January 11, 2024

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

Re: Fourth Quarter 2023 Environmental Monitoring Report
WM Lancaster Landfill, Facility ID# 101559
Mount Joy Township, Lancaster County, Pennsylvania

Dear Mr. Long:

Enclosed please find the Environmental Monitoring Report and completed Pennsylvania Department of Environmental Protection forms for the 4th Quarter 2023 for Lancaster Landfill.

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

Should you have any questions or require any additional information, please contact me at (215) 783-2216.

Respectively Submitted,

Jarod Freese
WM
Environmental Protection

Enclosure

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

FOURTH QUARTER 2023
ENVIRONMENTAL MONITORING REPORT

Submitted:
January 2024

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

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 4th Quarter 2023 groundwater monitoring activities at the Lancaster Landfill in Mount Joy Township, Lancaster County, Pennsylvania. The Lancaster Landfill is operated by WM under Pennsylvania Department of Environmental Protection (PADEP) Permit No. 101559. This sampling event was performed on November 6 – 7, 2023 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. The facility consists of an approximately 135-acre parcel of land, of 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 Providences 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 or Well Condition Inspection Form, both of which are provided in Appendix B. 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 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-105DR MW-106DR MW-107DR	MW-108DR MW-109DR MW-110DR MW-111DR
Surface Water		MGSU01 MGSD02 MGSU03 MGSD04	MGSD05 MGSU06 MGSU07
Underdrains		U-C2 U-C5 U-C6A U-C6B U-C8A U-C9B	U-C9C U-C10A U-C10B U-C10C U-C10D

As reported in previous quarterly reports, several underdrains to the north of the disposal area were first sampled in 2021. Four of these (U-C10A, U-C10B, U-C10C, and U-C10D) were recently found, and they were first sampled during the 1st Quarter 2022. During the process to locate and identify the underdrains, the on-site contractor and ARM Group (who prepared the certification report) confirmed that U-C9A was never installed because it was determined to be unnecessary during construction. All other underdrains have been located and will be sampled quarterly when flowing.

During the 1st Quarter 2022, MW-105DR and MW-106DR were installed to replace MW-105D and MW-106D at their approved locations to accommodate Cell 11 construction. In accordance with the permit, all four wells were sampled concurrently during the 1st and 2nd Quarters of 2022. The results from both sets of concurrent samples indicated that the groundwater quality in the replacement wells is generally comparable to the original wells. MW-105D and MW-106D were decommissioned in the spring of 2022.

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 4th Quarter 2023 sampling event are generally comparable to historical groundwater elevation measurements (see Table 2).

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 0.0295 ft/ft (Figure 3). Horizontal groundwater velocity in the New Oxford Formation Hydrostratigraphic Unit is 11.6 ft/day (4,234 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 4th Quarter 2023 were conducted on November 6 – 7, 2023 (Table 1). Monitoring well purging and sampling activities were implemented in accordance with the Groundwater Monitoring Plan (CEC, 2018) and site permit. The majority of the wells were sampled with a pump with low-flow purging and sampling techniques. Non-dedicated sampling equipment is decontaminated between locations. MW-107DR cannot support low-flow purging, so 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 Groundwater Monitoring Plan (CEC, 2018), monitoring wells and surface water at the site are analyzed for Form 21 detection constituents plus an additional 22 inorganic parameters (referred to as Form 21 Modified throughout the rest of this document). There is no annual sampling event. Refer to Table 1 of the 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 21 Modified is included in Appendix A. The laboratory reports, laboratory quality control report, and field forms are included in Appendix B. A summary of the analytical results is provided in Table 3.

3.5 ANALYTICAL PROGRAM RESULTS

Nine wells, seven surface water monitoring points, and two underdrain points were sampled during the 4th Quarter 2023 (underdrains U-C5, U-C6A, U-C6B, U-C9B, U-C9C, U-C10A, U-C10B, U-C10C, and U-C10D were dry). As reported in previous quarterly reports, underdrain location U-C9A was never installed. Sample analysis was completed without any difficulties and the results are representative of groundwater at the site.

3.6 GEOCHEMICAL ANALYSIS

The PADEP permit requires Lancaster Landfill to submit quarterly sampling results for Form 21 Modified 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 4), no historically significant upward trends were observed, except for alkalinity at MW-109DR and MW-110DR and TDS at MW-110DR. 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-106DR and MW-107DR appear to fluctuate seasonally; however, detected concentrations are within historic levels.

3.7 SURFACE WATER ANALYSIS

The current surface water Form 21 Modified detection monitoring program consists of seven surface water monitoring points. Those points are MGSU01, MGSD02, MGSU03, MGSD04, MGSD05, MGSU06, and MGSU07.

Surface water was sampled on November 6, 2023 for the required analysis pursuant to the permit requirements. Seven surface water locations were sampled during the 4th Quarter 2023. The concentration of metals and general chemistry constituents in the surface water samples were generally consistent with historical results. Surface water at Lancaster Landfill does not appear to show signs of 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 (Appendix C). All samples collected at Lancaster Landfill were delivered to Geochemical Testing for chemical analysis. During the 4th Quarter 2023, a grab sample from the composite LCZ was collected from the storage tank. Additionally, each LDZ was also sampled during the 4th Quarter 2023, except LDZ-5 which was dry.

The average daily LCZ flow from the landfill during the quarter was 695.6 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.

