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April 30, 2025

Mr. Brian Rath
Land Quality Bureau
Iowa Department of Natural Resources
6200 Park Ave., Suite 200
Des Moines, IA 50321

Subject: **Stoney Point Closed Landfill**
Permit No. 57-SDP-11-90C
Groundwater Quality Assessment Plan

Dear Mr. Rath:

On behalf of Interstate Power and Light Company (IPL), Alliant Energy is respectfully providing the attached Groundwater Quality Assessment Plan for the closed Stoney Point located in Cedar Rapids, Iowa.

Please call me at (515) 558-9704 or email me at jennycoughlin@alliantenergy.com with any questions regarding the enclosed responses.

Sincerely,

Jenny Coughlin
Sr. Environmental Specialist
Alliant Energy Corporate Services, Inc.

Enclosure

Cc: SCS Engineers

Groundwater Quality Assessment Plan

Interstate Power and Light Company
Stoney Point Closed Landfill
Permit #57-SDP-11-90C

Interstate Power and Light, Alliant Energy Company
1200 First Street SE
Cedar Rapids, Iowa 52401

SCS ENGINEERS

25225065.00 | April 30, 2025

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Madison, WI 53718
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EXECUTIVE SUMMARY

This Groundwater Quality Assessment Plan (Plan) was prepared in response to elevated parameter concentrations measured in groundwater samples from monitoring well MW-16. Iowa Department of Resources correspondence dated August 8, 2024 (Doc # 110661) specifically referenced boron concentrations in monitoring well MW-16 as significantly exceeding the statewide standard with an apparent increasing trend and numerous other parameter concentrations being highest at MW-16 compared to other monitoring wells in the shallow flow grouping. As summarized below and discussed in this Plan, assessment activities have occurred over a span of approximately three decades at this site, and an assessment with similar purpose was prepared in 2005. Also of note is that groundwater monitoring constituents have been added to the analyte list more recently, and elevated concentrations of the more recently added constituents have been measured, some of them above the groundwater protection standards. The detection of a newly added parameter at an elevated concentration should not necessarily be interpreted as a new release but more likely represents new and previously not collected information added to a long-running historical data set. An update and review of specific long-running historical data sets was a large part of the basis for the recommendations developed in this Plan. More recent data, particularly the new analytes, should at least initially be interpreted within the historical context.

The Interstate Power and Light Company Stoney Point Closed Landfill (Permit #57-SDP-11-90C) (Landfill) ceased accepting coal ash in 1987, or approximately 38 years ago, and was closed in 1992, or approximately 33 years ago. Groundwater sampling has occurred at the Landfill since 1994. Groundwater sampling has progressed since that time with the installation of additional monitoring wells and the expansion of the analytical parameter list, most recently in 2023 with six new laboratory parameters and two field parameters added. Metals analyses were also changed from dissolved to total in September 2016.

Historically, in response to elevated indicator parameter concentrations measured in groundwater monitoring wells, primarily to the north and downgradient of the Landfill, a groundwater quality assessment was performed in 2005 and reported in conjunction with the 2005 Annual Water Quality Report (Doc # 60409). Chloride, sulfate, specific conductance, and magnesium were identified as suitable indicator parameters of Landfill impact. Based on groundwater elevations and indicator parameter concentrations, the 2005 assessment concluded that the Landfill had impacted groundwater and postulated as to how impact migration was occurring, which is briefly summarized as follows and is referred to in this report as the 2005 migration theory:

- Groundwater monitoring is segregated into three flow systems: shallow, intermediate deep, and deep.
- Northward migration had occurred in the shallow flow system primarily from the northeast corner of the Landfill.
- Northward migration had also occurred in the intermediate deep and deep flow systems via downward flow from the southern two-thirds of the Landfill, which became upward flow along a northerly flow path, intersecting the intermediate deep and deep monitoring wells.
- Westward migration had occurred on the north side of the Landfill south of the creek from the monitoring well MW-16/17/18 well cluster in all three flow systems.

- The creek to the north of the Landfill generally provided a hydraulic barrier to migration in all three flow systems, but particularly in the shallow and deep flow systems. Very limited migration had possibly occurred to the north of the creek in the intermediate deep flow system.

Nearly 20 years of groundwater sampling have occurred since the 2005 assessment. These additional data for the four indicator parameters identified in the 2005 assessment were reviewed to evaluate water quality changes that have occurred since the 2005 assessment. The review revealed the following:

- Water quality has improved around the Landfill based on predominantly steady or declining trends in the indicator parameter data sets since 2005.

- The ratios of sulfate to chloride, two parameters assumed to migrate conservatively at this site, indicate there may be other influences in addition to the Landfill affecting water quality.

- The other influences, if present, raise some questions regarding portions of the 2005 migration theory.

Based on the predominantly improving water quality since 2005 as represented by the aforementioned indicator parameters and the anticipated benefit of collecting additional information from the existing monitoring network for addressing groundwater migration and the questions presented in the data with regard to water quality influences, the following are recommended:

- Add the missing major geochemical parameters to the analyte lists for the groundwater monitoring wells and leachate piezometers included in the 2025 September sampling event.

- Perform various geochemical evaluations of the full geochemical parameters list analytical results and conduct further review of the historical data sets with added insight derived from the geochemical evaluations.

- Report findings and make recommendations for further assessment actions as part of the 2025 Annual Water Quality Report. To allow sufficient time for the additional geochemical evaluation and data review, we request a revised due date of March 30, 2026, for the 2025 Annual Water Quality Report.

1.0 INTRODUCTION

1.1 PURPOSE

The Iowa Department of Natural Resources (DNR) provided review comments for the 2023 Annual Water Quality Report (Doc # 108357) in correspondence dated August 8, 2024 (Doc # 110661). As part of the comments, a site assessment was required based on indications of potential groundwater impact at monitoring well MW-16. Alliant Energy (Alliant) responded to the August 8, 2024 comment letter in correspondence dated September 20, 2024 (Doc # 110920) and suggested that in developing the proposed site assessment activities, the 1989 version of Iowa Administrative Code (IAC) chapter 567-103 should be used as a guide and that a Groundwater Quality Assessment Plan (Plan), generally as described in IAC 567-103.2(9)*a*. be prepared. The DNR approved the approach in email correspondence dated October 11, 2024 (Doc # 111047). The due date for submittal of the Plan was set as April 30, 2025, in email correspondence dated January 6, 2025 (Doc # 111709). The purpose, therefore, of this Plan is to develop the activities and evaluations to be performed to further assess groundwater quality in the vicinity of the Landfill to determine if the Landfill is a possible source of the elevated concentrations measured in compliance monitoring wells around the Landfill.

1.2 APPROACH

The approach used for the development of this Plan was to review and rely on past assessment data and evaluations to inform additional assessment activities that would expand upon the extensive amount of assessment already completed at the Landfill in order to generate a more complete understanding of groundwater quality, influences on groundwater quality, and groundwater movement in the vicinity of the Landfill. The Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, dated November 30, 2005 (Doc # 60409) was utilized as a starting point for evaluating changes to water quality and for developing recommendations.

1.3 SITE LOCATION

The Stoney Point Landfill (Landfill) property location is shown on **Figure 1**, Site Location Map. The Landfill is located in the SE ¼ of the NE ¼, Section 23, T83N, R8W, Linn County, approximately ¼ mile west of Cedar Rapids, Iowa.

1.4 BACKGROUND

A brief history of the Landfill was provided in the Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, dated November 30, 2005 (Doc # 60409). The following was excerpted from this report.

> *The location was a former limestone rock quarry, which was later used for disposal of coal combustion residue.*
>
> *Disposal of ash at the site ceased in 1987. Following the placement of final cover on the landfill during the summer of 1992, a site hydrogeologic investigation was performed by J.M Montgomery Consulting Engineers, Inc. (Montgomery), and the investigation report was submitted to the Iowa Department of Natural Resources (IDNR) in October 1992 (JMM, 1992a). The IDNR issued a landfill closure permit on November 30, 1993 (Appendix A). A long-term groundwater monitoring program was approved as part of the closure permit, and groundwater monitoring commenced in*

the fall of 1994. Since that time, Annual Water Quality Reports (AWQRs) describing the site groundwater quality have been prepared by Interstate Power & Light Company (IPL) or its consultant, and submitted to the IDNR.

As alluded to in the above citation, a significant amount of groundwater assessment has been conducted. The following are reports that contained either proposed or actual results of soil boring and monitoring well installations at the Landfill. A brief summary of subsurface assessment work described in the referenced report is also included below.

- Plan for the Hydrogeologic Investigation of the Stoney Point Coal Combustion Residue Landfill, James M. Montgomery Consulting Engineers, Inc., February 1992 (Doc # 29593).

  The report (Doc # 29593) contained documentation of previous hydrogeological assessment work conducted at the Landfill. The previous work is summarized as follows:

  – Six monitoring wells (MW-1 through MW-6) were installed in February 1990.

  – Two leachate piezometers (PZ-1 and PZ-2) were installed in June 1991.

  – Four soil borings (B-1 through B-4) were advanced in June 1991.

  – Nine falling head permeameter tests were performed and eleven grain size distribution curves were developed from samples collected during the above drilling activities.

  – There was also a boring log for what was listed as “Stoney Point Deep Well”, which apparently was advanced to a depth of 220 feet bgs and sampled at 5-foot intervals. No geologic material descriptions were provided from 190-220 feet bgs, indicating possibly that there was no recovery in that depth interval or the boring was advanced to 190 feet bgs as opposed to 220 feet bgs.

- Hydrogeological Investigation Report for the Stoney Point Ash Landfill, James M. Montgomery Consulting Engineers, Inc., October 1992 (Doc # 29592).

  – Thirteen soil borings were advanced and completed as monitoring wells (SB-7/MW-7 through SB-19/MW-19 in August 1992.

  – Slug-in and/or slug-out tests (12 of each) were performed in 15 of the 19 monitoring wells installed at the site.

  – Two tests each for moisture content, dry density, falling head permeability, and grain size were performed on samples collected from the above drilling activities.

  – MW-4, PZ-1, and PZ-2 were abandoned.

- Groundwater Quality Assessment Workplan, Interstate Power & Light Company Stoney Point Fly Ash Disposal Site (Closed), RMT, Inc., December 30, 2004 (Doc # 52794).

As this was a workplan, hydrogeological activities were only proposed and not performed; however, it appears that the following occurred since the 1992 Hydrogeological Investigation Report:

- Monitoring well MW-2 was replaced by MW-2A (see Doc # 52849).
- Three new leachate piezometers (LW-1 through LW-3) were installed (see Doc #29589).

- Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, Stoney Point Landfill Cedar Rapids, Iowa, RMT, Inc., November 30, 2005 (Doc # 60409).
  - Four monitoring wells (MW-20 through MW-23) and two drive point wells (DPW-1 and DPW-2 were installed in May 2005.
  - Five slug-out tests were performed on the four new monitoring wells and one slug-out test was performed on drive point well DPW-2.
- Proposed Monitoring Well Installation Workplan, Stoney Point Closed Ash Landfill, TRC, November 20, 2014 (Doc # 81881) and 2015 Annual Water Quality Report, TRC, November 25, 2015 (Doc # 84849).
  - Four monitoring wells (MW-24 through MW-27) were installed in February/March 2015.

In addition to the above assessment activities, regular groundwater sampling and analyses have been on-going at the Landfill since the fall of 1994 with periodic modifications to the parameter list, the most recent being the addition of molybdenum, lithium, and total suspended solids in 2023. These assessment activities have provided a significant amount of information to inform the direction of further assessment activities as proposed in this Plan.

1.5 REPORT CONTENTS

This Plan consists of the following sections:

- Section 1.0 Introduction – Purpose, approach, and background information of the Plan.
- Section 2.0 Geologic and Hydrogeologic Conditions – Summary descriptions of the geology and hydrogeology from past assessment activities.
- Section 3.0 Present Detection Monitoring System – Description and summary of the current groundwater monitoring system for the Landfill.
- Section 4.0 False Indication of Groundwater Impact – Discussion of possible non-release related influences on groundwater quality at the Landfill.
- Section 5.0 Leachate Migration Characterization – Summary of past evaluations of potential leachate migration and discussion of intended assessment activities to further evaluate the extent and rate of potential leachate migration.
- Section 6.0 Proposed Assessment Monitoring Points – Discussion of proposed initial and expanded, if necessary, assessment activities.
- Section 7.0 Well Design and Construction – Discussion of the groundwater monitoring well design and construction process and specifications.

- Section 8.0 Sampling and Analytical Program – Discussion of proposed sampling activities and parameters to be collected both in the field and to be analyzed in the samples submitted to the contract analytical laboratory.
- Section 9.0 Data Collection and Analyses Procedures – Discussion of additional proposed data to be collected and the evaluations planned for the data.
- Section 10.0 Implementation Schedule – Implementation schedule of the proposed Plan activities.
- Section 11.0 Updated Receptor Survey – As proposed in the 2024 AWQR
- Section 12.0 General Comments – General comments associated with the Plan.

2.0 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The geology and hydrogeology beneath the Landfill were extensively assessed and described in past assessments. Below are summaries derived from past assessment reports.

2.1 SITE GEOLOGY

The geology was described in the Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, Stoney Point Landfill Cedar Rapids, Iowa, RMT, Inc., November 30, 2005 (Doc # 60409). A citation from this report is included below.

> *The geology encountered during the May 2005 subsurface investigation is similar to that described in previous site investigations (JMM, 1992a). At the MW-20 location at the southern end of the site, only 2 feet of topsoil and sand was encountered over the bedrock surface. At the MW-23 location north of the fill area and north of the creek, the unconsolidated deposits were 44 feet thick. These deposits consisted of approximately 37 feet of clay till overlying 7 feet of alluvial clay and clayey sand.*
>
> *The bedrock units encountered in the May 2005 subsurface investigation were identified based on descriptions from previous investigations, and consist of Devonian limestones and dolomites. The Solon member of the Little Creek Formation extends from the base of the unconsolidated deposits to an elevation of approximately 780 feet mean sea level (M.S.L.) in the south, and 760 feet M.S.L. in the north. This unit consists of a brown to light-gray, fine-grained, muddy limestone. The Solon member was not encountered at the MW-23 location, where the bedrock surface dips below the elevation of 760 feet. The Spring Grove member of the Pinicon Ridge Formation was encountered beneath the Solon member to elevations of approximately 760 feet M.S.L. on the south, and approximately 740 feet M.S.L. in the north. This unit consists of a dark-grayish-brown, fine-grained limestone. The Solon and Spring Grove limestones are part of the Devonian aquifer sequence. The Kenwood member of the Pinicon Ridge Formation extends from below the Spring Grove member to elevations of approximately 740 feet M.S.L. in the south, and 730 feet M.S.L. in the north. This unit consists of a uniform dark-gray, fine grained, shalely dolomite. Beneath the Kenwood member is the Otis Formation, consisting of a brown, very fine-grained, dense limestone. The Kenwood member of the Pinicon Ridge Formation, and the Otis Formation are generally considered to be local confining beds, separating the Devonian aquifer from the underlying Silurian aquifer.*
>
> *The geologic information collected during this investigation was used, in conjunction with historical information, to construct geologic cross sections of the site (Figure 4). The depth to bedrock beneath the site ranges from approximately 0 to 50 feet bgs.*

The depth to bedrock is shallowest near the southern end of the landfill area, and the rock surface slopes gently to the south, and to the north toward the Cedar River. An east-west trending bedrock high/ridge exists between wells MW-2A and MW-3. A copy of the bedrock surface contour map from the 1992 Hydrogeologic Investigation Report (JMM, 1992a) in provided in Appendix B of this report.

Copies of the above referenced figures (geologic cross section – Figure 4 (Doc # 60411) and bedrock surface contour map – Figure 4-3 (Doc # 29592)) are included in **Appendix A** for ease of reference.

The geological description contained in the Hydrogeological Investigation Report for the Stoney Point Ash Landfill, James M. Montgomery Consulting Engineers, Inc., October 1992 (Doc # 29592), utilized to create the citation above, contained additional description along with numerous cross-sections. A citation from this report is included below.

Unconsolidated surficial deposits in the vicinity of the landfill consist of glacial till and alluvium. The glacial till consists of unsorted sediment which ranges in size from clay to boulders. The till was deposited 500,000 to 750,000 years ago. The alluvium consists of fine grained silts and clays which were deposited by the stream north of the landfill area in recent times. Figure 4-2 is an unconsolidated deposits isopach map. This map shows the thickness of the unconsolidated deposits that exist on site, not including the ash and cover materials contained in the landfill. The southern one-half of the site (which is outlined by an equal thickness contour of zero feet) contains no unconsolidated deposits. Therefore, in this area, ash is resting directly on top of bedrock. The thickest deposits of alluvium and glacial till exist on the north end of the site in the vicinity of the stream.

Bedrock exists on site at depths that range from 1 to 50 feet. Figure 4-3 [same figure as referenced previously] *is a bedrock surface contour map. As shown on this map, the bedrock surface slopes to the north where it reaches its greatest depth of approximately 50 feet.*

The bedrock geology of the landfill area consists of Middle Devonian-aged Little Cedar, Pinicon Ridge, and Otis Formations. The only member of the Little Cedar Formation identified on site is the Solon Member. The Pinicon Ridge Formation on site consists of the Davenport-Spring Grove Member and the Kenwood Member. The Solon and Davenport-Spring Grove Members on site consist of extensively brecciated limestones and are normally classified as part of the Devonian Aquifer. The Kenwood Member is an argillaceous dolomite, and the Otis Formation is a lithographic limestone. The Kenwood Member and the Otis Formation are normally classified as part of the Devonian aquiclude.

Figure 4-4 is a cross section location map. Displayed on this figure are the location of six cross sections constructed through the site which are shown in Figure 4-5 through 4-10. Water tables and potentiometric surfaces are inserted onto these cross sections.

Copies of the above-referenced figures (Figures 4-2 through 4-10) from Doc # 29592 are also included in **Appendix A** for ease of reference.

2.2 SITE HYDROGEOLOGY

The hydrogeology was described in the Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, Stoney Point Landfill Cedar Rapids, Iowa, RMT, Inc., November 30, 2005 (Doc # 60409). A citation from this report is included below.

> *Groundwater elevation data collected during the September 2005 groundwater monitoring event were used to construct the water table/shallow groundwater surface map, and the potentiometric surface maps for the site (Figures 5 and 6, respectively). A summary of the groundwater, leachate, and surface water elevation data is included in Appendix G.*
>
> *The shallow groundwater flow system includes shallow bedrock in the southern portion of the site, the saturated portion of the fill, and the shallow unconsolidated deposits near the creek. Shallow groundwater flows to the north beneath the northern two thirds of the site, toward the creek located at the northern edge of the landfill (Figure 5). It also appears as though shallow groundwater on the northern side of the creek flows to the south toward the creek/landfill. The shallow groundwater appears to discharge to the creek just north of the landfill from both the north and the south. In the southern third of the landfill area, shallow groundwater flows to the west and northwest. These observations are consistent with historical observations dating back to 1999. Note that monitoring well MW-1 was interpreted as being a deep monitoring well in past reports. Based on recent head level and the data presented in the previous site investigation report (JMM, 1992a), the water level appears to be an approximate representation of the water table surface because the top of the well's gravel/sand pack is only 3 to 4 feet below the water table/shallow groundwater surface and the well is screened in the same geologic unit (limestone) in which the water tables occurs. Consequently, the water level from this well was used to create the shallow groundwater surface map. The westerly groundwater flow observed in the shallow flow system may be the result of dewatering at the bedrock quarry located approximately 1,500 feet west of the site, or it may be a subdued reflection of the surface topography and drainage patterns.*
>
> *A review of historical leachate elevation data indicates that the ash fill in the northeastern quadrant of the landfill appears to be continually saturated, based on leachate head measurements at LW-2. Portions of the landfill ash in the southeastern area of the site are likely periodically saturated based on leachate levels measured at LW-3 and on historical boring information and cross sections contained in the 1992 Investigation Report (JMM, 1992a). LW-1 in the westcentral portion of the site has historically had negligible leachate levels, or it has been dry.*
>
> *The intermediate flow system includes wells completed in the Spring Grove limestone (in the south) and wells completed in the alluvium at the bedrock/alluvium contact near the creek (in the north). Groundwater flow in this system is very similar to that in the shallow flow system, with groundwater generally flowing to the north beneath the site, but with a deflection to the west along the western portion of the site (Figure 6). The westerly flow observed within the Spring Grove limestone is likely due to dewatering at the bedrock quarry or to a shallow groundwater divide that appears to be present in the southern portion of the site. Regional flow is likely toward the Cedar River. The groundwater flow in this unit is consistent with historical observations.*

The deep groundwater wells are completed in the Kenwood member of [the] *Pinicon Ridge Formation. At this time, data are insufficient to contour groundwater flow in this unit; however, it appears that groundwater flows to the north beneath the northern edge of the site, but to the south or west beneath the southern portion of the site (Figure 7). The presence of a groundwater divide beneath the site is assumed based on the presence of the Lee Crawford Quarry, located approximately 1,500 feet west of the site. Quarry operations have exposed rock to the top of the Kenwood member of the Pinicon Ridge Formation, and the quarry is kept dry by dewatering pumps.*

The water table at the site has been observed to fluctuate seasonally by as much as 10 feet or more, with the higher water levels typically in the spring and summer. This pattern was also noted in 2005, with the highest water level readings occurring during the June measurements. Monitoring wells MW-22 and MW-14 exhibited flowing conditions when the June 2005 water levels were measured. None of the wells exhibited flowing conditions during August or September 2005. Historically, intermediate well MW-14 and MW-17 and deep wells MW-10, MW-13, and MW-18 have exhibited seasonal flowing conditions. The flowing conditions have become more infrequent during the past 5 years. As a result of these highly variable groundwater levels at the site and their implication on groundwater flow conditions, shifts in the potential groundwater divide noted near the southern end of the site may cause changes in the hydraulic positions of the southern wells relative to the landfill.

The water elevation graphs also provide an indication of vertical hydraulic gradients across the site. Vertical gradients were also calculated from the September 2005 data and are included in Table 4. In the southern (upgradient) portion of the site, hydraulic gradients appear to be consistently downward (e.g., MW-20 nest). In the northern portion of the site, upward gradients exist within the unconsolidated formation, and at three of the four well nests (MW-10, MW-13, and MW-18), upward vertical gradients exist between the Kenwood member of the Pinicon Ridge Formation and the creek or groundwater surface. The 2005 vertical gradients at each well nest are generally consistent with the historical data, although the magnitude of the upward gradients, where present, decreased at these wells during 2005 versus those measured during 2004. In fact, slight downward gradients were noted from the shallow well MW-16 to intermediate-depth well MW-17 for the first time since April 2000. The 2005 water levels are shown on the geologic cross section (Figure 4).

Copies of the above-referenced figures (Figures 4, 6, and 7) from Doc # 60409 are included in **Appendix A** for ease of reference. Figure 5 was not available for download through DNR's electronic document retrieval system.

Additional hydrogeological description is contained in the Hydrogeological Investigation Report for the Stoney Point Ash Landfill, James M. Montgomery Consulting Engineers, Inc., October 1992 (Doc # 29592). A citation from this report is included below.

Hydrogeological cross sections A-A' and C-C' (listed as Figures 4-5 and 4-7, respectively) contain flow nets for the site. These flow nets show that downward groundwater flow is dominant on the south end of the site. In the central portion of the site, this flow becomes horizontal, and then on the north end of the site, flow *becomes upward and discharges into the creek in this area. This statement is supported by the fact that monitoring wells MW-10, MW-11, MW-13, MW-14, MW-17, and MW-18 are artesian wells with a water level over 10 feet above the stage of the stream.*

Figure 4-11 is a water table contour map for the site. Because a saturated water table is not found in the unconsolidated deposits in the center and south portions of the site, no water table contours have been included in Figure 4-1[1] *for those areas. Even though the three water table monitoring wells are not situated on site to accurately triangulate the water table surface, it can be stated with confidence that water table flow is in the direction of the stream because of data presented in flow nets and other water level information.*

Figure 4-12 is a Middle Devonian aquifer potentiometric surface map. This map was prepared using the water levels from middle Devonian aquifer monitoring wells MW-1 through MW-3, MW-9 through MW-11, MW-13, MW-14, and MW-17 through MW-19. Kenwood member monitoring wells (deep wells in the clusters) MW-10, MW-13, and MW-18 were included as part of the Middle Devonian aquifer in this area because the water levels in these wells were equal to or above those of the intermediate wells in the appropriate cluster. In addition, after the borings were installed to depth and before the wells were installed, flows from the Kenwood monitoring wells MW-10 and MW-18 were measured at 50 and 30 gallons per minute, respectively. Flow from Kenwood monitoring well MW-13 was not measured because it was [not] *possible to set up a weir to measure flow. Figure 4-12 shows the gradient of the potentiometric surface is approximately 0.02 feet per foot from the south to the north.*

Copies of the above-referenced figures (Figures 4-11 and 4-12) from Doc # 29592 are included in **Appendix A** for ease of reference.

3.0 PRESENT DETECTION MONITORING SYSTEM

The current groundwater monitoring system was recently defined in a table submitted to the DNR on September 2, 2021 (Doc # 101712) and approved in Permit Amendment No. 9 dated December 22, 2021 (Doc # 101925). Subsequent to this permit amendment, monitoring well MW-14 was removed from the monitoring network and abandoned. Monitoring well MW-14 abandonment documentation was submitted in correspondence dated January 20, 2023 (Doc # 105618). The locations of the monitoring points are shown on **Figure 2** – Monitoring Well Locations.

The groundwater monitoring network currently consists of twenty monitoring wells sampled on an annual basis along with three monitoring wells used for water level measurement only. Additionally, two surface water monitoring points are sampled annually in conjunction with the groundwater monitoring. The groundwater monitoring wells are divided into three different groupings labeled as "Shallow", "Intermediate Deep", and "Deep" as shown in Table 1 of the 2024 Annual Water Quality Report dated November 27, 2024 (Doc # 111406). The well groupings are listed in **Table 1**.

Table 1. Groundwater Monitoring Groupings and Geology

Well Grouping	Monitoring Well	Geologic Formation
Shallow	MW-1*	Solon Member
	MW-2A	Solon Member
	MW-3	Solon Member
	MW-12	Glacial Till
	MW-15	Glacial Till
	MW-16	Glacial Till
	MW-21	Glacial Till
	MW-25	Glacial Till
Intermediate Deep	MW-7*	Solon Member
	MW-8	Solon Member
	MW-9	Davenport-Spring Grove Member
	MW-11	Davenport-Spring Grove Member
	MW-14**	Davenport-Spring Grove Member
	MW-17	Davenport-Spring Grove Member
	MW-19*	Davenport-Spring Grove Member
	MW-22	Alluvium
	MW-26	Glacial Till
Deep	MW-10	Kenwood Member
	MW-13	Kenwood Member
	MW-18	Kenwood Member
	MW-20	Kenwood Member
	MW-23	Kenwood Member
	MW-24	Kenwood Member
	MW-27	Kenwood Member

Notes:
* - Indicates water level only monitoring point.
** - Indicates abandoned.

The groundwater samples collected from the Landfill monitoring wells are analyzed for one of two inorganic parameter lists in addition to the field parameters, both as specified in Table 2 of the 2024 Annual Water Quality Report – Interstate Power and Light Company Stoney Point Closed Landfill dated November 27, 2024 (Doc # 111406).

4.0 FALSE INDICATION OF GROUNDWATER IMPACT

Developing a deeper understanding of water quality with regard to understanding potential sources and influences on parameter concentrations measured in the vicinity of the Landfill is the goal of the additional assessment and evaluation activities proposed herein. Therefore, it is too early to definitively describe a process that would be employed to support a false indication of groundwater impact or if there is a false indication of groundwater impact. That said, the following are summarized here and discussed in greater detail in Section 5.0 as potential indications of alternative water quality influences:

- The ratios of two indicator parameters expected to act conservatively in the subsurface surrounding the Landfill (sulfate and chloride) exhibit instances that deviate from expected behavior under the conservative migration assumption.

- In some cases, the concentration magnitude and well location of indicator parameter samples are not always indicative of the Landfill being the cause of the measured concentrations. One example is the chloride concentrations in intermediate deep monitoring well MW-26, located more than 1,000 feet north of the Landfill on the north side of the creek and upgradient of the Landfill over the majority of this separation.

5.0 LEACHATE MIGRATION CHARACTERIZATION

Potential migration of leachate, and by extension, impacted groundwater, from the Landfill was reviewed in the Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, Stoney Point Landfill Cedar Rapids, Iowa, RMT, Inc., November 30, 2005 (Doc # 60409). The site conceptual model (referred to herein as the 2005 migration theory) presented in the report is cited below.

> *The site is located at the southern edge of a buried bedrock valley that trends east and west. Unconsolidated deposits of till and alluvium thicken to the north. Ash fill sits directly on the bedrock over approximately the southern two thirds of the fill area, and on top of the unconsolidated deposits in the northern one third of the fill area.*
>
> *The highest concentrations of contaminants in leachate occurred in the northeastern portions of the fill, where greater portions of the fill are saturated. Northerly groundwater flow in the shallow flow system transports contaminants to the north toward the creek, and downward vertical gradients beneath the landfill drive contaminants downward into the intermediate and deep flow systems (see Figure 4). These flow patterns result in high concentrations of indicator parameters observed at each well screen depth in the northeastern portion of the site (MW-16 well nest and MW-15 well nest).*
>
> *Horizontal hydraulic gradients in unconsolidated deposits beneath the creek bed were to the west (following the drainage pattern). This resulted in the migration of constituents to the west along the northern edge of the fill area, in the shallow flow system, and to some extent in the permeable alluvial deposits above the bedrock surface. This flow pattern resulted in the elevated concentrations of ash indicator parameters observed in the intermediate and deep wells at the MW-12 well nest and the MW-15 well nest (see cross section F-F’ in Appendix B with sulfate concentrations). Slightly elevated concentrations of ash indicator parameters were*

also present in the intermediate zone at well MW-22, north of the creek. This was likely the result of the preferential transport of chemical constituents in the more permeable alluvium and weathered rock at the bedrock surface, and the lessening effects of the creek as a point of discharge with depth in the aquifer system. Horizontal transport of chemical constituents across the creek was limited in less permeable units, such as the shallow clay till, and the deep Kenwood member of the Pinicon Ridge Formation, as was evidenced by the low concentrations of indicator parameters in the shallow and deep wells north of the creek.

Near the creek, vertical gradients between the shallow and intermediate/deep flow systems were generally upward. The upward gradients along the southern edge of the creek indicate that groundwater is discharging to the creek. As a result of this groundwater discharge, concentrations of ash indicator parameters in surface water increased from the upstream edge of the site to the downstream edge of the site.

The creek appears to have a significant influence on the groundwater flow pattern and the transport of constituents from beneath the landfill. While impacted groundwater appears to exist beneath portions of the landfill and in groundwater immediately downgradient of the landfill, no significant migration of contaminants has occurred to the north of the creek. The creek essentially acts as a natural hydraulic barrier.

The Groundwater Quality Assessment Report and 2005 Annual Water Quality Report, Stoney Point Landfill Cedar Rapids, Iowa, RMT, Inc., November 30, 2005 (Doc # 60409) also discussed landfill-related constituents considered indicative of potential impact from the Landfill and the apparent extent of groundwater impact at the time of the assessment activities (see Sections 5.1 – Landfill-related Constituents and 5.2 – Extent of Impacted Groundwater of the 2005 report). The selected indicator parameters included chloride, sulfate, specific conductance, and magnesium as indicated in the following citation from the above-referenced report.

In order to determine the extent of impacted groundwater beneath and adjacent to the landfill, the parameter list has been narrowed down to include only parameters that (1) are landfill related and occur at elevated concentrations in groundwater downgradient of the landfill, (2) are detected regularly in most site monitoring wells, and (3) are conservative (nonreactive) parameters.

Concentrations of chloride, magnesium, sulfate, iron, manganese, and specific conductance (as a general ash indicator) have been elevated in groundwater downgradient of the landfill, and these elevated concentrations appear to be related to the landfill. Iron and manganese occur naturally in aquifer materials as well as in fly ash (see leachate data). Both of these metals are soluble in water under reducing geochemical conditions, as may occur naturally in the groundwater flow system, or may be generated by the placement of a low-permeability cap over the fill area. As a result, the elevated concentrations of iron and manganese present in the groundwater downgradient of the landfill could either be the result of these constituents leaching from the fill material, or the result of changing geochemical conditions in the aquifer material downgradient of the landfill. In addition, both metals react quickly to changing geochemical conditions, such as the discharge of groundwater from a reducing environment to an oxidizing environment (such as a streambed), or changing conditions within the aquifer itself. As a result, these metals are of limited value as good ash indicators in determining the extent of impacted *groundwater beneath the landfill. Therefore, the discussion of the extent of impacted groundwater will focus on the ash indicator parameters chloride, magnesium, sulfate, and specific conductance.*

5.1 GROUNDWATER UPDATE SINCE 2005

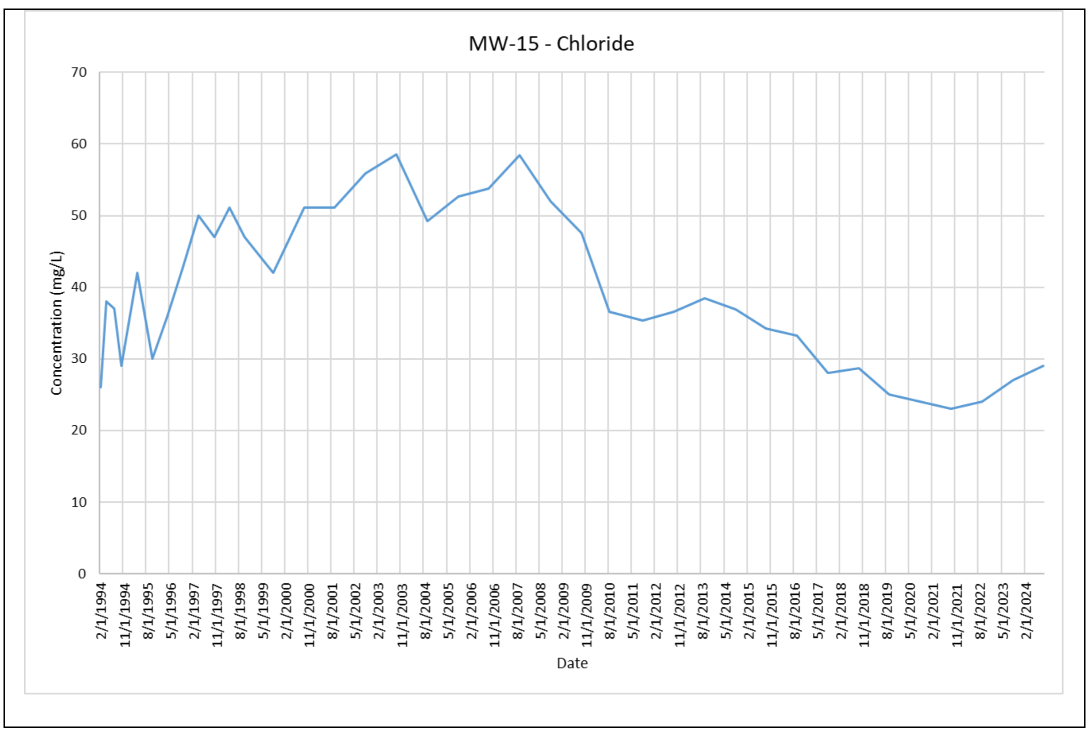
Monitoring wells identified as exhibiting elevated concentrations of the selected indicator parameters included the following divided by grouping assignment:

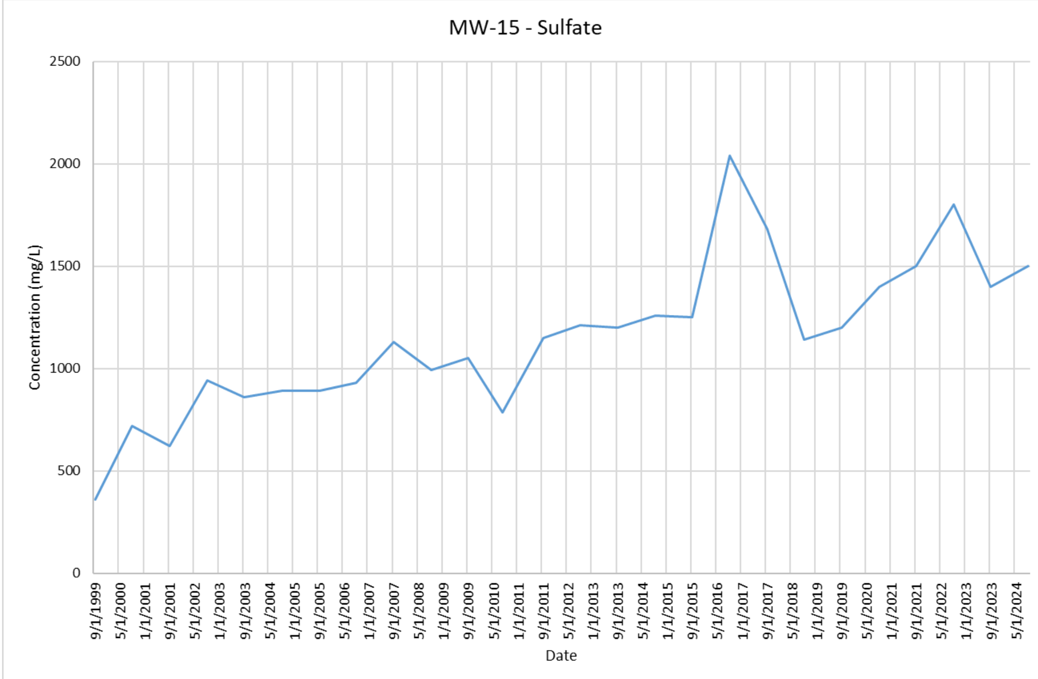
Shallow:	MW-15 and MW-16.
Intermediate Deep:	MW-11, MW-14, MW-17, and MW-22 (slightly). MW-8 was noted as exhibiting a gradual increase in sulfate. MW-9 was noted as not impacted but further analysis of sulfate might be warranted.
Deep:	MW-10, MW-13, and MW-18. MW-20 was noted as having slightly elevated indicator concentrations.

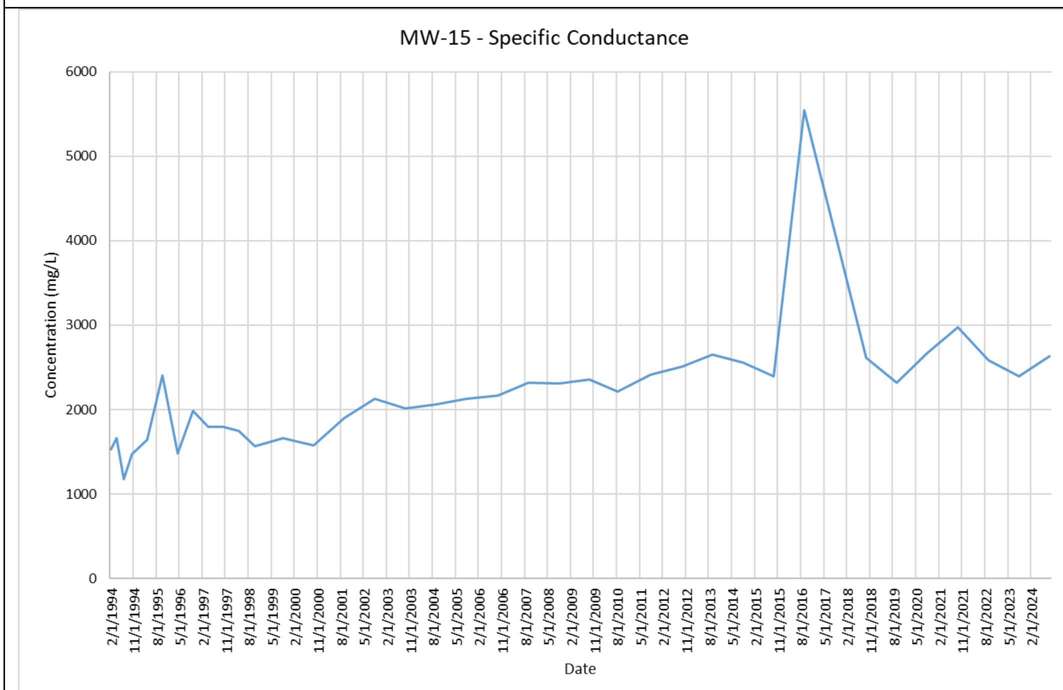
Nearly 20 years of additional groundwater analytical data are now available to further evaluate the 2005 conclusions. Below are discussions of the above-listed monitoring well indicator parameters inclusive of analytical data collected since 2005 for each of the monitoring wells listed above. It should be noted that for magnesium, only the totals analyses data, was included in the review as it is likely not directly comparable to the previously collected dissolved analyses data. Analysis for total magnesium began in 2016.

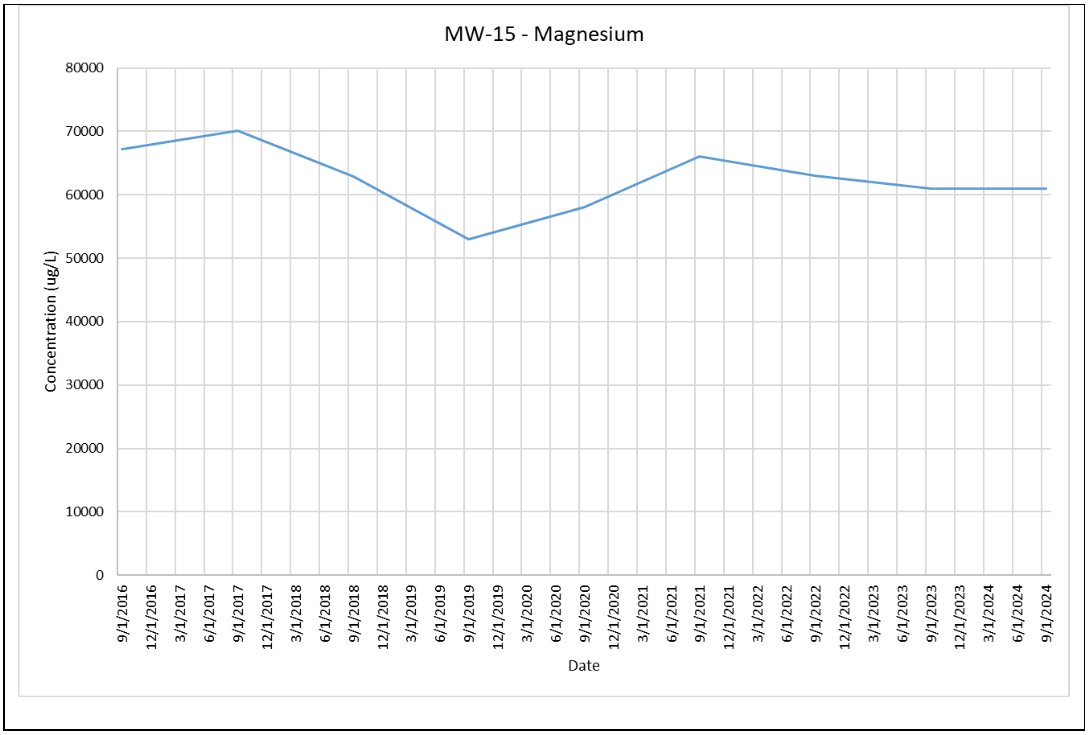
5.1.1 MW-15

The graphs below show monitoring well MW-15 concentrations of the indicator parameters.




MW-15 - Sulfate
Concentration (mg/L)
Date
0
500
1000
1500
2000
2500
9/1/1999
5/1/2000
1/1/2001
9/1/2001
5/1/2002
1/1/2003
9/1/2003
5/1/2004
1/1/2005
9/1/2005
5/1/2006
1/1/2007
9/1/2007
5/1/2008
1/1/2009
9/1/2009
5/1/2010
1/1/2011
9/1/2011
5/1/2012
1/1/2013
9/1/2013
5/1/2014
1/1/2015
9/1/2015
5/1/2016
1/1/2017
9/1/2017
5/1/2018
1/1/2019
9/1/2019
5/1/2020
1/1/2021
9/1/2021
5/1/2022
1/1/2023
9/1/2023
5/1/2024

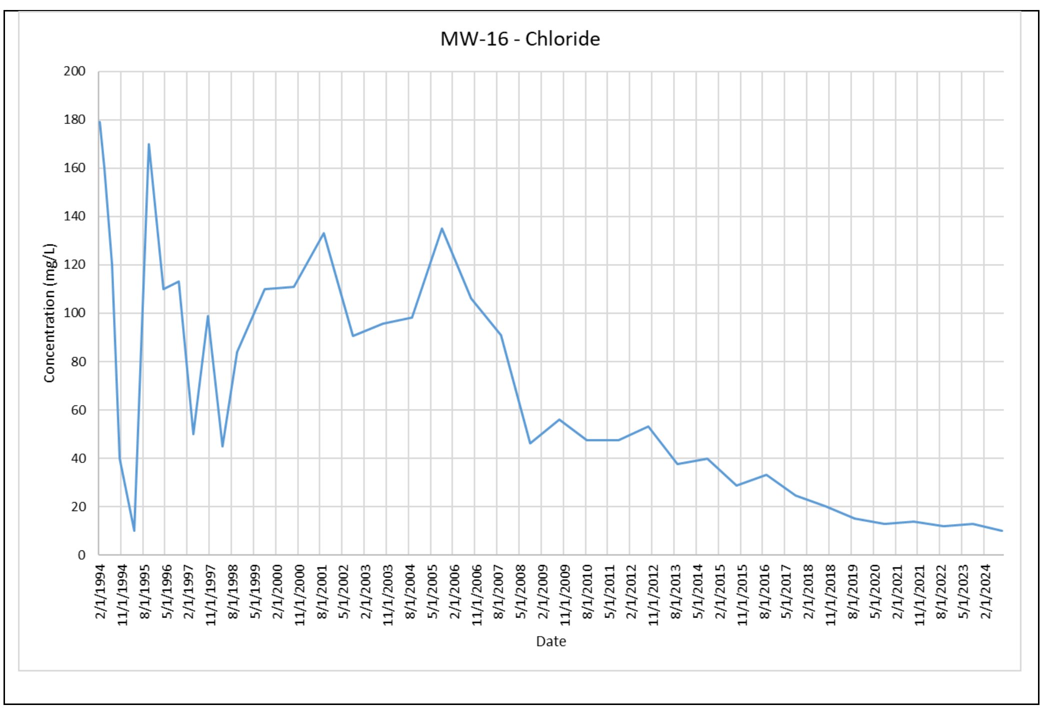

MW-15 - Specific Conductance
Concentration (mg/L)
Date
0
1000
2000
3000
4000
5000
6000
2/1/1994
11/1/1994
8/1/1995
5/1/1996
2/1/1997
11/1/1997
8/1/1998
5/1/1999
2/1/2000
11/1/2000
8/1/2001
5/1/2002
2/1/2003
11/1/2003
8/1/2004
5/1/2005
2/1/2006
11/1/2006
8/1/2007
5/1/2008
2/1/2009
11/1/2009
8/1/2010
5/1/2011
2/1/2012
11/1/2012
8/1/2013
5/1/2014
2/1/2015
11/1/2015
8/1/2016
5/1/2017
2/1/2018
11/1/2018
8/1/2019
5/1/2020
2/1/2021
11/1/2021
8/1/2022
5/1/2023
2/1/2024

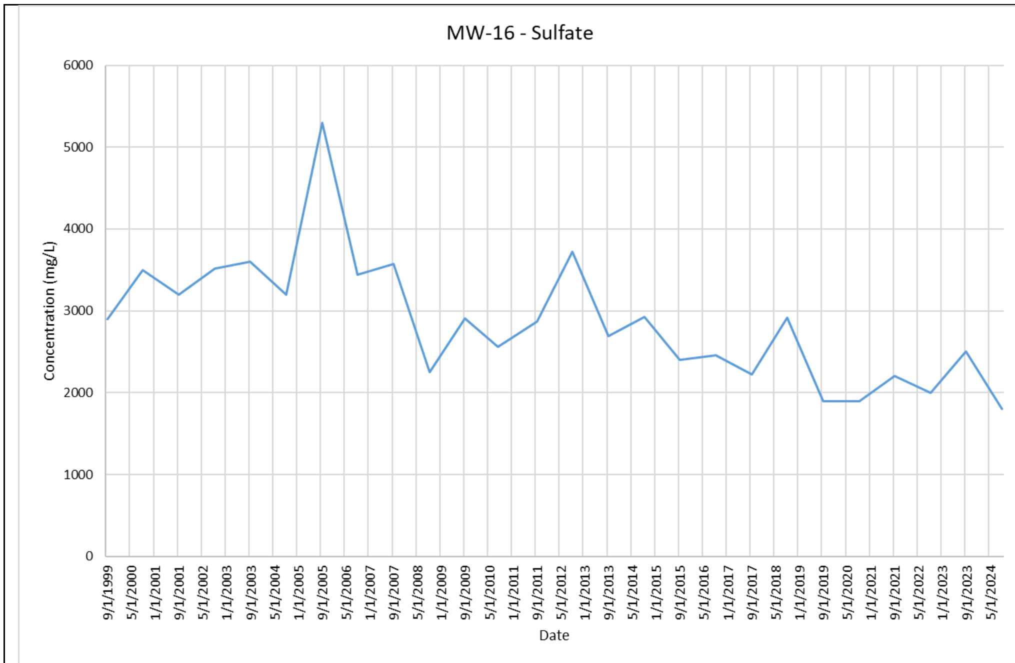


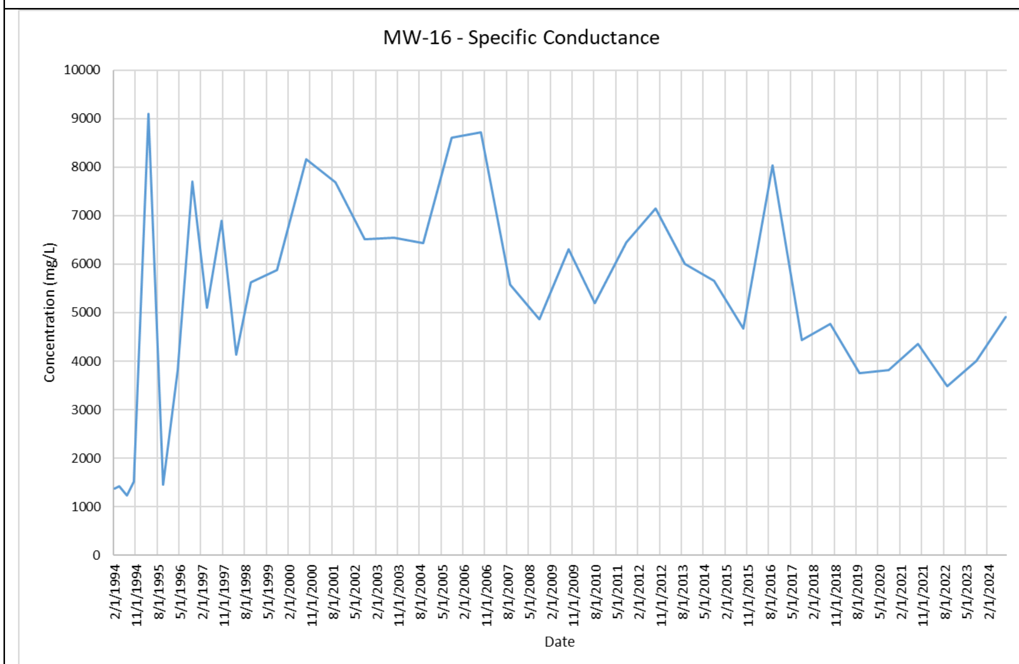
The above graphs indicate that since the 2005 assessment, chloride concentrations have generally decreased while sulfate and specific conductance concentrations have generally increased. The magnesium concentrations appear stable or slightly decreasing.

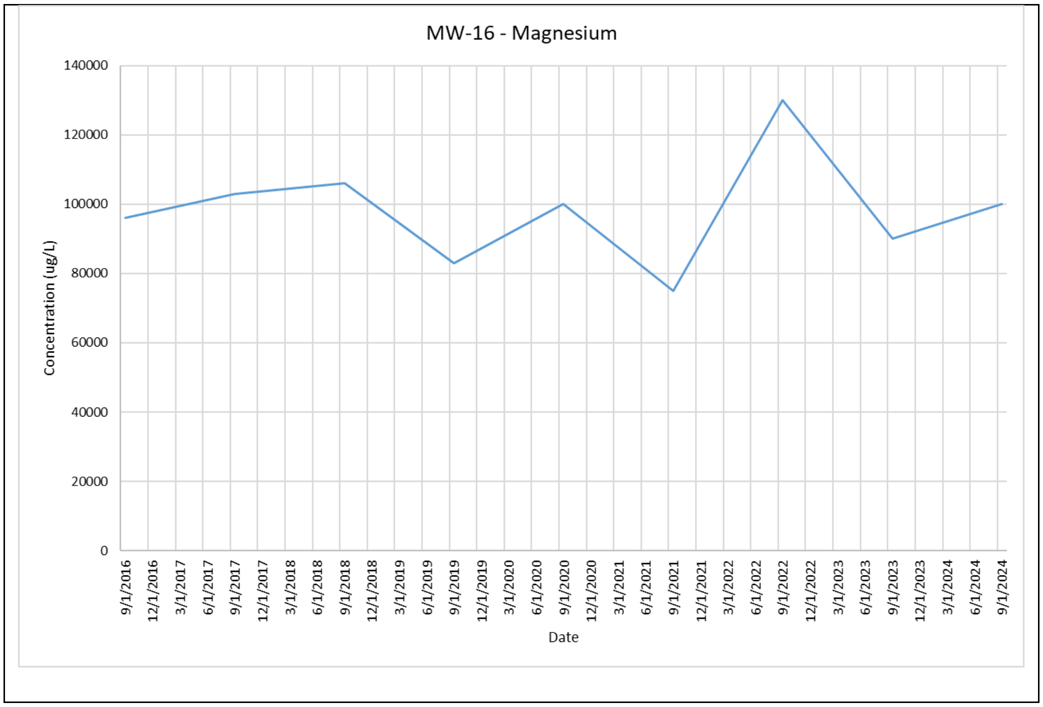
5.1.2 MW-16

The graphs below show monitoring well MW-16 concentrations of the indicator parameters.




