

December 21, 2018



Mr. Chad Staniszewski  
Mr. Eugene Melnyk  
New York State Department of Environmental Conservation  
270 Michigan Avenue  
Buffalo, NY 14203  
**OU2 East Remedial Action Work Plan Addendum**  
**NYSDEC Site No. C915201B**

Dear Mr. Staniszewski & Mr. Melnyk:

On behalf of Elk Street Commerce Park, LLC (ESCP), Amec E&E PC (AMEC) has prepared this Addendum to the approved *Remedial Action Work Plan for Operable Unit 2 East (RAWP)*, dated May 7, 2018. The Addendum includes a work plan for a total characteristic leaching procedure (TCLP) testing of lead impacted soils and presents the revisions to language used in the approved RAWP.

## **Background**

The approved Remedial Action Work Plan (RAWP) presented a Track 2 remedy which consisted of in-situ stabilization of lead impacted soils and in-situ treatment of petroleum impacted soils. Subsequent to the approval of the RAWP, NYSDEC provided direction that TCLP for lead impacted stabilized soils would be required. AMEC proposes the following work plan to collect samples and conduct TCLP for lead.

## **TCLP Sample Collection and Testing Work Plan**

Samples from the areas stabilized will be collected at a frequency of 1 sample per 1000 cubic yards of stabilized materials. This sampling frequency is consistent with DER-10 procedures for sampling an imported fill to a site. Based on a total estimated volume of approximately 36,000 cubic yards of soil throughout the lead stabilization areas, approximately 36 samples will be collected for TCLP analyses. The attached drawing illustrates the proposed locations of 36 borings, which have been preselected to provide uniform distribution of sample locations over the lead stabilized areas. In addition, two replicate samples (one per 20 samples or portion thereof) will be collected and analyzed. A total of 38 samples are anticipated for analyses. Additionally, a second sample will be collected from each sampling location to be analyzed in the event of the detection of lead in the sample leachate at a concentration exceeding 5 milligrams per liter (mg/l).

Samples will be collected from each of the identified boring locations using a direct-push soil sampling rig. Samples will be collected in a direct push sampling tube with acetate liners and visually logged and photographed upon retrieval. Soil samples will be collected from two separate, six-inch intervals for submittal to the laboratory. The six-inch intervals will be randomly

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predetermined for each boring based on the depth to the base of soil treatment and exclusion of the upper one foot of treated soil from sampling. NYSDEC has requested that the upper-most portion of the treated soil not be sampled because the curing of the treated soil results in a calcic crust at ground surface, which may be atypical of treated soil. The samples will be collected from two intervals of the boring, which are between a depth not less than one foot below ground surface and not deeper than approximately one foot less than the total depth of treated soil. One sample will be designated as the "Primary Sample" for laboratory analysis and the other will be designated as the "Secondary Sample" for analysis in the event results of the Primary Sample require analysis of the Secondary Sample (described below). The samples will be culled of any debris and rock fragments exceeding one-inch in diameter, placed into the respective sample jars and prepared for delivery to the laboratory for analysis. The Chain of Custody will clearly indicate which samples are to be analyzed for TCLP lead (Primary Samples) and which are to be held (Secondary Samples) pending further instructions.

The depth of stabilized soil will be determined at each boring location based on the mixed depth of the remediation cell in which the boring is located. Mixing depths have been recorded for each treated cell at the site. Potential sampling horizons will consist of six inch intervals from 1.0 feet to a depth 1 foot less than the total depth of the mixed cell. Each sampling horizon will be identified by the depth to the upper surface of the sample and will include the next six inches below that depth. Two random depths will be determined using a random number generator to select a depth to the nearest half foot increment. The first depth selected will be the Primary Sample and the second depth selected will be the Secondary Sample. For example if a boring is located at a treated cell where the depth of treated soil is six feet, random depths between 1.0 and 5.0 will be selected. If the random depths selected are 2.5 and 5.0 feet, the Primary Sample will be collected from 2.5 to 3.0 feet and the Secondary Sample will be collected from 5.0 to 5.5 feet. Primary Samples of stabilized materials submitted to an analytical laboratory will be tested for leachable lead in conformance with SW846 Method 1311. Secondary Samples will be submitted to the laboratory to be held for analyses only in the event that analysis of lead in the leachate from the Primary Sample exceeds 5 milligrams per liter (mg/l).

