Prepared for:
Black & Veatch



Water Quality Survey
Detroit Edison Company
Fermi 3 Project
Final Report

AECOM Environment
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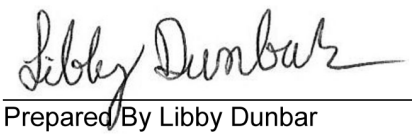

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1.0 Introduction

This report summarizes water quality data recently collected in the vicinity of the Detroit Edison Company (DECo) Nuclear Fermi 2 Power Plant (Fermi Site) located near Newport (Frenchtown Charter Township) in Monroe County, Michigan (Figure 1). Data were collected as part of a water quality survey to support DECo's Combined Operating License Application (COLA) to the Nuclear Regulatory Commission (NRC).

The Fermi site is located on the Western Basin of Lake Erie between the Swan Creek and Stony Creek watersheds. The site consists of approximately 1,120 acres of developed and undeveloped land with approximately 650 acres of land being designated as part of the Detroit River International Wildlife Refuge (DRIWR) and managed under a cooperative with the US Fish and Wildlife Survey. Waterbodies within the site include: Lake Erie, Swan Creek, on-site waterbodies and waters within the DRIWR. The on-site waterbodies are comprised of the overflow canal, quarry lakes, and the cooling tower make-up reservoir. Waterbodies in the DRIWR portion of the site include the south lagoon, north lagoon, and a small pond. In addition to the waterbodies there are wetlands associated with tributaries and low lying areas along many of the waterbodies.

The primary objective of the water quality study was to collect current data on a quarterly basis over a one year period in the vicinity of the site to supplement the water quality data included in the Environmental Report (ER) of the COLA. The survey was developed based on discussions with DECo. The goal of the study was to:

- Present site-specific data representing the mean, range, and spatial variations of the surface water and groundwater quality characteristics for the following parameters:
    - For surface waters: alkalinity, ammonia-nitrogen, antimony, arsenic. beryllium, bicarbonate, biological oxygen demand, cadmium, calcium, carbon dioxide, chemical oxygen demand, chloride, chlorophyll *a,* chromium, color, copper, dissolved oxygen, fecal coliform, hardness, iron, lead, magnesium, mercury, nickel, nitrate-nitrogen, nitrite-nitrogen, orthophosphorus, pH, potassium, selenium, silica, silver, sodium, specific conductance, sulfate, suspended solids, temperature, thallium, total dissolved solids, total Kjeldahl nitrogen, total phosphorus, turbidity, zinc
    - For groundwater: alkalinity, ammonia-nitrogen, antimony, arsenic, beryllium, bicarbonate, biological oxygen demand, cadmium, calcium, carbon dioxide, chemical oxygen demand, chloride, chlorophyll *a,* chromium, color, copper, dissolved oxygen, fecal coliform, hardness, iron, lead, magnesium, mercury, nickel, nitrate-nitrogen, nitrite-nitrogen, orthophosphorus, pH, potassium, selenium, silica, silver, sodium, specific conductance, sulfate, suspended solids, temperature, thallium, total dissolved solids, total Kjeldahl nitrogen, total phosphorus, turbidity, zinc

The list of parameters analyzed during this study was derived from NUREG 1555. Data summarized in this report cover the four quarters of water quality samples collected for the Fermi site. These data included water quality samples collected in July and October 2008, and February and April, 2009.

2.0 Materials and Methods

Water chemistry samples were collected during each quarter (i.e. July and October 2008, February and April, 2009) at each of the six surface water and four groundwater quality sampling locations (Figure 2). Locations included Lake Erie near the plant intake, at the outlet to Swan Creek, the South Quarry, the outfall at the south lagoon, and two outfalls near the plant. Three sites were not included in the February 2009 sampling due to unsafe ice conditions.

All surface water samples (except chlorophyll *a*, mercury and trace metals) were collected with a Kemmerer sample bottle at the water's surface (0.3 m). In order to collect chlorophyll *a* samples, the secchi disk transparency depth was measured in each of the water bodies. This depth was multiplied by two to estimate the photic zone. A depth integrated sampler was then lowered through the photic zone at a constant rate to capture the chlorophyll *a* sample. Mercury and trace metals samples were collected via a grab at the water's surface (i.e. 0.3 m) using modified Michigan Department of Environmental Quality (MDEQ) clean sampling technique procedures (see Attachment A).

In situ measurements of pH, water temperature, dissolved oxygen and specific conductance were made with a calibrated Hydrolab Quanta multi-parameter probe. Calibration of the probe prior to measurement was performed according to the manufacturer's guidelines.

Groundwater samples were collected according to the procedures outlined in Puls and Marcelona (1996).

All samples were suitably preserved and placed on wet ice for shipment via overnight courier to the analytical chemistry laboratories. Site preservation methods are included in Attachment A. The Great Lakes Environmental Center (GLEC) analytical chemistry laboratory analyzed samples for the following parameters: alkalinity, ammonia-nitrogen, biological oxygen demand, chloride, chlorophyll *a,* color, fecal coliform, hardness, nitrate-nitrogen, orthophosphorus, total suspended solids, total dissolved solids, total Kjeldahl nitrogen and total phosphorus. The TestAmerica analytical chemistry laboratory analyzed groundwater samples for bicarbonates and carbon dioxide. The White Water Associates (WWA) analytical chemistry laboratory analyzed the samples for all other parameters, including trace metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, magnesium, nickel, selenium, silver, thallium and zinc), mercury, calcium, chemical oxygen demand, iron, nitrite-nitrogen, potassium, silica, sodium, sulfate and turbidity. All sample analyses were performed using Environmental Protection Agency (EPA)-approved methods or Standard Methods (APHA 1998).

2.1 Surface Water Sampling

Surface water samples were collected at six locations. Locations were chosen to create a baseline of recent site-specific data for the plant vicinity. Location LE1-W, in Lake Erie, was chosen to represent water quality at the plant intake. QU-W, in the South Quarry, was sampled to establish baseline water quality data in the event the waterbody is used for dewatering. LE2-W, at the south lagoon, and SC-W at the outlet to Swan Creek correspond with aquatic sampling locations and represent on-site waterbodies. Location SC-W was also chosen to represent a mixing point for plant discharges to Swan Creek. Locations LA-W and IP-W are near existing plant outfalls in an area that may be used for excavation or dewatering. In February 2009, three sites (LE1-W, QU-W and LA-W) were not sampled due to unsafe ice conditions.

