

**CLEAN WATER/CLEAN AIR BOND ACT
ENVIRONMENTAL RESTORATION PROJECT**

**PILOT SCALE TREATABILITY
WORK PLAN**

for the

MATT PETROLEUM SITE

Leland Avenue

City of Utica, Oneida County, New York

DEC Site No. B00192-6

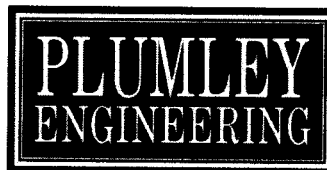
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1.0 INTRODUCTION

This pilot test work plan presents a scope to define field scale factors governing soil excavation and ex-situ soil treatment bioremediation at the former Matt Petroleum Site in Utica, New York. A bench scale study determined that bioremediation for this soil is feasible under controlled laboratory conditions (i.e. constant temperature, continuous aeration, optimum soil moisture, uniform nutrient loading). This pilot scale study will implement the bench scale treatability study findings at full-scale site conditions. The goal of this study is to assess the field variables that control the ability to meet standards, criteria and guidance values (SCGs), the length of time required for soil treatment, and treatment variables for large volumes of soil.

2.0 BACKGROUND

The complex soil and groundwater contamination patterns measured across the Matt Petroleum Site are consistent with a theory of multiple releases over a period of six decades. These releases include young light fraction non-aqueous phase liquid (LNAPL) releases, typified by the presence of Benzene-Toluene-Ethylbenzene-Xylene (BTEX) and Methyl-Tertiary-Butyl Ether (MTBE) plumes; long chain aliphatic hydrocarbons typical of old degraded petroleum, typified by the numerous tentatively identified compounds (TICs) and elevated concentrations of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene in soil and groundwater samples across the site; and heavier petroleum residuals, typified by petroleum aromatic hydrocarbons (PAHs), as shown in the semi-volatile organic compounds (SVOCs) found at the site. However, it should be noted that the PAHs, especially the four and higher ring PAHs, are not present in significant quantities at this site. This profile is likely to have resulted from releases at concurrent and/or different times of all or nearly all of the petroleum products handled at the site during its long history as a bulk petroleum terminal.

In the winter of 2006, a bench scale test was performed to assess the ability of site soils to meet SCGs. The bench test results are summarized below.

- Bench testing was performed to determine if site soils responded to either biodegradation or chemical oxidation.
- Bench study results indicated site soils can be either bio-remediated or chemically oxidized.
- Bio-remediation is approximately half the cost of chemical oxidation.
- Pilot testing is designed to confirm the best approach for soil cell treatment.

The overall site remedy will likely include the following techniques:

- Excavation and landfill disposal of grossly impacted soils and clean fill replacement;
- Groundwater skimming and treatment in the open excavation; and
- Ex-situ Area of Concern (AOC) soil treatment employing aeration, biodegradation and soil mixing with Allu bucket processing.

3.0 PILOT SCALE WORK SCOPE

The bench scale test verified that petroleum hydrocarbon degrading bacteria are present in site soils and estimated that up to twelve months of active bioremediation might be required to meet the SCGs. This is without any Allu bucket soil processing. Final remedial design will be based on results of both the bench and pilot study results. Currently, preliminary remedial design includes landfill disposal for most of the zone of gross contamination (ZGC) and Allu bucket processing (potentially plus bio-treatment) of the AOC soils over several summer seasons.

Scale-up of study results to full scale remedial design will be based on both the bench and pilot scale treatment studies. Ultimately, it is believed the site remedy lies within an approach that utilizes

multiple treatment technologies. At present, the options are Allu bucket alone, Allu bucket plus bio-treatment and soil disposal (either for recalcitrant soils or soils so heavily impacted when excavated they are designated for direct disposal). It is anticipated that soil treated in this pilot study will be stockpiled onsite and be available for immediate backfill in the ZGC when soils are excavated.

This study includes soils screening with a photoionization detection (PID) meter and both visual and olfactory observations of soil conditions along with analytical soil testing for STARS¹ SVOCs plus 20 TICs by EPA Method 8270, heterotrophic plate counts, and STARS volatile organic compounds (VOCs) plus 10 TICs by EPA Method 8260 for soil at the test conclusion. It is noted that VOC analyses are required to demonstrate SCG compliance if soils are to be available for backfill into the ground.

