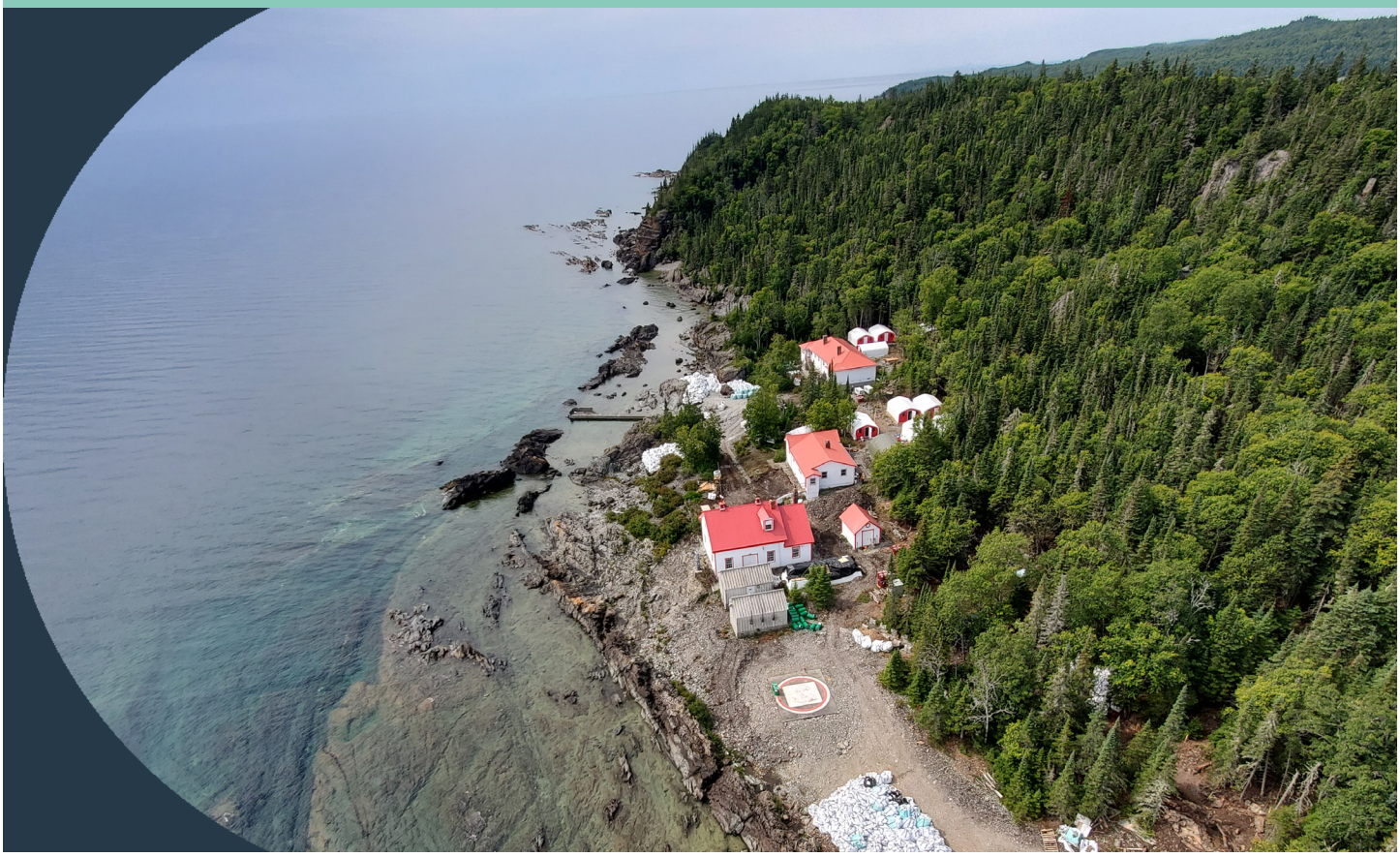
ENGLOBE

Canadian Consulting Engineering Awards
Environmental Remediation

Complex Remediation on the Slate Island Archipelago, Northwestern ON



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EXECUTIVE SUMMARY:

The Slate Islands are a remote archipelago nestled in the protected waters of the Lake Superior National Marine Conservation Area (LSNMCA). Located 12 km south of Terrace Bay, Ontario heading straight out into Lake Superior, the park is comprised of a series of rugged islands covered with a southern boreal forest and arctic-alpine flora. Relying on this unique ecosystem are at-risk woodland caribou as well as a host of other species including beaver, hare, fox, and various shorebirds. Containing the remnants of two Indigenous settlements, a former timber operation, and with speculation that the central islands are the remains of an ancient meteorite, the slate islands are unlike anywhere else in Canada.

The Slate Island Coast Guard site is situated on Sunday Point of Patterson Island: the largest and most southernly portion of the Slate Islands archipelago. It is located approximately 18 kilometers (km) south of Terrace Bay, Ontario, and 165 km east of Thunder Bay, Ontario. The site was operated as a staffed light station between 1903 and the late 1970s and consists of a lighthouse as well as several supporting structures which accommodated the lighthouse operations during that period.

As a result of the lighthouse operation, the surrounding soils were contaminated with lead at three main areas designated CS1, CS2, and CS3. With the Slate Islands meaning so much to the local community and public at large, Englobe was excited for the opportunity to manage the complex remediation. With key objectives for the project being centered on safety and sustainability, the challenge was to execute the perfect project: safely remove all contaminated soil from a remote island with minimal impact to the sensitive ecosystem, while meeting an aggressive schedule.

From extremely challenging site conditions presented by the remote island to issues caused by inclement weather, and a drastic change in the amount of contaminated soil present at the site, this project was far from standard. By implementing proactive Client management and extremely rigorous internal project management processes, the Englobe team helped to guarantee that all remediation activities were completed on schedule in one field season.

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PROJECT OBJECTIVES, SOLUTIONS AND ACHIEVEMENTS:

Objectives:
Though once crucial to navigating Lake Superior's tricky waters, the long-term light station and supporting facilities left a devastating legacy on the pristine Slate Islands ecosystem: the surrounding soils were contaminated with lead. Contamination was present at three main areas, and it was the Client's objective that all sites be remediated in a manner that was safe, non-disruptive to the unique park and marine conservation environment, but with clear emphasis on sustainability. It was to adhere to standards, codes, and regulations, be executed under the restrictive conditions presented by site location, all within an aggressive timeline.

Solutions:
Englobe applied innovative solutions and advanced project management to meet all project objectives:

- Unique combination of equipment and resources as work arounds to site challenges including custom engineered system of winches used for construction in the Swiss Alps.
- To overcome Lake Superior's rocky shoreline mobilisation was supported by a 220-tonne crane situated on a barge 150 feet off-shore allowing the transfer of larger equipment dramatically increasing production at the site.
- Excavation and off-site disposal of 1,369 tonnes of contaminated soil involved excavation work from cliff face and soil removal via rope work by trained employees.
- 511 bags of contaminated soil were slung with a helicopter to barge accessible sites.
- Advanced risk mitigation included careful study of Lake Superior weather patterns, consultation with local communities.
- Comprehensive project management plan covering quality control, change management, risk management, schedule, team organization, resources, and responsibilities.

Completing the excavation and off-site disposal of 1,369 tonnes of contaminated soil from the three distinct work areas required advanced technical knowledge, detailed specifications, and skillful project management. Englobe prepared the site-specific plan for the complex remediation and retained a host of unique equipment to execute the project. Under Englobe's technical direction, contaminated soil was excavated site-by-site using a highly specialized winch system and rope work, carefully located off-shore barge, expertly trained team, and with the support of a 220-tonne crane and helicopter in one field season.

