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REMEDIATION TECHNOLOGIES

August 9, 2005

Via email: PSones@haleyaldrich.com

Paul Sones
Haley & Aldrich, Inc.
9040 Friars Road, Suite 220
San Diego, CA 92108-5860

SUBJECT: Soil Natural Oxidant Demand Report

Dear Mr. Sones,

This document constitutes the results from the natural oxidant demand (NOD) test conducted on soil samples MWB020-SS080-0001, MWB020-SS100-0001, MWC022-SS110-0001, and MWC007-SS082-0001.

Testing Summary

Three soil samples in Ziploc bags (MWB020-SS080-0001, MWB020-SS100-0001, MWC022-SS110-0001) and two soil cores (MWC007-SS082-0001) were submitted to Adventus Remediation Technologies for NOD tests following procedure REMLAB 01 VER 1.3 (15 October 2004).

The two soil cores labelled MWC007-SS082-0001 were homogenized and a single NOD test was conducted on the homogenized sample. The remaining three soil samples were each homogenized separately and a NOD test was conducted on each homogenized sample. Prior to conducting the NOD test, each soil was sampled for VOCs and analyzed at AGAT Laboratories, Mississauga, Ontario.

On day-7, the test jars were photographed (Appendix A) and water and soils were sampled. The permanganate concentrations in jars 1, 2, and 3 were measured spectrophotometrically at 525 nm. The soils from the control and the least purple jar (i.e. treated soil) were submitted to Maxxam Analytics, Mississauga, Ontario for total organic carbon (TOC), ICP metals and pH analyses. Soil samples were also submitted for chemical oxidant demand (COD) analysis at AGAT Laboratories.

1345 Fewster Drive • Mississauga, Ontario, Canada L4W 2A5 • Tel 905.273.5374 • Fax 905.273.4367

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Results

The results from the initial VOC sampling revealed that trace concentrations (0.26 – 0.32 ug/g) of total VOCs were detected in three soil samples (Appendix B).

The results from the final soil sampling are presented in Appendices C-F.

The calculated natural oxidant demand values for the four soil samples are presented in **Table 1** along with the initial and final oxidant concentrations. Results indicate an average oxidant demand value of 0.11 mg/g for sample MWC022-SS110, 0.25 mg/g for sample MWB020-SS100, 0.13 mg/g for sample MWB020-SS080, and 0.15 mg/g for sample MWC007-SS082.

Table 1: Results of 7-day NOD batch tests

Soil Sample	Jar #	Mass of Soil (g)	Initial $KMnO_4$ Concentration (mg/mL)	Final $KMnO_4$ Concentration (mg/mL)	NOD (mg/g)
MWC022-SS110	1	50	0	0	**0**
	2	50	0.21	0.15	**0.087**
	3	50	0.63	0.54	**0.13**
MWB020-SS100	1	50	0	0	**0**
	2	50	0.21	0.09	**0.18**
	3	50	0.63	0.42	**0.32**
MWB020-SS080	1	50	0	0	**0**
	2	50	0.21	0.14	**0.10**
	3	50	0.63	0.53	**0.16**
MWC007-SS082	1	50	0	0	**0**
	2	50	0.21	0.13	**0.12**
	3	50	0.63	0.51	**0.18**

If you have any questions, requests, or comments, please contact me by telephone (905-273-5374 Ext. 232), or Email (eva.dmitrovic@adventustech.com).

Yours truly,
Adventus Remediation Technologies Inc.

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Eva Dmitrovic
Project Manager

