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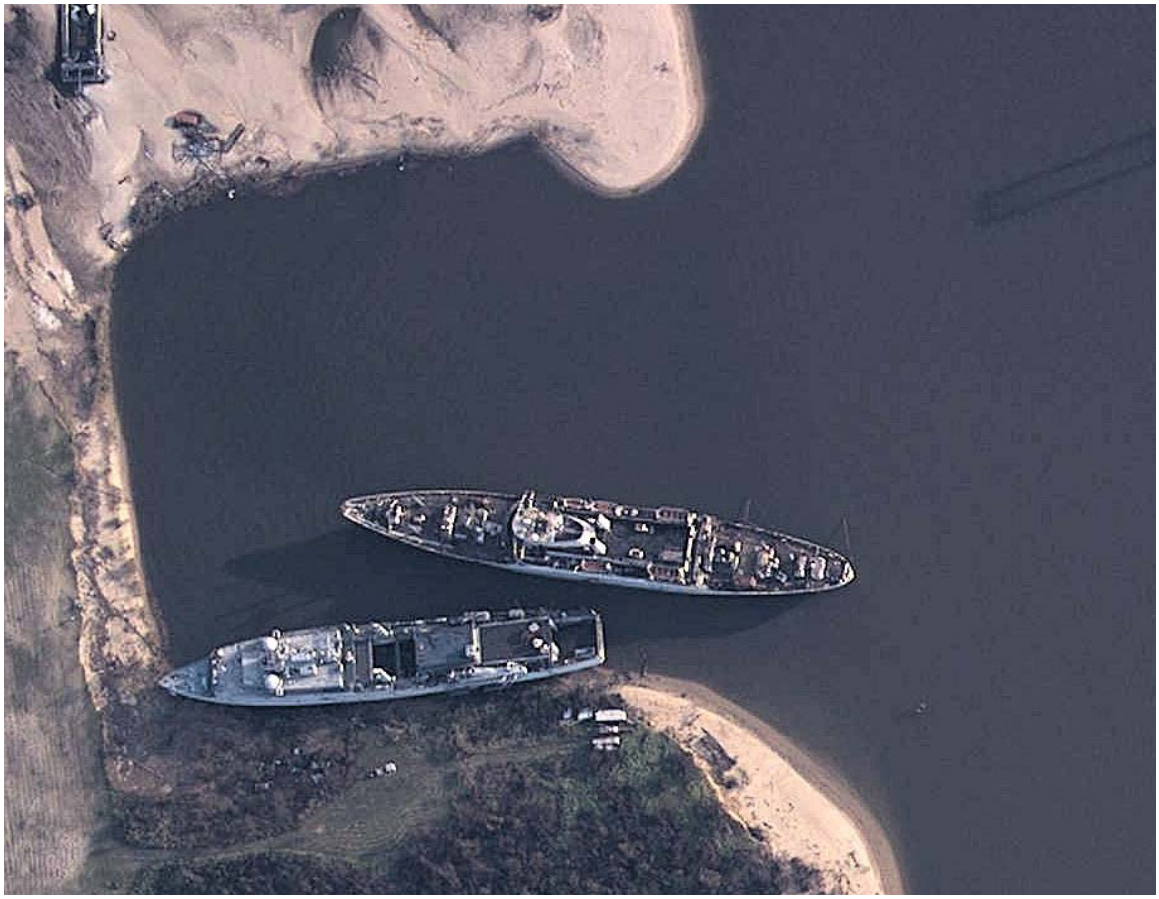
Ex-SHADWELL / Ex-State of Maine Salvage Report



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Foreword

Hurricane Katrina's storm surge and high winds funneled up Mobile Bay and shifted two fire test ships from their moor in Little Sand Island near Mobile, Alabama. The Navy and the Coast Guard's firefighting and materials test ships Ex USS SHADWELL and T/V-STATE OF MAINE were sufficiently grounded that on October 11th, CNO authorized SUPSALV to extract the vessels and return them to proper moors.

Seeing this as a training opportunity, Mobile Diving and Salvage Unit (MDSU) ONE deployed a detachment to provide diving and ground support services to support the extraction. SUPSALV contracted with DONJON for commercial dredging services. This team, lead by SUPSALV salvage engineers, developed a plan, executed it over a 2-1/2 month period, and successfully restored the vessels to their proper positions.

This task when coupled with the training opportunity for MDSU divers, provided a tangible benefit to both the Naval Research Laboratory and U.S. Coast Guard who where the "customers" and the Navy salvage community who gained valuable hands-on experience in vessel extraction..

Well done to the salvage teams who preformed this operation.

Richard Hooper
Captain, USN
Director of Ocean Engineering
Supervisor of Diving

Ex-SHADWELL / Ex-State of Maine Salvage Report
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Ex-SHADWELL / Ex-State of Maine
Salvage Report

1. Background

On August 31, 2005, Hurricane Katrina brought destructive storm surge and winds into Mobile Bay and caused USCG fire test vessel Ex-T/V-*State of Maine* (*Ex-SO MAINE*) and the Naval Research Laboratory (NRL) fire test vessel *Ex-SHADWELL* (LSD-15) to drag anchors and shift their respective moorings at Little Sand Island in Mobile AL. *Ex-SHADWELL*, a WWII amphibious landing dock ship, was moved approximately 100 yards north and rested on the beach at the north end of the cove. *Ex-SO MAINE*, originally contracted by American President Lines, but was taken over by the government for service as a Korean Conflict Troop Transport Ship, was driven 20 yards north and 150 yards east until it rested on a sand bar at the mouth of the cove. Little Sand Island is a man made island east of the main harbor channel leading to Mobile. It was developed from dredge spoils and is subject to Army Corps of Engineers (ACOE) oversight. This report will discuss the planning and extraction of the two ships and their return to permanent moors in the cove of Little Sand Island.

Figure 1. Ex-SO MAINE (on the right) grounded aft and to port of her original moor. Ex-SHADWELL pushed onto the beach in this overflight following Hurricane Katrina.

2. Ship Descriptions and Statistics

Ex-USS SHADWELL (LSD-15)	
	
Authorized Lend-Lease Act As British Mechanized Artillery Transport Tomahawk (BAPM-7)	Originally, WWII USN Landing Ship Dock
Commissioned:	07/24/1944
Decommissioned:	03/09/70
LOA:	458 Ft
Beam:	72 Ft
Max Draft:	18 Ft
Light Displacement:	4960 LT
Custodian:	NRL, Fire Research Det., Little Sands Island, Mobile Bay, Mobile, AL

T/V STATE OF MAINE (T-AP-198)

EX-USNS UPSHUR, EX-PRESIDENT HAYES	Built by New York Shipbuilding Co. in 1951. Taken over by US Navy renamed USS Upshur and used as Troop Transport Ship during Korean Conflict. From 1973 – 1997 loaned to Maine Maritime Academy renamed State of Maine. Currently, on loan from MARAD to US Coast Guard's Fire & Safety Test Detachment on Little Sand Island, Mobile AL, for fire-fighting research
Commissioned:	12/01/52
Decommissioned:	1973 (end of USN troopship era)
LOA:	533 Ft
Beam:	73 Ft
Max Draft:	27 Ft
Light Displacement:	6720 Lt
Custodian:	U.S. Coast Guard, Fire & Safety Test Detachment, Mobile, Al

3. Grounding Details and Development of a Plan

Naval Research Laboratory requested COMNAVSEASYSCOM salvage assistance after Hurricane Katrina via 311936Z AUG 05 NRL WASHINGTON DC Message and on 7 September, 2005 the Coast Guard Research and Development Center requested salvage and recovery assistance for the Coast Guard's Fire Test Vessel, STATE OF MAINE.

An initial survey was conducted in early September by SUPSALV engineers accompanied by Donjon Marine (US Navy East Coast Salvage Contractor) and of immediate concern was the material condition of *Ex-SHADWELL*'s hull. Decommissioned in 1970, the ship had not been dry docked since then and had minimal maintenance on the hull with practically no maintenance below the water line. The condition of *Ex-SO MAINE* was significantly better, due to the ship's continuous usage through 1997.

USS GRAPPLE (ARS-53), in theater participating in the Gulf Coast recovery from Hurricane Katrina, was able to provide the first post-hurricane depth survey of the cove. This depth survey, conducted during the week of 13 September 2005 provided an indication of the amount of dredging work that would be required to refloat the ships. USS GRAPPLE also provided additional input on the material condition of the ships and a situational report on the surrounding waters. USS GRAPPLE's Survey is included in Appendix A.

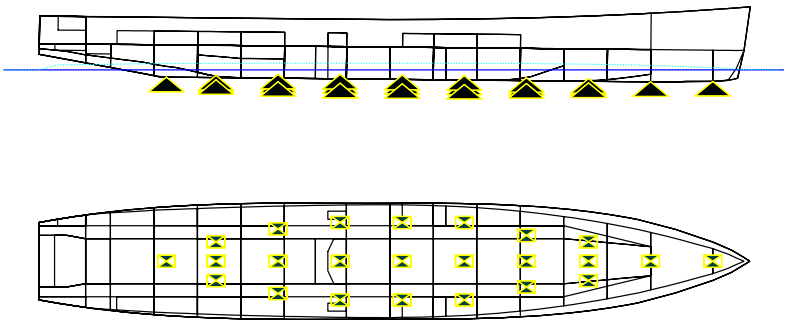
On 17 October 2005, Naval Research Laboratory (NRL) officially requested SUPSALV to provide salvage and recovery assistance for fire test ship *Ex-SHADWELL*. While the vessel was in no danger of sinking and was not a hazard to navigation, NRL requested SUPSALV assistance to restore the vessel to its moored position in order to allow continued use as a fire test vessel. This document and other NRL and Coast Guard tasking messages are included in Appendix B.

Due to the poor material condition of the hull, an in-depth survey of *Ex-SHADWELL*'s hull, which included Ultrasonic Testing, was conducted by GPC/PCCI (U.S. Navy contractors for ESSM support and POSSE modeling, respectively) in November, 2005. The survey documented considerable corrosion of the hull below the waterline and found that the longitudinals in this same region were completely wasted at the hull. This loss of the longitudinal stiffeners meant that much of the bottom plating was unsupported between the frames and susceptible to buckling under compressive loads. A copy of this survey is provided in Appendix C.

Both hulls were modeled in SUPSALV's Program for Ship Salvage Engineering (POSSE) to calculate hull stresses and to estimate the ground reaction. POSSE's versatility allowed for hull corrosion and loss of structural support to be figured into the strength analysis of the hull girder. In *Ex-SHADWELL*'s case, buckling of the bottom plating in compressive loading was the dominant failure mode of concern and the ship was estimated to be 4088 LT aground. *Ex-SO MAINE* was estimated to be 1800 LT aground and the analysis yielded no significant concern for the strength of the hull girder. Based on the strength of the *Ex-SO MAINE*, no additional modeling was performed. SUPSALV's concerns about *Ex-SHADWELL*'s structure resulted in a salvage plan that was developed to keep the hull girder system in tension throughout the process. The plan

involved jetting under the hull in the middle of the vessel and then lowering the stern and finally lowering the bow when the ship was ready to float free. The POSSE model was updated a number of times throughout the process. The initial condition of *Ex-SHADWELL* is depicted in Figure 2. Follow-on models accomplished as the salvage process evolved are included in Appendix D.

Draft/Displacement Summary
Refloat



Stranded Draft / Displacement Data

		Intact Direct	After Outflow	As Stranded
Draft at FP	**ft**	12.47		8.11
Draft at AP	**ft**	11.44		3.82
Trim	**ft**	1.03F		4.29F
Draft at Fwd Marks	**ft**	12.47		8.11
Draft at Aft Marks	**ft**	11.44		3.82
Static Heel Angle	**deg**	4P		7S
Total Weight	**LT**	5,482	5,482	5,482
VCG	**ft**	28.65	28.65	28.65
LCG	**ft-FP**	220.79A	220.79A	220.79A
TCG	**ft-CL**	0.20P	0.20P	0.20P
Buoyancy	**LT**	5,482		2,502
KB	**ft**	6.42		3.47
LCB	**ft-FP**	220.72A		205.17A
TCB	**ft-CL**	1.72P		4.66S
KMt	**ft**	31.53		69.00
FSc	**ft**	0.00		0.00
GMt	**ft**	2.88		32.23

Figure 2. Ex-SHADWELL's initial condition as modeled by PCCI using Program of Ship Salvage Engineering (POSSE).

From the initial survey, a notional salvage plan was developed which called for the use of dredging to reduce grounding forces and refloat the ships. To accomplish this

salvage, SUPSALV assembled a team that consisted of Donjon Marine, SUPSALV's East Coast Salvage Contractor, local contractors (under subcontract to Donjon), GPC who is SUPSALV's Emergency Ship Salvage Material (ESSM) contractor, and Mobile Diving and Salvage Unit (MDSU) ONE, Det ONE. It was anticipated that MDSU ONE divers would support the operation by assisting in jetting the hull plates under *Ex-SHADWELL*, assisting in clearing the dredging suctions and cutter heads as they encountered foreign objects, and setting up and operating the beach gear to aid in pulling the ships off their strands. This joint operation provided a rare real-world salvage opportunity for the MDSU divers, made use of the Navy owned ESSM Salvage equipment staged in Cheatham Annex, Virginia, and took advantage of the expertise of their east coast salvage contractor, Donjon. The joint salvage operation between commercial assets and U.S. Navy Salvage forces would reduce the cost of the salvage operation to the U.S. Government and provide a valuable salvage training experience to the U.S. Navy participants.

Other Team members included:

- PCCI who provided a salvage engineer to perform POSSE calculations
- US Coast Guard Fire & Safety Test Detachment, Mobile, AL. Provided base for staging equipment transport to Little Sand Island, provided Landing Craft for equipment transport and Personnel Boat for MDSU transport. Obtained permits for maintenance dredging. Provided access to *Ex-SO MAINE* and supported numerous other Little Sand Island logistics issues.
- U.S. Navy Research Lab. Provided access to and support for monitoring hull girder stresses on *Ex-SHADWELL*.

4. Salvage Plan

SUPSALV, in conjunction with Donjon, PCCI, and MDSU, developed a plan to conduct the salvage of the two fire test ships. The plan consisted of:

1. Establishing a dredge spoil area on Little Sand Island.
2. Dredging under and around the ships.
3. Dredging final berths for the two vessels.
4. Using land based earth removal equipment to open a channel on the port side of *Ex-SHADWELL* and to begin excavation to the south of to *Ex-SHADWELL's* new permanent berth.
5. Using MDSU divers to keep dredging equipment free of debris and to jet sand from under the keel of *Ex-SHADWELL*.
6. Using ESSM gear and local tugs to extract the two ships and position them in their final moor.
7. Continually monitor stresses on *Ex-SHADWELL* through use of a Hull Girder Deflection Monitoring System and to update the *Ex-SHADWELL* POSSE model as conditions changed during the salvage process.

The complete salvage plan, Titled "Refloat Concept of Operations" as developed by PCCI / GPC and Donjon on 1 December, 2005 is provided in Appendix E.

A final planning document was developed in conjunction with an on-site coordination meeting held prior to the start of the operation. This document, also provided in Appendix E, details the agenda of a 15-16 March 2006 planning meeting held in Mobile, AL. The document outlines the agenda, objectives, equipment required by all parties, and the final action items that needed to be resolved to ensure the operation was successful.

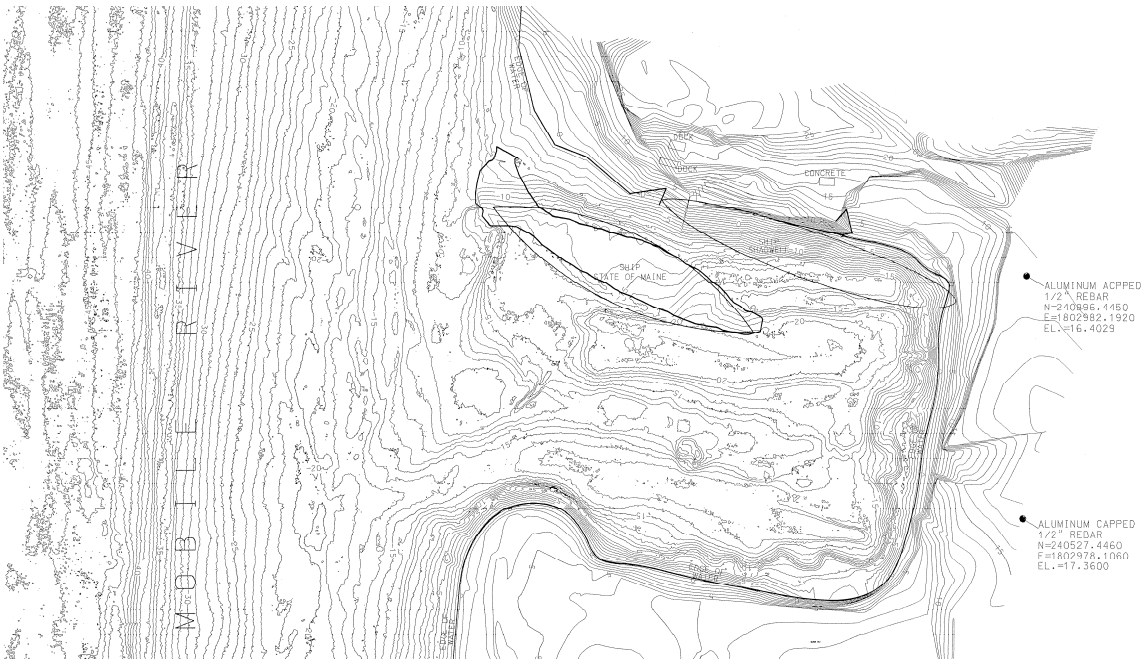


Figure 3. Chart compiled from surveys depicting the cove in Little Sand Island after the storm.

5. Berm Construction

Based on the initial USS GRAPPLE survey and subsequent surveys conducted by McWIlliams, the dredging requirements were developed. The salvage plan required removal of approximately 70,000 cubic yards of material. Donjon contracted with a local marine construction firm to construct a berm large enough to contain the anticipated dredge spoils. The berm would allow the dredge slurry to settle and water to flow out a spillway. Since Little Sand Island originated as a spoil site, the permitting process was simplified. The US Coast Guard Fire & Safety Test Detachment, Mobile, AL applied to have an existing permit for "maintenance dredging" reactivated.

The berm construction specifications called for construction of an 11 foot high earthen wall encompassing approximately 20 acres on Little Sand Island, Mobile, AL. (see Figure 4). The bermed area needed to be capable of accommodating 400,000 cubic yards of dredged spoil material to be removed from the mooring slip containing the Navy and Coast Guard test vessels at the island. The berm wall was to be constructed from ground material (i.e., sand) from the island. Sand would be excavated along the perimeter of the berm wall and used for the wall's construction. The berm wall had to be at least 10 feet wide at the top to allow movement of construction equipment on the wall top. The wall also had to be wide enough at the base to support the weight of sand

created by the wall's 11 foot height. The berm wall was sloped both on the inside and outside of the berm. The outside wall was sloped at a ratio of one foot high to three feet wide while the inside wall was built with a one to two foot slope.

Figure 4. Little Sand Island. Cove containing Ex-SO MAINE and Ex-SHADWELL to the left. Dredge spoil area and berm location drawn in red to right. This picture was taken well before Hurricane Katrina and the third vessel shown in the image to starboard of Ex-SO MAINE was not present at the time of the storm.

While the contractor had to provide all the heavy-duty equipment and personnel needed to construct the berm, they were offered transport to the island using the CG Fire & Safety Test Detachment's (F&STD) vessels. In support of this effort, F&STD provided transport for the contract workers to and from the island each day. Transport included F&STD's heavy duty transporter which was a 74 foot Landing Craft Mechanized (LCM-8) with a motorized front landing gate. The cargo bay of the LCM-8 is approximately 14 feet 5-inches wide, 42-feet long, and capable of transporting up to 120,000 pounds. Additionally, a 35-foot workboat and two 24-foot small boats were also available for transporting personnel. Each small boat could accommodate 10 people.

Figure 5. Coast Guard Fire and Safety Test Division transport vessel (LCM-8) delivering supplies to Little Sand Island.

6. Dredging and Land-Based Earth Removal

After completion of the spoil basin, the task of dredging began. The objectives were to:

1. Remove sufficient material to allow for the extraction of both the *Ex-SHADWELL* and *Ex-SO MAINE*.
2. Create two deepwater slips for both the *Ex-SHADWELL* and *Ex-SO MAINE* with a mound in between and to the "offshore sides" so that, except in the most extreme weather conditions, the vessels "slips", in conjunction with their mooring systems, will ensure they remain in their prescribed locations. The higher elevations outside the vessels' slips will substantially assist in this effort.

The large dredge arrived on site on 10 April 2006 and worked through 26 June. This machine pumped through a 15" diameter pipe to the spoil site. The dredge was staffed to work 24-hour operations. As the dredge began work in the cove, metallic debris was often encountered. This included old mooring chain, wire rope, pilings, and other miscellaneous debris. Encountering this material with a dredge cutter head resulted in down time while the equipment operators, often in conjunction with MDSU divers, cleared the dredge pumps, cutter head or suction pipes. Occasionally, damage resulted from the entanglement and supplies were required to return the equipment to operation. Figure 6 is an image of the dredge working on the starboard side of the *Ex-SO MAINE*. Figure 7 is an image of the cutter head of the dredge being cleared of debris by its crew.

Figure 6. Large Dredge working the starboard side of State of Maine

Figure 7. MDSU and dredge operators work to clear large dredge cutter head of debris encountered during dredging operations

In order to complete the dredging, Donjon eventually ordered a second dredge to the site. The second dredge worked from 3 May through 15 June and was instrumental in combating the high concentration of clay that occupied the cove under *Ex-SHADWELL* and *Ex-SO MAINE*. Figure 8 is a picture of the smaller dredge working under the port quarter of *Ex-SHADWELL* on the 1 June 2006.

Figure 8. Small Dredge clearing a channel on the port quarter of Ex-SHADWELL

Dredge spoils were pumped to the center of the bermed area where earth moving equipment tended the outflow pipes, monitored the outfall and graded dried sand to facilitate the containment of the dredge spoil. The large earth moving equipment on the island moved the spoils and the outflow pipes around the bermed area to ensure all the space inside the berm was effectively utilized. Figure 9 is an image of the spoil site. The image shows the outflow pipes, piled up spoil, and the berm, nearly filled with water in the background.

The earth moving equipment also supported the dredging efforts two additional ways. The first was by removing earth adjacent to *Ex-SHADWELL*'s port side as she sat on the beach. At the beginning of the operation, *Ex-SHADWELL* port side sat over hard sand. The excavator cleared enough material to allow the small dredge to begin working the port side of the hull. By mid-June, the large dredge was also able to work on *Ex-SHADWELL*'s port side.

The second dredging operation undertaken by the earth moving equipment was to help prepare the new moor for *Ex-SHADWELL*. During the week of 8 May, 2006 an excavator began pulling sand out of the shallows on the south west side of the cove. This portion of the cove had been filled in by Katrina and required clearing to allow *Ex-SHADWELL* into its prescribed moor. As the excavator dug, the shoreline shifted south. The sand that was removed was pushed and graded by a bulldozer and evolved into a substantial dune which would help shield *Ex-SHADWELL* from potential southerly blows. Figure 10 is an image of the sand piles being excavated and pushed up into dunes.

Figure 9 Little Sand Island spoil site. Earth moving equipment arranging sand during a dredging break.

Figure 10. South West corner of the cove on Little Sand Island. Machinery moving sand removed from Ex-SHADWELL's planned moor.

7. Laser Hull Girder Deflection Monitoring System

Concern for the potential of local failure through plate buckling resulted in the development of a system to monitor very small deflections of *Ex-SHADWELL*'s hull. This system, the Hull Girder Laser Monitoring System, used a surveyor's laser level and

a laser sensing target to measure changes in the hull at multiple pre-defined points, which were then be used to calculate stress in the hull. *Ex-SHADWELL*'s well deck was open and large enough to set the system up. The rotating laser was fixed in the center of the well deck and sixteen measurement points were established. The measurement points established hull deflection conditions at frames 22, 36, 74, 88, 101 and 111. Measurements could be collected in less than 30 minutes and the system proved accurate to within 1/16-inch over the length of the well deck. Figure 11 contains a photo of the rotating laser level and one of the measurement points. Appendix F. contains several spreadsheets depicting hull deflection readings from *Ex-SHADWELL*.

Figure 11. Davis White rotating laser level (to the right) and receiver/measurement point to the left (highlighted by arrow) in well deck of Ex-SHADWELL

8. T/V STATE OF MAINE Extraction

Ex-SO MAINE was grounded aft with the bow cantilevered over the ship's previous mooring position. The plan was to first, dress up the permanent moor berth with the dredge. Then dredging was to be concentrated at the stern until the ground force was estimated to be reduced to 150 LT. This would allow beach gear or beach gear and tug combination to pull the ship free of the bar and then have the tugs reposition *Ex-SO MAINE* in its moor. MDSU set up beach gear running from the starboard anchor hawse hole leading forward and starboard to shore and a second leg leading nearly perpendicular off the starboard side (see Figure 12). Each of these legs of U.S. Navy Standard Beach Gear consisted of the following: 6,000 pound Lightweight Anchor, one shot 2-1/4" chain, spools of 1-5/8" wire rope (300 or 600 feet), and a hydraulic puller. After dredging at the stern and starboard side for nearly 30 days (10 April – 9 May minus

dredge down time) an attempt was made to pull *Ex-SO MAINE* free of her stand. Nearly 100,000 lbs of pull was achieved with the starboard bow hydraulic puller but no movement was detected. On 10 May, a strong southerly was blowing water to the north end of Mobile Bay raising the water level above the normal high tide and two Crescent Tugs were engaged try to shift *Ex-SO MAINE*'s stern to starboard. The tugs effort in conjunction with the single leg of beach gear failed to shift *Ex-SO MAINE* that day so further dredging was employed.

Figure 12. Excavator assisting MDSU ONE team in setting the anchor in a deadman. In foreground is the bridle assembly and 50-ton hydraulic cable puller and to the left is the control panel and new electronic tension measuring device.

The second leg of beach gear was deployed on 11 May and tensioned, confirming the anchor was set. By 14 May, 24 hour a day dredge operations had completed a trench 30 ft deep along the grounded length of the hull on both the port and starboard side and on 15 May the ship refloated following the collapse of the remaining supporting ground material. The hull was positioned in the mooring location designated by the USCG FS&T Det in Little Sand Island Cove, which approximates the pre-stranding position. A temporary moor was established using ship's port and starboard bow anchors set on the shore and one stern mooring leg. One additional mooring leg is being readied for deployment following completion of Ex-SHADWELL ops. GPC began packing up much of the ESSM gear deployed for the operation including the U.S. Navy Standard Beach Gear and the Hydraulic Pulling engines. This material was returned to Cheatham Annex and the remaining ESSM gear, left on site for the Ex-Shadwell extraction, is identified in Appendix I, "Remaining ESSM Gear to Support Salvage Operations in Mobile AL".

Figure 13. Two Crescent Towing tugs attempting to free Ex-SO MAINE from strand on 10 May 2006. Ex-SO MAINE finally floated free on 15 May after additional dredging.

9. *Ex-SHADWELL* Extraction

Hurricane Katrina pushed *Ex-SHADWELL* on the beach. Her port side was sitting over dry sand and her bow was firmly pined on the beach. Figure 14 shows *Ex-SHADWELL* after the storm and at the beginning of the land-based excavation. *Ex-SHADWELL'*S extraction began on 7 April with excavators and bulldozers beginning to remove earth from the port side of the hull.

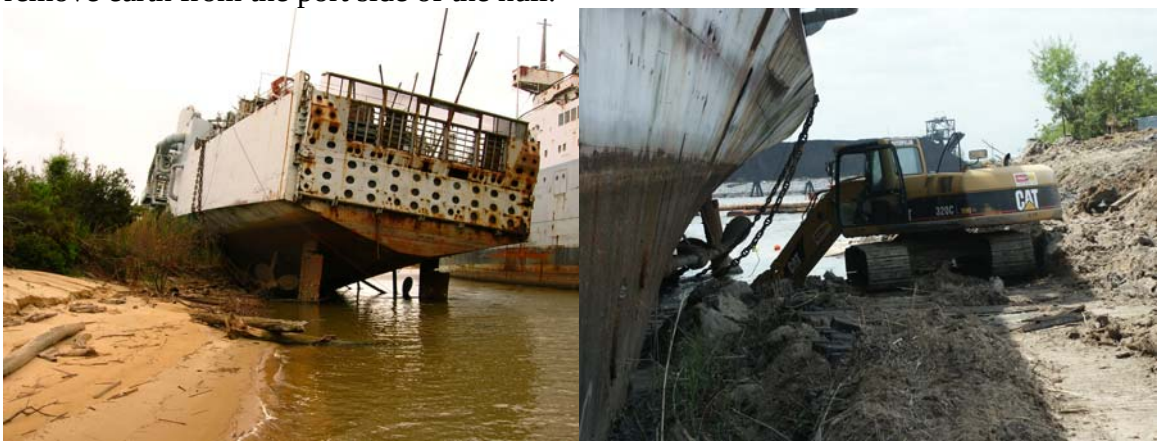


Figure 14. Ex-SHADWELL hard aground and at the beginning of land based excavation.

Because of *Ex-SHADWELL*'s degraded longitudinal stringers and the potential for the hull plates to buckle under additional stress, the salvors carefully planned her extraction to maintain tension on her hull girder system. Flooding alarms were installed (components from the ESSM Towing System) on 10 April and the Laser Hull Girder Monitoring System was set up on 12 April to track changes in hull stress.

By 21 April, shore-based excavation on the port side was complete and on 26 April, MDSU One divers began jetting sand out from under the hull between frames 24 and 76. This was done to place the center of the hull in tension and not increase any pressure on the plates and hull girders.

On April 26th, SUPSALV placed a second dredge on contract and began extracting sand and mud along the port and starboard quarters on *Ex-SHADWELL*. The large dredge was generally working on the *Ex-SO MAINE* extraction and dredging the cove where the two vessels would be permanently moored once extracted.

When *Ex-SO MAINE* floated free on 15 May, both dredges concentrated on *Ex-SHADWELL* alternating between *Ex-SHADWELL* and the site of the permanent moor. On 19 May pilings associated with an old service platform were discovered just to the north of *Ex-SHADWELL*'s planned permanent moor. It was decided to remove the portion of the platform above the cove bottom but not to remove its foundation because there was enough space between the service platform and the cove shoreline for the moored vessel.

Back on *Ex-SHADWELL*, the shore side digging and small dredging had increased the clearance on the port side to allow the large dredge to work both sides of the hull. MDSU One divers set up their diving barge forward on Ex SHADWELL on 19 May and began jetting under the hull between frames 15 and 29 and completed jetting between frames 29 and 85.

On 12 June, after nearly continuous dredging with both dredges since 15 May, *Ex-SHADWELL*'s list dropped from 11 degrees starboard to 6 degrees starboard. Dredging continued and MDSU divers were routinely engaged in removing obstructions from the dredge paths to keep those systems in operation. On 16 June, *Ex-SHADWELL* shifted from 7 degrees starboard to 0.5 degrees port. Attempts to push Ex-SHADWELL free using the Utility Tug that was providing daily support were unsuccessful. The large dredge re-engaged the clay on the starboard side of Ex SHADWELL and after two days of downtime for repairs on 21 and 22 June, the dredge continued working starboard side, from the stern forward to amidships, digging at the 33-foot level and then the 25 foot level. The ship continued to rest on a shelf along the centerline of the hull. It was anticipated that this shelf would fall away as its base was removed by the dredge.

Analysis of tidal predictions indicated that a period of more extreme tides was approaching and would peak during this 24 – 27 June time frame. The salvage team was hoping that their dredging efforts would allow them to take advantage of these high tides. A copy of the predicted tides for May and June are provided in Appendix G. The tide tables clearly show the key role the monthly tide cycle played on the days both *Ex-SO MAINE* and *Ex-SHADWELL* floated free of their strands.

On 26 June at 1045, more than an hour earlier than predicted, *Ex-SHADWELL* floated free and local tugs were used to pull the ship out of the cove, rotate her 180 degrees in the shipping channel and push her back the into her permanent mooring on the south end of the cove on the Little Sand Island. This moor, as diagrammed in Figure 15, was at the south end of the cove and well separated from *Ex-SO MAINE* whose shift toward *Ex-SHADWELL* during Hurricane Katrina may have contributed to her mooring system failure.

Following the setting of the permanent moor, PCCI was tasked with performing a mooring analysis for the final *Ex-SHADWELL* moor. That analysis concluded that it was possible that the ship would shift in its moor with strong northerly or southerly winds. Furthermore, they noted that if a significant storm surge did not accompany the wind, it was likely that the sides of the dredged channel would assist in keeping the ship in its moor. That Mooring Analysis report is included in Appendix H.

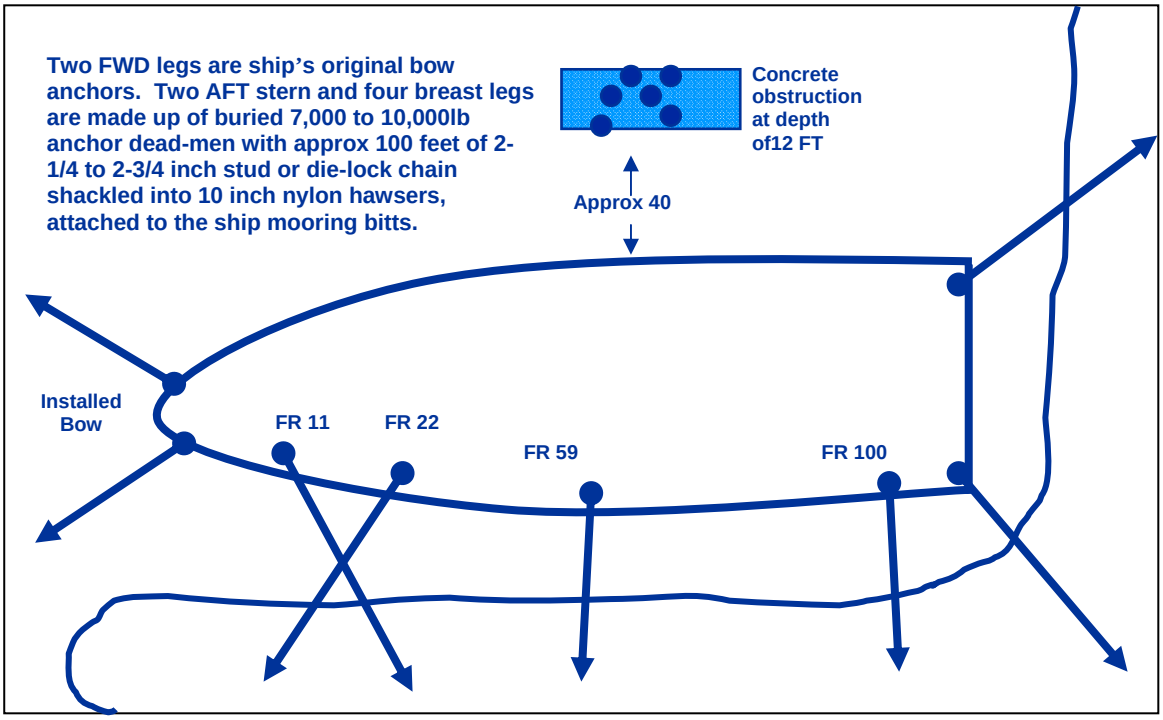


Figure 15. Ex-SHADWELL permanent mooring plan

10. Funding - Cost of Operation

Original tasking required separate identification of funding requirements for Ex-SHADWELL and *Ex-SO MAINE* so SUPSALV developed funding estimates for each of the tasks. Eventually, NRL indicated that they would pay the entire cost of the operation and then they would bill the Coast Guard for their share. This simplified the accounting task for SUPSALV who prorated costs to *Ex-SO MAINE* as a percentage of the total costs. Costs for each area of support for the operation are identified in Figure 15 and the breakdown of costs between Ex-SHADWELL and *Ex-SO MAINE* is provided in Figure 16.

Final Cost		Funds Appropiated			Obligations		
		USCG	HSCG3206XE00011	$15,249.00	N0002403D4202	10	$10,000.00
					N0002401D4018	856	$5,249.00
GPC PCCI & ESSM Support	**$269,308.00**	NRL	N0017306RC00013	$30,996.00	N0002401D4018	856	$20,996.00
Site Survey	included above				N0002403D4202	10	$10,000.00
Hull UT Inspection	included above	NRL	N0017306RC00049	$1,778,357.00	N0002401D4018	856	$5,330.00
POSSE Model SHADWELL	included above				N0002401D4018	856	$97,233.00
POSSE Model SOM	included above				N0002403D4202	10	$1,557,066.00
Laser Hull Girder Deflection System	included above				N0002401D4018	856	$30,000.00
ESSM Equipment & Operators	included above		N0017306RC00049.03	$150,000.00	N0002403D4202	10	$79,500.00
SHADWELL Mooring Design	included above				N0002401D4018	856	$70,500.00
SOM Mooring Design	$0.00		N0017306RC00049.04	$764,301.76	N0002403D4202	10	$740,500.00
					N0002401D4018	856	$25,000.00
DONJON Support	**$2,751,510.30**		N0017306RC00049.05	$500,000.00	N0002403D4202	10	$416,282.00
Salvage Master	included above				N0002401D4018	856	$15,000.00
Dredge Barges	included above						
Floating Crane w/Handling Tug	included above						
Harbor Tugs	included above						
Earth Moving Equipment	included above						
Berm Construction	included above						
SUPSALV Support/Travel	$0.00						
TOTAL w/out MDSU:	**$3,020,818.30**		**Total:**	**$3,238,903.76**	**Total:**		**$3,082,656.00**
Total Funds Not Used:	**$218,085.46**				**Unobligated Funds**		**$156,247.76**
MDSU ONE Support	**$85,000.00**	NRL	direct to MDSU	$100,000.00			
MDSU Extension	**$15,000.00**						
Total Cost:	**$3,120,818.30**						

Figure 16. Costing data for the extraction project.

Agency					Shadwell		St. of Maine
	Contract Delivery Orde	CATEGORY	TOTAL		COST		COST
DONJON MARINE CO., INC.	0010						
		Subcontractors					
		C&C Marine/Large Dredge	$1,932,000.23		$1,257,790.81		$674,209.42
		Construction Solutions/Crane Barge	$321,335.91		$208,856.13		$112,479.78
		Lott Enterprises/small dredge	$221,974.43		$170,096.35		$51,878.08
		Beard Equipment/Ground Equpment	$12,493.93		$9,624.85		$2,869.08
		Crescent Towing/Tugs	$14,368.35		$9,229.60		$5,138.75
		Others/Fuel, supplies, consumables	$4,155.07		$2,432.70		$1,722.37
		PCCI, Inc./Engineering Support	$101,652.56		$76,652.56		$25,000.00
		Subtotal	$2,607,980.48		$1,734,683.00		$873,297.48
		SCH LABOR	$99,493.22		$72,052.30		$27,440.92
		NONSCH LABOR	$10,496.48		$5,248.24		$5,248.24
		PERDIEM	$12,467.91		$8,729.59		$3,738.32
		TRANSPORT	$7,985.17		$5,283.52		$2,701.65
		MISC	$13,097.04		$10,624.34		$2,472.70
		Delivery Order Total	**$2,751,520.30**		**$1,836,620.99**		**$914,899.31**
GPC, Joint Venture	0856						
		Subcontractor	$9,234.00		$6,463.80		$2,770.20
		Engineering Labor	$50,601.45		$36,892.05		$13,709.40
		GPC labor	$90,785.00		$63,549.50		$27,235.50
		Travel/PerDiem	$37,262.00		$26,083.40		$11,178.60
		Transportation Equipment	$27,914.00		$19,539.80		$8,374.20
		Supplies/Material	$16,272.00		$11,390.40		$4,881.60
		Material Serv. On Order	$8,211.00		$5,747.70		$2,463.30
		Material On Order	$4,546.00		$3,182.20		$1,363.80
		Award Fee	$24,482.55		$17,284.89		$7,197.66
		Delivery Order Total	**$269,308.00**		**$190,133.74**		**$79,174.26**
MDSU			**$123,861.01**		**$83,861.01**		**$40,000.00**
		Project Total	**$3,144,689.31**		**$2,110,615.74**		**$1,034,073.57**

Figure 17. Cost breakdown between Ex-SHADWELL and Ex-SO MAINE.

11. Lessons Learned

Dredging Complications - Following the completion of operations to refloat SO MAINE and Ex-SHADWELL, the Program Management team conducted a review of the operation to determine factors which resulted in delays to the schedule. The list of factors is as follows:

1. Obstructions: The most significant obstacle to maintaining schedule was the substantial amount of general material and debris encountered within the cove area which obstructed dredging operations. The general material obstructions included electric cables, synthetic line, wire rope, anchor chain, anchors, mooring blocks, crab pots, fishing nets, building components, shipboard equipment, and miscellaneous metal items. Delays to dredging ops varied from minor, requiring only minimal time to clean out the cutter head of the dredge, to major, requiring several days to repair damage to the dredge.