The analytical results from the LDZ samples were generally consistent to historic results. Maximum Contaminant Levels (MCLs) were not exceeded, except for arsenic at LDZ-7. MCL exceedances at LDZ-7 have occurred periodically in the past, and additional parameters will be added to the groundwater sampling event during the 1st Quarter 2024. It should be noted that the groundwater samples are analyzed for PADEP Form 21 parameters; however, the PADEP Form 19 Detection Zone add-on list of parameters will be added to the groundwater samples collected next quarter as a conservative analysis based on the requirements of the PADEP Form 50. The average daily flows in g/a/d from the LDZs are presented below. These flows are generally consistent with historical results:

- 1.3 g/a/d at LDZ-1;
- 0.1 g/a/d at LDZ-2;
- 0.2 g/a/d at LDZ-3;
- 0.8 g/a/d at LDZ-4;
- 0.003 g/a/d at LDZ-5;
- 3.4 g/a/d at LDZ-6;
- 0.9 g/a/d at LDZ-7;
- 0 g/a/d at LDZ-10; and
- 0.1 g/a/d at LDZ-11.

It should also be noted that Cell 11 opened in March 2023 and flows were first recorded in the detection zone in late March 2023. In accordance with the PADEP Form 50, four quarters of baseline monitoring were initiated during the 2nd Quarter 2023, however, only one set of baseline samples have been collected to-date (during the 4th Quarter 2023) because this location was dry during the other quarters. Three more sets of baseline samples will be collected, after which a determination will be made whether or not this LDZ is influenced by leachate.

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. Finally, baseline monitoring is being conducted at LDZ-11.

Based on the above discussion, LDZ-5 and LDZ-11 are scheduled to be sampled during the 1st Quarter 2024.

3.9 METHANE PROBE MONITORING RESULTS

Field measurements of methane, carbon dioxide, oxygen, and balance were collected from the four on-site gas monitoring probes. Percent methane was then converted to percent lower explosive levels of methane. As shown in Appendix D, no methane was detected at or above the lower explosive limit in any probe during the 4th Quarter 2023.

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 1.5 mg/cm^2/month as specified in PA 25 §131.3 and referenced in PA 25 §273.217 during the 4th Quarter 2023, except for Locations A, B, and D during October. A review of the laboratory case narratives indicates the exceedances do not appear to be entirely

reflective of dust emissions generated from landfill operations, however, due to organic matter (insects, leaves, etc.) which is commonly present in the samples. During the month of October, Locations A, B, and D were each noted as containing brown water with dirt, insects, and leaves.

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 laboratory 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 4th Quarter 2023 sampling event:

- Lancaster Landfill was sampled for Form 21 Modified or Form 50 constituents on November 6 – 7, 2023.
- The New Oxford Formation Hydrostratigraphic Unit has a horizontal gradient to the north at 0.0295 ft/ft, with a horizontal velocity of 11.6 ft/day (4,234 ft/year) (Figure 3).
- Time-series analysis of select groundwater leachate indicator parameters shows no significant upward trends in these constituents through time, except for alkalinity at MW-109DR and MW-110DR and TDS at 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.
- Field measurements of methane, carbon dioxide, oxygen, and balance were collected from the four on-site gas monitoring probes and no methane was detected at or above the lower explosive limit in any probe during the 4th Quarter 2023.
- The results of the 4th Quarter 2023 dust fall analysis indicate no sample exceeded the maximum dust fall of 1.5 mg/cm^2/month, except for Locations A, B, and D during October. A review of the laboratory case narratives indicates the exceedances do not appear to be entirely reflective of dust emissions generated from landfill operations, however, due to organic matter (insects, leaves, etc.) which is commonly present in the samples. During the month of October, Locations A, B, and D were each noted as containing brown water with dirt, insects, and leaves.

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.

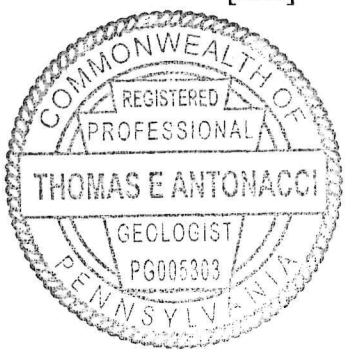
7.0 CERTIFICATION

By affixing my seal to this, I do hereby certify to the best of my knowledge, information, and belief that the information contained in this report is true and correct. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Name Thomas E. Antonacci, P.G. [seal]

Signature

Date 1/11/2024



TABLES

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

FOURTH QUARTER 2023
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	11/07/23	11:12 AM	18.94	54.00	5.61	16.83	1.9	0.34	5.20	180	13.2	
	MW-104D	11/06/23	10:52 AM	40.18	76.50	5.81	17.43	1.9	0.33	6.81	527	13.3	
	MW-105DR	11/06/23	10:09 AM	33.16	66.63	5.36	16.07	1.9	0.35	6.19	525	12.5	
	MW-106DR	11/06/23	09:24 AM	38.76	105.13	10.62	31.86	1.9	0.18	7.20	257	12.2	
	MW-107DR	11/07/23	10:50 AM	25.64	50.50	3.98	11.93	4.5	1.13	7.19	820	14.7	
	MW-108DR	11/07/23	12:09 PM	48.66	80.00	5.01	15.04	1.9	0.38	6.94	429	15.4	
	MW-109DR	11/06/23	11:29 AM	57.16	101.70	7.13	21.38	1.9	0.27	5.66	570	13.7	
	MW-110DR	11/06/23	12:44 PM	8.24	32.00	3.80	11.40	1.9	0.50	6.31	739	13.4	
	MW-111DR	11/06/23	12:14 PM	31.23	120.15	14.23	42.68	1.9	0.13	6.34	272	13.2	
Surface Water	MGSU01	11/06/23	11:50 AM							7.11	647	11.9	
	MGSD02	11/06/23	09:40 AM							7.39	363	10.5	
	MGSU03	11/06/23	10:00 AM							7.41	320	10.9	
	MGSD04	11/06/23	10:45 AM							7.53	363	13.5	
	MGSD05	11/06/23	10:40 AM							7.15	367	13.8	
	MGSU06	11/06/23	09:15 AM							7.21	354	10.7	
	MGSU07	11/06/23	09:00 AM							7.46	368	11.5	
Underdrain	U-C2	11/07/23	11:10 AM							6.52	445	18.1	
	U-C5												Dry
	U-C6A												Dry
	U-C6B												Dry
	U-C8A	11/06/23	12:15 PM							6.59	1,580	15.8	
	U-C9B												Dry
	U-C9C												Dry
	U-C10A												Dry
	U-C10B												Dry
	U-C10C												Dry
	U-C10D												Dry

