | 14,000 | 1,950 |
| **2008** | 65.25 | 23,250 | 2,775 | 28,000 | 10,250 | 550 | 760 | 13,750 | 1,825 |
| **2009** | 67.25 | 23,000 | 1,790 | 22,000 | 9,725 | 295 | 325 | 12,500 | 1,675 |
| **2010** | 63 | 23,500 | 2,875 | 30,750 | 10,025 | 238 | 148 | 12,500 | 1,650 |
| **2011** | 63.5 | 24,250 | 3,125 | 33,500 | 9,825 | 1,965 | 195 | 11,250 | 1,600 |
| **2012** | 62 | 22,250 | 2,975 | 32,500 | 9,475 | 1,025 | 171 | 10,500 | 1,625 |
| **2013** | 80.25 | 26,500 | 3,000 | 31,000 | 9,675 | 1,110 | 128 | 11,750 | 1,625 |
| **2014** | 66.5 | 26,250 | 3,025 | 36,750 | 9,775 | 1,400 | 193 | 11,250 | 1,675 |
| **2015** | 81.9 | 27,050 | 4,033 | 30,950 | 10,075 | 986 | 207 | 11,243 | 1,628 |
| **2016** | 67.53 | 26,675 | 4,490 | 30,900 | 9,270 | 1460 | 268 | 10,468 | 1,655 |

| Iron (mg/L) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **MW-1005P** | **MW-1013** | **MW-1013A** | **MW-1013B** | **MW-1013C** | **MW-1014** | **MW-1014A** | **MW-1014B** | **MW-1014C** |
| **1999** | 0.28 | - | - | 0.33 | 1.12 | - | - | 0.04 | 14.25 |
| **2000** | 0.17 | - | - | 0.47 | 1.73 | - | 0.9 | 0.23 | 12.5 |
| **2001** | 0.1 | - | - | 0.67 | 2.65 | - | 0.93 | 0.2 | 10.9 |
| **2002** | 0.13 | - | - | 0.48 | 4.48 | - | 0.52 | 0.15 | 9.2 |
| **2003** | 0.84 | - | - | 0.56 | 5.13 | - | 0.54 | 0.26 | 8.08 |
| **2004** | 0.35 | - | - | 0.65 | 6.25 | - | 0.4 | 0.28 | 7.12 |
| **2005** | 0.29 | - | - | 0.33 | 8.05 | - | 0.33 | 0.33 | 6.83 |
| **2006** | 0.33 | 7.1 | 0.33 | 0.3 | 8.15 | 0.33 | 0.41 | 0.33 | 6.15 |
| **2007** | 0.3 | 9.98 | 0.33 | 0.33 | 9.88 | 0.26 | 0.38 | 0.33 | 5.93 |
| **2008** | 0.91 | 8.93 | 0.33 | 0.33 | 9.53 | 0.25 | 0.33 | 0.33 | 5.48 |
| **2009** | 0.8 | 8.15 | 0.11 | 0.11 | 9.85 | 0.1 | 0.14 | 0.1 | 4.85 |
| **2010** | 0.95 | 4.65 | 0.18 | 0.16 | 10.38 | 0.16 | 0.15 | 0.15 | 4.9 |
| **2011** | 1.25 | 2.78 | 0.14 | 0.08 | 11 | 0.28 | 0.05 | 0.05 | 4.85 |
| **2012** | 1.33 | 6.25 | 0.08 | 0.02 | 12.25 | 0.01 | 0.02 | 0.01 | 4.8 |
| **2013** | 0.72 | 13.5 | 0.12 | 0.06 | 13.25 | 0.02 | 0.01 | 0.03 | 4.85 |
| **2014** | 0.96 | 8.15 | 0.07 | 0.08 | 13.75 | 0.04 | 0.02 | 0.02 | 5 |
| **2015** | 1.07 | 3.22 | 0.06 | 0.07 | 13.68 | 0.02 | 0.04 | 0.04 | 4.84 |
| **2016** | 1.08 | 3.60 | 0.18 | 0.05 | 13.88 | 0.01 | 0.01 | 0.01 | 4.76 |

Notes:

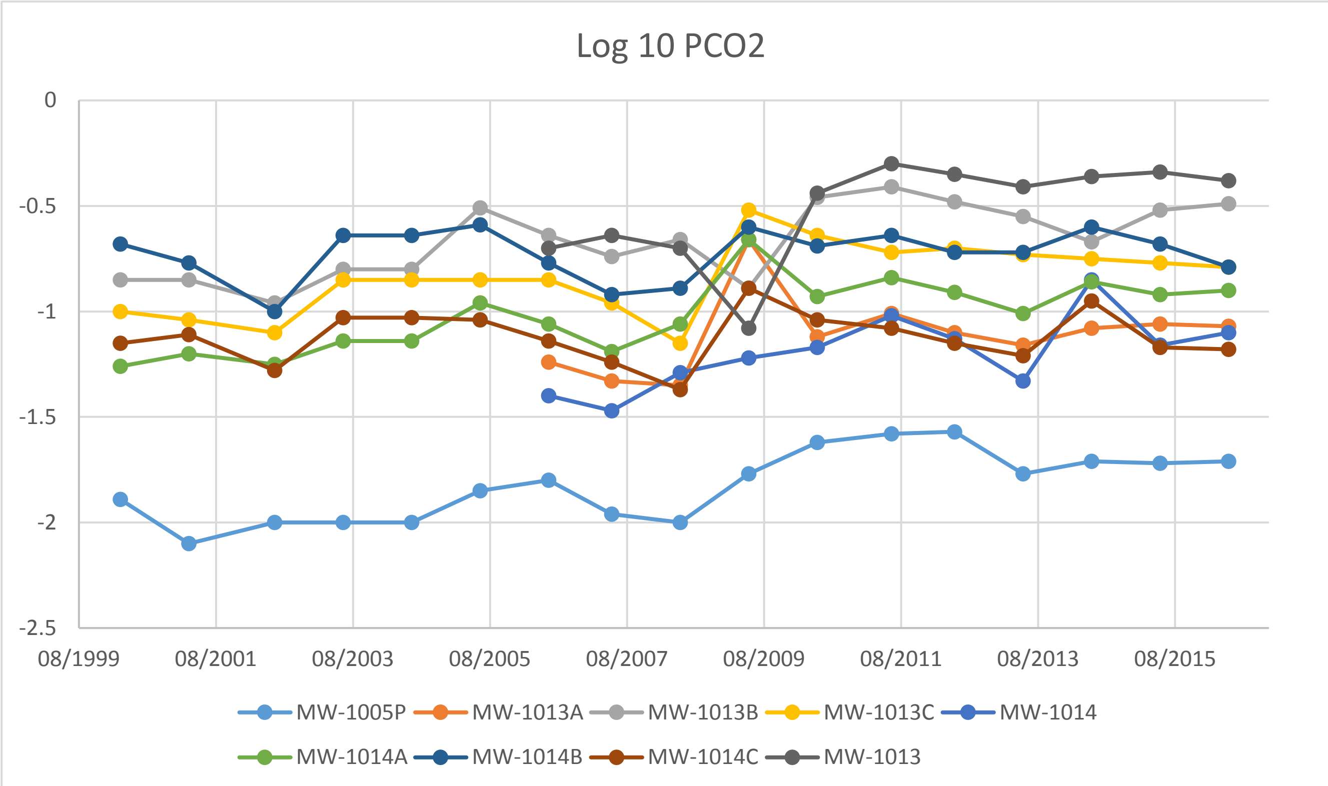
Prepared by: HLH
Checked by: ASH1

1. Annual averages are calculated from four quarterly samples
2. Pre-2014 values are as reported in Interralogic (2014).
3. 2014 and 2015 values are as reported in Golder (2016).
3. Non-detects have been replaced at the detection limit and values falling between the DL and PQL have been calculated at the given values

Abbreviations:

µg/L = micrograms per liter
mg/L = milligrams per liter

# Figures




Foth Infrastructure & Environment, LLC

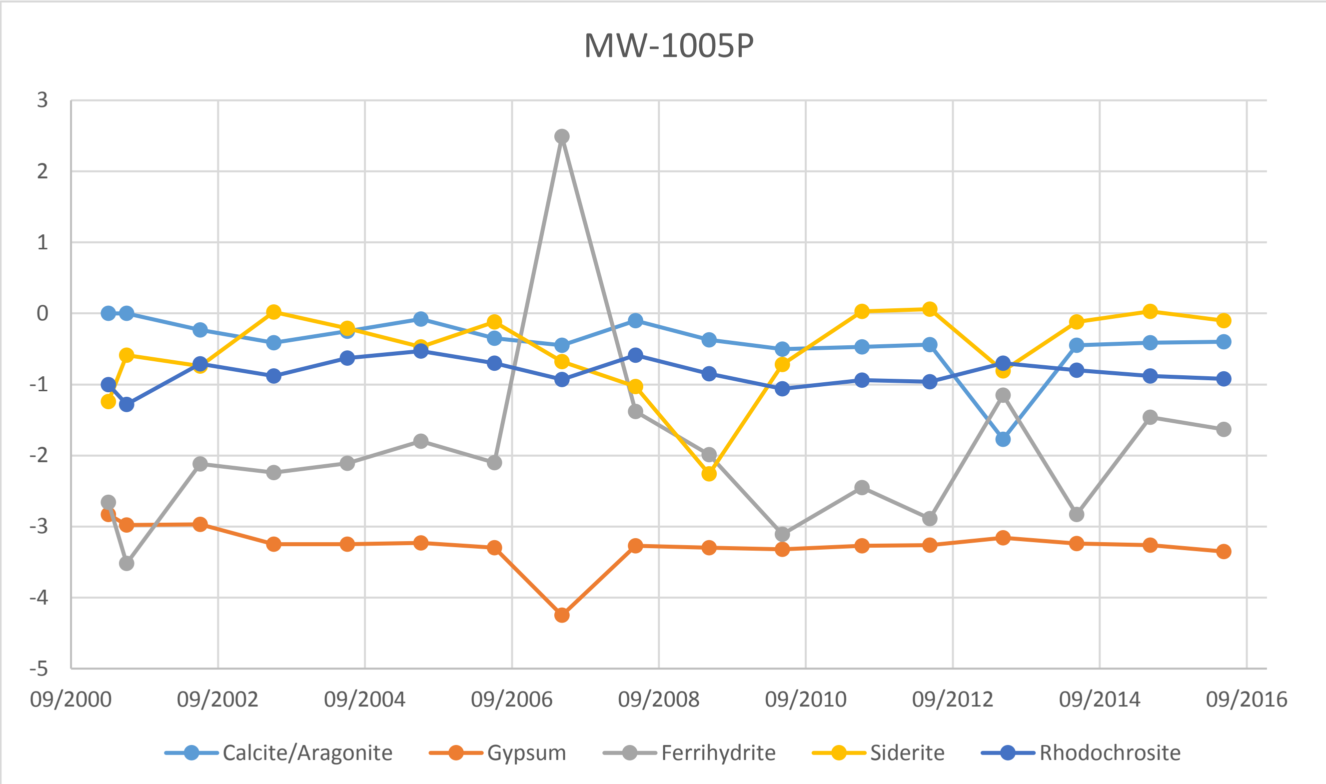
FLAMBEAU MINING COMPANY

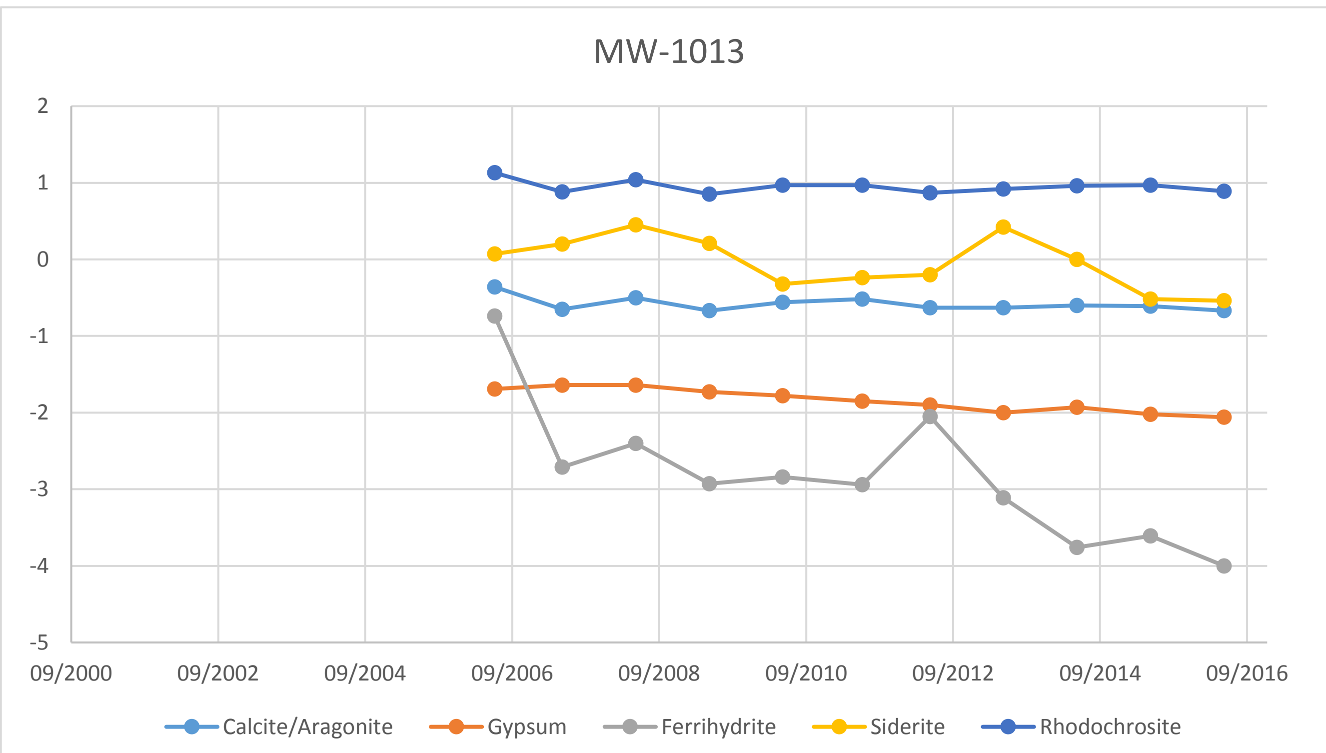
Figure A-1

Calculated Log 10 PCO2 for Wells in Backfilled Pit Area

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |




Foth Infrastructure & Environment, LLC

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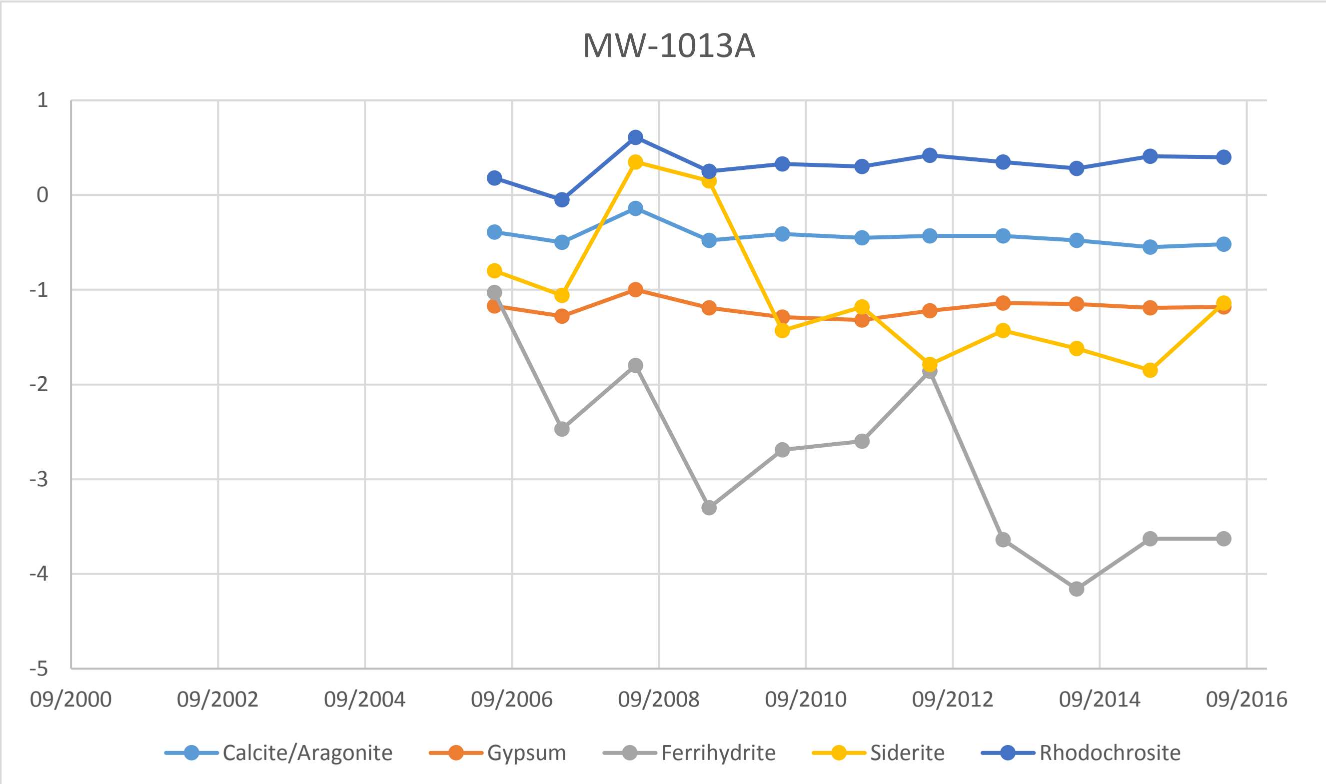
Figure A-2

Calculated Saturation Indices for Wells in Backfilled Pit Area

MW-1005P, MW-1013

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |



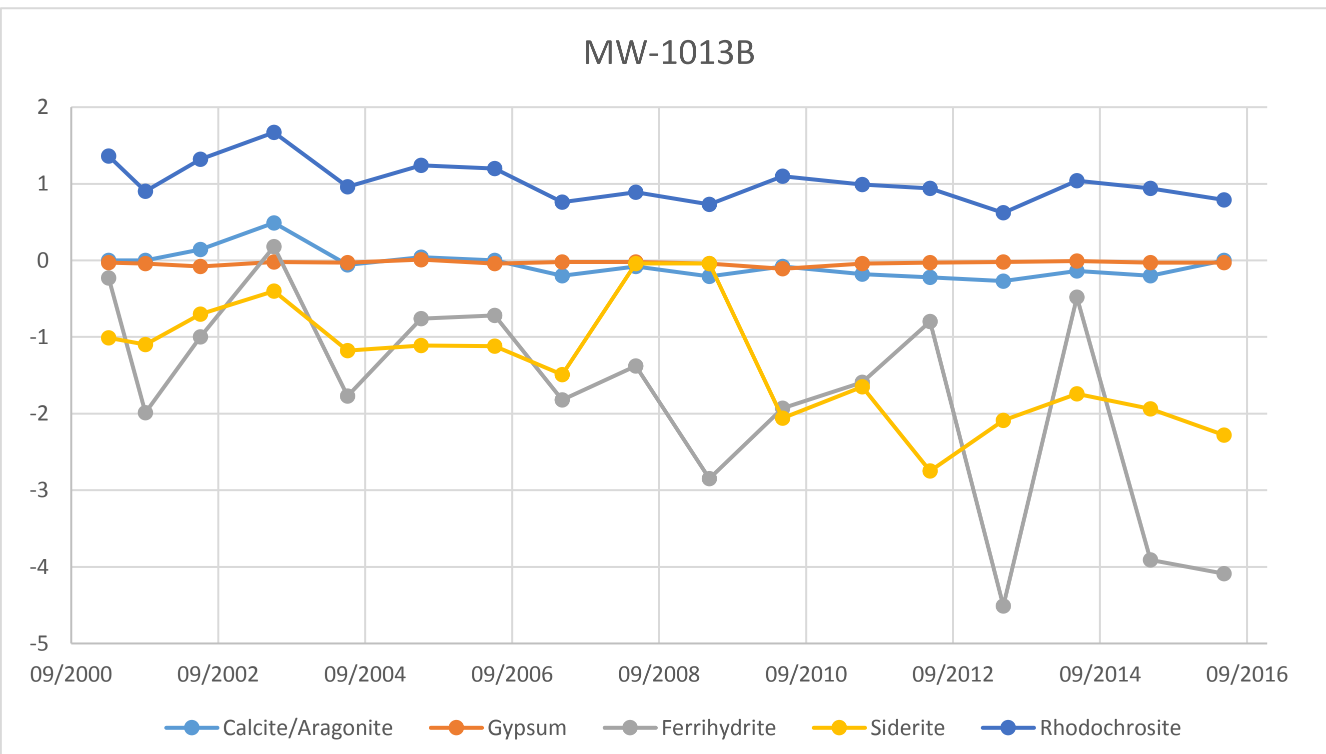




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Figure A-3

Calculated Saturation Indices for Wells in Backfilled Pit Area

MW-1013A, MW-1013B

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |

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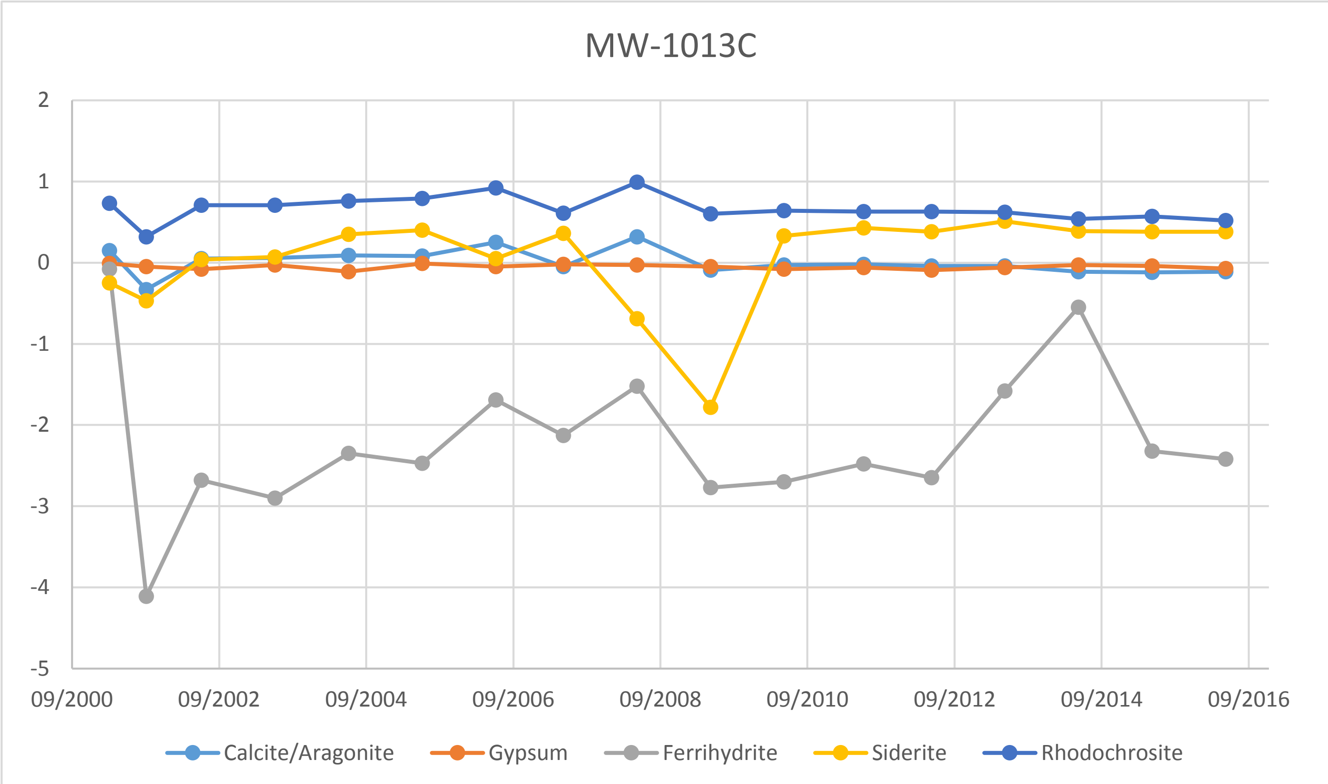
2016 Annual Report



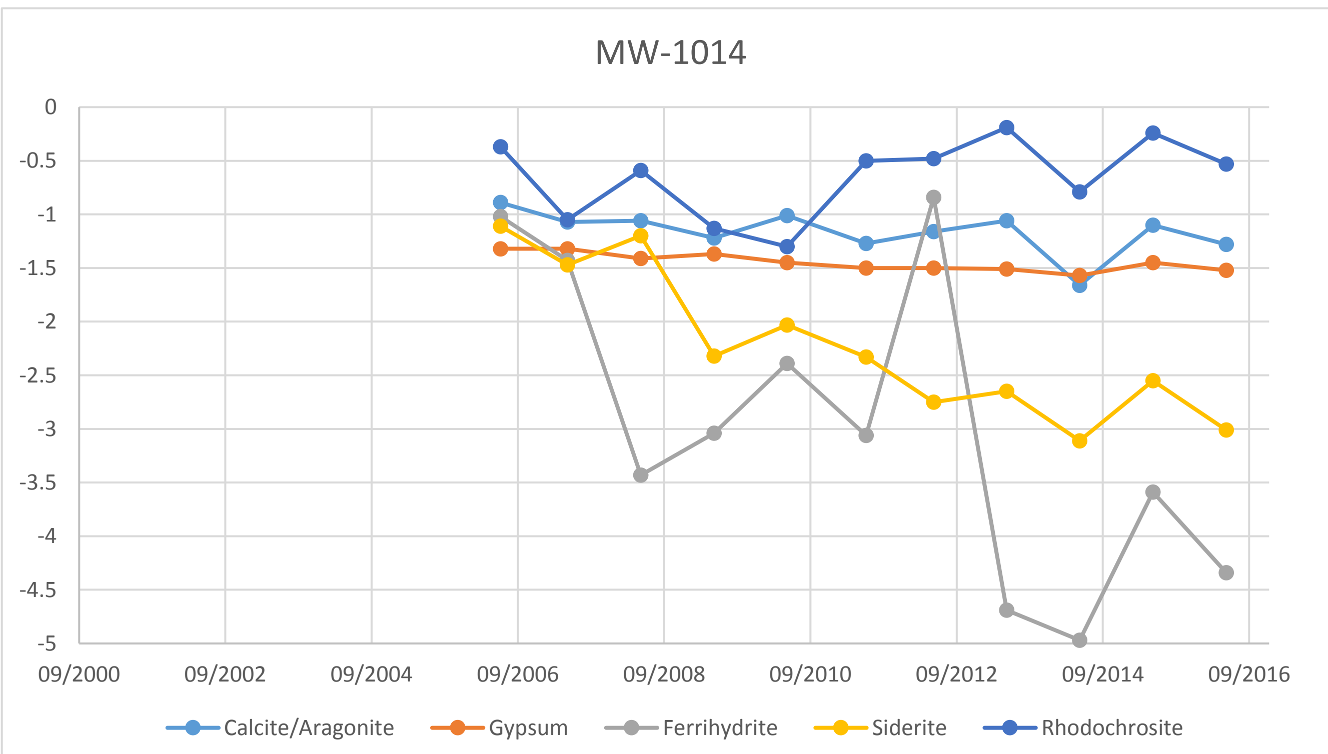




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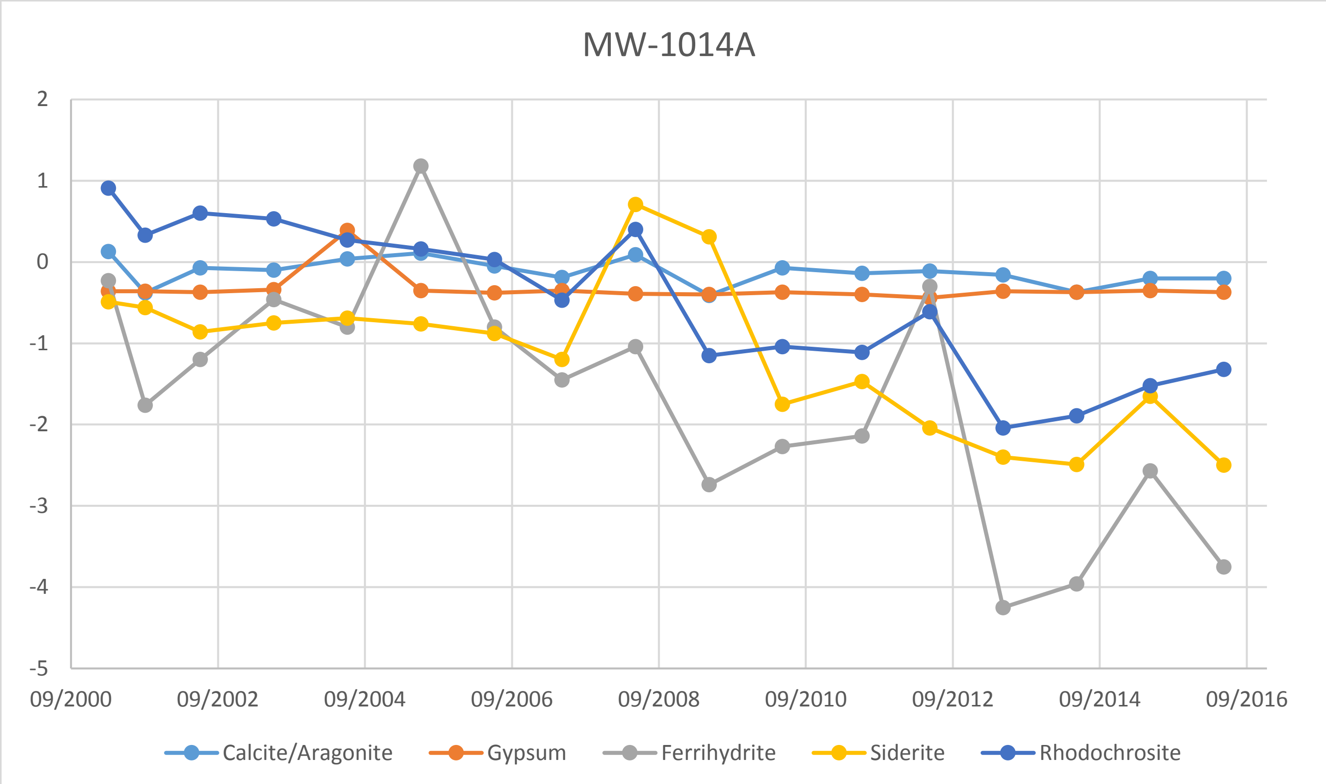
Figure A-4

Calculated Saturation Indices for Wells in Backfilled Pit Area

MW-1013C, MW-1014

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |



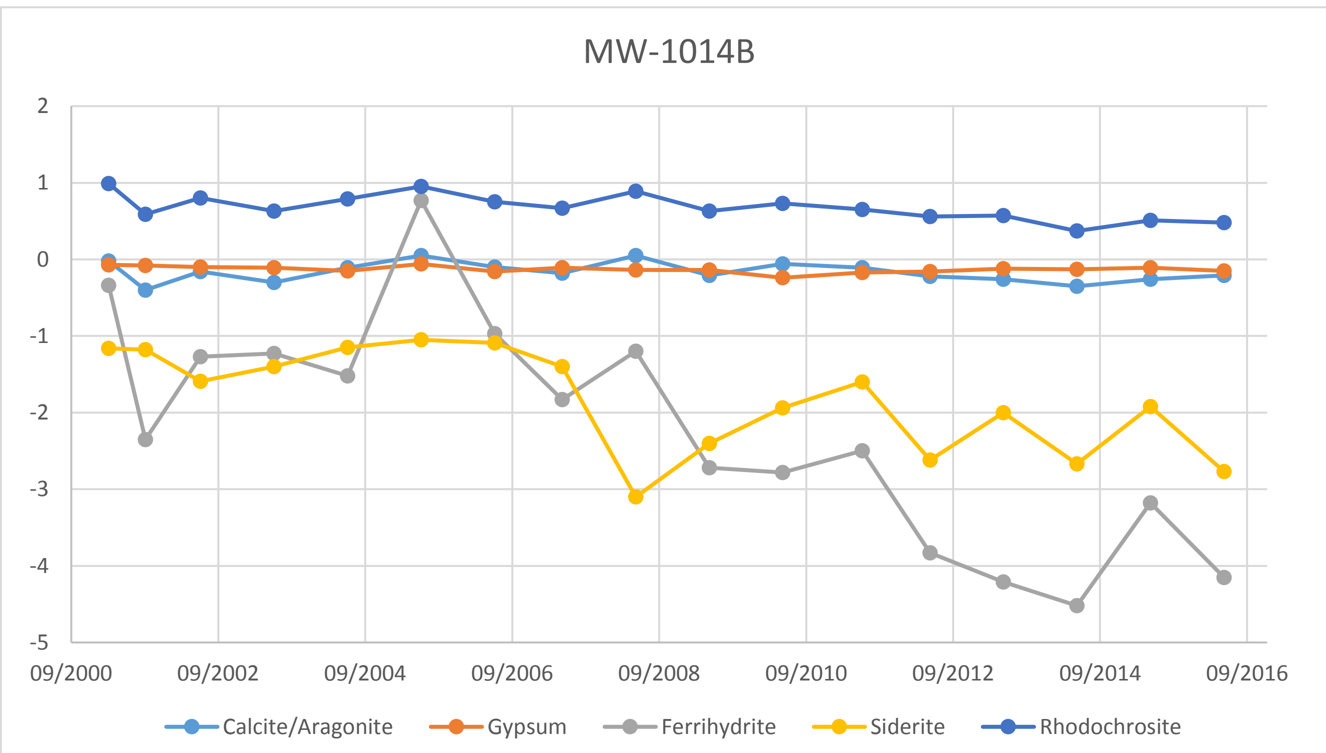




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Figure A-5

Calculated Saturation Indices for Wells in Backfilled Pit Area

MW-1014A, MW-1014B

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |

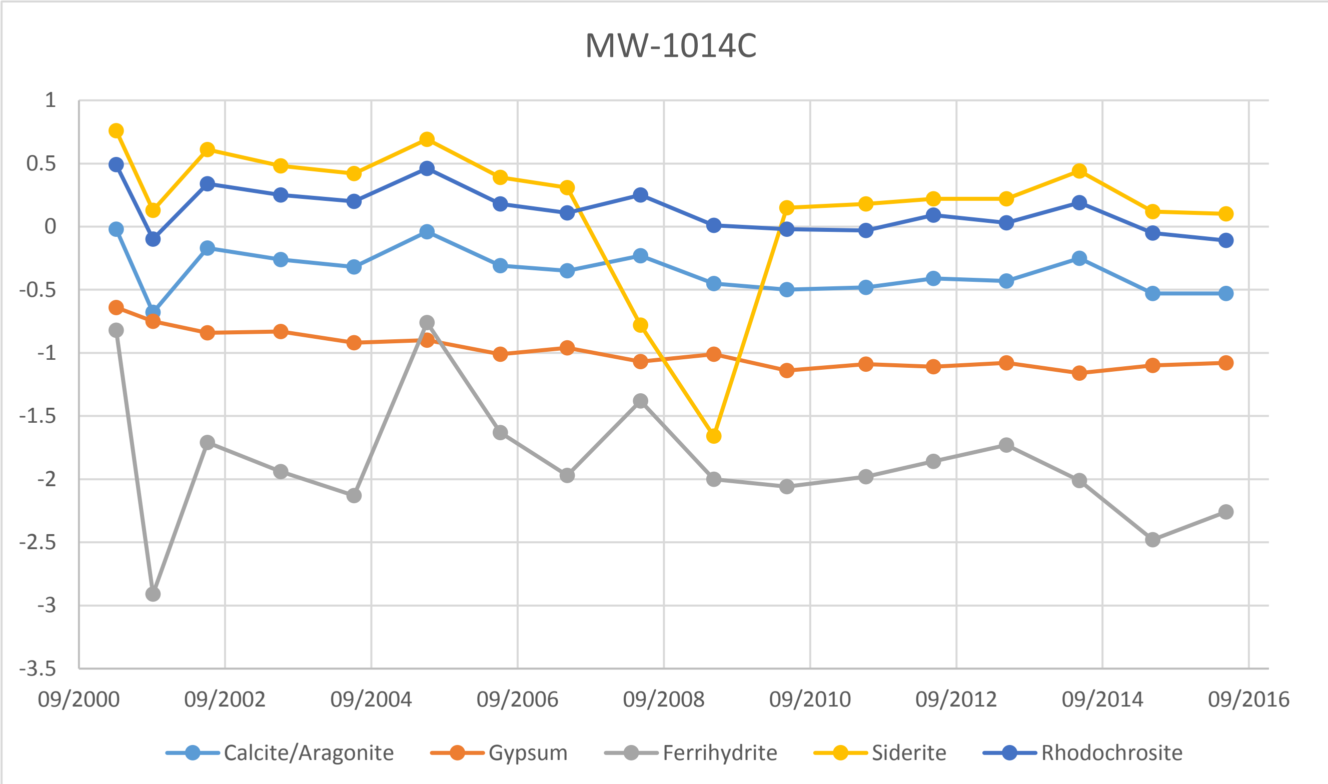


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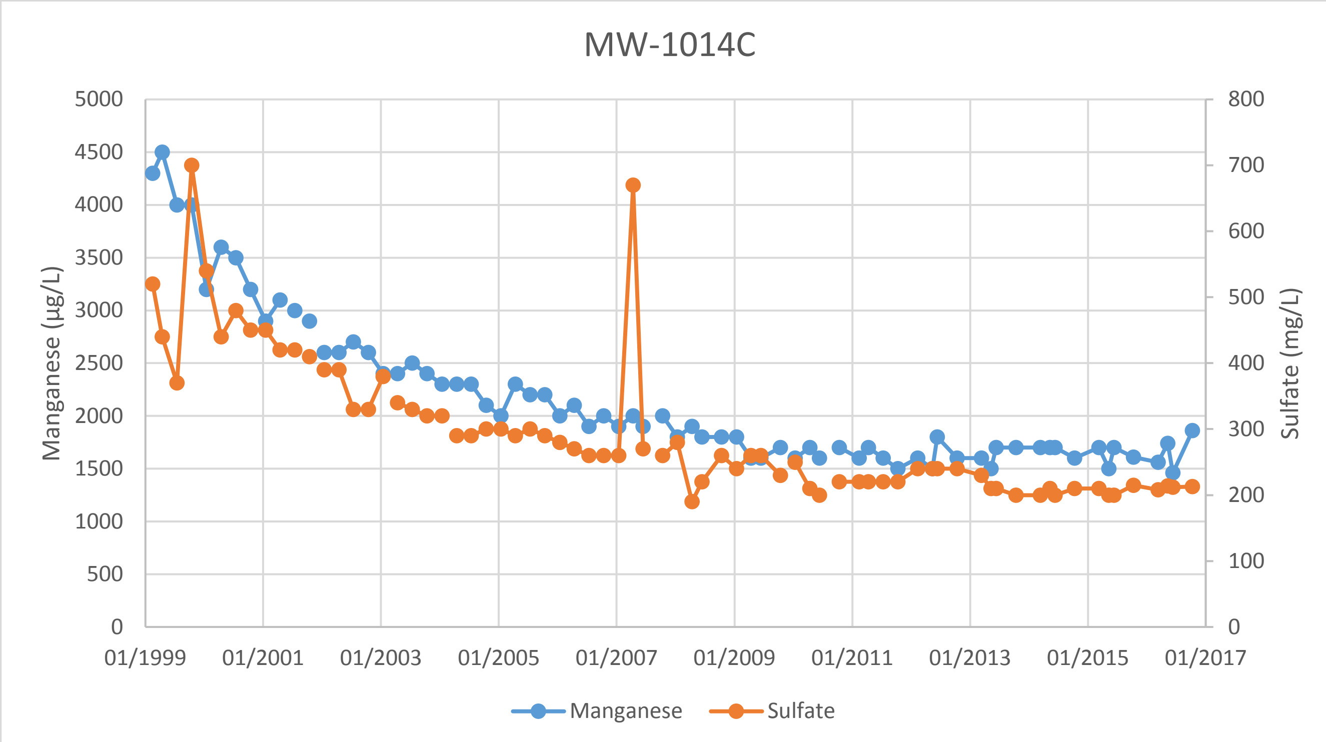
Figure A-6

Calculated Saturation Indices for Wells in Backfilled Pit Area

MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |



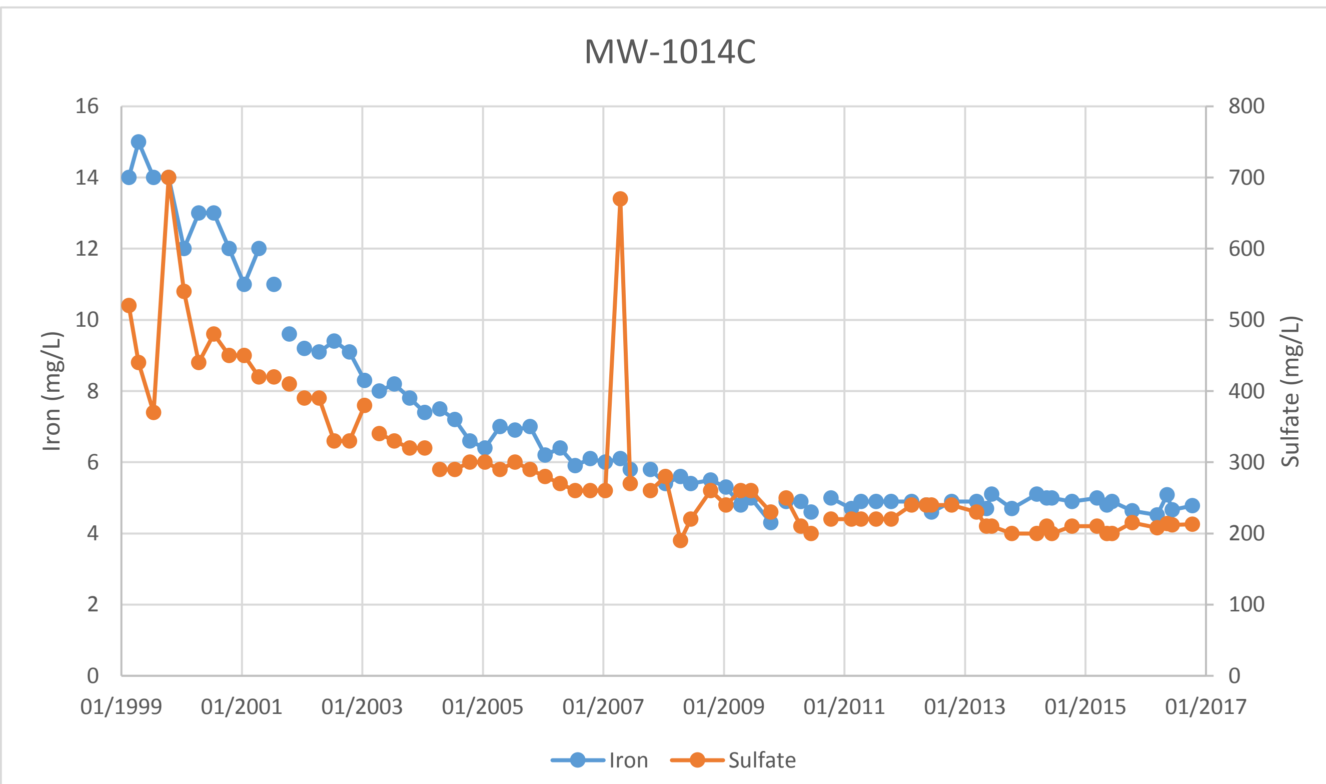




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Figure A-7

Comparison of Decreases in Groundwater Concentrations of Manganese and Iron to Sulfate in MW-1014C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Project: 16F777-00 |

# Attachment 1

# PHREEQC Calculations

```
   Input file: C:\Test Database Files\June_2016_AnnualGWmodel.pqi
  Output file: C:\Test Database Files\June_2016_AnnualGWmodel.pqo
Database file: C:\Test Database Files\wateq4f_TE.DAT

------------------
Reading data base.
------------------

	SOLUTION_MASTER_SPECIES
	SOLUTION_SPECIES
	PHASES
	EXCHANGE_MASTER_SPECIES
	EXCHANGE_SPECIES
	SURFACE_MASTER_SPECIES
	SURFACE_SPECIES
	RATES
	END
------------------------------------
Reading input data for simulation 1.
------------------------------------

	DATABASE C:\Test Database Files\wateq4f_TE.DAT
	SOLUTION_SPREAD
	    units    mg/l
	             Description         pH      pe       Temp       Alkalinity       As
	     Ba            Cd      Ca    Cl       Cu          Fe             Pb      Mg
	     Mn          K       Se            Ag      Na  S(6)      Zn
	    6/28/2016      MW-1005P       7.08  0.5361       9.82              241  0.00026
	    0.0672      0.000089    53.8   4.6  0.00029       0.821      0.000059    22.3
	    0.0648      9.04  0.00021     0.000016    8.76      2  0.0031
	    6/28/2016       MW-1013       6.11  0.9228        9.2              589  0.00057
	     0.124      0.000089     146  13.3   0.0164        1.8       0.00004    46.1
	      24.3         3  0.00053     0.000016      14  22.5  0.0031
	    6/28/2016      MW-1013A       6.58  0.7494       6.58              358  0.00033
	    0.0789      0.000089     130   6.6  0.00047       0.25       0.00004    44.7
	      4.22      7.06  0.00021     0.000016    30.6   188  0.0031
	    6/28/2016      MW-1013B       6.16  2.4109       9.67              574  0.00078
	    0.0142        0.0008     608  36.1    0.452      0.0461       0.00004     138
	        27      5.69  0.00088     0.000016    25.1  1560   0.126
	    6/28/2016      MW-1013C       6.41  0.8592      10.14              499   0.0193
	    0.0168      0.000089     561  67.6  0.00052       12.7       0.00008     130
	      8.83      22.1  0.00021     0.000016    26.9  1480    0.33
	    6/28/2016       MW-1014       6.28  2.1745       8.43              162  0.00016
	    0.0328        0.0001    77.5  39.7   0.0048       0.01       0.00004    25.7
	      1.52      3.19  0.00021     0.000016    13.3   111  0.0068
	    6/28/2016      MW-1014A       6.51  2.2051       8.86              473   0.0006
	    0.0133      0.000089     333  10.5   0.0024     0.0127       0.00004     115
	    0.0949      9.84  0.00024     0.000016    46.3   920   0.009
	    6/28/2016      MW-1014B       6.38  2.3322       8.84              469  0.00096
	    0.0218        0.0019     497  63.7    0.373       0.01      0.000068     111
	      9.01      15.7   0.0017     0.000016    19.8  1240   0.986
	    6/28/2016      MW-1014C       6.58  0.7489       9.47              272    0.023
	    0.0304      0.000089     150  63.9  0.00026       4.66       0.00004    35.8
	      1.46      4.58  0.00021     0.000016    10.2   212   0.267
-------------------------------------------
Beginning of initial solution calculations.
-------------------------------------------

Initial solution 1.	MW-1005P

-----------------------------Solution composition------------------------------

	Elements           Molality       Moles

	Ag               1.484e-10   1.484e-10
	Alkalinity       4.817e-03   4.817e-03
	As               3.471e-09   3.471e-09
```

| | | |
|---|---|---|
| Ba | 4.895e-07 | 4.895e-07 |
| Ca | 1.343e-03 | 1.343e-03 |
| Cd | 7.921e-10 | 7.921e-10 |
| Cl | 1.298e-04 | 1.298e-04 |
| Cu | 4.565e-09 | 4.565e-09 |
| Fe | 1.471e-05 | 1.471e-05 |
| K | 2.313e-04 | 2.313e-04 |
| Mg | 9.176e-04 | 9.176e-04 |
| Mn | 1.180e-06 | 1.180e-06 |
| Na | 3.812e-04 | 3.812e-04 |
| Pb | 2.849e-10 | 2.849e-10 |
| S(6) | 2.083e-05 | 2.083e-05 |
| Se | 2.660e-09 | 2.660e-09 |
| Zn | 4.744e-08 | 4.744e-08 |

----------------------------Description of solution----------------------------

| | | |
|---|---|---|
| pH | = | 7.080 |
| pe | = | 0.536 |
| Activity of water | = | 1.000 |
| Ionic strength (mol/kgw) | = | 7.197e-03 |
| Mass of water (kg) | = | 1.000e+00 |
| Total carbon (mol/kg) | = | 5.864e-03 |
| Total CO2 (mol/kg) | = | 5.864e-03 |
| Temperature (°C) | = | 9.82 |
| Electrical balance (eq) | = | 1.777e-04 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = | 1.78 |
| Iterations | = | 11 |
| Total H | = | 1.110172e+02 |
| Total O | = | 5.552284e+01 |

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 8.991e-08 | 8.318e-08 | -7.046 | -7.080 | -0.034 | 0.00 |
| OH- | 3.776e-08 | 3.461e-08 | -7.423 | -7.461 | -0.038 | (0) |
| H2O | 5.551e+01 | 9.999e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.484e-10 | | | | | |
| Ag+ | 1.176e-10 | 1.078e-10 | -9.930 | -9.968 | -0.038 | (0) |
| AgCl | 3.034e-11 | 3.039e-11 | -10.518 | -10.517 | 0.001 | (0) |
| AgCl2- | 4.411e-13 | 4.043e-13 | -12.355 | -12.393 | -0.038 | (0) |
| AgSO4- | 2.500e-14 | 2.291e-14 | -13.602 | -13.640 | -0.038 | (0) |
| AgOH | 1.293e-15 | 1.295e-15 | -14.888 | -14.888 | 0.001 | (0) |
| AgCl3-2 | 4.994e-17 | 3.524e-17 | -16.302 | -16.453 | -0.151 | (0) |
| Ag(OH)2- | 1.699e-20 | 1.557e-20 | -19.770 | -19.808 | -0.038 | (0) |
| AgCl4-3 | 1.522e-20 | 6.949e-21 | -19.817 | -20.158 | -0.341 | (0) |
| As(3) | 1.946e-09 | | | | | |
| H3AsO3 | 1.936e-09 | 1.939e-09 | -8.713 | -8.712 | 0.001 | (0) |
| H2AsO3- | 9.923e-12 | 9.095e-12 | -11.003 | -11.041 | -0.038 | (0) |
| H4AsO3+ | 8.719e-17 | 7.991e-17 | -16.060 | -16.097 | -0.038 | (0) |
| HAsO3-2 | 1.551e-19 | 1.095e-19 | -18.809 | -18.961 | -0.151 | (0) |
| AsO3-3 | 3.326e-28 | 1.518e-28 | -27.478 | -27.819 | -0.341 | (0) |
| As(5) | 1.526e-09 | | | | | |
| HAsO4-2 | 7.657e-10 | 5.403e-10 | -9.116 | -9.267 | -0.151 | (0) |
| H2AsO4- | 7.599e-10 | 6.965e-10 | -9.119 | -9.157 | -0.038 | (0) |
| AsO4-3 | 2.149e-14 | 9.809e-15 | -13.668 | -14.008 | -0.341 | (0) |
| H3AsO4 | 9.903e-15 | 9.920e-15 | -14.004 | -14.003 | 0.001 | (0) |
| Ba | 4.895e-07 | | | | | |
| Ba+2 | 4.776e-07 | 3.371e-07 | -6.321 | -6.472 | -0.151 | (0) |
| BaHCO3+ | 9.495e-09 | 8.703e-09 | -8.023 | -8.060 | -0.038 | (0) |
| BaSO4 | 2.105e-09 | 2.108e-09 | -8.677 | -8.676 | 0.001 | (0) |
| BaCO3 | 2.165e-10 | 2.169e-10 | -9.665 | -9.664 | 0.001 | (0) |
| BaOH+ | 1.498e-13 | 1.373e-13 | -12.825 | -12.862 | -0.038 | (0) |
| C(4) | 5.864e-03 | | | | | |
| HCO3- | 4.727e-03 | 4.343e-03 | -2.325 | -2.362 | -0.037 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CO2 | 1.053e-03 | 1.054e-03 | -2.978 | -2.977 | 0.001 | (0) |
| CaHCO3+ | 4.051e-05 | 3.713e-05 | -4.392 | -4.430 | -0.038 | (0) |
| MgHCO3+ | 3.357e-05 | 3.076e-05 | -4.474 | -4.512 | -0.038 | (0) |
| FeHCO3+ | 3.602e-06 | 3.302e-06 | -5.443 | -5.481 | -0.038 | (0) |
| CO3-2 | 2.369e-06 | 1.689e-06 | -5.625 | -5.772 | -0.147 | (0) |
| CaCO3 | 2.124e-06 | 2.127e-06 | -5.673 | -5.672 | 0.001 | (0) |
| NaHCO3 | 8.506e-07 | 8.520e-07 | -6.070 | -6.070 | 0.001 | (0) |
| MgCO3 | 8.047e-07 | 8.061e-07 | -6.094 | -6.094 | 0.001 | (0) |
| FeCO3 | 3.075e-07 | 3.080e-07 | -6.512 | -6.511 | 0.001 | (0) |
| MnHCO3+ | 2.522e-07 | 2.312e-07 | -6.598 | -6.636 | -0.038 | (0) |
| MnCO3 | 8.000e-08 | 8.013e-08 | -7.097 | -7.096 | 0.001 | (0) |
| ZnHCO3+ | 1.191e-08 | 1.092e-08 | -7.924 | -7.962 | -0.038 | (0) |
| BaHCO3+ | 9.495e-09 | 8.703e-09 | -8.023 | -8.060 | -0.038 | (0) |
| ZnCO3 | 6.717e-09 | 6.728e-09 | -8.173 | -8.172 | 0.001 | (0) |
| NaCO3- | 5.343e-09 | 4.897e-09 | -8.272 | -8.310 | -0.038 | (0) |
| Zn(CO3)2-2 | 3.443e-10 | 2.430e-10 | -9.463 | -9.614 | -0.151 | (0) |
| CuCO3 | 2.581e-10 | 2.585e-10 | -9.588 | -9.588 | 0.001 | (0) |
| PbCO3 | 2.390e-10 | 2.394e-10 | -9.622 | -9.621 | 0.001 | (0) |
| BaCO3 | 2.165e-10 | 2.169e-10 | -9.665 | -9.664 | 0.001 | (0) |
| CdHCO3+ | 7.495e-11 | 6.870e-11 | -10.125 | -10.163 | -0.038 | (0) |
| CuHCO3+ | 6.768e-11 | 6.203e-11 | -10.170 | -10.207 | -0.038 | (0) |
| PbHCO3+ | 3.070e-11 | 2.813e-11 | -10.513 | -10.551 | -0.038 | (0) |
| Pb(CO3)2-2 | 1.439e-12 | 1.016e-12 | -11.842 | -11.993 | -0.151 | (0) |
| Cu(CO3)2-2 | 7.790e-13 | 5.497e-13 | -12.108 | -12.260 | -0.151 | (0) |
| CdCO3 | 6.700e-13 | 6.711e-13 | -12.174 | -12.173 | 0.001 | (0) |
| Cd(CO3)2-2 | 5.080e-15 | 3.585e-15 | -14.294 | -14.446 | -0.151 | (0) |
| Ca | 1.343e-03 | | | | | |
| Ca+2 | 1.298e-03 | 9.250e-04 | -2.887 | -3.034 | -0.147 | (0) |
| CaHCO3+ | 4.051e-05 | 3.713e-05 | -4.392 | -4.430 | -0.038 | (0) |
| CaCO3 | 2.124e-06 | 2.127e-06 | -5.673 | -5.672 | 0.001 | (0) |
| CaSO4 | 1.980e-06 | 1.984e-06 | -5.703 | -5.703 | 0.001 | (0) |
| CaOH+ | 2.013e-09 | 1.845e-09 | -8.696 | -8.734 | -0.038 | (0) |
| CaHSO4+ | 8.987e-13 | 8.237e-13 | -12.046 | -12.084 | -0.038 | (0) |
| Cd | 7.921e-10 | | | | | |
| Cd+2 | 7.088e-10 | 5.002e-10 | -9.149 | -9.301 | -0.151 | (0) |
| CdHCO3+ | 7.495e-11 | 6.870e-11 | -10.125 | -10.163 | -0.038 | (0) |
| CdCl+ | 5.870e-12 | 5.380e-12 | -11.231 | -11.269 | -0.038 | (0) |
| CdSO4 | 1.630e-12 | 1.632e-12 | -11.788 | -11.787 | 0.001 | (0) |
| CdCO3 | 6.700e-13 | 6.711e-13 | -12.174 | -12.173 | 0.001 | (0) |
| CdOH+ | 1.666e-13 | 1.527e-13 | -12.778 | -12.816 | -0.038 | (0) |
| CdOHCl | 1.896e-14 | 1.900e-14 | -13.722 | -13.721 | 0.001 | (0) |
| Cd(CO3)2-2 | 5.080e-15 | 3.585e-15 | -14.294 | -14.446 | -0.151 | (0) |
| CdCl2 | 2.508e-15 | 2.512e-15 | -14.601 | -14.600 | 0.001 | (0) |
| Cd(SO4)2-2 | 3.490e-16 | 2.463e-16 | -15.457 | -15.609 | -0.151 | (0) |
| Cd(OH)2 | 3.223e-16 | 3.228e-16 | -15.492 | -15.491 | 0.001 | (0) |
| CdCl3- | 1.615e-19 | 1.480e-19 | -18.792 | -18.830 | -0.038 | (0) |
| Cd2OH+3 | 1.000e-21 | 4.566e-22 | -21.000 | -21.340 | -0.341 | (0) |
| Cd(OH)3- | 4.751e-22 | 4.354e-22 | -21.323 | -21.361 | -0.038 | (0) |
| Cd(OH)4-2 | 6.611e-29 | 4.665e-29 | -28.180 | -28.331 | -0.151 | (0) |
| Cl | 1.298e-04 | | | | | |
| Cl- | 1.298e-04 | 1.188e-04 | -3.887 | -3.925 | -0.038 | (0) |
| FeCl+ | 1.360e-09 | 1.247e-09 | -8.866 | -8.904 | -0.038 | (0) |
| MnCl+ | 3.154e-10 | 2.891e-10 | -9.501 | -9.539 | -0.038 | (0) |
| AgCl | 3.034e-11 | 3.039e-11 | -10.518 | -10.517 | 0.001 | (0) |
| CuCl2- | 1.896e-11 | 1.738e-11 | -10.722 | -10.760 | -0.038 | (0) |
| CdCl+ | 5.870e-12 | 5.380e-12 | -11.231 | -11.269 | -0.038 | (0) |
| ZnCl+ | 3.441e-12 | 3.153e-12 | -11.463 | -11.501 | -0.038 | (0) |
| ZnOHCl | 9.426e-13 | 9.441e-13 | -12.026 | -12.025 | 0.001 | (0) |
| AgCl2- | 4.411e-13 | 4.043e-13 | -12.355 | -12.393 | -0.038 | (0) |
| PbCl+ | 2.831e-14 | 2.595e-14 | -13.548 | -13.586 | -0.038 | (0) |
| CdOHCl | 1.896e-14 | 1.900e-14 | -13.722 | -13.721 | 0.001 | (0) |
| MnCl2 | 1.497e-14 | 1.499e-14 | -13.825 | -13.824 | 0.001 | (0) |
| CuCl+ | 4.543e-15 | 4.164e-15 | -14.343 | -14.380 | -0.038 | (0) |
| CuCl3-2 | 4.361e-15 | 3.077e-15 | -14.360 | -14.512 | -0.151 | (0) |
| CdCl2 | 2.508e-15 | 2.512e-15 | -14.601 | -14.600 | 0.001 | (0) |
| ZnCl2 | 3.673e-16 | 3.679e-16 | -15.435 | -15.434 | 0.001 | (0) |
| AgCl3-2 | 4.994e-17 | 3.524e-17 | -16.302 | -16.453 | -0.151 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| PbCl2 | 6.576e-18 | 6.587e-18 | -17.182 | -17.181 | 0.001 | (0) |
| MnCl3- | 5.353e-19 | 4.906e-19 | -18.271 | -18.309 | -0.038 | (0) |
| CuCl2 | 2.231e-19 | 2.235e-19 | -18.651 | -18.651 | 0.001 | (0) |
| CdCl3- | 1.615e-19 | 1.480e-19 | -18.792 | -18.830 | -0.038 | (0) |
| ZnCl3- | 4.861e-20 | 4.455e-20 | -19.313 | -19.351 | -0.038 | (0) |
| AgCl4-3 | 1.522e-20 | 6.949e-21 | -19.817 | -20.158 | -0.341 | (0) |
| FeCl+2 | 3.180e-21 | 2.244e-21 | -20.498 | -20.649 | -0.151 | (0) |
| PbCl3- | 6.145e-22 | 5.632e-22 | -21.211 | -21.249 | -0.038 | (0) |
| ZnCl4-2 | 3.312e-24 | 2.337e-24 | -23.480 | -23.631 | -0.151 | (0) |
| FeCl2+ | 2.158e-24 | 1.977e-24 | -23.666 | -23.704 | -0.038 | (0) |
| CuCl3- | 7.743e-26 | 7.097e-26 | -25.111 | -25.149 | -0.038 | (0) |
| PbCl4-2 | 4.013e-26 | 2.832e-26 | -25.397 | -25.548 | -0.151 | (0) |
| FeCl3 | 2.346e-29 | 2.349e-29 | -28.630 | -28.629 | 0.001 | (0) |
| CuCl4-2 | 4.135e-32 | 2.918e-32 | -31.383 | -31.535 | -0.151 | (0) |
| Cu(1) | 4.109e-09 | | | | | |
| Cu+ | 4.090e-09 | 3.748e-09 | -8.388 | -8.426 | -0.038 | (0) |
| CuCl2- | 1.896e-11 | 1.738e-11 | -10.722 | -10.760 | -0.038 | (0) |
| CuCl3-2 | 4.361e-15 | 3.077e-15 | -14.360 | -14.512 | -0.151 | (0) |
| Cu(2) | 4.566e-10 | | | | | |
| CuCO3 | 2.581e-10 | 2.585e-10 | -9.588 | -9.588 | 0.001 | (0) |
| Cu(OH)2 | 8.589e-11 | 8.604e-11 | -10.066 | -10.065 | 0.001 | (0) |
| CuHCO3+ | 6.768e-11 | 6.203e-11 | -10.170 | -10.207 | -0.038 | (0) |
| Cu+2 | 4.038e-11 | 2.850e-11 | -10.394 | -10.545 | -0.151 | (0) |
| CuOH+ | 3.738e-12 | 3.426e-12 | -11.427 | -11.465 | -0.038 | (0) |
| Cu(CO3)2-2 | 7.790e-13 | 5.497e-13 | -12.108 | -12.260 | -0.151 | (0) |
| CuSO4 | 6.491e-14 | 6.502e-14 | -13.188 | -13.187 | 0.001 | (0) |
| CuCl+ | 4.543e-15 | 4.164e-15 | -14.343 | -14.380 | -0.038 | (0) |
| Cu(OH)3- | 6.799e-17 | 6.232e-17 | -16.168 | -16.205 | -0.038 | (0) |
| Cu2(OH)2+2 | 1.487e-18 | 1.049e-18 | -17.828 | -17.979 | -0.151 | (0) |
| CuCl2 | 2.231e-19 | 2.235e-19 | -18.651 | -18.651 | 0.001 | (0) |
| Cu(OH)4-2 | 2.118e-22 | 1.495e-22 | -21.674 | -21.825 | -0.151 | (0) |
| CuCl3- | 7.743e-26 | 7.097e-26 | -25.111 | -25.149 | -0.038 | (0) |
| CuCl4-2 | 4.135e-32 | 2.918e-32 | -31.383 | -31.535 | -0.151 | (0) |
| Fe(2) | 1.471e-05 | | | | | |
| Fe+2 | 1.077e-05 | 7.602e-06 | -4.968 | -5.119 | -0.151 | (0) |
| FeHCO3+ | 3.602e-06 | 3.302e-06 | -5.443 | -5.481 | -0.038 | (0) |
| FeCO3 | 3.075e-07 | 3.080e-07 | -6.512 | -6.511 | 0.001 | (0) |
| FeSO4 | 1.257e-08 | 1.259e-08 | -7.901 | -7.900 | 0.001 | (0) |
| FeOH+ | 9.543e-09 | 8.746e-09 | -8.020 | -8.058 | -0.038 | (0) |
| FeCl+ | 1.360e-09 | 1.247e-09 | -8.866 | -8.904 | -0.038 | (0) |
| Fe(OH)2 | 2.223e-13 | 2.226e-13 | -12.653 | -12.652 | 0.001 | (0) |
| FeHSO4+ | 7.386e-15 | 6.770e-15 | -14.132 | -14.169 | -0.038 | (0) |
| Fe(OH)3- | 9.271e-17 | 8.498e-17 | -16.033 | -16.071 | -0.038 | (0) |
| Fe(3) | 1.273e-10 | | | | | |
| Fe(OH)2+ | 7.442e-11 | 6.821e-11 | -10.128 | -10.166 | -0.038 | (0) |
| Fe(OH)3 | 5.252e-11 | 5.261e-11 | -10.280 | -10.279 | 0.001 | (0) |
| Fe(OH)4- | 3.309e-13 | 3.032e-13 | -12.480 | -12.518 | -0.038 | (0) |
| FeOH+2 | 4.454e-14 | 3.143e-14 | -13.351 | -13.503 | -0.151 | (0) |
| Fe+3 | 2.275e-18 | 1.038e-18 | -17.643 | -17.984 | -0.341 | (0) |
| FeSO4+ | 1.088e-19 | 9.973e-20 | -18.963 | -19.001 | -0.038 | (0) |
| FeCl+2 | 3.180e-21 | 2.244e-21 | -20.498 | -20.649 | -0.151 | (0) |
| Fe(SO4)2- | 2.791e-23 | 2.558e-23 | -22.554 | -22.592 | -0.038 | (0) |
| FeCl2+ | 2.158e-24 | 1.977e-24 | -23.666 | -23.704 | -0.038 | (0) |
| Fe2(OH)2+4 | 2.077e-25 | 5.150e-26 | -24.683 | -25.288 | -0.606 | (0) |
| FeHSO4+2 | 3.292e-26 | 2.323e-26 | -25.483 | -25.634 | -0.151 | (0) |
| FeCl3 | 2.346e-29 | 2.349e-29 | -28.630 | -28.629 | 0.001 | (0) |
| Fe3(OH)4+5 | 2.837e-32 | 3.211e-33 | -31.547 | -32.493 | -0.946 | (0) |
| H(0) | 9.711e-19 | | | | | |
| H2 | 4.856e-19 | 4.864e-19 | -18.314 | -18.313 | 0.001 | (0) |
| K | 2.313e-04 | | | | | |
| K+ | 2.313e-04 | 2.117e-04 | -3.636 | -3.674 | -0.038 | (0) |
| KSO4- | 1.532e-08 | 1.404e-08 | -7.815 | -7.853 | -0.038 | (0) |
| Mg | 9.176e-04 | | | | | |
| Mg+2 | 8.820e-04 | 6.314e-04 | -3.055 | -3.200 | -0.145 | (0) |
| MgHCO3+ | 3.357e-05 | 3.076e-05 | -4.474 | -4.512 | -0.038 | (0) |
| MgSO4 | 1.221e-06 | 1.223e-06 | -5.913 | -5.912 | 0.001 | (0) |
| MgCO3 | 8.047e-07 | 8.061e-07 | -6.094 | -6.094 | 0.001 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| MgOH+ | 7.093e-09 | 6.501e-09 | -8.149 | -8.187 | -0.038 | (0) |
| Mn(2) | 1.180e-06 | | | | | |
| Mn+2 | 8.463e-07 | 5.972e-07 | -6.072 | -6.224 | -0.151 | (0) |
| MnHCO3+ | 2.522e-07 | 2.312e-07 | -6.598 | -6.636 | -0.038 | (0) |
| MnCO3 | 8.000e-08 | 8.013e-08 | -7.097 | -7.096 | 0.001 | (0) |
| MnSO4 | 9.752e-10 | 9.768e-10 | -9.011 | -9.010 | 0.001 | (0) |
| MnCl+ | 3.154e-10 | 2.891e-10 | -9.501 | -9.539 | -0.038 | (0) |
| MnOH+ | 5.466e-11 | 5.010e-11 | -10.262 | -10.300 | -0.038 | (0) |
| MnCl2 | 1.497e-14 | 1.499e-14 | -13.825 | -13.824 | 0.001 | (0) |
| MnCl3- | 5.353e-19 | 4.906e-19 | -18.271 | -18.309 | -0.038 | (0) |
| Mn(OH)3- | 1.794e-20 | 1.644e-20 | -19.746 | -19.784 | -0.038 | (0) |
| Mn(3) | 1.344e-32 | | | | | |
| Mn+3 | 1.344e-32 | 6.134e-33 | -31.872 | -32.212 | -0.341 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -71.627 | -71.779 | -0.151 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -81.635 | -81.673 | -0.038 | (0) |
| Na | 3.812e-04 | | | | | |
| Na+ | 3.803e-04 | 3.488e-04 | -3.420 | -3.457 | -0.037 | (0) |
| NaHCO3 | 8.506e-07 | 8.520e-07 | -6.070 | -6.070 | 0.001 | (0) |
| NaSO4- | 2.151e-08 | 1.971e-08 | -7.667 | -7.705 | -0.038 | (0) |
| NaCO3- | 5.343e-09 | 4.897e-09 | -8.272 | -8.310 | -0.038 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -60.917 | -60.916 | 0.001 | (0) |
| Pb | 2.849e-10 | | | | | |
| PbCO3 | 2.390e-10 | 2.394e-10 | -9.622 | -9.621 | 0.001 | (0) |
| PbHCO3+ | 3.070e-11 | 2.813e-11 | -10.513 | -10.551 | -0.038 | (0) |
| Pb+2 | 1.156e-11 | 8.155e-12 | -10.937 | -11.089 | -0.151 | (0) |
| PbOH+ | 2.085e-12 | 1.911e-12 | -11.681 | -11.719 | -0.038 | (0) |
| Pb(CO3)2-2 | 1.439e-12 | 1.016e-12 | -11.842 | -11.993 | -0.151 | (0) |
| PbSO4 | 5.713e-14 | 5.723e-14 | -13.243 | -13.242 | 0.001 | (0) |
| PbCl+ | 2.831e-14 | 2.595e-14 | -13.548 | -13.586 | -0.038 | (0) |
| Pb(OH)2 | 8.924e-15 | 8.939e-15 | -14.049 | -14.049 | 0.001 | (0) |
| PbCl2 | 6.576e-18 | 6.587e-18 | -17.182 | -17.181 | 0.001 | (0) |
| Pb(SO4)2-2 | 5.311e-18 | 3.748e-18 | -17.275 | -17.426 | -0.151 | (0) |
| Pb(OH)3- | 1.346e-18 | 1.234e-18 | -17.871 | -17.909 | -0.038 | (0) |
| Pb2OH+3 | 7.646e-22 | 3.490e-22 | -21.117 | -21.457 | -0.341 | (0) |
| PbCl3- | 6.145e-22 | 5.632e-22 | -21.211 | -21.249 | -0.038 | (0) |
| Pb(OH)4-2 | 4.815e-23 | 3.398e-23 | -22.317 | -22.469 | -0.151 | (0) |
| PbCl4-2 | 4.013e-26 | 2.832e-26 | -25.397 | -25.548 | -0.151 | (0) |
| Pb3(OH)4+2 | 1.920e-30 | 1.355e-30 | -29.717 | -29.868 | -0.151 | (0) |
| S(6) | 2.083e-05 | | | | | |
| SO4-2 | 1.757e-05 | 1.248e-05 | -4.755 | -4.904 | -0.149 | (0) |
| CaSO4 | 1.980e-06 | 1.984e-06 | -5.703 | -5.703 | 0.001 | (0) |
| MgSO4 | 1.221e-06 | 1.223e-06 | -5.913 | -5.912 | 0.001 | (0) |
| NaSO4- | 2.151e-08 | 1.971e-08 | -7.667 | -7.705 | -0.038 | (0) |
| KSO4- | 1.532e-08 | 1.404e-08 | -7.815 | -7.853 | -0.038 | (0) |
| FeSO4 | 1.257e-08 | 1.259e-08 | -7.901 | -7.900 | 0.001 | (0) |
| BaSO4 | 2.105e-09 | 2.108e-09 | -8.677 | -8.676 | 0.001 | (0) |
| MnSO4 | 9.752e-10 | 9.768e-10 | -9.011 | -9.010 | 0.001 | (0) |
| HSO4- | 8.082e-11 | 7.407e-11 | -10.093 | -10.130 | -0.038 | (0) |
| ZnSO4 | 5.155e-11 | 5.163e-11 | -10.288 | -10.287 | 0.001 | (0) |
| CdSO4 | 1.630e-12 | 1.632e-12 | -11.788 | -11.787 | 0.001 | (0) |
| CaHSO4+ | 8.987e-13 | 8.237e-13 | -12.046 | -12.084 | -0.038 | (0) |
| CuSO4 | 6.491e-14 | 6.502e-14 | -13.188 | -13.187 | 0.001 | (0) |
| PbSO4 | 5.713e-14 | 5.723e-14 | -13.243 | -13.242 | 0.001 | (0) |
| AgSO4- | 2.500e-14 | 2.291e-14 | -13.602 | -13.640 | -0.038 | (0) |
| Zn(SO4)2-2 | 8.394e-15 | 5.924e-15 | -14.076 | -14.227 | -0.151 | (0) |
| FeHSO4+ | 7.386e-15 | 6.770e-15 | -14.132 | -14.169 | -0.038 | (0) |
| Cd(SO4)2-2 | 3.490e-16 | 2.463e-16 | -15.457 | -15.609 | -0.151 | (0) |
| Pb(SO4)2-2 | 5.311e-18 | 3.748e-18 | -17.275 | -17.426 | -0.151 | (0) |
| FeSO4+ | 1.088e-19 | 9.973e-20 | -18.963 | -19.001 | -0.038 | (0) |
| Fe(SO4)2- | 2.791e-23 | 2.558e-23 | -22.554 | -22.592 | -0.038 | (0) |
| FeHSO4+2 | 3.292e-26 | 2.323e-26 | -25.483 | -25.634 | -0.151 | (0) |
| Se(-2) | 5.272e-21 | | | | | |
| HSe- | 5.268e-21 | 4.828e-21 | -20.278 | -20.316 | -0.038 | (0) |
| H2Se | 4.087e-24 | 4.094e-24 | -23.389 | -23.388 | 0.001 | (0) |

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Se(4)          2.660e-09
   HSeO3-           2.535e-09   2.324e-09    -8.596    -8.634    -0.038     (0)
   SeO3-2           1.252e-10   8.834e-11    -9.902   -10.054    -0.151     (0)
   H2SeO3           1.085e-13   1.087e-13   -12.965   -12.964     0.001     (0)
Se(6)          1.185e-25
   SeO4-2           1.185e-25   8.362e-26   -24.926   -25.078    -0.151     (0)
   HSeO4-           2.224e-31   2.038e-31   -30.653   -30.691    -0.038     (0)
Zn             4.744e-08
   Zn+2             2.829e-08   1.996e-08    -7.548    -7.700    -0.151     (0)
   ZnHCO3+          1.191e-08   1.092e-08    -7.924    -7.962    -0.038     (0)
   ZnCO3            6.717e-09   6.728e-09    -8.173    -8.172     0.001     (0)
   Zn(CO3)2-2       3.443e-10   2.430e-10    -9.463    -9.614    -0.151     (0)
   ZnOH+            8.533e-11   7.821e-11   -10.069   -10.107    -0.038     (0)
   ZnSO4            5.155e-11   5.163e-11   -10.288   -10.287     0.001     (0)
   Zn(OH)2          3.626e-11   3.632e-11   -10.441   -10.440     0.001     (0)
   ZnCl+            3.441e-12   3.153e-12   -11.463   -11.501    -0.038     (0)
   ZnOHCl           9.426e-13   9.441e-13   -12.026   -12.025     0.001     (0)
   Zn(SO4)2-2       8.394e-15   5.924e-15   -14.076   -14.227    -0.151     (0)
   Zn(OH)3-         1.506e-15   1.381e-15   -14.822   -14.860    -0.038     (0)
   ZnCl2            3.673e-16   3.679e-16   -15.435   -15.434     0.001     (0)
   ZnCl3-           4.861e-20   4.455e-20   -19.313   -19.351    -0.038     (0)
   Zn(OH)4-2        3.727e-21   2.630e-21   -20.429   -20.580    -0.151     (0)
   ZnCl4-2          3.312e-24   2.337e-24   -23.480   -23.631    -0.151     (0)

------------------------------Saturation indices-------------------------------

  Phase               SI** log IAP   log K(282 K,   1 atm)

  Ag2CO3          -14.26    -25.71  -11.44  Ag2CO3
  Ag2O            -18.77     -5.78   12.99  Ag2O
  Ag2SO4          -19.75    -24.84   -5.09  Ag2SO4
  AgMetal           4.00    -10.50  -14.50  Ag
  Anglesite        -8.12    -15.99   -7.87  PbSO4
  Anhydrite        -3.60     -7.94   -4.34  CaSO4
  Antlerite       -16.51     -8.22    8.29  Cu3(OH)4SO4
  Aragonite        -0.55     -8.81   -8.25  CaCO3
  Arsenolite      -15.76    -17.42   -1.66  As2O3
  Artinite         -8.74      1.99   10.73  MgCO3:Mg(OH)2:3H2O
  As2O5(cr)       -36.53    -28.01    8.53  As2O5
  As_native       -17.95    -31.56  -13.61  As
  Atacamite       -11.85     -3.78    8.07  Cu2(OH)3Cl
  Azurite         -13.00     -8.04    4.96  Cu3(OH)2(CO3)2
  Ba3(AsO4)2        3.05    -47.43  -50.48  Ba3(AsO4)2
  Barite           -1.13    -11.38  -10.25  BaSO4
  BaSeO3          -10.14    -16.53   -6.39  BaSeO3
  Bianchite       -10.85    -12.60   -1.76  ZnSO4:6H2O
  Birnessite      -20.43     23.17   43.60  MnO2
  Bixbyite        -21.93    -21.94   -0.01  Mn2O3
  Brochantite     -19.94     -4.60   15.34  Cu4(OH)6SO4
  Brucite          -6.95     10.96   17.91  Mg(OH)2
  Ca3(AsO4)2:4w   -18.21    -37.12  -18.91  Ca3(AsO4)2:4H2O
  Calcite          -0.40     -8.81   -8.41  CaCO3
  CaSeO3           -7.49    -13.09   -5.60  CaSeO3
  Cd(gamma)       -24.68    -10.37   14.30  Cd
  Cd(OH)2          -8.79      4.86   13.65  Cd(OH)2
  Cd(OH)2(a)       -9.69      4.86   14.55  Cd(OH)2
  Cd3(OH)2(SO4)2  -30.26    -23.55    6.71  Cd3(OH)2(SO4)2
  Cd3(OH)4SO4     -27.05     -4.49   22.56  Cd3(OH)4SO4
  Cd4(OH)6SO4     -28.03      0.37   28.40  Cd4(OH)6SO4
  CdCl2           -16.65    -17.15   -0.50  CdCl2
  CdCl2:2.5H2O    -15.14    -17.15   -2.01  CdCl2:2.5H2O
  CdCl2:H2O       -15.51    -17.15   -1.64  CdCl2:H2O
  CdMetal         -24.57    -10.37   14.20  Cd
  CdOHCl           -9.96     -6.15    3.81  CdOHCl
  CdSO4           -14.68    -14.20    0.48  CdSO4
  CdSO4:2.7H2O    -12.50    -14.20   -1.70  CdSO4:2.67H2O
  CdSO4:H2O       -12.84    -14.20   -1.36  CdSO4:H2O
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| | | | | |
|---|---|---|---|---|
| Cerargyrite | -3.53 | -13.89 | -10.37 | AgCl |
| Cerrusite | -3.54 | -16.86 | -13.32 | PbCO3 |
| Chalcanthite | -12.75 | -15.45 | -2.70 | CuSO4:5H2O |
| Claudetite | -15.82 | -17.42 | -1.61 | As2O3 |
| CO2(g) | -1.71 | -2.98 | -1.27 | CO2 |
| Cotunnite | -13.95 | -18.94 | -4.99 | PbCl2 |
| Cu(OH)2 | -5.62 | 3.61 | 9.24 | Cu(OH)2 |
| Cu2SO4 | -19.99 | -21.76 | -1.77 | Cu2SO4 |
| Cu3(AsO4)2:6w | -24.53 | -59.65 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -6.69 | -16.32 | -9.63 | CuCO3 |
| CuMetal | 0.47 | -8.96 | -9.43 | Cu |
| CuOCuSO4 | -24.76 | -11.83 | 12.93 | CuO:CuSO4 |
| CupricFerrite | 2.73 | 10.13 | 7.40 | CuFe2O4 |
| Cuprite | -0.90 | -2.69 | -1.80 | Cu2O |
| CuprousFerrite | 10.68 | 1.91 | -8.77 | CuFeO2 |
| CuSO4 | -19.17 | -15.45 | 3.72 | CuSO4 |
| Dolomite | -1.06 | -17.78 | -16.72 | CaMg(CO3)2 |
| Dolomite(d) | -1.67 | -17.78 | -16.10 | CaMg(CO3)2 |
| Epsomite | -5.85 | -8.10 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 2.99 | -0.05 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -1.63 | 3.26 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -30.70 | -66.13 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -4.67 | 15.55 | 20.22 | Fe3(OH)8 |
| FeSe2 | -11.94 | -30.52 | -18.58 | FeSe2 |
| Goethite | 3.69 | 3.26 | -0.43 | FeOOH |
| Goslarite | -10.51 | -12.60 | -2.09 | ZnSO4:7H2O |
| Gypsum | -3.35 | -7.94 | -4.59 | CaSO4:2H2O |
| H2(g) | -15.23 | -18.31 | -3.08 | H2 |
| H2O(g) | -1.92 | -0.00 | 1.92 | H2O |
| Halite | -8.93 | -7.38 | 1.55 | NaCl |
| Hausmannite | -25.95 | 39.04 | 64.99 | Mn3O4 |
| Hematite | 9.31 | 6.51 | -2.80 | Fe2O3 |
| Huntite | -6.77 | -35.72 | -28.96 | CaMg3(CO3)4 |
| Hydrocerrusite | -13.19 | -30.65 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.22 | -24.93 | -6.71 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -16.89 | 13.42 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -18.68 | 13.42 | 32.10 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.80 | -25.63 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -16.97 | -24.95 | -7.98 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -20.88 | -24.74 | -3.86 | NaFe3(SO4)2(OH)6 |
| JarositeH | -25.14 | -28.36 | -3.22 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -22.95 | -4.61 | 18.35 | Cu4(OH)6SO4:H2O |
| Larnakite | -12.89 | -12.92 | -0.03 | PbO:PbSO4 |
| Laurionite | -8.56 | -7.93 | 0.62 | PbOHCl |
| Litharge | -10.29 | 3.07 | 13.36 | PbO |
| Maghemite | 0.13 | 6.51 | 6.39 | Fe2O3 |
| Magnesite | -1.19 | -8.97 | -7.79 | MgCO3 |
| Magnetite | 9.83 | 15.55 | 5.72 | Fe3O4 |
| Malachite | -8.14 | -2.21 | 5.93 | Cu2(OH)2CO3 |
| Manganite | -9.79 | 15.55 | 25.34 | MnOOH |
| Massicot | -10.50 | 3.07 | 13.57 | PbO |
| Melanothallite | -22.61 | -18.40 | 4.21 | CuCl2 |
| Melanterite | -7.61 | -10.02 | -2.41 | FeSO4:7H2O |
| Minium | -53.28 | 24.45 | 77.73 | Pb3O4 |
| Mirabilite | -9.96 | -11.82 | -1.86 | Na2SO4:10H2O |
| Mn2(SO4)3 | -74.96 | -79.14 | -4.18 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -17.98 | -46.69 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -16.10 | -14.07 | 2.03 | MnCl2:4H2O |
| MnSO4 | -14.41 | -11.13 | 3.28 | MnSO4 |
| Monteponite | -9.88 | 4.86 | 14.74 | CdO |
| Nahcolite | -5.13 | -5.82 | -0.69 | NaHCO3 |
| Nantokite | -5.20 | -12.35 | -7.15 | CuCl |
| Natron | -10.76 | -12.69 | -1.93 | Na2CO3:10H2O |
| Nesquehonite | -3.58 | -8.97 | -5.39 | MgCO3:3H2O |
| Nsutite | -19.40 | 23.17 | 42.56 | MnO2 |
| O2(g) | -58.15 | -60.92 | -2.76 | O2 |
| Otavite | -3.07 | -15.07 | -12.00 | CdCO3 |

| | | | | |
|---|---|---|---|---|
| Pb(OH)2 | -5.63 | 3.07 | 8.70 | Pb(OH)2 |
| Pb2(OH)3Cl | -13.66 | -4.86 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -20.06 | 6.14 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -39.67 | 21.37 | 61.04 | Pb2O3 |
| Pb2OCO3 | -13.74 | -13.79 | -0.05 | PbO:PbCO3 |
| Pb3(AsO4)2 | -25.88 | -61.28 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -22.78 | -10.72 | 12.06 | PbCO3:2PbO |
| Pb3O2SO4 | -21.07 | -9.85 | 11.22 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -27.88 | -6.78 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -30.26 | -6.78 | 23.48 | PbSO4:3PbO |
| PbMetal | -16.42 | -12.16 | 4.25 | Pb |
| PbO:0.3H2O | -9.91 | 3.07 | 12.98 | PbO:0.33H2O |
| Phosgenite | -15.99 | -35.80 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -33.78 | 18.30 | 52.08 | PbO2 |
| Portlandite | -12.89 | 11.13 | 24.02 | Ca(OH)2 |
| Pyrochroite | -7.26 | 7.94 | 15.20 | Mn(OH)2 |
| Pyrolusite | -20.77 | 23.17 | 43.94 | MnO2 |
| Rhodochrosite | -0.92 | -12.00 | -11.07 | MnCO3 |
| Rhodochrosite(d) | -1.61 | -12.00 | -10.39 | MnCO3 |
| Scorodite | -11.74 | -31.99 | -20.25 | FeAsO4:2H2O |
| Se(s) | 5.16 | -12.16 | -17.32 | Se |
| SeO2 | -15.83 | -24.21 | -8.38 | SeO2 |
| Siderite | -0.10 | -10.89 | -10.79 | FeCO3 |
| Siderite(d)(3) | -0.44 | -10.89 | -10.45 | FeCO3 |
| Smithsonite | -3.64 | -13.47 | -9.83 | ZnCO3 |
| Smithsonite_PG | -2.67 | -13.47 | -10.80 | ZnCO3 |
| Tenorite | -4.60 | 3.61 | 8.22 | CuO |
| Thenardite | -11.66 | -11.82 | -0.16 | Na2SO4 |
| Thermonatrite | -12.92 | -12.69 | 0.24 | Na2CO3:H2O |
| Trona | -18.42 | -18.51 | -0.09 | NaHCO3:Na2CO3:2H2O |
| Witherite | -3.61 | -12.24 | -8.63 | BaCO3 |
| Zincite(c) | -5.54 | 6.46 | 12.00 | ZnO |
| Zincosite | -16.37 | -12.60 | 3.76 | ZnSO4 |
| Zn(OH)2-a | -5.99 | 6.46 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -5.29 | 6.46 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -5.74 | 6.46 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -5.04 | 6.46 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -5.25 | 6.46 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -13.64 | -6.14 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -13.28 | 1.92 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -23.57 | -51.12 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -40.20 | -18.75 | 21.46 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -21.62 | 6.78 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -28.21 | 10.29 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -23.27 | -15.55 | 7.72 | ZnCl2 |
| ZnCO3:1H2O | -3.21 | -13.47 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -3.21 | -13.47 | -10.26 | ZnCO3:H2O |
| ZnMetal | -35.98 | -8.77 | 27.20 | Zn |
| ZnO(a) | -4.85 | 6.46 | 11.31 | ZnO |
| ZnSO4:H2O | -12.45 | -12.60 | -0.15 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 2.      MW-1013

----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.485e-10 | 1.485e-10 |
| Alkalinity | 1.178e-02 | 1.178e-02 |
| As | 7.615e-09 | 7.615e-09 |
| Ba | 9.036e-07 | 9.036e-07 |
| Ca | 3.646e-03 | 3.646e-03 |
| Cd | 7.925e-10 | 7.925e-10 |
| Cl | 3.755e-04 | 3.755e-04 |

| | | |
|---|---|---|
| Cu | 2.583e-07 | 2.583e-07 |
| Fe | 3.226e-05 | 3.226e-05 |
| K | 7.679e-05 | 7.679e-05 |
| Mg | 1.898e-03 | 1.898e-03 |
| Mn | 4.427e-04 | 4.427e-04 |
| Na | 6.095e-04 | 6.095e-04 |
| Pb | 1.932e-10 | 1.932e-10 |
| S(6) | 2.344e-04 | 2.344e-04 |
| Se | 6.718e-09 | 6.718e-09 |
| Zn | 4.746e-08 | 4.746e-08 |

----------------------------Description of solution----------------------------

```
                                       pH  =   6.110
                                       pe  =   0.923
                        Activity of water  =   0.999
                 Ionic strength (mol/kgw)  =   1.762e-02
                       Mass of water (kg)  =   1.000e+00
                    Total carbon (mol/kg)  =   3.452e-02
                       Total CO2 (mol/kg)  =   3.452e-02
                         Temperature (°C)  =   9.20
                  Electrical balance (eq)  =   1.030e-04
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =   0.43
                               Iterations  =  10
                                  Total H  = 1.110242e+02
                                  Total O  = 5.558796e+01
```

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 8.660e-07 | 7.762e-07 | -6.062 | -6.110 | -0.048 | 0.00 |
| OH- | 3.986e-09 | 3.506e-09 | -8.399 | -8.455 | -0.056 | (0) |
| H2O | 5.551e+01 | 9.993e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.485e-10 | | | | | |
| Ag+ | 8.619e-11 | 7.583e-11 | -10.065 | -10.120 | -0.056 | (0) |
| AgCl | 5.959e-11 | 5.983e-11 | -10.225 | -10.223 | 0.002 | (0) |
| AgCl2- | 2.518e-12 | 2.215e-12 | -11.599 | -11.655 | -0.056 | (0) |
| AgSO4- | 1.561e-13 | 1.373e-13 | -12.807 | -12.862 | -0.056 | (0) |
| AgCl3-2 | 8.790e-16 | 5.265e-16 | -15.056 | -15.279 | -0.223 | (0) |
| AgOH | 9.722e-17 | 9.761e-17 | -16.012 | -16.010 | 0.002 | (0) |
| AgCl4-3 | 9.108e-19 | 2.875e-19 | -18.041 | -18.541 | -0.501 | (0) |
| Ag(OH)2- | 1.428e-22 | 1.257e-22 | -21.845 | -21.901 | -0.056 | (0) |
| As(3) | 7.592e-09 | | | | | |
| H3AsO3 | 7.587e-09 | 7.618e-09 | -8.120 | -8.118 | 0.002 | (0) |
| H2AsO3- | 4.242e-12 | 3.731e-12 | -11.372 | -11.428 | -0.056 | (0) |
| H4AsO3+ | 3.330e-15 | 2.930e-15 | -14.477 | -14.533 | -0.056 | (0) |
| HAsO3-2 | 7.799e-21 | 4.671e-21 | -20.108 | -20.331 | -0.223 | (0) |
| AsO3-3 | 2.148e-30 | 6.780e-31 | -29.668 | -30.169 | -0.501 | (0) |
| As(5) | 2.281e-11 | | | | | |
| H2AsO4- | 2.033e-11 | 1.789e-11 | -10.692 | -10.747 | -0.056 | (0) |
| HAsO4-2 | 2.475e-12 | 1.483e-12 | -11.606 | -11.829 | -0.223 | (0) |
| H3AsO4 | 2.353e-15 | 2.362e-15 | -14.628 | -14.627 | 0.002 | (0) |
| AsO4-3 | 8.983e-18 | 2.835e-18 | -17.047 | -17.547 | -0.501 | (0) |
| Ba | 9.036e-07 | | | | | |
| Ba+2 | 8.434e-07 | 5.051e-07 | -6.074 | -6.297 | -0.223 | (0) |
| BaHCO3+ | 3.325e-08 | 2.925e-08 | -7.478 | -7.534 | -0.056 | (0) |
| BaSO4 | 2.695e-08 | 2.706e-08 | -7.569 | -7.568 | 0.002 | (0) |
| BaCO3 | 7.693e-11 | 7.724e-11 | -10.114 | -10.112 | 0.002 | (0) |
| BaOH+ | 2.505e-14 | 2.203e-14 | -13.601 | -13.657 | -0.056 | (0) |
| C(4) | 3.452e-02 | | | | | |
| CO2 | 2.274e-02 | 2.284e-02 | -1.643 | -1.641 | 0.002 | (0) |
| HCO3- | 1.124e-02 | 9.934e-03 | -1.949 | -2.003 | -0.054 | (0) |
| CaHCO3+ | 2.125e-04 | 1.870e-04 | -3.673 | -3.728 | -0.056 | (0) |
| MnHCO3+ | 1.636e-04 | 1.439e-04 | -3.786 | -3.842 | -0.056 | (0) |
| MgHCO3+ | 1.362e-04 | 1.198e-04 | -3.866 | -3.921 | -0.056 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| FeHCO3+ | 1.290e-05 | 1.135e-05 | -4.889 | -4.945 | -0.056 | (0) |
| MnCO3 | 5.228e-06 | 5.249e-06 | -5.282 | -5.280 | 0.002 | (0) |
| NaHCO3 | 2.972e-06 | 2.984e-06 | -5.527 | -5.525 | 0.002 | (0) |
| CaCO3 | 1.139e-06 | 1.143e-06 | -5.944 | -5.942 | 0.002 | (0) |
| CO3-2 | 6.654e-07 | 4.065e-07 | -6.177 | -6.391 | -0.214 | (0) |
| MgCO3 | 3.261e-07 | 3.274e-07 | -6.487 | -6.485 | 0.002 | (0) |
| FeCO3 | 1.110e-07 | 1.114e-07 | -6.955 | -6.953 | 0.002 | (0) |
| BaHCO3+ | 3.325e-08 | 2.925e-08 | -7.478 | -7.534 | -0.056 | (0) |
| ZnHCO3+ | 2.111e-08 | 1.857e-08 | -7.675 | -7.731 | -0.056 | (0) |
| CuHCO3+ | 2.010e-08 | 1.768e-08 | -7.697 | -7.752 | -0.056 | (0) |
| CuCO3 | 7.722e-09 | 7.754e-09 | -8.112 | -8.110 | 0.002 | (0) |
| NaCO3- | 1.981e-09 | 1.743e-09 | -8.703 | -8.759 | -0.056 | (0) |
| ZnCO3 | 1.200e-09 | 1.205e-09 | -8.921 | -8.919 | 0.002 | (0) |
| CdHCO3+ | 1.355e-10 | 1.192e-10 | -9.868 | -9.924 | -0.056 | (0) |
| PbHCO3+ | 9.745e-11 | 8.573e-11 | -10.011 | -10.067 | -0.056 | (0) |
| BaCO3 | 7.693e-11 | 7.724e-11 | -10.114 | -10.112 | 0.002 | (0) |
| PbCO3 | 7.644e-11 | 7.675e-11 | -10.117 | -10.115 | 0.002 | (0) |
| Zn(CO3)2-2 | 1.748e-11 | 1.047e-11 | -10.758 | -10.980 | -0.223 | (0) |
| Cu(CO3)2-2 | 6.625e-12 | 3.968e-12 | -11.179 | -11.401 | -0.223 | (0) |
| Pb(CO3)2-2 | 1.308e-13 | 7.837e-14 | -12.883 | -13.106 | -0.223 | (0) |
| CdCO3 | 1.220e-13 | 1.225e-13 | -12.914 | -12.912 | 0.002 | (0) |
| Cd(CO3)2-2 | 2.630e-16 | 1.575e-16 | -15.580 | -15.803 | -0.223 | (0) |
| Ca | 3.646e-03 | | | | | |
| Ca+2 | 3.395e-03 | 2.073e-03 | -2.469 | -2.683 | -0.214 | (0) |
| CaHCO3+ | 2.125e-04 | 1.870e-04 | -3.673 | -3.728 | -0.056 | (0) |
| CaSO4 | 3.768e-05 | 3.784e-05 | -4.424 | -4.422 | 0.002 | (0) |
| CaCO3 | 1.139e-06 | 1.143e-06 | -5.944 | -5.942 | 0.002 | (0) |
| CaOH+ | 5.034e-10 | 4.429e-10 | -9.298 | -9.354 | -0.056 | (0) |
| CaHSO4+ | 1.658e-10 | 1.459e-10 | -9.780 | -9.836 | -0.056 | (0) |
| Cd | 7.925e-10 | | | | | |
| Cd+2 | 6.335e-10 | 3.794e-10 | -9.198 | -9.421 | -0.223 | (0) |
| CdHCO3+ | 1.355e-10 | 1.192e-10 | -9.868 | -9.924 | -0.056 | (0) |
| CdCl+ | 1.282e-11 | 1.128e-11 | -10.892 | -10.948 | -0.056 | (0) |
| CdSO4 | 1.052e-11 | 1.056e-11 | -10.978 | -10.976 | 0.002 | (0) |
| CdCO3 | 1.220e-13 | 1.225e-13 | -12.914 | -12.912 | 0.002 | (0) |
| Cd(SO4)2-2 | 2.289e-14 | 1.371e-14 | -13.640 | -13.863 | -0.223 | (0) |
| CdCl2 | 1.448e-14 | 1.454e-14 | -13.839 | -13.837 | 0.002 | (0) |
| CdOH+ | 1.340e-14 | 1.179e-14 | -13.873 | -13.928 | -0.056 | (0) |
| CdOHCl | 4.184e-15 | 4.202e-15 | -14.378 | -14.377 | 0.002 | (0) |
| Cd(CO3)2-2 | 2.630e-16 | 1.575e-16 | -15.580 | -15.803 | -0.223 | (0) |
| Cd(OH)2 | 2.798e-18 | 2.809e-18 | -17.553 | -17.551 | 0.002 | (0) |
| CdCl3- | 2.669e-18 | 2.348e-18 | -17.574 | -17.629 | -0.056 | (0) |
| Cd2OH+3 | 8.546e-23 | 2.697e-23 | -22.068 | -22.569 | -0.501 | (0) |
| Cd(OH)3- | 4.612e-25 | 4.057e-25 | -24.336 | -24.392 | -0.056 | (0) |
| Cd(OH)4-2 | 7.772e-33 | 4.655e-33 | -32.109 | -32.332 | -0.223 | (0) |
| Cl | 3.755e-04 | | | | | |
| Cl- | 3.752e-04 | 3.290e-04 | -3.426 | -3.483 | -0.057 | (0) |
| MnCl+ | 2.477e-07 | 2.179e-07 | -6.606 | -6.662 | -0.056 | (0) |
| CuCl2- | 7.713e-09 | 6.786e-09 | -8.113 | -8.168 | -0.056 | (0) |
| FeCl+ | 5.899e-09 | 5.190e-09 | -8.229 | -8.285 | -0.056 | (0) |
| AgCl | 5.959e-11 | 5.983e-11 | -10.225 | -10.223 | 0.002 | (0) |
| MnCl2 | 3.116e-11 | 3.129e-11 | -10.506 | -10.505 | 0.002 | (0) |
| CdCl+ | 1.282e-11 | 1.128e-11 | -10.892 | -10.948 | -0.056 | (0) |
| ZnCl+ | 7.163e-12 | 6.301e-12 | -11.145 | -11.201 | -0.056 | (0) |
| CuCl3-2 | 5.540e-12 | 3.318e-12 | -11.257 | -11.479 | -0.223 | (0) |
| AgCl2- | 2.518e-12 | 2.215e-12 | -11.599 | -11.655 | -0.056 | (0) |
| CuCl+ | 1.579e-12 | 1.389e-12 | -11.802 | -11.857 | -0.056 | (0) |
| ZnOHCl | 2.074e-13 | 2.083e-13 | -12.683 | -12.681 | 0.002 | (0) |
| PbCl+ | 1.070e-13 | 9.409e-14 | -12.971 | -13.026 | -0.056 | (0) |
| CdCl2 | 1.448e-14 | 1.454e-14 | -13.839 | -13.837 | 0.002 | (0) |
| CdOHCl | 4.184e-15 | 4.202e-15 | -14.378 | -14.377 | 0.002 | (0) |
| MnCl3- | 3.223e-15 | 2.835e-15 | -14.492 | -14.547 | -0.056 | (0) |
| ZnCl2 | 2.022e-15 | 2.030e-15 | -14.694 | -14.693 | 0.002 | (0) |
| AgCl3-2 | 8.790e-16 | 5.265e-16 | -15.056 | -15.279 | -0.223 | (0) |
| CuCl2 | 2.041e-16 | 2.050e-16 | -15.690 | -15.688 | 0.002 | (0) |
| PbCl2 | 6.673e-17 | 6.700e-17 | -16.176 | -16.174 | 0.002 | (0) |
| CdCl3- | 2.669e-18 | 2.348e-18 | -17.574 | -17.629 | -0.056 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| AgCl4-3 | 9.108e-19 | 2.875e-19 | -18.041 | -18.541 | -0.501 | (0) |
| ZnCl3- | 7.707e-19 | 6.780e-19 | -18.113 | -18.169 | -0.056 | (0) |
| FeCl+2 | 3.579e-20 | 2.144e-20 | -19.446 | -19.669 | -0.223 | (0) |
| PbCl3- | 1.796e-20 | 1.580e-20 | -19.746 | -19.801 | -0.056 | (0) |
| CuCl3- | 2.024e-22 | 1.780e-22 | -21.694 | -21.749 | -0.056 | (0) |
| ZnCl4-2 | 1.635e-22 | 9.795e-23 | -21.786 | -22.009 | -0.223 | (0) |
| FeCl2+ | 6.078e-23 | 5.347e-23 | -22.216 | -22.272 | -0.056 | (0) |
| PbCl4-2 | 3.653e-24 | 2.188e-24 | -23.437 | -23.660 | -0.223 | (0) |
| FeCl3 | 1.752e-27 | 1.759e-27 | -26.756 | -26.755 | 0.002 | (0) |
| CuCl4-2 | 3.331e-28 | 1.995e-28 | -27.477 | -27.700 | -0.223 | (0) |
| Cu(1) | 2.243e-07 | | | | | |
| Cu+ | 2.166e-07 | 1.905e-07 | -6.664 | -6.720 | -0.056 | (0) |
| CuCl2- | 7.713e-09 | 6.786e-09 | -8.113 | -8.168 | -0.056 | (0) |
| CuCl3-2 | 5.540e-12 | 3.318e-12 | -11.257 | -11.479 | -0.223 | (0) |
| Cu(2) | 3.400e-08 | | | | | |
| CuHCO3+ | 2.010e-08 | 1.768e-08 | -7.697 | -7.752 | -0.056 | (0) |
| CuCO3 | 7.722e-09 | 7.754e-09 | -8.112 | -8.110 | 0.002 | (0) |
| Cu+2 | 5.930e-09 | 3.552e-09 | -8.227 | -8.450 | -0.223 | (0) |
| Cu(OH)2 | 1.225e-10 | 1.230e-10 | -9.912 | -9.910 | 0.002 | (0) |
| CuSO4 | 6.880e-11 | 6.908e-11 | -10.162 | -10.161 | 0.002 | (0) |
| CuOH+ | 5.197e-11 | 4.572e-11 | -10.284 | -10.340 | -0.056 | (0) |
| Cu(CO3)2-2 | 6.625e-12 | 3.968e-12 | -11.179 | -11.401 | -0.223 | (0) |
| CuCl+ | 1.579e-12 | 1.389e-12 | -11.802 | -11.857 | -0.056 | (0) |
| Cu2(OH)2+2 | 2.914e-16 | 1.746e-16 | -15.535 | -15.758 | -0.223 | (0) |
| CuCl2 | 2.041e-16 | 2.050e-16 | -15.690 | -15.688 | 0.002 | (0) |
| Cu(OH)3- | 1.084e-17 | 9.540e-18 | -16.965 | -17.020 | -0.056 | (0) |
| CuCl3- | 2.024e-22 | 1.780e-22 | -21.694 | -21.749 | -0.056 | (0) |
| Cu(OH)4-2 | 4.091e-24 | 2.450e-24 | -23.388 | -23.611 | -0.223 | (0) |
| CuCl4-2 | 3.331e-28 | 1.995e-28 | -27.477 | -27.700 | -0.223 | (0) |
| Fe(2) | 3.226e-05 | | | | | |
| Fe+2 | 1.908e-05 | 1.143e-05 | -4.719 | -4.942 | -0.223 | (0) |
| FeHCO3+ | 1.290e-05 | 1.135e-05 | -4.889 | -4.945 | -0.056 | (0) |
| FeSO4 | 1.595e-07 | 1.601e-07 | -6.797 | -6.796 | 0.002 | (0) |
| FeCO3 | 1.110e-07 | 1.114e-07 | -6.955 | -6.953 | 0.002 | (0) |
| FeCl+ | 5.899e-09 | 5.190e-09 | -8.229 | -8.285 | -0.056 | (0) |
| FeOH+ | 1.520e-09 | 1.337e-09 | -8.818 | -8.874 | -0.056 | (0) |
| FeHSO4+ | 9.141e-13 | 8.041e-13 | -12.039 | -12.095 | -0.056 | (0) |
| Fe(OH)2 | 3.419e-15 | 3.433e-15 | -14.466 | -14.464 | 0.002 | (0) |
| Fe(OH)3- | 1.584e-19 | 1.394e-19 | -18.800 | -18.856 | -0.056 | (0) |
| Fe(3) | 3.158e-12 | | | | | |
| Fe(OH)2+ | 2.933e-12 | 2.580e-12 | -11.533 | -11.588 | -0.056 | (0) |
| Fe(OH)3 | 2.060e-13 | 2.068e-13 | -12.686 | -12.684 | 0.002 | (0) |
| FeOH+2 | 1.903e-14 | 1.140e-14 | -13.721 | -13.943 | -0.223 | (0) |
| Fe(OH)4- | 1.411e-16 | 1.242e-16 | -15.850 | -15.906 | -0.056 | (0) |
| Fe+3 | 1.160e-17 | 3.662e-18 | -16.935 | -17.436 | -0.501 | (0) |
| FeSO4+ | 3.372e-18 | 2.967e-18 | -17.472 | -17.528 | -0.056 | (0) |
| FeCl+2 | 3.579e-20 | 2.144e-20 | -19.446 | -19.669 | -0.223 | (0) |
| Fe(SO4)2- | 7.389e-21 | 6.501e-21 | -20.131 | -20.187 | -0.056 | (0) |
| FeCl2+ | 6.078e-23 | 5.347e-23 | -22.216 | -22.272 | -0.056 | (0) |
| FeHSO4+2 | 1.081e-23 | 6.473e-24 | -22.966 | -23.189 | -0.223 | (0) |
| Fe2(OH)2+4 | 5.413e-26 | 6.967e-27 | -25.267 | -26.157 | -0.890 | (0) |
| FeCl3 | 1.752e-27 | 1.759e-27 | -26.756 | -26.755 | 0.002 | (0) |
| Fe3(OH)4+5 | 4.311e-34 | 1.751e-35 | -33.365 | -34.757 | -1.391 | (0) |
| H(0) | 1.432e-17 | | | | | |
| H2 | 7.158e-18 | 7.187e-18 | -17.145 | -17.143 | 0.002 | (0) |
| K | 7.679e-05 | | | | | |
| K+ | 7.675e-05 | 6.730e-05 | -4.115 | -4.172 | -0.057 | (0) |
| KSO4- | 4.295e-08 | 3.778e-08 | -7.367 | -7.423 | -0.056 | (0) |
| Mg | 1.898e-03 | | | | | |
| Mg+2 | 1.744e-03 | 1.076e-03 | -2.758 | -2.968 | -0.210 | (0) |
| MgHCO3+ | 1.362e-04 | 1.198e-04 | -3.866 | -3.921 | -0.056 | (0) |
| MgSO4 | 1.747e-05 | 1.754e-05 | -4.758 | -4.756 | 0.002 | (0) |
| MgCO3 | 3.261e-07 | 3.274e-07 | -6.487 | -6.485 | 0.002 | (0) |
| MgOH+ | 1.267e-09 | 1.115e-09 | -8.897 | -8.953 | -0.056 | (0) |
| Mn(2) | 4.427e-04 | | | | | |
| Mn+2 | 2.714e-04 | 1.626e-04 | -3.566 | -3.789 | -0.223 | (0) |
| MnHCO3+ | 1.636e-04 | 1.439e-04 | -3.786 | -3.842 | -0.056 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| MnCO3 | 5.228e-06 | 5.249e-06 | -5.282 | -5.280 | 0.002 | (0) |
| MnSO4 | 2.239e-06 | 2.248e-06 | -5.650 | -5.648 | 0.002 | (0) |
| MnCl+ | 2.477e-07 | 2.179e-07 | -6.606 | -6.662 | -0.056 | (0) |
| MnOH+ | 1.569e-09 | 1.381e-09 | -8.804 | -8.860 | -0.056 | (0) |
| MnCl2 | 3.116e-11 | 3.129e-11 | -10.506 | -10.505 | 0.002 | (0) |
| MnCl3- | 3.223e-15 | 2.835e-15 | -14.492 | -14.547 | -0.056 | (0) |
| Mn(OH)3- | 6.248e-21 | 5.497e-21 | -20.204 | -20.260 | -0.056 | (0) |
| Mn(3) | 1.165e-29 | | | | | |
| Mn+3 | 1.165e-29 | 3.678e-30 | -28.934 | -29.434 | -0.501 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -75.590 | -75.812 | -0.223 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -85.309 | -85.365 | -0.056 | (0) |
| Na | 6.095e-04 | | | | | |
| Na+ | 6.062e-04 | 5.342e-04 | -3.217 | -3.272 | -0.055 | (0) |
| NaHCO3 | 2.972e-06 | 2.984e-06 | -5.527 | -5.525 | 0.002 | (0) |
| NaSO4- | 2.927e-07 | 2.575e-07 | -6.534 | -6.589 | -0.056 | (0) |
| NaCO3- | 1.981e-09 | 1.743e-09 | -8.703 | -8.759 | -0.056 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -63.480 | -63.478 | 0.002 | (0) |
| Pb | 1.932e-10 | | | | | |
| PbHCO3+ | 9.745e-11 | 8.573e-11 | -10.011 | -10.067 | -0.056 | (0) |
| PbCO3 | 7.644e-11 | 7.675e-11 | -10.117 | -10.115 | 0.002 | (0) |
| Pb+2 | 1.814e-11 | 1.086e-11 | -10.741 | -10.964 | -0.223 | (0) |
| PbSO4 | 6.505e-13 | 6.531e-13 | -12.187 | -12.185 | 0.002 | (0) |
| PbOH+ | 3.100e-13 | 2.727e-13 | -12.509 | -12.564 | -0.056 | (0) |
| Pb(CO3)2-2 | 1.308e-13 | 7.837e-14 | -12.883 | -13.106 | -0.223 | (0) |
| PbCl+ | 1.070e-13 | 9.409e-14 | -12.971 | -13.026 | -0.056 | (0) |
| Pb(SO4)2-2 | 6.117e-16 | 3.664e-16 | -15.213 | -15.436 | -0.223 | (0) |
| Pb(OH)2 | 1.360e-16 | 1.366e-16 | -15.866 | -15.865 | 0.002 | (0) |
| PbCl2 | 6.673e-17 | 6.700e-17 | -16.176 | -16.174 | 0.002 | (0) |
| PbCl3- | 1.796e-20 | 1.580e-20 | -19.746 | -19.801 | -0.056 | (0) |
| Pb(OH)3- | 2.295e-21 | 2.019e-21 | -20.639 | -20.695 | -0.056 | (0) |
| Pb2OH+3 | 2.102e-22 | 6.633e-23 | -21.677 | -22.178 | -0.501 | (0) |
| PbCl4-2 | 3.653e-24 | 2.188e-24 | -23.437 | -23.660 | -0.223 | (0) |
| Pb(OH)4-2 | 9.940e-27 | 5.954e-27 | -26.003 | -26.225 | -0.223 | (0) |
| Pb3(OH)4+2 | 6.346e-34 | 3.801e-34 | -33.198 | -33.420 | -0.223 | (0) |
| S(6) | 2.344e-04 | | | | | |
| SO4-2 | 1.765e-04 | 1.069e-04 | -3.753 | -3.971 | -0.218 | (0) |
| CaSO4 | 3.768e-05 | 3.784e-05 | -4.424 | -4.422 | 0.002 | (0) |
| MgSO4 | 1.747e-05 | 1.754e-05 | -4.758 | -4.756 | 0.002 | (0) |
| MnSO4 | 2.239e-06 | 2.248e-06 | -5.650 | -5.648 | 0.002 | (0) |
| NaSO4- | 2.927e-07 | 2.575e-07 | -6.534 | -6.589 | -0.056 | (0) |
| FeSO4 | 1.595e-07 | 1.601e-07 | -6.797 | -6.796 | 0.002 | (0) |
| KSO4- | 4.295e-08 | 3.778e-08 | -7.367 | -7.423 | -0.056 | (0) |
| BaSO4 | 2.695e-08 | 2.706e-08 | -7.569 | -7.568 | 0.002 | (0) |
| HSO4- | 6.653e-09 | 5.853e-09 | -8.177 | -8.233 | -0.056 | (0) |
| ZnSO4 | 3.260e-10 | 3.273e-10 | -9.487 | -9.485 | 0.002 | (0) |
| CaHSO4+ | 1.658e-10 | 1.459e-10 | -9.780 | -9.836 | -0.056 | (0) |
| CuSO4 | 6.880e-11 | 6.908e-11 | -10.162 | -10.161 | 0.002 | (0) |
| CdSO4 | 1.052e-11 | 1.056e-11 | -10.978 | -10.976 | 0.002 | (0) |
| FeHSO4+ | 9.141e-13 | 8.041e-13 | -12.039 | -12.095 | -0.056 | (0) |
| PbSO4 | 6.505e-13 | 6.531e-13 | -12.187 | -12.185 | 0.002 | (0) |
| Zn(SO4)2-2 | 5.399e-13 | 3.234e-13 | -12.268 | -12.490 | -0.223 | (0) |
| AgSO4- | 1.561e-13 | 1.373e-13 | -12.807 | -12.862 | -0.056 | (0) |
| Cd(SO4)2-2 | 2.289e-14 | 1.371e-14 | -13.640 | -13.863 | -0.223 | (0) |
| Pb(SO4)2-2 | 6.117e-16 | 3.664e-16 | -15.213 | -15.436 | -0.223 | (0) |
| FeSO4+ | 3.372e-18 | 2.967e-18 | -17.472 | -17.528 | -0.056 | (0) |
| Fe(SO4)2- | 7.389e-21 | 6.501e-21 | -20.131 | -20.187 | -0.056 | (0) |
| FeHSO4+2 | 1.081e-23 | 6.473e-24 | -22.966 | -23.189 | -0.223 | (0) |
| Se(-2) | 4.422e-17 | | | | | |
| HSe- | 4.391e-17 | 3.863e-17 | -16.357 | -16.413 | -0.056 | (0) |
| H2Se | 3.109e-19 | 3.121e-19 | -18.507 | -18.506 | 0.002 | (0) |
| Se(4) | 6.718e-09 | | | | | |
| HSeO3- | 6.676e-09 | 5.873e-09 | -8.176 | -8.231 | -0.056 | (0) |
| SeO3-2 | 3.994e-11 | 2.392e-11 | -10.399 | -10.621 | -0.223 | (0) |
| H2SeO3 | 2.553e-12 | 2.564e-12 | -11.593 | -11.591 | 0.002 | (0) |

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Se(6)          2.575e-27
   SeO4-2           2.575e-27   1.542e-27   -26.589   -26.812    -0.223     (0)
   HSeO4-           3.912e-32   3.441e-32   -31.408   -31.463    -0.056     (0)
Zn             4.746e-08
   Zn+2             2.479e-08   1.485e-08    -7.606    -7.828    -0.223     (0)
   ZnHCO3+          2.111e-08   1.857e-08    -7.675    -7.731    -0.056     (0)
   ZnCO3            1.200e-09   1.205e-09    -8.921    -8.919     0.002     (0)
   ZnSO4            3.260e-10   3.273e-10    -9.487    -9.485     0.002     (0)
   Zn(CO3)2-2       1.748e-11   1.047e-11   -10.758   -10.980    -0.223     (0)
   ZnCl+            7.163e-12   6.301e-12   -11.145   -11.201    -0.056     (0)
   ZnOH+            6.722e-12   5.913e-12   -11.173   -11.228    -0.056     (0)
   Zn(SO4)2-2       5.399e-13   3.234e-13   -12.268   -12.490    -0.223     (0)
   Zn(OH)2          3.086e-13   3.098e-13   -12.511   -12.509     0.002     (0)
   ZnOHCl           2.074e-13   2.083e-13   -12.683   -12.681     0.002     (0)
   ZnCl2            2.022e-15   2.030e-15   -14.694   -14.693     0.002     (0)
   Zn(OH)3-         1.434e-18   1.261e-18   -17.844   -17.899    -0.056     (0)
   ZnCl3-           7.707e-19   6.780e-19   -18.113   -18.169    -0.056     (0)
   ZnCl4-2          1.635e-22   9.795e-23   -21.786   -22.009    -0.223     (0)
   Zn(OH)4-2        4.297e-25   2.574e-25   -24.367   -24.589    -0.223     (0)

------------------------------Saturation indices-------------------------------

  Phase               SI** log IAP   log K(282 K,   1 atm)

  Ag2CO3          -15.17    -26.63  -11.46  Ag2CO3
  Ag2O            -21.03     -8.02   13.01  Ag2O
  Ag2SO4          -19.12    -24.21   -5.09  Ag2SO4
  AgMetal           3.50    -11.04  -14.55  Ag
  Anglesite        -7.06    -14.94   -7.88  PbSO4
  Anhydrite        -2.32     -6.65   -4.34  CaSO4
  Antlerite       -13.17     -4.88    8.29  Cu3(OH)4SO4
  Aragonite        -0.82     -9.07   -8.25  CaCO3
  Arsenolite      -14.56    -16.24   -1.67  As2O3
  Artinite        -10.89     -0.11   10.78  MgCO3:Mg(OH)2:3H2O
  As2O5(cr)       -37.79    -29.25    8.54  As2O5
  As_native       -15.55    -29.22  -13.66  As
  Atacamite       -10.16     -2.05    8.11  Cu2(OH)3Cl
  Azurite          -9.93     -4.92    5.02  Cu3(OH)2(CO3)2
  Ba3(AsO4)2       -3.48    -53.98  -50.50  Ba3(AsO4)2
  Barite           -0.00    -10.27  -10.26  BaSO4
  BaSeO3          -10.53    -16.92   -6.39  BaSeO3
  Bianchite       -10.04    -11.80   -1.76  ZnSO4:6H2O
  Birnessite      -21.11     22.50   43.60  MnO2
  Bixbyite        -22.22    -22.21    0.01  Mn2O3
  Brochantite     -16.45     -1.11   15.34  Cu4(OH)6SO4
  Brucite          -8.70      9.25   17.95  Mg(OH)2
  Ca3(AsO4)2:4w   -24.24    -43.15  -18.91  Ca3(AsO4)2:4H2O
  Calcite          -0.67     -9.07   -8.41  CaCO3
  CaSeO3           -7.70    -13.30   -5.60  CaSeO3
  Cd(gamma)       -25.60    -11.27   14.33  Cd
  Cd(OH)2         -10.85      2.80   13.65  Cd(OH)2
  Cd(OH)2(a)      -11.78      2.80   14.58  Cd(OH)2
  Cd3(OH)2(SO4)2  -30.70    -23.99    6.71  Cd3(OH)2(SO4)2
  Cd3(OH)4SO4     -30.35     -7.79   22.56  Cd3(OH)4SO4
  Cd4(OH)6SO4     -33.40     -5.00   28.40  Cd4(OH)6SO4
  CdCl2           -15.89    -16.39   -0.50  CdCl2
  CdCl2:2.5H2O    -14.38    -16.39   -2.01  CdCl2:2.5H2O
  CdCl2:H2O       -14.75    -16.39   -1.64  CdCl2:H2O
  CdMetal         -25.49    -11.27   14.23  Cd
  CdOHCl          -10.62     -6.79    3.82  CdOHCl
  CdSO4           -13.90    -13.39    0.50  CdSO4
  CdSO4:2.7H2O    -11.70    -13.39   -1.70  CdSO4:2.67H2O
  CdSO4:H2O       -12.04    -13.39   -1.35  CdSO4:H2O
  Cerargyrite      -3.21    -13.60  -10.39  AgCl
  Cerrusite        -4.03    -17.35  -13.33  PbCO3
  Chalcanthite     -9.72    -12.42   -2.70  CuSO4:5H2O
  Claudetite      -14.62    -16.24   -1.62  As2O3
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| | | | | |
|---|---|---|---|---|
| CO2(g) | -0.38 | -1.64 | -1.26 | CO2 |
| Cotunnite | -12.93 | -17.93 | -5.00 | PbCl2 |
| Cu(OH)2 | -5.50 | 3.77 | 9.27 | Cu(OH)2 |
| Cu2SO4 | -15.65 | -17.41 | -1.76 | Cu2SO4 |
| Cu3(AsO4)2:6w | -25.32 | -60.45 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.21 | -14.84 | -9.63 | CuCO3 |
| CuMetal | 1.82 | -7.64 | -9.46 | Cu |
| CuOCuSO4 | -21.64 | -8.65 | 12.99 | CuO:CuSO4 |
| CupricFerrite | -1.91 | 5.56 | 7.47 | CuFe2O4 |
| Cuprite | 0.59 | -1.22 | -1.81 | Cu2O |
| CuprousFerrite | 9.05 | 0.28 | -8.76 | CuFeO2 |
| CuSO4 | -16.17 | -12.42 | 3.75 | CuSO4 |
| Dolomite | -1.73 | -18.43 | -16.70 | CaMg(CO3)2 |
| Dolomite(d) | -2.35 | -18.43 | -16.09 | CaMg(CO3)2 |
| Epsomite | -4.69 | -6.94 | -2.26 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.06 | -1.98 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.00 | 0.89 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -31.31 | -66.74 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -11.16 | 9.06 | 20.22 | Fe3(OH)8 |
| FeSe2 | -5.12 | -23.70 | -18.58 | FeSe2 |
| Goethite | 1.30 | 0.89 | -0.41 | FeOOH |
| Goslarite | -9.71 | -11.80 | -2.10 | ZnSO4:7H2O |
| Gypsum | -2.06 | -6.66 | -4.59 | CaSO4:2H2O |
| H2(g) | -14.07 | -17.14 | -3.08 | H2 |
| H2O(g) | -1.94 | -0.00 | 1.94 | H2O |
| Halite | -8.30 | -6.76 | 1.54 | NaCl |
| Hausmannite | -25.80 | 39.36 | 65.16 | Mn3O4 |
| Hematite | 4.53 | 1.79 | -2.74 | Fe2O3 |
| Huntite | -8.24 | -37.15 | -28.91 | CaMg3(CO3)4 |
| Hydrocerrusite | -15.99 | -33.45 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -21.57 | -28.19 | -6.62 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -24.58 | 5.73 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -26.48 | 5.73 | 32.21 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -18.30 | -28.13 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -19.84 | -27.76 | -7.93 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -23.07 | -26.87 | -3.80 | NaFe3(SO4)2(OH)6 |
| JarositeH | -26.58 | -29.70 | -3.13 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -19.53 | -1.11 | 18.41 | Cu4(OH)6SO4:H2O |
| Larnakite | -13.66 | -13.68 | -0.02 | PbO:PbSO4 |
| Laurionite | -8.96 | -8.34 | 0.62 | PbOHCl |
| Litharge | -12.14 | 1.26 | 13.39 | PbO |
| Maghemite | -4.60 | 1.79 | 6.39 | Fe2O3 |
| Magnesite | -1.58 | -9.36 | -7.78 | MgCO3 |
| Magnetite | 3.26 | 9.06 | 5.81 | Fe3O4 |
| Malachite | -6.53 | -0.57 | 5.96 | Cu2(OH)2CO3 |
| Manganite | -9.88 | 15.46 | 25.34 | MnOOH |
| Massicot | -12.34 | 1.26 | 13.60 | PbO |
| Melanothallite | -19.65 | -15.42 | 4.24 | CuCl2 |
| Melanterite | -6.49 | -8.92 | -2.42 | FeSO4:7H2O |
| Minium | -60.07 | 17.83 | 77.90 | Pb3O4 |
| Mirabilite | -8.63 | -10.52 | -1.89 | Na2SO4:10H2O |
| Mn2(SO4)3 | -66.67 | -70.78 | -4.11 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -17.76 | -46.46 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.75 | -10.76 | 2.00 | MnCl2:4H2O |
| MnSO4 | -11.06 | -7.76 | 3.30 | MnSO4 |
| Monteponite | -11.99 | 2.80 | 14.79 | CdO |
| Nahcolite | -4.57 | -5.28 | -0.70 | NaHCO3 |
| Nantokite | -3.03 | -10.20 | -7.17 | CuCl |
| Natron | -10.98 | -12.94 | -1.96 | Na2CO3:10H2O |
| Nesquehonite | -3.98 | -9.36 | -5.38 | MgCO3:3H2O |
| Nsutite | -20.07 | 22.50 | 42.56 | MnO2 |
| O2(g) | -60.72 | -63.48 | -2.76 | O2 |
| Otavite | -3.81 | -15.81 | -12.00 | CdCO3 |
| Pb(OH)2 | -7.47 | 1.26 | 8.72 | Pb(OH)2 |
| Pb2(OH)3Cl | -15.87 | -7.08 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -23.69 | 2.51 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -44.46 | 16.58 | 61.04 | Pb2O3 |

| | | | | |
|---|---|---|---|---|
| Pb2OCO3 | -16.07 | -16.10 | -0.03 | PbO:PbCO3 |
| Pb3(AsO4)2 | -32.58 | -67.99 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -26.95 | -14.84 | 12.10 | PbCO3:2PbO |
| Pb3O2SO4 | -23.67 | -12.42 | 11.25 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -32.27 | -11.17 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -34.71 | -11.17 | 23.54 | PbSO4:3PbO |
| PbMetal | -17.06 | -12.81 | 4.25 | Pb |
| PbO:0.3H2O | -11.72 | 1.26 | 12.98 | PbO:0.33H2O |
| Phosgenite | -15.47 | -35.28 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -36.88 | 15.32 | 52.20 | PbO2 |
| Portlandite | -14.54 | 9.54 | 24.07 | Ca(OH)2 |
| Pyrochroite | -6.77 | 8.43 | 15.20 | Mn(OH)2 |
| Pyrolusite | -21.55 | 22.50 | 44.05 | MnO2 |
| Rhodochrosite | 0.89 | -10.18 | -11.07 | MnCO3 |
| Rhodochrosite(d) | 0.21 | -10.18 | -10.39 | MnCO3 |
| Scorodite | -14.74 | -34.98 | -20.25 | FeAsO4:2H2O |
| Se(s) | 8.86 | -8.46 | -17.32 | Se |
| SeO2 | -14.46 | -22.84 | -8.38 | SeO2 |
| Siderite | -0.54 | -11.33 | -10.79 | FeCO3 |
| Siderite(d)(3) | -0.88 | -11.33 | -10.45 | FeCO3 |
| Smithsonite | -4.40 | -14.22 | -9.82 | ZnCO3 |
| Smithsonite_PG | -3.42 | -14.22 | -10.80 | ZnCO3 |
| Tenorite | -4.47 | 3.77 | 8.25 | CuO |
| Thenardite | -10.36 | -10.52 | -0.16 | Na2SO4 |
| Thermonatrite | -13.18 | -12.94 | 0.24 | Na2CO3:H2O |
| Trona | -18.15 | -18.21 | -0.06 | NaHCO3:Na2CO3:2H2O |
| Witherite | -4.05 | -12.69 | -8.64 | BaCO3 |
| Zincite(c) | -7.65 | 4.39 | 12.04 | ZnO |
| Zincosite | -15.60 | -11.80 | 3.80 | ZnSO4 |
| Zn(OH)2-a | -8.06 | 4.39 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -7.36 | 4.39 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -7.81 | 4.39 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -7.11 | 4.39 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -7.32 | 4.39 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -14.91 | -7.41 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -16.01 | -0.81 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -31.03 | -58.58 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -40.77 | -19.21 | 21.56 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -27.03 | 1.37 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -35.73 | 2.77 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -22.54 | -14.79 | 7.75 | ZnCl2 |
| ZnCO3:1H2O | -3.96 | -14.22 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -3.96 | -14.22 | -10.26 | ZnCO3:H2O |
| ZnMetal | -36.94 | -9.67 | 27.27 | Zn |
| ZnO(a) | -6.92 | 4.39 | 11.31 | ZnO |
| ZnSO4:H2O | -11.67 | -11.80 | -0.13 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 3. MW-1013A

-----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.484e-10 | 1.484e-10 |
| Alkalinity | 7.158e-03 | 7.158e-03 |
| As | 4.408e-09 | 4.408e-09 |
| Ba | 5.749e-07 | 5.749e-07 |
| Ca | 3.246e-03 | 3.246e-03 |
| Cd | 7.924e-10 | 7.924e-10 |
| Cl | 1.863e-04 | 1.863e-04 |
| Cu | 7.402e-09 | 7.402e-09 |
| Fe | 4.480e-06 | 4.480e-06 |
| K | 1.807e-04 | 1.807e-04 |
| Mg | 1.840e-03 | 1.840e-03 |

| | | |
|---|---|---|
| Mn | 7.687e-05 | 7.687e-05 |
| Na | 1.332e-03 | 1.332e-03 |
| Pb | 1.932e-10 | 1.932e-10 |
| S(6) | 1.959e-03 | 1.959e-03 |
| Se | 2.662e-09 | 2.662e-09 |
| Zn | 4.746e-08 | 4.746e-08 |

----------------------------Description of solution----------------------------

| | | |
|---|---|---|
| pH | = | 6.580 |
| pe | = | 0.749 |
| Activity of water | = | 1.000 |
| Ionic strength (mol/kgw) | = | 1.658e-02 |
| Mass of water (kg) | = | 1.000e+00 |
| Total carbon (mol/kg) | = | 1.224e-02 |
| Total CO2 (mol/kg) | = | 1.224e-02 |
| Temperature (°C) | = | 6.58 |
| Electrical balance (eq) | = | 5.869e-04 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = | 2.79 |
| Iterations | = | 11 |
| Total H | = | 1.110196e+02 |
| Total O | = | 5.554569e+01 |

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 2.926e-07 | 2.630e-07 | -6.534 | -6.580 | -0.046 | 0.00 |
| OH- | 9.238e-09 | 8.157e-09 | -8.034 | -8.088 | -0.054 | (0) |
| H2O | 5.551e+01 | 9.997e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.484e-10 | | | | | |
| Ag+ | 1.072e-10 | 9.463e-11 | -9.970 | -10.024 | -0.054 | (0) |
| AgCl | 3.877e-11 | 3.892e-11 | -10.411 | -10.410 | 0.002 | (0) |
| AgSO4- | 1.671e-12 | 1.476e-12 | -11.777 | -11.831 | -0.054 | (0) |
| AgCl2- | 8.305e-13 | 7.333e-13 | -12.081 | -12.135 | -0.054 | (0) |
| AgOH | 3.583e-16 | 3.596e-16 | -15.446 | -15.444 | 0.002 | (0) |
| AgCl3-2 | 1.338e-16 | 8.136e-17 | -15.873 | -16.090 | -0.216 | (0) |
| AgCl4-3 | 6.786e-20 | 2.214e-20 | -19.168 | -19.655 | -0.486 | (0) |
| Ag(OH)2- | 1.548e-21 | 1.367e-21 | -20.810 | -20.864 | -0.054 | (0) |
| As(3) | 4.296e-09 | | | | | |
| H3AsO3 | 4.290e-09 | 4.306e-09 | -8.368 | -8.366 | 0.002 | (0) |
| H2AsO3- | 6.316e-12 | 5.577e-12 | -11.200 | -11.254 | -0.054 | (0) |
| H4AsO3+ | 6.355e-16 | 5.612e-16 | -15.197 | -15.251 | -0.054 | (0) |
| HAsO3-2 | 2.985e-20 | 1.814e-20 | -19.525 | -19.741 | -0.216 | (0) |
| AsO3-3 | 2.153e-29 | 7.025e-30 | -28.667 | -29.153 | -0.486 | (0) |
| As(5) | 1.119e-10 | | | | | |
| H2AsO4- | 8.282e-11 | 7.313e-11 | -10.082 | -10.136 | -0.054 | (0) |
| HAsO4-2 | 2.905e-11 | 1.766e-11 | -10.537 | -10.753 | -0.216 | (0) |
| H3AsO4 | 3.169e-15 | 3.181e-15 | -14.499 | -14.497 | 0.002 | (0) |
| AsO4-3 | 2.841e-16 | 9.268e-17 | -15.547 | -16.033 | -0.486 | (0) |
| Ba | 5.749e-07 | | | | | |
| Ba+2 | 4.391e-07 | 2.669e-07 | -6.357 | -6.574 | -0.216 | (0) |
| BaSO4 | 1.258e-07 | 1.263e-07 | -6.900 | -6.899 | 0.002 | (0) |
| BaHCO3+ | 9.992e-09 | 8.823e-09 | -8.000 | -8.054 | -0.054 | (0) |
| BaCO3 | 6.517e-11 | 6.542e-11 | -10.186 | -10.184 | 0.002 | (0) |
| BaOH+ | 3.893e-14 | 3.437e-14 | -13.410 | -13.464 | -0.054 | (0) |
| C(4) | 1.224e-02 | | | | | |
| HCO3- | 6.941e-03 | 6.157e-03 | -2.159 | -2.211 | -0.052 | (0) |
| CO2 | 5.087e-03 | 5.107e-03 | -2.294 | -2.292 | 0.002 | (0) |
| CaHCO3+ | 1.036e-04 | 9.152e-05 | -3.984 | -4.039 | -0.054 | (0) |
| MgHCO3+ | 7.933e-05 | 7.005e-05 | -4.101 | -4.155 | -0.054 | (0) |
| MnHCO3+ | 1.961e-05 | 1.731e-05 | -4.708 | -4.762 | -0.054 | (0) |
| NaHCO3 | 4.034e-06 | 4.049e-06 | -5.394 | -5.393 | 0.002 | (0) |
| MnCO3 | 1.714e-06 | 1.721e-06 | -5.766 | -5.764 | 0.002 | (0) |
| CaCO3 | 1.629e-06 | 1.635e-06 | -5.788 | -5.786 | 0.002 | (0) |
| FeHCO3+ | 1.262e-06 | 1.114e-06 | -5.899 | -5.953 | -0.054 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CO3-2 | 1.109e-06 | 6.868e-07 | -5.955 | -6.163 | -0.208 | (0) |
| MgCO3 | 4.998e-07 | 5.017e-07 | -6.301 | -6.300 | 0.002 | (0) |
| FeCO3 | 2.969e-08 | 2.981e-08 | -7.527 | -7.526 | 0.002 | (0) |
| ZnHCO3+ | 1.459e-08 | 1.288e-08 | -7.836 | -7.890 | -0.054 | (0) |
| BaHCO3+ | 9.992e-09 | 8.823e-09 | -8.000 | -8.054 | -0.054 | (0) |
| NaCO3- | 6.292e-09 | 5.556e-09 | -8.201 | -8.255 | -0.054 | (0) |
| ZnCO3 | 2.268e-09 | 2.277e-09 | -8.644 | -8.643 | 0.002 | (0) |
| CuCO3 | 2.769e-10 | 2.779e-10 | -9.558 | -9.556 | 0.002 | (0) |
| CuHCO3+ | 2.634e-10 | 2.326e-10 | -9.579 | -9.633 | -0.054 | (0) |
| PbCO3 | 1.164e-10 | 1.169e-10 | -9.934 | -9.932 | 0.002 | (0) |
| CdHCO3+ | 8.212e-11 | 7.251e-11 | -10.086 | -10.140 | -0.054 | (0) |
| BaCO3 | 6.517e-11 | 6.542e-11 | -10.186 | -10.184 | 0.002 | (0) |
| Zn(CO3)2-2 | 5.499e-11 | 3.343e-11 | -10.260 | -10.476 | -0.216 | (0) |
| PbHCO3+ | 5.425e-11 | 4.790e-11 | -10.266 | -10.320 | -0.054 | (0) |
| Cu(CO3)2-2 | 3.953e-13 | 2.403e-13 | -12.403 | -12.619 | -0.216 | (0) |
| Pb(CO3)2-2 | 3.317e-13 | 2.016e-13 | -12.479 | -12.695 | -0.216 | (0) |
| CdCO3 | 2.024e-13 | 2.031e-13 | -12.694 | -12.692 | 0.002 | (0) |
| Cd(CO3)2-2 | 7.257e-16 | 4.412e-16 | -15.139 | -15.355 | -0.216 | (0) |
| Ca | 3.246e-03 | | | | | |
| Ca+2 | 2.864e-03 | 1.773e-03 | -2.543 | -2.751 | -0.208 | (0) |
| CaSO4 | 2.769e-04 | 2.780e-04 | -3.558 | -3.556 | 0.002 | (0) |
| CaHCO3+ | 1.036e-04 | 9.152e-05 | -3.984 | -4.039 | -0.054 | (0) |
| CaCO3 | 1.629e-06 | 1.635e-06 | -5.788 | -5.786 | 0.002 | (0) |
| CaOH+ | 1.267e-09 | 1.118e-09 | -8.897 | -8.951 | -0.054 | (0) |
| CaHSO4+ | 4.029e-10 | 3.557e-10 | -9.395 | -9.449 | -0.054 | (0) |
| Cd | 7.924e-10 | | | | | |
| Cd+2 | 6.126e-10 | 3.724e-10 | -9.213 | -9.429 | -0.216 | (0) |
| CdSO4 | 8.955e-11 | 8.989e-11 | -10.048 | -10.046 | 0.002 | (0) |
| CdHCO3+ | 8.212e-11 | 7.251e-11 | -10.086 | -10.140 | -0.054 | (0) |
| CdCl+ | 6.185e-12 | 5.461e-12 | -11.209 | -11.263 | -0.054 | (0) |
| Cd(SO4)2-2 | 1.726e-12 | 1.049e-12 | -11.763 | -11.979 | -0.216 | (0) |
| CdCO3 | 2.024e-13 | 2.031e-13 | -12.694 | -12.692 | 0.002 | (0) |
| CdOH+ | 3.109e-14 | 2.745e-14 | -13.507 | -13.561 | -0.054 | (0) |
| CdOHCl | 5.620e-15 | 5.642e-15 | -14.250 | -14.249 | 0.002 | (0) |
| CdCl2 | 3.460e-15 | 3.473e-15 | -14.461 | -14.459 | 0.002 | (0) |
| Cd(CO3)2-2 | 7.257e-16 | 4.412e-16 | -15.139 | -15.355 | -0.216 | (0) |
| Cd(OH)2 | 2.393e-17 | 2.403e-17 | -16.621 | -16.619 | 0.002 | (0) |
| CdCl3- | 3.028e-19 | 2.674e-19 | -18.519 | -18.573 | -0.054 | (0) |
| Cd2OH+3 | 1.960e-22 | 6.393e-23 | -21.708 | -22.194 | -0.486 | (0) |
| Cd(OH)3- | 1.160e-23 | 1.025e-23 | -22.935 | -22.989 | -0.054 | (0) |
| Cd(OH)4-2 | 5.709e-31 | 3.470e-31 | -30.243 | -30.460 | -0.216 | (0) |
| Cl | 1.863e-04 | | | | | |
| Cl- | 1.863e-04 | 1.640e-04 | -3.730 | -3.785 | -0.055 | (0) |
| MnCl+ | 2.387e-08 | 2.107e-08 | -7.622 | -7.676 | -0.054 | (0) |
| FeCl+ | 4.638e-10 | 4.095e-10 | -9.334 | -9.388 | -0.054 | (0) |
| CuCl2- | 5.916e-11 | 5.223e-11 | -10.228 | -10.282 | -0.054 | (0) |
| AgCl | 3.877e-11 | 3.892e-11 | -10.411 | -10.410 | 0.002 | (0) |
| CdCl+ | 6.185e-12 | 5.461e-12 | -11.209 | -11.263 | -0.054 | (0) |
| ZnCl+ | 3.494e-12 | 3.085e-12 | -11.457 | -11.511 | -0.054 | (0) |
| MnCl2 | 1.503e-12 | 1.509e-12 | -11.823 | -11.821 | 0.002 | (0) |
| AgCl2- | 8.305e-13 | 7.333e-13 | -12.081 | -12.135 | -0.054 | (0) |
| ZnOHCl | 3.415e-13 | 3.429e-13 | -12.467 | -12.465 | 0.002 | (0) |
| PbCl+ | 4.450e-14 | 3.929e-14 | -13.352 | -13.406 | -0.054 | (0) |
| CuCl3-2 | 2.071e-14 | 1.259e-14 | -13.684 | -13.900 | -0.216 | (0) |
| CuCl+ | 1.440e-14 | 1.272e-14 | -13.842 | -13.896 | -0.054 | (0) |
| CdOHCl | 5.620e-15 | 5.642e-15 | -14.250 | -14.249 | 0.002 | (0) |
| CdCl2 | 3.460e-15 | 3.473e-15 | -14.461 | -14.459 | 0.002 | (0) |
| ZnCl2 | 4.877e-16 | 4.895e-16 | -15.312 | -15.310 | 0.002 | (0) |
| AgCl3-2 | 1.338e-16 | 8.136e-17 | -15.873 | -16.090 | -0.216 | (0) |
| MnCl3- | 7.716e-17 | 6.813e-17 | -16.113 | -16.167 | -0.054 | (0) |
| PbCl2 | 1.468e-17 | 1.474e-17 | -16.833 | -16.832 | 0.002 | (0) |
| CuCl2 | 9.023e-19 | 9.058e-19 | -18.045 | -18.043 | 0.002 | (0) |
| CdCl3- | 3.028e-19 | 2.674e-19 | -18.519 | -18.573 | -0.054 | (0) |
| ZnCl3- | 9.067e-20 | 8.006e-20 | -19.043 | -19.097 | -0.054 | (0) |
| AgCl4-3 | 6.786e-20 | 2.214e-20 | -19.168 | -19.655 | -0.486 | (0) |
| PbCl3- | 1.926e-21 | 1.700e-21 | -20.715 | -20.769 | -0.054 | (0) |
| FeCl+2 | 1.447e-21 | 8.794e-22 | -20.840 | -21.056 | -0.216 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| ZnCl4-2 | 9.265e-24 | 5.632e-24 | -23.033 | -23.249 | -0.216 | (0) |
| FeCl2+ | 1.359e-24 | 1.200e-24 | -23.867 | -23.921 | -0.054 | (0) |
| CuCl3- | 4.215e-25 | 3.722e-25 | -24.375 | -24.429 | -0.054 | (0) |
| PbCl4-2 | 1.888e-25 | 1.147e-25 | -24.724 | -24.940 | -0.216 | (0) |
| FeCl3 | 1.961e-29 | 1.968e-29 | -28.708 | -28.706 | 0.002 | (0) |
| CuCl4-2 | 3.194e-31 | 1.941e-31 | -30.496 | -30.712 | -0.216 | (0) |
| Cu(1) | 6.699e-09 | | | | | |
| Cu+ | 6.640e-09 | 5.863e-09 | -8.178 | -8.232 | -0.054 | (0) |
| CuCl2- | 5.916e-11 | 5.223e-11 | -10.228 | -10.282 | -0.054 | (0) |
| CuCl3-2 | 2.071e-14 | 1.259e-14 | -13.684 | -13.900 | -0.216 | (0) |
| Cu(2) | 7.032e-10 | | | | | |
| CuCO3 | 2.769e-10 | 2.779e-10 | -9.558 | -9.556 | 0.002 | (0) |
| CuHCO3+ | 2.634e-10 | 2.326e-10 | -9.579 | -9.633 | -0.054 | (0) |
| Cu+2 | 1.240e-10 | 7.536e-11 | -9.907 | -10.123 | -0.216 | (0) |
| Cu(OH)2 | 2.266e-11 | 2.274e-11 | -10.645 | -10.643 | 0.002 | (0) |
| CuSO4 | 1.263e-11 | 1.268e-11 | -10.899 | -10.897 | 0.002 | (0) |
| CuOH+ | 3.244e-12 | 2.864e-12 | -11.489 | -11.543 | -0.054 | (0) |
| Cu(CO3)2-2 | 3.953e-13 | 2.403e-13 | -12.403 | -12.619 | -0.216 | (0) |
| CuCl+ | 1.440e-14 | 1.272e-14 | -13.842 | -13.896 | -0.054 | (0) |
| Cu(OH)3- | 5.898e-18 | 5.208e-18 | -17.229 | -17.283 | -0.054 | (0) |
| CuCl2 | 9.023e-19 | 9.058e-19 | -18.045 | -18.043 | 0.002 | (0) |
| Cu2(OH)2+2 | 8.407e-19 | 5.110e-19 | -18.075 | -18.292 | -0.216 | (0) |
| Cu(OH)4-2 | 6.497e-24 | 3.949e-24 | -23.187 | -23.403 | -0.216 | (0) |
| CuCl3- | 4.215e-25 | 3.722e-25 | -24.375 | -24.429 | -0.054 | (0) |
| CuCl4-2 | 3.194e-31 | 1.941e-31 | -30.496 | -30.712 | -0.216 | (0) |
| Fe(2) | 4.480e-06 | | | | | |
| Fe+2 | 2.976e-06 | 1.809e-06 | -5.526 | -5.743 | -0.216 | (0) |
| FeHCO3+ | 1.262e-06 | 1.114e-06 | -5.899 | -5.953 | -0.054 | (0) |
| FeSO4 | 2.113e-07 | 2.121e-07 | -6.675 | -6.674 | 0.002 | (0) |
| FeCO3 | 2.969e-08 | 2.981e-08 | -7.527 | -7.526 | 0.002 | (0) |
| FeOH+ | 5.679e-10 | 5.014e-10 | -9.246 | -9.300 | -0.054 | (0) |
| FeCl+ | 4.638e-10 | 4.095e-10 | -9.334 | -9.388 | -0.054 | (0) |
| FeHSO4+ | 4.111e-13 | 3.630e-13 | -12.386 | -12.440 | -0.054 | (0) |
| Fe(OH)2 | 2.930e-15 | 2.941e-15 | -14.533 | -14.532 | 0.002 | (0) |
| Fe(OH)3- | 3.878e-19 | 3.424e-19 | -18.411 | -18.465 | -0.054 | (0) |
| Fe(3) | 2.051e-12 | | | | | |
| Fe(OH)2+ | 1.730e-12 | 1.528e-12 | -11.762 | -11.816 | -0.054 | (0) |
| Fe(OH)3 | 3.166e-13 | 3.178e-13 | -12.499 | -12.498 | 0.002 | (0) |
| FeOH+2 | 4.205e-15 | 2.556e-15 | -14.376 | -14.592 | -0.216 | (0) |
| Fe(OH)4- | 5.668e-16 | 5.005e-16 | -15.247 | -15.301 | -0.054 | (0) |
| FeSO4+ | 2.511e-18 | 2.217e-18 | -17.600 | -17.654 | -0.054 | (0) |
| Fe+3 | 1.014e-18 | 3.309e-19 | -17.994 | -18.480 | -0.486 | (0) |
| Fe(SO4)2- | 4.802e-20 | 4.240e-20 | -19.319 | -19.373 | -0.054 | (0) |
| FeCl+2 | 1.447e-21 | 8.794e-22 | -20.840 | -21.056 | -0.216 | (0) |
| FeHSO4+2 | 2.743e-24 | 1.667e-24 | -23.562 | -23.778 | -0.216 | (0) |
| FeCl2+ | 1.359e-24 | 1.200e-24 | -23.867 | -23.921 | -0.054 | (0) |
| Fe2(OH)2+4 | 2.899e-27 | 3.958e-28 | -26.538 | -27.403 | -0.865 | (0) |
| FeCl3 | 1.961e-29 | 1.968e-29 | -28.708 | -28.706 | 0.002 | (0) |
| Fe3(OH)4+5 | 1.735e-35 | 7.730e-37 | -34.761 | -36.112 | -1.351 | (0) |
| H(0) | 3.762e-18 | | | | | |
| H2 | 1.881e-18 | 1.888e-18 | -17.726 | -17.724 | 0.002 | (0) |
| K | 1.807e-04 | | | | | |
| K+ | 1.798e-04 | 1.583e-04 | -3.745 | -3.800 | -0.055 | (0) |
| KSO4- | 8.441e-07 | 7.454e-07 | -6.074 | -6.128 | -0.054 | (0) |
| Mg | 1.840e-03 | | | | | |
| Mg+2 | 1.625e-03 | 1.016e-03 | -2.789 | -2.993 | -0.204 | (0) |
| MgSO4 | 1.350e-04 | 1.356e-04 | -3.870 | -3.868 | 0.002 | (0) |
| MgHCO3+ | 7.933e-05 | 7.005e-05 | -4.101 | -4.155 | -0.054 | (0) |
| MgCO3 | 4.998e-07 | 5.017e-07 | -6.301 | -6.300 | 0.002 | (0) |
| MgOH+ | 2.697e-09 | 2.381e-09 | -8.569 | -8.623 | -0.054 | (0) |
| Mn(2) | 7.687e-05 | | | | | |
| Mn+2 | 5.190e-05 | 3.155e-05 | -4.285 | -4.501 | -0.216 | (0) |
| MnHCO3+ | 1.961e-05 | 1.731e-05 | -4.708 | -4.762 | -0.054 | (0) |
| MnSO4 | 3.627e-06 | 3.641e-06 | -5.440 | -5.439 | 0.002 | (0) |
| MnCO3 | 1.714e-06 | 1.721e-06 | -5.766 | -5.764 | 0.002 | (0) |
| MnCl+ | 2.387e-08 | 2.107e-08 | -7.622 | -7.676 | -0.054 | (0) |
| MnOH+ | 7.044e-10 | 6.220e-10 | -9.152 | -9.206 | -0.054 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| MnCl2 | | 1.503e-12 | 1.509e-12 | -11.823 | -11.821 | 0.002 | (0) |
| MnCl3- | | 7.716e-17 | 6.813e-17 | -16.113 | -16.167 | -0.054 | (0) |
| Mn(OH)3- | | 3.109e-20 | 2.745e-20 | -19.507 | -19.561 | -0.054 | (0) |
| Mn(3) | 9.540e-31 | | | | | | |
| Mn+3 | | 9.540e-31 | 3.112e-31 | -30.020 | -30.507 | -0.486 | (0) |
| Mn(6) | 0.000e+00 | | | | | | |
| MnO4-2 | | 0.000e+00 | 0.000e+00 | -74.329 | -74.545 | -0.216 | (0) |
| Mn(7) | 0.000e+00 | | | | | | |
| MnO4- | | 0.000e+00 | 0.000e+00 | -84.409 | -84.463 | -0.054 | (0) |
| Na | 1.332e-03 | | | | | | |
| Na+ | | 1.322e-03 | 1.170e-03 | -2.879 | -2.932 | -0.053 | (0) |
| NaSO4- | | 5.532e-06 | 4.884e-06 | -5.257 | -5.311 | -0.054 | (0) |
| NaHCO3 | | 4.034e-06 | 4.049e-06 | -5.394 | -5.393 | 0.002 | (0) |
| NaCO3- | | 6.292e-09 | 5.556e-09 | -8.201 | -8.255 | -0.054 | (0) |
| O(0) | 0.000e+00 | | | | | | |
| O2 | | 0.000e+00 | 0.000e+00 | -63.270 | -63.269 | 0.002 | (0) |
| Pb | 1.932e-10 | | | | | | |
| PbCO3 | | 1.164e-10 | 1.169e-10 | -9.934 | -9.932 | 0.002 | (0) |
| PbHCO3+ | | 5.425e-11 | 4.790e-11 | -10.266 | -10.320 | -0.054 | (0) |
| Pb+2 | | 1.611e-11 | 9.793e-12 | -10.793 | -11.009 | -0.216 | (0) |
| PbSO4 | | 5.178e-12 | 5.198e-12 | -11.286 | -11.284 | 0.002 | (0) |
| PbOH+ | | 8.219e-13 | 7.257e-13 | -12.085 | -12.139 | -0.054 | (0) |
| Pb(CO3)2-2 | | 3.317e-13 | 2.016e-13 | -12.479 | -12.695 | -0.216 | (0) |
| PbCl+ | | 4.450e-14 | 3.929e-14 | -13.352 | -13.406 | -0.054 | (0) |
| Pb(SO4)2-2 | | 4.235e-14 | 2.574e-14 | -13.373 | -13.589 | -0.216 | (0) |
| Pb(OH)2 | | 1.069e-15 | 1.073e-15 | -14.971 | -14.969 | 0.002 | (0) |
| PbCl2 | | 1.468e-17 | 1.474e-17 | -16.833 | -16.832 | 0.002 | (0) |
| Pb(OH)3- | | 5.303e-20 | 4.682e-20 | -19.275 | -19.330 | -0.054 | (0) |
| PbCl3- | | 1.926e-21 | 1.700e-21 | -20.715 | -20.769 | -0.054 | (0) |
| Pb2OH+3 | | 4.877e-22 | 1.591e-22 | -21.312 | -21.798 | -0.486 | (0) |
| Pb(OH)4-2 | | 6.707e-25 | 4.077e-25 | -24.173 | -24.390 | -0.216 | (0) |
| PbCl4-2 | | 1.888e-25 | 1.147e-25 | -24.724 | -24.940 | -0.216 | (0) |
| Pb3(OH)4+2 | | 2.235e-32 | 1.359e-32 | -31.651 | -31.867 | -0.216 | (0) |
| S(6) | 1.959e-03 | | | | | | |
| SO4-2 | | 1.536e-03 | 9.438e-04 | -2.814 | -3.025 | -0.212 | (0) |
| CaSO4 | | 2.769e-04 | 2.780e-04 | -3.558 | -3.556 | 0.002 | (0) |
| MgSO4 | | 1.350e-04 | 1.356e-04 | -3.870 | -3.868 | 0.002 | (0) |
| NaSO4- | | 5.532e-06 | 4.884e-06 | -5.257 | -5.311 | -0.054 | (0) |
| MnSO4 | | 3.627e-06 | 3.641e-06 | -5.440 | -5.439 | 0.002 | (0) |
| KSO4- | | 8.441e-07 | 7.454e-07 | -6.074 | -6.128 | -0.054 | (0) |
| FeSO4 | | 2.113e-07 | 2.121e-07 | -6.675 | -6.674 | 0.002 | (0) |
| BaSO4 | | 1.258e-07 | 1.263e-07 | -6.900 | -6.899 | 0.002 | (0) |
| HSO4- | | 1.890e-08 | 1.669e-08 | -7.724 | -7.778 | -0.054 | (0) |
| ZnSO4 | | 3.148e-09 | 3.160e-09 | -8.502 | -8.500 | 0.002 | (0) |
| CaHSO4+ | | 4.029e-10 | 3.557e-10 | -9.395 | -9.449 | -0.054 | (0) |
| CdSO4 | | 8.955e-11 | 8.989e-11 | -10.048 | -10.046 | 0.002 | (0) |
| Zn(SO4)2-2 | | 4.639e-11 | 2.820e-11 | -10.334 | -10.550 | -0.216 | (0) |
| CuSO4 | | 1.263e-11 | 1.268e-11 | -10.899 | -10.897 | 0.002 | (0) |
| PbSO4 | | 5.178e-12 | 5.198e-12 | -11.286 | -11.284 | 0.002 | (0) |
| Cd(SO4)2-2 | | 1.726e-12 | 1.049e-12 | -11.763 | -11.979 | -0.216 | (0) |
| AgSO4- | | 1.671e-12 | 1.476e-12 | -11.777 | -11.831 | -0.054 | (0) |
| FeHSO4+ | | 4.111e-13 | 3.630e-13 | -12.386 | -12.440 | -0.054 | (0) |
| Pb(SO4)2-2 | | 4.235e-14 | 2.574e-14 | -13.373 | -13.589 | -0.216 | (0) |
| FeSO4+ | | 2.511e-18 | 2.217e-18 | -17.600 | -17.654 | -0.054 | (0) |
| Fe(SO4)2- | | 4.802e-20 | 4.240e-20 | -19.319 | -19.373 | -0.054 | (0) |
| FeHSO4+2 | | 2.743e-24 | 1.667e-24 | -23.562 | -23.778 | -0.216 | (0) |
| Se(-2) | 2.863e-19 | | | | | | |
| HSe- | | 2.855e-19 | 2.521e-19 | -18.544 | -18.598 | -0.054 | (0) |
| H2Se | | 7.512e-22 | 7.540e-22 | -21.124 | -21.123 | 0.002 | (0) |
| Se(4) | 2.662e-09 | | | | | | |
| HSeO3- | | 2.616e-09 | 2.310e-09 | -8.582 | -8.636 | -0.054 | (0) |
| SeO3-2 | | 4.568e-11 | 2.777e-11 | -10.340 | -10.556 | -0.216 | (0) |
| H2SeO3 | | 3.403e-13 | 3.416e-13 | -12.468 | -12.466 | 0.002 | (0) |
| Se(6) | 1.154e-26 | | | | | | |
| SeO4-2 | | 1.154e-26 | 7.017e-27 | -25.938 | -26.154 | -0.216 | (0) |
| HSeO4- | | 5.536e-32 | 4.889e-32 | -31.257 | -31.311 | -0.054 | (0) |
| Zn | 4.746e-08 | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zn+2 | 2.733e-08 | 1.661e-08 | -7.563 | -7.780 | -0.216 | (0) |
| ZnHCO3+ | 1.459e-08 | 1.288e-08 | -7.836 | -7.890 | -0.054 | (0) |
| ZnSO4 | 3.148e-09 | 3.160e-09 | -8.502 | -8.500 | 0.002 | (0) |
| ZnCO3 | 2.268e-09 | 2.277e-09 | -8.644 | -8.643 | 0.002 | (0) |
| Zn(CO3)2-2 | 5.499e-11 | 3.343e-11 | -10.260 | -10.476 | -0.216 | (0) |
| Zn(SO4)2-2 | 4.639e-11 | 2.820e-11 | -10.334 | -10.550 | -0.216 | (0) |
| ZnOH+ | 1.768e-11 | 1.562e-11 | -10.752 | -10.806 | -0.054 | (0) |
| ZnCl+ | 3.494e-12 | 3.085e-12 | -11.457 | -11.511 | -0.054 | (0) |
| Zn(OH)2 | 3.010e-12 | 3.021e-12 | -11.521 | -11.520 | 0.002 | (0) |
| ZnOHCl | 3.415e-13 | 3.429e-13 | -12.467 | -12.465 | 0.002 | (0) |
| ZnCl2 | 4.877e-16 | 4.895e-16 | -15.312 | -15.310 | 0.002 | (0) |
| Zn(OH)3- | 4.112e-17 | 3.631e-17 | -16.386 | -16.440 | -0.054 | (0) |
| ZnCl3- | 9.067e-20 | 8.006e-20 | -19.043 | -19.097 | -0.054 | (0) |
| Zn(OH)4-2 | 3.598e-23 | 2.187e-23 | -22.444 | -22.660 | -0.216 | (0) |
| ZnCl4-2 | 9.265e-24 | 5.632e-24 | -23.033 | -23.249 | -0.216 | (0) |

------------------------------Saturation indices-------------------------------

| Phase | SI** | log IAP | log K(279 K, 1 atm) | |
|---|---|---|---|---|
| Ag2CO3 | -14.68 | -26.21 | -11.53 | Ag2CO3 |
| Ag2O | -19.97 | -6.89 | 13.08 | Ag2O |
| Ag2SO4 | -17.95 | -23.07 | -5.13 | Ag2SO4 |
| AgMetal | 3.95 | -10.77 | -14.73 | Ag |
| Anglesite | -6.14 | -14.03 | -7.89 | PbSO4 |
| Anhydrite | -1.43 | -5.78 | -4.34 | CaSO4 |
| Antlerite | -15.36 | -7.07 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.67 | -8.91 | -8.24 | CaCO3 |
| Arsenolite | -15.00 | -16.73 | -1.73 | As2O3 |
| Artinite | -9.98 | 1.01 | 10.99 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -37.59 | -28.99 | 8.59 | As2O5 |
| As_native | -16.49 | -30.35 | -13.86 | As |
| Atacamite | -12.53 | -4.29 | 8.24 | Cu2(OH)3Cl |
| Azurite | -13.71 | -8.47 | 5.24 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -1.22 | -51.79 | -50.57 | Ba3(AsO4)2 |
| Barite | 0.72 | -9.60 | -10.32 | BaSO4 |
| BaSeO3 | -10.74 | -17.13 | -6.39 | BaSeO3 |
| Bianchite | -9.05 | -10.81 | -1.76 | ZnSO4:6H2O |
| Birnessite | -20.28 | 23.32 | 43.60 | MnO2 |
| Bixbyite | -21.66 | -21.53 | 0.12 | Mn2O3 |
| Brochantite | -19.38 | -4.04 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.98 | 10.17 | 18.15 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -21.42 | -40.32 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.52 | -8.91 | -8.40 | CaCO3 |
| CaSeO3 | -7.71 | -13.31 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.39 | -10.93 | 14.47 | Cd |
| Cd(OH)2 | -9.92 | 3.73 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -11.00 | 3.73 | 14.73 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.89 | -21.18 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -27.55 | -4.99 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -29.66 | -1.26 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -16.54 | -17.00 | -0.46 | CdCl2 |
| CdCl2:2.5H2O | -14.98 | -17.00 | -2.02 | CdCl2:2.5H2O |
| CdCl2:H2O | -15.38 | -17.00 | -1.62 | CdCl2:H2O |
| CdMetal | -25.29 | -10.93 | 14.36 | Cd |
| CdOHCl | -10.51 | -6.63 | 3.88 | CdOHCl |
| CdSO4 | -13.07 | -12.45 | 0.61 | CdSO4 |
| CdSO4:2.7H2O | -10.79 | -12.45 | -1.67 | CdSO4:2.67H2O |
| CdSO4:H2O | -11.16 | -12.45 | -1.29 | CdSO4:H2O |
| Cerargyrite | -3.30 | -13.81 | -10.51 | AgCl |
| Cerrusite | -3.81 | -17.17 | -13.36 | PbCO3 |
| Chalcanthite | -10.44 | -13.15 | -2.71 | CuSO4:5H2O |
| Claudetite | -15.06 | -16.73 | -1.67 | As2O3 |
| CO2(g) | -1.07 | -2.29 | -1.22 | CO2 |
| Cotunnite | -13.54 | -18.58 | -5.04 | PbCl2 |
| Cu(OH)2 | -6.34 | 3.04 | 9.38 | Cu(OH)2 |
| Cu2SO4 | -17.76 | -19.49 | -1.73 | Cu2SO4 |

| | | | | |
|---|---|---|---|---|
| Cu3(AsO4)2:6w | -27.31 | -62.44 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -6.66 | -16.29 | -9.63 | CuCO3 |
| CuMetal | 0.61 | -8.98 | -9.59 | Cu |
| CuOCuSO4 | -23.36 | -10.11 | 13.25 | CuO:CuSO4 |
| CupricFerrite | -2.19 | 5.56 | 7.75 | CuFe2O4 |
| Cuprite | -1.45 | -3.30 | -1.85 | Cu2O |
| CuprousFerrite | 8.34 | -0.39 | -8.74 | CuFeO2 |
| CuSO4 | -17.03 | -13.15 | 3.89 | CuSO4 |
| Dolomite | -1.44 | -18.07 | -16.63 | CaMg(CO3)2 |
| Dolomite(d) | -2.07 | -18.07 | -16.00 | CaMg(CO3)2 |
| Epsomite | -3.74 | -6.02 | -2.28 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.19 | -1.85 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -3.63 | 1.26 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -33.20 | -68.63 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -10.29 | 9.94 | 20.22 | Fe3(OH)8 |
| FeSe2 | -9.70 | -28.28 | -18.58 | FeSe2 |
| Goethite | 1.56 | 1.26 | -0.30 | FeOOH |
| Goslarite | -8.69 | -10.81 | -2.12 | ZnSO4:7H2O |
| Gypsum | -1.18 | -5.78 | -4.60 | CaSO4:2H2O |
| H2(g) | -14.66 | -17.72 | -3.07 | H2 |
| H2O(g) | -2.02 | -0.00 | 2.02 | H2O |
| Halite | -8.25 | -6.72 | 1.54 | NaCl |
| Hausmannite | -25.25 | 40.64 | 65.89 | Mn3O4 |
| Hematite | 5.04 | 2.52 | -2.52 | Fe2O3 |
| Huntite | -7.66 | -36.38 | -28.72 | CaMg3(CO3)4 |
| Hydrocerrusite | -14.73 | -32.19 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -20.22 | -26.46 | -6.24 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -20.99 | 9.32 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -23.38 | 9.32 | 32.70 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -16.51 | -26.34 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -18.11 | -25.81 | -7.70 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -21.41 | -24.94 | -3.53 | NaFe3(SO4)2(OH)6 |
| JarositeH | -25.86 | -28.59 | -2.73 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -22.74 | -4.04 | 18.70 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.91 | -11.88 | 0.03 | PbO:PbSO4 |
| Laurionite | -8.84 | -8.21 | 0.62 | PbOHCl |
| Litharge | -11.36 | 2.15 | 13.51 | PbO |
| Maghemite | -3.87 | 2.52 | 6.39 | Fe2O3 |
| Magnesite | -1.43 | -9.16 | -7.73 | MgCO3 |
| Magnetite | 3.76 | 9.94 | 6.17 | Fe3O4 |
| Malachite | -8.82 | -2.72 | 6.10 | Cu2(OH)2CO3 |
| Manganite | -9.35 | 15.99 | 25.34 | MnOOH |
| Massicot | -11.57 | 2.15 | 13.72 | PbO |
| Melanothallite | -22.02 | -17.69 | 4.32 | CuCl2 |
| Melanterite | -6.31 | -8.77 | -2.46 | FeSO4:7H2O |
| Minium | -57.54 | 21.11 | 78.65 | Pb3O4 |
| Mirabilite | -6.86 | -8.89 | -2.03 | Na2SO4:10H2O |
| Mn2(SO4)3 | -66.26 | -70.09 | -3.83 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -16.86 | -45.57 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -13.94 | -12.07 | 1.87 | MnCl2:4H2O |
| MnSO4 | -10.94 | -7.53 | 3.42 | MnSO4 |
| Monteponite | -11.23 | 3.73 | 14.97 | CdO |
| Nahcolite | -4.42 | -5.14 | -0.73 | NaHCO3 |
| Nantokite | -4.78 | -12.02 | -7.24 | CuCl |
| Natron | -9.96 | -12.03 | -2.07 | Na2CO3:10H2O |
| Nesquehonite | -3.82 | -9.16 | -5.34 | MgCO3:3H2O |
| Nsutite | -19.25 | 23.32 | 42.56 | MnO2 |
| O2(g) | -60.54 | -63.27 | -2.73 | O2 |
| Otavite | -3.59 | -15.59 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.67 | 2.15 | 8.83 | Pb(OH)2 |
| Pb2(OH)3Cl | -14.86 | -6.06 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -21.90 | 4.30 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -42.08 | 18.96 | 61.04 | Pb2O3 |
| Pb2OCO3 | -15.07 | -15.02 | 0.05 | PbO:PbCO3 |
| Pb3(AsO4)2 | -29.69 | -65.09 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -25.17 | -12.87 | 12.30 | PbCO3:2PbO |
| Pb3O2SO4 | -21.13 | -9.73 | 11.40 | PbSO4:2PbO |

| | | | | |
|---|---|---|---|---|
| Pb4(OH)6SO4 | -28.68 | -7.58 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -31.37 | -7.58 | 23.79 | PbSO4:3PbO |
| PbMetal | -16.76 | -12.51 | 4.25 | Pb |
| PbO:0.3H2O | -10.83 | 2.15 | 12.98 | PbO:0.33H2O |
| Phosgenite | -15.94 | -35.75 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -35.90 | 16.81 | 52.71 | PbO2 |
| Portlandite | -13.89 | 10.41 | 24.30 | Ca(OH)2 |
| Pyrochroite | -6.54 | 8.66 | 15.20 | Mn(OH)2 |
| Pyrolusite | -21.21 | 23.32 | 44.52 | MnO2 |
| Rhodochrosite | 0.40 | -10.66 | -11.06 | MnCO3 |
| Rhodochrosite(d) | -0.27 | -10.66 | -10.39 | MnCO3 |
| Scorodite | -14.26 | -34.51 | -20.25 | FeAsO4:2H2O |
| Se(s) | 6.80 | -10.52 | -17.32 | Se |
| SeO2 | -15.34 | -23.72 | -8.38 | SeO2 |
| Siderite | -1.14 | -11.91 | -10.77 | FeCO3 |
| Siderite(d)(3) | -1.46 | -11.91 | -10.45 | FeCO3 |
| Smithsonite | -4.15 | -13.94 | -9.79 | ZnCO3 |
| Smithsonite_PG | -3.16 | -13.94 | -10.78 | ZnCO3 |
| Tenorite | -5.32 | 3.04 | 8.36 | CuO |
| Thenardite | -8.74 | -8.89 | -0.15 | Na2SO4 |
| Thermonatrite | -12.29 | -12.03 | 0.26 | Na2CO3:H2O |
| Trona | -17.24 | -17.17 | 0.07 | NaHCO3:Na2CO3:2H2O |
| Witherite | -4.07 | -12.74 | -8.66 | BaCO3 |
| Zincite(c) | -6.81 | 5.38 | 12.20 | ZnO |
| Zincosite | -14.74 | -10.80 | 3.94 | ZnSO4 |
| Zn(OH)2-a | -7.07 | 5.38 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -6.37 | 5.38 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -6.82 | 5.38 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -6.12 | 5.38 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -6.33 | 5.38 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -12.92 | -5.42 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -14.80 | 0.40 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -27.86 | -55.40 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -38.24 | -16.23 | 22.01 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -23.06 | 5.34 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -32.33 | 6.17 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -23.22 | -15.35 | 7.87 | ZnCl2 |
| ZnCO3:1H2O | -3.68 | -13.94 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -3.68 | -13.94 | -10.26 | ZnCO3:H2O |
| ZnMetal | -36.81 | -9.28 | 27.53 | Zn |
| ZnO(a) | -5.93 | 5.38 | 11.31 | ZnO |
| ZnSO4:H2O | -10.75 | -10.80 | -0.06 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 4. MW-1013B

-----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.488e-10 | 1.488e-10 |
| Alkalinity | 1.150e-02 | 1.150e-02 |
| As | 1.044e-08 | 1.044e-08 |
| Ba | 1.037e-07 | 1.037e-07 |
| Ca | 1.521e-02 | 1.521e-02 |
| Cd | 7.139e-09 | 7.139e-09 |
| Cl | 1.021e-03 | 1.021e-03 |
| Cu | 7.134e-06 | 7.134e-06 |
| Fe | 8.279e-07 | 8.279e-07 |
| K | 1.460e-04 | 1.460e-04 |
| Mg | 5.693e-03 | 5.693e-03 |
| Mn | 4.929e-04 | 4.929e-04 |
| Na | 1.095e-03 | 1.095e-03 |
| Pb | 1.936e-10 | 1.936e-10 |
| S(6) | 1.629e-02 | 1.629e-02 |

| | | |
|---|---|---|
| Se | 1.118e-08 | 1.118e-08 |
| Zn | 1.933e-06 | 1.933e-06 |

----------------------------Description of solution----------------------------

| | | |
|---|---|---|
| pH | = | 6.160 |
| pe | = | 2.411 |
| Activity of water | = | 0.999 |
| Ionic strength (mol/kgw) | = | 5.840e-02 |
| Mass of water (kg) | = | 1.000e+00 |
| Total carbon (mol/kg) | = | 2.902e-02 |
| Total CO2 (mol/kg) | = | 2.902e-02 |
| Temperature (°C) | = | 9.67 |
| Electrical balance (eq) | = | -1.039e-03 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = | -1.59 |
| Iterations | = | 10 |
| Total H | = | 1.110239e+02 |
| Total O | = | 5.564090e+01 |

