NCPTT

Ft. Livingston, Grand Terre Island
Field Report | 2010-03

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National Center for Preservation Technology and Training

Field Report

Fort Livingston, Grand Terre Island

Jefferson Parish, Louisiana

Site Visit: June 16, 2010

Photo: National Register of Historic Places nomination for Fort Livingston (1974)

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Summary

NCPTT staff visited Fort Livingston, Grand Terre Island, on June 16, 2010 to evaluate the condition of the structure and the amount of oil contamination; to conduct field tests on cleaning methods; and to collect oil, water, and oil-contaminated sand samples for further testing in the laboratory. The amount of oil and area of contamination were documented in field notes and through associated photographs. The structure was severely damaged in a hurricane in 1915. The remaining portions of the structure are in relatively good condition, but are more vulnerable to storm-generated waves and erosion because the gulf-facing side of the fort was destroyed. A wavebreak was constructed more recently (approximately 20 years ago) and provides some measure of protection from weather-related damage. The surfactants that were tested to clean oil from a small area performed satisfactorily. A poultice was also effective at removing surface soiling, though would be more effective at removing stains that penetrate the surface if left for a longer period. Further laboratory testing is planned and will be shared with the Louisiana Office of State Parks as the results are complied.

View across the courtyard looking southwest from the terreplein on the east side of the fort. Note the buildup of sand in the foreground, the light colored granite steps (left) and lintels over the openings in the brick walls, and the exposed tabby in the broken outer wall in the background, left of center. Barataria Pass and Grand Isle are visible beyond the fort. (Photo: NCPTT, Jason Church.)

Introduction

At the request of the Louisiana SHPO and Louisiana Office of State Parks, two NCPTT staff members visited Fort Livingston, Grand Terre Island, in Jefferson Parish, Louisiana to assess the amount of oil contamination on the fort and to test cleaning methods on small portions of the structure.

On June 16, 2010 Jason Church and Carol Chin met Sara Clowery of HDR/E^{2}M and Nicholas Neylon, Dianne Mouton-Allen and Tamara Augustine of the Louisiana Office of State Parks. Sara Clowery is a contracted archaeologist for BP who was on assignment at the BP incident command in Houma, Louisiana. Tamara Augustine is the Park Manager for Grand Isle State Park. The group and equipment were transported by a workboat and airboat to Grand Terre Island, which is accessible only by boat from Grand Isle, Louisiana.

On the day of the visit, the weather was warm, approximately 90°F. Temperatures on the sand were significantly warmer, which affected the viscosity of the oil observed on the beach. According to online NOAA tides data, high tide occurred at approximately 11:30 am on June 16. This is consistent with field observations. The group arrived at Grand Terre Island at approximately 11:30 am and returned to Grand Isle at approximately 4:00 pm and noticed that the tide had receded during that time.

Location and History

Grand Terre Island is a barrier island that trends southwest/northeast and is located just east of Grand Isle, Louisiana. Fort Livingston sits on the southwestern tip of Grand Terre Island, on the east side of Barataria Pass, the inlet to Barataria Bay. The fort is managed by the Louisiana Office of State Parks and has been designated a

State Cultural Area (SCA), part of Grand Isle State Park. It is also listed in the National Register of Historic Places.

The United States Government purchased land on the western tip of the island on January 10, 1834. Preparation of the site for construction began later that year but was suspended after construction of temporary quarters for the engineer and superintendent. In 1840 Captain J. G. Barnard arrived as the superintending engineer. Temporary buildings for workers were constructed during the following year. There are no remains of these structures today.

Plans for the fort were produced in Washington, D.C. under the direction of Colonel Joseph Gilbert Totten, Chief Engineer with the United States Army Corps of Engineers. Construction of the fort itself is believed to have begun in 1841-1842. Though still incomplete at the time of the Civil War, the fort was occupied by Confederate troops. The fort was abandoned after the Civil War and the property returned to the state of Louisiana in 1923.

Current Conditions

The fort is constructed of brick that is believed to have been produced in Mississippi or the Florida panhandle. The brick facing covers tabby walls (cemented shell). The shell for the tabby was reportedly gathered from local Indian middens. The fort sustained significant damage from hurricanes in 1893 and 1915 and has weathered several other significant hurricanes since that time. The remaining portions of the fort are in relatively good condition, though the structure is vulnerable to additional storm damage.

