

Alternate Source Demonstration for the Nearman Creek Power Station Bottom Ash Pond



Kansas City Board of Public Utilities

**Nearman Creek Power Station
Project No. 88777**

**Revision 0
12/12/2018**

Alternate Source Demonstration for the Nearman Creek Power Station Bottom Ash Pond

prepared for

**Kansas City Board of Public Utilities
Nearman Creek Power Station
Kansas City, Kansas**

Project No. 88777

**Revision 0
12/12/2018**

prepared by

**Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri**

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC.

INDEX AND CERTIFICATION

Kansas City Board of Public Utilities Alternate Source Demonstration for the Nearman Creek Power Station Bottom Ash Pond

Project No. 88777

Report Index

<u>Chapter Number</u>	<u>Chapter Title</u>	<u>Number of Pages</u>
1.0	Introduction	4
2.0	Alternate Source Demonstration	4
3.0	Report Limitations	1
Appendix A	September 2018 Monitoring Well Drill Logs	
Appendix B	KDHE Notifications and Concurrence Letters	
Appendix C	October 2018 Direct-Push Drill Logs	
Appendix D	November 2018 Monitoring Well Drill Logs	
Appendix E	Sanitas™ Software Statistical Output	

Certification

I hereby certify, as a Professional Engineer in the state of Kansas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Kansas City Board of Public Utilities or others without specific verification or adaptation by the Engineer.



Scott Martin, P.E.
Kansas License #24713
License Renewal Date: April 30, 2019

Date: December 12, 2018

12/12/18 11:34 AM

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION AND BACKGROUND INFORMATION	1-1
1.1 Recent Groundwater Monitoring Activities.....	1-1
1.2 Alternate Source Investigation Activities	1-2
2.0 ALTERNATE SOURCE DEMONSTRATION	2-1
2.1 Hydrogeologic Setting	2-1
2.1.1 Local Hydrogeology	2-1
2.2 Groundwater Occurrence and Flow	2-2
2.2.1 Hydraulic Connectivity and Position of MW-13 and MW-16.....	2-2
2.2.2 Potential for a Release of Arsenic from the Bottom Ash Pond	2-3
2.3 Natural Variation in Groundwater Quality	2-3
2.4 Results Summary	2-3
2.5 Concluding Remarks.....	2-4
3.0 REPORT LIMITATIONS.....	3-1
APPENDIX A - SEPTEMBER 2018 MONITORING WELL DRILL LOGS	
APPENDIX B – KDHE NOTIFICATION AND CONCURRENCE LETTERS	
APPENDIX C – OCTOBER 2018 DIRECT-PUSH DRILL LOGS	
APPENDIX D – NOVEMBER 2018 MONITORING WELL DRILL LOGS	
APPENDIX E – SANITAS™ SOFTWARE STATISTICAL OUTPUT	

LIST OF TABLES

Table No.	Title
1-1	Summary of Groundwater Protection Standards
1-2	Summary of June 2018 Results
1-3	Summary of Groundwater Results – October & November 2018 Sampling Events
1-4	Monitoring Well Gauging Data – October 1, 2018
1-5	Monitoring Well Gauging Data – October 31, 2018
1-6	Monitoring Well Gauging Data – November 19, 2018
2-1	2015-2016 Bottom Ash Pond Arsenic Results

LIST OF FIGURES

Figure No.	Title
1-1	Monitoring Well Locations
1-2	Oct. 1, 2018 Potentiometric Surface Map
1-3	Oct. 31, 2018 Potentiometric Surface Map
1-4	Nov. 19, 2018 Potentiometric Surface Map
1-5	Direct-Push Boring Locations

LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term/Phrase/Name</u>
ASD	Alternate Source Demonstration
bgs	below ground surface
BPU	Kansas City Board of Public Utilities
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
Nearman Creek	Nearman Creek Power Station
CCR	Coal Combustion Residual
CCR Rule	Title 40 Code of Federal Regulations, Parts 257 and 261, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule, April 17, 2015
CFR	Code of Federal Regulations
CY	Cubic Yards
DPGW	Direct push drilling groundwater sample location
KDHE	Kansas Department of Health and Environment
Groundwater Monitoring Program	Groundwater Monitoring Plan for the Nearman Creek Power Station Bottom Ash Pond (Burns & McDonnell, 2016a)
GWPS	Groundwater protection standards
mg/L	Milligrams per liter
MW	Monitoring Well
RCRA	Resource Conservation and Recovery Act
Report	Alternate Source Demonstration Report
SAP	Sampling and Analysis Plan
SSI	Statistically significant increase
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION AND BACKGROUND INFORMATION

This Alternate Source Demonstration (ASD) Report (Report) was prepared by Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) on behalf of Kansas City Board of Public Utilities (BPU) to present the results of an alternate source investigation performed under the United States Environmental Protection Agency's (USEPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities; Final Rule, 40 Code of Federal Regulations (CFR) Part 257, dated April 17, 2015 (USEPA, 2015) (Final CCR Rule) at the existing utility bottom ash pond (hereinafter referred to as the "Bottom Ash Pond") located at BPU's Nearman Creek Power Station (Nearman Creek or Site).

This Report has been prepared to provide a summary of groundwater data collected as part of the alternate source investigation in conjunction with routine monitoring network data collected from 2015 through 2018, and to document that statistically significant increases (SSI's) over background levels for arsenic are resultant from the natural variation of groundwater quality in proximity to the Bottom Ash Pond.

Routine groundwater monitoring activities are conducted in accordance with the Groundwater Monitoring Plan for the Nearman Creek Power Station Bottom Ash Pond (Burns & McDonnell, 2016a) (Groundwater Monitoring Program) and the Sampling and Analysis Plan for the Nearman Creek Power Station Bottom Ash Pond (Burns & McDonnell, 2016b). The Bottom Ash Pond groundwater monitoring network is presented in Figure 1-1. Included within Figure 1-1, are monitoring wells installed as part of assessment monitoring activities and to support the ASD.

1.1 Recent Groundwater Monitoring Activities

BPU initiated assessment monitoring activities for the Bottom Ash Pond in March 2018. Per 40 CFR §257.95(b), each of the monitoring wells included in the Bottom Ash Pond monitoring well network were sampled for the full list of 40 CFR Part 257 Appendix IV parameters in March of 2018, within 90 days of triggering the assessment monitoring program. In June 2018, the Bottom Ash Pond monitoring wells were resampled for 40 CFR Part 257 Appendix III parameters and those Appendix IV parameters that were detected during March 2018 monitoring (herein referred to as the "reduced Appendix IV list").

Groundwater protection standards (GWPS) were established in September 2018 in accordance with §257.95(h) for Appendix IV constituents that were detected in one or more monitoring wells from the March 2018 sampling event in accordance with §257.95(b). When establishing GWPSs, background concentrations were compared to maximum concentration limits (MCLs) and the concentrations presented for lithium and molybdenum in §257.95(h)(2). Background limits were generated using

prediction interval analysis consistent with §257.93(f)(3). The prediction interval assessment was performed using historic data from upgradient monitoring wells MW-3 and MW-4 as the background dataset. As presented on Table 1-1, background concentrations were compared to the levels identified in §257.95(h)(1) or §257.95(h)(2) and the higher of the two values was selected as the GWPS.

Table 1-2 presents the results of the June 2018 groundwater monitoring event and compares detected constituents to their respective GWPS and background concentrations. The June 2018 sampling event conducted at the Bottom Ash Pond was performed per the requirements presented in §257.95(d)(1). As presented on Table 1-2, arsenic was detected at a concentration above the GWPS in samples collected from monitoring wells MW-8A and MW-10. None of the other Appendix IV constituents were detected at concentrations above their respective GWPS.

Three groundwater monitoring wells (MW-13, MW-14, and MW-15) were installed in September 2018 at the locations presented on Figure 1-1 to assess the extent of arsenic at concentrations above the GWPS of 0.010 milligrams per liter (mg/L) in groundwater. Prior to installing these wells, a subsurface investigation was performed using a hydraulic profiling tool (HPT) and electrical conductance (EC) tool to assess the lithology present downgradient of the site. The HPT/EC survey results supported the placement of MW-13, MW-14, and MW-15 at locations that are hydraulically connected to the rest of the groundwater monitoring network and which were believed to be down-gradient and cross-gradient of the pond. On October 1, 2018, the three newly installed monitoring wells were sampled along with existing well network for 40 CFR Part 257 Appendix III parameters and the reduced Appendix IV list. This event also served as the second assessment monitoring event performed in 2018, the results of which are summarized on Table 1-3. As presented on Table 1-3, arsenic was detected in October 2018 at a concentration above the GWPS in samples collected from monitoring wells MW-10, and MW-13. Monitoring well locations are shown on Figure 1-1 and drill logs for MW-13, MW-14, and MW-15 are provided in Appendix A.

Based on review of historical groundwater gradients near the Bottom Ash Pond and the October 2018 and November 2018 potentiometric surface maps, presented as Figures 1-2 through 1-4, MW-13 is believed to be either upgradient or cross gradient of the Bottom Ash Pond. Groundwater elevation data for well gauging events performed in October and December of 2018 are presented on Tables 1-4 through 1-6.

1.2 Alternate Source Investigation Activities

Following review of the October 2018 monitoring event results and potentiometric surface information, Burns & McDonnell, on behalf of BPU, notified the Kansas Department of Health and Environment

(KDHE) of BPU's intent to conduct an alternate source investigation. KDHE concurred with BPU's approach of conducting an alternate source investigation based on the documented presence of naturally occurring arsenic in Kansas soils and groundwater. The notification to KDHE and KDHE's concurrence letter are included as Appendix B.

In October 2018, eight direct push borings were advanced in general proximity to the Bottom Ash Pond to assess the range of naturally occurring arsenic concentrations within the unconsolidated aquifer and aid in the placement of a one or more permanent monitoring wells for sampling via low-flow sampling techniques. Direct push boring locations are presented in Figure 1-5. Prior to collecting direct-push groundwater samples, soils were sampled using dual-tube sampling techniques and logged by a Geologist to assess the soil characteristics and to identify groundwater sampling horizons at each location. Groundwater samples were then collected by advancing a direct push rod equipped with a drop-screen sampling device to depths between 20 and 30 below ground surface (bgs). A groundwater sample was collected at each direct push boring location using an inertia pump. Samples were field-filtered and submitted to the project laboratory for the analysis of dissolved arsenic under standard chain of custody procedures. The resulting boreholes were abandoned by backfilling with bentonite chips to 1.0 ft bgs. The remainder of the borehole was allowed to collapse or was filled with material matching the surrounding grade. Direct push boring logs are provided in Appendix C. The Bottom Ash Pond well network was also gauged in conjunction with the direct-push event and the resulting potentiometric surface is presented on Figure 1-3.