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 8.135e-07 | 6.918e-07 | -6.090 | -6.160 | -0.070 | 0.00 |
| OH- | 5.024e-09 | 4.102e-09 | -8.299 | -8.387 | -0.088 | (0) |
| H2O | 5.551e+01 | 9.989e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.488e-10 | | | | | |
| AgCl | 8.261e-11 | 8.373e-11 | -10.083 | -10.077 | 0.006 | (0) |
| Ag+ | 5.239e-11 | 4.276e-11 | -10.281 | -10.369 | -0.088 | (0) |
| AgCl2- | 9.463e-12 | 7.725e-12 | -11.024 | -11.112 | -0.088 | (0) |
| AgSO4- | 4.299e-12 | 3.510e-12 | -11.367 | -11.455 | -0.088 | (0) |
| AgCl3-2 | 1.046e-14 | 4.646e-15 | -13.980 | -14.333 | -0.353 | (0) |
| AgOH | 6.092e-17 | 6.175e-17 | -16.215 | -16.209 | 0.006 | (0) |
| AgCl4-3 | 3.941e-17 | 6.344e-18 | -16.404 | -17.198 | -0.793 | (0) |
| Ag(OH)2- | 1.092e-22 | 8.916e-23 | -21.962 | -22.050 | -0.088 | (0) |
| As(3) | 1.752e-09 | | | | | |
| H3AsO3 | 1.751e-09 | 1.775e-09 | -8.757 | -8.751 | 0.006 | (0) |
| H2AsO3- | 1.218e-12 | 9.946e-13 | -11.914 | -12.002 | -0.088 | (0) |
| H4AsO3+ | 7.453e-16 | 6.084e-16 | -15.128 | -15.216 | -0.088 | (0) |
| HAsO3-2 | 3.218e-21 | 1.429e-21 | -20.492 | -20.845 | -0.353 | (0) |
| AsO3-3 | 1.472e-30 | 2.369e-31 | -29.832 | -30.625 | -0.793 | (0) |
| As(5) | 8.690e-09 | | | | | |
| H2AsO4- | 7.418e-09 | 6.056e-09 | -8.130 | -8.218 | -0.088 | (0) |
| HAsO4-2 | 1.271e-09 | 5.644e-10 | -8.896 | -9.248 | -0.353 | (0) |
| H3AsO4 | 7.067e-13 | 7.162e-13 | -12.151 | -12.145 | 0.006 | (0) |
| AsO4-3 | 7.620e-15 | 1.227e-15 | -14.118 | -14.911 | -0.793 | (0) |
| Ba | 1.037e-07 | | | | | |
| BaSO4 | 5.262e-08 | 5.333e-08 | -7.279 | -7.273 | 0.006 | (0) |
| Ba+2 | 4.968e-08 | 2.206e-08 | -7.304 | -7.656 | -0.353 | (0) |
| BaHCO3+ | 1.400e-09 | 1.143e-09 | -8.854 | -8.942 | -0.088 | (0) |
| BaCO3 | 3.370e-12 | 3.416e-12 | -11.472 | -11.467 | 0.006 | (0) |
| BaOH+ | 1.322e-15 | 1.079e-15 | -14.879 | -14.967 | -0.088 | (0) |
| C(4) | 2.902e-02 | | | | | |
| CO2 | 1.752e-02 | 1.776e-02 | -1.756 | -1.751 | 0.006 | (0) |
| HCO3- | 1.064e-02 | 8.759e-03 | -1.973 | -2.058 | -0.084 | (0) |
| CaHCO3+ | 4.876e-04 | 3.981e-04 | -3.312 | -3.400 | -0.088 | (0) |
| MgHCO3+ | 2.311e-04 | 1.887e-04 | -3.636 | -3.724 | -0.088 | (0) |
| MnHCO3+ | 1.219e-04 | 9.953e-05 | -3.914 | -4.002 | -0.088 | (0) |
| NaHCO3 | 4.245e-06 | 4.303e-06 | -5.372 | -5.366 | 0.006 | (0) |
| MnCO3 | 4.075e-06 | 4.130e-06 | -5.390 | -5.384 | 0.006 | (0) |
| CuHCO3+ | 2.874e-06 | 2.346e-06 | -5.542 | -5.630 | -0.088 | (0) |
| CaCO3 | 2.703e-06 | 2.739e-06 | -5.568 | -5.562 | 0.006 | (0) |
| CuCO3 | 1.155e-06 | 1.170e-06 | -5.938 | -5.932 | 0.006 | (0) |
| CO3-2 | 8.868e-07 | 4.077e-07 | -6.052 | -6.390 | -0.337 | (0) |
| MgCO3 | 5.826e-07 | 5.905e-07 | -6.235 | -6.229 | 0.006 | (0) |
| ZnHCO3+ | 5.473e-07 | 4.468e-07 | -6.262 | -6.350 | -0.088 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| FeHCO3+ | 2.240e-07 | 1.829e-07 | -6.650 | -6.738 | -0.088 | (0) |
| ZnCO3 | 3.252e-08 | 3.296e-08 | -7.488 | -7.482 | 0.006 | (0) |
| NaCO3- | 3.596e-09 | 2.935e-09 | -8.444 | -8.532 | -0.088 | (0) |
| FeCO3 | 2.015e-09 | 2.042e-09 | -8.696 | -8.690 | 0.006 | (0) |
| BaHCO3+ | 1.400e-09 | 1.143e-09 | -8.854 | -8.942 | -0.088 | (0) |
| Cu(CO3)2-2 | 1.353e-09 | 6.008e-10 | -8.869 | -9.221 | -0.353 | (0) |
| Zn(CO3)2-2 | 6.471e-10 | 2.874e-10 | -9.189 | -9.542 | -0.353 | (0) |
| CdHCO3+ | 5.919e-10 | 4.832e-10 | -9.228 | -9.316 | -0.088 | (0) |
| PbHCO3+ | 7.982e-11 | 6.516e-11 | -10.098 | -10.186 | -0.088 | (0) |
| PbCO3 | 6.548e-11 | 6.637e-11 | -10.184 | -10.178 | 0.006 | (0) |
| BaCO3 | 3.370e-12 | 3.416e-12 | -11.472 | -11.467 | 0.006 | (0) |
| CdCO3 | 5.575e-13 | 5.650e-13 | -12.254 | -12.248 | 0.006 | (0) |
| Pb(CO3)2-2 | 1.531e-13 | 6.797e-14 | -12.815 | -13.168 | -0.353 | (0) |
| Cd(CO3)2-2 | 1.641e-15 | 7.285e-16 | -14.785 | -15.138 | -0.353 | (0) |
| Ca | 1.521e-02 | | | | | |
| Ca+2 | 1.069e-02 | 4.939e-03 | -1.971 | -2.306 | -0.335 | (0) |
| CaSO4 | 4.033e-03 | 4.087e-03 | -2.394 | -2.389 | 0.006 | (0) |
| CaHCO3+ | 4.876e-04 | 3.981e-04 | -3.312 | -3.400 | -0.088 | (0) |
| CaCO3 | 2.703e-06 | 2.739e-06 | -5.568 | -5.562 | 0.006 | (0) |
| CaHSO4+ | 1.727e-08 | 1.410e-08 | -7.763 | -7.851 | -0.088 | (0) |
| CaOH+ | 1.450e-09 | 1.183e-09 | -8.839 | -8.927 | -0.088 | (0) |
| Cd | 7.139e-09 | | | | | |
| Cd+2 | 3.928e-09 | 1.745e-09 | -8.406 | -8.758 | -0.353 | (0) |
| CdSO4 | 2.169e-09 | 2.199e-09 | -8.664 | -8.658 | 0.006 | (0) |
| CdHCO3+ | 5.919e-10 | 4.832e-10 | -9.228 | -9.316 | -0.088 | (0) |
| Cd(SO4)2-2 | 2.890e-10 | 1.284e-10 | -9.539 | -9.892 | -0.353 | (0) |
| CdCl+ | 1.591e-10 | 1.299e-10 | -9.798 | -9.886 | -0.088 | (0) |
| CdCO3 | 5.575e-13 | 5.650e-13 | -12.254 | -12.248 | 0.006 | (0) |
| CdCl2 | 4.142e-13 | 4.198e-13 | -12.383 | -12.377 | 0.006 | (0) |
| CdOH+ | 7.742e-14 | 6.320e-14 | -13.111 | -13.199 | -0.088 | (0) |
| CdOHCl | 5.416e-14 | 5.489e-14 | -13.266 | -13.260 | 0.006 | (0) |
| Cd(CO3)2-2 | 1.641e-15 | 7.285e-16 | -14.785 | -15.138 | -0.353 | (0) |
| CdCl3- | 2.093e-16 | 1.709e-16 | -15.679 | -15.767 | -0.088 | (0) |
| Cd(OH)2 | 1.603e-17 | 1.625e-17 | -16.795 | -16.789 | 0.006 | (0) |
| Cd2OH+3 | 4.102e-21 | 6.604e-22 | -20.387 | -21.180 | -0.793 | (0) |
| Cd(OH)3- | 3.224e-24 | 2.632e-24 | -23.492 | -23.580 | -0.088 | (0) |
| Cd(OH)4-2 | 7.627e-32 | 3.387e-32 | -31.118 | -31.470 | -0.353 | (0) |
| Cl | 1.021e-03 | | | | | |
| Cl- | 1.020e-03 | 8.229e-04 | -2.991 | -3.085 | -0.093 | (0) |
| MnCl+ | 5.236e-07 | 4.274e-07 | -6.281 | -6.369 | -0.088 | (0) |
| CuCl2- | 2.552e-07 | 2.084e-07 | -6.593 | -6.681 | -0.088 | (0) |
| CuCl+ | 6.572e-10 | 5.365e-10 | -9.182 | -9.270 | -0.088 | (0) |
| CuCl3-2 | 5.750e-10 | 2.553e-10 | -9.240 | -9.593 | -0.353 | (0) |
| ZnCl+ | 5.390e-10 | 4.400e-10 | -9.268 | -9.357 | -0.088 | (0) |
| FeCl+ | 2.905e-10 | 2.371e-10 | -9.537 | -9.625 | -0.088 | (0) |
| CdCl+ | 1.591e-10 | 1.299e-10 | -9.798 | -9.886 | -0.088 | (0) |
| MnCl2 | 1.515e-10 | 1.535e-10 | -9.820 | -9.814 | 0.006 | (0) |
| AgCl | 8.261e-11 | 8.373e-11 | -10.083 | -10.077 | 0.006 | (0) |
| ZnOHCl | 1.573e-11 | 1.594e-11 | -10.803 | -10.797 | 0.006 | (0) |
| AgCl2- | 9.463e-12 | 7.725e-12 | -11.024 | -11.112 | -0.088 | (0) |
| CdCl2 | 4.142e-13 | 4.198e-13 | -12.383 | -12.377 | 0.006 | (0) |
| ZnCl2 | 3.505e-13 | 3.553e-13 | -12.455 | -12.449 | 0.006 | (0) |
| PbCl+ | 2.518e-13 | 2.055e-13 | -12.599 | -12.687 | -0.088 | (0) |
| CuCl2 | 1.964e-13 | 1.991e-13 | -12.707 | -12.701 | 0.006 | (0) |
| CdOHCl | 5.416e-14 | 5.489e-14 | -13.266 | -13.260 | 0.006 | (0) |
| MnCl3- | 4.262e-14 | 3.479e-14 | -13.370 | -13.458 | -0.088 | (0) |
| AgCl3-2 | 1.046e-14 | 4.646e-15 | -13.980 | -14.333 | -0.353 | (0) |
| ZnCl3- | 3.647e-16 | 2.977e-16 | -15.438 | -15.526 | -0.088 | (0) |
| PbCl2 | 3.576e-16 | 3.625e-16 | -15.447 | -15.441 | 0.006 | (0) |
| CdCl3- | 2.093e-16 | 1.709e-16 | -15.679 | -15.767 | -0.088 | (0) |
| AgCl4-3 | 3.941e-17 | 6.344e-18 | -16.404 | -17.198 | -0.793 | (0) |
| CuCl3- | 5.347e-19 | 4.365e-19 | -18.272 | -18.360 | -0.088 | (0) |
| PbCl3- | 2.627e-19 | 2.144e-19 | -18.581 | -18.669 | -0.088 | (0) |
| ZnCl4-2 | 2.432e-19 | 1.080e-19 | -18.614 | -18.967 | -0.353 | (0) |
| FeCl+2 | 7.101e-20 | 3.154e-20 | -19.149 | -19.501 | -0.353 | (0) |
| FeCl2+ | 2.370e-22 | 1.935e-22 | -21.625 | -21.713 | -0.088 | (0) |
| PbCl4-2 | 1.679e-22 | 7.458e-23 | -21.775 | -22.127 | -0.353 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuCl4-2 | 2.788e-24 | 1.238e-24 | -23.555 | -23.907 | -0.353 | (0) |
| FeCl3 | 1.571e-26 | 1.592e-26 | -25.804 | -25.798 | 0.006 | (0) |
| Cu(1) | 1.403e-06 | | | | | |
| Cu+ | 1.147e-06 | 9.364e-07 | -5.940 | -6.029 | -0.088 | (0) |
| CuCl2- | 2.552e-07 | 2.084e-07 | -6.593 | -6.681 | -0.088 | (0) |
| CuCl3-2 | 5.750e-10 | 2.553e-10 | -9.240 | -9.593 | -0.353 | (0) |
| Cu(2) | 5.731e-06 | | | | | |
| CuHCO3+ | 2.874e-06 | 2.346e-06 | -5.542 | -5.630 | -0.088 | (0) |
| Cu+2 | 1.204e-06 | 5.345e-07 | -5.920 | -6.272 | -0.353 | (0) |
| CuCO3 | 1.155e-06 | 1.170e-06 | -5.938 | -5.932 | 0.006 | (0) |
| CuSO4 | 4.645e-07 | 4.708e-07 | -6.333 | -6.327 | 0.006 | (0) |
| Cu(OH)2 | 2.297e-08 | 2.328e-08 | -7.639 | -7.633 | 0.006 | (0) |
| CuOH+ | 9.454e-09 | 7.717e-09 | -8.024 | -8.113 | -0.088 | (0) |
| Cu(CO3)2-2 | 1.353e-09 | 6.008e-10 | -8.869 | -9.221 | -0.353 | (0) |
| CuCl+ | 6.572e-10 | 5.365e-10 | -9.182 | -9.270 | -0.088 | (0) |
| Cu2(OH)2+2 | 1.179e-11 | 5.238e-12 | -10.928 | -11.281 | -0.353 | (0) |
| CuCl2 | 1.964e-13 | 1.991e-13 | -12.707 | -12.701 | 0.006 | (0) |
| Cu(OH)3- | 2.481e-15 | 2.026e-15 | -14.605 | -14.693 | -0.088 | (0) |
| CuCl3- | 5.347e-19 | 4.365e-19 | -18.272 | -18.360 | -0.088 | (0) |
| Cu(OH)4-2 | 1.314e-21 | 5.835e-22 | -20.881 | -21.234 | -0.353 | (0) |
| CuCl4-2 | 2.788e-24 | 1.238e-24 | -23.555 | -23.907 | -0.353 | (0) |
| Fe(2) | 8.279e-07 | | | | | |
| Fe+2 | 4.701e-07 | 2.088e-07 | -6.328 | -6.680 | -0.353 | (0) |
| FeHCO3+ | 2.240e-07 | 1.829e-07 | -6.650 | -6.738 | -0.088 | (0) |
| FeSO4 | 1.315e-07 | 1.333e-07 | -6.881 | -6.875 | 0.006 | (0) |
| FeCO3 | 2.015e-09 | 2.042e-09 | -8.696 | -8.690 | 0.006 | (0) |
| FeCl+ | 2.905e-10 | 2.371e-10 | -9.537 | -9.625 | -0.088 | (0) |
| FeOH+ | 3.491e-11 | 2.849e-11 | -10.457 | -10.545 | -0.088 | (0) |
| FeHSO4+ | 7.302e-13 | 5.961e-13 | -12.137 | -12.225 | -0.088 | (0) |
| Fe(OH)2 | 8.472e-17 | 8.587e-17 | -16.072 | -16.066 | 0.006 | (0) |
| Fe(OH)3- | 4.815e-21 | 3.930e-21 | -20.317 | -20.406 | -0.088 | (0) |
| Fe(3) | 2.617e-12 | | | | | |
| Fe(OH)2+ | 2.420e-12 | 1.975e-12 | -11.616 | -11.704 | -0.088 | (0) |
| Fe(OH)3 | 1.792e-13 | 1.817e-13 | -12.747 | -12.741 | 0.006 | (0) |
| FeOH+2 | 1.717e-14 | 7.626e-15 | -13.765 | -14.118 | -0.353 | (0) |
| Fe(OH)4- | 1.531e-16 | 1.249e-16 | -15.815 | -15.903 | -0.088 | (0) |
| FeSO4+ | 9.597e-17 | 7.835e-17 | -16.018 | -16.106 | -0.088 | (0) |
| Fe+3 | 1.316e-17 | 2.118e-18 | -16.881 | -17.674 | -0.793 | (0) |
| Fe(SO4)2- | 9.509e-18 | 7.762e-18 | -17.022 | -17.110 | -0.088 | (0) |
| FeCl+2 | 7.101e-20 | 3.154e-20 | -19.149 | -19.501 | -0.353 | (0) |
| FeHSO4+2 | 3.421e-22 | 1.519e-22 | -21.466 | -21.818 | -0.353 | (0) |
| FeCl2+ | 2.370e-22 | 1.935e-22 | -21.625 | -21.713 | -0.088 | (0) |
| Fe2(OH)2+4 | 7.848e-26 | 3.053e-27 | -25.105 | -26.515 | -1.410 | (0) |
| FeCl3 | 1.571e-26 | 1.592e-26 | -25.804 | -25.798 | 0.006 | (0) |
| Fe3(OH)4+5 | 8.938e-34 | 5.597e-36 | -33.049 | -35.252 | -2.203 | (0) |
| H(0) | 1.184e-20 | | | | | |
| H2 | 5.919e-21 | 5.999e-21 | -20.228 | -20.222 | 0.006 | (0) |
| K | 1.460e-04 | | | | | |
| K+ | 1.424e-04 | 1.148e-04 | -3.847 | -3.940 | -0.093 | (0) |
| KSO4- | 3.596e-06 | 2.935e-06 | -5.444 | -5.532 | -0.088 | (0) |
| Mg | 5.693e-03 | | | | | |
| Mg+2 | 4.048e-03 | 1.920e-03 | -2.393 | -2.717 | -0.324 | (0) |
| MgSO4 | 1.413e-03 | 1.432e-03 | -2.850 | -2.844 | 0.006 | (0) |
| MgHCO3+ | 2.311e-04 | 1.887e-04 | -3.636 | -3.724 | -0.088 | (0) |
| MgCO3 | 5.826e-07 | 5.905e-07 | -6.235 | -6.229 | 0.006 | (0) |
| MgOH+ | 2.866e-09 | 2.340e-09 | -8.543 | -8.631 | -0.088 | (0) |
| Mn(2) | 4.929e-04 | | | | | |
| Mn+2 | 2.871e-04 | 1.275e-04 | -3.542 | -3.894 | -0.353 | (0) |
| MnHCO3+ | 1.219e-04 | 9.953e-05 | -3.914 | -4.002 | -0.088 | (0) |
| MnSO4 | 7.928e-05 | 8.036e-05 | -4.101 | -4.095 | 0.006 | (0) |
| MnCO3 | 4.075e-06 | 4.130e-06 | -5.390 | -5.384 | 0.006 | (0) |
| MnCl+ | 5.236e-07 | 4.274e-07 | -6.281 | -6.369 | -0.088 | (0) |
| MnOH+ | 1.553e-09 | 1.267e-09 | -8.809 | -8.897 | -0.088 | (0) |
| MnCl2 | 1.515e-10 | 1.535e-10 | -9.820 | -9.814 | 0.006 | (0) |
| MnCl3- | 4.262e-14 | 3.479e-14 | -13.370 | -13.458 | -0.088 | (0) |
| Mn(OH)3- | 7.452e-21 | 6.083e-21 | -20.128 | -20.216 | -0.088 | (0) |
| Mn(3) | 5.951e-28 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mn+3 | 5.951e-28 | 9.580e-29 | -27.225 | -28.019 | -0.793 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -69.021 | -69.373 | -0.353 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -77.315 | -77.403 | -0.088 | (0) |
| Na | 1.095e-03 | | | | | |
| Na+ | 1.067e-03 | 8.736e-04 | -2.972 | -3.059 | -0.087 | (0) |
| NaSO4- | 2.335e-05 | 1.906e-05 | -4.632 | -4.720 | -0.088 | (0) |
| NaHCO3 | 4.245e-06 | 4.303e-06 | -5.372 | -5.366 | 0.006 | (0) |
| NaCO3- | 3.596e-09 | 2.935e-09 | -8.444 | -8.532 | -0.088 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -57.158 | -57.153 | 0.006 | (0) |
| Pb | 1.936e-10 | | | | | |
| PbHCO3+ | 7.982e-11 | 6.516e-11 | -10.098 | -10.186 | -0.088 | (0) |
| PbCO3 | 6.548e-11 | 6.637e-11 | -10.184 | -10.178 | 0.006 | (0) |
| PbSO4 | 2.507e-11 | 2.541e-11 | -10.601 | -10.595 | 0.006 | (0) |
| Pb+2 | 2.109e-11 | 9.366e-12 | -10.676 | -11.028 | -0.353 | (0) |
| Pb(SO4)2-2 | 1.448e-12 | 6.432e-13 | -11.839 | -12.192 | -0.353 | (0) |
| PbOH+ | 3.230e-13 | 2.637e-13 | -12.491 | -12.579 | -0.088 | (0) |
| PbCl+ | 2.518e-13 | 2.055e-13 | -12.599 | -12.687 | -0.088 | (0) |
| Pb(CO3)2-2 | 1.531e-13 | 6.797e-14 | -12.815 | -13.168 | -0.353 | (0) |
| PbCl2 | 3.576e-16 | 3.625e-16 | -15.447 | -15.441 | 0.006 | (0) |
| Pb(OH)2 | 1.461e-16 | 1.481e-16 | -15.835 | -15.829 | 0.006 | (0) |
| PbCl3- | 2.627e-19 | 2.144e-19 | -18.581 | -18.669 | -0.088 | (0) |
| Pb(OH)3- | 3.008e-21 | 2.456e-21 | -20.522 | -20.610 | -0.088 | (0) |
| Pb2OH+3 | 3.434e-22 | 5.529e-23 | -21.464 | -22.257 | -0.793 | (0) |
| PbCl4-2 | 1.679e-22 | 7.458e-23 | -21.775 | -22.127 | -0.353 | (0) |
| Pb(OH)4-2 | 1.829e-26 | 8.123e-27 | -25.738 | -26.090 | -0.353 | (0) |
| Pb3(OH)4+2 | 9.386e-34 | 4.168e-34 | -33.028 | -33.380 | -0.353 | (0) |
| S(6) | 1.629e-02 | | | | | |
| SO4-2 | 1.073e-02 | 4.824e-03 | -1.969 | -2.317 | -0.347 | (0) |
| CaSO4 | 4.033e-03 | 4.087e-03 | -2.394 | -2.389 | 0.006 | (0) |
| MgSO4 | 1.413e-03 | 1.432e-03 | -2.850 | -2.844 | 0.006 | (0) |
| MnSO4 | 7.928e-05 | 8.036e-05 | -4.101 | -4.095 | 0.006 | (0) |
| NaSO4- | 2.335e-05 | 1.906e-05 | -4.632 | -4.720 | -0.088 | (0) |
| KSO4- | 3.596e-06 | 2.935e-06 | -5.444 | -5.532 | -0.088 | (0) |
| CuSO4 | 4.645e-07 | 4.708e-07 | -6.333 | -6.327 | 0.006 | (0) |
| ZnSO4 | 3.992e-07 | 4.046e-07 | -6.399 | -6.393 | 0.006 | (0) |
| HSO4- | 2.909e-07 | 2.375e-07 | -6.536 | -6.624 | -0.088 | (0) |
| FeSO4 | 1.315e-07 | 1.333e-07 | -6.881 | -6.875 | 0.006 | (0) |
| BaSO4 | 5.262e-08 | 5.333e-08 | -7.279 | -7.273 | 0.006 | (0) |
| Zn(SO4)2-2 | 4.045e-08 | 1.796e-08 | -7.393 | -7.746 | -0.353 | (0) |
| CaHSO4+ | 1.727e-08 | 1.410e-08 | -7.763 | -7.851 | -0.088 | (0) |
| CdSO4 | 2.169e-09 | 2.199e-09 | -8.664 | -8.658 | 0.006 | (0) |
| Cd(SO4)2-2 | 2.890e-10 | 1.284e-10 | -9.539 | -9.892 | -0.353 | (0) |
| PbSO4 | 2.507e-11 | 2.541e-11 | -10.601 | -10.595 | 0.006 | (0) |
| AgSO4- | 4.299e-12 | 3.510e-12 | -11.367 | -11.455 | -0.088 | (0) |
| Pb(SO4)2-2 | 1.448e-12 | 6.432e-13 | -11.839 | -12.192 | -0.353 | (0) |
| FeHSO4+ | 7.302e-13 | 5.961e-13 | -12.137 | -12.225 | -0.088 | (0) |
| FeSO4+ | 9.597e-17 | 7.835e-17 | -16.018 | -16.106 | -0.088 | (0) |
| Fe(SO4)2- | 9.509e-18 | 7.762e-18 | -17.022 | -17.110 | -0.088 | (0) |
| FeHSO4+2 | 3.421e-22 | 1.519e-22 | -21.466 | -21.818 | -0.353 | (0) |
| Se(-2) | 4.336e-26 | | | | | |
| HSe- | 4.311e-26 | 3.519e-26 | -25.365 | -25.454 | -0.088 | (0) |
| H2Se | 2.461e-28 | 2.495e-28 | -27.609 | -27.603 | 0.006 | (0) |
| Se(4) | 1.118e-08 | | | | | |
| HSeO3- | 1.108e-08 | 9.046e-09 | -7.955 | -8.044 | -0.088 | (0) |
| SeO3-2 | 9.311e-11 | 4.135e-11 | -10.031 | -10.384 | -0.353 | (0) |
| H2SeO3 | 3.472e-12 | 3.519e-12 | -11.459 | -11.454 | 0.006 | (0) |
| Se(6) | 7.151e-24 | | | | | |
| SeO4-2 | 7.150e-24 | 3.175e-24 | -23.146 | -23.498 | -0.353 | (0) |
| HSeO4- | 7.850e-29 | 6.408e-29 | -28.105 | -28.193 | -0.088 | (0) |
| Zn | 1.933e-06 | | | | | |
| Zn+2 | 9.124e-07 | 4.052e-07 | -6.040 | -6.392 | -0.353 | (0) |
| ZnHCO3+ | 5.473e-07 | 4.468e-07 | -6.262 | -6.350 | -0.088 | (0) |
| ZnSO4 | 3.992e-07 | 4.046e-07 | -6.399 | -6.393 | 0.006 | (0) |
| Zn(SO4)2-2 | 4.045e-08 | 1.796e-08 | -7.393 | -7.746 | -0.353 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| ZnCO3 | 3.252e-08 | 3.296e-08 | -7.488 | -7.482 | 0.006 | (0) |
| Zn(CO3)2-2 | 6.471e-10 | 2.874e-10 | -9.189 | -9.542 | -0.353 | (0) |
| ZnCl+ | 5.390e-10 | 4.400e-10 | -9.268 | -9.357 | -0.088 | (0) |
| ZnOH+ | 2.306e-10 | 1.883e-10 | -9.637 | -9.725 | -0.088 | (0) |
| ZnOHCl | 1.573e-11 | 1.594e-11 | -10.803 | -10.797 | 0.006 | (0) |
| Zn(OH)2 | 1.049e-11 | 1.063e-11 | -10.979 | -10.973 | 0.006 | (0) |
| ZnCl2 | 3.505e-13 | 3.553e-13 | -12.455 | -12.449 | 0.006 | (0) |
| ZnCl3- | 3.647e-16 | 2.977e-16 | -15.438 | -15.526 | -0.088 | (0) |
| Zn(OH)3- | 5.948e-17 | 4.856e-17 | -16.226 | -16.314 | -0.088 | (0) |
| ZnCl4-2 | 2.432e-19 | 1.080e-19 | -18.614 | -18.967 | -0.353 | (0) |
| Zn(OH)4-2 | 2.502e-23 | 1.111e-23 | -22.602 | -22.954 | -0.353 | (0) |

------------------------------Saturation indices-------------------------------

| Phase | SI** | log IAP | log K(282 K, 1 atm) | |
|---|---|---|---|---|
| Ag2CO3 | -15.68 | -27.13 | -11.45 | Ag2CO3 |
| Ag2O | -21.41 | -8.42 | 12.99 | Ag2O |
| Ag2SO4 | -17.97 | -23.05 | -5.09 | Ag2SO4 |
| AgMetal | 1.73 | -12.78 | -14.51 | Ag |
| Anglesite | -5.47 | -13.35 | -7.88 | PbSO4 |
| Anhydrite | -0.29 | -4.62 | -4.34 | CaSO4 |
| Antlerite | -4.78 | 3.51 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.44 | -8.70 | -8.25 | CaCO3 |
| Arsenolite | -15.83 | -17.50 | -1.67 | As2O3 |
| Artinite | -10.25 | 0.49 | 10.74 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -32.82 | -24.29 | 8.53 | As2O5 |
| As_native | -20.84 | -34.46 | -13.63 | As |
| Atacamite | -5.23 | 2.85 | 8.08 | Cu2(OH)3Cl |
| Azurite | -3.27 | 1.71 | 4.98 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -2.30 | -52.79 | -50.49 | Ba3(AsO4)2 |
| Barite | 0.28 | -9.97 | -10.25 | BaSO4 |
| BaSeO3 | -11.65 | -18.04 | -6.39 | BaSeO3 |
| Bianchite | -6.95 | -8.71 | -1.76 | ZnSO4:6H2O |
| Birnessite | -18.03 | 25.57 | 43.60 | MnO2 |
| Bixbyite | -19.07 | -19.08 | -0.01 | Mn2O3 |
| Brochantite | -5.79 | 9.55 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -8.31 | 9.60 | 17.92 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -17.84 | -36.74 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.29 | -8.70 | -8.41 | CaCO3 |
| CaSeO3 | -7.09 | -12.69 | -5.60 | CaSeO3 |
| Cd(gamma) | -27.89 | -13.58 | 14.31 | Cd |
| Cd(OH)2 | -10.09 | 3.56 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.99 | 3.56 | 14.56 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -25.30 | -18.59 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -26.51 | -3.95 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -28.79 | -0.39 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.43 | -14.93 | -0.50 | CdCl2 |
| CdCl2:2.5H2O | -12.92 | -14.93 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.29 | -14.93 | -1.64 | CdCl2:H2O |
| CdMetal | -27.79 | -13.58 | 14.21 | Cd |
| CdOHCl | -9.50 | -5.68 | 3.81 | CdOHCl |
| CdSO4 | -11.56 | -11.07 | 0.49 | CdSO4 |
| CdSO4:2.7H2O | -9.37 | -11.08 | -1.70 | CdSO4:2.67H2O |
| CdSO4:H2O | -9.72 | -11.08 | -1.36 | CdSO4:H2O |
| Cerargyrite | -3.08 | -13.45 | -10.37 | AgCl |
| Cerrusite | -4.09 | -17.42 | -13.32 | PbCO3 |
| Chalcanthite | -5.89 | -8.59 | -2.70 | CuSO4:5H2O |
| Claudetite | -15.89 | -17.50 | -1.61 | As2O3 |
| CO2(g) | -0.49 | -1.75 | -1.26 | CO2 |
| Cotunnite | -12.21 | -17.20 | -4.99 | PbCl2 |
| Cu(OH)2 | -3.20 | 6.05 | 9.25 | Cu(OH)2 |
| Cu2SO4 | -12.60 | -14.37 | -1.77 | Cu2SO4 |
| Cu3(AsO4)2:6w | -13.52 | -48.64 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -3.03 | -12.66 | -9.63 | CuCO3 |
| CuMetal | 1.00 | -8.44 | -9.44 | Cu |
| CuOCuSO4 | -15.48 | -2.54 | 12.94 | CuO:CuSO4 |

| | | | | |
|---|---|---|---|---|
| CupricFerrite | 0.24 | 7.66 | 7.42 | CuFe2O4 |
| Cuprite | 2.06 | 0.26 | -1.80 | Cu2O |
| CuprousFerrite | 9.71 | 0.94 | -8.77 | CuFeO2 |
| CuSO4 | -12.32 | -8.59 | 3.73 | CuSO4 |
| Dolomite | -1.09 | -17.80 | -16.72 | CaMg(CO3)2 |
| Dolomite(d) | -1.70 | -17.80 | -16.10 | CaMg(CO3)2 |
| Epsomite | -2.78 | -5.04 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.07 | -1.97 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.09 | 0.80 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -31.07 | -66.50 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -12.97 | 7.25 | 20.22 | Fe3(OH)8 |
| FeSe2 | -21.87 | -40.45 | -18.58 | FeSe2 |
| Goethite | 1.23 | 0.81 | -0.42 | FeOOH |
| Goslarite | -6.62 | -8.71 | -2.09 | ZnSO4:7H2O |
| Gypsum | -0.03 | -4.62 | -4.59 | CaSO4:2H2O |
| H2(g) | -17.14 | -20.22 | -3.08 | H2 |
| H2O(g) | -1.93 | -0.00 | 1.93 | H2O |
| Halite | -7.69 | -6.14 | 1.55 | NaCl |
| Hausmannite | -22.61 | 42.42 | 65.03 | Mn3O4 |
| Hematite | 4.39 | 1.61 | -2.78 | Fe2O3 |
| Huntite | -7.07 | -36.01 | -28.94 | CaMg3(CO3)4 |
| Hydrocerrusite | -16.09 | -33.55 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -20.14 | -26.82 | -6.69 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -17.11 | 13.20 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -18.93 | 13.20 | 32.13 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.23 | -25.06 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -16.67 | -24.64 | -7.97 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -19.91 | -23.76 | -3.84 | NaFe3(SO4)2(OH)6 |
| JarositeH | -23.66 | -26.86 | -3.20 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -8.81 | 9.55 | 18.36 | Cu4(OH)6SO4:H2O |
| Larnakite | -12.03 | -12.05 | -0.02 | PbO:PbSO4 |
| Laurionite | -8.58 | -7.95 | 0.62 | PbOHCl |
| Litharge | -12.08 | 1.29 | 13.37 | PbO |
| Maghemite | -4.78 | 1.61 | 6.39 | Fe2O3 |
| Magnesite | -1.32 | -9.11 | -7.78 | MgCO3 |
| Magnetite | 1.51 | 7.25 | 5.74 | Fe3O4 |
| Malachite | -2.06 | 3.88 | 5.94 | Cu2(OH)2CO3 |
| Manganite | -8.34 | 17.00 | 25.34 | MnOOH |
| Massicot | -12.29 | 1.29 | 13.58 | PbO |
| Melanothallite | -16.66 | -12.44 | 4.22 | CuCl2 |
| Melanterite | -6.59 | -9.00 | -2.41 | FeSO4:7H2O |
| Minium | -56.76 | 21.01 | 77.77 | Pb3O4 |
| Mirabilite | -6.57 | -8.44 | -1.87 | Na2SO4:10H2O |
| Mn2(SO4)3 | -58.83 | -62.99 | -4.16 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -12.80 | -41.51 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.09 | -10.07 | 2.02 | MnCl2:4H2O |
| MnSO4 | -9.50 | -6.21 | 3.28 | MnSO4 |
| Monteponite | -11.19 | 3.56 | 14.75 | CdO |
| Nahcolite | -4.42 | -5.12 | -0.70 | NaHCO3 |
| Nantokite | -1.96 | -9.11 | -7.16 | CuCl |
| Natron | -10.58 | -12.51 | -1.94 | Na2CO3:10H2O |
| Nesquehonite | -3.72 | -9.11 | -5.39 | MgCO3:3H2O |
| Nsutite | -17.00 | 25.57 | 42.56 | MnO2 |
| O2(g) | -54.39 | -57.15 | -2.76 | O2 |
| Otavite | -3.15 | -15.15 | -12.00 | CdCO3 |
| Pb(OH)2 | -7.42 | 1.29 | 8.71 | Pb(OH)2 |
| Pb2(OH)3Cl | -15.46 | -6.66 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -23.62 | 2.58 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -41.32 | 19.72 | 61.04 | Pb2O3 |
| Pb2OCO3 | -16.08 | -16.13 | -0.04 | PbO:PbCO3 |
| Pb3(AsO4)2 | -27.50 | -62.91 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -26.91 | -14.84 | 12.07 | PbCO3:2PbO |
| Pb3O2SO4 | -21.99 | -10.76 | 11.22 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -30.57 | -9.47 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -32.97 | -9.47 | 23.49 | PbSO4:3PbO |
| PbMetal | -20.10 | -15.85 | 4.25 | Pb |
| PbO:0.3H2O | -11.69 | 1.29 | 12.98 | PbO:0.33H2O |

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|---|---|---|---|---|
| Phosgenite | -14.81 | -34.62 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -33.68 | 18.43 | 52.11 | PbO2 |
| Portlandite | -14.02 | 10.01 | 24.03 | Ca(OH)2 |
| Pyrochroite | -6.78 | 8.42 | 15.20 | Mn(OH)2 |
| Pyrolusite | -18.40 | 25.57 | 43.97 | MnO2 |
| Rhodochrosite | 0.79 | -10.28 | -11.07 | MnCO3 |
| Rhodochrosite(d) | 0.11 | -10.28 | -10.39 | MnCO3 |
| Scorodite | -12.34 | -32.59 | -20.25 | FeAsO4:2H2O |
| Se(s) | 2.85 | -14.47 | -17.32 | Se |
| SeO2 | -14.32 | -22.70 | -8.38 | SeO2 |
| Siderite | -2.28 | -13.07 | -10.79 | FeCO3 |
| Siderite(d)(3) | -2.62 | -13.07 | -10.45 | FeCO3 |
| Smithsonite | -2.96 | -12.78 | -9.83 | ZnCO3 |
| Smithsonite_PG | -1.98 | -12.78 | -10.80 | ZnCO3 |
| Tenorite | -2.18 | 6.05 | 8.23 | CuO |
| Thenardite | -8.28 | -8.43 | -0.16 | Na2SO4 |
| Thermonatrite | -12.74 | -12.51 | 0.24 | Na2CO3:H2O |
| Trona | -17.54 | -17.62 | -0.08 | NaHCO3:Na2CO3:2H2O |
| Witherite | -5.41 | -14.05 | -8.63 | BaCO3 |
| Zincite(c) | -6.08 | 5.93 | 12.01 | ZnO |
| Zincosite | -12.48 | -8.71 | 3.77 | ZnSO4 |
| Zn(OH)2-a | -6.52 | 5.93 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -5.82 | 5.93 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -6.27 | 5.93 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -5.57 | 5.93 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -5.78 | 5.93 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -10.28 | -2.78 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -12.59 | 2.61 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -21.45 | -49.00 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -32.97 | -11.49 | 21.48 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -19.33 | 9.07 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -27.35 | 11.15 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -20.29 | -12.56 | 7.72 | ZnCl2 |
| ZnCO3:1H2O | -2.52 | -12.78 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -2.52 | -12.78 | -10.26 | ZnCO3:H2O |
| ZnMetal | -38.43 | -11.21 | 27.22 | Zn |
| ZnO(a) | -5.38 | 5.93 | 11.31 | ZnO |
| ZnSO4:H2O | -8.56 | -8.71 | -0.15 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 5.    MW-1013C

-----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.487e-10 | 1.487e-10 |
| Alkalinity | 9.998e-03 | 9.998e-03 |
| As | 2.583e-07 | 2.583e-07 |
| Ba | 1.227e-07 | 1.227e-07 |
| Ca | 1.404e-02 | 1.404e-02 |
| Cd | 7.940e-10 | 7.940e-10 |
| Cl | 1.912e-03 | 1.912e-03 |
| Cu | 8.206e-09 | 8.206e-09 |
| Fe | 2.280e-04 | 2.280e-04 |
| K | 5.668e-04 | 5.668e-04 |
| Mg | 5.362e-03 | 5.362e-03 |
| Mn | 1.612e-04 | 1.612e-04 |
| Na | 1.173e-03 | 1.173e-03 |
| Pb | 3.872e-10 | 3.872e-10 |
| S(6) | 1.545e-02 | 1.545e-02 |
| Se | 2.667e-09 | 2.667e-09 |
| Zn | 5.062e-06 | 5.062e-06 |

----------------------------Description of solution----------------------------

```
                                     pH  =   6.410
                                     pe  =   0.859
                      Activity of water  =   0.999
                 Ionic strength (mol/kgw)  =   5.537e-02
                       Mass of water (kg)  =   1.000e+00
                    Total carbon (mol/kg)  =   1.853e-02
                       Total CO2 (mol/kg)  =   1.853e-02
                         Temperature (°C)  =  10.14
                  Electrical balance (eq)  =  -1.484e-03
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =  -2.39
                               Iterations  =  11
                                  Total H  = 1.110224e+02
                                  Total O  = 5.561507e+01
```

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 4.564e-07 | 3.890e-07 | -6.341 | -6.410 | -0.069 | 0.00 |
| OH- | 9.285e-09 | 7.607e-09 | -8.032 | -8.119 | -0.087 | (0) |
| H2O | 5.551e+01 | 9.991e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.487e-10 | | | | | |
| AgCl | 9.416e-11 | 9.537e-11 | -10.026 | -10.021 | 0.006 | (0) |
| Ag+ | 3.185e-11 | 2.609e-11 | -10.497 | -10.583 | -0.087 | (0) |
| AgCl2- | 2.013e-11 | 1.650e-11 | -10.696 | -10.783 | -0.087 | (0) |
| AgSO4- | 2.556e-12 | 2.094e-12 | -11.592 | -11.679 | -0.087 | (0) |
| AgCl3-2 | 4.192e-14 | 1.889e-14 | -13.378 | -13.724 | -0.346 | (0) |
| AgCl4-3 | 2.919e-16 | 4.853e-17 | -15.535 | -16.314 | -0.779 | (0) |
| AgOH | 6.616e-17 | 6.701e-17 | -16.179 | -16.174 | 0.006 | (0) |
| Ag(OH)2- | 2.101e-22 | 1.721e-22 | -21.678 | -21.764 | -0.087 | (0) |
| As(3) | 2.517e-07 | | | | | |
| H3AsO3 | 2.514e-07 | 2.546e-07 | -6.600 | -6.594 | 0.006 | (0) |
| H2AsO3- | 3.157e-10 | 2.587e-10 | -9.501 | -9.587 | -0.087 | (0) |
| H4AsO3+ | 5.990e-14 | 4.907e-14 | -13.223 | -13.309 | -0.087 | (0) |
| HAsO3-2 | 1.500e-18 | 6.759e-19 | -17.824 | -18.170 | -0.346 | (0) |
| AsO3-3 | 1.220e-27 | 2.029e-28 | -26.914 | -27.693 | -0.779 | (0) |
| As(5) | 6.650e-09 | | | | | |
| H2AsO4- | 5.107e-09 | 4.184e-09 | -8.292 | -8.378 | -0.087 | (0) |
| HAsO4-2 | 1.543e-09 | 6.950e-10 | -8.812 | -9.158 | -0.346 | (0) |
| H3AsO4 | 2.761e-13 | 2.797e-13 | -12.559 | -12.553 | 0.006 | (0) |
| AsO4-3 | 1.637e-14 | 2.721e-15 | -13.786 | -14.565 | -0.779 | (0) |
| Ba | 1.227e-07 | | | | | |
| BaSO4 | 6.197e-08 | 6.277e-08 | -7.208 | -7.202 | 0.006 | (0) |
| Ba+2 | 5.919e-08 | 2.666e-08 | -7.228 | -7.574 | -0.346 | (0) |
| BaHCO3+ | 1.499e-09 | 1.228e-09 | -8.824 | -8.911 | -0.087 | (0) |
| BaCO3 | 6.497e-12 | 6.580e-12 | -11.187 | -11.182 | 0.006 | (0) |
| BaOH+ | 2.832e-15 | 2.320e-15 | -14.548 | -14.634 | -0.087 | (0) |
| C(4) | 1.853e-02 | | | | | |
| HCO3- | 9.283e-03 | 7.671e-03 | -2.032 | -2.115 | -0.083 | (0) |
| CO2 | 8.544e-03 | 8.654e-03 | -2.068 | -2.063 | 0.006 | (0) |
| CaHCO3+ | 4.053e-04 | 3.321e-04 | -3.392 | -3.479 | -0.087 | (0) |
| MgHCO3+ | 1.933e-04 | 1.584e-04 | -3.714 | -3.800 | -0.087 | (0) |
| FeHCO3+ | 5.628e-05 | 4.611e-05 | -4.250 | -4.336 | -0.087 | (0) |
| MnHCO3+ | 3.611e-05 | 2.959e-05 | -4.442 | -4.529 | -0.087 | (0) |
| CaCO3 | 4.025e-06 | 4.077e-06 | -5.395 | -5.390 | 0.006 | (0) |
| NaHCO3 | 4.005e-06 | 4.056e-06 | -5.397 | -5.392 | 0.006 | (0) |
| MnCO3 | 2.185e-06 | 2.213e-06 | -5.661 | -5.655 | 0.006 | (0) |
| CO3-2 | 1.381e-06 | 6.438e-07 | -5.860 | -6.191 | -0.331 | (0) |
| ZnHCO3+ | 1.300e-06 | 1.065e-06 | -5.886 | -5.973 | -0.087 | (0) |
| FeCO3 | 9.165e-07 | 9.283e-07 | -6.038 | -6.032 | 0.006 | (0) |
| MgCO3 | 8.883e-07 | 8.997e-07 | -6.051 | -6.046 | 0.006 | (0) |
| ZnCO3 | 1.399e-07 | 1.417e-07 | -6.854 | -6.849 | 0.006 | (0) |
| NaCO3- | 6.252e-09 | 5.122e-09 | -8.204 | -8.291 | -0.087 | (0) |
| Zn(CO3)2-2 | 4.328e-09 | 1.950e-09 | -8.364 | -8.710 | -0.346 | (0) |
| BaHCO3+ | 1.499e-09 | 1.228e-09 | -8.824 | -8.911 | -0.087 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuHCO3+ | 2.595e-10 | 2.126e-10 | -9.586 | -9.672 | -0.087 | (0) |
| CuCO3 | 1.888e-10 | 1.912e-10 | -9.724 | -9.719 | 0.006 | (0) |
| PbCO3 | 1.812e-10 | 1.835e-10 | -9.742 | -9.736 | 0.006 | (0) |
| PbHCO3+ | 1.220e-10 | 9.994e-11 | -9.914 | -10.000 | -0.087 | (0) |
| CdHCO3+ | 5.792e-11 | 4.745e-11 | -10.237 | -10.324 | -0.087 | (0) |
| BaCO3 | 6.497e-12 | 6.580e-12 | -11.187 | -11.182 | 0.006 | (0) |
| Pb(CO3)2-2 | 6.587e-13 | 2.967e-13 | -12.181 | -12.528 | -0.346 | (0) |
| Cu(CO3)2-2 | 3.440e-13 | 1.550e-13 | -12.463 | -12.810 | -0.346 | (0) |
| CdCO3 | 9.877e-14 | 1.000e-13 | -13.005 | -13.000 | 0.006 | (0) |
| Cd(CO3)2-2 | 4.521e-16 | 2.036e-16 | -15.345 | -15.691 | -0.346 | (0) |
| Ca | 1.404e-02 | | | | | |
| Ca+2 | 9.915e-03 | 4.642e-03 | -2.004 | -2.333 | -0.330 | (0) |
| CaSO4 | 3.712e-03 | 3.759e-03 | -2.430 | -2.425 | 0.006 | (0) |
| CaHCO3+ | 4.053e-04 | 3.321e-04 | -3.392 | -3.479 | -0.087 | (0) |
| CaCO3 | 4.025e-06 | 4.077e-06 | -5.395 | -5.390 | 0.006 | (0) |
| CaHSO4+ | 8.938e-09 | 7.322e-09 | -8.049 | -8.135 | -0.087 | (0) |
| CaOH+ | 2.415e-09 | 1.979e-09 | -8.617 | -8.704 | -0.087 | (0) |
| Cd | 7.940e-10 | | | | | |
| Cd+2 | 4.342e-10 | 1.956e-10 | -9.362 | -9.709 | -0.346 | (0) |
| CdSO4 | 2.378e-10 | 2.408e-10 | -9.624 | -9.618 | 0.006 | (0) |
| CdHCO3+ | 5.792e-11 | 4.745e-11 | -10.237 | -10.324 | -0.087 | (0) |
| CdCl+ | 3.351e-11 | 2.745e-11 | -10.475 | -10.561 | -0.087 | (0) |
| Cd(SO4)2-2 | 3.030e-11 | 1.365e-11 | -10.519 | -10.865 | -0.346 | (0) |
| CdCl2 | 1.652e-13 | 1.673e-13 | -12.782 | -12.777 | 0.006 | (0) |
| CdCO3 | 9.877e-14 | 1.000e-13 | -13.005 | -13.000 | 0.006 | (0) |
| CdOHCl | 2.060e-14 | 2.087e-14 | -13.686 | -13.681 | 0.006 | (0) |
| CdOH+ | 1.599e-14 | 1.310e-14 | -13.796 | -13.883 | -0.087 | (0) |
| Cd(CO3)2-2 | 4.521e-16 | 2.036e-16 | -15.345 | -15.691 | -0.346 | (0) |
| CdCl3- | 1.576e-16 | 1.291e-16 | -15.802 | -15.889 | -0.087 | (0) |
| Cd(OH)2 | 5.690e-18 | 5.763e-18 | -17.245 | -17.239 | 0.006 | (0) |
| Cd2OH+3 | 9.174e-23 | 1.525e-23 | -22.037 | -22.817 | -0.779 | (0) |
| Cd(OH)3- | 2.027e-24 | 1.661e-24 | -23.693 | -23.780 | -0.087 | (0) |
| Cd(OH)4-2 | 8.437e-32 | 3.801e-32 | -31.074 | -31.420 | -0.346 | (0) |
| Cl | 1.912e-03 | | | | | |
| Cl- | 1.912e-03 | 1.548e-03 | -2.719 | -2.810 | -0.092 | (0) |
| MnCl+ | 3.332e-07 | 2.730e-07 | -6.477 | -6.564 | -0.087 | (0) |
| FeCl+ | 1.568e-07 | 1.285e-07 | -6.805 | -6.891 | -0.087 | (0) |
| CuCl2- | 3.331e-09 | 2.729e-09 | -8.477 | -8.564 | -0.087 | (0) |
| ZnCl+ | 2.815e-09 | 2.306e-09 | -8.551 | -8.637 | -0.087 | (0) |
| MnCl2 | 1.822e-10 | 1.845e-10 | -9.740 | -9.734 | 0.006 | (0) |
| ZnOHCl | 1.434e-10 | 1.452e-10 | -9.844 | -9.838 | 0.006 | (0) |
| AgCl | 9.416e-11 | 9.537e-11 | -10.026 | -10.021 | 0.006 | (0) |
| CdCl+ | 3.351e-11 | 2.745e-11 | -10.475 | -10.561 | -0.087 | (0) |
| AgCl2- | 2.013e-11 | 1.650e-11 | -10.696 | -10.783 | -0.087 | (0) |
| CuCl3-2 | 1.400e-11 | 6.305e-12 | -10.854 | -11.200 | -0.346 | (0) |
| ZnCl2 | 3.467e-12 | 3.511e-12 | -11.460 | -11.455 | 0.006 | (0) |
| PbCl+ | 8.374e-13 | 6.860e-13 | -12.077 | -12.164 | -0.087 | (0) |
| CdCl2 | 1.652e-13 | 1.673e-13 | -12.782 | -12.777 | 0.006 | (0) |
| CuCl+ | 1.308e-13 | 1.072e-13 | -12.883 | -12.970 | -0.087 | (0) |
| MnCl3- | 9.603e-14 | 7.868e-14 | -13.018 | -13.104 | -0.087 | (0) |
| AgCl3-2 | 4.192e-14 | 1.889e-14 | -13.378 | -13.724 | -0.346 | (0) |
| CdOHCl | 2.060e-14 | 2.087e-14 | -13.686 | -13.681 | 0.006 | (0) |
| ZnCl3- | 6.778e-15 | 5.553e-15 | -14.169 | -14.255 | -0.087 | (0) |
| PbCl2 | 2.226e-15 | 2.255e-15 | -14.652 | -14.647 | 0.006 | (0) |
| AgCl4-3 | 2.919e-16 | 4.853e-17 | -15.535 | -16.314 | -0.779 | (0) |
| CdCl3- | 1.576e-16 | 1.291e-16 | -15.802 | -15.889 | -0.087 | (0) |
| CuCl2 | 7.429e-17 | 7.524e-17 | -16.129 | -16.124 | 0.006 | (0) |
| ZnCl4-2 | 8.451e-18 | 3.807e-18 | -17.073 | -17.419 | -0.346 | (0) |
| PbCl3- | 3.073e-18 | 2.518e-18 | -17.512 | -17.599 | -0.087 | (0) |
| FeCl+2 | 1.114e-18 | 5.018e-19 | -17.953 | -18.299 | -0.346 | (0) |
| FeCl2+ | 6.955e-21 | 5.697e-21 | -20.158 | -20.244 | -0.087 | (0) |
| PbCl4-2 | 3.672e-21 | 1.654e-21 | -20.435 | -20.781 | -0.346 | (0) |
| CuCl3- | 3.824e-22 | 3.133e-22 | -21.417 | -21.504 | -0.087 | (0) |
| FeCl3 | 8.710e-25 | 8.822e-25 | -24.060 | -24.054 | 0.006 | (0) |
| CuCl4-2 | 3.758e-27 | 1.693e-27 | -26.425 | -26.771 | -0.346 | (0) |
| Cu(1) | 7.578e-09 | | | | | |
| Cu+ | 4.233e-09 | 3.468e-09 | -8.373 | -8.460 | -0.087 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuCl2- | 3.331e-09 | 2.729e-09 | -8.477 | -8.564 | -0.087 | (0) |
| CuCl3-2 | 1.400e-11 | 6.305e-12 | -10.854 | -11.200 | -0.346 | (0) |
| Cu(2) | 6.278e-10 | | | | | |
| CuHCO3+ | 2.595e-10 | 2.126e-10 | -9.586 | -9.672 | -0.087 | (0) |
| CuCO3 | 1.888e-10 | 1.912e-10 | -9.724 | -9.719 | 0.006 | (0) |
| Cu+2 | 1.228e-10 | 5.530e-11 | -9.911 | -10.257 | -0.346 | (0) |
| CuSO4 | 4.700e-11 | 4.761e-11 | -10.328 | -10.322 | 0.006 | (0) |
| Cu(OH)2 | 7.524e-12 | 7.620e-12 | -11.124 | -11.118 | 0.006 | (0) |
| CuOH+ | 1.734e-12 | 1.420e-12 | -11.761 | -11.848 | -0.087 | (0) |
| Cu(CO3)2-2 | 3.440e-13 | 1.550e-13 | -12.463 | -12.810 | -0.346 | (0) |
| CuCl+ | 1.308e-13 | 1.072e-13 | -12.883 | -12.970 | -0.087 | (0) |
| CuCl2 | 7.429e-17 | 7.524e-17 | -16.129 | -16.124 | 0.006 | (0) |
| Cu(OH)3- | 1.439e-18 | 1.179e-18 | -17.842 | -17.928 | -0.087 | (0) |
| Cu2(OH)2+2 | 4.147e-19 | 1.868e-19 | -18.382 | -18.729 | -0.346 | (0) |
| CuCl3- | 3.824e-22 | 3.133e-22 | -21.417 | -21.504 | -0.087 | (0) |
| Cu(OH)4-2 | 1.341e-24 | 6.043e-25 | -23.872 | -24.219 | -0.346 | (0) |
| CuCl4-2 | 3.758e-27 | 1.693e-27 | -26.425 | -26.771 | -0.346 | (0) |
| Fe(2) | 2.280e-04 | | | | | |
| Fe+2 | 1.334e-04 | 6.011e-05 | -3.875 | -4.221 | -0.346 | (0) |
| FeHCO3+ | 5.628e-05 | 4.611e-05 | -4.250 | -4.336 | -0.087 | (0) |
| FeSO4 | 3.724e-05 | 3.772e-05 | -4.429 | -4.423 | 0.006 | (0) |
| FeCO3 | 9.165e-07 | 9.283e-07 | -6.038 | -6.032 | 0.006 | (0) |
| FeCl+ | 1.568e-07 | 1.285e-07 | -6.805 | -6.891 | -0.087 | (0) |
| FeOH+ | 1.852e-08 | 1.517e-08 | -7.732 | -7.819 | -0.087 | (0) |
| FeHSO4+ | 1.157e-10 | 9.481e-11 | -9.937 | -10.023 | -0.087 | (0) |
| Fe(OH)2 | 8.401e-14 | 8.509e-14 | -13.076 | -13.070 | 0.006 | (0) |
| Fe(OH)3- | 8.499e-18 | 6.963e-18 | -17.071 | -17.157 | -0.087 | (0) |
| Fe(3) | 7.603e-11 | | | | | |
| Fe(OH)2+ | 6.673e-11 | 5.467e-11 | -10.176 | -10.262 | -0.087 | (0) |
| Fe(OH)3 | 9.031e-12 | 9.147e-12 | -11.044 | -11.039 | 0.006 | (0) |
| FeOH+2 | 2.582e-13 | 1.163e-13 | -12.588 | -12.934 | -0.346 | (0) |
| Fe(OH)4- | 1.395e-14 | 1.143e-14 | -13.856 | -13.942 | -0.087 | (0) |
| FeSO4+ | 7.835e-16 | 6.418e-16 | -15.106 | -15.193 | -0.087 | (0) |
| Fe+3 | 1.060e-16 | 1.762e-17 | -15.975 | -16.754 | -0.779 | (0) |
| Fe(SO4)2- | 7.574e-17 | 6.205e-17 | -16.121 | -16.207 | -0.087 | (0) |
| FeCl+2 | 1.114e-18 | 5.018e-19 | -17.953 | -18.299 | -0.346 | (0) |
| FeCl2+ | 6.955e-21 | 5.697e-21 | -20.158 | -20.244 | -0.087 | (0) |
| FeHSO4+2 | 1.549e-21 | 6.980e-22 | -20.810 | -21.156 | -0.346 | (0) |
| Fe2(OH)2+4 | 1.688e-23 | 6.951e-25 | -22.773 | -24.158 | -1.385 | (0) |
| FeCl3 | 8.710e-25 | 8.822e-25 | -24.060 | -24.054 | 0.006 | (0) |
| Fe3(OH)4+5 | 4.910e-30 | 3.361e-32 | -29.309 | -31.474 | -2.165 | (0) |
| H(0) | 4.729e-18 | | | | | |
| H2 | 2.364e-18 | 2.395e-18 | -17.626 | -17.621 | 0.006 | (0) |
| K | 5.668e-04 | | | | | |
| K+ | 5.530e-04 | 4.479e-04 | -3.257 | -3.349 | -0.092 | (0) |
| KSO4- | 1.374e-05 | 1.125e-05 | -4.862 | -4.949 | -0.087 | (0) |
| Mg | 5.362e-03 | | | | | |
| Mg+2 | 3.831e-03 | 1.840e-03 | -2.417 | -2.735 | -0.319 | (0) |
| MgSO4 | 1.337e-03 | 1.354e-03 | -2.874 | -2.868 | 0.006 | (0) |
| MgHCO3+ | 1.933e-04 | 1.584e-04 | -3.714 | -3.800 | -0.087 | (0) |
| MgCO3 | 8.883e-07 | 8.997e-07 | -6.051 | -6.046 | 0.006 | (0) |
| MgOH+ | 5.101e-09 | 4.179e-09 | -8.292 | -8.379 | -0.087 | (0) |
| Mn(2) | 1.612e-04 | | | | | |
| Mn+2 | 9.606e-05 | 4.327e-05 | -4.017 | -4.364 | -0.346 | (0) |
| MnHCO3+ | 3.611e-05 | 2.959e-05 | -4.442 | -4.529 | -0.087 | (0) |
| MnSO4 | 2.648e-05 | 2.682e-05 | -4.577 | -4.572 | 0.006 | (0) |
| MnCO3 | 2.185e-06 | 2.213e-06 | -5.661 | -5.655 | 0.006 | (0) |
| MnCl+ | 3.332e-07 | 2.730e-07 | -6.477 | -6.564 | -0.087 | (0) |
| MnOH+ | 9.745e-10 | 7.983e-10 | -9.011 | -9.098 | -0.087 | (0) |
| MnCl2 | 1.822e-10 | 1.845e-10 | -9.740 | -9.734 | 0.006 | (0) |
| MnCl3- | 9.603e-14 | 7.868e-14 | -13.018 | -13.104 | -0.087 | (0) |
| Mn(OH)3- | 1.418e-20 | 1.162e-20 | -19.848 | -19.935 | -0.087 | (0) |
| Mn(3) | 5.925e-30 | | | | | |
| Mn+3 | 5.925e-30 | 9.850e-31 | -29.227 | -30.007 | -0.779 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -73.510 | -73.857 | -0.346 | (0) |
| Mn(7) | 0.000e+00 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| MnO4- | 0.000e+00 | 0.000e+00 | -83.318 | -83.404 | -0.087 | (0) |
| Na | 1.173e-03 | | | | | |
| Na+ | 1.145e-03 | 9.403e-04 | -2.941 | -3.027 | -0.085 | (0) |
| NaSO4- | 2.447e-05 | 2.005e-05 | -4.611 | -4.698 | -0.087 | (0) |
| NaHCO3 | 4.005e-06 | 4.056e-06 | -5.397 | -5.392 | 0.006 | (0) |
| NaCO3- | 6.252e-09 | 5.122e-09 | -8.204 | -8.291 | -0.087 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -62.192 | -62.186 | 0.006 | (0) |
| Pb | 3.872e-10 | | | | | |
| PbCO3 | 1.812e-10 | 1.835e-10 | -9.742 | -9.736 | 0.006 | (0) |
| PbHCO3+ | 1.220e-10 | 9.994e-11 | -9.914 | -10.000 | -0.087 | (0) |
| PbSO4 | 4.277e-11 | 4.332e-11 | -10.369 | -10.363 | 0.006 | (0) |
| Pb+2 | 3.641e-11 | 1.640e-11 | -10.439 | -10.785 | -0.346 | (0) |
| Pb(SO4)2-2 | 2.371e-12 | 1.068e-12 | -11.625 | -11.971 | -0.346 | (0) |
| PbOH+ | 1.002e-12 | 8.213e-13 | -11.999 | -12.086 | -0.087 | (0) |
| PbCl+ | 8.374e-13 | 6.860e-13 | -12.077 | -12.164 | -0.087 | (0) |
| Pb(CO3)2-2 | 6.587e-13 | 2.967e-13 | -12.181 | -12.528 | -0.346 | (0) |
| PbCl2 | 2.226e-15 | 2.255e-15 | -14.652 | -14.647 | 0.006 | (0) |
| Pb(OH)2 | 8.102e-16 | 8.206e-16 | -15.091 | -15.086 | 0.006 | (0) |
| PbCl3- | 3.073e-18 | 2.518e-18 | -17.512 | -17.599 | -0.087 | (0) |
| Pb(OH)3- | 2.953e-20 | 2.420e-20 | -19.530 | -19.616 | -0.087 | (0) |
| PbCl4-2 | 3.672e-21 | 1.654e-21 | -20.435 | -20.781 | -0.346 | (0) |
| Pb2OH+3 | 1.814e-21 | 3.016e-22 | -20.741 | -21.521 | -0.779 | (0) |
| Pb(OH)4-2 | 3.160e-25 | 1.423e-25 | -24.500 | -24.847 | -0.346 | (0) |
| Pb3(OH)4+2 | 5.377e-32 | 2.422e-32 | -31.269 | -31.616 | -0.346 | (0) |
| S(6) | 1.545e-02 | | | | | |
| SO4-2 | 1.030e-02 | 4.697e-03 | -1.987 | -2.328 | -0.341 | (0) |
| CaSO4 | 3.712e-03 | 3.759e-03 | -2.430 | -2.425 | 0.006 | (0) |
| MgSO4 | 1.337e-03 | 1.354e-03 | -2.874 | -2.868 | 0.006 | (0) |
| FeSO4 | 3.724e-05 | 3.772e-05 | -4.429 | -4.423 | 0.006 | (0) |
| MnSO4 | 2.648e-05 | 2.682e-05 | -4.577 | -4.572 | 0.006 | (0) |
| NaSO4- | 2.447e-05 | 2.005e-05 | -4.611 | -4.698 | -0.087 | (0) |
| KSO4- | 1.374e-05 | 1.125e-05 | -4.862 | -4.949 | -0.087 | (0) |
| ZnSO4 | 1.063e-06 | 1.077e-06 | -5.973 | -5.968 | 0.006 | (0) |
| HSO4- | 1.601e-07 | 1.312e-07 | -6.796 | -6.882 | -0.087 | (0) |
| Zn(SO4)2-2 | 1.029e-07 | 4.636e-08 | -6.988 | -7.334 | -0.346 | (0) |
| BaSO4 | 6.197e-08 | 6.277e-08 | -7.208 | -7.202 | 0.006 | (0) |
| CaHSO4+ | 8.938e-09 | 7.322e-09 | -8.049 | -8.135 | -0.087 | (0) |
| CdSO4 | 2.378e-10 | 2.408e-10 | -9.624 | -9.618 | 0.006 | (0) |
| FeHSO4+ | 1.157e-10 | 9.481e-11 | -9.937 | -10.023 | -0.087 | (0) |
| CuSO4 | 4.700e-11 | 4.761e-11 | -10.328 | -10.322 | 0.006 | (0) |
| PbSO4 | 4.277e-11 | 4.332e-11 | -10.369 | -10.363 | 0.006 | (0) |
| Cd(SO4)2-2 | 3.030e-11 | 1.365e-11 | -10.519 | -10.865 | -0.346 | (0) |
| AgSO4- | 2.556e-12 | 2.094e-12 | -11.592 | -11.679 | -0.087 | (0) |
| Pb(SO4)2-2 | 2.371e-12 | 1.068e-12 | -11.625 | -11.971 | -0.346 | (0) |
| FeSO4+ | 7.835e-16 | 6.418e-16 | -15.106 | -15.193 | -0.087 | (0) |
| Fe(SO4)2- | 7.574e-17 | 6.205e-17 | -16.121 | -16.207 | -0.087 | (0) |
| FeHSO4+2 | 1.549e-21 | 6.980e-22 | -20.810 | -21.156 | -0.346 | (0) |
| Se(-2) | 6.621e-19 | | | | | |
| HSe- | 6.600e-19 | 5.407e-19 | -18.180 | -18.267 | -0.087 | (0) |
| H2Se | 2.095e-21 | 2.122e-21 | -20.679 | -20.673 | 0.006 | (0) |
| Se(4) | 2.667e-09 | | | | | |
| HSeO3- | 2.628e-09 | 2.153e-09 | -8.580 | -8.667 | -0.087 | (0) |
| SeO3-2 | 3.884e-11 | 1.750e-11 | -10.411 | -10.757 | -0.346 | (0) |
| H2SeO3 | 4.650e-13 | 4.710e-13 | -12.333 | -12.327 | 0.006 | (0) |
| Se(6) | 7.436e-27 | | | | | |
| SeO4-2 | 7.436e-27 | 3.350e-27 | -26.129 | -26.475 | -0.346 | (0) |
| HSeO4- | 4.708e-32 | 3.857e-32 | -31.327 | -31.414 | -0.087 | (0) |
| Zn | 5.062e-06 | | | | | |
| Zn+2 | 2.448e-06 | 1.103e-06 | -5.611 | -5.957 | -0.346 | (0) |
| ZnHCO3+ | 1.300e-06 | 1.065e-06 | -5.886 | -5.973 | -0.087 | (0) |
| ZnSO4 | 1.063e-06 | 1.077e-06 | -5.973 | -5.968 | 0.006 | (0) |
| ZnCO3 | 1.399e-07 | 1.417e-07 | -6.854 | -6.849 | 0.006 | (0) |
| Zn(SO4)2-2 | 1.029e-07 | 4.636e-08 | -6.988 | -7.334 | -0.346 | (0) |
| Zn(CO3)2-2 | 4.328e-09 | 1.950e-09 | -8.364 | -8.710 | -0.346 | (0) |
| ZnCl+ | 2.815e-09 | 2.306e-09 | -8.551 | -8.637 | -0.087 | (0) |
| ZnOH+ | 1.157e-09 | 9.482e-10 | -8.937 | -9.023 | -0.087 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| ZnOHCl | 1.434e-10 | 1.452e-10 | -9.844 | -9.838 | 0.006 | (0) |
| Zn(OH)2 | 9.041e-11 | 9.157e-11 | -10.044 | -10.038 | 0.006 | (0) |
| ZnCl2 | 3.467e-12 | 3.511e-12 | -11.460 | -11.455 | 0.006 | (0) |
| ZnCl3- | 6.778e-15 | 5.553e-15 | -14.169 | -14.255 | -0.087 | (0) |
| Zn(OH)3- | 9.077e-16 | 7.436e-16 | -15.042 | -15.129 | -0.087 | (0) |
| ZnCl4-2 | 8.451e-18 | 3.807e-18 | -17.073 | -17.419 | -0.346 | (0) |
| Zn(OH)4-2 | 6.719e-22 | 3.027e-22 | -21.173 | -21.519 | -0.346 | (0) |

------------------------------Saturation indices-------------------------------

| Phase | SI** | log IAP | log K(283 K, 1 atm) | |
|---|---|---|---|---|
| Ag2CO3 | -15.92 | -27.36 | -11.44 | Ag2CO3 |
| Ag2O | -21.33 | -8.35 | 12.98 | Ag2O |
| Ag2SO4 | -18.41 | -23.50 | -5.08 | Ag2SO4 |
| AgMetal | 3.04 | -11.44 | -14.48 | Ag |
| Anglesite | -5.24 | -13.11 | -7.87 | PbSO4 |
| Anhydrite | -0.33 | -4.66 | -4.34 | CaSO4 |
| Antlerite | -15.75 | -7.46 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.27 | -8.52 | -8.26 | CaCO3 |
| Arsenolite | -11.53 | -13.19 | -1.66 | As2O3 |
| Artinite | -9.55 | 1.16 | 10.71 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.62 | -25.11 | 8.52 | As2O5 |
| As_native | -14.81 | -28.40 | -13.59 | As |
| Atacamite | -12.15 | -4.10 | 8.06 | Cu2(OH)3Cl |
| Azurite | -14.30 | -9.36 | 4.94 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -1.38 | -51.85 | -50.48 | Ba3(AsO4)2 |
| Barite | 0.34 | -9.90 | -10.24 | BaSO4 |
| BaSeO3 | -11.94 | -18.33 | -6.39 | BaSeO3 |
| Bianchite | -6.53 | -8.29 | -1.76 | ZnSO4:6H2O |
| Birnessite | -20.61 | 22.99 | 43.60 | MnO2 |
| Bixbyite | -21.53 | -21.55 | -0.02 | Mn2O3 |
| Brochantite | -20.24 | -4.90 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.80 | 10.08 | 17.88 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -17.23 | -36.13 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.11 | -8.52 | -8.41 | CaCO3 |
| CaSeO3 | -7.49 | -13.09 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.71 | -11.43 | 14.29 | Cd |
| Cd(OH)2 | -10.54 | 3.11 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -11.42 | 3.11 | 14.53 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.67 | -20.96 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -28.38 | -5.82 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -31.10 | -2.70 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.82 | -15.33 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -13.32 | -15.33 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.69 | -15.33 | -1.64 | CdCl2:H2O |
| CdMetal | -25.61 | -11.43 | 14.18 | Cd |
| CdOHCl | -9.91 | -6.11 | 3.80 | CdOHCl |
| CdSO4 | -12.50 | -12.04 | 0.47 | CdSO4 |
| CdSO4:2.7H2O | -10.33 | -12.04 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -10.67 | -12.04 | -1.37 | CdSO4:H2O |
| Cerargyrite | -3.04 | -13.39 | -10.35 | AgCl |
| Cerrusite | -3.66 | -16.98 | -13.32 | PbCO3 |
| Chalcanthite | -9.89 | -12.59 | -2.70 | CuSO4:5H2O |
| Claudetite | -11.59 | -13.19 | -1.60 | As2O3 |
| CO2(g) | -0.79 | -2.06 | -1.27 | CO2 |
| Cotunnite | -11.42 | -16.41 | -4.99 | PbCl2 |
| Cu(OH)2 | -6.66 | 2.56 | 9.23 | Cu(OH)2 |
| Cu2SO4 | -17.47 | -19.25 | -1.77 | Cu2SO4 |
| Cu3(AsO4)2:6w | -24.78 | -59.90 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -6.82 | -16.45 | -9.63 | CuCO3 |
| CuMetal | 0.10 | -9.32 | -9.42 | Cu |
| CuOCuSO4 | -22.92 | -10.02 | 12.90 | CuO:CuSO4 |
| CupricFerrite | 0.15 | 7.51 | 7.37 | CuFe2O4 |
| Cuprite | -2.31 | -4.10 | -1.79 | Cu2O |
| CuprousFerrite | 9.20 | 0.43 | -8.77 | CuFeO2 |
| CuSO4 | -16.29 | -12.59 | 3.71 | CuSO4 |

| | | | | |
|---|---|---|---|---|
| Dolomite | -0.72 | -17.45 | -16.73 | CaMg(CO3)2 |
| Dolomite(d) | -1.34 | -17.45 | -16.11 | CaMg(CO3)2 |
| Epsomite | -2.82 | -5.07 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 2.75 | -0.29 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -2.42 | 2.47 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -30.35 | -65.78 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -6.67 | 13.55 | 20.22 | Fe3(OH)8 |
| FeSe2 | -7.64 | -26.22 | -18.58 | FeSe2 |
| Goethite | 2.92 | 2.48 | -0.44 | FeOOH |
| Goslarite | -6.20 | -8.29 | -2.09 | ZnSO4:7H2O |
| Gypsum | -0.07 | -4.66 | -4.59 | CaSO4:2H2O |
| H2(g) | -14.54 | -17.62 | -3.08 | H2 |
| H2O(g) | -1.91 | -0.00 | 1.91 | H2O |
| Halite | -7.38 | -5.84 | 1.55 | NaCl |
| Hausmannite | -24.99 | 39.91 | 64.90 | Mn3O4 |
| Hematite | 7.77 | 4.95 | -2.82 | Fe2O3 |
| Huntite | -6.33 | -35.30 | -28.98 | CaMg3(CO3)4 |
| Hydrocerrusite | -14.46 | -31.92 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.87 | -25.62 | -6.75 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -13.05 | 17.26 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -14.78 | 17.26 | 32.04 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -10.58 | -20.41 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -11.80 | -19.81 | -8.01 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -15.60 | -19.49 | -3.89 | NaFe3(SO4)2(OH)6 |
| JarositeH | -19.60 | -22.87 | -3.27 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -23.21 | -4.90 | 18.31 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.05 | -11.08 | -0.03 | PbO:PbSO4 |
| Laurionite | -7.81 | -7.19 | 0.62 | PbOHCl |
| Litharge | -11.32 | 2.03 | 13.35 | PbO |
| Maghemite | -1.44 | 4.95 | 6.39 | Fe2O3 |
| Magnesite | -1.13 | -8.93 | -7.79 | MgCO3 |
| Magnetite | 7.87 | 13.55 | 5.68 | Fe3O4 |
| Malachite | -9.31 | -3.40 | 5.91 | Cu2(OH)2CO3 |
| Manganite | -9.62 | 15.72 | 25.34 | MnOOH |
| Massicot | -11.52 | 2.03 | 13.56 | PbO |
| Melanothallite | -20.08 | -15.88 | 4.20 | CuCl2 |
| Melanterite | -4.14 | -6.55 | -2.41 | FeSO4:7H2O |
| Minium | -57.00 | 20.64 | 77.64 | Pb3O4 |
| Mirabilite | -6.54 | -8.39 | -1.84 | Na2SO4:10H2O |
| Mn2(SO4)3 | -62.79 | -67.00 | -4.21 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -13.52 | -42.22 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.03 | -9.99 | 2.04 | MnCl2:4H2O |
| MnSO4 | -9.96 | -6.69 | 3.26 | MnSO4 |
| Monteponite | -11.61 | 3.11 | 14.72 | CdO |
| Nahcolite | -4.45 | -5.14 | -0.69 | NaHCO3 |
| Nantokite | -4.13 | -11.27 | -7.14 | CuCl |
| Natron | -10.33 | -12.25 | -1.92 | Na2CO3:10H2O |
| Nesquehonite | -3.53 | -8.93 | -5.40 | MgCO3:3H2O |
| Nsutite | -19.57 | 22.99 | 42.56 | MnO2 |
| O2(g) | -59.42 | -62.19 | -2.77 | O2 |
| Otavite | -3.90 | -15.90 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.65 | 2.03 | 8.69 | Pb(OH)2 |
| Pb2(OH)3Cl | -13.94 | -5.15 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -22.13 | 4.07 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -42.43 | 18.61 | 61.04 | Pb2O3 |
| Pb2OCO3 | -14.88 | -14.94 | -0.06 | PbO:PbCO3 |
| Pb3(AsO4)2 | -26.08 | -61.49 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -24.94 | -12.91 | 12.04 | PbCO3:2PbO |
| Pb3O2SO4 | -20.24 | -9.04 | 11.20 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -28.11 | -7.01 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -30.46 | -7.01 | 23.45 | PbSO4:3PbO |
| PbMetal | -16.76 | -12.50 | 4.25 | Pb |
| PbO:0.3H2O | -10.95 | 2.03 | 12.98 | PbO:0.33H2O |
| Phosgenite | -13.57 | -33.38 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -35.45 | 16.57 | 52.02 | PbO2 |
| Portlandite | -13.51 | 10.49 | 23.99 | Ca(OH)2 |
| Pyrochroite | -6.74 | 8.46 | 15.20 | Mn(OH)2 |

| | | | | |
|---|---|---|---|---|
| Pyrolusite | -20.89 | 22.99 | 43.88 | MnO2 |
| Rhodochrosite | 0.52 | -10.56 | -11.08 | MnCO3 |
| Rhodochrosite(d) | -0.17 | -10.56 | -10.39 | MnCO3 |
| Scorodite | -11.07 | -31.32 | -20.25 | FeAsO4:2H2O |
| Se(s) | 7.18 | -10.14 | -17.32 | Se |
| SeO2 | -15.20 | -23.58 | -8.38 | SeO2 |
| Siderite | 0.38 | -10.41 | -10.79 | FeCO3 |
| Siderite(d)(3) | 0.04 | -10.41 | -10.45 | FeCO3 |
| Smithsonite | -2.32 | -12.15 | -9.83 | ZnCO3 |
| Smithsonite_PG | -1.35 | -12.15 | -10.80 | ZnCO3 |
| Tenorite | -5.64 | 2.56 | 8.21 | CuO |
| Thenardite | -8.22 | -8.38 | -0.16 | Na2SO4 |
| Thermonatrite | -12.48 | -12.25 | 0.23 | Na2CO3:H2O |
| Trona | -17.28 | -17.39 | -0.10 | NaHCO3:Na2CO3:2H2O |
| Witherite | -5.13 | -13.77 | -8.63 | BaCO3 |
| Zincite(c) | -5.12 | 6.86 | 11.98 | ZnO |
| Zincosite | -12.03 | -8.29 | 3.75 | ZnSO4 |
| Zn(OH)2-a | -5.59 | 6.86 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -4.89 | 6.86 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -5.34 | 6.86 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -4.64 | 6.86 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -4.85 | 6.86 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -8.92 | -1.42 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -10.70 | 4.50 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -19.46 | -47.00 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -31.11 | -9.71 | 21.40 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -16.10 | 12.30 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -22.63 | 15.87 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -19.28 | -11.58 | 7.70 | ZnCl2 |
| ZnCO3:1H2O | -1.89 | -12.15 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -1.89 | -12.15 | -10.26 | ZnCO3:H2O |
| ZnMetal | -34.85 | -7.68 | 27.17 | Zn |
| ZnO(a) | -4.45 | 6.86 | 11.31 | ZnO |
| ZnSO4:H2O | -8.13 | -8.29 | -0.16 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 6. MW-1014

----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.484e-10 | 1.484e-10 |
| Alkalinity | 3.238e-03 | 3.238e-03 |
| As | 2.136e-09 | 2.136e-09 |
| Ba | 2.389e-07 | 2.389e-07 |
| Ca | 1.934e-03 | 1.934e-03 |
| Cd | 8.901e-10 | 8.901e-10 |
| Cl | 1.120e-03 | 1.120e-03 |
| Cu | 7.557e-08 | 7.557e-08 |
| Fe | 1.791e-07 | 1.791e-07 |
| K | 8.162e-05 | 8.162e-05 |
| Mg | 1.058e-03 | 1.058e-03 |
| Mn | 2.768e-05 | 2.768e-05 |
| Na | 5.788e-04 | 5.788e-04 |
| Pb | 1.931e-10 | 1.931e-10 |
| S(6) | 1.156e-03 | 1.156e-03 |
| Se | 2.661e-09 | 2.661e-09 |
| Zn | 1.041e-07 | 1.041e-07 |

----------------------------Description of solution----------------------------

pH = 6.280
pe = 2.175
Activity of water = 1.000

```
                  Ionic strength (mol/kgw)  =   9.949e-03
                        Mass of water (kg)  =   1.000e+00
                     Total carbon (mol/kg)  =   7.784e-03
                        Total CO2 (mol/kg)  =   7.784e-03
                          Temperature (°C)  =   8.43
                   Electrical balance (eq)  =   3.047e-05
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =   0.24
                                Iterations  =  10
                                   Total H  = 1.110157e+02
                                   Total O  = 5.552965e+01
```

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 5.732e-07 | 5.248e-07 | -6.242 | -6.280 | -0.038 | 0.00 |
| OH- | 5.352e-09 | 4.841e-09 | -8.271 | -8.315 | -0.044 | (0) |
| H2O | 5.551e+01 | 9.998e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.484e-10 | | | | | |
| AgCl | 9.376e-11 | 9.397e-11 | -10.028 | -10.027 | 0.001 | (0) |
| Ag+ | 4.227e-11 | 3.823e-11 | -10.374 | -10.418 | -0.044 | (0) |
| AgCl2- | 1.190e-11 | 1.076e-11 | -10.925 | -10.968 | -0.044 | (0) |
| AgSO4- | 4.595e-13 | 4.156e-13 | -12.338 | -12.381 | -0.044 | (0) |
| AgCl3-2 | 1.152e-14 | 7.715e-15 | -13.938 | -14.113 | -0.174 | (0) |
| AgOH | 7.267e-17 | 7.284e-17 | -16.139 | -16.138 | 0.001 | (0) |
| AgCl4-3 | 3.194e-17 | 1.295e-17 | -16.496 | -16.888 | -0.392 | (0) |
| Ag(OH)2- | 1.534e-22 | 1.388e-22 | -21.814 | -21.858 | -0.044 | (0) |
| As(3) | 5.736e-10 | | | | | |
| H3AsO3 | 5.731e-10 | 5.745e-10 | -9.242 | -9.241 | 0.001 | (0) |
| H2AsO3- | 4.456e-13 | 4.030e-13 | -12.351 | -12.395 | -0.044 | (0) |
| H4AsO3+ | 1.651e-16 | 1.494e-16 | -15.782 | -15.826 | -0.044 | (0) |
| HAsO3-2 | 1.074e-21 | 7.191e-22 | -20.969 | -21.143 | -0.174 | (0) |
| AsO3-3 | 3.697e-31 | 1.499e-31 | -30.432 | -30.824 | -0.392 | (0) |
| As(5) | 1.563e-09 | | | | | |
| H2AsO4- | 1.341e-09 | 1.213e-09 | -8.872 | -8.916 | -0.044 | (0) |
| HAsO4-2 | 2.213e-10 | 1.482e-10 | -9.655 | -9.829 | -0.174 | (0) |
| H3AsO4 | 1.072e-13 | 1.074e-13 | -12.970 | -12.969 | 0.001 | (0) |
| AsO4-3 | 1.012e-15 | 4.104e-16 | -14.995 | -15.387 | -0.392 | (0) |
| Ba | 2.389e-07 | | | | | |
| Ba+2 | 1.945e-07 | 1.302e-07 | -6.711 | -6.885 | -0.174 | (0) |
| BaSO4 | 4.209e-08 | 4.218e-08 | -7.376 | -7.375 | 0.001 | (0) |
| BaHCO3+ | 2.359e-09 | 2.134e-09 | -8.627 | -8.671 | -0.044 | (0) |
| BaCO3 | 8.200e-12 | 8.219e-12 | -11.086 | -11.085 | 0.001 | (0) |
| BaOH+ | 9.291e-15 | 8.404e-15 | -14.032 | -14.076 | -0.044 | (0) |
| C(4) | 7.784e-03 | | | | | |
| CO2 | 4.546e-03 | 4.557e-03 | -2.342 | -2.341 | 0.001 | (0) |
| HCO3- | 3.175e-03 | 2.881e-03 | -2.498 | -2.540 | -0.042 | (0) |
| CaHCO3+ | 3.390e-05 | 3.067e-05 | -4.470 | -4.513 | -0.044 | (0) |
| MgHCO3+ | 2.362e-05 | 2.137e-05 | -4.627 | -4.670 | -0.044 | (0) |
| MnHCO3+ | 4.184e-06 | 3.785e-06 | -5.378 | -5.422 | -0.044 | (0) |
| NaHCO3 | 8.434e-07 | 8.454e-07 | -6.074 | -6.073 | 0.001 | (0) |
| CaCO3 | 2.756e-07 | 2.762e-07 | -6.560 | -6.559 | 0.001 | (0) |
| CO3-2 | 2.513e-07 | 1.704e-07 | -6.600 | -6.768 | -0.169 | (0) |
| MnCO3 | 1.991e-07 | 1.996e-07 | -6.701 | -6.700 | 0.001 | (0) |
| MgCO3 | 8.326e-08 | 8.345e-08 | -7.080 | -7.079 | 0.001 | (0) |
| FeHCO3+ | 3.001e-08 | 2.714e-08 | -7.523 | -7.566 | -0.044 | (0) |
| ZnHCO3+ | 2.021e-08 | 1.829e-08 | -7.694 | -7.738 | -0.044 | (0) |
| CuHCO3+ | 1.398e-08 | 1.265e-08 | -7.854 | -7.898 | -0.044 | (0) |
| CuCO3 | 7.999e-09 | 8.017e-09 | -8.097 | -8.096 | 0.001 | (0) |
| BaHCO3+ | 2.359e-09 | 2.134e-09 | -8.627 | -8.671 | -0.044 | (0) |
| ZnCO3 | 1.711e-09 | 1.714e-09 | -8.767 | -8.766 | 0.001 | (0) |
| NaCO3- | 7.556e-10 | 6.835e-10 | -9.122 | -9.165 | -0.044 | (0) |
| FeCO3 | 3.843e-10 | 3.852e-10 | -9.415 | -9.414 | 0.001 | (0) |
| PbCO3 | 7.697e-11 | 7.715e-11 | -10.114 | -10.113 | 0.001 | (0) |
| PbHCO3+ | 6.590e-11 | 5.961e-11 | -10.181 | -10.225 | -0.044 | (0) |
| CdHCO3+ | 4.807e-11 | 4.348e-11 | -10.318 | -10.362 | -0.044 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zn(CO3)2-2 | 9.331e-12 | 6.247e-12 | -11.030 | -11.204 | -0.174 | (0) |
| BaCO3 | 8.200e-12 | 8.219e-12 | -11.086 | -11.085 | 0.001 | (0) |
| Cu(CO3)2-2 | 2.569e-12 | 1.720e-12 | -11.590 | -11.764 | -0.174 | (0) |
| CdCO3 | 6.447e-14 | 6.462e-14 | -13.191 | -13.190 | 0.001 | (0) |
| Pb(CO3)2-2 | 4.933e-14 | 3.303e-14 | -13.307 | -13.481 | -0.174 | (0) |
| Cd(CO3)2-2 | 5.202e-17 | 3.482e-17 | -16.284 | -16.458 | -0.174 | (0) |
| Ca | 1.934e-03 | | | | | |
| Ca+2 | 1.769e-03 | 1.199e-03 | -2.752 | -2.921 | -0.169 | (0) |
| CaSO4 | 1.310e-04 | 1.313e-04 | -3.883 | -3.882 | 0.001 | (0) |
| CaHCO3+ | 3.390e-05 | 3.067e-05 | -4.470 | -4.513 | -0.044 | (0) |
| CaCO3 | 2.756e-07 | 2.762e-07 | -6.560 | -6.559 | 0.001 | (0) |
| CaOH+ | 4.192e-10 | 3.792e-10 | -9.378 | -9.421 | -0.044 | (0) |
| CaHSO4+ | 3.761e-10 | 3.402e-10 | -9.425 | -9.468 | -0.044 | (0) |
| Cd | 8.901e-10 | | | | | |
| Cd+2 | 7.129e-10 | 4.773e-10 | -9.147 | -9.321 | -0.174 | (0) |
| CdSO4 | 7.975e-11 | 7.994e-11 | -10.098 | -10.097 | 0.001 | (0) |
| CdHCO3+ | 4.807e-11 | 4.348e-11 | -10.318 | -10.362 | -0.044 | (0) |
| CdCl+ | 4.807e-11 | 4.348e-11 | -10.318 | -10.362 | -0.044 | (0) |
| Cd(SO4)2-2 | 9.422e-13 | 6.308e-13 | -12.026 | -12.200 | -0.174 | (0) |
| CdCl2 | 1.715e-13 | 1.719e-13 | -12.766 | -12.765 | 0.001 | (0) |
| CdCO3 | 6.447e-14 | 6.462e-14 | -13.191 | -13.190 | 0.001 | (0) |
| CdOHCl | 2.349e-14 | 2.354e-14 | -13.629 | -13.628 | 0.001 | (0) |
| CdOH+ | 2.276e-14 | 2.059e-14 | -13.643 | -13.686 | -0.044 | (0) |
| CdCl3- | 9.311e-17 | 8.423e-17 | -16.031 | -16.075 | -0.044 | (0) |
| Cd(CO3)2-2 | 5.202e-17 | 3.482e-17 | -16.284 | -16.458 | -0.174 | (0) |
| Cd(OH)2 | 7.720e-18 | 7.737e-18 | -17.112 | -17.111 | 0.001 | (0) |
| Cd2OH+3 | 1.477e-22 | 5.989e-23 | -21.831 | -22.223 | -0.392 | (0) |
| Cd(OH)3- | 1.828e-24 | 1.654e-24 | -23.738 | -23.782 | -0.044 | (0) |
| Cd(OH)4-2 | 4.194e-32 | 2.808e-32 | -31.377 | -31.552 | -0.174 | (0) |
| Cl | 1.120e-03 | | | | | |
| Cl- | 1.120e-03 | 1.011e-03 | -2.951 | -2.995 | -0.044 | (0) |
| MnCl+ | 6.715e-08 | 6.074e-08 | -7.173 | -7.217 | -0.044 | (0) |
| CuCl2- | 9.737e-09 | 8.807e-09 | -8.012 | -8.055 | -0.044 | (0) |
| FeCl+ | 1.454e-10 | 1.316e-10 | -9.837 | -9.881 | -0.044 | (0) |
| AgCl | 9.376e-11 | 9.397e-11 | -10.028 | -10.027 | 0.001 | (0) |
| ZnCl+ | 7.000e-11 | 6.332e-11 | -10.155 | -10.198 | -0.044 | (0) |
| CdCl+ | 4.807e-11 | 4.348e-11 | -10.318 | -10.362 | -0.044 | (0) |
| MnCl2 | 2.676e-11 | 2.682e-11 | -10.573 | -10.572 | 0.001 | (0) |
| CuCl3-2 | 1.971e-11 | 1.320e-11 | -10.705 | -10.880 | -0.174 | (0) |
| AgCl2- | 1.190e-11 | 1.076e-11 | -10.925 | -10.968 | -0.044 | (0) |
| CuCl+ | 1.117e-11 | 1.010e-11 | -10.952 | -10.996 | -0.044 | (0) |
| ZnOHCl | 3.209e-12 | 3.217e-12 | -11.494 | -11.493 | 0.001 | (0) |
| PbCl+ | 7.505e-13 | 6.789e-13 | -12.125 | -12.168 | -0.044 | (0) |
| CdCl2 | 1.715e-13 | 1.719e-13 | -12.766 | -12.765 | 0.001 | (0) |
| ZnCl2 | 6.235e-14 | 6.250e-14 | -13.205 | -13.204 | 0.001 | (0) |
| CdOHCl | 2.349e-14 | 2.354e-14 | -13.629 | -13.628 | 0.001 | (0) |
| AgCl3-2 | 1.152e-14 | 7.715e-15 | -13.938 | -14.113 | -0.174 | (0) |
| MnCl3- | 8.260e-15 | 7.471e-15 | -14.083 | -14.127 | -0.044 | (0) |
| CuCl2 | 4.528e-15 | 4.538e-15 | -14.344 | -14.343 | 0.001 | (0) |
| PbCl2 | 1.507e-15 | 1.510e-15 | -14.822 | -14.821 | 0.001 | (0) |
| CdCl3- | 9.311e-17 | 8.423e-17 | -16.031 | -16.075 | -0.044 | (0) |
| ZnCl3- | 7.058e-17 | 6.384e-17 | -16.151 | -16.195 | -0.044 | (0) |
| AgCl4-3 | 3.194e-17 | 1.295e-17 | -16.496 | -16.888 | -0.392 | (0) |
| PbCl3- | 1.204e-18 | 1.089e-18 | -17.919 | -17.963 | -0.044 | (0) |
| ZnCl4-2 | 4.207e-20 | 2.816e-20 | -19.376 | -19.550 | -0.174 | (0) |
| FeCl+2 | 1.345e-20 | 9.006e-21 | -19.871 | -20.045 | -0.174 | (0) |
| CuCl3- | 1.320e-20 | 1.194e-20 | -19.880 | -19.923 | -0.044 | (0) |
| PbCl4-2 | 6.880e-22 | 4.606e-22 | -21.162 | -21.337 | -0.174 | (0) |
| FeCl2+ | 7.845e-23 | 7.096e-23 | -22.105 | -22.149 | -0.044 | (0) |
| CuCl4-2 | 6.021e-26 | 4.031e-26 | -25.220 | -25.395 | -0.174 | (0) |
| FeCl3 | 7.161e-27 | 7.178e-27 | -26.145 | -26.144 | 0.001 | (0) |
| Cu(1) | 3.862e-08 | | | | | |
| Cu+ | 2.886e-08 | 2.611e-08 | -7.540 | -7.583 | -0.044 | (0) |
| CuCl2- | 9.737e-09 | 8.807e-09 | -8.012 | -8.055 | -0.044 | (0) |
| CuCl3-2 | 1.971e-11 | 1.320e-11 | -10.705 | -10.880 | -0.174 | (0) |
| Cu(2) | 3.695e-08 | | | | | |
| CuHCO3+ | 1.398e-08 | 1.265e-08 | -7.854 | -7.898 | -0.044 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Cu+2 | | 1.308e-08 | 8.759e-09 | -7.883 | -8.058 | -0.174 | (0) |
| CuCO3 | | 7.999e-09 | 8.017e-09 | -8.097 | -8.096 | 0.001 | (0) |
| CuSO4 | | 1.022e-09 | 1.024e-09 | -8.991 | -8.990 | 0.001 | (0) |
| Cu(OH)2 | | 6.626e-10 | 6.642e-10 | -9.179 | -9.178 | 0.001 | (0) |
| CuOH+ | | 1.845e-10 | 1.669e-10 | -9.734 | -9.778 | -0.044 | (0) |
| CuCl+ | | 1.117e-11 | 1.010e-11 | -10.952 | -10.996 | -0.044 | (0) |
| Cu(CO3)2-2 | | 2.569e-12 | 1.720e-12 | -11.590 | -11.764 | -0.174 | (0) |
| CuCl2 | | 4.528e-15 | 4.538e-15 | -14.344 | -14.343 | 0.001 | (0) |
| Cu2(OH)2+2 | | 3.188e-15 | 2.134e-15 | -14.496 | -14.671 | -0.174 | (0) |
| Cu(OH)3- | | 8.428e-17 | 7.624e-17 | -16.074 | -16.118 | -0.044 | (0) |
| CuCl3- | | 1.320e-20 | 1.194e-20 | -19.880 | -19.923 | -0.044 | (0) |
| Cu(OH)4-2 | | 4.329e-23 | 2.898e-23 | -22.364 | -22.538 | -0.174 | (0) |
| CuCl4-2 | | 6.021e-26 | 4.031e-26 | -25.220 | -25.395 | -0.174 | (0) |
| Fe(2) | 1.791e-07 | | | | | | |
| Fe+2 | | 1.407e-07 | 9.422e-08 | -6.852 | -7.026 | -0.174 | (0) |
| FeHCO3+ | | 3.001e-08 | 2.714e-08 | -7.523 | -7.566 | -0.044 | (0) |
| FeSO4 | | 7.841e-09 | 7.859e-09 | -8.106 | -8.105 | 0.001 | (0) |
| FeCO3 | | 3.843e-10 | 3.852e-10 | -9.415 | -9.414 | 0.001 | (0) |
| FeCl+ | | 1.454e-10 | 1.316e-10 | -9.837 | -9.881 | -0.044 | (0) |
| FeOH+ | | 1.691e-11 | 1.530e-11 | -10.772 | -10.815 | -0.044 | (0) |
| FeHSO4+ | | 2.954e-14 | 2.672e-14 | -13.530 | -13.573 | -0.044 | (0) |
| Fe(OH)2 | | 5.381e-17 | 5.393e-17 | -16.269 | -16.268 | 0.001 | (0) |
| Fe(OH)3- | | 3.552e-21 | 3.213e-21 | -20.450 | -20.493 | -0.044 | (0) |
| Fe(3) | 8.937e-13 | | | | | | |
| Fe(OH)2+ | | 8.071e-13 | 7.300e-13 | -12.093 | -12.137 | -0.044 | (0) |
| Fe(OH)3 | | 8.320e-14 | 8.339e-14 | -13.080 | -13.079 | 0.001 | (0) |
| FeOH+2 | | 3.363e-15 | 2.251e-15 | -14.473 | -14.648 | -0.174 | (0) |
| Fe(OH)4- | | 7.913e-17 | 7.157e-17 | -16.102 | -16.145 | -0.044 | (0) |
| FeSO4+ | | 2.733e-18 | 2.472e-18 | -17.563 | -17.607 | -0.044 | (0) |
| Fe+3 | | 1.268e-18 | 5.142e-19 | -17.897 | -18.289 | -0.392 | (0) |
| Fe(SO4)2- | | 3.609e-20 | 3.264e-20 | -19.443 | -19.486 | -0.044 | (0) |
| FeCl+2 | | 1.345e-20 | 9.006e-21 | -19.871 | -20.045 | -0.174 | (0) |
| FeCl2+ | | 7.845e-23 | 7.096e-23 | -22.105 | -22.149 | -0.044 | (0) |
| FeHSO4+2 | | 5.472e-24 | 3.663e-24 | -23.262 | -23.436 | -0.174 | (0) |
| FeCl3 | | 7.161e-27 | 7.178e-27 | -26.145 | -26.144 | 0.001 | (0) |
| Fe2(OH)2+4 | | 1.402e-27 | 2.817e-28 | -26.853 | -27.550 | -0.697 | (0) |
| Fe3(OH)4+5 | | 2.663e-36 | 2.168e-37 | -35.575 | -36.664 | -1.089 | (0) |
| H(0) | 2.074e-20 | | | | | | |
| H2 | | 1.037e-20 | 1.040e-20 | -19.984 | -19.983 | 0.001 | (0) |
| K | 8.162e-05 | | | | | | |
| K+ | | 8.135e-05 | 7.345e-05 | -4.090 | -4.134 | -0.044 | (0) |
| KSO4- | | 2.716e-07 | 2.457e-07 | -6.566 | -6.610 | -0.044 | (0) |
| Mg | 1.058e-03 | | | | | | |
| Mg+2 | | 9.702e-04 | 6.618e-04 | -3.013 | -3.179 | -0.166 | (0) |
| MgSO4 | | 6.368e-05 | 6.383e-05 | -4.196 | -4.195 | 0.001 | (0) |
| MgHCO3+ | | 2.362e-05 | 2.137e-05 | -4.627 | -4.670 | -0.044 | (0) |
| MgCO3 | | 8.326e-08 | 8.345e-08 | -7.080 | -7.079 | 0.001 | (0) |
| MgOH+ | | 1.038e-09 | 9.388e-10 | -8.984 | -9.027 | -0.044 | (0) |
| Mn(2) | 2.768e-05 | | | | | | |
| Mn+2 | | 2.202e-05 | 1.474e-05 | -4.657 | -4.831 | -0.174 | (0) |
| MnHCO3+ | | 4.184e-06 | 3.785e-06 | -5.378 | -5.422 | -0.044 | (0) |
| MnSO4 | | 1.210e-06 | 1.213e-06 | -5.917 | -5.916 | 0.001 | (0) |
| MnCO3 | | 1.991e-07 | 1.996e-07 | -6.701 | -6.700 | 0.001 | (0) |
| MnCl+ | | 6.715e-08 | 6.074e-08 | -7.173 | -7.217 | -0.044 | (0) |
| MnOH+ | | 1.909e-10 | 1.727e-10 | -9.719 | -9.763 | -0.044 | (0) |
| MnCl2 | | 2.676e-11 | 2.682e-11 | -10.573 | -10.572 | 0.001 | (0) |
| MnCl3- | | 8.260e-15 | 7.471e-15 | -14.083 | -14.127 | -0.044 | (0) |
| Mn(OH)3- | | 1.786e-21 | 1.615e-21 | -20.748 | -20.792 | -0.044 | (0) |
| Mn(3) | 1.295e-29 | | | | | | |
| Mn+3 | | 1.295e-29 | 5.250e-30 | -28.888 | -29.280 | -0.392 | (0) |
| Mn(6) | 0.000e+00 | | | | | | |
| MnO4-2 | | 0.000e+00 | 0.000e+00 | -70.630 | -70.805 | -0.174 | (0) |
| Mn(7) | 0.000e+00 | | | | | | |
| MnO4- | | 0.000e+00 | 0.000e+00 | -79.118 | -79.162 | -0.044 | (0) |
| Na | 5.788e-04 | | | | | | |
| Na+ | | 5.763e-04 | 5.218e-04 | -3.239 | -3.282 | -0.043 | (0) |
| NaSO4- | | 1.672e-06 | 1.513e-06 | -5.777 | -5.820 | -0.044 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| NaHCO3 | 8.434e-07 | 8.454e-07 | -6.074 | -6.073 | 0.001 | (0) |
| NaCO3- | 7.556e-10 | 6.835e-10 | -9.122 | -9.165 | -0.044 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -58.077 | -58.076 | 0.001 | (0) |
| Pb | 1.931e-10 | | | | | |
| PbCO3 | 7.697e-11 | 7.715e-11 | -10.114 | -10.113 | 0.001 | (0) |
| PbHCO3+ | 6.590e-11 | 5.961e-11 | -10.181 | -10.225 | -0.044 | (0) |
| Pb+2 | 3.891e-11 | 2.605e-11 | -10.410 | -10.584 | -0.174 | (0) |
| PbSO4 | 9.447e-12 | 9.469e-12 | -11.025 | -11.024 | 0.001 | (0) |
| PbOH+ | 1.070e-12 | 9.675e-13 | -11.971 | -12.014 | -0.044 | (0) |
| PbCl+ | 7.505e-13 | 6.789e-13 | -12.125 | -12.168 | -0.044 | (0) |
| Pb(CO3)2-2 | 4.933e-14 | 3.303e-14 | -13.307 | -13.481 | -0.174 | (0) |
| Pb(SO4)2-2 | 4.799e-14 | 3.212e-14 | -13.319 | -13.493 | -0.174 | (0) |
| PbCl2 | 1.507e-15 | 1.510e-15 | -14.822 | -14.821 | 0.001 | (0) |
| Pb(OH)2 | 7.154e-16 | 7.171e-16 | -15.145 | -15.144 | 0.001 | (0) |
| PbCl3- | 1.204e-18 | 1.089e-18 | -17.919 | -17.963 | -0.044 | (0) |
| Pb(OH)3- | 1.734e-20 | 1.568e-20 | -19.761 | -19.805 | -0.044 | (0) |
| Pb2OH+3 | 1.392e-21 | 5.642e-22 | -20.856 | -21.249 | -0.392 | (0) |
| PbCl4-2 | 6.880e-22 | 4.606e-22 | -21.162 | -21.337 | -0.174 | (0) |
| Pb(OH)4-2 | 1.022e-25 | 6.845e-26 | -24.990 | -25.165 | -0.174 | (0) |
| Pb3(OH)4+2 | 3.297e-32 | 2.207e-32 | -31.482 | -31.656 | -0.174 | (0) |
| S(6) | 1.156e-03 | | | | | |
| SO4-2 | 9.581e-04 | 6.464e-04 | -3.019 | -3.189 | -0.171 | (0) |
| CaSO4 | 1.310e-04 | 1.313e-04 | -3.883 | -3.882 | 0.001 | (0) |
| MgSO4 | 6.368e-05 | 6.383e-05 | -4.196 | -4.195 | 0.001 | (0) |
| NaSO4- | 1.672e-06 | 1.513e-06 | -5.777 | -5.820 | -0.044 | (0) |
| MnSO4 | 1.210e-06 | 1.213e-06 | -5.917 | -5.916 | 0.001 | (0) |
| KSO4- | 2.716e-07 | 2.457e-07 | -6.566 | -6.610 | -0.044 | (0) |
| BaSO4 | 4.209e-08 | 4.218e-08 | -7.376 | -7.375 | 0.001 | (0) |
| HSO4- | 2.608e-08 | 2.359e-08 | -7.584 | -7.627 | -0.044 | (0) |
| FeSO4 | 7.841e-09 | 7.859e-09 | -8.106 | -8.105 | 0.001 | (0) |
| ZnSO4 | 6.660e-09 | 6.675e-09 | -8.177 | -8.176 | 0.001 | (0) |
| CuSO4 | 1.022e-09 | 1.024e-09 | -8.991 | -8.990 | 0.001 | (0) |
| CaHSO4+ | 3.761e-10 | 3.402e-10 | -9.425 | -9.468 | -0.044 | (0) |
| CdSO4 | 7.975e-11 | 7.994e-11 | -10.098 | -10.097 | 0.001 | (0) |
| Zn(SO4)2-2 | 5.997e-11 | 4.015e-11 | -10.222 | -10.396 | -0.174 | (0) |
| PbSO4 | 9.447e-12 | 9.469e-12 | -11.025 | -11.024 | 0.001 | (0) |
| Cd(SO4)2-2 | 9.422e-13 | 6.308e-13 | -12.026 | -12.200 | -0.174 | (0) |
| AgSO4- | 4.595e-13 | 4.156e-13 | -12.338 | -12.381 | -0.044 | (0) |
| Pb(SO4)2-2 | 4.799e-14 | 3.212e-14 | -13.319 | -13.493 | -0.174 | (0) |
| FeHSO4+ | 2.954e-14 | 2.672e-14 | -13.530 | -13.573 | -0.044 | (0) |
| FeSO4+ | 2.733e-18 | 2.472e-18 | -17.563 | -17.607 | -0.044 | (0) |
| Fe(SO4)2- | 3.609e-20 | 3.264e-20 | -19.443 | -19.486 | -0.044 | (0) |
| FeHSO4+2 | 5.472e-24 | 3.663e-24 | -23.262 | -23.436 | -0.174 | (0) |
| Se(-2) | 5.139e-26 | | | | | |
| HSe- | 5.113e-26 | 4.625e-26 | -25.291 | -25.335 | -0.044 | (0) |
| H2Se | 2.586e-28 | 2.592e-28 | -27.587 | -27.586 | 0.001 | (0) |
| Se(4) | 2.661e-09 | | | | | |
| HSeO3- | 2.639e-09 | 2.387e-09 | -8.579 | -8.622 | -0.044 | (0) |
| SeO3-2 | 2.148e-11 | 1.438e-11 | -10.668 | -10.842 | -0.174 | (0) |
| H2SeO3 | 7.028e-13 | 7.044e-13 | -12.153 | -12.152 | 0.001 | (0) |
| Se(6) | 9.660e-25 | | | | | |
| SeO4-2 | 9.660e-25 | 6.467e-25 | -24.015 | -24.189 | -0.174 | (0) |
| HSeO4- | 1.053e-29 | 9.526e-30 | -28.978 | -29.021 | -0.044 | (0) |
| Zn | 1.041e-07 | | | | | |
| Zn+2 | 7.531e-08 | 5.042e-08 | -7.123 | -7.297 | -0.174 | (0) |
| ZnHCO3+ | 2.021e-08 | 1.829e-08 | -7.694 | -7.738 | -0.044 | (0) |
| ZnSO4 | 6.660e-09 | 6.675e-09 | -8.177 | -8.176 | 0.001 | (0) |
| ZnCO3 | 1.711e-09 | 1.714e-09 | -8.767 | -8.766 | 0.001 | (0) |
| ZnCl+ | 7.000e-11 | 6.332e-11 | -10.155 | -10.198 | -0.044 | (0) |
| Zn(SO4)2-2 | 5.997e-11 | 4.015e-11 | -10.222 | -10.396 | -0.174 | (0) |
| ZnOH+ | 3.076e-11 | 2.783e-11 | -10.512 | -10.556 | -0.044 | (0) |
| Zn(CO3)2-2 | 9.331e-12 | 6.247e-12 | -11.030 | -11.204 | -0.174 | (0) |
| ZnOHCl | 3.209e-12 | 3.217e-12 | -11.494 | -11.493 | 0.001 | (0) |
| Zn(OH)2 | 2.298e-12 | 2.303e-12 | -11.639 | -11.638 | 0.001 | (0) |
| ZnCl2 | 6.235e-14 | 6.250e-14 | -13.205 | -13.204 | 0.001 | (0) |
| ZnCl3- | 7.058e-17 | 6.384e-17 | -16.151 | -16.195 | -0.044 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zn(OH)3- | 1.534e-17 | 1.388e-17 | -16.814 | -16.858 | -0.044 | (0) |
| ZnCl4-2 | 4.207e-20 | 2.816e-20 | -19.376 | -19.550 | -0.174 | (0) |
| Zn(OH)4-2 | 6.258e-24 | 4.190e-24 | -23.204 | -23.378 | -0.174 | (0) |

------------------------------Saturation indices-------------------------------

| Phase | SI** | log IAP | log K(281 K, 1 atm) | |
|---|---|---|---|---|
| Ag2CO3 | -16.12 | -27.60 | -11.48 | Ag2CO3 |
| Ag2O | -21.31 | -8.28 | 13.03 | Ag2O |
| Ag2SO4 | -18.92 | -24.02 | -5.10 | Ag2SO4 |
| AgMetal | 2.01 | -12.59 | -14.60 | Ag |
| Anglesite | -5.89 | -13.77 | -7.88 | PbSO4 |
| Anhydrite | -1.77 | -6.11 | -4.34 | CaSO4 |
| Antlerite | -10.53 | -2.24 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -1.44 | -9.69 | -8.25 | CaCO3 |
| Arsenolite | -16.79 | -18.48 | -1.69 | As2O3 |
| Artinite | -11.41 | -0.57 | 10.84 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -34.49 | -25.94 | 8.55 | As2O5 |
| As_native | -20.89 | -34.60 | -13.72 | As |
| Atacamite | -8.42 | -0.27 | 8.15 | Cu2(OH)3Cl |
| Azurite | -9.22 | -4.13 | 5.08 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -0.91 | -51.43 | -50.52 | Ba3(AsO4)2 |
| Barite | 0.20 | -10.07 | -10.28 | BaSO4 |
| BaSeO3 | -11.34 | -17.73 | -6.39 | BaSeO3 |
| Bianchite | -8.73 | -10.49 | -1.76 | ZnSO4:6H2O |
| Birnessite | -18.96 | 24.64 | 43.60 | MnO2 |
| Bixbyite | -20.93 | -20.88 | 0.05 | Mn2O3 |
| Brochantite | -13.08 | 2.26 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -8.63 | 9.38 | 18.01 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -20.63 | -39.54 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -1.28 | -9.69 | -8.41 | CaCO3 |
| CaSeO3 | -8.16 | -13.76 | -5.60 | CaSeO3 |
| Cd(gamma) | -28.04 | -13.67 | 14.37 | Cd |
| Cd(OH)2 | -10.41 | 3.24 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -11.39 | 3.24 | 14.63 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -28.49 | -21.78 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -28.59 | -6.03 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -31.19 | -2.79 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.82 | -15.31 | -0.49 | CdCl2 |
| CdCl2:2.5H2O | -13.30 | -15.31 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.68 | -15.31 | -1.63 | CdCl2:H2O |
| CdMetal | -27.94 | -13.67 | 14.27 | Cd |
| CdOHCl | -9.88 | -6.04 | 3.84 | CdOHCl |
| CdSO4 | -13.05 | -12.51 | 0.54 | CdSO4 |
| CdSO4:2.7H2O | -10.82 | -12.51 | -1.69 | CdSO4:2.67H2O |
| CdSO4:H2O | -11.18 | -12.51 | -1.33 | CdSO4:H2O |
| Cerargyrite | -2.99 | -13.41 | -10.43 | AgCl |
| Cerrusite | -4.01 | -17.35 | -13.34 | PbCO3 |
| Chalcanthite | -8.55 | -11.25 | -2.70 | CuSO4:5H2O |
| Claudetite | -16.85 | -18.48 | -1.63 | As2O3 |
| CO2(g) | -1.10 | -2.34 | -1.25 | CO2 |
| Cotunnite | -11.56 | -16.57 | -5.01 | PbCl2 |
| Cu(OH)2 | -4.80 | 4.50 | 9.30 | Cu(OH)2 |
| Cu2SO4 | -16.60 | -18.36 | -1.75 | Cu2SO4 |
| Cu3(AsO4)2:6w | -19.82 | -54.95 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.20 | -14.83 | -9.63 | CuCO3 |
| CuMetal | -0.26 | -9.76 | -9.50 | Cu |
| CuOCuSO4 | -19.81 | -6.74 | 13.06 | CuO:CuSO4 |
| CupricFerrite | -1.94 | 5.60 | 7.55 | CuFe2O4 |
| Cuprite | -0.79 | -2.61 | -1.82 | Cu2O |
| CuprousFerrite | 8.00 | -0.75 | -8.76 | CuFeO2 |
| CuSO4 | -15.04 | -11.25 | 3.79 | CuSO4 |
| Dolomite | -2.95 | -19.64 | -16.68 | CaMg(CO3)2 |
| Dolomite(d) | -3.58 | -19.64 | -16.06 | CaMg(CO3)2 |
| Epsomite | -4.11 | -6.37 | -2.26 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 0.81 | -2.23 | -3.04 | Fe(OH)2.7Cl0.3 |

| | | | | |
|---|---|---|---|---|
| Fe(OH)3(a) | -4.34 | 0.55 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -33.67 | -69.10 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -13.59 | 6.64 | 20.22 | Fe3(OH)8 |
| FeSe2 | -22.21 | -40.79 | -18.58 | FeSe2 |
| Goethite | 0.93 | 0.55 | -0.38 | FeOOH |
| Goslarite | -8.39 | -10.49 | -2.10 | ZnSO4:7H2O |
| Gypsum | -1.52 | -6.11 | -4.59 | CaSO4:2H2O |
| H2(g) | -16.91 | -19.98 | -3.07 | H2 |
| H2O(g) | -1.96 | -0.00 | 1.96 | H2O |
| Halite | -7.82 | -6.28 | 1.54 | NaCl |
| Hausmannite | -25.28 | 40.09 | 65.37 | Mn3O4 |
| Hematite | 3.78 | 1.10 | -2.68 | Fe2O3 |
| Huntite | -10.68 | -39.53 | -28.86 | CaMg3(CO3)4 |
| Hydrocerrusite | -15.27 | -32.73 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -23.90 | -30.41 | -6.51 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -21.64 | 8.67 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -23.69 | 8.67 | 32.36 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -18.27 | -28.10 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -19.84 | -27.70 | -7.86 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -23.13 | -26.85 | -3.72 | NaFe3(SO4)2(OH)6 |
| JarositeH | -26.84 | -29.85 | -3.01 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -16.24 | 2.26 | 18.50 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.80 | -11.80 | -0.00 | PbO:PbSO4 |
| Laurionite | -7.92 | -7.30 | 0.62 | PbOHCl |
| Litharge | -11.45 | 1.98 | 13.43 | PbO |
| Maghemite | -5.28 | 1.10 | 6.39 | Fe2O3 |
| Magnesite | -2.18 | -9.95 | -7.76 | MgCO3 |
| Magnetite | 0.72 | 6.64 | 5.91 | Fe3O4 |
| Malachite | -5.82 | 0.18 | 6.00 | Cu2(OH)2CO3 |
| Manganite | -9.16 | 16.18 | 25.34 | MnOOH |
| Massicot | -11.66 | 1.98 | 13.63 | PbO |
| Melanothallite | -18.31 | -14.05 | 4.26 | CuCl2 |
| Melanterite | -7.78 | -10.22 | -2.43 | FeSO4:7H2O |
| Minium | -55.29 | 22.84 | 78.12 | Pb3O4 |
| Mirabilite | -7.82 | -9.76 | -1.93 | Na2SO4:10H2O |
| Mn2(SO4)3 | -64.10 | -68.13 | -4.03 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -16.56 | -45.27 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.78 | -10.82 | 1.96 | MnCl2:4H2O |
| MnSO4 | -11.36 | -8.02 | 3.34 | MnSO4 |
| Monteponite | -11.60 | 3.24 | 14.84 | CdO |
| Nahcolite | -5.11 | -5.82 | -0.71 | NaHCO3 |
| Nantokite | -3.39 | -10.58 | -7.19 | CuCl |
| Natron | -11.34 | -13.33 | -1.99 | Na2CO3:10H2O |
| Nesquehonite | -4.58 | -9.95 | -5.37 | MgCO3:3H2O |
| Nsutite | -17.93 | 24.64 | 42.56 | MnO2 |
| O2(g) | -55.33 | -58.08 | -2.75 | O2 |
| Otavite | -4.09 | -16.09 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.78 | 1.98 | 8.75 | Pb(OH)2 |
| Pb2(OH)3Cl | -14.12 | -5.32 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -22.25 | 3.95 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -40.18 | 20.86 | 61.04 | Pb2O3 |
| Pb2OCO3 | -15.37 | -15.38 | -0.01 | PbO:PbCO3 |
| Pb3(AsO4)2 | -27.12 | -62.53 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -25.56 | -13.40 | 12.16 | PbCO3:2PbO |
| Pb3O2SO4 | -21.12 | -9.82 | 11.30 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -28.95 | -7.85 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -31.46 | -7.85 | 23.61 | PbSO4:3PbO |
| PbMetal | -19.19 | -14.93 | 4.25 | Pb |
| PbO:0.3H2O | -11.00 | 1.98 | 12.98 | PbO:0.33H2O |
| Phosgenite | -14.12 | -33.93 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -33.47 | 18.88 | 52.35 | PbO2 |
| Portlandite | -14.50 | 9.64 | 24.14 | Ca(OH)2 |
| Pyrochroite | -7.47 | 7.73 | 15.20 | Mn(OH)2 |
| Pyrolusite | -19.55 | 24.64 | 44.19 | MnO2 |
| Rhodochrosite | -0.53 | -11.60 | -11.07 | MnCO3 |
| Rhodochrosite(d) | -1.21 | -11.60 | -10.39 | MnCO3 |
| Scorodite | -13.43 | -33.68 | -20.25 | FeAsO4:2H2O |

|  |  |  |  |  |
|---|---|---|---|---|
| Se(s) | 2.62 | -14.71 | -17.32 | Se |
| SeO2 | -15.02 | -23.40 | -8.38 | SeO2 |
| Siderite | -3.01 | -13.79 | -10.78 | FeCO3 |
| Siderite(d)(3) | -3.34 | -13.79 | -10.45 | FeCO3 |
| Smithsonite | -4.25 | -14.07 | -9.81 | ZnCO3 |
| Smithsonite_PG | -3.28 | -14.07 | -10.79 | ZnCO3 |
| Tenorite | -3.77 | 4.50 | 8.28 | CuO |
| Thenardite | -9.60 | -9.75 | -0.15 | Na2SO4 |
| Thermonatrite | -13.58 | -13.33 | 0.25 | Na2CO3:H2O |
| Trona | -19.14 | -19.16 | -0.02 | NaHCO3:Na2CO3:2H2O |
| Witherite | -5.01 | -13.65 | -8.65 | BaCO3 |
| Zincite(c) | -6.82 | 5.26 | 12.08 | ZnO |
| Zincosite | -14.33 | -10.49 | 3.84 | ZnSO4 |
| Zn(OH)2-a | -7.19 | 5.26 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -6.49 | 5.26 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -6.94 | 5.26 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -6.24 | 5.26 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -6.45 | 5.26 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -12.72 | -5.22 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -13.95 | 1.25 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -25.12 | -52.67 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -37.41 | -15.71 | 21.69 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -23.10 | 5.30 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -30.74 | 7.76 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -21.07 | -13.29 | 7.78 | ZnCl2 |
| ZnCO3:1H2O | -3.81 | -14.07 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -3.81 | -14.07 | -10.26 | ZnCO3:H2O |
| ZnMetal | -38.99 | -11.65 | 27.34 | Zn |
| ZnO(a) | -6.05 | 5.26 | 11.31 | ZnO |
| ZnSO4:H2O | -10.38 | -10.49 | -0.11 | ZnSO4:H2O |

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
For ideal gases, phi = 1.

Initial solution 7.      MW-1014A

-----------------------------Solution composition------------------------------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.486e-10 | 1.486e-10 |
| Alkalinity | 9.469e-03 | 9.469e-03 |
| As | 8.024e-09 | 8.024e-09 |
| Ba | 9.703e-08 | 9.703e-08 |
| Ca | 8.324e-03 | 8.324e-03 |
| Cd | 7.933e-10 | 7.933e-10 |
| Cl | 2.967e-04 | 2.967e-04 |
| Cu | 3.784e-08 | 3.784e-08 |
| Fe | 2.278e-07 | 2.278e-07 |
| K | 2.521e-04 | 2.521e-04 |
| Mg | 4.739e-03 | 4.739e-03 |
| Mn | 1.731e-06 | 1.731e-06 |
| Na | 2.018e-03 | 2.018e-03 |
| Pb | 1.934e-10 | 1.934e-10 |
| S(6) | 9.595e-03 | 9.595e-03 |
| Se | 3.045e-09 | 3.045e-09 |
| Zn | 1.379e-07 | 1.379e-07 |

----------------------------Description of solution----------------------------

pH = 6.510
pe = 2.205
Activity of water = 0.999
Ionic strength (mol/kgw) = 3.922e-02
Mass of water (kg) = 1.000e+00
Total carbon (mol/kg) = 1.642e-02
Total CO2 (mol/kg) = 1.642e-02

```
                       Temperature (°C)  =   8.86
                Electrical balance (eq)  =  -5.550e-04
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =  -1.23
                             Iterations  =  11
                                Total H  = 1.110219e+02
                                Total O  = 5.558690e+01
```

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 3.567e-07 | 3.090e-07 | -6.448 | -6.510 | -0.062 | 0.00 |
| OH- | 1.018e-08 | 8.543e-09 | -7.992 | -8.068 | -0.076 | (0) |
| H2O | 5.551e+01 | 9.993e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.486e-10 | | | | | |
| Ag+ | 9.470e-11 | 7.944e-11 | -10.024 | -10.100 | -0.076 | (0) |
| AgCl | 4.690e-11 | 4.733e-11 | -10.329 | -10.325 | 0.004 | (0) |
| AgSO4- | 5.441e-12 | 4.564e-12 | -11.264 | -11.341 | -0.076 | (0) |
| AgCl2- | 1.572e-12 | 1.319e-12 | -11.803 | -11.880 | -0.076 | (0) |
| AgCl3-2 | 4.713e-16 | 2.334e-16 | -15.327 | -15.632 | -0.305 | (0) |
| AgOH | 2.546e-16 | 2.569e-16 | -15.594 | -15.590 | 0.004 | (0) |
| AgCl4-3 | 4.650e-19 | 9.565e-20 | -18.333 | -19.019 | -0.687 | (0) |
| Ag(OH)2- | 9.903e-22 | 8.307e-22 | -21.004 | -21.081 | -0.076 | (0) |
| As(3) | 3.667e-10 | | | | | |
| H3AsO3 | 3.662e-10 | 3.695e-10 | -9.436 | -9.432 | 0.004 | (0) |
| H2AsO3- | 5.344e-13 | 4.483e-13 | -12.272 | -12.348 | -0.076 | (0) |
| H4AsO3+ | 6.745e-17 | 5.658e-17 | -16.171 | -16.247 | -0.076 | (0) |
| HAsO3-2 | 2.800e-21 | 1.387e-21 | -20.553 | -20.858 | -0.305 | (0) |
| AsO3-3 | 2.426e-30 | 4.990e-31 | -29.615 | -30.302 | -0.687 | (0) |
| As(5) | 7.657e-09 | | | | | |
| H2AsO4- | 5.663e-09 | 4.750e-09 | -8.247 | -8.323 | -0.076 | (0) |
| HAsO4-2 | 1.994e-09 | 9.873e-10 | -8.700 | -9.006 | -0.305 | (0) |
| H3AsO4 | 2.466e-13 | 2.488e-13 | -12.608 | -12.604 | 0.004 | (0) |
| AsO4-3 | 2.284e-14 | 4.699e-15 | -13.641 | -14.328 | -0.687 | (0) |
| Ba | 9.703e-08 | | | | | |
| Ba+2 | 5.208e-08 | 2.579e-08 | -7.283 | -7.589 | -0.305 | (0) |
| BaSO4 | 4.359e-08 | 4.398e-08 | -7.361 | -7.357 | 0.004 | (0) |
| BaHCO3+ | 1.349e-09 | 1.132e-09 | -8.870 | -8.946 | -0.076 | (0) |
| BaCO3 | 7.392e-12 | 7.459e-12 | -11.131 | -11.127 | 0.004 | (0) |
| BaOH+ | 3.369e-15 | 2.826e-15 | -14.473 | -14.549 | -0.076 | (0) |
| C(4) | 1.642e-02 | | | | | |
| HCO3- | 8.999e-03 | 7.607e-03 | -2.046 | -2.119 | -0.073 | (0) |
| CO2 | 6.954e-03 | 7.017e-03 | -2.158 | -2.154 | 0.004 | (0) |
| CaHCO3+ | 2.599e-04 | 2.180e-04 | -3.585 | -3.662 | -0.076 | (0) |
| MgHCO3+ | 1.905e-04 | 1.598e-04 | -3.720 | -3.796 | -0.076 | (0) |
| NaHCO3 | 7.059e-06 | 7.123e-06 | -5.151 | -5.147 | 0.004 | (0) |
| CaCO3 | 3.312e-06 | 3.342e-06 | -5.480 | -5.476 | 0.004 | (0) |
| CO3-2 | 1.516e-06 | 7.741e-07 | -5.819 | -6.111 | -0.292 | (0) |
| MgCO3 | 1.071e-06 | 1.080e-06 | -5.970 | -5.966 | 0.004 | (0) |
| MnHCO3+ | 4.210e-07 | 3.531e-07 | -6.376 | -6.452 | -0.076 | (0) |
| FeHCO3+ | 6.105e-08 | 5.121e-08 | -7.214 | -7.291 | -0.076 | (0) |
| ZnHCO3+ | 3.880e-08 | 3.255e-08 | -7.411 | -7.487 | -0.076 | (0) |
| MnCO3 | 3.174e-08 | 3.203e-08 | -7.498 | -7.494 | 0.004 | (0) |
| NaCO3- | 1.210e-08 | 1.015e-08 | -7.917 | -7.994 | -0.076 | (0) |
| CuHCO3+ | 1.150e-08 | 9.648e-09 | -7.939 | -8.016 | -0.076 | (0) |
| CuCO3 | 1.043e-08 | 1.052e-08 | -7.982 | -7.978 | 0.004 | (0) |
| ZnCO3 | 5.202e-09 | 5.249e-09 | -8.284 | -8.280 | 0.004 | (0) |
| BaHCO3+ | 1.349e-09 | 1.132e-09 | -8.870 | -8.946 | -0.076 | (0) |
| FeCO3 | 1.239e-09 | 1.250e-09 | -8.907 | -8.903 | 0.004 | (0) |
| Zn(CO3)2-2 | 1.755e-10 | 8.688e-11 | -9.756 | -10.061 | -0.305 | (0) |
| PbCO3 | 1.046e-10 | 1.055e-10 | -9.981 | -9.977 | 0.004 | (0) |
| CdHCO3+ | 6.928e-11 | 5.812e-11 | -10.159 | -10.236 | -0.076 | (0) |
| PbHCO3+ | 5.651e-11 | 4.740e-11 | -10.248 | -10.324 | -0.076 | (0) |
| Cu(CO3)2-2 | 2.070e-11 | 1.025e-11 | -10.684 | -10.989 | -0.305 | (0) |
| BaCO3 | 7.392e-12 | 7.459e-12 | -11.131 | -11.127 | 0.004 | (0) |
| Pb(CO3)2-2 | 4.144e-13 | 2.052e-13 | -12.383 | -12.688 | -0.305 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CdCO3 | 1.472e-13 | 1.486e-13 | -12.832 | -12.828 | 0.004 | (0) |
| Cd(CO3)2-2 | 7.344e-16 | 3.637e-16 | -15.134 | -15.439 | -0.305 | (0) |
| Ca | 8.324e-03 | | | | | |
| Ca+2 | 6.232e-03 | 3.188e-03 | -2.205 | -2.497 | -0.291 | (0) |
| CaSO4 | 1.829e-03 | 1.845e-03 | -2.738 | -2.734 | 0.004 | (0) |
| CaHCO3+ | 2.599e-04 | 2.180e-04 | -3.585 | -3.662 | -0.076 | (0) |
| CaCO3 | 3.312e-06 | 3.342e-06 | -5.480 | -5.476 | 0.004 | (0) |
| CaHSO4+ | 3.367e-09 | 2.825e-09 | -8.473 | -8.549 | -0.076 | (0) |
| CaOH+ | 2.039e-09 | 1.711e-09 | -8.690 | -8.767 | -0.076 | (0) |
| Cd | 7.933e-10 | | | | | |
| Cd+2 | 4.879e-10 | 2.416e-10 | -9.312 | -9.617 | -0.305 | (0) |
| CdSO4 | 2.117e-10 | 2.136e-10 | -9.674 | -9.670 | 0.004 | (0) |
| CdHCO3+ | 6.928e-11 | 5.812e-11 | -10.159 | -10.236 | -0.076 | (0) |
| Cd(SO4)2-2 | 1.786e-11 | 8.846e-12 | -10.748 | -11.053 | -0.305 | (0) |
| CdCl+ | 6.417e-12 | 5.383e-12 | -11.193 | -11.269 | -0.076 | (0) |
| CdCO3 | 1.472e-13 | 1.486e-13 | -12.832 | -12.828 | 0.004 | (0) |
| CdOH+ | 2.186e-14 | 1.833e-14 | -13.660 | -13.737 | -0.076 | (0) |
| CdCl2 | 5.158e-15 | 5.205e-15 | -14.288 | -14.284 | 0.004 | (0) |
| CdOHCl | 4.953e-15 | 4.998e-15 | -14.305 | -14.301 | 0.004 | (0) |
| Cd(CO3)2-2 | 7.344e-16 | 3.637e-16 | -15.134 | -15.439 | -0.305 | (0) |
| Cd(OH)2 | 1.118e-17 | 1.129e-17 | -16.951 | -16.947 | 0.004 | (0) |
| CdCl3- | 7.478e-19 | 6.273e-19 | -18.126 | -18.203 | -0.076 | (0) |
| Cd2OH+3 | 1.304e-22 | 2.683e-23 | -21.885 | -22.571 | -0.687 | (0) |
| Cd(OH)3- | 4.882e-24 | 4.095e-24 | -23.311 | -23.388 | -0.076 | (0) |
| Cd(OH)4-2 | 2.383e-31 | 1.180e-31 | -30.623 | -30.928 | -0.305 | (0) |
| Cl | 2.967e-04 | | | | | |
| Cl- | 2.967e-04 | 2.470e-04 | -3.528 | -3.607 | -0.080 | (0) |
| MnCl+ | 6.247e-10 | 5.241e-10 | -9.204 | -9.281 | -0.076 | (0) |
| CuCl2- | 1.691e-10 | 1.419e-10 | -9.772 | -9.848 | -0.076 | (0) |
| AgCl | 4.690e-11 | 4.733e-11 | -10.329 | -10.325 | 0.004 | (0) |
| FeCl+ | 2.736e-11 | 2.295e-11 | -10.563 | -10.639 | -0.076 | (0) |
| ZnCl+ | 1.269e-11 | 1.065e-11 | -10.897 | -10.973 | -0.076 | (0) |
| CdCl+ | 6.417e-12 | 5.383e-12 | -11.193 | -11.269 | -0.076 | (0) |
| AgCl2- | 1.572e-12 | 1.319e-12 | -11.803 | -11.880 | -0.076 | (0) |
| ZnOHCl | 8.908e-13 | 8.988e-13 | -12.050 | -12.046 | 0.004 | (0) |
| CuCl+ | 8.696e-13 | 7.295e-13 | -12.061 | -12.137 | -0.076 | (0) |
| CuCl3-2 | 1.050e-13 | 5.200e-14 | -12.979 | -13.284 | -0.305 | (0) |
| PbCl+ | 6.023e-14 | 5.053e-14 | -13.220 | -13.296 | -0.076 | (0) |
| MnCl2 | 5.599e-14 | 5.650e-14 | -13.252 | -13.248 | 0.004 | (0) |
| CdCl2 | 5.158e-15 | 5.205e-15 | -14.288 | -14.284 | 0.004 | (0) |
| CdOHCl | 4.953e-15 | 4.998e-15 | -14.305 | -14.301 | 0.004 | (0) |
| ZnCl2 | 2.548e-15 | 2.571e-15 | -14.594 | -14.590 | 0.004 | (0) |
| AgCl3-2 | 4.713e-16 | 2.334e-16 | -15.327 | -15.632 | -0.305 | (0) |
| CuCl2 | 7.973e-17 | 8.046e-17 | -16.098 | -16.094 | 0.004 | (0) |
| PbCl2 | 2.696e-17 | 2.720e-17 | -16.569 | -16.565 | 0.004 | (0) |
| MnCl3- | 4.582e-18 | 3.843e-18 | -17.339 | -17.415 | -0.076 | (0) |
| ZnCl3- | 7.666e-19 | 6.431e-19 | -18.115 | -18.192 | -0.076 | (0) |
| CdCl3- | 7.478e-19 | 6.273e-19 | -18.126 | -18.203 | -0.076 | (0) |
| AgCl4-3 | 4.650e-19 | 9.565e-20 | -18.333 | -19.019 | -0.687 | (0) |
| PbCl3- | 5.726e-21 | 4.804e-21 | -20.242 | -20.318 | -0.076 | (0) |
| FeCl+2 | 3.549e-21 | 1.758e-21 | -20.450 | -20.755 | -0.305 | (0) |
| ZnCl4-2 | 1.404e-22 | 6.953e-23 | -21.853 | -22.158 | -0.305 | (0) |
| CuCl3- | 6.212e-23 | 5.211e-23 | -22.207 | -22.283 | -0.076 | (0) |
| FeCl2+ | 3.970e-24 | 3.330e-24 | -23.401 | -23.477 | -0.076 | (0) |
| PbCl4-2 | 1.006e-24 | 4.980e-25 | -23.998 | -24.303 | -0.305 | (0) |
| CuCl4-2 | 8.775e-29 | 4.345e-29 | -28.057 | -28.362 | -0.305 | (0) |
| FeCl3 | 8.152e-29 | 8.226e-29 | -28.089 | -28.085 | 0.004 | (0) |
| Cu(1) | 8.587e-09 | | | | | |
| Cu+ | 8.418e-09 | 7.062e-09 | -8.075 | -8.151 | -0.076 | (0) |
| CuCl2- | 1.691e-10 | 1.419e-10 | -9.772 | -9.848 | -0.076 | (0) |
| CuCl3-2 | 1.050e-13 | 5.200e-14 | -12.979 | -13.284 | -0.305 | (0) |
| Cu(2) | 2.925e-08 | | | | | |
| CuHCO3+ | 1.150e-08 | 9.648e-09 | -7.939 | -8.016 | -0.076 | (0) |
| CuCO3 | 1.043e-08 | 1.052e-08 | -7.982 | -7.978 | 0.004 | (0) |
| Cu+2 | 5.110e-09 | 2.531e-09 | -8.292 | -8.597 | -0.305 | (0) |
| CuSO4 | 1.549e-09 | 1.563e-09 | -8.810 | -8.806 | 0.004 | (0) |
| Cu(OH)2 | 5.479e-10 | 5.529e-10 | -9.261 | -9.257 | 0.004 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuOH+ | 9.755e-11 | 8.183e-11 | -10.011 | -10.087 | -0.076 | (0) |
| Cu(CO3)2-2 | 2.070e-11 | 1.025e-11 | -10.684 | -10.989 | -0.305 | (0) |
| CuCl+ | 8.696e-13 | 7.295e-13 | -12.061 | -12.137 | -0.076 | (0) |
| Cu2(OH)2+2 | 1.087e-15 | 5.385e-16 | -14.964 | -15.269 | -0.305 | (0) |
| Cu(OH)3- | 1.284e-16 | 1.077e-16 | -15.891 | -15.968 | -0.076 | (0) |
| CuCl2 | 7.973e-17 | 8.046e-17 | -16.098 | -16.094 | 0.004 | (0) |
| Cu(OH)4-2 | 1.404e-22 | 6.952e-23 | -21.853 | -22.158 | -0.305 | (0) |
| CuCl3- | 6.212e-23 | 5.211e-23 | -22.207 | -22.283 | -0.076 | (0) |
| CuCl4-2 | 8.775e-29 | 4.345e-29 | -28.057 | -28.362 | -0.305 | (0) |
| Fe(2) | 2.278e-07 | | | | | |
| Fe+2 | 1.360e-07 | 6.732e-08 | -6.867 | -7.172 | -0.305 | (0) |
| FeHCO3+ | 6.105e-08 | 5.121e-08 | -7.214 | -7.291 | -0.076 | (0) |
| FeSO4 | 2.955e-08 | 2.982e-08 | -7.529 | -7.526 | 0.004 | (0) |
| FeCO3 | 1.239e-09 | 1.250e-09 | -8.907 | -8.903 | 0.004 | (0) |
| FeCl+ | 2.736e-11 | 2.295e-11 | -10.563 | -10.639 | -0.076 | (0) |
| FeOH+ | 2.293e-11 | 1.924e-11 | -10.640 | -10.716 | -0.076 | (0) |
| FeHSO4+ | 7.112e-14 | 5.966e-14 | -13.148 | -13.224 | -0.076 | (0) |
| Fe(OH)2 | 1.189e-16 | 1.200e-16 | -15.925 | -15.921 | 0.004 | (0) |
| Fe(OH)3- | 1.454e-20 | 1.220e-20 | -19.837 | -19.914 | -0.076 | (0) |
| Fe(3) | 2.415e-12 | | | | | |
| Fe(OH)2+ | 2.068e-12 | 1.735e-12 | -11.684 | -11.761 | -0.076 | (0) |
| Fe(OH)3 | 3.404e-13 | 3.435e-13 | -12.468 | -12.464 | 0.004 | (0) |
| FeOH+2 | 6.249e-15 | 3.095e-15 | -14.204 | -14.509 | -0.305 | (0) |
| Fe(OH)4- | 6.083e-16 | 5.103e-16 | -15.216 | -15.292 | -0.076 | (0) |
| FeSO4+ | 1.234e-17 | 1.035e-17 | -16.909 | -16.985 | -0.076 | (0) |
| Fe+3 | 1.968e-18 | 4.047e-19 | -17.706 | -18.393 | -0.687 | (0) |
| Fe(SO4)2- | 8.594e-19 | 7.209e-19 | -18.066 | -18.142 | -0.076 | (0) |
| FeCl+2 | 3.549e-21 | 1.758e-21 | -20.450 | -20.755 | -0.305 | (0) |
| FeHSO4+2 | 1.819e-23 | 9.009e-24 | -22.740 | -23.045 | -0.305 | (0) |
| FeCl2+ | 3.970e-24 | 3.330e-24 | -23.401 | -23.477 | -0.076 | (0) |
| Fe2(OH)2+4 | 8.677e-27 | 5.217e-28 | -26.062 | -27.283 | -1.221 | (0) |
| FeCl3 | 8.152e-29 | 8.226e-29 | -28.089 | -28.085 | 0.004 | (0) |
| Fe3(OH)4+5 | 7.382e-35 | 9.131e-37 | -34.132 | -36.040 | -1.908 | (0) |
| H(0) | 6.176e-21 | | | | | |
| H2 | 3.088e-21 | 3.116e-21 | -20.510 | -20.506 | 0.004 | (0) |
| K | 2.521e-04 | | | | | |
| K+ | 2.478e-04 | 2.062e-04 | -3.606 | -3.686 | -0.080 | (0) |
| KSO4- | 4.364e-06 | 3.661e-06 | -5.360 | -5.436 | -0.076 | (0) |
| Mg | 4.739e-03 | | | | | |
| Mg+2 | 3.593e-03 | 1.874e-03 | -2.445 | -2.727 | -0.283 | (0) |
| MgSO4 | 9.546e-04 | 9.632e-04 | -3.020 | -3.016 | 0.004 | (0) |
| MgHCO3+ | 1.905e-04 | 1.598e-04 | -3.720 | -3.796 | -0.076 | (0) |
| MgCO3 | 1.071e-06 | 1.080e-06 | -5.970 | -5.966 | 0.004 | (0) |
| MgOH+ | 5.618e-09 | 4.713e-09 | -8.250 | -8.327 | -0.076 | (0) |
| Mn(2) | 1.731e-06 | | | | | |
| Mn+2 | 1.052e-06 | 5.208e-07 | -5.978 | -6.283 | -0.305 | (0) |
| MnHCO3+ | 4.210e-07 | 3.531e-07 | -6.376 | -6.452 | -0.076 | (0) |
| MnSO4 | 2.256e-07 | 2.276e-07 | -6.647 | -6.643 | 0.004 | (0) |
| MnCO3 | 3.174e-08 | 3.203e-08 | -7.498 | -7.494 | 0.004 | (0) |
| MnCl+ | 6.247e-10 | 5.241e-10 | -9.204 | -9.281 | -0.076 | (0) |
| MnOH+ | 1.284e-11 | 1.077e-11 | -10.891 | -10.968 | -0.076 | (0) |
| MnCl2 | 5.599e-14 | 5.650e-14 | -13.252 | -13.248 | 0.004 | (0) |
| MnCl3- | 4.582e-18 | 3.843e-18 | -17.339 | -17.415 | -0.076 | (0) |
| Mn(OH)3- | 3.328e-22 | 2.792e-22 | -21.478 | -21.554 | -0.076 | (0) |
| Mn(3) | 1.038e-30 | | | | | |
| Mn+3 | 1.038e-30 | 2.135e-31 | -29.984 | -30.671 | -0.687 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -69.812 | -70.117 | -0.305 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -78.336 | -78.412 | -0.076 | (0) |
| Na | 2.018e-03 | | | | | |
| Na+ | 1.980e-03 | 1.665e-03 | -2.703 | -2.779 | -0.075 | (0) |
| NaSO4- | 3.038e-05 | 2.549e-05 | -4.517 | -4.594 | -0.076 | (0) |
| NaHCO3 | 7.059e-06 | 7.123e-06 | -5.151 | -5.147 | 0.004 | (0) |
| NaCO3- | 1.210e-08 | 1.015e-08 | -7.917 | -7.994 | -0.076 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -56.879 | -56.875 | 0.004 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pb | 1.934e-10 | | | | | |
| PbCO3 | 1.046e-10 | 1.055e-10 | -9.981 | -9.977 | 0.004 | (0) |
| PbHCO3+ | 5.651e-11 | 4.740e-11 | -10.248 | -10.324 | -0.076 | (0) |
| Pb+2 | 1.584e-11 | 7.845e-12 | -10.800 | -11.105 | -0.305 | (0) |
| PbSO4 | 1.488e-11 | 1.501e-11 | -10.827 | -10.824 | 0.004 | (0) |
| PbOH+ | 5.897e-13 | 4.947e-13 | -12.229 | -12.306 | -0.076 | (0) |
| Pb(SO4)2-2 | 5.414e-13 | 2.681e-13 | -12.267 | -12.572 | -0.305 | (0) |
| Pb(CO3)2-2 | 4.144e-13 | 2.052e-13 | -12.383 | -12.688 | -0.305 | (0) |
| PbCl+ | 6.023e-14 | 5.053e-14 | -13.220 | -13.296 | -0.076 | (0) |
| Pb(OH)2 | 6.168e-16 | 6.224e-16 | -15.210 | -15.206 | 0.004 | (0) |
| PbCl2 | 2.696e-17 | 2.720e-17 | -16.569 | -16.565 | 0.004 | (0) |
| Pb(OH)3- | 2.755e-20 | 2.311e-20 | -19.560 | -19.636 | -0.076 | (0) |
| PbCl3- | 5.726e-21 | 4.804e-21 | -20.242 | -20.318 | -0.076 | (0) |
| Pb2OH+3 | 4.224e-22 | 8.688e-23 | -21.374 | -22.061 | -0.687 | (0) |
| PbCl4-2 | 1.006e-24 | 4.980e-25 | -23.998 | -24.303 | -0.305 | (0) |
| Pb(OH)4-2 | 3.457e-25 | 1.712e-25 | -24.461 | -24.767 | -0.305 | (0) |
| Pb3(OH)4+2 | 1.087e-32 | 5.383e-33 | -31.964 | -32.269 | -0.305 | (0) |
| S(6) | 9.595e-03 | | | | | |
| SO4-2 | 6.777e-03 | 3.403e-03 | -2.169 | -2.468 | -0.299 | (0) |
| CaSO4 | 1.829e-03 | 1.845e-03 | -2.738 | -2.734 | 0.004 | (0) |
| MgSO4 | 9.546e-04 | 9.632e-04 | -3.020 | -3.016 | 0.004 | (0) |
| NaSO4- | 3.038e-05 | 2.549e-05 | -4.517 | -4.594 | -0.076 | (0) |
| KSO4- | 4.364e-06 | 3.661e-06 | -5.360 | -5.436 | -0.076 | (0) |
| MnSO4 | 2.256e-07 | 2.276e-07 | -6.647 | -6.643 | 0.004 | (0) |
| HSO4- | 8.786e-08 | 7.371e-08 | -7.056 | -7.132 | -0.076 | (0) |
| BaSO4 | 4.359e-08 | 4.398e-08 | -7.361 | -7.357 | 0.004 | (0) |
| FeSO4 | 2.955e-08 | 2.982e-08 | -7.529 | -7.526 | 0.004 | (0) |
| ZnSO4 | 2.356e-08 | 2.377e-08 | -7.628 | -7.624 | 0.004 | (0) |
| CaHSO4+ | 3.367e-09 | 2.825e-09 | -8.473 | -8.549 | -0.076 | (0) |
| CuSO4 | 1.549e-09 | 1.563e-09 | -8.810 | -8.806 | 0.004 | (0) |
| Zn(SO4)2-2 | 1.514e-09 | 7.498e-10 | -8.820 | -9.125 | -0.305 | (0) |
| CdSO4 | 2.117e-10 | 2.136e-10 | -9.674 | -9.670 | 0.004 | (0) |
| Cd(SO4)2-2 | 1.786e-11 | 8.846e-12 | -10.748 | -11.053 | -0.305 | (0) |
| PbSO4 | 1.488e-11 | 1.501e-11 | -10.827 | -10.824 | 0.004 | (0) |
| AgSO4- | 5.441e-12 | 4.564e-12 | -11.264 | -11.341 | -0.076 | (0) |
| Pb(SO4)2-2 | 5.414e-13 | 2.681e-13 | -12.267 | -12.572 | -0.305 | (0) |
| FeHSO4+ | 7.112e-14 | 5.966e-14 | -13.148 | -13.224 | -0.076 | (0) |
| FeSO4+ | 1.234e-17 | 1.035e-17 | -16.909 | -16.985 | -0.076 | (0) |
| Fe(SO4)2- | 8.594e-19 | 7.209e-19 | -18.066 | -18.142 | -0.076 | (0) |
| FeHSO4+2 | 1.819e-23 | 9.009e-24 | -22.740 | -23.045 | -0.305 | (0) |
| Se(-2) | 1.590e-27 | | | | | |
| HSe- | 1.586e-27 | 1.331e-27 | -26.800 | -26.876 | -0.076 | (0) |
| H2Se | 4.290e-30 | 4.329e-30 | -29.368 | -29.364 | 0.004 | (0) |
| Se(4) | 3.045e-09 | | | | | |
| HSeO3- | 2.993e-09 | 2.511e-09 | -8.524 | -8.600 | -0.076 | (0) |
| SeO3-2 | 5.188e-11 | 2.569e-11 | -10.285 | -10.590 | -0.305 | (0) |
| H2SeO3 | 4.324e-13 | 4.363e-13 | -12.364 | -12.360 | 0.004 | (0) |
| Se(6) | 7.744e-24 | | | | | |
| SeO4-2 | 7.744e-24 | 3.835e-24 | -23.111 | -23.416 | -0.305 | (0) |
| HSeO4- | 4.018e-29 | 3.371e-29 | -28.396 | -28.472 | -0.076 | (0) |
| Zn | 1.379e-07 | | | | | |
| Zn+2 | 6.863e-08 | 3.399e-08 | -7.163 | -7.469 | -0.305 | (0) |
| ZnHCO3+ | 3.880e-08 | 3.255e-08 | -7.411 | -7.487 | -0.076 | (0) |
| ZnSO4 | 2.356e-08 | 2.377e-08 | -7.628 | -7.624 | 0.004 | (0) |
| ZnCO3 | 5.202e-09 | 5.249e-09 | -8.284 | -8.280 | 0.004 | (0) |
| Zn(SO4)2-2 | 1.514e-09 | 7.498e-10 | -8.820 | -9.125 | -0.305 | (0) |
| Zn(CO3)2-2 | 1.755e-10 | 8.688e-11 | -9.756 | -10.061 | -0.305 | (0) |
| ZnOH+ | 3.937e-11 | 3.303e-11 | -10.405 | -10.481 | -0.076 | (0) |
| ZnCl+ | 1.269e-11 | 1.065e-11 | -10.897 | -10.973 | -0.076 | (0) |
| Zn(OH)2 | 4.434e-12 | 4.474e-12 | -11.353 | -11.349 | 0.004 | (0) |
| ZnOHCl | 8.908e-13 | 8.988e-13 | -12.050 | -12.046 | 0.004 | (0) |
| ZnCl2 | 2.548e-15 | 2.571e-15 | -14.594 | -14.590 | 0.004 | (0) |
| Zn(OH)3- | 5.455e-17 | 4.576e-17 | -16.263 | -16.340 | -0.076 | (0) |
| ZnCl3- | 7.666e-19 | 6.431e-19 | -18.115 | -18.192 | -0.076 | (0) |
| ZnCl4-2 | 1.404e-22 | 6.953e-23 | -21.853 | -22.158 | -0.305 | (0) |
| Zn(OH)4-2 | 4.736e-23 | 2.345e-23 | -22.325 | -22.630 | -0.305 | (0) |

-----------------------------Saturation indices-------------------------------

| Phase | SI** | log IAP | log K(282 K, 1 atm) | |
|---|---|---|---|---|
| Ag2CO3 | -14.84 | -26.31 | -11.47 | Ag2CO3 |
| Ag2O | -20.20 | -7.18 | 13.02 | Ag2O |
| Ag2SO4 | -17.57 | -22.67 | -5.10 | Ag2SO4 |
| AgMetal | 2.26 | -12.31 | -14.57 | Ag |
| Anglesite | -5.69 | -13.57 | -7.88 | PbSO4 |
| Anhydrite | -0.63 | -4.96 | -4.34 | CaSO4 |
| Antlerite | -10.51 | -2.22 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.36 | -8.61 | -8.25 | CaCO3 |
| Arsenolite | -17.18 | -18.86 | -1.68 | As2O3 |
| Artinite | -9.35 | 1.45 | 10.81 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.75 | -25.21 | 8.55 | As2O5 |
| As_native | -21.89 | -35.58 | -13.69 | As |
| Atacamite | -9.40 | -1.27 | 8.12 | Cu2(OH)3Cl |
| Azurite | -9.03 | -3.99 | 5.05 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -0.91 | -51.42 | -50.51 | Ba3(AsO4)2 |
| Barite | 0.21 | -10.06 | -10.27 | BaSO4 |
| BaSeO3 | -11.79 | -18.18 | -6.39 | BaSeO3 |
| Bianchite | -8.18 | -9.94 | -1.76 | ZnSO4:6H2O |
| Birnessite | -19.43 | 24.17 | 43.60 | MnO2 |
| Bixbyite | -22.31 | -22.28 | 0.03 | Mn2O3 |
| Brochantite | -13.14 | 2.20 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.68 | 10.29 | 17.98 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -17.24 | -36.15 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.20 | -8.61 | -8.41 | CaCO3 |
| CaSeO3 | -7.49 | -13.09 | -5.60 | CaSeO3 |
| Cd(gamma) | -28.38 | -14.03 | 14.35 | Cd |
| Cd(OH)2 | -10.25 | 3.40 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -11.20 | 3.40 | 14.60 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.48 | -20.77 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -27.84 | -5.28 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -30.28 | -1.88 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -16.34 | -16.83 | -0.49 | CdCl2 |
| CdCl2:2.5H2O | -14.82 | -16.83 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -15.20 | -16.83 | -1.63 | CdCl2:H2O |
| CdMetal | -28.27 | -14.03 | 14.25 | Cd |
| CdOHCl | -10.55 | -6.71 | 3.83 | CdOHCl |
| CdSO4 | -12.60 | -12.09 | 0.52 | CdSO4 |
| CdSO4:2.7H2O | -10.39 | -12.09 | -1.69 | CdSO4:2.67H2O |
| CdSO4:H2O | -10.74 | -12.09 | -1.34 | CdSO4:H2O |
| Cerargyrite | -3.30 | -13.71 | -10.41 | AgCl |
| Cerrusite | -3.88 | -17.22 | -13.33 | PbCO3 |
| Chalcanthite | -8.37 | -11.07 | -2.70 | CuSO4:5H2O |
| Claudetite | -17.24 | -18.86 | -1.63 | As2O3 |
| CO2(g) | -0.90 | -2.15 | -1.25 | CO2 |
| Cotunnite | -13.32 | -18.32 | -5.00 | PbCl2 |
| Cu(OH)2 | -4.86 | 4.42 | 9.28 | Cu(OH)2 |
| Cu2SO4 | -17.01 | -18.77 | -1.76 | Cu2SO4 |
| Cu3(AsO4)2:6w | -19.33 | -54.45 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.08 | -14.71 | -9.63 | CuCO3 |
| CuMetal | -0.88 | -10.36 | -9.48 | Cu |
| CuOCuSO4 | -19.66 | -6.64 | 13.02 | CuO:CuSO4 |
| CupricFerrite | -0.81 | 6.70 | 7.50 | CuFe2O4 |
| Cuprite | -1.47 | -3.28 | -1.81 | Cu2O |
| CuprousFerrite | 8.26 | -0.50 | -8.76 | CuFeO2 |
| CuSO4 | -14.84 | -11.06 | 3.77 | CuSO4 |
| Dolomite | -0.75 | -17.45 | -16.69 | CaMg(CO3)2 |
| Dolomite(d) | -1.37 | -17.45 | -16.07 | CaMg(CO3)2 |
| Epsomite | -2.94 | -5.20 | -2.26 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.14 | -1.90 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -3.75 | 1.14 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -33.13 | -68.56 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -12.10 | 8.12 | 20.22 | Fe3(OH)8 |
| FeSe2 | -24.91 | -43.49 | -18.58 | FeSe2 |

| | | | | |
|---|---|---|---|---|
| Goethite | 1.53 | 1.14 | -0.39 | FeOOH |
| Goslarite | -7.84 | -9.94 | -2.10 | ZnSO4:7H2O |
| Gypsum | -0.37 | -4.97 | -4.59 | CaSO4:2H2O |
| H2(g) | -17.43 | -20.51 | -3.08 | H2 |
| H2O(g) | -1.95 | -0.00 | 1.95 | H2O |
| Halite | -7.93 | -6.39 | 1.54 | NaCl |
| Hausmannite | -27.61 | 37.64 | 65.25 | Mn3O4 |
| Hematite | 4.99 | 2.27 | -2.71 | Fe2O3 |
| Huntite | -6.24 | -35.12 | -28.89 | CaMg3(CO3)4 |
| Hydrocerrusite | -15.06 | -32.52 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.49 | -25.06 | -6.57 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -19.81 | 10.50 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -21.78 | 10.50 | 32.28 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.45 | -25.28 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -16.84 | -24.74 | -7.90 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -20.07 | -23.84 | -3.76 | NaFe3(SO4)2(OH)6 |
| JarositeH | -24.49 | -27.57 | -3.08 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -16.25 | 2.20 | 18.45 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.65 | -11.66 | -0.01 | PbO:PbSO4 |
| Laurionite | -8.83 | -8.20 | 0.62 | PbOHCl |
| Litharge | -11.49 | 1.91 | 13.41 | PbO |
| Maghemite | -4.11 | 2.27 | 6.39 | Fe2O3 |
| Magnesite | -1.07 | -8.84 | -7.77 | MgCO3 |
| Magnetite | 2.27 | 8.12 | 5.85 | Fe3O4 |
| Malachite | -5.76 | 0.22 | 5.98 | Cu2(OH)2CO3 |
| Manganite | -9.89 | 15.45 | 25.34 | MnOOH |
| Massicot | -11.70 | 1.91 | 13.61 | PbO |
| Melanothallite | -20.06 | -15.81 | 4.25 | CuCl2 |
| Melanterite | -7.22 | -9.64 | -2.43 | FeSO4:7H2O |
| Minium | -54.83 | 23.17 | 78.00 | Pb3O4 |
| Mirabilite | -6.12 | -8.03 | -1.91 | Na2SO4:10H2O |
| Mn2(SO4)3 | -64.67 | -68.75 | -4.07 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -18.80 | -47.51 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -15.48 | -13.50 | 1.98 | MnCl2:4H2O |
| MnSO4 | -12.07 | -8.75 | 3.32 | MnSO4 |
| Monteponite | -11.41 | 3.40 | 14.81 | CdO |
| Nahcolite | -4.19 | -4.90 | -0.70 | NaHCO3 |
| Nantokite | -4.58 | -11.76 | -7.18 | CuCl |
| Natron | -9.70 | -11.67 | -1.97 | Na2CO3:10H2O |
| Nesquehonite | -3.46 | -8.84 | -5.38 | MgCO3:3H2O |
| Nsutite | -18.40 | 24.17 | 42.56 | MnO2 |
| O2(g) | -54.12 | -56.87 | -2.75 | O2 |
| Otavite | -3.73 | -15.73 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.82 | 1.91 | 8.74 | Pb(OH)2 |
| Pb2(OH)3Cl | -15.08 | -6.29 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -22.37 | 3.83 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -39.78 | 21.26 | 61.04 | Pb2O3 |
| Pb2OCO3 | -15.28 | -15.30 | -0.02 | PbO:PbCO3 |
| Pb3(AsO4)2 | -26.57 | -61.97 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -25.52 | -13.39 | 12.13 | PbCO3:2PbO |
| Pb3O2SO4 | -21.02 | -9.74 | 11.27 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -28.93 | -7.83 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -31.40 | -7.83 | 23.57 | PbSO4:3PbO |
| PbMetal | -19.77 | -15.52 | 4.25 | Pb |
| PbO:0.3H2O | -11.07 | 1.91 | 12.98 | PbO:0.33H2O |
| Phosgenite | -15.73 | -35.54 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -32.92 | 19.34 | 52.27 | PbO2 |
| Portlandite | -13.58 | 10.52 | 24.10 | Ca(OH)2 |
| Pyrochroite | -8.46 | 6.74 | 15.20 | Mn(OH)2 |
| Pyrolusite | -19.95 | 24.17 | 44.11 | MnO2 |
| Rhodochrosite | -1.32 | -12.39 | -11.07 | MnCO3 |
| Rhodochrosite(d) | -2.00 | -12.39 | -10.39 | MnCO3 |
| Scorodite | -12.47 | -32.72 | -20.25 | FeAsO4:2H2O |
| Se(s) | 1.37 | -15.96 | -17.32 | Se |
| SeO2 | -15.23 | -23.61 | -8.38 | SeO2 |
| Siderite | -2.50 | -13.28 | -10.79 | FeCO3 |
| Siderite(d)(3) | -2.83 | -13.28 | -10.45 | FeCO3 |

```
  Smithsonite      -3.76    -13.58   -9.82  ZnCO3
  Smithsonite_PG   -2.79    -13.58  -10.79  ZnCO3
  Tenorite         -3.84      4.42    8.26  CuO
  Thenardite       -7.87     -8.03   -0.16  Na2SO4
  Thermonatrite   -11.91    -11.67    0.24  Na2CO3:H2O
  Trona           -16.53    -16.57   -0.04  NaHCO3:Na2CO3:2H2O
  Witherite        -5.06    -13.70   -8.64  BaCO3
  Zincite(c)       -6.51      5.55   12.06  ZnO
  Zincosite       -13.75     -9.94    3.82  ZnSO4
  Zn(OH)2-a        -6.90      5.55   12.45  Zn(OH)2
  Zn(OH)2-b        -6.20      5.55   11.75  Zn(OH)2
  Zn(OH)2-c        -6.65      5.55   12.20  Zn(OH)2
  Zn(OH)2-e        -5.95      5.55   11.50  Zn(OH)2
  Zn(OH)2-g        -6.16      5.55   11.71  Zn(OH)2
  Zn2(OH)2SO4     -11.89     -4.39    7.50  Zn2(OH)2SO4
  Zn2(OH)3Cl      -14.22      0.98   15.20  Zn2(OH)3Cl
  Zn3(AsO4)2:2.5w -23.52    -51.06  -27.55  Zn3(AsO4)2:2.5H2O
  Zn3O(SO4)2      -35.94    -14.32   21.62  ZnO:2ZnSO4
  Zn4(OH)6SO4     -21.68      6.72   28.40  Zn4(OH)6SO4
  Zn5(OH)8Cl2     -30.98      7.52   38.50  Zn5(OH)8Cl2
  ZnCl2           -22.45    -14.68    7.76  ZnCl2
  ZnCO3:1H2O       -3.32    -13.58  -10.26  ZnCO3:1H2O
  ZnCO3:H2O        -3.32    -13.58  -10.26  ZnCO3:H2O
  ZnMetal         -39.18    -11.88   27.30  Zn
  ZnO(a)           -5.76      5.55   11.31  ZnO
  ZnSO4:H2O        -9.81     -9.94   -0.12  ZnSO4:H2O

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
  For ideal gases, phi = 1.

Initial solution 8.      MW-1014B

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Ag                1.487e-10   1.487e-10
      Alkalinity        9.393e-03   9.393e-03
      As                1.284e-08   1.284e-08
      Ba                1.591e-07   1.591e-07
      Ca                1.243e-02   1.243e-02
      Cd                1.695e-08   1.695e-08
      Cl                1.801e-03   1.801e-03
      Cu                5.884e-06   5.884e-06
      Fe                1.795e-07   1.795e-07
      K                 4.025e-04   4.025e-04
      Mg                4.577e-03   4.577e-03
      Mn                1.644e-04   1.644e-04
      Na                8.633e-04   8.633e-04
      Pb                3.290e-10   3.290e-10
      S(6)              1.294e-02   1.294e-02
      Se                2.158e-08   2.158e-08
      Zn                1.512e-05   1.512e-05

----------------------------Description of solution----------------------------

                                       pH  =   6.380
                                       pe  =   2.332
                        Activity of water  =   0.999
                 Ionic strength (mol/kgw)  =   4.881e-02
                       Mass of water (kg)  =   1.000e+00
                    Total carbon (mol/kg)  =   1.843e-02
                       Total CO2 (mol/kg)  =   1.843e-02
                         Temperature (°C)  =   8.84
                  Electrical balance (eq)  =  -1.424e-03
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =  -2.59
                               Iterations  =  11
```

Total H = 1.110218e+02
Total O = 5.560423e+01

----------------------------Distribution of species----------------------------

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 4.860e-07 | 4.169e-07 | -6.313 | -6.380 | -0.067 | 0.00 |
| OH- | 7.646e-09 | 6.321e-09 | -8.117 | -8.199 | -0.083 | (0) |
| H2O | 5.551e+01 | 9.992e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.487e-10 | | | | | |
| AgCl | 9.458e-11 | 9.565e-11 | -10.024 | -10.019 | 0.005 | (0) |
| Ag+ | 3.256e-11 | 2.691e-11 | -10.487 | -10.570 | -0.083 | (0) |
| AgCl2- | 1.923e-11 | 1.590e-11 | -10.716 | -10.799 | -0.083 | (0) |
| AgSO4- | 2.287e-12 | 1.890e-12 | -11.641 | -11.723 | -0.083 | (0) |
| AgCl3-2 | 3.589e-14 | 1.676e-14 | -13.445 | -13.776 | -0.331 | (0) |
| AgCl4-3 | 2.272e-16 | 4.098e-17 | -15.644 | -16.387 | -0.744 | (0) |
| AgOH | 6.379e-17 | 6.451e-17 | -16.195 | -16.190 | 0.005 | (0) |
| Ag(OH)2- | 1.870e-22 | 1.546e-22 | -21.728 | -21.811 | -0.083 | (0) |
| As(3) | 8.250e-10 | | | | | |
| H3AsO3 | 8.240e-10 | 8.334e-10 | -9.084 | -9.079 | 0.005 | (0) |
| H2AsO3- | 9.057e-13 | 7.488e-13 | -12.043 | -12.126 | -0.083 | (0) |
| H4AsO3+ | 2.082e-16 | 1.721e-16 | -15.682 | -15.764 | -0.083 | (0) |
| HAsO3-2 | 3.673e-21 | 1.715e-21 | -20.435 | -20.766 | -0.331 | (0) |
| AsO3-3 | 2.536e-30 | 4.573e-31 | -29.596 | -30.340 | -0.744 | (0) |
| As(5) | 1.202e-08 | | | | | |
| H2AsO4- | 9.444e-09 | 7.807e-09 | -8.025 | -8.108 | -0.083 | (0) |
| HAsO4-2 | 2.575e-09 | 1.203e-09 | -8.589 | -8.920 | -0.331 | (0) |
| H3AsO4 | 5.454e-13 | 5.515e-13 | -12.263 | -12.258 | 0.005 | (0) |
| AsO4-3 | 2.352e-14 | 4.241e-15 | -13.629 | -14.373 | -0.744 | (0) |
| Ba | 1.591e-07 | | | | | |
| Ba+2 | 8.007e-08 | 3.740e-08 | -7.097 | -7.427 | -0.331 | (0) |
| BaSO4 | 7.712e-08 | 7.799e-08 | -7.113 | -7.108 | 0.005 | (0) |
| BaHCO3+ | 1.916e-09 | 1.584e-09 | -8.718 | -8.800 | -0.083 | (0) |
| BaCO3 | 7.652e-12 | 7.738e-12 | -11.116 | -11.111 | 0.005 | (0) |
| BaOH+ | 3.674e-15 | 3.038e-15 | -14.435 | -14.517 | -0.083 | (0) |
| C(4) | 1.843e-02 | | | | | |
| CO2 | 9.047e-03 | 9.149e-03 | -2.043 | -2.039 | 0.005 | (0) |
| HCO3- | 8.815e-03 | 7.348e-03 | -2.055 | -2.134 | -0.079 | (0) |
| CaHCO3+ | 3.489e-04 | 2.884e-04 | -3.457 | -3.540 | -0.083 | (0) |
| MgHCO3+ | 1.665e-04 | 1.376e-04 | -3.779 | -3.861 | -0.083 | (0) |
| MnHCO3+ | 3.708e-05 | 3.066e-05 | -4.431 | -4.513 | -0.083 | (0) |
| ZnHCO3+ | 3.942e-06 | 3.259e-06 | -5.404 | -5.487 | -0.083 | (0) |
| CaCO3 | 3.241e-06 | 3.277e-06 | -5.489 | -5.484 | 0.005 | (0) |
| NaHCO3 | 2.860e-06 | 2.893e-06 | -5.544 | -5.539 | 0.005 | (0) |
| MnCO3 | 2.037e-06 | 2.060e-06 | -5.691 | -5.686 | 0.005 | (0) |
| CuHCO3+ | 1.776e-06 | 1.468e-06 | -5.751 | -5.833 | -0.083 | (0) |
| CuCO3 | 1.173e-06 | 1.186e-06 | -5.931 | -5.926 | 0.005 | (0) |
| CO3-2 | 1.147e-06 | 5.540e-07 | -5.940 | -6.256 | -0.316 | (0) |
| MgCO3 | 6.816e-07 | 6.893e-07 | -6.166 | -6.162 | 0.005 | (0) |
| ZnCO3 | 3.851e-07 | 3.894e-07 | -6.414 | -6.410 | 0.005 | (0) |
| FeHCO3+ | 4.455e-08 | 3.683e-08 | -7.351 | -7.434 | -0.083 | (0) |
| Zn(CO3)2-2 | 9.876e-09 | 4.613e-09 | -8.005 | -8.336 | -0.331 | (0) |
| NaCO3- | 3.690e-09 | 3.050e-09 | -8.433 | -8.516 | -0.083 | (0) |
| BaHCO3+ | 1.916e-09 | 1.584e-09 | -8.718 | -8.800 | -0.083 | (0) |
| Cu(CO3)2-2 | 1.771e-09 | 8.271e-10 | -8.752 | -9.082 | -0.331 | (0) |
| CdHCO3+ | 1.263e-09 | 1.044e-09 | -8.898 | -8.981 | -0.083 | (0) |
| FeCO3 | 6.587e-10 | 6.661e-10 | -9.181 | -9.176 | 0.005 | (0) |
| PbCO3 | 1.472e-10 | 1.489e-10 | -9.832 | -9.827 | 0.005 | (0) |
| PbHCO3+ | 1.092e-10 | 9.026e-11 | -9.962 | -10.045 | -0.083 | (0) |
| BaCO3 | 7.652e-12 | 7.738e-12 | -11.116 | -11.111 | 0.005 | (0) |
| CdCO3 | 1.956e-12 | 1.978e-12 | -11.709 | -11.704 | 0.005 | (0) |
| Pb(CO3)2-2 | 4.436e-13 | 2.072e-13 | -12.353 | -12.684 | -0.331 | (0) |
| Cd(CO3)2-2 | 7.419e-15 | 3.465e-15 | -14.130 | -14.460 | -0.331 | (0) |
| Ca | 1.243e-02 | | | | | |
| Ca+2 | 9.021e-03 | 4.369e-03 | -2.045 | -2.360 | -0.315 | (0) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | CaSO4 | 3.057e-03 | 3.092e-03 | -2.515 | -2.510 | 0.005 | (0) |
| | CaHCO3+ | 3.489e-04 | 2.884e-04 | -3.457 | -3.540 | -0.083 | (0) |
| | CaCO3 | 3.241e-06 | 3.277e-06 | -5.489 | -5.484 | 0.005 | (0) |
| | CaHSO4+ | 7.722e-09 | 6.384e-09 | -8.112 | -8.195 | -0.083 | (0) |
| | CaOH+ | 2.102e-09 | 1.738e-09 | -8.677 | -8.760 | -0.083 | (0) |
| Cd | | 1.695e-08 | | | | | |
| | Cd+2 | 9.623e-09 | 4.494e-09 | -8.017 | -8.347 | -0.331 | (0) |
| | CdSO4 | 4.804e-09 | 4.858e-09 | -8.318 | -8.314 | 0.005 | (0) |
| | CdHCO3+ | 1.263e-09 | 1.044e-09 | -8.898 | -8.981 | -0.083 | (0) |
| | CdCl+ | 7.223e-10 | 5.971e-10 | -9.141 | -9.224 | -0.083 | (0) |
| | Cd(SO4)2-2 | 5.268e-10 | 2.461e-10 | -9.278 | -9.609 | -0.331 | (0) |
| | CdCl2 | 3.404e-12 | 3.443e-12 | -11.468 | -11.463 | 0.005 | (0) |
| | CdCO3 | 1.956e-12 | 1.978e-12 | -11.709 | -11.704 | 0.005 | (0) |
| | CdOHCl | 4.061e-13 | 4.107e-13 | -12.391 | -12.386 | 0.005 | (0) |
| | CdOH+ | 3.053e-13 | 2.524e-13 | -12.515 | -12.598 | -0.083 | (0) |
| | Cd(CO3)2-2 | 7.419e-15 | 3.465e-15 | -14.130 | -14.460 | -0.331 | (0) |
| | CdCl3- | 2.992e-15 | 2.473e-15 | -14.524 | -14.607 | -0.083 | (0) |
| | Cd(OH)2 | 1.141e-16 | 1.153e-16 | -15.943 | -15.938 | 0.005 | (0) |
| | Cd2OH+3 | 3.811e-20 | 6.873e-21 | -19.419 | -20.163 | -0.744 | (0) |
| | Cd(OH)3- | 3.752e-23 | 3.102e-23 | -22.426 | -22.508 | -0.083 | (0) |
| | Cd(OH)4-2 | 1.419e-30 | 6.627e-31 | -29.848 | -30.179 | -0.331 | (0) |
| Cl | | 1.801e-03 | | | | | |
| | Cl- | 1.799e-03 | 1.473e-03 | -2.745 | -2.832 | -0.087 | (0) |
| | CuCl2- | 7.171e-07 | 5.928e-07 | -6.144 | -6.227 | -0.083 | (0) |
| | MnCl+ | 3.397e-07 | 2.809e-07 | -6.469 | -6.552 | -0.083 | (0) |
| | ZnCl+ | 7.952e-09 | 6.574e-09 | -8.099 | -8.182 | -0.083 | (0) |
| | CuCl3-2 | 2.774e-09 | 1.296e-09 | -8.557 | -8.888 | -0.331 | (0) |
| | CuCl+ | 8.278e-10 | 6.844e-10 | -9.082 | -9.165 | -0.083 | (0) |
| | CdCl+ | 7.223e-10 | 5.971e-10 | -9.141 | -9.224 | -0.083 | (0) |
| | ZnOHCl | 4.072e-10 | 4.118e-10 | -9.390 | -9.385 | 0.005 | (0) |
| | MnCl2 | 1.785e-10 | 1.806e-10 | -9.748 | -9.743 | 0.005 | (0) |
| | FeCl+ | 1.233e-10 | 1.019e-10 | -9.909 | -9.992 | -0.083 | (0) |
| | AgCl | 9.458e-11 | 9.565e-11 | -10.024 | -10.019 | 0.005 | (0) |
| | AgCl2- | 1.923e-11 | 1.590e-11 | -10.716 | -10.799 | -0.083 | (0) |
| | ZnCl2 | 9.360e-12 | 9.466e-12 | -11.029 | -11.024 | 0.005 | (0) |
| | CdCl2 | 3.404e-12 | 3.443e-12 | -11.468 | -11.463 | 0.005 | (0) |
| | PbCl+ | 7.180e-13 | 5.935e-13 | -12.144 | -12.227 | -0.083 | (0) |
| | CuCl2 | 4.450e-13 | 4.500e-13 | -12.352 | -12.347 | 0.005 | (0) |
| | CdOHCl | 4.061e-13 | 4.107e-13 | -12.391 | -12.386 | 0.005 | (0) |
| | MnCl3- | 8.860e-14 | 7.324e-14 | -13.053 | -13.135 | -0.083 | (0) |
| | AgCl3-2 | 3.589e-14 | 1.676e-14 | -13.445 | -13.776 | -0.331 | (0) |
| | ZnCl3- | 1.708e-14 | 1.412e-14 | -13.768 | -13.850 | -0.083 | (0) |
| | CdCl3- | 2.992e-15 | 2.473e-15 | -14.524 | -14.607 | -0.083 | (0) |
| | PbCl2 | 1.885e-15 | 1.906e-15 | -14.725 | -14.720 | 0.005 | (0) |
| | AgCl4-3 | 2.272e-16 | 4.098e-17 | -15.644 | -16.387 | -0.744 | (0) |
| | ZnCl4-2 | 1.949e-17 | 9.102e-18 | -16.710 | -17.041 | -0.331 | (0) |
| | PbCl3- | 2.428e-18 | 2.007e-18 | -17.615 | -17.697 | -0.083 | (0) |
| | CuCl3- | 2.101e-18 | 1.737e-18 | -17.677 | -17.760 | -0.083 | (0) |
| | FeCl+2 | 2.234e-20 | 1.044e-20 | -19.651 | -19.981 | -0.331 | (0) |
| | PbCl4-2 | 2.656e-21 | 1.240e-21 | -20.576 | -20.906 | -0.331 | (0) |
| | FeCl2+ | 1.427e-22 | 1.180e-22 | -21.845 | -21.928 | -0.083 | (0) |
| | CuCl4-2 | 1.849e-23 | 8.634e-24 | -22.733 | -23.064 | -0.331 | (0) |
| | FeCl3 | 1.719e-26 | 1.738e-26 | -25.765 | -25.760 | 0.005 | (0) |
| Cu(1) | | 1.724e-06 | | | | | |
| | Cu+ | 1.004e-06 | 8.298e-07 | -5.998 | -6.081 | -0.083 | (0) |
| | CuCl2- | 7.171e-07 | 5.928e-07 | -6.144 | -6.227 | -0.083 | (0) |
| | CuCl3-2 | 2.774e-09 | 1.296e-09 | -8.557 | -8.888 | -0.331 | (0) |
| Cu(2) | | 4.160e-06 | | | | | |
| | CuHCO3+ | 1.776e-06 | 1.468e-06 | -5.751 | -5.833 | -0.083 | (0) |
| | CuCO3 | 1.173e-06 | 1.186e-06 | -5.931 | -5.926 | 0.005 | (0) |
| | Cu+2 | 8.533e-07 | 3.986e-07 | -6.069 | -6.400 | -0.331 | (0) |
| | CuSO4 | 2.975e-07 | 3.009e-07 | -6.526 | -6.522 | 0.005 | (0) |
| | Cu(OH)2 | 4.731e-08 | 4.784e-08 | -7.325 | -7.320 | 0.005 | (0) |
| | CuOH+ | 1.156e-08 | 9.553e-09 | -7.937 | -8.020 | -0.083 | (0) |
| | Cu(CO3)2-2 | 1.771e-09 | 8.271e-10 | -8.752 | -9.082 | -0.331 | (0) |
| | CuCl+ | 8.278e-10 | 6.844e-10 | -9.082 | -9.165 | -0.083 | (0) |
| | Cu2(OH)2+2 | 1.568e-11 | 7.322e-12 | -10.805 | -11.135 | -0.331 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuCl2 | 4.450e-13 | 4.500e-13 | -12.352 | -12.347 | 0.005 | (0) |
| Cu(OH)3- | 8.358e-15 | 6.910e-15 | -14.078 | -14.161 | -0.083 | (0) |
| CuCl3- | 2.101e-18 | 1.737e-18 | -17.677 | -17.760 | -0.083 | (0) |
| Cu(OH)4-2 | 7.075e-21 | 3.304e-21 | -20.150 | -20.481 | -0.331 | (0) |
| CuCl4-2 | 1.849e-23 | 8.634e-24 | -22.733 | -23.064 | -0.331 | (0) |
| Fe(2) | 1.795e-07 | | | | | |
| Fe+2 | 1.073e-07 | 5.012e-08 | -6.969 | -7.300 | -0.331 | (0) |
| FeHCO3+ | 4.455e-08 | 3.683e-08 | -7.351 | -7.434 | -0.083 | (0) |
| FeSO4 | 2.683e-08 | 2.714e-08 | -7.571 | -7.566 | 0.005 | (0) |
| FeCO3 | 6.587e-10 | 6.661e-10 | -9.181 | -9.176 | 0.005 | (0) |
| FeCl+ | 1.233e-10 | 1.019e-10 | -9.909 | -9.992 | -0.083 | (0) |
| FeOH+ | 1.282e-11 | 1.060e-11 | -10.892 | -10.975 | -0.083 | (0) |
| FeHSO4+ | 8.859e-14 | 7.324e-14 | -13.053 | -13.135 | -0.083 | (0) |
| Fe(OH)2 | 4.837e-17 | 4.892e-17 | -16.315 | -16.311 | 0.005 | (0) |
| Fe(OH)3- | 4.456e-21 | 3.683e-21 | -20.351 | -20.434 | -0.083 | (0) |
| Fe(3) | 1.289e-12 | | | | | |
| Fe(OH)2+ | 1.146e-12 | 9.477e-13 | -11.941 | -12.023 | -0.083 | (0) |
| Fe(OH)3 | 1.374e-13 | 1.390e-13 | -12.862 | -12.857 | 0.005 | (0) |
| FeOH+2 | 4.887e-15 | 2.283e-15 | -14.311 | -14.642 | -0.331 | (0) |
| Fe(OH)4- | 1.849e-16 | 1.529e-16 | -15.733 | -15.816 | -0.083 | (0) |
| FeSO4+ | 1.525e-17 | 1.261e-17 | -16.817 | -16.899 | -0.083 | (0) |
| Fe+3 | 2.236e-18 | 4.033e-19 | -17.650 | -18.394 | -0.744 | (0) |
| Fe(SO4)2- | 1.298e-18 | 1.073e-18 | -17.887 | -17.969 | -0.083 | (0) |
| FeCl+2 | 2.234e-20 | 1.044e-20 | -19.651 | -19.981 | -0.331 | (0) |
| FeCl2+ | 1.427e-22 | 1.180e-22 | -21.845 | -21.928 | -0.083 | (0) |
| FeHSO4+2 | 3.169e-23 | 1.480e-23 | -22.499 | -22.830 | -0.331 | (0) |
| FeCl3 | 1.719e-26 | 1.738e-26 | -25.765 | -25.760 | 0.005 | (0) |
| Fe2(OH)2+4 | 5.970e-27 | 2.841e-28 | -26.224 | -27.547 | -1.322 | (0) |
| Fe3(OH)4+5 | 3.171e-35 | 2.722e-37 | -34.499 | -36.565 | -2.066 | (0) |
| H(0) | 6.246e-21 | | | | | |
| H2 | 3.123e-21 | 3.159e-21 | -20.505 | -20.501 | 0.005 | (0) |
| K | 4.025e-04 | | | | | |
| K+ | 3.940e-04 | 3.225e-04 | -3.404 | -3.491 | -0.087 | (0) |
| KSO4- | 8.466e-06 | 6.998e-06 | -5.072 | -5.155 | -0.083 | (0) |
| Mg | 4.577e-03 | | | | | |
| Mg+2 | 3.372e-03 | 1.671e-03 | -2.472 | -2.777 | -0.305 | (0) |
| MgSO4 | 1.038e-03 | 1.050e-03 | -2.984 | -2.979 | 0.005 | (0) |
| MgHCO3+ | 1.665e-04 | 1.376e-04 | -3.779 | -3.861 | -0.083 | (0) |
| MgCO3 | 6.816e-07 | 6.893e-07 | -6.166 | -6.162 | 0.005 | (0) |
| MgOH+ | 3.761e-09 | 3.109e-09 | -8.425 | -8.507 | -0.083 | (0) |
| Mn(2) | 1.644e-04 | | | | | |
| Mn+2 | 1.002e-04 | 4.681e-05 | -3.999 | -4.330 | -0.331 | (0) |
| MnHCO3+ | 3.708e-05 | 3.066e-05 | -4.431 | -4.513 | -0.083 | (0) |
| MnSO4 | 2.472e-05 | 2.500e-05 | -4.607 | -4.602 | 0.005 | (0) |
| MnCO3 | 2.037e-06 | 2.060e-06 | -5.691 | -5.686 | 0.005 | (0) |
| MnCl+ | 3.397e-07 | 2.809e-07 | -6.469 | -6.552 | -0.083 | (0) |
| MnOH+ | 8.665e-10 | 7.163e-10 | -9.062 | -9.145 | -0.083 | (0) |
| MnCl2 | 1.785e-10 | 1.806e-10 | -9.748 | -9.743 | 0.005 | (0) |
| MnCl3- | 8.860e-14 | 7.324e-14 | -13.053 | -13.135 | -0.083 | (0) |
| Mn(OH)3- | 1.236e-20 | 1.022e-20 | -19.908 | -19.991 | -0.083 | (0) |
| Mn(3) | 1.421e-28 | | | | | |
| Mn+3 | 1.421e-28 | 2.563e-29 | -27.847 | -28.591 | -0.744 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -68.373 | -68.704 | -0.331 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -76.790 | -76.873 | -0.083 | (0) |
| Na | 8.633e-04 | | | | | |
| Na+ | 8.446e-04 | 7.000e-04 | -3.073 | -3.155 | -0.082 | (0) |
| NaSO4- | 1.584e-05 | 1.310e-05 | -4.800 | -4.883 | -0.083 | (0) |
| NaHCO3 | 2.860e-06 | 2.893e-06 | -5.544 | -5.539 | 0.005 | (0) |
| NaCO3- | 3.690e-09 | 3.050e-09 | -8.433 | -8.516 | -0.083 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -56.899 | -56.894 | 0.005 | (0) |
| Pb | 3.290e-10 | | | | | |
| PbCO3 | 1.472e-10 | 1.489e-10 | -9.832 | -9.827 | 0.005 | (0) |
| PbHCO3+ | 1.092e-10 | 9.026e-11 | -9.962 | -10.045 | -0.083 | (0) |
| PbSO4 | 3.578e-11 | 3.618e-11 | -10.446 | -10.442 | 0.005 | (0) |

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   Pb+2            3.311e-11   1.546e-11   -10.480   -10.811    -0.331     (0)
   Pb(SO4)2-2      1.691e-12   7.900e-13   -11.772   -12.102    -0.331     (0)
   PbOH+           8.742e-13   7.227e-13   -12.058   -12.141    -0.083     (0)
   PbCl+           7.180e-13   5.935e-13   -12.144   -12.227    -0.083     (0)
   Pb(CO3)2-2      4.436e-13   2.072e-13   -12.353   -12.684    -0.331     (0)
   PbCl2           1.885e-15   1.906e-15   -14.725   -14.720     0.005     (0)
   Pb(OH)2         6.664e-16   6.739e-16   -15.176   -15.171     0.005     (0)
   PbCl3-          2.428e-18   2.007e-18   -17.615   -17.697    -0.083     (0)
   Pb(OH)3-        2.243e-20   1.855e-20   -19.649   -19.732    -0.083     (0)
   PbCl4-2         2.656e-21   1.240e-21   -20.576   -20.906    -0.331     (0)
   Pb2OH+3         1.387e-21   2.502e-22   -20.858   -21.602    -0.744     (0)
   Pb(OH)4-2       2.180e-25   1.018e-25   -24.661   -24.992    -0.331     (0)
   Pb3(OH)4+2      2.654e-32   1.240e-32   -31.576   -31.907    -0.331     (0)
S(6)          1.294e-02
   SO4-2           8.791e-03   4.161e-03    -2.056    -2.381    -0.325     (0)
   CaSO4           3.057e-03   3.092e-03    -2.515    -2.510     0.005     (0)
   MgSO4           1.038e-03   1.050e-03    -2.984    -2.979     0.005     (0)
   MnSO4           2.472e-05   2.500e-05    -4.607    -4.602     0.005     (0)
   NaSO4-          1.584e-05   1.310e-05    -4.800    -4.883    -0.083     (0)
   KSO4-           8.466e-06   6.998e-06    -5.072    -5.155    -0.083     (0)
   ZnSO4           2.979e-06   3.013e-06    -5.526    -5.521     0.005     (0)
   CuSO4           2.975e-07   3.009e-07    -6.526    -6.522     0.005     (0)
   Zn(SO4)2-2      2.488e-07   1.162e-07    -6.604    -6.935    -0.331     (0)
   HSO4-           1.470e-07   1.215e-07    -6.833    -6.915    -0.083     (0)
   BaSO4           7.712e-08   7.799e-08    -7.113    -7.108     0.005     (0)
   FeSO4           2.683e-08   2.714e-08    -7.571    -7.566     0.005     (0)
   CaHSO4+         7.722e-09   6.384e-09    -8.112    -8.195    -0.083     (0)
   CdSO4           4.804e-09   4.858e-09    -8.318    -8.314     0.005     (0)
   Cd(SO4)2-2      5.268e-10   2.461e-10    -9.278    -9.609    -0.331     (0)
   PbSO4           3.578e-11   3.618e-11   -10.446   -10.442     0.005     (0)
   AgSO4-          2.287e-12   1.890e-12   -11.641   -11.723    -0.083     (0)
   Pb(SO4)2-2      1.691e-12   7.900e-13   -11.772   -12.102    -0.331     (0)
   FeHSO4+         8.859e-14   7.324e-14   -13.053   -13.135    -0.083     (0)
   FeSO4+          1.525e-17   1.261e-17   -16.817   -16.899    -0.083     (0)
   Fe(SO4)2-       1.298e-18   1.073e-18   -17.887   -17.969    -0.083     (0)
   FeHSO4+2        3.169e-23   1.480e-23   -22.499   -22.830    -0.331     (0)
Se(-2)        1.179e-26
   HSe-            1.175e-26   9.714e-27   -25.930   -26.013    -0.083     (0)
   H2Se            4.218e-29   4.266e-29   -28.375   -28.370     0.005     (0)
Se(4)         2.158e-08
   HSeO3-          2.129e-08   1.760e-08    -7.672    -7.754    -0.083     (0)
   SeO3-2          2.859e-10   1.335e-10    -9.544    -9.874    -0.331     (0)
   H2SeO3          4.080e-12   4.126e-12   -11.389   -11.384     0.005     (0)
Se(6)         4.210e-23
   SeO4-2          4.210e-23   1.966e-23   -22.376   -22.706    -0.331     (0)
   HSeO4-          2.819e-28   2.330e-28   -27.550   -27.633    -0.083     (0)
Zn            1.512e-05
   Zn+2            7.543e-06   3.523e-06    -5.122    -5.453    -0.331     (0)
   ZnHCO3+         3.942e-06   3.259e-06    -5.404    -5.487    -0.083     (0)
   ZnSO4           2.979e-06   3.013e-06    -5.526    -5.521     0.005     (0)
   ZnCO3           3.851e-07   3.894e-07    -6.414    -6.410     0.005     (0)
   Zn(SO4)2-2      2.488e-07   1.162e-07    -6.604    -6.935    -0.331     (0)
   Zn(CO3)2-2      9.876e-09   4.613e-09    -8.005    -8.336    -0.331     (0)
   ZnCl+           7.952e-09   6.574e-09    -8.099    -8.182    -0.083     (0)
   ZnOH+           3.065e-09   2.533e-09    -8.514    -8.596    -0.083     (0)
   ZnOHCl          4.072e-10   4.118e-10    -9.390    -9.385     0.005     (0)
   Zn(OH)2         2.520e-10   2.548e-10    -9.599    -9.594     0.005     (0)
   ZnCl2           9.360e-12   9.466e-12   -11.029   -11.024     0.005     (0)
   ZnCl3-          1.708e-14   1.412e-14   -13.768   -13.850    -0.083     (0)
   Zn(OH)3-        2.336e-15   1.931e-15   -14.631   -14.714    -0.083     (0)
   ZnCl4-2         1.949e-17   9.102e-18   -16.710   -17.041    -0.331     (0)
   Zn(OH)4-2       1.571e-21   7.337e-22   -20.804   -21.134    -0.331     (0)

------------------------------Saturation indices-------------------------------

  Phase               SI** log IAP   log K(281 K,   1 atm)
```

| | | | | |
|---|---|---|---|---|
| Ag2CO3 | -15.93 | -27.40 | -11.47 | Ag2CO3 |
| Ag2O | -21.40 | -8.38 | 13.02 | Ag2O |
| Ag2SO4 | -18.42 | -23.52 | -5.10 | Ag2SO4 |
| AgMetal | 1.67 | -12.90 | -14.57 | Ag |
| Anglesite | -5.31 | -13.19 | -7.88 | PbSO4 |
| Anhydrite | -0.40 | -4.74 | -4.34 | CaSO4 |
| Antlerite | -4.35 | 3.94 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.37 | -8.62 | -8.25 | CaCO3 |
| Arsenolite | -16.48 | -18.16 | -1.68 | As2O3 |
| Artinite | -9.86 | 0.95 | 10.81 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.06 | -24.52 | 8.55 | As2O5 |
| As_native | -21.53 | -35.21 | -13.69 | As |
| Atacamite | -4.62 | 3.51 | 8.13 | Cu2(OH)3Cl |
| Azurite | -2.99 | 2.05 | 5.05 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -0.52 | -51.03 | -50.51 | Ba3(AsO4)2 |
| Barite | 0.46 | -9.81 | -10.27 | BaSO4 |
| BaSeO3 | -10.91 | -17.30 | -6.39 | BaSeO3 |
| Bianchite | -6.08 | -7.84 | -1.76 | ZnSO4:6H2O |
| Birnessite | -17.75 | 25.85 | 43.60 | MnO2 |
| Bixbyite | -18.93 | -18.90 | 0.03 | Mn2O3 |
| Brochantite | -5.04 | 10.30 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -8.00 | 9.98 | 17.98 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -16.92 | -35.83 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.21 | -8.62 | -8.41 | CaCO3 |
| CaSeO3 | -6.63 | -12.23 | -5.60 | CaSeO3 |
| Cd(gamma) | -27.36 | -13.01 | 14.35 | Cd |
| Cd(OH)2 | -9.24 | 4.41 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.19 | 4.41 | 14.60 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -23.75 | -17.04 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -24.46 | -1.90 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -25.89 | 2.51 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -13.52 | -14.01 | -0.49 | CdCl2 |
| CdCl2:2.5H2O | -12.00 | -14.01 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -12.38 | -14.01 | -1.63 | CdCl2:H2O |
| CdMetal | -27.26 | -13.01 | 14.25 | Cd |
| CdOHCl | -8.63 | -4.80 | 3.83 | CdOHCl |
| CdSO4 | -11.25 | -10.73 | 0.52 | CdSO4 |
| CdSO4:2.7H2O | -9.04 | -10.73 | -1.69 | CdSO4:2.67H2O |
| CdSO4:H2O | -9.39 | -10.73 | -1.34 | CdSO4:H2O |
| Cerargyrite | -2.99 | -13.40 | -10.41 | AgCl |
| Cerrusite | -3.73 | -17.07 | -13.33 | PbCO3 |
| Chalcanthite | -6.08 | -8.78 | -2.70 | CuSO4:5H2O |
| Claudetite | -16.53 | -18.16 | -1.63 | As2O3 |
| CO2(g) | -0.79 | -2.04 | -1.25 | CO2 |
| Cotunnite | -11.47 | -16.47 | -5.01 | PbCl2 |
| Cu(OH)2 | -2.92 | 6.36 | 9.28 | Cu(OH)2 |
| Cu2SO4 | -12.78 | -14.54 | -1.76 | Cu2SO4 |
| Cu3(AsO4)2:6w | -12.82 | -47.95 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -3.03 | -12.66 | -9.63 | CuCO3 |
| CuMetal | 1.07 | -8.41 | -9.48 | Cu |
| CuOCuSO4 | -15.44 | -2.42 | 13.02 | CuO:CuSO4 |
| CupricFerrite | 0.35 | 7.85 | 7.51 | CuFe2O4 |
| Cuprite | 2.41 | 0.60 | -1.81 | Cu2O |
| CuprousFerrite | 9.80 | 1.04 | -8.76 | CuFeO2 |
| CuSO4 | -12.55 | -8.78 | 3.77 | CuSO4 |
| Dolomite | -0.96 | -17.65 | -16.69 | CaMg(CO3)2 |
| Dolomite(d) | -1.58 | -17.65 | -16.07 | CaMg(CO3)2 |
| Epsomite | -2.90 | -5.16 | -2.26 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.02 | -2.02 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.15 | 0.74 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -30.98 | -66.41 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -13.27 | 6.95 | 20.22 | Fe3(OH)8 |
| FeSe2 | -23.32 | -41.90 | -18.58 | FeSe2 |
| Goethite | 1.14 | 0.74 | -0.39 | FeOOH |
| Goslarite | -5.74 | -7.84 | -2.10 | ZnSO4:7H2O |
| Gypsum | -0.15 | -4.74 | -4.59 | CaSO4:2H2O |
| H2(g) | -17.42 | -20.50 | -3.08 | H2 |

| | | | | |
|---|---|---|---|---|
| H2O(g) | -1.95 | -0.00 | 1.95 | H2O |
| Halite | -7.53 | -5.99 | 1.54 | NaCl |
| Hausmannite | -22.54 | 42.71 | 65.26 | Mn3O4 |
| Hematite | 4.20 | 1.49 | -2.71 | Fe2O3 |
| Huntite | -6.83 | -35.72 | -28.89 | CaMg3(CO3)4 |
| Hydrocerrusite | -14.73 | -32.19 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -19.59 | -26.15 | -6.57 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -10.80 | 19.50 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -12.78 | 19.50 | 32.28 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.90 | -25.73 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -17.26 | -25.16 | -7.90 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -21.06 | -24.82 | -3.76 | NaFe3(SO4)2(OH)6 |
| JarositeH | -24.97 | -28.05 | -3.07 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -8.16 | 10.30 | 18.45 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.23 | -11.24 | -0.01 | PbO:PbSO4 |
| Laurionite | -7.89 | -7.26 | 0.62 | PbOHCl |
| Litharge | -11.46 | 1.95 | 13.41 | PbO |
| Maghemite | -4.90 | 1.49 | 6.39 | Fe2O3 |
| Magnesite | -1.26 | -9.03 | -7.77 | MgCO3 |
| Magnetite | 1.09 | 6.95 | 5.86 | Fe3O4 |
| Malachite | -1.77 | 4.21 | 5.98 | Cu2(OH)2CO3 |
| Manganite | -8.20 | 17.14 | 25.34 | MnOOH |
| Massicot | -11.67 | 1.95 | 13.61 | PbO |
| Melanothallite | -16.31 | -12.06 | 4.25 | CuCl2 |
| Melanterite | -7.26 | -9.68 | -2.43 | FeSO4:7H2O |
| Minium | -54.74 | 23.27 | 78.01 | Pb3O4 |
| Mirabilite | -6.78 | -8.69 | -1.91 | Na2SO4:10H2O |
| Mn2(SO4)3 | -60.25 | -64.32 | -4.07 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -13.03 | -41.74 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -11.97 | -9.99 | 1.98 | MnCl2:4H2O |
| MnSO4 | -10.03 | -6.71 | 3.32 | MnSO4 |
| Monteponite | -10.40 | 4.41 | 14.81 | CdO |
| Nahcolite | -4.58 | -5.29 | -0.70 | NaHCO3 |
| Nantokite | -1.73 | -8.91 | -7.18 | CuCl |
| Natron | -10.60 | -12.57 | -1.97 | Na2CO3:10H2O |
| Nesquehonite | -3.66 | -9.03 | -5.38 | MgCO3:3H2O |
| Nsutite | -16.71 | 25.85 | 42.56 | MnO2 |
| O2(g) | -54.14 | -56.89 | -2.75 | O2 |
| Otavite | -2.60 | -14.60 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.79 | 1.95 | 8.74 | Pb(OH)2 |
| Pb2(OH)3Cl | -14.11 | -5.31 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -22.30 | 3.90 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -39.72 | 21.32 | 61.04 | Pb2O3 |
| Pb2OCO3 | -15.10 | -15.12 | -0.02 | PbO:PbCO3 |
| Pb3(AsO4)2 | -25.77 | -61.18 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -25.30 | -13.17 | 12.13 | PbCO3:2PbO |
| Pb3O2SO4 | -20.57 | -9.29 | 11.27 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -28.45 | -7.35 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -30.92 | -7.34 | 23.57 | PbSO4:3PbO |
| PbMetal | -19.73 | -15.48 | 4.25 | Pb |
| PbO:0.3H2O | -11.03 | 1.95 | 12.98 | PbO:0.33H2O |
| Phosgenite | -13.73 | -33.54 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -32.90 | 19.37 | 52.27 | PbO2 |
| Portlandite | -13.70 | 10.40 | 24.10 | Ca(OH)2 |
| Pyrochroite | -6.77 | 8.43 | 15.20 | Mn(OH)2 |
| Pyrolusite | -18.26 | 25.85 | 44.11 | MnO2 |
| Rhodochrosite | 0.48 | -10.59 | -11.07 | MnCO3 |
| Rhodochrosite(d) | -0.20 | -10.59 | -10.39 | MnCO3 |
| Scorodite | -12.52 | -32.77 | -20.25 | FeAsO4:2H2O |
| Se(s) | 2.35 | -14.97 | -17.32 | Se |
| SeO2 | -14.25 | -22.63 | -8.38 | SeO2 |
| Siderite | -2.77 | -13.56 | -10.79 | FeCO3 |
| Siderite(d)(3) | -3.11 | -13.56 | -10.45 | FeCO3 |
| Smithsonite | -1.89 | -11.71 | -9.82 | ZnCO3 |
| Smithsonite_PG | -0.92 | -11.71 | -10.79 | ZnCO3 |
| Tenorite | -1.90 | 6.36 | 8.26 | CuO |
| Thenardite | -8.54 | -8.69 | -0.15 | Na2SO4 |

```
  Thermonatrite   -12.81    -12.57    0.24  Na2CO3:H2O
  Trona           -17.82    -17.86   -0.04  NaHCO3:Na2CO3:2H2O
  Witherite        -5.04    -13.68   -8.64  BaCO3
  Zincite(c)       -4.75      7.31   12.06  ZnO
  Zincosite       -11.65     -7.83    3.82  ZnSO4
  Zn(OH)2-a        -5.14      7.31   12.45  Zn(OH)2
  Zn(OH)2-b        -4.44      7.31   11.75  Zn(OH)2
  Zn(OH)2-c        -4.89      7.31   12.20  Zn(OH)2
  Zn(OH)2-e        -4.19      7.31   11.50  Zn(OH)2
  Zn(OH)2-g        -4.40      7.31   11.71  Zn(OH)2
  Zn2(OH)2SO4      -8.03     -0.53    7.50  Zn2(OH)2SO4
  Zn2(OH)3Cl       -9.80      5.40   15.20  Zn2(OH)3Cl
  Zn3(AsO4)2:2.5w -17.56    -45.11  -27.55  Zn3(AsO4)2:2.5H2O
  Zn3O(SO4)2      -29.99     -8.36   21.62  ZnO:2ZnSO4
  Zn4(OH)6SO4     -14.32     14.08   28.40  Zn4(OH)6SO4
  Zn5(OH)8Cl2     -20.39     18.11   38.50  Zn5(OH)8Cl2
  ZnCl2           -18.88    -11.12    7.76  ZnCl2
  ZnCO3:1H2O       -1.45    -11.71  -10.26  ZnCO3:1H2O
  ZnCO3:H2O        -1.45    -11.71  -10.26  ZnCO3:H2O
  ZnMetal         -37.42    -10.12   27.30  Zn
  ZnO(a)           -4.00      7.31   11.31  ZnO
  ZnSO4:H2O        -7.71     -7.83   -0.12  ZnSO4:H2O

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
  For ideal gases, phi = 1.