Physical Description

The fort is described in the nomination to the National Register as follows:

> "…a trapeziform shaped stronghold, surrounded by a wet ditch and with outworks on the land side. The walls were constructed of cemented shell faced with brick and trimmed with granite. The bricks were shipped from either Pensacola or Mississippi; the shells were removed from local archaeological sites."

Condition of Structure

The southeast side of the fort, facing the gulf, was destroyed in 1915. Sand and water have intruded the courtyard and casemates. Erosion of the shoreline in front of the fort, on the gulf-facing side, was a concern from the time of its construction. A shoreline loss of 237 feet was documented between 1840 and 1854. Rock riprap was placed as a breakwater around the gulf side of the structure to prevent further erosion and undercutting of the fort. The date of construction of the breakwater is not known but is likely to be after a 1984 when a Site Record Update recommended that the fort be sheltered from direct wave action of the Gulf. Earlier photos indicate that this breakwater was a continuous wall. Today there is a breach in the riprap at the northern end along Barataria Pass, facing the bay.

Barrel-vaulted passageway between the courtyard and the moat on the northwest side of the fort. Photo taken looking southeast toward the courtyard. Note the sand that has covered the floor and partially filled the space. Water has intruded as well, as seen on to the right in the photo, and evident from the flow channels in the sand. Oil has not contaminated this space. (Photo: NCPTT, Jason Church.)

Sections of the tabby and brick walls and other debris remain submerged on the gulf side of the structure. The remaining structure and materials are in relatively good condition. Mortar has weathered and receded, but appears to be tight and stable. The bricks have retained their fireskin, and little to no spalling was visible. Granite steps

Location 2, inside the southernmost casemate. The cooler temperatures inside the casemate allow the oil to become more viscous so that it remains on top of the wet sand. Note the tabby walls with brick quoining in the background. (Photo: NCPTT, Carol Chin.)

and lintels are in good condition. Tabby is visible where the fort's walls have been breached and within some of the casemates where the tabby might have been the finished surface. The interior tabby is sound with the binder receded but stable. Some of these interior spaces retain their original stucco/limewash finish. A few of the sheltered interior arch ceilings still retail their original limewashed stucco finish. Etched graffiti is visible in some of the interior spaces. Some of the graffiti dates from the early 1950's with the most recent being dated May 28, 2010. This most recent graffiti may account for some of the oil laden foot prints and hand prints observed around the fort. Because of the structure's current location within the littoral zone, portions of the structure are permanently submerged and sand has intruded and built up into most of the interior spaces. Silting/filling of interior spaces with sand has prevented more significant penetration of oil into the structure and onto the bay-facing side. The bay side of the moat or "wet ditch" still contains water, but was one location where oil has not contaminated the water surrounding the fort. It is likely that this portion of the moat remains below sea level, as it was originally constructed.

Oil contamination. Oil reached Grand Terre Island and Fort Livingston in late May or early June 2010. High tide during the new moon on June 12-13, 2010 moved the oil farther into and up the sides of the structure. The consistency of the oil is dependent on the temperature and other conditions on site. In interior spaces where temperatures are cooler, the oil takes the form of a mousse: more viscous with globules stranded on the sand by higher water. Outside of the structure and on the surrounding beaches, the oil is less viscous: the oil adheres to the structure as a sticky coating approximately two to three millimeters thick; on the surrounding beaches it melts into the sand as the tide recedes. The beach on the northwest side of the fort's moat has oil soaked sand approximately three centimeters deep. The outer masonry wall sections that are on the outer edge of the moat are completely covered in a thick 2-3 mm coating of tar like oil up to the high tide line. The entire fort wall facing the water side has an oil coating to the high tide line, which is 5-6 brick courses high at low tide. The fort's interior rooms that face the water have an oil coating 20-25 cm up the brick and tabby walls. There is also a heavy band of green biogrowth directly above the oil line. This may have been caused by the oil contamination or it might be a preexisting feature.

