

## **APPENDIX 2 – Results of replicate sample analyses by U.S. Geological Survey National Water Quality Laboratory and the Michigan Department of Environmental Quality Drinking Water Laboratory**

### **Mapping Methods**

The maps showing the distribution of nitrate, chloride, and arsenic in Oakland County (figs. 8, 9, and 10, this report) were produced in collaboration with the Center for Applied Environmental Research at the University of Michigan – Flint (CAER). Results of water-quality analyses by the MDEQ Drinking Water Laboratory were checked by manual and automated methods for accuracy and completeness by CAER. Results were then sorted to identify unique wells. If two or more samples were analyzed from any one well, the highest value was retained. These unique wells were then assigned a geographic coordinate location using the Geocoding process in ArcView 3.1 (Environmental Systems Research Institute, 1998). In each case, some fraction of the unique wells identified did not contain sufficient address information to obtain a unique position.

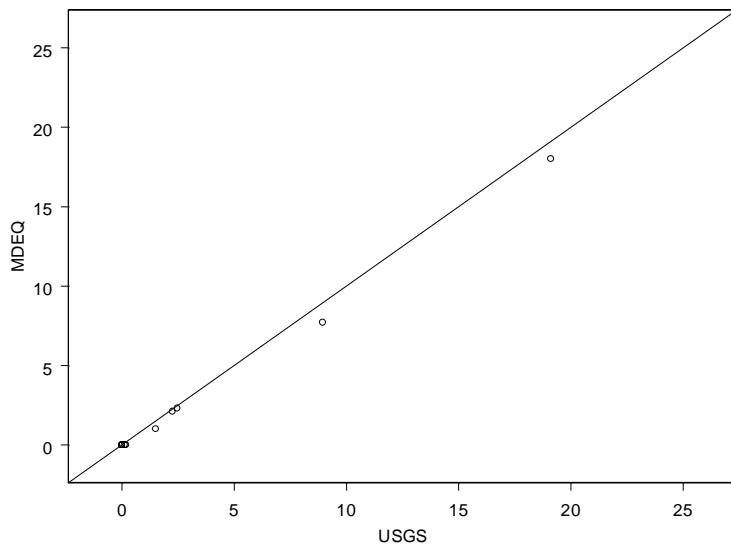
These point files were then spatially joined to an Oakland County section map provided by Michigan Department of Natural Resources. Once each point had been assigned to a section, the highest concentration value for the section was determined from the database, and the section classified. For points exceeding the Maximum Contaminant Level (MCL) or the Secondary Maximum Contaminant Level (SMCL), a buffer of one-quarter mile was placed around the well head. Any section that entered the buffer was reclassified into the MCL or SMCL exceedance class. This classification superceded any previous classification.

Geocoding, development of mapping methods, and production of maps for USGS Fact Sheet 135-98 (Aichele and others, 1998) was performed by the CAER. Production of the maps seen in this report used the same data bases and methods, but maps were modified to meet USGS publication guidelines.