Initial solution 9.      MW-1014C

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Ag                1.484e-10   1.484e-10
      Alkalinity        5.439e-03   5.439e-03
      As                3.072e-07   3.072e-07
      Ba                2.215e-07   2.215e-07
      Ca                3.745e-03   3.745e-03
      Cd                7.924e-10   7.924e-10
      Cl                1.804e-03   1.804e-03
      Cu                4.095e-09   4.095e-09
      Fe                8.351e-05   8.351e-05
      K                 1.172e-04   1.172e-04
      Mg                1.474e-03   1.474e-03
      Mn                2.660e-05   2.660e-05
      Na                4.440e-04   4.440e-04
      Pb                1.932e-10   1.932e-10
      S(6)              2.209e-03   2.209e-03
      Se                2.662e-09   2.662e-09
      Zn                4.088e-06   4.088e-06

----------------------------Description of solution----------------------------

                                       pH  =   6.580
                                       pe  =   0.749
                        Activity of water  =   1.000
                 Ionic strength (mol/kgw)  =   1.664e-02
                       Mass of water (kg)  =   1.000e+00
                    Total carbon (mol/kg)  =   9.029e-03
                       Total CO2 (mol/kg)  =   9.029e-03
                         Temperature (°C)  =   9.47
                  Electrical balance (eq)  =  -4.316e-04
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =  -2.10
                               Iterations  =   9
                                  Total H  = 1.110179e+02
                                  Total O  = 5.553855e+01

----------------------------Distribution of species----------------------------
```

| Species | Molality | Activity | Log Molality | Log Activity | Log Gamma | mole V cm³/mol |
|---|---|---|---|---|---|---|
| H+ | 2.928e-07 | 2.630e-07 | -6.533 | -6.580 | -0.047 | 0.00 |
| OH- | 1.202e-08 | 1.061e-08 | -7.920 | -7.974 | -0.054 | (0) |
| H2O | 5.551e+01 | 9.997e-01 | 1.744 | -0.000 | 0.000 | 18.02 |
| Ag | 1.484e-10 | | | | | |
| AgCl | 9.839e-11 | 9.877e-11 | -10.007 | -10.005 | 0.002 | (0) |
| Ag+ | 2.955e-11 | 2.607e-11 | -10.529 | -10.584 | -0.054 | (0) |
| AgCl2- | 1.994e-11 | 1.760e-11 | -10.700 | -10.755 | -0.054 | (0) |
| AgSO4- | 5.251e-13 | 4.633e-13 | -12.280 | -12.334 | -0.054 | (0) |
| AgCl3-2 | 3.349e-14 | 2.030e-14 | -13.475 | -13.692 | -0.217 | (0) |
| AgCl4-3 | 1.649e-16 | 5.346e-17 | -15.783 | -16.272 | -0.489 | (0) |
| AgOH | 9.872e-17 | 9.910e-17 | -16.006 | -16.004 | 0.002 | (0) |
| Ag(OH)2- | 4.269e-22 | 3.767e-22 | -21.370 | -21.424 | -0.054 | (0) |
| As(3) | 2.943e-07 | | | | | |
| H3AsO3 | 2.938e-07 | 2.950e-07 | -6.532 | -6.530 | 0.002 | (0) |
| H2AsO3- | 4.887e-10 | 4.312e-10 | -9.311 | -9.365 | -0.054 | (0) |
| H4AsO3+ | 4.356e-14 | 3.844e-14 | -13.361 | -13.415 | -0.054 | (0) |
| HAsO3-2 | 2.662e-18 | 1.614e-18 | -17.575 | -17.792 | -0.217 | (0) |
| AsO3-3 | 2.154e-27 | 6.984e-28 | -26.667 | -27.156 | -0.489 | (0) |
| As(5) | 1.290e-08 | | | | | |
| H2AsO4- | 9.507e-09 | 8.388e-09 | -8.022 | -8.076 | -0.054 | (0) |
| HAsO4-2 | 3.389e-09 | 2.054e-09 | -8.470 | -8.687 | -0.217 | (0) |
| H3AsO4 | 3.750e-13 | 3.764e-13 | -12.426 | -12.424 | 0.002 | (0) |
| AsO4-3 | 3.603e-14 | 1.168e-14 | -13.443 | -13.933 | -0.489 | (0) |
| Ba | 2.215e-07 | | | | | |
| Ba+2 | 1.659e-07 | 1.005e-07 | -6.780 | -6.998 | -0.217 | (0) |
| BaSO4 | 5.252e-08 | 5.272e-08 | -7.280 | -7.278 | 0.002 | (0) |
| BaHCO3+ | 3.123e-09 | 2.756e-09 | -8.505 | -8.560 | -0.054 | (0) |
| BaCO3 | 2.150e-11 | 2.158e-11 | -10.668 | -10.666 | 0.002 | (0) |
| BaOH+ | 1.467e-14 | 1.295e-14 | -13.833 | -13.888 | -0.054 | (0) |
| C(4) | 9.029e-03 | | | | | |
| HCO3- | 5.259e-03 | 4.662e-03 | -2.279 | -2.331 | -0.052 | (0) |
| CO2 | 3.594e-03 | 3.608e-03 | -2.444 | -2.443 | 0.002 | (0) |
| CaHCO3+ | 9.804e-05 | 8.651e-05 | -4.009 | -4.063 | -0.054 | (0) |
| MgHCO3+ | 4.789e-05 | 4.225e-05 | -4.320 | -4.374 | -0.054 | (0) |
| FeHCO3+ | 1.892e-05 | 1.670e-05 | -4.723 | -4.777 | -0.054 | (0) |
| MnHCO3+ | 5.425e-06 | 4.787e-06 | -5.266 | -5.320 | -0.054 | (0) |
| CaCO3 | 1.558e-06 | 1.564e-06 | -5.808 | -5.806 | 0.002 | (0) |
| ZnHCO3+ | 1.025e-06 | 9.043e-07 | -5.989 | -6.044 | -0.054 | (0) |
| NaHCO3 | 1.018e-06 | 1.022e-06 | -5.992 | -5.991 | 0.002 | (0) |
| CO3-2 | 9.186e-07 | 5.675e-07 | -6.037 | -6.246 | -0.209 | (0) |
| MnCO3 | 5.174e-07 | 5.194e-07 | -6.286 | -6.285 | 0.002 | (0) |
| FeCO3 | 4.857e-07 | 4.875e-07 | -6.314 | -6.312 | 0.002 | (0) |
| MgCO3 | 3.435e-07 | 3.448e-07 | -6.464 | -6.462 | 0.002 | (0) |
| ZnCO3 | 1.738e-07 | 1.745e-07 | -6.760 | -6.758 | 0.002 | (0) |
| Zn(CO3)2-2 | 3.493e-09 | 2.117e-09 | -8.457 | -8.674 | -0.217 | (0) |
| BaHCO3+ | 3.123e-09 | 2.756e-09 | -8.505 | -8.560 | -0.054 | (0) |
| NaCO3- | 2.042e-09 | 1.802e-09 | -8.690 | -8.744 | -0.054 | (0) |
| PbCO3 | 1.156e-10 | 1.161e-10 | -9.937 | -9.935 | 0.002 | (0) |
| CuCO3 | 7.128e-11 | 7.155e-11 | -10.147 | -10.145 | 0.002 | (0) |
| CuHCO3+ | 6.216e-11 | 5.485e-11 | -10.206 | -10.261 | -0.054 | (0) |
| CdHCO3+ | 5.862e-11 | 5.172e-11 | -10.232 | -10.286 | -0.054 | (0) |
| PbHCO3+ | 4.939e-11 | 4.358e-11 | -10.306 | -10.361 | -0.054 | (0) |
| BaCO3 | 2.150e-11 | 2.158e-11 | -10.668 | -10.666 | 0.002 | (0) |
| Pb(CO3)2-2 | 2.730e-13 | 1.655e-13 | -12.564 | -12.781 | -0.217 | (0) |
| CdCO3 | 1.576e-13 | 1.582e-13 | -12.803 | -12.801 | 0.002 | (0) |
| Cu(CO3)2-2 | 8.433e-14 | 5.112e-14 | -13.074 | -13.291 | -0.217 | (0) |
| Cd(CO3)2-2 | 4.683e-16 | 2.839e-16 | -15.329 | -15.547 | -0.217 | (0) |
| Ca | 3.745e-03 | | | | | |
| Ca+2 | 3.284e-03 | 2.028e-03 | -2.484 | -2.693 | -0.209 | (0) |
| CaSO4 | 3.619e-04 | 3.633e-04 | -3.441 | -3.440 | 0.002 | (0) |
| CaHCO3+ | 9.804e-05 | 8.651e-05 | -4.009 | -4.063 | -0.054 | (0) |
| CaCO3 | 1.558e-06 | 1.564e-06 | -5.808 | -5.806 | 0.002 | (0) |
| CaOH+ | 1.450e-09 | 1.279e-09 | -8.839 | -8.893 | -0.054 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CaHSO4+ | 5.391e-10 | 4.757e-10 | -9.268 | -9.323 | -0.054 | (0) |
| Cd | 7.924e-10 | | | | | |
| Cd+2 | 5.788e-10 | 3.508e-10 | -9.237 | -9.455 | -0.217 | (0) |
| CdSO4 | 9.541e-11 | 9.578e-11 | -10.020 | -10.019 | 0.002 | (0) |
| CdHCO3+ | 5.862e-11 | 5.172e-11 | -10.232 | -10.286 | -0.054 | (0) |
| CdCl+ | 5.704e-11 | 5.033e-11 | -10.244 | -10.298 | -0.054 | (0) |
| Cd(SO4)2-2 | 2.004e-12 | 1.215e-12 | -11.698 | -11.916 | -0.217 | (0) |
| CdCl2 | 3.122e-13 | 3.134e-13 | -12.506 | -12.504 | 0.002 | (0) |
| CdCO3 | 1.576e-13 | 1.582e-13 | -12.803 | -12.801 | 0.002 | (0) |
| CdOHCl | 5.551e-14 | 5.572e-14 | -13.256 | -13.254 | 0.002 | (0) |
| CdOH+ | 3.730e-14 | 3.291e-14 | -13.428 | -13.483 | -0.054 | (0) |
| Cd(CO3)2-2 | 4.683e-16 | 2.839e-16 | -15.329 | -15.547 | -0.217 | (0) |
| CdCl3- | 2.778e-16 | 2.451e-16 | -15.556 | -15.611 | -0.054 | (0) |
| Cd(OH)2 | 2.255e-17 | 2.264e-17 | -16.647 | -16.645 | 0.002 | (0) |
| Cd2OH+3 | 2.139e-22 | 6.935e-23 | -21.670 | -22.159 | -0.489 | (0) |
| Cd(OH)3- | 1.094e-23 | 9.654e-24 | -22.961 | -23.015 | -0.054 | (0) |
| Cd(OH)4-2 | 5.395e-31 | 3.270e-31 | -30.268 | -30.485 | -0.217 | (0) |
| Cl | 1.804e-03 | | | | | |
| Cl- | 1.804e-03 | 1.587e-03 | -2.744 | -2.800 | -0.056 | (0) |
| FeCl+ | 8.888e-08 | 7.843e-08 | -7.051 | -7.106 | -0.054 | (0) |
| MnCl+ | 8.439e-08 | 7.446e-08 | -7.074 | -7.128 | -0.054 | (0) |
| ZnCl+ | 3.621e-09 | 3.195e-09 | -8.441 | -8.496 | -0.054 | (0) |
| CuCl2- | 1.768e-09 | 1.560e-09 | -8.753 | -8.807 | -0.054 | (0) |
| ZnOHCl | 3.065e-10 | 3.077e-10 | -9.514 | -9.512 | 0.002 | (0) |
| AgCl | 9.839e-11 | 9.877e-11 | -10.007 | -10.005 | 0.002 | (0) |
| CdCl+ | 5.704e-11 | 5.033e-11 | -10.244 | -10.298 | -0.054 | (0) |
| MnCl2 | 5.137e-11 | 5.157e-11 | -10.289 | -10.288 | 0.002 | (0) |
| AgCl2- | 1.994e-11 | 1.760e-11 | -10.700 | -10.755 | -0.054 | (0) |
| CuCl3-2 | 6.075e-12 | 3.682e-12 | -11.216 | -11.434 | -0.217 | (0) |
| ZnCl2 | 4.950e-12 | 4.969e-12 | -11.305 | -11.304 | 0.002 | (0) |
| PbCl+ | 5.611e-13 | 4.951e-13 | -12.251 | -12.305 | -0.054 | (0) |
| CdCl2 | 3.122e-13 | 3.134e-13 | -12.506 | -12.504 | 0.002 | (0) |
| CdOHCl | 5.551e-14 | 5.572e-14 | -13.256 | -13.254 | 0.002 | (0) |
| CuCl+ | 5.093e-14 | 4.494e-14 | -13.293 | -13.347 | -0.054 | (0) |
| AgCl3-2 | 3.349e-14 | 2.030e-14 | -13.475 | -13.692 | -0.217 | (0) |
| MnCl3- | 2.554e-14 | 2.253e-14 | -13.593 | -13.647 | -0.054 | (0) |
| ZnCl3- | 9.087e-15 | 8.018e-15 | -14.042 | -14.096 | -0.054 | (0) |
| PbCl2 | 1.684e-15 | 1.691e-15 | -14.774 | -14.772 | 0.002 | (0) |
| CdCl3- | 2.778e-16 | 2.451e-16 | -15.556 | -15.611 | -0.054 | (0) |
| AgCl4-3 | 1.649e-16 | 5.346e-17 | -15.783 | -16.272 | -0.489 | (0) |
| CuCl2 | 3.195e-17 | 3.208e-17 | -16.495 | -16.494 | 0.002 | (0) |
| ZnCl4-2 | 9.237e-18 | 5.599e-18 | -17.034 | -17.252 | -0.217 | (0) |
| PbCl3- | 2.183e-18 | 1.926e-18 | -17.661 | -17.715 | -0.054 | (0) |
| FeCl+2 | 3.676e-19 | 2.228e-19 | -18.435 | -18.652 | -0.217 | (0) |
| FeCl2+ | 3.008e-21 | 2.654e-21 | -20.522 | -20.576 | -0.054 | (0) |
| PbCl4-2 | 2.127e-21 | 1.289e-21 | -20.672 | -20.890 | -0.217 | (0) |
| CuCl3- | 1.531e-22 | 1.351e-22 | -21.815 | -21.869 | -0.054 | (0) |
| FeCl3 | 4.195e-25 | 4.211e-25 | -24.377 | -24.376 | 0.002 | (0) |
| CuCl4-2 | 1.212e-27 | 7.350e-28 | -26.916 | -27.134 | -0.217 | (0) |
| Cu(1) | 3.910e-09 | | | | | |
| Cu+ | 2.136e-09 | 1.885e-09 | -8.670 | -8.725 | -0.054 | (0) |
| CuCl2- | 1.768e-09 | 1.560e-09 | -8.753 | -8.807 | -0.054 | (0) |
| CuCl3-2 | 6.075e-12 | 3.682e-12 | -11.216 | -11.434 | -0.217 | (0) |
| Cu(2) | 1.848e-10 | | | | | |
| CuCO3 | 7.128e-11 | 7.155e-11 | -10.147 | -10.145 | 0.002 | (0) |
| CuHCO3+ | 6.216e-11 | 5.485e-11 | -10.206 | -10.261 | -0.054 | (0) |
| Cu+2 | 3.873e-11 | 2.347e-11 | -10.412 | -10.629 | -0.217 | (0) |
| Cu(OH)2 | 7.058e-12 | 7.085e-12 | -11.151 | -11.150 | 0.002 | (0) |
| CuSO4 | 4.461e-12 | 4.478e-12 | -11.351 | -11.349 | 0.002 | (0) |
| CuOH+ | 1.011e-12 | 8.922e-13 | -11.995 | -12.050 | -0.054 | (0) |
| Cu(CO3)2-2 | 8.433e-14 | 5.112e-14 | -13.074 | -13.291 | -0.217 | (0) |
| CuCl+ | 5.093e-14 | 4.494e-14 | -13.293 | -13.347 | -0.054 | (0) |
| CuCl2 | 3.195e-17 | 3.208e-17 | -16.495 | -16.494 | 0.002 | (0) |
| Cu(OH)3- | 1.839e-18 | 1.623e-18 | -17.735 | -17.790 | -0.054 | (0) |
| Cu2(OH)2+2 | 1.130e-19 | 6.848e-20 | -18.947 | -19.164 | -0.217 | (0) |
| CuCl3- | 1.531e-22 | 1.351e-22 | -21.815 | -21.869 | -0.054 | (0) |
| Cu(OH)4-2 | 2.030e-24 | 1.230e-24 | -23.693 | -23.910 | -0.217 | (0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| CuCl4-2 | 1.212e-27 | 7.350e-28 | -26.916 | -27.134 | -0.217 | (0) |
| Fe(2) | 8.351e-05 | | | | | |
| Fe+2 | 5.908e-05 | 3.581e-05 | -4.229 | -4.446 | -0.217 | (0) |
| FeHCO3+ | 1.892e-05 | 1.670e-05 | -4.723 | -4.777 | -0.054 | (0) |
| FeSO4 | 4.919e-06 | 4.938e-06 | -5.308 | -5.306 | 0.002 | (0) |
| FeCO3 | 4.857e-07 | 4.875e-07 | -6.314 | -6.312 | 0.002 | (0) |
| FeCl+ | 8.888e-08 | 7.843e-08 | -7.051 | -7.106 | -0.054 | (0) |
| FeOH+ | 1.434e-08 | 1.265e-08 | -7.843 | -7.898 | -0.054 | (0) |
| FeHSO4+ | 9.520e-12 | 8.400e-12 | -11.021 | -11.076 | -0.054 | (0) |
| Fe(OH)2 | 9.807e-14 | 9.845e-14 | -13.008 | -13.007 | 0.002 | (0) |
| Fe(OH)3- | 1.341e-17 | 1.184e-17 | -16.872 | -16.927 | -0.054 | (0) |
| Fe(3) | 6.797e-11 | | | | | |
| Fe(OH)2+ | 5.602e-11 | 4.943e-11 | -10.252 | -10.306 | -0.054 | (0) |
| Fe(OH)3 | 1.181e-11 | 1.185e-11 | -10.928 | -10.926 | 0.002 | (0) |
| FeOH+2 | 1.206e-13 | 7.311e-14 | -12.919 | -13.136 | -0.217 | (0) |
| Fe(OH)4- | 2.410e-14 | 2.126e-14 | -13.618 | -13.672 | -0.054 | (0) |
| FeSO4+ | 7.072e-17 | 6.240e-17 | -16.150 | -16.205 | -0.054 | (0) |
| Fe+3 | 2.411e-17 | 7.817e-18 | -16.618 | -17.107 | -0.489 | (0) |
| Fe(SO4)2- | 1.518e-18 | 1.340e-18 | -17.819 | -17.873 | -0.054 | (0) |
| FeCl+2 | 3.676e-19 | 2.228e-19 | -18.435 | -18.652 | -0.217 | (0) |
| FeCl2+ | 3.008e-21 | 2.654e-21 | -20.522 | -20.576 | -0.054 | (0) |
| FeHSO4+2 | 7.598e-23 | 4.606e-23 | -22.119 | -22.337 | -0.217 | (0) |
| Fe2(OH)2+4 | 2.097e-24 | 2.832e-25 | -23.678 | -24.548 | -0.870 | (0) |
| FeCl3 | 4.195e-25 | 4.211e-25 | -24.377 | -24.376 | 0.002 | (0) |
| Fe3(OH)4+5 | 3.029e-31 | 1.326e-32 | -30.519 | -31.877 | -1.359 | (0) |
| H(0) | 3.651e-18 | | | | | |
| H2 | 1.826e-18 | 1.833e-18 | -17.739 | -17.737 | 0.002 | (0) |
| K | 1.172e-04 | | | | | |
| K+ | 1.166e-04 | 1.025e-04 | -3.933 | -3.989 | -0.056 | (0) |
| KSO4- | 6.420e-07 | 5.665e-07 | -6.192 | -6.247 | -0.054 | (0) |
| Mg | 1.474e-03 | | | | | |
| Mg+2 | 1.296e-03 | 8.081e-04 | -2.887 | -3.093 | -0.205 | (0) |
| MgSO4 | 1.295e-04 | 1.300e-04 | -3.888 | -3.886 | 0.002 | (0) |
| MgHCO3+ | 4.789e-05 | 4.225e-05 | -4.320 | -4.374 | -0.054 | (0) |
| MgCO3 | 3.435e-07 | 3.448e-07 | -6.464 | -6.462 | 0.002 | (0) |
| MgOH+ | 2.879e-09 | 2.540e-09 | -8.541 | -8.595 | -0.054 | (0) |
| Mn(2) | 2.660e-05 | | | | | |
| Mn+2 | 1.901e-05 | 1.152e-05 | -4.721 | -4.939 | -0.217 | (0) |
| MnHCO3+ | 5.425e-06 | 4.787e-06 | -5.266 | -5.320 | -0.054 | (0) |
| MnSO4 | 1.562e-06 | 1.568e-06 | -5.806 | -5.805 | 0.002 | (0) |
| MnCO3 | 5.174e-07 | 5.194e-07 | -6.286 | -6.285 | 0.002 | (0) |
| MnCl+ | 8.439e-08 | 7.446e-08 | -7.074 | -7.128 | -0.054 | (0) |
| MnOH+ | 3.355e-10 | 2.960e-10 | -9.474 | -9.529 | -0.054 | (0) |
| MnCl2 | 5.137e-11 | 5.157e-11 | -10.289 | -10.288 | 0.002 | (0) |
| MnCl3- | 2.554e-14 | 2.253e-14 | -13.593 | -13.647 | -0.054 | (0) |
| Mn(OH)3- | 1.136e-20 | 1.002e-20 | -19.945 | -19.999 | -0.054 | (0) |
| Mn(3) | 5.628e-31 | | | | | |
| Mn+3 | 5.628e-31 | 1.825e-31 | -30.250 | -30.739 | -0.489 | (0) |
| Mn(6) | 0.000e+00 | | | | | |
| MnO4-2 | 0.000e+00 | 0.000e+00 | -73.568 | -73.786 | -0.217 | (0) |
| Mn(7) | 0.000e+00 | | | | | |
| MnO4- | 0.000e+00 | 0.000e+00 | -83.438 | -83.492 | -0.054 | (0) |
| Na | 4.440e-04 | | | | | |
| Na+ | 4.409e-04 | 3.896e-04 | -3.356 | -3.409 | -0.054 | (0) |
| NaSO4- | 2.087e-06 | 1.842e-06 | -5.680 | -5.735 | -0.054 | (0) |
| NaHCO3 | 1.018e-06 | 1.022e-06 | -5.992 | -5.991 | 0.002 | (0) |
| NaCO3- | 2.042e-09 | 1.802e-09 | -8.690 | -8.744 | -0.054 | (0) |
| O(0) | 0.000e+00 | | | | | |
| O2 | 0.000e+00 | 0.000e+00 | -62.195 | -62.194 | 0.002 | (0) |
| Pb | 1.932e-10 | | | | | |
| PbCO3 | 1.156e-10 | 1.161e-10 | -9.937 | -9.935 | 0.002 | (0) |
| PbHCO3+ | 4.939e-11 | 4.358e-11 | -10.306 | -10.361 | -0.054 | (0) |
| Pb+2 | 1.941e-11 | 1.177e-11 | -10.712 | -10.929 | -0.217 | (0) |
| PbSO4 | 6.897e-12 | 6.924e-12 | -11.161 | -11.160 | 0.002 | (0) |
| PbOH+ | 9.883e-13 | 8.721e-13 | -12.005 | -12.059 | -0.054 | (0) |
| PbCl+ | 5.611e-13 | 4.951e-13 | -12.251 | -12.305 | -0.054 | (0) |
| Pb(CO3)2-2 | 2.730e-13 | 1.655e-13 | -12.564 | -12.781 | -0.217 | (0) |

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   Pb(SO4)2-2      6.272e-14   3.802e-14   -13.203   -13.420    -0.217     (0)
   PbCl2           1.684e-15   1.691e-15   -14.774   -14.772     0.002     (0)
   Pb(OH)2         1.285e-15   1.290e-15   -14.891   -14.890     0.002     (0)
   PbCl3-          2.183e-18   1.926e-18   -17.661   -17.715    -0.054     (0)
   Pb(OH)3-        6.377e-20   5.627e-20   -19.195   -19.250    -0.054     (0)
   PbCl4-2         2.127e-21   1.289e-21   -20.672   -20.890    -0.217     (0)
   Pb2OH+3         7.086e-22   2.297e-22   -21.150   -21.639    -0.489     (0)
   Pb(OH)4-2       8.083e-25   4.900e-25   -24.092   -24.310    -0.217     (0)
   Pb3(OH)4+2      6.333e-32   3.839e-32   -31.198   -31.416    -0.217     (0)
S(6)          2.209e-03
   SO4-2           1.708e-03   1.046e-03    -2.768    -2.980    -0.213     (0)
   CaSO4           3.619e-04   3.633e-04    -3.441    -3.440     0.002     (0)
   MgSO4           1.295e-04   1.300e-04    -3.888    -3.886     0.002     (0)
   FeSO4           4.919e-06   4.938e-06    -5.308    -5.306     0.002     (0)
   NaSO4-          2.087e-06   1.842e-06    -5.680    -5.735    -0.054     (0)
   MnSO4           1.562e-06   1.568e-06    -5.806    -5.805     0.002     (0)
   KSO4-           6.420e-07   5.665e-07    -6.192    -6.247    -0.054     (0)
   ZnSO4           3.319e-07   3.331e-07    -6.479    -6.477     0.002     (0)
   BaSO4           5.252e-08   5.272e-08    -7.280    -7.278     0.002     (0)
   HSO4-           2.211e-08   1.951e-08    -7.655    -7.710    -0.054     (0)
   Zn(SO4)2-2      5.302e-09   3.214e-09    -8.276    -8.493    -0.217     (0)
   CaHSO4+         5.391e-10   4.757e-10    -9.268    -9.323    -0.054     (0)
   CdSO4           9.541e-11   9.578e-11   -10.020   -10.019     0.002     (0)
   FeHSO4+         9.520e-12   8.400e-12   -11.021   -11.076    -0.054     (0)
   PbSO4           6.897e-12   6.924e-12   -11.161   -11.160     0.002     (0)
   CuSO4           4.461e-12   4.478e-12   -11.351   -11.349     0.002     (0)
   Cd(SO4)2-2      2.004e-12   1.215e-12   -11.698   -11.916    -0.217     (0)
   AgSO4-          5.251e-13   4.633e-13   -12.280   -12.334    -0.054     (0)
   Pb(SO4)2-2      6.272e-14   3.802e-14   -13.203   -13.420    -0.217     (0)
   FeSO4+          7.072e-17   6.240e-17   -16.150   -16.205    -0.054     (0)
   Fe(SO4)2-       1.518e-18   1.340e-18   -17.819   -17.873    -0.054     (0)
   FeHSO4+2        7.598e-23   4.606e-23   -22.119   -22.337    -0.217     (0)
Se(-2)        2.881e-19
   HSe-            2.874e-19   2.536e-19   -18.541   -18.596    -0.054     (0)
   H2Se            6.855e-22   6.881e-22   -21.164   -21.162     0.002     (0)
Se(4)         2.662e-09
   HSeO3-          2.615e-09   2.308e-09    -8.582    -8.637    -0.054     (0)
   SeO3-2          4.577e-11   2.775e-11   -10.339   -10.557    -0.217     (0)
   H2SeO3          3.400e-13   3.414e-13   -12.468   -12.467     0.002     (0)
Se(6)         1.154e-26
   SeO4-2          1.154e-26   6.996e-27   -25.938   -26.155    -0.217     (0)
   HSeO4-          6.046e-32   5.335e-32   -31.219   -31.273    -0.054     (0)
Zn            4.088e-06
   Zn+2            2.542e-06   1.541e-06    -5.595    -5.812    -0.217     (0)
   ZnHCO3+         1.025e-06   9.043e-07    -5.989    -6.044    -0.054     (0)
   ZnSO4           3.319e-07   3.331e-07    -6.479    -6.477     0.002     (0)
   ZnCO3           1.738e-07   1.745e-07    -6.760    -6.758     0.002     (0)
   Zn(SO4)2-2      5.302e-09   3.214e-09    -8.276    -8.493    -0.217     (0)
   ZnCl+           3.621e-09   3.195e-09    -8.441    -8.496    -0.054     (0)
   Zn(CO3)2-2      3.493e-09   2.117e-09    -8.457    -8.674    -0.217     (0)
   ZnOH+           2.100e-09   1.853e-09    -8.678    -8.732    -0.054     (0)
   ZnOHCl          3.065e-10   3.077e-10    -9.514    -9.512     0.002     (0)
   Zn(OH)2         2.791e-10   2.802e-10    -9.554    -9.553     0.002     (0)
   ZnCl2           4.950e-12   4.969e-12   -11.305   -11.304     0.002     (0)
   ZnCl3-          9.087e-15   8.018e-15   -14.042   -14.096    -0.054     (0)
   Zn(OH)3-        3.817e-15   3.368e-15   -14.418   -14.473    -0.054     (0)
   ZnCl4-2         9.237e-18   5.599e-18   -17.034   -17.252    -0.217     (0)
   Zn(OH)4-2       3.347e-21   2.029e-21   -20.475   -20.693    -0.217     (0)

------------------------------Saturation indices-------------------------------

  Phase               SI** log IAP   log K(282 K,   1 atm)

  Ag2CO3          -15.96    -27.41  -11.45  Ag2CO3
  Ag2O            -21.01     -8.01   13.00  Ag2O
  Ag2SO4          -19.06    -24.15   -5.09  Ag2SO4
  AgMetal           3.19    -11.33  -14.53  Ag
```

| | | | | |
|---|---|---|---|---|
| Anglesite | -6.03 | -13.91 | -7.88 | PbSO4 |
| Anhydrite | -1.34 | -5.67 | -4.34 | CaSO4 |
| Antlerite | -16.84 | -8.55 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.69 | -8.94 | -8.25 | CaCO3 |
| Arsenolite | -11.39 | -13.06 | -1.67 | As2O3 |
| Artinite | -10.03 | 0.73 | 10.76 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.38 | -24.85 | 8.53 | As2O5 |
| As_native | -14.88 | -28.52 | -13.64 | As |
| Atacamite | -12.41 | -4.32 | 8.09 | Cu2(OH)3Cl |
| Azurite | -15.22 | -10.23 | 4.99 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | 1.63 | -48.86 | -50.49 | Ba3(AsO4)2 |
| Barite | 0.28 | -9.98 | -10.26 | BaSO4 |
| BaSeO3 | -11.16 | -17.55 | -6.39 | BaSeO3 |
| Bianchite | -7.03 | -8.79 | -1.76 | ZnSO4:6H2O |
| Birnessite | -20.72 | 22.88 | 43.60 | MnO2 |
| Bixbyite | -22.00 | -22.00 | 0.00 | Mn2O3 |
| Brochantite | -21.36 | -6.02 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.86 | 10.07 | 17.93 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -17.04 | -35.94 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.53 | -8.94 | -8.41 | CaCO3 |
| CaSeO3 | -7.65 | -13.25 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.27 | -10.95 | 14.32 | Cd |
| Cd(OH)2 | -9.95 | 3.70 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.86 | 3.70 | 14.57 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.88 | -21.17 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -27.59 | -5.03 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -29.72 | -1.32 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.55 | -15.05 | -0.50 | CdCl2 |
| CdCl2:2.5H2O | -13.05 | -15.05 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.42 | -15.05 | -1.64 | CdCl2:H2O |
| CdMetal | -25.17 | -10.95 | 14.21 | Cd |
| CdOHCl | -9.49 | -5.67 | 3.82 | CdOHCl |
| CdSO4 | -12.93 | -12.44 | 0.49 | CdSO4 |
| CdSO4:2.7H2O | -10.74 | -12.44 | -1.70 | CdSO4:2.67H2O |
| CdSO4:H2O | -11.08 | -12.44 | -1.35 | CdSO4:H2O |
| Cerargyrite | -3.00 | -13.38 | -10.38 | AgCl |
| Cerrusite | -3.85 | -17.18 | -13.33 | PbCO3 |
| Chalcanthite | -10.91 | -13.61 | -2.70 | CuSO4:5H2O |
| Claudetite | -11.45 | -13.06 | -1.61 | As2O3 |
| CO2(g) | -1.18 | -2.44 | -1.26 | CO2 |
| Cotunnite | -11.53 | -16.53 | -5.00 | PbCl2 |
| Cu(OH)2 | -6.72 | 2.53 | 9.25 | Cu(OH)2 |
| Cu2SO4 | -18.66 | -20.43 | -1.77 | Cu2SO4 |
| Cu3(AsO4)2:6w | -24.63 | -59.75 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -7.25 | -16.88 | -9.63 | CuCO3 |
| CuMetal | -0.02 | -9.47 | -9.45 | Cu |
| CuOCuSO4 | -24.04 | -11.08 | 12.96 | CuO:CuSO4 |
| CupricFerrite | 0.36 | 7.80 | 7.44 | CuFe2O4 |
| Cuprite | -2.49 | -4.29 | -1.80 | Cu2O |
| CuprousFerrite | 9.25 | 0.49 | -8.77 | CuFeO2 |
| CuSO4 | -17.35 | -13.61 | 3.74 | CuSO4 |
| Dolomite | -1.57 | -18.28 | -16.71 | CaMg(CO3)2 |
| Dolomite(d) | -2.18 | -18.28 | -16.09 | CaMg(CO3)2 |
| Epsomite | -3.82 | -6.07 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 2.86 | -0.18 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -2.26 | 2.63 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -30.45 | -65.88 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -6.24 | 13.98 | 20.22 | Fe3(OH)8 |
| FeSe2 | -8.40 | -26.98 | -18.58 | FeSe2 |
| Goethite | 3.05 | 2.63 | -0.42 | FeOOH |
| Goslarite | -6.70 | -8.79 | -2.09 | ZnSO4:7H2O |
| Gypsum | -1.08 | -5.67 | -4.59 | CaSO4:2H2O |
| H2(g) | -14.66 | -17.74 | -3.08 | H2 |
| H2O(g) | -1.93 | -0.00 | 1.93 | H2O |
| Halite | -7.75 | -6.21 | 1.55 | NaCl |
| Hausmannite | -25.76 | 39.32 | 65.08 | Mn3O4 |
| Hematite | 8.03 | 5.27 | -2.77 | Fe2O3 |

