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January 29, 2016

Dennis Keller
Facilities Manager
Fairfield County Board of Commissioners
210 East Main Street, Room 406
Lancaster, Ohio 43130-3879

Re: Specific Conductance and Other Water Quality
Parameters in the Groundwater at the
Future Fairfield County Jail/Public Safety Facility
Site and the Adjacent City of Lancaster Miller Park
Wellfield Wells

Dear Mr. Keller:

Bennett & Williams has prepared this letter to provide additional information regarding water quality in monitoring wells MW-9S and MW-9D that were installed by Fairfield County on the site of the future Fairfield County Jail/Public Safety Facility. At the request of the City of Lancaster, these monitoring wells became part of their Source Water Protection monitoring well network for the Miller Park Wellfield. The details of that installation are contained in the report "*Installation and Sampling of Monitoring Wells MW-9S and MW-9D, Fairfield County Jail/Public Safety Facility, 334 West Wheeling Street, Lancaster, Ohio*" by Bennett & Williams and dated April 28, 2015.

As you are aware, the groundwater quality samples from the two monitoring wells have been collected by the City of Lancaster as part of their source water protection efforts. The first samples from these wells were collected in April 2015 as part of an annual sampling event for all the City of Lancaster source water protection groundwater monitoring wells. Starting October 7, 2015, the City of Lancaster collected samples biweekly from MW-9S and MW-9D through December 16, 2015. It is our understanding that the City of Lancaster also collected monthly water quality samples from pumping wells #15 and #23 starting in September 2015. The water quality data for MW-9S, MW-9D, Well #15 and Well #23 has been provided to us by the City of Lancaster and is included as Attachment 1. Since this time, additional samples have been collected on January 20, 2015 from MW-9S and MW-9D (and presumably a monthly sample from Well #15 and Well #23).

On January 19, 2015, Bob Hedges, President of the Lancaster City Council (and retired hydrogeologist), sent the following email to Brian Kuhn, Mayor of the City of Lancaster after the water quality data had been forwarded to him by the Mayor:

“Brian, Thank you. Shouldn't there be some more monitoring data since December on both the monitoring wells and the production wells? It is noteworthy that the new 'deep' monitoring well shows over a 60% increase in Specific Conductance (a surrogate (sic) for total dissolved solids) between November 4th and November 18th and has remained high ever since. Such an increase indicates either a drastic change in the source water flowing through the lower zone or a failure of the seal between the upper zone, which contains more dissolved solids, and the lower zone. The first instance would suggest activities on the jail site are causing a general degradation of water in the lower zone. The second instance would suggest the monitoring well is no longer functioning as intended (i.e. monitoring water quality in the lower zone) and should be abandoned and replaced with a properly installed monitoring well. The downward head differential (meaning waters are migrating downward) between the 'shallow' and 'deep' wells remained relatively the same (-0.63 feet on the 4th and -0.71 on the 18th), which would suggest the first instance is probably the more likely. Thanks again for the information and please forward all additional results as they become available.”

In response to this email, we re-reviewed the available water quality information and found the data referenced by Mr. Hedges for specific conductance in MW-9D to be correct (Table 1). The following presents the logic by which we evaluated the data. We looked first to the most obvious and typical explanations.

Table 1. Specific conductivity data in MW-9D.

Date	Specific Conductivity (umhos/cm)
4/1/2015	993
10/7/2015	810
10/20/2015	829
11/4/2015	815
11/18/2015	1309
12/2/2015	1415
12/16/2015	1230

Problem with the meter

Specific conductance is one of three field parameters used by the City of Lancaster to determine “stability” of water quality in a well prior to collection on a “valid” groundwater sample. When all three parameters (pH, specific conductance and temperature) are within acceptable tolerances in three consecutive measurements three to five minutes apart, the water is considered stable and the sample is collected. The specific conductance (as well as pH and temperature) is measured in the field using a hand-held meter. This meter was reported as calibrated each morning for pH and specific conductance by City of Lancaster personnel. Similarly, the specific conductance did not exhibit the same pattern in the shallow well, MW-9S,

even though data was collected using the same meter. Therefore, it appeared to us, that the variation could not be explained by a meter problem.