MW-16 - Sulfate
Concentration (mg/L)
Date

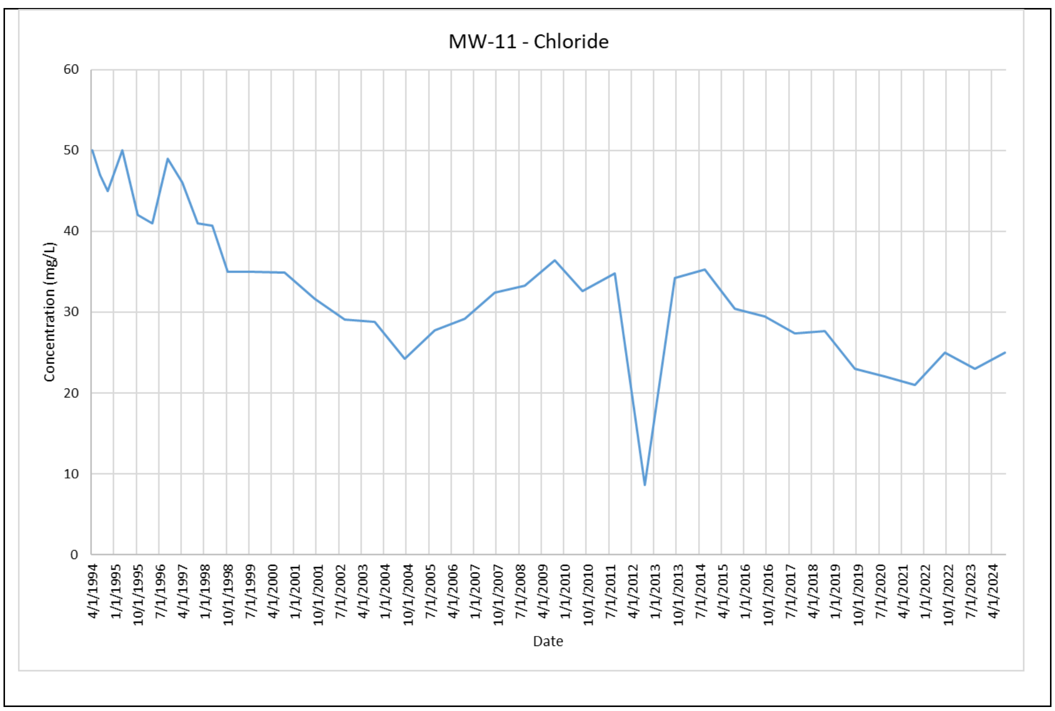

MW-16 - Specific Conductance
Concentration (mg/L)
Date

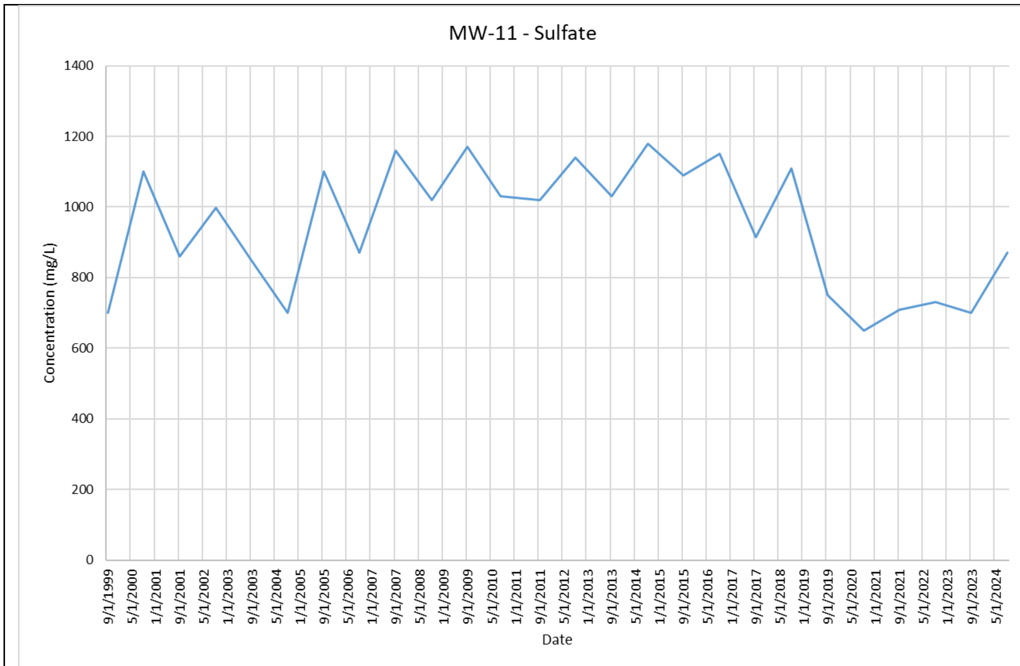


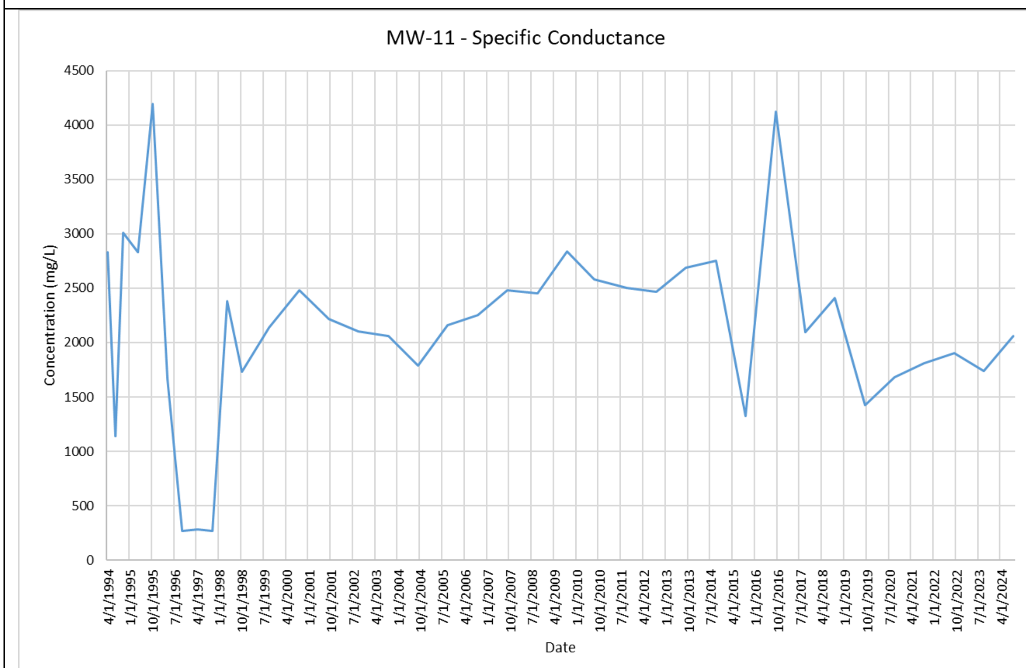
The above graphs indicate that since the 2005 assessment, indicator concentrations have generally decreased, by more than 90 percent in the case of chloride. The magnesium concentrations appear generally steady.

5.1.3 MW-11

The graphs below show monitoring well MW-11 concentrations of the indicator parameters.




MW-11 - Sulfate
Concentration (mg/L)
Date
0
200
400
600
800
1000
1200
1400
9/1/1999
5/1/2000
1/1/2001
9/1/2001
5/1/2002
1/1/2003
9/1/2003
5/1/2004
1/1/2005
9/1/2005
5/1/2006
1/1/2007
9/1/2007
5/1/2008
1/1/2009
9/1/2009
5/1/2010
1/1/2011
9/1/2011
5/1/2012
1/1/2013
9/1/2013
5/1/2014
1/1/2015
9/1/2015
5/1/2016
1/1/2017
9/1/2017
5/1/2018
1/1/2019
9/1/2019
5/1/2020
1/1/2021
9/1/2021
5/1/2022
1/1/2023
9/1/2023
5/1/2024


MW-11 - Specific Conductance
Concentration (mg/L)
Date
0
500
1000
1500
2000
2500
3000
3500
4000
4500
4/1/1994
1/1/1995
10/1/1995
7/1/1996
4/1/1997
1/1/1998
10/1/1998
7/1/1999
4/1/2000
1/1/2001
10/1/2001
7/1/2002
4/1/2003
1/1/2004
10/1/2004
7/1/2005
4/1/2006
1/1/2007
10/1/2007
7/1/2008
4/1/2009
1/1/2010
10/1/2010
7/1/2011
4/1/2012
1/1/2013
10/1/2013
7/1/2014
4/1/2015
1/1/2016
10/1/2016
7/1/2017
4/1/2018
1/1/2019
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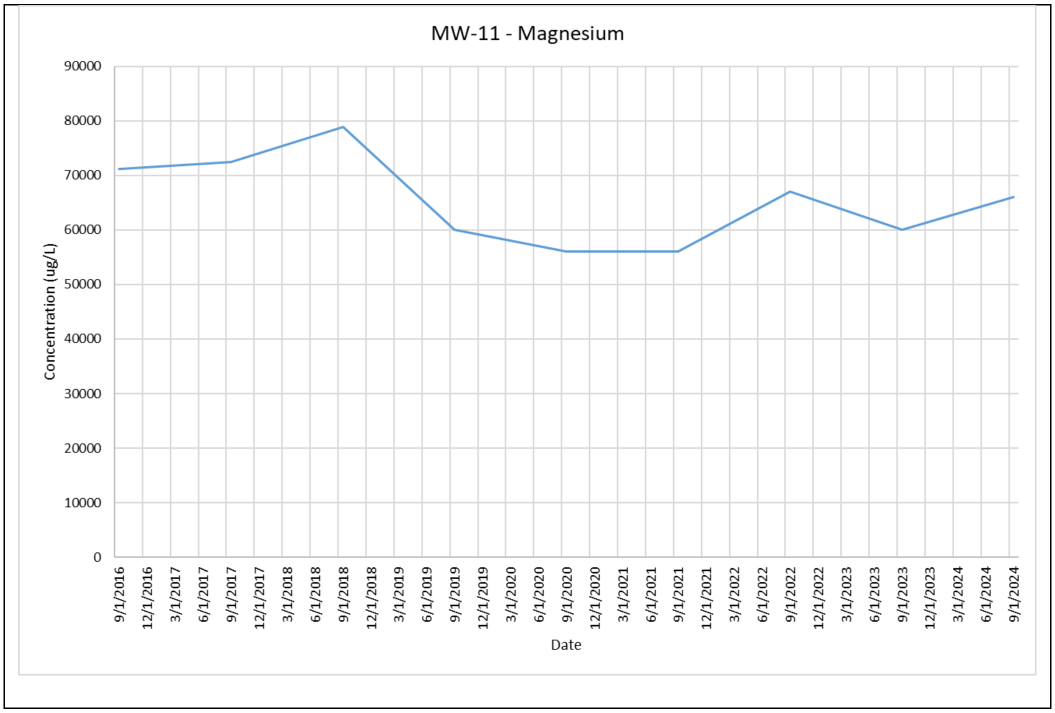
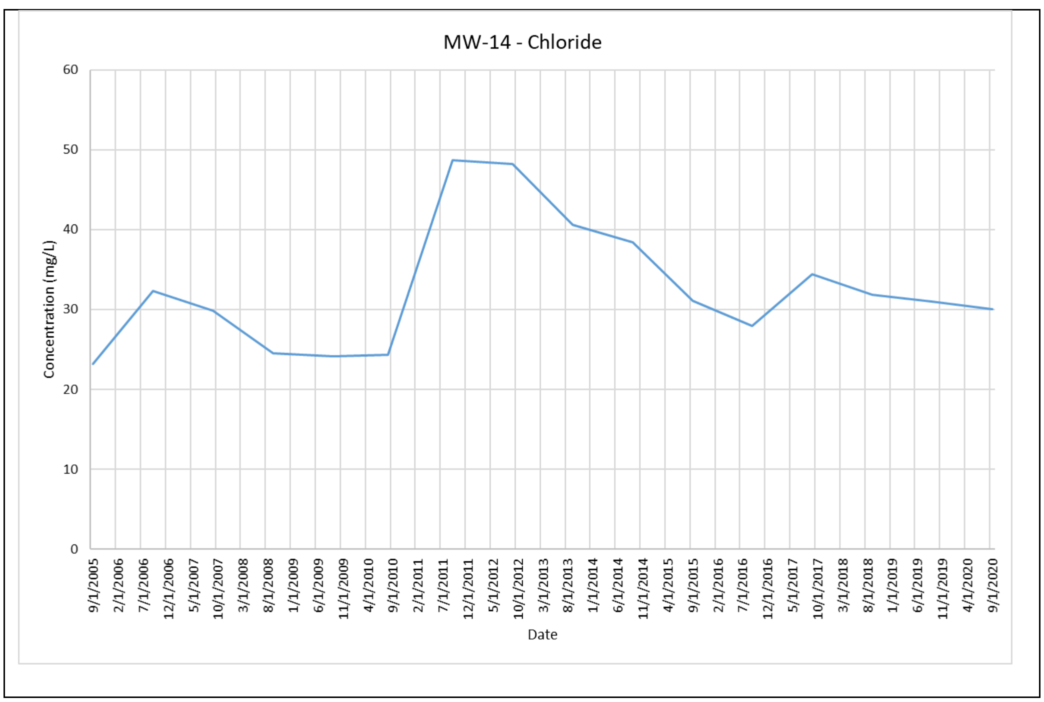
7/1/2020
4/1/2021
1/1/2022
10/1/2022
7/1/2023
4/1/2024

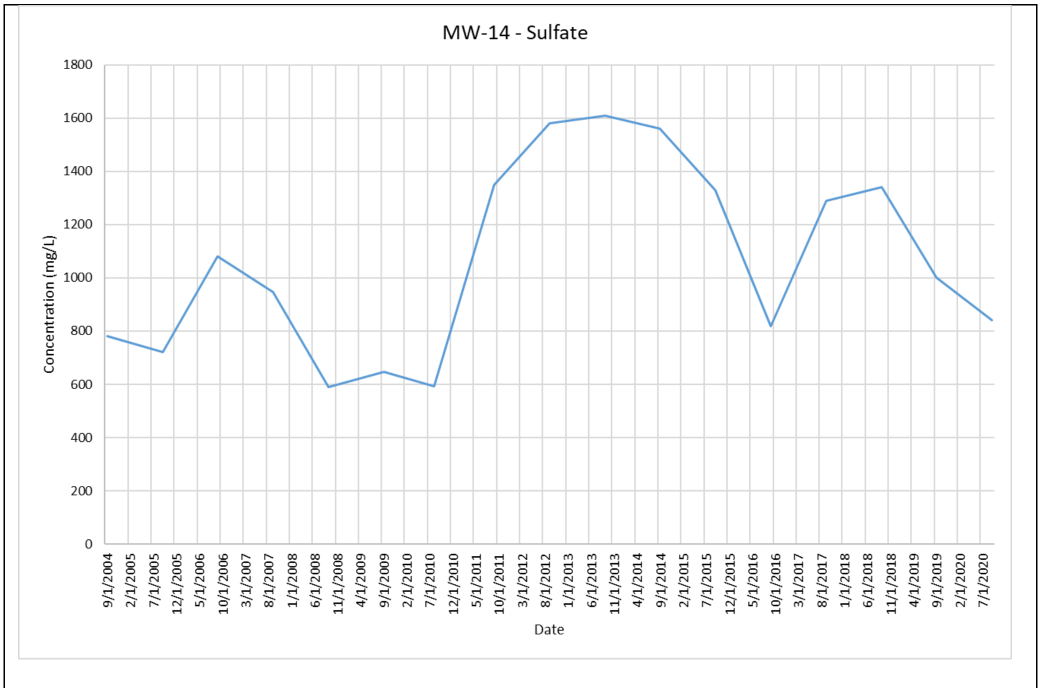


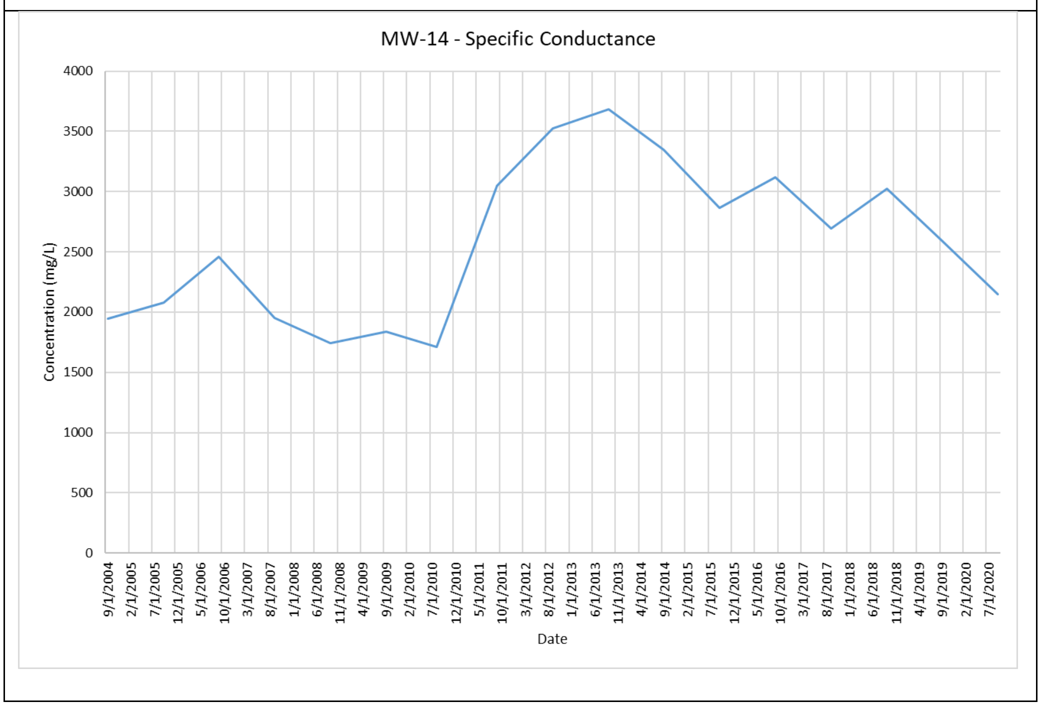
The above graphs indicate that since the 2005 assessment, indicator concentrations have generally remained stable. The magnesium concentrations appear slightly decreasing. Chloride concentrations appear to have slightly decreased prior to the 2005 assessment.

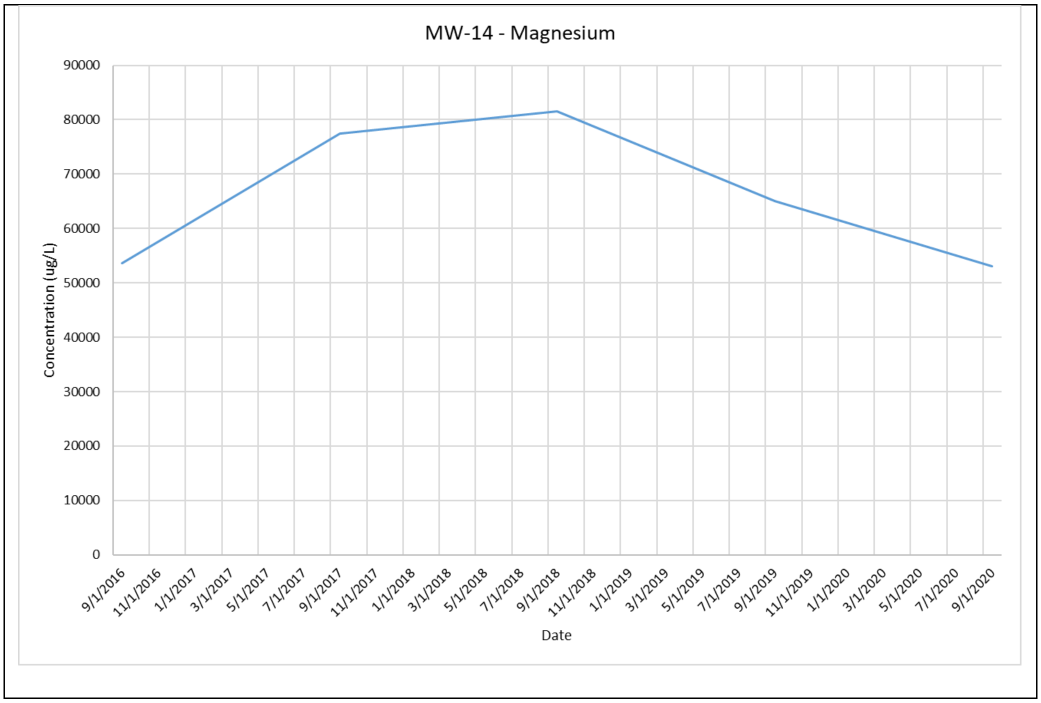
5.1.4 MW-14

The graphs below show monitoring well MW-14 concentrations of the indicator parameters.




MW-14 - Sulfate
Concentration (mg/L)
0
200
400
600
800
1000
1200
1400
1600
1800
9/1/2004
2/1/2005
7/1/2005
12/1/2005
5/1/2006
10/1/2006
3/1/2007
8/1/2007
1/1/2008
6/1/2008
11/1/2008
4/1/2009
9/1/2009
2/1/2010
7/1/2010
12/1/2010
5/1/2011
10/1/2011
3/1/2012
8/1/2012
1/1/2013
6/1/2013
11/1/2013
4/1/2014
9/1/2014
2/1/2015
7/1/2015
12/1/2015
5/1/2016
10/1/2016
3/1/2017
8/1/2017
1/1/2018
6/1/2018
11/1/2018
4/1/2019
9/1/2019
2/1/2020
7/1/2020
Date

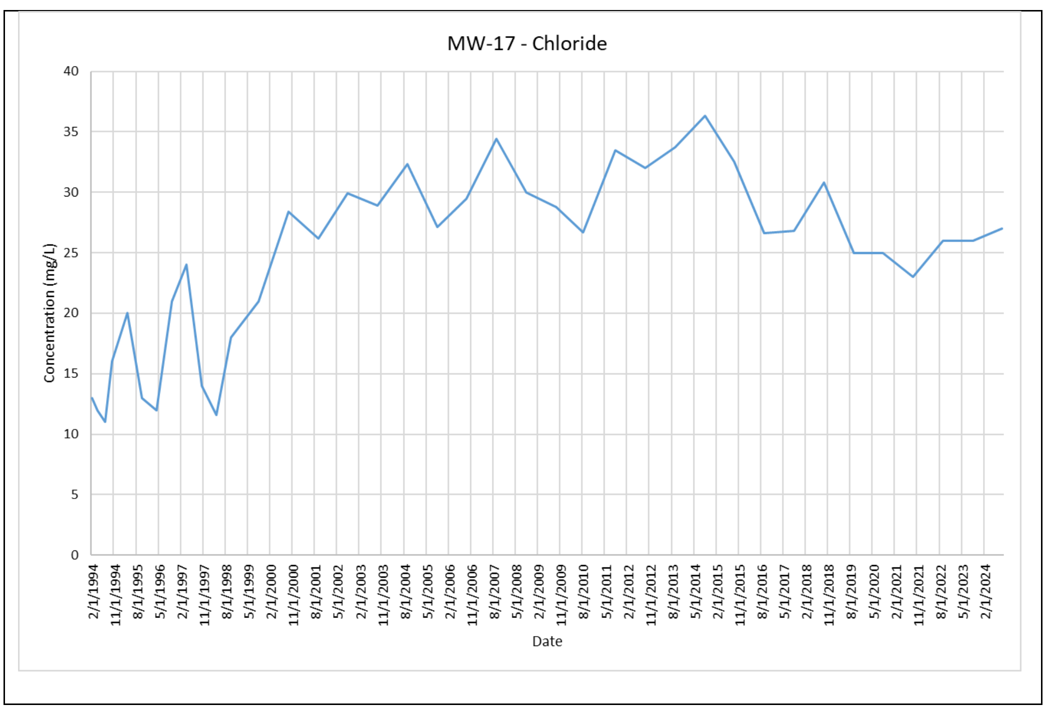

MW-14 - Specific Conductance
Concentration (mg/L)
0
500
1000
1500
2000
2500
3000
3500
4000
9/1/2004
2/1/2005
7/1/2005
12/1/2005
5/1/2006
10/1/2006
3/1/2007
8/1/2007
1/1/2008
6/1/2008
11/1/2008
4/1/2009
9/1/2009
2/1/2010
7/1/2010
12/1/2010
5/1/2011
10/1/2011
3/1/2012
8/1/2012
1/1/2013
6/1/2013
11/1/2013
4/1/2014
9/1/2014
2/1/2015
7/1/2015
12/1/2015
5/1/2016
10/1/2016
3/1/2017
8/1/2017
1/1/2018
6/1/2018
11/1/2018
4/1/2019
9/1/2019
2/1/2020
7/1/2020
Date

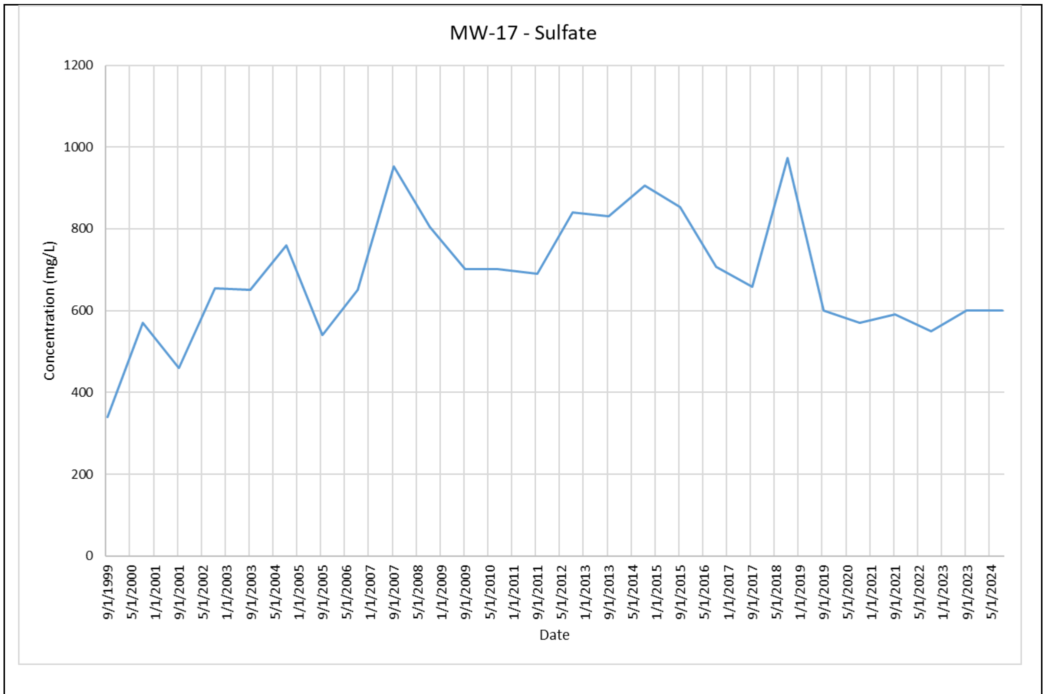


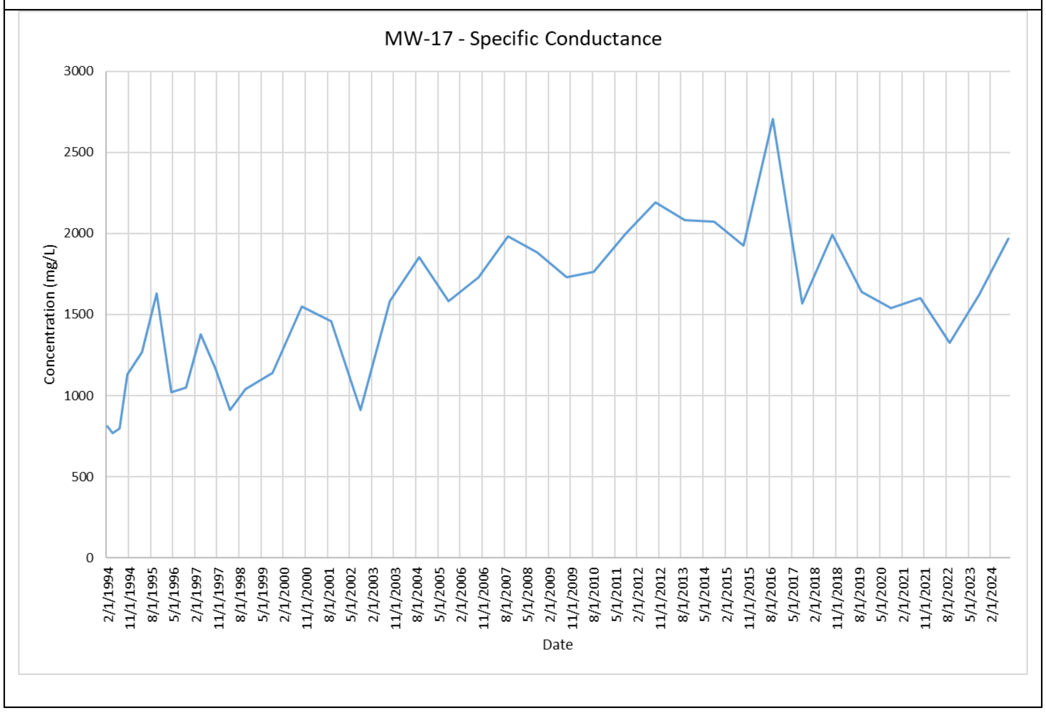
The above graphs indicate that since the 2005 assessment, indicator and magnesium concentrations have fluctuated but generally remained stable. Monitoring well MW-14 was abandoned in December 2022 and is no longer part of the monitoring network.

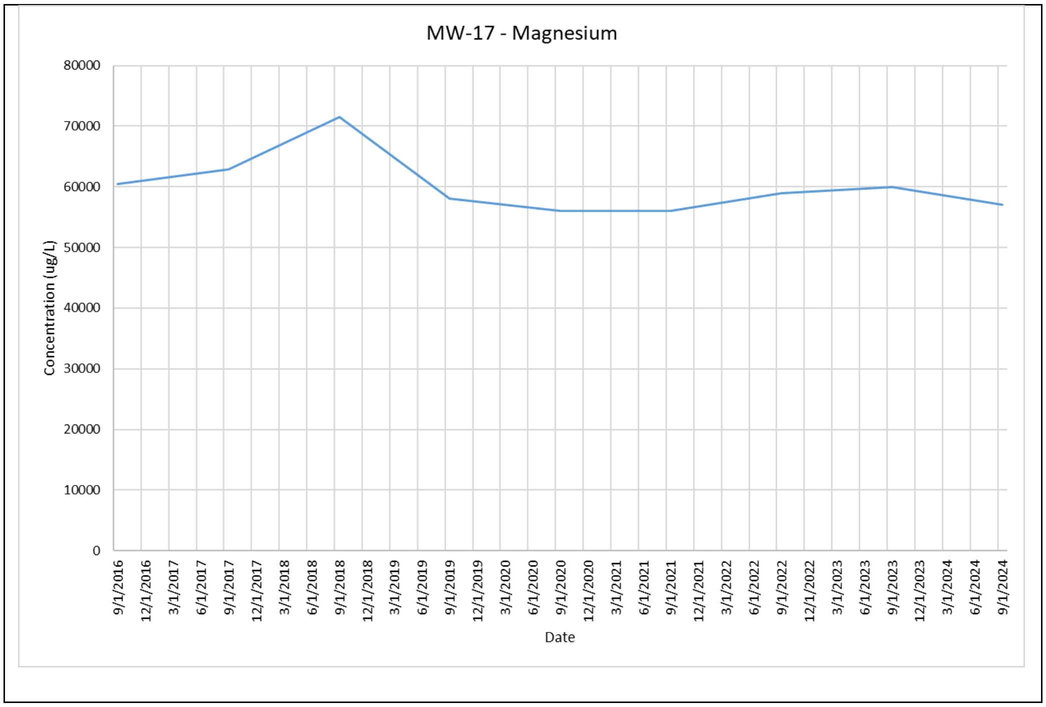
5.1.5 MW-17

The graphs below show monitoring well MW-17 concentrations of the indicator parameters.




MW-17 - Sulfate
Concentration (mg/L)
Date

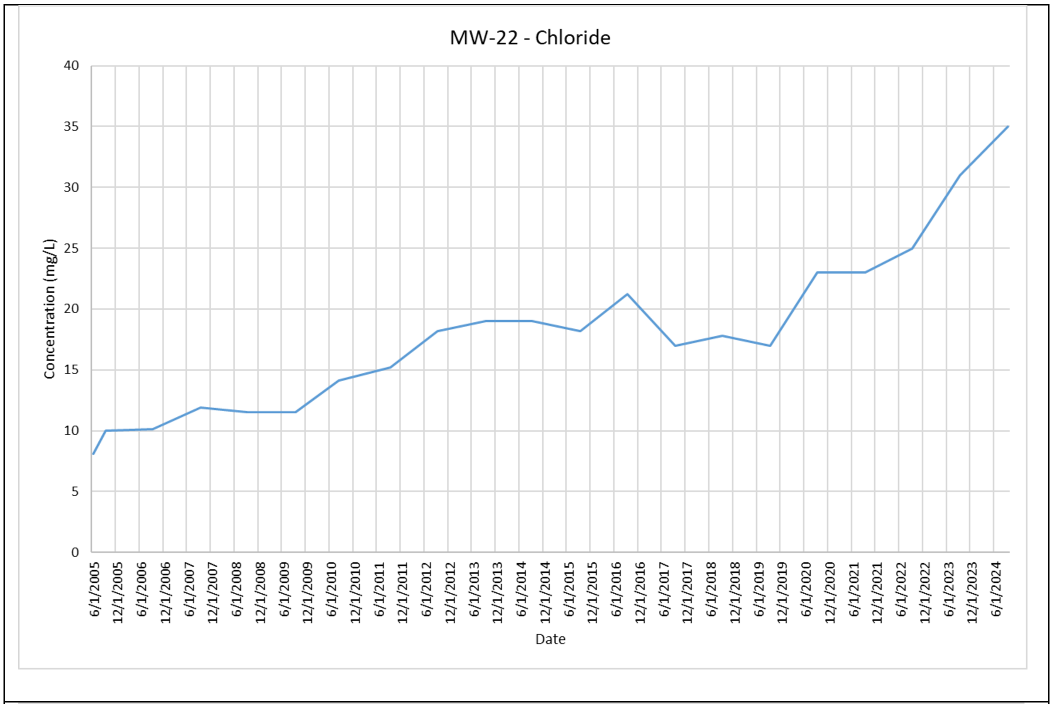

MW-17 - Specific Conductance
Concentration (mg/L)
Date



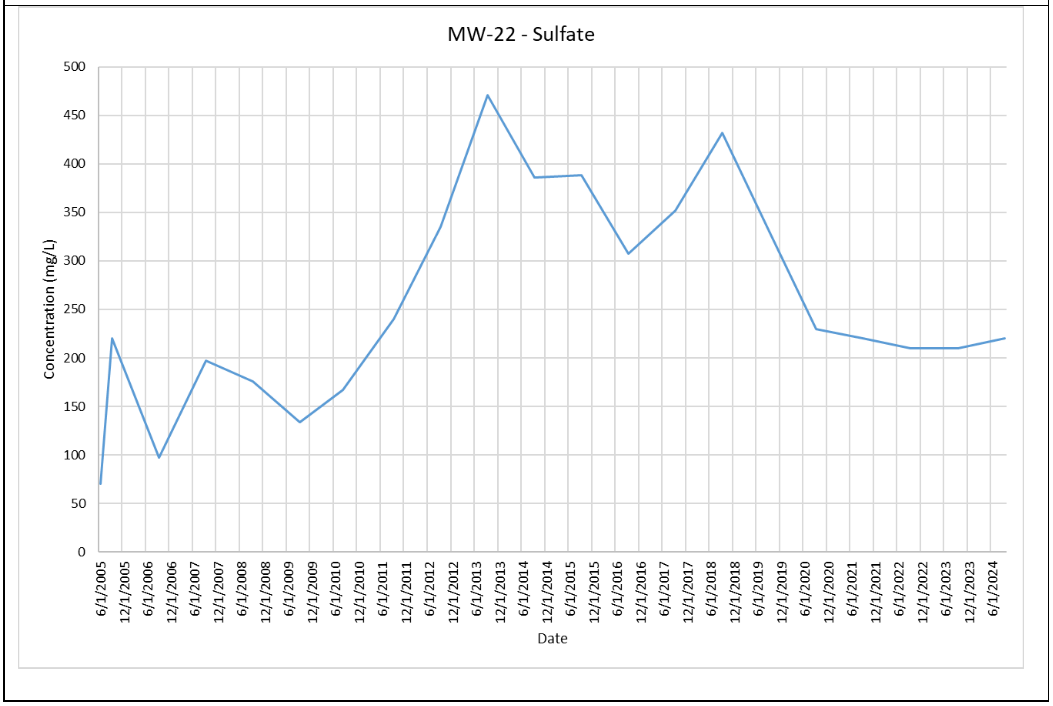
The above graphs indicate that leading into the 2005 assessment, indicator parameter concentrations were increasing; however, since the 2005 assessment, concentrations have been steady to slightly declining. Magnesium concentrations since 2016 also appear steady to slightly declining.

5.1.6 MW-22

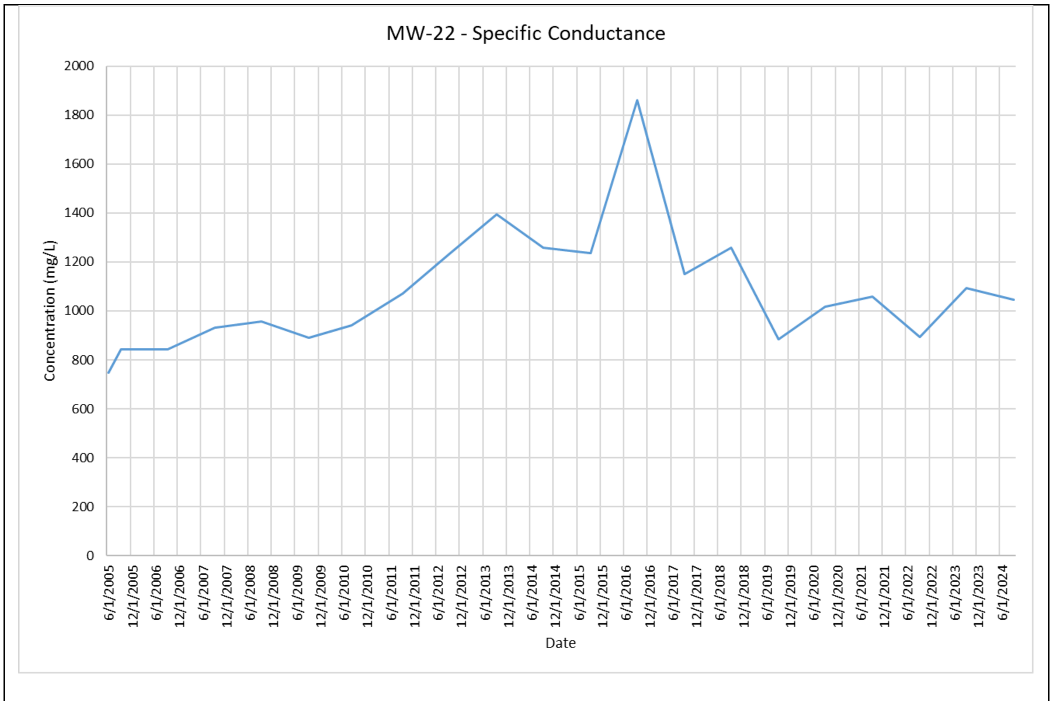
The 2005 assessment noted that monitoring well MW-22 measured slightly elevated indicator parameter concentrations. The graphs below show the monitoring well MW-22 concentrations of the indicator parameters.

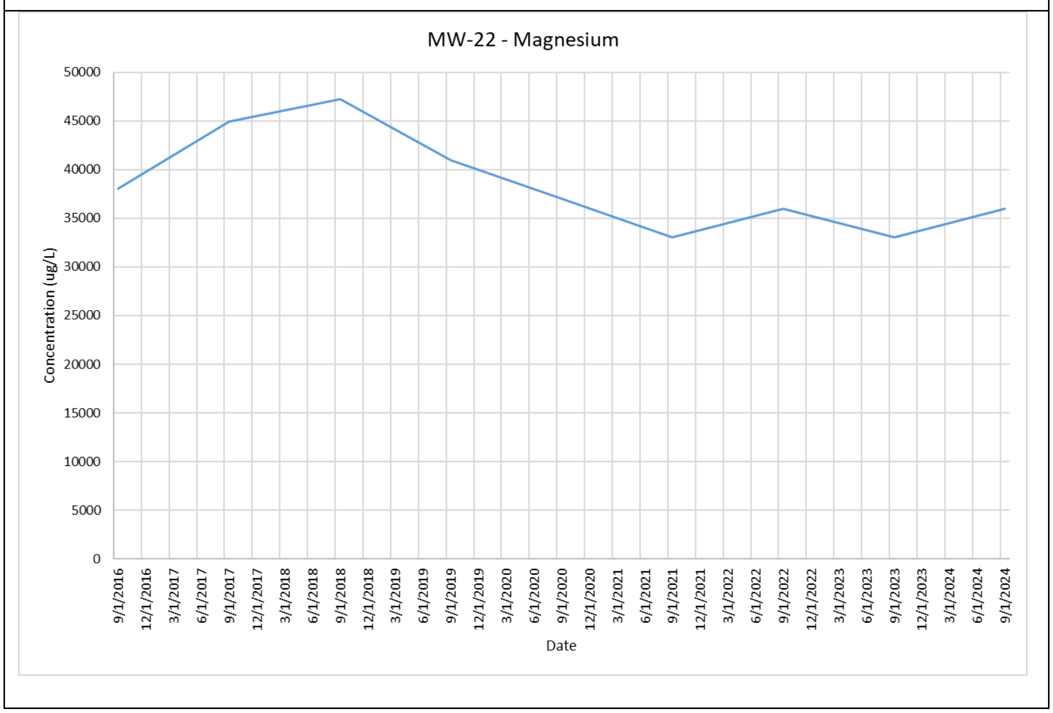


MW-22 - Chloride
Concentration (mg/L)
Date



MW-22 - Sulfate
Concentration (mg/L)
Date

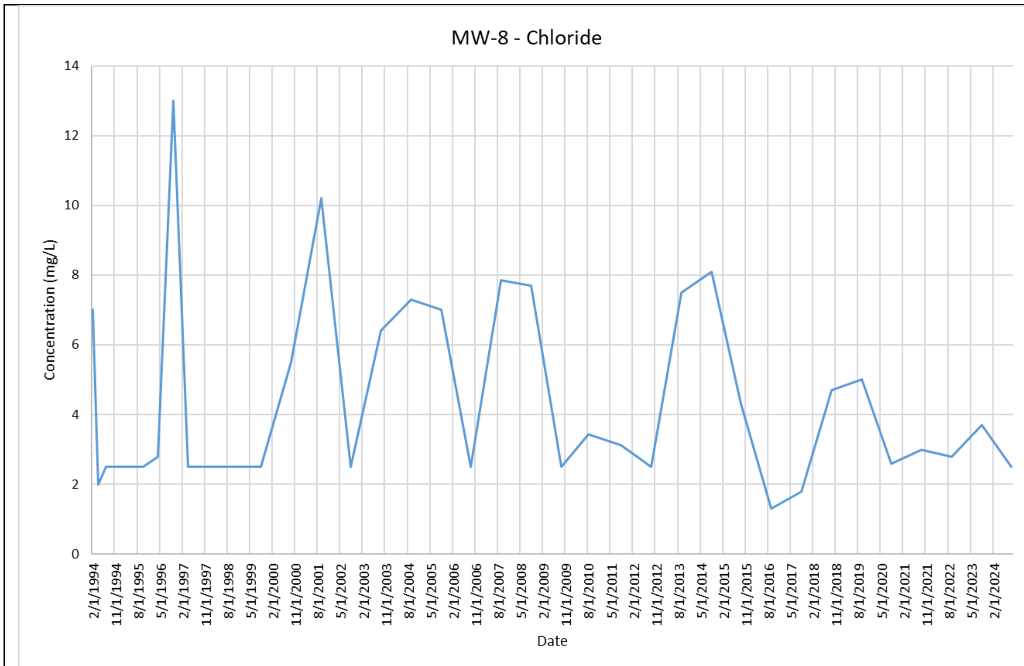


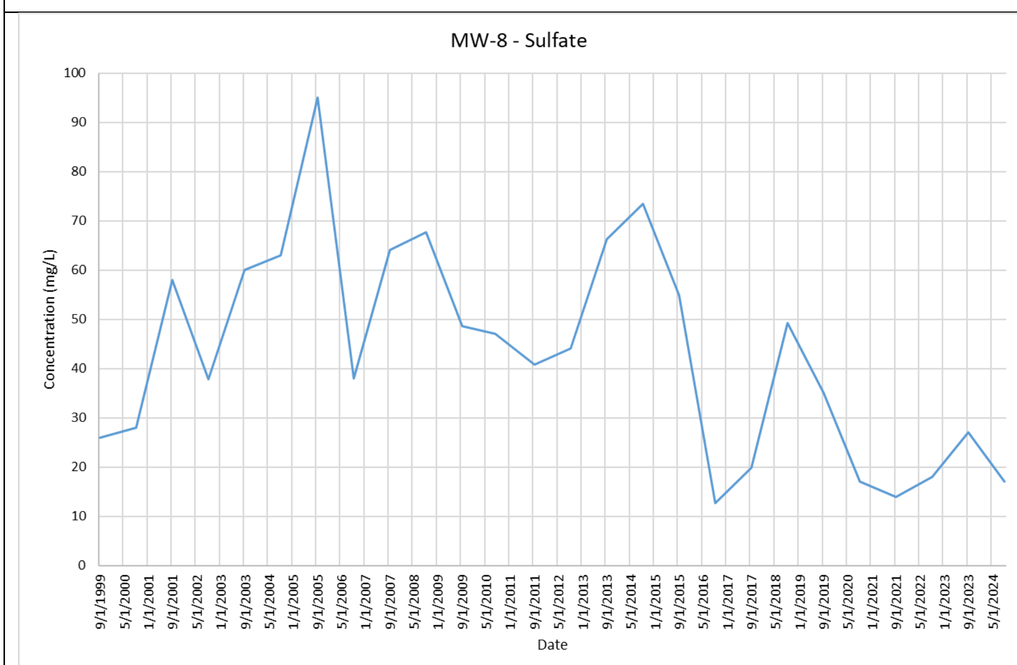


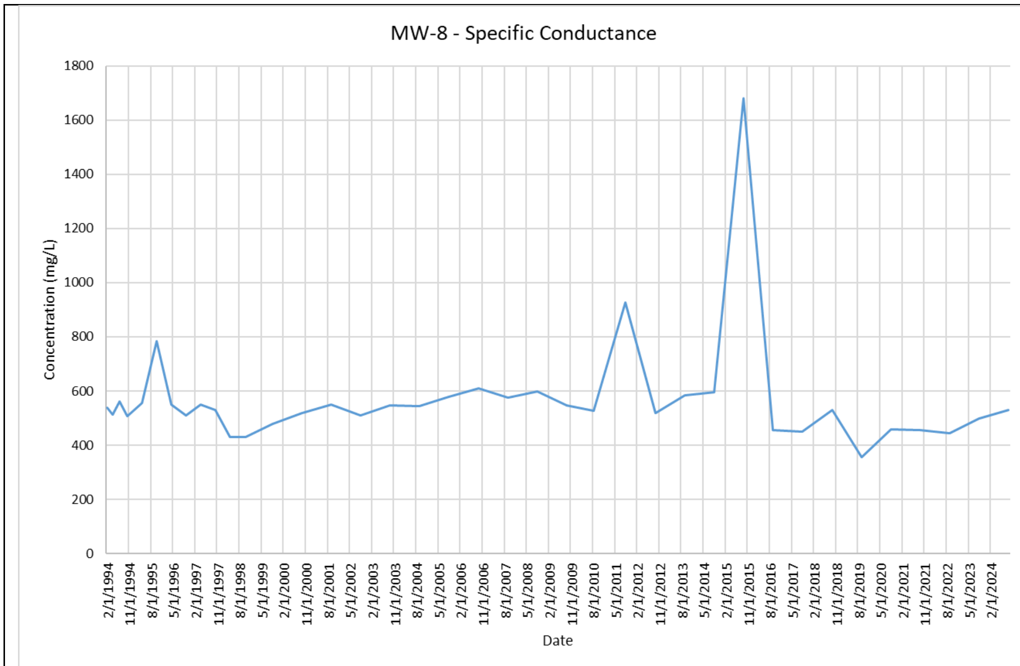
The above graphs indicate that since the 2005 assessment, chloride concentrations have generally increased and sulfate and specific conductance concentrations increased through 2013 and 2016, respectively, followed by generally decreasing concentrations. Magnesium concentrations since 2016 also appear steady to slightly declining.

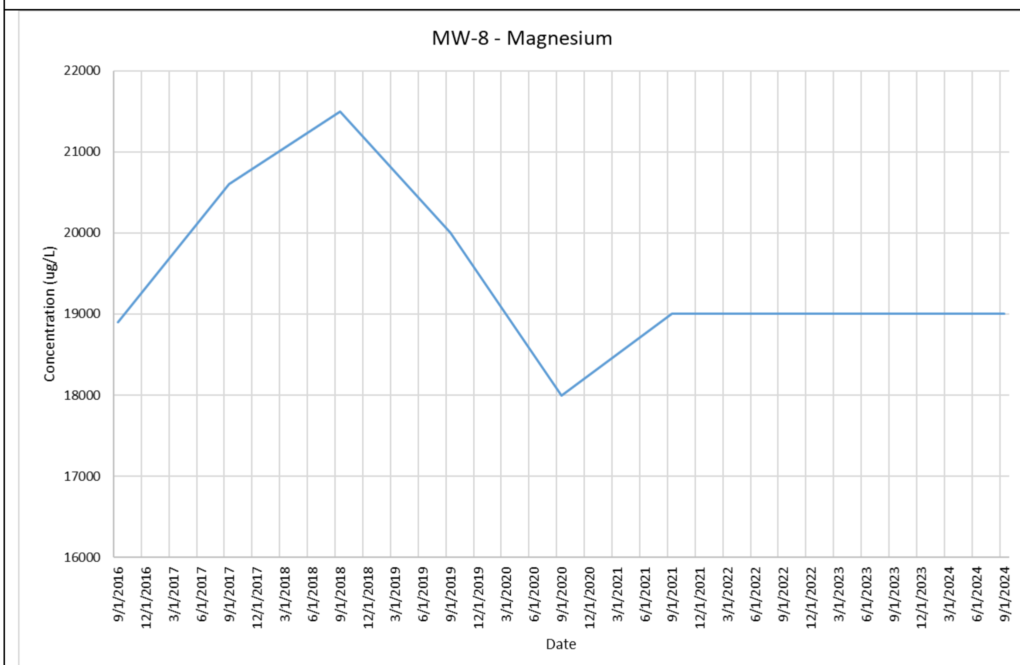
5.1.7 MW-8

The 2005 assessment did not specifically report monitoring well MW-8 as impacted, but did note that sample data was exhibiting a gradual increase in sulfate concentrations. The graphs below show the monitoring well MW-8 concentrations of the indicator parameters.





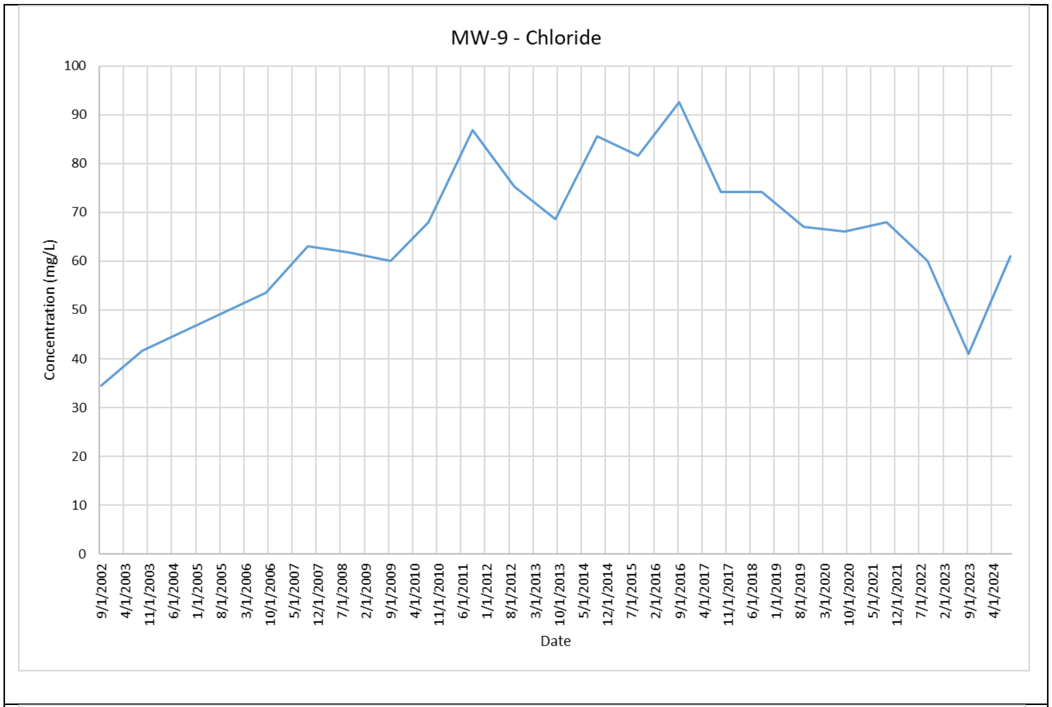


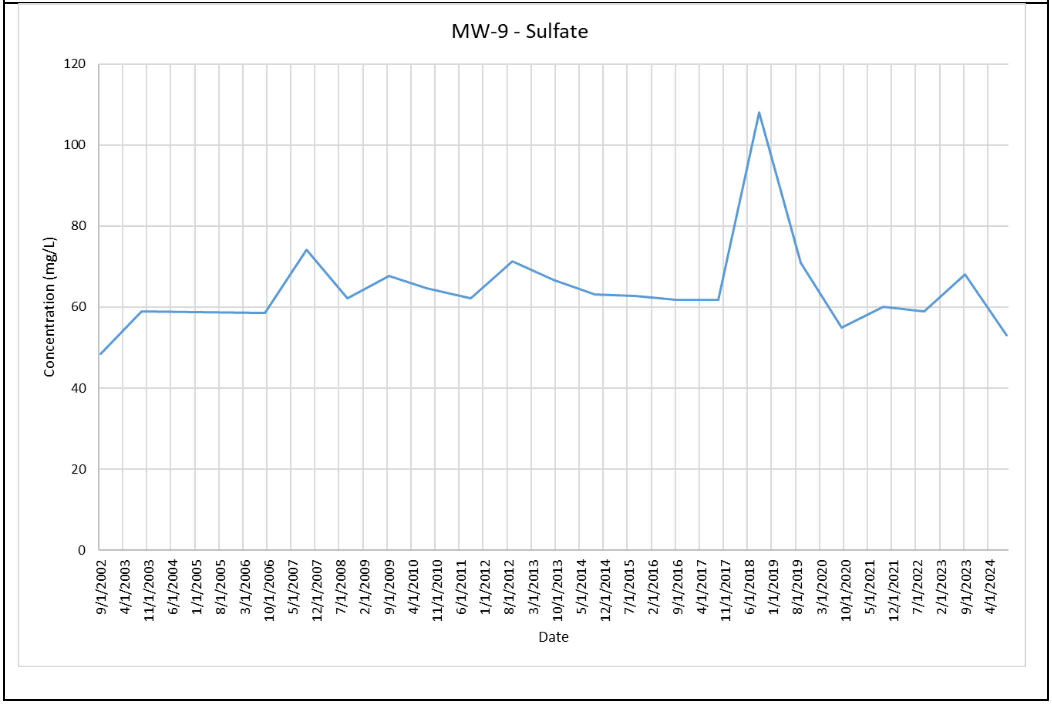


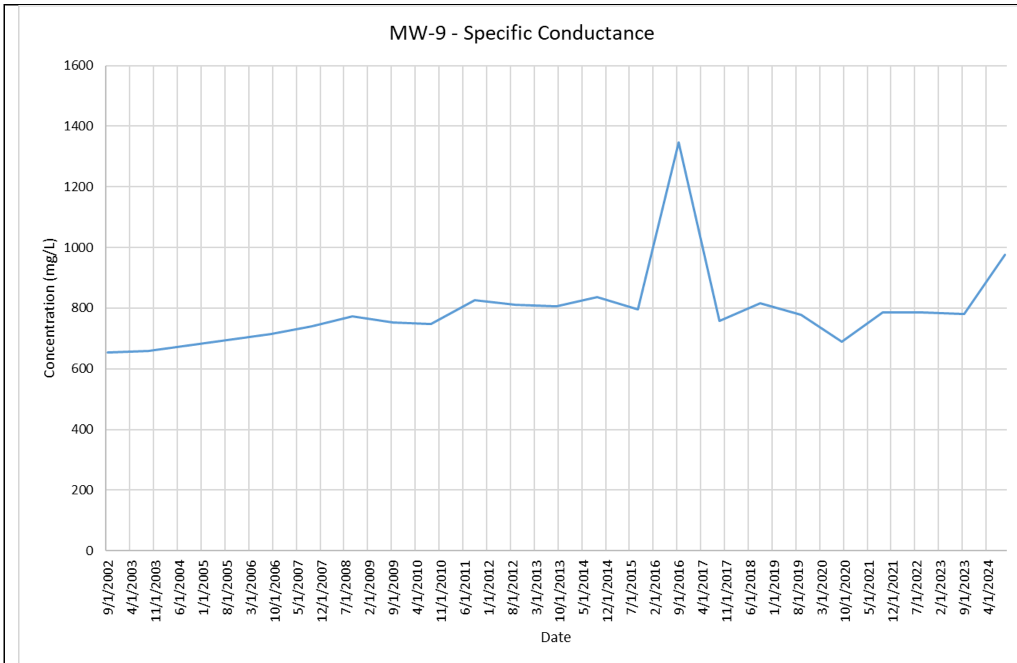
Despite increasing sulfate concentrations leading into 2005, sulfate concentrations in monitoring well MW-8 since the 2005 assessment have been generally declining. Chloride concentrations visually appear to indicate significant variability; however, it should be noted that measured chloride concentrations for more than 20 years have been below 10 mg/L, indicating very little chloride in this groundwater and small changes in concentrations appear significant when in fact they are not. Other than a couple of elevated concentrations, specific conductance measurements have been steady to declining. Magnesium concentrations have fluctuated but ended the data period of record at nearly the same concentration as the beginning of the data period of record.

