



July 13, 2021

Mr. Kurt Fritz, P.G.
Pennsylvania Department of
Environmental Protection
South Central Regional Office
909 Elmerton Avenue
Harrisburg, Pennsylvania 17110

**Re: Second Quarter 2021 Environmental Monitoring Report
Lancaster Landfill, Facility ID# 101559
Mount Joy Township, Lancaster County, Pennsylvania**

Dear Mr. Fritz:

Enclosed is a compact disk containing analytical data and completed Pennsylvania Department of Environmental Protection (DEP) Forms for the 2nd Quarter 2021 Environmental Monitoring Report for the Lancaster Landfill.

Sampling and analysis was performed by Geochemical Testing, Inc. Civil & Environmental Consultants, Inc. reviewed the data and prepared the Letter Report.

Should you have any questions or require any additional information, please contact me at (215) 269-2251.

Respectively Submitted,

A handwritten signature in blue ink, appearing to read 'Jeff Shanks'.

Jeff Shanks, P.G.
Waste Management
Environmental Protection

Enclosure



**LANCASTER LANDFILL
MOUNT JOY TOWNSHIP, LANCASTER COUNTY, PENNSYLVANIA
PADEP I.D. NO. 101559**

**SECOND QUARTER 2021
ENVIRONMENTAL MONITORING REPORT**

**Submitted:
July 2021**

**Prepared by:
Civil & Environmental Consultants, Inc.
4350 Northern Pike, Suite 141
Monroeville, Pennsylvania 15146
CEC Project 306-896**

TABLE OF CONTENTS

	<u>Page</u>
1.0	Introduction.....1
1.1	Scope and Purpose1
1.2	Site Description and Background1
2.0	Geology and Hydrogeology.....2
2.1	Regional Geology2
2.2	Local Geology.....2
2.3	Site Hydrogeology2
2.3.1	New Oxford Formation Hydrostratigraphic Unit3
3.0	Field Program, Monitoring Results, and Discussion4
3.1	Visual Well Inspections4
3.2	Well and Surface Water Monitoring Network and Groundwater Elevation Measurements4
3.2.1	Well and Surface Water Monitoring Network.....4
3.2.2	Groundwater Elevation Measurements.....5
3.3	Groundwater Gradient and Flow Velocity.....5
3.4	Sampling and Analytical Program6
3.4.1	Field Program.....6
3.4.2	Laboratory Analysis and Monitoring Parameters6
3.5	Analytical Program Results6
3.6	Geochemical Analyses.....7
3.6.1	Time-Series Analysis7
3.6.1.1	New Oxford Formation.....7
3.7	Surface Water Analysis.....8
3.8	Leachate Analysis8
3.9	Methane Probe Monitoring Results9
3.10	Dust Fall Results.....9
4.0	Laboratory and Field Quality Assurance and Quality Control11
4.1	Holding Times11
4.2	Sample Surrogate Recoveries11
4.3	Method Blanks11
4.4	Laboratory Control Spikes.....11
4.5	Initial Calibration, Continuing Calibration, and Internal Machine Standards12
5.0	Conclusions.....13
6.0	References.....15

LIST OF TABLES

1. Field Parameters
2. Water Level Elevations
3. Results of Chemical Analyses Performed on Groundwater and Surface Water

LIST OF FIGURES

1. Location Map
2. Sample Location Map
3. New Oxford Formation Hydrostratigraphic Unit Potentiometric Map, May 3 – 12, 2021
4. New Oxford Formation Time Series Charts

LIST OF APPENDICES (all on CD)

- A. 2nd Quarter 2021 PADEP Form 21 Groundwater and Surface Water Laboratory Results
- B. 2nd Quarter 2021 PADEP EDD and Geochemical Testing Lab Reports, Quality Assurance/Quality Control Report, and Field Forms
- C. 2nd Quarter 2021 PADEP Form 50 Leachate Laboratory Results
- D. 2nd Quarter 2021 Methane Probe Monitoring Results
- E. 2nd Quarter 2021 Dust Fall Results

1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 2nd Quarter 2021 groundwater monitoring activities at Lancaster Landfill in Mount Joy Township, Lancaster County, Pennsylvania. The Lancaster Landfill is operated by Waste Management (WM) under Pennsylvania Department of Environmental Protection (PADEP) Permit No. 101559. This sampling event was performed on May 3, 4, and 12, 2021 to satisfy requirements of the PADEP.

Lancaster Landfill is located in the northern portion of Lancaster County, Pennsylvania approximately five miles east of the city of Elizabethtown, Pennsylvania (Figure 1). The facility is accessed from Cloverleaf Road.

The groundwater Monitoring Program at Lancaster Landfill incorporates permanent monitoring elements to provide environmental protection during and after landfill development. All field work, sampling methodologies, data evaluation, data quality assurance and quality control (QA/QC), chemical analysis, and time-series analysis were conducted in accordance with the approved site permit.

1.2 SITE DESCRIPTION AND BACKGROUND

Lancaster Landfill is an active construction and demolition solid waste facility. Permit No. 101559 was originally issued on June 2, 1992 and reissued on March 18, 2011. The facility consists of an approximately 135-acre parcel of land, which approximately 58.81 acres are permitted for waste disposal.

2.0 GEOLOGY AND HYDROGEOLOGY

The information in this section was originally presented in Forms 6 and 7 of the 2007 Major Permit Application for the Phase I & II Landfill Expansion, prepared by Blazosky Associates, Inc. Refer to the complete Permit Application for more details.

2.1 REGIONAL GEOLOGY

Lancaster Landfill is located within the southwestern portion of the narrow neck sub-basin of the Gettysburg-Newark Basin Complex. This sub-basin is a transitional zone between the Newark sub-basin to the northwest and the Gettysburg sub-basin to the southeast. The Gettysburg-Newark Basin Complex lies between the Great Valley and Piedmont Physiographic Provinces and contains Triassic and Jurassic un-metamorphosed, sedimentary, and mafic igneous rocks (BAI, 2007a).

2.2 LOCAL GEOLOGY

Lancaster Landfill is underlain by Triassic conglomerate, sandstone, siltstone, and shale of the New Oxford Formation. These units are interpreted to record early syntectonic fluvial deposition in a half-graben basin, distal to the border fault in which surface water drainage was directed to the northwest, towards the border fault. Fluvial dominated stratigraphic successions such as these are typical of initial rift basin deposition and generally transition stratigraphically upward into lacustrine-dominated sedimentary successions. Lacustrine deposits have been reported by numerous works in the upper New Oxford and Gettysburg Formations. The sedimentary units in the vicinity of Lancaster Landfill generally strike east-northeast to west-southwest (approximately N60°E) and dip approximately 50 degrees to the north-northwest (BAI, 2007a).

2.3 SITE HYDROGEOLOGY

Groundwater is present beneath Lancaster Landfill within the New Oxford Formation. The New Oxford Formation is characterized by a series of interbedded sandstones, siltstones, and shales.

Groundwater movement within this unit is typical of fractured bedrock formations and flows primarily through secondary porosity (BAI, 2007b).