This pilot study is designed to reduce uncertainty for the full remediation design to reduce overall cost. Ex-situ soil mixing is a critical element of the proposed remedial alternative based on the soil grain size and soil heterogeneity observed across the site. The soil mixing technology identified is an Allu bucket to mix and aerate soils above ground. The Allu is a large clamshell bucket with a spiked roller in the center to aerate and homogenize the soil.

3.1 OBJECTIVES

Specific objectives of the pilot study are to:

- Determine the timing (amount of soil turning) and whether for Allu bucket processing alone will meet SCGs.
- Test whether added bacteria can shorten treatment time or provide added treatment where Allu alone falls short of the SCGs.

¹New York State Department of Environmental Conservation (DEC) Spill Technology and Remediation Series (STARS) Memo #1 – *Petroleum-Contaminated Soil Guidance Policy*, dated August 1992.

- Determine if soil covering is necessary to promote biological degradation (adds heat, retains moisture).
- Assess atmospheric particulate generation from the Allu handling and uncovered soil piles.
- Field test the effects of nutrient additions to soil microbe population density.
- Visually assess the scope of oil skimming and groundwater treatment necessary for the full scale remedial design.
- Nutrient (N-P-K) and food (dextrose) loading rate and frequency, soil moisture and temperature maintenance, and biological response to these factors.
- Assess the oxygen levels sustained in the soils from the Allu processing.
- Soil pile configuration, cell sizing and moisture control.
- Evaluate odor issues and vapor monitoring.
- Gather data sufficient to scale the pilot operation to full scale treatment.

In addition, this action is intended to generate treated soil meeting the SCGs that will be stockpiled for immediate backfill for the full-scale remediation.

3.2 EVALUATION AND SELECTION OF SOIL CONTRACTOR

Two upstate New York contractors own and operate equipment proven effective in treating ex-situ soil to provide aeration levels shown effective at successfully remediating petroleum affected soils. This equipment is an Allu bucket attached to a standard excavator. After

excavation and drainage of groundwater, if needed, soil screening and crushing is done with an accessory attachment to remove boulders, wood chunks and bricks while crushing small stones, brick and soil chunks. The soil is then placed into working cells that can be aerated through the Allu bucket processing. Quotes have been obtained from both contractors to provide services to excavate, screen and process soil with an Allu bucket for up to 42 calendar days (30 working days, Monday through Friday).

3.3 PILOT STUDY DESIGN

The pilot study will be implemented under the following design limitations. Refer to *Figure 1 – Pilot Study Schematic* for the design parameters for the six soil piles and *Figure 2 – Excavation Locations* for the locations of the proposed soil excavation and treatment areas.

- A volume of excavated soil selected according to a daily Allu processing rate of 1,000 to 1,300 cubic yards (1,500 to 2,000 tons) per day. This rate applies to post soil screening, which decreases soil density to approximately 1.5 tons per cubic yard.
- The bench treatability study recommendation to sustain biological activity was to turn the soil three times weekly to maintain adequate soil oxygen levels for microbial respiration. Contractor quotes were requested to identify the excavated soil volume that could be turned a minimum of three times weekly. Based on those quotes, a maximum of 4,000 tons of soil is to be excavated. Applying a density of 1.785 tons per cubic yard (compacted soil) equates to an excavation volume of 2,240 cubic yards. Therefore, a volume of 1,000 cubic yards will be excavated from the ZGC and 1,000 cubic yards from the AOC.
- A suitably sized area for staging and turning soil will be prepared by scraping off near surface soils (estimated at 6 to 24 inches) from an area large enough to contain two times the soil volume to a height 12 feet plus a suitable separation distance.

- Two thousand cubic yards of site soils will be excavated from the AOC and ZGC to test the degree of treatment attained from biological and soil turning processes. Figure 2 indicates 1,000 cubic yards will be excavated from the AOC at a location near SB-75 (downgradient of the former AST-6) and 1,000 cubic yards of grossly contaminated soils will be excavated from the ZGC in the vicinity of SB-19 (centered approximately 100 south of the loading dock).
- Excavated soil will be allowed to drain, then will be screened to remove boulders and break up soil chunks. This soil will then be placed in four similarly sized soil piles: two piles of AOC soil and two piles of ZGC soil.
- One AOC and one ZGC soil pile will receive water, nutrients and be covered with black poly sheeting when not being actively processed with the Allu bucket.
- A small soil volume from each location may be taken to perform bucket studies of enhanced bio-remediation that receive the water, nutrients and, also the addition of commercially available microbes to assess soil response under field conditions.
- Pre, mid (as warranted by visual, olfactory and PID screening) and post-processing soil samples for SVOCs, total heterotrophic plate counts and total PAHs will be collected, as detailed in Section 3.5.

