

2020 Annual Groundwater Monitoring and Corrective Action Report

Ottumwa Midland Landfill
Ottumwa, Iowa

Prepared for:

Alliant Energy



SCS ENGINEERS

25220073.00 | January 29, 2021

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Overview of Current Status
Ottumwa-Midland Landfill
2020 Annual Report

In accordance with §257.90(e)(6), this section at the beginning of the annual report provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. The groundwater monitoring system at the Ottumwa Midland Landfill (OML) monitors a single CCR unit. Supporting information is provided in the text of the annual report.

Category	Rule Requirement	Site Status
Monitoring Status – Start of Year	(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Monitoring Status – End of Year	(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Statistically Significant Increases (SSIs)	(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to §257.94(e):	
	(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and	<u>May/June 2020</u> Chloride: MW-303 <u>October 2020</u> No SSIs
	(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.	Alternative Source Demonstration prepared for the May 2020 event. Assessment monitoring not required.

Category	Rule Requirement	Site Status
Statistically Significant Levels (SSL) Above Groundwater Protection Standard	(iv) If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to §257.95(g) include all of the following:	Not applicable No Appendix IV sampling required
	(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;	
	(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;	
	(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and	
	(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.	
Selection of Remedy	(v) Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection; and	Not applicable In detection monitoring
Corrective Action	(vi) Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.	Not applicable In detection monitoring

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1.0 INTRODUCTION

This 2020 Annual Groundwater Monitoring and Corrective Action Report was prepared to support compliance with the groundwater monitoring requirements of the Coal Combustion Residuals (CCR) Rule [40 CFR 257.50-107]. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.90(e). The applicable sections of the Rule are provided below in *italics*, followed by applicable information relative to the 2020 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units.

This report covers the period of groundwater monitoring from January 1, 2020, through December 31, 2020.

The groundwater monitoring system at the Ottumwa Midland Landfill (OML) monitors a single CCR unit with two phases:

- OML Landfill & OML Landfill Expansion - Phase 1 (existing landfill)

The system is designed to detect monitored constituents in the uppermost aquifer at the waste boundary of OML as required by 40 CFR 257.91(d). The groundwater monitoring system consists of two upgradient and three downgradient monitoring wells.

2.0 BACKGROUND

To provide context for the annual report, the following background information is provided in this section of the report, prior to the annual report requirement sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system

2.1 GEOLOGIC AND HYDROGEOLOGIC SETTING

2.1.1 Regional Information

The uppermost bedrock unit in the site area consists of Pennsylvanian shales with minor siltstone, sandstone, limestone, and coal intervals. The continuity of these minor beds is highly variable. The thickness of the Pennsylvanian shale is variable; in some areas of Wapello County it is over 100 feet thick, while in other areas it is absent. The variation in thickness is due to erosion of the bedrock surface. Underlying the Pennsylvanian shales are Mississippian limestone and dolomite, with some shale and sandstone. The Devonian units underlying the Mississippian are composed of shale, dolomite, and limestone, and are in turn underlain by Silurian dolomite (Montgomery Watson, 1994). A summary of the regional hydrogeologic stratigraphy is presented in **Appendix A**.

The Des Moines River and associated alluvial aquifers are a major source of surface water and shallow groundwater in the area; however, the alluvial aquifer is not present at the OML site. Unconsolidated deposits at the site consist of clays overlain by loess, which are not productive sources of groundwater. The uppermost Pennsylvanian bedrock unit is considered to be a regional aquitard. The Mississippian unit is the shallowest regional bedrock aquifer. The Cambrian-Ordovician aquifer, comprised of dolomite and sandstone, is commonly the source of municipal and industrial high-capacity wells in the region (Coble, 1971).

A summary of the regional hydrogeologic stratigraphy and a map showing regional bedrock surface topography and the top of the Mississippian limestone in Southeastern Iowa are included in **Appendix A**. The bedrock surface elevation is highly variable due to erosion. Regional information indicates that groundwater flow within the Mississippian limestone is to the south-southeast. A map showing the regional potentiometric surface in the Mississippian limestone is included with the hydrogeologic background information presented in **Appendix A**.

For the purposes of groundwater monitoring, the Mississippian limestone unit is considered to be the uppermost aquifer unit at the OML site as defined under 40 CFR 257.53.

2.1.2 Site information

Unconsolidated soils at the site include clay, loam, silt loam, silty clay, sandy loam, and intermediate types. Where present, these soils are generally 5 to 7 feet thick. Pennsylvanian shales and Mississippian limestone underlie the unconsolidated soils. Soils encountered during the drilling and installation of the existing background wells MW-102M and MW-122M were described as 10 to 11 feet of lean clay, overlying 126 to 129 feet of shale with intermittent stringers of sandstone and coal. The shale was underlain by Mississippian limestone at 138 to 139 feet below ground surface.

During drilling of CCR wells MW-301, MW-302, and MW-303, soils were described as 4 to 11 feet of clay and silt, overlying 112 to 173 feet of shale with intermittent stringers of sandstone and coal. The shale was underlain by Mississippian limestone at 116 to 168 feet below ground surface.

The boring logs for the landfill CCR monitoring wells are provided in **Appendix B**. All CCR monitoring wells are screened within the Mississippian bedrock unit.

Shallow groundwater flow at the water table appears to be controlled partially by the landfill underdrain system and partially by the top of the Pennsylvanian shale. Shallow groundwater, near the current fill area, flows toward the landfill and the sedimentation pond. The landfill underdrain system includes a drainage layer and collection piping below the landfill liner, and is used to ensure that shallow groundwater does not affect performance of the landfill liner.

Based on water levels in the existing Mississippian piezometers at the OML site, a generally south-southeast flow direction has been identified in the Mississippian limestone aquifer, consistent with the regional flow information. The groundwater flow pattern in May 2020 is shown on **Figure 3**, and the groundwater flow pattern of the October 2020 sampling is shown on **Figure 4**. The groundwater elevation data for the CCR monitoring wells are provided in **Table 3**. Calculated horizontal gradients and flow velocities for each of the flow paths are provided in **Table 4**.

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established within the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells (**Table 1** and **Figure 2**). The upgradient monitoring wells include MW-122M and MW-102M. The downgradient monitoring wells include MW-301, MW-302, and MW-303. The CCR Rule wells are installed in the upper portions of the Mississippian Limestone aquifer. Well depths range from approximately 150.0 to 204.5 feet, measured from the top of the well casing.

3.0 § 257.90(E) ANNUAL REPORT REQUIREMENTS

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

3.1 §257.90(E)(1) SITE MAP

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

A map showing the location of the site is provided as **Figure 1**. The OML CCR units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the groundwater monitoring program are shown on **Figure 2**.

3.2 §257.90(E)(2) MONITORING SYSTEM CHANGES

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

No new monitoring wells were installed and no wells were decommissioned as part of the groundwater monitoring program for OML in 2020.

3.3 §257.90(E)(3) SUMMARY OF SAMPLING EVENTS

In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

Two semiannual groundwater sampling events were completed in 2020 for OML as part of ongoing detection monitoring.

Groundwater samples collected during the semiannual events, in May and October 2020, were analyzed for the Appendix III constituents. For the May event, resampling was completed for selected parameters at MW-303 in June 2020. A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring program is included in **Table 2**.

The sampling results for Appendix III parameters in 2020 are summarized in **Tables 5A** and **5B**. Field parameter results for the 2020 sampling events are provided in **Table 6**. The results of the analytical laboratory analyses are provided in the laboratory reports in **Appendix C**. Historical results for each monitoring well are summarized in **Appendix D**.

3.4 § 257.90(E)(4) MONITORING TRANSITION NARRATIVE

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels);

There were no transitions between monitoring programs during 2020. OML remained in the detection monitoring program.

In 2020, the monitoring results for the October 2019 and May 2020 monitoring events were evaluated for statistically significant increases (SSIs) in detection monitoring parameters relative to background. As part of the evaluation of the October 2020 monitoring results, the Interwell and Intrawell UPLs were updated based on additional background monitoring results. The Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (USEPA, 2009) recommends periodic updating of background. The UPL update calculations are included in **Appendix E**. The UPLs calculated in January 2021 were applied to the evaluation of the October 2020 monitoring results.

For the May 2020 event, an SSI for chloride was identified; however, an alternative source demonstration (ASD) was completed, demonstrating that the SSI likely reflected natural variability and was not due to the CCR landfill. The ASD report is provided in **Appendix F**.

3.5 § 257.90(E)(5) OTHER REQUIREMENTS

Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

Additional potentially applicable requirements for the annual report, and the location of the requirement within the Rule, are provided in the following sections. For each cited section of the Rule, the portion referencing the annual report requirement is provided below in italics, followed by applicable information relative to the 2020 Annual Groundwater Monitoring and Corrective Action Report for OML.

3.5.1 § 257.90(e) General Requirements

For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year.

Status of Groundwater Monitoring and Corrective Action Program. The groundwater monitoring and corrective action program is currently in detection monitoring.

Summary of Key Actions Completed.

- Statistical evaluation and determination of SSIs for the October 2019 and May 2020 monitoring events.
- ASD report for the SSI identified from the May 2020 monitoring event.
- Two semiannual detection monitoring events (May and October 2020).
- One groundwater resampling event for MW-303 (June 2020).

Description of Any Problems Encountered. No problems were encountered in 2020.

Discussion of Actions to Resolve the Problems. Not applicable.

Projection of Key Activities for the Upcoming Year (2021):

Statistical evaluation and determination of any SSIs for the October 2020 and April 2021 monitoring events.

- If an SSI is determined, then within 90 days either:
 - Complete ASD (if applicable), or
 - Establish an assessment monitoring program.
- Two semiannual groundwater sampling and analysis events (April and October 2021).

3.5.2 § 257.94(d) Alternative Detection Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. No alternative detection monitoring frequency has been proposed.

3.5.3 § 257.94(e)(2) Alternative Source Demonstration for Detection Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

The ASD report prepared to address the chloride SSI observed for the May 2020 sampling event is provided in **Appendix F**. The ASD report is certified by a qualified professional engineer.

3.5.4 § 257.95(c) Alternative Assessment Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has not been initiated.

3.5.5 § 257.95(d)(3) Assessment Monitoring Results and Standards

Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has not been initiated.

3.5.6 § 257.95(g)(3)(ii) Alternative Source Demonstration for Assessment Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Assessment monitoring has not been initiated.

3.5.7 § 257.96(a) Extension of Time for Corrective Measures Assessment

The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measure due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Corrective measures assessment has not been initiated.

3.6 §257.90(E)(6) OVERVIEW

A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit.

The specific requirements for the overview under §257.90(e)(6) are listed and the information is provided at the beginning of this report, before the Table of Contents.

4.0 REFERENCES

Coble, R.W., and Roberts, J.V., 1971, The Water Resources of Southeast Iowa: Iowa Geological Survey Water Atlas Number 4, 101 p.

Montgomery Watson, 1994, May 24, 1994, Hydrogeological Investigation Report and Hydrologic Monitoring System Plan, Ottumwa-Midland Commercial Landfill, Montgomery Watson, 1994.

U.S. Environmental Protection Agency (USEPA), 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, EPA 530-R-09-007, March 2009.

Tables

- 1 Groundwater Monitoring Network
- 2 CCR Rule Groundwater Samples Summary
- 3 Groundwater Elevation Summary
- 4 Horizontal Gradients and Flow Velocity
- 5A Groundwater Analytical Results Summary – January
– September 2020
- 5B Groundwater Analytical Results Summary – October
– December 2020
- 6 2020 Groundwater Field Data Summary

**Table 1. Groundwater Monitoring Well Network
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Monitoring Well	Location in Monitoring Network	Role in Monitoring Network
MW-102M	Upgradient	Background
MW-122M	Upgradient	Background
MW-301	Downgradient	Compliance
MW-302	Downgradient	Compliance
MW-303	Downgradient	Compliance

Created by:	<u>RM</u>	Date:	<u>12/14/2020</u>
Last revision by:	<u>RM</u>	Date:	<u>1/8/2021</u>
Checked by:	<u>TK</u>	Date:	<u>1/17/2021</u>

**Table 2. CCR Rule Groundwater Samples Summary
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Sample Dates	Downgradient Wells			Background Wells	
	MW-301	MW-302	MW-303	MW-102M	MW-122M
5/21-26/2020	D	D	D	D	D
6/29/2020	--	--	D-R	--	--
10/6-7/2020	D	D	D	D	D
Total Samples	2	2	3	2	2

Abbreviations:

D = Required by Detection Monitoring Program

D-R = Detection Monitoring Retest Sample

Created by:	<u>NDK</u>	Date:	<u>1/4/2019</u>
Last revision by:	<u>RM</u>	Date:	<u>1/17/2021</u>
Checked by:	<u>TK</u>	Date:	<u>1/17/2021</u>

**Table 3. Groundwater Elevation Summary
Ottumwa-Midland Landfill / SCS Engineers Project #25220073.00**

Ground Water Elevation in feet above mean sea level (amsl)					
Well Number	MW-301	MW-302	MW-303	MW-102M	MW-122M
Top of Casing Elevation (feet amsl)	817.88	761.77	762.40	798.03	792.70
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0
Total Depth (ft from top of casing)	204.5	157.7	150.0	152.1	155.3
Top of Well Screen Elevation (ft)	618.38	609.07	617.40	652.65	642.94
Measurement Date					
May 4, 2016	686.46	685.80	686.04	728.73	729.27
June 22, 2016	686.40	685.79	687.72	718.74	725.67
August 9, 2016	686.19	685.48	687.77	715.65	725.16
October 25-26, 2016	683.70	684.94	685.56	716.94	724.61
January 17, 2017	685.57	685.68	685.60	717.91	724.02
April 19-20, 2017	685.72	684.73	685.51	717.80	724.04
June 20-21, 2017	685.88	684.76	685.59	714.83	723.51
July 17, 2017	NM	NM	684.92	NM	NM
August 21-22, 2017	684.96	683.89	684.70	713.23	722.02
November 7-8, 2017	684.50	683.38	684.26	713.53	720.52
April 16-18, 2018	684.85	683.87	684.68	717.38	723.25
October 15-16, 2018	684.58	683.52	684.33	717.05	723.36
April 16-17, 2019	686.38	685.35	686.13	717.97	723.43
June 6, 2019	NA	NA	686.05	NA	NA
August 7, 2019	NA	NA	NA	712.00	720.42
October 14-15, 2019	686.56	685.44	686.08	715.50	708.94
May 20-26, 2020	687.29	686.25	687.14	717.61	724.23
June 29, 2020	NA	NA	687.36	NA	NA
October 5-6, 2020	686.80	685.86	686.35	712.05	718.39
Bottom of Well Elevation (ft)	613.38	604.07	612.40	645.93	637.40

Notes:
NM = not measured

Created by: KAK
Last rev. by: RM
Checked by: TK

Date: 5/1/2017
Date: 1/8/2021
Date: 1/17/2021

**Table 4. Horizontal Gradients and Flow Velocity
Ottumwa Midland Landfill /
SCS Engineers Project #25220073.00
January - December 2020**

Sampling Dates	Southeast				
	h1 (ft)	h2 (ft)	Δl (ft)	Δh/Δl (ft/ft)	V (ft/d)
5/20-26/2020	715.00	690.00	1354	0.018	0.3
10/5-6/2020	710.00	690.00	1398	0.014	0.2

Well	K Value (cm/sec)	K Value (ft/d)
MW-102M	N/A	N/A
MW-122M	N/A	N/A
MW-301	8.0E-04	2.3
MW-302	3.6E-04	1.0
MW-303	1.1E-02	30
Geometric Mean	1.5E-03	4.1

Assumed Porosity, n
0.25

Groundwater flow velocity equation: $V = [K*(\Delta h/\Delta l)] / n$

ft = feet

ft/d = feet per day

K = hydraulic conductivity

n = effective porosity

V = groundwater flow velocity

h1, h2 = point interpreted groundwater elevation at locations 1 and 2

Δl = distance between location 1 and 2

Δh/Δl = hydraulic gradient

N/A = Not applicable, geometric mean K based on downgradient wells

Created by: RM
Last revision by: RM
Checked by: SCC

Date: 12/29/2020
Date: 1/18/2021
Date: 1/18/2021

Table 5A. Groundwater Analytical Results Summary
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
January - September 2020

Parameter Name	Interwell UPL	Background Wells		Compliance Wells						
		MW-102M	MW-122M	MW-301		MW-302		MW-303		
		5/21/2020	5/21/2020	Intrawell UPL	5/26/2020	Intrawell UPL	5/21/2020	Intrawell UPL	5/26/2020	6/29/2020
Appendix III										
Boron, ug/L	5,220	1,500	5,100		660		780		770	NA
Calcium, mg/L	599	38	430		120		41		120	NA
Chloride, mg/L		16	9.0	67.0	61	10.4	8.9	7.92	8.5	6.9
Fluoride, mg/L	6.31	5.0	0.23 J		0.77		1.0		0.81	NA
Field pH, Std. Units	8.63	7.82	6.91		5.67		7.05		6.21	6.74
Sulfate, mg/L	17,500	350	9,800		390		79		440	NA
Total Dissolved Solids, mg/L	18,100	3,700	16,000		1,100		930		1,100	NA

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL and the LOQ.

Abbreviations:

UPL = Upper Prediction Limit

SSI = Statistically Significant Increase

LOQ = Limit of Quantitation

LOD = Limit of Detection

µg/L = micrograms per liter

mg/L = milligrams per liter

Lab Notes:

J = Estimated concentration at or above the LOD and below the LOQ.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-102M and MW-122M for the period from May 2016 through November 2017. Interwell UPLs based on 1-of-2 retesting approach.
3. Intrawell UPL for chloride was calculated based on results from each monitoring well for the period from May 2016 through April 2018.

Created by: NDK
 Last revision by: RM
 Checked by: NDK
 PM/Scient. QA/QC: TK

Date: 5/1/2018
 Date: 1/8/2021
 Date: 1/18/2021
 Date: 1/18/2021

**Table 5B. Groundwater Analytical Results Summary
 Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
 October - December 2020**

Parameter Name	Interwell UPL	Compliance Wells							
		MW-102M	MW-122M	MW-301		MW-302		MW-303	
		10/7/2020	10/7/2020	Intrawell UPL	10/6/2020	Intrawell UPL	10/6/2020	Intrawell UPL	10/6/2020
Appendix III									
Boron, ug/L	5,560	1,600	4,100		770		870		740
Calcium, mg/L	599	150	430		180		65		100
Chloride, mg/L		14	8.3	62.7	24	10.1	7.2	11.5	7.3
Fluoride, mg/L	5.70	5.3	<0.23 J		0.67		1.1		0.88
Field pH, Std. Units	8.63	8.29	7.00		7.22		7.14		7.01
Sulfate, mg/L	17,500	350	8,700		620		73		230
Total Dissolved Solids, mg/L	18,100	1,700	14,000		1,400		700		840

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL and the LOQ.

Abbreviations:

UPL = Upper Prediction Limit LOQ = Limit of Quantitation µg/L = micrograms per liter
 SSI = Statistically Significant Increase LOD = Limit of Detection mg/L = milligrams per liter

Lab Notes:

J = Estimated concentration at or above the LOD and below the LOQ.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-102M and MW-122M for the period from May 2016 through October 2020. Interwell UPLs based on 1-of-2 retesting approach. The UPLs were updated in January 2021.
3. Intrawell UPL for chloride was calculated based on results from each monitoring well for the period from April 2019 through May 2020. Intrawell UPLs based on 1-of-2 retesting approach. The UPLs were updated in January 2021.

Created by: NDK Date: 5/1/2018
 Last revision by: RM Date: 1/18/2021
 Checked by: NDK Date: 1/18/2021
 PM/Scient. QA/QC: TK Date: 1/18/2021

Table 6. 2020 Groundwater Field Data Summary
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
January - December 2020

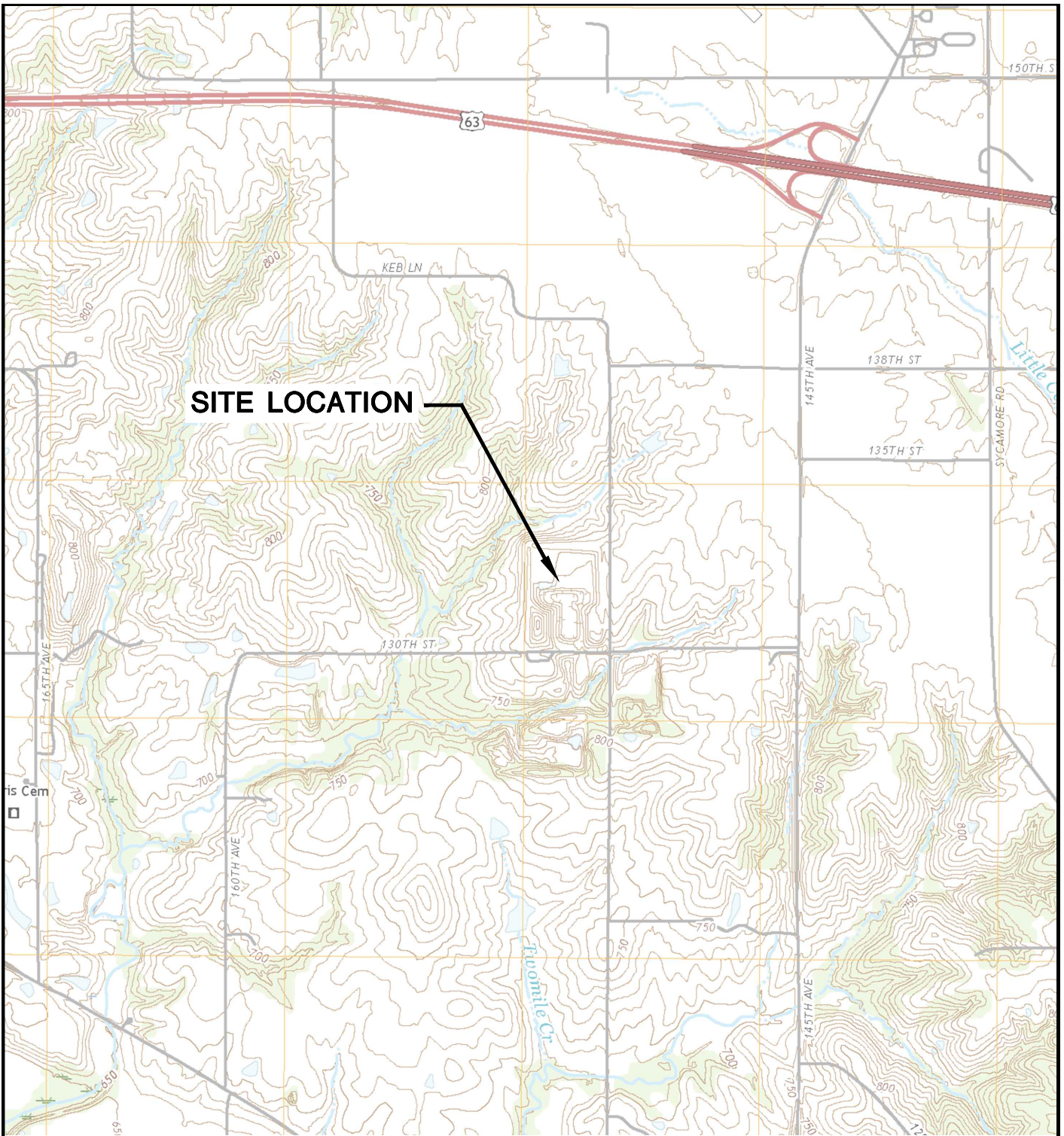
Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-102M	5/21/2020	717.61	13.1	7.82	1.59	2260	21.20	297
	10/7/2020	712.05	14.5	8.29	5.11	2123	22.00	--
MW-122M	5/21/2020	724.23	13.0	6.91	0.61	14090	-4.400	2.31
	10/7/2020	718.39	13.6	7.00	0.56	13603	-28.20	--
MW-301	5/26/2020	687.29	15.8	5.67	0.41	1546	-57.80	21.8
	10/6/2020	686.80	14.5	7.22	0.25	1820	-105.9	21.4
MW-302	5/21/2020	686.25	13.1	7.05	1.06	1129	-83.40	12.5
	10/6/2020	685.86	13.5	7.14	0.28	1025	-169.4	136
MW-303	5/26/2020	687.14	14.4	6.21	2.31	1963	-30.00	57.1
	6/29/2020	687.36	16.1	6.74	0.49	1739	-53.30	59.0
	10/6/2020	686.35	13.9	7.01	0.30	1262	-137.3	240

Created by: RM _____
 Last revision by: RM _____
 Checked by: NDK _____

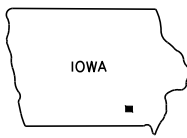
Date: 12/22/2020 _____
 Date: 1/8/2021 _____
 Date: 1/18/2021 _____

Figures

- 1 Site Location Map
- 2 Site Plan and Monitoring Well Locations
- 3 Potentiometric Surface Map, May 20 – 26, 2020
- 4 Potentiometric Surface Map, October 5 – 6, 2020

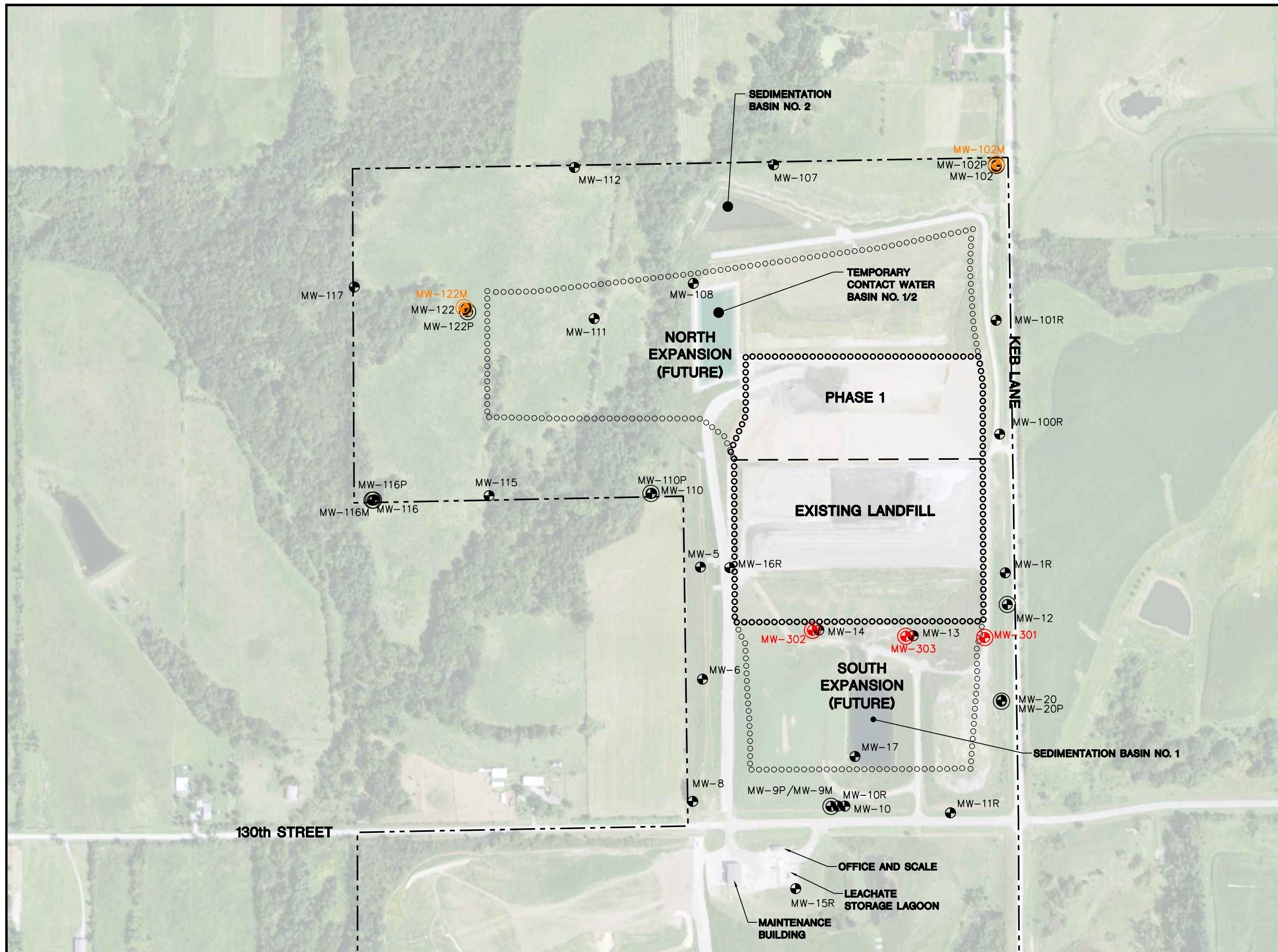


OTTUMWA NORTH QUADRANGLE
 IOWA-WAPELLO CO.
 7.5 MINUTE SERIES (TOPOGRAPHIC)
 2018
 SCALE: 1" = 2,000'



CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501		SITE	ALLIANT ENERGY OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA		ENGINEER	SITE LOCATION MAP		
	PROJECT NO.	252519073.00		DRAWN BY:	BSS		SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE	1
	DRAWN:	11/18/2019		CHECKED BY:	MDB				
REVISED:	01/13/2020	APPROVED BY:	TK 01/30/2020						

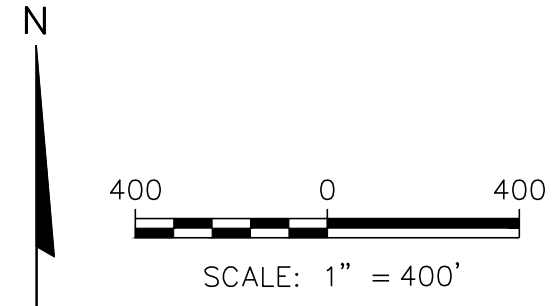
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LEGEND

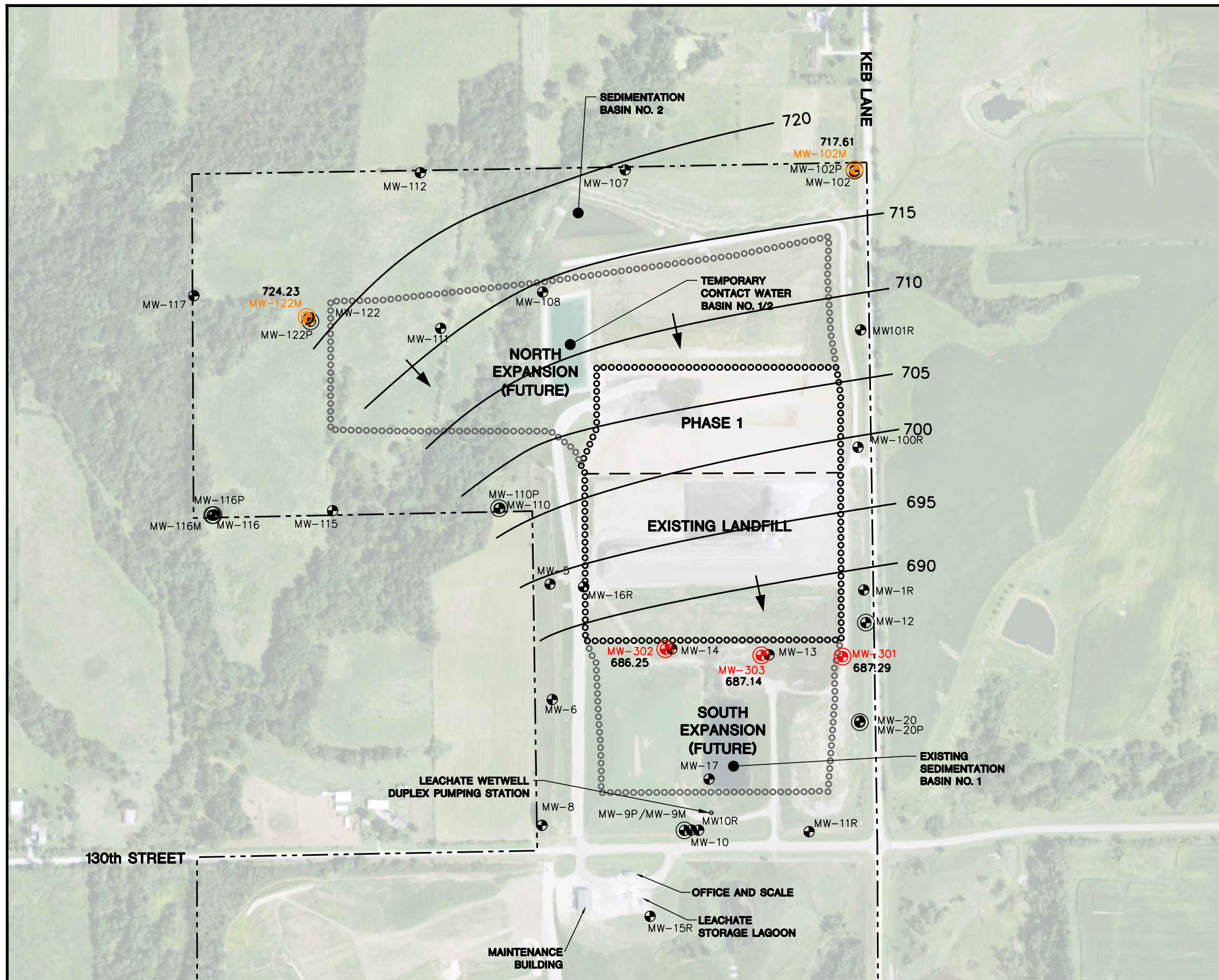
- APPROXIMATE PROPERTY LINE
- EXISTING WASTE LIMITS
- PERMITTED WASTE LIMITS
- ⊕ CCR RULE PIEZOMETER
- ⊕ CCR BACKGROUND MONITORING WELL
- ⊙ MONITORING WELL
- ⊕ ADDITIONAL PIEZOMETER

- NOTES:**
1. 2015 AERIAL PHOTOGRAPH IS FROM THE IOWA GEOGRAPHIC MAP SERVER-IOWA STATE UNIVERSITY GEOGRAPHIC INFORMATION SYSTEMS SUPPORT & RESEARCH FACILITY.
 2. PROPERTY LINE SOUTH OF 130TH STREET FROM SURVEY MAP PREPARED BY GARDEN & ASSOCIATES, OSKALOOSA, IOWA, DATED DECEMBER 20, 1988.
 3. PROPERTY LINE NORTH OF 130TH STREET FROM PLAT OF SURVEY MAP PREPARED BY SCS ENGINEERS, MADISON, WISCONSIN, DATED FEBRUARY 20, 2013.
 4. EXISTING LIMITS OF WASTE ARE APPROXIMATE.
 5. MONITORING WELLS MW-301 AND MW-302 WERE INSTALLED BY CASCADE DRILLING BETWEEN NOVEMBER 16, 2015, AND DECEMBER 3, 2015.
 6. MONITORING WELL MW-303 WAS INSTALLED BY TEAM SERVICES BETWEEN APRIL 11, 2016 AND APRIL 26, 2016.
 7. THE BACKGROUND MONITORING WELLS FOR THE OTTUMWA MIDLAND LANDFILL ARE: MW-122M AND MW-102M.



PROJECT NO. 25219073.00	DRAWN BY: BSS	ENGINEER SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501	SITE ALLIANT ENERGY OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	SITE PLAN AND MONITORING WELL LOCATIONS	FIGURE
DRAWN: 11/18/2019	CHECKED BY: MDB					2
REVISED: 01/30/2020	APPROVED BY: TK 01/28/2021					

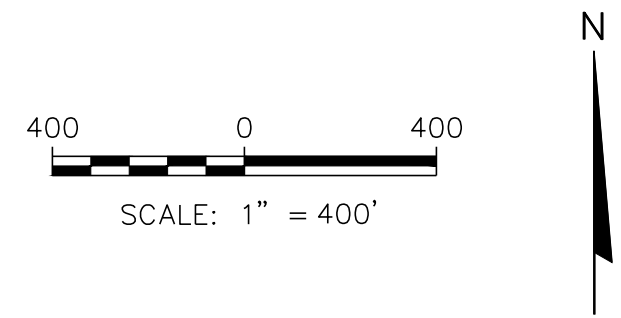
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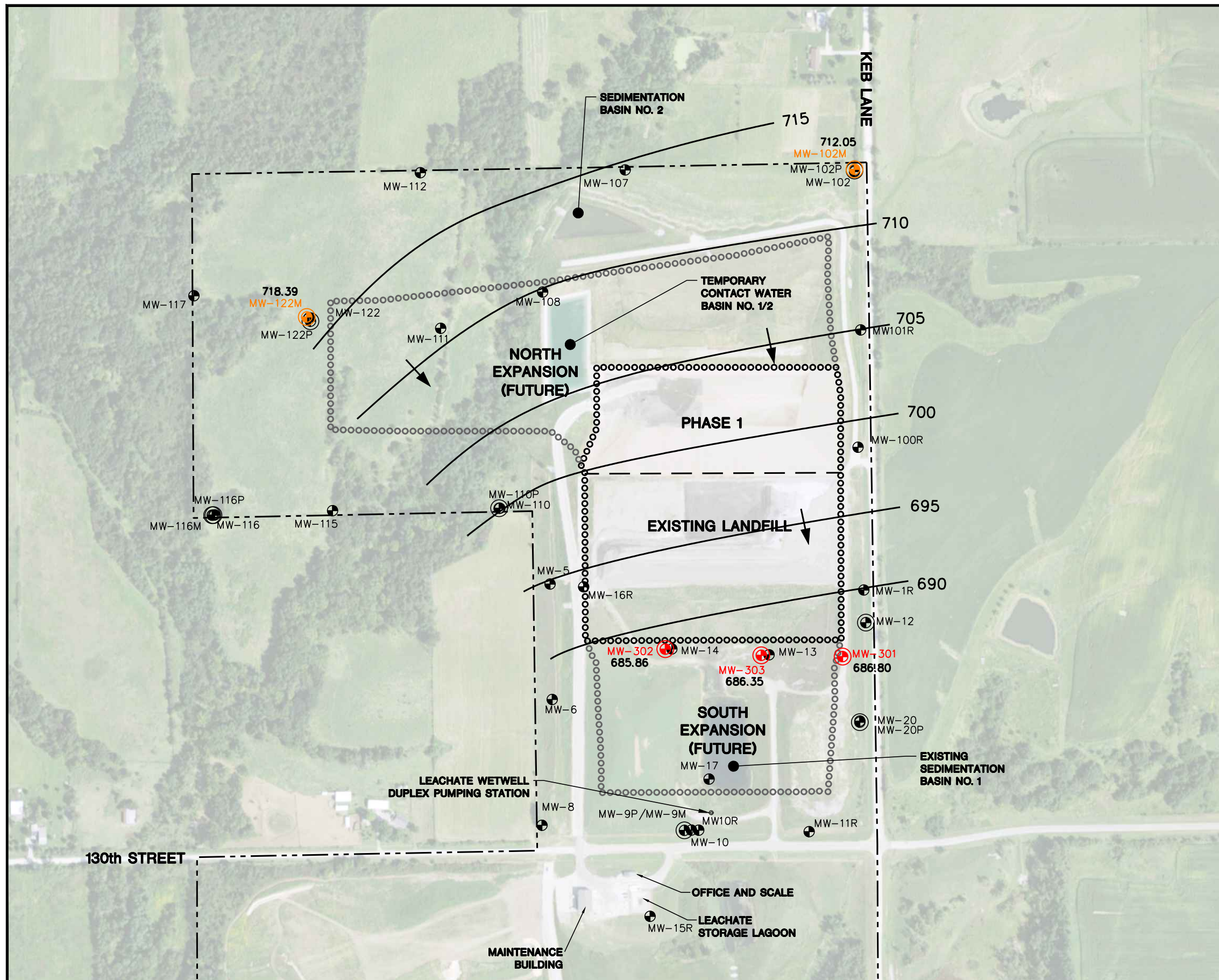
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	APPROVED WASTE LIMITS
	EXISTING WASTE LIMITS
	PHASE LIMIT
	EXISTING MONITORING WELL
	EXISTING PIEZOMETER
	CCR MONITORING WELL
	CCR BACKGROUND MONITORING WELL
723.59	WATER TABLE ELEVATION MEASURED ON MAY 20 - 26, 2020
	POTENTIOMETRIC SURFACE CONTOUR (DASHED WHERE INFERRED)
	APPROXIMATE GROUNDWATER FLOW DIRECTION

- NOTES:
- 2015 AERIAL PHOTOGRAPH IS FROM THE IOWA GEOGRAPHIC MAP SERVER-IOWA STATE UNIVERSITY GEOGRAPHIC INFORMATION SYSTEMS SUPPORT & RESEARCH FACILITY.
 - PROPERTY LINE SOUTH OF 130TH STREET FROM SURVEY MAP PREPARED BY GARDEN & ASSOCIATES, OSKALOOSA, IOWA, DATED DECEMBER 20, 1988.
 - PROPERTY LINE NORTH OF 130TH STREET FROM PLAT OF SURVEY MAP PREPARED BY SCS ENGINEERS, MADISON, WISCONSIN, DATED FEBRUARY 20, 2013.
 - EXISTING LIMITS OF WASTE ARE APPROXIMATE.
 - THE BACKGROUND MONITORING WELLS FOR THE OTTUMWA MIDLAND LANDFILL ARE: MW-122M AND MW-102M.



PROJECT NO. 25220073.00	DRAWN BY: ZTW	ENGINEER SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT INTERSTATE POWER AND LIGHT CO. 15300 130th STREET OTTUMWA, IA 52501	SITE OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	POTENTIOMETRIC SURFACE MAP MAY 20 - 26, 2020	FIGURE
DRAWN: 10/24/16	CHECKED BY: NDK					3
REVISED: 09/09/2020	APPROVED BY: SCC 09/25/2020					

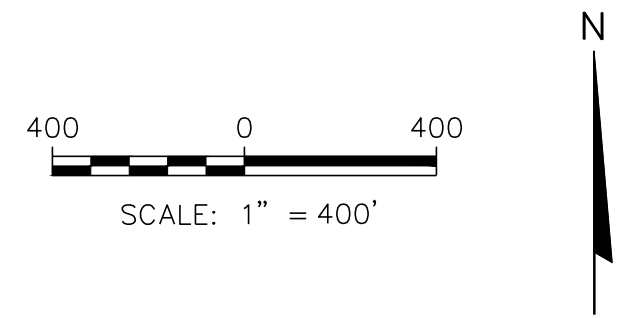
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LEGEND

---	APPROXIMATE PROPERTY LINE
⊙⊙⊙⊙⊙⊙	APPROVED WASTE LIMITS
⊙⊙⊙⊙⊙⊙	EXISTING WASTE LIMITS
- - -	PHASE LIMIT
⊕	EXISTING MONITORING WELL
⊕	EXISTING PIEZOMETER
⊕	CCR MONITORING WELL
⊕	CCR BACKGROUND MONITORING WELL
723.59	WATER TABLE ELEVATION MEASURED ON OCTOBER 5-6, 2020
---	POTENTIOMETRIC SURFACE CONTOUR (DASHED WHERE INFERRED)
➔	APPROXIMATE GROUNDWATER FLOW DIRECTION

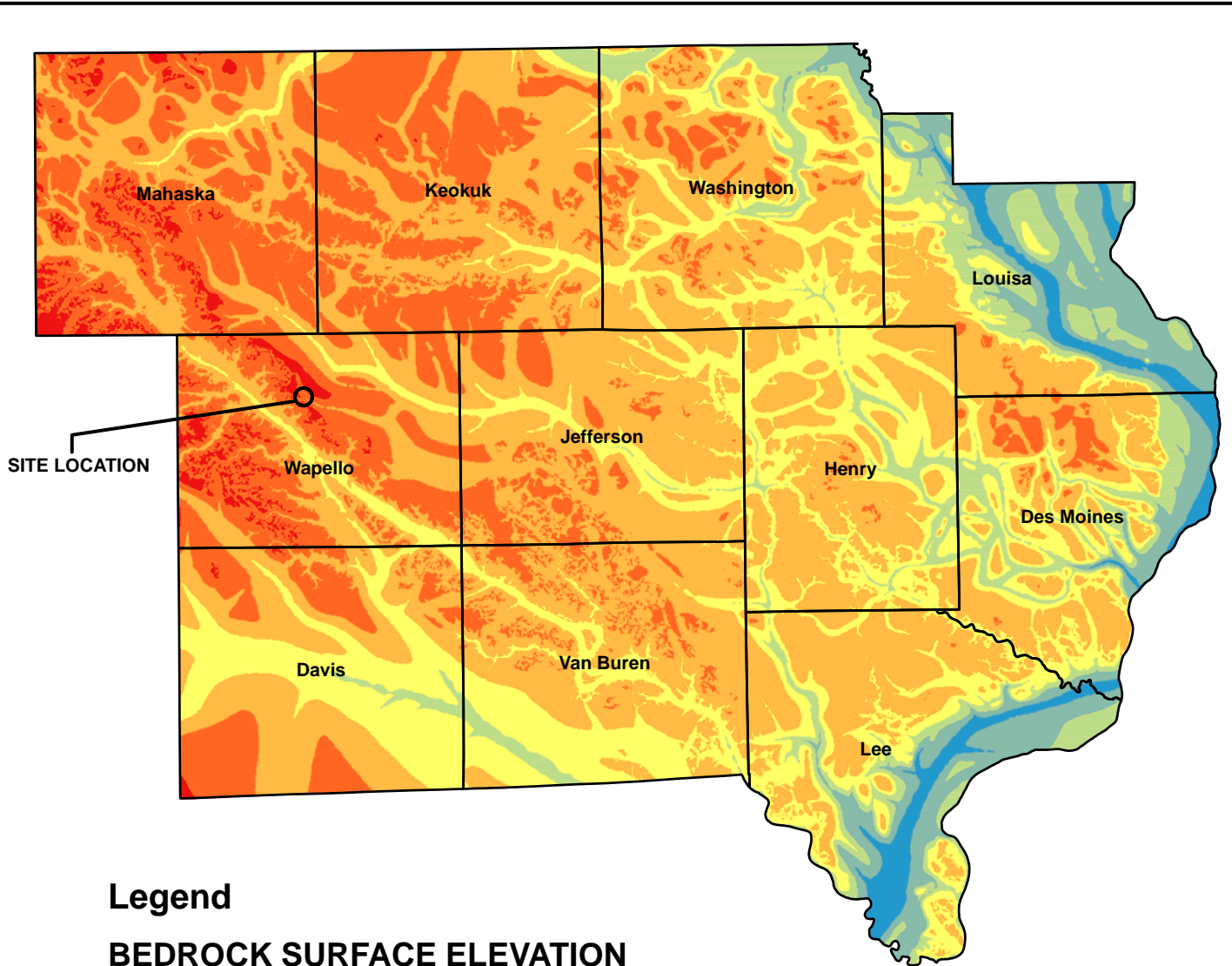
- NOTES:
- 2015 AERIAL PHOTOGRAPH IS FROM THE IOWA GEOGRAPHIC MAP SERVER-IOWA STATE UNIVERSITY GEOGRAPHIC INFORMATION SYSTEMS SUPPORT & RESEARCH FACILITY.
 - PROPERTY LINE SOUTH OF 130TH STREET FROM SURVEY MAP PREPARED BY GARDEN & ASSOCIATES, OSKALOOSA, IOWA, DATED DECEMBER 20, 1988.
 - PROPERTY LINE NORTH OF 130TH STREET FROM PLAT OF SURVEY MAP PREPARED BY SCS ENGINEERS, MADISON, WISCONSIN, DATED FEBRUARY 20, 2013.
 - EXISTING LIMITS OF WASTE ARE APPROXIMATE.
 - THE BACKGROUND MONITORING WELLS FOR THE OTTUMWA MIDLAND LANDFILL ARE: MW-122M AND MW-102M.



PROJECT NO. 25220073.00	DRAWN BY: ZTW	ENGINEER SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT INTERSTATE POWER AND LIGHT CO. 15300 130th STREET OTTUMWA, IA 52501	SITE OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	POTENTIOMETRIC SURFACE MAP OCTOBER 5-6, 2020	FIGURE
DRAWN: 10/24/16	CHECKED BY: TK					4
REVISED: 12/09/2020	APPROVED BY: TK 01/28/2021					



Appendix A
Regional Hydrogeologic Information

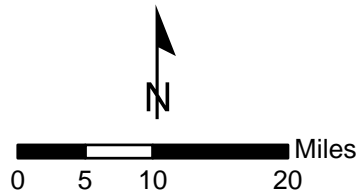


Legend

BEDROCK SURFACE ELEVATION

ELEVATION ABOVE MEAN SEA LEVEL IN FEET

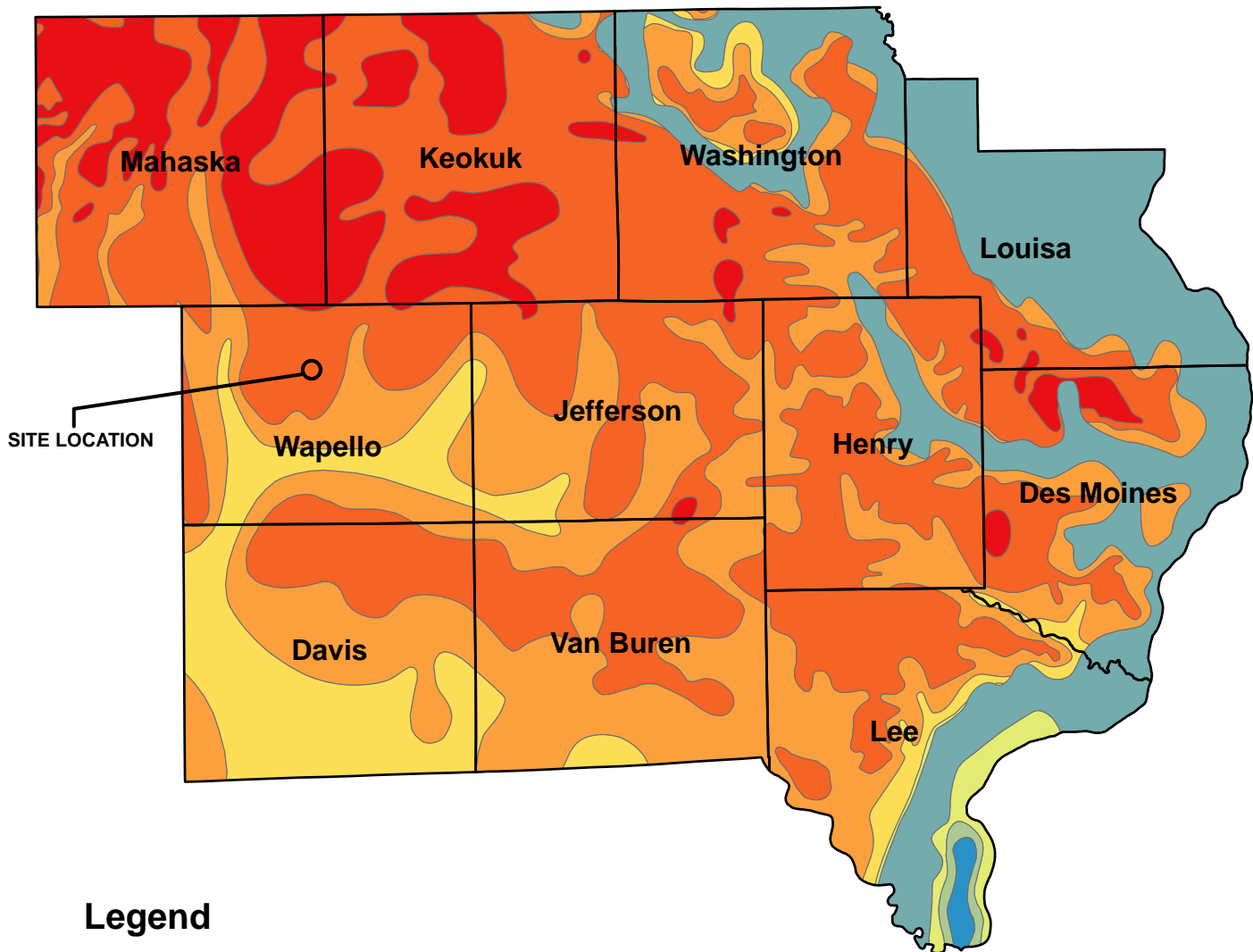
- BELOW 300
- 300 TO 400
- 400 TO 500
- 500 TO 600
- 600 TO 700
- 700 TO 800
- 800 TO 900



MAP DATA DERIVED FROM IOWA GEOLOGICAL AND WATER SURVEY
 IOWA BEDROCK SURFACE ELEVATION AS OBTAINED
 FROM IOWA NATURAL RESOURCES
 GEOGRAPHIC INFORMATION SYSTEMS LIBRARY

CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501	SITE	OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	SE IOWA REGIONAL BEDROCK SURFACE ELEVATION
PROJECT NO.	25215053.03	DRAWN BY:	JB	SCS ENGINEERS <small>2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830 FAX: (608) 224-2839</small>
DRAWN:	07/29/13	CHECKED BY:	MDB	
REVISED:	08/02/13	APPROVED BY:		
				ENGINEER
				FIGURE
				4

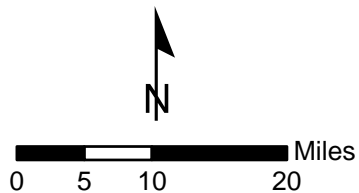
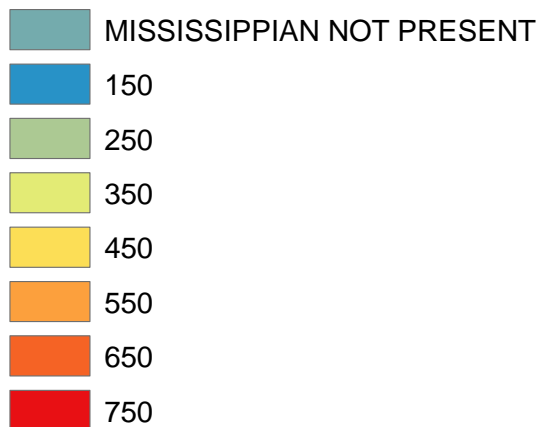
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Legend

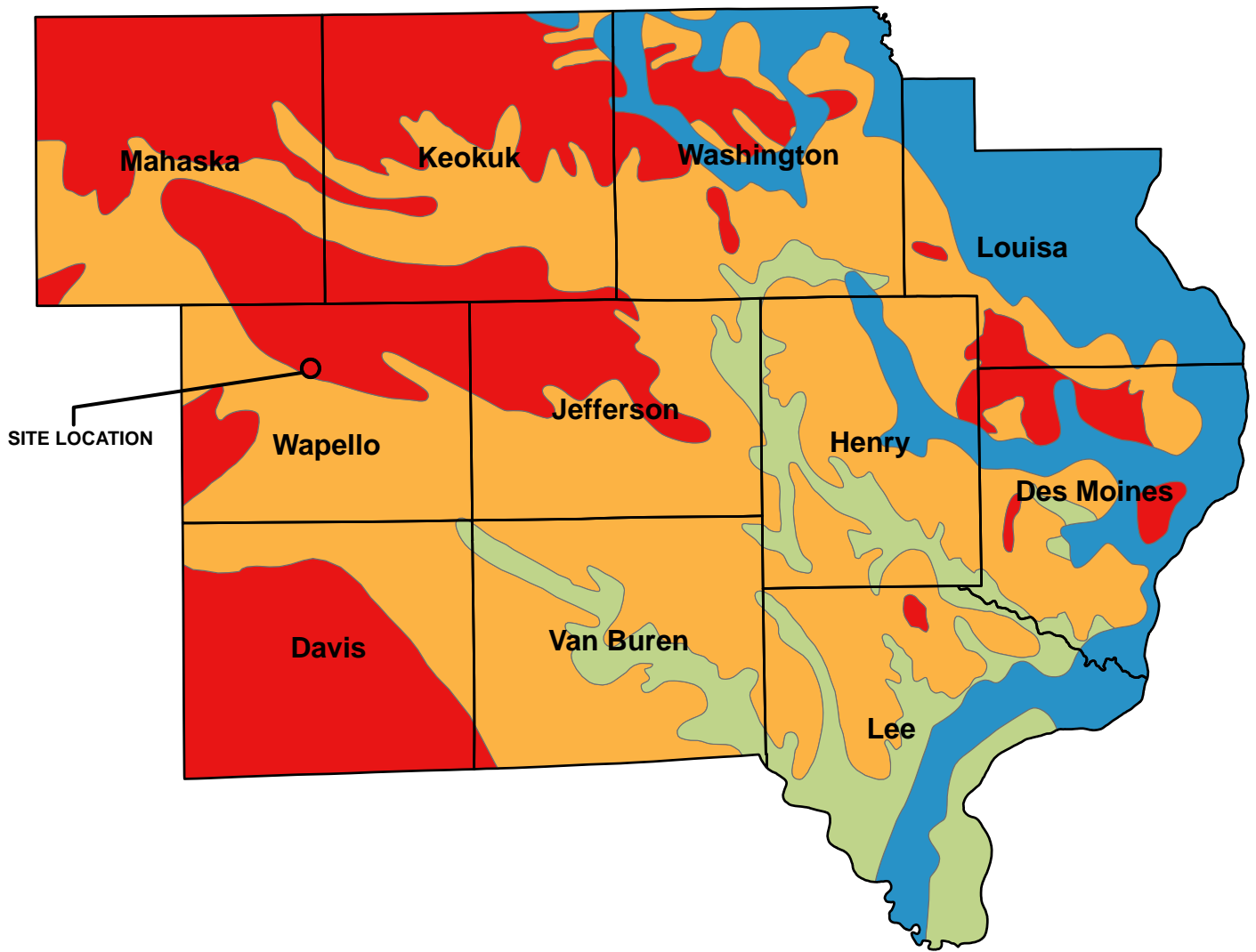
MISSISSIPPIAN AQUIFER ELEVATION

ELEVATION ABOVE MEAN SEA LEVEL IN FEET



MAP DATA DERIVED FROM IOWA GEOLOGICAL AND WATER SURVEY
 MISSISSIPPIAN AQUIFER SURFACE ELEVATION AS OBTAINED
 FROM IOWA NATURAL RESOURCES
 GEOGRAPHIC INFORMATION SYSTEMS LIBRARY

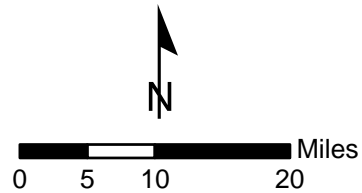
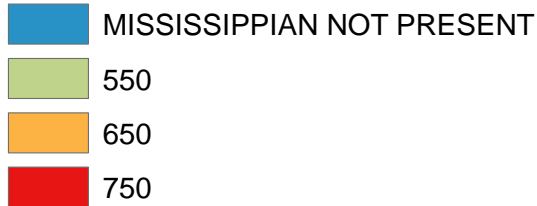
CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501	SITE	OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830 FAX: (608) 224-2839	FIGURE	5
	PROJECT NO. 25215053.03		DRAWN BY: JB				
	DRAWN: 07/29/13		CHECKED BY: MDB				
	REVISED: 08/02/13		APPROVED BY:				



Legend

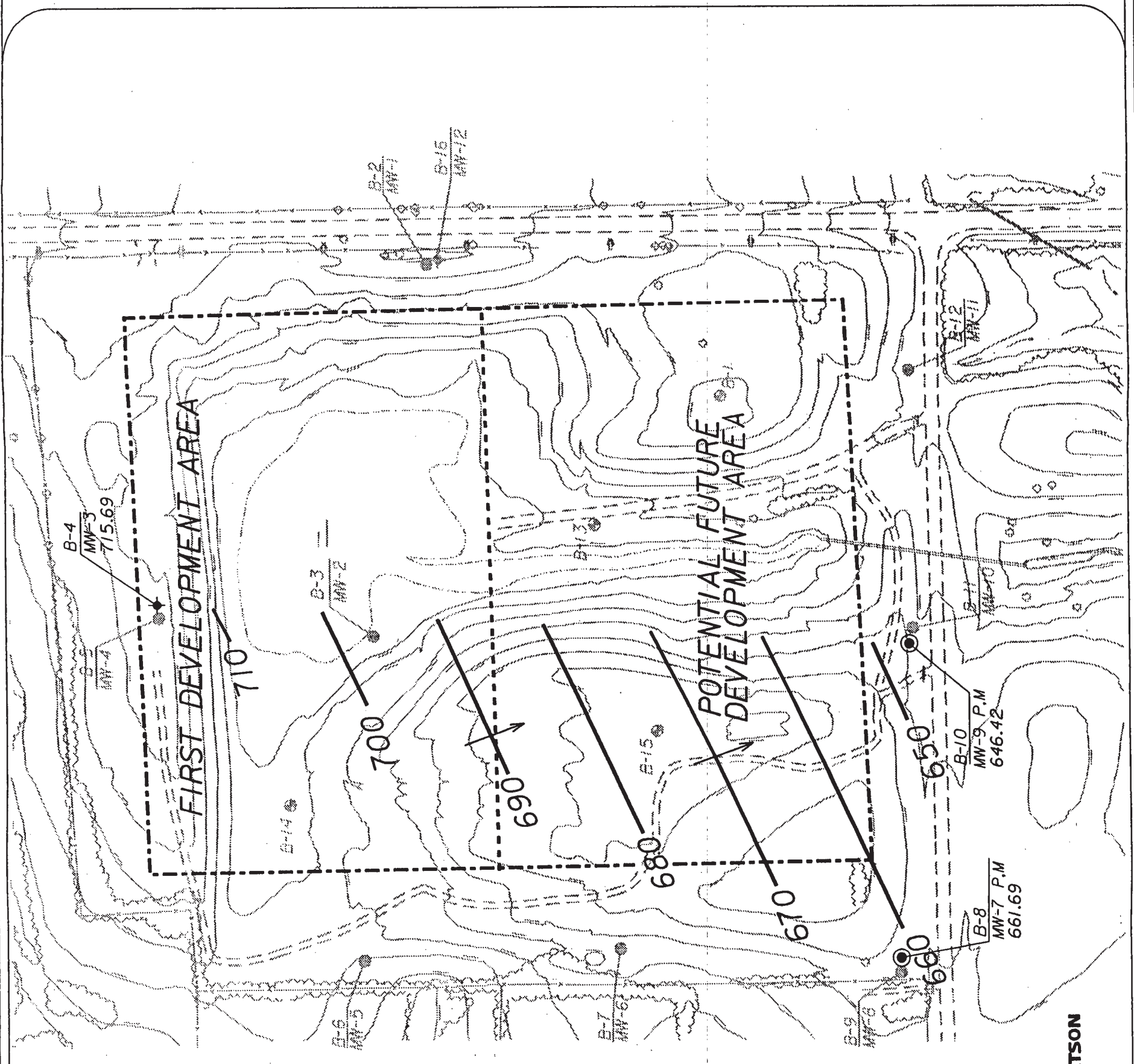
MISSISSIPPIAN AQUIFER POTENTIOMETRIC SURFACE

ELEVATION ABOVE MEAN SEA LEVEL IN FEET



MAP DATA DERIVED FROM IOWA GEOLOGICAL AND WATER SURVEY
 MISSISSIPPIAN AQUIFER POTENTIOMETRIC SURFACE ELEVATION AS OBTAINED
 FROM IOWA NATURAL RESOURCES
 GEOGRAPHIC INFORMATION SYSTEMS LIBRARY

CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501	SITE	OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	SE IOWA REGIONAL MISSISSIPPIAN AQUIFER POTENTIOMETRIC SURFACE ELEVATION	
	PROJECT NO. 25215053.03		DRAWN BY: JB	SCS ENGINEERS	FIGURE
	DRAWN: 07/29/13		CHECKED BY: MDB		
REVISD: 08/02/13	APPROVED BY:				



LEGEND:

- BORING
- ◆ DEEP MONITORING WELL
- ◎ MULTIPLE-CASED DEEP WELL
- SHALLOW MONITORING WELL
- PROPOSED LANDFILL BOUNDARY
- 661.69 POTENTIOMETRIC SURFACE ELEVATION ON 03-02-94
- INFERRED DIRECTION OF GROUNDWATER FLOW

NOTES:

1. CONTOUR INTERVAL = 10 FT.
2. ALL ELEVATIONS ARE REFERENCED TO NGVD.


OTTUMWA-MIDLAND
DEVELOPMENT CORPORATION

**POTENTIOMETRIC SURFACE
CONTOURS - MISSISSIPPIAN
(03-02-94)**

FIGURE 4-18



76



Appendix B
Boring Logs and Well Construction Documentation

SCS ENGINEERS
Civil & Environmental Engineering

SOIL BORING LOG INFORMATION





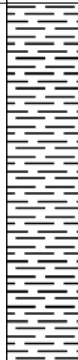



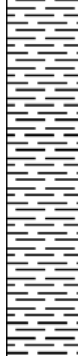

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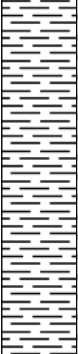



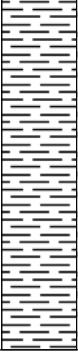

Facility/Project Name Ottumwa Midland Landfill		SCS # 25211509.03		License/Permit/Monitoring Number		Boring Number B-102	
Boring Drilled By (Firm name and name of crew chief) Boart Longyear Paul Dickinson				Drilling Started 08/20/2012		Drilling Completed 08/27/2012	
Facility Well No.		Unique Well No.		Common Well Name MW-102M		Static Water Level Feet	
						Surface Elevation 795.0 Feet	
						Borehole Diam. 10.5/6 Inches	
Boring Location State Plane N, E NE 1/4 of SE 1/4 of Section 34, T. 73 N., R. 14 W.				Lat. Long.		Local Grid Location (If applicable)	
County Wapello				Location Code		Civil Town/City/or Village Ottumwa	

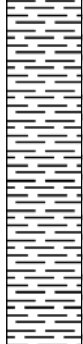

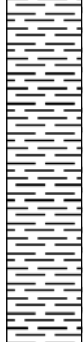

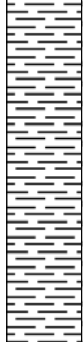

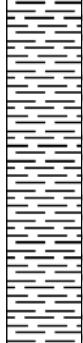

Sample Number	Length Recovered	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
									Standard Penetration	Moisture Content	P200	
S1	8	05,07 09,12		SILTY CLAY, dark brown (10YR 3/3), stiff, massive, few roots (topsoil/loess).	CL-ML				1.25	M		begin drilling with 6-1/4" hollow stem augers and sampling with split-spoons and 140 lb hammer
S2	8	06,13 09,18		LEAN CLAY, mottled olive yellow (2.5Y 6/8) and light olive brown (2.5Y 5/3), hard, blocky (loess).	CL				>4.5	M		
S3	14	12,17 10,14	5	LEAN CLAY, very dark grayish brown (2.5Y 3/2) mottled dark red (2.5YR 3/6), with silt, very stiff, cobble at 6' (till).	CL				>4.5	M		
S4 ST	24				CL					M		

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature 	Firm SCS ENGINEERS Tyler Munson
---------------	------------------------------------

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S5	10	12,21 38, 30/2"		CLAY, grayish brown (10YR 5/2) with black (10YR 2/1) and dark reddish brown (2.5YR 2.5/4) mottles, hard.	CL				4.25	M		at 15' auger refusal, begin drilling with 6" air hammer and sample drill cuttings
S6	12	22,17 61/4"		WEATHERED SHALE, gray (2.5Y 5/1), trace to few black (2.5Y 2.5/1) zones, massive, with silt (Pennsylvanian). As above, except silty with pale red zones instead of black zones.	Shale				>4.5	M		
S7			15	SHALE, light brownish gray (10YR 6/2) and brownish yellow (10YR 6/6).								
S8			20	As above, except trace very dark grayish brown (10YR 3/2).								
S9			25	As above, except gray (10YR 6/1 to 10YR 5/1).								