2. Clay Deposits: Located in the cove and as part of the northern hill on which *Ex-SHADWELL* was beached, the clay deposits proved to be a tough impediment to get through.

a. Clay deposits below the water surface slowed dredging ops by resisting breaking up as the cutter head passed and demonstrated a high compressive strength, supporting the stranded hulls well beyond the engineering calculations for that soil type.

b. The sand and clay mixture that was deposited on the hillside adjacent to Ex-SHADWELL proved unstable. The soil on the hill and down at the water level was unable to support the spoils that were removed and placed ashore as land-based digging equipment began to free Ex-SHADWELL from the embankment. After witnessing the unstable and slipping material edge back into the recently excavated slipway, additional spoil extraction and movement further from the shoreline was required. This unstable shoreline resulted in an unplanned removal of approximately 25,000 cubic yards of material to support dredge operations.

3. Sediment Volume: The sediment content of the Mobile River and the location of the cove in the river's flow, resulted in a rapid back fill of dredged areas. This frequently resulted in having to redredge areas multiple times in order for salvage operations to proceed.

4. Abandoned Structures: Abandoned structures on the island not only became obstructions to dredging after being swept in to the water by the storm, but also structures abandoned in the water became potential items threatening ship safety. Removal of the items delayed dredge ops and required support of alternate methods to accomplish their removal.

5. Reported Drafts: Differences in the reported drafts of the ship before stranding and the actual drafts following refloating ops resulted in an increase of approximately 60% in the calculated ground reaction and a corresponding increase in the dredging required in order to free the hulls. The initial dredging plan, which was developed in response to the

calculated ground reaction, was obviously unable to refloat the ship. Progressively deeper cuts were required in order to free the hull. This extended the duration of the overall salvage operation.

MDSU One

MDSU participated in this salvage task as a training opportunity for the members who deployed to Alabama. Setting up two sets of beach gear on the *Ex-SO MAINE* and placing a load on the gear was an excellent practical exercise although it was not clear that the beach gear played a role in freeing *Ex-SO MAINE* from its strand.

A key MDSU task was the the jetting of mud under the hull of *EX-SHADWELL*. This task was an integral part of the salvage plan. It reduced the ground reaction of the hull and ensured the keel was kept in tension, easing the pressure on the fragile hull plates and structure

MDSU was on site from 1 April through 7 June 2006. In addition to the jetting task and the beach gear setup exercise, MDSU divers supported the dredging operations with almost daily dives to clear the dredge of debris or to locate and identify debris encountered by the dredges and rig that debris for removal. Other than when performing the two planned salvage support tasks, it was difficult to keep the team fully employed until the dredges encountered a new item of debris in its path This was a minor time management efficiency issue.

ESSM

Appendix I contains a detailed list of equipment ESSM provided to support this operation. Appendix I also includes a list of equipment that was retained after *Ex-SO MAINE* extraction and positioning at her permanent moor. As a part of providing and maintaining this equipment for the duration of the operation, a number of issues came to light and lessons resulting from those issues are identified below:

- Equipment Repair Kits: Evaluate Configuration to support extended operations.
- RHIB: Equipment Configuration & Trailer needed to support long distance tow and long term operations. The bladders were worn and one had to be re-pressurized regularly.
- Small Electric Generators: ESSM should purchase hand carry model for portable operations.
- Pump & Hose Fittings: Complete conversion to Camlock compatible system.
- Salvage Rigging Van: Develop a Field Kit
- Local Fuel Loading and Storage Requirements
- Shipboard Welding Kit – Purchase/stock kit for portable above water welding.

00C Staff

SUPSALV salvors should have a kit of gear to support remote operations. This kit should include a marine band VHF radio, a handheld GPS, and a digital camera. The

NMCI provided laptops outfitted with Verizon Cards provided satisfactory remote electronic communications.

12. Conclusion

Ex-SHADWELL and *Ex-SO MAINE* were extracted from their strand and positioned in their final mooring locations and all mooring equipment has been positioned to meet the customer's requirements. Little Sand Island's cove has been dredged to support the permanent moors. All salvage equipment has been removed from the island, loaded on to trucks, and is being transported back to the ESSM warehouse. Certification of Delivery letters were provided to customer reps for both ships and are included as Appendix J. A copy of the timeline for this operation is included in Appendix K. Text from the Situation Report Messages, issued three times a week, are included as Appendix L. This Timeline and the Situation Reports document the determination and perseverance of the project team who steadfastly resolved the many obstacles encountered in order to complete the successful salvage operation. GPC's final report for Operational Delivery Order #0856/S116 is provided as Appendix M. A briefing conducted after the operation highlights many of the challenges of the tasks and provides additional photos of the operations. This brief is provided as Appendix N.

Figure 18. Ex SHADWELL and Ex-SO MAINE moored in their final positions.

Appendix A

ex-STATE OF MAINE SALVAGE SURVEY

LT Shaun P. Hayes, USNR
USS GRAPPLE (ARS 53)

TABLE OF CONTENTS

TABLE OF FIGURES

SALVAGE SURVEY

General Information:					
Type of Casualty:	Stranding				
Date/time of casualty:	Hurricane KATRINA, August 2005				
Ship's name:	ex-STATE OF MAINE				
Hull type:	BARRETT Class Transport				
Builder:	New York Shipbuilding Corp. Camden, N.J.		Year:	1952	
Flag:	United States				
Hull or Pennant # (Naval)/Official # and Builder's (merchant):	AP-198				
Homport:	Little Sands Island Mobile Bay, Mobile Alabama				
Planning Yard (USN):	Unknown				
Owner:	Custodian Fire Research Detachment Little Sands Island Mobile Bay, Mobile, AL				
ISIC (Naval)/Agent (merchant):	Not applicable				
Local Contact:	CWO Quincy Merriweather, USCG – (251) 441-5040				
Location (area name):	Little Sands Island Mobile Bay, Mobile Alabama				
(coordinates):	approximately 30° 30.7' N 088° 01.7' W				
Nearest Port:	Mobile, Alabama		Distance:	Negligible	
Nearest U.S. or Allied Naval facility:	Naval Station Pascagoula- 58 Nm (sea) / 44 mi (land)				
Nearest major U.S. or Allied Naval station/repair facility:	Naval Station Ingelside- 605 Nm (sea) / 681 mi (land) Naval Station Mayport- 1000 Nm (sea) / 425 mi (land)				
Crew Status:	Not applicable				
Hazardous Cargo?	Numerous miscellaneous hazardous cargo onboard. Many of the miscellaneous HAZMAT distributed throughout the ship in individual containers		Spill?	Possible	
Oil spill or other pollution occurred or likely?	Possible				

Principal characteristics of casualty:					
LBP:	Unknown	LOA:	534'	Beam:	73'
		Light Draft (original)		***Seagoing Loaded (original)***	
Normal service draft:		Unknown		27' *(original)*	
Displacement:		11230 tons *(original)*		17630 tons *(original)*	
Deadweight:		6400 tons *(original)*			
Number of Tanks/Holds:		Unknown			
Propulsion:		Unknown			
Framing system/significant structural details:		Unknown			

Brief descriptions of casualty, pre-casualty condition, cargo load, major damage, and ship's overall condition:	
Damage (hull/structural):	No signs of damage to hull from external survey conducted. Small damage to added-on ladder and porthole on port side near main deck from apparent collision with ex-SHADWELL. See Enclosure 1, Figure 3 & 4.
Machinery (condition/status):	Unknown.
Flooding:	No signs of flooding caused by stranding from external survey conducted.
Fire:	Used as fire research facility. No fires appear to have been caused by stranding.
Aim/intent of salvage operation:	Debeach ex-STATE OF MAINE into a dredged moor on Little Sands Island Mobile Bay, Mobile Alabama
Available Assets:	
On-scene:	USCG Group Mobile
In-area:	USS GRAPPLE (ARS 53) Mobile Diving and Salvage Unit Two detachments in theater
Other assets:	

Drawings and documents available:			
General Arrangments	Unknown	Lines	Unknown

Secrion Scantlings	Unknown	Shell Expansion	Unknown
DC Book	Unknown	DC Plates	Unknown
Liquid Load Diagram	Unknown	Flooding Effect Diagram	Unknown
Draft Diagram	Unknown	Ship's Information Book	Unknown
Bonjean's Curves	Unknown	Structural Plans	Unknown
Sounding/Ullage Tables	Unknown	Capacity Plan	Unknown
Deadweight Scale	Unknown	Trim and Stability Book	Unknown
Stowage/Load Plan	Unknown	Cargo Manifest	Unknown
Deck Log	Unknown	Engineer's Log	Unknown

Pre-casualty stability information known or available from plans/documents:

KG	Unknown	KM	Unknown	TPI	Unknown	MTI	Unknown

Comments: None

	Before Stranding	After Stranding
Drafts:		**13SEP05, 1900Z**
Fwd:	Unknown	18' 9" (18' 6" PORT/ 19' STBD)
Aft:	Unknown	18' 6" (approximated)
Hog/Sag:	Unknown	Unknown
Displacement:	Unknown	Unknown
Trim:	Unknown	Unknown
List:	Unknown	Visible starboard list of unknown amount
Heading:	Unknown	072T (calculated from GPS data)
Engine Order:	None	None
Loading Summary*	Unknown	Unknown
Solid Cargo:	Unknown	Unknown
Liquid Cargo:	Unknown	Unknown
Fuel:	Unknown	Unknown
Lube Oil:	Unknown	Unknown
Feed Water:	Unknown	Unknown
Portable Water:	Unknown	Unknown
Water Ballast:	Unknown	Unknown
Permanent Ballast:	Unknown	Unknown
Ammunition/Explosives	Unknown	Unknown
Flooding Summary*	Unknown	Unknown
Course/speed at time of stranding:	None/None	
Position of rudder at time of stranding:	Amidships. See Enclosure 1, Figure 5 & 6.	

* See attached sheet(s) for detailed loading/flooding accounting

ACTION TAKEN TO DATE

Date:	Accomplished by:	Action:
Unknown	Unknown	*Anchors Laid Out:* Mooring chain laid out for berth prior to Hurricane Katrina. See Enclosure 1, Figure 7 & 8.
Unknown	Unknown	*Ship Ballasted:* Unknown
Unknown	Unknown	*Ship Lightened:* Unknown
Unknown	Unknown	*Weight Shifts/Changes:* Unknown

SITE SURVEY

Casualty exposed to:			
Swell:	(height/period)		
Seas:	(height/period, breaking?)		
Wind:	(speed/direction)		
Currents:	(surface, speed/direction)		
	(subsurface, speed/direction)		
Weather Temperature:			
Type and range of tide:			
Bottom:			
Material:			
Slope:			
Topography:			
Beach Survey Conducted?			
Access:			
to the wreck site:	Via Mobile shipping channel (approx. depth of 45 feet)		
to the wreck:	Added-on platform and ladders on starboard side		
to beach/shore:	Via Mobile shipping channel (approx. depth of 45 feet)		
General Site Description:			
Exposure:			
Weather:			
Access to Deep Water:			
Weather forecasts available?			
Tides tables available?		**Tide gage set up?**	
Current predictions available?		**Current monitored?**	
Current Effects:			
Scouring:	From discussion with local USCG personnel, and from depth contour information provided by USCG, it appears there has been no historical scouring effect by current.		
Silting/Sand Buildup?	From discussion with local USCG personnel and from depth contour information provided by USCG, current appears to historically cause sand buildup in the Little Sand Island inlet. Additionally, from the depth contour information provided by local USCG personnel and from GRAPPLE's own soundings, it appears Hurricane Katrina has caused a build up of at least 3 to 4 feet of sand in the Little Sand Island inlet.		
Accurate large scale chart, recent edition, covering salvage site available?			
Area around casualty and channel to deep water sounded?			
Pollution note:			
Description:	None observed during initial external survey.		
Magnitude:			
Source:			

Attach sketch showing position/orientation of casualty relative to shoreline, obstructions, hazards, deep water; channel to deep water; soundings; any anchors laid out; extent of any pollution and containment efforts, etc.

EXTERNAL CASUALTY SURVEY

Date/Time:	September 13, 2005 1900Z		
Dive Survey:	None conducted	Supervisor:	N/A
Photographs, video tapes, sonar traces, etc., available?		See Enclosure ????	
Aground over what length(s):		Unknown	
Settled into bottom?	Yes	Machinery Suctions clear?	All visible appear clear

Soundings:		
Distance from Bow:	**Port**	**Starboard**
0 Ft	20’	18’ 6”
1st chock on hull of ex-STATE OF MAINE	20’	16’ 6”
2nd chock on hull of ex-STATE OF MAINE	20’ 6”	15’ 5”
3rd chock on hull of ex-STATE OF MAINE	21’	11’
4th chock on hull of ex-STATE OF MAINE	15’	12’
Double Water Tight Doors (3rd Level)	15’	12’
5th chock on hull of ex-STATE OF MAINE	15’	12’
6th chock on hull of ex-STATE OF MAINE	15’	13’
7th chock on hull of ex-STATE OF MAINE	12’ 6”	12’
Stern point of rudder	6’	6’

External Damage:	
General Position/Attitude/Damage:	Ex-STATE OF MAINE appears to have twisted to starboard during the surge of Hurricane Katrina. Based on the soundings above, it appears that she may still be floating in the bow but she most likely ran aground aft due to the twist.
Cargo leaking/spilling from hull ruptures:	None observed during initial external survey (13SEP05)
Propeller(s) and Shaft(s):	1 Propeller1 and 1 Shaft
Rudder:	1
Hatches and W/T Closures:	Three sets of double water tight doors on the hull on both sides of ex-STATE OF MAINE. Numerous water tight doors above the main deck have rusted in the closed position.

Potential removable weights:		
Object	Location	Approximate Weight
	Many potential removable weights topside, see Enclosure 1, Figures 9-11.	

Lifting points: Due to size of ex-STATE OF MAINE, lifting appears to be impracticable
Pulling points: See Enclosure 1, Figures 12-14.

Attach sketches or copy of arrangement plans showing damage to shell plating, superstructure and decks, mudline, portions of ship aground. Scaled underwater profiles for U.S. Navy hulls can be found in Chapter 2 of the Underwater Ship Husbandry Manual (UWSHM) (S0600-AA-PRO-020).

INTERNAL CASUALTY SURVEY

Structural Damage:			
Framing:	Unknown		
Tank Tops:	Unknown		
Hatches/Doors:	Unknown		
Piping Systems:	Unknown		
Machinery Spaces:	Unknown		
Significant material available from casualty bos'n locker/riggers' stores? Unknown			
Main Machinery:			
Type:	Unknown	No. Shafts:	2
SHP:	Unknown	Engines per shaft:	Unknown
Status:	Unknown	Repairable on site?	Unknown
Fuel available?	Unknown	Salvageable?	Unknown

AUXILIARY MACHINERY SUMMARY

	No. Units	Power Required:	Capacity	Status*
Air Compressors:	Unknown	(cfm/psi)		
Generator Sets:	Unknown	(kW/volt)		
Boilers:	Unknown	(lbs/hr, psi)		
Evaporators:	Unknown	(gal/hr)		
Hydraulic Units:	Unknown	(gpm/psi)		
Pumps:	Unknown	(gpm/psi)		
Other:	Unknown			

* STATUS

OOC	Out-of-commission, not operable
CW	Operable, if cooling water can be supplied
PWR	Operable, but requires power source
F	Operable, prime mover requires fuel--note fuel type (DFM, No 2, gas, etc.)
A1	Fully operable
A2	Operable at reduced capability

DECK MACHINERY SUMMARY

	Location	Power Required:	Capacity	Status*
Winches:	Unknown	Unknown (wire/tons)	Unkown	Unkown
Booms/Cranes:	Unknown	Unknown (tons)	Unkown	Unkown
Capstans/Gypsy Heads:	2 located aft	Unknown (tons)	Unkown	Unkown
Anchor Windlass:	Unknown	(anchor)	Unkown	Unkown

PORT/STBD Units? _____ Cross-connect? _____

* STATUS

OOC	Out-of-commission, not operable
CW	Operable, if cooling water can be supplied
PWR	Operable, but requires power source
F	Operable, prime mover requires fuel -- note fuel type (DFM, No 2, gas, etc.)
A1	Fully operable
A2	Operable at reduced capability
BG	Fall/blocks usable for beach gear (for booms/cranes)

BOAT SUMMARY

Location	Type[2]	Weight[3]	Capacity[4]	Status[5]
Starboard Side 01 Level	Unknown	Unknown	Unknown	Unknown
Starboard Side 01 Level	Unknown	Unknown	Unknown	Unknown
Starboard Side 01 Level	Unknown	Unknown	Unknown	Unknown
Starboard Side 01 Level	Unknown	Unknown	Unknown	Unknown
Port Side 01 Level	Unknown	Unknown	Unknown	Unknown
Port Side 01 Level	Unknown	Unknown	Unknown	Unknown
Port Side 01 Level	Unknown	Unknown	Unknown	Unknown
Port Side 01 Level	Unknown	Unknown	Unknown	Unknown

TOTAL LIQUID WEIGHT: _____

1 Note whether in skids, davits or welldeck, fore/aft and p/s position
2 LCM, motor whaleboat, etc., note propulsion
3 Weight in tons
4 Pounds cargo/number of personnel
5 Use following codes for boat status and availability

A1	fully operable	L1	launchable
A2	operable at reduced capability	L2	launchable,risk of damage
A3	inoperable propulsion/hull sound	L3	crane/boom req'd
A4	hull damage, repairable	L4	inaccessible
A5	OOC, beyond repair on site		

CARGO SUMMARY

Hold	Type	Contents	Weight	LCG	KG
Unknown					

TOTAL CARGO WEIGHT: _____ _____

LCG measured from: _____

Hold: Give number/letter designation; list 'tween-decks separately if loaded w/cargo different from hold
Type: Bulk (BLK), break-bulk (BK BLK), palletized (PLT), containerized (CTR-40 or CTR-20), roll-on/roll-off (RO/RO), vehicles (VEH)
Contents: Give actual commodities carried, i.e., grain, coal, machine parts, etc. If arrangement plans not available, include sketch showing hold locations

Items of cargo useful for salvage operations?

LIQUID LOAD SUMMARY

Liquid Load as of _____ / _____ casualty
(before / after)

Tank	Contents	Weight	LCG	KG	TCG
Unknown					

TOTAL LIQUID WEIGHT: _____

List all liquids carried. Segregate cargo, ships, fuel, lube oil, feed and potable water, ballast, etc. Casualty's pre-printed sounding record sheets may be used if available (obtain from fuel, oil, water king, liquid cargo officer, DCA). Include sketches if arrangement plans or liquid load diagram are not available. Mark ruptured/leaking tanks. Compare before and after stranding quantities. Can differences be accounted for?

FLOODING SUMMARY

Flooding as of _____ / _____ casualty
(before / after)

Compartment	Depth	Weight	LCG	KG	TCG	FS?	FC?
Unknown							

TOTAL FLOODING WEIGHT: _____

Comments:

ex-STATE OF MAINE Initial Survey Photographs

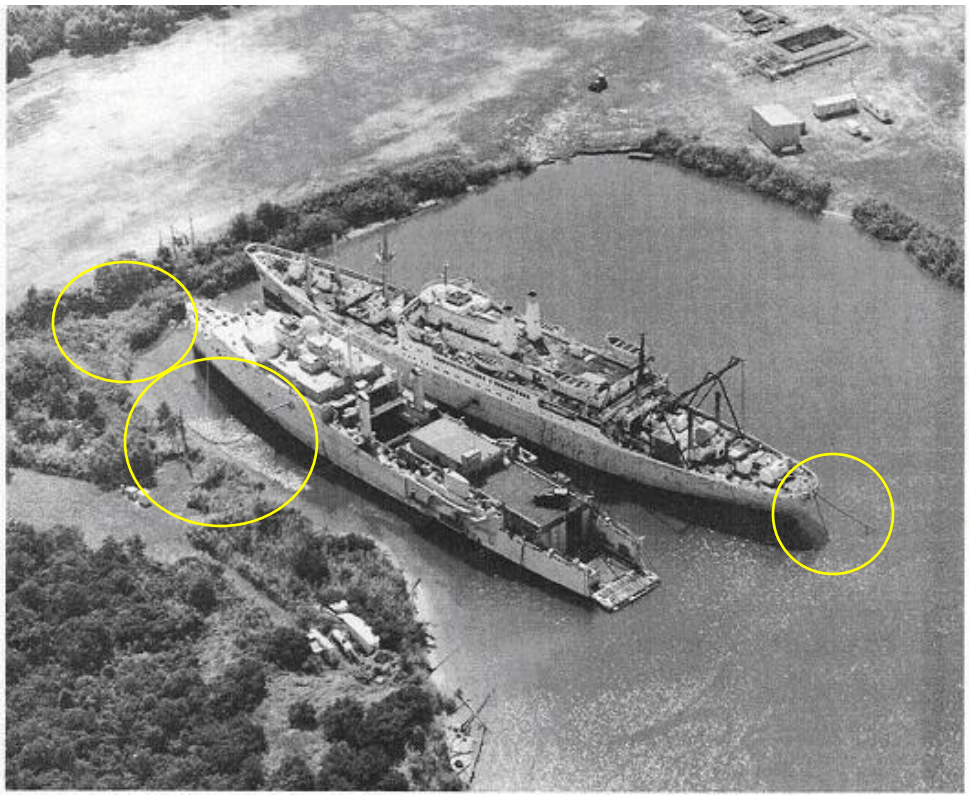


Figure 1: ex-SHADWELL / ex-STATE OF MAINE before Hurricane Katrina

The ex-SHADWELL (left) and ex-STATE OF MAINE prior to Hurricane Katrina. Items to note, from left to right, are the forward port mooring leg of ex-SHADWELL, the shore power cables of ex-SHADWELL, and the aft mooring legs of ex-STATE OF MAINE.

Figure 2: ex-SHADWELL / ex-STATE OF MAINE after Hurricane Katrina

Figure 3: Structural damage to ex-STATE OF MAINE

Items to note, the crushed added-on ladder and ruptured porthole from an apparent collision with ex-SHADWELL.

Figure 4: Starboard Side of ex-STATE OF MAINE

No apparent damage to the starboard side of ex-STATE OF MAINE as a result of Hurricane Katrina or the stranding.

Figure 5: ex-STATE OF MAINE rudder from port side

From view of port and starboard side, with no discernable draft marks available near the waterline, scaled measurement of the above and below photographs estimates the aft draft to be approximately 18’ 6”. It can also be seen that the rudder is amidships after stranding.

Figure 6: ex-STATE OF MAINE rudder from starboard side

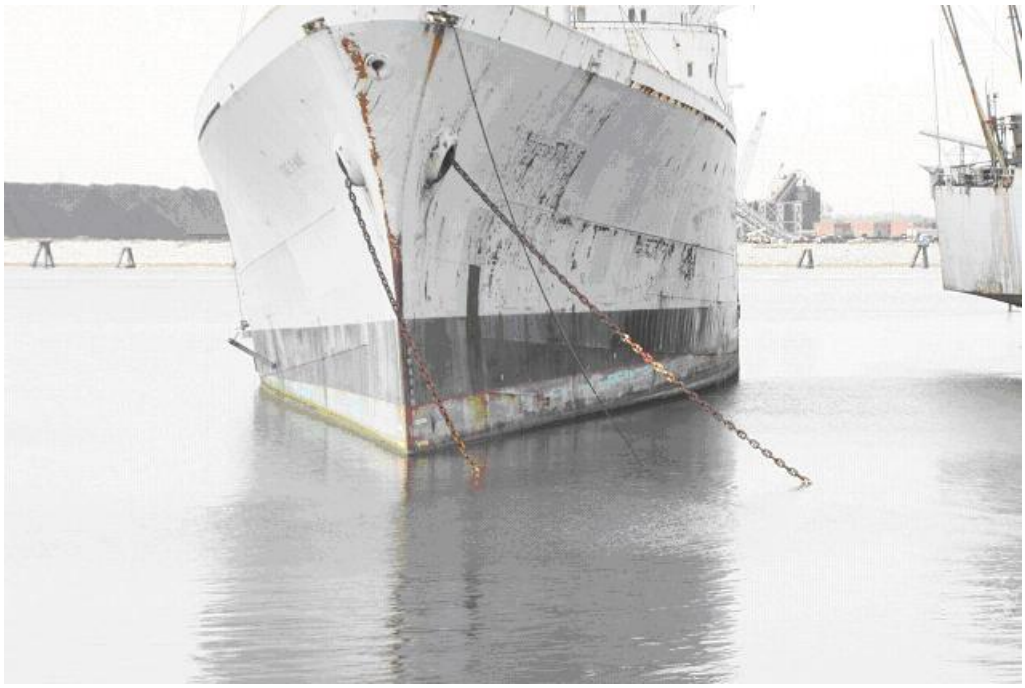


Figure 7: ex-STATE OF MAINE Bow View

Two things of importance can be seen in the above photograph. One, the obvious list to starboard of the ex-STATE OF MAINE. Two, both bow anchor chains tending out of the hawse pipe toward the ship's port side. Below (though hard to tell from the picture), port stern anchor chain now tends aft and to starboard since Katrina. From these two observations it seems the ex-STATE OF MAINE may have twisted to starboard, possibly colliding with ex-SHADWELL.

Figure 8: Starboard side of ex-STATE OF MAINE

Figure 9: ex-STATE OF MAINE Port Main Deck

Figure 10: ex-STATE OF MAINE Starboard Main Deck

Figure 11: ex-STATE OF MAINE Foc'sle

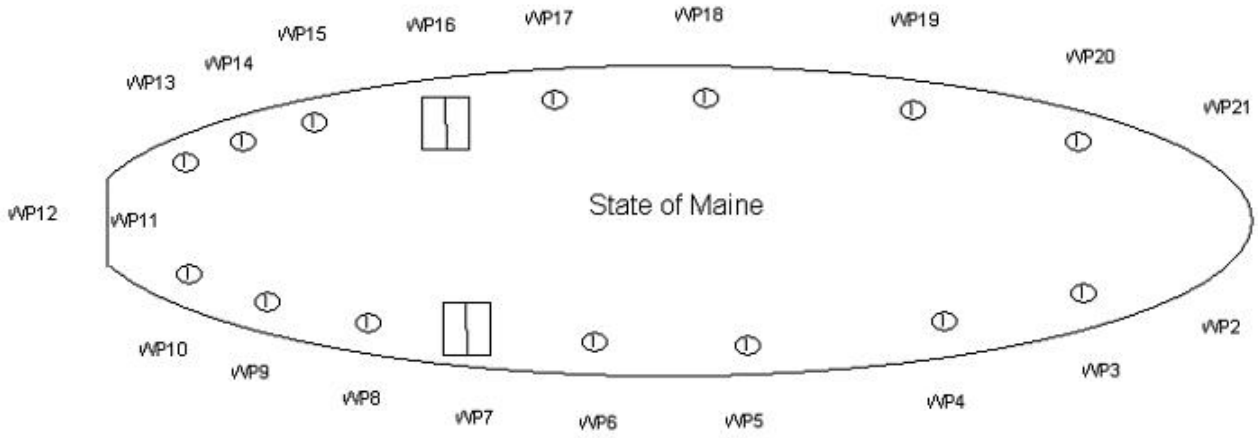
Figure 12: ex-STATE OF MAINE Aft Gypsy Heads

Figure 13: ex-STATE OF MAINE Starboard Aft Bits

Figure 14: ex-STATE OF MAINE Port Aft Bits

ex-STATE OF MAINE Soundings (13SEP05/1900Z)

Waypoint	Latitude	Longitude	Average Depth	Notes
WPT 2	30 30.659N	088 01.656 W	20'	Stbd side bow, draft marking 19'
WPT 3	30 39.654N	088 01.670 W	20'	Stbd Chalk
WPT 4	30 39.660N	088 01.682 W	20.5'	Stbd Chalk
WPT 5	30 39.665N	088 01.686 W	21'	Stbd Chalk
WPT 6	30 39.671N	088 01.697 W	15'	Stbd Chalk
WPT 7	30 39.681 N	088 01.705 W	15'	Stbd Double Doors
WPT 8	30 39.683 N	088 01.716 W	15'	Stbd Chalk
WPT 9	30 39.685 N	088 01.726 W	15'	Stbd Chalk
WPT 10	30 39.692 N	088 01.737 W	12.5	Stbd Chalk
WPT 11*	30 39.696 N	088 01.740 W	N/A	Waypoint 11 is Stern on the Main Deck
WPT 12*	30 39.697 N	088 01.740 W	6'	Waypoint 12 is the Rudder at the Waterline
WPT 13	30 39.699 N	088 01.730 W	12'	Port Chalk
WPT 14	30 39.700 N	088 01.722W	13'	Port Chalk
WPT 15	30 39.700 N	088 01.711 W	12'	Port Chalk
WPT 16	30 39.694 N	088 01.703 W	12'	Port Double Doors
WPT 17	30 39.688 N	088 01.689 W	12'	Port Chalk
WPT 18	30 39.685 N	088 01.681 W	11'	Port Chalk
WPT 19	30 39.682 N	088 01.671 W	15.5	Port Chalk
WPT 20	30 39.681 N	088 01.657 W	16.5	Port Chalk
WPT 21	30 39.672 N	088 01.643 W	18.5	Port side bow, draft marking 18.5'



Little Sands Island Inlet Soundings

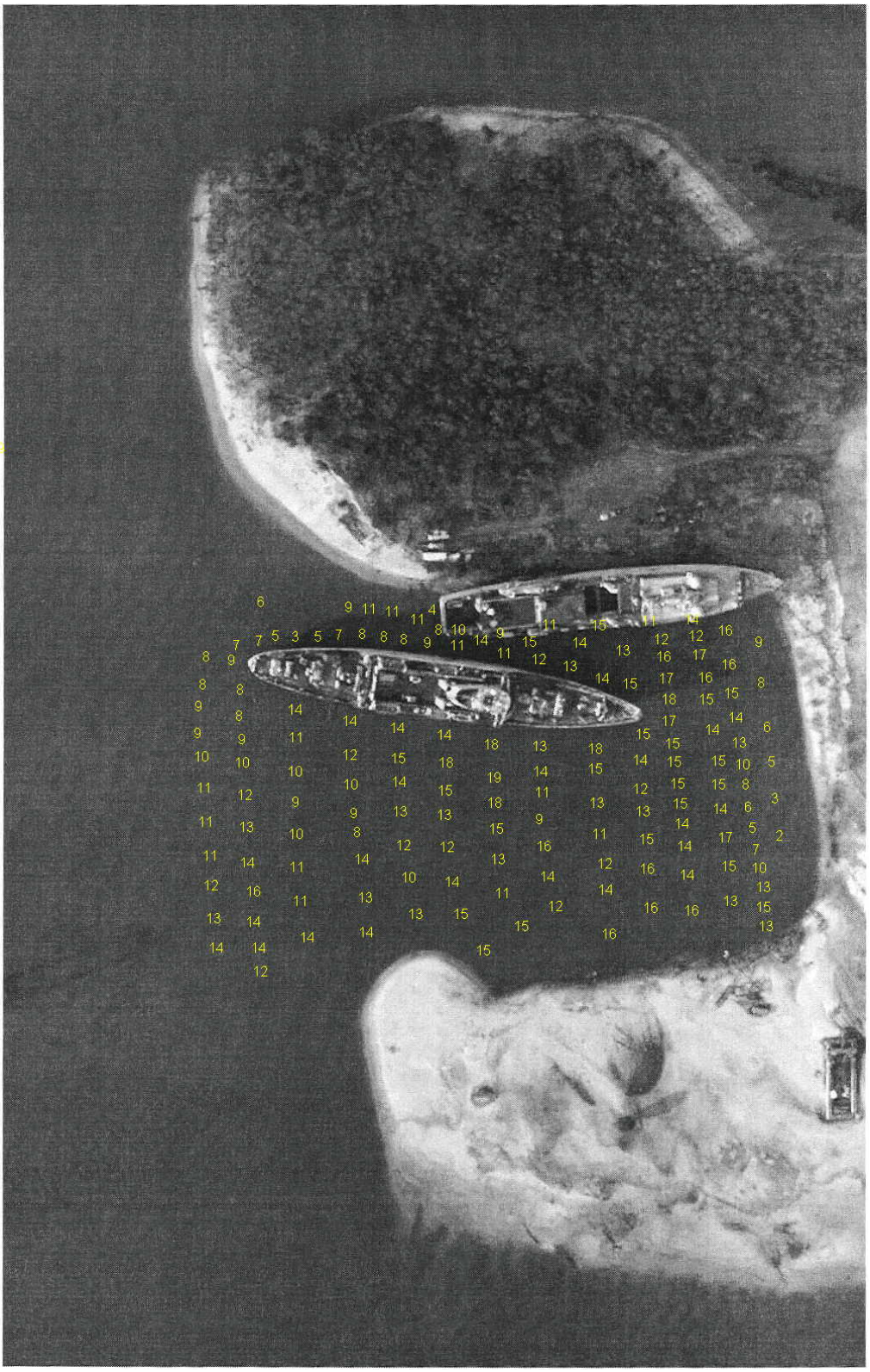


Figure 15: ex-SHADWELL/ex-STATE OF MAINE Soundings After Katrina

ex-STATE OF MAINE Soundings (Pre-KATRINA)

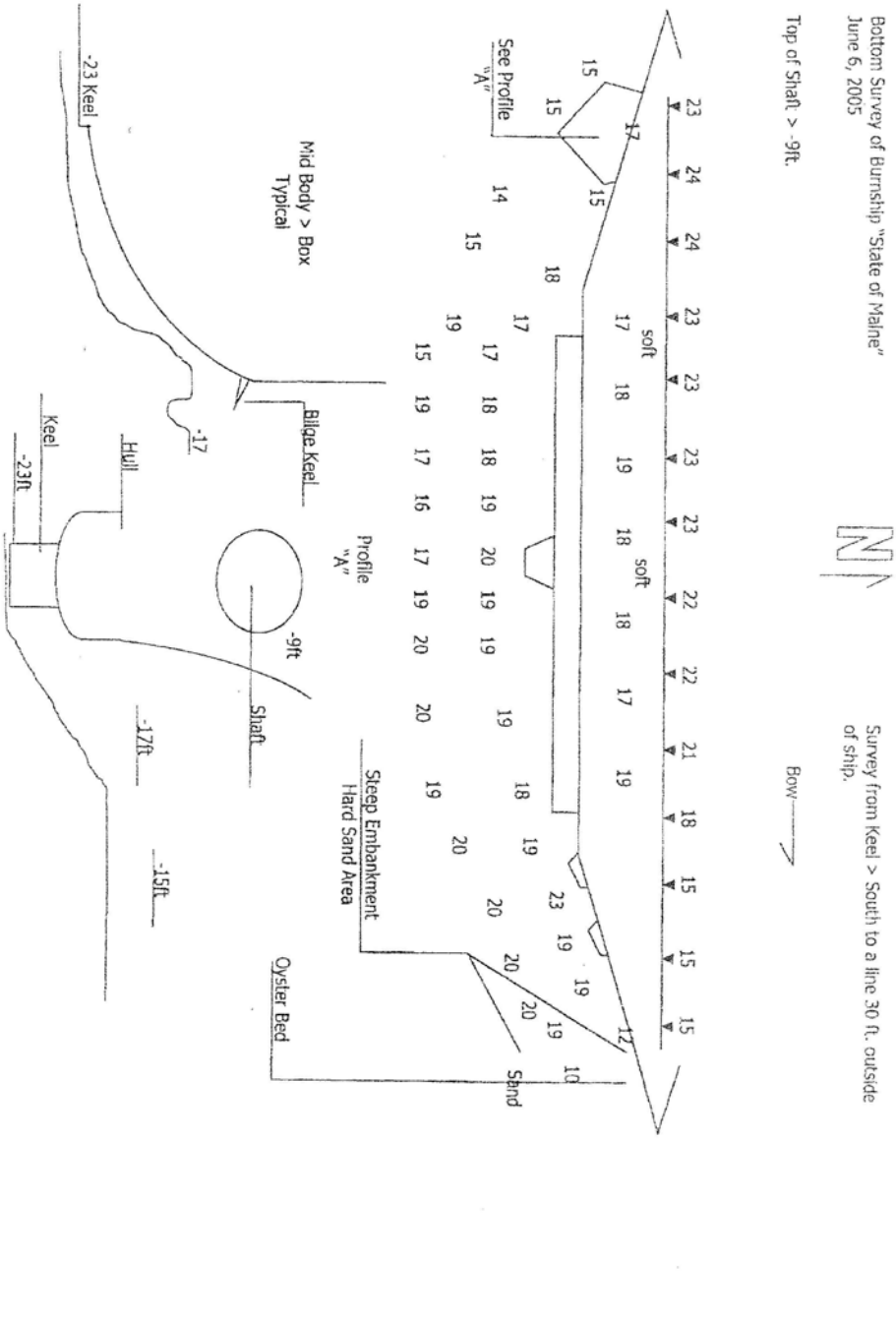


Figure 16: ex-STATE OF MAINE Sounding Before Katrina

Appendix B-1
NRL Request for Salvage Assistance

NAVAL RESEARCH LABORATORY

CHEMISTRY DIVISION
NAVY TECHNOLOGY CENTER FOR
SAFETY & SURVIVABILITY
CODE 6180, WASHINGTON, D.C.

From: JOHN PARRY	NRL Code: 6180	Phone: (202) 404-8459
Telefax Machine Number: (202) 767-1716		DSN: 297-1716
Verify Line Number: (202) 767-2002		DSN: 297-2002
Receiving Office Fax Number: SEA 00C (KAREN HOPSON)		
Please Deliver to: (202) 781-4588		On Extension:
Number of Pages to Follow: 2	Date:	
Subject: SALVAGE SUPPORT FOR NRL.		

KAREN)

FUNDING DOCUMENT TO FOLLOW.

JOHN

DEPARTMENT OF THE NAVY
NAVAL RESEARCH LABORATORY
4555 OVERLOOK AVE SW
WASHINGTON DC 20375-5320

IN REPLY REFER TO
3120
Ser 6180/0425
17 OCT 2005

From: Commanding Officer, Naval Research Laboratory
To: Naval Sea Systems Command (K. Hopson, SEA OOC)

Subj: REQUEST FOR SALVAGE AND RECOVERY ASSITANCE

Ref: (a) Facsimile from Karen Hopson (SEA OOC) to John Farley (NRL) of 06 October 2005

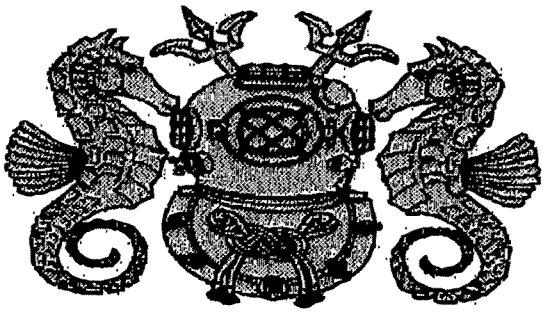
1. In accordance with reference (a), the Naval Research Laboratory (NRL) requests salvage and recovery assistance for the Navy's fire test ship, ex-USS SHADWELL, which is located at the United States Coast Guard (USCG) Fire and Safety Test Detachment (F&STD), Little Sand Island in Mobile, AL. The ex-USS SHADWELL's mooring has shifted and is now beached on Little Sand Island due to storm surge resulting from hurricane Katernia.

2. The ex-USS SHADWELL poses no hazard to navigation and appears to be structurally sound and not in danger of capsizing. It is requested that NAVSEA OOC supervise the salvage and recovery effort and develop a salvage plan that will minimize further damage to the ex-USS SHADWELL and accommodate the relocation of the USCG vessel State of Maine.

3. It is expected that this operation will involve multiple heavy lift assets, appropriate crew, support vessels, and other special salvage equipment. Funding for the Navy effort will be provided under NRL problem number 61-6829.

4. The Naval Research Laboratory's points of contact are Dr. Frederick W. Williams, (202) 767-2476, e-mail: fwilliam@ccs.nrl.navy.mil or John P. Farley (202) 404-8459, e-mail: farley@ccs.nrl.navy.mil.

JAMES S. MURDAY
By direction



Office of the Supervisor of Salvage and Diving, USN
Director of Ocean Engineering

SUPSALV COST ESTIMATE SHEET

TASK DESCRIPTION: Obtaining and prepaing the necessary drawings and determination of ship's present condition in support of developing a POSSE model for the EX-SHADWELL and Model development.

ESF: N/A
TASK: 2NRL

COTP: N/A

Ship Survey (EX-SHADWELL)	15,996.00
Model Development	5,000.00
Salvage Master/Salvage Plan	10,000.00
SUPSALV Support Cost:	5,000.00
TOTAL:	35,996.00

KAREN B.B. HOPSON
DIRECTOR, BUSINESS/LOGISTICS MANAGEMEI
SUPERVISOR OF SALVAGE AND DIVING
OCEAN ENGINEERING

Appendix B-2.