Table 1-3 presents the results of the October 2018 direct push sampling event. As presented on Table 1-3, dissolved arsenic was detected at a concentration above the GWPS in samples collected from DPGW-1 and DPGW-5.

Monitoring Well MW-16 was installed in November 2018 in proximity to DPGW-5 to support the collection of groundwater samples for total arsenic using low flow sampling procedures consistent with the Final Rule. This location was selected to better represent the full range of naturally occurring background conditions at locations upgradient of the Bottom Ash Pond and to provide data for use in statistical assessment. Monitoring Wells MW-2A, MW-3, MW-4, MW-8A, MW-10, MW-13, MW-14, MW-15, and MW-16 were sampled in November 2018 for laboratory analysis of total and dissolved arsenic. As presented on Table 1-3, total arsenic was detected at a concentration above the GWPS in samples collected from MW-8A, MW-13, and MW-16. Monitoring well locations are shown on Figure 1-1 with MW-16 drill log provided in Appendix D. Based on review of groundwater gradients near the

Bottom Ash Pond and the November 2018 potentiometric surface map, presented as Figure 1-4, MW-16 is upgradient of the Bottom Ash Pond.

2.0 ALTERNATE SOURCE DEMONSTRATION

Per 40 CFR §257.94.(e)(2), an owner or 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 natural variation in groundwater quality. USEPA's *Solid Waste Disposal Facility Criteria Technical Manual, Subpart E* (EPA530-R-93-017, November 1993) states that an ASD shall document that:

- ❖ An alternative source exists.
- ❖ Hydraulic connection exists between the alternative source and the groundwater monitoring well(s) with the significant increase.
- ❖ Constituent(s) are present at the alternative source or along the flow path from the alternative source prior to possible release from the [CCR] unit.
- ❖ The relative concentration and distribution of constituents in the zone of contamination are more strongly linked to the alternative source than to the [CCR] unit when the fate and transport characteristics of the constituents are considered.
- ❖ The concentration observed in groundwater could not have resulted from the [CCR] unit given the waste constituents and concentrations in the [CCR] unit impoundment water that is in contact with CCR, and site hydrogeologic conditions.
- ❖ The data supporting conclusions regarding the alternative source are historically consistent with hydrogeologic conditions and findings of the monitoring program.

2.1 Hydrogeologic Setting

2.1.1 Local Hydrogeology

The hydrogeology beneath the Bottom Ash Pond is characterized by a single groundwater aquifer comprised of the Missouri River Alluvium (Miller and Vandike, 1997). The Missouri River alluvium receives recharge from four sources: infiltration from the Missouri River, bedrock adjacent to and underlying the alluvium, precipitation falling upon the floodplain, and downward leakage of water from streams, other than the Missouri River, flowing across the alluvium. In areas where surficial materials are sandy and permeable, the amount of recharge water is significant. Where there is a clay or silt overlying

the more permeable deposits, the recharge is less. The typical geologic sequences encountered beneath the Site in the alluvial aquifer includes the following (from top to bottom):

- Alluvial silt with some sand and little clay
- Alluvial sand – fine to medium grain, loose, and poorly graded

2.2 Groundwater Occurrence and Flow

The uppermost water bearing zone lies within the thick sand deposits of the alluvial aquifer and is considered to be unconfined. Groundwater depth measurements were collected from the wells presented on Figure 1-1 on October 1, 2018, October 31, 2018, and November 19, 2018 and are summarized in Tables 1-4 through 1-6, respectively. Potentiometric surface maps (Figures 1-2 through 1-4) were prepared using this data and present hydraulic gradients and the general direction of groundwater flow near the Bottom Ash Pond. Figures 1-2 through 1-4 indicate that the direction of groundwater flow beneath the Site is generally to the west-northwest. This is consistent with historical groundwater monitoring activities that show fluctuations in groundwater flow ranging from west-northwest to north-northwest.

Historical groundwater gradients present at the Site and the piezometric surface contours presented on Figures 1-2 through 1-4 indicate that the direction of groundwater flow is predominantly controlled by the presences of horizontal collector wells (HCW)-1 and HCW-2 and the Missouri River elevation. While river stage can affect the direction of groundwater flow at locations near the Bottom Ash Pond during periods of pronounced high water elevations, fluctuations from the predominant north-westerly flow pattern are short lived.

2.2.1 Hydraulic Connectivity and Position of MW-13 and MW-16

Based on review of drill logs and direct sensing (HPT/EC) profiles, the upper unconsolidated water-bearing units consists predominately of alluvial sands and silt with relatively high hydraulic conductivity. These water-bearing units have been observed across the site and are believed to be in hydraulic connection at locations near the Bottom Ash Pond. All the monitoring wells presented in Figure 1-1 and used as part of the Bottom Ash Pond groundwater monitoring program and this ASD are screened within these upper water-bearing units and are expected to be in hydraulic connection with one another. As presented on Figures 1-2 through 1-4, monitoring well MW-13 is upgradient or cross-gradient of the Bottom Ash Pond and monitoring well MW-16 is upgradient of the Bottom Ash Pond. As a result, it can be concluded that the arsenic detected in samples from these monitoring wells did not originate from the Bottom Ash Pond.

2.2.2 Potential for a Release of Arsenic from the Bottom Ash Pond

Bottom Ash Pond surface water samples were collected during select background groundwater monitoring events conducted from 2015 and 2016 for the analysis of 40 CFR Part 257 Appendix III and IV parameters. The Bottom Ash Pond surface water is in contact with CCR and was historically utilized to transport (sluice) CCR into the Bottom Ash Pond as part of a closed loop bottom ash handling system. The results of the Bottom Ash Pond surface water sampling events are presented on Table 2-1. As presented on Table 2-1, total arsenic was either not detected or detected at concentrations well below the GWPS. Based upon a review of the data presented in Table 2-1, the arsenic concentrations observed in MW-8A and MW-10 are not believed to be resultant from the CCR unit given the observed arsenic concentrations in the Bottom Ash Pond surface water samples.

2.3 Natural Variation in Groundwater Quality

As provided in Table 1-1, the Bottom Ash Pond's historical arsenic background concentration of 0.00269 mg/L was determined utilizing interwell prediction limits and sample data collected from October 2015 through June 2018 at upgradient monitoring wells MW-3 and MW-4. Since MW-16 is also located upgradient of the Bottom Ash Pond and provides additional information on the full range of naturally occurring arsenic in the upper portions of the aquifer, it is appropriate to include this location in the development of site-specific background concentration for arsenic at the Bottom Ash Pond. When the total arsenic concentration observed at MW-16 is included in an interwell prediction limit assessment, the background concentration for arsenic was determined to be 0.035 mg/L utilizing data from October 2015 through November 2018 at upgradient wells MW-16, MW-3, and MW-4. A Sanitas™ output for this statistical evaluation is included in Appendix E.

With the exception of MW-16, concentrations of arsenic observed throughout the CCR Groundwater Monitoring Program do not exceed the calculated background limit of 0.035 mg/L. This along with the gradients presented on Figures 1-2 through 1-4 indicate that arsenic observed in the upper portion of the aquifer is more strongly linked to the natural variation in groundwater quality than to the Bottom Ash Pond.

2.4 Results Summary

Per USEPA's *Solid Waste Disposal Facility Criteria Technical Manual, Subpart E* (EPA530-R-93-017, November 1993), this ASD has documented that:

- ❖ An alternative source exists. Monitoring well MW-16 has arsenic present at three times the GWPS established for the bottom ash pond (0.010 mg/L). The arsenic observed in samples

collected from MW-16 is believed to be naturally occurring and representative of background conditions. The highest concentration of arsenic in groundwater was observed at MW-16, which is approximately 1,500 ft upgradient of the Bottom Ash Pond.

- ❖ Hydraulic connection exists between the alternative source and the groundwater monitoring well(s) with the significant increase. The alluvial aquifer is consistent across the Site. The established monitoring well network and newly installed monitoring wells at the Site are all screened within the same hydrostratigraphic zone of the alluvial aquifer and are all considered to be hydraulically connected.
- ❖ Constituent(s) are present at the alternative source or along the flow path from the alternative source prior to possible release from the [CCR] unit. The highest concentration of arsenic in groundwater was observed at MW-16, which is upgradient of the Bottom Ash Pond.
- ❖ The relative concentration and distribution of constituents in the zone of contamination are more strongly linked to the alternative source than to the [CCR] unit when the fate and transport characteristics of the constituents are considered. The highest concentration of arsenic in groundwater was observed at MW-16, which is upgradient of the Bottom Ash Pond.
- ❖ The concentration observed in groundwater could not have resulted from the [CCR] unit given the waste constituents and concentrations in the [CCR] unit leachate and wastes, and site hydrogeologic conditions. Arsenic present in the surface water samples collected from the Bottom Ash Pond is more than an order of magnitude lower than the concentration present at MW-16, which is upgradient of the Bottom Ash Pond.
- ❖ The data supporting conclusions regarding the alternative source are historically consistent with hydrogeologic conditions and findings of the monitoring program. See Section 2.5.

2.5 Concluding Remarks

As presented in prior sections of this Report, groundwater data collected as part of the alternate source investigation was compared with routine monitoring network data collected from 2015 through 2018. The data presented herein supports the conclusion that the uppermost groundwater zone within the alluvial aquifer is hydraulically connected across the Site and the highest concentration of arsenic observed at the Site is present upgradient of the Bottom Ash Pond at MW-16. Therefore, based on the findings presented in this Report, the detections of arsenic in proximity to the Bottom Ash Pond are believed to be from the natural variation in background groundwater quality that is present at the Site.

3.0 REPORT LIMITATIONS

This document has been prepared in accordance with generally accepted environmental engineering and geologic practices for groundwater quality monitoring and reporting. Conclusions contained herein are BMcD's interpretation of readily available data and constitute a professional opinion based on said data. No other warranty, express or implied, is made as to the information included in this document. In the event that others make conclusions and recommendations based on data contained herein, such conclusions and recommendations are the responsibility of others.

BMcD has exercised reasonable skill, care, and diligence in preparation of this report in accordance with customarily accepted standards of good professional practice in effect at the time this report was prepared. Special risks are inherently associated with the characterization and description of groundwater quality, including, but not limited to: groundwater occurrence, groundwater contaminant concentrations, site geology and site hydrogeology. Even a comprehensive groundwater assessment and/or monitoring program using appropriate equipment, implemented by experienced personnel under the direction of trained professionals may fail to detect certain conditions. Therefore, such conditions may not be identified in this report. For similar reasons, conditions inferred to exist between sampling points might differ significantly from the conditions that actually exist.