2.2 Groundwater Sampling

Locations chosen for groundwater monitoring were existing groundwater wells and areas likely to be used for dewatering. The locations were chosen based on site topography and movement of groundwater in the vicinity of the site.

3.0 Results and Discussion

Tables 1 through 6 provide the results of sampling in July and October 2008, and February and April 2009, at the six surface water sampling locations (SC-W, LE1-W, LE2-W, QU-W, IP-W and LA-W). Tables 7 through 10 provide the results of the groundwater sampling taken from the four designated groundwater sampling locations (MW-393, MW-391, MW-384 and MW-381). In February 2009, three sites (LE1-W, QU-W and LA-W) were not sampled due to unsafe ice conditions. Analytical chemistry reports from the GLEC, WWA and TestAmerica laboratories are provided in Appendix B.

Seasonal variations in suspended solids, turbidity, temperature, pH, and dissolved oxygen were present and represent expected seasonal fluctuation in water quality parameters. TSS and turbidity had the highest results in April and the lower results in July or October. Temperature had seasonal highs in the summer and lows in the winter. A seasonal high is present for pH in the summer and a seasonal low for Dissolved Oxygen is present in the summer.

Concentrations of conventional parameters such as calcium, magnesium, sulfate, and chloride were generally consistent among sampling sites. Hardness, alkalinity, pH, specific conductance and dissolved and suspended solids concentrations were also generally typical of regional waters at most sampling stations. Alkalinity, hardness, specific conductance, total dissolved solids, calcium, magnesium, sodium, and chloride are present in amounts typical of freshwater bodies.

Levels of nutrients (total phosphorus, nitrate and nitrite-nitrogen, total Kjeldahl nitrogen and orthophosphorus) collected from surface waters associated with the DTE Fermi facility are indicative of mesotrophic to eutrophic conditions and were, for the most part, relatively constant across time at a given sampling station.

Biological oxygen demand, carbon dioxide, chemical oxygen demand, dissolved oxygen levels are within the expected range for freshwater bodies.

Fecal coliform levels ranged from 0 colonies/100ml to 87 colonies/100ml in surface water samples. Levels are within an expected range for freshwater bodies. Fecal coliforn was low or not detected in groundwater samples. (Of the 16 samples 13 were not detected and none were over 2 cfu/100ml)

Due to a large number of non-detects and results close to detection limit heavy metal concentrations including antimony, arsenic, beryllium, chromium, copper, iron, lead, nickel selenium, silica, silver, thallium, and zinc were determined to be relatively low. The highest concentration for metals in the groundwater samples was 22.5 mg/l for Silica. The highest concentration for metals in the surface water samples was 9.8 mg/l for Silica.

Mercury concentrations measured in surface water samples often exceeded the Michigan Rule 57 Water Quality Value of 1.3 ng/L; mercury in groundwater was either not detected or below the laboratory reporting limit for all samples. Mercury intake data was compared with intake and discharge amounts sampled for the NPDES permit and was found to be consistent with documented existing conditions for the intake water.

The western basin of Lake Erie receives inputs from the Detroit River, Huron River, River Raisin, Rouge River, as well as smaller drainages including Swan Creek and Stony Creek. Eighty percent of the total input of water to Lake Erie comes through the Detroit River. Water quality data collected and analyzed for metals from 1998 to 2003 indicate an increasing trend in mercury concentrations with some seasonal fluctuations. The Detroit River is on the Michigan Department of Environmental Quality (MDEQ) Section 303(d) list for 2006. The river is listed for water quality standard exceedances for mercury (Total Maximum Daily Load (TMDL) completion year 2011). It is also listed for fish consumption advisories mercury in fish tissue (TMDL completion year 2012). The River Raisin is on the MQED Section 303(d) list for 2006.

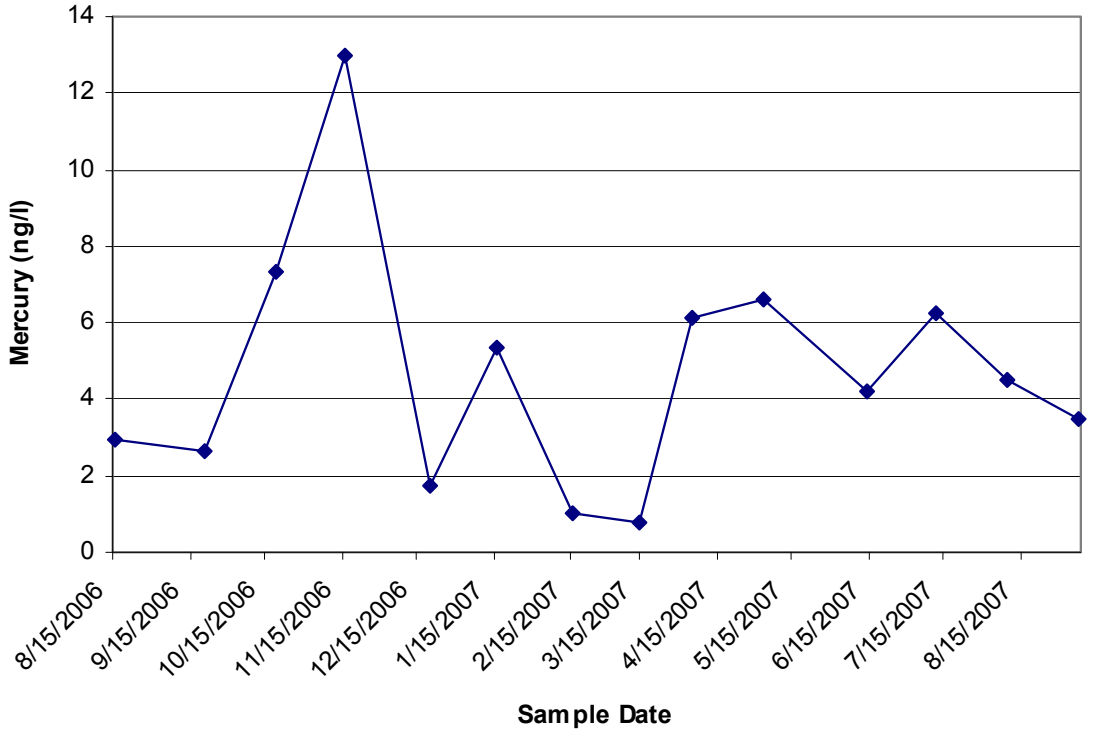
The area in the vicinity of Monroe is listed for mercury (TMDL completion year 2011). The Rouge River is on the Michigan Section 303(d) list for 2006. The segment from the W. Jefferson Avenue bridge upstream

0.5 miles and downstream 0.05 miles is listed for exceedances of the water quality standard for mercury (TMDL completion year 2011).