Site Construction Activities

Normally, potential water quality effects at the site would be expected to be present in the shallower well first. This is further corroborated by the head differences measured in the two wells, which shows that flow is downward. The exception to this would be installation of the auger cast piles at the site that are penetrating into the subsurface to depths of either 55 or 65 feet, depending on the desired structural support needed. In this case, it might be possible to observe effects in the deeper well without seeing them in the shallow well.

We reviewed site activities to determine when installation of the surface protective casings (to case off the fill materials and seat the protective casing in the underlying native materials) took place. Similarly, we reviewed the installation schedule for the deeper auger cast piles at the site.

The test pile protective casings were the first to be installed. These were set on December 3 and 4, 2015 and were located on the east side and adjacent to the existing Minimum Security and Misdemeanor Jail (MSMJ) approximately at the southern end of the building. On December 7, 2015, two auger cast piles (one to a depth of 55 feet and the other to a depth of 65 feet) were installed through the surface protective casings for the test piles.

The first protective casings to seal off the fill materials were installed starting December 8, 2015. The first auger cast piles were installed on December 28, 2015. Therefore, the difference in specific conductance between November 4 and November 18 cannot be explained by construction activities that penetrated into the subsurface materials.

Based on this construction schedule, we conclude that the construction activities at the future jail site have not impacted the water quality to date.

Possible Problem with the Construction of the Monitoring Well

We reviewed the construction of the well and the available water quality data (all parameters) for monitoring well MW-9D. First, it should be noted that measurements of water quality parameters in the field are the least reliable because they are not performed using laboratory equipment that is subject to frequent and rigorous quality assurance/quality control procedures (QA/QC). Also, decisions about water quality impacts are not typically addressed by looking only at one parameter (such as specific conductance). That is why a suite of parameters are collected and analyzed.

With regard to the construction of the monitoring well, the construction techniques and materials were specified by the City of Lancaster's consultant (Burgess & Niple). This well did encounter heaving sands that were difficult to control during drilling. As a result, sand extended five feet above the screen (as opposed to a typical two feet) and a heavy bentonite grout was used to assist in controlling further heaving sands. These in-field conditions were discussed with

Burgess & Niple as field conditions unfolded and this completion was acceptable to the City and within typical professional standards. After reviewing the available water quality and construction data, we could find no additional parameters to indicate a potential well construction problem.

Conclusions Reached By Mr. Hedges

Mr. Hedges concluded that the differences in specific conductance between November 4, 2015 and November 18, 2015 likely either be caused by a *“failure of the seal between the upper zone...and the lower zone”* or a *“drastic change in the source water flowing through the lower zone”*. The implication is that somehow the construction activities at the future jail site were responsible for the specific conductivity differences. With regard to the “seal”, the data available from boring logs does not support the presence of a so-called “seal” that is continuous across the aquifer in this area. Indeed, the groundwater flow model prepared for the City as part of the source water protection plan modelled the site as unconfined (meaning no seal) because it was a better fit for measured data.

Alternately, Mr. Hedges concluded that *“the monitoring well is no longer functioning as intended...and should be abandoned and replaced with a properly installed monitoring well”*. Based on evaluation and analyses, we cannot concur with his conclusions.

However, the fact remains that the difference noted by Mr. Hedges in specific conductance does exist. In order to explain the difference, we evaluated more of the available data. It should be noted that the data is limited and only seven sampling events have been conducted to date.