Changes in subsurface conditions can be influenced by many factors. These factors include but are not limited to: management of surrounding areas, off-site contaminant sources, seasonal rainfall fluctuations, changes in drainage conditions in and around the site, changes in contaminant source area and composition, groundwater occurrence, and biodegradation. Over time, actual conditions discovered through sampling are subject to variation because of natural occurrences and/or man-made intervention on or near the site.

TABLES

Table 1-1
Summary of Groundwater Protection Standards
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond

Appendix IV Parameter	Units	Background*	MCL	§257.95(h)(2) Criteria	Groundwater Protection Standard
Arsenic	mg/L	0.00269	0.010	--	0.010
Barium	mg/L	0.182	2	--	2
Fluoride	mg/L	0.1836	4	--	4
Lithium	mg/L	0.06023	--	0.040	0.06023
Molybdenum	mg/L	0.005	--	0.100	0.100
Combined Radium 226 and 228	pCi/L	2.611**	5	--	5

Notes:

*Background concentrations were determined utilizing interwell prediction limits. Upgradient wells MW-3 and MW-4 were used to determine these background concentrations. This included data from October 2015 through June 2018.

**Combined radium is reported with an associated range. However, this range cannot be incorporated into statistical calculations as it varies per result and is not a standard value. Therefore, to maintain consistency in reporting these results, the reported laboratory concentration was used for the statistical analyses.

mg/L - milligrams per Liter

pCi/L - picocuries per Liter

MCL - Maximum Contaminant Level

**Table 1-2
Summary of June 2018 Results
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond**

		Sample Location Sample Date Lab ID	Calculated Background ¹	GWPS ²	MW-2A 6/4/2018 L999032-01	MW-3 6/4/2018 L999032-02	MW-4 6/4/2018 L999032-03	MW-8A 6/4/2018 L999032-04	DUP-1 6/4/2018 L999032-06	MW-10 6/4/2018 L999032-05
Analytical Method	Analyte	Unit			Duplicate Pair					
Appendix III - Detection Monitoring										
6010B	Boron	mg/L	0.272	--	0.2 U	0.212	0.2 U	2.44	2.47	1.5
6010B	Calcium	mg/L	228.5	--	156	215	214 O1 V	129	129	168
9056MOD	Chloride	mg/L	12.1	--	4.34	5.74	3.59	25.7	25.5	19.6
9056MOD	Fluoride	mg/L	0.1836	--	0.274 J+	0.173 J+	0.156 J+	0.453 J+	0.441 J+	0.235 J+
9040C	pH	su	6.34	--	7.05 J	6.94 J	6.93 J	6.97 J	6.98 J	6.94 J
In Situ	pH	su	6.56	--	6.81	7.18	6.94	6.86	6.86	6.61
9056MOD	Sulfate	mg/L	150	--	53.8	137	116	353	360	214
2540 C-2011	Total Dissolved Solids	mg/L	852.6	--	537	788	741	853	881	748
Detected Appendix IV - Assessment Monitoring³										
6020	Arsenic	mg/L	0.00269	0.010	0.002 U	0.002 U	0.002 U	0.0204	0.0195	0.0126
6010B	Barium	mg/L	0.182	2	0.147	0.159	0.134	0.0559	0.0548	0.107
9056MOD	Fluoride	mg/L	0.1836	4	0.274 J+	0.173 J+	0.156 J+	0.453 J+	0.441 J+	0.235 J+
6010B	Lithium	mg/L	0.06023	0.06023	0.0352	0.0606	0.051	0.0262	0.031	0.0445
6010B	Molybdenum	mg/L	0.005	0.100	0.005 U	0.005 U	0.005 U	0.00865	0.00876	0.005 U
Calculated 904/903.1	Radium 226/228 Combined	pCi/L	2.611	5	1.64	1.62	0.876	1.61	1.54	1.18

Notes

1 - Background concentrations were determined utilizing interwell prediction limits. Upgradient wells MW-3 and MW-4 were used to determine these background concentrations. This included data ranging from October 2015 through June 2018.

2 - GWPSs were developed in accordance with §257.95(h).

3 - Samples were analyzed for Appendix IV parameters which were detected at one or more monitoring wells during the sampling event conducted in accordance with §257.95(b).

BOLD and SHADED Parameter was detected in well(s) located downgradient of the Bottom Ash Pond at a concentration greater than the GWPS.

GWPS - Groundwater Protection Standard

J - qualified as estimated during data validation

J+ - qualified as estimated, biased high, during data validation

mg/l - milligram per liter

pCi/L - picocurie per liter

su - standard unit

U - Non Detect at the identified concentration

V = The sample concentration is too high to evaluate accurate spike recoveries

**Table 1-3
Summary of Groundwater Results
October & November 2018 Sampling Events
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond**

Groundwater Sampling Event - October 1 - 3, 2018								
Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	MW-2A 10/1 & 10/3/2018 L1031071-01/10 & L1031413-06	MW-3 10/2/2018 L1031071-02/11 & I1031413-01	MW-4 10/2/2018 L1031071-03/12 & L1031413-02	MW-8A 10/1 & 10/3/2018 L1031071-04/13 & L1031413-07	MW-10 10/1 & 10/3/2018 L1031071-05/14 & L1031413-08	DUP-1 10/3/2018 L1031071-09/18 & L1031413-09 *Dup of MW-10
Analyte	Unit							
Dissolved Solids	mg/l	N/A	580	747	619	920	822	808
Chloride	mg/l	N/A	5.12	7.13	1.95	26.2	18.6	18.7
Fluoride	mg/l	4	0.208	0.186	0.177	0.394	0.219	0.217
Sulfate	mg/l	N/A	68.5	136	87	419	234	232
Arsenic, Total	mg/l	0.01	0.00359	0.0021	0.002 U	0.00278	0.0245	0.0241
Barium, Total	mg/l	2	0.157	0.163	0.121	0.0602	0.129	0.128
Boron, Total	mg/l	N/A	0.2 U	0.2 U	0.2 U	2.31	1.22	1.23
Calcium, Total	mg/l	N/A	163	207	176	122	179	179
Lithium, Total	mg/l	0.06023	0.027	0.0481	0.0304	0.0174	0.0281	0.0286
Molybdenum, Total	mg/l	0.1	0.005 U	0.005 U	0.005 U	0.00967	0.005 U	0.005 U
pH	su	N/A	6.96 J	6.83 J	6.91 J	6.95 J	6.98 J	6.96 J
Combined Radium	pCi/l	2.611	1.25 J	0.555 J	0.186 J	0.589 J	0.35 J	0.35

Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	MW-13 10/1/2018 L1031071-06/15 & L1031413-03	MW-14 10/1/2018 L1031071-07/16 & L1031413-04	MW-15 10/1/2018 L1031071-08/17 & L1031413-05			
Analyte	Unit							
Dissolved Solids	mg/l	N/A	542	839	505			
Chloride	mg/l	N/A	19.5	21.5	16.4			
Fluoride	mg/l	4	0.38	0.208	0.462			
Sulfate	mg/l	N/A	155	221	194			
Arsenic, Total	mg/l	0.01	0.0252	0.002 U	0.00482			
Barium, Total	mg/l	2	0.205	0.0765	0.107			
Boron, Total	mg/l	N/A	0.2 U	0.2 U	0.2 U			
Calcium, Total	mg/l	N/A	95	200	78.3			
Lithium, Total	mg/l	0.06023	0.0296	0.0297	0.0428			
Molybdenum, Total	mg/l	0.1	0.005 U	0.005 U	0.005 U			
pH	su	N/A	7.1 J	6.7 J	7.45 J			
Combined Radium	pCi/l	2.611	0.765 J	0.138 J	1.35 J			

Note 2: The radium results were presented in a separate data package than the other noted analytes. The first two noted laboratory numbers are the data package for all results except radium. Radium results are presented in the second noted data package.

BOLD and SHADED Parameter was detected in well(s) located downgradient of the Bottom Ash Pond or direct-push samples at a concentration greater than the GWPS.
 GWPS - Groundwater Protection Standard
 J - Estimated Value
 mg/l - Milligrams per Liter
 N/A - Not Applicable
 pCi/l - picoCuries per Liter
 su - Standard Units
 U - Nondetect

**Table 1-3
Summary of Groundwater Results
October & November 2018 Sampling Events
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond**

Direct-Push Groundwater Sampling Event - October 29-30, 2018								
Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	DPGW-1/GW01 10/30/2018 L1039637-04	DPGW-DUP/GW01 10/30/2018 L1039637-05 <small>*(Dup of DPGW-1/GW01)</small>	DPGW-2/GW01 10/29/2018 L1039637-01	DPGW-3/GW01 10/30/2018 L1039637-06	DPGW-4/GW01 10/30/2018 L1039637-09	
Analyte	Unit							
Arsenic, Dissolved	mg/l	0.010 <small>*(Total arsenic)</small>	0.0258	0.0239	0.002 U	0.002 U	0.002 U	

Direct-Push Groundwater Sampling Event - October 29-30, 2018								
Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	DPGW-5/GW01 10/30/2018 L1039637-08	DPGW-6/GW01 10/30/2018 L1039637-07	DPGW-7/GW01 10/29/2018 L1039637-03	DPGW-8/GW01 10/29/2018 L1039637-02		
Analyte	Unit							
Arsenic, Dissolved	mg/l	0.010 <small>*(Total arsenic)</small>	0.0314	0.00273	0.002 U	0.002 U		

Alternative Source Investigation Sampling Event - November 19-20, 2018								
Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	MW-2A 11/20/2018 L1046228-01	MW-3 11/20/2018 L1046228-02	MW-4 11/20/2018 L1046228-03	MW-8A 11/20/2018 L1046228-04	MW-10 11/20/2018 L1046228-05	DUP 11/20/2018 L1046228-10 <small>Dup of MW-10</small>
Analyte	Unit							
Arsenic, Total	mg/l	0.010	0.00324	0.002 U	0.002 U	0.0183	0.00789	0.00821
Arsenic, Dissolved	mg/l	<small>*(Total arsenic)</small>	0.0023	0.002 U	0.002 U	0.0146	0.00453	0.00472

Alternative Source Investigation Sampling Event - November 19-20, 2018								
Sample Identification: Date(s) Sampled: Data Package(s): Note(s):		GWPS	MW-13 11/19/2018 L1046228-06	MW-14 11/19/2018 L1046228-07	MW-15 11/19/2018 L1046228-08	MW-16 11/19/2018 L1046228-09		
Analyte	Unit							
Arsenic, Total	mg/l	0.010	0.024	0.002 U	0.00509	0.035		
Arsenic, Dissolved	mg/l	<small>*(Total arsenic)</small>	0.0233	0.002 U	0.00535	0.0356		

Bold and shaded indicates the noted GWPS was exceeded. Note that only a total arsenic GWPS was available for the arsenic screening.