TABLE 1
LANCASTER LANDFILL
PADEP ID NO. 101559

FOURTH QUARTER 2023
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	Leachate Storage Tank	11/06/23	12:00 PM							8.27	6,450	14.6	
	LDZ-1	11/06/23	09:25 AM							7.30	914	12.2	Sampled annually
	LDZ-2	11/06/23	09:45 AM							6.83	1,293	19.6	Sampled annually
	LDZ-3	11/06/23	09:55 AM							7.09	1,448	18.9	Sampled annually
	LDZ-4	11/06/23	10:10 AM							7.05	1,210	20.3	Sampled annually
	LDZ-5												Dry. Sampled annually
	LDZ-6	11/06/23	10:30 AM							7.30	825	15.7	
	LDZ-7	11/06/23	11:20 AM							7.51	5,950	18.0	Sampled annually
	LDZ-10	11/06/23	11:05 AM							6.95	1,304	22.3	Sampled annually
	LDZ-11	11/06/23	09:05 AM							8.77	4,360	18.3	Baseline Monitoring

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

FOURTH QUARTER 2023
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
New Oxford Formation	MW-101U	11/7/2023	495.93	18.94	476.99
	MW-104D	11/6/2023	418.86	40.18	378.68
	MW-105DR	11/6/2023	410.93	33.16	377.77
	MW-106DR	11/6/2023	427.53	38.76	388.77
	MW-107DR	11/7/2023	430.50	25.64	404.86
	MW-108DR	11/7/2023	465.36	48.66	416.70
	MW-109DR	11/6/2023	435.00	57.16	377.84
	MW-110DR	11/6/2023	428.00	8.24	419.76
	MW-111DR	11/6/2023	486.65	31.23	455.42

Notes:
[1] Elevation for the top of the PVC from field forms.
[2] Measured from the top of the PVC riser pipe.
ft amsl = feet above mean sea level.
NA = not applicable.

TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

FOURTH QUARTER 2023
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER								
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-101U**	**MW-104D**	**MW-105DR**	**MW-106DR**	**MW-107DR**	**MW-108DR**	**MW-109DR**	**MW-110DR**	**MW-111DR**
Form 21 Inorganics												
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloride	mg/L	EPA 300.0	250*	6.0	6.8	34.2	< 1.0	87.6	7.2	20.2	11.1	12.2
Iron	mg/L	EPA 200.7	0.3*	< 0.05	1.17	< 0.05	0.13	0.41	< 0.05	0.18	0.26	2.24
Iron, dissolved	mg/L	EPA 200.7	0.3*	< 0.05	< 0.05	< 0.05	0.09	< 0.05	< 0.05	< 0.05	< 0.05	1.01
pH (Field)	su	Field	NA	5.20	6.81	6.19	7.20	7.19	6.94	5.66	6.31	6.34
Lab pH	su	SM 4500-H+ B	NA	6.97 H	7.25 H	6.67 H	7.62 H	7.98 H	8.18 H	6.20 H	7.48 H	6.87 H
Sodium	mg/L	EPA 200.7	NA	7.5	14.7	21.0	15.3	16.0	9.2	19.7	4.9	16.9
Sodium, dissolved	mg/L	EPA 200.7	NA	7.4	14.9	20.3	16.0	16.3	9.7	18.9	4.9	17.2
Specific Conductance (Field)	µmhos/cm	Field	NA	180	527	525	257	820	429	570	739	272
Specific Conductance	µmhos/cm	EPA 120.1	NA	181	496	496	252	785	408	536	752	262
Sulfate	mg/L	EPA 300.0	250*	14.2	38.1	51.5	< 10	21.1	31.9	126	41.4	43.6
Total Organic Carbon	mg/L	SM 5310 C	NA	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.6	1.4	< 1.0
Total Organic Halogen	µg/L	EPA 9020	NA	< 50	< 50	< 50	< 50	< 50	< 50 C1	97	< 50	< 50
Additional Inorganics												
Alkalinity to pH 4.5	mg/L	ASTM D 1067-11	NA	41	205	112	122	229	161	81	365	55
Ammonia Nitrogen	mg/L	EPA 350.1	NA	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	ug/L	EPA 200.8	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Arsenic, dissolved	ug/L	EPA 200.8	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Barium	mg/L	EPA 200.7	2	0.18	0.14	0.09	0.17	0.61	0.21	0.03	0.29	0.13
Barium, dissolved	mg/L	EPA 200.7	2	0.18	0.10	0.09	0.18	0.60	0.21	0.03	0.28	0.12
Calcium	mg/L	EPA 200.7	NA	15.3	66.0	49.8	25.2	96.6	53.7	57.7	134	15.3
Calcium, dissolved	mg/L	EPA 200.7	NA	15.0	65.6	48.4	26.5	98.3	53.9	57.4	132	15.5
Chromium	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium, dissolved	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead	ug/L	EPA 200.8	15	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	8.2	< 5.0	< 5.0
Lead, dissolved	ug/L	EPA 200.8	15	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium	mg/L	EPA 200.7	NA	5.5	15.8	16.7	6.9	27.7	12.0	18.6	15.4	11.4
Magnesium, dissolved	mg/L	EPA 200.7	NA	5.4	15.8	16.2	7.3	27.7	11.9	18.3	15.1	11.4
Manganese	mg/L	EPA 200.7	0.05*	< 0.01	0.10	0.04	0.22	0.04	< 0.01	1.18	0.06	1.44
Manganese, dissolved	mg/L	EPA 200.7	0.05*	< 0.01	0.05	0.03	0.20	< 0.01	< 0.01	1.14	0.02	1.44
Nickel	mg/L	EPA 200.7	NA	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nickel, dissolved	mg/L	EPA 200.7	NA	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenolics	ug/L	EPA 420.4	NA	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0
Potassium	mg/L	EPA 200.7	NA	1.7	2.7	2.7	1.3	2.3	2.2	3.7	1.4	1.8
Potassium, dissolved	mg/L	EPA 200.7	NA	1.7	2.5	2.7	1.3	2.3	2.3	3.6	1.4	1.8
Total dissolved solids	mg/L	SM 2540 C	500*	126	286	262	128	430	216	302	422	158

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.