The 2004 Lake Erie Lakewide Management Program (LaMP) reported mercury as a cause of impairment, primarily in relation to fish and wildlife consumption advisories.

Fermi 2 monitors intake water from Lake Erie monthly for mercury in accordance with NPDES Permit No. MI0037028. A summary of recent (August 2006 to September 2007) mercury concentrations monitored monthly at the intake is provided in Figure 1 (average = 4.72 ng/l, minimum = 0.78 ng/l, maximum = 13.00 ng/l). The following chart summarizes mercury levels at the plant intake in 2006 and 2007.

Figure 1. Mercury Concentrations at Fermi's General Service Water Intake (Tri-Matrix laboratories, April 20, 2007)



Surface water data from the 2008 and 2009 quarterly sampling events were compared with the regional and site specific data included in the Fermi 3 Environmental Report, Section 2.3.3. Water quality data from Section 2.3.3 of the ER included data for Lake Erie from U.S. EPA's Great Lakes National Program Office, the River Raisin, Huron River, and Rouge River USGS monitoring stations, and previous samples from the site. No noticeable variations were observed in the site specific data when compared to the data collected and included in Section 2.3.3.

Groundwater data from Section 2.3.3 included data from nine USGS wells within 10 miles of the Fermi site sampled one time by USGS from 1991 to 1992, groundwater samples from private wells collected by the Michigan Department of Agriculture in 1990 and 1991, county-specific data covering the time period from 1983 to 2007 for arsenic, nitrates, and volatile organic compounds (VOCs) provided by MDEQ, data from onsite monitoring wells sampled in August 2007, and samples collected in the Fermi site vicinity by the Detroit Edison Company in 1969 and 1970. Elevated calcium, alkalinity, hardness and dissolved solids were observed at the groundwater sampling sites and in the quarry lake (QU-W).

Groundwater data from the 2008 and 2009 quarterly sampling events were compared with the data reported in Section 2.3.3. No noticeable variations were observed in the site specific data when compared to the data collected and included in Section 2.3.3. Groundwater data from the dates and locations selected for the 2008-2009 study provide a baseline of site-specific data and represent seasonal and temporal variations of the groundwater quality characteristics.

Literature Cited

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Puls, R.W. and M.J. Barcelona. 1996. Ground Water Issues: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. United States Environmental Protection Agency, Office of Research and Development and Office of Solid Waste and Emergency Responses. EPA/540/S-95/504.12 pp.

TriMatrix Laboratories, "Project: Mercury Analysis," 2006-2007.

U.S. Nuclear Regulatory Commission, Environmental Review Standard Plan, NUREG 1555, October 1999

TABLES

Table 1 - Surface Water Sampling Location SC-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	124	120	108	124	119
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	ND	0.001	0.002	ND	0.002
arsenic	mg/L	0.002	0.002	0.002	0.002	0.002
beryllium	mg/L	0.0001	ND	ND	ND	0.0001
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	2.6	5.2	3.7	2.3	3.45
cadmium	mg/L	ND	0.0012	0.00011	ND	0.00065
calcium	mg/L	45.6	51.2	41.5	55.8	48.5
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	21	26	20	9	19
chloride	mg/L	42.0	50.6	48.4	47.0	46.9
chlorophyll *a*	ug/L	17.4	16.7	0.7	6.4	10.3
chromium	mg/L	0.0028	0.002	0.0036	0.0033	0.0029
color	mg/L	189	93	419	261	240
copper	mg/L	0.0034	0.0019	0.0047	0.0016	0.0029
dissolved oxygen	mg/L	6.52	10.11	10.33	11.46	9.61
fecal coliform	cfu/100mL	<1	4	7	14	8
hardness	mg/L	148	188	148	172	164
iron	mg/L	NS	0.48	NS	NS	0.48
lead	mg/L	ND	0.0011	0.0026	0.0011	0.0016
magnesium	mg/L	11.8	12.3	9.81	14.1	12.0
mercury	mg/L	2.4	3.2	4.4	5.4	3.8
nickel	mg/L	0.002	ND	0.003	ND	0.0025
nitrate-nitrogen	mg/L	0.347	<0.002	1.080	0.552	0.660
nitrite-nitrogen	mg/L	0.0242	0.0033	0.0447	0.0321	0.0261
orthophosphorus	mg/L	<0.0005	0.0058	0.0310	0.0031	0.0133
pH	s.u.	7.93	8.71	6.32	8.5	7.87
potassium	mg/L	3.38	8.38	4.4	2.86	4.76
selenium	mg/L	ND	0.002	ND	0.001	0.002
silica	mg/L	NS	2.4	NS	8.1	5.25
silver	mg/L	ND	ND	ND	0.0005	0.0005
sodium	mg/L	17.3	37.6	23.9	24.6	25.8
specific conductance	*m*s/cm	420	413	14	560	352
sulfate	mg/L	31.7	52.5	41.8	53.6	44.9
suspended solids	mg/L	29.8	20.7	29.9	40.7	30.3
temperature	°C	26.14	11.06	1.17	7.62	11.50
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	260	275	264	317	279
total Kjeldahl nitrogen	mg/L	0.906	0.665	1.069	0.842	0.871
total phosphorus	mg/L	0.0735	0.0460	0.1160	0.0434	0.0697
turbidity	NTU	0.908	2.9	60.4	20.9	21.9
zinc	mg/L	0.013	0.016	ND	ND	0.015