3.4 SOIL TREATMENT LOCATION

It is proposed to stage and treat soils adjacent to their point of excavation. These soils will be staged directly on the ground surface after unimpacted surface soils (if any) have been scraped and stockpiled. Refer to Figure 2.

3.5 SOIL SAMPLING AND HANDLING PROCEDURES

Soil samples will be collected at the pilot test beginning, during and at the test conclusion to document treatment time required and effectiveness of the treatment processes tested. Samples will be collected and analyzed for SVOCs, heterotrophic plate count (from bio-cells only), and, at the study conclusion, for VOCs from all cells. The DEC SCGs contain cleanup goals for specific petroleum compounds, the sum of VOCs and SVOCs included in the laboratory analyses (indicated as STARS + 10/20 TICs) and odor. A heterotrophic plate count is a measure of the density of bacteria in the soil. The bench scale test demonstrated that site soils contain between 10^2 to 10^4 colonies per gram of soil. However, effective bioremediation occurs at bacteria densities of 10^5 to 10^6 and higher. Therefore, heterotrophic plate counts will be performed to measure the bacteria density in the two covered soil piles to indicate if bioremediation plays a significant role in reducing petroleum contamination during the pilot test and also to demonstrate if an increase in bacteria density occurs during the pilot test. Increasing plate counts toward the end of the pilot test may be reason to allow longer treatment time in the full-scale remediation to benefit from the reduced contaminant concentrations that bio-degradation can provide, if needed to meet SCGs.

Plumley Engineering personnel shall provide oversight and collect field samples in accordance with the field collection procedures outlined below.

- Initial soil samples shall be collected from each soil cell at the test beginning. Sampling will include two grab and three composite samples for analysis of SVOCs + 20 TICs by EPA Method 8270. In addition, five composite soil samples will be collected for analysis of the heterotrophic plate counts from each of the two covered soil piles.
- After the first two-week interval, SVOC soil sample collection will be based on field indicators of VOC/SVOC/odor reduction. SVOC soil samples will be collected from each of the four soil piles if field indicators of staining, odor and PID meter

screening indicate a significant drop in VOCs/SVOCs has occurred. If these criteria are **not** met two weeks into the pilot study, no samples will be collected at that time. However, sampling will subsequently be performed at two-week intervals thereafter, regardless of field indicators. This will generate analytical data to assess progress of the pilot study and for use in the full-scale remedial design. Soil sampling will include the collection of two grab and three composite samples for analysis of SVOCs by EPA Method 8270. In addition, five composite soil samples will be collected for analysis of the heterotrophic plate counts **at two week intervals** from each of the two covered soil piles throughout the pilot study. These samples will track biological population growth, as these piles will be managed to encourage biological growth.

- At the test conclusion, the following soil samples shall be collected from each of the four soil piles and submitted to the laboratory for analysis: two grab and five composite samples for analysis of STARS + 20 TICs SVOCs by EPA Method 8270; five grab and two composite samples for analysis of STARS + 10 TICs VOCs by EPA Method 8260; and five composite soil samples for analysis of the heterotrophic plate counts. The number of SVOC/VOC soil samples is in general accordance with DEC STARS Memo #1. This sampling will be performed to document whether the soils meet the SCGs and can be placed back into the ground.
- Clean protective gloves must be worn at all times during the collection of soil samples. No touching of the internal containers or cap shall occur. Soil samples may be analyzed for microbial content and the potential for the introduction of foreign biological material into the sample container by the sampler must be minimized during sampling.
- Each sample shall be collected in duplicate and the jars labeled with a sample number, date and time of collection, site name and the initials of the collector. The number and type of sampling jars, as well as any preservative, will be as indicated by the laboratory.

- All filled sample containers shall be placed into a thermally insulated container with a heat sink (typically ice) after sample collection.
- A field log, including the sample identification number, time of collection, PID readings and any additional information deemed relevant to sample collection, shall be recorded by the sample collector.
- All samples will be shipped priority overnight to the laboratory with chain of custody documentation.

4.0 COST

The cost to implement this pilot study is approximately \$40 per ton of soil treated, or \$160,000.

5.0 REPORTING OF PILOT SCALE TEST RESULTS

5.1 SUMMARY OF BENCH SCALE RESULTS

A summary of the pilot scale test results will be included in the Remedial Alternatives Report. These results will be used in the remedial design phase and will provide information to specify costs including equipment, supplies, manpower and timing to complete the final site remediation.