311936Z AUG 05 NRL WASHINGTON DC REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE

FW: P 311936Z AUG 05 NRL WASHINGTON DC REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE// UNCLASProperties...Add
To ContactsAdd Sender to Safe Senders ListAdd Sender to Blocked Senders ListAdd to Safe Recipients ListReplyReply to allForwardHelp

https://webmail.nmci.navy.mil/exchweb/help/USA/ie5/default.htm?readnote.htm

From: Herb, Michael CIV NAVSEASent: Wed 8/31/2005 5:42 PM
To: Wilkins, James R CAPT SEA 00; Asher, Richard C CIV SEA 00
Cc: Tokarick, Kevin CAPT COMCMRON THREE; Allen, Glenn R CDR MDSU2 CO; Debuse, Robert K LCDR MOBDIVSALU TWO, MDSU 2; Colman, Daniel M CDR MOBDIVSALU ONE, CO; Trumbore, Jeffrey CAPT COMEODGRU TWO; Heinze, Marvin H CAPT (COMEODGRU ONE); Cooper, Keith R CIV SEA 00; Lawrence, Brian David LCDR CNO, N431K; Price, Joshua S LCDR NAVSEA ,00C; Ruth, James D CIV SEA 00; Sasse, John R CIV SEA 00; Stahovec, Joseph G CIV SEA 00; Thiel, Richard A CIV 00, 00C; Walker, William A CIV SEA 00
Subject: FW: P 311936Z AUG 05 NRL WASHINGTON DC REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE// UNCLAS
Attachments:

<BASE href="https://webmail.nmci.navy.mil/exchange/don.fegley/Inbox/RE:%20Shadwell%20SOM%20report-2.EML/FW:%20P%20311936Z%20AUG%2005%20NRL%20WASHINGTON%20DC%20REQUEST%20FOR%20SALVAGE%20AND%20RECOVERY%20ASSISTANCE_xF8FF__xF8FF_%20%20UNCLAS.EML/" />
<META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=utf-8">
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2//EN">
<HTML>
<HEAD>

<META NAME="Generator" CONTENT="MS Exchange Server version 6.5.7651.14">
<TITLE>FW: P 311936Z AUG 05 NRL WASHINGTON DC REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE// UNCLAS </TITLE>
</HEAD>
<BODY>

Jim, here is the request from NRL on the SHADWELL. Hope to get confirmation we can get to her shortly. Plan is still to send Rick Thiel and a salvor or two from MDSU-2. BT</FONT></P>

Marvin, Dan ... for your SA. As stuff roles in to us or FFC we will advocate pushing as much work to the Fleet as we can and perhaps get MDSU ONE engaged as well. I suspect MARFPCOM can best facilitate that.</FONT></P>

vr/ Mike</FONT>

Mike Herb</FONT>

Director, Salvage Operations (00C2)</FONT>

Supervisor of Salvage and Diving, NAVSEA</FONT>

202-781-2736 (DSN 326)</FONT>

Cell: 703-209-4492</FONT>
</P>

-----Original Message-----</FONT>

From: DMDS Profiler [<A HREF="mailto:DMDSProfiler@NAVSEA.NAVY.MIL"
target=_blank>mailto:DMDSProfiler@NAVSEA.NAVY.MIL</A>]</FONT>

Sent: Wednesday, August 31, 2005 16:59</FONT>

To: ~DMPS 00C; DMDS Profiler; ~DMPS 53K; ~DMPS 04RS; ~DMPS 00; ~DMPS</FONT>

09AOSH</FONT>

Cc: ~DMPS DEFAULT SEA08; ~DMPS DEFAULT SEA104; ~DMPS 5D4MED; ~DMPS 03P;</FONT>

~DMPS 05PB; ~DMPS 05D3; ~DMPS 00F; ~DMPS 04L2; ~DMPS PMS373T; ~DMPS</FONT>

PMS444-21; ~DMPS PMS395</FONT>

Subject: DMS:P 311936Z AUG 05 NRL WASHINGTON DC REQUEST FOR SALVAGE AND</FONT>

RECOVERY ASSISTANCE// UNCLAS </FONT>
</P>

PAAUZYUW RULSADG0001 2431936-UUUU--RHMCSUU RULSADG.</FONT>

ZNR UUUUU</FONT>

P 311936Z AUG 05 ZYB</FONT>

FM NRL WASHINGTON DC//1220//</FONT>

TO CNO WASHINGTON DC//N312//</FONT>

INFO COMLANTFLT NORFOLK VA</FONT>

COMNAVSEASYSCOM WASHINGTON DC//OOC//</FONT>

CNR ARLINGTON VA</FONT>

BT</FONT>

UNCLAS //N05500//</FONT>

MSGID/GENADMIN/NRL WASH DC 6180//</FONT>

SUBJ/REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE//</FONT>

REF/A/DOC/OPNAVINST/-/4740.2F//</FONT>

```
AMPN/REF A IS OPNAVINST 4740.2F DTD 10 JULY 1997//</FONT>

POC/FARLEY, JOHN P./CIV/NRL/LOC:WASH DC/TEL:202-404-8459//</FONT>

POC/WILLAIMS, FREDERICK/CIV/NRL/LOC:WASH DC/TEL:202-767-2476//</FONT>

RMKS/1.  IAW REF A, THE NAVAL RESEARCH LABORATORY (NRL) REQUESTS</FONT>

SALVAGE AND RECOVERY ASSISTANCE FOR THE NAVY'S FIRE TEST SHIP EX-USS</FONT>

SHADWELL, WHICH IS LOCATED AT THE UNITED STATES COAST GUARD (USCG)</FONT>

FIRE AND SAFETY TEST DETACHMENT (F&amp;STD), LITTLE SAND ISLAND IN</FONT>

MOBILE, AL. THE EX-USS SHADWELL'S MOORING HAS SHIFTED AND IS NOW</FONT>

BEACHED ON LITTLE SAND ISLAND DUE TO STORM SURGE RESULTING FROM</FONT>

HURRICANE KATRINA.  IT IS REQUESTED THAT COMNAVSEASYSCOM (SEA OOC)</FONT>

BE ASSIGNED RESPONSIBILITY FOR SUPERVISION OF THE SALVAGE OPERATION</FONT>

AND THAT CNO AUTHORIZE FLEET ASSET UTILIZATION.  THE NAVAL RESEARCH</FONT>

LABORATORY IS CURRENTLY REVIEWING FUNDING OPTIONS WITH THE NAVY</FONT>

COMPTROLLER.//</FONT>

BT</FONT>

#0001</FONT>
</P>
<BR>

NNNN</FONT>
</P>

ACTION: </FONT>

~DMPS 09AOSH</FONT>

~DMPS 00</FONT>

~DMPS 04RS</FONT>

~DMPS 53K</FONT>

DMDS PROFILER</FONT>

~DMPS 00C</FONT>
</P>

</BODY>
</HTML>
```

Appendix B-3
CNO salvage authorization.txt

```
PAAUZYUW RUEWMCS0973 2842358-UUUU--RHMFIUU.
ZNR UUUUU ZUI RUENAAA0973 2842358
P 112358Z OCT 05 ZYB
FM CNO WASHINGTON DC//N3ON//
TO RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//00C//
RHMFIUU/COMNAVSEASYSCOM WASHINGTON DC//00C//
INFO RUCBCLF/COMFLTFORCOM NORFOLK VA//N3/N33/N333/N7/N805//
RULSOCA/CNR ARLINGTON VA
RHMFIUU/CNR ARLINGTON VA
RHMFIUU/NRL WASHINGTON DC//1220//
RHBPPAB/COMSECONDFLT//N3/N357//
RHMFIUU/COMSEALOGLANT NORFOLK VA//N3//
RUENAAA/CNO WASHINGTON DC//N3ON/N311//
RHMFIUU/CNO WASHINGTON DC//N3ON/N311//
RUCOWCX/COMCOGARD SECTOR MOBILE AL
RUCOWCX/CCGDEIGHT NEW ORLEANS LA
RUCOWCX/COCOGARD MLC LANT NORFOLK VA//KSE//
BT
UNCLAS
MSGID/GENADMIN/CNO N3ON//
SUBJ/SALVAGE AUTHORIZATION FOR EX-SHADWELL AND STATE OF MAINE//
REF/A/RMG/NRL WASHINGTON DC/311936ZAUG2005//
REF/B/RMG/COGARD R AND DC GROTON CT/071309ZSEP2005//
REF/C/DOC/CNO WASHINGTON DC/10JUL1997//
REF/D/DOC/US NAVY AND US COAST GUARD/15SEP1980//
NARR/REF A IS NRL REQUEST FOR SALVAGE ASSISTANCE FOR EX-SHADWELL.
REF B IS USCG REQUEST FOR SALVAGE ASSISTANCE FOR EX-STATE OF MAINE.
REF C IS OPNAVINST 4740.2F, SALVAGE AND RECOVERY PROGRAM.  REF D IS
THE INTERAGENCY AGREEMENT BETWEEN THE US NAVY AND US COAST GUARD FOR
COOPERATION IN OIL SPILL CLEAN-UP OPERATIONS AND SALVAGE OPERATIONS.
//
POC/FARLEY, JOHN/CIV/NRL/LOC:WASHINGTON DC/TEL:202-404-8459//
POC/KITCHENS, RICK/CDR/CNO N3ON/LOC:WASHINGTON, DC
/EMAIL:RICHARD.W.KITCHENS(AT)NAVY.MIL/TEL:(703) 692-1852//
POC/BEENE, DAVID/CIV/USCG RDC/LOC:GROTON CT/TEL:860-441-2759//
RMKS/1. TAKE REFS A AND B FOR ACTION IN ACCORDANCE WITH REFS C AND D.
2. DIRLAUTH WITH COMFLTFORCOM REGARDING THE USE OF FLEET ASSETS.
3. FUNDING AMOUNTS HAVE NOT YET BEEN IDENTIFIED.  DIRLAUTH WITH NRL
AND USCG REGARDING FUNDING, KEEPING ALCON INFORMED.//
BT
#0973
```

Appendix B-4.
USCG SOM Request for assist

Subject: FW: R 071309Z SEP 05, REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE, COGARD R AND DC GROTON CT
Date: Fri, 9 Sep 2005 09:40:32 -0400
X-MS-Has-Attach:
X-MS-TNEF-Correlator:
Thread-Topic: R 071309Z SEP 05, REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE, COGARD R AND DC GROTON CT
Thread-Index: AcW0hM0/8g8lTWztQ9CZ1WRiX7RlGAAAX7XwAASBVMAAAJolkAAoAiLwAAI6XDA=
From: "Beene, Dave " <Dave.E.Beene@uscg.mil>
To: <farley@ccs.nrl.navy.mil>
Cc: "Merriweather, Quincy CWO" <QTMerriweather@fstdmobile.uscg.mil>
X-OriginalArrivalTime: 09 Sep 2005 13:40:33.0388 (UTC) FILETIME=[0D3492C0:01C5B544]
Sender: Dave.E.Beene@uscg.mil
X-Scanned-By: MIMEDefang 2.52
X-CCS-MailScanner-Info: See http://www.nrl.navy.mil/ccs/support/email
X-CCS-MailScanner: No viruses found.
X-CCS-MailScanner-SpamCheck: NOT SPAM

From: Brown, Sharon YN1
Sent: Thursday, September 08, 2005 1:11 PM
To: Beene, Dave
Subject: FW: R 071309Z SEP 05, REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE, COGARD R AND DC GROTON CT

R 071309Z SEP 05
FM COGARD R AND DC GROTON CT
TO CNO WASHINGTON DC//N312//
INFO COMNAVSEASYSCOM WASHINGTON DC//OOC//
COMDT COGARD WASHINGTON DC//CG-6/G-M/CG-66/G-MS/G-MSE//
COMCOGARD SECTOR MOBILE AL
CCGDEIGHT NEW ORLEANS LA
COCOGARD MLC LANT NORFOLK VA//KSE//
NRL WASHINGTON DC//1220//
BT
UNCLAS //N05500//
SUBJ: REQUEST FOR SALVAGE AND RECOVERY ASSISTANCE
A. OPNAVIST 4740.2F

1. IAW REF A, THE U. S. COAST GUARD RESEARCH AND DEVELOPMENT CENTER
(RDC) REQUESTS SALVAGE AND RECOVERY ASSISTANCE FOR THE COAST GUARD'S
FIRE TEST VESSEL, STATE OF MAINE, WHICH IS LOCATED AT THE U.S. COAST
GUARD FIRE AND SAFETY TEST DETACHMENT (F&STD), LITTLE SAND ISLAND,
MOBILE, AL. THE STATE OF MAINE HAS SHIFTED AND MOVED PARTIALLY
OUTSIDE ITS MOORING SLIP AT LITTLE SAND ISLAND DUE TO STORM SURGE
RESULTING FROM HURRICANE KATRINA.
2. IT IS REQUESTED THAT COMNAVSEASYSCOM (SEA OOC) BE ASSIGNED
RESPONSIBILITY FOR SUPERVISION OF THE SALVAGE OPERATION AND THAT CNO
AUTHORIZE FLEET ASSET UTILIZATION.
3. THE NAVAL RESEARCH LABORATORY HAS REQUESTED SIMILAR ASSISTANCE FOR
THEIR TEST VESSEL, EX-SHADWELL WHICH WAS MOORED AT LITTLE SAND ISLAND
BUT IS NOW BEACHED THERE DUE TO ACTIONS OF HURRICANE KATRINA. DUE TO
THE CURRENT POSITIONING OF BOTH TEST VESSELS, THE STATE OF MAINE MUST
BE REPOSITIONED BEFORE THE EX-SHADWELL CAN BE MOVED.
4. THE RDC WILL REVIEW FUNDING REQUIREMENTS AS NECESSARY WITH
COMNAVSEASYSCOM.
5. POC: MR. DAVID BEENE,USCG RDC GROTON, CT PH.860 441 2759 OR CWO
QUINCY MERRIWEATHER, MOBILE, AL PH. 251 441 5040.
BT
NNNN

Appendix B-5
US Coast Guard State of Maine Purchase Request and SOW

U.S. Department
of Transportation

**United States
Coast Guard**

Research & Development Center
Finance/Supply/Procurement Office
1082 Shennecossett Road
Groton CT 06340-6096

Fax Cover Sheet

Fax Phone: (860) 441-2607

From: SKI Bylsma
Phone: 860-441-2608
Email:

To: Karen Hopson, Director
~~Attn:~~ of: Salvage & Diving Ocean Engineering
Fax Number:
Phone Number:

Subj: MIPR FOR STATE OF MAINE

Total Number including Cover Sheet: 10

MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

1. Page 1 of 3

2. FSC	3. CONTROL SYMBOL NO	4. DATE PREPARED	5. MIPR NO	6. AMEND NO
	21-06-326E00011	10/14/2005	HSCG32-06-X-E00011	BASIC

7. TO:
NAVAL SEA SYSTEMS COMMAND (0000)
1333 ISSAC HALL AVE, SOUTHEAST
WASHINGTON NAVY YARD
WASHINGTON DC 20376-3801
USA

8. FROM: (agency, name, telephone number of originator)
Contracting Office, USCG R&DC
1082 Shennecossett Rd.
Groton 06340-6096
Ph: (860)441-2608 EXT:
Jessica Bylsma

9. ITEMS SCREENING ○ ARE ◉ ARE NOT INCLUDED IN THE INTERSERVICE SUPPLY SUPPORT PROGRAM AND REQUIRED INTERSERVICE
○ HAS ◉ HAS NOT BEEN ACCOMPLISHED

ITEM NO a.	DESCRIPTION (Federal stock number, nomenclature, specification and/or drawing no., etc.) b.	QTY. c.	UNIT d.	ESTIMATED UNIT PRICE e.	ESTIMATED TOTAL PRICE f.
1	Execute MIPR to transfer funds to Office of Supervisor of Salvage/Diving (Naval Sea Systems Command) to conduct salvage survey of CG test vessel, STATE OF MAINE at Little Sand Island, Mobile, AL and prepare a plan for repositioning the vessel back into its mooring slip at the Island. Repositioning needed as a result of Hurricane Katrina. NOTE: A. The amount of the MIPR shall not be exceeded without prior written approval from the contracting officer. B. To facilitate reimbursement, show both numbers in block 3 and 5 on your invoice. Failure to do so will result in non-payment. General Instructions: A. Forward original and 2 copies of acceptance, DD form 448-2 to: 1082 Shennecossett Rd	1	EA	$15,249.00	$15,249.00

10. SEE ATTACHED PAGES FOR DELIVERY SCHEDULES, PRESERVATION AND PACKAGING INSTRUCTIONS, SHIPPING INSTRUCTIONS AND INSTRUCTIONS FOR DISTRIBUTION OF CONTRACTS AND RELATED DOCUMENTS.

11. GRAND TOTAL: $15,249.00

12. TRANSPORTATION ALLOTMENT (Used if FOB contractor's plant)

13. MAIL INVOICES TO (Payment will be made by)
Commanding Officer
USCG FINANCE CENTER
1430A Kristina Way
Chesapeake
VA 23326-1000

PAY OFFICE DODAAD Z 51600

14. FUNDS FOR PROCUREMENT ARE PROPERLY CHARGEABLE TO THE ALLOTMENTS SET FORTH BELOW, THE AVAILABLE BALANCES OF WHICH ARE SUFFICIENT TO COVER THE ESTIMATED TOTAL PRICE.

ACRN	APPROPRIATION	LIMIT/ SUBHEAD	SUPPLEMENTAL ACCOUNTING CLASSIFICATION	ACCTG STA DODAAD	ACCOUNTING AMOUNT
000	70X0615		2EX8A 1810000100/79872/2521		15249.00
			ALC 70-06-0000 21-06-326E00011		

15. AUTHORIZING OFFICER (Type name and title)
Simone Albano CONTRACTING OFFICER

16. SIGNATURE

17. DATE 10/14/2005

DD FORM 448 1 JUN 72 PREVIOUS EDITION IS OBSOLETE S/N 0102-004-6501 C-25708

MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

1. Page 2 of 3

CONTROL SYMBOL NO: 21-06-326E00011

ITEM NO. a	DESCRIPTION (Federal stock number, nomenclature, specification and/ or drawing no. etc) b	QTY c	UNIT d	ESTIMATED UNIT PRICE e	ESTIMATED TOTAL PRICE f
	Groton, CT 06340 Attn: SK1 Bylsma B. Contract copies (if any) and related documents resulting from this request should be forwarded to the above address. Contract documents should show numbers cited in block No. 5 of this MIPR. C. All invoices for payment shall contain the requisition/purchase request number in block No. 5. Failure to do so will result in rejection of the invoice. D. The original copy of the invoice shall be forwarded to the address in block No. 8. E. U.S. Coast Guard Officer Representative, (COTR) is: David Beene USCG R&D Center 1082 Shennecossett RD Groton, CT 06340 F. Funds are non expiring 2EX8A 1810000100/ 79872/2521/0111 003/DEF. TASK $15249.00				

ACCEPTANCE OF MIPR

1. TO (Requiring Activity Address)(Include Zip Code)
Contracting Office, USCG R&DC
Jessica Bylsma
Rout Sym:
Room No.:
Groton CT 06340-6096

2. MIPR NUMBER: HSCG32-06-X-E00011

3. AMENDMENT NO.: BASIC

4. DATE (MIPR Signature date):

5. AMOUNT (As Listed on the MIPR): $15,249.00

6. The MIPR identified above is accepted and the items requested will be provided as follows: (Check as Applicable)

a. ☐ ALL ITEMS WILL BE PROVIDED THROUGH REIMBURSEMENT (Category I)

b. ☐ ALL ITEMS WILL BE PROCURED BY THE DIRECT CITATION OF FUNDS (Category II)

c. ☐ ITEMS WILL BE PROVIDED BY BOTH CATEGORY I AND CATEGORY II AS INDICATED BELOW

d. ☐ THIS ACCEPTANCE, FOR CATEGORY I ITEMS, IS QUALIFIED BECAUSE OF ANTICIPATED CONTINGENCIES AS TO FINAL PRICE. CHANGES IN THIS ACCEPTANCE FIGURE WILL BE FURNISHED PERIODICALLY UPON DETERMINATION OF DEFINITIZED PRICES, BUT PRIOR TO SUBMISSION OF BILLINGS.

7. ☐ MIPR ITEM NUMBER(S) IDENTIFIED IN BLOCK 13, "REMARKS" IS NOT ACCEPTED (IS REJECTED) FOR REASONS INDICATED.

8. TO BE PROVIDED THROUGH REIMBURSEMENT CATEGORY I			9. TO BE PROCURED BY DIRECT CITATION OF FUNDS CATEGORY II		
ITEM NO. a.	QUANTITY b.	ESTIMATED PRICE c.	ITEM NO. a.	QUANTITY b.	ESTIMATED PRICE c.
d. TOTAL ESTIMATED PRICE			e. TOTAL ESTIMATED PRICE		

10. ANTICIPATED DATE OF OBLIGATION FOR CATEGORY II ITEMS

11. GRAND TOTAL ESTIMATED PRICE OF ALL ITEMS

12. FUNDS DATA (Check if Applicable)

a. ☐ ADDITIONAL FUNDS IN THE AMOUNT OF $0.00 ARE REQUIRED (See Justification in Block 13)

b. ☐ FUNDS IN THE AMOUNT OF $0.00 ARE NOT REQUIRED AND MAY BE WITHDRAWN

13. REMARKS

14. ACCEPTING ACTIVITY (Complete Address)

15. TYPED NAME AND TITLE OF AUTHORIZED OFFICIAL
Title:

16. SIGNATURE

17. DATE

DD FORM 448-2, JUL 71 (EG)

PREVIOUS EDITION WILL BE USED UNTIL EXHAUSTED.

To: F&S RDC
From: Dave Beene

13 October 2005

I request a MIPR be issued to fund the Navy's Office of the Supervisor of Salvage and Diving (SUPSALV) to inspect/survey the STATE OF MAINE at Little Sand Island, Mobile, AL and then develop a plan to reposition the vessel inside its mooring slip at the Island. The vessel was moved outside its slip in August by Hurricane Katrina. I have included a PR, a Statement of Work, a government cost estimate, a determination of findings and a cost estimate from SUPSALV for their effort.

On 29 August 2005 Hurricane Katrina moved the Navy's test vessel the EX-SHADWELL out of its mooring slip and approximately 100 yards north onto Little Sand Island. It then moved the STATE OF MAINE approximately 150 yard west outside its mooring slip and then approximately 20 yards north into the position previously occupied by the EX-SHADWELL.

The Navy Research Laboratory (responsible for the EX-SHADWELL) contacted SUPSALV and requested they survey and develop a plan to reposition the EX-SHADWELL back into its mooring slip. The Coast Guard R&D Center has also contacted SUPSALV and requested they survey and conduct a plan to reposition the STATE OF MAINE back into its mooring slip. SUPSALV could conduct a survey and develop a plan to reposition both vessels as one project in order to reduce labor and cost to both the Navy and the Coast Guard. As a practicality, the STATE OF MAINE must be moved first in order to have a location for the EX-SHADWELL to be moved into.

My POC at SUPSALV provided me a cost estimate for their effort to survey the STATE OF MAINE and develop a plan to reposition it. I have included this estimate. My government cost estimate (which is also included) reflects SUPSALV's cost to be fair and reasonable. There, the MIPR should reflect the cost indicated by SUPSALV.

Please fax a copy of the MIPR and paperwork to Ms. Karen B. Hopson, Director, Business/Logistics, Management, Supervisor of Salvage and Diving Ocean Engineering (phone number 202/781-0648, fax number 202/781-4588). I understand she also needs the agency locator code for the CG R&D Center. 781-4588

Thanks for your support.

Dave Beene

Dave Beene

STATEMENT OF WORK

Navy Office of the Supervisor of Salvage and Diving (SUPSALV)

Conduct Survey of STATE OF MAINE and Develop Plan for Repositioning the Vessel Back Into its Mooring Slip at Little Island, Mobile, AL

1.0 Background

Hurricane Katrina struck Mobile, AL on 29 August 2005 and repositioned the Navy's test vessel (the EX-SHADWELL) and the Coast Guard's test vessel (the STATE OF MAINE) into various locations outside their mooring slip in Little Sand Island, Mobile, AL. The EX-SHADWELL was moved North and partially upon the Island while the STATE OF MAINE was moved approximately 120 yards West and partially North into the prior location of the EX-SHADWELL. Both vessels need to be repositioned back into their mooring slip at the Island for safety of vessel traffic and in order to conduct future test projects.

2.0 Scope

Reimburse SUPSALV for the cost they occur while surveying the STATE OF MAINE and developing a plan to reposition the vessel back inside its mooring slip at Little Sand Island, Mobile, AL.

3.0 Requirements

SUPSALV shall send personnel to the SOM, inspect the vessel for towability, survey the mooring slip for any necessary dredging, and then develop a plan for repositioning the vessel back inside its mooring slip at the Island

4.0 Cost

SUPSALV cost proposal: $15,249.00
Government cost estimate: $16,100.00

GOVERNMENT COST ESTIMATE

Direct Cost:

Personnel to Inspect/survey STATE OF MAINE (SOM)

--Vessel/slip inspection	$6000.00
--Travel to/from vessel	$3500.00
--Develop Plan to Reposition SOM	$4300.00

Indirect Cost:

--Management/Administration	$1200.00
--Financial	$700.00
--Overhead	$400.00

Total: $16,100.00

DETERMINATION AND FINDINGS for

MIPR to Navy Supervisor of Salvage and Diving to Inspect/Survey
STATE OF MAINE, and Develop Plan for Repositioning Vessel
Back Inside Mooring Slip at Little Sand, Mobile, AL

1. The U.S. Coast Guard Research and Development Center proposes issuance of MIPR to Office of the Supervisor of Salvage and Diving (SUPSALV), USN, Naval Sea Systems Command, Washington DC. This MIPR is to provide payment to SUPSALV for their cost of inspecting and surveying the STATE OF MAINE at Little Sand Island, Mobile, AL and developing a plan to reposition the vessel back inside its mooring slip at the Island. Hurricane Katrina moved the vessel outside its mooring slip on 29 August 2005. The current location is unsafe for local vessel traffic and for project work; therefore the vessel must be inspected for safety of towability and a plan developed for repositioning the vessel back inside its mooring slip. The Navy (NRL) has a test vessel at the Island which also needs to be repositioned due to the effects of Hurricane Katrina. SUPSALV will perform a similar repositioning study effort for NRL. Having SUPSALV conduct the effort simultaneously for both vessels will make the task more cost effective for both the CG and NRL. Additionally, SUPSALV has the qualified and knowledgeable personnel to conduct this type study.

2. The cost estimate ($15249.00) provided by SUPSALV for surveying the vessel and developing a plan for repositioning it is determined to be fair and reasonable for the level of effort required. The government cost estimate was $16,100.00.

To John Hanley

Vacoff
51249-talal

Office of the Supervisor of Salvage and Diving, USN
Director of Ocean Engineering

SUPSALV COST ESTIMATE SHEET

10/6/2005

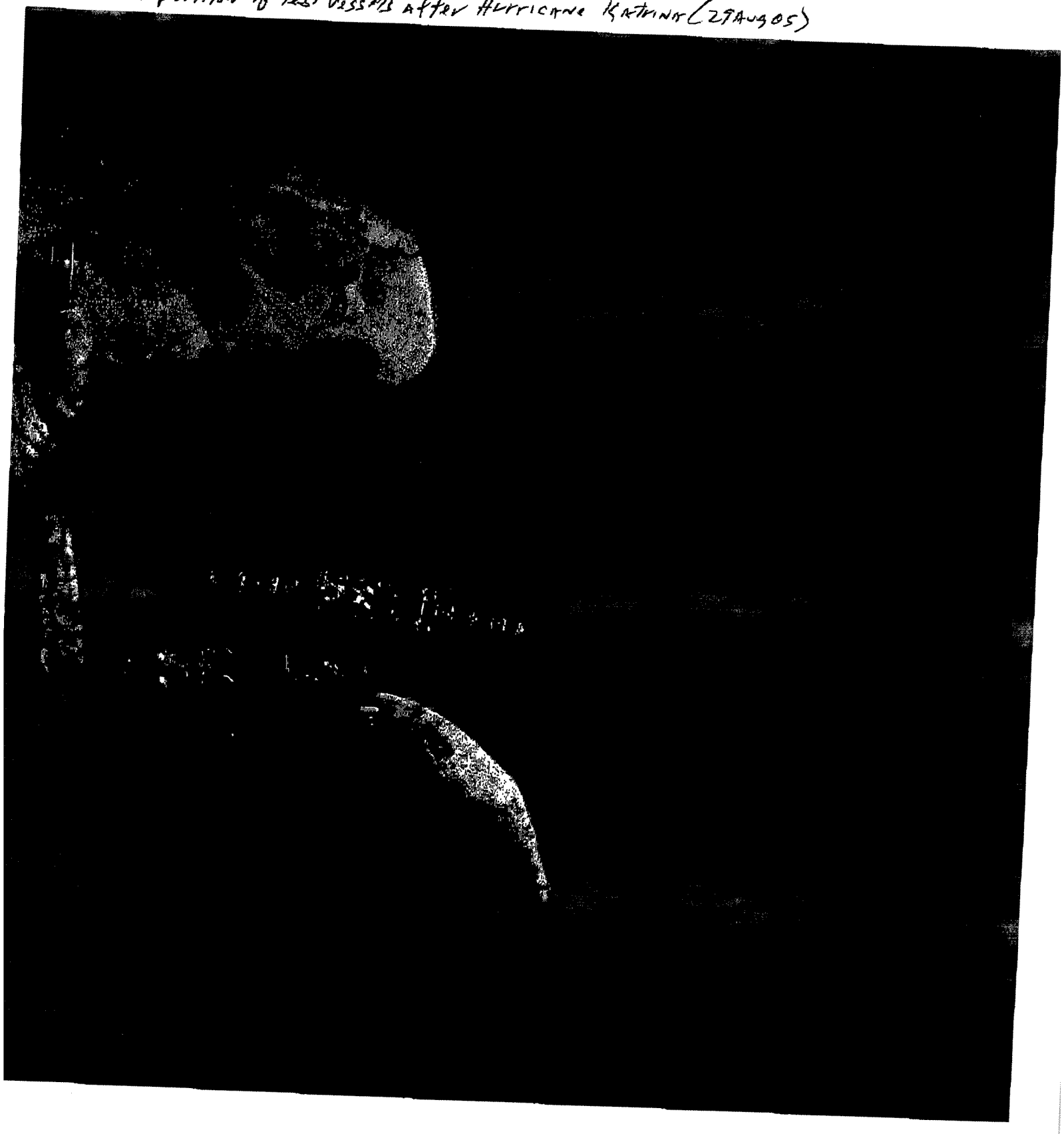
TASK DESCRIPTION: Obtaining and prepaing the necessary drawings and determination of ship's present condition in support of developing a POSSE model for the STATE OF MAINE and Model development

ESF: N/A
TASK NRL, 1NRL
CASE 1971
COTP: N/A

Ship Survey (STATE OF MAINE)	10,249.00 -
Model Development	5,000.00
TOTAL:	15,249.00

KAREN B.B. HOPSON
DIRECTOR, BUSINESS/LOGISTICS MANAGEMENT
SUPERVISOR OF SALVAGE AND DIVING
OCEAN ENGINEERING

Current position of test vessels after Hurricane KATRINA (29AUG05)



Appendix C

REPORT OF ULTRASONIC SURVEY AND STRUCTURAL ASSESSMENT OF EX-SHADWELL (LSD-15)

November 18, 2005

Prepared By:

GPC – A Joint Venture
ESSM Operations
P.O. Box JK
Williamsburg, VA 23187

Prepared for:

NAVAL SEA SYSTEMS COMMAND
DIRECTOR OF OCEAN ENGINEERING
SUPERVISOR OF SALVAGE AND DIVING
SALVAGE OPERATIONS/OCEAN ENGINEERING
00C2

Background:

An ultrasonic test survey (UTS) of Ex-Shadwell was conducted November 7th & 8th to sample the extent of corrosion wastage and general structural integrity for a proposed refloat (salvage) operation to be conducted at the soonest practical date. The survey consisted of UT samplings of plating of known construction thickness at 29 locations inside and outside the Ex-Shadwell. Craig Moffatt, an ESSM engineer, conducted the survey using a Cygnus underwater thickness gauge (Type 1 – Model 3473). Locations of concern were previously identified by a salvage planning survey conducted October 25th. This report is a companion document to the Summary Findings provided earlier.

Ex-Shadwell Structural Configuration (see Fig 1):

Ex-Shadwell is an LSD built just prior to the end of WWII. The 454' x 72' x 37' ship is transversely framed on 4 Ft centers with relatively light scantlings. The vessel had a history of structural failures (cracking at the 01-02 level near midship) and structural integrity issues (side shell plate panting). She was extensively refitted with intercostals shell stiffeners above the turn of the bilge to the 3rd deck level to support the light scantlings and relatively long span of shell plating between transverses (4ft c/c). In addition, ½ inch doubler plating and ½ frames were added to the shell from the FP to Fr 36 to reduce panting. A crack arrestor was added at the Main Deck level throughout the vessel's length after cracks appeared on the 01-02 level fashion plates. These fashion plates were replaced with thick insert plates.

With reference to Figure 1 the LSD's structural configuration reflects the design of a self propelled floating drydock with a stern gate and WTB forward (F15) to form a well. Wing walls (37 Ft high and 22 Ft off CL P&S) extend 394 Ft from the stern forward to form a well with the 3rd Deck (20Ft ABL) for FLO/FLO operations, and a Longitudinal BHD below the 3rd deck to the shell plating. Except for manned spaces below the 3rd Deck, ballast tankage extends throughout the vessel's length inboard and outboard of longitudinal BHDS 14 Ft off CL (P&S). Manned spaces extend from Fr 50 – Fr 73 outboard of the 14Ft Longitudinal BHD. There is a non-tight swash bulkhead on centerline in way of all CL tanks.

In calculating the hull girder section modulus all continuous longitudinal structure with the exception of side shell intercostals has been included. This consists of: CL NT BHD (Shell to 3rd Dk); Bottom and Side Plating to Main Dk); Main, 2nd and 3rd Dk Plating (including Well Dk); 22 ft Wing Wall & Long'l BHD (Bottom to Main Dk); 14 Ft Long'l BHD (Bottom to 3rd Dk); Bottom Long'l stiffeners L-1 through L-7, and finally Main Dk, Upper shell, and Wing wall long'l stiffeners. At midship (1' fwd of Fr 57) the POSSE calculated cross section properties without wastage are as follows:

- Horizontal Axis Inertia (Ixx) 3,153 Ft^4.
- Top Extreme Fiber Distance (yt) 18.57 Ft
- Section Modulus – Top 170 Ft^3
- Bottom Extreme Fiber Distance (yb) 18.59 Ft
- Section Modulus – Bottom 170 Ft^3
- Shear Area 8.0 Ft^2

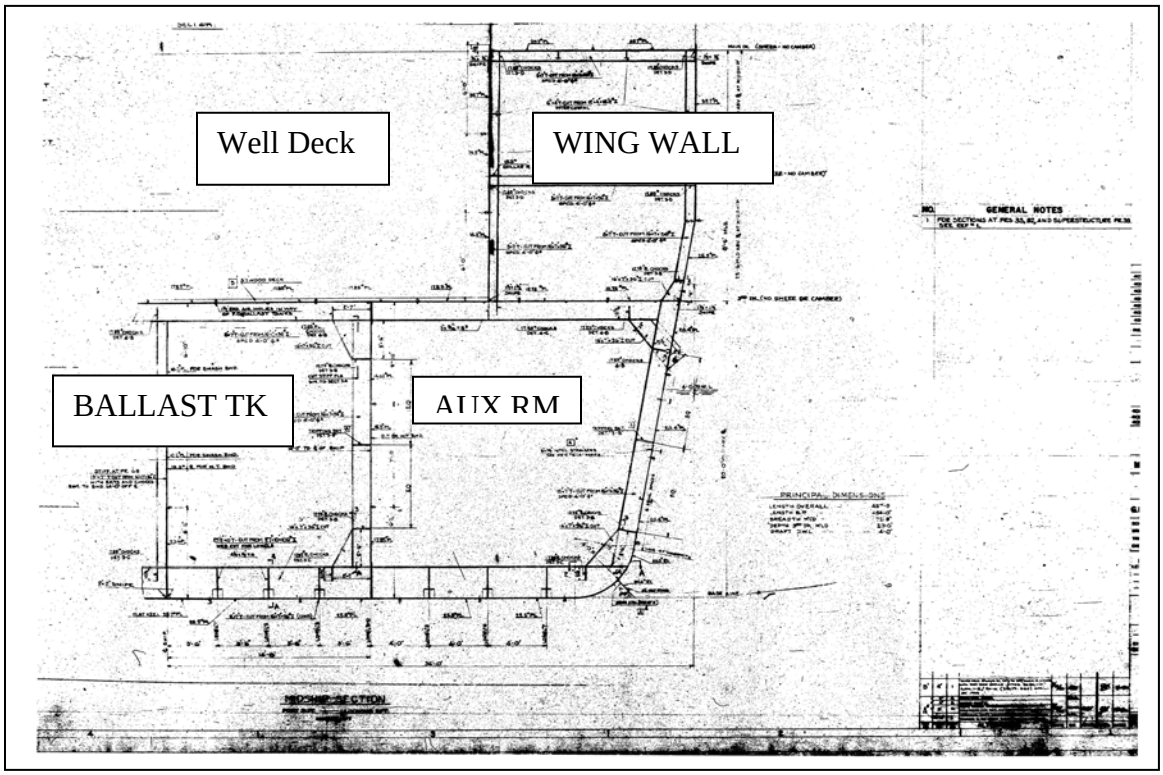


Figure 1
MIDSHIP SECTION

Findings:

The survey consisted of sampling shell plating and the longitudinal stiffeners welded to the shell plating as well as inspection of welded seams. Table 1 contains a complete listing of locations of samples taken and the readings obtained. It also references the attached photographic documentation provided as an attachment to this document. These photographs give a general overview of the vessel's structure.

Generally the bottom and shell plating is structurally sound in the ballast tanks entered. The survey describes the bottom, bulkhead and stiffener structure as "clean, no scale, just surface rust"). We applied wastage of 10% to the shell plating and stiffeners within these areas to be conservative and reflect the worst wastage measured (10.4% in SWBT A420W). No photos are available for these tanks. In way of the manned spaces the story is much different. Here the bottom shell plating exhibited similar wastage (10%) but the turn of the bilge showed as much as 30% thickness loss in way of the Engine Room. The longitudinal stiffeners welded to the shell plating were completely wasted. From exterior shell plate samples above the waterline, we measured wastage generally under 5%. Accordingly, the side shell plating above the turn of the bilge reflects 5% wastage in the revised POSSE model and up to 30% wastage at the turn of the bilge. All shell longitudinals outboard of the 14 Ft Long'l BHD have been removed from the hull girder structural calculation (note: this loss of stiffened plating will be a factor in local load bearing). The remaining longitudinal structure in the wing walls and side shell from the 3rd to the Main Deck appears structurally sound and we have not applied a wastage factor to this structure. For the corroded hull, again at midship (1' fwd of Fr 57) the POSSE calculated cross section properties with wastage are as follows:

• Horizontal Axis Inertia (Ixx)	3,040 Ft^4	3.5% Loss.
• Top Extreme Fiber Distance (yt)	18.18 Ft	
• Section Modulus – Top	167 Ft^3	1.7% Loss
• Bottom Extreme Fiber Distance (yb)	18.97 Ft	
• Section Modulus – Bottom	160 Ft^3	5.8% Loss
• Shear Area	7.7 Ft^2	3.75% Loss

In addition wastage, the vessel shows its age in terms of the "wash board" appearance of the shell plating (see Photo – 15 attached). The point of concern here is local shell buckling when subject to hogging loads (bottom shell plating in compression).

Structurally speaking, the loss of section modulus in the bottom plating, together with the loss of local strength (between transverse frames) indicates that planning measures will be required to accommodate and offsets these effects. However, our findings are that loss of structural integrity will not be a show stopper in refloating the ship.

