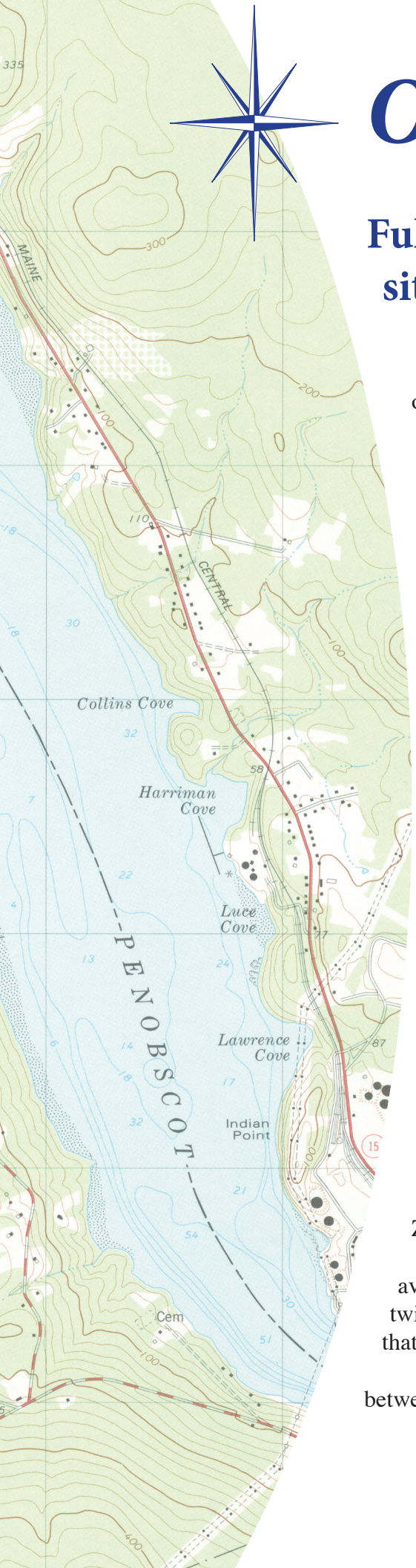


On the Penobscot

Fall 2015 Vol. 10, Issue 2

Fully enclosed rail cars arrive at Orrington site to begin soil removal transport

The backbone for a secure contaminated-soil excavation and removal operation at the former HoltraChem site in Orrington has begun to arrive in the form of fully enclosed rail cars. The first rail shipments will move soil from Orrington to a secure landfill in New York. Future shipments will also go to a second facility in Canada.

Mallinckrodt US LLC, which is overseeing the environmental remediation of the Orrington site, is opting to use rail transfer as the primary mode of soil removal because it is more secure and less disruptive than hauling all of the soils by truck, which would have carried the material out along the River Road and added to congestion along the town's main access road.

Rail is an efficient and environmentally friendly mode of transportation. One freight train can replace hundreds of trucks and reduce traffic and wear and tear on roadways. According to the Association of American Railroads, US freight railroads moved a ton of freight an average of 479 miles per gallon of fuel in 2014, a mileage rating to be envied by even the most eco-friendly car. Greenhouse gas emissions are also directly related to fuel consumption, so moving materials from the Orrington site by rail is expected to reduce greenhouse gas emissions by 75 percent.

The spur rail line that runs from the main line into the site has been upgraded to allow for safe transport of the material off the site and onto the main rail line for its final destination.

Although some material will be moved by truck, the majority of the material will be transported over the rail lines to keep the truck traffic to a minimum. Mallinckrodt US LLC plans to work with local residents to minimize disruptions as much as possible.

"For many of our neighbors, their route to work, school and daily errands is across this rail spur, so we are trying to make sure that when these cars move out it is as efficient and convenient as possible," said Kathryn Zeigler, Director of Environmental Remediation for Mallinckrodt US LLC.

The current plan is to stack the cars behind a locomotive and move an average of 15 cars per week with outgoing rail traffic no more frequently than twice a week. Empty cars will also move inbound in order to replace those cars that are shipped offsite.

Operational hours for the outbound and inbound trains will generally occur between 7 a.m. and 5 p.m. Monday through Friday.

Orrington environmental remediation is helping Maine's Economy

This Orrington, ME illustration is used with permission from Creative Commons. Find them at http://townmapsusa.com/d/map-of-orrington-maine-me/orrington_me

The potential redevelopment of the former HoltraChem site in Orrington is still some years away, but the current environmental remediation of the site is beginning to be felt in the local economy

"Our strong preference is to purchase our materials and services from Maine, if possible," said Kathryn Zeigler, director of Environmental Remediation for Mallinckrodt US LLC. "Our site contractors, led by CDM Smith, have a great affinity for Maine and many of our key site personnel were either raised in Maine or have spent much of their careers here so they know how important it is to support the local economy."