Note 2: The radium results were presented in a separate data package than the other noted analytes. The first two noted laboratory numbers are the data package for all results except radium. Radium results are presented in the second noted data package.

<p>BOLD and SHADED Parameter was detected in well(s) located downgradient of the Bottom Ash Pond or direct-push samples at a concentration greater than the GWPS.</p> <p>GWPS - Groundwater Protection Standard</p> <p>J - Estimated Value</p> <p>mg/l - Milligrams per Liter</p> <p>N/A - Not Applicable</p>	<p>pCi/l - picoCuries per Liter</p> <p>su - Standard Units</p> <p>U - Nondetect</p>
--	---

Table 1-4
Monitoring Well Gauging Data - October 1, 2018
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond

Well	Date Measured	Top of Casing Elevation (ft MSL)	Total Depth Constructed (ft bTOC)	Measured Total Depth (ft bTOC)	Measured Water Level (ft bTOC)	Elevation of Water Level (ft MSL)
MW-2A	10/1/2018	747.86	31.68	NM	14.32	733.54
MW-3	10/1/2018	750.44	34.7	NM	17.26	733.18
MW-4	10/1/2018	746.9	31.75	NM	14.03	732.87
MW-8A	10/1/2018	750.1	35.17	NM	17.12	732.98
MW-10	10/1/2018	745.25	29.5	NM	11.92	733.33
MW-13	10/1/2018	747.81	33.48	NM	12.25	735.56
MW-14	10/1/2018	749.18	33.27	NM	15.65	733.53
MW-15	10/1/2018	752.88	32.7	NM	15.33	737.55

Notes:

ft - feet

ft bTOC - feet below top of casing

ft MSL - feet above mean sea level.

NM - Not Measured

Table 1-5
Monitoring Well Gauging Data - October 31, 2018
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond

Well	Date Measured	Top of Casing Elevation (ft MSL)	Total Depth Constructed (ft bTOC)	Measured Total Depth (ft bTOC)	Measured Water Level (ft bTOC)	Elevation of Water Level (ft MSL)
MW-2A	10/31/2018	747.86	31.68	NM	14.26	733.60
MW-3	10/31/2018	750.44	34.7	NM	16.55	733.89
MW-4	10/31/2018	746.9	31.75	NM	13.05	733.85
MW-8A	10/31/2018	750.1	35.17	NM	17.40	732.70
MW-10	10/31/2018	745.25	29.5	NM	12.20	733.05
MW-13	10/31/2018	747.81	33.48	NM	12.51	735.30
MW-14	10/31/2018	749.18	33.27	NM	20.05	729.13
MW-15	10/31/2018	752.88	32.7	NM	16.86	736.02

Notes:

ft - feet

ft bTOC - feet below top of casing

ft MSL - feet above mean sea level.

NM - Not Measured

Table 1-6
Monitoring Well Gauging Data - November 19, 2018
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond

Well	Date Measured	Top of Casing Elevation (ft MSL)	Total Depth Constructed (ft bTOC)	Measured Total Depth (ft bTOC)	Measured Water Level (ft bTOC)	Elevation of Water Level (ft MSL)
MW-2A	11/19/2018	747.86	31.68	NM	15.35	732.51
MW-3	11/19/2018	750.44	34.7	NM	17.63	732.81
MW-4	11/19/2018	746.9	31.75	NM	14.17	732.73
MW-8A	11/19/2018	750.1	35.17	NM	18.58	731.52
MW-10	11/19/2018	745.25	29.5	NM	13.27	731.98
MW-13	11/19/2018	747.81	33.48	NM	13.64	734.17
MW-14	11/19/2018	749.18	33.27	NM	20.15	729.03
MW-15	11/19/2018	752.88	32.7	NM	18.41	734.47
MW-16	11/19/2018	748.43	32.51	NM	14.89	733.54

Notes:

ft - feet

ft bTOC - feet below top of casing

ft MSL - feet above mean sea level.

NM - Not Measured

Table 2-1
2015-2016 Bottom Ash Pond Arsenic Results
Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond

Sample Location Sample Date Lab ID			GWPS	BA POND 10/30/2015 L798087-09 L798090-06	DUP-2 10/30/2015 L798087-11 L798090-08	BA POND 1/27/2016 L814632-06 390438006	DUP-2 1/27/2016 L814632-08 390438008	BA POND 4/27/2016 L832453-06 20160407-06
Analytical Method	Analyte	Unit		Duplicate Pair		Duplicate Pair		
6020	Arsenic	mg/l	0.010	0.002 U	0.002 U	0.00224	0.00205	0.002 U

Sample Location Sample Date Lab ID			GWPS	BA POND 7/25/2016 L849542-07 20160702-07	DUP-2 7/25/2016 L849542-09 20160702-09	BA POND 10/27/2016 L868992-07 20161076-07	DUP-2 10/27/2016 L868992-09 20161076-09
Analytical Method	Analyte	Unit		Duplicate Pair		Duplicate Pair	
6020	Arsenic	mg/l	0.010	0.00254	0.00245	0.00205	0.00213

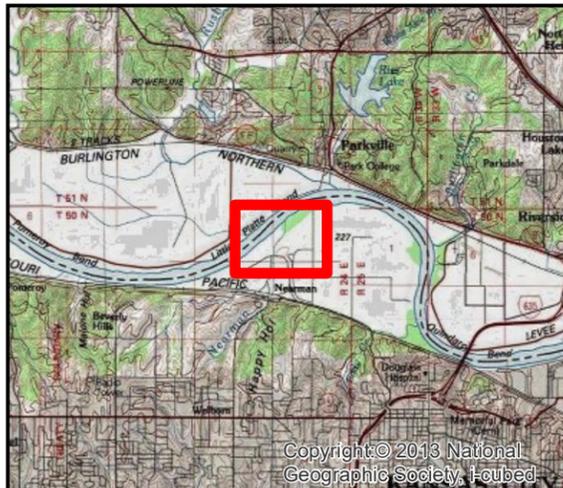
Notes:

BA = Bottom Ash

mg/l = milligram per liter

U - Non Detect at the identified concentration

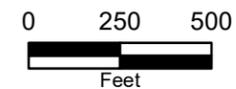
FIGURES



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

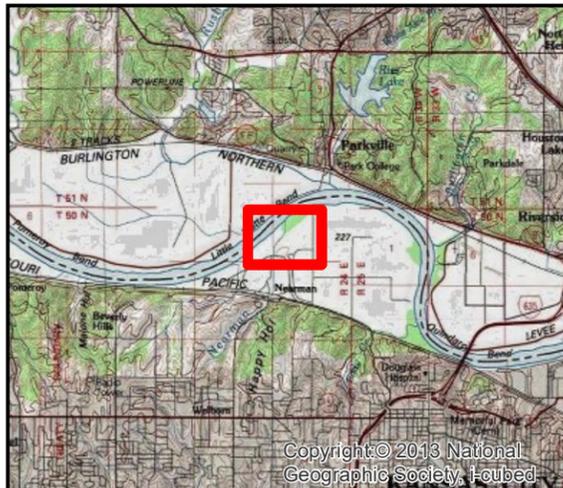
Legend

- ◆ BA Pond Monitoring Well
- ◆ Assessment Monitoring Well
- ◆ ASD Monitoring Well



**FIGURE 1-1
MONITORING WELL LOCATIONS
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS**

Source: ESRI and Burns & McDonnell Engineering.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Monitoring Well
- Approximate Groundwater Flow Direction
- Piezometric Surface Contour

Notes

Groundwater levels used to create piezometric surface gauged on October 1, 2018

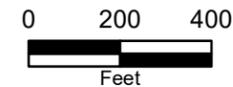
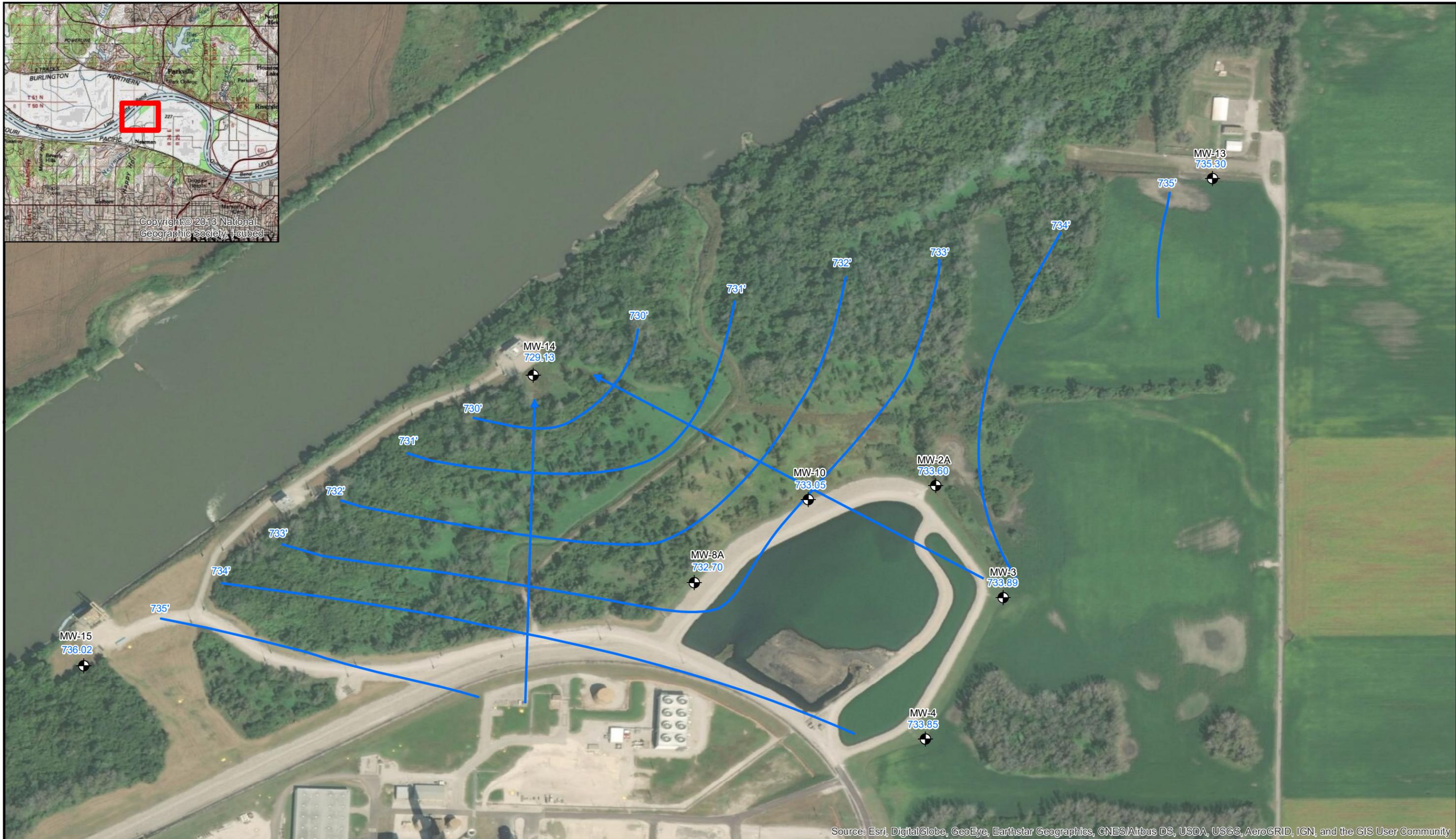
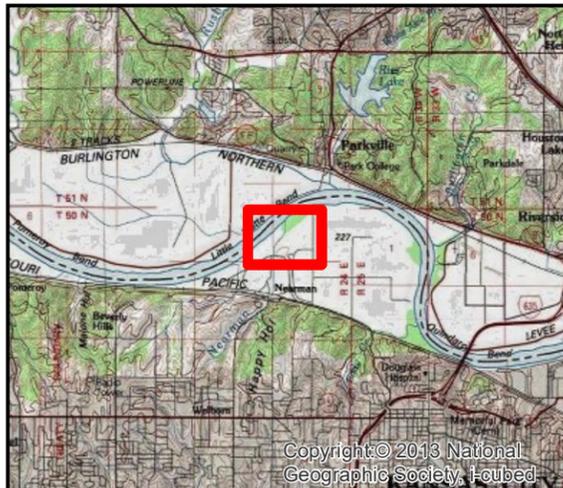