cc. K. Bolanos-Shaw – Adventus Remediation

Appendix A – Photograph of test jars on day 7

MWC022-SS110

MWB020-SS100

MWB020-SS080

MWC007-SS082

Appendix B – Initial VOC Characterization

Parameter	MWC022-SS110	MWB020-SS100	MWB020-SS080	MWC007-SS082	Units	DL
Chloromethane	<0.010	<0.010	<0.010	<0.010	µg/g	0.010
Vinyl Chloride	<0.003	<0.003	<0.003	<0.003	µg/g	0.003
Bromomethane	<0.009	<0.009	<0.009	<0.009	µg/g	0.009
Chloroethane	<0.010	<0.010	<0.010	<0.010	µg/g	0.010
Trichlorofluoromethane	<0.003	<0.003	<0.003	<0.003	µg/g	0.003
Acetone	**0.26**	<0.074	**0.31**	**0.28**	µg/g	0.074
1,1-Dichloroethylene	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
Methylene Chloride	<0.007	<0.007	<0.007	<0.007	µg/g	0.007
TRANS-1,2-Dichloroethylene	<0.005	<0.005	<0.005	<0.005	µg/g	0.005
Methyl tert-butyl Ether	<0.005	<0.005	<0.005	<0.005	µg/g	0.005
1,1-Dichloroethane	<0.006	<0.006	<0.006	<0.006	µg/g	0.006
Methyl Ethyl Ketone	<0.044	<0.044	<0.044	<0.044	µg/g	0.044
CIS 1,2-Dichloroethylene	<0.006	<0.006	<0.006	<0.006	µg/g	0.006
Chloroform	<0.009	<0.009	<0.009	<0.009	µg/g	0.009
1,2- Dichloroethane	<0.003	<0.003	<0.003	<0.003	µg/g	0.003
1,1,1-Trichloroethane	<0.003	<0.003	<0.003	<0.003	µg/g	0.003
Carbon Tetrachloride	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Benzene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
1,2-Dichloropropane	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Trichloroethylene	<0.005	<0.005	<0.005	<0.005	µg/g	0.005
Bromodichloromethane	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
CIS-1,3-Dichloropropene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Methyl Isobutyl Ketone	<0.018	<0.018	<0.018	<0.018	µg/g	0.018
TRANS-1,3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.005	µg/g	0.005
Toluene	<0.002	<0.002	**0.013**	<0.002	µg/g	0.002
2-Hexanone	<0.021	<0.021	<0.021	<0.021	µg/g	0.021
Dibromochloromethane	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Ethylene Dibromide	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Tetrachloroethylene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
1,1,1,2-Tetrachloroethane	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Chlorobenzene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Ethylbenzene	<0.003	<0.003	<0.003	<0.003	µg/g	0.003
m & p-Xylene	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
Bromoform	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Styrene	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
1,1,2,2- Tetrachloroethane	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
o-Xylene	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
1,3-Dichlorobenzene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
1,4-Dichlorobenzene	<0.005	<0.005	<0.005	<0.005	µg/g	0.005
1,2-Dichlorobenzene	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
1,2,4-Trichlorobenzene	<0.007	<0.007	<0.007	<0.007	µg/g	0.007
1,3-Dichloropropene (Cis + Tran	<0.004	<0.004	<0.004	<0.004	µg/g	0.004
Xylenes (Total)	<0.002	<0.002	<0.002	<0.002	µg/g	0.002
Total VOCs	**0.26**	**0**	**0.323**	**0.28**	**µg/g**	

Appendix C: TOC, COD, pH, ICP Metals Results for MWC022-SS110

Parameter	Control (Jar 1)	Least Purple Jar (Jar 2)	Units
TOC	1,300	930	µg/g
COD	689	206	mg/kg
pH	9.14	9.24	pH units
ICP Metals			
Aluminum	3,000	2,600	µg/g
Antimony	ND (<1)	ND (<1)	µg/g
Arsenic	1	2	µg/g
Barium	20	19	µg/g
Beryllium	ND (<0.5)	ND (<0.5)	µg/g
Cadmium	ND (<0.5)	ND (<0.5)	µg/g
Calcium	10,000	21,000	µg/g
Chromium	8	7	µg/g
Cobalt	3	2	µg/g
Copper	4	4	µg/g
Iron	6,100	5,800	µg/g
Lead	ND (<5)	ND (<5)	µg/g
Magnesium	1,700	1,500	µg/g
Manganese	90	140	µg/g
Molybdenum	ND (<2)	ND (<2)	µg/g
Nickel	5	ND (<5)	µg/g
Phosphorus	690	760	µg/g
Potassium	880	790	µg/g
Selenium	ND (<1)	ND (<1)	µg/g
Silver	ND (<1)	ND (<1)	µg/g
Sodium	150	170	µg/g
Strontium	41	44	µg/g
Sulfur	ND (<50)	ND (<50)	µg/g
Thallium	ND (<1)	ND (<1)	µg/g
Tin	ND (<20)	ND (<20)	µg/g
Titanium	290	250	µg/g
Vanadium	11	11	µg/g
Zinc	14	13	µg/g