Due to the heterogeneous nature of the stabilized lead-impacted soil, some samples may include individual particles that will disproportionately influence the results of the analyses. Those analytical results will therefore be non-representative of the treated material. If a sample is analyzed, and laboratory results indicate a concentration of lead in the leachate exceeding 5 mg/l, the sample will be subjected to a repeated analysis. The laboratory will be directed to obtain another aliquot from the same sample bottle and analyze the second aliquot for TCLP lead. In addition, the Secondary Sample from that boring will be analyzed for leachable lead in conformance with SW846 Method 1311.

The following resample logic will be followed based on the results of the reanalysis:

- If the resample result and the Secondary Sample result both meet criteria, then no further action is necessary in the respective mix area.
- If the resample result and the Secondary Sample result both do not meet criteria, then further action is necessary in the respective mix area.
- If either the resample result or Secondary Sample result do not meet the criteria, then further action is necessary in the respective mix area.

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At the conclusion of testing, a letter report will be presented to the DEC that will include the explanation of testing results, laboratory test result data, and a location plan showing the approximate location of samples collected. If sampling results indicate that additional actions are necessary, DEC will be informed of the actions prior to execution.

### **Amendment to Specification Section 31 23 24 Solidification**

Included in an appendix to the RAWP was the specification section 31 23 24 – Solidification. Quality control measures were documented in paragraph 3.02 of the specification. Under subparagraph E, the laboratory testing requirements were presented in a table. The table is presented below for reference.

**Requirements for Solidified Material**

<b>Test Name</b>	<b>Method</b>	<b>Sample Frequency</b>	<b>Required Result</b>
Unconfined Compressive Strength	ASTM D1633-00	1 per 500 CY; (minimum of 1 test per treatment cell)	Average of all samples shall be between 40 and 150 psi (at 28 days) (estimated to be 20 to 80 psi at 7 days), with no more than 10% of samples below 40 psi or above 150 psi (90 psi at 7 days). No samples shall be below 30 psi.

Table presents the requirement that no more than 10 percent of the unconfined compressive strength (UCS) test results are greater than 150 psi. The intent of the UCS testing is to ensure that a complete and thorough mixture of reagent and soil have been obtained through the mixing process. This thorough mixture is obtained if the lower bound 40 psi criteria is met. The upper bound of 150 psi does not indicate that the sample was not mixed properly. In fact, it shows a greater likelihood that a thorough mixture has been achieved. The upper bound was not intended to be criteria for proper mixture, rather it was selected to ease redevelopment activities. Further review of this criteria indicates that soil mixtures up to 800 psi are excavatable with mid-sized excavators that would typically be used during for the types of construction envisioned for the site. Therefore, we request to amend the RAWP specification such that the upper bound UCS is set at a not to exceed 800 psi as opposed to a 10 percent greater than 150 psi criteria.

The table above also presents provides the criteria for obtaining the lower bound 40 psi strength at 28 days. The rate of strength gain within a stabilized mixture is dependent on several factors including, water to cement ratio, organic content of soil and is also impacted by other contaminants present in the soil. The 28 days presented provided a base for testing but it is proven that soil-cement mixtures continue to gain strength beyond 28 days. Therefore, we request to amend the RAWP specification to remove the 28-day criteria.