ULTRASONIC THICKNESS TESTING
NRL Fire Test Ship Ex-Shadwell
ESSM Survey November 7 & 8 2005

Item Find Number	Location or Space	Frames	Description	Thickness at built	UT Readings	Difference	Percent Wastage	Comments	Figure No.
1	E/R - P	64-74 - P	Long'l Bhd at Shell	0.438	0.410	0.028	6.29%		1
2	E/R - P	64-74 - P	Shell PL at Long'l Bhd	0.625	0.575	0.050	8.00%		2
3	E/R - P	64-74 - P	Web of Long'l L-6	0.500	0.355	0.145	29.00%	Heavy corrosion in L-7	3
4	Pump Rm	67-69 - S	CL BHD @ Shell	0.500	0.260	0.240	48.00%	Unreliable Reading -	4
5	Pump Rm	67-69 - S	Shell PL @ CL BHD	0.875	0.745	0.130	14.86%		4
6	Pump Rm	67-69 - S	Transverse @ F68 - Web	0.515	0.485	0.030	5.83%	Transverse appears sound	
7	E/R - S	64-67- S	Shell PL @ Turn of Bilge	0.625	0.610	0.015	2.40%		5
8	E/R - S	64-67- S	Side Shell PL abv L-8	0.500	0.310	0.190	38.00%	See Exterior Samples for Comparison	6
9	E/R - S	64-67- S	6 x 4 T on Side Shell					Web Completely Wasted	6
10	B/R - S	57-64 - S	Shell PL at Turn of Bilge	0.625	0.520	0.105	16.80%		
11	B/R - S	57-64 - S	Side Shell PL abv L-8	0.500	0.397	0.103	20.60%	See Exterior Samples for Comparison	
12	Aux - S	50-57 - S	Side Shell PL abv L-8	0.500	0.437	0.063	12.60%	See Exterior Samples for Comparison	
13	A-406W	22-29 - CL	Ballast Tank - Flat of Keel	0.875	0.795	0.080	9.14%	Tank Clean; No Scale Just Surface Rust	

14	A-406W	22-29 - CL	Ballast Tank - L1 Web	0.295	0.270	0.025	8.47%	8x7x18# T c/f 16x7x36# I	
15	A-409W	29-36 - CL	Ballast Tank - Shell PL	0.625	0.590	0.035	5.60%	Tank Clean; No Scale Just Surface Rust	
16	A-403W	15-22 - CL	Ballast Tank - Flat of Keel	0.875	0.820	0.055	6.29%	Tank Clean; No Scale Just Surface Rust	
17	A-403W	15-22 CL	Ballast Tank - Turn of Bilge	0.5625	0.550	0.013	2.22%	Tank Clean; No Scale Just Surface Rust	
18	A-420W	43-50 - P	Ballast Tank - Shell PL	0.625	0.560	0.065	10.40%	Tank Clean; No Scale Just Surface Rust	
19	Hull Loc#1 A-402W	Frame 11	Outboard Shell PL along rust scale line of hull	0.5	0.471	0.029	5.80%	See Note 11 Peak Ballast Tank	7,8
20	Hull Loc#2 A-417F	Frame 36	Outboard Shell PL along rust scale line of hull	0.5	0.501	-0.001	-0.20%	Note .50 inch doubler plate Aft of Transverse BHD 36	9
21	Hull Loc#3 A-423 F	Frame 47	Outboard Shell PL along rust scale line of hull	0.5	0.481	0.019	3.80%		10
22	Hull Loc#4	Frame 64	Outboard Shell PL along rust scale line of hull	0.5	0.482	0.018	3.60%	E/R Stbd	11
23	Hull Loc#5 C-405 F	Frame 79	Outboard Shell PL along rust scale line of hull	0.5	0.46	0.040	8.00%		12
24	Hull Loc#6 C-407 F	Frame 84	Outboard Shell PL along rust scale line of hull	0.5	0.478	0.022	4.40%		13
25	Hull Loc# 7 C-407 F	Frame 81	Between Location 5 and 6 at scale line on hull	0.5	0.46	0.040	8.00%		13
26	Hull Loc#8 C-413W	Frame 99.5	Stbd side, Aft, 2 feet outboard of shaft Strut bearing hull doubler	0.5	0.477	0.023	4.60%	Heavy Pitting w/ thick rust: could not be pounded off as scale	13
27	Hull Loc#9 C-417 V	Frame 103	Stbd side, Aft, between shaft strut bearing and propeller	0.5	0.48	0.020	4.00%	Heavy Pitting w/ thick rust: could not be pounded off as scale	13

28	Hull Loc#10 C-414 W	Frame 100	Port Side Inboard of shaft 11 feet, This is area of weld hole	0.5	0.425	0.075	15.00%	Difficult to find a flat spot to take reading due to pitting	14
29	Hull Loc#11 TK C-414W	Frame 98	Port Side Inboard of shaft 11 feet, This is area of weld hole.	0.5	0.482	0.018	3.60%	Heavy Pitting and thick rust that could not be pounded off as scale.	14

General Notes & Observations

1 Intercostals L- 8 & L-9 of side shell in way of Aux Rm - E/R (F50-74 P&S) Display Wastage and are not considered structurally sound

2 Continuous L-5;L-6;L-7 in way of Aux Rm - E/R (F50-74 P&S) are not considered structurally sound

3 Structure Within Tanks Inspected appear to be in good condition considering readings taken and lack of scale

4 UKN entries indicate that shapes are apparently no longer made and will be researched for thicknesses

5 TBD entries indicate that shapes are not directly indicated in drawings available and will required further research to identify

6 Ultra-Sonic Thickness Entries from outboard side shell locations are average of readings taken both above and below line of rust scale

7 The instrument used for UT is the Model Cygnus Type 1 Underwater Thickness Gauge Serial Model #3473

8 The UT instrument will not read layers of metal e.g., a welded as a doubler plate, will only read first plate. Verified with bench tests at CAX

9 The UT instrument will read through light rust with out cleaning it off and will not pick up the rust as metal thickness.

10 Photographic Reference: Photos combine Survey of Oct 25th and Nov 7th and 8th

11 UT was not picking up thickness of local shell plate behind doubler (local shell plate thickness varies

Weld Integrity.

The UT survey revealed another point of concern: plate seam weld integrity. Photo-16, attached shows a hole created in a weld seam by striking the seam with a ball peen hammer in way of Tank C-414W. The shell plating surrounding this corroded and disintegrating weld showed very little corrosion consequently a visual inspection of plating seams would not reveal likely failure. In planning the refloat operation, the salvage team may be required to magnetic particle test critical weld seams and create crack arrestors and/or install splicer plates to bridge critical welds.

Recommendations:

The POSSE model for the refloat operation has been updated to incorporate the sectional properties of the corroded structure so it will be possible to quantify some of the hull girder effects of refloat scenarios once they have been identified. In planning the operation the following recommendations should be addressed:

1. To minimize plate buckling in way of the manned spaces every effort should be made to keep the bottom plating in tension, however:
2. In light of the weld failure tensile stress in the side shell and bottom should as low as possible.
3. Hull girder deflection should be monitored throughout the refloat operation to alert salvors of possible over-stress.
4. Selective use of ballast water will be required to "pin" the vessel in a desired position as needed.
5. Beachgear padeyes and fairlead softeners for wire rope to beachgear should be placed on rigid structure. Use 3rd Deck and shell intersection wherever possible.
6. In "working" the vessel with beachgear it may be desirable to "work" the bow out into deeper water rather than the stern (see POSSE model).
7. A thorough hull inspection of weld seams will be required at the start of salvage operations. This inspection should include hammering and if necessary Magnetic Particle inspection. Splicer plates and crack arrestor drilling may be needed to insure that rupture does not occur.
8. To reduce the risk of shell plate buckling between transverse frames it may be desirable to add external hull stiffening in way of "washboard plating".
9. Refloat plan should include structural analysis of the hull's ultimate strength using POSSE Ulstr module as well as lateral bending and torsion reactions to the use of beach gear.
10. To minimize the overturning moments due to beachgear loads the horizontal line of action should be as low as practical.
11. Stability will be of concern late in the refloat process – so the selective use of ballast may be necessary to minimize the risk of sudden list. This use of ballast must be built into the plans from the beginning.

Conclusions:

The POSSE model is up and running. Once the NRL survey data is made available it is recommended that the salvage team assemble to develop a comprehensive strategy to refloat Ex-Shadwell. This strategy should include extensive use of POSSE to help predict where in the process structural loading may become of concern.

Figure 1. Longitudinal structural support frame in port engine space bilge shows rust and scale deterioration with heaviest deterioration along shell plate interface. Typical of most frames (transverse frames, longitudinal frames and many intercostals in the engine room spaces.

Figure 2. Transverse beam intersecting longitudinal L-7 in port engine room.

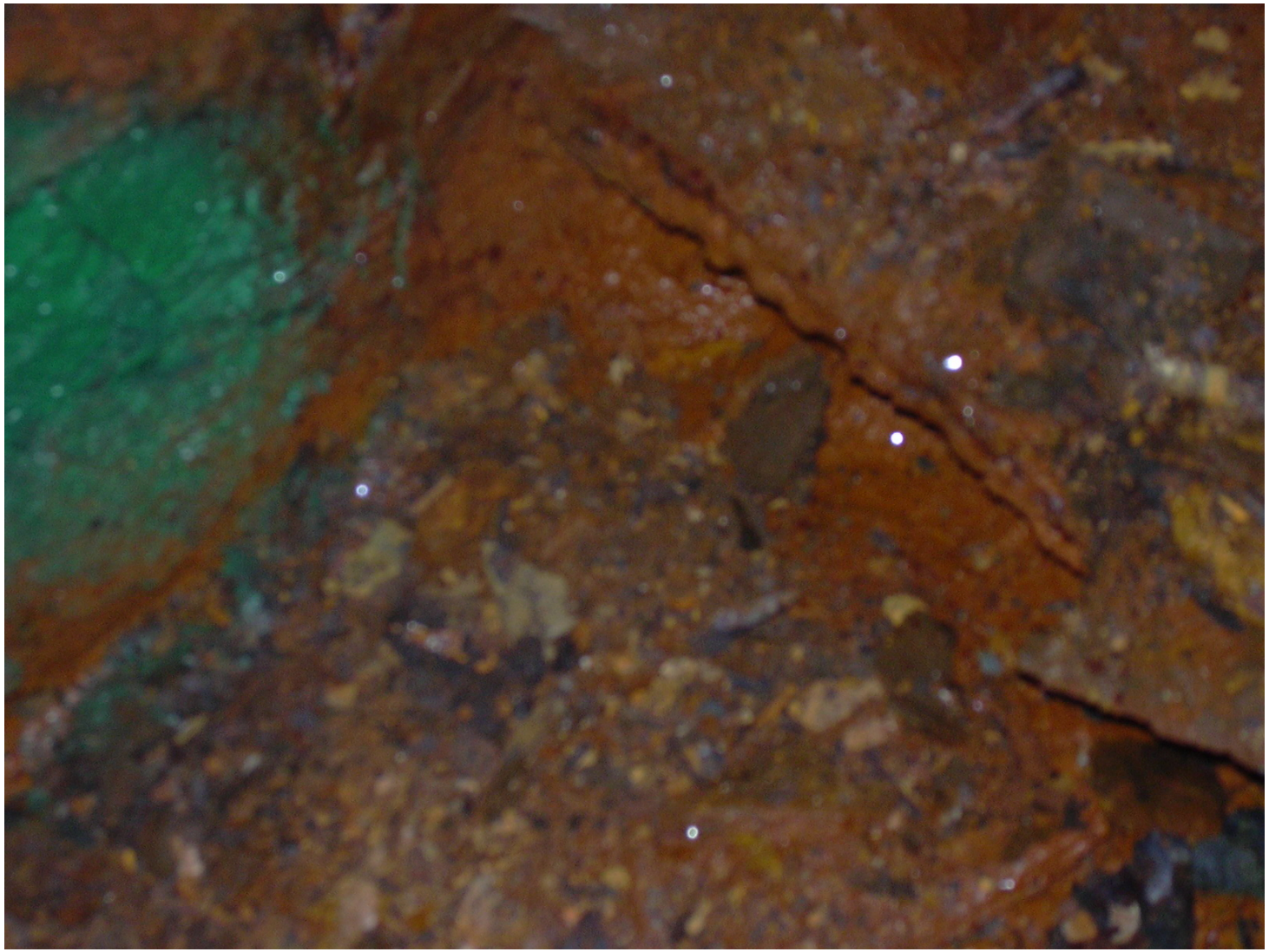


Figure 3. Typical wasted shell plating in way of turn of bilge – port engine room.

Figure 4. Flat of Keel plate at CL-BHD and Frame 69.

Figure 5. L-8 wasted in stbd. engine room.

Figure 6. Wasted 6X4 longitudinal above turn of bilge in stbd. engine room.

Figure 7. Location 1 Outboard Shell Plate. Readings were taken both above and below the rust/scale line.

Figure 8. Area showing green location mark at Location 1, and area of chipped off scale.

Figure 9. Location 2, Frame 36. Readings were taken aft of the doubler plate in areas both above and below the scale line.

Figure 10. Location 3, Frame 49 in way of seachest for clean ballast.

Figure 11. Location 4, Frame 64. Readings were taken both above and below the weld seam to the right of the location number. Note hollowed shell plating between frames

Figure 12. Location 5, Frame 79. In way of seachest for clean ballast.

Figure 13. Location 6 and 7 would forward of this picture to the right side. Location 8 is just outboard of the center strut bearing hull attachment and location 9 is midway between the strut bearing and the prop near the upper left padeye left in this picture. Note – shaft angle is known so this photo provides good evidence of the vessel's trim.

Figure 14. Hull UT readings 10 and 11 were taken on the port stern. Number 10 was located to the right of the shaft next to where the worker is shown in this photo. Number 10 is also where the hole was created in the weld seam. Location 11 is further forward near the strut bearing.

Figure 15. Washboard Plating.

Figure 16. Disintegrated weld in seam near FR 100 port.

Appendix C
UT Report Summary of Findings

SUMMARY FINDINGS

ULTRASONIC TESTING SURVEY
OF
EX-SHADWELL (LSD-15)

Background:

An ultrasonic test survey (UTS) of Ex-Shadwell was conducted November 7th & 8th to sample the extent of corrosion wastage and general structural integrity for a proposed refloat (salvage) operation to be conducted at the soonest practical date. The survey consisted of UT samplings of plating of known construction thickness at 29 locations inside and outside the Ex-Shadwell. Craig Moffatt, and ESSM engineer, conducted the survey using a Cygnus underwater thickness gauge (Type 1 – Model 3473). Locations of concern were previously identified by a salvage planning survey conducted October 25th. This summary finding is provided in anticipation of the complete survey report to follow.

Ex-Shadwell Structural Configuration (see Fig 1):

Ex-Shadwell was an LSD built just prior to the end of WWII. The 454' x 72' x 37' ship is transversely framed on 4 Ft centers with relatively light scantlings. The vessel had a history of structural issues (cracking at the 01-02 level near midship) and problems (side shell plate panting). She was extensively refitted with intercostals shell stiffeners above the turn of the bilge to the 3rd deck level to support the light scantlings and relatively long span of shell plating between transverses (4ft c/c). In addition, ½ inch doubler plating and ½ frames were added to the shell from the FP to Fr 36 to reduce panting. A crack arrestor was added at the Main Deck level throughout the vessel's length after cracks appeared on the 01-02 level fashion plates. These fashion plates were replaced with thick doublers.

With reference to Figure 1 the LSD's structural configuration reflects the design of a self propelled floating drydock with a stern gate and WTB forward to form a well. Wing walls (37 Ft high and 22 Ft off CL P&S) extend 394 Ft from the stern forward to form a well with the 3rd Deck (20Ft ABL) for FLO/FLO operations, and a Longitudinal BHD below the 3rd deck to the shell plating. Except for manned spaces below the 3rd Deck, ballast tankage extends throughout the vessel's length inboard and outboard of longitudinal BHDS 14 Ft off CL (P&S). Manned spaces extend from Fr 50 – Fr 73 outboard of the 14Ft Longitudinal BHD.

In calculating the hull girder section modulus all continuous longitudinal structure with the exception of side shell intercostals has been included. This consists of: CL NT BHD (Shell to 3rd Dk); Bottom and Side Plating to Main Dk); Main, 2nd and 3rd Dk Plating (including Well Dk); 22 ft Wing Wall & Long'l BHD (Bottom to Main Dk); 14 Ft

Long'l BHD (Bottom to 3rd Dk); Bottom Long'l stiffeners L-1 through L-7, and finally Main Dk, Upper shell, and Wing wall long'l stiffeners. At midship (1' fwd of Fr 57) the POSSE calculated cross section properties without wastage are as follows:

- Horizontal Axis Inertia (Ixx) 3,153 Ft^4.
- Top Extreme Fiber Distance (yt) 18.57 Ft
- Section Modulus – Top 170 Ft^3
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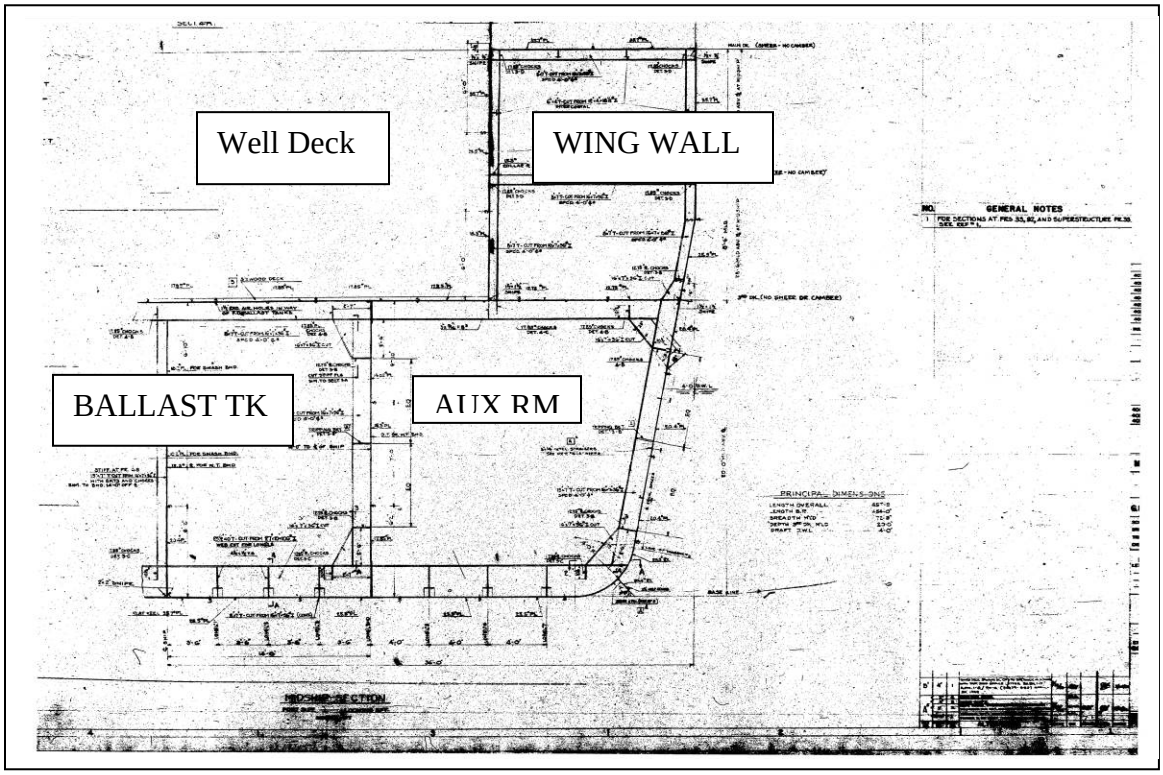

Figure 1
MIDSHIP SECTION

Findings:

The survey consisted of sampling shell plating and the longitudinal stiffeners welded to the shell plating as well as inspection of welded seams.

Generally the bottom and shell plating is structurally sound in the ballast tanks entered. The survey describes the bottom, bulkhead and stiffener structure as "clean, no scale, just surface rust"). We applied wastage of 10% to the shell plating and stiffeners within these areas to be conservative and reflect the worst wastage measured (10.4% in SWBT A420W). No photos are available for these tanks. In way of the manned spaces the story is much different. Here the bottom shell plating exhibited similar wastage (10%) but the turn of the bilge showed as much as 20% thickness loss in way of the Engine Room. The longitudinal stiffeners welded to the shell plating were completely wasted (see Photo -1 attached). From exterior shell plate samples above the waterline, we measured wastage generally under 5%. Accordingly, the side shell plating above the turn of the bilge reflects 5% wastage in the revised POSSE model and up to 20% wastage at the turn of the bilge. All shell longitudinals outboard of the 14 Ft Long'l BHD have been removed from the hull girder structural calculation (note: this loss of stiffened plating will be a factor in local load bearing). The remaining longitudinal structure in the wing walls and side shell from the 3rd to the Main Deck appears structurally sound and we have not applied a wastage factor to this structure. For the corroded hull, again at midship (1' fwd of Fr 57) the POSSE calculated cross section properties with wastage are as follows:

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• Top Extreme Fiber Distance (yt)	18.18 Ft	
• Section Modulus – Top	167 Ft^3	1.7% Loss
• Bottom Extreme Fiber Distance (yb)	18.97 Ft	
• Section Modulus – Bottom	160 Ft^3	5.8% Loss
• Shear Area	7.7 Ft^2	3.75% Loss

In addition wastage, the vessel shows its age in terms of the "wash board" appearance of the shell plating (see Photo – 2 attached). The point of concern here is local shell buckling when subject to hogging loads (bottom shell plating in compression).

Structurally speaking, the loss of section modulus in the bottom plating, together with the loss of local strength (between transverse frames) indicates that planning measures will be required to accommodate and offsets these effects. However, our findings are that loss of structural integrity will not be a show stopper in refloating the ship. A complete report with attached photos will be available for salvage planning and the current POSSE structural model is in the process of being modified to incorporate the corrosion document in the survey.

Weld Integrity.

The UT survey revealed another point of concern: plate seam weld integrity. Photo-3, attached shows a hole created in a weld seam by striking the seam with a ball peen hammer. The shell plating surrounding the corroded and disintegrated weld showed virtually no corrosion. In planning the refloat operation, the salvage team may be required to magentic particle test critical weld seams and create crack arrestors and/or install splicer plates to bridge critical welds.

PHOTO – 1
WASTED LONGITUDINAL GIRDER
ER STBD

PHOTO-2 - WASHBOARD PLATING

PHOTO – 3 - DISINTEGRATED WELD IN SEAM - FR 100 PORT

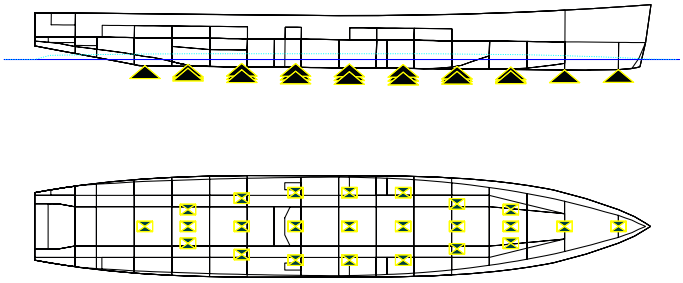
Appendix D
POSSE Models

Current Condition

PCCI-POSSE
Ex_Shadwell

POSSE 4 4.6.5

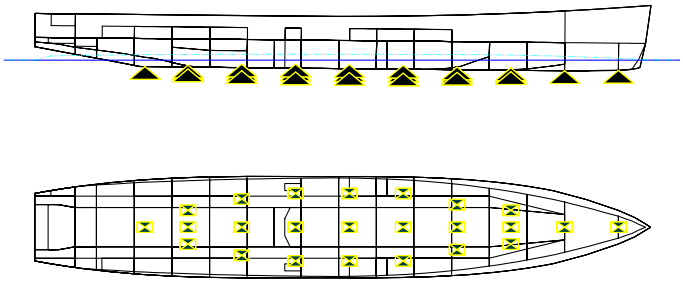
Draft/Displacement Summary
Refloat



Stranded Draft / Displacement Data

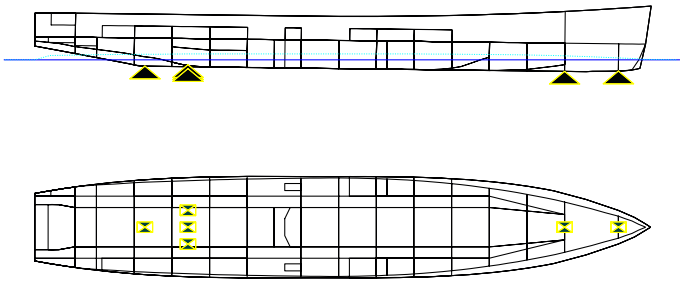
		Intact Direct	After Outflow	As Stranded
Draft at FP	**ft**	12.47		8.11
Draft at AP	**ft**	11.44		3.82
Trim	**ft**	1.03F		4.29F
Draft at Fwd Marks	**ft**	12.47		8.11
Draft at Aft Marks	**ft**	11.44		3.82
Static Heel Angle	**deg**	4P		7S
Total Weight	**LT**	5,482	5,482	5,482
VCG	**ft**	28.65	28.65	28.65
LCG	**ft-FP**	220.79A	220.79A	220.79A
TCG	**ft-CL**	0.20P	0.20P	0.20P
Buoyancy	**LT**	5,482		2,502
KB	**ft**	6.42		3.47
LCB	**ft-FP**	220.72A		205.17A
TCB	**ft-CL**	1.72P		4.66S
KMt	**ft**	31.53		69.00
FSc	**ft**	0.00		0.00
GMt	**ft**	2.88		32.23

Draft/Displacement Summary
Hollow Out Middle



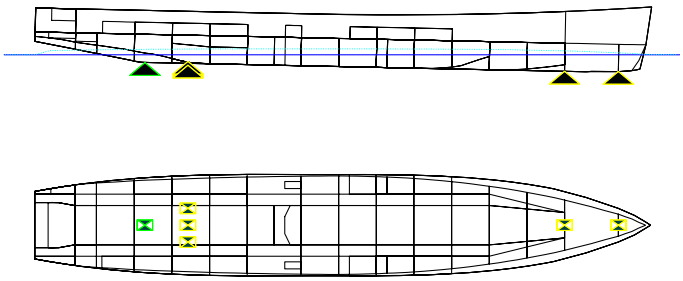
		Stranded Draft / Displacement Data		
		Intact Direct	After Outflow	As Stranded
Draft at FP	**ft**	12.47		8.19
Draft at AP	**ft**	11.44		3.89
Trim	**ft**	1.03F		4.30F
Draft at Fwd Marks	**ft**	12.47		8.19
Draft at Aft Marks	**ft**	11.44		3.89
Static Heel Angle	**deg**	4P		7S
Total Weight	**LT**	5,482	5,482	5,482
VCG	**ft**	28.65	28.65	28.65
LCG	**ft-FP**	220.79A	220.79A	220.79A
TCG	**ft-CL**	0.20P	0.20P	0.20P
Buoyancy	**LT**	5,482		2,539
KB	**ft**	6.42		3.52
LCB	**ft-FP**	220.72A		205.31A
TCB	**ft-CL**	1.72P		4.70S
KMt	**ft**	31.53		47.77
FSc	**ft**	0.00		0.00
GMt	**ft**	2.88		-2.89

Draft/Displacement Summary
Hollow Bow Next



		Stranded Draft / Displacement Data		
		Intact Direct	After Outflow	As Stranded
Draft at FP	**ft**	12.47		9.02
Draft at AP	**ft**	11.44		3.65
Trim	**ft**	1.03F		5.37F
Draft at Fwd Marks	**ft**	12.47		9.02
Draft at Aft Marks	**ft**	11.44		3.65
Static Heel Angle	**deg**	4P		7S
Total Weight	**LT**	5,482	5,482	5,482
VCG	**ft**	28.65	28.65	28.65
LCG	**ft-FP**	220.79A	220.79A	220.79A
TCG	**ft-CL**	0.20P	0.20P	0.20P
Buoyancy	**LT**	5,482		2,686
KB	**ft**	6.42		3.71
LCB	**ft-FP**	220.72A		202.67A
TCB	**ft-CL**	1.72P		4.50S
KMt	**ft**	31.53		45.74
FSc	**ft**	0.00		0.00
GMt	**ft**	2.88		-3.82

Draft/Displacement Summary
Swing Out HW



		Stranded Draft / Displacement Data		
		Intact Direct	After Outflow	As Stranded
Draft at FP	**ft**	12.47		13.10
Draft at AP	**ft**	11.44		3.87
Trim	**ft**	1.03F		9.23F
Draft at Fwd Marks	**ft**	12.47		13.10
Draft at Aft Marks	**ft**	11.44		3.87
Static Heel Angle	**deg**	4P		7S
Total Weight	**LT**	5,482	5,482	5,482
VCG	**ft**	28.65	28.65	28.65
LCG	**ft-FP**	220.79A	220.79A	220.79A
TCG	**ft-CL**	0.20P	0.20P	0.20P
Buoyancy	**LT**	5,482		3,753
KB	**ft**	6.42		4.98
LCB	**ft-FP**	220.72A		197.39A
TCB	**ft-CL**	1.72P		3.50S
KMt	**ft**	31.53		36.56
FSc	**ft**	0.00		0.00
GMt	**ft**	2.88		-0.46

Appendix E
Salvage Planning Documentation

REFLOAT CONCEPT OF OPERATIONS FOR NRL FIRE TEST VESSEL *EX-SHADWELL (LSD-15)* AND USCG FIRE TEST VESSEL *EX-STATE OF MAINE*

Prepared By:

NAVSEA 00C
PCCI, Inc and GPC – A Joint Venture
Donjon Marine, Inc

Prepared for:

Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375

December 01, 2005

1. Introduction

The storm surge and associated winds of hurricane Katrina caused the USCG fire test vessel *Ex-State of Maine* (SO Maine) and the NRL fire test vessel *Ex-Shadwell* (Shadwell) to drag anchors and shift their respective moorings at Little Sand Island in Mobile AL. The storm's passing saw both vessels aground, with the SO Maine surrounded by water and Shadwell with her port side high and dry (see Figure 1). Sand Island is a man made island developed from dredge spoils and is subject to ACOE oversight. This document's purpose is to outline how NAVSEA 00C (SUPSALV) intends to refloat these vessels and moor them in a predetermined location for further use by their respective commands.

2. Summary

A site survey by SUPSALV and its salvage contractor Donjon Marine Inc indicates that the vessels can be refloated by a combination of selected suction dredging to provide buoyancy and tug assist to free the vessels. Preliminary results of salvage engineering calculations using the SUPSALV computer salvage modeling program POSSE indicate that at high water the SO Maine rests with approximately 1800 Long Tons (LT) aground and Shadwell with approximately 4000 LT aground. With this magnitude of ground reaction, beach gear and tug assist alone cannot provide the necessary force to overcome bottom friction in order to retract the vessels. In addition, potentially destructive hull stresses generated from pulling forces during the salvage effort need to be minimized. Buoyancy in place is required. The outline of this plan was discussed on October 26th at a stakeholder meeting in Mobile, AL with all affected parties.

In order to effect salvage of the Shadwell, the SO Maine will have to be refloated and moved. Suction dredging will be employed to carve a hole around SO Maine, in order to refloat the vessel in place, and create a narrow channel to permit the vessel to be shifted aft into the navigation channel under tug control. SO Maine will then be moored either 1) temporarily in an area parallel to the navigation channel or 2) immediately in its final mooring area within a previously dredged narrow cut south of its pre-Katrina location.

Refloating Shadwell will be accomplished by a combination of port and starboard dredging to reduce the vessel's tons aground to manageable proportions. In addition, dredging will be conducted aft of Shadwell to provide enough water to extract the vessel by tug into the navigation channel. During this evolution SUPSALV intends to use Navy fleet assets and beach gear to work the Shadwell to starboard if necessary to further reduce the ground reaction and help free the vessel for tugs to pull her into the channel. Shadwell will be returned as near as practical to its pre-Katrina location and moored. As

the storm surge and current forces have altered the bathymetry of Little Sand Island's mooring cove, additional dredging may be required to provide a new slip for Shadwell as well as the SO Maine. Proposed Slip locations are shown in Figure 1.

3. Work Breakdown

The following chronology is general in nature and subject to revisions and modifications. SUPSALV will contract and arrange all work associated with this operation either directly with the fleet or through its salvage contractor Donjon Marine Inc.

1. Engage local contractor to build a spoils berm on Little Sand Island to receive the dredge spoils (note: dredge permit for this operation is in place and approved). Preposition shore-side equipment.

2. Mobilize fleet assets and Mobile Diving and Salvage Unit (MDSU) personnel and equipment for beach gear operations to the extent they can be used at a savings or no additional cost to the customer. Commercial tug and salvage assets mobilized as required for salvage support. Lay moorings for SO Maine.

3. Modify and enhance Shadwell's structural integrity as required to meet refloat forces and loads while SO Maine dredging takes place. Weld beach gear pad eyes to the Shadwell and secure all lose gear for the refloat evolution. Clear area to port of Shadwell of all vegetation and begin bulldozer operations to dig out a trench along the vessel's port side. Set up laser/optical transit on Shadwell's 3rd deck to monitor hull girder bending during refloat operations. Pre-ballast Shadwell as required to support dredging operations.

4. Mobilize dredge assets and carve out new channel and final mooring slip for SO Maine south of original location. Depth at MLW should mirror the free-floating drafts for SO Maine (reported to be 17 ft forward and 24 ft aft). The mooring approach will require sufficient depth to move the vessel in place.

5. Dredge around SO Maine in its current location sufficiently to "refloat" the vessel in place. Then dredge a channel to shift SO Maine aft under tug control. Either shift SO Maine to its final home, or temporarily moor the vessel parallel to channel.

6. Dredge Shadwell's pre-Katrina mooring area to its pre-Katrina depths (estimated to be 14 ft at MLW).

7. The Shadwell refloat operation will require a continued dredging operation at the vessel's stern and along its starboard side while the trench is excavated along and under the vessel's port side. Beach gear will be used as needed to "work" the vessel into the dredged area aft of the ship. The trenching and dredging details will be established to as to minimize hull girder stress. Ballast may be adjusted to support operations as developed in the detailed salvage plan.

8. When the ground reaction has been minimized consistent with beach gear and tug capability, the Shadwell will be shifted aft and to starboard into deeper water.

9. Shadwell will then be positioned in it pre-Katrina location with a new mooring established.

4. Naval Architecture: Strength and Stability Considerations:

POSSE models have been generated for both SO Maine and Shadwell. A site survey of both vessels was conducted on October 25th to determine the feasibility of a refloat operation and to assist in the stakeholder's discussion. On the basis of this survey and the confirmation of Shadwell's residual strength by ultra-sonic testing (UT), calculations indicate that Shadwell can withstand the forces associated with this salvage approach.

5. Dredging:

Donjon plans to move approximately 70,000 cubic yards of material using a 10" suction dredge. The dredge spoil will be placed, using pipes and booster pumps, into an existing spoil/sand basin on Sand Island (the adjacent manmade spoil island). All work will need to be performed in accordance with the USACOE permit requirements. This basin will need to be constructed previous to commencement of the dredging work. The specific requirements of this plan are to:

1. Remove sufficient material to allow for the safe removal, from stranding, of both the Shadwell and SO Maine.

2. Create two deepwater slips for both the Shadwell and SO Maine with a mound in between and to the "offshore sides" so that except in the most extreme weather conditions, the vessels, in conjunction with their mooring systems, will remain on location. The higher elevations outside the vessels will substantially assist in this effort.

6. Timeline:

The following timeline estimates are based on workable weather conditions. High winds and related sea conditions may impact progress. Prevailing northerly winds during the winter in the Mobile area and rough seas may adversely impact estimated completion times.

1. Dredge Spoil Berm Construction- 30 Days
2. Refloating Operations (including dredging) - 24 days.
    a. Dredging at the Site- 15 Days
3. Total Timeline: 54 Work Days

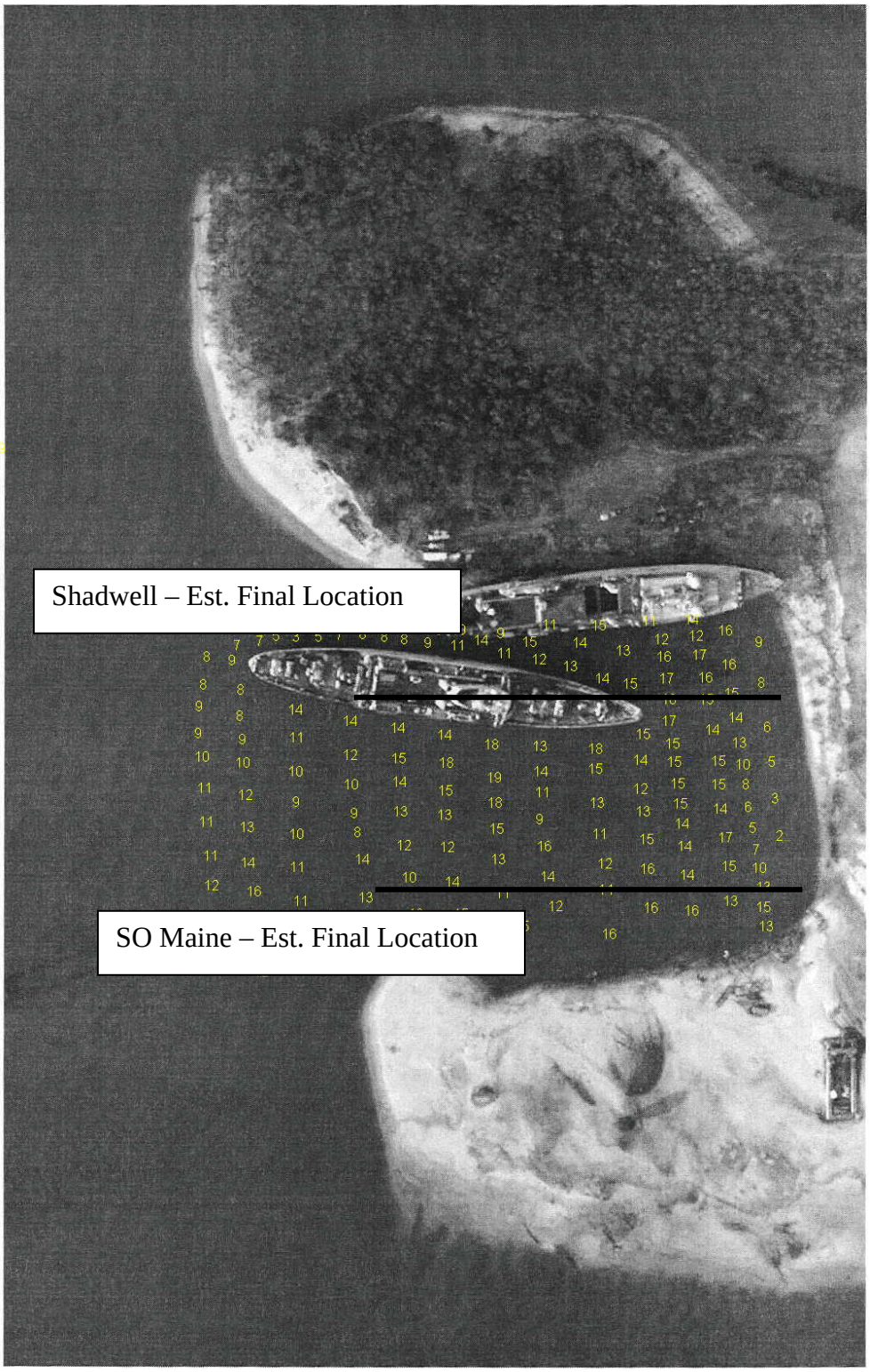


Figure 1
Post Katrina and Post Salvage Mooring Locations

Final Planning Meeting

SALVOPS
of
EX-SHADWELL & STATE OF MAINE

Date: **15 March, 2006**

Time	**Activity**
0645	Assemble at USCG Pier
0700	Depart for SHADWELL
0730-until	Walk-Thru Inspection of SHADWELL & STATE OF MAINE Little Sand Island Note: Lunch on Site, BYOF&D

Date: **16 March, 2006**

Time	**Activity**
0900 - 0930	Opening Comments, Review of Current Situation
0930 – 1000	Laser Hull Girder Deflection Monitoring System Stress Condition of the Hull
1000 – 1030	Dredging Plan: State of Maine Repositioning Refloating of SHADWELL
1030 – 1100	Mooring Plan
1100 - 1130	SALVOPS Schedule, Hull Preps
1130 – 1200	ESSM Equipment Requirements
1200 – 1230	Logistics Support, Other Issues

Final Planning Meeting of 15 March 2006

SALVOPS
of
EX-SHADWELL & STATE OF MAINE

Objectives:

1. Establish final Salvage Operations Plan and Schedule of Events.
2. Determine the final mooring configuration of SHADWELL and SOM.
3. Required support vessels and barges.
4. Personnel requirements for all phases of SALVOPS
5. Develop List of ESSM Equipment required for SALVOPS.
6. Define Hull Preps for SHADWELL and SOM.
7. Resolve all logistic support issues.
    a. Lodging
    b. Crew Sustainment
    c. Medical Emergency Plan
    d. Comms Plan
    e. Other Issues

Comm Plans

Cel Phones

Marine Radios:

Channels 16 (Emergency)
13 (tugs)
2 (working)

Motorola FM

DONJON Sub-Contract Equipment

Dredge

Bull Dozer

Excavator

Small Barge (20 x 60)

(2) Tugs 4000 – 6000 HP

(2) Tugs (anchor handling)

ESSM Equipment

(4) Jetting Pumps and Associated Components

(2) Light Towers and Light Kits

(2) Hydraulic Puller w/ One Leg of Beach Gear (NAVMOOR Anchor) and HPU

(8) Hydraulic Hose Reels (1600' total)

(2) Mod 9

Hydraulic Tool Kit

Salvaged Support Rigging Van

(6) Gasoline Jerry Cans

Pollution Response Kit (pallet of sausage boom / pallet of sponge pads) **local purchase**

Flood Alarm Temporary System (6 zones)

Extra Fuel Tanks (120 gal, (2) 350 gal

Underwater Welding Kit

Brocco Torch Kit

(2) Magnetic Patch Kits

USCG Equipment

74’ Utility Craft

35’ Work Boat

(2) 24’ Runabout

All Terrain Fork Lift

18 ton Crane

Bob Cat Front Loader

(3) Ranger 8s Welders w/Gasoline Pwr Gen

Small Buoys for Making Mooring Positions

NRL Equipment

42’ Crew Boat

35’ Work Boat

(2) OXYACET Cutter

More than a mile of 2 ½” Hose

(4) 300amp Pwr Cons

Rigging Equipment

Steel Plate

DC Plugs

Action Items

Agency	Action
00C/PCCI	Continue to refine Salvage Calculations/Plan
SHADWELL	Prepare Tanks and Systems for ballast and pumping
00C/DONJON	Initiate Contract for Dredge
NRL	Steel Plate & Pipes fort Equipment Base Plates
00C/ESSM/DONJON	Refueling Support Plan
00C/PCCI	Mooring Plan for CAT 3
00C	ACOE Dredging Plan
00C/PCCI	Padeye Design and Placement for SOM & SHADWELL
00C/PCCI/DONJON	Estimate Dredge Material for SALVOPS
NRL	Public Relations Coordination
DONJON	Personnel Access List

Appendix F

PCCI

Marine and Environmental Engineering

Ex-SHADWELL Hull Deflection Discussion
15 March 2006

PCCI
Marine and Environmental Engineering

Sag/Hog Stress

- Sag measured on CL at Frames 29,36, 57, 74, 88, 101,and 111 all relative to laser at F74 and leveled to sight at F36.
- Deck shape shown on CL viewed from stbd side.
- Hull stress calculated from the local bending curvature of the hull between 3 successive points.