Probable Explanation for Differences in Specific Conductance in MW-9D

During data evaluation, we noted that there appeared to be a correlation between specific conductance and the production well pumping scenario utilized by the City of Lancaster. Well #15 and Well #23 are the two closest wells to the current construction site (Attachment 2). The City of Lancaster pumps either Well #15 or Well #23 on a rotational basis. Although we do not have access to the pumping schedule, when samples are collected by the City of Lancaster in monitoring wells MW-9S and MW-9D, the production well that is being pumped is noted. Therefore, there may be some variability in pumping schedules (e.g. how long a certain well has been pumping – or off).

We chose to evaluate the limited data using statistics to test whether or not the observations were statistically significant (i.e. supported by scientific analyses). Statistics are used to provide an overall view of the “big picture”. Please note that the data is limited and additional data will yield more powerful statistics. First we looked at the differences in water quality between the two production wells.

Water quality data collected from the City of Lancaster Wells #15 and #23 were compared. The City of Lancaster sampled these production wells four times in 2015 (September, October, November and December). Parameters for which mostly non-detect results were

recorded were not analyzed (aluminum, antimony, beryllium, cadmium, chromium, cobalt, copper, cyanide, iron, lead, mercury, nickel, selenium, silver, sulfide, thallium, tin, vanadium and zinc).

Data for arsenic, barium, calcium, magnesium, manganese, potassium and sodium were analyzed statistically using a single factor analysis of variance (ANOVA). An ANOVA is used to compare the means of two sample populations to determine whether the two sample populations share the same mean (not statistically different) or whether the means of the two sample populations are different. Excel was used to perform this analysis. The results are summarized in Table 2.

Table 2. Comparison of groundwater quality in Well #15 and Well #23.

Parameter	Mean Concentration		F-value+	P-value^
	Well #15	Well #23		
Arsenic (µg/L)	4.33*	8.00	24.69	0.00421
Barium (µg/L)	99.5	76.5	41.22	0.00067
Calcium (mg/L)	123.0	137.0	40.55	0.00070
Magnesium (mg/L)	33.4	36.4	37.91	0.00084
Manganese (µg/L)	215.8	268.0	123.74	0.00003
Potassium (mg/L)	5.20	5.68	16.16	0.00696
Sodium (mg/L)	55.6	67.0	90.07	0.00008

*nondetect value (November 2015) in Well #15 was omitted from this analysis because the detection limit was not provided.

+The F-value is the ratio of two mean squares that are used in the statistical calculation of the P-value.

^P-values less than 0.05 indicate that the water quality in Well #15 is statistically significantly different from the water quality in Well #23.

The P-value in Table 2 provides an indication of the probability that the means of data from Well #15 and Well #23 are statistically different. A P-value of less than 0.05 corresponds to a greater than 95 percent confidence that the mean values are statistically different (shown in bold in Table 2). Table 2 shows that Well #15 has statistically lower average concentrations of arsenic, calcium, magnesium, manganese, potassium and sodium when compared to Well #23. Additionally, Well #15 has a statistically higher average concentration of barium when compared to Well #23. This available data shows that all parameters that were consistently detected are statistically significantly different from each other. The conclusion is that the flow paths (i.e. source) of the water are different between the two wells when they are pumping such that there is a statistically measurable difference in the water quality.

Second, a similar analysis was performed for the water quality data available for MW-9D. In this analysis, the data were divided into two groups based on which production well was pumping during the sampling event (Well #15 or Well #23). Parameters for which mostly non-detect results were recorded were not analyzed (aluminum, antimony, beryllium, cadmium, chromium, cobalt, copper, cyanide, iron, lead, mercury, nickel, selenium, silver, sulfide, thallium, tin, vanadium and zinc). The results are summarized in Table 3.

Table 3. Comparison of water quality in MW-9D when Well #15 and Well #23 are pumping.