FIGURE 1-2
OCT. 1 2018 POTENTIOMETRIC MAP
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS

Source: ESRI and Burns & McDonnell Engineering.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: Z:\Clients\ENSIKCBPU188777_CORGMON\Studies\Geospatial\ArcDocs\FIGURE 1-3_Oct 31 2018 Potentiometric Map.mxd
 COPYRIGHT © 2018 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

- Legend**
- Monitoring Well
 - Approximate Groundwater Flow Direction
 - Piezometric Surface Contour
 - Water Level Elevation

Notes
 Groundwater levels used to create piezometric surface gauged on October 31, 2018

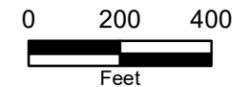
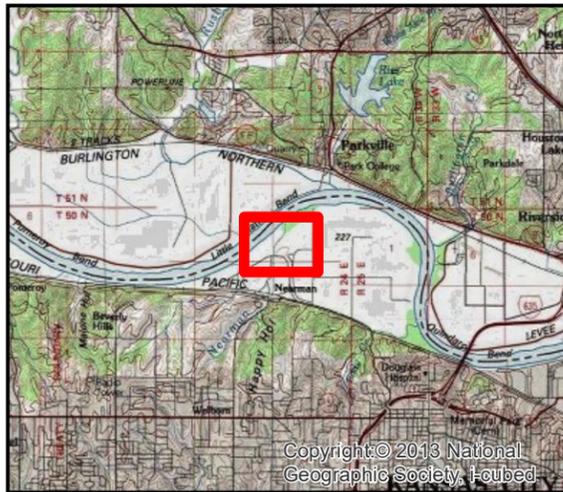


FIGURE 1-3
OCT. 31 2018 POTENTIOMETRIC MAP
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS

Source: ESRI and Burns & McDonnell Engineering.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

-  Monitoring Well
-  Approximate Groundwater Flow Direction
-  Piezometric Surface Contour
-  Water Level Elevation

Notes

Groundwater levels used to create piezometric surface gauged on November 19, 2018

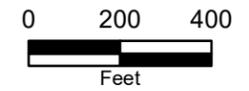
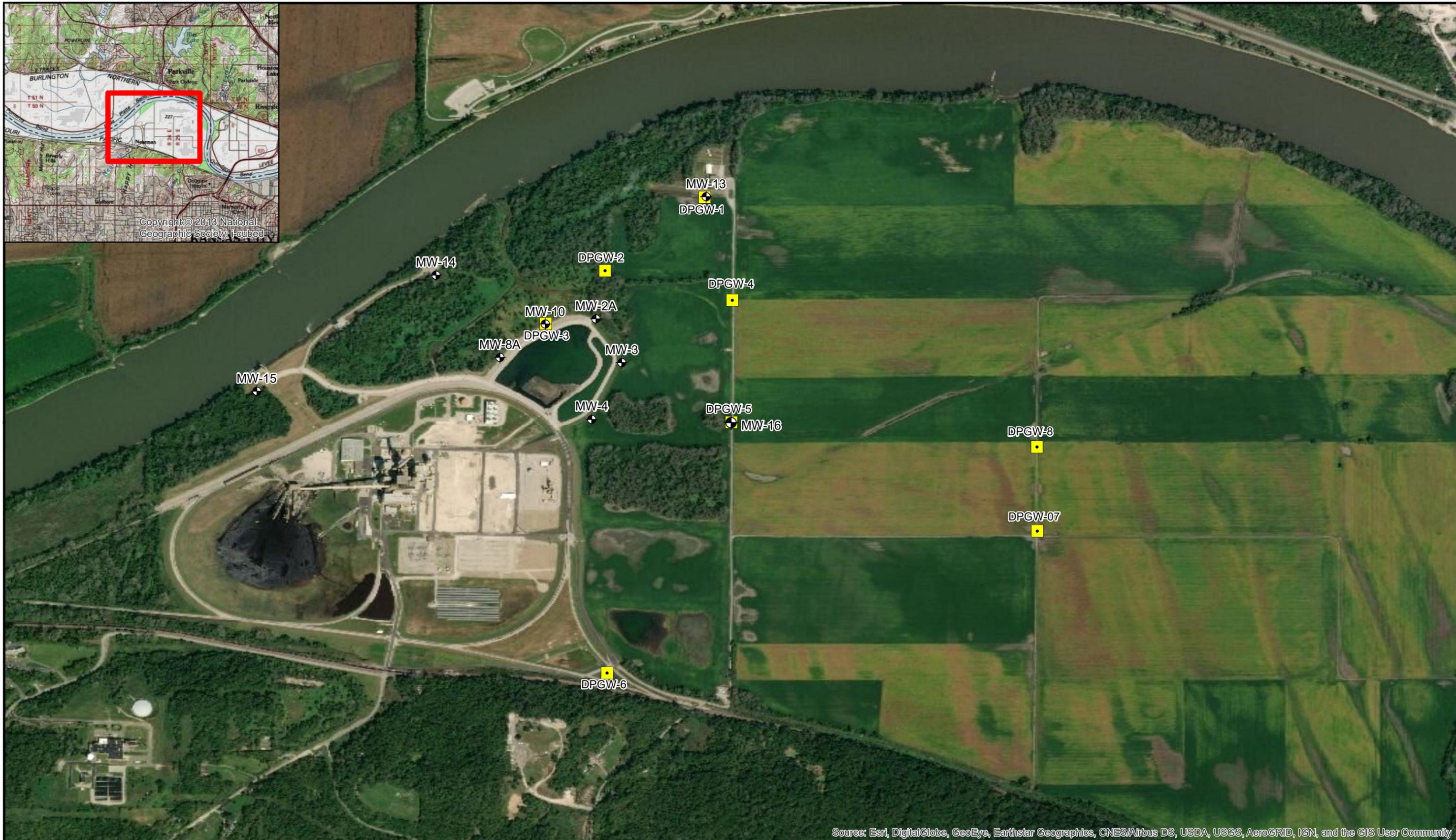
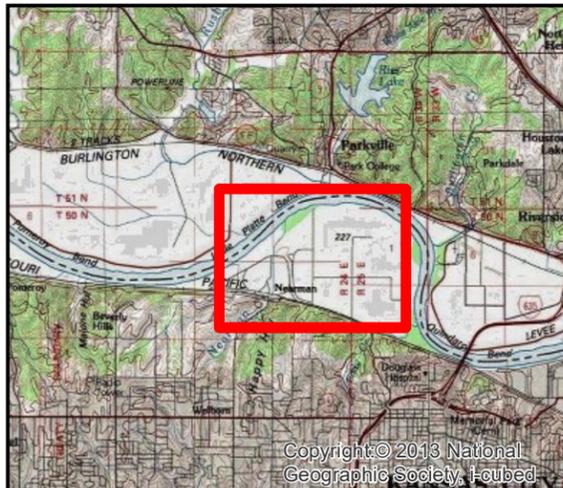


FIGURE 1-4
NOV. 19 2018 POTENTIOMETRIC MAP
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS

Path: Z:\Clients\ENSIKCBPU088777_CORGMON\Studies\Geospatial\ArcDocs\FIGURE 1-420181205_CGR Piezometric Surface Map.mxd
 COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC.
 Issued: December, 7 2018

Source: ESRI and Burns & McDonnell Engineering.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

-  Monitoring Wells
-  Direct-Push Sample Location

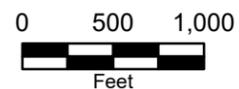


FIGURE 1-5
DIRECT-PUSH LOCATIONS
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS

Path: Z:\Clients\ENSK\CBPU\88777_CORGMON\Studies\Geospatial\ArcDocs\FIGURE 1-5_20181206_DirectPushSampleLocations.mxd
 COPYRIGHT © 2018 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

APPENDIX A - SEPTEMBER 2018 MONITORING WELL DRILL LOGS

Drilling Log

Project Name <i>KCBW Newman Creek</i>		Project Number <i>88777</i>		Boring Number <i>MW-15</i>	
Ground Elevation		Location <i>Kansas City KS</i>		Page <i>1 of 2</i>	
Air Monitoring Equipment <i>let O2</i>				Total Footage <i>30</i>	
Drilling Type <i>Direct Push USA</i>	Hole Size <i>2" / 844</i>	Overburden Footage <i>30</i>	Bedrock Footage <i>—</i>	No. of Samples <i>—</i>	No. of Core Boxes
Drilling Company <i>RAZEL</i>			Driller(s) <i>Tony Paulin Greg Gosh</i>		
Drilling Rig <i>Geopac 782201</i>			Type of Sampler <i>MAROCORE</i>		
Date <i>9-20-18</i>		To <i>9-20-18</i>		Field Observer(s) <i>Kevin Bolling</i>	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	<i>Silt, 104R 4/3, damp</i>									
2	<i>Silt, 104R 4/3, damp, sandy</i>									
3	<i>Sand, very fine to med. s. 104R 4/3, damp loose</i>									
4	<i>Silt, 104R 4/3, damp, silty</i>									
5	<i>SAND, 104R 5/3, damp loose Silt to medium sandily + face gradly</i>				<i>1640</i>					
6	<i>Silt, 104R 4/3, damp, medium silty non plastic, trace roots</i>									
9	<i>SAND, fine sand, 104R 6/3 damp, loose,</i>				<i>1623</i>					
10										
11										
12										
13										
14										