Table 2 - Surface Water Sampling Location LE1-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	96	88	NS	108	97
ammonia-nitrogen	mg/L	<0.5	<0.5	NS	<0.5	<0.5
antimony	mg/L	0.001	ND	NS	ND	0.001
arsenic	mg/L	0.001	0.002	NS	0.001	0.001
beryllium	mg/L	ND	ND	NS	ND	ND
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	0.8	1.8	NS	1.7	1.4
cadmium	mg/L	ND	ND	NS	ND	ND
calcium	mg/L	33.9	33.5	NS	41.9	36.4
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	22	ND	NS	8	15
chloride	mg/L	26.0	18.1	NS	38.0	27.4
chlorophyll *a*	ug/L	1.9	4.8	NS	2.7	3.1
chromium	mg/L	0.0016	0.001	NS	0.0026	0.0017
color	mg/L	28	9	NS	100	46
copper	mg/L	0.0023	0.0014	NS	0.0012	0.0016
dissolved oxygen	mg/L	5.35	9.43	NS	11.64	8.81
fecal coliform	colonies/100mL	4	5	NS	17	8.7
hardness	mg/L	136	112	NS	160	136
iron	mg/L	NS	0.2	NS	NS	0.2
lead	mg/L	ND	ND	NS	0.0016	0.0016
magnesium	mg/L	10.1	9.09	NS	11.5	10.23
mercury	mg/L	1	2.6	NS	3.6	2.4
nickel	mg/L	ND	ND	NS	ND	ND
nitrate-nitrogen	mg/L	0.920	0.447	NS	0.473	0.613
nitrite-nitrogen	mg/L	0.0230	0.0187	NS	0.0173	0.0197
orthophosphorus	mg/L	0.0134	0.0059	NS	0.0046	0.0080
pH	s.u.	7.57	8.2	NS	8.88	8.22
potassium	mg/L	2.34	1.49	NS	1.95	1.93
selenium	mg/L	ND	ND	NS	ND	ND
silica	mg/L	NS	1.8	NS	2.9	2.35
silver	mg/L	0.0005	ND	NS	0.0006	0.0006
sodium	mg/L	11.4	9.75	NS	20.6	13.92
specific conductance	*m*s/cm	322	276	NS	411	336
sulfate	mg/L	30.3	28.3	NS	32.5	30.4
suspended solids	mg/L	5.6	2.9	NS	34.5	14.3
temperature	°C	24.61	14.17	NS	6.97	15.25
thallium	mg/L	ND	ND	NS	ND	ND
total dissolved solids	mg/L	194	165	NS	213	191
total Kjeldahl nitrogen	mg/L	0.416	0.226	NS	0.710	0.451
total phosphorus	mg/L	0.0456	0.0189	NS	0.0387	0.0344
turbidity	NTU	0.781	0.5	NS	24.4	8.56
zinc	mg/L	0.005	0.009	NS	ND	0.007

Table 3 – Surface Water Sampling Location LE2-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	98	94	92	126	102
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	ND	ND	0.003	0.002	0.003
arsenic	mg/L	0.002	0.002	0.001	0.002	0.002
beryllium	mg/L	ND	ND	ND	ND	ND
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	1.2	1.7	4.0	2.7	2.4
cadmium	mg/L	ND	ND	ND	0.00009	0.00009
calcium	mg/L	35	34.8	35.2	56.6	40.4
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	15	ND	ND	28	21
chloride	mg/L	23.3	44.3	38.7	48.7	38.8
chlorophyll *a*	ug/L	3.0	3.3	0.9	10.9	4.5
chromium	mg/L	0.0012	0.002	0.0009	0.0052	0.0023
color	mg/L	39	27	99	379	136
copper	mg/L	0.0019	0.0021	0.0024	0.0036	0.0025
dissolved oxygen	mg/L	6.79	10.3	12.49	11.4	10.25
fecal coliform	cfu/100mL	87	10	12	<1	36
hardness	mg/L	124	120	144	180	142
iron	mg/L	NS	0.46	0.68	NS	0.57
lead	mg/L	0.0006	ND	0.0011	0.0029	0.0015
magnesium	mg/L	10	9.42	8.98	14.4	10.70
mercury	ng/L	0.8	5.2	1.4	9.2	4.2
nickel	mg/L	ND	ND	0.001	0.004	0.003
nitrate-nitrogen	mg/L	0.745	0.471	0.559	0.490	0.566
nitrite-nitrogen	mg/L	0.0293	0.0188	0.0173	0.0339	0.0248
orthophosphorus	mg/L	0.0070	0.0073	0.0138	0.0017	0.0075
pH	s.u.	8.17	8.23	7.18	7.68	7.82
potassium	mg/L	2.19	1.63	2.3	3.02	2.29
selenium	mg/L	0.001	ND	ND	0.002	0.002
silica	mg/L	NS	1.6	1.7	9.8	4.37
silver	mg/L	ND	ND	ND	0.0007	0.0007
sodium	mg/L	11	10	23.4	25.4	17.5
specific conductance	*m*s/cm	312	294	12	555	293
sulfate	mg/L	28.3	27.4	32.9	49.2	34.5
suspended solids	mg/L	2.3	7.3	10.5	98.5	29.7
temperature	°C	25.28	14.30	0.24	6.84	11.67
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	177	162	206	322	217
total Kjeldahl nitrogen	mg/L	0.526	1.005	0.554	0.787	0.718
total phosphorus	mg/L	0.0362	0.0280	0.0408	0.0881	0.048
turbidity	NTU	0.21	0.2	9.8	53.7	15.98
zinc	mg/L	0.006	0.008	ND	0.02	0.01