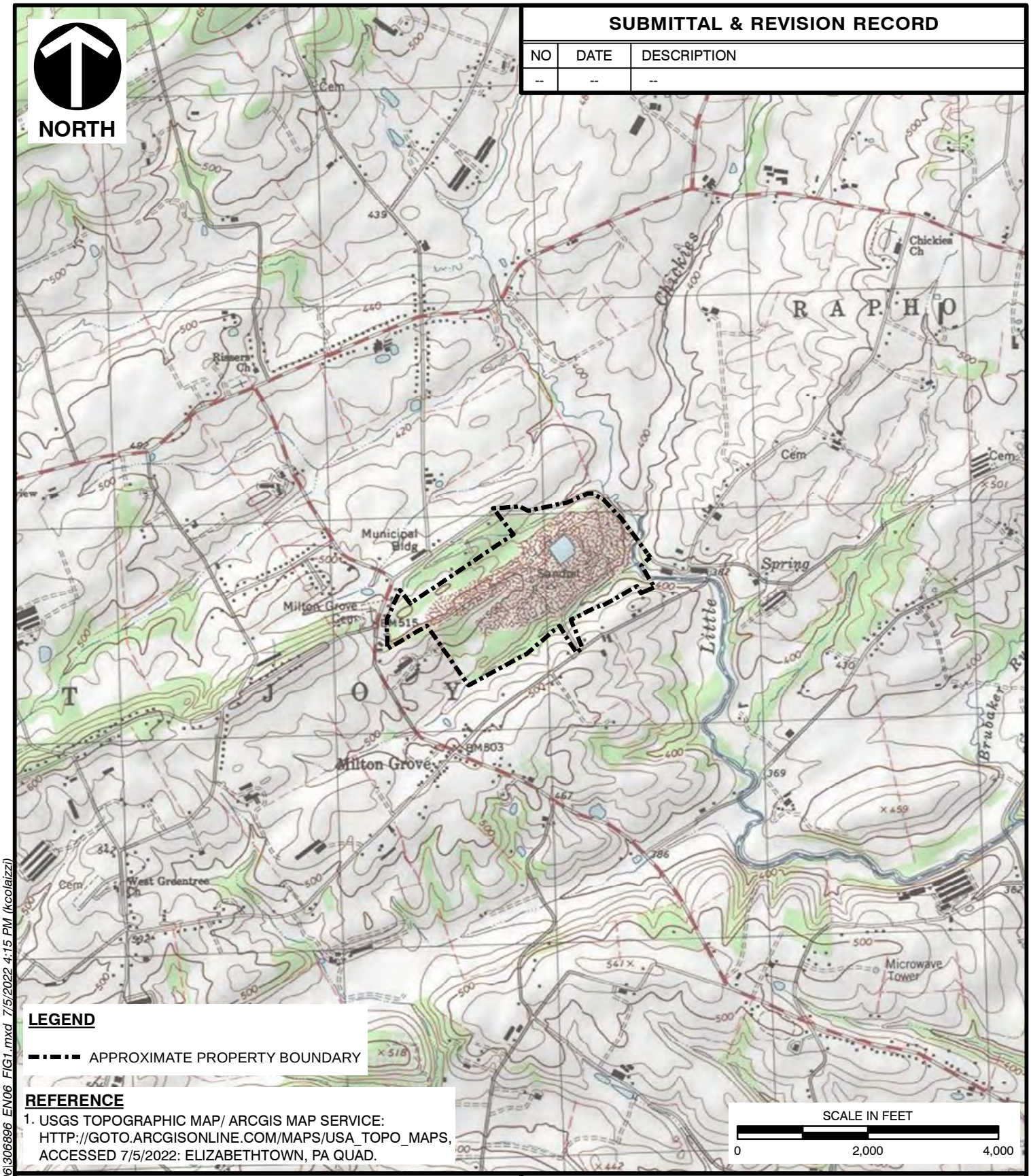
TABLE 3
LANCASTER LANDFILL
PADEP ID NO. 101559