| | | | | |
|---|---|---|---|---|
| Huntite | -8.02 | -36.95 | -28.93 | CaMg3(CO3)4 |
| Hydrocerrusite | -14.66 | -32.12 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -20.63 | -27.29 | -6.66 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -11.39 | 18.92 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -13.25 | 18.92 | 32.16 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -12.46 | -22.29 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -13.84 | -21.79 | -7.95 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -17.39 | -21.21 | -3.82 | NaFe3(SO4)2(OH)6 |
| JarositeH | -21.21 | -24.38 | -3.17 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -24.40 | -6.02 | 18.39 | Cu4(OH)6SO4:H2O |
| Larnakite | -11.66 | -11.68 | -0.02 | PbO:PbSO4 |
| Laurionite | -7.77 | -7.15 | 0.62 | PbOHCl |
| Litharge | -11.15 | 2.23 | 13.38 | PbO |
| Maghemite | -1.12 | 5.27 | 6.39 | Fe2O3 |
| Magnesite | -1.56 | -9.34 | -7.78 | MgCO3 |
| Magnetite | 8.21 | 13.98 | 5.77 | Fe3O4 |
| Malachite | -9.80 | -3.85 | 5.95 | Cu2(OH)2CO3 |
| Manganite | -9.79 | 15.55 | 25.34 | MnOOH |
| Massicot | -11.36 | 2.23 | 13.59 | PbO |
| Melanothallite | -20.45 | -16.23 | 4.23 | CuCl2 |
| Melanterite | -5.01 | -7.43 | -2.42 | FeSO4:7H2O |
| Minium | -56.48 | 21.35 | 77.83 | Pb3O4 |
| Mirabilite | -7.92 | -9.80 | -1.88 | Na2SO4:10H2O |
| Mn2(SO4)3 | -66.28 | -70.42 | -4.14 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -13.97 | -42.68 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.55 | -10.54 | 2.01 | MnCl2:4H2O |
| MnSO4 | -11.21 | -7.92 | 3.29 | MnSO4 |
| Monteponite | -11.06 | 3.70 | 14.77 | CdO |
| Nahcolite | -5.04 | -5.74 | -0.70 | NaHCO3 |
| Nantokite | -4.36 | -11.52 | -7.16 | CuCl |
| Natron | -11.12 | -13.07 | -1.95 | Na2CO3:10H2O |
| Nesquehonite | -3.95 | -9.34 | -5.39 | MgCO3:3H2O |
| Nsutite | -19.68 | 22.88 | 42.56 | MnO2 |
| O2(g) | -59.43 | -62.19 | -2.76 | O2 |
| Otavite | -3.70 | -15.70 | -12.00 | CdCO3 |
| Pb(OH)2 | -6.48 | 2.23 | 8.71 | Pb(OH)2 |
| Pb2(OH)3Cl | -13.71 | -4.92 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -21.74 | 4.46 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -41.92 | 19.12 | 61.04 | Pb2O3 |
| Pb2OCO3 | -14.91 | -14.94 | -0.04 | PbO:PbCO3 |
| Pb3(AsO4)2 | -25.25 | -60.65 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -24.80 | -12.71 | 12.08 | PbCO3:2PbO |
| Pb3O2SO4 | -20.68 | -9.45 | 11.24 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -28.32 | -7.22 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -30.73 | -7.22 | 23.51 | PbSO4:3PbO |
| PbMetal | -16.68 | -12.43 | 4.25 | Pb |
| PbO:0.3H2O | -10.75 | 2.23 | 12.98 | PbO:0.33H2O |
| Phosgenite | -13.89 | -33.70 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -35.26 | 16.89 | 52.15 | PbO2 |
| Portlandite | -13.58 | 10.47 | 24.05 | Ca(OH)2 |
| Pyrochroite | -6.98 | 8.22 | 15.20 | Mn(OH)2 |
| Pyrolusite | -21.12 | 22.88 | 44.00 | MnO2 |
| Rhodochrosite | -0.11 | -11.18 | -11.07 | MnCO3 |
| Rhodochrosite(d) | -0.79 | -11.18 | -10.39 | MnCO3 |
| Scorodite | -10.79 | -31.04 | -20.25 | FeAsO4:2H2O |
| Se(s) | 6.80 | -10.52 | -17.32 | Se |
| SeO2 | -15.34 | -23.72 | -8.38 | SeO2 |
| Siderite | 0.10 | -10.69 | -10.79 | FeCO3 |
| Siderite(d)(3) | -0.24 | -10.69 | -10.45 | FeCO3 |
| Smithsonite | -2.23 | -12.06 | -9.82 | ZnCO3 |
| Smithsonite_PG | -1.26 | -12.06 | -10.80 | ZnCO3 |
| Tenorite | -5.70 | 2.53 | 8.23 | CuO |
| Thenardite | -9.64 | -9.80 | -0.16 | Na2SO4 |
| Thermonatrite | -13.30 | -13.06 | 0.24 | Na2CO3:H2O |
| Trona | -18.74 | -18.81 | -0.07 | NaHCO3:Na2CO3:2H2O |
| Witherite | -4.61 | -13.24 | -8.64 | BaCO3 |
| Zincite(c) | -4.67 | 7.35 | 12.02 | ZnO |

```
  Zincosite       -12.58     -8.79    3.78  ZnSO4
  Zn(OH)2-a        -5.10      7.35   12.45  Zn(OH)2
  Zn(OH)2-b        -4.40      7.35   11.75  Zn(OH)2
  Zn(OH)2-c        -4.85      7.35   12.20  Zn(OH)2
  Zn(OH)2-e        -4.15      7.35   11.50  Zn(OH)2
  Zn(OH)2-g        -4.36      7.35   11.71  Zn(OH)2
  Zn2(OH)2SO4      -8.95     -1.45    7.50  Zn2(OH)2SO4
  Zn2(OH)3Cl       -9.88      5.32   15.20  Zn2(OH)3Cl
  Zn3(AsO4)2:2.5w -17.76    -45.30  -27.55  Zn3(AsO4)2:2.5H2O
  Zn3O(SO4)2      -31.75    -10.24   21.52  ZnO:2ZnSO4
  Zn4(OH)6SO4     -15.15     13.25   28.40  Zn4(OH)6SO4
  Zn5(OH)8Cl2     -20.52     17.98   38.50  Zn5(OH)8Cl2
  ZnCl2           -19.15    -11.41    7.73  ZnCl2
  ZnCO3:1H2O       -1.80    -12.06  -10.26  ZnCO3:1H2O
  ZnCO3:H2O        -1.80    -12.06  -10.26  ZnCO3:H2O
  ZnMetal         -34.55     -7.31   27.24  Zn
  ZnO(a)           -3.96      7.35   11.31  ZnO
  ZnSO4:H2O        -8.65     -8.79   -0.14  ZnSO4:H2O

**For a gas, SI = log10(fugacity). Fugacity = pressure * phi / 1 atm.
  For ideal gases, phi = 1.

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End of simulation.
------------------

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Reading input data for simulation 2.
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End of Run after 0.329 Seconds.
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```

# Appendix B

## Groundwater Quality & Elevation/Surface Water Quality Trends

Memorandum

Foth Infrastructure & Environment, LLC

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January 30, 2017

TO: Dave Cline, Flambeau Mining Company

CC: Steve Donohue, Foth Infrastructure & Environment, LLC
Sharon Kozicki, P.G., Foth Infrastructure & Environment, LLC

FR: Stephen Lehrke, Ph.D., Foth Infrastructure & Environment, LLC
Allison Haus, Ph.D., Foth Infrastructure & Environment, LLC

RE: 2016 Annual Report Groundwater and Surface Water Trends

## 1. Background

Groundwater and surface water sample results collected for the 2016 monitoring programs were added to the analytical monitoring historical database. These results were statistically tested and graphically displayed to determine whether any significant increasing or decreasing trends are occurring in the groundwater or surface water chemistry. This is done to satisfy the requirements of Part 4, Condition 9 of the Mine Permit to summarize the monitoring activities and any observed trends. The 2016 surface water samples in the Flambeau River were not required but taken voluntarily by Flambeau Mining Company (Flambeau).

Groundwater quality results, trend graphs and statistical test results are included as Attachment 1 for the quarterly monitoring parameters and Attachment 2 for the annual monitoring parameters. Surface water quality results, trend graphs and statistical test results are included as Attachment 3. Hydrographs are included as Attachment 4.

Intervention boundary wells included in the trend analyses are MW-1000PR, MW-1002, MW-1002G, MW-1004P, MW-1004S, MW-1005, MW-1005P, MW-1005S, and MW-1010P. The in-pit wells included in the trend analyses are MW-1013, MW-1013A, MW-1013B, MW-1013C, MW-1014, MW-1014A, MW-1014B and MW-1014C. Wells MW-1015A and MW-1015B (also included in the analyses) were constructed in January 2001 approximately 1,000 feet northwest of the backfilled pit and adjacent to the compliance boundary.

## 2. Statistical Methods

Groundwater and surface water trends over time were assessed using the non-parametric Mann-Kendall test. This test indicates whether any general increasing or decreasing trends have occurred over the time periods evaluated. Two data sets (utilizing two distinct start dates) were assessed: “short-term” trends encompassing the results of 2012 through 2016, i.e., the last five years, and “long-term” trends encompassing the results from October 1997, when the post-mining period began, through the end of 2016.

Note that annual monitoring, and thus long-term trend analyses, did not begin until July 1999 for barium, cadmium, calcium, chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc. Also note that the long-term trend analyses begin with February 1999 for the in-pit wells MW-1013B, MW-1013C, MW-1014A, MW-1014B and MW-1014C, and with April 2001 for wells MW-1015A and MW-1015B, which is when monitoring was initiated for these wells. Trend analyses are also included for wells MW-1013, MW-1013A and MW-1014 beginning with October 2005, and for MW-1000R and MW-1004 beginning with October 2010, at which time sufficient groundwater recovery occurred to collect samples.

The statistical results of the non-parametric Mann-Kendall test for trend are used in conjunction with the trend graphs of Attachments 1, 2, and 3 to properly evaluate trend conditions in the context of the broader site hydrology. It should be noted that a statistically increasing or decreasing trend as determined through the Mann-Kendall test does not necessarily indicate a substantial increase or decrease in actual parameter concentrations. There are situations where variation in the data is small, allowing slight consecutive concentration changes to be detected as a statistically significant trend. Although these minor trends may occur, they should not be construed as an indication of a broader impact on water quality.

The procedure for the Mann-Kendall test is given in Gilbert (1987)[1] and USEPA (2009)[2]. The Type I error for each test was set to 0.01 (two-tailed), with the exception of the 5-year trend tests for the annual parameters. To counteract the decrease in power due to small sample sizes in those cases, the type I error (two-tailed) was set to 0.05 to increase the statistical power (power of detecting existing trends). All non-detected values were replaced with a common value below the lowest detected value.

In the trend test results of Attachments 1, 2, and 3, a “+” indicates a statistically increasing trend and a “-” indicates a statistically decreasing trend. If neither a “+” or “-” is given, no statistically significant trend is present.

## 3. Trend Results

The majority of trends, increasing and/or decreasing, were exhibited in the groundwater results for the quarterly parameters of alkalinity, copper, hardness, iron, manganese, sulfate, total dissolved solids (TDS), conductivity and redox. Many are similar to those noted in the previous annual reports.

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[1]Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, New York.

[2]USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007. Office of Resource Conservation and Recovery, Program Implementation and Information Division, Washington, D.C.

Statistical trend results at each well are summarized below. Historical trend graphs from Attachment 1 (quarterly parameters), Attachment 2 (annual parameters), Attachment 3 (surface water) and Attachment 4 (hydrographs) aid in interpretation. The results are organized by well nest or well location groupings.

As previously noted, the Mann-Kendall test may at times indicate that a statistical trend exists due to slight but consecutive concentration changes (either increasing or decreasing). The discussion below is limited to those instances which show at least a modest change in relative concentration level.

## 3.1. Quarterly Parameters (Attachment 1)

### 3.1.1. Intervention Boundary Wells

- **MW-1000R/MW-1000PR/MW-1010P (Figures B-1a to B-1d):** These three wells are located near the immediate southwest boundary and hydraulically downgradient of the reclaimed mine pit.

  Changes in Reported Trends from Previous Annual Report:
  Arsenic in MW-1000PR has increased since 2013, while copper in MW-1000PR and alkalinity in MW-1000R have followed decreasing trends over this time. Both remain within historically reported variation levels.

  Continuing Trends from Previous Annual Report:
  Long-term decreasing trends in MW-1000PR continue to be noted for hardness, manganese, sulfate, TDS and conductivity. These decreasing trends have been occurring since an initial concentration increase was observed at the onset of the post-mining period.

- **MW-1002/MW-1002G (Figures B-2a to B-2d):** This well nest is located approximately 1,800 feet to the northwest and hydraulically sidegradient of the former mine pit.

  Changes in Reported Trends from Previous Annual Report:
  TDS in MW-1002 and MW-1002G has modestly increased since 2013. Concentrations remain within variation levels observed during the pre-mining period.

- **MW-1004/MW-1004S/MW-1004P (Figures B-3a to B-3d):** This well nest is located near the immediate northwest boundary, and is hydraulically downgradient of the former mine pit.

  No significant trend changes or substantial continuing trends to report.

- **<u>MW-1005/MW-1005S/MW-1005P (Figures B-4a to B-4d)</u>:** This well nest is located approximately 1,000 feet to the southeast and hydraulically upgradient of the former mine pit.

  <u>Changes in Reported Trends from Previous Annual Report:</u>
  Hardness, TDS and conductivity in MW-1005 have increasing trends since 2013. Historical maximums were observed during the last two sampling events for TDS and conductivity within this well. The increase in these parameters may be due to application of road salt on State Highway 27, which is proximal to the well location. Additional contributing factors may include rising water levels and evaporative concentration effects.

- **<u>MW-1015A/MW-1015B (Figures B-5a to B-5d)</u>:** This well nest is located approximately 1000 feet to the west and hydraulically downgradient of the former mine pit.

  <u>Continuing Trends from Previous Annual Report:</u>
  Following concentration increases of iron and manganese in the boundary well MW-1015B during 2002 and 2003, subsequently decreasing trends occurred through 2013. Concentrations have remained consistent since then.

#### 3.1.2. In-Pit Wells

- **<u>MW-1013/MW-1013A/MW-1013B/MW-1013C (Figures B-6a to B-6d)</u>:** This well nest is located within the former mine pit on the southwest side.

  <u>Continuing Trends from Previous Annual Report:</u>
  Copper concentrations followed an increasing trend in MW-1013B from 2001 through 2010. At that time, the increasing trend ceased, with concentrations levels remaining fairly consistent since. Water levels in all four wells (MW-1013, MW-1013A, MW-1013B and MW-1013C) have increased since 2010.

- **<u>MW-1014/MW-1014A/MW-1014B/MW-1014C (Figures B-7a to B-7d)</u>:** This well nest is located within the former mine pit on the northeast side.

  <u>Continuing Trends from Previous Annual Report:</u>
  The in-pit wells MW-1014A, MW-1014B and MW-1014C have decreasing trends for manganese beginning in 1999 and continuing through 2010. Iron in MW-1014C also followed a significantly decreasing trend over this time. Manganese and iron concentrations in these wells since then have remained at consistent levels.

### 3.2. Annual Parameters (Attachment 2)

Similar to past trend results, the annual groundwater parameters of barium, cadmium, calcium, chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc illustrated few statistically significant trends, and of those that are noted, most generally reflect relatively small consecutive concentration changes. Barium, calcium, chloride, magnesium, sodium had an increased concentration level during the latest sampling event in MW-1005 The increase in these parameters may be due to application of road salt on State Highway 27, which is proximal to the well location. Additional contributing factors may include rising water levels and evaporative concentration effects.

Historical trend charts for the annual parameters are illustrated on Figures B-8a through B-14e of Attachment 2.

### 3.3. Surface Water (Attachment 3)

Flambeau voluntarily continued surface water sampling of the Flambeau River in 2016. Parameters currently included in the surface water monitoring are copper, hardness, iron, zinc, total suspended solids, pH, conductivity, dissolved oxygen and redox potential. Concentrations were stable and no statistical trends increasing or decreasing were noted in the surface water results.

### 3.4. Hydrographs (Attachment 4)

As observed in the hydrographs (Figures B-16a through B-16p), water levels in all wells illustrating significant drawdown during the production period of 1993 to 1997 have stabilized.

Groundwater elevations increased steadily from 1999 through 2002 for the in-pit wells of MW-1013A, MW-1013B, MW-1013C, MW-1014, MW-1014A, MW-1014B and MW-1014C, but stabilized subsequent to 2003. Elevations for MW-1013 rose through 2004, but appear to have stabilized during 2005.

Generally higher groundwater elevations are noted for all wells during 2010 and 2011, reflecting the increased precipitation observed in those years. Elevations dropped in 2012, but rebounded again during the summer of 2013. An increase in water levels was observed in 2014 and remaining in 2016 for both intervention boundary and in-pit wells.

## 4. WT-5 Water Levels

Data collected from the Wetland 1 (WT-5) water level staff gauge is tabulated and presented in Attachment 5.

## 5. Conclusions

A detailed analysis of statistical trends occurring in the groundwater and surface water data was performed. Statistical tests evaluated long-term trends occurring during the post-mining period (October 1997 to the present) and short-term trends for the most recent five years. Historical trend graphs of the data are also presented.

The majority of the trends with notable concentration changes occur in the quarterly groundwater monitoring parameters. A general discussion of the trend results for each well nest is provided in Section 3 above. The changes in the results of the statistical trend tests from the 2015 Annual Report include the following:

- Arsenic in MW-1000PR has increased since 2013, while copper in MW-1000PR and alkalinity in MW-1000R have followed decreasing trends over this time. Both remain within variation levels reported historically.

- TDS in MW-1002 and MW-1002G has increased since 2013. Concentrations remain within variation levels observed during the pre-mining period.

- Hardness, TDS and conductivity in MW-1005 have increasing trends since 2013. Historical maximums were observed during the last two sampling events for TDS and conductivity within this well. Also, the annual parameters of barium, calcium, chloride, magnesium, sodium had an increased concentration level during the latest sampling event in MW-1005. The increase in these parameters may be due to application of road salt on State Highway 27, which is proximal to the well location. Additional contributing factors may include rising water levels and evaporative concentration effects.

No statistically significant trends were observed in the surface water monitoring results.

# Attachment 1

## Statistical Results

## Trend Graphs

## Historical Data

## (Groundwater - Quarterly Parameters)

## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2016

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Cond (umhos /cm) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1000PR** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 18 | 20 |
| Mann-Kendall S | 29 | 80 | -80 | -87 | 32 | 9 | -162 | -64 | -46 | -69 | 21 | 46 |
| p-Level | 0.369 | 0.010 | 0.010 | 0.004 | 0.318 | 0.798 | 0.000 | 0.040 | 0.146 | 0.026 | 0.454 | 0.146 |
| Trend | | + | - | - | | | - | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 58 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 61 | 77 |
| Mann-Kendall S | 1650 | 636 | -673 | -1939 | -491 | -1684 | -2231 | -1871 | 661 | -2096 | -484 | 680 |
| p-Level | 0.000 | 0.000 | 0.003 | 0.000 | 0.031 | 0.000 | 0.000 | 0.000 | 0.004 | 0.000 | 0.003 | 0.003 |
| Trend | + | + | - | - | | - | - | - | + | - | - | + |
| **MW-1000R** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -34 | 37 | 10 | -31 | -7 | 38 | 79 | -8 | -42 | -32 | -35 | 64 |
| p-Level | 0.288 | 0.247 | 0.774 | 0.335 | 0.847 | 0.234 | 0.011 | 0.822 | 0.186 | 0.318 | 0.238 | 0.04 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 24 | 76 |
| Mann-Kendall S | -111 | 77 | -50 | -100 | -11 | -13 | 24 | -89 | -96 | -90 | -26 | 743 |
| p-Level | 0.009 | 0.076 | 0.256 | 0.02 | 0.818 | 0.782 | 0.594 | 0.039 | 0.026 | 0.036 | 0.54 | 0.001 |
| Trend | - | | | | | | | | | | | + |
| **MW-1010P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 90 | -9 | 47 | 16 | -9 | 23 | 54 | 99 | 48 | 52 | -69 | 38 |
| p-Level | 0.004 | 0.798 | 0.137 | 0.630 | 0.798 | 0.480 | 0.086 | 0.001 | 0.128 | 0.098 | 0.016 | 0.234 |
| Trend | + | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 58 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 62 | 77 |
| Mann-Kendall S | 601 | 670 | -829 | 1995 | -659 | -347 | 2120 | 406 | 604 | 1785 | 790 | 495 |
| p-Level | 0.004 | 0.000 | 0.000 | 0.000 | 0.003 | 0.128 | 0.000 | 0.073 | 0.008 | 0.000 | 0.000 | 0.030 |
| Trend | + | + | - | + | - | | + | | + | + | + | |
| **MW-1002** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 12 | 20 |
| Mann-Kendall S | 59 | -9 | 63 | 46 | 3 | 62 | -3 | 108 | -58 | 34 | -14 | 64 |
| p-Level | 0.059 | 0.798 | 0.043 | 0.146 | 0.949 | 0.046 | 0.949 | 0.000 | 0.064 | 0.288 | 0.380 | 0.040 |
| Trend | | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 55 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 12 | 77 |
| Mann-Kendall S | 859 | 22 | 16 | 915 | -384 | -178 | -734 | -301 | -334 | 684 | -14 | 393 |
| p-Level | 0.000 | 0.734 | 0.929 | 0.000 | 0.040 | 0.246 | 0.001 | 0.187 | 0.142 | 0.003 | 0.380 | 0.085 |
| Trend | + | | | + | | | - | | | + | | |
| **MW-1002G** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 12 | 20 |
| Mann-Kendall S | 122 | 0 | 49 | 63 | 36 | 73 | 6 | 104 | -58 | 69 | -2 | 64 |
| p-Level | 0.000 | 1.000 | 0.120 | 0.043 | 0.260 | 0.018 | 0.872 | 0.000 | 0.064 | 0.026 | 0.946 | 0.040 |
| Trend | + | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 55 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 12 | 77 |
| Mann-Kendall S | 536 | -77 | 232 | 1543 | -128 | 262 | -1238 | 334 | -533 | 1352 | -2 | 365 |
| p-Level | 0.018 | 0.088 | 0.054 | 0.000 | 0.468 | 0.087 | 0.000 | 0.139 | 0.019 | 0.000 | 0.946 | 0.109 |
| Trend | | | | + | | | - | | | + | | |

## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2016

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Cond (umhos /cm) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1004** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 18 | 19 |
| Mann-Kendall S | -65 | 1 | 54 | -71 | 23 | -13 | -67 | 14 | -11 | -72 | -82 | 45 |
| p-Level | 0.024 | 1 | 0.063 | 0.012 | 0.446 | 0.678 | 0.02 | 0.653 | 0.73 | 0.011 | 0.002 | 0.124 |
| Trend | | | | | | | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 23 | 64 |
| Mann-Kendall S | -85 | 11 | 140 | -70 | 26 | 18 | -36 | 59 | -50 | -55 | -108 | 322 |
| p-Level | 0.036 | 0.807 | 0 | 0.088 | 0.54 | 0.676 | 0.39 | 0.151 | 0.226 | 0.182 | 0.004 | 0.063 |
| Trend | | | + | | | | | | | | - | |
| **MW-1004S** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -85 | 11 | 4 | -62 | 13 | 77 | 11 | 63 | -67 | -57 | -73 | 58 |
| p-Level | 0.005 | 0.749 | 0.924 | 0.046 | 0.701 | 0.013 | 0.749 | 0.043 | 0.031 | 0.069 | 0.010 | 0.064 |
| Trend | - | | | | | | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 57 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 62 | 77 |
| Mann-Kendall S | 513 | 9 | 472 | 1028 | -440 | -210 | 1520 | -223 | 27 | 663 | -150 | 847 |
| p-Level | 0.024 | 0.886 | 0.023 | 0.000 | 0.011 | 0.255 | 0.000 | 0.326 | 0.909 | 0.004 | 0.365 | 0.000 |
| Trend | | | | + | | | + | | | + | | + |
| **MW-1004P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 13 | 20 |
| Mann-Kendall S | 55 | 66 | 9 | 5 | 65 | 54 | 65 | 92 | 58 | 50 | -14 | 79 |
| p-Level | 0.080 | 0.034 | 0.798 | 0.898 | 0.037 | 0.086 | 0.037 | 0.002 | 0.064 | 0.112 | 0.436 | 0.011 |
| Trend | | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 78 | 58 | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 58 | 78 |
| Mann-Kendall S | 311 | 213 | -672 | 770 | 1567 | 1566 | -85 | -426 | 302 | 919 | -564 | 979 |
| p-Level | 0.096 | 0.037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.665 | 0.065 | 0.193 | 0.000 | 0.000 | 0.000 |
| Trend | | | - | + | + | + | | | | + | - | + |
| **MW-1005** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 12 | 20 |
| Mann-Kendall S | -2 | 49 | -56 | 68 | 24 | 53 | 0 | 78 | -98 | 68 | 11 | 89 |
| p-Level | 0.974 | 0.120 | 0.074 | 0.028 | 0.460 | 0.092 | 1.000 | 0.012 | 0.002 | 0.028 | 0.503 | 0.004 |
| Trend | | | | | | | | | - | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 55 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 12 | 76 |
| Mann-Kendall S | -1339 | -277 | 741 | 783 | -402 | -70 | 429 | 793 | -716 | 931 | 11 | 577 |
| p-Level | 0.000 | 0.041 | 0.000 | 0.001 | 0.076 | 0.761 | 0.051 | 0.000 | 0.002 | 0.000 | 0.503 | 0.010 |
| Trend | - | | + | + | | | | + | - | + | | + |
| **MW-1005S** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 12 | 20 |
| Mann-Kendall S | -55 | -3 | 13 | -80 | -21 | -44 | 58 | 51 | 70 | -56 | 16 | 92 |
| p-Level | 0.080 | 0.949 | 0.701 | 0.010 | 0.521 | 0.164 | 0.064 | 0.105 | 0.024 | 0.074 | 0.310 | 0.002 |
| Trend | | | | - | | | | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 55 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 12 | 77 |
| Mann-Kendall S | 972 | -31 | 23 | 953 | 468 | 789 | -717 | -344 | 130 | 870 | 16 | 638 |
| p-Level | 0.000 | 0.827 | 0.772 | 0.000 | 0.038 | 0.000 | 0.000 | 0.129 | 0.570 | 0.000 | 0.310 | 0.005 |
| Trend | + | | | + | | + | - | | | + | | + |

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## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2016

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Cond (umhos /cm) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1005P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 55 | 67 | 55 | -22 | -23 | 37 | -6 | 46 | 81 | -44 | 39 | 100 |
| p-Level | 0.080 | 0.031 | 0.080 | 0.500 | 0.480 | 0.247 | 0.872 | 0.146 | 0.009 | 0.164 | 0.186 | 0.000 |
| Trend | | | | | | | | | + | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 77 | 55 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 64 | 77 |
| Mann-Kendall S | 10 | 102 | 34 | 320 | 1398 | 451 | -297 | -387 | -174 | 773 | -217 | 440 |
| p-Level | 0.967 | 0.253 | 0.811 | 0.144 | 0.000 | 0.048 | 0.045 | 0.088 | 0.446 | 0.001 | 0.210 | 0.053 |
| Trend | | | | | + | | | | | + | | |
| **MW-1015A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 17 | 0 | 43 | -12 | 44 | -20 | -126 | 99 | -73 | -43 | -67 | 63 |
| p-Level | 0.608 | 1.000 | 0.175 | 0.724 | 0.164 | 0.542 | 0.000 | 0.001 | 0.018 | 0.175 | 0.020 | 0.043 |
| Trend | | | | | | | - | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 71 | 64 | 71 | 71 | 72 | 72 | 71 | 71 | 72 | 72 | 48 | 72 |
| Mann-Kendall S | 344 | -107 | 287 | 467 | 103 | -1199 | 228 | -305 | 314 | 1342 | 44 | 104 |
| p-Level | 0.084 | 0.092 | 0.019 | 0.020 | 0.427 | 0.000 | 0.259 | 0.129 | 0.128 | 0.000 | 0.702 | 0.617 |
| Trend | | | | | | - | | | | + | | |
| **MW-1015B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 4 | 59 | -7 | 22 | 56 | 1 | 40 | 76 | 21 | -17 | -3 | 66 |
| p-Level | 0.924 | 0.059 | 0.847 | 0.500 | 0.074 | 0.987 | 0.208 | 0.014 | 0.521 | 0.608 | 0.946 | 0.034 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 71 | 64 | 71 | 71 | 72 | 72 | 71 | 71 | 72 | 72 | 49 | 72 |
| Mann-Kendall S | -199 | 192 | 63 | 978 | 10 | -673 | 47 | 33 | 419 | 1300 | 717 | 157 |
| p-Level | 0.205 | 0.053 | 0.281 | 0.000 | 0.965 | 0.001 | 0.635 | 0.873 | 0.042 | 0.000 | 0.000 | 0.448 |
| Trend | | | | + | | - | | | | + | + | |
| **MW-1013** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -16 | 0 | 59 | -42 | -72 | 62 | -104 | -46 | -12 | -79 | -57 | 96 |
| p-Level | 0.630 | 1.000 | 0.059 | 0.186 | 0.020 | 0.046 | 0.000 | 0.146 | 0.724 | 0.011 | 0.050 | 0.002 |
| Trend | | | | | | | - | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 72 |
| Mann-Kendall S | 211 | -104 | 349 | -6 | -182 | 425 | -738 | 121 | -202 | -196 | -122 | 1769 |
| p-Level | 0.039 | 0.273 | 0.001 | 0.961 | 0.076 | 0.000 | 0.000 | 0.238 | 0.048 | 0.056 | 0.237 | 0.000 |
| Trend | | | + | | | + | - | | | | | + |
| **MW-1013A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 18 | 20 |
| Mann-Kendall S | 74 | 51 | -43 | 40 | 21 | 106 | 8 | 55 | -57 | 62 | -79 | 122 |
| p-Level | 0.016 | 0.105 | 0.175 | 0.208 | 0.521 | 0.000 | 0.822 | 0.080 | 0.069 | 0.046 | 0.002 | 0.000 |
| Trend | | | | | | + | | | | | - | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 44 | 72 |
| Mann-Kendall S | 72 | 22 | 173 | 15 | 496 | 425 | -149 | 89 | -160 | -67 | -265 | 1152 |
| p-Level | 0.483 | 0.791 | 0.057 | 0.891 | 0.000 | 0.000 | 0.144 | 0.388 | 0.119 | 0.518 | 0.008 | 0.000 |
| Trend | | | | | + | + | | | | | - | + |

## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2016

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Cond (umhos /cm) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1013B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -9 | 27 | -70 | -20 | 40 | -14 | -27 | 1 | -39 | -37 | -103 | 122 |
| p-Level | 0.798 | 0.404 | 0.024 | 0.542 | 0.208 | 0.678 | 0.404 | 0.987 | 0.221 | 0.247 | 0.000 | 0.000 |
| Trend | | | | | | | | | | | - | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 72 | 60 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 64 | 72 |
| Mann-Kendall S | -392 | -237 | 1691 | -469 | -301 | -95 | 248 | -668 | -383 | -544 | 148 | 1190 |
| p-Level | 0.057 | 0.092 | 0.000 | 0.016 | 0.118 | 0.647 | 0.200 | 0.001 | 0.062 | 0.008 | 0.394 | 0.000 |
| Trend | | | + | | | | | - | | - | | + |
| **MW-1013C** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -63 | 68 | -76 | -80 | 64 | 2 | -71 | -86 | 3 | -61 | 17 | 124 |
| p-Level | 0.043 | 0.028 | 0.014 | 0.010 | 0.040 | 0.974 | 0.022 | 0.004 | 0.949 | 0.050 | 0.580 | 0.000 |
| Trend | | | | - | | | | - | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 72 | 60 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 71 | 64 | 72 |
| Mann-Kendall S | 285 | 746 | 52 | -818 | 2220 | 642 | -520 | -1019 | 26 | -819 | 302 | 1168 |
| p-Level | 0.166 | 0.000 | 0.744 | 0.000 | 0.000 | 0.002 | 0.008 | 0.000 | 0.903 | 0.000 | 0.081 | 0.000 |
| Trend | | + | | - | + | + | - | - | | - | | + |
| **MW-1014** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 5 | 48 | -40 | 5 | 22 | 30 | -45 | 62 | -47 | 14 | -67 | 114 |
| p-Level | 0.898 | 0.128 | 0.208 | 0.898 | 0.500 | 0.352 | 0.155 | 0.046 | 0.137 | 0.678 | 0.020 | 0.000 |
| Trend | | | | | | | | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 69 |
| Mann-Kendall S | 29 | 15 | -23 | -244 | 98 | 203 | -673 | -191 | -233 | -272 | -233 | 1198 |
| p-Level | 0.779 | 0.837 | 0.828 | 0.016 | 0.153 | 0.048 | 0.000 | 0.062 | 0.023 | 0.008 | 0.023 | 0.000 |
| Trend | | | | | | | - | | | - | | + |
| **MW-1014A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 56 | 47 | -95 | 41 | 42 | 18 | -28 | -42 | -42 | 19 | -53 | 108 |
| p-Level | 0.074 | 0.137 | 0.002 | 0.197 | 0.186 | 0.586 | 0.386 | 0.186 | 0.186 | 0.564 | 0.068 | 0.000 |
| Trend | | | - | | | | | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 67 | 57 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 64 | 72 |
| Mann-Kendall S | 471 | -82 | 668 | -296 | -713 | -1680 | -187 | -429 | -415 | -683 | -17 | 1371 |
| p-Level | 0.011 | 0.518 | 0.000 | 0.079 | 0.000 | 0.000 | 0.310 | 0.015 | 0.024 | 0.000 | 0.926 | 0.000 |
| Trend | | | + | | - | - | | | | - | | + |
| **MW-1014B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | 37 | 3 | -9 | -31 | 28 | -9 | -20 | 2 | -22 | -41 | -35 | 122 |
| p-Level | 0.247 | 0.949 | 0.798 | 0.335 | 0.386 | 0.798 | 0.542 | 0.974 | 0.500 | 0.197 | 0.238 | 0.000 |
| Trend | | | | | | | | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 72 | 60 | 72 | 72 | 72 | 72 | 72 | 72 | 73 | 73 | 64 | 73 |
| Mann-Kendall S | -400 | -166 | -545 | -1171 | -27 | -2013 | -889 | -1217 | 36 | -1234 | -833 | 1251 |
| p-Level | 0.052 | 0.266 | 0.008 | 0.000 | 0.833 | 0.000 | 0.000 | 0.000 | 0.867 | 0.000 | 0.000 | 0.000 |
| Trend | | | - | - | | - | - | - | | - | - | + |

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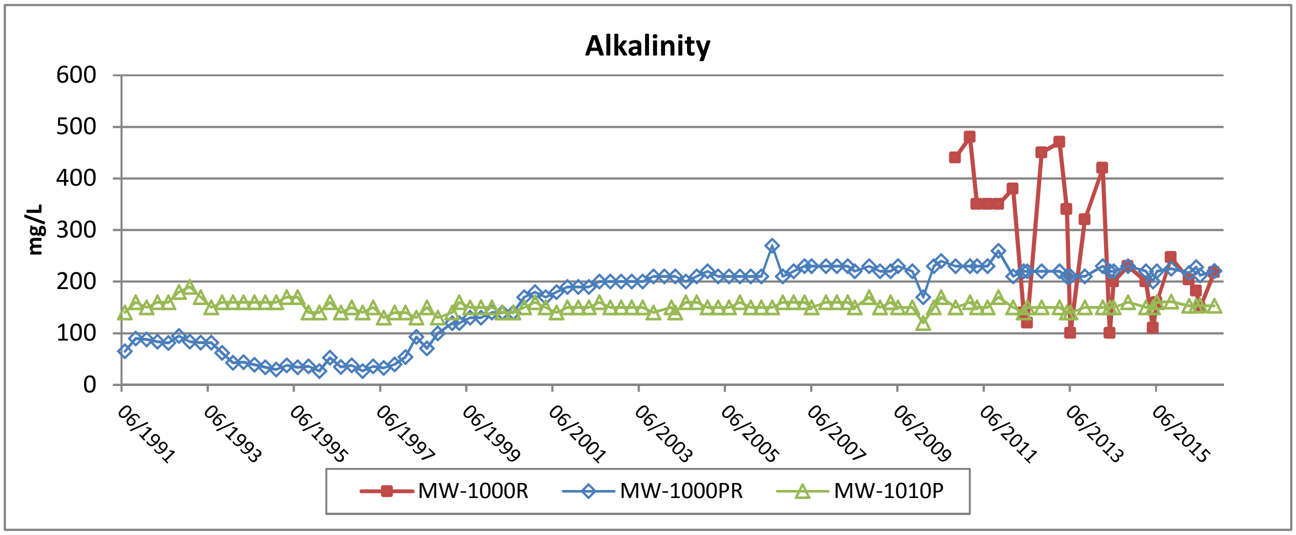
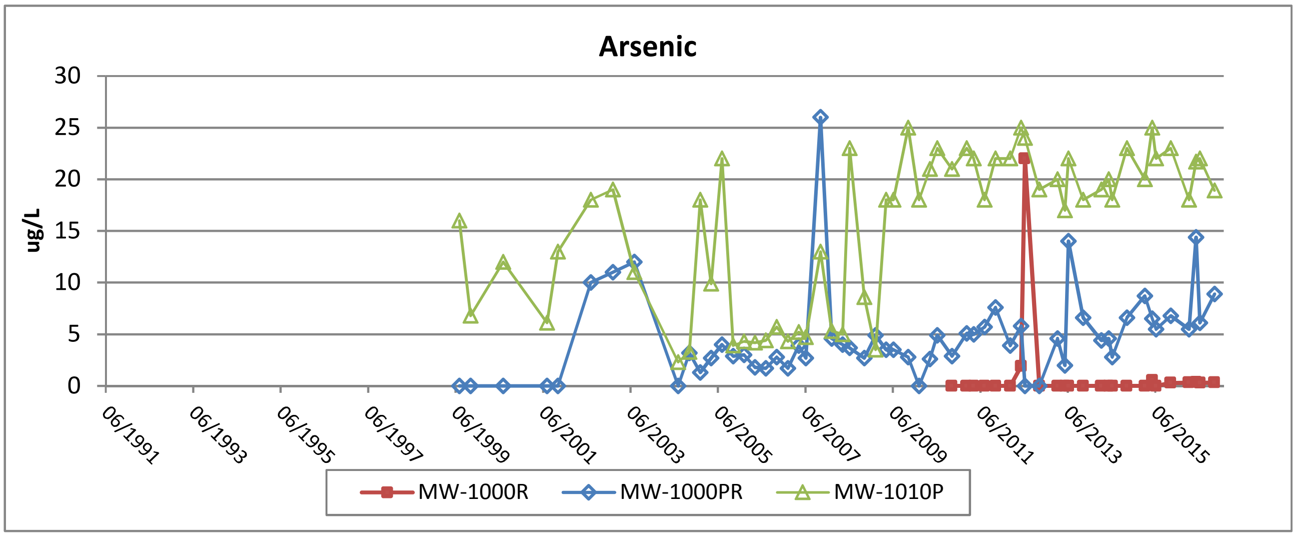
## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2016

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Cond (umhos /cm) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1014C** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -20 | 29 | -72 | 10 | -18 | 18 | -50 | 6 | -21 | -30 | -24 | 120 |
| p-Level | 0.542 | 0.369 | 0.020 | 0.774 | 0.586 | 0.586 | 0.112 | 0.872 | 0.521 | 0.352 | 0.426 | 0.000 |
| Trend | | | | | | | | | | | | + |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 72 | 60 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 64 | 72 |
| Mann-Kendall S | -1639 | 915 | 372 | -1866 | -2029 | -1957 | -1974 | -1672 | 533 | -1965 | 152 | 1145 |
| p-Level | 0.000 | 0.000 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.000 | 0.381 | 0.000 |
| Trend | - | + | | - | - | - | - | - | + | - | | + |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
All trend tests performed at a Type I (two-tailed) error rate of 0.01.



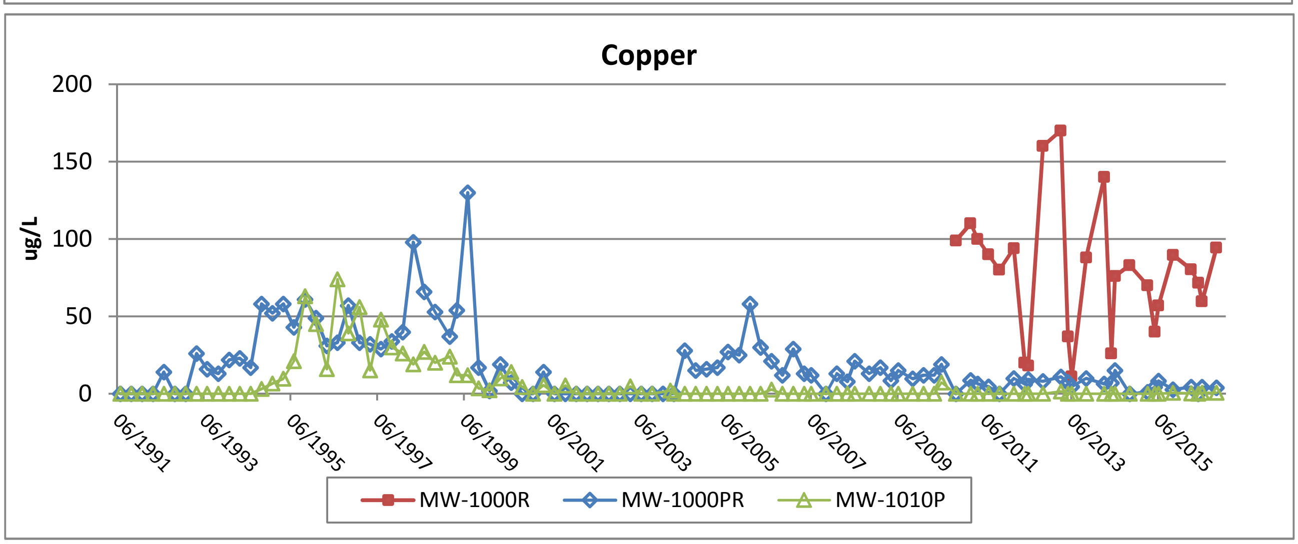




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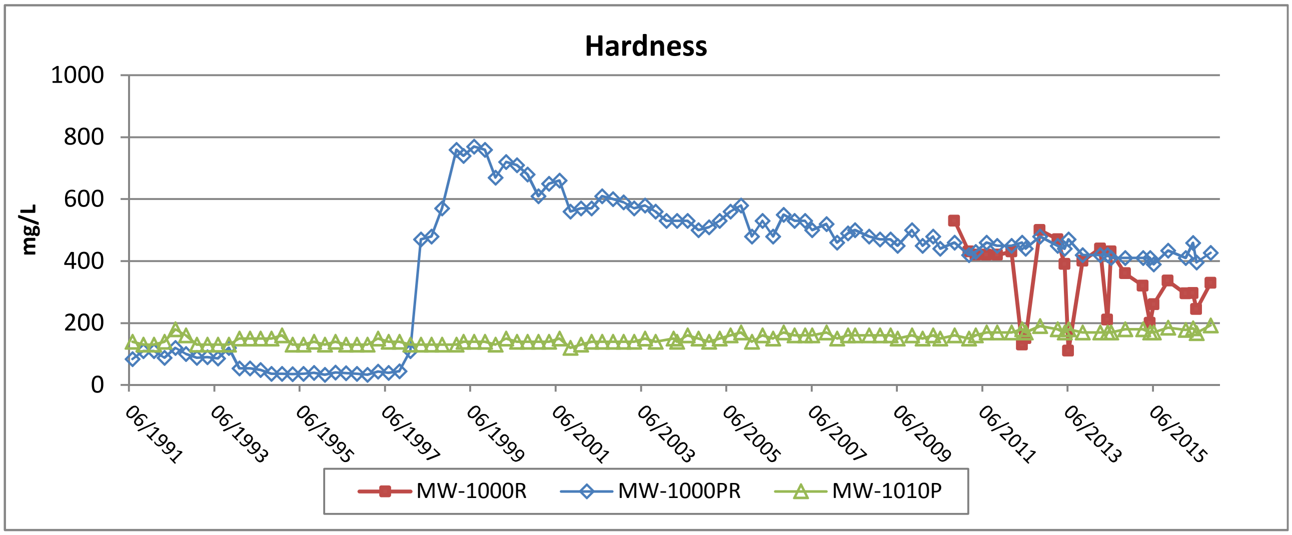
Figure B-1a

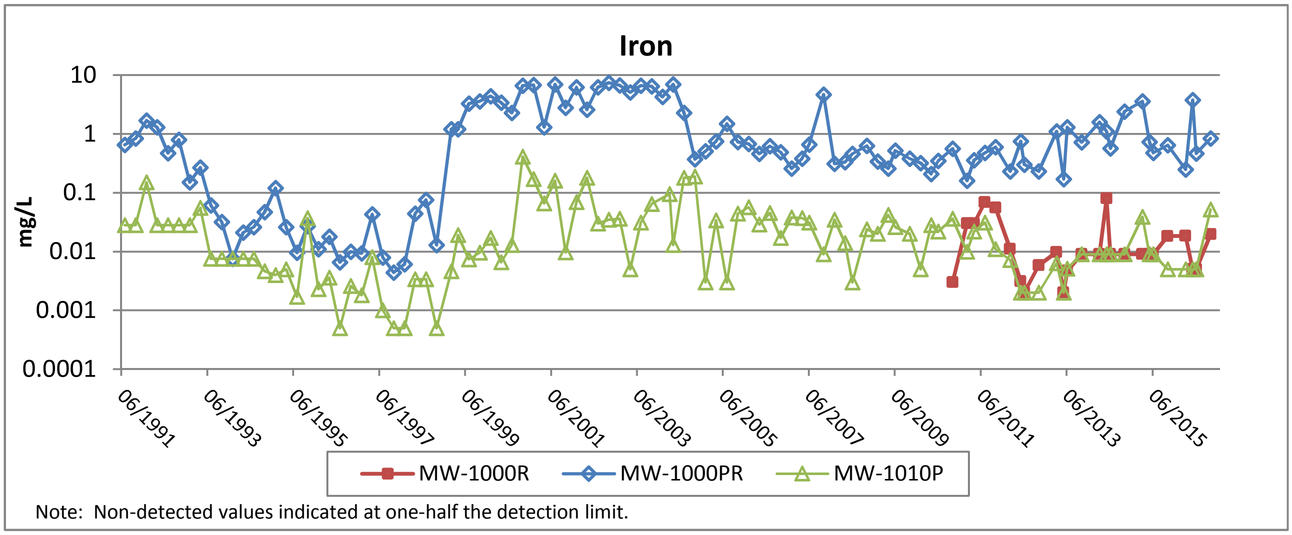
Groundwater Trend Graphs - Quarterly Results

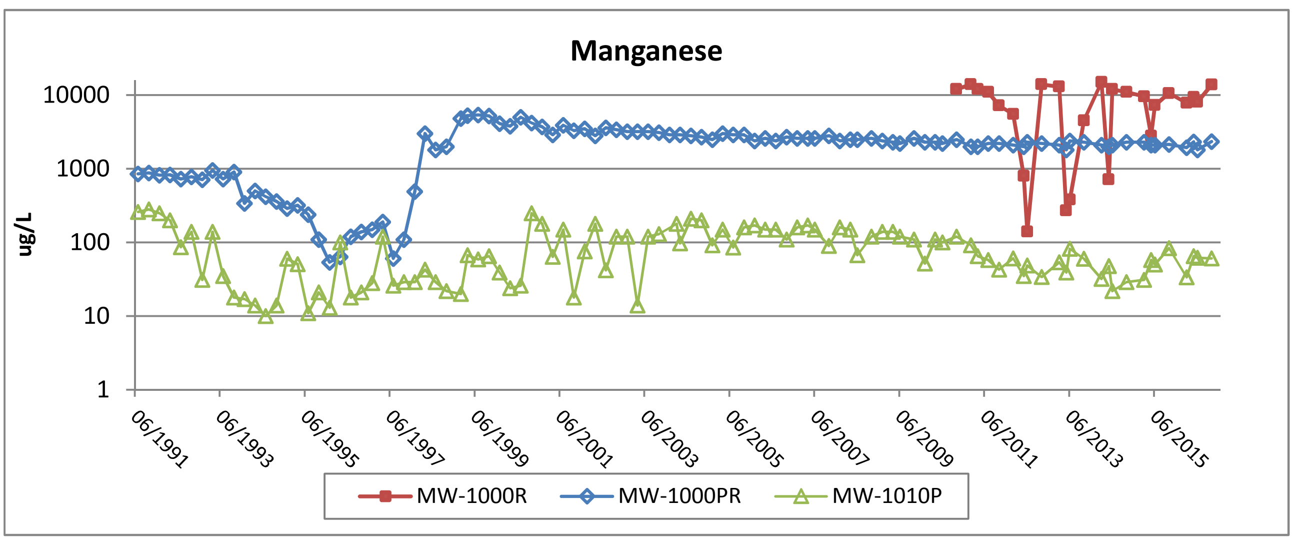
MW-1000R/MW-1000PR/MW-1010P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |




Note: Iron trend graphs are displayed on a logarithmic scale so the trend patterns of MW-1000R, MW-1000PR and MW-1010P are visible at different concentration scales.

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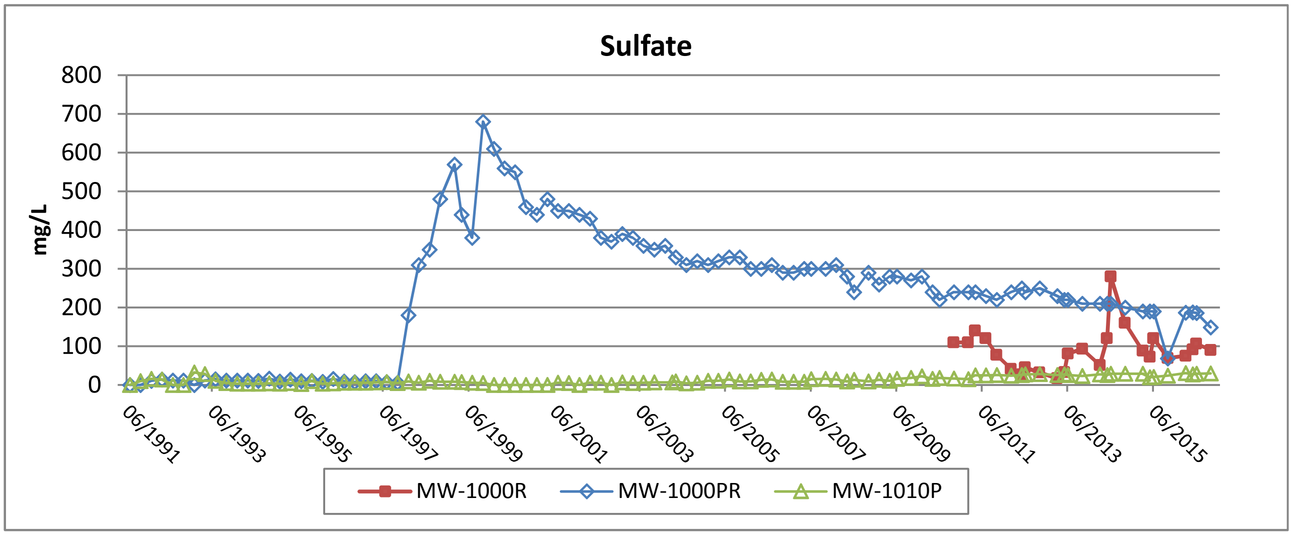
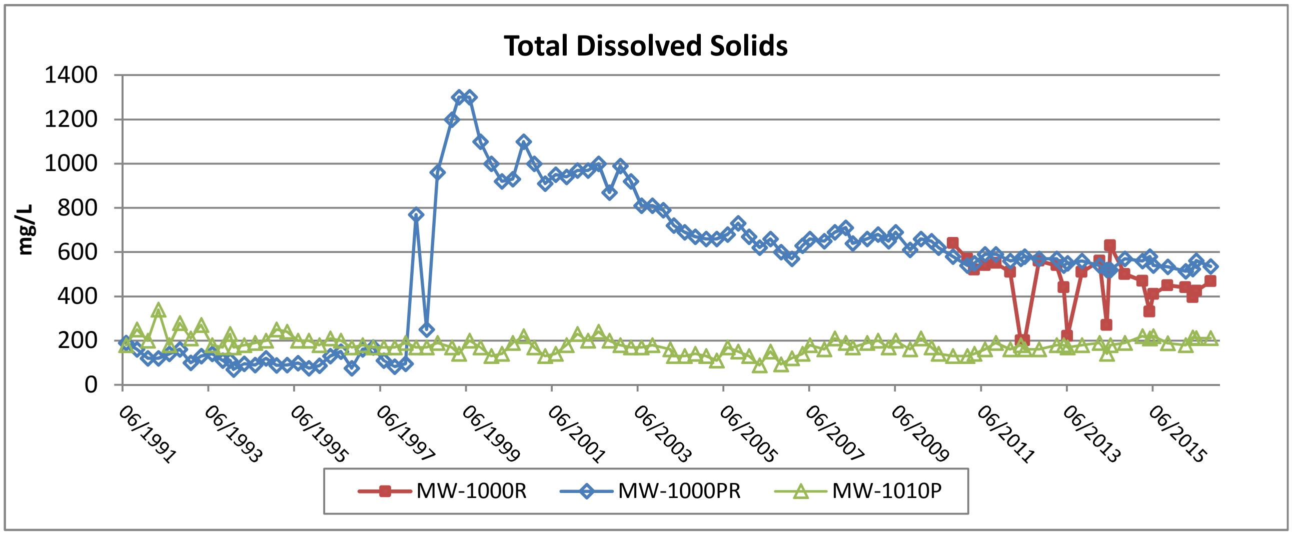
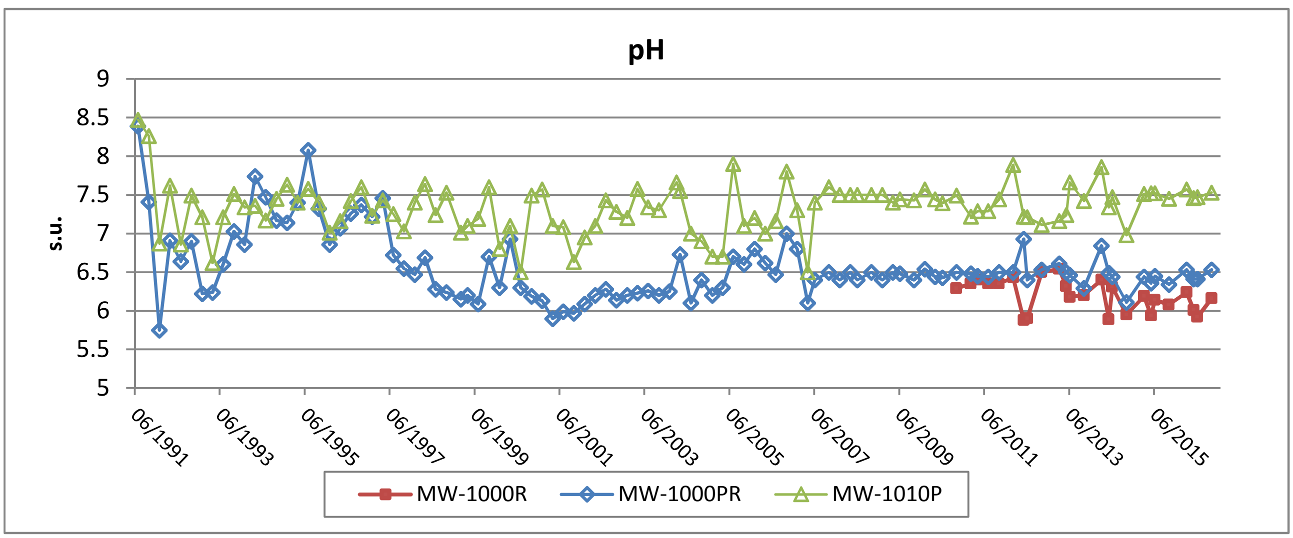
| FLAMBEAU MINING COMPANY | | |
|---|---|---|
| Figure B-1b<br>Groundwater Trend Graphs - Quarterly Results<br>MW-1000R/MW-1000PR/MW-1010P | | |
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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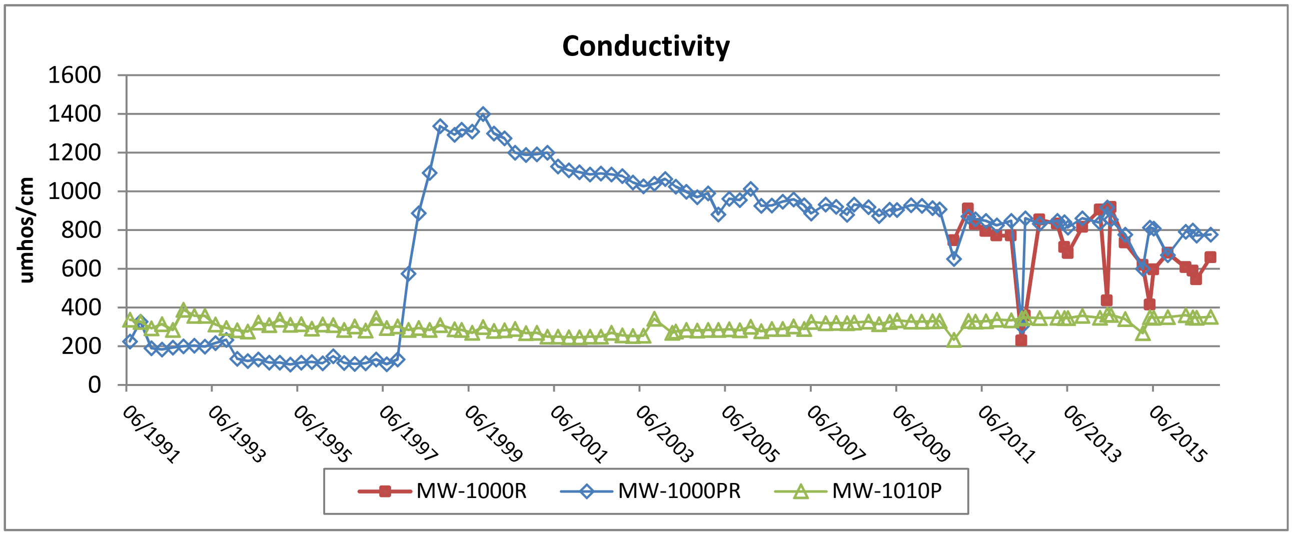
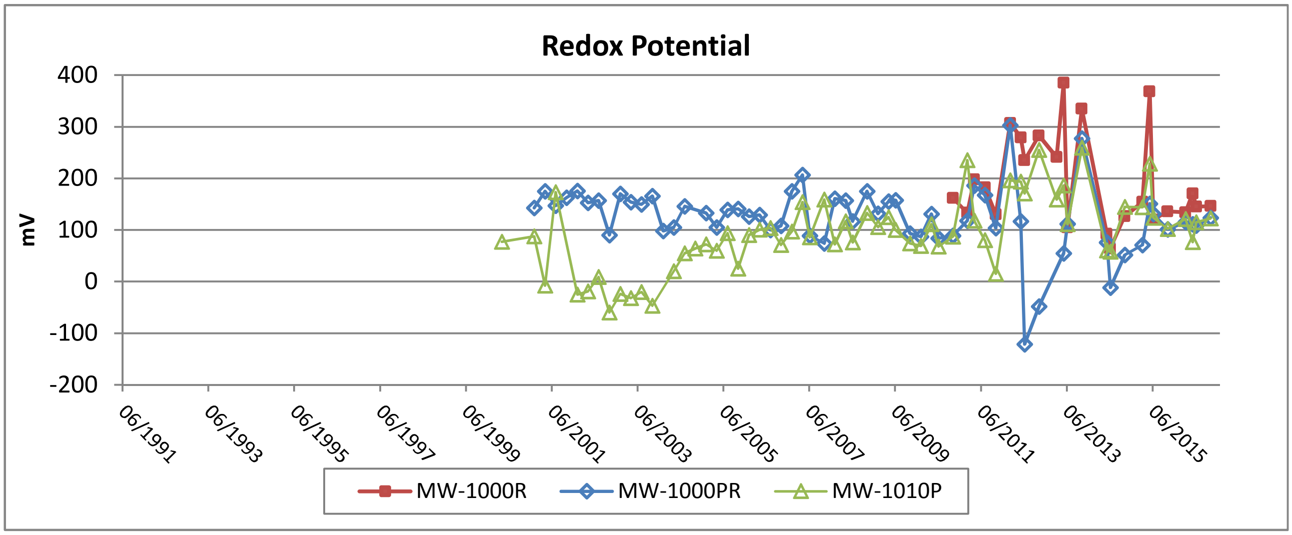
| FLAMBEAU MINING COMPANY | | |
|---|---|---|
| Figure B-1c<br>Groundwater Trend Graphs - Quarterly Results<br>MW-1000R/MW-1000PR/MW-1010P | | |
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



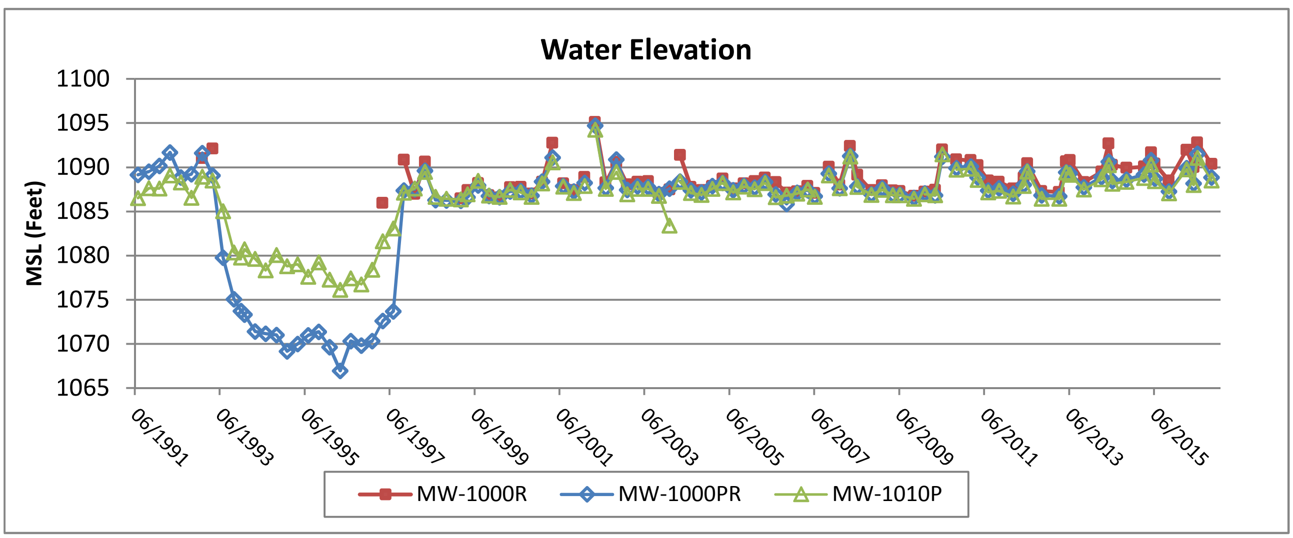




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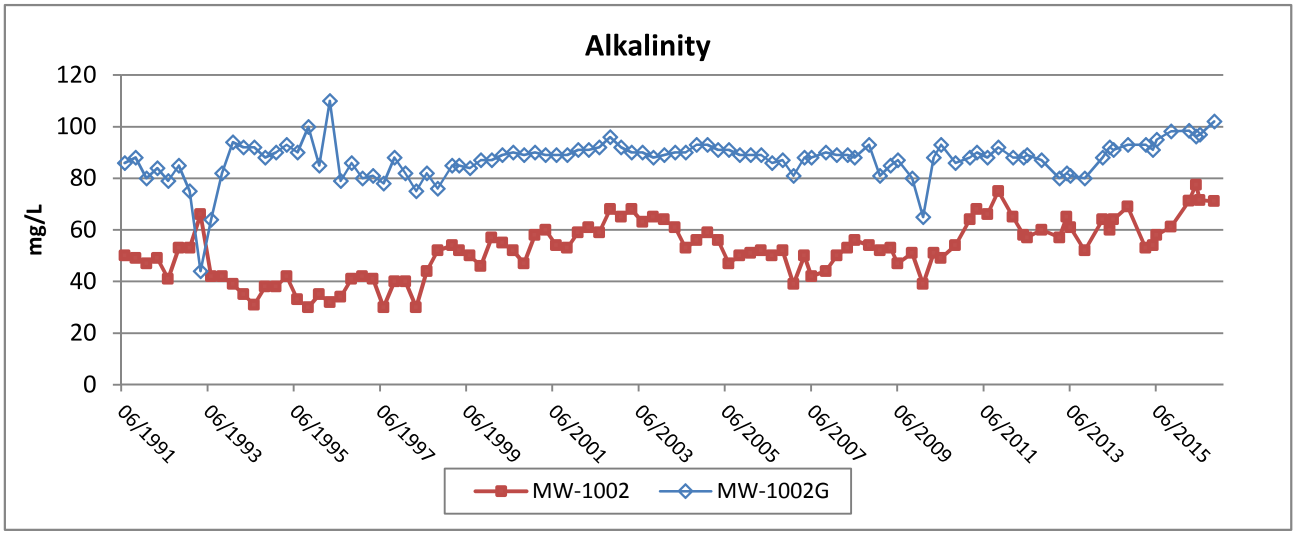
Figure B-1d

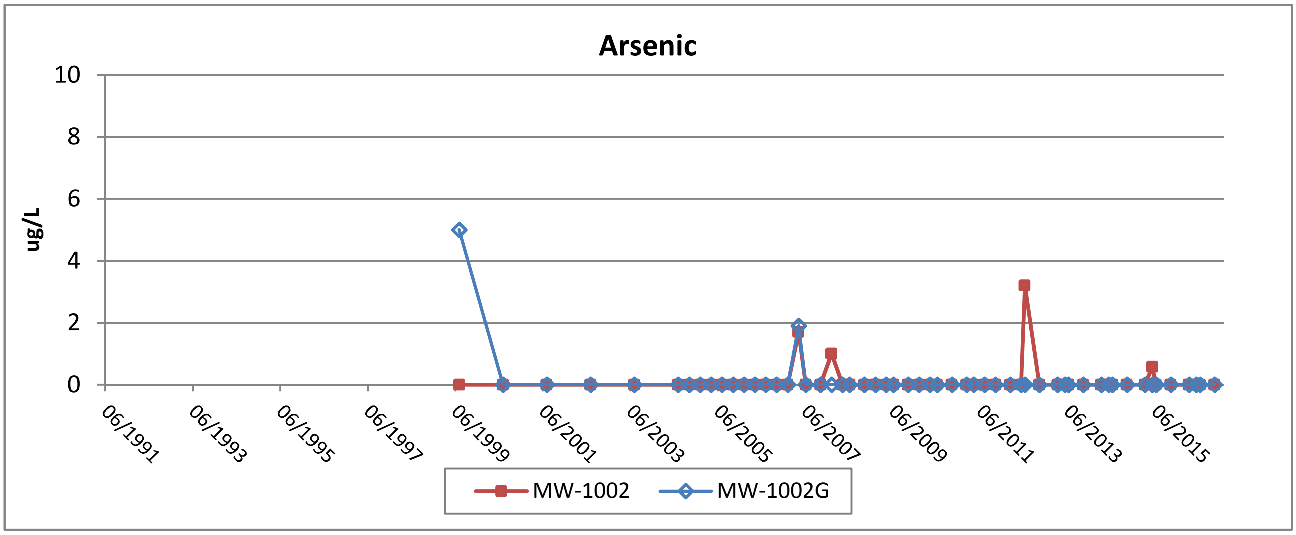
Groundwater Trend Graphs - Quarterly Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2017 |
|---|---|

| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |
|---|---|---|



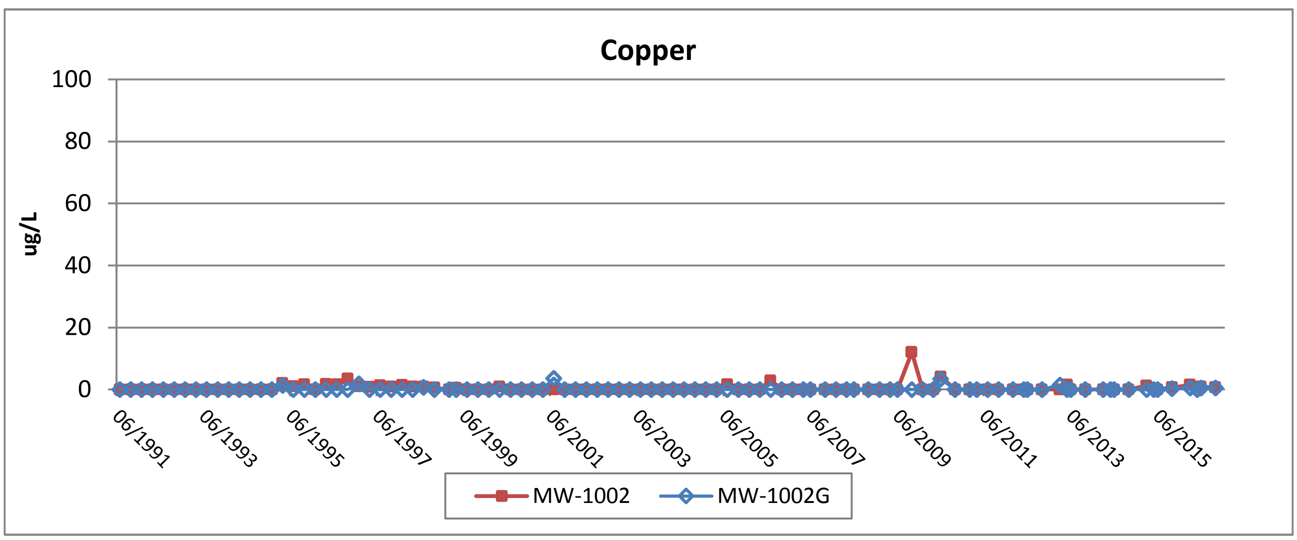




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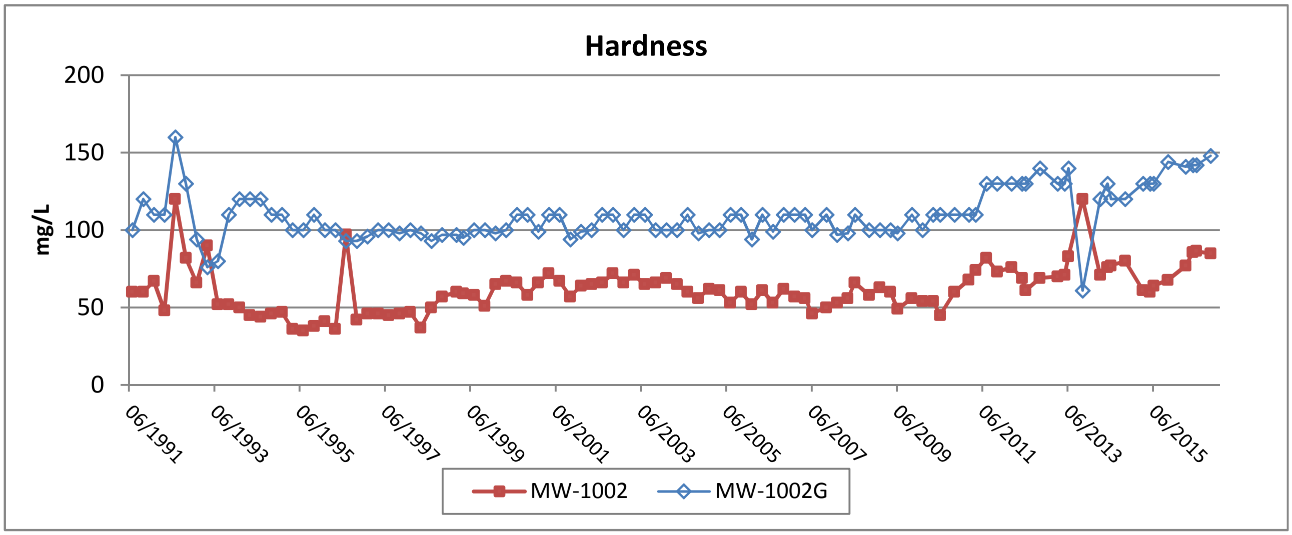
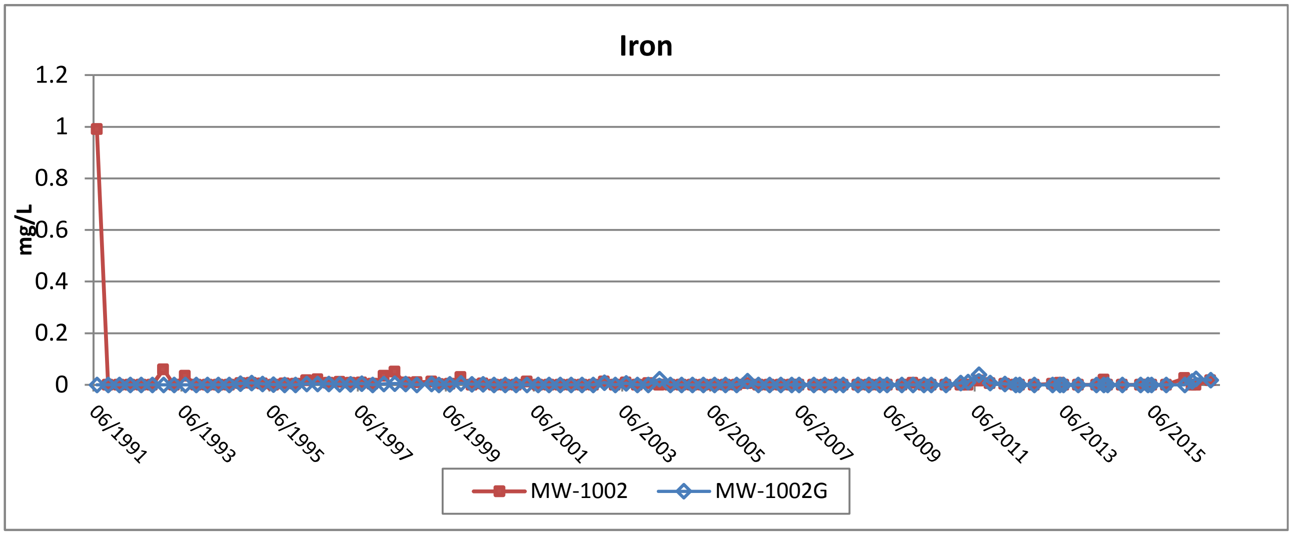
Figure B-2a

Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



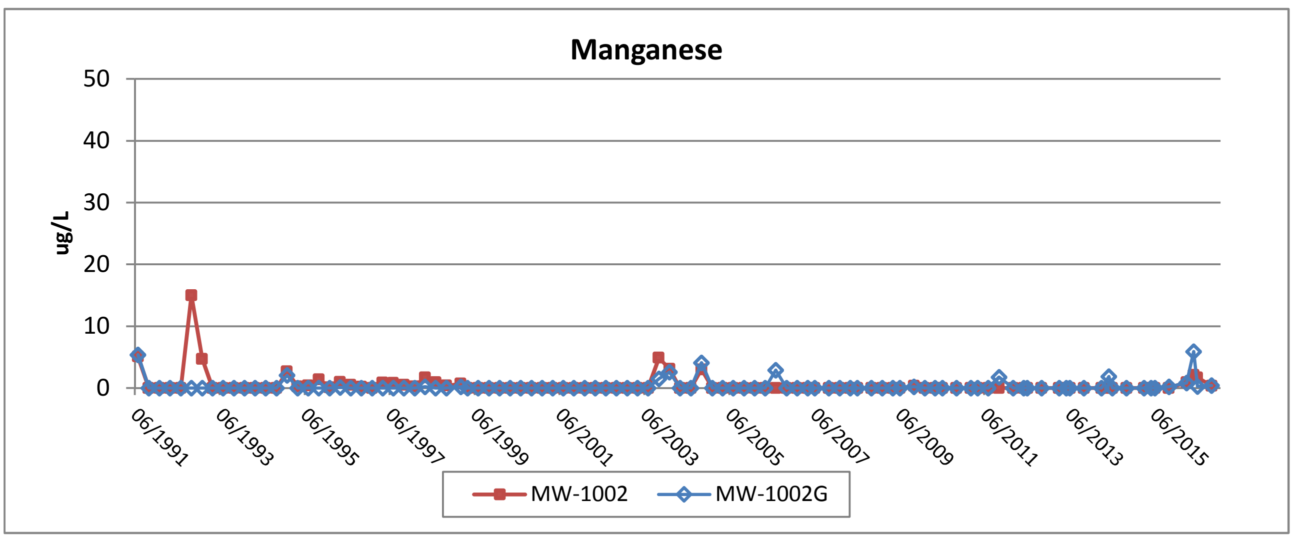




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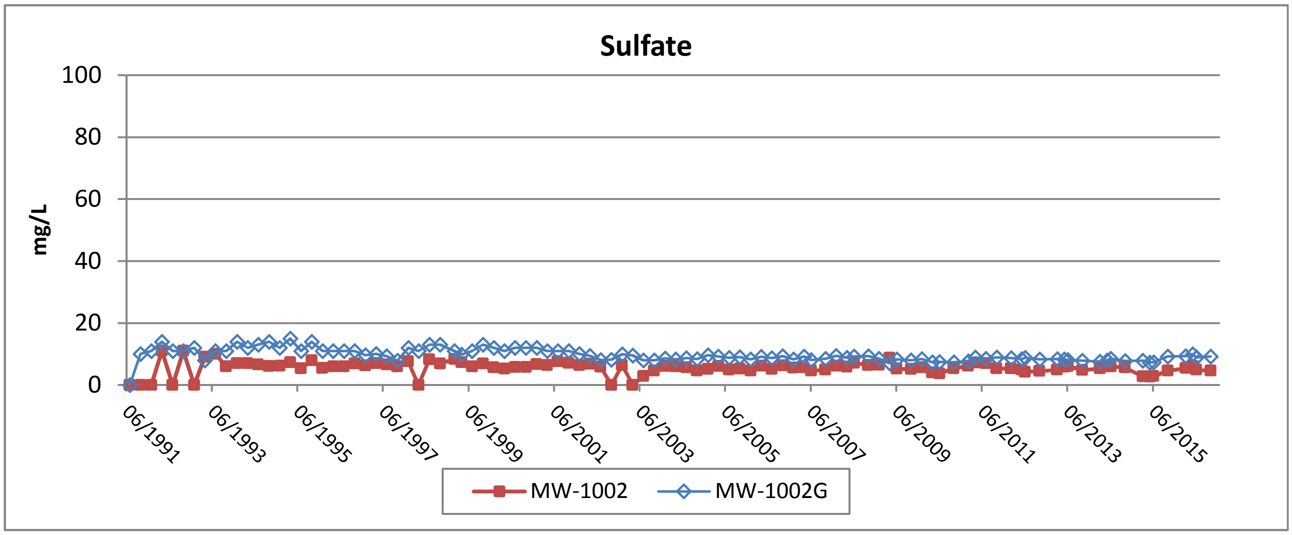
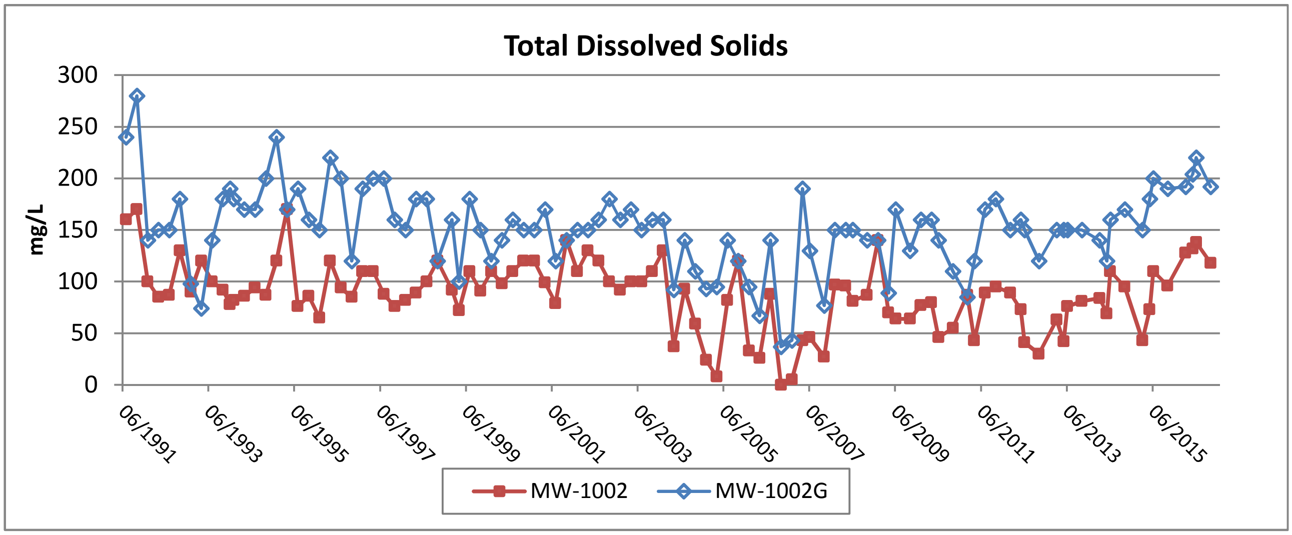
Figure B-2b
Groundwater Trend Graphs - Quarterly Results
MW-1002/MW-1002G

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



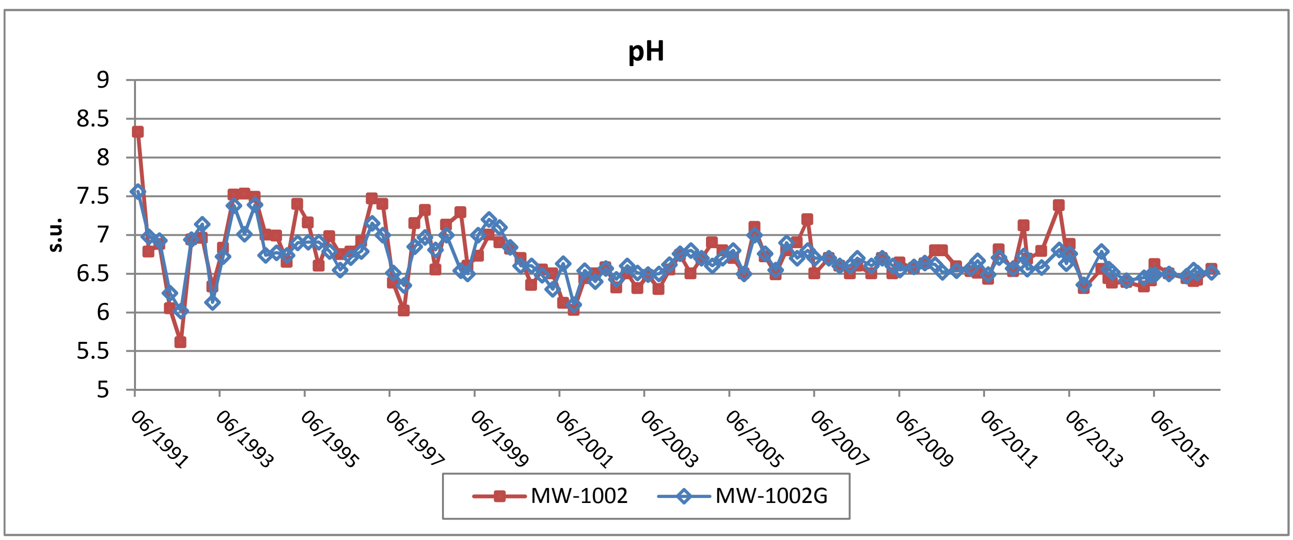




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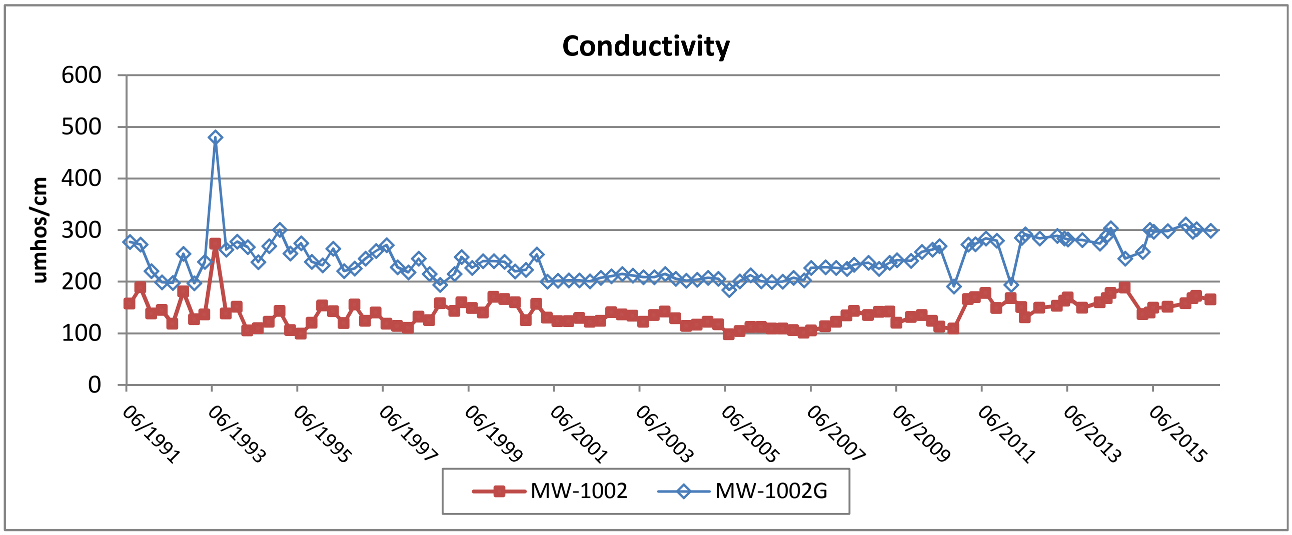
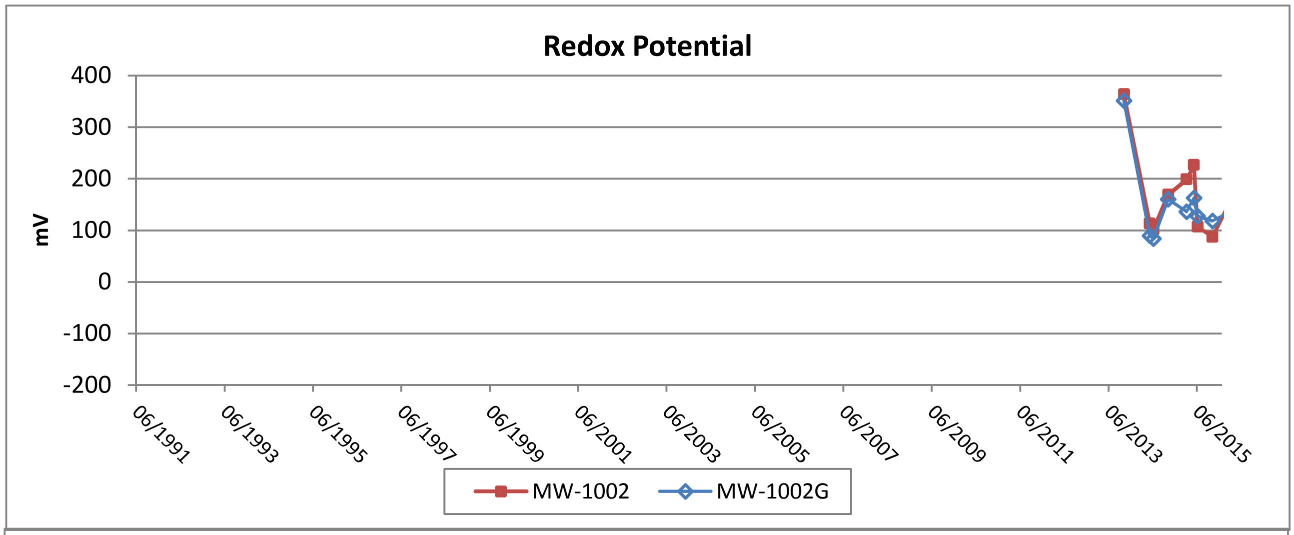
Figure B-2c

Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| | | |
|---|---|---|
| Scale: NA | | Date: January 2017 |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



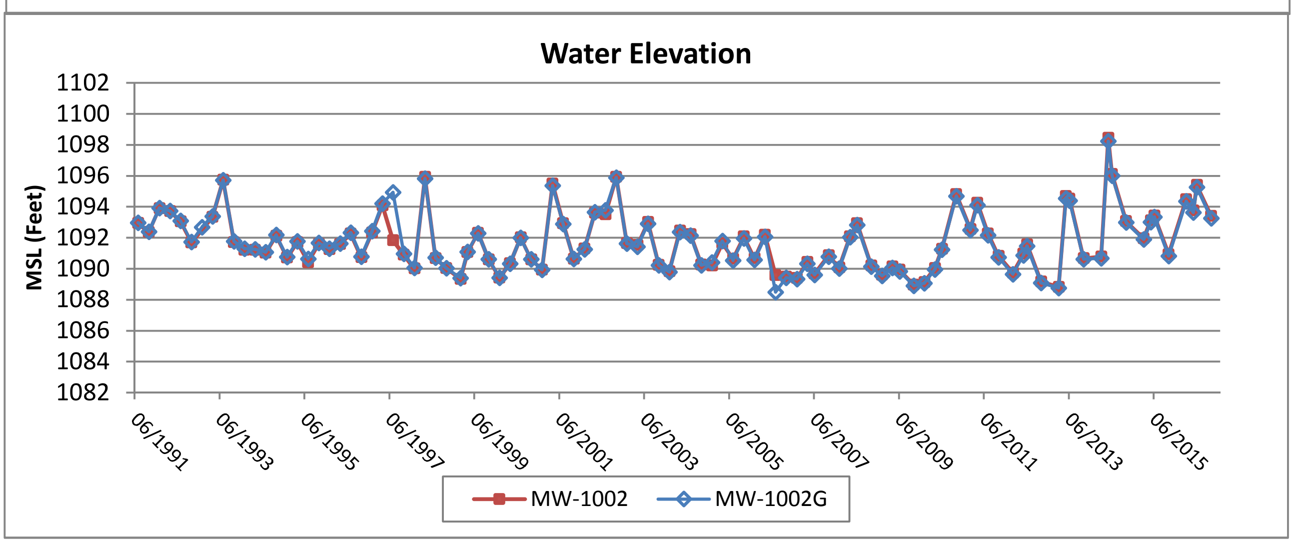




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Figure B-2d

Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2017 |
|---|---|

| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |
|---|---|---|

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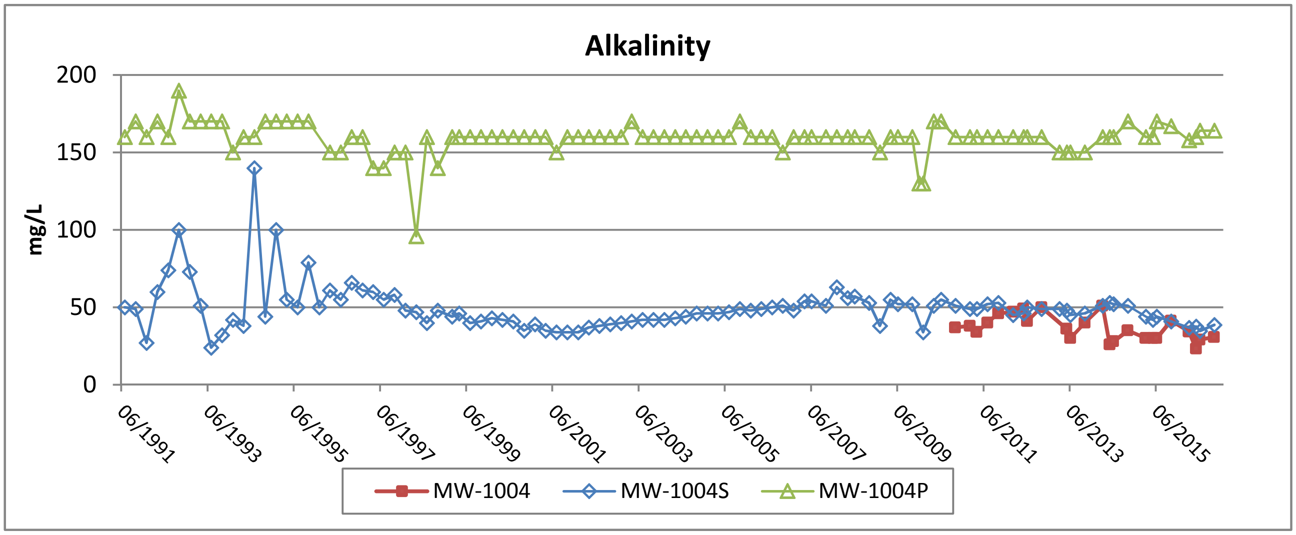


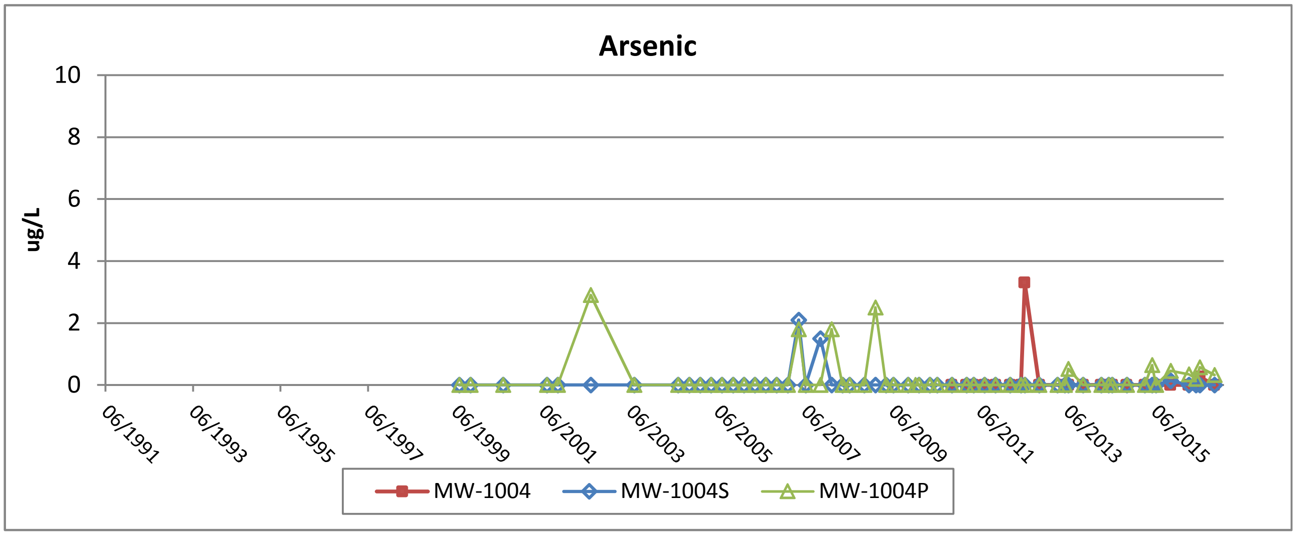


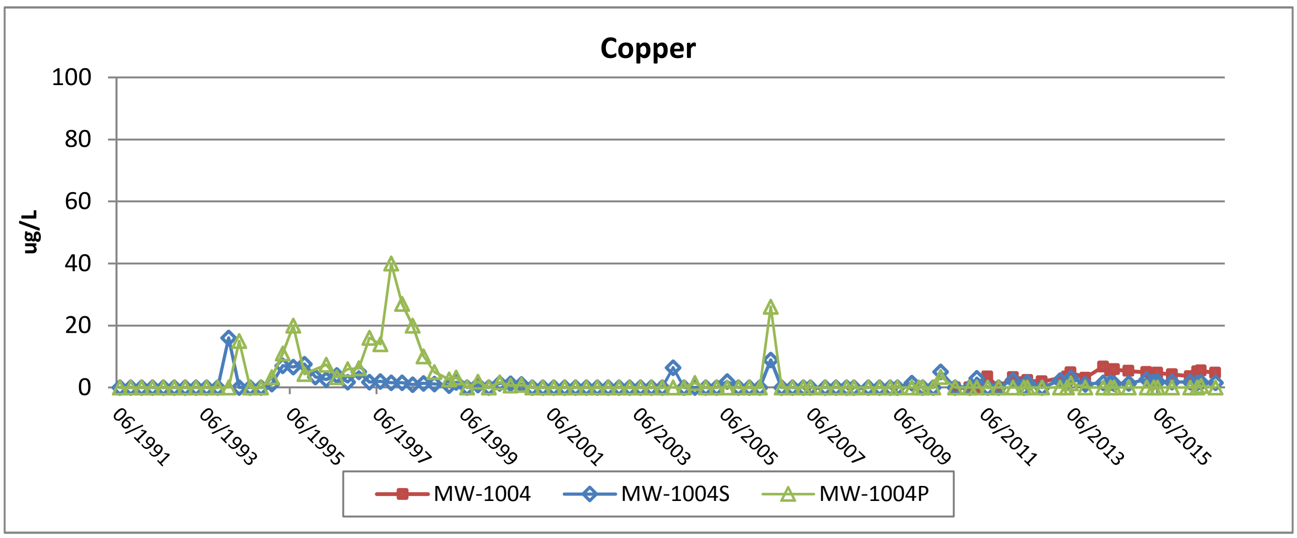


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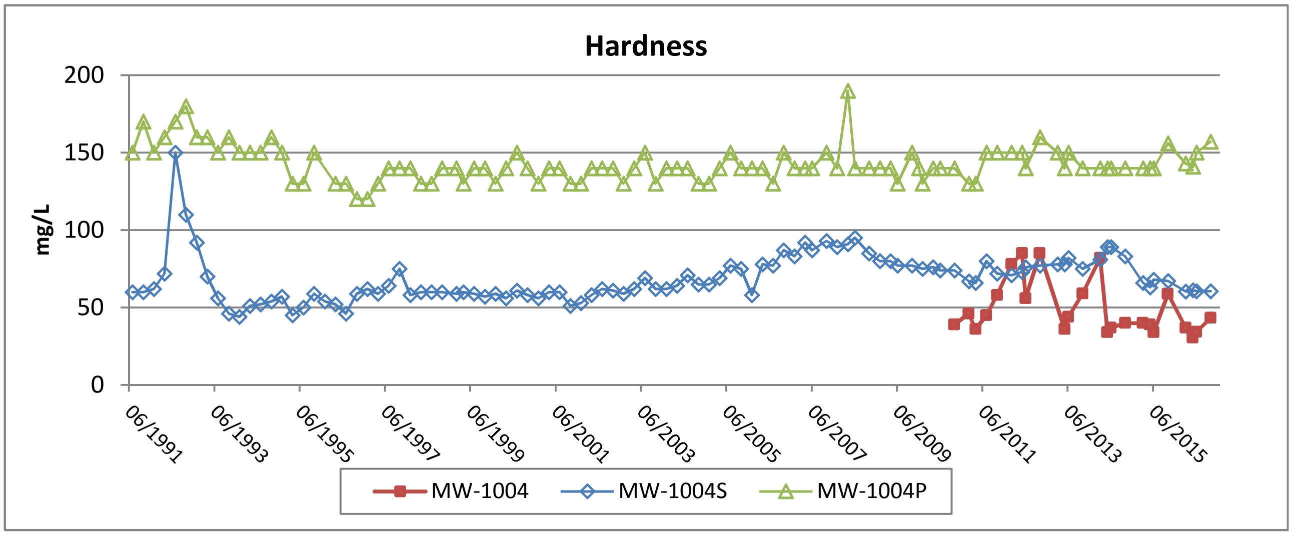
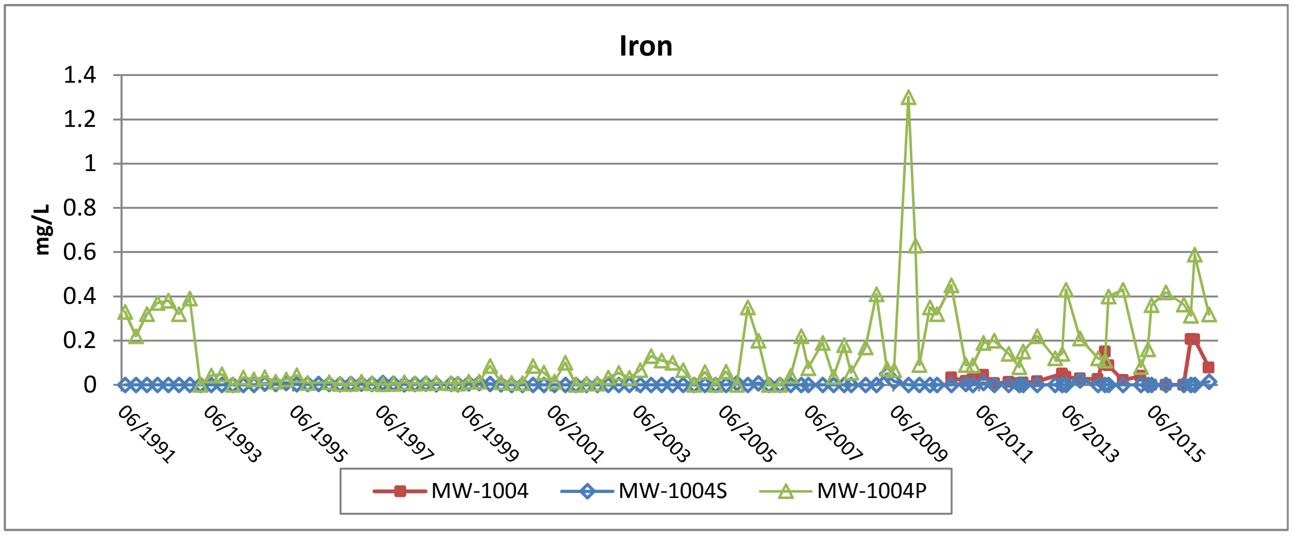
Figure B-3a

Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



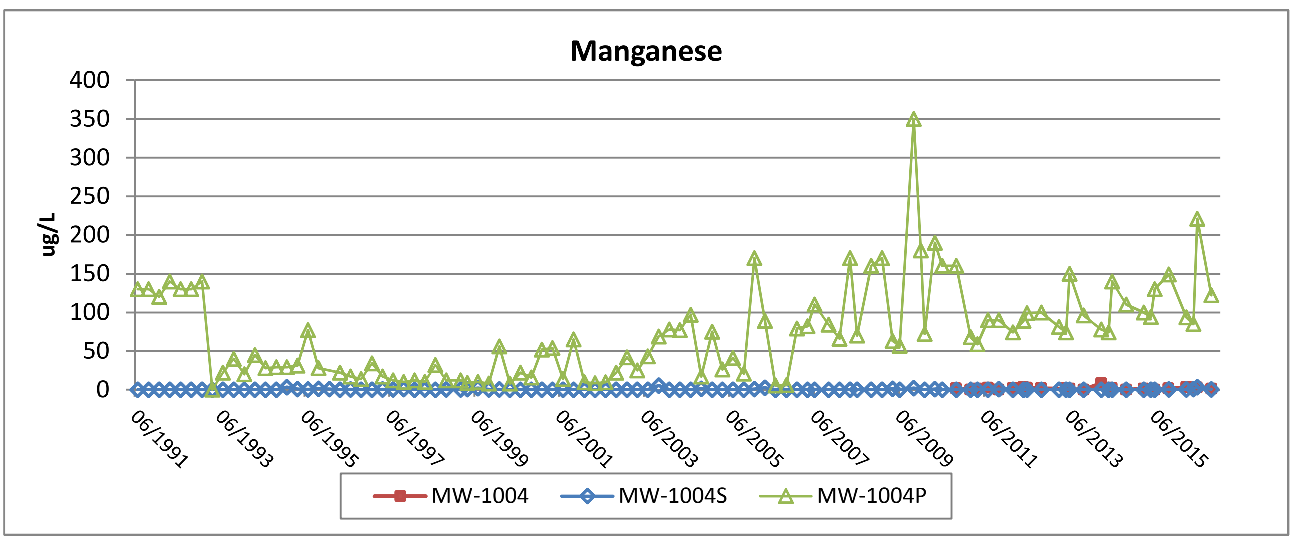




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Figure B-3b

Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

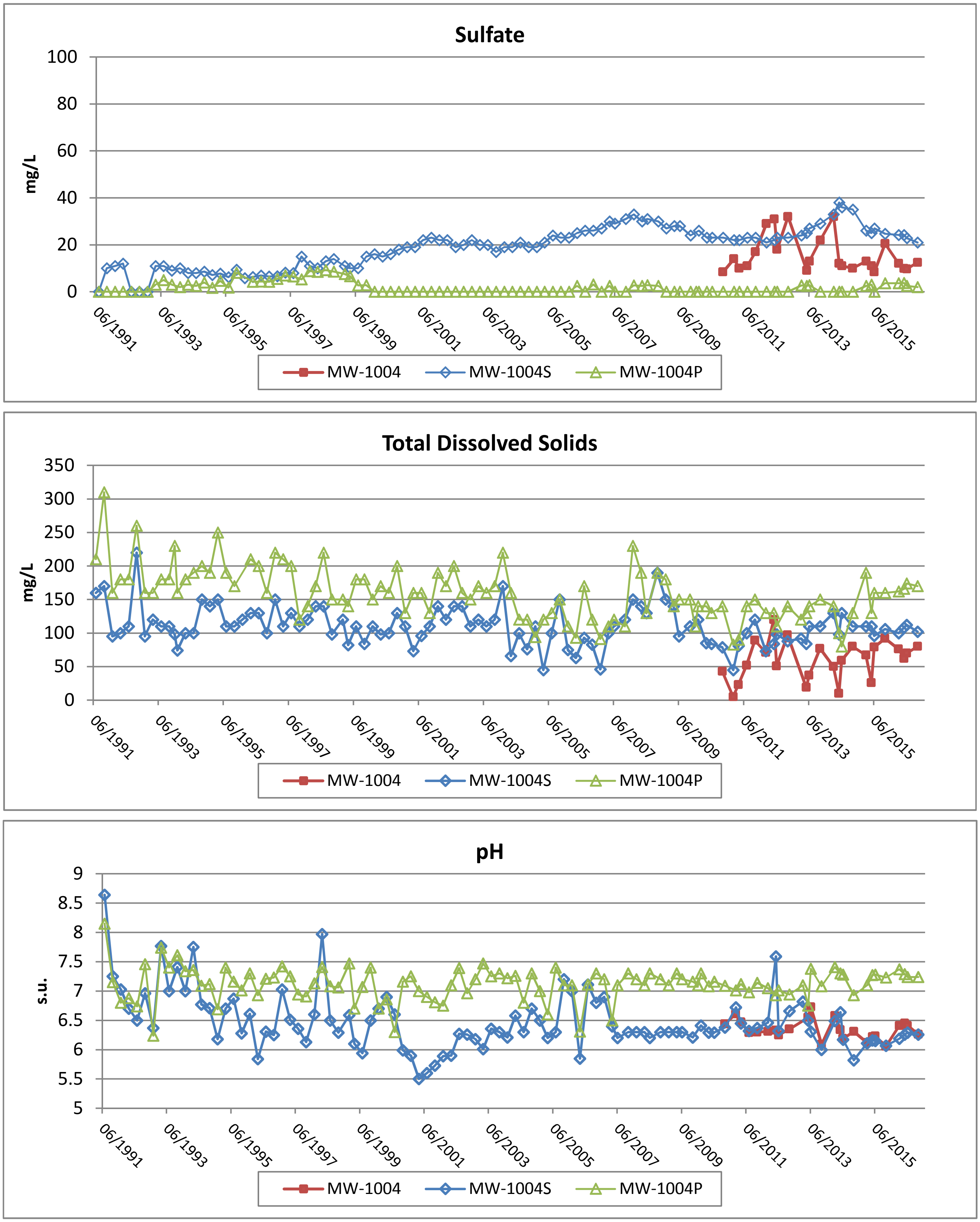


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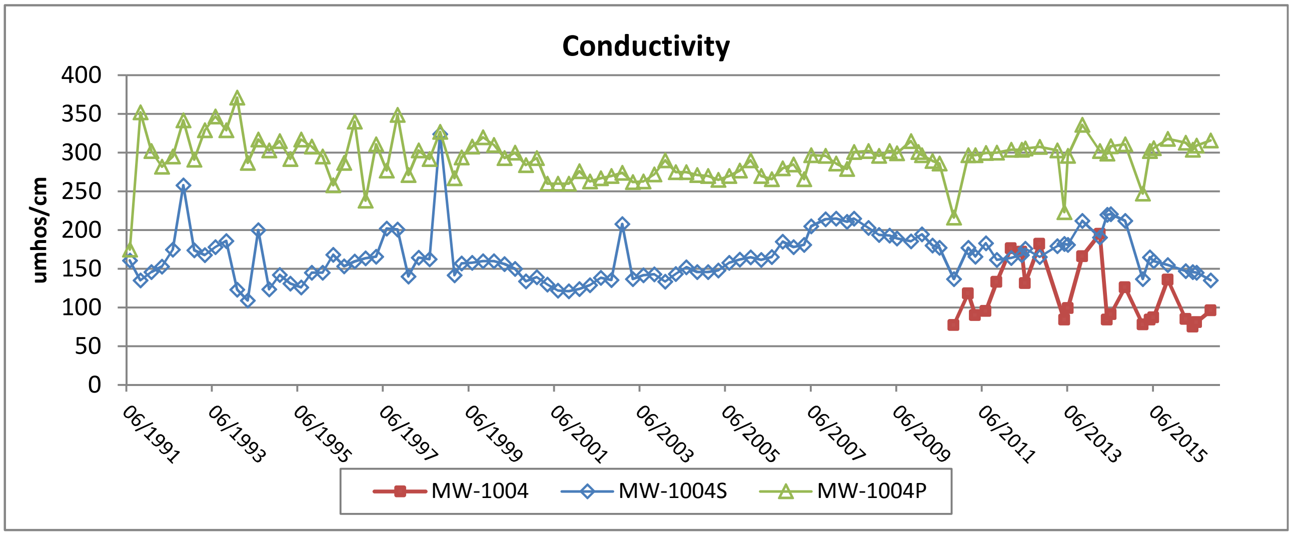
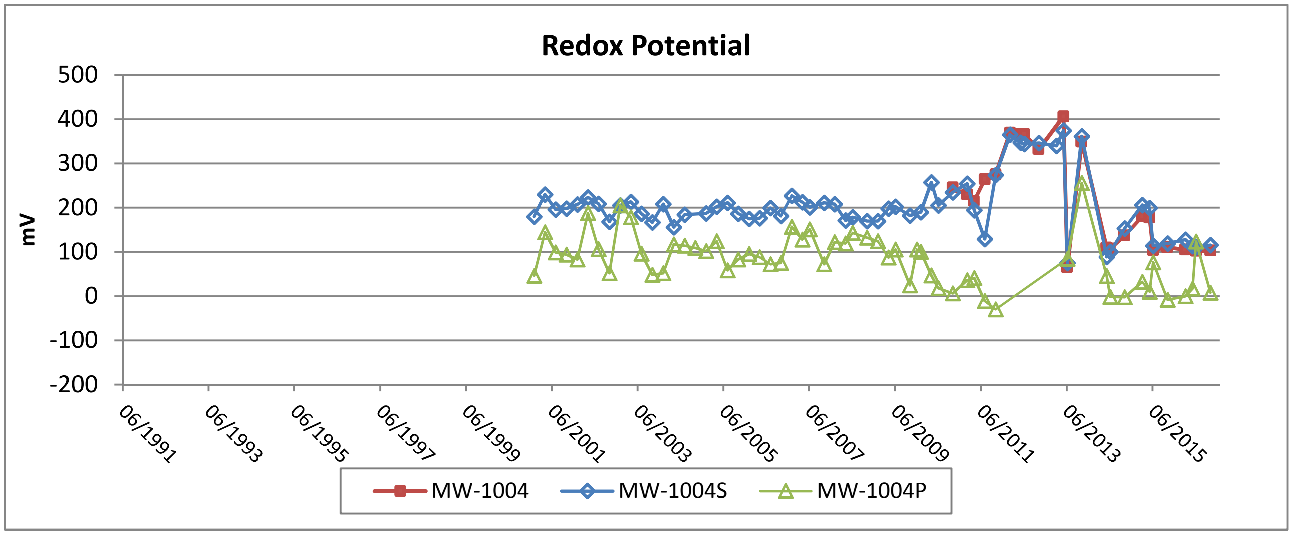
Figure B-3c

Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



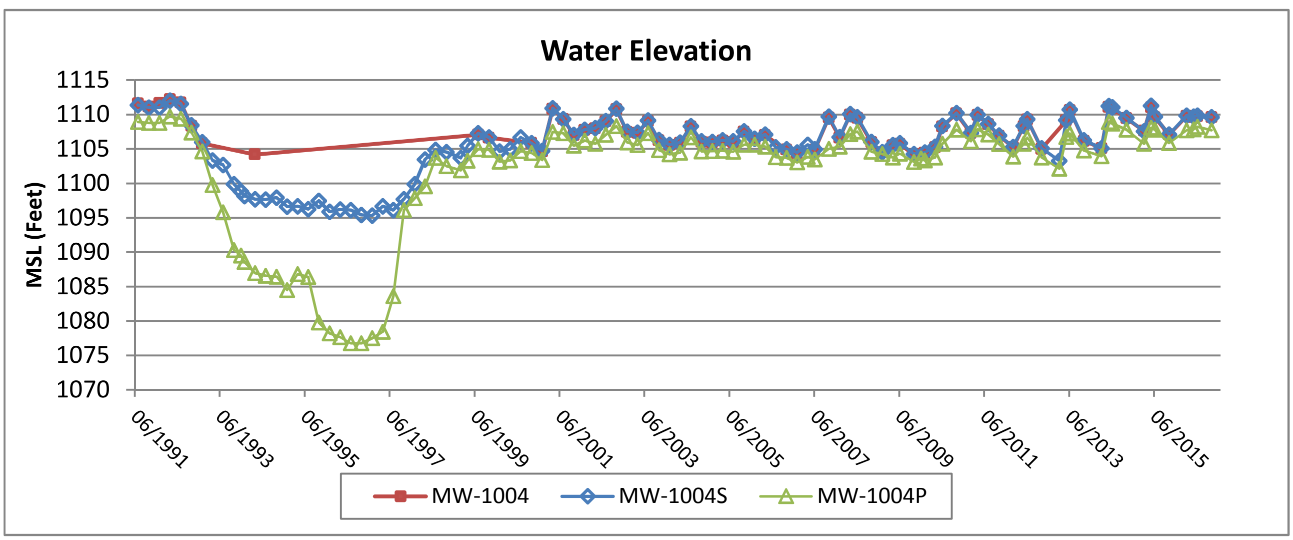




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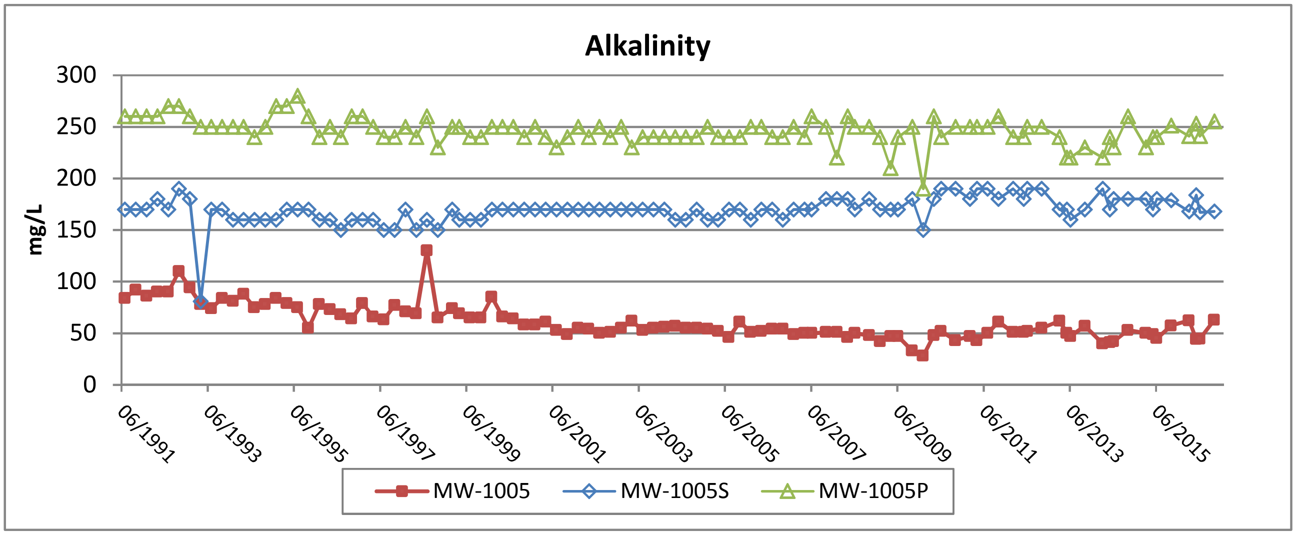
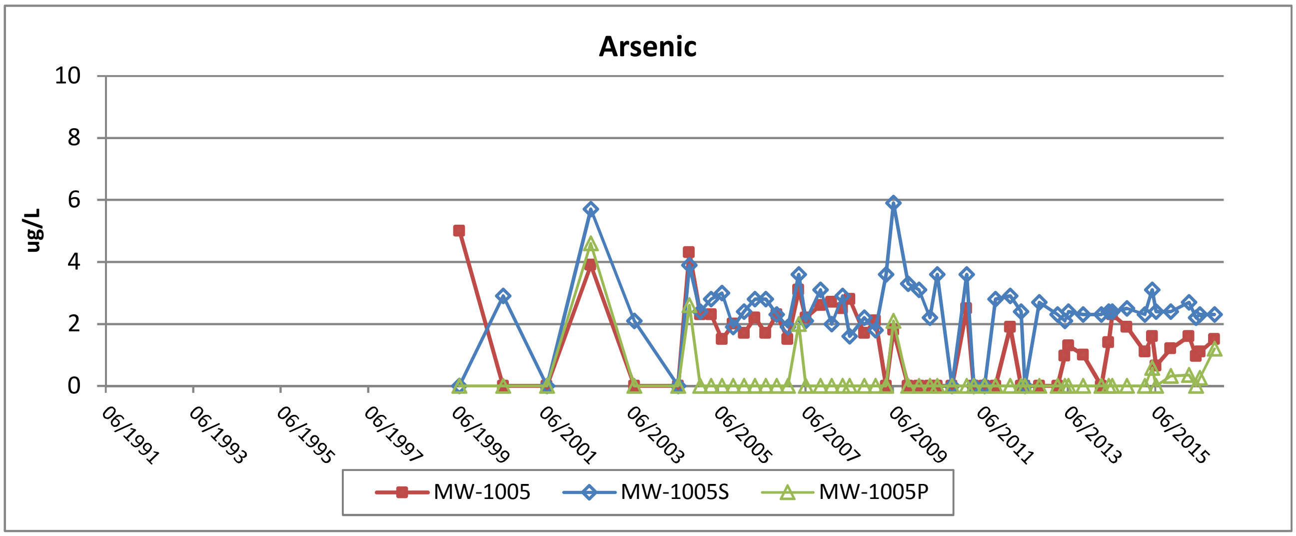
Figure B-3d

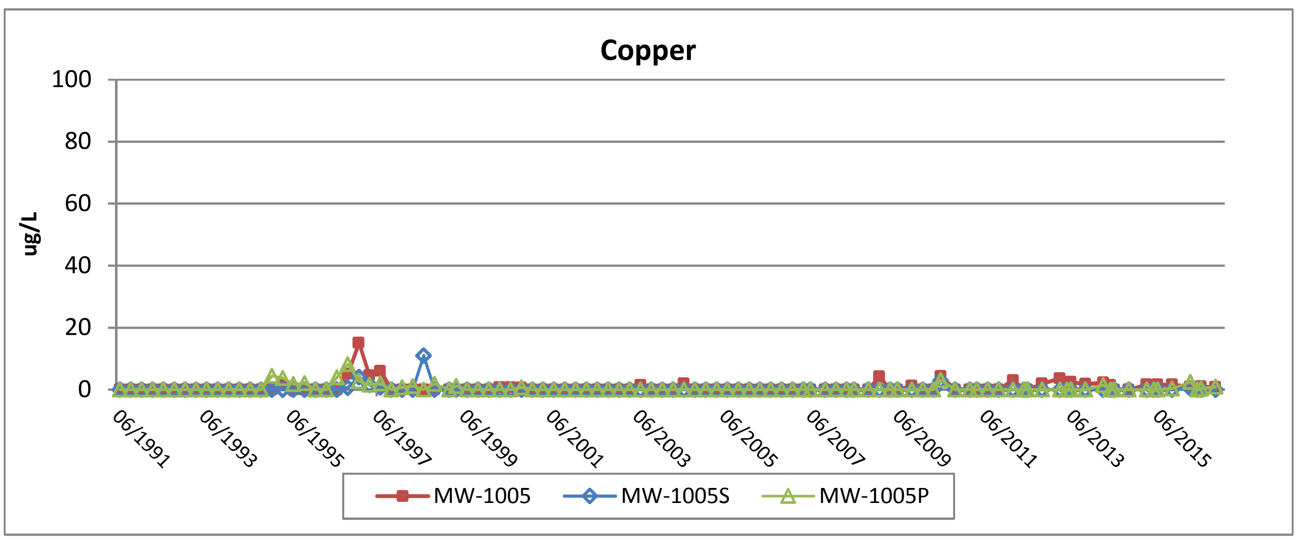
Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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| FLAMBEAU MINING COMPANY | | |
|---|---|---|
| Figure B-4a<br>Groundwater Trend Graphs - Quarterly Results<br>MW-1005/MW-1005S/MW-1005P | | |
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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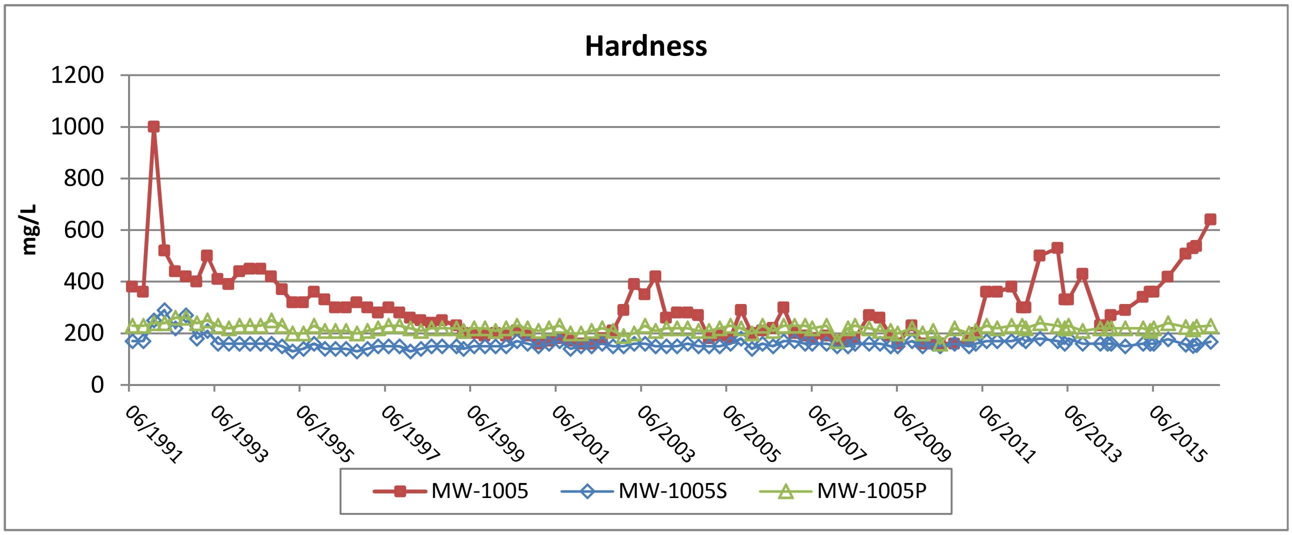


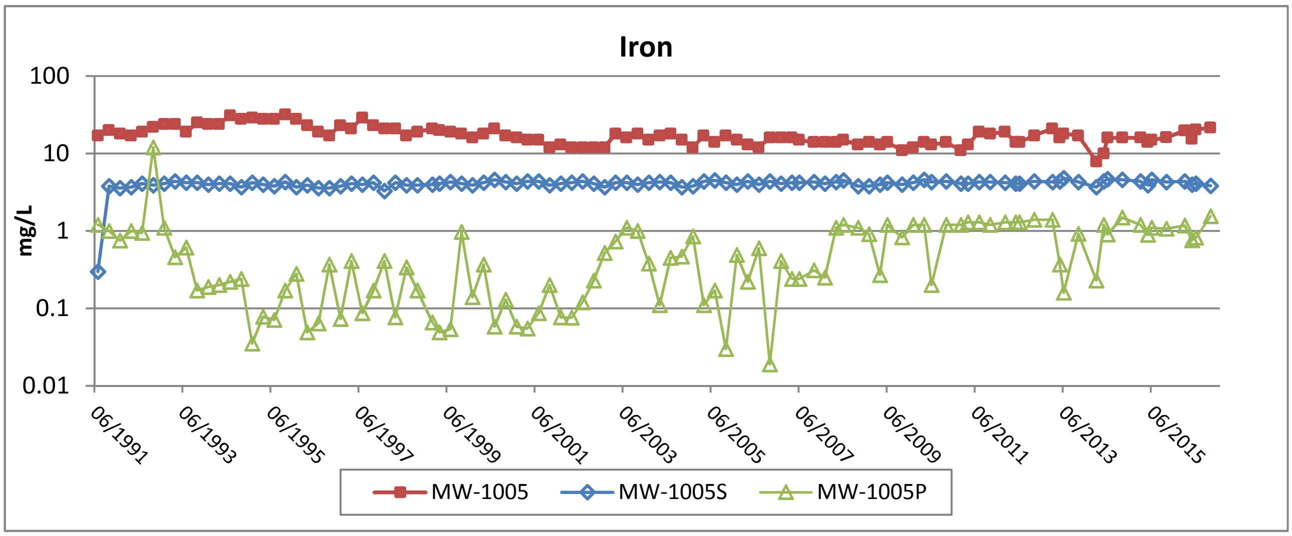


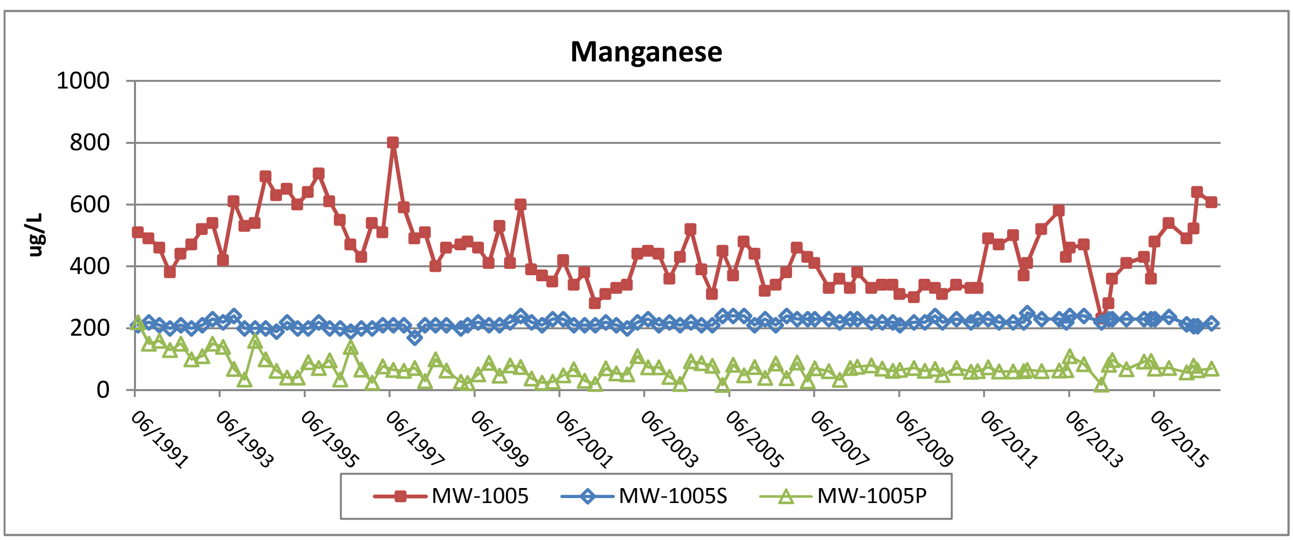


Note: Iron trend graphs are displayed on a logarithmic scale so the trend patterns of MW-1005, MW-1005S and MW-1005P are visible at different concentration scales.

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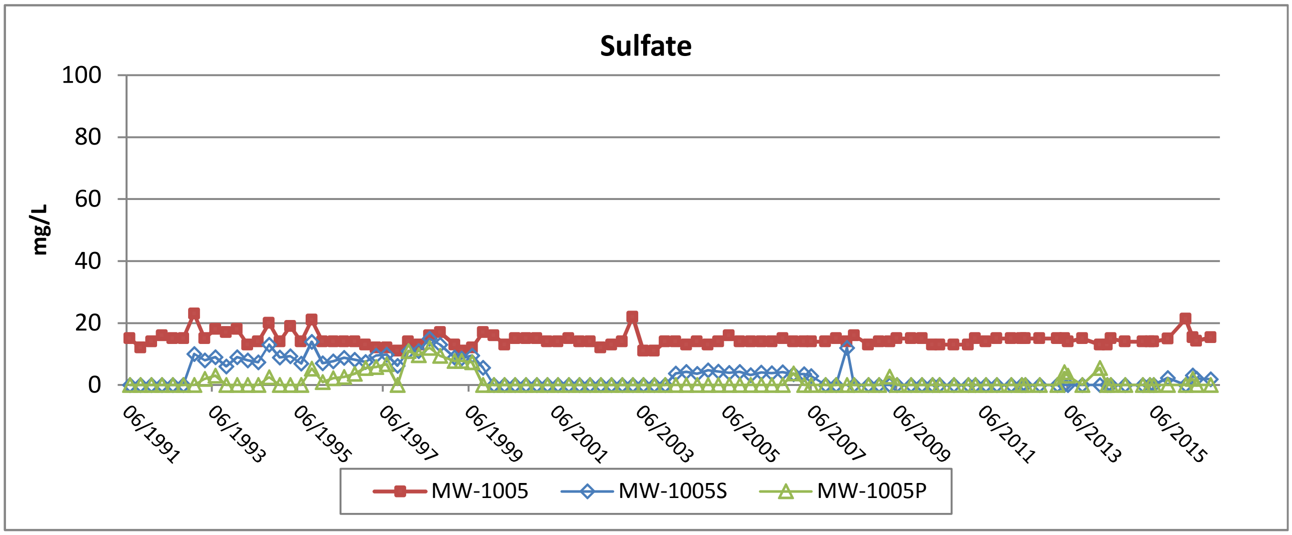
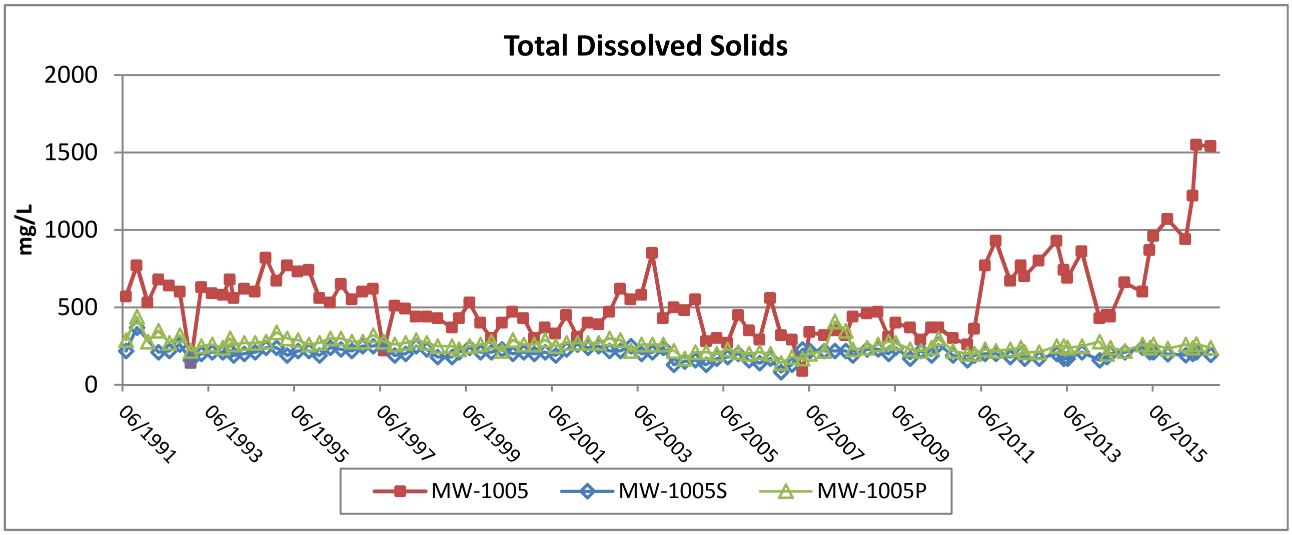
Figure B-4b

Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



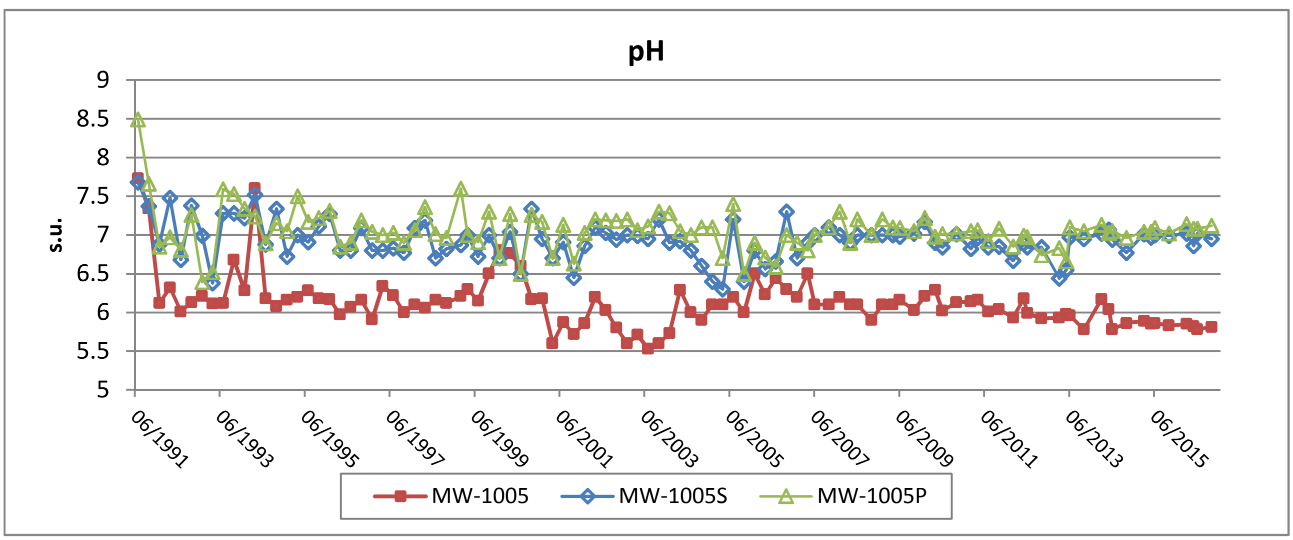




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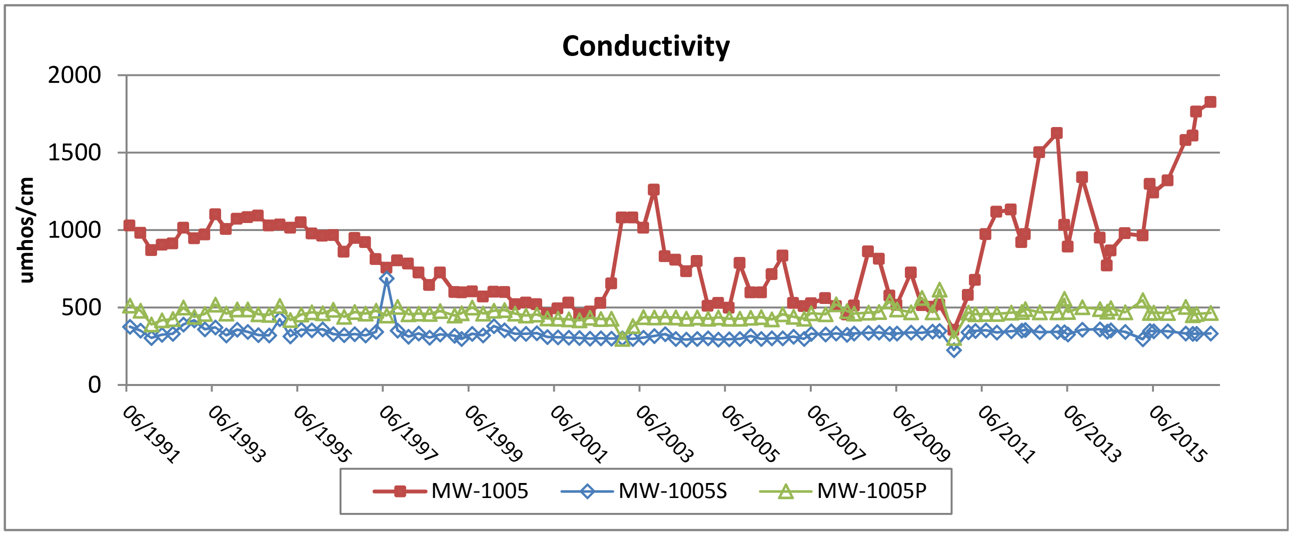
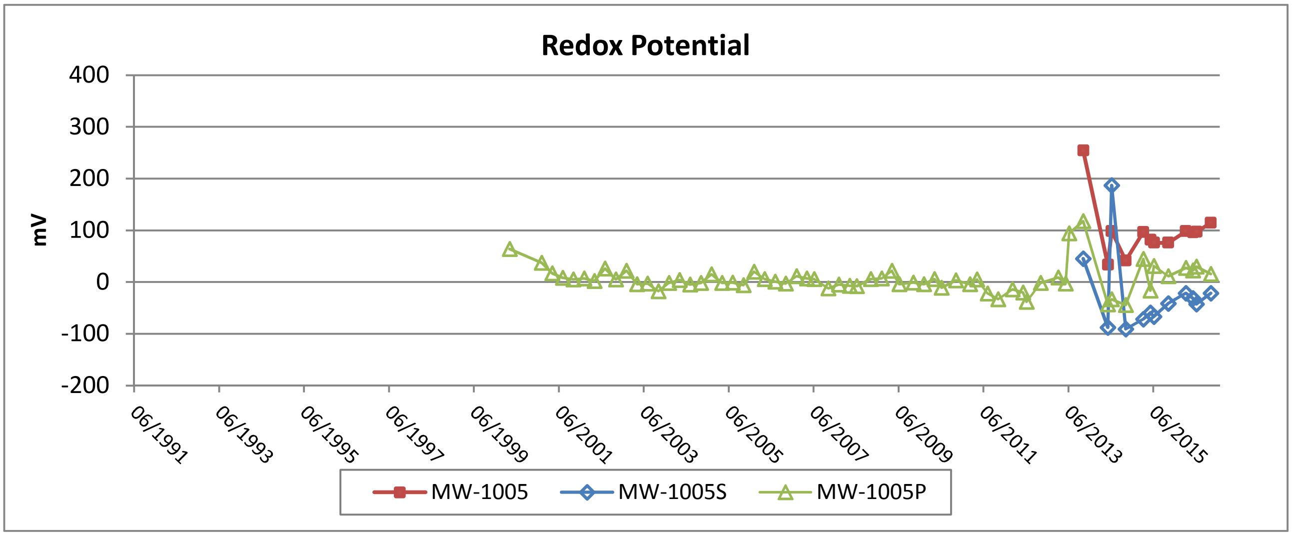
Figure B-4c

Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



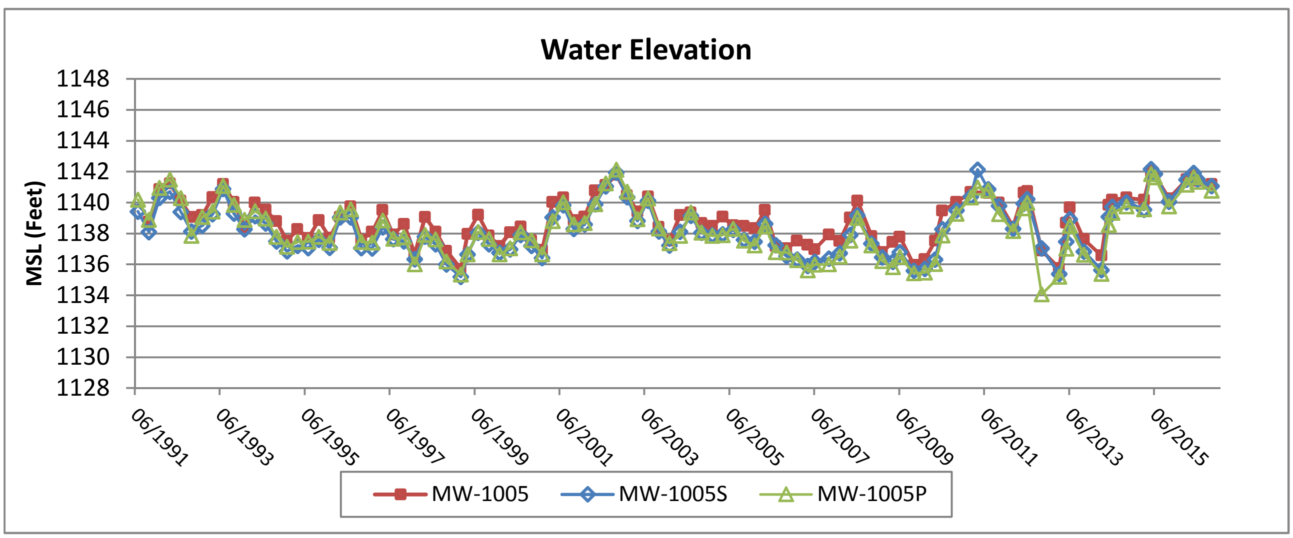




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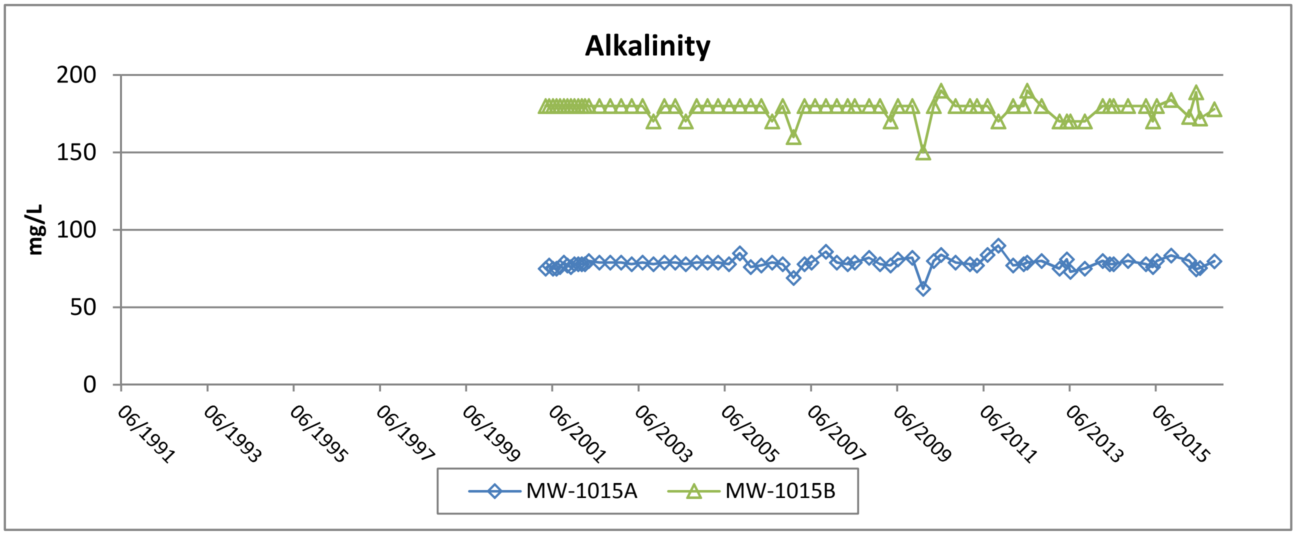
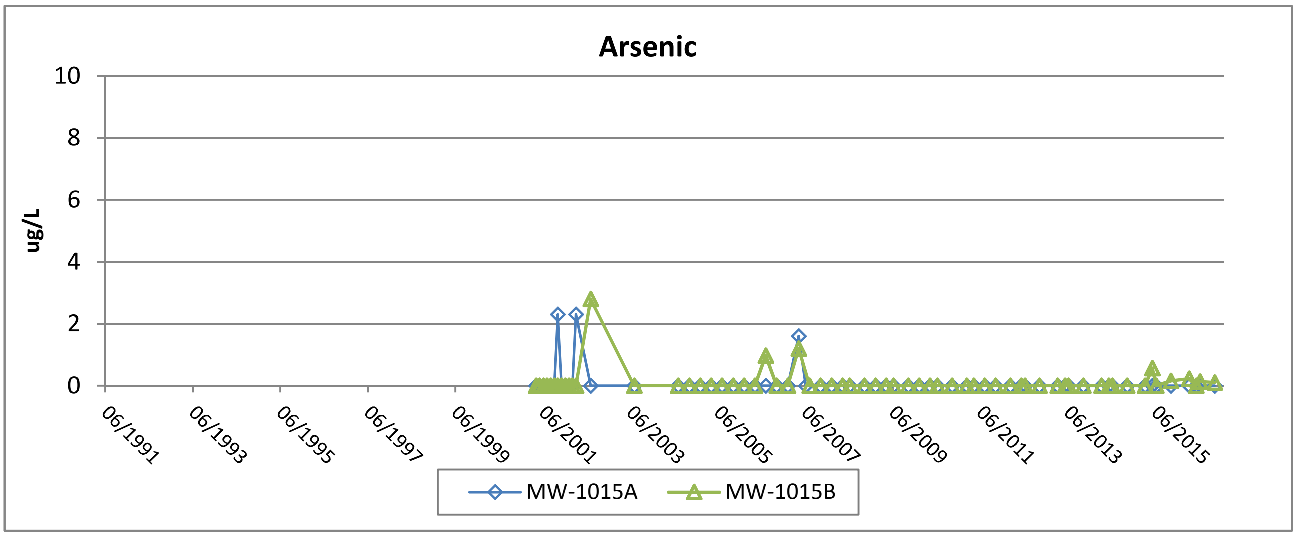
Figure B-4d

Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



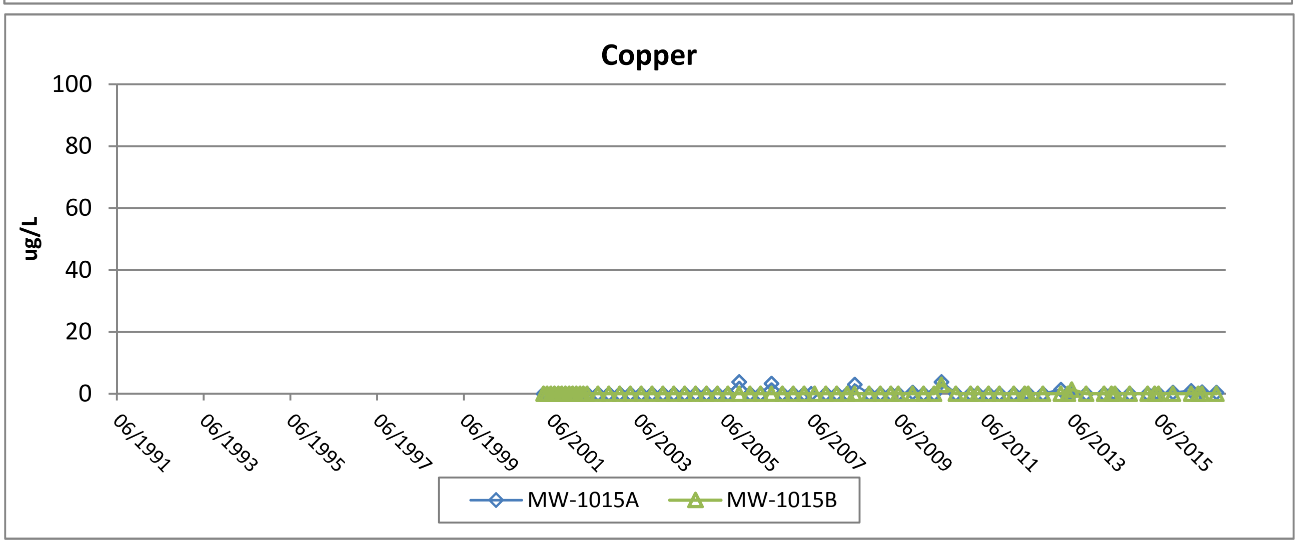




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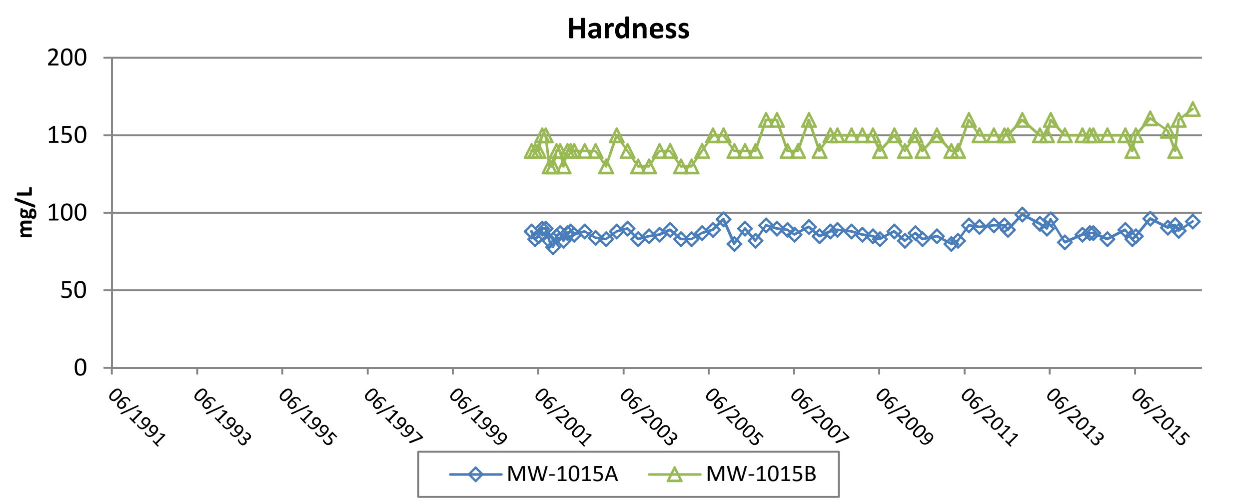
Figure B-5a

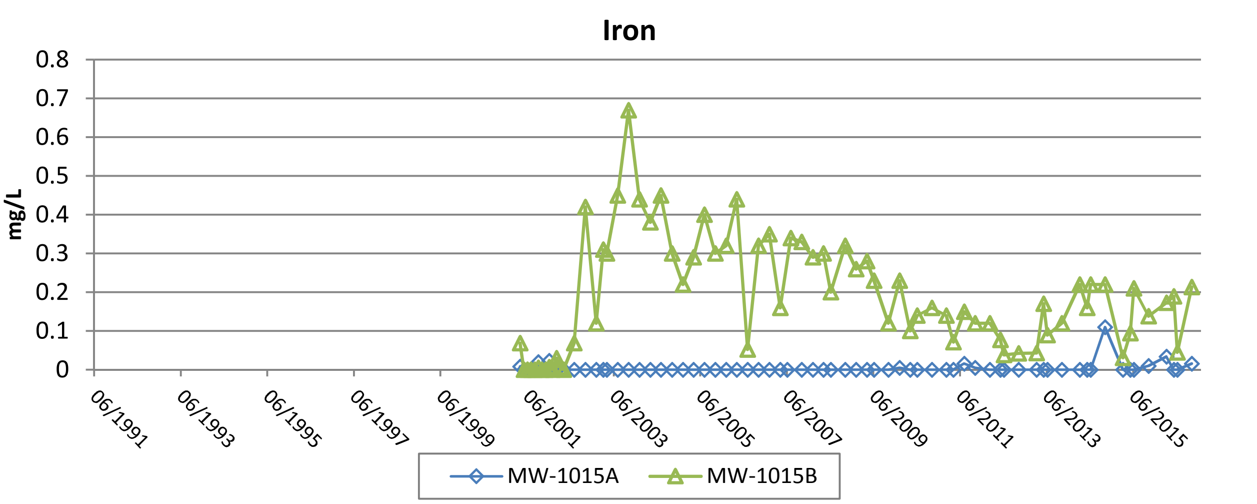
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



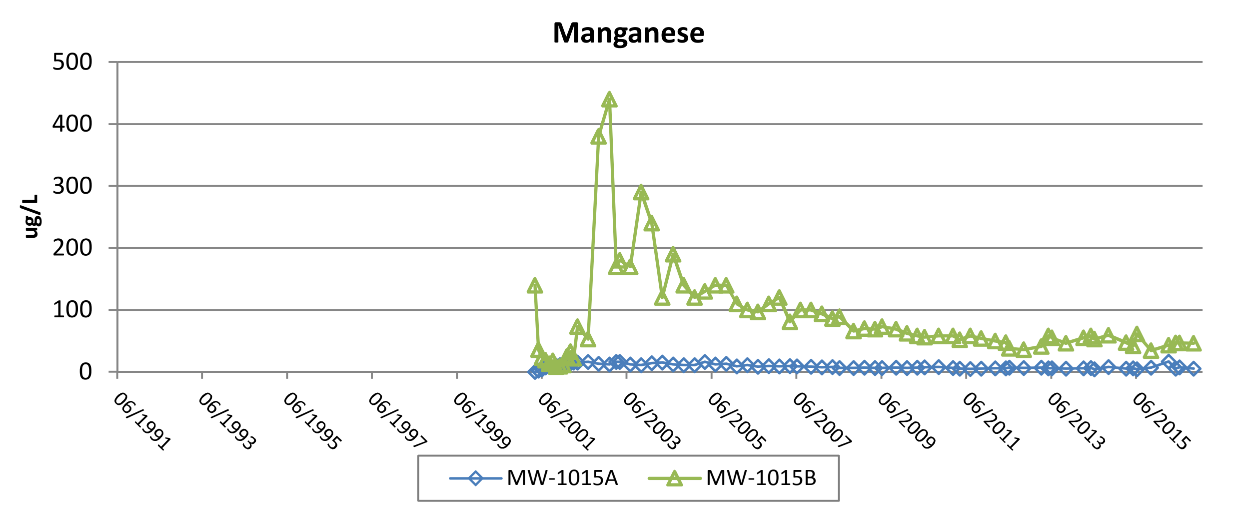




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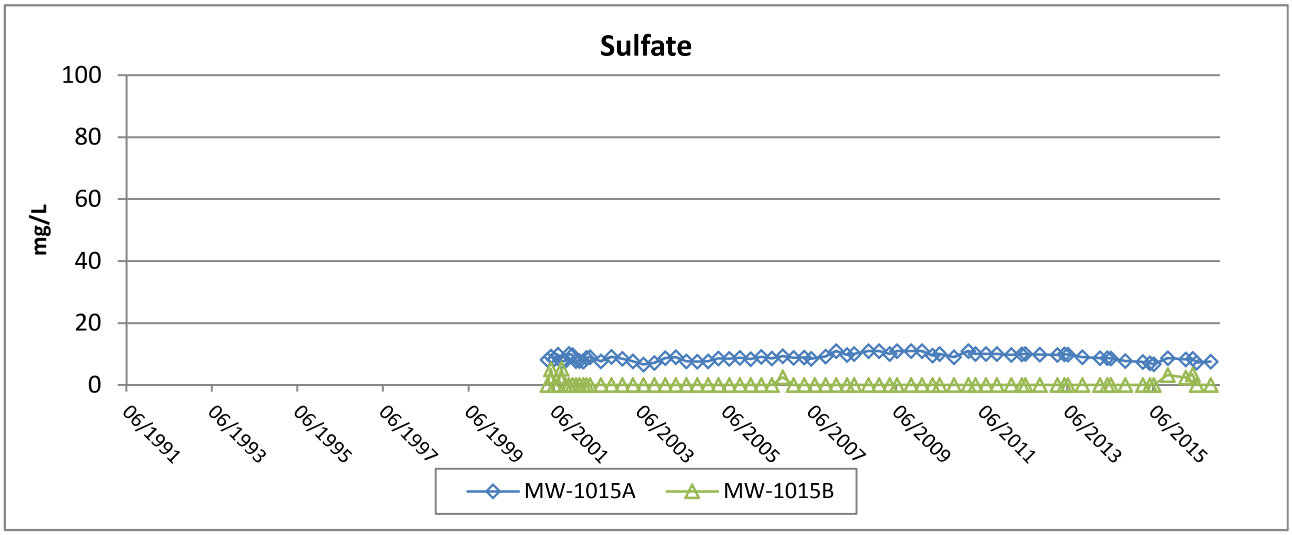
Figure B-5b

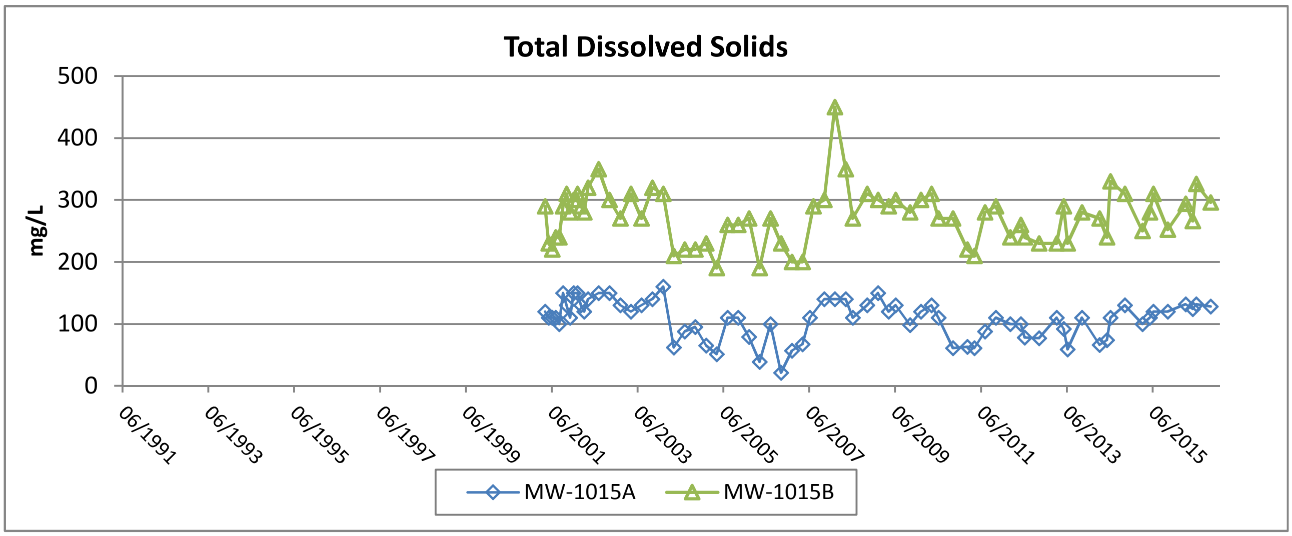
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



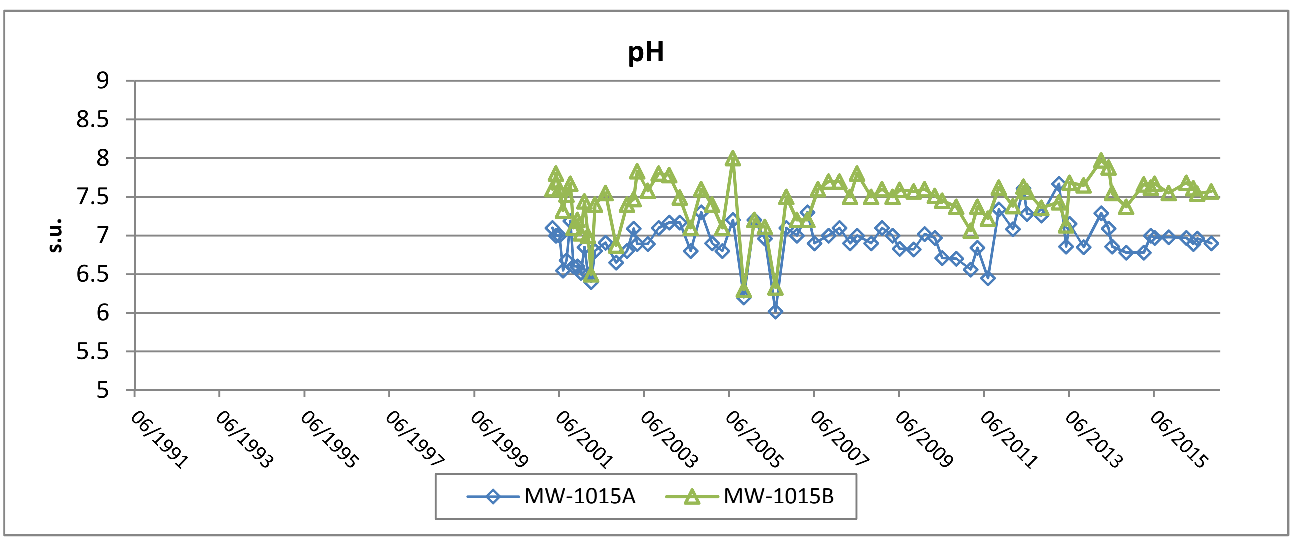




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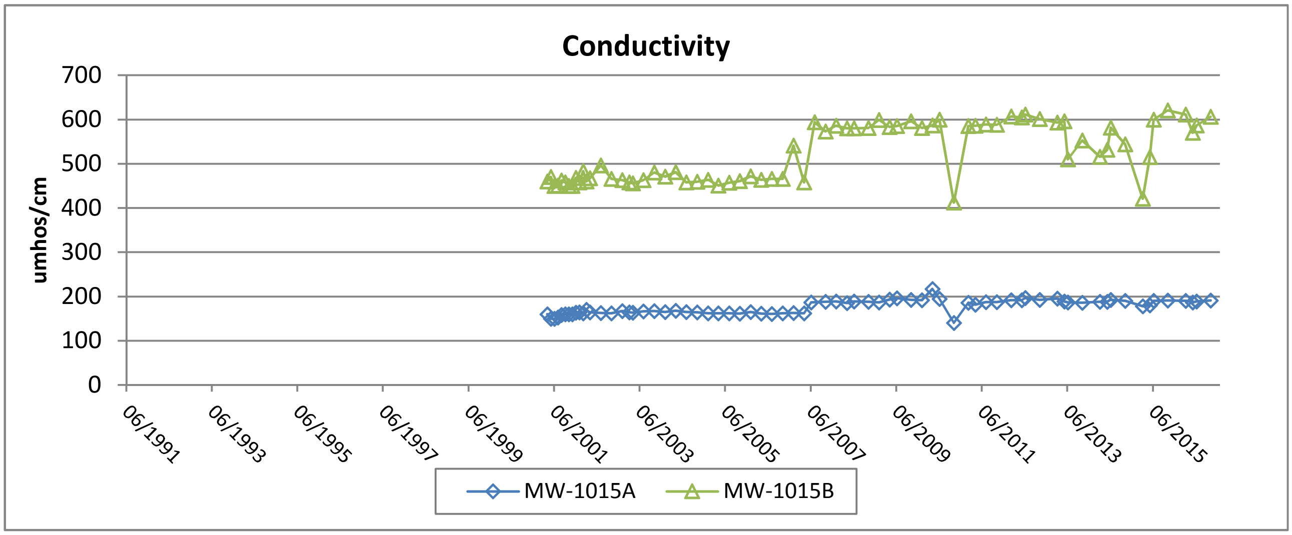
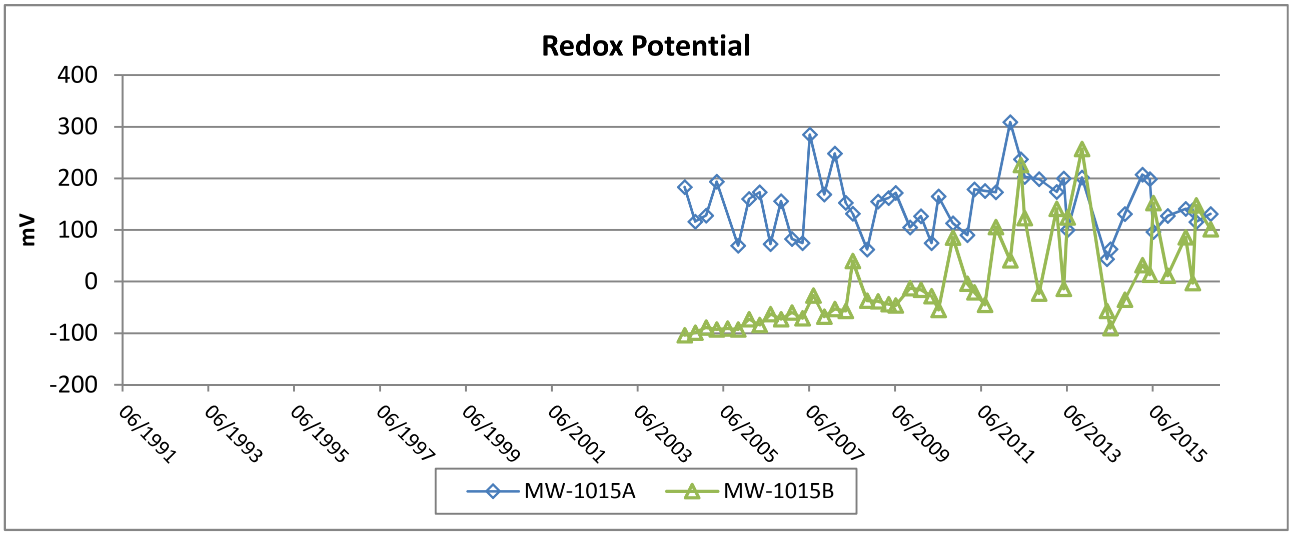
Figure B-5c

Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2017 | |
| --- | --- | --- |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



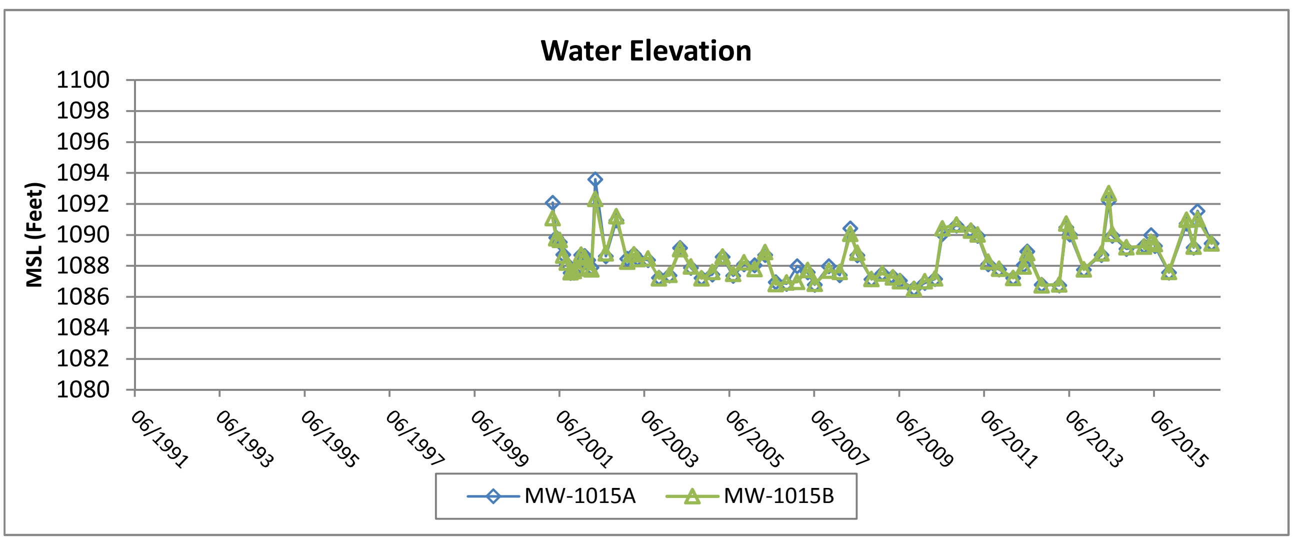




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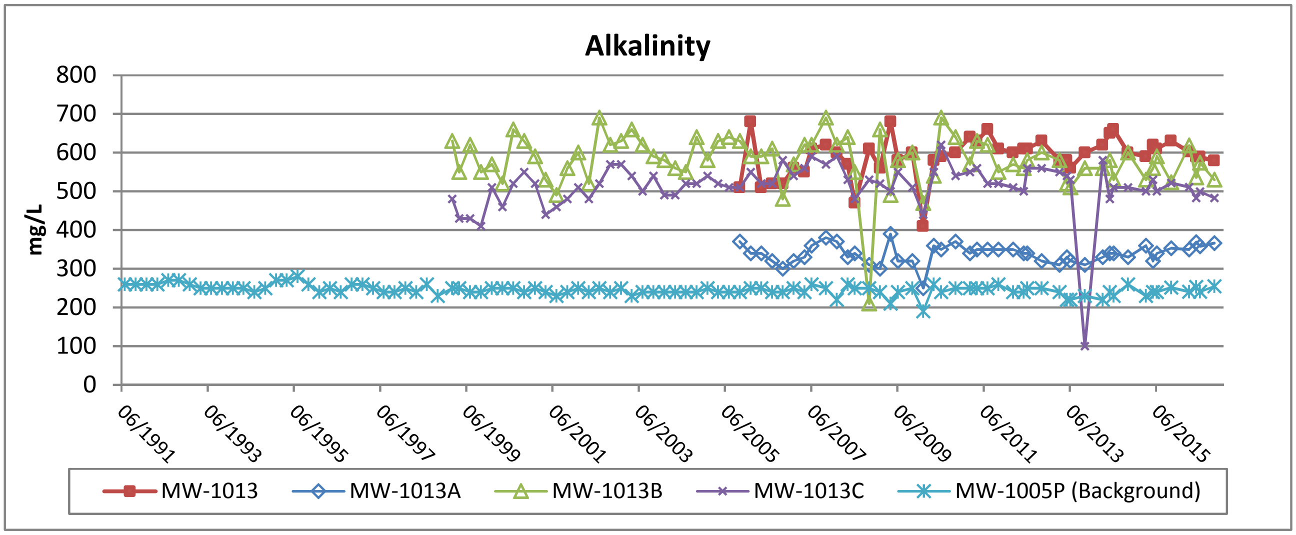
Figure B-5d

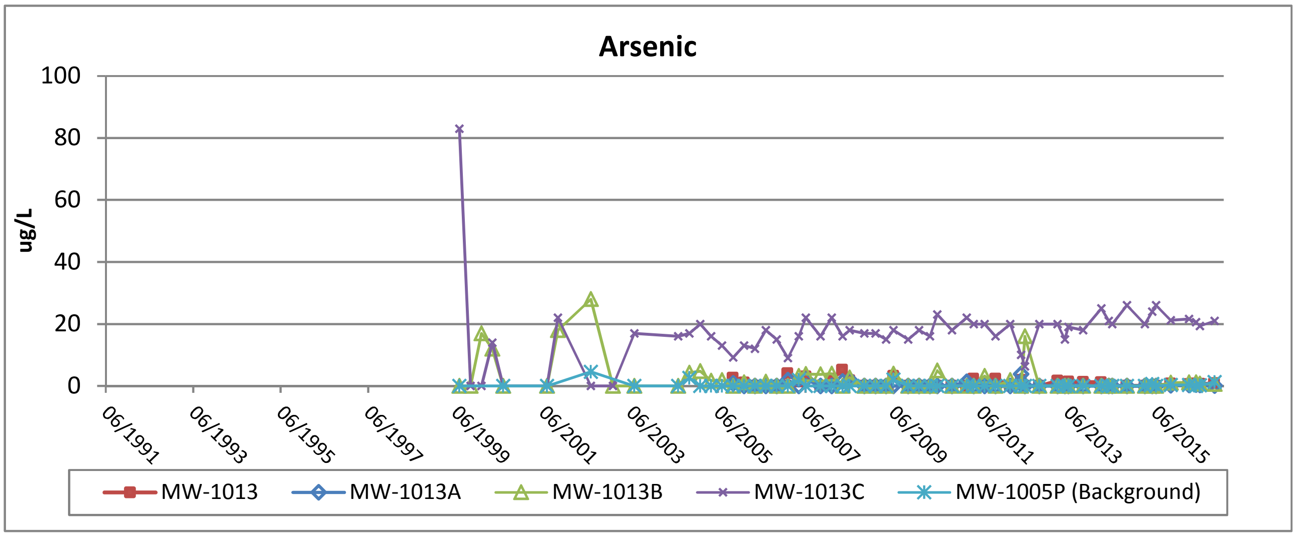
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



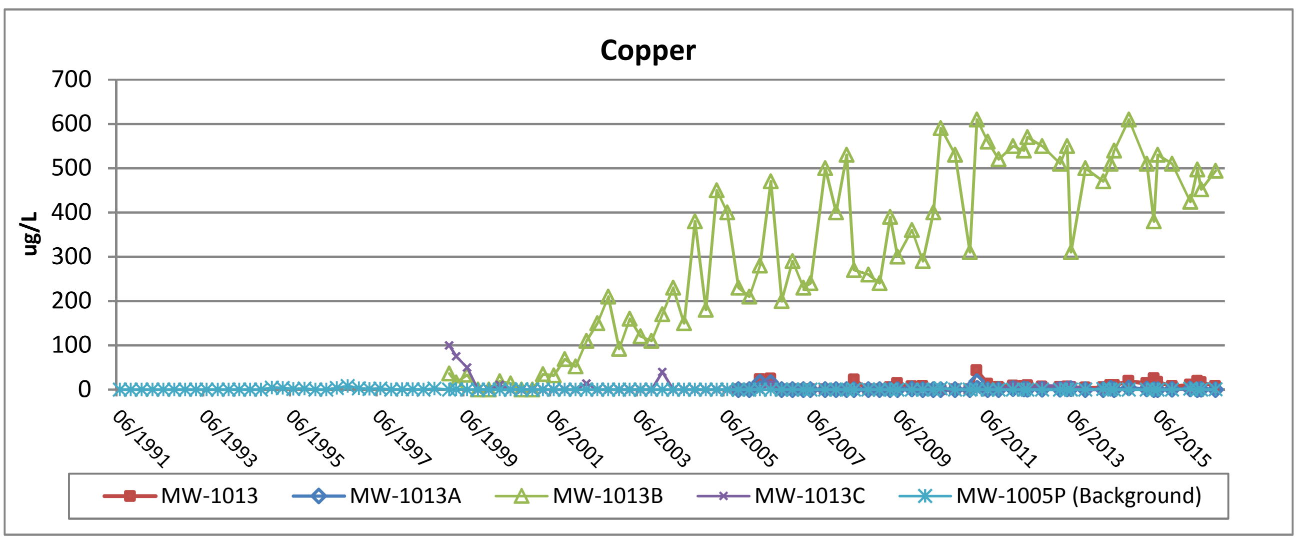




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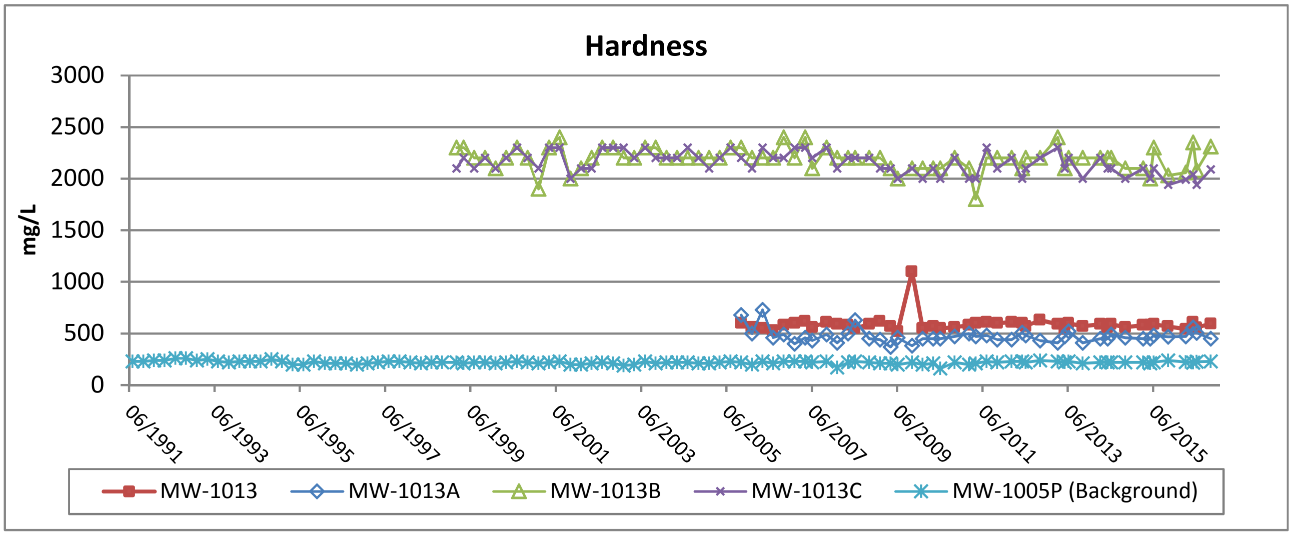
Figure B-6a

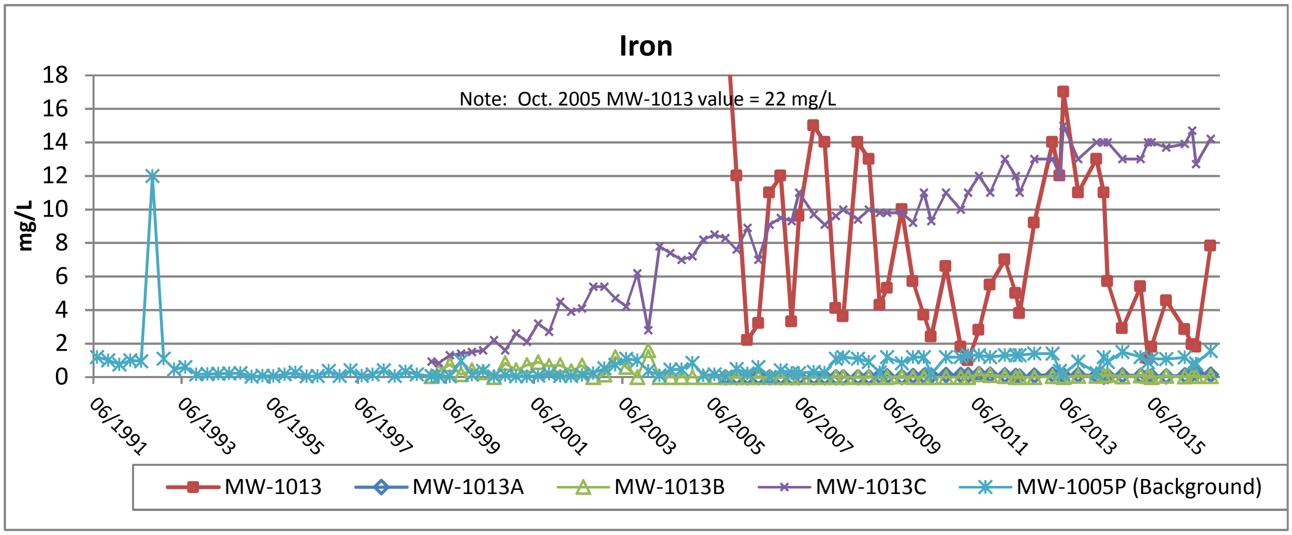
Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



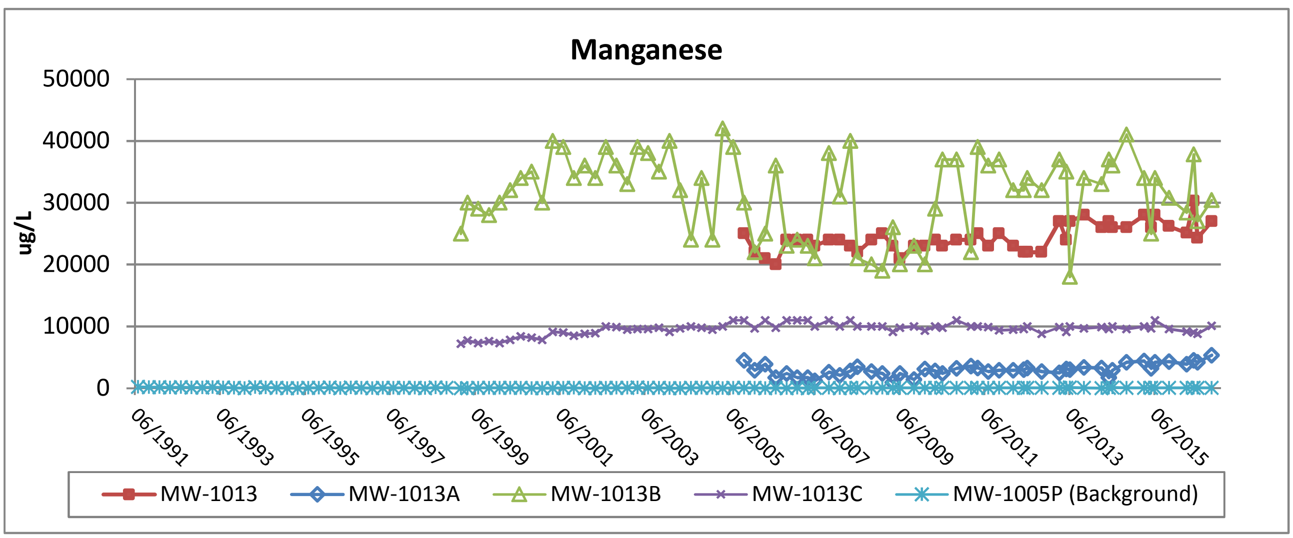




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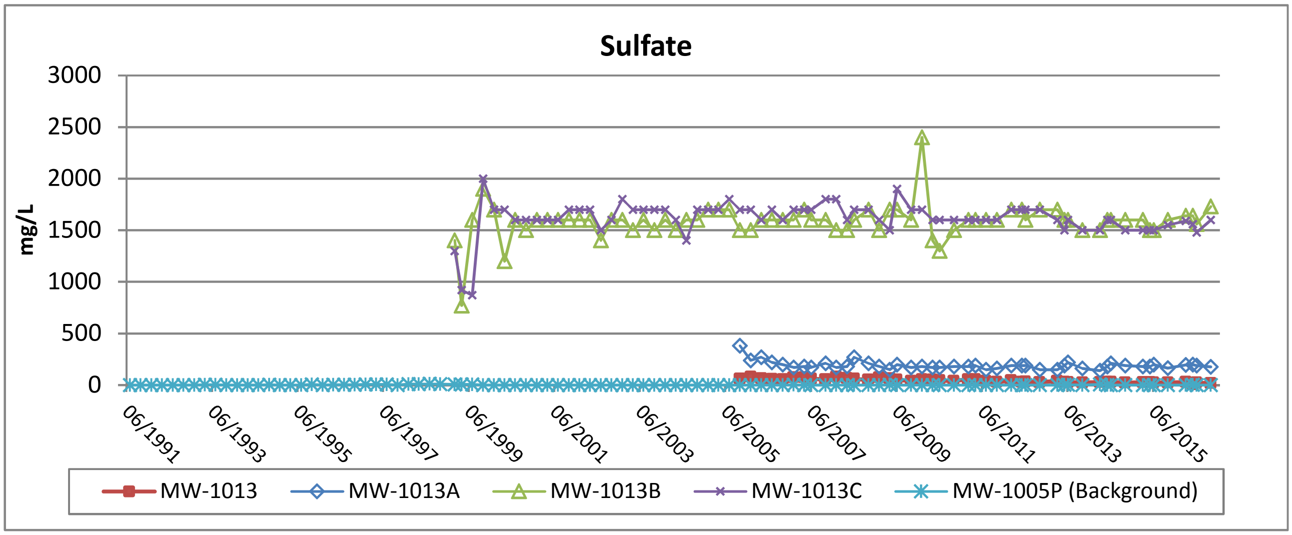
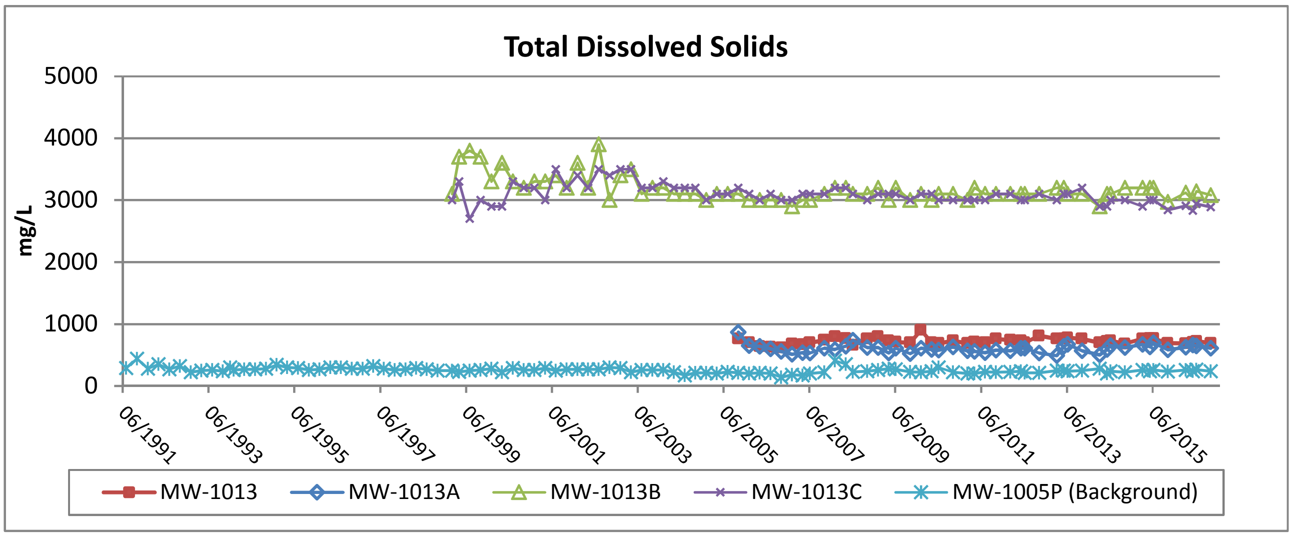
Figure B-6b

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



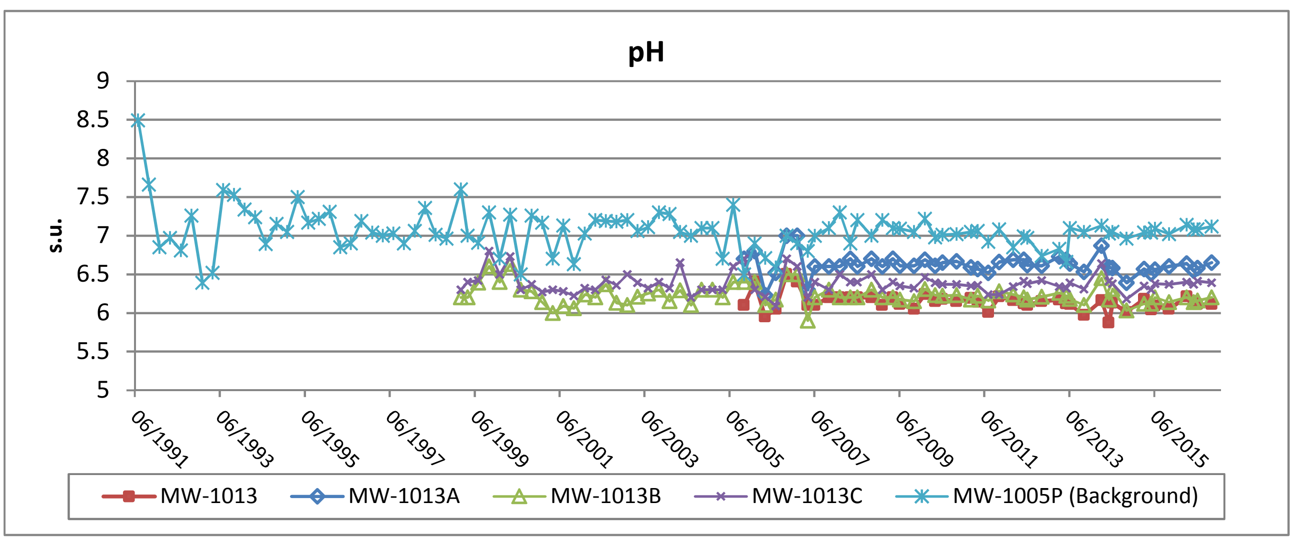




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Figure B-6c

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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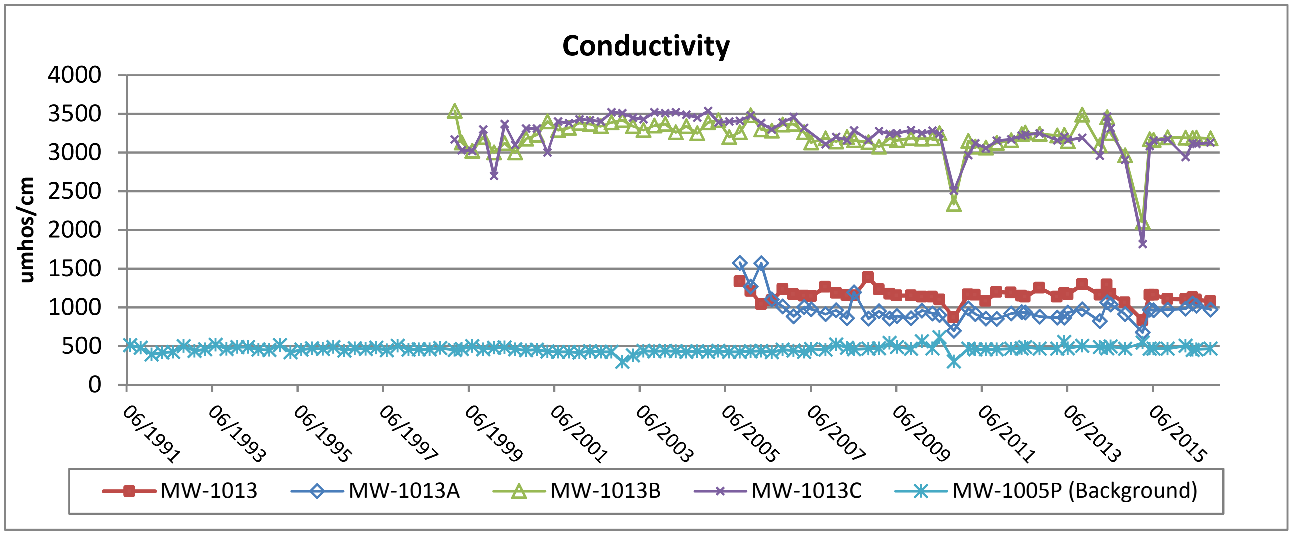


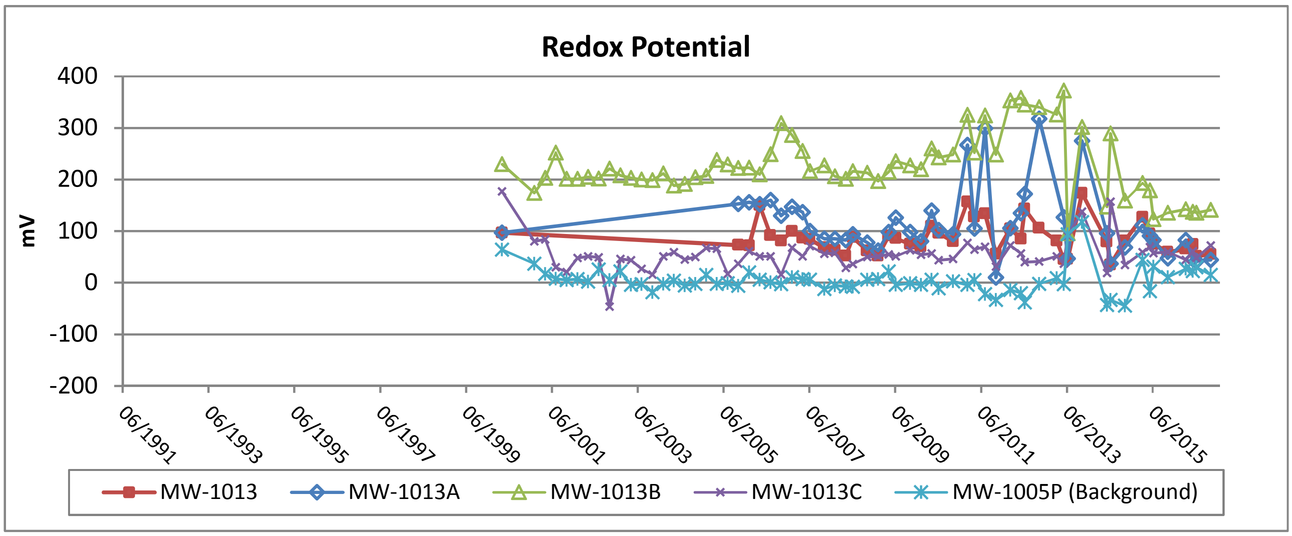


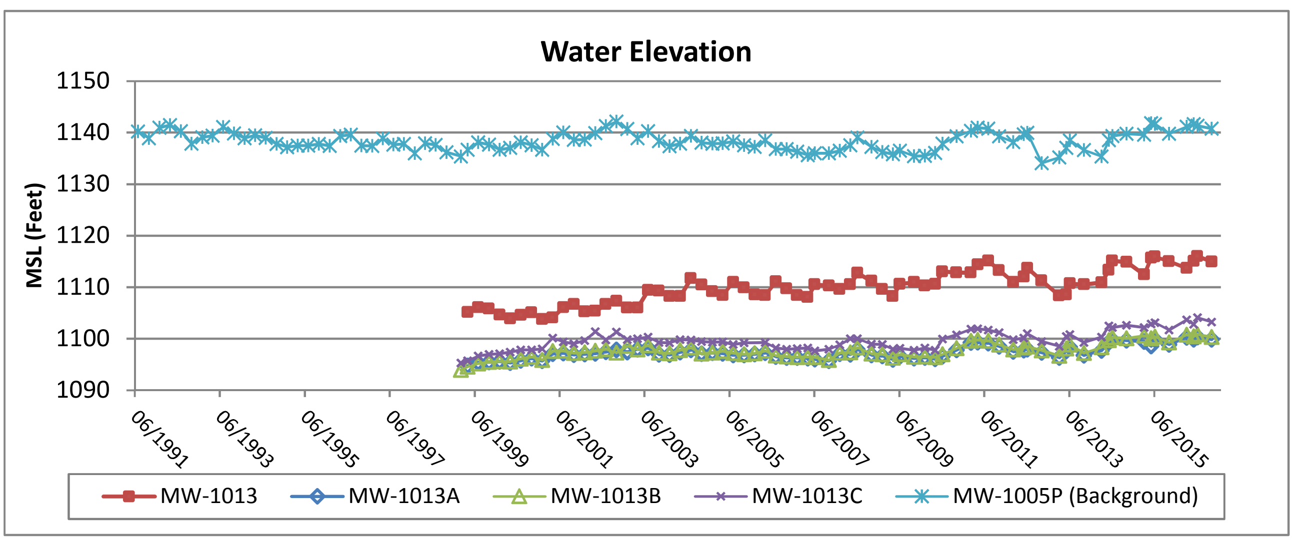


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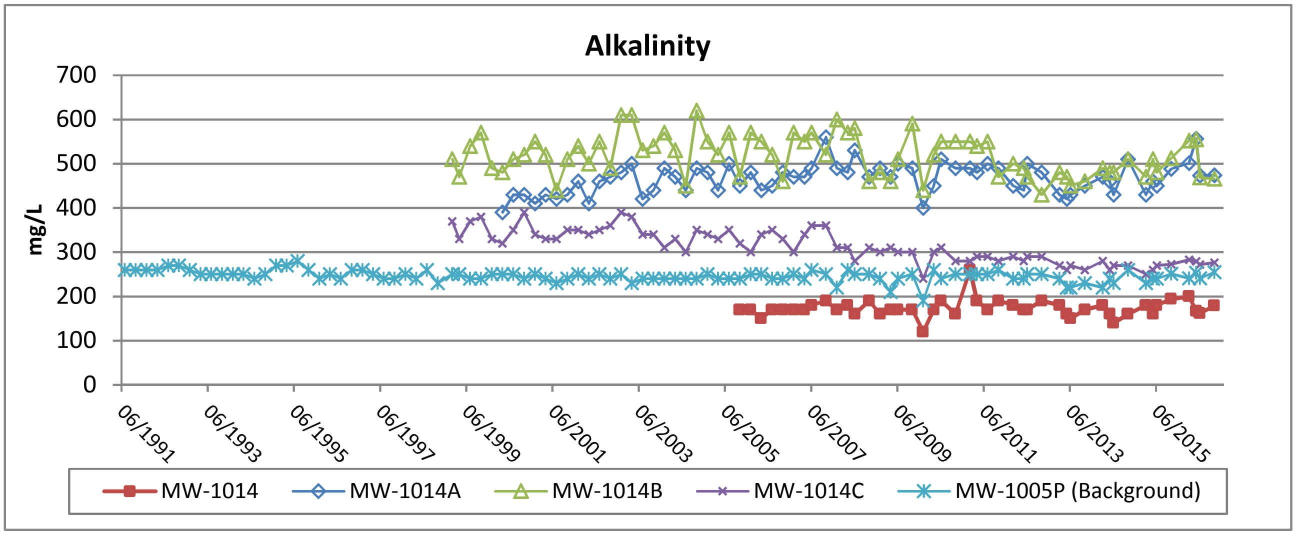
FLAMBEAU MINING COMPANY

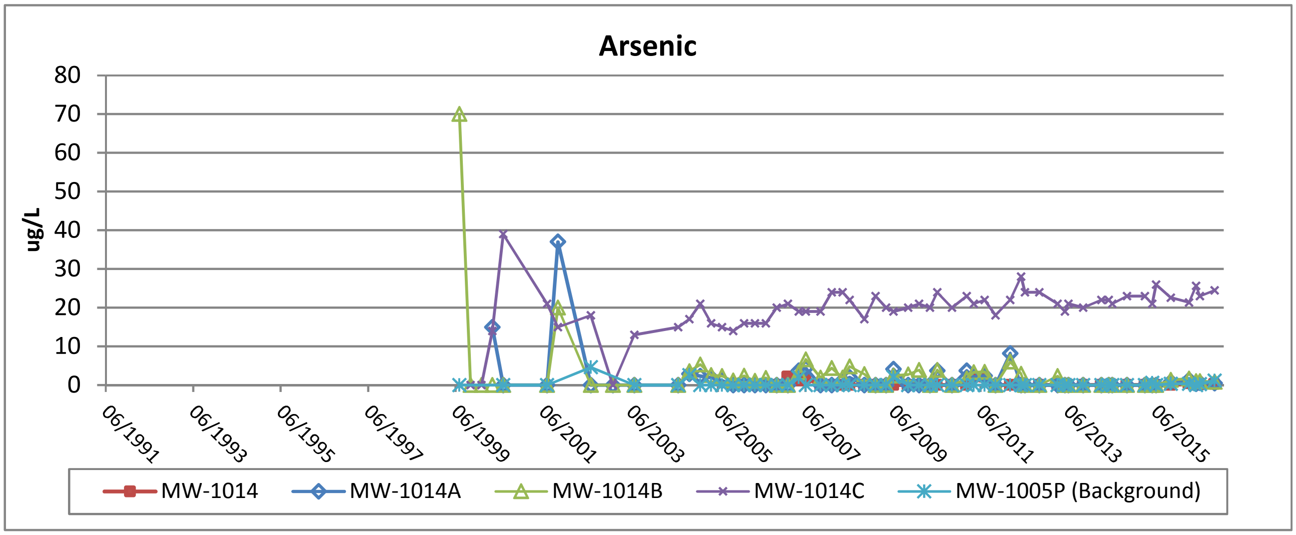
Figure B-6d

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



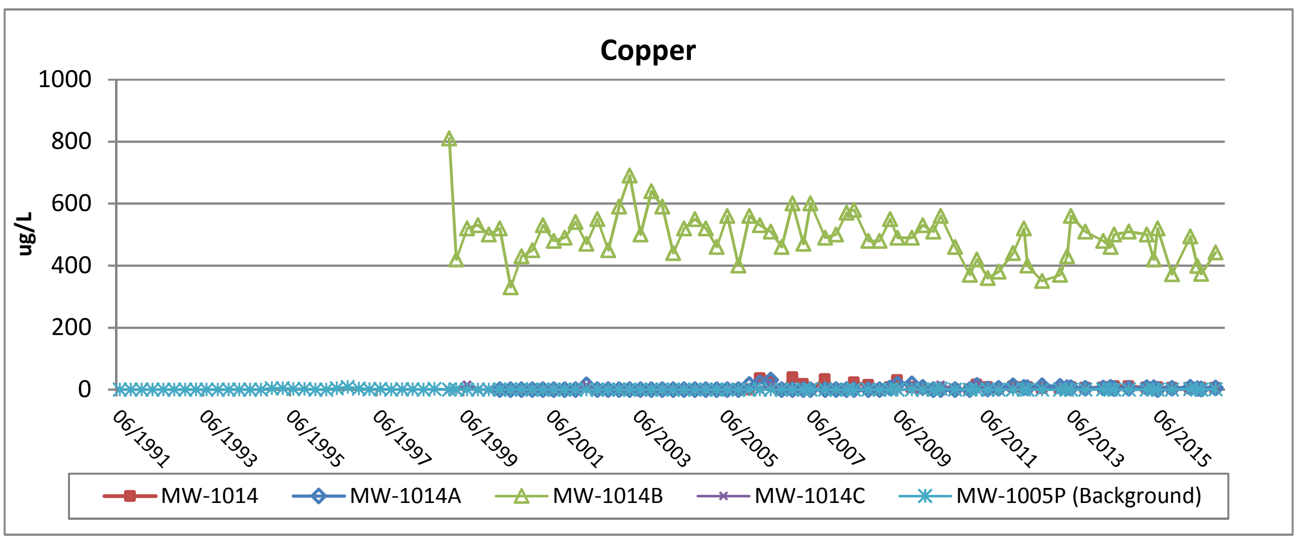




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Figure B-7a

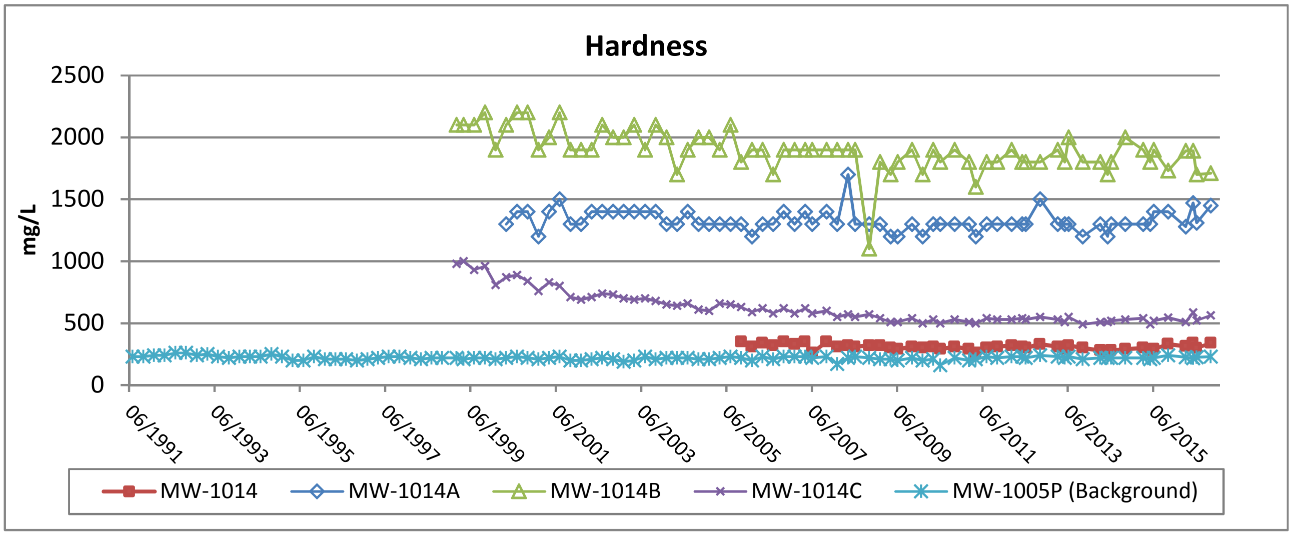
Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

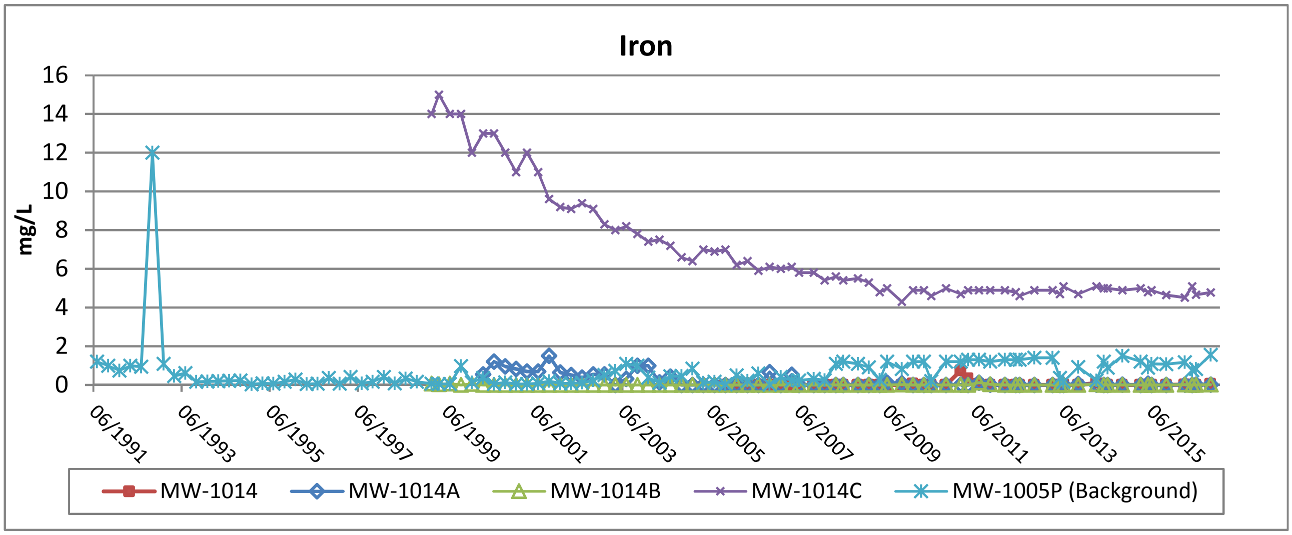
MW-1014/MW-1014A/MW-1014B/MW-1014C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

Flambeau Mining Co.
2016 Annual Report



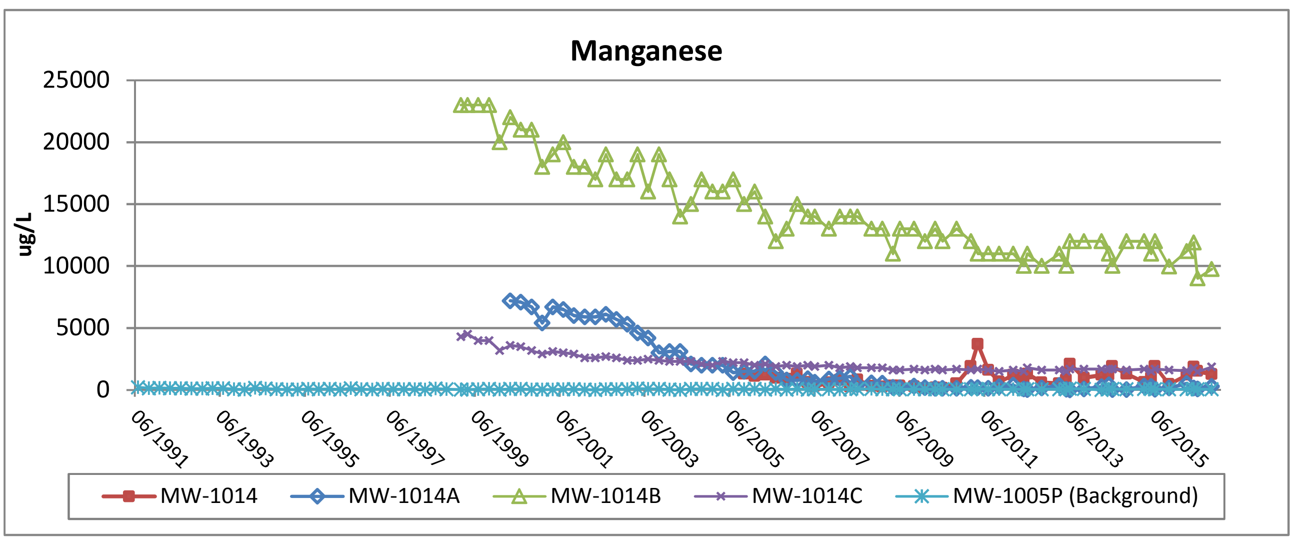




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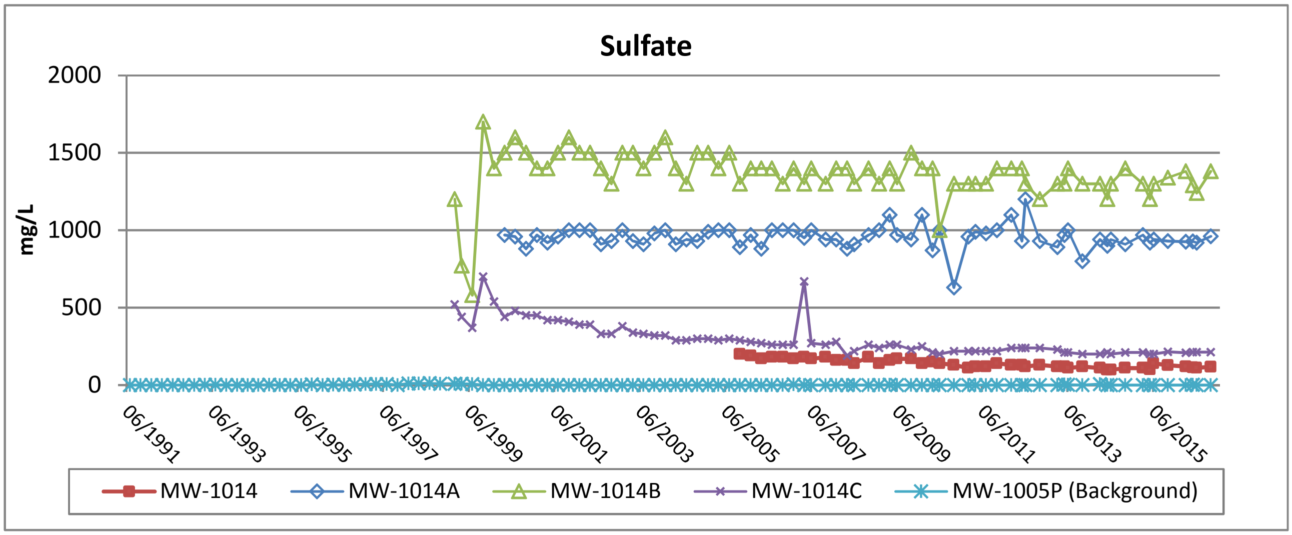
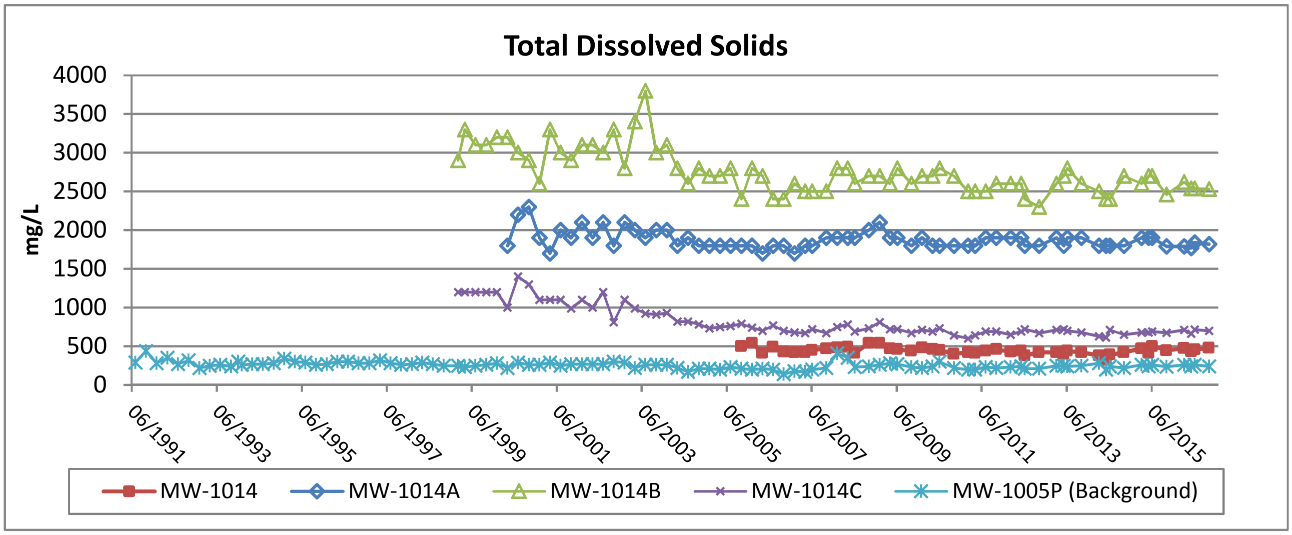
Figure B-7b

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



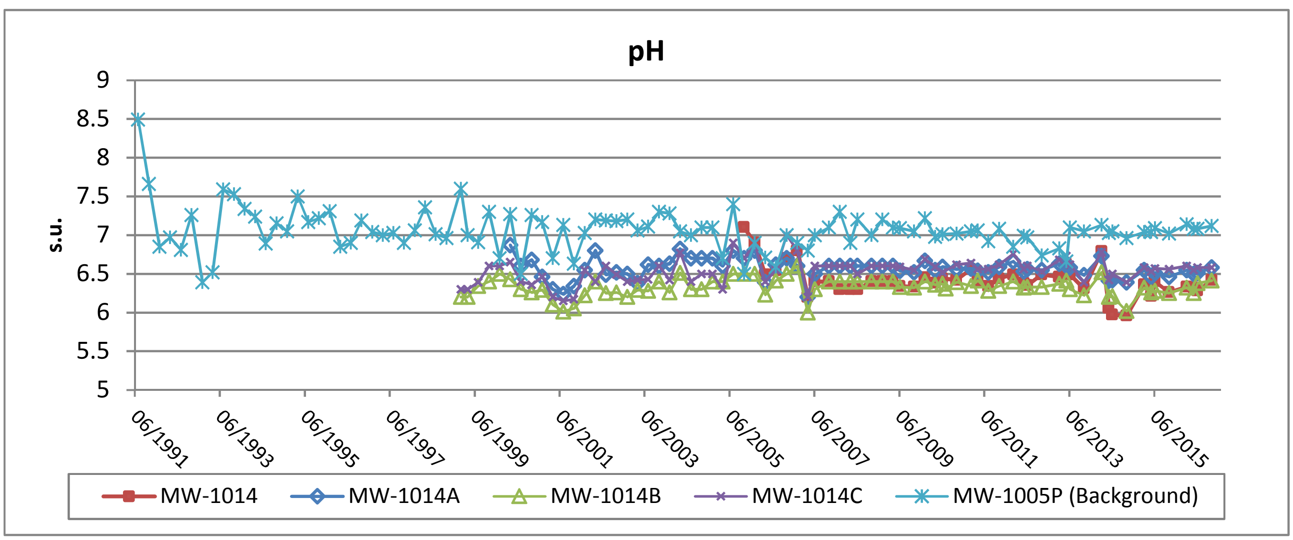




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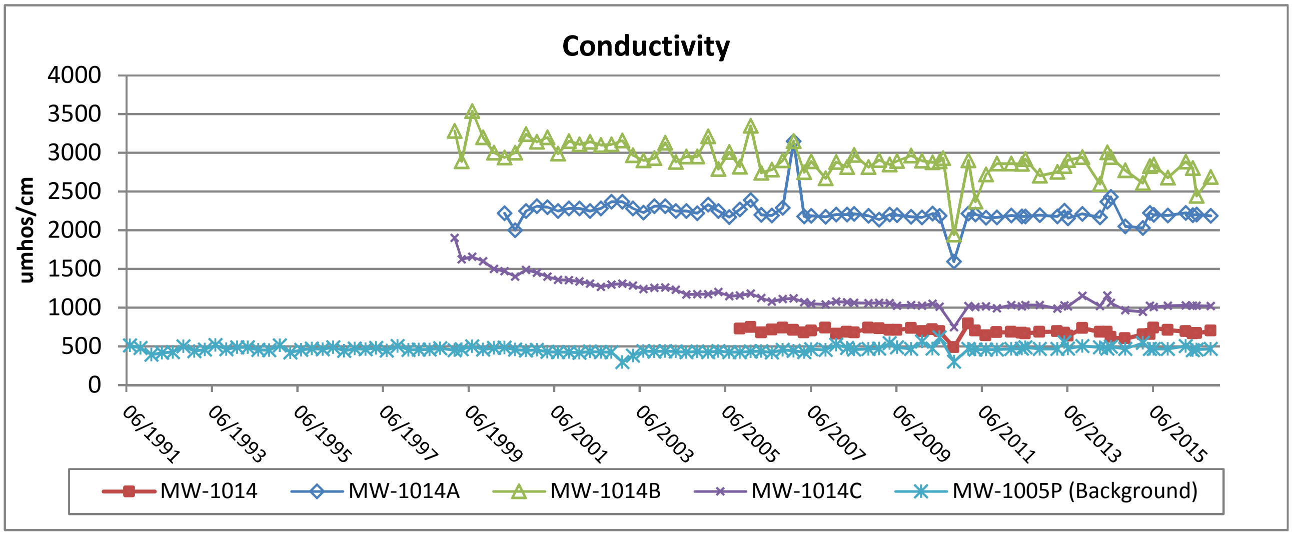
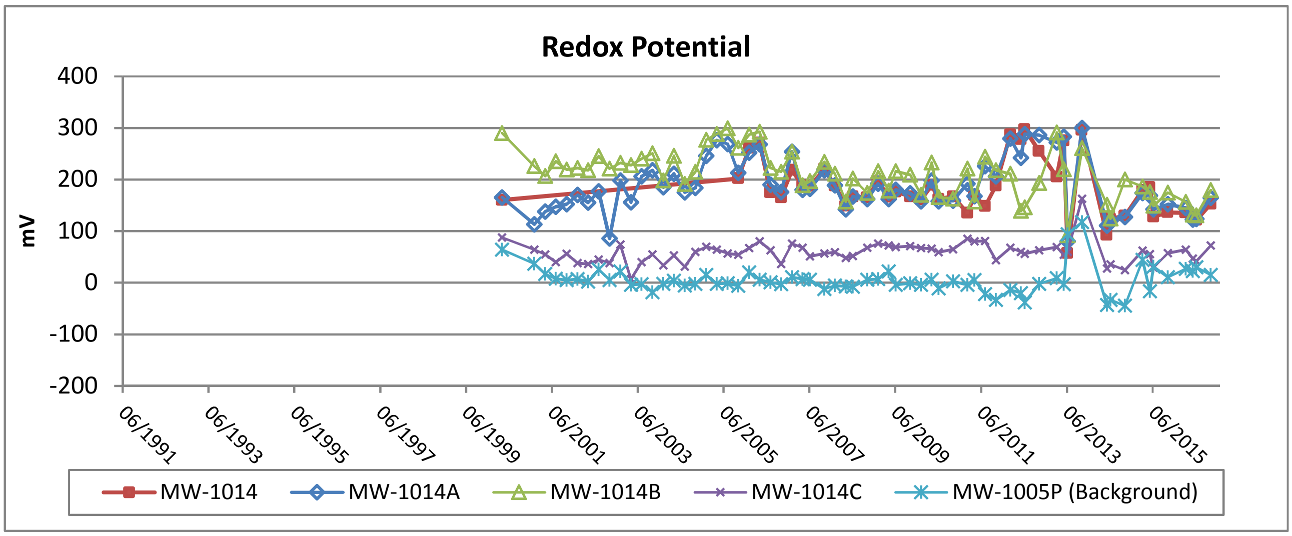
Figure B-7c

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



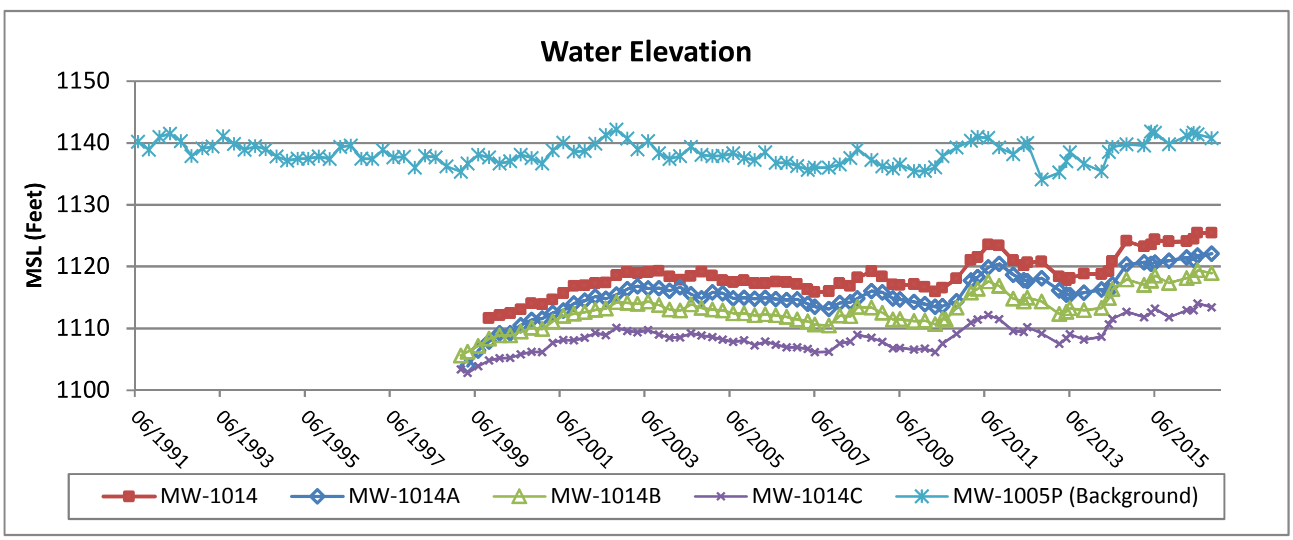




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Figure B-7d

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1987-10 | MW-1005 | | | 64 | | < 5 | 370 | 7.2 | 1400 | 16 | 640 | 5.5 | 844 | |
| 1987-11 | MW-1005 | | | 74 | | < 5 | 380 | 6.1 | 1100 | 16 | 610 | 5.6 | 816 | |
| 1987-12 | MW-1005 | | | 64 | | < 5 | 380 | 13 | 750 | 17 | 650 | 5.79 | 822 | |
| 1988-01 | MW-1005 | | | 70 | | < 6 | 380 | 12 | 650 | 8 | 640 | 5.6 | 787 | |
| 1988-02 | MW-1005 | | | 80 | | 5 | 390 | 12 | 750 | 22 | 550 | 5.51 | 867 | |
| 1988-03 | MW-1005 | | | 60 | | 16 | 390 | 7.9 | 710 | 20 | 630 | 5.25 | 880 | |
| 1988-04 | MW-1005 | | | 60 | | 18 | 360 | 3.5 | 630 | 17 | 580 | 5.91 | 868 | |
| 1988-05 | MW-1005 | | | 72 | | < 10 | 400 | 15 | 560 | 18 | 730 | 5.96 | 954 | |
| 1988-06 | MW-1005 | | | 81 | | < 10 | 350 | 21 | 620 | 9 | 770 | 6.05 | 924 | |
| 1988-07 | MW-1005 | | | 81 | | 25 | 340 | 19 | 640 | 17 | 650 | 7.01 | 468 | |
| 1988-08 | MW-1005 | | | 60 | | 15 | 330 | 1.1 | 450 | 20 | 1000 | 6.1 | 825 | |
| 1988-09 | MW-1005 | | | 93 | | < 10 | 380 | 12 | 560 | < 25 | 690 | 5.58 | 842 | |
| 1989-01 | MW-1000PR | | 1088.83 | | | | | | | | | | | |
| 1989-04 | MW-1000PR | | 1088.75 | | | | | | | | | | | |
| 1989-07 | MW-1000PR | | 1090.13 | | | | | | | | | | | |
| 1989-11 | MW-1000PR | | 1088.04 | | | | | | | | | | | |
| 1990-01 | MW-1000PR | | 1087.46 | | | | | | | | | | | |
| 1990-04 | MW-1000PR | | 1088.19 | | | | | | | | | | | |
| 1990-08 | MW-1000PR | | 1087.94 | | | | | | | | | | | |
| 1990-10 | MW-1000PR | | 1090.73 | | | | | | | | | | | |
| 1991-01 | MW-1000PR | | 1089.12 | | | | | | | | | | | |
| 1991-01 | MW-1005 | | | | | | | | | | | 7.82 | 733 | |
| 1991-04 | MW-1000PR | | 1091.83 | | | | | | | | | | | |
| 1991-04 | MW-1005 | | | | | | | | | | | 6.58 | 842 | |
| 1991-07 | MW-1000PR | | 1089.14 | 65 | | < 14 | 84 | 0.65 | 850 | < 10 | 190 | 8.39 | 225 | |
| 1991-07 | MW-1002 | | 1092.94 | 50 | | < 14 | 60 | 0.99 | 5.1 | < 10 | 160 | 8.33 | 157 | |
| 1991-07 | MW-1002G | | 1092.97 | 86 | | < 14 | 100 | < 0.055 | 5.4 | < 10 | 240 | 7.56 | 277 | |
| 1991-07 | MW-1004 | | 1111.57 | | | | | | | | | | | |
| 1991-07 | MW-1004P | | 1108.93 | 160 | | < 14 | 150 | 0.33 | 130 | < 10 | 210 | 8.15 | 175 | |
| 1991-07 | MW-1004S | | 1111.39 | 50 | | < 14 | 60 | < 0.055 | < 4 | < 10 | 160 | 8.64 | 161 | |
| 1991-07 | MW-1005 | | | 84 | | < 14 | 380 | 17 | 510 | 15 | 570 | 7.73 | 1028 | |
| 1991-07 | MW-1005P | | 1140.19 | 260 | | < 14 | 230 | 1.2 | 220 | < 10 | 290 | 8.49 | 512 | |
| 1991-07 | MW-1005S | | 1139.43 | 170 | | < 14 | 170 | 0.3 | 210 | < 10 | 220 | 7.68 | 377 | |
| 1991-07 | MW-1010P | | 1086.5 | 140 | | < 14 | 140 | < 0.055 | 260 | < 10 | 180 | 8.47 | 337 | |
| 1991-10 | MW-1000PR | | 1089.51 | 90 | | < 14 | 110 | 0.84 | 880 | < 10 | 160 | 7.41 | 327 | |
| 1991-10 | MW-1002 | | 1092.36 | 49 | | < 14 | 60 | < 0.055 | < 4 | < 10 | 170 | 6.78 | 189 | |
| 1991-10 | MW-1002G | | 1092.4 | 88 | | < 14 | 120 | < 0.055 | < 4 | 10 | 280 | 6.98 | 272 | |
| 1991-10 | MW-1004 | | 1111.14 | | | | | | | | | | | |
| 1991-10 | MW-1004P | | 1108.79 | 170 | | < 14 | 170 | 0.22 | 130 | < 10 | 310 | 7.15 | 352 | |
| 1991-10 | MW-1004S | | 1111 | 49 | | < 14 | 60 | < 0.055 | < 4 | 10 | 170 | 7.25 | 135 | |
| 1991-10 | MW-1005 | | 1138.75 | 92 | | < 14 | 360 | 20 | 490 | 12 | 770 | 7.34 | 981 | |
| 1991-10 | MW-1005P | | 1138.88 | 260 | | < 14 | 230 | 1 | 150 | < 10 | 440 | 7.66 | 479 | |
| 1991-10 | MW-1005S | | 1138.1 | 170 | | < 14 | 170 | 3.8 | 220 | < 10 | 370 | 7.37 | 351 | |
| 1991-10 | MW-1010P | | 1087.62 | 160 | | < 14 | 130 | < 0.055 | 280 | 10 | 250 | 8.26 | 326 | |
| 1992-01 | MW-1000PR | | 1090.15 | 88 | | < 14 | 110 | 1.7 | 820 | 11 | 120 | 5.75 | 190 | |
| 1992-01 | MW-1002 | | 1093.9 | 47 | | < 14 | 67 | < 0.055 | < 4 | < 10 | 100 | 6.88 | 138 | |
| 1992-01 | MW-1002G | | 1093.93 | 80 | | < 14 | 110 | < 0.055 | < 4 | 11 | 140 | 6.93 | 221 | |
| 1992-01 | MW-1004 | | 1111.65 | | | | | | | | | | | |
| 1992-01 | MW-1004P | | 1108.79 | 160 | | < 14 | 150 | 0.32 | 120 | < 10 | 160 | 6.8 | 302 | |
| 1992-01 | MW-1004S | | 1111 | 27 | | < 14 | 62 | < 0.055 | < 4 | 11 | 95 | 7.03 | 146 | |
| 1992-01 | MW-1005 | | 1140.86 | 86 | | < 14 | 1000 | 18 | 460 | 14 | 530 | 6.12 | 870 | |
| 1992-01 | MW-1005P | | 1140.95 | 260 | | < 14 | 240 | 0.75 | 160 | < 10 | 280 | 6.85 | 391 | |
| 1992-01 | MW-1005S | | 1140.32 | 170 | | < 14 | 250 | 3.6 | 210 | < 10 | | 6.88 | 303 | |
| 1992-01 | MW-1010P | | 1087.6 | 150 | | < 14 | 130 | 0.15 | 250 | 16 | 200 | 6.87 | 292 | |
| 1992-04 | MW-1000PR | | 1091.67 | 84 | | < 14 | 88 | 1.3 | 830 | 14 | 120 | 6.91 | 183.2 | |
| 1992-04 | MW-1002 | | 1093.7 | 49 | | < 14 | 48 | < 0.055 | < 4 | 11 | 85 | 6.05 | 145 | |
| 1992-04 | MW-1002G | | 1093.75 | 84 | | < 14 | 110 | < 0.055 | < 4 | 14 | 150 | 6.25 | 199 | |
| 1992-04 | MW-1004 | | 1112.19 | | | | | | | | | | | |
| 1992-04 | MW-1004P | | 1109.72 | 170 | | < 14 | 160 | 0.37 | 140 | < 10 | 180 | 6.88 | 282 | |
| 1992-04 | MW-1004S | | 1112.05 | 60 | | < 14 | 72 | < 0.055 | < 4 | 12 | 100 | 6.7 | 153 | |
| 1992-04 | MW-1005 | | 1141.23 | 90 | | < 14 | 520 | 17 | 380 | 16 | 680 | 6.32 | 905 | |
| 1992-04 | MW-1005P | | 1141.48 | 260 | | < 14 | 240 | 1 | 130 | < 10 | 350 | 6.97 | 417 | |
| 1992-04 | MW-1005S | | 1140.71 | 180 | | < 14 | 290 | 3.7 | 200 | < 10 | 210 | 7.48 | 324 | |
| 1992-04 | MW-1010P | | 1089.08 | 160 | | < 14 | 140 | < 0.055 | 200 | 14 | 340 | 7.62 | 314 | |
| 1992-07 | MW-1000PR | | 1088.87 | 81 | | 14 | 120 | 0.47 | 730 | 12 | 140 | 6.64 | 194 | |
| 1992-07 | MW-1002 | | 1093.04 | 41 | | < 14 | 120 | < 0.055 | < 4 | < 10 | 87 | 5.61 | 118 | |
| 1992-07 | MW-1002G | | 1093.09 | 79 | | < 14 | 160 | < 0.055 | < 4 | 11 | 150 | 6.02 | 198 | |
| 1992-07 | MW-1004 | | 1111.73 | | | | | | | | | | | |
| 1992-07 | MW-1004P | | 1109.39 | 160 | | < 14 | 170 | 0.38 | 130 | < 10 | 180 | 6.74 | 295 | |
| 1992-07 | MW-1004S | | 1111.58 | 74 | | < 14 | 150 | < 0.055 | < 4 | < 10 | 110 | 6.5 | 175 | |
| 1992-07 | MW-1005 | | 1140.11 | 90 | | < 14 | 440 | 19 | 440 | 15 | 640 | 6.01 | 912 | |
| 1992-07 | MW-1005P | | 1140.29 | 270 | | < 14 | 260 | 0.95 | 150 | < 10 | 270 | 6.81 | 426 | |
| 1992-07 | MW-1005S | | 1139.4 | 170 | | < 14 | 220 | 4.1 | 210 | < 10 | 220 | 6.68 | 331 | |
| 1992-07 | MW-1010P | | 1088.28 | 160 | | < 14 | 180 | < 0.055 | 86 | < 10 | 180 | 6.86 | 285 | |
| 1992-10 | MW-1000PR | | 1089.22 | 95 | | < 14 | 100 | 0.8 | 780 | 12 | 160 | 6.9 | 201 | |
| 1992-10 | MW-1002 | | 1091.69 | 53 | | < 14 | 82 | < 0.055 | 15 | 11 | 130 | 6.94 | 181 | |
| 1992-10 | MW-1002G | | 1091.73 | 85 | | < 14 | 130 | < 0.055 | < 4 | 11 | 180 | 6.94 | 254 | |
| 1992-10 | MW-1004 | | 1108.33 | | | | | | | | | | | |
| 1992-10 | MW-1004P | | 1107.39 | 190 | | < 14 | 180 | 0.32 | 130 | < 10 | 260 | 7.46 | 342 | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992-10 | MW-1004S | | 1108.44 | 100 | | < 14 | 110 | < 0.055 | < 4 | < 10 | 220 | 6.96 | 258 | |
| 1992-10 | MW-1005 | | 1139.07 | 110 | | < 14 | 420 | 22 | 470 | 15 | 600 | 6.13 | 1013 | |
| 1992-10 | MW-1005P | | 1137.84 | 270 | | < 14 | 260 | 12 | 100 | < 10 | 320 | 7.26 | 501 | |
| 1992-10 | MW-1005S | | 1138.13 | 190 | | < 14 | 270 | 3.9 | 200 | < 10 | 260 | 7.38 | 391 | |
| 1992-10 | MW-1010P | | 1086.55 | 180 | | < 14 | 160 | < 0.055 | 140 | < 10 | 280 | 7.49 | 389 | |
| 1993-01 | MW-1000PR | | 1091.62 | 84 | | < 14 | 88 | 0.15 | 710 | < 10 | 100 | 6.22 | 203 | |
| 1993-01 | MW-1000R | | 1091.01 | | | | | | | | | | | |
| 1993-01 | MW-1002 | | | 53 | | < 14 | 66 | 0.059 | 4.7 | < 10 | 90 | 6.96 | 127 | |
| 1993-01 | MW-1002G | | 1092.69 | 75 | | < 14 | 94 | < 0.055 | < 4 | 12 | 98 | 7.14 | 197 | |
| 1993-01 | MW-1004 | | 1105.8 | | | | | | | | | | | |
| 1993-01 | MW-1004P | | 1104.64 | 170 | | < 14 | 160 | 0.39 | 140 | < 10 | 160 | 6.24 | 291 | |
| 1993-01 | MW-1004S | | 1105.97 | 73 | | < 14 | 92 | < 0.055 | < 4 | < 10 | 95 | 6.37 | 174 | |
| 1993-01 | MW-1005 | | 1139.18 | 94 | | < 14 | 400 | 24 | 520 | 23 | 140 | 6.21 | 945 | |
| 1993-01 | MW-1005P | | 1139.08 | 260 | | < 14 | 240 | 1.1 | 110 | < 10 | 220 | 6.39 | 440 | |
| 1993-01 | MW-1005S | | 1138.52 | 180 | | < 14 | 180 | 4.1 | 210 | 10 | 160 | 6.99 | 418 | |
| 1993-01 | MW-1010P | | 1088.95 | 190 | | < 14 | 130 | < 0.055 | 31 | 32 | 210 | 7.21 | 357 | |
| 1993-04 | MW-1000PR | | 1089.06 | 82 | | 26 | 90 | 0.27 | 950 | 12 | 130 | 6.24 | 198 | |
| 1993-04 | MW-1000R | | 1092.11 | | | | | | | | | | | |
| 1993-04 | MW-1002 | | 1093.34 | 66 | | < 12 | 90 | < 0.015 | < 4 | 9 | 120 | 6.33 | 136 | |
| 1993-04 | MW-1002G | | 1093.38 | 44 | | < 12 | 76 | < 0.015 | < 4 | 8 | 74 | 6.13 | 239 | |
| 1993-04 | MW-1004P | | 1099.76 | 170 | | < 12 | 160 | < 0.015 | < 4 | 3 | 160 | 7.74 | 329 | |
| 1993-04 | MW-1004S | | 1103.31 | 51 | | < 12 | 70 | < 0.015 | < 4 | 11 | 120 | 7.77 | 168 | |
| 1993-04 | MW-1005 | | 1140.35 | 78 | | < 12 | 500 | 24 | 540 | 15 | 630 | 6.11 | 971 | |
| 1993-04 | MW-1005P | | 1139.42 | 250 | | < 12 | 250 | 0.46 | 150 | 2 | 250 | 6.52 | 458 | |
| 1993-04 | MW-1005S | | 1139.26 | 81 | | < 12 | 210 | 4.4 | 230 | 8 | 200 | 6.38 | 360 | |
| 1993-04 | MW-1010P | | 1088.51 | 170 | | < 14 | 130 | 0.055 | 140 | 28 | 270 | 6.62 | 357 | |
| 1993-07 | MW-1000PR | | 1079.77 | 82 | | 16 | 86 | 0.061 | 730 | 15 | 140 | 6.6 | 217 | |
| 1993-07 | MW-1002 | | 1095.73 | 42 | | < 12 | 52 | 0.034 | < 4 | 10 | 100 | 6.83 | 273 | |
| 1993-07 | MW-1002G | | 1095.72 | 64 | | < 12 | 80 | < 0.015 | < 4 | 11 | 140 | 6.72 | 480 | |
| 1993-07 | MW-1004P | | 1095.77 | 170 | | < 12 | 150 | 0.042 | 22 | 5 | 180 | 7.4 | 347 | |
| 1993-07 | MW-1004S | | 1102.69 | 24 | | < 12 | 56 | < 0.015 | < 4 | 11 | 110 | 7 | 178 | |
| 1993-07 | MW-1005 | | 1141.19 | 74 | | < 12 | 410 | 19 | 420 | 18 | 590 | 6.12 | 1100 | |
| 1993-07 | MW-1005P | | 1141.08 | 250 | | < 12 | 230 | 0.61 | 140 | 3 | 260 | 7.59 | 519 | |
| 1993-07 | MW-1005S | | 1140.88 | 170 | | < 12 | 160 | 4.2 | 220 | 9 | 210 | 7.28 | 372 | |
| 1993-07 | MW-1010P | | 1085.01 | 150 | | < 12 | 130 | < 0.015 | 35 | 11 | 180 | 7.21 | 313 | |
| 1993-08 | MW-1000PR | | 1077.59<br>1079.23<br>1078.63<br>1077.13 | | | | | | | | | | | |
| 1993-08 | MW-1000R | | 1084.61 | | | | | | | | | | | |
| 1993-08 | MW-1004 | | | | | | | | | | | | | |
| 1993-08 | MW-1004P | | 1094.63<br>1094.34<br>1094.03<br>1093.16 | | | | | | | | | | | |
| 1993-08 | MW-1004S | | 1101.99<br>1101.73<br>1101.57<br>1101.29 | | | | | | | | | | | |
| 1993-08 | MW-1010P | | 1083.01<br>1081.55<br>1081.58<br>1080.71 | | | | | | | | | | | |
| 1993-09 | MW-1000PR | | 1076.89<br>1076.75<br>1077.04<br>1076.2<br>1075.12 | | | | | | | | | | | |
| 1993-09 | MW-1000R | | | | | | | | | | | | | |
| 1993-09 | MW-1004 | | | | | | | | | | | | | |
| 1993-09 | MW-1004P | | 1092.64<br>1092.45<br>1092.34<br>1092.2<br>1091.84 | | | | | | | | | | | |
| 1993-09 | MW-1004S | | 1101.04<br>1100.85<br>1100.65<br>1100.49<br>1100.33 | | | | | | | | | | | |
| 1993-09 | MW-1010P | | 1081.61<br>1081.22<br>1081.84<br>1081.13<br>1080.95 | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993-10 | MW-1000PR | | 1074.73<br>1075.31<br>1074.86<br>1075.56<br>1074.99 | 62 | | 13 | 120 | 0.032 | 910 | 12 | 110 | 7.03 | 233 | |
| 1993-10 | MW-1000R | | | | | | | | | | | | | |
| 1993-10 | MW-1002 | | 1091.71 | 42 | | < 12 | 52 | < 0.015 | < 4 | 6 | 92 | 7.52 | 138 | |
| 1993-10 | MW-1002G | | 1091.77 | 82 | | < 12 | 110 | < 0.015 | < 4 | 11 | 180 | 7.38 | 262 | |
| 1993-10 | MW-1004 | | | | | | | | | | | | | |
| 1993-10 | MW-1004P | | 1091.04<br>1090.18<br>1090.27<br>1090.09<br>1089.84 | 170 | | < 12 | 160 | 0.048 | 40 | 3 | 180 | 7.61 | 329 | |
| 1993-10 | MW-1004S | | 1100.18<br>1099.98<br>1099.82<br>1099.78<br>1099.61 | 32 | | < 12 | 46 | < 0.015 | < 4 | 9 | 110 | 7.41 | 186 | |
| 1993-10 | MW-1005 | | 1140.03 | 84 | | < 12 | 390 | 25 | 610 | 17 | 580 | 6.68 | 1005 | |
| 1993-10 | MW-1005P | | 1139.85 | 250 | | < 12 | 220 | 0.17 | 69 | < 2 | 240 | 7.53 | 462 | |
| 1993-10 | MW-1005S | | 1139.29 | 170 | | < 12 | 160 | 4.2 | 240 | 6 | 210 | 7.28 | 321 | |
| 1993-10 | MW-1010P | | 1080.02<br>1081.25<br>1080.16<br>1080.01 | 160 | | < 12 | 130 | < 0.015 | 18 | 5 | 170 | 7.51 | 294 | |
| 1993-11 | MW-1000PR | | 1075.95<br>1075.09<br>1074.87<br>1074.21 | | | | | | | | | | | |
| 1993-11 | MW-1000R | | | | | | | | | | | | | |
| 1993-11 | MW-1004 | | | | | | | | | | | | | |
| 1993-11 | MW-1004P | | 1090.03<br>1089.94<br>1088.84<br>1089.75 | | | | | | | | | | | |
| 1993-11 | MW-1004S | | 1099.45<br>1099.27<br>1099.18<br>1099.06 | | | | | | | | | | | |
| 1993-11 | MW-1010P | | 1079.89<br>1079.71<br>1080.55<br>1079.91 | | | | | | | | | | | |
| 1993-12 | MW-1000PR | | 1074.1<br>1073.61<br>1073.49 | | | | | | | | 110 | | | |
| 1993-12 | MW-1000R | | | | | | | | | | | | | |
| 1993-12 | MW-1002 | | | | | | | | | | 78 | | | |
| 1993-12 | MW-1002G | | | | | | | | | | 190 | | | |
| 1993-12 | MW-1004 | | | | | | | | | | | | | |
| 1993-12 | MW-1004P | | 1089.76<br>1089.54<br>1089.27 | | | | | | | | 230 | | | |
| 1993-12 | MW-1004S | | 1098.95<br>1098.78<br>1098.67 | | | | | | | | 98 | | | |
| 1993-12 | MW-1005 | | | | | | | | | | 680 | | | |
| 1993-12 | MW-1005P | | | | | | | | | | 300 | | | |
| 1993-12 | MW-1005S | | | | | | | | | | 220 | | | |
| 1993-12 | MW-1010P | | 1079.57<br>1079.91<br>1079.9 | | | | | | | | 230 | | | |
| 1994-01 | MW-1000PR | | 1073.55<br>1072.7<br>1073.75 | 43 | | 22 | 54 | < 0.015 | 340 | 12 | 70 | 6.86 | 135 | |
| 1994-01 | MW-1000R | | | | | | | | | | | | | |
| 1994-01 | MW-1002 | | 1091.21 | 39 | | < 12 | 50 | < 0.015 | < 4 | 7 | 82 | 7.53 | 151 | |
| 1994-01 | MW-1002G | | 1091.31 | 94 | | < 12 | 120 | < 0.015 | < 4 | 14 | 180 | 7.01 | 278 | |
| 1994-01 | MW-1004 | | | | | | | | | | | | | |
| 1994-01 | MW-1004P | | 1088.81<br>1088.52<br>1088.4 | 150 | | < 12 | 150 | < 0.015 | 20 | 2 | 160 | 7.34 | 371 | |
| 1994-01 | MW-1004S | | 1098.3<br>1098.18<br>1097.96 | 42 | | 16 | 44 | < 0.015 | < 4 | 10 | 74 | 7 | 123 | |
| 1994-01 | MW-1005 | | 1138.39 | 81 | | < 12 | 440 | 24 | 530 | 18 | 560 | 6.28 | 1072 | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-01 | MW-1005P | | 1138.88 | 250 | | < 12 | 230 | 0.19 | 35 | < 2 | 260 | 7.34 | 487 | |
| 1994-01 | MW-1005S | | 1138.29 | 160 | | < 12 | 160 | 4 | 200 | 9 | 190 | 7.22 | 357 | |
| 1994-01 | MW-1010P | | 1080.83<br>1080.25<br>1081.09 | 160 | | < 12 | 150 | < 0.015 | 17 | 3 | 170 | 7.34 | 283 | |
| 1994-02 | MW-1000PR | | 1073.23<br>1071.99<br>1071.66<br>1071.64 | | | | | | | | | | | |
| 1994-02 | MW-1000R | | | | | | | | | | | | | |
| 1994-02 | MW-1004 | | | | | | | | | | | | | |
| 1994-02 | MW-1004P | | 1088.45<br>1088.32<br>1088.13<br>1088.24 | | | | | | | | | | | |
| 1994-02 | MW-1004S | | 1097.82<br>1097.74<br>1097.67<br>1097.97 | | | | | | | | | | | |
| 1994-02 | MW-1010P | | 1080.99<br>1080.89<br>1080.51<br>1080.58 | | | | | | | | | | | |
| 1994-03 | MW-1000PR | | 1071.26<br>1070.68<br>1070.41<br>1070.71 | | | | | | | | | | | |
| 1994-03 | MW-1000R | | | | | | | | | | | | | |
| 1994-03 | MW-1004 | | | | | | | | | | | | | |
| 1994-03 | MW-1004P | | 1088.11<br>1087.64<br>1087.56<br>1087.15 | | | | | | | | | | | |
| 1994-03 | MW-1004S | | 1097.71<br>1097.77<br>1097.74<br>1097.76 | | | | | | | | | | | |
| 1994-03 | MW-1010P | | 1080.62<br>1079.5<br>1078.94<br>1079.52 | | | | | | | | | | | |
| 1994-04 | MW-1000PR | | 1070.66<br>1071.16<br>1071.91<br>1071.98 | 44 | | 23 | 54 | 0.021 | 500 | 12 | 95 | 7.74 | 124 | |
| 1994-04 | MW-1000R | | | | | | | | | | | | | |
| 1994-04 | MW-1002 | | 1091.21 | 35 | | < 12 | 45 | < 0.015 | < 4 | 7 | 86 | 7.49 | 105 | |
| 1994-04 | MW-1002G | | 1091.27 | 92 | | < 12 | 120 | < 0.015 | < 4 | 12 | 170 | 7.39 | 267 | |
| 1994-04 | MW-1004 | | 1104.19<br>1104.19 | | | | | | | | | | | |
| 1994-04 | MW-1004P | | 1086.88<br>1087<br>1086.91<br>1087.03 | 160 | | 15 | 150 | 0.033 | 45 | 3 | 180 | 7.36 | 287 | |
| 1994-04 | MW-1004S | | 1097.73<br>1097.66<br>1097.6<br>1097.72 | 38 | | < 12 | 51 | < 0.015 | < 4 | 8 | 100 | 7.75 | 109 | |
| 1994-04 | MW-1005 | | 1140 | 88 | | < 12 | 450 | 24 | 540 | 13 | 620 | 7.6 | 1082 | |
| 1994-04 | MW-1005P | | 1139.44 | 250 | | < 12 | 230 | 0.2 | 160 | < 2 | 270 | 7.24 | 487 | |
| 1994-04 | MW-1005S | | 1139.14 | 160 | | < 12 | 160 | 4.1 | 200 | 8 | 200 | 7.52 | 344 | |
| 1994-04 | MW-1010P | | 1079.25<br>1079.25<br>1080.02<br>1080 | 160 | | < 12 | 150 | < 0.015 | 14 | 3 | 180 | 7.36 | 276 | |
| 1994-05 | MW-1000PR | | 1071.59<br>1071.21<br>1070.96<br>1071.22 | | | | | | | | | | | |
| 1994-05 | MW-1000R | | | | | | | | | | | | | |
| 1994-05 | MW-1004 | | | | | | | | | | | | | |
| 1994-05 | MW-1004P | | 1087.18<br>1086.87<br>1086.65<br>1086.66 | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-05 | MW-1004S | | 1098.23<br>1098.42<br>1098.41<br>1098.31 | | | | | | | | | | | |
| 1994-05 | MW-1010P | | 1079.94<br>1079<br>1078.84<br>1078.33 | | | | | | | | | | | |
| 1994-06 | MW-1000PR | | 1071.93<br>1071.71<br>1071.45<br>1071.41<br>1071.18 | | | | | | | | | | | |
| 1994-06 | MW-1000R | | | | | | | | | | | | | |
| 1994-06 | MW-1004 | | | | | | | | | | | | | |
| 1994-06 | MW-1004P | | 1086.57<br>1086.58<br>1086.57<br>1086.47<br>1086.48 | | | | | | | | | | | |
| 1994-06 | MW-1004S | | 1098.12<br>1098<br>1097.88<br>1097.77<br>1097.67 | | | | | | | | | | | |
| 1994-06 | MW-1010P | | 1079.45<br>1078.94<br>1078.43<br>1078.37<br>1078.25 | | | | | | | | | | | |
| 1994-07 | MW-1000PR | | 1071.28<br>1071.01<br>1071.19<br>1071.1 | 39 | | 17 | 49 | 0.026 | 420 | 11 | 90 | 7.47 | 132.6 | |
| 1994-07 | MW-1000R | | | | | | | | | | | | | |
| 1994-07 | MW-1002 | | 1091.02 | 31 | | < 12 | 44 | < 0.015 | < 4 | 6.6 | 94 | 7 | 109.4 | |
| 1994-07 | MW-1002G | | 1091.07 | 92 | | < 12 | 120 | < 0.015 | < 4 | 13 | 170 | 6.74 | 238 | |
| 1994-07 | MW-1004 | | | | | | | | | | | | | |
| 1994-07 | MW-1004P | | 1086.56<br>1086.74<br>1086.64<br>1086.39 | 160 | | < 12 | 150 | 0.024 | 28 | 2.5 | 190 | 7.09 | 317 | |
| 1994-07 | MW-1004S | | 1097.7<br>1097.66<br>1097.59<br>1097.56 | 140 | | < 12 | 52 | < 0.015 | < 4 | 8 | 100 | 6.77 | 200 | |
| 1994-07 | MW-1005 | | 1139.53 | 75 | | < 12 | 450 | 31 | 690 | 14 | 600 | 6.18 | 1093 | |
| 1994-07 | MW-1005P | | 1138.96 | 240 | | < 12 | 230 | 0.22 | 100 | < 2 | 270 | 6.89 | 456 | |
| 1994-07 | MW-1005S | | 1138.65 | 160 | | < 12 | 160 | 4.1 | 200 | 7.3 | 210 | 6.88 | 322 | |
| 1994-07 | MW-1010P | | 1078.46<br>1078.27<br>1078.24<br>1078.37 | 160 | | < 12 | 150 | < 0.015 | 10 | 3.4 | 190 | 7.17 | 322 | |
| 1994-08 | MW-1000PR | | 1071.07<br>1070.87<br>1070.55<br>1070.75 | | | | | | | | | | | |
| 1994-08 | MW-1000R | | | | | | | | | | | | | |
| 1994-08 | MW-1004 | | | | | | | | | | | | | |
| 1994-08 | MW-1004P | | 1086.12<br>1086.01<br>1085.86<br>1085.8 | | | | | | | | | | | |
| 1994-08 | MW-1004S | | 1097.49<br>1097.43<br>1097.33<br>1097.27 | | | | | | | | | | | |
| 1994-08 | MW-1010P | | 1078.31<br>1078.05<br>1077.91<br>1078.76 | | | | | | | | | | | |
| 1994-09 | MW-1000PR | | 1070.91<br>1070.71 | | | | | | | | | | | |
| 1994-09 | MW-1000R | | | | | | | | | | | | | |
| 1994-09 | MW-1004 | | | | | | | | | | | | | |
| 1994-09 | MW-1004P | | 1085.86<br>1085.92<br>1086.6 | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-09 | MW-1004S | | 1097.16<br>1097.08<br>1097.87 | | | | | | | | | | | |
| 1994-09 | MW-1010P | | 1078.59<br>1078.55<br>1086.68<br>1085.52<br>1084.29<br>1083.36<br>1082.6<br>1081.25<br>1080.72<br>1080.87 | | | | | | | | | | | |
| 1994-10 | MW-1000PR | | 1071.03 | 34 | | 58 | 36 | 0.047 | 360 | 17 | 120 | 7.17 | 115.9 | |
| 1994-10 | MW-1000R | | | | | | | | | | | | | |
| 1994-10 | MW-1002 | | 1092.12 | 38 | | < 1.6 | 46 | 0.0056 | < 0.47 | 6.1 | 87 | 6.99 | 122 | |
| 1994-10 | MW-1002G | | 1092.18 | 88 | | < 1.6 | 110 | 0.0054 | < 0.47 | 14 | 200 | 6.77 | 269 | |
| 1994-10 | MW-1004 | | | | | | | | | | | | | |
| 1994-10 | MW-1004P | | 1086.47<br>1086.45<br>1086.4<br>1086.36<br>1086.46 | 170 | | < 1.6 | 160 | 0.035 | 29 | 3.9 | 200 | 7.12 | 303 | |
| 1994-10 | MW-1004S | | 1098.1<br>1097.99<br>1097.84<br>1097.75<br>1097.97 | 44 | | < 1.6 | 54 | 0.0064 | < 0.47 | 8.6 | 150 | 6.71 | 123.5 | |
| 1994-10 | MW-1005 | | 1138.79 | 78 | | < 1.6 | 420 | 28 | 630 | 20 | 820 | 6.08 | 1028 | |
| 1994-10 | MW-1005P | | 1137.79 | 250 | | < 1.6 | 250 | 0.24 | 62 | 2.5 | 280 | 7.15 | 452 | |
| 1994-10 | MW-1005S | | 1137.49 | 160 | | < 1.6 | 160 | 3.7 | 190 | 13 | 240 | 7.34 | 320 | |
| 1994-10 | MW-1010P | | 1079.81<br>1079.8<br>1080.6<br>1080.17<br>1079.92 | 160 | | 3.2 | 150 | 0.0046 | 14 | 4.5 | 200 | 7.45 | 309 | |
| 1994-11 | MW-1000PR | | 1070.27<br>1070.28<br>1070.23 | | | | | | | | | | | |
| 1994-11 | MW-1000R | | | | | | | | | | | | | |
| 1994-11 | MW-1004 | | | | | | | | | | | | | |
| 1994-11 | MW-1004P | | 1086.24<br>1086.14<br>1086.1 | | | | | | | | | | | |
| 1994-11 | MW-1004S | | 1097.63<br>1097.53<br>1097.35 | | | | | | | | | | | |
| 1994-11 | MW-1010P | | 1079.07<br>1078.85<br>1079.29 | | | | | | | | | | | |
| 1994-12 | MW-1000PR | | 1069.65<br>1069.28<br>1069.24<br>1068.91 | | | | | | | | | | | |
| 1994-12 | MW-1000R | | | | | | | | | | | | | |
| 1994-12 | MW-1004 | | | | | | | | | | | | | |
| 1994-12 | MW-1004P | | 1086.29<br>1086.07<br>1085.93<br>1085.84 | | | | | | | | | | | |
| 1994-12 | MW-1004S | | 1097.24<br>1097.14<br>1097.03<br>1096.95 | | | | | | | | | | | |
| 1994-12 | MW-1010P | | 1078.61<br>1078.12<br>1078.66<br>1078.33 | | | | | | | | | | | |
| 1995-01 | MW-1000PR | | 1069.57<br>1069.2<br>1068.79<br>1069.18 | 30 | | 52 | 36 | 0.12 | 290 | 9 | 88 | 7.14 | 115.6 | |
| 1995-01 | MW-1000R | | | | | | | | | | | | | |
| 1995-01 | MW-1002 | | 1090.71 | 38 | | < 0.47 | 47 | 0.0073 | 2.7 | 6.2 | 120 | 6.65 | 143.2 | |
| 1995-01 | MW-1002G | | 1090.77 | 90 | | < 0.47 | 110 | 0.0072 | 2.1 | 12 | 240 | 6.74 | 301 | |
| 1995-01 | MW-1004 | | | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995-01 | MW-1004P | | 1080.64<br>1085.72<br>1085.81<br>1085.79 | 170 | | 3.3 | 150 | 0.015 | 29 | 1.7 | 190 | 6.69 | 315 | |
| 1995-01 | MW-1004S | | 1096.75<br>1096.65<br>1096.59<br>1096.47 | 100 | | 1.1 | 57 | 0.0049 | 3.4 | 7.1 | 140 | 6.18 | 142.4 | |
| 1995-01 | MW-1005 | | 1137.52 | 84 | | < 0.47 | 370 | 29 | 650 | 14 | 670 | 6.16 | 1035 | |
| 1995-01 | MW-1005P | | 1137.14 | 270 | | 4.4 | 230 | 0.035 | 41 | < 0.56 | 340 | 7.05 | 511 | |
| 1995-01 | MW-1005S | | 1136.86 | 160 | | < 0.47 | 150 | 4.2 | 220 | 8.9 | 240 | 6.72 | 425 | |
| 1995-01 | MW-1010P | | 1079.52<br>1078.76<br>1078.26<br>1078.61 | 160 | | 6.7 | 160 | 0.004 | 60 | 3.3 | 250 | 7.63 | 337 | |
| 1995-02 | MW-1000PR | | 1069.14<br>1069.19<br>1069.09<br>1069.68 | | | | | | | | | | | |
| 1995-02 | MW-1000R | | | | | | | | | | | | | |
| 1995-02 | MW-1004 | | | | | | | | | | | | | |
| 1995-02 | MW-1004P | | 1085.73<br>1085.63<br>1085.56<br>1085.6 | | | | | | | | | | | |
| 1995-02 | MW-1004S | | 1096.39<br>1096.31<br>1096.24<br>1096.16 | | | | | | | | | | | |
| 1995-02 | MW-1010P | | 1078.21<br>1078.37<br>1078.32<br>1078.49 | | | | | | | | | | | |
| 1995-04 | MW-1000PR | | 1070 | 38 | | 58 | 35 | 0.026 | 320 | 14 | 90 | 7.4 | 106 | |
| 1995-04 | MW-1000R | | | | | | | | | | | | | |
| 1995-04 | MW-1002 | | 1091.7 | 42 | | 2 | 36 | 0.0039 | 0.27 | 7.3 | 170 | 7.4 | 106 | |
| 1995-04 | MW-1002G | | 1091.77 | 93 | | 1.4 | 100 | 0.0044 | < 0.086 | 15 | 170 | 6.9 | 255 | |
| 1995-04 | MW-1002G | Dup. | | 93 | | < 0.68 | 100 | 0.0061 | < 0.086 | 15 | 160 | | | |
| 1995-04 | MW-1004 | | | | | | | | | | | | | |
| 1995-04 | MW-1004P | | 1086.8 | 170 | | 11 | 130 | 0.025 | 31 | 4.7 | 250 | 7.4 | 292 | |
| 1995-04 | MW-1004S | | 1096.68 | 55 | | 7 | 45 | 0.0087 | 0.87 | 7.8 | 150 | 6.7 | 131 | |
| 1995-04 | MW-1005 | | 1138.27 | 79 | | 1.3 | 320 | 28 | 600 | 19 | 770 | 6.2 | 1014 | |
| 1995-04 | MW-1005P | | 1137.45 | 270 | | 3.7 | 200 | 0.078 | 41 | < 0.56 | 300 | 7.5 | 420 | |
| 1995-04 | MW-1005S | | 1137.2 | 170 | | < 0.68 | 130 | 4 | 200 | 9.3 | 190 | 7 | 315 | |
| 1995-04 | MW-1010P | | 1079.01 | 170 | | 9.7 | 130 | 0.005 | 51 | 5.1 | 240 | 7.4 | 311 | |
| 1995-05 | MW-1000PR | | | | | | | | | | | | | |
| 1995-05 | MW-1005 | | 1138.55 | | | | | | | | | | | |
| 1995-05 | MW-1005P | | 1137.9 | | | | | | | | | | | |
| 1995-05 | MW-1005S | | 1137.55 | | | | | | | | | | | |
| 1995-07 | MW-1000PR | | 1070.99 | 34 | | 43 | 36 | 0.0096 | 240 | 10 | 99 | 8.08 | 115.7 | |
| 1995-07 | MW-1000R | | | | | | | | | | | | | |
| 1995-07 | MW-1002 | | 1090.41 | 33 | | 0.97 | 35 | < 0.0017 | 0.42 | 5.3 | 76 | 7.16 | 99 | |
| 1995-07 | MW-1002G | | 1090.65 | 90 | | < 0.68 | 100 | 0.0019 | < 0.086 | 11 | 190 | 6.91 | 275 | |
| 1995-07 | MW-1002G | Dup. | | 97 | | < 0.68 | 100 | 0.005 | 0.28 | 11 | 190 | | | |
| 1995-07 | MW-1004 | | | | | | | | | | | | | |
| 1995-07 | MW-1004P | | 1086.38 | 170 | | 20 | 130 | 0.044 | 77 | 1.8 | 190 | 7.16 | 317 | |
| 1995-07 | MW-1004S | | 1096.28 | 50 | | 6.6 | 50 | 0.0031 | 0.5 | 6.2 | 110 | 6.87 | 126.3 | |
| 1995-07 | MW-1005 | | 1137.69 | 75 | | < 0.68 | 320 | 28 | 640 | 14 | 730 | 6.28 | 1049 | |
| 1995-07 | MW-1005P | | 1137.47 | 280 | | 1.8 | 200 | 0.071 | 90 | < 0.56 | 290 | 7.17 | 454 | |
| 1995-07 | MW-1005S | | 1137.06 | 170 | | < 0.68 | 140 | 3.8 | 200 | 6.9 | 220 | 6.91 | 358 | |
| 1995-07 | MW-1010P | | 1077.61 | 170 | | 21 | 130 | 0.0017 | 11 | 2.4 | 200 | 7.58 | 315 | |
| 1995-10 | MW-1000PR | | 1071.39 | 36 | | 61 | 39 | 0.027 | 110 | 11 | 75 | 7.32 | 118.8 | |
| 1995-10 | MW-1000PR | Dup. | | 34 | | 60 | 39 | 0.036 | 140 | 9.2 | 71 | | | |
| 1995-10 | MW-1000R | | | | | | | | | | | | | |
| 1995-10 | MW-1002 | | 1091.61 | 30 | | 1.6 | 38 | 0.004 | 1.4 | 7.9 | 86 | 6.6 | 120 | |
| 1995-10 | MW-1002G | | 1091.68 | 100 | | < 0.68 | 110 | < 0.0017 | < 0.086 | 14 | 160 | 6.91 | 239 | |
| 1995-10 | MW-1004 | | | | | | | | | | | | | |
| 1995-10 | MW-1004P | | 1079.81 | 170 | | 4.3 | 150 | 0.0086 | 28 | 8.1 | 170 | 7.01 | 308 | |
| 1995-10 | MW-1004S | | 1097.49 | 79 | | 7.6 | 59 | 0.004 | 1.3 | 9.4 | 110 | 6.28 | 144.9 | |
| 1995-10 | MW-1005 | | 1138.86 | 55 | | < 0.68 | 360 | 32 | 700 | 21 | 740 | 6.18 | 976 | |
| 1995-10 | MW-1005P | | 1137.79 | 260 | | 2.1 | 230 | 0.17 | 72 | 5.3 | 260 | 7.22 | 470 | |
