ARCHEOLOGICAL DREDGE

Archeologists use of Cable Arm
Environmental Level-Cut Clamshell Bucket,
ClamVision Positioning Software &
Imaging Sonar Equipment on
USS *Westfield* in Texas City Channel,
near Galveston Harbor

In November of 2009, work began onsite within the Texas City Channel, near Galveston Harbor, to raise artifacts from the Civil War gunboat USS *Westfield*. USS *Westfield*, a Staten Island civilian ferry, was purchased by the U.S. Navy and converted to a gunboat in 1862. *Westfield* was helping the Union win control over the lower Mississippi and New Orleans before it was sent to aid in the capture of Galveston. On January 1, 1863, it was defending the city from Confederate forces, whose intent was to recapture the city. It ran aground just before the battle had begun, and *Westfield* was deliberately blown up by its crew to prevent capture. It was reported that fourteen crew died in the explosion. Although the wreckage has been salvaged at least twice since its destruction, many significant artifacts still remained, including a rare cannon. Technological advances proved vital in locating and raising these precious artifacts.

The United States Army Corps of Engineers (USACE), Galveston District, funded the recovery of USS *Westfield* as part of the Texas City Channel Deepening Project. The remnants of USS *Westfield* were required to be removed prior to deepening

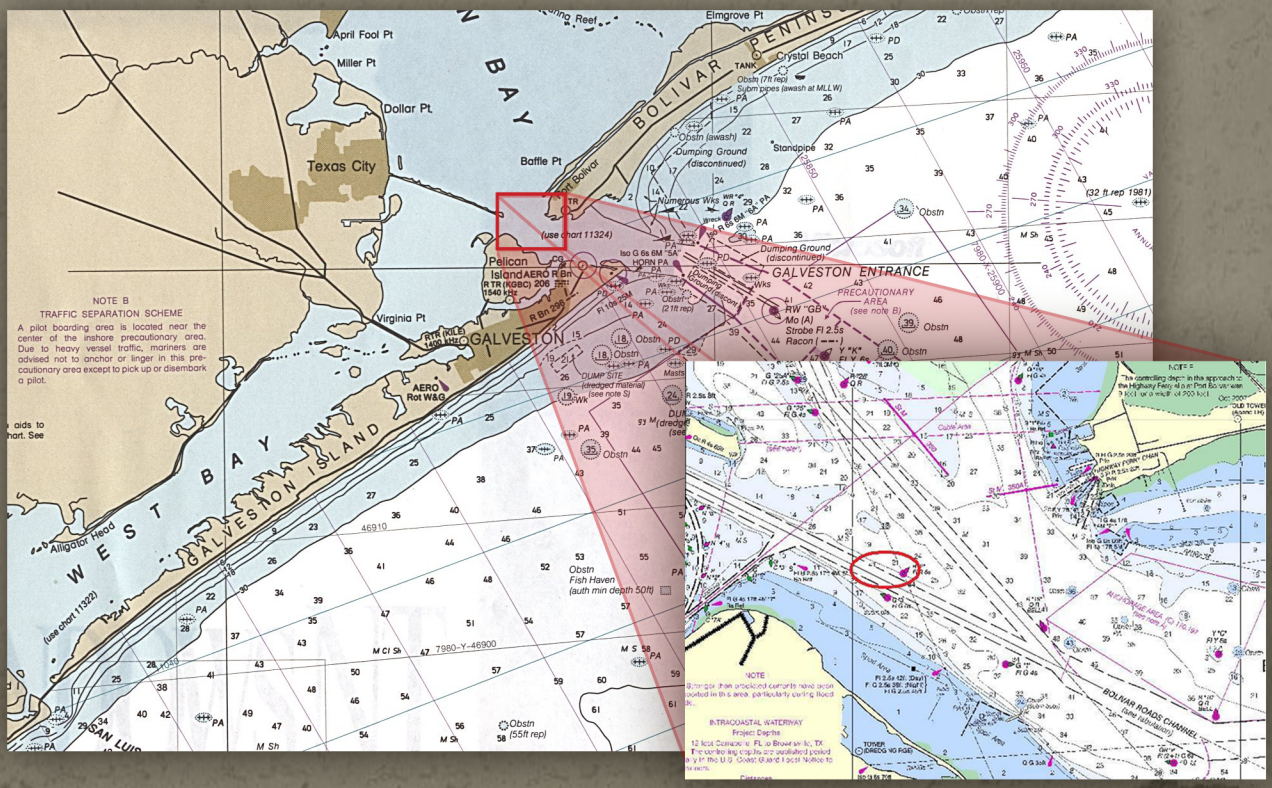

Image 1: Site location - Texas City Channel

the channel to 45 ft. The Navy's Supervisor of Salvage managed recovery operations for USACE. Navy salvage contractor Donjon Marine coordinated with PBS&J, a USACE contracted archeology team, to work through tough environmental conditions and strict requirements to successfully recover the remaining fragments of USS *Westfield* from the Texas City Channel.

Harsh conditions, due to ship traffic and high velocity currents at the location of the wreckage, called for non-traditional methods to be used when raising the artifacts. An onsite crane barge with anchor system was used as the main platform for work. Also, there were two additional platforms: one for dive operations and one for containers. The containers transported artifacts and site sediment to an offloading site in Freeport, TX. Also used was a five feet diameter magnet along with a Cable Arm Environmental Clamshell bucket. An array of technologies including GPS, imaging sonar, bucket pressure sensors, and Cable Arm ClamVision precision software gave the archeologists the ability to map precise locations of artifacts and reduce the time and efforts needed to accomplish their goals.

Image 2: Rare 9-inch Dahlgren cannon raised from USS *Westfield*

