ROC Equipment: Excavating the Impossible

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Differing sites drilled in the 1960s.

Island Mystery

Scientific breakthroughs typically occur in what appears to be a natural rate of progress. Sometimes, a serendipitous action will turn into an earth-shattering discovery, but most technological developments are in sync with the maturity of the society around them. Skyscraper construction took off with the advent of the mass production of steel and the use of mechanized hoisting equipment after stone and masonry construction methods had plateaued. Transportation of goods and people exploded in volume when the high pressure steam engine was invented that would power a locomotive; early steam engines were not robust enough to power a vehicle the size of a train.

But some accomplishments in history have appeared to be anachronistic with respect to the apparent technology needed to perform the work. Speculation has run amok about the possible method the Egyptians employed to build the Pyramid of Giza. The stones used to construct the monument were much too large for the hoisting means thought to be available at the time. The stone blocks at the Pre-Columbian temple at Tiwanaku, in western Bolivia, show no chisel marks or other evidence of how they were shaped. And the Nazca Lines, in the high desert of Peru, cover huge distances and depict shapes that only could be seen from high above; these features were created at a time when air travel was but a distant dream.

Subsurface features at Oak Island, on the Atlantic Coast in Nova Scotia, Canada, appear to follow this pattern of structures that shouldn't have been possible at the time they were built. However, the wrinkle at Oak Island is that no one is certain exactly what the structures

(continued on page 27) ➤

ROC Equipment's drilling site.

are. Many people have attempted to solve this mystery over the past 200 years, and ADSC Associate Member ROC Equipment, of Salt Lake City, Utah, was fortunate to have been invited to share in the adventure.

Oak Island consists of about 140 acres of relatively level ground with a high point about 36 feet above sea level. The island was called by many names after it was populated by European settlers, most stemming from the names of property owners. But the land was heavily forested, and the name Oak Island eventually persisted from colloquial usage.

During the late 1600s and early 1700s, the small islands in this area of Nova Scotia became favored havens by pirates preying on ships traversing the heavily traveled shipping corridors leading to Boston, Massachusetts, and other nearby ports. In fact, Oak Island lies only about 200 nautical miles from Boston; the lure of such uninhabited, heavily forested land was strong for pirates who were looking for safe locations to stow their illegally obtained hauls. As a result, treasure lore was common currency in the Oak Island area by the late 1700s.

In 1795, a young teenager on a nearby island noticed unexplained lights on Oak Island in the middle of the night. Curious, he visited the following day and found a depressed circle on the ground surface not far from the southeastern edge of the island. The circle was about 13 feet in diameter and was ringed by the stumps of oak trees that had been cut down. He was aware of the rumors of pirate treasure in the vicinity, and he could not resist the allure of a possible cache right in his own back yard. So he and a few friends used pick axes and shovels to dig into the depressed zone, certain they would find vast riches just below the surface.

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However, the boys' excavation efforts did not yield the easy return they hoped. Although they encountered a layer of stones just below the ground surface, the underlying void was ringed in soil with no sign of the gold they anticipated. They kept digging, uncovering a layer of rotting timbers at a depth of about 10 feet. The timbers had been driven into the sidewalls of the hole, apparently stabilizing what had been an opening. At this point, the diameter of what now appeared to be a shaft had decreased to about 7 feet. A void was present below the timbers and was about 2 feet deep, below which was loose soil. Ten feet below the first set of timbers another set of timbers was found, similar in orientation. This sequence continued to a depth of near 25 feet, at which point the boys gave up their quest.

Numerous groups of treasure hunters attempted to advance the effort over the next 50 years, moving the excavation down to a depth of near 90 feet. But a devilish system of tunnels repeatedly flooded the shaft, making excavation beyond that depth impossible. The tunnels eventually were found to be tied to discharge/inflow points along the shoreline quite a distance from the shaft. Pumps available at the time could not accommodate the inflow, and odd water flow characteristics complicated all endeavors to reach an imagined treasure chamber. Subsequent treasure hunts were made by way of crude augers drilled down to below the depth where water made advancement by workers impossible. Each team uncovered what were perceived to be

Caption.

finds of importance, including the presence of coconut fibers which pointed to the likelihood that the persons who built the subsurface features had journeyed to places where pirates were known to frequent. During this time, the feature became known as the Money Pit.

None of the expeditions were able to make significant headway toward recovering any treasure below the surface, in part because the shaft and flood tunnels appeared to have been constructed with means not available at the time they likely were built. Team after team were thwarted by the complex configuration of the shaft and tunnels and the use of water as a barrier to accessing the supposed subsurface chamber in which the "treasure" was assumed to be kept. In fact, exploration activities led to the collapse of most of the shaft structure below

(continued on page 28) ➤

Caption.

30 feet, making the ultimate goal even more elusive and giving credence to the idea that the feature was booby-trapped.

Various discoveries, including a heavy, etched stone tablet recovered from the shaft at about 90 feet, suggested that a treasure chamber, if present, likely existed at a depth of 130-200 feet below the current ground surface elevation. Many of the exploratory operations were thwarted by the difficulties of drilling at that depth with water inflow and random obstructions.

Present Day Drama

The History Channel commissioned a reality television show in 2013 based on the efforts of current site owners Marty Lagina and Rick Lagina to explore the Money Pit using modern excavation technology. In 2016, they approached Irving Equipment, a general contractor, to discuss providing drilling services that could be used to target specific locations and depths while working around the previously encountered complications, such as water from the flood tunnels. Irving teamed with ADSC Associate Member Bermingham Foundation Solutions, who contacted ROC to discuss equipment needed to fit the very particular needs of the project.