FOURTH QUARTER 2023
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				SURFACE WATER						
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MGSU01**	**MGSD02**	**MGSU03**	**MGSD04**	**MGSD05**	**MGSU06**	**MGSU07**
Form 21 Inorganics										
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	23	20	12	< 10	< 10
Chloride	mg/L	EPA 300.0	250*	46.9	26.0	22.0	21.0	26.1	19.8	33.2
Iron	mg/L	EPA 200.7	0.3*	5.37	0.09	0.71	1.40	0.79	0.08	0.06
Iron, dissolved	mg/L	EPA 200.7	0.3*	3.29	< 0.05	< 0.05	< 0.05	< 0.05	0.05	< 0.05
pH (Field)	su	Field	NA	7.11	7.39	7.41	7.53	7.15	7.21	7.46
Lab pH	su	SM 4500-H+ B	NA	7.31 H	7.86 H	7.67 H	7.96 H	7.47 H	7.62 H	7.73 H
Sodium	mg/L	EPA 200.7	NA	25.1	16.1	17.0	14.6	15.8	14.0	16.3
Sodium, dissolved	mg/L	EPA 200.7	NA	25.0	15.5	16.3	15.1	15.5	14.0	16.3
Specific Conductance (Field)	µmhos/cm	Field	NA	647	363	320	363	367	354	368
Specific Conductance	µmhos/cm	EPA 120.1	NA	594	370	314	381	393	361	369
Sulfate	mg/L	EPA 300.0	250*	39.9	21.7	18.1	27.8	39.4	22.8	21.1
Total Organic Carbon	mg/L	SM 5310 C	NA	4.0	3.1	2.2	2.5	4.2	3.3	3.1
Total Organic Halogen	µg/L	EPA 9020	NA	0	0	0	0	0	0	0
Additional Inorganics										
Alkalinity to pH 4.5	mg/L	ASTM D 1067-11	NA	177	97	77	104	99	97	97
Ammonia Nitrogen	mg/L	EPA 350.1	NA	0.27	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	ug/L	EPA 200.8	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Arsenic, dissolved	ug/L	EPA 200.8	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Barium	mg/L	EPA 200.7	2	0.16	0.09	0.17	0.13	0.10	0.08	0.08
Barium, dissolved	mg/L	EPA 200.7	2	0.12	0.09	0.15	0.12	0.09	0.08	0.08
Calcium	mg/L	EPA 200.7	NA	68.7	38.4	29.7	39.1	39.3	37.1	34.6
Calcium, dissolved	mg/L	EPA 200.7	NA	67.2	36.8	27.8	37.9	38.2	37.0	34.7
Chromium	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium, dissolved	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead	ug/L	EPA 200.8	15	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Lead, dissolved	ug/L	EPA 200.8	15	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium	mg/L	EPA 200.7	NA	15.5	11.4	10.6	12.5	11.7	10.1	11.5
Magnesium, dissolved	mg/L	EPA 200.7	NA	15.1	10.9	10	12.1	11.3	10.1	11.5
Manganese	mg/L	EPA 200.7	0.05*	4.30	0.02	0.17	0.12	0.18	0.04	0.01
Manganese, dissolved	mg/L	EPA 200.7	0.05*	3.65	0.02	0.06	0.03	0.03	0.03	< 0.01
Nickel	mg/L	EPA 200.7	NA	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nickel, dissolved	mg/L	EPA 200.7	NA	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenolics	ug/L	EPA 420.4	NA	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0
Potassium	mg/L	EPA 200.7	NA	3.5	3.6	3.4	3.9	3.6	3.7	3.1
Potassium, dissolved	mg/L	EPA 200.7	NA	3.4	3.4	3.1	3.9	3.5	3.7	3.2
Total dissolved solids	mg/L	SM 2540 C	500*	318	206	158	192	190	196	202

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.

FIGURES



SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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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
MOUNT JOY TOWNSHIP, LANCASTER COUNTY, PENNSYLVANIA

SITE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	1
DATE:	07/05/2022	SCALE:	1 " = 2,000 '	PROJECT NO:	306-896	* Hand signature on file	

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NORTH

SUBMITTAL & REVISION RECORD		
NO	DATE	DESCRIPTION
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MGSU07
MGSU06
U-C10A
U-C10B
U-C10C
U-C10D
MW-109DR
MGSD02
Trib 07965 to Little Chickies Creek
GMP-3R
MGSU01
MW-104D
MW-110DR
Trib 07967 to Little Chickies Creek
Trib 07966 to Little Chickies Creek
CELL 10
CELL 7
U-C9B
Little Chickies Creek
LOCATION C
MW-105DR
MGSD05
U-C8A
CELL 9
CELL 1
CELL 11
U-C9C
LOCATION B
CELL 2
MW-111DR
MGSD04
CELL 8
CELL 3
MW-106DR
GMP-4
CELL 4
U-C2
GMP-2
CELL 5
MW-107DR
CELL 6A
U-C5
LOCATION A
CELL 6B
GMP-1R
LOCATION D
MW-101U
Trib 07964 to Little Chickies Creek
U-C6B
MW-108DR
MGSU03
U-C6A

380
400
420
440
460
480

SCALE IN FEET
0 1,000 2,000

LEGEND

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

REFERENCE

1. PENNSYLVANIA EMERGENCY MANAGEMENT AGENCY (PEMA) IMAGERY WEB MAPPING SERVICE IMAGE DATE: 2018-2021, DOWNLOADED: 04/06/2023.

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WASTE MANAGEMENT LANCASTER LANDFILL MOUNT JOY TOWNSHIP, LANCASTER COUNTY, PENNSYLVANIA

SAMPLE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	2
DATE:	07/13/2023	SCALE:	1 " = 1,000 '	PROJECT NO:	306-896	* Hand signature on file	

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NORTH

SUBMITTAL & REVISION RECORD		
NO	DATE	DESCRIPTION
--	--	--

i (MW-101U to MW-104D) = 0.0295
k = 98 ft/day
n = 25%
v = 11.6 ft/day (4,234 ft/yr)
Measured November 6-7, 2023

MW-109DR 377.84
MW-104D 378.68
MW-110DR 419.76
MW-105DR 377.77
MW-111DR 455.42
MW-106DR 388.77
MW-107DR 404.86
MW-108DR 416.70
MW-101U 476.99

CELL 10
CELL 7
CELL 9
CELL 1
CELL 11
CELL 2
CELL 8
CELL 3
CELL 4
CELL 5
CELL 6A
CELL 6B

380
400
420
440
460

SCALE IN FEET
0 300 600

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. PENNSYLVANIA EMERGENCY MANAGEMENT AGENCY (PEMA) IMAGERY WEB MAPPING SERVICE IMAGE DATE: 2018-2021, DOWNLOADED: 04/06/2023.