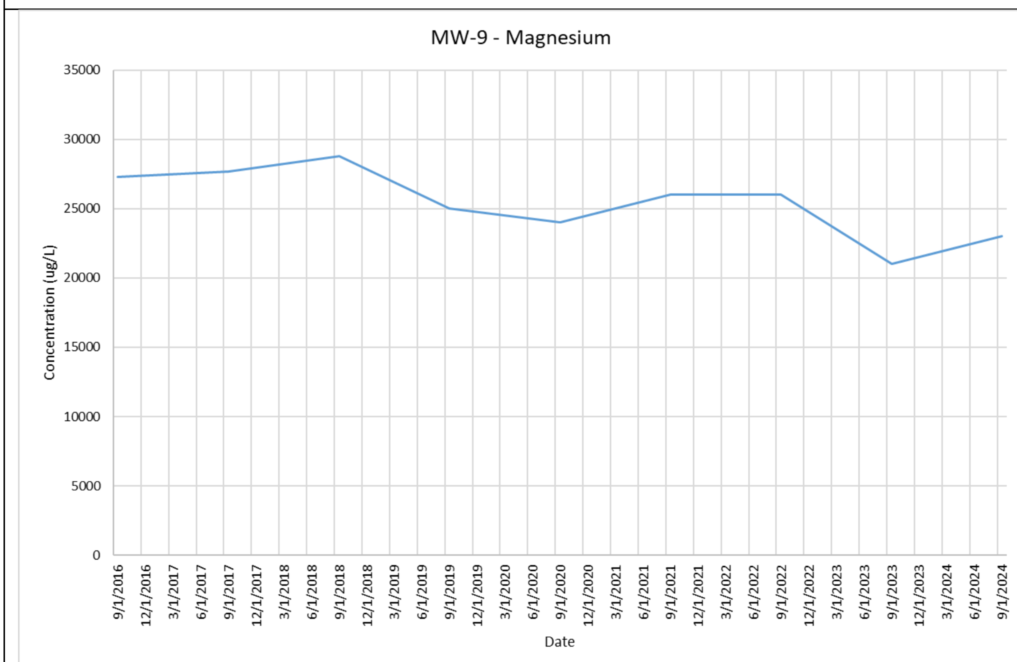
5.1.8 MW-9

The 2005 assessment noted monitoring well MW-9 as not impacted, but did indicate further analysis of sulfate might be warranted. The graphs below show monitoring well MW-9 concentrations of the indicator parameters.





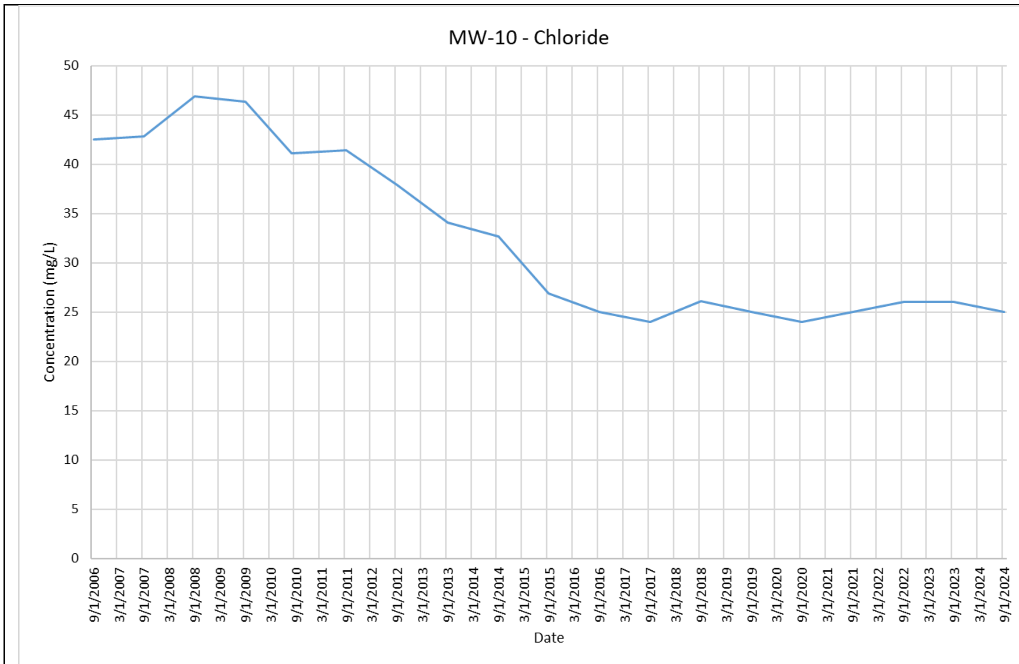


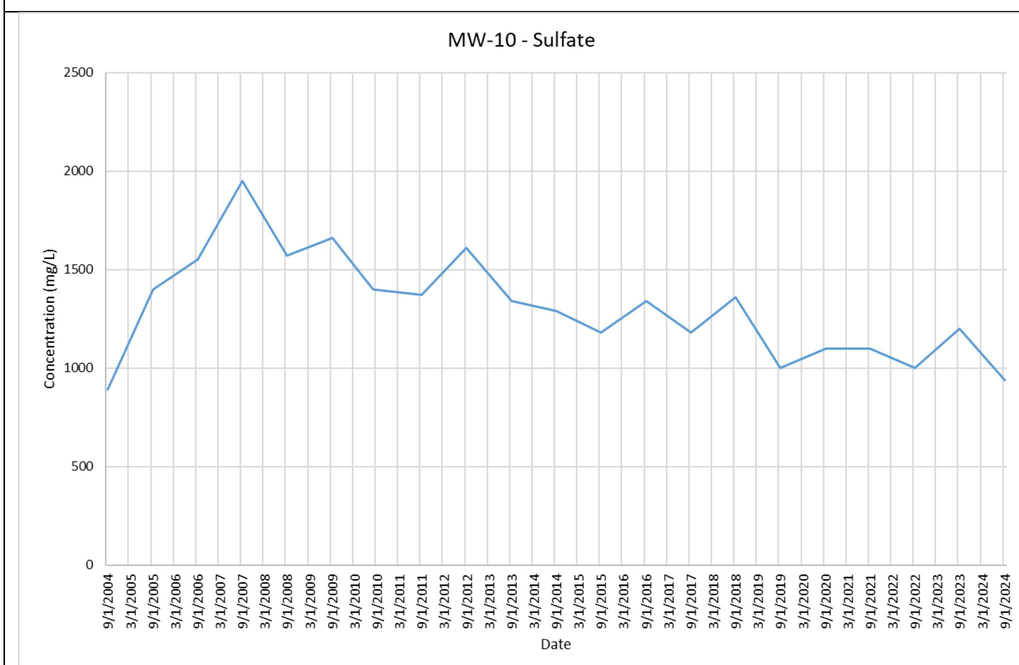


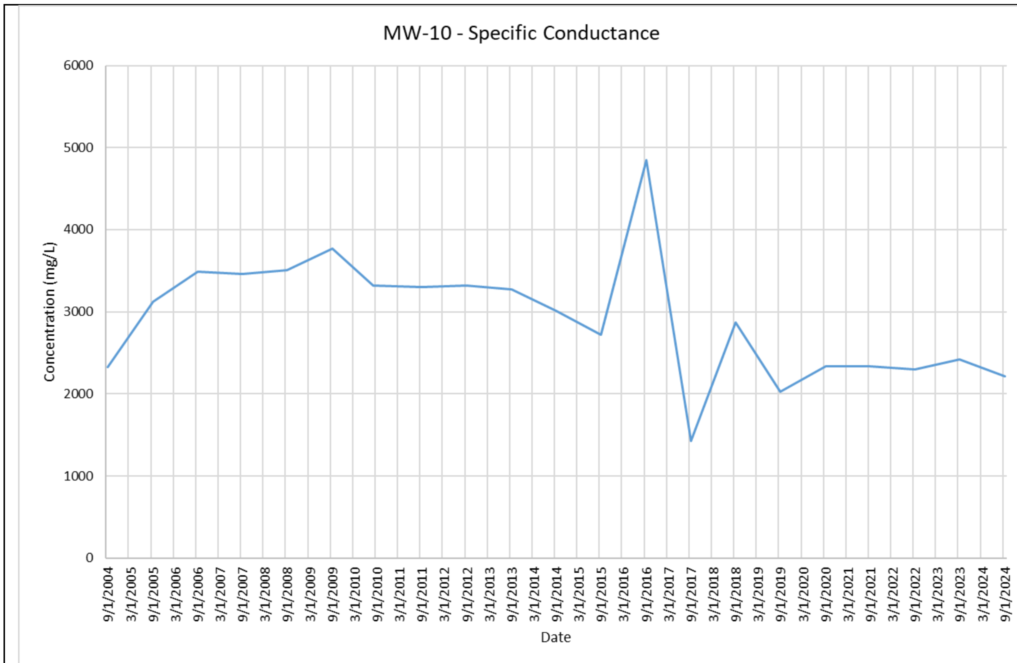
Sulfate concentrations in monitoring well MW-9 since the 2005 assessment have remained steady. Chloride concentrations generally increased through 2016 followed by decreasing concentrations returning to the concentrations measured at the time of the 2005 assessment. Specific conductance has increased slightly. Magnesium concentrations have generally declined.

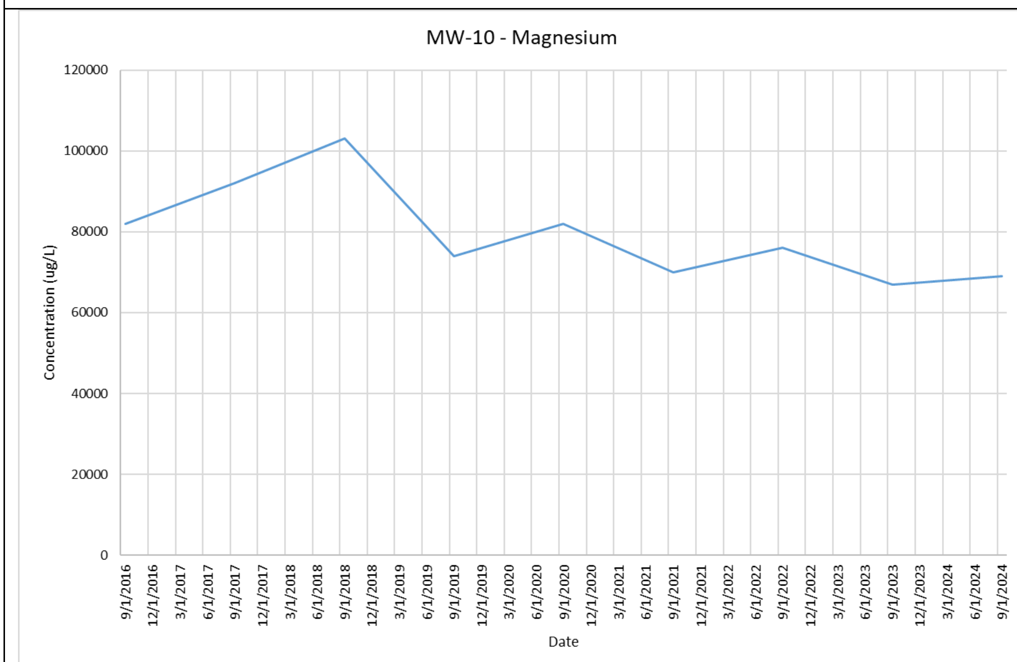
5.1.9 MW-10

The graphs below show monitoring well MW-10 concentrations of the indicator parameters.





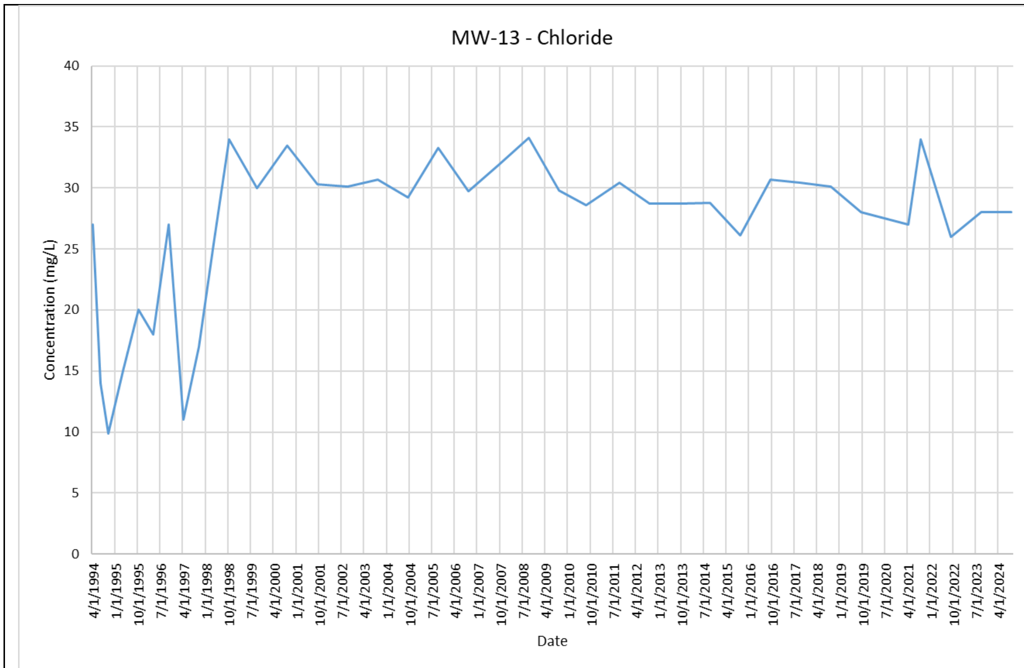


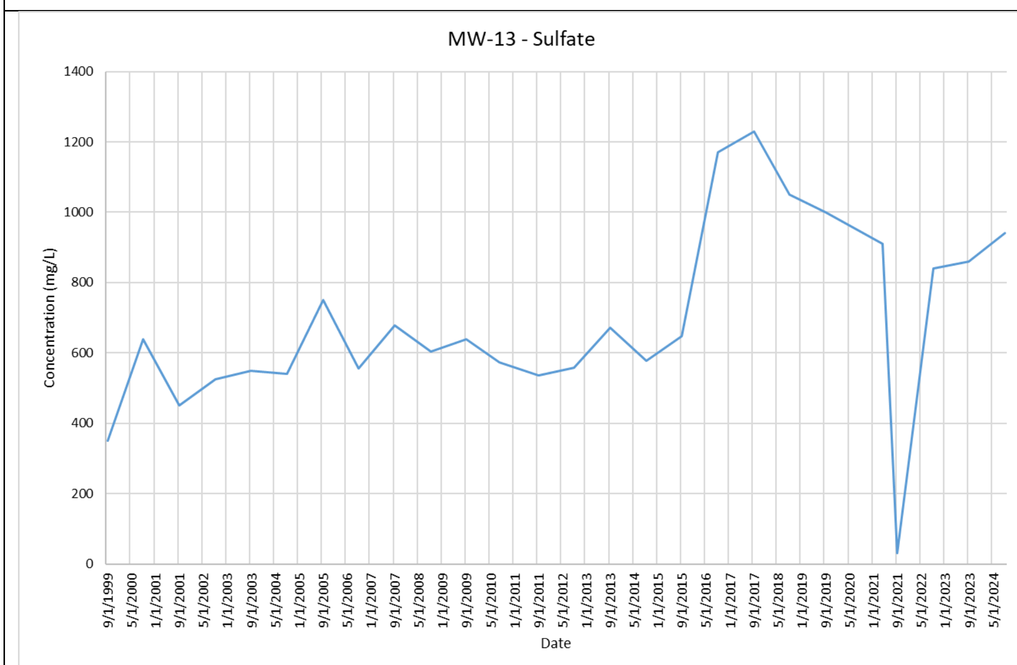


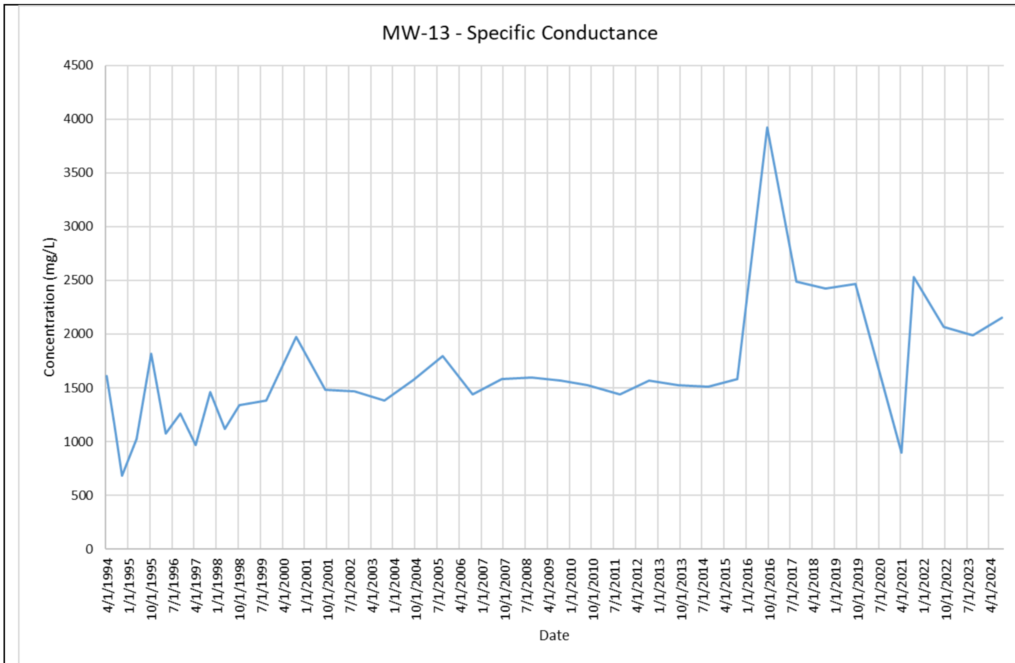
The above graphs indicate that since the 2005 assessment, indicator concentrations initially increased for approximately two years followed by a lengthy period of generally declining concentrations through the end of the period of record for chloride, sulfate, and specific conductance. The magnesium concentrations are generally decreasing.

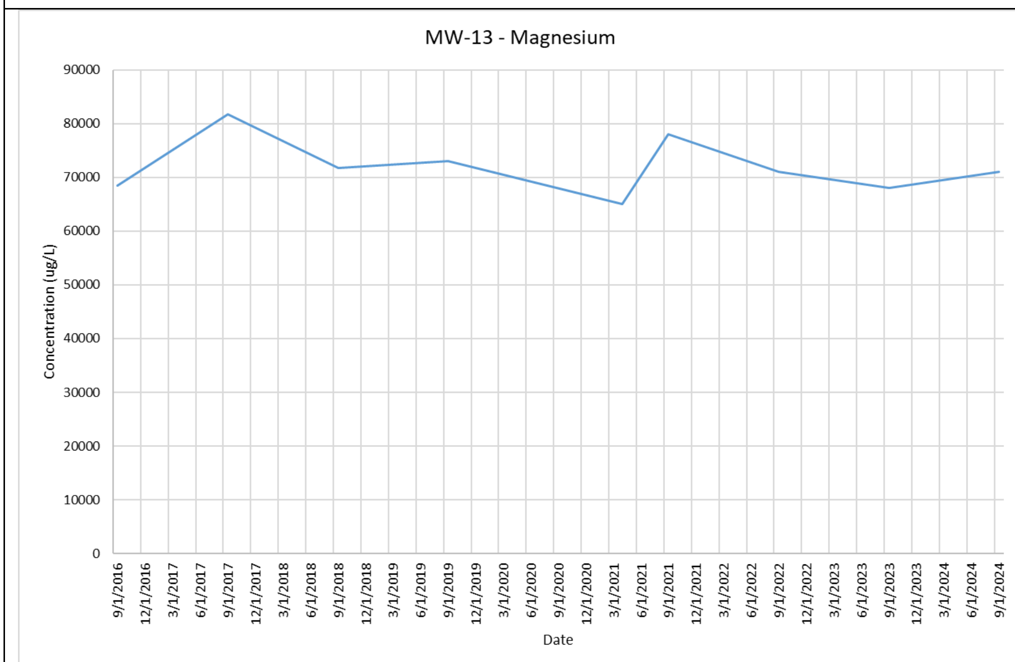
5.1.10 MW-13

The graphs below show monitoring well MW-13 concentrations of the indicator parameters.





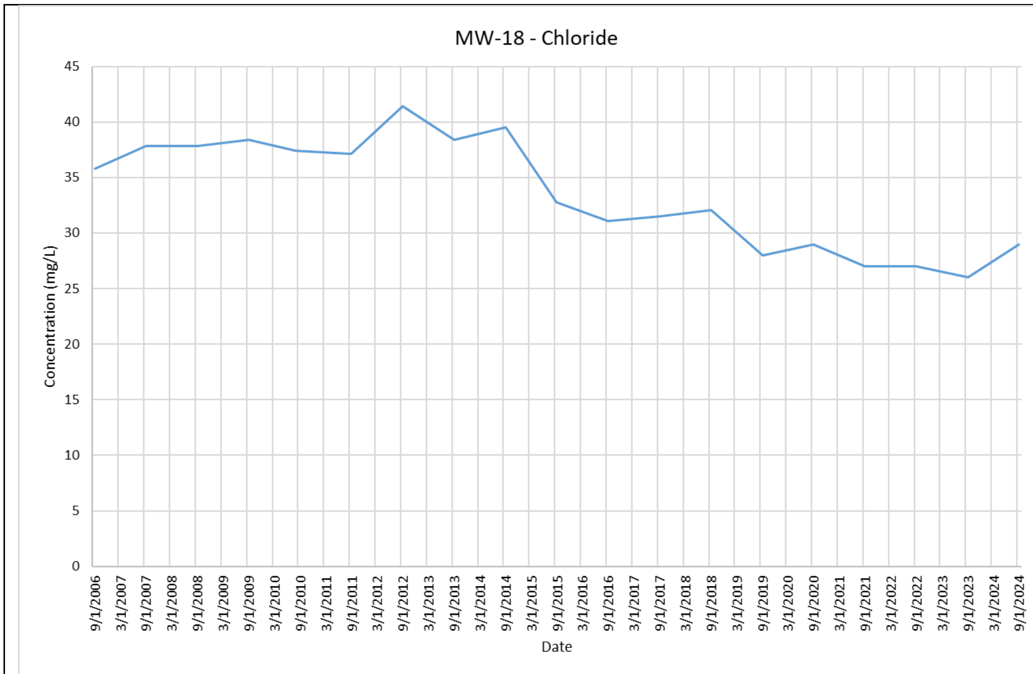


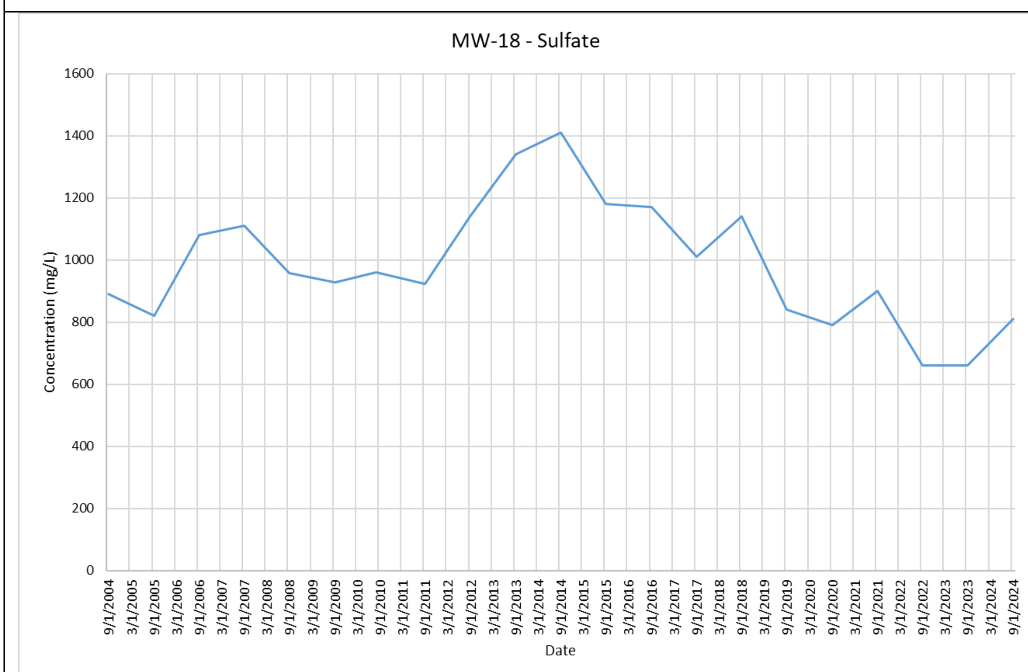


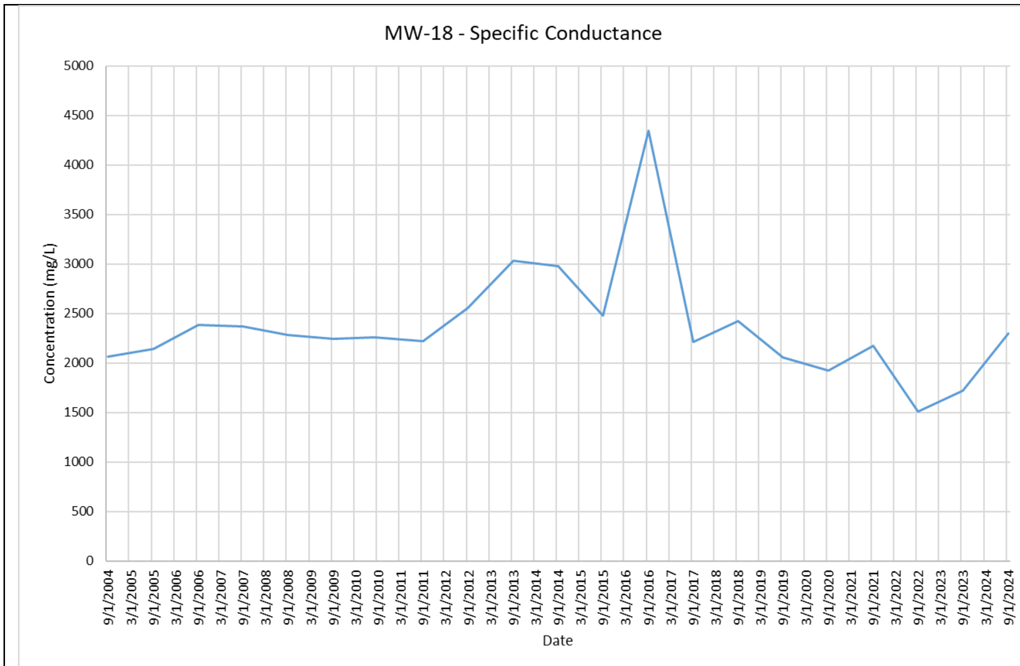
The above graphs indicate that since the 2005 assessment, chloride concentrations exhibited a slightly decreasing trend and sulfate and specific conductance exhibited generally stable concentrations through 2015 followed by increases. The specific conductance increase is likely a secondary measurement of the sulfate increase based on the similarity in the concentration fluctuations and sulfate being an influence on specific conductance measurements. The magnesium concentrations were steady.

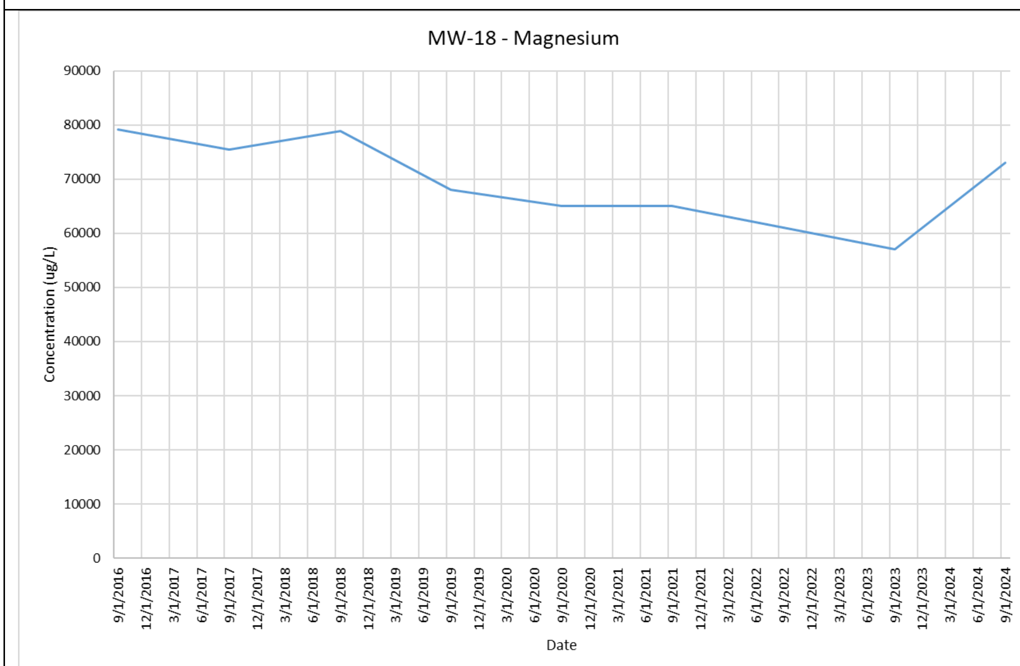
5.1.11 MW-18

The graphs below show monitoring well MW-18 concentrations of the indicator parameters.





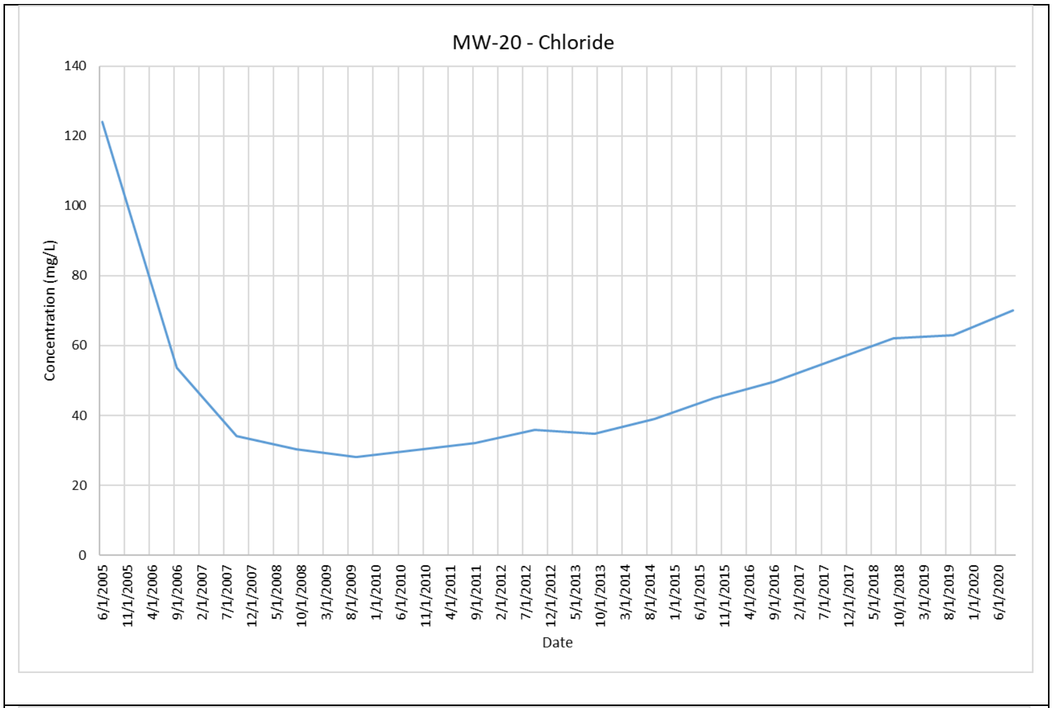


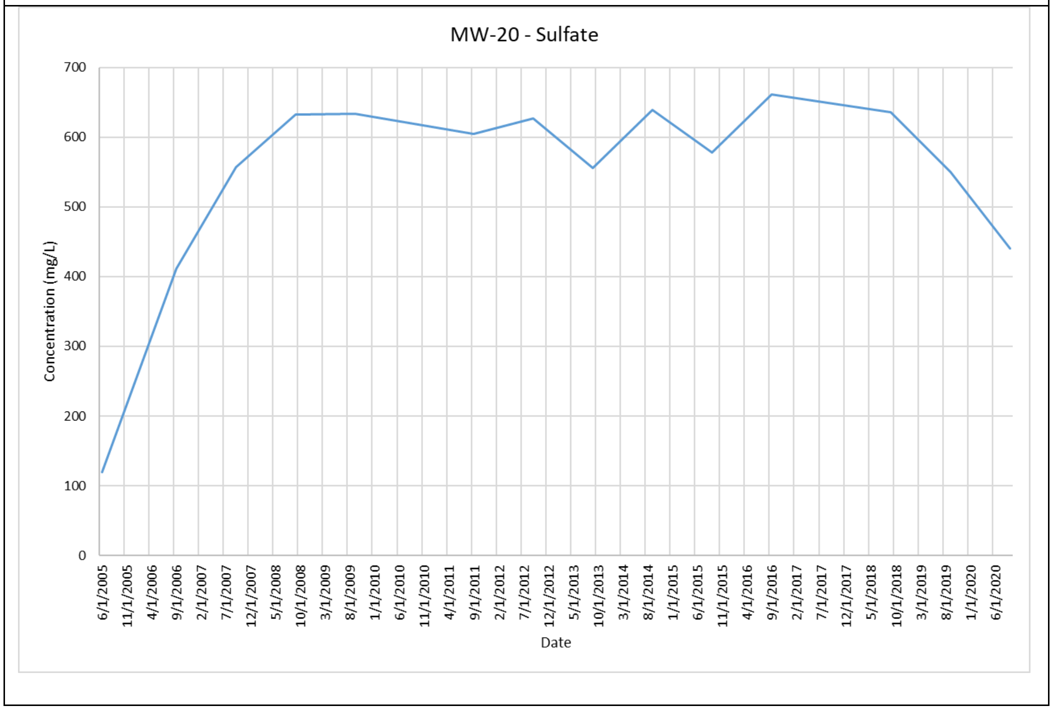


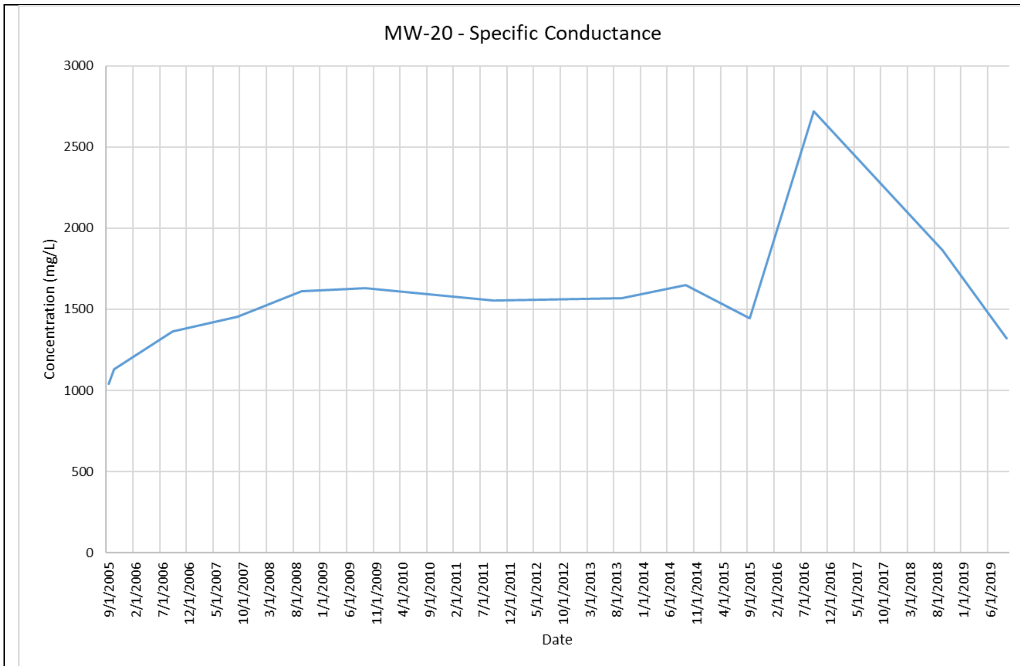
The above graphs indicate that since the 2005 assessment, chloride, sulfate, and specific conductance concentrations were steady to slightly increasing through approximately 2014, followed by decreasing trends to the end of the period of record. The magnesium concentrations were generally declining.

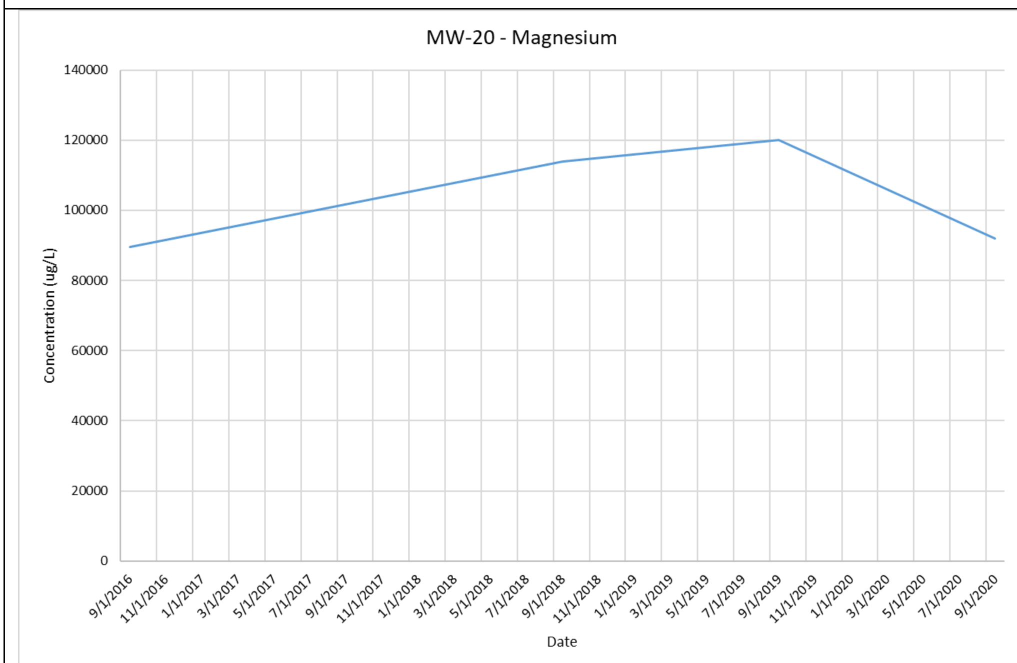
5.1.12 MW-20

The graphs below show monitoring well MW-20 concentrations of the indicator parameters.









The above graphs indicate that since the 2005 assessment, chloride and sulfate concentrations moved inversely to each other with respect to increases and decreases, specific conductance increased to approximately 50 percent higher than the 2005 concentrations and then remained relatively steady other than two elevated concentrations in 2016 and 2018. The magnesium concentrations increased and then decreased to end near the beginning concentration for the data period of record. Data is only available to 2020 as monitoring well MW-20 has had insufficient water for sampling in more recent sampling events.

5.1.13 Summary

Overall, when considering concentration trends since 2005 of the four key indicator parameters identified in the 2005 assessment, the vast majority of the indicator parameter concentrations appear to be generally steady or declining. Exceptions of note include sulfate and specific conductance in monitoring well MW-15, chloride in monitoring well MW-22, and sulfate in monitoring well MW-13, where concentrations have generally increased since 2005 and sulfate in monitoring well MW-20 in which sulfate concentrations increase significantly from 2005 to 2008 and then remained relatively steady with trending toward declining more recently. These trends are further discussed in the next section.

5.2 MIGRATION UPDATE DISCUSSION

The major groundwater migration conclusions (re-cited) from the 2005 assessment are listed and discussed individually below with consideration of the nearly 20 years of additional groundwater analytical data collected since the 2005 conclusions were developed. The basis of the 2005 conclusions is referred to herein as the 2005 migration theory.

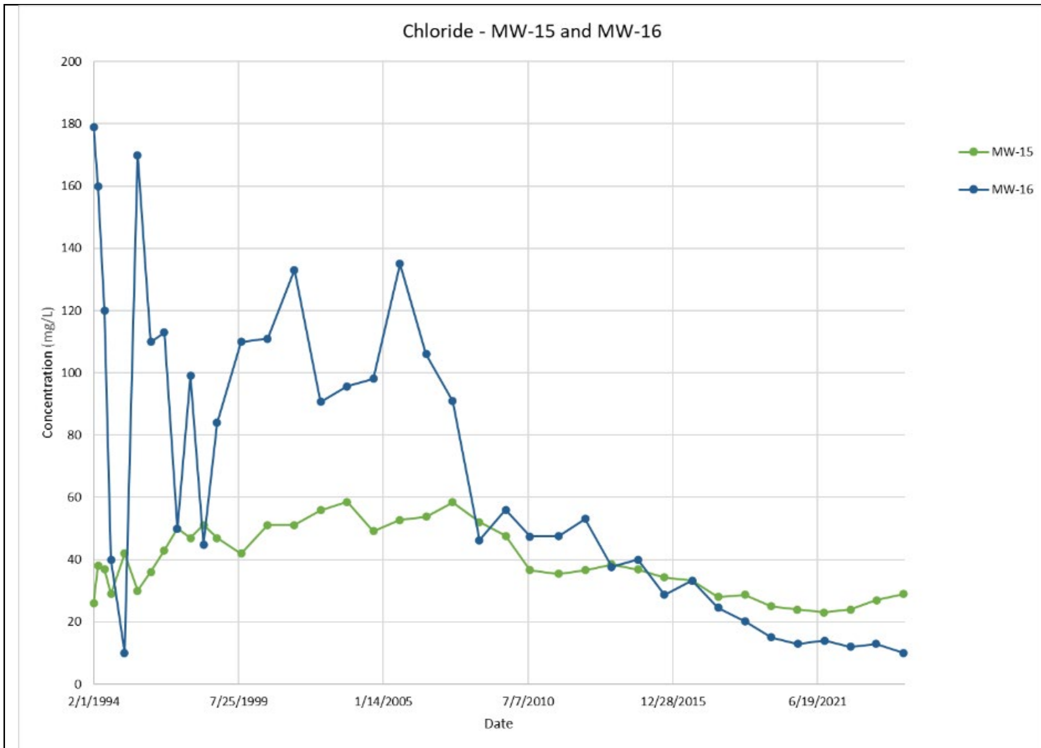
In addition to the indicator parameters included in the 2005 assessment and summarized above, boron concentrations for samples collected since 2016 are included in the discussion below. Boron was voluntarily added to the monitoring program in 2006 and was therefore not included in the 2005 data evaluation. As noted above regarding magnesium, only the totals analysis data for boron are included in this review as it is likely not directly comparable to the previously collected dissolved analyses data. Analysis for total boron began in 2016.

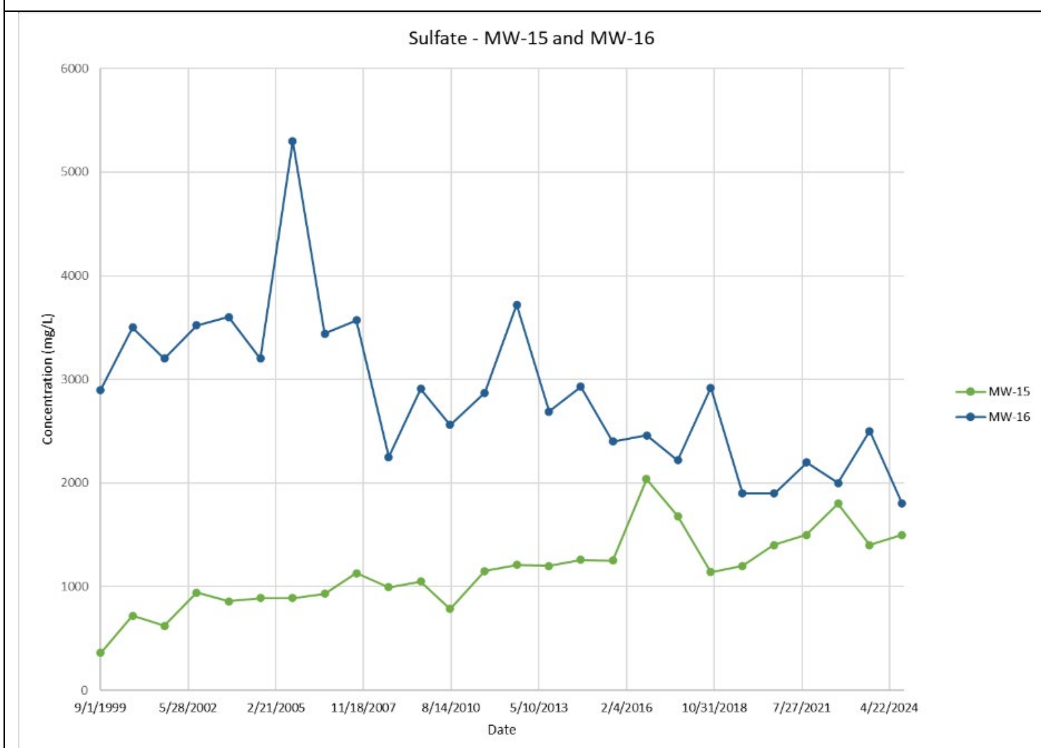
5.2.1 Shallow Migration to the North

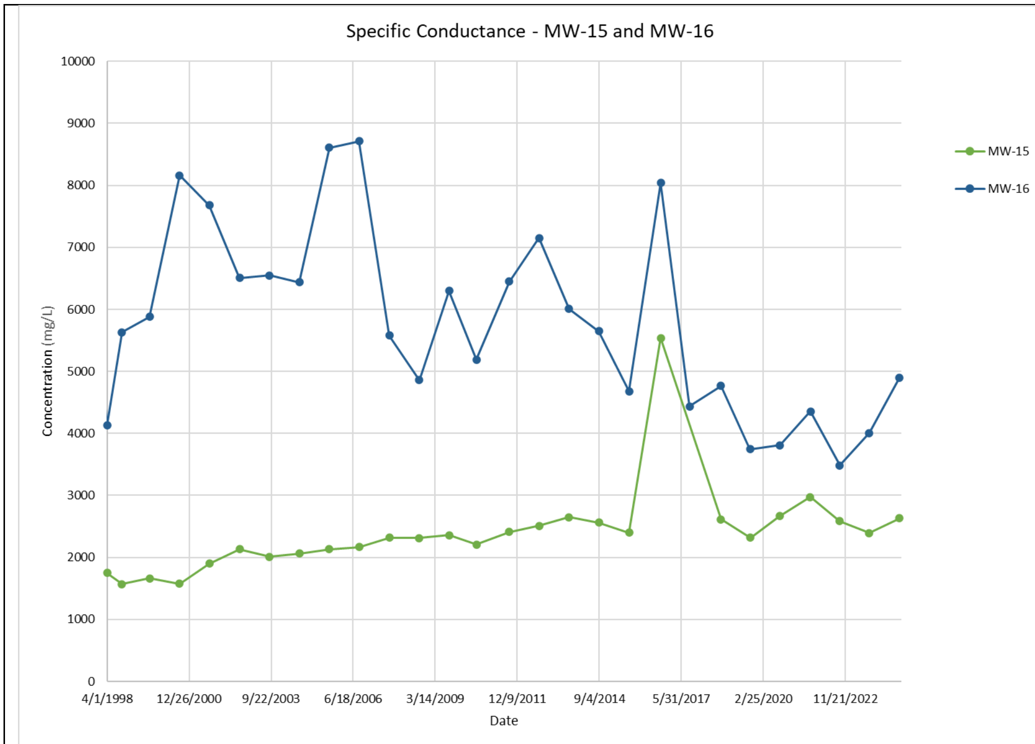
> *The highest concentrations of contaminants in leachate occurred in the northeastern portions of the fill, where greater portions of the fill are saturated. Northerly groundwater flow in the shallow flow system transports contaminants to the north toward the creek, …*

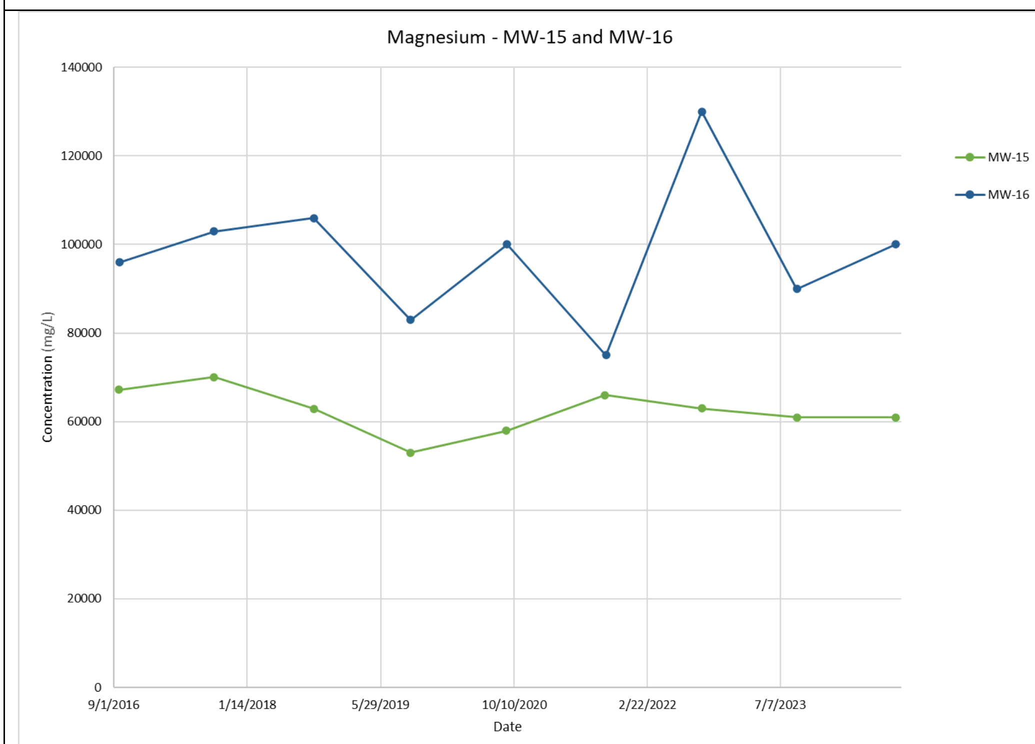
The shallow flow system monitoring wells on the north side of the Landfill potentially influenced by the northeastern portion of the fill are monitoring wells MW-15 (north-central) and MW-16 (northeast corner). Not considering chloride concentrations measured in the intermediate flow system well MW-26 located north of the creek and more than 1,000 feet north of the Landfill, monitoring well MW-16 has the highest concentrations of the four indicator parameters in the period of record. Monitoring well MW-15 also exhibited elevated concentrations of the four indicator parameters, but in most cases at concentrations significantly lower than MW-16 concentrations.