Table 4 - Surface Water Sampling Location QU-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	98	102	NS	110	103
ammonia-nitrogen	mg/L	<0.5	<0.5	NS	<0.5	<0.5
antimony	mg/L	ND	ND	NS	ND	ND
arsenic	mg/L	0.001	0.002	NS	ND	0.002
beryllium	mg/L	0.0002	ND	NS	ND	0.0002
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	1.0	1.1	NS	1.0	1.0
cadmium	mg/L	ND	ND	NS	ND	ND
calcium	mg/L	124	139	NS	127	130
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	191	ND	NS	10	101
chloride	mg/L	199.8	123.6	NS	167.8	163.7
chlorophyll *a*	ug/L	0.7	0.6	NS	0.5	0.6
chromium	mg/L	0.002	0.003	NS	0.0032	0.0027
color	mg/L	21	70	NS	20	37
copper	mg/L	0.0009	0.0005	NS	ND	0.0007
dissolved oxygen	mg/L	7.62	8.95	NS	12.12	9.56
fecal coliform	cfu/100mL	<1	<1	NS	<1	<1
hardness	mg/L	512	548	NS	536	532
iron	mg/L	NS	0.04	NS	NS	0.04
lead	mg/L	ND	ND	NS	0.0006	0.0006
magnesium	mg/L	42.5	44	NS	45.3	43.9
mercury	ng/L	<0.5	ND	NS	<0.5	<0.5
nickel	mg/L	ND	ND	NS	ND	ND
nitrate-nitrogen	mg/L	0.044	<0.002	NS	0.051	0.048
nitrite-nitrogen	mg/L	<0.0011	<0.0011	NS	0.0043	0.0043
orthophosphorus	mg/L	<0.0005	0.0020	NS	0.0016	0.0018
pH	s.u.	8.13	8.18	NS	7.34	7.88
potassium	mg/L	3.1	2.95	NS	2.46	2.84
selenium	mg/L	0.001	0.002	NS	0.001	0.001
silica	mg/L	NS	1.6	NS	1.8	1.70
silver	mg/L	ND	ND	NS	0.001	0.001
sodium	mg/L	98.7	104	NS	100	101
specific conductance	*m*s/cm	1,384	1,392	NS	1,603	1460
sulfate	mg/L	424	432	NS	398	418
suspended solids	mg/L	1.4	0.6	NS	1.5	1.3
temperature	°C	27.07	15.48	NS	7.09	16.55
thallium	mg/L	ND	ND	NS	ND	ND
total dissolved solids	mg/L	959	939	NS	969	956
total Kjeldahl nitrogen	mg/L	0.224	0.226	NS	0.179	0.210
total phosphorus	mg/L	0.0032	0.0024	NS	0.0026	0.0027
turbidity	NTU	0.278	0.2	NS	2.18	0.886
zinc	mg/L	0.009	0.014	NS	ND	0.012

Table 5 – Surface Water Sampling Location IP-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	132	140	162	126	140
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	ND	ND	0.002	0.001	0.002
arsenic	mg/L	0.003	0.003	0.002	ND	0.003
beryllium	mg/L	ND	ND	ND	ND	ND
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	1.6	9.0	4.0	2.3	4.23
cadmium	mg/L	ND	ND	ND	ND	ND
calcium	mg/L	39.6	45.5	87.5	51.8	56.1
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	37	40	15	20	28
chloride	mg/L	49.2	29.9	123.3	49.0	62.9
chlorophyll *a*	ug/L	2.9	20.6	2.7	6.5	8.2
chromium	mg/L	0.0019	0.002	0.0018	0.0025	0.0021
color	mg/L	53	215	153	152	143
copper	mg/L	0.0008	0.0021	ND	ND	0.0015
dissolved oxygen	mg/L	6.4	12.4	10.01	9.7	9.63
fecal coliform	cfu/100mL	26	72	19	30	37
hardness	mg/L	136	128	332	188	196
iron	mg/L	NS	1.02	1.08	NS	1.05
lead	mg/L	ND	0.0019	0.0014	0.0007	0.0013
magnesium	mg/L	9.66	12.4	20.9	13.8	14.2
mercury	ng/L	0.9	ND	2.3	1.8	1.7
nickel	mg/L	ND	ND	0.002	ND	0.002
nitrate-nitrogen	mg/L	<0.002	0.017	2.910	0.320	1.082
nitrite-nitrogen	mg/L	<0.0011	0.0357	0.0515	0.0189	0.0354
orthophosphorus	mg/L	0.0223	0.0073	0.0099	0.0027	0.0106
pH	s.u.	7.55	7.85	6.98	7.7	7.5
potassium	mg/L	1.04	5.5	4.2	2.71	3.36
selenium	mg/L	ND	ND	0.002	ND	0.002
silica	mg/L	NS	3.8	5.1	5.9	4.9
silver	mg/L	ND	ND	0.0008	0.0008	0.0008
sodium	mg/L	24.2	13.3	60.3	27.8	31.4
specific conductance	*m*s/cm	418	385	32	556	348
sulfate	mg/L	12.4	31.6	133	35	53.0
suspended solids	mg/L	5.0	29.4	8.2	4.5	11.8
temperature	°C	26.37	14.35	1.68	6.71	12.28
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	241	225	600	304	343
total Kjeldahl nitrogen	mg/L	0.790	1.379	1.110	0.556	0.959
total phosphorus	mg/L	0.0785	0.0678	0.0664	0.0455	0.0646
turbidity	NTU	0.279	1	14.7	16.5	8.12
zinc	mg/L	0.004	0.015	ND	ND	0.010

