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## LTC General Approach to ISCO Soil Mixing Projects

This document is not specific to any site. The approach to specific projects can vary significantly due to site specific conditions, specifications, and cleanup criteria.

### Soil Mixing Equipment:

- LTC Dual Axis blender equipped with an onboard GPS. Information showing that the treatment area has been mixed to the specified horizontal and vertical limits can be downloaded from the onboard computer.
- LTC ISCO Mixing Plant equipped with a dual platform integrated scale system that records the quantities of reagent delivered to each mixing cell. The plant includes a dry bulk bin with computerized scale system and pumps and plumbing for handling liquid reagent batching. The system is capable of batching a combination of dry and liquid reagents.
- Fully equipped service truck
- Telehandler forklift to handle reagent containers.
- Sample taking tool for telehandler.
- GPS equipment for layout, operation and QA/QC.

### Mixing cell layout and designation:

- A typical mixing cell layout and cell designation shown on drawing ST-002. It is based on 10'x10' mixing cells with some variation on the perimeter to accommodate the shape of the treatment area.
- Drawing PH-001 illustrates the mixing procedure that will be employed. Four quadrant mixing plunges are made during which 1/4th of the total cell reagent quantity is distributed. Additional mixing plunges are performed to homogenized the cell and the adjoining cells.

### GPS Utilization:

- The blender operator sees the cell layout and designation, the blender and the blender head on his screen. He also sees the downward progress of the blender head.
- This screen is broadcast to a screen on the ISCO mixing plant so that the plant operator has real time information on which cell is being mixed and the rate of mixing production. The attached ISCO SOQ shows the screen on page 5.

### Reagent Delivery:

- LTC develops an Excel workbook that calculates the quantity of reagent required for each cell. The reagent required for each cell is shown on the Cell Qt'ys Sheet of the workbook. It calculates these quantities from the soil volume of each cell on the Cell Yd3 sheet and the formulas entered on the Mix Design sheet. Pages 3 & 4 of the attached ISCO SOQ show a project cell layout and the associated Cell Qt'ys sheet for it. Changes in the workbook can be made quickly if field conditions warrant it.
- Additional water may be added to produce an homogenous mixture and facilitate mixing based on field observations. The extra water is supplied through a separate hose run to the DAB. The extra water is controlled by the DAB operator.
- The correct amount of reagent by weight for a cell will be entered into the onboard computer along with the water volume. These reagent components are directed to either tank A or tank B on the ISCO mixing plant. When the entered quantities are reached the

system automatically shuts off the delivery to the tank.

- The plant operator directs the system to pump from the appropriate tank and enters the solution volume to be pumped for the cell that is being mixed. The operator can adjust the rate of delivery to match the rate of mixing progress.
- While reagent solution is being pumped from tank A, tank B is being filled and vice versa so that soil mixing proceeds without interruption.

#### Excavation and Soil Mixing Procedure:

When there is a layer of clean overburden above the contaminated zone the excavation and soil mixing will be conducted in conjunction so that the DAB, hoses and crew remain on the clean soil and are not exposed to the contaminated soil.

- Drawing CT-002 shows the geometry of this approach.
- Using drawing ST-002 as an example, all cells in the S1 row can be excavated prior to the start of soil mixing.
- Soil mixing will start in cell E2S1 with the DAB sitting in cell E2S2 and proceed to the east.
- When soil mixing has proceeded far enough so that there is room to work, excavation can begin in the E1S2 and proceed to the east behind the soil mixing operation so that when mixing is completed in E2S1 it can immediately commence in E1S2.
- Excavation and soil mixing will proceed in conjunction in this manner for the remainder of the project. This method does not expose the DAB tracks, the reagent delivery hoses or the workmen to the contaminated soil. Only the mixing tool will come in contact with the contaminated soil.

#### QA/QC:

Information for daily and final reports can be downloaded from the onboard computers on LTC equipment. As described earlier, the GPS screen in the blender shows the cell layout and designation, the machine and the mixing tool. This screen is broadcast to a screen on the ISCO mixing plant so that the plant operator has real time information as to which cell the blender is working in and the mixing progress. This allows the plant operator to match the rate of reagent delivery to the mixing progress and insures that there is no confusion as to which cell the blender is working in.

- A color coded map showing the cells can be downloaded that verifies the cells have been mixed to the horizontal and vertical limits specified. An example is shown on page 5 of the ISCO SOQ,
- The plant computer records the cell designation, the quantity of reagent delivered to each cell and the time that the cell was completed. This information can be downloaded after every shift.

The attachments listed are part of this project approach.

- Drawings PH-001, CT-002 and ST-002
- LTC ISCO Statement of Qualifications
- LTC Project List 1\_19