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S10			35	As above.	Shale							
				SHALE with coal, black (10YR 2/1) to very dark brown (10YR 2/2).								
				COAL, black (10YR 2/1).								
				SHALE, light gray (10YR 7/1) to gray (10YR 6/1).								
S11			40	Coal								
S12			45	Shale								
S13												

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S14			55	SHALE, gray (10YR 5/1)								
S15			60	As above, except gray (10YR 6/1) to dark gray (10YR 4/1).	Shale							
S16			65	As above, except very dark gray (10YR 3/1).								
S17												

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S18	Run 1	58/78	75	SHALE, gray (10YR 6/1).	Shale							at 74', begin NQ3 coring
				SILTY SHALE, gray (10YR 5/1), 1mm to 3mm-thick lamina, intensely fractured.	Shale							
				SANDSTONE, gray (10YR 5/1) with some light yellowish brown (10YR 6/4) lamina, strong, moderately fractured.	Sandstone							
				SILTY SHALE, gray (10YR 5/1), 1mm to 3mm-thick lamina, moderately fractured, moderate to strong.	Shale							
				SANDSTONE, gray (10YR 5/1) with some light yellowish brown (10YR 6/4) lamina, strong, moderately fractured.	Sandstone							
				SANDSTONE, gray (10YR 5/1) with some light yellowish brown (10YR 6/4) lamina, strong, moderately fractured.	Shale							
				SILTY SHALE, gray (10YR 5/1), 1mm to 3mm-thick lamina, moderately fractured, moderate to strong.	Sandstone							
				SANDSTONE, gray (10YR 5/1), strong, moderately fractured.	Sandstone							
				VOID or FRACTURES in possible shale.								
Run 2	8/24			SHALE	Shale							Run 2 (81.5' to 83.5') TCR=33% SCR=0% MCR=0% RQD=Very Poor
				WEATHERED SHALE (clay).	Shale							
Run 3	57/96			SHALE, very dark gray (10YR 3/1), moderate strength, intensely fractured, few pyrite nodules up to 1mm by 3mm in size, some highly decomposed zones.	Shale							Run 3 (83.5' to 91.5') TCR=59% SCR=53% MCR=8% RQD=Very Poor

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 4	31/ 120		95	As above.	Shale							Run 4 (91.5' to 101.5') TCR=26% SCR=21% MCR=3% RQD=Very Poor
				SILTY SHALE, black (10YR 2/1), weak to moderate strength, intensely fractured.	Shale							
Run 5	88/ 120		105	SILTY SHALE, dark brown (7.5YR 3/2), very weak, 1mm to 3mm-thick lamina, highly decomposed.	Shale							Run 5 (101.5'-111.5') TCR=73% SCR=73% MCR=35% RQD=Poor
				SILTY SHALE, dark gray (7.5YR 4/1), moderate strength to strong, massive, few weak zones, no decomposition.	Shale							

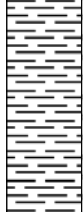

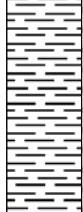

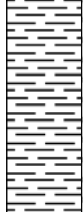

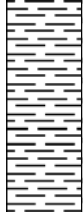

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 6	119/ 120		115	As above, except calcitic, pyrite nodules 5mm by 20mm in size at 112.8' and 117.3', slightly disintegrated and decomposed, slightly fractured, with some pyrite infilling.	Shale						Run 6 (111.5'-121.5') TCR=99% SCR=99% MCR=84% RQD=Good	
			120	SHALE, greenish gray (5GY 6/1), weak to moderate strength, pyrite mineralization along laminated zones, few disintegrated zones.	Shale							
Run 7	44/ 120		125	As above, except dark gray (7.5YR 4/1), massive, aphanitic.	Shale							Run 7 (121.5'-131.5') TCR=37% SCR=35% MCR=27% RQD=Poor
				SHALE, reddish brown (2.5YR 4/3), highly decomposed.	Shale							
				SHALE, gray (7.5YR 5/1), weak to moderate strength, with white limestone	Shale							

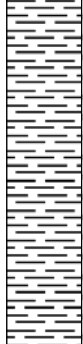

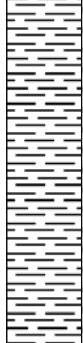

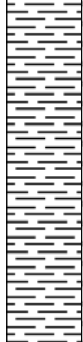

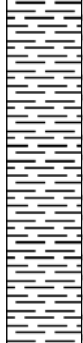

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 8	0/120			gravel, slighty to moderately disintegrated.	Shale							
			135	WEATHERED SHALE, highly decomposed, possibly soft shale in clay. Possible limestone at 138'.	Shale							Run 8 (131.5'-141.5') TCR=0% SCR=0% MCR=0% RQD=Very Poor at 138', driller reports change in drilling
Run 9	29/60		140	LIMESTONE, gray (10YR 5/1), strong (Mississippian).	Lime-stone							Run 9 (141.5'-146.5') TCR=48% SCR=38% MCR=15% RQD=Very Poor
			145	Blind drill.								after coring, reamed hole with 6" air hammer to 153'

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
				Blind drill.								
			155	End of boring @ 153'. Set MW-102M with 5' PVC screen to 148'.								
			160									
			165									

Facility/Project Name Ottumwa Midland Landfill		SCS # 25211509.03		License/Permit/Monitoring Number		Boring Number B-122						
Boring Drilled By (Firm name and name of crew chief) Boart Longyear Paul Dickinson				Drilling Started 12/06/2012		Drilling Completed 12/09/2012		Drilling Method HSA, Air Hammer, Core				
Facility Well No.		Unique Well No.		Common Well Name MW-122M		Static Water Level Feet		Surface Elevation 790.6 Feet		Borehole Diam. 10.5/6 Inches		
Boring Location State Plane N, E NW 1/4 of SE 1/4 of Section 34, T. 73 N., R. 14 W.				Lat. Long.		Local Grid Location (If applicable)						
County Wapello				Location Code		Civil Town/City/or Village Ottumwa						
Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S1	9	06-10 14-20		SILT, dark yellowish brown (10YR 4/4), massive, few roots (topsoil/loess).	ML				1.5	M		
				LEAN CLAY, olive yellow (2.5Y 6/6) mottled gray (2.5Y 6/1) and reddish brown (5YR 4/4), trace fine to coarse sand (till).	CL				2.75		2.0	
S2	24	06-17 20-26		CLAY, gray (5Y 5/1), few olive yellow (2.5Y 6/6) and dark reddish brown (5YR 3/4) layers, hard, 1mm to 5mm-thick lamina (weathered shale).	CL			4.5	M			
S3 ST	20		5		CL						pushed shelby tube from 5' to 7'	
S4	24	07-17 27-34		As above, except less gray and with black layers/lamina.					3.5	M		at 10', auger refusal, and begin drilling with 6" air hammer and sampling drill cuttings
				CLAY, black (2.5Y 2.5/1), 1mm to 2mm-thick lamina (weathered shale)	CL							
I hereby certify that the information on this form is true and correct to the best of my knowledge.												
Signature					Firm SCS ENGINEERS Meghan Blodgett							

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S5				WEATHERED SHALE, black (2.5Y 2.5/1), lamina up to 5mm-thick.								
S6			15	WEATHERED SHALE, dark gray (2.5Y 4/1) to black (2.5Y 2.5/1).								
S7			20	SHALE and WEATHERED SHALE, dark gray (2.5Y 4/1).	Shale							
S8			25	SHALE and WEATHERED SHALE, dark gray (2.5Y 4/1) to black (2.5Y 2.5/1).								




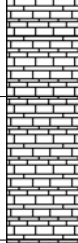
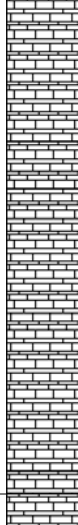
Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S9				As above.								
S10			35	SHALE, dark gray (2.5Y 4/1).								
S11			40	As above.	Shale							
S12			45	As above.								

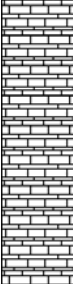
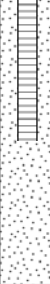
Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
S13				SHALE, dark gray (2.5Y 4/1) to black (2.5Y 2.5/1).								
S14			55	As above.								
S15			60	As above, except 6" coal seam at approximately 64.5'.	Shale							
S16			65	SHALE, light gray (2.5Y 7/1) to very dark gray (2.5y 3/1).								

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 1	68/78			SHALE, very dark gray (2.5Y 3/1) to gray (2.5Y 5/1), weak to moderate strength, 1mm to 5mm-thick lamina, moderately decomposed (clay along fractures), intensely fractured, some sand at 70' to 71'.							begin NQ3 coring at 70' Run 1 (70' to 76.5') TCR=87% SCR=82% MCR=46% RQD=Poor	
			75	As above, except few sandy intervals up to 2" in length at 77.5' to 78.5'.							Run 2 (76.5' to 81.5') TCR=90% SCR=75% MCR=8% RQD=Very Poor	
Run 2	54/60			SHALE, very dark gray (2.5Y 3/1) with little gray (2.5Y 5/1 & 6/1), 1mm to 5mm-thick lamina, moderately weathered (clay along fractures), trace pyrite nodules throughout.	Shale						Run 3 (81.5' to 86.5') TCR=67% SCR=55% MCR=0% RQD= Very Poor	
			80								Run 4 (86.5' to 91.5') TCR=60% SCR=53% MCR=40% RQD=Poor	
Run 3	40/60			As above.								
			85									
Run 4	36/60											

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 4 (cont)				As above.	Shale							four 6" to 8" bit drops one foot apart indicated possible voids from 93' to 97'
				SILTSTONE, very dark gray (2.5Y 3/1), moderately strong, massive, trace fractures infilled with calcite.	Silt-stone							
			95	SHALE, very dark gray (2.5Y 3/1), very weak to weak, 1mm to 5mm-thick lamina, moderately to highly decomposed (highly decomposed in top 2' of recovered shale), trace pyrite throughout, possible voids from approximately 93' to 97', bedding planes are horizontal where present.								
Run 5	59/120											
			100		Shale							
Run 6	48/60			SHALE, light to dark gray (2.5Y 7/1 to 4/1), weak, 1mm to 3mm-thick lamina, massive from 104' to 105', trace coal on fracture planes, trace pyrite throughout.								Run 6 (101.5'-106.5') TCR=80% SCR=68% MCR=48% RQD=Poor
			105									
Run 7	6/60			SHALE, gray (2.5Y 5/1), weak to moderate strength, 1mm to 3mm-thick lamina, silty.								Run 7 (106.5'-111.5') TCR=10% SCR=10% MCR=7% RQD=Very Poor

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 7 (cont)				As above.								
Run 8	30/30			SHALE, dark gray (2.5Y 4/1) with gray (2.5Y 5/1), weak to moderate strength, bedding vairable, 1mm-thick lamina to 2cm-thick beds, moderately decomposed (clay in fractures), few 1cm to 3cm-thick sandy zones, trace pyrite nodules throughout.								Run 8 (111.5'-114') TCR=100% SCR=80% MCR=60% RQD=Fair
Run 9	65/90		115	Interbedded SHALE, SILTSTONE, and SANDSTONE, gray (10YR 6/1) to very dark gray (10YR 3/1), weak strength to strong, sandstone/siltstone/shale intervals are 1" to 10"-thick, bedding ranges from 1mm-thick lamina in shale to massive in siltstones, some slump/flame structures in sand, intensely fractured, fresh to moderately decomposed (clay in fractures), trace pyrite throughout.	Shale							Run 9 (114'-121.5') TCR=72% SCR=70% MCR=9% RQD=Very Poor
Run 10	12/12		120									Run 10 (121.5'-122.5') TCR=100% SCR=92% MCR=0% RQD=Very Poor
			125	SHALY SILTSTONE and SANDSTONE, black (2.5Y 2.5/1) with bands of light gray (2.5Y 7/1), moderate strength, 1mm to 10mm-thick lamina, trace pyrite throughout, moderately to intensely fractured.	Silt-stone							
Run 11	108/108			SHALE, black (2.5Y 2.5/1), weak, 1mm to 5mm-thick lamina, some silt and sand, moderatly decomposed, moderately fractured, trace pyrite throughout.	Shale							Run 11 (122.5'-131.5') TCR=100% SCR=95% MCR=60% RQD=Fair

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 11 (cont)				As above.	Shale							
			135	SHALE, dark greenish gray (5GY 4/1), weak to moderate strength, 1mm to 5mm-thick lamina, moderately to highly decomposed.	Shale							Run 12 (131.5'-141.5') TCR=92% SCR=86% MCR=63% RQD=Fair
Run 12	110/ 120			LIMESTONE CONGLOMERATE, reddish brown (5YR 5/3) with gray shale between clasts, weak, massive.	Lime-stone							
			140	SHALY LIMESTONE, greenish gray (5GY 5/1), weak, massive, 2" of light gray clay at interface with above conglomerate.	Lime-stone							
			145	SHALY LIMESTONE, reddish brown (5YR 4/3), few greenish gray zones, moderate strength, few clasts of hard competent limestone up to 1.5" in diameter, moderately decomposed.	Lime-stone							Run 13 (141.5'-151.5') TCR=95% SCR=95% MCR=73% RQD=Fair
Run 13	114/ 120											

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Max. PID/FID	Soil Properties			RQD/ Comments
Number	Length Recovered								Standard Penetration	Moisture Content	P200	
Run 13 (cont)	30/30			SHALY LIMESTONE, yellowish gray (5GY 5/1), weak, massive, fresh to slightly decomposed.	Lime-stone							Run 14 (151.5'-154') TCR=100% SCR=90% MCR=90% RQD=Good
Run 14				As above.								
			155	End of Boring @ 154'. Set MW-122M with 5' PVC screen to 152'.								
			160									
			165									



IOWA DEPARTMENT OF NATURAL RESOURCES
MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Ottumwa Midland Landfill Permit No.: 90-SDP-8-92P
Well or Piezometer No: MW-301
Dates Started: 11/23/15 Date Completed: 11/24/15

A. SURVEYED LOCATIONS AND ELEVATIONS
B. SOIL BORING INFORMATION
Locations (± 0.5 ft): Specify corner of site: SE
Distance & direction along boundary: 700'N
Distance & direction from boundary to wall: 90' W
Elevations (± 0.01 ft MSL):
Ground Surface: 815.51'
Top of protective casing: 818.36'
Top of well casing: 817.88'
Benchmark elevation: 818.70
Benchmark description: Control Point #2
Name & Address of Construction Company: Cascade Drilling, LP
301 Alderson St
Schofield, WI 54476
Name of Driller: Todd Schmalfeld
Drilling Method: 4.25' HSA to 24.5'/Air Rotary to 164'/coring
Drilling Fluid: NA
Bore Hole Diameter: 8.50 inch/ 6 inch
Soil Sampling Method: Split Spoon/cuttings/core
Depth of Boring: 202'

C. MONITORING WELL INSTALLATION
Casing material: sch 80 PVC
Length of casing: 196'
Outside casing diameter: 2.38"
Inside casing diameter: 1.9"
Casing joint type: threaded
Casing/screen joint type: threaded
Screen material: PVC
Screen opening size: 0.010
Screen length: 5 ft
Depth of well: 201 ft
Filter Pack:
Material: Red Flint
Grain size: #40
Volume: 2 cubic ft
Seal (minimum 3 ft length above filter pack):
Material: AquaGuard grout
Placement method: tremie
Volume: 400 gallons
Backfill (if different from seal):
Material: 3/8" bentonite chips and Aqua Guard grout
Placement method: gravity/tremie
Volume:
Surface seal design:
Material of protective casing: Steel 6 inch
Material of grout between protective casing and well casing: sand
Protective cap:
Material: Steel
Vented: [X] Yes [] No Locking: [] Yes [] No
Well Cap:
Material: PVC
Vented: [] Yes [X] No

D. GROUNDWATER MEASUREMENT (± 0.01 ft below top of inner well casing)
Water level: 125.9 Stabilization Time: 20 HR
Well development method: Surged and bailed, then pumped to reduce turbidity.
Average depth of frostline: 3.5'

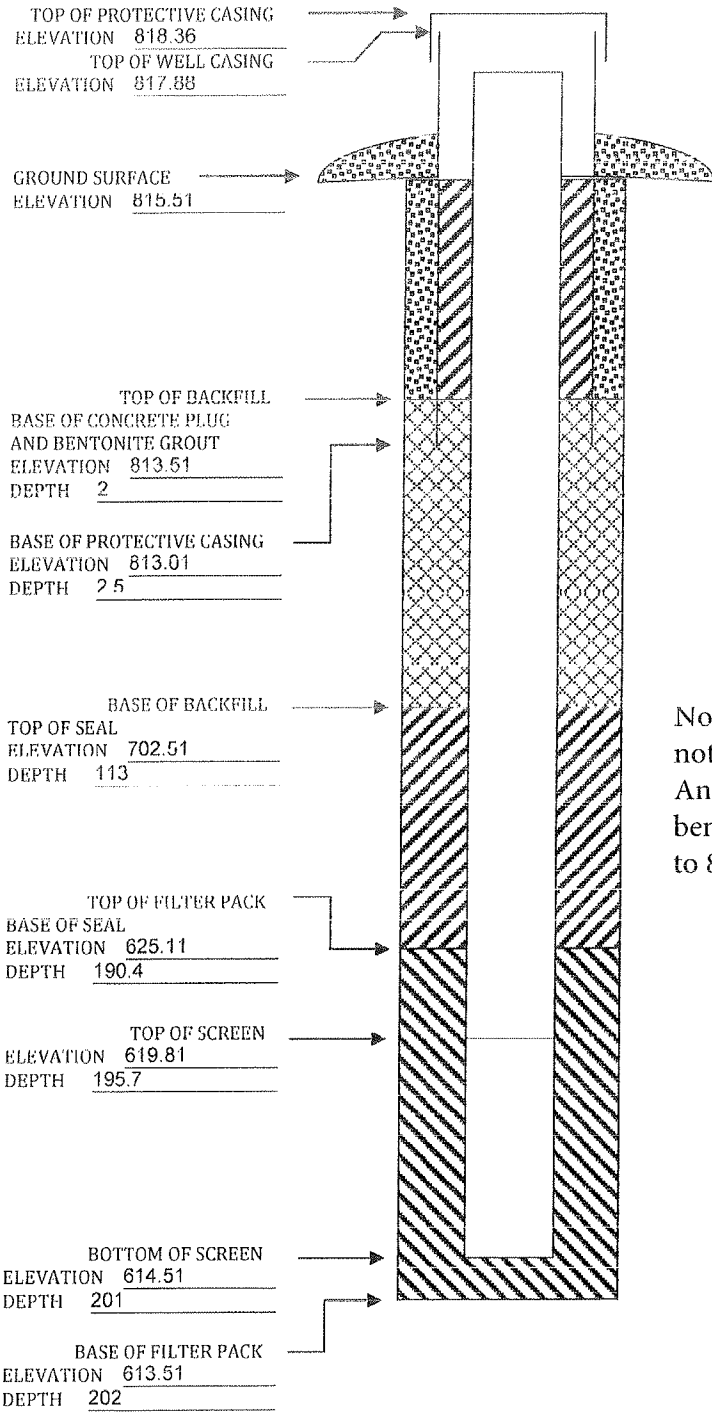
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 1/2x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)



Note: Grout placed from 190.4' bgs to 113' bgs. Void noted from 105' bgs to 113'. Grout basket placed at 95'bgs. Annular space above grout basket sealed with 3/8" bentonite chips (80'-95' bgs) and bentonite grout (3' bgs to 80' bgs).



IOWA DEPARTMENT OF NATURAL RESOURCES
MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Ottumwa Midland LandfillPermit No.: 90-SDP-8-92PWell or Piezometer No: MW-302Dates Started: 12/1/15Date Completed: 12/3/15

A. SURVEYED LOCATIONS AND ELEVATIONS	B. SOIL BORING INFORMATION
Locations (± 0.5 ft): _____	Name & Address of Construction Company: _____
Specify corner of site: <u>SE</u>	<u>Cascade Drilling, LP</u>
Distance & direction along boundary: <u>700' N</u>	<u>301 Alderson St</u>
Distance & direction from boundary to wall: <u>725' W</u>	<u>Schofield, WI 54476</u>
Elevations (± 0.01 ft MSL): _____	Name of Driller: <u>Todd Schmalfeld</u>
Ground Surface: <u>759.50'</u>	Drilling Method: <u>4.25'HSA to 14.5'/Air Rotary to 95'/coring</u>
Top of protective casing: <u>762.31'</u>	Drilling Fluid: <u>NA</u>
Top of well casing: _____ <u>761.77'</u>	Bore Hole Diameter: <u>8.5 inch/6 inch</u>
Benchmark elevation: <u>818.70</u>	Soil Sampling Method: <u>Spoon/cuttings/core</u>
Benchmark description: <u>Control Point #2</u>	Depth of Boring: <u>156.5'</u>
C. MONITORING WELL INSTALLATION	
Casing material: _____ <u>sch 80 PVC</u>	Placement method: <u>gravity</u>
Length of casing: _____ <u>150'</u>	Volume: <u>0.5 cubic ft</u>
Outside casing diameter: _____ <u>2.38"</u>	Backfill (if different from seal): _____
Inside casing diameter: _____ <u>1.9"</u>	Material: <u>Agua Guard Grout</u>
Casing joint type: _____ <u>threaded</u>	Placement method: <u>Tremie</u>
Casing/screen joint type: _____ <u>threaded</u>	Volume: <u>300 gallons</u>
Screen material: _____ <u>PVC</u>	Surface seal design: _____
Screen opening size: _____ <u>0.010</u>	Material of protective casing: <u>Steel 6 inch</u>
Screen length: _____ <u>5'</u>	Material of grout between protective casing and well casing: <u>sand</u>
Depth of well: _____ <u>155'</u>	Protective cap: _____
Filter Pack: _____	Material: <u>Steel</u>
Material: _____ <u>Red Flint</u>	Vented: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Locking: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Grain size: _____ <u>#40</u>	Well Cap: _____
Volume: _____ <u>2 cubic ft</u>	Material: <u>PVC</u>
Seal (minimum 3 ft length above filter pack): _____	Vented: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Material: <u>3/8" bentonite chips</u>	
D. GROUNDWATER MEASUREMENT (± 0.01 ft below top of inner well casing)	
Water level: <u>75.97'</u>	Stabilization Time: <u><1 hour</u>
Well development method: <u>Surged and bailed then pumped to reduce turbidity</u>	
Average depth of frostline: <u>3.5'</u>	

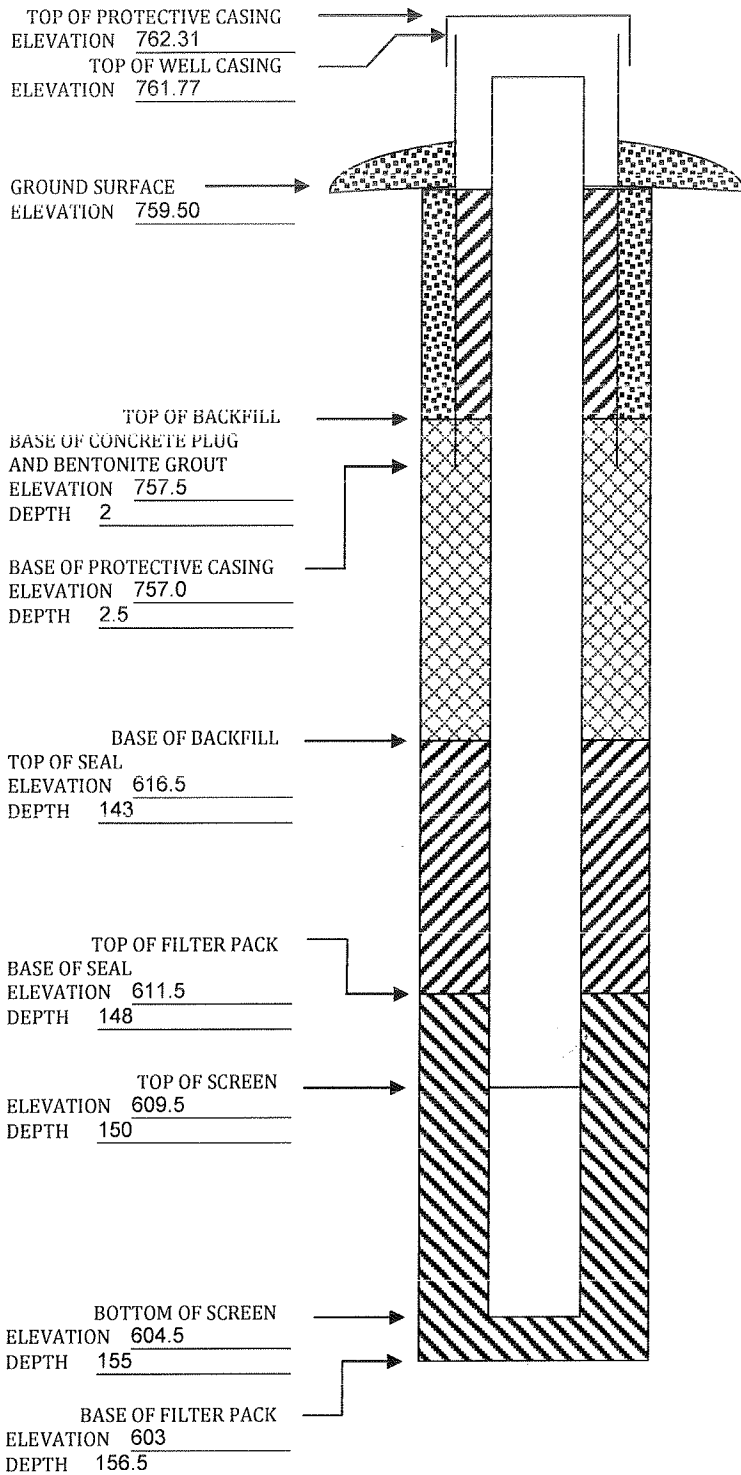
Attachments: Driller's log, Pipe schedules and grouting schedules. 8 1/2x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)





IOWA DEPARTMENT OF NATURAL RESOURCES
MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: IPL - Ottumwa Midland Landfill Permit No.: 90-SDP-8-92P

Well or Piezometer No: MW-303

Dates Started: 4/25/16 Date Completed: 4/26/16

A. SURVEYED LOCATIONS AND ELEVATIONS B. SOIL BORING INFORMATION

Locations (± 0.5 ft):
Specify corner of site: SE
Distance & direction along boundary: 700' N
Distance & direction from boundary to wall: 350' W
Elevations (± 0.01 ft MSL):
Ground Surface: 759.93
Top of protective casing: 762.94
Top of well casing: 762.40
Benchmark elevation: 818.70
Benchmark description: Control Point #2

Name & Address of Construction Company:
Name of Driller:
Drilling Method: 4.25'HSA to/Air Rotary/coring
Drilling Fluid: NA
Bore Hole Diameter: 8.5 inch/6 inch
Soil Sampling Method: Spoon/cuttings/core
Depth of Boring:

C. MONITORING WELL INSTALLATION

Casing material: sch 80 PVC
Length of casing: 142'
Outside casing diameter: 2.40"
Inside casing diameter: 1.9"
Casing joint type: threaded
Casing/screen joint type: threaded
Screen material: PVC sch 80
Screen opening size: 0.010
Screen length: 5'
Depth of well: 147'
Filter Pack:
Material: Unamin Filtersil
Grain size: 10/20 mesh
Volume: 2.5 cubic ft
Seal (minimum 3 ft length above filter pack):
Material: 3/8" bentonite chips

Placement method: tremie
Volume: 300 gal
Backfill (if different from seal):
Material: 3/8" bentonite chips
Placement method: gravity
Volume: 15 cubic ft
Surface seal design:
Material of protective casing: steel
Material of grout between protective casing and well casing: bentonite chips and sand
Protective cap:
Material: steel
Vented: [X] Yes [] No Locking: [] Yes [] No
Well Cap:
Material: Plastic
Vented: [] Yes [] No

D. GROUNDWATER MEASUREMENT (± 0.01 ft below top of inner well casing)

Water level: 76.36 Stabilization Time: <1hr.
Well development method: surged and bailed, then pumped to reduce turbidity.
Average depth of frostline: 3.5

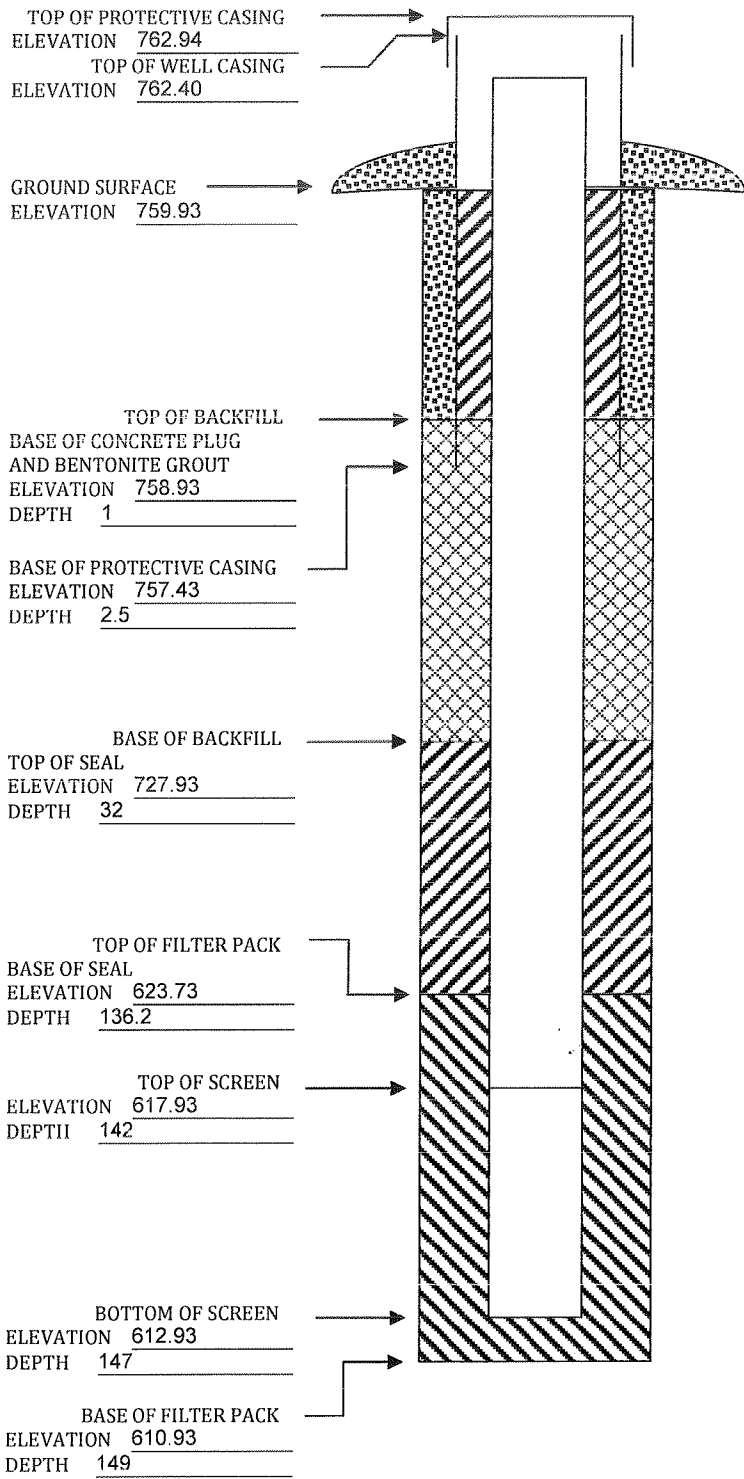
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 1/2x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)




Route To: Watershed/Wastewater Waste Management
Remediation/Redevelopment Other

Facility/Project Name IPL-Ottumwa Midland Landfill		SCS#: 25215135.50		License/Permit/Monitoring Number 90-SDP-8-92P		Boring Number MW-301	
Boring Drilled By: Name of crew chief (first, last) and Firm Todd Schmalfeld Cascade Drilling				Date Drilling Started 11/16/2015		Date Drilling Completed 11/19/2015	
Drilling Method 4.25"HSA /6"air rot/core		Unique Well No. N/A		DNR Well ID No. N/A		Common Well Name MW-301	
Final Static Water Level Feet		Surface Elevation 815.5 Feet		Borehole Diameter 8.5"/6" in			
Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Boring Location <input checked="" type="checkbox"/> State Plane 1,930,292 N, 394,330 E S/C/N				Lat ° ' "		Local Grid Location <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	
NE 1/4 of SE 1/4 of Section 34, T 73 N, R 14 W				Long ° ' "			

Facility ID	County Wapello	Civil Town/City/ or Village Ottumwa
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Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
									Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S1	16	5 6 8 10	1	FAT CLAY, very dark grayish brown, (2.5Y 3/2).	CH							M		
S2	16	5 6 6 9	3	FAT CLAY, black (2.5Y 2.5/1).								M		
S3	22	5 5 6 7	6	Same as above, except very dark grayish brown (2.5Y 3/2).								M		
S4	5	8 7 8 12	8	Same as above, except black (2.5Y 2.5/1).	CH							M		
S5	20	3 6 7 11	11									M		
S6	21	3 5 7 9	14	Same as above, except very dark grayish brown (2.5Y 3/2).								M		

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature 	Firm SCS Engineers 2830 Dairy Drive Madison, WI 53711	Tel: (608) 224-2830 Fax:
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Boring Number MW-301

Page 2 of 9

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S7	23	3 4 8 9	16 17	LEAN CLAY WITH SAND, gray (2.5Y 5/1), fine grained sand.	CL										
S8	20	4 9 9 11	18 19	FAT CLAY, primary color-black (2.5Y 2.5/1), secondary color-yellowish brown (10YR 5/6).	CH										
S9	24	8 27 22 24	20 21 22	SILT, ash, black (2.5Y 2.5/1).	ML										
S10	16	18 28 34 44	23 24	SHALE, gray (10YR 5/1) matrix, moderate strength, massive.											Saturation @ 23.5 ft bgs
S11			25 26 27 28 29 30												Air Rotary
S12			31 32 33	Same as above, except light yellowish brown (10YR 6/4).											
S13			34 35 36 37 38 39 40	Same as above, except gray (10YR 5/1).											

Boring Number MW-301

Page 3 of 9

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S14			41	SHALE, gray (10YR 5/1) matrix, moderate strength, massive. <i>(continued)</i>										
			42											
S15			43	Same as above, except yellowish brown (10YR 6/4).										
			44											
S16			45	Same as above, except yellowish brown (10YR 6/4).										
			46											
S17			47	Same as above, except yellowish brown (10YR 6/4).										
			48											
S18			49	Same as above, except dark gray (10YR 4/1).										
			50											
S18			51	Same as above, except dark gray (10YR 4/1).										
			52											
S18			53	Same as above, except dark gray (10YR 4/1).										
			54											
S18			55	Same as above, except dark gray (10YR 4/1).										
			56											
S18			57	Same as above, except dark gray (10YR 4/1).										
			58											
S18			59	Same as above, except dark gray (10YR 4/1).										
			60											
S18			61	Same as above, except dark gray (10YR 4/1).										
			62											
S18			63	Same as above, except black (10YR 2/1).										
			64											
S18			65	Same as above, except black (10YR 2/1).										
			66											

Boring Number MW-301

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S19			66	SHALE, gray (10YR 5/1) matrix, moderate strength, massive. <i>(continued)</i>											
			67												
			68												S
			69												
			70												
S20			71												
			72												
			73												S
			74												
			75												
S21			76	Same as above, except light gray (2.5Y 7/1).											
			77												
			78												S
			79												
			80												
S22			81												
			82												
			83												S
			84												
			85												
S23			86	Same as above, except very dark gray (5Y 3/1).											
			87												
			88												S
			89												
			90												

Boring Number MW-301

Page 5 of 9

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S24			91	SHALE, gray (10YR 5/1) matrix, moderate strength, massive. (continued)											
			92												
			93												S
			94												
			95												
S25			96	Same as above, except black (10YR 2/1).											
			97												
			98												S
			99												
			100												
S26			101	VOID.											
			102												
			103												S
			104												
			105												
S27			106	SHALE, black (10YR 2/1).											
			107												
			108												S
			109												
			110												
			111												
			112												
			113												
			114												
			115												

Void @ 105
ft bgs, sulfur
smell.

Boring Number MW-301

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments				
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200					
				SHALE, black (10YR 2/1). (continued)														
			116															
S28			117															
			118										S					
			119															
			120															
			121															
S29			122															
			123										S					
			124															
			125															
			126															
			127															
S30			128										S					
			129															
			130															
			131															
			132															
S31			133										S					
			134															
			135															
			136															
			137															
S32			138										S					
			139															
			140															

Boring Number MW-301

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S33			141	SHALE, black (10YR 2/1). (continued)										
			142											
			143											S
			144											
			145											
S34			146	Same as above, except drak grayish brown (10YR 3/2).										
			147											
			148											S
			149											
			150											
S35			151	Same as above, except drak grayish brown (10YR 3/2).										
			152											
			153											S
			154											
			155											
S36			156	WEATHERED SHALE AND LIMESTONE, dark grayish brown (10YR 3/2), gray limestone (10YR 6/1).										
			157											
			158											S
			159											
			160											
			161	NO RECOVERY.										
			162											
			163											
			164											
			165											
			166	WEATHERED SHALE, gray (2.5Y 6/1), soft shale in clay.										
			167											

Boring Number MW-301

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
R1	62/72		166	WEATHERED SHALE, gray (2.5Y 6/1), soft shale in clay. <i>(continued)</i>									Run 1 164'-170' bgs TCR=86% SCR=73% MCR=33%	
			167	LIMESTONE, gray (10YR 5/1), strong, massive.										
R2	22/24		168	LIMESTONE, gray (10YR 5/1), strong, massive.									Run 2 170'-172'bgs TCR=92% SCR=92% MCR=66%	
			169											
R3	32/36		170										Run 3 172'- 175' bgs TCR=88% SCR=88% MCR=82%	
			171	SHALE, greenish gray (5G 5/1), with pyrite, weak.										
R4	18/120		172										Run 4 175'- 185' bgs TCR=98% SCR=98% MCR=89%	
			173	LIMESTONE, gray (10YR 5/1), interbedded with shale laminations, strong.										
			174											
			175											
			176											
			177											
			178											
			179											
			180											
			181											
			182											
			183											
			184											
			185											
			186											
			187											
			188											
			189											
			190											

Boring Number MW-301

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
R5	16/120		185	LIMESTONE, gray (10YR 5/1), strong. <i>(continued)</i>										Run 5 185'-195' bgs TCR=97% SCR=93% MCR=84%
			191	SHALE, greenish gray (5G 5/1), clayey.										
			192											
			193											
			194	SANDSTONE, greenish gray (5G 6/1), strong, well cemented.										
			195											
			196											
			197	Very weak.										
R6	33/60		198											Run 6 195'-200' bgs TCR=55% SCR=47% MCR=13%
			199											
			200											
			201											
			202	End of Boring at 202 feet bgs. Boring reamed to 202' bgs prior to installation of MW-301.										

Route To: Watershed/Wastewater Waste Management
 Remediation/Redevelopment Other

Facility/Project Name IPL-Ottumwa Midland Landfill		SCS#: 25215135.50		License/Permit/Monitoring Number 90-SDP-8-92P		Boring Number MW-302	
Boring Drilled By: Name of crew chief (first, last) and Firm Todd Schmalfeld Cascade Drilling				Date Drilling Started 12/1/2015		Date Drilling Completed 12/3/2015	
Unique Well No. N/A		DNR Well ID No. N/A		Common Well Name MW-302		Final Static Water Level Feet	
				Surface Elevation 759.5 Feet		Borehole Diameter 8.5"/6" in	
Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Boring Location <input checked="" type="checkbox"/> State Plane 1,929,605 N, 394,359 E S/C/N				Lat ° ' "		Local Grid Location	
NW 1/4 of SE 1/4 of Section 34, T 73 N, R 14 W				Long ° ' "		<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	

Facility ID	County Wapello	Civil Town/City/ or Village Ottumwa
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Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments		
									Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200			
S1	20	2 3 5 8	1	TOPSOIL FAT CLAY, dark gray (10YR 4/1), secondary color- Dark yellowish brown (10YR 4/4), organics, fill.	TOPSOIL											
S2	6	3 50	2	Weathered Shale	CH											
S3	18	6 17 44 50	3	SHALE, dark gray (10YR 4/1), moderate strength, massive.												
S4	16	3 15 26 28	4													
S5	5	6 50	5													
S6	12	2 50	6													Saturation @12.5 ft bgs.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature 	Firm SCS Engineers 2830 Dairy Drive Madison, WI 53711	Tel: (608) 224-2830 Fax:
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Boring Number MW-302

Page 2 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S7			16	SHALE, dark gray (10YR 4/1), moderate strength, massive. <i>(continued)</i>											
			17	same as above, except black (2.5Y 2.5/1), clayey.											S
			18												
			19												
			20												
S8			21												
			22		S										
			23												
			24												
			25												
S9			26												
			27	same as above, except dark gray (2.5Y 4/1), clayey.	S										
			28												
			29												
			30												
S10			31												
			32		S										
			33												
			34												
			35												
S11			36												
			37		S										
			38												
			39												
			40												

Boring Number MW-302

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S12			41	SHALE, dark gray (10YR 4/1), moderate strength, massive. <i>(continued)</i> same as above, except black (2.5Y 2.5/1).											
			42												
S13			43												
			44												
S14			45												
			46												
S15			47												
			48												
S16			49												
			50												
S16			51												
			52												
S16			53												
			54												
S16			55												
			56												
S16			57												
			58												
S16			59												
			60												
S16			61												
			62												
S16			63												a lot of water @ 62 ft bgs.
			64												
S16			65												
			66												

Boring Number MW-302

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S17			66	SHALE, dark gray (10YR 4/1), moderate strength, massive. <i>(continued)</i>										
			67	Shale, black (2.5Y2.5/1), not as clayey as above.										
			68											
			69											
			70											
S18			71											
			72											
			73											
			74											
			75											
S19			76	same as above, except dark gray (2.5Y 4/1).										
			77											
			78											
			79											
			80											
S20			81											
			82											
			83											
			84											
			85											
S21			86											
			87											
			88											
			89											
			90											

Boring Number MW-302

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S22			91	SHALE, dark gray (10YR 4/1), moderate strength, massive. <i>(continued)</i>										
			92	same as above, except gray (2.5Y 5/1).										
			93											
			94											
			95											
R1	24/36		96	WEATHERED SHALE, greenish gray (5G 5/1), clayey.									Run 1 96'-99' bgs TCR=66% SCR=66% MCR=47%	
			97											
			98	SHALE, greenish gray (5G 5/1), weak, massive.										
R2	02/120		99											Run 2 99'-109' bgs TCR=85% SCR=77% MCR=52%
			100											
			101	SHALE, very dark brown (2.5YR 2.5/3), very weak.										
			102											
			103											
			104	SHALE, clayey, greenish gray (5G 5/1), very weak.										
			105											
R3	68/72		106											Run 3 109'-117' bgs TCR=95% SCR=90%
			107											
			108											
			109											
			110											
			111											
112														
			113											
			114											
			115											

Boring Number MW-302

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
R4	24/24		116	SHALE, clayey, greenish gray (5G 5/1), very weak. <i>(continued)</i> not as clayey, weak.									MCR=75%	
			117											
			118											
			119											
R5	16/120		120	LIMESTONE, gray (10YR 6/1), interbedded with shale laminations, strong.									Run 4 117'-119' bgs TCR=100% SCR=100% MCR=92%	
			121											
			122											
			123											
R6	20/120		124	SHALE, greenish gray (5G 5/1), weak.									Run 5 119'-129' bgs TCR=97% SCR=97% MCR=93%	
			125											
			126											
			127											
			128											
			129											
			130											
			131											
			132											
			133											
			134											
			135											
			136											
			137											
			138											
			139											
			140											

Boring Number MW-302

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Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
R7	03/120		141	LIMESTONE, gray (10YR 6/1), strong.										
		142	SHALE, greenish gray (5G 5/1), weak.											
		143												
		144												
		145	SANDSTONE, greenish gray (5G 5/1), very weak, fine grained.											
		146												
		147												
		148												
		149												
		150												
R8	45/60		151											
		152												
		153												
		154												
		155												
		156												
			156.5	End of Boring at 156.5 ft bgs. Boring reamed with air rotary prior to installation of MW-302.										

Run 7
139'-149'
bgs
TCR=88%
SCR=85%
MCR=74%

Run 8
149'-154'
bgs
TCR=75%
SCR=75%
MCR=57%

Route To: Watershed/Wastewater Waste Management
 Remediation/Redevelopment Other

Facility/Project Name IPL-Ottumwa Midland Landfill		SCS#: 25215135.50		License/Permit/Monitoring Number 90-SDP-8-92P		Boring Number MW-303	
Boring Drilled By: Name of crew chief (first, last) and Firm Don Carlson Team Services				Date Drilling Started 4/11/2016		Date Drilling Completed 4/26/2016	
Unique Well No. N/A		DNR Well ID No. N/A		Common Well Name MW-303		Final Static Water Level Feet	
				Surface Elevation 759.9 Feet		Borehole Diameter 8.5"/6" in	
Local Grid Origin <input type="checkbox"/> (estimated: <input type="checkbox"/>) or Boring Location <input checked="" type="checkbox"/> State Plane 1,929,977 N, 394,335 E S/C/N				Lat ° ' "		Local Grid Location	
NW 1/4 of SE 1/4 of Section 34, T 73 N, R 14 W				Long ° ' "		<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	

Facility ID	County Wapello	Civil Town/City/ or Village Ottumwa
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Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments	
									Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200		
S1	11	24 6	1	TOPSOIL.	TOPSOIL										
S2	16	23 16	3	FAT CLAY, light gray (10YR 7/1).	CH						M				
S3	0	50/5	5	SHALE, Gray (10YR 6/1), very weak, massive, clayey.							M				
S4			7	Same as above except, dark gray (10YR 4/1).											No return-refusal.
S5			15												

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature 	Firm SCS Engineers 2830 Dairy Drive Madison, WI 53711	Tel: (608) 224-2830 Fax:
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Boring Number MW-303

Page 2 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S6			16	SHALE, Gray (10YR 6/1), very weak, massive, clayey. <i>(continued)</i>										
			17	Same as above except, black (10YR 3/1).										
			18											
S7			19											
			20	Same as above except, light gray (10YR 1/1).										
			21											
S8			22											
			23											
			24											
S9			25	Same as above except, gray (10YR 6/1).										
			26											
			27											
S10			28											
			29											
			30	Same as above except, light gray (10YR 7/1).										
		31												
		32												
		33												
		34												
		35		Same as above except, gray (10YR 6/1).										
		36												
		37												
		38												
		39												
		40												

Cave-in 32'
to 45' bgs.

Boring Number MW-303

Page 3 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S11			41	SHALE, Gray (10YR 6/1), very weak, massive, clayey. <i>(continued)</i>										
			42											
			43											
			44											
			45											
S12			46	Same as above except, dark gray (10YR 4/1), clayey.										
			47											
			48											
			49											
			50											
S13			51	Same as above except, black (10YR 2/1), less clayey.										
			52											
			53											
			54											
			55											
S14			56											
			57											
			58											
			59											
			60											
S15			61											
			62											
			63											
			64											
			65											

38'-45' no return, need to add water.

Borehole producing a lot of water.

Boring Number MW-303

Page 4 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S16			66	SHALE, Gray (10YR 6/1), very weak, massive, clayey. <i>(continued)</i>										
			67	Same as above except, black (10YR 2/1) and gray (10YR 6/1), laminated.										
			68											
			69											
			70											
S17			71											
			72											
			73											
			74											
			75											
S18			76											
			77											
			78											
			79											
			80	Same as above except, gray (10YR 6/1), clayey.										
S19			81											
			82											
			83											
			84											
			85	Same as above except, gray (10YR 6/1), black (10YR 2/1), Reddish brown (5YR 4/3).										
S20			86										Sulfur smell.	
			87											
			88											
			89											
			90											

Boring Number MW-303

Page 5 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
S21			91	SHALE, Gray (10YR 6/1), very weak, massive, clayey. <i>(continued)</i>										
			92	Same as above except, black (10YR 2/1), reddish brown (5YR 4/3), dark greenish gray (5GY 4/1).										
			93											
			94											
			95											
S22			96											
			97											
			98											
			99											
			100											
S23			101	Same as above with laminations.									Sulfur smell.	
			102											
			103											
			104											
			105											
S24			106	SHALE, black (10YR 2/1), reddish brown (5YR 4/3), dark greenish gray (5G 4/1), clayey.										
			107											
			108											
			109											
			110											
S25			111	Same as above except, black (10YR 3/1), pale brown (10YR 6/3), reddish brown (5YR 4/3), Dark Greenish Gray (5GY 4/1), clayey.										
			112											
			113											
			114											
			115	Same as above except, limestone fragments are encountered.										

Boring Number MW-303

Page 6 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			116	SHALE, Gray (10YR 6/1), very weak, massive, clayey. <i>(continued)</i>										
S26			117	LIMESTONE, dark greenish gray (5G 4/1), clayey, clay is pale brown (10YR 6/3) and reddish brown (5YR 4/3), shale fragments, shale is black (10YR 3/1).										Air rotary drilling complete.
			118											
			119											
R1	8/12		120	SHALE, greensih gray (5GY 6/1), strong, massive, clayey.										Run 1 120'-121'.
R2	12/12		121											Run 1 TCR=66% SCR=66% MCR=42%
			122	LIMESTONE, gray (10YR 6/1), interbedded with shale laminations, strong, shells.										Run 2 121'-122'.
			123											Run 2 TCR=100% SCR=100% MCR=77%.
R3	36/36		124	SHALE, greenish gray (5GY 6/1), shells, very weak, clayey, massive.										Run 3 122'-125'.
			125											Run 3 TCR=100% SCR=100% MCR=92%.
			126	LIMESTONE, gray (10YR 5/1), strong.										
			127											
			128	SHALE, greenish gray (5GY 6/1), weak.										
			129	LIMESTONE, gray (10YR 5/1), strong, interbedded with shale laminations.										
R4	00/120		130											Run 4 125.5'-135.5'.
			131											Run4 TCR=83% SCR=83% MCR= 76%.
			132											
			133											
			134											
			135											
			136	SHALE, dark greenish gray (5GY 4/1), clayey, weak, interbedded with limestone-gray (10YR 5/1).										
			137											
R5	59/60		138											Run 5 135.5'-140.5'.
			139											TCR= 99% SCR=94% MCR= 75%.
			140											

Boring Number MW-303

Page 7 of 7

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	Vane Shear	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plasticity Index	P 200	
R6	87/120		141	SANDSTONE, greenish gray (5GY 6/1), very weak, fine grained.										
			142											
			143											
			144											
			145											
			146											
			147											
			148											
			149	SHALE, dark greenish gray (5GY 4/1), clayey, weak, interbedded with limestone-gray (10YR 5/1).										
			150											
				End of boring at 150.5 ft bgs. Boring reamed with 6" rotary before installation of MW-303.										

Run 6
140.5'-150.5'
Run 6
TCR=73%
SCR=69%
MCR=59%.



IOWA DEPARTMENT OF NATURAL RESOURCES
MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: Ottumwa Midland Landfill Permit No.: 38223
 Well or Piezometer No: MW-102M
 Dates Started: August 20, 2012 Date Completed: August 27, 2012

A. SURVEYED LOCATIONS AND ELEVATIONS	B. SOIL BORING INFORMATION
Locations (\pm 0.5 ft): _____	Name & Address of Construction Company: _____
Specify corner of site: <u>NE</u>	<u>Boart Longyear</u>
Distance & direction along boundary: <u>29 S</u>	<u>901D Grossman Drive</u>
Distance & direction from boundary to wall: <u>7 W</u>	<u>Schofield, WI 54476</u>
Elevations (\pm 0.01 ft MSL): _____	Name of Driller: <u>Paul Dickinson</u>
Ground Surface: <u>795.50</u>	Drilling Method: <u>HSA, Air Hammer, NQ3 Core</u>
Top of protective casing: <u>798.23</u>	Drilling Fluid: <u>Air, Water</u>
Top of well casing: _____ <u>798.03</u>	Bore Hole Diameter: <u>10.5/6.0 in</u>
Benchmark elevation: <u>820.39</u>	Soil Sampling Method: <u>Split spoon, screen chips, core</u>
Benchmark description: <u>Brass cap in concrete, 408 ft N of MW-20</u>	Depth of Boring: <u>153 ft</u>

C. MONITORING WELL INSTALLATION	
Casing material: <u>Flush threaded PVC schedule 80</u>	Placement method: <u>Gravity</u>
Length of casing: _____ <u>152.1</u>	Volume: <u>0.7 ft³</u>
Outside casing diameter: _____ <u>2.4 in</u>	Backfill (if different from seal): _____
Inside casing diameter: _____ <u>1.9 in</u>	Material: <u>Bentonite Slurry</u>
Casing joint type: _____ <u>Flush Threaded</u>	Placement method: <u>Tremie pumped</u>
Casing/screen joint type: <u>Flush Threaded</u>	Volume: <u>40.1 ft³</u>
Screen material: _____ <u>Sch 80 PVC</u>	Surface seal design: _____
Screen opening size: <u>0.01 in</u>	Material of protective casing: <u>Steel</u>
Screen length: _____ <u>5 ft</u>	Material of grout between protective casing and well casing: <u>bentonite & concrete</u>
Depth of well: _____ <u>147.9 ft</u>	Protective cap: _____
Filter Pack: _____	Material: <u>Aluminum</u>
Material: _____ <u>Red Flint Filter Sand</u>	Vented: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Locking: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Grain size: _____ <u>#40</u>	Well Cap: _____
Volume: _____ <u>1.5 ft³</u>	Material: <u>plastic with rubber gasket</u>
Seal (minimum 3 ft length above filter pack): _____	Vented: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Material: <u>3/8 inch bentonite chips</u>	

D. GROUNDWATER MEASUREMENT (\pm 0.01 ft below top of inner well casing)	
Water level: <u>100.81</u>	Stabilization Time: <u>1 week</u>
Well development method: <u>Surged & bailed with bailer and pump</u>	
Average depth of frostline: <u>3 feet</u>	

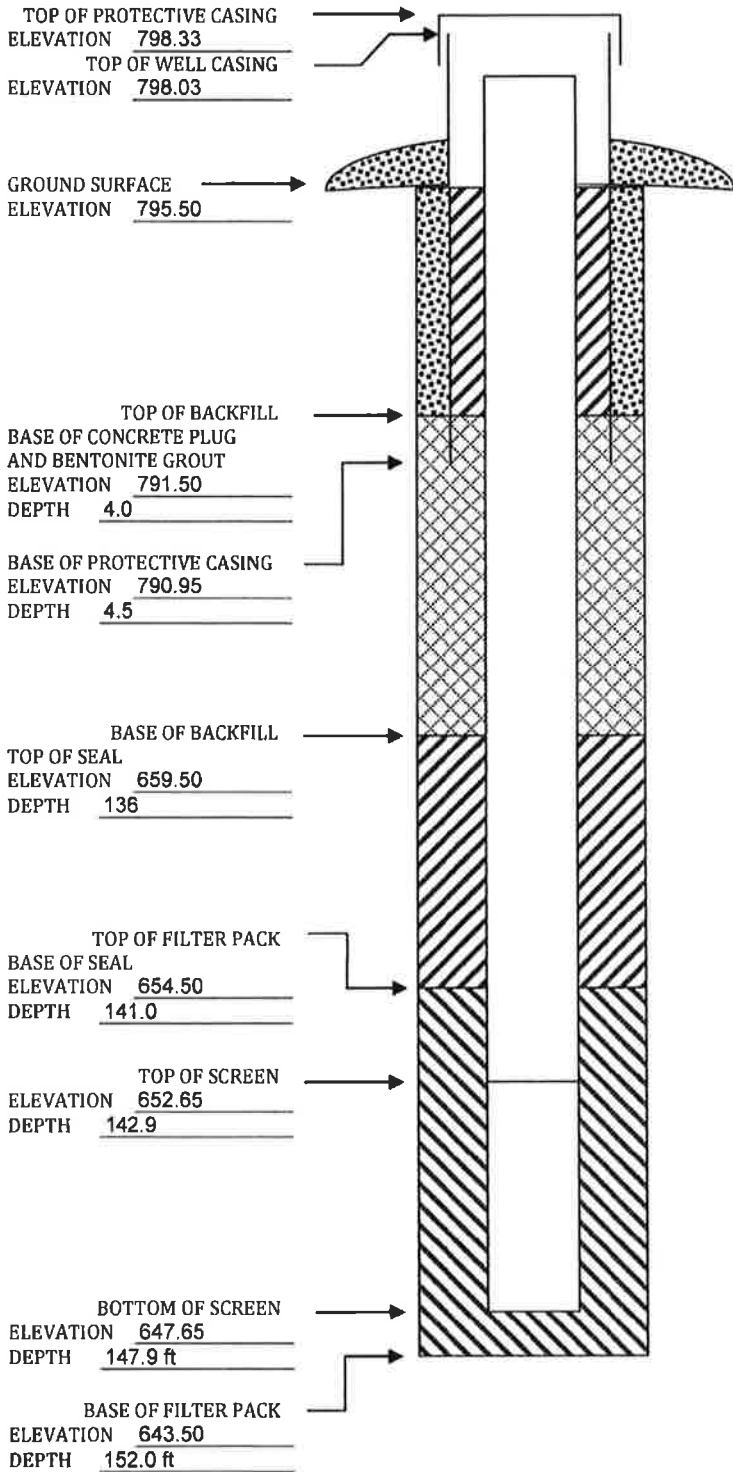
Attachments: Driller's log. Pipe schedules and grouting schedules. 8 1/2x11 inch map showing locations of all monitoring wells and piezometers.

Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL.)





IOWA DEPARTMENT OF NATURAL RESOURCES
MONITORING WELL/PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: Ottumwa Midland Landfill Permit No.: 38230

Well or Piezometer No: MW-122M

Dates Started: December 6, 2012 Date Completed: December 9, 2012

A. SURVEYED LOCATIONS AND ELEVATIONS
B. SOIL BORING INFORMATION
Locations (± 0.5 ft):
Specify corner of site: NW
Distance & direction along boundary: 553 S
Distance & direction from boundary to wall: 462 E
Elevations (± 0.01 ft MSL):
Ground Surface: 790.74
Top of protective casing: 792.94
Top of well casing: 792.70
Benchmark elevation: 820.39
Benchmark description: Brass cap in concrete, 408 ft N of MW-20
Name & Address of Construction Company:
Boart Longyear
901D Grossman Drive
Schofield, WI 54476
Name of Driller: Paul Dickinson
Drilling Method: Rotary, HSA
Drilling Fluid: Air
Bore Hole Diameter: 10.5" to 10', 6" below 10'
Soil Sampling Method: Split spoon, screen air rotary chips
Depth of Boring: 154 ft

C. MONITORING WELL INSTALLATION
Casing material: Flush threaded PVC schedule 80
Length of casing: 155.3
Outside casing diameter: 2.4 in
Inside casing diameter: 1.89 in
Casing joint type: Flush Threaded
Casing/screen joint type: Flush Threaded
Screen material: PVC
Screen opening size: 0.01 in
Screen length: 5 ft
Depth of well: 152.8 ft
Filter Pack:
Material: Red Flint Filter Sand
Grain size: #40
Volume: 1.5 ft^3
Seal (minimum 3 ft length above filter pack):
Material: 3/8 inch bentonite chips
Placement method: Gravity
Volume: 0.67 ft^3
Backfill (if different from seal):
Material: Bentonite Slurry / 3/8" Chips
Placement method: Tremie Pumped / Gravity
Volume: 400 gal. Slurry / 6 ft^3 Chips
Surface seal design:
Material of protective casing: Steel
Material of grout between protective casing and well casing: bentonite & concrete
Protective cap:
Material: aluminum
Vented: [X] Yes [] No Locking: [X] Yes [] No
Well Cap:
Material: plastic with rubber gasket
Vented: [X] Yes [] No

D. GROUNDWATER MEASUREMENT (± 0.01 ft below top of inner well casing)
Water level: 68.81 Stabilization Time: 1 week
Well development method: Surged & bailed with bailer and pump
Average depth of frostline: 3 feet

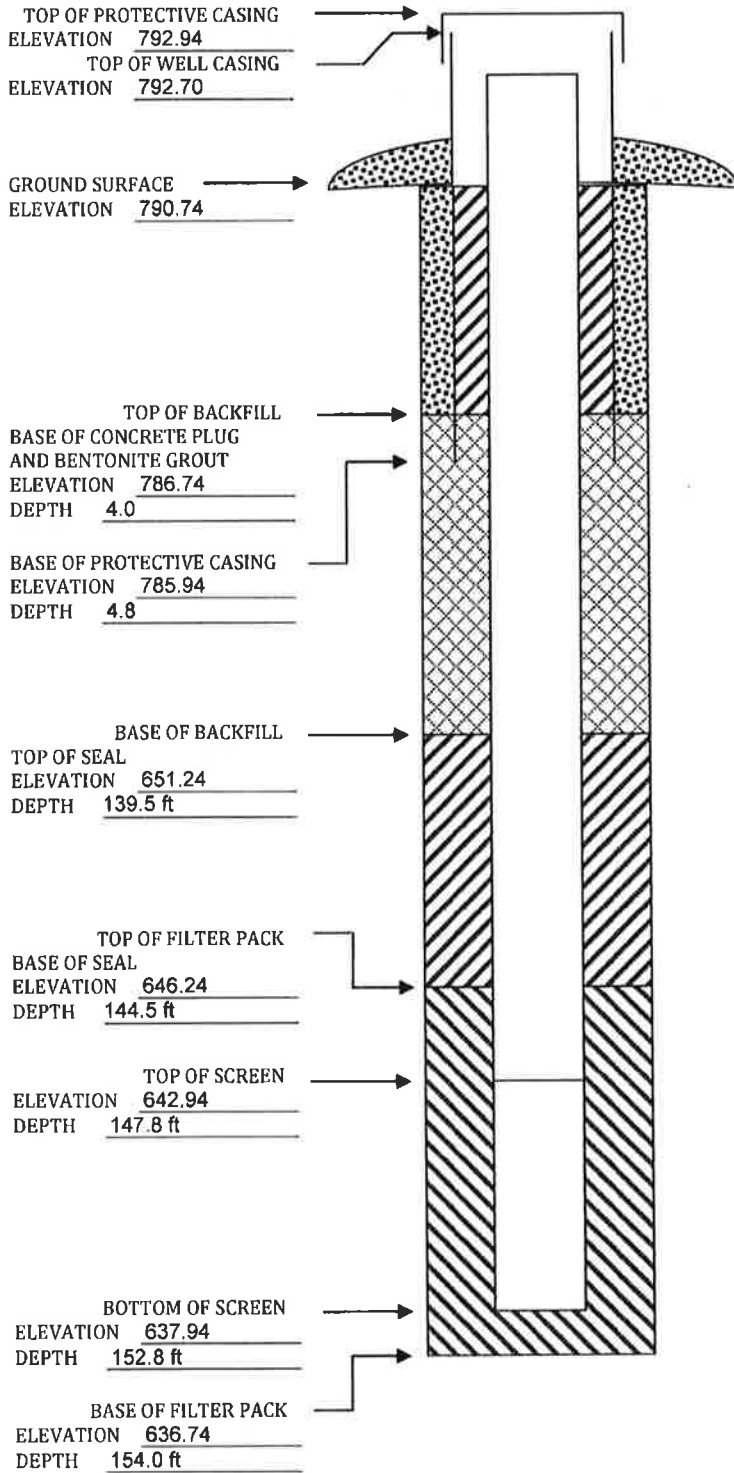
Attachments: Driller's log, Pipe schedules and grouting schedules. 8 1/2x11 inch map showing locations of all monitoring wells and piezometers.


Please mail completed for to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E 9th St, Des Moines IA 50319-0034.

Questions? Call or Email: Nina Koger, Environmental Engineer Sr., 515-281-8986, Nina.Koger@dnr.iowa.gov

ELEVATIONS: ± 0.01 ft MSL
DEPTHS: ± 0.1 ft FROM GROUND SURFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL)





Appendix C
Laboratory Reports

C1 May 2020 Detection Monitoring

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-182422-1

Login Number: 182422

List Source: Eurofins TestAmerica, Cedar Falls

List Number: 1

Creator: Johnson, Josie A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-182422-1
Client Project/Site: Ottumwa Midland LF - 25216073

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett



Authorized for release by:
6/9/2020 8:44:38 AM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

LINKS

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results through
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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Job ID: 310-182422-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative 310-182422-1

Comments

No additional comments.

Receipt

The samples were received on 5/22/2020 4:10 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was -0.4° C.

HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals

Method 3010A: The reference method requires samples to be preserved to a pH of <2. The following sample was received with insufficient preservation at a pH of >2: MW-102M (310-182422-2). The sample(s) was preserved to the appropriate pH in the laboratory.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



Sample Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-182422-1	MW-302	Water	05/21/20 14:15	05/22/20 16:10	
310-182422-2	MW-102M	Water	05/21/20 10:45	05/22/20 16:10	
310-182422-3	MW-122M	Water	05/21/20 10:05	05/22/20 16:10	
310-182422-4	Field Blank	Water	05/21/20 12:00	05/22/20 16:10	

- 1
- 2
- 3
- 4
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- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Detection Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: MW-302

Lab Sample ID: 310-182422-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	8.9		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	1.0		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	79		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	780		100	73	ug/L	1		6020A	Total/NA
Calcium	41		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	930		30	26	mg/L	1		SM 2540C	Total/NA
pH	7.5	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	686.25				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-83.4				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	1.06				mg/L	1		Field Sampling	Total/NA
pH, Field	7.05				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1129				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.1				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	12.5				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-102M

Lab Sample ID: 310-182422-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	16		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	5.0		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	350		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	1500		100	73	ug/L	1		6020A	Total/NA
Calcium	38		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	3700		150	130	mg/L	1		SM 2540C	Total/NA
pH	7.9	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	717.61				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	21.2				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	1.59				mg/L	1		Field Sampling	Total/NA
pH, Field	7.82				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	2260				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.1				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	297				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-122M

Lab Sample ID: 310-182422-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	9.0		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.23	J	0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	9800		100	71	mg/L	100		9056A	Total/NA
Boron	5100		400	290	ug/L	4		6020A	Total/NA
Calcium	430		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	16000		300	260	mg/L	1		SM 2540C	Total/NA
pH	7.0	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	724.23				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-4.4				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.61				mg/L	1		Field Sampling	Total/NA
pH, Field	6.91				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	14090				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.0				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	2.31				NTU	1		Field Sampling	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Detection Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: Field Blank

Lab Sample ID: 310-182422-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Fluoride	0.056	J	0.10	0.046	mg/L	1		9056A	Total/NA
Total Dissolved Solids	330		30	26	mg/L	1		SM 2540C	Total/NA
pH	7.8	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls



Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: MW-302

Lab Sample ID: 310-182422-1

Date Collected: 05/21/20 14:15

Matrix: Water

Date Received: 05/22/20 16:10

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	8.9		5.0	2.0	mg/L			06/02/20 20:18	5
Fluoride	1.0		0.50	0.23	mg/L			06/02/20 20:18	5
Sulfate	79		5.0	3.6	mg/L			06/02/20 20:18	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	780		100	73	ug/L		05/27/20 08:06	05/29/20 10:21	1
Calcium	41		0.50	0.19	mg/L		05/27/20 08:06	05/29/20 10:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	930		30	26	mg/L			05/26/20 12:14	1
pH	7.5	HF	0.1	0.1	SU			05/23/20 11:03	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	686.25				ft			05/21/20 14:15	1
Oxidation Reduction Potential	-83.4				millivolts			05/21/20 14:15	1
Oxygen, Dissolved, Client Supplied	1.06				mg/L			05/21/20 14:15	1
pH, Field	7.05				SU			05/21/20 14:15	1
Specific Conductance, Field	1129				umhos/cm			05/21/20 14:15	1
Temperature, Field	13.1				Degrees C			05/21/20 14:15	1
Turbidity, Field	12.5				NTU			05/21/20 14:15	1



Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: MW-102M

Lab Sample ID: 310-182422-2

Date Collected: 05/21/20 10:45

Matrix: Water

Date Received: 05/22/20 16:10

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	16		5.0	2.0	mg/L			06/02/20 21:05	5
Fluoride	5.0		0.50	0.23	mg/L			06/02/20 21:05	5
Sulfate	350		5.0	3.6	mg/L			06/02/20 21:05	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	1500		100	73	ug/L		05/27/20 08:06	05/29/20 10:23	1
Calcium	38		0.50	0.19	mg/L		05/27/20 08:06	05/29/20 10:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	3700		150	130	mg/L			05/26/20 12:14	1
pH	7.9	HF	0.1	0.1	SU			05/23/20 11:07	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	717.61				ft			05/21/20 10:45	1
Oxidation Reduction Potential	21.2				millivolts			05/21/20 10:45	1
Oxygen, Dissolved, Client Supplied	1.59				mg/L			05/21/20 10:45	1
pH, Field	7.82				SU			05/21/20 10:45	1
Specific Conductance, Field	2260				umhos/cm			05/21/20 10:45	1
Temperature, Field	13.1				Degrees C			05/21/20 10:45	1
Turbidity, Field	297				NTU			05/21/20 10:45	1



Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: MW-122M

Lab Sample ID: 310-182422-3

Date Collected: 05/21/20 10:05

Matrix: Water

Date Received: 05/22/20 16:10

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	9.0		5.0	2.0	mg/L			06/02/20 21:52	5
Fluoride	0.23	J	0.50	0.23	mg/L			06/02/20 21:52	5
Sulfate	9800		100	71	mg/L			06/03/20 11:12	100

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	5100		400	290	ug/L		05/27/20 08:06	05/29/20 11:03	4
Calcium	430		0.50	0.19	mg/L		05/27/20 08:06	05/29/20 10:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	16000		300	260	mg/L			05/26/20 12:14	1
pH	7.0	HF	0.1	0.1	SU			05/23/20 11:09	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	724.23				ft			05/21/20 10:05	1
Oxidation Reduction Potential	-4.4				millivolts			05/21/20 10:05	1
Oxygen, Dissolved, Client Supplied	0.61				mg/L			05/21/20 10:05	1
pH, Field	6.91				SU			05/21/20 10:05	1
Specific Conductance, Field	14090				umhos/cm			05/21/20 10:05	1
Temperature, Field	13.0				Degrees C			05/21/20 10:05	1
Turbidity, Field	2.31				NTU			05/21/20 10:05	1

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: Field Blank

Lab Sample ID: 310-182422-4

Date Collected: 05/21/20 12:00

Matrix: Water

Date Received: 05/22/20 16:10

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			06/02/20 22:07	1
Fluoride	0.056	J	0.10	0.046	mg/L			06/02/20 22:07	1
Sulfate	<0.71		1.0	0.71	mg/L			06/02/20 22:07	1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<73		100	73	ug/L		05/27/20 08:06	05/29/20 10:29	1
Calcium	<0.19		0.50	0.19	mg/L		05/27/20 08:06	05/29/20 10:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	330		30	26	mg/L			05/26/20 12:14	1
pH	7.8	HF	0.1	0.1	SU			05/23/20 11:12	1

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Definitions/Glossary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-280927/3
Matrix: Water
Analysis Batch: 280927

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			06/02/20 19:47	1
Fluoride	<0.046		0.10	0.046	mg/L			06/02/20 19:47	1
Sulfate	<0.71		1.0	0.71	mg/L			06/02/20 19:47	1

Lab Sample ID: LCS 310-280927/4
Matrix: Water
Analysis Batch: 280927

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	10.2		mg/L		102	90 - 110
Fluoride	2.00	1.97		mg/L		98	90 - 110
Sulfate	10.0	10.2		mg/L		102	90 - 110

Lab Sample ID: 310-182422-1 MS
Matrix: Water
Analysis Batch: 280927

Client Sample ID: MW-302
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	8.9		25.0	32.8		mg/L		95	80 - 120
Fluoride	1.0		5.00	6.12		mg/L		102	80 - 120
Sulfate	79		25.0	102		mg/L		91	80 - 120

Lab Sample ID: 310-182422-1 MSD
Matrix: Water
Analysis Batch: 280927

Client Sample ID: MW-302
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	8.9		25.0	32.8		mg/L		95	80 - 120	0	15
Fluoride	1.0		5.00	6.15		mg/L		103	80 - 120	0	15
Sulfate	79		25.0	102		mg/L		92	80 - 120	0	15

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-280136/1-A
Matrix: Water
Analysis Batch: 280544

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 280136

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<73		100	73	ug/L		05/27/20 08:06	05/29/20 09:43	1
Calcium	<0.19		0.50	0.19	mg/L		05/27/20 08:06	05/29/20 09:43	1

Lab Sample ID: LCS 310-280136/2-A
Matrix: Water
Analysis Batch: 280544

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 280136

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1760	1770		ug/L		101	80 - 120
Calcium	4.00	4.06		mg/L		102	80 - 120

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QC Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-280050/1
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<26		30	26	mg/L			05/26/20 12:14	1

Lab Sample ID: LCS 310-280050/2
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	1080		mg/L		108	90 - 110

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-279933/1
Matrix: Water
Analysis Batch: 279933

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

Lab Sample ID: 310-182422-1 DU
Matrix: Water
Analysis Batch: 279933

Client Sample ID: MW-302
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	7.5	HF	7.5		SU		0	20

QC Association Summary

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

HPLC/IC

Analysis Batch: 280927

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	9056A	
310-182422-2	MW-102M	Total/NA	Water	9056A	
310-182422-3	MW-122M	Total/NA	Water	9056A	
310-182422-3	MW-122M	Total/NA	Water	9056A	
310-182422-4	Field Blank	Total/NA	Water	9056A	
MB 310-280927/3	Method Blank	Total/NA	Water	9056A	
LCS 310-280927/4	Lab Control Sample	Total/NA	Water	9056A	
310-182422-1 MS	MW-302	Total/NA	Water	9056A	
310-182422-1 MSD	MW-302	Total/NA	Water	9056A	

Metals

Prep Batch: 280136

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	3010A	
310-182422-2	MW-102M	Total/NA	Water	3010A	
310-182422-3	MW-122M	Total/NA	Water	3010A	
310-182422-4	Field Blank	Total/NA	Water	3010A	
MB 310-280136/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-280136/2-A	Lab Control Sample	Total/NA	Water	3010A	

Analysis Batch: 280544

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	6020A	280136
310-182422-2	MW-102M	Total/NA	Water	6020A	280136
310-182422-3	MW-122M	Total/NA	Water	6020A	280136
310-182422-3	MW-122M	Total/NA	Water	6020A	280136
310-182422-4	Field Blank	Total/NA	Water	6020A	280136
MB 310-280136/1-A	Method Blank	Total/NA	Water	6020A	280136
LCS 310-280136/2-A	Lab Control Sample	Total/NA	Water	6020A	280136

General Chemistry

Analysis Batch: 279933

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	SM 4500 H+ B	
310-182422-2	MW-102M	Total/NA	Water	SM 4500 H+ B	
310-182422-3	MW-122M	Total/NA	Water	SM 4500 H+ B	
310-182422-4	Field Blank	Total/NA	Water	SM 4500 H+ B	
LCS 310-279933/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
310-182422-1 DU	MW-302	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 280050

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	SM 2540C	
310-182422-2	MW-102M	Total/NA	Water	SM 2540C	
310-182422-3	MW-122M	Total/NA	Water	SM 2540C	
310-182422-4	Field Blank	Total/NA	Water	SM 2540C	
MB 310-280050/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-280050/2	Lab Control Sample	Total/NA	Water	SM 2540C	

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QC Association Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Field Service / Mobile Lab

Analysis Batch: 281404

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182422-1	MW-302	Total/NA	Water	Field Sampling	
310-182422-2	MW-102M	Total/NA	Water	Field Sampling	
310-182422-3	MW-122M	Total/NA	Water	Field Sampling	

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Lab Chronicle

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Client Sample ID: MW-302

Date Collected: 05/21/20 14:15

Date Received: 05/22/20 16:10

Lab Sample ID: 310-182422-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	280927	06/02/20 20:18	ACJ	TAL CF
Total/NA	Prep	3010A			280136	05/27/20 08:06	HED	TAL CF
Total/NA	Analysis	6020A		1	280544	05/29/20 10:21	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280050	05/26/20 12:14	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	279933	05/23/20 11:03	AFZ	TAL CF
Total/NA	Analysis	Field Sampling		1	281404	05/21/20 14:15	ANO	TAL CF

Client Sample ID: MW-102M

Date Collected: 05/21/20 10:45

Date Received: 05/22/20 16:10

Lab Sample ID: 310-182422-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	280927	06/02/20 21:05	ACJ	TAL CF
Total/NA	Prep	3010A			280136	05/27/20 08:06	HED	TAL CF
Total/NA	Analysis	6020A		1	280544	05/29/20 10:23	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280050	05/26/20 12:14	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	279933	05/23/20 11:07	AFZ	TAL CF
Total/NA	Analysis	Field Sampling		1	281404	05/21/20 10:45	ANO	TAL CF

Client Sample ID: MW-122M

Date Collected: 05/21/20 10:05

Date Received: 05/22/20 16:10

Lab Sample ID: 310-182422-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	280927	06/02/20 21:52	ACJ	TAL CF
Total/NA	Analysis	9056A		100	280927	06/03/20 11:12	ACJ	TAL CF
Total/NA	Prep	3010A			280136	05/27/20 08:06	HED	TAL CF
Total/NA	Analysis	6020A		1	280544	05/29/20 10:26	ACJ	TAL CF
Total/NA	Prep	3010A			280136	05/27/20 08:06	HED	TAL CF
Total/NA	Analysis	6020A		4	280544	05/29/20 11:03	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280050	05/26/20 12:14	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	279933	05/23/20 11:09	AFZ	TAL CF
Total/NA	Analysis	Field Sampling		1	281404	05/21/20 10:05	ANO	TAL CF

Client Sample ID: Field Blank

Date Collected: 05/21/20 12:00

Date Received: 05/22/20 16:10

Lab Sample ID: 310-182422-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	280927	06/02/20 22:07	ACJ	TAL CF
Total/NA	Prep	3010A			280136	05/27/20 08:06	HED	TAL CF
Total/NA	Analysis	6020A		1	280544	05/29/20 10:29	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280050	05/26/20 12:14	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	279933	05/23/20 11:12	AFZ	TAL CF

Eurofins TestAmerica, Cedar Falls

Lab Chronicle

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

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Accreditation/Certification Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-21

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Method Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF - 25216073

Job ID: 310-182422-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401



Fredrick, Sandie

From: Blodgett, Meghan <mblodgett@scsengineers.com>
Sent: Wednesday, May 27, 2020 7:56 PM
To: Fredrick, Sandie
Cc: Kron, Nicole; Karwoski, Thomas
Subject: RE: Eurofins TestAmerica Sample Login Confirmation files from 310-182422 Ottumwa Midland LF - 25216073

EXTERNAL EMAIL*

Sandie,

We also need chloride, fluoride, and sulfate on these samples. I don't see those listed on the login info.

Meghan Blodgett
SCS Engineers
Madison, WI
608-345-9221 (C)
mblodgett@scsengineers.com
www.scsengineers.com

From: Sandie Fredrick <sandie.fredrick@testamericainc.com>
Sent: Tuesday, May 26, 2020 8:56 AM
To: Blodgett, Meghan <mblodgett@scsengineers.com>; Kron, Nicole <NKron@scsengineers.com>; Karwoski, Thomas <TKarwoski@scsengineers.com>
Subject: Eurofins TestAmerica Sample Login Confirmation files from 310-182422 Ottumwa Midland LF - 25216073

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Hello Everyone,

Attached, please find the Sample Confirmation files for job 310-182422; Ottumwa Midland LF - 25216073

Please feel free to contact me if you have any questions.

Thank you.

Sandie Fredrick
Project Manager

TestAmerica Laboratories, Inc.
Phone: 920-261-1660

E-mail: sandie.fredrick@testamericainc.com
www.eurofinsus.com/env



Reference: [310-430992]
Attachments: 3

Please let us know if we met your expectations by rating the service you received from Eurofins TestAmerica on this project by visiting our website at: [Project Feedback](#)

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Environment Testing
TestAmerica



310-182422 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information		
Client: <u>SCS Engineers</u>		
City/State: <u>CITY</u>	STATE	Project: <u>Ottumwa Midland LF 25216073</u>
Receipt Information		
Date/Time Received: DATE <u>5/22/20</u> TIME <u>1610</u>	Received By: <u>ER</u>	
Delivery Type: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> FedEx Ground <input type="checkbox"/> US Mail <input type="checkbox"/> Spee-Dee <input checked="" type="checkbox"/> Lab Courier <input type="checkbox"/> Lab Field Services <input type="checkbox"/> Client Drop-off <input type="checkbox"/> Other: _____		
Condition of Cooler/Containers		
Sample(s) received in Cooler? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes: Cooler ID: <u>AB-37</u>	
Multiple Coolers? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Cooler # _____ of _____	
Cooler Custody Seals Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes: Cooler custody seals intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Sample Custody Seals Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Sample custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Which VOA samples are in cooler? ↓	
Temperature Record		
Coolant: <input checked="" type="checkbox"/> Wet ice <input type="checkbox"/> Blue ice <input type="checkbox"/> Dry ice <input type="checkbox"/> Other: _____ <input type="checkbox"/> NONE		
Thermometer ID: <u>N</u>	Correction Factor (°C): <u>0</u>	
• Temp Blank Temperature - If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature		
Uncorrected Temp (°C): <u>-0.9</u>	Corrected Temp (°C): <u>-0.9</u>	
• Sample Container Temperature		
Container(s) used:	<u>CONTAINER 1</u>	<u>CONTAINER 2</u>
Uncorrected Temp (°C):		
Corrected Temp (°C):		
Exceptions Noted		
1) If temperature exceeds criteria, was sample(s) received same day of sampling? <input type="checkbox"/> Yes <input type="checkbox"/> No		
a) If yes: Is there evidence that the chilling process began? <input type="checkbox"/> Yes <input type="checkbox"/> No		
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
NOTE: If yes, contact PM before proceeding. If no, proceed with login		
Additional Comments		

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Eurofins TestAmerica, Cedar Falls
 3019 Venture Way
 Cedar Falls, IA 50613
 Phone (319) 277-2401 Fax (319) 277-2425

Chain of Custody Record

<p>Client Information</p> <p>Sampler: Matthew Catalan Lab PM: Fredrick, Sandie</p> <p>Phone: 515-250-0305 E-Mail: sandie.fredrick@testamericainc.com</p>		<p>Carrier Tracking No(s): 310-48958-14130.1</p> <p>Page: Page 1 of 1</p> <p>Job #:</p>										
<p>Company: SCS Engineers</p> <p>Address: 8450 Hickman Road Suite 20 27</p> <p>City: Clive</p> <p>State, Zip: IA, 50325</p> <p>Phone: 515-250-0305</p> <p>Email: mcatalan@scsengineers.com</p> <p>Project Name: Ottumwa Midland LF</p> <p>Site: Ottumwa Midland LF</p>		<p>Analysis Requested</p> <p>Due Date Requested: PER TAT</p> <p>TAT Requested (days): PER CONTRACT</p> <p>PO #: Purchase Order Requested</p> <p>WO #:</p> <p>Project #: 31011020</p> <p>SSOW#:</p>										
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=soil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A - B/Ca	2540C Calcd. SM4500_H+	N	D	Total Number of Containers	Special Instructions/Note:
MW-901	5/21/20	1415	G	Water	N	N	X	X			0	
MW-302	5/21/20	1045	G	Water	N	N	X	X			0	
MW-903	5/21/20	1005	G	Water	N	N	X	X			0	
MW-102M	5/21/20	1200	G	Water	N	N	X	X			0	
MW-122M				Water								
Field Blank				Water								
<p>Possible Hazard Identification <input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input checked="" type="checkbox"/> Unknown <input type="checkbox"/> Radiological</p> <p>Deliverable Requested: I, II, III, IV, Other (specify)</p> <p>Empty Kit Relinquished by: _____ Date: _____</p> <p>Relinquished by: Matthew Catalan Date/Time: 5/22/20 1100 Company: SCS</p> <p>Relinquished by: _____ Date/Time: _____ Company: _____</p> <p>Relinquished by: _____ Date/Time: _____ Company: _____</p> <p>Custody Seals Intact: _____ Δ Yes Δ No</p> <p>Custody Seal No.: _____</p>												
<p>Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months</p> <p>Special Instructions/QC Requirements:</p> <p>Received by: Peri Joakim Date/Time: 05/22/20 1600 Company: ET&A</p> <p>Received by: _____ Date/Time: _____ Company: _____</p> <p>Received by: _____ Date/Time: _____ Company: _____</p> <p>Cooler Temperature(s) °C and Other Remarks:</p>												
<p>Preservation Codes:</p> <p>A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - pH 4-5 L - EDA Z - other (specify)</p> <p>Other:</p>												

Groundwater Monitoring Results - Field Parameters
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
May 2020

Sample	Date/Time	Groundwater Elevation (feet amsl)	Temperature (Deg. C)	pH (Std. Units)	Dissolved Oxygen (mg/L)	Specific Conductivity (µmhos/cm)	ORP (mV)	Turbidity (NTU)
MW-301	5/26 - 1320	687.29	15.8	5.67	0.41	1546	-57.8	21.8
MW-302	5/21 - 1415	686.25	13.1	7.05	1.06	1129	-83.4	12.5
MW-303	5/26 - 1215	687.14	14.4	6.21	2.31	1963	-30.0	57.1
MW-102M	5/21 - 1045	717.61	13.1	7.82	1.59	2260	21.2	297
MW-122M	5/21 - 1005	724.23	13.0	6.91	0.61	14090	-4.4	2.31

Abbreviations:

amsl = above mean sea level

mg/L = milligrams per liter

µmhos/cm = microSiemens per centimeter

NA = Not Analyzed

Laboratory Notes/Qualifiers:

none

ORP = Oxidation Reduction (REDOX)

mV = millivolts

NTU = Nephelometric Turbidity Units

Created by: AJR Date: 6/27/2019
 Last revision by: LWJ Date: 10/17/2019
 Checked by: JSN Date: 10/21/2019
 Scientist QA/QC: NDK Date: 10/31/2019

C:\Users\FredrickS\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\KGHZYGWC\May 2020_OML_GW_Fie



ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-182584-1
Client Project/Site: Ottumwa Midland LF 25220073

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett



Authorized for release by:
6/9/2020 2:33:16 PM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Job ID: 310-182584-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative 310-182584-1

Comments

No additional comments.

Receipt

The samples were received on 5/27/2020 4:45 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.2° C.

HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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Sample Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-182584-1	MW-301	Water	05/26/20 13:20	05/27/20 16:45	
310-182584-2	MW-303	Water	05/26/20 12:15	05/27/20 16:45	

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Detection Summary

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Client Sample ID: MW-301

Lab Sample ID: 310-182584-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	61		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.77		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	390		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	660		100	73	ug/L	1		6020A	Total/NA
Calcium	120		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	1100		60	52	mg/L	1		SM 2540C	Total/NA
pH	7.3	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	687.29				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-57.8				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.41				mg/L	1		Field Sampling	Total/NA
pH, Field	5.67				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1546				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	15.8				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	21.8				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-303

Lab Sample ID: 310-182584-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	8.5		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.81		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	440		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	770		100	73	ug/L	1		6020A	Total/NA
Calcium	120		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	1100		30	26	mg/L	1		SM 2540C	Total/NA
pH	7.3	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	687.14				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-30.0				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	2.31				mg/L	1		Field Sampling	Total/NA
pH, Field	6.21				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1963				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	14.4				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	57.1				NTU	1		Field Sampling	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Client Sample ID: MW-301

Lab Sample ID: 310-182584-1

Date Collected: 05/26/20 13:20

Matrix: Water

Date Received: 05/27/20 16:45

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	61		5.0	2.0	mg/L			06/05/20 19:30	5
Fluoride	0.77		0.50	0.23	mg/L			06/05/20 19:30	5
Sulfate	390		5.0	3.6	mg/L			06/05/20 19:30	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	660		100	73	ug/L		05/29/20 08:00	06/02/20 14:10	1
Calcium	120		0.50	0.19	mg/L		05/29/20 08:00	06/01/20 22:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1100		60	52	mg/L			05/28/20 14:53	1
pH	7.3	HF	0.1	0.1	SU			05/27/20 21:23	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	687.29				ft			05/26/20 13:20	1
Oxidation Reduction Potential	-57.8				millivolts			05/26/20 13:20	1
Oxygen, Dissolved, Client Supplied	0.41				mg/L			05/26/20 13:20	1
pH, Field	5.67				SU			05/26/20 13:20	1
Specific Conductance, Field	1546				umhos/cm			05/26/20 13:20	1
Temperature, Field	15.8				Degrees C			05/26/20 13:20	1
Turbidity, Field	21.8				NTU			05/26/20 13:20	1

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Client Sample ID: MW-303

Lab Sample ID: 310-182584-2

Date Collected: 05/26/20 12:15

Matrix: Water

Date Received: 05/27/20 16:45

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	8.5		5.0	2.0	mg/L			06/05/20 19:46	5
Fluoride	0.81		0.50	0.23	mg/L			06/05/20 19:46	5
Sulfate	440		5.0	3.6	mg/L			06/05/20 19:46	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	770		100	73	ug/L		05/29/20 08:00	06/02/20 14:15	1
Calcium	120		0.50	0.19	mg/L		05/29/20 08:00	06/01/20 22:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1100		30	26	mg/L			05/28/20 14:53	1
pH	7.3	HF	0.1	0.1	SU			05/27/20 21:24	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	687.14				ft			05/26/20 12:15	1
Oxidation Reduction Potential	-30.0				millivolts			05/26/20 12:15	1
Oxygen, Dissolved, Client Supplied	2.31				mg/L			05/26/20 12:15	1
pH, Field	6.21				SU			05/26/20 12:15	1
Specific Conductance, Field	1963				umhos/cm			05/26/20 12:15	1
Temperature, Field	14.4				Degrees C			05/26/20 12:15	1
Turbidity, Field	57.1				NTU			05/26/20 12:15	1

Definitions/Glossary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Sample Results

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-281431/3
Matrix: Water
Analysis Batch: 281431

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			06/05/20 16:07	1
Fluoride	<0.046		0.10	0.046	mg/L			06/05/20 16:07	1
Sulfate	<0.71		1.0	0.71	mg/L			06/05/20 16:07	1

Lab Sample ID: LCS 310-281431/4
Matrix: Water
Analysis Batch: 281431

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	10.4		mg/L		104	90 - 110
Fluoride	2.00	2.11		mg/L		105	90 - 110
Sulfate	10.0	10.4		mg/L		104	90 - 110

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-280347/1-A
Matrix: Water
Analysis Batch: 280748

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 280347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	<0.19		0.50	0.19	mg/L		05/29/20 08:00	06/01/20 21:43	1

Lab Sample ID: MB 310-280347/1-A
Matrix: Water
Analysis Batch: 280866

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 280347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<73		100	73	ug/L		05/29/20 08:00	06/02/20 13:23	1

Lab Sample ID: LCS 310-280347/2-A
Matrix: Water
Analysis Batch: 280748

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 280347

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	4.00	4.34		mg/L		108	80 - 120

Lab Sample ID: LCS 310-280347/2-A
Matrix: Water
Analysis Batch: 280866

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 280347

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1760	1790		ug/L		102	80 - 120

Lab Sample ID: 310-182584-1 DU
Matrix: Water
Analysis Batch: 280748

Client Sample ID: MW-301
Prep Type: Total/NA
Prep Batch: 280347

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Calcium	120		124		mg/L		3	20

Eurofins TestAmerica, Cedar Falls

QC Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 310-182584-1 DU
 Matrix: Water
 Analysis Batch: 280866

Client Sample ID: MW-301
 Prep Type: Total/NA
 Prep Batch: 280347

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	Limit
Boron	660		669		ug/L		0.7	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-280375/1
 Matrix: Water
 Analysis Batch: 280375

Client Sample ID: Method Blank
 Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<26		30	26	mg/L			05/28/20 14:53	1

Lab Sample ID: LCS 310-280375/2
 Matrix: Water
 Analysis Batch: 280375

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	988		mg/L		99	90 - 110

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-280254/1
 Matrix: Water
 Analysis Batch: 280254

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	7.0		SU		100	98 - 102

QC Association Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

HPLC/IC

Analysis Batch: 281431

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	9056A	
310-182584-2	MW-303	Total/NA	Water	9056A	
MB 310-281431/3	Method Blank	Total/NA	Water	9056A	
LCS 310-281431/4	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 280347

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	3010A	
310-182584-2	MW-303	Total/NA	Water	3010A	
MB 310-280347/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-280347/2-A	Lab Control Sample	Total/NA	Water	3010A	
310-182584-1 DU	MW-301	Total/NA	Water	3010A	

Analysis Batch: 280748

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	6020A	280347
310-182584-2	MW-303	Total/NA	Water	6020A	280347
MB 310-280347/1-A	Method Blank	Total/NA	Water	6020A	280347
LCS 310-280347/2-A	Lab Control Sample	Total/NA	Water	6020A	280347
310-182584-1 DU	MW-301	Total/NA	Water	6020A	280347

Analysis Batch: 280866

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	6020A	280347
310-182584-2	MW-303	Total/NA	Water	6020A	280347
MB 310-280347/1-A	Method Blank	Total/NA	Water	6020A	280347
LCS 310-280347/2-A	Lab Control Sample	Total/NA	Water	6020A	280347
310-182584-1 DU	MW-301	Total/NA	Water	6020A	280347

General Chemistry

Analysis Batch: 280254

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	SM 4500 H+ B	
310-182584-2	MW-303	Total/NA	Water	SM 4500 H+ B	
LCS 310-280254/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 280375

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	SM 2540C	
310-182584-2	MW-303	Total/NA	Water	SM 2540C	
MB 310-280375/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-280375/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Field Service / Mobile Lab

Analysis Batch: 281404

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-182584-1	MW-301	Total/NA	Water	Field Sampling	
310-182584-2	MW-303	Total/NA	Water	Field Sampling	

Eurofins TestAmerica, Cedar Falls

Lab Chronicle

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Client Sample ID: MW-301

Lab Sample ID: 310-182584-1

Date Collected: 05/26/20 13:20

Matrix: Water

Date Received: 05/27/20 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	281431	06/05/20 19:30	ACJ	TAL CF
Total/NA	Prep	3010A			280347	05/29/20 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	280748	06/01/20 22:41	ACJ	TAL CF
Total/NA	Prep	3010A			280347	05/29/20 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	280866	06/02/20 14:10	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280375	05/28/20 14:53	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	280254	05/27/20 21:23	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	281404	05/26/20 13:20	ANO	TAL CF

Client Sample ID: MW-303

Lab Sample ID: 310-182584-2

Date Collected: 05/26/20 12:15

Matrix: Water

Date Received: 05/27/20 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	281431	06/05/20 19:46	ACJ	TAL CF
Total/NA	Prep	3010A			280347	05/29/20 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	280748	06/01/20 22:46	ACJ	TAL CF
Total/NA	Prep	3010A			280347	05/29/20 08:00	HED	TAL CF
Total/NA	Analysis	6020A		1	280866	06/02/20 14:15	ACJ	TAL CF
Total/NA	Analysis	SM 2540C		1	280375	05/28/20 14:53	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	280254	05/27/20 21:24	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	281404	05/26/20 12:15	ANO	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-21

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Method Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-182584-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401



Environment Testing
TestAmerica



310-182584 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: <u>SCS Engineers</u>			
City/State: <small>CITY</small> <u>Clive</u>	<small>STATE</small> <u>IA</u>	Project: <u>Ottumwa Midland LF 25216073</u>	
Receipt Information			
Date/Time Received: <small>DATE</small> <u>5/27/20</u>	<small>TIME</small> <u>1645</u>	Received By: <u>JR</u>	
Delivery Type: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> FedEx Ground <input type="checkbox"/> US Mail <input type="checkbox"/> Spee-Dee <input checked="" type="checkbox"/> Lab Courier <input type="checkbox"/> Lab Field Services <input type="checkbox"/> Client Drop-off <input type="checkbox"/> Other: _____			
Condition of Cooler/Containers			
Sample(s) received in Cooler?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes: Cooler ID: _____
Multiple Coolers?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Cooler # _____ of _____
Cooler Custody Seals Present?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Cooler custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No
Sample Custody Seals Present?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Sample custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No
Trip Blank Present?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Which VOA samples are in cooler? ↓
Temperature Record			
Coolant: <input checked="" type="checkbox"/> Wet ice <input type="checkbox"/> Blue ice <input type="checkbox"/> Dry ice <input type="checkbox"/> Other: _____ <input type="checkbox"/> NONE			
Thermometer ID: <u>M</u>		Correction Factor (°C): <u>+0.1</u>	
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C): <u>1.1</u>		Corrected Temp (°C): <u>1.2</u>	
• Sample Container Temperature			
Container(s) used:	<u>CONTAINER 1</u>	<u>CONTAINER 2</u>	
Uncorrected Temp (°C):			
Corrected Temp (°C):			
Exceptions Noted			
1) If temperature exceeds criteria, was sample(s) received same day of sampling? <input type="checkbox"/> Yes <input type="checkbox"/> No			
a) If yes: Is there evidence that the chilling process began? <input type="checkbox"/> Yes <input type="checkbox"/> No			
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) <input type="checkbox"/> Yes <input type="checkbox"/> No			
NOTE: If yes, contact PM before proceeding. If no, proceed with login			
Additional Comments			

Chain of Custody Record

Eurofins TestAmerica, Cedar Falls
 3019 Venture Way
 Cedar Falls, IA 50613
 Phone (319) 277-2401 Fax (319) 277-2425

Client Information		Sampler:		Lab PM:		Carrier Tracking No(s):		COC No:	
Client Contact: <u>Matthew Cahalan</u>		Phone: <u>515-250-0305</u>		Fredrick, Sandie		310-48958-14130.1		Page: 1 of 1	
Company: <u>SCS Engineers</u>		E-Mail: <u>sandie.fredrick@testamericainc.com</u>		Sandie, Fredrick				Job #:	
Address: <u>8450 Hickman Road Suite 20 27</u>		Due Date Requested: <u>PER TAT</u>		Perform IMS/MSD (Yes or No)		Total Number of Containers		Preservation Codes:	
City: <u>Clive</u>		TAT Requested (days): <u>PER CONTRACT</u>		Field Filtered Sample (Yes or No)				A - HCL B - NaOH C - Zn Acetate D - Nitric Acid E - NaHSO4 F - MeOH G - Amchlor H - Ascorbic Acid I - Ice J - DI Water K - EDTA L - EDA Other:	
State, Zip: <u>IA, 50325</u>		PO #: <u>Purchase Order Requested</u>		2540C_Calcd, SM4500_H+				M - Hexane N - None O - AsNaO2 P - Na2OAS Q - Na2SO3 R - Na2S2O3 S - H2SO4 T - TSP Dodecahydrate U - Acetone V - MCAA W - pH 4-5 Z - other (specify)	
Phone: <u>515-250-0305</u>		WO #: <u></u>		6020A - B/Ca				Special Instructions/Note:	
Email: <u>mcahalana@scsengineers.com</u>		Project #: <u>31011020</u>		N D					
Project Name: <u>Ottumwa Midland LF</u>		SSOW#: <u></u>		N X X					
Site: <u>Ottumwa Midland LF</u>		Sample Date		Sample Time		Sample Type (C=comp, G=grab)		Matrix (Water, Solid, On-site)	
		5/26/2020 1320		G		Water		Water	
		5/26/2020 1215		G		Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	
						Water		Water	

Possible Hazard Identification
 Non-Hazard Flammable Skin Irritant Unknown Radiological

Deliverable Requested: I, II, III, IV, Other (specify)

Empty Kit Relinquished by: _____ Date: _____

Relinquished by: Matthew Cahalan Date/Time: 5/26/2020 1030 Company: SCS

Relinquished by: _____ Date/Time: _____ Company: _____

Relinquished by: _____ Date/Time: _____ Company: _____

Custody Seals Intact: Yes No

Custody Seal No.: _____

Received by: [Signature] Date/Time: 5/27/20 1330 Company: DSM

Received by: _____ Date/Time: _____ Company: _____

Received by: Carmel Christensen Date/Time: 5/27/20 1645 Company: ETA

Cooler/Temperature(s) °C and Other Remarks: _____

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
 Return To Client Disposal By Lab Archive For _____ Months

Special Instructions/Requirements: _____

Fredrick, Sandie

From: Blodgett, Meghan <mbloodgett@scsengineers.com>
Sent: Wednesday, May 27, 2020 8:00 PM
To: Fredrick, Sandie
Cc: Kron, Nicole
Subject: Parameter list for Ottumwa Midland Landfill MW-301 and MW-303 - SCS #25220073

EXTERNAL EMAIL*

Sandie,

We couldn't get to these two wells last week, so they were sampled yesterday. They should have arrived at the lab today. The parameter list is below (this should also be reflected on the COC).

Chloride
Fluoride
Sulfate
TDS
Boron
Calcium
pH

Let us know if you have any questions on this one. Thank you.

Meghan Blodgett, PG*
Hydrogeologist
SCS Engineers
2830 Dairy Drive
Madison, WI 53718-6751 USA
608-345-9221 (C)
mbloodgett@scsengineers.com
*Licensed in WI

Driven by Client Success
www.scsengineers.com

* WARNING - EXTERNAL: This email originated from outside of Eurofins TestAmerica. Do not click any links or open any attachments unless you trust the sender and know that the content is safe!

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Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-182584-1

Login Number: 182584

List Source: Eurofins TestAmerica, Cedar Falls

List Number: 1

Creator: Homolar, Dana J

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Groundwater Monitoring Results - Field Parameters
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
May 2020

Sample	Date/Time	Groundwater Elevation (feet amsl)	Temperature (Deg. C)	pH (Std. Units)	Dissolved Oxygen (mg/L)	Specific Conductivity (µmhos/cm)	ORP (mV)	Turbidity (NTU)
MW-301	5/26 - 1320	687.29	15.8	5.67	0.41	1546	-57.8	21.8
MW-302	5/21 - 1415	686.25	13.1	7.05	1.06	1129	-83.4	12.5
MW-303	5/26 - 1215	687.14	14.4	6.21	2.31	1963	-30.0	57.1
MW-102M	5/21 - 1045	717.61	13.1	7.82	1.59	2260	21.2	297
MW-122M	5/21 - 1005	724.23	13.0	6.91	0.61	14090	-4.4	2.31

Abbreviations:

amsl = above mean sea level

mg/L = milligrams per liter

µmhos/cm = microSiemens per centimeter

NA = Not Analyzed

Laboratory Notes/Qualifiers:

none

ORP = Oxidation Reduction (REDOX)

mV = millivolts

NTU = Nephelometric Turbidity Units

Created by: AJR Date: 6/27/2019
 Last revision by: LWJ Date: 10/17/2019
 Checked by: JSN Date: 10/21/2019
 Scientist QA/QC: NDK Date: 10/31/2019

C:\Users\FredrickS\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\KGHZYGWC\May 2020_OML_GW_Fie



C2 June 2020 Resample

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-185156-1
Client Project/Site: Ottumwa Midland LF 25220073

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett



Authorized for release by:
7/6/2020 4:34:29 PM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

LINKS

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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Job ID: 310-185156-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative
310-185156-1

Comments

No additional comments.

Receipt

The samples were received on 6/30/2020 5:45 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.4° C.

HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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Sample Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-185156-1	MW-303	Water	06/29/20 14:30	06/30/20 17:45	
310-185156-2	Field Blank	Water	06/29/20 14:30	06/30/20 17:45	

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Detection Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Client Sample ID: MW-303

Lab Sample ID: 310-185156-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.9		5.0	2.0	mg/L	5		9056A	Total/NA
Ground Water Elevation	687.36				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-53.3				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.49				mg/L	1		Field Sampling	Total/NA
pH, Field	6.74				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1739				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	16.1				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	59.0				NTU	1		Field Sampling	Total/NA

Client Sample ID: Field Blank

Lab Sample ID: 310-185156-2

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Client Sample ID: MW-303

Lab Sample ID: 310-185156-1

Date Collected: 06/29/20 14:30

Matrix: Water

Date Received: 06/30/20 17:45

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.9		5.0	2.0	mg/L			07/01/20 19:38	5

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	687.36				ft			06/29/20 14:30	1
Oxidation Reduction Potential	-53.3				millivolts			06/29/20 14:30	1
Oxygen, Dissolved, Client Supplied	0.49				mg/L			06/29/20 14:30	1
pH, Field	6.74				SU			06/29/20 14:30	1
Specific Conductance, Field	1739				umhos/cm			06/29/20 14:30	1
Temperature, Field	16.1				Degrees C			06/29/20 14:30	1
Turbidity, Field	59.0				NTU			06/29/20 14:30	1

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Client Sample Results

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Client Sample ID: Field Blank

Lab Sample ID: 310-185156-2

Date Collected: 06/29/20 14:30

Matrix: Water

Date Received: 06/30/20 17:45

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			07/01/20 19:53	1

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Definitions/Glossary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

QC Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-283997/3
Matrix: Water
Analysis Batch: 283997

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			07/01/20 13:23	1

Lab Sample ID: LCS 310-283997/4
Matrix: Water
Analysis Batch: 283997

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	10.0	9.59		mg/L		96	90 - 110

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QC Association Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

HPLC/IC

Analysis Batch: 283997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-185156-1	MW-303	Total/NA	Water	9056A	
310-185156-2	Field Blank	Total/NA	Water	9056A	
MB 310-283997/3	Method Blank	Total/NA	Water	9056A	
LCS 310-283997/4	Lab Control Sample	Total/NA	Water	9056A	

Field Service / Mobile Lab

Analysis Batch: 284211

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-185156-1	MW-303	Total/NA	Water	Field Sampling	

Lab Chronicle

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Client Sample ID: MW-303

Date Collected: 06/29/20 14:30

Date Received: 06/30/20 17:45

Lab Sample ID: 310-185156-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	283997	07/01/20 19:38	ACJ	TAL CF
Total/NA	Analysis	Field Sampling		1	284211	06/29/20 14:30	SJF	TAL CF

Client Sample ID: Field Blank

Date Collected: 06/29/20 14:30

Date Received: 06/30/20 17:45

Lab Sample ID: 310-185156-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	283997	07/01/20 19:53	ACJ	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-21

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Method Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-185156-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401





Environment Testing
TestAmerica



310-185156 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: <u>SCS Engineers</u>			
City/State:	CITY <u>Olive</u>	STATE <u>IA</u>	Project: <u>Ottumwa Midland CF</u>
Receipt Information			
Date/Time Received:	DATE <u>6/20/20</u>	TIME <u>0745</u>	Received By: <u>JJ</u>
Delivery Type:	<input type="checkbox"/> UPS	<input type="checkbox"/> FedEx	<input type="checkbox"/> FedEx Ground
	<input checked="" type="checkbox"/> Lab Courier	<input type="checkbox"/> Lab Field Services	<input type="checkbox"/> Client Drop-off
		<input type="checkbox"/> US Mail	<input type="checkbox"/> Spee-Dee
			<input type="checkbox"/> Other: _____
Condition of Cooler/Containers			
Sample(s) received in Cooler?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	If yes: Cooler ID: _____
Multiple Coolers?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	If yes: Cooler # _____ of _____
Cooler Custody Seals Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	If yes: Cooler custody seals intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Sample Custody Seals Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	If yes: Sample custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No
Trip Blank Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	If yes: Which VOA samples are in cooler? ↓
Temperature Record			
Coolant:	<input checked="" type="checkbox"/> Wet ice	<input type="checkbox"/> Blue ice	<input type="checkbox"/> Dry ice
			<input type="checkbox"/> Other: _____ <input type="checkbox"/> NONE
Thermometer ID:	<u>M</u>		Correction Factor (°C): <u>0.1</u>
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C):	<u>0.3</u>		Corrected Temp (°C): <u>0.1</u>
• Sample Container Temperature			
Container(s) used:	CONTAINER 1	CONTAINER 2	
Uncorrected Temp (°C):			
Corrected Temp (°C):			
Exceptions Noted			
1) If temperature exceeds criteria, was sample(s) received same day of sampling? <input type="checkbox"/> Yes <input type="checkbox"/> No			
a) If yes: Is there evidence that the chilling process began? <input type="checkbox"/> Yes <input type="checkbox"/> No			
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) <input type="checkbox"/> Yes <input type="checkbox"/> No			
NOTE: If yes, contact PM before proceeding. If no, proceed with login			
Additional Comments			



Client Information Client Contact: <u>Matthew Cahalan</u> Phone: <u>515-250-0305</u> E-Mail: <u>sandle.fredrick@testamericainc.com</u>		Lab PM: <u>Fredrick, Sandle</u> E-Mail: <u>sandle.fredrick@testamericainc.com</u>		Carrier Tracking No(s): COC No: <u>310-51415-15659-1</u>	
Company: <u>SCS Engineers</u> Address: <u>8450 Hickman Road Suite 2027</u> City: <u>Clive</u> State/Zip: <u>IA, 50325</u> Phone: <u>515-250-0305</u> Email: <u>ljennings@scsengineers.com</u> Project Name: <u>Ottumwa Midland LF</u> Project #: <u>31011020</u> Site: <u>Ottumwa Midland LF</u>		Due Date Requested: <u>per TAT</u> TAT Requested (days): <u>3-2day TAT</u> PO #: <u>515-250-0305</u> Purchase Order Requested: <u>WO #:</u> Project #: <u>31011020</u> SSOW#:		Analysis Requested 9056A_ORGM_28D - (MOD) Chloride and Sulfate Perform MS/MSD (Yes or No) <u>N</u> Field Filtered Sample (Yes or No) <u>N</u> Total Number of Containers	
Sample Identification MW-303 Field Blank		Sample Date <u>09/29/2020</u> <u>09/29/2020</u>	Sample Time <u>1430</u> <u>1430</u>	Sample Type (C=Comp, G=grab) <u>G</u> <u>G</u>	Matrix (W=water, S=solid, O=wasteoil, BT=tissue, A=air) Preservation Code: <u>Water</u> <u>Water</u>
Possible Hazard Identification <input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input checked="" type="checkbox"/> Unknown <input type="checkbox"/> Radiological		Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months			
Empty Kit Relinquished by:		Date: _____ Time: _____		Method of Shipment: _____	
Relinquished by: <u>Matthew Cahalan</u>		Date/Time: <u>09/29/2020 1340</u>		Received by: <u>[Signature]</u>	
Relinquished by:		Date/Time:		Received by:	
Relinquished by:		Date/Time:		Received by:	
Custody Seals Intact: Δ Yes Δ No		Cooler Temperature(s) °C and Other Remarks:			
Special Instructions/Note: <u>1 Chloride analysis only</u> <u>1 Chloride analysis only</u> <u>* 3-day TAT *</u>		Preservation Codes: A - HCL B - NaOH N - None O - AsNaO2 P - Na2O4S Q - Na2SO3 R - Na2SO4 S - H2SO4 G - Amchlor H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA L - EDA W - pH 4-5 Z - other (specify) Other:			

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-185156-1

Login Number: 185156

List Source: Eurofins TestAmerica, Cedar Falls

List Number: 1

Creator: Homolar, Dana J

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Fredrick, Sandie

Sandie,

Field data for MW-303 at OML are below:

Groundwater elevation: 687.36 ft amsl

Temperature: 16.1 deg C

pH: 6.74 std. units

ORP: -53.3 mV

DO: 0.49 mg/L

Turbidity: 59.0 NTU

Sp. Cond: 1739 us/cm

Meghan Blodgett

SCS Engineers

Madison, WI

608-345-9221 (C)

mblodgett@scsengineers.com

www.scsengineers.com

Please let us know if we met your expectations by rating the service you received from TestAmerica on this project by visiting our website at: [Project Feedback](#)

We are thankful for your business and hope that you have a wonderful day!

Sandie Fredrick

Project Manager

Eurofins TestAmerica

2417 Bond Street

University Park, IL 60484

USA

Phone: 920-261-1660

E-mail: sandie.fredrick@testamericainc.com

www.EurofinsUS.com | www.TestAmericainc.com

Please note: In order to continue to provide critical testing services, **Eurofins Environment Testing laboratories in the US are maintaining our courier services and continue to sample, analyze and report all test data as usual.** The situation around COVID-19 continues to be fluid and we are continuing to follow local and government mandates as applicable. For up-to-date business information, visit our website and follow us on Facebook and LinkedIn.

Links to use:

Website: <https://www.eurofinsus.com/environment-testing/>

Facebook: <https://www.facebook.com/EurofinsEnvTesting>

LinkedIn: <https://www.linkedin.com/company/eurofins-env-testing-america/>

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C3 October 2020 Detection Monitoring

ANALYTICAL REPORT

Eurofins TestAmerica, Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Tel: (319)277-2401

Laboratory Job ID: 310-192584-1
Client Project/Site: Ottumwa Midland LF 25220073

For:
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Attn: Meghan Blodgett



Authorized for release by:
10/23/2020 11:26:50 AM

Sandie Fredrick, Project Manager II
(920)261-1660
sandra.fredrick@eurofinset.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Job ID: 310-192584-1

Laboratory: Eurofins TestAmerica, Cedar Falls

Narrative

Job Narrative 310-192584-1

Comments

No additional comments.

Receipt

The samples were received on 10/8/2020 5:50 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.8° C.