ATTACHMENTS

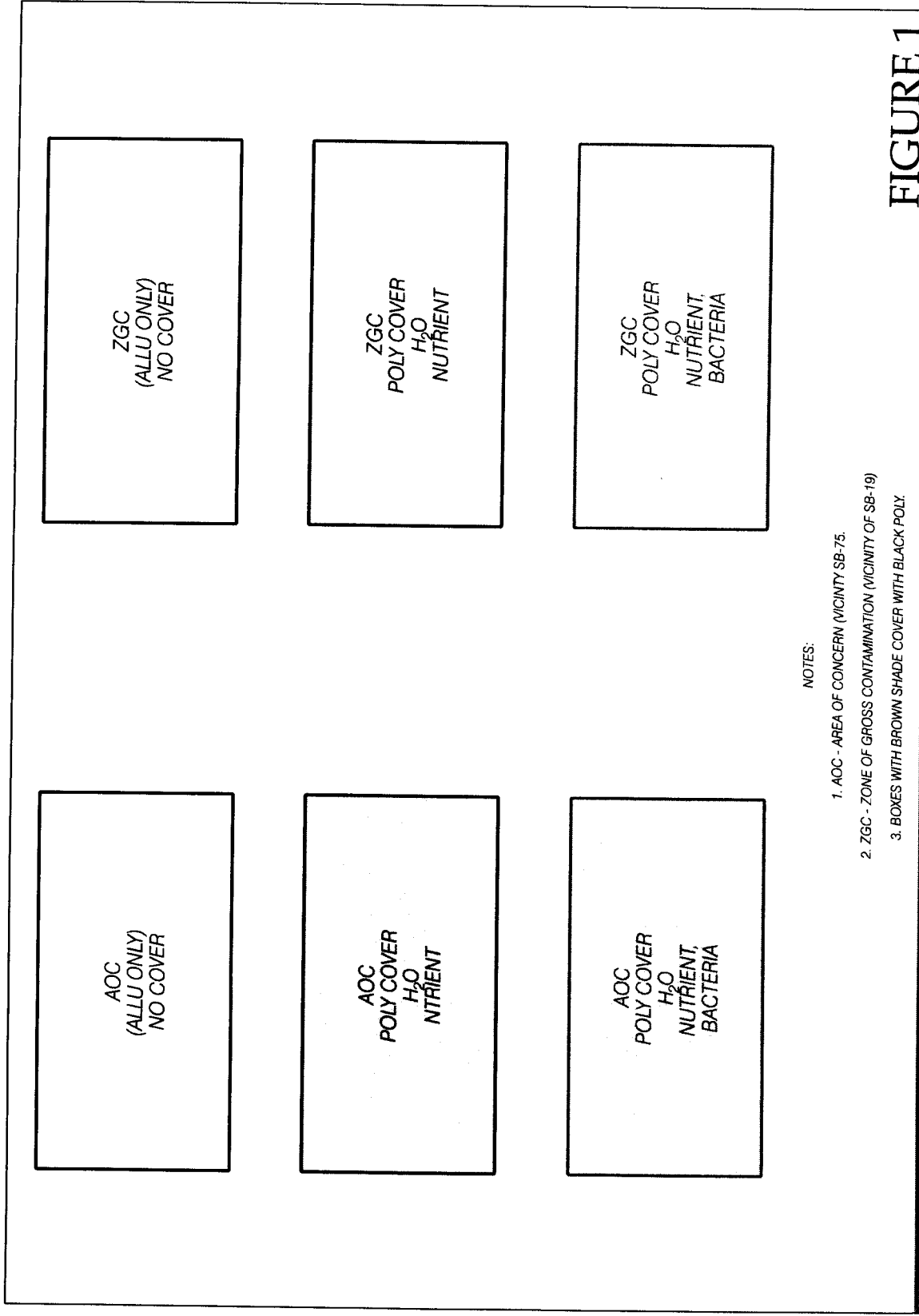


FIGURE 1

NOTES:

1. AOC - AREA OF CONCERN VICINITY SB-75.
2. ZGC - ZONE OF GROSS CONTAMINATION (VICINITY OF SB-19)
3. BOXES WITH BROWN SHADE COVER WITH BLACK POLY.