Parameter	Mean Concentration		F-value ⁺	P-value [^]
	Well #15 pumping	Well #23 pumping		
Arsenic (µg/L)*	7.0	8.3	2.286	0.1910
Barium (µg/L)	73.3	110.7	5.609	0.0641
Calcium (mg/L)	115.3	139	7.968	0.0370
Magnesium (mg/L)	31.9	37.1	13.490	0.0144
Manganese (µg/L)	274	367	16.060	0.0102
Potassium (mg/L)	3.4	7.2	85.489	0.0002
Sodium (mg/L)	30.3	85.4	18.797	0.0075

+The F-value is the ratio of two mean squares that are used in the statistical calculation of the P-value.

^P-values less than 0.05 indicate that the water quality in MW-9D when Well #15 is pumping is statistically significantly different from the water quality in MW-9D when Well #23 is pumping.

The P-value in Table 3 provides an indication of the probability that the means of data from MW-9D when Well #15 is pumping and when Well #23 is pumping are statistically different. As before, a P-value of less than 0.05 corresponds to a greater than 95 percent confidence that the mean values are statistically different (shown in bold in Table 3). Table 3 shows that water samples from MW-9D when Well #15 is pumping have statistically lower average concentrations of calcium, magnesium, manganese, potassium and sodium when compared to water samples from MW-9D when Well #23 is pumping.

The conclusion is that when different production wells are pumping, five of the seven parameters that are statistically different between Well #15 and Well #23 are also statistically different in MW-9D. This supports water quality differences in MW-9D when the two different production wells are pumping. This conclusion is further supported by the statistical analyses that show statistically lower concentrations of the five parameters in MW-9D when Well #15 is pumping that compares well with statistically lower concentrations of the same parameters in Well # 15 when compared to Well #23.

The bottom line is that water quality in MW-9D appears (from the limited data set available) to be greatly influenced by the production well that is being pumped (either Well #15 or Well #23) at the time of sample collection – so much so that the water quality is statistically different between pumping scenarios.

Conclusions

- 1) The increase in specific conductance in MW-9D between the November 4, 2015 and November 18, 2015 sampling events does not appear to be attributable to meter issues or lack of calibration;
- 2) Water quality changes due to construction activities at the site are expected to be seen in the shallow well at the site first and then in the deeper well unless drilling activities of the auger cast piles are influencing the site;

- 3) Installation of protective casings to seal off the fill materials was not started until December. Similarly, deeper auger cast pile installation was not started until later in December. Therefore, the increase in specific conductance in the deeper monitoring well, MW-9D, is not attributable to construction activities at the jail site;
- 4) The increase in specific conductance does not appear due to construction issues during monitoring well installation. Similarly, the monitoring wells have not been damaged since installation. Therefore, the monitoring well does not need to be replaced at this time;
- 5) The hypothesis by Mr. Hedges that there is a "*failure of the seal between the upper zone...and the lower zone*" is not supported by data;
- 6) The second hypothesis by Mr. Hedges that "*activities on the jail site are causing a general degradation of water quality in the lower zone*" is not supported by the specific conductance data;
- 7) The third hypothesis by Mr. Hedges that "*the monitoring well is no longer functioning as intended...and should be abandoned and replaced with a properly installed monitoring well*" is not supported by data;
- 8) A more probable explanation for the increase in specific conductance in MW-9D between November 4, 2015 and November 18, 2015 relates to the pumping schedule of Well #15 and Well #23 at the Miller Park wellfield when samples are collected from MW-9D;
- 9) Using the limited dataset available, statistically different water quality between all parameters with consistent detections (seven parameters) were found in the source waters in Well #15 and Well #23;
- 10) Similarly, statistically different water quality for five of these same seven parameters was found in MW-9D when the two different production wells (Well-#15 and Well #23) were pumping during sample collection; and
- 11) Concentrations of these five significantly different parameters were significantly lower in MW-9D when Well #15 is pumping and significantly lower in Well #15 than in Well #23.

If you have questions, please do not hesitate to contact us.

Respectfully submitted
BENNETT & WILLIAMS
ENVIRONMENTAL CONSULTANTS, INC.



