



Infrastructure, buildings, environment, communications

Michael R. Schmoller
South Central Region Headquarters
Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711

Subject:

Groundwater Injection Pilot Test and Groundwater Monitoring, Middleton Cleaners, Middleton, Wisconsin.

Dear Mr. Schmoller:

This letter serves to follow-up and confirm the telephone conversation of January 23, 2002 with Dino Tisoris of the Wisconsin Department of Natural Resources (WDNR) regarding the scope of work for completion of additional groundwater sampling at the Middleton Cleaners site located at 6617-6619 University Avenue, in the City of Middleton, Wisconsin. This letter includes a summary of the injection activities completed and a brief summary of the recommended additional activities.

Preliminary Pilot Test Results

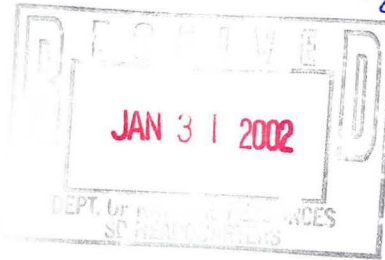
ARCADIS completed three injection events at the Middleton Cleaners site from September through December 2001. The injection events were completed in accordance with our telephone conversation on August 22, 2001 and the August 23, 2001 follow up and confirmation letter. A 10:1 solution of potable water and food-grade molasses (i.e., 10 gallons of water for every 1 gallon of food-grade molasses) was injected into the impacted aquifer through the shallow and deep injection wells. Approximately 250 gallons of the dilute molasses solution was injected into each injection well. The third injection event was completed in November and December 2001 in order to inject the proposed quantity of the dilute molasses solution.

In November 2001, groundwater samples were collected using low-flow sampling methods from the 15 existing monitoring wells/piezometers located at the site for the analysis of total organic carbon (TOC), volatile organic compounds (VOCs), and methane, ethane, and ethene. A downhole probe was used to measure other natural attenuation parameters, including dissolved oxygen, pH, and oxidation-reduction potential (ORP). The natural attenuation parameters, particularly ORP and organic carbon, are used to evaluate biological conditions within the aquifer and to evaluate the potential need to modify the current injection frequency.

The November 2001 analytical results indicated that the VOC and dissolved gases concentrations in Monitoring Well MW-4 confirm that reductive dechlorination is occurring in this area. Table 1 presents the analytical results. Based on the groundwater velocity at the site, 75 to 100 feet per year, the aquifer conditions created by the molasses injections have not reached the entire remediation area. The injection events began in April 2001, therefore, it is anticipated that the injected

Part of a bigger picture

Fowler Property
Hi-way Dry cleaners
02-13-096833



ARCADIS G&M, Inc.
126 North Jefferson Street
Suite 400
Milwaukee
Wisconsin 53202
Tel 414 276 7742
Fax 414 276 7603

ENVIRONMENTAL

Milwaukee,
29 January 2002

Contact:
Jennine Cota Trask

Extension:
203

molasses solution has traveled approximately 55 to 74 feet to the east. Due to the distance from the injection wells to several of the monitoring wells (approximately 160 feet), ARCADIS recommends sampling two to three injection wells at the site to verify that sufficient conditions are present at the site to enhance the reductive dechlorination. Per the telephone conversation with Dino Tsois and his subsequent approval, ARCADIS will proceed with the groundwater sampling during the week ending February 1, 2002. The groundwater from the injection wells will be analyzed for TOC, VOCs, and natural attenuation parameters.

Estimated Costs

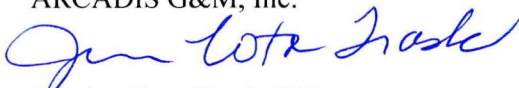
The costs to conduct the scope of work described above are estimated to be \$2,320. The costs for the completion of these services are included in the cost estimate presented in the "Scope of Work and Cost Estimate, Supplemental Investigation and Remediation Services" dated February 4, 2000. This project will be performed on a time and materials basis in accordance with the existing Services Agreement between Northern Properties, Inc. and ARCADIS. The estimated costs presented herein will not be exceeded without prior authorization from the WDNR in accordance with the DERP. It is anticipated that the costs associated with the above scope of work will be reimbursable under the DERP.

Closing

Thank you again for your cooperation with this project. Should you have any questions regarding the information contained herein, please feel free to call at your convenience.

Sincerely,

ARCADIS G&M, Inc.