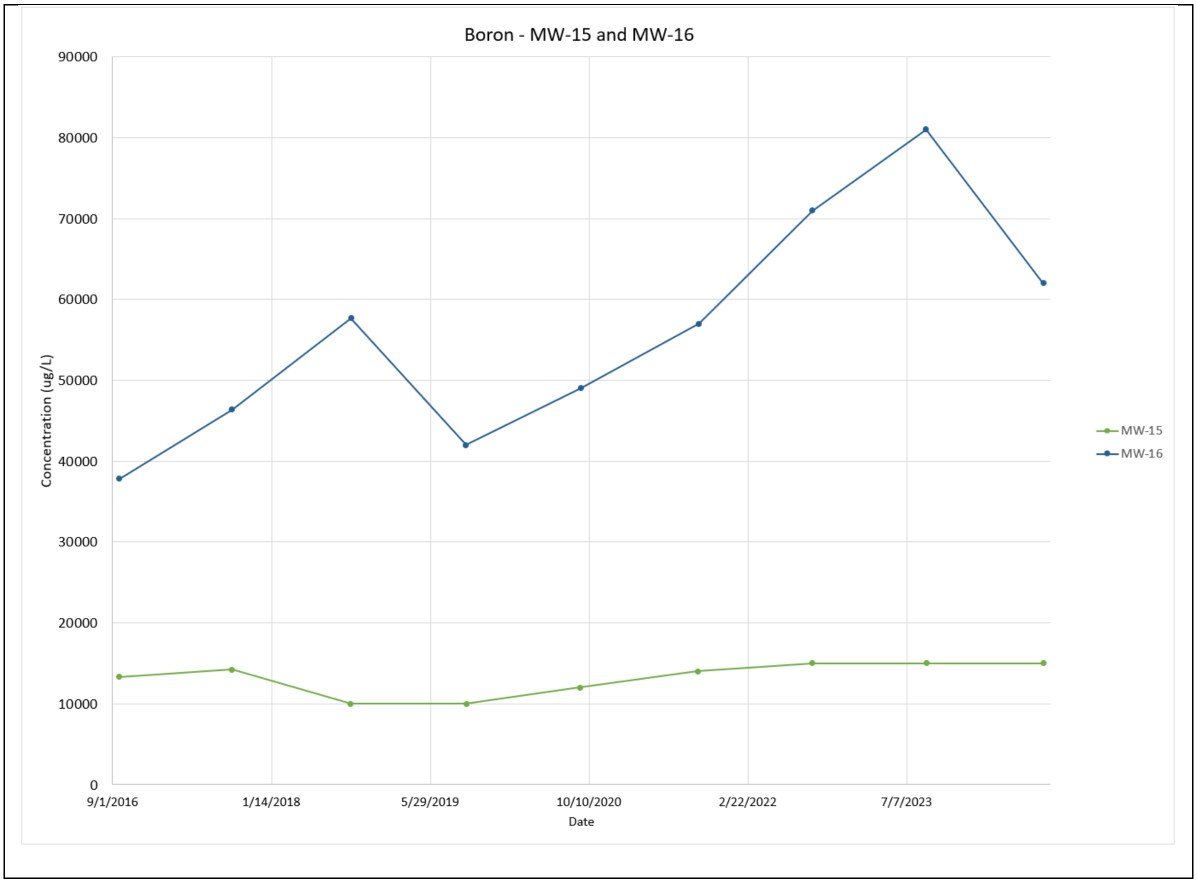
As illustrated in Section 5.1, the magnesium concentrations (total only) in monitoring well MW-16 have remained generally stable, and the chloride, sulfate, and specific conductance concentrations have decreased with chloride decreasing significantly (approximately 90 percent) since 2005. In monitoring well MW-15, sulfate concentrations have increased along with specific conductance (it should be noted that sulfate and specific conductance are not completely independent parameters as increased sulfate concentrations would also likely result in increased specific conductance), magnesium concentrations (total only) have decreased slightly, and chloride concentration decreased by approximately 50 percent. For ease of reference and to illustrate concentration differences between the two monitoring wells, graphs of the four indicator parameters for monitoring wells MW-15 and MW-16 combined are provided below. Sulfate and chloride concentrations are discussed further in Section 5.3.






Specific Conductance - MW-15 and MW-16
Concentration (mg/L)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
4/1/1998
12/26/2000
9/22/2003
6/18/2006
3/14/2009
12/9/2011
9/4/2014
5/31/2017
2/25/2020
11/21/2022
Date
MW-15
MW-16


Magnesium - MW-15 and MW-16
Concentration (mg/L)
0
20000
40000
60000
80000
100000
120000
140000
9/1/2016
1/14/2018
5/29/2019
10/10/2020
2/22/2022
7/7/2023
Date
MW-15
MW-16

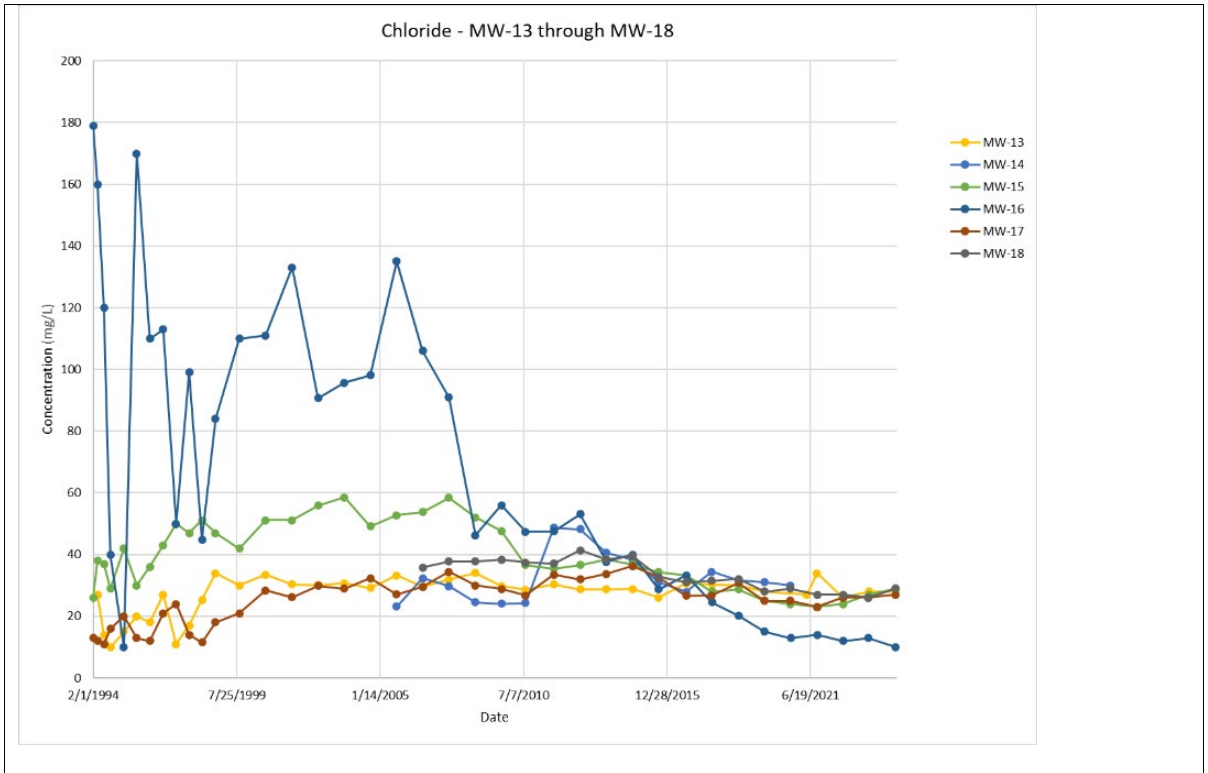


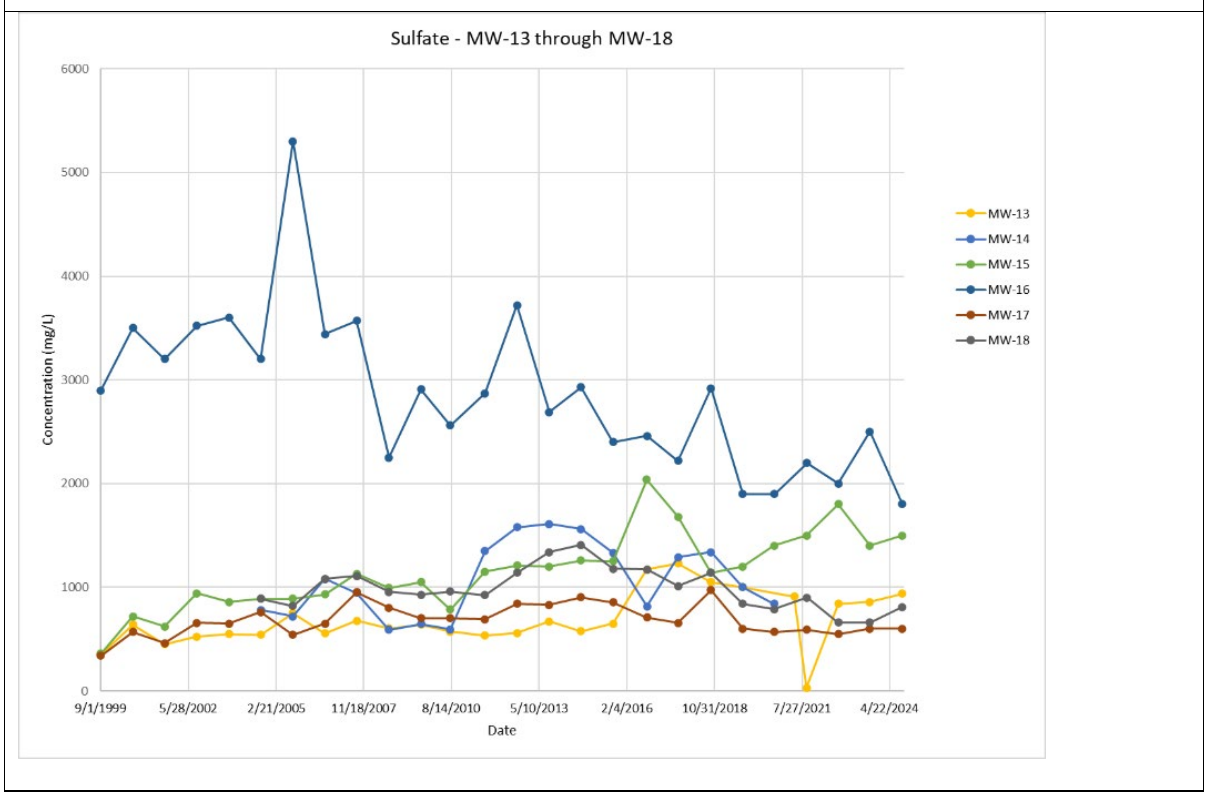
The indicator parameter data collected since the 2005 assessment supports the 2005 migration theory of migration to the north, particularly from the northeast corner as concentrations measured at monitoring well MW-16 are frequently some of the highest parameter concentrations in the groundwater monitoring network. Total boron concentrations at MW-16 have increased since 2016. As discussed in the 2024 AWQR, MW-16 is the only well on site with a GWPS exceedance for boron that shows a statistically significant increasing trend. However, other indicator parameter concentrations at MW-16 show relatively consistent improvement.

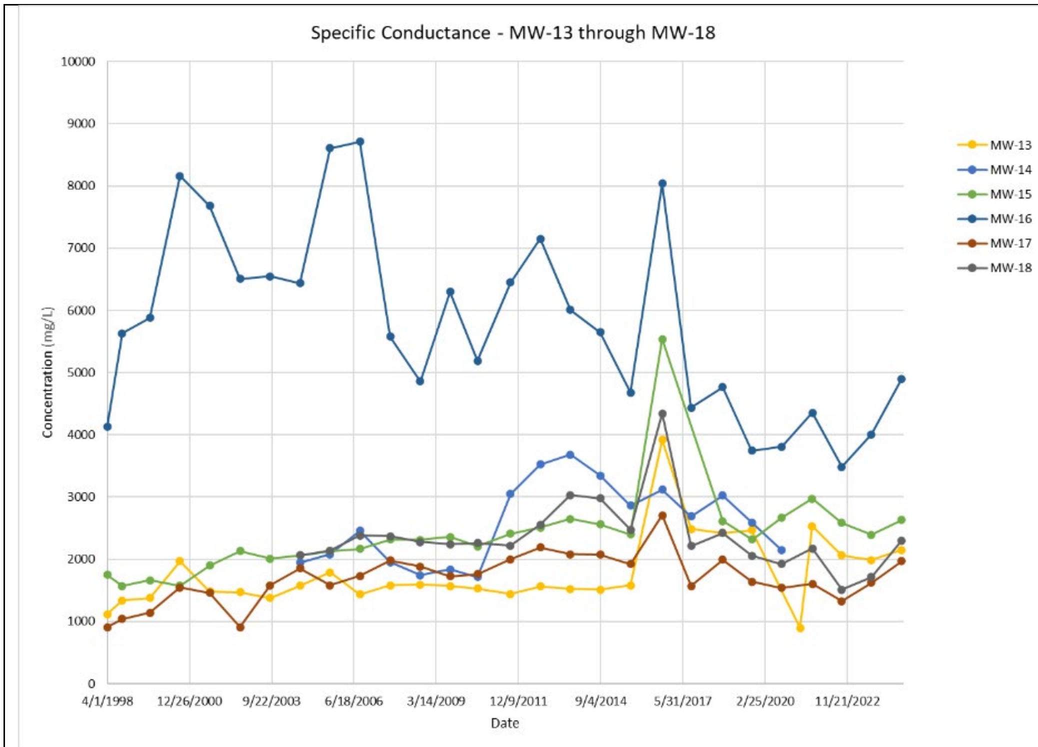
5.2.2 Upward Vertical Migration in the Intermediate and Deep Flow Systems

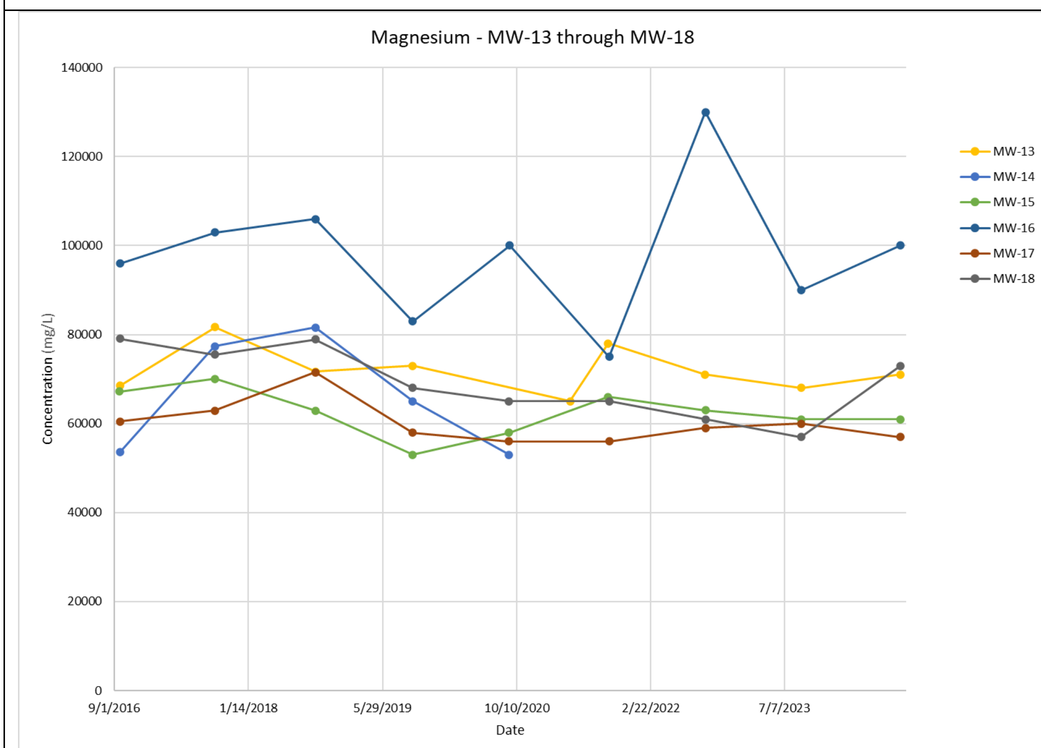
> *… and downward vertical gradients beneath the landfill drive contaminants downward into the intermediate and deep flow systems (see Figure 4). These flow patterns result in high concentrations of indicator parameters observed at each well screen depth in the northeastern portion of the site (MW-16 well nest and MW-15 well nest).*

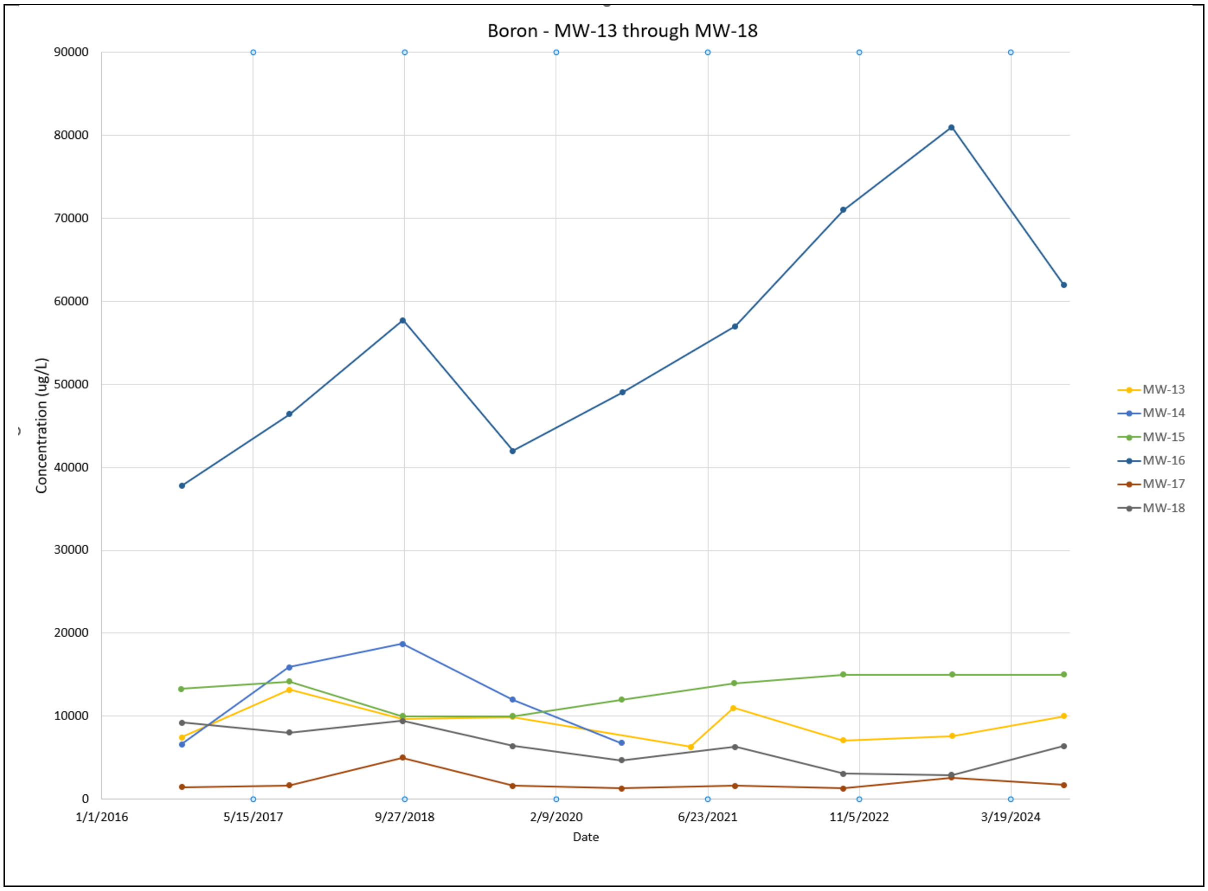
Shallow monitoring wells MW-15 and MW-16 are part of three-well clusters. The deeper wells clustered with monitoring well MW-15 are MW-14 (intermediate deep) and MW-13 (deep), and the deeper wells clustered with monitoring well MW-16 are MW-17 (intermediate deep) and MW-18 (deep). Graphs of indicator parameter concentrations at these two three-well clusters are included below.


Chloride - MW-13 through MW-18
Concentration (mg/L)
0
20
40
60
80
100
120
140
160
180
200
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18


Sulfate - MW-13 through MW-18
Concentration (mg/L)
0
1000
2000
3000
4000
5000
6000
9/1/1999
5/28/2002
2/21/2005
11/18/2007
8/14/2010
5/10/2013
2/4/2016
10/31/2018
7/27/2021
4/22/2024
Date
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18


Specific Conductance - MW-13 through MW-18
Concentration (mg/L)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
4/1/1998
12/26/2000
9/22/2003
6/18/2006
3/14/2009
12/9/2011
9/4/2014
5/31/2017
2/25/2020
11/21/2022
Date
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18


Magnesium - MW-13 through MW-18
Concentration (mg/L)
140000
120000
100000
80000
60000
40000
20000
0
9/1/2016
1/14/2018
5/29/2019
10/10/2020
2/22/2022
7/7/2023
Date
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18



A review of indicator concentrations since 2005 shown in the graphs above indicates that the intermediate deep and deep monitoring well concentrations have remained relatively stable. As with most parameters, the highest concentrations are generally measured in monitoring well MW-16, with the exception of chloride more recently and notwithstanding distant intermediate deep monitoring well MW-26 more than 1,000 feet north of the Landfill.

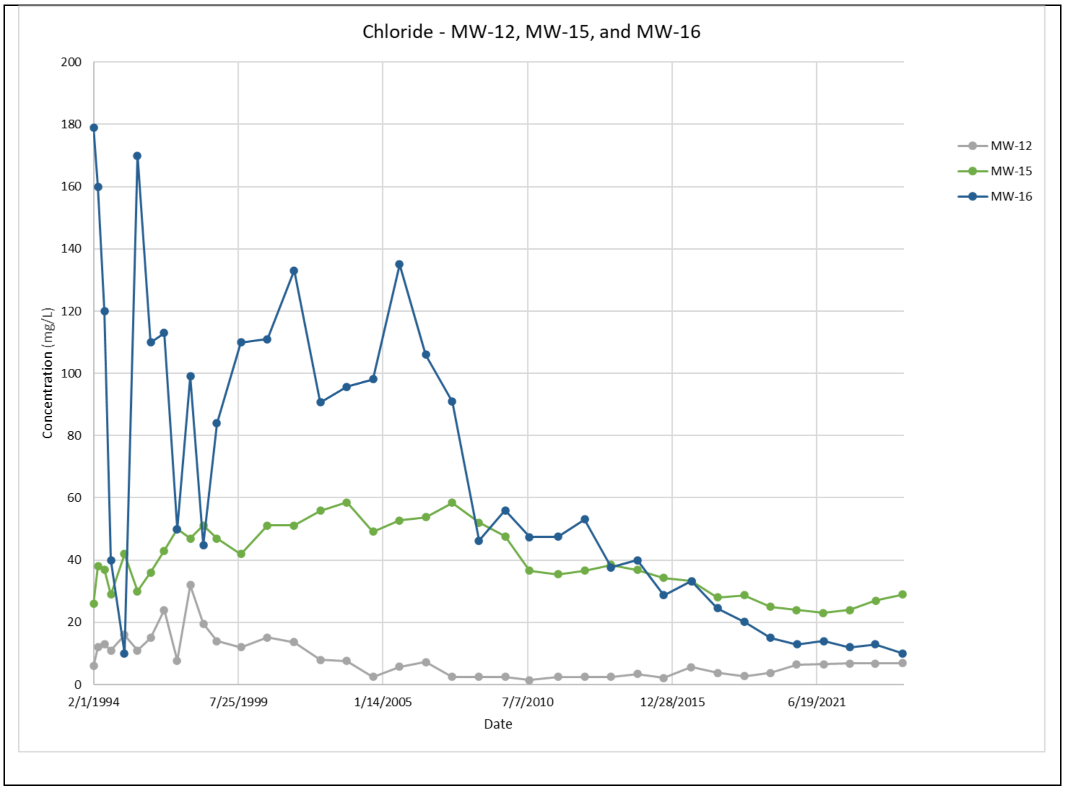
Notable trending was present in the shallow monitoring wells MW-15 and MW-16, as discussed above. As discussed above and in the 2024 AWQR, a statistically significant increasing trend for boron is present at MW-16 based on data from 2016 through 2024, but concentrations at other wells with GWPS exceedances for boron did not display significant increasing trends over the same period. The water quality in the intermediate deep and deep flow systems appears relatively consistent over the period.

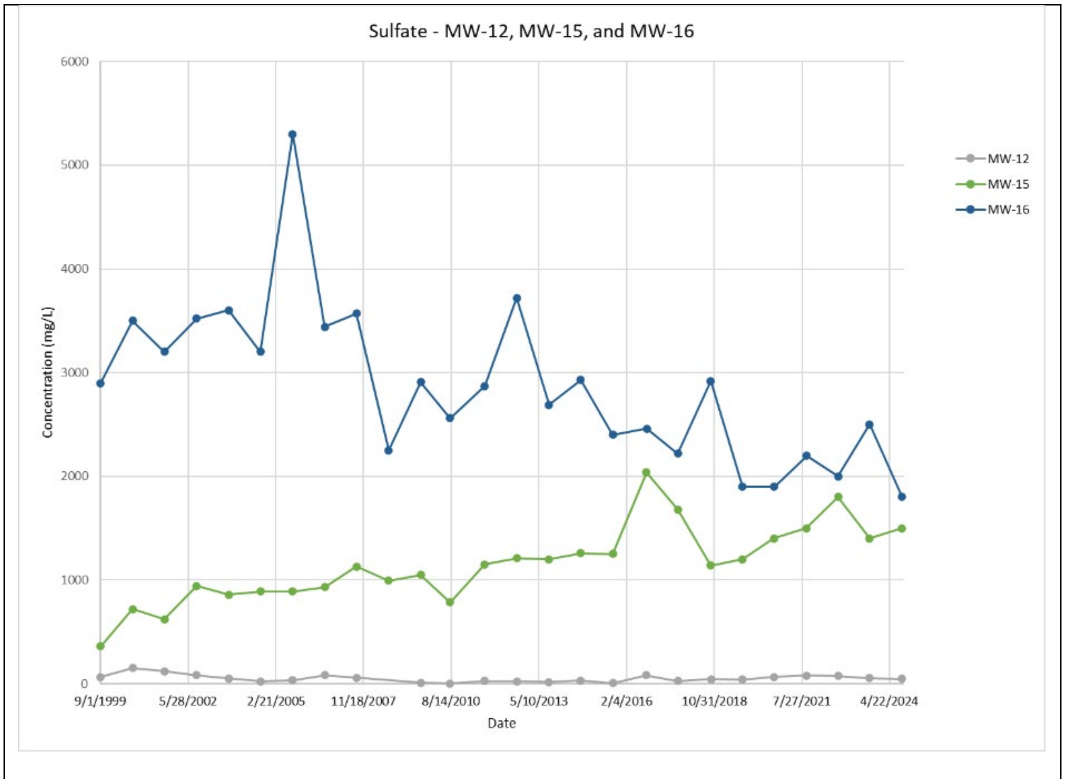
The indicator parameter data does not necessarily support or refute the 2005 migration theory of the deeper flow paths being downward beneath the Landfill and upward to the north of the Landfill; however, regardless of the actual flow path, generally stable water quality conditions appear present in the intermediate deep and deep flow systems on the north side of the Landfill.

5.2.3 Shallow Flow System Migration to the West Immediately North of the Landfill

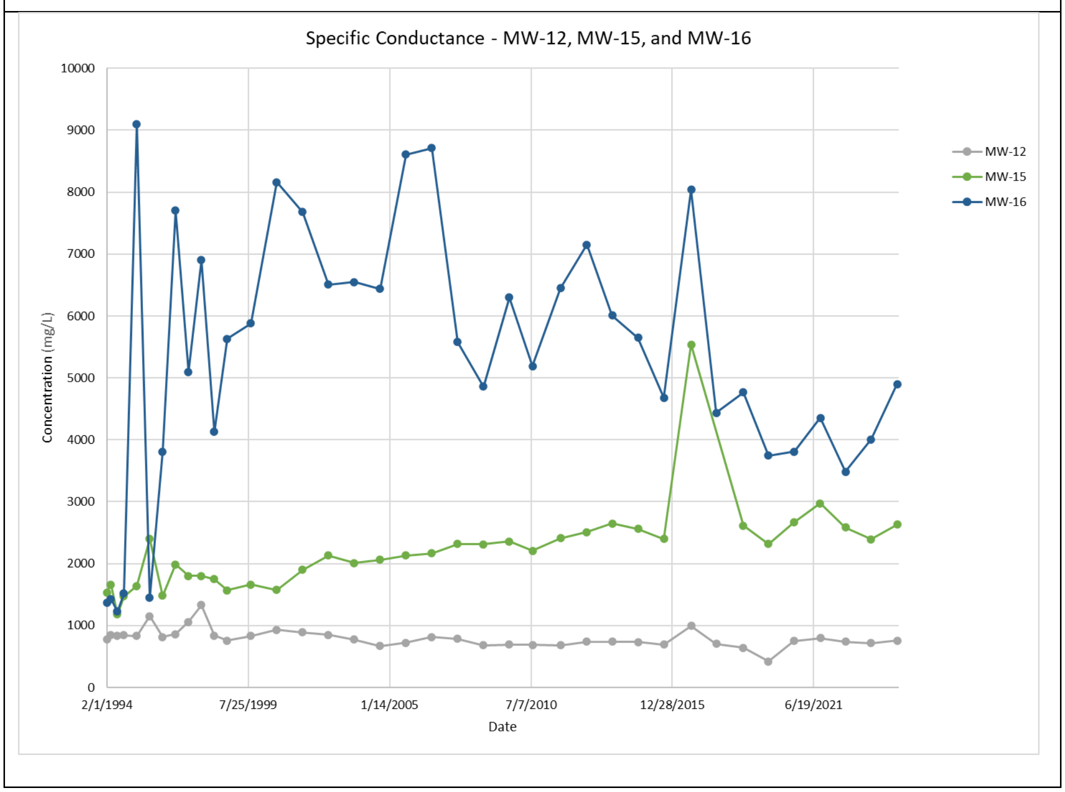
Horizontal hydraulic gradients in unconsolidated deposits beneath the creek bed were to the west (following the drainage pattern). This resulted in the migration of constituents to the west along the northern edge of the fill area, in the shallow flow system, and to some extent in the permeable alluvial deposits above the bedrock surface.

The shallow flow system monitoring wells from east to west along the north side of the Landfill are MW-16, MW-15, and MW-12. Graphs of the four indicator parameters for the north-side shallow monitoring wells are included below.

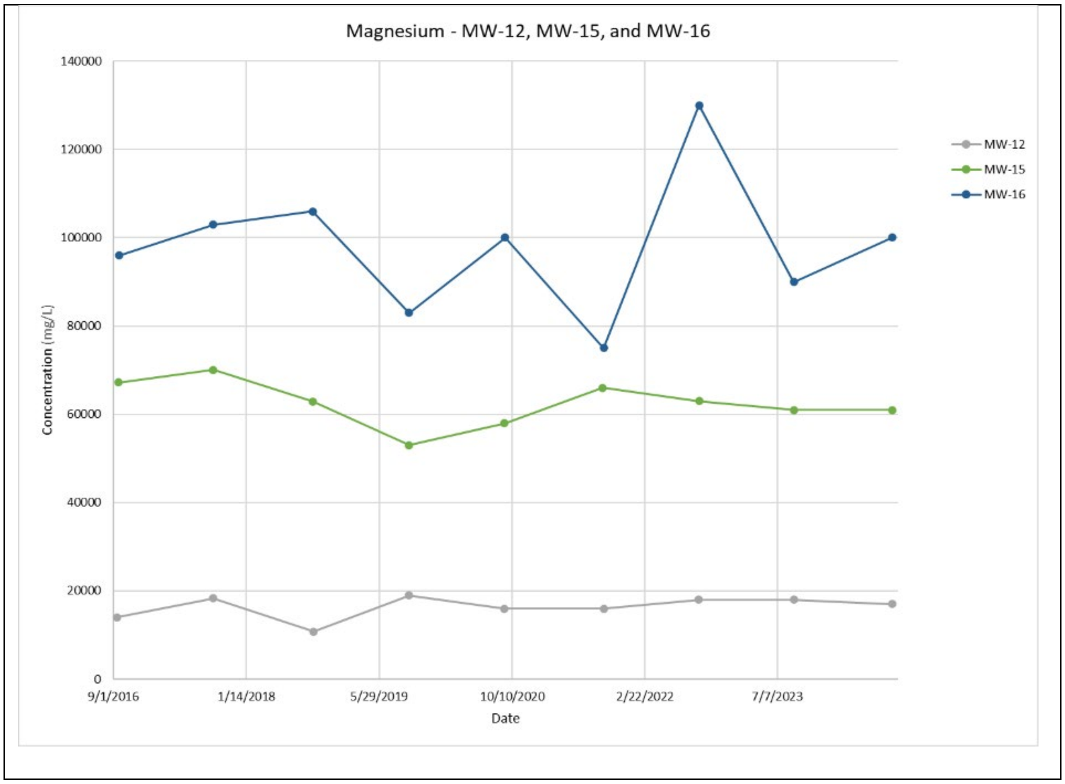




Sulfate - MW-12, MW-15, and MW-16
6000
5000
4000
3000
2000
1000
0
Concentration (mg/L)
9/1/1999
5/28/2002
2/21/2005
11/18/2007
8/14/2010
5/10/2013
2/4/2016
10/31/2018
7/27/2021
4/22/2024
Date
MW-12
MW-15
MW-16



Specific Conductance - MW-12, MW-15, and MW-16
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Concentration (mg/L)
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-12
MW-15
MW-16



As cited above, the 2005 migration theory speculated westerly migration of constituents in the shallow monitoring wells east to west from monitoring MW-16 through MW-15 to MW-12. The inclusion of the groundwater analytical data collected since 2005 indicated the following:

- Concentrations generally decrease from east to west from monitoring well MW-16, as would be consistent with the 2005 migration theory of the northeast corner of the Landfill being a potential source area based on the presence of more leachate in this area.

- Generally consistent declining concentrations of chloride, sulfate, and specific conductance in monitoring well MW-16 would indicate that, if the northeast corner of the Landfill is a source area, the source may be adequately controlled.

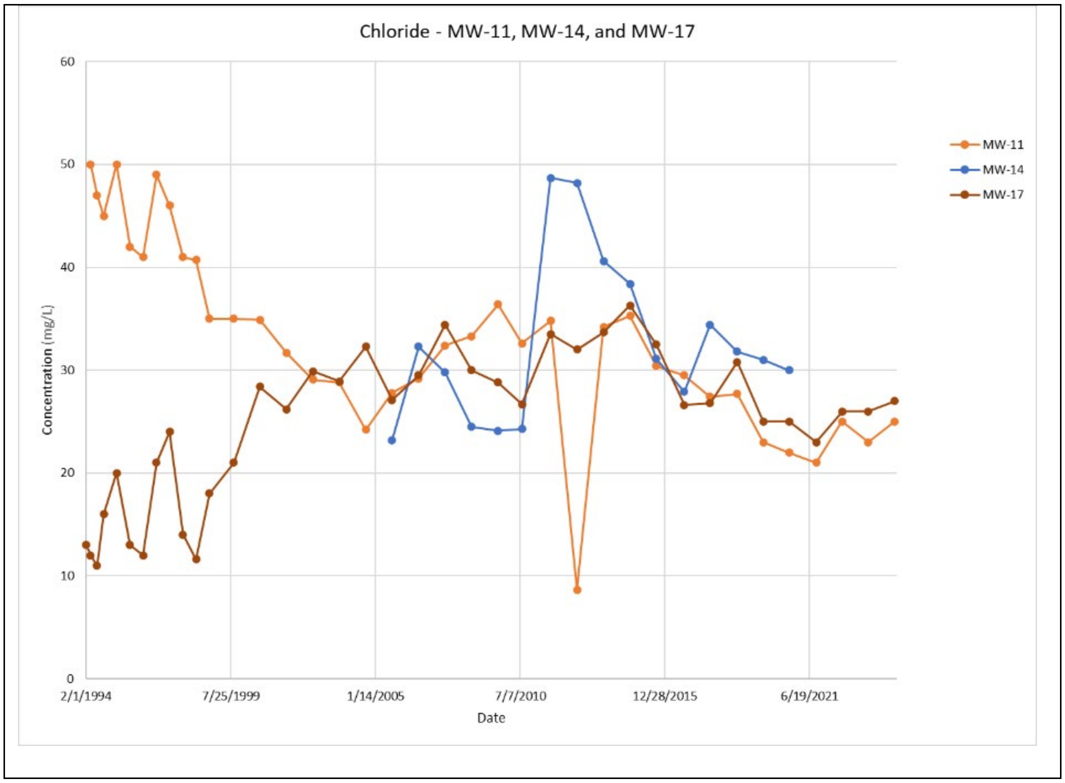
- A possible interpretation of the increasing sulfate concentrations in monitoring well MW-15 is the migration of higher concentrations at MW-16 downgradient to MW-15. A problem with this interpretation is the lack of chloride concentrations trending proportionally to the sulfate concentrations. In the absence of organics, sulfate, being an anion like chloride, is expected to migrate conservatively like chloride. See Section 5.3 for further discussion of sulfate and chloride migration.

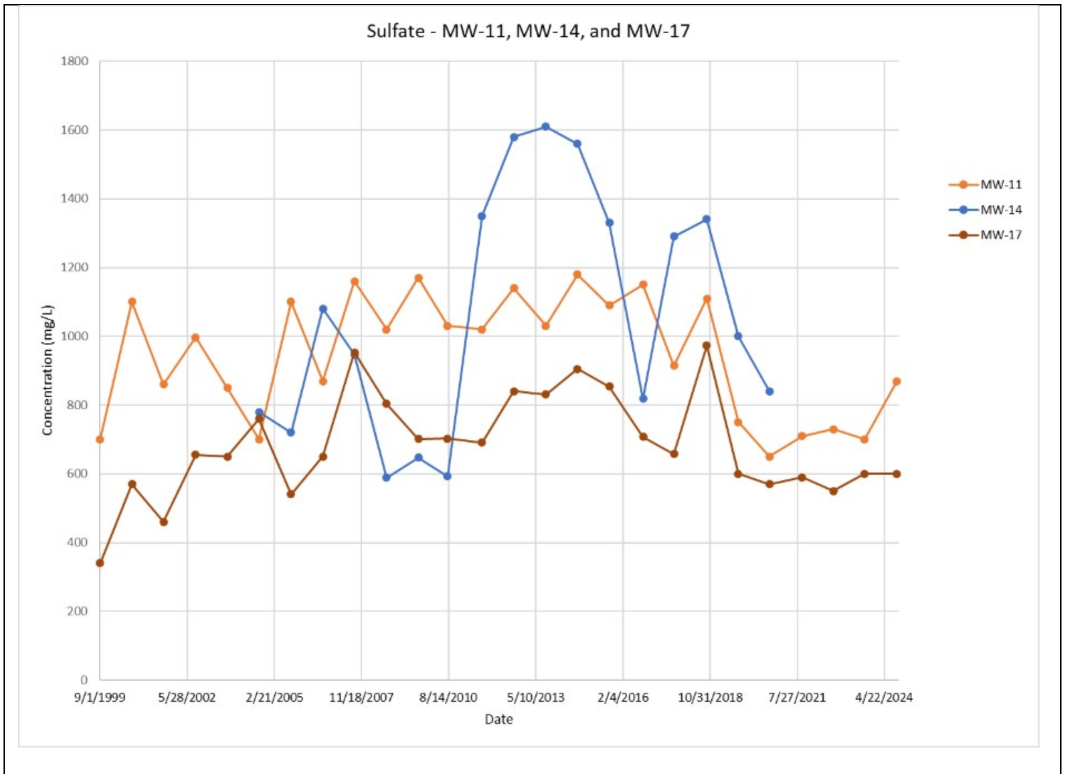
- The monitoring well MW-12 indicator parameter concentrations do not appear to indicate migration influence from upgradient monitoring well MW-15, which would either not support significant westerly migration in the shallow flow system along a MW-16 to MW-15 to MW-12 flow path, would indicate an impacted area that is in a steady or declining state and will not reach MW-12 or has not had sufficient time at this point to reach MW-12.

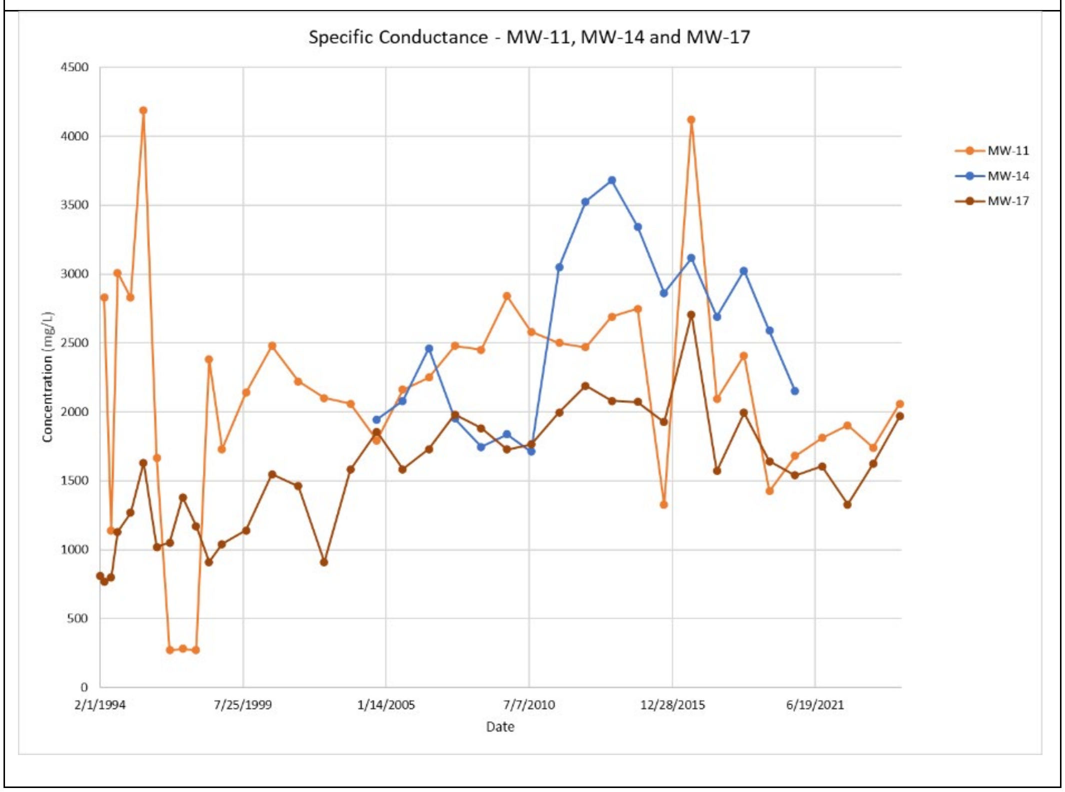
5.2.4 Intermediate and Deep Flow System Migration to the West Immediately North of the Landfill

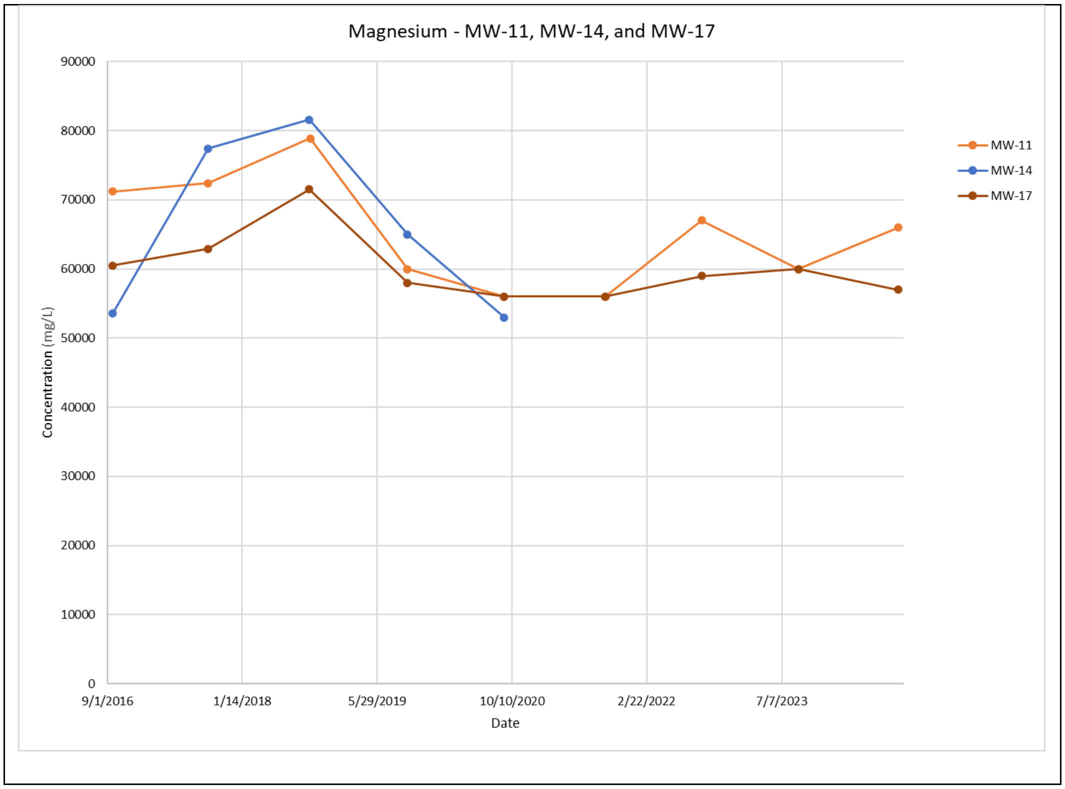
This flow pattern resulted in the elevated concentrations of ash indicator parameters observed in the intermediate and deep wells at the MW-12 well nest and the MW-15 well nest (see cross section F-F' in Appendix B with sulfate concentrations).

The intermediate deep monitoring wells along the north side of the Landfill from east to west include MW-17, MW-14, and MW-11, and the deep monitoring wells along the north side of the Landfill from east to west include MW-18, MW-13, and MW-10. Graphs of the indicator parameters for the intermediate deep and deep flow systems are provided below.




Sulfate - MW-11, MW-14, and MW-17
1800
1600
1400
1200
1000
800
600
400
200
0
Concentration (mg/L)
9/1/1999
5/28/2002
2/21/2005
11/18/2007
8/14/2010
5/10/2013
2/4/2016
10/31/2018
7/27/2021
4/22/2024
Date
MW-11
MW-14
MW-17


Specific Conductance - MW-11, MW-14 and MW-17
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Concentration (mg/L)
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-11
MW-14
MW-17

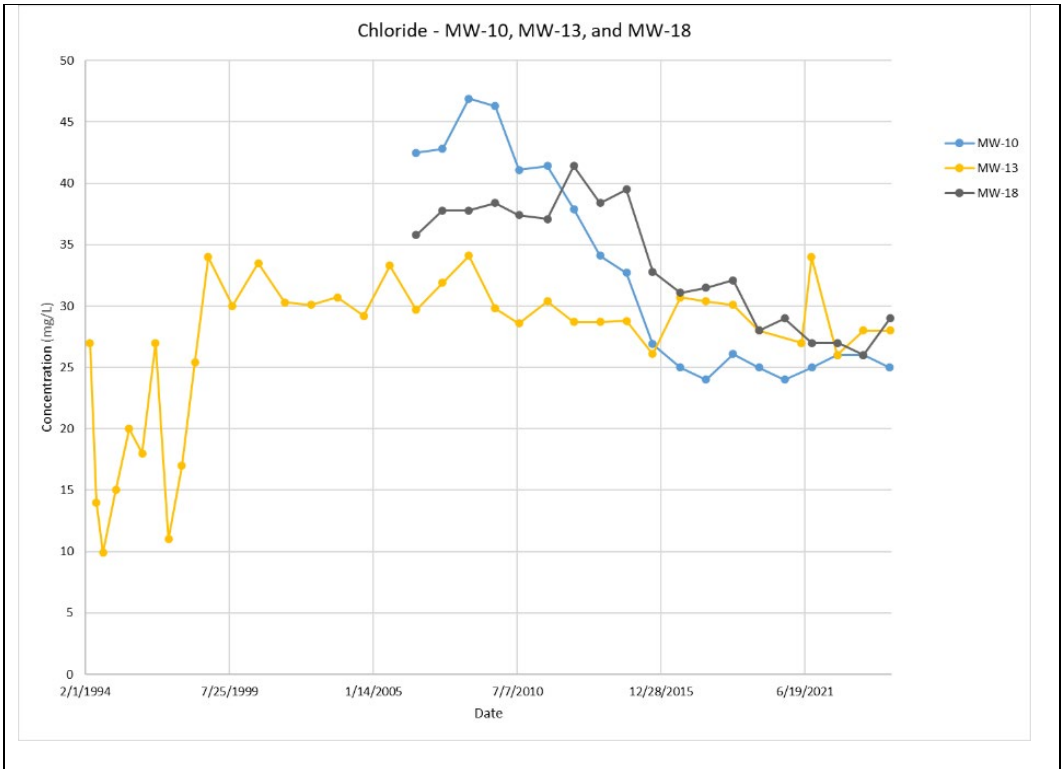


As with the shallow flow system monitoring wells, the 2005 migration theory speculated that intermediate deep flow system elevated concentrations were the result of migration from the northeast corner of the Landfill as measured in the MW-16/MW-17/MW-18 monitoring well cluster. The inclusion of the groundwater analytical data collected since 2005 indicated the following:

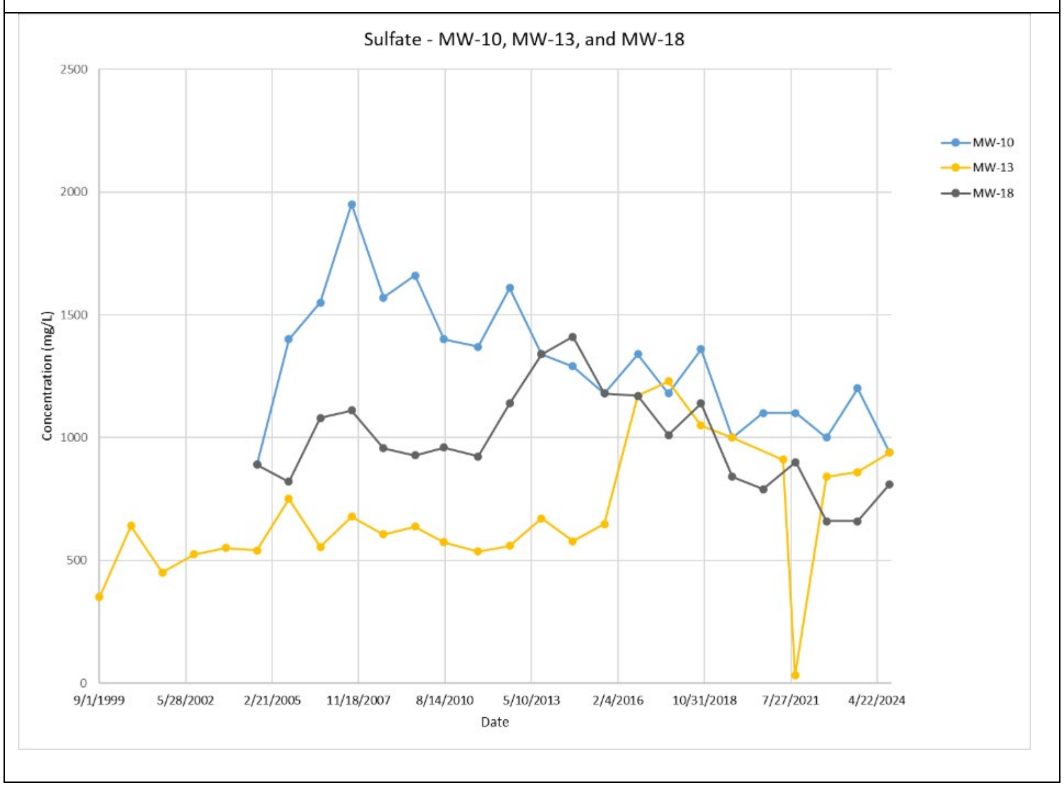
- The intermediate deep flow system indicator parameter concentrations on the north side of the Landfill do not necessarily support this component of the 2005 migration theory that elevated indicator concentrations in monitoring wells MW-11 and MW-14 were the result of migration from the east as the results from many of the sampling events indicated monitoring well MW-17 on the east side had the lowest indicator concentrations. The highest concentrations were often recorded at the westernmost intermediate deep well (MW-11) and sometimes at the middle well (MW-14).

- Since 2005, the indicator parameter concentrations were overall generally steady with some indication of variable trending, with initial increases followed by decreases.

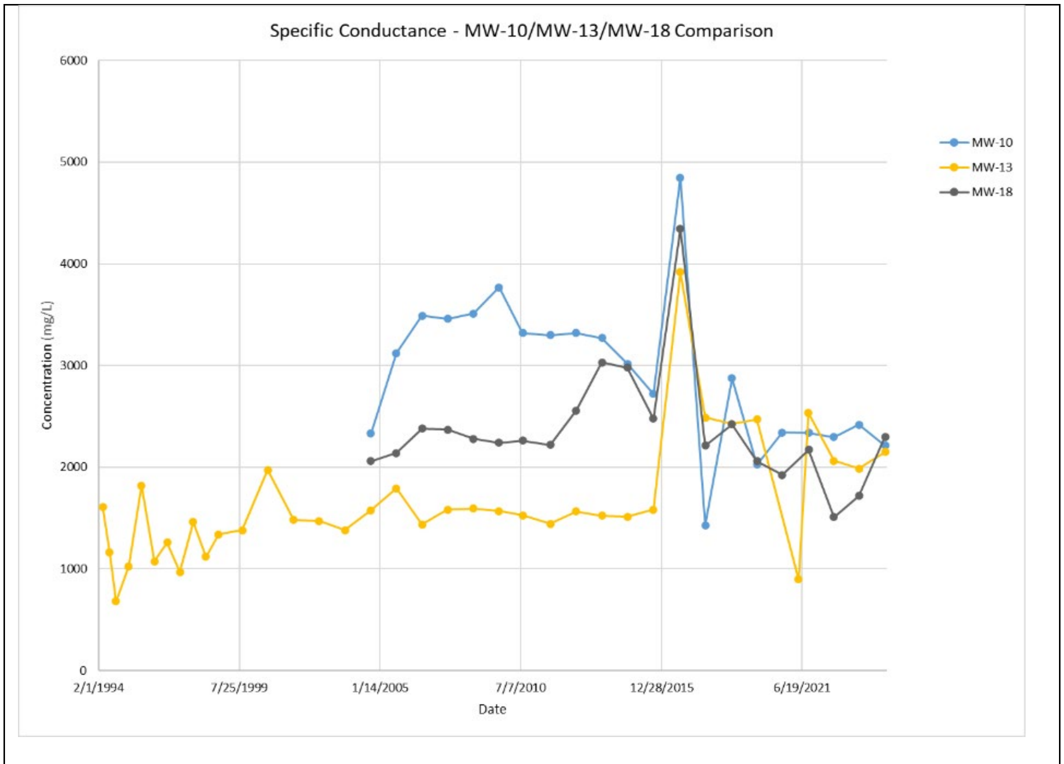
- A comparison of chloride concentrations over time in monitoring wells MW-11 and MW-17 reveals some interesting observations. From the beginning of the data period of record in 1994 through approximately 2002, the chloride concentrations in the two monitoring wells were converging with MW-17 concentrations increasing and MW-11 concentrations decreasing. From 2002 on, the chloride concentrations in the two monitoring wells generally tracked each other with similar concentrations and changes in concentration.