The job progressed in phases, the first to excavate were the divers. Under a previous contract with USACE, PBS&J archeologists had already identified the wreckage and mapped the site. Navy contractor, Phoenix International, used their dive and navigation teams to locate and prepare some of the larger artifacts to be raised with the help of slings. For the next ten days, due to strong currents, Phoenix was given a window of three to four hours of dive time per day. Equipped with a Sonardyne, ultra-short base line (USBL) tracking system, the dive team was able to view the diver's real-time position within the navigation software. Previous side scan and multi-beam surveys provided the background of the navigation software which guided the diver to the artifacts with great ease. Armor plating and various parts of the gunboat were raised, as well as the treasured 9-inch Dahlgren cannon (Image 2).

The second phase involved using Smit America's five feet diameter magnet (Image 3) to raise medium sized artifacts. The magnet was able to pull metal artifacts from under the mud-line that were not visible in the multi-beam, nor the side scan survey data. A 9x8 steel plate was fastened to the magnet's surface to

Image 3: Smit America's five feet diameter magnet

distribute the weight and size of the targeted objects. Cable Arm's imaging sonar aided in the positioning of the magnet underwater. In addition, Cable Arm's ClamVision dredging software logged the position of each area covered using Hemisphere 2cm GPS to position the tip of the crane's boom. Within the next three days, the magnet was used to lift many pieces of the wreckage; uncovering more of history's marvels.

Image 4: Cable Arm Environmental Level-Cut Clamshell bucket

During the third phase of the artifact recovery of USS *Westfield*, a 2.5CY, 6x9 footprint Cable Arm Environmental Level-Cut Clamshell bucket was used to recover sediment and retrieve smaller artifacts resting in the mud and shell hash. Cable Arm's dredging software, ClamVision, enabled the operator and archeologists a full coverage view of the area which helped keep track of each bucket filled with material.

The area was sectioned into individually numbered 15'x15' grids. Sediment from different grids could not be commingled. Archeologists tagged each bucket with a time stamp and position which matched the bucket material's recieving

container. Ultimately, this method allowed the archeologists to know where each artifact's original location was on the channel bottom.

During the last of the phases, the use of an imaging sonar proved invaluable. First, while using the magnet, archeologists were able to place it directly on top of any visible anomalies shown through the sonar display. Secondly, the sonar image verified the clamshell coverage. Finally, the sonar provided information used in determining an object's offset distance against its originally calculated position.

In conclusion, there are many benefits of using a Cable Arm Environmental Clamshell bucket, ClamVision positioning software, and imaging sonar equipment when excavating delicate compositions. The combination of technologies save time and money, and allow the recovery of artifacts which are not possible with the use of other techniques.

Figure 1: ClamVision precision software and imaging sonar show the Cable Arm bucket patterns and coverage. Grid 112 was bypassed due to the lack of visible anomalies within the sonar image.