Jennine Cota Trask, P.E.
Environmental Engineer



Edmund A. Buc, P.E.
Senior Engineer

Copies:

Dr. Edward Hommel – Northern Properties
Aubrey R. Fowler, Esq. – Northern Properties
Donald P. Gallo – Reinhart Boerner et al
Robin Schmidt – WDNR

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	MW-1				MW-2				MW-3	
	07/27/00	03/20/01	06/22/01	11/16/01	07/25/00	03/20/01	06/21/01	11/20/01	07/25/00	03/19/01
VOC										
Trimethylbenzenes (Total)	<6.3	<8	<0.2	<4	<0.63	0.11	<0.2	<0.4	<0.63	<0.8
1,1,1-Trichloroethane	<2.1	<10	2.5	<5.0	3.9	0.69	0.91	0.78	<0.21	<1.0
1,1,2-Trichloroethane	<3.3	<10	2.8	<5.0	<0.33	<0.25	<0.25	<0.50	<0.33	<1.0
1,2-Dichloroethane	<2.1	<10	3.4	<5.0	<0.21	<0.25	<0.25	<0.50	<0.21	<1.0
Bromochloromethane	<5.6	<10	0.39	<5.0	<0.56	<0.25	<0.25	<0.50	<0.56	<1.0
Chlorodibromomethane	<28	<10	150	<5.0	<2.8	<0.25	<0.25	<0.50	<2.8	<1.0
cis-1,2-Dichloroethylene	6.3 Q	<10	5.5	<5.0	3.8	<0.25	0.36	<0.50	0.42 Q	<1.0
Methyl-tert-butyl-ether	<2.0	<10	<0.25	<5.0	0.21 Q	<0.25	<0.25	<0.50	<0.20	<1.0
Methylene Chloride	<3.6	67 L	0.26 L	24 L	<0.36	<0.25	<0.25	1.7 L	<0.36	4.6 L
Tetrachloroethylene	830	1,900	1,400	980	150	99	100	150	120	150
Trichloroethylene	17	16	18	11	7.5	1.4	2.5	2.9	3.5	3
Field Parameters										
DO (mg/L)	4.92	6.56	2.43	6.99	3.9	6.08	3.7	6.32	7.28	7.2
ORP (mV)	282.7	401.2	204.3	323.4	172	396	184.4	237.5	212.9	376
pH	6.76	6.79	7.09	7.17	6.62	7.04	7.06	6.83	6.83	6.94
Specific Conductance (µS/cm)	1,076	1,120	1,109	967	1,645	982	1,179	1,164	1,186	1,462
Temperature (°C)	29.1	12.11	14.94	13.19	28.29	12.69	16.63	11.77	24.28	11.64
Gases										
Ethane	<10	<0.2	<0.005	<0.005	<10	<0.2	<0.005	0.014	<10	<0.2
Ethene	<10	<0.30	<0.005	<0.005	<10	<0.30	<0.005	<0.005	<10	<0.30
Methane	<10	0.85	0.13	0.34	<10	0.9	0.2	0.17	<10	<0.5
Total Organic Carbon (mg/L)	1.7	1.4	1.4	2.5	2.8 A	0.94	0.82	1.1	3.9 A	1.2

Footnotes on Page 7.