The five-year remediation project has already utilized the services of more than a dozen Maine companies including:

- **H. E. Bridges**, located in Glenburn, which has provided earthwork services, demolition, fill materials, snow removal and sanding in the winter.
- **Seacoast Security** in Brewer, which provides security guards when work crews are not on site.
- **Maine Track** in Fairfield, which has performed the restoration work for the rail spur that will enable secured trains to transport site soils and other materials off site for secure disposal.
- **CES** in Brewer, which is performing surveying work onsite.
- **Crescent Lumber** in Orrington, where CDM Smith goes to purchase its lumber and other supplies.
- **Davinci Signs** in Hermon, which produced the sign that greets visitors at the site.
- **Furbush Roberts Printing** in Bangor, which has published this newsletter since 2008.

This is just a partial list and doesn't include what may be the most appreciated suppliers in Orrington itself –Pizzaland, Snow's Corner On the Run store at the Shell station, and Dunkin Donuts – all of which are regularly patronized for breakfast and lunch, and coffee or cold drinks depending on the weather.

Company Profile: Sevee & Maher Engineers

As the environmental activist decade in America was unfolding during the 1970's, two aspiring engineers, unknown to one another, were separately pursuing their undergraduate and graduate degrees to prepare for a future as environmental engineers.

They crossed paths in 1979 while both were working at E.C. Jordan Company, a civil engineering firm in Portland, ME. By 1985, they left to form Sevee & Maher Engineers, Inc. in Cumberland, ME, and 30 years later the firm has established itself as one of the leading environmental engineering firms in New England.

It was a good match of talents as companies and communities across the country were struggling to understand and respond to new federal laws regulating clean water, air, and the disposal of wastes. New regulations and revised standards meant industrial waste that had been legally buried in landfills or discharged to surface waters were now considered a threat to drinking water, air quality and the environment as a whole.

The office of Sevee & Maher Engineers, Inc.

Peter M. Maher, P.E., who had earned his Masters of Science degree in water treatment and environmental engineering from the University of Maine in Orono, carved out a specialty in investigating existing landfills and designing new secure landfills to protect groundwater and surface water.

John E. Sevee, P.E. who earned his Masters of Science degree in geotechnical engineering would become the hydrogeology expert in the firm, working alongside Maher to assess potential threats to groundwater and surface water and then developing remediation plans to intercept and remove contaminants to protect the groundwater.

"When we started out in 1985, a lot of engineering firms were transitioning their businesses to cleaning up these sites, but no one really understood how to approach the problems," says Mr. Sevee. "There was a lot of misinformation at that time and even the government agencies that were in the process of identifying contaminated sites didn't understand the problem. Often, if a trace amount of contamination in a water aquifer was found, everyone just assumed that the whole aquifer was contaminated, which wasn't usually the case. Over time, as science has been applied to understanding these problems, rational approaches have been developed for addressing contaminated sites, and a better understanding of the environmental risks has evolved," says Mr. Sevee.

Over the years, Sevee & Maher Engineers, Inc. has grown from two engineers in 1985 to 44 employees today, including environmental and civil engineers, geologists, data experts, chemical engineers, groundwater modelers, computer graphic specialists and administrative staff. Today, Sevee & Maher Engineers, Inc. is one of the environmental engineering firms that are part of a collaborative effort to remediate the contamination left behind at the former HoltraChem plant in Orrington that operated from 1967 until 2000.

Those decades of Sevee & Maher experience match well with the task of identifying the scope and behavior of contamination at the Orrington site and developing a clear and safe strategy for addressing contaminated groundwater, removing two landfills, and recapping three landfills on site.