Advancing a deep exploratory hole without allowing water in the subsurface to flood and destabilize the hole was the most obvious requirement for this more modern expedition. In addition, the Laginas had specified that they wished to be able to retrieve items from the drilling spoils without those items being damaged or destroyed. Furthermore, the location and verticality of the shafts was extremely critical to be able to document specific conditions relative to other discoveries at the site in the past.

Louis Fritz of Bermingham knew ROC Equipment had extensive knowledge in the casing oscillator method and recommended that ROC be involved with the shaft placement by means of oscillator and grab instead of a traditional Kelly bar-operated drill rig. An oscillator works by turning casing back and forth rather than by rotating a Kelly bar attached to an auger. The stiffness and size of the casing oscillator allows for more precision in location and less deviation from verticality when inconsistent subsurface conditions are encountered. Tests reported by industry sources on shafts advanced using a casing oscillator have shown deviations from vertical in the range of 0.35% to 0.5% in 200 feet, versus 1.5% for traditional Kelly bar drilling techniques. In addition, spoils can be removed using a grab without the disturbance associated with an auger and cased shafts provided more control over water issues. The use of a casing oscillator theoretically also provided the possibility that shafts could be entered after completion. The reality of that option would depend on conditions during drilling and applicable Canadian workplace safety and health regulations.

Tools for the Task

The project team determined that a crane-mounted casing oscillator would be most appropriate for the needs of the site so that a grab could be used to remove spoils. Due to project schedule and final shaft diameter, a BUMA drill-mounted oscillator was used. In order to use this oscillator with a crane, it was necessary to fabricate a special bridge to connect it to the crane. The team worked together to design a bridge that Bermingham was able to fabricate out of drill leads to save money on the project budget. The bridge needed to be strong enough to resist the torque generated by the oscillator and to allow clearance to operate the grab for excavation of the shafts.

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(continued on page 31) ➤

Caption.

Planning for the venture took several months, but the project itself lasted approximately six weeks. ROC Equipment sent a team of personnel to assist Irving Equipment and Bermingham with equipment modifications, setup and shaft installation.

The casing oscillator allowed several different methodologies to be executed in order to successfully install the requested shafts. First, casing was telescoped to the desired depth. ROC's team installed 1500mm temporary casing to a depth of 120ft, placed reduction inserts into the oscillator, and then installed 1092mm permanent pipe inside the larger casing to a depth of 200ft. Then the team installed temporary casing down to 150ft, at which depth a flying lead drill provided by Bermingham was attached to the oscillator support bridge to drill into rock below the casing. Finally a basic cased shaft was excavated using a grab. The oscillator installed the temporary casing the entire length of the shaft while being excavated by means of a BUMA hammer grab. It was a unique project in that it called for installing four shafts with three different methodologies, all of which were performed successfully. .

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While previous expeditions had experienced difficulty with excavation activities, the Irving-Bermingham-ROC team was able to advance four holes up to depths of 200 feet with precision and efficiency. However, the previous teams did not have to deal with several new problems that cropped up, (at least in the minds of the drilling team): timing work to coincide with the schedule of a film crew; attempting to speak into a microphone during drilling; and trying to maintain a profanity-free construction site for the History Channel audience. (This last feat was considered more difficult than any excavation challenges that might be presented). Lucido stated that working on an isolated island 3,400 miles from ROC's facility yard posed significant unknowns at the start of the project but didn't prove to present problems when work actually took place. Spoil retention was worth noting on this project because of the unique documented constituents of the subsurface and the possible small and/or delicate materials that could be present amidst large amounts of wet soil. All eyes on the site went up each time the grab came out of the shaft. Every bucketful was inspected thoroughly, and as the shaft advanced closer to the target depth, team members held their breath in collective anticipation of what the jaws might hold.

The four shafts advanced were placed to provide information in two vertical columns where drilling had taken place previously and evidence of possible treasure chambers had been found. Previous drilling in those spots was performed using methods that obtained samples from a much smaller cross-sectional area. Wood, concrete, and loose metal had been encountered in the exploratory borings in the past, but the drilling methods had limited the condition and type of materials that could be retrieved from the subsurface.

What Did They Find?

No real treasure was encountered in the shafts advanced by the

(continued on page 32) ➤

team, but significant materials were found to perpetuate the hope of the treasure hunters, thanks to the efforts and carefully planning of key team members Andrew Folkins of Irving Equipment, Louis Fritz of Bermingham Foundation Solutions, and Dawn Walters and Vanessa Lucido of ROC Equipment. In general, the shafts completed by the team assisted in eliminating some areas for potential future exploration and confirmed that more drilling is needed in other areas. Most importantly, the operation provided ample evidence that the drilling methodology utilized was the best means to-date to overcome the particular obstacles at the Money Pit site.

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Caption.

The mystery of how such an apparently complex, deep subsurface structure could have been constructed well before modern drilling and excavation shoring methods were available probably will persist even after the site is fully explored. But the chance that whatever is present down below will be found increases with every advancement in specialty drilling and excavation. In most projects, the "treasure" is a well-constructed foundation system. The same high quality means and methods that provide foundations for structures all over the world may someday bring in treasure in a more literal sense at the Money Pit on Oak Island. Stay tuned.

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