Table 6 - Surface Water Sampling Location LA-W						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	134	154	NS	132	140
ammonia-nitrogen	mg/L	<0.5	<0.5	NS	<0.5	<0.5
antimony	mg/L	0.001	0.001	NS	ND	0.001
arsenic	mg/L	0.003	0.002	NS	ND	0.003
beryllium	mg/L	0.0001	ND	NS	ND	0.0001
bicarbonate	mg/L	NS	NS	NS	NS	NS
biological oxygen demand	mg/L	11.7	6.9	NS	2.7	7.1
cadmium	mg/L	ND	ND	NS	ND	ND
calcium	mg/L	70.7	97.2	NS	62.4	76.8
carbon dioxide	ug/L	NS	NS	NS	NS	NS
chemical oxygen demand	mg/L	38	18	NS	21	25.7
chloride	mg/L	122.6	149.3	NS	61.3	111.1
chlorophyll *a*	ug/L	30.4	22.2	NS	9.8	20.8
chromium	mg/L	0.0028	0.002	NS	0.0027	0.0025
color	mg/L	81	82	NS	206	123
copper	mg/L	0.002	0.0011	NS	0.0011	0.0014
dissolved oxygen	mg/L	11.07	12.13	NS	9.62	10.94
fecal coliform	cfu/100mL	8	34	NS	75	39
hardness	mg/L	268	336	NS	220	275
iron	mg/L	NS	0.27	NS	NS	0.27
lead	mg/L	0.0009	ND	NS	0.001	0.001
magnesium	mg/L	21.4	26.5	NS	17.9	21.9
mercury	ng/L	1	0.8	NS	3	1.6
nickel	mg/L	0.003	ND	NS	ND	0.003
nitrate-nitrogen	mg/L	0.011	0.310	NS	0.665	0.329
nitrite-nitrogen	mg/L	0.0040	0.0133	NS	0.0246	0.0140
orthophosphorus	mg/L	0.0034	0.0057	NS	0.0059	0.0050
pH	s.u.	8.35	8.38	NS	8.03	8.25
potassium	mg/L	3.05	3.5	NS	3.26	3.27
selenium	mg/L	0.001	0.002	NS	ND	0.002
silica	mg/L	NS	4.5	NS	7.1	5.80
silver	mg/L	ND	ND	NS	0.0008	0.0008
sodium	mg/L	59.5	95	NS	34.8	63.1
specific conductance	*m*s/cm	831	1,036	NS	700	856
sulfate	mg/L	152	198	NS	72.2	140.7
suspended solids	mg/L	24.1	11.8	NS	21.1	19.0
temperature	°C	25.40	14.12	NS	7.83	15.78
thallium	mg/L	ND	ND	NS	ND	ND
total dissolved solids	mg/L	506	643	NS	383	511
total Kjeldahl nitrogen	mg/L	2.006	0.584	NS	0.799	1.130
total phosphorus	mg/L	0.1060	0.0353	NS	0.0741	0.072
turbidity	NTU	0.258	0.7	NS	25.7	8.89
zinc	mg/L	0.012	0.014	NS	ND	0.013

Table 7 - Groundwater Sampling Location MW-391						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	436	306	320	320	345
ammonia-nitrogen	mg/L	<0.5	<0.5	0.88	0.72	0.80
antimony	mg/L	ND	0.001	0.001	ND	0.001
arsenic	mg/L	0.002	0.002	0.003	ND	0.002
beryllium	mg/L	0.0001	ND	ND	ND	0.0001
bicarbonate	mg/L	542	335	337	339	388
biological oxygen demand	mg/L	0.8	1.2	2.1	1.0	1.3
cadmium	mg/L	ND	ND	ND	ND	ND
calcium	mg/L	587	84.2	299	304	319
carbon dioxide	ug/L	2,800	1,700	19,000	16,000	9875
chemical oxygen demand	mg/L	13	11	7	16	12
chloride	mg/L	113.1	40.6	40.1	38.9	58.2
chlorophyll *a*	ug/L	NS	NS	NS	NS	NS
chromium	mg/L	0.0061	0.0182	0.0029	0.0044	0.0079
color	mg/L	74	18	85	48	56
copper	mg/L	0.0032	ND	ND	ND	0.0032
dissolved oxygen	mg/L	1.64	203	0.39	0.41	51.36
fecal coliform	cfu/100mL	<1	<1	<1	<1	<1
hardness	mg/L	2,330	1,180	1,184	1,252	1487
iron	mg/L	0.04	0.422	1.45	1.32	0.81
lead	mg/L	ND	ND	0.0013	ND	0.0013
magnesium	mg/L	353	27.6	103	112	148.9
mercury	ng/L	<0.5	ND	<0.5	<0.5	<0.5
nickel	mg/L	0.007	0.009	ND	ND	0.008
nitrate-nitrogen	mg/L	0.025	<0.002	<0.002	<0.0012	0.025
nitrite-nitrogen	mg/L	0.0046	<0.0011	<0.0011	<0.0011	0.0046
orthophosphorus	mg/L	<0.0005	0.0020	0.0030	0.0023	0.0024
pH	s.u.	6.91	6.92	6.77	7.5	7.03
potassium	mg/L	9.02	3.35	14.9	14.5	10.4
selenium	mg/L	0.004	0.001	0.007	0.003	0.004
silica	mg/L	11	5.8	16.4	13	11.5
silver	mg/L	ND	ND	0.0024	0.0025	0.0025
sodium	mg/L	96.4	22.4	32.1	31.9	45.7
specific conductance	*m*s/cm	2,780	1,880	60	2,230	1737
sulfate	mg/L	2570	183	930	853	1134
suspended solids	mg/L	24.5	3.8	5.7	1.7	8.9
temperature	°C	17.92	12.03	11.07	10.11	12.78
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	3,277	1,620	1,591	1,657	2036
total Kjeldahl nitrogen	mg/L	0.357	1.327	1.467	1.246	1.099
total phosphorus	mg/L	0.0484	0.0114	0.0143	0.0137	0.0220
turbidity	NTU	0.099	0.1	13.4	7.89	5.37
zinc	mg/L	0.031	ND	ND	ND	0.031