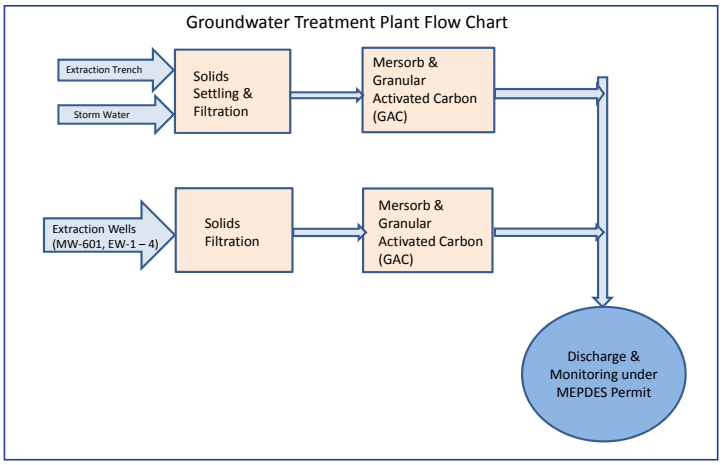
Sevee & Maher Engineers' expertise in hydrogeology, geotechnical engineering, and landfill design and construction fits well with other site engineering firms that include CDM Smith, Geosyntec and Anchor QEA, LLC, all of whom have substantial experience in environmental remediation.

"The Orrington site presents some interesting engineering challenges associated with the types

Sevee & Maher, continued on page 8

The EXPLAINER:
The Groundwater Interceptor and Treatment System Paying En

Looking across the now barren landscape where once there stood dozens of buildings, tanks and elevated pipelines, it is difficult to see what engineers see when they survey the former HoltraChem site in Orrington where a large-scale environmental remediation is now underway.



This flow chart (above) illustrates the path of ground and surface waters that are captured from a series of wells and then pumped into the groundwater treatment plant where they are filtered and then discharged as clean water.

Although you cannot see what is below the ground, after extensive study site engineers know with increasing certainty what lies beneath them and how they are going to proceed with the excavation and removal of more than 100,000 tons of soil. They can also point to where an unseen web of underground piping transports thousands of gallons of groundwater to a state-of-the-art groundwater treatment plant where it is treated to remove mercury and other contaminants.

From extensive probing, groundwater testing and soil samples, a more detailed picture of the site below ground is beginning to emerge, affirming Mallinckrodt US LLC's understanding of the scope of the multi-year cleanup remediation that will entail the removal of two landfills, the recapping of three other landfills, and, finally, the restoration of the site for potential reuse.

While continuous extraction and treatment of groundwater and the excavation of soils and recapping of landfills may seem fairly straightforward, the engineering firms that are managing the remediation say it is a more complex process than one might think even though some of the lead engineers have more than 40 years of experience with sites similar to the HoltraChem site.

What follows is a more detailed look at the groundwater extraction and treatment system, based on interviews with John Sevee, owner and principal of Sevee and Maher Engineers (see related profiles of Mr. Sevee and the firm), and Dean Carter, Site Construction Manager for the global engineering firm CDM Smith. Mr. Sevee is a hydrogeology expert. Mr. Carter has more than 25 years experience in landfill reclamation.

The Groundwater Extraction and Treatment System

The groundwater remediation process begins with a thorough site investigation to establish not only the extent and location of below-ground contamination, but also to better understand the geology of the site itself because no two sites are ever alike. One of the earliest remedial actions at the Orrington site was to capture and extract groundwater and treat it to remove the mercury. Even before all the groundwater investigations and modeling was complete, a groundwater extraction well (MW-601) was installed in the area of Landfill 1 in 2005 and an extraction trench (southerly stream interceptor trench or SSIT) was also installed south of the manufacturing area. Groundwater captured by these two systems was pumped to the existing wastewater treatment plant where mercury was removed and treated water discharged in accordance with the site's existing Maine Pollutant Discharge Elimination System (MEPDES) permit. In 2011, the engineering firm Woodard & Curran located in Portland, Maine was retained to design and construct a new state-of-the-art groundwater treatment plant (GWTP). The design objectives were to provide a new treatment system that would:

- Maintain compliance with the discharge permit
- Involve simple and reliable processes
- Replace the existing system with no interruption in service
- Handle increased groundwater flows during implementation of the site remedy
- Operate in the long-term with minimal maintenance

The treatment processes in the existing plant (solids coagulation and filtration followed by granular activated carbon (GAC) and Mersorb to remove mercury

vironmental Dividends

and other contaminants) represented the best available treatment technology to remove mercury from groundwater, however several aspects of the design were modified to improve efficiency and more robust operations, including:

- The new groundwater treatment plant is located in a new, energy efficient building
- All new process equipment was purchased to ensure long-term reliability
- A new system to remove the silica and filter solids requires less labor and fewer chemicals
- Two, new 15,000 gallon insulated effluent storage tanks were added
- A new remote monitoring and alarm system was added
- Additional discharge monitoring points were installed within the treatment building to improve safety and winter access ability.