2.3.1 New Oxford Formation Hydrostratigraphic Unit

Based on aquifer pumping tests, the New Oxford Formation hydrostratigraphic unit has an average hydraulic conductivity of 24 to 98 ft/day. The storage coefficient is estimated to be 4.1×10^{-4} to 5.47×10^{-3} (unitless). Effective porosity is estimated to be 25 percent (BAI, 2007b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL WELL INSPECTIONS

During completion of each groundwater sampling event, monitoring wells are visually inspected for integrity, any physical damage and/or changes that may have occurred to the well or surrounding area, or signs of distressed vegetation surrounding the well. Any variation from previous sampling events is noted on the Field Information Form. Well casing stickup length, well casing diameter, and material of construction is recorded on the Field Information Form.

3.2 WELL AND SURFACE WATER MONITORING NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well and Surface Water Monitoring Network

The monitoring network at Lancaster Landfill includes quarterly sampling at wells completed within the New Oxford Formation as well as surface water monitoring locations. The monitoring well network targets the preferential flow path for the facility as described in the approved Groundwater Monitoring Plan [Civil & Environmental Consultants, Inc. (CEC), 2018] and is designed as an early detection monitoring system.

Form 21 Monitoring Points			
Monitored Zone		Location ID	
Groundwater	Upgradient Well	MW-101U	
	Downgradient Wells	MW-104D	MW-108DR
		MW-105D	MW-109DR
		MW-106D	MW-110DR
		MW-107DR	MW-111DR
Surface Water		MGSU01	MGSD05
		MGSD02	MGSU06
		MGSD03	MGSU07
		MGSD04	
Underdrains		U-C2	U-C6A
		U-C5	U-C6B
		U-C8A	U-C10A
		U-C9A	U-C10B
		U-C9B	U-C10C
		U-C9C	U-C-10D

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation [feet above mean sea level (famsl)] were recorded to the nearest hundredth of a foot. The water level measurements are utilized in preparation of groundwater contours to determine groundwater flow direction and gradient at the site. Groundwater elevations for the 2nd Quarter 2021 sampling event are generally comparable to historical groundwater elevation measurements.

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocities were estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

- v = average groundwater velocity;
- K_h = aquifer horizontal conductivity;
- i = average hydraulic gradient; and
- n_e = effective aquifer porosity.

The potentiometric surface map of the New Oxford Formation Hydrostratigraphic Unit indicates that the horizontal gradient is to the northeast at 0.0310 ft/ft (Figure 2). Horizontal groundwater velocity in the New Oxford Formation Hydrostratigraphic Unit is 12.2 ft/day (4,438 ft/year), based upon an average hydraulic conductivity of 98 ft/day and an effective porosity of 25 percent (BAI, 2007b).

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the detection monitoring wells for the 2nd Quarter 2021 were conducted on March 3, 4, and 12, 2021 (Table 1). Monitoring well purging and sampling activities were implemented in accordance with the approved Sampling and Analysis Plan and site permit. The majority of the wells were sampled with a submersible pump with low-flow purging and sampling techniques. Non-dedicated sampling equipment is decontaminated between locations. MW-110DR is purged conventionally (i.e., three well volumes are removed) using a bailer prior to sampling. MW-107DR cannot support low-flow purging, a dedicated bailer is used to purge the well dry and then a sample is collected within 24 hours.

3.4.2 Laboratory Analysis and Monitoring Parameters

In accordance with the approved plan, monitoring wells and surface water at the site are analyzed for Form 21 detection constituents plus an additional 22 inorganic parameters. There is no annual sampling event. Refer to Table 1 of the approved Groundwater Monitoring Plan (CEC, 2018) for complete details.

All water samples collected at the site were delivered to Geochemical Testing, Inc., in Somerset, Pennsylvania for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. The PADEP Form 21s are included in Appendix A. The laboratory reports, laboratory quality control report, and field forms are included in Appendix B.

3.5 ANALYTICAL PROGRAM RESULTS

Nine wells and two underdrain points were sampled during the 2nd Quarter 2021 (underdrains U-C5 and U-C6B were dry). Sample analysis was completed without any difficulties and the

results are representative of groundwater at the site. It should be noted that eight additional underdrains located to the north of the disposal area were scheduled to be sampled during the 2nd Quarter 2021 at PADEP's request. Waste Management identified six of the eight underdrains or the rip rap around the underdrain piping and found that all six locations were dry (i.e., U-C8A, U-C9B, U-C9C, U-C10A, U-C10B, and U-C10C). Waste Management is working with ARM Group (who prepared the certification report) and on-site contractors to locate the remaining two underdrains (i.e., U-C9A and U-C10D), and Waste Management anticipates this will be completed in late July 2021. The located underdrains are scheduled to be sampled during the 3rd Quarter 2021 and then on a quarterly basis moving forward.

3.6 GEOCHEMICAL ANALYSIS

The PADEP permit requires Lancaster Landfill to submit quarterly sampling results for Form 21 parameters. Lancaster Landfill is providing a quarterly review of time-series analysis for leachate indicator parameters.

3.6.1 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters [ammonia-nitrogen, alkalinity, total dissolved solids (TDS), chloride, and sodium] were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.1.1 New Oxford Formation

As shown in the time-series graphs for the monitoring wells installed in the New Oxford Formation Hydrostratigraphic Unit (Figure 3), no historically significant upward trends were observed, except for alkalinity at MW-104D, MW-107DR, MW-108DR, and MW-110DR. However, these trends do not appear to be a result of leachate influence because the remaining indicator parameters are relatively stable over the same period of

time. It should also be noted that chloride, sodium, and TDS in MW-106D appear to fluctuate seasonally, however, detected concentrations are within historic levels.

3.7 SURFACE WATER ANALYSIS

The current surface water Form 21 detection monitoring program consists of seven surface water monitoring points. Those points are MGSU01, MGSD02, MGSD03, MGSD04, MGSD05, MGSU06, and MGSU07.

Surface water was sampled on May 3, 2021 for the required analysis pursuant to the permit requirements. All seven surface water locations were sampled during the 2nd Quarter 2021. The concentration of metals and general chemistry constituents in the surface water samples for the 2nd Quarter 2021 sampling event were generally consistent with historical results. Surface water at Lancaster Landfill does not appear to show signs of a leachate influence.

3.8 LEACHATE ANALYSIS

Cells are monitored as part of the leachate collection zone (LCZ) and leachate detection zone (LDZ) monitoring network. During each quarter, a composite leachate collection sample is collected from the storage tank and analyzed for PADEP Form 50 parameters. All samples collected at Lancaster Landfill were delivered to Geochemical Testing for chemical analysis. During the 2nd Quarter 2021, a grab sample from the composite LCZ was collected from the storage tank on May 3, 2021 for Form 50 parameters; additionally, LDZ-1, LDZ-3, and LDZ-5 were also sampled during the quarter.

Volatile organic compounds (VOCs) were not detected above the established reporting limits in the LCZ sample during the 2nd Quarter 2021. The average daily LCZ flow from the landfill during the quarter was 394.1 gallons per acre per day (g/a/d). This flow is generally comparable with historic results. Based on recommendations communicated to CEC from the PADEP, the flows were calculated using data collected from the entire calendar quarter.

Analytical data from the LDZs were generally consistent with historic results. The average daily LDZ flows from the landfill were: 2.8 g/a/d from LDZ 1, 0.1 g/a/d from LDZ 2, 0.1 g/a/d from LDZ 3, 0.3 g/a/d from LDZ 4, 2.5 g/a/d from LDZ 5, 5.7 g/a/d from LDZ 6, 1.0 g/a/d from LDZ 7, and 1.6 g/a/d from LDZ 10. These flows are generally consistent to historical flow measurements.