Linda Aller, CPG, RS
Principal Geologist



Kerry Zwierschke, PhD., P.E.
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Attachments (2)

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ATTACHMENT 1
WATER QUALITY RESULTS
PRODUCTION WELLS #15 AND #23
MONITORING WELLS MW-9S AND MW-9D

City of Lancaster, Ohio
Division of Water
Historical Groundwater Quality Data

PARAMETERS	Units	MCL/SMCL/ ACTION LEVEL	Well #15			
			Sep-15	Oct-15	Nov-15	Dec-15
INORGANICS						
ALUMINUM	mg/L	50 to 200 (S)	ND	ND	ND	ND
ANTIMONY	ug/L	6	ND	ND	ND	ND
ARSENIC	ug/L	10.0	4	4	ND	5
BARIUM	ug/L	2000	97	99	104	98
BERYLLIUM	ug/L	4.0	ND	ND	ND	ND
CADMIUM	ug/L	5.0	ND	ND	ND	ND
CALCIUM	mg/L	--	120	120	127	125
CHROMIUM	ug/L	100	ND	ND	ND	ND
COBALT	ug/L	--	ND	ND	ND	ND
COPPER	ug/L	1000 (S) / 1300 (A)	ND	ND	ND	ND
CYANIDE	mg/L	0.2	ND	ND	ND	ND
IRON	ug/L	300 (S)	ND	275	ND	ND
LEAD	ug/L	15 (A)	ND	ND	ND	ND
MAGNESIUM	mg/L	--	32.5	33.5	33.9	33.8
MANGANESE	ug/L	50 (S)	216	215	211	221
MERCURY	ug/L	2.0	ND	ND	ND	ND
NICKEL	ug/L	--	ND	ND	ND	ND
POTASSIUM	mg/L	--	5.3	5.2	5.1	5.2
SELENIUM	ug/L	50.0	ND	ND	ND	ND
SILVER	ug/L	100 (S)	ND	ND	ND	ND
SODIUM	mg/L	--	58.9	53.4	55.3	54.9
SULFIDE	mg/L	--	ND	ND	ND	ND
THALLIUM	ug/L	2.0	ND	ND	ND	ND
TIN	ug/L	--	ND	ND	ND	ND
VANADIUM	mg/L	--	ND	ND	ND	ND
ZINC	ug/L	5000 (S)	ND	ND	ND	ND
VOLATILE ORGANICS VOC'S						
Method 8260	Varies	Varies	ND	ND	ND	ND

(S) = Secondary Maximum Contaminant Level

(A) = Action Level

(O) = Ohio EPA Primary Maximum Contaminant Level

D = DETECTED

ND = NOT DETECTED

NA = NOT ANALYZED

NM = NOT MEASURED

City of Lancaster, Ohio
Division of Water
Historical Groundwater Quality Data

PARAMETERS	Units	MCL/SMCL/ ACTION LEVEL	Well #23			
			Sep-15	Oct-15	Nov-15	Dec-15
INORGANICS						
ALUMINUM	mg/L	50 to 200 (S)	ND	ND	ND	ND
ANTIMONY	ug/L	6	ND	ND	ND	ND
ARSENIC	ug/L	10.0	7	9	7	9
BARIUM	ug/L	2000	79	74	69	84
BERYLLIUM	ug/L	4.0	ND	ND	ND	ND
CADMIUM	ug/L	5.0	ND	ND	ND	ND
CALCIUM	mg/L	--	136	134	138	140
CHROMIUM	ug/L	100	ND	ND	ND	ND
COBALT	ug/L	--	ND	ND	ND	ND
COPPER	ug/L	1000 (S) / 1300 (A)	ND	ND	ND	ND
CYANIDE	mg/L	0.2	ND	ND	ND	ND
IRON	ug/L	300 (S)	ND	460	ND	292
LEAD	ug/L	15 (A)	ND	ND	ND	ND
MAGNESIUM	mg/L	--	36.3	37.4	35.8	36.0
MANGANESE	ug/L	50 (S)	270	279	263	260
MERCURY	ug/L	2.0	ND	ND	ND	ND
NICKEL	ug/L	--	ND	ND	ND	ND
POTASSIUM	mg/L	--	5.8	5.9	5.4	5.6
SELENIUM	ug/L	50.0	ND	ND	ND	ND
SILVER	ug/L	100 (S)	ND	ND	ND	ND
SODIUM	mg/L	--	67.8	67.0	66.4	66.9
SULFIDE	mg/L	--	ND	ND	ND	ND
THALLIUM	ug/L	2.0	ND	ND	ND	ND
TIN	ug/L	--	ND	ND	ND	ND
VANADIUM	mg/L	--	ND	ND	ND	ND
ZINC	ug/L	5000 (S)	28.0	22.00	ND	ND
VOLATILE ORGANICS VOC'S						
Method 8260	Varies	Varies	ND	ND	ND	ND