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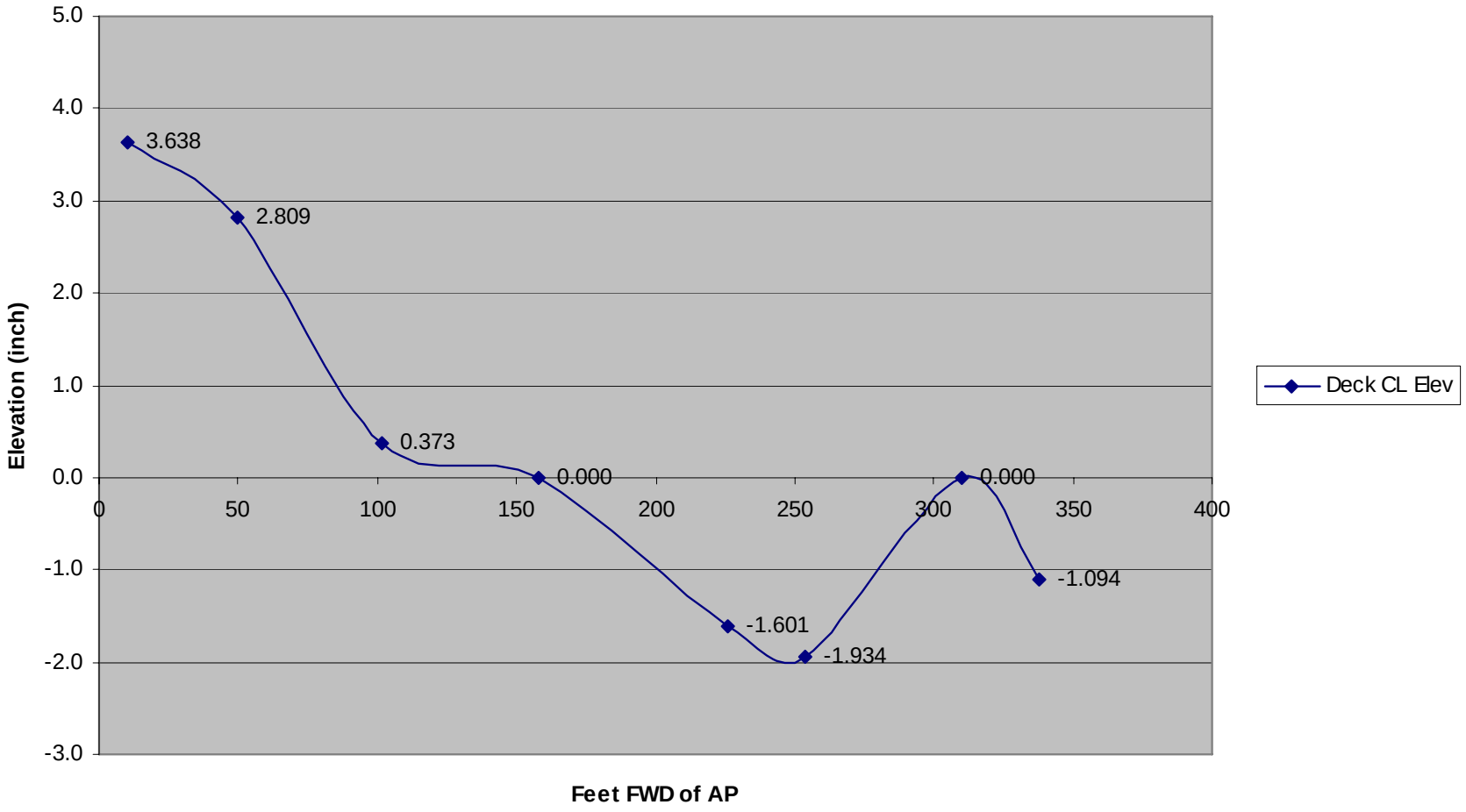
Marine and Environmental Engineering

Hog/Sag 7Mar06 1600 (+1.5 tide)



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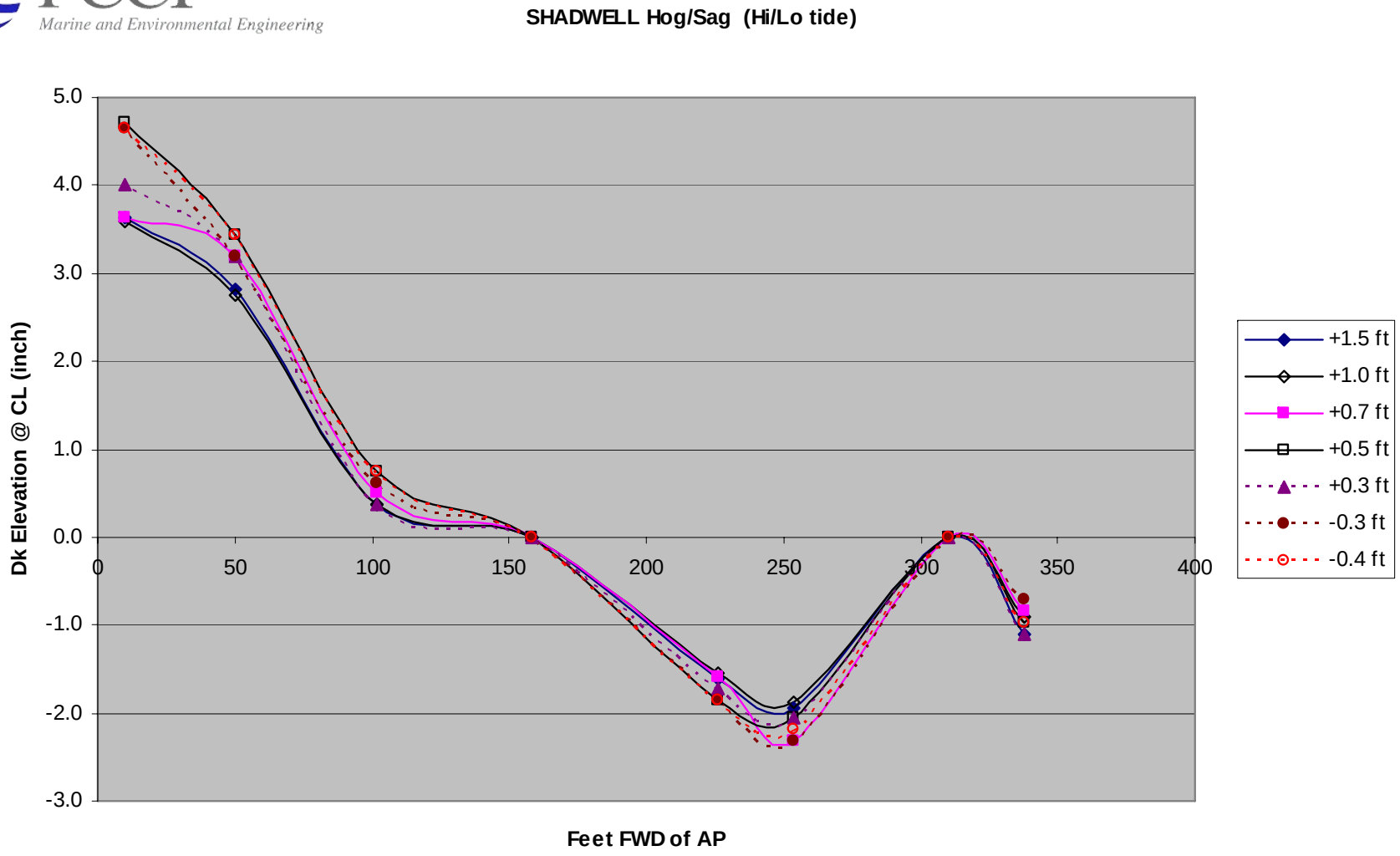
Marine and Environmental Engineering

Date	3/7/06	**Time**	1600	**Tide**	+1.5

Frame Number	x fwd of AP (ft)	z deck elev decimal ft	dz2/dx2 Local Curvature	Distance from N.A. to Keel (ft)	Keel Stress (psi)	+1.5 ft tide Ref Stress (psi)	Change in Stress (psi)
29	336.1667	-0.09115					
36	308.8333	0	-7.63511E-05	20	-44,284	-44,284	0
50	254	-0.16114	4.74199E-05	20	27,504	27,504	0
57	226	-0.13344	1.01369E-05	19.1	5,615	5,615	0
74	158	0	-1.13551E-05	19.1	-6,290	-6,290	0
88	102.5	0.031081	3.06109E-05	18.9	16,778	16,778	0
101	50	0.234046	-2.31129E-05	21.1	-14,143	-14,143	0
111	10	0.303167					

PCCI
Marine and Environmental Engineering



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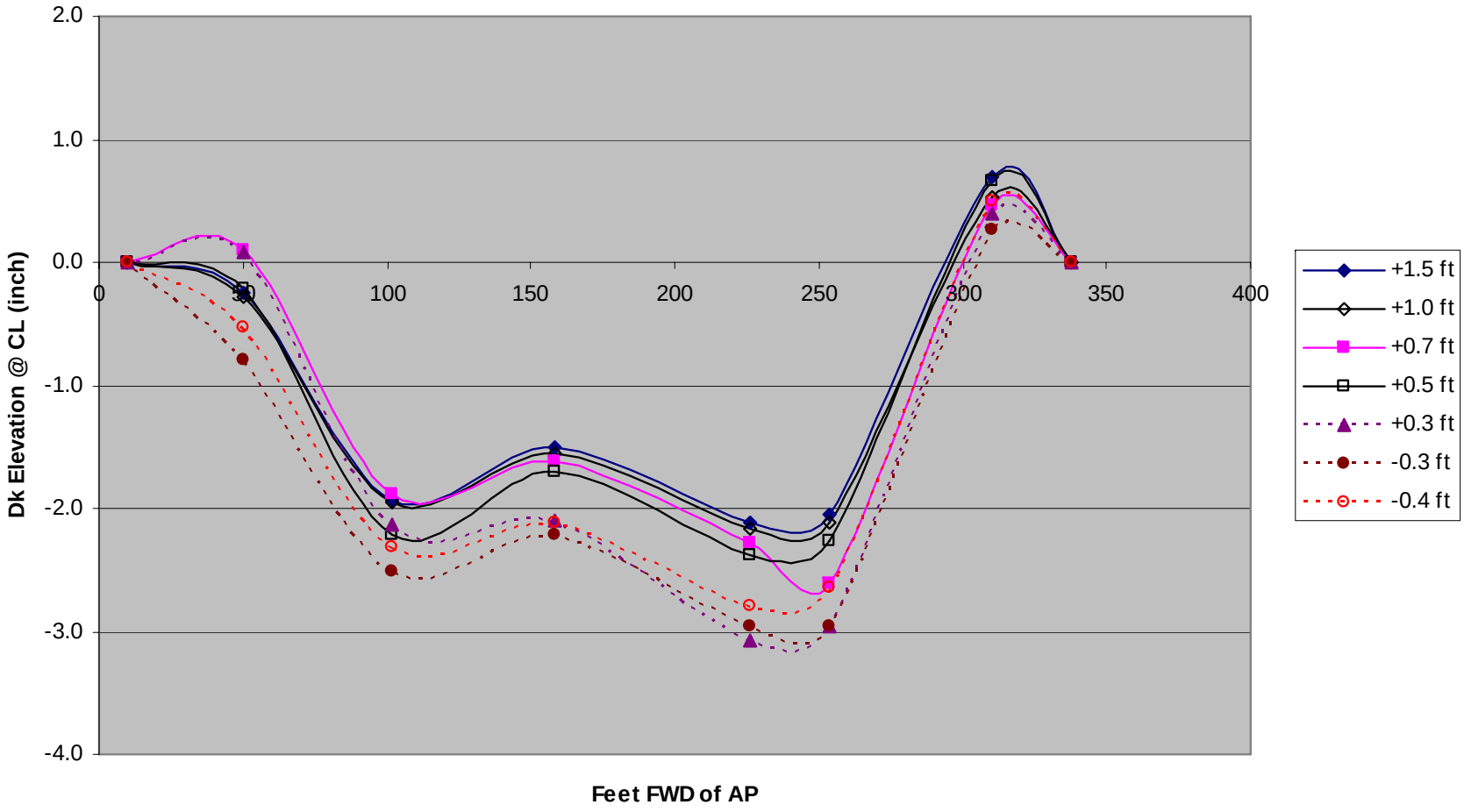

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Marine and Environmental Engineering

Torsion

- Torsion measured at F36, F57, F88 & F101, all relative to laser at F74
- Deck shape shown by elevation of 3 lines, Port, Centerline and Stbd, viewed from stbd side.
- Individual Port and Stbd raw readings are translated to show 3rd deck elevation at 20-ft equal distance P/S from C.L.

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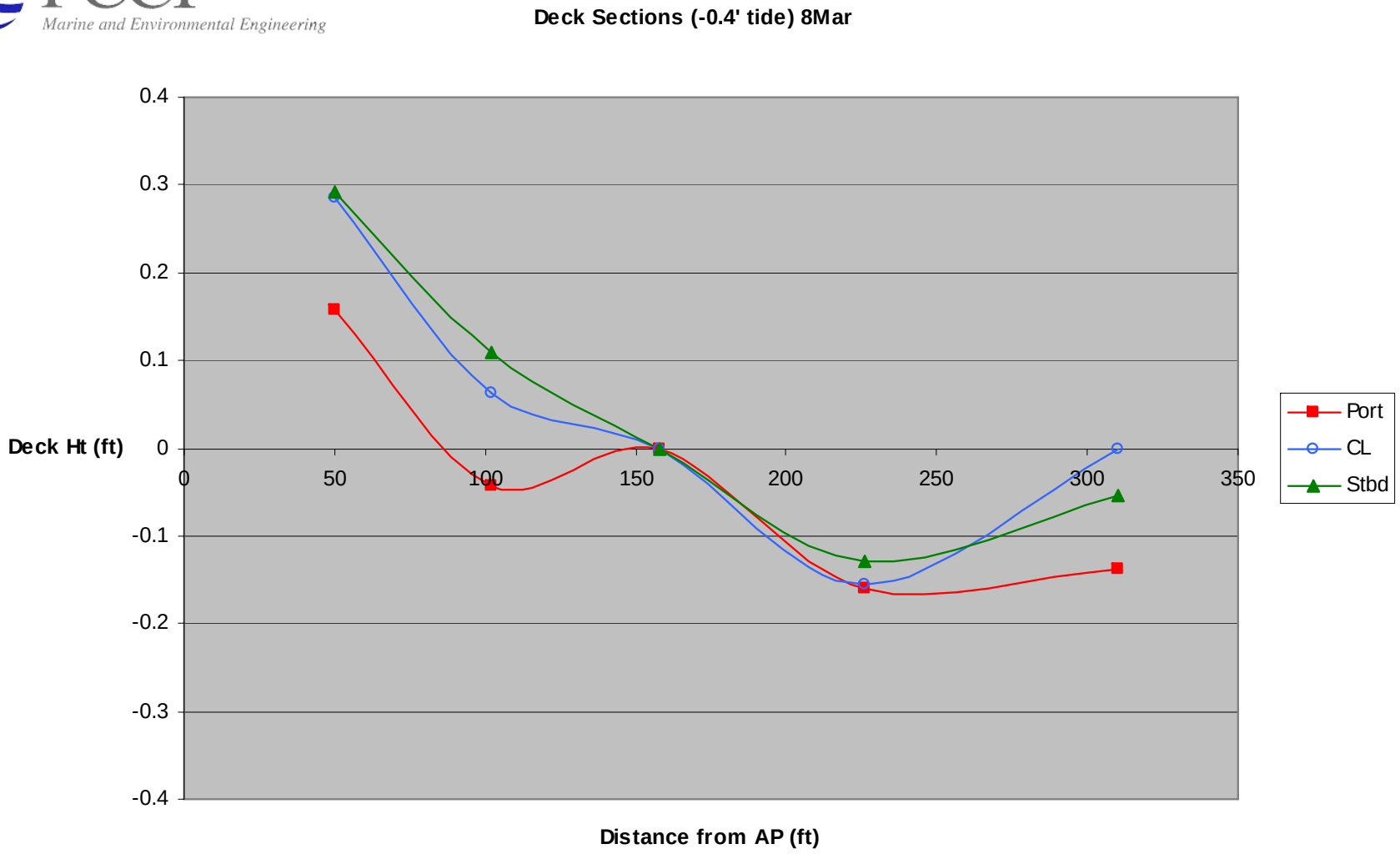
Marine and Environmental Engineering



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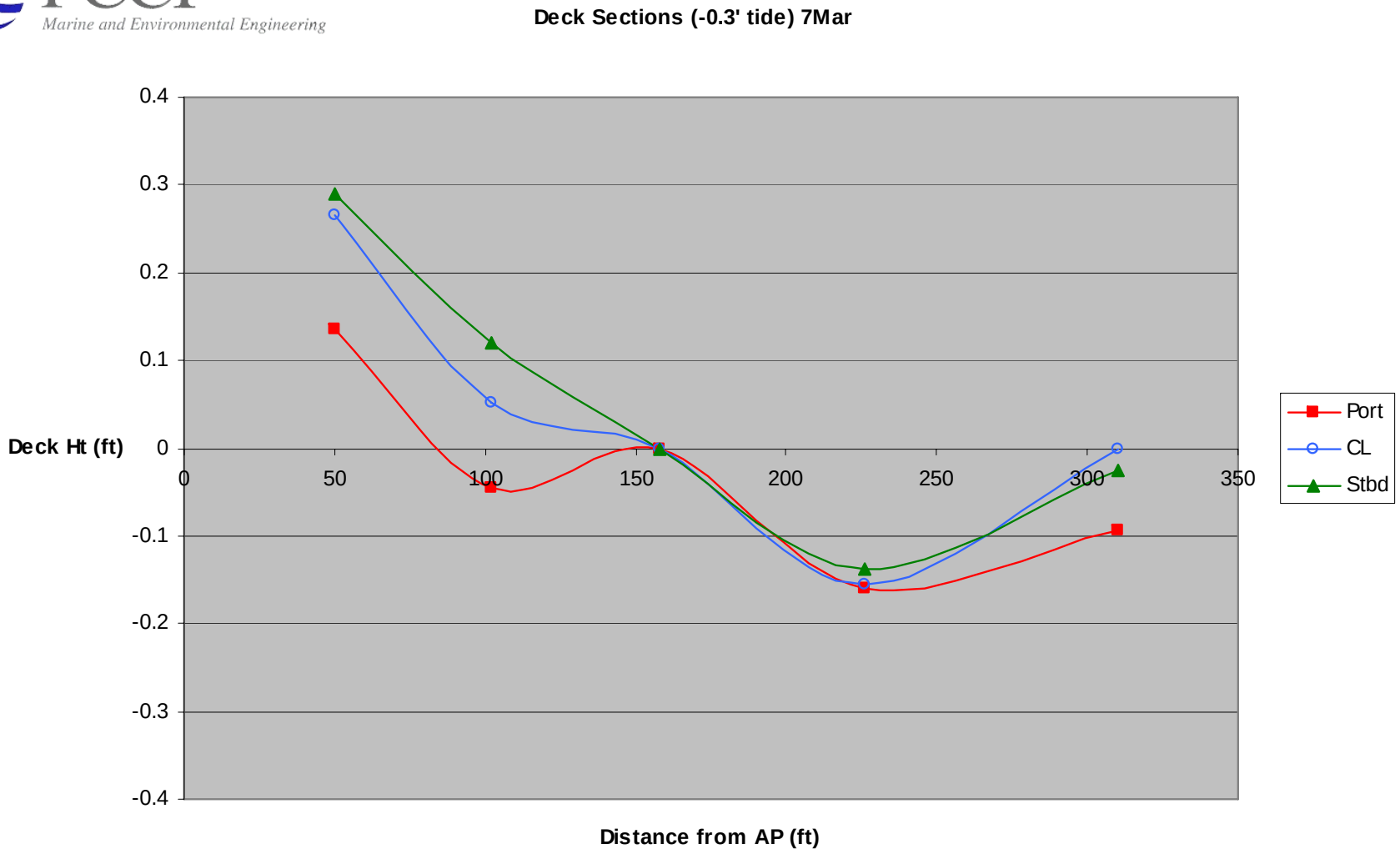
Marine and Environmental Engineering



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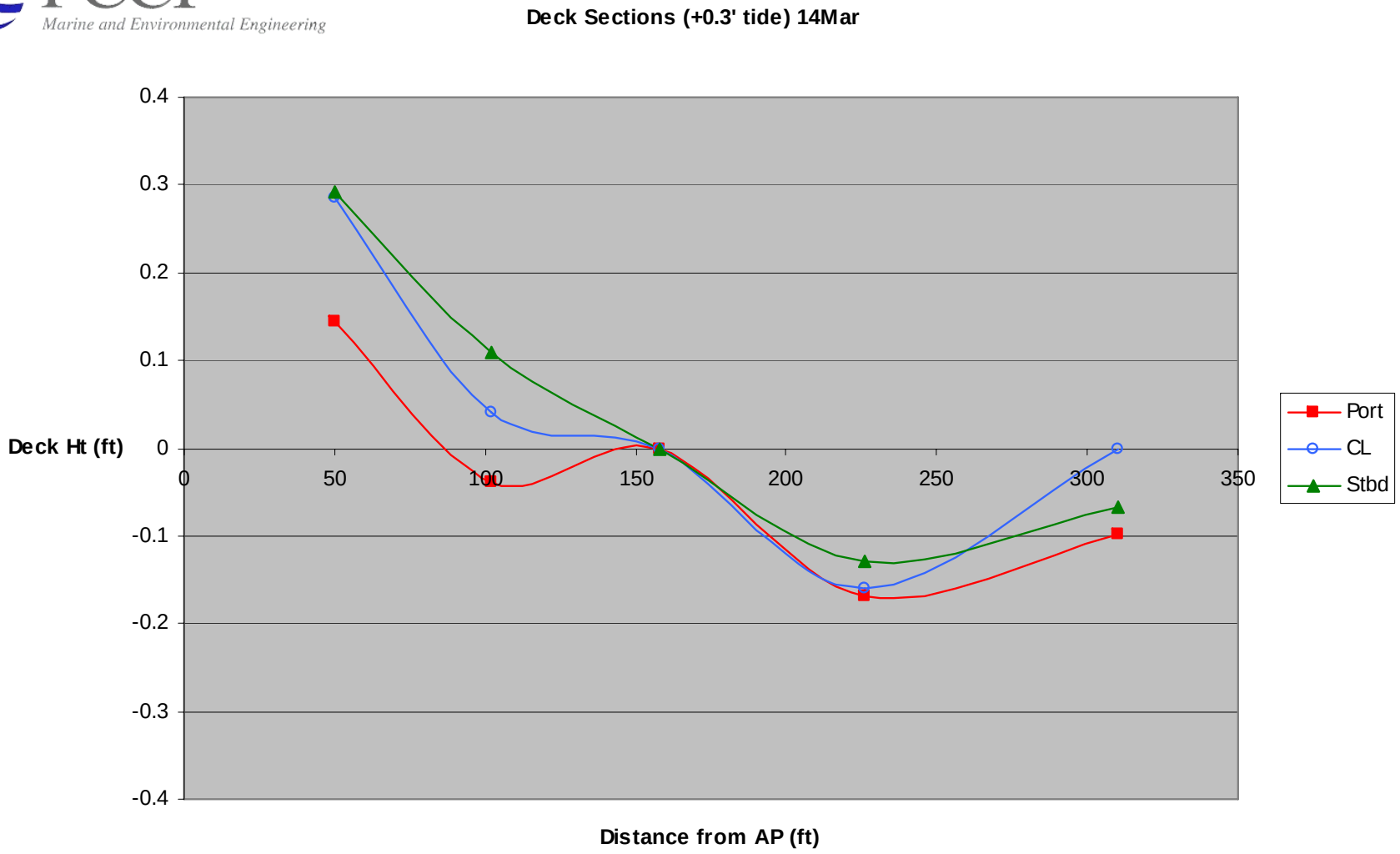

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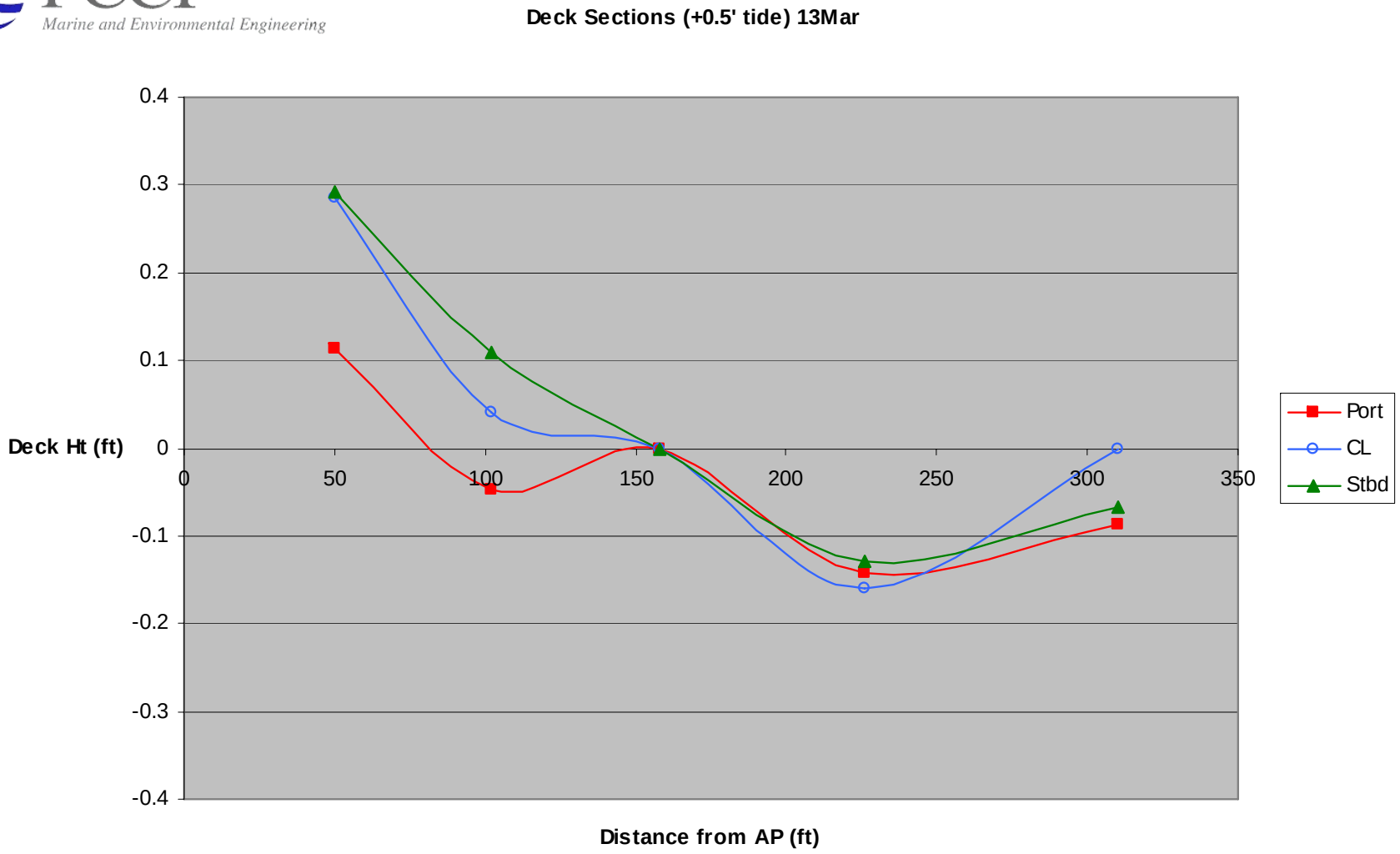

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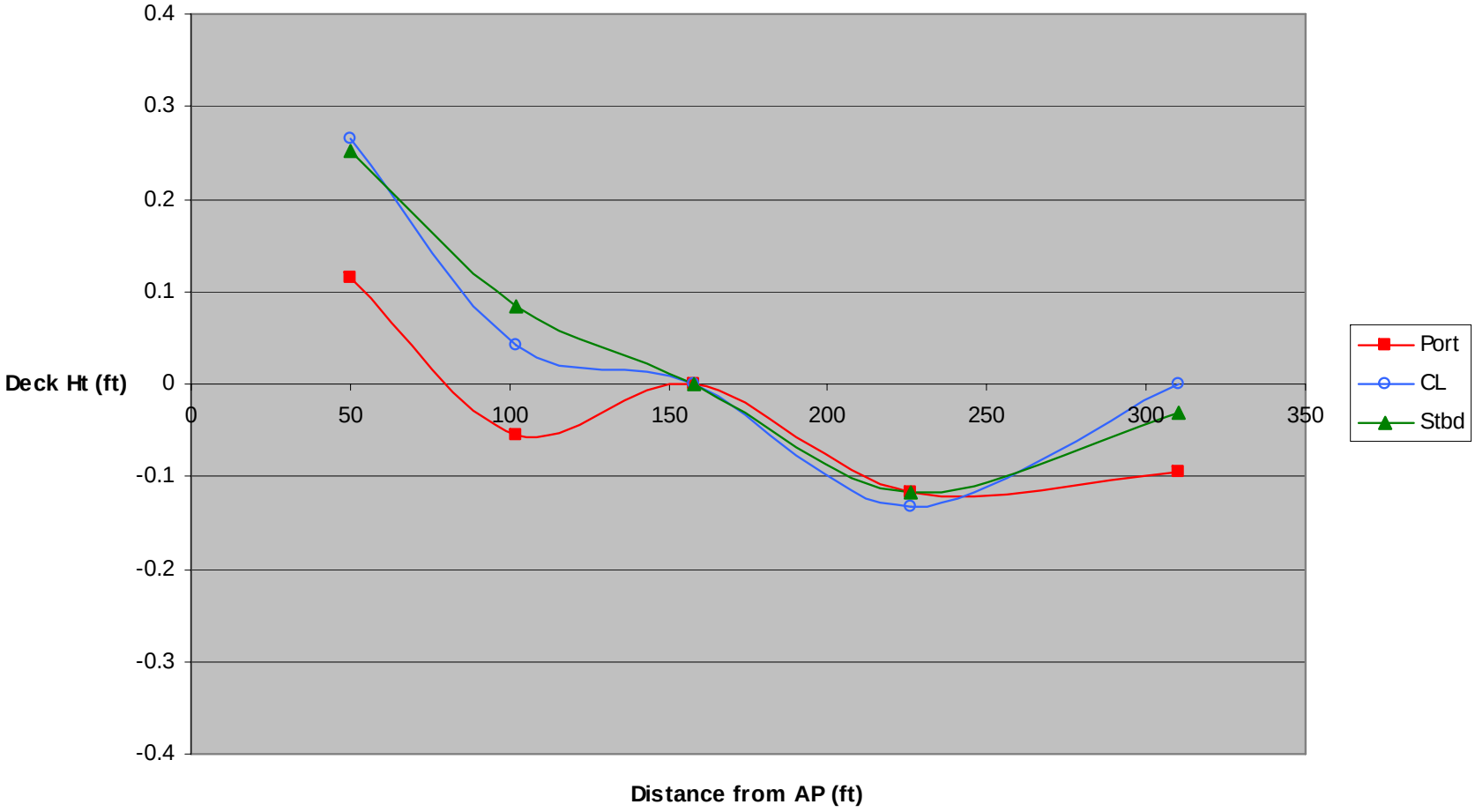
Deck Sections (+0.7' tide) 1Mar



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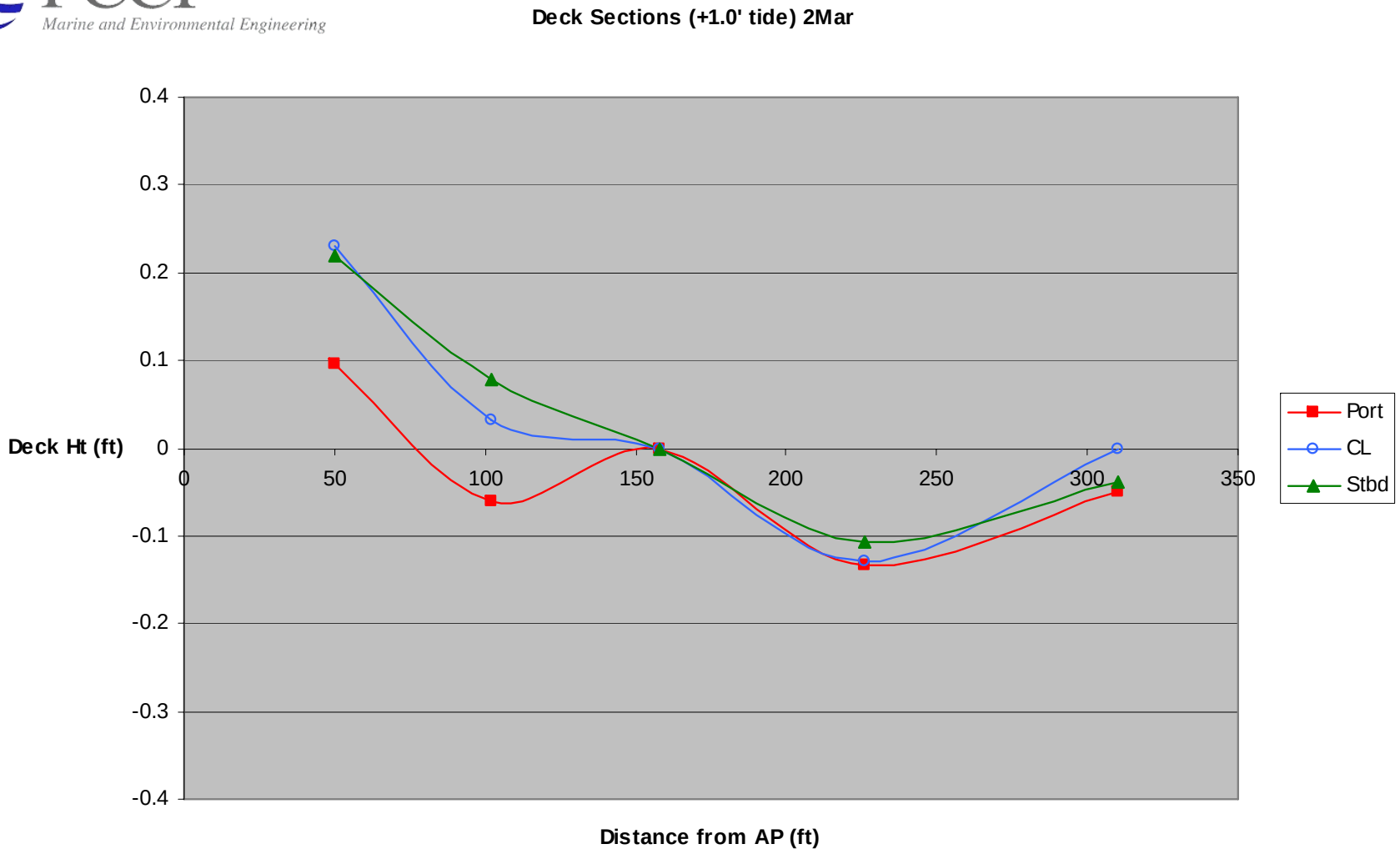

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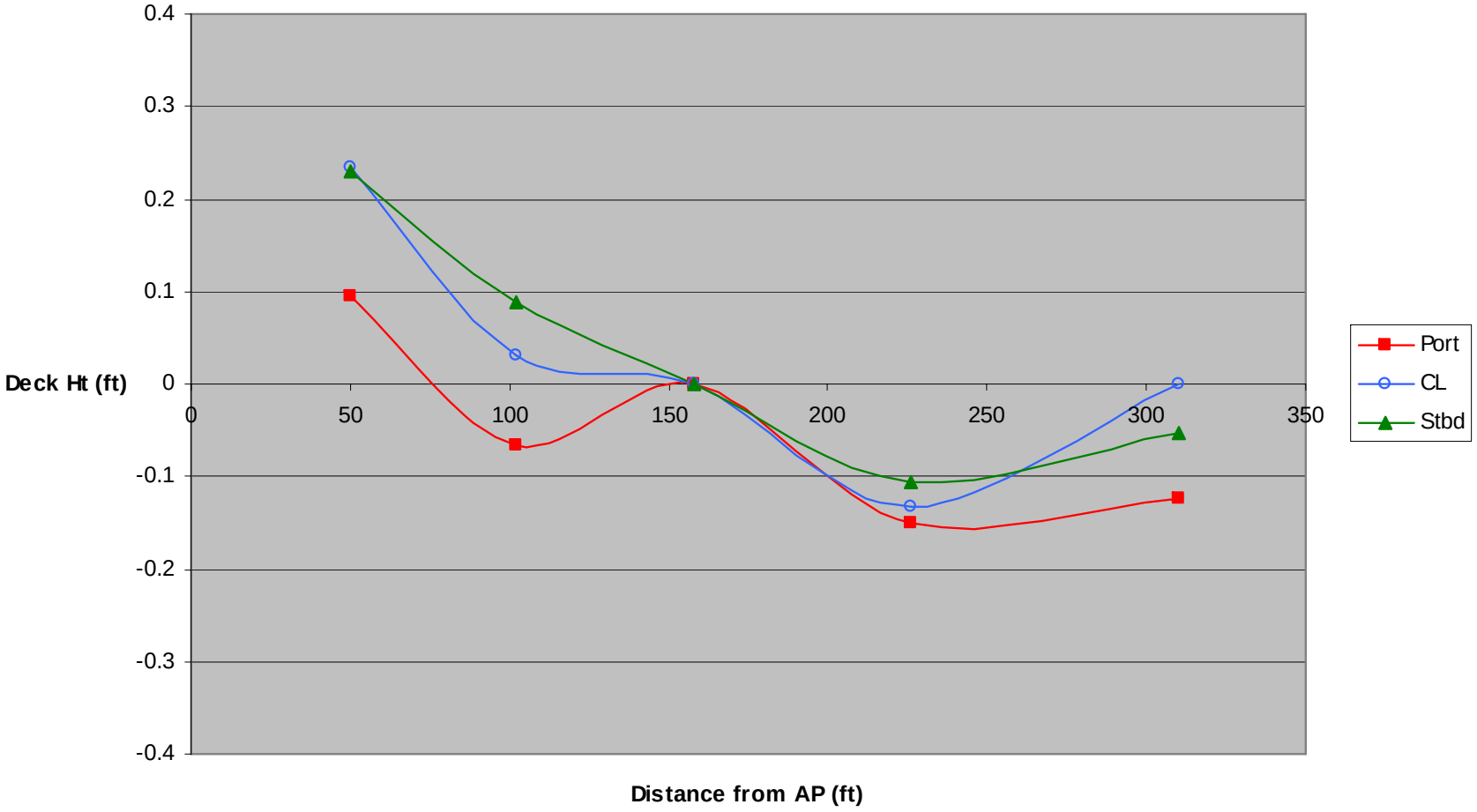
Marine and Environmental Engineering