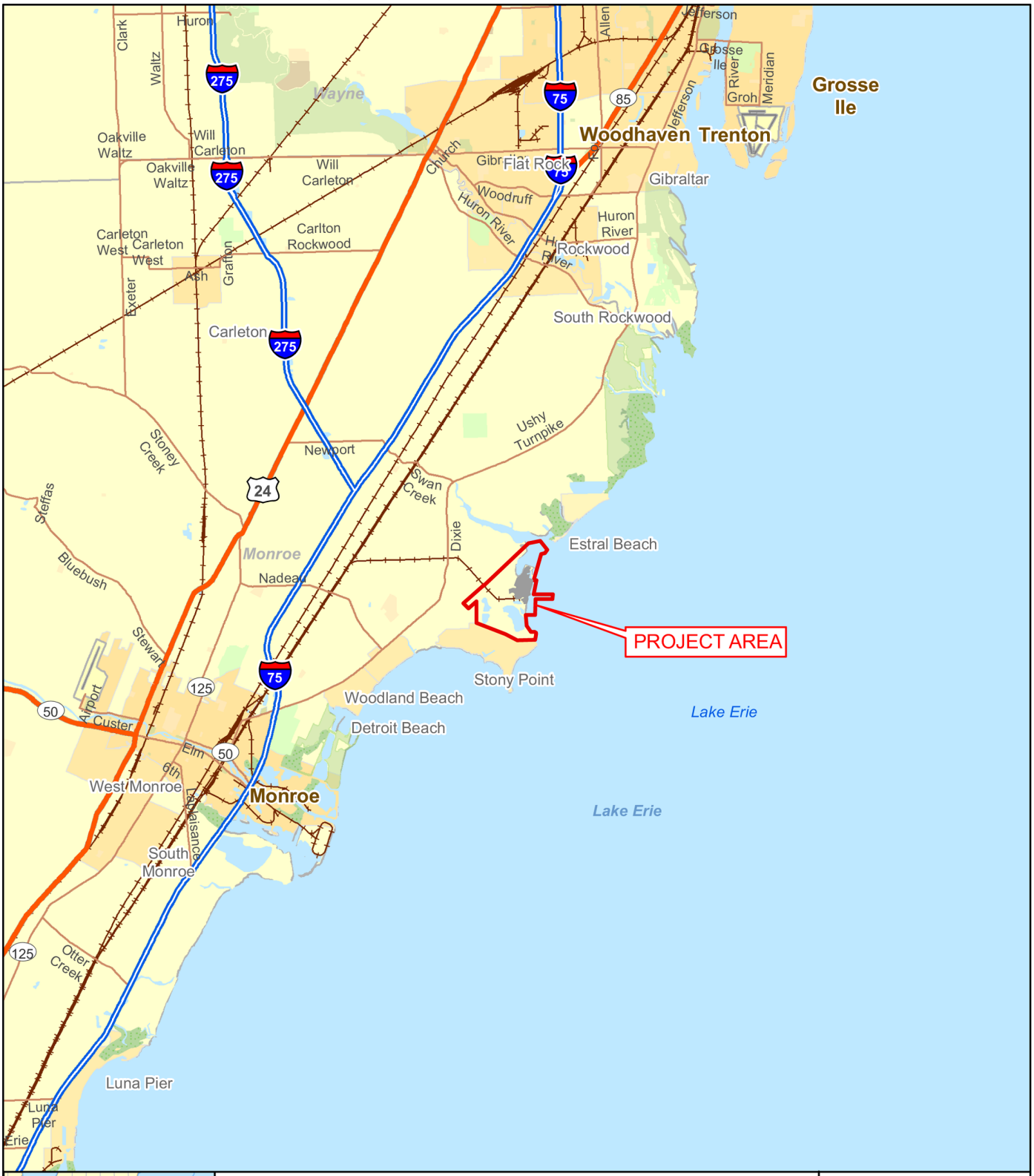
Table 8 - Groundwater Sampling Location MW-393						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	356	168	144	138	201
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	ND	ND	0.002	ND	0.002
arsenic	mg/L	0.001	0.001	0.002	ND	0.001
beryllium	mg/L	0.0001	ND	ND	ND	0.0001
bicarbonate	mg/L	191	182	157	164	174
biological oxygen demand	mg/L	0.5	0.8	0.8	0.4	0.63
cadmium	mg/L	ND	ND	ND	ND	ND
calcium	mg/L	89.9	290	75	79.1	134
carbon dioxide	ug/L	2,300	2,000	2,100	1,600	2000
chemical oxygen demand	mg/L	ND	24	ND	ND	24
chloride	mg/L	52.5	37.3	39.1	37.0	41.5
chlorophyll *a*	ug/L	NS	NS	NS	NS	NS
chromium	mg/L	0.0015	0.0146	ND	0.0015	0.0059
color	mg/L	7	14	11	15	12
copper	mg/L	0.001	ND	0.0011	ND	0.0011
dissolved oxygen	mg/L	2.45	1.91	0.92	0.71	1.50
fecal coliform	cfu/100mL	1	<1	<1	<1	1
hardness	mg/L	368	352	308	328	339
iron	mg/L	0.04	1.4	0.18	0.1	0.43
lead	mg/L	ND	0.002	0.0016	ND	0.0018
magnesium	mg/L	27.3	117	21.3	24.7	47.6
mercury	ng/L	<0.5	ND	<0.5	<0.5	<0.5
nickel	mg/L	ND	0.006	ND	ND	0.006
nitrate-nitrogen	mg/L	0.197	0.060	0.418	0.356	0.258
nitrite-nitrogen	mg/L	0.0086	<0.0011	0.0062	0.0044	0.0064
orthophosphorus	mg/L	<0.0005	0.0011	0.0021	<0.0005	0.0016
pH	s.u.	7.46	7.39	7.37	11.8	8.51
potassium	mg/L	3.47	15.8	3	2.56	6.21
selenium	mg/L	ND	0.004	ND	ND	0.004
silica	mg/L	2.8	14.5	4	3.5	6.2
silver	mg/L	ND	ND	0.0006	0.0012	0.0009
sodium	mg/L	23.6	31.3	22	22.1	24.8
specific conductance	*m*s/cm	307	741	20	786	464
sulfate	mg/L	206	938	156	179	370
suspended solids	mg/L	8.2	2.9	2.0	43.0	14.0
temperature	°C	18.81	18.87	10.98	10.01	14.67
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	516	499	363	483	465
total Kjeldahl nitrogen	mg/L	0.253	0.061	0.420	0.143	0.2193
total phosphorus	mg/L	0.0046	0.0011	0.0064	0.0259	0.0095
turbidity	NTU	0.256	0.2	0.624	1.84	0.73
zinc	mg/L	0.008	ND	ND	ND	0.008