During development of the RAWP it was assumed, as stated in paragraphs 3.5, that the treatment cell size was to 2,500 square feet. Within an approximate average depth of stabilization/treatment being approximately 5 feet across the site, each cell would have a volume

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of approximately 500 cubic yards. During the RA, it was determined that smaller cells with areal footprint of 300 square feet would be more manageable and could provide for more thorough and complete mixing. The quality control testing, as noted in the RAWP, indicated that UCS samples would be collected at frequency of one test per 500 cubic yards or a minimum frequency of one per test cell. The cells during implementation of the RA have an average volume of approximately 55 cubic yards per cell. Testing on a per cell basis, using the smaller cells, would increase the testing by nine times the initial amount based on the 2,500 square foot cell. We propose to amend the RAWP to indicate that UCS testing will be completed at frequency of at least one test per 500 cubic yards and remove the per cell criteria.

The attached revised specification includes the following revised table:

Requirements for Solidified Material			
Test Name	Method	Sample Frequency	Required Result
Unconfined Compressive Strength	ASTM D1633-00	1 per 500 CY	No more than 10% less than 40 psi with no test results less than 30 psi or greater than 800 psi.

Sincerely,  
**AMEC E&E, PC**



Richard Egan  
Associate Geotechnical Engineer



Sam Farnsworth  
Project Manager

Attachments

Figures  
Specification Section

cc: Paul Neureuter ESCP, LLC  
Pete Pederson ESCP, LLC  
Arnie Cubins, Krog

**FIGURE 1**  
**TCLP SAMPLING LOCATIONS**



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## SECTION 31 23 24

### SOLIDIFICATION

#### PART 1 – GENERAL

##### 1.01 SCOPE OF WORK

This section includes the minimum requirements for the in-situ stabilization/treatment (ISS) of petroleum impacted subsurface materials as shown on contract drawings.

The ISS work consists of furnishing all plant, labor, equipment, and materials and performing all operations as required to solidify/treat the subsurface materials as specified herein. The lateral and vertical extent (depth to clay contours) of solidification/treatment is shown on the contract drawings. Debris greater than six inches in diameter must be either reduced in size or removed prior to conducting ISS, consistent with the selected equipment's limitations and capability. The completed solidification project shall be a cured homogeneous mixture of amendment and the subsurface materials meeting performance requirements. The ISS work may be accomplished by mixing amendments and soil using pug mills or by in-situ dry or wet mixing methods.

##### 1.02 REFERENCE STANDARDS

The publications listed below, latest edition unless otherwise noted, form a part of this Technical Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

REFERENCE	TITLE OF DESCRIPTION
ACI 211	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
ASTM D1633	Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders (Unconfined Compressive Strength (UCS)).
ASTM C150	Standard Specification for Portland Cement.
ASTM C94	Standard Specification for Ready-Mixed Concrete.
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
API SPEC 13A	Specification for Drilling-Fluid Materials.

New York State Department of Transportation (NYSDOT) Standard Specifications

##### 1.03 SUBMITTALS

- A. Qualifications -The Solidification CONTRACTOR shall be knowledgeable and experienced in soil improvement using solidification techniques. This experience shall include, but not necessarily be limited to:
- 1) The use and control of the injection of grout;
  - 2) Methods required to properly mix the amendments (and additives, as required);
  - 3) Laying out the progression of treatment;

- 4) Knowledge of construction equipment and material; and
- 5) Field quality assurance/quality control testing described herein.

The CONTRACTOR shall control the mixing of the amendments, rate of treatment and the grout addition rate. The CONTRACTOR shall supervise and ensure that the solidification treatment has been properly mixed and interconnected.

The Contractor shall submit the name, qualifications and contact information for the third party geotechnical testing laboratory.