Deck Sections (+1.5' tide) 7Mar

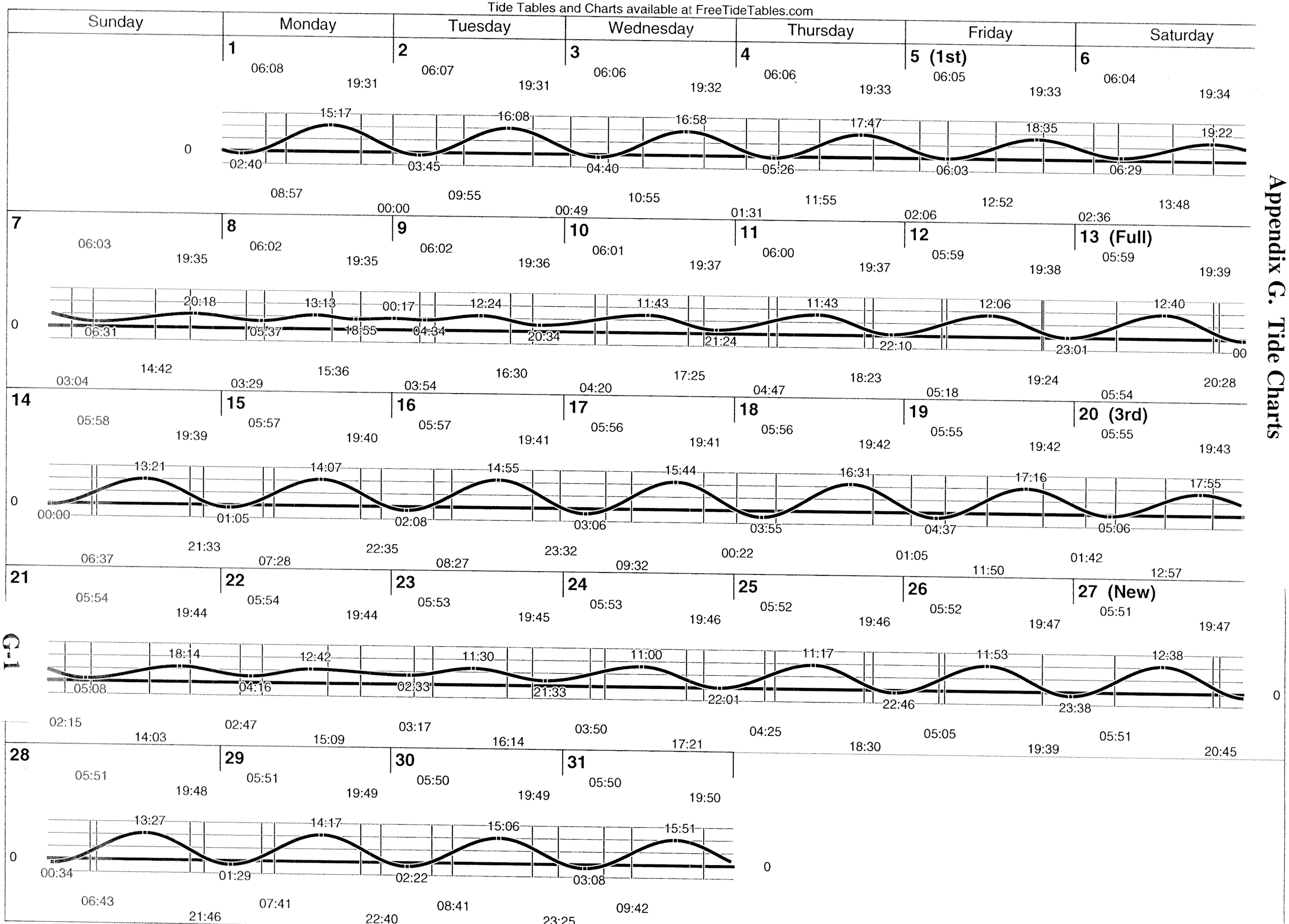


Appendix G. Tide Charts

Alabama, Mobile
N 30° 42.3' / W 88° 02.4'

May 2006

Tide Tables and Charts available at FreeTideTables.com

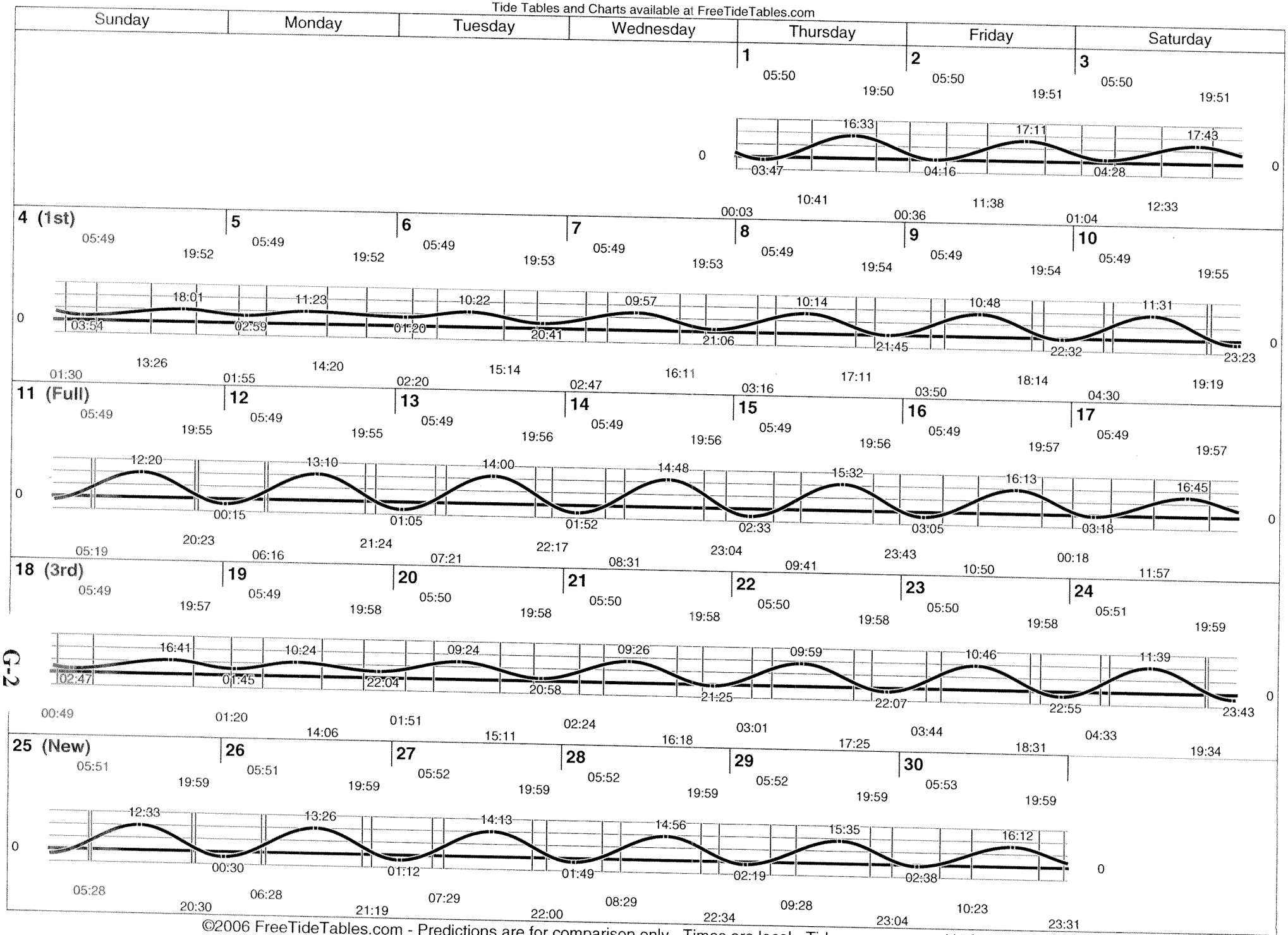


©2006 FreeTideTables.com - Predictions are for comparison only - Times are local - Tides are measured in feet from MLLW

Alabama, Mobile
N 30° 42.3' / W 88° 02.4'

June 2006

Tide Tables and Charts available at FreeTideTables.com



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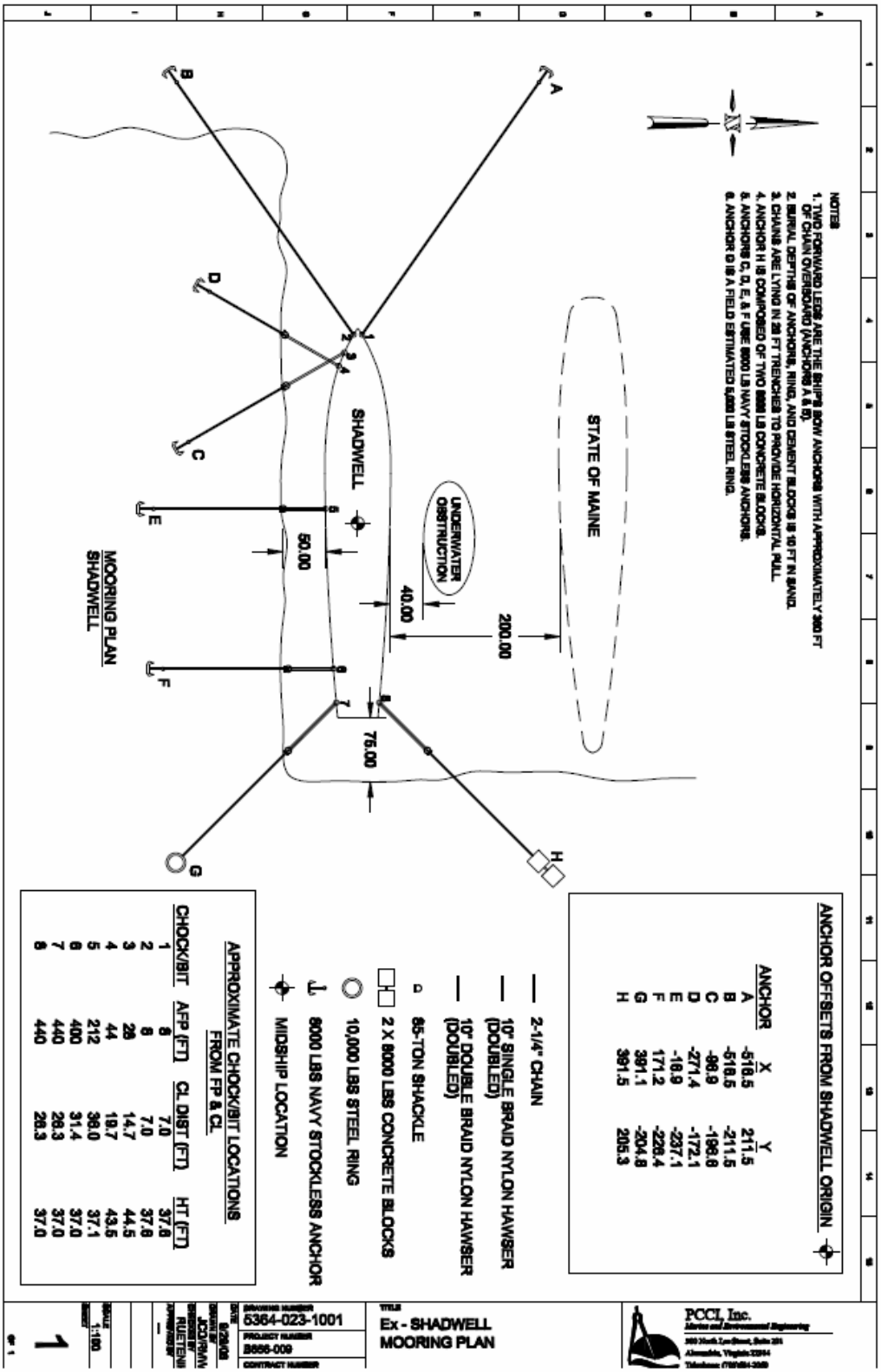
Appendix H
EX-SHADWELL Mooring Plan



ANALYSIS OF MULTI-POINT MOORING FOR NRL FIRE TEST VESSEL *EX-SHADWELL (LSD-15)* AT LITTLE SAND ISLAND, MOBILE BAY, ALABAMA

FINAL REPORT

Submitted By:

SUPERVISOR OF SALVAGE AND DIVING
DIRECTOR OF OCEAN ENGINEERING

NAVAL SEA SYSTEMS COMMAND (SEA 00C)

Prepared By:

PCCI, Inc for
GPC – A Joint Venture
ESSM Operations
P.O. Box JK
Williamsburg, VA 23187

November 13, 2006

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LIST OF TABLES AND FIGURES

APPENDICES

1. SUMMARY

This report presents a capability analysis of the spread mooring installed at Little Sand Island, Mobile, AL in June 2006 to moor the Ex-Shadwell after the ship was refloated. The performance of the mooring is dictated solely by the holding power of the eight anchors in the mooring. The mooring lines and chains are all of sufficient strength to overpower the anchors. The mooring will likely drag its stern anchor in winds exceeding 28 knots that approach from any direction in the northern quadrant, which are striking the ship broadside on the starboard side. The anchors on the south side of the ship will begin to drag in winds over 45 knots approaching from the southern quadrant (blowing on-shore from the Gulf of Mexico).

2. BACKGROUND

The storm surge and associated winds of hurricane Katrina caused the USCG fire test vessel *T/V State of Maine* (SO Maine) and the Naval Research Lab (NRL) fire test vessel *Ex-Shadwell* (Shadwell) to drag anchors and shift their respective moorings in the cove at Little Sand Island in Mobile AL. The storm's passing saw both vessels aground and in close proximity on the north side of the cove.

NRL tasked the US Navy Supervisor of Salvage and Diving (SUPSALV) to refloat Shadwell at the earliest practical date. Early in the planning process it became apparent that SO Maine must be moved prior to undertaking the dredging work around and under Shadwell. By mid-May 2006 SO Maine was refloated and moored in her pre-Katrina location with existing mooring equipment in use before the hurricane.

In June 2006, Shadwell was successfully refloated in place and then relocated to a newly-dredged berth area to the south of SO Maine. The Navy moored the ship on the south side of the cove with the bow facing to the west. A multi-leg mooring was assembled using the ship's two bow anchors, other available ship anchors and chain, and mooring line hawsers from the ESSM warehouse. As of September 2006 and due to continuing work to restore the ship to service, Shadwell's final mooring configuration was not complete, as lines 3 and 4 had not yet been connected and the ship was still about 40-feet further north from the beach than the final intended position.

3. PURPOSE

This report describes an analysis of the potential capacity of Shadwell's mooring to secure the ship in various wind conditions. The objective is to define the maximum wind speed for which the mooring is capable of maintaining the ship in its berth.

The mooring performance was analyzed using the Optimoor Mooring Analysis Computer Program for spread moorings, Version 4.8.10 March 2005, developed by Tension Technologies International, Inc.

4. VESSEL

The Shadwell was commissioned in June 1944 as a United States Navy Landing Ship Dock, and decommissioned in March 1970. The ship is an adaptation of the floating dry-dock principal with a large well deck that opens at the stern to accommodate landing craft. The principal characteristics of the ship are listed below, along with the draft and displacement computed after Shadwell was refloated.

LBP:	454 feet
Beam:	72 feet
Molded Depth:	37 feet (keel to main deck)
Displacement, June 2006:	6,442 long tons
Draft, June 2006:	14 feet

5. MOORING ARRANGEMENT

This analysis is based on the intended final spread mooring arrangement described by SUPSALV in Ref (a), and by NRL in Ref (b), and summarized in Table 1. As of September 2006, the ship was not yet in its final position and two of the mooring lines were not yet connected. The final spread moor will have eight lines attached directly to chains and anchors, with no mooring buoys. The eight mooring lines are arranged as shown in Appendix A, PCCI Drawing 5364-023-1001. The mooring lines are numbered starting with the starboard bow anchor chain as Line #1 and proceeding counterclockwise around the vessel.

The ship's bow anchors are used in their normal configuration off the bow to the west, each is deployed with 4 shots of 2-5/8-inch Dilok chain over the side. The other six mooring lines are run to anchors which are buried on the shore of Sand Island.

Table 1. Mooring Line Azimuths

Mooring Line #	Location on Ship	Angle to Anchor CW from Bow
1	Stbd Anchor Hawse	35 deg
2	Port Anchor Hawse	325 deg
3	Port FR 7	250 deg
4	Port FR 11	290 deg
5	Port FR 53	270 deg
6	Port FR 100	270 deg
7	Port FR 110	225 deg
8	Stbd FR 110	135 deg

The exact locations of the anchors were not surveyed during the installation of the mooring. For the purpose of this analysis, the anchor positions were defined by NRL personnel estimating the angle of each of the mooring lines relative to the vessel centerline, Ref (b). PCCI inferred the anchor locations from the estimated angle of each of the mooring lines and the reported lengths of chain that were deployed from the shoreline to each anchor, Ref (c). The ultimate holding capacity of this mooring is not very sensitive to the exact positions of the anchors and lines. A variation of +/-10 degrees in the azimuth directions of the mooring lines will not substantially change the mooring capacity.

5.1 Mooring Lines

The Shadwell is moored with the two bow anchors and six other mooring lines made up with a combination of synthetic hawsers connected to lengths of chain to anchors buried in sand on the beach. The hawser sizes, and sizes and lengths of chain, were reported by Ref (c). The chains and anchors were positioned so that the chain would extend from the anchor location to the shoreline, where the chain was joined to the hawser with a shackle and the hawser was passed over the water to the ship. Table 2 below provides a complete description of each mooring leg used.

The hawsers are nylon and of either double-braid or single braid construction as noted in Table 2. All of the hawsers are run as doubled lines from the ship to a shackle at the chain on shore, and then back to the ship. The hawsers were part of US Navy Salvage Material stored at the SUPSALV ESSM warehouse and were supplied from excess material inventory. The hawsers were administratively de-certified for continued US Navy use, but there was no known wear or damage which would significantly affect its performance.

The strengths of the chains and hawsers exceed the calculated holding capacity of any of the anchors by a factor of more than 10, as shown in Table 2. Therefore, the hawser condition and type of fiber, and the type and size of chains, do not determine the capacity of the mooring. This analysis indicates that all mooring lines have sufficient scope so

that the chains pull horizontally at the anchor under the maximum tensions, and thus develop the optimum holding capacity of the anchors.

Of concern is the degradation of the hawsers due to continuous exposure of the synthetic material to the elements. The hawsers will be lying on the deck of the ship, constantly exposed to UV radiation, which will cause a breakdown and weakening of the material. The hawser is also in contact with the chain shackles and the hull, which is in less than perfect material condition. Exposure to the elements will cause both to introduce corrosion products to the hawser, weakening the material at the contact points. The last concern is the potential for chafing which will serve to mechanically breakdown the material and reduce the load capacity of the line.

5.2 Anchor Types and Capacities

Four different anchors are used in the mooring. The capacity of the entire mooring is independent of the strength of the mooring chains and lines and is determined strictly by the holding capacity of the anchors. The anchors are the weakest link. The mooring chains have enough scope to ensure a horizontal pull at the anchors and thus maximize the performance of the anchors. The anchors are not expected to fail due to uplift from the mooring lines.

Mooring Lines 1 and 2 are the ship's own two 18,000-pound Baldt stockless anchors and chains. Lines 3 through 6 on the port side are moored to 8,000-pound stockless anchors. The holding capacity of the stockless anchors was calculated per NAVFAC guidelines for drag embedment anchors Ref (d) and (e). The anchors were analyzed as unmodified stockless anchors, with a 48-degree fluke opening angle in sand. The 18,000-lb bow anchors have a predicted maximum holding power of 70,000-lbs. The 8,000-lb anchors have a predicted maximum holding power of 36,000-lbs.

The port stern Line #7 is secured to a scrap steel ring (pipe section), that was buried on the beach as a deadman. The steel ring was not measured in the field but was reported to be 5 feet in diameter by 6 feet long, and be made of 4-inch thick steel Ref (f). The salvage contractor estimated the weight of the steel ring at 5,000-pounds. This deadman is predicted to have a holding power of 56,000-lbs in sand, using Ref (g).

From the dimensions given, the weight of the steel ring calculates to be 14,400-pounds. However, if the calculated weight is used, the ultimate capacity of this deadman anchor buried in sand would increase by only 10%, which would not have a significant effect on the overall performance of the spread mooring.

The starboard stern Line #8 is secured to two 8,000-lb concrete clumps that were buried in the beach as deadmen. The dimensions and shape of these concrete blocks were not recorded. The blocks were analyzed as an in-line arrangement of two cubes of concrete at 150 pounds per cubic foot density. Calculations per Ref (g) give a predicted maximum holding capacity of this deadman of 38,000-lbs.

Table 2. Ex-Shadwell Mooring Lines and Anchors at Sand Island, June 2006

Mooring Line	Hawser Constr. & Circ.	Hawser Break Strength (kips) (doubled line)	Chain Size & Type	Chain Break Strength (kips*)	Chain Length	Anchor	Anchor Ultimate Holding in Sand (kips*)
1	None	n/a	2-5/8” Dilok	813	360-ft	18,000-lb Stockless	70
2	None	n/a	2-5/8” Dilok	813	360-ft	18,000-lb Stockless	70
3	10” single braid	508	2-1/4” stud link	565	130-ft	8,000-lb Stockless	36
4	10” single braid	508	2-1/4” stud link	565	100-ft	8,000-lb Stockless	36
5	10” double braid	638	2-1/4” stud link	565	150-ft	8,000-lb Stockless	36
6	10” double braid	638	2-1/4” stud link	565	145-ft	8,000-lb Stockless	36
7	10” double braid	638	2-3/4” stud link	829	175-ft	5,000-lb Steel ring	56
8	10” double braid	638	2-3/4” stud link	829	175-ft	2 x 8,000-lb Concrete Clump	38

kips* = 1,000-pounds

6. WIND LOADS ON VESSEL

The wind loads on the hull of the Shadwell were determined from the exposed hull and areas above the main deck. The total fore/aft windage area of the hull was calculated as 3,410 square feet. The side windage area is 18,618 square feet. The wind force on the ship increases with the square of the wind speed as shown in Figure 1 for both broadside winds and for winds on the stern. Because of the multi-point mooring, Shadwell can not weathervane to reduce the exposed windage. Therefore, the vessel may be exposed to full broadside winds at some time. Figure 1 shows that minimal hurricane Category 1 winds of 64 knots will produce a lateral force of 234-kips on the ship that must be restrained by the multi-leg mooring. The same wind on the bow or stern would produce a force of only 20-kips, or one-tenth of the broadside wind force.

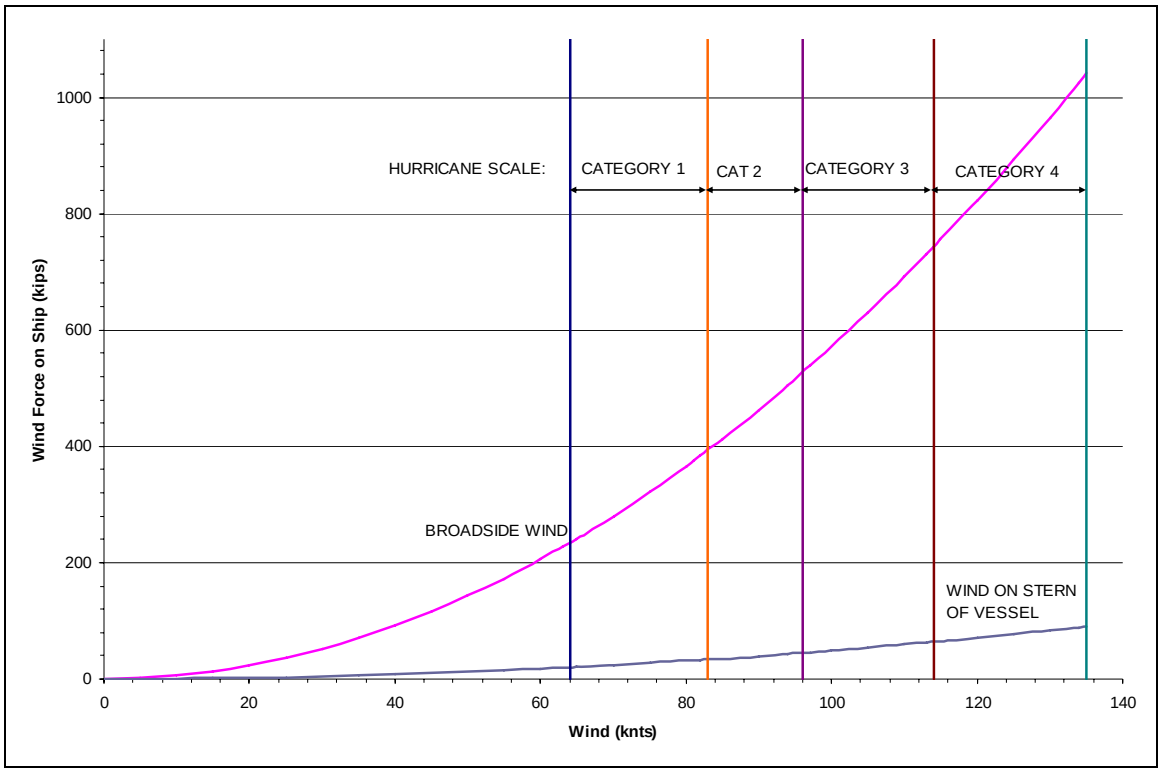


Figure 1. Ex-Shadwell Wind Force vs Wind Speed

7. MOORING CAPACITY

The mooring performance in various wind conditions was analyzed using OPTIMOOR computer simulation for spread moorings, Ref (h). The wind was applied to the vessel from various headings and with increasing wind speeds, until the load on any one of the anchors exceeded the maximum holding power of the anchor. At that combination of wind speed and direction, the anchor would begin to drag through the sand and the ship would drift from its mooring location. The ultimate holding power of the anchor was used in this analysis, without any safety factors applied for anchor performance.

Because of the relatively low wind speed capability of the Shadwell mooring, this analysis did not include any effects of increased water levels due to storm surge in a hurricane. The effect of water currents on the hull were not considered significant, due to the sheltered mooring location in the Little Sand Island cove.

The OPTIMOOR software computes the effects of winds from all compass directions, and notes which of the mooring legs fails for the various wind directions. This information can be plotted as a Wind Capability Rose, which shows the maximum wind speed for each compass direction, which will cause a mooring line loading of 40%, 50%, and 100% of the ultimate anchor holding capacity. This Wind Capability Rose is shown in Figure 2. The wind rose shows the Shadwell in the center of the rose with its bow pointed west and labeled F (front). The ultimate capacity of the mooring to hold the Shadwell in winds from different directions is shown by the line plotted for “Max Wind for 100% Strength”, which is based on the ultimate holding power of the individual anchors without any safety factors applied.

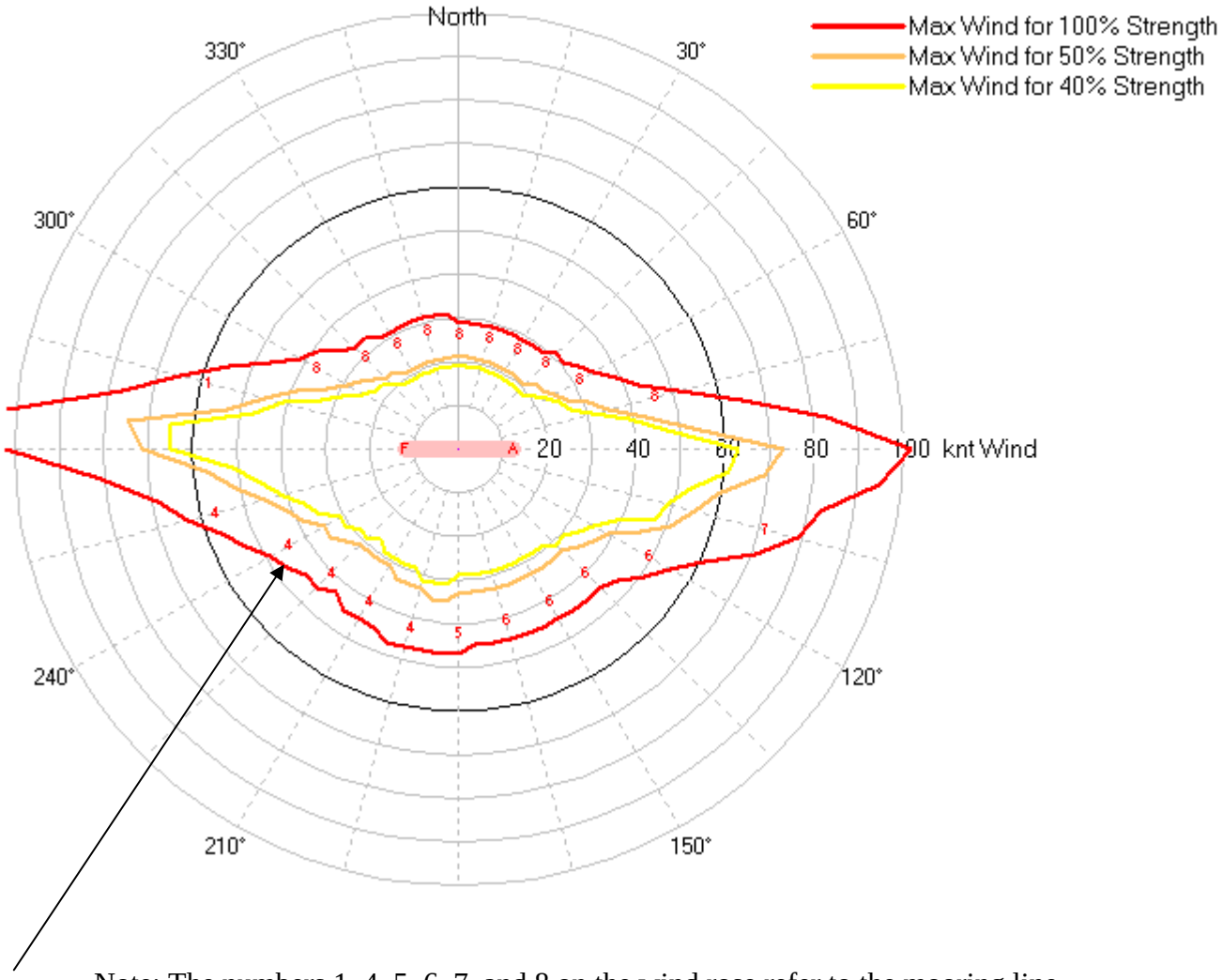
Figure 2 shows that the Shadwell mooring is least able to resist the forces of broadside winds approaching from the north and the south. The mooring is weakest in winds from the north, primarily due to the arrangement of only two anchors on the north side of the Shadwell. Winds greater than 28 knots from the north or north-east will cause dragging of the anchor on Line #8 at the starboard stern. Also winds from the northwest direction, on the starboard bow quarter, will also cause dragging failure of the starboard stern anchor line #8, when winds exceed 30 knots.

For winds from the south, the anchor legs on the south (port) side of the can hold the ship in winds up to 45 knots before anchor dragging. Depending on wind direction, the anchors on lines 4, 5, 6 or 7 will begin to drag at winds over 45 knots.

The mooring can hold the Shadwell in winds directly on the bow or stern up to about 100-knots. However, as these winds veer off by as little as 15-degrees off the bow or stern, the capability of the mooring rapidly drops to a maximum wind speed of 50-60 knots.

OPTIMOOR Wind Capability Rose for SHADWELL
w/clumps 2 at Sand Island 11Aug06

Analysis for Time: 1400 Aug 29 2006
Ref: 1233 Aug 29 2006
Remarks: Berth layout from R. Thiel 11Aug06.
Water Level: 0.00 above datum
Draft: 14.0
Trim: 0.0
Deck Level: 23.0 above Datum (at Target)



Note: The numbers 1, 4, 5, 6, 7, and 8 on the wind rose refer to the mooring line anchor taking the highest load due to wind from that particular direction.

Figure 2. Wind Capability Rose for Shadwell at Sand Island, June 2006

8. CONCLUSION

The mooring installed in June 2006 for Shadwell at Little Sand Island will likely drag anchors at winds in excess of 28 knots from the north, and in excess of 45 knots from the south. The north and south winds strike the ship broadside in the spread mooring, thus overloading the stockless anchors that were installed. The two deadman anchors seem to be appropriately sized to match the capability of the stockless anchor array. The mooring lines and chains have adequate strength for the installed anchors. The combined capacity of the anchors is just overpowered by winds in excess of 28-45 knots. The mooring will fail by dragging one or more anchors into a new position, and the ship will be left in a new position after the wind has passed.

The analysis determined that mooring chains have long enough scope so that all chains are pulling horizontally on the anchors, and the anchors can develop their full capacity. The holding capacity of the mooring is not very sensitive to the exact positions of the anchors, and the wind speed capability of the mooring will not be improved by merely relocating the anchors or lines to a different configuration of the same anchors. More anchors will be required to increase the Shadwell mooring capacity for higher wind speeds.

Shadwell may be restrained in its mooring basin in winds that would otherwise overload the anchors, if the hull contacts the sides of the dredged basin. In this case, there is literally not enough water depth to either side of the Shadwell for the vessel to pull out of the mooring. This scenario assumes that there is no storm surge to cause the water level to rise. If there is a storm surge with strong winds, the Shadwell may drag its moorings during the high water and end up aground on one side of the mooring basin after the storm surge has receded.

Due to continuous exposure of the hawsers to the elements, concern exists for the degradation of the hawser material. Reduction in the load carrying capacity of the hawser will occur as a result of UV exposure, corrosion products interaction, and mechanical chaffing of the hawser.

9. REFERENCES

(a) Email correspondence from Rick Thiel, SUPSALV to Gus Ruetenik of PCCI, Inc. on 11Aug06, regarding the arrangement of Shadwell mooring lines and anchors installed in June 2006.

(b) Email correspondence from Arthur Durkin, NRL to Rick Thiel, SUPSALV, on 8Aug06, regarding the azimuth angles of the Shadwell mooring lines.

(c) Email correspondence from Richard Dauphinee, ESSM, to Rick Thiel, SUPSALV, on 30Jun06, regarding the make-up of the Shadwell mooring lines.

(d) Military Handbook Mooring Design, MIL-HDBK-1026/4A, 1 July 1999, pp 107-111.

(e) Naval Civil Engineering Laboratory, Techdata Sheet 83-08R Drag Embedment Anchors for Navy Moorings, June 87.

(f) Phoncon between Dale Springer, DonJon Marine Inc. and Gus Ruetenik, PCCI Inc. on16Aug06, regarding the dimensions and weights of the steel ring and concrete clumps.

(g) Naval Civil Engineering Laboratory, Handbook for Marine Geotechnical Engineering, March 1985, Chapter 4.

(h) Tension Technology International, Inc., OPTIMOOR Mooring Analysis Computer Program, Version 4.8.10, March 2005

Mooring Line Information

DESCRIPTION	SPEC #	DIA.	CIRC.	(FT)	LBS/100 FT.	STRENGH (LBS)	STRENGTH (LBS)	STRENGTH (LBS)	EACH
12-STRAND POLYESTER (SINGLE-BRAID)	N/A	3.25	10.00	2400	271.00	315,000	283,500	189,000	$ 38,840.00
DOUBLE-BRAID POLYESTER	MIL-DTL-24677	3.25	10.00	2400	294.00	322,000	295,000	252,000	$ 42,500.00
MANUFACTURER:									
SAMPSON ROPE									
2090 THORNTON STREET									
FERNDALE, WA 98298									
EMAIL:									
custserv@sampsonrope.com									

Appendix I - ESSM Equipment

ESSM EQUIPMENT TO SUPPORT SALVAGE OPS IN MOBILE, AL						
DATE REQUIRED IN MOBILE, AL: 4/3/06						
EQUIPMENT	**SYSTEM #**	**ESSM #**	**QTY**			
BEACH GEAR GROUND LEG	S05100	BG0100	2			
BEACH GEAR GROUND LEG	S05100	BG0101	2			
WIRE ROPE, 1 5/8" X 300'	S05100	WR0150	2			
WIRE ROPE, 1 5/8" X 600'	S05100	WR0151	4			
NAVMOOR-6 ANCHOR	S05100	AN2140	2			
CROWN BUOY, 42" DIA	S05100	BU0003	4			
CHAIN, DI-LOK, 2 1/4' X 90'	S05100	CH0004	2			
HYDRAULIC PULLER SYSTEM	S17100		2			
REEL, HYDRAULIC HOSE ASSEMBLY	S17100	HC0003	8			
HYDRAULIC PULLER	S17100	HC0012	2			
SPARE PARTS KIT	S17100	HC0013	1			
ANCILLARY SET FOR HC0012	S17100	HC0015	1			
BRIDLE ASSEMBLY	S17100	HC0047	2			
CONTROL PANEL	S17100	HC0049	2			
POWER UNIT, HYD, MOD 6	S17100	PW0045	1			
SPARE PARTS KIT FOR PW0045	S17100	PW0046	1			
POWER UNIT, HYD, MOD 6 (BACKUP)	S17100	PW0045	1			
SPARE PARTS KIT FOR PW0045 (FOR BACKUP HPU)	S17100	PW0046	1			
SHACKLE, FIXED PLATE	S17100	SS0160	4			
SHACKLE, PLATE, ASSY, 2 3/4" BOLTS	S17100	SS0172	4			
SHACKLE, ALLOY, 2" 50 TON	S17100	SS0204	6			
PASSING PENDANT, 1 5/8" x 50'	S17100	WR0185	2			
WIRE ROPE ASSY, 1 5/8" X 58" CLSD SKTS	S17100	WR2000	4			
SHACKLE, BOLT-TYPE, 2 1/2" 55 TON	S17100		2			
SHACKLE, BOLT-TYPE, 2 1/2" 85 TON	S17100	SS1084	2			
TENSION LINK, 200K CAPACITY	S24100	TE0054	2			
LOAD INDICATOR, DIGITAL, PORTABLE	S24100	TE0055	2			
JETTING PUMP	S18500	PU0229	2			
SPARE PARTS KIT	S18500	PU0231	2			
ANCILLARY SET	S18500	PU0232	2			
JETTING PUMP	S18500	PU0230	2			
SPARE PARTS KIT	S18500	PU0231	2			
ANCILLARY SET	S18500	PU0232	2			
LIGHT TOWER	S14100	LT0430	2			
SPARE PARTS KIT	S14100	LT0431	2			
LIGHTING KIT	S15100	LI0440	2			
WELDER, 400 AMP	S29100	WL0470	1			
SPARE PARTS KIT	S29100	WL0471	1			
WELDING KIT	S29100	WL0472	1			
TRASH PUMP	S18200	PU0330	1			
SPARE PARTS KIT FOR PU0330	S18200	PU0331	1			
ANCILLARY SET FOR PU0330	S18200	PU0235	1			
TANK, DIESEL FUEL, 120-GALLON	S18000	TK0045	1			
TANK, DIESEL FUEL, 350-GALLON	S01300	TK0040	2			
UNDERWATER CUTTING KIT	S26100	KT0558	1			
SMART TOW SYSTEM	DS0530		1			
BATTERY PACK	DS0530	AL0025	1			
BATTERY PACK	DS0530	AL0025	1			
TUG SYSTEM-LAPTOP COMPUTER W/SUPPORT EQUIP.	DS0530	AL0300	1			
MARSHALLING BOX	DS0530	AL0310	1			
ANTENNA ASSEMBLY	DS0530	AL0311	1			
TOW CABLES #2	DS0530	AL0313	1			
WIRELESS TOW ALARM SYSTEM	DS0525		1			
LOCAL CONTROL STATION	DS0525	AL0255	1			
LIGHT TOWER	DS0525	AL0260	1			

Appendix I - ESSM Equipment

SENSORS AND REPEATERS	DS0525	AL0265	1			
SPARE PARTS KIT	DS0525	AL0270	1			
BATTERY PACK	DS0525	AL0275	8			
BATTERY CHARGER	DS0525	AL0280	1			
MOD 9 HPU		UW0333	2			
HYDRAULIC HOSES W/REEL		UW0145	2			
REEL STAND, HYD, SELF LOADING, 63' X 47" CAP		WR0020	1			
EXTRA HYD HOSE - CONTROL PANEL		HC0049	4			
LEAK PATCHING KIT, MAG. BASE, 7.5" X 14"		LP0010	2			
LEAK PATCHING KIT, MAG. BASE, 2 3/4" X 4"		LP0020	2			
CONTAINMENT BERM		CP3000	2			
CONTAINMENT BERM		CP3010	4			
BOAT, 24' RIGID HULL INFLATABLE (RIB)		WB0936	1			
CRADLE, 24' RIGID HULL INFLATABLE (RIB)		BC0736	1			
VHF RADIO ICOM, W/ CHARGER, BATTERY, MIKE		CB1705	2			
SHACKLES, SAFETY, 1 3/8", 20.7 TONS		SS0190	2			
SHACKLES, SAFETY, 1 3/8", 26 TONS		SS0200	2			
SHACKLE, BOLT TYPE, 1 3/8", 13.5 TON		SS0184	14			
SHACKLE, BOLT TYPE, 1 3/8", 24 TON		SS0195	2			
SHACKLE, BOLT TYPE, 1 3/4"		SS2036	2			
STOPPER, CARPENTER, 1 5/8"		ST0050	4			
BRIDDLE, WR, 1 5/8", CARPENTER STOPPER		ST0052	4			
LINK, DETACHABLE, PEAR SHAPED, 2 1/8' X 2 3/8"		LK0181	2			
LINK, DETACHABLE, PEAR SHAPED, 1 5/8' X 2"		LK0183	2			
WIRE ROPE, 1 5/8" X 20', CLOSED SOCKETS			3			
WIRE ROPE, 1 5/8" X 10', CLOSED SOCKETS			2			
SHACKLES, SAFETY, 3/4"			6			
SHACKLES, SAFETY, 1 1/4"			2			
SHACKLES, SAFETY, 1 3/4"			2			
SHACKLE, SAFETY, 1 1/2"			1			
SHACKLE, SAFETY, 2 1/2", 35 TON			2			
HOSE, FIRE, 2 1/2" X 50'			5			
PRI-JET EDUCTOR, 4" DISCHARGE			1			
LAYFLAT HOSE, 4" X 50'			2			
PICKUP TUBE NOZZLE, ANGLE, 4"			1			
PICKUP TUBE NOZZLE, FLAT, 4"			1			
PICKUP TUBE NOZZLE, FLAT, 3"			1			
JERRY CAN, 5 GALLON (GASOLINE)			6			
JERRY CAN, 5 GALLON W/RANDO 46			1			
JERRY CAN, 5 GALLON W/1192 HYD FLUID			1			
JERRY CAN, 5 GALLON W/LUBE OIL, 15W40			1			
JERRY CAN, 5 GALLON W/LUBE OIL, 40W			1			
JERRY CAN, 5 GALLON W/HYDRO-START FLUID			1			
JACK STANDS (1 SET) W/PIPE			1			
3/4" DOUBLE BRAID LINE (REEL)			1			
8" X 10' ABSORBANT BOOM (BALES)			22			
PADS, SORBENT, 200 PER PACK			2			
ROPAK CONTAINER (POL)			1			
FIRE HOSE, 1 1/2" (FOR USE WITH PU0330)			1			
NOZZLE, FIRE, 1 1/2" (FOR USE WITH PU0330)			1			
BUOY, STRAWBERRY			4			
RIGGING BOX			1			
SLING, EN60 X 8', S/N 08512-0034			1			
SLING, EN60 X 8', S/N 08512-0035			1			
SLING, UNIVERSAL (RED), S/N 08512-0042			1			
SLING, UNIVERSAL (RED), S/N 08512-0043			1			
TOOL BOX, MECHANICS			2			
SPRAY NINE			2			
PUMP, FUEL TRANSFER, ELECTRIC			1			