Based on current and historical analytical and flow data from the LDZs as well as the requirements of the PADEP Form 50, the LDZ sampling and analysis schedule is as follows. LDZ 1, LDZ 2, LDZ 3, LDZ 4, LDZ 5, and LDZ 10 do not appear to be influenced by leachate. Therefore, they should be sampled once per year (during the 4th quarter) for the PADEP Form 50 indicator parameters, assuming flows remain less than 10 g/a/d. LDZ 6 and LDZ 7 appear to be influenced by leachate. Therefore, they should be sampled once per year (during the 4th quarter) for the full PADEP Form 50 list of parameters, regardless of flow.

Based on the discussion above, the LDZs do not need to be sampled during the 3rd Quarter 2021.

3.9 METHANE PROBE MONITORING RESULTS

Field measurements of methane, carbon dioxide, oxygen, balance, and percent lower explosive level were collected from the four on-site gas monitoring probes. As shown in Appendix D, no methane was detected at or above the lower explosive limit in any probe during the 2nd Quarter 2021.

3.10 DUST FALL RESULTS

Dust collection analysis is performed monthly through the placement of four dust fall jars around Lancaster Landfill. The jars are collected monthly, and a fresh jar is placed in the holders. It should be noted that analysis method American Society for Testing and Materials (ASTM) D 1739-98 MOD is a conservative analysis because it includes organic matter that would otherwise be removed for analysis via method ASTM D 1739-82 MOD.

The results of the dust fall analysis contained in Appendix E indicate no sample exceeded the maximum dust fall of 15 g/m²/month as specified in PA 25 §131.3 and referenced in PA 25 §273.217 during the 2nd Quarter 2021, except for Location D during March, Locations B and D during April, and Locations A and C during May. However, a review of the laboratory case narratives indicates these exceedences do not appear to be entirely reflective of dust emissions generated from landfill operations due to observed organic matter (insects, leaves, etc.) which is commonly present in the samples. During the month of March, Location D was noted as containing clear water with dirt and a fly. During the month of April, Location B was noted as containing light tan colored water with dirt, bugs, and leaves; Location D was noted as containing clear water with dirt and bugs. During the month of May, Locations A and C were noted as containing cloudy water with dirt, bugs, leaves, and larvae.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method, except for lab pH, which has a 15 minute hold time. However, field pH readings were collected at the sampling locations in accordance with industry standard practices.

4.2 SAMPLE SURROGATE RECOVERIES

Sample surrogate recovery analyses are performed with each quarterly event. However, if results are not within acceptable ranges, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

4.3 METHOD BLANKS

No laboratory method blanks contained concentrations of any chemicals that would place the sampling event into question.

4.4 LABORATORY CONTROL SPIKES

Laboratory control spikes for all analytical methods are performed with each quarterly event. However, if results are not within advisory limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

4.5 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

Laboratory calibration is performed with each quarterly event. However, if results are not within acceptable limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix B).

5.0 CONCLUSIONS

Samples were collected at Lancaster Landfill according to appropriate sampling procedures and sent to Geochemical Testing. The following observations are noted for the 2nd Quarter 2021 sampling event:

- Lancaster Landfill was sampled for Form 21 groundwater, underdrain, and surface water constituents on May 3, 4, and 12, 2021.
- Lancaster Landfill was sampled for Form 50 leachate constituents on May 3, 2021.
- The New Oxford Formation Hydrostratigraphic Unit has a horizontal gradient to the north at 0.0310 ft/ft, with a horizontal velocity of 12.2 ft/day (4,438 ft/year) (Figure 2).
- Time-series analysis of select groundwater leachate indicator parameters shows no significant upward trends in these constituents through time, except for alkalinity at MW-104D, MW-107DR, MW-108DR, and MW-110DR. However, these trends do not appear to be a result of leachate influence because the remaining indicator parameters are relatively stable over the same period of time.
- During the 2nd Quarter 2021, analytical and flow data from the LDZs were generally consistent with historic results.
- Field measurements of methane, carbon dioxide, oxygen, balance, and percent lower explosive level were collected from the four on-site gas monitoring probes. As shown in Appendix D, no methane was detected at or above the lower explosive limit in any probe during the 2nd Quarter 2021.
- The results of the dust fall analysis indicate no sample exceeded the maximum dust fall of 15 g/m²/month, except for Location D during March, Locations B and D during April, and Locations A and C during May. However, a review of the laboratory case narratives indicates these exceedences do not appear to be entirely reflective of dust emissions generated from landfill operations; however, due to observed organic matter (insects, leaves, etc.) which is commonly present in the samples. During the month of March, Location D was noted as containing clear water with dirt and a fly. During the month of April, Location B was noted as containing light tan colored water with dirt, bugs and leaves; Location D was noted as containing clear water with dirt and bugs. During the

month of May, Locations A and C were noted as containing cloudy water with dirt, bugs, leaves, and larvae.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater or surface water conditions;
2. The groundwater monitoring network is capable of monitoring the hydrostratigraphic unit beneath Lancaster Landfill; and
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

Blazosky Associates, Inc (BAI, 2007a). PADEP Form 6 Geologic Information. Veolia ES Lancaster, LLC; Veolia ES Lancaster Landfill; Phase I & II Landfill Expansion Application for Major Permit Modification. June 2007.

Blazosky Associates, Inc (BAI, 2007b). PADEP Form 7 Hydrogeologic Information. Veolia ES Lancaster, LLC; Veolia ES Lancaster Landfill; Phase I & II Landfill Expansion Application for Major Permit Modification. June 2007.

Civil & Environmental Consultants, Inc., 2018. “Lancaster Landfill Groundwater and Surface Water Sampling and Analysis Plan.” Submitted September 2018.

TABLES

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

**SECOND QUARTER 2021
FIELD PARAMETERS**

AQUIFER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	WATER LEVEL ¹ (ft)	WELL DEPTH ¹ (ft)	WATER VOLUME ² (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS
										pH	COND (µS/cm)	TEMP (C)	
New Oxford Formation	MW-101U	05/04/21	08:34 AM	14.42	54.00	6.33	19.00	6.0	0.95	4.81	146	11.2	
	MW-104D	05/03/21	12:44 PM	40.09	76.50	5.83	17.48	11.0	1.89	6.40	7,141	15.2	
	MW-105D	05/03/21	11:34 AM	51.55	80.60	4.65	13.94	14.8	3.17	6.87	456	17.3	
	MW-106D	05/03/21	09:47 AM	34.68	80.90	7.40	22.19	14.8	1.99	6.64	1,840	14.0	
	MW-107DR	05/03/21	02:15 PM	25.35	50.50	4.02	12.07	4.0	0.99	6.70	1,060	14.9	
	MW-108DR	05/04/21	09:19 AM	46.64	80.00	5.34	16.01	6.0	1.12	7.00	431	15.8	
	MW-109DR	05/03/21	01:54 PM	56.18	101.70	7.28	21.85	9.8	1.34	5.23	584	15.6	
	MW-110DR	05/04/21	09:50 AM	8.47	32.00	3.76	11.29	11.5	3.05	6.31	736	13.7	
	MW-111DR	05/12/21	11:45 AM	30.31	120.15	14.37	43.12	--	--	6.25	166	12.6	
Surface Water	MGSU01	05/03/21	10:00 AM							7.46	399	16.2	
	MGSD02	05/03/21	09:35 AM							7.38	300	16.3	
	MGSD03	05/03/21	10:30 AM							7.13	292	15.1	
	MGSD04	05/03/21	11:10 AM							7.78	304	16.7	
	MGSD05	05/03/21	11:30 AM							7.43	301	17.4	
	MGSU06	05/03/21	09:10 AM							7.12	300	16.3	
	MGSU07	05/03/21	08:50 AM							7.35	304	16.7	
Underdrain	U-C2	05/03/21	11:50 AM							6.73	403	18.8	
	U-C5												Dry
	U-C6A	05/03/21	12:20 PM							6.37	410	18.6	
	U-C6B												Dry