- B. Work Plan - The CONTRACTOR shall submit a preconstruction work plan for review by the ENGINEER at least 10 business days prior to the start of work under this section. The work plan shall include the following items:
1. Schedule: A schedule in sufficient detail to identify the major segments of the work. Starting and ending dates for all major work items shall be clearly identified.
  2. Solidification/Treatment Method: A detailed description of the methods of construction which shall include the method of advancing treatment, method of application of amendment (pug mill mixing or dry and/or wet mixing methods) grout mixing and monitoring, rate of advancement, and the minimum gallons [based on proposed cement to water ratio] of grout per treatment area or volume. An estimate of the swelled in-place volume shall be provided, based on the design mix.
  3. Equipment: A list of major equipment by type and capacity. This may include: excavator, grout mixer, batch plant, mixer heads, demo heads, storage silos and transport equipment.
  4. Drawings: The following drawings shall be provided by the CONTRACTOR:
    - a. Equipment Arrangement - the locations of all equipment including that required to mix raw materials;
    - b. Process and Instrumentation Diagram - A process and instrumentation diagram showing the flow of all raw materials and the size of all pumps and associated equipment required to conduct operations.
    - c. Material Treatment Plan - the approximate location of treatment units and their dimensions (and/or coordinates) should be provided along with the estimated rate of treatment.
  5. Material Certificates – The following material certificates shall be provided by the CONTRACTOR:
    - a. Cement: The CONTRACTOR shall submit the manufacturer's catalog certificate and specification prior to shipment of any cement, and certificate of compliance for each lot or shipment of cement upon arrival on site regarding compliance with ASTM C150 (Type I).
    - b. Bentonite: The CONTRACTOR shall submit the manufacturer's catalog certificate and specification prior to shipment of any bentonite, and certificate of compliance for each lot or shipment of bentonite upon arrival on site regarding conformance with API Spec 13A,



## Section 10.

- c. Grout: (if applicable) The CONTRACTOR shall supply testing results in accordance with ACI 211 verifying the proper water to cement ratio and unit weight.
  - d. Slag: (if applicable) The CONTRACTOR shall submit for certificates each lot or shipment of slag upon arrival at the site showing conformance with NYSDOT Specification 711-12. Slag material that are considered Technically Enhanced Naturally Occurring Radioactive Material (TENORM) are prohibited from the site.
  - e. Water: The CONTRACTOR shall submit a certificate that water used in ready mix grout supplied to the site meets the requirements of ASTM C1602. Indicate the source of the water.
  - f. Additives: Submit a manufacturer's catalog certificate and specification prior to shipment of any additives, and a certificate of conformance for each lot or shipment of additive upon arrival on site.
- C. Quality Control Plan -The QC Plan shall be submitted along with the Work Plan for review and approval by the Engineer.

The plan shall include a list of test methods and minimum standards the CONTRACTOR plans to implement to gauge the quality of the work during construction, including grout density (if applicable), depth measurements, densities of mixed materials, pocket penetrometer testing of mixed materials and UCS testing.

The plan shall address the physical properties and manufacturer's stated properties for all permanent materials including manufacturer's certifications of quality, mill certificates, gradation test data, etc.

The plan shall state when all quality control data will be submitted to the ENGINEER and the correction procedures to be employed in the case of substandard results.

The plan shall include a plan for corrective measures to be taken in the event performance requirements are not met in a specific area.

## PART 2 - PRODUCTS

### 2.01 MATERIALS REQUIREMENTS

Provided below are general guidelines for evaluating the quality of raw materials to be used in the process. The CONTRACTOR may propose alternative materials, material quality standards, and test methods for the raw materials, subject to approval by the Engineer.

- A. Cement - if used in preparing grout, shall conform to ASTM Designation C150, "Requirements for Portland Type I." The cement shall be adequately

protected from moisture and contamination while in transit. Cement shall be stored in supersacks or silos or temporarily in other appropriate bulk storage containers and protected from moisture. Reclaimed cement or cement containing lumps or deleterious matter shall not be used.