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		SCALE: NTS DATE: JUN. 2006 ENG'D BY: WJS DRAWN BY: JMD CHECKED BY: PAK © Plumley Engineering, P.C. 2006	
DESC: PILOT STUDY SCHEMATIC PROJ.: MATT PETROLEUM SITE CLIENT: CITY OF UTICA LOTN: CITY OF UTICA, ONEIDA COUNTY, NEW YORK		REVISIONS: A. _____ DATE: _____ BY: _____ NOTE: NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7208 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.	

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CHECKED BY: JAD

DATE: JUN 2005

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PROJECT NO.: 2003118

FILE NAME: 2003118

PROJECT: CITY OF UTICA, ONEIDA COUNTY, NEW YORK

CITY OF UTICA

CLIENT: CITY OF UTICA

DWG. TITLE: PILOT STUDY EXCAVATION LOCATION

PROJECT: MATT PETROLEUM SITE

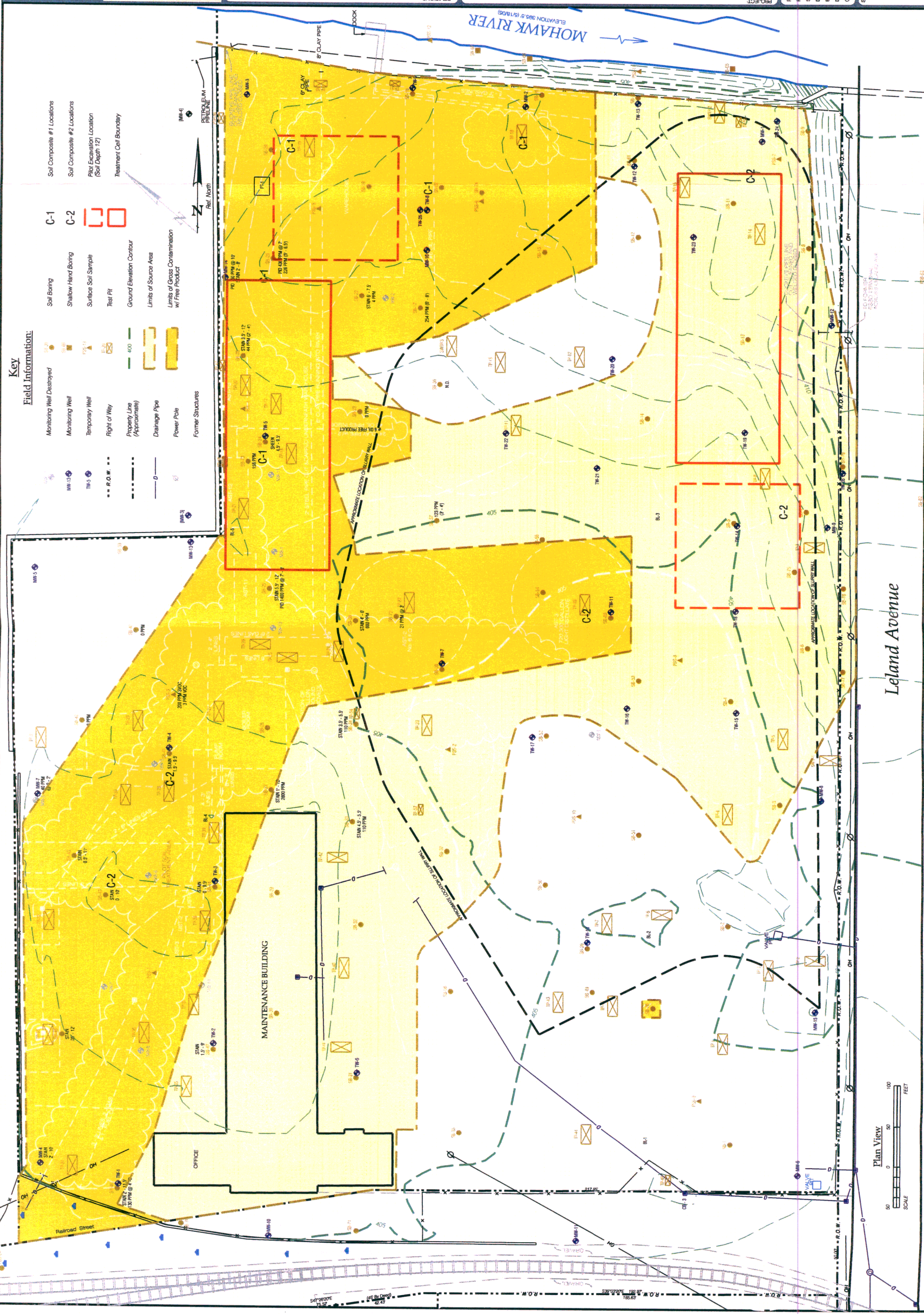
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NO.	DATE	BY