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	MW-3 (continued)		MW-4				AGMW-1			
	06/21/01	11/20/01	07/27/00	03/21/01	06/22/01	11/20/01	07/24/00	03/13/01	06/20/01	11/16/01
VOC										
Trimethylbenzenes (Total)	<0.2	<0.4	<12.6	<8	<0.2	<10	<0.63	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	0.64	0.78	<4.2	<10	4.8	<12	<0.21	<0.25	<0.25	<0.25
1,1,2-Trichloroethane	<0.25	<0.50	<6.6	<10	<0.25	<12	<0.33	<0.25	<0.25	<0.25
1,2-Dichloroethane	<0.25	<0.50	<4.2	<10	<0.25	<12	<0.21	<0.25	<0.25	<0.25
Bromochloromethane	<0.25	<0.50	<11	<10	<0.25	<12	<0.56	<0.25	<0.25	<0.25
Chlorodibromomethane	<0.25	<0.50	<56	<10	<0.25	<12	<2.8	<0.25	<0.25	<0.25
cis-1,2-Dichloroethylene	0.28	<0.50	17	<10	15	230	<0.27	<0.25	<0.25	<0.25
Methyl-tert-butyl-ether	<0.25	<0.50	<4.0	<10	<0.25	<12	<0.20	<0.25	<0.25	<0.25
Methylene Chloride	<0.25	1.3 L	<7.2	66 L	0.27 L	26 L	<0.36	<0.25	0.28 L	0.61 L
Tetrachloroethylene	130	300	1,800	1,600	2,500	3,100	<0.85	2	0.41	37
Trichloroethylene	3.2	6.9	31	11	33	100	<0.32	<0.25	<0.25	0.72
Field Parameters										
DO (mg/L)	4.61	7.34	5.68	6.57	2.82	3.74	7.32	9.49	10.21	3.69
ORP (mV)	205.4	259.9	238.2	398.1	200.1	239.7	374.9	379.9	185.6	256.1
pH	7.06	6.79	6.75	7.06	7.05	6.66	6.88	7.17	7.25	7.04
Specific Conductance (µS/cm)	1,378	1,593	1,705	959	1,456	2,067	689	666	726	774
Temperature (°C)	15.95	11.26	21.78	12.03	13.82	11.62	25.57	10.8	15.4	13.13
Gases										
Ethane	<0.005	0.017	<10	<0.2	<0.005	0.032	<10	<0.2	<0.005	NA
Ethene	<0.005	<0.005	<10	<0.30	<0.005	0.044	<10	<0.3	0.0092	NA
Methane	0.14	0.23	<10	0.64	0.15	0.4	<10	<0.5	0.88	NA
Total Organic Carbon (mg/L)	0.91	1.1	1.8	1.1	1.5	5.1	2.9 A	0.95	0.69	

Footnotes on Page 7.

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	AGMW-2				AGMW-4			
	07/26/00	03/20/01	06/21/01	11/20/01	07/28/00	03/15/01	06/20/01	11/19/01
VOC								
Trimethylbenzenes (Total)	<3.1	<8	<5	<2.1	<0.63	<0.2	<0.2	<0.4
1,1,1-Trichloroethane	4.2	<10	<6.2	<5.0	<0.21	<0.25	<0.25	<0.50
1,1,2-Trichloroethane	<1.7	<10	<6.2	<5.0	<0.33	<0.25	<0.25	<0.50
1,2-Dichloroethane	<1.1	<10	<6.2	<5.0	<0.21	<0.25	<0.25	<0.50
Bromochloromethane	<2.8	<10	<6.2	<5.0	<0.56	<0.25	<0.25	<0.50
Chlorodibromomethane	<14	<10	<6.2	<5.0	<2.8	<0.25	<0.25	<0.50
cis-1,2-Dichloroethylene	5.5	<10	6.5	19	<0.27	<0.25	<0.25	<0.50
Methyl-tert-butyl-ether	<1.0	<10	<6.2	<5.0	<0.20	<0.25	<0.25	<0.50
Methylene Chloride	2.8 Q	67 L	39 L	12 L	<0.36	<0.25	<0.25	1.9 L
Tetrachloroethylene	510	1,500	1,100	1,200	130	29	110	70
Trichloroethylene	11	13	16	22	0.52 Q	<0.25	0.28	<0.50
Field Parameters								
DO (mg/L)	4.73	5.62	4.65	4.53	7.94	9.49	10.14	3.83
ORP (mV)	252.8	390.6	203.7	263.4	238	350.7	137	214.8
pH	6.87	6.98	7.08	6.77	7.13	7.25	7.3	7.18
Specific Conductance (µS/cm)	1,169	1,057	1,095	1,326	819	865	903	1,030
Temperature (°C)	28.32	12.44	15.03	12.16	22.05	10.23	15.98	11
Gases								
Ethane	<10	<0.2	<0.005	0.018	<10	<0.2	<0.005	0.029
Ethene	<10	<0.30	<0.005	<0.005	<10	<0.3	0.0075	<0.005
Methane	<10	0.7	0.11	0.3	<10	<0.5	9.9	0.46
Total Organic Carbon (mg/L)	1.9	1.2	1.1	1.6	1.4	1.2	1.3	1.1

Footnotes on Page 7.

