

# SHEET PILE WALLS DRIVE HAMILTON HARBOUR CLEANUP

Randle Reef is one of the most contaminated sites in the Great Lakes; a massive pile driving project is at the centre of cleanup efforts

By Lee Toop, Associate Editor

**A**t the western end of Lake Ontario lies Hamilton Harbour, a busy port that has for over a century served shipping and heavy industry in the Great Lakes. For much of that century, the industrial users nearby have released various contaminants into the environment that today are targeted by extensive cleanup efforts.

One of the most contaminated sites in the Great Lakes rests just offshore, next to a steel mill. Randle Reef is around 20 to 35 feet deep and lies at a point that has received much of the runoff from industry, as well as local wastewater plants.

The result has been pollution collected in the sediment of the lakebed that is heavily toxic – to the point that there are virtually no living creatures in that part of the lake.

As part of a \$139-million project, Randle Reef is in the process of being remediated. The centrepiece of this work is an enclosure that will surround the worst of the pollution, then be filled with dredged sediment from around it.

“Stakeholders went through a range of options, everything from dredging it all up and trucking it to a hazardous waste landfill site to incinerating it,” explained Jon Gee, the manager of

Great Lakes areas of concern for Environment and Climate Change Canada. “They concluded that the best option was to enclose it in an engineered containment facility (ECF). By doing that, the city would be managing the problem within its own boundaries, and it would come at a cost within the range of affordability.”

The worst of the pollution is not far from Pier 15 on the Hamilton waterfront, which had to be rebuilt as the first segment of the project; that was done in 2015 to allow construction of the ECF to begin. It’s a challenging job, especially for the contractor tasked with driving hundreds of steel sheet piles to create the enclosure.

Birmingham Foundations, as a subcontractor to McNally International, started driving piles in 2016.

Project manager Jeff Thomson said working on the water is unique but not necessarily unfamiliar. “Birmingham has worked on the water throughout the Great Lakes, but this job is a little more unique in terms of how you approach it,” he said. “The lakebed material we’re trying to contain, that has been highlighted as contaminated material, is not something you want to disturb.”

The ECF is essentially a double-wall coffer dam; the interior Waterloo barrier is designed to be impermeable, with the ability to contain both the sediment already within the structure and more that will be dredged from

the lakebed later in the project.

Sediment from between the inner and outer walls will be dredged mechanically, then clean crushed rock will fill the space for structural rigidity.

Working on the water adds difficulty to a piling project, obviously, and this is no different. To ensure the piling is installed precisely, Birmingham has had to do some fancy footwork with its falsework.

“We can’t put in excessive amounts of falsework because that would disturb the lakebed material. So, we actually implemented a floating template system,” Thomson explained. “We mounted our falsework onto a smaller sectional barge and hold that in place with

temporary spuds. We can move it along the length of the wall as we install it. That limits the amount of disturbance.”

The template system allows for easier handling of the sheet piles, which are on the longer end of the range for such work.

“The sheet piling on the outer wall is around 100 feet long at the longest section – that’s getting up there for the maximum length you’d see on a sheet piling installation,” Thomson said. “When you’re dealing with hundred-foot steel, controlling that leading edge while keeping it in the location and tolerance is a big challenge.”

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Top: Falsework to guide the sheet piles into place had to be installed on a barge between the inner and outer walls. Above: An overhead view of the structure nearing the halfway point in construction.

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Birmingham is driving piles from barges anchored offshore, using a Terex 165 and Liebherr 895 as its workhorse crawler cranes.

The location means all the necessary tools and equipment have to be on the crew boats and stored on the barges – there’s no quick trip back to the yard if anything gets missed. In addition, while Lake Ontario doesn’t experience heavy swells like one might experience on the ocean, there are other weather factors to be considered.

“We may have done a little overkill on the equipment barge sizes to make sure we had adequate stability,” Thomson said.

“The biggest challenge working on the water is the wind – when we’re picking up material that’s upwards of a hundred feet long it can act like a big sail. When you pick that up, and you have your tag lines trying to hold it in place, that’s a lot of surface area. We get several forecasts through the day.”

On the business end of the machines, Birmingham is using a combination of hammers to set the piles. Working with the interlocking sheets of Waterloo barrier means changing the way the material is handled.

“We have to have certain jaws and clamps for the vibratory hammers, to fit them over the different styles of interlocks,” Thomson said. “You don’t want to damage or crush it, because then you lose the ability to actually seal the structure.”

The interior wall has been set with vibratory hammers, but the outer wall requires different techniques. Birmingham has relied on its own in-house Birmingham diesel hammers to get the piles to grade.

“We have set the face wall and structural piles with larger vibratory hammers, and then pick up some of our diesel hammers to get them to final grade,” Thomson explained.

“We have had to fit different driving adaptors so they transfer the energy properly into a corrugated sheet pile section as opposed to a nice round pipe or H-beam. We have developed those adaptor plates and connections in-house for this job. It’s a big benefit to be able to modify your own equipment and get it out into the field.”

Birmingham expects to wrap up its part of the Randle Reef project this summer.

“There will be some 3,400 pilings that go in,” Jon Gee said. “Somebody estimated that if you were to place the pilings end to end it would go from the project site pretty much into Toronto.”