NOTES

1. ELEVATIONS ARE MEASURED IN FEET ABOVE MEAN SEA LEVEL.
2. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
3. 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.

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WASTE MANAGEMENT
LANCASTER LANDFILL
MOUNT JOY TOWNSHIP,
LANCASTER COUNTY, PENNSYLVANIA

NEW OXFORD FORMATION
POTENTIOMETRIC SURFACE MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	RCD*	FIGURE NO:	3
DATE:	01/04/2024	SCALE:	1 " = 300 '	PROJECT NO:	306-896	* Hand signature on file	

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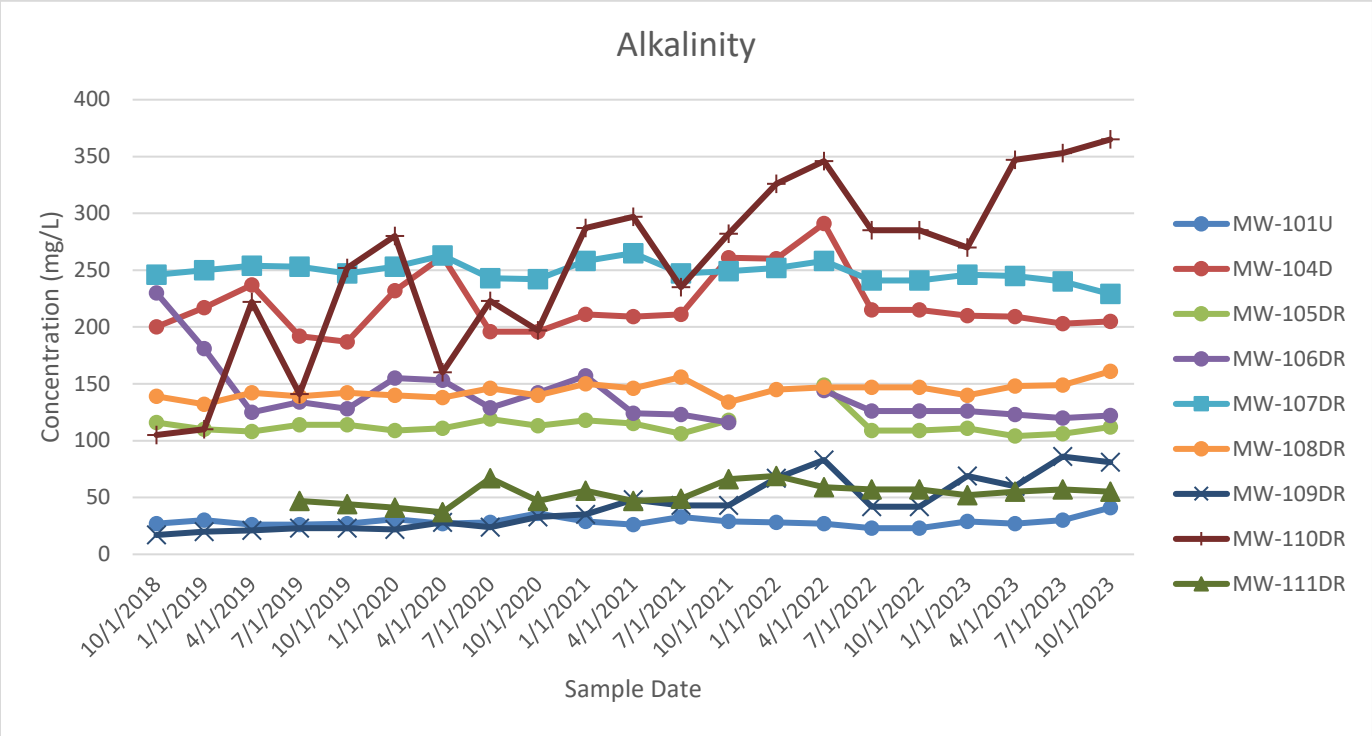
FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



Note: MW-105DR and MW-106DR were first sampled 1st Quarter 2022; prior results shown are from MW-105D and MW-106D.