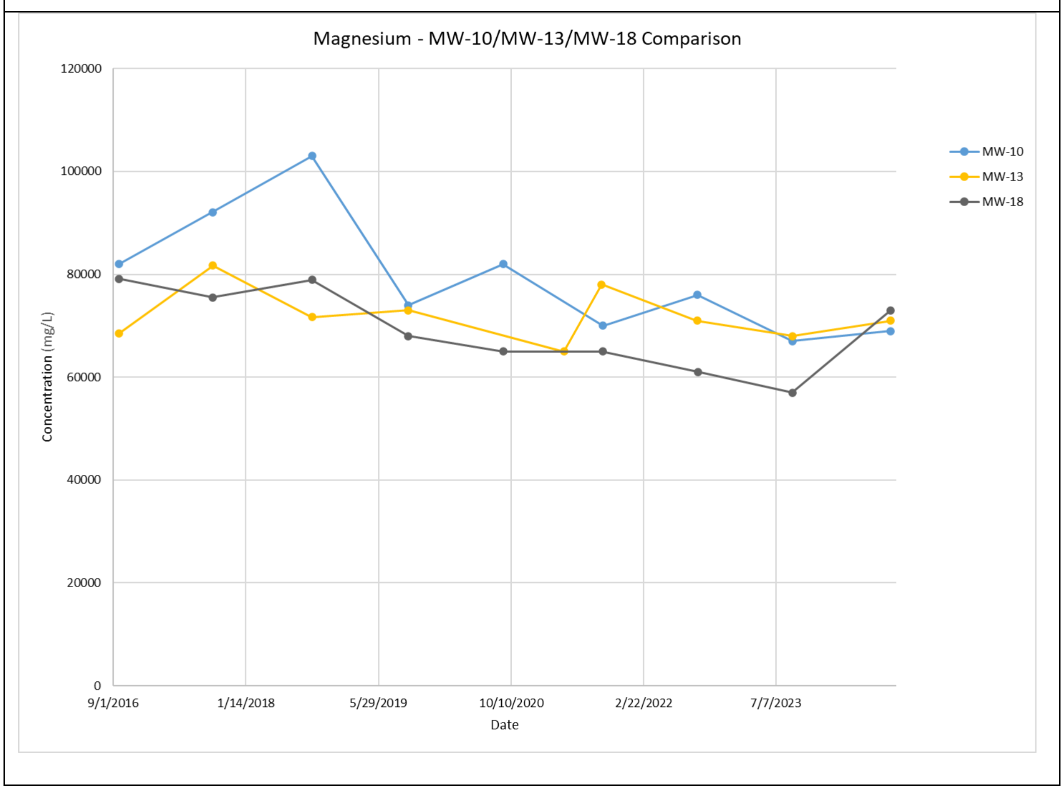


Chloride - MW-10, MW-13, and MW-18
Concentration (mg/L)
50
45
40
35
30
25
20
15
10
5
0
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-10
MW-13
MW-18



Sulfate - MW-10, MW-13, and MW-18
Concentration (mg/L)
2500
2000
1500
1000
500
0
9/1/1999
5/28/2002
2/21/2005
11/18/2007
8/14/2010
5/10/2013
2/4/2016
10/31/2018
7/27/2021
4/22/2024
Date
MW-10
MW-13
MW-18


Specific Conductance - MW-10/MW-13/MW-18 Comparison
6000
5000
4000
3000
2000
1000
0
Concentration (mg/L)
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-10
MW-13
MW-18


Magnesium - MW-10/MW-13/MW-18 Comparison
120000
100000
80000
60000
40000
20000
0
Concentration (mg/L)
9/1/2016
1/14/2018
5/29/2019
10/10/2020
2/22/2022
7/7/2023
Date
MW-10
MW-13
MW-18

The 2005 migration theory also speculated that deep flow system elevated concentrations were the result of migration from the northeast corner of the Landfill as measured in the MW-16/MW-17/MW-18 monitoring well cluster. The inclusion of the groundwater analytical data collected since 2005 indicated the following:

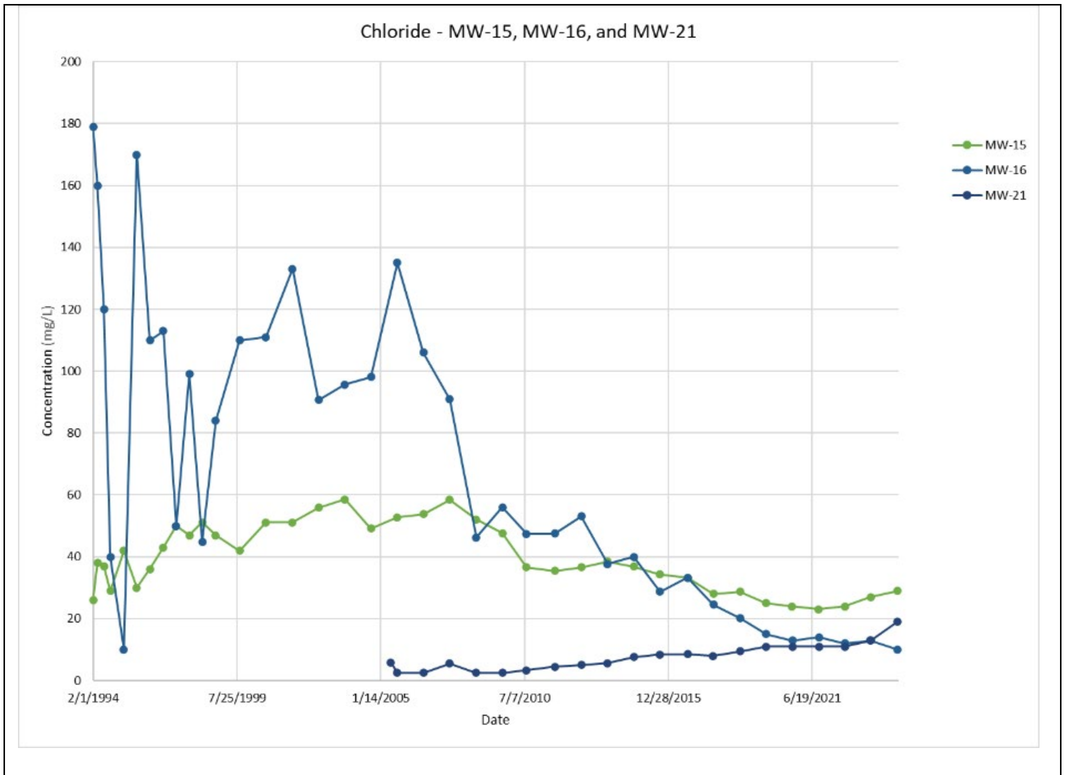
- The above indicator concentration trends indicate predominantly improving water quality in the deep flow system north of the Landfill.
- The deep flow system indicator parameter concentrations on the north side of the Landfill do not necessarily support the component of the 2005 migration theory that elevated indicator concentrations in monitoring wells MW-10 and MW-13 were the result of migration from the east as the majority of the higher concentrations of the indicator parameters were measured in monitoring well MW-10, which would be considered the most downgradient monitoring well in the migration theory.

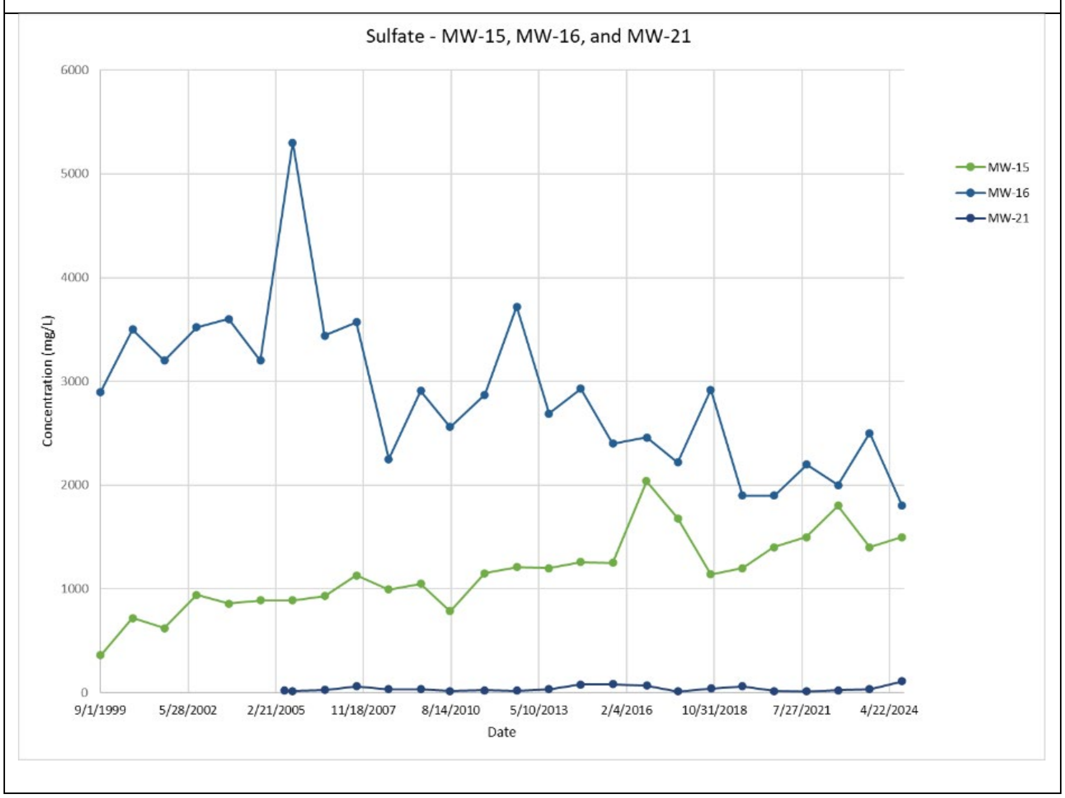
5.2.5 Indication of Northward Migration in Intermediate Flow Zone to North of the Creek

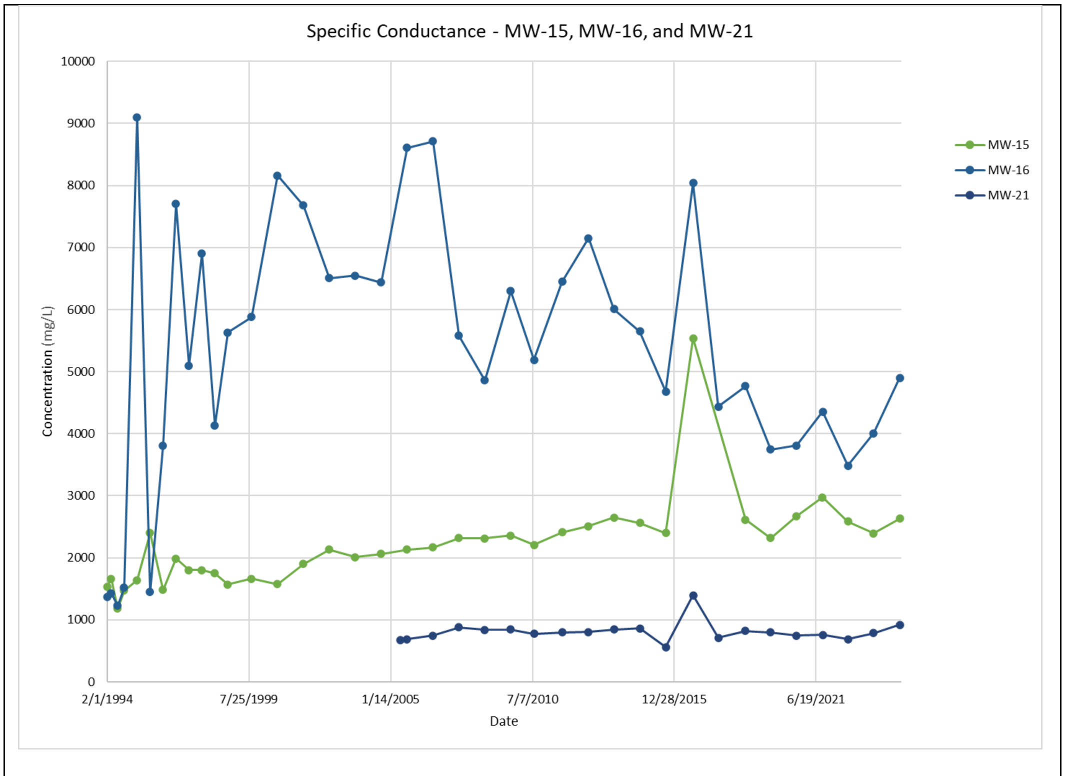
Slightly elevated concentrations of ash indicator parameters were also present in the intermediate zone at well MW-22, north of the creek. This was likely the result of the preferential transport of chemical constituents in the more permeable alluvium and weathered rock at the bedrock surface, and the lessening effects of the creek as a point of discharge with depth in the aquifer system. Horizontal transport of chemical constituents across the creek was limited in less permeable units, such as the shallow clay till, and the deep Kenwood member of the Pinnicon Ridge Formation, as was evidenced by the low concentrations of indicator parameters in the shallow and deep wells north of the creek.

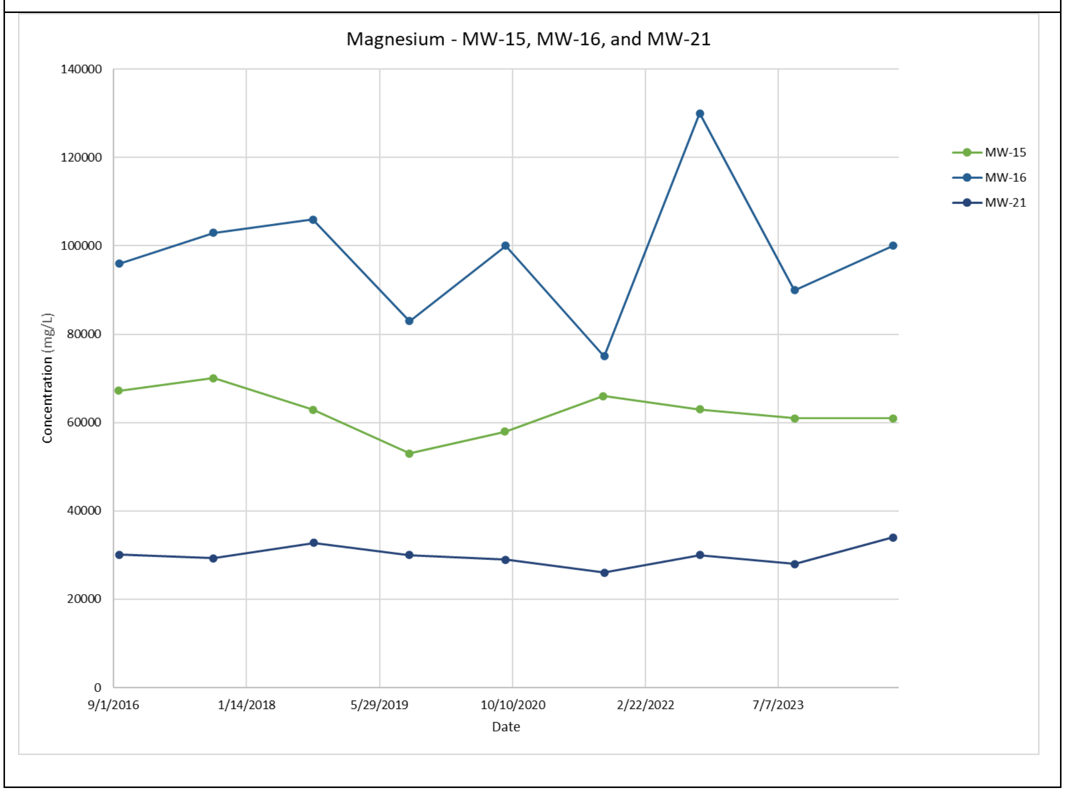
Further review of this component of the 2005 migration theory was accomplished by comparing indicator parameter concentrations in the three flow systems using monitoring wells from the MW-16/17/18, MW13/14/15, and MW-21/22/23 well clusters. Graphs of the indicator parameters for the shallow, intermediate deep, and deep flow systems are provided below.

Shallow Flow System Wells:






Specific Conductance - MW-15, MW-16, and MW-21
Concentration (mg/L)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021
Date
MW-15
MW-16
MW-21

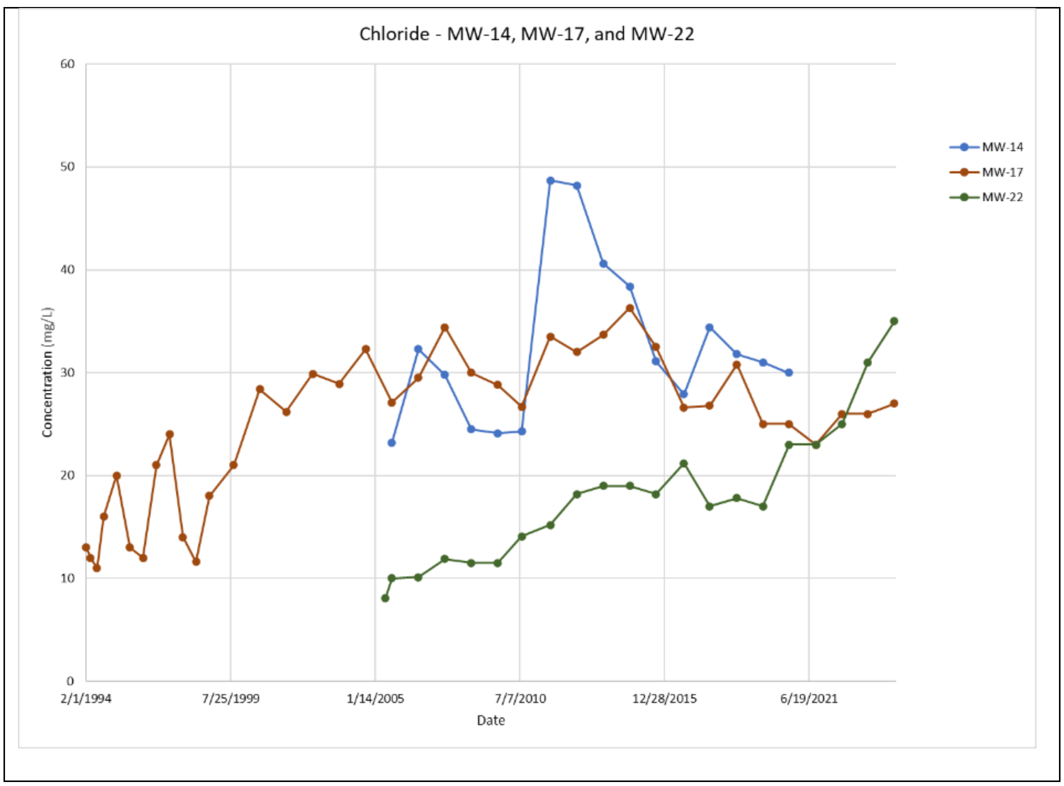

Magnesium - MW-15, MW-16, and MW-21
Concentration (mg/L)
140000
120000
100000
80000
60000
40000
20000
0
9/1/2016
1/14/2018
5/29/2019
10/10/2020
2/22/2022
7/7/2023
Date
MW-15
MW-16
MW-21

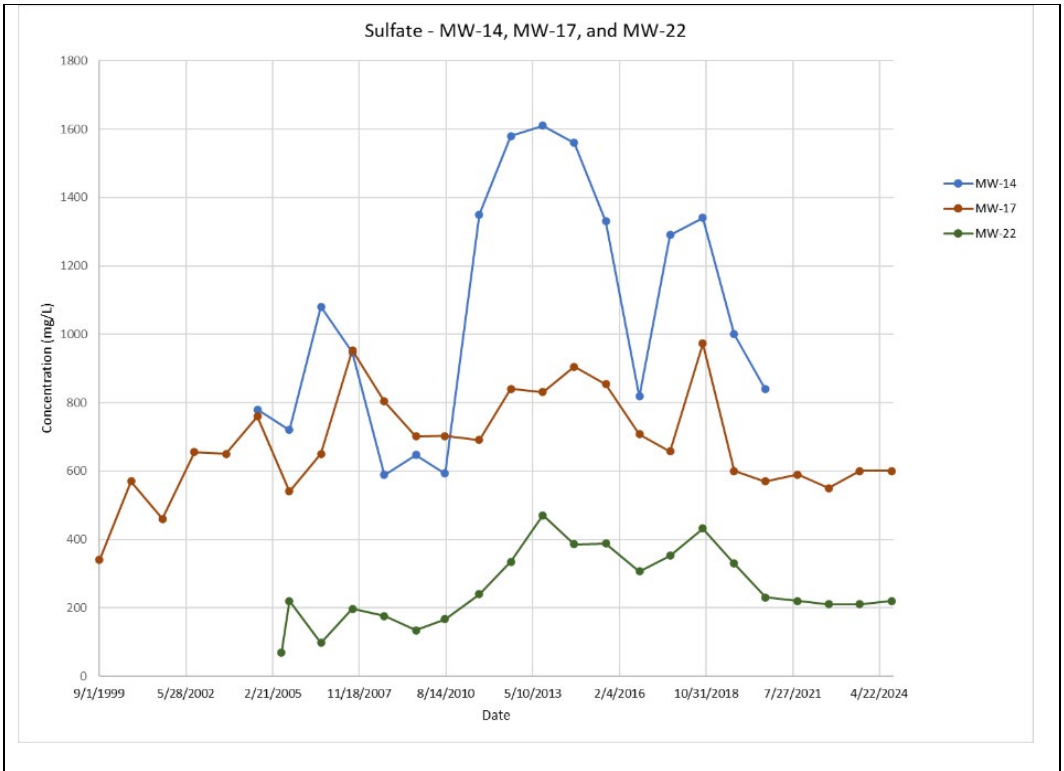
The 2005 migration theory indicated that the transport of chemical constituents in the shallow flow zone would be limited due to the lower permeability of the shallow clay till. The inclusion of the groundwater analytical data collected since 2005 indicated the following:

- Somewhat in support of the 2005 migration theory, the indicator parameter concentrations in the shallow well north of the creek (MW-21) were consistently lower than the concentrations in the shallow wells south of the creek, with the exception of very recent chloride concentrations, which have been increasing in monitoring well MW-21 and decreasing significantly in monitoring well MW-16.

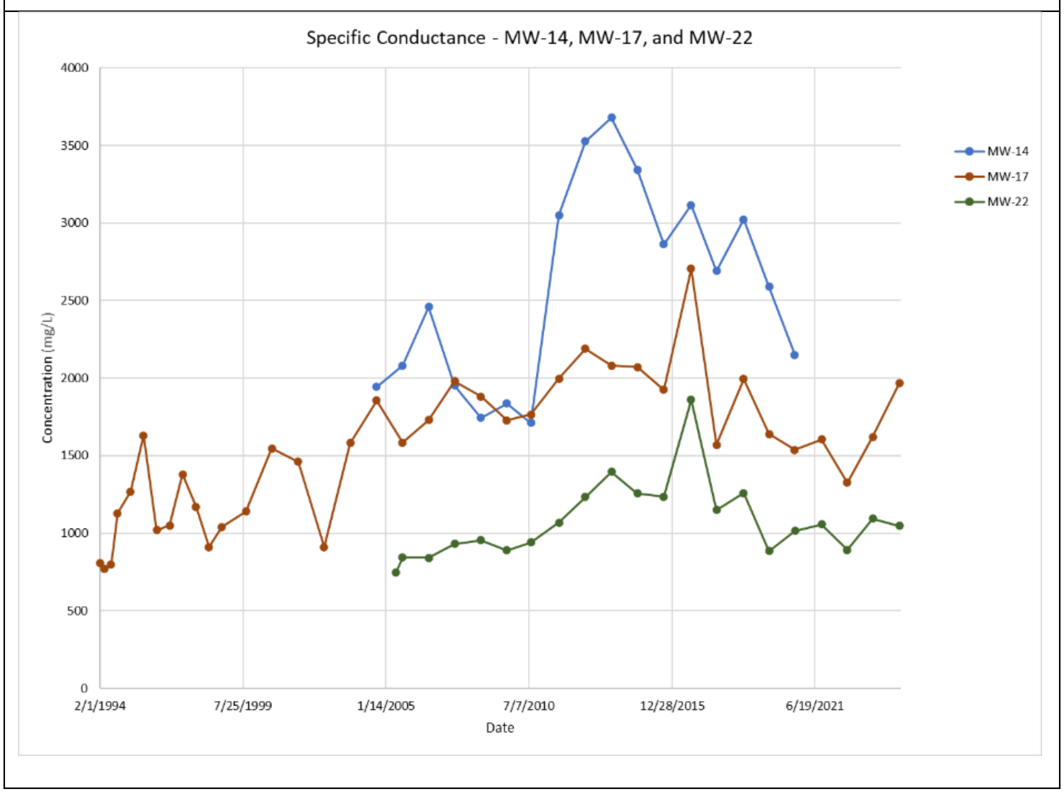
- Somewhat contradictory to the 2005 migration theory are the increasing chloride concentrations measured in monitoring well MW-21, which could indicate shallow flow system flow to the north under the creek. However, the ratio of sulfate to chloride is not consistent with the source of the chloride being from the groundwater south of the creek – see discussion in Section 5.3.

Intermediate Deep Flow System Wells:

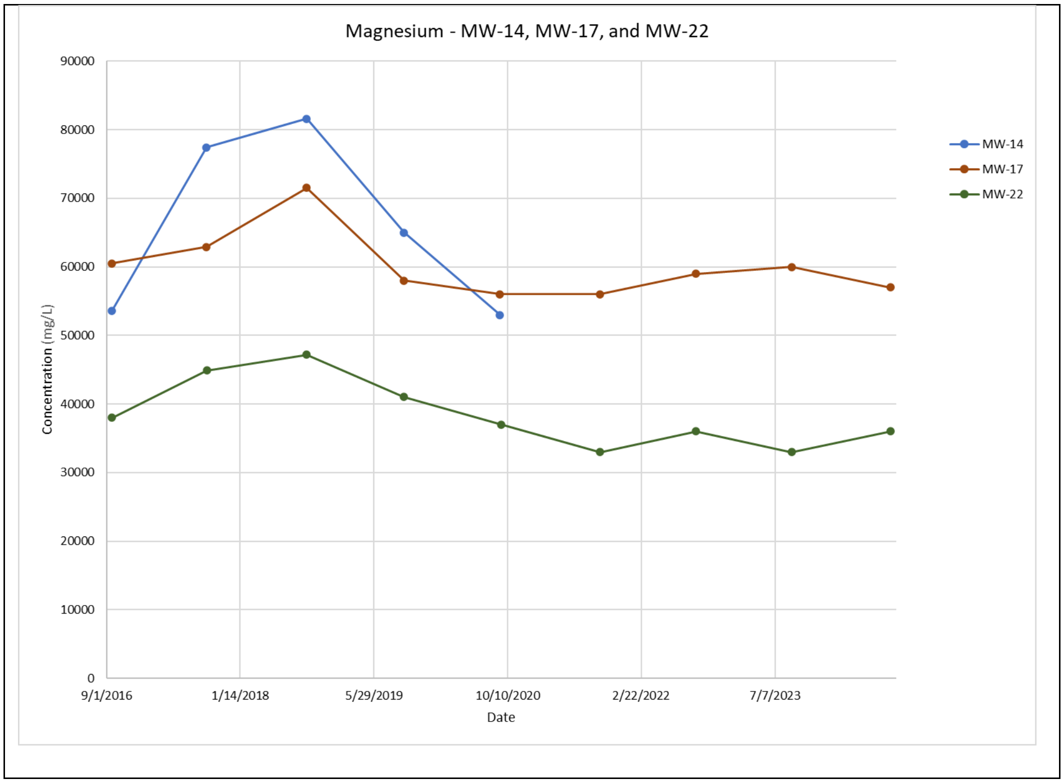




Sulfate - MW-14, MW-17, and MW-22
Concentration (mg/L)
Date
MW-14
MW-17
MW-22
0
200
400
600
800
1000
1200
1400
1600
1800
9/1/1999
5/28/2002
2/21/2005
11/18/2007
8/14/2010
5/10/2013
2/4/2016
10/31/2018
7/27/2021
4/22/2024



Specific Conductance - MW-14, MW-17, and MW-22
Concentration (mg/L)
Date
MW-14
MW-17
MW-22
0
500
1000
1500
2000
2500
3000
3500
4000
2/1/1994
7/25/1999
1/14/2005
7/7/2010
12/28/2015
6/19/2021

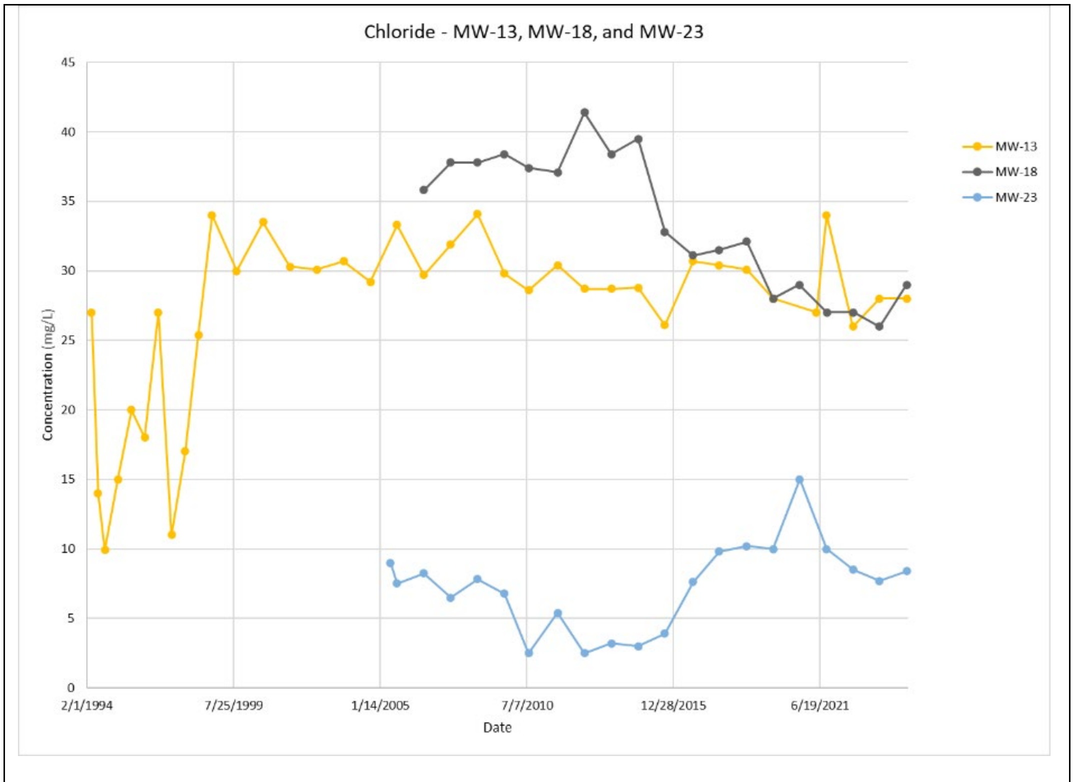


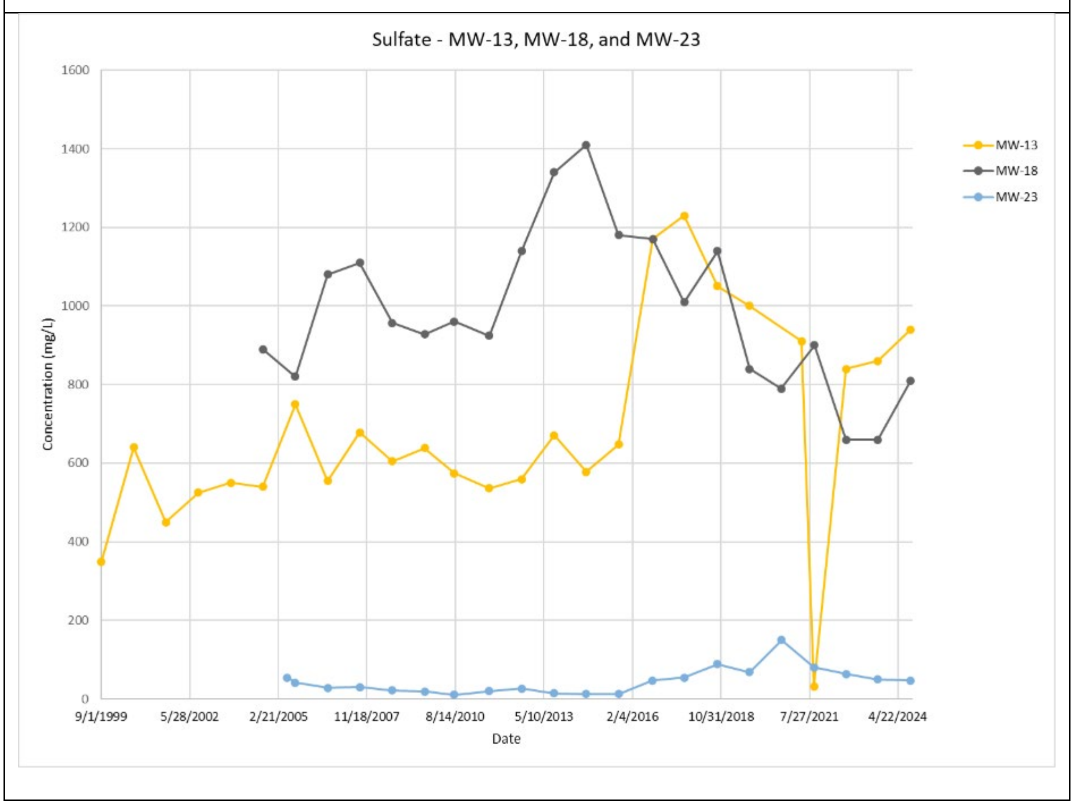
The 2005 migration theory indicated that the transport of chemical constituents in intermediate deep zone could occur in the more permeable alluvium and weathered rock at the bedrock surface and the lessening effects of the creek as a point of discharge with depth in the aquifer system. The inclusion of the groundwater analytical data collected since 2005 indicated the following:

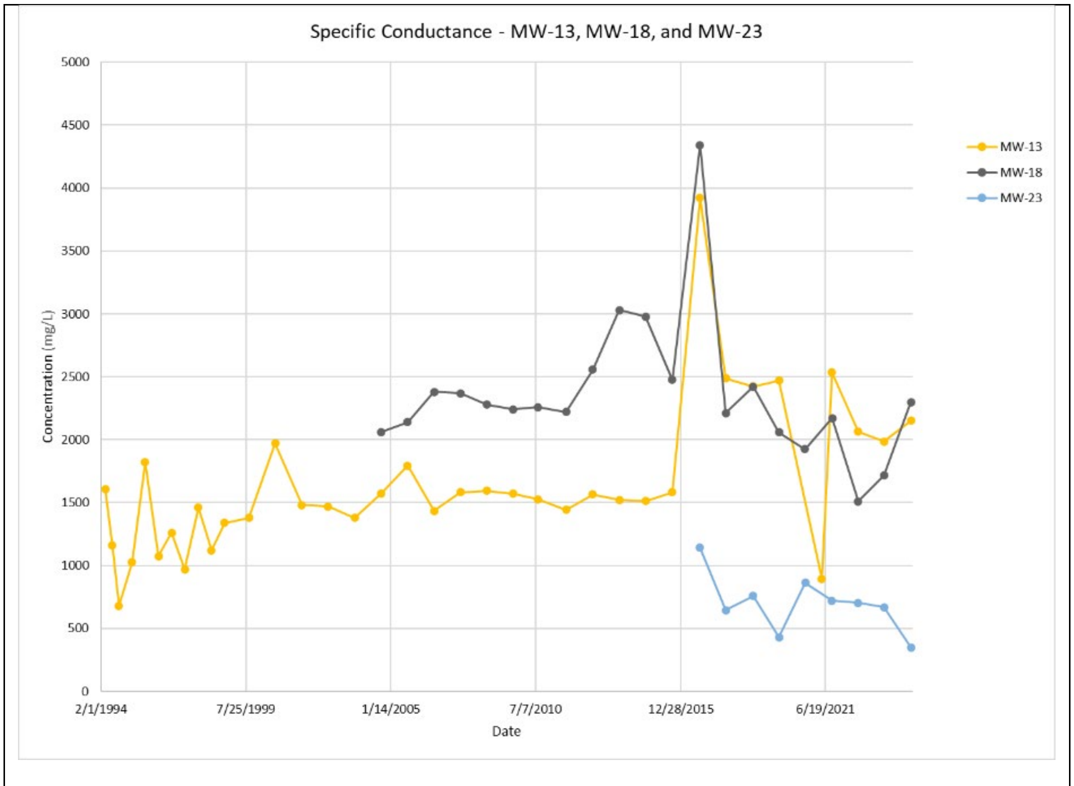
- Somewhat in support of the 2005 migration theory, there is some indication of relative concentration tracking between monitoring wells MW-17 and MW-22 and the trend of increasing chloride concentrations has continued.

- Somewhat contradictory to the 2005 migration theory are the chloride concentrations in monitoring well MW-22 north of the creek increasing to nearly the maximum chloride concentration measured in MW-17 much closer to the Landfill and in the primary area of the presumed landfill-impacted groundwater. Additionally, the ratio of sulfate to chloride is not consistent with the source of the chloride being from the groundwater south of the creek – see discussion in Section 5.3.

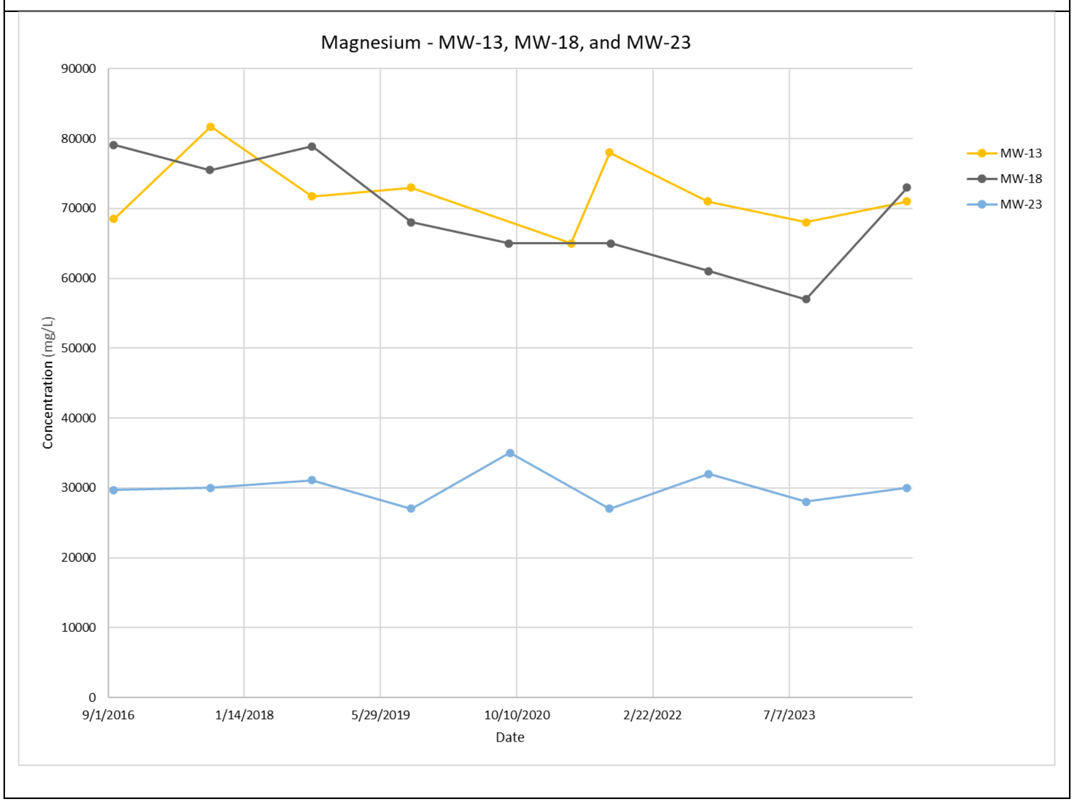
Deep Flow System Wells:







Specific Conductance - MW-13, MW-18, and MW-23
Concentration (mg/L)
Date
MW-13
MW-18
MW-23



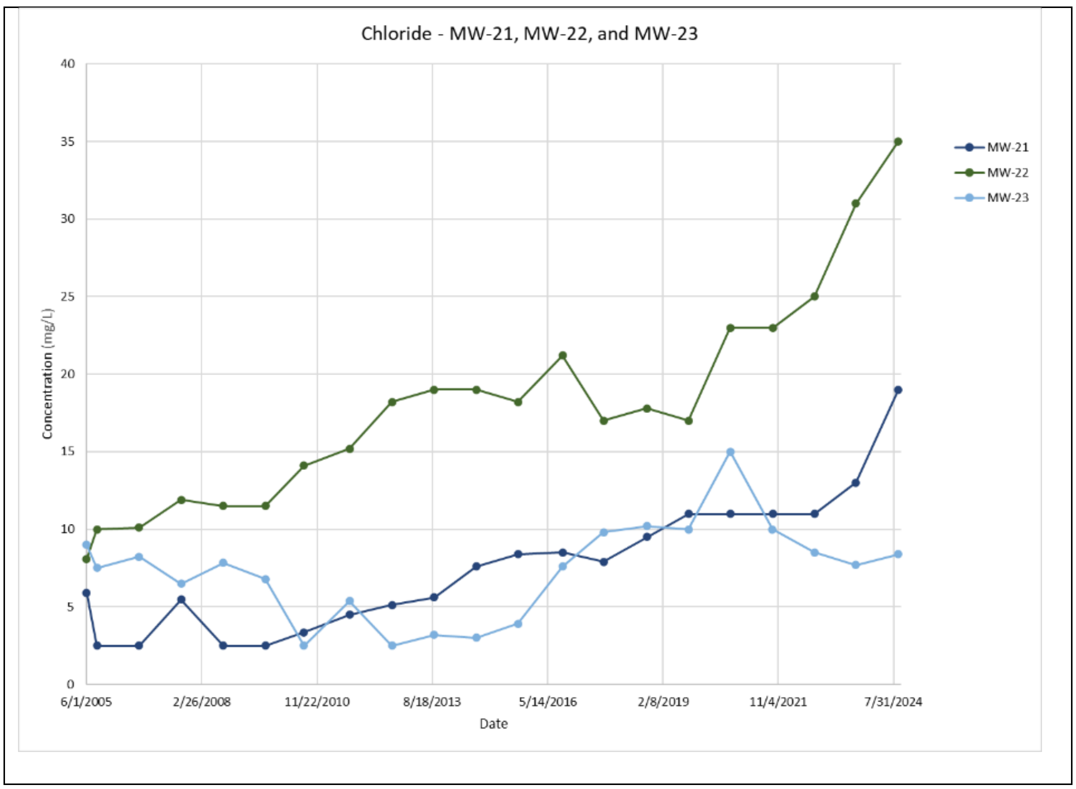
Magnesium - MW-13, MW-18, and MW-23
Concentration (mg/L)
Date
MW-13
MW-18
MW-23

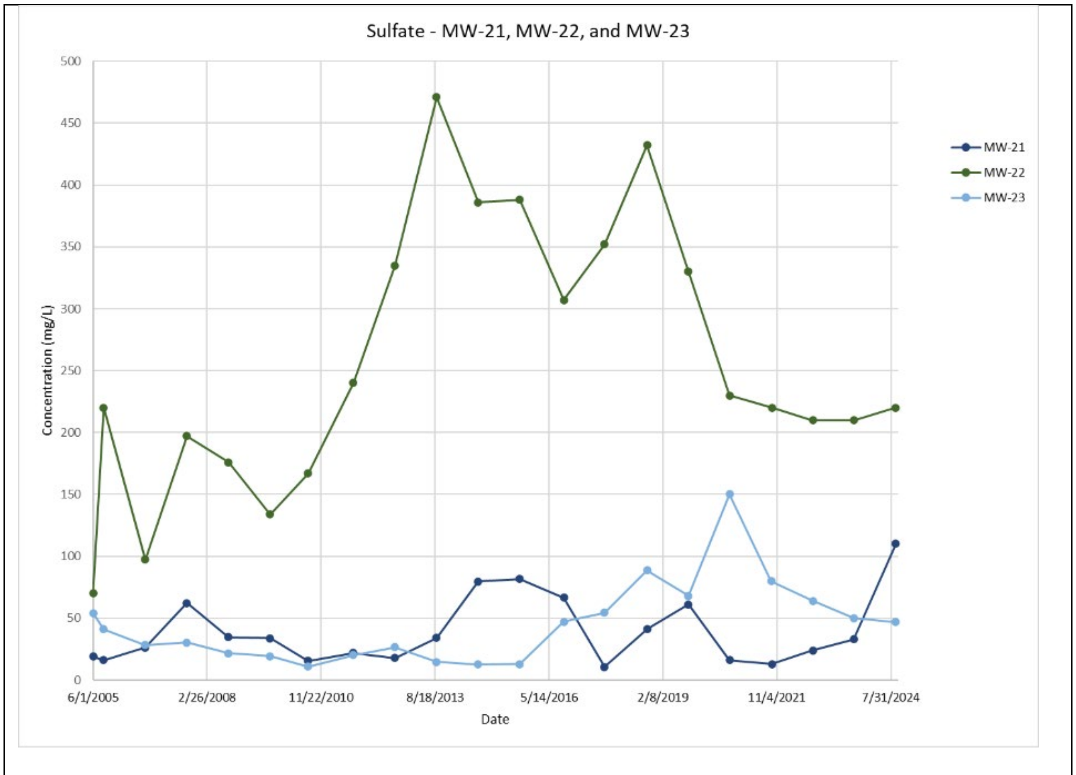
As with the shallow flow system, the 2005 migration theory indicated that horizontal transport of chemical constituents northward beneath the creek would be limited in the lower permeability Kenwood member of the Pinnicon Ridge Formation. The inclusion of the groundwater analytical data collected since 2005 supports this conclusion.

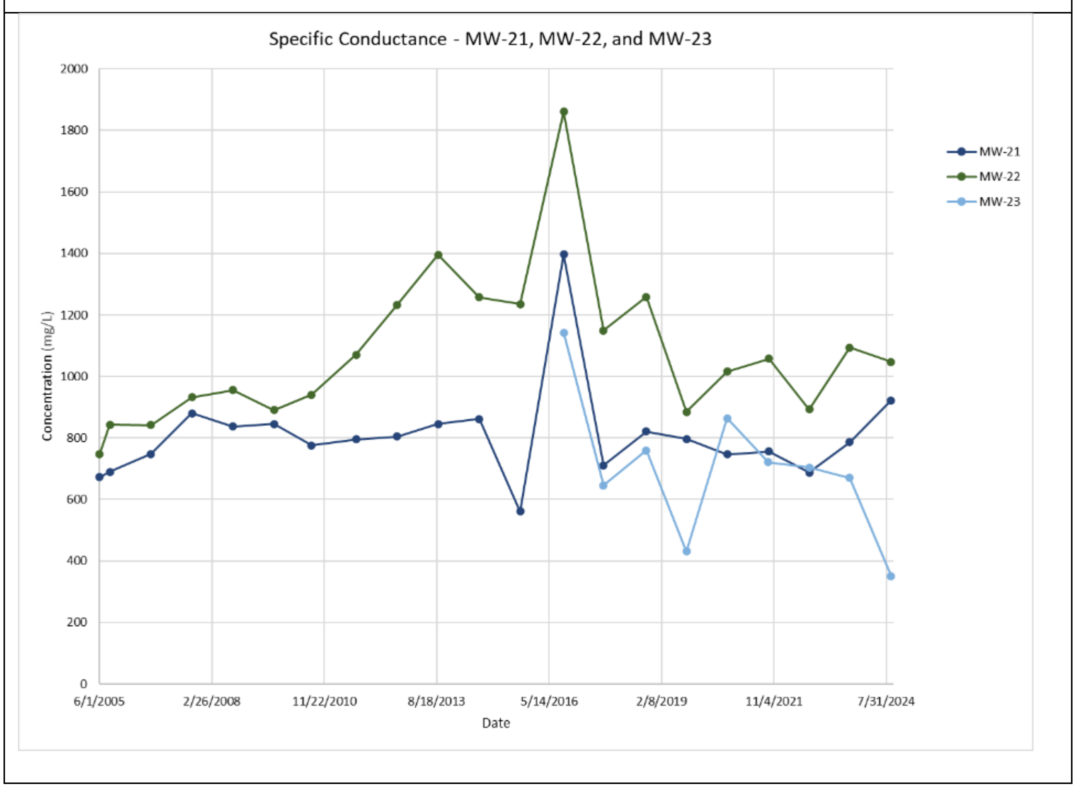
5.2.6 Creek as a Barrier to Northward Migration

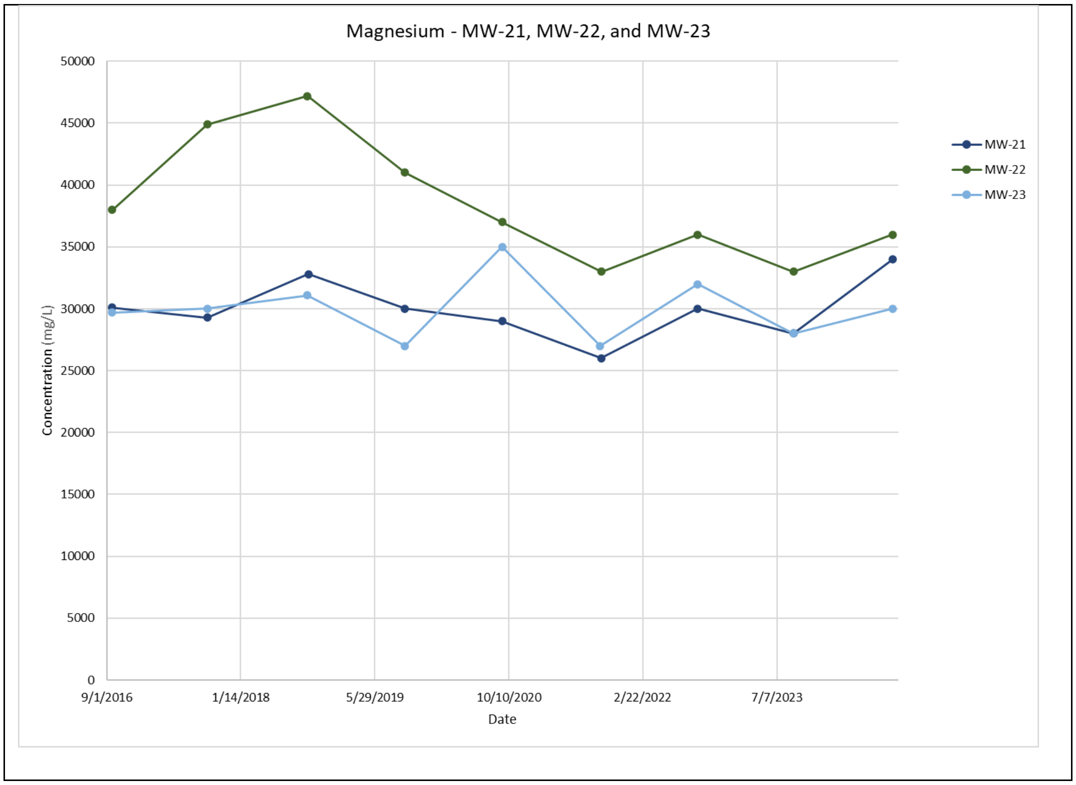
> *The creek appears to have a significant influence on the groundwater flow pattern and the transport of constituents from beneath the landfill. While impacted groundwater appears to exist beneath portions of the landfill and in groundwater immediately downgradient of the landfill, no significant migration of contaminants has occurred to the north of the creek. The creek essentially acts as a natural hydraulic barrier.*

Further review of this component of the 2005 migration theory was discussed with the previous set of graphs and through comparison of indicator parameter concentrations measured in samples from the MW-21/22/23 well cluster discussed in this section. Graphs of the indicator parameters for the MW-21/22/23 well cluster are provided below.