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City of Lancaster, Ohio
 Division of Water
 Miller Park Wellhead Protection Program
 Historical Groundwater Quality Data

PARAMETERS	Units	MCL/SMCL/ ACTION LEVEL	MW-9S						
			4/1/15	10/7/15	10/20/15	11/4/15	11/18/15	12/2/15	12/16/15
INORGANICS									
ALUMINUM	mg/L	50 to 200 (S)	ND	ND	ND	ND	ND	ND	ND
ANTIMONY	ug/L	6	ND	ND	ND	ND	ND	ND	ND
ARSENIC	ug/L	10.0	5.0	9.0	7.0	6.0	6.0	7.0	5.0
BARIUM	ug/L	2000	399	459	405	413	393	419	422
BERYLLIUM	ug/L	4.0	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ug/L	5.0	ND	ND	ND	ND	ND	ND	ND
CALCIUM	mg/L	--	166	163	142	144	144	157	164
CHROMIUM	ug/L	100	ND	ND	ND	ND	ND	ND	ND
COBALT	ug/L	--	ND	ND	ND	ND	ND	ND	ND
COPPER	ug/L	1000 (S) / 1300 (A)	ND	ND	ND	ND	ND	ND	ND
CYANIDE	mg/L	0.2	ND	ND	ND	ND	ND	ND	ND
IRON	ug/L	300 (S)	446	1830	1660	293	139	798	689
LEAD	ug/L	15 (A)	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	mg/L	--	44.3	44.0	39.1	42.4	45.6	46.0	44.5
MANGANESE	ug/L	50 (S)	204	142	133	128	144	147	140
MERCURY	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND
NICKEL	ug/L	--	ND	ND	ND	ND	ND	ND	ND
POTASSIUM	mg/L	--	30.1	19.4	17.8	17.6	16.9	16.8	16.9
SELENIUM	ug/L	50.0	ND	ND	ND	ND	ND	ND	ND
SILVER	ug/L	100 (S)	ND	ND	ND	ND	ND	ND	ND
SODIUM	mg/L	--	302.0	272.0	243.0	212.0	176.0	188.0	184.0
SULFIDE	mg/L	--	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND
TIN	ug/L	--	ND	ND	ND	ND	ND	ND	ND
VANADIUM	mg/L	--	ND	ND	ND	ND	ND	ND	ND
ZINC	ug/L	5000 (S)	ND	ND	ND	ND	ND	ND	ND
VOLATILE ORGANICS VOC'S									
Method 8260	Varies	Varies	ND	ND	ND	ND	D	D	D
11/18_MTBE 1.1ug/l 12/4_MTBE 1.5ug/l 12/16_MTBE 1.2ug/l									
FIELD PARAMETERS									
STATIC WATER LEVEL	* from reference point		18.86	21.24	21.99	22.44	21.29	20.40	20.36
TEMPERATURE	°C	--	18.1	17.4	17.1	17.4	17.4	17.1	18.0
pH	S.U.	6.5-8.5 (S)	6.95	6.97	7.00	6.97	6.96	6.88	6.89
CONDUCTIVITY	umhos/cm	--	2280	2340	2170	2010	1941	1947	1970