Appendix D: TOC, COD, pH, ICP Metals Results for MWB020-SS100

Parameter	Control (Jar 1)	Least Purple Jar (Jar 2)	Units
TOC	580	940	µg/g
COD	993	ND (<60)	mg/kg
pH	9.14	9.2	pH units
ICP Metals			
Aluminum	4,400	2,700	µg/g
Antimony	ND (<1)	ND (<1)	µg/g
Arsenic	ND (<1)	ND (<1)	µg/g
Barium	28	15	µg/g
Beryllium	ND (<0.5)	ND (<0.5)	µg/g
Cadmium	ND (<0.5)	ND (<0.5)	µg/g
Calcium	9,900	11,000	µg/g
Chromium	8	5	µg/g
Cobalt	4	3	µg/g
Copper	7	4	µg/g
Iron	9,800	5,100	µg/g
Lead	ND (<5)	ND (<5)	µg/g
Magnesium	2,700	1,500	µg/g
Manganese	120	110	µg/g
Molybdenum	ND (<2)	ND (<2)	µg/g
Nickel	6	ND (<5)	µg/g
Phosphorus	580	220	µg/g
Potassium	1,300	630	µg/g
Selenium	ND (<1)	ND (<1)	µg/g
Silver	ND (<1)	ND (<1)	µg/g
Sodium	140	140	µg/g
Strontium	30	29	µg/g
Sulfur	ND (<50)	54	µg/g
Thallium	ND (<1)	ND (<1)	µg/g
Tin	ND (<20)	ND (<20)	µg/g
Titanium	470	200	µg/g
Vanadium	16	7	µg/g
Zinc	21	12	µg/g

Appendix E: TOC, COD, pH, ICP Metals Results for MWB020-SS080

Parameter	Control (Jar 1)	Least Purple Jar (Jar 2)	Units
TOC	1,300	1,600	µg/g
COD	262	521	mg/kg
pH	8.34	8.4	pH units
ICP Metals			
Aluminum	5,300	5,400	µg/g
Antimony	ND (<1)	ND (<1)	µg/g
Arsenic	4	3	µg/g
Barium	42	41	µg/g
Beryllium	ND (<0.05)	ND (<0.05)	µg/g
Cadmium	ND (<0.05)	ND (<0.05)	µg/g
Calcium	2,200	2,500	µg/g
Chromium	10	12	µg/g
Cobalt	5	5	µg/g
Copper	8	9	µg/g
Iron	12,000	13,000	µg/g
Lead	ND (<5)	ND (<5)	µg/g
Magnesium	3,400	3,400	µg/g
Manganese	150	190	µg/g
Molybdenum	ND (<2)	ND (<2)	µg/g
Nickel	8	8	µg/g
Phosphorus	420	490	µg/g
Potassium	1,600	1,700	µg/g
Selenium	ND (<1)	ND (<1)	µg/g
Silver	ND (<1)	ND (<1)	µg/g
Sodium	ND (<100)	100	µg/g
Strontium	14	14	µg/g
Sulfur	ND (<50)	ND (<50)	µg/g
Thallium	ND (<1)	ND (<1)	µg/g
Tin	ND (<20)	ND (<20)	µg/g
Titanium	580	600	µg/g
Vanadium	19	21	µg/g
Zinc	25	26	µg/g

Appendix F: TOC, COD, pH, ICP Metals Results for MWC007-SS082

Parameter	Control (Jar 1)	Least Purple Jar (Jar 2)	Units
TOC	ND (<500)	ND (<500)	µg/g
COD	723	376	mg/kg
pH	8.58	8.75	pH units
ICP Metals			
Aluminum	2,800	3,400	µg/g
Antimony	ND (<1)	ND (<1)	µg/g
Arsenic	ND (<1)	ND (<1)	µg/g
Barium	20	26	µg/g
Beryllium	ND (<0.5)	ND (<0.5)	µg/g
Cadmium	ND (<0.5)	ND (<0.5)	µg/g
Calcium	1,600	2,600	µg/g
Chromium	7	9	µg/g
Cobalt	2	3	µg/g
Copper	7	9	µg/g
Iron	5,400	7,400	µg/g
Lead	ND (<5)	ND (<5)	µg/g
Magnesium	1,300	1,600	µg/g
Manganese	57	110	µg/g
Molybdenum	ND (<2)	ND (<2)	µg/g
Nickel	ND (<5)	ND (<5)	µg/g
Phosphorus	410	700	µg/g
Potassium	750	880	µg/g
Selenium	ND (<1)	ND (<1)	µg/g
Silver	ND (<1)	ND (<1)	µg/g
Sodium	ND (<100)	ND (<100)	µg/g
Strontium	9	12	µg/g
Sulfur	ND (<50)	ND (<50)	µg/g
Thallium	ND (<1)	ND (<1)	µg/g
Tin	ND (<20)	ND (<20)	µg/g
Titanium	230	310	µg/g
Vanadium	9	13	µg/g
Zinc	23	28	µg/g