APPENDIX B

MT2 TREATABILITY REPORT

Treatability Study Report

Known Distance Range – Target Berm

Camp Dawson, West Virginia

Prepared for

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1.0 OBJECTIVE

The objective of this report is to present findings of a laboratory treatability study conducted on samples from the Known Distance Range on the Target Range at Camp Dawson. This study is designed to determine TCLP leachable lead (Pb) concentration; screening analysis for recovery of lead fragments for potential recycling; determine the amount of ECOBOND® required to treat the samples to below 5.0 mg/l for lead; and analyze samples for soil type classification, grain size distribution, pH, and moisture content. The study was conducted on 4 site samples: 3 from the most heavily-contaminated portion of the range; and 1 sample considered average for total lead.

2.0 SAMPLE DESCRIPTION and GEOTECHNICAL PARAMETERS

Four samples of Pb contaminated material were delivered to MT2 Sample Receiving. The samples were received in 1-gallon bags. Samples used for the treatability study are presented in Table 1.

Table 1 Sample Description and Characterization

Sample #	Natural Moisture Content	Gravel %	Sand %	Percent Passing No. 200 Sieve	Atterberg Limits - Liquid Limit %	Atterberg Limits – Plasticity Index %	pH	Soil Type
#4	23.0%	1	12	87	44	16	4.26	Silt (ML)
#12	13.6%	26	23	51	41	13	3.91	Gravelly Silt w/Sand (ML)
#23	16.0%	27	37	36	33	4	5.18	Silty Sand w/Gravel (SM)
#26	15.0%	7	17	76	39	9	5.12	Silt w/Sand (ML)

Please see attached Kumar and Associates Geotechnical Report

3.0 SCREENING RESULTS FOR POTENTIAL LEAD RECYCLING

MT2 screened the 4 samples to simulate screening in the field to determine if lead could be recovered for potential recycling. Table 2 records these results.

Table 2 Screening Results for Potential Lead Recovery

Sample #	Weight of rock/gravel > ¾"	% >3/4"	Weight Gravel/pebbles >1/4	% >1/4"	Weight of lead fragments	% of lead fragments	Weight of soil <1/4"	% <1/4"	Total weight of sample
#4	2.625 lbs	51.2%	1.375 lbs	26.8%	0 lbs	0%	1.125 lbs	22.0%	5.125 lbs
#12	1.3125 lbs	15.8%	3.0 lbs	36.1%	0 lbs	0%	4.0 lbs	48.1%	8.3125 lbs
#23	1.625 lbs	19.3%	1.1875 lbs	14.1%	0.125 lbs	1.5%	5.5 lbs	65.1%	8.4375 lbs
#26	0.25 lbs	4.1%	2.3125 lbs	37.8%	.0625 lbs	1.0%	3.5 lbs	57.1%	6.125 lbs

MT2 conducted screening analysis as part of the MT2 treatability report to determine the amount of lead bullet fragments in soils. The analysis procedure performed was to hand screen soils through a ¾" screen to collect any large rock or debris and then screen soils through a ¼" screen to collect lead fragments. The soils and small gravel pass through the ¼" screen. From this hand screening procedure, Samples 4 and 12 contained no lead fragments; Sample 23 contained 1.5% by weight of lead fragments and Sample 26 contained 1.0% by weight of lead fragments.

MT2 has found that screening of lead is cost-effective when there is at least 10% by weight of lead fragments. With two of the samples containing no lead and two of the samples containing a small percentage of lead, MT2 recommends no screening because it would not be cost-effective. This low amount of lead would not affect ECOBOND® treatment. In fact, Sample 26 contained 1.5% by weight of lead, but this only leached 1.0 mg/l of TCLP Pb, which is below the RCRA standard for TCLP Pb.

An additional consideration is that soils are going to an active range where new bullet fragments would be quickly re-introduced to this soil. This information is provided for evaluation and is based on MT2 experience and cost considerations.

4.0 PRE-TREATMENT ANALYSIS

The samples were tested for hazardous Pb using EPA SW-846 Method No. 1311 Toxicity Characteristic Leaching Procedure (TCLP). The TCLP extraction fluids were filtered and analyzed by inductively coupled plasma-atomic emission spectrometry (ICP-AES). The results of the subsequent analysis are presented in Table 3.

Table 3 Pre-Treatment Total and TCLP Pb Results

Sample #	Total Pb via XRF (mg/Kg)	TCLP Pb (mg/l)
#4	3,768	16
#12	3,418	47
#23	2,940	5.4
#26	713	1.0

5.0 ECOBOND TREATMENT STUDIES

ECOBOND® Pb formula was applied and mixed with sample material. For each sample, MT2 added 1% and 2% by weight of ECOBOND® to each sample. For example, if the sample weighed 125 grams, MT2 added 1.25 grams of ECOBOND® Pb for the 1% by weight treatment of ECOBOND® Pb and added 2.50 grams of ECOBOND® Pb for the 2% by weight treatment. After weighing measurements and complete mixing with treatment material, the sample and treatment material were allowed to cure and stabilize. A sub-sample was taken and extracted for Pb implementing EPA's SW-846 Method No. 1311 TCLP. The TCLP extraction fluid was filtered and analyzed by ICP. The results of the ECOBOND® Pb treatment test are presented in Table 4.

Table 4 ECOBOND® Pb TCLP Treatment Data

Sample Number	ECOBOND Pb (% by weight applied)	TCLP Pb (mg/l)
#4	1%	2.3
#4	2%	0.73
#12	1%	1.9
#12	2%	0.72
#23	1%	0.66
#23	2%	0.71
#26	1%	0.71
#26	2%	0.12

The independent laboratory report from Environmental Science Corporation (ESC) is included as an attachment.

For sample #23, the 1% by weight addition of ECOBOND® Pb effectively lowered the TCLP lead to 0.66. The addition of 2% by weight addition of ECOBOND® Pb did not further treat the sample to below 0.66. This is because the 1% of ECOBOND® is effectively chemically binding the available lead.

6.0 CONCLUSIONS

The addition of ECOBOND® Pb significantly lowered TCLP Pb in samples to below RCRA standards of less than 5.0 mg/kg TCLP Pb.

7.0 RECOMMENDATION

MT2 recommends the addition of a minimum 1 % by weight of ECOBOND® Pb to soil to effectively lower TCLP Pb to below 5.0 mg/l.