| 1995-10 | MW-1005S | | 1137.6 | 170 | | < 0.68 | 160 | 4.3 | 220 | 14 | 220 | 7.11 | 354 | |
| 1995-10 | MW-1010P | | 1079.23 | 140 | | 63 | 140 | 0.037 | 21 | 9.6 | 200 | 7.4 | 291 | |
| 1996-01 | MW-1000PR | | 1069.64 | 27 | | 49 | 33 | 0.011 | 54 | 8.5 | 87 | 6.86 | 112.4 | |
| 1996-01 | MW-1000R | | | | | | | | | | | | | |
| 1996-01 | MW-1002 | | 1091.25 | 35 | | < 0.68 | 41 | 0.0031 | 0.12 | 5.4 | 65 | 6.98 | 153.7 | |
| 1996-01 | MW-1002G | | 1091.31 | 85 | | < 0.68 | 100 | < 0.0017 | < 0.086 | 11 | 150 | 6.79 | 232 | |
| 1996-01 | MW-1002G | Dup. | | 82 | | < 0.68 | 100 | 0.0049 | < 0.086 | 11 | 160 | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1996-01 | MW-1004 | | | | | | | | | | | | | |
| 1996-01 | MW-1004P | | 1078.22 | | | | | | | | | 7.3 | 295 | |
| 1996-01 | MW-1004S | | 1095.89 | 50 | | 3.4 | 54 | 0.0038 | 1.1 | 5.8 | 120 | 6.61 | 144.9 | |
| 1996-01 | MW-1005 | | 1137.72 | 78 | | < 0.68 | 330 | 28 | 610 | 14 | 560 | 6.17 | 963 | |
| 1996-01 | MW-1005P | | 1137.39 | 240 | | < 0.68 | 210 | 0.28 | 97 | 0.93 | 270 | 7.31 | 464 | |
| 1996-01 | MW-1005S | | 1137.09 | 160 | | < 0.68 | 140 | 3.7 | 200 | 7 | 190 | 7.27 | 360 | |
| 1996-01 | MW-1010P | | 1077.28 | 140 | | 45 | 130 | 0.0023 | 13 | 3.4 | 180 | 7.01 | 313 | |
| 1996-04 | MW-1000PR | | 1066.96 | 53 | | 31 | 40 | 0.018 | 64 | 16 | 130 | 7.07 | 149.4 | |
| 1996-04 | MW-1000R | | | | | | | | | | | | | |
| 1996-04 | MW-1002 | | 1091.57 | 32 | | 1.7 | 36 | 0.017 | 0.98 | 5.9 | 120 | 6.75 | 142.2 | |
| 1996-04 | MW-1002 | Dup. | | 32 | | 2.2 | 35 | 0.015 | 0.71 | 5.9 | 85 | | | |
| 1996-04 | MW-1002G | | 1091.63 | 110 | | < 0.68 | 100 | 0.0039 | 0.14 | 11 | 220 | 6.55 | 264 | |
| 1996-04 | MW-1004 | | | | | | | | | | | | | |
| 1996-04 | MW-1004P | | 1077.65 | 150 | | 7.3 | 130 | 0.011 | 22 | 4.2 | 210 | 6.93 | 258 | |
| 1996-04 | MW-1004S | | 1096.23 | 61 | | 2.6 | 52 | 0.0048 | 0.32 | 6.3 | 130 | 5.84 | 168.2 | |
| 1996-04 | MW-1005 | | 1139.05 | 73 | | < 0.68 | 300 | 23 | 550 | 14 | 530 | 5.97 | 967 | |
| 1996-04 | MW-1005P | | 1139.37 | 250 | | < 0.68 | 210 | 0.049 | 35 | 2.2 | 300 | 6.85 | 486 | |
| 1996-04 | MW-1005S | | 1139.04 | 160 | | < 0.68 | 140 | 3.9 | 200 | 7.7 | 240 | 6.8 | 329 | |
| 1996-04 | MW-1010P | | 1076.11 | 160 | | 16 | 140 | 0.0036 | 100 | 3.8 | 210 | 7.16 | 309 | |
| 1996-07 | MW-1000PR | | 1070.33 | 35 | | 33 | 38 | 0.0066 | 120 | 9.3 | 150 | 7.26 | 113.5 | |
| 1996-07 | MW-1000R | | | | | | | | | | | | | |
| 1996-07 | MW-1002 | | 1092.26 | 34 | | 1.6 | 97 | 0.021 | 0.5 | 5.9 | 94 | 6.78 | 119.6 | |
| 1996-07 | MW-1002G | | 1092.33 | 79 | | < 0.54 | 93 | 0.0038 | < 0.18 | 11 | 200 | 6.71 | 221 | |
| 1996-07 | MW-1004 | | | | | | | | | | | | | |
| 1996-07 | MW-1004P | | 1076.74 | 150 | | 3.3 | 130 | 0.0047 | 17 | 4.3 | 200 | 7.21 | 287 | |
| 1996-07 | MW-1004S | | 1096.12 | 55 | | 3.9 | 46 | 0.0023 | 0.72 | 6.9 | 130 | 6.31 | 153.5 | |
| 1996-07 | MW-1004S | Dup. | | 54 | | 3.7 | 46 | 0.0033 | 0.54 | 7 | 140 | | | |
| 1996-07 | MW-1005 | | 1139.74 | 68 | | < 0.54 | 300 | 19 | 470 | 14 | 650 | 6.07 | 858 | |
| 1996-07 | MW-1005P | | 1139.57 | 240 | | 3.9 | 210 | 0.064 | 140 | 2.6 | 300 | 6.9 | 441 | |
| 1996-07 | MW-1005S | | 1139.05 | 150 | | < 0.54 | 140 | 3.6 | 190 | 8.8 | 230 | 6.8 | 323 | |
| 1996-07 | MW-1010P | | 1077.43 | 140 | | 74 | 130 | < 0.001 | 18 | 5.9 | 200 | 7.42 | 285 | |
| 1996-10 | MW-1000PR | | 1069.84 | 38 | | 57 | 36 | 0.010 | 140 | 7.1 | 76 | 7.37 | 108.5 | |
| 1996-10 | MW-1000R | | | | | | | | | | | | | |
| 1996-10 | MW-1002 | | 1090.73 | 41 | | 3.5 | 42 | 0.0063 | 0.2 | 6.9 | 85 | 6.92 | 155.1 | |
| 1996-10 | MW-1002G | | 1090.78 | 86 | | < 0.54 | 93 | 0.0039 | < 0.18 | 11 | 120 | 6.79 | 226 | |
| 1996-10 | MW-1004 | | | | | | | | | | | | | |
| 1996-10 | MW-1004P | | 1076.74 | 160 | | 5.9 | 120 | 0.0042 | 14 | 4.2 | 160 | 7.23 | 340 | |
| 1996-10 | MW-1004S | | 1095.43 | 66 | | 1.8 | 59 | 0.0049 | 0.29 | 6.5 | 100 | 6.25 | 159.5 | |
| 1996-10 | MW-1004S | Dup. | | 61 | | 2.1 | 60 | 0.0069 | 0.5 | 7.1 | 100 | | | |
| 1996-10 | MW-1005 | | 1137.6 | 64 | | 5 | 320 | 17 | 430 | 14 | 550 | 6.16 | 948 | |
| 1996-10 | MW-1005P | | 1137.46 | 260 | | 8.2 | 200 | 0.37 | 67 | 3.6 | 280 | 7.19 | 471 | |
| 1996-10 | MW-1005S | | 1137.07 | 160 | | 0.63 | 130 | 3.6 | 200 | 8.2 | 220 | 7.09 | 329 | |
| 1996-10 | MW-1010P | | 1076.75 | 150 | | 39 | 130 | 0.0026 | 21 | 5.8 | 170 | 7.6 | 302 | |
| 1997-01 | MW-1000PR | | 1070.35 | 27 | | 33 | 33 | 0.0093 | 150 | 9.9 | 160 | 7.22 | 112.4 | |
| 1997-01 | MW-1000R | | | | | | | | | | | | | |
| 1997-01 | MW-1002 | | 1092.32 | 42 | | 0.99 | 46 | 0.011 | < 0.18 | 6.3 | 110 | 7.47 | 123.8 | |
| 1997-01 | MW-1002G | | 1092.43 | 80 | | 1.9 | 96 | 0.0024 | < 0.18 | 9.6 | 190 | 7.15 | 245 | |
| 1997-01 | MW-1004 | | | | | | | | | | | | | |
| 1997-01 | MW-1004P | | 1077.5 | 160 | | 6.2 | 120 | 0.015 | 34 | 5.5 | 220 | 7.42 | 238 | |
| 1997-01 | MW-1004S | | 1095.33 | 61 | | 5.1 | 62 | 0.0061 | 0.25 | 6.6 | 150 | 7.03 | 163.7 | |
| 1997-01 | MW-1005 | | 1138.1 | 79 | | 15 | 300 | 23 | 540 | 13 | 600 | 5.91 | 921 | |
| 1997-01 | MW-1005P | | 1137.41 | 260 | | 2.7 | 210 | 0.073 | 24 | 5.5 | 280 | 7.04 | 462 | |
| 1997-01 | MW-1005S | | 1137.05 | 160 | | 4 | 140 | 3.8 | 200 | 7.4 | 250 | 6.8 | 321 | |
| 1997-01 | MW-1005S | Dup. | | 160 | | 1.6 | 140 | 3.8 | 200 | 6.9 | 210 | | | |
| 1997-01 | MW-1010P | | 1078.4 | 140 | | 56 | 130 | 0.0018 | 28 | 5.8 | 180 | 7.23 | 282 | |
| 1997-04 | MW-1000PR | | 1072.62 | 36 | | 32 | 43 | 0.043 | 190 | 9.9 | 170 | 7.46 | 132.9 | |
| 1997-04 | MW-1000R | | 1085.95 | | | | | | | | | | | |
| 1997-04 | MW-1002 | | 1094.09 | 41 | | 0.79 | 46 | 0.007 | 0.87 | 7 | 110 | 7.4 | 140 | |
| 1997-04 | MW-1002 | Dup. | | 42 | | 1.1 | 46 | 0.0058 | 0.37 | 7.3 | 130 | | | |
| 1997-04 | MW-1002G | | 1094.21 | 81 | | < 0.54 | 100 | 0.0029 | < 0.18 | 10 | 200 | 7 | 260 | |
| 1997-04 | MW-1004 | | | | | | | | | | | | | |
| 1997-04 | MW-1004P | | 1078.42 | 140 | | 16 | 130 | 0.008 | 17 | 6.9 | 210 | 7.25 | 311 | |
| 1997-04 | MW-1004S | | 1096.67 | 60 | | 1.8 | 59 | 0.0049 | 0.72 | 8.2 | 110 | 6.51 | 165.8 | |
| 1997-04 | MW-1005 | | 1139.51 | 66 | | 4.5 | 280 | 21 | 510 | 12 | 620 | 6.34 | 812 | |
| 1997-04 | MW-1005P | | 1138.85 | 250 | | 1.6 | 220 | 0.41 | 77 | 5.8 | 320 | 7 | 480 | |
| 1997-04 | MW-1005S | | 1138.4 | 160 | | 1.6 | 150 | 4.1 | 210 | 9.5 | 250 | 6.8 | 344 | |
| 1997-04 | MW-1010P | | 1081.61 | 150 | | 15 | 150 | 0.008 | 120 | 6.7 | 170 | 7.43 | 346 | |
| 1997-07 | MW-1000PR | | 1073.7 | 33 | | 29 | 39 | 0.0079 | 61 | 7.8 | 110 | 6.72 | 107.1 | |
| 1997-07 | MW-1000R | | | | | | | | | | | | | |
| 1997-07 | MW-1002 | | 1091.83 | 30 | | 1.3 | 45 | 0.0087 | 0.8 | 6.6 | 88 | 6.38 | 118.4 | |
| 1997-07 | MW-1002G | | 1094.93 | 78 | | < 0.54 | 100 | 0.0051 | < 0.18 | 9.3 | 200 | 6.51 | 271 | |
| 1997-07 | MW-1004 | | | | | | | | | | | | | |
| 1997-07 | MW-1004P | | 1083.61 | 140 | | 14 | 140 | 0.0035 | 12 | 6.5 | 200 | 6.94 | 277 | |
| 1997-07 | MW-1004P | Dup. | | 140 | | 13 | 140 | 0.0042 | 12 | 6.4 | 130 | | | |
| 1997-07 | MW-1004S | | 1096.13 | 55 | | 2 | 64 | 0.0091 | 0.38 | 8 | 130 | 6.36 | 202 | |
| 1997-07 | MW-1005 | | 1137.92 | 63 | | 5.9 | 300 | 29 | 800 | 12 | 220 | 6.22 | 755 | |
| 1997-07 | MW-1005P | | 1137.66 | 240 | | 2 | 230 | 0.087 | 66 | 6.7 | 280 | 7.03 | 448 | |
| 1997-07 | MW-1005S | | 1137.65 | 150 | | 0.71 | 150 | 4 | 210 | 9.8 | 260 | 6.83 | 689 | |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997-07 | MW-1010P | | 1083.07 | 130 | | 48 | 140 | 0.001 | 26 | 7.1 | 170 | 7.25 | 295 | |
| 1997-10 | MW-1000PR | | 1087.37 | 40 | | 34 | 45 | 0.0044 | 110 | 5.9 | 82 | 6.55 | 132 | |
| 1997-10 | MW-1000R | | 1090.84 | | | | | | | | | | | |
| 1997-10 | MW-1002 | | 1090.89 | 40 | | 0.86 | 46 | 0.003 | 0.52 | 6 | 76 | 6.02 | 114 | |
| 1997-10 | MW-1002G | | 1090.97 | 88 | | < 0.54 | 98 | < 0.001 | < 0.18 | 7.9 | 160 | 6.35 | 228 | |
| 1997-10 | MW-1004 | | | | | | | | | | | | | |
| 1997-10 | MW-1004P | | 1096.14 | 150 | | 40 | 140 | 0.0047 | 10 | 5.3 | 120 | 6.91 | 349 | |
| 1997-10 | MW-1004S | | 1097.72 | 58 | | 1.6 | 75 | 0.0057 | 0.93 | 15 | 110 | 6.13 | 201 | |
| 1997-10 | MW-1005 | | 1138.61 | 77 | | < 0.54 | 280 | 23 | 590 | 11 | 510 | 6 | 804 | |
| 1997-10 | MW-1005P | | 1137.77 | 240 | | < 0.54 | 230 | 0.17 | 62 | < 5 | 260 | 6.9 | 505 | |
| 1997-10 | MW-1005S | | 1137.49 | 150 | | < 0.54 | 150 | 4.2 | 210 | 6.2 | 190 | 6.77 | 351 | |
| 1997-10 | MW-1010P | | 1087.13 | 140 | | 30 | 140 | < 0.001 | 29 | 5.1 | 170 | 7.03 | 303 | |
| 1997-10 | MW-1010P | Dup. | | 130 | | 31 | 140 | 0.0039 | 28 | 6.2 | 140 | | | |
| 1998-01 | MW-1000PR | | 1087.51 | 54 | | 40 | 110 | 0.0061 | 490 | 180 | 96 | 6.47 | 576 | |
| 1998-01 | MW-1000PR | Dup. | | 61 | | 42 | 120 | 0.0071 | 520 | 260 | 200 | | | |
| 1998-01 | MW-1000R | | 1086.97 | | | | | | | | | | | |
| 1998-01 | MW-1002 | | 1090 | 40 | | 1.4 | 47 | 0.034 | 0.26 | 7.6 | 82 | 7.15 | 109.8 | |
| 1998-01 | MW-1002G | | 1090.06 | 82 | | < 0.54 | 100 | 0.0034 | < 0.18 | 12 | 150 | 6.85 | 218 | |
| 1998-01 | MW-1004 | | | | | | | | | | | | | |
| 1998-01 | MW-1004P | | 1097.86 | 150 | | 27 | 140 | 0.012 | 12 | 8.8 | 140 | 7.13 | 271 | |
| 1998-01 | MW-1004S | | 1099.89 | 48 | | 1.6 | 58 | 0.0027 | 0.3 | 11 | 120 | 6.6 | 140.1 | |
| 1998-01 | MW-1005 | | 1136.65 | 71 | | < 0.54 | 260 | 21 | 490 | 14 | 490 | 6.1 | 782 | |
| 1998-01 | MW-1005P | | 1136 | 250 | | 0.73 | 220 | 0.41 | 72 | 11 | 270 | 7.06 | 456 | |
| 1998-01 | MW-1005S | | 1136.35 | 170 | | < 0.54 | 130 | 3.3 | 170 | 11 | 200 | 7.09 | 313 | |
| 1998-01 | MW-1010P | | 1087.61 | 140 | | 26 | 130 | < 0.001 | 29 | 9.2 | 190 | 7.4 | 284 | |
| 1998-04 | MW-1000PR | | 1089.61 | 93 | | 98 | 470 | 0.044 | 3000 | 310 | 770 | 6.69 | 888 | |
| 1998-04 | MW-1000PR | Dup. | | 94 | | 95 | 470 | 0.0054 | 3000 | 320 | 790 | | | |
| 1998-04 | MW-1000R | | 1090.61 | | | | | | | | | | | |
| 1998-04 | MW-1002 | | 1095.91 | 30 | | 0.86 | 37 | 0.05 | 1.7 | < 5 | 89 | 7.32 | 131.7 | |
| 1998-04 | MW-1002G | | 1095.83 | 75 | | < 0.54 | 98 | 0.0047 | 0.21 | 11 | 180 | 6.97 | 245 | |
| 1998-04 | MW-1004 | | | | | | | | | | | | | |
| 1998-04 | MW-1004P | | 1099.54 | 96 | | 20 | 130 | 0.0064 | 9.9 | 8.5 | 170 | 7.41 | 303 | |
| 1998-04 | MW-1004S | | 1103.49 | 47 | | 0.92 | 60 | 0.0049 | 0.52 | 10 | 140 | 7.97 | 164.6 | |
| 1998-04 | MW-1005 | | 1139.07 | 69 | | < 0.54 | 250 | 21 | 510 | 13 | 440 | 6.06 | 725 | |
| 1998-04 | MW-1005P | | 1137.92 | 240 | | 1.1 | 210 | 0.077 | 29 | 9.6 | 290 | 7.36 | 461 | |
| 1998-04 | MW-1005S | | 1137.81 | 150 | | < 0.54 | 140 | 4.2 | 210 | 11 | 250 | 7.19 | 332 | |
| 1998-04 | MW-1010P | | 1089.49 | 130 | | 19 | 130 | 0.0034 | 43 | 5.6 | 170 | 7.64 | 294 | |
| 1998-07 | MW-1000PR | | 1086.3 | 71 | | 66 | 480 | 0.076 | 1800 | 350 | 250 | 6.28 | 1097 | |
| 1998-07 | MW-1000PR | Dup. | | 99 | | 160 | 640 | 0.58 | 3600 | 440 | 330 | | | |
| 1998-07 | MW-1000R | | | | | | | | | | | | | |
| 1998-07 | MW-1002 | | 1090.67 | 44 | | 0.9 | 50 | 0.0077 | 0.92 | 8.2 | 100 | 6.55 | 124.8 | |
| 1998-07 | MW-1002G | | 1090.72 | 82 | | 0.69 | 93 | 0.0038 | < 0.18 | 13 | 180 | 6.81 | 215 | |
| 1998-07 | MW-1004 | | | | | | | | | | | | | |
| 1998-07 | MW-1004P | | 1103.72 | 160 | | 10 | 130 | 0.0077 | 32 | 9.2 | 220 | 7.08 | 292 | |
| 1998-07 | MW-1004S | | 1104.88 | 40 | | 1.4 | 60 | 0.0054 | 0.29 | 13 | 140 | 6.5 | 162.3 | |
| 1998-07 | MW-1005 | | 1138.11 | 130 | | < 0.54 | 240 | 17 | 400 | 16 | 440 | 6.16 | 644 | |
| 1998-07 | MW-1005P | | 1137.63 | 260 | | < 0.54 | 220 | 0.34 | 100 | 12 | 270 | 7.01 | 458 | |
| 1998-07 | MW-1005S | | 1137.32 | 160 | | 11 | 150 | 3.9 | 210 | 15 | 230 | 6.7 | 305 | |
| 1998-07 | MW-1010P | | 1086.64 | 150 | | 27 | 130 | 0.0034 | 29 | 11 | 170 | 7.24 | 284 | |
| 1998-10 | MW-1000PR | | 1086.24 | 100 | | 53 | 570 | 0.013 | 2000 | 480 | 960 | 6.24 | 1338 | |
| 1998-10 | MW-1000PR | Dup. | | 100 | | 40 | 650 | 0.017 | 3300 | 460 | 1100 | | | |
| 1998-10 | MW-1000R | | | | | | | | | | | | | |
| 1998-10 | MW-1002 | | 1090.03 | 52 | | 0.56 | 57 | 0.0096 | 0.4 | 6.9 | 120 | 7.13 | 158 | |
| 1998-10 | MW-1002G | | 1090.04 | 76 | | < 0.54 | 97 | < 0.001 | < 0.18 | 13 | 120 | 7 | 194 | |
| 1998-10 | MW-1004 | | | | | | | | | | | | | |
| 1998-10 | MW-1004P | | 1102.48 | 140 | | 5 | 140 | 0.0094 | 12 | 8.6 | 150 | 7.06 | 327 | |
| 1998-10 | MW-1004S | | 1104.56 | 48 | | 1.1 | 60 | 0.0029 | 0.45 | 14 | 98 | 6.29 | 324 | |
| 1998-10 | MW-1005 | | 1136.87 | 65 | | < 0.54 | 250 | 19 | 460 | 17 | 430 | 6.12 | 724 | |
| 1998-10 | MW-1005P | | 1136.19 | 230 | | 1.9 | 220 | 0.17 | 63 | 9.4 | 250 | 6.96 | 477 | |
| 1998-10 | MW-1005S | | 1136.02 | 150 | | < 0.54 | 150 | 3.9 | 210 | 13 | 180 | 6.82 | 327 | |
| 1998-10 | MW-1010P | | 1086.42 | 130 | | 20 | 130 | < 0.001 | 22 | 8.6 | 190 | 7.53 | 309 | |
| 1999-02 | MW-1000PR | | 1086.21 | 120 | | 37 | 760 | 1.2 | 4800 | 570 | 1200 | 6.15 | 1293 | |
| 1999-02 | MW-1000R | | 1086.44 | | | | | | | | | | | |
| 1999-02 | MW-1002 | | 1089.33 | 54 | | < 0.54 | 60 | 0.012 | 0.71 | 8.3 | 92 | 7.29 | 142.9 | |
| 1999-02 | MW-1002G | | 1089.39 | 85 | | < 0.54 | 97 | 0.0035 | 0.24 | 11 | 160 | 6.54 | 215 | |
| 1999-02 | MW-1004 | | | | | | | | | | | | | |
| 1999-02 | MW-1004P | | 1101.9 | 160 | | 2.6 | 140 | 0.007 | 12 | 7.6 | 150 | 7.47 | 267 | |
| 1999-02 | MW-1004P | Dup. | | 160 | | 2.8 | 140 | 0.0069 | 12 | 7.6 | 170 | | | |
| 1999-02 | MW-1004S | | 1103.7 | 44 | | 0.6 | 59 | 0.005 | 0.63 | 11 | 120 | 6.59 | 141.8 | |
| 1999-02 | MW-1005 | | 1135.69 | 74 | | < 0.54 | 230 | 21 | 470 | 13 | 370 | 6.21 | 598 | |
| 1999-02 | MW-1005P | | 1135.35 | 250 | | < 0.54 | 220 | 0.066 | 27 | 7.8 | 250 | 7.6 | 449 | |
| 1999-02 | MW-1005S | | 1135.21 | 170 | | < 0.54 | 150 | 4 | 200 | 8.9 | 180 | 6.87 | 319 | |
| 1999-02 | MW-1010P | | 1086.37 | 140 | | 24 | 130 | 0.0046 | 20 | 8.3 | 170 | 7.01 | 288 | |
| 1999-02 | MW-1013 | | | | | | | | | | | | | |
| 1999-02 | MW-1013A | | | | | | | | | | | | | |
| 1999-02 | MW-1013B | | 1093.95 | 630 | | 36 | 2300 | 0.045 | 25000 | 1400 | 3100 | 6.2 | 3540 | |
| 1999-02 | MW-1013C | | 1095.27 | 480 | | 100 | 2100 | 0.92 | 7200 | 1300 | 3000 | 6.3 | 3170 | |
| 1999-02 | MW-1014 | | | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999-02 | MW-1014A | | | | | | | | | | | | | |
| 1999-02 | MW-1014B | | 1105.62 | 510 | | 810 | 2100 | 0.062 | 23000 | 1200 | 2900 | 6.2 | 3280 | |
| 1999-02 | MW-1014C | | 1103.39 | 370 | | < 4.7 | 980 | 14 | 4300 | 520 | 1200 | 6.3 | 1900 | |
| 1999-04 | MW-1000PR | | 1086.61 | 120 | | 54 | 740 | 1.2 | 5300 | 440 | 1300 | 6.2 | 1319 | |
| 1999-04 | MW-1000PR | Dup. | | 120 | | 55 | 770 | 1.3 | 5300 | 340 | 1200 | | | |
| 1999-04 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 1999-04 | MW-1002 | | 1091.06 | 52 | | 0.51 | 59 | 0.0018 | < 0.41 | 7.3 | 72 | 6.6 | 160 | |
| 1999-04 | MW-1002G | | 1091.1 | 85 | | < 0.47 | 95 | < 0.001 | < 0.41 | 9.8 | 100 | 6.5 | 248 | |
| 1999-04 | MW-1004 | | | | | | | | | | | | | |
| 1999-04 | MW-1004P | | 1103.29 | 160 | | 3.2 | 130 | 0.0066 | 9 | 6.6 | 140 | 6.7 | 294 | |
| 1999-04 | MW-1004S | | 1105.49 | 46 | | 1.7 | 60 | 0.0037 | 0.87 | 10 | 82 | 6.1 | 157 | |
| 1999-04 | MW-1005 | | 1137.97 | 69 | | < 0.47 | 200 | 20 | 480 | 11 | 430 | 6.3 | 596 | |
| 1999-04 | MW-1005P | | 1136.65 | 250 | | 1.1 | 210 | 0.049 | 23 | 7.8 | 230 | 7 | 464 | |
| 1999-04 | MW-1005S | | 1136.65 | 160 | | < 0.47 | 140 | 4.1 | 210 | 8.6 | 210 | 7 | 297 | |
| 1999-04 | MW-1010P | | 1086.95 | 160 | | 12 | 140 | 0.019 | 67 | 7.6 | 140 | 7.1 | 284 | |
| 1999-04 | MW-1013 | | 1105.11 | | | | | | | | | | | |
| 1999-04 | MW-1013A | | 1094.73 | | | | | | | | | | | |
| 1999-04 | MW-1013B | | 1094.58 | 550 | | 16 | 2300 | 0.33 | 30000 | 770 | 3700 | 6.2 | 3130 | |
| 1999-04 | MW-1013C | | 1095.73 | 430 | | 75 | 2200 | 0.84 | 7700 | 920 | 3300 | 6.4 | 3030 | |
| 1999-04 | MW-1014 | | | | | | | | | | | | | |
| 1999-04 | MW-1014A | | 1103.93 | | | | | | | | | | | |
| 1999-04 | MW-1014B | | 1106.23 | 470 | | 420 | 2100 | 0.033 | 23000 | 770 | 3300 | 6.2 | 2890 | |
| 1999-04 | MW-1014C | | 1102.83 | 330 | | < 4.7 | 1000 | 15 | 4500 | 440 | 1200 | 6.3 | 1623 | |
| 1999-06 | MW-1000R | | 1087.69 | | | | | | | | | | | |
| 1999-06 | MW-1013 | | 1105.34 | | | | | | | | | | | |
| 1999-06 | MW-1013A | | 1094.82 | | | | | | | | | | | |
| 1999-06 | MW-1014 | | | | | | | | | | | | | |
| 1999-06 | MW-1014A | | 1105.19 | | | | | | | | | | | |
| 1999-07 | MW-1000PR | | 1087.96 | 130 | < 42 | 130 | 770 | 3.3 | 5400 | 380 | 1300 | 6.09 | 1310 | |
| 1999-07 | MW-1000PR | Dup. | | 130 | < 42 | 97 | 770 | 3.2 | 5600 | 350 | 1300 | | | |
| 1999-07 | MW-1000R | | 1088.18 | | | | | | | | | | | |
| 1999-07 | MW-1002 | | 1092.31 | 50 | < 4.2 | < 4.7 | 58 | 0.0027 | < 0.41 | 5.9 | 110 | 6.73 | 148.6 | |
| 1999-07 | MW-1002G | | 1092.3 | 84 | 5 | < 4.7 | 100 | 0.0022 | < 0.41 | 11 | 180 | 7 | 227 | |
| 1999-07 | MW-1004 | | 1107.06 | | | | | | | | | | | |
| 1999-07 | MW-1004P | | 1104.96 | 160 | < 4.2 | < 6.9 | 140 | 0.014 | 10 | 2.7 | 180 | 7.07 | 308 | |
| 1999-07 | MW-1004S | | 1107.29 | 40 | < 4.2 | < 6.9 | 59 | 0.0068 | 2.3 | 10 | 110 | 5.94 | 157.9 | |
| 1999-07 | MW-1005 | | 1139.21 | 65 | 5 | < 4.7 | 200 | 19 | 460 | 12 | 530 | 6.15 | 603 | |
| 1999-07 | MW-1005P | | 1138.09 | 240 | < 4.2 | < 4.7 | 220 | 0.054 | 51 | 7.3 | 250 | 6.91 | 501 | |
| 1999-07 | MW-1005S | | 1138.05 | 160 | < 4.2 | < 4.7 | 150 | 4.3 | 220 | 9.5 | 240 | 6.72 | 331 | |
| 1999-07 | MW-1010P | | 1088.46 | 150 | 16 | 12 | 140 | 0.0074 | 59 | 5.5 | 200 | 7.19 | 269 | |
| 1999-07 | MW-1013 | | 1106.07 | | | | | | | | | | | |
| 1999-07 | MW-1013A | | 1095.38 | | | | | | | | | | | |
| 1999-07 | MW-1013B | | 1095.2 | 620 | < 42 | 33 | 2200 | 0.76 | 29000 | 1600 | 3800 | 6.39 | 3020 | |
| 1999-07 | MW-1013C | | 1096.67 | 430 | 83 | 50 | 2100 | 1.3 | 7300 | 870 | 2700 | 6.42 | 3020 | |
| 1999-07 | MW-1014 | | | | | | | | | | | | | |
| 1999-07 | MW-1014A | | 1106.42 | | | | | | | | | | | |
| 1999-07 | MW-1014B | | 1107.13 | 540 | 70 | 520 | 2100 | 0.072 | 23000 | 580 | 3100 | 6.34 | 3540 | |
| 1999-07 | MW-1014C | | 1103.9 | 370 | < 42 | 16 | 930 | 14 | 4000 | 370 | 1200 | 6.39 | 1657 | |
| 1999-10 | MW-1000PR | | 1086.75 | 130 | < 8.4 | 17 | 760 | 3.6 | 5200 | 680 | 1100 | 6.7 | 1400 | |
| 1999-10 | MW-1000R | | 1086.8 | | | | | | | | | | | |
| 1999-10 | MW-1002 | | 1090.59 | 46 | | < 0.47 | 51 | 0.029 | < 0.41 | 6.9 | 91 | 7 | 140 | |
| 1999-10 | MW-1002G | | 1090.62 | 87 | | < 0.47 | 100 | 0.0061 | < 0.41 | 13 | 150 | 7.2 | 240 | |
| 1999-10 | MW-1004 | | 1106.62 | | | | | | | | | | | |
| 1999-10 | MW-1004P | | 1104.88 | 160 | < 4.2 | 1.9 | 140 | 0.014 | 8.1 | 2.8 | 180 | 7.4 | 320 | |
| 1999-10 | MW-1004S | | 1106.68 | 41 | < 4.2 | 0.83 | 57 | 0.0089 | 0.63 | 15 | 84 | 6.5 | 160 | |
| 1999-10 | MW-1005 | | 1137.86 | 65 | | < 0.47 | 190 | 18 | 410 | 17 | 400 | 6.5 | 570 | |
| 1999-10 | MW-1005P | | 1137.64 | 240 | | < 0.47 | 220 | 0.97 | 88 | < 1.5 | 260 | 7.3 | 460 | |
| 1999-10 | MW-1005S | | 1137.32 | 160 | | < 0.47 | 150 | 4.1 | 210 | 5.6 | 210 | 7 | 320 | |
| 1999-10 | MW-1010P | | 1086.81 | 150 | 6.8 | 3.5 | 140 | 0.0096 | 65 | 5.3 | 170 | 7.6 | 300 | |
| 1999-10 | MW-1010P | Dup. | | 140 | 13 | 0.84 | 140 | 0.011 | 130 | 5.2 | 170 | | | |
| 1999-10 | MW-1013 | | 1105.8 | | | | | | | | | | | |
| 1999-10 | MW-1013A | | 1095.51 | | | | | | | | | | | |
| 1999-10 | MW-1013B | | 1095.49 | 550 | < 42 | < 9.4 | 2200 | 0.17 | 28000 | 1900 | 3700 | 6.6 | 3200 | |
| 1999-10 | MW-1013C | | 1096.97 | 410 | < 42 | < 9.4 | 2200 | 1.4 | 7600 | 2000 | 3000 | 6.8 | 3300 | |
| 1999-10 | MW-1014 | | 1111.6 | | | | | | | | | | | |
| 1999-10 | MW-1014A | | 1107.87 | | | | | | | | | | | |
| 1999-10 | MW-1014B | | 1108.33 | 570 | < 42 | 530 | 2200 | < 0.010 | 23000 | 1700 | 3100 | 6.4 | 3200 | |
| 1999-10 | MW-1014C | | 1104.81 | 380 | < 42 | < 9.4 | 960 | 14 | 4000 | 700 | 1200 | 6.6 | 1600 | |
| 2000-01 | MW-1000PR | | 1086.61 | 140 | | 1.9 | 670 | 4.4 | 4100 | 610 | 1000 | 6.3 | 1300 | |
| 2000-01 | MW-1000R | | 1086.58 | | | | | | | | | | | |
| 2000-01 | MW-1002 | | 1089.42 | 57 | | < 0.47 | 65 | < 0.001 | < 0.41 | 5.6 | 110 | 6.9 | 170 | |
| 2000-01 | MW-1002G | | 1089.43 | 87 | | < 0.47 | 98 | 0.0031 | < 0.41 | 12 | 120 | 7.1 | 240 | |
| 2000-01 | MW-1004 | | | | | | | | | | | | | |
| 2000-01 | MW-1004P | | 1103.16 | 160 | | < 0.47 | 130 | 0.085 | 56 | < 5 | 150 | 6.7 | 310 | |
| 2000-01 | MW-1004S | | 1104.64 | 43 | | < 0.47 | 59 | 0.0051 | 0.65 | 16 | 110 | 6.7 | 160 | |
| 2000-01 | MW-1005 | | 1137.18 | 85 | | < 0.47 | 200 | 16 | 530 | 16 | 300 | 6.8 | 600 | |
| 2000-01 | MW-1005P | | 1136.65 | 250 | | < 0.47 | 210 | 0.14 | 47 | < 5 | 280 | 6.7 | 480 | |
| 2000-01 | MW-1005S | | 1136.76 | 170 | | < 0.47 | 150 | 3.9 | 210 | < 5 | 210 | 6.7 | 380 | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000-01 | MW-1010P | | 1086.65 | 150 | | 2.2 | 130 | 0.017 | 39 | < 5 | 130 | 6.8 | 280 | |
| 2000-01 | MW-1013 | | 1104.64 | | | | | | | | | | | |
| 2000-01 | MW-1013A | | 1095.62 | | | | | | | | | | | |
| 2000-01 | MW-1013B | | 1095.59 | 570 | 17 | < 4.7 | 2100 | 0.41 | 30000 | 1700 | 3300 | 6.4 | 3000 | |
| 2000-01 | MW-1013C | | 1097.1 | 510 | < 15 | < 4.7 | 2100 | 1.5 | 7300 | 1700 | 2900 | 6.5 | 2700 | |
| 2000-01 | MW-1014 | | 1112.07 | | | | | | | | | | | |
| 2000-01 | MW-1014A | | 1109.22 | | | | | | | | | | | |
| 2000-01 | MW-1014B | | 1108.88 | 490 | < 15 | 500 | 1900 | 0.055 | 20000 | 1400 | 3200 | 6.5 | 3000 | |
| 2000-01 | MW-1014C | | 1105.18 | 330 | < 15 | < 0.47 | 810 | 12 | 3200 | 540 | 1200 | 6.6 | 1500 | |
| 2000-01 | MW-1014C | Dup. | | 310 | < 15 | < 0.47 | 820 | 11 | 3100 | 560 | 1300 | | | |
| 2000-04 | MW-1000PR | | 1087.26 | 140 | | 19 | 720 | 3.4 | 3800 | 560 | 920 | 6.93 | 1274 | |
| 2000-04 | MW-1000PR | Dup. | | 150 | | 18 | 700 | 4.3 | 4000 | 550 | 1000 | | | |
| 2000-04 | MW-1000R | | 1087.73 | | | | | | | | | | | |
| 2000-04 | MW-1002 | | 1090.33 | 55 | | 0.91 | 67 | 0.0039 | < 0.41 | 5.2 | 98 | 6.82 | 166 | |
| 2000-04 | MW-1002G | | 1090.34 | 89 | | < 0.6 | 100 | 0.0027 | < 0.41 | 11 | 140 | 6.84 | 239 | |
| 2000-04 | MW-1004 | | | | | | | | | | | | | |
| 2000-04 | MW-1004P | | 1103.32 | 160 | | 1.7 | 140 | 0.012 | 7.9 | < 5 | 170 | 6.86 | 293 | |
| 2000-04 | MW-1004S | | 1104.96 | 42 | | 1.3 | 56 | 0.0027 | < 0.41 | 15 | 98 | 6.9 | 156.3 | |
| 2000-04 | MW-1005 | | 1138.07 | 66 | | 0.67 | 190 | 18 | 410 | 13 | 400 | 6.76 | 598 | |
| 2000-04 | MW-1005P | | 1137.05 | 250 | | < 0.6 | 220 | 0.37 | 80 | < 5 | 220 | 7.27 | 483 | 64 |
| 2000-04 | MW-1005S | | 1136.99 | 170 | | < 0.6 | 150 | 4.2 | 220 | < 5 | 230 | 7.04 | 354 | |
| 2000-04 | MW-1010P | | 1087.46 | 140 | | 9.9 | 150 | 0.0066 | 24 | < 5 | 140 | 7.1 | 283 | 77 |
| 2000-04 | MW-1013 | | 1103.87 | | | | | | | | | | | 97 |
| 2000-04 | MW-1013A | | 1095.36 | | | | | | | | | | | 97 |
| 2000-04 | MW-1013B | | 1095.54 | 520 | 12 | 19 | 2200 | 0.27 | 32000 | 1200 | 3600 | 6.63 | 3120 | 230 |
| 2000-04 | MW-1013C | | 1097.39 | 460 | 14 | 11 | 2200 | 1.6 | 7800 | 1700 | 2900 | 6.73 | 3370 | 177 |
| 2000-04 | MW-1014 | | 1112.41 | | | | | | | | | | | 160 |
| 2000-04 | MW-1014A | | 1109.24 | 390 | 15 | < 6 | 1300 | 0.55 | 7200 | 970 | 1800 | 6.87 | 2220 | 165 |
| 2000-04 | MW-1014B | | 1108.85 | 480 | < 7.5 | 520 | 2100 | < 0.15 | 22000 | 1500 | 3200 | 6.43 | 2940 | 290 |
| 2000-04 | MW-1014C | | 1105.25 | 320 | 14 | < 6 | 870 | 13 | 3600 | 440 | 1000 | 6.65 | 1470 | 88 |
| 2000-07 | MW-1000PR | | 1087.3 | 140 | < 8.7 | 7.3 | 710 | 2.3 | 5000 | 550 | 930 | 6.3 | 1200 | |
| 2000-07 | MW-1000R | | 1087.74 | | | | | | | | | | | |
| 2000-07 | MW-1002 | | 1092.01 | 52 | < 1.7 | < 0.53 | 66 | < 0.005 | < 2 | 5.7 | 110 | 6.7 | 160 | |
| 2000-07 | MW-1002G | | 1092 | 90 | < 1.7 | < 0.53 | 110 | < 0.005 | < 2 | 12 | 160 | 6.6 | 220 | |
| 2000-07 | MW-1004 | | | | | | | | | | | | | |
| 2000-07 | MW-1004P | | 1104.68 | 160 | < 1.7 | 0.65 | 150 | 0.0086 | 22 | < 5 | 160 | 6.3 | 300 | |
| 2000-07 | MW-1004S | | 1106.7 | 41 | < 1.7 | 1.2 | 61 | < 0.005 | < 2 | 16 | 100 | 6.6 | 150 | |
| 2000-07 | MW-1005 | | 1138.43 | 64 | < 1.7 | 0.7 | 210 | 21 | 600 | 15 | 470 | 6.6 | 520 | |
| 2000-07 | MW-1005P | | 1138.08 | 250 | < 1.7 | < 0.53 | 230 | 0.058 | 75 | < 5 | 290 | 6.5 | 460 | |
| 2000-07 | MW-1005S | | 1137.92 | 170 | 2.9 | < 0.53 | 170 | 4.6 | 240 | < 5 | 200 | 6.5 | 330 | |
| 2000-07 | MW-1010P | | 1087.16 | 140 | 12 | 14 | 140 | < 0.025 | 26 | < 5 | 190 | 6.5 | 290 | |
| 2000-07 | MW-1010P | Dup. | | 150 | 11 | 9.9 | 140 | 0.013 | 40 | < 5 | 170 | | | |
| 2000-07 | MW-1013 | | 1104.58 | | | | | | | | | | | |
| 2000-07 | MW-1013A | | 1095.79 | | | | | | | | | | | |
| 2000-07 | MW-1013B | | 1096.09 | 660 | < 21 | 14 | 2300 | < 0.36 | 34000 | 1600 | 3300 | 6.3 | 3000 | |
| 2000-07 | MW-1013C | | 1097.84 | 520 | < 21 | < 12 | 2300 | 2.2 | 8400 | 1600 | 3300 | 6.3 | 3100 | |
| 2000-07 | MW-1014 | | 1113 | | | | | | | | | | | |
| 2000-07 | MW-1014A | | 1110.5 | 430 | < 21 | < 12 | 1400 | 1.2 | 7100 | 960 | 2200 | 6.6 | 2000 | |
| 2000-07 | MW-1014B | | 1109.47 | 510 | < 21 | 330 | 2200 | < 0.36 | 21000 | 1600 | 3000 | 6.3 | 3000 | |
| 2000-07 | MW-1014C | | 1105.82 | 350 | 39 | < 12 | 890 | 13 | 3500 | 480 | 1400 | 6.4 | 1400 | |
| 2000-10 | MW-1000PR | | 1086.79 | 170 | | < 2.7 | 680 | 6.6 | 4200 | 460 | 1100 | 6.19 | 1189 | |
| 2000-10 | MW-1000R | | 1087.01 | | | | | | | | | | | |
| 2000-10 | MW-1002 | | 1090.59 | 47 | | < 0.53 | 58 | < 0.005 | < 2 | 5.7 | 120 | 6.35 | 125 | |
| 2000-10 | MW-1002G | | 1090.62 | 89 | | < 0.53 | 110 | < 0.005 | < 2 | 12 | 150 | 6.6 | 223 | |
| 2000-10 | MW-1004 | | 1105.86 | | | | | | | | | | | |
| 2000-10 | MW-1004P | | 1104.4 | 160 | | 0.8 | 140 | 0.008 | 16 | < 5 | 200 | 7.16 | 284 | |
| 2000-10 | MW-1004P | Dup. | | 160 | | < 0.53 | 140 | 0.17 | 79 | < 5 | 200 | | | |
| 2000-10 | MW-1004S | | 1105.86 | 35 | | 1 | 58 | < 0.005 | < 2 | 18 | 130 | 5.99 | 134.1 | |
| 2000-10 | MW-1005 | | 1137.55 | 58 | | 0.58 | 190 | 17 | 390 | 15 | 430 | 6.17 | 530 | |
| 2000-10 | MW-1005P | | 1137.56 | 240 | | 0.74 | 220 | 0.13 | 38 | < 5 | 260 | 7.26 | 448 | |
| 2000-10 | MW-1005S | | 1137.2 | 170 | | < 0.53 | 160 | 4.3 | 220 | < 5 | 210 | 7.34 | 330 | |
| 2000-10 | MW-1010P | | 1086.67 | 150 | | 4.3 | 140 | 0.41 | 250 | < 5 | 220 | 7.49 | 268 | |
| 2000-10 | MW-1013 | | 1105.06 | | | | | | | | | | | |
| 2000-10 | MW-1013A | | 1096.2 | | | | | | | | | | | |
| 2000-10 | MW-1013B | | 1096.45 | 630 | | < 12 | 2200 | 0.84 | 35000 | 1500 | 3200 | 6.28 | 3180 | |
| 2000-10 | MW-1013C | | 1097.86 | 550 | | < 12 | 2200 | 1.6 | 8200 | 1600 | 3200 | 6.37 | 3310 | |
| 2000-10 | MW-1014 | | 1113.98 | | | | | | | | | | | |
| 2000-10 | MW-1014A | | 1111.39 | 430 | | < 12 | 1400 | 0.96 | 6700 | 880 | 2300 | 6.68 | 2250 | |
| 2000-10 | MW-1014B | | 1110.09 | 520 | | 430 | 2200 | < 0.36 | 21000 | 1500 | 2900 | 6.26 | 3240 | |
| 2000-10 | MW-1014C | | 1106.21 | 390 | | < 12 | 840 | 12 | 3200 | 450 | 1300 | 6.36 | 1490 | |
| 2001-01 | MW-1000PR | | 1088.39 | 180 | | < 2.7 | 610 | 6.8 | 3700 | 440 | 1000 | 6.13 | 1192 | 143 |
| 2001-01 | MW-1000R | | 1088.35 | | | | | | | | | | | |
| 2001-01 | MW-1002 | | 1089.93 | 58 | | < 0.53 | 66 | < 0.005 | < 2 | 6.7 | 120 | 6.55 | 156.3 | |
| 2001-01 | MW-1002G | | 1089.93 | 90 | | < 0.53 | 99 | < 0.005 | < 2 | 12 | 150 | 6.48 | 253 | |
| 2001-01 | MW-1004 | | 1104.61 | | | | | | | | | | | |
| 2001-01 | MW-1004P | | 1103.36 | 160 | | < 0.53 | 130 | 0.085 | 52 | < 5 | 130 | 7.25 | 293 | 46 |
| 2001-01 | MW-1004S | | 1104.72 | 39 | | < 0.53 | 56 | < 0.005 | < 2 | 19 | 110 | 5.9 | 139.3 | 180 |
| 2001-01 | MW-1005 | | 1136.92 | 58 | | < 0.53 | 160 | 16 | 370 | 15 | 300 | 6.18 | 520 | |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-01 | MW-1005P | | 1136.65 | 250 | | < 0.53 | 210 | 0.058 | 24 | < 5 | 260 | 7.17 | 454 | 37 |
| 2001-01 | MW-1005S | | 1136.42 | 170 | | < 0.53 | 150 | 4.1 | 210 | < 5 | 200 | 6.95 | 335 | |
| 2001-01 | MW-1010P | | 1088.16 | 160 | | < 0.53 | 140 | 0.17 | 180 | < 5 | 170 | 7.57 | 270 | 88 |
| 2001-01 | MW-1013 | | 1103.78 | | | | | | | | | | | |
| 2001-01 | MW-1013A | | 1095.72 | | | | | | | | | | | |
| 2001-01 | MW-1013B | | 1095.86 | 590 | | < 12 | 1900 | 0.41 | 30000 | 1600 | 3300 | 6.14 | 3230 | 174 |
| 2001-01 | MW-1013C | | 1098.03 | 520 | | < 12 | 2100 | 2.6 | 7800 | 1600 | 3200 | 6.27 | 3310 | 80 |
| 2001-01 | MW-1013C | Dup. | | 470 | | < 12 | 2000 | 2.5 | 7700 | 1600 | 3000 | | | |
| 2001-01 | MW-1014 | | 1113.86 | | | | | | | | | | | |
| 2001-01 | MW-1014A | | 1111.59 | 410 | | < 12 | 1200 | 0.83 | 5400 | 970 | 1900 | 6.46 | 2310 | 113 |
| 2001-01 | MW-1014B | | 1109.89 | 550 | | 450 | 1900 | < 0.36 | 18000 | 1400 | 2600 | 6.29 | 3140 | 226 |
| 2001-01 | MW-1014C | | 1106.15 | 340 | | < 12 | 760 | 11 | 2900 | 450 | 1100 | 6.46 | 1452 | 64 |
| 2001-04 | MW-1000PR | | 1091.12 | 170 | | 14 | 650 | 1.3 | 2900 | 480 | 910 | 5.9 | 1200 | 175 |
| 2001-04 | MW-1000R | | 1092.76 | | | | | | | | | | | |
| 2001-04 | MW-1002 | | 1095.48 | 60 | | < 2.7 | 72 | 0.012 | < 2 | 6.4 | 99 | 6.5 | 130 | |
| 2001-04 | MW-1002G | | 1095.38 | 89 | | < 2.7 | 110 | < 0.005 | < 2 | 11 | 170 | 6.3 | 200 | |
| 2001-04 | MW-1002G | Dup. | | 89 | | < 2.7 | 110 | < 0.005 | < 2 | 11 | 200 | | | |
| 2001-04 | MW-1004 | | 1110.8 | | | | | | | | | | | |
| 2001-04 | MW-1004P | | 1107.46 | 160 | | < 2.7 | 140 | 0.055 | 54 | < 5 | 160 | 7 | 260 | 144 |
| 2001-04 | MW-1004S | | 1110.92 | 35 | | < 2.7 | 60 | < 0.005 | < 2 | 19 | 73 | 5.5 | 130 | 230 |
| 2001-04 | MW-1005 | | 1140.04 | 61 | | < 2.7 | 170 | 15 | 350 | 14 | 370 | 5.6 | 460 | |
| 2001-04 | MW-1005P | | 1138.8 | 240 | | < 2.7 | 220 | 0.055 | 27 | < 5 | 290 | 6.7 | 430 | 17 |
| 2001-04 | MW-1005S | | 1139.04 | 170 | | < 2.7 | 160 | 4.4 | 230 | < 5 | 210 | 6.7 | 310 | |
| 2001-04 | MW-1010P | | 1090.56 | 150 | | 5.5 | 140 | 0.066 | 64 | < 5 | 130 | 7.1 | 250 | -8 |
| 2001-04 | MW-1013 | | 1104.08 | | | | | | | | | | | |
| 2001-04 | MW-1013A | | 1097.1 | | | | | | | | | | | |
| 2001-04 | MW-1013B | | 1097.57 | 530 | | 35 | 2300 | 0.72 | 40000 | 1600 | 3300 | 6 | 3400 | 203 |
| 2001-04 | MW-1013C | | 1100.12 | 440 | | < 13 | 2300 | 2.1 | 9100 | 1600 | 3000 | 6.3 | 3000 | 84 |
| 2001-04 | MW-1014 | | 1114.62 | | | | | | | | | | | |
| 2001-04 | MW-1014A | | 1112.51 | 430 | | < 13 | 1400 | 0.69 | 6700 | 920 | 1700 | 6.3 | 2300 | 138 |
| 2001-04 | MW-1014B | | 1111.14 | 520 | | 530 | 2000 | < 0.15 | 19000 | 1400 | 3300 | 6.1 | 3200 | 207 |
| 2001-04 | MW-1014C | | 1107.65 | 330 | | < 13 | 830 | 12 | 3100 | 420 | 1100 | 6.2 | 1400 | 55 |
| 2001-04 | MW-1015A | | 1092.09 | 75 | < 2.3 | < 2.7 | 88 | 0.0082 | < 2 | 8.2 | 120 | 7.1 | 160 | |
| 2001-04 | MW-1015B | | 1091.09 | 180 | < 2.3 | < 2.7 | 140 | 0.069 | 140 | < 5 | 290 | 7.6 | 460 | |
| 2001-05 | MW-1015A | | 1089.83 | 77 | < 2.3 | < 2.7 | 83 | < 0.005 | 2.5 | 9.2 | 110 | 7 | 150 | |
| 2001-05 | MW-1015B | | 1089.79 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 36 | 5.1 | 230 | 7.8 | 470 | |
| 2001-06 | MW-1015A | | 1089.53 | 75 | < 2.3 | < 2.7 | 85 | < 0.005 | 4.2 | 8.4 | 110 | 7 | 150 | |
| 2001-06 | MW-1015B | | 1089.69 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 23 | < 5 | 220 | 7.6 | 450 | |
| 2001-07 | MW-1000PR | | 1087.88 | 180 | < 11 | < 13 | 660 | 7 | 3900 | 450 | 950 | 5.99 | 1130 | 147 |
| 2001-07 | MW-1000R | | 1088.16 | | | | | | | | | | | |
| 2001-07 | MW-1002 | | 1092.93 | 54 | < 2.3 | < 2.7 | 67 | < 0.005 | < 2 | 7.6 | 79 | 6.12 | 123 | |
| 2001-07 | MW-1002G | | 1092.9 | 89 | < 2.3 | 3.6 | 110 | < 0.005 | < 2 | 11 | 120 | 6.63 | 202 | |
| 2001-07 | MW-1004 | | 1109.31 | | | | | | | | | | | |
| 2001-07 | MW-1004P | | 1107.3 | 150 | < 2.3 | < 2.7 | 140 | 0.015 | 14 | < 5 | 160 | 6.9 | 260 | 99 |
| 2001-07 | MW-1004S | | 1109.32 | 34 | < 2.3 | < 2.7 | 60 | < 0.005 | < 2 | 22 | 96 | 5.6 | 122 | 196 |
| 2001-07 | MW-1005 | | 1140.32 | 53 | < 2.3 | < 2.7 | 180 | 15 | 420 | 14 | 330 | 5.87 | 493 | |
| 2001-07 | MW-1005P | | 1140.03 | 230 | < 2.3 | < 2.7 | 230 | 0.087 | 48 | < 5 | 250 | 7.13 | 428 | 8 |
| 2001-07 | MW-1005P | Dup. | | 240 | < 2.3 | < 2.7 | 230 | 0.77 | 80 | < 5 | 210 | | | |
| 2001-07 | MW-1005S | | 1139.84 | 170 | < 2.3 | < 2.7 | 170 | 4.4 | 230 | < 5 | 190 | 6.91 | 308 | |
| 2001-07 | MW-1010P | | 1087.82 | 140 | 6.1 | < 2.7 | 150 | 0.16 | 150 | 6 | 140 | 7.08 | 250 | 173 |
| 2001-07 | MW-1013 | | 1106.08 | | | | | | | | | | | |
| 2001-07 | MW-1013A | | 1097.19 | | | | | | | | | | | |
| 2001-07 | MW-1013B | | 1097.63 | 490 | < 15 | 32 | 2400 | 0.89 | 39000 | 1600 | 3400 | 6.09 | 3290 | 252 |
| 2001-07 | MW-1013C | | 1099.39 | 460 | < 15 | < 13 | 2300 | 3.2 | 9000 | 1600 | 3500 | 6.28 | 3400 | 30 |
| 2001-07 | MW-1014 | | 1115.67 | | | | | | | | | | | |
| 2001-07 | MW-1014A | | 1112.88 | 420 | < 15 | < 13 | 1500 | 0.7 | 6500 | 960 | 2000 | 6.24 | 2250 | 147 |
| 2001-07 | MW-1014B | | 1112.02 | 440 | < 15 | 480 | 2200 | < 0.15 | 20000 | 1500 | 3000 | 6.01 | 2990 | 235 |
| 2001-07 | MW-1014C | | 1108.11 | 330 | 21 | < 13 | 800 | 11 | 3000 | 420 | 1100 | 6.15 | 1360 | 40 |
| 2001-07 | MW-1015A | | 1088.74 | 75 | < 2.3 | < 2.7 | 90 | < 0.005 | 7.5 | 9.8 | 110 | 6.55 | 153 | |
| 2001-07 | MW-1015B | | 1088.67 | 180 | < 2.3 | < 2.7 | 150 | < 0.005 | 19 | < 5 | 240 | 7.32 | 451 | |
| 2001-08 | MW-1015A | | 1088.12 | 76 | < 2.3 | < 2.7 | 90 | < 0.005 | 9.7 | 7.6 | 100 | 6.68 | 158.7 | |
| 2001-08 | MW-1015B | | 1088.21 | 180 | < 2.3 | < 2.7 | 150 | < 0.005 | 13 | 5.3 | 240 | 7.53 | 462 | |
| 2001-09 | MW-1015A | | 1087.55 | 79 | < 2.3 | < 2.7 | 82 | 0.02 | 15 | 7.8 | 150 | 7.19 | 159.9 | |
| 2001-09 | MW-1015B | | 1087.59 | 180 | < 2.3 | < 2.7 | 130 | 0.0052 | 18 | < 5 | 290 | 7.67 | 458 | |
| 2001-10 | MW-1000PR | | 1087.26 | 190 | < 11 | < 13 | 560 | 2.8 | 3300 | 450 | 940 | 5.97 | 1109 | 163 |
| 2001-10 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 2001-10 | MW-1002 | | 1090.63 | 53 | | < 2.7 | 57 | < 0.005 | < 2 | 7.1 | 140 | 6.03 | 123.3 | |
| 2001-10 | MW-1002G | | 1090.63 | 89 | | < 2.7 | 94 | < 0.005 | < 2 | 11 | 140 | 6.1 | 203 | |
| 2001-10 | MW-1004 | | 1106.99 | | | | | | | | | | | |
| 2001-10 | MW-1004P | | 1105.49 | 160 | < 2.3 | < 2.7 | 130 | 0.1 | 65 | < 5 | 130 | 6.81 | 260 | 94 |
| 2001-10 | MW-1004S | | 1107.06 | 34 | < 2.3 | < 2.7 | 51 | < 0.005 | < 2 | 23 | 110 | 5.73 | 121.3 | 198 |
| 2001-10 | MW-1004S | Dup. | | 33 | < 2.3 | < 2.7 | 50 | < 0.005 | < 2 | 23 | 110 | | | |
| 2001-10 | MW-1005 | | 1138.85 | 49 | | < 2.7 | 170 | 12 | 340 | 15 | 450 | 5.72 | 530 | |
| 2001-10 | MW-1005P | | 1138.59 | 240 | | < 2.7 | 200 | 0.2 | 68 | < 5 | 270 | 6.63 | 424 | 5 |
| 2001-10 | MW-1005S | | 1138.31 | 170 | | < 2.7 | 140 | 3.9 | 210 | < 5 | 230 | 6.45 | 306 | |
| 2001-10 | MW-1010P | | 1087.1 | 150 | 13 | 5.3 | 120 | 0.0097 | 18 | 5.4 | 180 | 6.63 | 246 | |
| 2001-10 | MW-1013 | | 1106.69 | | | | | | | | | | | |
| 2001-10 | MW-1013A | | 1096.9 | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-10 | MW-1013B | | 1097.19 | 560 | 18 | 69 | 2000 | 0.66 | 34000 | 1600 | 3200 | 6.06 | 3320 | 201 |
| 2001-10 | MW-1013C | | 1099.04 | 480 | 22 | < 13 | 2000 | 2.7 | 8500 | 1700 | 3200 | 6.22 | 3380 | 21 |
| 2001-10 | MW-1014 | | 1116.86 | | | | | | | | | | | |
| 2001-10 | MW-1014A | | 1114.03 | 430 | 37 | < 13 | 1300 | 1.5 | 6000 | 1000 | 1900 | 6.34 | 2280 | 152 |
| 2001-10 | MW-1014B | | 1112.38 | 510 | 20 | 490 | 1900 | < 0.15 | 18000 | 1600 | 2900 | 6.05 | 3150 | 219 |
| 2001-10 | MW-1014C | | 1108.1 | 350 | 15 | < 13 | 710 | 9.6 | 2900 | 410 | 990 | 6.17 | 1354 | 56 |
| 2001-10 | MW-1015A | | 1087.58 | 77 | 2.3 | < 2.7 | 78 | < 0.005 | 10 | 10 | 130 | 6.6 | 160 | |
| 2001-10 | MW-1015B | | 1087.67 | 180 | < 2.3 | < 2.7 | 130 | < 0.005 | 8.6 | < 5 | 310 | 7.1 | 450 | |
| 2001-11 | MW-1015A | | 1087.86 | 76 | < 2.3 | < 2.7 | 85 | < 0.005 | 11 | 9.7 | 110 | 6.6 | 160 | |
| 2001-11 | MW-1015B | | 1087.84 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 8.9 | < 5 | 280 | 7.2 | 450 | |
| 2001-12 | MW-1015A | | 1088.72 | 78 | < 2.3 | < 2.7 | 87 | 0.023 | 13 | 7.8 | 150 | 6.52 | 163.5 | |
| 2001-12 | MW-1015B | | 1088.74 | 180 | < 2.3 | < 2.7 | 140 | 0.0069 | 11 | < 5 | 300 | 7.03 | 468 | |
| 2002-01 | MW-1000PR | | 1088.25 | 190 | | < 13 | 570 | 6.2 | 3500 | 440 | 970 | 6.09 | 1099 | 176 |
| 2002-01 | MW-1000R | | 1088.89 | | | | | | | | | | | |
| 2002-01 | MW-1002 | | 1091.3 | 59 | | < 2.7 | 64 | < 0.005 | < 2 | 6.4 | 110 | 6.44 | 129.3 | |
| 2002-01 | MW-1002G | | 1091.25 | 91 | | < 2.7 | 99 | < 0.005 | < 2 | 10 | 150 | 6.54 | 203 | |
| 2002-01 | MW-1004 | | 1107.71 | | | | | | | | | | | |
| 2002-01 | MW-1004P | | 1106.2 | 160 | | < 2.7 | 130 | < 0.005 | 9.6 | < 5 | 190 | 6.75 | 276 | 83 |
| 2002-01 | MW-1004P | Dup. | | 160 | | < 2.7 | 130 | 0.0061 | 11 | < 5 | 200 | | | |
| 2002-01 | MW-1004S | | 1107.79 | 34 | | < 2.7 | 53 | < 0.005 | < 2 | 22 | 140 | 5.89 | 124.1 | 207 |
| 2002-01 | MW-1005 | | 1139.08 | 55 | | < 2.7 | 160 | 13 | 380 | 14 | 310 | 5.86 | 455 | |
| 2002-01 | MW-1005P | | 1138.67 | 250 | | < 2.7 | 200 | 0.077 | 30 | < 5 | 270 | 7.03 | 418 | 7 |
| 2002-01 | MW-1005S | | 1138.59 | 170 | | < 2.7 | 150 | 4.1 | 210 | < 5 | 260 | 6.86 | 304 | |
| 2002-01 | MW-1010P | | 1087.87 | 150 | | < 2.7 | 130 | 0.069 | 76 | < 5 | 230 | 6.95 | 246 | -25 |
| 2002-01 | MW-1013 | | 1105.28 | | | | | | | | | | | |
| 2002-01 | MW-1013A | | 1097.02 | | | | | | | | | | | |
| 2002-01 | MW-1013B | | 1097.33 | 600 | | 52 | 2100 | 0.71 | 36000 | 1600 | 3600 | 6.24 | 3380 | 201 |
| 2002-01 | MW-1013C | | 1099.65 | 510 | | < 13 | 2100 | 4.5 | 8800 | 1700 | 3400 | 6.32 | 3430 | 48 |
| 2002-01 | MW-1014 | | 1116.91 | | | | | | | | | | | |
| 2002-01 | MW-1014A | | 1114.51 | 460 | | < 13 | 1300 | 0.65 | 5900 | 1000 | 2100 | 6.55 | 2280 | 170 |
| 2002-01 | MW-1014B | | 1112.61 | 540 | | 540 | 1900 | < 0.15 | 18000 | 1500 | 3100 | 6.22 | 3110 | 222 |
| 2002-01 | MW-1014C | | 1108.48 | 350 | | < 13 | 690 | 9.2 | 2600 | 390 | 1100 | 6.55 | 1341 | 38 |
| 2002-01 | MW-1015A | | 1088.65 | 78 | < 2.3 | < 2.7 | 82 | < 0.005 | 12 | 7.8 | 150 | 6.85 | 164.2 | |
| 2002-01 | MW-1015B | | 1088.54 | 180 | < 2.3 | < 2.7 | 130 | < 0.005 | 25 | < 5 | 310 | 7.44 | 458 | |
| 2002-02 | MW-1015A | | 1088.38 | 78 | < 2.3 | < 2.7 | 87 | < 0.005 | 14 | 7.6 | 130 | 6.5 | 162 | |
| 2002-02 | MW-1015B | | 1087.9 | 180 | < 2.3 | < 2.7 | 140 | 0.03 | 33 | < 5 | 290 | 7 | 483 | |
| 2002-03 | MW-1015A | | 1087.91 | 78 | 2.3 | < 2.7 | 88 | 0.0074 | 15 | 8.8 | 120 | 6.4 | 170 | |
| 2002-03 | MW-1015B | | 1087.79 | 180 | < 2.3 | < 2.7 | 140 | 0.0066 | 22 | < 5 | 280 | 6.5 | 460 | |
| 2002-04 | MW-1000PR | | 1094.71 | 190 | | < 13 | 570 | 2.6 | 2800 | 430 | 970 | 6.2 | 1088 | 153 |
| 2002-04 | MW-1000R | | 1095.09 | | | | | | | | | | | |
| 2002-04 | MW-1002 | | 1093.61 | 61 | | < 2.7 | 65 | < 0.005 | < 2 | 6.8 | 130 | 6.5 | 122 | |
| 2002-04 | MW-1002 | Dup. | | 60 | | < 2.7 | 65 | < 0.005 | < 2 | 7 | 130 | | | |
| 2002-04 | MW-1002G | | 1093.66 | 91 | | < 2.7 | 100 | < 0.005 | < 2 | 9.4 | 150 | 6.4 | 201 | |
| 2002-04 | MW-1004 | | 1107.96 | | | | | | | | | | | |
| 2002-04 | MW-1004P | | 1105.73 | 160 | | < 2.7 | 140 | 0.0053 | 8.3 | < 5 | 170 | 7.1 | 263 | 188 |
| 2002-04 | MW-1004S | | 1108.04 | 37 | | < 2.7 | 58 | < 0.005 | < 2 | 22 | 120 | 5.9 | 129 | 223 |
| 2002-04 | MW-1005 | | 1140.78 | 54 | | < 2.7 | 160 | 12 | 280 | 14 | 400 | 6.2 | 472 | |
| 2002-04 | MW-1005P | | 1139.89 | 240 | | < 2.7 | 210 | 0.076 | 20 | < 5 | 270 | 7.2 | 434 | 2 |
| 2002-04 | MW-1005S | | 1139.89 | 170 | | < 2.7 | 150 | 4.2 | 210 | < 5 | 240 | 7.1 | 300 | |
| 2002-04 | MW-1010P | | 1094.26 | 150 | | < 2.7 | 140 | 0.18 | 180 | 5.5 | 200 | 7.1 | 249 | -19 |
| 2002-04 | MW-1013 | | 1105.35 | | | | | | | | | | | |
| 2002-04 | MW-1013A | | 1097.18 | | | | | | | | | | | |
| 2002-04 | MW-1013B | | 1097.63 | 520 | | 110 | 2200 | 0.36 | 34000 | 1600 | 3200 | 6.2 | 3370 | 205 |
| 2002-04 | MW-1013C | | 1101.39 | 480 | | 14 | 2100 | 3.9 | 8900 | 1700 | 3200 | 6.3 | 3420 | 51 |
| 2002-04 | MW-1014 | | 1117.24 | | | | | | | | | | | |
| 2002-04 | MW-1014A | | 1115.15 | 410 | | 16 | 1400 | 0.51 | 5900 | 1000 | 1900 | 6.8 | 2250 | 155 |
| 2002-04 | MW-1014B | | 1113 | 500 | | 470 | 1900 | < 0.15 | 17000 | 1500 | 3100 | 6.4 | 3140 | 218 |
| 2002-04 | MW-1014C | | 1109.25 | 340 | | 15 | 710 | 9.1 | 2600 | 390 | 1000 | 6.4 | 1310 | 36 |
| 2002-04 | MW-1015A | | 1093.59 | 80 | | < 2.7 | 86 | < 0.005 | 15 | 9 | 140 | 6.8 | 164 | |
| 2002-04 | MW-1015B | | 1092.33 | 180 | | < 2.7 | 140 | < 0.005 | 73 | < 5 | 320 | 7.4 | 467 | |
| 2002-07 | MW-1000PR | | 1087.66 | 200 | 10 | < 13 | 610 | 6.2 | 3600 | 380 | 1000 | 6.28 | 1093 | 157 |
| 2002-07 | MW-1000R | | 1088.28 | | | | | | | | | | | |
| 2002-07 | MW-1002 | | 1093.51 | 59 | < 2.6 | < 2.7 | 66 | < 0.005 | < 2 | 5.8 | 120 | 6.58 | 123.7 | |
| 2002-07 | MW-1002G | | 1093.78 | 92 | < 2.6 | < 2.7 | 110 | < 0.005 | < 2 | 8.1 | 160 | 6.57 | 208 | |
| 2002-07 | MW-1004 | | 1108.97 | | | | | | | | | | | |
| 2002-07 | MW-1004P | | 1107.04 | 160 | 2.9 | < 2.7 | 140 | 0.0056 | 9.7 | < 5 | 200 | 7.39 | 267 | 106 |
| 2002-07 | MW-1004S | | 1109.06 | 38 | < 2.7 | < 2.7 | 62 | < 0.005 | < 2 | 19 | 140 | 6.27 | 138.4 | 209 |
| 2002-07 | MW-1005 | | 1141.12 | 50 | 3.9 | < 2.7 | 180 | 12 | 310 | 12 | 390 | 6.03 | 528 | |
| 2002-07 | MW-1005P | | 1141.25 | 250 | 4.6 | < 2.7 | 220 | 0.12 | 71 | < 5 | 270 | 7.19 | 426 | 26 |
| 2002-07 | MW-1005S | | 1141.05 | 170 | 5.7 | < 2.7 | 160 | 4.4 | 220 | < 5 | 250 | 7.03 | 302 | |
| 2002-07 | MW-1010P | | 1087.55 | 160 | 18 | < 2.7 | 140 | 0.03 | 42 | 5.8 | 240 | 7.43 | 250 | 9 |
| 2002-07 | MW-1013 | | 1106.66 | | | | | | | | | | | |
| 2002-07 | MW-1013A | | 1097.44 | | | | | | | | | | | |
| 2002-07 | MW-1013B | | 1097.95 | 690 | 28 | 150 | 2300 | 0.7 | 39000 | 1400 | 3900 | 6.37 | 3340 | 202 |
| 2002-07 | MW-1013C | | 1099.76 | 520 | < 27 | < 13 | 2300 | 4.1 | 10000 | 1500 | 3500 | 6.43 | 3400 | 49 |
| 2002-07 | MW-1014 | | 1117.37 | | | | | | | | | | | |
| 2002-07 | MW-1014A | | 1114.8 | 460 | < 27 | < 13 | 1400 | 0.38 | 6100 | 910 | 2100 | 6.49 | 2280 | 177 |
| 2002-07 | MW-1014A | Dup. | | 480 | < 27 | < 13 | 1500 | 0.42 | 6400 | 910 | 2200 | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-07 | MW-1014B | | 1113.19 | 550 | < 27 | 550 | 2100 | < 0.15 | 19000 | 1400 | 3000 | 6.25 | 3100 | 245 |
| 2002-07 | MW-1014C | | 1108.93 | 350 | 18 | < 13 | 740 | 9.4 | 2700 | 330 | 1200 | 6.6 | 1269 | 45 |
| 2002-07 | MW-1015A | | 1088.64 | 79 | < 2.7 | < 2.7 | 88 | < 0.005 | 16 | 7.7 | 150 | 6.91 | 162.8 | |
| 2002-07 | MW-1015B | | 1088.82 | 180 | 2.8 | < 2.7 | 140 | 0.069 | 53 | < 5 | 350 | 7.55 | 496 | |
| 2002-10 | MW-1000PR | | 1090.89 | 200 | | < 13 | 600 | 7.4 | 3400 | 370 | 870 | 6.14 | 1088 | 90 |
| 2002-10 | MW-1000R | | 1090.59 | | | | | | | | | | | |
| 2002-10 | MW-1002 | | 1095.93 | 68 | | < 2.7 | 72 | < 0.005 | < 2 | < 5 | 100 | 6.32 | 140.5 | |
| 2002-10 | MW-1002G | | 1095.89 | 96 | | < 2.7 | 110 | < 0.005 | < 2 | 8.2 | 180 | 6.43 | 211 | |
| 2002-10 | MW-1004 | | 1110.75 | | | | | | | | | | | |
| 2002-10 | MW-1004P | | 1108.3 | 160 | | < 2.7 | 140 | 0.033 | 22 | < 5 | 160 | 6.96 | 270 | 52 |
| 2002-10 | MW-1004S | | 1110.88 | 39 | | < 2.7 | 61 | < 0.005 | < 2 | 20 | 140 | 6.26 | 135.7 | 168 |
| 2002-10 | MW-1005 | | 1141.78 | 51 | | < 2.7 | 210 | 12 | 330 | 13 | 470 | 5.8 | 655 | |
| 2002-10 | MW-1005 | Dup. | | 50 | | < 2.7 | 210 | 12 | 320 | 12 | 510 | | | |
| 2002-10 | MW-1005P | | 1142.14 | 240 | | < 2.7 | 210 | 0.23 | 54 | < 5 | 300 | 7.18 | 428 | 5 |
| 2002-10 | MW-1005S | | 1141.94 | 170 | | < 2.7 | 150 | 4.1 | 210 | < 5 | 220 | 6.94 | 300 | |
| 2002-10 | MW-1010P | | 1089.49 | 150 | | < 2.7 | 140 | 0.035 | 120 | < 5 | 200 | 7.28 | 269 | -60 |
| 2002-10 | MW-1013 | | 1107.28 | | | | | | | | | | | |
| 2002-10 | MW-1013A | | 1097.85 | | | | | | | | | | | |
| 2002-10 | MW-1013B | | 1097.3 | 620 | | 210 | 2300 | < 0.15 | 36000 | 1600 | 3000 | 6.13 | 3390 | 221 |
| 2002-10 | MW-1013C | | 1101.33 | 570 | | < 13 | 2300 | 5.4 | 9900 | 1600 | 3400 | 6.36 | 3520 | -46 |
| 2002-10 | MW-1014 | | 1118.56 | | | | | | | | | | | |
| 2002-10 | MW-1014A | | 1115.5 | 470 | | < 13 | 1400 | 0.54 | 5700 | 930 | 1800 | 6.52 | 2370 | 86 |
| 2002-10 | MW-1014B | | 1114.21 | 490 | | 450 | 2000 | < 0.15 | 17000 | 1300 | 3300 | 6.26 | 3110 | 221 |
| 2002-10 | MW-1014C | | 1110.1 | 360 | | < 13 | 730 | 9.1 | 2600 | 330 | 810 | 6.49 | 1299 | 38 |
| 2002-10 | MW-1015A | | 1090.94 | 79 | | < 2.7 | 84 | < 0.005 | 13 | 9.1 | 150 | 6.65 | 162.4 | |
| 2002-10 | MW-1015B | | 1091.21 | 180 | | < 2.7 | 140 | 0.42 | 380 | < 5 | 300 | 6.87 | 466 | |
| 2003-01 | MW-1000PR | | 1087.45 | 200 | 11 | < 13 | 590 | 6.7 | 3200 | 390 | 990 | 6.2 | 1080 | 170 |
| 2003-01 | MW-1000R | | 1088.05 | | | | | | | | | | | |
| 2003-01 | MW-1002 | | 1091.65 | 65 | | < 2.7 | 66 | 0.012 | < 2 | 6.4 | 92 | 6.5 | 136 | |
| 2003-01 | MW-1002G | | 1091.63 | 92 | | < 2.7 | 100 | 0.0089 | < 2 | 9.9 | 160 | 6.6 | 215 | |
| 2003-01 | MW-1004 | | 1107.43 | | | | | | | | | | | |
| 2003-01 | MW-1004P | | 1105.93 | 160 | | < 2.7 | 130 | 0.053 | 42 | < 5 | 150 | 7.2 | 274 | 205 |
| 2003-01 | MW-1004S | | 1107.52 | 40 | | < 2.7 | 59 | < 0.005 | < 2 | 22 | 110 | 6.18 | 208 | 205 |
| 2003-01 | MW-1005 | | 1140.47 | 55 | | < 2.7 | 290 | 12 | 340 | 14 | 620 | 5.6 | 1079 | |
| 2003-01 | MW-1005P | | 1140.7 | 250 | | < 2.7 | 190 | 0.52 | 51 | < 5 | 290 | 7.2 | 298 | 22 |
| 2003-01 | MW-1005S | | 1140.35 | 170 | | < 2.7 | 150 | 3.7 | 200 | < 5 | 220 | 7 | 301 | |
| 2003-01 | MW-1010P | | 1086.94 | 150 | 19 | < 2.7 | 140 | 0.036 | 120 | 7 | 180 | 7.2 | 257 | -24 |
| 2003-01 | MW-1013 | | 1105.97 | | | | | | | | | | | |
| 2003-01 | MW-1013A | | 1097.39 | | | | | | | | | | | |
| 2003-01 | MW-1013B | | 1098.58 | 630 | < 27 | 92 | 2200 | 0.15 | 33000 | 1600 | 3400 | 6.1 | 3420 | 208 |
| 2003-01 | MW-1013C | | 1099.8 | 570 | < 27 | < 13 | 2300 | 5.4 | 9500 | 1800 | 3500 | 6.5 | 3510 | 46 |
| 2003-01 | MW-1014 | | 1119.07 | | | | | | | | | | | |
| 2003-01 | MW-1014A | | 1116.36 | 480 | < 27 | < 13 | 1400 | 0.54 | 5300 | 1000 | 2100 | 6.5 | 2370 | 198 |
| 2003-01 | MW-1014B | | 1114.14 | 610 | < 27 | 590 | 2000 | < 0.15 | 17000 | 1500 | 2800 | 6.2 | 3160 | 232 |
| 2003-01 | MW-1014C | | 1109.58 | 390 | < 27 | < 13 | 700 | 8.3 | 2400 | 380 | 1100 | 6.4 | 1311 | 74 |
| 2003-01 | MW-1014C | Dup. | | 370 | < 27 | < 13 | 690 | 8.3 | 2400 | 370 | 1000 | | | |
| 2003-01 | MW-1015A | | 1088.46 | 79 | | < 2.7 | 83 | < 0.005 | 12 | 8.5 | 130 | 6.8 | 167 | |
| 2003-01 | MW-1015B | | 1088.27 | 180 | | < 2.7 | 130 | 0.12 | 440 | < 5 | 270 | 7.4 | 463 | |
| 2003-03 | MW-1015A | | 1088.75 | | | | | < 0.010 | 16 | | | 7.09 | 164.4 | |
| 2003-03 | MW-1015B | | 1088.76 | | | | | 0.31 | 170 | | | 7.47 | 458 | |
| 2003-04 | MW-1000PR | | 1087.83 | 200 | | < 6.7 | 570 | 5.1 | 3200 | 380 | 920 | 6.23 | 1047 | 154 |
| 2003-04 | MW-1000R | | 1088.35 | | | | | | | | | | | |
| 2003-04 | MW-1002 | | 1091.51 | 68 | | < 1.3 | 71 | < 0.010 | < 2 | < 5 | 100 | 6.31 | 133.6 | |
| 2003-04 | MW-1002G | | 1091.43 | 90 | | < 1.3 | 110 | < 0.010 | < 2 | 9.5 | 170 | 6.51 | 212 | |
| 2003-04 | MW-1004 | | 1107.32 | | | | | | | | | | | |
| 2003-04 | MW-1004P | | 1105.58 | 170 | | < 1.3 | 140 | 0.032 | 25 | < 5 | 170 | 7.47 | 262 | 178 |
| 2003-04 | MW-1004S | | 1107.39 | 41 | | < 1.3 | 62 | < 0.010 | < 2 | 20 | 120 | 6.01 | 136.7 | 213 |
| 2003-04 | MW-1005 | | 1139.42 | 62 | | < 1.3 | 390 | 18 | 440 | 22 | 550 | 5.71 | 1080 | |
| 2003-04 | MW-1005P | | 1138.93 | 230 | | < 1.3 | 200 | 0.73 | 110 | < 5 | 220 | 7.06 | 381 | -4 |
| 2003-04 | MW-1005S | | 1138.82 | 170 | | < 1.3 | 160 | 4.2 | 220 | < 5 | 250 | 6.99 | 298 | |
| 2003-04 | MW-1010P | | 1087.55 | 150 | | 4.8 | 140 | < 0.010 | 14 | 5.3 | 170 | 7.58 | 253 | -32 |
| 2003-04 | MW-1013 | | 1106.02 | | | | | | | | | | | |
| 2003-04 | MW-1013A | | 1097.95 | | | | | | | | | | | |
| 2003-04 | MW-1013B | | 1097.87 | 660 | | 160 | 2200 | 1.2 | 39000 | 1500 | 3500 | 6.21 | 3340 | 203 |
| 2003-04 | MW-1013C | | 1099.98 | 540 | | < 13 | 2200 | 4.7 | 9600 | 1700 | 3500 | 6.39 | 3450 | 44 |
| 2003-04 | MW-1014 | | 1118.91 | | | | | | | | | | | |
| 2003-04 | MW-1014A | | 1116.82 | 500 | | < 13 | 1400 | < 0.29 | 4600 | 930 | 2000 | 6.38 | 2280 | 156 |
| 2003-04 | MW-1014B | | 1113.96 | 610 | | 690 | 2100 | < 0.29 | 19000 | 1500 | 3400 | 6.29 | 2970 | 228 |
| 2003-04 | MW-1014C | | 1109.35 | 380 | | < 13 | 690 | 8 | 2400 | 340 | 990 | 6.42 | 1287 | 7 |
| 2003-04 | MW-1015A | | 1088.49 | 78 | | < 1.3 | 88 | < 0.010 | 16 | 7.7 | 120 | 6.89 | 163.3 | |
| 2003-04 | MW-1015B | | 1088.45 | 180 | | < 1.3 | 150 | 0.3 | 180 | < 5 | 310 | 7.83 | 456 | |
| 2003-04 | MW-1015B | Dup. | | 190 | | < 1.3 | 140 | 0.21 | 250 | < 5 | 320 | | | |
| 2003-07 | MW-1000PR | | 1087.76 | 200 | 12 | < 6.7 | 580 | 6.6 | 3200 | 360 | 810 | 6.26 | 1027 | 150 |
| 2003-07 | MW-1000R | | 1088.41 | | | | | | | | | | | |
| 2003-07 | MW-1002 | | 1093 | 63 | < 1.2 | < 1.3 | 65 | 0.0079 | < 1 | 2.9 | 100 | 6.48 | 121.8 | |
| 2003-07 | MW-1002G | | 1092.92 | 90 | < 1.2 | < 1.3 | 110 | 0.0066 | < 1 | 8 | 150 | 6.49 | 209 | |
| 2003-07 | MW-1004 | | 1109.01 | | | | | | | | | | | |
| 2003-07 | MW-1004P | | 1107.3 | 160 | < 1.2 | < 1.3 | 150 | 0.066 | 43 | < 2.5 | 160 | 7.25 | 263 | 96 |

pw:\\PW-APS1.foth.com:PW_IE\Documents\Clients\Flambeau Mining\0016F777.00\10500 Reference Information\Stats Analysis\2016 Annual Report\Data Report_Quarterly GW.xlsx

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003-07 | MW-1004S | | 1109.16 | 42 | < 1.2 | < 1.3 | 69 | < 0.005 | < 1 | 20 | 110 | 6.36 | 141.9 | 186 |
| 2003-07 | MW-1005 | | 1140.38 | 53 | < 1.2 | 1.4 | 350 | 16 | 450 | 11 | 580 | 5.53 | 1014 | |
| 2003-07 | MW-1005P | | 1140.27 | 240 | < 1.2 | < 1.3 | 230 | 1.1 | 74 | < 2.5 | 260 | 7.11 | 439 | -3 |
| 2003-07 | MW-1005S | | 1140.12 | 170 | 2.1 | < 1.3 | 160 | 4.2 | 230 | < 2.5 | 200 | 6.95 | 305 | |
| 2003-07 | MW-1010P | | 1087.54 | 150 | 11 | < 1.3 | 150 | 0.031 | 120 | 5.9 | 170 | 7.34 | 255 | -20 |
| 2003-07 | MW-1013 | | 1109.38 | | | | | | | | | | | |
| 2003-07 | MW-1013A | | 1098.2 | | | | | | | | | | | |
| 2003-07 | MW-1013B | | 1098.71 | 620 | < 2.6 | 120 | 2300 | 0.61 | 38000 | 1600 | 3100 | 6.25 | 3290 | 200 |
| 2003-07 | MW-1013B | Dup. | | 580 | 4.3 | 110 | 2300 | 0.36 | 37000 | 1500 | 3100 | | | |
| 2003-07 | MW-1013C | | 1100.31 | 500 | 17 | < 13 | 2300 | 4.2 | 9600 | 1700 | 3200 | 6.32 | 3430 | 27 |
| 2003-07 | MW-1014 | | 1119.06 | | | | | | | | | | | |
| 2003-07 | MW-1014A | | 1116.45 | 420 | < 2.6 | < 13 | 1400 | 0.32 | 4200 | 910 | 1900 | 6.62 | 2230 | 206 |
| 2003-07 | MW-1014B | | 1114.33 | 530 | < 2.6 | 500 | 1900 | < 0.29 | 16000 | 1400 | 3800 | 6.28 | 2900 | 240 |
| 2003-07 | MW-1014C | | 1109.74 | 340 | 13 | < 13 | 700 | 8.2 | 2500 | 330 | 920 | 6.43 | 1239 | 40 |
| 2003-07 | MW-1015A | | 1088.38 | 79 | < 1.2 | < 1.3 | 90 | < 0.005 | 12 | 6.6 | 130 | 6.89 | 166.3 | |
| 2003-07 | MW-1015B | | 1088.49 | 180 | < 1.2 | < 1.3 | 140 | 0.45 | 170 | < 2.5 | 270 | 7.58 | 463 | |
| 2003-10 | MW-1000PR | | 1086.98 | 210 | | < 6.7 | 560 | 6.5 | 3100 | 350 | 810 | 6.2 | 1040 | 166 |
| 2003-10 | MW-1000R | | 1087.08 | | | | | | | | | | | |
| 2003-10 | MW-1002 | | 1090.23 | 65 | | < 1.3 | 66 | < 0.005 | 4.9 | 4.6 | 110 | 6.3 | 135 | |
| 2003-10 | MW-1002G | | 1090.23 | 88 | | < 1.3 | 100 | < 0.005 | 1.5 | 8 | 160 | 6.5 | 209 | |
| 2003-10 | MW-1004 | | 1106.23 | | | | | | | | | | | |
| 2003-10 | MW-1004P | | 1104.84 | 160 | | < 1.3 | 130 | 0.13 | 69 | < 2.5 | 170 | 7.3 | 272 | 48 |
| 2003-10 | MW-1004S | | 1106.29 | 42 | | < 1.3 | 62 | < 0.005 | 5.4 | 17 | 120 | 6.3 | 143 | 167 |
| 2003-10 | MW-1005 | | 1138.41 | 55 | | < 1.3 | 420 | 18 | 440 | 11 | 850 | 5.6 | 1260 | |
| 2003-10 | MW-1005P | | 1138.32 | 240 | | < 1.3 | 210 | 1 | 74 | < 2.5 | 260 | 7.3 | 436 | -18 |
| 2003-10 | MW-1005S | | 1138.15 | 170 | | < 1.3 | 150 | 4 | 210 | < 2.5 | 210 | 7.2 | 317 | |
| 2003-10 | MW-1010P | | 1086.76 | 140 | | < 1.3 | 140 | 0.064 | 130 | 6.4 | 180 | 7.3 | 343 | -47 |
| 2003-10 | MW-1013 | | 1109.3 | | | | | | | | | | | |
| 2003-10 | MW-1013A | | 1097 | | | | | | | | | | | |
| 2003-10 | MW-1013B | | 1097.29 | 590 | | 110 | 2300 | < 0.29 | 35000 | 1500 | 3200 | 6.3 | 3350 | 199 |
| 2003-10 | MW-1013B | Dup. | | 550 | | 140 | 2200 | 0.83 | 37000 | 1500 | 3200 | | | |
| 2003-10 | MW-1013C | | 1099.27 | 540 | | < 13 | 2200 | 6.2 | 9800 | 1700 | 3200 | 6.4 | 3520 | 16 |
| 2003-10 | MW-1014 | | 1119.25 | | | | | | | | | | | |
| 2003-10 | MW-1014A | | 1116.5 | 440 | | < 13 | 1400 | 1 | 3000 | 980 | 2000 | 6.6 | 2310 | 218 |
| 2003-10 | MW-1014B | | 1113.77 | 540 | | 640 | 2100 | < 0.29 | 19000 | 1500 | 3000 | 6.4 | 2930 | 251 |
| 2003-10 | MW-1014C | | 1109.01 | 340 | | < 1.3 | 680 | 7.8 | 2400 | 320 | 910 | 6.6 | 1256 | 55 |
| 2003-10 | MW-1015A | | 1087.24 | 78 | | < 1.3 | 83 | < 0.005 | 11 | 7.1 | 140 | 7.1 | 167 | |
| 2003-10 | MW-1015B | | 1087.21 | 170 | | < 1.3 | 130 | 0.67 | 290 | < 2.5 | 320 | 7.8 | 480 | |
| 2004-01 | MW-1000PR | | 1087.59 | 210 | | < 6.7 | 530 | 4.3 | 2900 | 360 | 790 | 6.25 | 1065 | 98 |
| 2004-01 | MW-1000R | | 1087.45 | | | | | | | | | | | |
| 2004-01 | MW-1002 | | 1089.83 | 64 | | < 1.3 | 69 | 0.006 | 3.1 | 6.1 | 130 | 6.55 | 141.5 | |
| 2004-01 | MW-1002G | | 1089.8 | 89 | | < 1.3 | 100 | < 0.005 | 2.6 | 8.6 | 160 | 6.62 | 215 | |
| 2004-01 | MW-1004 | | 1105.52 | | | | | | | | | | | |
| 2004-01 | MW-1004P | | 1104.23 | 160 | | < 1.3 | 140 | 0.11 | 78 | < 2.5 | 220 | 7.22 | 290 | 52 |
| 2004-01 | MW-1004S | | 1105.62 | 42 | | < 1.3 | 62 | < 0.005 | < 1 | 19 | 170 | 6.21 | 133.7 | 208 |
| 2004-01 | MW-1005 | | 1137.52 | 56 | | < 1.3 | 260 | 15 | 360 | 14 | 430 | 5.73 | 829 | |
| 2004-01 | MW-1005 | Dup. | | 58 | | < 1.3 | 270 | 19 | 540 | 14 | 510 | | | |
| 2004-01 | MW-1005P | | 1137.38 | 240 | | < 1.3 | 220 | 0.38 | 43 | < 2.5 | 260 | 7.28 | 438 | -2 |
| 2004-01 | MW-1005S | | 1137.23 | 170 | | < 1.3 | 150 | 4.2 | 220 | < 2.5 | 240 | 6.9 | 329 | |
| 2004-01 | MW-1010P | | 1083.41 | | | | | | | | | | | |
| 2004-01 | MW-1013 | | 1108.22 | | | | | | | | | | | |
| 2004-01 | MW-1013A | | 1096.91 | | | | | | | | | | | |
| 2004-01 | MW-1013B | | 1097.13 | 580 | | 170 | 2200 | 1.6 | 40000 | 1600 | 3200 | 6.15 | 3370 | 212 |
| 2004-01 | MW-1013C | | 1099.18 | 490 | | 40 | 2200 | 2.8 | 9100 | 1700 | 3300 | 6.32 | 3510 | 51 |
| 2004-01 | MW-1014 | | 1118.37 | | | | | | | | | | | |
| 2004-01 | MW-1014A | | 1116.08 | 490 | | < 13 | 1300 | 1 | 3100 | 1000 | 2000 | 6.63 | 2310 | 185 |
| 2004-01 | MW-1014B | | 1113.07 | 570 | | 590 | 2000 | < 0.29 | 17000 | 1600 | 3100 | 6.26 | 3130 | 198 |
| 2004-01 | MW-1014C | | 1108.52 | 310 | | < 1.3 | 650 | 7.4 | 2300 | 320 | 930 | 6.42 | 1259 | 34 |
| 2004-01 | MW-1015A | | 1087.39 | 79 | | < 1.3 | 85 | < 0.005 | 14 | 8.7 | 160 | 7.17 | 165.1 | |
| 2004-01 | MW-1015B | | 1087.43 | 180 | | < 1.3 | 130 | 0.44 | 240 | < 2.5 | 310 | 7.78 | 471 | |
| 2004-03 | MW-1010P | | | 150 | | 2.1 | 150 | 0.095 | 180 | 6.9 | 160 | 7.66 | 269 | |
| 2004-04 | MW-1000PR | RD | | 205 | 13.5 | 2.1 | 540 | 6.6 | 3010 | 363 | 750 | | | |
| 2004-04 | MW-1000PR | | 1088.38 | 210 | | < 6.7 | 530 | 7 | 2900 | 330 | 720 | 6.73 | 1025 | 105 |
| 2004-04 | MW-1000R | | 1091.37 | | | | | | | | | | | |
| 2004-04 | MW-1002 | | 1092.45 | 61 | | < 1.3 | 65 | < 0.005 | < 1 | 6 | 37 | 6.74 | 128.4 | |
| 2004-04 | MW-1002G | | 1092.38 | 90 | | < 1.3 | 100 | 0.022 | < 1 | 8.3 | 92 | 6.76 | 206 | |
| 2004-04 | MW-1004 | | 1105.88 | | | | | | | | | | | |
| 2004-04 | MW-1004P | | 1104.46 | 160 | | < 1.3 | 140 | 0.1 | 77 | < 2.5 | 160 | 7.26 | 275 | 117 |
| 2004-04 | MW-1004S | | 1105.94 | 43 | | 6.4 | 64 | < 0.005 | < 1 | 19 | 66 | 6.58 | 143.3 | 156 |
| 2004-04 | MW-1005 | | 1139.18 | 57 | | < 1.3 | 280 | 17 | 430 | 14 | 500 | 6.29 | 807 | |
| 2004-04 | MW-1005P | | 1137.86 | 240 | | < 1.3 | 220 | 0.11 | 20 | < 2.5 | 220 | 7.05 | 436 | 4 |
| 2004-04 | MW-1005S | | 1138.11 | 160 | | < 1.3 | 150 | 4.3 | 210 | 3.7 | 130 | 6.92 | 298 | |
| 2004-04 | MW-1010P | RD | | 144 | 14.5 | 1.6 | 145 | < 0.1 | 92 | 7.8 | 178 | | | |
| 2004-04 | MW-1010P | | 1088.35 | 140 | | < 1.3 | 140 | 0.013 | 97 | 8.8 | 130 | 7.55 | 276 | 20 |
| 2004-04 | MW-1013 | | 1108.2 | | | | | | | | | | | |
| 2004-04 | MW-1013A | | 1097.43 | | | | | | | | | | | |
| 2004-04 | MW-1013B | | 1097.77 | 560 | | 230 | 2200 | < 0.33 | 32000 | 1500 | 3100 | 6.29 | 3260 | 188 |
| 2004-04 | MW-1013C | RD | | 527 | 9.9 | 2.3 | 2180 | 7.2 | 9830 | 1840 | 3210 | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-04 | MW-1013C | | 1099.81 | 490 | | < 13 | 2200 | 7.8 | 9700 | 1600 | 3200 | 6.65 | 3520 | 59 |
| 2004-04 | MW-1014 | | 1117.83 | | | | | | | | | | | |
| 2004-04 | MW-1014A | RD | | 463 | < 1 | 6 | 1320 | 0.1 | 3050 | 1040 | 1920 | | | |
| 2004-04 | MW-1014A | | 1116.64 | 470 | | < 13 | 1300 | 0.13 | 3100 | 910 | 1800 | 6.82 | 2250 | 211 |
| 2004-04 | MW-1014B | RD | | 461 | < 1 | 492 | 1920 | < 0.1 | 18800 | 1480 | 2530 | | | |
| 2004-04 | MW-1014B | | 1112.89 | 530 | | 440 | 1700 | < 0.33 | 14000 | 1400 | 2800 | 6.51 | 2880 | 246 |
| 2004-04 | MW-1014B | Dup. | | 570 | | 440 | 1700 | < 0.33 | 14000 | 1400 | 2800 | | | |
| 2004-04 | MW-1014C | RD | | | 8.4 | 1.2 | 657 | 6.9 | 2220 | 330 | 868 | | | |
| 2004-04 | MW-1014C | | 1108.53 | 330 | | < 13 | 640 | 7.5 | 2300 | 290 | 820 | 6.77 | 1233 | 53 |
| 2004-04 | MW-1015A | | 1089.17 | 79 | | < 1.3 | 86 | < 0.005 | 15 | 9 | 62 | 7.17 | 167.7 | |
| 2004-04 | MW-1015B | | 1089.08 | 180 | | < 1.3 | 140 | 0.38 | 120 | < 2.5 | 210 | 7.49 | 481 | |
| 2004-07 | MW-1000PR | | 1087.4 | 200 | < 1.8 | 28 | 530 | 2.3 | 2800 | 310 | 690 | 6.1 | 998 | 146 |
| 2004-07 | MW-1000R | | 1087.74 | | | | | | | | | | | |
| 2004-07 | MW-1002 | | 1092.22 | 53 | < 1.8 | < 1.3 | 60 | < 0.005 | < 1 | 5.6 | 93 | 6.5 | 114 | |
| 2004-07 | MW-1002G | | 1092.14 | 90 | < 1.8 | < 1.3 | 110 | < 0.005 | < 1 | 8.7 | 140 | 6.8 | 202 | |
| 2004-07 | MW-1004 | | 1108.26 | | | | | | | | | | | |
| 2004-07 | MW-1004P | | 1106.68 | 160 | < 1.8 | < 1.3 | 140 | 0.066 | 97 | < 2.5 | 120 | 6.8 | 275 | 114 |
| 2004-07 | MW-1004S | | 1108.32 | 44 | < 1.8 | < 1.3 | 71 | < 0.005 | < 1 | 21 | 100 | 6.3 | 152 | 184 |
| 2004-07 | MW-1005 | | 1139.35 | 55 | < 1.8 | 1.9 | 280 | 18 | 520 | 13 | 480 | 6 | 733 | |
| 2004-07 | MW-1005P | | 1139.37 | 240 | < 1.8 | < 1.3 | 220 | 0.45 | 93 | < 2.5 | 170 | 7 | 428 | -5 |
| 2004-07 | MW-1005S | | 1139.16 | 160 | < 1.8 | < 1.3 | 160 | 4.2 | 220 | 4.2 | 150 | 6.8 | 294 | |
| 2004-07 | MW-1010P | | 1087.09 | 160 | 2.3 | < 1.3 | 160 | 0.18 | 210 | 4.3 | 130 | 7 | 284 | 55 |
| 2004-07 | MW-1013 | | 1111.69 | | | | | | | | | | | |
| 2004-07 | MW-1013A | | 1097.86 | | | | | | | | | | | |
| 2004-07 | MW-1013B | | 1098.27 | 550 | < 2.6 | 150 | 2200 | < 0.33 | 24000 | 1600 | 3100 | 6.1 | 3340 | 191 |
| 2004-07 | MW-1013C | | 1099.75 | 520 | 16 | < 13 | 2300 | 7.4 | 10000 | 1400 | 3200 | 6.2 | 3490 | 45 |
| 2004-07 | MW-1013C | Dup. | | 490 | 9.7 | < 13 | 2200 | 7.3 | 10000 | 1600 | 3200 | | | |
| 2004-07 | MW-1014 | | 1118.45 | | | | | | | | | | | |
| 2004-07 | MW-1014A | | 1115.52 | 440 | < 2.6 | < 13 | 1400 | 0.43 | 2100 | 940 | 1900 | 6.7 | 2250 | 175 |
| 2004-07 | MW-1014B | | 1113.85 | 450 | < 2.6 | 520 | 1900 | < 0.33 | 15000 | 1300 | 2600 | 6.3 | 2950 | 191 |
| 2004-07 | MW-1014C | | 1109.22 | 300 | 15 | < 13 | 660 | 7.2 | 2300 | 290 | 820 | 6.4 | 1171 | 31 |
| 2004-07 | MW-1015A | | 1087.88 | 78 | < 1.8 | < 1.3 | 89 | < 0.005 | 12 | 7.7 | 88 | 6.8 | 165 | 183 |
| 2004-07 | MW-1015B | | 1087.97 | 170 | < 1.8 | < 1.3 | 140 | 0.45 | 190 | < 2.5 | 220 | 7.1 | 458 | -104 |
| 2004-10 | MW-1000PR | | 1087.16 | 210 | 3.2 | 15 | 500 | 0.37 | 2700 | 320 | 670 | 6.4 | 970 | |
| 2004-10 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 2004-10 | MW-1002 | | 1090.26 | 56 | < 1.8 | < 1.3 | 56 | < 0.005 | 3 | 4.6 | 59 | 6.7 | 116 | |
| 2004-10 | MW-1002G | | 1090.23 | 93 | < 1.8 | < 1.3 | 98 | < 0.005 | 4.1 | 8.4 | 110 | 6.7 | 204 | |
| 2004-10 | MW-1004 | | 1106.01 | | | | | | | | | | | |
| 2004-10 | MW-1004P | | 1104.64 | 160 | < 1.8 | 1.5 | 130 | < 0.005 | 17 | < 2.5 | 120 | 7.3 | 271 | 109 |
| 2004-10 | MW-1004S | | 1106.12 | 46 | < 1.8 | < 1.3 | 65 | < 0.005 | 1.3 | 19 | 76 | 6.7 | 146 | |
| 2004-10 | MW-1005 | | 1138.67 | 55 | 4.3 | < 1.3 | 270 | 15 | 390 | 14 | 550 | 5.9 | 799 | |
| 2004-10 | MW-1005P | | 1138.05 | 240 | 2.6 | < 1.3 | 210 | 0.47 | 87 | < 2.5 | 210 | 7.1 | 436 | -2 |
| 2004-10 | MW-1005S | | 1138.06 | 170 | 3.9 | < 1.3 | 150 | 3.7 | 210 | 3.6 | 160 | 6.6 | 298 | |
| 2004-10 | MW-1010P | | 1086.86 | 160 | 3.3 | < 1.3 | 150 | 0.19 | 200 | 6.1 | 140 | 6.9 | 281 | 64 |
| 2004-10 | MW-1013 | | 1110.47 | | | | | | | | | | | |
| 2004-10 | MW-1013A | | 1097.11 | | | | | | | | | | | |
| 2004-10 | MW-1013B | | 1097.1 | 640 | 4.2 | 380 | 2200 | < 0.33 | 34000 | 1600 | 3100 | 6.3 | 3250 | 204 |
| 2004-10 | MW-1013C | | 1099.48 | 520 | 17 | < 13 | 2200 | 7 | 9800 | 1700 | 3200 | 6.3 | 3450 | 50 |
| 2004-10 | MW-1014 | | 1119.12 | | | | | | | | | | | |
| 2004-10 | MW-1014A | | 1114.83 | 490 | 2.9 | < 13 | 1300 | < 0.33 | 2000 | 930 | 1800 | 6.7 | 2220 | 184 |
| 2004-10 | MW-1014B | | 1113.33 | 620 | 3.6 | 550 | 2000 | < 0.33 | 17000 | 1500 | 2800 | 6.3 | 2950 | 215 |
| 2004-10 | MW-1014C | | 1108.87 | 350 | 17 | < 13 | 610 | 6.6 | 2100 | 300 | 780 | 6.5 | 1175 | 60 |
| 2004-10 | MW-1015A | | 1087.22 | 79 | < 1.8 | < 1.3 | 83 | < 0.005 | 11 | 7.6 | 95 | 7.3 | 164 | 116 |
| 2004-10 | MW-1015B | | 1087.21 | 180 | < 1.8 | < 1.3 | 130 | 0.3 | 140 | < 2.5 | 220 | 7.6 | 459 | -99 |
| 2004-10 | MW-1015B | Dup. | | 180 | < 1.8 | < 1.3 | 130 | 0.3 | 140 | < 2.5 | 230 | | | |
| 2005-01 | MW-1000PR | | 1087.9 | 220 | 1.3 | 16 | 510 | 0.51 | 2500 | 310 | 660 | 6.2 | 991 | 133 |
| 2005-01 | MW-1000R | | 1087.88 | | | | | | | | | | | |
| 2005-01 | MW-1002 | | 1090.2 | 59 | < 0.73 | < 1.3 | 62 | < 0.005 | < 1 | 5.1 | 24 | 6.9 | 122 | |
| 2005-01 | MW-1002G | | 1090.42 | 93 | < 0.73 | < 1.3 | 100 | < 0.005 | < 1 | 9.6 | 93 | 6.6 | 208 | |
| 2005-01 | MW-1004 | | 1105.9 | | | | | | | | | | | |
| 2005-01 | MW-1004P | | 1104.67 | 160 | < 0.73 | < 1.3 | 130 | 0.058 | 75 | < 2.5 | 94 | 7 | 270 | 102 |
| 2005-01 | MW-1004S | | 1106.02 | 46 | < 0.73 | < 1.3 | 65 | < 0.005 | < 1 | 19 | 110 | 6.5 | 146 | 187 |
| 2005-01 | MW-1004S | Dup. | | 46 | < 0.73 | < 1.3 | 65 | < 0.005 | < 1 | 19 | 79 | | | |
| 2005-01 | MW-1005 | | 1138.48 | 54 | 2.3 | < 1.3 | 180 | 12 | 310 | 13 | 280 | 6.1 | 510 | |
| 2005-01 | MW-1005P | | 1137.86 | 250 | < 0.73 | < 1.3 | 210 | 0.85 | 79 | < 2.5 | 210 | 7.1 | 428 | 15 |
| 2005-01 | MW-1005S | | 1137.89 | 160 | 2.4 | < 1.3 | 150 | 3.8 | 210 | 4.8 | 130 | 6.4 | 301 | |
| 2005-01 | MW-1010P | | 1087.56 | 150 | 18 | < 1.3 | 140 | < 0.005 | 92 | 11 | 130 | 6.7 | 284 | 72 |
| 2005-01 | MW-1013 | | 1109.19 | | | | | | | | | | | |
| 2005-01 | MW-1013A | | 1097.27 | | | | | | | | | | | |
| 2005-01 | MW-1013B | | 1097.29 | 580 | 4.8 | 180 | 2200 | < 0.33 | 24000 | 1700 | 3000 | 6.3 | 3390 | 207 |
| 2005-01 | MW-1013C | | 1099.34 | 540 | 20 | < 13 | 2100 | 7.2 | 9500 | 1700 | 3000 | 6.3 | 3540 | 67 |
| 2005-01 | MW-1014 | | 1118.5 | | | | | | | | | | | |
| 2005-01 | MW-1014A | | 1115.84 | 480 | 2.3 | < 13 | 1300 | < 0.33 | 2000 | 990 | 1800 | 6.7 | 2330 | 246 |
| 2005-01 | MW-1014B | | 1113.05 | 550 | 5.3 | 520 | 2000 | < 0.33 | 16000 | 1500 | 2700 | 6.4 | 3210 | 277 |
| 2005-01 | MW-1014C | | 1108.62 | 340 | 21 | < 13 | 600 | 6.4 | 2000 | 300 | 730 | 6.5 | 1174 | 70 |
| 2005-01 | MW-1015A | | 1087.45 | 79 | < 0.73 | < 1.3 | 83 | < 0.005 | 11 | 7.7 | 65 | 6.9 | 162 | 128 |
| 2005-01 | MW-1015B | | 1087.61 | 180 | < 0.73 | < 1.3 | 130 | 0.22 | 120 | < 2.5 | 230 | 7.4 | 464 | -89 |
| 2005-04 | MW-1000PR | | 1088.23 | 210 | 2.7 | 17 | 530 | 0.75 | 3000 | 320 | 660 | 6.3 | 882 | 105 |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005-04 | MW-1000R | | 1088.69 | | | | | | | | | | | |
| 2005-04 | MW-1002 | | 1091.64 | 56 | < 0.66 | < 1.3 | 61 | < 0.005 | < 1 | 6.1 | 8 | 6.8 | 117 | |
| 2005-04 | MW-1002G | | 1091.79 | 91 | < 0.66 | < 1.3 | 100 | < 0.005 | < 1 | 9.2 | 95 | 6.7 | 206 | |
| 2005-04 | MW-1004 | | 1106.18 | | | | | | | | | | | |
| 2005-04 | MW-1004P | | 1104.74 | 160 | < 0.66 | < 1.3 | 140 | < 0.005 | 26 | < 2.5 | 120 | 6.6 | 265 | 124 |
| 2005-04 | MW-1004S | | 1106.28 | 46 | < 0.66 | < 1.3 | 69 | < 0.005 | < 1 | 21 | 45 | 6.2 | 148 | 202 |
| 2005-04 | MW-1005 | | 1139.08 | 52 | 2.3 | < 1.3 | 190 | 17 | 450 | 14 | 300 | 6.1 | 528 | |
| 2005-04 | MW-1005 | Dup. | | 51 | 2.2 | < 1.3 | 190 | 17 | 460 | 14 | 290 | | | |
| 2005-04 | MW-1005P | | 1137.9 | 240 | < 0.66 | < 1.3 | 220 | 0.11 | 17 | < 2.5 | 200 | 6.7 | 437 | -2 |
| 2005-04 | MW-1005S | | 1137.95 | 160 | 2.8 | < 1.3 | 150 | 4.4 | 240 | 4.3 | 170 | 6.3 | 294 | |
| 2005-04 | MW-1010P | | 1088.2 | 150 | 9.9 | < 1.3 | 150 | 0.034 | 150 | 11 | 110 | 6.7 | 284 | 60 |
| 2005-04 | MW-1013 | | 1108.43 | | | | | | | | | | | |
| 2005-04 | MW-1013A | | 1097.16 | | | | | | | | | | | |
| 2005-04 | MW-1013B | | 1097.61 | 630 | 1.7 | 450 | 2200 | < 0.33 | 42000 | 1700 | 3100 | 6.2 | 3420 | 238 |
| 2005-04 | MW-1013C | | 1099.38 | 520 | 16 | < 13 | 2200 | 8.2 | 10000 | 1700 | 3100 | 6.3 | 3390 | 66 |
| 2005-04 | MW-1014 | | 1117.72 | | | | | | | | | | | |
| 2005-04 | MW-1014A | | 1115.68 | 440 | 1.9 | < 13 | 1300 | < 0.33 | 2000 | 1000 | 1800 | 6.6 | 2250 | 276 |
| 2005-04 | MW-1014B | | 1112.91 | 520 | 2.6 | 460 | 1900 | < 0.33 | 16000 | 1400 | 2700 | 6.4 | 2790 | 288 |
| 2005-04 | MW-1014C | | 1108.19 | 330 | 16 | < 13 | 660 | 7 | 2300 | 290 | 750 | 6.3 | 1202 | 64 |
| 2005-04 | MW-1015A | | 1088.58 | 79 | < 0.66 | < 1.3 | 87 | < 0.005 | 16 | 8.6 | 51 | 6.8 | 162 | 194 |
| 2005-04 | MW-1015B | | 1088.6 | 180 | < 0.66 | < 1.3 | 140 | 0.29 | 130 | < 2.5 | 190 | 7.1 | 451 | -93 |
| 2005-07 | MW-1000PR | | 1087.41 | 210 | 4 | 27 | 560 | 1.5 | 2900 | 330 | 680 | 6.7 | 962 | 139 |
| 2005-07 | MW-1000R | | 1087.59 | | | | | | | | | | | |
| 2005-07 | MW-1002 | | 1090.63 | 47 | < 0.66 | 1.6 | 53 | < 0.005 | < 1 | 4.9 | 82 | 6.7 | 98 | |
| 2005-07 | MW-1002G | | 1090.54 | 91 | < 0.66 | < 1.3 | 110 | < 0.005 | < 1 | 8.8 | 140 | 6.8 | 184 | |
| 2005-07 | MW-1004 | | 1105.97 | | | | | | | | | | | |
| 2005-07 | MW-1004P | | 1104.59 | 160 | < 0.66 | < 1.3 | 150 | 0.059 | 41 | < 2.5 | 130 | 7.4 | 270 | 58 |
| 2005-07 | MW-1004S | | 1106.1 | 47 | < 0.66 | 2 | 77 | < 0.005 | < 1 | 24 | 100 | 6.3 | 158 | 211 |
| 2005-07 | MW-1004S | Dup. | | 47 | < 0.66 | 2.8 | 78 | < 0.005 | < 1 | 24 | 260 | | | |
| 2005-07 | MW-1005 | | 1138.52 | 46 | 1.5 | < 1.3 | 180 | 14 | 370 | 16 | 270 | 6.2 | 497 | |
| 2005-07 | MW-1005P | | 1138.3 | 240 | < 0.66 | < 1.3 | 230 | 0.17 | 82 | < 2.5 | 230 | 7.4 | 428 | -1 |
| 2005-07 | MW-1005S | | 1138.25 | 170 | 3 | < 1.3 | 160 | 4.5 | 240 | 3.9 | 180 | 7.2 | 296 | |
| 2005-07 | MW-1010P | | 1087.16 | 150 | 22 | < 1.3 | 160 | < 0.005 | 85 | 14 | 170 | 7.9 | 288 | 94 |
| 2005-07 | MW-1013 | | 1110.98 | | | | | | | | | | | |
| 2005-07 | MW-1013A | | 1096.86 | | | | | | | | | | | |
| 2005-07 | MW-1013B | | 1097.22 | 640 | 1.9 | 400 | 2300 | < 0.33 | 39000 | 1700 | 3100 | 6.4 | 3200 | 229 |
| 2005-07 | MW-1013C | | 1098.89 | 510 | 13 | < 13 | 2300 | 8.5 | 11000 | 1800 | 3100 | 6.6 | 3400 | 17 |
| 2005-07 | MW-1014 | | 1117.46 | | | | | | | | | | | |
| 2005-07 | MW-1014A | | 1114.86 | 500 | 1.2 | < 13 | 1300 | < 0.33 | 1400 | 1000 | 1800 | 6.8 | 2170 | 269 |
| 2005-07 | MW-1014B | | 1112.42 | 570 | 2.3 | 560 | 2100 | < 0.33 | 17000 | 1500 | 2800 | 6.5 | 3010 | 299 |
| 2005-07 | MW-1014C | | 1107.8 | 350 | 15 | < 13 | 650 | 6.9 | 2200 | 300 | 760 | 6.9 | 1150 | 57 |