Sulfate - MW-21, MW-22, and MW-23
500
450
400
350
300
250
200
150
100
50
0
Concentration (mg/L)
6/1/2005
2/26/2008
11/22/2010
8/18/2013
5/14/2016
2/8/2019
11/4/2021
7/31/2024
Date
MW-21
MW-22
MW-23


Specific Conductance - MW-21, MW-22, and MW-23
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Concentration (mg/L)
6/1/2005
2/26/2008
11/22/2010
8/18/2013
5/14/2016
2/8/2019
11/4/2021
7/31/2024
Date
MW-21
MW-22
MW-23

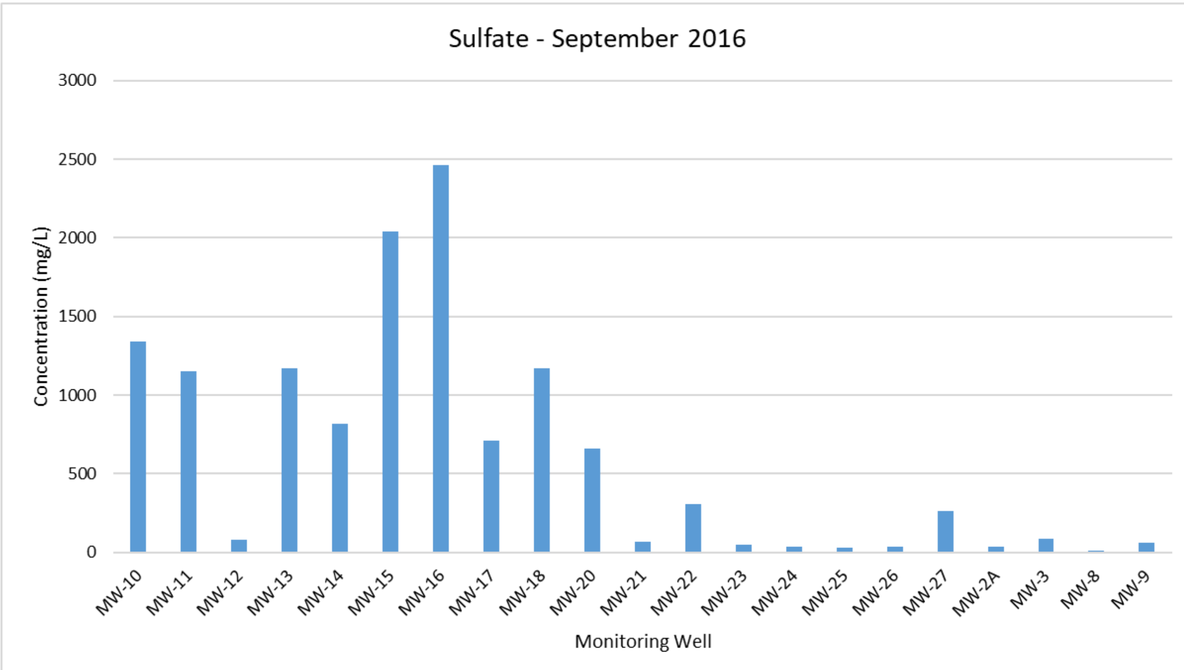


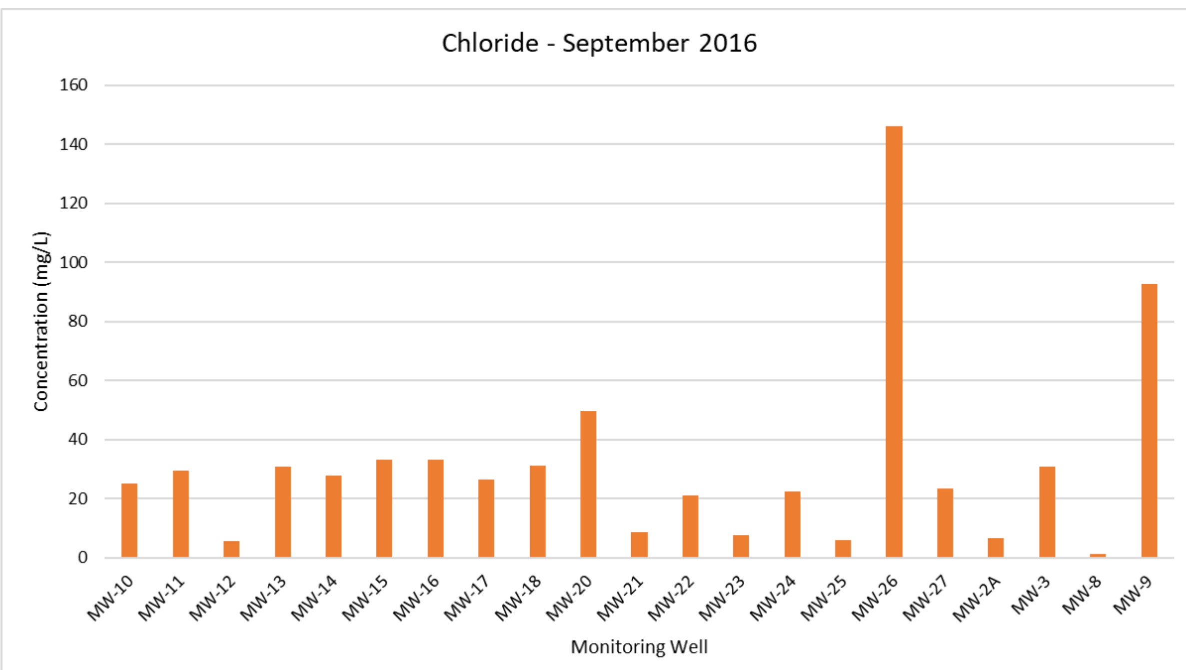
The inclusion of the groundwater analytical data collected since 2005 indicated that the indicator parameter concentrations in the intermediate deep flow system monitoring well are consistently above the shallow and deep flow system monitoring wells. This is potentially in support of the component of the 2005 migration theory that some north of the creek migration could occur in this flow system. Additionally, chloride concentrations in monitoring wells MW-21 and MW-22 are generally increasing, which is potentially in support of this component of the 2005 migration theory and potentially inclusive of the shallow flow system. However, as mentioned previously, the ratio of sulfate to chloride is not consistent with the source of the chloride being from the groundwater south of the creek – see discussion in Section 5.3.

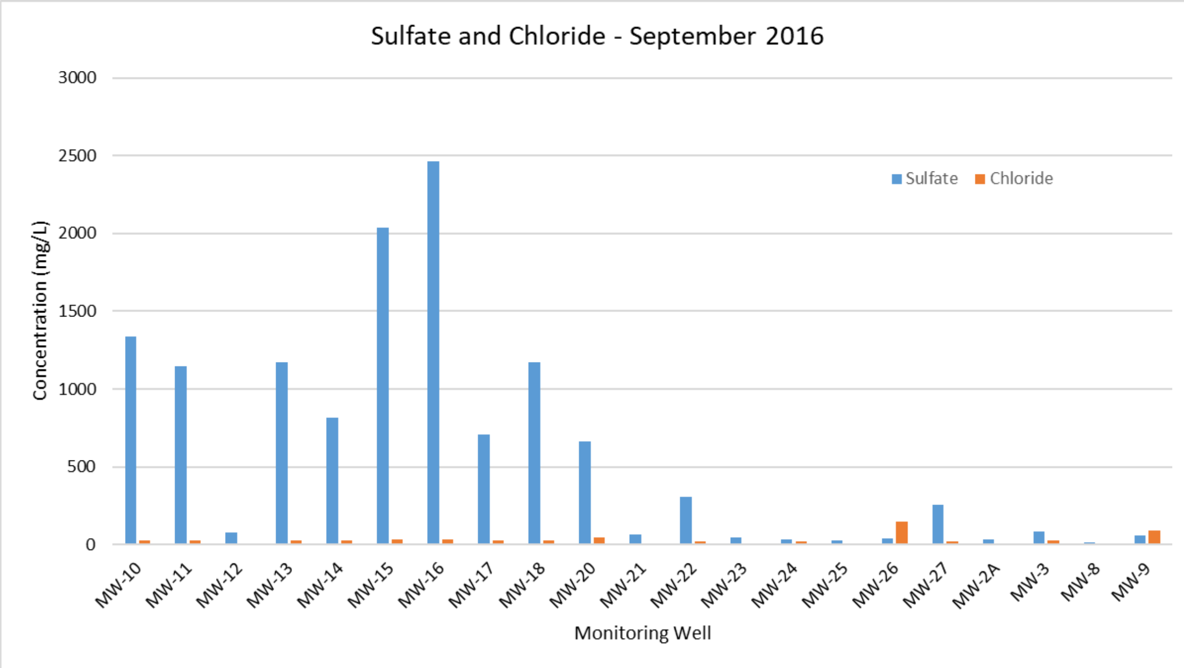
5.3 SULFATE:CHLORIDE REVIEW

Chloride in groundwater migrates conservatively, meaning that its concentration is largely unaffected by reactions in the subsurface. Sulfate also generally migrates conservatively when in an oxidizing environment. Both these ions were identified in the 2005 assessment as indicator parameters for possible water quality influences from the Landfill. The field oxidation potential measurements at the site indicate that the groundwater is predominantly oxidizing. Therefore, both of these ions would be expected to generally migrate conservatively with the groundwater. Working under this conservative migration assumption with the implication being that sulfate and chloride from the same source should maintain similar ratios despite dilution and dispersion, the sulfate:chloride ratios and the trending of those ratios were reviewed to potentially provide additional information for interpretation of the sampling data from the groundwater monitoring well network over time.

To provide context to the sulfate:chloride ratios as the ratios do not compare actual concentrations between wells, graphs of the sulfate and chloride concentrations for samples collected in September 2016 (first complete sampling event) including the monitoring wells currently utilized along with monitoring well MW-14 are shown below, first on separate charts and then on one which shows both sulfate and chloride concentrations at each well.







The above graphs indicate the following:

- The higher sulfate concentrations are generally concentrated on the north side of the Landfill south of the creek (all three flow systems) and also tend to be higher in the deep flow system throughout.

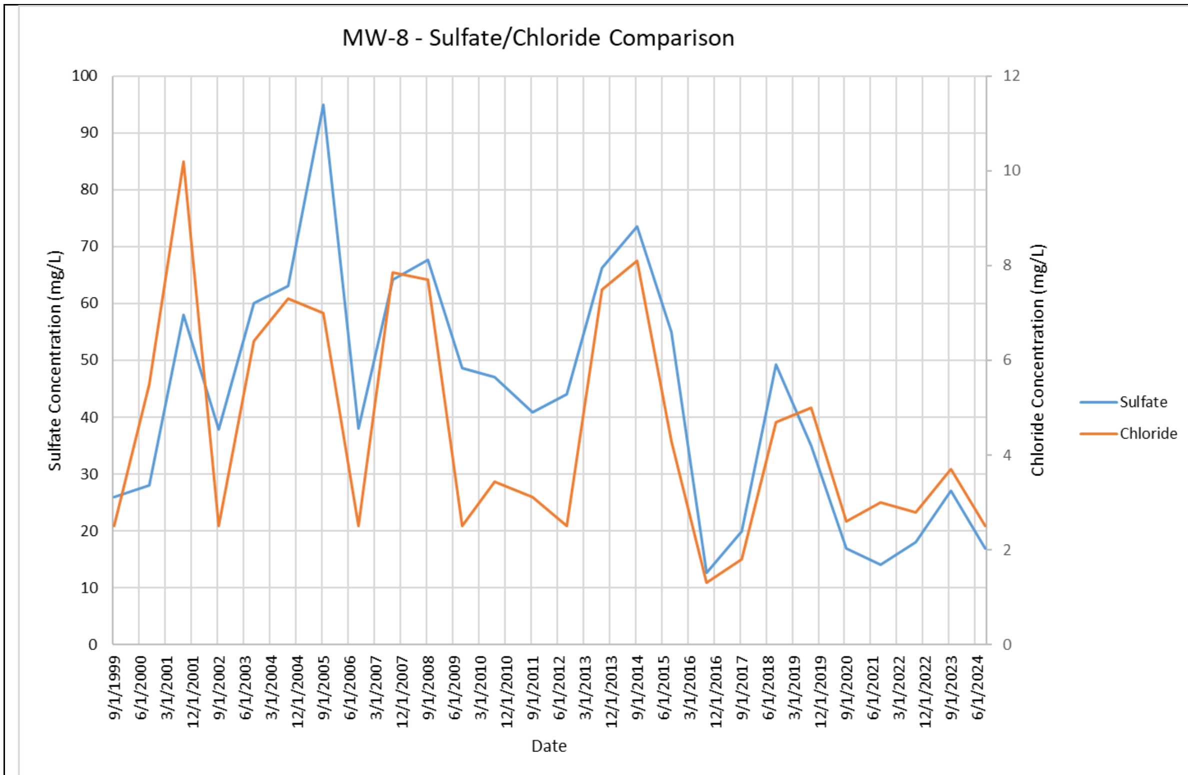
- The highest sulfate concentrations were measured in monitoring wells MW-15 and MW-16 in the shallow flow system. The September 2016 monitoring well MW-15 sulfate concentration happens to be the maximum sulfate concentration in the period of record for MW-15. As noted previously, sulfate concentrations in monitoring well MW-16 have been declining and in MW-15 have been slightly increasing during the periods of record.

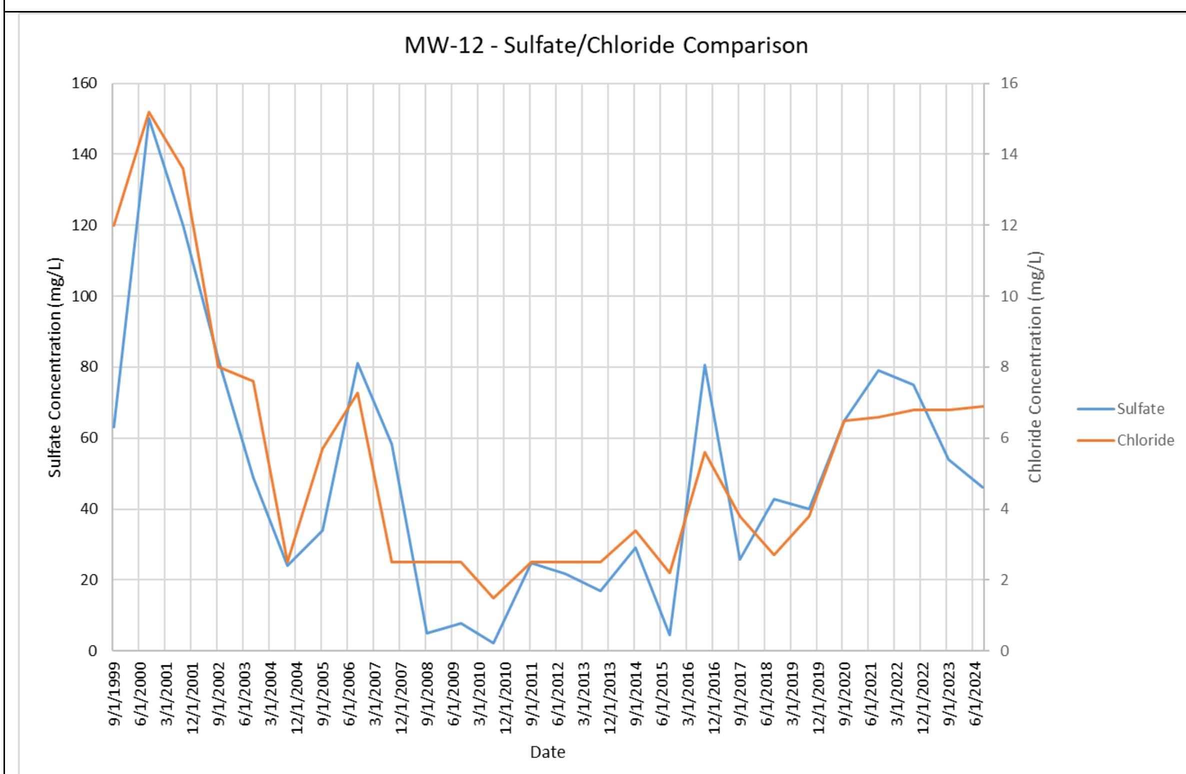
- There is a smaller overall range of detected concentrations in the chloride data as compared to the sulfate data. However, more consistent chloride concentrations are present on the north side of the Landfill south of the creek, and higher concentrations also tend to be present in the intermediate deep flow system.

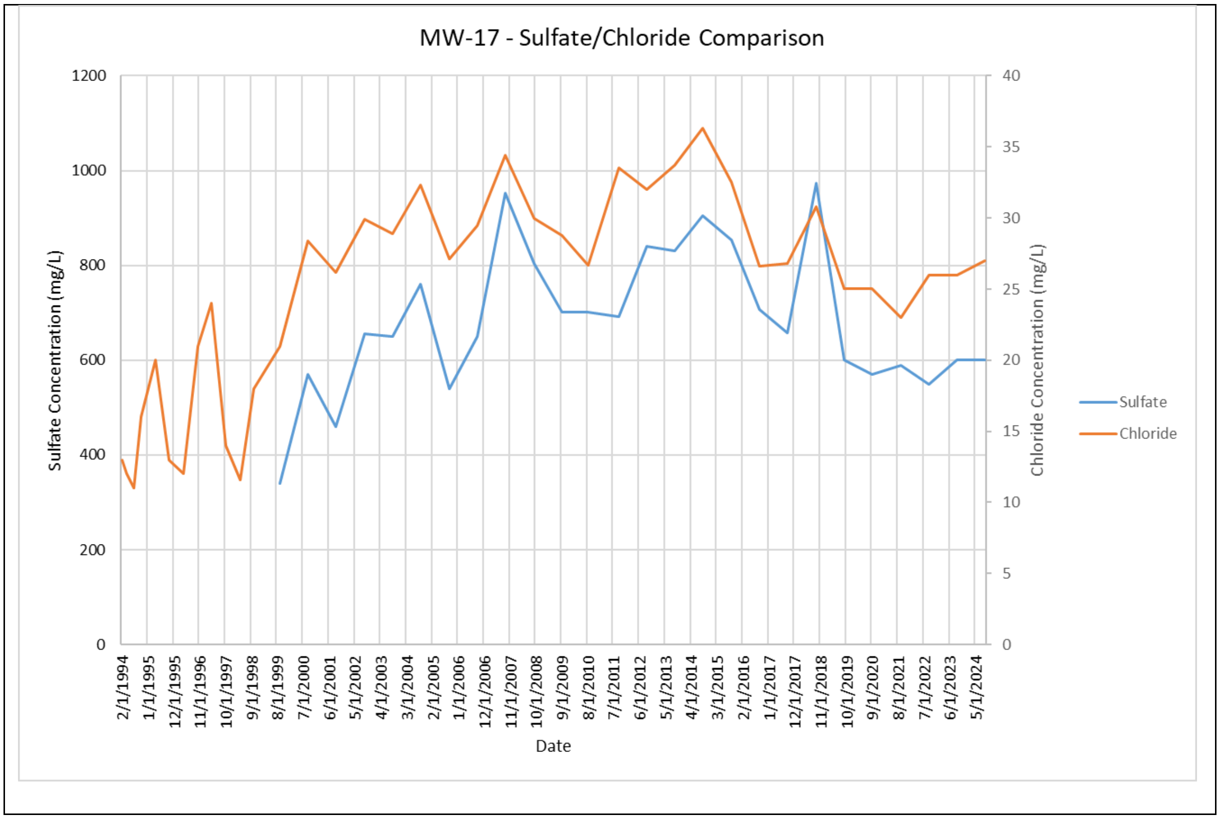
- The highest chloride concentrations were measured in monitoring wells MW-26, more than 1,000 feet north of the Landfill, and in MW-9 on the west side of the Landfill. Both of these wells are included in the intermediate deep flow system, however, the geology of the screened intervals is very different with MW-26 screened in unconsolidated materials and MW-9 screened in bedrock. When considering the data period of record since 2016, MW-26 chloride concentrations have been increasing and MW-9 concentrations have been decreasing.

- Sulfate concentrations tend to be greater than chloride concentrations (MW-9 and MW-26 are exceptions in the graph and MW-24 is an exception in the period of record), often significantly greater, particularly on the north side of the Landfill south of the creek and in monitoring well MW-20.

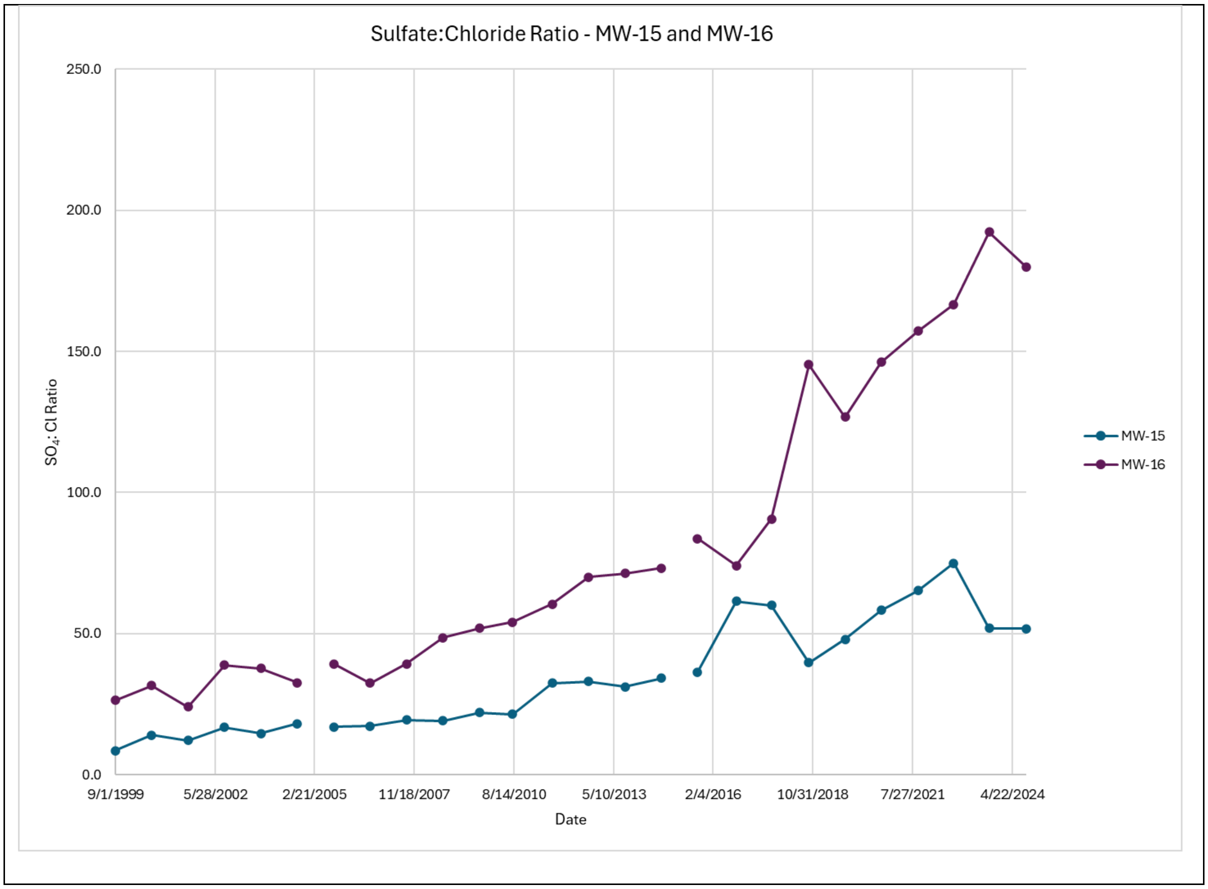
Below are some examples of sulfate and chloride concentrations moving in tandem, in support of the underlying assumption of conservative migration of both parameters.



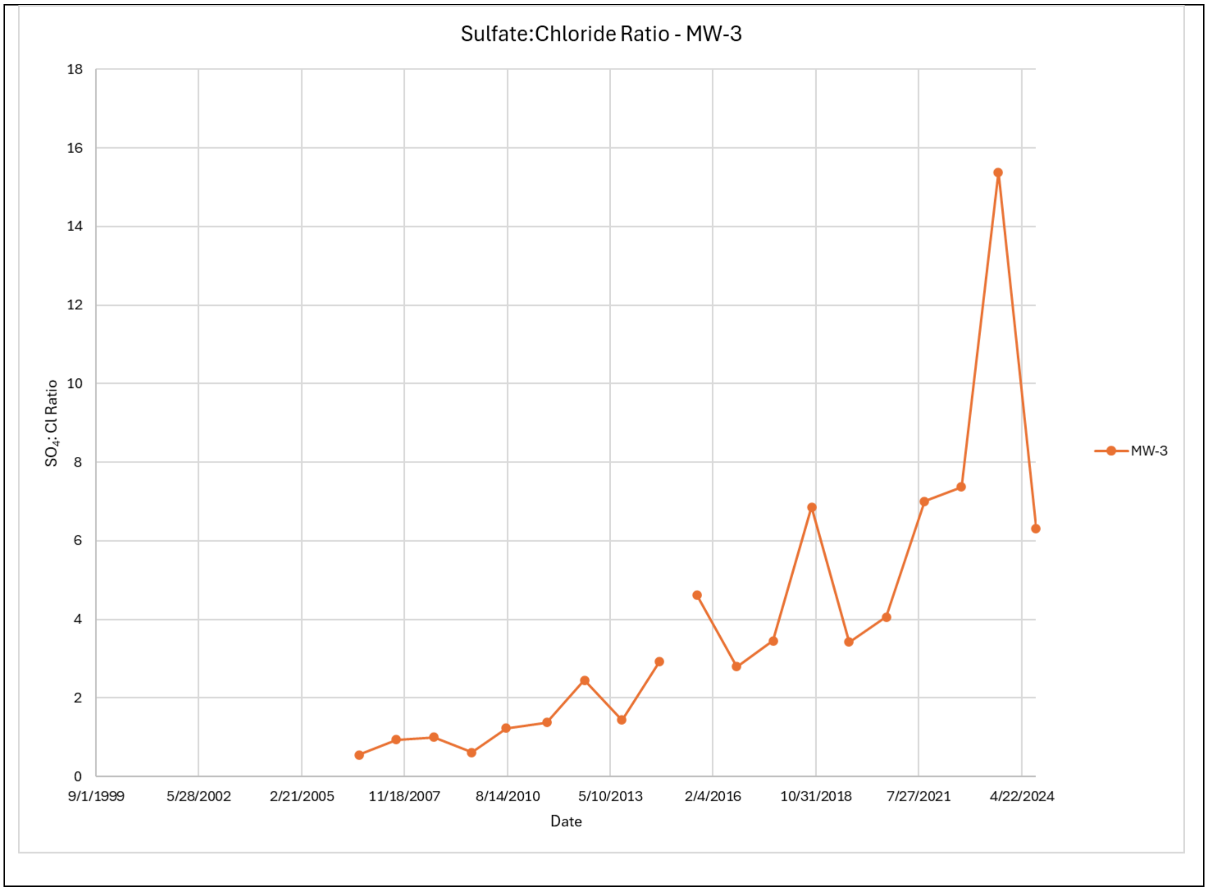




Most of the monitoring wells adhere to varying degrees to the underlying assumption of conservative behavior, causing the sulfate:chloride ratio to vary within a range. Monitoring wells on the north side of the Landfill south of the creek tend to exhibit ratios in the 20 to 40 range, notably MW-10, MW-11, MW-13, MW-14, MW-15, MW-16, MW-17, and MW-18. It should be noted that an increasing trend in the ratio is present in the monitoring wells MW-15 and MW-16 data as shown in the graph below.



In the case of monitoring well MW-15, the increasing ratio trend is the result of increasing sulfate concentrations and decreasing chloride concentrations. In the case of monitoring well MW-16, the increasing ratio trend is the result of chloride concentrations decreasing faster than sulfate. Both sulfate and chloride concentrations are decreasing in monitoring well MW-16. Monitoring well MW-3 also exhibited an increasing ratio trend as shown below, but at a much lower ratio.

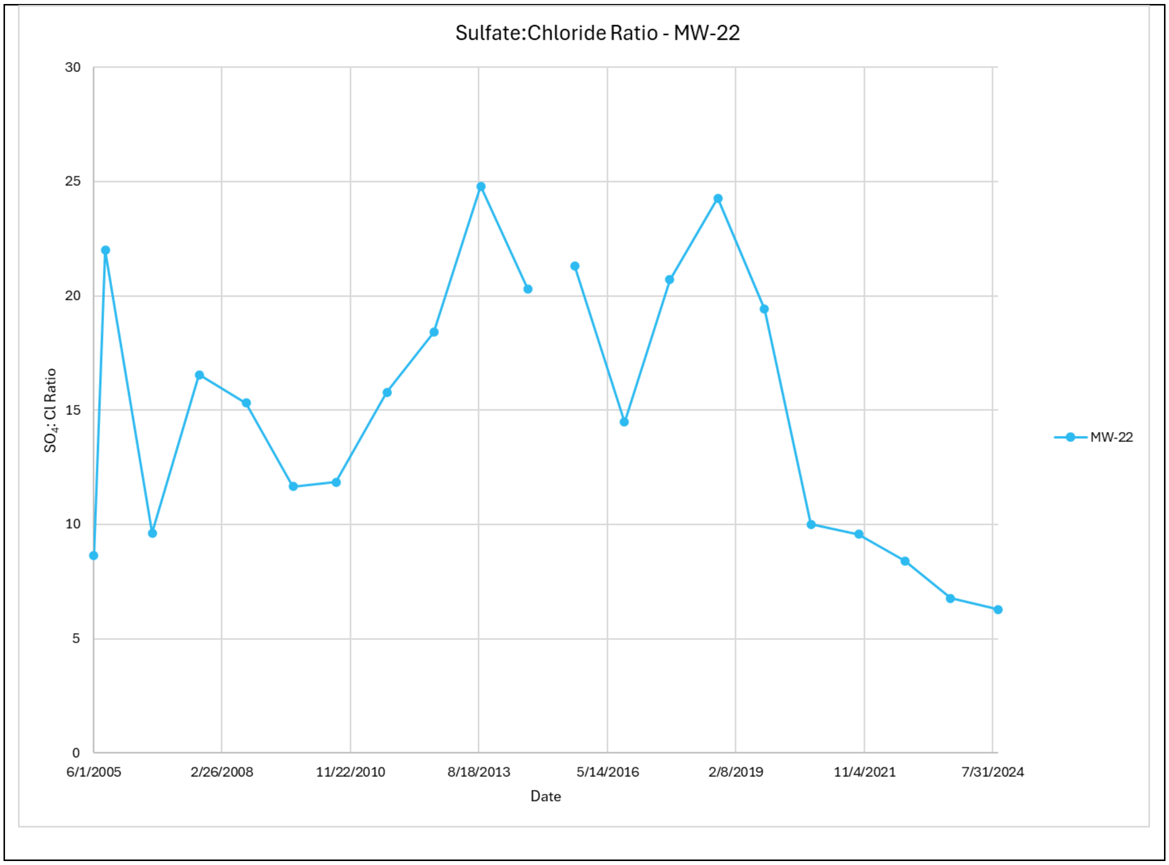


Like monitoring well MW-15, sulfate concentrations are increasing and chloride concentrations are decreasing in monitoring well MW-3

The remainder of the monitoring wells (MW-3 included) had lower ratios, generally in the range of 5 to 20. Exceptions to this were as follows:

- MW-9 with ratios generally around 1.5.
- MW-21 with ratios generally less than 5 since 2017.
- MW-24 with ratios generally less than 1.
- MW-25 with ratios generally less than 5.
- MW-26 with ratios generally in the range of 0.2 to 0.3, the lowest ratios of the site.
- MW-27 with ratios generally less than 5 since 2020.

Monitoring well MW-22, the intermediate deep flow system well, was identified in the 2005 migration theory as exhibiting a possible indication of limited migration from the south under the creek. It should be noted that the 2005 report also concluded that the creek likely acted as a hydraulic barrier and that no significant migration of contaminants had occurred to the north of the creek. Since 2005, chloride concentrations have generally been increasing. However, the sulfate:chloride ratio has been decreasing since approximately 2018 as shown below.



The more recently emerging ratio trend in monitoring well MW-22 is primarily the result of increasing chloride concentrations. The value of the ratio has always been lower than that measured south of the creek and is trending still lower, which is a possible indication of influence from the north and not the Landfill as speculated in the 2005 migration theory, albeit to a very limited extent.

The sulfate:chloride ratio review indicated the following:

- There may be other sources of sulfate and chloride or natural variability affecting concentrations at the site, the presence of which could indicate other geochemical processes/influences may be in play.

- The water quality at MW-22 may be predominantly influenced from the north, which would support the 2005 conclusion that migration north of the creek is generally not occurring.

5.4 EXTENT OF MIGRATION EVALUATION

No additional efforts to further assess the extent of migration in the form of new monitoring well installations are proposed at this time. New monitoring well installations do not appear necessary at this time for the following reasons:

1. The inclusion of groundwater analytical data collected since the 2005 assessment into the same review criteria used in 2005 indicated predominantly improving groundwater quality around the Landfill.

2. The 2005 conclusion that the creek likely acted as a hydraulic barrier and that no significant migration of contaminants had occurred to the north of the creek appears correct, although some very limited migration cannot be ruled out at this time.
3. Additional geochemical sampling, analyses, and evaluation will likely provide a greater understanding of the influences on groundwater quality at the site and the effect of the Landfill on water quality, which would better inform the evaluation of whether new monitoring well installations are needed.

In lieu of installing additional monitoring wells at this time, additional geochemical parameters will be added to the sampling program for 2025 and the results evaluated as described in Section 9.0.

5.5 RATE OF MIGRATION EVALUATION

The 2005 Groundwater Quality Assessment Report described a migration theory that speculated migration pathways and limitations to migration. This 2005 migration theory was reviewed in light of additional data collected since 2005 as discussed previously herein. The review indicated general agreement with portions of the 2005 migration theory, predominantly improved water quality surrounding the Landfill since 2005, and additional questions regarding other portions of the 2005 migration theory such as possible influences on indicator parameter concentrations at monitoring well MW-22.

The additional parameters and evaluations proposed in Sections 8.0 and 9.0, respectively, will be used to provide a better understanding of water quality influences, which can be used to refine the 2005 migration theory as appropriate and determine possible data utilization to estimate a rate of migration of indicator parameters. As previously stated, the indicator parameter concentration trends indicate a predominantly improving water quality condition at the Landfill, which will factor into the determination of appropriate data sets and locations from which to calculate estimates. The process of developing estimates of migration rates will include further review of the groundwater elevations and elevation trends over time, soil and bedrock material hydraulic properties, and calculations as indicated below.

Horizontal groundwater flow rates will be estimated in the directions downgradient of the Landfill waste boundary and parallel to the creek, as indicated in the 2005 migration theory. Vertical flow rates will be estimated from the monitoring well clusters. Horizontal and vertical groundwater flow rates vary directly as a function of hydraulic conductivity and gradient, and inversely as a function of the effective porosity. Flow rates for the site will be calculated using the following form of Darcy's equation:

$$V_a = Ki/\eta$$

where:

V_a = the actual flow velocity (feet/day);
K = the in-situ hydraulic conductivity (ft/day);
i = the hydraulic gradient (unitless); and
η = the effective porosity of the saturated matrix (unitless).

Vertical groundwater flow gradients will be estimated at each of the clustered well-sites using the following equation:

$$i = (H_a-H_b)/L$$

where:

i = the vertical gradient;
H_a = the water level in the deeper well;
H_b = the water level in the more shallow well; and
L = the distance between midpoints of the screens.

6.0 PROPOSED ASSESSMENT MONITORING POINTS

6.1 INITIAL ASSESSMENT PHASE

Based on the past assessment activity findings and the review of more recent concentrations, no new monitoring points are proposed for the initial assessment phase. Instead, sampling for the eight major ions used in geochemical evaluations are proposed as an attempt to gain a clearer understanding of the source of the elevated concentrations, and, if the Landfill is a source, attempt to estimate the Landfill's contribution to changes in water quality. The geochemical parameter list is discussed in Section 8.0 – Sampling and Analytical Program, and examples of the proposed geochemical evaluations are included in Section 9.0 – Data Collection and Analysis Procedures.

6.2 EXPANDED ASSESSMENT PHASE

The findings of the initial assessment phase will be used to evaluate whether an expanded phase is necessary. If deemed necessary, an expanded assessment phase may include additional monitoring well installations and sampling and/or additional parameters and data evaluation methods to expand the understanding of groundwater quality as relates to the Landfill. It is worth noting that the 2012-2013 AWQRs refer to efforts to further investigate groundwater quality to the northwest of the site; however, the 2013 AWQR stated that recent local information was impacting this assessment. It is our understanding that the neighboring property owner was not receptive to inquiries regarding possible well installation, and the property ownership has not changed in the interim.

Further information regarding expanded assessment phase activities is not included herein and will be developed based on the initial assessment phase findings.

6.3 DRILLING DEPTHS

As additional drilling is not proposed at this time, a determination of drilling depths was not prepared. In the event that drilling is proposed at a later time based on the additional groundwater sampling and data evaluation as described in this Plan, proposed drilling depths will be included in the report that recommends additional monitoring well installation.

7.0 WELL DESIGN AND CONSTRUCTION

7.1 MONITORING WELL/SOIL BORING SPECIFICATIONS

In the event that monitoring well installation is recommended as part of future assessment activities, soil boring and monitoring well installation/construction will be performed in general accordance with the 1992 version of IAC 567-110.11(455B) Monitoring well/soil boring construction standards. These standards include the following by IAC citation:

- 110.11(1) – General Consideration.
- 110.11(2) – Casings.

- 110.11(3) – Well Screens.
- 110.11(4) – Filter Pack.
- 110.11(5) – Grouting.
- 110.11(6) – Well Protection.
- 110.11(7) – Well Drilling.

A copy of the pages from IAC 567-110 that encompass 110.11 is included in **Appendix B.**

7.2 MONITORING WELL DEVELOPMENT

In the event that monitoring well installation is recommended as part of future assessment activities, monitoring well development will be performed in general accordance with the 1992 version of IAC 567-110.11(455B). Monitoring well development procedures for water quality monitoring purposes are included in 110.11(8). A copy of the pages from IAC 567-110 that encompass 110.11 is included in **Appendix B.**

8.0 SAMPLING AND ANALYTICAL PROGRAM

The proposed sampling program is the routine annual monitoring presented in Table 2 of the 2024 Annual Water Quality Report – Interstate Power and Light Company – Stoney Point Closed Landfill dated November 27, 2024 (Doc # 111406) with the addition of the major geochemical parameters to complete set of eight parameters. The eight geochemical parameters are the following:

- Bicarbonate (HCO_3)
- Carbonate (CO_3)
- Calcium (Ca)
- Magnesium (Mg)
- Potassium (K)
- Chloride (Cl)
- Sodium (Na)
- Sulfate (SO_4)

The current sampling program presented in Table 2 of the 2024 Annual Water Quality Report includes parameters Lists A, B, and C. Parameters required to be added to each list are included below:

List A: HCO_3, CO_3, Ca, K, Na
List B: HCO_3, CO_3, Ca, K, Na
List C: HCO_3, CO_3, Ca, Mg, K, Cl, Na

The sampling schedule will remain in September to maintain temporal comparability to previous samples. Additional sampling, if necessary, will be determined following the evaluation of the geochemistry with the full list of parameters, with discussion and recommendations included in the 2025 Annual Water Quality Report.

9.0 DATA COLLECTION AND ANALYSIS PROCEDURES

Data collection will be consistent with X. Special Provision 4. of Permit No. 57-SDP-11-90C, most recently revised on June 30, 2023 (Doc # 107093). Analysis procedures will preliminarily include Schoeller and Tickel geochemical evaluation using the eight major ions listed in Section 8.0 along with temporal stability review as afforded by the partial major ion data set in the historical analytical data record. The geochemical evaluation will include development of leachate and unimpacted groundwater end-member signatures and comparison of those signatures to the signatures of the compliance monitoring wells.

The initial geochemical signature comparisons often lead to ideas for additional comparisons or evaluations that may be informative in better understanding influences on groundwater quality at the site. In addition to the above geochemical evaluation, Spearman's Rho correlation evaluations will be prepared to evaluate if there are groupings of direct or inverse correlations that may provide further insight and direction to additional data evaluation methods that may be useful.

Based on the above evaluations, additional data evaluations such as ratio trending and mixing line evaluations may be performed.

10.0 IMPLEMENTATION SCHEDULE

The implementation schedule for the Plan activities proposed herein is aligned with the 2025 routine groundwater monitoring schedule for the Landfill as presented in Table 2 of the 2024 Annual Water Quality Report – Interstate Power and Light Company Stoney Point Closed Landfill dated November 27, 2024 (Doc # 111406) and the 2025 Annual Water Quality Report. The sampling proposed herein will be performed in September 2025 to maintain temporal consistency of the sampling event and avoid introducing potential additional variability in the form of seasonality.

The analytical results, data evaluations, conclusions, and recommendations resulting from the implementation of this Plan will be included in the 2025 Annual Water Quality Report. Annual Water Quality Reports for this site are typically due on November 30, however due to the additional data evaluation to be performed following 2025 sampling we are requesting a due date of March 30, 2026 for the 2025 AWQR. If the data evaluation indicates that collection of additional data during the next planned site monitoring event (April 2026 water level measurements) is recommended, this proposed reporting timeline would align with that schedule.

11.0 UPDATED RECEPTOR SURVEY

SCS contacted the Linn County Health Department for assistance with an updated receptor survey for the Site. Mr. Todd Jewell of Linn County Public Health provided assistance with a search for public and private water supply sources within one mile of the Site. Mr. Jewell suggested that searching publicly-available GeoSAM and Private Well Tracking System (PWTS) databases is typically the first approach. Mr. Jewell also offered to search the County's records and identified some wells that did not appear in either GeoSAM or PWTS. Wells within one mile of the site that appeared in one or more of these searches are summarized in tables and a map in **Appendix C**. Wells identified in the search that are described as non-supply wells (e.g. monitoring wells or heat pump wells), or which are listed as retired, are included in the tables in **Appendix C** but are not shown on the map.

The Linn County Health Department provided the installation record for the private well on the adjacent property to the west (downgradient) of Stoney Point Landfill, at 5400 F Ave NW (**Appendix C**). The record for this well indicates it was installed in 1990, however it does not appear in the GeoSAM or PWTS databases. The well is cased to 52 feet below ground surface (bgs) and is open to 215 feet bgs. IPL sent a letter to the well owner on October 11, 2024 offering to sample the well. The well owner did not respond.

12.0 GENERAL COMMENTS

The analysis and opinions expressed in this report are based upon data obtained from the samples collected at the indicated locations and from any other information discussed in this report. This report does not reflect any variation in subsurface stratigraphy, hydrogeology, or chemical concentrations that may occur between sampling locations or across the site. Actual subsurface conditions may vary and may not become evident without further exploration.

SCS Engineers has prepared this report for the exclusive use of our client for the specific application to the project discussed. No warranty is expressly stated or implied in this report with regard to the condition of substrate and groundwater below the surface of the facility. SCS Engineers has relied upon information furnished by others as noted in the report, and SCS Engineers accepts no responsibility for any deficiency, misstatements, or inaccuracy in this report as a result of misstatements, omissions, misrepresentations, fraudulent, or inaccurate information or data provided by others.

Figures

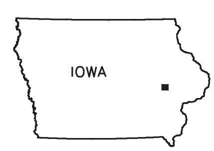
CEDAR RAPIDS SOUTH QUADRANGLE

IOWA–LINN CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)

2015

SCALE: 1" = 2,000'



CLIENT	ALLIANT ENERGY. INTERSTATE POWER AND LIGHT	SITE	STONEY POINT LANDFILL CEDAR RAPIDS, IOWA	SITE LOCATION MAP

PROJECT NO.	25216065.00	DRAWN BY:	AHB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718–6751 PHONE: (608) 224–2830	FIGURE
DRAWN:	10/28/16	CHECKED BY:	MDB			1
REVISED:	10/28/16	APPROVED BY:	TK 11/20/2017			

I:\25216065.00\Drawings\□i□□L□□.dwg, 11/20/2017 □:12:17 □M

PROJECT NO.	25222065.00	DRAWN BY:	AHB
DRAWN:	09/23/2022	CHECKED BY:	MDB
REVISED:	10/24/2023	APPROVED BY:	MDB 11/30/2023

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT: ALLIANT ENERGY. INTERSTATE POWER AND LIGHT

SITE: STONEY POINT LANDFILL
CEDAR RAPIDS, IOWA

MONITORING WELL LOCATIONS

FIGURE
2

I:\25222065.00\Drawings\Monitoring Wells.dwg, 10/24/2023 1:17:50 PM

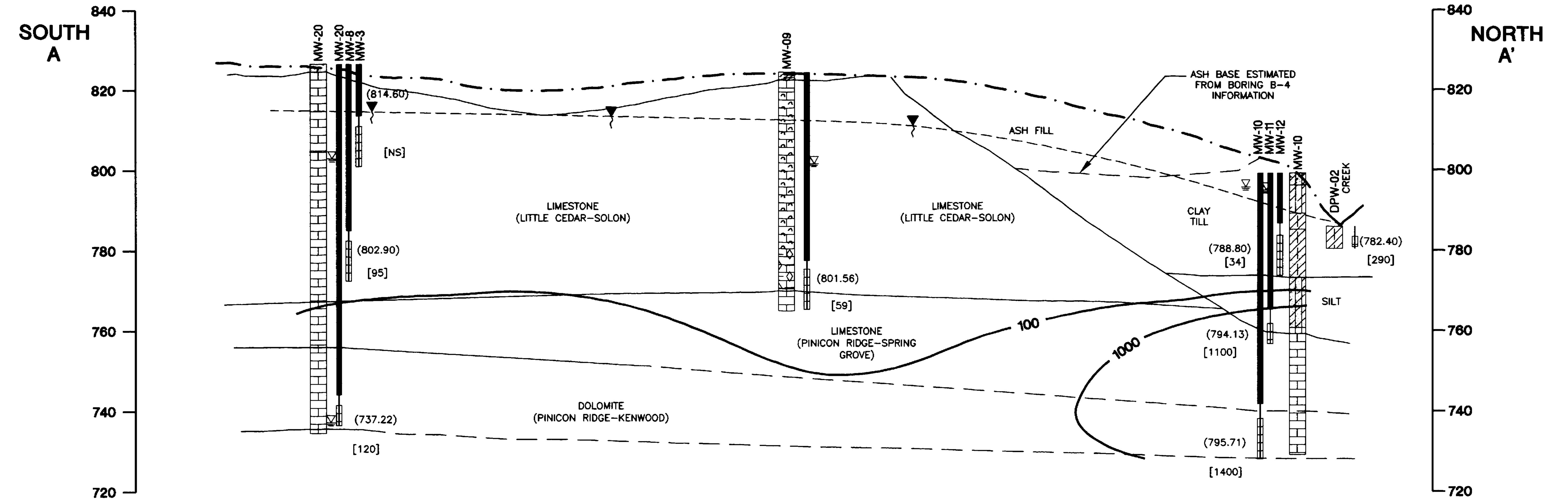
Appendix A

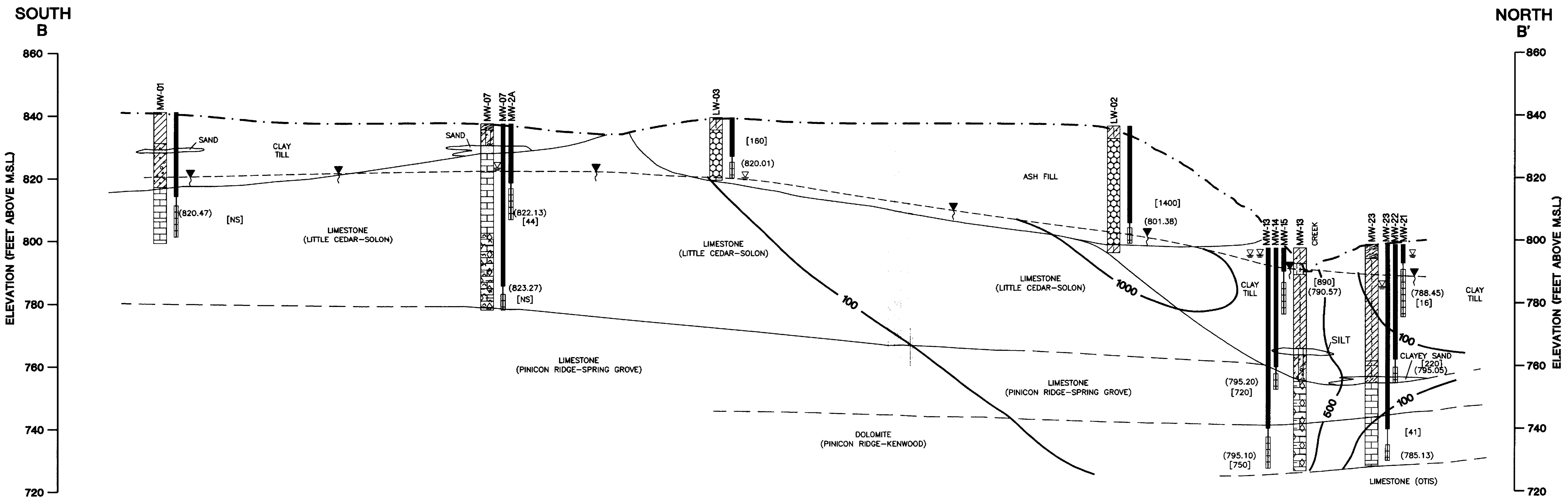
Reference Figures

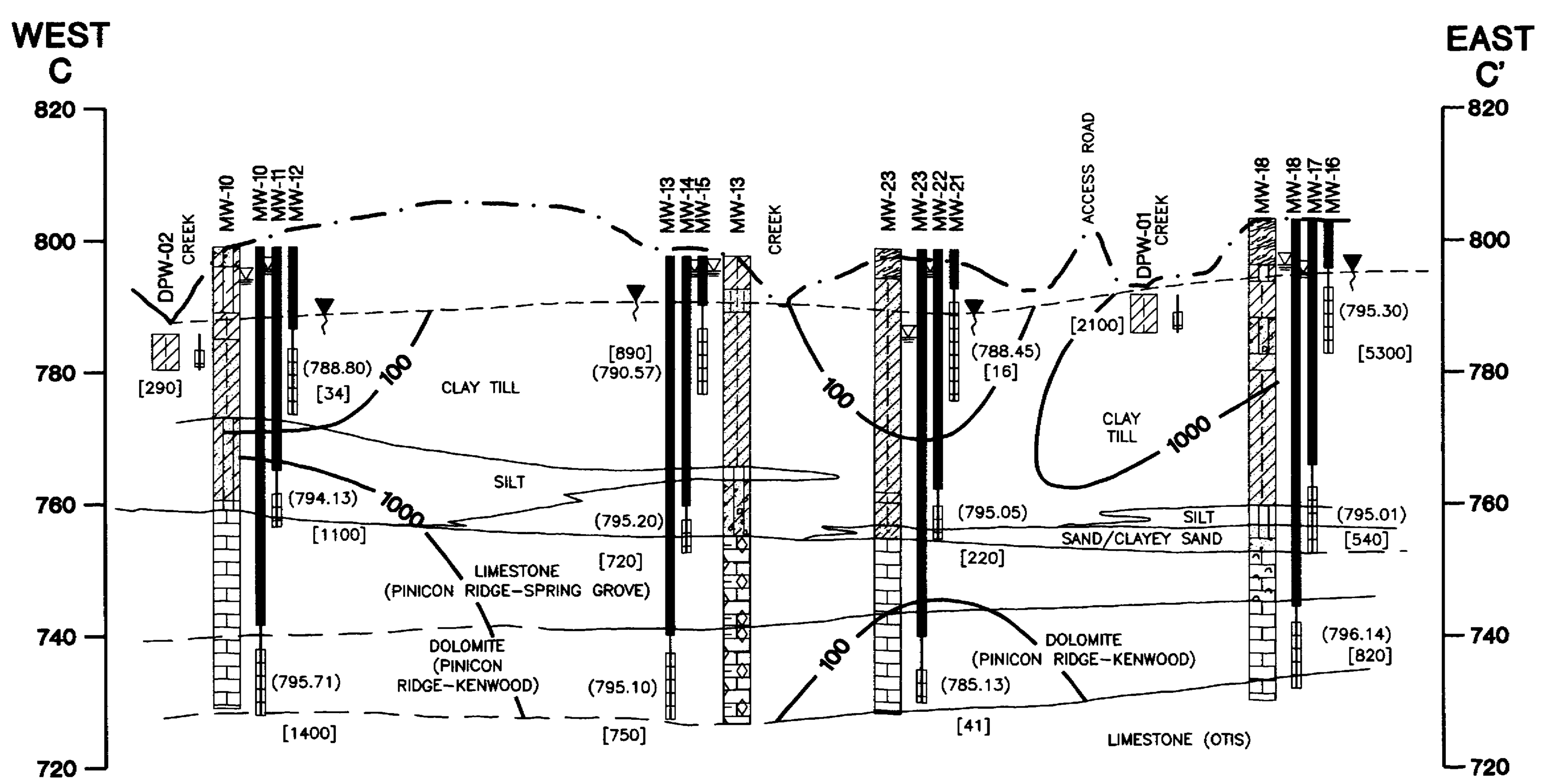
Figure 4 (Doc # 60411)

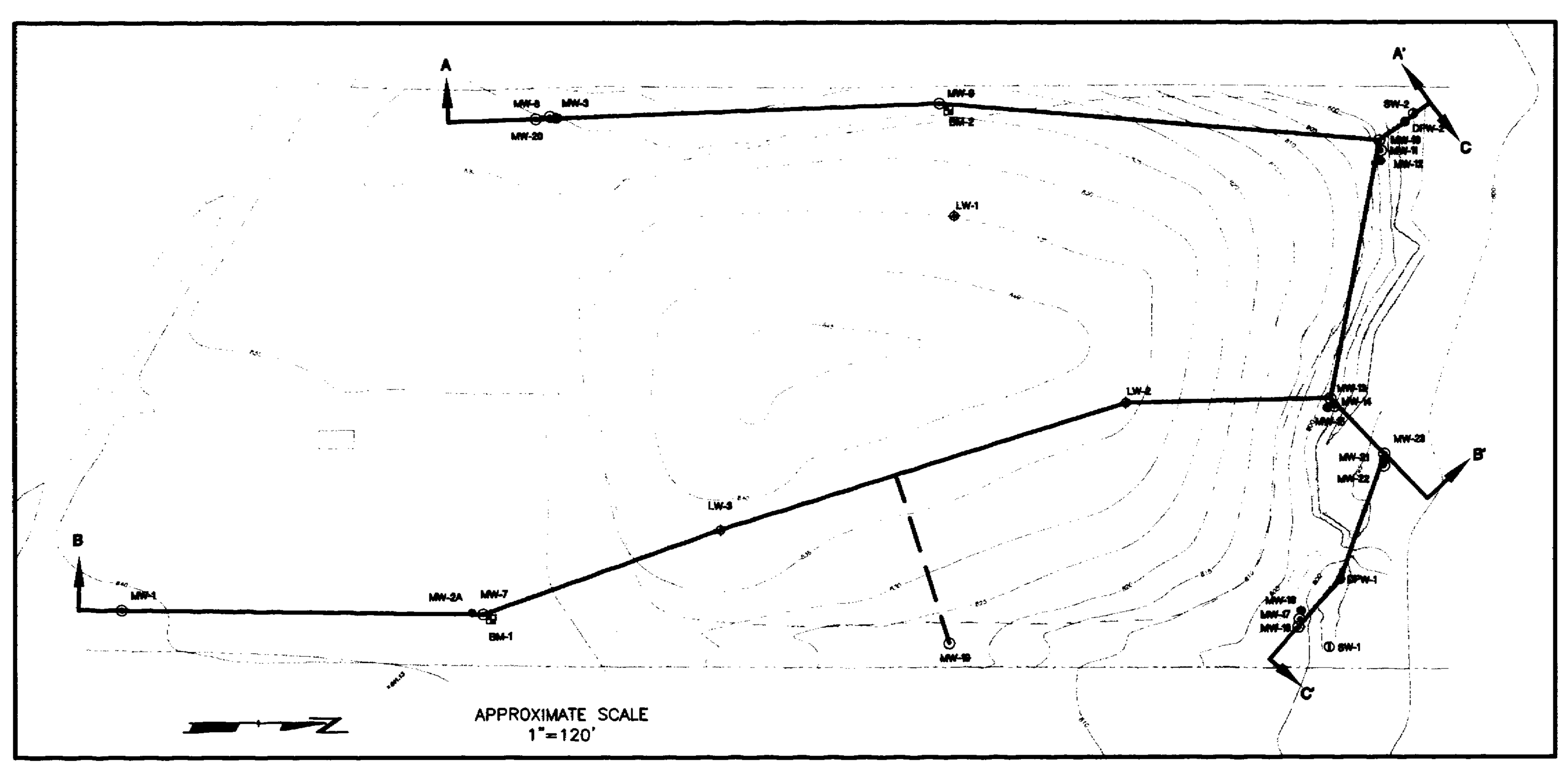
Figures 4-3 through 4-12 (Doc # 29592)

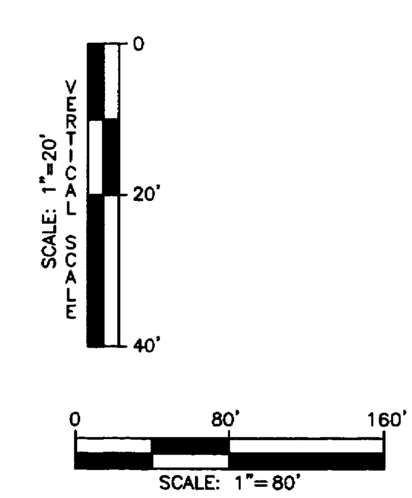
Figures 4, 6, & 7 (Doc # 60409)











VERTICAL SCALE EXAGGERATED 4X

LEGEND

- STRATIGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- UNCONFORMITY BOUNDARY
- EXISTING GROUND SURFACE
- WATER TABLE/SHALLOW GROUNDWATER SURFACE
- WATER ELEVATION IN DEEP PIEZOMETER
- (895.29) WATER ELEVATION IN WELL (FT. M.S.L.)
- [220] SULFATE CONCENTRATION (mg/L)
- [NS] NO SAMPLE
- 100 LINE OF EQUAL SULFATE CONCENTRATION

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN

GEOLOGIC SYMBOLOGY

CLAYS

- LEAN CLAY, WITH SAND/GRAVEL (CL)
- SILTY CLAY/SILTY CLAY WITH SAND/GRAVEL (CL-ML)
- SANDY SILTY CLAY/SANDY SILTY CLAY WITH GRAVEL (CL-ML)

SILTS

- SILT, WITH SAND/GRAVEL (ML)
- SANDY SILT, WITH GRAVEL (ML)
- SANDY, CLAYEY SILT (ML)

SANDS

- POORLY-GRADED SAND (SW OR SP)
- SILTY SAND/SILTY SAND WITH GRAVEL (SM)
- POORLY-GRADED SAND, WITH SILT/GRAVEL (SP-SM)
- CLAYEY SAND, WITH GRAVEL (SC)
- SILTY, CLAYEY SAND (SC-SM)

GRAVELS

- WELL-GRADED/POORLY-GRADED GRAVEL (GW OR GP)
- SILTY GRAVEL (GM)
- SILTY GRAVEL WITH SAND (GM), WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM)

BEDROCK

- DOLOSTONE
- SANDSTONE
- SHALE, MUDSTONE
- SILTY SANDSTONE
- SANDY, SILTY, SHALEY DOLOSTONE
- SILTSTONE

MISCELLANEOUS MATERIALS

- FILL
- TOPSOIL
- WASTE MATERIAL
- LIMESTONE
- FOSSILIFEROUS LIMESTONE
- BRECCIATED LIMESTONE

NOTES

1. THE CORRELATION LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
2. HORIZONTAL DISTANCES ARE MEASURED AND THE WATER TABLE DATA ARE PLOTTED WITH RESPECT TO THE CENTER OF EACH BORING LOCATION. WELL CONSTRUCTION SCHEMATICS ARE OFFSET FOR CLARITY.
3. ELEVATIONS ARE SHOWN IN REFERENCE TO USGS MEAN SEA LEVEL (M.S.L.) DATUM.
4. REFER TO THE GROUNDWATER QUALITY ASSESSMENT REPORT APPENDICES FOR DETAILED LITHOLOGICAL DESCRIPTIONS, MONITORING WELL CONSTRUCTION DETAILS AND FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS.
5. REFER TO FIGURE 3 FOR DETAILED SITE LAYOUT INFORMATION.
6. SHALLOW GROUNDWATER FLOW SURFACE BASED ON ELEVATIONS MEASURED IN SEPTEMBER 2005, EXCEPT FOR MW-3 (AUGUST 2005) AND MW-20 (OCTOBER 2005).
7. SULFATE RESULTS FROM DATA ANALYZED IN SEPTEMBER 2005 EXCEPT FOR MW-20 (JUNE 2005) AND MW-9 (SEPTEMBER 2003).
8. BASE OF LANDFILL APPROXIMATE.