- B. Grout -The pumpable mixture of pozzolonic material and other approved additives added to the subsurface will be referred to as grout. The purpose of the grout is to solidify subsurface materials to render immobile any NAPL present in areas shown on contract drawings. In addition, when cured, the subsurface solidified matrix shall be capable of supporting backfill and the final cover material.
- C. Water - Fresh water, free of deleterious substances that adversely affect the properties of the grout, shall be used for ready mixed grout. Potential water sources shall be tested by the CONTRACTOR prior to beginning the construction to assure that the water is of suitable characteristics for grout preparation. Water shall meet ASTM C1602 standards.
- D. Slag – Ground Granulated Blast - Furnace Slag shall conform with New York State Department of Transportation (NYSDOT) Specification 711-12. Slag materials that are considered Technically Enhanced Naturally Occurring Radioactive Material (TENORM) are prohibited from the site.
- E. Additives (Optional) - Admixtures of softening agents, dispersants, retarders or plugging or bridging agents may be added to the water or the grout to permit efficient use of materials and proper workability of the grout. However, no additives shall be used prior to informing, and gaining approval from, the ENGINEER.
- F. Proprietary Chemicals (Optional) - Shall be approved by the ENGINEER based on initial bench scale testing results provided by the CONTRACTOR.

## 2.02 EQUIPMENT

- A. General -The CONTRACTOR shall furnish the equipment for construction of the facilities necessary to complete the ISS work. The CONTRACTOR'S equipment shall be of the type and capacity to complete the work in an efficient manner and shall be maintained in operable condition at all times.
- B. Equipment used to complete the ISS work may include, but is not limited to, excavators with bucket attachment and/or auger mixing heads, pug mills, grout mixing plants, Frac tanks or liquid holding tanks and transport equipment.
- C. Grout Mixing Plant - (Optional), the CONTRACTOR shall provide a grout mixing plant containing the necessary equipment for preparing the grout including a high-shear/high speed colloidal mixer capable of producing a stable grout mixture. If no grout mixing plant is to be provided, provide mix information on pre-mixed grout from facility, meeting the requirements of ASTM C-94.
- D. Quality Control Data - Submit all quality control data in accordance with the approved Quality Control Plan.

- E. Dry materials used in the grout mixing, if stored on site, shall be stored in silos prior to mixing and fed via a calibrated rotary valve [screw feeder] to the colloidal mixer(s) for agitation and circulation. If dry materials are delivered to the site in supersacks, the material shall be adequately protected from weather.
- F. If applicable, calibration of mixing components shall be done at the start of the project and at a minimum of weekly thereafter. The screw feeders or rotary valve shall be calibrated against time to deliver a predetermined weight. Water shall be controlled by flow meter and/or by the volume level indicators in the colloidal mixer. The specific gravity of the grout shall be determined during the design mix program for double checking grout proportions. Grout volumes from the mixing plant shall be monitored by a flow meter capable of measuring liquids containing high solids or other acceptable method.
- G. Solidification Equipment - Solidification equipment must be capable of delivering and mixing solidification reagents such that uniform dispersion of reagents occurs, producing a uniform product capable of producing the required strength.
- G. Environmental Control Equipment-Environmental control equipment may consist of the following: odor and emissions control foam, water sprays (misting), a dust hood on the bucket of the loader/excavator, and a perimeter odor masking system to regulate and reduce the amount of potentially noxious emissions while treating with solidification agents and curing.

## PART 3 - EXECUTION

### 3.01 EXECUTION OF WORK

- A. General -The solidification area shall be constructed within the boundary shown on contract drawings and in accordance with these specifications unless otherwise approved by the ENGINEER.
- B. Horizontal Alignment -The solidification treatment areas shall be carefully staked out prior to beginning construction. The advancement of solidification treatment shall be set according to surveyed reference points in accordance with the approved Work Plan.
- C. Vertical Alignment -The CONTRACTOR shall establish vertical survey control prior to beginning construction for use throughout mixing operations.
- D. Mixing Speed – (if applicable) The mixing speed of reagents shall be adjusted to accommodate a constant rate of mixing based on the degree of mixing difficulty.
- E. Grout Take – (if applicable) The grout take per measured unit of solidified soil will be adjusted to the requirements of the design mix. Positive displacement pumps will be used to transfer the grout from the mix plant to the active treatment area.
- F. Performance Criteria -The treated subsurface materials shall achieve the

characteristics presented in Table in Subsection 3.02E.

