

APPENDIX I

GROUNDWATER RESAMPLING RESULTS



IT-MC-CK05-0392

Project No. 774645

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Contract: Contract No. DACA21-96-D-0018/CK05
Fort McClellan, Alabama

Subject: Groundwater Resampling Results

Dear Mr. Pope:

This letter report summarizes the results of the resampling effort conducted by IT Corporation to evaluate the effect of turbidity on metals concentrations in groundwater at Fort McClellan (FTMC).

At approximately 20 percent of the wells installed by IT at FTMC, the turbidity of the groundwater at the time of sample collection could not be reduced below 20 NTUs. In accordance with the installation-wide sampling and analysis plan (SAP), groundwater samples were collected for chemical analysis after five well volumes were removed from the well, regardless of the turbidity of the water. High turbidity is believed to have caused artificially high metals results in these groundwater samples due to suspended particulates. To determine whether high turbidity caused the elevated metals results, IT resampled five wells (four temporary wells and one permanent well) that previously had high turbidity at the time the original samples were collected. As shown in Table 1, the turbidities of the five wells originally sampled ranged from 211.4 nephelometric turbidity units (NTU) to greater than 1000 NTUs.

For the resampling effort, IT sampled the wells in accordance with procedures outlined in the SAP, however, at purge rates of between 0.1 and 0.5 liters per minute (i.e., low flow). IT used a peristaltic pump at three well locations and a Fultz in-line pump at two locations. The wells were purged until field parameters (pH, temperature, conductivity, and dissolved oxygen) stabilized and turbidity readings were below 10 NTUs.

The results of the low-flow resampling study are presented in Table 1. As shown in Table 1, the low turbidity samples had fewer metals detected and lower metals concentrations overall than the high turbidity groundwater samples. For most metals (except calcium, magnesium, potassium, sodium, and thallium), the concentrations in the low turbidity samples were significantly lower (1-2 orders of magnitude) than in the high turbidity samples. Several metals (beryllium, cadmium, chromium, lead, mercury, and selenium) that were detected in one or more of the high turbidity samples were not detected in the low turbidity samples. Certain metals (i.e., calcium, magnesium, potassium, and sodium), with a few exceptions, showed a slight decrease in the low turbidity samples; however, these metals results were generally within the same order of magnitude as the high turbidity samples.

The low-flow sampling method resulted in fewer detected metals and overall lower metals concentrations. Most metals concentrations decreased significantly using the low-flow procedure. The

Table 1

**Metals Concentrations in Groundwater
High Turbidity Samples vs. Low Turbidity Samples
Fort McClellan, Calhoun County, Alabama**

Parcel Sample Location Sample Number Sample Date Turbidity		FTA-145 FTA-145-GP06 CY3005 12-Jan-99 >1000		FTA-145 FTA-145-GP06 CY3005R 6-Jul-00 3.72		FTA-145 FTA-145-GP12 CY3012 18-Dec-98 612.40		FTA-145 FTA-145-GP12 CY3012R 6-Jul-00 5.42		FTA-151 FTA-151-GP05 BJ3005 2-Dec-98 309.00		FTA-151 FTA-151-GP05 BJ3005R 5-Jul-00 2.82		GSBP-501 GSBP-501-MW02 BX3004 5-Jan-00 >1000		GSBP-501 GSBP-501-MW02 BX3004R 7-Jul-00 8.47		PPMP-173 PPMP-173-GP03 KF3004 17-Feb-99 211.40		PPMP-173 PPMP-173-GP03 KF3004R 5-Jul-00 8.64	
Metal	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aluminum	mg/L	5.33E+01 J		1.09E-01		6.81E+01 J		2.95E-01		3.64E+01		1.17E-01		4.93E+01		6.24E-01		1.98E+01		3.08E-01	
Antimony	mg/L	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Arsenic	mg/L	1.06E-02 J		3.20E-03		1.12E-02		ND		1.12E-02		ND		4.51E-02		ND		5.09E-02		ND	
Barium	mg/L	4.15E-01 J		7.50E-02		5.13E-01		4.39E-02		5.16E-01		3.64E-01		2.40E-01		1.76E-02		2.08E-01		3.34E-02	
Beryllium	mg/L	2.80E-03 J		ND		2.90E-03 B		ND		2.20E-03 J		ND		9.20E-03		ND		5.80E-03		ND	
Cadmium	mg/L	ND		ND		ND		ND		ND		ND		1.00E-03 J		ND		7.50E-03		ND	
Calcium	mg/L	1.12E+02 J		7.85E+01		1.86E+01		1.32E+01		6.87E+01		5.04E+01		4.97E+01		4.01E+01		3.61E+01		4.28E+01	
Chromium	mg/L	1.27E-01 J		ND		8.71E-02		ND		7.70E-02		ND		6.70E-02		ND		1.98E-02		ND	
Cobalt	mg/L	1.63E-02 J		2.70E-03		5.18E-02		4.40E-03		3.18E-02 J		ND		2.35E-02 J		ND		6.84E-02		ND	
Copper	mg/L	7.93E-02 J		2.40E-03		9.99E-02		ND		6.52E-02		ND		5.82E-02 J		9.50E-03		4.31E-02		ND	
Iron	mg/L	7.20E+01 J		3.99E+00		9.25E+01 J		1.47E-01		5.64E+01		3.59E-01		7.23E+01		5.62E-01		8.49E+01		6.42E-01	
Lead	mg/L	3.33E-02 J		ND		4.71E-02		ND		3.27E-02		ND		1.87E-01		ND		4.22E-02		ND	
Magnesium	mg/L	6.23E+01 J		3.80E+01		3.42E+01		1.25E+01		3.62E+01		1.47E+01		3.13E+01		2.28E+01		9.14E+00		7.30E+00	
Manganese	mg/L	1.34E+00 J		1.56E+00		1.62E+00		7.55E-01		7.10E-01		1.55E-01		3.67E+00		9.82E-02		1.78E+00		1.09E-02	
Mercury	mg/L	2.50E-04 J		ND		1.40E-04 B		ND		9.30E-05 J		ND		1.30E-03		ND		1.10E-04 J		ND	
Nickel	mg/L	1.08E-01 J		4.70E-03		1.29E-01		2.76E-02		8.12E-02		ND		5.34E-02		5.70E-03		4.37E-01		6.20E-03	
Potassium	mg/L	1.51E+01 J		1.87E+00		1.32E+01		2.45E+00		1.03E+01		1.93E+00		4.65E+00 J		4.72E-01		4.13E+00 J		3.70E-01	
Selenium	mg/L	ND		ND		5.40E-03		ND		ND		ND		ND		ND		ND		ND	
Silver	mg/L	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sodium	mg/L	1.28E+01		1.16E+01		7.33E+00		6.58E+00		3.37E+01		2.93E+01		2.72E+00 J		2.75E+00		4.29E+00 J		3.48E+00	
Thallium	mg/L	5.00E-03 J		8.80E-03		6.50E-03 B		5.40E-03		ND		ND		ND		ND		ND		ND	
Vanadium	mg/L	9.26E-02 J		ND		4.11E-02 J		ND		5.20E-02		ND		3.06E-01		3.90E-03		3.98E-02 J		ND	
Zinc	mg/L	2.03E-01 J		1.46E-02		3.12E-01		1.36E-02		1.25E-01		ND		2.90E-01		2.03E-02		1.06E+00		1.76E-02	
# of detected metals		19		14		20		12		18		8		19		12		19		10	

Shaded = resample results

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than stated method detection limit but less than or equal to specified reporting limit.

mg/L - Milligrams per liter

ND - Not detected

Qual - Data validation qualifier