The outcome was a pristine ecosystem free of contamination, and a project that perfectly captured the sustainable and safe vision the Client has for the remediation program. Combining custom engineered features with a low-impact remediation plan, the Slate Island

remediation epitomized a textbook project even when little about the project was close to standard. The final project met Client's objectives and surpassed their expectations with high consideration for the environment.

Project Management:
Factoring in extreme weather fluctuations, and all the challenges associated with remote and rugged project sites – managing this project was a full-time, round the clock affair. Going beyond standard project management conventions such as uniting the Client and extended team, providing continuous oversight, creating a shared vision for success, and holding people accountable, this project called for above and beyond measures: ongoing, acute awareness of the key project issues.

From start to finish, the team was proactive, on top of every aspect of the project, proficient at handling multiple priorities, committed to follow-through, and it was highly organized. Priority was placed on maintaining an open and transparent line of communication with the Client and the extended team, making sure everyone understood priorities, project objectives, and desired outcomes. The team was in constant communication, working together to ensure smooth operations. Establishing the norm of highly responsive communication meant that any on-site issues or emergency situations were actioned immediately. And, perhaps most importantly, it meant the project manager knew the Client and all resources very well. Having a clear understanding of each team members strengths and weaknesses meant resources were utilized to the best interest of the project.

Because projects never go as planned, a robust process around the identification, management and mitigation of risk was developed at the onset, helping to prevent risk from derailing the project. The project manager had extensive experience with environmental remediation in remote locations and knew the kinds of issues that typically arise. It was also understood that unexpected issues are common with this type of project, so everyone needed to understand the process and protocols to be followed for unexpected risks. Weather, changes to scope, new demands on resources, issues with equipment all led to unforeseen challenges that required prompt action, proactive planning, and fast thinking.

Project Achievements:
- Excavation and off-site disposal of 1,369 tonnes of contaminated soil from three distinct work areas – CS1, CS2 and CS3.
- Screened soils originating from CS1 and CS2 to reduce overall tonnage and thus save disposal and transportation costs.
- CS2 involved excavation work from cliff face, soil was removed via rope work by trained employees.
- Due to the inaccessibility of the CS2 Site, bagged soils were slung with a helicopter to barge accessible sites – 511 bags total were slung over the duration of the project.
- Removal / disposal of 6 diesel generators from site buildings.
- Branches from trees felled to support remediation work were chipped and used as organic cover to promote reforestation of the area.
- Mobilisation was performed by a chartered barge from Hamilton, Ontario and supported a 220-tonne crane to overcome Slate Islands rocky Lake Superior shoreline.
- Saved our client money by completing the project in 1 field season.

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LEVEL OF COMPLEXITY AND PROJECT CHALLENGES

Elements to overcome:
Projects in northwestern Ontario encounter unique challenges all of which are compounded when working on an island in Lake Superior: cold climates, remote location, lack of infrastructure, rugged geography, challenging and variable ground conditions, unpredictable and dangerous lake conditions, sparse populations, species-at-risk etc. These challenges can result in transportation and material handling difficulties, labour shortages, mobilization challenges, and require special equipment considerations. The Slate Island project presented several opportunities for Englobe to display its prowess in remote site remediation and logistics. A project that was assessed to require 2 years to complete the team was able to finish, successfully and to the Clients satisfaction, over the course of 4 months. This was achieved because of the innovative solutions developed by the Englobe team.

The shoreline of the Slate Island Archipelago is extremely rugged with huge, jagged rocky outcrops meaning the team could not rely on traditional logistic plans to mobilize for this project. Due to the shoreline landing the barge was impossible at the CS1 site – the largest of the three sites – and needed to be safely anchored approximately 150 feet from shore. The initial assessments had concluded all materials and equipment for remediation would require a helicopter for mobilisation, greatly limiting the size of machinery and in turn production at the site.