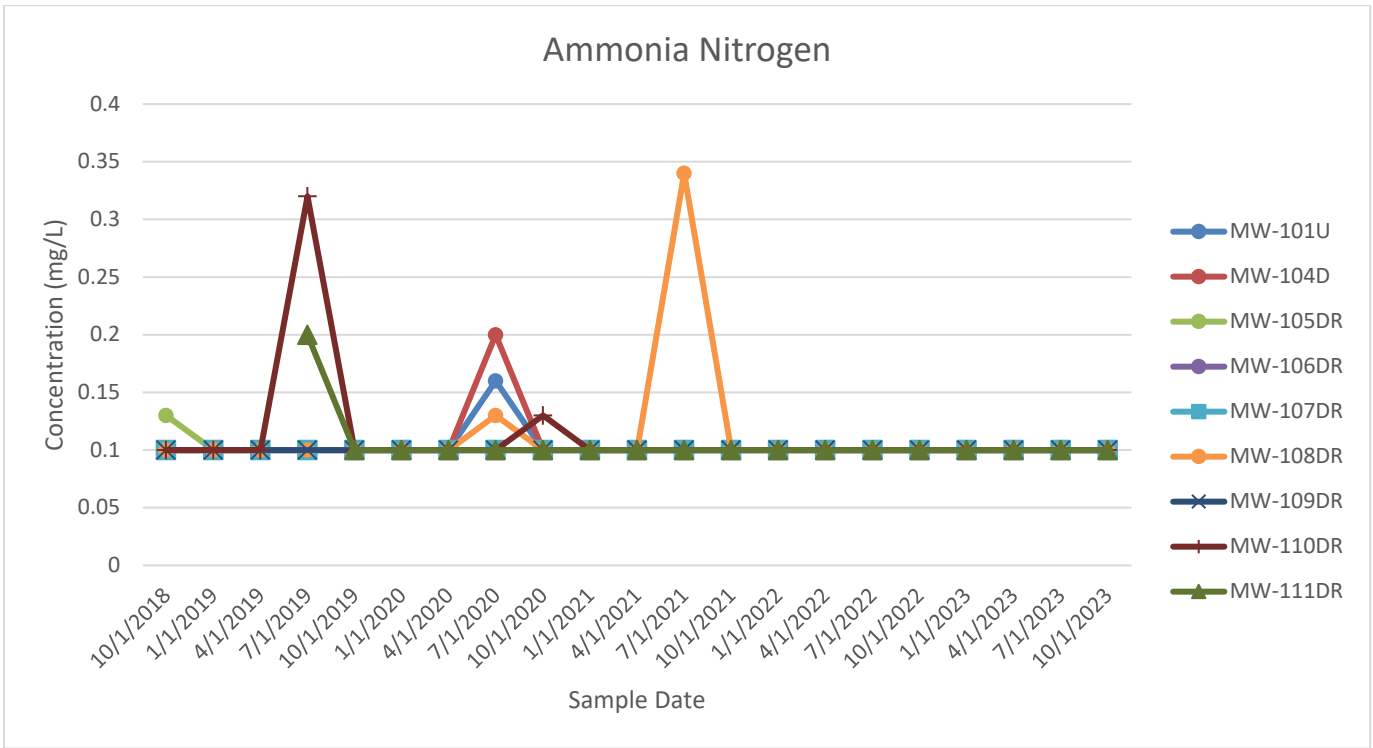
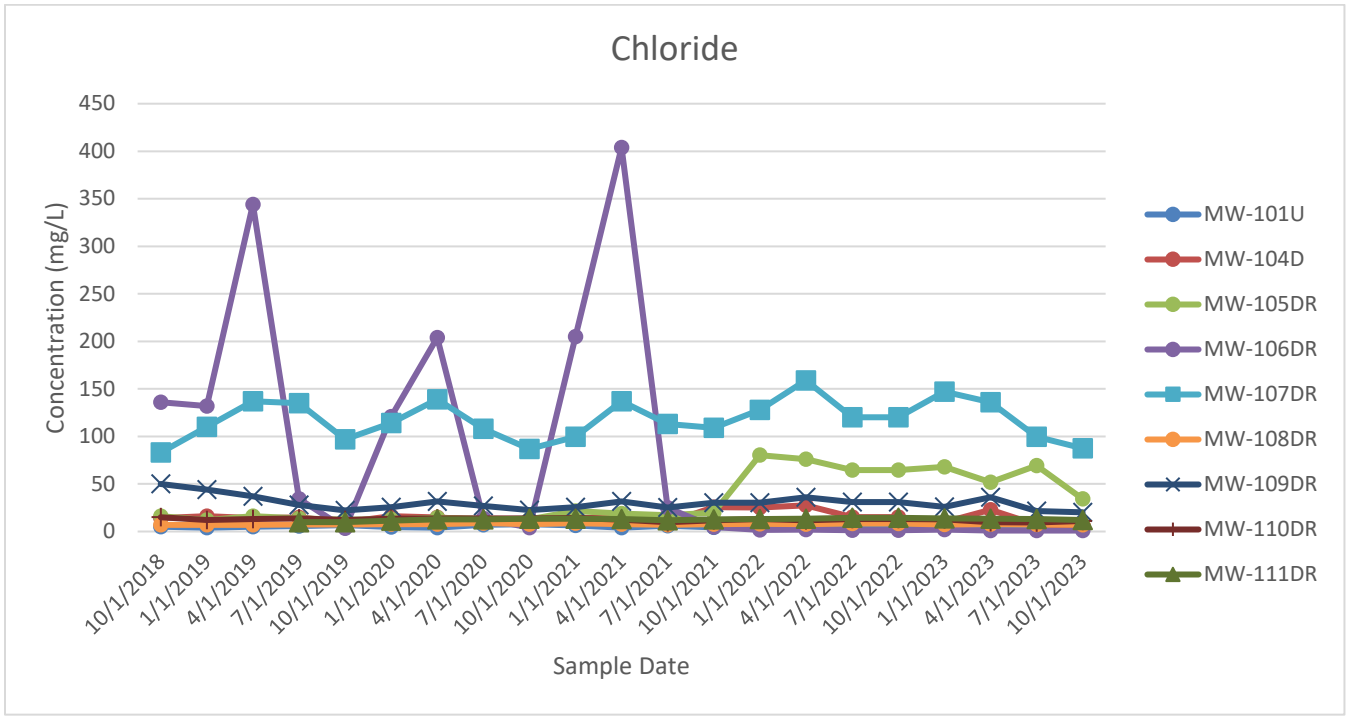