HPLC/IC

Method 9056A: The following sample was diluted due to the nature of the sample matrix: MW-122M (310-192584-5). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals

Method 3010A: The reference method requires samples to be preserved to a pH of <2. The following samples were received with insufficient preservation at a pH of >2: MW-102M (310-192584-4) and MW-122M (310-192584-5). The sample(s) was preserved to the appropriate pH in the laboratory.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



Sample Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
310-192584-1	MW-301	Water	10/06/20 13:17	10/08/20 17:50	
310-192584-2	MW-302	Water	10/06/20 09:30	10/08/20 17:50	
310-192584-3	MW-303	Water	10/06/20 11:22	10/08/20 17:50	
310-192584-4	MW-102M	Water	10/07/20 08:35	10/08/20 17:50	
310-192584-5	MW-122M	Water	10/07/20 09:24	10/08/20 17:50	
310-192584-6	Field Blank	Water	10/06/20 13:30	10/08/20 17:50	

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Detection Summary

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-301

Lab Sample ID: 310-192584-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	24		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.67		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	620		20	14	mg/L	20		9056A	Total/NA
Boron	770		100	80	ug/L	1		6020A	Total/NA
Calcium	180		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	1400		150	130	mg/L	1		SM 2540C	Total/NA
pH	6.9	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	686.80				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-105.9				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.25				mg/L	1		Field Sampling	Total/NA
pH, Field	7.22				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1820				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	14.5				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	21.4				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-302

Lab Sample ID: 310-192584-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	7.2		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	1.1		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	73		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	870		100	80	ug/L	1		6020A	Total/NA
Calcium	65		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	700		30	26	mg/L	1		SM 2540C	Total/NA
pH	7.6	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	685.86				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-169.4				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.28				mg/L	1		Field Sampling	Total/NA
pH, Field	7.14				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1025				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.5				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	136				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-303

Lab Sample ID: 310-192584-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	7.3		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.88		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	230		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	740		100	80	ug/L	1		6020A	Total/NA
Calcium	100		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	840		30	26	mg/L	1		SM 2540C	Total/NA
pH	7.2	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	686.35				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-137.3				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.30				mg/L	1		Field Sampling	Total/NA
pH, Field	7.01				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	1262				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.9				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	240				NTU	1		Field Sampling	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Detection Summary

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-102M

Lab Sample ID: 310-192584-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	14		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	5.3		0.50	0.23	mg/L	5		9056A	Total/NA
Sulfate	350		5.0	3.6	mg/L	5		9056A	Total/NA
Boron	1600		100	80	ug/L	1		6020A	Total/NA
Calcium	150		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	1700		150	130	mg/L	1		SM 2540C	Total/NA
pH	8.1	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	712.05				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	22.0				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	5.11				mg/L	1		Field Sampling	Total/NA
pH, Field	8.29				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	2123				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	14.5				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	NM				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-122M

Lab Sample ID: 310-192584-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	8.3		5.0	2.0	mg/L	5		9056A	Total/NA
Sulfate	8700		100	71	mg/L	100		9056A	Total/NA
Boron	4100		1000	800	ug/L	10		6020A	Total/NA
Calcium	430		0.50	0.19	mg/L	1		6020A	Total/NA
Total Dissolved Solids	14000		300	260	mg/L	1		SM 2540C	Total/NA
pH	6.9	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA
Ground Water Elevation	718.39				ft	1		Field Sampling	Total/NA
Oxidation Reduction Potential	-28.2				millivolts	1		Field Sampling	Total/NA
Oxygen, Dissolved, Client Supplied	0.56				mg/L	1		Field Sampling	Total/NA
pH, Field	7.00				SU	1		Field Sampling	Total/NA
Specific Conductance, Field	13603				umhos/cm	1		Field Sampling	Total/NA
Temperature, Field	13.6				Degrees C	1		Field Sampling	Total/NA
Turbidity, Field	NM				NTU	1		Field Sampling	Total/NA

Client Sample ID: Field Blank

Lab Sample ID: 310-192584-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	85	J	100	80	ug/L	1		6020A	Total/NA
Calcium	0.24	J	0.50	0.19	mg/L	1		6020A	Total/NA
pH	6.4	HF	0.1	0.1	SU	1		SM 4500 H+ B	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Cedar Falls

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-301

Lab Sample ID: 310-192584-1

Date Collected: 10/06/20 13:17

Matrix: Water

Date Received: 10/08/20 17:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	24		5.0	2.0	mg/L			10/13/20 15:50	5
Fluoride	0.67		0.50	0.23	mg/L			10/13/20 15:50	5
Sulfate	620		20	14	mg/L			10/14/20 08:16	20

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	770		100	80	ug/L		10/12/20 08:45	10/14/20 22:55	1
Calcium	180		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 22:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1400		150	130	mg/L			10/12/20 11:43	1
pH	6.9	HF	0.1	0.1	SU			10/08/20 21:27	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	686.80				ft			10/06/20 13:17	1
Oxidation Reduction Potential	-105.9				millivolts			10/06/20 13:17	1
Oxygen, Dissolved, Client Supplied	0.25				mg/L			10/06/20 13:17	1
pH, Field	7.22				SU			10/06/20 13:17	1
Specific Conductance, Field	1820				umhos/cm			10/06/20 13:17	1
Temperature, Field	14.5				Degrees C			10/06/20 13:17	1
Turbidity, Field	21.4				NTU			10/06/20 13:17	1

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-302
 Date Collected: 10/06/20 09:30
 Date Received: 10/08/20 17:50

Lab Sample ID: 310-192584-2
 Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	7.2		5.0	2.0	mg/L			10/13/20 16:06	5
Fluoride	1.1		0.50	0.23	mg/L			10/13/20 16:06	5
Sulfate	73		5.0	3.6	mg/L			10/13/20 16:06	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	870		100	80	ug/L		10/12/20 08:45	10/14/20 22:58	1
Calcium	65		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 22:58	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	700		30	26	mg/L			10/12/20 11:43	1
pH	7.6	HF	0.1	0.1	SU			10/08/20 21:32	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	685.86				ft			10/06/20 09:30	1
Oxidation Reduction Potential	-169.4				millivolts			10/06/20 09:30	1
Oxygen, Dissolved, Client Supplied	0.28				mg/L			10/06/20 09:30	1
pH, Field	7.14				SU			10/06/20 09:30	1
Specific Conductance, Field	1025				umhos/cm			10/06/20 09:30	1
Temperature, Field	13.5				Degrees C			10/06/20 09:30	1
Turbidity, Field	136				NTU			10/06/20 09:30	1



Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-303
 Date Collected: 10/06/20 11:22
 Date Received: 10/08/20 17:50

Lab Sample ID: 310-192584-3
 Matrix: Water

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	7.3		5.0	2.0	mg/L			10/13/20 16:21	5
Fluoride	0.88		0.50	0.23	mg/L			10/13/20 16:21	5
Sulfate	230		5.0	3.6	mg/L			10/13/20 16:21	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	740		100	80	ug/L		10/12/20 08:45	10/14/20 23:01	1
Calcium	100		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 23:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	840		30	26	mg/L			10/12/20 11:43	1
pH	7.2	HF	0.1	0.1	SU			10/08/20 21:34	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	686.35				ft			10/06/20 11:22	1
Oxidation Reduction Potential	-137.3				millivolts			10/06/20 11:22	1
Oxygen, Dissolved, Client Supplied	0.30				mg/L			10/06/20 11:22	1
pH, Field	7.01				SU			10/06/20 11:22	1
Specific Conductance, Field	1262				umhos/cm			10/06/20 11:22	1
Temperature, Field	13.9				Degrees C			10/06/20 11:22	1
Turbidity, Field	240				NTU			10/06/20 11:22	1



Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-102M

Lab Sample ID: 310-192584-4

Date Collected: 10/07/20 08:35

Matrix: Water

Date Received: 10/08/20 17:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	14		5.0	2.0	mg/L			10/13/20 16:37	5
Fluoride	5.3		0.50	0.23	mg/L			10/13/20 16:37	5
Sulfate	350		5.0	3.6	mg/L			10/13/20 16:37	5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	1600		100	80	ug/L		10/12/20 08:45	10/14/20 23:03	1
Calcium	150		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 23:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1700		150	130	mg/L			10/12/20 11:43	1
pH	8.1	HF	0.1	0.1	SU			10/08/20 21:35	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	712.05				ft			10/07/20 08:35	1
Oxidation Reduction Potential	22.0				millivolts			10/07/20 08:35	1
Oxygen, Dissolved, Client Supplied	5.11				mg/L			10/07/20 08:35	1
pH, Field	8.29				SU			10/07/20 08:35	1
Specific Conductance, Field	2123				umhos/cm			10/07/20 08:35	1
Temperature, Field	14.5				Degrees C			10/07/20 08:35	1
Turbidity, Field	NM				NTU			10/07/20 08:35	1

Client Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-122M

Lab Sample ID: 310-192584-5

Date Collected: 10/07/20 09:24

Matrix: Water

Date Received: 10/08/20 17:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	8.3		5.0	2.0	mg/L			10/13/20 16:52	5
Fluoride	<0.23		0.50	0.23	mg/L			10/13/20 16:52	5
Sulfate	8700		100	71	mg/L			10/14/20 08:31	100

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	4100		1000	800	ug/L		10/12/20 08:45	10/15/20 16:21	10
Calcium	430		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 23:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	14000		300	260	mg/L			10/12/20 11:43	1
pH	6.9	HF	0.1	0.1	SU			10/08/20 21:37	1

Method: Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ground Water Elevation	718.39				ft			10/07/20 09:24	1
Oxidation Reduction Potential	-28.2				millivolts			10/07/20 09:24	1
Oxygen, Dissolved, Client Supplied	0.56				mg/L			10/07/20 09:24	1
pH, Field	7.00				SU			10/07/20 09:24	1
Specific Conductance, Field	13603				umhos/cm			10/07/20 09:24	1
Temperature, Field	13.6				Degrees C			10/07/20 09:24	1
Turbidity, Field	NM				NTU			10/07/20 09:24	1



Client Sample Results

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: Field Blank

Lab Sample ID: 310-192584-6

Date Collected: 10/06/20 13:30

Matrix: Water

Date Received: 10/08/20 17:50

Method: 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			10/13/20 17:08	1
Fluoride	<0.046		0.10	0.046	mg/L			10/13/20 17:08	1
Sulfate	<0.71		1.0	0.71	mg/L			10/13/20 17:08	1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	85	J	100	80	ug/L		10/12/20 08:45	10/14/20 23:11	1
Calcium	0.24	J	0.50	0.19	mg/L		10/12/20 08:45	10/14/20 23:11	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<26		30	26	mg/L			10/12/20 11:43	1
pH	6.4	HF	0.1	0.1	SU			10/08/20 21:40	1

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Definitions/Glossary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

QC Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-295631/3
Matrix: Water
Analysis Batch: 295631

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.40		1.0	0.40	mg/L			10/13/20 13:15	1
Fluoride	<0.046		0.10	0.046	mg/L			10/13/20 13:15	1
Sulfate	<0.71		1.0	0.71	mg/L			10/13/20 13:15	1

Lab Sample ID: LCS 310-295631/4
Matrix: Water
Analysis Batch: 295631

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	10.0	9.84		mg/L		98	90 - 110
Fluoride	2.00	2.11		mg/L		106	90 - 110
Sulfate	10.0	10.3		mg/L		103	90 - 110

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 310-295023/1-A
Matrix: Water
Analysis Batch: 295528

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 295023

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	<80		100	80	ug/L		10/12/20 08:45	10/14/20 22:14	1
Calcium	<0.19		0.50	0.19	mg/L		10/12/20 08:45	10/14/20 22:14	1

Lab Sample ID: LCS 310-295023/2-A
Matrix: Water
Analysis Batch: 295528

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 295023

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	200	219		ug/L		109	80 - 120
Calcium	2.00	1.83		mg/L		92	80 - 120

Lab Sample ID: 310-192584-5 DU
Matrix: Water
Analysis Batch: 295528

Client Sample ID: MW-122M
Prep Type: Total/NA
Prep Batch: 295023

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Calcium	430		439		mg/L		1	20

Lab Sample ID: 310-192584-5 DU
Matrix: Water
Analysis Batch: 295753

Client Sample ID: MW-122M
Prep Type: Total/NA
Prep Batch: 295023

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Boron	4100		4230		ug/L		3	20

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QC Sample Results

Client: SCS Engineers
 Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-295081/1
 Matrix: Water
 Analysis Batch: 295081

Client Sample ID: Method Blank
 Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<26		30	26	mg/L			10/12/20 11:43	1

Lab Sample ID: LCS 310-295081/2
 Matrix: Water
 Analysis Batch: 295081

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	934		mg/L		93	90 - 110

Method: SM 4500 H+ B - pH

Lab Sample ID: LCS 310-294755/1
 Matrix: Water
 Analysis Batch: 294755

Client Sample ID: Lab Control Sample
 Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
pH	7.00	6.9		SU		99	98 - 102

Lab Sample ID: 310-192584-1 DU
 Matrix: Water
 Analysis Batch: 294755

Client Sample ID: MW-301
 Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	6.9	HF	6.9		SU		0.6	20

QC Association Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

HPLC/IC

Analysis Batch: 295631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	9056A	
310-192584-1	MW-301	Total/NA	Water	9056A	
310-192584-2	MW-302	Total/NA	Water	9056A	
310-192584-3	MW-303	Total/NA	Water	9056A	
310-192584-4	MW-102M	Total/NA	Water	9056A	
310-192584-5	MW-122M	Total/NA	Water	9056A	
310-192584-5	MW-122M	Total/NA	Water	9056A	
310-192584-6	Field Blank	Total/NA	Water	9056A	
MB 310-295631/3	Method Blank	Total/NA	Water	9056A	
LCS 310-295631/4	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 295023

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	3010A	
310-192584-2	MW-302	Total/NA	Water	3010A	
310-192584-3	MW-303	Total/NA	Water	3010A	
310-192584-4	MW-102M	Total/NA	Water	3010A	
310-192584-5	MW-122M	Total/NA	Water	3010A	
310-192584-6	Field Blank	Total/NA	Water	3010A	
MB 310-295023/1-A	Method Blank	Total/NA	Water	3010A	
LCS 310-295023/2-A	Lab Control Sample	Total/NA	Water	3010A	
310-192584-5 DU	MW-122M	Total/NA	Water	3010A	

Analysis Batch: 295528

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	6020A	295023
310-192584-2	MW-302	Total/NA	Water	6020A	295023
310-192584-3	MW-303	Total/NA	Water	6020A	295023
310-192584-4	MW-102M	Total/NA	Water	6020A	295023
310-192584-5	MW-122M	Total/NA	Water	6020A	295023
310-192584-6	Field Blank	Total/NA	Water	6020A	295023
MB 310-295023/1-A	Method Blank	Total/NA	Water	6020A	295023
LCS 310-295023/2-A	Lab Control Sample	Total/NA	Water	6020A	295023
310-192584-5 DU	MW-122M	Total/NA	Water	6020A	295023

Analysis Batch: 295753

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-5	MW-122M	Total/NA	Water	6020A	295023
310-192584-5 DU	MW-122M	Total/NA	Water	6020A	295023

General Chemistry

Analysis Batch: 294755

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	SM 4500 H+ B	
310-192584-2	MW-302	Total/NA	Water	SM 4500 H+ B	
310-192584-3	MW-303	Total/NA	Water	SM 4500 H+ B	
310-192584-4	MW-102M	Total/NA	Water	SM 4500 H+ B	
310-192584-5	MW-122M	Total/NA	Water	SM 4500 H+ B	
310-192584-6	Field Blank	Total/NA	Water	SM 4500 H+ B	

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QC Association Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

General Chemistry (Continued)

Analysis Batch: 294755 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 310-294755/1	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
310-192584-1 DU	MW-301	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 295081

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	SM 2540C	
310-192584-2	MW-302	Total/NA	Water	SM 2540C	
310-192584-3	MW-303	Total/NA	Water	SM 2540C	
310-192584-4	MW-102M	Total/NA	Water	SM 2540C	
310-192584-5	MW-122M	Total/NA	Water	SM 2540C	
310-192584-6	Field Blank	Total/NA	Water	SM 2540C	
MB 310-295081/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-295081/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Field Service / Mobile Lab

Analysis Batch: 296776

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-192584-1	MW-301	Total/NA	Water	Field Sampling	
310-192584-2	MW-302	Total/NA	Water	Field Sampling	
310-192584-3	MW-303	Total/NA	Water	Field Sampling	
310-192584-4	MW-102M	Total/NA	Water	Field Sampling	
310-192584-5	MW-122M	Total/NA	Water	Field Sampling	

Lab Chronicle

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-301

Lab Sample ID: 310-192584-1

Date Collected: 10/06/20 13:17

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	295631	10/13/20 15:50	ACJ	TAL CF
Total/NA	Analysis	9056A		20	295631	10/14/20 08:16	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 22:55	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:27	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	296776	10/06/20 13:17	SLD	TAL CF

Client Sample ID: MW-302

Lab Sample ID: 310-192584-2

Date Collected: 10/06/20 09:30

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	295631	10/13/20 16:06	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 22:58	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:32	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	296776	10/06/20 09:30	SLD	TAL CF

Client Sample ID: MW-303

Lab Sample ID: 310-192584-3

Date Collected: 10/06/20 11:22

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	295631	10/13/20 16:21	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 23:01	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:34	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	296776	10/06/20 11:22	SLD	TAL CF

Client Sample ID: MW-102M

Lab Sample ID: 310-192584-4

Date Collected: 10/07/20 08:35

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	295631	10/13/20 16:37	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 23:03	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:35	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	296776	10/07/20 08:35	SLD	TAL CF

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Lab Chronicle

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Client Sample ID: MW-122M

Lab Sample ID: 310-192584-5

Date Collected: 10/07/20 09:24

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		5	295631	10/13/20 16:52	ACJ	TAL CF
Total/NA	Analysis	9056A		100	295631	10/14/20 08:31	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 23:06	SAD	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		10	295753	10/15/20 16:21	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:37	JMH	TAL CF
Total/NA	Analysis	Field Sampling		1	296776	10/07/20 09:24	SLD	TAL CF

Client Sample ID: Field Blank

Lab Sample ID: 310-192584-6

Date Collected: 10/06/20 13:30

Matrix: Water

Date Received: 10/08/20 17:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056A		1	295631	10/13/20 17:08	ACJ	TAL CF
Total/NA	Prep	3010A			295023	10/12/20 08:45	HED	TAL CF
Total/NA	Analysis	6020A		1	295528	10/14/20 23:11	SAD	TAL CF
Total/NA	Analysis	SM 2540C		1	295081	10/12/20 11:43	SAS	TAL CF
Total/NA	Analysis	SM 4500 H+ B		1	294755	10/08/20 21:40	JMH	TAL CF

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Laboratory: Eurofins TestAmerica, Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-21

1

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Method Summary

Client: SCS Engineers
Project/Site: Ottumwa Midland LF 25220073

Job ID: 310-192584-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	TAL CF
6020A	Metals (ICP/MS)	SW846	TAL CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CF
SM 4500 H+ B	pH	SM	TAL CF
Field Sampling	Field Sampling	EPA	TAL CF
3010A	Preparation, Total Metals	SW846	TAL CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CF = Eurofins TestAmerica, Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401



Cooler/Sample Receipt and Temperature Log

Client Information			
Client: <u>SCS</u>			
City/State: <u>Clive IA</u>	CITY	STATE	Project: <u>Ottumwa Midland LF</u>
Receipt Information			
Date/Time Received: <u>10-8-20 1750</u>	DATE	TIME	Received By: <u>ER</u>
Delivery Type: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> FedEx Ground <input type="checkbox"/> US Mail <input type="checkbox"/> Spee-Dee <input checked="" type="checkbox"/> Lab Courier <input type="checkbox"/> Lab Field Services <input type="checkbox"/> Client Drop-off <input type="checkbox"/> Other: _____			
Condition of Cooler/Containers			
Sample(s) received in Cooler?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes: Cooler ID: _____	
Multiple Coolers?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Cooler # _____ of _____	
Cooler Custody Seals Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes: Cooler custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Sample Custody Seals Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Sample custody seals intact? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Trip Blank Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes: Which VOA samples are in cooler? ↓	
Temperature Record			
Coolant: <input checked="" type="checkbox"/> Wet ice <input type="checkbox"/> Blue ice <input type="checkbox"/> Dry ice <input type="checkbox"/> Other: _____ <input type="checkbox"/> NONE			
Thermometer ID: <u>0</u>	Correction Factor (°C): <u>+0.1</u>		
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C): _____	Corrected Temp (°C): _____		
• Sample Container Temperature			
Container(s) used:	CONTAINER 1	CONTAINER 2	
	<u>plastic 260 mL</u>		
Uncorrected Temp (°C):	<u>4.7</u>		
Corrected Temp (°C):	<u>4.8</u>		
Exceptions Noted			
1) If temperature exceeds criteria, was sample(s) received same day of sampling? <input type="checkbox"/> Yes <input type="checkbox"/> No			
a) If yes: Is there evidence that the chilling process began? <input type="checkbox"/> Yes <input type="checkbox"/> No			
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid)? <input type="checkbox"/> Yes <input type="checkbox"/> No			
NOTE: If yes, contact PM before proceeding. If no, proceed with login			
Additional Comments			

Document: CF-LG-WI-002
Revision: 25
Date: 06/17/2019

Eurofins TestAmerica, Cedar Falls

General temperature criteria is 0 to 6°C
Bacteria temperature criteria is 0 to 10°C

Eurofins TestAmerica, Cedar Falls
 3019 Venture Way
 Cedar Falls, IA 50613
 Phone: 319-277-2401 Fax: 319-277-2425

TestAmerica Des Moines SC
 214

Chain of Custody Record

Client Information
 Client Contact: Tanten Buszka
 Phone: 264-993-0855
 Company: SCS Engineers
 Address: 8450 Hickman Road Suite 207
 City: Clive
 State, Zip: IA, 50325
 Phone: 264-993-0855
 Email: tbuszka@scsengineers.com
 Project Name: Ottumwa Midland LF 25220073
 Site: 27220073

Due Date Requested:
 TAT Requested (days):
 PO #: Purchase Order Requested
 WO #:
 Project #: 31011020
 SSOW#: 27220073

Carrier Tracking No(s):
 Lab #/M: Fredrick, Sandie
 E-Mail: sandra.fredrick@eurofinset.com

COC No: 310-54603-14130.1
 Page: Page 1 of 1
 Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=water/oil, BT=tissue, A=air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6020A - B/Ca	2540C, Calcd, SM4500_H+	N	D	Total Number of Containers	Special Instructions/Note:
MW-301	10-6-20	13:17	G	Water	X	X	X	X				See attached Sampling Points + Parameters table for requested analyses
MW-302	10-6-20	9:30	G	Water	X	X	X	X				
MW-303	10-6-20	11:22	G	Water	X	X	X	X				
MW-102M	10-7-20	8:35	G	Water	X	X	X	X				
MW-122M	10-7-20	9:24	G	Water	X	X	X	X				
Field Blank	10-6-20	13:30	G	Water	X	X	X	X				

Preservation Codes:
 A - HCL
 B - NaOH
 C - Zn Acetate
 D - Nitric Acid
 E - NaHSO4
 F - MeOH
 G - Amchlor
 H - Ascorbic Acid
 I - Ice
 J - DI Water
 K - EDTA
 L - EDA
 Other:
 M - Hexane
 N - None
 O - AsNaO2
 P - Na2O4S
 Q - Na2SO3
 R - Na2SO3
 S - H2SO4
 T - TSP Dodecahydrate
 U - Acetone
 V - MCAA
 W - pH 4-5
 X - other (specify)

Possible Hazard Identification
 Non-Hazard Flammable Skin Irritant Poison B Unknown Radiological
 Deliverable Requested: I, II, III, IV, Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
 Return To Client Disposal By Lab Archive For _____ Months
 Special Instructions/QC Requirements:

Empty Kit Relinquished by: _____ Date: _____
 Relinquished by: Matthew Cabrelan Date/Time: 10/18/20 1200
 Relinquished by: _____ Date/Time: _____
 Relinquished by: _____ Date/Time: _____
 Custody Seals Intact: Yes No
 Custody Seal No.: _____

Received by: _____ Date/Time: 10-8-20 1750
 Received by: _____ Date/Time: _____
 Received by: _____ Date/Time: _____
 Cooler Temperature(s) °C and Other Remarks:



Table 2. Sampling Points and Parameters - CCR Rule Sampling Program - Detection Monitoring
Groundwater Monitoring - Ottumwa Midland Landfill / SCS Engineers Project #25216073

	Parameter	MW-301	MW-302	MW-303	MW-102M	MW-122M	Field Blank	TOTAL
Appendix III Parameters	Boron	x	x	x	x	x	x	6
	Calcium	x	x	x	x	x	x	6
	Chloride	x	x	x	x	x	x	6
	Fluoride	x	x	x	x	x	x	6
	pH	x	x	x	x	x	x	6
	Sulfate	x	x	x	x	x	x	6
	TDS	x	x	x	x	x	x	6
Appendix IV Parameters	Antimony							0
	Arsenic							0
	Barium							0
	Beryllium							0
	Cadmium							0
	Chromium							0
	Cobalt							0
	Fluoride							0
	Lead							0
	Lithium							0
	Mercury							0
	Molybdenum							0
	Selenium							0
	Thallium							0
Radium							0	
Field Parameters	Groundwater Elevation	x	x	x	x	x		5
	Well Depth	x	x	x	x	x		5
	pH (field)	x	x	x	x	x		5
	Specific Conductance	x	x	x	x	x		5
	Dissolved Oxygen	x	x	x	x	x		5
	ORP	x	x	x	x	x		5
	Temperature	x	x	x	x	x		5
	Turbidity	x	x	x	x	x		5
	Color	x	x	x	x	x		5
	Odor	x	x	x	x	x		5

Notes: All samples are unfiltered (total).

I:\25216073.00\Data and Calculations\Field Notes\Field Work Requests\[Table_2_OML_CCR_Rule_Sampling_Det

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-192584-1

Login Number: 192584

List Source: Eurofins TestAmerica, Cedar Falls

List Number: 1

Creator: Marzen, Brita K

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Groundwater Monitoring Results - Field Parameters
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00
October 2020

Sample	Date	Groundwater Elevation (ft. amsl)	Temperature (Deg. C)	pH (Std. Units)	DO (mg/L)	Specific Conductivity (µmhos/cm)	ORP (mV)	Turbidity (NTU)
MW-301	10/6/2020	686.80	14.5	7.22	0.25	1820	-105.9	21.4
MW-302	10/6/2020	685.86	13.5	7.14	0.28	1025	-169.4	136
MW-303	10/6/2020	686.35	13.9	7.01	0.30	1262	-137.3	240
MW-102M	10/7/2020	712.05	14.5	8.29	5.11	2123	22.0	--
MW-122M	10/5/2020	718.39	13.6	7.00	0.56	13603	-28.2	--

Abbreviations:

amsl = above mean sea level

µmhos/cm = microSiemens per centimeter


Laboratory Notes/Qualifiers:

none

Created by: AJR
 Last revision by: RM
 Checked by: ACW

Date: 8/15/2019
 Date: 10/22/2020
 Date: 10/22/2020

C:\Users\FredrickS\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\NYDS7C58\[October 2020_OML_GW_Field Parameters.xlsx]GW Field Data



Appendix D
Historical Monitoring Results

Single Location

Name: IPL - Ottumwa Midland Landfill

Location ID: MW-102M																			
Number of Sampling Dates: 17																			
Parameter Name	Units	5/4/2016	6/22/2016	6/23/2016	8/10/2016	10/25/2016	10/26/2016	1/18/2017	4/20/2017	6/21/2017	8/22/2017	11/8/2017	4/17/2018	10/16/2018	4/18/2019	10/15/2019	5/21/2020	10/7/2020	
Boron	ug/L	1510	1440	--	1480	--	1420	1480	1460	1410	1440	1480	1550	1340	1400	1500	1500	1600	
Calcium	mg/L	45.9	147	--	129	--	31.5	23.6	26	67.7	79.7	10.4	25.3	12.9	51	14	38	150	
Chloride	mg/L	16.3	13.8	--	13.4	--	13	12.3	12.5	12.8	13.1	12.3	13.5	13.6	14	15	16	14	
Fluoride	mg/L	4.2	4.2	--	4.4	--	4.6	4.1	4	4.6	4.5	4.6	4.5	4.7	5.7	4.5	5	5.3	
Field pH	Std. Units	8.09	7.68	--	--	--	--	7.62	7.35	7.64	6.89	8.16	8.34	7.8	8.55	7.81	7.82	8.29	
Sulfate	mg/L	378	350	--	354	--	384	415	348	356	358	335	352	384	340	350	350	350	
Total Dissolved Solids	mg/L	1670	1530	--	1620	--	1420	1530	1620	1480	1400	1410	1540	1500	1700	1400	3700	1700	
Antimony	ug/L	0.38	0.19	--	0.17	--	0.51	0.26	0.1	0.21	0.16	--	--	--	--	--	--	--	
Arsenic	ug/L	0.64	0.68	--	0.78	--	0.9	0.89	0.92	0.9	0.9	--	--	--	--	--	--	--	
Barium	ug/L	48.5	39.5	--	55.4	--	28.2	21.1	28.4	37.2	31	--	--	--	--	--	--	--	
Beryllium	ug/L	0.74	1.4	--	1.1	--	0.37	0.19	0.34	0.54	0.41	--	--	--	--	--	--	--	
Cadmium	ug/L	<0.029	0.12	--	0.078	--	0.11	<0.029	0.046	0.063	0.062	--	--	--	--	--	--	--	
Chromium	ug/L	20.5	17.9	--	27.1	--	11.8	2.8	8.7	16	9.6	--	--	--	--	--	--	--	
Cobalt	ug/L	3.5	4.5	--	7.3	--	2.4	0.74	1.7	2.1	2.5	--	--	--	--	--	--	--	
Lead	ug/L	3.1	3.6	--	3.8	--	1.7	0.87	1.4	2.2	1.8	--	--	--	--	--	--	--	
Lithium	ug/L	46.7	80.7	--	52.3	--	75.4	71.8	73.6	52.7	54	--	--	--	--	--	--	--	
Mercury	ug/L	<0.039	<0.039	--	<0.039	--	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	--	--	--	--	--	
Molybdenum	ug/L	21.7	10.3	--	20.9	--	11.7	10.6	10.8	11.1	9.5	--	--	--	--	--	--	--	
Selenium	ug/L	0.42	1	--	1.4	--	0.31	0.24	0.4	0.49	0.43	--	--	--	--	--	--	--	
Thallium	ug/L	<0.5	<0.5	--	<0.5	--	<0.5	<0.5	0.04	0.084	0.067	--	--	--	--	--	--	--	
Total Radium	pCi/L	2.64	--	1.66	1.17	--	0.814	0.567	1.57	1.12	0.594	--	--	--	--	--	--	--	
Radium-226	pCi/L	-0.058	--	0.58	0.144	--	0.444	0.209	0.754	0.285	0.368	--	--	--	--	--	--	--	
Radium-228	pCi/L	2.64	--	1.08	1.03	--	0.37	0.358	0.816	0.832	0.226	--	--	--	--	--	--	--	
pH at 25 Degrees C	Std. Units	7.9	7.9	--	7.9	--	7.8	8.1	7.9	8	8	7.8	8	8	8.2	7.9	7.9	8.1	
Groundwater Elevation	feet	728.73	718.74	--	730.49	716.94	--	717.91	717.8	714.83	713.23	713.53	717.38	717.05	717.97	715.5	717.61	712.05	
Field Oxidation Potential	mV	128.2	-102.4	--	--	--	--	--	--	--	--	219.9	-77.8	-104.7	--	--	21.2	22	
Field Specific Conductance	umhos/cm	2197	2037	--	--	--	--	--	--	--	2751	2085	2113	0	--	--	2260	2123	
Field Temperature	deg C	14	14.2	--	--	--	--	--	--	--	13.4	12.9	10.1	12.9	--	--	13.1	14.5	
Oxygen, Dissolved	mg/L	0.79	3.06	--	--	--	--	--	--	--	--	0.73	4.51	2.14	--	--	1.59	5.11	
Turbidity	NTU	350.9	614.3	--	--	--	--	--	--	--	--	--	--	--	--	--	297	--	

Single Location

Name: IPL - Ottumwa Midland Landfill

Location ID:		MW-122M																	
Number of Sampling Dates:		18																	
Parameter Name	Units	5/4/2016	5/5/2016	6/22/2016	6/23/2016	8/10/2016	10/25/2016	10/26/2016	1/18/2017	4/20/2017	6/21/2017	8/22/2017	11/8/2017	4/17/2018	10/16/2018	4/17/2019	10/15/2019	5/21/2020	10/7/2020
Boron	ug/L	--	3140	--	1720	4550	--	4060	4720	4480	4710	4980	5220	5560	4580	5500	4100	5100	4100
Calcium	mg/L	--	599	--	312	419	--	415	386	382	386	386	383	402	366	400	400	430	430
Chloride	mg/L	--	16.4	--	21.9	11.8	--	8.2	8.3	8	7.8	7.8	7.2	8	8.6	8.8	10	9	8.3
Fluoride	mg/L	--	1.1	--	0.89	0.74	--	0.48	<0.027	0.88	1.1	0.6	0.5	<0.063	<0.19	0.7	<0.23	0.23	<0.23
Field pH	Std. Units	--	6.97	--	6.68	--	--	--	6.06	--	6.42	6.32	6.16	6.65	6.31	7.34	6.6	6.91	7
Sulfate	mg/L	--	8260	--	5330	8950	--	8600	9680	14300	17500	9190	9440	10400	<0.24	8300	8400	9800	8700
Total Dissolved Solids	mg/L	--	11500	--	7430	14200	--	13200	14100	18100	12800	14300	13400	14400	13300	13000	13000	16000	14000
Antimony	ug/L	--	0.36	--	1	0.26	--	0.29	0.12	<0.079	<0.13	<0.13	--	--	--	--	--	--	--
Arsenic	ug/L	--	<0.52	--	<0.52	<0.21	--	<0.52	0.11	0.19	<0.26	<0.26	--	--	--	--	--	--	--
Barium	ug/L	--	31.5	--	17.9	14.5	--	16.8	11.8	13	11.2	10.3	--	--	--	--	--	--	--
Beryllium	ug/L	--	<0.4	--	<0.24	<0.16	--	<0.24	<0.4	0.054	<0.035	<0.058	--	--	--	--	--	--	--
Cadmium	ug/L	--	<0.14	--	<0.14	<0.058	--	<0.14	<0.029	<0.053	<0.089	<0.089	--	--	--	--	--	--	--
Chromium	ug/L	--	<1.7	--	<1.7	<0.68	--	1.3	0.51	0.26	<0.27	0.56	--	--	--	--	--	--	--
Cobalt	ug/L	--	5.3	--	6.5	3.5	--	6	2.1	1.4	1.2	0.96	--	--	--	--	--	--	--
Lead	ug/L	--	<0.96	--	<0.96	<0.39	--	<1.9	<0.19	0.22	<0.16	<0.16	--	--	--	--	--	--	--
Lithium	ug/L	--	450	--	332	601	--	544	679	643	640	667	--	--	--	--	--	--	--
Mercury	ug/L	--	<0.039	--	<0.039	<0.039	--	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	--	--	--	--	--
Molybdenum	ug/L	--	2.6	--	2.6	0.57	--	0.58	0.15	2.1	0.6	0.43	--	--	--	--	--	--	--
Selenium	ug/L	--	<0.92	--	<0.92	<0.37	--	<0.92	<0.18	0.33	<0.43	<0.43	--	--	--	--	--	--	--
Thallium	ug/L	--	<2.5	--	<2.5	<1	--	<5	<0.5	<0.11	<0.18	<0.18	--	--	--	--	--	--	--
Total Radium	pCi/L	--	2.12	--	1.25	2.26	--	1.83	1.07	1.1	1.55	1.09	--	--	--	--	--	--	--
Radium-226	pCi/L	--	0.157	--	0.56	0.75	--	0.392	0.32	0.796	0.333	0.559	--	--	--	--	--	--	--
Radium-228	pCi/L	--	1.96	--	0.691	1.51	--	1.44	0.752	0.305	1.22	0.532	--	--	--	--	--	--	--
pH at 25 Degrees C	Std. Units	--	6.5	--	6.7	6.1	--	6.2	6.1	6.4	6.2	6	6.2	6.4	6.4	6.6	6.7	7	6.9
Groundwater Elevation	feet	729.27	--	725.67	--	710.32	724.61	--	742.02	724.04	723.51	722.02	720.52	723.25	723.36	723.43	708.94	724.23	718.39
Field Oxidation Potential	mV	--	34.3	--	-50.7	--	--	--	--	--	--	-7.7	195.4	-61.1	-53.5	--	--	-4.4	-28.2
Field Specific Conductance	umhos/cm	--	3025	--	8161	--	--	--	--	--	--	--	13375	13773	0	--	--	14090	13603
Field Temperature	deg C	--	16.1	--	14.9	--	--	--	--	--	--	16.2	13.1	13.4	11.8	--	--	13	13.6
Oxygen, Dissolved	mg/L	--	1.92	--	2.29	--	--	--	--	--	--	--	0.49	0.36	1.48	--	--	0.61	0.56
Turbidity	NTU	--	212.1	--	-46.36	--	--	--	--	--	--	--	--	--	--	--	--	2.31	--

Single Location

Name: IPL - Ottumwa Midland Landfill

Location ID:		MW-301														
Number of Sampling Dates:		15														
Parameter Name	Units	5/4/2016	6/22/2016	8/9/2016	10/26/2016	1/17/2017	4/20/2017	6/20/2017	8/22/2017	11/7/2017	4/17/2018	10/15/2018	4/16/2019	10/15/2019	5/26/2020	10/6/2020
Boron	ug/L	2280	1860	1770	1410	1310	1040	1040	994	1010	854	784	660	600	660	770
Calcium	mg/L	596	472	479	393	337	224	202	158	161	131	135	110	100	120	180
Chloride	mg/L	42.4	112	46.6	43.4	32.6	58	38.9	40.8	28.9	33.9	26.9	45	46	61	24
Fluoride	mg/L	0.68	0.38	0.55	0.72	0.77	0.72	0.93	0.78	0.77	0.87	0.84	0.85	0.85	0.77	0.67
Field pH	Std. Units	6.44	6.62	7.81	6.33	6.31	6.15	6.73	6.51	6.56	7.09	6.59	7.1	6.67	5.67	7.22
Sulfate	mg/L	5160	5370	4050	2630	1780	1170	1180	902	926	638	837	360	310	390	620
Total Dissolved Solids	mg/L	6260	5380	5810	4030	2830	1990	2060	1870	1760	1400	1550	970	860	1100	1400
Antimony	ug/L	<0.58	<0.12	<0.12	<0.058	0.089	<0.026	0.058	0.04	--	--	--	--	--	--	--
Arsenic	ug/L	<1	0.84	0.29	0.3	0.64	0.56	0.42	0.56	--	--	--	--	--	--	--
Barium	ug/L	28.1	26.6	24.2	32.1	41.5	41	47.1	45.7	--	--	--	--	--	--	--
Beryllium	ug/L	<0.8	<0.24	<0.16	<0.08	<0.08	<0.012	<0.012	<0.012	--	--	--	--	--	--	--
Cadmium	ug/L	<0.29	<0.058	<0.058	<0.029	<0.029	<0.018	<0.018	0.04	--	--	--	--	--	--	--
Chromium	ug/L	<3.4	<0.68	<0.68	0.46	0.5	0.31	0.16	0.2	--	--	--	--	--	--	--
Cobalt	ug/L	<5	<1	<1	<0.5	<0.5	0.21	0.22	0.17	--	--	--	--	--	--	--
Lead	ug/L	<1.9	<0.96	<0.39	<0.19	<0.19	0.046	0.038	0.091	--	--	--	--	--	--	--
Lithium	ug/L	274	268	195	171	156	110	111	114	--	--	--	--	--	--	--
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	--	--	--	--	--
Molybdenum	ug/L	4.6	2	2.1	2.9	2.9	6.3	5.3	6.5	--	--	--	--	--	--	--
Selenium	ug/L	<1.8	<0.37	<0.37	<0.18	<0.18	<0.086	<0.086	0.12	--	--	--	--	--	--	--
Thallium	ug/L	<5	<2.5	<1	<0.5	<0.5	<0.036	0.076	0.068	--	--	--	--	--	--	--
Total Radium	pCi/L	1.99	0.285	1.89	1.68	1.96	1.34	1.56	1.5	--	--	--	--	--	--	--
Radium-226	pCi/L	0.565	0.071	0.606	0.66	0.44	0.855	0.734	0.6	--	--	--	--	--	--	--
Radium-228	pCi/L	1.42	0.214	1.28	1.02	1.52	0.488	0.829	0.896	--	--	--	--	--	--	--
pH at 25 Degrees C	Std. Units	6.2	6.2	6.2	6.2	6.2	6.9	6.4	6.4	6.4	6.8	7.5	6.8	7	7.3	6.9
Groundwater Elevation	feet	686.46	686.4	686.19	683.7	685.57	685.72	685.88	684.96	684.5	684.85	684.58	686.38	686.56	687.29	686.8
Field Oxidation Potential	mV	-58.5	-49.7	-53	-79.4	-57.8	-49.8	-63.1	-20.6	144.3	-102.8	88.2	-50.2	-58.4	-57.8	-105.9
Field Specific Conductance	umhos/cm	7267	5132	5607	4377	3607	2631	2384	3187	2395	1910	2112	1603	1512	1546	1820
Field Temperature	deg C	13.4	14.3	13.9	13.5	13.1	13	13.8	13.9	13.4	13	13.6	13.87	13.68	15.8	14.5
Oxygen, Dissolved	mg/L	0.27	0.14	0.1	0.55	0.19	0.18	0.16	0.11	0.37	0.16	0.2	1.27	0.4	0.41	0.25
Turbidity	NTU	2.86	3.34	1.05	0.92	0.63	1.12	2.69	0.99	1.91	1.13	4.91	8.88	4.75	21.8	21.4

Single Location


Name: IPL - Ottumwa Midland Landfill

Location ID:		MW-302														
Number of Sampling Dates:		15														
Parameter Name	Units	5/4/2016	6/22/2016	8/10/2016	10/26/2016	1/17/2017	4/19/2017	6/20/2017	8/22/2017	11/7/2017	4/17/2018	10/15/2018	4/16/2019	10/15/2019	5/21/2020	10/6/2020
Boron	ug/L	853	796	802	784	824	777	767	783	848	834	752	760	780	780	870
Calcium	mg/L	72.1	56.6	48.8	42.8	42.9	41	46.1	50.2	74	77.3	66.9	44	68	41	65
Chloride	mg/L	9.2	8.1	7.5	6	7.7	8	8	8.5	7.8	8.6	9.2	10	7.3	8.9	7.2
Fluoride	mg/L	1.1	1	0.98	1	0.97	1	1.1	1	1.2	1	1.1	1.5	1.2	1	1.1
Field pH	Std. Units	7.38	7.76	9.55	7.22	7.23	7.6	7.29	7.12	7.41	7.8	7.25	7.49	7.21	7.05	7.14
Sulfate	mg/L	201	133	102	78.9	76.7	76.7	79.3	77.2	77.5	79.3	80.9	83	73	79	73
Total Dissolved Solids	mg/L	784	715	671	644	639	671	656	672	607	690	708	690	680	930	700
Antimony	ug/L	0.12	0.15	0.095	<0.058	0.1	<0.026	0.094	0.056	--	--	--	--	--	--	--
Arsenic	ug/L	0.19	0.39	0.28	0.24	0.31	0.23	0.25	0.38	--	--	--	--	--	--	--
Barium	ug/L	39.3	45.4	50	54	57.2	48.9	49.9	47.5	--	--	--	--	--	--	--
Beryllium	ug/L	0.22	0.16	<0.08	<0.08	<0.08	0.051	0.084	0.15	--	--	--	--	--	--	--
Cadmium	ug/L	<0.029	<0.029	<0.029	<0.029	<0.029	<0.018	0.018	<0.018	--	--	--	--	--	--	--
Chromium	ug/L	5.5	6.2	1.9	1.8	1.4	1.4	2.2	2.9	--	--	--	--	--	--	--
Cobalt	ug/L	1.1	1.1	<0.5	<0.5	<0.5	0.24	0.38	0.66	--	--	--	--	--	--	--
Lead	ug/L	1.1	0.9	0.32	0.26	0.26	0.25	0.36	0.54	--	--	--	--	--	--	--
Lithium	ug/L	81.1	81.2	75.9	79.8	80.8	79.6	78.5	82	--	--	--	--	--	--	--
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	--	--	--	--	--
Molybdenum	ug/L	0.32	0.49	0.31	0.18	0.24	0.2	0.17	0.24	--	--	--	--	--	--	--
Selenium	ug/L	0.19	0.39	<0.18	<0.18	<0.18	<0.086	0.21	0.21	--	--	--	--	--	--	--
Thallium	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.036	0.065	0.089	--	--	--	--	--	--	--
Total Radium	pCi/L	0.874	0.677	1.17	1.17	1.57	1.65	1.54	2.6	--	--	--	--	--	--	--
Radium-226	pCi/L	0.412	-0.066	0.426	0.505	0.525	0.872	0.987	1.74	--	--	--	--	--	--	--
Radium-228	pCi/L	0.462	0.677	0.744	0.663	1.04	0.777	0.549	0.863	--	--	--	--	--	--	--
pH at 25 Degrees C	Std. Units	7.3	7.1	7.3	7.4	7.6	7.5	7.6	7.4	7.2	7.6	7.5	7.4	7.5	7.5	7.6
Groundwater Elevation	feet	685.8	685.79	685.48	684.94	685.68	684.73	684.76	683.89	683.38	683.87	683.52	685.35	685.44	686.25	685.86
Field Oxidation Potential	mV	-153.3	-114.6	-100.7	-126.7	-109.6	-64	-66.8	-96.2	112.3	-138.7	-103.6	8.13	-56.4	-83.4	-169.4
Field Specific Conductance	umhos/cm	1326	1132	1102	1075	1081	1081	1018	1429	1079	1091	1102	1168	1067	1129	1025
Field Temperature	deg C	13.6	14	13.9	13.5	12.9	14	14	13.7	13.1	12.7	13.4	13.63	14.26	13.1	13.5
Oxygen, Dissolved	mg/L	0.08	0.09	0.1	0.66	0.29	0.17	0.22	0.11	0.3	0.3	0.22	1.59	0.75	1.06	0.28
Turbidity	NTU	170.8	167.5	74.76	29.05	43.07	39.01	58.63	77.96	202.4	200.6	131.5	44.2	102.8	12.5	136

Single Location

Name: IPL - Ottumwa Midland Landfill

Location ID:		MW-303																
Number of Sampling Dates:		17																
Parameter Name	Units	5/4/2016	6/22/2016	8/9/2016	10/26/2016	1/17/2017	4/19/2017	7/19/2017	8/22/2017	11/7/2017	4/17/2018	10/16/2018	4/16/2019	6/6/2019	10/15/2019	5/26/2020	6/29/2020	10/6/2020
Boron	ug/L	3510	2430	1640	1100	955	800	755	737	738	738	661	850	--	760	770	--	740
Calcium	mg/L	686	462	250	157	116	97.4	87.7	94	94.9	103	90.5	150	--	120	120	--	100
Chloride	mg/L	13.5	11.5	8.7	7.5	7.1	6.9	7.2	7.3	6.9	7.3	7.4	8.1	8	7.5	8.5	6.9	7.3
Fluoride	mg/L	0.68	0.47	0.9	0.87	0.86	0.86	0.86	0.85	0.77	0.8	0.84	<0.23	--	0.87	0.81	--	0.88
Field pH	Std. Units	6.24	6.93	7.84	6.66	6.69	7.12	7.1	6.71	6.96	7.32	6.87	6.97	6.71	6.76	6.21	6.74	7.01
Sulfate	mg/L	6230	4690	1950	780	497	329	255	287	232	262	310	600	--	390	440	--	230
Total Dissolved Solids	mg/L	9540	7120	2750	1500	1080	931	809	868	783	839	891	1300	--	1100	1100	--	840
Antimony	ug/L	<0.58	<0.058	<0.12	<0.058	0.082	<0.026	0.042	0.041	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	<1	0.3	<0.21	0.13	0.2	0.24	0.59	0.53	--	--	--	--	--	--	--	--	--
Barium	ug/L	55.8	47.6	19.3	13.4	11.7	11.9	12.8	13.1	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	1.2	<0.24	0.16	0.11	0.099	0.13	0.24	0.24	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	<0.29	<0.029	<0.058	0.037	<0.029	<0.018	0.019	0.026	--	--	--	--	--	--	--	--	--
Chromium	ug/L	22.1	3.1	2.7	2.6	1.1	2.6	5.1	4.5	--	--	--	--	--	--	--	--	--
Cobalt	ug/L	12.7	1.6	1.2	1	<0.5	1.1	2.5	2.1	--	--	--	--	--	--	--	--	--
Lead	ug/L	5.7	1.6	0.51	0.57	0.3	0.57	1	1.2	--	--	--	--	--	--	--	--	--
Lithium	ug/L	289	270	126	102	96.5	92.4	90.8	92.8	--	--	--	--	--	--	--	--	--
Mercury	ug/L	<0.039	<0.039	<0.039	<0.039	<0.039	<0.046	<0.046	<0.046	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	3	0.38	0.69	0.43	0.29	0.3	0.26	0.29	--	--	--	--	--	--	--	--	--
Selenium	ug/L	<1.8	0.38	<0.37	<0.18	<0.18	0.26	0.4	0.42	--	--	--	--	--	--	--	--	--
Thallium	ug/L	<5	<2.5	<1	<0.5	<0.5	<0.036	0.049	0.048	--	--	--	--	--	--	--	--	--
Total Radium	pCi/L	10.6	7.5	3.59	2.18	1.47	1.82	1.33	0.803	--	--	--	--	--	--	--	--	--
Radium-226	pCi/L	2.51	2.96	1.26	0.634	0.199	0.481	0.273	0.559	--	--	--	--	--	--	--	--	--
Radium-228	pCi/L	8.08	4.54	2.33	1.55	1.27	1.34	1.06	0.244	--	--	--	--	--	--	--	--	--
pH at 25 Degrees C	Std. Units	6.2	6.2	6.4	6.6	6.9	7	7	6.9	6.8	7.2	7.1	6.8	--	7	7.3	--	7.2
Groundwater Elevation	feet	686.04	687.72	687.77	685.56	685.6	685.51	684.92	684.7	684.26	684.68	684.33	686.13	686.05	686.08	687.14	687.36	686.35
Field Oxidation Potential	mV	-50	-49.5	-76.7	-102.1	-93.5	-56.6	-83.6	-72.6	125.7	-103.8	-117.7	-20	-40	-55.6	-30	-53.3	-137.3
Field Specific Conductance	umhos/cm	8206	6426	3419	2120	1681	1451	1300	1836	1307	1358	0	2209	1331	1628	1963	1739	1262
Field Temperature	deg C	14	14	14	13.7	13	13.7	14.5	14	13.2	13.3	13.5	14.07	16.7	15.44	14.4	16.1	13.9
Oxygen, Dissolved	mg/L	0.16	0.11	0.08	0.46	0.16	0.17	0.5	0.31	0.45	0.38	0.41	1.41	0.42	0.43	2.31	0.49	0.3
Turbidity	NTU	677.5	160.2	169.9	84.13	113.7	120.3	179.4	161.5	258.2	248	61.64	99.2	169.9	27.9	57.1	59	240



Appendix E
Statistical Evaluation

January 12, 2021
File No. 25220073.00

TECHNICAL MEMORANDUM

SUBJECT: Statistical Evaluation of Groundwater Monitoring Results – UPL Update
Ottumwa Midland Landfill, CCR Units, October 2020

PREPARED BY: Nicole Kron

CHECKED BY: Sherren Clark

STATISTICAL METHOD

Groundwater monitoring data for the Ottumwa Midland Landfill (OML) CCR units is evaluated in accordance with 40 CFR 257.93(f)(3), using a prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper prediction limit.

Statistical evaluation is performed using commercially available software (*Sanitas for Groundwater*® or similar) in general accordance with the USEPA's *Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* dated March 2009 (Unified Guidance) (USEPA, 2009) and generally accepted procedures.

The OML monitoring data includes two background monitoring wells, MW-102M and MW-122M, and three compliance monitoring wells, MW-301, MW-302, and MW-303. The statistical analysis includes intrawell evaluation for chloride and Interwell evaluation for the remaining Appendix III parameters.

The initial Interwell UPLs were calculated based on nine rounds of background monitoring performed up to the initiation of compliance monitoring for the existing CCR units at OML, from May 2016 through November 2017. In the November 2017 and April 2018 detection monitoring events, interwell SSIs for chloride were identified for compliance well MW-301. These SSIs were attributed to natural variation in ASDs completed for these two events. Following the completion of the April 2018 ASD, dated October 31, 2018, the statistical method for evaluating chloride data at the three compliance monitoring wells was modified to an intrawell approach. This approach is appropriate for constituents which exhibit natural spatial variability, as has been documented for chloride at the OML facility.

As part of the evaluation of the October 2020 monitoring results, the background data set for the UPL calculations is being updated. The updated interwell background dataset will include data from the background wells collected through October 2020. The updated intrawell background dataset for chloride will include data collected through April 2020. This memo addresses updated UPLs for Appendix III parameters.



TIME SERIES PLOTS

Time series plots are prepared for the required monitoring parameters to show the concentration variations over time. Time series graphs are included in **Attachment 1**.

OUTLIER ANALYSIS - INTERWELL

An outlier analysis is performed for background monitoring results. A statistical outlier is a value that is extremely different from the other values in the data set. The Sanitas outlier tests identify data points that do not fit the distribution of the rest of the data set and determine if they differ significantly from the rest of the data. The outlier analysis performed in Sanitas includes the following steps:

- 1) Run normality test (Shapiro Wilk/Francia).
- 2) If normally distributed, run USEPA's 1989 Outlier Test to identify suspected outliers.
 - a) If number of background samples is less than or equal to 25, run Dixon's test for suspected outliers.
 - b) If number of background samples is more than 25, run Rosner's test for suspected outliers.
- 3) If not normally distributed, run Tukey's test for outliers.
- 4) Review data flagged as possible outliers to evaluate whether they should be removed from the background data set. Also review time series plots for possible outliers that were not picked up in the statistical evaluation (e.g., outlier test may not identify outliers when two values are similar to each other, but very different from all other data).

Results identified as statistical outliers are checked for possible lab instrument failure, field collection problems, or data entry errors; however, outliers may exist naturally in the data if there is an extremely wide inherent or temporal variability in the data. The Unified Guidance states that unless a likely error can be identified, the outlier should not be removed.

For the October 2020 sampling event, the following background values from background wells MW-102M and MW-122M were identified as potential outliers for the interwell analysis and handled as described:

- **Boron (MW-122M).** One low result from the June 2016 event was flagged as a statistical outlier. This result was not removed from the dataset because there was no known explanation for the lower result and it appeared to be within the range of potential natural variation relative to the other observed boron concentrations.
- **Calcium (MW-122M).** Two results from the May and June 2016 events were flagged as statistical outliers. The May 2016 result was removed because it was the first sampling event, was higher than all subsequent results, and may represent conditions before the water quality at the well stabilized after installation. The June 2016 result was not removed from the dataset because there was no known explanation for the low result and the result appeared to be within the range of potential natural variation relative to the other observed calcium concentrations.

- **Sulfate (MW-122M).** Two results from the June 2017 and October 2018 events were flagged as statistical outliers. The high result (June 2017) was not removed from the dataset because there was no known explanation for the high result, the April 2017 result was also higher than typical values, and the high result appeared to be within the range of potential natural variation relative to the other observed sulfate concentrations. The low result was removed as an outlier because it was below detection, which appears very unlikely to be a valid result based on other detections, and may represent a sampling or laboratory error.
- **Total Dissolved Solids (MW-102M).** One high result from the May 2020 event was flagged as a statistical outlier. This result was not removed from the dataset because there was no known explanation for the higher results and it appeared to be within the range of potential natural variation relative to the other observed Total Dissolved Solids (TDS) concentrations.
- **Total Dissolved Solids (MW-122M).** Two results from the June 2016 and April 2017 events were flagged as statistical outliers. The results were not removed from the dataset because there was no known explanation for low and high results. Also, the high result appeared to be within the range of potential natural variation relative to the other observed TDS concentrations.

The outlier analysis is included in **Attachment 2**.

OUTLIERS ANALYSIS - INTRAWELL

An outlier analysis is performed for background monitoring results at the compliance wells when intrawell prediction limits are calculated for constituents. A statistical outlier is a value that is extremely different from the other values in the data set. The outlier analysis performed in Sanitas using the same steps noted above.

For the October 2020 sampling event, the following background values were identified as potential chloride outliers in the compliance monitoring wells (MW-301, MW-302, and MW-303) and handled as described:

- **MW-301.** One high result from the June 2016 event was flagged as a statistical outlier. This result was removed from the dataset because this results appeared to be outside the range of likely natural variation relative to the observed chloride concentrations at MW-301.
- **MW-303.** One high result from the May 2016 event was initially flagged by Sanitas as a statistical outlier. This result was removed from the dataset because it was the first sample from the newly installed well and exceeded subsequent observed chloride concentrations at MW-303. The second sample from this well (June 2016) was not initially flagged as an outlier, but was flagged as an outlier when the analysis was rerun after removing the May 2016 result. This result was also removed from the dataset for the prediction limit analysis.

Outlier analysis of chloride results from the compliance wells is included in **Attachment 2**.

BACKGROUND UPDATE

The background data pool was updated in accordance with the Unified Guidance, which recommends updating background every 2 to 3 years for semiannual sampling. Prior to expanding the interwell data pool, the original interwell background data set (5/2016 through 11/2017) and the data to be added (4/2018 through 10/2020) were compared. For the intrawell analysis of chloride, the previous intrawell background data set (5/2016 through 4/2018) and the data to be added (10/2018 through 4/2020) were compared. The Unified Guidance states that recently collected measurements from the background wells can be added to the existing pool if a Student's t-test or Wilcoxon rank-sum test finds no significant difference between the two groups at the 1% level of significance.

The Sanitas background group comparison for the OML background data sets, included in **Attachment 3**, indicated no significant difference at the 1% level; therefore, the more recent data can be added to the background pool. The comparison uses Welch's t-test for normally distributed data and the Mann-Whitney test for non-normal data. (Note: The Sanitas output labels the earlier background dataset as "Background" and the later background dataset as "Compliance," but all data shown is proposed background data.)

INTERWELL PREDICTION LIMITS

Interwell prediction limits were calculated for Appendix III parameters except for chloride. Interwell prediction limits are calculated using background data from the upgradient monitoring wells (MW-122M and MW-102M) for each monitored constituent, with outliers removed as noted above. The prediction limit analysis performed in Sanitas includes the following steps:

- 1) If 100% of the background values are non-detect, the Double Quantification rule applies and no prediction limit is calculated.
- 2) If 50% or more of results are non-detect, then a non-parametric prediction limit is calculated.
- 3) If fewer than 50% of the results are non-detect, run normality test (Shapiro Wilk/Francia) to assess whether the data fit a normal distribution or can be transformed to fit a normal distribution (e.g., lognormal).
- 4) If normal or transformed normal, calculate parametric prediction limit.
- 5) If not normal or transformed normal, calculate non-parametric prediction limit.

Consistent with the Unified Guidance, parametric prediction limits are calculated based on a 1-of-2 retesting protocol and a 10 percent site-wide false positive rate. Sanitas establishes the per-test significance level based on user inputs of the number of events per year, number of constituents being evaluated, and number of compliance wells. For the October 2020 event, the following values were used:

Parameter	Value	Comments
Evaluations per year	2	Spring and Fall events
Constituents analyzed	7	Total of 7 constituents analyzed
Compliance wells	3	MW-301, MW-302, MW-303

Non-parametric prediction limits are also based on a 1-of-2 retesting protocol. The non-parametric limit is the highest value in the background dataset, which provides an alpha value (false positive rate) similar to that used for the parametric analysis.

For evaluation of parameters with less than 100 percent non-detects in the background sampling, the non-detects were adjusted using the Kaplan-Meier technique, unless the non-detects represent less than 15 percent of the total samples, in which case one-half of the detection limit was used.

Interwell prediction limit analysis results are included in **Attachment 4**.

INTRAWELL PREDICTION LIMITS

Interwell prediction limits were calculated for chloride. Intrawell prediction limits are calculated using background data from the compliance monitoring wells (MW-301, MW-302, and MW303) for each monitored constituent, with outliers removed as noted above. For this evaluation of October 2020 results, background results from May 2016 through April 2020 were included to calculate the intrawell prediction limits. The intrawell prediction limit analysis performed in Sanitas includes the same steps noted above.

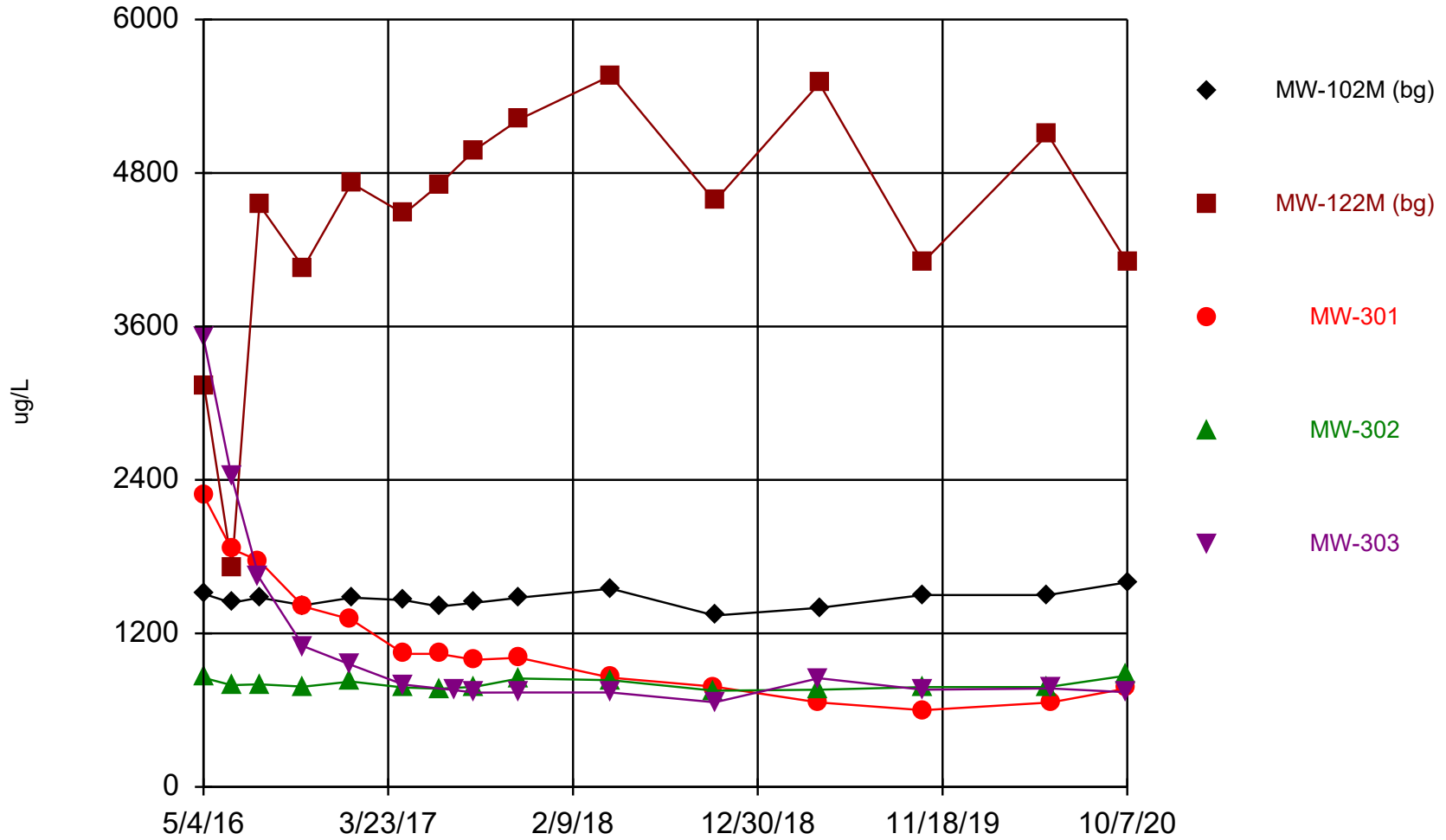
Intrawell prediction limit analysis results are included in **Attachment 4**.

