Coordinating the Who, What, Where and When

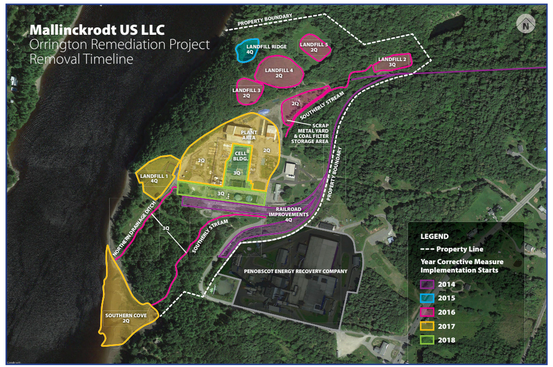
A key component of any large remediation project is planning a realistic schedule that takes into account the numerous steps from design to completion and addresses the inter-dependencies of each activity. The remediation at the Orrington Site has been divided into ten separate components and detailed schedules for each must be prepared well in advance to ensure designs and work plans are submitted to Maine DEP with enough time for appropriate review and discussions.

Then, when a final design is agreed upon, contractors are evaluated, requests for bids are sent out to these contractors, a contractor is selected and construction and restoration can be completed in the appropriate season. In summary, a master schedule must be developed to answer **What** work will be done **Where** and **When,** and it must also include the steps needed to answer **Who** will do the work.

During 2015 and early 2016, we completed a significant number of pre-design activities to provide data needed to develop the Corrective Measures Implementation Plans, also referred to as CMI Plans or simply, the designs. This work included soil and groundwater sampling throughout the former manufacturing area, installation of additional groundwater monitoring wells, additional investigations in and around Landfills 1 and2 and construction of material handling facilities that will be used for all remedial areas. The ten remedial areas and the anticipated start of construction are shown on the adjacent map.

At this stage, the site remediation is anticipated to be completed by 2019. This schedule is dependent on completion of all of the designs and detailed work plans for each area in the timeframes allowed. Mallinckrodt and DEP have agreed to this schedule and are working jointly to meet the proposed deadlines through ongoing team meetings to facilitate communication and ensure all parties stay on track to meet the projected schedule. However, as any true Mainer knows, winter can quickly throw a wrench into any optimistic plans for work during December through March.

A detailed description of the Landfill Ridge and the Landfills 3, 4 and 5 Capping remedies is found elsewhere in this newsletter, and future newsletters will answer all these questions for the other remedial areas.



A detailed schedule map of the ten remedial tasks that comprise the Corrective Measures Implementation (CMI) Plan are color coded by the year when that work will occur.

Excavation of Landfill *Continued from front page*

restore the area, including the steep slope that leads down to the Penobscot River. Since this earthwork couldn't be completed with frozen soil, Envirocon has currently left the site and will return in late spring. This last phase of work will include creating terraces and benches to create a stable slope, constructing storm water management systems, and planting the area with shrubbery, trees and grass consistent with the natural growth of the area. Once everything grows in, this cleaned and restored area will be a beautifully vegetated area indistinguishable from other natural slopes along the banks of the Penobscot River.

Excavated soils from the Landfill Ridge Area were transported to this protected area for stockpiling before being shipped off site to a secure landfill.

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Excavation of Landfill Ridge Area moves briskly as site work shifts into high gear

With the second warmest winter in Maine history, the remediation of the former HoltraChem site in Orrington saw good progress over the winter months with the excavation of the landfill ridge area begun in November. The warmer temperatures allowed site workers to continuously excavate over 45,000 tons of soil for offsite disposal. **[See excavation photos on page 2]**

The landfill ridge was selected as the first area to be remediated because the soils in this area were the least contaminated, said Mallinckrodt's Senior Remediation Specialist Kathryn Zeigler. "We knew that we would learn a lot from that work that we could then apply to more challenging areas," she said.

The pre-design work for excavation of the landfill ridge areas actually began in 2014 when geologists took deep soil borings around the 1.8-acre area to determine where site contaminants were present that exceeded the criteria established by the Maine Department of Environmental Protection (DEP). Between July and September 2015, geologists conducted an additional 97 geotechnical soil borings that confirmed mercury was the only contaminant that exceeded the site clean-up criteria.

The pre-design work provided a precise understanding of where contamination is located both horizontally and vertically.

This information was then used to prepare a detailed design plan, or Corrective Measures Implementation (CMI) Plan, which outlines the details of how the soil will be excavated, where it will be transported and disposed, and how the area will be restored once all impacted soils are removed. This plan was submitted to the Maine DEP for review, preliminary approval was received in July 2015 and after a series of comments and revisions, final approval was received in December 2015.