ENVIRONMENTAL RESTORATION PROJECT
MATT PETROLEUM SITE
DEC Site No. B00192-6
Leland Avenue
City of Utica, Oneida County, New York

PROJECT BUDGET
Revised June 30, 2006

Task	Subtotal	Task Totals	DEC Share (%)	City Cost	DEC Reimbursement
Work Plan	\$ 31,498				
SI/RIR Work Plan	\$ 3,869				
Force Account Work Plan		\$ 35,367	90%	\$ 3,536.69	\$ 31,830
Subtotal - Work Plan					
Site Investigation (Work Complete)	\$ 151,480		90%	\$ 15,147.95	\$ 136,332
Professional Engineering	\$ 8,362		90%	\$ 836.21	\$ 7,526
Engineering Expenses	\$ 61,950		90%	\$ 6,195.00	\$ 55,755
Contracted Services		\$ 221,792		\$ 22,179.16	\$ 199,612.47
Subtotal - Site Investigation (Completed as of September 1, 2005)					
Out of Work Plan Scope - Supplemental Investigation	\$ -		90%	\$ -	\$ -
Force Account Work by City of Utica	\$ 63,372		90%	\$ 6,337.23	\$ 57,035
Professional Engineering	\$ 2,088		90%	\$ 208.78	\$ 1,879
Engineering Expenses	\$ 18,790		90%	\$ 1,878.98	\$ 16,911
Contracted Services		\$ 84,250		\$ 8,425	\$ 75,825
Subtotal - Supplemental Investigation					
Treatability Study (microbial; chem-ox)	\$ 14,800		90%	\$ 1,480.00	\$ 13,320
Professional Engineering	\$ 200		90%	\$ 20.00	\$ 180
Engineering Expenses	\$ 55,000		90%	\$ 5,500.00	\$ 49,500
Contracted Services		\$ 70,000		\$ 7,000	\$ 63,000
Subtotal - Supplemental Investigation					
Pilot Study (Field Application Allu, Allu + Bio-Treatment)	\$ 50,000		90%	\$ 5,000.00	\$ 45,000
Professional Engineering	\$ 10,000		90%	\$ 1,000.00	\$ 9,000
Engineering Expenses	\$ 100,000		90%	\$ 10,000.00	\$ 90,000
Contracted Services		\$ 160,000		\$ 16,000	\$ 144,000
Subtotal - Supplemental Investigation					
Remedial Alternatives Evaluation and Report	\$ 36,000		90%	\$ 3,600.00	\$ 32,400
Professional Engineering	\$ 10,000		90%	\$ 1,000.00	\$ 9,000
PRAP / ROD Process		\$ 46,000		\$ 4,600	\$ 41,400
Subtotal - Remedial Alternatives Evaluation and Report					
Subtotal Plumley Engineering Project Budget					
Interim Remedial Measures (IRMs)	\$ 107,034		Varies	\$ 35,604.50	\$ 71,429.30
Force Account Work by City of Utica	\$ 233,395		90%	\$ 23,339.50	\$ 210,056
Contracted Services by City					
Subtotal - IRMs		\$ 340,429		\$ 58,944.00	\$ 281,485
TOTAL PROJECT BUDGET		\$ 957,837		\$ 120,685	\$ 837,152

Notes: Changes to February 2004 Work Plan Budget

1. Work Plan:
 - a. The budget for the SI/RAR and Force Account Work Plans reflect actual costs.
 - b. A line item was added for preparing the Force Account Work Plan as it was not in the original estimate.
2. Site Investigation:
 - a. The budget for Professional Engineering, Expenses, and Contracted Services reflect actual costs.
3. Out of Work Plan Scope - Supplemental Investigation:
 - a. Supplemental investigation includes work identified in letters from Plumley Engineering to Peter Ouderkirk dated September 10, 2004, February 28, 2005. December 6, 2005, June 30, 2006.
 - b. Costs for supplemental investigation reflect Actual costs for work completed.
4. Remedial Alternatives Evaluation and Report:
 - a. Estimated costs have been added as two line item tasks for Professional Engineering and the PRAP/ROD Process.
5. Interim Remedial Measures:
 - a. The Force Account Work has been adjusted to reflect actual costs.
 - b. Contracted Services have been adjusted to reflect actual costs.