NDK/SCC

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Attachment 1
Times Series Graphs

Boron



Time Series Analysis Run 12/4/2020 6:43 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

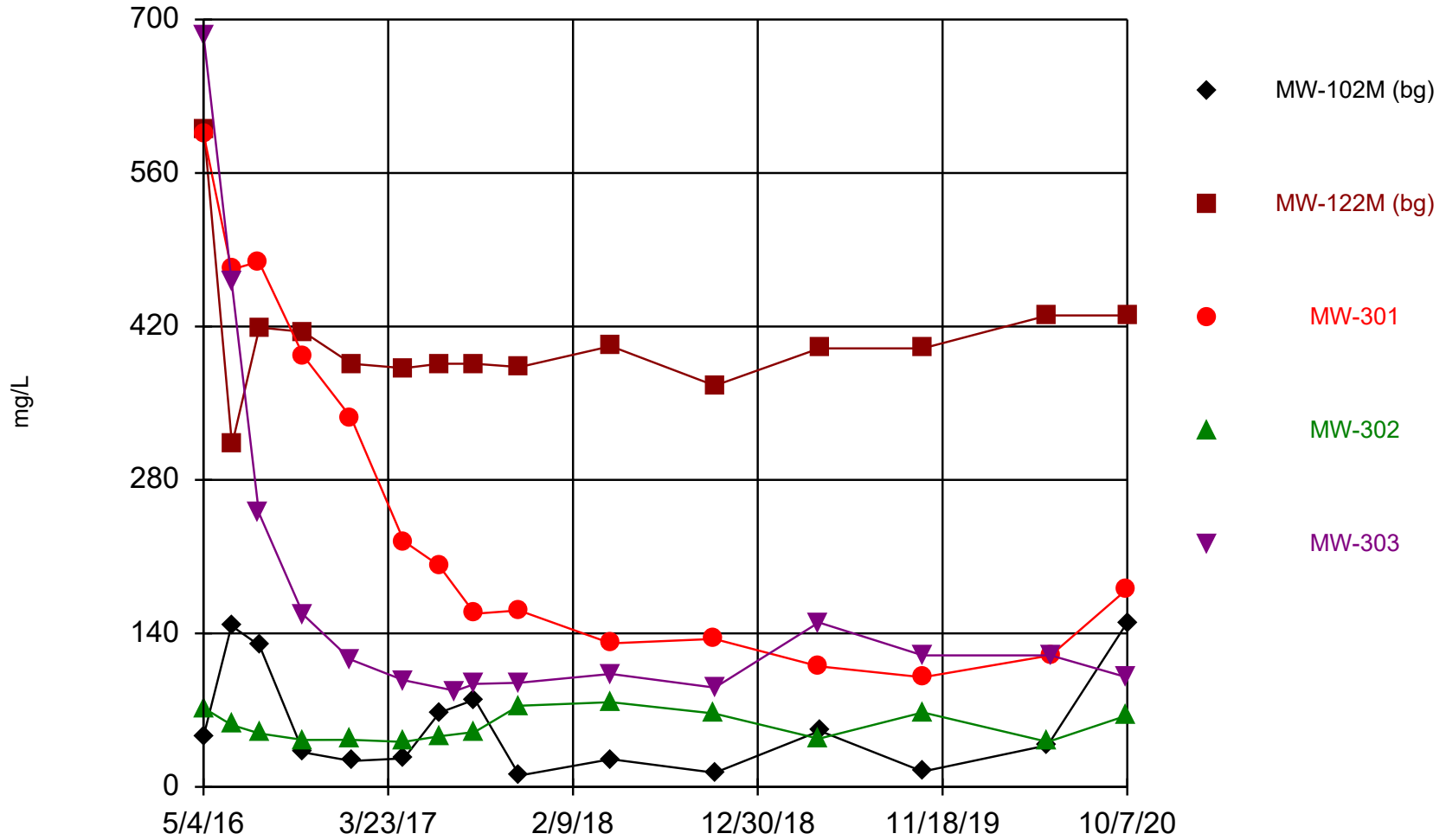
Time Series

Constituent: Boron (ug/L) Analysis Run 12/4/2020 6:45 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	1510		2280	853	3510
5/5/2016		3140			
6/22/2016	1440		1860	796	2430
6/23/2016		1720			
8/9/2016			1770		1640
8/10/2016	1480	4550		802	
10/26/2016	1420	4060	1410	784	1100
1/17/2017			1310	824	955
1/18/2017	1480	4720			
4/19/2017				777	800
4/20/2017	1460	4480	1040		
6/20/2017			1040	767	
6/21/2017	1410	4710			
7/19/2017					755
8/22/2017	1440	4980	994	783	737
11/7/2017			1010	848	738
11/8/2017	1480	5220			
4/17/2018	1550	5560	854	834	738
10/15/2018			784	752	
10/16/2018	1340	4580			661
4/16/2019			660	760	850
4/17/2019		5500			
4/18/2019	1400				
10/15/2019	1500	4100	600	780	760
5/21/2020	1500	5100		780	
5/26/2020			660		770
10/6/2020			770	870	740
10/7/2020	1600	4100			

Calcium



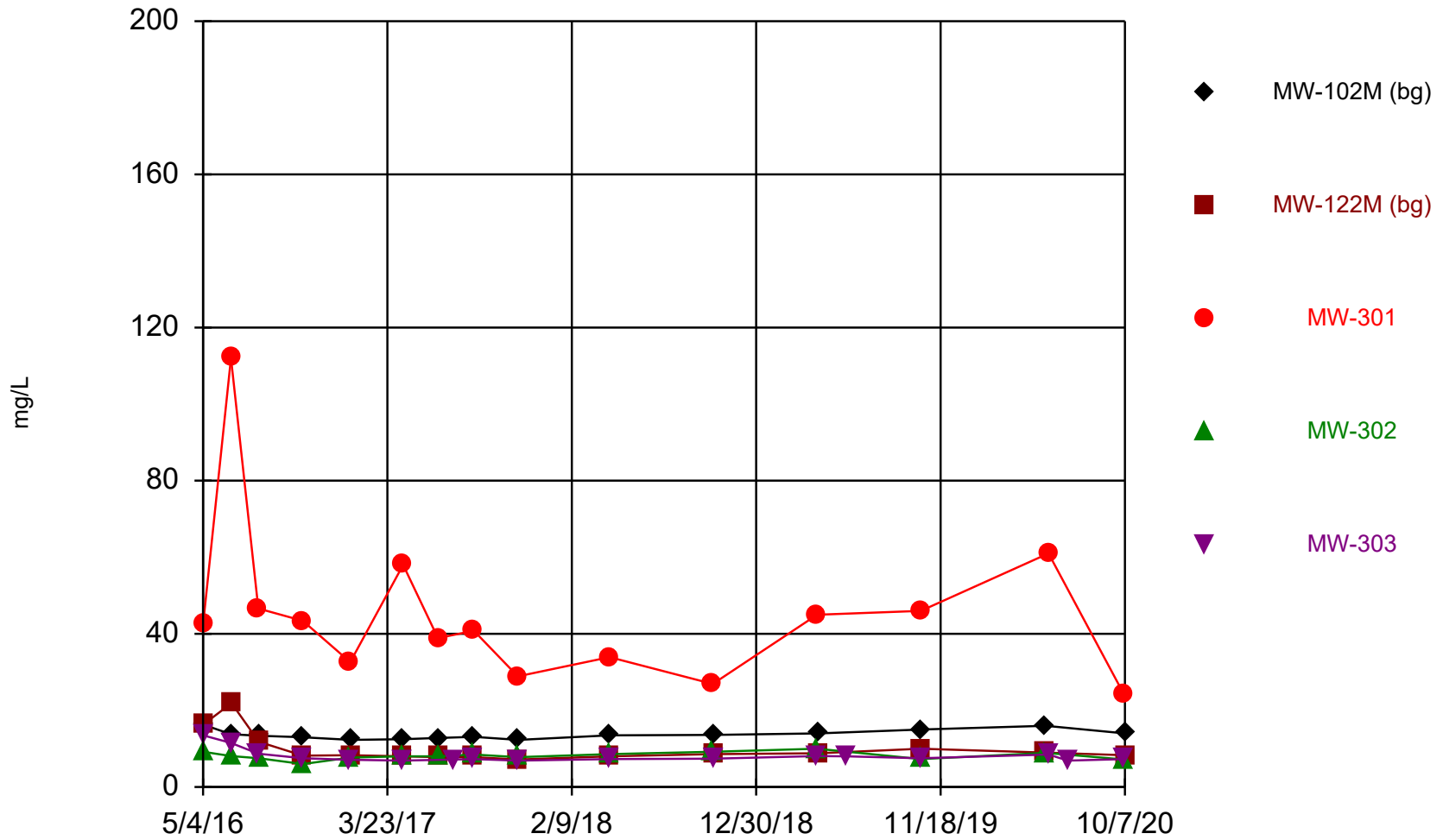
Time Series

Constituent: Calcium (mg/L) Analysis Run 12/4/2020 6:45 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	45.9		596	72.1	686
5/5/2016		599			
6/22/2016	147		472	56.6	462
6/23/2016		312			
8/9/2016			479		250
8/10/2016	129	419		48.8	
10/26/2016	31.5	415	393	42.8	157
1/17/2017			337	42.9	116
1/18/2017	23.6	386			
4/19/2017				41	97.4
4/20/2017	26	382	224		
6/20/2017			202	46.1	
6/21/2017	67.7	386			
7/19/2017					87.7
8/22/2017	79.7	386	158	50.2	94
11/7/2017			161	74	94.9
11/8/2017	10.4	383			
4/17/2018	25.3	402	131	77.3	103
10/15/2018			135	66.9	
10/16/2018	12.9	366			90.5
4/16/2019			110	44	150
4/17/2019		400			
4/18/2019	51				
10/15/2019	14	400	100	68	120
5/21/2020	38	430		41	
5/26/2020			120		120
10/6/2020			180	65	100
10/7/2020	150	430			

Chloride



Time Series Analysis Run 12/4/2020 6:44 PM

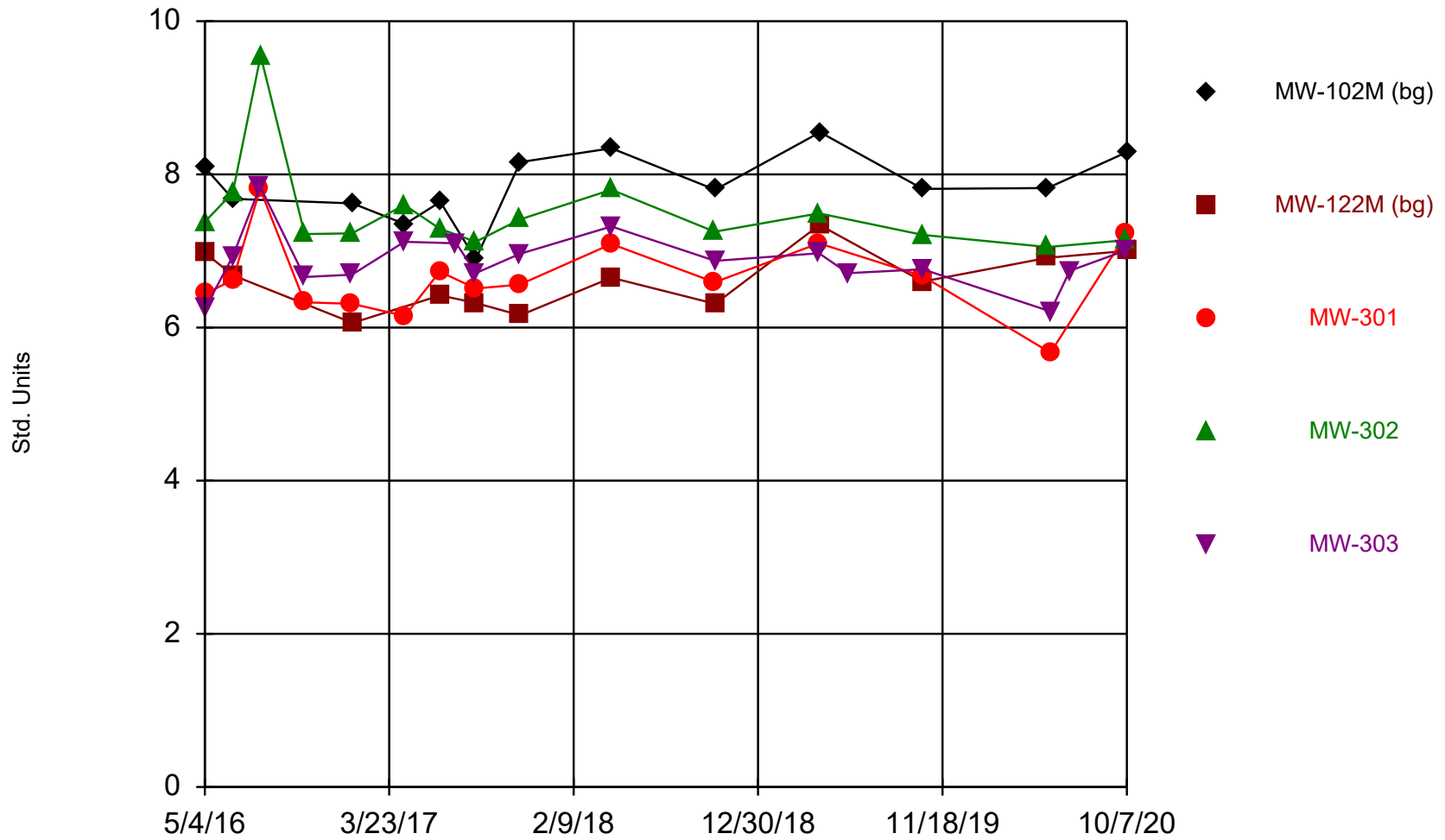
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Time Series

Constituent: Chloride (mg/L) Analysis Run 12/4/2020 6:45 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	16.3		42.4	9.2	13.5
5/5/2016		16.4			
6/22/2016	13.8		112	8.1	11.5
6/23/2016		21.9			
8/9/2016			46.6		8.7
8/10/2016	13.4	11.8		7.5	
10/26/2016	13	8.2	43.4	6	7.5
1/17/2017			32.6	7.7	7.1
1/18/2017	12.3	8.3			
4/19/2017				8	6.9
4/20/2017	12.5	8	58		
6/20/2017			38.9	8	
6/21/2017	12.8	7.8			
7/19/2017					7.2
8/22/2017	13.1	7.8	40.8	8.5	7.3
11/7/2017			28.9	7.8	6.9
11/8/2017	12.3	7.2			
4/17/2018	13.5	8	33.9	8.6	7.3
10/15/2018			26.9	9.2	
10/16/2018	13.6	8.6			7.4
4/16/2019			45	10	8.1
4/17/2019		8.8			
4/18/2019	14				
6/6/2019					8
10/15/2019	15	10	46	7.3	7.5
5/21/2020	16	9		8.9	
5/26/2020			61		8.5
6/29/2020					6.9
10/6/2020			24	7.2	7.3
10/7/2020	14	8.3			

Field pH



Time Series Analysis Run 12/4/2020 6:44 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

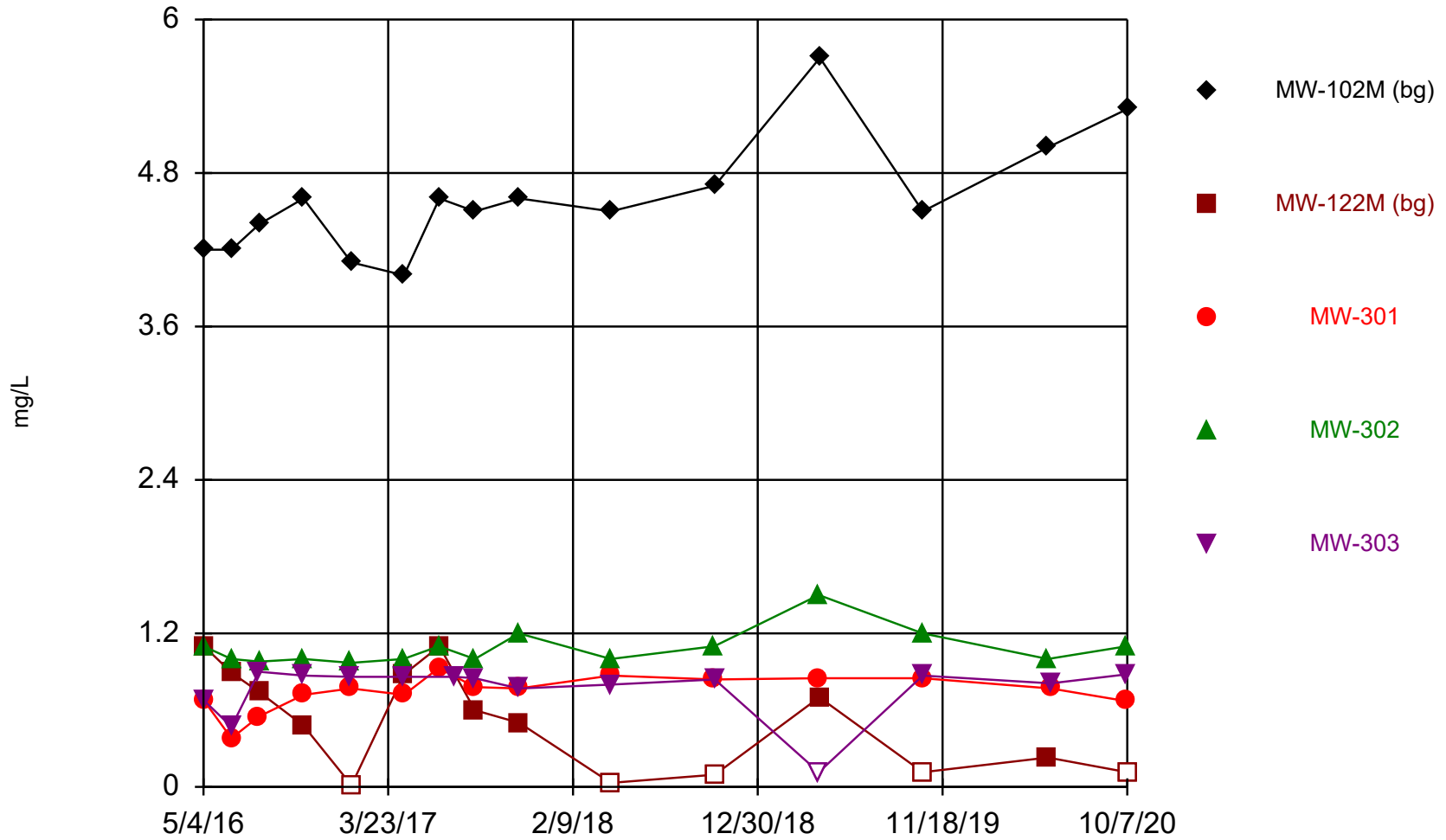
Time Series

Constituent: Field pH (Std. Units) Analysis Run 12/4/2020 6:45 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	8.09		6.44	7.38	6.24
5/5/2016		6.97			
6/22/2016	7.68		6.62	7.76	6.93
6/23/2016		6.68			
8/9/2016			7.81		7.84
8/10/2016				9.55	
10/26/2016			6.33	7.22	6.66
1/17/2017			6.31	7.23	6.69
1/18/2017	7.62	6.06			
4/19/2017				7.6	7.12
4/20/2017	7.35		6.15		
6/20/2017			6.73	7.29	
6/21/2017	7.64	6.42			
7/19/2017					7.1
8/22/2017	6.89	6.32	6.51	7.12	6.71
11/7/2017			6.56	7.41	6.96
11/8/2017	8.16	6.16			
4/17/2018	8.34	6.65	7.09	7.8	7.32
10/15/2018			6.59	7.25	
10/16/2018	7.8	6.31			6.87
4/16/2019			7.1	7.49	6.97
4/17/2019		7.34			
4/18/2019	8.55				
6/6/2019					6.71
10/15/2019	7.81	6.6	6.67	7.21	6.76
5/21/2020	7.82	6.91		7.05	
5/26/2020			5.67		6.21
6/29/2020					6.74
10/6/2020			7.22	7.14	7.01
10/7/2020	8.29	7			

Fluoride



Time Series Analysis Run 12/4/2020 6:44 PM

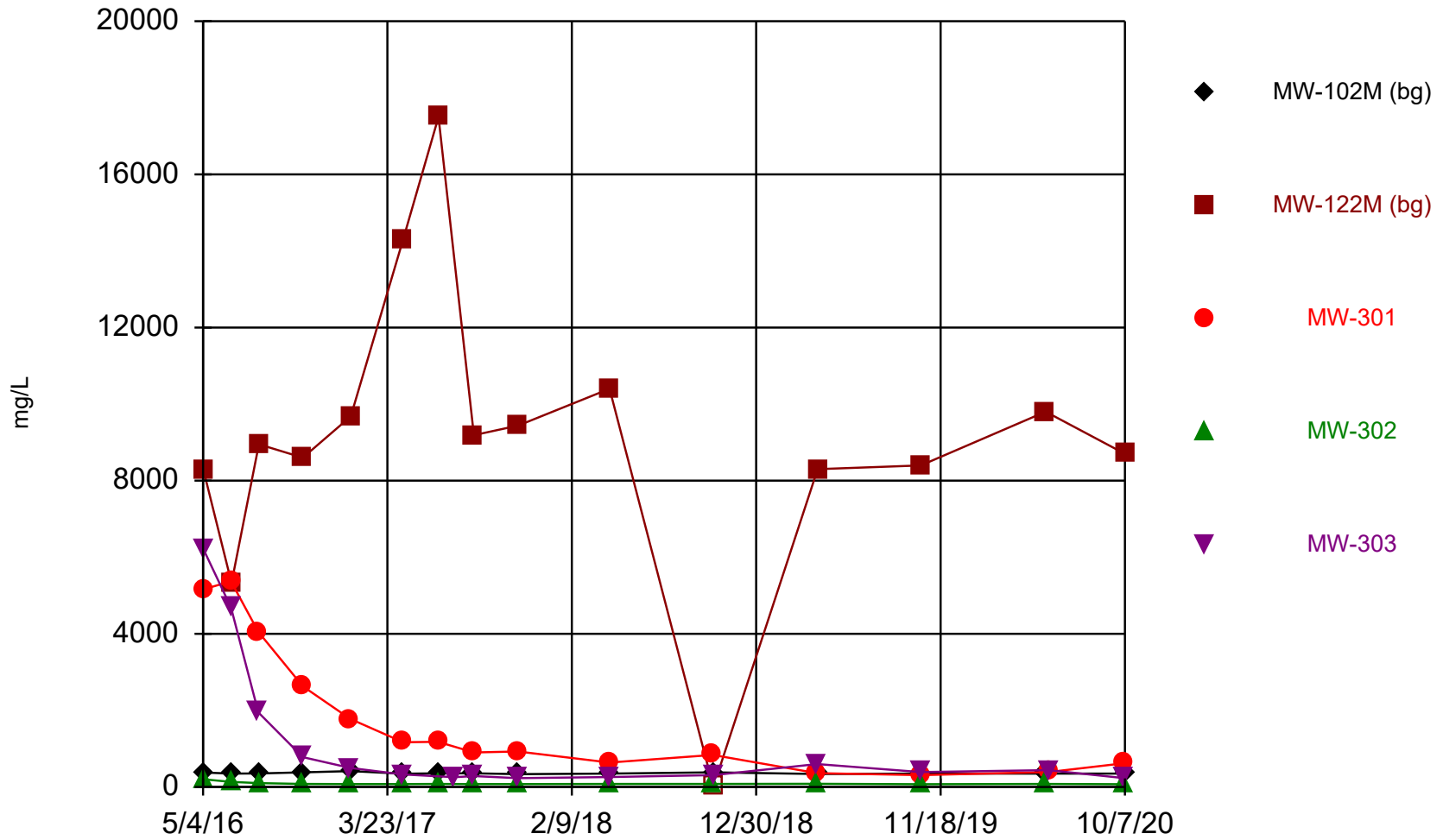
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Time Series

Constituent: Fluoride (mg/L) Analysis Run 12/4/2020 6:45 PM
 Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	4.2		0.68	1.1	0.68
5/5/2016		1.1			
6/22/2016	4.2		0.38	1	0.47
6/23/2016		0.89			
8/9/2016			0.55		0.9
8/10/2016	4.4	0.74		0.98	
10/26/2016	4.6	0.48	0.72	1	0.87
1/17/2017			0.77	0.97	0.86
1/18/2017	4.1	<0.027 (U)			
4/19/2017				1	0.86
4/20/2017	4	0.88	0.72		
6/20/2017			0.93	1.1	
6/21/2017	4.6	1.1			
7/19/2017					0.86
8/22/2017	4.5	0.6	0.78	1	0.85
11/7/2017			0.77	1.2	0.77
11/8/2017	4.6	0.5			
4/17/2018	4.5	<0.063 (U)	0.87	1	0.8
10/15/2018			0.84	1.1	
10/16/2018	4.7	<0.19 (U)			0.84
4/16/2019			0.85	1.5	<0.23 (U)
4/17/2019		0.7			
4/18/2019	5.7				
10/15/2019	4.5	<0.23 (U)	0.85	1.2	0.87
5/21/2020	5	0.23 (J)		1	
5/26/2020			0.77		0.81
10/6/2020			0.67	1.1	0.88
10/7/2020	5.3	<0.23 (U)			

Sulfate



Time Series Analysis Run 12/4/2020 6:44 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

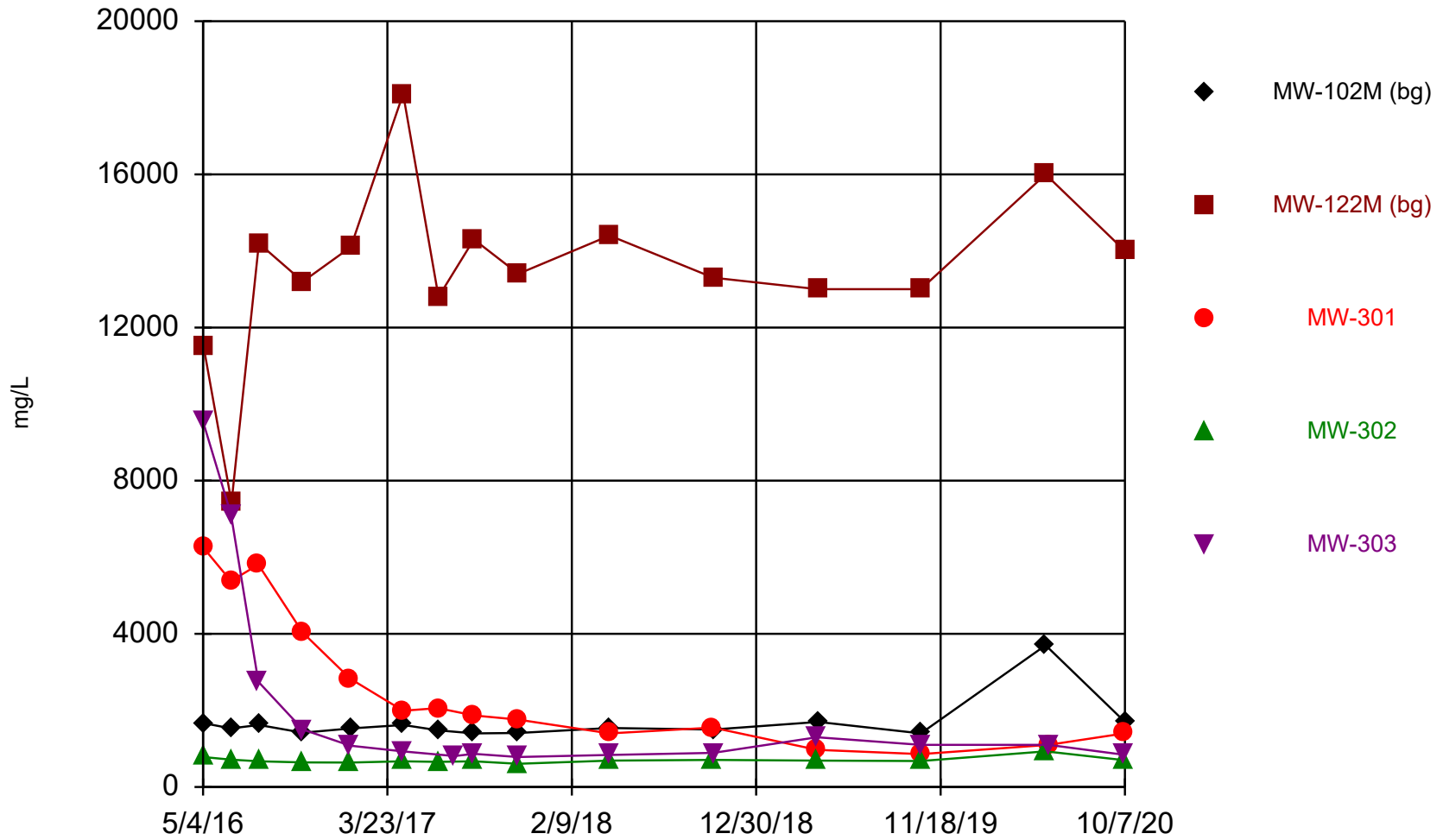
Time Series

Constituent: Sulfate (mg/L) Analysis Run 12/4/2020 6:45 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	378		5160	201	6230
5/5/2016		8260			
6/22/2016	350		5370	133	4690
6/23/2016		5330			
8/9/2016			4050		1950
8/10/2016	354	8950		102	
10/26/2016	384	8600	2630	78.9	780
1/17/2017			1780	76.7	497
1/18/2017	415	9680			
4/19/2017				76.7	329
4/20/2017	348	14300	1170		
6/20/2017			1180	79.3	
6/21/2017	356	17500			
7/19/2017					255 (255)
8/22/2017	358	9190	902	77.2	287
11/7/2017			926	77.5	232
11/8/2017	335	9440			
4/17/2018	352	10400	638	79.3	262
10/15/2018			837	80.9	
10/16/2018	384	<0.24 (U)			310
4/16/2019			360	83	600
4/17/2019		8300			
4/18/2019	340				
10/15/2019	350	8400	310	73	390
5/21/2020	350	9800		79	
5/26/2020			390		440
10/6/2020			620	73	230
10/7/2020	350	8700			

Total Dissolved Solids



Time Series Analysis Run 12/4/2020 6:44 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Time Series

Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/4/2020 6:45 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	1670		6260	784	9540
5/5/2016		11500			
6/22/2016	1530		5380	715	7120
6/23/2016		7430			
8/9/2016			5810		2750
8/10/2016	1620	14200		671	
10/26/2016	1420	13200	4030	644	1500
1/17/2017			2830	639	1080
1/18/2017	1530	14100			
4/19/2017				671	931
4/20/2017	1620	18100	1990		
6/20/2017			2060	656	
6/21/2017	1480	12800			
7/19/2017					809
8/22/2017	1400	14300	1870	672	868
11/7/2017			1760	607	783
11/8/2017	1410	13400			
4/17/2018	1540	14400	1400	690	839
10/15/2018			1550	708	
10/16/2018	1500	13300			891
4/16/2019			970	690	1300
4/17/2019		13000			
4/18/2019	1700				
10/15/2019	1400	13000	860	680	1100
5/21/2020	3700	16000		930	
5/26/2020			1100		1100
10/6/2020			1400	700	840
10/7/2020	1700	14000			

Attachment 2

Outlier Analysis

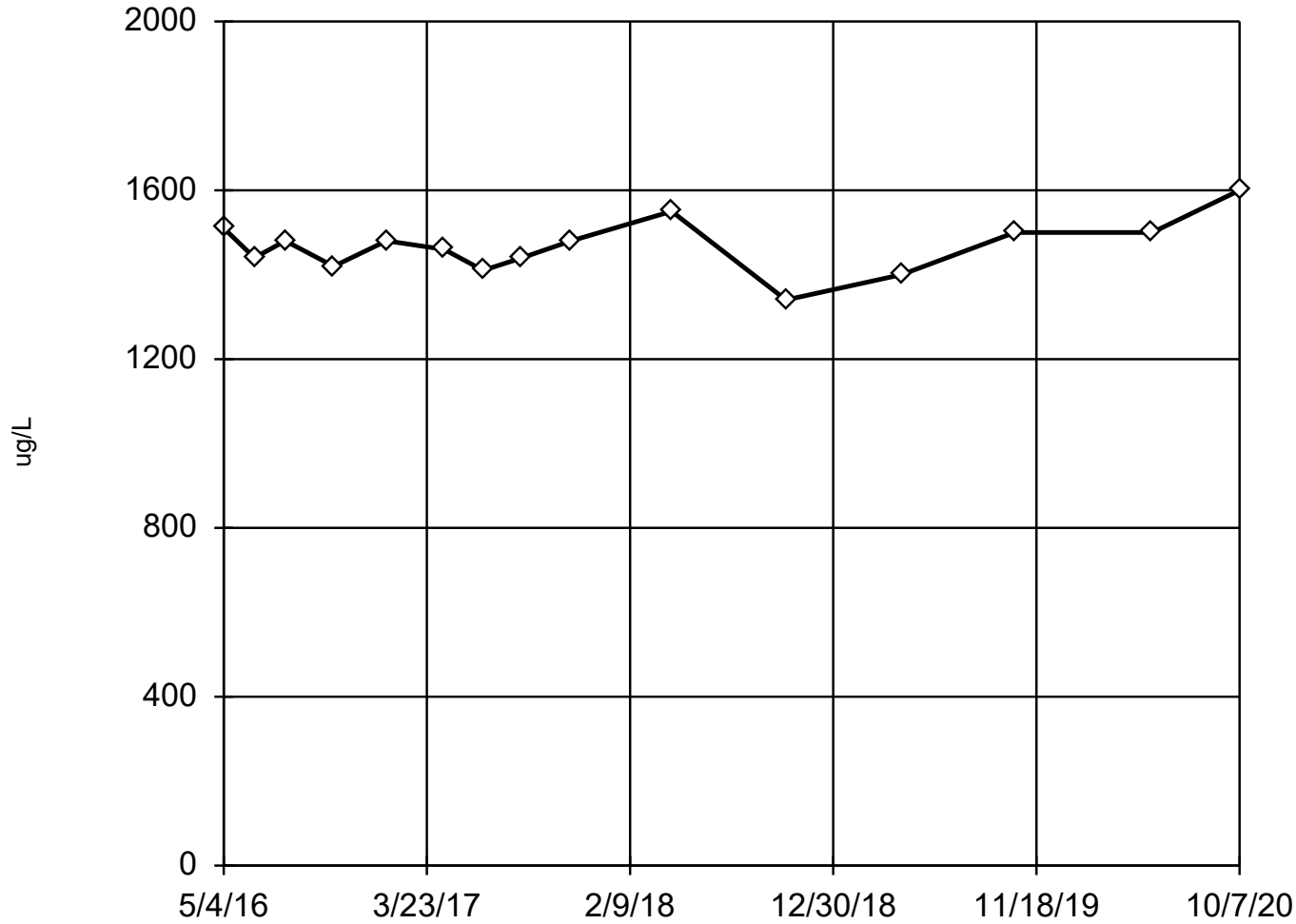
Outlier Analysis

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 12/31/2020, 12:27 AM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Date(s)</u>	<u>Method</u>	<u>Alpha</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Boron (ug/L)	MW-102M (bg)	No	n/a	n/a	EPA 1989	0.05	15	1467	63.64	normal	ShapiroWilk
Boron (ug/L)	MW-122M (bg)	Yes	1720	6/23/2016	Dixon`s	0.05	15	4435	976.9	normal	ShapiroWilk
Calcium (mg/L)	MW-102M (bg)	No	n/a	n/a	EPA 1989	0.05	15	56.8	48.39	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-122M (bg)	Yes	599,312	5/5/2016,...	Dixon`s	0.05	15	406.4	60.64	normal	ShapiroWilk
Field pH (Std. Units)	MW-102M (bg)	No	n/a	n/a	EPA 1989	0.05	13	7.849	0.4453	normal	ShapiroWilk
Field pH (Std. Units)	MW-122M (bg)	No	n/a	n/a	EPA 1989	0.05	12	6.618	0.3844	normal	ShapiroWilk
Fluoride (mg/L)	MW-102M (bg)	No	n/a	n/a	EPA 1989	0.05	15	4.593	0.4527	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-122M (bg)	No	n/a	n/a	Dixon`s	0.05	15	0.5307	0.3625	normal	ShapiroWilk
Sulfate (mg/L)	MW-102M (bg)	No	n/a	n/a	NP (nrm)	NaN	15	360.3	21.03	unknown	ShapiroWilk
Sulfate (mg/L)	MW-122M (bg)	Yes	17500,0.12	6/21/2017...	NP (nrm)	NaN	15	9123	3775	unknown	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-102M (bg)	Yes	3700	5/21/2020	Dixon`s	0.05	15	1681	568.4	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-122M (bg)	Yes	18100,7430	4/20/2017...	Dixon`s	0.05	15	13515	2267	normal	ShapiroWilk

EPA Screening (suspected outliers for Dixon's Test)

MW-102M (bg)



n = 15
Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 1467, std. dev. 63.64, critical Tn 2.409
Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9821
Critical = 0.901
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 12/31/2020 12:26 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

EPA 1989 Outlier Screening

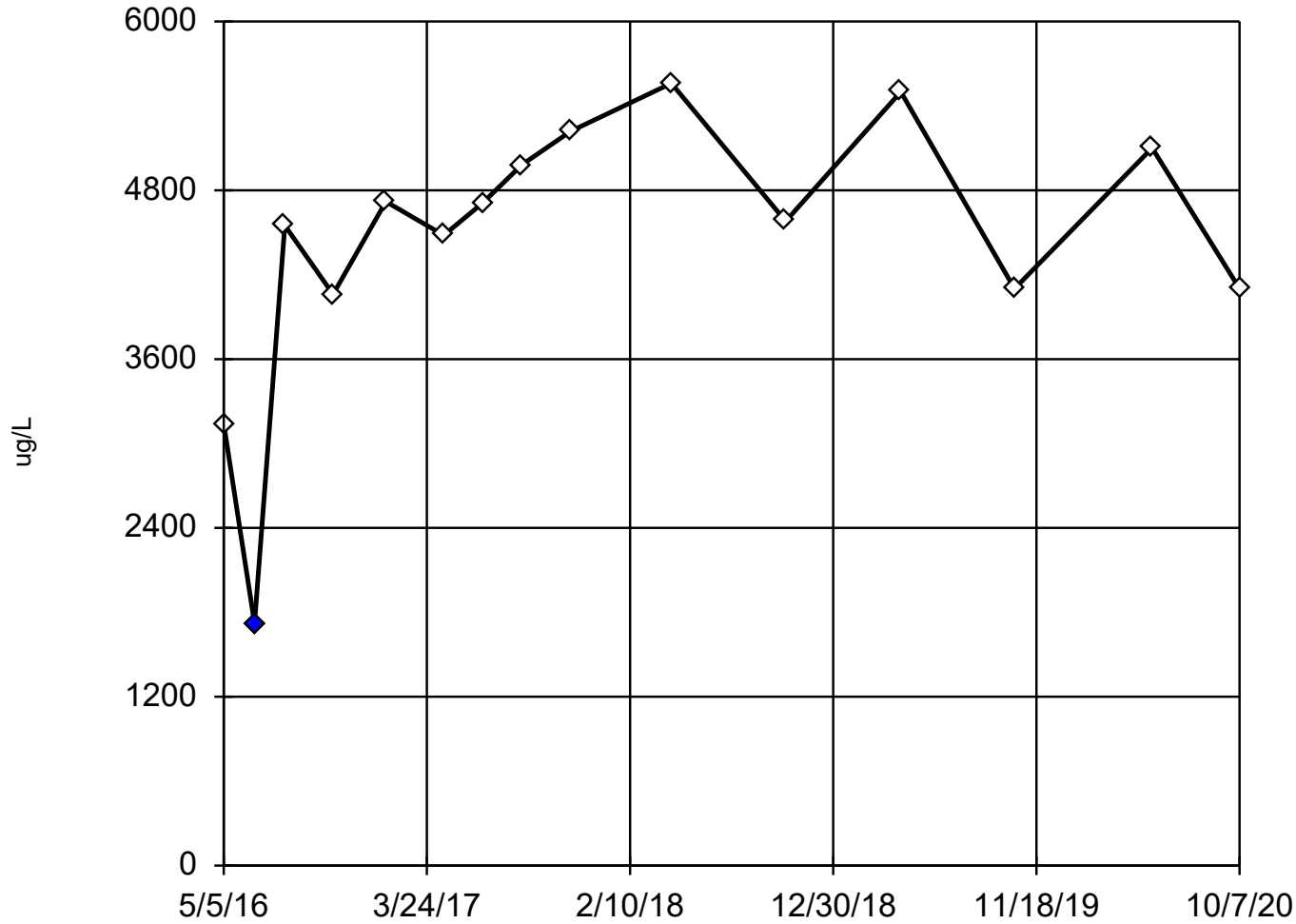
Constituent: Boron (ug/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)
5/4/2016	1510
6/22/2016	1440
8/10/2016	1480
10/26/2016	1420
1/18/2017	1480
4/20/2017	1460
6/21/2017	1410
8/22/2017	1440
11/8/2017	1480
4/17/2018	1550
10/16/2018	1340
4/18/2019	1400
10/15/2019	1500
5/21/2020	1500
10/7/2020	1600

Dixon's Outlier Test

MW-122M (bg)



n = 15

Statistical outlier is drawn as solid.
Testing for 2 low outliers.
Mean = 4435.
Std. Dev. = 976.9.
3140: c = 0.4615
tab1 = 0.525.
Alpha = 0.05.
1720: c = 0.6686
tab1 = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9525
Critical = 0.895
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Boron Analysis Run 12/31/2020 12:26 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Dixon's Outlier Test

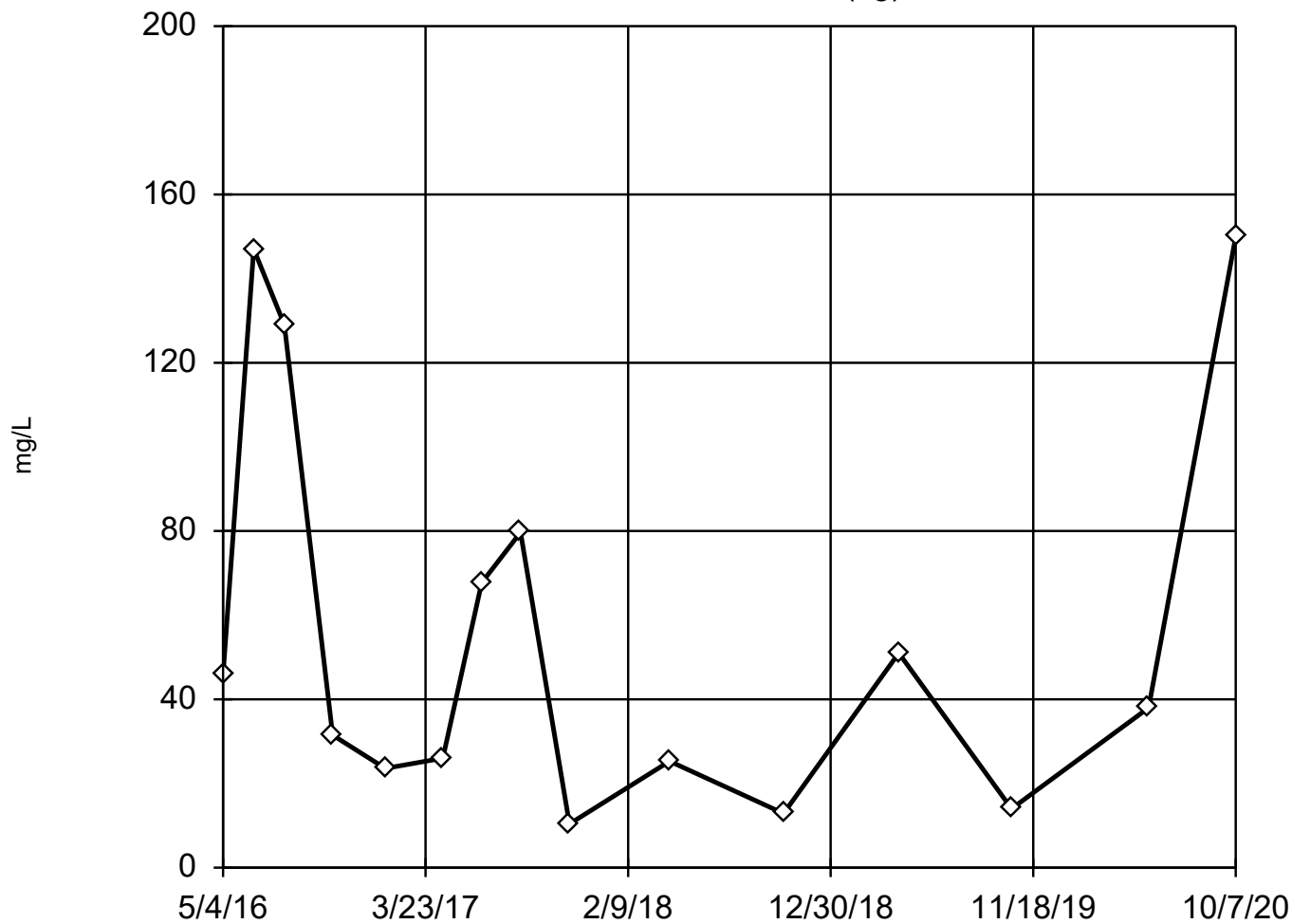
Constituent: Boron (ug/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M (bg)
5/5/2016	3140
6/23/2016	1720 (O)
8/10/2016	4550
10/26/2016	4060
1/18/2017	4720
4/20/2017	4480
6/21/2017	4710
8/22/2017	4980
11/8/2017	5220
4/17/2018	5560
10/16/2018	4580
4/17/2019	5500
10/15/2019	4100
5/21/2020	5100
10/7/2020	4100

EPA Screening (suspected outliers for Dixon's Test)

MW-102M (bg)



n = 15
Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 56.8, std. dev. 48.39, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9507
Critical = 0.901 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Calcium Analysis Run 12/31/2020 12:26 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

EPA 1989 Outlier Screening

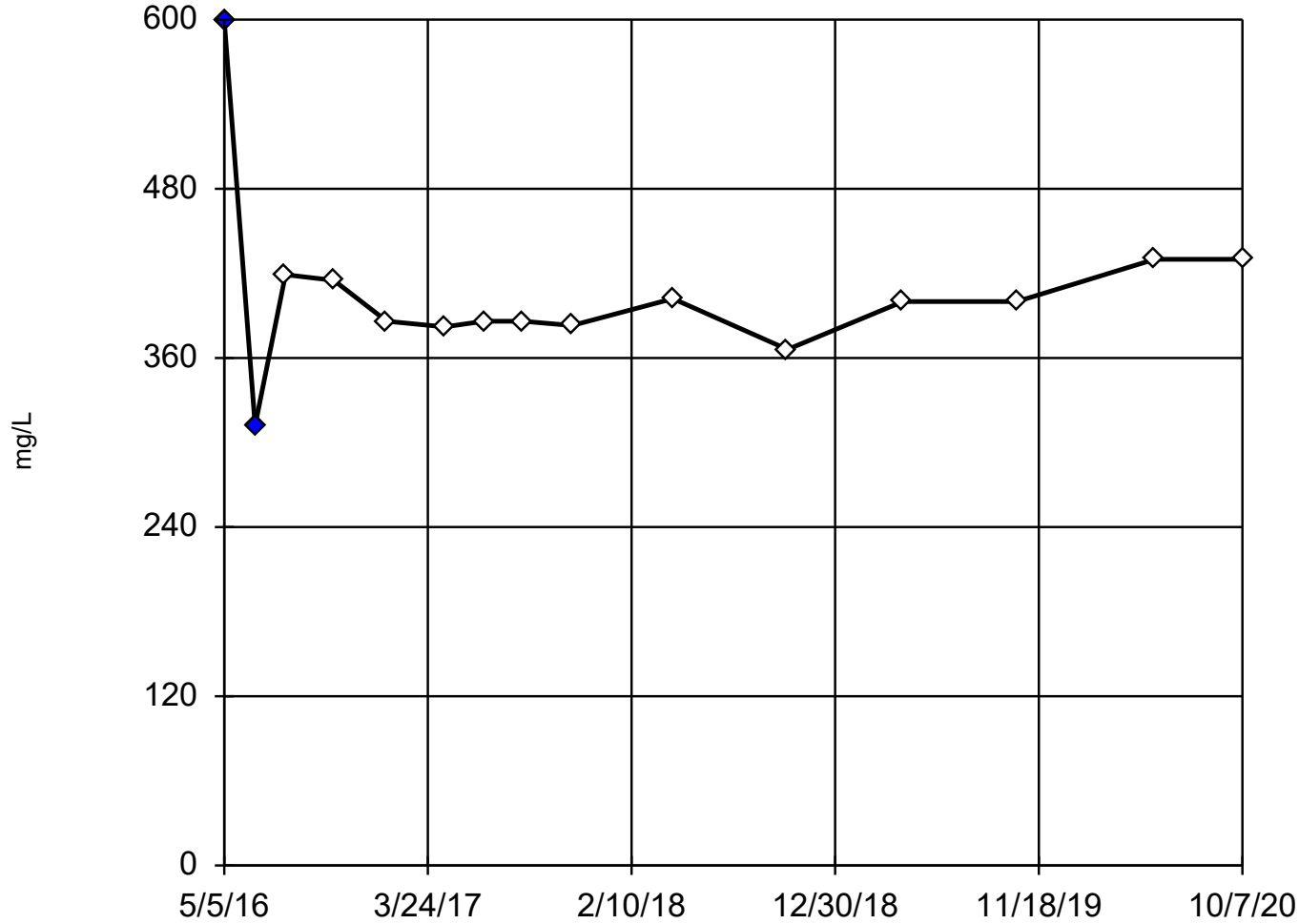
Constituent: Calcium (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)
5/4/2016	45.9
6/22/2016	147
8/10/2016	129
10/26/2016	31.5
1/18/2017	23.6
4/20/2017	26
6/21/2017	67.7
8/22/2017	79.7
11/8/2017	10.4
4/17/2018	25.3
10/16/2018	12.9
4/18/2019	51
10/15/2019	14
5/21/2020	38
10/7/2020	150

Dixon's Outlier Test

MW-122M (bg)



n = 15

Statistical outliers are drawn as solid.
Testing for 1 high and 1 low outliers.
Mean = 406.4.
Std. Dev. = 60.64.
599: c = 0.7788
tabl = 0.525.
312: c = 0.5932
tabl = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9323
Critical = 0.889
The distribution, after removal of suspect values, was found to be normally distributed.

Constituent: Calcium Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Dixon's Outlier Test

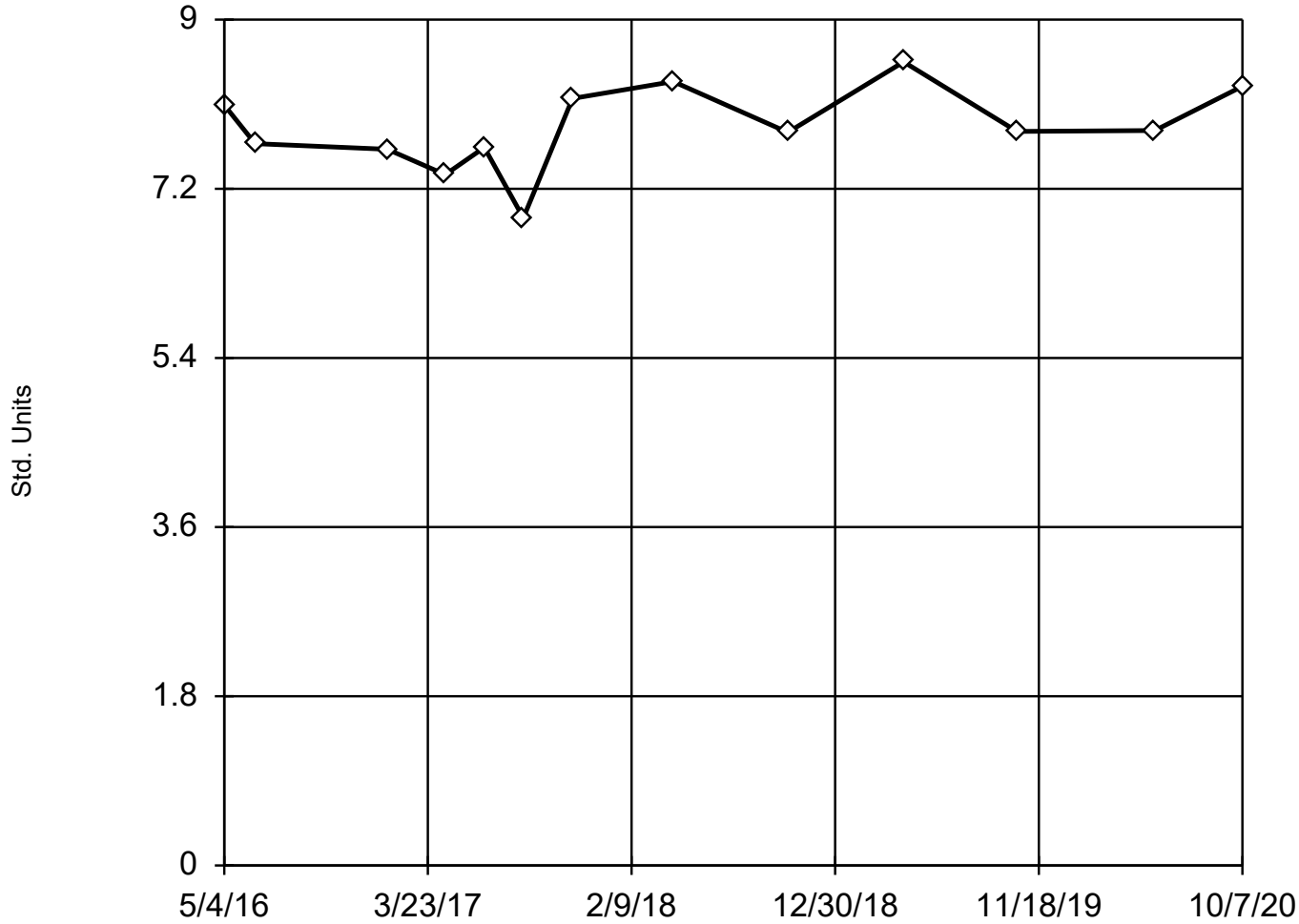
Constituent: Calcium (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M (bg)
5/5/2016	599 (O)
6/23/2016	312 (O)
8/10/2016	419
10/26/2016	415
1/18/2017	386
4/20/2017	382
6/21/2017	386
8/22/2017	386
11/8/2017	383
4/17/2018	402
10/16/2018	366
4/17/2019	400
10/15/2019	400
5/21/2020	430
10/7/2020	430

EPA Screening (suspected outliers for Dixon's Test)

MW-102M (bg)



n = 13

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 7.849, std. dev.
0.4453, critical Tn 2.331

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9648
Critical = 0.889
The distribution was found
to be normally distrib-
uted.

Constituent: Field pH Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

EPA 1989 Outlier Screening

Constituent: Field pH (Std. Units) Analysis Run 12/31/2020 12:27 AM

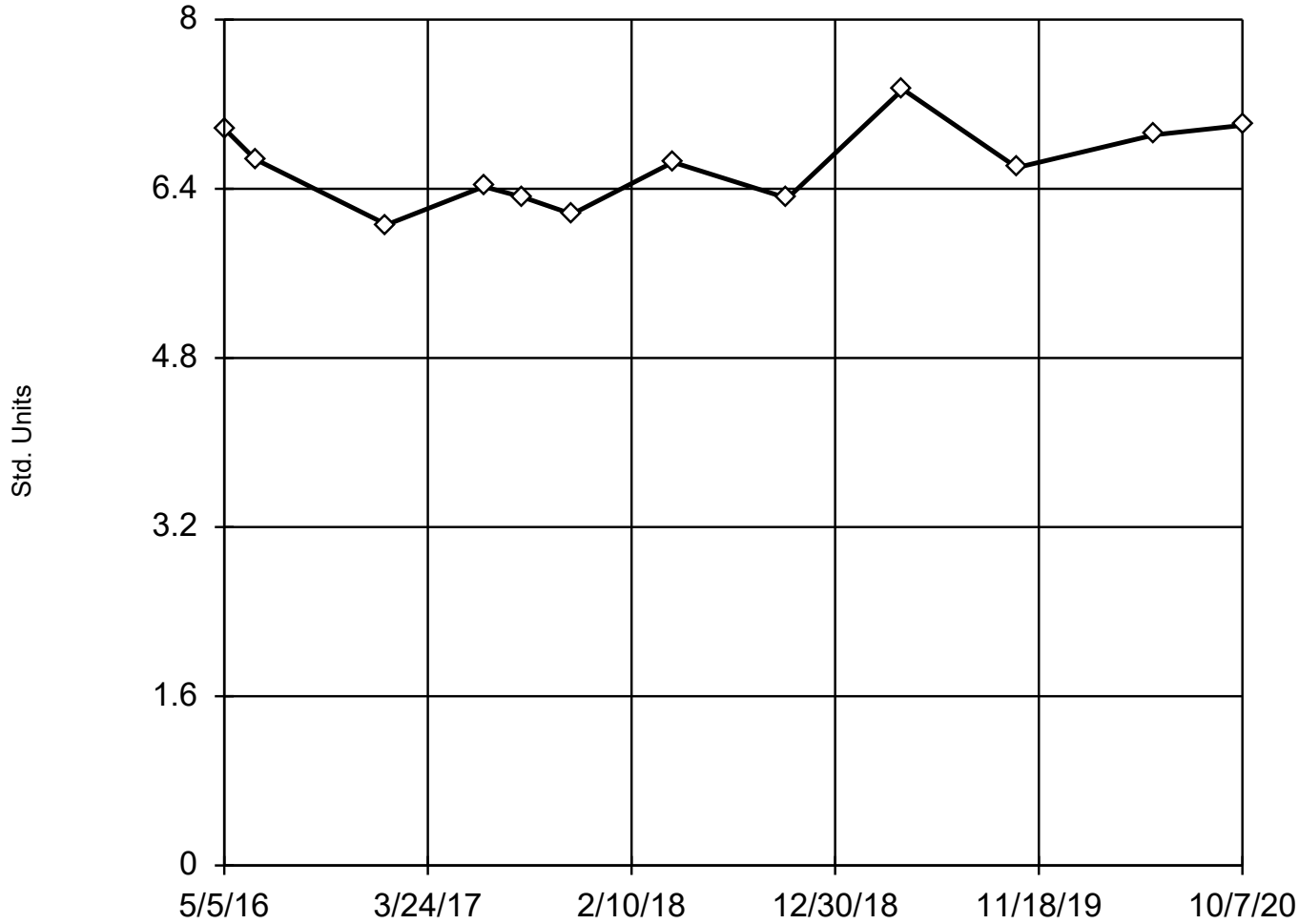
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

MW-102M (bg)

5/4/2016	8.09
6/22/2016	7.68
1/18/2017	7.62
4/20/2017	7.35
6/21/2017	7.64
8/22/2017	6.89
11/8/2017	8.16
4/17/2018	8.34
10/16/2018	7.8
4/18/2019	8.55
10/15/2019	7.81
5/21/2020	7.82
10/7/2020	8.29

EPA Screening (suspected outliers for Dixon's Test)

MW-122M (bg)



n = 12

Dixon's will not be run.
No suspect values identified
or unable to establish
suspect values.
Mean 6.618, std. dev.
0.3844, critical Tn 2.285

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9675
Critical = 0.883
The distribution was found
to be normally distrib-
uted.