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

**SECOND QUARTER 2021
FIELD PARAMETERS**

AQUIFER	SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	WATER LEVEL ¹ (ft)	WELL DEPTH ¹ (ft)	WATER VOLUME ² (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS	
										pH	COND (µS/cm)	TEMP (C)		
Leachate	Leacahte Storage Tank	05/03/21	02:30 PM								8.09	6,120	19.2	
	LDZ-1	05/03/21	01:50 PM								6.46	1,123	20.4	Sampled annually
	LDZ-2													Sampled annually
	LDZ-3	05/03/21	01:30 PM								6.81	3,290	21.9	Sampled annually
	LDZ-4													Sampled annually
	LDZ-5	05/03/21	01:10 PM								6.56	3,720	19.8	Sampled annually
	LDZ-6													Sampled annually
	LDZ-7													Sampled annually
LDZ-10													Sampled annually	

Notes:

¹ Measured from top of inner casing.

² Calculated using 0.16 gallons per foot of water for 2-inch wells.

Calculated using 0.65 gallons per foot of water for 4-inch wells.

Calculated using 1.47 gallons per foot of water for 6-inch wells.

C = Degrees Centigrade.

µS/cm = microSiemens/centimeter.

gpm = gallons per minute.

ft = feet

NA = not applicable

TABLE 2
LANCASTER LANDFILL
PADEP ID NO. 101559

SECOND QUARTER 2021
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	MEASUREMENT DATE	MEASUREMENT POINT ELEV.¹ (ft amsl)	WATER LEVEL² (ft)	WATER LEVEL ELEV. (ft amsl)
New Oxford Formation	MW-101U	5/4/2021	495.93	14.42	481.51
	MW-104D	5/3/2021	418.32	40.09	378.23
	MW-105D	5/3/2021	439.55	51.55	388.00
	MW-106D	5/3/2021	426.52	34.68	391.84
	MW-107DR	5/3/2021	466.85	25.35	441.50
	MW-108DR	5/4/2021	471.40	46.64	424.76
	MW-109DR	5/3/2021	435.00	56.18	378.82
	MW-110DR	5/4/2021	428.00	8.47	419.53
	MW-111DR	5/12/2021	486.65	30.31	456.34

Notes:

¹ Elevation for the top of the PVC from field forms.

ft amsl = feet above mean sea level.

² Measured from the top of the PVC riser pipe.

NA = not applicable.

TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

SECOND QUARTER 2021
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	GROUNDWATER								
				MW-101U	MW-104D	MW-105D	MW-106D	MW-107DR	MW-108DR	MW-109DR	MW-110DR	MW-111DR
<i>Inorganics</i>												
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	12	< 10	< 10	< 10	< 10	< 10
Chloride	mg/L	EPA 300.0	250*	4.0	14.9	18.8	404	137	7.6	31.7	12.6	13.2
Iron	mg/L	EPA 200.7	0.3*	0.10	0.52	1.06	0.25	0.25	0.13	0.28	< 0.05	0.79
Iron, dissolved	mg/L	EPA 200.7	0.3*	< 0.05	0.10	0.11	0.18	< 0.05	< 0.05	0.10	< 0.05	< 0.05
pH (Field)	su	Field	NA	4.81	6.40	6.87	6.64	6.70	7.00	5.23	6.31	6.25
Lab pH	su	SM 4500-H+ B	NA	6.26 H	6.92 H	7.31 H	6.92 H	7.09 H	8.05 H	5.86 H	7.32 H	6.30 H
Sodium	mg/L	EPA 200.7	NA	4.4	15.6	12.2	145	14.6	9.4	20.3	6.5	17.6
Sodium, dissolved	mg/L	EPA 200.7	NA	4.4	15.9	12.9	136	14.6	9.6	20.4	5.7	17.0
Specific Conductance (Field)	µmhos/cm	Field	NA	146	711	456	1840	1060	431	584	736	166
Specific Conductance	µmhos/cm	EPA 120.1	NA	135	621	412	1570	937	377	524	652	239
Sulfate	mg/L	EPA 300.0	250*	14.2	105	63.5	41.8	19.7	32.3	159	39.2	51.4
Total Organic Carbon	mg/L	SM 5310 C	NA	< 1.0	1.6	3.2	4.6	< 1.0	< 1.0	2.2	1.7	< 1.0
Total Organic Halogen	µg/L	EPA 9020	NA	< 50	< 50	< 50	77	61	< 50	76	< 50	< 50

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or PADEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist).

* These values represent secondary MCLs.

Dry Points: MGSU01

TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

SECOND QUARTER 2021
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	SURFACE WATER						
				MGSU01	MGSD02	MGSD03	MGSD04	MGSD05	MGSU06	MGSU07
<i>Inorganics</i>										
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	< 10	< 10	12	< 10
Chloride	mg/L	EPA 300.0	250*	42.3	24.2	14.9	20.2	24.2	18.8	26.6
Iron	mg/L	EPA 200.7	0.3*	0.26	0.09	0.07	< 0.05	0.11	3.64	0.11
Iron, dissolved	mg/L	EPA 200.7	0.3*	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
pH - Field	su	Field	NA	7.46	7.38	7.13	7.78	7.43	7.12	7.35
pH - Lab	su	SM 4500-H+ B	NA	8.00 H	8.32 H	7.83 H	7.54 H	7.61 H	8.10 H	8.20 H
Sodium	mg/L	EPA 200.7	NA	23.1	14.3	10.7	13.4	14.3	11.7	14.8
Sodium, dissolved	mg/L	EPA 200.7	NA	22.8	14.0	10.6	13.2	14.4	12.0	14.8
Specific Conductance - Field	µmhos/cm	Field	NA	399	300	292	304	301	300	304
Specific Conductance - Lab	µmhos/cm	EPA 120.1	NA	396	298	294	292	294	302	295
Sulfate	mg/L	EPA 300.0	250*	29.3	21.6	22.8	25.1	21.9	24.1	16.9
Total Organic Carbon	mg/L	SM 5310 C	NA	1.1	2.6	1.4	1.6	2.7	2.6	2.7
Total Organic Halogen	µg/L	EPA 9020	NA							

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or PADEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist).

* These values represent secondary MCLs.