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	AGMW-5			AGPZ-1				AGPZ-2			
	03/13/01	06/21/01	11/19/01	07/25/00	03/14/01	06/19/01	11/15/01	07/26/00	03/15/01	06/19/01	11/15/01
<u>VOC</u>											
Trimethylbenzenes (Total)	<0.2	<0.2	<0.2	<0.63	<0.2	<0.2	<0.2	<0.63	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	0.47	<0.25	0.44	<0.21	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25
1,1,2-Trichloroethane	<0.25	<0.25	<0.25	<0.33	<0.25	<0.25	<0.25	<0.33	<0.25	<0.25	<0.25
1,2-Dichloroethane	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25
Bromochloromethane	<0.25	<0.25	<0.25	<0.56	<0.25	<0.25	<0.25	<0.56	<0.25	<0.25	<0.25
Chlorodibromomethane	<0.25	<0.25	<0.25	<2.8	<0.25	<0.25	<0.25	<2.8	<0.25	<0.25	<0.25
cis-1,2-Dichloroethylene	<0.25	<0.25	<0.25	<0.27	<0.25	<0.25	<0.25	<0.27	<0.25	<0.25	<0.25
Methyl-tert-butyl-ether	1.2	1.8	2.9	<0.20	<0.25	<0.25	<0.25	<0.20	<0.25	<0.25	<0.25
Methylene Chloride	<0.25	0.29 L	0.75 L	<0.36	<0.25	<0.25	0.26 L	<0.36	<0.25	<0.25	1.5 L
Tetrachloroethylene	38	63	76	<0.85	0.47	<0.25	<0.25	36	0.36	<0.25	<0.25
Trichloroethylene	0.91	1.5	1.8	<0.32	<0.25	<0.25	0.75	<0.32	<0.25	<0.25	2.6
<u>Field Parameters</u>											
DO (mg/L)	5.9	6.23	7.7	1.84	0.2	2.13	1.11	6.68	7.62	9.29	4.77
ORP (mV)	373.2	189.4	221.6	-13.7	88.3	52.6	210	80.2	364.5	195.2	115
pH	6.91	6.95	6.89	6.98	7.14	7.16	7.22	7.09	7.23	7.25	7.4
Specific Conductance (µS/cm)	1,134	1,286	1,242	814	822	906	876	944	904	984	926
Temperature (°C)	8.31	14.2	11.7	22.03	10.03	13.86	12.98	20.84	9.38	12.86	17.07
<u>Gases</u>											
Ethane	<0.2	<0.005	0.026	<10	<0.2	0.0074	0.0067	<10	<0.2	<0.005	0.057
Ethene	<0.3	0.0065	<0.005	<10	<0.3	0.012	0.0091	<10	<0.3	<0.005	0.055
Methane	<0.5	0.72	0.44	<10	8.7	8.7	8.3	<10	<0.5	2.4	1.4
Total Organic Carbon (mg/L)	1.3	0.99	1.2	4.0 A	2.7	2.4	3	1.4	0.92	0.73	4.5

Footnotes on Page 7.

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	AGPZ-3				AGPZ-3D			AGPZ-4			
	07/27/00	03/19/01	06/20/01	11/19/01	03/13/01	06/19/01	11/16/01	07/26/00	03/14/01	06/19/01	11/15/01
VOC											
Trimethylbenzenes (Total)	<1.26	0.13	<0.2	<0.2	<0.2	<0.2	<0.2	<0.63	<0.2	<0.2	<0.2
1,1,1-Trichloroethane	<0.42	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25
1,1,2-Trichloroethane	<0.66	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.33	<0.25	<0.25	<0.25
1,2-Dichloroethane	<0.42	3.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25
Bromochloromethane	<1.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.56	<0.25	<0.25	<0.25
Chlorodibromomethane	<5.6	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<2.8	<0.25	<0.25	<0.25
cis-1,2-Dichloroethylene	<0.54	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.27	<0.25	<0.25	<0.25
Methyl-tert-butyl-ether	<0.40	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.20	<0.25	<0.25	<0.25
Methylene Chloride	<0.72	<0.25	0.26 L	0.68 L	<0.25	<0.25	0.64 L	<0.36	<0.25	0.39 L	0.77 L
Tetrachloroethylene	260	5.9	<0.25	5.8	0.66	<0.25	<0.25	18	0.37	<0.25	<0.25
Trichloroethylene	1.4 Q	<0.25	<0.25	0.5	<0.25	<0.25	0.55	<0.32	<0.25	<0.25	0.7
Field Parameters											
DO (mg/L)	1.89	0.18	0.97	1.29	0.16	1.01	0.56	5.69	8.39	10.4	4.52
ORP (mV)	-19.7	144.7	-28.4	132.3	155.4	110	318.9	-31.9	331.1	183.8	277.8
pH	7.04	7.14	7.14	7	7.37	7.42	7.57	7.26	7.35	7.38	7.49
Specific Conductance (µS/cm)	865	797	900	853	569	615	562	1,046	951	1,031	843
Temperature (°C)	30.71	10.73	14.71	11.04	10.44	12.27	11.87	26.04	9.98	13.92	13
Gases											
Ethane	<10	<0.2	0.01	0.089	<0.2	<0.005	<0.005	<10	<0.2	<0.005	<0.005
Ethene	<10	<0.30	0.0094	0.016	<0.3	<0.005	<0.005	<10	<0.3	0.013	<0.005
Methane	<10	7.1	0.78	13	4.6	2.5	2	<10	<0.5	1.9	0.6
Total Organic Carbon (mg/L)	4.1	2.6	2.5	3.3	1.4	1.3	1.5	3.2 A	0.84	0.63	1.1