Constituent: Field pH Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

EPA 1989 Outlier Screening

Constituent: Field pH (Std. Units) Analysis Run 12/31/2020 12:27 AM

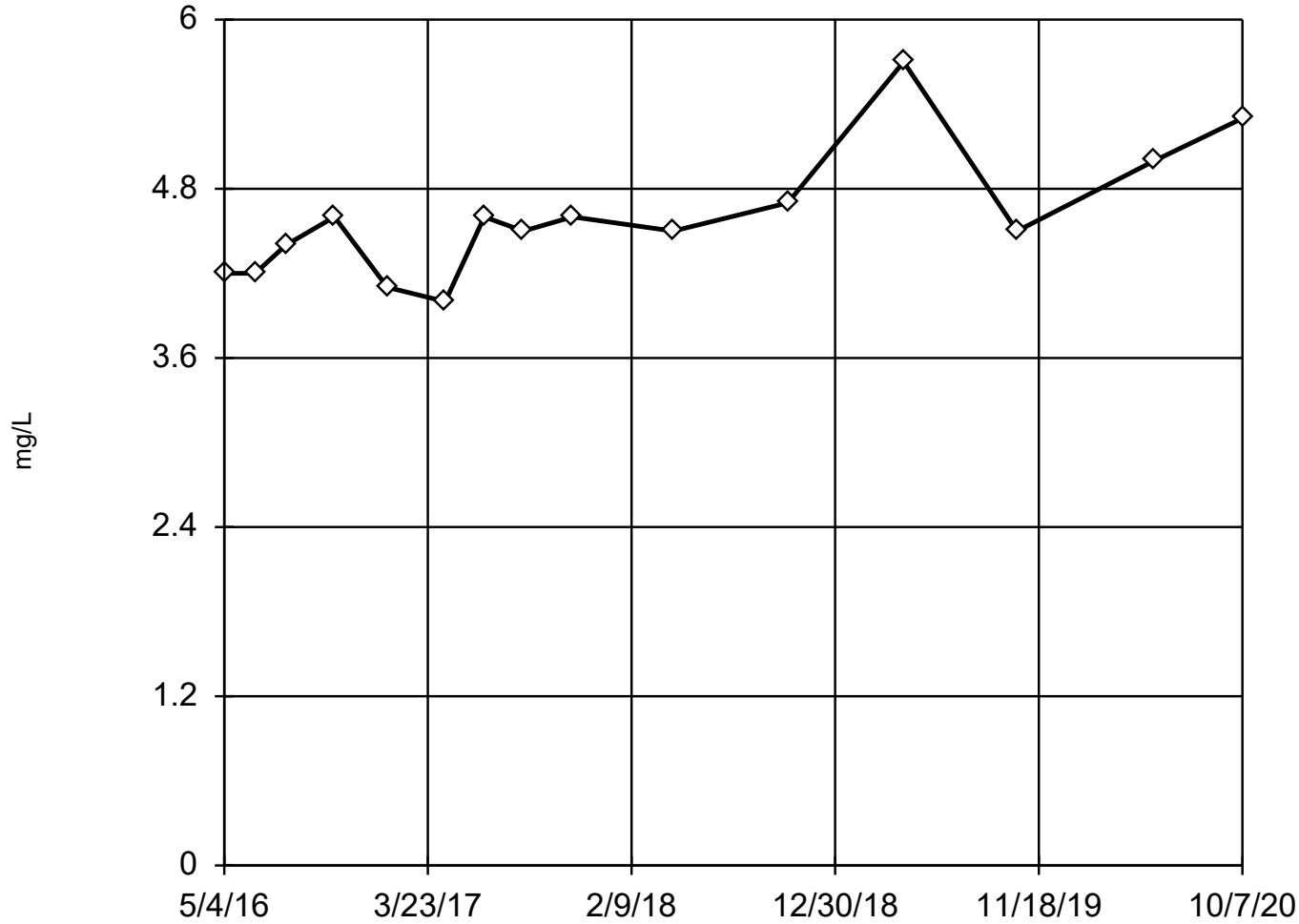
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML-Chempoint- input-Oct2020

MW-122M (bg)

5/5/2016	6.97
6/23/2016	6.68
1/18/2017	6.06
6/21/2017	6.42
8/22/2017	6.32
11/8/2017	6.16
4/17/2018	6.65
10/16/2018	6.31
4/17/2019	7.34
10/15/2019	6.6
5/21/2020	6.91
10/7/2020	7

EPA Screening (suspected outliers for Dixon's Test)

MW-102M (bg)



n = 15

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 4.593, std. dev. 0.4527, critical Tn 2.409

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9239
Critical = 0.901 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Fluoride Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

EPA 1989 Outlier Screening

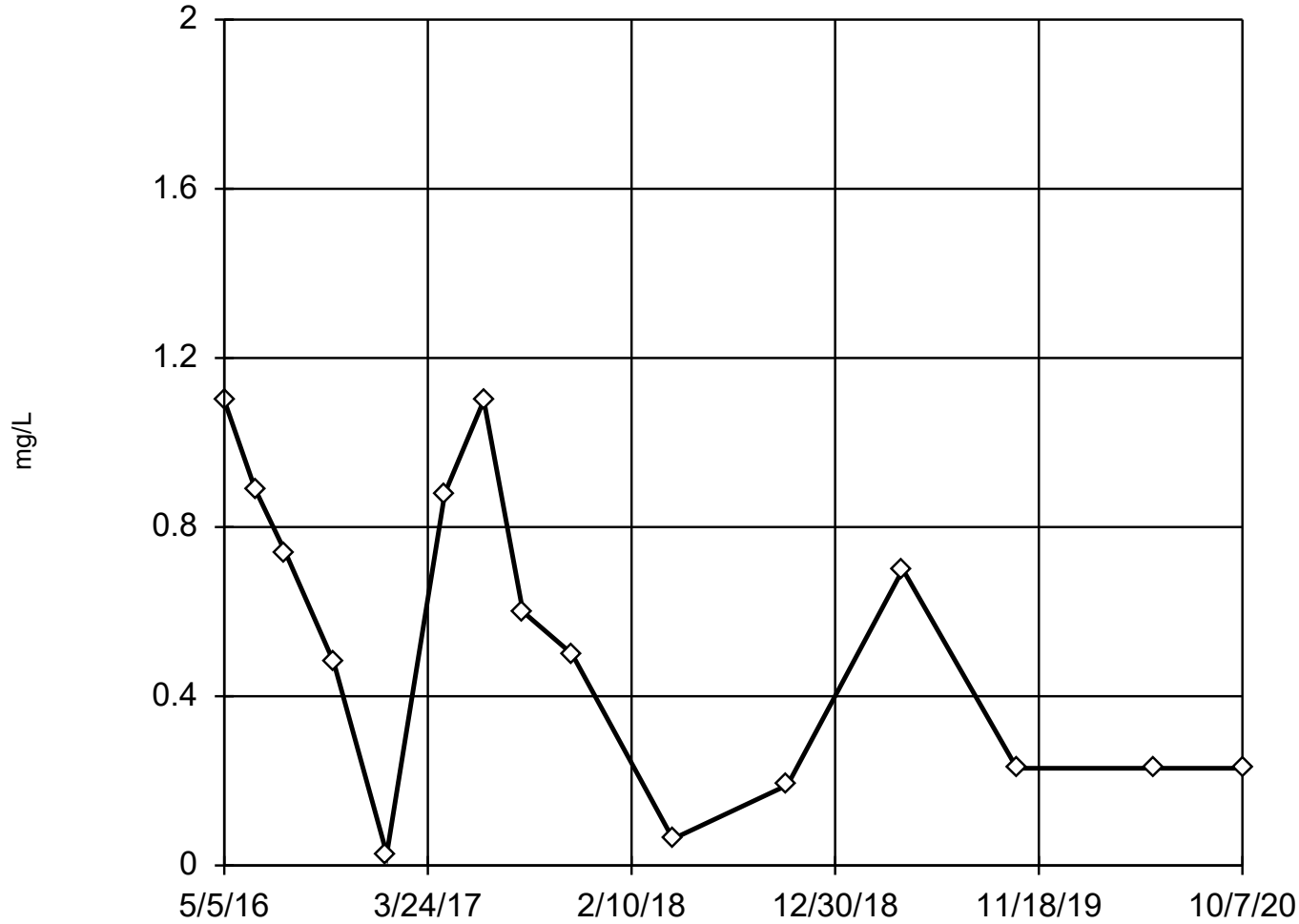
Constituent: Fluoride (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)
5/4/2016	4.2
6/22/2016	4.2
8/10/2016	4.4
10/26/2016	4.6
1/18/2017	4.1
4/20/2017	4
6/21/2017	4.6
8/22/2017	4.5
11/8/2017	4.6
4/17/2018	4.5
10/16/2018	4.7
4/18/2019	5.7
10/15/2019	4.5
5/21/2020	5
10/7/2020	5.3

Dixon's Outlier Test

MW-122M (bg)



n = 15

No statistical outliers.
Testing for 1 low outlier.
Mean = 0.5307.
Std. Dev. = 0.3625.
<0.027 (U); c = 0.1889
tab1 = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.93
Critical = 0.895
The distribution was found
to be normally distrib-
uted.

Constituent: Fluoride Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Dixon's Outlier Test

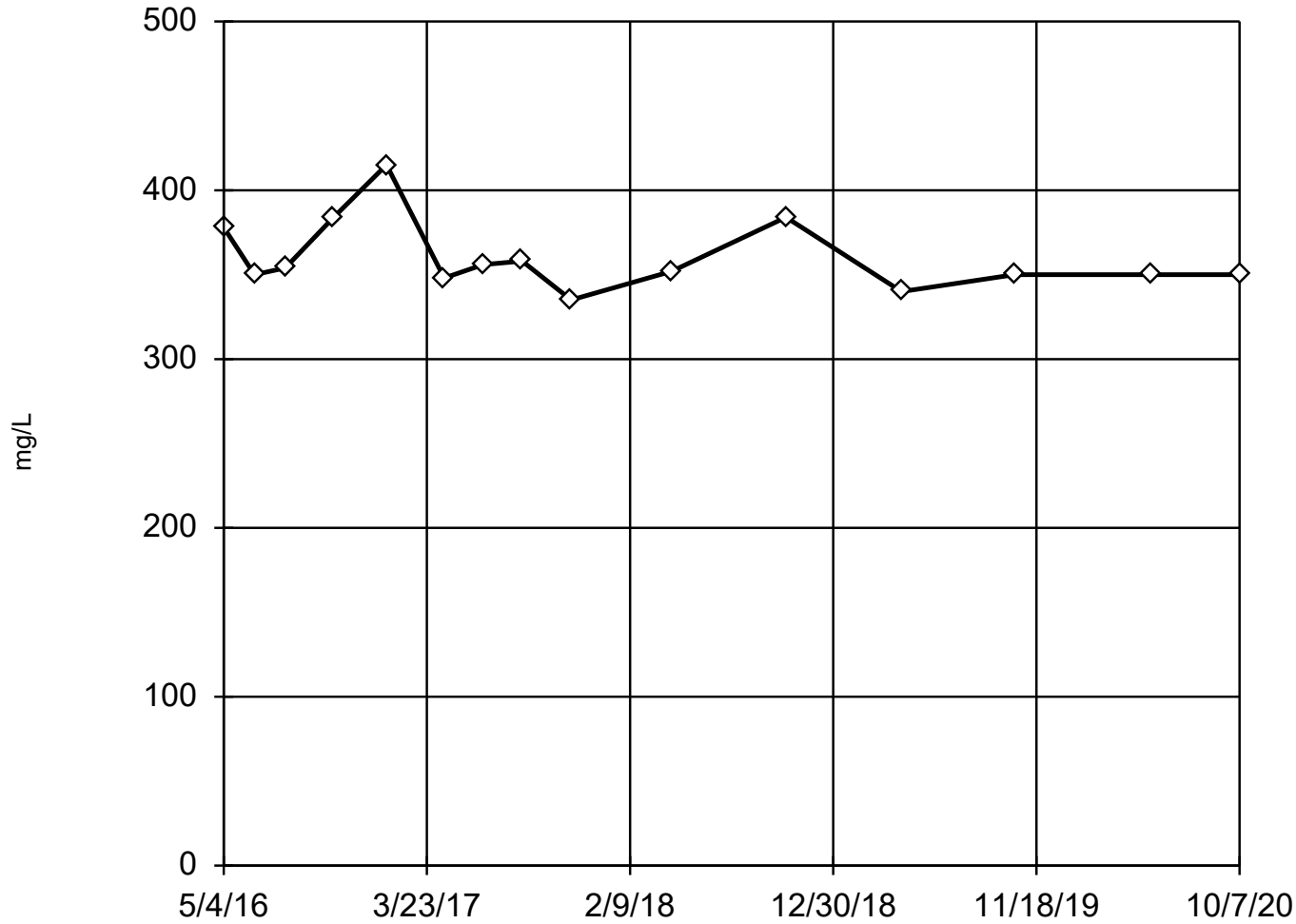
Constituent: Fluoride (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M (bg)
5/5/2016	1.1
6/23/2016	0.89
8/10/2016	0.74
10/26/2016	0.48
1/18/2017	<0.027 (U)
4/20/2017	0.88
6/21/2017	1.1
8/22/2017	0.6
11/8/2017	0.5
4/17/2018	<0.063 (U)
10/16/2018	<0.19 (U)
4/17/2019	0.7
10/15/2019	<0.23 (U)
5/21/2020	0.23 (J)
10/7/2020	<0.23 (U)

Tukey's Outlier Screening

MW-102M (bg)



n = 15

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 476.2, low cutoff = 277.8, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Tukey's Outlier Screening

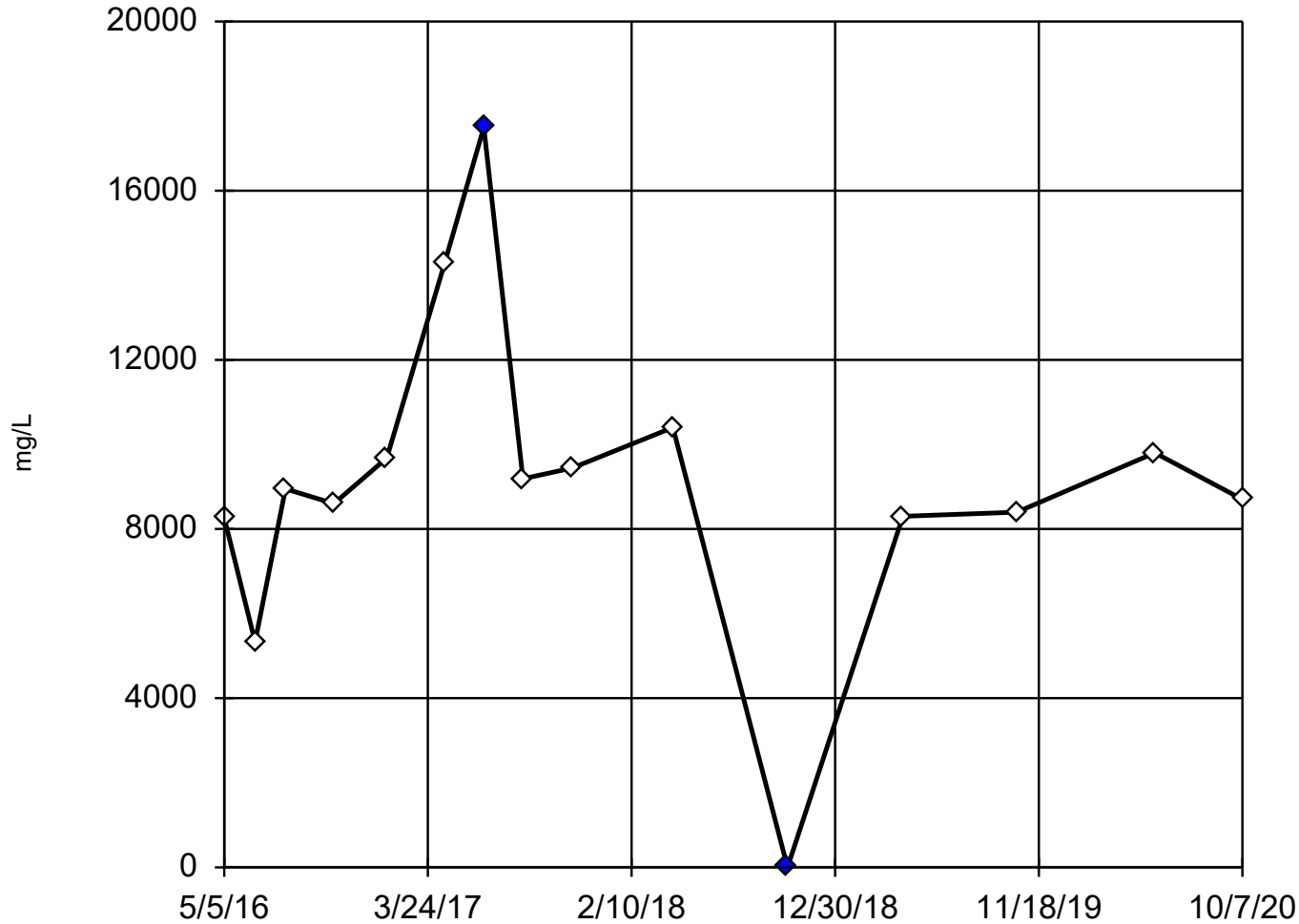
Constituent: Sulfate (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)
5/4/2016	378
6/22/2016	350
8/10/2016	354
10/26/2016	384
1/18/2017	415
4/20/2017	348
6/21/2017	356
8/22/2017	358
11/8/2017	335
4/17/2018	352
10/16/2018	384
4/18/2019	340
10/15/2019	350
5/21/2020	350
10/7/2020	350

Tukey's Outlier Screening

MW-122M (bg)



n = 15

Outliers are drawn as solid.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 14300, low cutoff = 3800, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Tukey's Outlier Screening

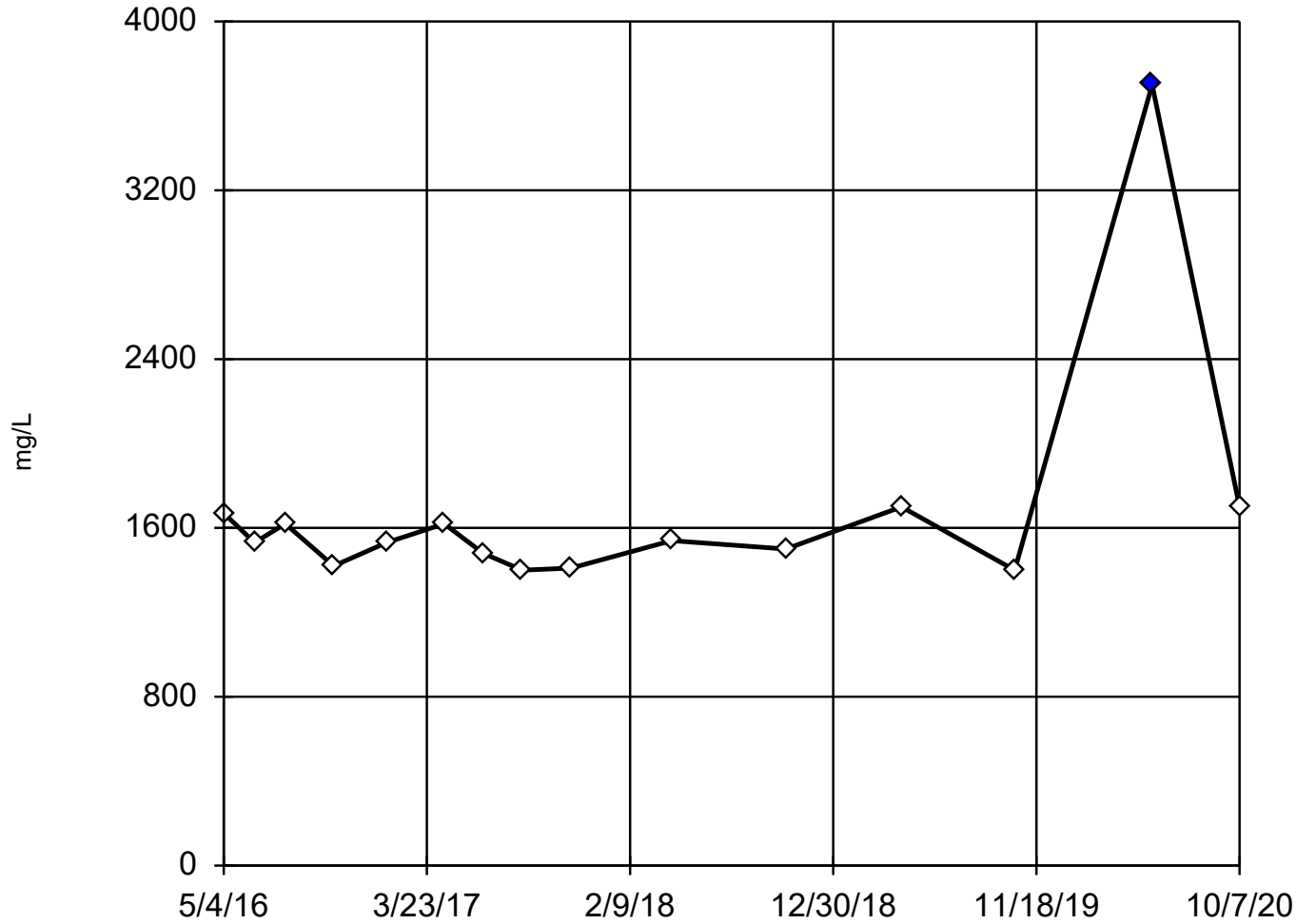
Constituent: Sulfate (mg/L) Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M (bg)
5/5/2016	8260
6/23/2016	5330
8/10/2016	8950
10/26/2016	8600
1/18/2017	9680
4/20/2017	14300
6/21/2017	17500 (O)
8/22/2017	9190
11/8/2017	9440
4/17/2018	10400
10/16/2018	<0.24 (UO)
4/17/2019	8300
10/15/2019	8400
5/21/2020	9800
10/7/2020	8700

Dixon's Outlier Test

MW-102M (bg)



n = 15

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 1681.
Std. Dev. = 568.4.
3700: c = 0.8734
tab1 = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9087
Critical = 0.895
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Total Dissolved Solids Analysis Run 12/31/2020 12:27 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/31/2020 12:27 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)
5/4/2016	1670
6/22/2016	1530
8/10/2016	1620
10/26/2016	1420
1/18/2017	1530
4/20/2017	1620
6/21/2017	1480
8/22/2017	1400
11/8/2017	1410
4/17/2018	1540
10/16/2018	1500
4/18/2019	1700
10/15/2019	1400
5/21/2020	3700 (O)
10/7/2020	1700

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/31/2020 12:27 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M (bg)
5/5/2016	11500
6/23/2016	7430 (O)
8/10/2016	14200
10/26/2016	13200
1/18/2017	14100
4/20/2017	18100 (O)
6/21/2017	12800
8/22/2017	14300
11/8/2017	13400
4/17/2018	14400
10/16/2018	13300
4/17/2019	13000
10/15/2019	13000
5/21/2020	16000
10/7/2020	14000

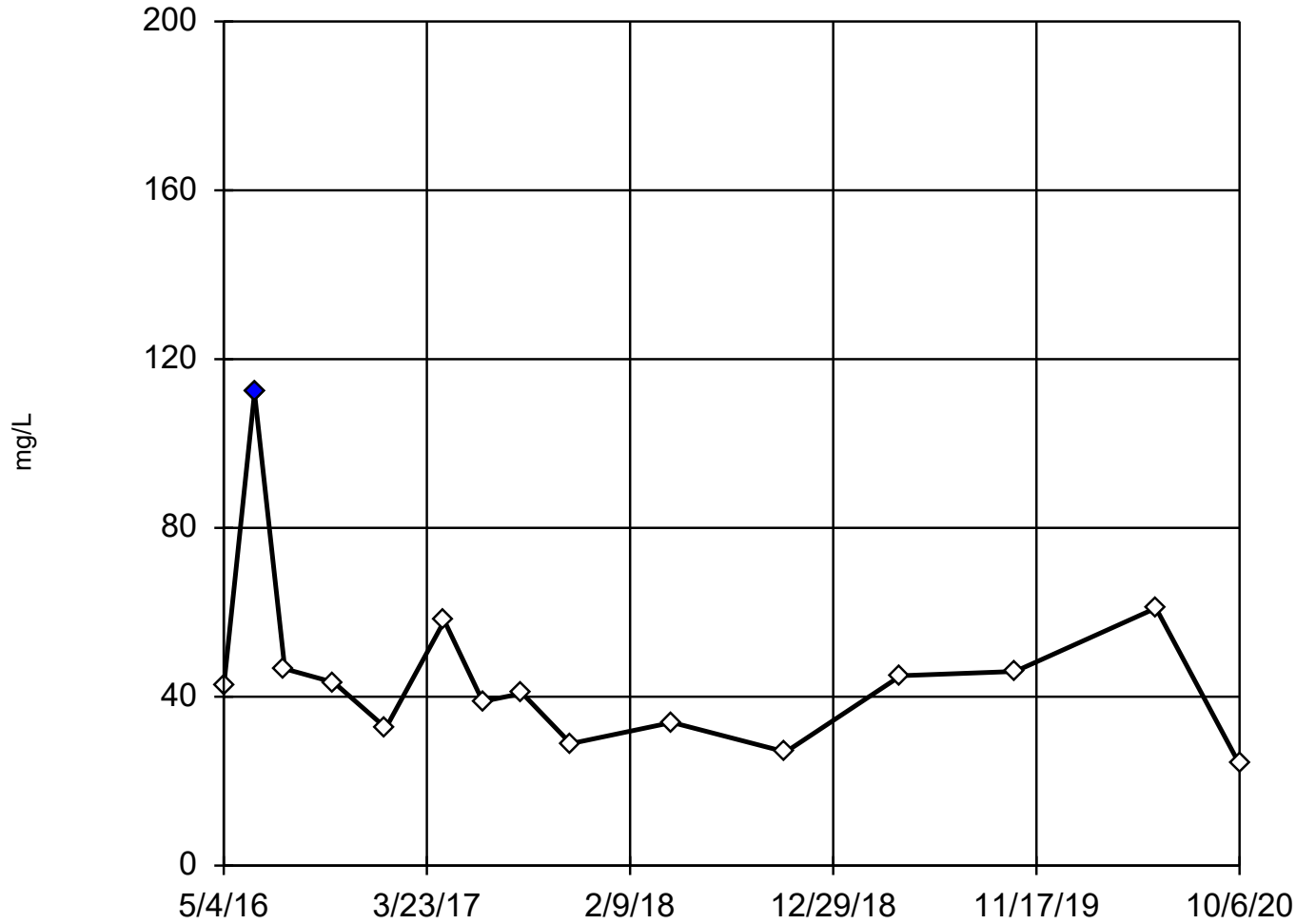
Outlier Analysis

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 12/4/2020, 7:07 PM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Date(s)</u>	<u>Method</u>	<u>Alpha</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Chloride (mg/L)	MW-301	Yes	112	6/22/2016	Dixon's	0.05	15	45.36	21.19	normal	ShapiroWilk
Chloride (mg/L)	MW-302	No	n/a	n/a	EPA 1989	0.05	15	8.133	0.9839	normal	ShapiroWilk
Chloride (mg/L)	MW-303	Yes	13.5	5/4/2016	NP (nrm)	NaN	17	8.094	1.777	unknown	ShapiroWilk

Dixon's Outlier Test

MW-301



n = 15

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 45.36.
Std. Dev. = 21.19.
112: c = 0.6498
tab1 = 0.525.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9589
Critical = 0.895
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Chloride Analysis Run 12/4/2020 7:06 PM

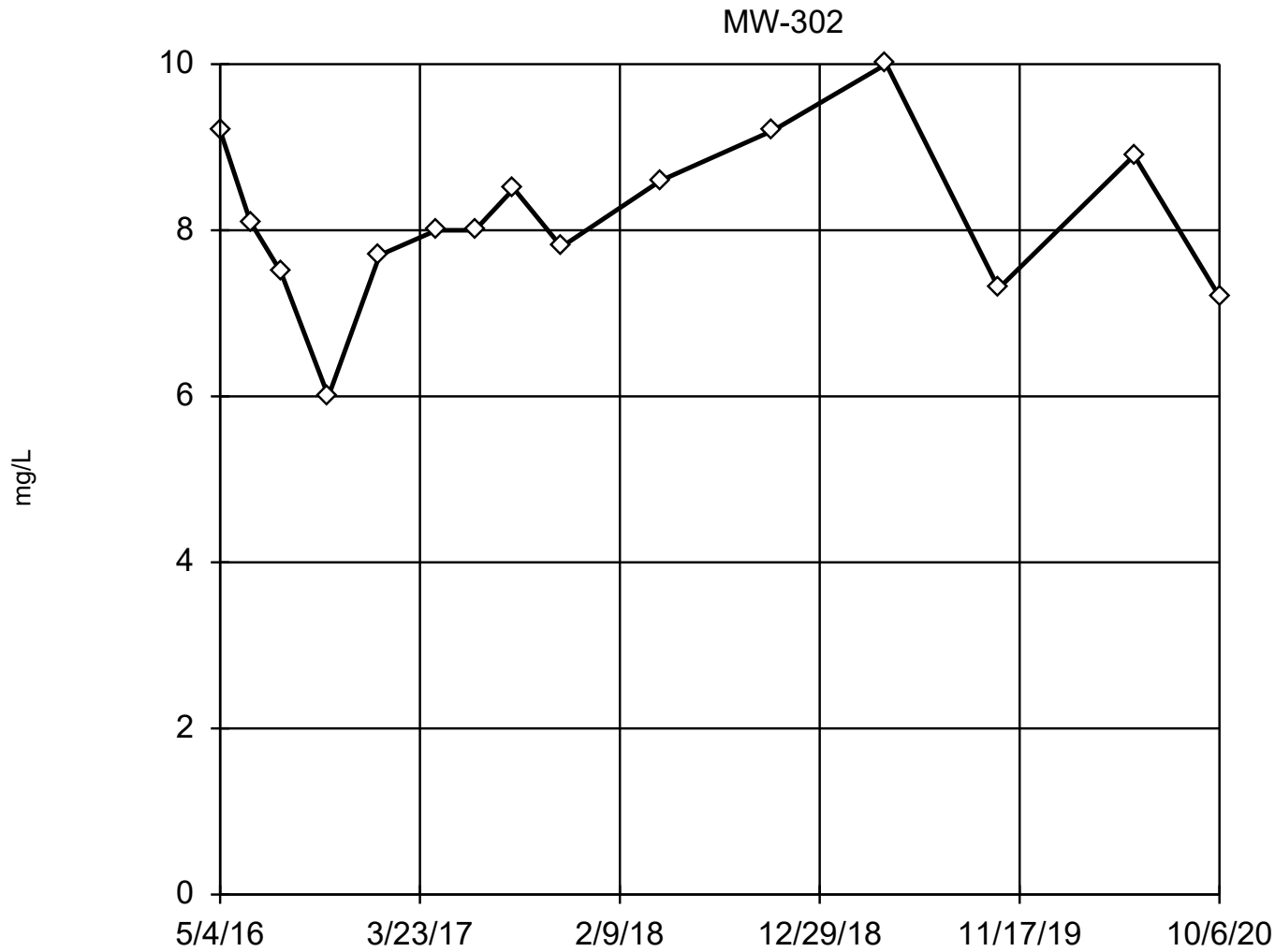
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Dixon's Outlier Test

Constituent: Chloride (mg/L) Analysis Run 12/4/2020 7:07 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-301
5/4/2016	42.4
6/22/2016	112 (O)
8/9/2016	46.6
10/26/2016	43.4
1/17/2017	32.6
4/20/2017	58
6/20/2017	38.9
8/22/2017	40.8
11/7/2017	28.9
4/17/2018	33.9
10/15/2018	26.9
4/16/2019	45
10/15/2019	46
5/26/2020	61
10/6/2020	24

EPA Screening (suspected outliers for Dixon's Test)



EPA 1989 Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 12/4/2020 7:07 PM

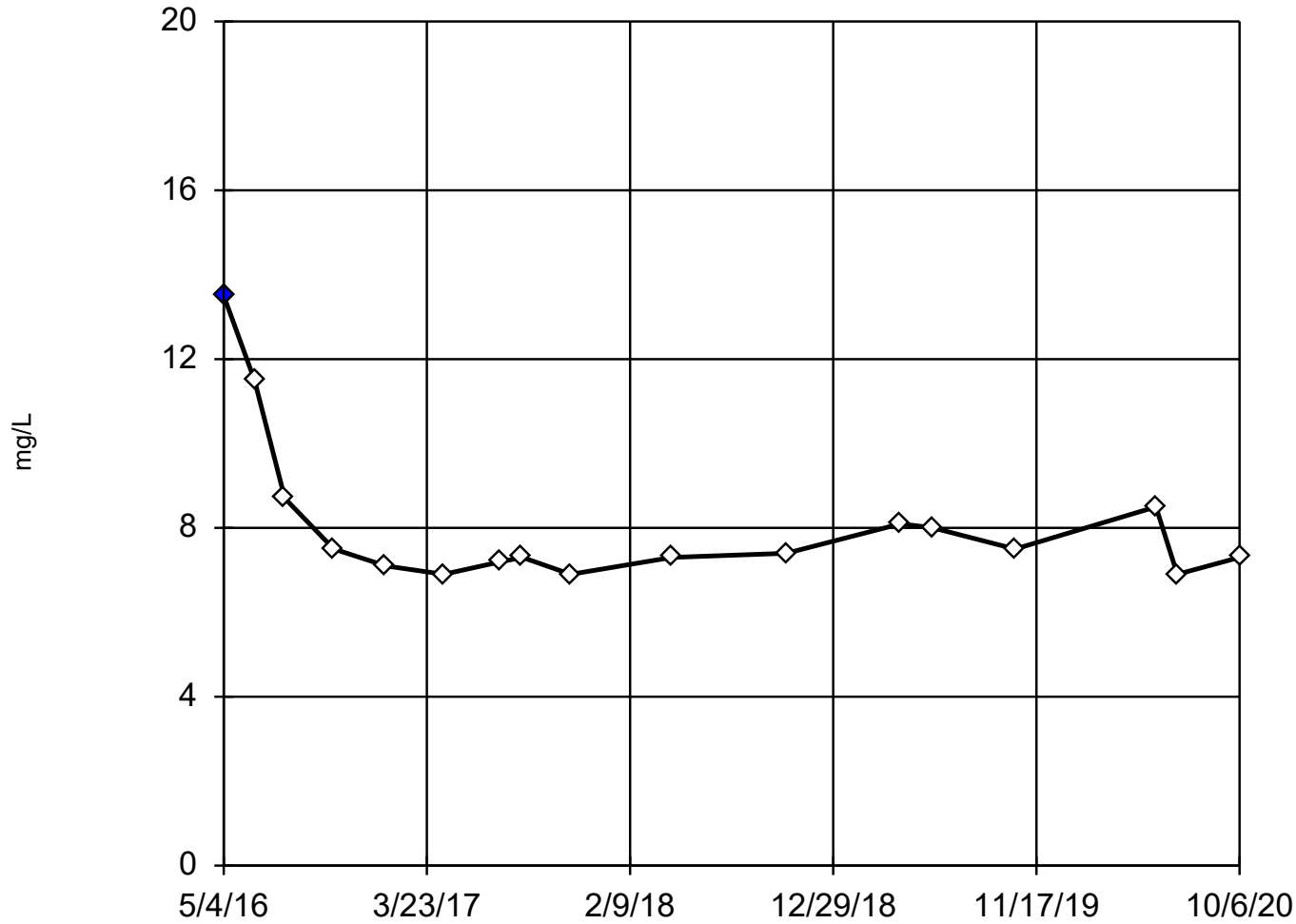
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

MW-302

5/4/2016	9.2
6/22/2016	8.1
8/10/2016	7.5
10/26/2016	6
1/17/2017	7.7
4/19/2017	8
6/20/2017	8
8/22/2017	8.5
11/7/2017	7.8
4/17/2018	8.6
10/15/2018	9.2
4/16/2019	10
10/15/2019	7.3
5/21/2020	8.9
10/6/2020	7.2

Tukey's Outlier Screening

MW-303



n = 17

Outlier is drawn as solid. Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 12.97, low cutoff = 4.574, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 12/4/2020 7:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Tukey's Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 12/4/2020 7:07 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-303
5/4/2016	13.5 (O)
6/22/2016	11.5
8/9/2016	8.7
10/26/2016	7.5
1/17/2017	7.1
4/19/2017	6.9
7/19/2017	7.2
8/22/2017	7.3
11/7/2017	6.9
4/17/2018	7.3
10/16/2018	7.4
4/16/2019	8.1
6/6/2019	8
10/15/2019	7.5
5/26/2020	8.5
6/29/2020	6.9
10/6/2020	7.3

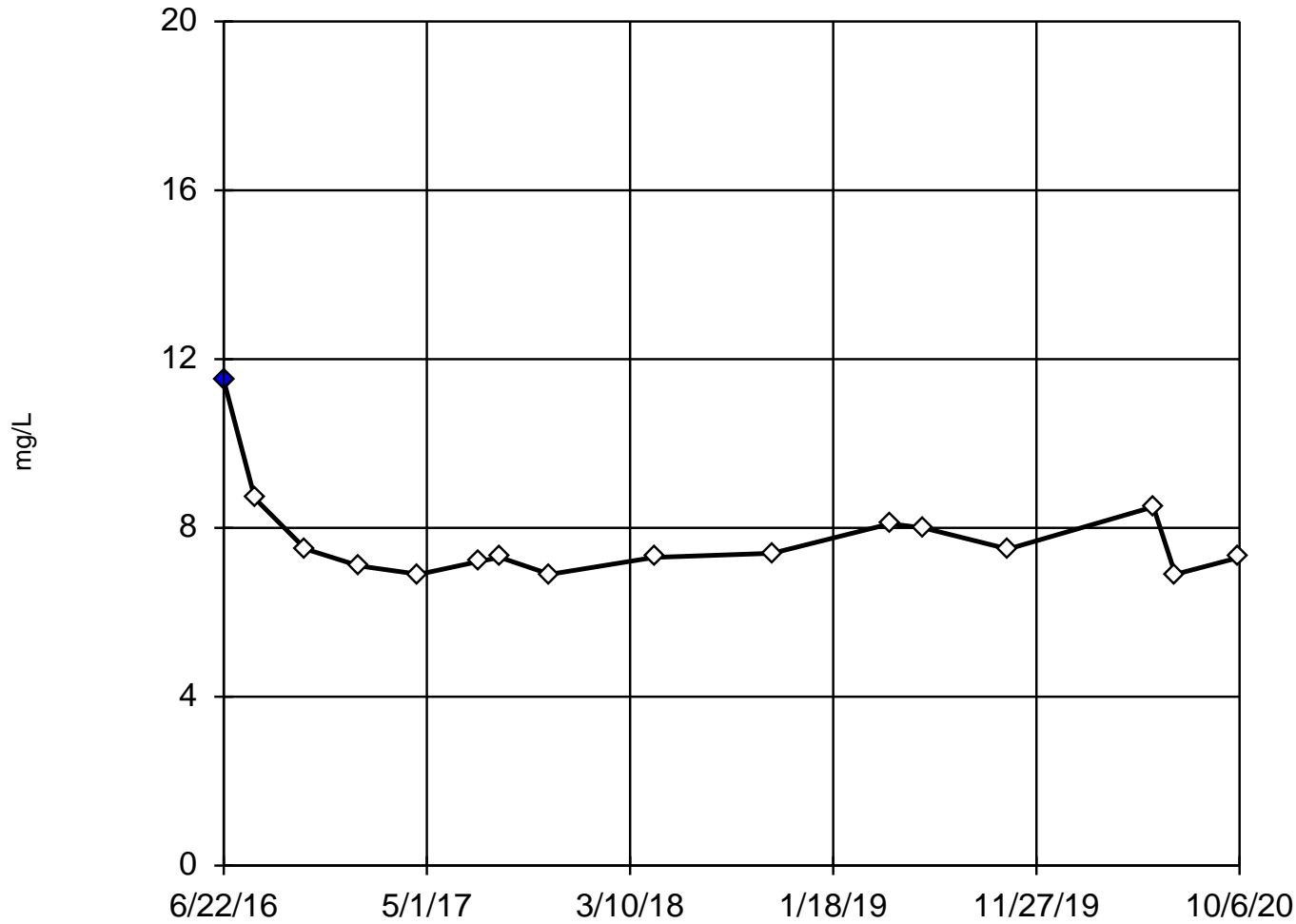
Outlier Analysis

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 1/12/2021, 10:10 AM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Date(s)</u>	<u>Method</u>	<u>Alpha</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Chloride (mg/L)	MW-303	Yes	11.5	6/22/2016	NP (nrm)	NaN	16	7.756	1.139	unknown	ShapiroWilk

Chloride

MW-303



n = 16

Outlier is drawn as solid.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.1 alpha level.

High cutoff = 10.75, low cutoff = 4.45, based on IQR multiplier of 3.

Tukey's Outlier Screening Analysis Run 1/12/2021 10:09 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Tukey's Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 10:10 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-303
5/4/2016	13.5 (X)
6/22/2016	11.5 (O)
8/9/2016	8.7
10/26/2016	7.5
1/17/2017	7.1
4/19/2017	6.9
7/19/2017	7.2
8/22/2017	7.3
11/7/2017	6.9
4/17/2018	7.3
10/16/2018	7.4
4/16/2019	8.1
6/6/2019	8
10/15/2019	7.5
5/26/2020	8.5
6/29/2020	6.9
10/6/2020	7.3

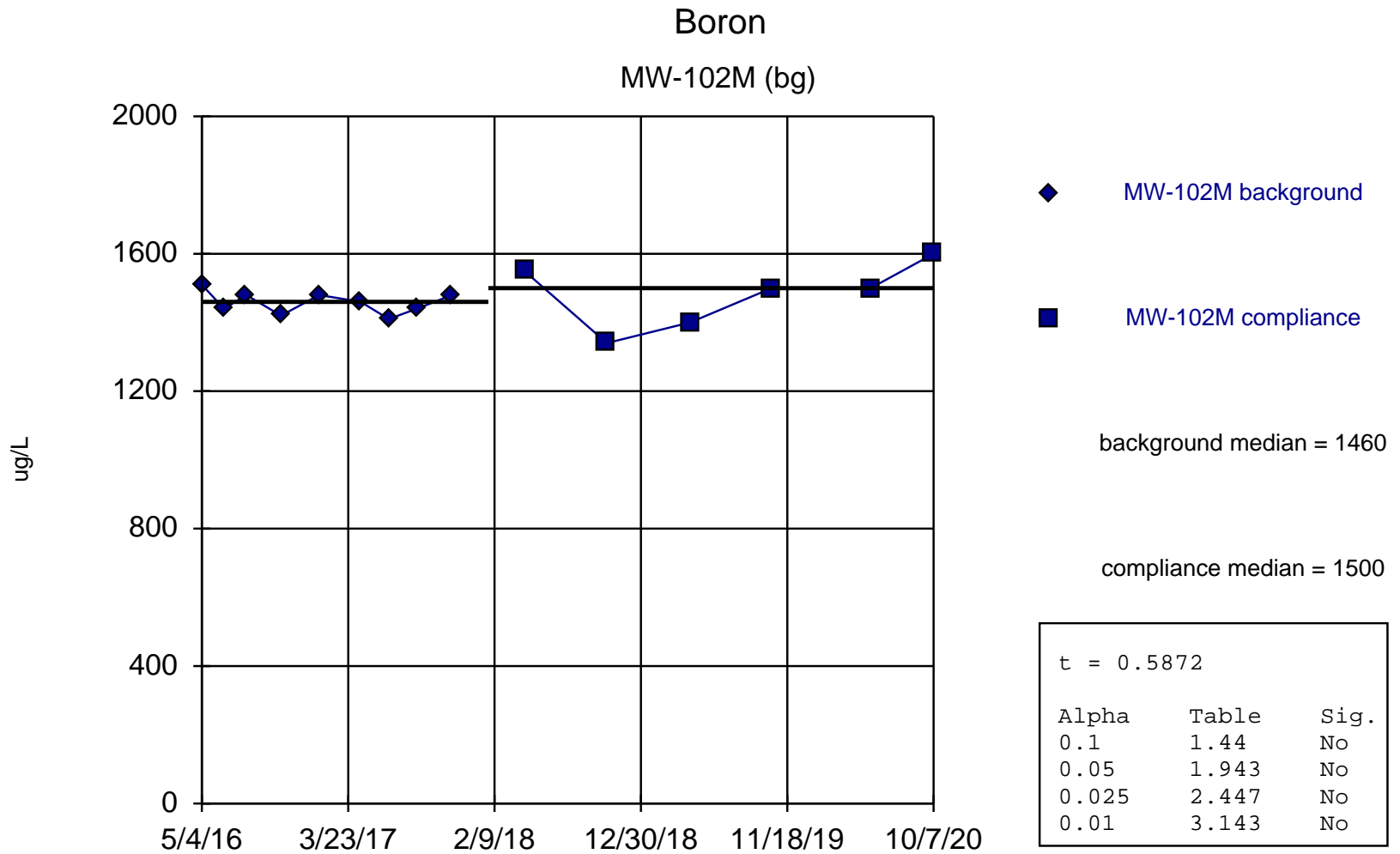
Attachment 3

Welch's/Mann-Whitney Comparison

Welch's t-test/Mann-Whitney

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 1/11/2021, 9:13 PM

<u>Constituent</u>	<u>Well</u>	<u>Calc.</u>	<u>0.1</u>	<u>0.05</u>	<u>0.025</u>	<u>0.01</u>	<u>Alpha</u>	<u>Sig.</u>	<u>Bg. Wells</u>	<u>Method</u>
Boron (ug/L)	MW-102M (bg)	0.5872	No	No	No	No	0.01	No	(intrawell)	Welch`s
Boron (ug/L)	MW-122M (bg)	1.403	Yes	No	No	No	0.01	No	(intrawell)	Welch`s
Calcium (mg/L)	MW-102M (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Calcium (mg/L)	MW-122M (bg)	0.5848	No	No	No	No	0.01	No	(intrawell)	Mann-W (normality)
Field pH (Std. Units)	MW-102M (bg)	2.21	Yes	Yes	Yes	No	0.01	No	(intrawell)	Welch`s
Field pH (Std. Units)	MW-122M (bg)	1.817	Yes	Yes	No	No	0.01	No	(intrawell)	Welch`s
Fluoride (mg/L)	MW-102M (bg)	2.813	Yes	Yes	Yes	No	0.01	No	(intrawell)	Welch`s
Fluoride (mg/L)	MW-122M (bg)	-2.951	No	No	No	No	0.01	No	(intrawell)	Welch`s
Sulfate (mg/L)	MW-102M (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Sulfate (mg/L)	MW-122M (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Total Dissolved Solids (mg/L)	MW-102M (bg)	1.12	No	No	No	No	0.01	No	(intrawell)	Welch`s
Total Dissolved Solids (mg/L)	MW-122M (bg)	0.6902	No	No	No	No	0.01	No	(intrawell)	Welch`s



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9475, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

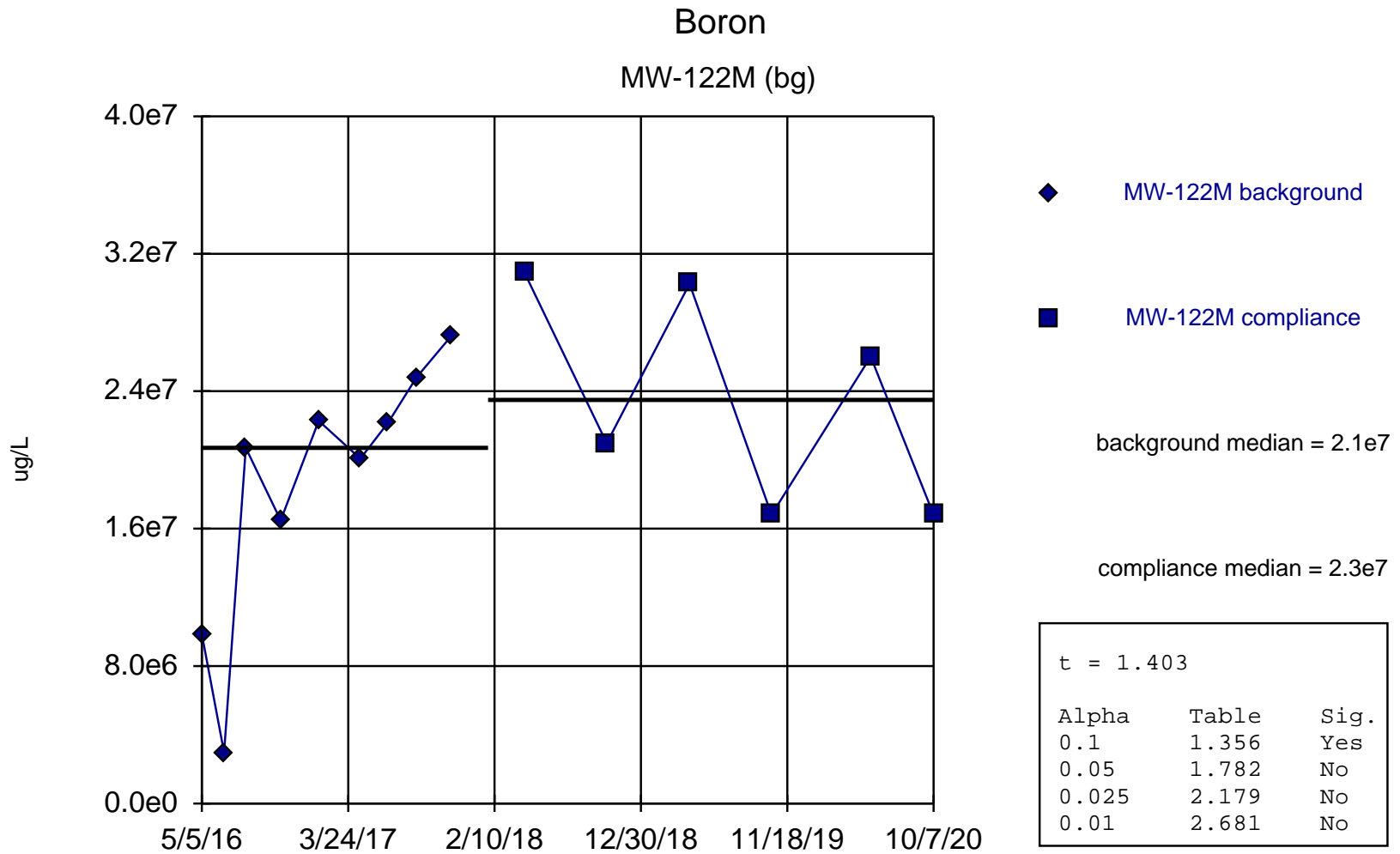
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Boron (ug/L) Analysis Run 1/11/2021 9:13 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	1510	
6/22/2016	1440	
8/10/2016	1480	
10/26/2016	1420	
1/18/2017	1480	
4/20/2017	1460	
6/21/2017	1410	
8/22/2017	1440	
11/8/2017	1480	
4/17/2018		1550
10/16/2018		1340
4/18/2019		1400
10/15/2019		1500
5/21/2020		1500
10/7/2020		1600



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8905 after square transformation, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

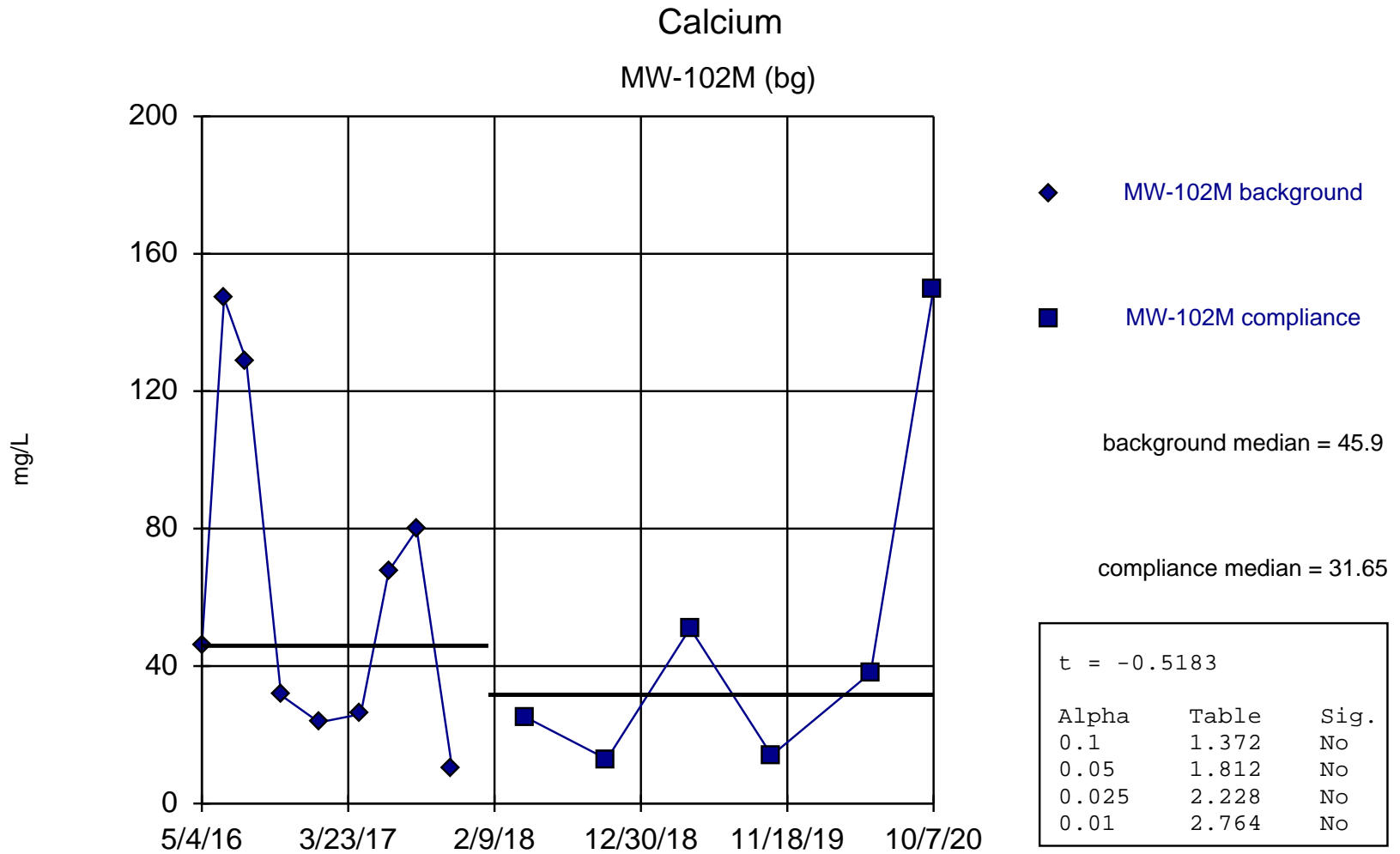
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Boron (ug/L) Analysis Run 1/11/2021 9:13 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M	MW-122M
5/5/2016	3140	
6/23/2016	1720	
8/10/2016	4550	
10/26/2016	4060	
1/18/2017	4720	
4/20/2017	4480	
6/21/2017	4710	
8/22/2017	4980	
11/8/2017	5220	
4/17/2018		5560
10/16/2018		4580
4/17/2019		5500
10/15/2019		4100
5/21/2020		5100
10/7/2020		4100



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8861, critical = 0.829.

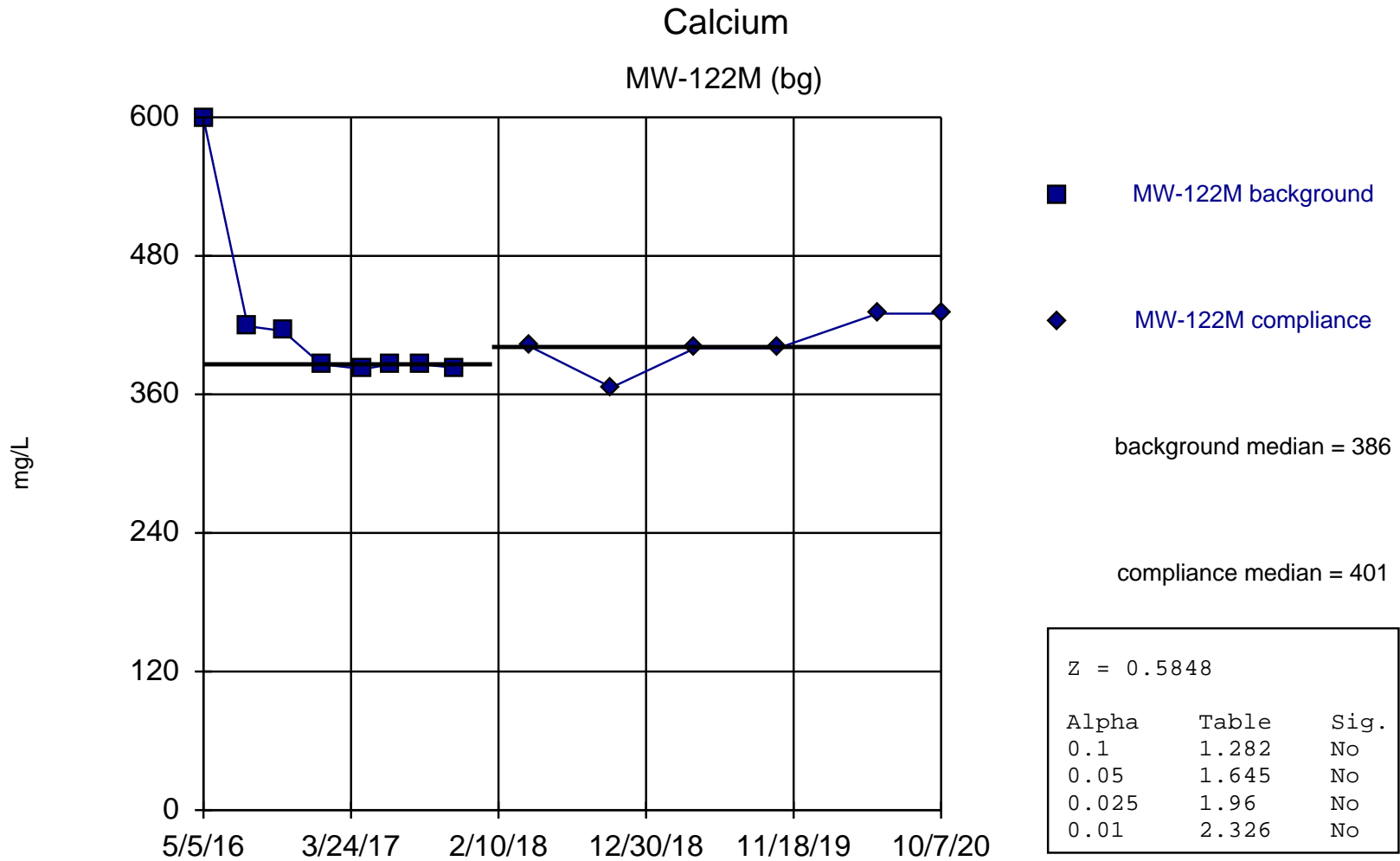
Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Calcium (mg/L) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	45.9	
6/22/2016	147	
8/10/2016	129	
10/26/2016	31.5	
1/18/2017	23.6	
4/20/2017	26	
6/21/2017	67.7	
8/22/2017	79.7	
11/8/2017	10.4	
4/17/2018		25.3
10/16/2018		12.9
4/18/2019		51
10/15/2019		14
5/21/2020		38
10/7/2020		150



Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level.

Mann-Whitney (Wilcoxon Rank Sum) Analysis Run 1/11/2021 9:06 PM

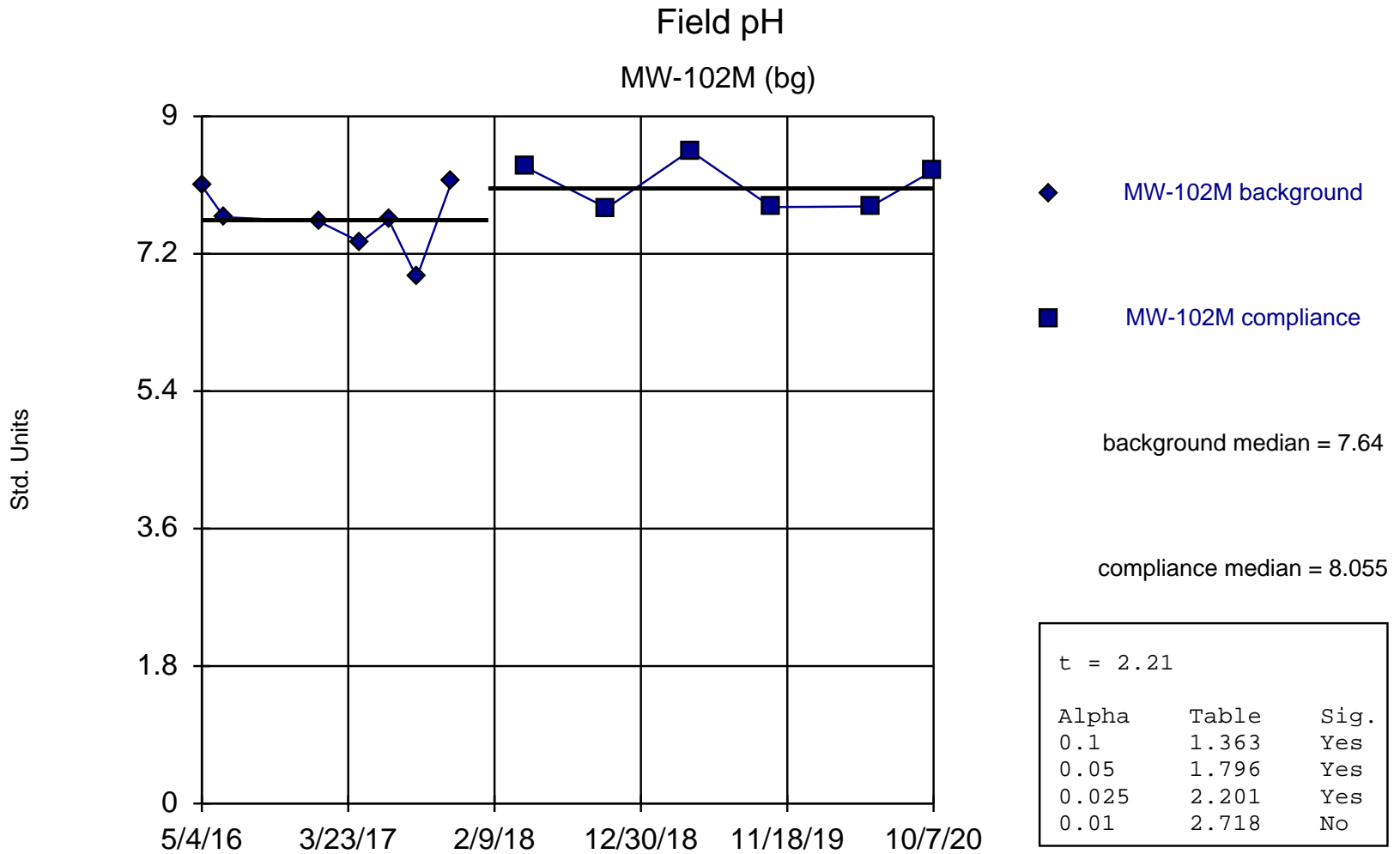
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Calcium (mg/L) Analysis Run 1/11/2021 9:13 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M	MW-122M
5/5/2016	599	
6/23/2016	312 (X)	
8/10/2016	419	
10/26/2016	415	
1/18/2017	386	
4/20/2017	382	
6/21/2017	386	
8/22/2017	386	
11/8/2017	383	
4/17/2018		402
10/16/2018		366
4/17/2019		400
10/15/2019		400
5/21/2020		430
10/7/2020		430



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9358, critical = 0.803.