In several places, oil contamination has resulted from transfer by visitors. Boot/shoe marks are evident on the granite steps that lead to the terreplein and hand transfer of oil is evident on some of the walls.

Sampling and Testing Stations

Samples of oil/mousse, oiled sand, and water with an oil sheen were collected from locations around the fort. Cleaning tests were done in two locations, on both brick and granite surfaces. GPS coordinates for each of these sites were recorded by Sara Clowery.

Station 1 – poultice tests and exposure of soft bricks for testing in the laboratory.
Station 2 – collection of samples of mousse and mousse + sand.
Station 3 – collection of oil/water samples.
Station 4 – test cleaning, discussed below.
Station 5 – collection of oil/water samples.
Station 6 – collection of oil/sand samples, water with oil sheen, and oiled shells that had weathered and fallen from the tabby.

Cleaning

The Louisiana Office of State Parks staff requested advice on the removal of oil contamination from Fort Livingston. The initial advice from NCPTT was not to undertake multiple cleanings. The State Parks staff were particularly interested in a product made by VeruTEK.

Considerations

Cleaning products and methods need to be tested to determine efficacy, effects on materials, and potential environmental issues. Multiple cleanings are not advised as each cleaning has the potential to remove some of the original material, or to otherwise damage the structure, and additional oil is sure to arrive and re-contaminate the site.

Aerial view of Fort Livingston. The red arrow shows the general location of stations 1 through 4. The yellow arrows show stations 5 and 6. The southeast wall of the fort, facing the gulf, was initially destroyed in a hurricane in 1915. A wavebreak protects the structure on the gulf side. Today the wavebreak is breached on the northwest side at the shoreline. Structures in the northeast corner of the photo are part of the Louisiana Department of Wildlife and Fisheries' (LDWF) Lyle St. Amant Marine Research Lab which closed in 2008 after hurricane Gustav. (Image modified from Google Earth.)

Field Testing

Two cleaning methods were tested on the structure: poulticing and surface washing agents. Surface washing agents are typically surfactants, and VeruTEK products were tested here. Another surfactant, Volpex, was available for testing but time constraints precluded testing this product in the field.

VeruTEK products. The following VeruTEK products were tested: VeruSOLVE, VeruSOLVE-Marine, and VeruSOL Green-Marine. The "Marine" designation indicates that the product has been adjusted to approximate the salinity of seawater. Both VeruSOLVE and VeruSOLVE-Marine include hydrogen peroxide as an oxidant to break down the emulsified oil.

Poultice. A poultice of agapultite clay and mineral spirits was tested. Normally a poultice would be applied and allowed to remain for a minimum of 24 hours, but because of limited time, the poultice was applied at the beginning of work at the site and removed just before departure that same day.

Fort Livingston Courtyard. The red arrows indicate the locations of poultice applications (Station 1), the black arrow shows the sampling location for oil/mousse and water (Station 3), and the blue arrow shows the location of the cleaning tests (Station 4). (Photo: NCPTT, Jason Church.)

Results

Initial testing of VeruTEK products on brick indicated that they are effective as surface washing agents. However, because of the short time in the field, it was not possible to observe the surfaces after they had dried or, as would be preferable, after a few days to determine how effective these products were at removing oil that had penetrated the materials and whether there were any undesirable consequences from cleaning. VeruTEK products are in the process of being added to the NCP Product Schedule but do not appear on the schedule dated 6/3/2010.

The poultice was effective at lifting/removing the surface soiling from both brick and granite. Because of the short time for the poultice to "cure," some staining remained from oil that had penetrated deeper into the material. A poultice applied over a longer period would be more effective at removing such a stain. It should also be noted that large area application of a poultice is not practical, and that poultices are normally used for small areas and more stubborn stains.

Recommendations

Preliminary recommendations are to wait until the threat of contamination with additional oil has passed before beginning large-scale cleaning. Use a product that complies with federal, state, and local requirements. Surface washing agents, which are made up of surfactants, should be formulated so as not to cause damage to the materials or surfaces being cleaned. The lime mortar, bricks, and shells that make up the tabby will be sensitive to products with a low pH (more acidic). A test should be conducted on a small, inconspicuous area before large-scale cleaning is undertaken. Damage to the surface might not be obvious immediately, so test patches should be observed after cleaning, after drying, and after some time (days to weeks) to be sure that damage has not occurred.