| 2005-07 | MW-1015A | | 1087.37 | 78 | < 0.66 | < 1.3 | 89 | < 0.005 | 12 | 8.5 | 110 | 7.2 | 162 | |
| 2005-07 | MW-1015B | | 1087.49 | 180 | < 0.66 | < 1.3 | 150 | 0.4 | 140 | < 2.5 | 260 | 8 | 457 | -91 |
| 2005-10 | MW-1000PR | | 1087.92 | 210 | 2.9 | 25 | 580 | 0.73 | 2900 | 330 | 730 | 6.6 | 955 | 141 |
| 2005-10 | MW-1000R | | 1088.17 | | | | | | | | | | | |
| 2005-10 | MW-1002 | | 1092.07 | 50 | < 0.66 | < 2.7 | 60 | < 0.005 | < 1 | 5.2 | 120 | 6.5 | 104 | |
| 2005-10 | MW-1002G | | 1091.97 | 89 | < 0.66 | < 2.7 | 110 | < 0.005 | < 1 | 9 | 120 | 6.5 | 201 | |
| 2005-10 | MW-1004 | | 1107.51 | | | | | | | | | | | |
| 2005-10 | MW-1004P | | 1105.6 | 170 | < 0.66 | < 2.7 | 140 | < 0.005 | 21 | < 2.5 | 150 | 7.1 | 277 | 83 |
| 2005-10 | MW-1004S | | 1107.58 | 49 | < 0.66 | < 2.7 | 75 | 0.008 | < 1 | 23 | 150 | 7.2 | 162 | 186 |
| 2005-10 | MW-1005 | | 1138.49 | 61 | 2 | < 2.7 | 290 | 17 | 480 | 14 | 450 | 6 | 786 | |
| 2005-10 | MW-1005P | | 1137.53 | 240 | < 0.66 | < 2.7 | 220 | 0.03 | 48 | < 2.5 | 210 | 6.5 | 427 | -6 |
| 2005-10 | MW-1005S | | 1137.6 | 170 | 1.9 | < 2.7 | 180 | 4.2 | 240 | 4.2 | 200 | 6.4 | 298 | |
| 2005-10 | MW-1010P | | 1087.81 | 160 | 3.9 | < 2.7 | 170 | 0.044 | 160 | 8.8 | 150 | 7.1 | 283 | 25 |
| 2005-10 | MW-1013 | | 1109.89 | 510 | 2.5 | < 13 | 600 | 22 | 25000 | 62 | 760 | 6.1 | 1332 | 73 |
| 2005-10 | MW-1013A | | 1096.84 | 370 | 0.86 | < 13 | 680 | < 0.33 | 4500 | 380 | 870 | 6.7 | 1576 | 153 |
| 2005-10 | MW-1013B | | 1096.98 | 630 | < 0.85 | 230 | 2300 | < 0.33 | 30000 | 1500 | 3100 | 6.4 | 3260 | 222 |
| 2005-10 | MW-1013C | | 1099.2 | 510 | 9.2 | < 13 | 2200 | 8.3 | 11000 | 1700 | 3200 | 6.7 | 3410 | 37 |
| 2005-10 | MW-1013C | Dup. | | 500 | 9.4 | < 13 | 2300 | 8.7 | 11000 | 1700 | 3100 | | | |
| 2005-10 | MW-1014 | | 1117.7 | 170 | < 0.85 | < 13 | 350 | < 0.33 | 1300 | 200 | 500 | 7.1 | 726 | 202 |
| 2005-10 | MW-1014A | | 1114.97 | 450 | < 0.85 | < 13 | 1300 | < 0.33 | 1500 | 890 | 1800 | 6.7 | 2270 | 213 |
| 2005-10 | MW-1014B | | 1112.41 | 470 | 1.2 | 400 | 1800 | < 0.33 | 15000 | 1300 | 2400 | 6.5 | 2820 | 261 |
| 2005-10 | MW-1014C | | 1108.06 | 320 | 14 | < 13 | 630 | 7 | 2200 | 290 | 790 | 6.7 | 1157 | 54 |
| 2005-10 | MW-1015A | | 1088.12 | 85 | < 0.66 | 3.8 | 96 | < 0.005 | 13 | 8.8 | 110 | 6.2 | 161 | 70 |
| 2005-10 | MW-1015B | | 1088.24 | 180 | < 0.66 | < 2.7 | 150 | 0.3 | 140 | < 2.5 | 260 | 6.3 | 461 | -93 |
| 2006-01 | MW-1000PR | | 1087.71 | 210 | 3 | 58 | 480 | 0.68 | 2400 | 300 | 670 | 6.8 | 1014 | 126 |
| 2006-01 | MW-1000R | | 1088.41 | | | | | | | | | | | |
| 2006-01 | MW-1002 | | 1090.67 | 51 | < 0.66 | < 2.7 | 52 | < 0.005 | < 1 | 4.6 | 33 | 7.1 | 112 | |
| 2006-01 | MW-1002G | | 1090.58 | 89 | < 0.66 | < 2.7 | 94 | < 0.005 | < 1 | 8.3 | 95 | 7 | 213 | |
| 2006-01 | MW-1004 | | 1106.31 | | | | | | | | | | | |
| 2006-01 | MW-1004P | | 1105.59 | 160 | < 0.66 | < 2.7 | 140 | 0.35 | 170 | < 2.5 | 110 | 7.1 | 290 | 95 |
| 2006-01 | MW-1004S | | 1106.51 | 48 | < 0.66 | < 2.7 | 58 | < 0.005 | 1 | 23 | 75 | 7 | 165 | 175 |
| 2006-01 | MW-1005 | | 1138.33 | 51 | 1.7 | < 2.7 | 200 | 15 | 440 | 14 | 350 | 6.5 | 597 | |
| 2006-01 | MW-1005P | | 1137.24 | 250 | < 0.66 | < 2.7 | 200 | 0.49 | 75 | < 2.5 | 200 | 6.9 | 434 | 20 |
| 2006-01 | MW-1005S | | 1137.47 | 160 | 2.4 | < 2.7 | 140 | 4 | 210 | 3.2 | 160 | 6.8 | 316 | |
| 2006-01 | MW-1010P | | 1087.51 | 150 | 4.3 | < 2.7 | 140 | 0.057 | 170 | 9.2 | 130 | 7.2 | 301 | 90 |
| 2006-01 | MW-1013 | | 1108.54 | 680 | 0.98 | < 13 | 560 | 12 | 22000 | 79 | 700 | 6.4 | 1211 | 72 |
| 2006-01 | MW-1013A | | 1097.01 | 340 | < 0.85 | < 13 | 500 | < 0.33 | 2900 | 240 | 650 | 6.8 | 1271 | 156 |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006-01 | MW-1013B | | 1097.17 | 590 | 1.1 | 210 | 2200 | < 0.33 | 22000 | 1500 | 3000 | 6.4 | 3480 | 223 |
| 2006-01 | MW-1013C | | | 550 | 13 | < 13 | 2100 | 7.6 | 9700 | 1700 | 3100 | 6.3 | 3480 | 61 |
| 2006-01 | MW-1014 | | 1117.27 | 170 | < 0.85 | < 13 | 310 | < 0.33 | 1100 | 190 | 540 | 6.9 | 748 | 261 |
| 2006-01 | MW-1014A | | 1114.81 | 480 | < 0.85 | 17 | 1200 | < 0.33 | 1500 | 970 | 1800 | 6.8 | 2390 | 252 |
| 2006-01 | MW-1014B | | 1112.12 | 570 | 2.4 | 560 | 1900 | < 0.33 | 16000 | 1400 | 2800 | 6.5 | 3350 | 287 |
| 2006-01 | MW-1014C | | 1107.25 | 300 | 16 | < 13 | 590 | 6.2 | 2000 | 280 | 740 | 6.9 | 1182 | 67 |
| 2006-01 | MW-1014C | Dup. | | 310 | 18 | < 13 | 570 | 6 | 1900 | 270 | 750 | | | |
| 2006-01 | MW-1015A | | 1088.05 | 76 | < 0.66 | < 2.7 | 80 | < 0.005 | 9 | 8.4 | 79 | 7.2 | 165 | 160 |
| 2006-01 | MW-1015B | | 1087.8 | 180 | < 0.66 | < 2.7 | 140 | 0.32 | 110 | < 2.5 | 270 | 7.2 | 472 | -73 |
| 2006-02 | MW-1013C | | 1099.3 | | | | | | | | | | | |
| 2006-04 | MW-1000PR | | 1088.35 | 210 | 1.8 | 30 | 530 | 0.46 | 2600 | 300 | 620 | 6.62 | 926 | 129 |
| 2006-04 | MW-1000R | | 1088.82 | | | | | | | | | | | |
| 2006-04 | MW-1002 | | 1092.17 | 52 | < 0.57 | < 2.7 | 61 | 0.006 | < 1 | 6.2 | 26 | 6.72 | 112 | |
| 2006-04 | MW-1002G | | 1092.06 | 89 | < 0.57 | < 2.7 | 110 | 0.015 | < 1 | 9.1 | 67 | 6.76 | 201 | |
| 2006-04 | MW-1004 | | 1106.96 | | | | | | | | | | | |
| 2006-04 | MW-1004P | | 1105.34 | 160 | < 0.57 | < 2.7 | 140 | 0.2 | 89 | 2.5 | 93 | 6.31 | 270 | 88 |
| 2006-04 | MW-1004S | | 1107.08 | 49 | < 0.57 | < 2.7 | 78 | 0.008 | 2.6 | 25 | 63 | 5.85 | 161.6 | 176 |
| 2006-04 | MW-1005 | | 1139.51 | 52 | 2.2 | < 2.7 | 210 | 13 | 320 | 14 | 290 | 6.23 | 596 | |
| 2006-04 | MW-1005P | | 1138.47 | 250 | < 0.57 | < 2.7 | 230 | 0.22 | 40 | < 2.5 | 210 | 6.71 | 439 | 6 |
| 2006-04 | MW-1005S | | 1138.64 | 170 | 2.8 | < 2.7 | 160 | 4.4 | 230 | 4 | 140 | 6.56 | 298 | |
| 2006-04 | MW-1005S | Dup. | | 170 | 2.3 | < 2.7 | 160 | 4.4 | 230 | 4 | 110 | | | |
| 2006-04 | MW-1010P | | 1088.21 | 150 | 4.2 | < 2.7 | 160 | 0.029 | 150 | 13 | 89 | 7 | 278 | 101 |
| 2006-04 | MW-1013 | | 1108.42 | 510 | < 1 | 23 | 550 | 2.2 | 21000 | 65 | 640 | 5.95 | 1040 | 150 |
| 2006-04 | MW-1013A | | 1097.29 | 340 | < 1 | 17 | 730 | < 0.33 | 3900 | 270 | 640 | 6.23 | 1571 | 152 |
| 2006-04 | MW-1013B | | 1097.65 | 590 | < 1 | 280 | 2200 | < 0.33 | 25000 | 1600 | 3000 | 6.1 | 3300 | 210 |
| 2006-04 | MW-1013C | | 1099.24 | 520 | 12 | < 13 | 2300 | 8.9 | 11000 | 1600 | 3000 | 6.21 | 3380 | 51 |
| 2006-04 | MW-1014 | | 1117.25 | 150 | < 1 | 36 | 340 | < 0.33 | 1200 | 170 | 410 | 6.49 | 677 | 271 |
| 2006-04 | MW-1014A | | 1114.95 | 440 | < 1 | 22 | 1300 | < 0.33 | 2100 | 880 | 1700 | 6.39 | 2200 | 268 |
| 2006-04 | MW-1014B | | 1112.27 | 550 | 1.1 | 530 | 1900 | < 0.33 | 14000 | 1400 | 2700 | 6.23 | 2740 | 292 |
| 2006-04 | MW-1014C | | 1107.9 | 340 | 16 | < 13 | 620 | 6.4 | 2100 | 270 | 700 | 6.4 | 1124 | 80 |
| 2006-04 | MW-1015A | | 1088.71 | 77 | < 0.57 | < 2.7 | 90 | < 0.005 | 11 | 9.1 | 39 | 6.96 | 161.5 | 173 |
| 2006-04 | MW-1015B | | 1088.89 | 180 | < 0.57 | < 2.7 | 140 | 0.44 | 100 | < 2.5 | 190 | 7.11 | 464 | -84 |
| 2006-07 | MW-1000PR | | 1086.96 | 270 | 1.7 | 21 | 480 | 0.62 | 2400 | 310 | 660 | 6.47 | 928 | 100 |
| 2006-07 | MW-1000R | | 1088.31 | | | | | | | | | | | |
| 2006-07 | MW-1002 | | 1089.57 | 50 | < 0.57 | 2.9 | 53 | < 0.005 | < 1 | 5.1 | 88 | 6.49 | 108.8 | |
| 2006-07 | MW-1002G | | 1088.49 | 86 | < 0.57 | < 2.7 | 99 | < 0.005 | 2.9 | 8.7 | 140 | 6.55 | 199.4 | |
| 2006-07 | MW-1004 | | | | | | | | | | | | | |
| 2006-07 | MW-1004P | | 1103.79 | 160 | < 0.57 | 26 | 130 | < 0.005 | 5.6 | < 2.5 | 170 | 7.11 | 266 | 72 |
| 2006-07 | MW-1004S | | 1105.22 | 50 | < 0.57 | 8.9 | 77 | < 0.005 | < 1 | 26 | 93 | 7.11 | 165.3 | 199 |
| 2006-07 | MW-1005 | | 1137.18 | 54 | 1.7 | < 2.7 | 220 | 12 | 340 | 14 | 560 | 6.44 | 715 | |
| 2006-07 | MW-1005P | | 1136.8 | 240 | < 0.57 | < 2.7 | 210 | 0.6 | 86 | < 2.5 | 200 | 6.59 | 423 | 1 |
| 2006-07 | MW-1005S | | 1137.26 | 170 | 2.8 | < 2.7 | 150 | 4 | 210 | 3.8 | 170 | 6.66 | 302 | |
| 2006-07 | MW-1010P | | 1086.63 | 150 | 4.4 | 2.8 | 150 | 0.045 | 150 | 14 | 150 | 7.16 | 290 | 104 |
| 2006-07 | MW-1013 | | 1111.08 | 520 | < 1 | 24 | 530 | 3.2 | 20000 | 58 | 630 | 6.05 | 1091 | 92 |
| 2006-07 | MW-1013 | Dup. | | 560 | < 1 | 29 | 520 | 3.2 | 19000 | 58 | 670 | | | |
| 2006-07 | MW-1013A | | 1096.52 | 320 | < 1 | 16 | 460 | < 0.33 | 1700 | 220 | 600 | 6.52 | 1104 | 160 |
| 2006-07 | MW-1013B | | 1096.73 | 610 | 1.4 | 470 | 2200 | < 0.33 | 36000 | 1600 | 3000 | 6.17 | 3280 | 249 |
| 2006-07 | MW-1013C | | 1098.2 | 520 | 18 | 14 | 2200 | 7 | 9800 | 1700 | 3100 | 6.09 | 3300 | 51 |
| 2006-07 | MW-1014 | | 1117.53 | 170 | < 1 | 26 | 320 | < 0.33 | 940 | 180 | 490 | 6.54 | 713 | 175 |
| 2006-07 | MW-1014A | | 1114.77 | 450 | < 1 | 31 | 1300 | < 0.33 | 1400 | 1000 | 1800 | 6.62 | 2190 | 190 |
| 2006-07 | MW-1014B | | 1112.1 | 520 | 1.8 | 510 | 1700 | < 0.33 | 12000 | 1400 | 2400 | 6.41 | 2780 | 222 |
| 2006-07 | MW-1014C | | 1107.35 | 350 | 16 | 16 | 580 | 5.9 | 1900 | 260 | 770 | 6.55 | 1080 | 63 |
| 2006-07 | MW-1015A | | 1086.95 | 79 | < 0.57 | 3.3 | 82 | < 0.005 | 8.2 | 8.6 | 100 | 6.02 | 160.8 | 73 |
| 2006-07 | MW-1015B | | 1086.84 | 170 | 0.97 | < 2.7 | 140 | 0.052 | 97 | < 2.5 | 270 | 6.33 | 466 | -63 |
| 2006-10 | MW-1000PR | | 1085.87 | 210 | 2.8 | 12 | 550 | 0.49 | 2700 | 290 | 600 | 7 | 948 | 108 |
| 2006-10 | MW-1000R | | 1087.12 | | | | | | | | | | | |
| 2006-10 | MW-1002 | | 1089.47 | 52 | < 0.57 | < 2.7 | 62 | < 0.005 | < 1 | 6.3 | < 2 | 6.8 | 109 | |
| 2006-10 | MW-1002G | | 1089.42 | 87 | < 0.57 | < 2.7 | 110 | < 0.005 | < 1 | 9.3 | 37 | 6.9 | 200 | |
| 2006-10 | MW-1004 | | 1104.87 | | | | | | | | | | | |
| 2006-10 | MW-1004P | | 1103.68 | 150 | < 0.57 | < 2.7 | 150 | < 0.005 | 6.1 | 3.1 | 120 | 7.3 | 280 | 75 |
| 2006-10 | MW-1004P | Dup. | | 160 | < 0.57 | < 2.7 | 150 | < 0.005 | 6.2 | 4.5 | 66 | | | |
| 2006-10 | MW-1004S | | 1104.98 | 51 | < 0.57 | < 2.7 | 87 | < 0.005 | < 1 | 26 | 83 | 6.8 | 185 | 181 |
| 2006-10 | MW-1005 | | 1137.03 | 54 | 2.3 | < 2.7 | 300 | 16 | 380 | 15 | 320 | 6.3 | 833 | |
| 2006-10 | MW-1005P | | 1136.78 | 240 | < 0.57 | < 2.7 | 230 | 0.019 | 39 | < 2.5 | 140 | 7 | 456 | -3 |
| 2006-10 | MW-1005S | | 1136.55 | 160 | 2.3 | < 2.7 | 170 | 4.4 | 240 | 4.1 | 83 | 7.3 | 302 | |
| 2006-10 | MW-1010P | | 1086.79 | 160 | 5.7 | < 2.7 | 170 | 0.017 | 110 | 8.1 | 92 | 7.8 | 289 | 71 |
| 2006-10 | MW-1013 | | 1109.73 | 520 | < 1 | < 13 | 580 | 11 | 24000 | 55 | 620 | 6.5 | 1233 | 81 |
| 2006-10 | MW-1013A | | 1096.36 | 300 | < 1 | < 13 | 490 | < 0.33 | 2400 | 200 | 560 | 7 | 1015 | 130 |
| 2006-10 | MW-1013B | | 1096.54 | 480 | < 1 | 200 | 2400 | < 0.33 | 23000 | 1600 | 3000 | 6.5 | 3360 | 309 |
| 2006-10 | MW-1013C | | 1097.94 | 580 | 15 | < 13 | 2200 | 9.1 | 11000 | 1600 | 3000 | 6.7 | 3390 | 16 |
| 2006-10 | MW-1014 | | 1117.45 | 170 | < 1 | < 13 | 350 | < 0.33 | 880 | 180 | 430 | 6.7 | 739 | 165 |
| 2006-10 | MW-1014A | | 1114.6 | 480 | < 1 | < 13 | 1400 | 0.66 | 820 | 1000 | 1800 | 6.7 | 2290 | 176 |
| 2006-10 | MW-1014B | | 1111.88 | 460 | < 1 | 460 | 1900 | < 0.33 | 13000 | 1300 | 2400 | 6.5 | 2900 | 215 |
| 2006-10 | MW-1014C | | 1106.97 | 330 | 20 | < 13 | 620 | 6.1 | 2000 | 260 | 700 | 7 | 1113 | 36 |
| 2006-10 | MW-1015A | | 1086.85 | 78 | < 0.57 | < 2.7 | 92 | < 0.005 | 9.5 | 9.3 | 21 | 7.1 | 162 | 156 |
| 2006-10 | MW-1015B | | 1086.94 | 180 | < 0.57 | < 2.7 | 160 | 0.32 | 110 | 2.5 | 230 | 7.5 | 466 | -73 |
| 2007-01 | MW-1000PR | | 1087.12 | 220 | 1.7 | 29 | 530 | 0.26 | 2600 | 290 | 570 | 6.8 | 959 | 175 |
| 2007-01 | MW-1000R | | 1087.25 | | | | | | | | | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007-01 | MW-1002 | | 1089.38 | 39 | < 0.57 | < 2.7 | 57 | < 0.005 | < 1 | 5.5 | 5 | 6.9 | 106 | |
| 2007-01 | MW-1002G | | 1089.34 | 81 | < 0.57 | < 2.7 | 110 | < 0.005 | < 1 | 8.3 | 43 | 6.7 | 208 | |
| 2007-01 | MW-1004 | | 1104.37 | | | | | | | | | | | |
| 2007-01 | MW-1004P | | 1103.05 | 160 | < 0.57 | < 2.7 | 140 | 0.04 | 79 | < 2.5 | 91 | 7.2 | 285 | 157 |
| 2007-01 | MW-1004S | | 1104.49 | 48 | < 0.57 | < 2.7 | 83 | < 0.005 | < 1 | 27 | 46 | 6.9 | 178 | 227 |
| 2007-01 | MW-1005 | | 1137.54 | 49 | 1.5 | < 2.7 | 200 | 16 | 460 | 14 | 290 | 6.2 | 528 | |
| 2007-01 | MW-1005P | | 1136.27 | 250 | < 0.57 | < 2.7 | 230 | 0.41 | 89 | 3.7 | 180 | 6.9 | 441 | 11 |
| 2007-01 | MW-1005S | | 1136.33 | 170 | 1.9 | < 2.7 | 170 | 4.1 | 230 | 3.5 | 130 | 6.7 | 312 | |
| 2007-01 | MW-1010P | | 1087 | 160 | 4.3 | < 2.7 | 160 | 0.038 | 160 | 8.7 | 120 | 7.3 | 303 | 97 |
| 2007-01 | MW-1010P | Dup. | | 150 | 4.4 | < 2.7 | 160 | 0.035 | 160 | 8.4 | 130 | | | |
| 2007-01 | MW-1013 | | 1108.4 | 560 | 4 | < 13 | 600 | 12 | 24000 | 72 | 680 | 6.4 | 1168 | 100 |
| 2007-01 | MW-1013A | | 1096.32 | 320 | 1.9 | < 13 | 400 | < 0.33 | 1700 | 170 | 510 | 7 | 885 | 147 |
| 2007-01 | MW-1013B | | 1096.44 | 570 | < 1 | 290 | 2200 | < 0.33 | 24000 | 1600 | 2900 | 6.5 | 3370 | 286 |
| 2007-01 | MW-1013C | | 1098.06 | 540 | 9 | < 13 | 2300 | 9.5 | 11000 | 1700 | 3000 | 6.6 | 3460 | 68 |
| 2007-01 | MW-1014 | | 1117.15 | 170 | 2.1 | 39 | 330 | < 0.33 | 1300 | 170 | 420 | 6.8 | 710 | 218 |
| 2007-01 | MW-1014A | | 1114.68 | 470 | < 1 | < 13 | 1300 | < 0.33 | 780 | 1000 | 1700 | 6.6 | 3150 | 254 |
| 2007-01 | MW-1014B | | 1111.42 | 570 | < 1 | 600 | 1900 | < 0.33 | 15000 | 1400 | 2600 | 6.6 | 3150 | 254 |
| 2007-01 | MW-1014C | | 1106.92 | 300 | 21 | < 13 | 580 | 6 | 1900 | 260 | 680 | 6.8 | 1122 | 76 |
| 2007-01 | MW-1015A | | 1087.99 | 69 | < 0.57 | < 2.7 | 90 | < 0.005 | 8.9 | 8.8 | 57 | 7 | 163 | 83 |
| 2007-01 | MW-1015B | | 1086.98 | 160 | < 0.57 | < 2.7 | 160 | 0.35 | 120 | < 2.5 | 200 | 7.2 | 541 | -60 |
| 2007-04 | MW-1000PR | | 1087.43 | 230 | 3.9 | 13 | 530 | 0.38 | 2600 | 300 | 630 | 6.1 | 929 | 207 |
| 2007-04 | MW-1000R | | 1087.88 | | | | | | | | | | | |
| 2007-04 | MW-1002 | | 1090.43 | 50 | 1.7 | < 2.7 | 56 | < 0.005 | < 1 | 5.6 | 43 | 7.2 | 101 | |
| 2007-04 | MW-1002G | | 1090.34 | 88 | 1.9 | < 2.7 | 110 | < 0.005 | < 1 | 9.2 | 190 | 6.8 | 203 | |
| 2007-04 | MW-1004 | | | | | | | | | | | | | |
| 2007-04 | MW-1004P | | 1103.86 | 160 | 1.8 | < 2.7 | 140 | 0.22 | 82 | 2.5 | 110 | 6.5 | 266 | 128 |
| 2007-04 | MW-1004S | | 1105.59 | 54 | 2.1 | < 2.7 | 92 | < 0.005 | < 1 | 30 | 100 | 6.4 | 181 | 212 |
| 2007-04 | MW-1005 | | 1137.26 | 50 | 3.1 | < 2.7 | 190 | 16 | 430 | 14 | 89 | 6.5 | 508 | |
| 2007-04 | MW-1005 | Dup. | | 51 | 2.9 | < 2.7 | 190 | 16 | 430 | 14 | 170 | | | |
| 2007-04 | MW-1005P | | 1135.62 | 240 | 2 | < 2.7 | 230 | 0.24 | 28 | < 2.5 | 170 | 6.8 | 427 | 7 |
| 2007-04 | MW-1005S | | 1135.91 | 170 | 3.6 | < 2.7 | 160 | 4.2 | 230 | 3.5 | 230 | 6.9 | 297 | |
| 2007-04 | MW-1010P | | 1087.48 | 160 | 5.2 | < 2.7 | 160 | 0.037 | 170 | 8.1 | 140 | 6.5 | 289 | 154 |
| 2007-04 | MW-1013 | | 1108.02 | 550 | 1.4 | < 13 | 620 | 3.3 | 24000 | 74 | 670 | 6.1 | 1149 | 87 |
| 2007-04 | MW-1013A | | 1096.2 | 330 | < 1 | < 13 | 460 | < 0.33 | 1700 | 180 | 540 | 6.3 | 1006 | 137 |
| 2007-04 | MW-1013B | | 1096.45 | 620 | 3.2 | 230 | 2400 | < 0.33 | 23000 | 1700 | 3000 | 5.9 | 3260 | 255 |
| 2007-04 | MW-1013C | | 1098.24 | 560 | 16 | < 13 | 2300 | 9.3 | 11000 | 1700 | 3100 | 6.2 | 3320 | 51 |
| 2007-04 | MW-1014 | | 1116.26 | 170 | 1.1 | 17 | 350 | < 0.033 | 610 | 180 | 420 | 6.2 | 677 | 188 |
| 2007-04 | MW-1014A | | 1113.98 | 470 | 3.7 | < 13 | 1400 | 0.53 | 920 | 950 | 1800 | 6.2 | 2180 | 180 |
| 2007-04 | MW-1014B | | 1111.12 | 550 | 3.2 | 470 | 1900 | < 0.33 | 14000 | 1300 | 2500 | 6 | 2750 | 189 |
| 2007-04 | MW-1014C | | 1106.71 | 340 | 19 | < 13 | 620 | 6.1 | 2000 | 670 | 670 | 6.2 | 1072 | 68 |
| 2007-04 | MW-1015A | | 1087.59 | 78 | 1.6 | < 2.7 | 89 | < 0.005 | 9.3 | 8.9 | 67 | 7.3 | 162 | 75 |
| 2007-04 | MW-1015B | | 1087.75 | 180 | 1.2 | < 2.7 | 140 | 0.16 | 81 | < 2.5 | 200 | 7.2 | 458 | -71 |
| 2007-06 | MW-1000PR | | 1086.72 | 230 | 2.7 | 12 | 500 | 0.66 | 2600 | 300 | 660 | 6.4 | 887 | 89 |
| 2007-06 | MW-1000R | | 1087.06 | | | | | | | | | | | |
| 2007-06 | MW-1002 | | 1089.67 | 42 | < 0.83 | < 2.7 | 46 | < 0.005 | < 1 | 4.6 | 46 | 6.5 | 105 | |
| 2007-06 | MW-1002G | | 1089.6 | 88 | < 0.83 | < 2.7 | 100 | < 0.005 | < 1 | 8.1 | 130 | 6.7 | 227 | |
| 2007-06 | MW-1004 | | 1104.83 | | | | | | | | | | | |
| 2007-06 | MW-1004P | | 1103.49 | 160 | < 0.83 | < 2.7 | 140 | 0.075 | 110 | < 2.5 | 120 | 7.1 | 297 | 151 |
| 2007-06 | MW-1004S | | 1104.94 | 54 | < 0.83 | < 2.7 | 87 | < 0.005 | < 1 | 29 | 110 | 6.2 | 205 | 201 |
| 2007-06 | MW-1005 | | 1136.98 | 50 | 2.2 | < 2.7 | 180 | 15 | 410 | 14 | 340 | 6.1 | 527 | |
| 2007-06 | MW-1005P | | 1135.99 | 260 | < 0.83 | < 2.7 | 220 | 0.24 | 71 | < 2.5 | 200 | 7 | 464 | 6 |
| 2007-06 | MW-1005S | | 1136.17 | 170 | 2.1 | < 2.7 | 160 | 4.2 | 230 | 2.9 | 220 | 7 | 331 | |
| 2007-06 | MW-1010P | | 1086.67 | 150 | 4.7 | < 2.7 | 160 | 0.031 | 150 | 15 | 180 | 7.4 | 326 | 86 |
| 2007-06 | MW-1013 | | 1110.51 | 610 | 3 | < 13 | 560 | 9.6 | 23000 | 61 | 700 | 6.1 | 1144 | 84 |
| 2007-06 | MW-1013A | | 1096.07 | 360 | 2.1 | < 13 | 430 | < 0.33 | 1200 | 170 | 530 | 6.6 | 974 | 100 |
| 2007-06 | MW-1013B | | 1096.39 | 620 | 3.8 | 240 | 2100 | < 0.33 | 21000 | 1600 | 3000 | 6.2 | 3131 | 216 |
| 2007-06 | MW-1013C | | 1097.64 | 590 | 22 | < 13 | 2200 | 11 | 10000 | 1700 | 3100 | 6.4 | | 71 |
| 2007-06 | MW-1014 | | 1115.87 | 180 | 1.8 | < 13 | 260 | < 0.33 | 310 | 170 | 450 | 6.4 | 701 | 187 |
| 2007-06 | MW-1014 | Dup. | | 190 | 2.8 | 15 | 330 | < 0.33 | 380 | 170 | 430 | | | |
| 2007-06 | MW-1014A | | 1113.49 | 490 | 4.4 | < 13 | 1300 | < 0.33 | 640 | 1000 | 1800 | 6.5 | 2187 | 182 |
| 2007-06 | MW-1014B | | 1110.64 | 570 | 6.6 | 600 | 1900 | < 0.33 | 14000 | 1400 | 2500 | 6.3 | 2888 | 197 |
| 2007-06 | MW-1014C | | 1106.19 | 360 | 19 | < 13 | 580 | 5.8 | 1900 | 270 | 720 | 6.6 | 1050 | 51 |
| 2007-06 | MW-1015A | | 1086.78 | 79 | < 0.83 | < 2.7 | 86 | < 0.005 | 8.8 | 8.5 | 110 | 6.9 | 187 | 285 |
| 2007-06 | MW-1015B | | 1086.85 | | | | | | | | | | | |
| 2007-07 | MW-1015B | | | 180 | < 0.83 | < 2.7 | 140 | 0.34 | 100 | < 2.5 | 290 | 7.6 | 594 | -27 |
| 2007-10 | MW-1000PR | | 1089.31 | 230 | 26 | < 2.7 | 520 | 4.7 | 2800 | 300 | 650 | 6.5 | 933 | 74 |
| 2007-10 | MW-1000R | | 1090.03 | | | | | | | | | | | |
| 2007-10 | MW-1002 | | 1090.85 | 44 | < 0.83 | < 2.7 | 50 | < 0.005 | < 1 | 4.9 | 27 | 6.7 | 113 | |
| 2007-10 | MW-1002G | | 1090.79 | 90 | < 0.83 | < 2.7 | 110 | < 0.005 | < 1 | 8.5 | 77 | 6.7 | 228 | |
| 2007-10 | MW-1004 | | 1109.54 | | | | | | | | | | | |
| 2007-10 | MW-1004P | | 1105.02 | 160 | < 0.83 | < 2.7 | 150 | 0.19 | 84 | < 2.5 | 110 | 7.3 | 296 | 72 |
| 2007-10 | MW-1004S | | 1109.7 | 51 | 1.5 | < 2.7 | 93 | < 0.005 | < 1 | 31 | 120 | 6.3 | 214 | 211 |
| 2007-10 | MW-1005 | | 1137.93 | 51 | 2.6 | < 2.7 | 190 | 14 | 330 | 14 | 320 | 6.1 | 560 | |
| 2007-10 | MW-1005P | | 1136 | 250 | < 0.83 | < 2.7 | 230 | 0.31 | 61 | < 2.5 | 220 | 7.1 | 457 | -12 |
| 2007-10 | MW-1005S | | 1136.38 | 180 | 3.1 | < 2.7 | 160 | 4.3 | 230 | < 2.5 | 220 | 7.1 | 326 | |
| 2007-10 | MW-1010P | | 1089.09 | 160 | 13 | < 2.7 | 170 | 0.009 | 90 | 16 | 160 | 7.6 | 319 | 159 |
| 2007-10 | MW-1013 | | 1110.28 | 620 | < 1 | < 13 | 610 | 15 | 24000 | 53 | 740 | 6.2 | 1261 | 68 |
| 2007-10 | MW-1013A | | 1095.72 | 380 | < 1 | < 13 | 490 | < 0.33 | 2600 | 210 | 610 | 6.6 | 912 | 85 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007-10 | MW-1013B | | 1095.86 | 690 | 3.7 | 500 | 2300 | < 0.33 | 38000 | 1600 | 3100 | 6.3 | 3182 | 227 |
| 2007-10 | MW-1013C | | 1097.98 | 570 | 16 | < 13 | 2300 | 9.7 | 11000 | 1800 | 3100 | 6.3 | 3108 | 56 |
| 2007-10 | MW-1014 | | 1115.95 | 190 | < 1 | 33 | 350 | < 0.33 | 580 | 180 | 470 | 6.4 | 739 | 220 |
| 2007-10 | MW-1014A | | 1113.13 | 560 | < 1 | < 13 | 1400 | < 0.33 | 890 | 940 | 1900 | 6.6 | 2175 | 218 |
| 2007-10 | MW-1014A | Dup. | | 510 | 1.5 | 27 | 1400 | < 0.33 | 880 | 860 | 1800 | | | |
| 2007-10 | MW-1014B | | 1110.47 | 520 | 1.9 | 490 | 1900 | < 0.33 | 13000 | 1300 | 2500 | 6.4 | 2670 | 234 |
| 2007-10 | MW-1014C | | 1106.22 | 360 | 19 | < 13 | 600 | 5.8 | 2000 | 260 | 670 | 6.6 | 1041 | 57 |
| 2007-10 | MW-1015A | | 1087.98 | 86 | < 0.83 | < 2.7 | 91 | < 0.005 | 8.7 | 9.2 | 140 | 7 | 188 | 169 |
| 2007-10 | MW-1015A | Dup. | | 80 | < 0.83 | < 2.7 | 91 | < 0.005 | 8.6 | 9.4 | 55 | | | |
| 2007-10 | MW-1015B | | 1087.7 | 180 | < 0.83 | < 2.7 | 160 | 0.33 | 100 | < 2.5 | 300 | 7.7 | 573 | -68 |
| 2008-01 | MW-1000PR | | 1087.62 | 230 | 4.6 | 13 | 460 | 0.31 | 2400 | 310 | 690 | 6.4 | 921 | 161 |
| 2008-01 | MW-1000PR | Dup. | | 220 | 5.3 | 12 | 490 | 0.32 | 2500 | 310 | 670 | | | |
| 2008-01 | MW-1000R | | 1088.01 | | | | | | | | | | | |
| 2008-01 | MW-1002 | | 1090.08 | 50 | 1 | < 2.7 | 53 | < 0.005 | < 1 | 6.2 | 97 | 6.6 | 122 | |
| 2008-01 | MW-1002G | | 1090.02 | 89 | < 0.83 | < 2.7 | 97 | < 0.005 | < 1 | 9.4 | 150 | 6.6 | 227 | |
| 2008-01 | MW-1004 | | 1106.62 | | | | | | | | | | | |
| 2008-01 | MW-1004P | | 1105.32 | 160 | 1.8 | < 2.7 | 140 | 0.036 | 66 | 2.7 | 230 | 7.2 | 286 | 122 |
| 2008-01 | MW-1004S | | 1106.72 | 63 | < 0.83 | < 2.7 | 89 | < 0.005 | < 1 | 33 | 150 | 6.3 | 215 | 208 |
| 2008-01 | MW-1005 | | 1137.51 | 51 | 2.7 | < 2.7 | 170 | 14 | 360 | 15 | 350 | 6.2 | 508 | |
| 2008-01 | MW-1005P | | 1136.5 | 220 | < 0.83 | < 2.7 | 170 | 0.25 | 33 | < 2.5 | 410 | 7.3 | 520 | -5 |
| 2008-01 | MW-1005S | | 1136.74 | 180 | 2 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 220 | 7 | 332 | |
| 2008-01 | MW-1010P | | 1087.63 | 160 | 5.3 | < 2.7 | 150 | 0.035 | 160 | 14 | 210 | 7.5 | 321 | 72 |
| 2008-01 | MW-1013 | | 1109.61 | 600 | 2.2 | < 13 | 590 | 14 | 24000 | 78 | 800 | 6.2 | 1183 | 63 |
| 2008-01 | MW-1013A | | 1097.1 | 370 | < 1 | < 13 | 410 | < 0.33 | 2100 | 170 | 590 | 6.6 | 963 | 85 |
| 2008-01 | MW-1013B | | 1097.27 | 620 | 3.9 | 400 | 2200 | < 0.33 | 31000 | 1500 | 3200 | 6.2 | 3141 | 206 |
| 2008-01 | MW-1013C | | 1098.85 | 590 | 22 | < 13 | 2100 | 9.1 | 10000 | 1800 | 3200 | 6.5 | 3203 | 58 |
| 2008-01 | MW-1014 | | 1117.28 | 170 | < 1 | < 13 | 310 | < 0.33 | 800 | 160 | 480 | 6.3 | 661 | 188 |
| 2008-01 | MW-1014A | | 1114.15 | 490 | < 1 | < 13 | 1300 | < 0.33 | 940 | 940 | 1900 | 6.6 | 2202 | 189 |
| 2008-01 | MW-1014B | | 1112.06 | 600 | 4.4 | 500 | 1900 | < 0.33 | 14000 | 1400 | 2800 | 6.4 | 2882 | 211 |
| 2008-01 | MW-1014C | | 1107.58 | 310 | 24 | < 13 | 550 | 5.4 | 1800 | 280 | 750 | 6.6 | 1081 | 59 |
| 2008-01 | MW-1015A | | 1087.41 | 79 | < 0.83 | < 2.7 | 85 | < 0.005 | 7.3 | 11 | 140 | 7.1 | 189 | 248 |
| 2008-01 | MW-1015B | | 1087.61 | 180 | < 0.83 | < 2.7 | 140 | 0.29 | 94 | < 2.5 | 450 | 7.7 | 586 | -53 |
| 2008-04 | MW-1000PR | | 1091.29 | 230 | 4 | 7.8 | 490 | 0.33 | 2500 | 280 | 710 | 6.5 | 880 | 157 |
| 2008-04 | MW-1000R | | 1092.39 | | | | | | | | | | | |
| 2008-04 | MW-1002 | | 1092.08 | 53 | < 1.5 | < 2.7 | 56 | < 0.005 | < 1 | 5.8 | 96 | 6.5 | 134 | |
| 2008-04 | MW-1002G | | 1092.04 | 89 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.8 | 150 | 6.6 | 225 | |
| 2008-04 | MW-1004 | | 1109.95 | | | | | | | | | | | |
| 2008-04 | MW-1004P | | 1107.14 | 160 | < 1.5 | < 2.7 | 190 | 0.18 | 170 | 2.5 | 190 | 7.1 | 279 | 119 |
| 2008-04 | MW-1004S | | 1110.09 | 56 | < 1.5 | < 2.7 | 91 | < 0.005 | < 1 | 30 | 140 | 6.3 | 211 | 171 |
| 2008-04 | MW-1005 | | 1139.01 | 46 | 2.5 | < 2.7 | 170 | 14 | 330 | 14 | 320 | 6.1 | 453 | |
| 2008-04 | MW-1005P | | 1137.53 | 260 | < 1.5 | < 2.7 | 220 | 1.1 | 72 | < 0.25 | 350 | 6.9 | 478 | -7 |
| 2008-04 | MW-1005P | Dup. | | 220 | < 1.5 | < 2.7 | 220 | 1.1 | 72 | < 2.5 | 350 | 7.1 | 474 | |
| 2008-04 | MW-1005S | | 1137.92 | 180 | 2.9 | < 2.7 | 150 | 4.3 | 230 | 12 | 220 | 6.9 | 324 | |
| 2008-04 | MW-1010P | | 1091.2 | 160 | 5 | < 2.7 | 160 | 0.014 | 150 | 9.5 | 190 | 7.5 | 319 | 117 |
| 2008-04 | MW-1013 | | 1110.52 | 570 | 5.1 | < 13 | 580 | 4.1 | 23000 | 66 | 770 | 6.2 | 1155 | 52 |
| 2008-04 | MW-1013A | | 1096.94 | 330 | 1.5 | < 13 | 500 | < 0.33 | 2800 | 180 | 640 | 6.7 | 862 | 83 |
| 2008-04 | MW-1013B | | 1097.36 | 640 | < 1 | 530 | 2200 | < 0.33 | 40000 | 1500 | 3200 | 6.2 | 3200 | 201 |
| 2008-04 | MW-1013B | Dup. | | 630 | 2.9 | 550 | 2200 | < 0.33 | 39000 | 1400 | 3200 | 6.2 | 3209 | |
| 2008-04 | MW-1013C | | 1099.98 | 530 | 16 | < 13 | 2200 | 9.6 | 11000 | 1600 | 3200 | 6.4 | 3156 | 29 |
| 2008-04 | MW-1014 | | 1116.86 | 180 | < 1 | < 13 | 320 | < 0.33 | 260 | 160 | 490 | 6.3 | 683 | 149 |
| 2008-04 | MW-1014A | | 1114.25 | 480 | 1.2 | < 13 | 1700 | < 0.33 | 1100 | 880 | 1900 | 6.6 | 2202 | 142 |
| 2008-04 | MW-1014B | | 1111.97 | 570 | 1.9 | 570 | 1900 | < 0.33 | 14000 | 1400 | 2800 | 6.4 | 2815 | 157 |
| 2008-04 | MW-1014C | | 1107.87 | 310 | 24 | < 13 | 570 | 5.6 | 1900 | 190 | 780 | 6.6 | 1069 | 48 |
| 2008-04 | MW-1015A | | 1090.43 | 78 | < 1.5 | < 2.7 | 88 | < 0.005 | 8.1 | 9.7 | 140 | 6.9 | 185 | 153 |
| 2008-04 | MW-1015B | | 1090.08 | 180 | < 1.5 | < 2.7 | 150 | 0.3 | 86 | < 0.25 | 350 | 7.5 | 580 | -57 |
| 2008-06 | MW-1000PR | | 1087.84 | 220 | 3.7 | 21 | 500 | 0.46 | 2500 | 240 | 640 | 6.4 | 932 | 117 |
| 2008-06 | MW-1000R | | 1089.12 | | | | | | | | | | | |
| 2008-06 | MW-1002 | | 1092.92 | 56 | < 1.5 | < 2.7 | 66 | < 0.005 | < 1 | 7.1 | 81 | 6.6 | 143 | |
| 2008-06 | MW-1002G | | 1092.84 | 88 | < 1.5 | < 2.7 | 110 | < 0.005 | < 1 | 9.2 | 150 | 6.7 | 233 | |
| 2008-06 | MW-1002G | Dup. | | 88 | < 1.5 | < 2.7 | 110 | 0.035 | < 1 | 11 | 150 | 6.7 | 231 | |
| 2008-06 | MW-1004 | | 1109.48 | | | | | | | | | | | |
| 2008-06 | MW-1004P | | 1107.51 | 160 | < 1.5 | < 2.7 | 140 | 0.055 | 70 | 2.8 | 130 | 7.3 | 301 | 143 |
| 2008-06 | MW-1004S | | 1109.6 | 57 | < 1.5 | < 2.7 | 95 | < 0.005 | < 1 | 31 | 130 | 6.2 | 215 | 178 |
| 2008-06 | MW-1005 | | 1140.12 | 50 | 2.8 | < 2.7 | 180 | 15 | 380 | 16 | 440 | 6.1 | 511 | |
| 2008-06 | MW-1005P | | 1139 | 250 | < 1.5 | < 2.7 | 230 | 1.2 | 76 | < 2.5 | 230 | 7.2 | 460 | -8 |
| 2008-06 | MW-1005S | | 1139.17 | 170 | 1.6 | < 2.7 | 160 | 4.5 | 230 | < 2.5 | 190 | 7 | 332 | |
| 2008-06 | MW-1010P | | 1087.77 | 150 | 23 | < 2.7 | 160 | < 0.005 | 67 | 13 | 170 | 7.5 | 322 | 76 |
| 2008-06 | MW-1013 | | 1112.75 | 470 | 1.7 | 22 | 550 | 3.6 | 22000 | 60 | 660 | 6.2 | 1150 | 88 |
| 2008-06 | MW-1013A | | 1097.88 | 340 | 2 | < 13 | 630 | < 0.33 | 3500 | 270 | 740 | 6.6 | 1195 | 94 |
| 2008-06 | MW-1013B | | 1098.29 | 550 | 2.7 | 270 | 2200 | < 0.33 | 21000 | 1600 | 3100 | 6.2 | 3159 | 216 |
| 2008-06 | MW-1013C | | 1100 | 480 | 18 | < 13 | 2200 | 10 | 10000 | 1700 | 3100 | 6.4 | 3288 | 36 |
| 2008-06 | MW-1014 | | 1118.17 | 160 | < 1.5 | 22 | 310 | < 0.005 | 830 | 140 | 410 | 6.3 | 676 | 167 |
| 2008-06 | MW-1014A | | 1114.85 | 530 | 2 | < 13 | 1300 | < 0.33 | 410 | 910 | 1900 | 6.6 | 2211 | 167 |
| 2008-06 | MW-1014B | | 1113.44 | 580 | 4.8 | 580 | 1900 | < 0.33 | 14000 | 1300 | 2600 | 6.4 | 2972 | 202 |
| 2008-06 | MW-1014B | Dup. | | 480 | 5.5 | 570 | 2000 | < 0.33 | 14000 | 1400 | 2700 | 6.5 | 2975 | |
| 2008-06 | MW-1014C | | 1108.96 | 280 | 22 | < 13 | 550 | 5.4 | 1800 | 220 | 690 | 6.5 | 1061 | 52 |
| 2008-06 | MW-1015A | | 1088.69 | 79 | < 1.5 | 3 | 89 | < 0.005 | 6.3 | 10 | 110 | 7 | 189 | 132 |
| 2008-06 | MW-1015B | | 1088.85 | 180 | < 1.5 | < 2.7 | 150 | 0.2 | 89 | < 2.5 | 270 | 7.8 | 580 | 40 |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008-10 | MW-1000PR | | 1086.95 | 230 | 2.7 | 13 | 480 | 0.63 | 2600 | 290 | 660 | 6.5 | 919 | 175 |
| 2008-10 | MW-1000R | | 1087.38 | | | | | | | | | | | |
| 2008-10 | MW-1002 | | 1090.2 | 54 | < 1.5 | < 2.7 | 58 | < 0.005 | < 1 | 6.4 | 87 | 6.5 | 135 | |
| 2008-10 | MW-1002G | | 1090.15 | 93 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 9.3 | 140 | 6.6 | 237 | |
| 2008-10 | MW-1004 | | 1105.94 | | | | | | | | | | | |
| 2008-10 | MW-1004P | | 1104.58 | 160 | < 1.5 | < 2.7 | 140 | 0.17 | 160 | 2.5 | 190 | 7.2 | 302 | 132 |
| 2008-10 | MW-1004S | | 1106.05 | 53 | < 1.5 | < 2.7 | 85 | < 0.005 | < 1 | 30 | 190 | 6.3 | 203 | 170 |
| 2008-10 | MW-1005 | | 1137.82 | 48 | 1.7 | < 2.7 | 270 | 13 | 330 | 13 | 460 | 5.9 | 861 | |
| 2008-10 | MW-1005P | | 1137.23 | 250 | < 1.5 | < 2.7 | 220 | 1.1 | 80 | < 2.5 | 240 | 7 | 468 | 6 |
| 2008-10 | MW-1005S | | 1137.36 | 180 | 2.2 | < 2.7 | 160 | 3.8 | 220 | < 2.5 | 230 | 7 | 336 | |
| 2008-10 | MW-1010P | | 1086.88 | 170 | 8.6 | < 2.7 | 160 | 0.024 | 120 | 9.5 | 190 | 7.5 | 328 | 133 |
| 2008-10 | MW-1013 | | 1111.19 | 610 | < 2.4 | < 13 | 590 | 14 | 24000 | 51 | 760 | 6.2 | 1389 | 62 |
| 2008-10 | MW-1013A | | 1096.84 | 310 | < 2.4 | < 13 | 450 | < 0.33 | 2700 | 210 | 620 | 6.7 | 854 | 78 |
| 2008-10 | MW-1013A | Dup. | | 340 | < 2.4 | < 13 | 460 | < 0.33 | 2700 | 200 | 620 | | | |
| 2008-10 | MW-1013B | | 1097.1 | 210 | < 2.4 | 260 | 2200 | < 0.33 | 20000 | 1700 | 3100 | 6.3 | 3134 | 213 |
| 2008-10 | MW-1013C | | 1098.96 | 530 | 17 | < 13 | 2200 | 9.4 | 10000 | 1700 | 3000 | 6.5 | 3163 | 50 |
| 2008-10 | MW-1014 | | 1119.24 | 190 | < 2.4 | 14 | 320 | < 0.33 | 310 | 180 | 540 | 6.4 | 739 | 165 |
| 2008-10 | MW-1014A | | 1116.06 | 470 | < 2.4 | < 13 | 1300 | < 0.33 | 590 | 970 | 2000 | 6.6 | 2185 | 162 |
| 2008-10 | MW-1014B | | 1113.37 | 460 | 2.8 | 480 | 1100 | < 0.33 | 13000 | 1400 | 2700 | 6.4 | 2814 | 174 |
| 2008-10 | MW-1014C | | 1108.49 | 310 | 17 | < 13 | 570 | 5.5 | 1800 | 260 | 730 | 6.6 | 1058 | 68 |
| 2008-10 | MW-1015A | | 1087.15 | 82 | < 1.5 | < 2.7 | 88 | < 0.005 | 6.5 | 11 | 130 | 6.9 | 188 | 62 |
| 2008-10 | MW-1015B | | 1087.16 | 180 | < 1.5 | < 2.7 | 150 | 0.32 | 66 | < 2.5 | 310 | 7.5 | 581 | -37 |
| 2008-10 | MW-1015B | Dup. | | 180 | < 1.5 | < 2.7 | 150 | 0.32 | 65 | < 2.5 | 300 | | | |
| 2009-01 | MW-1000PR | | 1087.63 | 220 | 4.9 | 17 | 470 | 0.34 | 2400 | 260 | 680 | 6.4 | 873 | 132 |
| 2009-01 | MW-1000R | | 1087.94 | | | | | | | | | | | |
| 2009-01 | MW-1002 | | 1089.6 | 52 | < 1.5 | < 2.7 | 63 | < 0.005 | < 1 | 6.5 | 140 | 6.7 | 141 | |
| 2009-01 | MW-1002G | | 1089.54 | 81 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 8.5 | 140 | 6.7 | 225 | |
| 2009-01 | MW-1004 | | 1104.46 | | | | | | | | | | | |
| 2009-01 | MW-1004P | | 1104.25 | 150 | 2.5 | < 2.7 | 140 | 0.41 | 170 | < 2.5 | 180 | 7.1 | 296 | 124 |
| 2009-01 | MW-1004S | | 1104.54 | 38 | < 1.5 | < 2.7 | 80 | < 0.005 | < 1 | 27 | 150 | 6.3 | 194 | 170 |
| 2009-01 | MW-1004S | Dup. | | 48 | < 1.5 | < 2.7 | 80 | 0.006 | < 1 | 28 | 120 | | | |
| 2009-01 | MW-1005 | | 1136.78 | 42 | 2.1 | 4.2 | 260 | 14 | 340 | 14 | 470 | 6.1 | 814 | |
| 2009-01 | MW-1005P | | 1136.22 | 240 | < 1.5 | < 2.7 | 210 | 0.91 | 70 | < 2.5 | 260 | 7.2 | 472 | 7 |
| 2009-01 | MW-1005S | | 1136.46 | 170 | 1.8 | < 2.7 | 160 | 3.8 | 220 | < 2.5 | 230 | 7 | 339 | |
| 2009-01 | MW-1010P | | 1087.44 | 150 | 3.5 | < 2.7 | 160 | 0.02 | 140 | 13 | 200 | 7.5 | 315 | 106 |
| 2009-01 | MW-1013 | | 1109.57 | 560 | < 2.4 | < 13 | 620 | 13 | 25000 | 73 | 800 | 6.1 | 1230 | 52 |
| 2009-01 | MW-1013A | | 1096.69 | 300 | < 2.4 | < 13 | 440 | < 0.33 | 2400 | 180 | 620 | 6.6 | 953 | 62 |
| 2009-01 | MW-1013B | | 1096.95 | 660 | < 2.4 | 240 | 2200 | < 0.33 | 19000 | 1500 | 3200 | 6.2 | 3075 | 197 |
| 2009-01 | MW-1013C | | 1098.87 | 520 | 17 | < 13 | 2100 | 10 | 10000 | 1600 | 3100 | 6.3 | 3277 | 51 |
| 2009-01 | MW-1014 | | 1118.33 | 160 | < 2.4 | < 13 | 320 | < 0.33 | 260 | 140 | 540 | 6.4 | 729 | 196 |
| 2009-01 | MW-1014A | | 1115.84 | 490 | < 2.4 | < 13 | 1300 | < 0.33 | 560 | 1000 | 2100 | 6.6 | 2138 | 192 |
| 2009-01 | MW-1014B | | 1112.54 | 480 | < 2.4 | 480 | 1800 | < 0.33 | 13000 | 1300 | 2700 | 6.4 | 2908 | 216 |
| 2009-01 | MW-1014C | | 1107.83 | 300 | 23 | < 13 | 540 | 5.3 | 1800 | 240 | 810 | 6.6 | 1061 | 76 |
| 2009-01 | MW-1014C | Dup. | | 320 | 22 | < 13 | 540 | 5.3 | 1800 | 240 | 730 | | | |
| 2009-01 | MW-1015A | | 1087.52 | 78 | < 1.5 | < 2.7 | 86 | < 0.005 | 6.7 | 11 | 150 | 7.1 | 187 | 155 |
| 2009-01 | MW-1015B | | 1087.51 | 180 | < 1.5 | < 2.7 | 150 | 0.26 | 70 | < 2.5 | 300 | 7.6 | 599 | -38 |
| 2009-04 | MW-1000PR | | 1086.89 | 220 | 3.5 | 8.4 | 470 | 0.26 | 2300 | 280 | 650 | 6.5 | 906 | 155 |
| 2009-04 | MW-1000R | | 1087.37 | | | | | | | | | | | |
| 2009-04 | MW-1002 | | 1090.13 | 53 | < 1.5 | < 2.7 | 60 | < 0.005 | < 1 | 8.7 | 70 | 6.5 | 142 | |
| 2009-04 | MW-1002G | | 1090.07 | 85 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 7 | 89 | 6.6 | 237 | |
| 2009-04 | MW-1004 | | 1105.47 | | | | | | | | | | | |
| 2009-04 | MW-1004P | | 1103.73 | 160 | < 1.5 | < 2.7 | 140 | 0.072 | 63 | < 2.5 | 140 | 7.3 | 302 | 87 |
| 2009-04 | MW-1004S | | 1105.58 | 55 | < 1.5 | < 2.7 | 80 | 0.049 | 1.5 | 28 | 140 | 6.3 | 193 | 198 |
| 2009-04 | MW-1005 | | 1137.45 | 47 | < 1.5 | < 2.7 | 190 | 13 | 340 | 14 | 310 | 6.1 | 576 | |
| 2009-04 | MW-1005P | | 1135.83 | 210 | < 1.5 | < 2.7 | 210 | 0.27 | 62 | 2.7 | 280 | 7.1 | 540 | 22 |
| 2009-04 | MW-1005S | | 1136.18 | 170 | 3.6 | < 2.7 | 150 | 4 | 220 | < 2.5 | 200 | 7 | 330 | |
| 2009-04 | MW-1005S | Dup. | | 170 | 2.4 | < 2.7 | 150 | 4 | 220 | < 2.5 | 130 | 7 | 336 | |
| 2009-04 | MW-1010P | | 1086.85 | 160 | 18 | < 2.7 | 160 | 0.042 | 140 | 11 | 170 | 7.4 | 325 | 125 |
| 2009-04 | MW-1013 | | 1108.25 | 680 | < 2.4 | 4.4 | 570 | 4.3 | 23000 | 65 | 730 | 6.2 | 1172 | 91 |
| 2009-04 | MW-1013A | | 1096 | 390 | < 2.4 | < 1.3 | 370 | 0.071 | 960 | 150 | 530 | 6.7 | 856 | 98 |
| 2009-04 | MW-1013B | | 1096.3 | 490 | < 2.4 | 390 | 2100 | < 0.033 | 26000 | 1700 | 3000 | 6.2 | 3181 | 215 |
| 2009-04 | MW-1013C | | 1097.96 | 500 | 15 | < 1.3 | 2100 | 9.8 | 9100 | 1500 | 3100 | 6.4 | 3241 | 55 |
| 2009-04 | MW-1013C | Dup. | | 460 | 14 | < 1.3 | 2700 | 13 | 12000 | 1700 | 3100 | 6.4 | 3265 | 55 |
| 2009-04 | MW-1014 | | 1117.03 | 170 | < 2.4 | 6.3 | 300 | < 0.033 | 330 | 160 | 470 | 6.4 | 711 | 166 |
| 2009-04 | MW-1014A | | 1114.88 | 470 | < 2.4 | 4.8 | 1200 | < 0.033 | 210 | 1100 | 1900 | 6.6 | 2203 | 162 |
| 2009-04 | MW-1014B | | 1111.43 | 460 | < 2.4 | 550 | 1700 | < 0.033 | 11000 | 1400 | 2600 | 6.4 | 2850 | 178 |
| 2009-04 | MW-1014C | | 1106.8 | 310 | 20 | < 1.3 | 510 | 4.8 | 1600 | 260 | 720 | 6.6 | 1059 | 72 |
| 2009-04 | MW-1015A | | 1087.28 | 77 | < 1.5 | < 2.7 | 85 | < 0.005 | 6.5 | 10 | 120 | 7 | 193 | 162 |
| 2009-04 | MW-1015B | | 1087.27 | 170 | < 1.5 | < 2.7 | 150 | 0.28 | 69 | < 2.5 | 290 | 7.5 | 583 | -44 |
| 2009-06 | MW-1000PR | | 1086.9 | 230 | 3.5 | 15 | 450 | 0.52 | 2200 | 280 | 690 | 6.48 | 904 | 158 |
| 2009-06 | MW-1000R | | 1087.29 | | | | | | | | | | | |
| 2009-06 | MW-1002 | | 1089.92 | 47 | < 1.5 | < 2.7 | 49 | < 0.005 | < 1 | 5.2 | 64 | 6.64 | 120 | |
| 2009-06 | MW-1002G | | 1089.84 | 87 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.3 | 170 | 6.55 | 242 | |
| 2009-06 | MW-1002G | Dup. | | 86 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.7 | 150 | | | |
| 2009-06 | MW-1004 | | 1105.72 | | | | | | | | | | | |
| 2009-06 | MW-1004P | | 1104.32 | 160 | < 1.5 | < 2.7 | 130 | 0.067 | 57 | < 2.5 | 150 | 7.2 | 299.4 | 105 |
| 2009-06 | MW-1004S | | 1105.83 | 52 | < 1.5 | < 2.7 | 77 | 0.016 | < 1 | 28 | 95 | 6.3 | 189.4 | 202 |
| 2009-06 | MW-1005 | | 1137.78 | 47 | 1.8 | < 2.7 | 160 | 14 | 310 | 15 | 400 | 6.16 | 516 | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009-06 | MW-1005P | | 1136.49 | 240 | 2.1 | < 2.7 | 200 | 1.2 | 65 | < 2.5 | 270 | 7.09 | 488.1 | -4 |
| 2009-06 | MW-1005S | | 1136.79 | 170 | 5.9 | < 2.7 | 150 | 4.2 | 210 | < 2.5 | 240 | 6.98 | 332 | |
| 2009-06 | MW-1010P | | 1086.83 | 150 | 18 | < 2.7 | 150 | 0.026 | 120 | 16 | 200 | 7.44 | 333.8 | 100 |
| 2009-06 | MW-1013 | | 1110.6 | 580 | 3.2 | 14 | 520 | 5.3 | 21000 | 51 | 710 | 6.11 | 1153 | 86 |
| 2009-06 | MW-1013A | | 1096.57 | 320 | < 2.4 | < 13 | 460 | 0.044 | 2400 | 200 | 610 | 6.61 | 887 | 126 |
| 2009-06 | MW-1013B | | 1096.97 | 580 | 3.9 | 300 | 2000 | < 0.033 | 20000 | 1700 | 3200 | 6.17 | 3160 | 235 |
| 2009-06 | MW-1013B | Dup. | | 630 | 3.9 | 270 | 2000 | < 0.033 | 19000 | 1600 | 3200 | | | |
| 2009-06 | MW-1013C | | 1098.14 | 550 | 18 | < 13 | 2000 | 9.8 | 9800 | 1900 | 3100 | 6.35 | 3251 | 51 |
| 2009-06 | MW-1014 | | 1117.02 | 170 | < 2.4 | 30 | 290 | < 0.033 | 320 | 170 | 460 | 6.34 | 710 | 176 |
| 2009-06 | MW-1014A | | 1114.7 | 500 | 4.1 | 18 | 1200 | 0.12 | 200 | 970 | 1900 | 6.54 | 2195 | 180 |
| 2009-06 | MW-1014B | | 1111.48 | 510 | 2.4 | 490 | 1800 | < 0.033 | 13000 | 1300 | 2800 | 6.33 | 2893 | 216 |
| 2009-06 | MW-1014C | | 1106.86 | 300 | 19 | < 13 | 510 | 5 | 1600 | 260 | 720 | 6.59 | 1026 | 69 |
| 2009-06 | MW-1015A | | 1087.06 | 81 | < 1.5 | < 2.7 | 83 | < 0.005 | 6.4 | 11 | 130 | 6.83 | 196 | 172 |
| 2009-06 | MW-1015B | | 1087.01 | 180 | < 1.5 | < 2.7 | 140 | 0.23 | 73 | < 2.5 | 300 | 7.59 | 585 | -46 |
| 2009-10 | MW-1000PR | | 1086.56 | 220 | 2.8 | 9.7 | 500 | 0.38 | 2600 | 270 | 610 | 6.4 | 929 | 93 |
| 2009-10 | MW-1000R | | 1086.74 | | | | | | | | | | | |
| 2009-10 | MW-1002 | | 1088.96 | 51 | < 1.5 | 12 | 56 | < 0.0037 | 0.34 | 5.1 | 64 | 6.57 | 131 | |
| 2009-10 | MW-1002G | | 1088.91 | 80 | < 1.5 | < 0.31 | 110 | < 0.0037 | 0.21 | 8 | 130 | 6.59 | 240.8 | |
| 2009-10 | MW-1004 | | 1104.19 | | | | | | | | | | | |
| 2009-10 | MW-1004P | | 1103.1 | 160 | < 1.5 | < 0.31 | 150 | 1.3 | 350 | < 2.5 | 150 | 7.16 | 315.1 | 24 |
| 2009-10 | MW-1004S | | 1104.28 | 52 | < 1.5 | 1.5 | 77 | < 0.0037 | 2.3 | 24 | 110 | 6.21 | 185.5 | 182 |
| 2009-10 | MW-1005 | | 1135.95 | 33 | < 1.5 | 1.2 | 230 | 11 | 300 | 15 | 370 | 6.03 | 724 | |
| 2009-10 | MW-1005P | | 1135.44 | 250 | < 1.5 | < 0.31 | 220 | 0.83 | 72 | < 2.5 | 230 | 7.05 | 468.6 | -1 |
| 2009-10 | MW-1005S | | 1135.59 | 180 | 3.3 | < 0.31 | 170 | 4 | 220 | < 2.5 | 170 | 7.02 | 338.6 | |
| 2009-10 | MW-1005S | Dup. | | 180 | 4.1 | < 0.31 | 170 | 3.6 | 240 | < 2.5 | 180 | | | |
| 2009-10 | MW-1010P | | 1086.42 | 150 | 25 | < 0.31 | 160 | 0.02 | 110 | 18 | 160 | 7.43 | 327 | 74 |
| 2009-10 | MW-1013 | | 1110.93 | 600 | < 2.4 | 6.8 | 1100 | 10 | 23000 | 40 | 700 | 6.05 | 1153 | 75 |
| 2009-10 | MW-1013A | | 1096.23 | 320 | < 2.4 | 1.4 | 380 | 0.012 | 1400 | 170 | 520 | 6.61 | 862 | 98 |
| 2009-10 | MW-1013B | | 1096.47 | 600 | < 2.4 | 360 | 2100 | 0.031 | 23000 | 1600 | 3000 | 6.15 | 3185 | 227 |
| 2009-10 | MW-1013C | | 1097.8 | 510 | 15 | < 0.31 | 2100 | 9.8 | 10000 | 1700 | 3000 | 6.32 | 3289 | 63 |
| 2009-10 | MW-1014 | | 1117.09 | 170 | < 2.4 | 7.1 | 310 | < 0.0037 | 270 | 170 | 440 | 6.33 | 735 | 167 |
| 2009-10 | MW-1014A | | 1114.28 | 490 | < 2.4 | 19 | 1300 | 0.076 | 330 | 940 | 1800 | 6.52 | 2173 | 173 |
| 2009-10 | MW-1014B | | 1111.21 | 590 | 2.7 | 490 | 1900 | 0.010 | 13000 | 1500 | 2600 | 6.32 | 2964 | 209 |
| 2009-10 | MW-1014C | | 1106.57 | 300 | 20 | < 0.31 | 540 | 4.3 | 1700 | 230 | 670 | 6.55 | 1034 | 71 |
| 2009-10 | MW-1014C | Dup. | | 290 | 20 | < 0.31 | 520 | 4.2 | 1600 | 250 | 670 | | | |
| 2009-10 | MW-1015A | | 1086.54 | 82 | < 1.5 | 0.37 | 88 | < 0.0037 | 7 | 11 | 98 | 6.82 | 192.4 | 105 |
| 2009-10 | MW-1015B | | 1086.53 | 180 | < 1.5 | < 0.31 | 150 | 0.12 | 69 | < 2.5 | 280 | 7.57 | 596 | -13 |
| 2009-12 | MW-1004P | | 1103.61 | 130 | < 0.80 | < 2.7 | 140 | 0.63 | 180 | < 2.5 | 110 | 7.1 | 301 | 105 |
| 2009-12 | MW-1004P | Dup. | | 130 | < 0.80 | < 2.7 | 73 | 0.32 | 95 | < 2.5 | 98 | | | |
| 2010-01 | MW-1000PR | | 1087.06 | 170 | < 1.5 | 12 | 450 | 0.32 | 2300 | 280 | 660 | 6.54 | 926 | 87 |
| 2010-01 | MW-1000R | | 1087.22 | | | | | | | | | | | |
| 2010-01 | MW-1002 | | 1089.13 | 39 | < 1.5 | < 2.7 | 54 | 0.007 | < 1 | 5.6 | 77 | 6.63 | 134.6 | |
| 2010-01 | MW-1002G | | 1089.07 | 65 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 8.4 | 160 | 6.64 | 257.9 | |
| 2010-01 | MW-1004 | | 1104.43 | | | | | | | | | | | |
| 2010-01 | MW-1004P | | 1103.32 | 130 | < 1.5 | < 2.7 | 130 | 0.09 | 72 | < 2.5 | 140 | 7.3 | 296.7 | 100 |
| 2010-01 | MW-1004P | Dup. | | 130 | < 1.5 | < 2.7 | 130 | 0.087 | 77 | < 2.5 | 170 | | | |
| 2010-01 | MW-1004S | | 1104.51 | 34 | < 1.5 | < 2.7 | 75 | < 0.005 | < 1 | 26 | 120 | 6.41 | 194.7 | 190 |
| 2010-01 | MW-1005 | | 1136.33 | 28 | < 1.5 | < 2.7 | 160 | 12 | 340 | 15 | 290 | 6.21 | 513 | |
| 2010-01 | MW-1005P | | 1135.48 | 190 | < 1.5 | < 2.7 | 200 | 1.2 | 62 | < 2.5 | 220 | 7.22 | 563 | -4 |
| 2010-01 | MW-1005S | | 1135.72 | 150 | 3.1 | < 2.7 | 150 | 4.2 | 220 | < 2.5 | 220 | 7.17 | 336.6 | |
| 2010-01 | MW-1010P | | 1086.94 | 120 | 18 | < 2.7 | 150 | 0.005 | 52 | 22 | 210 | 7.57 | 327.7 | 69 |
| 2010-01 | MW-1013 | | 1110.28 | 410 | < 2.4 | 8 | 550 | 5.7 | 23000 | 56 | 900 | 6.24 | 1133 | 70 |
| 2010-01 | MW-1013A | | 1096.36 | 250 | < 2.4 | < 1.3 | 450 | 0.077 | 3100 | 180 | 610 | 6.69 | 959 | 80 |
| 2010-01 | MW-1013B | | 1096.54 | 470 | < 2.4 | 290 | 2100 | < 0.033 | 20000 | 2400 | 3100 | 6.31 | 3180 | 220 |
| 2010-01 | MW-1013C | | 1098.23 | 440 | 18 | < 1.3 | 2000 | 9.2 | 9300 | 1700 | 3100 | 6.46 | 3249 | 54 |
| 2010-01 | MW-1014 | | 1116.71 | 120 | < 2.4 | 4.2 | 300 | 0.066 | 120 | 140 | 480 | 6.45 | 691 | 161 |
| 2010-01 | MW-1014A | | 1113.9 | 400 | < 2.4 | 7.6 | 1200 | < 0.033 | 190 | 1100 | 1900 | 6.67 | 2167 | 158 |
| 2010-01 | MW-1014B | | 1111.26 | 440 | 3.9 | 530 | 1700 | < 0.033 | 12000 | 1400 | 2700 | 6.4 | 2899 | 170 |
| 2010-01 | MW-1014C | | 1106.72 | 240 | 21 | < 1.3 | 500 | 4.9 | 1600 | 250 | 710 | 6.69 | 1026 | 67 |
| 2010-01 | MW-1014C | Dup. | | 240 | 18 | < 1.3 | 510 | 4.9 | 1600 | 240 | 700 | | | |
| 2010-01 | MW-1015A | | 1086.91 | 62 | < 1.5 | < 2.7 | 82 | 0.005 | 6.5 | 11 | 120 | 7.02 | 192 | 127 |
| 2010-01 | MW-1015B | | 1087.01 | 150 | < 1.5 | < 2.7 | 140 | 0.23 | 62 | < 2.5 | 300 | 7.6 | 581 | -16 |
| 2010-04 | MW-1000PR | | 1086.84 | 230 | 2.6 | 12 | 480 | 0.21 | 2300 | 240 | 650 | 6.44 | 914 | 131 |
| 2010-04 | MW-1000R | | 1087.42 | | | | | | | | | | | |
| 2010-04 | MW-1002 | | 1090.03 | 51 | < 1.5 | < 2.7 | 54 | < 0.005 | < 1 | 4 | 80 | 6.8 | 123.5 | |
| 2010-04 | MW-1002G | | 1089.96 | 88 | < 1.5 | < 2.7 | 110 | < 0.005 | < 1 | 7.3 | 160 | 6.62 | 262.2 | |
| 2010-04 | MW-1004 | | 1105.22 | | | | | | | | | | | |
| 2010-04 | MW-1004P | | 1103.76 | 170 | < 1.5 | < 2.7 | 140 | 0.35 | 190 | < 2.5 | 140 | 7.08 | 289.4 | 47 |
| 2010-04 | MW-1004S | | 1105.33 | 51 | < 1.5 | < 2.7 | 76 | < 0.005 | 1.1 | 23 | 85 | 6.29 | 180.3 | 257 |
| 2010-04 | MW-1005 | | 1137.52 | 48 | < 1.5 | < 2.7 | 160 | 14 | 330 | 13 | 370 | 6.29 | 504 | |
| 2010-04 | MW-1005P | | 1136.03 | 260 | < 1.5 | < 2.7 | 210 | 1.2 | 69 | < 2.5 | 240 | 6.98 | 469.5 | 6 |
| 2010-04 | MW-1005S | | 1136.33 | 180 | 2.2 | < 2.7 | 160 | 4.6 | 240 | < 2.5 | 190 | 6.9 | 345 | |
| 2010-04 | MW-1010P | | 1086.83 | 150 | 21 | < 2.7 | 160 | 0.028 | 110 | 16 | 170 | 7.44 | 329.7 | 111 |
| 2010-04 | MW-1013 | | 1110.58 | 580 | < 2.4 | < 13 | 570 | 3.7 | 24000 | 51 | 700 | 6.15 | 1133 | 110 |
| 2010-04 | MW-1013A | | 1096.1 | 360 | < 2.4 | < 13 | 450 | 0.072 | 2800 | 170 | 590 | 6.61 | 922 | 140 |
| 2010-04 | MW-1013B | | 1096.39 | 540 | < 2.4 | 400 | 2100 | < 0.066 | 29000 | 1400 | 3000 | 6.23 | 3181 | 260 |
| 2010-04 | MW-1013C | | 1097.76 | 550 | 16 | < 13 | 2100 | 11 | 10000 | 1600 | 3100 | 6.39 | 3280 | 57 |
| 2010-04 | MW-1014 | | 1115.93 | 170 | < 2.4 | < 13 | 310 | < 0.033 | 170 | 150 | 460 | 6.38 | 718 | 189 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010-04 | MW-1014A | | 1113.52 | 450 | < 2.4 | < 13 | 1300 | < 0.033 | 140 | 870 | 1800 | 6.55 | 2216 | 198 |
| 2010-04 | MW-1014B | | 1110.65 | 520 | < 2.4 | 510 | 1900 | < 0.033 | 13000 | 1400 | 2700 | 6.36 | 2879 | 233 |
| 2010-04 | MW-1014C | | 1106.17 | 300 | 20 | < 13 | 530 | 4.9 | 1700 | 210 | 690 | 6.59 | 1051 | 66 |
| 2010-04 | MW-1015A | | 1087.17 | 80 | < 1.5 | < 2.7 | 87 | < 0.005 | 6.8 | 9.5 | 130 | 6.97 | 217 | 75 |
| 2010-04 | MW-1015B | | 1087.2 | 180 | < 1.5 | < 2.7 | 150 | 0.1 | 58 | < 2.5 | 310 | 7.51 | 587 | -28 |
| 2010-06 | MW-1000PR | | 1091.22 | 240 | 4.9 | 19 | 440 | 0.35 | 2200 | 220 | 620 | 6.43 | 907 | 84 |
| 2010-06 | MW-1000R | | 1091.99 | | | | | | | | | | | |
| 2010-06 | MW-1002 | | 1091.26 | 49 | < 2.5 | 4.1 | 45 | < 0.005 | < 1 | 3.7 | 46 | 6.8 | 112.4 | |
| 2010-06 | MW-1002G | | 1091.23 | 93 | < 2.5 | 3.4 | 110 | < 0.005 | < 1 | 7.4 | 140 | 6.52 | 269.4 | |
| 2010-06 | MW-1004 | | 1108.24 | | | | | | | | | | | |
| 2010-06 | MW-1004P | | 1105.73 | 170 | < 2.5 | 3.4 | 140 | 0.32 | 160 | < 2.5 | 130 | 7.16 | 285.9 | 18 |
| 2010-06 | MW-1004S | | 1108.35 | 55 | < 2.5 | 5.1 | 74 | < 0.005 | < 1 | 23 | 84 | 6.29 | 177.3 | 205 |
| 2010-06 | MW-1005 | | 1139.47 | 52 | < 2.5 | 4.3 | 160 | 13 | 310 | 13 | 370 | 6.02 | 517 | |
| 2010-06 | MW-1005P | | 1137.87 | 240 | < 2.5 | 3.1 | 160 | 0.2 | 49 | < 2.5 | 300 | 7.01 | 617 | -11 |
| 2010-06 | MW-1005S | | 1138.29 | 190 | 3.6 | 2.9 | 150 | 4.3 | 220 | < 2.5 | 260 | 6.84 | 349.1 | |
| 2010-06 | MW-1010P | | 1091.45 | 170 | 23 | 7.2 | 150 | 0.022 | 100 | 18 | 140 | 7.39 | 331.1 | 68 |
| 2010-06 | MW-1013 | | 1113.03 | 590 | < 1.3 | < 13 | 550 | 2.4 | 23000 | 44 | 690 | 6.18 | 1096 | 96 |
| 2010-06 | MW-1013A | | 1096.58 | 350 | < 1.3 | < 13 | 450 | 0.08 | 2400 | 170 | 580 | 6.65 | 900 | 102 |
| 2010-06 | MW-1013B | | 1096.97 | 690 | 5 | 590 | 2100 | < 0.05 | 37000 | 1300 | 3100 | 6.22 | 3251 | 243 |
| 2010-06 | MW-1013C | | 1099.95 | 620 | 23 | < 13 | 2000 | 9.3 | 9800 | 1600 | 3000 | 6.37 | 3245 | 44 |
| 2010-06 | MW-1014 | | 1116.51 | 190 | < 1.3 | < 13 | 290 | < 0.05 | 140 | 140 | 450 | 6.44 | 691 | 162 |
| 2010-06 | MW-1014A | | 1113.64 | 510 | 3.7 | < 13 | 1300 | < 0.05 | 130 | 1000 | 1800 | 6.59 | 2186 | 158 |
| 2010-06 | MW-1014B | | 1111.55 | 550 | 3.9 | 560 | 1800 | < 0.05 | 12000 | 1000 | 2800 | 6.37 | 2888 | 166 |
| 2010-06 | MW-1014C | | 1107.56 | 310 | 24 | 16 | 500 | 4.6 | 1600 | 200 | 730 | 6.52 | 1011 | 59 |
| 2010-06 | MW-1015A | | 1090.08 | 84 | < 2.5 | 3.8 | 83 | < 0.005 | 7.2 | 10 | 110 | 6.71 | 194.6 | 165 |
| 2010-06 | MW-1015B | | 1090.43 | 190 | < 2.5 | 2.9 | 140 | 0.14 | 56 | < 2.5 | 270 | 7.45 | 600 | -55 |
| 2010-07 | MW-1014B | | 1111.44 | | | | | | | | | 6.31 | 2930 | |
| 2010-10 | MW-1000PR | | 1089.9 | 230 | 2.9 | < 2.7 | 460 | 0.56 | 2500 | 240 | 580 | 6.5 | 651 | 89 |
| 2010-10 | MW-1000R | | 1090.87 | 440 | < 2.5 | 99 | 530 | < 0.005 | 12000 | 110 | 640 | 6.29 | 747 | 162 |
| 2010-10 | MW-1002 | | 1094.8 | 54 | < 2.5 | < 2.7 | 60 | < 0.005 | < 1 | 5.3 | 55 | 6.59 | 108.8 | |
| 2010-10 | MW-1002G | | 1094.7 | 86 | < 2.5 | < 2.7 | 110 | < 0.005 | < 1 | 7.3 | 110 | 6.54 | 190.7 | |
| 2010-10 | MW-1002G | Dup. | | 85 | < 2.5 | < 2.7 | 110 | 0.007 | < 1 | 7.1 | 120 | | | |
| 2010-10 | MW-1004 | | 1110.13 | 37 | < 2.5 | < 2.7 | 39 | 0.032 | 1.6 | 8.4 | 43 | 6.44 | 77.3 | 245 |
| 2010-10 | MW-1004P | | 1107.78 | 160 | < 2.5 | < 2.7 | 140 | 0.45 | 160 | < 2.5 | 140 | 7.09 | 216.4 | 6 |
| 2010-10 | MW-1004S | | 1110.23 | 51 | < 2.5 | < 2.7 | 74 | < 0.005 | < 1 | 23 | 79 | 6.38 | 136.7 | 235 |
| 2010-10 | MW-1005 | | 1140.03 | 43 | < 2.5 | < 2.7 | 160 | 14 | 340 | 13 | 300 | 6.13 | 354 | |
| 2010-10 | MW-1005P | | 1139.28 | 250 | < 2.5 | < 2.7 | 220 | 1.2 | 72 | < 2.5 | 220 | 7.02 | 303.5 | 3 |
| 2010-10 | MW-1005S | | 1139.5 | 190 | < 2.5 | < 2.7 | 160 | 4.4 | 230 | < 2.5 | 190 | 7.01 | 225.9 | |
| 2010-10 | MW-1010P | | 1089.72 | 150 | 21 | < 2.7 | 160 | 0.036 | 120 | 17 | 130 | 7.49 | 233.4 | 87 |
| 2010-10 | MW-1013 | | 1112.84 | 600 | < 1.3 | < 13 | 560 | 6.6 | 24000 | 40 | 730 | 6.15 | 870 | 80 |
| 2010-10 | MW-1013A | | 1097.84 | 370 | < 1.3 | < 13 | 470 | 0.12 | 3200 | 180 | 630 | 6.67 | 697 | 94 |
| 2010-10 | MW-1013B | | 1098.15 | 640 | < 1.3 | 530 | 2200 | < 0.05 | 37000 | 1500 | 3100 | 6.23 | 2334 | 248 |
| 2010-10 | MW-1013B | Dup. | | 670 | < 1.3 | 520 | 2200 | < 0.5 | 37000 | 1300 | 3100 | | | |
| 2010-10 | MW-1013C | | 1100.78 | 540 | 18 | < 13 | 2200 | 11 | 11000 | 1600 | 3000 | 6.37 | 2511 | 46 |
| 2010-10 | MW-1014 | | 1118.04 | 160 | < 1.3 | < 13 | 310 | < 0.05 | 520 | 130 | 400 | 6.42 | 488 | 167 |
| 2010-10 | MW-1014A | | 1114.4 | 490 | < 1.3 | < 13 | 1300 | < 0.05 | 130 | 630 | 1800 | 6.56 | 1595 | 159 |
| 2010-10 | MW-1014B | | 1113.34 | 550 | < 1.3 | 460 | 1900 | < 0.05 | 13000 | 1300 | 2700 | 6.39 | 1943 | 163 |
| 2010-10 | MW-1014C | | 1109.12 | 280 | 20 | < 13 | 530 | 5 | 1700 | 220 | 640 | 6.62 | 750 | 65 |
| 2010-10 | MW-1015A | | 1090.62 | 79 | < 2.5 | < 2.7 | 85 | < 0.005 | 7.9 | 9 | 61 | 6.7 | 140.3 | 113 |
| 2010-10 | MW-1015B | | 1090.67 | 180 | < 2.5 | < 2.7 | 150 | 0.16 | 58 | < 2.5 | 270 | 7.37 | 412.4 | 85 |
| 2011-02 | MW-1000PR | | 1090.08 | 230 | 5.1 | 8.7 | 420 | 0.16 | 2000 | 240 | 540 | 6.48 | 872 | 118 |
| 2011-02 | MW-1000R | | 1090.78 | 480 | < 2.5 | 110 | 430 | < 0.05 | 14000 | 110 | 570 | 6.35 | 910 | 133 |
| 2011-02 | MW-1002 | | 1092.56 | 64 | < 2.5 | < 2.7 | 68 | < 0.005 | < 1 | 6.2 | 87 | 6.53 | 166.2 | |
| 2011-02 | MW-1002G | | 1092.49 | 88 | < 2.5 | < 2.7 | 110 | 0.008 | < 1 | 7.7 | 85 | 6.57 | 272 | |
| 2011-02 | MW-1004 | | 1107.28 | 38 | < 2.5 | < 2.7 | 46 | 0.017 | < 1 | 14 | 5 | 6.61 | 118.2 | 229 |
| 2011-02 | MW-1004P | | 1106.13 | 160 | < 2.5 | < 2.7 | 130 | 0.09 | 68 | < 2.5 | 83 | 7.01 | 297 | 36 |
| 2011-02 | MW-1004S | | 1107.34 | 49 | < 2.5 | < 2.7 | 67 | 0.005 | < 1 | 22 | 45 | 6.72 | 177.2 | 254 |
| 2011-02 | MW-1005 | | 1140.68 | 47 | 2.5 | < 2.7 | 170 | 11 | 330 | 13 | 260 | 6.14 | 580 | |
| 2011-02 | MW-1005P | | 1140.33 | 250 | < 2.5 | < 2.7 | 200 | 1.2 | 59 | < 2.5 | 200 | 7.05 | 466.3 | -4 |
| 2011-02 | MW-1005S | | 1140.4 | 180 | 3.6 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 160 | 6.82 | 342.1 | |
| 2011-02 | MW-1005S | Dup. | | 190 | 3.2 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 130 | | | |
| 2011-02 | MW-1010P | | 1089.83 | 160 | 23 | < 2.7 | 150 | 0.010 | 92 | 15 | 130 | 7.22 | 330.6 | 235 |
| 2011-02 | MW-1013 | | 1112.81 | 640 | < 1.3 | < 13 | 580 | 1.8 | 24000 | 56 | 690 | 6.19 | 1164 | 157 |
| 2011-02 | MW-1013A | | 1099.29 | 340 | 1.4 | < 13 | 500 | 0.12 | 3600 | 180 | 570 | 6.59 | 990 | 267 |
| 2011-02 | MW-1013B | | 1099.55 | 570 | < 1.3 | 310 | 2100 | < 0.005 | 22000 | 1600 | 3000 | 6.17 | 3149 | 325 |
| 2011-02 | MW-1013C | | 1101.87 | 550 | 22 | < 13 | 2000 | 10 | 10000 | 1600 | 3000 | 6.35 | 2970 | 77 |
| 2011-02 | MW-1014 | | 1121.03 | 260 | < 1.3 | < 13 | 290 | 0.74 | 1900 | 110 | 420 | 6.56 | 793 | 135 |
| 2011-02 | MW-1014A | | 1117.75 | 490 | 3.7 | < 13 | 1300 | 0.016 | 210 | 960 | 1800 | 6.57 | 2215 | 192 |
| 2011-02 | MW-1014B | | 1115.76 | 550 | 1.7 | 370 | 1800 | < 0.005 | 12000 | 1300 | 2500 | 6.34 | 2903 | 221 |
| 2011-02 | MW-1014B | Dup. | | 530 | 4.2 | 370 | 1800 | < 0.005 | 12000 | 1300 | 2500 | | | |
| 2011-02 | MW-1014C | | 1110.94 | 280 | 23 | < 13 | 510 | 4.7 | 1600 | 220 | 600 | 6.64 | 1021 | 85 |
| 2011-02 | MW-1015A | | 1090.29 | 78 | < 2.5 | < 2.7 | 80 | < 0.005 | 6.4 | 11 | 63 | 6.56 | 185.8 | 90 |
| 2011-02 | MW-1015B | | 1090.29 | 180 | < 2.5 | < 2.7 | 140 | 0.14 | 58 | < 2.5 | 220 | 7.06 | 585 | -4 |
| 2011-04 | MW-1000PR | | 1088.85 | 230 | 5 | 6.4 | 430 | 0.36 | 2000 | 240 | 550 | 6.45 | 857 | 186 |
| 2011-04 | MW-1000R | | 1090.2 | 350 | < 2.5 | 100 | 420 | < 0.05 | 12000 | 140 | 520 | 6.4 | 831 | 198 |
| 2011-04 | MW-1002 | | 1094.24 | 68 | < 2.5 | < 2.7 | 74 | < 0.005 | < 1 | 7.2 | 43 | 6.51 | 169.8 | |
| 2011-04 | MW-1002G | | 1094.12 | 90 | < 2.5 | < 2.7 | 110 | 0.011 | < 1 | 8.9 | 120 | 6.67 | 272.6 | |
| 2011-04 | MW-1004 | | 1109.9 | 34 | < 2.5 | < 2.7 | 36 | 0.024 | 1.3 | 10 | 23 | 6.47 | 90 | 215 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011-04 | MW-1004P | | 1107.84 | 160 | < 2.5 | < 2.7 | 130 | 0.088 | 59 | < 2.5 | 90 | 7.12 | 296.6 | 41 |
| 2011-04 | MW-1004S | | 1109.97 | 49 | < 2.5 | 3 | 66 | < 0.005 | < 1 | 22 | 81 | 6.45 | 165.9 | 194 |
| 2011-04 | MW-1005 | | | 43 | < 2.5 | < 2.7 | 200 | 13 | 330 | 15 | 360 | 6.16 | 677 | |
| 2011-04 | MW-1005P | | 1140.97 | 250 | < 2.5 | < 2.7 | 210 | 1.3 | 61 | < 2.5 | 200 | 7.06 | 457.1 | 5 |
| 2011-04 | MW-1005S | | 1142.13 | 190 | < 2.5 | < 2.7 | 160 | 4.1 | 230 | < 2.5 | 190 | 6.96 | 349.7 | |
| 2011-04 | MW-1010P | | 1088.56 | 150 | 22 | < 2.7 | 160 | 0.022 | 65 | 25 | 140 | 7.29 | 326.7 | 118 |
| 2011-04 | MW-1013 | | 1114.4 | 630 | 2.2 | 43 | 600 | 1 | 25000 | 53 | 710 | 6.14 | 1159 | 128 |
| 2011-04 | MW-1013A | | 1099.34 | 350 | < 1.3 | 18 | 470 | 0.12 | 3300 | 190 | 560 | 6.57 | 913 | 105 |
| 2011-04 | MW-1013B | | 1099.78 | 630 | < 1.3 | 610 | 1800 | < 0.05 | 39000 | 1600 | 3200 | 6.22 | 3076 | 252 |
| 2011-04 | MW-1013C | | 1101.96 | 560 | 20 | < 13 | 2000 | 11 | 10000 | 1600 | 3000 | 6.36 | 3121 | 64 |
| 2011-04 | MW-1014 | | 1121.5 | 190 | 2 | 15 | 260 | 0.32 | 3700 | 120 | 410 | 6.41 | 700 | 169 |
| 2011-04 | MW-1014A | | 1118.32 | 480 | 2.1 | 14 | 1200 | < 0.05 | 180 | 990 | 1800 | 6.54 | 2205 | 168 |
| 2011-04 | MW-1014A | Dup. | | 500 | 2.4 | 19 | 1300 | < 0.05 | 180 | 910 | 1800 | | | |
| 2011-04 | MW-1014B | | 1116.4 | 540 | 3.3 | 420 | 1600 | < 0.05 | 11000 | 1300 | 2500 | 6.41 | 2369 | 157 |
| 2011-04 | MW-1014C | | 1111.43 | 290 | 21 | 16 | 500 | 4.9 | 1700 | 220 | 640 | 6.56 | 1007 | 80 |
| 2011-04 | MW-1015A | | 1089.95 | 77 | < 2.5 | < 2.7 | 82 | < 0.005 | 5.2 | 10 | 61 | 6.84 | 181.5 | 179 |
| 2011-04 | MW-1015B | | 1090.04 | 180 | < 2.5 | < 2.7 | 140 | 0.071 | 52 | < 2.5 | 210 | 7.37 | 586 | -21 |
| 2011-04 | MW-1015B | Dup. | | 190 | < 2.5 | < 2.7 | 140 | 0.072 | 52 | < 2.5 | 230 | | | |
| 2011-07 | MW-1000PR | | 1087.39 | 230 | 5.7 | 4.5 | 460 | 0.48 | 2200 | 230 | 590 | 6.44 | 848 | 168 |
| 2011-07 | MW-1000R | | 1088.49 | 350 | < 2.5 | 90 | 420 | 0.069 | 11000 | 120 | 540 | 6.35 | 794 | 182 |
| 2011-07 | MW-1002 | | 1092.27 | 66 | < 2.5 | < 1.3 | 82 | 0.015 | < 1 | 7 | 89 | 6.43 | 177.7 | |
| 2011-07 | MW-1002G | | 1092.17 | 88 | < 2.5 | < 1.3 | 130 | 0.04 | < 1 | 8.5 | 170 | 6.49 | 283.8 | |
| 2011-07 | MW-1002G | Dup. | | 88 | 2.9 | < 1.3 | 130 | 0.04 | < 1 | 9.2 | 170 | | | |
| 2011-07 | MW-1004 | | 1108.55 | 40 | < 2.5 | 3.5 | 45 | 0.044 | 2.5 | 11 | 52 | 6.29 | 95.4 | 264 |
| 2011-07 | MW-1004P | | 1107.09 | 160 | < 2.5 | < 1.3 | 150 | 0.19 | 90 | < 2.5 | 140 | 6.98 | 299.5 | -11 |
| 2011-07 | MW-1004S | | 1108.64 | 52 | < 2.5 | < 1.3 | 80 | 0.0083 | < 1 | 23 | 100 | 6.32 | 183.2 | 129 |
| 2011-07 | MW-1005 | | 1140.62 | 50 | < 2.5 | < 1.3 | 360 | 19 | 490 | 14 | 770 | 6.01 | 972 | |
| 2011-07 | MW-1005P | | 1140.79 | 250 | < 2.5 | < 1.3 | 230 | 1.3 | 74 | < 2.5 | 230 | 6.92 | 458.2 | -22 |
| 2011-07 | MW-1005S | | 1140.87 | 190 | < 2.5 | < 1.3 | 170 | 4.3 | 230 | < 2.5 | 200 | 6.84 | 353.3 | |
| 2011-07 | MW-1010P | | 1087.17 | 150 | 18 | < 1.3 | 170 | 0.031 | 58 | 25 | 160 | 7.29 | 328.4 | 80 |
| 2011-07 | MW-1013 | | 1115.09 | 660 | < 1.3 | 13 | 610 | 2.8 | 23000 | 38 | 700 | 6.01 | 1081 | 134 |
| 2011-07 | MW-1013 | Dup. | | 580 | 1.5 | 13 | 600 | 2.7 | 23000 | 37 | 720 | | | |
| 2011-07 | MW-1013A | | 1099.12 | 350 | < 1.3 | < 0.73 | 480 | 0.18 | 2700 | 150 | 540 | 6.52 | 856 | 299 |
| 2011-07 | MW-1013B | | 1099.58 | 620 | 3.2 | 560 | 2200 | 0.16 | 36000 | 1600 | 3100 | 6.16 | 3062 | 324 |
| 2011-07 | MW-1013C | | 1101.68 | 520 | 20 | < 1.5 | 2300 | 12 | 9900 | 1600 | 3000 | 6.24 | 3054 | 70 |
| 2011-07 | MW-1014 | | 1123.51 | 170 | 2 | 6.3 | 300 | 0.046 | 1600 | 120 | 440 | 6.34 | 638 | 148 |
| 2011-07 | MW-1014A | | 1119.85 | 500 | 2.4 | 2.1 | 1300 | 0.11 | 130 | 980 | 1900 | 6.52 | 2164 | 226 |
| 2011-07 | MW-1014B | | 1117.57 | 550 | 3.4 | 360 | 1800 | 0.12 | 11000 | 1300 | 2500 | 6.28 | 2720 | 244 |
| 2011-07 | MW-1014C | | 1112.18 | 290 | 22 | < 0.73 | 540 | 4.9 | 1600 | 220 | 690 | 6.56 | 1017 | 81 |
| 2011-07 | MW-1015A | | 1088.12 | 84 | < 2.5 | < 1.3 | 92 | 0.016 | 4.8 | 10 | 88 | 6.45 | 187.6 | 176 |
| 2011-07 | MW-1015B | | 1088.27 | 180 | < 2.5 | < 1.3 | 160 | 0.15 | 58 | < 2.5 | 280 | 7.22 | 589 | -45 |
| 2011-10 | MW-1000PR | | 1087.64 | 260 | 7.6 | < 1.3 | 450 | 0.6 | 2200 | 220 | 590 | 6.5 | 825 | 104 |
| 2011-10 | MW-1000R | | 1088.35 | 350 | < 2.5 | 80 | 420 | 0.056 | 7200 | 77 | 550 | 6.35 | 771 | 130 |
| 2011-10 | MW-1002 | | 1090.82 | 75 | < 2.5 | < 1.3 | 73 | 0.0056 | < 1 | 5.3 | 95 | 6.81 | 148.5 | |
| 2011-10 | MW-1002G | | 1090.74 | 92 | < 2.5 | < 1.3 | 130 | 0.0076 | 1.8 | 8.9 | 180 | 6.71 | 279.9 | |
| 2011-10 | MW-1004 | | 1106.9 | 46 | < 2.5 | < 1.3 | 58 | 0.0062 | < 1 | 17 | 89 | 6.3 | 133 | 275 |
| 2011-10 | MW-1004 | Dup. | | 50 | < 2.5 | < 1.3 | 59 | 0.007 | < 1 | 17 | 70 | | | |
| 2011-10 | MW-1004P | | 1105.68 | 160 | < 2.5 | < 1.3 | 150 | 0.2 | 90 | < 2.5 | 150 | 7.14 | 300.2 | -30 |
| 2011-10 | MW-1004S | | 1106.96 | 53 | < 2.5 | < 1.3 | 72 | < 0.003 | 1 | 23 | 120 | 6.37 | 161.6 | 274 |
| 2011-10 | MW-1005 | | 1140 | 61 | < 2.5 | < 1.3 | 360 | 18 | 470 | 15 | 930 | 6.04 | 1117 | |
| 2011-10 | MW-1005P | | 1139.25 | 260 | < 2.5 | < 1.3 | 220 | 1.2 | 60 | < 2.5 | 220 | 7.08 | 458.7 | -33 |
| 2011-10 | MW-1005S | | 1139.8 | 180 | 2.8 | < 1.3 | 170 | 4.3 | 220 | < 2.5 | 200 | 6.85 | 338.1 | |
| 2011-10 | MW-1010P | | 1087.35 | 170 | 22 | < 1.3 | 170 | 0.011 | 43 | 26 | 190 | 7.44 | 337.2 | 15 |
| 2011-10 | MW-1013 | | 1113.28 | 610 | 2.2 | 5.7 | 600 | 5.5 | 25000 | 30 | 760 | 6.21 | 1198 | 56 |
| 2011-10 | MW-1013A | | 1098.53 | 350 | < 1.3 | < 0.73 | 440 | 0.15 | 2900 | 160 | 580 | 6.66 | 850 | 10 |
| 2011-10 | MW-1013B | | 1098.86 | 550 | < 1.3 | 520 | 2200 | 0.1 | 37000 | 1600 | 3100 | 6.28 | 3124 | 248 |
| 2011-10 | MW-1013C | | 1101.18 | 520 | 16 | < 0.73 | 2100 | 11 | 9400 | 1600 | 3100 | 6.24 | 3154 | 31 |
| 2011-10 | MW-1014 | | 1123.37 | 190 | < 1.3 | 1.6 | 310 | < 0.014 | 660 | 140 | 460 | 6.44 | 682 | 188 |
| 2011-10 | MW-1014A | | 1120.43 | 490 | < 1.3 | 4.2 | 1300 | 0.023 | 260 | 1000 | 1900 | 6.59 | 2166 | 206 |
| 2011-10 | MW-1014B | | 1116.86 | 470 | < 1.3 | 380 | 1800 | 0.035 | 11000 | 1400 | 2600 | 6.34 | 2860 | 218 |
| 2011-10 | MW-1014B | Dup. | | 500 | 1.8 | 380 | 1900 | 0.034 | 11000 | 1400 | 2600 | | | |
| 2011-10 | MW-1014C | | 1111.48 | 280 | 18 | < 0.73 | 530 | 4.9 | 1500 | 220 | 690 | 6.62 | 992 | 44 |
| 2011-10 | MW-1015A | | 1087.79 | 90 | < 2.5 | < 1.3 | 91 | 0.005 | 5.5 | 10 | 110 | 7.34 | 187.2 | 173 |
| 2011-10 | MW-1015B | | 1087.82 | 170 | < 2.5 | < 1.3 | 150 | 0.12 | 54 | < 2.5 | 290 | 7.62 | 588 | 106 |
| 2012-02 | MW-1000PR | | 1087.01 | 210 | 3.9 | 9.9 | 450 | 0.23 | 2100 | 240 | 560 | 6.5 | 849 | 303 |
| 2012-02 | MW-1000R | | 1087.58 | 380 | < 1.9 | 94 | 430 | 0.011 | 5500 | 41 | 510 | 6.43 | 772 | 307 |
| 2012-02 | MW-1002 | | 1089.73 | 65 | < 1.9 | < 1.3 | 76 | 0.0033 | < 1 | 5.3 | 89 | 6.53 | 168 | |
| 2012-02 | MW-1002G | | 1089.64 | 88 | < 1.9 | < 1.3 | 130 | 0.0044 | < 1 | 8.7 | 150 | 6.57 | 193.8 | |
| 2012-02 | MW-1004 | | 1105.22 | 47 | < 1.9 | 3.3 | 78 | 0.012 | 1.9 | 29 | 71 | 6.31 | 176.5 | 369 |
| 2012-02 | MW-1004P | | 1103.91 | 160 | < 1.9 | < 1.3 | 150 | 0.14 | 74 | < 2.5 | 130 | 7.05 | 303.7 | |
| 2012-02 | MW-1004S | | 1105.28 | 45 | < 1.9 | 2.4 | 71 | < 0.003 | < 1 | 21 | 73 | 6.46 | 164.2 | 365 |
| 2012-02 | MW-1005 | | 1138.42 | 51 | 1.9 | 3 | 380 | 19 | 500 | 15 | 670 | 5.93 | 1132 | |
| 2012-02 | MW-1005P | | 1138.16 | 240 | < 1.9 | < 1.3 | 230 | 1.3 | 60 | < 2.5 | 230 | 6.85 | 466.8 | -14 |
| 2012-02 | MW-1005S | | 1138.3 | 190 | 2.9 | < 1.3 | 170 | 4.2 | 220 | < 2.5 | 180 | 6.67 | 348.2 | |
| 2012-02 | MW-1010P | | 1086.7 | 150 | 22 | < 1.3 | 170 | 0.0072 | 61 | 24 | 160 | 7.89 | 334.7 | 196 |
| 2012-02 | MW-1013 | | 1110.98 | 600 | < 1.3 | 8.6 | 610 | 7 | 23000 | 45 | 740 | 6.16 | 1190 | 105 |
| 2012-02 | MW-1013A | | 1097.52 | 350 | < 1.3 | 2.1 | 440 | 0.11 | 2900 | 190 | 570 | 6.69 | 920 | 106 |
| 2012-02 | MW-1013B | | 1097.87 | 570 | 1.9 | 550 | 2200 | 0.04 | 32000 | 1700 | 3100 | 6.24 | 3157 | 353 |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012-02 | MW-1013B | Dup. | | 590 | 6 | 550 | 2200 | 0.046 | 32000 | 1700 | 3200 | | | |
| 2012-02 | MW-1013C | | 1099.83 | 510 | 20 | 9.9 | 2200 | 13 | 9500 | 1700 | 3100 | 6.34 | 3169 | 72 |
| 2012-02 | MW-1014 | | 1120.98 | 180 | < 1.3 | 9.2 | 320 | < 0.014 | 1200 | 130 | 430 | 6.49 | 684 | 287 |
| 2012-02 | MW-1014A | | 1118.66 | 450 | 8.2 | 12 | 1300 | < 0.014 | 390 | 1100 | 1900 | 6.66 | 2189 | 279 |
| 2012-02 | MW-1014B | | 1114.78 | 500 | 6 | 440 | 1900 | < 0.014 | 11000 | 1400 | 2600 | 6.4 | 2859 | 211 |
| 2012-02 | MW-1014C | | 1109.59 | 290 | 22 | 2.9 | 530 | 4.9 | 1600 | 240 | 650 | 6.76 | 1035 | 68 |
| 2012-02 | MW-1015A | | 1087.22 | 77 | < 1.9 | < 1.3 | 92 | < 0.003 | 6 | 9.7 | 100 | 7.08 | 191.8 | 309 |
| 2012-02 | MW-1015B | | 1087.22 | 180 | < 1.9 | < 1.3 | 150 | 0.12 | 50 | < 2.5 | 240 | 7.38 | 607 | 41 |
| 2012-02 | MW-1015B | Dup. | | 180 | < 1.9 | < 1.3 | 150 | 0.12 | 51 | < 2.5 | 250 | | | |
| 2012-05 | MW-1000PR | | 1088.04 | 220 | 5.8 | 6.3 | 460 | 0.75 | 2000 | 250 | 570 | 6.93 | 303.8 | 117 |
| 2012-05 | MW-1000R | | 1088.85 | 140 | 1.9 | 20 | 130 | 0.0031 | 800 | 27 | 200 | 5.88 | 229.5 | 279 |
| 2012-05 | MW-1002 | | 1090.95 | 58 | < 1.9 | < 1.3 | 69 | < 0.003 | < 1 | 4.9 | 73 | 7.12 | 150.3 | |
| 2012-05 | MW-1002G | | 1090.86 | 88 | < 1.9 | < 1.3 | 130 | < 0.003 | < 1 | 8.4 | 160 | 6.73 | 285 | |
| 2012-05 | MW-1002G | Dup. | | 88 | < 1.9 | < 1.3 | 130 | < 0.003 | < 1 | 8.5 | 170 | | | |
| 2012-05 | MW-1004 | | 1108.29 | 49 | < 1.9 | 1.6 | 85 | 0.0066 | 3.1 | 31 | 120 | 6.33 | 171.8 | 366 |
| 2012-05 | MW-1004P | | 1105.73 | 160 | < 1.9 | < 1.3 | 150 | 0.079 | 89 | < 2.5 | 130 | 6.93 | 303.8 | |
| 2012-05 | MW-1004S | | 1108.35 | 46 | < 1.9 | < 1.3 | 73 | < 0.003 | < 1 | 22 | 84 | 7.59 | 167.8 | 347 |
| 2012-05 | MW-1005 | | 1140.64 | 51 | < 1.9 | < 1.3 | 300 | 14 | 370 | 15 | 770 | 6.18 | 920 | |
| 2012-05 | MW-1005P | | 1139.63 | 240 | < 1.9 | < 1.3 | 230 | 1.3 | 61 | < 2.5 | 240 | 6.99 | 472 | -20 |
| 2012-05 | MW-1005S | | 1139.93 | 180 | 2.4 | < 1.3 | 180 | 4.1 | 220 | < 2.5 | 200 | 6.89 | 351.1 | |
| 2012-05 | MW-1010P | | 1087.88 | 140 | 25 | < 1.3 | 180 | < 0.003 | 35 | 26 | 180 | 7.22 | 344.5 | 194 |
| 2012-05 | MW-1013 | | 1112 | 610 | 1.8 | 7.6 | 600 | 5 | 22000 | 31 | 730 | 6.12 | 1148 | 85 |
| 2012-05 | MW-1013A | | 1097.79 | 340 | 3.8 | 1.2 | 510 | 0.059 | 3000 | 190 | 610 | 6.69 | 938 | 135 |
| 2012-05 | MW-1013B | | 1098.26 | 560 | < 1.3 | 540 | 2100 | < 0.028 | 32000 | 1700 | 3100 | 6.2 | 3236 | 358 |
| 2012-05 | MW-1013C | | 1100.12 | 500 | 10 | 6.7 | 2000 | 12 | 9600 | 1700 | 3000 | 6.41 | 3220 | 57 |
| 2012-05 | MW-1014 | | 1120.13 | 170 | < 1.3 | 7 | 310 | < 0.014 | 1000 | 130 | 440 | 6.38 | 670 | 278 |
| 2012-05 | MW-1014A | | 1117.79 | 440 | < 2.6 | 7.1 | 1300 | < 0.014 | 95 | 930 | 1900 | 6.53 | 2178 | 242 |
| 2012-05 | MW-1014A | Dup. | | 500 | < 2.6 | 7.4 | 1300 | < 0.014 | 97 | 940 | 1800 | | | |
| 2012-05 | MW-1014B | | 1114.33 | 490 | 2.9 | 520 | 1800 | < 0.014 | 10000 | 1400 | 2600 | 6.32 | 2857 | 139 |
| 2012-05 | MW-1014C | | 1109.42 | 280 | 28 | 0.86 | 540 | 4.8 | 1500 | 240 | 690 | 6.56 | 1016 | 60 |
| 2012-05 | MW-1015A | | 1088.07 | 78 | < 1.9 | < 1.3 | 92 | < 0.003 | 5.9 | 9.9 | 100 | 7.61 | 191.6 | 237 |
| 2012-05 | MW-1015B | | 1087.97 | 180 | < 1.9 | < 1.3 | 150 | 0.077 | 47 | < 2.5 | 260 | 7.63 | 605 | 226 |
| 2012-06 | MW-1000PR | | 1089.54 | 220 | < 1.9 | 9.4 | 440 | 0.3 | 2300 | 240 | 580 | 6.4 | 862 | -121 |
| 2012-06 | MW-1000R | | 1090.43 | 120 | 22 | 18 | 150 | < 0.003 | 140 | 45 | 200 | 5.9 | 357.3 | 235 |
| 2012-06 | MW-1002 | | 1091.56 | 57 | 3.2 | < 1.3 | 61 | < 0.003 | < 1 | 4.2 | 41 | 6.69 | 130.5 | |
| 2012-06 | MW-1002G | | 1091.46 | 89 | < 1.9 | < 1.3 | 130 | < 0.006 | < 1 | 8.8 | 150 | 6.56 | 292 | |
| 2012-06 | MW-1004 | | 1109.28 | 41 | 3.3 | 2.3 | 56 | 0.0095 | 2.6 | 18 | 51 | 6.25 | 131.4 | 366 |
| 2012-06 | MW-1004P | | 1106.62 | 160 | < 1.9 | < 1.3 | 140 | 0.15 | 99 | < 2.5 | 110 | 7.01 | 305.4 | |
| 2012-06 | MW-1004S | | 1109.35 | 50 | < 1.9 | 1.7 | 76 | < 0.003 | < 1 | 23 | 98 | 6.32 | 175.9 | 344 |
| 2012-06 | MW-1005 | | 1140.74 | 52 | < 1.9 | < 1.3 | 300 | 14 | 410 | 15 | 700 | 5.99 | 973 | |
| 2012-06 | MW-1005P | | 1139.98 | 250 | < 1.9 | < 1.3 | 220 | 1.3 | 66 | < 2.5 | 210 | 6.97 | 489.99 | -38 |
| 2012-06 | MW-1005S | | 1140.22 | 190 | < 1.9 | < 1.3 | 170 | 4.1 | 250 | < 2.5 | 170 | 6.84 | 355.4 | |
| 2012-06 | MW-1010P | | 1089.51 | 150 | 24 | < 1.3 | 170 | < 0.003 | 49 | 27 | 160 | 7.21 | 349.5 | 171 |
| 2012-06 | MW-1013 | | 1113.7 | 610 | < 1.3 | 9.3 | 570 | 3.8 | 22000 | 34 | 700 | 6.1 | 1134 | 143 |
| 2012-06 | MW-1013A | | 1097.96 | 340 | < 1.3 | 0.99 | 480 | 0.039 | 3300 | 190 | 610 | 6.62 | 934 | 172 |
| 2012-06 | MW-1013B | | 1098.44 | 580 | 16 | 570 | 2200 | < 0.014 | 34000 | 1600 | 3100 | 6.17 | 3257 | 345 |
| 2012-06 | MW-1013C | | 1100.99 | 560 | 6.3 | 5 | 2100 | 11 | 10000 | 1700 | 3000 | 6.38 | 3234 | 40 |
| 2012-06 | MW-1014 | | 1120.6 | 170 | < 1.3 | 7.1 | 300 | < 0.014 | 1300 | 120 | 380 | 6.35 | 664 | 297 |
| 2012-06 | MW-1014 | Dup. | | 170 | 8.5 | 6.2 | 300 | < 0.014 | 1300 | 120 | 410 | | | |
| 2012-06 | MW-1014A | | 1117.63 | 500 | < 1.3 | 6 | 1300 | < 0.028 | 38 | 1200 | 1800 | 6.56 | 2179 | 288 |
| 2012-06 | MW-1014B | | 1114.98 | 470 | < 1.3 | 400 | 1800 | < 0.014 | 11000 | 1300 | 2400 | 6.33 | 2919 | 146 |
| 2012-06 | MW-1014C | | 1110.19 | 290 | 24 | 0.79 | 530 | 4.6 | 1800 | 240 | 720 | 6.6 | 1033 | 56 |
| 2012-06 | MW-1015A | | 1088.95 | 79 | < 1.9 | < 1.3 | 89 | < 0.003 | 7 | 10 | 78 | 7.28 | 196.8 | 203 |
| 2012-06 | MW-1015A | Dup. | | 81 | < 1.9 | < 1.3 | 90 | < 0.003 | 6.9 | 10 | 83 | | | |
| 2012-06 | MW-1015B | | 1088.84 | 190 | < 1.9 | < 1.3 | 150 | 0.038 | 38 | < 2.5 | 240 | 7.57 | 611 | 123 |
| 2012-10 | MW-1000PR | | 1086.82 | 220 | < 1.9 | 8 | 480 | 0.23 | 2200 | 250 | 570 | 6.53 | 833 | -48 |
| 2012-10 | MW-1000R | | 1087.3 | 450 | < 1.9 | 160 | 500 | 0.0058 | 14000 | 32 | 560 | 6.5 | 854 | 283 |
| 2012-10 | MW-1002 | | 1089.16 | 60 | < 1.9 | < 1.3 | 69 | < 0.003 | < 1 | 4.5 | 30 | 6.79 | 149.3 | |
| 2012-10 | MW-1002G | | 1089.1 | 87 | < 1.9 | < 1.3 | 140 | < 0.003 | < 1 | 8.3 | 120 | 6.58 | 283.7 | |
| 2012-10 | MW-1004 | | 1104.99 | 50 | < 1.9 | 1.9 | 85 | 0.016 | 1.9 | 32 | 97 | 6.35 | 181.9 | 332 |
| 2012-10 | MW-1004P | | 1103.75 | 160 | < 1.9 | < 1.3 | 160 | 0.22 | 100 | < 2.5 | 140 | 6.94 | 307.6 | |
| 2012-10 | MW-1004S | | 1105.09 | 49 | < 1.9 | < 1.3 | 77 | < 0.003 | < 1 | 23 | 88 | 6.66 | 165.4 | 346 |
| 2012-10 | MW-1005 | | 1136.89 | 55 | < 1.9 | 1.9 | 500 | 17 | 520 | 15 | 800 | 5.92 | 1502 | |
| 2012-10 | MW-1005P | | 1134.07 | 250 | < 1.9 | < 1.3 | 240 | 1.4 | 61 | < 2.5 | 210 | 6.74 | 468.4 | -2 |
| 2012-10 | MW-1005S | | 1137.04 | 190 | 2.7 | < 1.3 | 180 | 4.4 | 230 | < 2.5 | 170 | 6.84 | 340.5 | |
| 2012-10 | MW-1010P | | 1086.45 | 150 | 19 | < 1.3 | 190 | < 0.003 | 34 | 28 | 160 | 7.11 | 345.3 | 255 |
| 2012-10 | MW-1013 | | 1111.26 | 630 | < 1.3 | 6.4 | 630 | 9.2 | 22000 | 27 | 810 | 6.15 | 1252 | 106 |
| 2012-10 | MW-1013 | Dup. | | 670 | < 1.3 | 7.8 | 730 | 10 | 27000 | 26 | 780 | | | |
| 2012-10 | MW-1013A | | 1097.36 | 320 | < 1.3 | 1.1 | 430 | 0.092 | 2700 | 150 | 530 | 6.61 | 881 | 318 |
| 2012-10 | MW-1013B | | 1097.7 | 600 | < 1.3 | 550 | 2200 | < 0.014 | 32000 | 1700 | 3100 | 6.21 | 3240 | 340 |
| 2012-10 | MW-1013C | | 1099.48 | 560 | 20 | 9.5 | 2200 | 13 | 8800 | 1700 | 3100 | 6.42 | 3250 | 41 |
| 2012-10 | MW-1014 | | 1120.8 | 190 | < 1.3 | 4.1 | 330 | < 0.014 | 600 | 130 | 420 | 6.49 | 686 | 255 |
| 2012-10 | MW-1014A | | 1118.09 | 480 | < 1.3 | 12 | 1500 | < 0.014 | 160 | 930 | 1800 | 6.55 | 2197 | 286 |
| 2012-10 | MW-1014B | | 1114.32 | 430 | < 1.3 | 350 | 1800 | < 0.014 | 10000 | 1200 | 2300 | 6.33 | 2702 | 193 |
| 2012-10 | MW-1014C | | 1109.18 | 290 | 24 | 1.3 | 550 | 4.9 | 1600 | 240 | 670 | 6.53 | 1032 | 63 |
| 2012-10 | MW-1015A | | 1086.79 | 80 | < 1.9 | < 1.3 | 99 | < 0.003 | 6.4 | 9.8 | 77 | 7.26 | 192.7 | 199 |
| 2012-10 | MW-1015B | | 1086.74 | 180 | < 1.9 | < 1.3 | 160 | 0.042 | 36 | < 2.5 | 230 | 7.36 | 601 | -23 |
| 2012-10 | MW-1015B | Dup. | | 180 | < 1.9 | < 1.3 | 150 | 0.046 | 41 | < 2.5 | 230 | | | |

# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013-03 | MW-1000PR | | 1086.71 | 220 | 4.6 | 11 | 450 | 1.1 | 2100 | 230 | 570 | 6.61 | 848 | |