Drilling Log Continuation

2

Project Name HC8PU						Boring Number MW-13			
Project Number 88777						Page 252			
						Date 9-20-18			

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
15	SAND, 10-12% fine gr. damp. 1705				1644					
16					35					
17					50					
18	wet,									
19	fine to med. w/ gravel									
20					1655					
21					20					
22					50					
23										
24										
25					1708					
26					166					
27					50					
28										
29	fine to coarse w/ gravel									
30										
31	COB 30' G.S.									
32										

Drilling Log

Project Name KC BPO		Project Number 88777		Boring Number MW-14	
Ground Elevation		Location Kansas City KS		Page 1 of 2	
Air Monitoring Equipment 4-CO₂				Total Footage 30	
Drilling Type Direct Push HSD	Hole Size 8.25	Overburden Footage 30	Bedrock Footage —	No. of Samples —	No. of Core Boxes —
Drilling Company RAZER			Driller(s) Tony Patton Greg Goode		
Drilling Rig Geoprobe 782205			Type of Sampler macrocam		
Date 9-20-16		To 9-20-18		Field Observer(s) Kevin Bolling	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	Silt, var. granish brown 10 1/2" 1/2, damp, soft									
2										
3										
4	Silt, same clay 10 1/2" 3 soft, low, plastic, damp									
5	Sand, very fine Silt, brown 10 1/2" 3/4 moist, soft				1414					
6	CLAY, very dark grayish brown 10 1/2" 3/4 damp, med. soft medium plastic									
7	SAND, silty, sand, fine grain, 10 1/2" 3/4 damp									
8	Silt, 10 1/2" 1/2, moist, soft									
9	SAND, 10 1/2" 1/2, medium grain, damp, loose									
10	Silt, 10 1/2" 1/2, moist, soft w/ clay				1420					
11	Silt, med plastic									
12										
13	SAND, medium grain, 10 1/2" 3/4 damp, loose, poorly graded									
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

						Boring Number MW-14			
Project Name KCBPO						Page 2 of 2			
Project Number 89777						Date 9-2-15			
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	PID (ppm)			Remarks/ Water Levels
						BZ	BH	S	
15	SAND, 10-12 $\frac{1}{4}$ fine damp, med-grain, 100% graded, loss								
16			3						
17			5						
18	wet at 16.5								
19									
20					1420				
21									
22	fine med-grain loose, well graded + fine gravel		2						
23									
24									
25	SAND, light yellowish brown 10-12 $\frac{1}{4}$, fine to med-grain								
26	grain, well loose, poorly graded								
27			2.5						
28			5						
29									
30					1445				
31	ESS 30' bss								
32									

Drilling Log

Project Name KCBPU		Project Number 88177		Boring Number MW-13	
Ground Elevation		Location Kansas City, KS		Page 1 of 2	
Air Monitoring Equipment 4-54				Total Footage 30	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
Direct Push USIT	8.25	30	-	-	-
Drilling Company KATZEL			Driller(s) Tony Paulsen Greg Gade		
Drilling Rig Geoprobe 182205			Type of Sampler Mercio core		
Date 9-20-18		To 9-20-18		Field Observer(s) Kevin Holman	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	Gravelly silt, 10 yd 1/2 dia Silt, silty clay, 10 yd 1/2 dia dmp, soft.			3						
2				5						
3										
4	10 yd 1/2 dia moist									
5					0924					
6	SAND, very fine to fine grain, 10 yd 1/2 dia dmp, loose, poorly sorted			2						
7	SILT, 10 yd 1/2 dia			5						
8	SAND, very fine to fine grain 10 yd 1/2 dia, dmp, loose, poorly sorted									
9										
10					0924					
11				3						
12				5						
13	SAND, very fine to fine grain 10 yd 1/2 dia, dmp, loose, poorly sorted									
14										

BZ=Breathing Zone

BH=Bore Hole

S=Sample

051601 Form WCD-2-1

Drilling Log Continuation

						Boring Number MW-13				
Project Name KCBPU						Page 2 of 2				
Project Number SS777						Date 9-26-18				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
15	SAWD, 1042.5, fine sand									
16	1042.5, wet, fine sand			2						
17				5						
18										
19	SAWD, yellowish brown									
20	1042.5, wet bore, fine to med. sand									
21										
22				1						
23				5						
24	SAWD, dark gray, 1044.5, well graded, fine to med. sand, wet									
25	1044.5, fine to coarse sand									
26	trace fine gravel									
27				2						
28				5						
29										
30										
31	EOB 3016.3									
32										

APPENDIX B – KDHE NOTIFICATION AND CONCURRENCE LETTERS



October 12, 2018

Mr. Bill Bider
Director - Bureau of Waste Management
Kansas Department of Health & Environment
1000 SW Jackson, Suite 320
Topeka, Kansas 66612-1366

Re: Kansas City Board of Public Utilities
Nearman Creek Power Station Bottom Ash Pond
KDHE Permit No.413
Assessment Monitoring Notification - Alternate Source Demonstration

Dear Mr. Bider:

As indicated in Burns & McDonnell Engineering Company, Inc.'s (Burns & McDonnell's) Notification Regarding Groundwater Protection Standards letter dated October 12, 2018, arsenic has been detected at three wells within the Bottom Ash Pond groundwater monitoring network at statistically significant levels above its groundwater protection standard.

As per §257.95, BPU is planning on conducting an investigation to assess whether a source other than the Bottom Ash Pond is causing the exceedance of the applicable groundwater protection standard. The assessment will include, but may not be limited to, evaluation of natural variation in groundwater quality near the Bottom Ash Pond, groundwater gradients and migration pathways, and will be completed within 90 days from September 13, 2018.

On behalf of BPU, Burns & McDonnell is requesting concurrence with the approach of conducting an alternate source demonstration prior to initiating an assessment of corrective measures for the Bottom Ash Pond, as allowed in 40 CFR, Part 257.

If you have questions regarding the information presented herein, please contact the undersigned at samartin@burnsmcd.com or bhoye@burnsmcd.com.

Sincerely,

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

Mr. Scott A. Martin, PE
Professional Engineer

A handwritten signature in blue ink, appearing to read 'B. R. Hoye'.

Mr. Brian R. Hoye, PG
Project Manager

BRH/sam

STATE OF KANSAS

DEPARTMENT OF HEALTH AND ENVIRONMENT
DIVISION OF ENVIRONMENT
CURTIS STATE OFFICE BUILDING
1000 SW JACKSON ST., SUITE 400
TOPEKA, KS 66612-1367



PHONE: (785) 296-1535
FAX: (785) 559-4264
WWW.KDHEKS.GOV

GOVERNOR JEFF COLYER, M.D.
JEFF ANDERSEN, SECRETARY

October 18, 2018

Ingrid Setzler
Director of Environmental Services
Kansas City Board of Public Utilities
300 N 65th St.
Kansas City, KS 66102

RE: Assessment Monitoring Notification – Alternate Source Demonstration
Nearman Creek Power Station, Bottom Ash Pond, Permit 413
Kansas City, Wyandotte County

Dear Ingrid Setzler:

The Kansas Department of Health and Environment – Bureau of Waste Management (KDHE/BWM) has received and reviewed the above referenced letter communicating the Board of Public Utilities' (BPU) plan to conduct an alternate source demonstration at the Nearman Creek Power Station's Bottom Ash Pond. This investigation would assess whether a source other than the Bottom Ash Pond is responsible for statistically significant increases of arsenic above the site's groundwater protection standard at three monitoring wells. KDHE/BWM concurs with BPU's approach of conducting an alternate source demonstration under 40 CFR, Part 257 based on the documented presence of naturally occurring arsenic in Kansas soils and groundwater.

If you have any questions, please contact me at William.Bider@ks.gov or 785-296-1612.

Sincerely,

William L. Bider
Director
Bureau of Waste Management

C: Tom Winn, KDHE/NEDO → Waste Programs
Dennis Degner, KDHE/BWM
Mike Selm, KDHE/BWM
Wally Mack, KDHE/BWM
Scott A. Martin, Burns & McDonnell
Brian R. Hoye, Burns & McDonnell

APPENDIX C – OCTOBER 2018 DIRECT-PUSH DRILL LOGS

Drilling Log

Project Name Nearman Creek		Project Number 88777			Boring Number DPGW-1		
Ground Elevation		Location			Page 1 of 2		
Air Monitoring Equipment NA					Total Footage 20		
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes		
Direct-Push	3.25"	20	NA	3	NA		
Drilling Company EPS				Driller(s) Blase Martin			
Drilling Rig 7822 DT				Type of Sampler Acetate Sleeve			
Date 10/30/18		To 10/30/18		Field Observer(s) Lewis Turner JTS			

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	Asphalt gravel 0.4' SILT, some clay, very dark grayish brown (104R 3/2) damp, medium to low plasticity, medium consistency.	ML	NA		NA	DPGW-1 SS01 1-2'	NA			START 0818 Dual-Tube Offset x2 low recovery
2				2/5						
3										
4										
5										0830
6	SAND, trace silt, pale brown (104R 6/3) fine grain, loose moist. poorly grade.	SP								
7	SILT, some clay, very dark gray GLEY1 (2M) wet, medium plasticity, soft consistency.	ML								
8						DPGW-1 SS02 8-9'				
9	SILTY SAND very dark gray Gley1 (3M) wet, trace plasticity, soft	SP								0835
10										<input checked="" type="checkbox"/> moisture
11	SAND, brown (104R 4/3) fine grain, loose, wet, poorly grade	SP		4/5						
12										
13										
14										

Drilling Log Continuation

						Boring Number <i>DPGW-1</i>				
Project Name <i>Nearman Creek</i>						Page <i>2 of 2</i>				
Project Number <i>88777</i>						Date <i>10/30/18</i>				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	<i>SAND, brown (104R 4/3) fine grain, loose, wet, poorly graded.</i>	<i>SP</i>	<i>NA</i>		<i>NA</i>			<i>NA</i>		<i>0845</i>
15										
16										
17				<i>5/5</i>						
18										
19	<i>SAND, brown (104R 4/3) loose, fine to medium grain, wet, poorly graded</i>	<i>SP</i>								
20										<i>0850 Stop</i>
	<i>Bottom of Boring - SAND HEAVE.</i>									
						<i>DPGW-1 Gw01 22-26' Dup</i>				<i>offset Boring for GW</i>