A Design Basis report for the new treatment system was submitted to the Maine Department of Environmental Protection (DEP) in August 2011, construction was completed in 2012 and the plant began treating extracted groundwater in August 2012 under the existing MEPDES Permit. In July 2013 the Maine DEP issued a revised MEPDES Permit and Waste Discharge License. The new GWTP is designed to handle 60 gallons per minute (gpm) on an ongoing basis with additional capacity to handle increased flows during remediation or severe storms. Both the incoming (influent) groundwater is tested basis to ensure treatment systems are appropriate and the treated (effluent) groundwater is tested to ensure compliance with the MEPDES permit. Monthly discharge reports are also submitted to Maine DEP as required by the permit.

As described in related articles in this newsletter, John Sevee of Sevee and Maher Engineers (SME) is no stranger to the Orrington site and has studied the site's complex geological characteristics for some time. In June 2014 Mallinckrodt authorized SME to submit a work plan to Maine DEP to install four new extraction wells (EW-1 through EW-4) in the Landfill 1 area to capture additional groundwater at the site.

Based upon discussions and comments from DEP, the Work Plan was revised and approved in September 2014. The expanded extraction system prevents chemicals in the groundwater beneath the Site from migrating into the river, thereby protecting the river ecology.

"The groundwater is intercepted by a line of pumping wells strategically positioned to take advantage of the direction of groundwater flow and the Site-specific geology," Mr. Sevee says.

These extraction wells are constructed of 4-inch diameter PVC plastic with screened bottoms and range in depth from about 30 to 60 feet below grade. Submersible pumps are installed in each extraction well which pull, or extract, the groundwater from the aquifer and pump it up to the surface where it is piped to the new on-Site water treatment plant. The wells are also fitted with water level and flow measurement equipment. Construction of the expanded extractions wells and the piping to the new GWTP were completed in February 2015. During the start-up period the pumping rates of the wells were varied to identify the optimum set of pumping conditions that would capture the maximum amount of mercury impacted groundwater, and the combined maximum flow from all five wells (MW-601 and EW-1 through EW-4) is 28 gpm. Monthly operational reports were submitted to DEP through July 2015 (six months) and quarterly reports are now being submitted.

"What the data shows us is that this system has been very effective in eliminating any flow into the river," says Mr. Sevee. "It is a fairly simple system, but it has significantly controlled any migration from the site and I think the key was how and where it was positioned."

These tanks contain Mersorb and Granulated Activated Carbon which remove mercury and other contaminants from extracted groundwater before it is discharged in compliance with the MEPDES Permit.

One-on-One with John Sevee

John Sevee

When did you decide you wanted to be an engineer? What was that one experience that turned you in that direction?
When I was at the University of Vermont, I was actually enrolled in a premed program and my father-in-law was a highway engineer. He started showing me what he did every day. That interaction got me thinking that this is kind of fun and you get to build things, which I always enjoyed when I was young. So my father-in-law unknowingly redirected me from premed into engineering.

Is environmental remediation a big business these days? It seems that there is a lot of work out there recovering from our industrial past.
I've been involved in this business since the early 1980's when a lot of engineering companies transitioned to cleaning up contaminated sites. When we first started, no one really understood how best to approach the cleanups. There was a lack of understanding of what chemicals were contaminants in the environment and how the contaminants behaved in soil, water and air. Government agencies were also still in the process of identifying contaminated sites and prioritizing investigations and clean-ups. Thirty years later we have all learned a lot about where the contamination came from, how contamination moves in the environment and how to deal with such problems. Over the last decade we are seeing fewer and fewer new hazardous waste sites being found because strong regulations are now in place and most such sites have been identified, although new contamination sites are still found during property sales and upgrades. Investigation and remedy selection has been streamlined at the regulatory level, which shortens the overall remediation process. However old sites that have been remediated require long-term maintenance and monitoring, so the remediation business continues but at a slowing pace.

Describe the work that Sevee and Maher does. Has it changed much since you started the firm? What would you say is the firm's specialty?
When we started out in 1985, Peter Maher specialized in landfill design and I was focused on groundwater contamination transport and remediation, and we have pretty much kept to that model. We have grown considerably over the years by expanding our geographic area of service. Technically, we have expanded into clean water source supply and commercial spring development, civil engineering and permitting, some waste water treatment, and compliance monitoring for many of our industrial clients. Fewer landfills are being built today and fewer complex contamination sites are being discovered, but we have expanded our client base so these two disciplines remain at the core of our business.

How does Maine rank among industrial states that are trying to recover from that industrial past?
We don't have the industrial past that some areas of the country have, but we have had some major issues, like solvent spills and Superfund sites. Compared to such indus-

Education: University of Vermont, Bachelor of Science in Civil Engineering and Masters of Science in Geotechnical Engineering; University of Southern Maine, Bachelor of Arts in Physics.