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.

NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

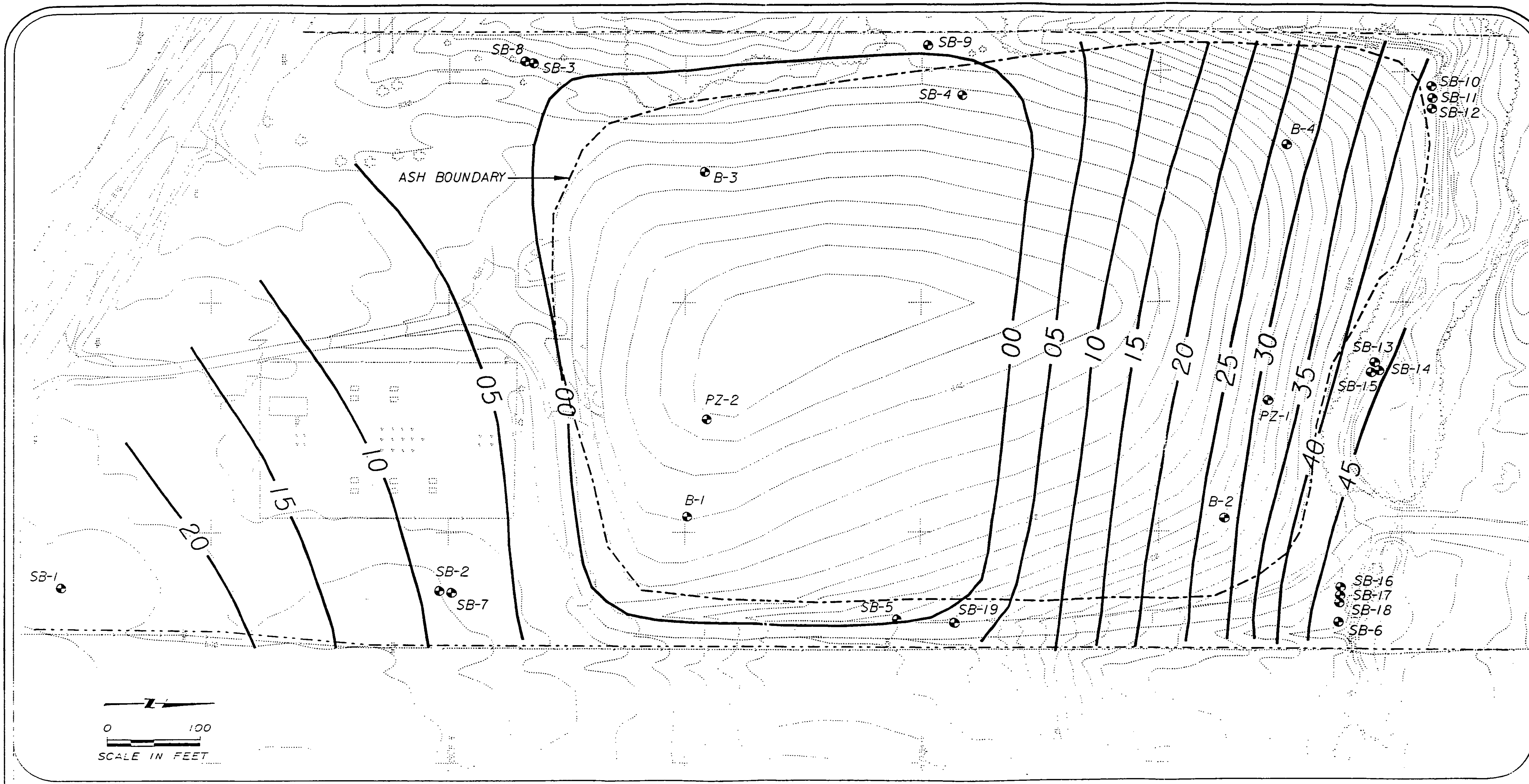
PROJECT: **INTERSTATE POWER AND LIGHT CO. STONEY POINT LANDFILL - CEDAR RAPIDS, IOWA GROUNDWATER QUALITY ASSESSMENT REPORT**

SHEET TITLE: **GEOLOGIC CROSS SECTIONS WITH SULFATE CONCENTRATIONS**

DRAWN BY: FIEBRANT	SCALE: AS SHOWN	PROJ. NO. 4774.19
CHECKED BY: JCO		FILE NO. XSECTIONS 1.dwg
APPROVED BY: JMR	DATE PRINTED: NOV 30 2005	**FIGURE 4**
DATE: NOVEMBER 2005		

RMT INC.
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923 53708-8923
Phone: 608-831-4444
Fax: 608-831-3334

Con 12-1-1
Doc # 60411



NOTE: - CONTOUR INTERVAL = 5.0 FT.

JMM James M. Montgomery
Consulting Engineers, Inc.

LEGEND:

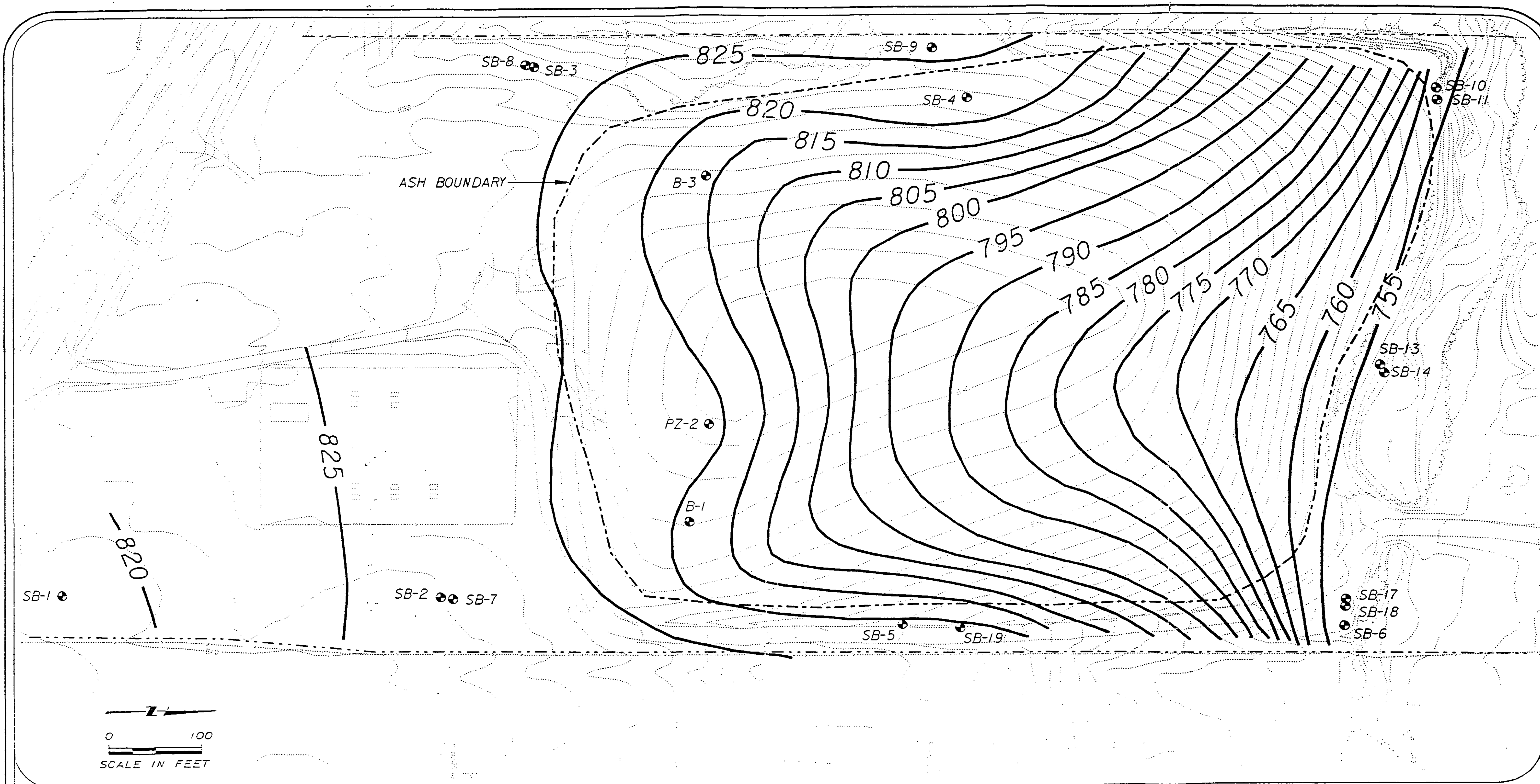
SOIL BORING

CONTOUR LINE OF EQUAL THICKNESS (FT.)

IOWA ELECTRIC LIGHT AND POWER COMPANY
STONEY POINT

UNCONSOLIDATED DEPOSITS ISOPACH MAP

FIGURE 4-2



NOTE: - CONTOUR INTERVAL = 5.0 FT. NGVD

JMM James M. Montgomery
Consulting Engineers, Inc.

LEGEND:

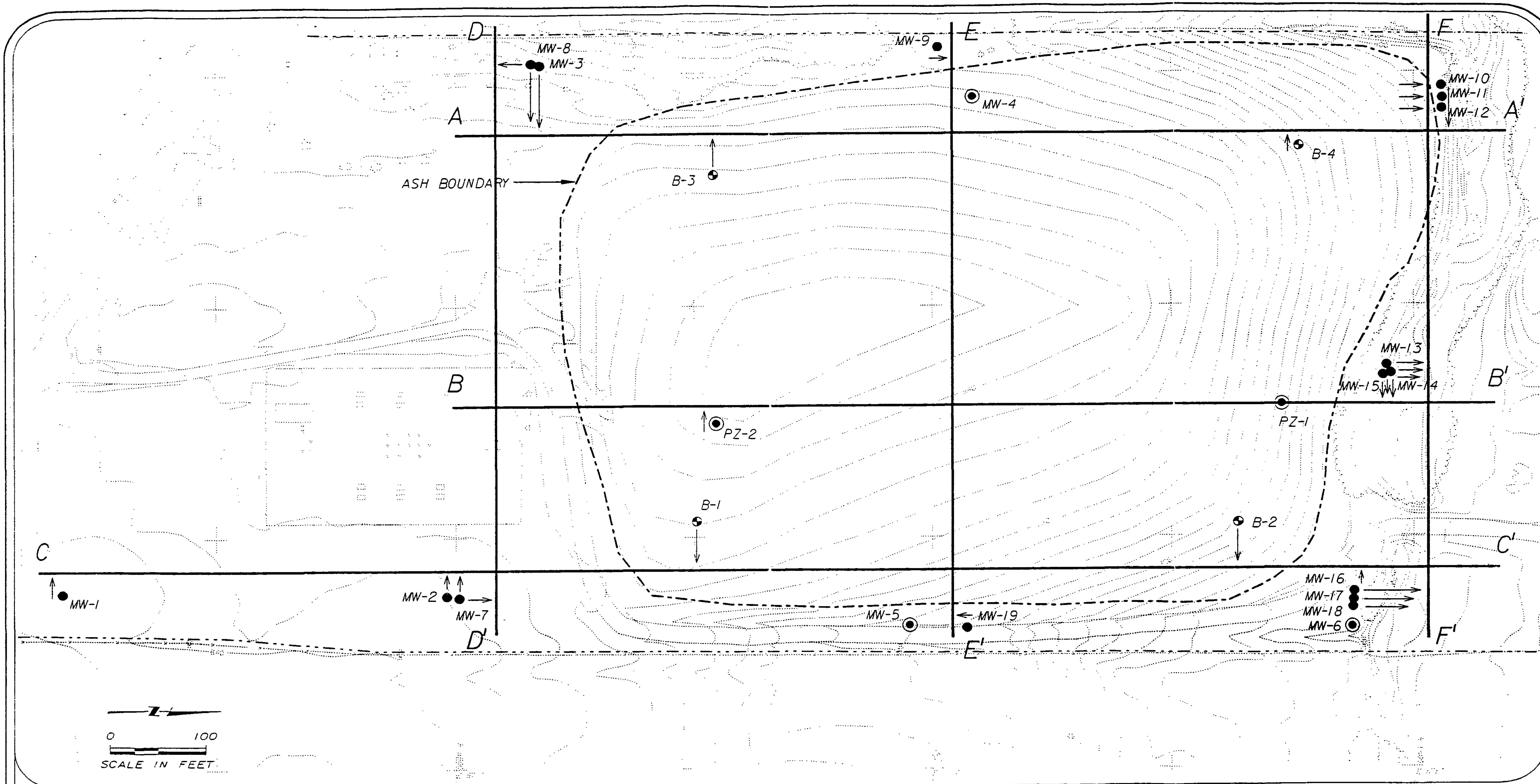
SOIL BORING THAT REACHED BEDROCK

BEDROCK SURFACE CONTOUR

IOWA ELECTRIC LIGHT AND POWER COMPANY
STONEY POINT

BEDROCK SURFACE CONTOURS

FIGURE 4-3



LEGEND:

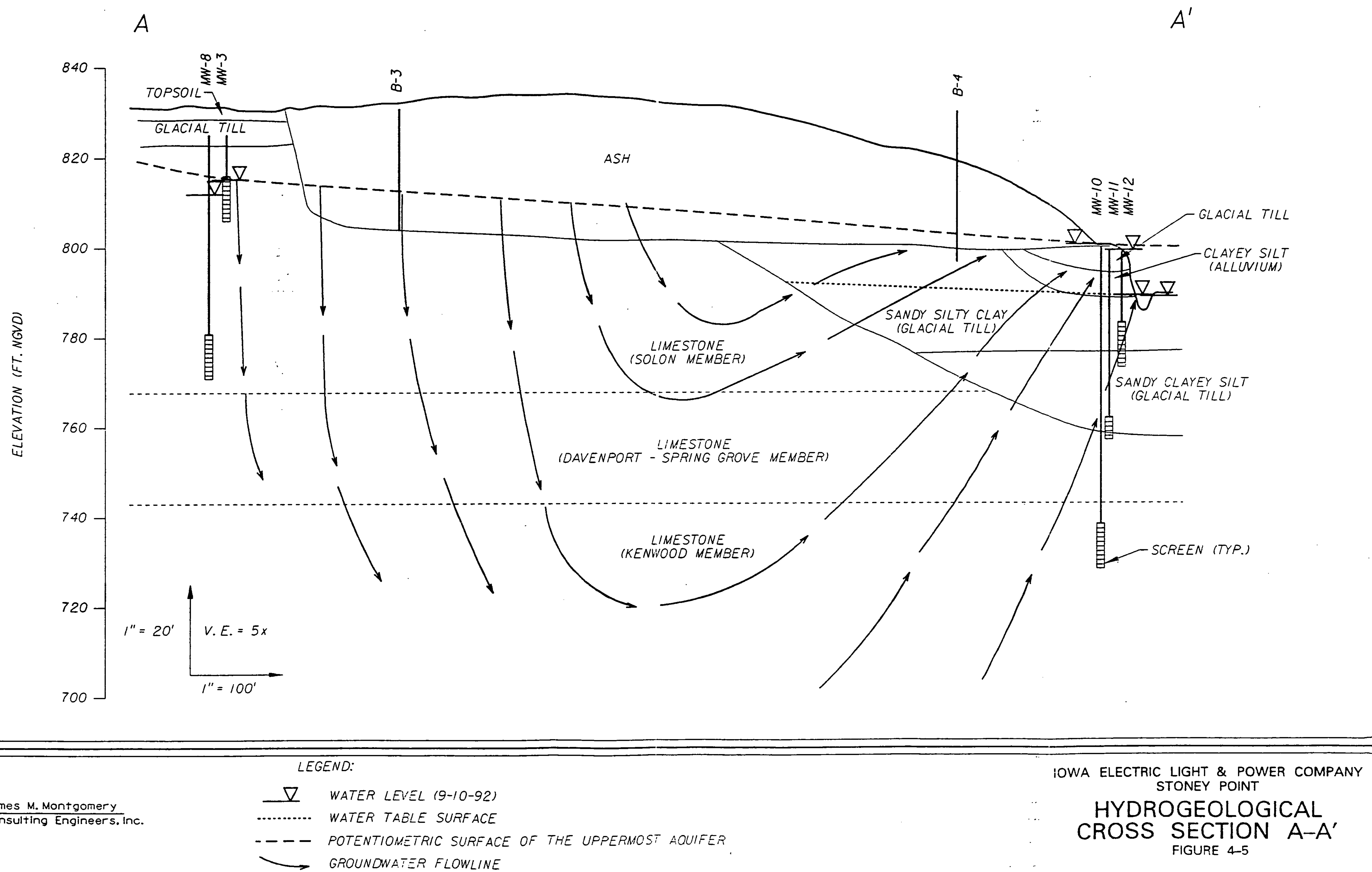
- ⊙ ABANDONED MONITORING WELL / PIEZOMETER
- ◒ SOIL BORING
- ● MONITORING WELL
- A ——— A' CROSS SECTION LINE

JMM James M. Montgomery
Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT AND POWER COMPANY
STONEY POINT

CROSS SECTION LOCATIONS

FIGURE 4-4

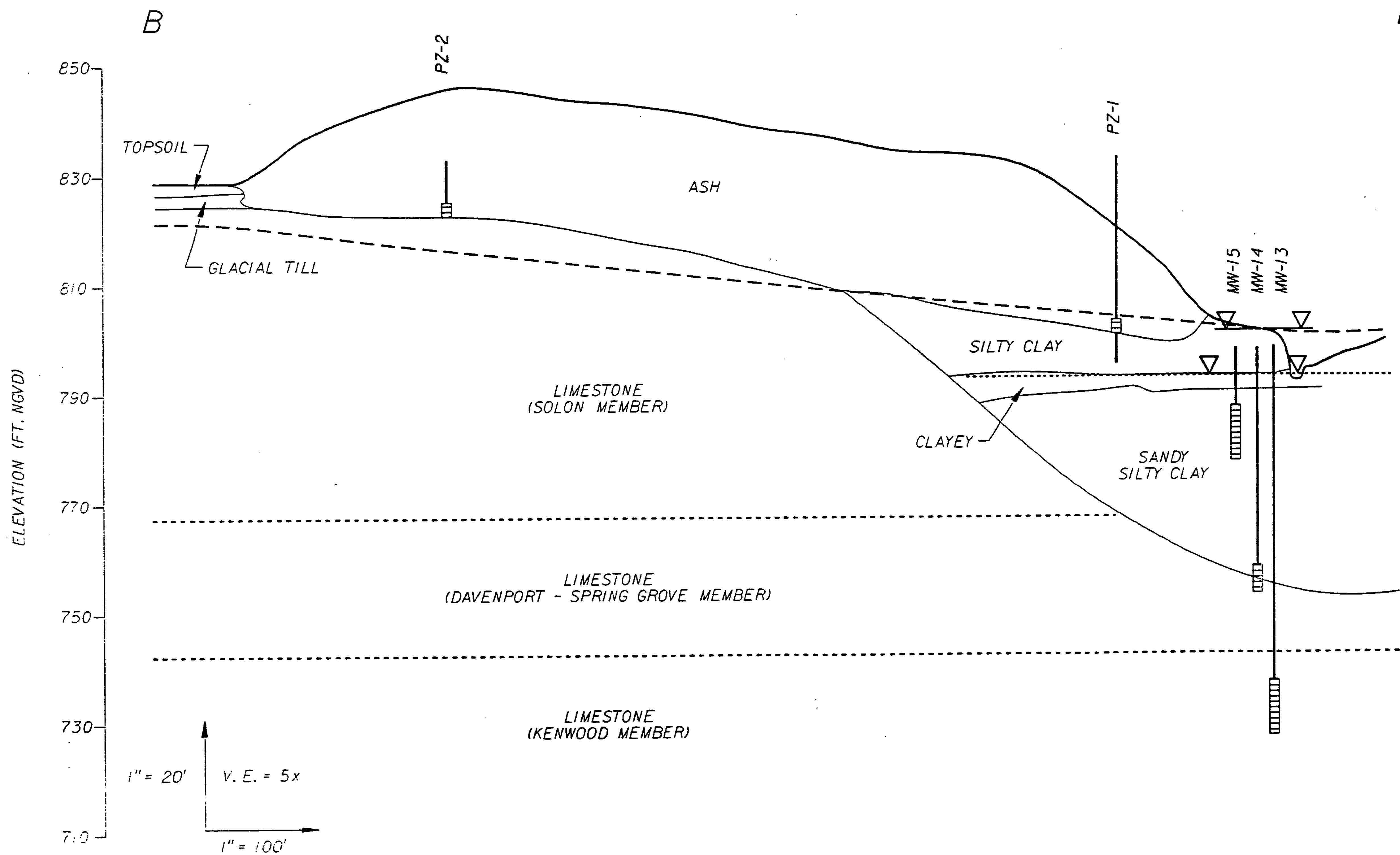


JMM James M. Montgomery Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT

HYDROGEOLOGICAL CROSS SECTION A–A'

FIGURE 4–5



LEGEND:

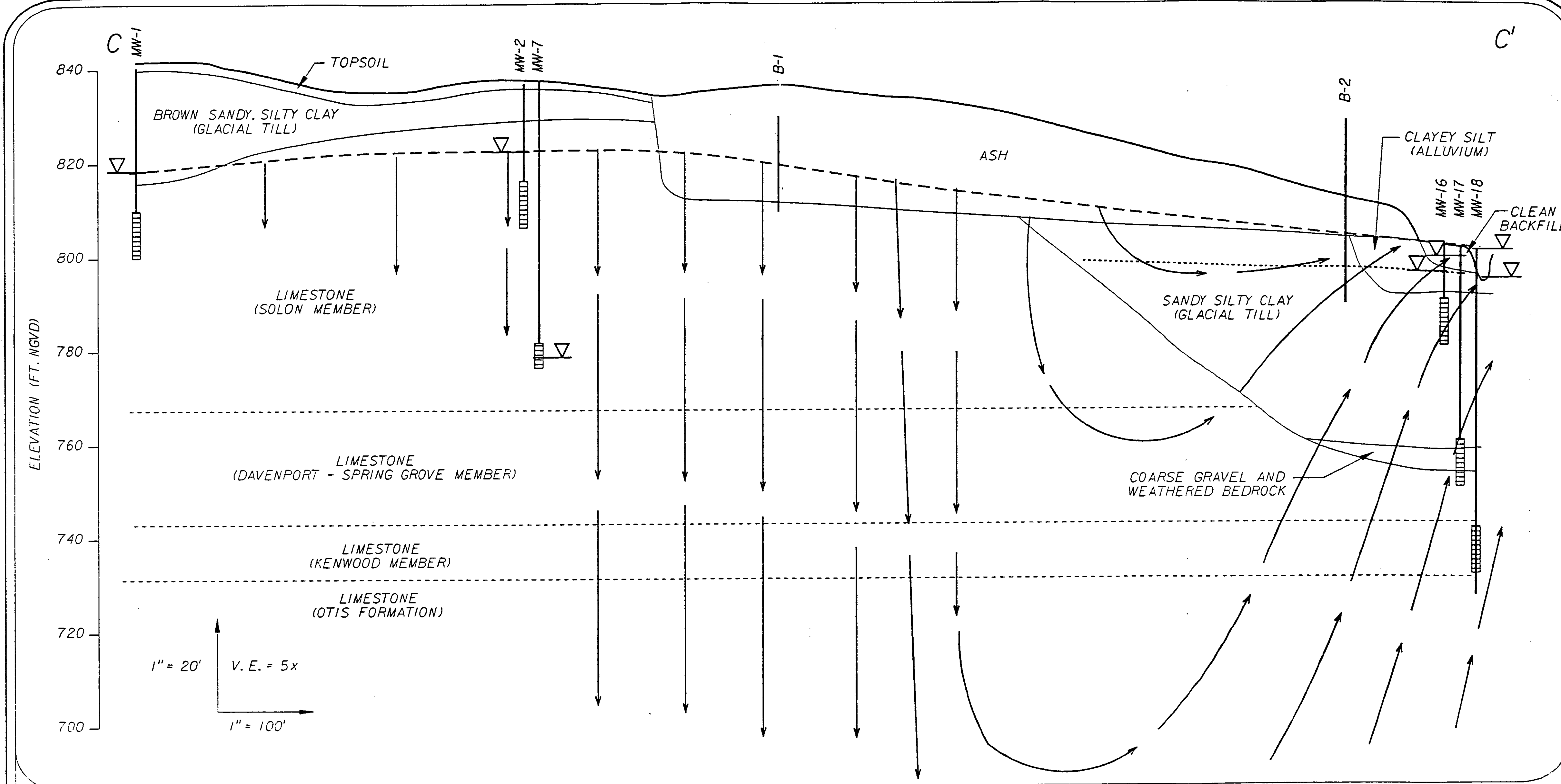
- WATER LEVEL (9-10-92)
- WATER TABLE SURFACE
- POTENTIOMETRIC SURFACE OF THE UPPERMOST AQUIFER

JMM James M. Montgomery, Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT

HYDROGEOLOGICAL CROSS SECTION B–B'

FIGURE 4–6



LEGEND:

WATER LEVEL (9-10-92)

WATER TABLE SURFACE

POTENTIOMETRIC SURFACE OF THE UPPERMOST AQUIFER

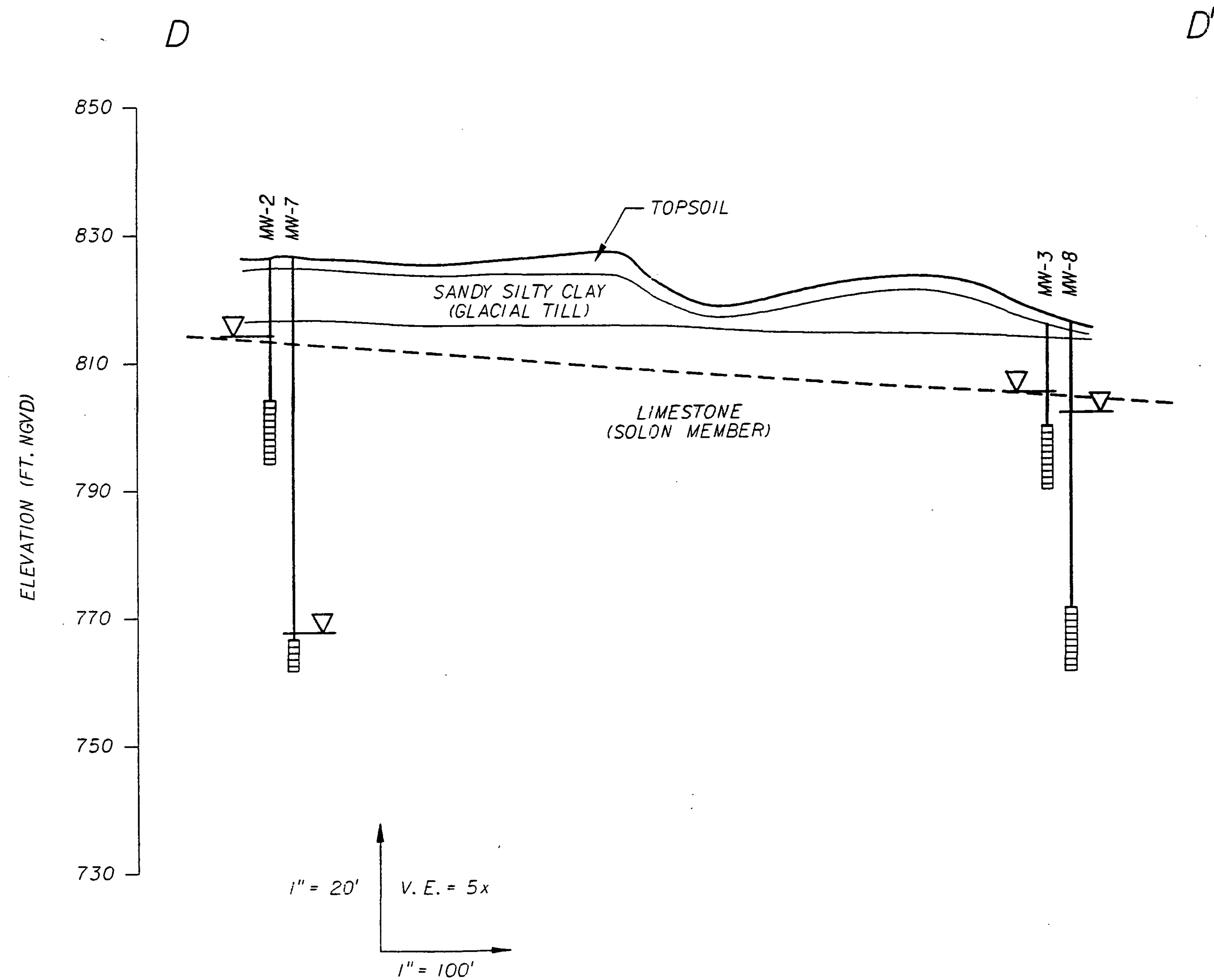
GROUNDWATER FLOWLINE

JMM James M. Montgomery
Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT

HYDROGEOLOGICAL
CROSS SECTION C–C'

FIGURE 4–7



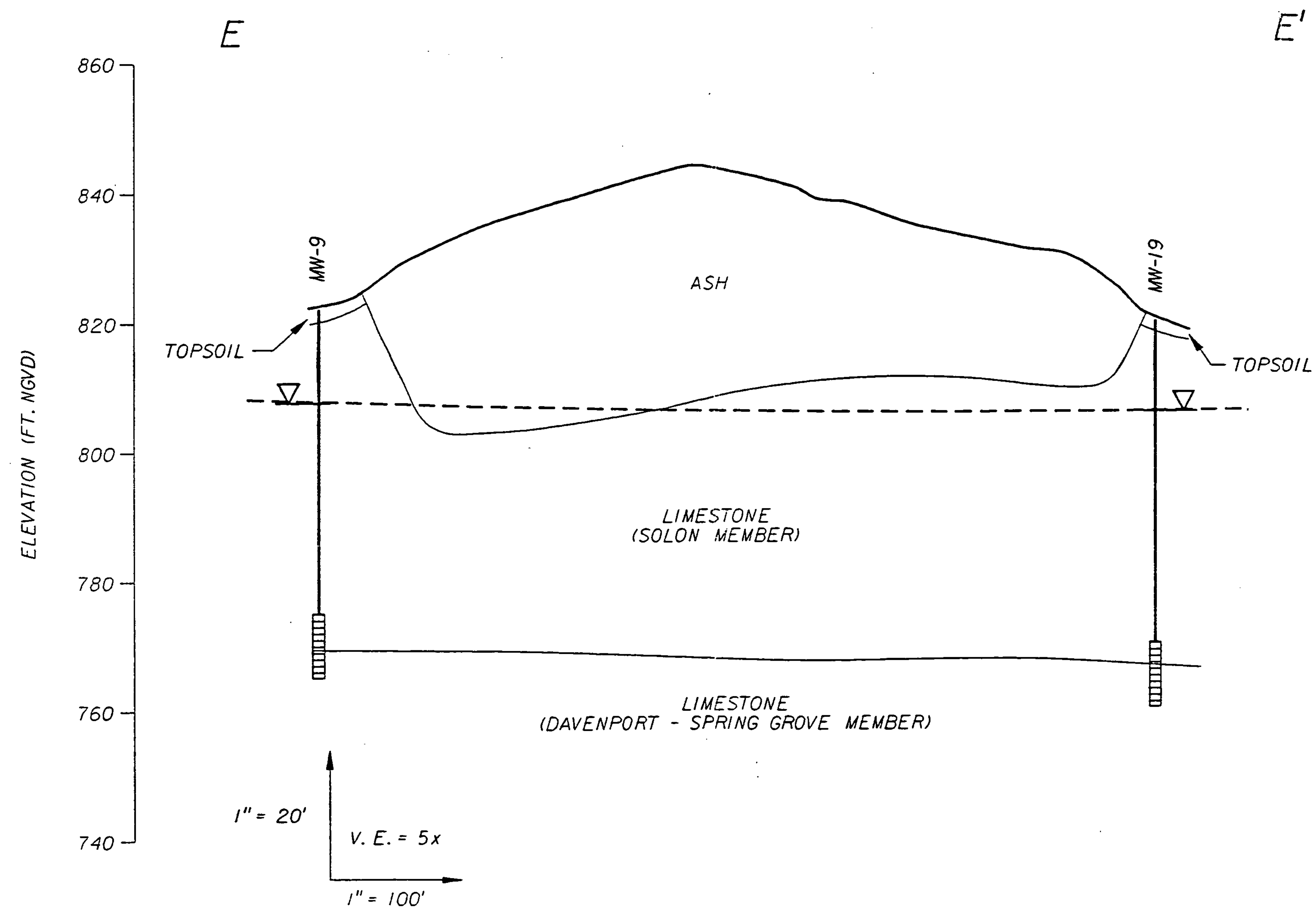
LEGEND:

WATER LEVEL (9-10-92)

POTENTIOMETRIC SURFACE OF THE UPPERMOST AQUIFER

JMM James M. Montgomery
Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT
HYDROGEOLOGICAL
CROSS SECTION D–D'
FIGURE 4–8



LEGEND:

▽ WATER LEVEL (9-10-92)

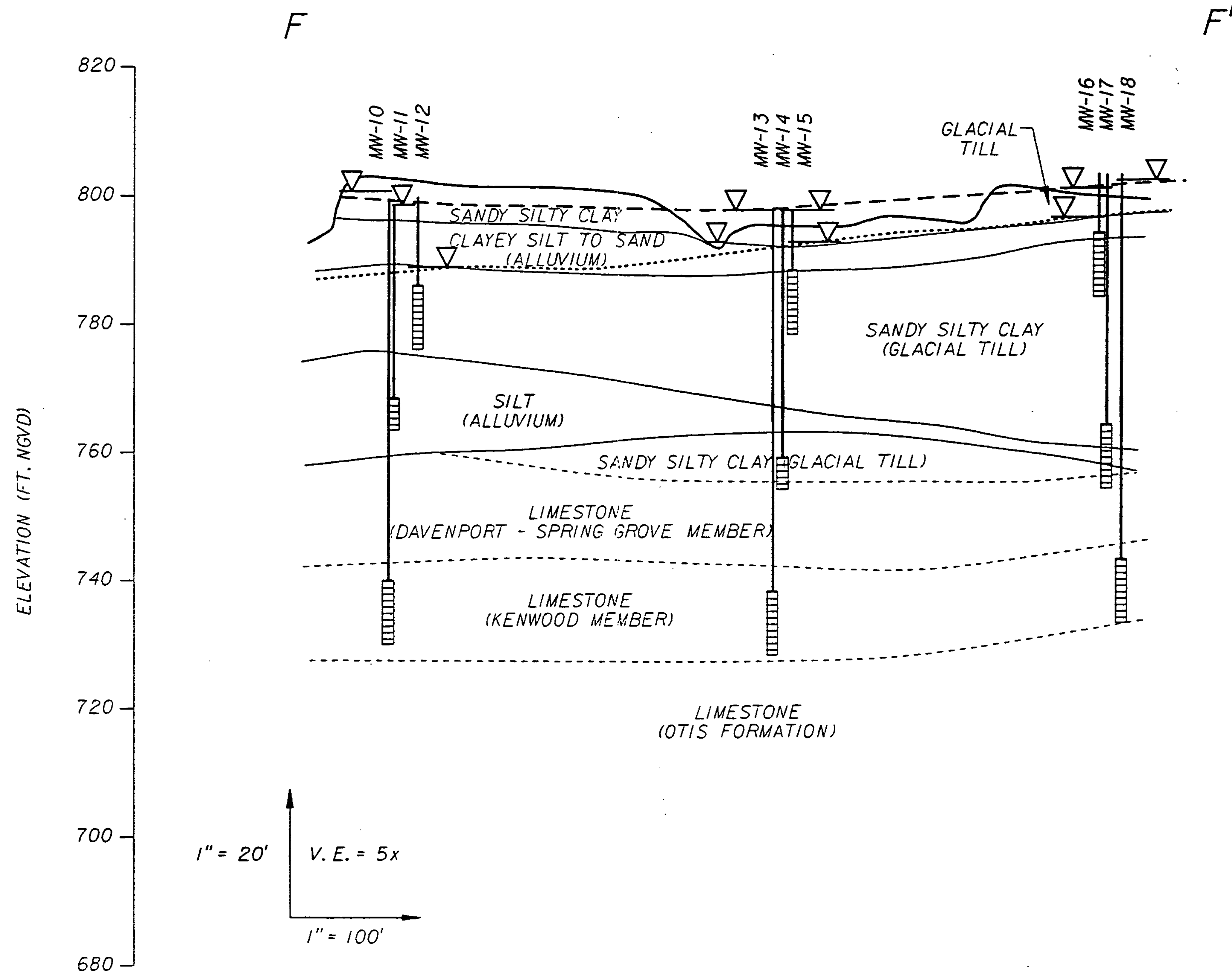
- - - - POTENTIOMETRIC SURFACE OF THE UPPERMOST AQUIFER

JMM James M. Montgomery
Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT

HYDROGEOLOGICAL
CROSS SECTION E–E'

FIGURE 4–9



LEGEND:

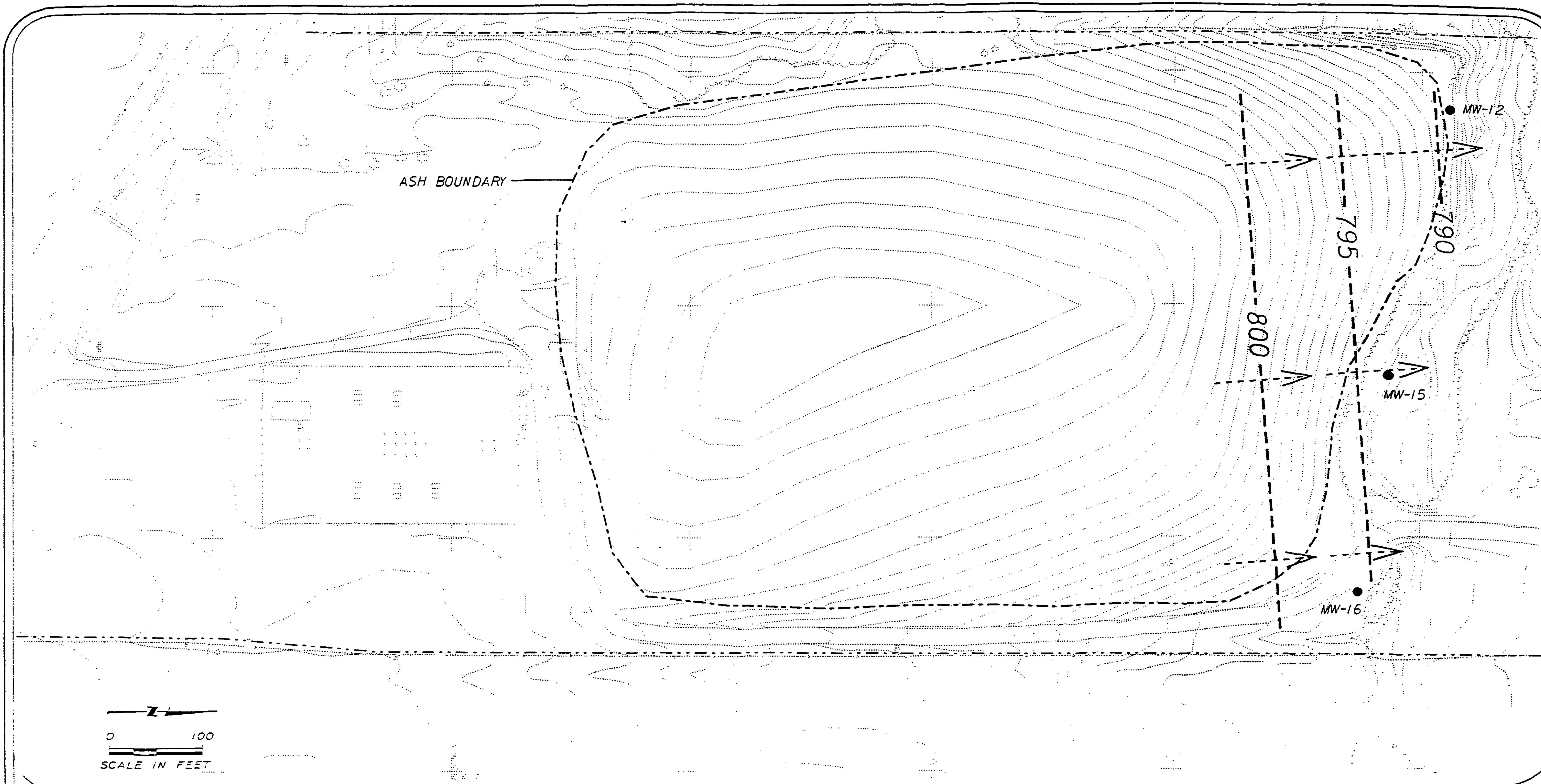
- ▽ WATER LEVEL (9-10-92)
- ··········· WATER TABLE SURFACE
- – – – – POTENTIOMETRIC SURFACE OF THE UPPERMOST AQUIFER

JMM James M. Montgomery
Consulting Engineers, Inc.

IOWA ELECTRIC LIGHT & POWER COMPANY
STONEY POINT

HYDROGEOLOGICAL CROSS SECTION F–F'

FIGURE 4–10



NOTE: - CONTOUR INTERVAL = 5.0 FT. NGVD

JMM James M. Montgomery
Consulting Engineers, Inc.

LEGEND:

● WATER TABLE MONITORING WELL

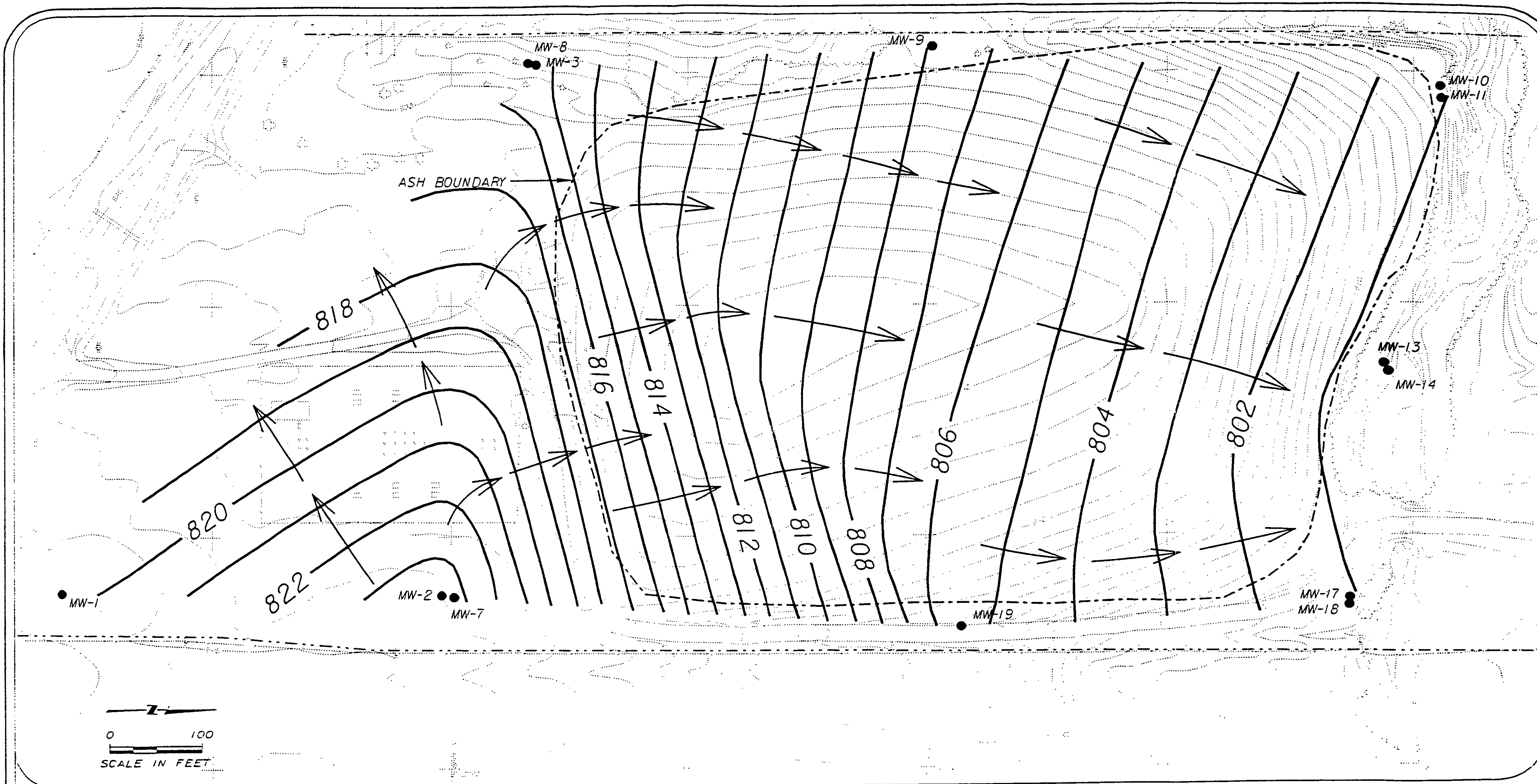
- - - -> APPROXIMATED GROUNDWATER FLOW DIRECTION

800 - - - - APPROXIMATED GROUNDWATER CONTOUR LINE

IOWA ELECTRIC LIGHT AND POWER COMPANY
STONEY POINT

WATER TABLE SURFACE
(09–10–92)

FIGURE 4–11



NOTE: - CONTOUR INTERVAL = 1.0 FT. NGVD

JMM James M. Montgomery
Consulting Engineers, Inc.