| 2013-03 | MW-1000PR | Dup. | | 220 | 5 | 11 | 460 | 1.1 | 2200 | 240 | 570 | | | |
| 2013-03 | MW-1000R | | 1087.19 | 470 | < 0.5 | 170 | 470 | 0.0098 | 13000 | 17 | 540 | 6.54 | 832 | 241 |
| 2013-03 | MW-1002 | | 1088.82 | 57 | < 0.5 | < 1.3 | 70 | 0.0035 | < 1 | 4.9 | 63 | 7.38 | 153 | |
| 2013-03 | MW-1002G | | 1088.75 | 80 | < 0.5 | 1.5 | 130 | < 0.003 | < 1 | 8.4 | 150 | 6.81 | 289.1 | |
| 2013-03 | MW-1004 | | | | | | | | | | | | | |
| 2013-03 | MW-1004P | | 1102.12 | 150 | < 0.5 | < 1.3 | 150 | 0.12 | 81 | 2.7 | 120 | 7.1 | 302.8 | |
| 2013-03 | MW-1004S | | 1103.3 | 49 | < 0.5 | 2.3 | 78 | < 0.003 | < 1 | 24 | 92 | 6.82 | 179.3 | 340 |
| 2013-03 | MW-1005 | | 1135.76 | 62 | < 0.5 | 3.6 | 530 | 21 | 580 | 15 | 930 | 5.93 | 1626 | |
| 2013-03 | MW-1005P | | 1135.2 | 240 | < 0.5 | < 1.3 | 230 | 1.4 | 63 | < 2.5 | 250 | 6.83 | 468.3 | 9 |
| 2013-03 | MW-1005S | | 1135.39 | 170 | 2.3 | < 1.3 | 170 | 4.3 | 230 | < 2.5 | 200 | 6.44 | 343.7 | |
| 2013-03 | MW-1010P | | 1086.43 | 150 | 20 | 1.4 | 180 | 0.0063 | 54 | 26 | 180 | 7.16 | 347.7 | 159 |
| 2013-03 | MW-1013 | | 1108.36 | 580 | 1.6 | 5.3 | 590 | 14 | 27000 | 39 | 760 | 6.17 | 1133 | 81 |
| 2013-03 | MW-1013A | | 1096.32 | 310 | < 1 | 0.87 | 410 | 0.14 | 2500 | 150 | 490 | 6.73 | 868 | |
| 2013-03 | MW-1013B | | 1096.68 | 580 | < 5 | 510 | 2400 | 0.058 | 37000 | 1700 | 3200 | 6.26 | 3222 | 326 |
| 2013-03 | MW-1013C | | 1098.53 | 550 | 20 | 8.1 | 2300 | 13 | 9900 | 1600 | 3000 | 6.34 | 3157 | 51 |
| 2013-03 | MW-1014 | | 1118.33 | 180 | < 1 | 3.6 | 310 | < 0.014 | 520 | 120 | 420 | 6.46 | 691 | 205 |
| 2013-03 | MW-1014A | | 1116.13 | 430 | < 2 | 10 | 1300 | < 0.014 | 360 | 890 | 1900 | 6.63 | 2180 | 272 |
| 2013-03 | MW-1014B | | 1112.33 | 480 | 2.3 | 370 | 1900 | < 0.014 | 11000 | 1300 | 2600 | 6.37 | 2752 | 291 |
| 2013-03 | MW-1014C | | 1107.49 | 270 | 21 | 1.5 | 530 | 4.9 | 1600 | 230 | 710 | 6.68 | 989 | 69 |
| 2013-03 | MW-1015A | | 1086.75 | 75 | < 0.5 | 1.4 | 93 | < 0.003 | 7 | 9.7 | 110 | 7.67 | 195.1 | 174 |
| 2013-03 | MW-1015B | | 1086.81 | 170 | < 0.5 | < 1.3 | 150 | 0.043 | 41 | < 2.5 | 230 | 7.43 | 593 | 141 |
| 2013-03 | MW-1015B | Dup. | | 180 | < 0.5 | < 1.3 | 150 | 0.046 | 40 | 2.6 | 250 | | | |
| 2013-05 | MW-1000PR | | 1089.45 | 210 | 2 | 7.5 | 440 | 0.17 | 1800 | 220 | 540 | 6.5 | 842 | 55 |
| 2013-05 | MW-1000R | | 1090.65 | 340 | < 0.5 | 37 | 390 | < 0.003 | 270 | 33 | 440 | 6.32 | 712 | 385 |
| 2013-05 | MW-1002 | | 1094.68 | 65 | < 0.5 | 1.5 | 71 | 0.0063 | < 1 | 5.8 | 42 | 6.78 | 162.6 | |
| 2013-05 | MW-1002G | | 1094.54 | 82 | < 0.5 | < 1.3 | 130 | < 0.003 | < 1 | 8.3 | 150 | 6.63 | 284 | |
| 2013-05 | MW-1004 | | 1109.12 | 36 | < 0.5 | 3.5 | 36 | 0.05 | 1.5 | 9.1 | 19 | 6.55 | 84.1 | 406 |
| 2013-05 | MW-1004P | | 1106.71 | 150 | < 0.5 | < 1.3 | 140 | 0.14 | 74 | 2.5 | 130 | 6.75 | 223.4 | |
| 2013-05 | MW-1004P | Dup. | | 150 | < 0.5 | < 1.3 | 140 | 0.13 | 71 | 2.6 | 140 | | | |
| 2013-05 | MW-1004S | | 1109.18 | 48 | < 0.5 | 1.8 | 78 | < 0.003 | < 1 | 25 | 84 | 6.5 | 182.4 | 374 |
| 2013-05 | MW-1005 | | 1138.68 | 50 | 0.97 | 1.6 | 330 | 16 | 430 | 15 | 740 | 5.98 | 1032 | |
| 2013-05 | MW-1005P | | 1137.03 | 220 | < 0.5 | < 1.3 | 220 | 0.37 | 64 | 4.1 | 250 | 6.66 | 556 | -3 |
| 2013-05 | MW-1005S | | 1137.47 | 170 | 2.1 | < 1.3 | 160 | 4.4 | 220 | < 2.5 | 170 | 6.55 | 340.3 | |
| 2013-05 | MW-1010P | | 1089.39 | 140 | 17 | < 1.3 | 170 | < 0.003 | 39 | 27 | 180 | 7.24 | 346.4 | 186 |
| 2013-05 | MW-1013 | | 1108.56 | 580 | < 1 | 6.3 | 540 | 12 | 24000 | 31 | 760 | 6.12 | 1181 | 45 |
| 2013-05 | MW-1013A | | 1097.63 | 330 | < 1 | 1.7 | 470 | 0.11 | 3100 | 190 | 640 | 6.69 | 870 | 127 |
| 2013-05 | MW-1013B | | 1098.09 | 520 | < 1 | 550 | 2100 | 0.053 | 35000 | 1600 | 3200 | 6.22 | 3229 | 372 |
| 2013-05 | MW-1013C | | 1100.47 | 540 | 15 | 6.4 | 2100 | 12 | 9100 | 1500 | 3100 | 6.32 | 3202 | 37 |
| 2013-05 | MW-1014 | | 1117.71 | 160 | < 1 | 5 | 290 | < 0.014 | 830 | 120 | 400 | 6.63 | 673 | 275 |
| 2013-05 | MW-1014A | | 1115.45 | 420 | < 1 | 6.5 | 1300 | < 0.014 | 53 | 970 | 1800 | 6.6 | 2251 | 283 |
| 2013-05 | MW-1014B | | 1112.67 | 470 | < 1 | 430 | 1800 | < 0.014 | 10000 | 1300 | 2700 | 6.41 | 2828 | 220 |
| 2013-05 | MW-1014C | | 1108.37 | 260 | 19 | 1.9 | 510 | 4.7 | 1500 | 210 | 720 | 6.73 | 1028 | 54 |
| 2013-05 | MW-1014C | Dup. | | 270 | 19 | 2.5 | 510 | 4.7 | 1500 | 220 | 670 | | | |
| 2013-05 | MW-1015A | | 1090.49 | 81 | < 0.5 | < 1.3 | 90 | < 0.003 | 6 | 9.9 | 92 | 6.86 | 189.2 | 200 |
| 2013-05 | MW-1015B | | 1090.73 | 170 | < 0.5 | < 1.3 | 150 | 0.17 | 58 | < 2.5 | 290 | 7.13 | 596 | -14 |
| 2013-06 | MW-1000PR | | 1089.33 | 210 | 14 | 4.6 | 470 | 1.3 | 2400 | 220 | 550 | 6.46 | 814 | 112 |
| 2013-06 | MW-1000R | | 1090.79 | 100 | < 0.5 | 11 | 110 | 0.0047 | 380 | 81 | 220 | 6.18 | 680 | 105 |
| 2013-06 | MW-1002 | | 1094.51 | 61 | < 0.5 | < 1.3 | 83 | < 0.003 | < 1 | 6.1 | 76 | 6.88 | 169 | |
| 2013-06 | MW-1002G | | 1094.41 | 81 | < 0.5 | < 1.3 | 140 | < 0.003 | < 1 | 8.1 | 150 | 6.76 | 282 | |
| 2013-06 | MW-1002G | Dup. | | 82 | < 0.5 | < 1.3 | 130 | < 0.003 | < 1 | 8.3 | 160 | | | |
| 2013-06 | MW-1004 | | 1110.6 | 30 | < 0.5 | 4.8 | 44 | 0.036 | 1.1 | 13 | 37 | 6.73 | 99 | 65 |
| 2013-06 | MW-1004P | | 1107.24 | 150 | 0.52 | 1.3 | 150 | 0.43 | 150 | 2.8 | 140 | 7.38 | 296 | 84 |
| 2013-06 | MW-1004S | | 1110.73 | 45 | < 0.5 | 3.1 | 82 | < 0.003 | < 1 | 27 | 110 | 6.31 | 181.2 | 75 |
| 2013-06 | MW-1005 | | 1139.69 | 47 | 1.3 | 2.4 | 330 | 18 | 460 | 14 | 690 | 5.96 | 891 | |
| 2013-06 | MW-1005P | | 1138.5 | 220 | < 0.5 | < 1.3 | 230 | 0.16 | 110 | 3 | 240 | 7.1 | 472 | 94 |
| 2013-06 | MW-1005S | | 1138.93 | 160 | 2.4 | < 1.3 | 180 | 4.8 | 240 | < 2.5 | 170 | 6.97 | 327 | |
| 2013-06 | MW-1010P | | 1089.16 | 140 | 22 | < 1.3 | 180 | 0.0051 | 82 | 26 | 170 | 7.66 | 346 | 111 |
| 2013-06 | MW-1013 | | 1110.7 | 560 | 1.3 | 5.2 | 600 | 17 | 27000 | 28 | 780 | 6.11 | 1168 | 46 |
| 2013-06 | MW-1013A | | 1098.36 | 320 | < 1 | 2.5 | 520 | 0.097 | 3000 | 220 | 670 | 6.64 | 934 | 47 |
| 2013-06 | MW-1013B | | 1098.83 | 510 | < 1 | 310 | 2200 | < 0.07 | 18000 | 1600 | 3100 | 6.18 | 3147 | 96 |
| 2013-06 | MW-1013C | | 1100.81 | 530 | 19 | 9.3 | 2200 | 15 | 10000 | 1600 | 3100 | 6.39 | 3162 | 91 |
| 2013-06 | MW-1014 | | 1118.1 | 150 | < 1 | 6.4 | 320 | 0.014 | 2100 | 110 | 440 | 6.49 | 633 | 57 |
| 2013-06 | MW-1014A | | 1115.44 | 430 | < 1 | 5.9 | 1300 | < 0.014 | 16 | 1000 | 1900 | 6.58 | 2155 | 80 |
| 2013-06 | MW-1014B | | 1113.25 | 450 | < 1 | 560 | 2000 | < 0.07 | 12000 | 1400 | 2800 | 6.3 | 2908 | 92 |
| 2013-06 | MW-1014B | Dup. | | 460 | < 1 | 610 | 1900 | < 0.07 | 13000 | 1400 | 2800 | | | |
| 2013-06 | MW-1014C | | 1109.06 | 270 | 21 | 1.6 | 550 | 5.1 | 1700 | 210 | 700 | 6.62 | 1017 | 60 |
| 2013-06 | MW-1015A | | 1090.03 | 73 | < 0.5 | < 1.3 | 96 | < 0.003 | 5.9 | 9.8 | 59 | 7.15 | 187 | 100 |
| 2013-06 | MW-1015B | | 1090.24 | 170 | < 0.5 | 1.4 | 160 | 0.089 | 55 | < 2.5 | 230 | 7.68 | 510 | 124 |
| 2013-10 | MW-1000PR | | 1087.73 | 210 | 6.6 | 10 | 420 | 0.72 | 2300 | 210 | 560 | 6.29 | 862 | 277.7 |
| 2013-10 | MW-1000R | | 1088.3 | 320 | < 1 | 88 | 400 | < 0.018 | 4500 | 93 | 510 | 6.2 | 816 | 334.7 |
| 2013-10 | MW-1002 | | 1090.67 | 52 | < 1 | < 1 | 120 | < 0.018 | < 1 | 4.8 | 81 | 6.31 | 149 | 363.5 |
| 2013-10 | MW-1002G | | 1090.62 | 80 | < 1 | < 1 | 61 | < 0.018 | < 1 | 7.9 | 150 | 6.36 | 281 | 351.5 |
| 2013-10 | MW-1002G | Dup. | | 81 | < 1 | < 1 | 120 | < 0.018 | < 1 | 7.7 | 140 | | | |
| 2013-10 | MW-1004 | | 1106.16 | 40 | < 1 | 3.1 | 59 | 0.028 | < 1 | 22 | 77 | 6.09 | 166 | 348.5 |
| 2013-10 | MW-1004P | | 1104.77 | 150 | < 1 | < 1 | 140 | 0.21 | 96 | < 2.5 | 150 | 7.08 | 336 | 256 |
| 2013-10 | MW-1004S | | 1106.27 | 46 | < 1 | 1 | 75 | 0.021 | < 1 | 29 | 110 | 6.0 | 212 | 361.4 |
| 2013-10 | MW-1005 | | 1137.63 | 57 | 1 | 1.8 | 430 | 17 | 470 | 15 | 860 | 5.78 | 1340 | 254.1 |

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## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013-10 | MW-1005P | | 1136.64 | 230 | < 1 | < 1 | 210 | 0.92 | 84 | < 2.5 | 250 | 7.05 | 503 | 117.6 |
| 2013-10 | MW-1005S | | 1136.84 | 170 | 2.3 | < 1 | 160 | 4.3 | 240 | < 2.5 | 210 | 6.95 | 357 | 45 |
| 2013-10 | MW-1010P | | 1087.5 | 150 | 18 | < 1 | 170 | < 0.018 | 60 | 23 | 180 | 7.42 | 358 | 259.4 |
| 2013-10 | MW-1013 | | 1110.51 | 600 | 1.2 | 3.9 | 570 | 11 | 28000 | 24 | 760 | 5.97 | 1296 | 173.4 |
| 2013-10 | MW-1013A | | 1096.77 | 310 | < 1 | < 1 | 410 | 0.13 | 3400 | 160 | 570 | 6.53 | 975 | 275 |
| 2013-10 | MW-1013B | | 1097.19 | 560 | < 1 | 500 | 2200 | 0.06 | 34000 | 1500 | 3100 | 6.1 | 3490 | 301.6 |
| 2013-10 | MW-1013C | | 1099.24 | 100 | 18 | < 1 | 2000 | 13 | 9700 | 1500 | 3200 | 6.31 | 3192 | 138 |
| 2013-10 | MW-1014 | | 1118.83 | 170 | < 1 | 4.6 | 300 | < 0.018 | 990 | 120 | 420 | 6.31 | 735 | 295.8 |
| 2013-10 | MW-1014A | | 1115.77 | 450 | < 1 | 3.8 | 1200 | 0.045 | 81 | 800 | 1900 | 6.48 | 2213 | 300 |
| 2013-10 | MW-1014B | | 1112.96 | 460 | < 1 | 510 | 1800 | < 0.018 | 12000 | 1300 | 2600 | 6.22 | 2942 | 260.5 |
| 2013-10 | MW-1014B | Dup. | | 510 | < 1 | 460 | 1800 | < 0.018 | 13000 | 1200 | 2600 | | | |
| 2013-10 | MW-1014C | | 1108.19 | 260 | 20 | < 1 | 490 | 4.7 | 1700 | 200 | 680 | 6.39 | 1155 | 163 |
| 2013-10 | MW-1015A | | 1087.76 | 75 | < 1 | < 1 | 81 | < 0.018 | 5.3 | 9 | 110 | 6.85 | 186 | 202.1 |
| 2013-10 | MW-1015B | | 1087.79 | 170 | < 1 | < 1 | 150 | 0.12 | 46 | < 2.5 | 280 | 7.65 | 553 | 257.1 |
| 2014-03 | MW-1000PR | | 1088.91 | 230 | 4.4 | 6.5 | 420 | 1.6 | 2100 | 210 | 540 | 6.84 | 839 | |
| 2014-03 | MW-1000R | | 1089.48 | 420 | < 0.5 | 140 | 440 | < 0.018 | 15000 | 51 | 560 | 6.40 | 905 | |
| 2014-03 | MW-1002 | | 1090.78 | 64 | < 0.5 | < 1 | 71 | < 0.018 | < 1 | 5.3 | 84 | 6.56 | 159.7 | |
| 2014-03 | MW-1002G | | 1090.69 | 88 | < 0.5 | < 1 | 120 | < 0.018 | < 1 | 7.6 | 140 | 6.79 | 273.9 | |
| 2014-03 | MW-1002G | Dup. | | 89 | < 0.5 | < 1 | 120 | < 0.018 | < 1 | 7.3 | 120 | | | |
| 2014-03 | MW-1004 | | 1105.06 | 51 | < 0.5 | 6.7 | 82 | 0.026 | 8.3 | 32 | 50 | 6.58 | 195.1 | |
| 2014-03 | MW-1004P | | 1103.94 | 160 | < 0.5 | < 1 | 140 | 0.12 | 78 | < 2.5 | 140 | 7.41 | 302.1 | |
| 2014-03 | MW-1004S | | 1105.12 | 51 | < 0.5 | 1.6 | 81 | < 0.018 | < 1 | 33 | 130 | 6.49 | 190.5 | |
| 2014-03 | MW-1005 | | 1136.57 | 40 | < 0.5 | 2.2 | 230 | 7.9 | 230 | 13 | 430 | 6.17 | 950 | |
| 2014-03 | MW-1005P | | 1135.39 | 220 | < 0.5 | 1.5 | 220 | 0.23 | 18 | 5.5 | 280 | 7.13 | 490 | |
| 2014-03 | MW-1005S | | 1135.64 | 190 | 2.3 | < 1 | 160 | 3.7 | 220 | < 2.5 | 160 | 7.02 | 360.7 | |
| 2014-03 | MW-1010P | | 1088.63 | 150 | 19 | < 1 | 170 | < 0.018 | 32 | 27 | 190 | 7.86 | 348 | |
| 2014-03 | MW-1013 | | 1110.91 | 620 | 1.1 | 4.6 | 590 | 13 | 26000 | 27 | 700 | 6.16 | 1160 | |
| 2014-03 | MW-1013A | | 1097.74 | 330 | < 1 | < 1 | 450 | 0.085 | 3300 | 140 | 500 | 6.87 | 824 | |
| 2014-03 | MW-1013B | | 1098.31 | 560 | < 1 | 470 | 2200 | 0.071 | 33000 | 1500 | 2900 | 6.45 | 3093 | |
| 2014-03 | MW-1013C | | 1100.3 | 580 | 25 | < 1 | 2200 | 14 | 9900 | 1500 | 2900 | 6.64 | 2959 | |
| 2014-03 | MW-1014 | | 1118.74 | 180 | < 1 | 5.8 | 280 | 0.094 | 1200 | 110 | 380 | 6.79 | 685 | |
| 2014-03 | MW-1014A | | 1116.32 | 470 | < 1 | 5.7 | 1300 | 0.024 | 270 | 940 | 1800 | 6.73 | 2165 | |
| 2014-03 | MW-1014B | | 1113.31 | 490 | < 1 | 480 | 1800 | 0.028 | 12000 | 1300 | 2500 | 6.52 | 2596 | |
| 2014-03 | MW-1014B | Dup. | | 430 | < 1 | 470 | 1800 | 0.027 | 11000 | 1300 | 2500 | | | |
| 2014-03 | MW-1014C | | 1108.64 | 280 | 22 | 1.2 | 510 | 5.1 | 1700 | 200 | 630 | 6.78 | 1021 | |
| 2014-03 | MW-1015A | | 1088.71 | 80 | < 0.5 | < 1 | 86 | < 0.018 | 5.9 | 8.7 | 66 | 7.29 | 187.8 | |
| 2014-03 | MW-1015B | | 1088.82 | 180 | < 0.5 | < 1 | 150 | 0.22 | 55 | < 2.5 | 270 | 7.97 | 516 | |
| 2014-05 | MW-1000PR | | 1090.65 | 220 | 4.6 | 7 | 420 | 1.1 | 2000 | 210 | 520 | 6.49 | 918 | 75.7 |
| 2014-05 | MW-1000R | | 1092.68 | 100 | < 0.5 | 26 | 210 | 0.08 | 720 | 120 | 270 | 5.89 | 436 | 92.2 |
| 2014-05 | MW-1002 | | 1098.45 | 60 | < 0.5 | < 1 | 76 | 0.019 | < 1 | 6 | 69 | 6.44 | 168 | 113.0 |
| 2014-05 | MW-1002G | | 1098.25 | 92 | < 0.5 | < 1 | 130 | < 0.018 | 1.9 | 8 | 120 | 6.56 | 290 | 90 |
| 2014-05 | MW-1002G | Dup. | | 90 | < 1 | < 1 | 120 | < 0.018 | < 1 | 7.8 | 130 | | | |
| 2014-05 | MW-1004 | | 1111.07 | 26 | < 0.5 | 5.3 | 34 | 0.15 | 2.6 | 12 | 10 | 6.34 | 84.0 | 109.2 |
| 2014-05 | MW-1004P | | 1108.89 | 160 | < 0.5 | < 1 | 140 | 0.11 | 74 | < 2.5 | 100 | 7.30 | 299 | 45 |
| 2014-05 | MW-1004S | | 1111.23 | 53 | < 0.5 | 1.6 | 89 | < 0.018 | < 1 | 38 | 98 | 6.64 | 220 | 88.7 |
| 2014-05 | MW-1005 | | 1139.85 | 41 | 1.4 | 1.4 | 230 | 10 | 280 | 13 | 450 | 6.04 | 769 | 33.4 |
| 2014-05 | MW-1005P | | 1138.55 | 240 | < 0.5 | < 1 | 220 | 1.2 | 82 | < 2.5 | 200 | 7.03 | 473 | -43.1 |
| 2014-05 | MW-1005S | | 1139.09 | 170 | 2.4 | < 1 | 160 | 4.4 | 230 | < 2.5 | 180 | 7.07 | 346 | -87.9 |
| 2014-05 | MW-1010P | | 1090.25 | 150 | 20 | < 1 | 170 | < 0.018 | 48 | 26 | 140 | 7.34 | 364 | 60.4 |
| 2014-05 | MW-1013 | | 1113.33 | 650 | < 1 | 9.5 | 560 | 11 | 27000 | 30 | 720 | 5.87 | 1293 | 79.6 |
| 2014-05 | MW-1013A | | 1099.31 | 340 | < 1 | 2.7 | 450 | 0.037 | 1700 | 180 | 590 | 6.59 | 1068 | 96.0 |
| 2014-05 | MW-1013B | | 1099.72 | 580 | < 1 | 510 | 2200 | 0.09 | 37000 | 1600 | 3100 | 6.17 | 3456 | 147.2 |
| 2014-05 | MW-1013C | | 1102.52 | 480 | 21 | < 1 | 2100 | 14 | 9600 | 1600 | 2900 | 6.41 | 3463 | 18.9 |
| 2014-05 | MW-1014 | | 1119.16 | 160 | < 1 | 7 | 270 | < 0.018 | 1200 | 99 | 320 | 6.06 | 685 | 92.3 |
| 2014-05 | MW-1014A | | 1116.02 | 460 | < 1 | 7.5 | 1200 | < 0.018 | 420 | 900 | 1800 | 6.412 | 2370 | 110.9 |
| 2014-05 | MW-1014B | | 1114.93 | 480 | < 1 | 460 | 1700 | < 0.018 | 11000 | 1200 | 2400 | 6.20 | 3004 | 151.1 |
| 2014-05 | MW-1014B | Dup. | | 100 | < 1 | 440 | 1700 | < 0.018 | 10000 | 1300 | 2400 | | | |
| 2014-05 | MW-1014C | | 1110.69 | 260 | 22 | < 1 | 510 | 5 | 1700 | 210 | 610 | 6.42 | 1156 | 27.8 |
| 2014-05 | MW-1015A | | 1092.21 | 78 | < 0.5 | < 1 | 87 | < 0.018 | 6.2 | 8.7 | 74 | 7.09 | 188 | 43.9 |
| 2014-05 | MW-1015B | | 1092.7 | 180 | < 0.5 | < 1 | 150 | 0.16 | 58 | < 2.5 | 240 | 7.88 | 532 | -57.0 |
| 2014-06 | MW-1000PR | | 1088.46 | 220 | 2.8 | 15 | 410 | 0.57 | 2100 | 210 | 520 | 6.44 | 854.4 | -11.5 |
| 2014-06 | MW-1000R | | 1090.27 | 200 | < 0.5 | 76 | 430 | < 0.018 | 12000 | 280 | 630 | 6.31 | 918.3 | 64 |
| 2014-06 | MW-1002 | | 1096.1 | 64 | < 0.5 | < 1 | 77 | < 0.018 | < 1 | 6 | 110 | 6.38 | 177.4 | 101 |
| 2014-06 | MW-1002G | | 1096.01 | 91 | < 0.5 | < 1 | 120 | < 0.018 | < 1 | 8.5 | 160 | 6.52 | 303.7 | 84 |
| 2014-06 | MW-1002G | Dup. | | 91 | < 0.5 | < 1 | 130 | < 0.018 | < 1 | 8.5 | 170 | | | |
| 2014-06 | MW-1004 | | 1110.86 | 28 | < 0.5 | 5.8 | 37 | 0.087 | 2.1 | 11 | 59 | 6.19 | 91.2 | 107.0 |
| 2014-06 | MW-1004P | | 1108.7 | 160 | < 0.5 | < 1 | 140 | 0.4 | 140 | < 2.5 | 80 | 7.28 | 308.4 | -1.9 |
| 2014-06 | MW-1004S | | 1111.03 | 52 | < 0.5 | 1.2 | 89 | < 0.018 | < 1 | 36 | 130 | 6.17 | 220.6 | 100 |
| 2014-06 | MW-1005 | | 1140.17 | 42 | 2.3 | < 1 | 270 | 16 | 360 | 15 | 440 | 5.78 | 867.8 | 98.4 |
| 2014-06 | MW-1005P | | 1139.34 | 230 | < 0.5 | < 1 | 220 | 0.9 | 98 | < 2.5 | 240 | 7.05 | 497.0 | -33 |
| 2014-06 | MW-1005S | | 1139.74 | 180 | 2.4 | < 1 | 160 | 4.7 | 230 | < 2.5 | 200 | 6.94 | 353.6 | 187 |
| 2014-06 | MW-1010P | | 1088.15 | 150 | 18 | < 1 | 170 | < 0.018 | 22 | 29 | 180 | 7.47 | 362.1 | 57.9 |
| 2014-06 | MW-1013 | | 1115.1 | 660 | < 1 | 10 | 590 | 5.7 | 26000 | 31 | 730 | 6.13 | 1173 | 35 |
| 2014-06 | MW-1013A | | 1099.77 | 340 | < 1 | < 1 | 490 | 0.072 | 2900 | 210 | 650 | 6.58 | 1039 | 37 |
| 2014-06 | MW-1013B | | 1100.24 | 530 | < 1 | 540 | 2200 | 0.12 | 36000 | 1600 | 3100 | 6.31 | 3248 | 289.4 |
| 2014-06 | MW-1013C | | 1102.21 | 510 | 20 | < 1 | 2100 | 14 | 10000 | 1600 | 3000 | 6.38 | 3316 | 157 |
| 2014-06 | MW-1014 | | 1120.82 | 140 | < 1 | 10 | 280 | < 0.018 | 1900 | 98 | 390 | 5.97 | 616.8 | 124 |
| 2014-06 | MW-1014A | | 1117.13 | 430 | < 1 | 2.7 | 1300 | < 0.018 | 36 | 940 | 1800 | 6.42 | 2429 | 120.0 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014-06 | MW-1014B | | 1116.33 | 480 | < 1 | 500 | 1800 | < 0.018 | 10000 | 1300 | 2400 | 6.21 | 2943 | 124 |
| 2014-06 | MW-1014B | Dup. | | 470 | < 1 | 500 | 1800 | < 0.018 | 10000 | 1300 | 2500 | | | |
| 2014-06 | MW-1014C | | 1111.53 | 270 | 21 | < 1 | 520 | 5 | 1700 | 200 | 710 | 6.50 | 1064 | 35.7 |
| 2014-06 | MW-1015A | | 1089.95 | 78 | < 0.5 | < 1 | 87 | < 0.018 | 4.5 | 8.6 | 110 | 6.86 | 192.8 | 63.0 |
| 2014-06 | MW-1015B | | 1090.07 | 180 | < 0.5 | < 1 | 150 | 0.22 | 53 | < 2.5 | 330 | 7.55 | 581.4 | -90 |
| 2014-10 | MW-1000PR | | 1088.6 | 230 | 6.6 | < 1 | 410 | 2.4 | 2300 | 200 | 570 | 6.11 | 777 | 51.5 |
| 2014-10 | MW-1000R | | 1089.92 | 230 | < 0.5 | 83 | 360 | < 0.018 | 11000 | 160 | 500 | 5.95 | 735 | 126.6 |
| 2014-10 | MW-1002 | | 1093.06 | 69 | < 0.5 | < 1 | 80 | < 0.018 | < 1 | 5.6 | 95 | 6.39 | 188 | 168.7 |
| 2014-10 | MW-1002G | | 1092.99 | 93 | < 0.5 | < 1 | 120 | < 0.018 | < 1 | 7.8 | 170 | 6.41 | 245 | 160.7 |
| 2014-10 | MW-1002G | Dup. | | 94 | < 0.5 | < 1 | 130 | < 0.018 | < 1 | 7.7 | 170 | | | |
| 2014-10 | MW-1004 | | 1109.43 | 35 | < 0.5 | 5.3 | 40 | 0.021 | < 1 | 10 | 80 | 6.31 | 126 | 136.4 |
| 2014-10 | MW-1004P | | 1107.81 | 170 | < 0.5 | < 1 | 140 | 0.43 | 110 | < 2.5 | 130 | 6.93 | 311 | -2.5 |
| 2014-10 | MW-1004S | | 1109.5 | 51 | < 0.5 | 1.3 | 83 | < 0.018 | < 1 | 35 | 110 | 5.82 | 212 | 153.3 |
| 2014-10 | MW-1005 | | 1140.32 | 53 | 1.9 | < 1 | 290 | 16 | 410 | 14 | 660 | 5.86 | 978 | 41.3 |
| 2014-10 | MW-1005P | | 1139.75 | 260 | < 0.5 | < 1 | 220 | 1.5 | 68 | < 2.5 | 220 | 6.96 | 469 | -44.6 |
| 2014-10 | MW-1005S | | 1140.02 | 180 | 2.5 | < 1 | 150 | 4.6 | 230 | < 2.5 | 210 | 6.77 | 344 | -90.7 |
| 2014-10 | MW-1010P | | 1088.36 | 160 | 23 | < 1 | 180 | < 0.018 | 29 | 29 | 190 | 6.98 | 341 | 144.9 |
| 2014-10 | MW-1013 | | 1114.88 | 600 | < 1 | 19 | 560 | 2.9 | 26000 | 23 | 680 | 6.01 | 1060 | 81.3 |
| 2014-10 | MW-1013A | | 1099.7 | 330 | < 1 | 3.8 | 460 | 0.099 | 4200 | 190 | 620 | 6.39 | 914 | 68.3 |
| 2014-10 | MW-1013B | | 1100.08 | 600 | < 1 | 610 | 2100 | 0.036 | 41000 | 1600 | 3200 | 6.03 | 2963 | 159.1 |
| 2014-10 | MW-1013C | | 1102.61 | 510 | 26 | < 1 | 2000 | 13 | 9600 | 1500 | 3000 | 6.18 | 2905 | 34.1 |
| 2014-10 | MW-1014 | | 1124.11 | 160 | < 1 | 9.4 | 290 | < 0.018 | 1300 | 110 | 420 | 5.96 | 600 | 129.3 |
| 2014-10 | MW-1014A | | 1120.32 | 510 | < 1 | 4 | 1300 | 0.019 | 46 | 910 | 1800 | 6.39 | 2052 | 127.2 |
| 2014-10 | MW-1014B | | 1117.92 | 510 | < 1 | 510 | 2000 | < 0.018 | 12000 | 1400 | 2700 | 6.02 | 2775 | 199.7 |
| 2014-10 | MW-1014B | Dup. | | 550 | 1.1 | 520 | 1900 | < 0.018 | 12000 | 1400 | 2800 | | | |
| 2014-10 | MW-1014C | | 1112.66 | 270 | 23 | < 1 | 530 | 4.9 | 1600 | 210 | 650 | 6.39 | 967 | 24.3 |
| 2014-10 | MW-1015A | | 1089.11 | 80 | < 0.5 | < 1 | 83 | 0.11 | 7.7 | 7.8 | 130 | 6.78 | 190 | 131.3 |
| 2014-10 | MW-1015B | | 1089.21 | 180 | < 0.5 | < 1 | 150 | 0.22 | 59 | < 2.5 | 310 | 7.37 | 544 | -35.3 |
| 2015-03 | MW-1000PR | | 1089.17 | 220 | 8.7 | 1.1 | 410 | 3.6 | 2300 | 190 | 560 | 6.44 | 600 | 71.2 |
| 2015-03 | MW-1000R | | 1090.07 | 200 | < 0.5 | 70 | 320 | < 0.018 | 9600 | 88 | 470 | 6.19 | 619 | 154.3 |
| 2015-03 | MW-1002 | | 1091.96 | | | | | | | | | | | |
| 2015-03 | MW-1002G | Dup. | | 92 | < 0.5 | < 1 | 130 | < 0.018 | < 1 | 8.3 | 170 | | | |
| 2015-03 | MW-1002G | | 1091.9 | 93 | < 0.5 | < 1 | 130 | < 0.018 | < 1 | 7.9 | 150 | 6.45 | 258 | 136.5 |
| 2015-03 | MW-1004 | | 1107.63 | 30 | < 0.5 | 4.9 | 40 | 0.04 | 1.2 | 13 | 67 | 6.12 | 78 | 179.8 |
| 2015-03 | MW-1004P | | 1105.74 | 160 | < 0.5 | < 1 | 140 | 0.081 | 100 | 2.5 | 190 | 7.1 | 247 | 32.2 |
| 2015-03 | MW-1004S | | 1107.57 | 44 | < 0.5 | 2.6 | 66 | < 0.018 | < 1 | 26 | 110 | 6.11 | 137 | 205.9 |
| 2015-03 | MW-1005 | | 1140.17 | 50 | 1.1 | 1.6 | 340 | 16 | 430 | 14 | 600 | 5.89 | 964 | 96.4 |
| 2015-03 | MW-1005P | | 1139.57 | | | | | | | | | | | |
| 2015-03 | MW-1005S | | 1139.55 | 180 | 2.3 | < 1 | 160 | 4.4 | 230 | < 2.5 | 240 | 7.01 | 296 | -71.6 |
| 2015-03 | MW-1010P | | 1088.80 | 150 | 20 | < 1 | 180 | 0.039 | 31 | 29 | 220 | 7.51 | 268 | 144.3 |
| 2015-03 | MW-1013 | | 1112.44 | 590 | < 1 | 14 | 580 | 5.4 | 28000 | 28 | 760 | 6.18 | 832 | 127.3 |
| 2015-03 | MW-1013A | | 1099.43 | 360 | < 1 | 1.2 | 450 | 0.087 | 4400 | 180 | 670 | 6.57 | 677 | 111.5 |
| 2015-03 | MW-1013B | | 1100.56 | 530 | < 1 | 510 | 2100 | 0.08 | 34000 | 1600 | 3200 | 6.12 | 2103 | 193.3 |
| 2015-03 | MW-1013C | | 1102.15 | 500 | 20 | 1.6 | 2100 | 13 | 10000 | 1500 | 2900 | 6.35 | 1820 | 59.3 |
| 2015-03 | MW-1014 | | 1123.19 | 180 | < 1 | 5.4 | 300 | < 0.018 | 620 | 110 | 470 | 6.36 | 652 | 179.2 |
| 2015-03 | MW-1014A | | 1120.69 | 430 | < 1 | 6 | 1300 | < 0.018 | 310 | 970 | 1900 | 6.55 | 2030 | 174 |
| 2015-03 | MW-1014B | | 1117.02 | 470 | < 1 | 500 | 1900 | < 0.018 | 12000 | 1300 | 2600 | 6.32 | 2607 | 186.2 |
| 2015-03 | MW-1014C | Dup. | | 300 | 23 | < 1 | 520 | 5 | 1700 | 200 | 700 | | | |
| 2015-03 | MW-1014C | | 1111.8 | 250 | 23 | < 1 | 540 | 5 | 1700 | 210 | 680 | 6.58 | 947 | 62 |
| 2015-03 | MW-1015A | | 1089.3 | 78 | < 0.5 | < 1 | 89 | < 0.018 | 5.5 | 7.4 | 100 | 6.78 | 178 | 207.5 |
| 2015-03 | MW-1015B | | 1089.25 | 180 | < 0.5 | < 1 | 150 | 0.031 | 47 | < 2.5 | 250 | 7.66 | 421 | 32 |
| 2015-04 | MW-1002 | | | 53 | < 0.5 | 1.2 | 61 | < 0.018 | < 1 | 2.7 | 43 | 6.33 | 137 | 198.4 |
| 2015-04 | MW-1005P | | | 230 | < 0.5 | < 1 | 220 | 1.2 | 92 | < 2.5 | 260 | 7.04 | 547 | 44.6 |
| 2015-05 | MW-1000PR | | 1090.81 | 200 | 6.5 | 4.3 | 410 | 0.73 | 2100 | 190 | 580 | 6.36 | 814 | 151.1 |
| 2015-05 | MW-1000R | | 1091.65 | 110 | 0.53 | 40 | 200 | < 0.018 | 2800 | 72 | 330 | 5.94 | 415 | 368.3 |
| 2015-05 | MW-1002 | Dup. | | 54 | < 0.5 | < 1 | 61 | < 0.018 | < 1 | 2.5 | 130 | | | |
| 2015-05 | MW-1002 | | 1093.11 | 54 | 0.57 | < 1 | 60 | < 0.018 | < 1 | 2.6 | 73 | 6.41 | 140 | 226.5 |
| 2015-05 | MW-1002G | | 1093.02 | 91 | < 0.5 | < 1 | 130 | < 0.018 | < 1 | 7.2 | 180 | 6.48 | 301 | 163.2 |
| 2015-05 | MW-1004 | | 1111.05 | 30 | < 0.5 | 4.2 | 39 | < 0.018 | < 1 | 11 | 26 | 6.22 | 84 | 177.6 |
| 2015-05 | MW-1004P | | 1108.09 | 160 | 0.64 | < 1 | 140 | 0.16 | 94 | 3 | 130 | 7.27 | 302 | 10.1 |
| 2015-05 | MW-1004S | | 1111.27 | 42 | < 0.5 | 1.9 | 63 | < 0.018 | < 1 | 25 | 110 | 6.16 | 165 | 199.5 |
| 2015-05 | MW-1005 | | 1142.02 | 49 | 1.6 | 1.2 | 360 | 14 | 360 | 14 | 870 | 5.85 | 1297 | 81.7 |
| 2015-05 | MW-1005P | | 1141.85 | 240 | 0.58 | < 1 | 210 | 0.89 | 94 | < 2.5 | 240 | 7.04 | 466 | -16.7 |
| 2015-05 | MW-1005S | | 1142.17 | 170 | 3.1 | < 1 | 160 | 3.9 | 230 | < 2.5 | 210 | 6.97 | 349 | -59.1 |
| 2015-05 | MW-1010P | | 1090.32 | 150 | 25 | < 1 | 170 | < 0.018 | 58 | 20 | 210 | 7.52 | 351 | 228.2 |
| 2015-05 | MW-1013 | | 1115.7 | 620 | < 1 | 25 | 580 | 1.1 | 26000 | 28 | 770 | 6.04 | 1160 | 94.6 |
| 2015-05 | MW-1013A | | 1098.57 | 320 | < 1 | < 1 | 450 | 0.034 | 3200 | 180 | 630 | 6.51 | 970 | 90.9 |
| 2015-05 | MW-1013B | | 1100.09 | 560 | < 2 | 380 | 2000 | 0.056 | 25000 | 1500 | 3200 | 6.12 | 3169 | 179.1 |
| 2015-05 | MW-1013C | | 1102.84 | 530 | 24 | < 2 | 2000 | 14 | 9700 | 1500 | 3000 | 6.3 | 3085 | 68.9 |
| 2015-05 | MW-1014 | | 1123.53 | 160 | < 1 | 5.5 | 280 | < 0.018 | 970 | 100 | 410 | 6.21 | 657 | 184.9 |
| 2015-05 | MW-1014A | | 1120.42 | 460 | < 2 | 5.8 | 1300 | 0.06 | 300 | 920 | 1900 | 6.46 | 2223 | 168.8 |
| 2015-05 | MW-1014B | | 1117.69 | 510 | < 2 | 420 | 1800 | < 0.036 | 11000 | 1200 | 2700 | 6.26 | 2828 | 175.5 |
| 2015-05 | MW-1014C | Dup. | | 260 | 21 | < 1 | 500 | 4.8 | 1600 | 200 | 680 | | | |
| 2015-05 | MW-1014C | | 1112.59 | 260 | 21 | < 1 | 490 | 4.8 | 1500 | 200 | 680 | 6.53 | 1027 | 55.7 |
| 2015-05 | MW-1015A | | 1090 | 76 | < 0.5 | < 1 | 83 | < 0.018 | 5.7 | 7 | 110 | 7 | 180 | 198.7 |
| 2015-05 | MW-1015B | | 1089.56 | 170 | 0.57 | < 1 | 140 | 0.094 | 42 | < 2.5 | 280 | 7.62 | 515 | 13.2 |
| 2015-06 | MW-1000PR | | 1088.72 | 220 | 5.5 | 8.3 | 390 | 0.48 | 2100 | 190 | 540 | 6.45 | 809 | 131 |
| 2015-06 | MW-1000R | | 1090.39 | 160 | < 0.50 | 57 | 260 | < 0.018 | 7300 | 120 | 410 | 6.14 | 596 | 119.7 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2015-06 | MW-1002 | Dup. | | 60 | < 0.50 | < 1.0 | 65 | < 0.018 | < 1.0 | 3.0 | 150 | | | |
| 2015-06 | MW-1002 | | 1093.41 | 58 | < 0.50 | < 1.0 | 64 | < 0.018 | < 1.0 | 2.8 | 110 | 6.62 | 149 | 106.9 |
| 2015-06 | MW-1002G | | 1093.34 | 95 | < 0.50 | < 1.0 | 130 | < 0.018 | < 1.0 | 7.3 | 200 | 6.49 | 297 | 127.5 |
| 2015-06 | MW-1004 | | 1109.61 | 30 | < 0.50 | 4.7 | 34 | < 0.018 | < 1.0 | 8.4 | 79 | 6.23 | 87 | 103.7 |
| 2015-06 | MW-1004P | | 1107.81 | 170 | < 0.50 | < 1.0 | 140 | 0.36 | 130 | < 2.5 | 160 | 7.28 | 306 | 76.1 |
| 2015-06 | MW-1004S | | 1109.72 | 44 | < 0.50 | 1.9 | 68 | < 0.018 | < 1.0 | 27 | 96 | 6.15 | 160 | 113.7 |
| 2015-06 | MW-1005 | | 1141.73 | 45 | 0.65 | 1.6 | 360 | 15 | 480 | 14 | 960 | 5.86 | 1242 | 75.7 |
| 2015-06 | MW-1005P | | 1141.63 | 240 | < 0.50 | < 1.0 | 220 | 1.1 | 70 | < 2.5 | 260 | 7.09 | 467 | 31.3 |
| 2015-06 | MW-1005S | | 1141.87 | 180 | 2.4 | < 1.0 | 160 | 4.6 | 230 | < 2.5 | 210 | 7 | 347 | -66.7 |
| 2015-06 | MW-1010P | | 1088.42 | 160 | 22 | < 1.0 | 170 | < 0.018 | 50 | 21 | 220 | 7.52 | 347 | 123.4 |
| 2015-06 | MW-1013 | | 1115.9 | 610 | < 1.0 | 17 | 590 | 1.8 | 28000 | 24 | 770 | 6.09 | 1160 | 75.2 |
| 2015-06 | MW-1013A | | 1099.85 | 340 | < 1.0 | < 1.0 | 480 | 0.046 | 4200 | 200 | 700 | 6.56 | 963 | 82.5 |
| 2015-06 | MW-1013B | | 1100.37 | 590 | < 5.0 | 530 | 2300 | < 0.090 | 34000 | 1500 | 3200 | 6.2 | 3163 | 123 |
| 2015-06 | MW-1013C | | 1103.09 | 500 | 26 | < 5.0 | 2100 | 14 | 11000 | 1500 | 3000 | 6.38 | 3157 | 57.2 |
| 2015-06 | MW-1014 | | 1124.32 | 180 | < 1.0 | 6.4 | 290 | < 0.018 | 1900 | 140 | 500 | 6.4 | 739 | 127.5 |
| 2015-06 | MW-1014A | | 1120.66 | 450 | < 5.0 | < 5.0 | 1400 | < 0.090 | 62 | 940 | 1900 | 6.51 | 2199 | 142.1 |
| 2015-06 | MW-1014B | | 1118.53 | 480 | < 5.0 | 520 | 1900 | < 0.090 | 12000 | 1300 | 2700 | 6.28 | 2850 | 149.2 |
| 2015-06 | MW-1014C | Dup. | | 280 | 25 | < 1.0 | 520 | 4.8 | 1700 | 200 | 700 | | | |
| 2015-06 | MW-1014C | | 1113.19 | 270 | 26 | < 1.0 | 520 | 4.9 | 1700 | 200 | 690 | 6.57 | 1008 | 29.2 |
| 2015-06 | MW-1015A | | 1089.3 | 80 | < 0.50 | < 1.0 | 85 | < 0.018 | 4.5 | 6.7 | 120 | 6.97 | 190 | 96.7 |
| 2015-06 | MW-1015B | | 1089.41 | 180 | < 0.50 | < 1.0 | 150 | 0.21 | 61 | < 2.5 | 310 | 7.67 | 600 | 152.2 |
| 2015-09 | MW-1005 | Resample | | 58.4 | 1.8 | 1.2 | 527 | 20.2 | 611 | 14.5 | 803 | | | |
| 2015-10 | MW-1000PR | | 1087.28 | 225 | 6.8 | 2.7 | 434 | 0.642 | 2150 | 68.3 | 534 | 6.34 | 671 | 101.2 |
| 2015-10 | MW-1000R | | 1088.48 | 247 | 0.29 | 89.7 | 336 | 0.0183 | 10600 | 69.2 | 450 | 6.08 | 682 | 135.9 |
| 2015-10 | MW-1002 | Dup. | | 58.6 | 0.10 | 1.1 | 69.0 | 0.0259 | 0.37 | 4.5 | 104 | | | |
| 2015-10 | MW-1002 | | 1090.92 | 61.2 | < 0.099 | 0.67 | 67.8 | < 0.0100 | < 0.18 | 4.6 | 96.0 | 6.5 | 151 | 87.1 |
| 2015-10 | MW-1002G | | 1090.83 | 98.2 | < 0.099 | 0.35 | 144 | < 0.0100 | 0.23 | 9.2 | 190 | 6.5 | 298 | 118.5 |
| 2015-10 | MW-1004 | | 1107.07 | 41.3 | < 0.099 | 4.2 | 58.9 | < 0.0100 | 1.4 | 20.5 | 92.0 | 6.06 | 136 | 110.1 |
| 2015-10 | MW-1004P | | 1105.83 | 167 | 0.46 | < 0.26 | 156 | 0.418 | 149 | 3.6 | 160 | 7.23 | 318 | -8.4 |
| 2015-10 | MW-1004S | | 1107.11 | 40.9 | 0.13 | 1.8 | 67.2 | < 0.0100 | 0.73 | 24.7 | 106 | 6.07 | 155 | 118.8 |
| 2015-10 | MW-1005 | | 1140.26 | 57.3 | 1.2 | 1.6 | 418 | 16.2 | 540 | 14.9 | 1070 | 5.83 | 1319 | 75.7 |
| 2015-10 | MW-1005P | | 1139.76 | 251 | 0.32 | 0.32 | 240 | 1.07 | 71.6 | < 2.0 | 234 | 7.02 | 466 | 11.1 |
| 2015-10 | MW-1005S | | 1140.07 | 179 | 2.4 | < 0.26 | 177 | 4.29 | 237 | 2.3 | 198 | 6.99 | 347 | -41.6 |
| 2015-10 | MW-1010P | | 1087.06 | 161 | 23.0 | 0.55 | 185 | < 0.0100 | 83.4 | 24.4 | 188 | 7.45 | 351 | 101.9 |
| 2015-10 | MW-1013 | | 1115.02 | 630 | 0.63 | 7.6 | 568 | 4.57 | 26200 | 24.9 | 692 | 6.05 | 1106 | 59.4 |
| 2015-10 | MW-1013A | | 1098.88 | 353 | 0.26 | 0.47 | 468 | 0.0547 | 4330 | 163 | 586 | 6.6 | 970 | 47.2 |
| 2015-10 | MW-1013B | | 1099.29 | 523 | 1.0 | 510 | 2030 | 0.0632 | 30800 | 1600 | 2970 | 6.14 | 3197 | 135.5 |
| 2015-10 | MW-1013C | | 1101.66 | 522 | 21.2 | 0.78 | 1940 | 13.7 | 9600 | 1550 | 2840 | 6.37 | 3174 | 60.1 |
| 2015-10 | MW-1014 | | 1124.02 | 194 | < 0.099 | 5.2 | 332 | < 0.0100 | 455 | 128 | 446 | 6.26 | 710 | 136.3 |
| 2015-10 | MW-1014A | | 1120.98 | 488 | 0.81 | 3.8 | 1400 | < 0.0100 | 156 | 931 | 1790 | 6.46 | 2190 | 152.2 |
| 2015-10 | MW-1014B | | 1117.33 | 512 | 1.3 | 372 | 1730 | < 0.0100 | 9970 | 1340 | 2460 | 6.25 | 2680 | 174.4 |
| 2015-10 | MW-1014C | Dup. | | 274 | 22.8 | < 0.26 | 528 | 4.83 | 1580 | 214 | 670 | | | |
| 2015-10 | MW-1014C | | 1111.82 | 273 | 22.6 | 0.36 | 545 | 4.64 | 1610 | 215 | 676 | 6.56 | 1026 | 57.1 |
| 2015-10 | MW-1015A | | 1087.57 | 83.5 | < 0.099 | 0.46 | 96.4 | 0.0101 | 6.8 | 8.7 | 120 | 6.98 | 191 | 127.7 |
| 2015-10 | MW-1015B | | 1087.61 | 184 | 0.16 | < 0.26 | 161 | 0.138 | 34.3 | 3.2 | 252 | 7.55 | 621 | 11.3 |
| 2016-03 | MW-1000PR | | 1089.9 | 217 | 5.5 | 4.4 | 410 | 0.25 | 1930 | 187 | 514 | 6.53 | 792 | 115.8 |
| 2016-03 | MW-1000R | | 1091.96 | 204 | 0.32 | 80.4 | 295 | 0.0184 | 7810 | 75.1 | 440 | 6.24 | 607 | 134.1 |
| 2016-03 | MW-1002 | | 1094.48 | 71.2 | < 0.099 | 1.5 | 76.9 | 0.0250 | 0.94 | 5.4 | 128 | 6.44 | 158 | 158 |
| 2016-03 | MW-1002G | Dup. | | 74.8 | < 0.099 | 0.82 | 83.5 | < 0.0100 | 1.2 | 5.5 | 126 | | | |
| 2016-03 | MW-1002G | | 1094.36 | 98.5 | < 0.099 | 0.52 | 141 | < 0.0100 | 0.86 | 9.3 | 192 | 6.47 | 311 | 136.8 |
| 2016-03 | MW-1004 | | 1109.77 | 34.3 | < 0.099 | 3.6 | 37.0 | < 0.0100 | 3.3 | 12.0 | 76.0 | 6.41 | 85 | 104.7 |
| 2016-03 | MW-1004P | | 1107.68 | 158 | 0.34 | < 0.26 | 143 | 0.363 | 93.8 | 3.6 | 162 | 7.37 | 313 | -0.4 |
| 2016-03 | MW-1004S | | 1109.85 | 36.7 | < 0.099 | 1.8 | 60.4 | < 0.0100 | 0.74 | 24.2 | 100 | 6.19 | 147 | 127.5 |
| 2016-03 | MW-1005 | | 1141.5 | 62.3 | 1.6 | 0.91 | 508 | 19.7 | 490 | 21.3 | 940 | 5.85 | 1580 | 98.1 |
| 2016-03 | MW-1005P | | 1141.16 | 241 | 0.35 | 2.5 | 224 | 1.18 | 57.2 | < 10.0 | 260 | 7.14 | 505 | 27.2 |
| 2016-03 | MW-1005S | | 1141.48 | 168 | 2.7 | 0.39 | 156 | 4.36 | 213 | < 20.0 | 192 | 7.02 | 333 | -21.6 |
| 2016-03 | MW-1010P | | 1089.75 | 153 | 18.0 | 0.27 | 178 | < 0.0100 | 33.7 | 30.4 | 180 | 7.57 | 361 | 121.5 |
| 2016-03 | MW-1013 | | 1113.66 | 602 | 0.49 | 10.4 | 542 | 2.85 | 25100 | 29.6 | 686 | 6.21 | 1105 | 65.7 |
| 2016-03 | MW-1013A | | 1100.24 | 350 | 0.35 | 1.5 | 471 | 0.104 | 3870 | 195 | 626 | 6.64 | 983 | 82.9 |
| 2016-03 | MW-1013B | | 1100.75 | 618 | 1.1 | 424 | 2060 | 0.0384 | 28400 | 1640 | 3120 | 6.2 | 3190 | 142.3 |
| 2016-03 | MW-1013C | | 1103.65 | 511 | 21.6 | < 0.26 | 1990 | 13.9 | 9160 | 1590 | 2910 | 6.4 | 2945 | 44.6 |
| 2016-03 | MW-1014 | | 1124.06 | 200 | 0.38 | 4.6 | 313 | 0.0126 | 1200 | 120 | 474 | 6.33 | 691 | 135.5 |
| 2016-03 | MW-1014A | | 1121.48 | 501 | 1.3 | 6.9 | 1280 | 0.0145 | 528 | 926 | 1790 | 6.55 | 2222 | 144.9 |
| 2016-03 | MW-1014B | | 1118.11 | 552 | 1.7 | 494 | 1890 | 0.0227 | 11200 | 1380 | 2620 | 6.32 | 2887 | 156.4 |
| 2016-03 | MW-1014C | Dup. | | 268 | 22.7 | 0.54 | 505 | 4.53 | 1550 | 210 | 672 | | | |
| 2016-03 | MW-1014C | | 1112.95 | 283 | 21.3 | 0.58 | 510 | 4.52 | 1560 | 208 | 712 | 6.6 | 1028 | 64.3 |
| 2016-03 | MW-1015A | | 1090.74 | 80.1 | < 0.099 | 0.91 | 90.5 | 0.0341 | 16.9 | 8.3 | 132 | 6.97 | 190 | 140.9 |
| 2016-03 | MW-1015B | | 1090.98 | 173 | 0.23 | < 0.26 | 153 | 0.173 | 43.1 | 2.4 | 294 | 7.68 | 611 | 85.6 |
| 2016-05 | MW-1000PR | | 1088.17 | 228 | 14.4 | < 0.26 | 459 | 3.78 | 2320 | 188 | 524 | 6.41 | 799 | 111.2 |
| 2016-05 | MW-1000R | | 1090.01 | 182 | 0.36 | 71.7 | 296 | < 0.0100 | 9380 | 91.4 | 396 | 6.01 | 589 | 170.5 |
| 2016-05 | MW-1002 | | 1093.74 | 77.4 | < 0.099 | 0.56 | 85.7 | < 0.0100 | 2.1 | 6.1 | 132 | 6.4 | 168 | 130.3 |
| 2016-05 | MW-1002G | Dup. | | 98.4 | < 0.099 | < 0.26 | 141 | < 0.0100 | 0.71 | 10 | 210 | | | |
| 2016-05 | MW-1002G | | 1093.64 | 96.2 | < 0.099 | < 0.26 | 142 | 0.0138 | 5.9 | 9.9 | 204 | 6.55 | 297 | 121.3 |
| 2016-05 | MW-1004 | | 1109.6 | 23.3 | < 0.099 | 5.1 | 30.4 | 0.206 | 2.8 | 9.9 | 62.0 | 6.45 | 75 | 110.2 |
| 2016-05 | MW-1004P | | 1107.86 | 160 | 0.20 | < 0.26 | 141 | 0.313 | 85.0 | 3.7 | 166 | 7.29 | 304 | 17.2 |
| 2016-05 | MW-1004S | | 1109.69 | 37.7 | < 0.099 | 1.6 | 61.2 | < 0.0100 | 0.99 | 24.2 | 108 | 6.26 | 146 | 113 |
| 2016-05 | MW-1005 | | 1141.77 | 44.3 | 0.96 | 0.78 | 529 | 15.5 | 522 | 15.4 | 1220 | 5.82 | 1609 | 95.7 |
| 2016-05 | MW-1005P | | 1141.64 | 253 | < 0.099 | < 0.26 | 216 | 0.757 | 78.9 | 2.0 | 240 | 7.08 | 450 | 22.6 |

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# Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2016-05 | MW-1005S | | 1141.93 | 184 | 2.2 | < 0.26 | 151 | 3.98 | 207 | 3.1 | 200 | 6.86 | 330 | -31.2 |
| 2016-05 | MW-1010P | | 1087.98 | 153 | 21.7 | < 0.26 | 183 | < 0.0100 | 65.3 | 27.2 | 214 | 7.46 | 349 | 76.3 |
| 2016-05 | MW-1013 | | 1115.07 | 589 | 0.63 | 19.3 | 608 | 1.94 | 30300 | 5.3 | 704 | 6.15 | 1125 | 74.6 |
| 2016-05 | MW-1013A | | 1099.91 | 369 | 0.37 | < 0.26 | 559 | 0.209 | 4520 | 198 | 660 | 6.55 | 1052 | 46 |
| 2016-05 | MW-1013B | | 1100.42 | 536 | 1.1 | 497 | 2350 | 0.0660 | 37800 | 1640 | 3000 | 6.14 | 3187 | 137.3 |
| 2016-05 | MW-1013C | | 1102.83 | 483 | 20.6 | < 0.26 | 2040 | 14.7 | 8990 | 1560 | 2830 | 6.37 | 3119 | 61.2 |
| 2016-05 | MW-1014 | | 1124.42 | 167 | < 0.099 | 4.5 | 341 | < 0.0100 | 1850 | 113 | 432 | 6.32 | 665 | 126.6 |
| 2016-05 | MW-1014A | | 1121.12 | 556 | 0.36 | 3.1 | 1470 | < 0.0100 | 158 | 929 | 1770 | 6.5 | 2197 | 122.6 |
| 2016-05 | MW-1014B | | 1118.4 | 555 | 0.96 | 399 | 1890 | < 0.0100 | 11900 | 1290 | 2540 | 6.25 | 2804 | 131.6 |
| 2016-05 | MW-1014C | Dup. | | 289 | 23.0 | < 0.26 | 525 | 4.68 | 1540 | 218 | 658 | | | |
| 2016-05 | MW-1014C | | 1112.96 | 279 | 25.6 | < 0.26 | 586 | 5.09 | 1740 | 214 | 660 | 6.55 | 1026 | 46.5 |
| 2016-05 | MW-1015A | | 1089.18 | 74.7 | < 0.099 | < 0.26 | 92.1 | < 0.0100 | 5.6 | 8.5 | 124 | 6.89 | 187 | 138.4 |
| 2016-05 | MW-1015B | | 1089.26 | 189 | < 0.099 | < 0.26 | 140 | 0.189 | 46.5 | 3.4 | 266 | 7.61 | 570 | -2.5 |
| 2016-06 | MW-1000PR | | 1091.53 | 212 | 6.1 | 4.3 | 396 | 0.465 | 1800 | 186 | 562 | 6.41 | 773 | 109 |
| 2016-06 | MW-1000R | | 1092.8 | 149 | 0.30 | 59.6 | 244 | < 0.0100 | 8050 | 106 | 424 | 5.92 | 545 | 145.3 |
| 2016-06 | MW-1002 | | 1095.4 | 71.5 | < 0.099 | 0.86 | 86.5 | < 0.0100 | 1.7 | 4.9 | 138 | 6.42 | 172 | 124.8 |
| 2016-06 | MW-1002G | Dup. | | 98.1 | < 0.099 | 0.41 | 141 | < 0.0100 | 0.38 | 8.9 | 206 | | | |
| 2016-06 | MW-1002G | | 1095.27 | 97.0 | < 0.099 | 0.48 | 142 | 0.0238 | 0.28 | 8.9 | 220 | 6.51 | 302 | 141.9 |
| 2016-06 | MW-1004 | | 1109.75 | 29.1 | 0.26 | 5.4 | 34.3 | 0.205 | 2.9 | 9.7 | 70.0 | 6.41 | 81 | 102.2 |
| 2016-06 | MW-1004P | | 1108.22 | 164 | 0.57 | 0.51 | 150 | 0.589 | 221 | 2.5 | 174 | 7.24 | 309 | 123.3 |
| 2016-06 | MW-1004S | | 1109.83 | 34.8 | < 0.099 | 1.7 | 60.6 | < 0.0100 | 3.3 | 22.8 | 112 | 6.29 | 145 | 110.6 |
| 2016-06 | MW-1005 | | 1141.4 | 44.6 | 1.1 | 0.96 | 538 | 20.4 | 640 | 14.2 | 1550 | 5.78 | 1764 | 96.7 |
| 2016-06 | MW-1005P | | 1141.35 | 241 | 0.26 | 0.29 | 226 | 0.821 | 64.8 | < 2.0 | 262 | 7.08 | 458 | 30.1 |
| 2016-06 | MW-1005S | | 1141.52 | 167 | 2.3 | < 0.26 | 155 | 4.09 | 207 | 2.1 | 210 | 7.02 | 330 | -42.7 |
| 2016-06 | MW-1010P | | 1091.05 | 154 | 22.0 | 0.61 | 167 | < 0.0100 | 61.8 | 29.4 | 212 | 7.47 | 347 | 115.1 |
| 2016-06 | MW-1013 | | 1116 | 589 | 0.57 | 16.4 | 556 | 1.8 | 24300 | 22.5 | 722 | 6.11 | 1098 | 51.7 |
| 2016-06 | MW-1013A | | 1100.31 | 358 | 0.33 | 0.47 | 507 | 0.25 | 4220 | 188 | 644 | 6.58 | 1020 | 41.6 |
| 2016-06 | MW-1013B | | 1100.83 | 574 | 0.78 | 452 | 2080 | 0.0461 | 27000 | 1560 | 3140 | 6.16 | 3190 | 135.3 |
| 2016-06 | MW-1013C | | 1104.09 | 499 | 19.3 | 0.52 | 1940 | 12.7 | 8830 | 1480 | 2940 | 6.41 | 3114 | 48.3 |
| 2016-06 | MW-1014 | | 1125.44 | 162 | 0.16 | 4.8 | 299 | < 0.0100 | 1520 | 111 | 456 | 6.28 | 669 | 121.5 |
| 2016-06 | MW-1014A | | 1121.8 | 473 | 0.60 | 2.4 | 1310 | 0.0127 | 94.9 | 920 | 1840 | 6.51 | 2204 | 123.4 |
| 2016-06 | MW-1014B | | 1119.38 | 469 | 0.96 | 373 | 1700 | < 0.0100 | 9010 | 1240 | 2540 | 6.38 | 2441 | 130.5 |
| 2016-06 | MW-1014C | Dup. | | 269 | 22.4 | 14.9 | 531 | 4.66 | 1520 | 205 | 674 | | | |
| 2016-06 | MW-1014C | | 1114.03 | 272 | 23.0 | < 0.26 | 522 | 4.66 | 1460 | 212 | 714 | 6.58 | 1024 | 42 |
| 2016-06 | MW-1015A | | 1091.54 | 75.5 | < 0.099 | 0.51 | 88.4 | < 0.0100 | 7.2 | 7.2 | 132 | 6.96 | 189 | 115.6 |
| 2016-06 | MW-1015B | | 1091.03 | 172 | 0.13 | < 0.26 | 160 | 0.0448 | 46.8 | < 2.0 | 326 | 7.54 | 587 | 147.8 |
| 2016-10 | MW-1000PR | | 1088.87 | 221 | 8.9 | 3.9 | 427 | 0.842 | 2340 | 149 | 536 | 6.53 | 777 | 123.5 |
| 2016-10 | MW-1000R | | 1090.36 | 218 | 0.32 | 94.4 | 329 | 0.0196 | 13800 | 90.1 | 468 | 6.16 | 659 | 146.3 |
| 2016-10 | MW-1002 | Dup. | | 72.1 | < 0.099 | 0.85 | 84.3 | < 0.0100 | 0.30 | 4.6 | 120 | | | |
| 2016-10 | MW-1002 | | 1093.4 | 71.1 | < 0.099 | 0.69 | 84.8 | 0.0169 | 0.36 | 4.6 | 118 | 6.56 | 165 | 115.3 |
| 2016-10 | MW-1002G | | 1093.27 | 102 | < 0.099 | 0.53 | 148 | 0.0186 | 0.45 | 9.2 | 192 | 6.52 | 299 | 133.1 |
| 2016-10 | MW-1004 | | 1109.57 | 30.8 | < 0.099 | 4.7 | 43.3 | 0.0778 | 1.3 | 12.5 | 80.0 | 6.26 | 96 | 102.7 |
| 2016-10 | MW-1004P | | 1107.72 | 164 | 0.32 | < 0.26 | 157 | 0.318 | 122 | 2.0 | 170 | 7.24 | 316 | 7.9 |
| 2016-10 | MW-1004S | | 1109.62 | 38.7 | < 0.099 | 1.6 | 60.5 | 0.0151 | 0.47 | 21.0 | 102 | 6.26 | 135 | 115.3 |
| 2016-10 | MW-1005 | | 1141.18 | 62.8 | 1.5 | 0.75 | 641 | 21.6 | 607 | 15.4 | 1540 | 5.81 | 1825 | 114.3 |
| 2016-10 | MW-1005P | | 1140.77 | 255 | 1.2 | 0.97 | 230 | 1.55 | 69.2 | < 1.0 | 240 | 7.12 | 466 | 15.3 |
| 2016-10 | MW-1005S | | 1141.07 | 168 | 2.3 | < 0.26 | 167 | 3.83 | 216 | 1.9 | 194 | 6.95 | 332 | -21.4 |
| 2016-10 | MW-1010P | | 1088.5 | 153 | 18.9 | 0.60 | 192 | 0.0519 | 61.0 | 30.1 | 212 | 7.53 | 352 | 122.4 |
| 2016-10 | MW-1013 | | 1114.95 | 579 | 0.79 | 7.5 | 594 | 7.82 | 27000 | 17.3 | 692 | 6.11 | 1078 | 55 |
| 2016-10 | MW-1013A | | 1099.87 | 366 | 0.15 | 0.27 | 451 | 0.139 | 5350 | 176 | 608 | 6.65 | 973 | 44.4 |
| 2016-10 | MW-1013B | | 1100.32 | 530 | 0.61 | 494 | 2310 | 0.0527 | 30400 | 1730 | 3080 | 6.2 | 3182 | 141.3 |
| 2016-10 | MW-1013C | | 1103.24 | 483 | 21.0 | 0.41 | 2090 | 14.2 | 10100 | 1600 | 2890 | 6.39 | 3130 | 72.2 |
| 2016-10 | MW-1014 | | 1125.42 | 179 | 0.22 | 5.0 | 339 | 0.0372 | 1270 | 117 | 478 | 6.42 | 699 | 152.7 |
| 2016-10 | MW-1014A | | 1122.08 | 474 | 0.51 | 5.1 | 1450 | 0.0226 | 292 | 961 | 1820 | 6.58 | 2188 | 164.3 |
| 2016-10 | MW-1014B | | 1118.94 | 466 | 0.85 | 442 | 1710 | 0.0258 | 9760 | 1380 | 2530 | 6.41 | 2685 | 179.7 |
| 2016-10 | MW-1014C | Dup. | | 275 | 23.6 | 0.48 | 523 | 4.54 | 1560 | 218 | 668 | | | |
| 2016-10 | MW-1014C | | 1113.41 | 276 | 24.5 | 0.38 | 564 | 4.78 | 1860 | 213 | 700 | 6.58 | 1023 | 72.2 |
| 2016-10 | MW-1015A | | 1089.45 | 79.8 | < 0.099 | 0.37 | 94.4 | 0.0161 | 5.4 | 7.5 | 128 | 6.9 | 191 | 131.1 |
| 2016-10 | MW-1015B | | 1089.45 | 178 | 0.10 | < 0.26 | 167 | 0.213 | 46.4 | < 1.0 | 296 | 7.57 | 606 | 101.3 |

Attachment 2

Statistical Results

Trend Graphs

Historical Data

(Groundwater - Annual Parameters)

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2016

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1000PR** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -6 | -6 | -5 | -8 | 7 | -1 | -6 | 2 | -8 | 4 | -2 | -9 | -6 |
| p-Level | 0.234 | 0.234 | 0.359 | 0.084 | 0.159 | 1.000 | 0.234 | 0.816 | 0.084 | 0.484 | 0.816 | 0.050 | 0.234 |
| Trend | | | | | | | | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 22 | 22 | 22 | 16 | 22 | 22 | 22 | 22 | 14 | 22 | 22 | 13 | 30 |
| Mann-Kendall S | -47 | 37 | -190 | 45 | 32 | 38 | -190 | 19 | 6 | 25 | 1 | -16 | -266 |
| p-Level | 0.198 | 0.314 | 0.000 | 0.047 | 0.387 | 0.301 | 0.000 | 0.616 | 0.789 | 0.504 | 1.000 | 0.368 | 0.000 |
| Trend | | | - | | | | - | | | | | | - |
| **MW-1000R** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 4 | 0 | 2 | 6 | 2 | -4 | 2 | -4 | 4 | 0 | -2 | 2 | 0 |
| p-Level | 0.484 | 1 | 0.816 | 0.234 | 0.816 | 0.484 | 0.816 | 0.484 | 0.484 | 1 | 0.816 | 0.816 | 1 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 |
| Mann-Kendall S | -1 | 1 | -1 | 5 | 7 | -3 | -3 | -3 | -1 | 0 | -5 | 2 | 1 |
| p-Level | 1 | 1 | 1 | 0.47 | 0.272 | 0.72 | 0.72 | 0.72 | 1 | 1 | 0.47 | 0.816 | 1 |
| Trend | | | | | | | | | | | | | |
| **MW-1010P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -5 | -4 | -3 | 2 | 0 | -2 | -3 | 0 | 1 | -4 | -2 | -5 | 3 |
| p-Level | 0.359 | 0.484 | 0.650 | 0.816 | 1.000 | 0.816 | 0.650 | 1.000 | 1.000 | 0.484 | 0.816 | 0.359 | 0.650 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 22 | 22 | 22 | 16 | 22 | 22 | 22 | 22 | 14 | 22 | 22 | 13 | 30 |
| Mann-Kendall S | 82 | -16 | 137 | 77 | -7 | 19 | 143 | 0 | 14 | -16 | 3 | -42 | 78 |
| p-Level | 0.021 | 0.676 | 0.000 | 0.000 | 0.868 | 0.616 | 0.000 | 1.000 | 0.484 | 0.676 | 0.956 | 0.010 | 0.171 |
| Trend | | | + | + | | | + | | | | | - | |
| **MW-1002** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 3 | 0 | 4 | 4 | 6 | -4 | 4 | 0 | 3 | 0 | 0 | 4 | 0 |
| p-Level | 0.650 | 1.000 | 0.484 | 0.484 | 0.234 | 0.484 | 0.484 | 1.000 | 0.650 | 1.000 | 1.000 | 0.484 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 17 | 13 | 18 | 18 | 17 | 18 | 13 | 18 | 18 | 12 | 28 |
| Mann-Kendall S | 22 | -17 | 29 | 54 | -7 | 9 | 32 | 0 | 26 | 1 | 1 | 26 | 0 |
| p-Level | 0.432 | 0.550 | 0.253 | 0.000 | 0.822 | 0.766 | 0.204 | 1.000 | 0.128 | 1.000 | 1.000 | 0.086 | 1.000 |
| Trend | | | | + | | | | | | | | | |
| **MW-1002G** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 4 | 0 | 5 | 4 | 3 | 0 | 3 | 0 | -2 | 0 | 0 | 6 | 0 |
| p-Level | 0.484 | 1.000 | 0.359 | 0.484 | 0.650 | 1.000 | 0.650 | 1.000 | 0.816 | 1.000 | 1.000 | 0.234 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 17 | 13 | 18 | 18 | 17 | 18 | 13 | 18 | 18 | 12 | 28 |
| Mann-Kendall S | 89 | -17 | 62 | 68 | 10 | 0 | 61 | 0 | 15 | -23 | 0 | 40 | -17 |
| p-Level | 0.000 | 0.550 | 0.010 | 0.000 | 0.737 | 1.000 | 0.012 | 1.000 | 0.402 | 0.410 | 1.000 | 0.006 | 0.755 |
| Trend | + | | + | + | | | | | | | | + | |

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2016

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1004** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -3 | 0 | -8 | 4 | -3 | 4 | -10 | 0 | -3 | 4 | -2 | -10 | 4 |
| p-Level | 0.65 | 1 | 0.084 | 0.484 | 0.65 | 0.484 | 0.016 | 1 | 0.65 | 0.484 | 0.816 | 0.016 | 0.484 |
| Trend | | | | | | | - | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 |
| Mann-Kendall S | -2 | 0 | -10 | 5 | -6 | 5 | -13 | 0 | -4 | 5 | -1 | -10 | 5 |
| p-Level | 0.86 | 1 | 0.096 | 0.47 | 0.371 | 0.47 | 0.016 | 1 | 0.595 | 0.47 | 1 | 0.016 | 0.47 |
| Trend | | | | | | | | | | | | | |
| **MW-1004S** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -4 | 0 | -4 | -4 | 8 | -2 | -4 | 0 | -4 | 4 | 0 | -3 | 0 |
| p-Level | 0.484 | 1.000 | 0.484 | 0.484 | 0.084 | 0.816 | 0.484 | 1.000 | 0.484 | 0.484 | 1.000 | 0.650 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 14 | 20 | 20 | 20 | 20 | 14 | 20 | 20 | 13 | 29 |
| Mann-Kendall S | 75 | -17 | 85 | -28 | -4 | 28 | 78 | 0 | -13 | 8 | 0 | -24 | 0 |
| p-Level | 0.015 | 0.608 | 0.005 | 0.142 | 0.924 | 0.386 | 0.012 | 1.000 | 0.518 | 0.822 | 1.000 | 0.164 | 1.000 |
| Trend | | | + | | | | | | | | | | |
| **MW-1004P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 0 | 0 | 1 | 4 | 0 | 0 | 1 | 0 | -1 | 0 | 0 | 1 | 0 |
| p-Level | 1.000 | 1.000 | 1.000 | 0.484 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 14 | 20 | 20 | 20 | 20 | 14 | 20 | 20 | 13 | 29 |
| Mann-Kendall S | 68 | -8 | 34 | 7 | -37 | 0 | 26 | 0 | 14 | 7 | 0 | -3 | 8 |
| p-Level | 0.028 | 0.822 | 0.288 | 0.748 | 0.247 | 1.000 | 0.422 | 1.000 | 0.484 | 0.847 | 1.000 | 0.905 | 0.896 |
| Trend | | | | | | | | | | | | | |
| **MW-1005** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 8 | -1 | 6 | 4 | 1 | -4 | 6 | 0 | 0 | 0 | 0 | 8 | 4 |
| p-Level | 0.084 | 1.000 | 0.234 | 0.484 | 1.000 | 0.484 | 0.234 | 1.000 | 1.000 | 1.000 | 1.000 | 0.084 | 0.484 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 17 | 13 | 18 | 18 | 17 | 18 | 13 | 18 | 18 | 12 | 28 |
| Mann-Kendall S | 48 | 23 | 24 | 30 | -36 | 13 | 29 | 0 | 36 | 0 | -5 | 43 | 27 |
| p-Level | 0.075 | 0.410 | 0.348 | 0.076 | 0.188 | 0.654 | 0.253 | 1.000 | 0.030 | 1.000 | 0.882 | 0.003 | 0.610 |
| Trend | | | | | | | | | | | | + | |
| **MW-1005S** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -7 | 0 | -4 | 2 | 4 | -4 | -6 | 0 | -4 | 0 | 0 | -9 | 0 |
| p-Level | 0.159 | 1.000 | 0.484 | 0.816 | 0.484 | 0.484 | 0.234 | 1.000 | 0.484 | 1.000 | 1.000 | 0.050 | 1.000 |
| Trend | | | | | | | | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 17 | 13 | 18 | 18 | 17 | 18 | 13 | 18 | 18 | 12 | 28 |
| Mann-Kendall S | 42 | 0 | 19 | 16 | 0 | 9 | 33 | 0 | 6 | -11 | 1 | -24 | 0 |
| p-Level | 0.122 | 1.000 | 0.465 | 0.368 | 1.000 | 0.766 | 0.190 | 1.000 | 0.766 | 0.708 | 1.000 | 0.116 | 1.000 |
| Trend | | | | | | | | | | | | | |

**Trend Analysis Results - Groundwater (Annual Parameters)**
**Year Ending 2016**

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1005P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -3 | -4 | -1 | -4 | 0 | -3 | 5 | 0 | 0 | 0 | 0 | -4 | 0 |
| p-Level | 0.650 | 0.484 | 1.000 | 0.484 | 1.000 | 0.650 | 0.359 | 1.000 | 1.000 | 1.000 | 1.000 | 0.484 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 18 | 13 | 18 | 18 | 18 | 18 | 13 | 18 | 18 | 12 | 28 |
| Mann-Kendall S | 12 | -20 | -4 | 37 | -13 | 36 | 23 | 0 | 17 | 1 | 0 | 23 | 5 |
| p-Level | 0.681 | 0.477 | 0.911 | 0.026 | 0.654 | 0.188 | 0.410 | 1.000 | 0.337 | 1.000 | 1.000 | 0.134 | 0.938 |
| Trend | | | | | | | | | | | | | |
| **MW-1015A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -6 | -4 | -5 | -7 | 4 | -4 | -4 | 0 | -8 | -4 | 0 | -3 | 0 |
| p-Level | 0.234 | 0.484 | 0.359 | 0.159 | 0.484 | 0.484 | 0.484 | 1.000 | 0.084 | 0.484 | 1.000 | 0.650 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 27 | 27 | 17 | 12 | 27 | 27 | 17 | 27 | 12 | 27 | 27 | 11 | 32 |
| Mann-Kendall S | -295 | 27 | 9 | 21 | 26 | 39 | 30 | 0 | -26 | 18 | -18 | 11 | 0 |
| p-Level | 0.000 | 0.592 | 0.746 | 0.174 | 0.606 | 0.432 | 0.236 | 1.000 | 0.086 | 0.726 | 0.726 | 0.446 | 1.000 |
| Trend | - | | | | | | | | | | | | |
| **MW-1015B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 0 | 0 | 4 | 8 | 4 | 0 | 3 | 0 | -2 | 0 | 0 | 3 | 0 |
| p-Level | 1.000 | 1.000 | 0.484 | 0.084 | 0.484 | 1.000 | 0.650 | 1.000 | 0.816 | 1.000 | 1.000 | 0.650 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 27 | 27 | 17 | 12 | 27 | 27 | 17 | 27 | 12 | 27 | 27 | 11 | 32 |
| Mann-Kendall S | -24 | 0 | 64 | 7 | 33 | 27 | 86 | 0 | 19 | 10 | 0 | 32 | 0 |
| p-Level | 0.635 | 1.000 | 0.008 | 0.688 | 0.508 | 0.592 | 0.000 | 1.000 | 0.223 | 0.852 | 1.000 | 0.013 | 1.000 |
| Trend | | | + | | | | + | | | | | | |
| **MW-1013** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -3 | -4 | -3 | -4 | 6 | -7 | -3 | 0 | -5 | 4 | -2 | -7 | 2 |
| p-Level | 0.650 | 0.484 | 0.650 | 0.484 | 0.234 | 0.159 | 0.650 | 1.000 | 0.359 | 0.484 | 0.816 | 0.159 | 0.816 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 12 | 12 | 10 | 12 |
| Mann-Kendall S | -3 | 5 | 15 | -44 | 27 | -19 | 24 | 0 | 7 | 5 | 7 | -11 | 9 |
| p-Level | 0.893 | 0.789 | 0.345 | 0.002 | 0.074 | 0.223 | 0.116 | 1.000 | 0.648 | 0.789 | 0.688 | 0.380 | 0.592 |
| Trend | | | | - | | | | | | | | | |
| **MW-1013A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -2 | 0 | 2 | -1 | 2 | -4 | 0 | 0 | -6 | 0 | -2 | 2 | 0 |
| p-Level | 0.816 | 1.000 | 0.816 | 1.000 | 0.816 | 0.484 | 1.000 | 1.000 | 0.234 | 1.000 | 0.816 | 0.816 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 12 | 12 | 10 | 12 |
| Mann-Kendall S | -14 | 0 | 4 | -1 | 9 | -9 | 6 | 0 | 12 | 0 | -1 | -7 | -11 |
| p-Level | 0.380 | 1.000 | 0.840 | 0.973 | 0.592 | 0.592 | 0.738 | 1.000 | 0.402 | 1.000 | 0.973 | 0.600 | 0.503 |
| Trend | | | | | | | | | | | | | |

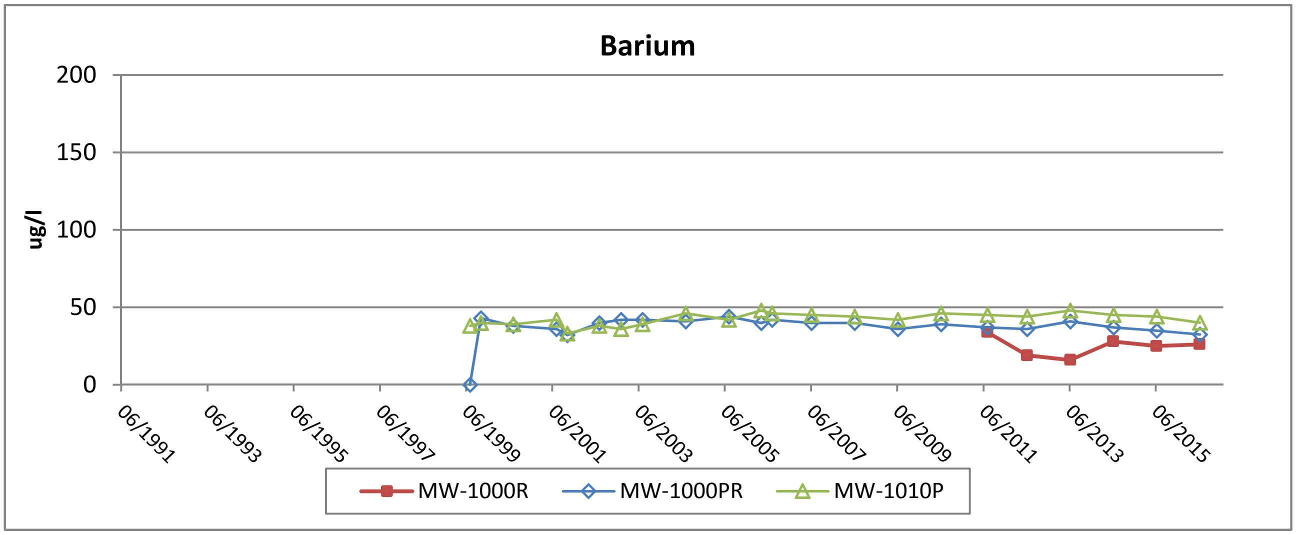
## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2016

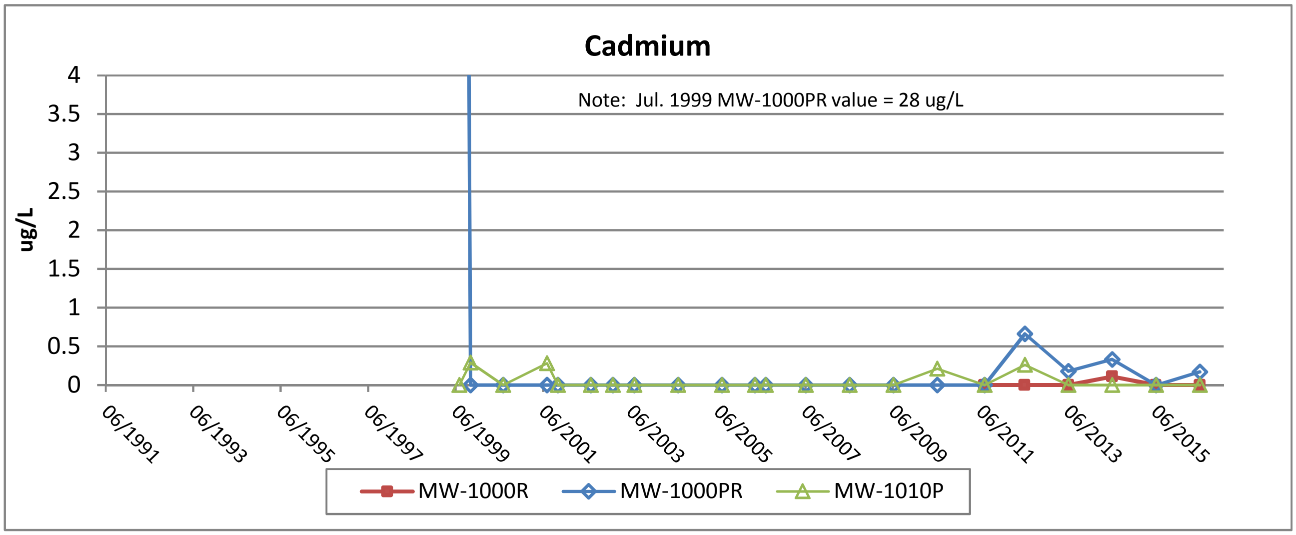
| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1013B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -1 | -3 | 2 | -6 | 3 | -5 | -5 | 2 | -8 | 4 | -2 | -9 | -5 |
| p-Level | 1.000 | 0.650 | 0.816 | 0.234 | 0.650 | 0.359 | 0.359 | 0.816 | 0.084 | 0.484 | 0.816 | 0.050 | 0.359 |
| Trend | | | | | | | | | | | | - | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 25 | 19 | 24 | 24 | 25 | 24 | 17 | 24 | 24 | 16 | 32 |
| Mann-Kendall S | 102 | 43 | -29 | 37 | -76 | 44 | -83 | 21 | -21 | -1 | -21 | -44 | 277 |
| p-Level | 0.012 | 0.301 | 0.517 | 0.210 | 0.062 | 0.290 | 0.055 | 0.623 | 0.416 | 0.990 | 0.623 | 0.052 | 0.000 |
| Trend | | | | | | | | | | | | | + |
| **MW-1013C** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -3 | 0 | 1 | -2 | 0 | -3 | -7 | 0 | -8 | 0 | -2 | -7 | -2 |
| p-Level | 0.650 | 1.000 | 1.000 | 0.816 | 1.000 | 0.650 | 0.159 | 1.000 | 0.084 | 1.000 | 0.816 | 0.159 | 0.816 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 25 | 19 | 24 | 24 | 25 | 24 | 17 | 24 | 24 | 16 | 32 |
| Mann-Kendall S | 104 | -13 | -16 | 95 | -21 | 69 | -99 | 0 | 8 | -21 | -22 | -51 | -235 |
| p-Level | 0.010 | 0.769 | 0.728 | 0.000 | 0.623 | 0.092 | 0.021 | 1.000 | 0.776 | 0.623 | 0.606 | 0.023 | 0.000 |
| Trend | + | | | + | | | | | | | | | - |
| **MW-1014** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -10 | -1 | -3 | 1 | 4 | -4 | -2 | 0 | -4 | 0 | -2 | -3 | 0 |
| p-Level | 0.016 | 1.000 | 0.650 | 1.000 | 0.484 | 0.484 | 0.816 | 1.000 | 0.484 | 1.000 | 0.816 | 0.650 | 1.000 |
| Trend | - | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 12 | 12 | 10 | 12 |
| Mann-Kendall S | 7 | 6 | -22 | 42 | 11 | 3 | -13 | 0 | -21 | -1 | -1 | -18 | -6 |
| p-Level | 0.688 | 0.738 | 0.152 | 0.004 | 0.503 | 0.893 | 0.420 | 1.000 | 0.120 | 0.973 | 0.973 | 0.132 | 0.738 |
| Trend | | | | + | | | | | | | | | |
| **MW-1014A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -1 | -4 | 6 | 4 | 5 | -6 | -3 | 0 | -6 | 4 | -2 | -6 | 2 |
| p-Level | 1.000 | 0.484 | 0.234 | 0.484 | 0.359 | 0.234 | 0.650 | 1.000 | 0.234 | 0.484 | 0.816 | 0.234 | 0.816 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 22 | 16 | 21 | 21 | 22 | 21 | 14 | 21 | 21 | 13 | 29 |
| Mann-Kendall S | 7 | 12 | -82 | -13 | 5 | 20 | -41 | 0 | -13 | 19 | -3 | 13 | 110 |
| p-Level | 0.858 | 0.742 | 0.021 | 0.595 | 0.905 | 0.570 | 0.262 | 1.000 | 0.518 | 0.591 | 0.952 | 0.473 | 0.040 |
| Trend | | | | | | | | | | | | | |
| **MW-1014B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | -1 | -5 | -2 | 0 | 5 | -3 | -5 | 0 | -7 | 4 | -2 | -5 | -2 |
| p-Level | 1.000 | 0.359 | 0.816 | 1.000 | 0.359 | 0.650 | 0.359 | 1.000 | 0.159 | 0.484 | 0.816 | 0.359 | 0.816 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 25 | 18 | 24 | 24 | 25 | 24 | 17 | 24 | 24 | 16 | 32 |
| Mann-Kendall S | 102 | -157 | -147 | 95 | 6 | 75 | -162 | 0 | -26 | -40 | 5 | -54 | -321 |
| p-Level | 0.012 | 0.000 | 0.000 | 0.000 | 0.902 | 0.066 | 0.000 | 1.000 | 0.308 | 0.338 | 0.922 | 0.016 | 0.000 |
| Trend | | - | - | + | | | - | | | | | | - |

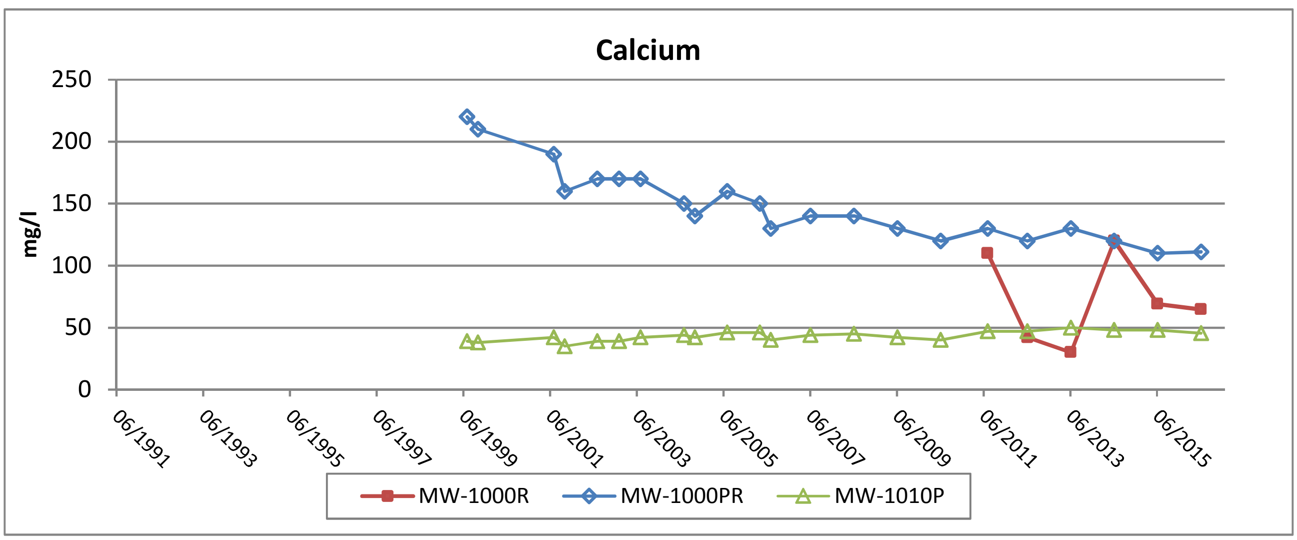
## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2016

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1014C** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Mann-Kendall S | 2 | -4 | -2 | 5 | 0 | 0 | -2 | 0 | -9 | 0 | -2 | -3 | -7 |
| p-Level | 0.816 | 0.484 | 0.816 | 0.359 | 1.000 | 1.000 | 0.816 | 1.000 | 0.050 | 1.000 | 0.816 | 0.650 | 0.159 |
| Trend | | | | | | | | | - | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 25 | 19 | 24 | 24 | 25 | 24 | 17 | 24 | 24 | 16 | 32 |
| Mann-Kendall S | 164 | 19 | -245 | 120 | -27 | 9 | -244 | 19 | -44 | -41 | 5 | -21 | -477 |
| p-Level | 0.000 | 0.658 | 0.000 | 0.000 | 0.524 | 0.845 | 0.000 | 0.658 | 0.076 | 0.325 | 0.922 | 0.374 | 0.000 |
| Trend | + | | - | + | | | - | | | | | | - |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
Long term trend tests performed at a Type I (two-tailed) error rate of 0.01.
5-Year Trend tests performed at a Type I (two-tailed) error rate of 0.05.
N/A - No trend test performed due to insufficient data.

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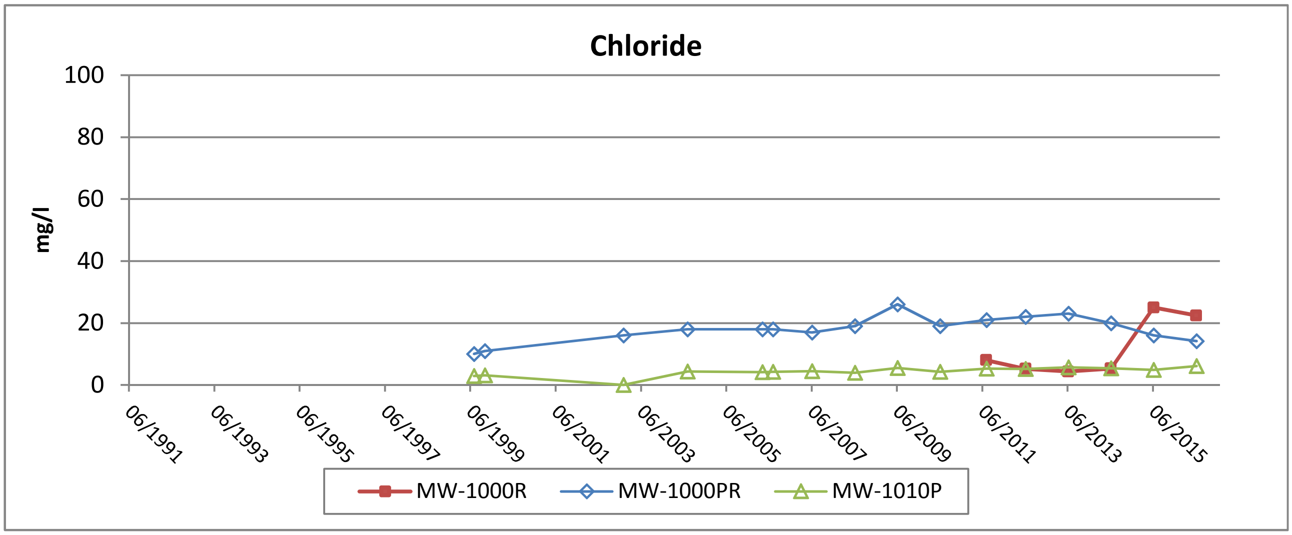
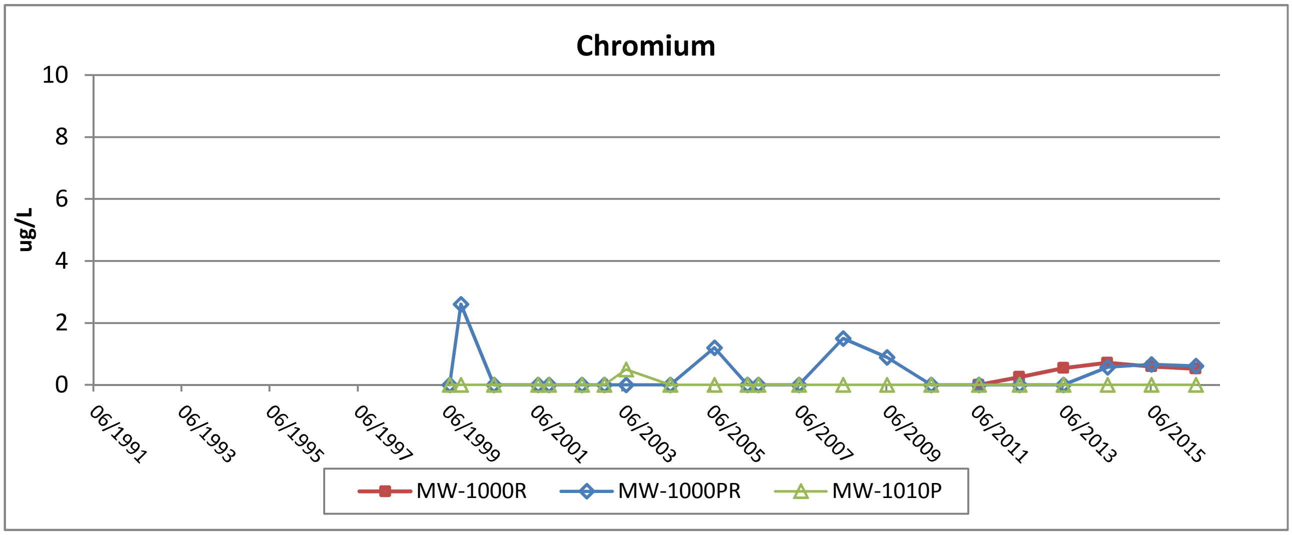
| FLAMBEAU MINING COMPANY | | |
|---|---|---|
| Figure B-8a<br>Groundwater Trend Graphs - Annual Results<br>MW-1000R/MW-1000PR/MW-1010P | | |
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



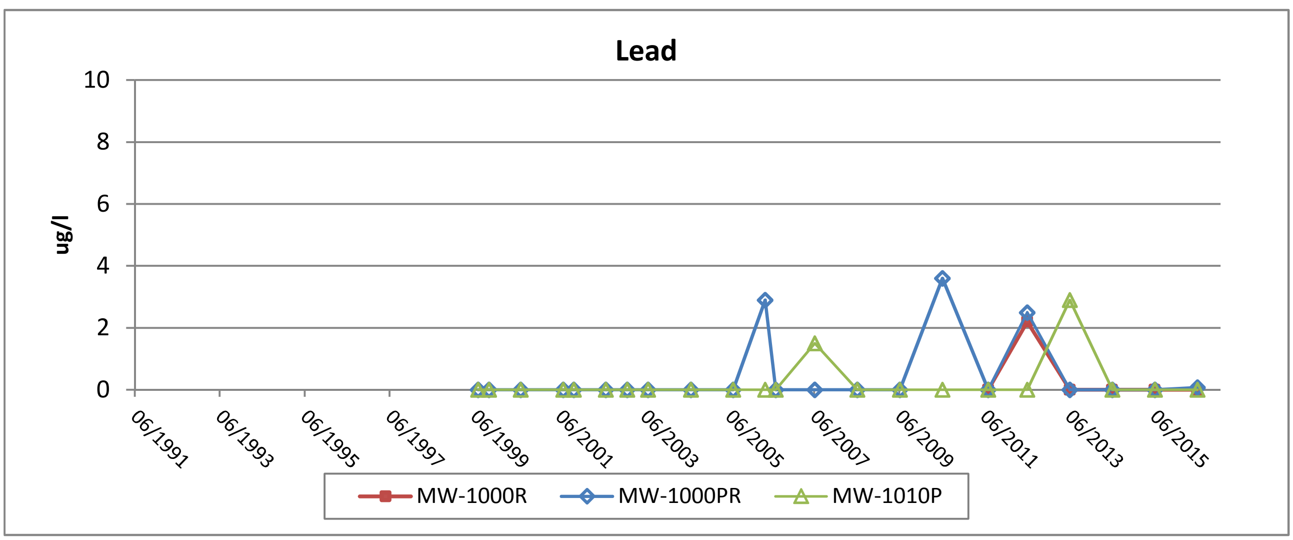




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Figure B-8b

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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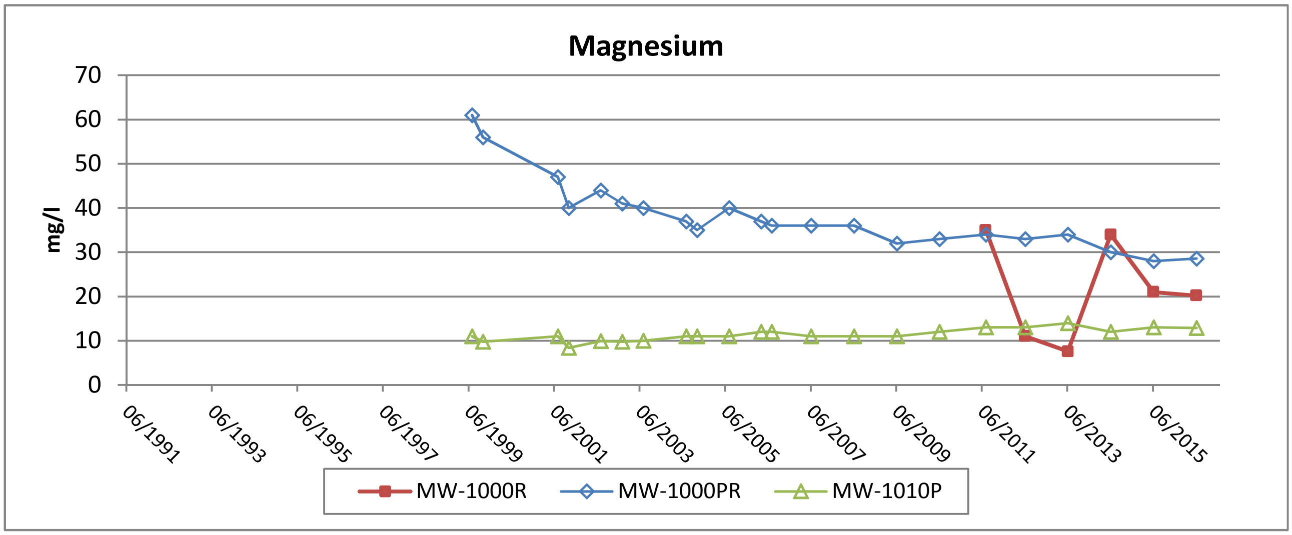


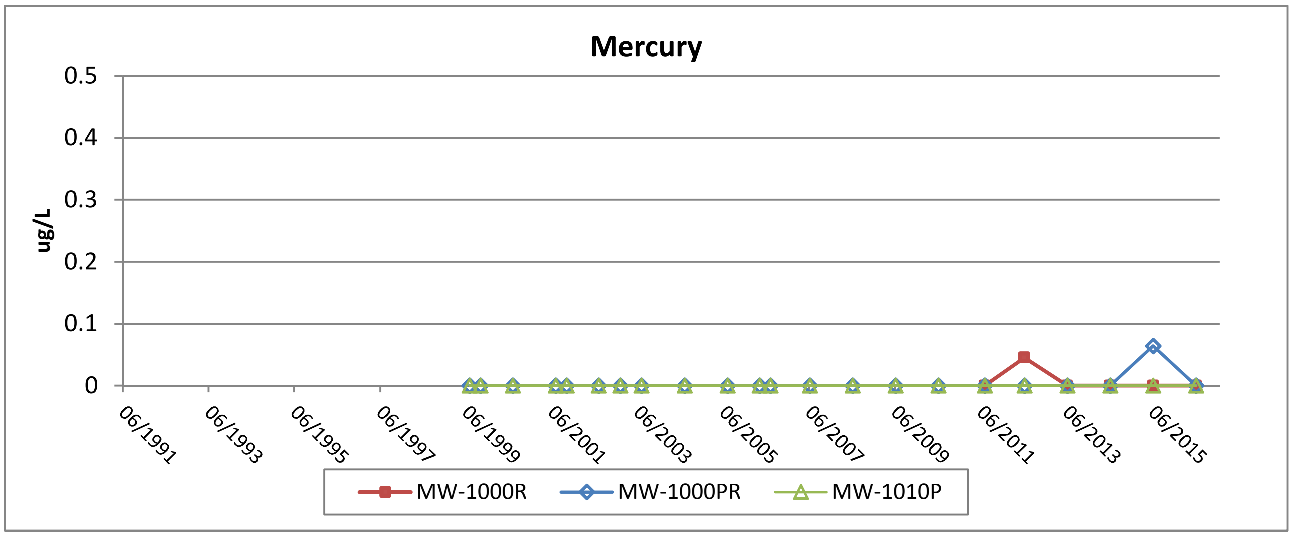


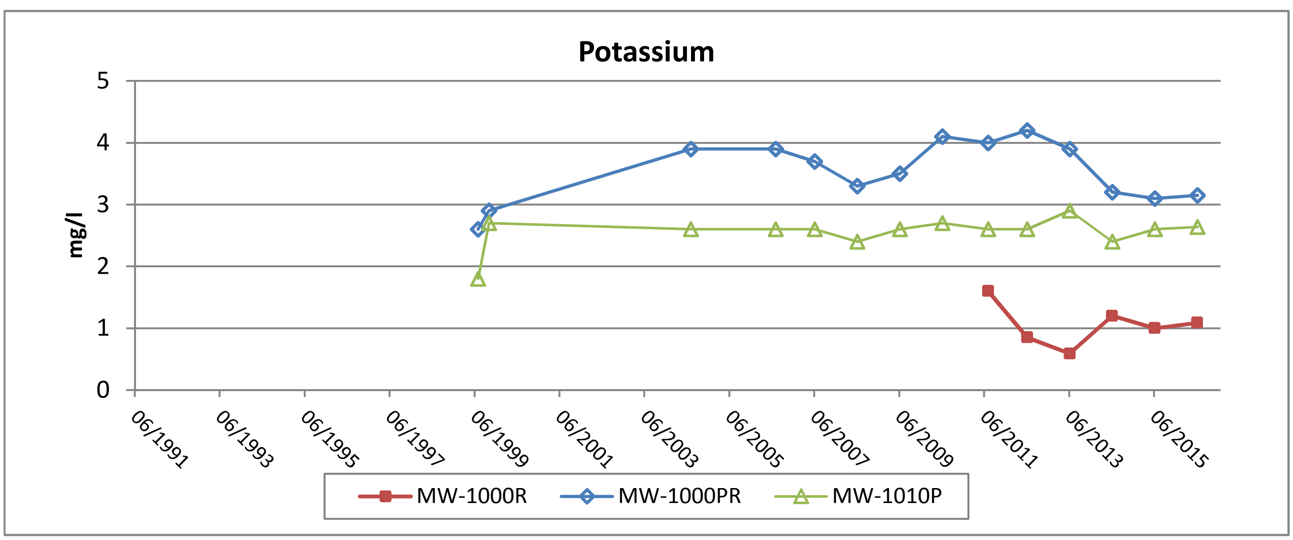


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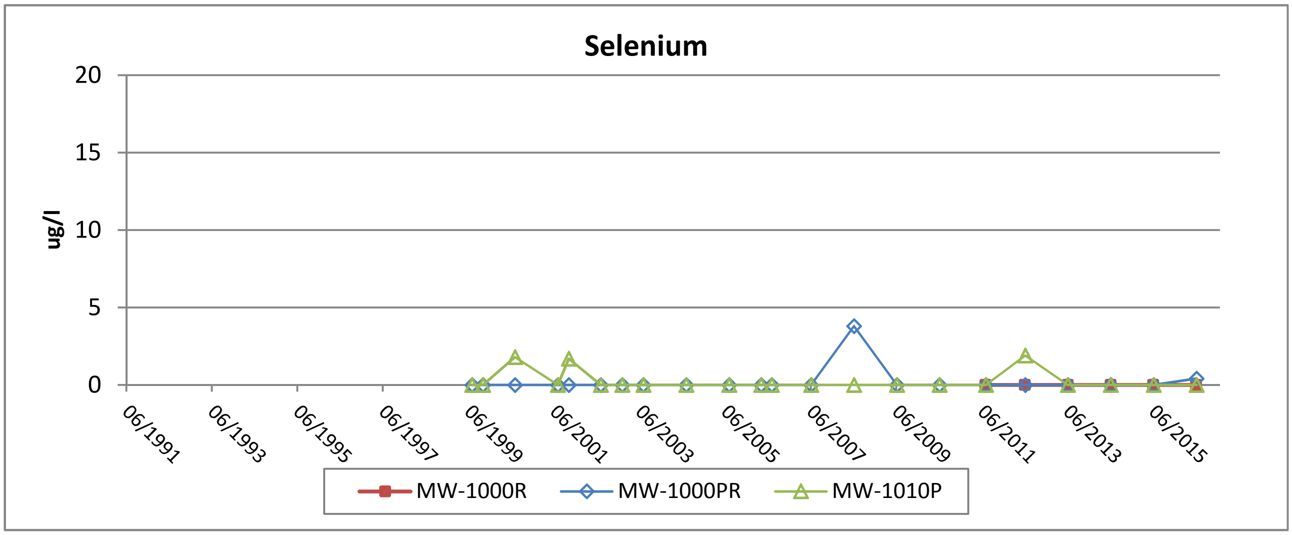
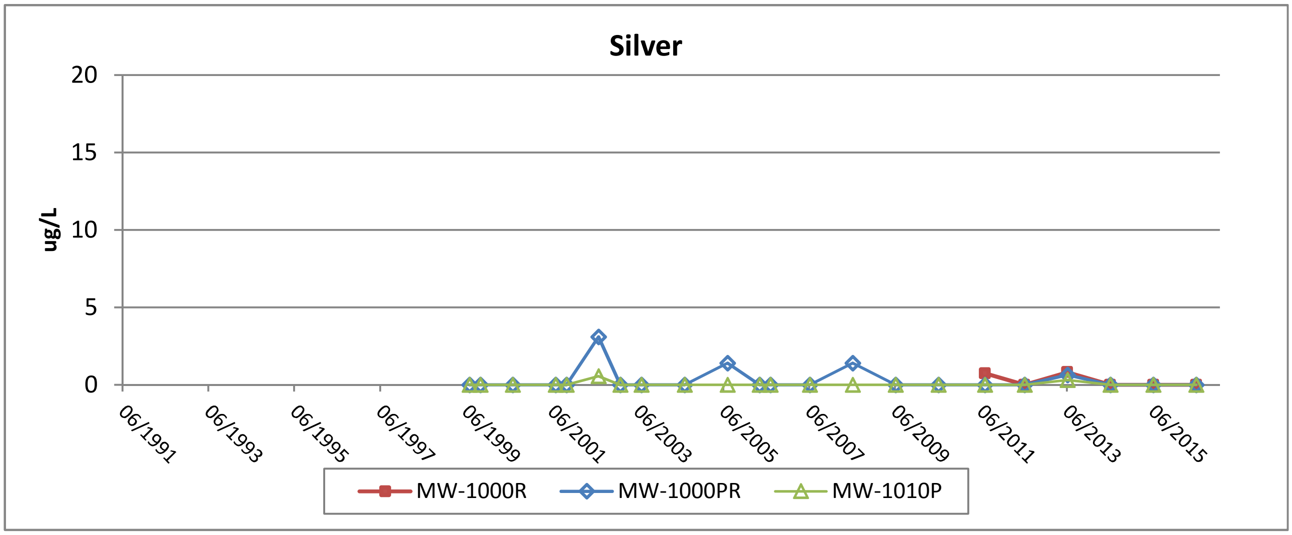
Figure B-8c

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



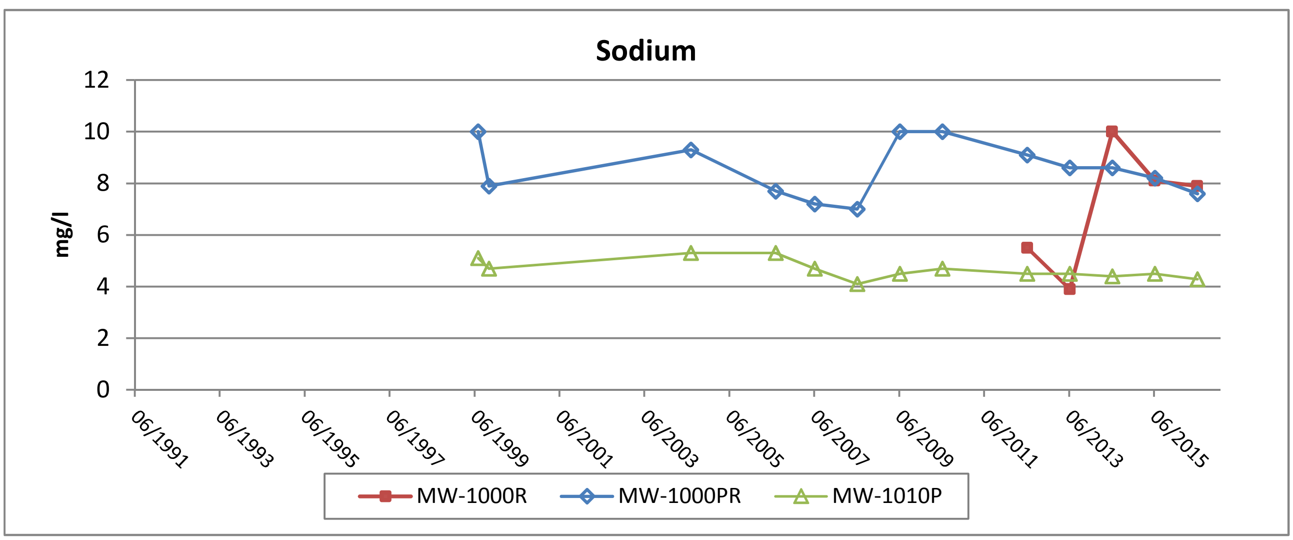




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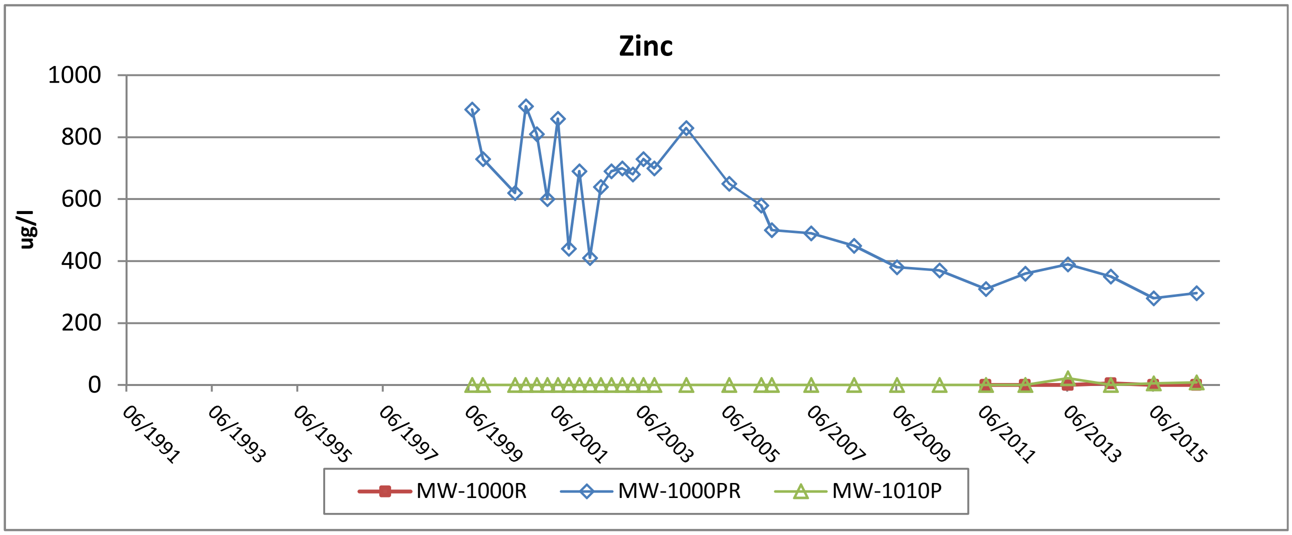
Figure B-8d

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |




| | |
|---|---|
| FLAMBEAU MINING COMPANY | |
| Figure B-8e<br>Groundwater Trend Graphs - Annual Results<br>MW-1000R/MW-1000PR/MW-1010P | |
| Scale: NA | Date: January 2017 |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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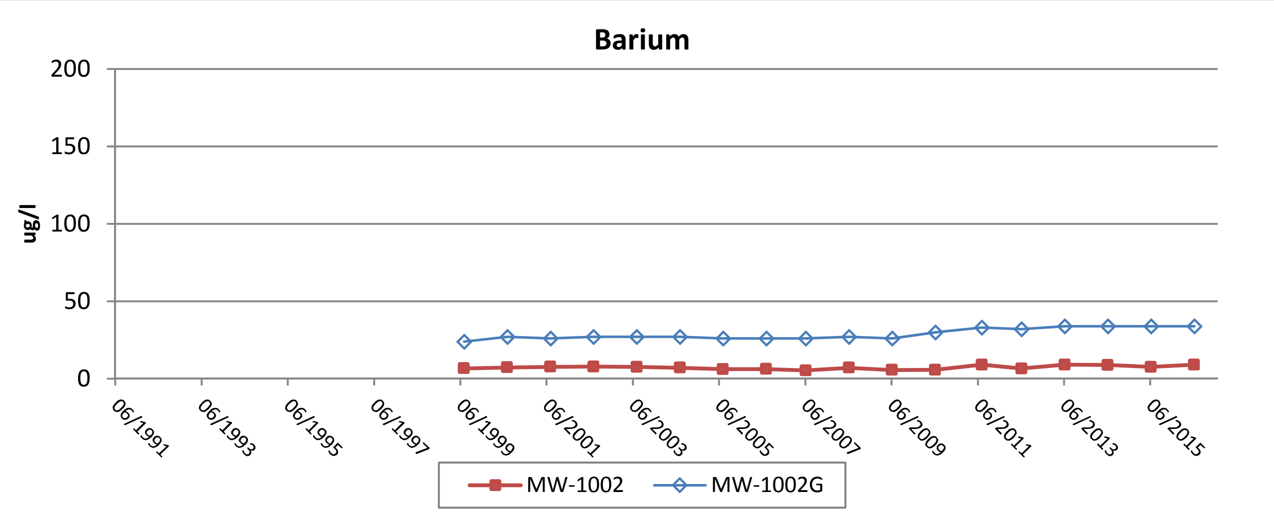


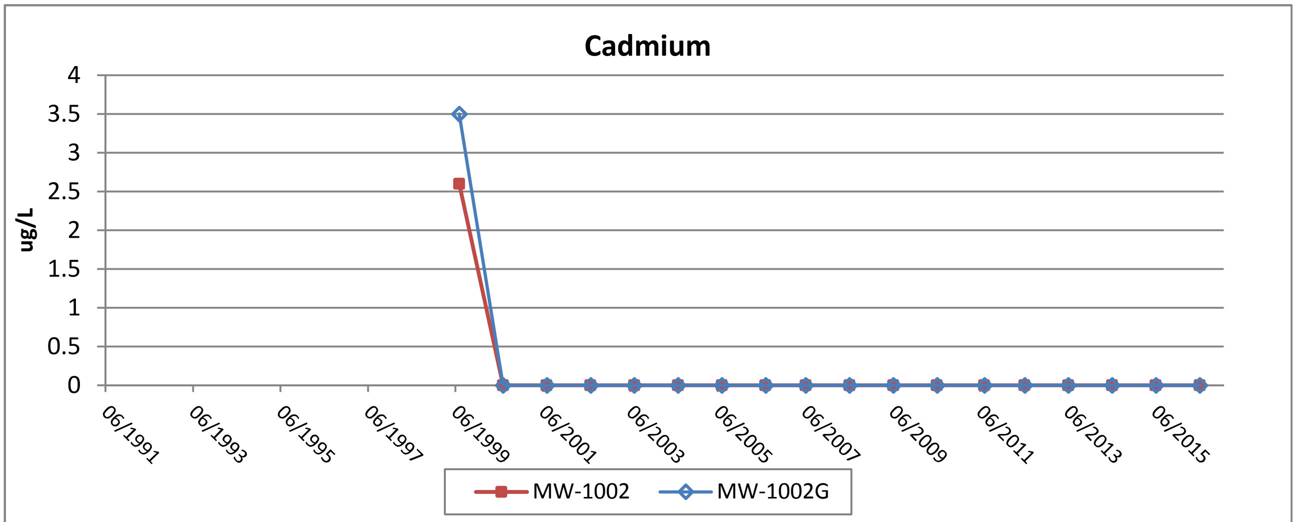


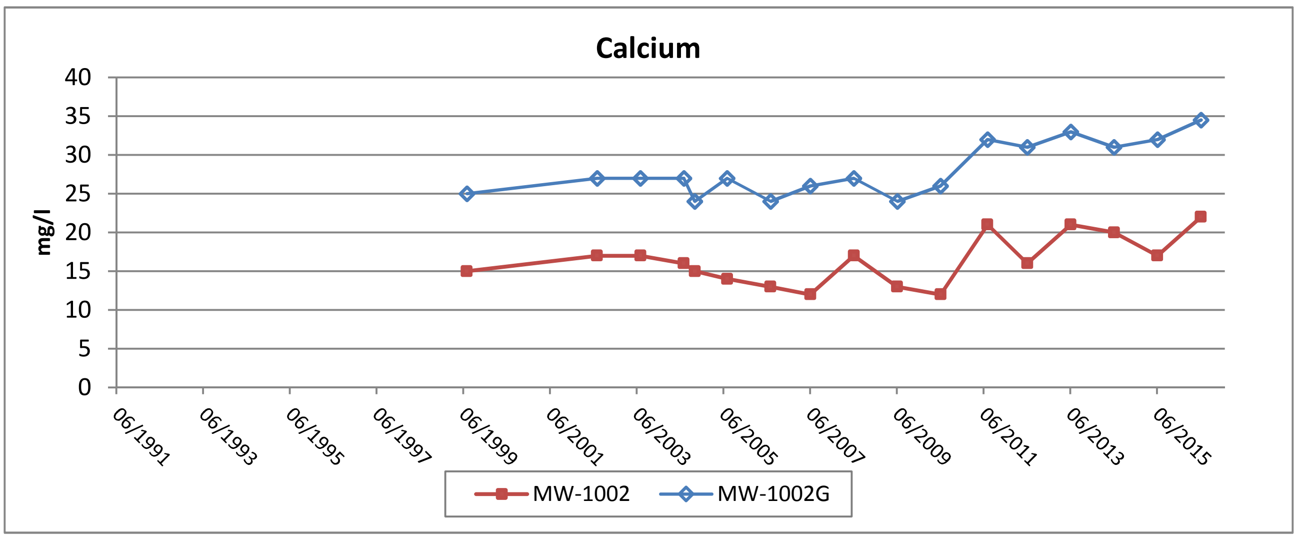


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Figure B-9a

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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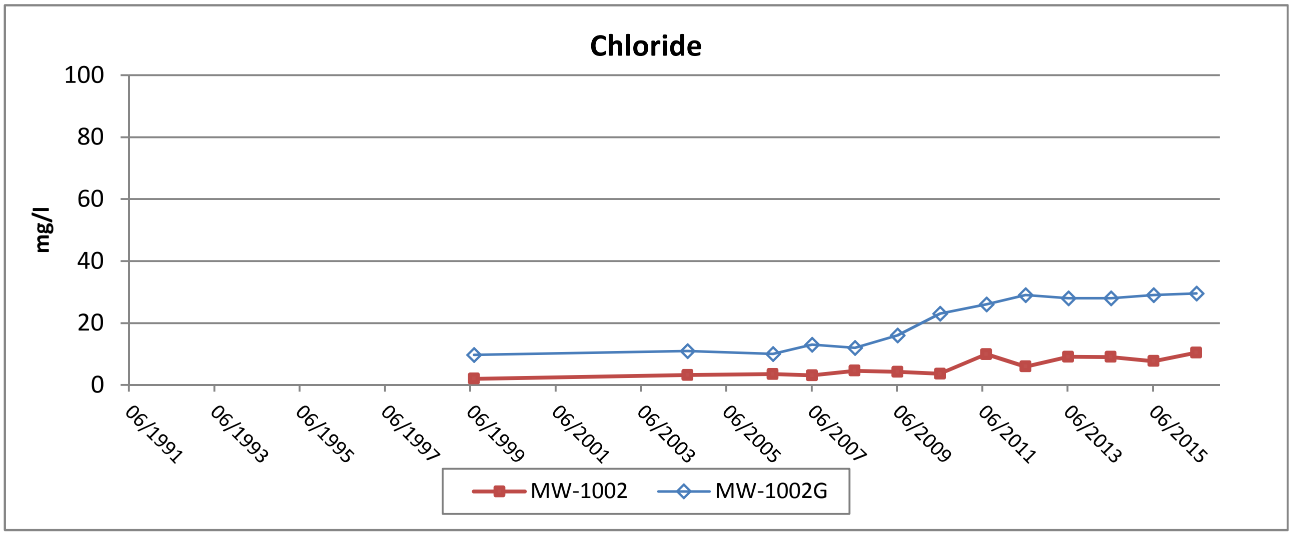


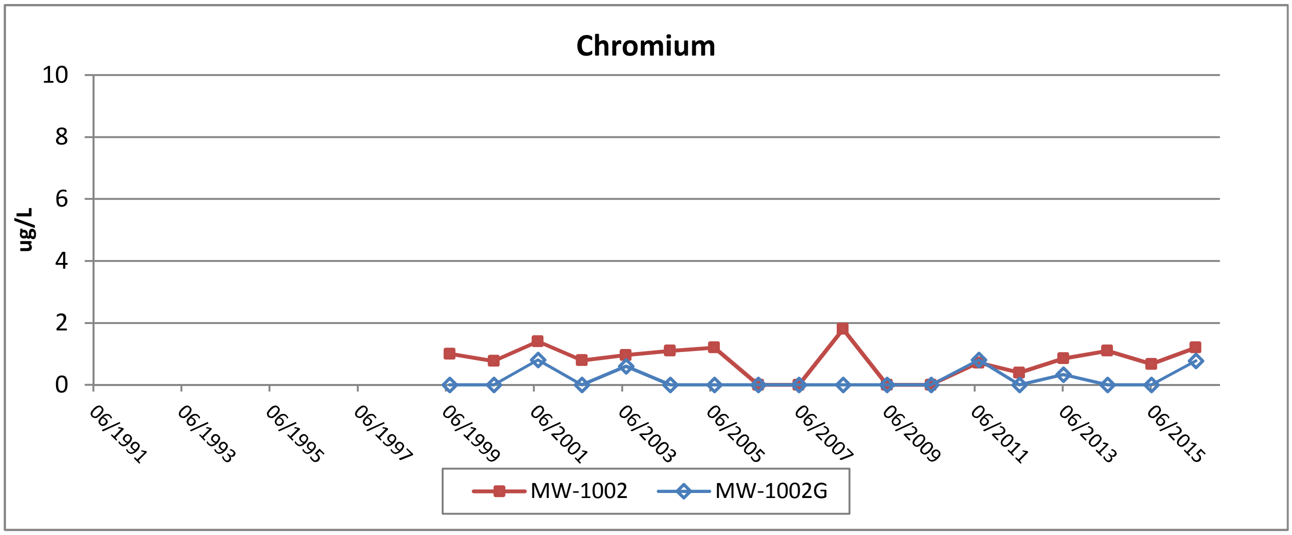


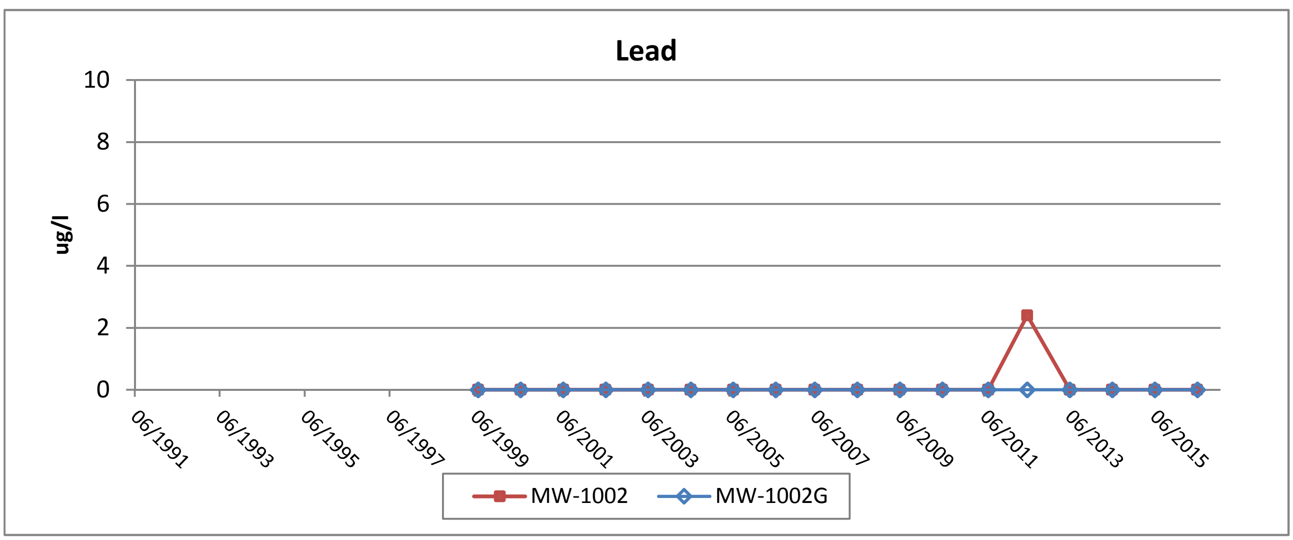


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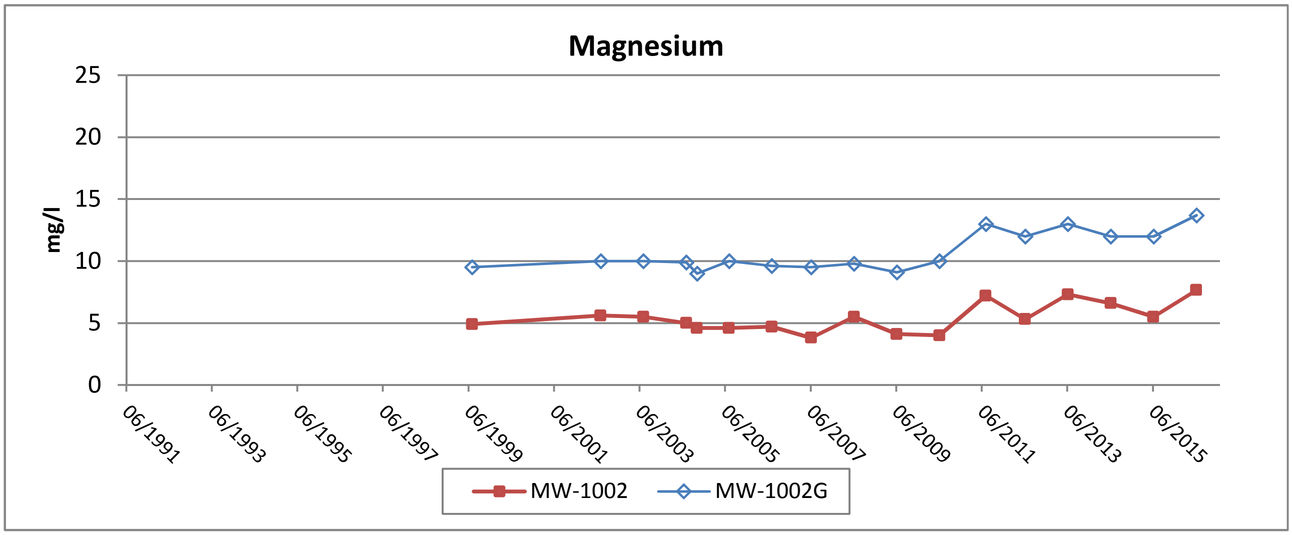
Figure B-9b

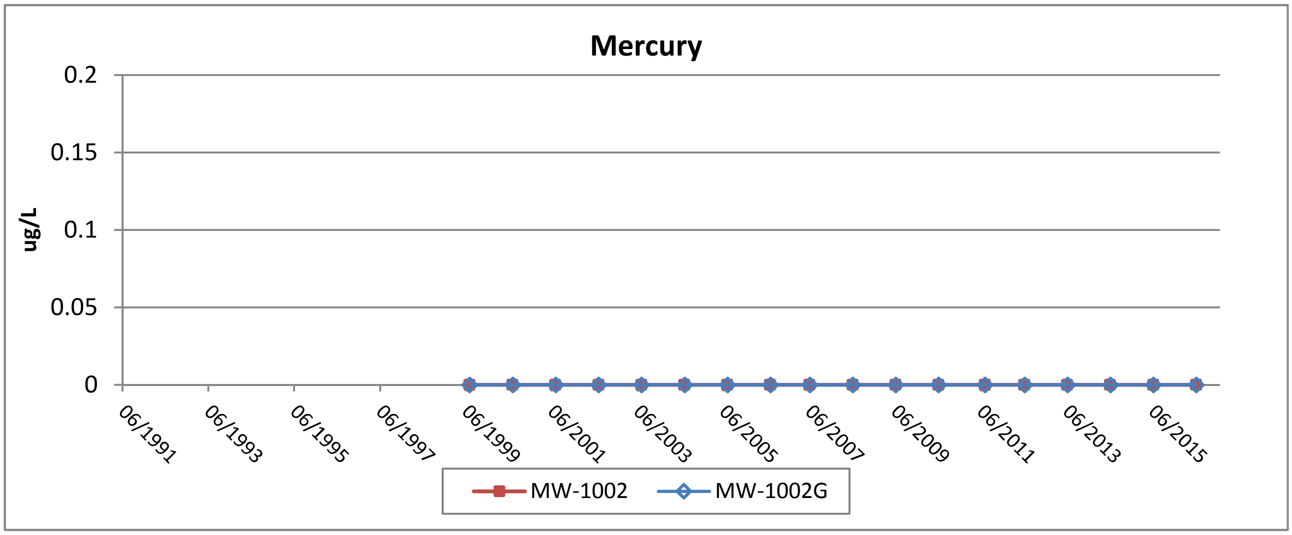
Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



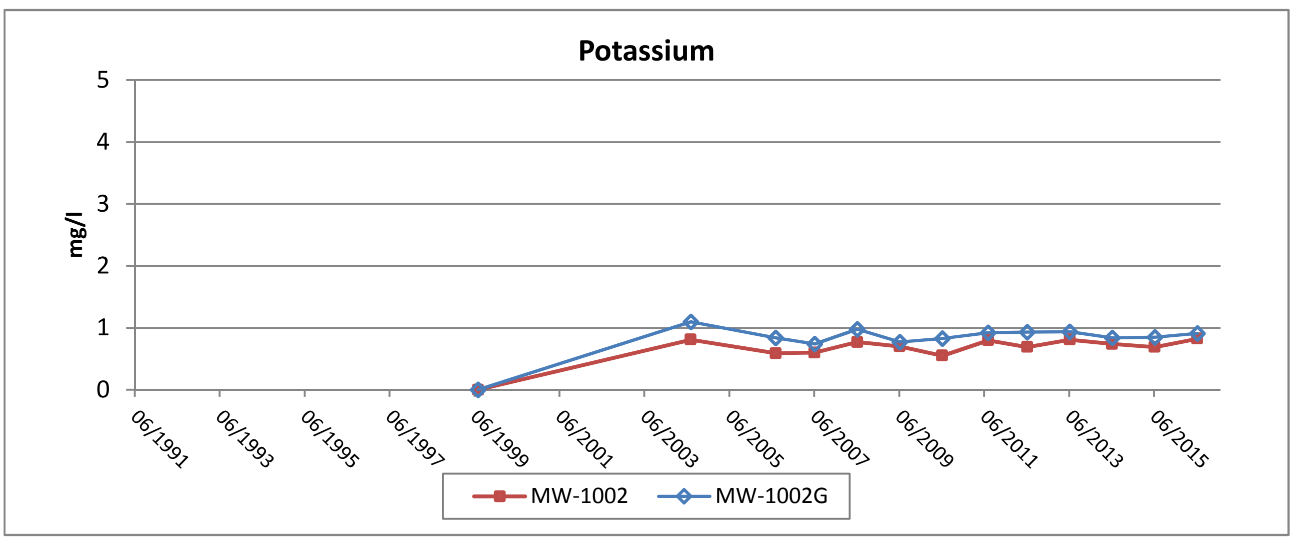




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Figure B-9c

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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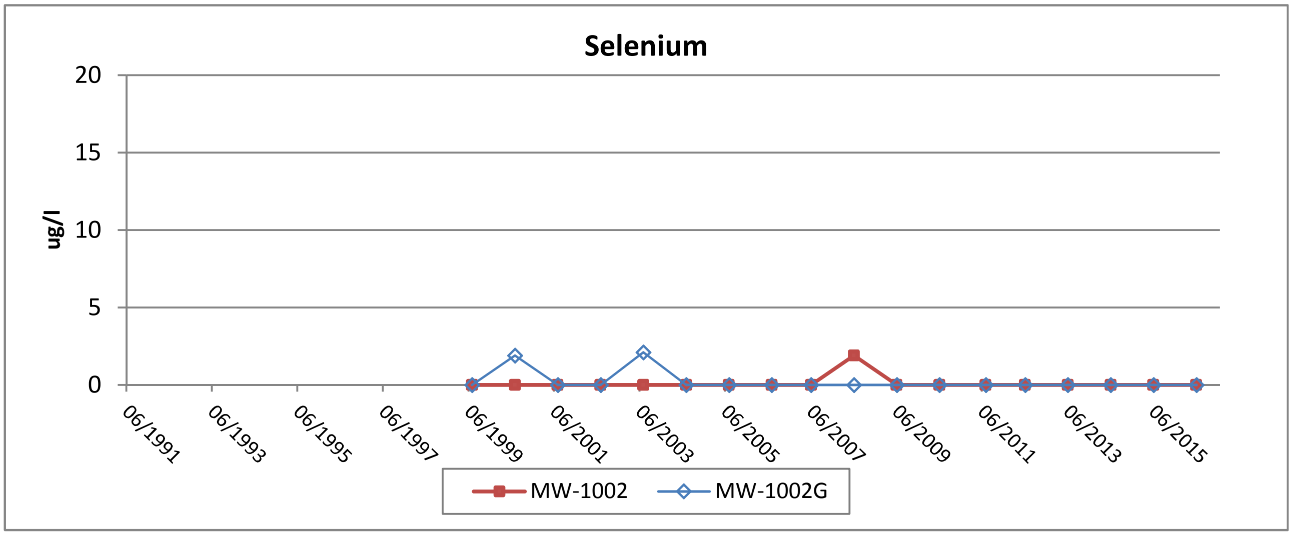


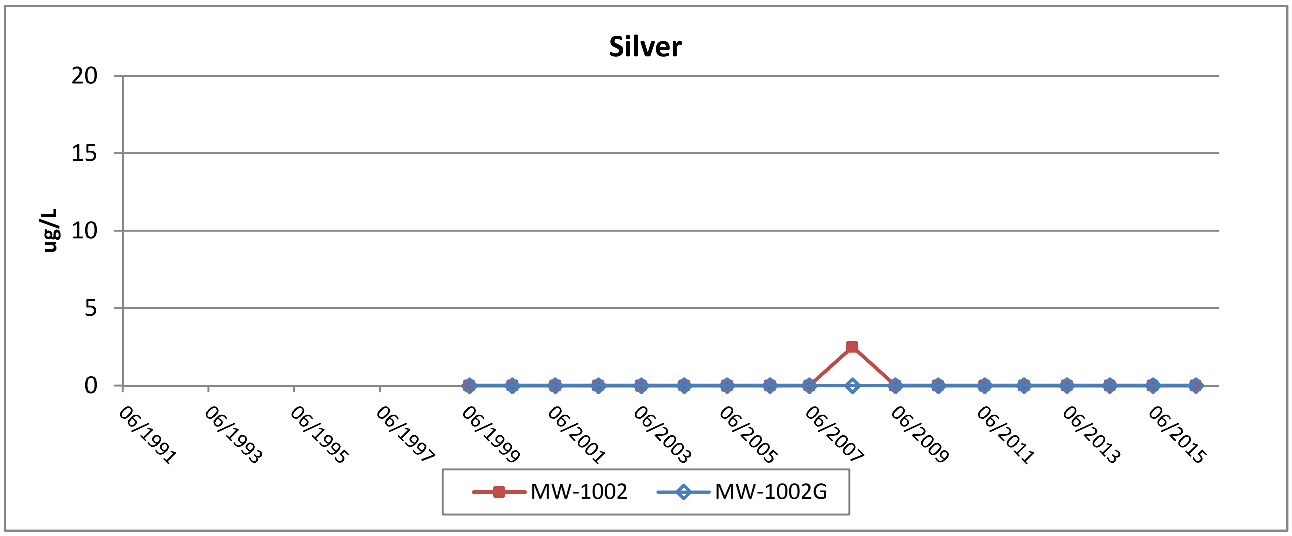


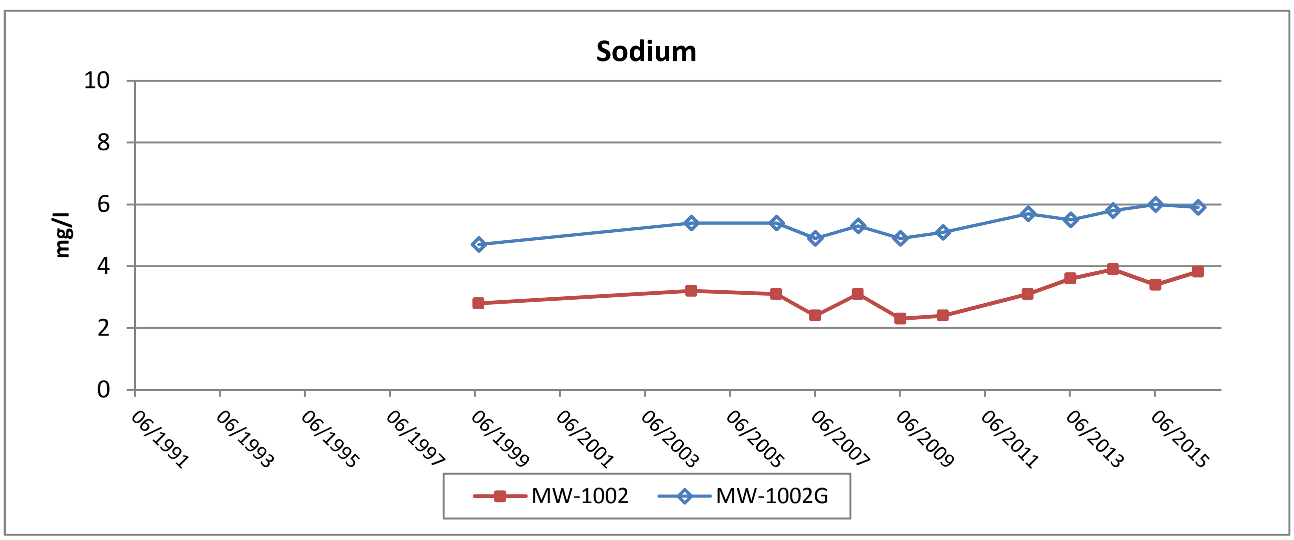


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Figure B-9d

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

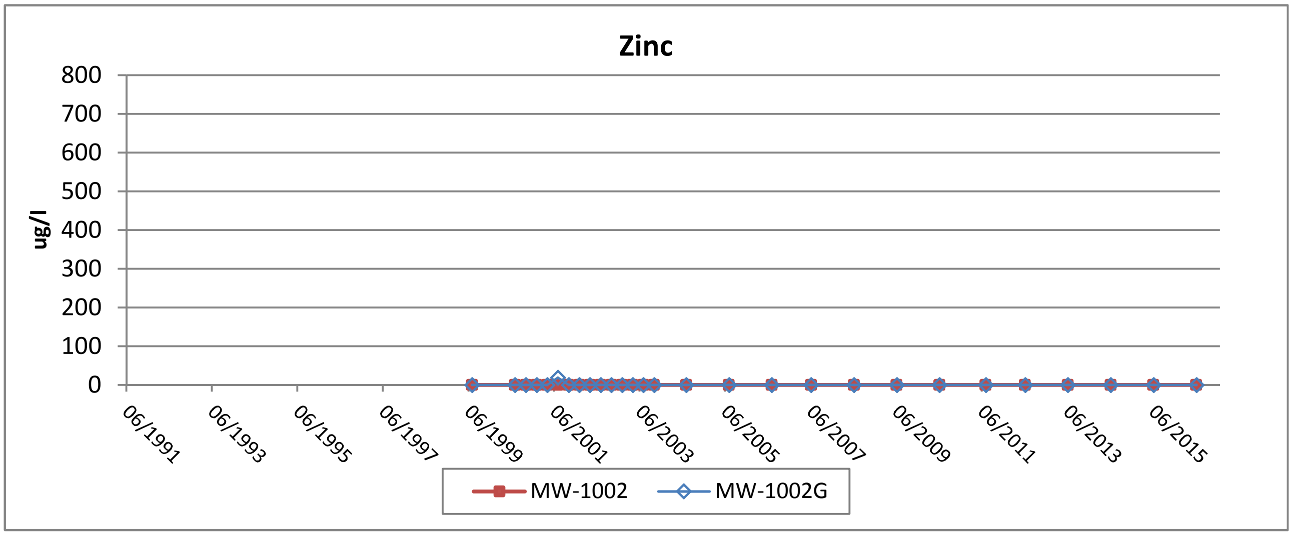


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Figure B-9e

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| | | |
|---|---|---|
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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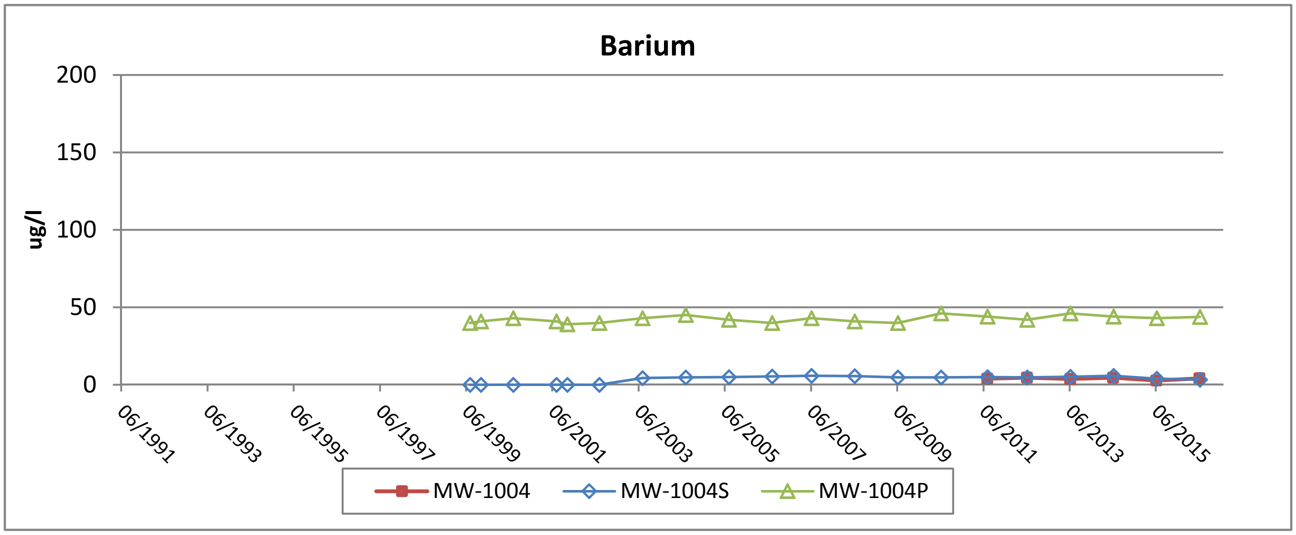


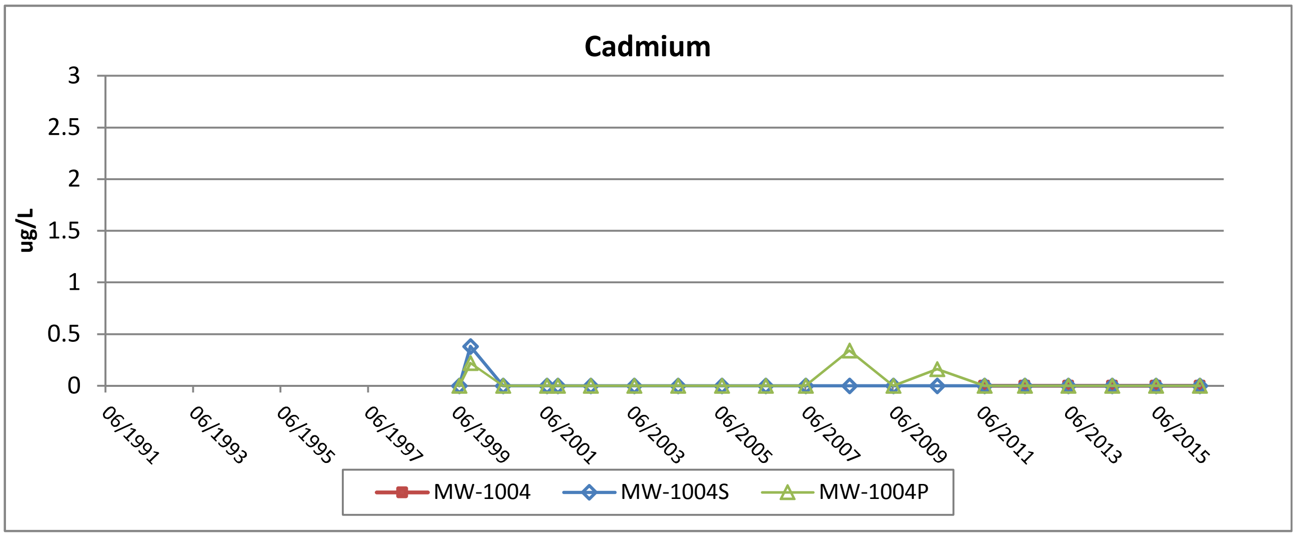


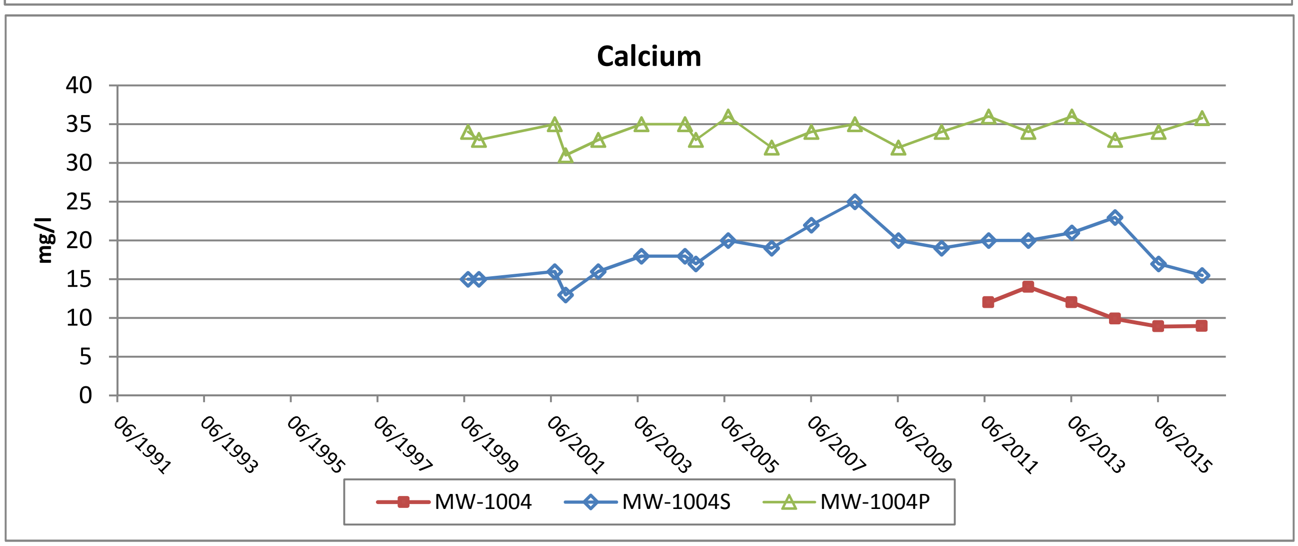


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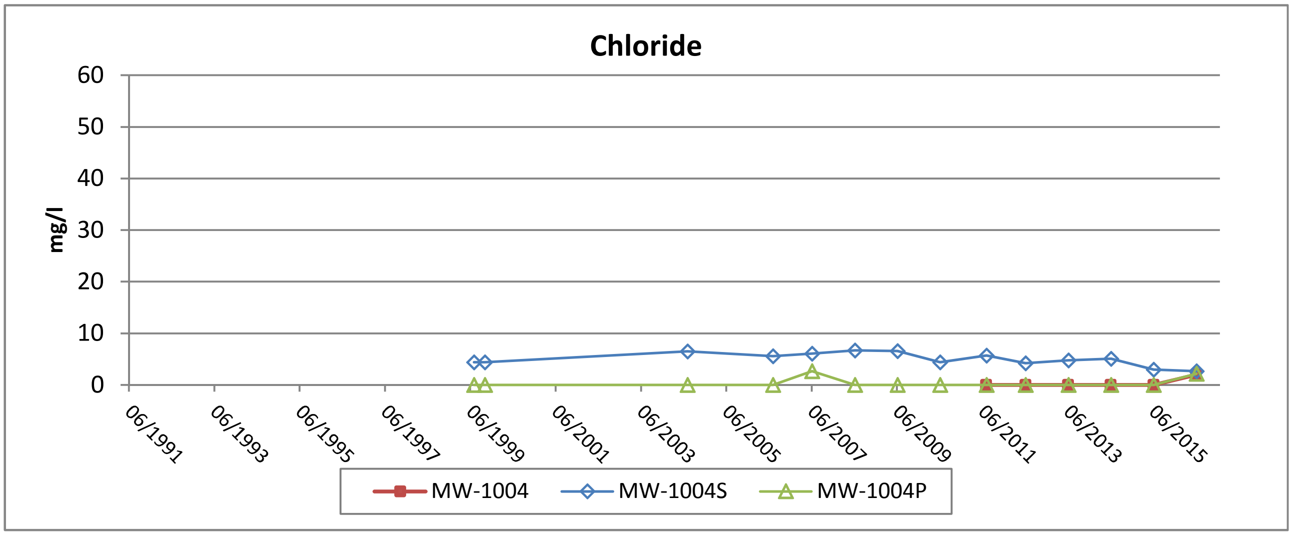
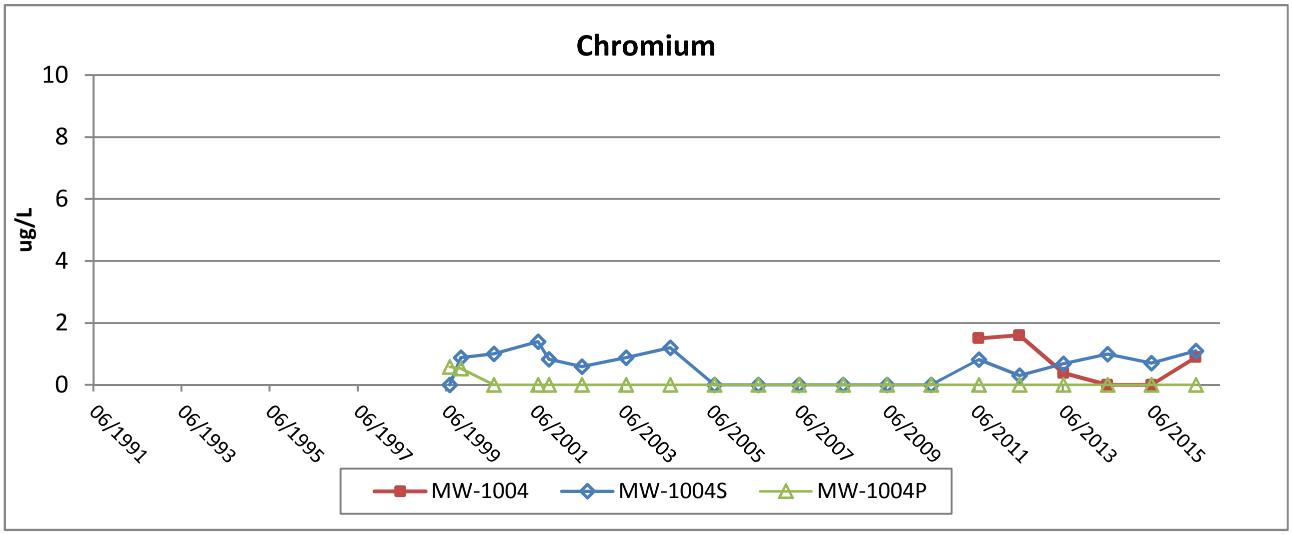
Figure B-10a

Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



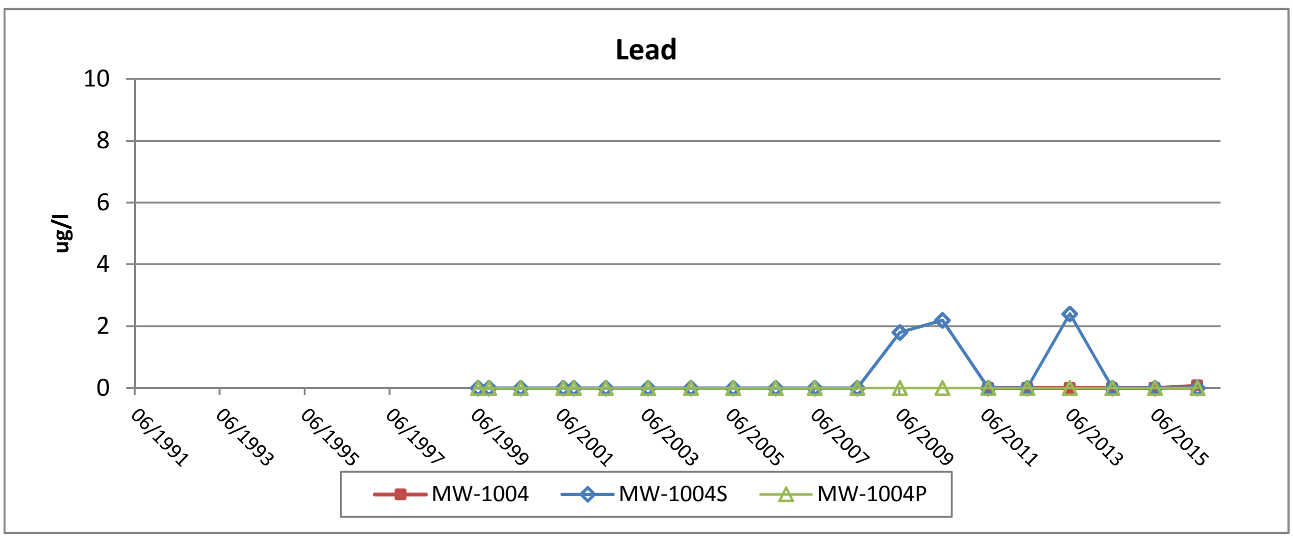




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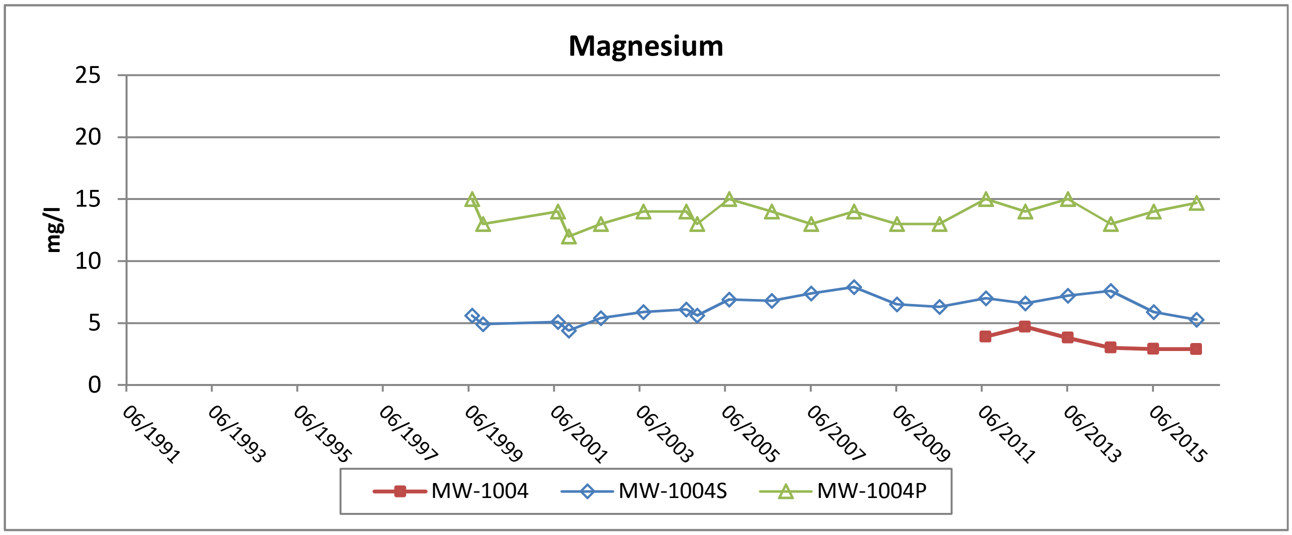
Figure B-10b

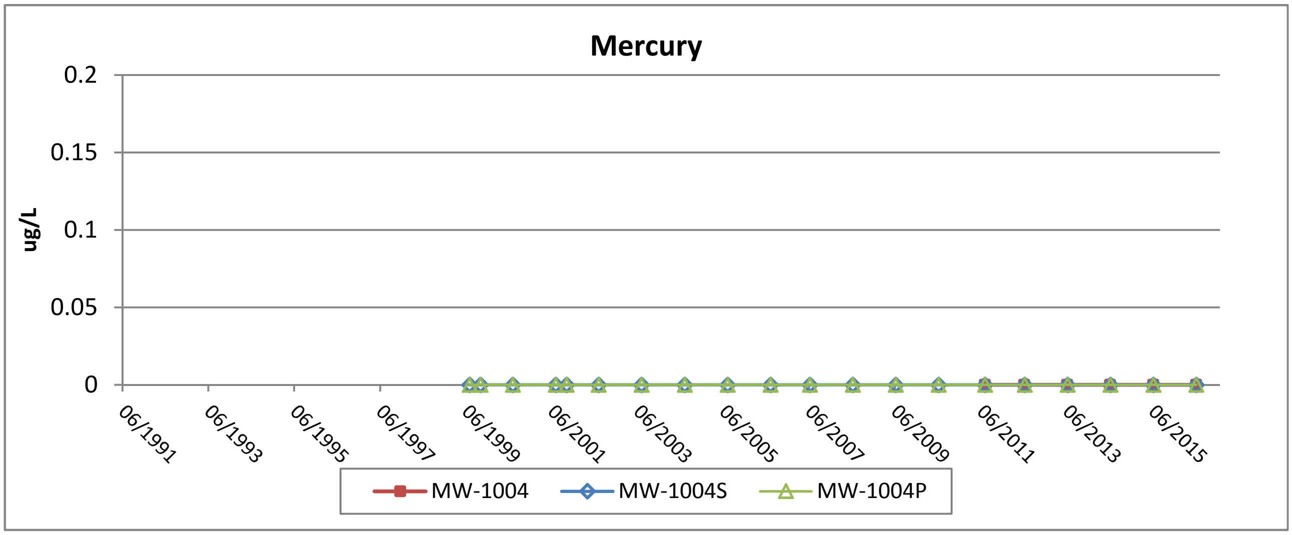
Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



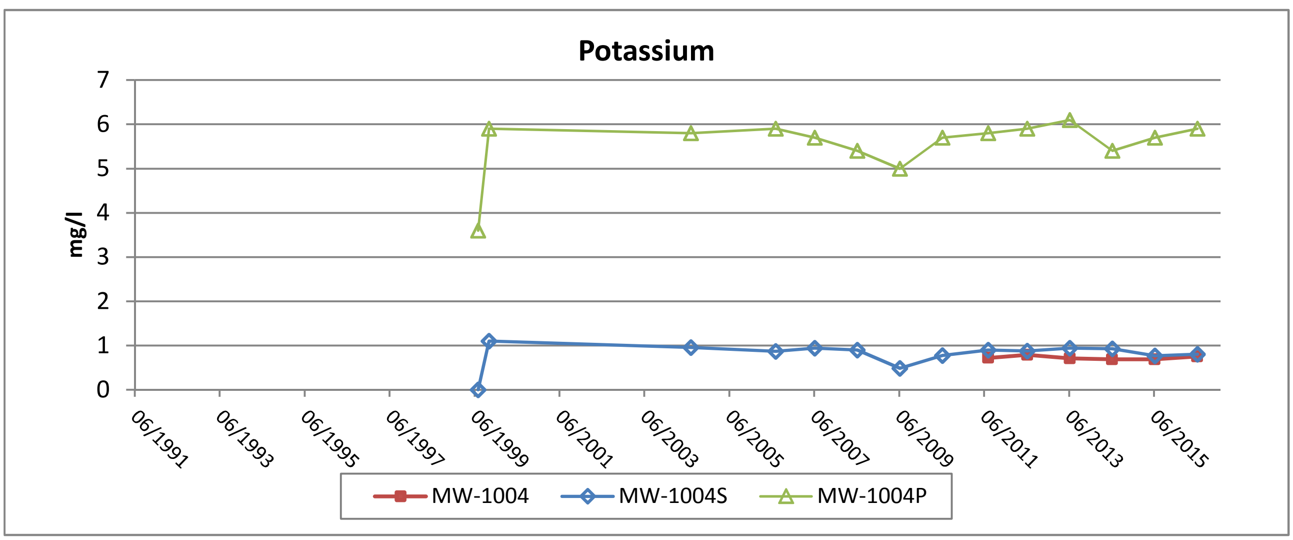




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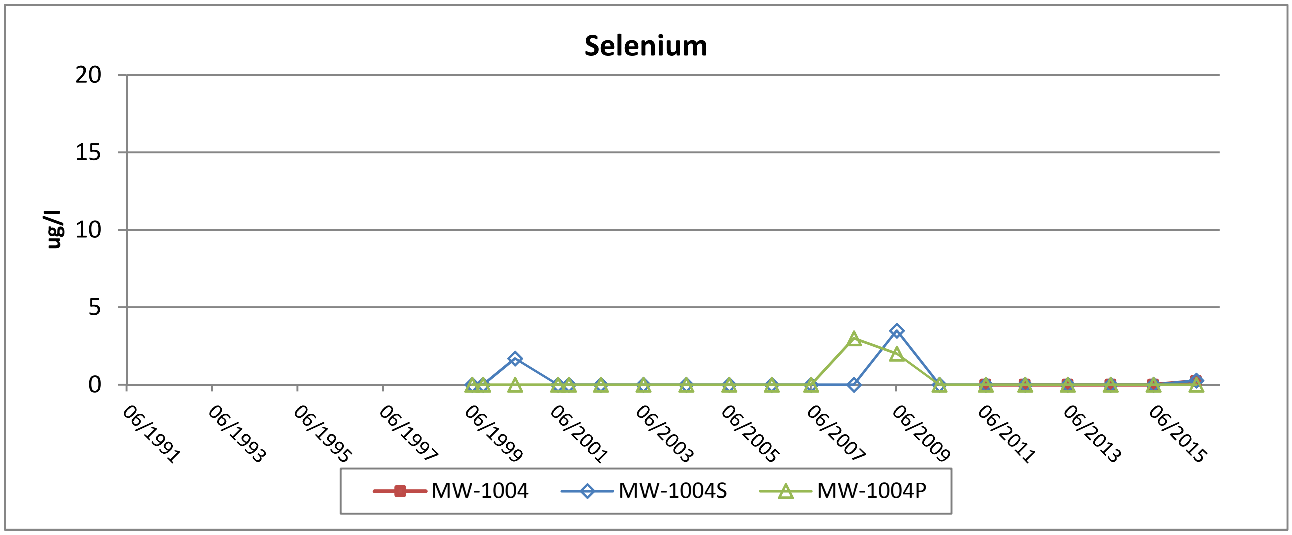
Figure B-10c

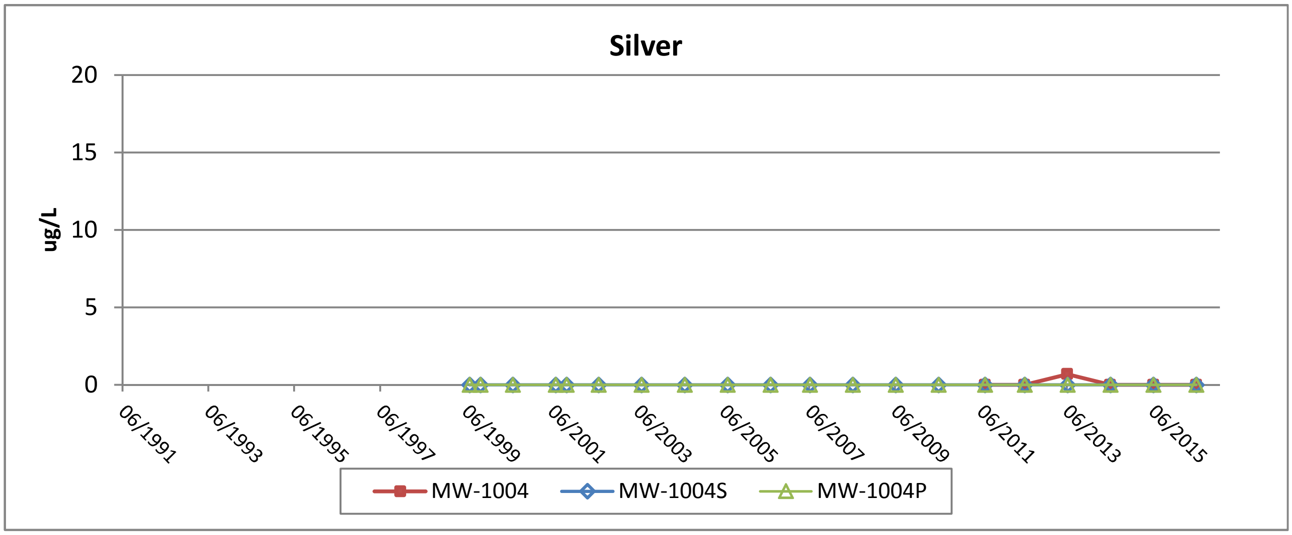
Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



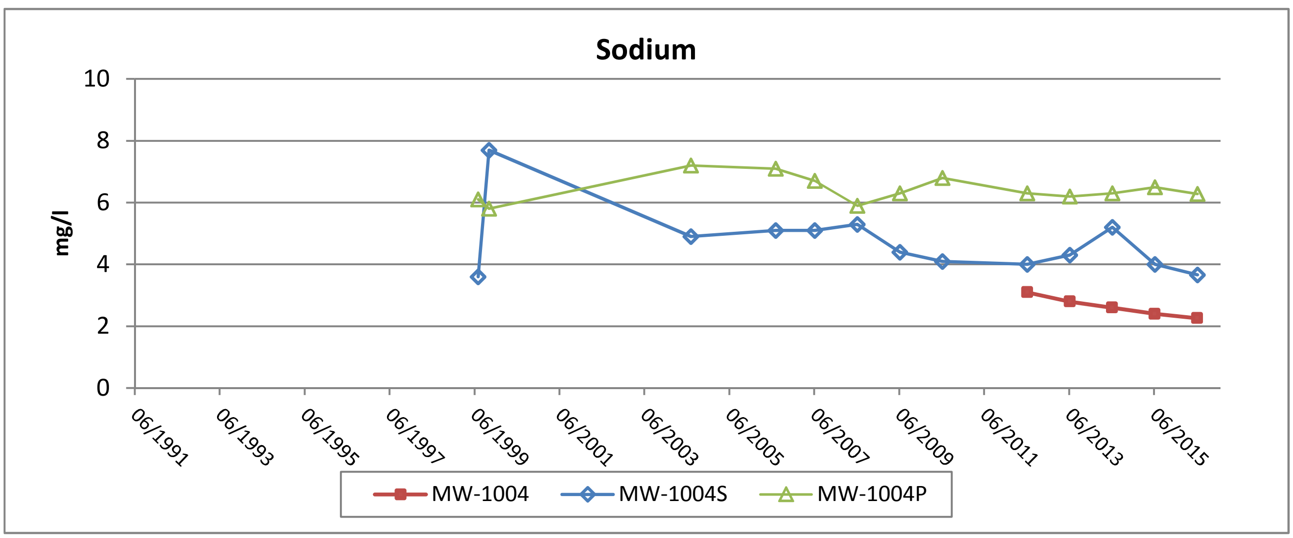




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Figure B-10d

Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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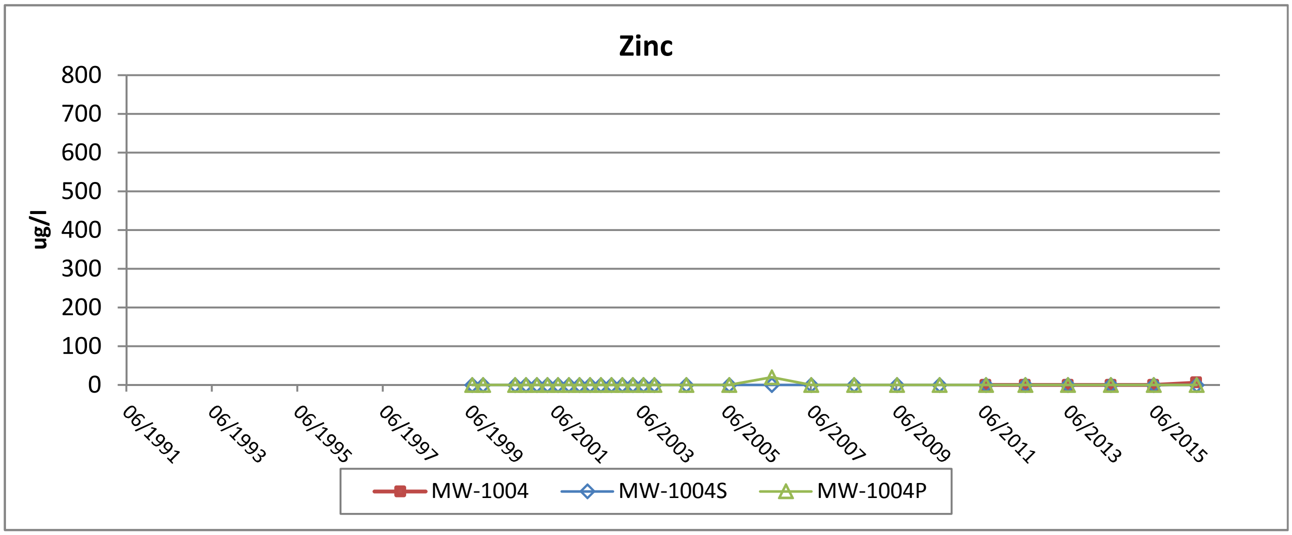


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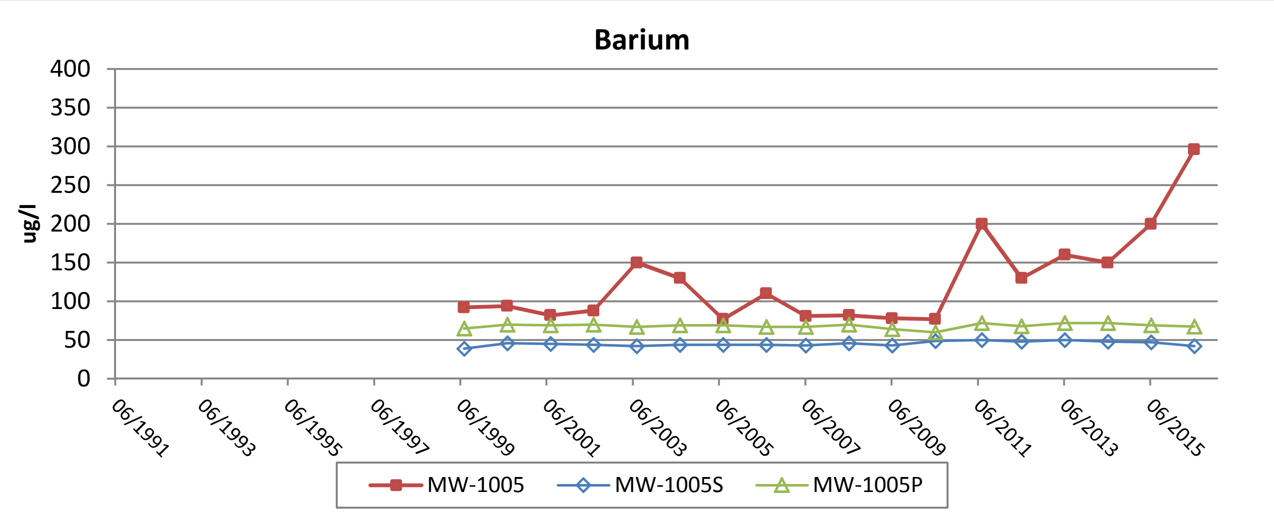
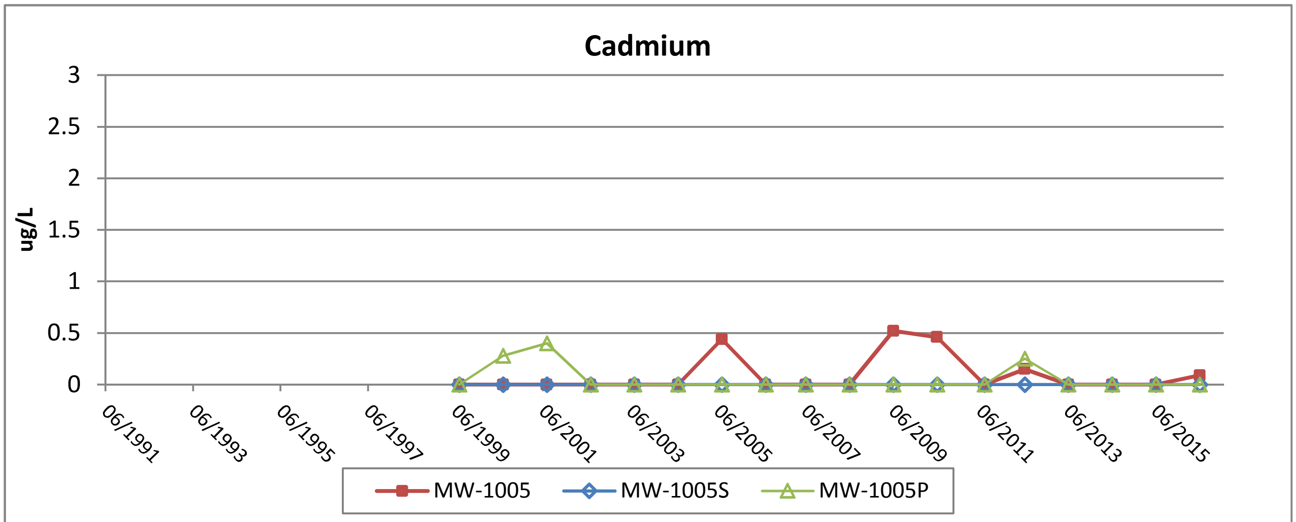
Figure B-10e

Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



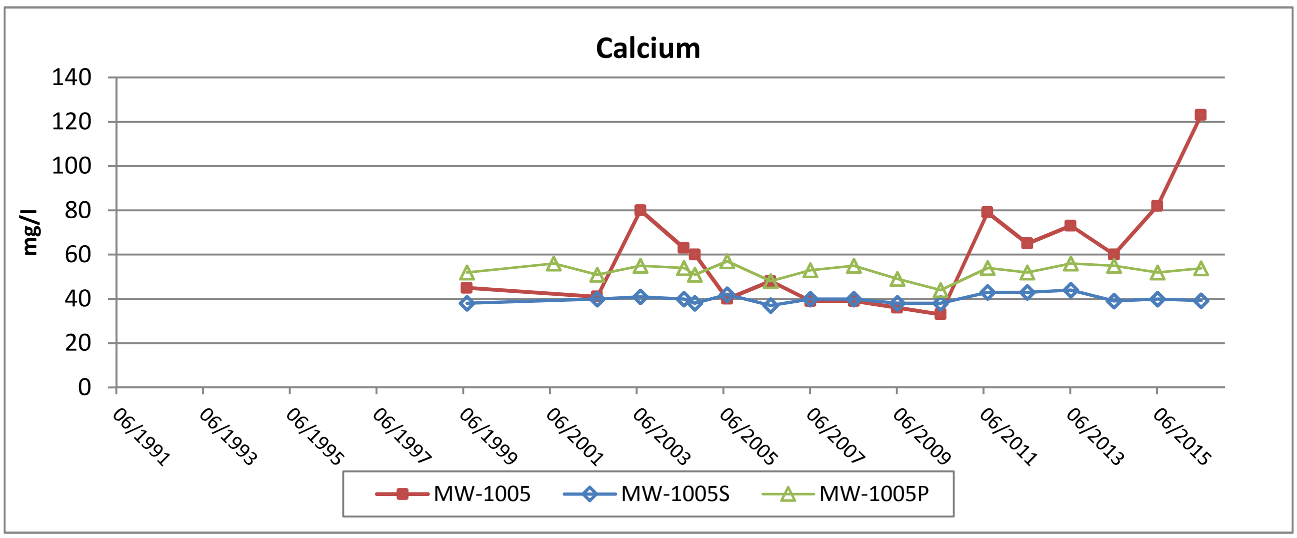




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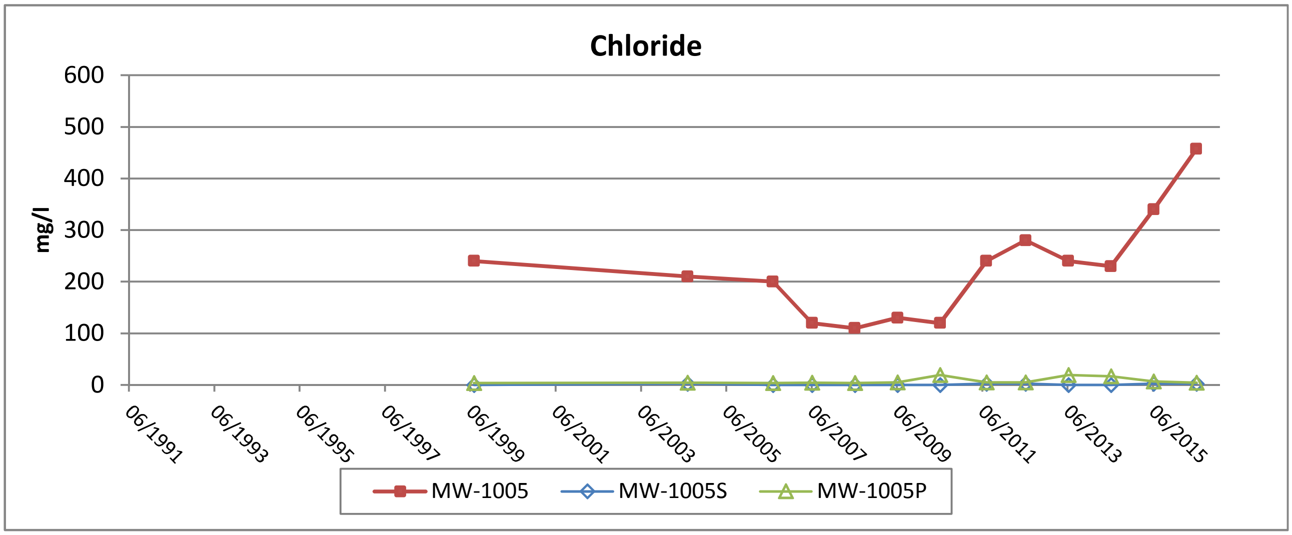
Figure B-11a

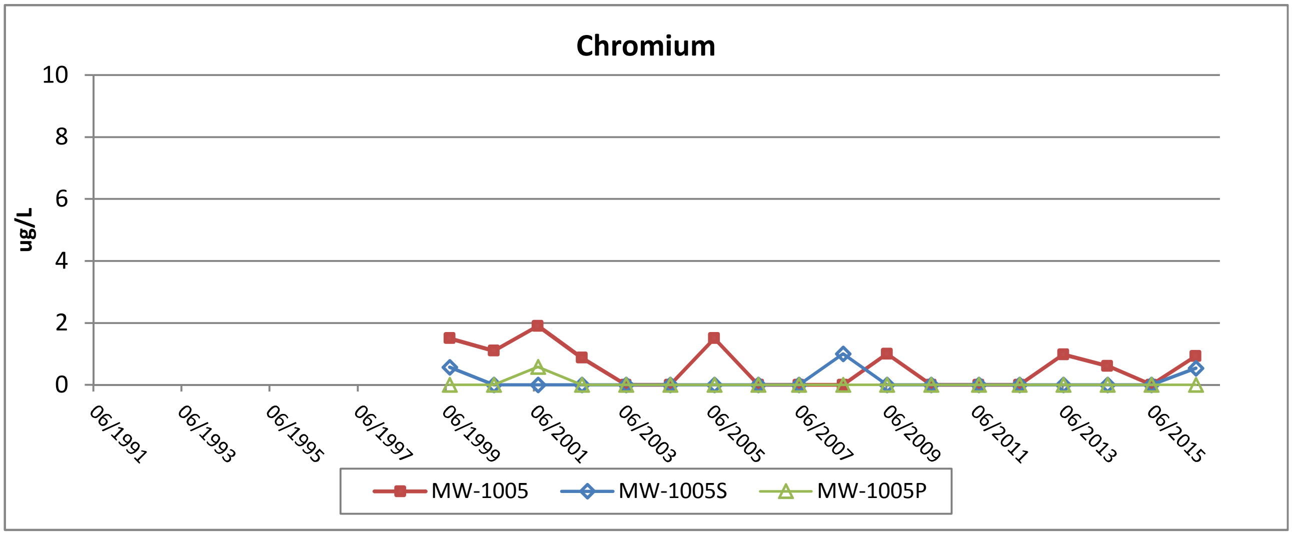
Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



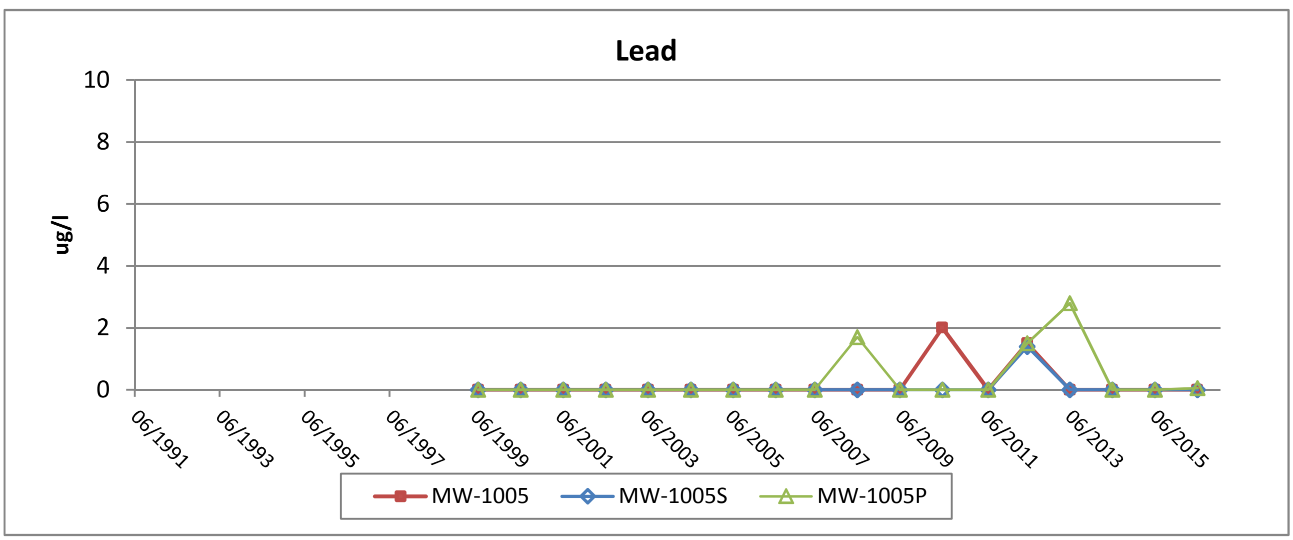




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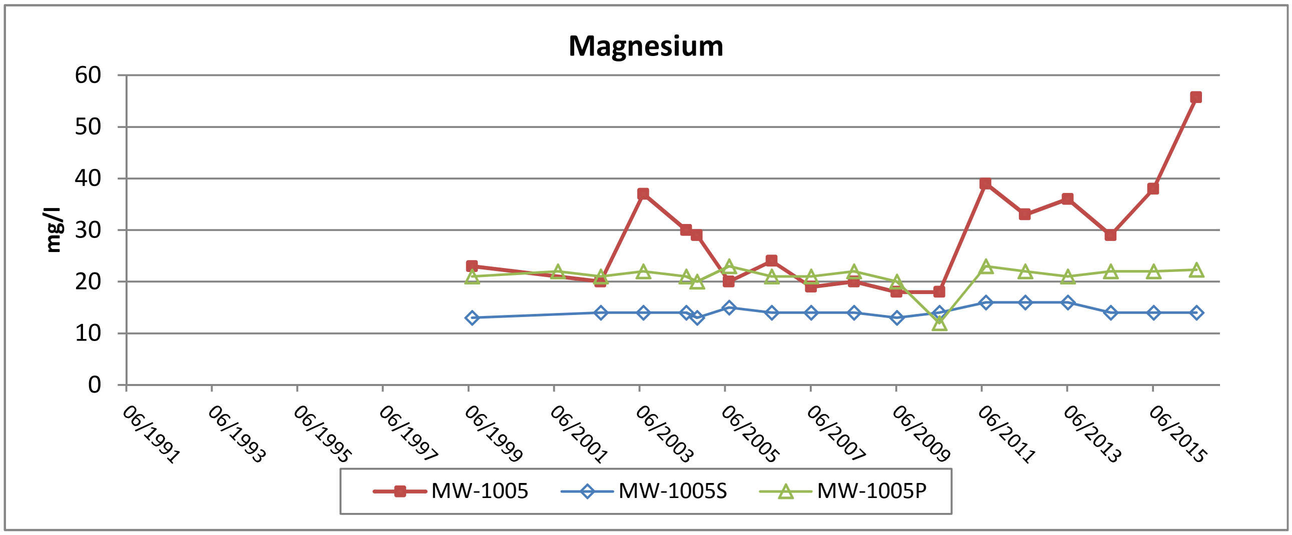
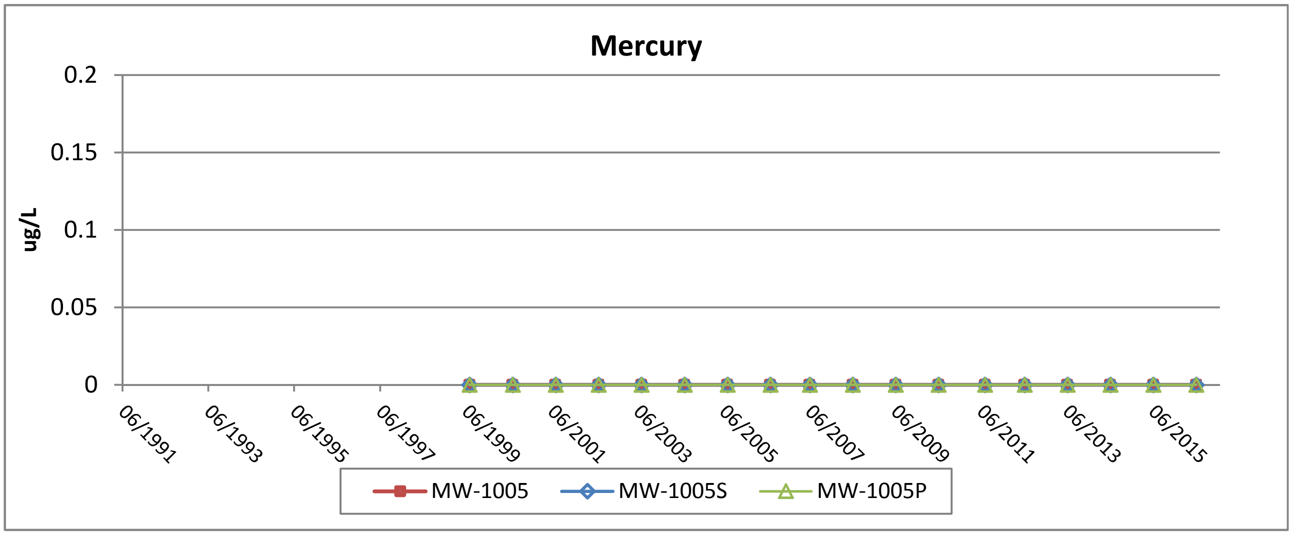
Figure B-11b

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



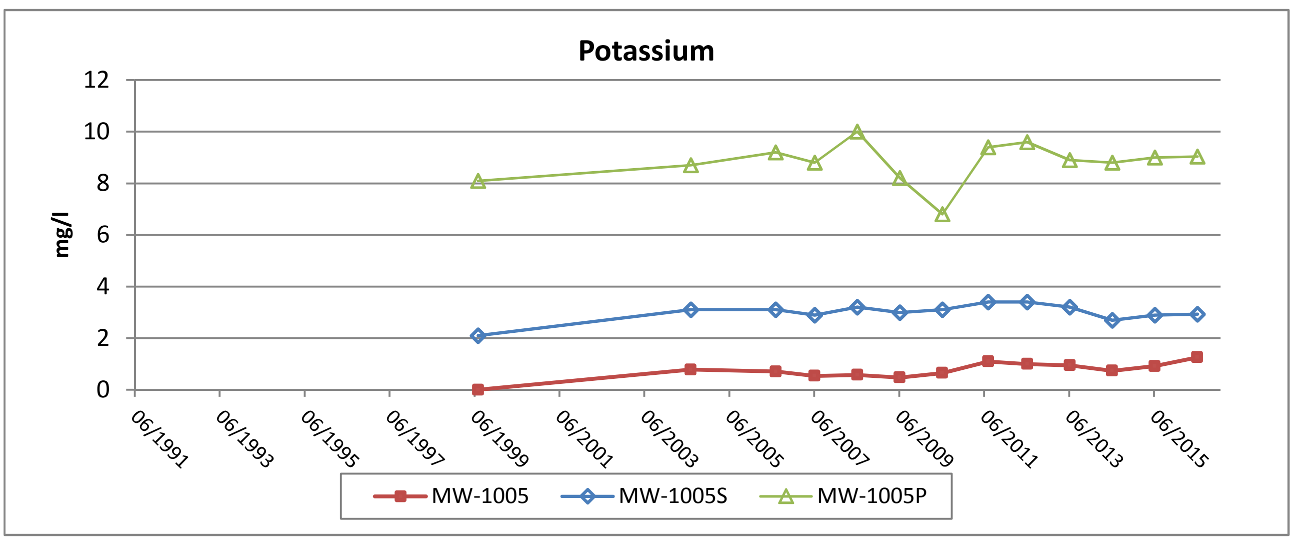




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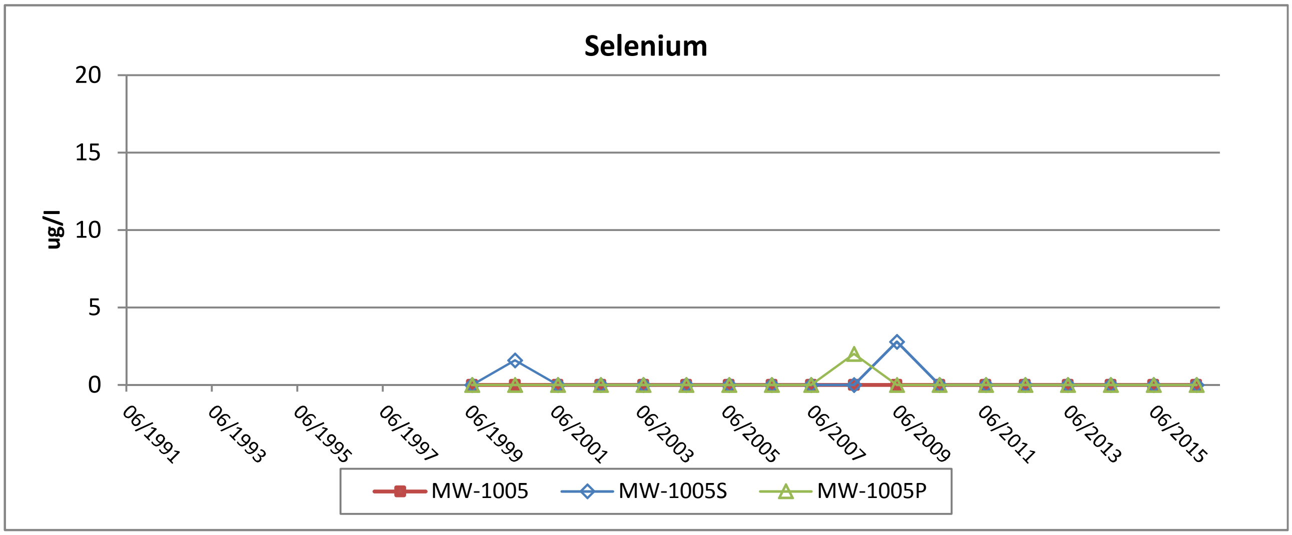
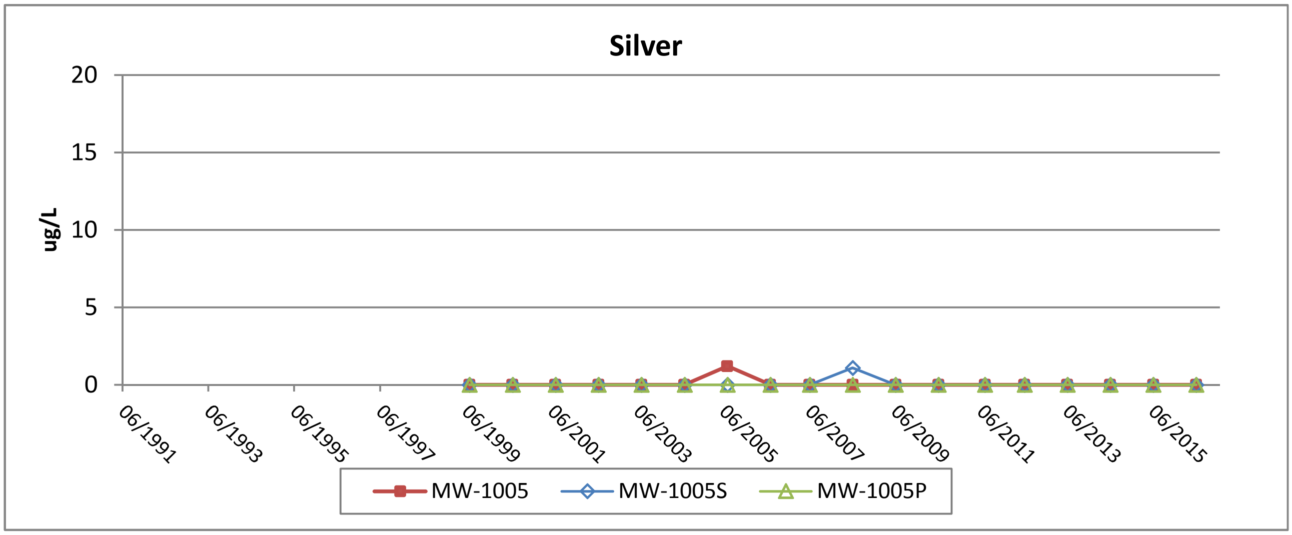
Figure B-11c

Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



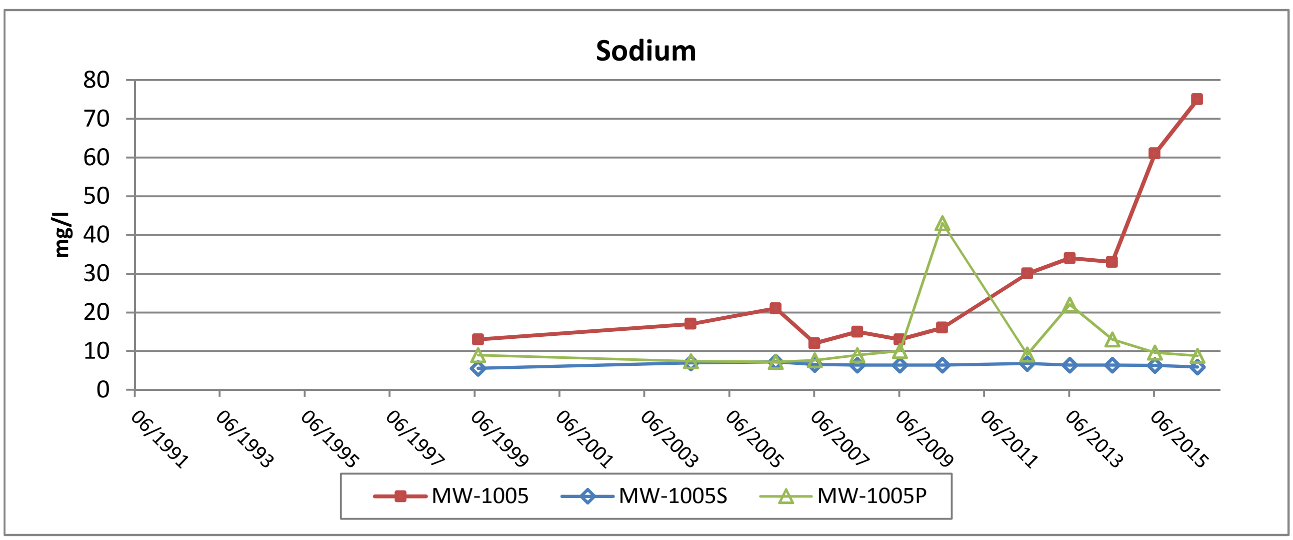




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Figure B-11d

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

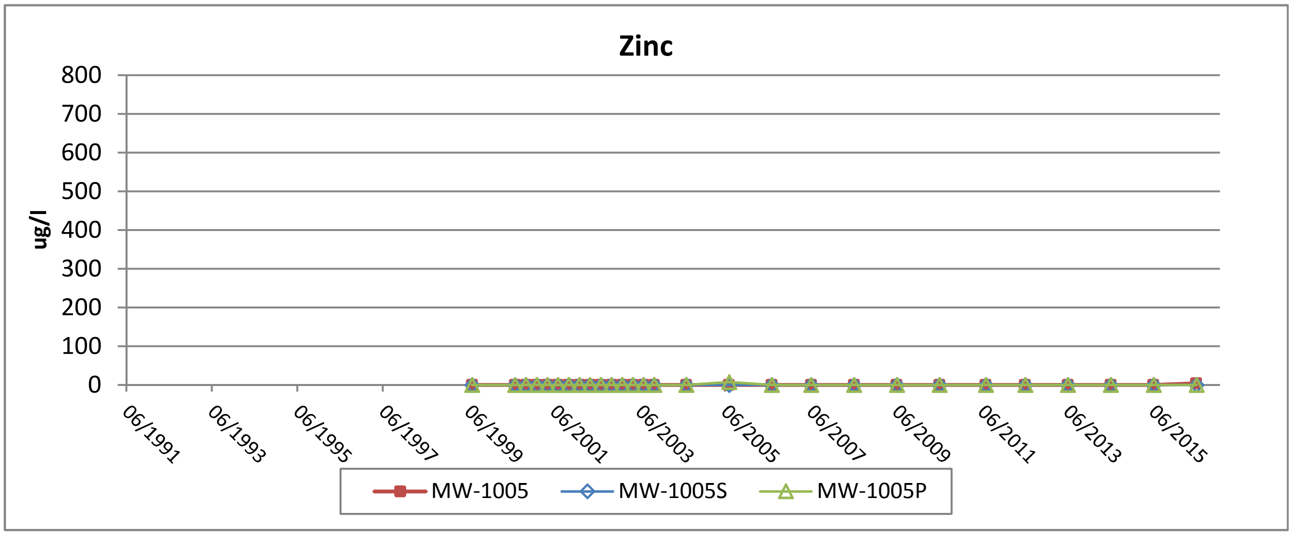


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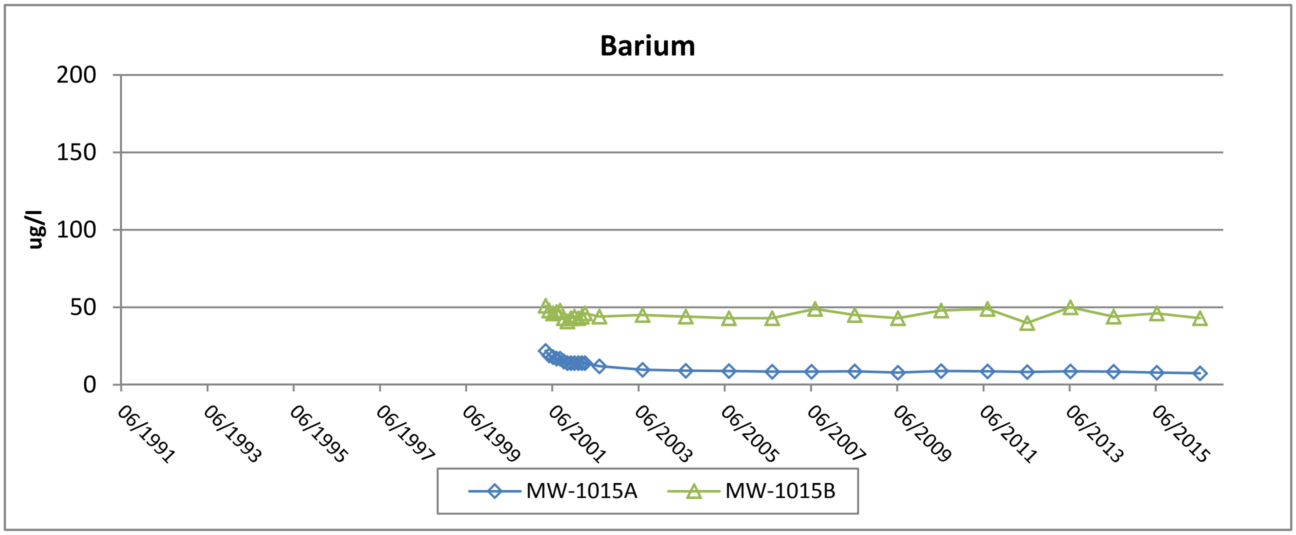
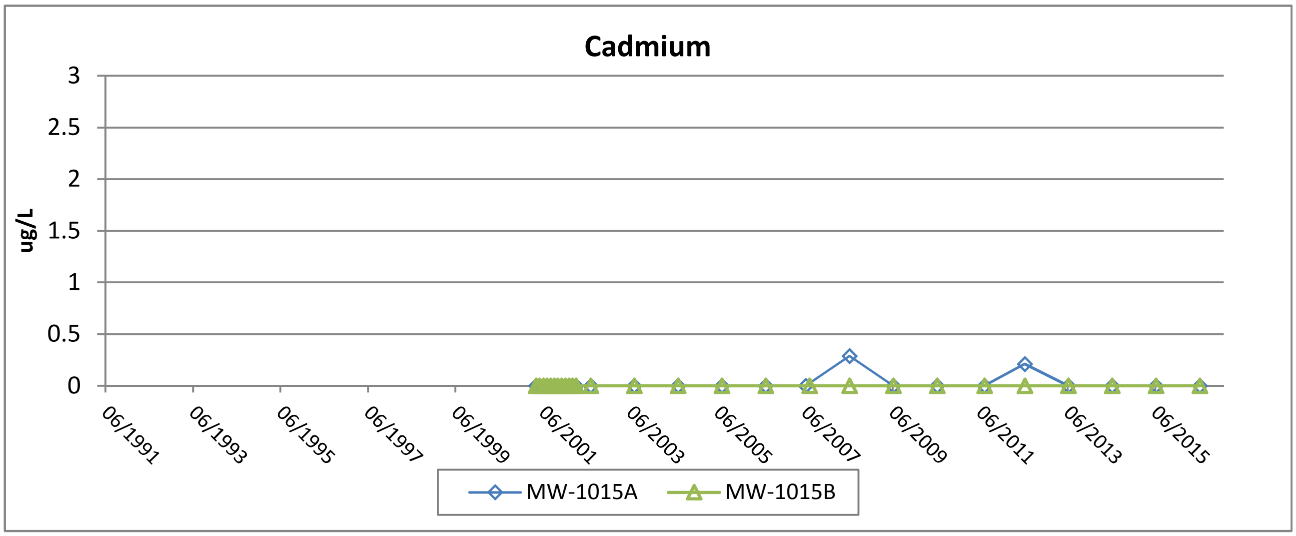
Figure B-11e

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



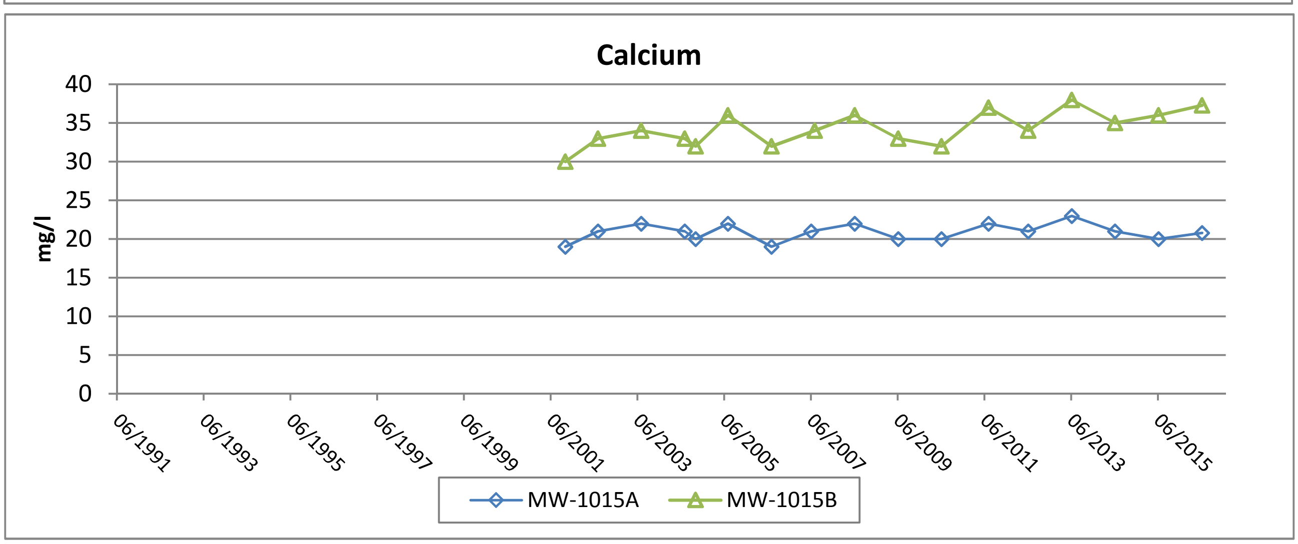




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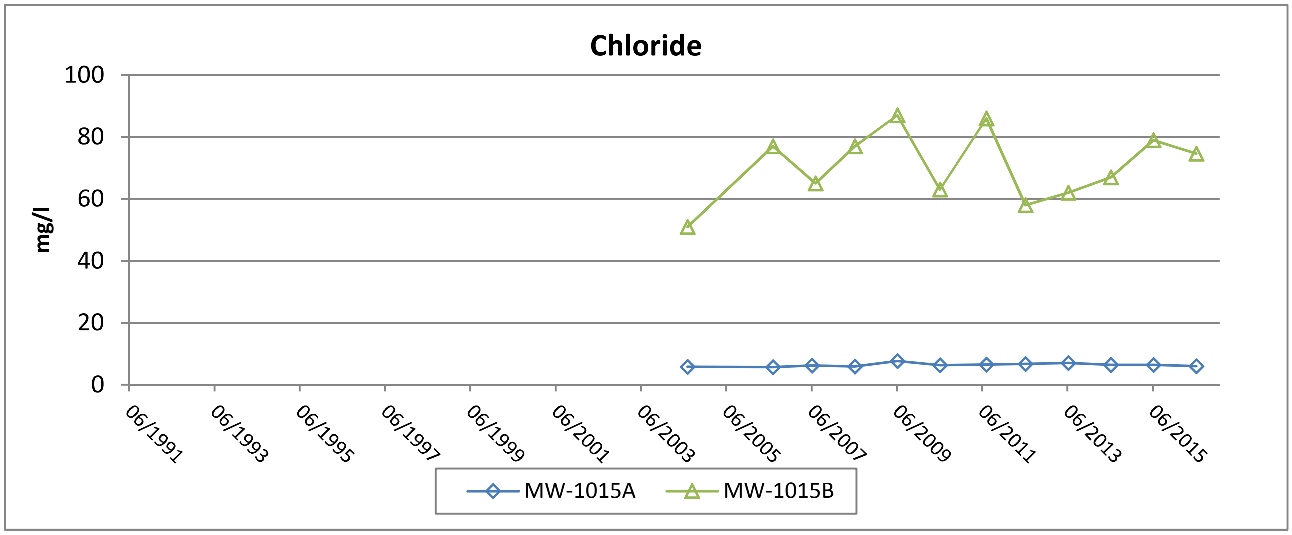
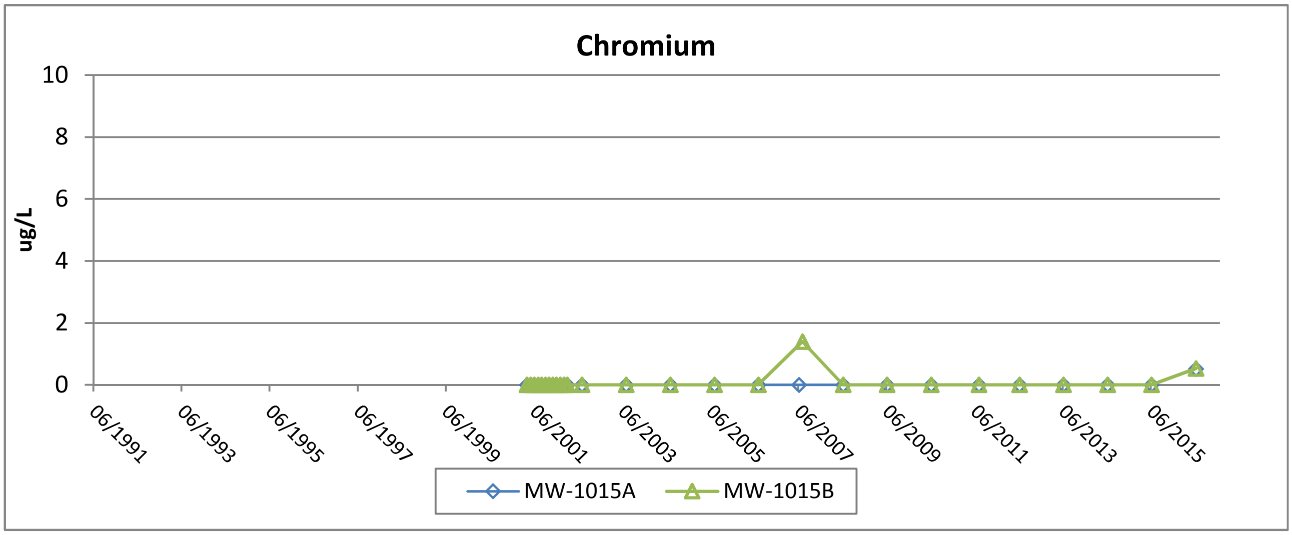
Figure B-12a

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| | | |
|---|---|---|
| Scale: NA | Date: January 2017 | |
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



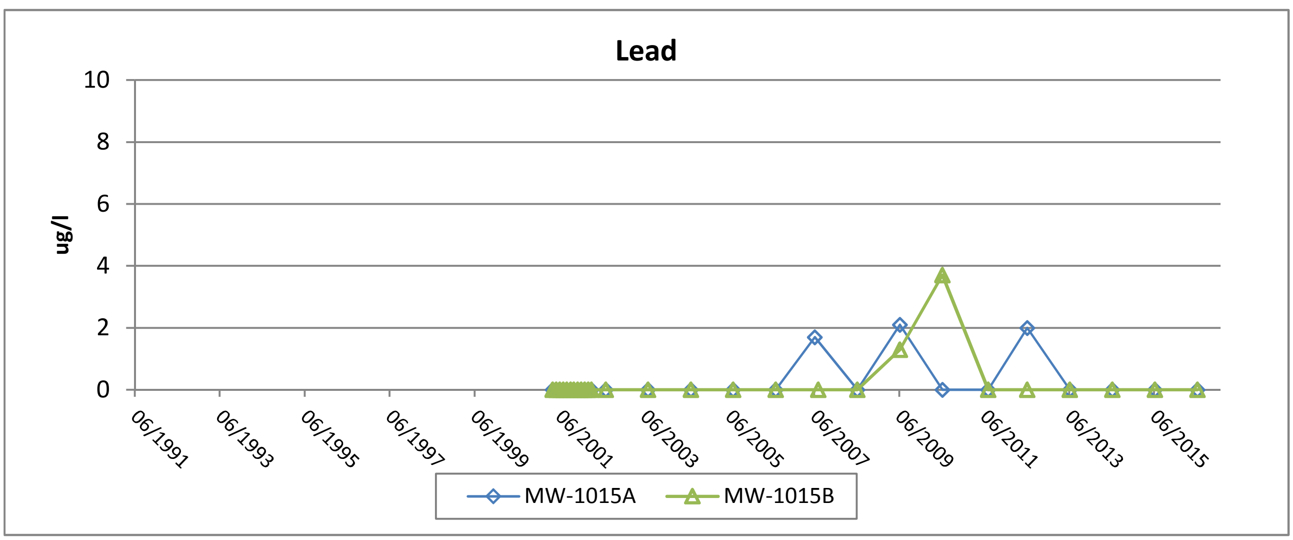




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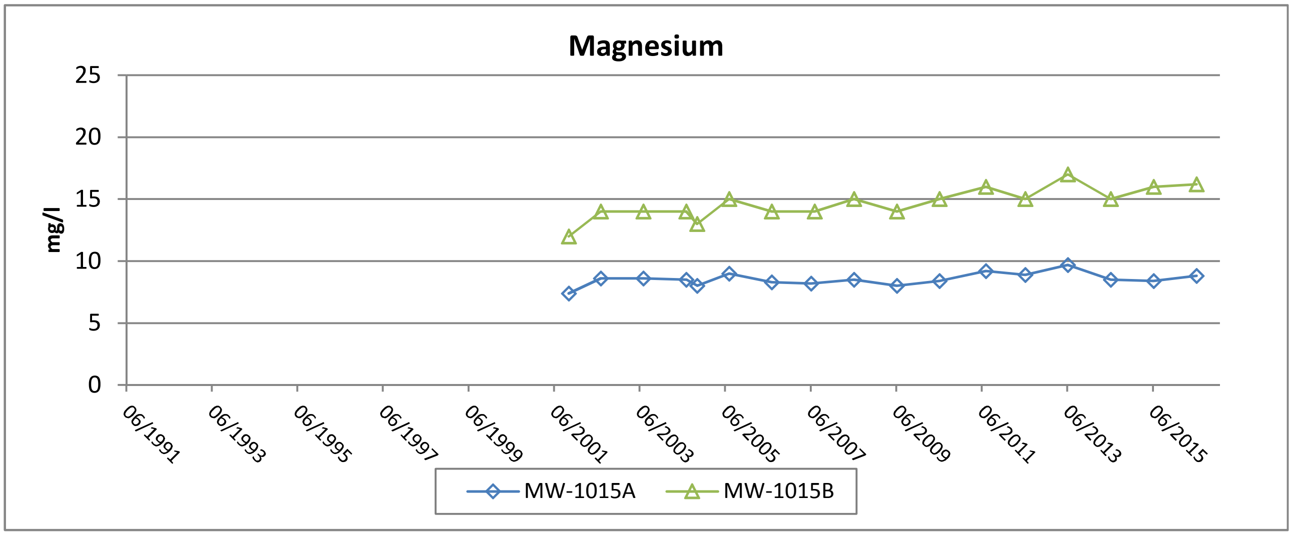
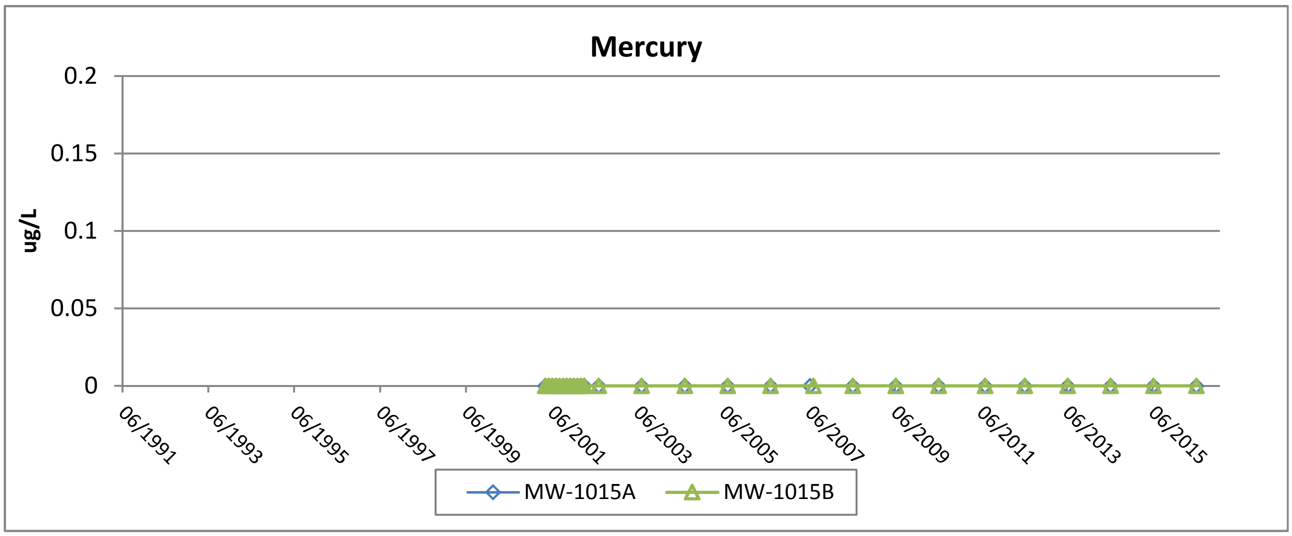
Figure B-12b

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



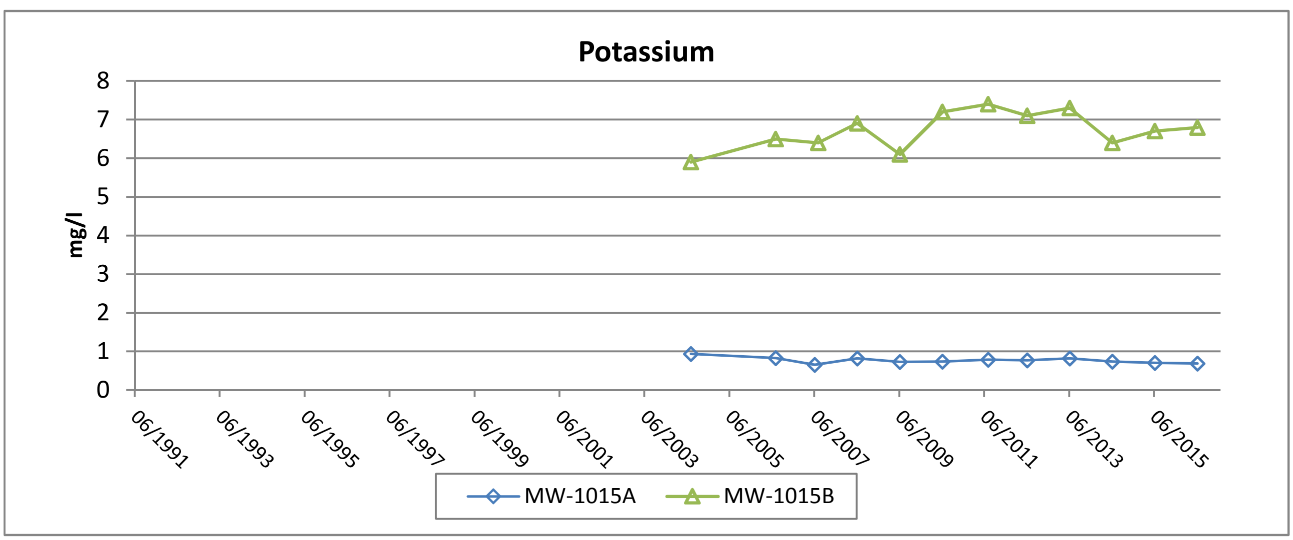




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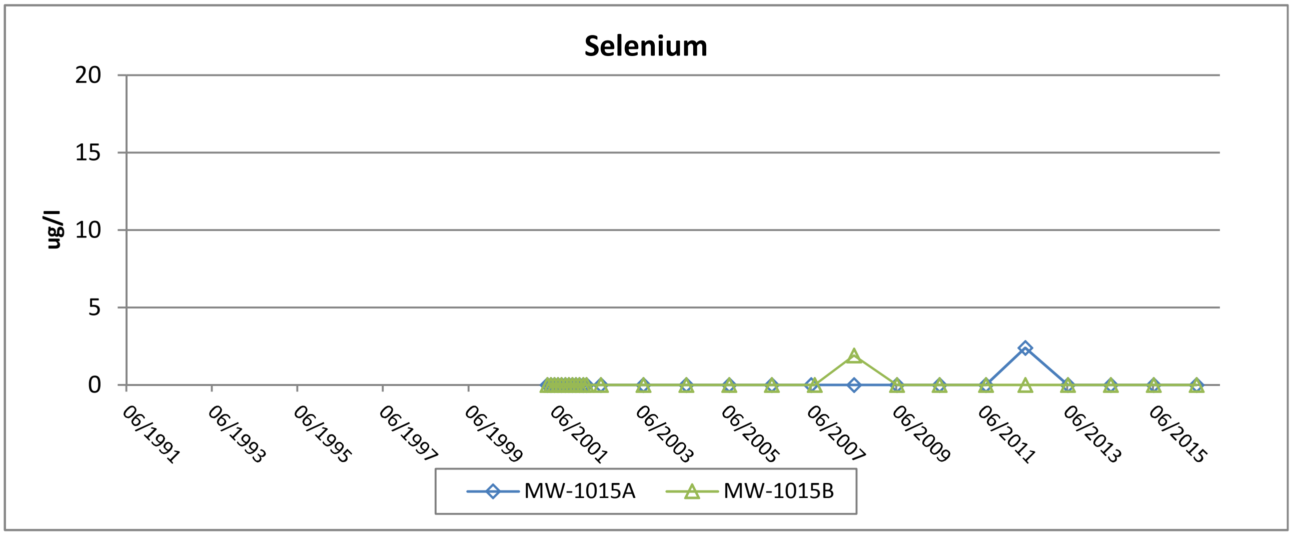
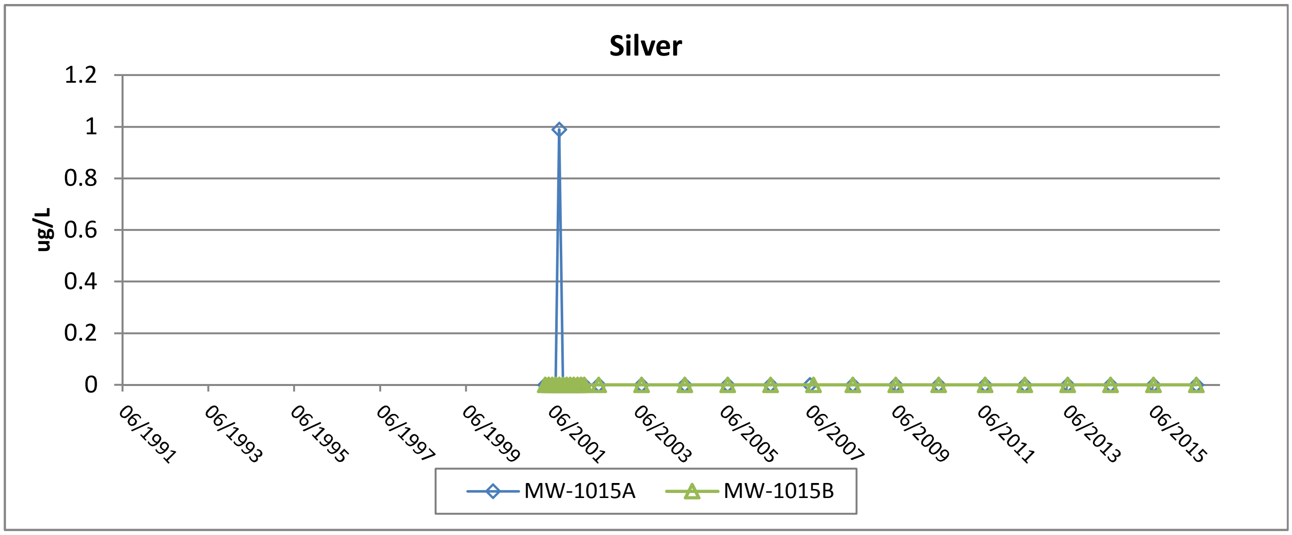
Figure B-12c

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



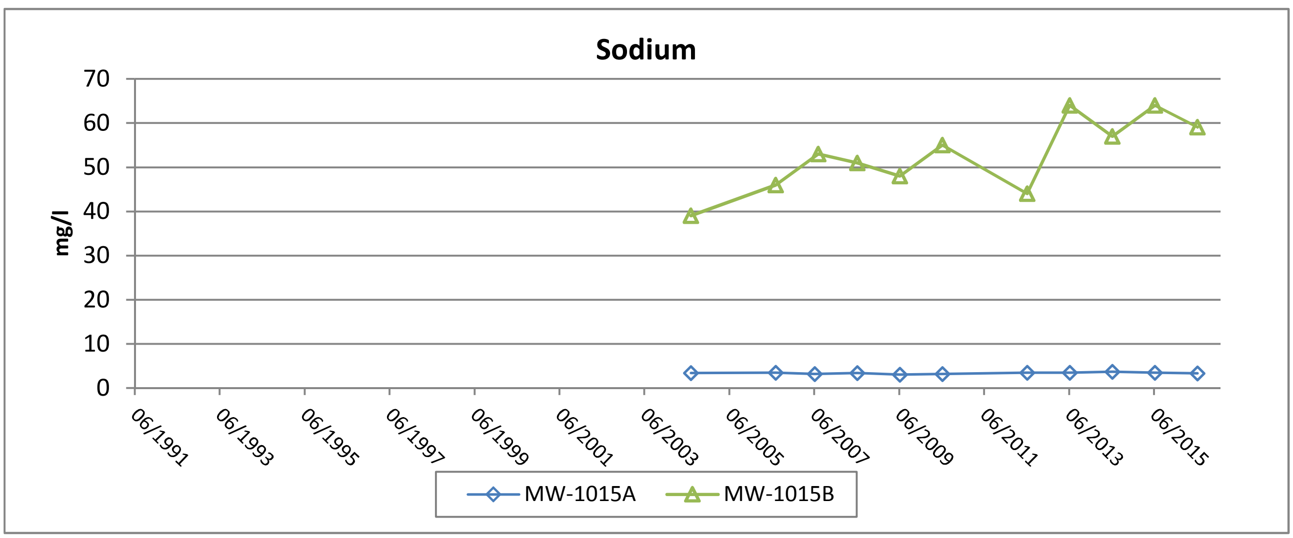




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Figure B-12d

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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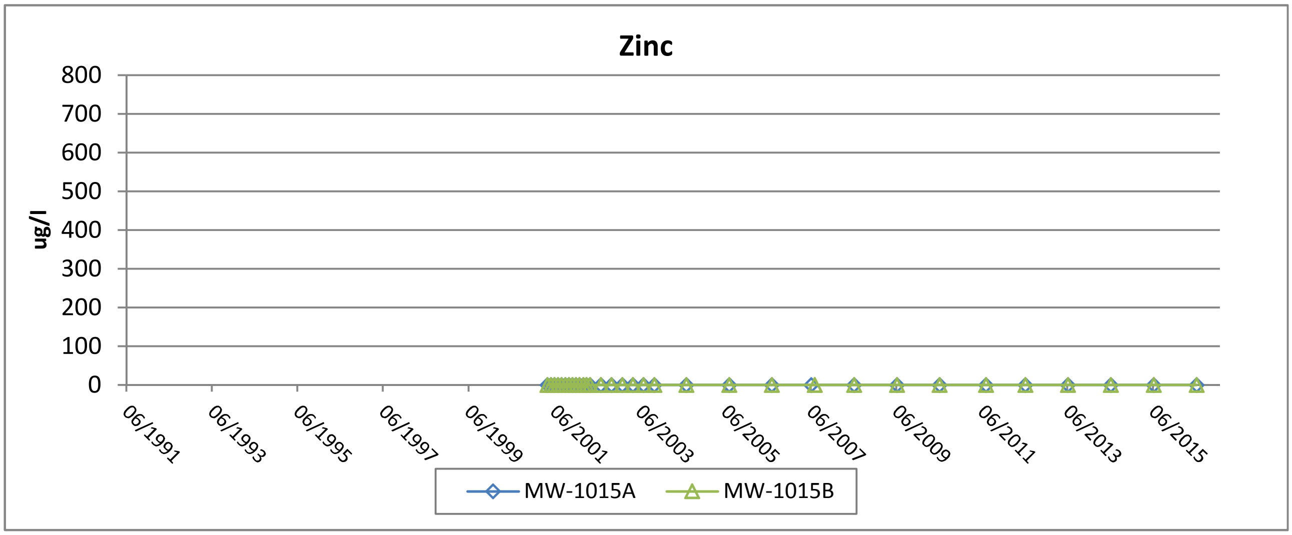
2016 Annual Report




| |
|---|
| Foth Infrastructure & Environment, LLC |
| FLAMBEAU MINING COMPANY |
| Figure B-12e<br>Groundwater Trend Graphs - Annual Results<br>MW-1015A/MW-1015B |
| Scale: NA · Date: January 2017 |
| Prepared By: HLH · Checked By: SVF · Scope: 16F777-00 |

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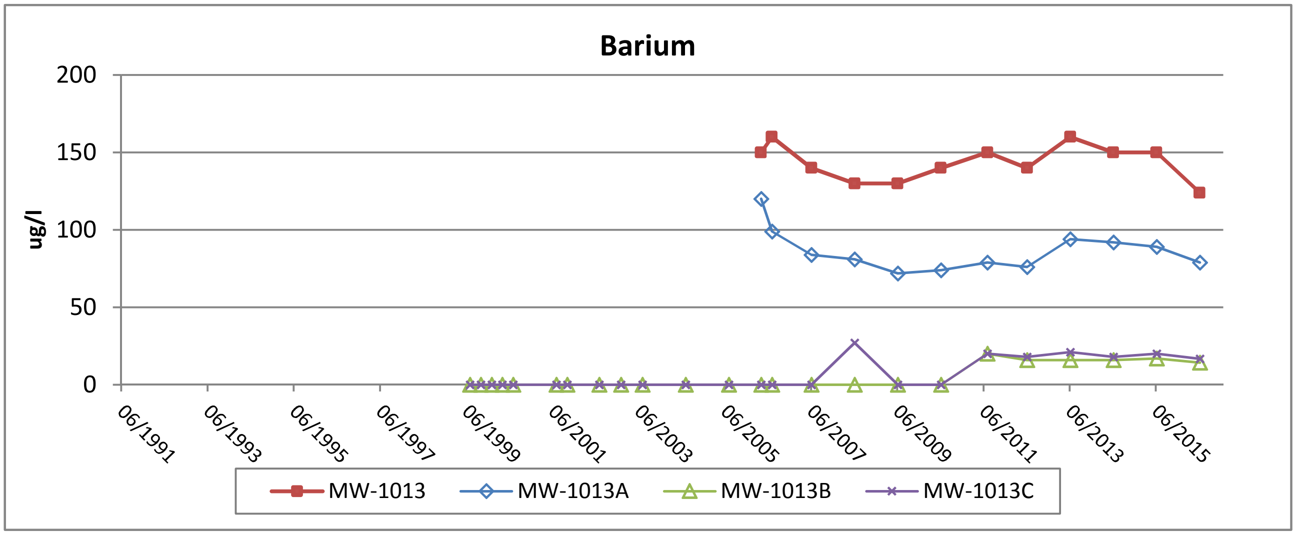
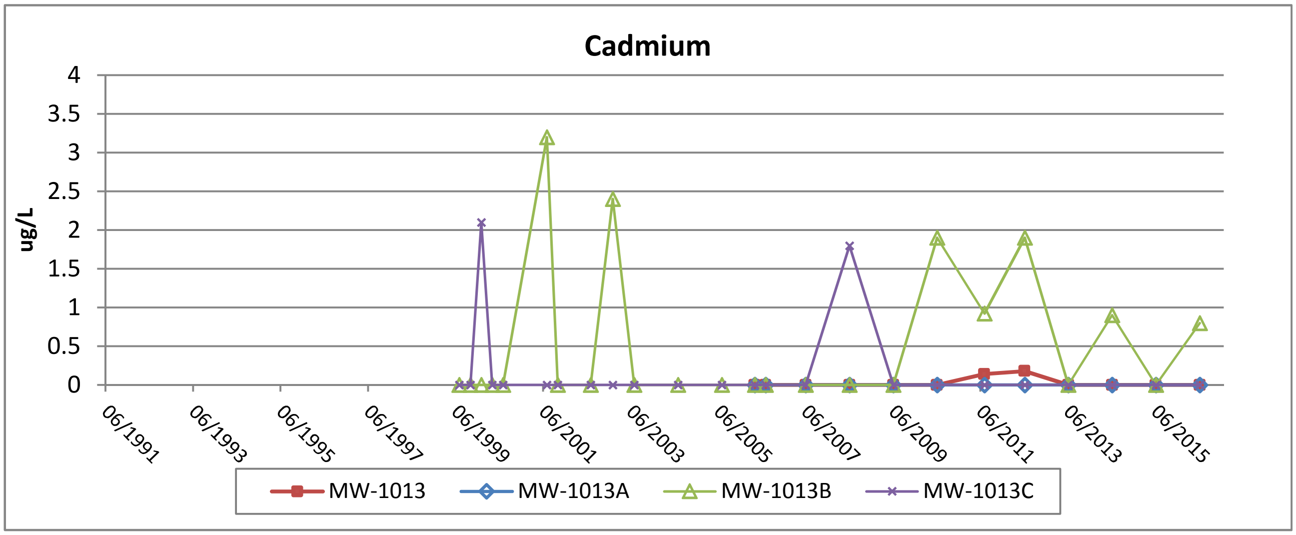
2016 Annual Report

PW_IE\Documents\Clients\Flambeau Mining\0016F777.00\10500 Reference Information\Stats Analysis\2016 Annual Report\GWGraphs_Ann.xlsm



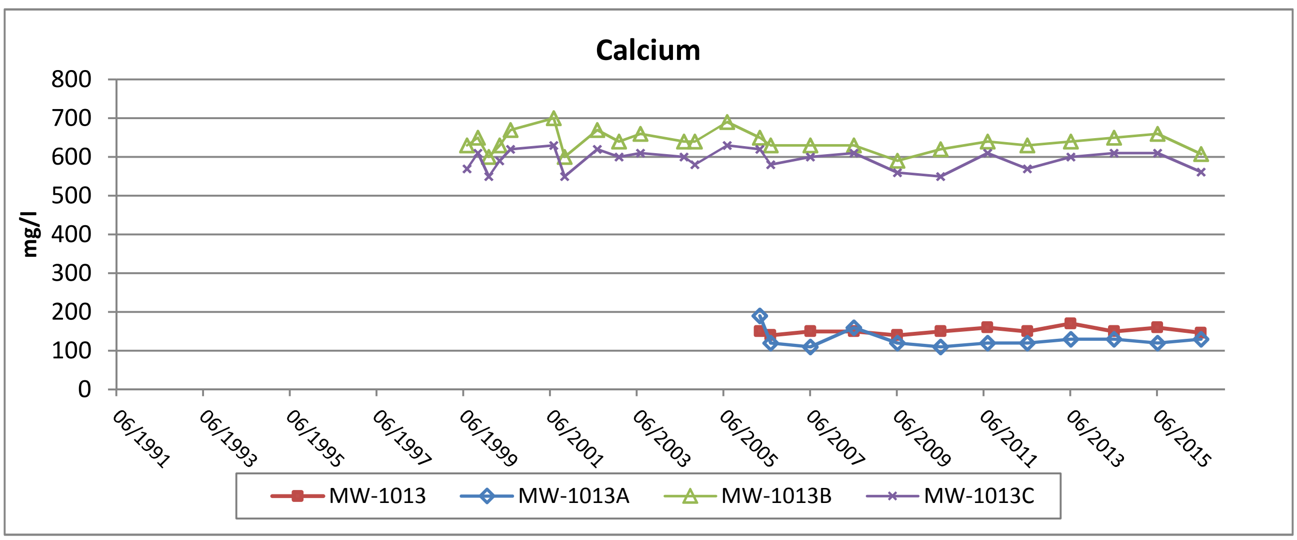




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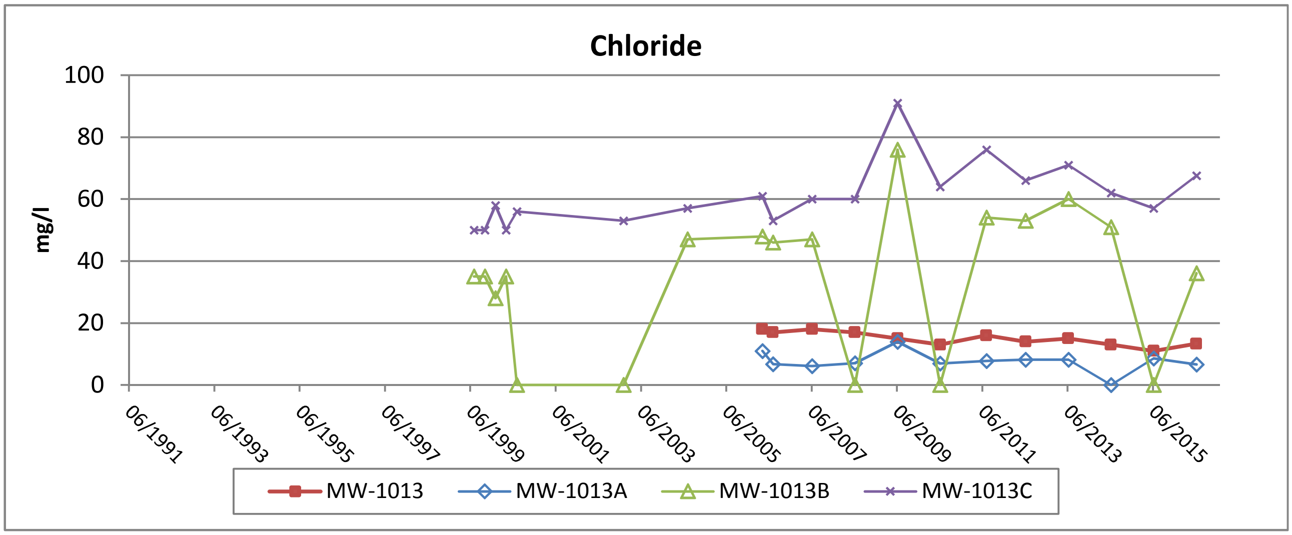
Figure B-13a

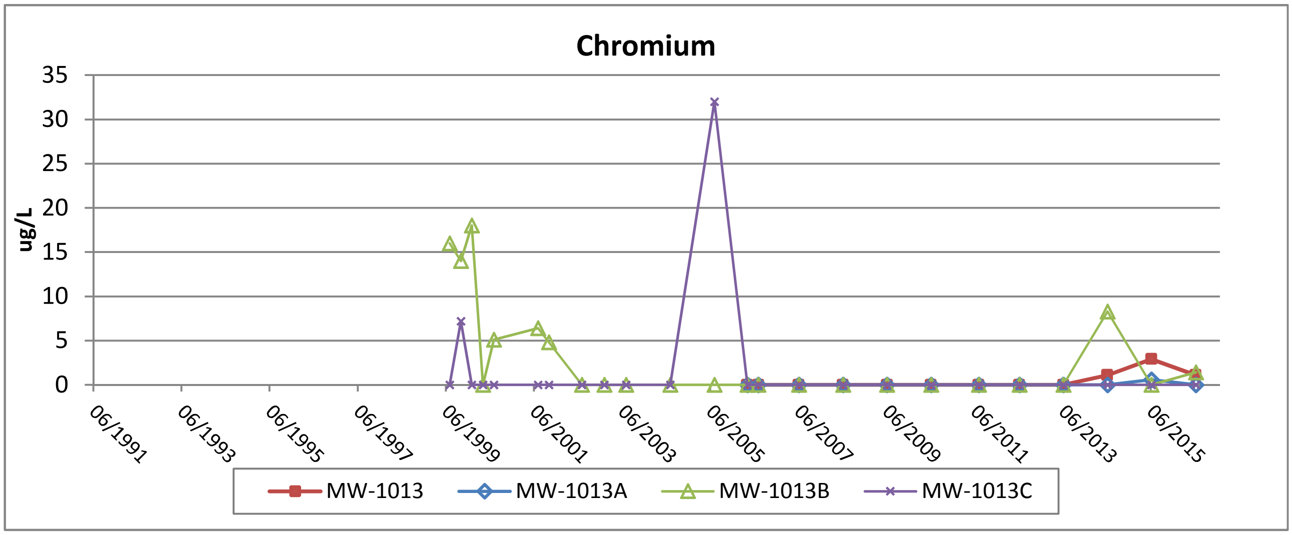
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



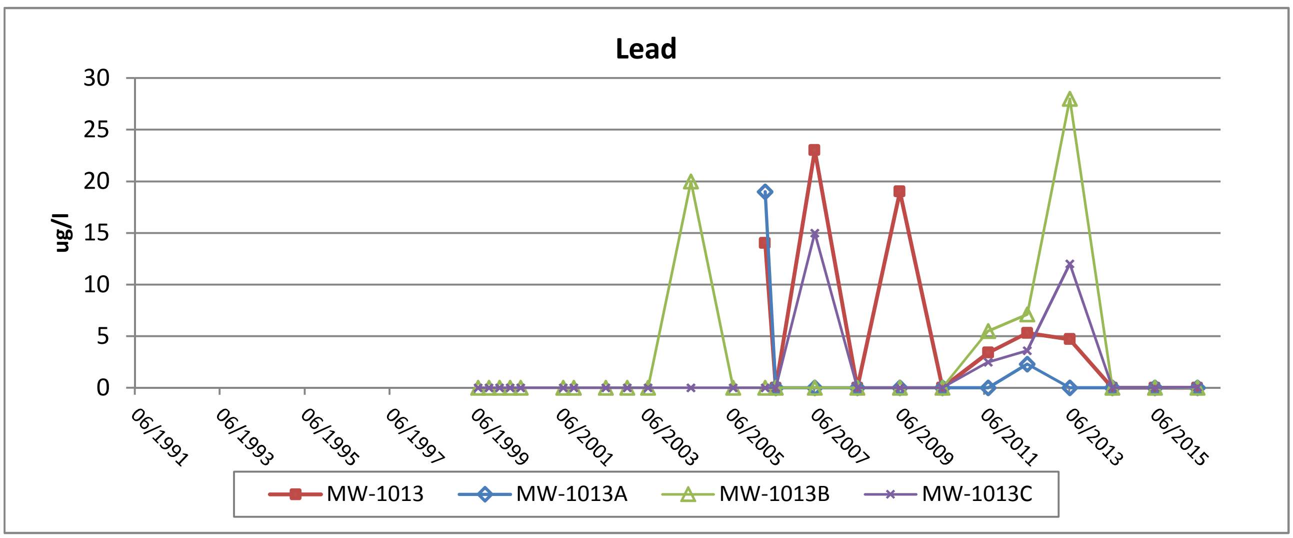




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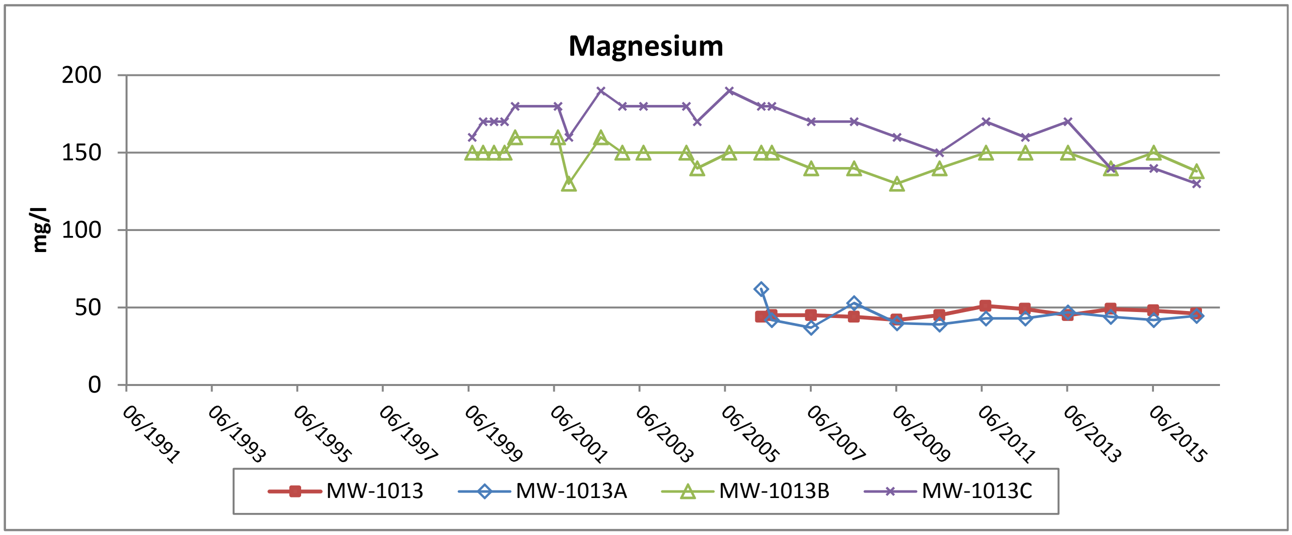
Figure B-13b

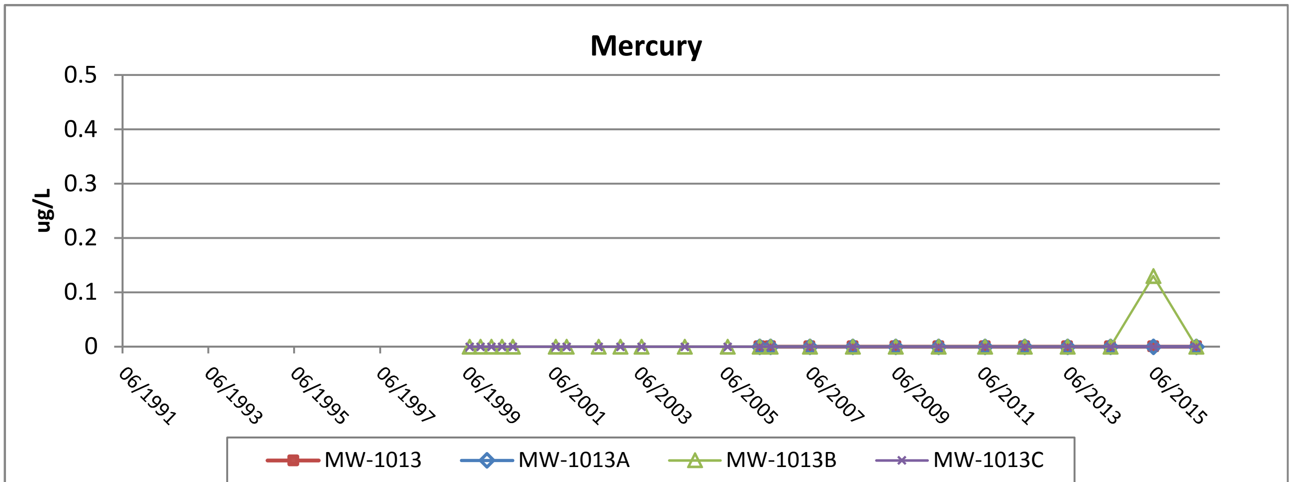
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |




Note: June 2015 detected concentration was below the quantitation limit.

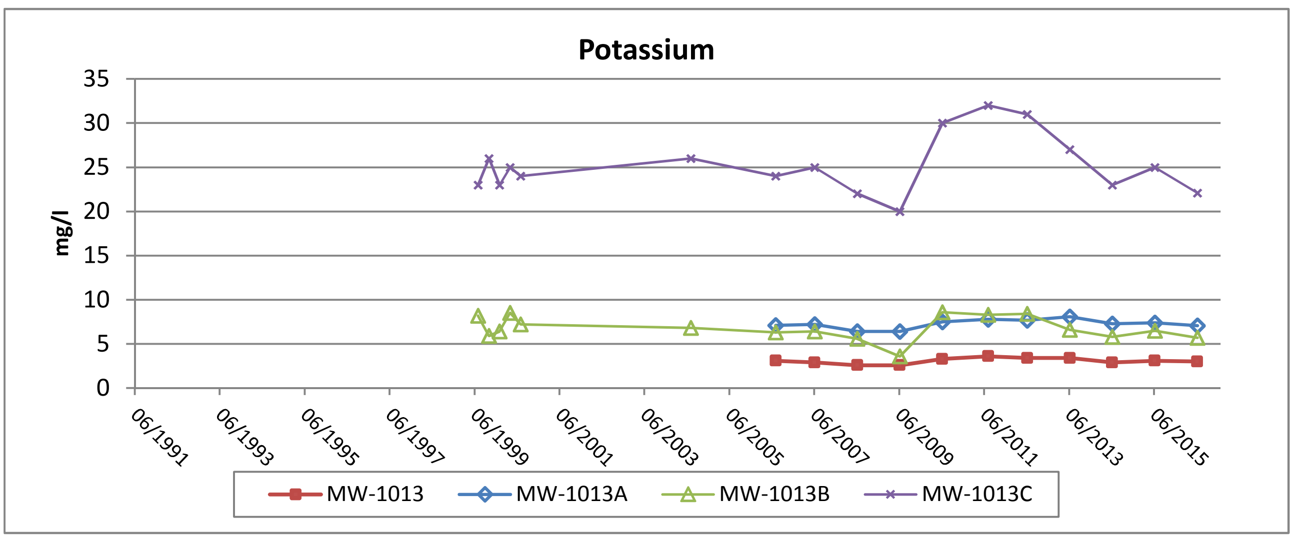



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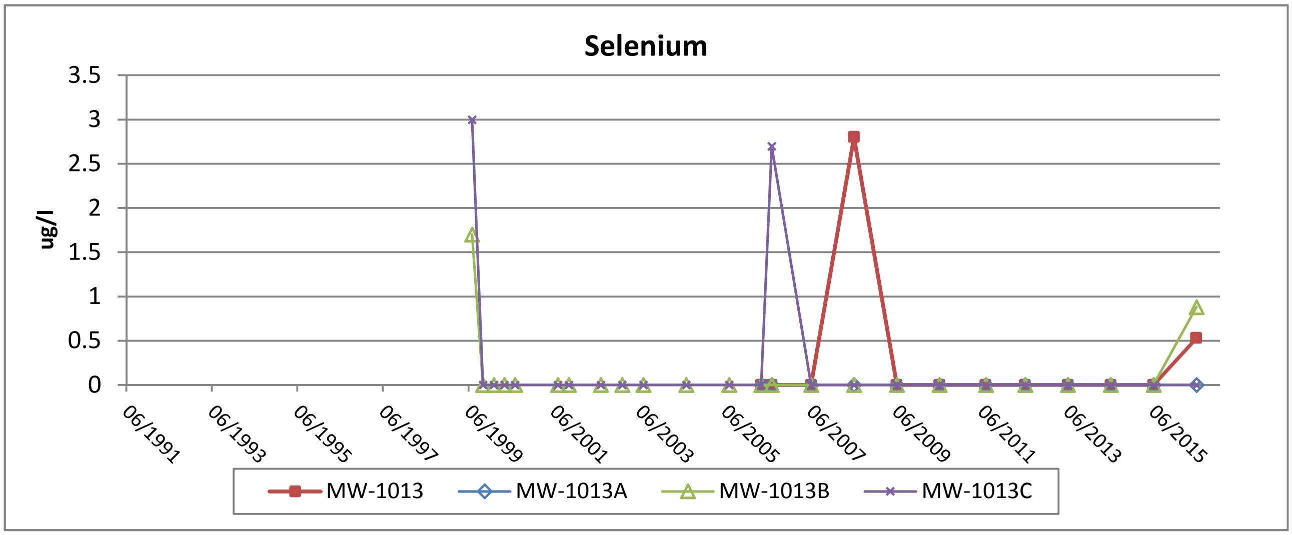
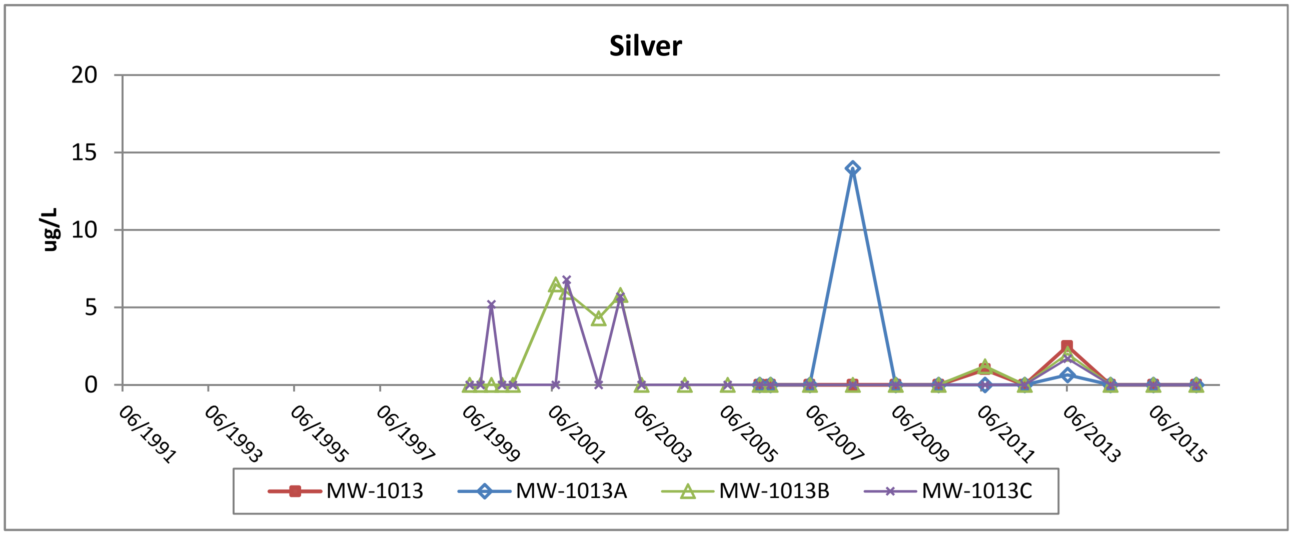
Figure B-13c

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



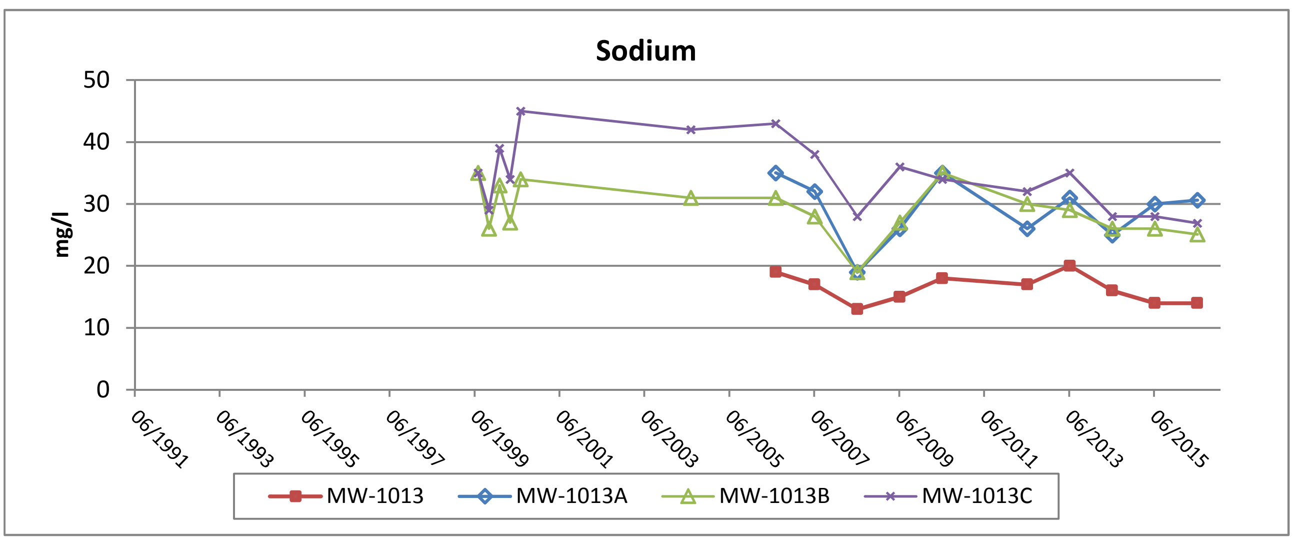




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Figure B-13d

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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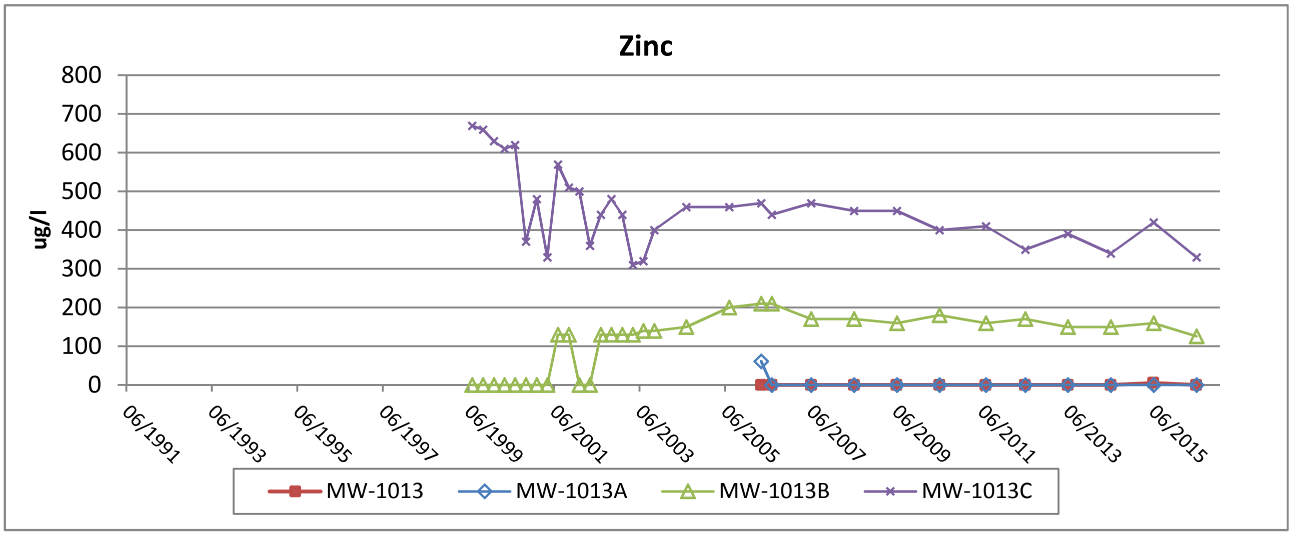


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Figure B-13e

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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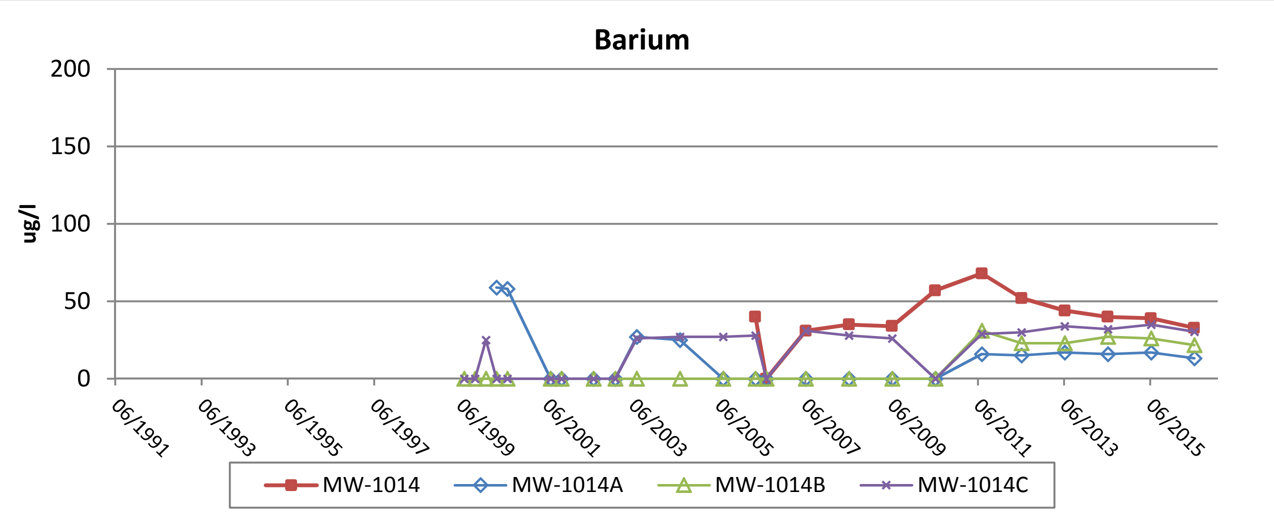
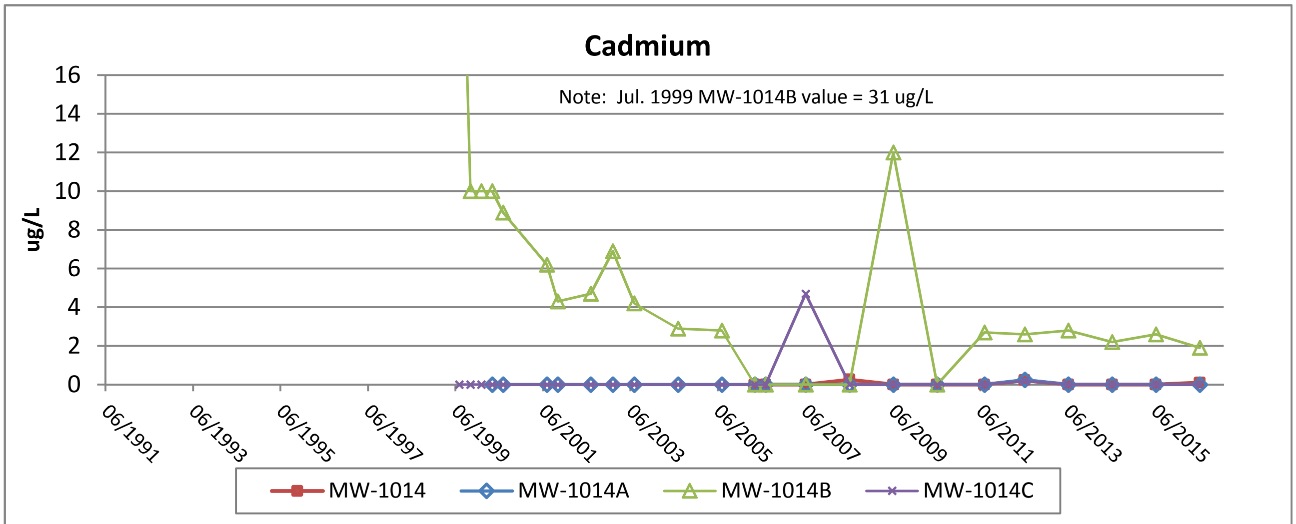
2016 Annual Report



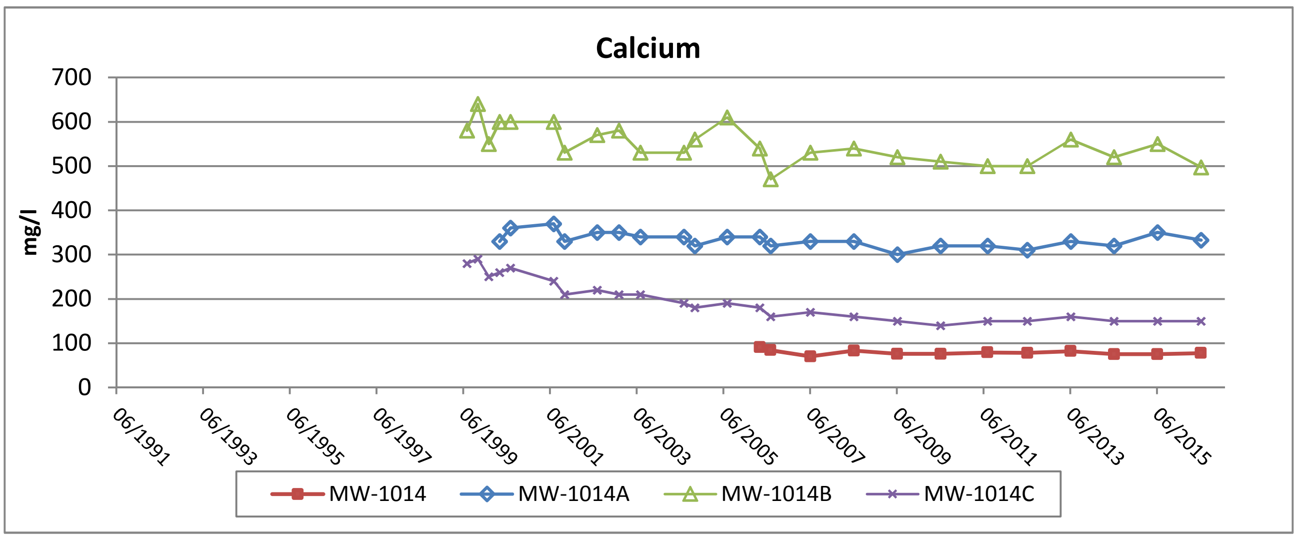




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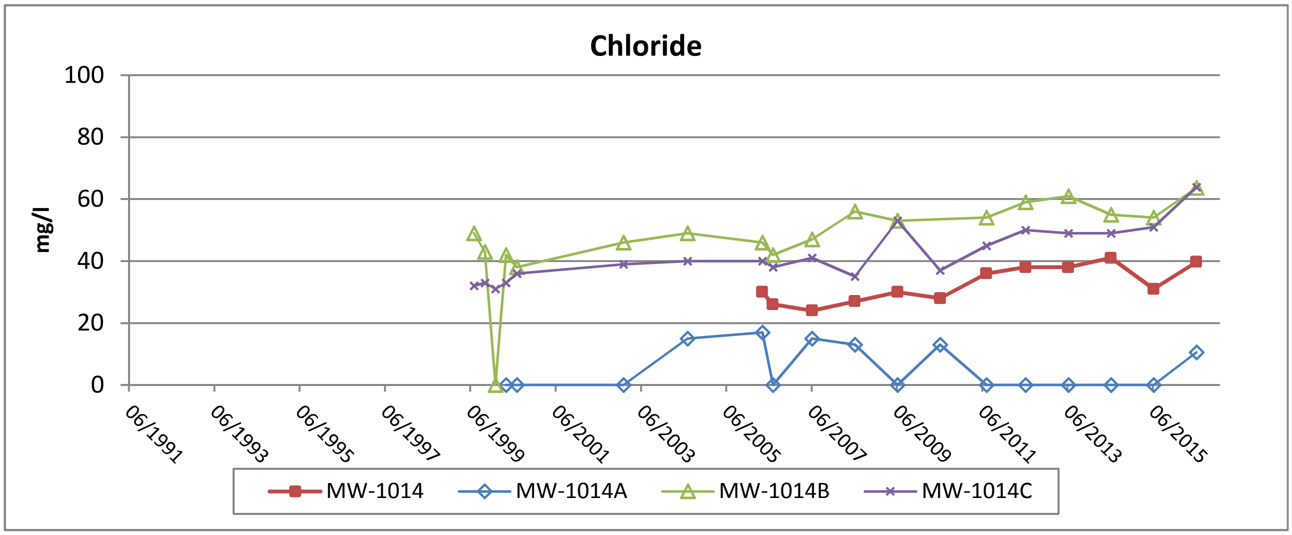
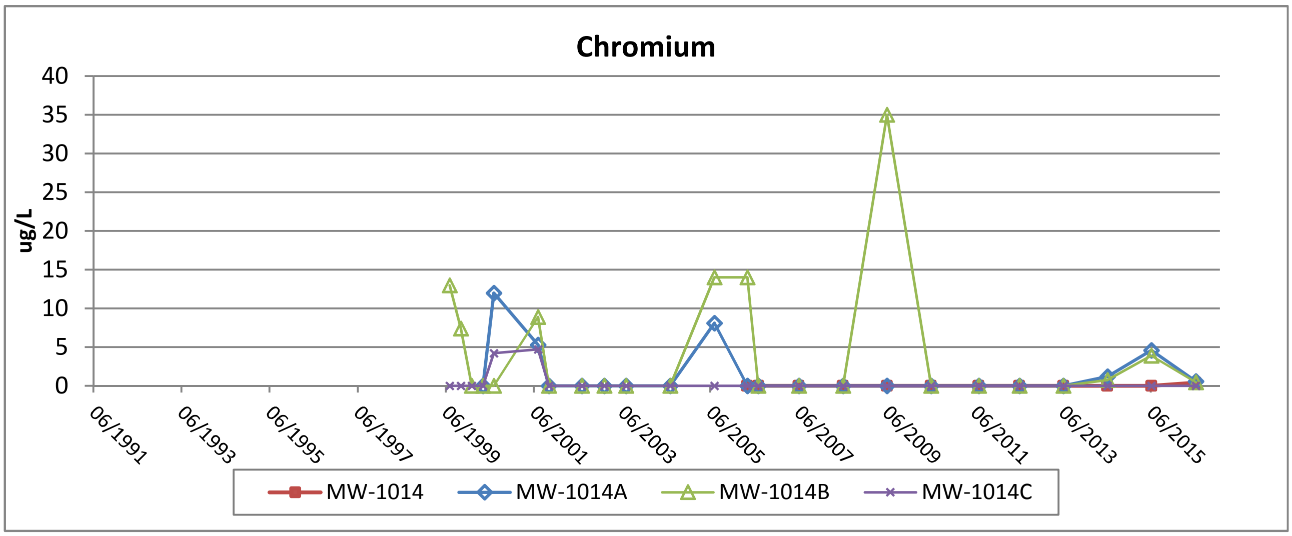
Figure B-14a

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



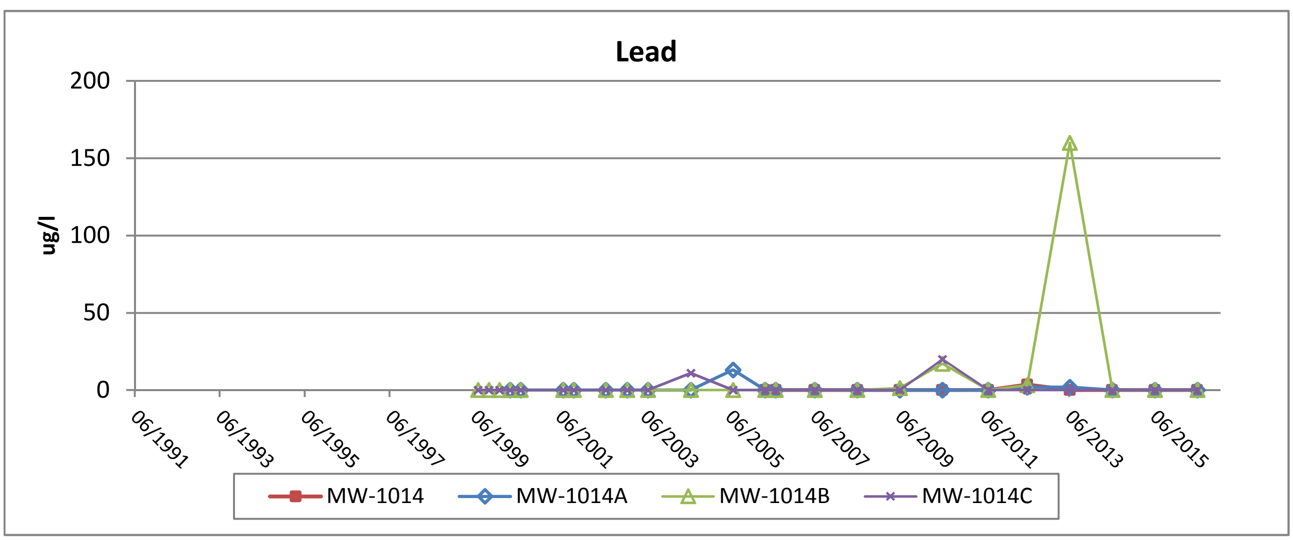




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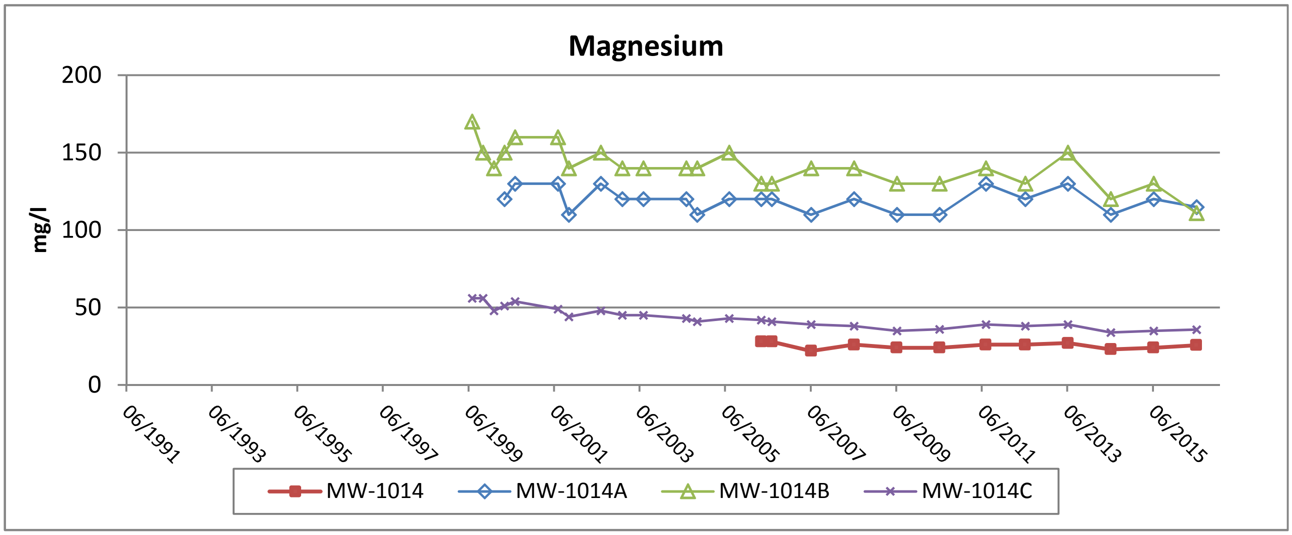
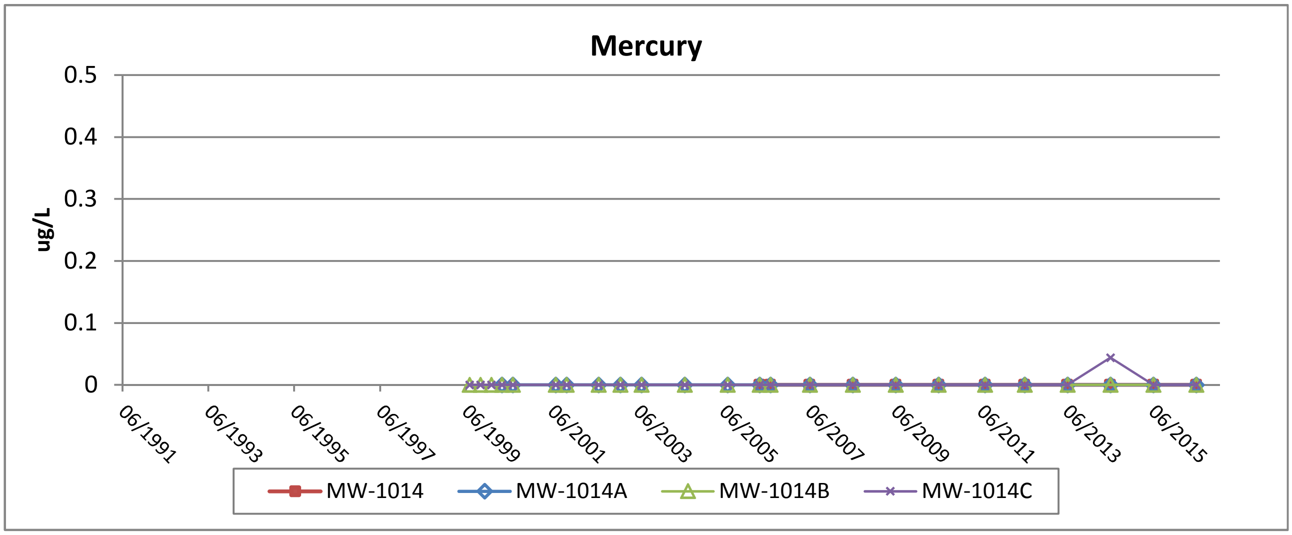
Figure B-14b

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



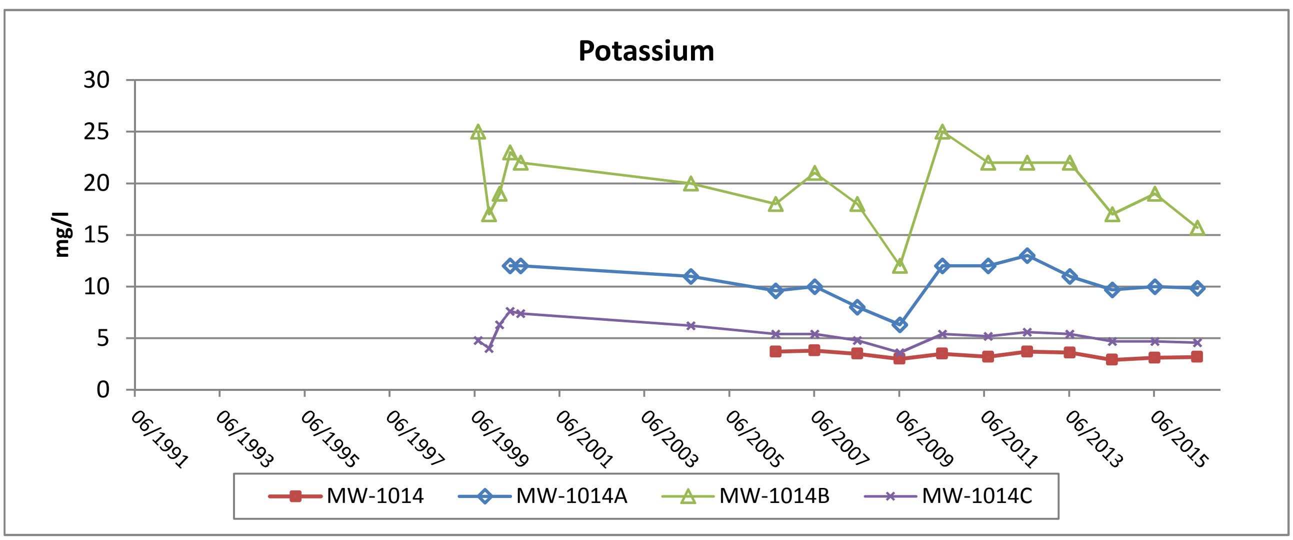




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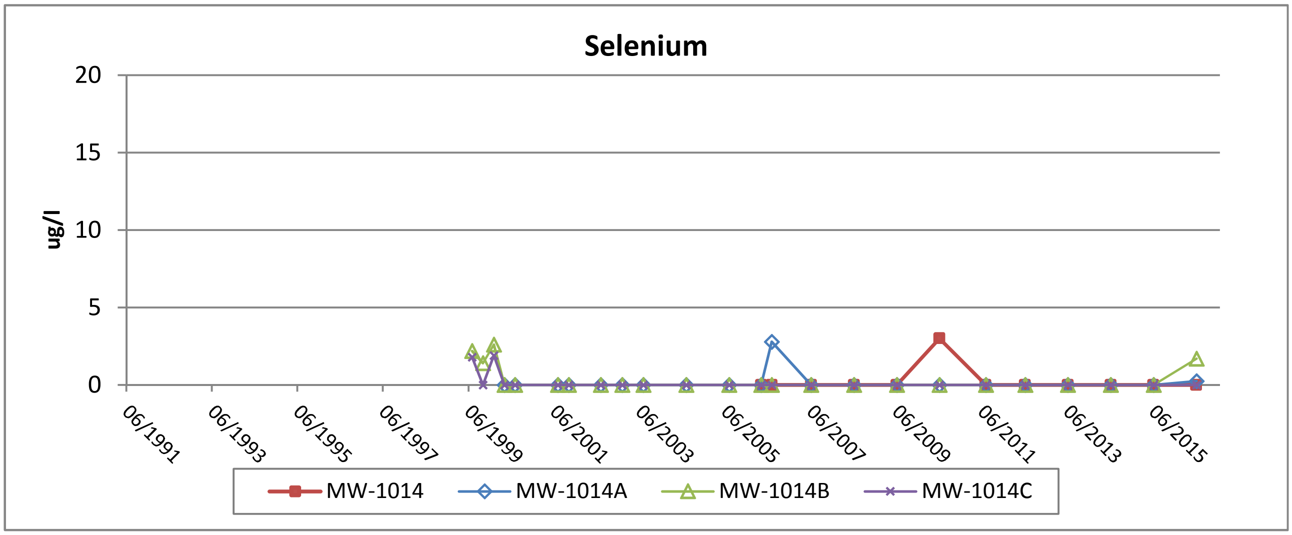
Figure B-14c

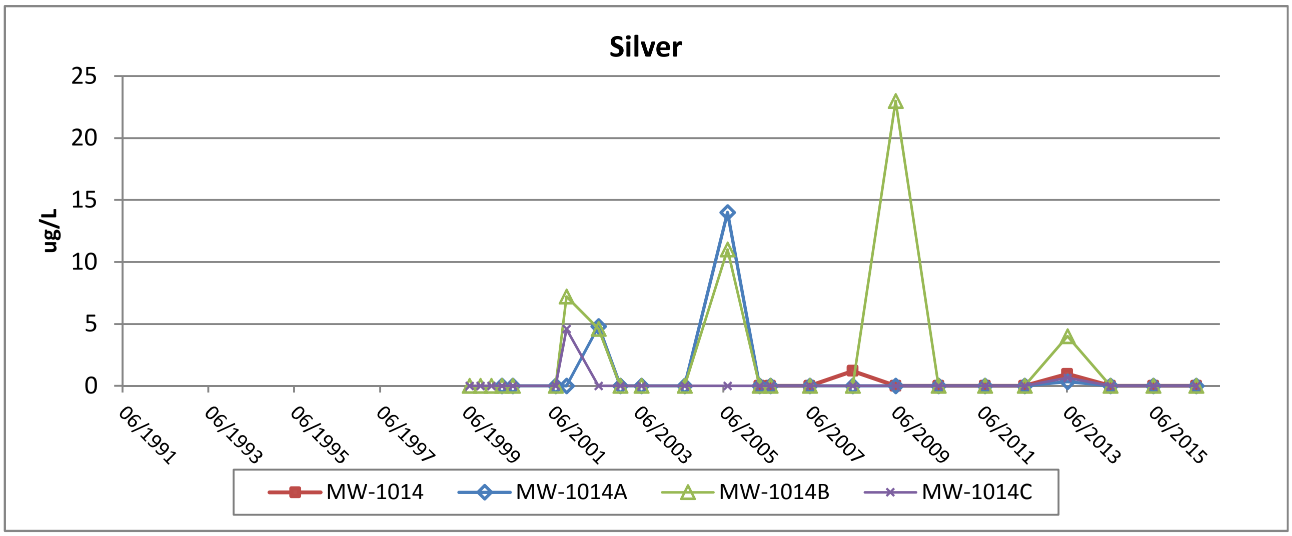
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |



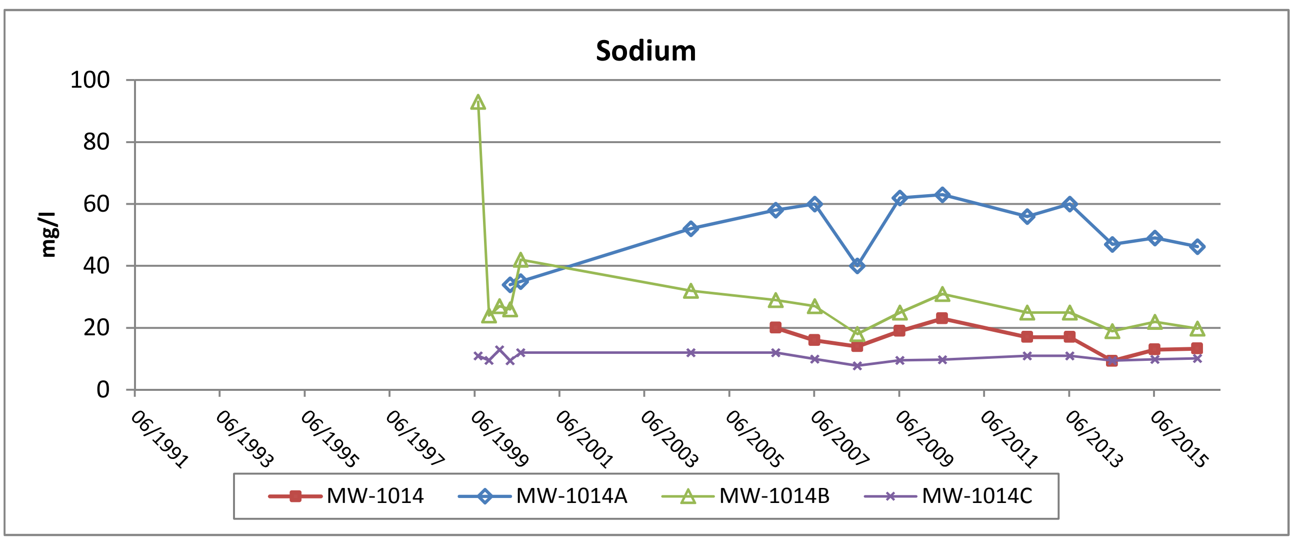




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Figure B-14d

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

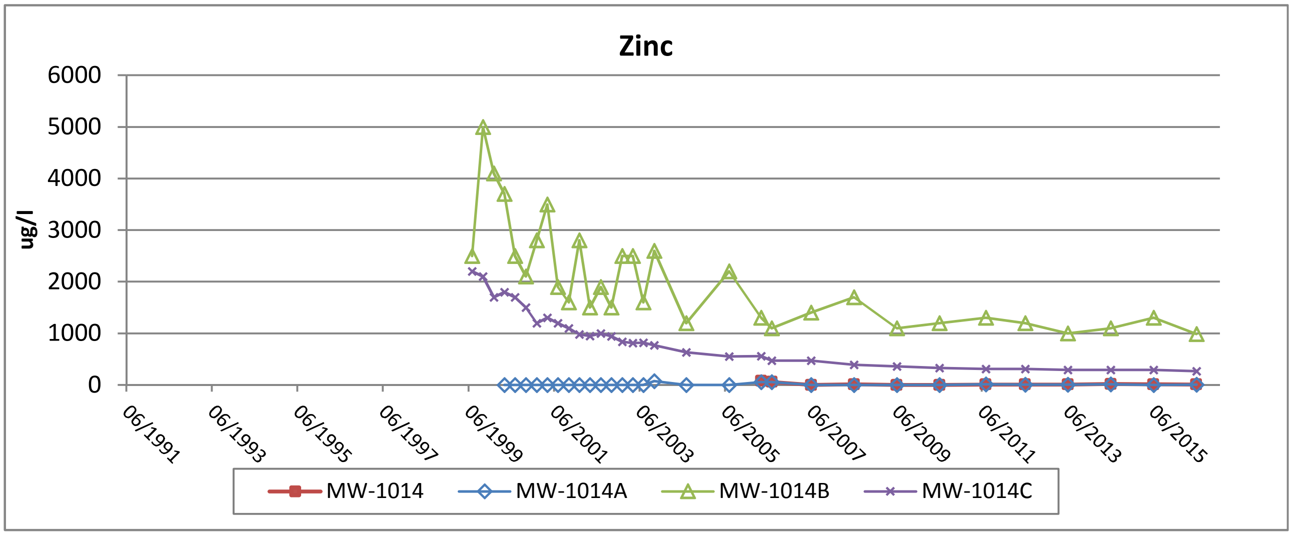


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Figure B-14e

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999-07 | MW-1000PR | | < 50 | 28 | 220 | 10 | < 4.2 | < 14 | 61 | < 0.05 | 2.6 | < 1.3 | < 4.5 | 10 | 890 |
| 1999-07 | MW-1000PR | Dup. | < 50 | < 21 | 220 | 10 | < 4.2 | < 14 | 62 | < 0.05 | 2.8 | 1.6 | < 4.5 | 10 | 880 |
| 1999-07 | MW-1002 | | 6.7 | 2.6 | 15 | 2 | 1 | < 1.4 | 4.9 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 2.8 | < 12 |
| 1999-07 | MW-1002G | | 24 | 3.5 | 25 | 9.7 | < 0.42 | < 1.4 | 9.5 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 4.7 | < 12 |
| 1999-07 | MW-1004P | | 40 | < 2.1 | 34 | < 1.7 | 0.58 | < 1.4 | 15 | < 0.05 | 3.6 | < 1.3 | < 0.45 | 6.1 | < 12 |
| 1999-07 | MW-1004S | | < 5 | < 2.1 | 15 | 4.4 | < 0.42 | < 1.4 | 5.6 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 3.6 | < 12 |
| 1999-07 | MW-1005 | | 92 | < 2.1 | 45 | 240 | 1.5 | < 1.4 | 23 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 13 | < 12 |
| 1999-07 | MW-1005P | | 65 | < 2.1 | 52 | 3.5 | < 0.42 | < 1.4 | 21 | < 0.05 | 8.1 | < 1.3 | < 0.45 | 9 | < 12 |
| 1999-07 | MW-1005S | | 39 | < 2.1 | 38 | < 1.7 | 0.57 | < 1.4 | 13 | < 0.05 | 2.1 | < 1.3 | < 0.45 | 5.6 | < 12 |
| 1999-07 | MW-1010P | | 38 | < 2.1 | 39 | 2.9 | < 0.42 | < 1.4 | 11 | < 0.05 | 1.8 | < 1.3 | < 0.45 | 5.1 | < 12 |
| 1999-07 | MW-1013B | | < 50 | < 21 | 630 | 35 | 16 | < 14 | 150 | < 0.05 | 8.2 | 1.7 | < 4.5 | 35 | < 120 |
| 1999-07 | MW-1013C | | < 50 | < 21 | 570 | 50 | < 4.2 | < 14 | 160 | < 0.05 | 23 | 3 | < 4.5 | 35 | 670 |
| 1999-07 | MW-1014B | | < 50 | 31 | 580 | 49 | 13 | < 14 | 170 | < 0.05 | 25 | 2.2 | < 45 | 93 | 2500 |
| 1999-07 | MW-1014C | | < 50 | < 21 | 280 | 32 | < 4.2 | < 14 | 56 | < 0.05 | 4.8 | 1.8 | < 45 | 11 | 2200 |
| 1999-10 | MW-1000PR | | 43 | < 2.1 | 210 | 11 | 2.6 | < 2.9 | 56 | < 0.05 | 2.9 | < 1.3 | < 0.9 | 7.9 | 730 |
| 1999-10 | MW-1004P | | 41 | 0.22 | 33 | < 1.7 | 0.53 | < 1.4 | 13 | < 0.05 | 5.9 | < 1.3 | < 0.45 | 5.8 | < 12 |
| 1999-10 | MW-1004S | | < 5 | 0.38 | 15 | 4.4 | 0.88 | < 1.4 | 4.9 | < 0.05 | 1.1 | < 1.3 | < 0.45 | 7.7 | < 12 |
| 1999-10 | MW-1010P | | 40 | 0.29 | 38 | 3.1 | < 0.42 | < 1.4 | 9.8 | < 0.05 | 2.7 | < 1.3 | < 0.45 | 4.7 | < 12 |
| 1999-10 | MW-1010P | Dup. | 41 | < 0.21 | 40 | 2.6 | < 0.42 | < 1.4 | 10 | < 0.05 | 2.6 | < 1.3 | < 0.45 | 3.7 | < 12 |
| 1999-10 | MW-1013B | | < 50 | < 4.2 | 650 | 35 | 14 | < 14 | 150 | < 0.05 | 5.9 | < 1.3 | < 4.5 | 26 | < 120 |
| 1999-10 | MW-1013C | | < 50 | < 4.2 | 610 | 50 | 7.2 | < 14 | 170 | < 0.05 | 26 | < 1.3 | < 4.5 | 29 | 660 |
| 1999-10 | MW-1014B | | < 50 | 10 | 640 | 43 | 7.4 | < 14 | 150 | < 0.05 | 17 | 1.4 | < 4.5 | 24 | 5000 |
| 1999-10 | MW-1014C | | < 50 | < 4.2 | 290 | 33 | < 4.2 | < 14 | 56 | < 0.05 | 4 | < 1.3 | < 4.5 | 9.6 | 2100 |
| 2000-01 | MW-1013B | | < 50 | < 2.1 | 600 | 28 | 18 | < 14 | 150 | < 0.05 | 6.4 | < 1.3 | < 4.5 | 33 | < 120 |
| 2000-01 | MW-1013C | | < 50 | 2.1 | 550 | 58 | < 4.2 | < 14 | 170 | < 0.05 | 23 | < 1.3 | 5.2 | 39 | 630 |
| 2000-01 | MW-1014B | | < 50 | 10 | 550 | < 100 | < 4.2 | < 14 | 140 | < 0.05 | 19 | 2.6 | < 4.5 | 27 | 4100 |
| 2000-01 | MW-1014C | | 25 | < 0.21 | 250 | 31 | < 0.42 | < 1.4 | 48 | < 0.05 | 6.3 | 1.9 | < 0.45 | 13 | 1700 |
| 2000-01 | MW-1014C | Dup. | 25 | < 0.21 | 230 | 30 | 2 | 2 | 46 | < 0.05 | 6.3 | 1.6 | < 0.45 | 11 | 1600 |
| 2000-04 | MW-1013B | | < 50 | < 3.1 | 630 | 35 | < 6.2 | < 24 | 150 | < 0.05 | 8.5 | < 7.8 | < 4.7 | 27 | < 120 |
| 2000-04 | MW-1013C | | < 50 | < 3.1 | 590 | 50 | < 6.2 | < 24 | 170 | < 0.05 | 25 | < 7.8 | < 4.7 | 34 | 610 |
| 2000-04 | MW-1014A | | 59 | < 3.1 | 330 | < 50 | < 6.2 | < 24 | 120 | < 0.05 | 12 | < 7.8 | < 4.7 | 34 | < 120 |
| 2000-04 | MW-1014B | | < 50 | 10 | 600 | 42 | < 6.2 | < 24 | 150 | < 0.05 | 23 | < 7.8 | < 4.7 | 26 | 3700 |
| 2000-04 | MW-1014C | | < 50 | < 3.1 | 260 | 33 | < 6.2 | < 24 | 51 | < 0.05 | 7.6 | < 7.8 | < 4.7 | 9.4 | 1800 |
| 2000-07 | MW-1000PR | | 38 | < 1 | | | < 3.7 | < 7.2 | | < 0.05 | | < 1.6 | < 2.7 | | 620 |
| 2000-07 | MW-1002 | | 7.3 | < 0.21 | | | 0.77 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1002G | | 27 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | 1.9 | < 0.55 | | < 12 |
| 2000-07 | MW-1004P | | 43 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1004S | | < 5 | < 0.21 | | | 1 | < 1.4 | | < 0.05 | | 1.7 | < 0.55 | | < 12 |
| 2000-07 | MW-1005 | | 94 | < 0.21 | | | 1.1 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1005P | | 70 | 0.28 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1005S | | 46 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1010P | | 39 | < 1 | | | < 3.7 | < 7.2 | | < 0.05 | | 1.8 | < 2.7 | | < 60 |
| 2000-07 | MW-1010P | Dup. | 39 | 0.69 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1013B | | < 50 | < 2.3 | 670 | < 40 | 5.1 | < 9.6 | 160 | < 0.05 | 7.2 | < 17 | < 5.5 | 34 | < 120 |
| 2000-07 | MW-1013C | | < 50 | < 2.3 | 620 | 56 | < 4 | < 9.6 | 180 | < 0.05 | 24 | < 17 | < 5.5 | 45 | 620 |
| 2000-07 | MW-1014A | | 58 | < 2.3 | 360 | < 25 | 12 | < 9.6 | 130 | < 0.05 | 12 | < 17 | < 5.5 | 35 | < 120 |
| 2000-07 | MW-1014B | | < 50 | 8.9 | 600 | 38 | < 4 | < 9.6 | 160 | < 0.05 | 22 | < 17 | < 5.5 | 42 | 2500 |
| 2000-07 | MW-1014C | | < 50 | < 2.3 | 270 | 36 | 4.2 | < 9.6 | 54 | < 0.05 | 7.4 | < 17 | < 5.5 | 12 | 1700 |
| 2000-10 | MW-1000PR | | | | | | | | | | | | | | 900 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000-10 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004P | Dup. | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2000-10 | MW-1013C | | | | | | | | | | | | | | 370 |