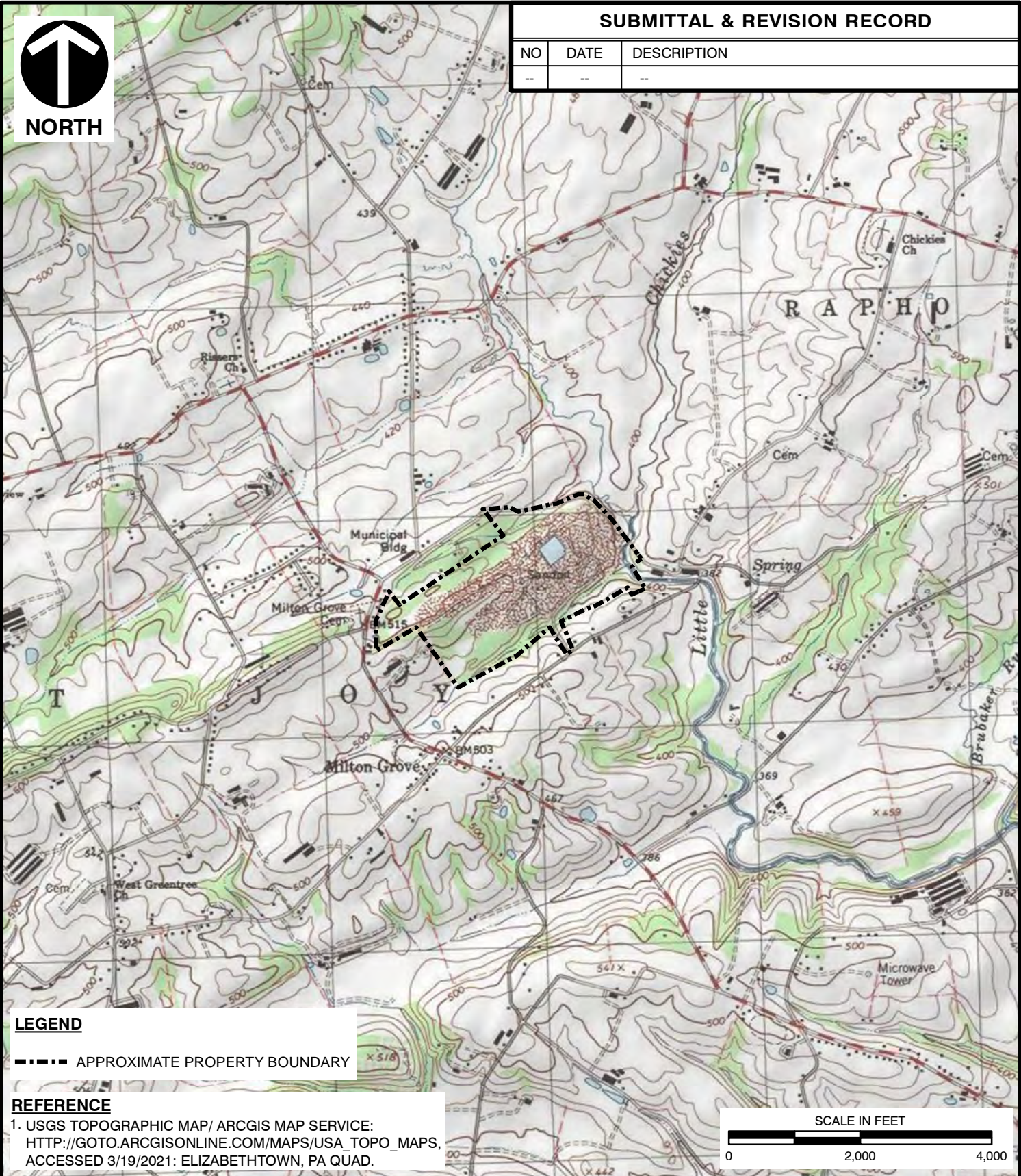
Dry Points: MGSU01

FIGURES



SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
--	--	--

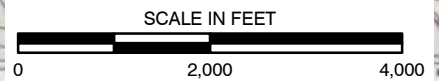


LEGEND

--- APPROXIMATE PROPERTY BOUNDARY

REFERENCE

1. USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE:
[HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS](http://goto.arcgisonline.com/maps/usa_topo_maps),
 ACCESSED 3/19/2021: ELIZABETHTOWN, PA QUAD.



I:\svr-fs-rm\projects\300-000\306-896-GIS\MapInfo\EN01\306896 EN01 FIG1.mxd 3/19/2021 6:17 PM (kcolajzzi)



Civil & Environmental Consultants, Inc.

4350 Northern Pike, Suite 141 - Monroeville, PA 15146
 724-327-5200 · 800-899-3610
 www.cecinc.com

**WASTE MANAGEMENT
 LANCASTER LANDFILL
 ELIZABETHTOWN, PENNSYLVANIA**

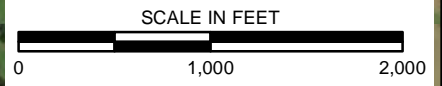
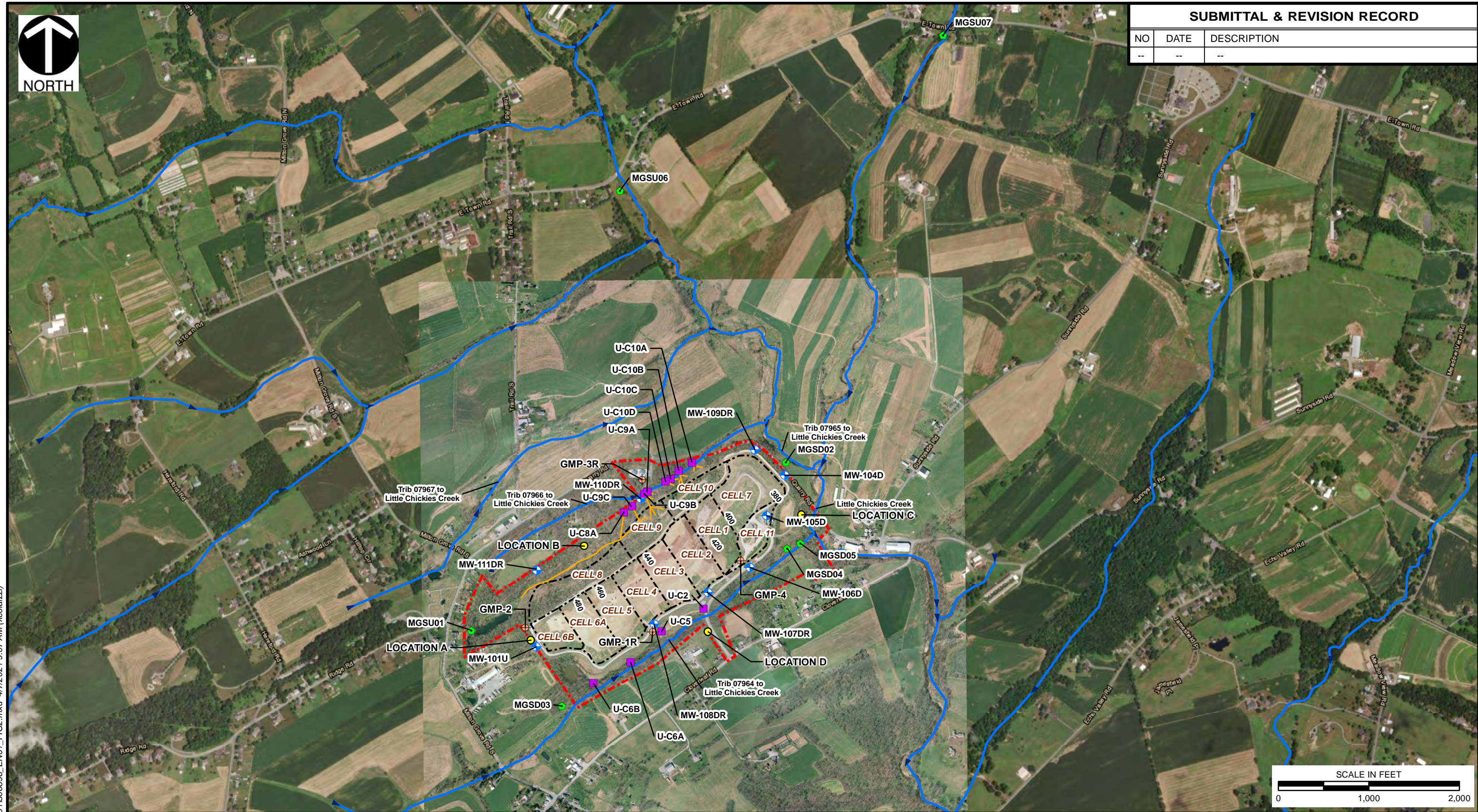
SITE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	1
DATE:	09/05/2018	SCALE:	1" = 2,000'	PROJECT NO:	306-896	* Hand signature on file	



SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
--	--	--



LEGEND

	GROUNDWATER MONITORING WELLS		PADEP 305B STREAM
	SURFACE WATER POINTS		APPROXIMATE CELL LOCATION
	UNDERDRAIN POINTS		APPROXIMATE PROPERTY BOUNDARY
	DUST FALL MONITORING POINTS		
	GAS MONITORING PROBES		

REFERENCE

- APRIL, 2016 IMAGERY PROVIDED BY CORNERSTONE.
- ESRI WORLD IMAGERY / ARCGIS MAP SERVICE:
[HTTP://GTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY](http://gto.arcgis.com/maps/world_imagery)
 ACCESSED 7/15/2021, IMAGERY DATE: 2017.



Civil & Environmental Consultants, Inc.
 4350 Northern Pike, Suite 141 - Monroeville, PA 15146
 724-327-5200 • 800-899-3610
www.cecinc.com

DRAWN BY:	KMC	CHECKED BY:	TEA
DATE:	04/07/2021	SCALE:	1" = 1,000'

**WASTE MANAGEMENT
 LANCASTER LANDFILL
 ELIZABETHTOWN, PENNSYLVANIA**

SAMPLE LOCATION MAP

APPROVED BY:	RCD*	FIGURE NO:	2
PROJECT NO:	306-896	* Hand signature on file	

P:\300-0001306-896\GIS\Maps\EN01306896_EN01_FIG2.mxd 4/7/2021 9:07 AM (kcolazzi)



SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
--	--	--

i (MW-101U to MW-104D) = 0.0310
 k = 98 ft/day
 n = 25%
 v = 12.2 ft/day (4,438 ft/yr)
 Measured May 3-12, 2021

P:\300-000\306-896-GIS\Maps\EN02\306896_EN02_FIG_3_SECOND_QUARTER_POTENTIOMETRIC_SURFACE_MAP.mxd 7/8/2021 7:27 AM (kcolatzi)



LEGEND

	MW-101U GROUNDWATER MONITORING WELLS
	400 APPROXIMATE GROUNDWATER ELEVATION CONTOUR
	APPROXIMATE CELL LOCATION
	PADEP 305B STREAM
	HYDRAULIC GRADIENT MEASURED BETWEEN MW-101U AND MW-104D
	GROUNDWATER FLOW DIRECTION

REFERENCE
 1. APRIL, 2016 IMAGERY PROVIDED BY CORNERSTONE.

NOTES

- ELEVATIONS ARE MEASURED IN FEET ABOVE MEAN SEA LEVEL.
- THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
- POTENTIOMETRIC CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. ACTUAL STATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.
- THE GROUNDWATER ELEVATION AT MW-107DR HAS BEEN OMITTED FROM THE CONTOUR CALCULATIONS DUE TO HISTORIC ANOMALOUS DATA FROM THIS WELL.



Civil & Environmental Consultants, Inc.

4350 Northern Pike, Suite 141 - Monroeville, PA 15146
 724-327-5200 • 800-899-3610
 www.cecinc.com

DRAWN BY:	KMC	CHECKED BY:	TEA
DATE:	07/08/2021	SCALE:	1" = 300'