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City of Lancaster, Ohio
 Division of Water
 Miller Park Wellhead Protection Program
 Historical Groundwater Quality Data

PARAMETERS	Units	MCL/SMCL/ ACTION LEVEL	MW-9D						
			4/1/15	10/7/15	10/20/15	11/4/15	11/18/15	12/2/15	12/16/15
INORGANICS									
ALUMINUM	mg/L	50 to 200 (S)	ND	ND	ND	ND	ND	ND	ND
ANTIMONY	ug/L	6	ND	ND	ND	ND	ND	ND	ND
ARSENIC	ug/L	10.0	7	8	8	6	9	9	6
BARIUM	ug/L	2000	74	78	73	74	135	123	68
BERYLLIUM	ug/L	4.0	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ug/L	5.0	ND	ND	ND	ND	ND	ND	ND
CALCIUM	mg/L	--	123	118	109	108	149	145	126
CHROMIUM	ug/L	100	ND	ND	ND	ND	ND	ND	ND
COBALT	ug/L	--	ND	ND	ND	ND	ND	ND	ND
COPPER	ug/L	1000 (S) / 1300 (A)	ND	ND	ND	ND	ND	ND	ND
CYANIDE	mg/L	0.2	ND	ND	ND	ND	ND	ND	ND
IRON	ug/L	300 (S)	934	298	1200	ND	374	1570	321
LEAD	ug/L	15 (A)	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	mg/L	--	34.7	33.0	29.8	31.7	39.4	37.3	32.9
MANGANESE	ug/L	50 (S)	339	261	276	241	370	392	318
MERCURY	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND
NICKEL	ug/L	--	ND	ND	ND	ND	ND	ND	ND
POTASSIUM	mg/L	--	6.8	3.2	3.2	3.0	7.2	7.7	4.3
SELENIUM	ug/L	50.0	ND	ND	ND	ND	ND	ND	ND
SILVER	ug/L	100 (S)	ND	ND	ND	ND	ND	ND	ND
SODIUM	mg/L	--	69.1	22.0	22.7	20.0	87.5	99.6	56.4
SULFIDE	mg/L	--	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND
TIN	ug/L	--	ND	ND	ND	ND	ND	ND	ND
VANADIUM	mg/L	--	ND	ND	ND	ND	ND	ND	ND
ZINC	ug/L	5000 (S)	ND	ND	ND	ND	ND	ND	ND
VOLATILE ORGANICS VOC'S									
Method 8260	Varies	Varies	ND	D	ND	ND	ND	ND	ND
10/7/15 - CHLOROFORM 1.5									
FIELD PARAMETERS									
STATIC WATER LEVEL	* from reference point		19.45	23.24	23.04	23.08	21.40	21.22	21.98
TEMPERATURE	°C	--	16.7	16.1	15.8	16.0	16.7	16.5	15.9
pH	S.U.	6.5-8.5 (S)	7.11	7.21	7.20	7.20	7.07	6.94	7.05
CONDUCTIVITY	umhos/cm	--	993	810	829	815	1309	1415	1230

(S) = Secondary Maximum Contaminant Level
 (A) = Action Level
 (O) = Ohio EPA Primary Maximum Contaminant Level
 D = DETECTED
 ND = NOT DETECTED
 NA = NOT ANALYZED
 NM = NOT MEASURED

ATTACHMENT 2
MAP SHOWING LOCATION OF
PRODUCTION WELLS #15 AND #23 AND
MONITORING WELLS MW-9S AND MW-9D

0 35 70 140 210 280 Feet



Well #23

Well #15

WHEELING

MEMORIAL

MW-9S

MW-9D

Figure 1. Location of monitoring wells and production wells #15 and #23.