Table 9 - Groundwater Sampling Location MW-384						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	382	432	394	208	354
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	ND	ND	0.001	ND	0.001
arsenic	mg/L	0.002	0.008	0.004	0.002	0.004
beryllium	mg/L	0.0002	ND	ND	ND	0.0002
bicarbonate	mg/L	413	482	421	238	389
biological oxygen demand	mg/L	1.2	2.2	1.7	1.0	1.5
cadmium	mg/L	ND	ND	ND	ND	ND
calcium	mg/L	572	551	547	518	547
carbon dioxide	ug/L	2,800	30,000	46,000	9,000	21950
chemical oxygen demand	mg/L	6	6	5	8	6
chloride	mg/L	44.1	39.4	36.4	85.9	51.4
chlorophyll *a*	ug/L	NS	NS	NS	NS	NS
chromium	mg/L	0.0059	0.005	0.0059	0.0077	0.0061
color	mg/L	23	130	164	6	81
copper	mg/L	ND	ND	ND	ND	ND
dissolved oxygen	mg/L	3.89	1.91	0.37	0.3	1.62
fecal coliform	cfu/100mL	<1	<1	<1	1	1
hardness	mg/L	2,200	2,168	2,180	1,896	2111
iron	mg/L	3.4	11.8	5.02	0.04	5.07
lead	mg/L	ND	0.0027	0.0009	ND	0.0018
magnesium	mg/L	162	18,512.40	166.00	176	4754.10
mercury	ng/L	<0.5	ND	<0.5	<0.5	<0.5
nickel	mg/L	ND	0.005	0.002	ND	0.004
nitrate-nitrogen	mg/L	0.955	<0.002	0.027	<0.0012	0.491
nitrite-nitrogen	mg/L	<0.0011	0.0021	0.0208	<0.0011	0.0115
orthophosphorus	mg/L	<0.0005	0.0010	0.0016	0.0109	0.0045
pH	s.u.	6.28	6.66	6.47	7.87	6.82
potassium	mg/L	4.52	4.84	2.3	3.07	3.68
selenium	mg/L	0.005	0.005	0.006	0.004	0.005
silica	mg/L	6.3	22.5	21.5	8.9	14.8
silver	mg/L	ND	ND	0.0045	0.0044	0.0045
sodium	mg/L	38.8	29.9	34	28.9	32.9
specific conductance	*m*s/cm	1,032	963	92	3,167	1314
sulfate	mg/L	1840	1,760	1,840	1,800	1810
suspended solids	mg/L	13.6	7.4	1.9	1.7	6.2
temperature	°C	13.57	13.54	9.65	11.51	12.07
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	3,015	2,787	3,316	2,487	2901
total Kjeldahl nitrogen	mg/L	0.407	0.576	0.477	0.564	0.506
total phosphorus	mg/L	0.0029	0.0025	0.0030	0.0120	0.0051
turbidity	NTU	0.571	0.2	43.4	ND	14.72
zinc	mg/L	0.029	ND	ND	ND	0.029

Table 10 - Groundwater Sampling Location MW-381						
Parameter	**Unit**	**July 2008**	**October 2009**	**February 2009**	**April 2009**	**Mean**
alkalinity	mg/L	276	254	244	270	261
ammonia-nitrogen	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
antimony	mg/L	0.002	ND	0.001	ND	0.002
arsenic	mg/L	0.001	0.001	0.003	ND	0.002
beryllium	mg/L	ND	ND	ND	ND	ND
bicarbonate	mg/L	291	272	255	300	280
biological oxygen demand	mg/L	0.6	1.0	0.8	0.8	0.8
cadmium	mg/L	0.0001	ND	ND	ND	0.0001
calcium	mg/L	162	170	150	169	163
carbon dioxide	ug/L	2,600	1,900	8,300	9,700	5625
chemical oxygen demand	mg/L	11	25	8	ND	15
chloride	mg/L	95.2	83.4	87.2	72.8	84.6
chlorophyll *a*	ug/L	NS	NS	NS	NS	NS
chromium	mg/L	0.002	0.0509	0.0012	0.0027	0.0142
color	mg/L	7	7	8	8	7.5
copper	mg/L	0.0119	ND	ND	ND	0.0119
dissolved oxygen	mg/L	6.77	3.3	0.59	0.98	2.91
fecal coliform	cfu/100mL	<1	2	<1	<1	2
hardness	mg/L	656	620	612	684	643
iron	mg/L	0.04	0.244	0.19	0.18	0.16
lead	mg/L	ND	0.0011	0.0015	ND	0.0013
magnesium	mg/L	52.6	58.2	48.3	55.8	53.7
mercury	ng/L	<0.5	ND	<0.5	<0.5	<0.5
nickel	mg/L	0.006	0.023	ND	ND	0.015
nitrate-nitrogen	mg/L	0.046	<0.002	<0.002	<0.0012	0.046
nitrite-nitrogen	mg/L	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
orthophosphorus	mg/L	0.0368	0.0016	0.0072	0.0032	0.0122
pH	s.u.	7.66	7.08	6.99	7.59	7.33
potassium	mg/L	2.85	2.63	2	1.96	2.36
selenium	mg/L	ND	0.002	0.003	0.003	0.003
silica	mg/L	2.7	6.2	6.8	5.6	5.3
silver	mg/L	ND	ND	0.0014	0.0014	0.0014
sodium	mg/L	38.6	41.8	42.2	40.9	40.9
specific conductance	*m*s/cm	454	1,266	40	1,488	812
sulfate	mg/L	369	366	400	417	388
suspended solids	mg/L	1.6	1.7	2.7	3.2	2.3
temperature	°C	12.78	11.09	11.55	10.86	11.57
thallium	mg/L	ND	ND	ND	ND	ND
total dissolved solids	mg/L	978	918	735	897	882
total Kjeldahl nitrogen	mg/L	0.154	0.106	0.226	0.238	0.181
total phosphorus	mg/L	0.0851	0.0028	0.0094	0.0052	0.0256
turbidity	NTU	0.143	0.2	0.798	1.74	0.72
zinc	mg/L	0.031	ND	ND	ND	0.031

FIGURES

Location: J:\00940-Black & Veatch\00940-040 Aquatic Eco Stdy-Lake Erie Nuc Plant\6.0 Reference Materials\GIS



Water Quality Survey
DTE Fermi 3
Project Site Location Map

Legend

- FERMI Site (Developed Areas)
- Project Area

N

0 0.5 1 2

Miles

Projection: Michigan South State Plain, NAD 83
Background: ESRI Resource Center
Source: http://resources.esri.com

Black & Veatch

AECOM

FIGURE 1

Date: October 2009

Project No.: 00940-040

Location: J:\00940-Black & Veatch\00940-040 Aquatic Eco Stdy-Lake Erie Nuc Plant\6.0 Reference Materials\GIS

DTE Biological Survey
Water Quality

Legend

- Water Quality Surface
- Water Quality Ground

N

0 500 1,000 2,000

Feet

Projection: Michigan South State Plain, NAD 83
Background: ESRI Resource Center
Source: http://resources.esri.com

Black & Veatch

ENSR | AECOM

FIGURE 2

October, 2009

Project No.: 00940-040