FIGURE 4

NEW OXFORD FORMATION
TIME SERIES PLOTS



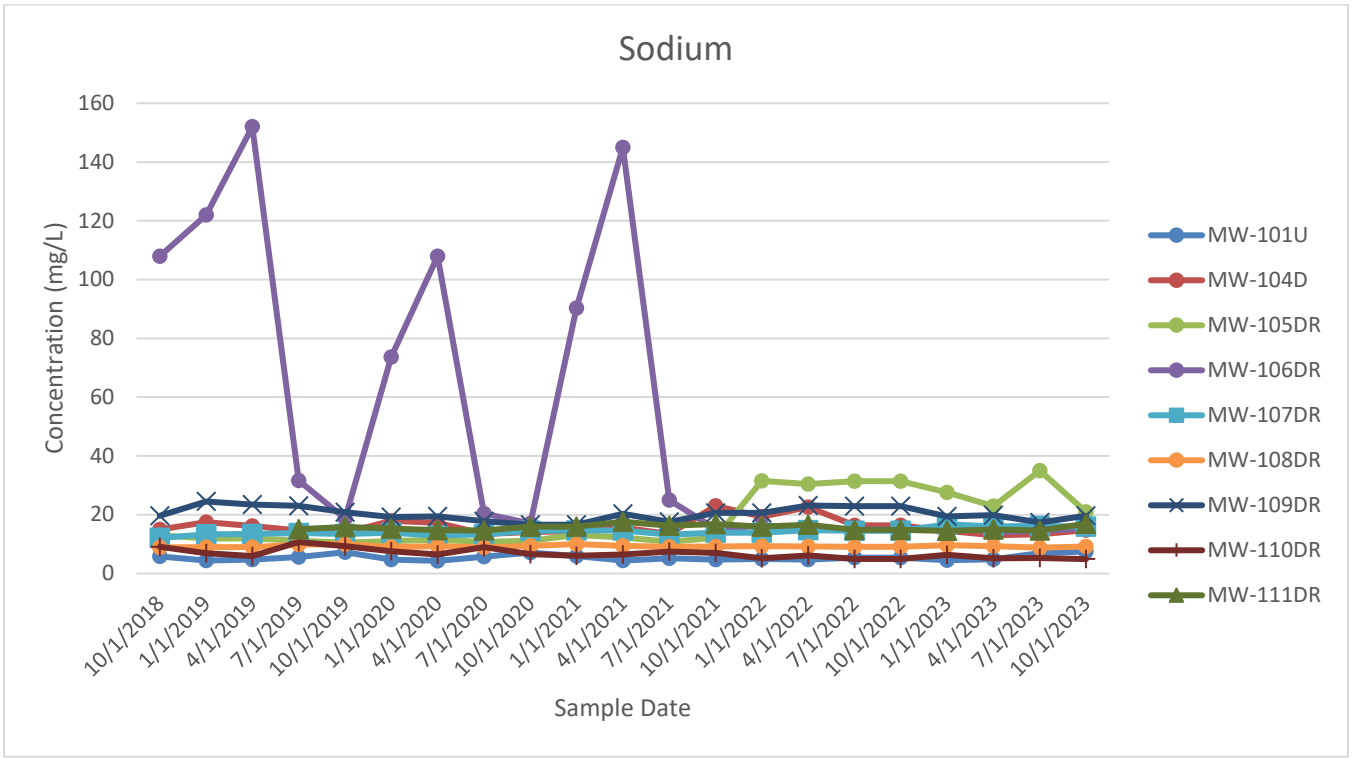
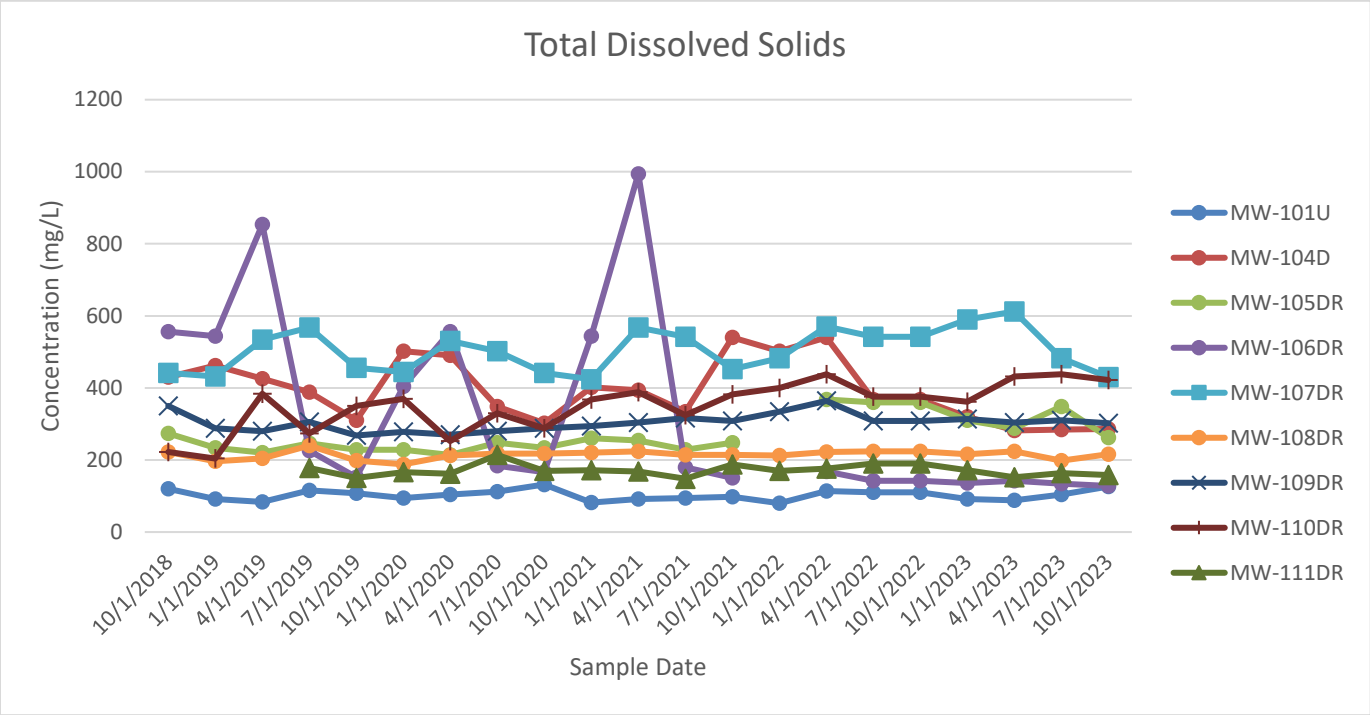


FIGURE 4

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 Laboratory 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