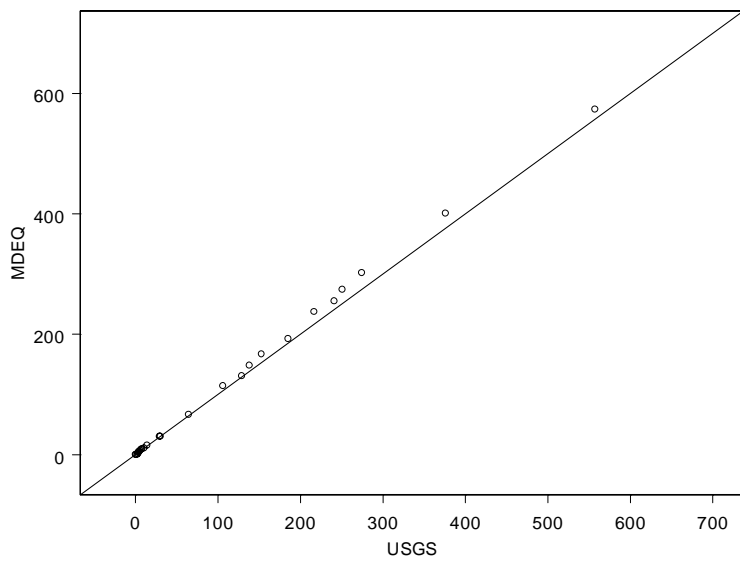
### **Replicate Sample Analysis**

Twenty-six replicate samples were collected for analysis by the MDEQ Drinking Water Laboratory. Samples were collected from sites with a wide variety of concentration levels for each constituent, based on the results of previous water-quality analyses. The purpose of this activity was to provide a basis for comparison between USGS analytical results for arsenic, nitrate and chloride and the results obtained by the MDEQ. Neither laboratory was informed that a replicate sample was being analyzed elsewhere. Collection procedures were identical, and samples were handled in accordance with each laboratory's specified procedures, including limitations on holding times in the case arsenic and nitrate. Graphs of the results of these analyses are presented in the figures A2.1, A2.2, and A2.3.

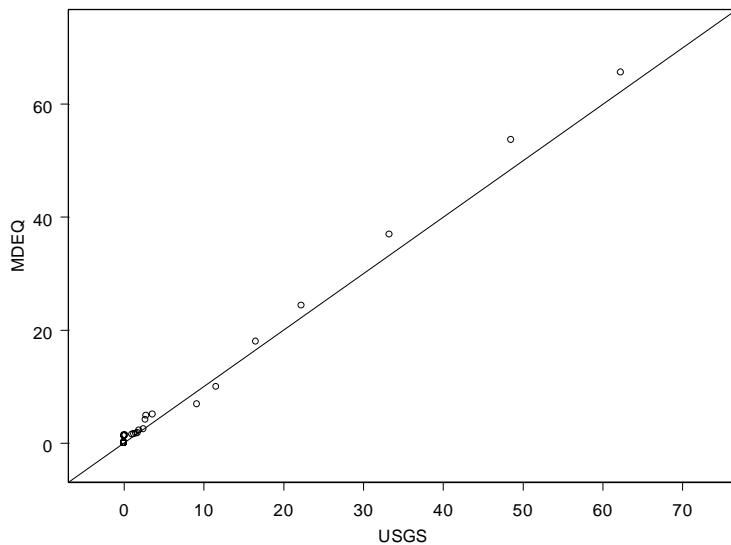
The mean difference between the USGS results and the MDEQ results was 0.1, 6.8 and 0.0008 mg/ L for nitrate, chloride, and arsenic, respectively. The standard deviation of the differences was 0.3, 9.6, and 0.003 for nitrate, chloride, and arsenic, respectively.



**Figure 2A.** Nitrate concentrations as determined by the Michigan Department of Environmental Quality Drinking Water Laboratory (MDEQ) and the U.S. Geological Survey National Water Quality Laboratory (USGS). Concentrations in milligrams per liter as nitrogen.



**Figure 2B.** Chloride concentrations as determined by the Michigan Department of Environmental Quality Drinking Water Laboratory (MDEQ) and the U.S. Geological Survey National Water Quality Laboratory (USGS). Concentrations in milligrams per liter.



**Figure 2C.** Arsenic concentrations as determined by the Michigan Department of environmental Quality Drinking Water Laboratory (MDEQ) and the U.S. Geological Survey National Water Quality Laboratory (USGS). Concentrations in micrograms per liter.