Footnotes on Page 7.

Table 1. Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Sample I.D. Sample Date	AGPZ-5			PZ-1				PAL	ES
	03/12/01	06/18/01	11/13/01	07/27/00	03/14/01	06/20/01	11/16/01		
<u>VOC</u>									
Trimethylbenzenes (Total)	<0.2	<0.2	<0.2	<0.63	<0.2	<0.2	<0.2	96	480
1,1,1-Trichloroethane	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25	40	200
1,1,2-Trichloroethane	<0.25	<0.25	<0.25	<0.33	<0.25	<0.25	<0.25	0.5	5
1,2-Dichloroethane	<0.25	<0.25	<0.25	<0.21	<0.25	<0.25	<0.25	0.5	5
Bromochloromethane	<0.25	<0.25	<0.25	<0.56	<0.25	<0.25	<0.25	NE	NE
Chlorodibromomethane	<0.25	<0.25	<0.25	<2.8	<0.25	<0.25	<0.25	NE	NE
cis-1,2-Dichloroethylene	<0.25	<0.25	<0.25	<0.27	<0.25	<0.25	<0.25	7	70
Methyl-tert-butyl-ether	<0.25	<0.25	<0.25	<0.20	<0.25	<0.25	<0.25	12	60
Methylene Chloride	<0.25	0.32 L	0.39 L	<0.36	<0.25	<0.25	0.34 L	0.5	5
Tetrachloroethylene	<0.25	<0.25	1.4	150	1.2	<0.25	54	0.5	5
Trichloroethylene	<0.25	<0.25	<0.25	<0.32	<0.25	<0.25	0.67	0.5	5
<u>Field Parameters</u>									
DO (mg/L)	0.3	0.51	4.73	7.07	9.06	11.11	4.6	NE	NE
ORP (mV)	-211.6	73	291.7	273	358.4	185.4	319.8	NE	NE
pH	7.15	7.13	7.26	7.01	7.25	7.27	7.36	NE	NE
Specific Conductance (µS/cm)	705	822	752	1,154	1,069	1,204	1,034	NE	NE
Temperature (°C)	8.95	15.45	8.02	25.5	10.85	13.94	12.97	NE	NE
<u>Gases</u>									
Ethane	<0.2	0.012	NA	<10	<0.2	<0.005	<0.005	NE	NE
Ethene	<0.3	0.024	NA	<10	<0.3	<0.005	<0.005	NE	NE
Methane	8.7	29	NA	<10	<0.5	1.1	0.21	NE	NE
Total Organic Carbon (mg/L)	3	2.6		1.1	1	0.92	<0.88	NE	NE

Footnotes on Page 7.

Table . Summary of Groundwater Analytical Results, Middleton Cleaners, Middleton, Wisconsin.

Results are in micrograms per liter ($\mu\text{g/L}$), unless otherwise indicated.

VOCs	Volatile organic compounds.
WDNR	Wisconsin Department of Natural Resources.
Q	Value is between the limit of detection and the limit of quantitation.
A	Analyte detected in blank.
	Value exceeds the WDNR Enforcement Standard (ES).
	Value exceeds the WDNR Preventive Action Limit (PAL).
mg/L	Milligrams per liter.
NE	Not established.
$^{\circ}\text{C}$	Degrees Celsius.
mV	Millivolts.
$\mu\text{S/cm}$	MicroSiemens per centimeter.
DO	Dissolved Oxygen.
ORP	Oxidation Reduction Potential.
L	Common laboratory contaminant.
NA	Not analyzed.