- G. Remixing - In the event the soil mix has not: 1. adequately incorporated site contaminants into a homogeneous mix as evidenced through testing conducted by the ENGINEER; or 2. through additional field testing by the ENGINEER indicating likely failure to meet strength requirements; or 3. achieved the specified structural requirements at 28 days, the CONTRACTOR shall retreat this material per the direction of the ENGINEER at no additional cost to the project to meet this minimum treatment standard.

### 3.02 QUALITY CONTROL

General -The CONTRACTOR shall be responsible to ensure that all work is performed to the standards established, herein, subject to review and inspection by the ENGINEER. All quality control records, routine tests, observations, and measurements shall generated by the CONTRACTOR and made available for inspection by the ENGINEER. All quality control testing shall be at the expense of the CONTRACTOR. CONTRACTOR is obligated to provide ENGINEER with required test cylinders for independent laboratory testing. Cylinder specimens will be collected under the inspection of the ENGINEER and will as close as possible represent the sample on which the CONTRACTOR performs its performance testing.

- A. Submittals -The CONTRACTOR shall make timely submittals of all information required by Section 2.0 to the ENGINEER.
- B. Materials -The CONTRACTOR shall submit data, tests, manufacturers' certificates, etc., to document the compliance of all materials to specifications determined by the CONTRACTOR in the quality control plan.
- C. Soil Mixing - Thorough mixing of soil and PC will be visually evaluated and mixing will continue until no unmixed product is visible, odor, oil, discoloration, and PID readings are indicative of stabilized/treated GCM and two consistent readings of a photographic gray scale containing 10 scale divisions between white and black are returned.
- D. Mixed Soil -Samples of the stabilized/treated soil for UCS testing will be taken each day (for each treatment cell); but not less than 1 sample for every 500 cubic yards of material treated. The CONTRACTOR shall devise and implement procedures to correlate specific samples to specific treatment areas. Sufficient samples shall be collected to make up three molds for quality control testing and additional two molds to serve as backup samples. The soil mix shall be placed in suitable molds, rodded to remove trapped air pockets, placed in a plastic bag that contains sufficient moisture to keep the mixture damp, and stored within a heated enclosure.

Samples for visual inspection by the New York State Department of Conservation (NYSDEC) shall be conducted at a rate of one sample per 5,000 square feet of stabilized/treated area but no less than one per treatment cell. The sampling will be conducted prior to complete curing of a treated area by pushing a thin-walled tube into the stabilized/treated material and extracting a sample. Where the depth of

stabilization/treatment is greater than the length of the tube, a second tube will be advanced. The samples will be visually inspected for the following criteria:

- Visible nonaqueous-phase liquid;
- Non-mechanical induced cracking within the core; and
- Percent of core sample recovered.

- E. Laboratory Testing - Samples shall be transported to an independent geotechnical laboratory for testing once the samples have sufficient strength so as to not adversely affect the properties. One sample from each sample location shall be tested for the following:

**Requirements for Solidified Material**

Test Name	Method	Sample Frequency	Required Result
Unconfined Compressive Strength	ASTM D1633-00	1 per 500 CY	No more than 10% less than 40 psi with no test results less than 30 psi or greater than 800 psi.

CY =cubic yards

psi = pounds per square inch

All test results shall be reported to the ENGINEER as soon as they become available from the laboratory. If initial sample test results do not meet criteria, a backup sample shall be tested.

- F. Records -The CONTRACTOR shall maintain records for all testing, measurements, observations, and inspections. Quality Control Reports shall be submitted to the ENGINEER each day on a form acceptable to the ENGINEER. These reports shall list all test results, measurements, and observations made and/or received by the CONTRACTOR for that day.
- G. ENGINEER Quality Control -The ENGINEER reserves the right to perform additional tests, with support of the CONTRACTOR, on the solidification area. The ENGINEER's testing will in no way relieve the CONTRACTOR of the responsibility to perform the tests as specified in the above sections and to meet this specification.

--END OF SECTION--