Drilling Log

Project Name <i>Nearman Creek</i>		Project Number <i>88777</i>		Boring Number <i>DPGW-2</i>	
Ground Elevation		Location		Page <i>1 of 2</i>	
Air Monitoring Equipment <i>NA</i>				Total Footage <i>25</i>	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
<i>Direct-push</i>	<i>3.25</i>	<i>25</i>	<i>NA</i>	<i>3</i>	<i>NA</i>
Drilling Company <i>EPS</i>			Driller(s) <i>Blase Martin</i>		
Drilling Rig <i>7822 DT</i>			Type of Sampler <i>Acetate Sleeve</i>		
Date <i>10/29/18</i>		To <i>10/29/18</i>		Field Observer(s) <i>Lewis Turner JF</i>	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	<i>Silt, trace clay, very dark grayish brown (104R 3/8), damp, trace plasticity to non plastic, medium to soft consistency.</i>	<i>ML</i>	<i>NA</i>		<i>NA</i>	<i>DPGW-2 SS01 1-2'</i>	<i>NA</i>			<i>START 1454 Dual-Tube</i>
2	<i>trace iron color</i>			<i>3.5/5</i>						
3	<i>SAND, trace silt, yellowish brown (104R 5/6) fine grain, loose, damp partly graded.</i>	<i>SP</i>								<i>1455</i>
4										
5	<i>Silt, some sand, dark gray (104R 4/1) damp, non plastic, soft consistency.</i>	<i>ML</i>				<i>DPGW-2 SS02 5-6'</i>				<i>▼</i>
6				<i>3.5/5</i>						<i>moisture</i>
7	<i>SAND, trace silt, pale brown (104R 6/3) fine grain, loose, damp to moist to wet, poorly graded.</i>	<i>SP</i>								<i>1457</i>
8										
9										
10										
11				<i>3.8/5</i>						
12										
13	<i>becomes very dark gray (grey 1 3/2)</i>									
14										



Drilling Log Continuation

Boring Number **DPGW-2**

Project Name **Nearman Creek**

Page **2 of 2**

Project Number **88777**

Date **10/29/18**

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SANDS, dark grayish brown (104R 4/8) Fine to medium grain, loose, wet	SP	NA		NA			NA		1500
15										
16										
17				4/5						
18										
19										
20	trace shale fragments									1510
21						DPGW-2 Gw01 20-24'				offsite Boring For GL
22				5/5						
23										
24										
25										1515 STOP
	Bottom of Boring - SAND HEAVE.									

Drilling Log

Project Name Nearman Creek		Project Number 88777		Boring Number DPGW-3	
Ground Elevation		Location		Page 1 of 2	
Air Monitoring Equipment NA				Total Footage 20	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
Direct-Push	3.25	20	NA	3	NA
Drilling Company EPS			Driller(s) Blase Martin		
Drilling Rig 7822 DT			Type of Sampler Acetate Sleeve		
Date 10/30/18		To 10/30/18		Field Observer(s) Lewis Turner JT?	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
0	CLAY with silt, very dense grayish brown (104R3/8) damp, medium plasticity, stiff to medium.	CL	NA		NA					START 1013
1	SELT, trace clay brown (104R4/3), damp non plastic, soft consistency	ML				DPGW-3 SS01 1-2'				Dual-Tube
2				3/5						
3	SAND, trace silt, brown (104R4/3) fine grain, loose, damp, poorly graded.	SP								
4										
5	1 mm dark seam									1015
6										
7				3.5/5						
8						DPGW-3 SS02 7.5-8.5'				
9						Dup				
10	Becomes wet									1018
11										moisture
12				4/5						
13	SAND, trace silt, fine to medium grain brown (104R4/3) loose, wet, poorly graded	SP								
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

						Boring Number DPGW-3				
Project Name Nearman Creek						Page 2 of 2				
Project Number 88777						Date 10/30/18				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SAND, trace silt, fine to coarse, fine gravel traces. brown (104R 4/3), lowe, wet, well graded	Sp	NA		NA			NA		1020
15										
16										
17				5/5						
18	Dark area bleed (104R 2/1) 0.24'									
19										
20										1020 STOP
	Bottom of Boring - SAND HEAVE.									
						DPGW-3 GWS1 22-26'				offset Boring for GW

Drilling Log

Project Name Nearmer Creek		Project Number 88777		Boring Number DPGW-4	
Ground Elevation		Location		Page 1 of 2	
Air Monitoring Equipment NA				Total Footage 25	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
Direct-push	3.25"	25	NA	3	NA
Drilling Company EPS			Driller(s) Blase Martin		
Drilling Rig 7822DT			Type of Sampler Acetate sleeve		
Date 10/30/18		To 10/30/18		Field Observer(s) Lewis Turner / TR	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	Silt with clay, very dark grayish brown (104R 3/3) damp, medium plasticity, soft.	ML	NA		NA		NA			START 1425 Dual Tube
2				2/5		DPGW-4 SS01 1-2'				
3	2" sand seam.									
4	Silt very dark grayish brown (104R 3/3) damp, non plastic, soft.	ML								1426
5										
6				2/5						
7	SAND, trace silt, pale brown (104R 6/3) fine grain loose, damp, poorly graded.	SP								
8										
9										1428
10										
11	SAND, trace silt, dark grayish brown (104R 4/2) fine grain, trace medium loose, damp, poorly graded becomes wet	SP				DPGW-4 SS02 10-11'				
12				3/5						moisture
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

							Boring Number DPGW-4			
Project Name Nearman Creek							Page 2 of 2			
Project Number 88777							Date 10/30/18			
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SAND, trace silt, dark grayish brown (10yr 4/2) fine grain trace medium loose wet, poorly graded	SP	NA		NA			NA		1430
15										
16										
17				4/5						
18										
19										
20										1430
21										
22				5/5						
23										
24						DPGW-4 GLW1 24-28' MS/MSD				
25										Boring offset for GLW 1445 STOP
	Bottom of Boring - SAND HEAVE.									

Drilling Log

Project Name <i>Nearman Creek</i>		Project Number <i>88777</i>		Boring Number <i>DPGW-5</i>	
Ground Elevation		Location		Page <i>1 of 2</i>	
Air Monitoring Equipment <i>NA</i>				Total Footage <i>25</i>	

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
<i>Direct-Push</i>	<i>3.85</i>	<i>25</i>	<i>NA</i>	<i>3</i>	<i>NA</i>

Drilling Company <i>EPS</i>	Driller(s) <i>Blaise Martin.</i>
--------------------------------	-------------------------------------

Drilling Rig <i>7822 DT</i>	Type of Sampler <i>Acetate sleeve</i>
--------------------------------	--

Date <i>10/30/18</i>	To <i>10/30/18</i>	Field Observer(s) <i>Lewis Turner JTS</i>
-------------------------	-----------------------	--

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	<i>Silt with clay very dark grayish brown (104R 3/2) damp, med. um plasticity, soft.</i>	<i>ML</i>	<i>NA</i>		<i>NA</i>					<i>START 1318</i>
2				<i>2.5/5</i>		<i>DPGW-5</i>				<i>DUAL-TUBE</i>
3	<i>Silt, very dark grayish brown (104R 3/2) damp to moist, trace plasticity, soft.</i>	<i>ML</i>				<i>SS01</i>				<i>1-2'</i>
4										
5										<i>1319</i>
6										
7				<i>3/5</i>						
8										
9	<i>SAND, trace s.H. pale brown (104R 6/5) brown (104R 4/3), fine grain, loose, wet poorly graded</i>	<i>SP</i>				<i>DPGW-5</i>				<i>SS02</i>
10						<i>9-10'</i>				<i>1320</i>
11						<i>ms/msd</i>				
12				<i>3/5</i>						<i>moisture</i>
13										
14										

Drilling Log Continuation

Project Name Nearman Creek						Boring Number DPGW-5			
Project Number 88777						Page 2 of 2			
						Date 10/30/18			

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SAND, trace silt, pale brown (104R6/3) brown (104R4/3) fine grain, loose, wet, poorly graded.	SP	NA		NA			NA		1324
15										
16										
17				4/5						
18										
19	SAND, very dark gray (61ey 1 3/4) fine to coarse grain, loose, WET , moderately graded.	SP								1327
20										
21										
22	Fine grain			5/5						
23										
24	more gravel.									
25						DPGW-5 GW01 24-28'				Offset Boring For GW 1340 stop
	Bottom of Boring - Heaving SAND									

Drilling Log

Project Name Nearman Creek		Project Number 88777		Boring Number DPGW-6	
Ground Elevation		Location		Page 1 of 3	
Air Monitoring Equipment NA				Total Footage 35	

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
Direct-Push	3.25	35	NA	3	NA

Drilling Company EPS		Driller(s) Blase Martin	
Drilling Rig 7828 DT		Type of Sampler Acetate sleeve	
Date 10/30/18	To 10/30/18	Field Observer(s) Lewis Turner <i>LT</i>	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	CLAY with silt, very dark grayish brown (104R 3/8), damp, medium to trace plasticity, medium consistency.	CL	NA		NA	DPGW-6 SS01 1-2'	NA			START 1140
2	SILT, trace clay very dark grayish brown (104R 3/8) damp, trace plasticity, medium consistency.	ML		3/5						
3										
4										
5										1142
6	SILT, trace clay, dark gray (104R 4/1) damp, non plastic, medium consistency.	ML								
7				5/5						
8										
9										
10	SILT with clay, brown (104R 4/3) damp, medium plasticity, medium consistency.	ML								1143
11										
12	SILT with clay, brown (104R 4/2) and very dark grayish brown (104R 3/8) medium plasticity, damp, medium consistency.	ML		3.5/5						
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample



Drilling Log Continuation

						Boring Number DPGW-6				
Project Name Nearman Creek						Page 2 of 3				
Project Number 88777						Date 10/30/18				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SILT, with clay, brown (104R4/2) and very dark grayish brown (104R3/3) damp medium plasticity, medium consistency.	ML	NA		NA			NA		1144
15										
16				5/5		DPGW-6 S502 15-16'				
17	SILT with very fine sand, dark grayish brown (104R4/2) moist to wet, nonplastic, soft consistency.	ML								moisture ▾
18										
19										
20	SAND with silt, fine grain, dark grayish brown (104R4/2) wet, loose, poorly graded.	SP								1146
21										
22				5/5						
23										
24										
25										1148
26										
27				5/5						
28										
29										
30	SILT with clay and fine sand, very dark greenish gray (Gley 1 3/1), wet, medium to high plasticity. Soft consistency	ML								1155
31										
32										

Drilling Log Continuation

Project Name Nearman Creek						Boring Number DPGW-6				
Project Number 88777						Page 3 of 3				
						Date 10/30/18				

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
32	SILT, with clay and fine sand, very dark greenish gray (6% clay (3/1), wet, medium to high plasticity, soft consistency)	ML	NA	5/5	NA			NA		
33										
34										
35										1200 STOP
	Bottom of Boring.									