Appendix I - ESSM Equipment

FUEL PRIMER BULB			1			
FUNNEL			1			
MEASURING TAPE, 200'			1			
TARP, BLUE POLY, 10' X 12'			7			
TARP, SILVER, 8' X 10'			4			
BUNGEE, BALL, PAK OF 25			2			
BUNGEE, FLEXIBLE, PAK OF 30			2			
WIPING TOWELS, BOX			1			
EAR PLUGS, BOX			1			
MACHINE WIPES, BOX			1			
LIFE JACKET			1			

Appendix I - ESSM Equipment

REMAINING ESSM EQUIPMENT TO SUPPORT SALVAGE OPS IN MOBILE, AL						
DATE: 06/23/06						
	SYSTEM	**ESSM**	**SERIAL**		**ESTIMATED**	**LOCATION**
EQUIPMENT	**#**	**#**	**#**	**QTY**	**TOTAL WT**	**IN MOBILE**
JETTING PUMP	S18500	PU0229	6D38472	1	4300	USCG BASE
SPARE PARTS KIT	S18500	PU0231	005147	1	60	USCG BASE
ANCILLARY SET	S18500	PU0232	Set #629	1	1300	USCG BASE
JETTING PUMP	S18500	PU0230	3D35275	1	4500	USCG BASE
SPARE PARTS KIT	S18500	PU0231	005150	1	60	USCG BASE
ANCILLARY SET	S18500	PU0232	Set #660	1	1300	USCG BASE
HOSE, FIRE, 2 1/2" X 50'				5		USCG BASE
WIRELESS TOW ALARM SYSTEM	DS0525			1		SHADWELL
LOCAL CONTROL STATION	DS0525	AL0255	255-001	1	125	SHADWELL
LIGHT TOWER	DS0525	AL0260	260-001	1	200	SHADWELL
SENSORS AND REPEATERS	DS0525	AL0265	265-001	1	75	SHADWELL
SPARE PARTS KIT	DS0525	AL0270	270-001	1	40	SHADWELL
BATTERY PACK	DS0525	AL0275	275-001	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-002	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-003	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-004	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-005	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-006	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-007	1	125	SHADWELL
BATTERY PACK	DS0525	AL0275	275-008	1	125	SHADWELL
BATTERY CHARGER	DS0525	AL0280	007208	1	40	SHADWELL
SMART TOW SYSTEM	DS0530			1		
BATTERY PACK	DS0530	AL0025	007194	1	125	SHADWELL
BATTERY PACK	DS0530	AL0025	007196	1	125	SHADWELL
TUG SYSTEM-LAPTOP COMPUTER W/SUPPORT EQUIP.	DS0530	AL0300	300-002	1	80	.UE WATER-2
MARSHALLING BOX	DS0530	AL0310	310-002	1	100	SHADWELL
ANTENNA ASSEMBLY	DS0530	AL0311	311-002	1	40	SHADWELL
TOW CABLES #2	DS0530	AL0313	313-002	1	50	SHADWELL
TANK, DIESEL FUEL, 120-GALLON	S18000	TK0045	125322	1	300	USCG BASE
CONTAINMENT BERM		CP3000		2	60	USCG BASE
JACK STANDS (1 SET) W/PIPE		SE0080	008C	1	150	LT SAND ISL
8" X 10' ABSORBANT BOOM (BALES) (TRI-WALL CNTR)				5	600	LT SAND ISL
BOAT, 24' RIGID HULL INFLATABLE (RIB)		WB0936	24RB8704	1	5000	USCG BASE
CRADLE, 24' RIGID HULL INFLATABLE (RIB)		BC0736	009004	1	1300	USCG BASE
MISCELLANEOUS (ROPAK-BLACK CONTAINER)					600	USCG BASE
PADS, SORBENT, 200 PER PACK				2		
JERRY CAN, 5 GALLON (GASOLINE)				6		
JERRY CAN, 5 GALLON W/RANDO 46				1		
JERRY CAN, 5 GALLON W/1192 HYD FLUID				1		
JERRY CAN, 5 GALLON W/LUBE OIL, 15W40				1		
JERRY CAN, 5 GALLON W/LUBE OIL, 40W				1		
JERRY CAN, 5 GALLON W/HYDRO-START FLUID				1		
ROPAK CONTAINER (POLL)				1		
MECHANICS TOOL BOX W/TOOLS				1		
TARP, BLUE POLY, 10' X 12'				7		
TARP, SILVER, 8' X 10'				4		
BUNGEE, BALL, PAK OF 25				2		
BUNGEE, FLEXIBLE, PAK OF 30				2		
BUOY, STRAWBERRY				4		
LAYFLAT HOSE, 4" X 50'				2		
WIPING TOWELS, BOX				1		
EAR PLUGS, BOX				1		
PICKUP TUBE NOZZLE, ANGLE, 4"				1		

Appendix I - ESSM Equipment

PICKUP TUBE NOZZLE, FLAT, 4"				1		
PICKUP TUBE NOZZLE, FLAT, 3"				1		
TOOL BOX, MECHANICS				1		
SPRAY NINE				2		
PUMP, FUEL TRANSFER, ELECTRIC				1		
MACHINE WIPES, BOX				1		
MEASURING TAPE, 200'				1		
TOTAL SHIPPED WEIGHT (LBS)					**21530**	
TOTAL SHIPPED WEIGHT (TONS)					**10.8**	
TOTAL NUMBER COMMERCIAL TRUCKS					**2**	

Appendix J
Certificates of Delivery

29 June 2006

From: U.S. Navy Supervisor of Salvage and Diving
To: Director, Advanced Fire Research Laboratory, EX-USS SHADWELL, Mobile, AL

Subj: CERTIFICATE OF DELIVERY FOR EX-USS SHADWELL

1. This is to certify that the Advanced Fire Research Laboratory test ship, EX-USS SHADWELL, was re-floated from her strand in the cove of Little Sand Island, Mobile Bay, AL on or about the 28th of June, 2006 and re-moored as directed by the on-scene representative, Arthur Durkin, using existing and/or provided mooring equipment and hardware. The ship has been placed in an 8-point moor using both port and starboard bow anchors, two stern legs – port and starboard, and four legs on the port side - two breast lines and two spring lines.

2. Receipt of the EX-USS SHADWELL is hereby acknowledged. Final determination of costs and funding associated with this salvage operation shall be via separate correspondence.

For the owner/custodian:

Arthur L. Durkin

MECHANICAL ENGR (NRL 6186)
(Signature / Title)

SUPSALV REP:

Salvage PM (SEA 00C21)
(Signature / Title)

29 June 2006

From: U. S. Navy Supervisor of Salvage and Diving
To: Supervisor, U. S. Coast Guard Fire and Safety Test Detachment, Mobile, AL

Subj: CERTIFICATE OF DELIVERY FOR T/V STATE OF MAINE

1. This is to certify that the U. S. Coast Guard Fire and Safety test ship, T/V-STATE of MAINE, was re-floated from her strand in the cove of Little Sand Island, Mobile Bay, AL on or about 15 May and re-moored as directed by U. S. Coast Guard on-scene representative, CWO Merriweather, using the existing mooring legs and hardware. The ship has been placed is a 4-point moor using both port starboard bow anchors and two mooring legs off of the stern - port and starboard.

2. Receipt of T/V STATE of MAINE is hereby acknowledged. Final determination of costs and funding associated with this salvage operation shall be via separate correspondence.

For the owner/custodian:

CWO3 Supervisor
(Signature / Title)

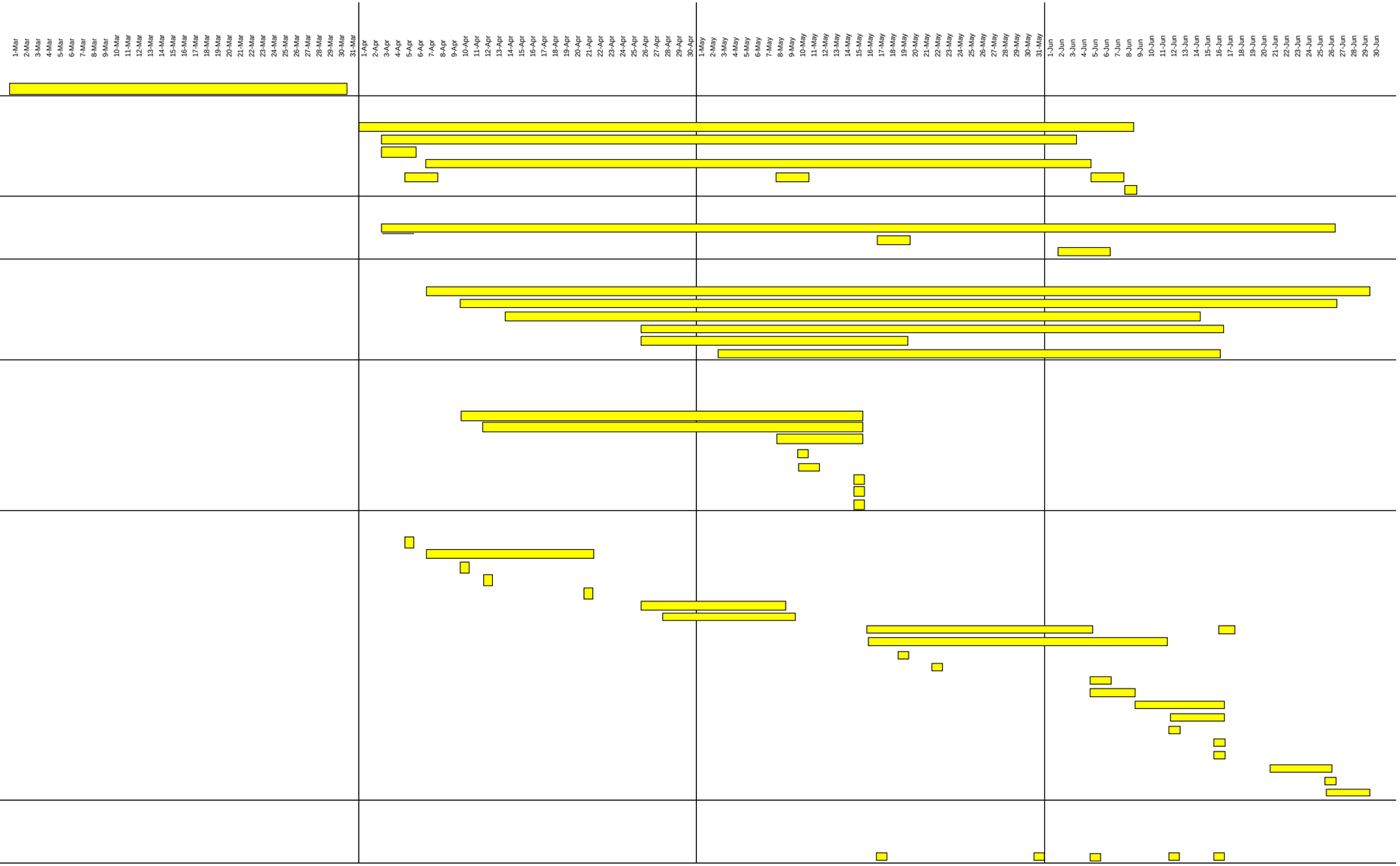
SUPSALV REP:

Salvage PM (SEA 00C21)
(Signature / Title)

Appendix K

Shadwell / State of Maine Timeline of events

Berm Construction		
Berm Construction	1-Mar-06	30-Mar-06
MDSU		
MDSU On Station	1-Apr-06	
Diving Operations	3-Apr-06	
Complete hull surveys	5-Apr-06	
Dive Ops Jetting and obstruction removal	7-Apr-06	
Set beach gear and perm moor	various	
Demobilize MDSU 1	7-8 June-06	
ESSM Gear		
ESSM Salvage Gear on site	3-Apr-06	
Demobilize beach gear, jetting pumps, etc.	17-May-06	
Ordered - rcvd add'l hardware for Shadwell moor		
Other Gear		
Floating Crane and Suport barge arrive on site	7-Apr-06	
Large Dredge supporting operation	10-Apr-06	
Second Bulldozer on-site	14-Apr-06	
Second Dredge under contract	26-Apr-06	
Add'l excavator under contract	26-Apr-06	
Second (smaller) dredge on site	3-May-06	
State of Maine		
Install first beach gear	10-Apr-06	
Dredging Ops begin (first dredge)	12-Apr-06	
Second dredge working	8-May-06	
Attempt push w/ 2 large tug	10-May-06	
Set second leg beach gear	10-May-06	
stbd side 30' trench completed	14-May-06	
ship refloated and placed position for perm moor	15-May-06	
Temporary Moor holding ship	15-May-06	
Ex-Shadwell		
Remove mooring lines/shore power cable	5-Apr-06	
Removal of shore material port side	7-Apr-06	21-Apr-06
Install remote flooding alarm	10-Apr-06	
Bottom survey/hull stress analysis comp.	12-Apr-06	
Port shoreline collapsed	21-Apr-06	
divers jetting under frames 24 - 76	26-Apr-06	8-May-06
Equip removing port side earth	28-Apr-06	
Large dredge working new mooring berth	15-May-06	
Small dredge working port side	15-May-06	
Divers jet between fr 15 - 29	19-May-06	
Attempted to dredge pilings around old service platfor	22-May-06	
Setting ground tackle for permanent moor	5-Jun-06	
Large dredge working stbd side and aft path	5 - 8 June 06	
Large dredge working port quarter	10-Jun-06	
Small dredge jetting from stbd side	12-Jun-06	
Shadwell list drops from 11 to 6 degrees stbd	12-Jun-06	
Shadwell list drops from 6 deg port to 1 deg stbd	16-Jun-06	
Attempted to push stern with small tug	16-Jun-06	
Large Dredge working stbd side	22-Jun-06	
Shadwell Floats free - pushed to perm. Mooring	26-Jun-06	
Complete Final Mooring	26-Jun-06	
PCCI		
Salvage Plan development	Nov 05 - Jan 06	
Salvage Plan Refinement	10-Apr-06	
Shadwell Salvage Plan assessment/re-baseline	17-May-06	



Appendix L. SUPSALV Situation Reports

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 03 APRIL '06

CURRENT OPS: SUPSALV Project Officer, Lead Contractor, Donjon Marine and Mobile Diving and Salvage Unit One DET ONE (MDSU1 DET 1) are on site. Berm construction in preparation for salvage dredging is complete. MDSU completed initial dives and marked two obstructions. Salvage equipment from Cheatham Annex ESSM base (beach gear, hydraulic pullers, jetting equipment, aux winches, etc) arrived and is staged for boat transport it Little Sand Island (salvage site).

INTENTIONS: Continue salvage plan execution. Transport initial salvage equipment to Little Sand Island. Begin identification and removal of sunken and land obstructions; and begin removal of ships after mooring legs in prep for dredging. Dredging contractor scheduled to arrive 7 APR.

ISSUES/CONCERNS: None. On course for 30 April completion.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 05 APRIL '06

CURRENT OPS: MSDU completed hull surveys of EX-SHADWELL (XSDL) and STATE OF MAINE (SOM). Data provided to PCCI for salvage plan refinement. Continuing dive ops to locate and classify obstructions within the dredge ops area. Existing mooring equipment for both hulls being marked in preparation for removal. 98% of Salvage equipment from CAX has been stage on Little Sand Island. Lay-out of beach gear to accomplish pull on SOM is in Progress. Removal of XSDL port mooring line under high tension is complete, action delayed one day due to transportation vehicle engine trouble. Removal of XSDL shore power cables and removal of shore material from port side of XSDL is in Progress.

INTENTIONS: Complete transportation of salvage equipment from CAX to little sand island. Continue lay out of beach gear. Start removal of obstructions and existing mooring systems NLT 07Apr. Continue removal of shore material from port side of XSDL and commence dredging ops in areas cleared of interference NLT 08April.

ISSUES/CONCERNS: Due to significant regional workload, equipment planned to support SALVOPS (removal of obstructions and existing mooring systems) is not available to support per current schedule. Alternate equipment has been identified and contracting issues are being resolved. Current impact to schedule: minor. On course for 30 April completion.

ISSUES/CONCERNS: None. On course for 30 April completion.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 07 APRIL '06

CURRENT OPS: Salvage Plan refinement continues with analysis support from PCCI. Lay-out of Beach Gear is complete and a test pull was successfully performed on a 7200 lbs NAVMOOR anchor. Continuing dive ops to locate and classify obstructions within the dredge ops area. Removal of shore material from port side of XSDL continues by tracked excavator and bull dozer. Floating Crane (25 ton) and utility support barge were placed on contract 06Apr and are transiting to Little Sand Island in support of obstruction removal and jetting operations.

INTENTIONS: Set up utility barge for jetting ops. Review existing moorings for SOM with dredging contractor to determine which mooring legs can remain in place during dredge ops. Remove all remaining obstructions and mooring legs with 25ton Floating Crane for start of dredge ops. Continue removal of shore material from port side of XSDL with tracked excavator and bull dozer. Conduct on site salvage plan review with PCCI during week of 10Apr.

ISSUES/CONCERNS:

1. Weather conditions deteriorating on site and in the Mobile Bay region with thunderstorms and 20 kt wind forecasted for today and tomorrow. Dredge unable to depart today for work site and not expected to get underway tomorrow. Weather conditions may also shut down dive ops for the same time period. Fair weather is expected to return on Sunday, 09Apr. If dredge is able to tow on 09Apr, then dredge ops could commence as early as 10Apr.

2. Obstruction located on north side of XSDL new mooring location has been identified as the remnant piers (4) to a USCG service platform (removed). Piers are steel reinforced concrete and approximately 24" in diameter and two of the piers protrude 2-3 fts above the floor in about 16 fsw. Concern is that a future storm surge could land XSDL on piers, causing extensive hull damage. Due to reported depth of embedment (~50ft), retraction equipment is not readily available in the region. Multiple COA being explored and expect recommendation by next SITREP.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 10 APRIL 06

CURRENT OPS: Salvage Plan refinement with analysis support from PCCI is complete. Salvage Plan to be reviewed by site management team on 11Apr06. Wire rope (1 5/8") that was hung this weekend from a fwd bit and feed through the stbd haws pipe is to be used by the Beach Gear to pull on the SOM. Remote flooding alarm system installed and tested on board XSDL. Completed dive ops to locate and mark obstructions within the dredge ops area. Removal of shore material from port side of XSDL continues by tracked excavator and bull dozer. Floating Crane (25 ton) and utility support barge are on site at the cove on Little Sand Island. Jetting equipment was loaded on board the utility barge, set up for operations, and successfully tested. Dredging equipment is underway this morning for Little Sand Island, ETA is late this afternoon.

INTENTIONS: Continue removal of shore material from port side of XSDL with tracked excavator and bull dozer. Set up dredge equipment in Little Sand Island Cove and commence dredging ops. Conduct on site salvage plan review with PCCI on 11Apr06.

ISSUES/CONCERNS:

1. Severe weather conditions (thunderstorms and 20 kt winds) on site this past weekend delayed mobilization of dredge equipment until today. Schedule impact is being assessed. 24hr dredge ops to be conducted were and when appropriate to mitigate schedule impact.

2. POA for remnant USCG piers (4): Dredge/jet around piers to the maximum extent possible (+30 ft) and then attempt extraction with on-site assets. If extraction is not

possible, then use demolitions to cut piers at deepest depth possible to ensure no contact with XSDL hull in all tide conditions and all ballast states.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 12 APRIL 06

CURRENT OPS: Summary of Dive Survey and Salvage Plan Refinement:

1. Hull survey of bottom contact with SOM hull determined that the hull stresses for SOM are not as significant as originally estimated. Therefore, a more aggressive dredging plan is possible which would simplify the process for refloating SOM.

2. Bottom contact with XSDL hull is very close to original estimates. This reinforces the current model which shows favorable hull stresses around frame 74 of the hull, which has been determined to be the weakest section due to corrosion/wastage. Plan is proceeding as originally developed, but could be modified as the hull reacts to the refloating operations in progress. Dive ops continuing with the 25 ton floating crane to remove obstructions within the dredge ops area. Removal of shore material from port side of XSDL continues by tracked excavator and bull dozer. A larger 2nd bull dozer is on scene to assist in repositioning shore material. Dredging equipment arrived on scene late 10Apr with set up completed the next day. Dredge ops is in progress, but has been slowed by debris that is buried deep in the mud and is getting caught in the cutter head assembly.

INTENTIONS: Continue removal of shore material from port side of XSDL with tracked excavator and bull dozers. Continue dredge ops in Little Sand Island Cove.

ISSUES/CONCERNS: Dredge ops are in progress, but is being slowed by debris that is burried deep in the mud. Less than one day operating dredge, additional time needed to establish actual dredging performance.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 14 APRIL 06

CURRENT OPS: Dive ops continuing with the floating crane to remove obstructions within the dredge ops area. Removal of shore material from port side of XSDL continues with an additional tracked excavator and the large bull dozer. The shore material, which is composed of earlier dredge spoils, is tending to slump back into the port side trench. As a result, more material is being moved than originally estimated and additional equipment has been employed to accomplish this additional requirement. Dredge ops is in progress, but has been slowed by debris that is buried deep in the mud and is getting caught in the cutter head assembly. Because of the location of the SOM's mooring location in relation to its current grounded position, the dredger is able to prepare SOM's mooring and removing the material necessary to reduce their ground reaction at the same time.

INTENTIONS: Continue removal of shore material from port side of XSDL with tracked excavators and bull dozer. Continue dredge ops in Little Sand Island Cove.

ISSUES/CONCERNS: Dredge ops are in progress, but is being slowed by

debris that is buried deep in the mud. Due to the poor dredging performance and delays due to weather, the project is approximately one week behind schedule. Currently investigating different methods to improve dredging performance.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 17 APRIL 06

CURRENT OPS: Dive ops continue with the floating crane to remove obstructions within the dredge ops area. Removal of shore material from port side of XSDL continues and is approximately 70% complete. Dredge ops was halted due to a bent spud, which resulted from the cutter head hitting a substantial obstruction. Dredge crew removed/repaired/reinstalled the bent spud this weekend and has recommenced dredging ops. Dredging ops continues to be plagued by misc. debris within the cove which fouls the cutting head and slows the pace of operations.

INTENTIONS: Continue removal of shore material from port side of XSDL with tracked excavators and bull dozer. Continue dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction.

ISSUES/CONCERNS: Dredge ops are in progress, but is being slowed by debris that is buried deep in the mud. Currently investigating different methods to improve dredging performance.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 19 APRIL 06

CURRENT OPS: Dive ops continue with the floating crane to remove obstructions within the dredge ops area. Initial phase to remove shore material from port side of XSDL is complete. Dredge ops has made significant progress due to lesser amounts of debris in the local vicinity of operations. Dredge sustained a hydraulic hose casualty at approximately 0900, losing less than 50 gallons of hydraulic fluid with less than 35 gallons reaching the water. Absorbent sausage boom and pads were deployed around the dredge. Reports were made to the National Response Center and USCG Mobile Sector. Spill response was completed as well as repairs to the dredge and dredge ops have resumed.

INTENTIONS: Continue dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Support with dive ops to clear obstructions. Earliest date expected to pull SOM is 23Apr06.

ISSUES/CONCERNS: Dredge ops are in progress, but is being slowed by debris that is buried deep in the mud. Smaller dredge located which would be able to conduct simultaneous dredging with the current dredge. Negotiations currently in progress to determine schedule availability and cost for mob/demob/operation rate.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 21 APRIL 06

CURRENT OPS: Dive ops continue with the floating crane to remove obstructions within the dredge ops area. Initial phase to remove shore material from port side of XSDL is complete. Trench was excavated to a depth of 15ft but has filled in to a depth of 3ft to 7ft due to the instability of the

bordering hill, which is composed of dredge spoil material. Dredging completed as of today includes 20% or XSDL new mooring position, 80% of SOM's new mooring position, SOM: midship fwd/stbd to 18 ft, midship aft/stbd from 18ft to 6ft.

INTENTIONS: Support with dive ops to clear obstructions. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Areas remaining: SOM new mooring position (remaining 20%), final cut on stbd side of SOM: 22ft at midship and 25ft at stern, aft of SOM to 25ft for tug access, port side from stern to midship at 23ft. Earliest date possible to pull SOM is Tuesday, 25Apr06, pending dredge progress.

ISSUES/CONCERNS:

1. Dredge ops have been impacted by a significant amount of debris that was encountered in the ops area. Project is investigating the use of a smaller dredge to conduct simultaneous operations with the current dredge on the SOM and then on the XSDL. Negotiations currently in progress to determine schedule availability and cost for mob/demob/operation rate. Hill bordering XSDL portside trench has shown itself to be very unstable. Working to identify additional land based equipment to relocate subject material away from the salvage ops area which will allow additional dredging/trenching on the portside of XSDL.

2. Based on current progress and issues encountered, analysis of the remaining work indicates that additional time and funding may be required to complete the operation. Alternatives are being reviewed, risks assessed, and projections of completion time and cost are in progress. Project assessment meeting/review scheduled for 25Apr06.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 24 APRIL 06

CURRENT OPS: Over the weekend, completed dredging the head of SOM's mooring position after conducting dive ops to removing old abandoned mooring chain and other debris. Also worked XSDL's new mooring position for one shift before shifting to stern of SOM to reduce ground reaction and to provide area for support tugs to operate. Current dredge ops progress has been very good in the last 24hrs witrh very little delays. Levels of debris outside of the cove initially appear to be significantly less than what was experienced inside the cove.

INTENTIONS: Support with dive ops to clear obstructions. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working aft of SOM, dredging to 25ft for tug access. Areas remaining: SOM new mooring position (remaining 15%), final cut on stbd side of SOM: 22ft at midship and 25ft at stern, port side from stern to midship at 23ft. Best estimate to pull SOM is Friday, 28Apr06, pending dredge progress.

ISSUES/CONCERNS:

1. Dredge ops have been impacted by a significant amount of debris that was encountered in the ops area. Project has identified a smaller dredge which

could conduct simultaneous operations with the current dredge on the SOM and then on the XSDL. Dredge can support starting on Friday and all rates have been discussed. Hill bordering XSDL portside trench has shown itself to be very unstable. Additional land based equipment has been identified which could be used to relocate subject material away from the salvage ops area which will allow additional dredging/trenching on the portside of XSDL.

2. Based on current progress and issues encountered, analysis of the remaining work indicates that additional time and funding may be required to complete the operation. Alternatives are being reviewed, risks assessed, and projections of completion time and cost are in progress. Project assessment meeting/review scheduled for 25Apr06. Project review with NRL / USCG following assessment meeting.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 26 APRIL 06

CURRENT OPS: Continuing to dredge SOM stern area and current progress has been good in the last 48hrs with very few delays. Dredge suffered another hydraulic hose rupture internal to the hull, so no external spill resulted. Crew was able to quickly replace hose and was only down for a few hours. Dredge is moving a significant amount of material and therefore, is only able to advance foreword at a slow pace. Levels of debris outside of the cove continue to be significantly less than what was experienced inside the cove. Diving ops emphasis has shifted from obstruction removal to jetting ops under XSDL between frames 24 to 76. MDSU was able to jet completely under XSDL hull and create an opening large enough for a diver to pass.

INTENTIONS: Support with dive ops to clear obstructions for dredge ops and jet material from XSDL hull. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working aft of SOM, dredging to 25ft for tug access. Areas remaining: SOM new mooring position (remaining 10%), final cut on stbd side of SOM: 22ft at midship and 25ft at stern, port side from stern to midship at 23ft. Best estimate to pull SOM is Sunday, 30Apr06, pending dredge progress.

ISSUES/CONCERNS:

1. Conducted project assessment. Review meeting and refined salvage plan based on current progress and experience to date. Schedule has been revised for completion in middle of May (new schedule to be issued) and updated costs projections developed. Results have been reviewed with project sponsor, NRL (info USCG), and verbal acknowledgement received to proceed as planned. Additional funding to be provided via SEPCOR.

2. Major actions resulting from the assessment/review meeting:

- Contracted for second dredge to work site to assist in material removal from SOM and XSDL. Dredge expected in site on 28Apr06.

- Contracted for additional land equipment to redistribute shore material on portside of XSDL, which supports dredge ops required to refloat XSDL. Initial equipment arrived today and work is in progress. Additional equipment due on site tomorrow.

- Salvage Plan will continue to pursue a conservative approach (minimum risk, higher cost) of refloating XSDL in place and extraction by pulling on the stern of the ship. As conditions develop and with proper engineering review, alternatives may be persued to improve schedule and reduce costs.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 28 APRIL 06

CURRENT OPS: Dredge suffered collapse of suction pipe and will be down down until at least until 29th while a new suction pipe is manufactured and installed. Second dredge suffered damage during mobilization and is currently undergoing repairs. MDSU continues to jet under XSDL, removing material between frames 26 to 74. Hull girder deflection measurements indicates that the ground reaction is shifting and is starting to effect the hull. Additional equipment is in place and is removing the shore material on the port side of XSDL.

INTENTIONS: Continue with dive ops to jet material from XSDL hull. Complete dredge repairs and restart 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working aft of SOM, dredging to 25ft for tug access. Areas remaining: SOM new mooring position (remaining 10%), final cut on stbd side of SOM: 22ft at midship and 25ft at stern, port side from stern to midship at 23ft. Best estimate to pull SOM is under review pending restart of dredge ops.

ISSUES/CONCERNS: Needed repairs to dredge equipment have completely stopped dredge ops. Schedule impact is being evaluated.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 01 May 06

CURRENT OPS: Dredge completed repair to collapsed section of suction pipe and resumed dredge ops on 29 Apr. Dredge was able to advance along the stern of SOM and make to turn to start working the port side. Second dredge has updated repair/mob schedule and estimates it will be on station by 03 May 06. Severe weather on 30 Apr secured diving ops and significantly limited small boat ops. Dredging ops and shore redistribution of material was able to proceed. MDSU has continued jetting under XSDL and has completed jetting from frame 29 to 50, out of a total planned area from frame 26 to 74.

INTENTIONS: Continue with dive ops to jet material from XSDL hull. Complete redistribution of shore material to support dredging port side of XSDL. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working port side of SOM, dredging to 25ft for tug access. Areas remaining: SOM new mooring position (remaining 10%), final cut on stbd side of SOM: 22ft at midship and 25ft at stern. Best estimate to pull SOM is under review pending dredge progress and amount of debris on SOM port side and performance with additional dredge.

ISSUES/CONCERNS: Second dredge contracted to improve total dredging capacity. Arrival on scene 03 MAY will allow schedule impact/improvement to be evaluated and adjusted.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 03 May 06

CURRENT OPS: Second dredge arrived on station 03 May 06, but the second dredge

pipeline is still in the process of fusing joints. The dredge contractor is having problems with the fusing machine. The length of completed dredge pipe will be towed to the work site on Thursday morning (06 May). Additional sections will be sent as joint fusing is complete. First dredge remains working off the stern and port side of SOM. Following the storms over the past weekend and increased current, material has filled in again astern of SOM. Areas that had been dredged to 23 feet are now back at 14 feet. The previous dredged mooring area for SOM has also filled in again in sections to 14-17 feet. Once the second dredge is operational, the second dredge will work astern and along the port side of SOM. The first dredge will move back to the SOM mooring area to re-dredge. Shore redistribution of material continues with very good progress. MDSU has continued jetting under XSDL and has completed jetting from frame 29 to 60, out of a total planned area from frame 26 to 74.

INTENTIONS: Continue with dive ops to jet material from XSDL hull. Complete redistribution of shore material to support dredging port side of XSDL. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working stern and port side of SOM, dredging to 25ft for tug access. Areas remaining: Re-dredge SOM new mooring position, final cut on stbd side of SOM: 22ft at midship and 25ft at stern. Best estimate to pull SOM is under review pending dredge progress, amount of debris on SOM port side and performance with additional dredge.

ISSUES/CONCERNS: Second dredge contracted to improve total dredging capacity. Current and storms continue to fill in previously dredged areas. The second dredge is on site but on hold until adequate length of dredge pipe is provided.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 05 May 06

CURRENT OPS: Second dredge arrived on station 03 May 06. 500 feet of the dredge pipeline for the second dredge arrived on site 04 May 06. The pipeline is being laid out to determine if it has enough length to reach the material settling area. The arrival of the remaining 400 feet of dredge pipeline has not been determined due to joint fusing machine problems. First dredge remains working off the stern and port side of SOM. Following the storms over the past weekend and increased current, material has filled in again astern of SOM. Once the piping for the second dredge is on-site and able to reach the settling area, the second dredge will work astern and along the port side of SOM. The first dredge will move back to the SOM mooring area to re-dredge.

Shore redistribution of material continues with very good progress. Heavy machinery is clearing the dirt from the port side of XSDL to allow the dredge to access the area between the ship and land. MDSU has continued jetting under XSDL and has completed jetting from frame 29 to 68, out of a total planned area from frame 26 to 74.

INTENTIONS: Continue with dive ops to jet material from XSDL hull. Complete redistribution of shore material to support dredging port side of XSDL. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working stern and port side of SOM, dredging to 25ft for tug access. Areas remaining: Re-dredge SOM new mooring position, final cut on stbd side of SOM: 22ft at midship and 25ft at stern. Best estimate to pull SOM is under review pending dredge progress, amount of debris on SOM port side and performance with additional dredge.

ISSUES/CONCERNS: Second dredge contracted to improve total dredging capacity. Current and storms continue to fill in previously dredged areas. The second dredge is on site but on hold until adequate length of dredge pipe is provided.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 08 May 06

CURRENT OPS: Second dredge currently working port side of SOM from midships to aft. First dredge is working the stern and stbd side of SOM. Shore redistribution of material continues with very good progress. Heavy machinery is clearing the dirt from the port side of XSDL to allow the dredge to access the area between the ship and land. MDSU has completed jetting under XSDL from frame 26 to 74.

INTENTIONS: Complete redistribution of shore material to support dredging port side of XSDL. Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Currently working two dredges port and stbd of SOM to the stern, minimum depth required is 25ft for tug access. Areas remaining: Re-dredge SOM new mooring position, final cut on stbd side of SOM: 22ft at midship and 25ft at stern. Best estimate to pull SOM is under review pending dredge progress, amount of debris on SOM port side and performance with additional dredge.

ISSUES/CONCERNS: Second dredge contracted to improve total dredging capacity. River current and weather continue to fill in previously dredged areas.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 10 May 06

CURRENT OPS: Second dredge currently down for repairs after ingesting a cable into the pump. Dredge crew has opened pump casing to remove the cable and repair damaged components. Repairs are estimated to be complete by 11May06. First dredge continues to work stbd side of SOM. Shore redistribution of material is complete on the port side of XSDL and dredging can be supported in that area following completion of work on SOM. Dive ops continue to support dredge operations.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to prepare SOM's mooring and reduce ground reaction. Complete repairs to second dredge and resume dredge ops of port side of SOM. Currently working dredge on stbd side of SOM. Areas remaining: Re-dredge SOM new mooring position, final cut on port and stbd side of SOM: 22ft at midship and 25ft at stern. Next tide window to pull SOM starts on 13 May 06 and remains open for approximately 5 days.

ISSUES/CONCERNS: Second dredge down for repairs to pump after ingesting cable.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 12 May 06

CURRENT OPS: Second dredge is back on line following repairs to pump after ingesting a cable The dredge is currently working port side of SOM. First dredge continues to work stbd side of SOM and is creating a trench 30 ft deep along the grounded length of the hull. The trench is expected to be complete by 14May06. Dive ops continue to support dredge operations. Trench is being cut to allow the ground to shift from under the SOM's hull, reducing the ground reaction, and allowing the hull to pick up buoyancy. A similar trench will be cut on the port side.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce SOM's ground reaction. Following completion of the stbd trench, the first dredge will be shifted

to the port side of SOM and will start digging a 30 ft trench along the hull, from the stern to approximately midships (the position of XSDL's stern limits further travel by this larger dredge). The smaller second dredge will be shifted to the port side of XSDL to work the channel created for dredge ops. Tide window to pull SOM is 13 - 19 May06.

ISSUES/CONCERNS: Maintain good dredge progress to be able to pull SOM during the current tide window.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 15 May 06

CURRENT OPS: SOM has been refloated following collapse of remaining supporting ground material. Hull has been positioned in the mooring location designated by the USCG FS&T Det in Little Sand Island Cove, which approximates the pre-stranding position. A temporary moor has been established using ship's port and stbd bow anchors set on the shore and one stern mooring leg. One additional mooring leg is being readied for deployment following completion of XSDL ops. Large dredge is currently working XSDL's new mooring, dredging to approximately 25 ft. Little dredge is working the area aft XSDL towards the port side channel. Dive ops continue to support dredge operations.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce XSDL's ground reaction and prepare new mooring location. Little dredge to work port side of XSDL from stern to frame 24 with the intention of reducing the stbd list. Large dredge to work XSDL's new mooring location.

ISSUES/CONCERNS: Salvage Operations being reviewed for the best predicted completion date, required assets, and estimated cost to refloat of XSDL.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 17 May 06

CURRENT OPS: Dredge ops continue on Little Sand Island. Large dredge is currently working XSDL's new mooring, dredging to approximately 25 ft. Progress continues to be very good as the dredge moves sand and silt from the new mooring location with only minor obstructions being encountered thus far. Little dredge has worked its way up to the stern of XSDL and is dredging in the port side channel cut for salvage ops. Progress is slow as the dredge cuts in the hard clay which was encountered while working SOM. Only minor obstructions continue to be encountered thus far. Dive ops continue in support of dredge operations. ESSM equipment has begun demobing from the island and is being staged at the USCG station while preps are made to ship the material back to the ESSM base at Chettam Annex, VA. All equipment to be processed for return shipment except a portion of the jetting equipment and the RHIB. Assessment of the Salvage Plan has been completed with a thorough review of the hull stresses. Additional jetting will be performed at XSDL's bow from frame 15 aft.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce XSDL's ground reaction and prepare new mooring location. Little dredge to work port side of XSDL from stern to frame 15 with the intention of reducing the stbd list. Large dredge to work XSDL's new mooring location. Commence jetting ops at XSDL's bow from frame 15 aft.

ISSUES/CONCERNS: Salvage plan review has been completed and cost estimate to refloat XSDL is routing for review.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 19 May 06

CURRENT OPS: Dredge ops continue on Little Sand Island. Large dredge is currently working XSDL's new mooring, dredging to approximately 25 ft, as progress continues to be good. Dredging was temporarily interrupted for the divers to remove an old mooring chain which is laying across the access channel to the mooring. Little dredge was down for most of today to make repairs to its diesel radiator. Repairs are complete and dredging has resumed in XSDL's port side channel cut for salvage ops. Progress continues to be slow as the little dredge works through the clay deposits. Dive ops continue in support of dredge operations. The first phase of ESSM equipment has been loaded on to trucks and is enroute to the ESSM base at Cheatham Annex, VA. Equipment remaining on site includes jetting pumps and RHIB. MDSU divers rapidly completed the latest jetting task, moving the bottom material from between frames 15 to 29 in less than one day.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce XSDL's ground reaction and prepare new mooring location. Little dredge to work port side of XSDL from stern to frame 15 with the intention of reducing the stbd list. Large dredge to work XSDL's new mooring location and will also work around the old service platform pilings in preparation for cutting. Sub-contractor is scheduled for 21May06 to utilize a hydraulic cutter to remove pilings following dredging to desired depth of 25 ft.

ISSUES/CONCERNS: Cost estimate to complete salvage work awaiting input from lead contractors for actual cost to date before final projections can be completed. Expect to finalize input NLT 22May06.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 22 May 06

CURRENT OPS: Dredge ops continue on Little Sand Island. Large dredge continues working XSDL's new mooring, dredging to approximately 25 ft. Progress continues to be steady with interruptions to clean cutter head and pump sump of minor debris. Small dredge continues to work XSDL's port side channel, which was cut for salvage ops. Progress continues to be slow as the dredge works through the clay deposits. Dive ops continue in support of dredge operations. In preparation for removal, attempt was made to dredge around the old service platform pilings, but the effort had to be abandoned due to the character of the debris surrounding the pilings. Dive survey after the initial dredge effort revealed that the debris is composed of large chunks of concrete, rebar, misc metal items. This material caused the dredge to be shut down for maintenance following a 16 inch piece of concrete and steel rebar clogged the pump. Due to risk of serious dredge damage, actions were suspended pending further review.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce XSDL's ground reaction and prepare new mooring location. Large dredge to work XSDL's new mooring location. Little dredge to work port side of XSDL from stern to frame 15 with the intention of reducing the stbd list.

ISSUES/CONCERNS: Cost estimate to complete salvage work provided to sponsor. Concern continues with respect to the amount of debris in the cove and its potential to affect progress. Removal of old service platform pilings was suspended pending additional review. Pilings do not lay within the XSDL's new mooring and therefore, do not have a direct impact on the needed actions for salvage.