**Table 2A.** Analytical results of nitrate and nitrite analyses from the U.S. Geological Survey National Water Quality Laboratory and the Michigan Department of Environmental Quality Drinking Water Laboratory  
 [USGS, U.S. Geological Survey National Water Quality Laboratory; MDEQ, Michigan Department of Environmental Quality Drinking Water Laboratory; mg/L, milligrams per liter; --, no data]

Station ID	USGS Nitrite (mg/L as N)	USGS Nitrite + Nitrate (mg/L as N)	MDEQ Nitrite (mg/L as N)	MDEQ Nitrate (mg/L as N)
423307083290201	<0.01	0.0	<0.05	<0.4
424144083074701	<.01	.0	<.05	<.4
425221083374101	--	--	<.05	<.4
425131083363001	<.01	.0	<.05	<.4
425033083165701	.01	23.9	<.05	23
425157083083001	<.01	.0	<.05	<.4
423105083173201	<.01	.0	<.05	<.4
423334083293601	<.01	.0	<.05	<.4
423847083265601	<.01	.0	<.05	<.4
423036083182701	<.01	.0	<.05	<.4
423343083292101	<.01	.0	<.05	<.4
423108083173801	<.01	.0	<.05	<.4
423817083365501	.03	2.12	<.05	2
424505083205901	<.01	2.56	<.05	2.4
423600083262301	<.01	.20	<.05	<.4
424315083183901	.01	14.00	<.05	13
424048083243201	<.01	.16	<.05	<.4
424519083081101	<.01	.0	<.05	<.4
422850083230101	<.01	.0	<.05	<.4
424308083245701	<.01	.0	<.05	<.4
425042083083101	<.01	.0	<.05	<.4
424319083315701	<.01	.0	<.05	<.4
425218083375001	<.01	.0	<.05	<.4
424323083250501	<.01	.0	<.05	<.4
424504083324901	<.01	.0	<.05	<.4
425046083083601	<.01	2.34	<.05	2.2

**Table 2B.** Analytical results of chloride analyses from the U.S. Geological Survey National Water Quality Laboratory and the Michigan Department of Environmental Quality Drinking Water Laboratory  
 [USGS, U.S. Geological Survey National Water Quality Laboratory; MDEQ, Michigan Department of Environmental Quality Drinking Water Laboratory; mg/L, milligrams per liter; --, no data]

Station ID	MDEQ Chloride (mg/L)	USGS Chloride (mg/L)
422850083230101	30	29.2
423036083182701	256	248.5
423108083173801	199	194.4
423307083290201	<4	0.9
423334083293601	314	289.2
423343083292101	252	225.6
423600083262301	132	131.6
423817083365501	171	156.2
423847083265601	284	252.5
424048083243201	68	66.0
424144083074701	0	3.5
424308083245701	14	13.0
424315083182801	--	68.2
424315083183901	118	109.8
424319083315701	9	7.7
424323083250501	7	6.1
424504083324901	4	3.5
424505083205901	151	139.5
424519083081101	30	30.5
425033083165701	670	661.4
425042083083101	10	10.4
425046083083601	4	4.1
425131083363001	<4	0.6
425157083083001	469	444.2
425218083375001	8	6.9
425221083374101	<4	--

**Table 2C.** Analytical results of arsenic analyses from the U.S. Geological Survey National Water Quality Laboratory and the Michigan Department of Environmental Quality Drinking Water Laboratory  
 [USGS, U.S. Geological Survey National Water Quality Laboratory; MDEQ, Michigan Department of Environmental Quality Drinking Water Laboratory; mg/L, milligrams per liter]

Station ID	USGS Total Arsenic (mg/L as As)	MDEQ Total Arsenic (mg/L as As)
423307083290201	0.003	0.0014
424144083074701	<.001	<.0001
425221083374101	.068	.0698
425131083363001	.056	.0612
425033083165701	<.001	.0075
425157083083001	.002	.0025
423334083293601	<.001	<.0001
423847083265601	.001	.0016
423036083182701	.002	.0023
423343083292101	<.001	.0012
423108083173801	.001	.0014
423817083365501	<.001	<.0001
424505083205901	<.001	<.0001
423600083262301	<.001	<.0001
424315083183901	<.001	<.0001
424048083243201	.003	.0051
424519083081101	.012	.0018
422850083230101	.004	.0050
424308083245701	.024	.0261
425042083083101	.019	.0214
424319083315701	.000	.0015
425218083375001	.039	.0443
424323083250501	.011	.0110
424504083324901	.003	.0044
425046083083601	<.001	<.0001
424315083182801	.002	.0017