Drilling Log

Project Name Nearman Creek		Project Number 88777		Boring Number DPGW-7	
Ground Elevation		Location		Page 1 of 2	
Air Monitoring Equipment NA				Total Footage 25	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
Direct-Push	3.25	25	NA	3	NA
Drilling Company EPS			Driller(s) Blase Martin		
Drilling Rig 7822DT			Type of Sampler acetate sleeve		
Date 10/29/18		To 10/29/18		Field Observer(s) Lewis Turner JF	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	SELT, trace clay, very dark grayish brown (10 YR 3/8), damp, trace plasticity, soft consistency.	mb	NA		NA	DPGW-7/ SS01 1-2'	NA			START 1751 Dual-Tube
2				2/5						
3	sand, trace silt, pale brown (10 YR 4/1), fine grain, loose, damp, poorly graded.	SP								
4										
5										1752
6										
7				3/5						
8										
9	SAND, trace silt, dark grayish brown (10 YR 4/2) Fine grain, trace medium. loose, damp, poorly graded	SP				DPGW-7 SS02 9-10'				1758
10										
11	becomes wet.			4/5						moisture
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

						Boring Number DPGL-7				
Project Name Nearman Creek						Page 2 of 2				
Project Number 88777						Date 10/29/18				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SAND, trace silt, dark grayish brown (10YR 4/2) fine grain, trace medium loose, damp to wet, poorly graded	SP	NA		NA			NA		1801
15										
16										
17				5/5						
18										
19										
20	SAND, very dark gray (10YR 3/1), fine grain, loose, wet, poorly graded.	SP								1805
21	Some organic material.									
22				5/5		DPGL-7 GWS1 21-25				Offset boring For GW.
23										
24	SAND, dark grayish brown (10YR 4/2) fine to coarse sand, fine gravel, loose, wet, well graded.	SP								1810 STOP
25										
	BOTTOM OF BORING. SAND HEAVE.									

Drilling Log

Project Name <i>Nearman Creek</i>		Project Number <i>88777</i>		Boring Number <i>DPGW-8</i>	
Ground Elevation		Location		Page <i>1 of 2</i>	
Air Monitoring Equipment <i>NA</i>				Total Footage <i>20</i>	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
<i>Direct-Push</i>	<i>3.25</i>	<i>20</i>	<i>NA</i>	<i>3</i>	<i>NA</i>
Drilling Company <i>EPS</i>			Driller(s) <i>Blase Martin</i>		
Drilling Rig <i>T822DT</i>			Type of Sampler <i>Acetate sleeve</i>		
Date <i>10/29/18</i>		To <i>10/29/18</i>		Field Observer(s) <i>Lewis Turner J.T.</i>	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	<i>SILT, trace clay, very dark grayish brown (104R3/2), damp. trace plasticity, medium consistency.</i>	<i>ML</i>	<i>NA</i>		<i>NA</i>	<i>DPGW-8 SS01 1-2' Dup</i>				<i>START 1630 Duel-Tube</i>
2				<i>2.5/5</i>						
3	<i>SAND, trace silt, pale brown (104R4/1), fine grain, loose, damp, poorly graded.</i>	<i>SP</i>								
4										
5										<i>1633</i>
6										
7				<i>3/5</i>						
8										
9										
10										<i>1635</i>
11	<i>SAND, trace silt, dark grayish brown (104R4/2) fine grain trace medium, low, wet, poorly graded.</i>	<i>SP</i>				<i>DPGW-8 SS02 10-11'</i>				
12				<i>3.5/5</i>						<i>moisture</i>
13										
14										

BZ=Breathing Zone

BH=Bore Hole

S=Sample

Drilling Log Continuation

						Boring Number DPGW-8				
Project Name Nearman Creek						Page 2 of 2				
Project Number 88777						Date 10/29/18				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
14	SAND, trace silt, dark grayish brown (10YR 4/2) fine grain, trace medium, loose, wet, poorly graded.	SP	NA		NA			NA		1640
15										
16										
17										
18										
19										
20										1650 STOP
	Bottom of Boring . SAND HEAVE.									

APPENDIX D – NOVEMBER 2018 MONITORING WELL DRILL LOGS

Drilling Log

Project Name <i>KC BPO KERRICK</i>		Project Number <i>88777</i>		Boring Number <i>MW-16</i>	
Ground Elevation		Location <i>KCIC</i>		Page <i>1052</i>	
Air Monitoring Equipment				Total Footage	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. of Core Boxes
<i>Direct Push USA</i>	<i>8"</i>				
Drilling Company <i>RAZGIC</i>			Driller(s) <i>Tony Porter, Greg Cook</i>		
Drilling Rig <i>Geopole 7822PT</i>			Type of Sampler <i>Macro core</i>		
Date <i>11-15-18</i>		To <i>11-15-18</i>		Field Observer(s) <i>Kevin Bollan</i>	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
1	<i>CLAY, 10-12 3/31, medium soft, moist plastic,</i>			<i>76 5</i>						
3	<i>SILT, 10-12 5/3, damp, soft</i>									
5				<i>0941</i>	<i>0941</i>					
6				<i>3.5 4</i>						
8	<i>SAND, 10-12 6/31, very fine sand, some silt, damp, loose</i>									
10				<i>0943</i>	<i>0943</i>					
11	<i>wet at 12'</i>			<i>4 5</i>						
12	<i>CLAY, some silt, 10-12 4/11, soft moist, medium plastic</i>									
14	<i>SAND, fine sand, some silt, 10-12 4/11, moist, loose</i>									

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

						Boring Number MW-16				
Project Name KC BPU NE RIVER CREEK						Page 2 of 2				
Project Number 88777						Date 11-15-78				
Depth (feet)	Description	Class	Blow Count	Recov.	Run/Time	Sample Desig.	PID (ppm)			Remarks/ Water Levels
							BZ	BH	S	
15	SAND, fine granular, somewhat, 10% clay, mostly loose				0946					
17	Silt, trace sand, wet soft,				4 5					
20	SAND, 10% clay, well graded fine to coarse, granular, wet									
22	SAND fine to medium granular, 10% clay, wet, loose & trace wood, trace charcoal.				3 5					
27					3 5					
30					0951					
30	E03-30' 6" - 7"									
31										
32										

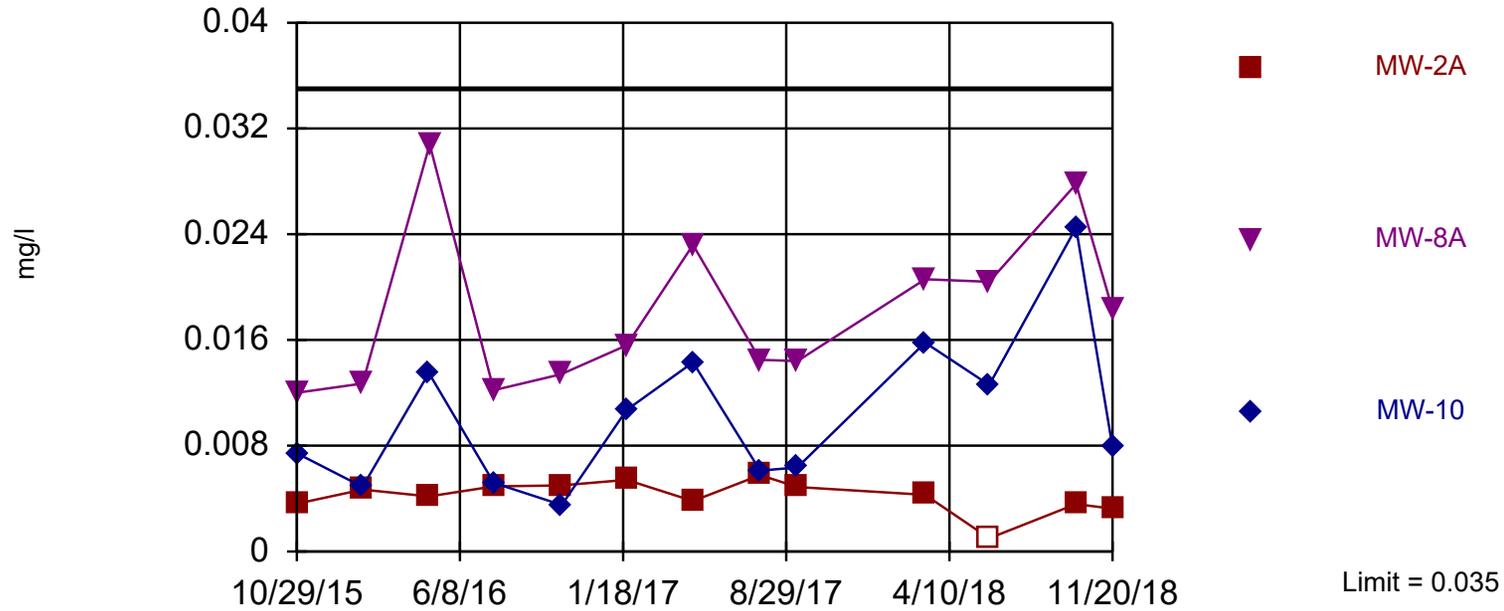
BZ=Breathing Zone BH=Bore Hole S=Sample



APPENDIX E – SANITAS™ SOFTWARE STATISTICAL OUTPUT

Within Limit

Prediction Limit
Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 27 background values. 81.48% NDs. Report alpha = 0.1. Individual comparison alpha = 0.03451. Most recent point for each compliance well compared to limit. After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

Constituent: Arsenic Analysis Run 12/4/2018 5:16 PM
BPU Client: Burns & McDonnell Data: BPU_Groundwater_CCR

Interwell Prediction Limits - BPU Alt Source Demonstration

BPU Client: Burns & McDonnell Data: BPU_Groundwater_CCR Printed 12/4/2018, 5:18 PM

<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>%NDs</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Arsenic (mg/l)	MW-2A	0.035	n/a	11/20/2018	0.00324	No	27	81.48	n/a	0.03451	NP Inter (NDs)
Arsenic (mg/l)	MW-8A	0.035	n/a	11/20/2018	0.0183	No	27	81.48	n/a	0.03451	NP Inter (NDs)
Arsenic (mg/l)	MW-10	0.035	n/a	11/20/2018	0.00789	No	27	81.48	n/a	0.03451	NP Inter (NDs)



CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com