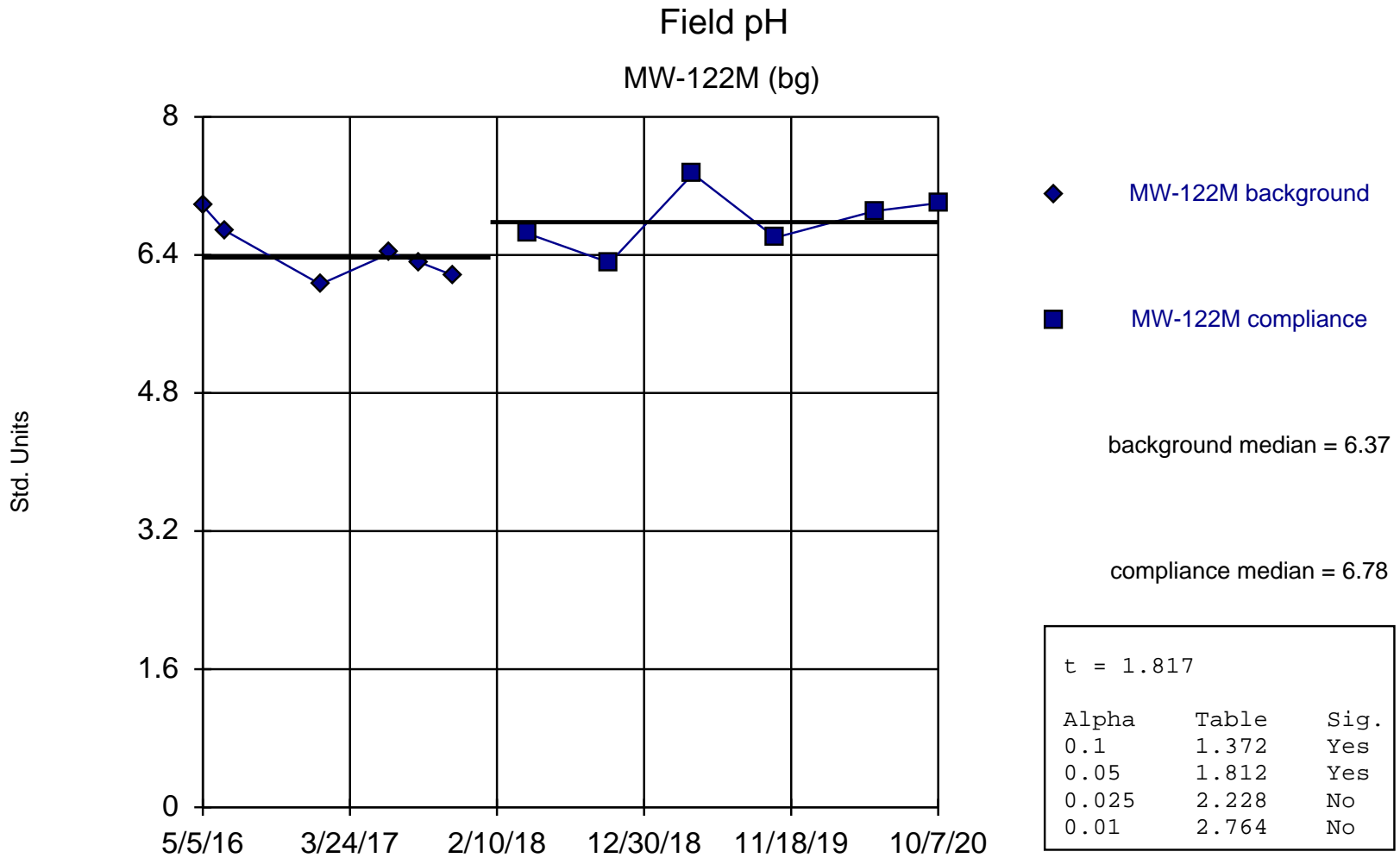
Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Field pH (Std. Units) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	8.09	
6/22/2016	7.68	
1/18/2017	7.62	
4/20/2017	7.35	
6/21/2017	7.64	
8/22/2017	6.89	
11/8/2017	8.16	
4/17/2018		8.34
10/16/2018		7.8
4/18/2019		8.55
10/15/2019		7.81
5/21/2020		7.82
10/7/2020		8.29



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9505, critical = 0.788.

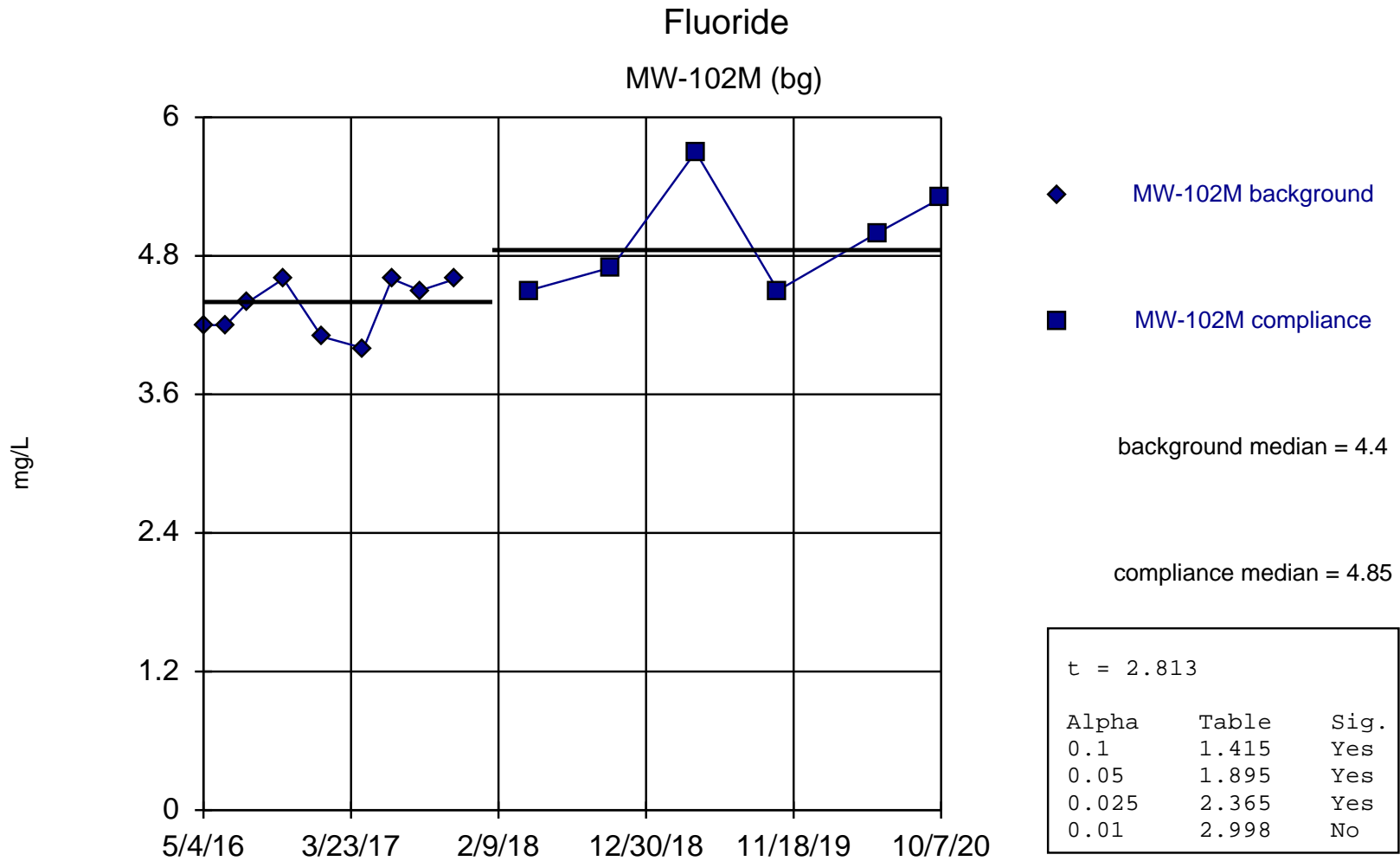
Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Field pH (Std. Units) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M	MW-122M
5/5/2016	6.97	
6/23/2016	6.68	
1/18/2017	6.06	
6/21/2017	6.42	
8/22/2017	6.32	
11/8/2017	6.16	
4/17/2018		6.65
10/16/2018		6.31
4/17/2019		7.34
10/15/2019		6.6
5/21/2020		6.91
10/7/2020		7



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8775, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

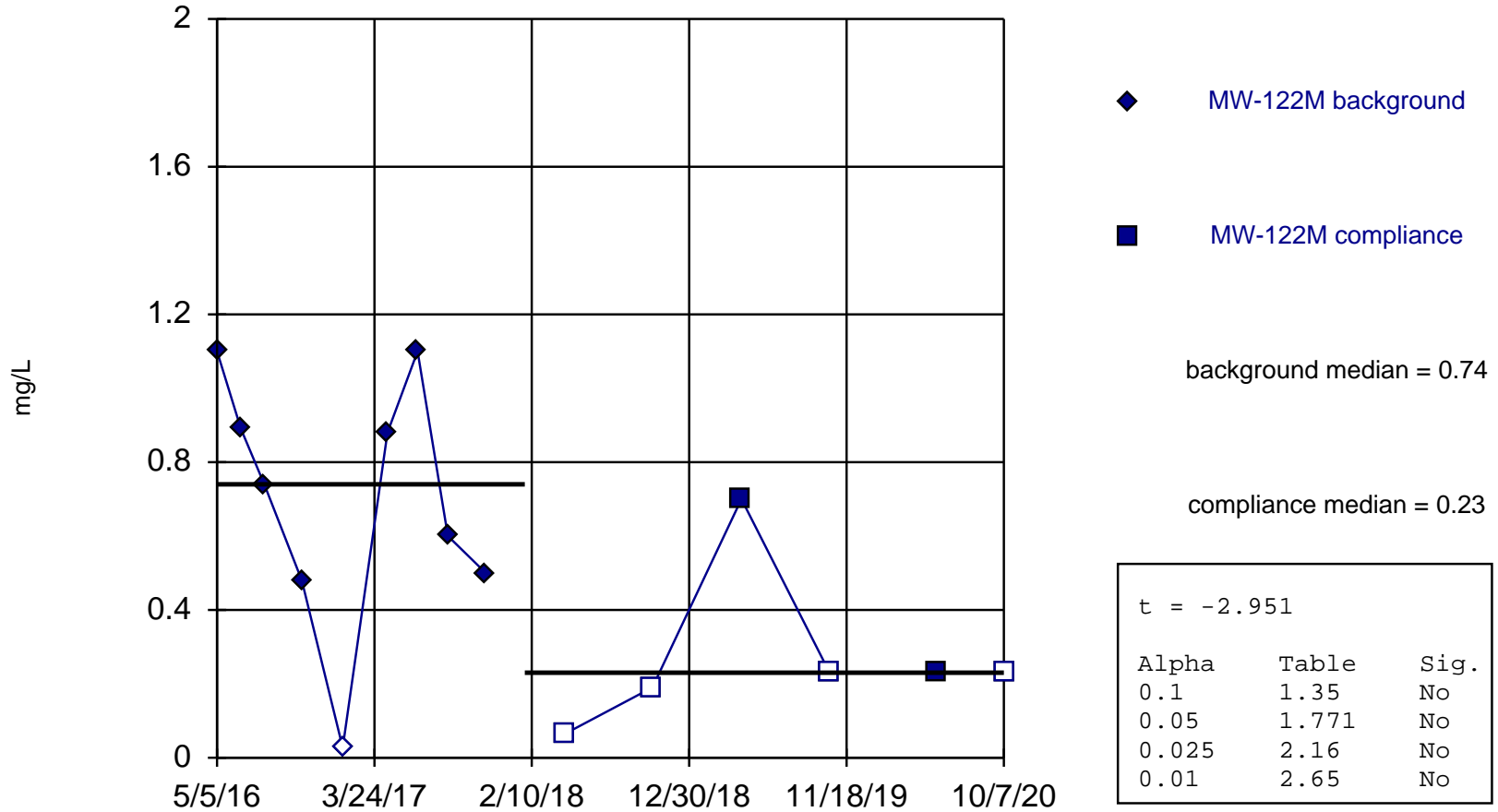
Welch's t-test

Constituent: Fluoride (mg/L) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	4.2	
6/22/2016	4.2	
8/10/2016	4.4	
10/26/2016	4.6	
1/18/2017	4.1	
4/20/2017	4	
6/21/2017	4.6	
8/22/2017	4.5	
11/8/2017	4.6	
4/17/2018		4.5
10/16/2018		4.7
4/18/2019		5.7
10/15/2019		4.5
5/21/2020		5
10/7/2020		5.3

Fluoride

MW-122M (bg)



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9316, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

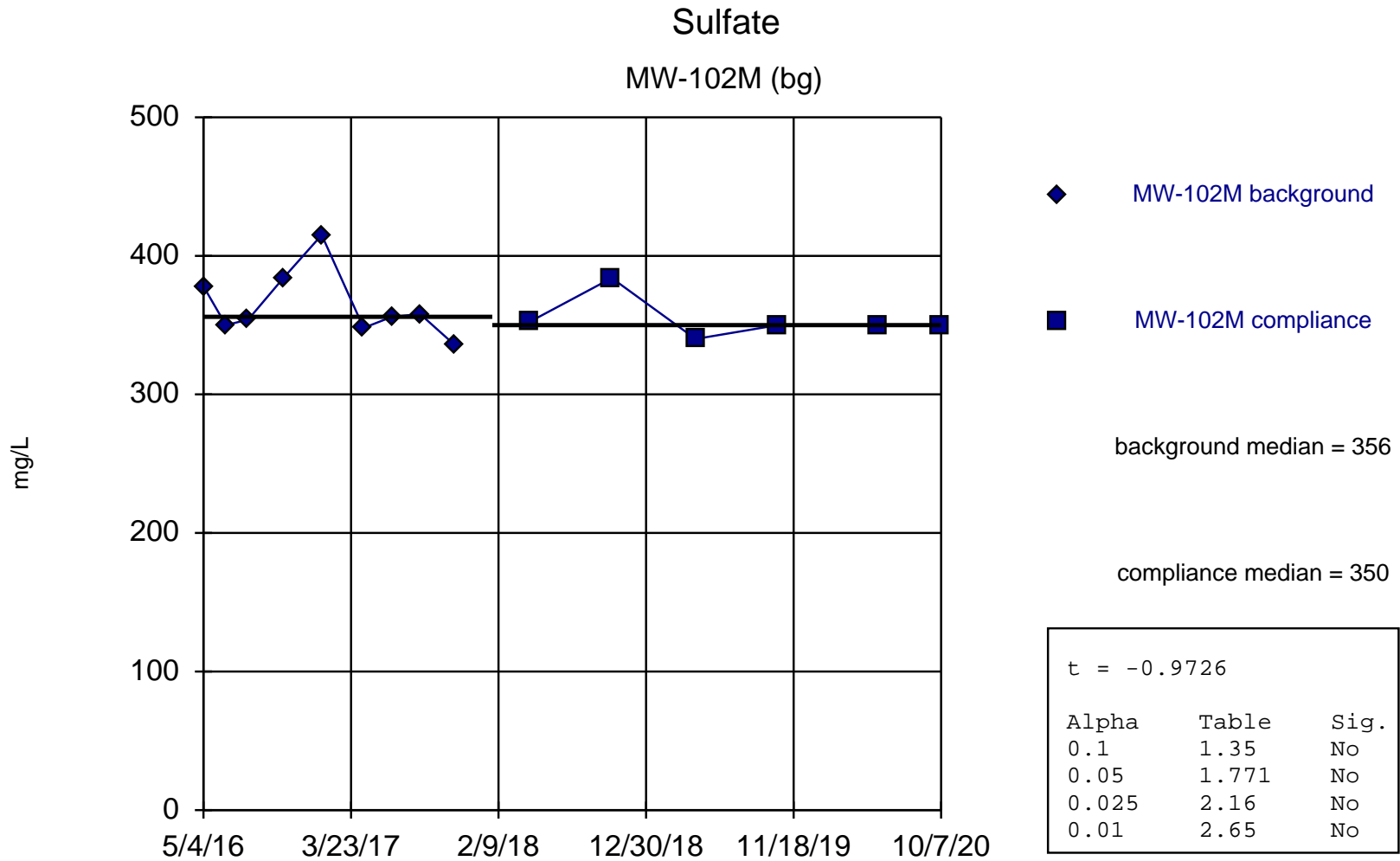
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Fluoride (mg/L) Analysis Run 1/11/2021 9:13 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M	MW-122M
5/5/2016	1.1	
6/23/2016	0.89	
8/10/2016	0.74	
10/26/2016	0.48	
1/18/2017	<0.027 (U)	
4/20/2017	0.88	
6/21/2017	1.1	
8/22/2017	0.6	
11/8/2017	0.5	
4/17/2018		<0.063 (U)
10/16/2018		<0.19 (U)
4/17/2019		0.7
10/15/2019		<0.23 (U)
5/21/2020		0.23 (J)
10/7/2020		<0.23 (U)



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8925, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

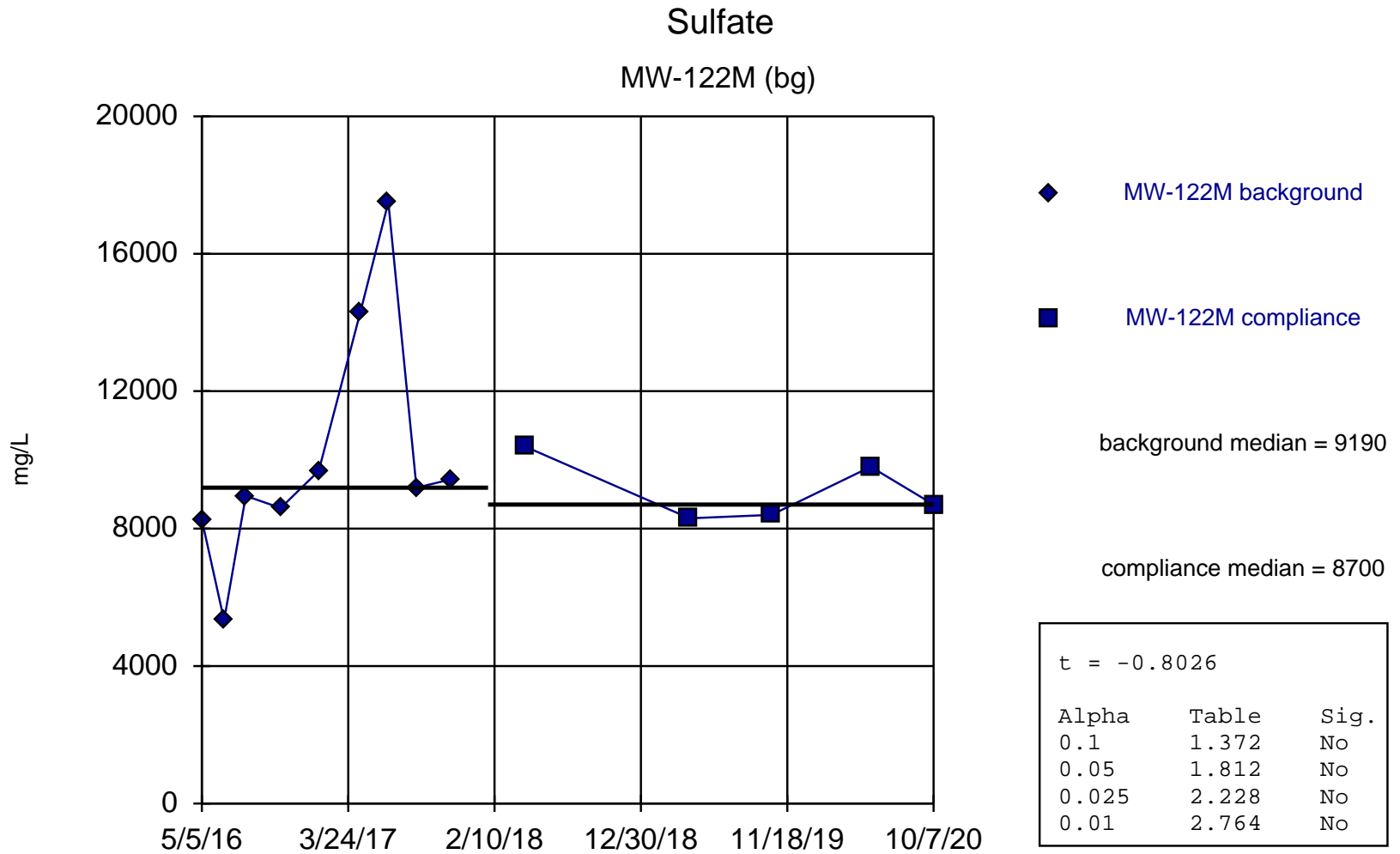
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Sulfate (mg/L) Analysis Run 1/11/2021 9:13 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	378	
6/22/2016	350	
8/10/2016	354	
10/26/2016	384	
1/18/2017	415	
4/20/2017	348	
6/21/2017	356	
8/22/2017	358	
11/8/2017	335	
4/17/2018		352
10/16/2018		384
4/18/2019		340
10/15/2019		350
5/21/2020		350
10/7/2020		350



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8507, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

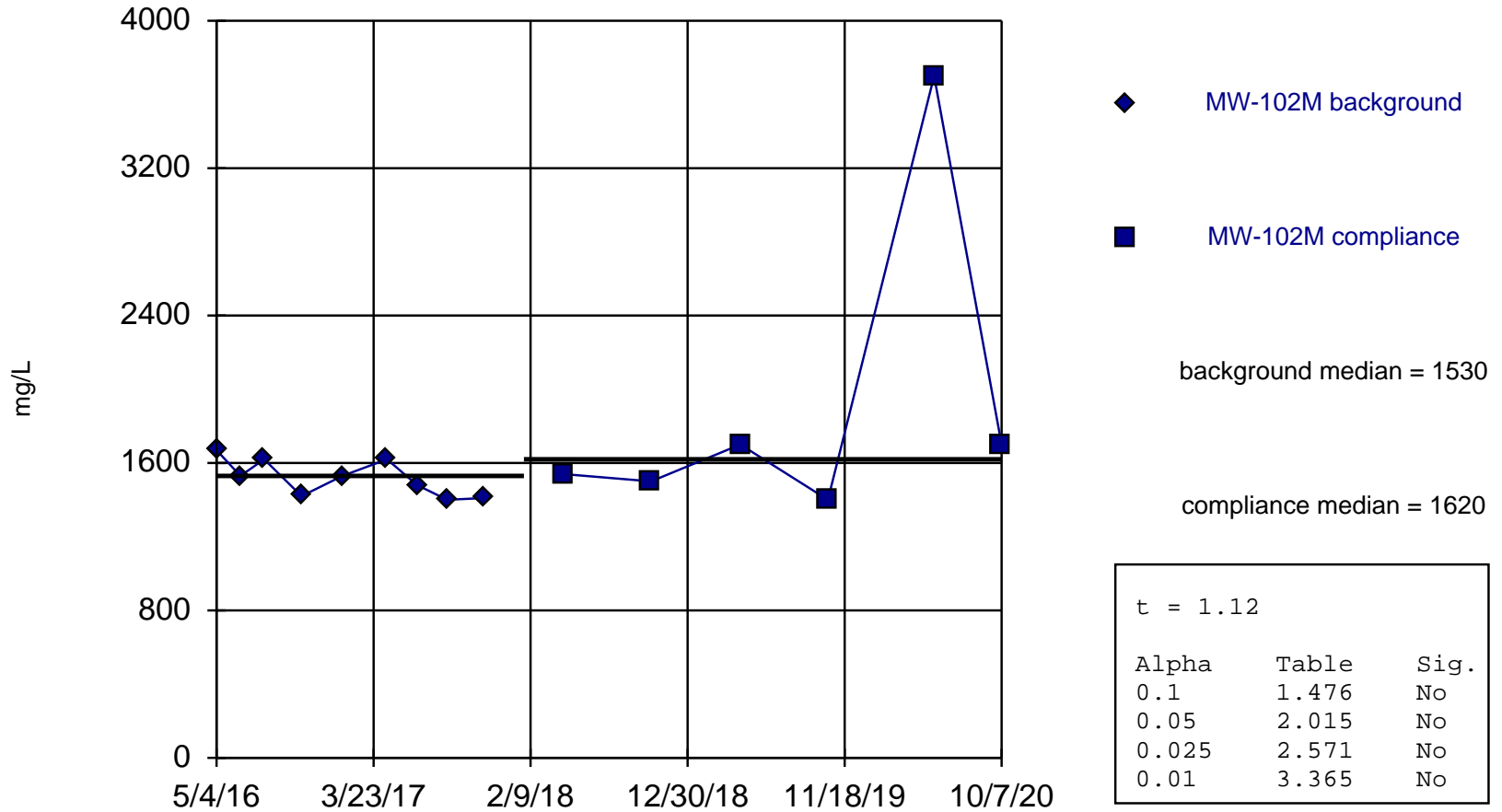
Welch's t-test

Constituent: Sulfate (mg/L) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-122M	MW-122M
5/5/2016	8260	
6/23/2016	5330	
8/10/2016	8950	
10/26/2016	8600	
1/18/2017	9680	
4/20/2017	14300	
6/21/2017	17500	
8/22/2017	9190	
11/8/2017	9440	
4/17/2018		10400
10/16/2018	<0.24 (UX)	
4/17/2019		8300
10/15/2019		8400
5/21/2020		9800
10/7/2020		8700

Total Dissolved Solids

MW-102M (bg)



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9113, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

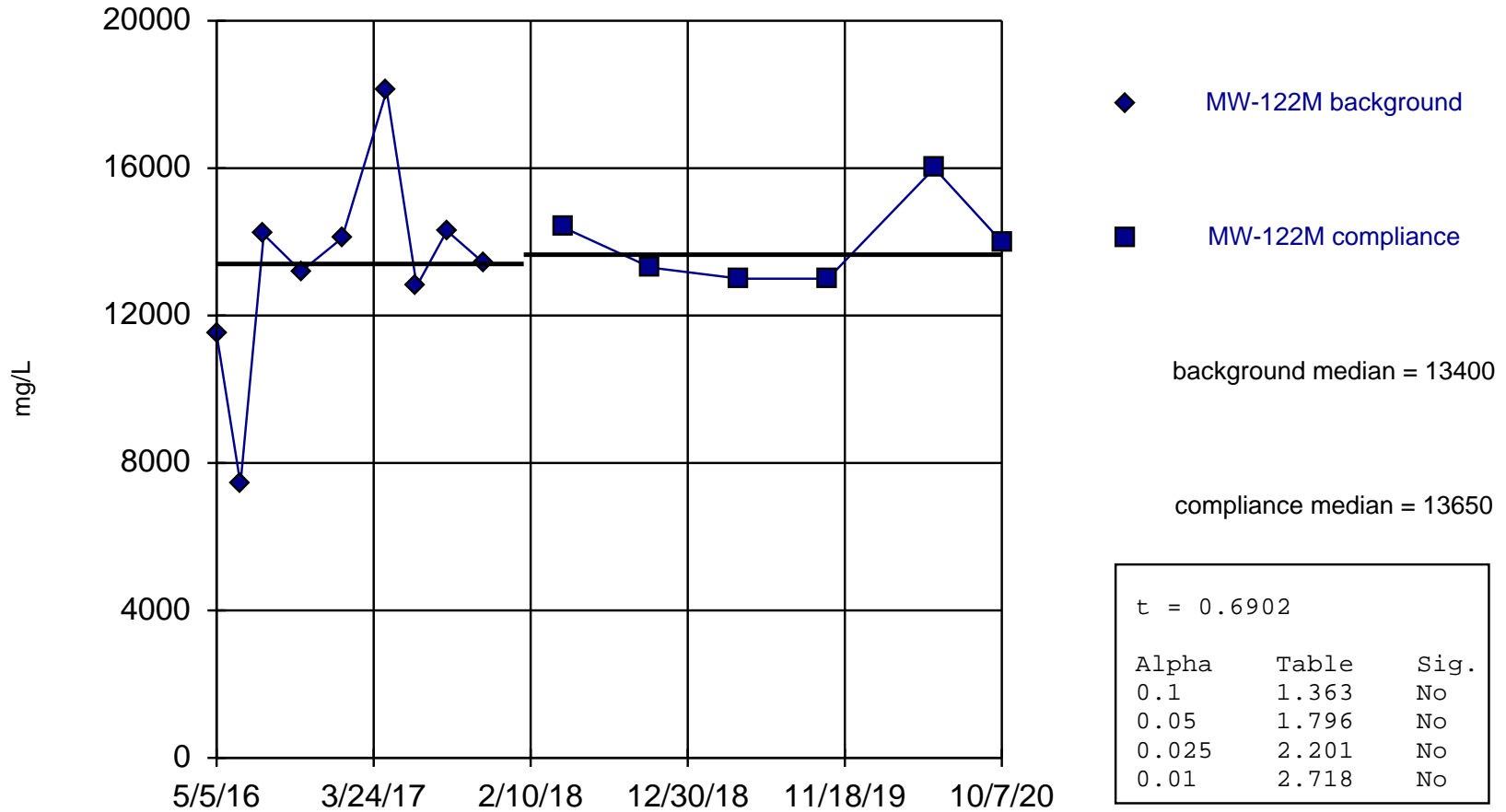
Welch's t-test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M	MW-102M
5/4/2016	1670	
6/22/2016	1530	
8/10/2016	1620	
10/26/2016	1420	
1/18/2017	1530	
4/20/2017	1620	
6/21/2017	1480	
8/22/2017	1400	
11/8/2017	1410	
4/17/2018		1540
10/16/2018		1500
4/18/2019		1700
10/15/2019		1400
5/21/2020		3700
10/7/2020		1700

Total Dissolved Solids

MW-122M (bg)



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.8996, critical = 0.829.

Welch's t-test Analysis Run 1/11/2021 9:06 PM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/11/2021 9:13 PM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

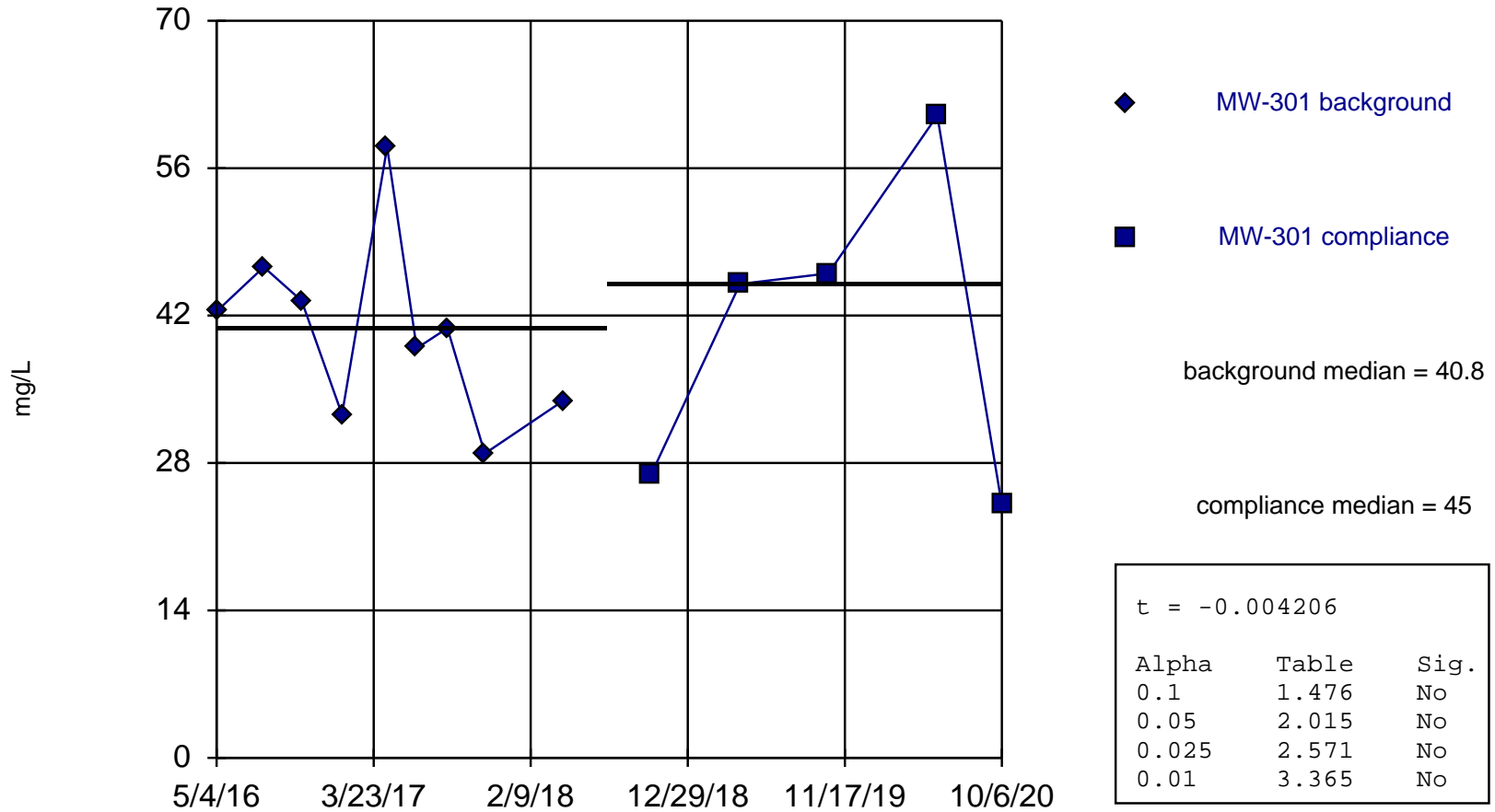
	MW-122M	MW-122M
5/5/2016	11500	
6/23/2016	7430	
8/10/2016	14200	
10/26/2016	13200	
1/18/2017	14100	
4/20/2017	18100	
6/21/2017	12800	
8/22/2017	14300	
11/8/2017	13400	
4/17/2018		14400
10/16/2018		13300
4/17/2019		13000
10/15/2019		13000
5/21/2020		16000
10/7/2020		14000

Welch's t-test/Mann-Whitney

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 1/12/2021, 10:21 AM

<u>Constituent</u>	<u>Well</u>	<u>Calc.</u>	<u>0.1</u>	<u>0.05</u>	<u>0.025</u>	<u>0.01</u>	<u>Alpha</u>	<u>Sig.</u>	<u>Bg. Wells</u>	<u>Method</u>
Chloride (mg/L)	MW-301	-0....	No	No	No	No	0.01	No	(intrawell)	Welch's
Chloride (mg/L)	MW-302	0.9502	No	No	No	No	0.01	No	(intrawell)	Welch's
Chloride (mg/L)	MW-303 (bg)	1.283	Yes	No	No	No	0.01	No	(intrawell)	Mann-W (normality)

Chloride MW-301



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9531, critical = 0.829.

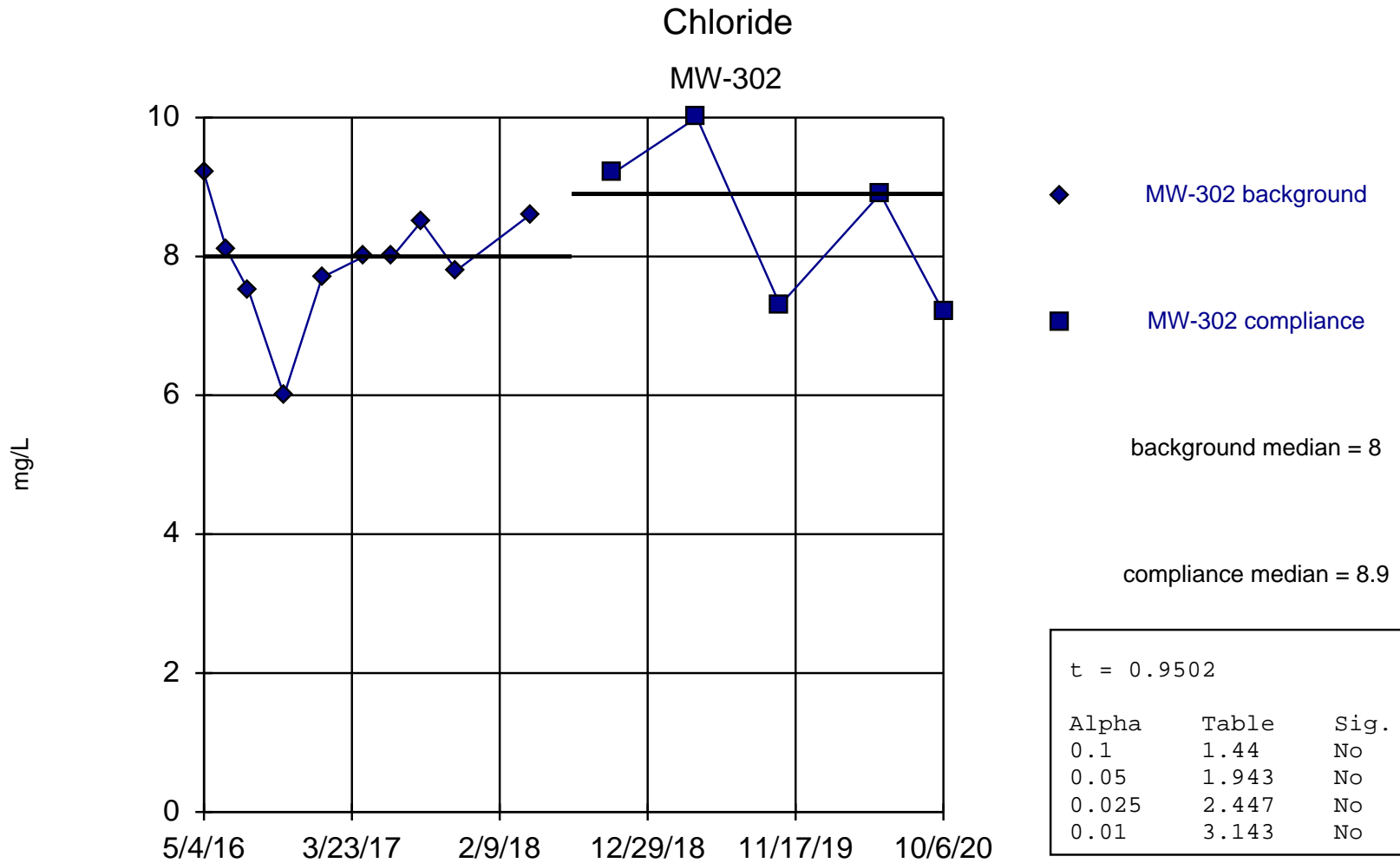
Welch's t-test Analysis Run 1/12/2021 10:19 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 10:21 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-301	MW-301
5/4/2016	42.4	
6/22/2016	112 (X)	
8/9/2016	46.6	
10/26/2016	43.4	
1/17/2017	32.6	
4/20/2017	58	
6/20/2017	38.9	
8/22/2017	40.8	
11/7/2017	28.9	
4/17/2018	33.9	
10/15/2018		26.9
4/16/2019		45
10/15/2019		46
5/26/2020		61
10/6/2020		24



Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9043, critical = 0.842.

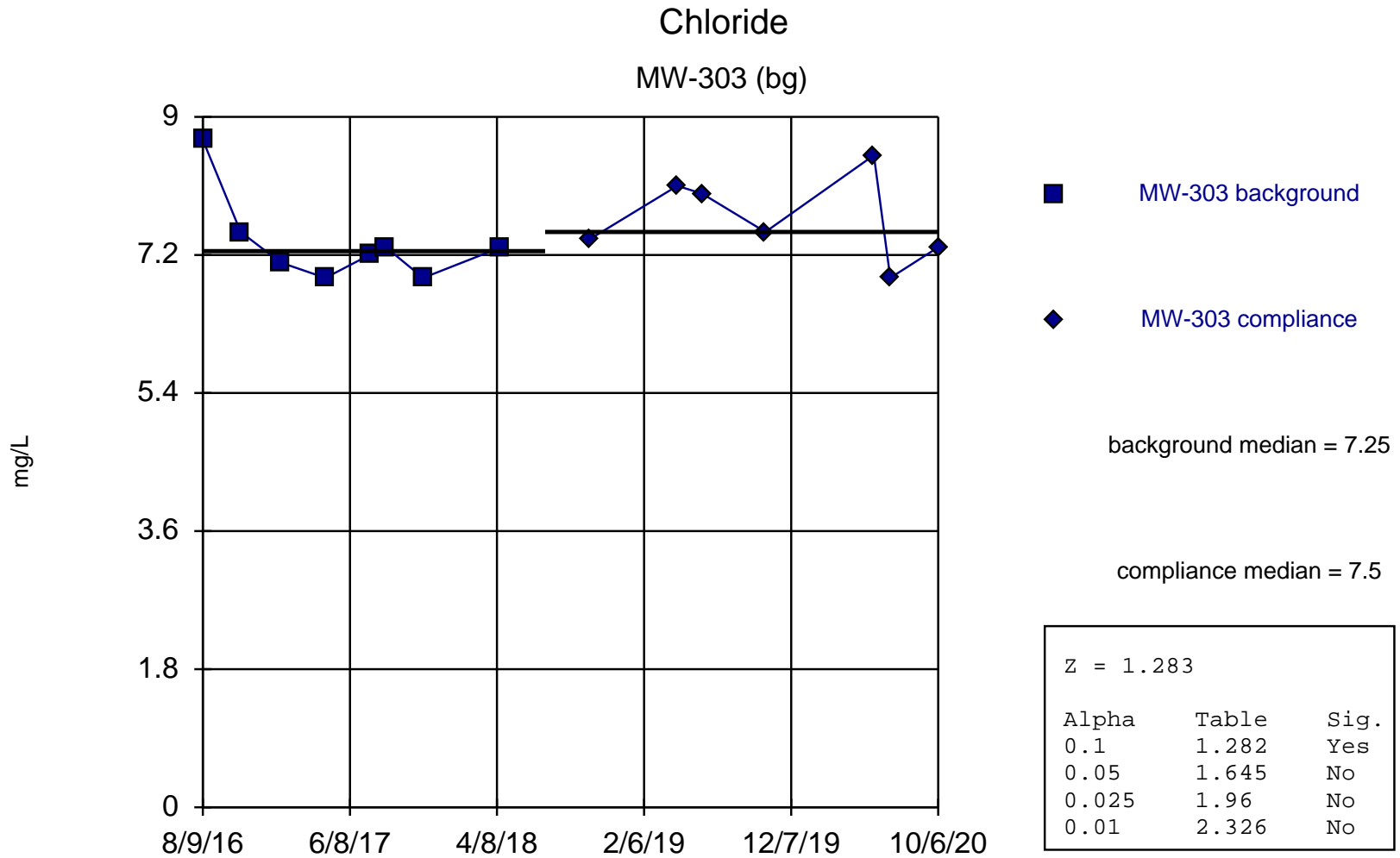
Welch's t-test Analysis Run 1/12/2021 10:19 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Welch's t-test

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 10:21 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-302	MW-302
5/4/2016	9.2	
6/22/2016	8.1	
8/10/2016	7.5	
10/26/2016	6	
1/17/2017	7.7	
4/19/2017	8	
6/20/2017	8	
8/22/2017	8.5	
11/7/2017	7.8	
4/17/2018	8.6	
10/15/2018		9.2
4/16/2019		10
10/15/2019		7.3
5/21/2020		8.9
10/6/2020		7.2



Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level.

Mann-Whitney (Wilcoxon Rank Sum) Analysis Run 1/12/2021 10:19 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 10:21 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-303	MW-303
5/4/2016	13.5 (X)	
6/22/2016	11.5 (X)	
8/9/2016	8.7	
10/26/2016	7.5	
1/17/2017	7.1	
4/19/2017	6.9	
7/19/2017	7.2	
8/22/2017	7.3	
11/7/2017	6.9	
4/17/2018	7.3	
10/16/2018		7.4
4/16/2019		8.1
6/6/2019		8
10/15/2019		7.5
5/26/2020		8.5
6/29/2020		6.9
10/6/2020		7.3

Attachment 4

Interwell Prediction Limit Analysis

Interwell Prediction Limit

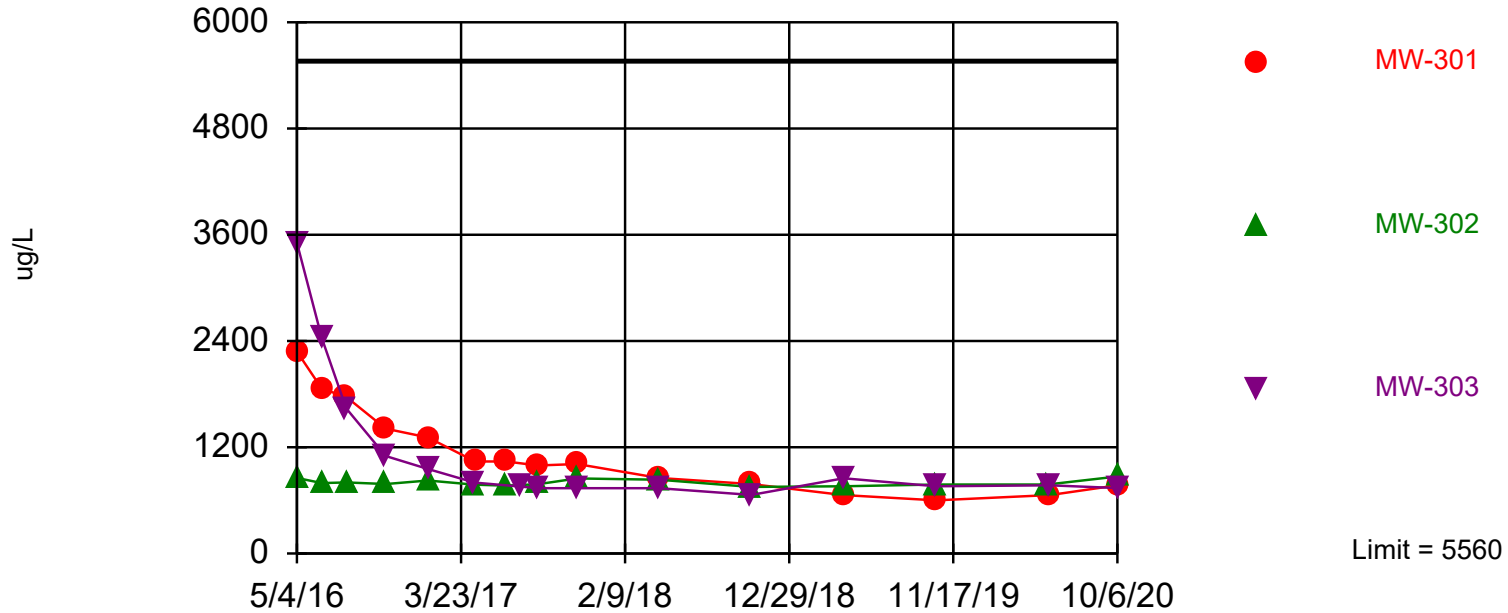
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 12/31/2020, 12:31 AM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Date</u>	<u>Observ.</u>	<u>Sig.</u>	<u>Bg N</u>	<u>Bg Wells</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron (ug/L)	MW-301	5560	n/a	10/6/2020	770	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2
Boron (ug/L)	MW-302	5560	n/a	10/6/2020	870	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2
Boron (ug/L)	MW-303	5560	n/a	10/6/2020	740	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2
Calcium (mg/L)	MW-301	599	n/a	10/6/2020	180	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Calcium (mg/L)	MW-302	599	n/a	10/6/2020	65	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Calcium (mg/L)	MW-303	599	n/a	10/6/2020	100	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Field pH (Std. Units)	MW-301	8.63	n/a	10/6/2020	7.22	No	25	MW-102M,MW-122M	7.258	0.7489	0	None	No	0.002505	Param 1 of 2
Field pH (Std. Units)	MW-302	8.63	n/a	10/6/2020	7.14	No	25	MW-102M,MW-122M	7.258	0.7489	0	None	No	0.002505	Param 1 of 2
Field pH (Std. Units)	MW-303	8.63	n/a	10/6/2020	7.01	No	25	MW-102M,MW-122M	7.258	0.7489	0	None	No	0.002505	Param 1 of 2
Fluoride (mg/L)	MW-301	5.70	n/a	10/6/2020	0.67	No	30	MW-122M,MW-102M	n/a	n/a	16.67	n/a	n/a	0.00197	NP (normality) 1 of 2
Fluoride (mg/L)	MW-302	5.70	n/a	10/6/2020	1.1	No	30	MW-122M,MW-102M	n/a	n/a	16.67	n/a	n/a	0.00197	NP (normality) 1 of 2
Fluoride (mg/L)	MW-303	5.70	n/a	10/6/2020	0.88	No	30	MW-122M,MW-102M	n/a	n/a	16.67	n/a	n/a	0.00197	NP (normality) 1 of 2
Sulfate (mg/L)	MW-301	17500	n/a	10/6/2020	620	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Sulfate (mg/L)	MW-302	17500	n/a	10/6/2020	73	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Sulfate (mg/L)	MW-303	17500	n/a	10/6/2020	230	No	29	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.002128	NP (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-301	18100	n/a	10/6/2020	1400	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-302	18100	n/a	10/6/2020	700	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-303	18100	n/a	10/6/2020	840	No	30	MW-102M,MW-122M	n/a	n/a	0	n/a	n/a	0.00197	NP (normality) 1 of 2

Within Limit

Boron

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Prediction Limit

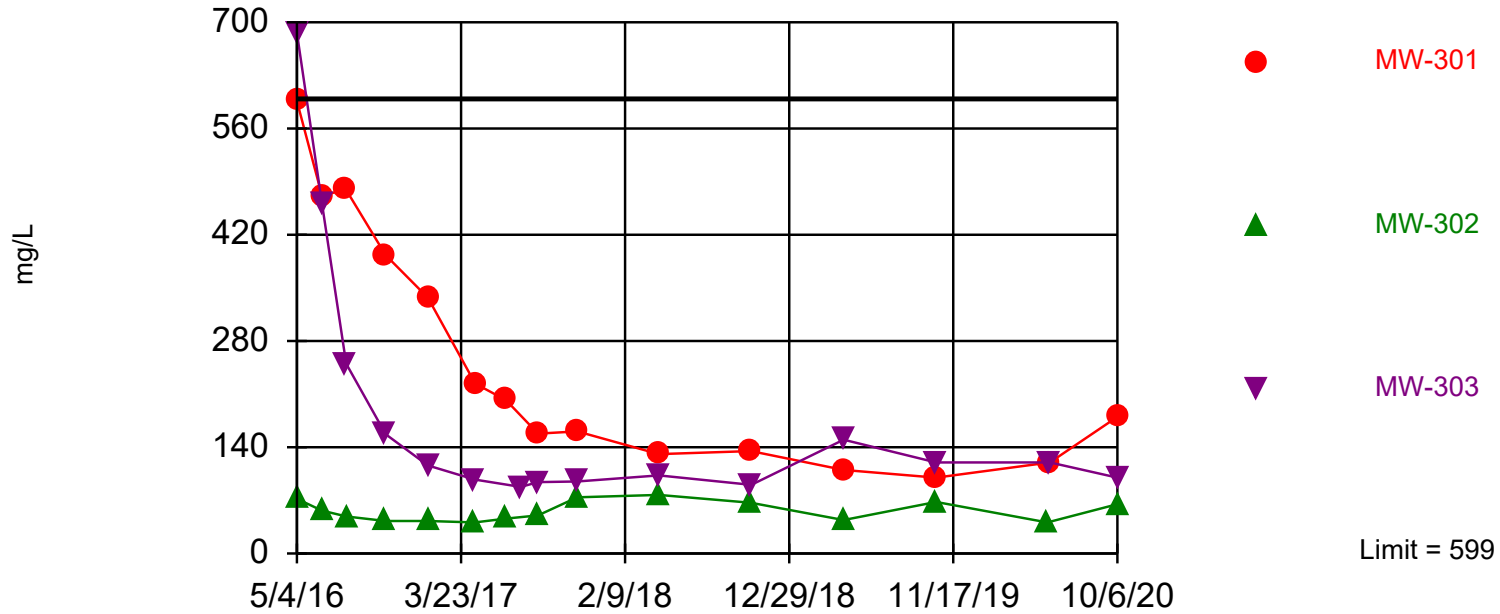
Constituent: Boron (ug/L) Analysis Run 12/31/2020 12:31 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-303	MW-302	MW-301	MW-122M (bg)
5/4/2016	1510	3510	853	2280	
5/5/2016					3140
6/22/2016	1440	2430	796	1860	
6/23/2016					1720
8/9/2016		1640		1770	
8/10/2016	1480		802		4550
10/26/2016	1420	1100	784	1410	4060
1/17/2017		955	824	1310	
1/18/2017	1480				4720
4/19/2017		800	777		
4/20/2017	1460			1040	4480
6/20/2017			767	1040	
6/21/2017	1410				4710
7/19/2017		755			
8/22/2017	1440	737	783	994	4980
11/7/2017		738	848	1010	
11/8/2017	1480				5220
4/17/2018	1550	738	834	854	5560
10/15/2018			752	784	
10/16/2018	1340	661			4580
4/16/2019		850	760	660	
4/17/2019					5500
4/18/2019	1400				
10/15/2019	1500	760	780	600	4100
5/21/2020	1500		780		5100
5/26/2020		770		660	
10/6/2020		740	870	770	
10/7/2020	1600				4100

Within Limit

Calcium Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 29 background values. Annual per-constituent alpha = 0.0127. Individual comparison alpha = 0.002128 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

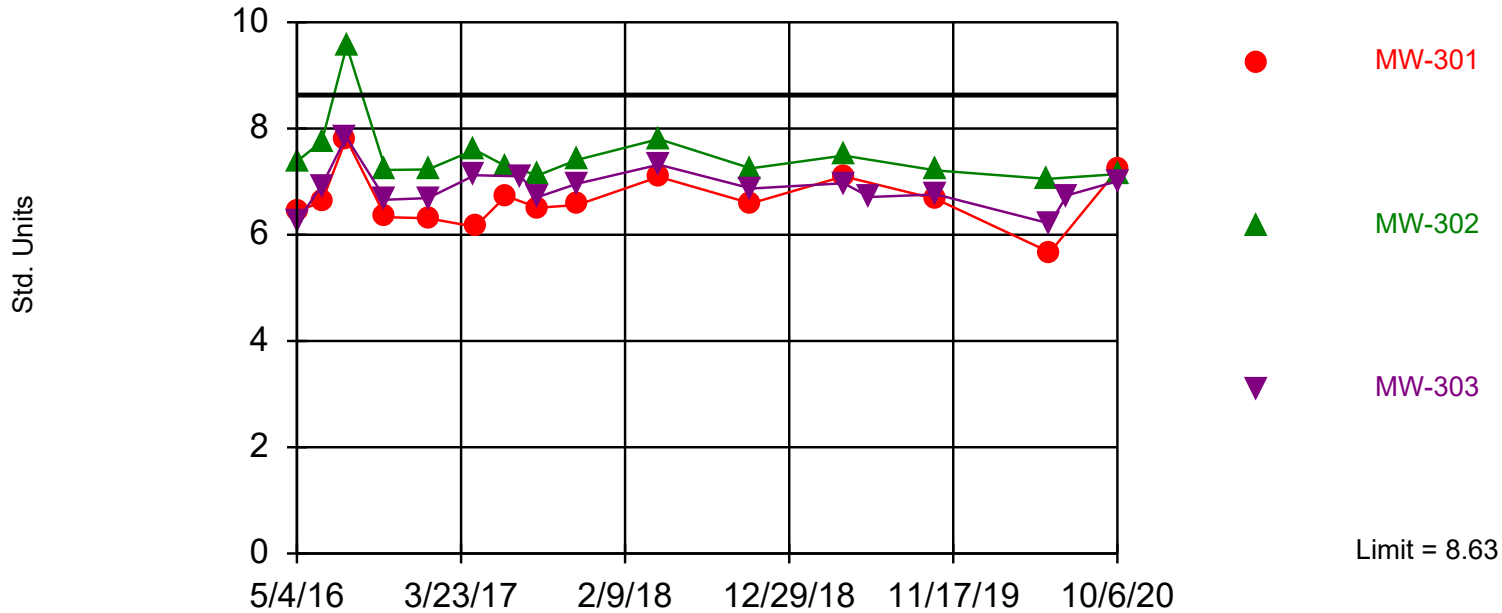
Prediction Limit

Constituent: Calcium (mg/L) Analysis Run 12/31/2020 12:31 AM
 Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-301	MW-302	MW-303	MW-122M (bg)
5/4/2016	45.9	596	72.1	686	
5/5/2016					599
6/22/2016	147	472	56.6	462	
6/23/2016					312 (X)
8/9/2016		479		250	
8/10/2016	129		48.8		419
10/26/2016	31.5	393	42.8	157	415
1/17/2017		337	42.9	116	
1/18/2017	23.6				386
4/19/2017			41	97.4	
4/20/2017	26	224			382
6/20/2017		202	46.1		
6/21/2017	67.7				386
7/19/2017				87.7	
8/22/2017	79.7	158	50.2	94	386
11/7/2017		161	74	94.9	
11/8/2017	10.4				383
4/17/2018	25.3	131	77.3	103	402
10/15/2018		135	66.9		
10/16/2018	12.9			90.5	366
4/16/2019		110	44	150	
4/17/2019					400
4/18/2019	51				
10/15/2019	14	100	68	120	400
5/21/2020	38		41		430
5/26/2020		120		120	
10/6/2020		180	65	100	
10/7/2020	150				430

Within Limit

Field pH Interwell Parametric



Background Data Summary: Mean=7.258, Std. Dev.=0.7489, n=25. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9504, critical = 0.888. Kappa = 1.834 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Comparing 3 points to limit.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Prediction Limit

Constituent: Field pH (Std. Units) Analysis Run 12/31/2020 12:31 AM

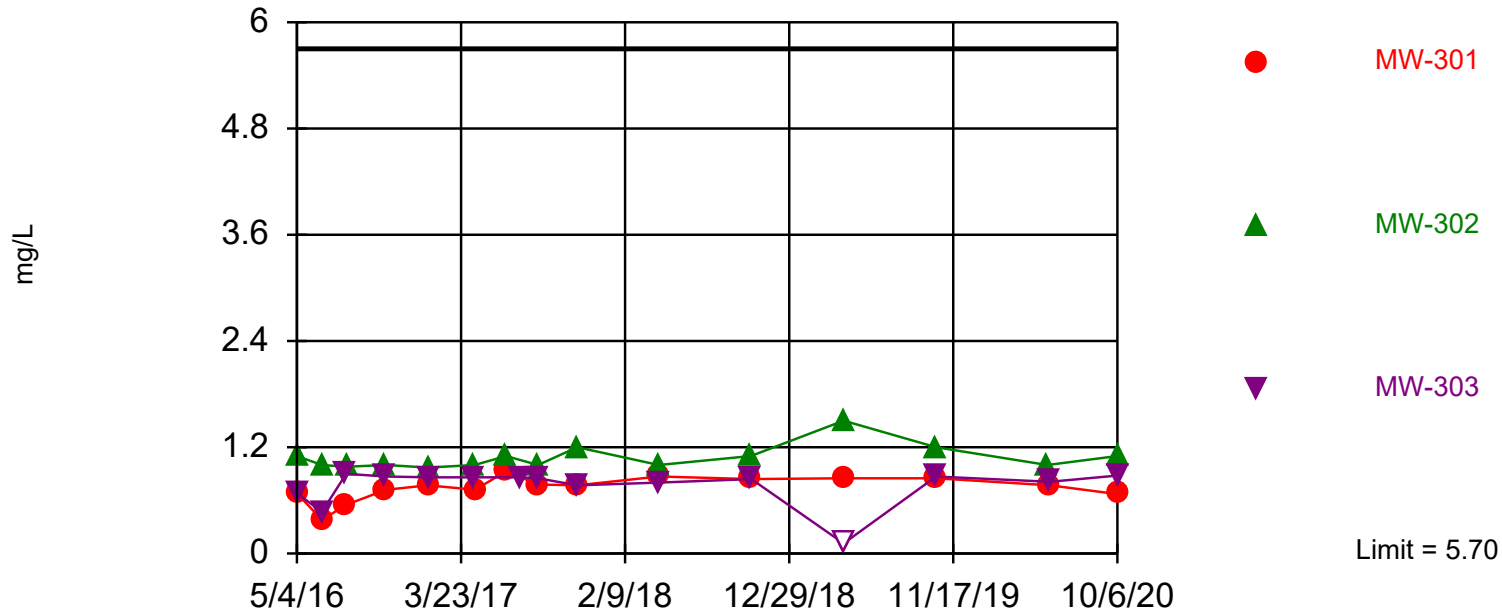
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-122M (bg)	MW-301	MW-302	MW-303
5/4/2016	8.09		6.44	7.38	6.24
5/5/2016		6.97			
6/22/2016	7.68		6.62	7.76	6.93
6/23/2016		6.68			
8/9/2016			7.81		7.84
8/10/2016				9.55	
10/26/2016			6.33	7.22	6.66
1/17/2017			6.31	7.23	6.69
1/18/2017	7.62	6.06			
4/19/2017				7.6	7.12
4/20/2017	7.35		6.15		
6/20/2017			6.73	7.29	
6/21/2017	7.64	6.42			
7/19/2017					7.1
8/22/2017	6.89	6.32	6.51	7.12	6.71
11/7/2017			6.56	7.41	6.96
11/8/2017	8.16	6.16			
4/17/2018	8.34	6.65	7.09	7.8	7.32
10/15/2018			6.59	7.25	
10/16/2018	7.8	6.31			6.87
4/16/2019			7.1	7.49	6.97
4/17/2019		7.34			
4/18/2019	8.55				
6/6/2019					6.71
10/15/2019	7.81	6.6	6.67	7.21	6.76
5/21/2020	7.82	6.91		7.05	
5/26/2020			5.67		6.21
6/29/2020					6.74
10/6/2020			7.22	7.14	7.01
10/7/2020	8.29	7			