Personal: Moved to Maine in 1979; currently lives in Yarmouth, has two grown children and five grandchildren all of whom live in Yarmouth as well.

Years as an Engineer: 42

Career Path: 1973-1979 - Project Geotechnical Engineer at Ardaman and Associates in Florida; 1979-1985 - Manager of Earth Sciences at E.C. Jordan in Maine; 1985-Present, Owner/Principal, Sevee & Maher Engineers, Inc.

trialized and populated states as New Jersey and California, however, our issues have been relatively small and contained. Maine is one of the more sophisticated states in terms of their regulatory agencies and local residents often become involved in cleanups.

How would you describe your company's and your past experience as it applies to the Orrington site? A lot of lessons learned that are being applied here?

We have investigated the hydrogeology on many sites here in Maine. All that experience comes into play on any site we study. Our engineers have remediated sites all over the country and are familiar with the behavior of various chemicals and remediation approaches for specific chemicals. The Orrington site is interesting because the mercury mobility in the groundwater environment is fairly complex. However, our understanding of that behavior from working on similar mercury sites is directly applicable here. One particular challenge is trying to understand how long it will take for the mercury to desorb from the soils and to collect that mercury with strategically-placed pumping wells or underdrains. From a geologic standpoint, groundwater movement through the bedrock fractures is also a challenge. Our experience with groundwater behavior in Maine bedrock also comes in handy here. We are figuring these things out and the good news is that the mobile mercury has decreased significantly over the years so we know the groundwater can be cleaned up.

> ***"I love Maine. I grew up in the hills of Vermont and I always thought that I would stay there, but I love being close to the coast and also being able to travel an hour and hike in the mountains. This is my home."***

How important has the groundwater pump-and-treat process been in capturing contamination before the excavation work begins?

The groundwater pump and treat system was installed in 2005 and expanded at the end of 2014 and has been in operation ever since. What the data has shown is that that system has eliminated the discharge of mercury moving within the groundwater. Prior to implementing the pump and treat system an extensive geologic investigation was undertaken. The pump and treat system design takes advantage of the site geology. Our computer model simulations, using site-specific information, confirm the effectiveness of this pump and treat system in protecting the river.

Describe the landfill excavation process.

Two landfills will be removed by excavation. In both cases the landfills being taken out are located adjacent to bodies of water. So an important removal design consideration is making sure that the excavation process doesn't result in contaminant migration into surface water bodies. Each exaction will remove residual waste and then dig down until clean soil is encountered. Any groundwater or rainfall entering the excavations will require collection and treatment at the onsite treatment plant. When complete, the excavations will be graded and covered with vegetation to prevent erosion. This will all be done while monitoring the site and surrounding water, air and sediment environments. The monitoring guarantees that excavations are being carried out as planned and without adverse impacts.

Are you optimistic that the Orrington site can be cleaned up?

The Orrington site is very well understood at this point from a hydrogeologic perspective. The types and distribution of contaminants are well defined. During the cleanup there may be a few details that must be addressed through additional pre-design investigations but, by and large, the site is sufficiently defined so that appropriate remedies can be selected for the various areas. The tremendous volume of data collected will allow engineers to design remedies that can be implemented while simultaneously protecting the offsite groundwater, the river and air. The remedial technologies have been successfully used before for similar chemicals. We expect a good outcome because of the volume of site-specific knowledge and demonstrated successful use of the selected cleanup techniques. Ultimately, the river will be protected by the cleanup and the site can be reused once the cleanup is complete.

Sevee & Maher, continued from page 3

of chemicals present in the soil and groundwater and the mobility of the contaminants in groundwater in a fairly complex geological setting," Mr. Sevee says. "But while it is complex, we have two big things going for us here: one is the extensive volume of site-specific data which has been paramount to selecting appropriate remedies, the second is that the groundwater extraction system is working very effectively and works well to control contamination from leaving the site. The entire remediation team is poised to safely and effectively remediate the Orrington site."

For more information about Sevee & Maher, check out the in-depth interview with Mr. Sevee elsewhere in this newsletter.

This Hyster loader will be used to expedite the loading and sealing of rail cars in preparation for the shipment of materials off site.

Printed on 100% recycled paper. Please recycle when done.
Published by Mallinckrodt US LLC.

On The Penobscot
P.O. Box 14
99 Industrial Way
Orrington, ME 04474

PRSRT STD
U.S. Postage
PAID
Permit #76
Bangor, ME