**WASTE MANAGEMENT
 LANCASTER LANDFILL
 ELIZABETHTOWN, PENNSYLVANIA**

**NEW OXFORD FORMATION
 POTENTIOMETRIC SURFACE MAP**

APPROVED BY:	RCD*	FIGURE NO:	3
PROJECT NO:	306-896	* Hand signature on file	

FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS

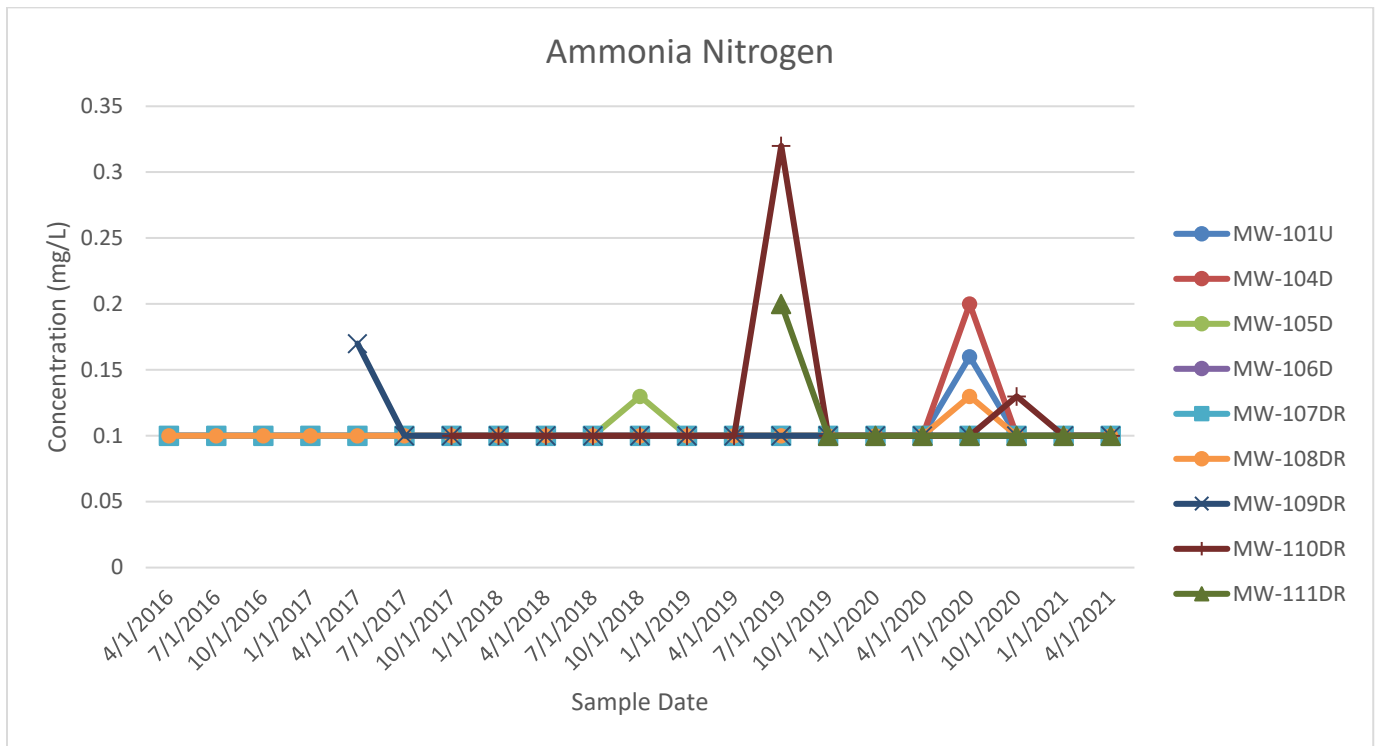
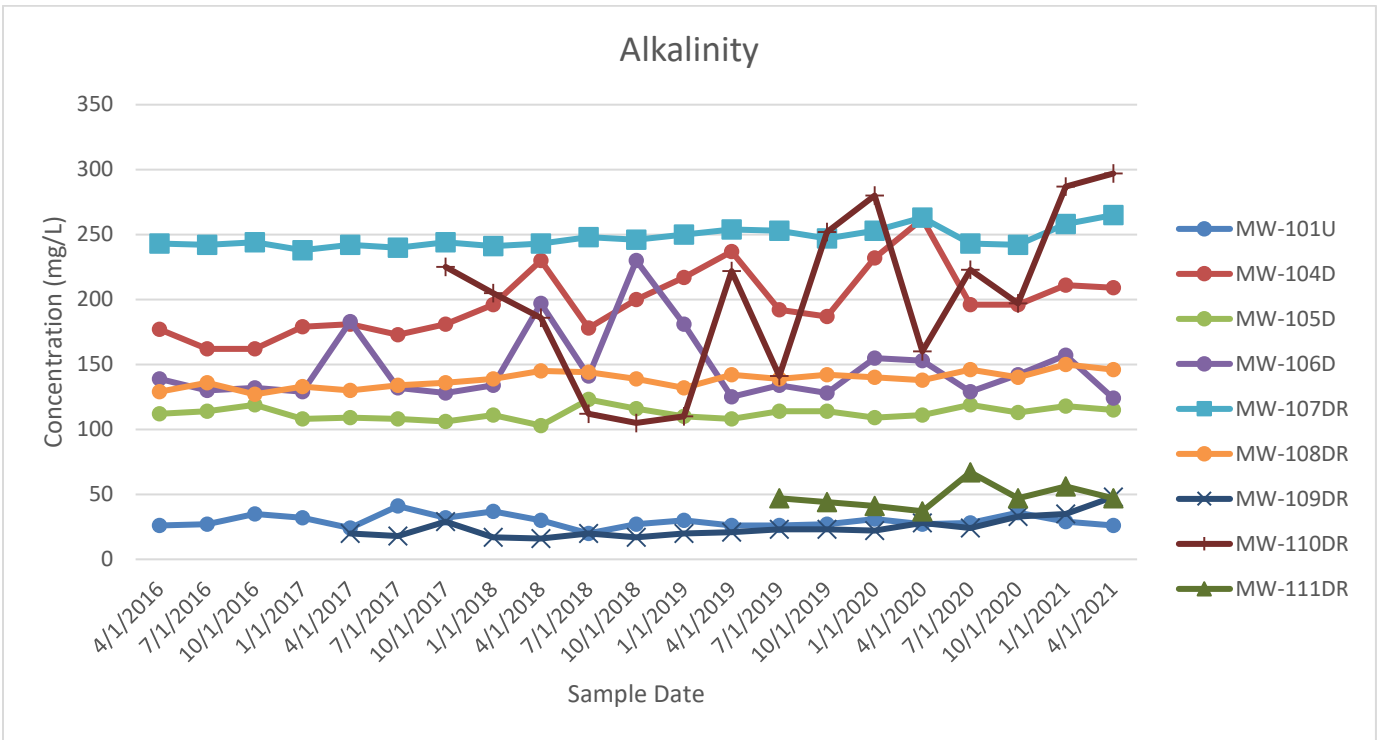


FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS

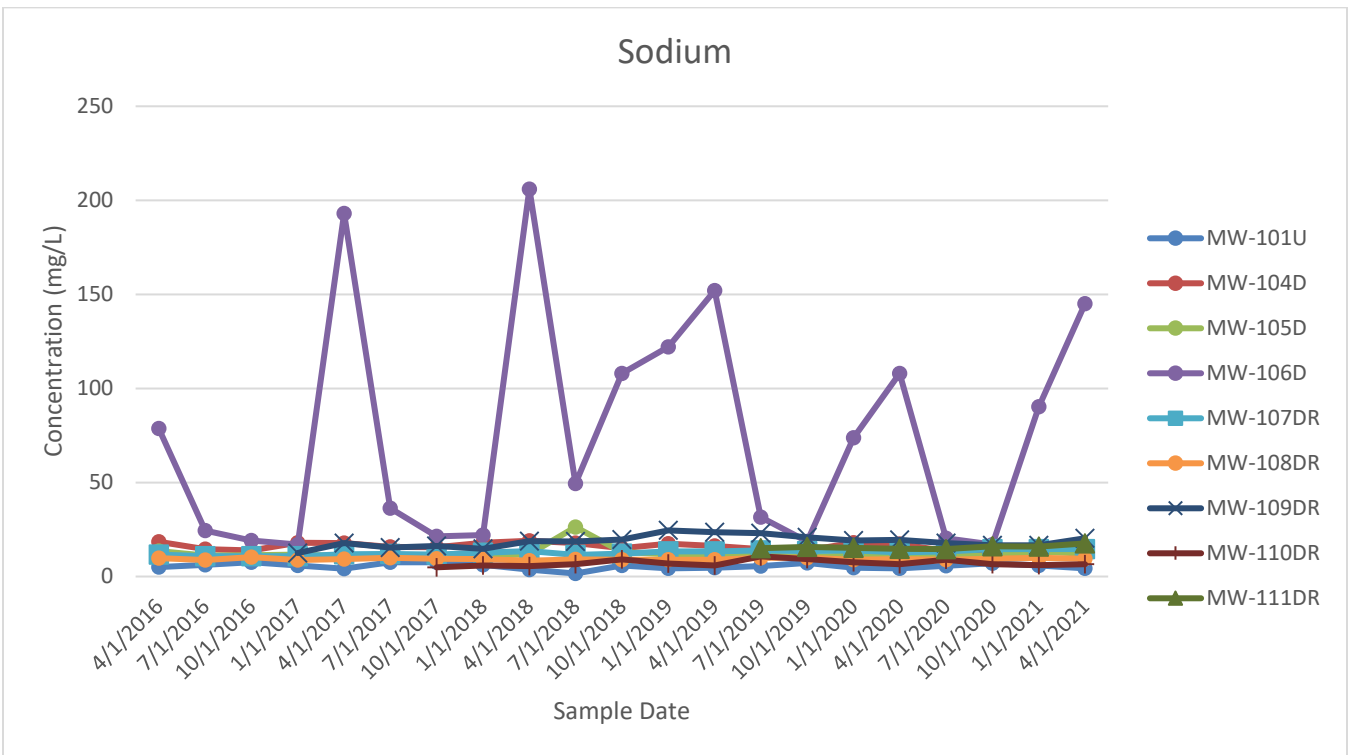
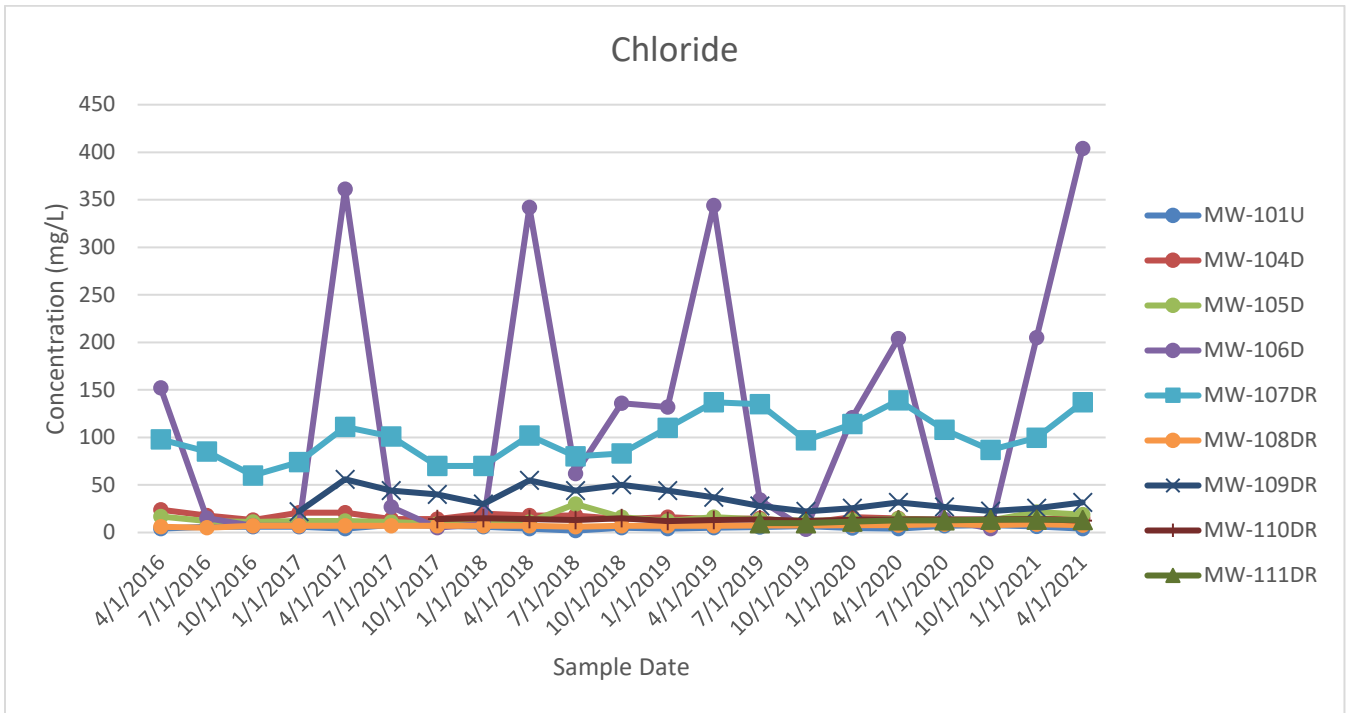
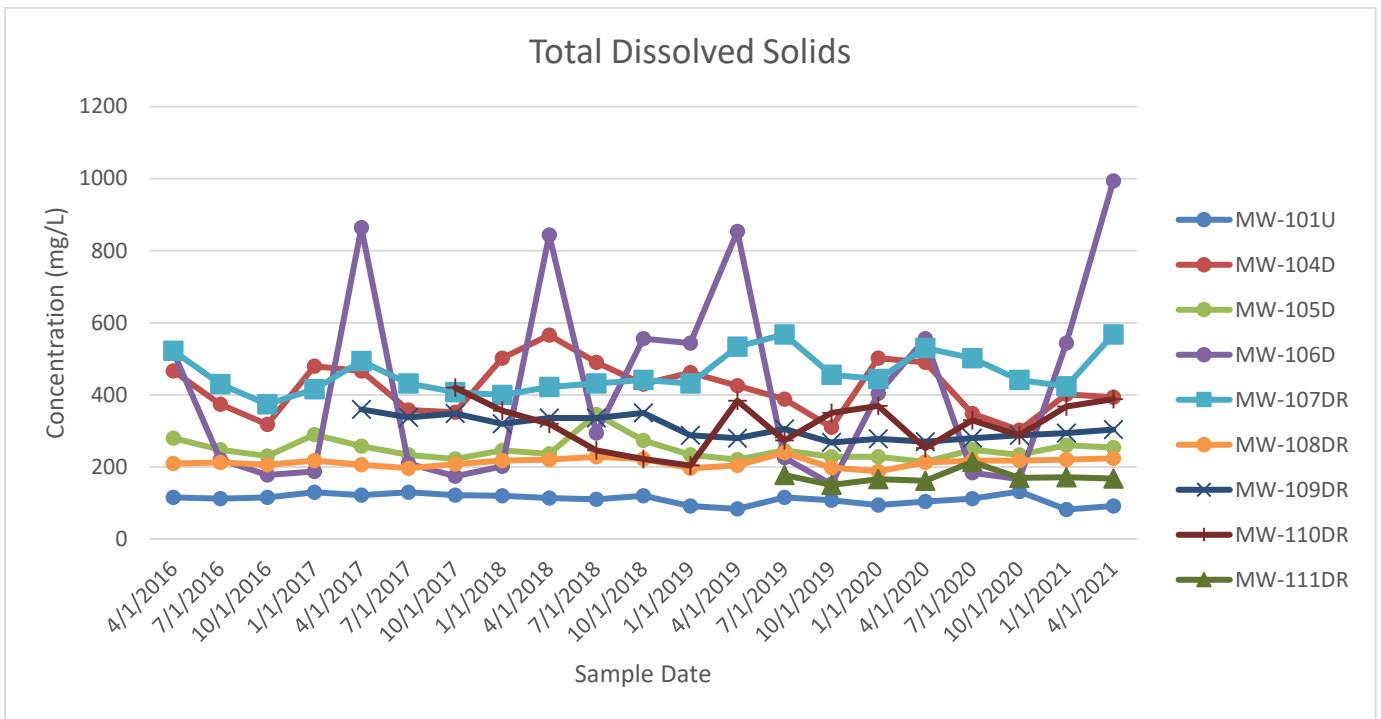


FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



APPENDICES (on CD)

Appendix A – PADEP Form 21 Groundwater and Surface Water Laboratory Results

Appendix B – PADEP EDD and Geochemical Testing Lab Reports, Quality Assurance/Quality Control Report, and Field Forms

Appendix C – PADEP Form 50 Leachate Laboratory Results

Appendix D – Methane Probe Monitoring Results

Appendix E – Dust Fall Monitoring Results