Before application of a surface washing agent, surrounding, uncontaminated areas should be wet so that the product remains on the surface of the material. In general, a surface washing agent should be applied and allowed to dwell on the surface for approximately 20 minutes to penetrate and react with the oil. Depending on the product, additional time might provide better results. Additional product can then be applied before agitating with a soft bristle brush. A brush that is soft enough not to scratch the finish on a vehicle is soft enough to use for this purpose. Agitate to make sure the surface washing agent comes in contact with the surface being cleaned, but avoid scrubbing. Rinse and reapply the surface washing agent again as necessary.

Jason Church collecting samples of oiled sand; station 6, northwest of the exterior wall of Fort Livingston. Note the oil on the bricks on the left side of the photo and in the background on the fort's outer wall. (Photo: NCPTT, Carol Chin.)

NCPTT will continue to test products that are currently included in the National Contingency Plan (NCP) Product Schedule to determine which products could be used on historic structures and cultural materials. Results and further guidance will be provided as the research proceeds. In addition to standard cleaning methods, products will be tested for their efficacy in "pre-cleaning" or interim cleaning of structures that have been contaminated with oil but are expected to be exposed to additional oil.

It should be noted that the National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan (NCP), is the federal

government's blueprint for responding to both oil spills and hazardous substance releases. The Environmental Protection Agency (EPA) maintains a schedule of products that may be authorized for use on oil discharges (NCP Product Schedule). Use of products that results in a release of those products to a navigable waterway must be approved in advance by the Regional Response Team (RRT). Louisiana and Texas are part of Federal Region VI. Mississippi, Alabama, and Florida are part of Federal Region IV. For more information see: http://www.epa.gov/osweroe1/content/partners/nrsrrt.htm.

Prevention of further oiling of Fort Livingston

Oil is expected to continue to arrive on the shores of Grand Terre Island over the coming months. The breakwater on the gulf side of Fort Livingston provides an opportunity to prevent a significant amount of additional oil from reaching the fort. If resources are available, additional sand could be added to the breakwater to help prevent the oil from penetrating the riprap in the breakwater and reaching Fort Livingston. This sand would fill gaps and voids in the breakwater, trapping oil. The continued use of booms is also recommended.

Additional sand would need to be dredged from the gulf side of the breakwater, and preferably some distance from the island, as remnants of the fort lie submerged in the waters within the breakwater and are also likely to be found beyond the breakwater in Barataria Pass. Bagged sand could be used to help stabilize the loose, dredged sand added to fill gaps in the breakwater.

It is likely that such an approach would only be effective until a large storm washes the additional sand from the breakwater, or dislodges sand bags. With the development of La Niña conditions, it is expected that there will be an active hurricane season this year. The potential environmental issues involved in dredging sand should be considered in determining the most appropriate source of sand.

References

At the time of Hurricane Katrina, the island was the site of several points of interest:

1. Fort Livingston
2. The Louisiana Department of Wildlife and Fisheries' (LDWF) Lyle St. Amant Marine Research Lab (closed after Hurricane Gustav, 2008)
3. Two Coastal Wetlands Planning, Protection and Restoration Act (WPPRA) projects that were sponsored by the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service and the Louisiana Department of Natural Resources (LDNR.)

National Register of Historic Places, Fort Livingston, Grand Terre Island, Jefferson Parish, Louisiana, National Register #74000925, 1974; Available from: http://www.crt.state.la.us/hp/nationalregister/nhl/search_results.asp?search_type=city&value=Grand+Terre+Island&pageno=1

[NOAA] National Oceanic and Atmospheric Administration/National Ocean Service (US), Tide/Water Level Data, Preliminary Data, Grand Isle, Louisiana, Station ID 8761724; 2010 Jun [cited 2010 Jun 24]; Available from: http://tidesandcurrents.noaa.gov

Site Record Form for Fort Livingston, State Survey No. 16JE49, State of Louisiana, 1977; including associated Site Update Forms dated 1984 and 2001.