Within Limit

Fluoride

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. 16.67% NDs. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Prediction Limit

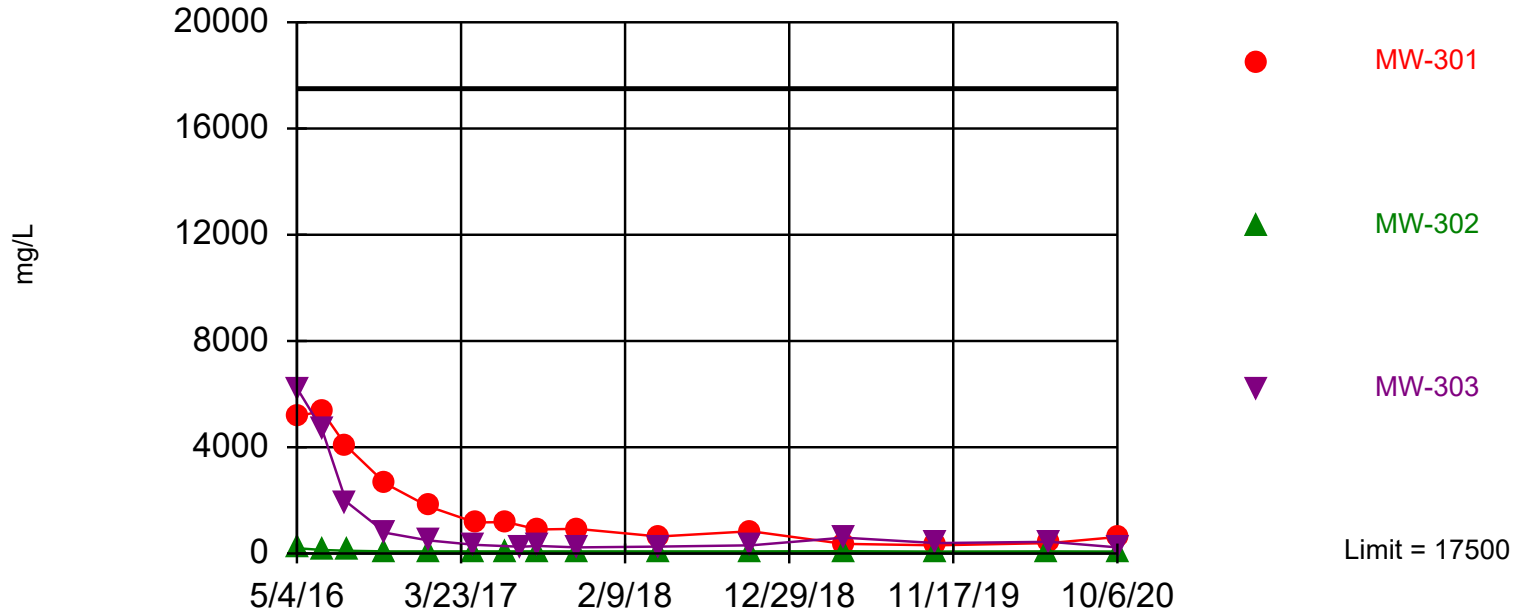
Constituent: Fluoride (mg/L) Analysis Run 12/31/2020 12:31 AM
 Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-303	MW-302	MW-301	MW-122M (bg)
5/4/2016	4.2	0.68	1.1	0.68	
5/5/2016					1.1
6/22/2016	4.2	0.47	1	0.38	
6/23/2016					0.89
8/9/2016		0.9		0.55	
8/10/2016	4.4		0.98		0.74
10/26/2016	4.6	0.87	1	0.72	0.48
1/17/2017		0.86	0.97	0.77	
1/18/2017	4.1				<0.027 (U)
4/19/2017		0.86	1		
4/20/2017	4			0.72	0.88
6/20/2017			1.1	0.93	
6/21/2017	4.6				1.1
7/19/2017		0.86			
8/22/2017	4.5	0.85	1	0.78	0.6
11/7/2017		0.77	1.2	0.77	
11/8/2017	4.6				0.5
4/17/2018	4.5	0.8	1	0.87	<0.063 (U)
10/15/2018			1.1	0.84	
10/16/2018	4.7	0.84			<0.19 (U)
4/16/2019		<0.23 (U)	1.5	0.85	
4/17/2019					0.7
4/18/2019	5.7				
10/15/2019	4.5	0.87	1.2	0.85	<0.23 (U)
5/21/2020	5		1		0.23 (J)
5/26/2020		0.81		0.77	
10/6/2020		0.88	1.1	0.67	
10/7/2020	5.3				<0.23 (U)

Within Limit

Sulfate

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 29 background values. Annual per-constituent alpha = 0.0127. Individual comparison alpha = 0.002128 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

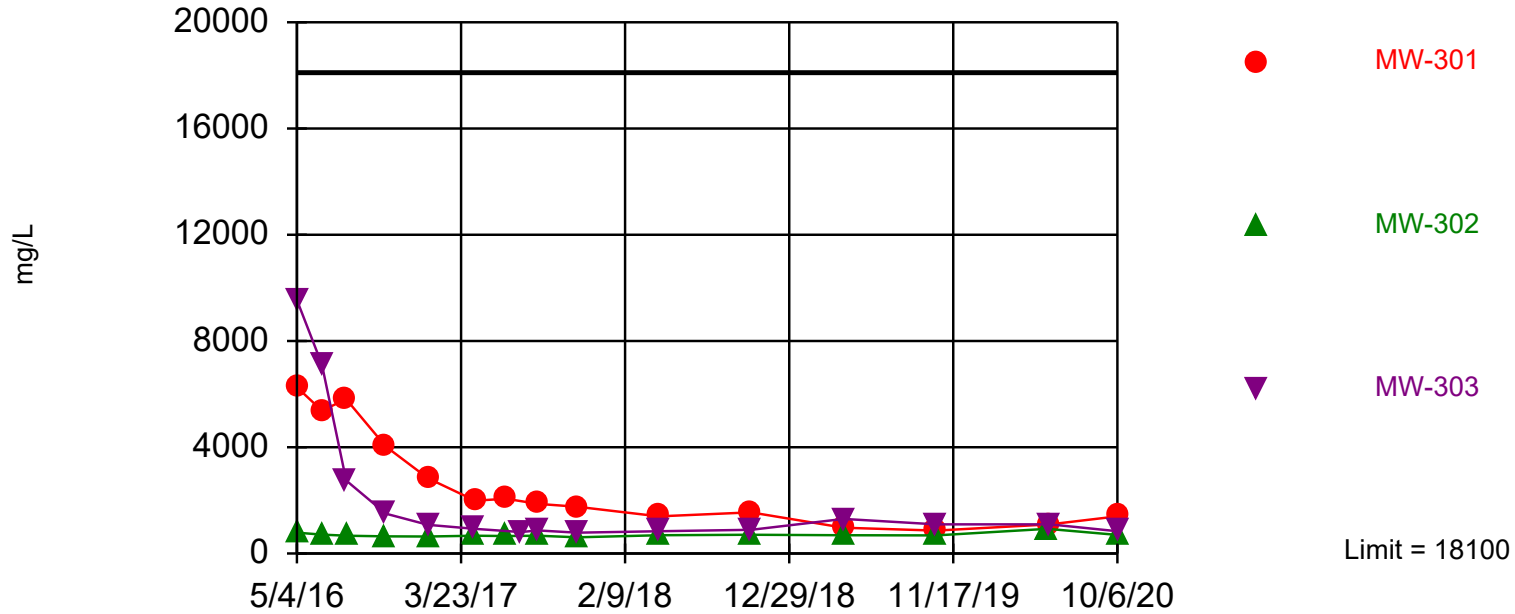
Prediction Limit

Constituent: Sulfate (mg/L) Analysis Run 12/31/2020 12:31 AM
 Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-301	MW-303	MW-302	MW-122M (bg)
5/4/2016	378	5160	6230	201	
5/5/2016					8260
6/22/2016	350	5370	4690	133	
6/23/2016					5330
8/9/2016		4050	1950		
8/10/2016	354			102	8950
10/26/2016	384	2630	780	78.9	8600
1/17/2017		1780	497	76.7	
1/18/2017	415				9680
4/19/2017			329	76.7	
4/20/2017	348	1170			14300
6/20/2017		1180		79.3	
6/21/2017	356				17500
7/19/2017			255 (255)		
8/22/2017	358	902	287	77.2	9190
11/7/2017		926	232	77.5	
11/8/2017	335				9440
4/17/2018	352	638	262	79.3	10400
10/15/2018		837		80.9	
10/16/2018	384		310		<0.24 (UX)
4/16/2019		360	600	83	
4/17/2019					8300
4/18/2019	340				
10/15/2019	350	310	390	73	8400
5/21/2020	350			79	9800
5/26/2020		390	440		
10/6/2020		620	230	73	
10/7/2020	350				8700

Within Limit

Total Dissolved Solids Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit. Seasonality was not detected with 95% confidence.

Prediction Limit Analysis Run 12/31/2020 12:29 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Prediction Limit

Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/31/2020 12:31 AM
 Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-102M (bg)	MW-303	MW-302	MW-301	MW-122M (bg)
5/4/2016	1670	9540	784	6260	
5/5/2016					11500
6/22/2016	1530	7120	715	5380	
6/23/2016					7430
8/9/2016		2750		5810	
8/10/2016	1620		671		14200
10/26/2016	1420	1500	644	4030	13200
1/17/2017		1080	639	2830	
1/18/2017	1530				14100
4/19/2017		931	671		
4/20/2017	1620			1990	18100
6/20/2017			656	2060	
6/21/2017	1480				12800
7/19/2017		809			
8/22/2017	1400	868	672	1870	14300
11/7/2017		783	607	1760	
11/8/2017	1410				13400
4/17/2018	1540	839	690	1400	14400
10/15/2018			708	1550	
10/16/2018	1500	891			13300
4/16/2019		1300	690	970	
4/17/2019					13000
4/18/2019	1700				
10/15/2019	1400	1100	680	860	13000
5/21/2020	3700		930		16000
5/26/2020		1100		1100	
10/6/2020		840	700	1400	
10/7/2020	1700				14000

Attachment 5

Intrawell Prediction Limit Analysis

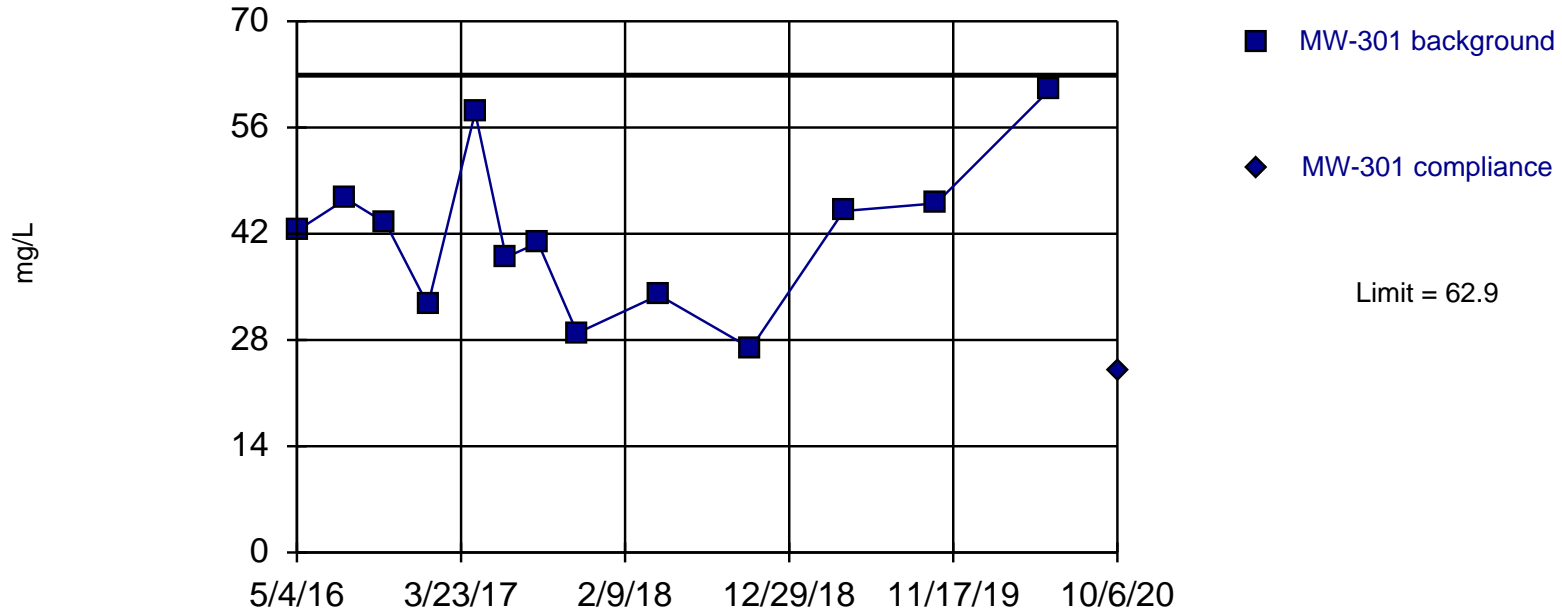
Intrawell Prediction Limit

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020 Printed 1/12/2021, 9:51 AM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Date</u>	<u>Observ.</u>	<u>Sig.</u>	<u>Bg N</u>	<u>Bg Wells</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Chloride (mg/L)	MW-301	62.9	n/a	10/6/2020	24	No	13	n/a	41.88	10.12	0	None	No	0.002505	Param 1 of 2
Chloride (mg/L)	MW-302	10.2	n/a	10/6/2020	7.2	No	14	n/a	8.2	0.9853	0	None	No	0.002505	Param 1 of 2
Chloride (mg/L)	MW-303	8.72	n/a	10/6/2020	7.3	No	14	n/a	7.521	0.586	0	None	No	0.002505	Param 1 of 2

Within Limit

Chloride Intrawell Parametric



Background Data Summary: Mean=41.88, Std. Dev.=10.12, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9513, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Prediction Limit Analysis Run 1/12/2021 9:31 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

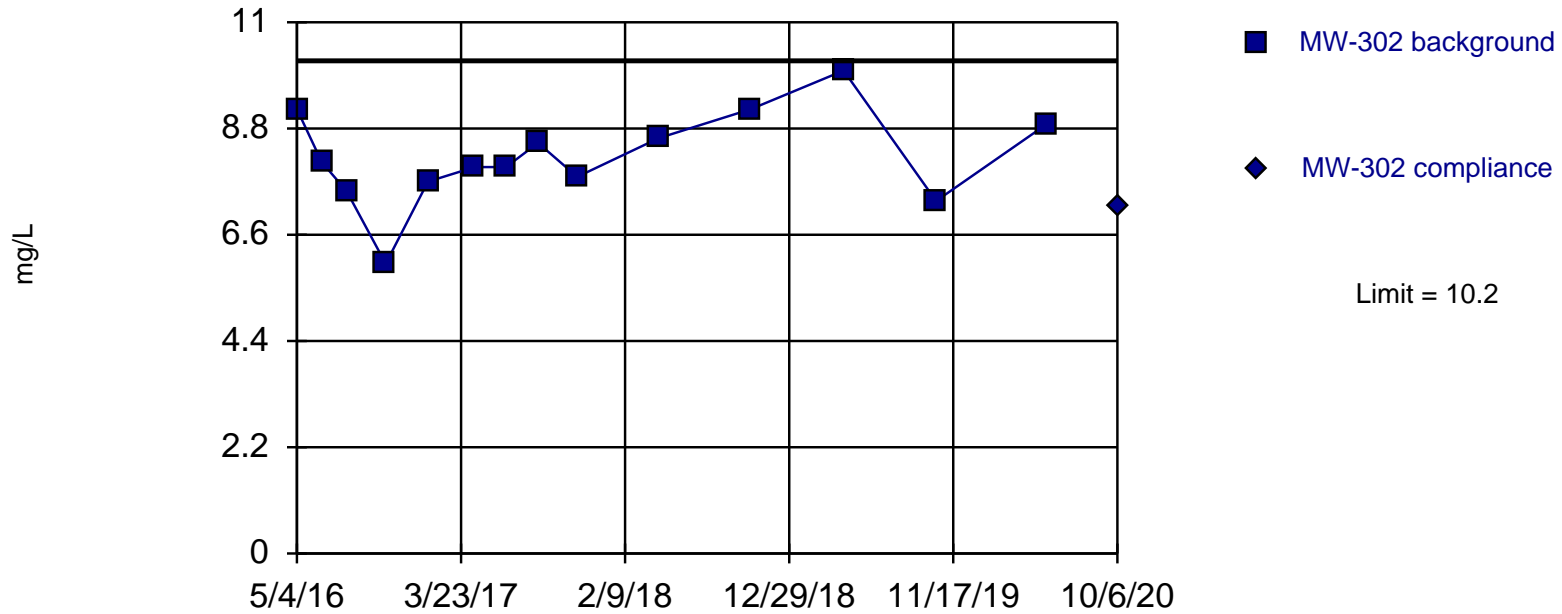
Prediction Limit

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 9:51 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-301	MW-301
5/4/2016	42.4	
6/22/2016	112 (X)	
8/9/2016	46.6	
10/26/2016	43.4	
1/17/2017	32.6	
4/20/2017	58	
6/20/2017	38.9	
8/22/2017	40.8	
11/7/2017	28.9	
4/17/2018	33.9	
10/15/2018	26.9	
4/16/2019	45	
10/15/2019	46	
5/26/2020	61	
10/6/2020		24

Within Limit

Chloride Intrawell Parametric



Background Data Summary: Mean=8.2, Std. Dev.=0.9853, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9725, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Prediction Limit Analysis Run 1/12/2021 9:31 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

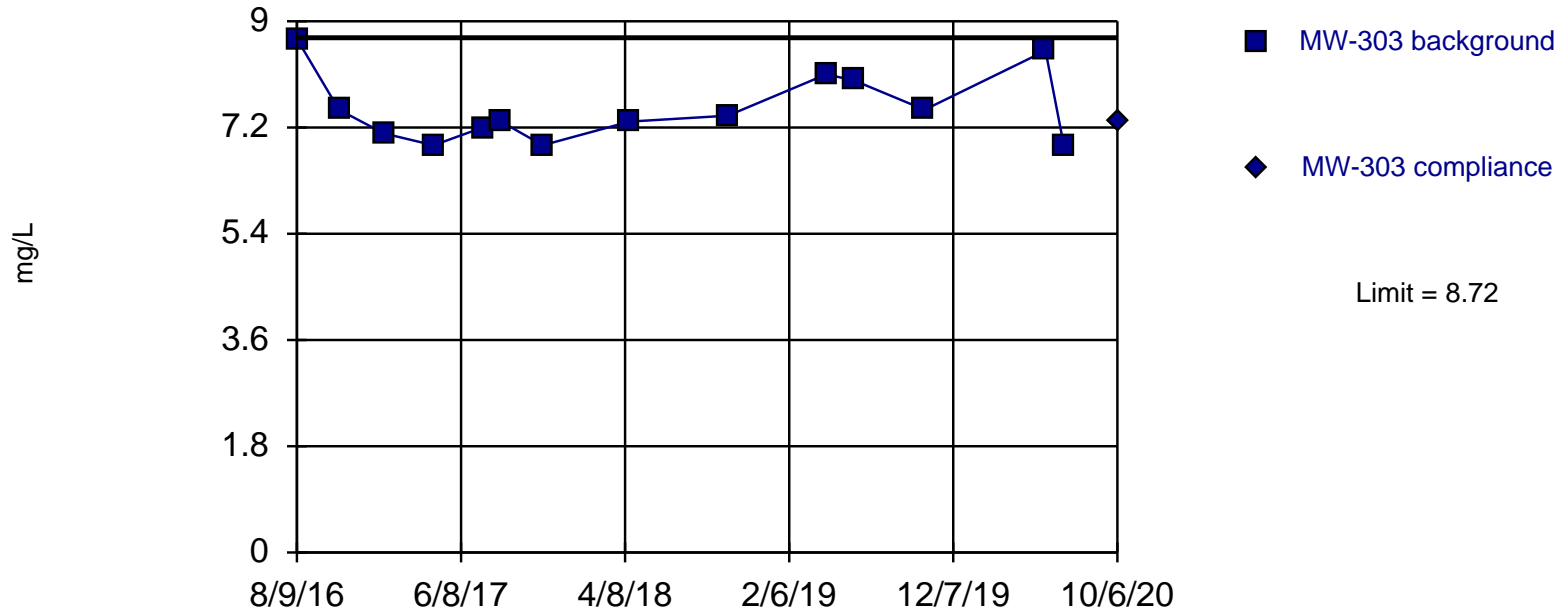
Prediction Limit

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 9:51 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-302	MW-302
5/4/2016	9.2	
6/22/2016	8.1	
8/10/2016	7.5	
10/26/2016	6	
1/17/2017	7.7	
4/19/2017	8	
6/20/2017	8	
8/22/2017	8.5	
11/7/2017	7.8	
4/17/2018	8.6	
10/15/2018	9.2	
4/16/2019	10	
10/15/2019	7.3	
5/21/2020	8.9	
10/6/2020		7.2

Within Limit

Chloride Intrawell Parametric



Background Data Summary: Mean=7.521, Std. Dev.=0.586, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.885, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Prediction Limit Analysis Run 1/12/2021 9:31 AM

Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

Prediction Limit

Constituent: Chloride (mg/L) Analysis Run 1/12/2021 9:51 AM
Ottumwa-Midland Landfill Client: SCS Engineers Data: OML- Chempoint- input-Oct2020

	MW-303	MW-303
5/4/2016	13.5 (X)	
6/22/2016	11.5 (X)	
8/9/2016	8.7	
10/26/2016	7.5	
1/17/2017	7.1	
4/19/2017	6.9	
7/19/2017	7.2	
8/22/2017	7.3	
11/7/2017	6.9	
4/17/2018	7.3	
10/16/2018	7.4	
4/16/2019	8.1	
6/6/2019	8	
10/15/2019	7.5	
5/26/2020	8.5	
6/29/2020	6.9	
10/6/2020		7.3

Appendix F

May 2020 Alternative Source Demonstration

Alternative Source Demonstration May 2020 Detection Monitoring

Ottumwa Midland Landfill
Ottumwa, Iowa

Prepared for:



SCS ENGINEERS

25220073.00 | November 12, 2020

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Table 2.	Historical Analytical Results for Parameters with SSIs
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Figure 2.	Site Plan and Monitoring Well Locations
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Appendix

Appendix A CCR Well Trend Plot - Chloride

I:\25220073.00\Deliverables\2020 May ASD\201112_ASD_OML-May20.docx

PE CERTIFICATION

 <p>11/12/20</p>	<p>I, Eric J. Nelson, hereby certify that that the information in this alternative source demonstration is accurate and meets the requirements of 40 CFR 257.94(e)(2). This certification is based on my review of the groundwater data and related site information available for the Ottumwa Midland Landfill. I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p>	
		11/12/2020
	(signature)	(date)
	Eric J. Nelson (printed or typed name)	
	<p>License number 23136</p> <p>My license renewal date is December 31, 2020.</p>	
<p>Pages or sheets covered by this seal: Alternative Source Demonstration May 2020</p>		
<p>Detection Monitoring, Ottumwa Midland Landfill, Ottumwa, Iowa</p>		

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1.0 INTRODUCTION

This Alternative Source Demonstration (ASD) was prepared to support compliance with the groundwater monitoring requirements of the “Coal Combustion Residuals (CCR) Final Rule” published by the U.S. Environmental Protection Agency (USEPA) in the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, dated April 17, 2015 (USEPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.94(e)(2). The applicable sections of the Rule are provided below in italics.

1.1 §257.94(E)(2) ALTERNATIVE SOURCE DEMONSTRATION REQUIREMENTS

The owner and operator may demonstrate that a source other than the CCR Unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels.

An ASD is completed when there are exceedances of one or more benchmark concentrations established within the groundwater monitoring program. The ASD is completed to determine if any other sources are likely causes of the identified exceedance(s) of established benchmark(s) at the site. This ASD was performed in response to results indicating a statistically significant increase (SSI) over background levels during detection monitoring under the CCR Rule.

This ASD report is evaluating the SSI observed in the statistical evaluation of the May 2020 detection monitoring event at the Ottumwa Midland Landfill (OML). The first ASD was prepared for this facility evaluating an SSI observed in the statistical evaluation of the November 2017 detection monitoring event (SCS Engineers [SCS], 2018). The November 2017 ASD concluded that several lines of evidence demonstrate that the SSI reported for chloride concentration in the compliance monitoring well was likely due to natural occurring chloride in the bedrock aquifer at OML.

As discussed in more detail in **Section 4.2** of this ASD, the findings of the May 2020 monitoring event were consistent with those for the previous event.

1.2 SITE INFORMATION AND MAP

The OML facility is located at 15300 130th Street in Ottumwa, Wappello County, Iowa (**Figure 1**). OML is an active CCR landfill, operating under Iowa Department of Natural Resources (IDNR) permit #90-SDP-8-92P.

The locations of the CCR Units and all background and compliance monitoring wells with identification numbers for the groundwater monitoring program are shown on **Figure 2**.

1.3 STATISTICALLY SIGNIFICANT INCREASES IDENTIFIED

The only SSI for the May 2020 monitoring event was for chloride at monitoring well MW-303. A summary of the May 2020 constituent concentrations and the established benchmark concentrations is provided in **Table 1**. Results from a resampling event completed in June for MW-303 are also included for comparison.

1.4 OVERVIEW OF ALTERNATIVE SOURCE DEMONSTRATION

This ASD report includes:

- Background information (**Section 2.0**)
- Evaluation of potential that SSIs are due to methodology or analysis (**Section 3.0**)
- Evaluation of potential that SSIs are due to natural sources or man-made sources other than the CCR Units (**Section 4.0**)
- ASD conclusions (**Section 5.0**)
- Monitoring recommendations (**Section 6.0**)

The chloride results from background and compliance sampling under the CCR Rule are provided in **Table 2**. The laboratory report for the May 2020 detection monitoring event will be included in the 2020 Annual Groundwater Monitoring and Corrective Action Report submitted in January 2021. Complete laboratory reports for the background monitoring events and previous detection monitoring events were included in the previous annual groundwater monitoring and corrective action reports.

2.0 BACKGROUND

To provide context for the ASD evaluation, the following background information is provided in this section of the report, prior to the ASD evaluation sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system
- Other monitoring wells

A more detailed discussion of the background information for the site is provided in the ASD for the November 2017 event (SCS, 2018).

2.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

For the purposes of groundwater monitoring, the Mississippian limestone unit is considered to be the uppermost aquifer unit at the OML site as defined under 40 CFR 257.53. Devonian aged units underlay the Mississippian limestone and are composed of shale, dolomite, and limestone. Silurian dolomite underlays the Devonian shale, dolomite, and limestone.

The Des Moines River and associated alluvial aquifers are a major source of surface water and shallow groundwater in the area; however, the alluvial aquifer is not present at the OML site.

Unconsolidated deposits at the site consist of clays overlain by loess, which are not productive sources of groundwater. The Pennsylvanian shale bedrock unit, which overlies the Mississippian limestone aquifer, is considered to be a regional aquitard. The Cambrian-Ordovician aquifer, comprised of dolomite and sandstone, is commonly the source of municipal and industrial high-capacity wells in the region (Coble, 1971).

Regional information indicates that groundwater flow within the Mississippian limestone is to the south-southeast.

2.2 COAL COMBUSTION RESIDUALS MONITORING SYSTEM

The groundwater monitoring system established under the CCR Rule consists of two background monitoring wells and three compliance monitoring wells. The background monitoring wells include MW-122M and MW-102M. The compliance monitoring wells include MW-301, MW-302, and MW-303. The CCR Rule wells are installed in the upper portions of the Mississippian limestone aquifer. Well depths range from approximately 150.0 to 204.5 feet, measured from the top of the well casing.

2.3 OTHER MONITORING WELLS

Additional groundwater monitoring wells currently exist at OML as part of the monitoring system developed for the state monitoring program. The well locations are shown on **Figure 2**.

Monitoring wells for the state monitoring program are installed in the unconsolidated deposits and in the Pennsylvanian shale unit, which are not the uppermost aquifer as defined under 40 CFR 257.53. The state monitoring system includes water table wells, piezometers in the Pennsylvanian shale, and piezometers in the underlying Mississippian limestone. Well depths range from approximately 20 to 177 feet, measured from the top of the well casing.

2.4 GROUNDWATER FLOW DIRECTION

As discussed in the November 2017 ASD (dated April 2018), shallow groundwater flow at the water table appears to be controlled partially by the landfill underdrain system and partially by the top of the Pennsylvanian shale. Shallow groundwater, near the current fill area, flows toward the landfill and the sedimentation pond.

The May 2020 potentiometric surface map for the Mississippian limestone aquifer (**Figure 3**) shows groundwater flow to the south, consistent with previous potentiometric surface maps, and the regional groundwater flow. The groundwater elevations for the May and June 2020 sampling events are shown in **Table 3**.

3.0 METHODOLOGY AND ANALYSIS REVIEW

To evaluate the potential that an SSI is due to a source other than the regulated CCR Unit, SCS used a two-step evaluation process. First, the sample collection, field and laboratory analysis, and statistical evaluation were reviewed to identify any potential error or analysis that led to exceedance of the benchmark. Second, potential alternative sources, including natural variation and man-made sources other than the CCR Unit, were evaluated. This section provides the findings of the methodology and analysis review. **Section 4.0** of this report addresses the potential alternative sources.

3.1 SAMPLING AND FIELD ANALYSIS REVIEW

Field notes and sampling results were reviewed to determine if any sampling error may have caused or contributed to the observed SSI for chloride. Potential field sampling errors or issues could include mislabeling of samples, improper sample handling, missed holding times, cross contamination during sampling, or other field error. Field blank sample results were also reviewed for any indication of potential contamination from sampling equipment or containers. Based on the review of the field notes and results, SCS did not identify any indication that the chloride SSI was due to a sampling error.

Because chloride is a laboratory parameter, there is little potential for a field analysis error to contribute to an SSI.

3.2 LABORATORY ANALYSIS REVIEW

Laboratory reports for the May 2020 detection monitoring were reviewed to determine if any laboratory analysis error or issue may have caused or contributed to the observed SSI for chloride. The laboratory report review included reviewing the laboratory quality control flags and narrative, verifying that correct methods were used and desired detection limits were achieved, and checking the field and laboratory blank sample results.

Based on the review of the laboratory reports, SCS did not identify any indication that the chloride SSI was due to a laboratory analysis error. There were no laboratory quality control flags or issues identified in the laboratory report that affect the usability of the data for detection monitoring.

Following a review of the sample results from the May 2020 event, SCS completed a retest of chloride at MW-303 in June of 2020. The chloride concentration at MW-303 did not exceed the UPL for MW-303 and does not confirm an SSI at OML. Further evaluation of the chloride SSI for MW-303 is provided in **Section 4**.

Time series plots of the analytical data for chloride were reviewed for any anomalous results that might indicate a possible sampling or laboratory error (e.g., dilution error or incorrect sample labeling). Time series plots are provided in **Appendix A**. The time series plot of chloride concentrations show the May and June events are within the historical range of chloride concentrations.

3.3 STATISTICAL EVALUATION REVIEW

The review of the statistical results and methods includes a quality control check of the following:

- Input analytical data vs. laboratory analytical reports
- Statistical method and process for each SSI

Based on the review of the statistical evaluation, SCS did not identify any errors in the statistical evaluation that caused or contributed to the determination of an intrawell SSI for chloride at well MW-303. However, the small size of the intrawell background data set and elimination of early results as outliers may have contributed to the identification of the May 2020 result as an SSI.

When detection monitoring under the CCR Rule was initiated in October 2017, the selected statistical approach was a prediction limit procedure using interwell statistics with two background wells. The interwell approach was chosen because the landfill was already active so we could not assume in advance that data collected during the background monitoring period would represent natural background. In the October 2017 and April 2018 detection monitoring events, interwell SSIs for chloride were identified for compliance well MW-301. These SSIs were attributed to natural variation in ASDs completed for these two events.

Following the completion of the April 2018 ASD, dated October 31, 2018, the statistical method for evaluating chloride data at the three compliance monitoring wells was modified to an intrawell approach. This approach is appropriate for constituents which exhibit natural spatial variability, as has been documented for chloride at the OML facility.

The intrawell upper prediction limits (UPLs) for chloride were calculated based on a parametric approach. Because the background results for compliance well MW-303 were lower than the background results for both upgradient wells, the intrawell UPL for chloride at MW-303 was lower than the previously used interwell UPL. The first three background chloride results for MW-303 were identified as outliers in the statistical analysis (Dixon's test) and were excluded from the dataset for calculation of the UPL. With these three results removed, the remaining background results for MW-303 were very consistent, resulting in a low calculated UPL that may not fully capture the natural variability of chloride concentrations at this well.

Further evaluation of the chloride SSI for MW-303 is provided in **Section 4.2**.

3.4 SUMMARY OF METHODOLOGY AND ANALYSIS REVIEW FINDINGS

In summary, there were no changes to the SSI determinations for the May 2020 monitoring event based on the methodology and analysis review, and no errors causing or contributing to the reported chloride SSI were identified. While not an error in the statistical analysis, the small dataset available to calculate the UPL likely contributed to the determination that an SSI had occurred for chloride at MW-303.

4.0 ALTERNATIVE SOURCES

This section of the report discusses the potential alternative sources for the chloride SSI at MW-303, identifies the most likely alternative source(s), and presents the lines of evidence indicating that an alternative source is the most likely cause of the observed SSI for chloride.

4.1 POTENTIAL CAUSES OF STATISTICALLY SIGNIFICANT INCREASE

4.1.1 Natural Variation

The statistical analysis for chloride was completed using an intrawell approach, comparing the May 2020 detection monitoring results to the UPLs calculated based on sampling of the background data from each monitoring well. The intrawell approach allows for spatial variability within the aquifer; however, if the background monitoring period is relatively short, it may not fully represent the temporal variability in constituent concentrations at a specific well.

Chloride is naturally present in the limestone aquifer based on observations of previous studies in the area. Based on regional and site information, discussed below, natural variation appears to be the most likely cause of the chloride SSI for well MW-303.

4.1.2 Man-made Alternative Sources

Man-made alternative sources that could potentially contribute to the chloride SSI at MW-303 include on-site management of CCR leachate or contact water, or non-CCR sources such as road salt use, septic systems, or surrounding agricultural land use. Based on the depth to the Mississippian aquifer and the low permeability of the overlying Pennsylvanian shale, it does not appear likely that one or more of these man-made alternative sources is the cause of the chloride SSI.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSI for chloride in compliance well MW-303 relative to the intrawell UPL is due to natural variability include:

1. Regional and site-specific groundwater information indicates that the observed chloride concentrations for MW-303 are within typical ranges for the Mississippian limestone aquifer and below the concentrations at the upgradient monitoring wells.
2. Other CCR indicator parameters, such as boron, were not detected at concentrations exceeding background levels in the sample from MW-303.
3. The hydraulic conductivity of the Pennsylvanian shale aquitard overlying the Mississippian limestone aquifer is very low, and there is limited hydrogeologic connection between the shallow groundwater and the aquifer.
4. Both the original landfill and expansion Phase 1 are designed with low permeability liner systems and underdrain systems that collect groundwater below the liner.

Each of these lines of evidence and the supporting data are discussed in more detail in the following sections. For lines of evidence that were discussed in detail in the ASD for the November 2017 detection monitoring event (SCS, 2018), a brief discussion is provided below, focusing on any updated information collected since the previous ASD, with references to the previous ASD for additional details.

4.2.1 Mississippian Limestone Aquifer Water Quality

Regional and site-specific information indicates that chloride concentrations in the Mississippian limestone aquifer are variable, and the concentrations detected in samples from MW-303 are well within the range of concentrations naturally present in the aquifer. The U.S. Geological Survey (USGS) completed an Open File Report 82-1014, Hydrology of Area 38, of the Western Region, Interior Coal Province of Iowa and Missouri (USGS, 1983). OML is located within the area of investigation, and a chapter from the report addressed water quality in the Mississippian limestone aquifer. The USGS investigation reported chloride concentrations ranging from 0.5 to 3,570 milligrams per liter (mg/L) for the limestone aquifer within the study area, with an average chloride concentration of 137 mg/L. The chloride concentration for MW-303 in the May 2020 detection monitoring event was 8.5 mg/L and in June, dropped to 6.9 mg/L; therefore, the observed concentration for MW-303 was well below the average concentration of chloride in the limestone aquifer.

In background sampling performed for the Phase 1 expansion, four monitoring wells installed in the Mississippian aquifer were sampled in April 2013, prior to construction of the expansion. The wells included the two wells used as background wells for the CCR Rule monitoring system (MW-102M and MW-122M) and two additional wells in the Mississippian aquifer (MW-110M and MW-116M). The chloride results for the sample event ranged from 20 to 75.8 mg/L, significantly exceeding the May and June 2020 chloride concentrations at MW-303.

The May and June 2020 chloride concentrations for samples from MW-303 were below the interwell UPL (21.9 mg/L) that was previously calculated based on the eight background monitoring events at upgradient wells MW-102M and MW-122M). The MW-303 chloride results were also lower than the May 2020 chloride results for the upgradient wells and the other two compliance wells (MW-301 and

MW-302). These findings demonstrate that the MW-303 results are at the low end of the range of natural variability for chloride concentrations in the Mississippian dolomite aquifer.

4.2.2 Leachate Versus Groundwater Concentrations

Although chloride exceeded the intrawell SSI, other CCR indicator parameters such as boron, were not detected at concentrations exceeding background levels in the sample from MW-303. In recent samples from the leachate lagoon, boron and sulfate have typically been detected at concentrations at least an order of magnitude higher than the chloride concentration. Leachate and ash contact water are monitored under the state monitoring program for the landfill. See the November 2017 ASD for additional details (SCS, 2018).

If leachate from the CCR landfill were the source of elevated chloride, then some increase in boron and sulfate relative to background would also be expected. The absence of other CCR indicator parameters with SSIs, or increasing concentration trends, suggests that the chloride SSI is due to natural variation rather than CCR disposal.

4.2.3 Overlying Pennsylvanian Shale Aquitard

The hydraulic conductivity of the Pennsylvanian shale aquitard overlying the Mississippian limestone aquifer is low, and there is limited hydrogeologic connection between the shallow groundwater and the aquifer. The lack of hydrogeologic connection is evidenced by large differences between water levels measured in wells in the unconsolidated deposits or Pennsylvanian shale and water levels measured in wells in the Mississippian limestone. Water levels in Mississippian aquifer monitoring wells MW-302 and MW-303 are approximately 40 feet below the water levels measured in adjacent Pennsylvanian shale monitoring wells MW-14 and MW-13.

4.2.4 Landfill Liner System

Both the original landfill and expansion Phase 1 have low permeability liners. The original landfill was lined with 4 feet of compacted fine-grained soil having a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). Expansion Phase 1 has a composite liner system including 2 feet of compacted clay, a 60-mil high density polyethylene (HDPE) geomembrane, and a leachate collection drainage layer. The original landfill and expansion Phase 1 both have underdrain systems that collect groundwater below the liner and maintain separation between the water table and the liner.

5.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSIONS

The lines of evidence discussed above regarding the SSI reported for the chloride concentration in downgradient monitoring well MW-303 demonstrate that the SSI is likely due to naturally occurring chloride in the limestone aquifer at the OML site.

6.0 SITE GROUNDWATER MONITORING RECOMENDATIONS

In accordance with section 257.94(e)(2) of the CCR Rule, the OML site may continue with detection monitoring based on this ASD. This ASD report will be included in the 2020 Annual Report due January 31, 2021.

7.0 REFERENCES

Coble, R.W., 1971, The Water Resources of Southeast Iowa, Iowa Geological Survey Water Atlas Number 4, 1971.

SCS Engineers, 2018, Alternative Source Demonstration November 2017 Detection Monitoring, Ottumwa Midland Landfill, Ottumwa, IA, April 2018. (2018)

U.S. Environmental Protection Agency, 2015, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 2015.

U.S. Geological Survey, 1983, Water Resources Investigations Open File Report 82-1014, Hydrogeology Area 38, Western Region, Interior Coal Province, Iowa and Missouri; Rolla, Missouri and Iowa City, Iowa, May 1983.

Tables

- 1 Groundwater Analytical Results Summary – May and June 2020 Events
- 2 Historical Analytical Results for Parameters with SSIs
- 3 Groundwater Elevation – CCR Rule Monitoring Network

**Table 1. Groundwater Analytical Results Summary - May June 2020 Events
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Parameter Name	Interwell UPL	Background Wells		Compliance Wells						
		MW-102M	MW-122M	MW-301		MW-302		MW-303		
		5/21/2020	5/21/2020	Intrawell UPL	5/26/2020	Intrawell UPL	5/21/2020	Intrawell UPL	5/26/2020	6/29/2020
Appendix III										
Boron, ug/L	5,220	1,500	5,100		660		780		770	NA
Calcium, mg/L	599	38	430		120		41		120	NA
Chloride, mg/L		16	9.0	67.0	61	10.4	8.9	7.92	8.5	6.9
Fluoride, mg/L	6.31	5.0	0.23 J		0.77		1.0		0.81	NA
Field pH, Std. Units	8.63	7.82	6.91		5.67		7.05		6.21	6.74
Sulfate, mg/L	17,500	350	9,800		390		79		440	NA
Total Dissolved Solids, mg/L	18,100	3,700	16,000		1,100		930		1,100	NA

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:

UPL = Upper Prediction Limit
DQ = Double Qualification
NA = Not Analyzed

LOQ = Limit of Quantitation
LOD = Limit of Detection
SSI = Statistically Significant Increase

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

Lab Notes:

J = Estimated concentration at or above the LOD and below the LOQ.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-102M and MW-122M for the period from May 2016 through November 2017. Interwell UPLs based on 1-of-2 retesting approach.
3. Intrawell UPL for chloride was calculated based on results from each monitoring well for the period from May 2016 through April 2018.

Created by: NDK
Last revision by: RM
Checked by: NDK
PM/Scient. QA/QC: TK

Date: 5/1/2018
Date: 9/21/2020
Date: 9/21/2020
Date: 10/28/2020

I:\25220073.00\Data and Calculations\Tables\[CCR GW Screening Summary_OML.xlsx]Table -single event

**Table 2. Historical Analytical Results for Parameters with SSIs
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Well Group	Well	Collection Date	Chloride (mg/L)
Background	MW-102M	5/4/2016	16.3
		6/22/2016	13.8
		8/10/2016	13.4
		10/26/2016	13.0
		1/18/2017	12.3
		4/20/2017	12.5
		6/21/2017	12.8
		8/22/2017	13.1
		11/8/2017	12.3
		4/17/2018	13.5
		10/16/2018	13.6
		4/18/2019	14.0
		10/15/2019	15.0
		5/21/2020	16.0
	MW-122M	5/5/2016	16.4
		6/23/2016	21.9
		8/10/2016	11.8
		10/26/2016	8.20
		1/18/2017	8.30
		4/20/2017	8.00
		6/21/2017	7.80
		8/22/2017	7.80
		11/8/2017	7.20
		4/17/2018	8.00
		10/16/2018	8.60
4/17/2019		8.80	
10/15/2019	10.0		
5/21/2020	9.00		

**Table 2. Historical Analytical Results for Parameters with SSIs
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Well Group	Well	Collection Date	Chloride (mg/L)
Compliance	MW-301	5/4/2016	4.24
		6/22/2016	112
		8/9/2016	46.6
		10/26/2016	43.4
		1/17/2017	32.6
		4/20/2017	58.0
		6/20/2017	38.9
		8/22/2017	40.8
		11/7/2017	28.9
		4/17/2018	33.9
		10/15/2018	26.9
		4/16/2019	45.0
		10/15/2019	46.0
		5/26/2020	61.0
	MW-302	5/4/2016	9.20
		6/22/2016	8.10
		8/10/2016	7.50
		10/26/2016	6.00
		1/17/2017	7.70
		4/19/2017	8.00
		6/20/2017	8.00
		8/22/2017	8.50
		11/7/2017	7.80
		4/17/2018	8.60
		10/15/2018	9.20
4/16/2019		10.0	
10/15/2019	7.30		
5/21/2020	8.90		

**Table 2. Historical Analytical Results for Parameters with SSIs
Ottumwa Midland Landfill / SCS Engineers Project #25220073.00**

Well Group	Well	Collection Date	Chloride (mg/L)
Compliance	MW-303	5/4/2016	13.5
		6/22/2016	11.5
		8/9/2016	8.70
		10/26/2016	7.50
		1/17/2017	7.10
		4/19/2017	6.90
		7/19/2017	7.20
		8/22/2017	7.30
		11/7/2017	6.90
		4/17/2018	7.30
		10/16/2018	7.40
		4/16/2019	8.10
		6/6/2019	8.00
		10/15/2019	7.50
		5/26/2020	8.50
		6/29/2020	6.90

Abbreviations:
mg/L = milligrams per liter

Created by: <u>LMH</u>	Date: <u>9/12/2019</u>
Last revision by: <u>ACW</u>	Date: <u>8/31/2020</u>
Checked by: <u>AJR</u>	Date: <u>8/31/2020</u>
Scientist QA/QC: <u>NDK</u>	Date: <u>9/30/2020</u>

I:\25220073.00\Data and Calculations\Tables\[ASD-2_Appendix III Constituents with SSIs.xlsx]GW Natural Attenuation

**Table 3. Groundwater Elevation - CCR Rule Monitoring Network
Ottumwa-Midland Landfill / SCS Engineers Project #25220073.00**

Depth to Water in feet below top of well casing					
Raw Data	MW-301	MW-302	MW-303	MW-102M	MW-122M
Measurement Date					
May 4, 2016	131.42	75.97	76.36	69.30	63.43
June 22, 2016	131.48	75.98	74.68	79.29	67.03
August 9, 2016	131.69	76.29	74.63	82.38	67.54
October 25-26, 2016	134.18	76.83	76.84	81.09	68.09
January 17, 2017	132.31	76.09	76.80	80.12	68.68
April 19-20, 2017	132.16	77.04	76.89	80.23	68.66
June 20-21, 2017	132.00	77.01	76.81	83.20	69.19
July 17, 2017	NM	NM	77.48	NM	NM
August 21-22, 2017	132.92	77.88	77.70	84.80	70.68
November 7-8, 2017	133.38	78.39	78.14	84.50	72.18
April 16-18, 2018	133.03	77.90	77.72	80.65	69.45
October 15-16, 2018	133.30	78.25	78.07	80.98	69.34
April 16-17, 2019	131.50	76.42	76.27	80.06	69.27
June 6, 2019	NA	NA	76.35	NA	NA
August 7, 2019	NA	NA	NA	86.03	72.28
October 14-15, 2019	131.32	76.33	76.32	82.53	83.76
May 20-26, 2020	130.59	75.52	75.26	80.42	68.47
June 29, 2020	NA	NA	75.04	NA	NA
October 5-6, 2020	131.08	75.91	76.05	85.98	74.31

Ground Water Elevation in feet above mean sea level (amsl)					
Well Number	MW-301	MW-302	MW-303	MW-102M	MW-122M
Top of Casing Elevation (feet amsl)	817.88	761.77	762.40	798.03	792.70
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0
Total Depth (ft from top of casing)	204.5	157.7	150.0	152.1	155.3
Top of Well Screen Elevation (ft)	618.38	609.07	617.40	652.65	642.94
Measurement Date					
May 4, 2016	686.46	685.80	686.04	728.73	729.27
June 22, 2016	686.40	685.79	687.72	718.74	725.67
August 9, 2016	686.19	685.48	687.77	715.65	725.16
October 25-26, 2016	683.70	684.94	685.56	716.94	724.61
January 17, 2017	685.57	685.68	685.60	717.91	724.02
April 19-20, 2017	685.72	684.73	685.51	717.80	724.04
June 20-21, 2017	685.88	684.76	685.59	714.83	723.51
July 17, 2017	NM	NM	684.92	NM	NM
August 21-22, 2017	684.96	683.89	684.70	713.23	722.02
November 7-8, 2017	684.50	683.38	684.26	713.53	720.52
April 16-18, 2018	684.85	683.87	684.68	717.38	723.25
October 15-16, 2018	684.58	683.52	684.33	717.05	723.36
April 16-17, 2019	686.38	685.35	686.13	717.97	723.43
June 6, 2019	NA	NA	686.05	NA	NA
August 7, 2019	NA	NA	NA	712.00	720.42
October 14-15, 2019	686.56	685.44	686.08	715.50	708.94
May 20-26, 2020	687.29	686.25	687.14	717.61	724.23
June 29, 2020	NA	NA	687.36	NA	NA
October 5-6, 2020	686.80	685.86	686.35	712.05	718.39
Bottom of Well Elevation (ft)	613.38	604.07	612.40	645.93	637.40

Notes:
NM = not measured

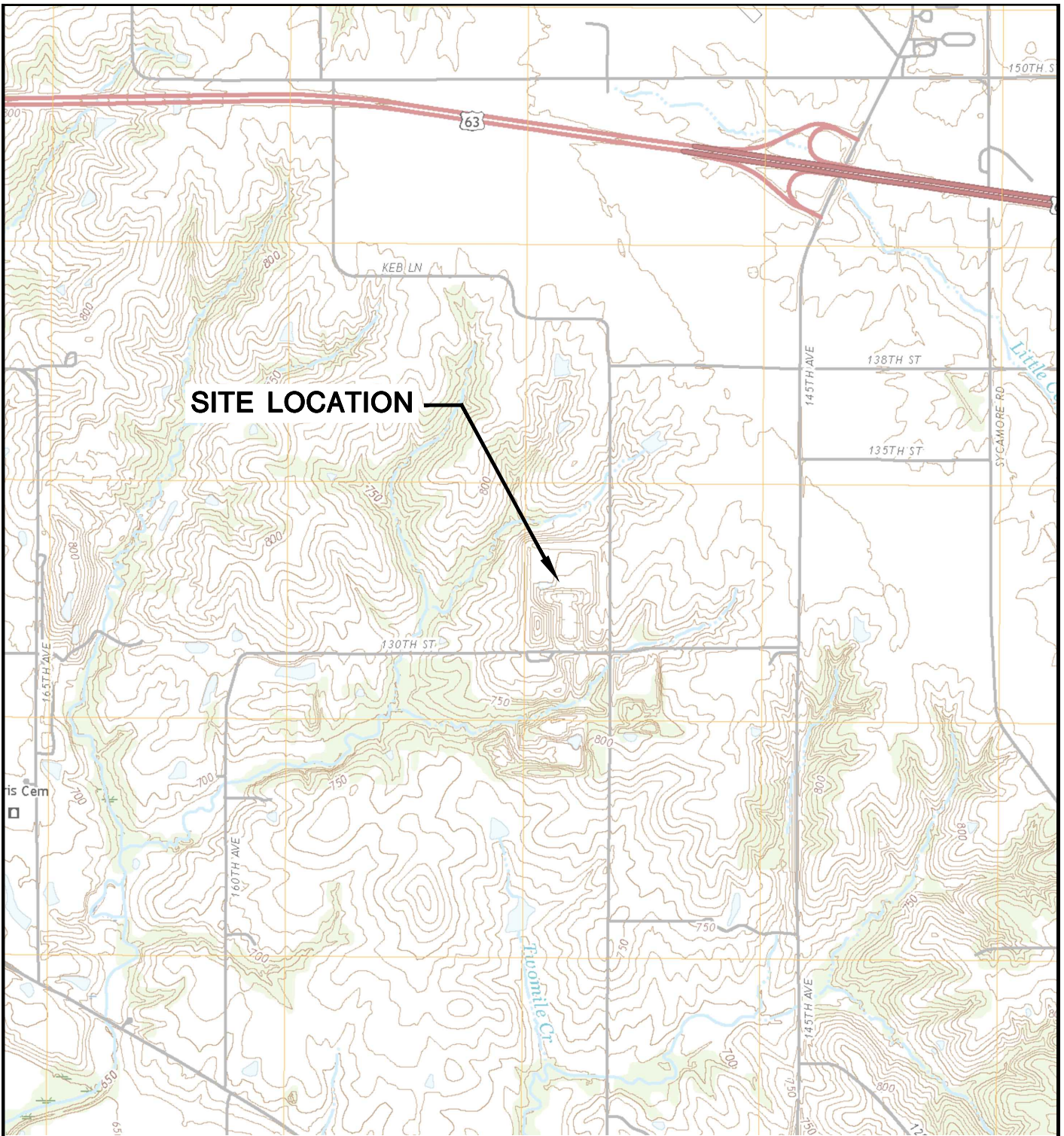
Created by: KAK
Last rev. by: RM
Checked by: ACW

Date: 5/1/2017
Date: 10/22/2020
Date: 10/22/2020

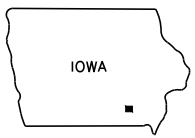
I:\25220073.00\Data and Calculations\Tables\[wlstat_OML_CCR_wells.xls]levels

Figures

- 1 Site Location Map
- 2 Site Plan and Monitoring Well Locations
- 3 Potentiometric Surface Map – May 20-26, 2020

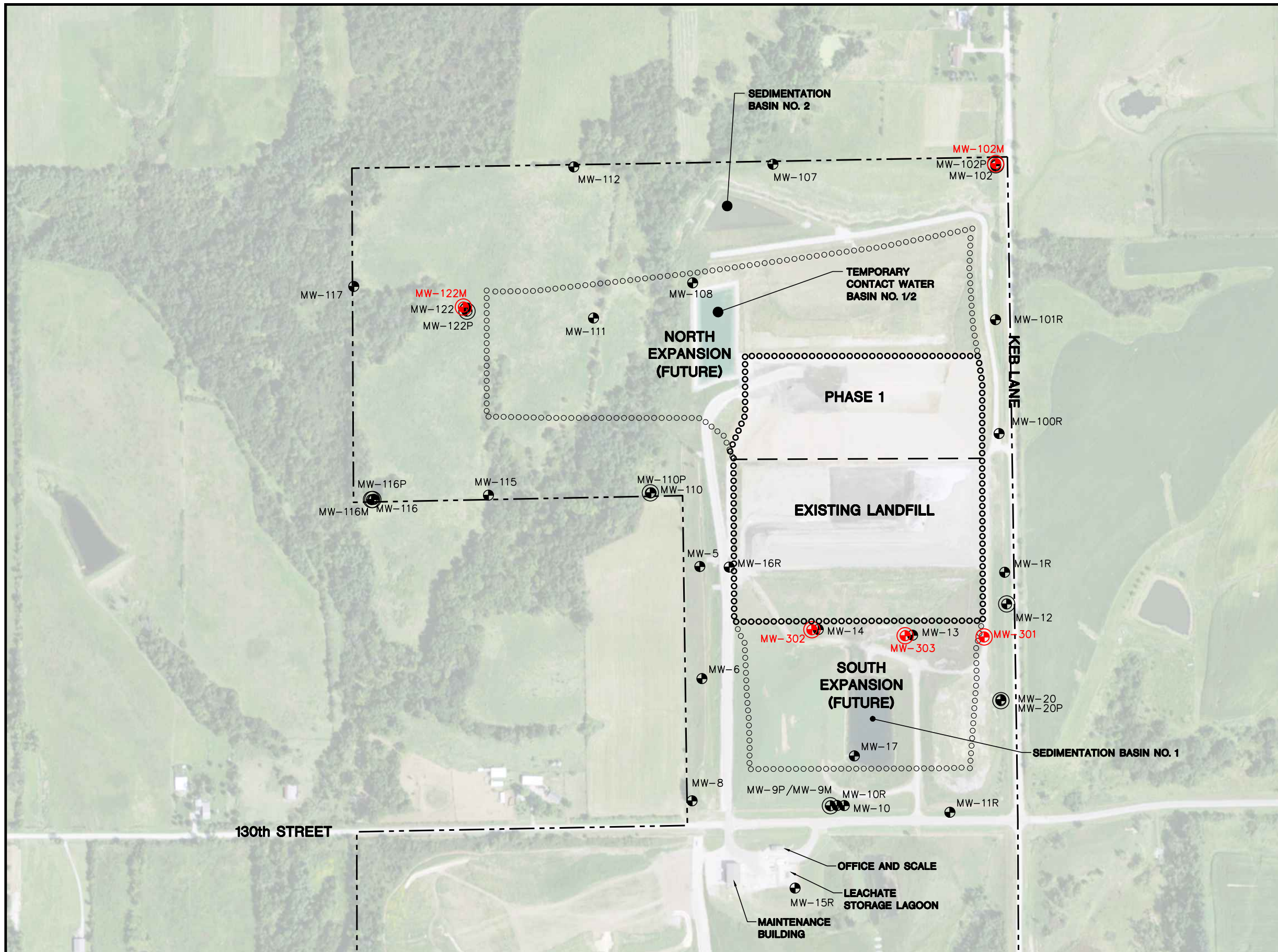


OTTUMWA NORTH QUADRANGLE
 IOWA-WAPELLO CO.
 7.5 MINUTE SERIES (TOPOGRAPHIC)
 2018
 SCALE: 1" = 2,000'



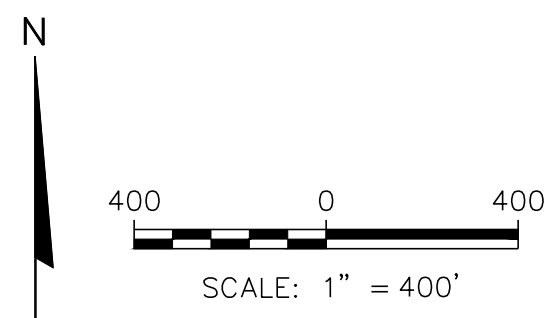
CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501		SITE	ALLIANT ENERGY OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA		ENGINEER	SITE LOCATION MAP		
	PROJECT NO.	252519073.00		DRAWN BY:	BSS		SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE	1
	DRAWN:	11/18/2019		CHECKED BY:	MDB				
REVISED:	01/13/2020	APPROVED BY:	TK 01/30/2020						

I:\25219073.00\Drawings\CCR 2019 Annual Report\Site Location Map.dwg, 1/30/2020 3:56:54 PM



- LEGEND**
- APPROXIMATE PROPERTY LINE
 - EXISTING WASTE LIMITS
 - PERMITTED WASTE LIMITS
 - ⊕ CCR RULE PIEZOMETER
 - ⊙ MONITORING WELL
 - ⊕ ADDITIONAL PIEZOMETER

- NOTES:**
1. 2015 AERIAL PHOTOGRAPH IS FROM THE IOWA GEOGRAPHIC MAP SERVER-IOWA STATE UNIVERSITY GEOGRAPHIC INFORMATION SYSTEMS SUPPORT & RESEARCH FACILITY.
 2. PROPERTY LINE SOUTH OF 130TH STREET FROM SURVEY MAP PREPARED BY GARDEN & ASSOCIATES, OSKALOOSA, IOWA, DATED DECEMBER 20, 1988.
 3. PROPERTY LINE NORTH OF 130TH STREET FROM PLAT OF SURVEY MAP PREPARED BY SCS ENGINEERS, MADISON, WISCONSIN, DATED FEBRUARY 20, 2013.
 4. EXISTING LIMITS OF WASTE ARE APPROXIMATE.
 5. MONITORING WELLS MW-301 AND MW-302 WERE INSTALLED BY CASCADE DRILLING BETWEEN NOVEMBER 16, 2015, AND DECEMBER 3, 2015.
 6. MONITORING WELL MW-303 WAS INSTALLED BY TEAM SERVICES BETWEEN APRIL 11, 2016 AND APRIL 26, 2016.



PROJECT NO. 25219073.00	DRAWN BY: BSS	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT	INTERSTATE POWER AND LIGHT CO. 15300 130TH STREET OTTUMWA, IA 52501	SITE	ALLIANT ENERGY OTTUMWA MIDLAND LANDFILL OTTUMWA, IOWA	SITE PLAN AND MONITORING WELL LOCATIONS	FIGURE
DRAWN: 11/18/2019	CHECKED BY: MDB								2
REVISED: 01/30/2020	APPROVED BY: TK 01/30/2020								

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Appendix A
CCR Well Trend Plot – Chloride