LEGEND:

● MIDDLE DEVONIAN AQUIFER MONITORING WELL

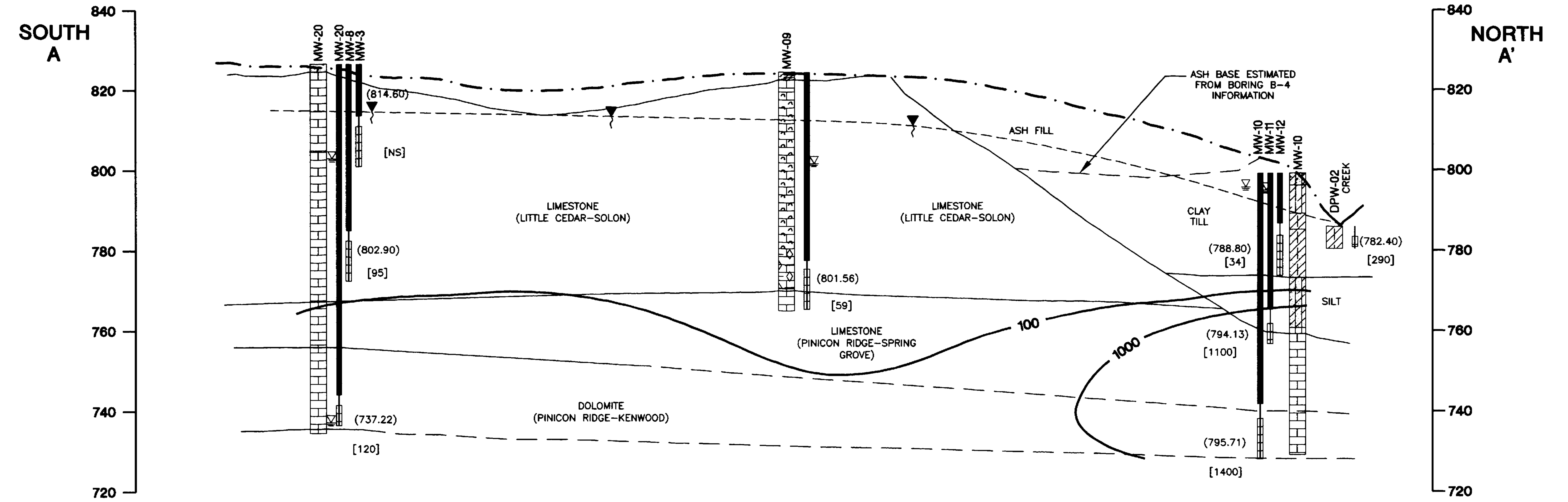
→ GROUNDWATER FLOW DIRECTION

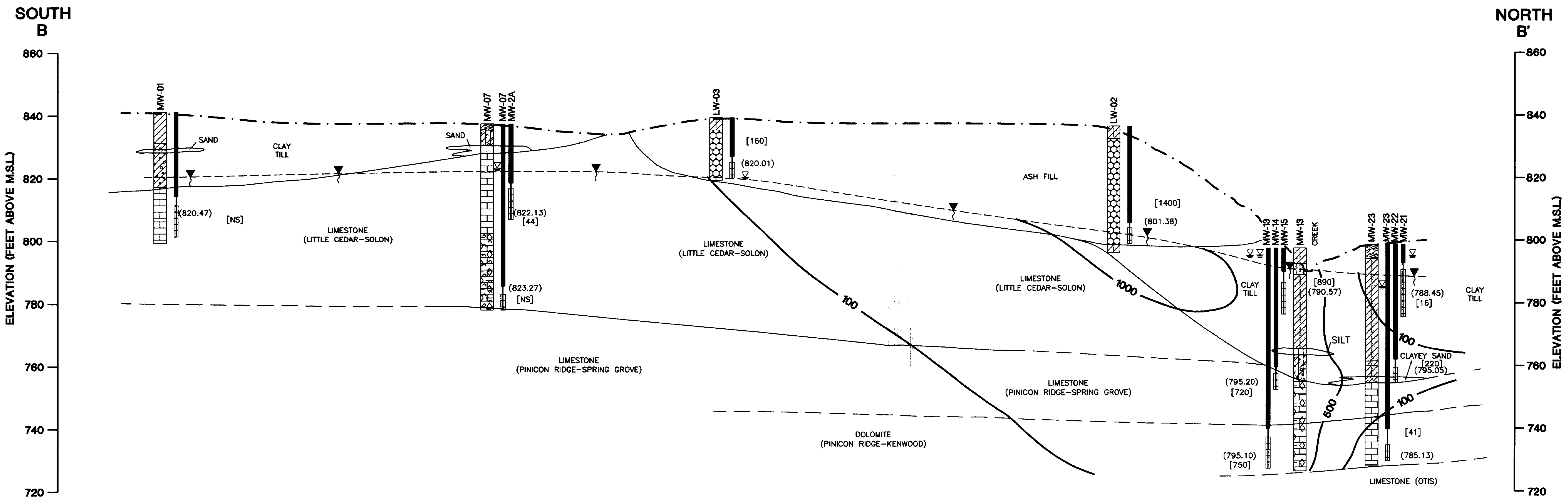
802 — EQUIPOTENTIAL LINE

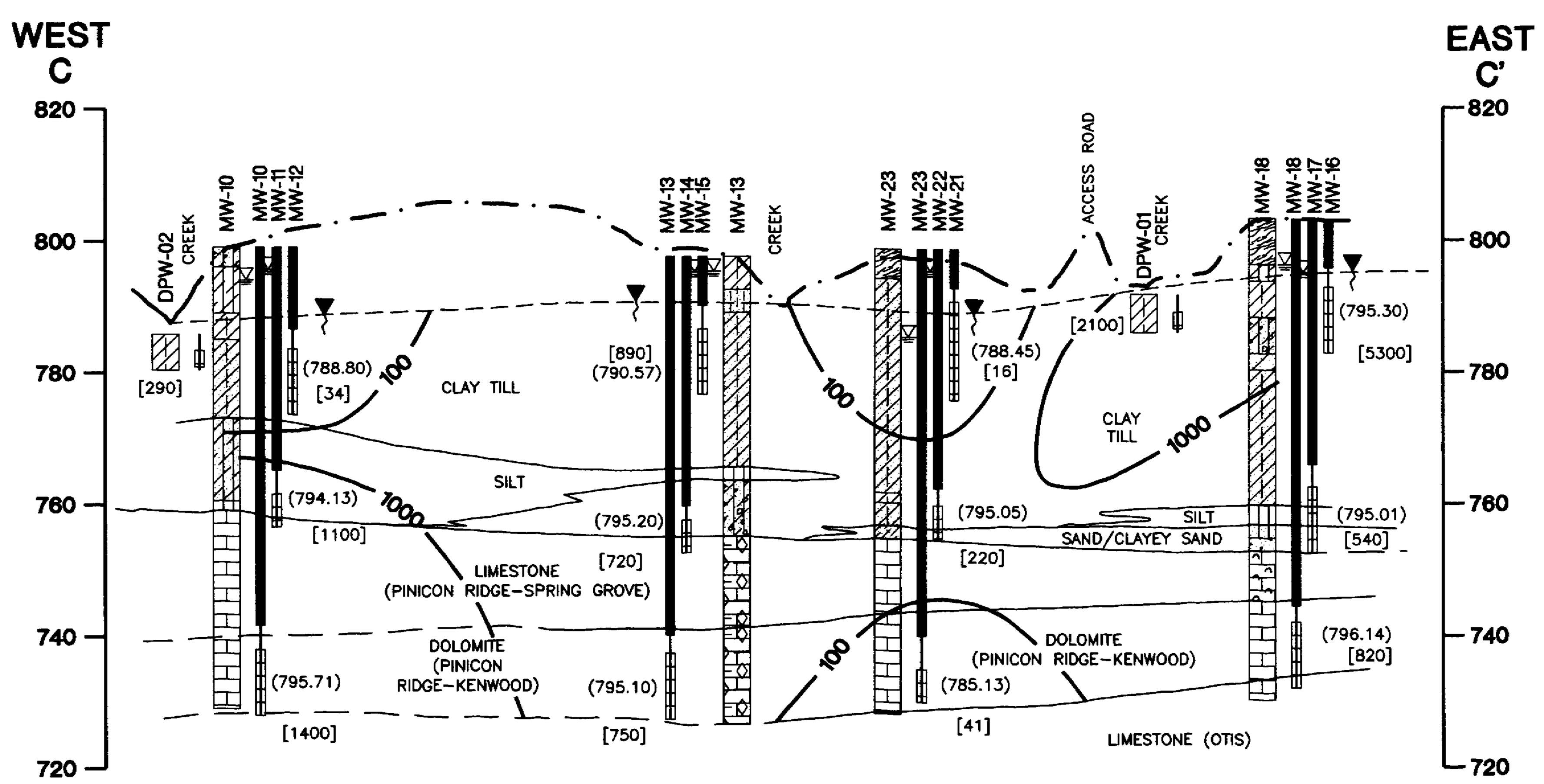
IOWA ELECTRIC LIGHT AND POWER COMPANY
STONEY POINT

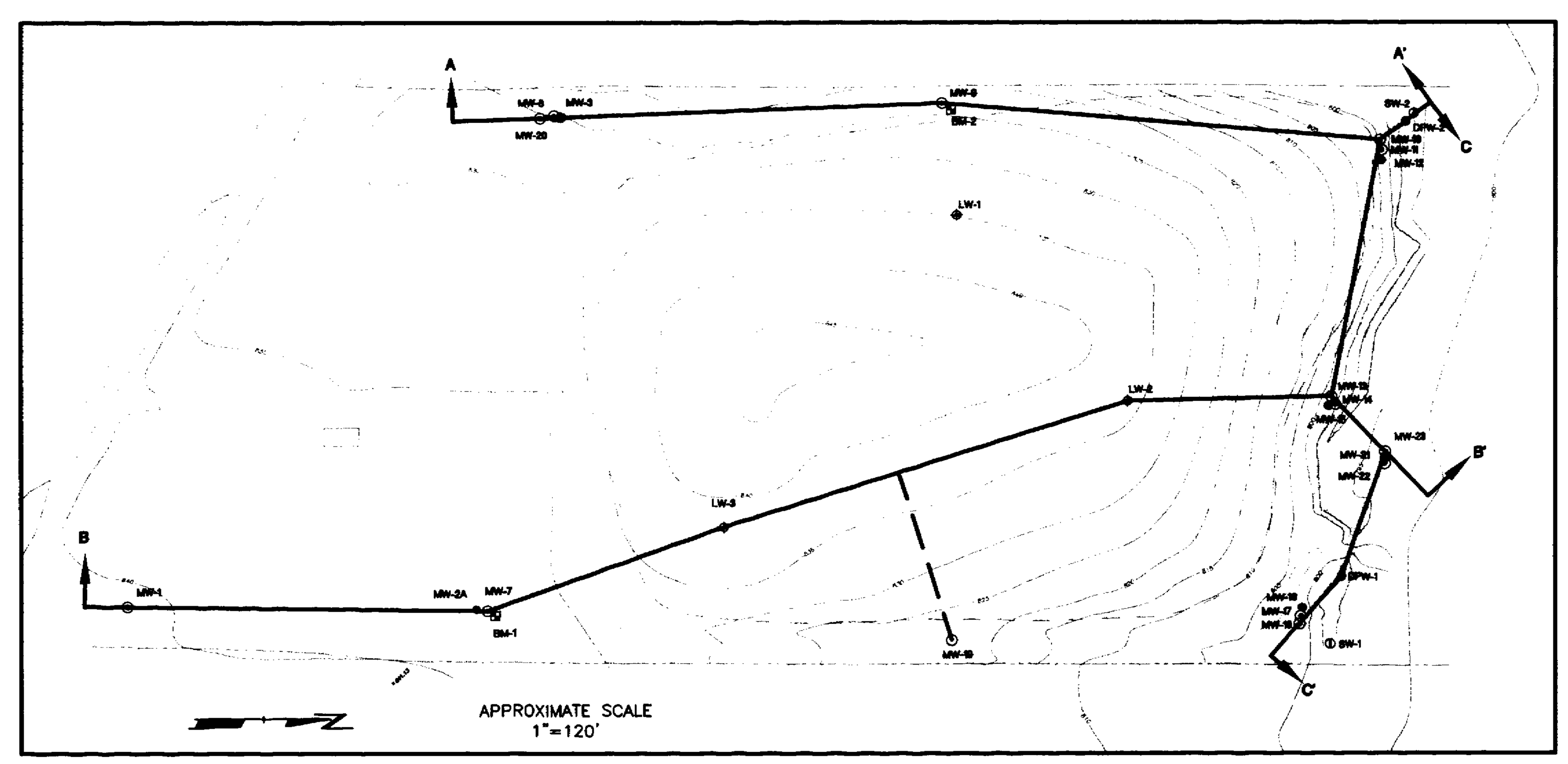
MIDDLE DEVONIAN AQUIFER POTENTIOMETRIC SURFACE (09-10-92)

FIGURE 4-12









SCALE: 1"=20'
VERTICAL SCALE
0
20'
40'

0 80' 160'
SCALE: 1"=80'
HORIZONTAL SCALE

VERTICAL SCALE EXAGGERATED 4X

LEGEND

- STRATIGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- UNCONFORMITY BOUNDARY
- EXISTING GROUND SURFACE
- WATER TABLE/SHALLOW GROUNDWATER SURFACE
- WATER ELEVATION IN DEEP PIEZOMETER
- (895.29) WATER ELEVATION IN WELL (FT. M.S.L.)
- [220] SULFATE CONCENTRATION (mg/L)
- [NS] NO SAMPLE
- 100 LINE OF EQUAL SULFATE CONCENTRATION

WELL CONSTRUCTION
- WELL SEAL
- WELL CASING
- WELL SCREEN

GEOLOGIC SYMBOLOGY

CLAYS
- LEAN CLAY, WITH SAND/GRAVEL (CL)
- SILTY CLAY/SILTY CLAY WITH SAND/GRAVEL (CL-ML)
- SANDY SILTY CLAY/SANDY SILTY CLAY WITH GRAVEL (CL-ML)

SILTS
- SILT, WITH SAND/GRAVEL (ML)
- SANDY SILT, WITH GRAVEL (ML)
- SANDY, CLAYEY SILT (ML)

SANDS
- POORLY-GRADED SAND (SW OR SP)
- SILTY SAND/SILTY SAND WITH GRAVEL (SM)
- POORLY-GRADED SAND, WITH SILT/GRAVEL (SP-SM)
- CLAYEY SAND, WITH GRAVEL (SC)
- SILTY, CLAYEY SAND (SC-SM)

GRAVELS
- WELL-GRADED/POORLY-GRADED GRAVEL (GW OR GP)
- SILTY GRAVEL (GM)
- SILTY GRAVEL WITH SAND (GM), WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM)

BEDROCK
- DOLOSTONE
- SANDSTONE
- SHALE, MUDSTONE
- SILTY SANDSTONE
- SANDY, SILTY, SHALEY DOLOSTONE
- SILTSTONE

MISCELLANEOUS MATERIALS
- FILL
- TOPSOIL
- WASTE MATERIAL
- LIMESTONE
- FOSSILIFEROUS LIMESTONE
- BRECCIATED LIMESTONE

NOTES

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3. ELEVATIONS ARE SHOWN IN REFERENCE TO USGS MEAN SEA LEVEL (M.S.L.) DATUM.
4. REFER TO THE GROUNDWATER QUALITY ASSESSMENT REPORT APPENDICES FOR DETAILED LITHOLOGICAL DESCRIPTIONS, MONITORING WELL CONSTRUCTION DETAILS AND FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS.
5. REFER TO FIGURE 3 FOR DETAILED SITE LAYOUT INFORMATION.
6. SHALLOW GROUNDWATER FLOW SURFACE BASED ON ELEVATIONS MEASURED IN SEPTEMBER 2005, EXCEPT FOR MW-3 (AUGUST 2005) AND MW-20 (OCTOBER 2005).
7. SULFATE RESULTS FROM DATA ANALYZED IN SEPTEMBER 2005 EXCEPT FOR MW-20 (JUNE 2005) AND MW-9 (SEPTEMBER 2003).
8. BASE OF LANDFILL APPROXIMATE.

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NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

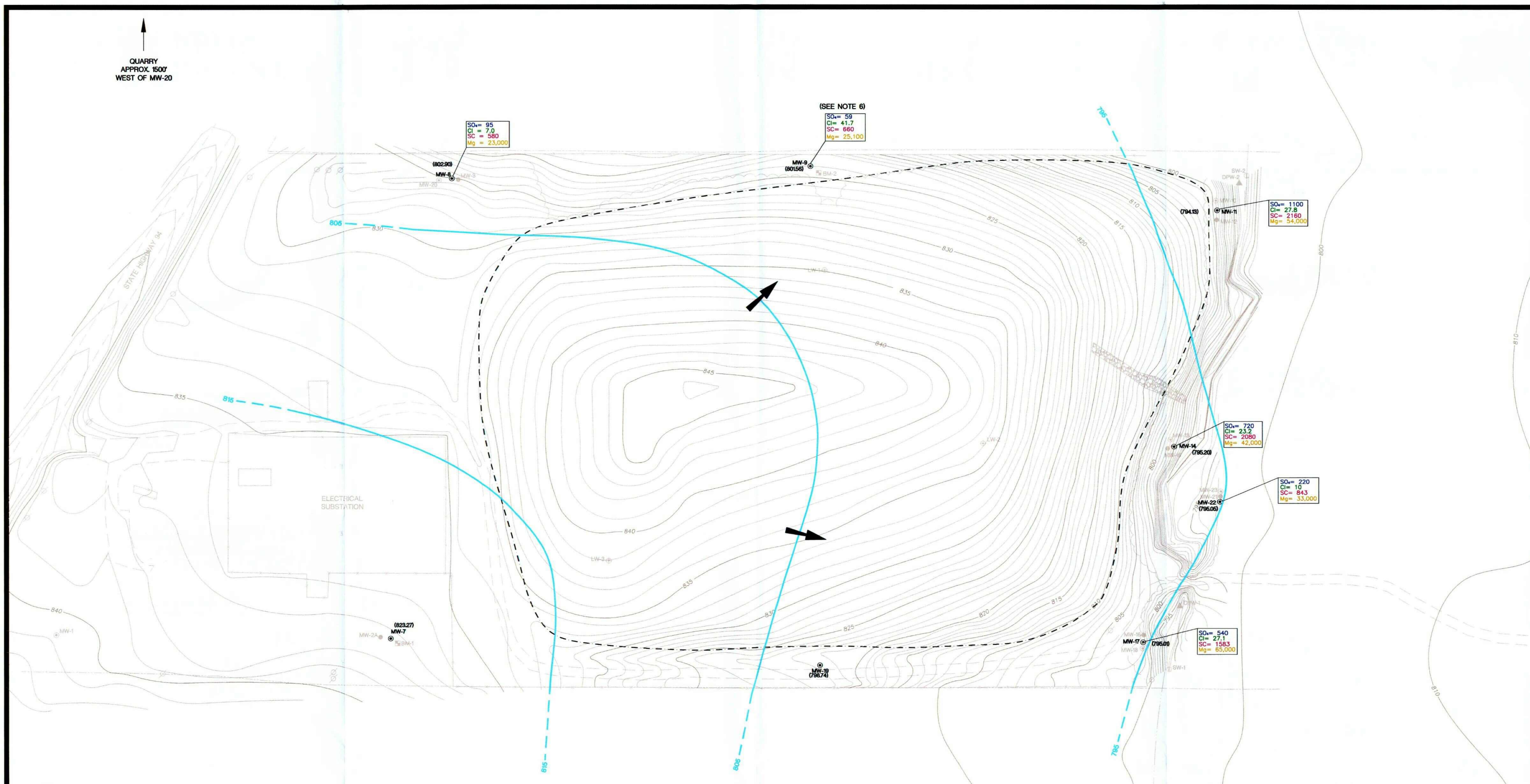
PROJECT: **INTERSTATE POWER AND LIGHT CO.**
STONEY POINT LANDFILL - CEDAR RAPIDS, IOWA
GROUNDWATER QUALITY ASSESSMENT REPORT

SHEET TITLE: **GEOLOGIC CROSS SECTIONS WITH SULFATE CONCENTRATIONS**

DRAWN BY: FIEBRANT	SCALE: AS SHOWN	PROJ. NO. 4774.19
CHECKED BY: JCO		FILE NO. XSECTIONS 1.dwg
APPROVED BY: JMR	DATE PRINTED: NOV 30 2005	**FIGURE 4**
DATE: NOVEMBER 2005		

RMT INC.
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923 53708-8923
Phone: 608-831-4444
Fax: 608-831-3334

Con 12-1-1
Doc # 60411



LEGEND

MW-12	WATER TABLE MONITORING WELL
MW-13	DEEP MONITORING WELL
SW-1	SURFACE WATER MONITORING STAFF GAUGE LOCATION
BM-1	BENCHMARK
LW-3	LEACHATE HEAD WELL
DPW-1	DRIVE POINT WELL
	POWER POLE
795	POTENTIOMETRIC CONTOUR 10-FOOT INTERVAL (DASHED WHERE INFERED)
(795.05)	GROUND WATER ELEVATION (FT. MSL)
	GROUNDWATER FLOW DIRECTION
SO_4=	SULFATE CONCENTRATION (mg/L)
Cl=	CHLORIDE CONCENTRATION (mg/L)
SC=	SPECIFIC CONDUCTANCE (μmhos/cm)
Mg=	MAGNESIUM CONCENTRATION (ug/L)
	UNNAMED CREEK
	APPROXIMATE LIMITS OF ASH DISPOSAL
	ACCESS ROAD
	PROPERTY LINE
	TREE LINE
810	EXISTING GROUND SURFACE CONTOURS
	RIPRAP FLUME
	GATE

NOTES:

1. MAP BASED ON A SURVEY PREPARED BY JENKINS SURVEY & DESIGN, INC., VERONA, WISCONSIN FOR RMT, INC. SURVEY COMPLETED DURING THE WEEK OF AUGUST 24, 2005.
2. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS 1 FOOT.
3. CONTOURS TO THE NORTH OF STREAM AND EAST OF THE SITE ARE DIGITIZED FROM CEDAR RAPIDS SOUTH, IOWA 7.5 MINUTE USGS QUADRANGLE.
4. SELECTED SITE FEATURES (i.e. LIMITS OF ASH DISPOSAL LINE AND PROPERTY LINE) HAVE BEEN DIGITIZED FROM A BASE MAP PREPARED BY MONTGOMERY WATSON.
5. GROUNDWATER CHEMISTRY DATA AND WATER LEVELS ARE FROM SAMPLES COLLECTED AND MEASUREMENTS MADE ON SEPTEMBER 12 AND 13, 2005 EXCEPT WHERE INDICATED.
6. GROUNDWATER CHEMISTRY DATA FOR MW-9 COLLECTED ON 9/13/03.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: **INTERSTATE POWER AND LIGHT CO.**
STONEY POINT LANDFILL-CEDAR RAPIDS, IOWA
GROUNDWATER QUALITY ASSESSMENT REPORT

SHEET TITLE: **INTERMEDIATE ZONE POTENTIOMETRIC SURFACE MAP WITH ASH INDICATOR CONCENTRATIONS**

DRAWN BY: FIEBRANZT	SCALE: 1"=60'	PROJ. NO. 04774.19
CHECKED BY: JCO		FILE NO. 47741907.DWG
APPROVED BY: JMR	DATE PRINTED: NOV 30 2005	**FIGURE 6**
DATE: NOVEMBER 2005		

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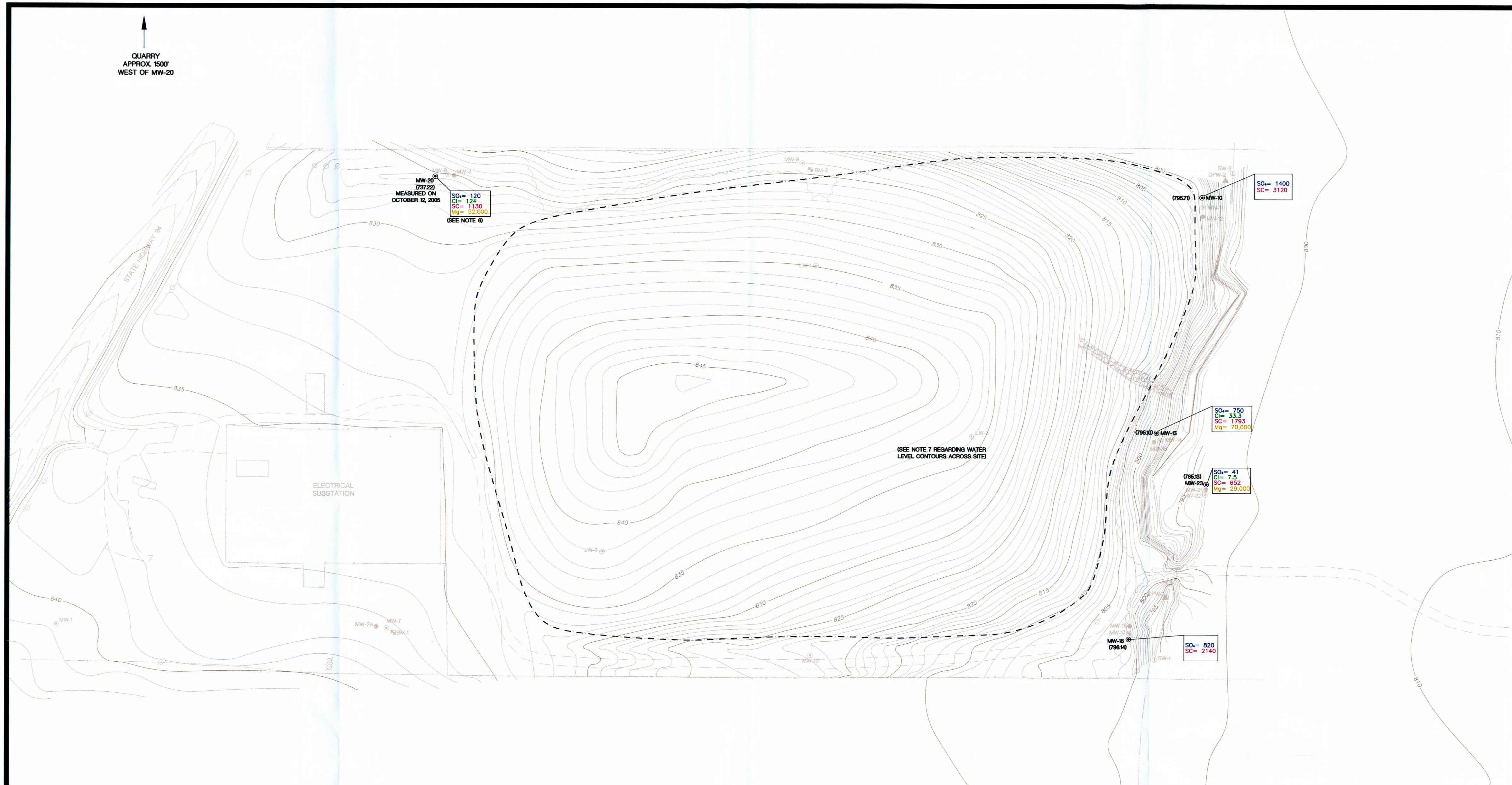
Phone: 608-831-4444
Fax: 608-831-3334

Con 12-1-1
Doc # 60413



RESIDENTIAL DEVELOPMENT

N

0 60 120

SCALE: 1"=60'

LEGEND

MW-12	WATER TABLE MONITORING WELL
MW-13	DEEP MONITORING WELL
SW-1	SURFACE WATER MONITORING STAFF GAUGE LOCATION
BM-1	BENCHMARK
LW-3	LEACHATE HEAD WELL
DPW-1	DRIVE POINT WELL
	POWER POLE
(796.14)	GROUND WATER ELEVATION (FT. MSL)
SO_4=	SULFATE CONCENTRATION (mg/L)
Cl=	CHLORIDE CONCENTRATION (mg/L)
SC=	SPECIFIC CONDUCTANCE (µmhos/cm)
Mg=	MAGNESIUM CONCENTRATION (ug/L)
	UNNAMED CREEK
	APPROXIMATE LIMITS OF ASH DISPOSAL
	ACCESS ROAD
	PROPERTY LINE
	TREE LINE
810	EXISTING GROUND SURFACE CONTOURS
	RIPRAP FLUME
	GATE

NOTES:

1. MAP BASED ON A SURVEY PREPARED BY JENKINS SURVEY & DESIGN, INC., VERONA, WISCONSIN FOR RMT, INC. SURVEY COMPLETED DURING THE WEEK OF AUGUST 24, 2005.
2. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS 1 FOOT.
3. CONTOURS TO THE NORTH OF STREAM AND EAST OF THE SITE ARE DIGITIZED FROM CEDAR RAPIDS SOUTH, IOWA 7.5 MINUTE USGS QUADRANGLE.
4. SELECTED SITE FEATURES (i.e. LIMITS OF ASH DISPOSAL LINE AND PROPERTY LINE) HAVE BEEN DIGITIZED FROM A BASE MAP PREPARED BY MONTGOMERY WATSON.
5. GROUNDWATER CHEMISTRY DATA AND WATER LEVELS ARE FROM SAMPLES COLLECTED AND MEASUREMENTS MADE ON SEPTEMBER 12 AND 13, 2005 EXCEPT WHERE INDICATED.
6. CHLORIDE AND SULFATE DATA FOR MW–20 COLLECTED ON 6/15/05; SPECIFIC CONDUCTANCES AND MAGNESIUM DATA COLLECTED ON 10/12/05.
7. AS DISCUSSED IN THE REPORT TEXT INSUFFICIENT/LIMITED DATA EXISTS TO CONTOUR THE GROUNDWATER FLOW WITHIN THIS UNIT.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: **INTERSTATE POWER AND LIGHT CO.**
STONEY POINT LANDFILL - CEDAR RAPIDS, IOWA
GROUNDWATER QUALITY ASSESSMENT REPORT

SHEET TITLE:
DEEP ZONE POTENTIOMETRIC SURFACE MAP WITH ASH INDICATOR CONCENTRATIONS

DRAWN BY: FIEBRANZT	SCALE: 1"=60'	PROJ. NO. 04774.19
CHECKED BY: JCO		FILE NO. 47741908.DWG
APPROVED BY: JMR	DATE PRINTED: NOV 3 0 2005	**FIGURE 7**
DATE: NOVEMBER 2005		

RMT
744 Heartland Trail
Madison, WI 53717–1934
P.O. Box 8923 53708–8923
Phone: 608–831–4444
Fax: 608–831–3334

Appendix B

IAC 567-110.11

110.10(3) *Uppermost aquifer monitoring wells.* If different than water table monitoring wells, at least three uppermost aquifer monitoring wells shall be installed at each facility. Uppermost aquifer monitoring wells shall be spaced no more than 600 feet apart. If the uppermost aquifer is located more than 50 feet below the water table, this requirement may be relaxed, although at least one downgradient uppermost aquifer monitoring well will be required.

110.10(4) *Other downgradient monitoring wells*. Additional downgradient monitoring wells will be required if the water table and uppermost aquifer monitoring wells do not intercept most vertical flow paths from the site. In such situations, monitoring wells shall be placed at the appropriate depths to intercept the remaining flow paths and shall be spaced at no more than 600 feet apart.

110.10(5) *Upgradient monitoring wells.* Upgradient monitoring wells shall not be affected by the site. At least one upgradient monitoring well shall be installed into each stratum being monitored by downgradient monitoring wells. If it is not possible to actually locate a monitoring well upgradient of the site, the well should be placed as near the site as feasible without being affected by the site.

110.10(6) *Monitoring point identification system.* The various types of monitoring points should be identified as follows:

Monitoring Well	MW# _______
Surface Water Monitoring Point	SW# _______
Piezometer	PZ# _______

Each monitoring point must have a unique number, regardless of the type of monitoring point, and that number must never change.

567—110.11(455B) Monitoring well/soil boring construction standards.

110.11(1) *General considerations.*

a. Contractors involved in construction of monitoring wells and piezometers and soil boring activities shall be registered with the department as required in 567—Chapter 37.

b. To the extent possible, all monitoring well construction materials must not absorb, desorb, react or otherwise alter the screened soil stratum or the quality of the groundwater being sampled. Galvanized metal, glues, welding solvents, pipe thread lubricants and other foreign substances must not be used.

c. All monitoring well construction materials must be protected from contamination prior to installation.

d. A typical cross section of a property constructed monitoring well is shown in Figure 1 at the end of this chapter.

110.11(2) *Casings.*

a. As a minimum, the diameter of the inner casing (see Figure 1) of a monitoring well must be at least 2 inches.

b. Plastic cased wells must be constructed of materials with threaded, nonglued joints which do not allow water infiltration under natural subsurface pressure conditions or when the well is evacuated for sampling.

c. Well casings must provide structural stability to prevent casing collapse during installation as well as drill hole integrity when installed. Flush joint casing is required for small diameter wells installed through hollow stem augers.

d. Well casings must be constructed of inert materials such as polytetrafluorethylene, stainless steel or polyvinyl chloride. The department may approve other casing materials if the owner or operator can demonstrate the material has a low potential for biasing the water quality parameters of samples. The department may approve the construction of composite well casings (casings with less inert materials in the unsaturated zone).

110.11(3) *Well screens*.

a. Slot size will be based on sieve analysis of the sand and gravel stratum or filter pack. The slot size must hold out 35 percent to 60 percent of the formation material and not less than 90 percent of the filter pack.

b. Slot configuration and open area must permit effective development of the well.

c. Screen length. Maximum screen length shall be 10 feet except for water table wells in which the screen must be of sufficient length to accommodate expected seasonal fluctuations of the water table. The screen should be placed 5 feet above and below the observed water table, unless local conditions are known to produce greater fluctuations. Screen length for piezometers should be 2 feet or less.

Multiple screened single-cased wells are prohibited.

110.11(4) *Filter pack.*

a. To prevent other materials from coming in contact with the well screen, extend the filter pack 18 inches above and 12 inches below the well screen.

b. Size must be based on sieve analysis of sand and gravel stratum. The filter pack material must be 2.5 to 3 times larger than 50 percent grain size of the zone being monitored.

110.11(5) *Grouting*.

a. The annular space above the filter pack must be sealed with expanding cement or bentonite grout. The vertical dimension of this seal must be a minimum of 3 feet.

b. The annular space between the seal and to just below the frostline must be backfilled with an impervious material such as bentonite or expanding cement.

c. The remaining annular space must be sealed with bentonite grout to the ground surface.

d. Grouting materials must be installed from the top of the filter pack up in one continuous operation with a tremie tube.

110.11(6) *Well protection.*

a. Plastic cased wells. A protective metal casing must be installed around the well casing. The inside diameter of the protective metal casing should be at least 2 inches larger than the outside diameter of the well casing. Extend the protective metal casing from a minimum of 1 foot below the frostline to slightly above the well casing top. The protective casing should be shortened or omitted if it covers part of the well screen. Seal or immobilize the protective casing with a concrete plug around the outside. The bottom of the concrete plug must extend at least 1 foot below the frostline. The concrete plug should be shortened if it covers part of the well screen. Extend the top of the plug approximately 3 to 6 inches above the ground surface and slope it away from the well approximately 3 feet. Soil may be placed above the plug. Seal the inside of the protective casing with a bentonite grout. Place a vented cap on the well casing and a protective locking cap on the metal casing. The lockable cap must be kept locked when the well is not in use.

b. Metal cased wells. Extend the concrete plug from at least 1 foot below the frostline to approximately 3 to 6 inches above the ground surface and slope it away from the well approximately 3 feet. Soil may be placed on top of the concrete plug. Place a vented, locking cap on the casing. The lockable cap must be kept locked when the well is not in use. See Figure 1.

c. To protect against accidental damage, a ring of brightly colored posts or other protective devices must be installed around all wells.

110.11(7) *Well drilling.*

a. The owner or operator must ensure that in all phases of drilling, well installation and completion, the methods and materials used do not introduce substances that may alter the results of water quality analyses.

b. Well drilling equipment coming into contact with contaminants in the borehole or above ground must be thoroughly cleaned to avoid spreading contamination to other depths or locations. Contaminated materials or leachate from wells must not be discharged onto the ground surface or into ponds or streams so as to cause environmental harm in the processes of drilling or well development.

c. The owner or operator must ensure that, at a minimum, the following well design and construction log information be retained at the site and a copy of this information be sent to the department.

Date/time of construction;
Name and address of the driller;
Drilling method and drilling fluid used;
Soil sampling methods;
Surveyed location (±0.5 ft.);
Soil and rock classifications;
Field observations;
Well name/number;
Borehole diameter and well casing diameter;
Well depth (±0.1 ft.);
Water level measurements;
Drilling and lithologic logs;
Casing materials, inside diameter and weight or wall thickness;
Screen materials;
Casing and screen joint type;
Screen slot size/length;
Filter pack material/size; (depths from ____ to ____)
Filter pack volume;
Filter pack replacement method;
Sealant materials; (depths from ____ to ____)
Sealant volume;
Sealant placement method;
Grouting schedule and materials;
Surface seal design/construction; (depths from ____ to ____)
Type of protection well cap;
Ground surface elevation (±0.1 ft.);
Well cap elevation (±0.01 ft.);
Top of casing elevation (±0.01 ft.); and
Detailed drawing of well (include dimensions).

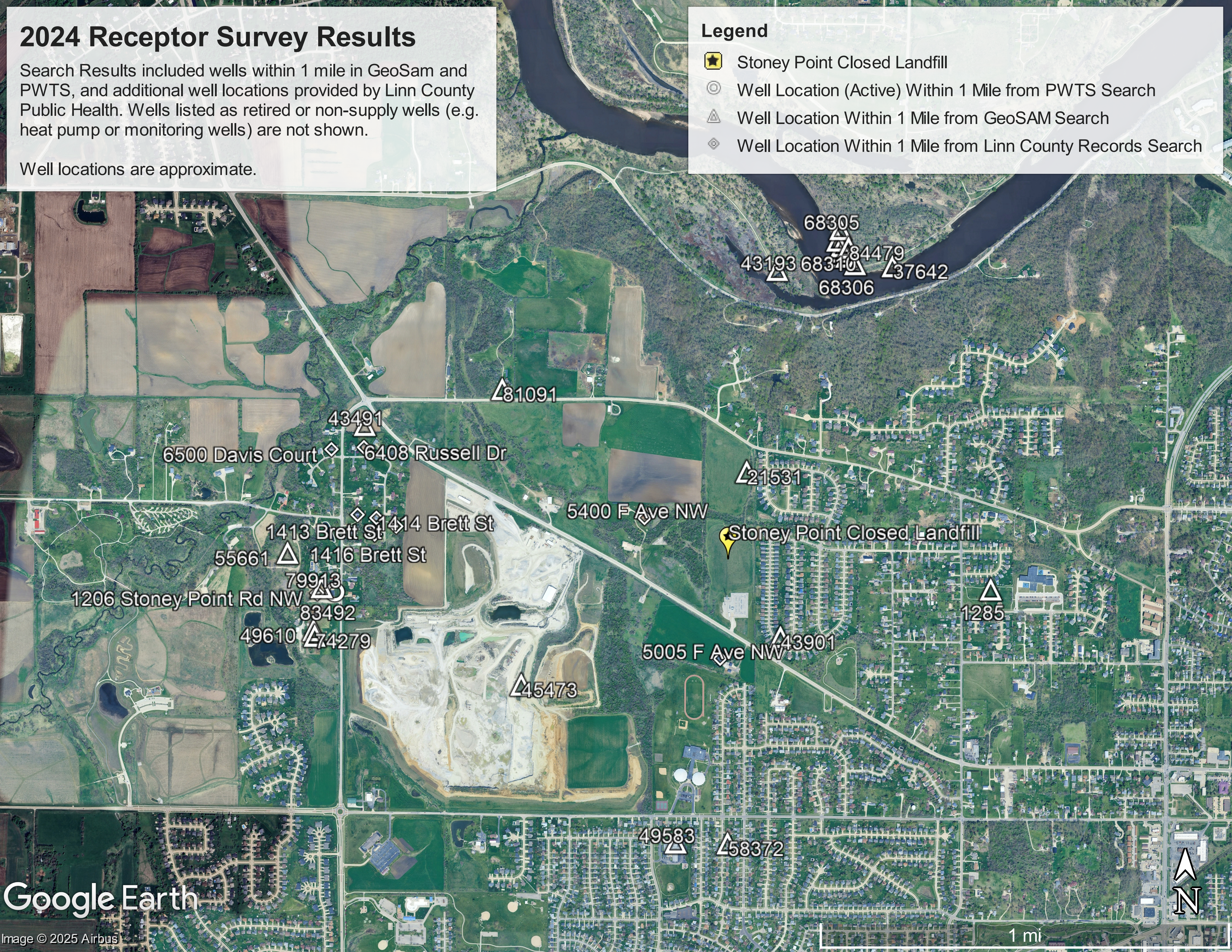
110.11(8) *Well development*. Prior to use of the monitoring well for water quality monitoring purposes, well development is required to ensure the collection of representative groundwater samples. Procedures used in well development involve using a surge block, bailing or surging by pumping of compressed inert gas to produce a movement of water at alternately high and low velocities into and out of the well screen and gravel pack in order to loosen and remove fine materials. Development of low hydraulic conductivity wells may require the circulation of water down the well casing, out through the screen and gravel pack, and up the open borehole prior to the placement of grout or seal in the annulus. Any additional water used must be of a quality so as not to interfere with future groundwater quality determinations. Following surging, the well is pumped until the water does not contain significant quantities of suspended solids.

567—110.12(455B) Sealing abandoned wells and boreholes. Boreholes, piezometers and observation wells not used for groundwater monitoring must be sealed. Document in writing the location of the abandoned well or borehole with reference to the landfill's coordinate system and method of sealing. The document must be retained at the landfill with a copy sent to the department.

110.12(1) *Sealing boreholes*. Fill the borehole by extending a tremie tube to the bottom of the hole. Apply bentonite or expanding cement grout through the tube to the bottom of the hole and raise the tremie tube as the hole is filled from the bottom upward. Keep the end of the tremie tube submerged in the grout while filling. Fill the borehole from the base of the boring all the way to the ground surface.

Appendix C

Receptor Survey


2024 Receptor Survey Results
Search Results included wells within 1 mile in GeoSam and PWTS, and additional well locations provided by Linn County Public Health. Wells listed as retired or non-supply wells (e.g. heat pump or monitoring wells) are not shown.
Well locations are approximate.
Legend
Stoney Point Closed Landfill
Well Location (Active) Within 1 Mile from PWTS Search
Well Location Within 1 Mile from GeoSAM Search
Well Location Within 1 Mile from Linn County Records Search
68305
43193
68310
84479
37642
68306
81091
43491
6500 Davis Court
6408 Russell Dr
21531
5400 F Ave NW
Stoney Point Closed Landfill
1413 Brett St
1414 Brett St
55661
1416 Brett St
79913
1206 Stoney Point Rd NW
83492
49610
74279
1285
43901
5005 F Ave NW
45473
49583
58372
Google Earth
Image © 2025 Airbus
1 mi
N

wnumber	1285	21531	30422	32726	32727	37817	37642
FID	293	19697	26618	28174	28175	34864	35868
owner_name	Prochaska, Richard	Washburn, Dean	Stoney Point	Ccr Landfill - Stoney Point	Ccr Landfill - Stoney Point	Cedar Rapids, City Of	Cedar Rapids, City Of
alt_name			MONITOR WELL	STP PZ-1	STP PZ-2	#10	SEMINOLE 9
pwts_id	0	0	0	0	0	0	0
pwts_well_status							
well_type	Private	Private	Monitor	Monitor	Monitor	Municipal, Public Supply	Municipal, Public Supply
project	Unknown	Unknown	Unknown	Unknown	Unknown	Source Water Protection	Source Water Protection
operator	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
county	Linn	Linn	Linn	Linn	Linn	Linn	Linn
quad	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa
township	T83N	T83N	T83N	T83N	T83N	T83N	T83N
range	R8W	R8W	R8W	R8W	R8W	R8W	R8W
section	24	23	23	23	23	13	13
quarter	NE SW NW	NE NE NE NE	NE SE SE	NE SE NE SW NE	NE SE SE NW SE	SW NW SE	SW NE SW
latitude	41.986441	41.990583	41.986611	41.988203	41.986842	41.998182	41.997852
longitude	-91.724305	-91.735833	-91.736677	-91.736969	-91.736981	-91.731419	-91.728856
ll_acc	Calc. +/- 470 ft.	Calc. +/- 230 ft.	Calc. +/- 470 ft.	Calc. +/- 115 ft.	Calc. +/- 115 ft.	Meas. +/- 115 ft.	Meas. +/- 115 ft.
utm_x	605673	604712	604648	604621	604623	605065	605278
utm_y	4649058	4649504	4649062	4649238	4649087	4650353	4650319
elevation	840	824	829	825	829	709	719
elev_acc	Topo Map Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft
field_loca	0	0	0	0	0	0	0
site_type	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole
position	Unknown	Unknown	Unknown	Unknown	Unknown	Valley	Valley
dpth_br	80	10	15	0	10	0	0
dpth_well	415	181	302	37	11	69	58
dpth_tot	415	181	302	37	11	71	59
drill_comp	Nolan, Charles D.	Novotny & Son Well Drilling Co	Latta & Sons Well Drilling	Wendling Quarries	Wendling Quarries	Layne Western - Ia.	Layne Western - Ia.
icon	3	2	3	3	3	0	0
drl_date	31-Dec-39	30-Jan-64	31-Dec-88	12-Jun-91	13-Jun-91	14-Jan-71	13-Jan-71
aquifer			Silurian/ Devonian	Quaternary	Quaternary	Alluvium	Alluvium
smpl_type	Chips	Chips	Chips	Chips	Chips		
log_drlr	1	0	1	1	1	0	0
log_strp	1	1	1	1	1	0	0
log_geop	0	0	0	0	0	0	0
log_other	0	0	0	0	0	0	0
HLINK	https://www.iihr.uiowa.edu/igs/geosam/well/1285/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/21531/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/30422/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/32726/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/32727/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/37817/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/37642/general-information
x	-10210702.93	-10211986.22	-10212080.17	-10212112.68	-10212114.01	-10211494.85	-10211209.54
y	5158948.58794851З	5159568.927481258	5158974.04773379б	5159212.474434338Ƽ	5159008.643	5160707.12035705З	5160657.68949785З

wnumber	43193	43491	43901	45473	49583	49610	55661
FID	38064	38357	41361	41615	45275	45333	51233
owner_name	Cedar Rapids, City Of	Thompson, Paul	Coonrod, Virgel	Thompson, Paul	Siefken, Keith	Larson, Roger	Thompson, Paul
alt_name	#55						
pwts_id	0	0	0	0	0	0	0
pwts_well_status							
well_type	Municipal, Public Supply	Private	Private	Private	Private	Private	Private
project	Source Water Protection	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
operator	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
county	Linn	Linn	Linn	Linn	Linn	Linn	Linn
quad	Cedar Rapids South, Iowa	Fairfax, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Fairfax, Iowa	Fairfax, Iowa
township	T83N	T83N	T83N	T83N	T83N	T83N	T83N
range	R8W	R8W	R8W	R8W	R8W	R8W	R8W
section	13	23	24	23	26	22	22
quarter	SW NW SW	NW NW NW	SW NW NW	SW NE SE	NE NE NW	SE NE NE	NE SE
latitude	41.99772	41.992232	41.984777	41.983087	41.97756	41.984996	41.987724
longitude	-91.734349	-91.75396	-91.734251	-91.746509	-91.739204	-91.756372	-91.757602
ll_acc	Meas. +/- 230 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 930 ft.
utm_x	604823	603208	604852	603840	604454	603019	602913
utm_y	4650298	4649665	4648861	4648658	4648053	4648858	4649160
elevation	719	758	848	787	850	780	780
elev_acc	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 50 ft	Digital Elevation Model Accurate to 10 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 10 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft
field_loca	0	0	0	0	0	0	0
site_type	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole
position	Valley	Unknown	Unknown	Unknown	Upland	Upland	Upland
dpth_br	0	0	63	35	35	7	34
dpth_well	75	200	325	300	200	237	183
dpth_tot	75	200	325	300	200	237	183
drill_comp	Unknown	Greiner Well Service, Inc.	Greiner Well Service, Inc.	Freese Well Drilling	Greiner Well Service, Inc.	Greiner Well Service, Inc.	Greiner Well Service, Inc.
icon	0	0	1	1	1	1	1
drl_date	31-Dec-95	2-Feb-95	17-Jul-94	31-Jul-94	1-Jun-98	4-Jan-99	13-Mar-00
aquifer	Alluvium						
smpl_type							
log_drlr	0	0	1	1	1	1	1
log_strp	0	0	0	0	0	0	0
log_geop	0	0	0	0	0	0	0
log_other	0	1	0	0	0	0	0
HLINK	https://www.iihr.uiowa.edu/igs/geosam/well/43193/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/43491/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/43901/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/45473/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/49583/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/49610/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/55661/general-information
x	-10211821.02	-10214004.11	-10211810.11	-10213174.66	-10212361.48	-10214272.61	-10214409.53
y	5160637.917225945	5159815.906336956	5158699.385169004	5158446.295262546	5157618.633	5158732.183	5159140.736125356

wnumber	58372	68305	68306	68307	68308	68309	68310
FID	54267	64044	64045	64046	64047	64048	64049
owner_name	Truman School	Cedar Rapids, City Of	Cedar Rapids, City Of	Cedar Rapids, City Of	Cedar Rapids, City Of	Cedar Rapids, City Of	Cedar Rapids, City Of
alt_name		C7-A	C7-B	C7-C	C7-D	C7-E	C7-F
pwts_id	0	0	0	0	0	0	0
pwts_well_status							
well_type	Test (water only)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
project	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
operator	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
county	Linn	Linn	Linn	Linn	Linn	Linn	Linn
quad	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa
township	T83N	T83N	T83N	T83N	T83N	T83N	T83N
range	R8W	R8W	R8W	R8W	R8W	R8W	R8W
section	26	13	13	13	13	13	13
quarter	NE NE NE	SW SW NW	SW SW NW	SW SW NW	SW SW NW	SW SW NW	SW SW NW
latitude	41.977533	41.999164	41.997924	41.99819	41.998372	41.998562	41.998758
longitude	-91.736754	-91.731346	-91.73064	-91.731053	-91.731398	-91.73129	-91.731494
ll_acc	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.
utm_x	604657	605069	605130	605095	605066	605075	605058
utm_y	4648053	4650462	4650325	4650354	4650374	4650395	4650417
elevation	854	719	719	719	719	719	720
elev_acc	Digital Elevation Model Accurate to 20 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 5 ft
field_loca	0	0	0	0	0	0	0
site_type	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole
position	Unknown	Valley	Valley	Valley	Valley	Valley	Valley
dpth_br	55	63	72	72	74	68	65
dpth_well	304	67	73	74	76	69	67
dpth_tot	304	67	73	74	76	69	67
drill_comp	Shawver Well Co.	International Water Consultants, Inc.	International Water Consultants, Inc.	International Water Consultants, Inc.	International Water Consultants, Inc.	International Water Consultants, Inc.	International Water Consultants, Inc.
icon	1	1	1	1	1	1	1
drl_date	27-Nov-03	20-Mar-06	21-Mar-06	24-Mar-06	24-Mar-06	25-Mar-06	26-Mar-06
aquifer	Alluvium						
smpl_type	Chips						
log_drlr	1	1	1	1	1	1	1
log_strp	0	0	0	0	0	0	0
log_geop	0	0	0	0	0	0	0
log_other	0	0	0	0	0	0	0
HLINK	https://www.iihr.uiowa.edu/igs/geosam/well/58372/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68305/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68306/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68307/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68308/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68309/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/68310/general-information
x	-10212088.74	-10211486.73	-10211408.13	-10211454.11	-10211492.52	-10211480.49	-10211503.2
y	5157614.59	5160854.216127144	5160668.474390724	5160708.318684103	5160735.580665002	5160764.041057914	5160793.400289126

wnumber	68385	73280	74279	79913	81091	83492	84473
FID	64124	68555	69901	75662	77531	79451	79945
owner_name	Gardner, Frank	Cedar Rapids Community School District	Robinson, Bill	Morgan Creek Maintenance	Beardsley, Tom	Barker Lemar Engineering Consultants	Fox, Ian
alt_name		Taft Middle School		Well #1; Fife, Darren; Barker Lemar Engineering Consultants			
pwts_id	2099396	2146323	0	0	0	2188983	2189049
pwts_well_status	Retired	Active Logged				Active Water Test	Active Logged
well_type	Private	Heat Pump	Private	Unknown	Private	Private	Heat Pump
project	Unknown	Unknown	Unknown				
operator	Unknown	Unknown	Unknown				
county	Linn	Linn	Linn	Linn	Linn	Linn	Linn
quad	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Fairfax, Iowa	Fairfax, Iowa	Cedar Rapids South, Iowa	Fairfax, Iowa	Cedar Rapids South, Iowa
township	T83N	T83N	T83N	T83N	T83N	T83N	T83N
range	R8W	R8W	R8W	R8W	R8W	R8W	R8W
section	13	23	22	22	14	22	25
quarter	SE SE SW	SE SE NW	SE NE NE	NE SE SE	SW SE SE	NE SE SE	NW NE NW
latitude	41.9937	41.980801	41.984797	41.986516	41.9935	41.986332	41.977273
longitude	-91.73183	-91.739403	-91.756315	-91.755971	-91.747419	-91.755348	-91.729763
ll_acc	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 470 ft.	Calc. +/- 230 ft.	Calc. +/- 115 ft.
utm_x	605038	604432	603024	603050	603747	603102	605236
utm_y	4649855	4648413	4648836	4649028	4649813	4649008	4648033
elevation	883	831	769	800	777	802	830
elev_acc	Digital Elevation Model Accurate to 50 ft	Digital Elevation Model Accurate to 20 ft	Digital Elevation Model Accurate to 5 ft	Digital Elevation Model Accurate to 10 ft	Digital Elevation Model Accurate to 10 ft	Topo Map Accurate to 2 ft	Topo Map Accurate to 2 ft
field_loca	0	0	0	0	0	0	0
site_type	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole
position	Upland	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
dpth_br	72	14	20	10	20	12	0
dpth_well	300	300	250	45	216	220	50
dpth_tot	300	300	250	45	216	220	50
drill_comp	Greiner Well Service, Inc.	Shawver Well Co.	Greiner Well Service, Inc.	Shawver Well Co.	Greiner Well Service, Inc.	Gingerich Well Co.	Geothermal Eco Options, Inc.
icon	1	1	1	1	1	1	1
drl_date	26-Apr-04	28-Feb-10	28-Jul-09	25-Aug-14	1-Apr-13	8-Sep-16	6-Jul-16
aquifer							
smpl_type						Chips	
log_drlr	1	1	1	1	1	1	1
log_strp	0	0	0	0	0	0	0
log_geop	0	0	0	0	0	0	0
log_other	0	0	0	0	0	0	0
HLINK	https://www.iihr.uiowa.edu/igs/geosam/well/68385/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/73280/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/74279/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/79913/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/81091/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/83492/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/84473/general-information
x	-10211540.61	-10212383.63	-10214266.26	-10214227.97	-10213275.96	-10214158.62	-10211310.51
y	5160035.781314348	5158103.960669545	5158702.380356053	5158959.820198347	5160005.825296969	5158932.263769008	5157575.657384857

wnumber	84479	95929	96023	96185	96186
FID	80003	91530	91830	91995	91996
owner_name	Cedar Rapids, City of	Jackson Elementary	Jackson Elementary	Jackson Elementary	Jackson Elementary
alt_name	HCW-5	injection well #1; NE	injection well #2; SE	supply well #1; NW	supply well #2; SW
pwts_id	0	0	0	0	0
pwts_well_status					
well_type	Public Supply	Heat Pump	Heat Pump	Heat Pump	Heat Pump
project					
operator					
county	Linn	Linn	Linn	Linn	Linn
quad	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa	Cedar Rapids South, Iowa
township	T83N	T83N	T83N	T83N	T83N
range	R8W	R8W	R8W	R8W	R8W
section	13	24	24	24	24
quarter	SW NW NE	NE SW SE	NE SW SE	NE SW SE	NE SW SE
latitude	41.998505	41.986925	41.986361	41.986783	41.986331
longitude	-91.730949	-91.721075	-91.720836	-91.723153	-91.723169
ll_acc	Maps/Air Photos +/- 20 m.	GPS	GPS	GPS	GPS
utm_x	605103	605940	605961	605768	605768
utm_y	4650389	4649116	4649053	4649097	4649047
elevation	726	868	853	842	846
elev_acc	Topo Map Accurate to 2 ft	Topo Map Accurate to 2 ft	Topo Map Accurate to 2 ft	Topo Map Accurate to 2 ft	Topo Map Accurate to 2 ft
field_loca	0	0	0	0	0
site_type	Drilled hole	Drilled hole	Drilled hole	Drilled hole	Drilled hole
position	Unknown	Unknown	Unknown	Unknown	Unknown
dpth_br	69	59	57	43	41
dpth_well	69	522	525	520	520
dpth_tot	69	522	525	520	520
drill_comp	Layne Christensen Company	Shawver Well Co.	Shawver Well Co.	Shawver Well Co.	Shawver Well Co.
icon	1	1	1	1	1
drl_date	18-Nov-16	30-Nov-21	11-Jan-22	31-Mar-22	6-May-22
aquifer					
smpl_type		Chips	Chips	Chips	Chips
log_drlr	1	1	1	1	1
log_strp	0	0	0	0	0
log_geop	0	0	0	0	0
log_other	0	0	0	0	0
HLINK	https://www.iihr.uiowa.edu/igs/geosam/well/84479/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/95929/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/96023/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/96185/general-information	https://www.iihr.uiowa.edu/igs/geosam/well/96186/general-information
x	-10211442.53	-10210343.36	-10210316.76	-10210574.69	-10210576.47
y	5160755.502931121	5159021.073633617	5158936.606896609	5158999.80711516€	5158932.11400602€

Linn County Health Department Records Search: Wells Within 1 Mile of Stoney Point Closed Landfill, October 2024

Address	City	State	Zip Code
5005 F Ave NW	Cedar Rapids	IA	52405
5400 F Ave NW	Cedar Rapids	IA	52405
1206 Stoney Point Rd NW	Cedar Rapids	IA	52405
1413 Stoney Point Rd NW	Cedar Rapids	IA	52405
1416 Brett St	Cedar Rapids	IA	52405
1414 Brett St	Cedar Rapids	IA	52405
1413 Brett St	Cedar Rapids	IA	52405
6408 Russell Dr	Cedar Rapids	IA	52405
6500 Davis Court	Cedar Rapids	IA	52405

12-26-87

PHYSICAL DETAIL OF WATER WELL

(To be filled out and signed by driller)

TO: Linn County Health Department

FROM: Freese
(Driller)

SUBJECT: Stephen R Powell
(Property Owner)

Legal Description of Well Location:

Twp: 83 Range: 8 Section: 23

Addition: ______

Lot #: ______

NOTE:
If casing not grouted in rock, describe measures taken to avoid contamination of water supply:

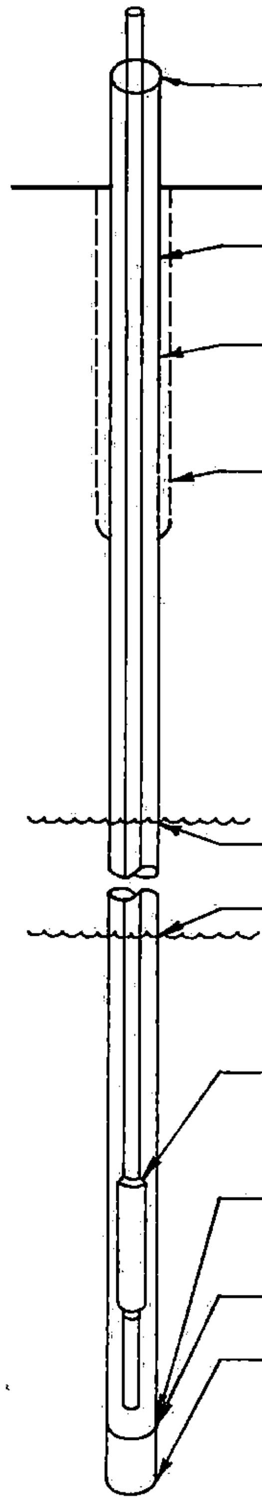
______

______

______

______

If all information not given, indicate items that are not applicable.



Casing Extends 12 " Above Ground Level

Ground Level

Diameter of Casing 6 inches

Casing Material & lb. per ft.
PVC SDR 21

Annular Space Sealed With:
- ☐ Cement Grout
- ☒ Puddled Clay
- ☐ Not Grouted
- ☐ Pitless Adapter Unit

Depth to Static Water Level ____ ft.

Pumping Level ____ ft.

At 35 G.P.M.

Pump Setting 160 ft.
Recommended Pump Setting ____ ft.

Casing Grouted in Rock ☒ Yes ☐ No

Length of Casing 52 ft.

Depth to Bottom of Well Hole 215 ft.

I certify the above information is true and correct. Rick Freese Driller

RECEIVED
AUG 21 1990
LINN COUNTY HEALTH DEPT.
BY ______

NOTE: If this form is not applicable, please contact this department for further instructions.

HD8620-PDW