By levering the experience of our staff, Englobe devised an alternative, more efficient approach. The team positioned a 220-tonne crane with a reach of 150 feet onto a barge that was anchored in safe waters off the rugged shoreline. Using the crane, Englobe was able to transfer much larger equipment that was initially not considered viable because of the rocky shoreline of CS1 successfully onto the island. Use of the crane dramatically increased production at the site because it meant the team had more than manual human labour to complete the excavation - they had machinery.

The rocky slopes of CS2 presented a unique set of challenges. The slope where excavation was to occur was extremely steep and rugged forcing the team to be creative in their approach to mobilizing equipment for this section of the project. Utilizing a prefabricated and custom engineered system of winches more commonly used for construction in the Swiss Alps, Englobe was able to access the difficult slope with machinery which once again dramatically increased production to positively impact the project timeline.

In addition to completing the original scope of work in half the time estimated by a previous consultant, the team met this impressive timeline while also managing more than double the initial volume of contaminated soil assessed at the CS1 site. Despite this significant change in scope, Englobe was still able to complete the project within one field season.

All three of the project sites were nestled in the Lake Superior National Marine Conservation Area, adding another layer of complexity. Unlike more predictable water systems, the only thing about Lake Superior that is predictable is its volatile nature and extremely cold temperatures. By implementing rigorous and highly proactive project management, the team was able to mitigate any issues that were caused by changes to lake conditions. The safety of the team and protection of all equipment were always a top priority, and if conditions on the lake became unfavourable the team was able to pivot without allowing it to derail the project's schedule.

Special use of equipment:
The most challenging part of this project was mobilizing equipment onto the actual project site – not close to the site, but onto the remote island where the contamination needed to be excavated. Without access to equipment, the project team would need to rely on manual labour which is why the estimated schedule for the project was 2 years. The team was creative in their approach to mobilizing machinery on-site to complete the remediation work. Notably, each of the 3 project sites, CS1, CS2, and CS3, all presented unique access challenges, and each required a unique plan; a one-size-fits-all solution does not apply when the project is located in a Provincial Park in Lake Superior, the second largest fresh-water lake in the world. With no road access to drive traditional machinery used for large-scale remediations, the team relied on a barge and helicopter to get the equipment on island.

- Mobilisation was performed by a chartered barge from Hamilton, Ontario and was supported by a 220-tonne crane with a 150-foot reach to overcome Slate Islands rocky Lake Superior shoreline.
- Utilized a custom engineered system of winches used for construction in the Swiss Alps to support excavation work from a cliff service. This involved complex rope work and comprehensive training.
- Due to the inaccessibility of the CS2 Site, bagged soils were slung with a helicopter to barge accessible sites – 511 bags total were slung over the duration of the project.

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TECHNICAL EXCELLENCE AND INNOVATION

Internal resources:
Englobe understands the overall benefit of working across traditional boundaries and favoured a multidisciplinary approach for this project. Start to finish, this project epitomized a collective effort. Working in close consultation with professionals from a variety of backgrounds, Englobe's network of resources was leveraged effectively to the benefit of the Client. Collaboration on this level is only possible when the project managers have a deep understanding of the firm's resources and the needs of the project objectives. As part of the quality control and risk mitigation plan, our team regularly evaluated resources to make sure the right people were working on the right task at the appropriate time.

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CONTRIBUTIONS TO ECONOMIC, SOCIAL AND / OR ENVIRONMENTAL QUALITY OF LIFE

Sustainable Development:
Englobe completed the Slate Island project in partnership with the local First Nations from the surrounding north of Lake Superior region: Pays Plat, Pik River, Pik Mobert and Fort William First Nation. The local contacts helped with the provision of employment by bringing notice of job opportunities to community members. The project was completed in the unique and pristine Slate Islands archipelago ecosystem. Home to populations of animals and birds, it is a remaining sanctuary for woodland caribou. A known species at risk in Ontario the entire project proceeded cautiously to ensure that the local flora and fauna were unimpacted.