Envirocon was selected as the contractor to complete this work and excavation started in November 2015. Soils that exceeded the clean-up standard for mercury were excavated and loaded into rail cars and shipped to a secure landfill in New York for permanent containment.

By the end of February 2016, all the soils containing mercury above the clean-up standard were removed. The final phase of the project will be to regrade and

Excavation of Landfill *Continued on back page*

An aerial view of the former manufacturing site shows the locations of three landfills that will have their existing protective caps removed and then replaced with new caps. The Landfill Ridge Area that was excavated this winter is shown here to the left of the three landfills.

This sequence of photos show the start of excavation of the Landfill Ridge area during a late Autumn day and then the rapid increase in activity that ensued during the winter months. At bottom right, excavated soil is loaded into a lined rail car for shipment off site.

New Caps on Three Site Landfills

While much of the focus of the ongoing remediation of the former HoltraChem site in Orrington has been on the removal of two landfills, a key part of the overall site reclamation includes the installation of new protective covers on the three remaining landfills that will remain on the site as required by the Maine Department of Environmental Protection (DEP).

These new covers, also known as landfill caps, feature a geosynthetic clay liner (GCL), which is designed to keep rainfall from reaching the material below the cover. The installation of these new caps, however, is more complicated than simply overlaying new liners and finishing it with new soil and plantings. The process is not unlike installing a new roof which involves removing the old shingles first and then cleaning up the roof in preparation for the new layer of shingles.

The work is scheduled to commence during 2016.

The existing caps will first be removed and then the underlying area will be smoothed out and prepared before the new caps are installed. (See the side panels for definitions of some of the technical terms used in the description below and the proper sequence of constructing new landfill caps).

Geo-Speak. *A guide to the materials used in building secure landfill caps*

Geosynthetic Clay Liner: A woven, fabric-like material that incorporates clay in its construction. GCL has very low permeability which allows little or no water to pass through

Geomembrane: A very low permeability, synthetic membrane barrier typically made from thin continuous polymeric sheets. Geomembranes control fluid or gas migration.

Geonet: A synthetic mesh made from high-density polyethylene. Unlike GCLs and geomembranes, geonets transmit fluids and gases evenly across its surface.

Geotextile: Permeable textile material used to increase soil stability, provide erosion control and/or aid in drainage.

The landfills being capped (Landfills 3, 4, and 5) were all used for brief periods of time while the chlor-alkali manufacturing plant was in operation. The landfills were installed between 1972 and 1978 and have been covered, maintained and monitored since that time. All have been closed since 1984. Combined, the landfills cover approximately three acres. The remedial design is for Landfills 3 and 4 to be capped together, and Landfill 5 will receive a separate cap.

RTD Enterprises, located in Madison, Maine has been selected to install the geosynthetic liners. CDM Smith, one of the supervising engineering firms overseeing the remediation, will perform the majority of the rest of the work, including removal of the soil and existing caps, placement of base layers, installation of drainage layers, placement of soil and vegetation above the geosynthetic layer, vents and final restoration of the area. While these landfills already have secure caps in place, Mallinckrodt agreed to install new covers in order to upgrade the covers to the current EPA regulatory requirements. “Recapping existing landfills is a standard closure design that has been implemented at landfills all over the United States,” says Dean Carter, a project manager for CDM Smith.

The steps required in building new landfill caps are well prescribed. The sequence is as follows:

1. Removal of vegetation and soil over the existing caps; stockpile for reuse;

2. Removal of existing caps for disposal off-site;

3. Installation of a 6-inch thick (minimum) gas vent soil layer to direct any potential landfill gases to vents; this layer also serves as a base layer for the final cover system;

4. Placement of a composite barrier to minimize infiltration of storm water consisting of:
   a. new geosynthetic clay liner (GCL)
   b. a 40-mil thick textured HDPE geomembrane liner over the GCL

5. installation of a geocomposite drainage layer to protect the barrier layer consisting of:
   a. a geonet drainage core
   b. an upper geotextile filter to prevent clogging of the geonet
   c. a lower geotextile to enhance stability

6. Installation of gas vents on each landfill

7. Establishment of a 24-inch thick vegetative cover layer to limit erosion and protect the barrier system, consisting of:
   a. the lower 18-inch of protective soil
   b. the upper 6-inch of topsoil with vegetation

8. Grading the final caps to allow proper drainage and storm water control