After that, stage two of the ECF construction will commence, with dredging of the contaminated sediment into the structure taking place in 2018 and 2019.

From there, stage three will be to dewater the interior structure and build an impermeable cap over the entire ECF.

Once completed, the structure will be handed over to the Hamilton Port Authority, which is expected to pave over the structure for use as a marine facility. **HEG**

**LIEBHERR**

**NEW RIGS AND CRANES INTRODUCED AT CONEXPO FOR NORTH AMERICAN MARKET**

The Liebherr LRB 355 piling and drilling rig (shown) has been specially equipped with a larger undercarriage for the North American market, a move that increases the machine’s already high level of stability. Another advantage of the new undercarriage is the minimized transport weight. The jack-up system allows the crawlers to be dismantled, resulting in a transport weight of only 42 US tons (38 tonnes) for the basic machine. The machine’s parallel kinematics provide for a large operating area. Since all winches are mounted directly on the leader, this allows for a direct view from the operator’s cab to the main winch, and ensures the ropes do not move during leader adjustment. The optional elevating working platform of the LRB 355 enables safe and easy access to the attachments. The rig is available in two different configurations with a maximum height of 110 feet (33 m) and a maximum weight of approximately 105 US tons (95 tonnes), without attachments. It is driven by a powerful Tier 4 Final V12 diesel engine offering 600 kW (805 hp) or an optional 750 kW (1006 hp).

The LR 1300 crawler crane with attached fixed leader system serves as the base machine for

the LRH 600 piling rig. In this configuration, the rig is usable for a diverse range of applications including: piling work with a hammer or vibrator, drilling operations with continuous flight auger or down-the-hole hammer, and various soil improvement techniques. At CONEXPO, it was displayed with the rotary drive BAT 320 and continuous flight auger.

The leader elements of the LRH 600 allow quick and easy assembly through the pin connections. Stability is ensured by the lattice boom design and through the kicker, secured via supporting tubes at the boom head. The two compensating cylinders ensure that the leader always remains parallel to the upper carriage, and provide the maximum transmission of the torque. Inclination and radius can be adjusted using another pair of cylinders. The LRH 600 achieves an effective working length of 164 feet (51 m) and a maximum radius of 50 feet (15 m) with a fixed leader.

The Liebherr duty cycle crawler crane HS 8130 HD can be used for various deep foundation applications or for the typical material handling tasks of a duty cycle crawler crane. When developing the 143-US-ton (130 tonne)



machine, Liebherr paid special attention to the robust design of the steel fabrication, the optimization of performance and safety, the easy and quick transportation, and fast set-up of the machine. The HS 8130 HD can be transported with the railings, catwalks and pedestals fully assembled on the upper carriage. This accelerates the mobilization of the crane on the jobsite. The undercarriage has been enlarged for the requirements of the North American market, and lowers the ground pressure of the crawler crane while increasing the lifting capacity.

**BAUER-PILECO**

**BG 24H CRANE CAN BE QUICKLY CONVERTED FOR ALL COMMON DRILLING METHODS**

BAUER-Pileco showcased a selection of equipment at CONEXPO from BAUER, Pileco, RTG, Klemm and MAT.

The biggest attraction was the BAUER BG 24H PremiumLine (pictured) on a new BT 75 base carrier, which features Energy-Efficient Power (EEP) technology. EEP technology was first implemented in the BAUER BG PremiumLine rigs three years ago and soon became a standard feature.

With an optimized, smart hydraulic system and main winch function in the closed hydraulic circuit, this technology reduces diesel consumption on the construction site by 20 to 30 percent while boosting performance thanks to efficiency enhancements and direct energy recovery.

As a PremiumLine rig, the BG 24H – a state-of-the-art Kelly drilling rig – can be quickly and easily converted for all common drilling methods without extensive modifications. The central element is the B-Tronic user interface, which gives the operator optimal control and flexibility thanks to a colour monitor with a touch function.

Extendable service platforms enable safe and efficient servicing, while reduced noise emissions are easy on the environment and the nerves of neighbouring residents. The rig also features a fall protection unit, which can be retracted during transport, on its upper carriage, as well as two cameras for monitoring the rear area. The rig on display was sold during the show and delivered directly to the customer after the end of the fair.



Bauer presented an MC 96 crawler crane equipped with a Pileco D100-13 diesel hammer for the first time. The rig was sold just before the show. The MC 96 features a 764 hp CAT C 18 engine and is used in various special foundation engineering applications: as a cable-excavator with a mechanical cable gripper or drop weights for dynamic soil compaction; and as a base carrier for hydraulic diaphragm wall grabs or piled bore grab for drilling cased bore holes in combination with casing oscillators, for depth vibrators and oscillating vibrators, for trench cutters or for diesel hammers.

The ultra sound-proofed cab provides an optimal view of the work area and has numerous features that offer maximum convenience for the operator. Energy Efficient Power (EEP) technology allows for variable and intelligent control of the cooler and air system, reduction of flow losses thanks to optimized hydraulic components, a smart ECO mode for the diesel engine and closed hydraulic circuits for operation of the main winch.