| 2000-10 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2000-10 | MW-1014B | | | | | | | | | | | | | | 2100 |
| 2000-10 | MW-1014C | | | | | | | | | | | | | | 1500 |
| 2001-01 | MW-1000PR | | | | | | | | | | | | | | 810 |
| 2001-01 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2001-01 | MW-1013C | | | | | | | | | | | | | | 480 |
| 2001-01 | MW-1013C | Dup. | | | | | | | | | | | | | 470 |
| 2001-01 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2001-01 | MW-1014B | | | | | | | | | | | | | | 2800 |
| 2001-01 | MW-1014C | | | | | | | | | | | | | | 1200 |
| 2001-04 | MW-1000PR | | | | | | | | | | | | | | 600 |
| 2001-04 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1002G | Dup. | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2001-04 | MW-1013C | | | | | | | | | | | | | | 330 |
| 2001-04 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2001-04 | MW-1014B | | | | | | | | | | | | | | 3500 |
| 2001-04 | MW-1014C | | | | | | | | | | | | | | 1300 |
| 2001-04 | MW-1015A | | 22 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-04 | MW-1015B | | 51 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-05 | MW-1015A | | 19 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-05 | MW-1015B | | 48 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-06 | MW-1015A | | 18 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-06 | MW-1015B | | 46 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1000PR | | 36 | < 1.1 | 190 | | < 2.9 | < 4.6 | 47 | < 0.05 | | < 1.6 | < 2.8 | | 860 |
| 2001-07 | MW-1002 | | 7.7 | < 0.23 | | | 1.4 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1002G | | 26 | < 0.23 | | | 0.81 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | 19 |
| 2001-07 | MW-1004P | | 41 | < 0.23 | 35 | | < 0.57 | < 0.92 | 14 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1004S | | < 5 | < 0.23 | 16 | | 1.4 | < 0.92 | 5.1 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005 | | 82 | < 0.23 | | | 1.9 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005P | | 69 | 0.4 | 56 | | 0.58 | < 0.92 | 22 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005P | Dup. | 68 | < 0.23 | 56 | | < 0.57 | < 0.92 | 22 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005S | | 45 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1010P | | 42 | 0.28 | 42 | | < 0.57 | < 0.92 | 11 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1013B | | < 50 | 3.2 | 700 | | 6.4 | < 7.9 | 160 | < 0.05 | | < 10 | 6.5 | | 130 |
| 2001-07 | MW-1013C | | < 50 | < 1.7 | 630 | | < 3.4 | < 7.9 | 180 | < 0.05 | | < 10 | < 3.1 | | 570 |
| 2001-07 | MW-1014A | | < 50 | < 1.7 | 370 | | 5.3 | < 7.9 | 130 | < 0.05 | | < 10 | < 3.1 | | < 120 |
| 2001-07 | MW-1014B | | < 50 | 6.2 | 600 | | 8.9 | < 7.9 | 160 | < 0.05 | | < 10 | < 3.1 | | 1900 |
| 2001-07 | MW-1014C | | < 50 | < 1.7 | 240 | | 4.7 | < 7.9 | 49 | < 0.05 | | < 10 | < 3.1 | | 1200 |
| 2001-07 | MW-1015A | | 17 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1015B | | 47 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-08 | MW-1015A | | 17 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | 0.99 | | < 12 |
| 2001-08 | MW-1015B | | 48 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-09 | MW-1015A | | 15 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-09 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1000PR | | 32 | < 1.1 | 160 | | < 2.9 | < 4.6 | 40 | < 0.05 | | < 1.6 | < 2.8 | | 440 |
| 2001-10 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1004P | | 39 | < 0.23 | 31 | | < 0.57 | < 0.92 | 12 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1004S | | < 5 | < 0.23 | 13 | | 0.83 | < 0.92 | 4.4 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1004S | Dup. | < 5 | < 0.23 | 13 | | 0.68 | < 0.92 | 4.3 | < 0.05 | | 2.2 | < 0.56 | | < 12 |
| 2001-10 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1010P | | 33 | < 0.23 | 35 | | < 0.57 | < 0.92 | 8.4 | < 0.05 | | 1.7 | < 0.56 | | < 12 |
| 2001-10 | MW-1013B | | < 50 | < 1.7 | 600 | | 4.8 | < 7.9 | 130 | < 0.05 | | < 16 | 6 | | 130 |
| 2001-10 | MW-1013C | | < 50 | < 1.7 | 550 | | < 3.4 | < 7.9 | 160 | < 0.05 | | < 16 | 6.8 | | 510 |
| 2001-10 | MW-1014A | | < 50 | < 1.7 | 330 | | < 3.4 | < 7.9 | 110 | < 0.05 | | < 16 | < 3.1 | | < 120 |
| 2001-10 | MW-1014B | | < 50 | 4.3 | 530 | | < 3.4 | < 7.9 | 140 | < 0.05 | | < 16 | 7.2 | | 1600 |
| 2001-10 | MW-1014C | | < 50 | < 1.7 | 210 | | < 3.4 | < 7.9 | 44 | < 0.05 | | < 1.6 | 4.6 | | 1100 |
| 2001-10 | MW-1015A | | 14 | < 0.23 | 19 | | < 0.57 | < 0.92 | 7.4 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1015B | | 41 | < 0.23 | 30 | | < 0.57 | < 0.92 | 12 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-11 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-11 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-12 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-12 | MW-1015B | | 44 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-01 | MW-1000PR | | | | | | | | | | | | | | 690 |
| 2002-01 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004P | Dup. | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004S | | | | | | | | | | | | | | < 12 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-01 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2002-01 | MW-1013C | | | | | | | | | | | | | | 500 |
| 2002-01 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-01 | MW-1014B | | | | | | | | | | | | | | 2800 |
| 2002-01 | MW-1014C | | | | | | | | | | | | | | 980 |
| 2002-01 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-01 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-02 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-02 | MW-1015B | | 44 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-03 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-03 | MW-1015B | | 46 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-04 | MW-1000PR | | | | | | | | | | | | | | 410 |
| 2002-04 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1002 | Dup. | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2002-04 | MW-1013C | | | | | | | | | | | | | | 360 |
| 2002-04 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-04 | MW-1014B | | | | | | | | | | | | | | 1500 |
| 2002-04 | MW-1014C | | | | | | | | | | | | | | 950 |
| 2002-04 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2002-07 | MW-1000PR | | 40 | < 1.1 | 170 | | < 2.2 | < 9.2 | 44 | < 0.05 | | < 2.5 | 3.1 | | 640 |
| 2002-07 | MW-1002 | | 7.8 | < 0.23 | 17 | | 0.79 | < 0.92 | 5.6 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1002G | | 27 | < 0.23 | 27 | | < 0.44 | < 0.92 | 10 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1004P | | 40 | < 0.23 | 33 | | < 0.44 | < 0.92 | 13 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1004S | | < 5 | < 0.23 | 16 | | 0.59 | < 0.92 | 5.4 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005 | | 88 | < 0.23 | 41 | | 0.87 | < 0.92 | 20 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005P | | 70 | < 0.23 | 51 | | < 0.44 | < 0.92 | 21 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005S | | 44 | < 0.23 | 40 | | < 0.44 | < 0.92 | 14 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1010P | | 38 | < 0.23 | 39 | | < 0.44 | < 0.92 | 9.9 | < 0.05 | | < 2.5 | 0.55 | | < 10 |
| 2002-07 | MW-1013B | | < 50 | < 1.7 | 670 | | < 4.5 | < 7.4 | 160 | < 0.05 | | < 15 | 4.3 | | 130 |
| 2002-07 | MW-1013C | | < 50 | < 1.7 | 620 | | < 4.5 | < 7.4 | 190 | < 0.05 | | < 15 | < 4.3 | | 440 |
| 2002-07 | MW-1014A | | < 50 | < 1.7 | 350 | | < 4.5 | < 7.4 | 130 | < 0.05 | | < 15 | 4.8 | | < 120 |
| 2002-07 | MW-1014A | Dup. | < 50 | < 1.7 | 370 | | < 4.5 | < 7.4 | 130 | < 0.05 | | < 15 | < 4.3 | | < 120 |
| 2002-07 | MW-1014B | | < 50 | 4.7 | 570 | | < 4.5 | < 7.4 | 150 | < 0.05 | | < 15 | 4.6 | | 1900 |
| 2002-07 | MW-1014C | | < 50 | < 1.7 | 220 | | < 4.5 | < 7.4 | 48 | < 0.05 | | < 15 | < 4.3 | | 1000 |
| 2002-07 | MW-1015A | | 12 | < 0.23 | 21 | | < 0.44 | < 0.92 | 8.6 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1015B | | 44 | < 0.23 | 33 | | < 0.44 | < 0.92 | 14 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-10 | MW-1000PR | | | | | | | | | | | | | | 690 |
| 2002-10 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005 | Dup. | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1013B | | | | | | | | | | | | | | 130 |
| 2002-10 | MW-1013C | | | | | | | | | | | | | | 480 |
| 2002-10 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-10 | MW-1014B | | | | | | | | | | | | | | 1500 |
| 2002-10 | MW-1014C | | | | | | | | | | | | | | 940 |
| 2002-10 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1000PR | | 42 | < 1.1 | 170 | 16 | < 2.2 | < 9.2 | 41 | < 0.05 | | < 13 | < 2.4 | | 700 |
| 2003-01 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1010P | | 36 | < 0.23 | 39 | < 5 | < 0.44 | < 0.92 | 9.8 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2003-01 | MW-1013B | | < 50 | 2.4 | 640 | < 50 | < 4.5 | < 7.4 | 150 | < 0.05 | | < 30 | 5.8 | | 130 |
| 2003-01 | MW-1013C | | < 50 | < 1.7 | 600 | 53 | < 4.5 | < 7.4 | 180 | < 0.05 | | < 30 | 5.7 | | 440 |
| 2003-01 | MW-1014A | | < 50 | < 1.7 | 350 | < 20 | < 4.5 | < 7.4 | 120 | < 0.05 | | < 30 | < 4.3 | | < 120 |
| 2003-01 | MW-1014B | | < 50 | 6.9 | 580 | 46 | < 4.5 | < 74 | 140 | < 0.05 | | < 30 | < 4.3 | | 2500 |
| 2003-01 | MW-1014C | | < 50 | < 1.7 | 210 | 39 | < 4.5 | < 7.4 | 45 | < 0.05 | | < 30 | < 4.3 | | 840 |
| 2003-01 | MW-1014C | Dup. | < 50 | < 1.7 | 200 | 42 | < 4.5 | < 7.4 | 45 | < 0.05 | | < 30 | < 4.3 | | 860 |
| 2003-01 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1000PR | | | | | | | | | | | | | | 680 |
| 2003-04 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1013B | | | | | | | | | | | | | | 130 |
| 2003-04 | MW-1013C | | | | | | | | | | | | | | 310 |
| 2003-04 | MW-1014A | | | | | | | | | | | | | | < 100 |
| 2003-04 | MW-1014B | | | | | | | | | | | | | | 2500 |
| 2003-04 | MW-1014C | | | | | | | | | | | | | | 810 |
| 2003-04 | MW-1015A | | | | | | | | | | | | | | < 10 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003-04 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1015B | Dup. | | | | | | | | | | | | | < 10 |
| 2003-07 | MW-1000PR | | 42 | < 0.85 | 170 | | < 2.2 | < 4.7 | 40 | < 0.025 | | < 2 | < 2 | | 730 |
| 2003-07 | MW-1002 | | 7.6 | < 0.17 | 17 | | 0.96 | < 0.94 | 5.5 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1002G | | 27 | < 0.17 | 27 | | 0.6 | < 0.94 | 10 | < 0.025 | | 2.1 | < 0.4 | | < 5 |
| 2003-07 | MW-1004P | | 43 | < 0.17 | 35 | | < 0.43 | < 0.94 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1004S | | 4.3 | < 0.17 | 18 | | 0.88 | < 0.94 | 5.9 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1005 | | 150 | < 0.85 | 80 | | < 0.43 | < 0.94 | 37 | < 0.025 | | < 2 | < 2 | | < 5 |
| 2003-07 | MW-1005P | | 67 | < 0.17 | 55 | | < 0.43 | < 0.94 | 22 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1005S | | 42 | < 0.17 | 41 | | < 0.43 | < 0.94 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1010P | | 39 | < 0.17 | 42 | | 0.5 | < 0.94 | 10 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1013B | | < 25 | < 2.1 | 660 | | < 6.4 | < 10 | 150 | < 0.025 | | < 2.7 | < 7.7 | | 140 |
| 2003-07 | MW-1013B | Dup. | < 25 | < 2.1 | 660 | | < 6.4 | < 10 | 150 | < 0.025 | | < 2.7 | < 7.7 | | 130 |
| 2003-07 | MW-1013C | | < 25 | < 2.1 | 610 | | < 6.4 | < 10 | 180 | < 0.025 | | < 27 | < 7.7 | | 320 |
| 2003-07 | MW-1014A | | 27 | < 2.1 | 340 | | < 6.4 | < 10 | 120 | < 0.025 | | < 2.7 | < 7.7 | | < 50 |
| 2003-07 | MW-1014B | | < 25 | 4.2 | 530 | | < 6.4 | < 10 | 140 | < 0.025 | | < 2.7 | < 7.7 | | 1600 |
| 2003-07 | MW-1014C | | 26 | < 2.1 | 210 | | < 6.4 | < 10 | 45 | < 0.025 | | < 13 | < 7.7 | | 820 |
| 2003-07 | MW-1015A | | 9.8 | < 0.17 | 22 | | < 0.43 | < 0.94 | 8.6 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1015B | | 45 | < 0.17 | 34 | | < 0.43 | < 4.7 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-10 | MW-1000PR | | | | | | | | | | | | | | 700 |
| 2003-10 | MW-1002 | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1002G | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1004P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1004S | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005 | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005S | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1010P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1013B | | | | | | | | | | | | | | 140 |
| 2003-10 | MW-1013B | Dup. | | | | | | | | | | | | | 150 |
| 2003-10 | MW-1013C | | | | | | | | | | | | | | 400 |
| 2003-10 | MW-1014A | | | | | | | | | | | | | | 77 |
| 2003-10 | MW-1014B | | | | | | | | | | | | | | 2600 |
| 2003-10 | MW-1014C | | | | | | | | | | | | | | 770 |
| 2003-10 | MW-1015A | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1015B | | | | | | | | | | | | | | < 5 |
| 2004-04 | MW-1000PR | RD | 43 | 0.3 | 151 | 17.3 | < 1 | < 1 | 39.7 | < 0.03 | | < 1 | < 0.1 | | 623 |
| 2004-04 | MW-1010P | RD | 33 | 0.06 | 40.9 | 3.2 | < 1 | < 1 | 10.4 | < 0.03 | | < 1 | < 0.1 | | < 16 |
| 2004-04 | MW-1013C | RD | 15 | 0.1 | 576 | 52.4 | 5.4 | < 1 | 180 | < 0.03 | | < 1 | 0.3 | | 454 |
| 2004-04 | MW-1014A | RD | 20 | 1.05 | 331 | 10.9 | 1.5 | < 1 | 119 | < 0.03 | | < 1 | < 0.1 | | < 16 |
| 2004-04 | MW-1014B | RD | 15 | 4.39 | 538 | 39 | 4.3 | < 1 | 139 | < 0.03 | | < 1 | < 0.1 | | 1470 |
| 2004-04 | MW-1014C | RD | 26 | < 0.05 | 185 | 38.2 | < 1 | < 1 | 47.3 | < 0.03 | | < 1 | < 0.1 | | 638 |
| 2004-07 | MW-1000PR | | 41 | < 0.8 | 150 | 18 | < 2.3 | < 5.2 | 37 | < 0.025 | 3.9 | < 2.1 | < 3.4 | 9.3 | 830 |
| 2004-07 | MW-1002 | | 7.1 | < 0.16 | 16 | 3.2 | 1.1 | < 1 | 5 | < 0.025 | 0.81 | < 2.1 | < 0.67 | 3.2 | < 5 |
| 2004-07 | MW-1002G | | 27 | < 0.16 | 27 | 11 | < 0.45 | < 1 | 9.9 | < 0.025 | 1.1 | < 2.1 | < 0.67 | 5.4 | < 5 |
| 2004-07 | MW-1004P | | 45 | < 0.16 | 35 | < 2.5 | < 0.45 | < 1 | 14 | < 0.025 | 5.8 | < 2.1 | < 0.67 | 7.2 | < 5 |
| 2004-07 | MW-1004S | | 4.8 | < 0.16 | 18 | 6.5 | 1.2 | < 1 | 6.1 | < 0.025 | 0.96 | < 2.1 | < 0.67 | 4.9 | < 5 |
| 2004-07 | MW-1005 | | 130 | < 0.16 | 63 | 210 | < 0.45 | < 1 | 30 | < 0.025 | 0.78 | < 2.1 | < 0.67 | 17 | < 5 |
| 2004-07 | MW-1005P | | 69 | < 0.16 | 54 | 4.2 | < 0.45 | < 1 | 21 | < 0.025 | 8.7 | < 2.1 | < 0.67 | 7.4 | < 5 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-07 | MW-1005S | | 44 | < 0.16 | 40 | 2.6 | < 0.45 | < 1 | 14 | < 0.025 | 3.1 | < 2.1 | < 0.67 | 7 | < 5 |
| 2004-07 | MW-1010P | | 46 | < 0.16 | 44 | 4.3 | < 0.45 | < 1 | 11 | < 0.025 | 2.6 | < 2.1 | < 0.67 | 5.3 | < 5 |
| 2004-07 | MW-1013B | | < 25 | < 1.7 | 640 | 47 | < 5.1 | 20 | 150 | < 0.025 | 6.8 | < 8 | < 6.7 | 31 | 150 |
| 2004-07 | MW-1013C | | < 25 | < 1.7 | 600 | 57 | < 5.1 | < 8.7 | 180 | < 0.025 | 26 | < 16 | < 6.7 | 42 | 460 |
| 2004-07 | MW-1013C | Dup. | < 25 | < 1.7 | 590 | 61 | < 5.1 | 14 | 180 | < 0.025 | 25 | < 8 | < 6.7 | 41 | 460 |
| 2004-07 | MW-1014A | | 25 | < 1.7 | 340 | 15 | < 5.1 | < 8.7 | 120 | < 0.025 | 11 | < 8 | < 6.7 | 52 | < 50 |
| 2004-07 | MW-1014B | | < 25 | 2.9 | 530 | 49 | < 5.1 | < 8.7 | 140 | < 0.025 | 20 | < 8 | < 6.7 | 32 | 1200 |
| 2004-07 | MW-1014C | | 27 | < 1.7 | 190 | 40 | < 5.1 | 11 | 43 | < 0.025 | 6.2 | < 8 | < 6.7 | 12 | 630 |
| 2004-07 | MW-1015A | | 9.2 | < 0.16 | 21 | 5.8 | < 0.45 | < 1 | 8.5 | < 0.025 | 0.94 | < 2.1 | < 0.67 | 3.4 | < 5 |
| 2004-07 | MW-1015B | | 44 | < 0.16 | 33 | 51 | < 0.45 | < 1 | 14 | < 0.13 | 5.9 | < 2.1 | < 0.67 | 39 | < 5 |
| 2004-10 | MW-1000PR | | | | 140 | | | | 35 | | | | | | |
| 2004-10 | MW-1002 | | | | 15 | | | | 4.6 | | | | | | |
| 2004-10 | MW-1002G | | | | 24 | | | | 9 | | | | | | |
| 2004-10 | MW-1004P | | | | 33 | | | | 13 | | | | | | |
| 2004-10 | MW-1004S | | | | 17 | | | | 5.6 | | | | | | |
| 2004-10 | MW-1005 | | | | 60 | | | | 29 | | | | | | |
| 2004-10 | MW-1005P | | | | 51 | | | | 20 | | | | | | |
| 2004-10 | MW-1005S | | | | 38 | | | | 13 | | | | | | |
| 2004-10 | MW-1010P | | | | 42 | | | | 11 | | | | | | |
| 2004-10 | MW-1013B | | | | 640 | | | | 140 | | | | | | |
| 2004-10 | MW-1013C | | | | 580 | | | | 170 | | | | | | |
| 2004-10 | MW-1014A | | | | 320 | | | | 110 | | | | | | |
| 2004-10 | MW-1014B | | | | 560 | | | | 140 | | | | | | |
| 2004-10 | MW-1014C | | | | 180 | | | | 41 | | | | | | |
| 2004-10 | MW-1015A | | | | 20 | | | | 8 | | | | | | |
| 2004-10 | MW-1015B | | | | 32 | | | | 13 | | | | | | |
| 2004-10 | MW-1015B | Dup. | | | 32 | | | | 13 | | | | | | |
| 2005-07 | MW-1000PR | | 44 | < 0.17 | 160 | | 1.2 | < 1.2 | 40 | < 0.025 | | < 2 | 1.4 | | 650 |
| 2005-07 | MW-1002 | | 6.2 | < 0.17 | 14 | | 1.2 | < 1.2 | 4.6 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1002G | | 26 | < 0.17 | 27 | | < 0.55 | < 1.2 | 10 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004P | | 42 | < 0.17 | 36 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004S | | 4.9 | < 0.17 | 20 | | < 0.55 | < 1.2 | 6.9 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004S | Dup. | 4.8 | < 0.17 | 20 | | 1.3 | < 1.2 | 6.9 | < 0.025 | | < 2 | 0.95 | | < 5 |
| 2005-07 | MW-1005 | | 77 | 0.44 | 40 | | 1.5 | < 1.2 | 20 | < 0.025 | | < 2 | 1.2 | | < 5 |
| 2005-07 | MW-1005P | | 69 | < 0.17 | 57 | | < 0.55 | < 1.2 | 23 | < 0.025 | | < 2 | < 0.47 | | 7.1 |
| 2005-07 | MW-1005S | | 44 | < 0.17 | 42 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1010P | | 42 | < 0.17 | 46 | | < 0.55 | < 1.2 | 11 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1013B | | < 25 | < 1.7 | 690 | | < 4.5 | < 10 | 150 | < 0.025 | | < 1.9 | < 6.7 | | 200 |
| 2005-07 | MW-1013C | | < 25 | < 1.7 | 630 | | 32 | < 10 | 190 | < 0.025 | | < 1.9 | < 6.7 | | 460 |
| 2005-07 | MW-1014A | | < 25 | < 1.7 | 340 | | 8.1 | 13 | 120 | < 0.025 | | < 7.4 | 14 | | < 50 |
| 2005-07 | MW-1014B | | < 25 | 2.8 | 610 | | 14 | < 10 | 150 | < 0.025 | | < 1.9 | 11 | | 2200 |
| 2005-07 | MW-1014C | | 27 | < 1.7 | 190 | | < 4.5 | < 10 | 43 | < 0.025 | | < 1.9 | < 6.7 | | 550 |
| 2005-07 | MW-1015A | | 8.9 | < 0.17 | 22 | | < 0.55 | < 1.2 | 9 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1015B | | 43 | < 0.17 | 36 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2006-04 | MW-1000PR | | 40 | < 0.17 | 150 | 18 | < 0.88 | 2.9 | 37 | < 0.025 | | < 1.8 | < 1.1 | | 580 |
| 2006-04 | MW-1010P | | 48 | < 0.17 | 46 | 4.1 | < 0.88 | < 1.3 | 12 | < 0.025 | | < 1.8 | < 1.1 | | < 5 |
| 2006-04 | MW-1013 | | 150 | < 1.7 | 150 | 18 | < 10 | 14 | 44 | < 0.025 | | < 2.4 | < 12 | | < 50 |
| 2006-04 | MW-1013A | | 120 | < 1.7 | 190 | 11 | < 10 | 19 | 62 | < 0.025 | | < 2.4 | < 12 | | 61 |
| 2006-04 | MW-1013B | | < 25 | < 1.7 | 650 | 48 | < 10 | < 13 | 150 | < 0.025 | | < 2.4 | < 12 | | 210 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006-04 | MW-1013C | | < 25 | < 1.7 | 620 | 61 | < 10 | < 13 | 180 | < 0.025 | | < 2.4 | < 12 | | 470 |
| 2006-04 | MW-1014 | | 40 | < 1.7 | 91 | 30 | < 10 | < 13 | 28 | < 0.025 | | < 2.4 | < 12 | | 79 |
| 2006-04 | MW-1014A | | < 25 | < 1.7 | 340 | 17 | < 10 | < 13 | 120 | < 0.025 | | < 2.4 | < 12 | | 55 |
| 2006-04 | MW-1014B | | < 25 | < 1.7 | 540 | 46 | 14 | < 13 | 130 | < 0.025 | | < 2.4 | < 12 | | 1300 |
| 2006-04 | MW-1014C | | 28 | < 1.7 | 180 | 40 | < 10 | < 13 | 42 | < 0.025 | | < 2.4 | < 12 | | 560 |
| 2006-07 | MW-1000PR | | 42 | < 0.17 | 130 | 18 | < 0.88 | < 1.3 | 36 | < 0.025 | 3.9 | < 1.8 | < 1.1 | 7.7 | 500 |
| 2006-07 | MW-1002 | | 6.3 | < 0.17 | 13 | 3.5 | < 0.88 | < 1.3 | 4.7 | < 0.025 | 0.59 | < 1.8 | < 1.1 | 3.1 | < 5 |
| 2006-07 | MW-1002G | | 26 | < 0.17 | 24 | 10 | < 0.88 | < 1.3 | 9.6 | < 0.025 | 0.84 | < 1.8 | < 1.1 | 5.4 | < 5 |
| 2006-07 | MW-1004P | | 40 | < 0.17 | 32 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 5.9 | < 1.8 | < 1.1 | 7.1 | 20 |
| 2006-07 | MW-1004S | | 5.3 | < 0.17 | 19 | 5.6 | < 0.88 | < 1.3 | 6.8 | < 0.025 | 0.87 | < 1.8 | < 1.1 | 5.1 | < 5 |
| 2006-07 | MW-1005 | | 110 | < 0.17 | 48 | 200 | < 0.88 | < 1.3 | 24 | < 0.025 | 0.71 | < 1.8 | < 1.1 | 21 | < 5 |
| 2006-07 | MW-1005P | | 67 | < 0.17 | 48 | 4 | < 0.88 | < 1.3 | 21 | < 0.025 | 9.2 | < 1.8 | < 1.1 | 7.2 | < 5 |
| 2006-07 | MW-1005S | | 44 | < 0.17 | 37 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 3.1 | < 1.8 | < 1.1 | 7.2 | < 5 |
| 2006-07 | MW-1010P | | 46 | < 0.17 | 40 | 4.2 | < 0.88 | < 1.3 | 12 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2006-07 | MW-1013 | | 160 | < 1.7 | 140 | 17 | < 10 | < 13 | 45 | < 0.025 | 3.1 | < 2.4 | < 12 | 19 | < 50 |
| 2006-07 | MW-1013 | Dup. | 150 | < 1.7 | 140 | 17 | < 10 | < 13 | 43 | < 0.025 | 3.1 | 3.4 | < 12 | 18 | < 50 |
| 2006-07 | MW-1013A | | 99 | < 1.7 | 120 | 6.7 | < 10 | < 13 | 42 | < 0.025 | 7.1 | < 2.4 | < 12 | 35 | < 50 |
| 2006-07 | MW-1013B | | < 25 | < 1.7 | 630 | 46 | < 10 | < 13 | 150 | < 0.025 | 6.3 | < 4.8 | < 12 | 31 | 210 |
| 2006-07 | MW-1013C | | < 25 | < 1.7 | 580 | 53 | < 10 | < 13 | 180 | < 0.025 | 24 | 2.7 | < 12 | 43 | 440 |
| 2006-07 | MW-1014 | | < 25 | < 1.7 | 84 | 26 | < 10 | < 13 | 28 | < 0.025 | 3.7 | < 2.4 | < 12 | 20 | 59 |
| 2006-07 | MW-1014A | | < 25 | < 1.7 | 320 | < 18 | < 10 | < 13 | 120 | < 0.025 | 9.6 | 2.8 | < 12 | 58 | 57 |
| 2006-07 | MW-1014B | | < 25 | < 1.7 | 470 | 42 | < 10 | < 13 | 130 | < 0.025 | 18 | < 2.4 | < 12 | 29 | 1100 |
| 2006-07 | MW-1014C | | < 25 | < 1.7 | 160 | 38 | < 10 | < 13 | 41 | < 0.025 | 5.4 | < 2.4 | < 12 | 12 | 470 |
| 2006-07 | MW-1015A | | 8.5 | < 0.17 | 19 | 5.7 | < 0.88 | < 1.3 | 8.3 | < 0.025 | 0.83 | < 1.8 | < 1.1 | 3.5 | < 5 |
| 2006-07 | MW-1015B | | 43 | < 0.17 | 32 | 77 | < 0.88 | < 1.3 | 14 | < 0.025 | 6.5 | < 1.8 | < 1.1 | 46 | < 5 |
| 2007-06 | MW-1000PR | | 40 | < 0.17 | 140 | 17 | < 0.88 | < 1.3 | 36 | < 0.025 | 3.7 | < 1.8 | < 1.1 | 7.2 | 490 |
| 2007-06 | MW-1002 | | 5.3 | < 0.17 | 12 | 3.1 | < 0.88 | < 1.3 | 3.8 | < 0.025 | 0.6 | < 1.8 | < 1.1 | 2.4 | < 5 |
| 2007-06 | MW-1002G | | 26 | < 0.17 | 26 | 13 | < 0.88 | < 1.3 | 9.5 | < 0.025 | 0.74 | < 1.8 | < 1.1 | 4.9 | < 5 |
| 2007-06 | MW-1004P | | 43 | < 0.17 | 34 | 2.7 | < 0.88 | < 1.3 | 13 | < 0.025 | 5.7 | < 1.8 | < 1.1 | 6.7 | < 5 |
| 2007-06 | MW-1004S | | 5.7 | < 0.17 | 22 | 6.1 | < 0.88 | < 1.3 | 7.4 | < 0.025 | 0.94 | < 1.8 | < 1.1 | 5.1 | < 5 |
| 2007-06 | MW-1005 | | 81 | < 0.17 | 39 | 120 | < 0.88 | < 1.3 | 19 | < 0.025 | 0.54 | < 1.8 | < 1.1 | 12 | < 5 |
| 2007-06 | MW-1005P | | 67 | < 0.17 | 53 | 4.4 | < 0.88 | < 1.3 | 21 | < 0.025 | 8.8 | < 1.8 | < 1.1 | 7.6 | < 5 |
| 2007-06 | MW-1005S | | 43 | < 0.17 | 40 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 2.9 | < 1.8 | < 1.1 | 6.6 | < 5 |
| 2007-06 | MW-1010P | | 45 | < 0.17 | 44 | 4.4 | < 0.88 | 1.5 | 11 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 4.7 | < 5 |
| 2007-06 | MW-1013 | | 140 | < 1.7 | 150 | 18 | < 10 | 23 | 45 | < 0.025 | 2.9 | < 2.4 | < 12 | 17 | < 50 |
| 2007-06 | MW-1013A | | 84 | < 1.7 | 110 | 6.1 | < 10 | < 13 | 37 | < 0.025 | 7.2 | < 2.4 | < 12 | 32 | < 50 |
| 2007-06 | MW-1013B | | < 25 | < 1.7 | 630 | 47 | < 10 | < 13 | 140 | < 0.025 | 6.4 | < 2.4 | < 12 | 28 | 170 |
| 2007-06 | MW-1013C | | < 25 | < 1.7 | 600 | 60 | < 10 | 15 | 170 | < 0.025 | 25 | < 2.4 | < 12 | 38 | 470 |
| 2007-06 | MW-1014 | | 31 | < 1.7 | 70 | 24 | < 10 | < 13 | 22 | < 0.025 | 3.8 | < 2.4 | < 12 | 16 | < 50 |
| 2007-06 | MW-1014 | Dup. | 39 | < 1.7 | 86 | 24 | < 10 | < 13 | 27 | < 0.025 | 3.8 | < 2.4 | < 12 | 20 | < 50 |
| 2007-06 | MW-1014A | | < 25 | < 1.7 | 330 | 15 | < 10 | < 13 | 110 | < 0.025 | 10 | < 2.4 | < 12 | 60 | < 50 |
| 2007-06 | MW-1014B | | < 25 | < 1.7 | 530 | 47 | < 10 | < 13 | 140 | < 0.025 | 21 | < 2.4 | < 12 | 27 | 1400 |
| 2007-06 | MW-1014C | | 31 | 4.7 | 170 | 41 | < 10 | < 13 | 39 | < 0.025 | 5.4 | < 2.4 | < 12 | 10 | 470 |
| 2007-06 | MW-1015A | | 8.5 | < 0.17 | 21 | 6.2 | < 0.88 | 1.7 | 8.2 | < 0.025 | 0.66 | < 1.8 | < 1.1 | 3.2 | < 5 |
| 2007-07 | MW-1015B | | 49 | < 0.17 | 34 | 65 | 1.4 | < 1.3 | 14 | < 0.025 | 6.4 | < 1.8 | < 1.1 | 53 | < 5 |
| 2008-06 | MW-1000PR | | 40 | < 0.17 | 140 | 19 | 1.5 | < 1.3 | 36 | < 0.025 | 3.3 | 3.8 | 1.4 | 7 | 450 |
| 2008-06 | MW-1002 | | 7.1 | < 0.17 | 17 | 4.6 | 1.8 | < 1.3 | 5.5 | < 0.025 | 0.77 | 1.9 | 2.5 | 3.1 | < 5 |
| 2008-06 | MW-1002G | | 27 | < 0.17 | 27 | 12 | < 0.88 | < 1.3 | 9.8 | < 0.025 | 0.98 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2008-06 | MW-1002G | Dup. | 27 | 0.4 | 26 | 13 | < 0.88 | < 1.3 | 9.8 | < 0.025 | 0.79 | < 1.8 | < 1.1 | 4.9 | < 5 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008-06 | MW-1004P | | 41 | 0.34 | 35 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 5.4 | 3 | < 1.1 | 5.9 | < 5 |
| 2008-06 | MW-1004S | | 5.6 | < 0.17 | 25 | 6.7 | < 0.88 | < 1.3 | 7.9 | < 0.025 | 0.9 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2008-06 | MW-1005 | | 82 | < 0.17 | 39 | 110 | < 0.88 | < 1.3 | 20 | < 0.025 | 0.58 | < 1.8 | < 1.1 | 15 | < 5 |
| 2008-06 | MW-1005P | | 70 | < 0.17 | 55 | 3.9 | < 0.88 | 1.7 | 22 | < 0.025 | 10 | 2 | < 1.1 | 9 | < 5 |
| 2008-06 | MW-1005S | | 46 | < 0.17 | 40 | < 2.5 | 1 | < 1.3 | 14 | < 0.025 | 3.2 | < 1.8 | 1.1 | 6.4 | < 5 |
| 2008-06 | MW-1010P | | 44 | < 0.17 | 45 | 3.9 | < 0.88 | < 1.3 | 11 | < 0.025 | 2.4 | < 1.8 | < 1.1 | 4.1 | < 5 |
| 2008-06 | MW-1013 | | 130 | < 1.7 | 150 | 17 | < 10 | < 13 | 44 | < 0.025 | 2.6 | 2.8 | < 12 | 13 | < 50 |
| 2008-06 | MW-1013A | | 81 | < 1.7 | 160 | 7 | < 10 | < 13 | 53 | < 0.025 | 6.4 | < 2.4 | 14 | 19 | < 50 |
| 2008-06 | MW-1013B | | < 25 | < 1.7 | 630 | < 50 | < 10 | < 13 | 140 | < 0.025 | 5.6 | < 2.4 | < 12 | 19 | 170 |
| 2008-06 | MW-1013C | | 27 | 1.8 | 610 | 60 | < 10 | < 13 | 170 | < 0.025 | 22 | < 2.4 | < 12 | 28 | 450 |
| 2008-06 | MW-1014 | | 35 | 0.25 | 83 | 27 | < 0.88 | < 1.3 | 26 | < 0.025 | 3.5 | < 1.8 | 1.2 | 14 | 12 |
| 2008-06 | MW-1014A | | < 25 | < 1.7 | 330 | 13 | < 10 | < 13 | 120 | < 0.025 | 8 | < 2.4 | < 12 | 40 | < 50 |
| 2008-06 | MW-1014B | | < 25 | < 1.7 | 540 | 56 | < 10 | < 13 | 140 | < 0.025 | 18 | < 2.4 | < 12 | 18 | 1700 |
| 2008-06 | MW-1014B | Dup. | < 25 | 4.2 | 550 | 36 | < 10 | < 13 | 140 | < 0.025 | 21 | < 2.4 | < 12 | 29 | 1700 |
| 2008-06 | MW-1014C | | 28 | < 1.7 | 160 | 35 | < 10 | < 13 | 38 | < 0.025 | 4.8 | < 2.4 | < 12 | 7.8 | 390 |
| 2008-06 | MW-1015A | | 8.7 | 0.29 | 22 | 5.9 | < 0.88 | < 1.3 | 8.5 | < 0.025 | 0.82 | < 1.8 | < 1.1 | 3.4 | < 5 |
| 2008-06 | MW-1015B | | 45 | < 0.17 | 36 | 77 | < 0.88 | < 1.3 | 15 | < 0.025 | 6.9 | 1.9 | < 1.1 | 51 | < 5 |
| 2009-06 | MW-1000PR | | 36 | < 0.17 | 130 | 26 | 0.89 | < 1.3 | 32 | < 0.025 | 3.5 | < 1.8 | < 1.1 | 10 | 380 |
| 2009-06 | MW-1002 | | 5.6 | < 0.17 | 13 | 4.2 | < 0.88 | < 1.3 | 4.1 | < 0.025 | 0.7 | < 1.8 | < 1.1 | 2.3 | < 5 |
| 2009-06 | MW-1002G | | 26 | < 0.17 | 24 | 16 | < 0.88 | < 1.3 | 9.1 | < 0.025 | 0.77 | < 1.8 | < 1.1 | 4.9 | < 5 |
| 2009-06 | MW-1002G | Dup. | 26 | < 0.17 | 24 | 17 | < 0.88 | 1.6 | 9 | < 0.025 | 0.71 | < 1.8 | < 1.1 | 4.7 | < 5 |
| 2009-06 | MW-1004P | | 40 | < 0.17 | 32 | < 2.5 | < 0.88 | < 1.3 | 13 | < 0.025 | 5 | 2 | < 1.1 | 6.3 | < 5 |
| 2009-06 | MW-1004S | | 4.8 | < 0.17 | 20 | 6.6 | < 0.88 | 1.8 | 6.5 | < 0.025 | 0.49 | 3.5 | < 1.1 | 4.4 | < 5 |
| 2009-06 | MW-1005 | | 78 | 0.52 | 36 | 130 | 1 | < 1.3 | 18 | < 0.025 | 0.48 | < 1.8 | < 1.1 | 13 | < 5 |
| 2009-06 | MW-1005P | | 64 | < 0.17 | 49 | 5.2 | < 0.88 | < 1.3 | 20 | < 0.025 | 8.2 | < 1.8 | < 1.1 | 10 | < 5 |
| 2009-06 | MW-1005S | | 43 | < 0.17 | 38 | < 2.5 | < 0.88 | < 1.3 | 13 | < 0.025 | 3 | 2.8 | < 1.1 | 6.4 | < 5 |
| 2009-06 | MW-1010P | | 42 | < 0.17 | 42 | 5.5 | < 0.88 | < 1.3 | 11 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 4.5 | < 5 |
| 2009-06 | MW-1013 | | 130 | < 1.7 | 140 | 15 | < 10 | 19 | 42 | < 0.025 | 2.6 | < 3.1 | < 12 | 15 | < 50 |
| 2009-06 | MW-1013A | | 72 | < 1.7 | 120 | 14 | < 10 | < 13 | 40 | < 0.025 | 6.4 | < 3.1 | < 12 | 26 | < 50 |
| 2009-06 | MW-1013B | | < 25 | < 1.7 | 590 | 76 | < 10 | < 13 | 130 | < 0.025 | 3.6 | < 3.1 | < 12 | 27 | 160 |
| 2009-06 | MW-1013B | Dup. | < 25 | < 1.7 | 580 | 77 | < 10 | < 13 | 130 | < 0.025 | 2.7 | < 3.1 | < 12 | 27 | 160 |
| 2009-06 | MW-1013C | | < 25 | < 1.7 | 560 | 91 | < 10 | < 13 | 160 | < 0.025 | 20 | < 24 | < 12 | 36 | 450 |
| 2009-06 | MW-1014 | | 34 | < 1.7 | 76 | 30 | < 10 | < 13 | 24 | < 0.025 | 3 | < 3.1 | < 12 | 19 | < 50 |
| 2009-06 | MW-1014A | | < 25 | < 1.7 | 300 | < 50 | < 10 | < 13 | 110 | < 0.025 | 6.3 | < 3.1 | < 12 | 62 | < 50 |
| 2009-06 | MW-1014B | | < 25 | 12 | 520 | 53 | 35 | 1.3 | 130 | < 0.025 | 12 | < 3.1 | 23 | 25 | 1100 |
| 2009-06 | MW-1014C | | 26 | < 1.7 | 150 | 53 | < 10 | < 13 | 35 | < 0.025 | 3.6 | < 3.1 | < 12 | 9.5 | 360 |
| 2009-06 | MW-1015A | | 7.9 | < 0.17 | 20 | 7.7 | < 0.88 | 2.1 | 8 | < 0.025 | 0.73 | < 1.8 | < 1.1 | 3.1 | < 5 |
| 2009-06 | MW-1015B | | 43 | < 0.17 | 33 | 87 | < 0.88 | 1.3 | 14 | < 0.025 | 6.1 | < 1.8 | < 1.1 | 48 | < 5 |
| 2010-06 | MW-1000PR | | 39 | < 0.16 | 120 | 19 | < 1.3 | 3.6 | 33 | < 0.025 | 4.1 | < 1.8 | < 0.77 | 10 | 370 |
| 2010-06 | MW-1002 | | 5.7 | < 0.16 | 12 | 3.6 | < 1.3 | < 1.2 | 4 | < 0.025 | 0.55 | < 1.8 | < 0.77 | 2.4 | < 5 |
| 2010-06 | MW-1002G | | 30 | < 0.16 | 26 | 23 | < 1.3 | < 1.2 | 10 | < 0.025 | 0.83 | < 1.8 | < 0.77 | 5.1 | < 5 |
| 2010-06 | MW-1004P | | 46 | 0.16 | 34 | < 2.5 | < 1.3 | < 1.2 | 13 | < 0.025 | 5.7 | < 1.8 | < 0.77 | 6.8 | < 5 |
| 2010-06 | MW-1004S | | 4.8 | < 0.16 | 19 | 4.4 | < 1.3 | 2.2 | 6.3 | < 0.025 | 0.78 | < 1.8 | < 0.77 | 4.1 | < 5 |
| 2010-06 | MW-1005 | | 77 | 0.46 | 33 | 120 | < 1.3 | 2 | 18 | < 0.025 | 0.65 | < 1.8 | < 0.77 | 16 | < 5 |
| 2010-06 | MW-1005P | | 60 | < 0.16 | 44 | 19 | < 1.3 | < 1.2 | 12 | < 0.025 | 6.8 | < 1.8 | < 0.77 | 43 | < 5 |
| 2010-06 | MW-1005S | | 49 | < 0.16 | 38 | < 2.5 | < 1.3 | < 1.2 | 14 | < 0.025 | 3.1 | < 1.8 | < 0.77 | 6.4 | < 5 |
| 2010-06 | MW-1010P | | 46 | 0.21 | 40 | 4.2 | < 1.3 | < 1.2 | 12 | < 0.025 | 2.7 | < 1.8 | < 0.77 | 4.7 | < 5 |
| 2010-06 | MW-1013 | | 140 | < 1.7 | 150 | 13 | < 11 | < 13 | 45 | < 0.025 | 3.3 | < 2.4 | < 14 | 18 | < 50 |
| 2010-06 | MW-1013A | | 74 | < 1.7 | 110 | 6.9 | < 11 | < 13 | 39 | < 0.025 | 7.5 | < 2.4 | < 14 | 35 | < 50 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010-06 | MW-1013B | | < 25 | 1.9 | 620 | < 50 | < 11 | < 13 | 140 | < 0.025 | 8.6 | < 2.4 | < 14 | 35 | 180 |
| 2010-06 | MW-1013C | | < 25 | < 1.7 | 550 | 64 | < 11 | < 13 | 150 | < 0.025 | 30 | < 2.4 | < 14 | 34 | 400 |
| 2010-06 | MW-1014 | | 57 | < 1.7 | 76 | 28 | < 11 | < 13 | 24 | < 0.025 | 3.5 | 3 | < 14 | 23 | < 50 |
| 2010-06 | MW-1014A | | < 25 | < 1.7 | 320 | 13 | < 11 | < 13 | 110 | < 0.025 | 12 | < 2.4 | < 14 | 63 | < 50 |
| 2010-06 | MW-1014B | | < 25 | < 1.7 | 510 | | < 11 | 17 | 130 | < 0.025 | 25 | < 2.4 | < 14 | 31 | 1200 |
| 2010-06 | MW-1014C | | < 25 | < 1.7 | 140 | 37 | < 11 | 20 | 36 | < 0.025 | 5.4 | < 2.4 | < 14 | 9.8 | 330 |
| 2010-06 | MW-1015A | | 8.9 | < 0.16 | 20 | 6.3 | < 1.3 | < 1.2 | 8.4 | < 0.025 | 0.74 | < 1.8 | < 0.77 | 3.2 | < 5 |
| 2010-06 | MW-1015B | | 48 | < 0.16 | 32 | 63 | < 1.3 | 3.7 | 15 | < 0.025 | 7.2 | < 1.8 | < 0.77 | 55 | < 5 |
| 2011-07 | MW-1000PR | | 37 | < 0.13 | 130 | 21 | < 0.18 | < 1.4 | 34 | < 0.025 | 4 | < 1.8 | < 0.26 | | 310 |
| 2011-07 | MW-1000R | | 34 | < 0.13 | 110 | 8 | < 0.18 | < 1.4 | 35 | < 0.025 | 1.6 | < 1.8 | 0.74 | | < 5 |
| 2011-07 | MW-1002 | | 9.1 | < 0.13 | 21 | 9.9 | 0.71 | < 1.4 | 7.2 | < 0.025 | 0.8 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1002G | | 33 | < 0.13 | 32 | 26 | 0.81 | < 1.4 | 13 | < 0.025 | 0.92 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1002G | Dup. | 32 | < 0.13 | 32 | 26 | 0.83 | < 1.4 | 12 | < 0.025 | 0.91 | < 1.8 | 3.1 | | < 5 |
| 2011-07 | MW-1004 | | 3.9 | < 0.13 | 12 | < 2.5 | 1.5 | < 1.4 | 3.9 | < 0.025 | 0.72 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1004P | | 44 | < 0.13 | 36 | < 2.5 | < 0.18 | < 1.4 | 15 | < 0.025 | 5.8 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1004S | | 5 | < 0.13 | 20 | 5.7 | 0.82 | < 1.4 | 7 | < 0.025 | 0.9 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005 | | 200 | < 0.13 | 79 | 240 | < 0.18 | < 1.4 | 39 | < 0.025 | 1.1 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005P | | 72 | < 0.13 | 54 | 4.7 | < 0.18 | < 1.4 | 23 | < 0.025 | 9.4 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005S | | 50 | < 0.13 | 43 | 2.7 | < 0.18 | < 1.4 | 16 | < 0.025 | 3.4 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1010P | | 45 | < 0.13 | 47 | 5.3 | < 0.18 | < 1.4 | 13 | < 0.025 | 2.6 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1013 | | 150 | 0.14 | 160 | 16 | < 0.67 | 3.4 | 51 | < 0.025 | 3.6 | < 12 | 1 | | < 5 |
| 2011-07 | MW-1013 | Dup. | 150 | < 0.12 | 160 | 16 | < 0.67 | 2.1 | 50 | < 0.025 | 3.6 | < 12 | 2.3 | | < 5 |
| 2011-07 | MW-1013A | | 79 | < 0.12 | 120 | 7.8 | < 0.67 | < 1.4 | 43 | < 0.025 | 7.8 | < 12 | < 0.28 | | < 5 |
| 2011-07 | MW-1013B | | 20 | 0.92 | 640 | 54 | < 0.67 | 5.5 | 150 | < 0.025 | 8.3 | < 12 | 1.2 | | 160 |
| 2011-07 | MW-1013C | | 20 | < 0.12 | 610 | 76 | < 0.67 | 2.5 | 170 | < 0.025 | 32 | < 12 | < 0.28 | | 410 |
| 2011-07 | MW-1014 | | 68 | < 0.12 | 79 | 36 | < 0.67 | < 1.4 | 26 | < 0.025 | 3.2 | < 12 | < 0.28 | | 7.2 |
| 2011-07 | MW-1014A | | 16 | < 0.12 | 320 | < 25 | < 0.67 | < 1.4 | 130 | < 0.025 | 12 | < 12 | < 0.28 | | 13 |
| 2011-07 | MW-1014B | | 31 | 2.7 | 500 | 54 | < 0.67 | < 1.4 | 140 | < 0.025 | 22 | < 12 | < 0.28 | | 1300 |
| 2011-07 | MW-1014C | | 29 | < 0.12 | 150 | 45 | < 0.67 | < 1.4 | 39 | < 0.025 | 5.2 | < 12 | < 0.28 | | 310 |
| 2011-07 | MW-1015A | | 8.6 | < 0.13 | 22 | 6.5 | < 0.18 | < 1.4 | 9.2 | < 0.025 | 0.79 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1015B | | 49 | < 0.13 | 37 | 86 | < 0.18 | < 1.4 | 16 | < 0.025 | 7.4 | < 1.8 | < 0.26 | | < 5 |
| 2012-06 | MW-1000PR | | 36 | 0.66 | 120 | 22 | < 0.23 | 2.5 | 33 | < 0.025 | 4.2 | < 1.8 | < 0.26 | 9.1 | 360 |
| 2012-06 | MW-1000R | | 19 | < 0.13 | 42 | 5.2 | 0.25 | 2.2 | 11 | 0.045 | 0.85 | < 1.8 | < 0.26 | 5.5 | < 5 |
| 2012-06 | MW-1002 | | 6.6 | < 0.13 | 16 | 5.9 | 0.39 | 2.4 | 5.3 | < 0.025 | 0.69 | < 1.8 | < 0.26 | 3.1 | < 5 |
| 2012-06 | MW-1002G | | 32 | < 0.13 | 31 | 29 | < 0.23 | < 1.4 | 12 | < 0.025 | 0.93 | < 1.8 | < 0.26 | 5.7 | < 5 |
| 2012-06 | MW-1004 | | 4.5 | < 0.13 | 14 | < 2.5 | 1.6 | < 1.4 | 4.7 | < 0.025 | 0.79 | < 1.8 | < 0.26 | 3.1 | < 5 |
| 2012-06 | MW-1004P | | 42 | < 0.13 | 34 | < 2.5 | < 0.23 | < 1.4 | 14 | < 0.025 | 5.9 | < 1.8 | < 0.26 | 6.3 | < 5 |
| 2012-06 | MW-1004S | | 4.7 | < 0.13 | 20 | 4.2 | 0.3 | < 1.4 | 6.6 | < 0.025 | 0.88 | < 1.8 | < 0.26 | 4 | < 5 |
| 2012-06 | MW-1005 | | 130 | 0.15 | 65 | 280 | < 0.23 | 1.5 | 33 | < 0.025 | 1 | < 1.8 | < 0.26 | 30 | < 5 |
| 2012-06 | MW-1005P | | 68 | 0.25 | 52 | 4.8 | < 0.23 | 1.5 | 22 | < 0.025 | 9.6 | < 1.8 | < 0.26 | 9.1 | < 5 |
| 2012-06 | MW-1005S | | 48 | < 0.13 | 43 | 2.5 | < 0.23 | 1.4 | 16 | < 0.025 | 3.4 | < 1.8 | < 0.26 | 6.8 | < 5 |
| 2012-06 | MW-1010P | | 44 | 0.26 | 47 | 5.2 | < 0.23 | < 1.4 | 13 | < 0.025 | 2.6 | 1.9 | < 0.26 | 4.5 | < 5 |
| 2012-06 | MW-1013 | | 140 | 0.18 | 150 | 14 | < 0.67 | 5.3 | 49 | < 0.025 | 3.4 | < 2.7 | < 0.28 | 17 | < 5 |
| 2012-06 | MW-1013A | | 76 | < 0.12 | 120 | 8.2 | < 0.67 | 2.3 | 43 | < 0.025 | 7.7 | < 2.7 | < 0.28 | 26 | < 5 |
| 2012-06 | MW-1013B | | 16 | 1.9 | 630 | 53 | < 0.67 | 7.1 | 150 | < 0.025 | 8.4 | < 2.7 | < 0.28 | 30 | 170 |
| 2012-06 | MW-1013C | | 18 | < 0.6 | 570 | 66 | < 0.67 | 3.6 | 160 | < 0.025 | 31 | < 2.7 | < 0.28 | 32 | 350 |
| 2012-06 | MW-1014 | | 52 | 0.22 | 78 | 38 | < 0.67 | 3.5 | 26 | < 0.025 | 3.7 | < 2.7 | < 0.28 | 17 | 7 |
| 2012-06 | MW-1014 | Dup. | 53 | < 0.12 | 78 | 39 | < 0.67 | < 1.4 | 26 | < 0.025 | 3.7 | < 2.7 | 3.9 | 17 | 7 |
| 2012-06 | MW-1014A | | 15 | 0.25 | 310 | < 25 | < 0.67 | 1.9 | 120 | < 0.025 | 13 | < 2.7 | < 0.28 | 56 | 7.2 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012-06 | MW-1014B | | 23 | 2.6 | 500 | 59 | < 0.67 | 3.2 | 130 | < 0.025 | 22 | < 2.7 | < 0.56 | 25 | 1200 |
| 2012-06 | MW-1014C | | 30 | 0.18 | 150 | 50 | < 0.67 | < 1.4 | 38 | < 0.025 | 5.6 | < 2.7 | < 0.28 | 11 | 310 |
| 2012-06 | MW-1015A | | 8.3 | 0.21 | 21 | 6.7 | < 0.23 | 2 | 8.9 | < 0.025 | 0.77 | 2.4 | < 0.26 | 3.5 | < 5 |
| 2012-06 | MW-1015A | Dup. | 8.3 | < 0.13 | 21 | 6.8 | < 0.23 | < 1.4 | 8.9 | < 0.025 | 0.77 | < 1.8 | < 0.26 | 3.4 | < 5 |
| 2012-06 | MW-1015B | | 40 | < 0.13 | 34 | 58 | < 0.23 | < 1.4 | 15 | < 0.025 | 7.1 | < 1.8 | < 0.26 | 44 | < 5 |
| 2013-06 | MW-1000PR | | 41 | 0.18 | 130 | 23 | < 0.23 | < 1.4 | 34 | < 0.025 | 3.9 | < 2 | 0.65 | 8.6 | 390 |
| 2013-06 | MW-1000R | | 16 | < 0.13 | 30 | 4.3 | 0.54 | < 1.4 | 7.6 | < 0.025 | 0.59 | < 2 | 0.81 | 3.9 | < 5 |
| 2013-06 | MW-1002 | | 9.1 | < 0.13 | 21 | 9.1 | 0.85 | < 1.4 | 7.3 | < 0.025 | 0.81 | < 2 | < 0.26 | 3.6 | < 5 |
| 2013-06 | MW-1002G | | 34 | < 0.13 | 33 | 28 | 0.33 | < 1.4 | 13 | < 0.025 | 0.94 | < 2 | < 0.26 | 5.5 | < 5 |
| 2013-06 | MW-1002G | Dup. | 33 | < 0.13 | 31 | 28 | < 0.23 | 3 | 13 | < 0.025 | 0.94 | < 2 | < 0.26 | 6.2 | < 5 |
| 2013-06 | MW-1004 | | 3.7 | < 0.13 | 12 | < 2.5 | 0.38 | < 1.4 | 3.8 | < 0.025 | 0.71 | < 2 | 0.69 | 2.8 | < 5 |
| 2013-06 | MW-1004P | | 46 | < 0.13 | 36 | < 2.5 | < 0.23 | < 1.4 | 15 | < 0.025 | 6.1 | < 2 | < 0.26 | 6.2 | < 5 |
| 2013-06 | MW-1004S | | 5.1 | < 0.13 | 21 | 4.8 | 0.68 | 2.4 | 7.2 | < 0.025 | 0.94 | < 2 | < 0.26 | 4.3 | < 5 |
| 2013-06 | MW-1005 | | 160 | < 0.13 | 73 | 240 | 0.98 | < 1.4 | 36 | < 0.025 | 0.95 | < 2 | < 0.26 | 34 | < 5 |
| 2013-06 | MW-1005P | | 72 | < 0.13 | 56 | 19 | < 0.23 | 2.8 | 21 | < 0.025 | 8.9 | < 2 | < 0.26 | 22 | < 5 |
| 2013-06 | MW-1005S | | 50 | < 0.13 | 44 | < 2.5 | < 0.23 | < 1.4 | 16 | < 0.025 | 3.2 | < 2 | < 0.26 | 6.4 | < 5 |
| 2013-06 | MW-1010P | | 48 | < 0.13 | 50 | 5.7 | < 0.23 | 2.9 | 14 | < 0.025 | 2.9 | < 2 | 0.32 | 4.5 | 22 |
| 2013-06 | MW-1013 | | 160 | < 0.12 | 170 | 15 | < 0.67 | 4.7 | 45 | < 0.025 | 3.4 | < 2 | 2.5 | 20 | < 5 |
| 2013-06 | MW-1013A | | 94 | < 0.12 | 130 | 8.2 | < 0.67 | < 1.4 | 47 | < 0.025 | 8.1 | < 2 | 0.64 | 31 | < 5 |
| 2013-06 | MW-1013B | | 16 | < 0.6 | 640 | 60 | < 3.4 | 28 | 150 | < 0.025 | 6.6 | < 2 | 2 | 29 | 150 |
| 2013-06 | MW-1013C | | 21 | < 0.6 | 600 | 71 | < 3.4 | 12 | 170 | < 0.025 | 27 | < 2 | 1.7 | 35 | 390 |
| 2013-06 | MW-1014 | | 44 | < 0.12 | 82 | 38 | < 0.67 | < 1.4 | 27 | < 0.025 | 3.6 | < 2 | 0.95 | 17 | 7.8 |
| 2013-06 | MW-1014A | | 17 | < 0.12 | 330 | < 25 | < 0.67 | 1.9 | 130 | < 0.025 | 11 | < 2 | 0.35 | 60 | 7.6 |
| 2013-06 | MW-1014B | | 23 | 2.8 | 560 | 61 | < 3.4 | 160 | 150 | < 0.025 | 22 | < 2 | 4 | 25 | 1000 |
| 2013-06 | MW-1014B | Dup. | 23 | 2.2 | 540 | 44 | < 3.4 | 29 | 170 | < 0.025 | 24 | < 2 | < 1.4 | 36 | 1200 |
| 2013-06 | MW-1014C | | 34 | < 0.12 | 160 | 49 | < 0.67 | < 1.4 | 39 | < 0.025 | 5.4 | < 2 | 0.65 | 11 | 290 |
| 2013-06 | MW-1015A | | 8.7 | < 0.13 | 23 | 7 | < 0.23 | < 1.4 | 9.7 | < 0.025 | 0.82 | < 2 | < 0.26 | 3.5 | < 5 |
| 2013-06 | MW-1015B | | 50 | < 0.13 | 38 | 62 | < 0.23 | < 1.4 | 17 | < 0.025 | 7.3 | < 2 | < 0.26 | 64 | < 5 |
| 2014-06 | MW-1000PR | | 37 | 0.33 | 120 | 20 | 0.57 | < 0.1 | 30 | < 0.025 | 3.2 | < 2 | < 0.13 | 8.6 | 350 |
| 2014-06 | MW-1000R | | 28 | 0.11 | 120 | 5.3 | 0.71 | < 0.1 | 34 | < 0.025 | 1.2 | < 2 | < 0.13 | 10 | 5 |
| 2014-06 | MW-1002 | | 8.8 | < 0.1 | 20 | 9 | 1.1 | < 0.1 | 6.6 | < 0.025 | 0.74 | < 2 | < 0.13 | 3.9 | < 5 |
| 2014-06 | MW-1002G | Dup. | 34 | < 0.1 | 31 | 28 | < 0.5 | < 0.1 | 12 | < 0.025 | 0.83 | < 2 | < 0.13 | 5.8 | < 5 |
| 2014-06 | MW-1002G | | 34 | < 0.1 | 31 | 28 | < 0.5 | < 0.1 | 12 | < 0.025 | 0.84 | < 2 | < 0.13 | 5.8 | < 5 |
| 2014-06 | MW-1004 | | 4.5 | < 0.1 | 9.9 | < 2.5 | < 0.5 | < 0.1 | 3 | < 0.025 | 0.69 | < 2 | < 0.13 | 2.6 | < 5 |
| 2014-06 | MW-1004P | | 44 | < 0.1 | 33 | < 2.5 | < 0.5 | < 0.1 | 13 | < 0.025 | 5.4 | < 2 | < 0.13 | 6.3 | < 5 |
| 2014-06 | MW-1004S | | 5.7 | < 0.1 | 23 | 5.1 | 0.99 | < 0.1 | 7.6 | < 0.025 | 0.93 | < 2 | < 0.13 | 5.2 | < 5 |
| 2014-06 | MW-1005 | | 150 | < 0.1 | 60 | 230 | 0.61 | < 0.1 | 29 | < 0.025 | 0.74 | < 2 | < 0.13 | 33 | < 5 |
| 2014-06 | MW-1005P | | 72 | < 0.1 | 55 | 17 | < 0.5 | < 0.1 | 22 | < 0.025 | 8.8 | < 2 | < 0.13 | 13 | < 5 |
| 2014-06 | MW-1005S | | 48 | < 0.1 | 39 | < 2.5 | < 0.5 | < 0.1 | 14 | < 0.025 | 2.7 | < 2 | < 0.13 | 6.4 | < 5 |
| 2014-06 | MW-1010P | | 45 | < 0.1 | 48 | 5.4 | < 0.5 | < 0.1 | 12 | < 0.025 | 2.4 | < 2 | < 0.13 | 4.4 | < 5 |
| 2014-06 | MW-1013 | | 150 | < 0.25 | 150 | 13 | 1.1 | < 0.25 | 49 | < 0.025 | 2.9 | < 2 | < 0.25 | 16 | < 5 |
| 2014-06 | MW-1013A | | 92 | < 0.25 | 130 | < 13 | < 0.5 | < 0.25 | 44 | < 0.025 | 7.3 | < 2 | < 0.25 | 25 | < 5 |
| 2014-06 | MW-1013B | | 16 | 0.9 | 650 | 51 | 8.3 | < 0.25 | 140 | < 0.025 | 5.8 | < 2 | < 0.25 | 26 | 150 |
| 2014-06 | MW-1013C | | 18 | < 0.25 | 610 | 62 | < 0.5 | < 0.25 | 140 | < 0.025 | 23 | < 2 | < 0.25 | 28 | 340 |
| 2014-06 | MW-1014 | | 40 | < 0.25 | 75 | 41 | < 0.5 | < 0.25 | 23 | < 0.025 | 2.9 | < 2 | < 0.25 | 9.3 | 17 |
| 2014-06 | MW-1014A | | 16 | < 0.25 | 320 | < 25 | 1.2 | < 0.25 | 110 | < 0.025 | 9.7 | < 2 | < 0.25 | 47 | 11 |
| 2014-06 | MW-1014B | Dup. | 27 | 2.2 | 520 | 43 | 0.56 | < 0.25 | 120 | < 0.025 | 17 | < 2 | < 0.25 | 19 | 1100 |
| 2014-06 | MW-1014B | | 27 | 2.2 | 520 | 55 | 0.76 | < 0.25 | 120 | < 0.025 | 17 | < 2 | < 0.25 | 19 | 1100 |
| 2014-06 | MW-1014C | | 32 | < 0.25 | 150 | 49 | < 0.5 | < 0.25 | 34 | 0.044 | 4.7 | < 2 | < 0.25 | 9.4 | 290 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014-06 | MW-1015A | | 8.5 | < 0.1 | 21 | 6.4 | < 0.5 | < 0.1 | 8.5 | < 0.025 | 0.74 | < 2 | < 0.13 | 3.7 | < 5 |
| 2014-06 | MW-1015B | | 44 | < 0.1 | 35 | 67 | < 0.5 | < 0.1 | 15 | < 0.025 | 6.4 | < 2 | < 0.13 | 57 | < 5 |
| 2015-06 | MW-1000PR | | 35 | < 0.10 | 110 | 16 | 0.66 | < 0.10 | 28 | 0.064 | 3.1 | < 2.0 | < 0.13 | 8.2 | 280 |
| 2015-06 | MW-1000R | | 25 | < 0.10 | 69 | 25 | 0.59 | < 0.10 | 21 | < 0.025 | 1.0 | < 2.0 | < 0.13 | 8.1 | < 5.0 |
| 2015-06 | MW-1002 | Dup. | 7.4 | < 0.10 | 17 | 8.0 | 0.70 | < 0.10 | 5.6 | < 0.025 | 0.69 | < 2.0 | < 0.13 | 3.3 | < 5.0 |
| 2015-06 | MW-1002 | | 7.6 | < 0.10 | 17 | 7.7 | 0.67 | < 0.10 | 5.5 | < 0.025 | 0.69 | < 2.0 | < 0.13 | 3.4 | < 5.0 |
| 2015-06 | MW-1002G | | 34 | < 0.10 | 32 | 29 | < 0.50 | < 0.10 | 12 | < 0.025 | 0.85 | < 2.0 | < 0.13 | 6.0 | < 5.0 |
| 2015-06 | MW-1004 | | 2.7 | < 0.10 | 8.9 | < 2.5 | < 0.50 | < 0.10 | 2.9 | < 0.025 | 0.69 | < 2.0 | < 0.13 | 2.4 | < 5.0 |
| 2015-06 | MW-1004P | | 43 | < 0.10 | 34 | < 2.5 | < 0.50 | < 0.10 | 14 | < 0.025 | 5.7 | < 2.0 | < 0.13 | 6.5 | < 5.0 |
| 2015-06 | MW-1004S | | 3.9 | < 0.10 | 17 | 3.0 | 0.70 | < 0.10 | 5.9 | < 0.025 | 0.77 | < 2.0 | < 0.13 | 4.0 | < 5.0 |
| 2015-06 | MW-1005 | | 200 | < 0.10 | 82 | 340 | < 0.50 | < 0.10 | 38 | < 0.025 | 0.92 | < 2.0 | < 0.13 | 61 | < 5.0 |
| 2015-06 | MW-1005P | | 69 | < 0.10 | 52 | 6.8 | < 0.50 | < 0.10 | 22 | < 0.025 | 9.0 | < 2.0 | < 0.13 | 9.6 | < 5.0 |
| 2015-06 | MW-1005S | | 47 | < 0.10 | 40 | 2.7 | < 0.50 | < 0.10 | 14 | < 0.025 | 2.9 | < 2.0 | < 0.13 | 6.3 | < 5.0 |
| 2015-06 | MW-1010P | | 44 | < 0.10 | 48 | 4.9 | < 0.50 | < 0.10 | 13 | < 0.025 | 2.6 | < 2.0 | < 0.13 | 4.5 | 5.4 |
| 2015-06 | MW-1013 | | 150 | < 0.25 | 160 | 11 | 2.9 | < 0.25 | 48 | < 0.025 | 3.1 | < 2.0 | < 0.25 | 14 | 5.1 |
| 2015-06 | MW-1013A | | 89 | < 0.25 | 120 | 8.6 | 0.57 | < 0.25 | 42 | < 0.025 | 7.4 | < 2.0 | < 0.25 | 30 | < 5.0 |
| 2015-06 | MW-1013B | | 17 | < 1.3 | 660 | < 50 | < 2.5 | < 1.3 | 150 | 0.13 | 6.5 | < 10 | < 1.3 | 26 | 160 |
| 2015-06 | MW-1013C | | 20 | < 1.3 | 610 | 57 | < 2.5 | < 1.3 | 140 | < 0.13 | 25 | < 10 | < 1.3 | 28 | 420 |
| 2015-06 | MW-1014 | | 39 | < 0.25 | 75 | 31 | < 0.50 | < 0.25 | 24 | < 0.025 | 3.1 | < 2.0 | < 0.25 | 13 | 12 |
| 2015-06 | MW-1014A | | 17 | < 1.3 | 350 | < 25 | 4.6 | < 1.3 | 120 | < 0.13 | 10 | < 10 | < 1.3 | 49 | < 25 |
| 2015-06 | MW-1014B | | 26 | 2.6 | 550 | 54 | 3.9 | < 1.3 | 130 | < 0.13 | 19 | < 10 | < 1.3 | 22 | 1300 |
| 2015-06 | MW-1014C | Dup. | 36 | < 0.25 | 150 | 51 | < 0.50 | < 0.25 | 36 | < 0.025 | 4.7 | < 2.0 | < 0.25 | 10 | 290 |
| 2015-06 | MW-1014C | | 35 | < 0.25 | 150 | 51 | < 0.50 | < 0.25 | 35 | < 0.025 | 4.7 | < 2.0 | < 0.25 | 9.9 | 290 |
| 2015-06 | MW-1015A | | 7.9 | < 0.10 | 20 | 6.4 | < 0.50 | < 0.10 | 8.4 | < 0.025 | 0.71 | < 2.0 | < 0.13 | 3.5 | < 5.0 |
| 2015-06 | MW-1015B | | 46 | < 0.10 | 36 | 79 | < 0.50 | < 0.10 | 16 | < 0.025 | 6.7 | < 2.0 | < 0.13 | 64 | < 5.0 |
| 2015-09 | MW-1005 | Resample | 317 | 0.091 | 122 | 397 | 0.61 | < 0.033 | 53.9 | < 0.022 | 1.36 | < 0.16 | < 0.086 | 71.9 | 5.4 |
| 2016-06 | MW-1000PR | | 32.4 | 0.17 | 111 | 14.2 | 0.61 | 0.072 | 28.6 | < 0.13 | 3.15 | 0.41 | < 0.016 | 7.6 | 297 |
| 2016-06 | MW-1000R | | 26.1 | < 0.089 | 64.7 | 22.4 | 0.52 | < 0.040 | 20.2 | < 0.13 | 1.09 | < 0.21 | < 0.016 | 7.89 | < 3.1 |
| 2016-06 | MW-1002 | | 9.1 | < 0.089 | 22 | 10.4 | 1.2 | < 0.040 | 7.66 | < 0.13 | 0.825 | < 0.21 | < 0.016 | 3.82 | < 3.1 |
| 2016-06 | MW-1002G | Dup. | 32.5 | < 0.089 | 34.6 | 29.7 | 0.47 | < 0.040 | 13.3 | < 0.13 | 0.901 | < 0.21 | < 0.016 | 5.54 | < 3.1 |
| 2016-06 | MW-1002G | | 34.0 | < 0.089 | 34.5 | 29.6 | 0.78 | < 0.040 | 13.7 | < 0.13 | 0.91 | < 0.21 | < 0.016 | 5.9 | < 3.1 |
| 2016-06 | MW-1004 | | 4.1 | < 0.089 | 8.96 | 2.0 | 0.89 | 0.077 | 2.89 | < 0.13 | 0.752 | 0.22 | < 0.016 | 2.26 | 5.9 |
| 2016-06 | MW-1004P | | 43.8 | < 0.089 | 35.8 | 2.2 | < 0.39 | < 0.040 | 14.7 | < 0.13 | 5.9 | < 0.21 | < 0.016 | 6.28 | < 3.1 |
| 2016-06 | MW-1004S | | 3.4 | < 0.089 | 15.5 | 2.7 | 1.1 | < 0.040 | 5.28 | < 0.13 | 0.804 | 0.26 | < 0.016 | 3.66 | < 3.1 |
| 2016-06 | MW-1005 | | 296 | 0.089 | 123 | 457 | 0.93 | < 0.040 | 55.7 | < 0.13 | 1.26 | < 0.21 | < 0.016 | 75 | 3.8 |
| 2016-06 | MW-1005P | | 67.2 | < 0.089 | 53.8 | 4.6 | < 0.39 | 0.059 | 22.3 | < 0.13 | 9.04 | < 0.21 | < 0.016 | 8.76 | < 3.1 |
| 2016-06 | MW-1005S | | 42.0 | < 0.089 | 39.2 | 2.5 | 0.54 | < 0.040 | 14 | < 0.13 | 2.93 | < 0.21 | < 0.016 | 5.92 | < 3.1 |
| 2016-06 | MW-1010P | | 40.2 | < 0.089 | 45.5 | 6.1 | < 0.39 | < 0.040 | 12.9 | < 0.13 | 2.64 | < 0.21 | < 0.016 | 4.29 | 8.6 |
| 2016-06 | MW-1013 | | 124 | < 0.089 | 146 | 13.3 | 1.1 | < 0.040 | 46.1 | < 0.13 | 3 | 0.53 | < 0.016 | 14 | < 3.1 |
| 2016-06 | MW-1013A | | 78.9 | < 0.089 | 130 | 6.6 | < 0.39 | < 0.040 | 44.7 | < 0.13 | 7.06 | < 0.21 | < 0.016 | 30.6 | < 3.1 |
| 2016-06 | MW-1013B | | 14.2 | 0.80 | 608 | 36.1 | 1.4 | < 0.040 | 138 | < 0.13 | 5.69 | 0.88 | < 0.016 | 25.1 | 126 |
| 2016-06 | MW-1013C | | 16.8 | < 0.089 | 561 | 67.6 | < 0.39 | 0.080 | 130 | < 0.13 | 22.1 | < 0.21 | < 0.016 | 26.9 | 330 |
| 2016-06 | MW-1014 | | 32.8 | 0.10 | 77.5 | 39.7 | 0.40 | < 0.040 | 25.7 | < 0.13 | 3.19 | < 0.21 | < 0.016 | 13.3 | 6.8 |
| 2016-06 | MW-1014A | | 13.3 | < 0.089 | 333 | 10.5 | 0.59 | < 0.040 | 115 | < 0.13 | 9.84 | 0.24 | < 0.016 | 46.3 | 9.0 |
| 2016-06 | MW-1014B | | 21.8 | 1.9 | 497 | 63.7 | 0.47 | 0.068 | 111 | < 0.13 | 15.7 | 1.7 | < 0.016 | 19.8 | 986 |
| 2016-06 | MW-1014C | Dup. | 30.4 | < 0.089 | 155 | 52.8 | < 0.39 | 0.60 | 35.2 | < 0.13 | 4.63 | < 0.21 | < 0.016 | 9.68 | 270 |
| 2016-06 | MW-1014C | | 30.4 | < 0.089 | 150 | 63.9 | < 0.39 | < 0.040 | 35.8 | < 0.13 | 4.58 | < 0.21 | < 0.016 | 10.2 | 267 |
| 2016-06 | MW-1015A | | 7.4 | < 0.089 | 20.8 | 6.0 | 0.52 | < 0.040 | 8.82 | < 0.13 | 0.691 | < 0.21 | < 0.016 | 3.38 | < 3.1 |
| 2016-06 | MW-1015B | | 43.0 | < 0.089 | 37.3 | 74.6 | 0.53 | < 0.040 | 16.2 | < 0.13 | 6.79 | < 0.21 | < 0.016 | 59.1 | < 3.1 |

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# Attachment 3

## Statistical Results

## Trend Graphs

## Historical Data

## (Surface Water)

## Trend Analysis Results - Surface Water
## Year Ending 2016

| | Conductivity (Field) (umhos/cm) | pH(Field) (su) | Copper | Hardness | Iron | Zinc | Dissolved Oxygen | Redox Potential | Total Suspended Solids |
|---|---|---|---|---|---|---|---|---|---|
| **SW-1** | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | |
| Sample Size | 8 | 8 | 8 | 8 | 4 | 8 | 7 | 7 | 7 |
| Mann-Kendall S | -2 | 8 | -10 | -3 | -4 | 3 | -5.000 | 5.000 | 11.000 |
| p-Level | 0.904 | 0.398 | 0.276 | 0.812 | 0.334 | 0.812 | 0.562 | 0.562 | 0.136 |
| Trend | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | |
| Sample Size | 41 | 41 | 41 | 38 | 31 | 41 | 16 | 7 | 15 |
| Mann-Kendall S | -115 | -29 | 32 | 8 | 99 | 32 | 40 | 5.000 | -20 |
| p-Level | 0.200 | 0.753 | 0.715 | 0.930 | 0.096 | 0.691 | 0.078 | 0.562 | 0.354 |
| Trend | | | | | | | | | |
| **SW-2** | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | |
| Sample Size | 8 | 8 | 8 | 8 | 4 | 8 | 7 | 7 | 7 |
| Mann-Kendall S | -2 | 6 | -4 | -4 | -4 | 0 | -3.000 | 3.000 | 7.000 |
| p-Level | 0.904 | 0.548 | 0.720 | 0.720 | 0.334 | 1.000 | 0.772 | 0.772 | 0.382 |
| Trend | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | |
| Sample Size | 41 | 41 | 41 | 38 | 31 | 41 | 16 | 7 | 15 |
| Mann-Kendall S | -145 | 23 | 172 | -33 | 31 | 77 | 39 | 3.000 | -17 |
| p-Level | 0.106 | 0.805 | 0.042 | 0.690 | 0.612 | 0.330 | 0.087 | 0.772 | 0.436 |
| Trend | | | | | | | | | |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
All trend tests performed at a Type I (two-tailed) error rate of 0.01.

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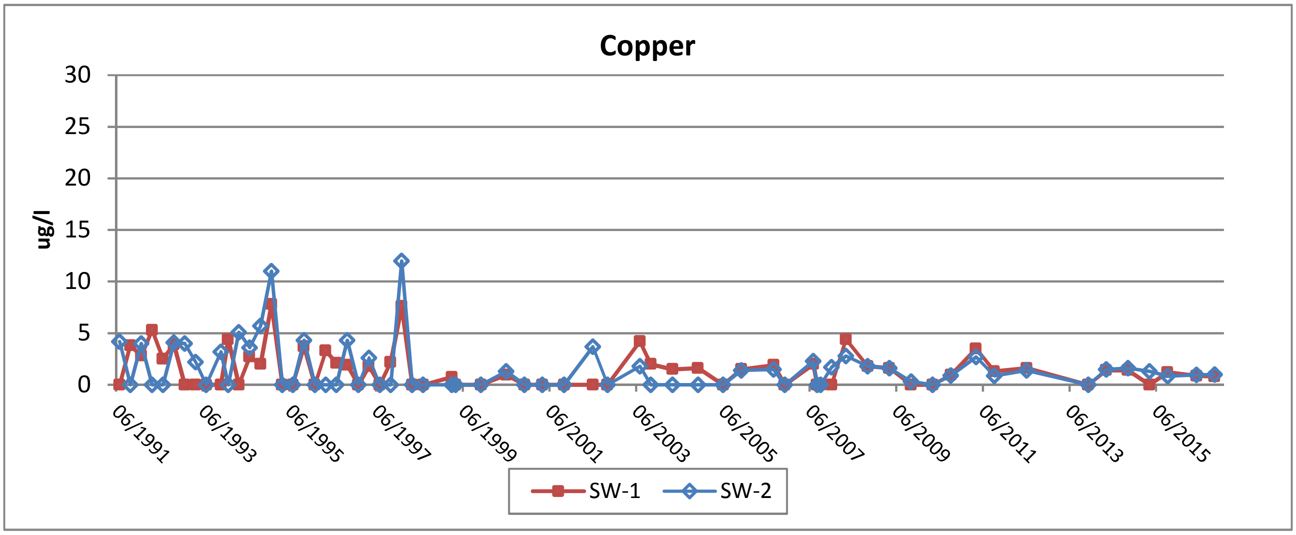


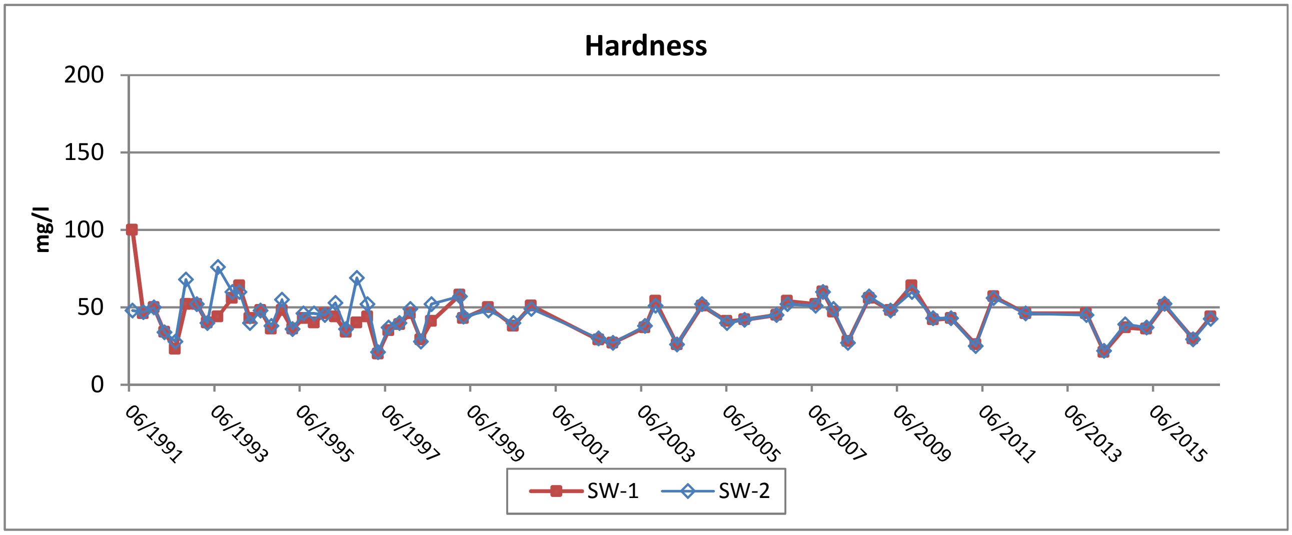


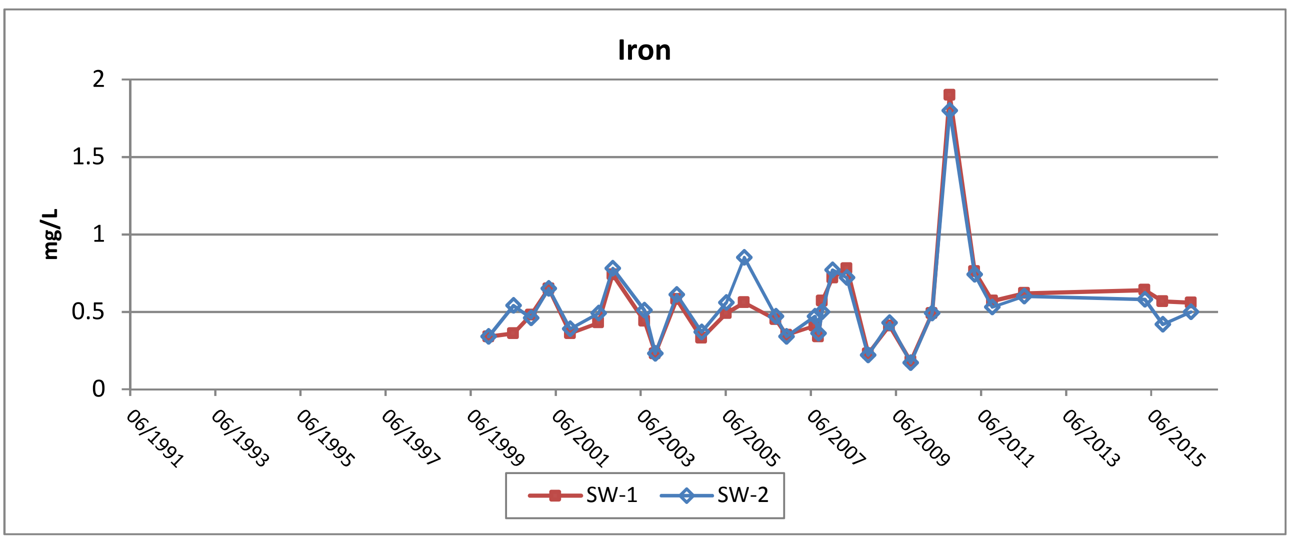


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Figure B-15a

Surface Water Trend Graphs

SW-1/SW-2

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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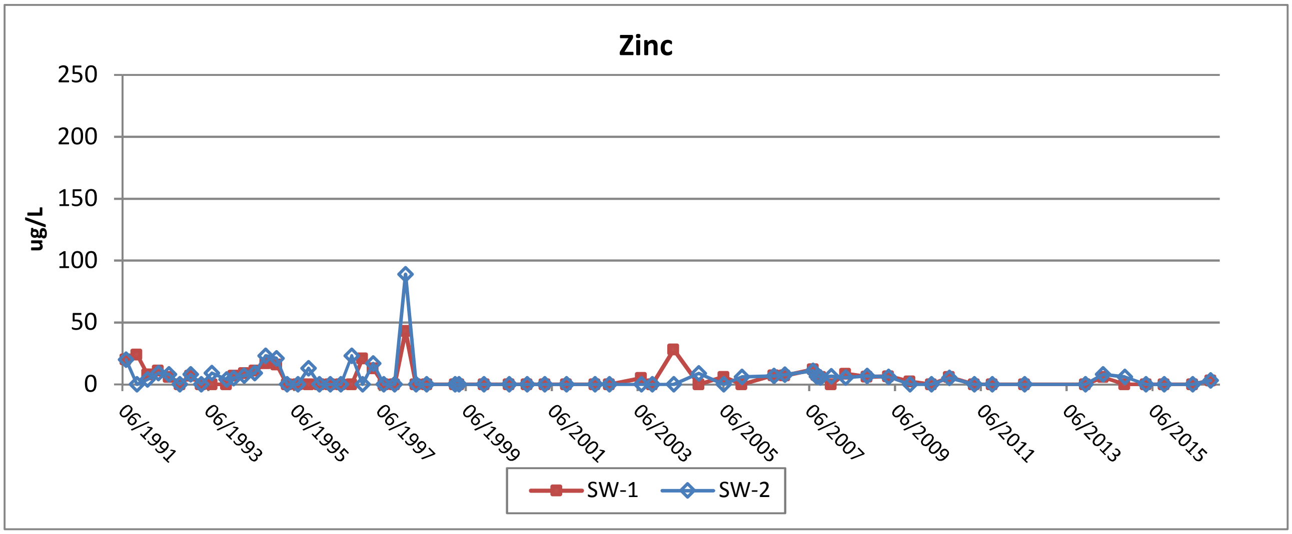


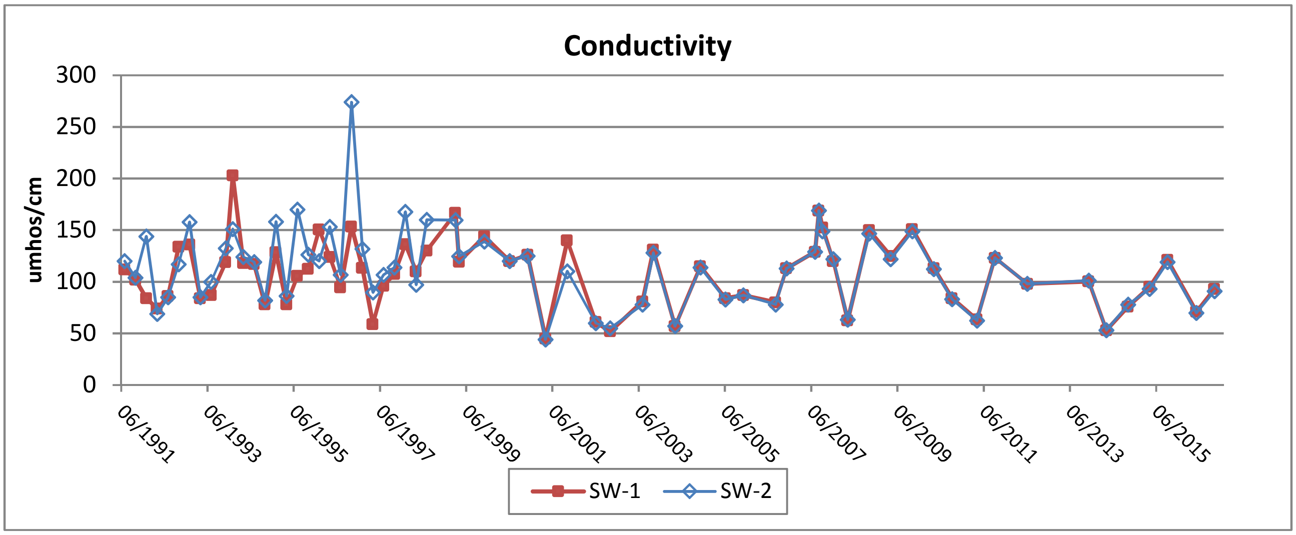


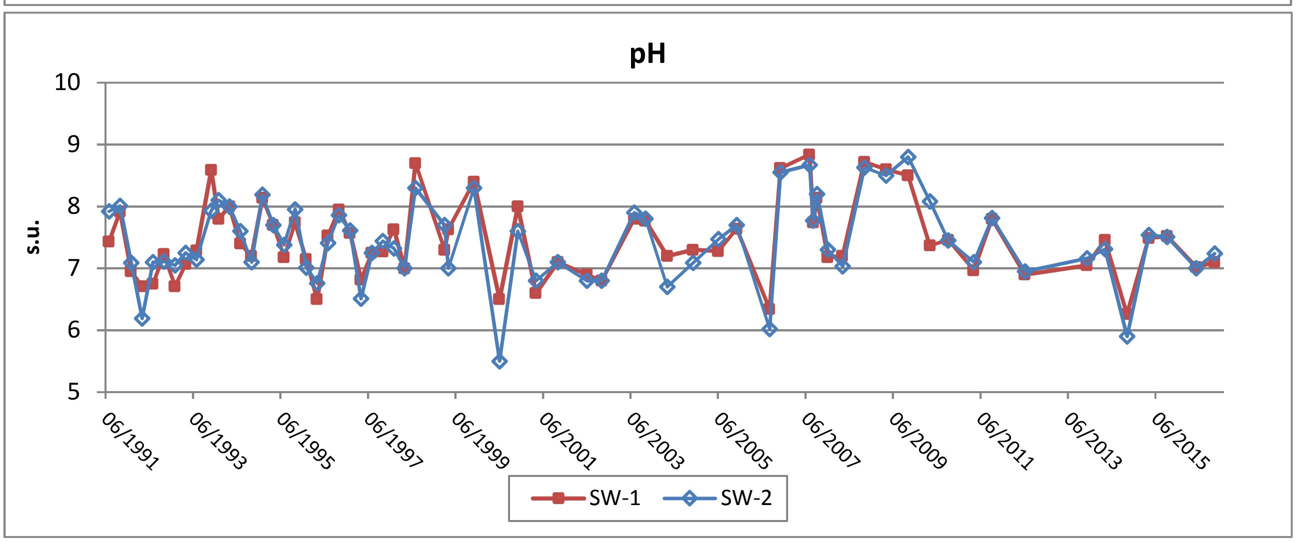


Foth Infrastructure & Environment, LLC

FLAMBEAU MINING COMPANY

Figure B-15b

Surface Water Trend Graphs

SW-1/SW-2

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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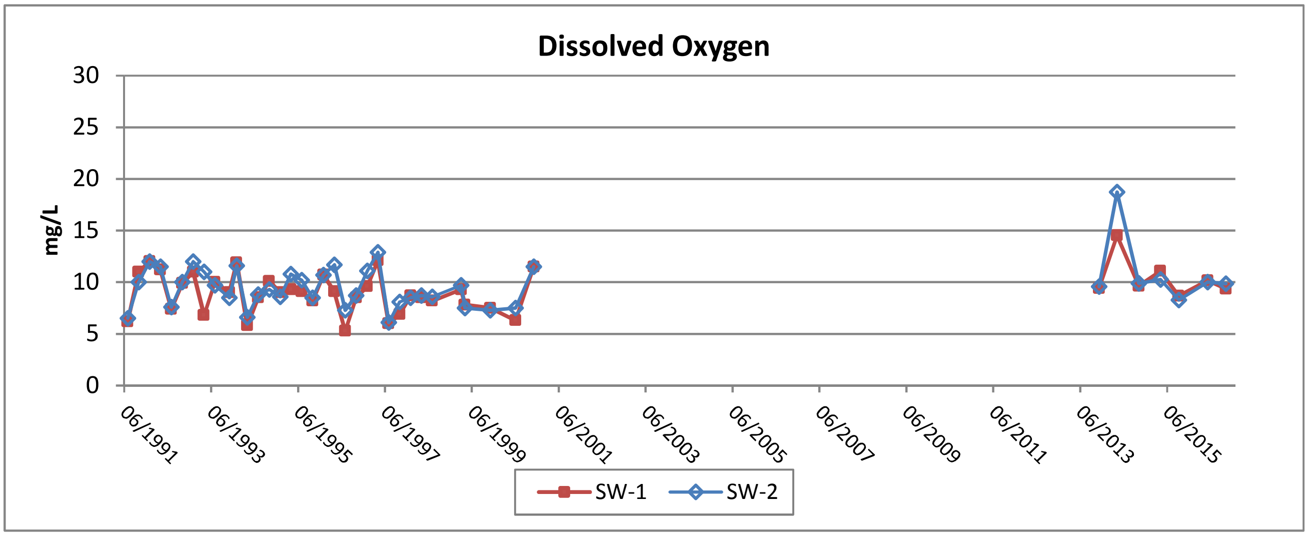


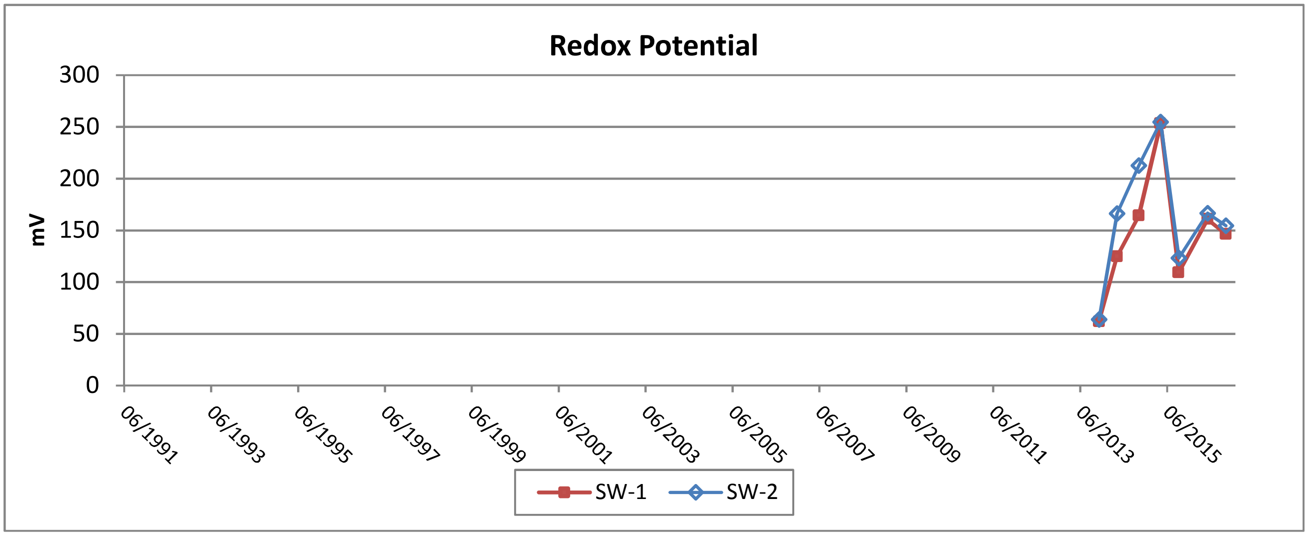


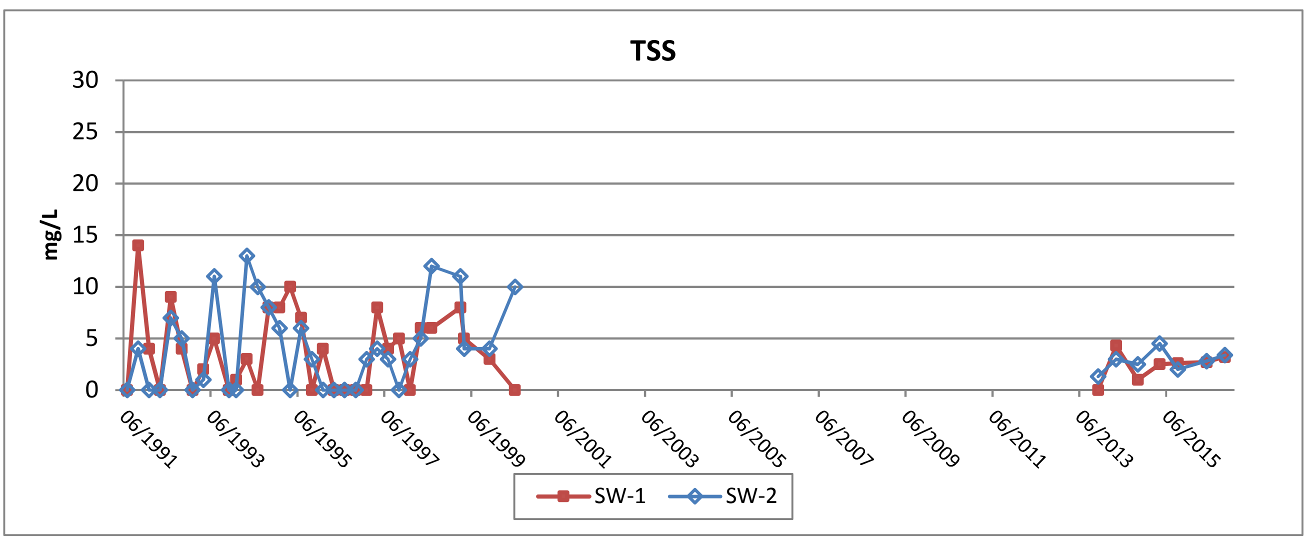


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Figure B-15c

Surface Water Trend Graphs

SW-1/SW-2

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: HLH | Checked By: SVF | Scope: 16F777-00 |

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2016 Annual Report

# Historical Surface Water Results

| Sample Da (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l | Dissolved Oxygen mg/l | Redox Potential mV | Total Suspended Solids mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1991-07 | SW-1 | | 112 | 7.43 | < 3 | 100 | | | | 20 | 6.2 | | < 1 |
| 1991-07 | SW-2 | | 120 | 7.92 | 4.2 | 48 | | | | 20 | 6.5 | | < 1 |
| 1991-10 | SW-1 | | 102 | 7.92 | 3.8 | 46 | | | | 24 | 11 | | 14 |
| 1991-10 | SW-2 | | 104 | 8.01 | < 2 | 47 | | | | < 3 | 10 | | 4 |
| 1992-01 | SW-1 | | 84 | 6.95 | 2.8 | 50 | | | | 8 | 12 | | 4 |
| 1992-01 | SW-2 | | 144 | 7.09 | 4 | 50 | | | | 4 | 12 | | < 1 |
| 1992-04 | SW-1 | | 74 | 6.71 | 5.3 | 34 | | | | 11 | 11.2 | | < 1 |
| 1992-04 | SW-2 | | 69 | 6.19 | < 2 | 34 | | | | 9 | 11.5 | | < 1 |
| 1992-07 | SW-1 | | 86 | 6.75 | 2.5 | 23 | | | | 6 | 7.4 | | 9 |
| 1992-07 | SW-2 | | 85 | 7.1 | < 2 | 28 | | | | 8 | 7.6 | | 7 |
| 1992-10 | SW-1 | | 134 | 7.23 | 3.9 | 52 | | | | < 3 | 9.9 | | 4 |
| 1992-10 | SW-2 | | 117 | 7.11 | 4.1 | 68 | | | | < 3 | 10 | | 5 |
| 1993-01 | SW-1 | | 136 | 6.71 | < 2 | 52 | | | | 7 | 11 | | < 1 |
| 1993-01 | SW-2 | | 158 | 7.05 | 4 | 52 | | | | 8 | 12 | | < 1 |
| 1993-04 | SW-1 | | 84 | 7.07 | < 2 | 40 | | | | < 3 | 6.8 | | 2 |
| 1993-04 | SW-2 | | 85 | 7.25 | 2.2 | 40 | | | | < 3 | 11 | | 1 |
| 1993-07 | SW-1 | | 87 | 7.29 | < 12 | 44 | | | | < 3 | 10 | | 5 |
| 1993-07 | SW-2 | | 100 | 7.14 | < 12 | 76 | | | | 9 | 9.7 | | 11 |
| 1993-11 | SW-1 | | 118.9 | 8.59 | < 2 | 56 | | | | < 3 | 9 | | < 1 |
| 1993-11 | SW-2 | | 132.6 | 7.93 | 3.2 | 60 | | | | 4 | 8.5 | | < 1 |
| 1994-01 | SW-1 | | 203 | 7.8 | 4.4 | 64 | | | | 7 | 11.9 | | 1 |
| 1994-01 | SW-2 | | 151 | 8.1 | < 2 | 60 | | | | 5 | 11.6 | | < 1 |
| 1994-04 | SW-1 | | 118 | 8 | < 2 | 43 | | | | 9 | 5.8 | | 3 |
| 1994-04 | SW-2 | | 124 | 8 | 5.1 | 40 | | | | 7 | 6.6 | | 13 |
| 1994-07 | SW-1 | | 117 | 7.4 | 2.7 | 48 | | | | 11 | 8.5 | | < 1 |
| 1994-07 | SW-2 | | 119 | 7.6 | 3.6 | 48 | | | | 9 | 8.8 | | 10 |
| 1994-10 | SW-1 | | 78 | 7.2 | 2 | 36 | | | | 17 | 10.1 | | 8 |
| 1994-10 | SW-2 | | 82 | 7.1 | 5.7 | 38 | | | | 23 | 9.3 | | 8 |
| 1995-01 | SW-1 | | 128.5 | 8.14 | 7.8 | 48 | | | | 16 | 9 | | 8 |
| 1995-01 | SW-2 | | 158.3 | 8.19 | 11 | 55 | | | | 21 | 8.6 | | 6 |
| 1995-04 | SW-1 | | 78.1 | 7.7 | < 3.8 | 36 | | | | < 12 | 9.3 | | 10 |
| 1995-04 | SW-2 | | 86.2 | 7.7 | < 3.8 | 36 | | | | < 12 | 10.8 | | < 1 |
| 1995-04 | SW-2 | Dup. | | | < 3.8 | 36 | | | | < 12 | | | < 1 |
| 1995-07 | SW-1 | | 105.5 | 7.18 | < 1.7 | 43 | | | | < 12 | 9.1 | | 7 |
| 1995-07 | SW-2 | | 170 | 7.38 | < 1.7 | 46 | | | | < 12 | 10.2 | | 6 |
| 1995-10 | SW-1 | | 112.5 | 7.74 | 3.7 | 40 | | | | < 12 | 8.2 | | < 1 |
| 1995-10 | SW-2 | | 126.3 | 7.95 | 4.3 | 46 | | | | 13 | 8.5 | | 3 |
| 1996-01 | SW-1 | | 150.5 | 7.15 | < 1.7 | 46 | | | | < 12 | 10.7 | | 4 |
| 1996-01 | SW-2 | | 120.2 | 7.01 | < 1.7 | 45 | | | | < 12 | 10.7 | | < 1 |
| 1996-04 | SW-1 | | 124 | 6.5 | 3.3 | 44 | | | | < 12 | 9.1 | | < 1 |
| 1996-04 | SW-2 | | 153.1 | 6.76 | < 1.7 | 53 | | | | < 12 | 11.7 | | < 1 |
| 1996-07 | SW-1 | | 94.5 | 7.53 | 2.1 | 34 | | | | < 12 | 5.3 | | < 1 |
| 1996-07 | SW-2 | | 106.8 | 7.41 | < 1.7 | 36 | | | | < 12 | 7.3 | | < 1 |
| 1996-10 | SW-1 | | 153.5 | 7.95 | 1.9 | 40 | | | | < 12 | 8.5 | | < 1 |
| 1996-10 | SW-2 | | 274 | 7.86 | 4.3 | 69 | | | | 23 | 8.7 | | < 1 |
| 1997-01 | SW-1 | | 113.3 | 7.57 | < 1.7 | 44 | | | | 21 | 9.6 | | < 1 |
| 1997-01 | SW-2 | | 132 | 7.61 | < 1.7 | 52 | | | | < 12 | 11.1 | | 3 |
| 1997-04 | SW-1 | | 58.9 | 6.82 | 1.8 | 20 | | | | 13 | 12.1 | | 8 |
| 1997-04 | SW-2 | | 89.6 | 6.51 | 2.6 | 21 | | | | 17 | 12.9 | | 4 |
| 1997-07 | SW-1 | | 96.1 | 7.25 | < 1.7 | 35 | | | | < 12 | 6 | | 4 |
| 1997-07 | SW-2 | | 106.8 | 7.25 | < 1.7 | 37 | | | | < 12 | 6.1 | | 3 |
| 1997-10 | SW-1 | | 107.6 | 7.27 | 2.2 | 39 | | | | < 12 | 6.9 | | 5 |
| 1997-10 | SW-2 | | 113.8 | 7.44 | < 1.7 | 40 | | | | < 12 | 8.1 | | < 1 |
| 1998-01 | SW-1 | | 136.3 | 7.63 | 7.6 | 46 | | | | 43 | 8.7 | | < 1 |
| 1998-01 | SW-2 | | 167.9 | 7.32 | 12 | 49 | | | | 89 | 8.5 | | 3 |
| 1998-04 | SW-1 | | 110 | 7 | < 1.7 | 29 | | | | < 12 | 8.5 | | 6 |
| 1998-04 | SW-2 | | 97 | 7 | < 1.7 | 28 | | | | < 12 | 8.7 | | 5 |
| 1998-07 | SW-1 | | 130 | 8.7 | < 1.7 | 41 | | | | < 12 | 8.2 | | 6 |
| 1998-07 | SW-2 | | 160 | 8.3 | < 1.7 | 52 | | | | < 12 | 8.6 | | 12 |
| 1999-03 | SW-1 | | 166.7 | 7.3 | 0.74 | 58 | | | | < 12 | 9.3 | | 8 |
| 1999-03 | SW-2 | | 159.6 | 7.7 | < 0.6 | 57 | | | | < 12 | 9.7 | | 11 |
| 1999-04 | SW-1 | | 119.3 | 7.63 | < 0.6 | 43 | | | | < 12 | 7.8 | | 5 |
| 1999-04 | SW-2 | | 124.7 | 7 | < 0.6 | 44 | | | | < 12 | 7.5 | | 4 |
| 1999-11 | SW-1 | | 144 | 8.4 | < 0.6 | 50 | 0.34 | 42 | 7.7 | < 12 | 7.5 | | 3 |

# Historical Surface Water Results

| Sample Da (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l | Dissolved Oxygen mg/l | Redox Potential mV | Total Suspended Solids mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999-11 | SW-2 | | 139 | 8.3 | < 0.6 | 48 | 0.34 | 38 | 7.9 | < 12 | 7.3 | | 4 |
| 2000-06 | SW-1 | | 120 | 6.5 | 0.94 | 38 | 0.36 | 60 | 5.2 | < 12 | 6.3 | | < 1 |
| 2000-06 | SW-2 | | 120 | 5.5 | 1.3 | 40 | 0.54 | 89 | 5.2 | < 12 | 7.5 | | 10 |
| 2000-11 | SW-1 | | 126 | 8 | < 1.2 | 51 | 0.48 | 56 | 8.6 | < 12 | 11.5 | | |
| 2000-11 | SW-2 | | 125 | 7.6 | < 1.2 | 49 | 0.46 | 53 | 8.4 | < 12 | 11.5 | | |
| 2001-04 | SW-1 | | 45 | 6.6 | < 1.3 | | 0.65 | 68 | < 5 | < 12 | | | |
| 2001-04 | SW-2 | | 44 | 6.8 | < 1.3 | | 0.65 | 66 | < 5 | < 12 | | | |
| 2001-10 | SW-1 | | 140 | 7.1 | < 1.3 | | 0.36 | 83 | 8.8 | < 12 | | | |
| 2001-10 | SW-2 | | 110 | 7.1 | < 1.3 | | 0.39 | 95 | 8.9 | < 12 | | | |
| 2002-06 | SW-1 | | 61 | 6.9 | < 1.3 | 29 | 0.43 | 45 | < 5 | < 12 | | | |
| 2002-06 | SW-2 | | 60 | 6.8 | 3.7 | 30 | 0.49 | 58 | < 5 | < 12 | | | |
| 2002-10 | SW-1 | | 52 | 6.8 | < 1.3 | 27 | 0.74 | 48 | < 5 | < 12 | | | |
| 2002-10 | SW-2 | | 55 | 6.8 | < 1.3 | 27 | 0.78 | 47 | < 5 | < 12 | | | |
| 2003-07 | SW-1 | | 81 | 7.8 | 4.2 | 37 | 0.44 | 44 | 2.6 | 5.1 | | | |
| 2003-07 | SW-2 | | 78 | 7.9 | 1.8 | 38 | 0.51 | 58 | 2.6 | < 5 | | | |
| 2003-10 | SW-1 | | 131 | 7.77 | 2 | 54 | 0.23 | 81 | 6.7 | < 5 | | | |
| 2003-10 | SW-2 | | 128 | 7.8 | < 1.3 | 51 | 0.23 | 68 | 7.1 | < 5 | | | |
| 2004-04 | SW-1 | | 57 | 7.2 | 1.5 | 26 | 0.58 | 64 | 5.4 | 28 | | | |
| 2004-04 | SW-2 | | 57 | 6.7 | < 1.3 | 26 | 0.61 | 63 | 5.4 | < 5 | | | |
| 2004-11 | SW-1 | | 115 | 7.3 | 1.6 | 51 | 0.33 | 45 | 7.2 | < 5 | | | |
| 2004-11 | SW-2 | | 114 | 7.09 | < 1.3 | 52 | 0.37 | 49 | 6.3 | 8.8 | | | |
| 2005-06 | SW-1 | | 84 | 7.28 | < 1.3 | 41 | 0.49 | 82 | < 2.5 | 6 | | | |
| 2005-06 | SW-2 | | 83 | 7.47 | < 1.3 | 40 | 0.56 | 87 | 5.7 | < 5 | | | |
| 2005-11 | SW-1 | | 87 | 7.64 | 1.5 | 42 | 0.56 | 45 | 7.2 | < 5 | | | |
| 2005-11 | SW-2 | | 87 | 7.7 | 1.4 | 42 | 0.85 | 75 | 7.3 | 5.9 | | | |
| 2006-08 | SW-1 | | 80 | 6.34 | 1.9 | 45 | 0.45 | 120 | 4.7 | 7.3 | | | |
| 2006-08 | SW-2 | | 78 | 6.02 | 1.5 | 45 | 0.47 | 120 | 4.3 | 6.9 | | | |
| 2006-11 | SW-1 | | 113 | 8.62 | < 1.3 | 54 | 0.35 | 45 | 8.1 | 7.1 | | | |
| 2006-11 | SW-2 | | 113 | 8.55 | < 1.3 | 52 | 0.34 | 44 | 8.1 | 7.8 | | | |
| 2006-11 | SW-2 | Dup. | | | < 1.3 | 52 | 0.34 | 44 | 8.1 | 7.8 | | | |
| 2007-07 | SW-1 | | 129 | 8.84 | 2 | 52 | 0.41 | 110 | 6.9 | 12 | | | |
| 2007-07 | SW-2 | | 129 | 8.67 | 2.3 | 51 | 0.47 | 81 | 7 | 11 | | | |
| 2007-08 | SW-1 | | 169 | 7.74 | < 1.3 | | 0.34 | 170 | 10 | 7.5 | | | |
| 2007-08 | SW-2 | | 169 | 7.77 | < 1.3 | | 0.36 | 170 | 10 | 6.4 | | | |
| 2007-09 | SW-1 | | 152.4 | 8.14 | < 1.3 | 60 | 0.57 | 130 | 10 | 6 | | | |
| 2007-09 | SW-2 | | 149 | 8.2 | < 1.3 | 60 | 0.5 | 130 | 11 | 5.4 | | | |
| 2007-12 | SW-1 | | 120 | 7.18 | < 1.3 | 47 | 0.72 | 54 | 7.7 | < 5 | | | |
| 2007-12 | SW-1 | Dup. | | | < 1.3 | 51 | 0.76 | 56 | 8.8 | < 5 | | | |
| 2007-12 | SW-2 | | 122 | 7.3 | 1.7 | 49 | 0.77 | 57 | 9.1 | 6.5 | | | |
| 2008-04 | SW-1 | | 62.7 | 7.2 | 4.4 | 28 | 0.78 | 96 | 4.7 | 8.5 | | | |
| 2008-04 | SW-2 | | 63.2 | 7.03 | 2.8 | 27 | 0.72 | 88 | 4.9 | 5.5 | | | |
| 2008-10 | SW-1 | | 149.9 | 8.72 | 1.8 | 56 | 0.23 | 46 | 9.5 | 6.1 | | | |
| 2008-10 | SW-1 | Dup. | | | 2.2 | 58 | 0.24 | 48 | 9.8 | 5.5 | | | |
| 2008-10 | SW-2 | | 146.6 | 8.63 | 1.8 | 57 | 0.22 | 48 | 9.4 | 6.9 | | | |
| 2009-04 | SW-1 | | 125 | 8.6 | 1.6 | 48 | 0.41 | 51 | 8.7 | 6.5 | | | |
| 2009-04 | SW-2 | | 122 | 8.5 | 1.6 | 48 | 0.43 | 51 | 9 | 6 | | | |
| 2009-10 | SW-1 | | 151 | 8.5 | < 0.29 | 64 | 0.18 | 66 | 9.4 | 2.2 | | | |
| 2009-10 | SW-2 | | 149 | 8.8 | 0.32 | 60 | 0.17 | 56 | 9.8 | < 2 | | | |
| 2010-04 | SW-1 | | 113.1 | 7.37 | < 1.3 | 42 | 0.49 | 54 | 6.1 | < 5.0 | | | |
| 2010-04 | SW-2 | | 112.4 | 8.08 | < 1.3 | 43 | 0.49 | 55 | 6.7 | < 5.0 | | | |
| 2010-04 | SW-2 | Dup. | | | < 1.3 | 41 | 0.44 | 54 | 6.5 | < 5.0 | | | |
| 2010-09 | SW-1 | | 84.1 | 7.46 | 0.94 | 43 | 1.9 | 190 | 3.3 | 5.8 | | | |
| 2010-09 | SW-2 | | 83.2 | 7.45 | 0.89 | 43 | 1.8 | 180 | 2.9 | 5.2 | | | |
| 2011-04 | SW-1 | | 63.4 | 6.97 | 3.5 | 26 | 0.76 | 37 | 3.3 | < 5 | | | |
| 2011-04 | SW-2 | | 62.5 | 7.10 | 2.7 | 25 | 0.74 | 36 | 3.3 | < 5 | | | |
| 2011-09 | SW-1 | | 123.1 | 7.80 | 1.3 | 57 | 0.57 | 65 | 5.3 | < 5 | | | |
| 2011-09 | SW-2 | | 123.2 | 7.81 | 0.86 | 56 | 0.53 | 58 | 5.4 | < 5 | | | |
| 2012-06 | SW-1 | | 98 | 6.9 | 1.6 | 46 | 0.62 | 120 | 4.7 | < 5 | | | |
| 2012-06 | SW-2 | | 98 | 6.95 | 1.4 | 46 | 0.6 | 110 | 4.8 | < 5 | | | |
| 2013-11 | SW-1 | | 100.3 | 7.05 | < 0.73 | 46 | | | | < 5 | 9.42 | 62 | < 1 |
| 2013-11 | SW-2 | | 101.2 | 7.16 | < 0.73 | 45 | | | | < 5 | 9.58 | 64 | 1.3 |
| 2014-04 | SW-1 | | 53 | 7.46 | 1.4 | 21 | | | | 5.8 | 14.51 | 124.8 | 4.3 |
| 2014-04 | SW-2 | | 53 | 7.31 | 1.5 | 22 | | | | 8 | 18.73 | 166.4 | 3 |
| 2014-10 | SW-1 | | 76 | 6.26 | 1.4 | 37 | | | | < 5.0 | 9.63 | 164.2 | 1.0 |

pw:\\PW-APS1.foth.com:PW_IE\Documents\Clients\Flambeau Mining\0016F777.00\10500 Reference Information\Stats Analysis\2016 Annual Report\Data Report_SW.xlsx

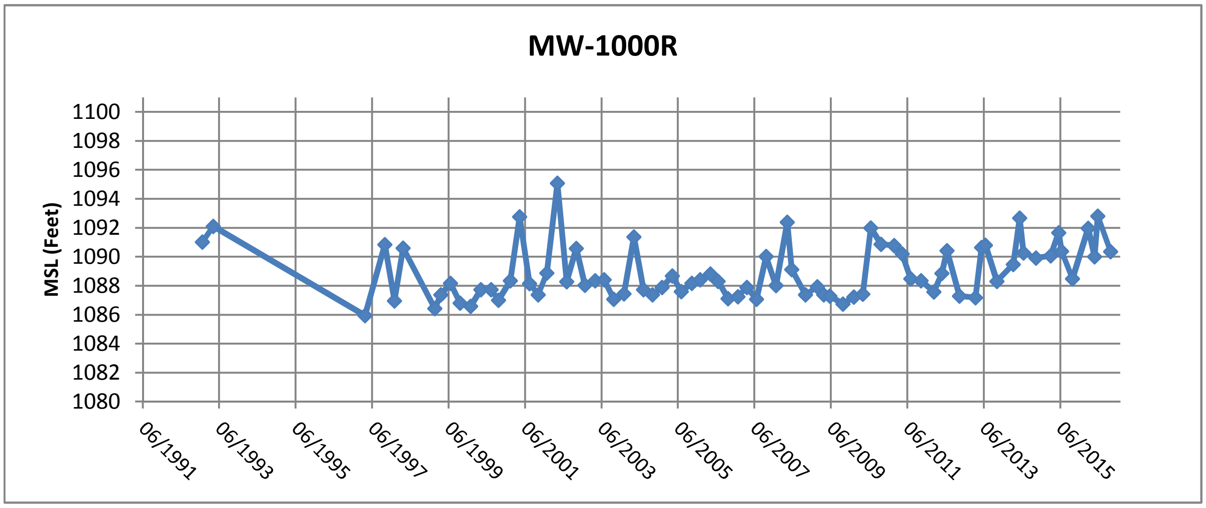
# Historical Surface Water Results

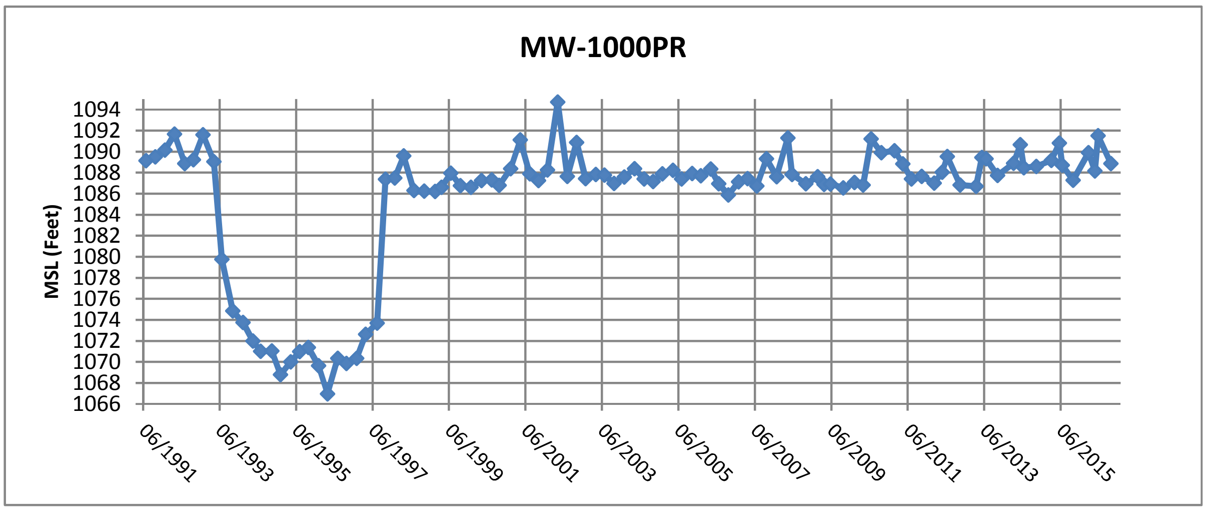
| Sample Da (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l | Dissolved Oxygen mg/l | Redox Potential mV | Total Suspended Solids mg/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014-10 | SW-2 | | 78 | 5.9 | 1.6 | 39 | | | | 6.1 | 9.88 | 212.7 | 2.5 |
| 2015-04 | SW-1 | | 95 | 7.49 | < 1.3 | 36 | 0.64 | | | < 5 | 11.07 | 253.4 | 2.5 |
| 2015-04 | SW-2 | | 93 | 7.54 | 1.3 | 37 | 0.58 | | | < 5 | 10.25 | 254.7 | 4.5 |
| 2015-09 | SW-1 | | 121 | 7.52 | 1.2 | 51.3 | 0.567 | | | < 3.1 | 8.68 | 109.3 | 2.6 |
| 2015-09 | SW-2 | | 119 | 7.51 | 0.84 | 52.3 | 0.418 | | | < 3.1 | 8.27 | 123.4 | 2.0 |
| 2016-05 | SW-1 | Dup. | | | 0.88 | 30.6 | 0.548 | | | < 3.1 | | | 2.8 |
| 2016-05 | SW-1 | | 71 | 7.02 | 0.87 | 29.7 | 0.559 | | | < 3.1 | 10.17 | 160.9 | 2.7 |
| 2016-05 | SW-2 | | 70 | 7 | 0.95 | 29.4 | 0.5 | | | < 3.1 | 10 | 166.7 | 2.8 |
| 2016-10 | SW-1 | | 93 | 7.1 | 0.80 | 43.9 | | | | 3.1 | 9.36 | 146.3 | 3.2 |
| 2016-10 | SW-2 | | 91 | 7.24 | 1.0 | 42.6 | | | | 3.1 | 9.86 | 154.7 | 3.4 |

pw:\\PW-APS1.foth.com:PW_IE\Documents\Clients\Flambeau Mining\0016F777.00\10500 Reference Information\Stats Analysis\2016 Annual Report\Data Report_SW.xlsx

# Attachment 4

# Hydrographs



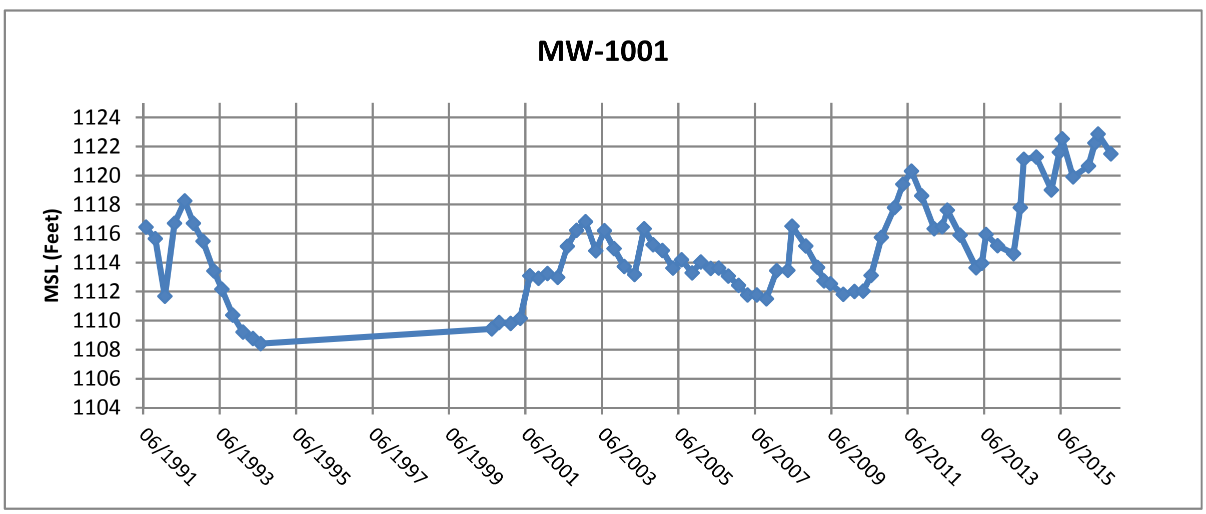




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Figure B-16a
Hydrographs

| Scale: NA | Date: January 2017 | |
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| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |

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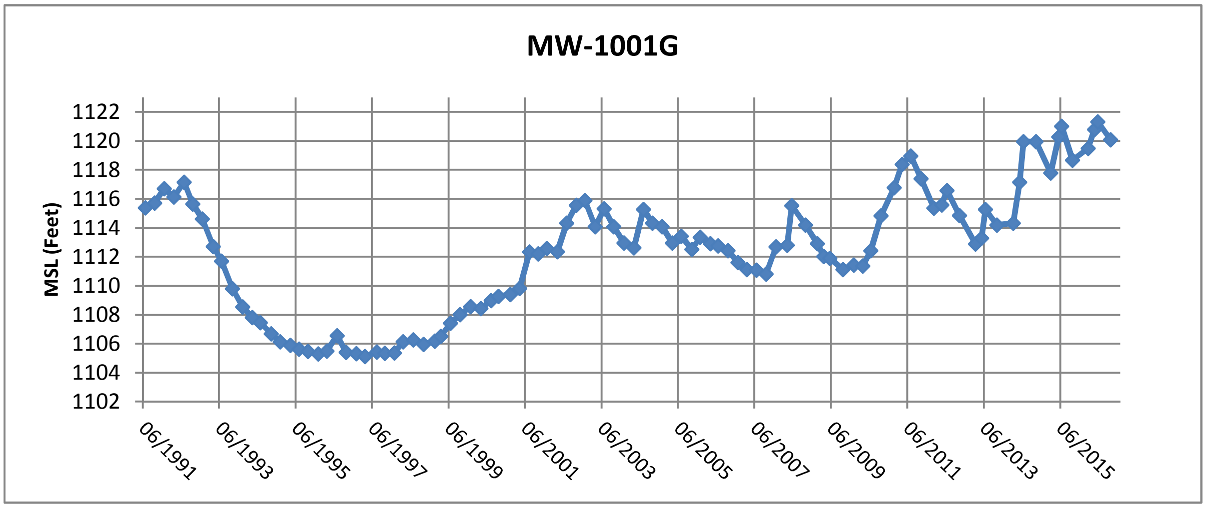


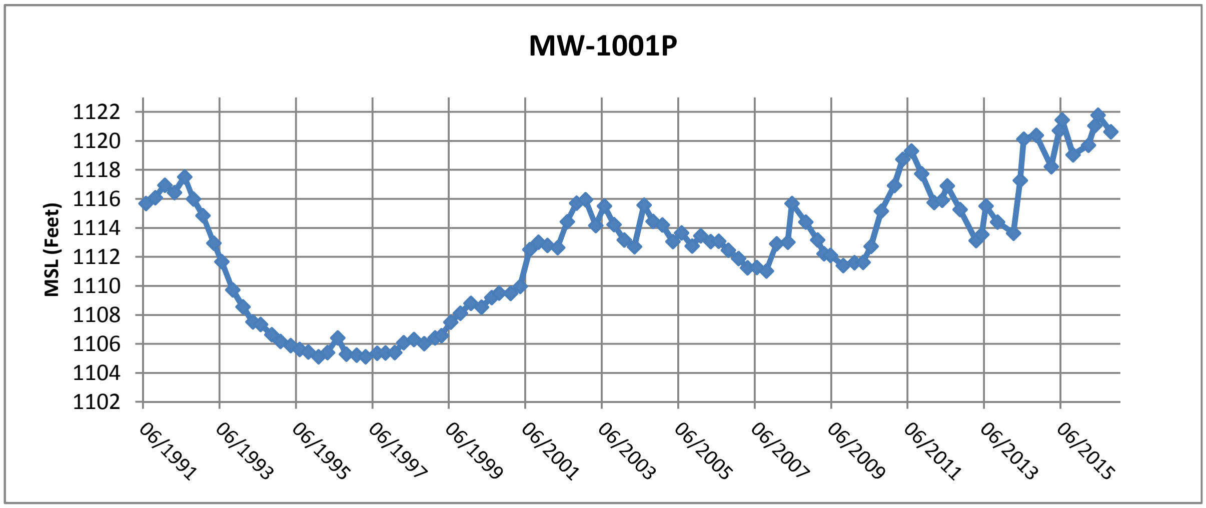


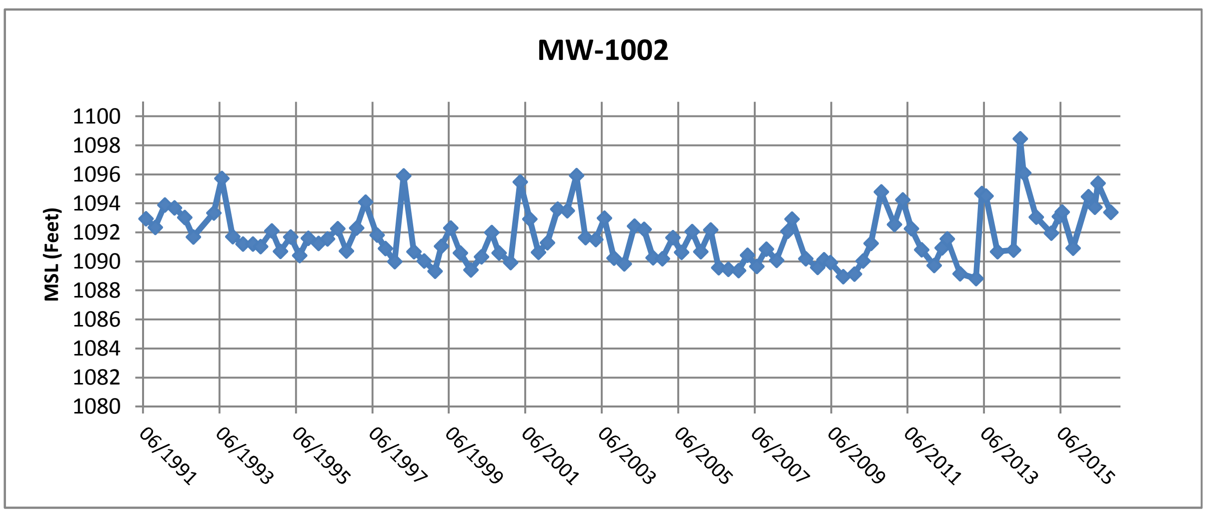


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Figure B-16b
Hydrographs

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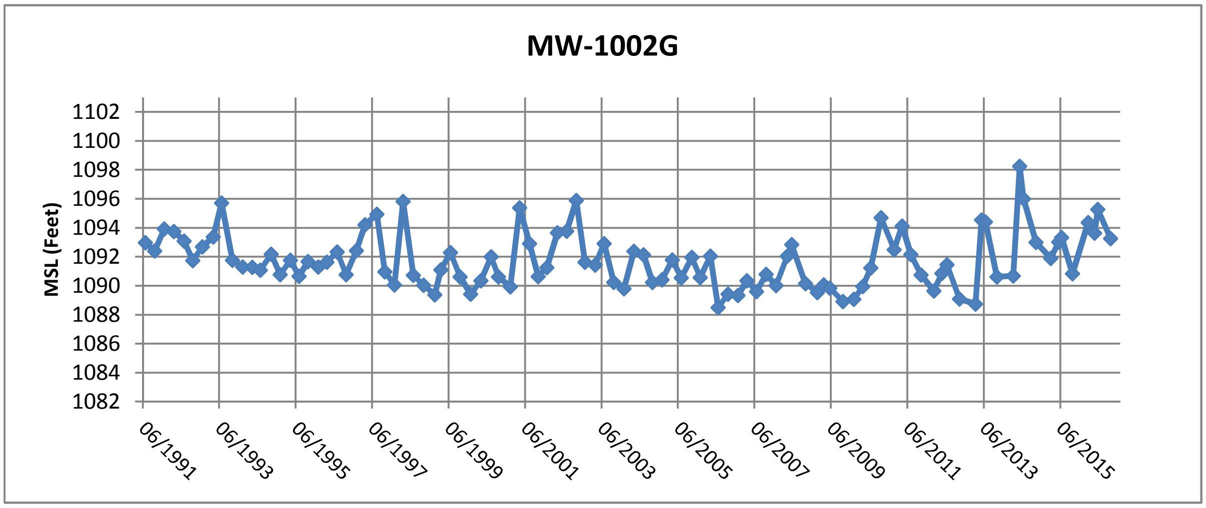


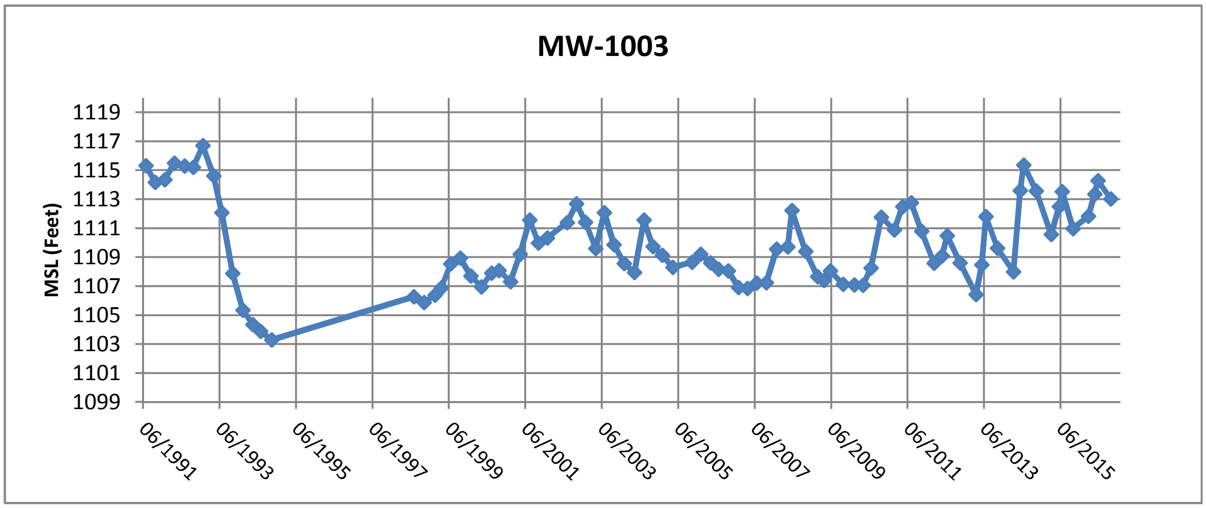


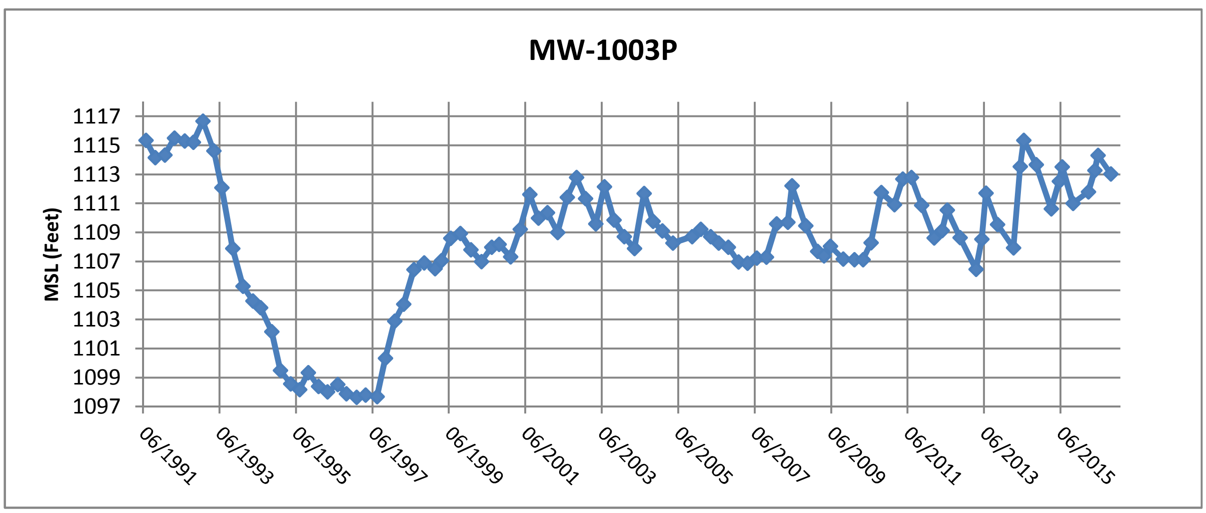


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Figure B-16c
Hydrographs

| | |
|---|---|
| Scale: NA | Date: January 2017 |

| | | |
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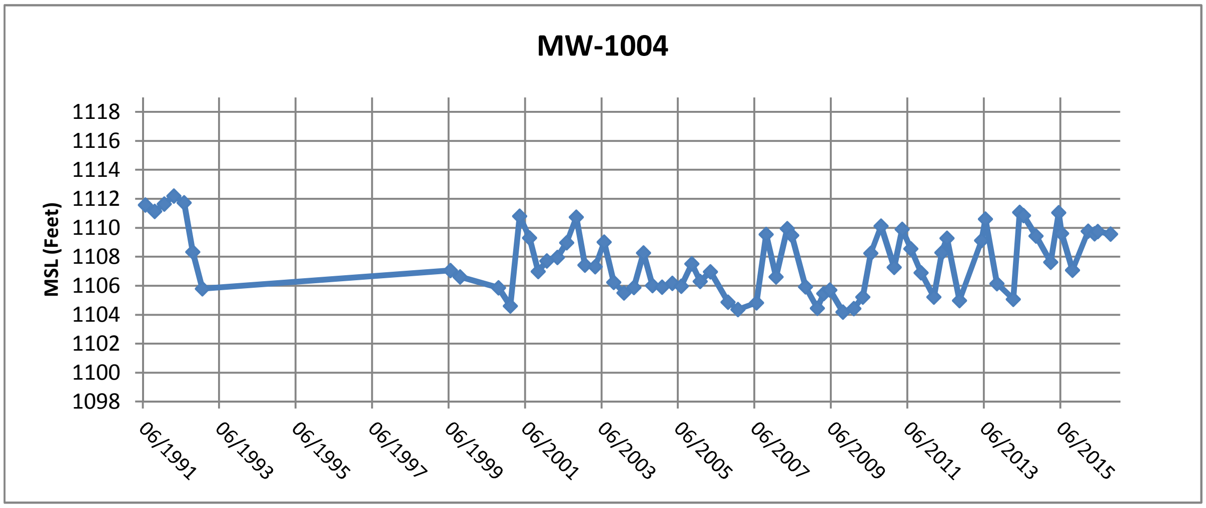


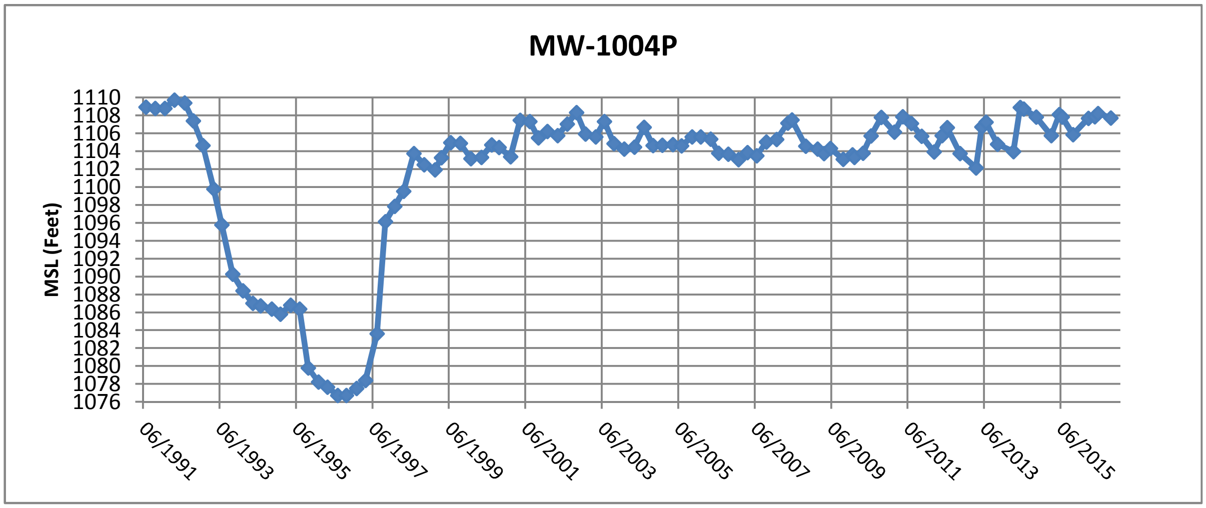


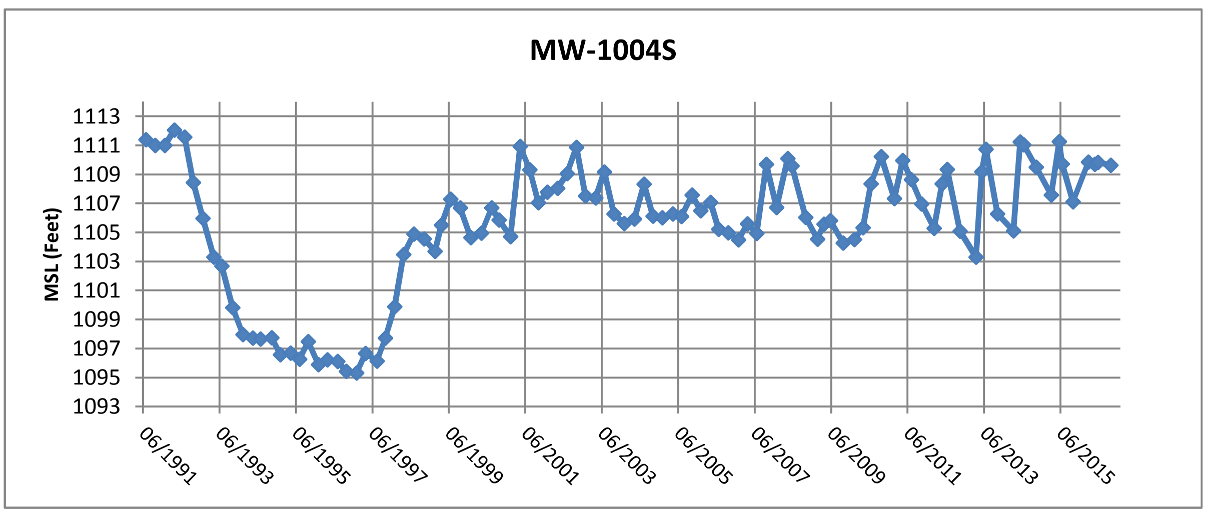


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Figure B-16d
Hydrographs

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| | | |
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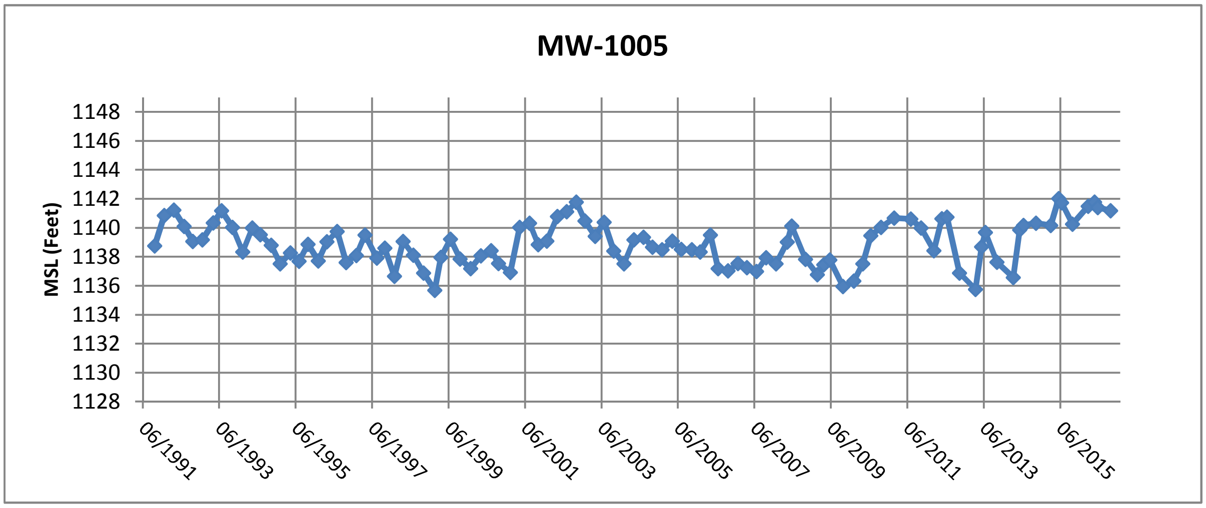


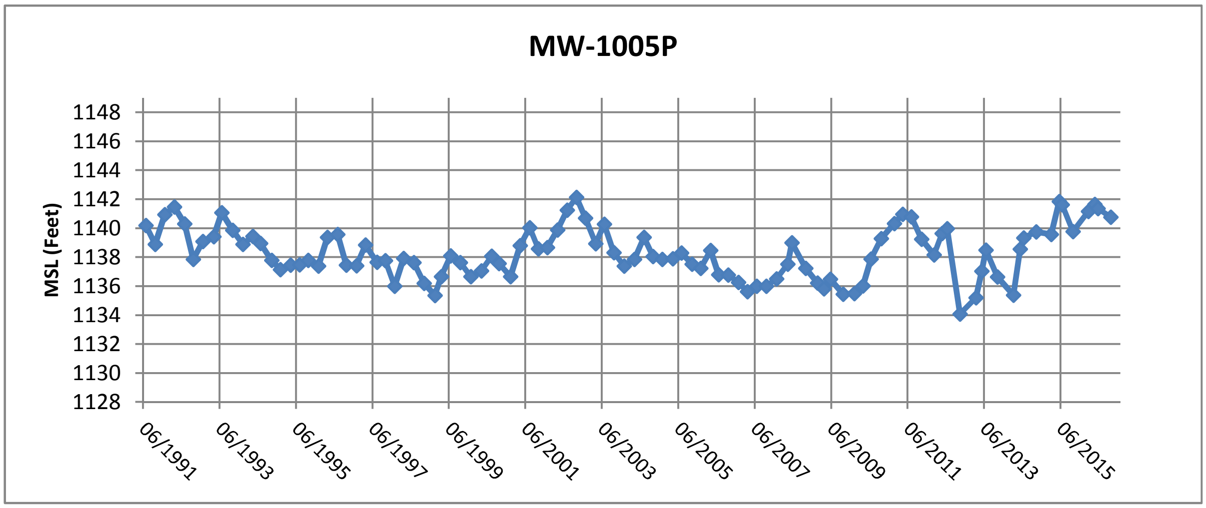


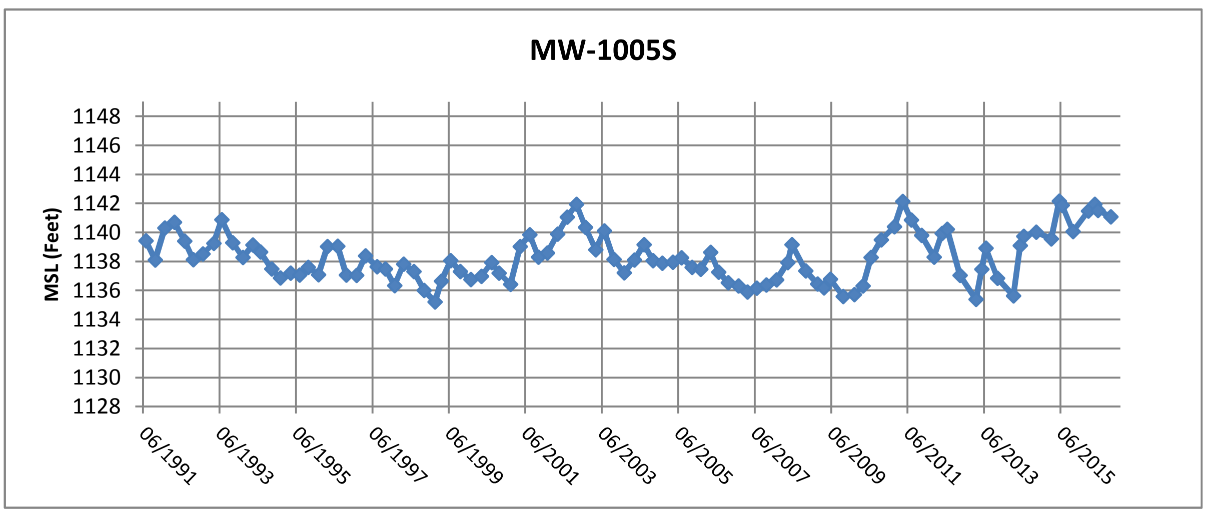


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Figure B-16e
Hydrographs

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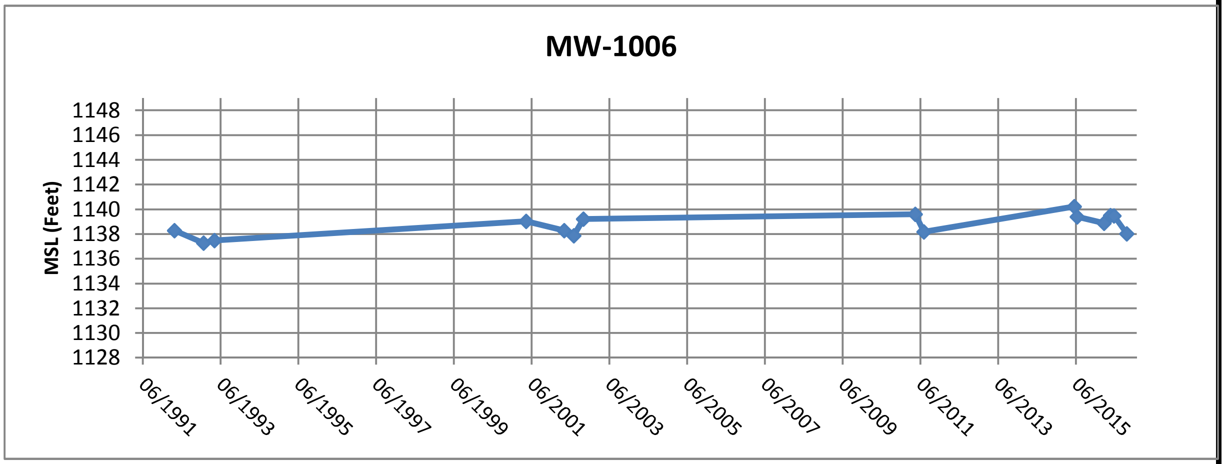
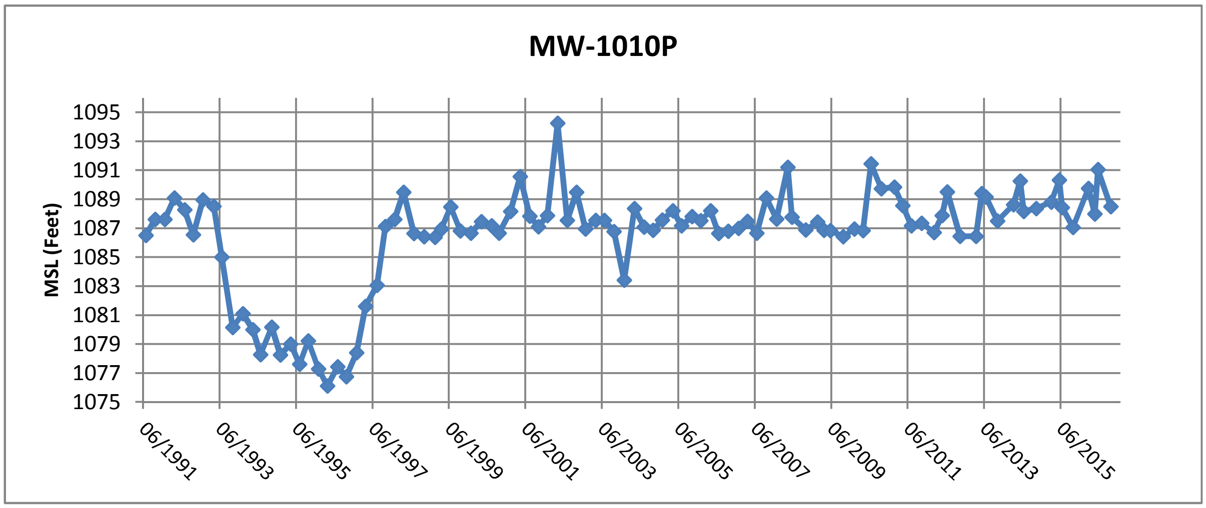



Note: Gaps between collected data are due to dry well.



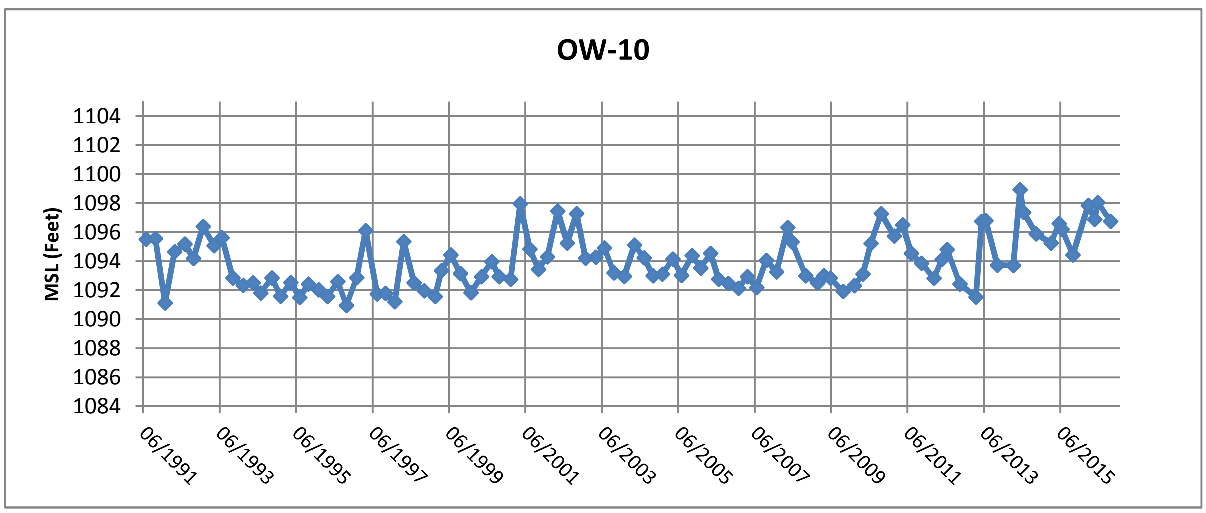




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Figure B-16f
Hydrographs

| Scale: NA | Date: January 2017 | |
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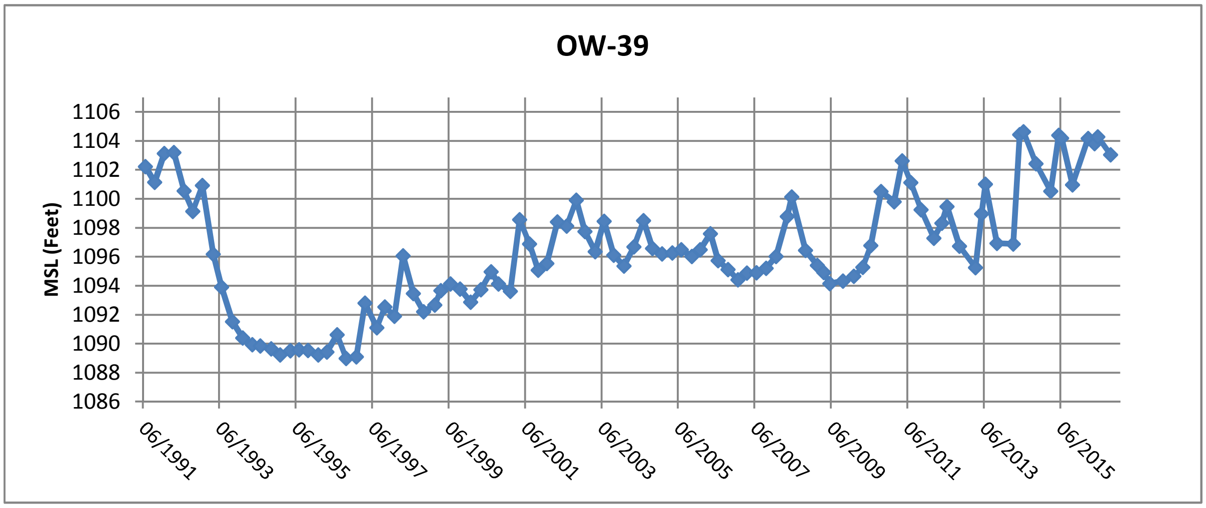


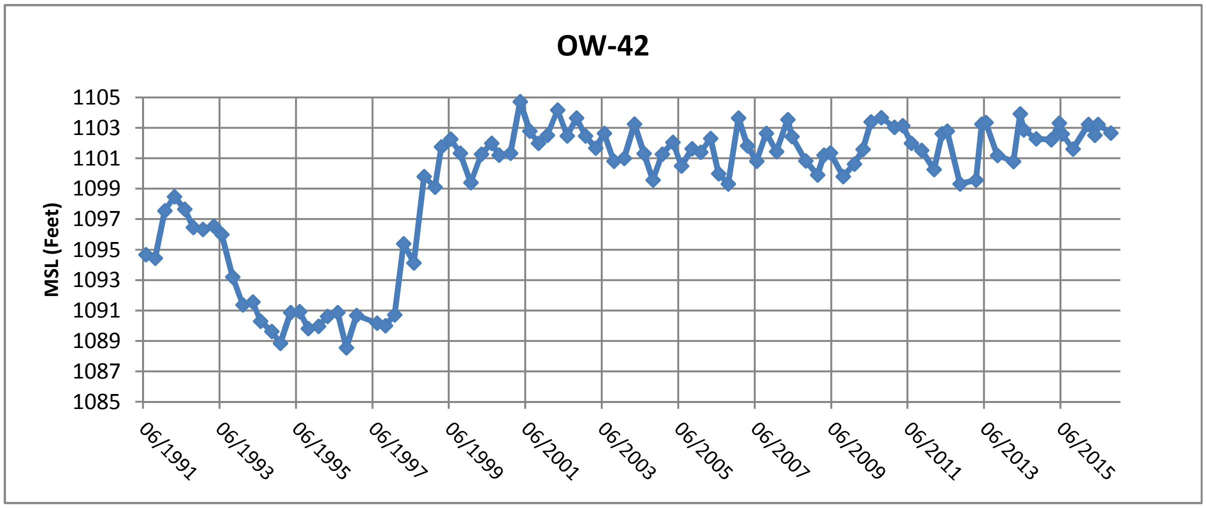


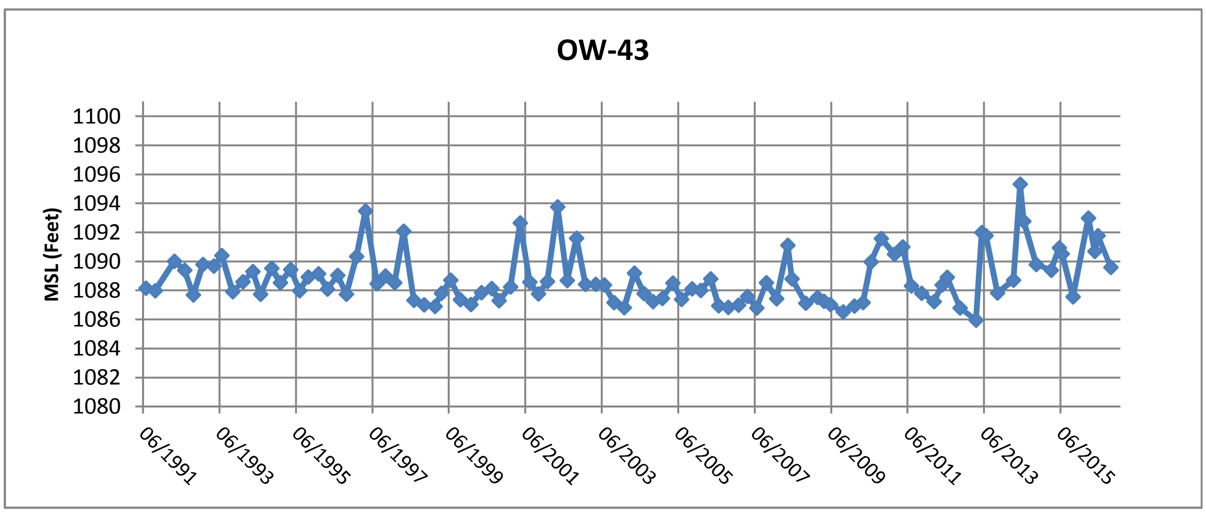


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Figure B-16g
Hydrographs

| Scale: NA | Date: January 2017 | |
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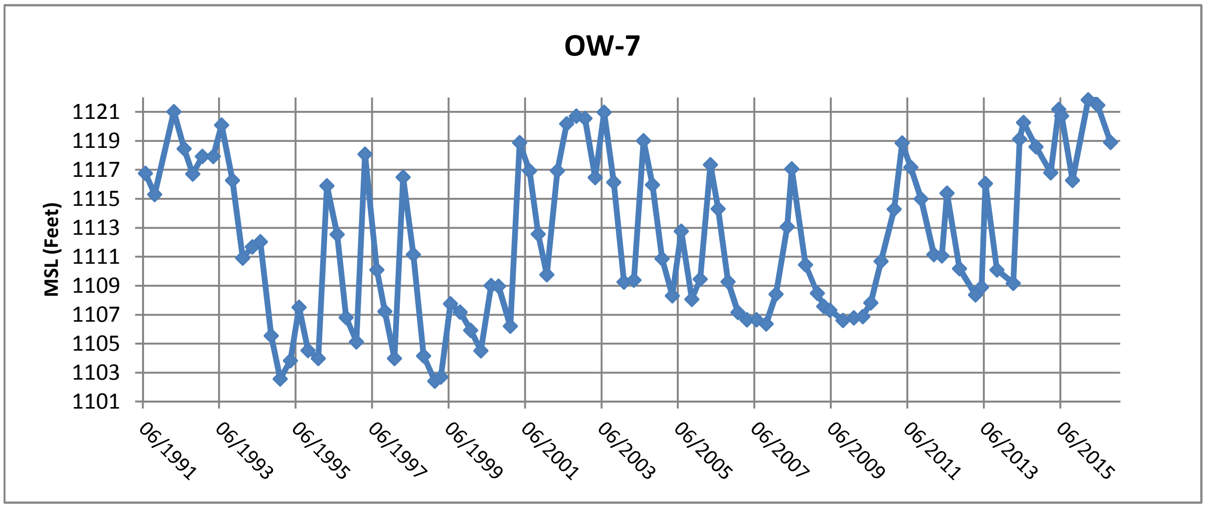


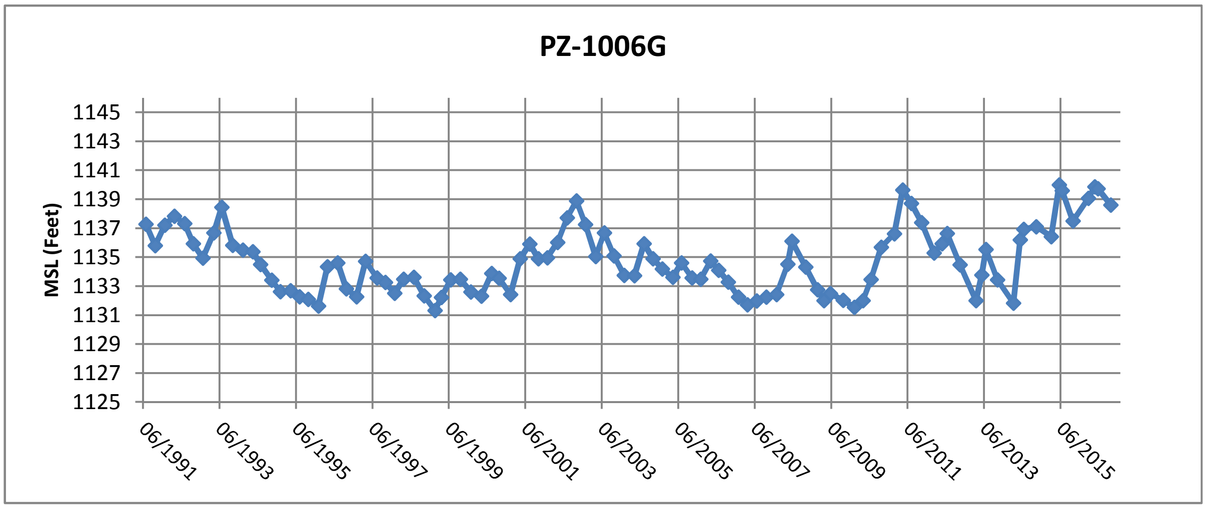


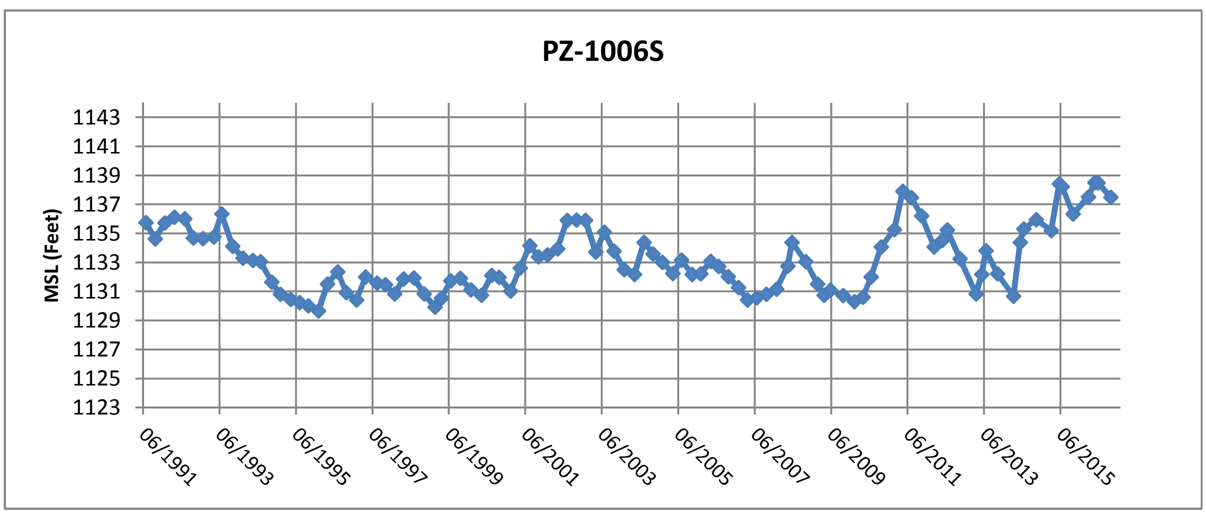


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Figure B-16h
Hydrographs

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |

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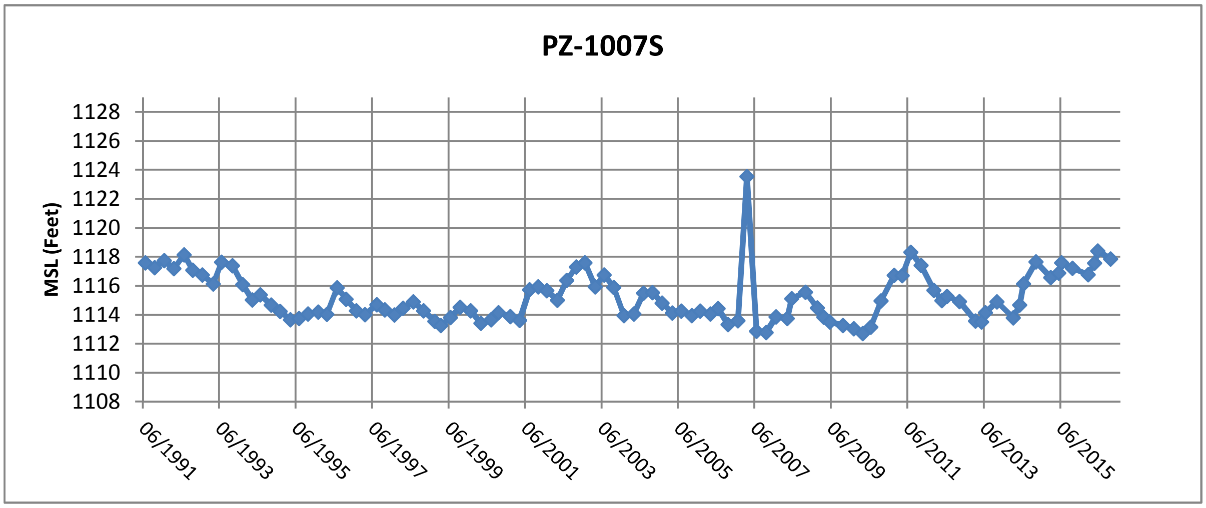


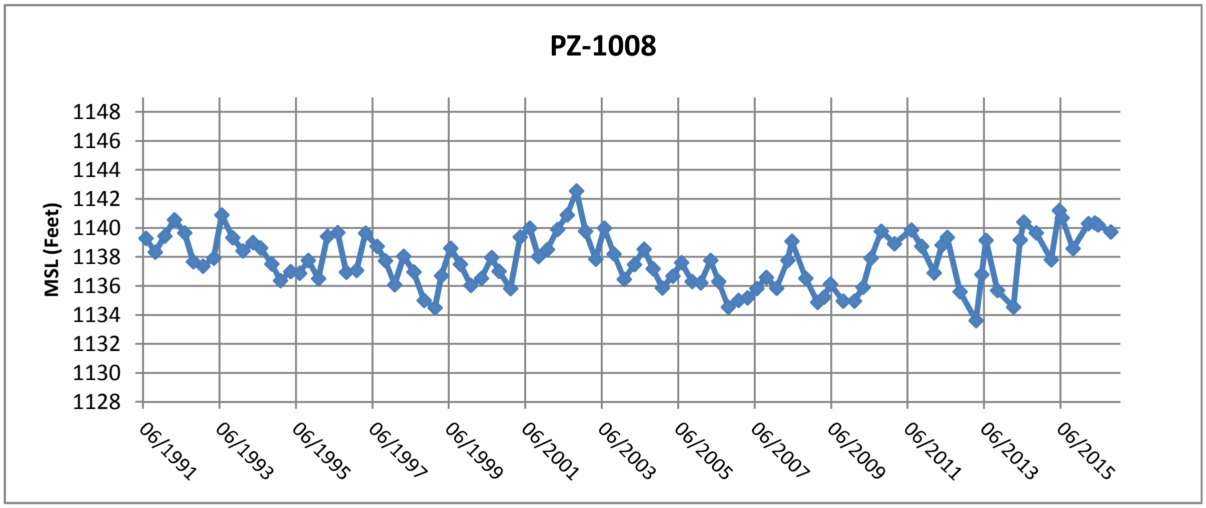


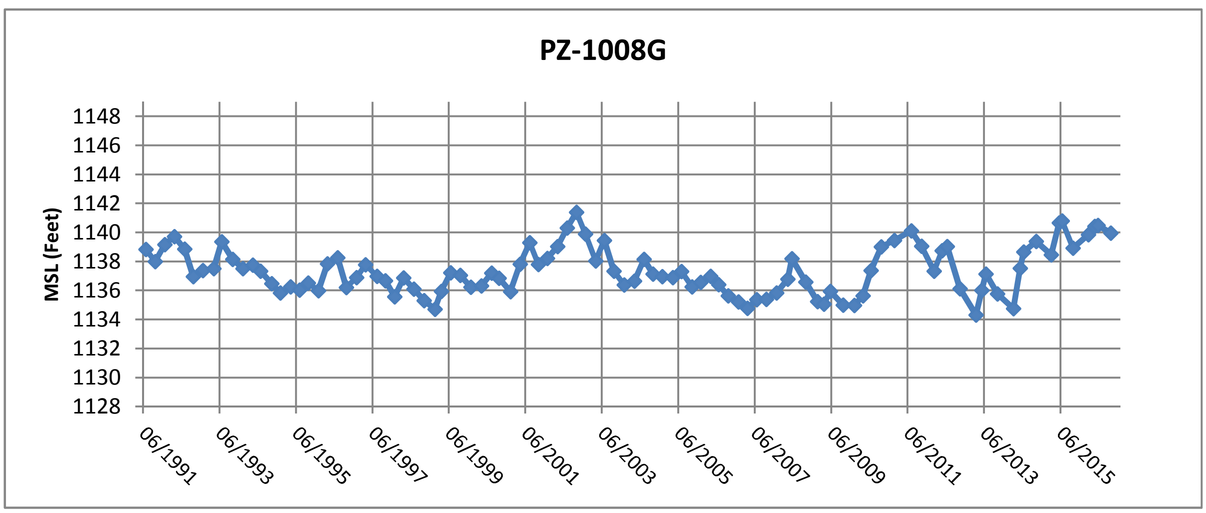


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Figure B-16i
Hydrographs

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| Scale: NA | Date: January 2017 |

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| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |

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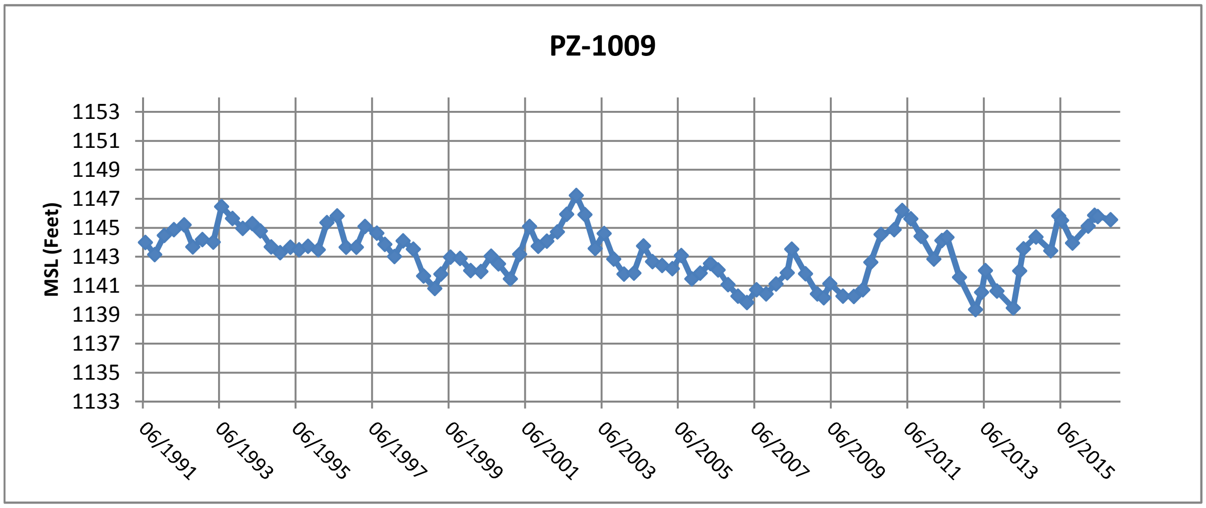


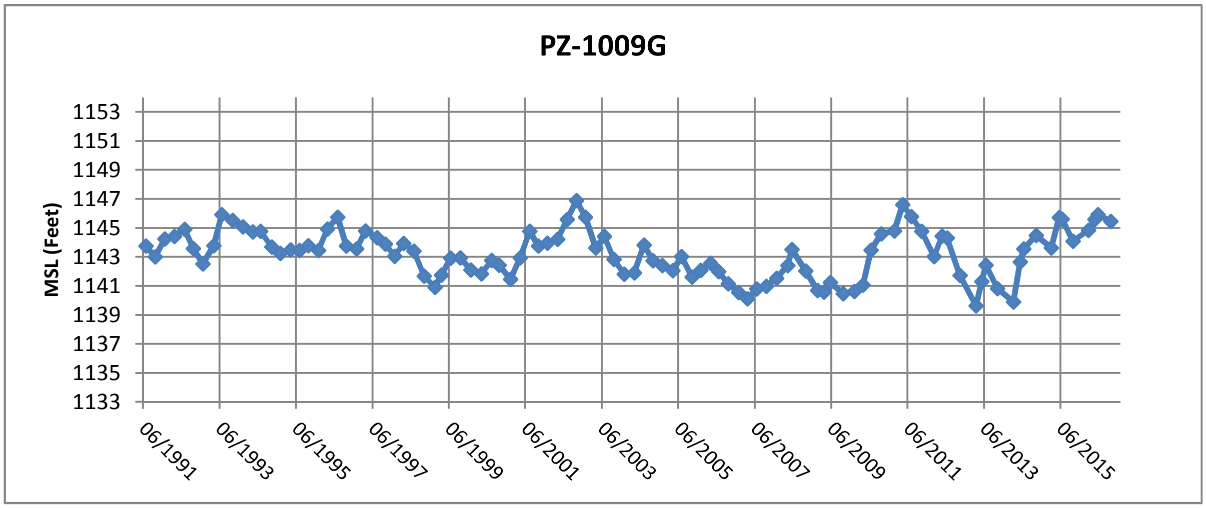


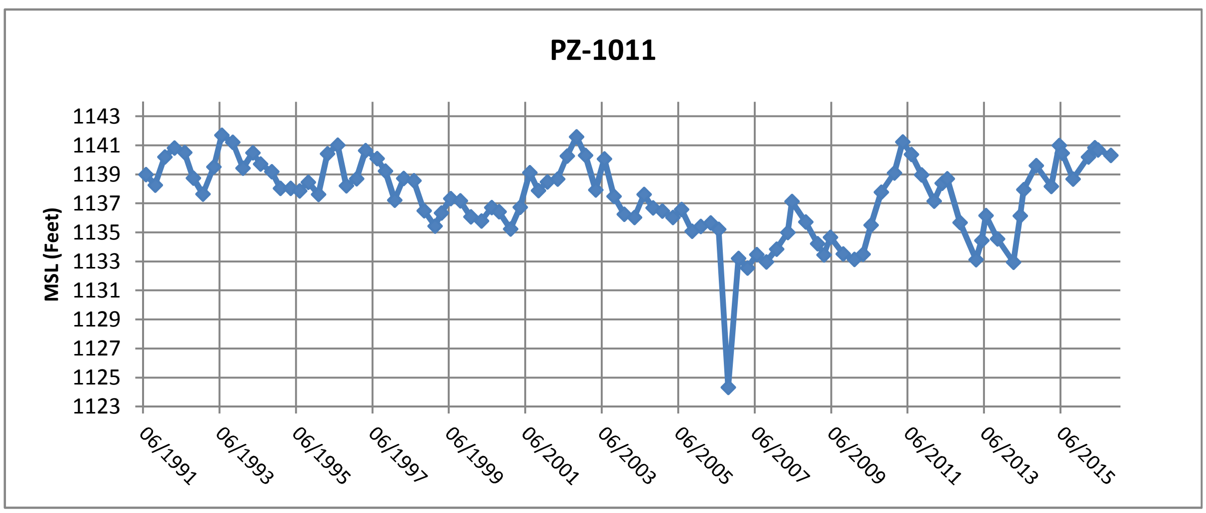


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Figure B-16j
Hydrographs

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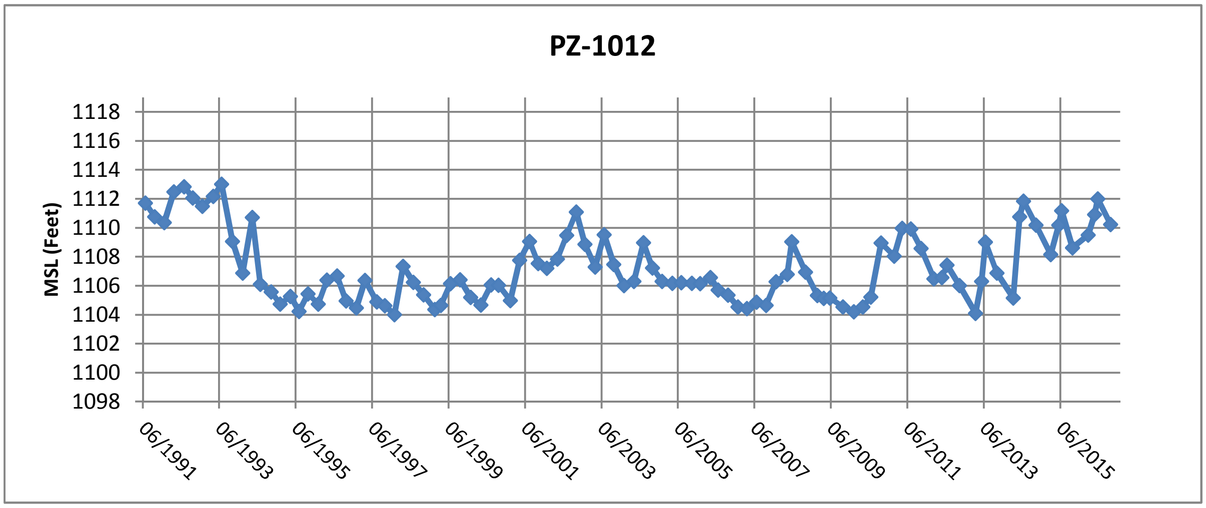
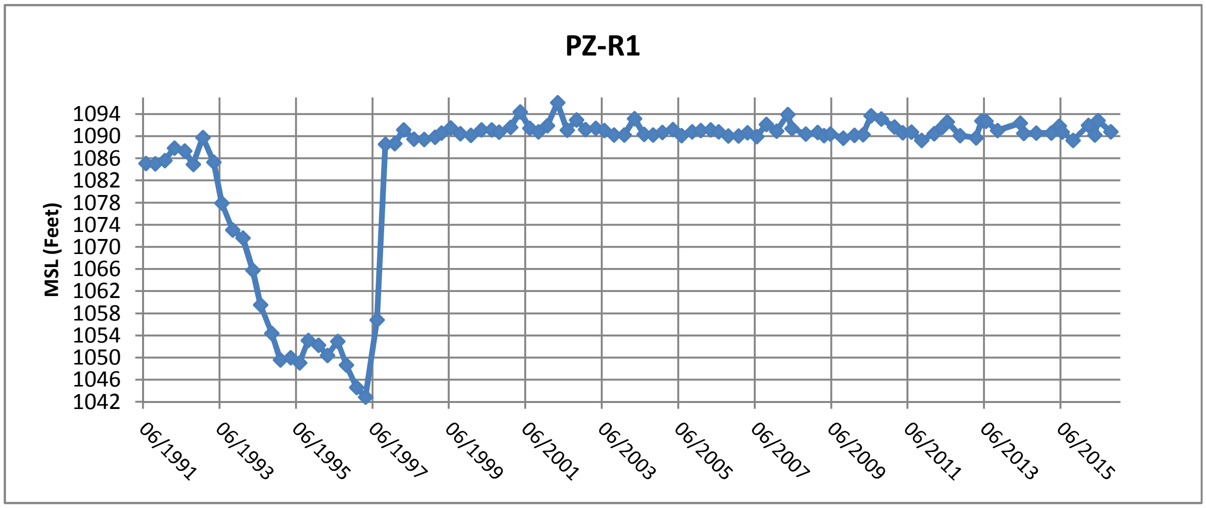
| Scale: NA | Date: January 2017 | |
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |



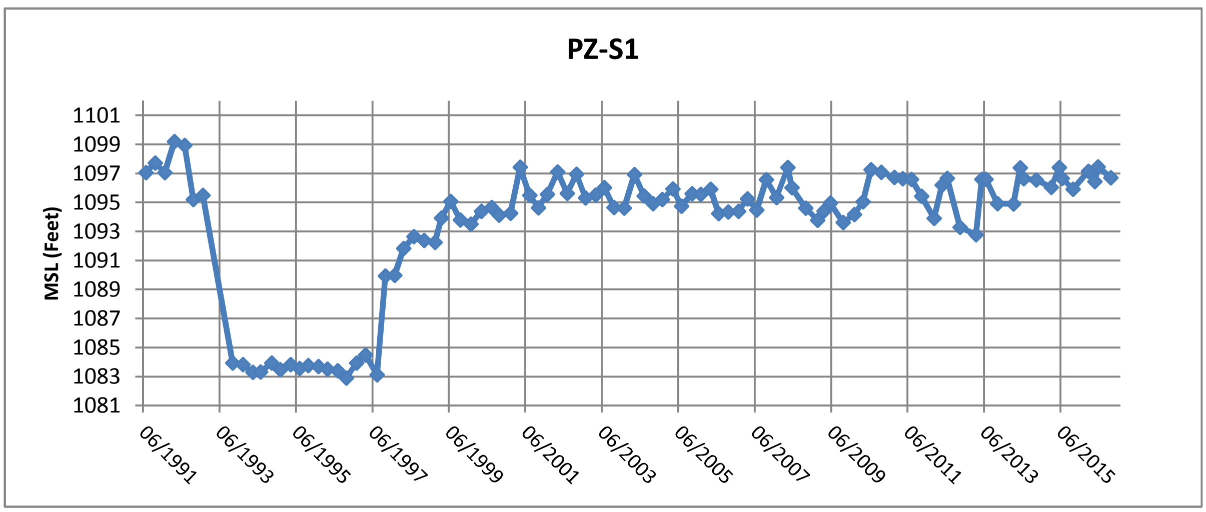




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Figure B-16k
Hydrographs

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |

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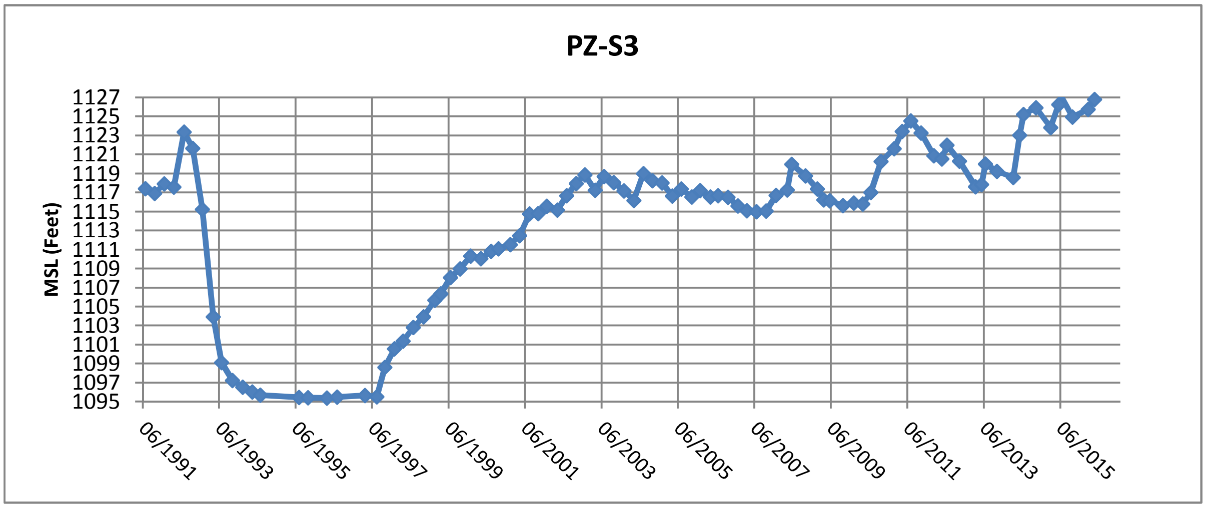


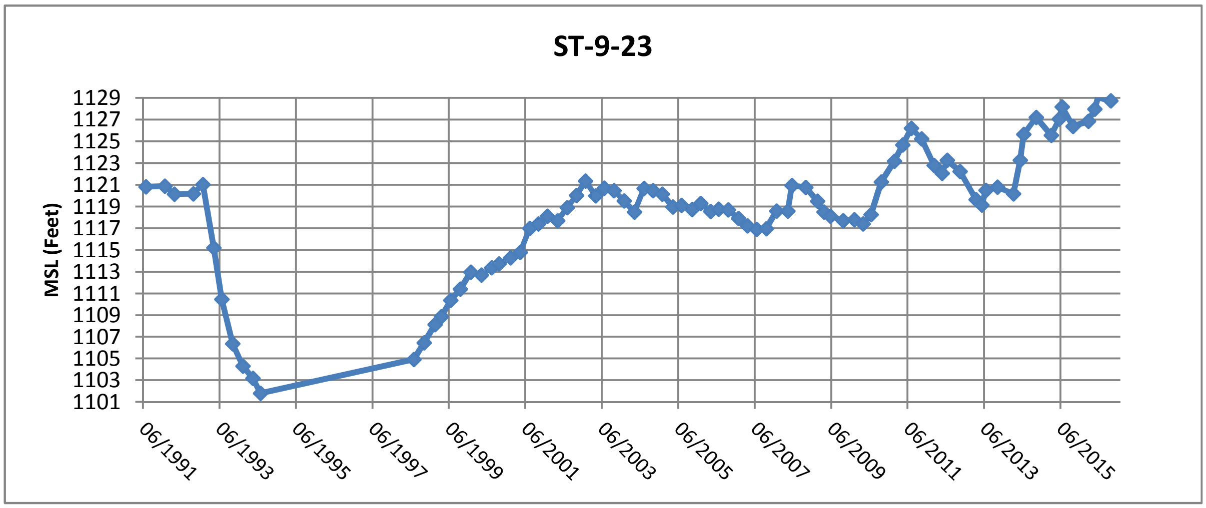


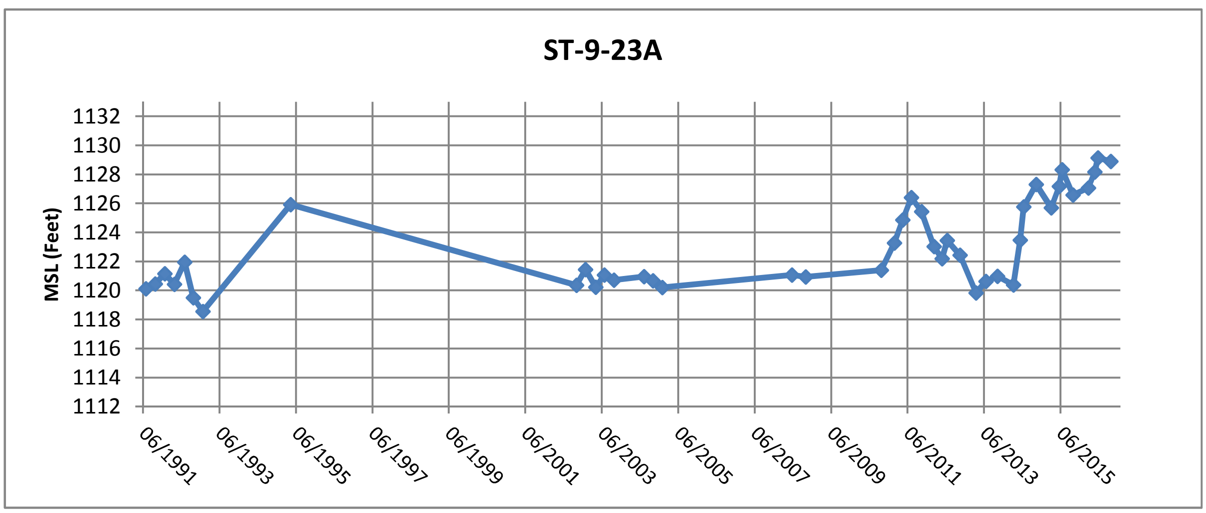


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Figure B-16l
Hydrographs

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| Scale: NA | Date: January 2017 |

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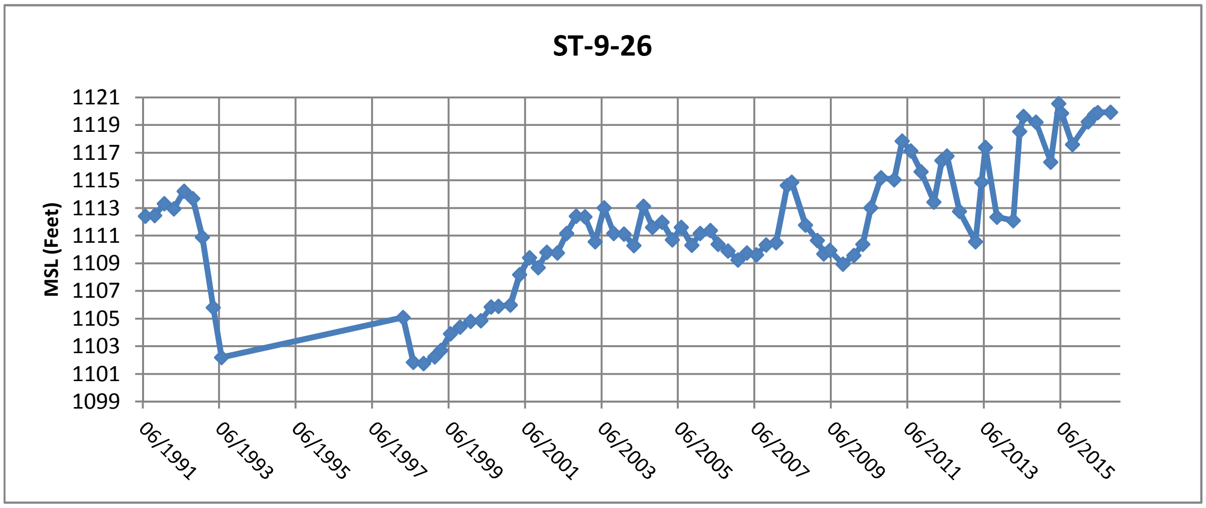
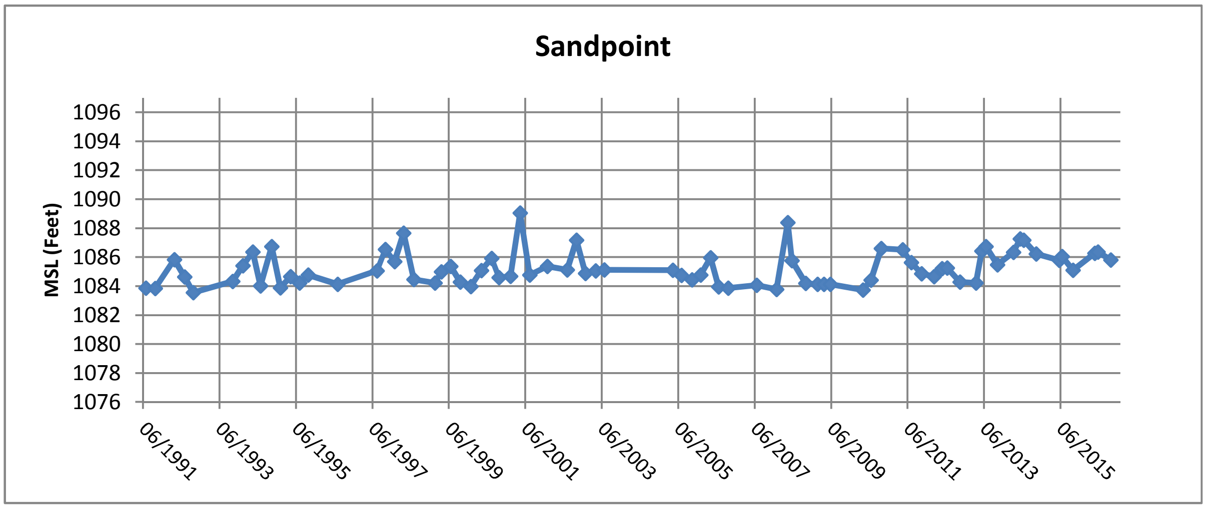
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |



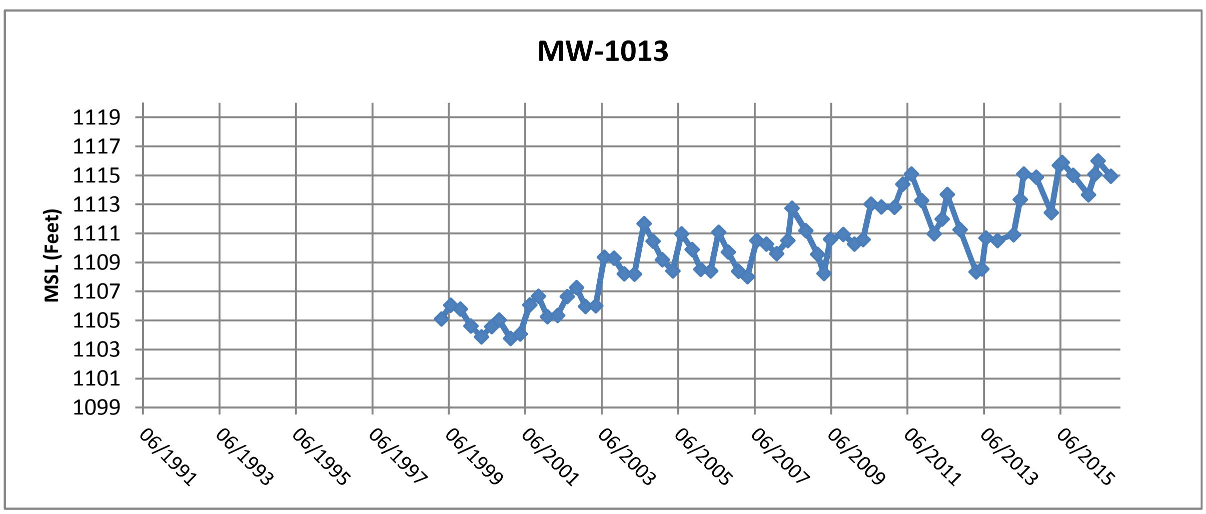




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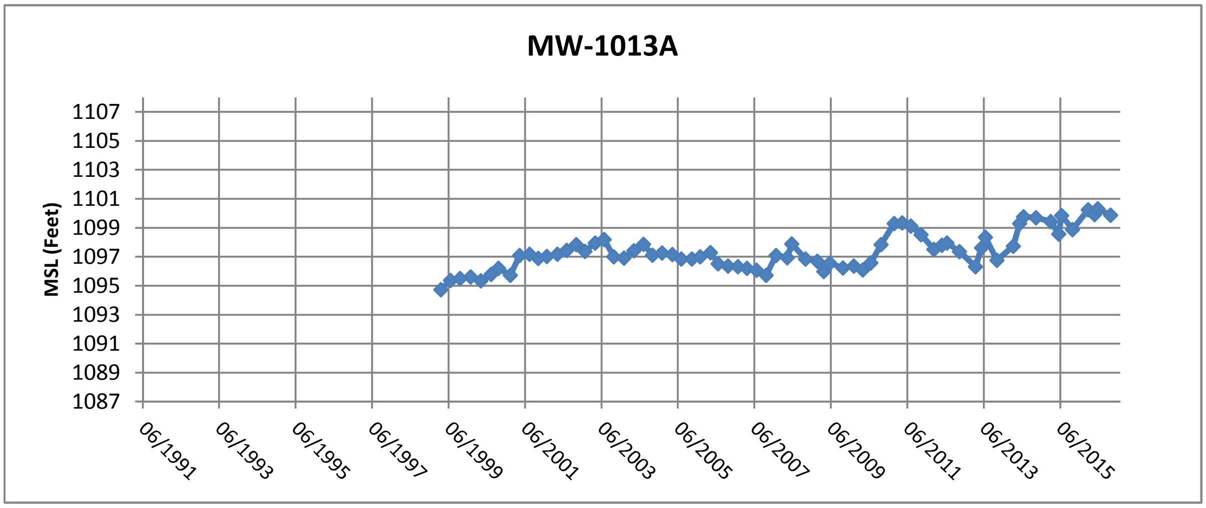
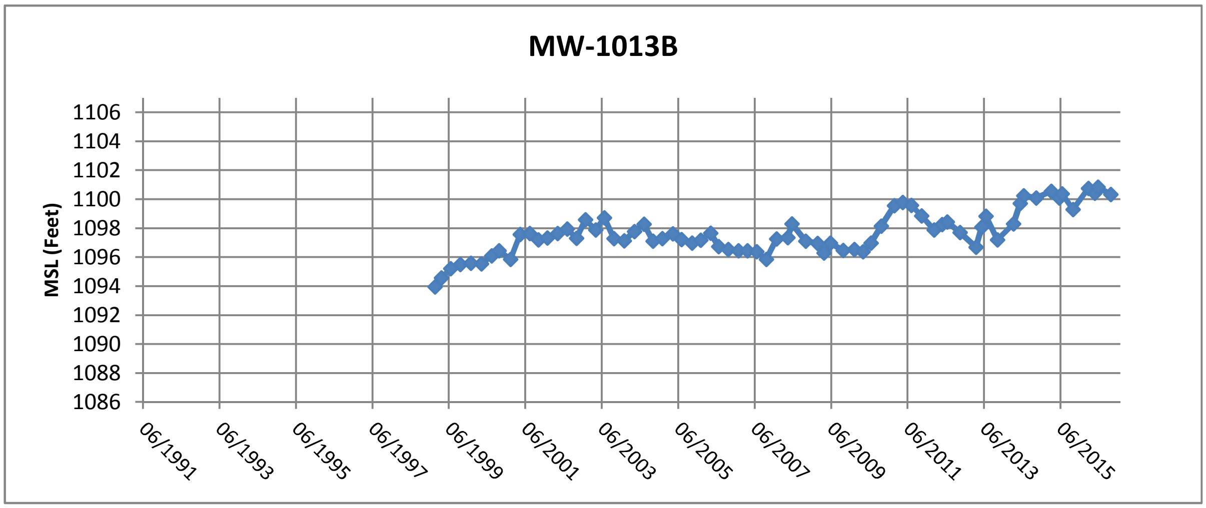
Figure B-16m

Hydrographs

| Scale: NA | Date: January 2017 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |



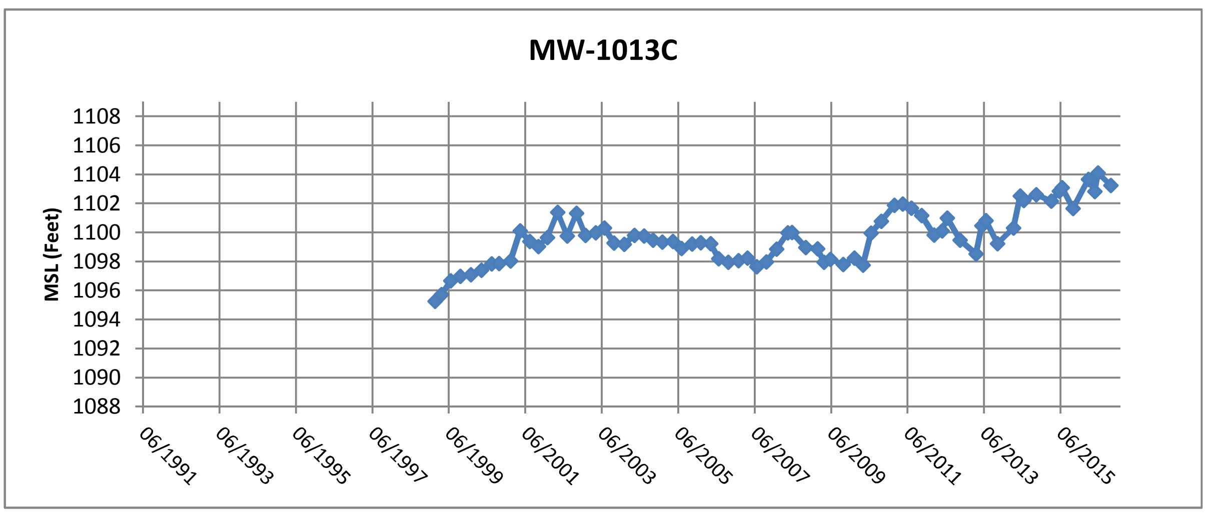




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Figure B-16n
Hydrographs

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| Scale: NA | Date: January 2017 |

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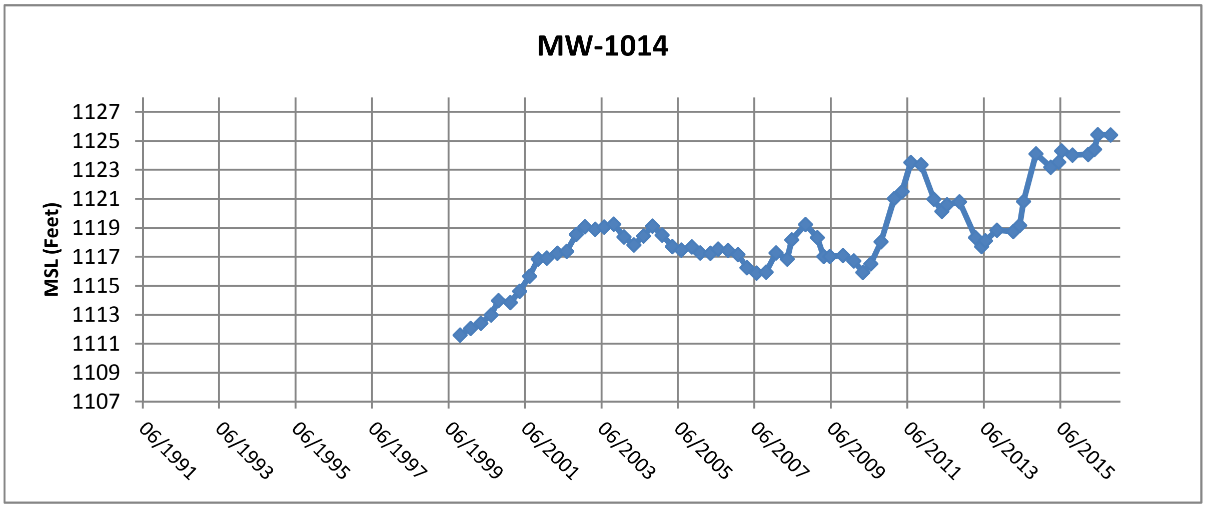
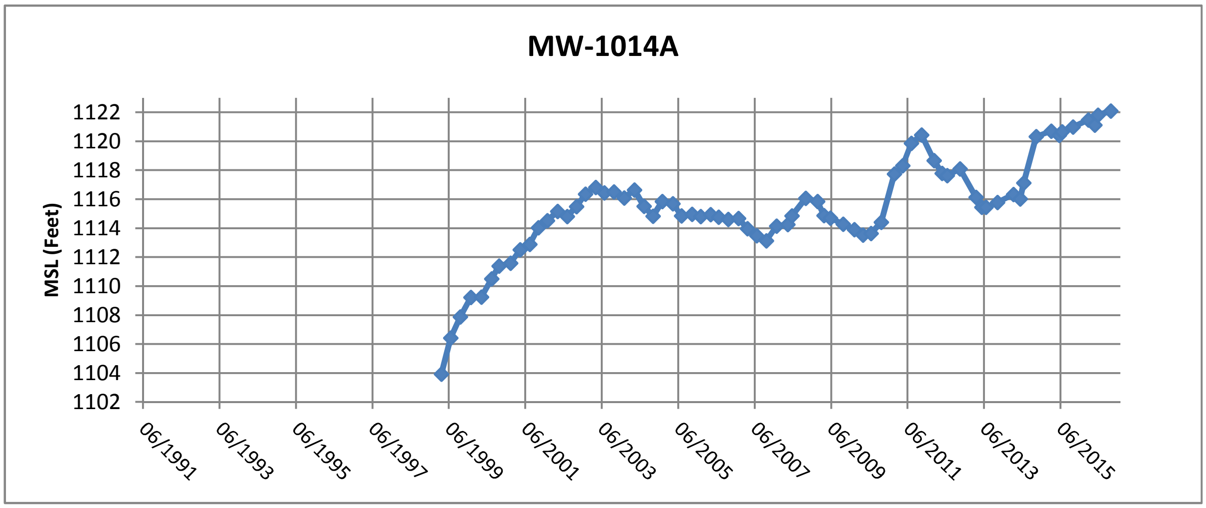
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |



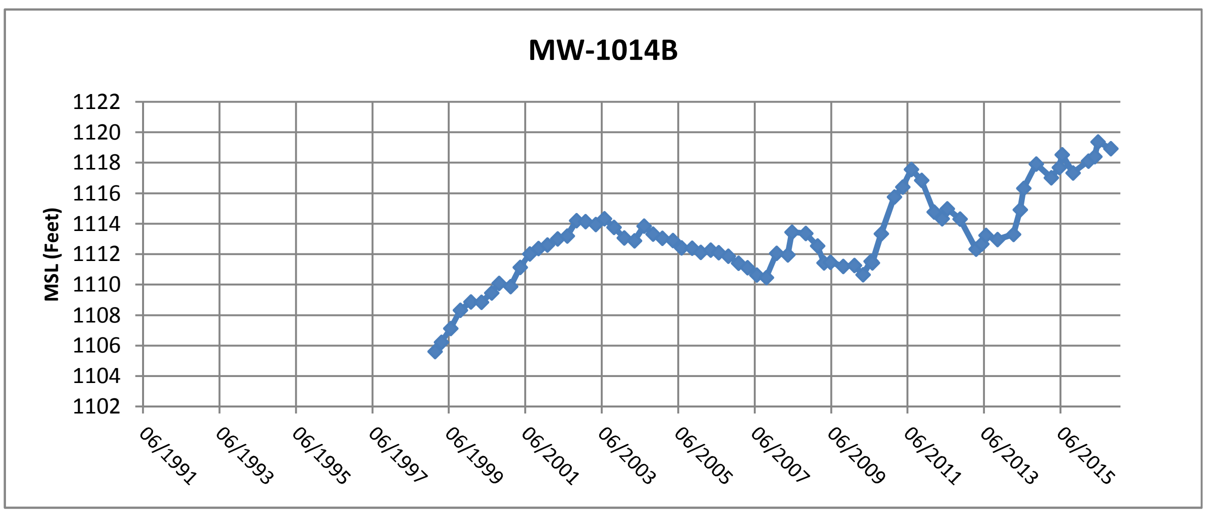




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Figure B-16o
Hydrographs

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| Scale: NA | | Date: January 2017 |
| Prepared By: SGL | Checked By: SVF | Scope: 16F777-00 |

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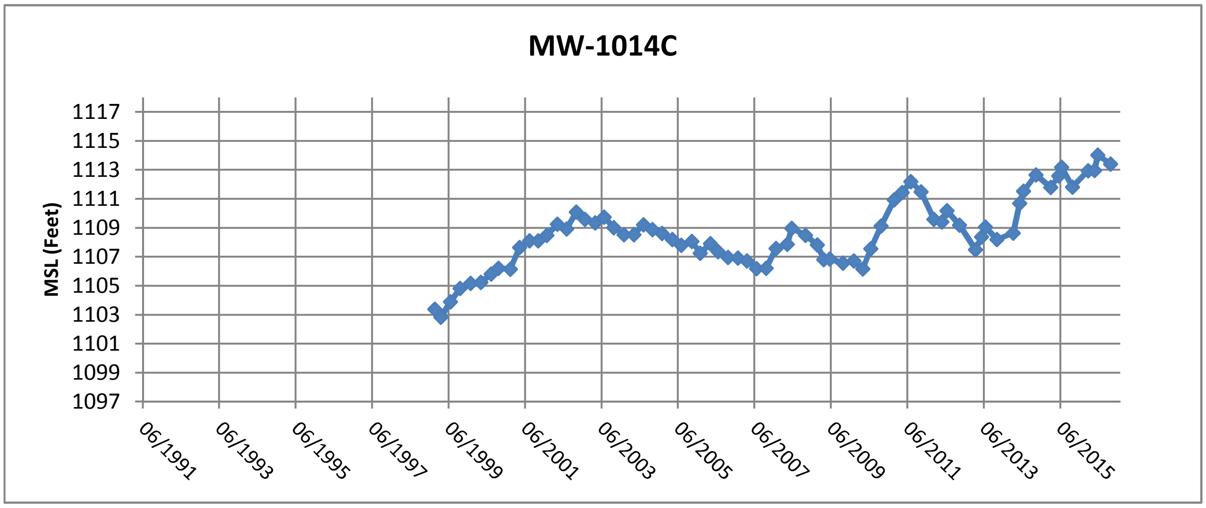


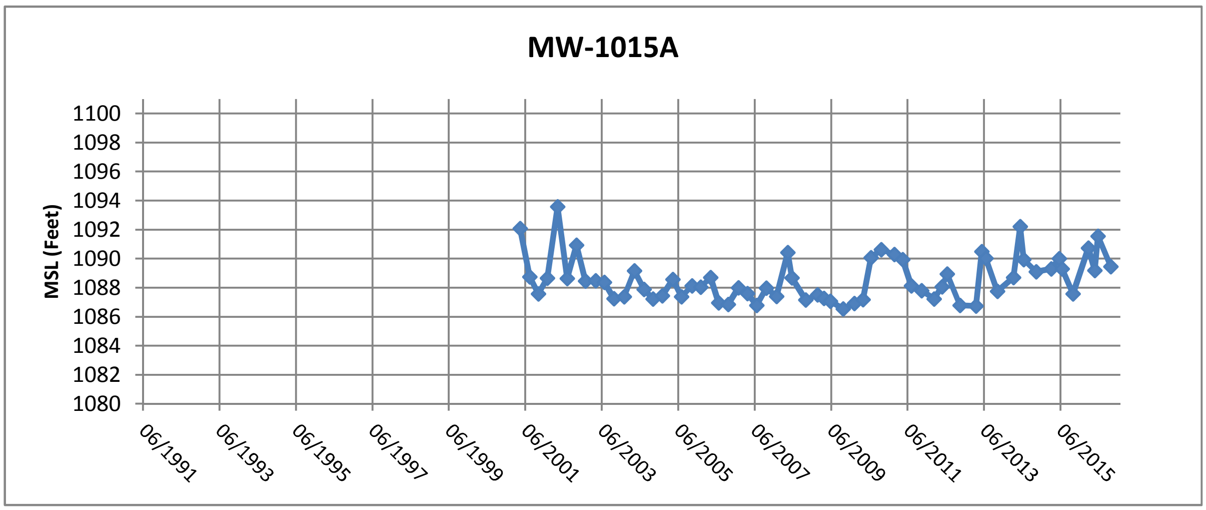


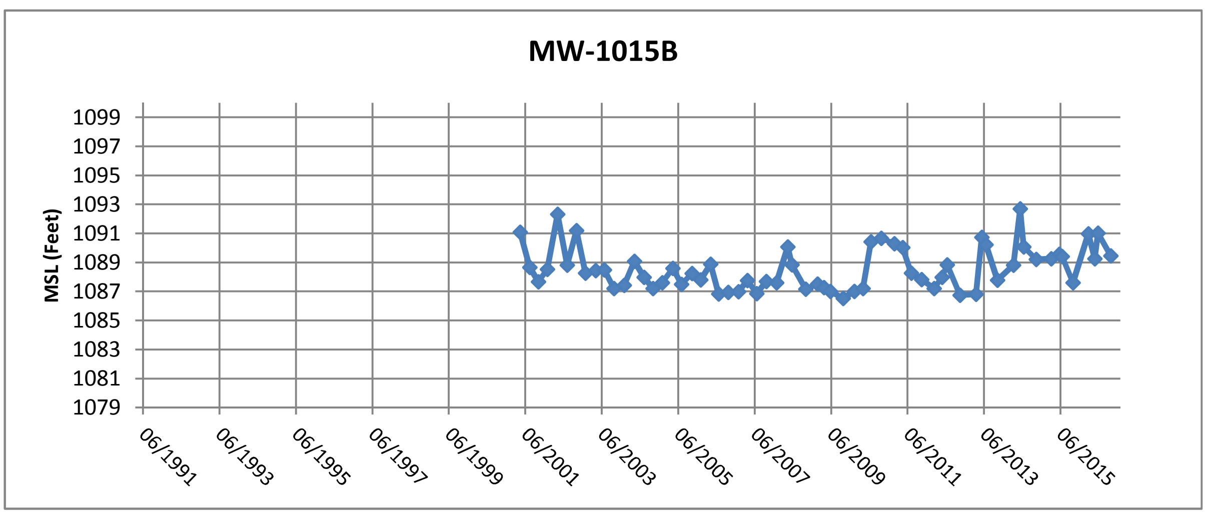


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Figure B-16p
Hydrographs

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| Scale: NA | Date: January 2017 |

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|---|---|---|
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# Attachment 5

## WT-5 Water Levels

# Wetland 1 (WT-5) Water Level Readings

| Date | Level | Elevation | Comment |
|---|---|---|---|
| 3/24/2016 | 0.07 | (1) | |
| 5/18/2016 | 0.01 | (1) | |
| 6/27/2016 | - | (1) | Standing water but below lowest gauge reading. |
| 10/24/2016 | 0.1 | (1) | |

(1) "0" mark elevation not established.

pw:\\PW-APS1.foth.com:PW_IE\Documents\Clients\Flambeau Mining\0016F777.00\10500 Reference Information\Stats Analysis\2016 Annual Report\WT-5 data.xlsx