SITREP IOC Ex-SHADWELL and Ex-State of Maine Salvage: 24 May 06

CURRENT OPS: Dredge ops continue on Little Sand Island. Large dredge continues working XSDL's new mooring, dredging to approximately 25 ft. Progress continues to be steady with interruptions to clean cutter head and pump sump of minor debris. Dredge suffered a hydraulic hose failure his morning and the crew is currently in progress of repairing the affected fitting. Dredge is expected to be back on line this afternoon. Small dredge continues to work XSDL's port side channel, which was cut for salvage ops. Progress continues to be slow as the dredge works through the clay deposits. Dive ops continue in support of dredge operations.

INTENTIONS: Continue 24 hr dredge ops in Little Sand Island Cove to reduce XSDL's ground reaction and prepare new mooring location. Large dredge to work XSDL's new mooring location. Little dredge to work port side of XSDL from stern to frame 15 with the intention of reducing the stbd list.

ISSUES/CONCERNS: Cost estimate to complete salvage work provided to sponsor for review and comment. Concern continues with respect to the amount of debris in the cove and its potential to affect progress. Removal of old service platform pilings was suspended pending additional review. Pilings do not lay within the XSDL's new mooring and therefore, do not have a direct impact on the needed actions for salvage. Per request of the sponsor, 00C is preparing two estimates, one for removal of the pilings and debris using a larger bucket dredge and another for the installation of new pilings to act as a barrier to protect the ship from damage and to provide additional support against a Cat III hurricane.

26 May: No Report

29 May 06: Memorial Day, No Report

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 31May '06

CURRENT OPS: Dredging operations commenced 0600 Tuesday 30 May after Memorial Day break. Small dredge completed first pass down port side of X-SHADWELL to approx 10FT depth and is now repositioned to stern AM 31 MAY and beginning next pass for deeper cut. Large dredge is continuing work on X-SHAD new berth in south end of cove. Progress is good with only periodic stops to clear cutterhead and pump of smaller debris. Conducted sounding of dredged areas and still experiencing some backfill but not as much as experienced after initial dredging.

INTENTIONS: Continue dredge ops. Expect large dredge to complete X-SHAD new berth some time Friday then will shift her to STBD side of X-SHAD to begin final cuts for refloating. Conducting mtg AM 01 JUN with ALCON and PCCI Naval Arch to review progress and firm up plan for final refloating effort, mooring recommendations and options for dealing with reinforced concrete obstruction just north of X-SHAD's new berth. Begin coordination for tugs and pilot for X-SHAD movement to new berth.

ISSUES/CONCERNS: Narrowing the options for the preferred mooring arrangement that provides maximum storm protection, minimizes risks of the concrete obstructions and at the best cost.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 02 JUN '06

CURRENT OPS: Dredging operations continuing. Small dredge positioned on X-SHADWELL port quarter and is cutting to approx 16FT depth around rudders and is now moving forward in the vicinity of frame 90. Expect large dredge to complete work on X-SHAD new berth in south end of cove this evening if predicted storms are not too severe. Developed temporary mooring plan for X-SHAD and conducted inventory and inspection of old anchors, deadmen and chain that was buried throughout the island and identified what is suitable for use in temp mooring. Directed shipment of one truckload of hawser, wire and shackles for ESSM to supplement mooring hardware. Developed two permanent mooring arrangements with estimated costs for forwarding to NRL for review. Conducted verification dive on concrete obstruction.

INTENTIONS: Continue dredge ops. Upon completion of X-SHAD berth, shift large dredge to X-SHAD STBD side and begin dredging area of remaining ground reaction from frame 94 to about 70. Over next few days MDSU team will work to set anchors/deadmen and prep chain legs in position for X-SHAD's temp mooring.

ISSUES/CONCERNS: Only immediate concern is unknown of potential buried obstructions that might impede final dredging progress on PORT and STBD sides of X-SHAD and storms predicted over next few days.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 05 JUN '06

CURRENT OPS: Dredging operations continuing with small dredge working on X-SHADWELL PORT quarter and progressing forward from stern to just aft of frame 74 at the forward end of the AFT ground reaction and large dredge, after completing work on X-SHAD new berth in south end of cove, shifted positions and is dredging on her STBD AFT side. Both dredges are hitting hard compressed clay but obstructions in this area are so far minimal. Between 2300 and 0100 Sunday/Monday X-SHAD increased STBD list from 7-5/8 degrees to 13 degrees indicating pinnacle between frames 95 and 74 is beginning to collapse to STBD. Morning deflection readings show a reduction in torsional stress and slightly reduced sag condition in the vicinity of frame 74 which is well inside parameters established. Naval Arch, Tony Coppersmith, PCCI, now on scene and updating model regularly. MDSU One DET worked preps for X-SHAD's new berth: ran and set ranges to mark sides of X-SHAD's new berth; set five deadman/anchors and ran chain along south beach of cove for mooring leg attachment points; and marked extraction and insertion routes for X-SHAD movement to new berth identifying high spots from backfill that will require some dredging after X-SHAD refloating. Received truck of mooring line, wire and shackles, transported to island and staged for mooring evolution.

INTENTIONS: Continue progressively deeper cuts with small dredge on PORT side at the major point of ground reaction, between frames 95 and 74, to facilitate continued collapse of AFT ground pinnacle until stern refloats or ground reaction reduced enough to extract with tugs. To allow PORT side material removal to catch-up to STBD side intend to shift large dredge to stern of X-SHAD and cleanup extraction channel to required depth. Increasing frequency of deflection readings to 2 to 3 times daily.

ISSUES/CONCERNS: Movement of X-SHAD in last 24 hours encouraging but still could be several days of dredging to continue collapse of pinnacle for sufficient reduction of ground reaction.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 07 JUN '06

CURRENT OPS: Dredging operations continuing with small dredge working on X-SHADWELL PORT quarter concentrating in the area of the AFT ground pinnacle between frames 95 and 74. Progress of small dredge slowed due to hard clay and small obstruction which required regular clearing of pump and lost a day of small dredge progress due to pipe breakage down time. Large dredge completed one pass on STBD quarter and is now working AFT of X-SHAD to ensure a clear extraction route. Deflection readings show slight variations in torsional and longitudinal stress but all within acceptable limits. Programming re-baseline of POSSE model to account for new soundings along the hull and the increased list (to 13 degrees) reported last SITREP.

To help reduce daily operational cost, directed MDSU DET to begin DEMOB. There is reasonable certainty that all obstructions requiring dive ops have been removed and we can contract for day worker line handlers for when we shift X-SHAD and re-moor. SUPSALV greatly appreciates the superb dedication and professionalism of MDSU 1 DET 1 during this large scale salvage operation ... BZ!

INTENTIONS: Continue progressively deeper cuts with small dredge on PORT side at the major point of ground reaction, between frames 95 and 74, to facilitate continued collapse of AFT ground pinnacle until stern refloats or ground reaction reduced enough to extract with tugs. Will make any dredging plan adjustments based on new POSSE run from re-baselining discussed above. Continue dredging extraction and insertion routes to X-SHAD's new berth. Begin coordination with Mobile Bay Pilot in preparation of final re-moor evolution. Effective 08 JUN, LCDR Josh Price is taking over as SUPSALV on scene Project Officer.

ISSUES/CONCERNS: Sufficient dredging progress and reduction of ground reaction to take advantage of upcoming higher tide cycle over the next week.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 09 JUN '06

CURRENT OPS: Dredging operations continuing at Slightly Bigger Sand Island, Mobile Bay, AL with small dredge working on X-SHADWELL PORT forward quarter concentrating in the area between frame 30 and frame 54. Large dredge completed cut of retraction channel aft of X-SHADWELL and moved onto Port midships to Port aft quarter between frame 54 and Frame 95 to reduce ground reaction of the aft pinnacle. Ground reaction readings and deflection readings continue to show slight variations in torsional and longitudinal stress due to dredging and tide action but all within acceptable limits. Starboard list reduced to 11.5 degrees. Re-baselining of POSSE will be conducted tomorrow to account for this change and any other changes induced by continued dredging tonight and high tide (1131 CST) tomorrow.

MDSU-1 site demobilization complete.

INTENTIONS: Continue progressively deeper cuts with both dredges on PORT side at the major point of ground reaction, between frames 95 and 74, to facilitate continued collapse of AFT ground pinnacle. Highest tides are predicted for Tuesday and Wednesday (13-14 June) next week. We are targeting this window of opportunity for the first pull with tugs on X-SHADWELL.

ISSUES/CONCERNS: No Changes from previous SITREP.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 12 JUN '06

CURRENT OPS: Shifted smaller dredge to starboard side and used the dredge as a jetting pump between frames 64 and 50. Water flow indicates that there is now free communication from starboard to port in way of frame 50. Larger dredge continuing to dredge port side of Shadwell. Deflection readings corroborate increased buoyancy midships as the ship is progressing to a hogging condition at high water. All deflection readings within acceptable limits. Within 4 hours of commencing jetting operation, Shadwell assumed a 6.825 degree starboard list (see attached photo taken just after high water at 1350 CST). This change in list also corresponded with high tide at 1310 CST. Falling tide did not appear to change Shadwell's list. Re-baselining of POSSE indicates that ground reaction has been reduced by approximately 30% from last report.

INTENTIONS: Continue progressively deeper cuts with larger dredge on PORT side near the bow forward of frame 34. Continue to jet with small dredge between frames 34 and 64. Highest tides are predicted for Tuesday and Wednesday (13-14 June), and these tides correspond with predicted rainfall resulting from Tropical Storm Alberto. Currently targeting Wednesday as the widow of opportunity to bring harbor tugs in for a retraction attempt. Relatively high tides are predicted through Saturday (17 June), and the retraction attempt may be delayed pending observed ship conditions.

ISSUES/CONCERNS: No Changes from previous SITREP.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 14 JUN '06

CURRENT OPS: Smaller dredge jetting from starboard side of Shadwell in the vicinity of frame 88. Larger dredge continuing to dredge port side of Shadwell. Completed dredging from stern forward to frame 15. Shifted larger dredge aft to frame 88 and commenced cut to 32 ft. Deflection readings continue to corroborate increased buoyancy midships as the ship has assumed a slight hog condition at high water. All deflection readings within acceptable limits. Starboard list at high water is now 6.5 degrees. At low water the starboard list increases to approximately 7.25 degrees.

INTENTIONS: Continue progressively deeper cuts with larger dredge on PORT side from frame 88 to frame 54. Continue to jet with small dredge between frames 88 and 54. Last of the highest tides will occur 6/15/06. Shadwell is still approximately 600 tons aground at high water. Pending ship condition at high water, we will continue to shift the larger dredge to attempt to collapse the aft pinnacle

ISSUES/CONCERNS: As high water decreases, ground reaction will preclude a retraction attempt without a collapse of the aft pinnacle.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 16 JUN '06

CURRENT OPS: Shadwell shifted to a 0.5 degree **port** list Thursday evening. Smaller dredge completed jetting operations on the starboard side of Shadwell, and has been released. Large dredge shifted to complete the dredging in the mooring slip channel south of Ex-State of Maine. Shadwell continues to exhibit a hogging condition at high water. The deflection readings continue to be within established limits. Shortly after the starboard list corrected to a slight port list water was observed leaking out of piping systems in the Port Pump Room, Starboard Pump Room, Port Engine Room, and Port Boiler Room. The only leak that appears to be coming from the sea was leaking coming from a 3/4 inch sea chest connection in the Port Pump Room. NRL personnel started

Shadwell's generator, and pumped the water from these spaces. Temporary repairs to leaking piping in the port pump room complete. Leaking from piping systems in the other spaces has stopped, and the water appears to have been pooled by Shadwell's list condition, and moved within the ship when the list was corrected. This minor leaking will not effect ongoing salvage operations. Attempt with 600 hp pusher boat at high water to shift the stern of Shadwell to port and starboard was unsuccessful.

INTENTIONS: Utilize large dredge to complete mooring slip and extraction channel preparation. We believe this effort will take several days to complete. Based on the estimated light ship weight and current loading condition, we believe that Shadwell can be retracted with the 3000 hp and 4000 hp tugs available locally with approximately a 2 - 2.5 ft tide. We are heading into a neap tide period, and we may not have water at the high tide to attempt the extraction until the neap tide has passed. We will use this time to complete mooring ship and extraction channel preparations.

ISSUES/CONCERNS: Continue to monitor hull deflection during high and low tide cycles. Coordinate with NRL personnel for a complete space walk-thru to monitor any other potential leaking piping systems.

19 JUN 06: No Report

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 21 JUN 06

CURRENT OPS: Large dredge completed working the mooring slip channel south of Ex-State of Maine and has shifted to dredging the starboard side of XSDL. Water depths on port side of XSDL are greater than +25 ft, while shallow areas of 16 ft exist on the starboard side aft of XSDL. The hull continues to rest on a shelf along the centerline of the hull. XSDL continues with a slight port list and no additional reports of water leakage in the hull. Dredge suffered a winch casualty and lost the ability to raise and lower the ladder which holds the cutter head and suction pipe. Winch motor is in a service shop in LA awaiting parts for repair. Repair parts have been located and are being shipped overnight. Repairs will commence as soon as parts are received.

INTENTIONS: Complete repair to large dredge winch and continue dredging starboard side of XSDL. Continue to monitor hull deflections during high and low tide cycles.

ISSUES/CONCERNS: Based on the current ship model which estimates light ship weight and current loading conditions, XSDL could be retracted with the 3000 hp and 4000 hp tugs available locally with approximately a 2 ft tide. Tides approaching 2 ft will occur on June 24, 25, and 26. Uncertainty in the estimates for weights and loading on the ship means that additional dredging to reduce the ground reaction is desirable to ensure the ship lifts off with the available tides and can be retracted with the available tugs.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 23 JUN 06

CURRENT OPS: Repairs completed to winch motor and large dredge returned to service late yesterday. Dredge completed working starboard stern of XSDL to 33 ft and ladder was raised to 25 ft and is currently working midship area of the hull. The hull continues to rest on a shelf along the centerline of the hull which is expected fall away as dredging proceeds. XSDL continues with a slight port list and no additional reports of water leakage in the hull. Pending adequate reduction of the ground reaction from dredging, plan is to use locally available tugs to pull on XSDL on 26 June 06.

INTENTIONS: Continue dredging starboard side of XSDL thru the weekend with a target date of 26 Jun 06 to retract the hull. Continue to monitor hull deflections during high and low tide cycles.

ISSUES/CONCERNS: Based on the current ship model which estimates light ship weight and current loading conditions, XSDL could be retracted with the 3000 hp and 4000 hp tugs available locally with approximately a 2 ft tide. Tides approaching 2 ft will occur on June 24, 25, and 26. Uncertainty in the estimates for weights and loading on the ship means that additional dredging to reduce the ground reaction is desirable to ensure the ship lifts off with the available tides and can be retracted with the available tugs.

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 26 JUN 06

CURRENT OPS: At approximately 1045 this morning, XSDL lifted off the bottom with the incoming tide, more than an hour earlier than predicted. Local tugs (2) were brought in and the ship was pulled from its beached location and slipped into its new mooring position. The ship will initially be secured in a 4 point moor, two bow anchors and two stern lines running to two anchors on the beach aft of XSDL. Over the next two days, the remaining 4 mooring legs will be made up to the ship. All of the mooring chain and anchors have been prepositioned on the beach. The ESSM team is on station to demob all remaining SUPSALV salvage gear.

INTENTIONS: Install the remaining 4 mooring legs to complete the temporary mooring set-up. Conduct a final hull deflections survey and combine with a final load list and ballast report. Remove all temporary support systems from XSDL and pack all remaining salvage equipment for shipment back to the ESSM warehouse in Cheatham Annex, VA.

ISSUES/CONCERNS: None

SITREP IOC Ex-SHADWELL and Ex- State of Maine Salvage: 29 JUN 06

CURRENT OPS: XSDL and SOM have been positioned in there final mooring locations and all mooring equipment has been positioned to the customer's requirements. All salvage equipment has been removed from the island, loaded on to trucks, and is being transported back to the ESSM warehouse. Certification of Delivery letters have been provided to customer reps for both ships and signed copies will be picked up on 30Jun06.

INTENTIONS: Collect final cost information and complete all financial actions for this salvage operation.

ISSUES/CONCERNS: None. Final report this op. Thanks to all involved! Through the determination and perseverance of the project team, the many obstacle encountered were swiftly dealt with and the salvage operation successfully completed.

Appendix M

GPC *A Joint Venture*

CAX/FT/bj
29 September 2006

Naval Sea Systems Command
Code 00C1
1333 Isaac Hull Ave. SE Stop 1071
Washington Navy Yard, DC 20376-1071

ATTN: T. Robinson-Gore

SUBJ: **Final Report Part One–Operational Delivery Order #0856/S116, N00024-01-D-4018, CONTRACT VALUE - $ 247,998.00**

INFO: J. Price (Code 00C20B), NAVSEA Project Manager

a. Executive Summary: The contractor shall assist the Supervisor of Salvage and Diving (SUPSALV), USN, by providing labor and material in support of EX-USS SHADWELL and M/V STATE OF MAINE refloat operations.

b. Chronology of Events:

1. Developed POSSE models for ex-SHADWELL and STATE OF MAINE.
2. Provided miscellaneous engineering support for various tasks associated with re-floating the vessels and positioning them in new mooring sites.
3. Performed hull girder deflection analysis of ex-SHADWELL to determine baseline hull deformation.
4. Provided drawings and determination of ships' present conditions in connection with developing POSSE models for both ships.
5. Provided ESSM salvage equipment for use in recovery of ex-SHADWELL.

c. Problems Encountered: None

d. Lessons Learned/Recommendations: None

e. Equipment Utilized: Beach Gear, HYD Pullers, Jetting Pumps, RIB Boat, Tow Alarm System, and Various Line & wire rope.

f. Equipment Evaluations: RIB BOAT: One Inflatable Bladder leaked, Bladders were old and are being replaced, Radar Antenna was crushed and had to be replaced, Propeller was damaged on site and was replaced, Jetting Pumps froze up due to not being flushed with fresh water after use.

g. Appendices as Required: see Final Part 2.

Sincerely,

Fred Touchstone
Project Coordinator

P.O. Box JK, Williamsburg, VA 23187 (757) 637-9000 FAX (757) 637-9089

GPC *A Joint Venture*

CAX/AB/bj
29 September 2006

Naval Sea Systems Command
Code 00C1
1333 Isaac Hull Ave. SE Stop 1071
Washington Navy Yard, DC 20376-1071

ATTN: T. Robinson-Gore

SUBJ: **Final Report Part Two: Operational Delivery Order #0856/S116, N00024-01-D-4018, CONTRACT VALUE - $247,998.00**

INFO: J. Price (Code 00C20B), NAVSEA Project Manager

Executive Summary: This Delivery Order was established to assist the Supervisor of Salvage and Diving (SUPSALV), USN, by providing labor and material in support of recovery operations of the EX-USS SHADWELL and STATE OF MAINE refloat operations.

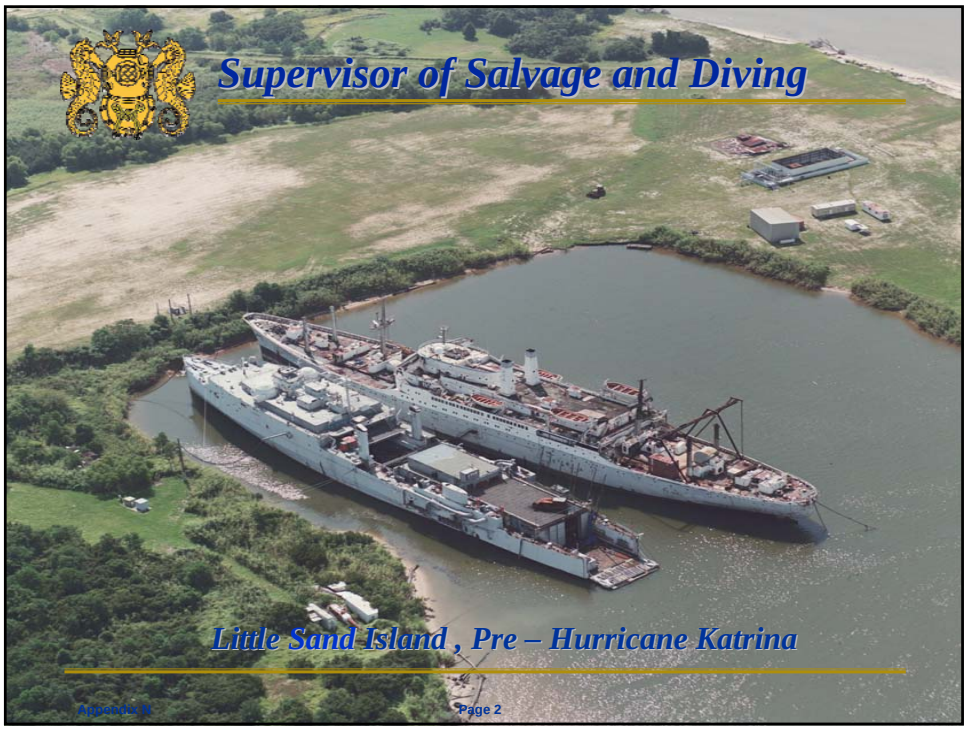
Appendix G:

All equipment use on the job was refurbished and returned to RFI condition.
Refurbishment cost = $14,306.56

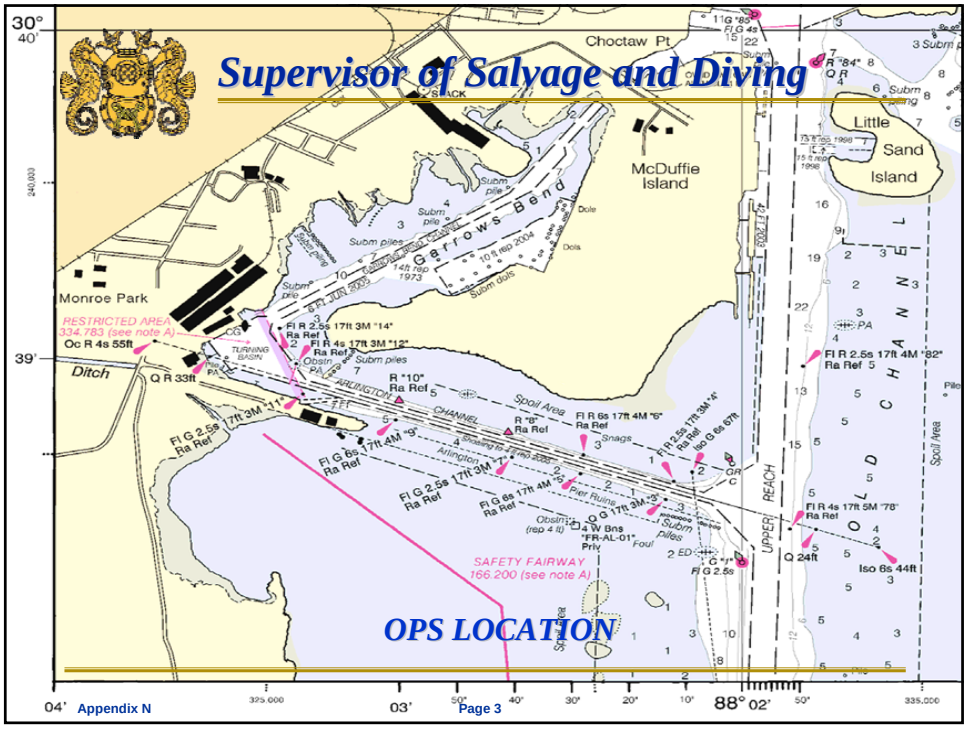
Sincerely,

Fred Touchstone
Project Coordinator

Appendix N - Salvage Ops Debrief



Appendix N - Salvage Ops Debrief



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EX-USS SHADWELL (LSD-15)

- *AUTHORIZED LEND-LEASE ACT AS BRITISH MECHANIZED ARTILLERY TRANSPORT TOMAHAWK (BAPM-7)*
- *WWII USN LANDING SHIP DOCK*
- *COMMISSIONED: 07/24/1944*
- *DECOMMISSIONED: 03/09/70*
- *LOA: 458 FT*
- *BEAM: 72 FT*
- *MAX. DRAFT: 18 FT*
- *LIGHT DISPLACEMENT: 4960 LT*
- *CUSTODIAN: NRL, FIRE RESEARCH DET., LITTLE SAND ISLAND, MOBILE BAY, MOBILE, AL*

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T/V STATE OF MAINE (T-AP-198)

- *EX-USNS UPSHUR, EX-PRESIDENT HAYES*
- *ORIGINALLY INTENDED FOR APL, TAKEN OVER BY MSTS*
- *KOREAN CONFLICT TROOP TRANSPORT SHIP*
- *COMMISSIONED: 12/01/52*
- *DECOMMISSIONED: 1973 "END OF USN TROOPSHIP ERA"*
- *LOA: 534 FT*
- *BEAM: 73 FT*
- *MAX DRAFT: 27 FT*
- *LIGHT DISPLACEMENT: 6720 LT*
- *CUSTODIAN: US COAST GUARD, FIRE & SAFETY TEST DETACHMENT, MOBILE, AL*

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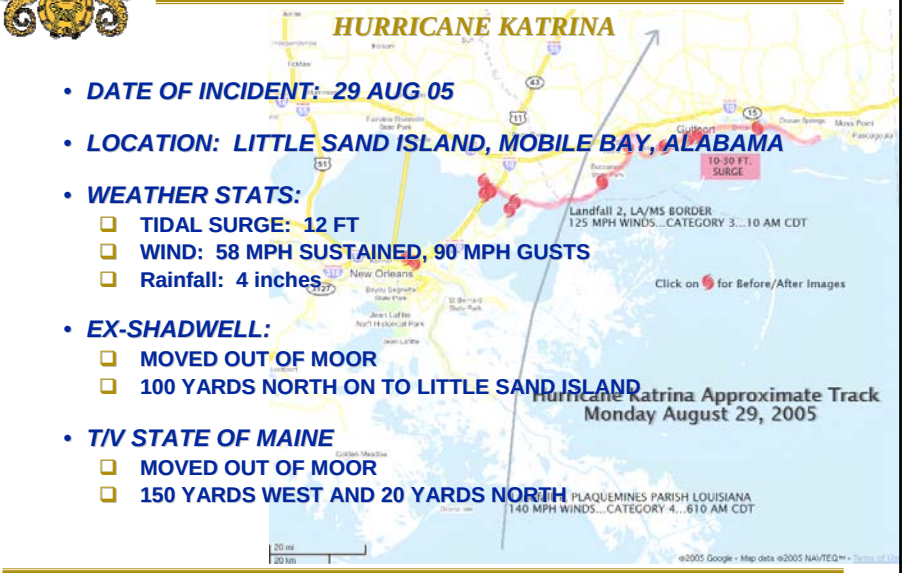
HURRICANE KATRINA

- DATE OF INCIDENT: 29 AUG 05
- LOCATION: LITTLE SAND ISLAND, MOBILE BAY, ALABAMA
- WEATHER STATS:
  - TIDAL SURGE: 12 FT
  - WIND: 58 MPH SUSTAINED, 90 MPH GUSTS
  - Rainfall: 4 inches
- EX-SHADWELL:
  - MOVED OUT OF MOOR
  - 100 YARDS NORTH ON TO LITTLE SAND ISLAND
- T/V STATE OF MAINE
  - MOVED OUT OF MOOR
  - 150 YARDS WEST AND 20 YARDS NORTH



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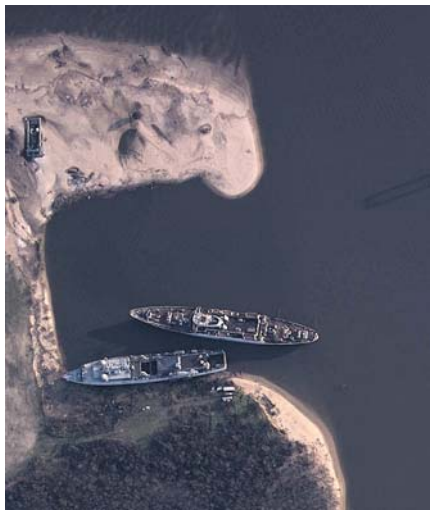
STRANDED SITUATION



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SITE SURVEYS

- *INITIAL SURVEY*
  - SEPT 2005
  - 00C & DONJON
  - CONCERN FOR HULL MATERIAL CONDITION
  - NEED FOR IN-DEPTH HULL SURVEY / UT TESTING
  - INITIAL DISCUSSION TO REFLOAT HULL BY DREDGING
- *SUPPORTING SURVEYS*
  - USS GRAPPLE (ARS-50)
    - SALVAGE SURVEY
  - TRANS WORLD TECHNOLOGIES
    - TOPOGRAPHIC / HYDROGRAPHIC SURVEY
    - BOTTOM REPORT
  - MDSU ONE, DET ONE
    - IN-DEPTH DIVE SURVEY

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HYDROGRAPHIC SURVEY

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HULL SURVEYS

- *TECHNICAL HULL SURVEY (NOV 05)*
  - SHELL PLATING:
    - UP TO 30% WASTAGE
  - SHELL LONGITUDINALS
    - BELOW 3RD DECK AND OUTBRD 14' CL
    - NOT STRUCTURALLY SOUND – WEB MATERIAL GONE
  - REDUCTION IN SECTION MODULUS – 5.8%
  - WELD SEAM INTEGRITY
    - CORROSION AT BOUNDARY BETWEEN WELD AND BASE METAL
    - STRESS RISER
      - CRITICAL CRACK LENGTH
  - FAILURE MODE:
    - LOCALIZED SHELL PLATE BUCKLING IN COMPRESSION
      - REDUCED LOAD CARRYING CAPACITY
    - REDUCED TENSILE STRENGTH
      - DUE TO LOSS OF BASE MATERIAL

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HULL SURVEY

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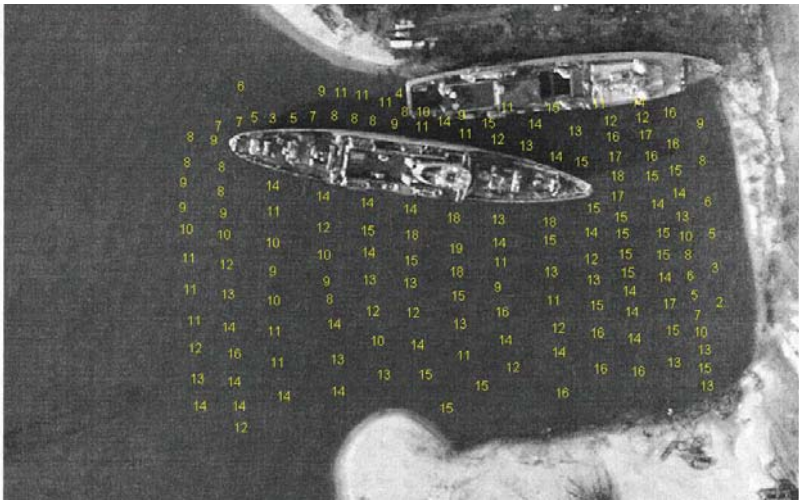
Depth Sounding Survey



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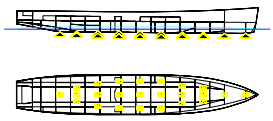
POSSE MODELING

PCCI-POSSE
Ex_Shadwell

POSSE 4 4.6.5

Draft/Displacement Summary
Refloat

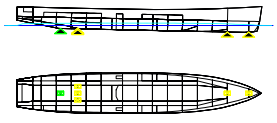


Stranded Draft / Displacement Data				
		Intact Displ.	After Outflo	As Stranded
Draft at FP	ft	12.4		8.11
Draft at AP	ft	11.44		3.82
Trim	ft	1.03I		4.29F
Draft at Fwd Marks	ft	12.47		8.11
Draft at Aft Marks	ft	11.4		3.82
Static Heel Angle	deg	4P		7S
Total Weight	LT	5,482	5,482	5,482
VCG	ft	28.6	28.6	28.65
LCG	ft-FP	220.79A	220.79A	220.79A
TCG	ft-CL	0.20I	0.20I	0.20P
Buoyancy	LT	5,48		2,502
KB	ft	6.42		3.47
LCB	ft-FP	220.72		205.17A
TCB	ft-CL	1.72P		4.66S
KMt	ft	31.53		69.00
FSc	ft	0.0I		0.00
GMt	ft	2.88		32.23

PCCI-POSSE
Ex_Shadwell

POSSE 4 4.6.5

Draft/Displacement Summary
Swing Out HW



Stranded Draft / Displacement Data				
		Intact Direct	After Outflow	As Stranded
Draft at FP	ft	12.47		13.10
Draft at AP	ft	11.44		3.87
Trim	ft	1.03F		9.23F
Draft at Fwd Marks	ft	12.47		13.10
Draft at Aft Marks	ft	11.44		3.87
Static Heel Angle	deg	4P		7S
Total Weight	LT	5,482	5,482	5,482
VCG	ft	28.65	28.65	28.65
LCG	ft-FP	220.79A	220.79A	220.79A
TCG	ft-CL	0.20P	0.20P	0.20P
Buoyancy	LT	5,482		3,753
KB	ft	6.42		4.98
LCB	ft-FP	220.72A		197.39A
TCB	ft-CL	1.72P		3.50S
KMt	ft	31.53		36.56
FSc	ft	0.00		0.00
GMt	ft	2.88		-0.46

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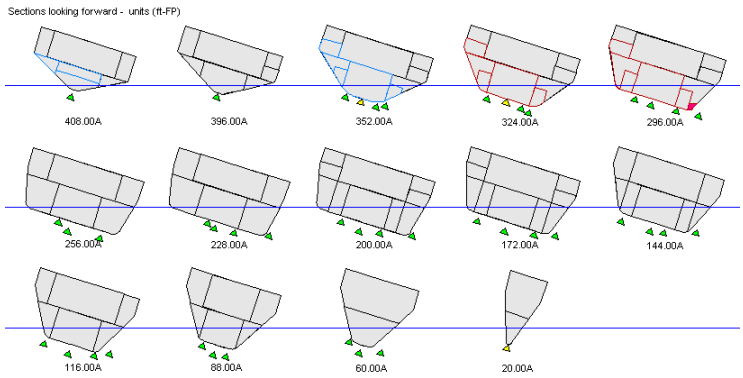
POSSE MODELING



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POSSE MODELING

- *EX-SHADWELL*
  - SAG THROUGH MOST OF HULL WITH HOG CONDITION AFT
  - GROUND REACTION: 4088 LT
  - MAX STRESS: 1.7 KSI (TENSION), -4.92 KSI (COMPRESSION)
  - STRESS LIMIT: 10 KSI (TENSION), -5.0 KSI (COMPRESSION)
- *T/V STATE OF MAINE*
  - CANTILEVERED BOW
  - GROUND REACTION: 1800 LT
  - MAX STRESS: -5 KSI (COMPRESSION)
- *NEED TO MONITOR EX-SHADWELL HULL STRESSES*
  - HULL GIRDER DEFLECTION LASER MEASURING SYSTEM

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Hull Girder Deflection Laser Monitoring System

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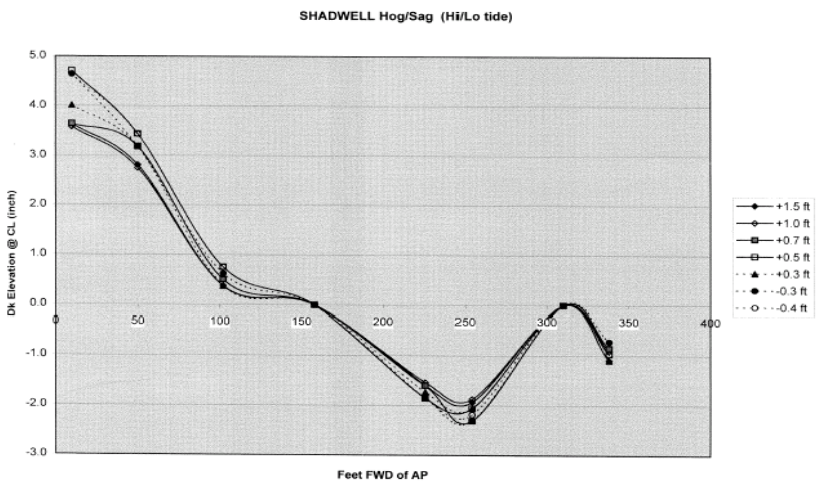
Hull Girder Deflection Laser Monitoring System



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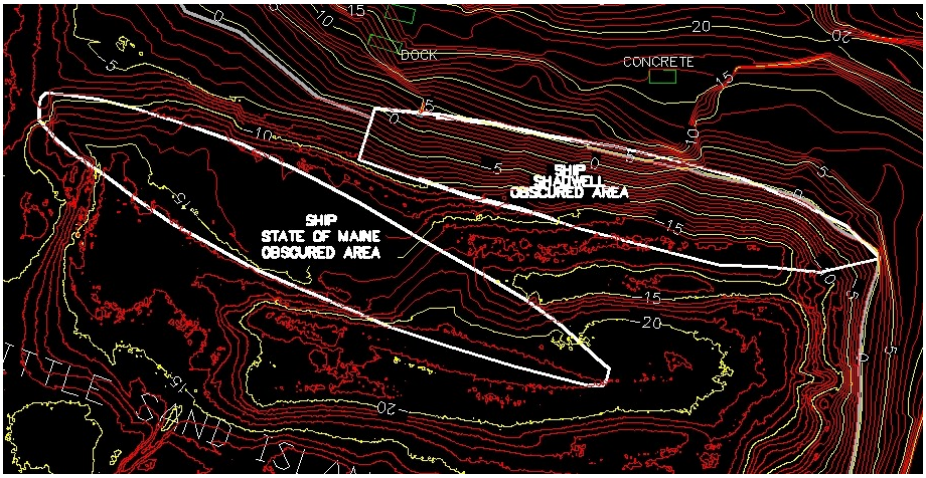
SALVAGE PLAN



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SALVAGE PLAN

- ***RE-FLOAT SHIPS BY DREDGING***
  - ASSIST PROVIDED BY LOCAL TUGS
  - MDSU TO PROVIDE BEACH GEAR TO ASSIST WITH SOM
- ***RE-FLOAT SOM 1ST, MOOR IN ORIGINAL LOCATION***
  - DRESS-UP MOORING
  - DREDGE BOW
  - DREDGE AFT, PORT AND STBD
  - BEACH GEAR TO PULL HULL OFF BAR
- ***RE-FLOAT XSDL & SHIFT TO SOUTHERN END OF COVE***
  - DREDGE NEW MOOR
  - LEAVE BOW PINNED, JET MID-SECTION OF HULL
  - DREDGE AFT TO LEVEL HULL, THEN SETTLE INTO WATER
  - DIG OUT BOW

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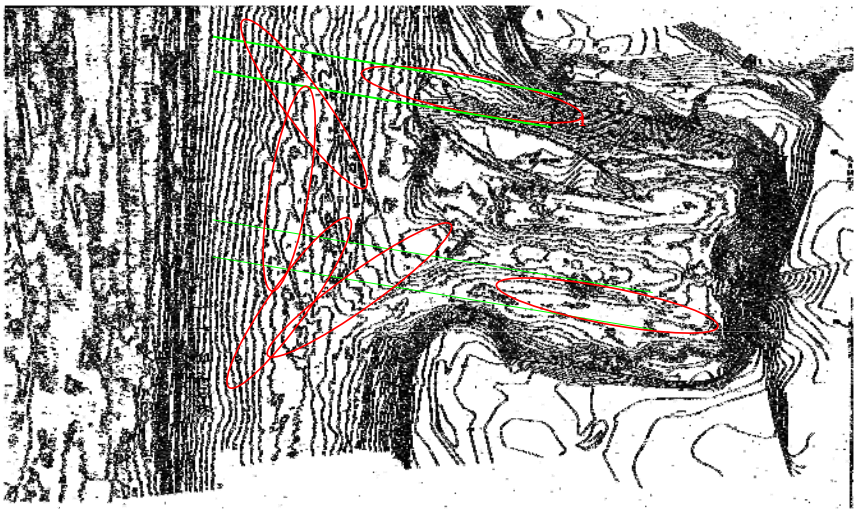
SHADWELL Repositioning



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Berm Construction

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PARTICIPATING UNITS

- ***SUPERVISOR OF SAVAGE AND DIVING (00C)***
  - PM, ESSM EQUIPMENT, TECHNICAL SUPPORT (PCCI)
- ***NAVAL RESEARCH LABORATORY***
  - FUNDING, SHADWELL CREW & SHOP SUPPORT SERVICES
- ***USCG FIRE & SAFETY TEST DET***
  - SOM CREW, TRANSPORTATION SERVICES, & MISC SUPPORT
- ***DONJON MARINE SERVICES***
  - SALVAGE MASTER, CONTRACTING
- ***MOBILE DIVING AND SALVAGE UNIT ONE, DET ONE***
  - SALVAGE AND DIVING SUPPORT
- ***CONTRUCTION SOLUTIONS INC***
  - TUG / FLOATING CRANE / WORK BARGE
- ***C & C***
  - BIG DREDGE
- ***LOTT ENTERPRIZES***
  - LITTLE DREDGE
- ***CRESCENT TOWING***
  - SUPPORT TUGS

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GEAR TRANSPORT AND BEACH LOAD-OUT

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Appendix N - Salvage Ops Debrief

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DREDGING OPS

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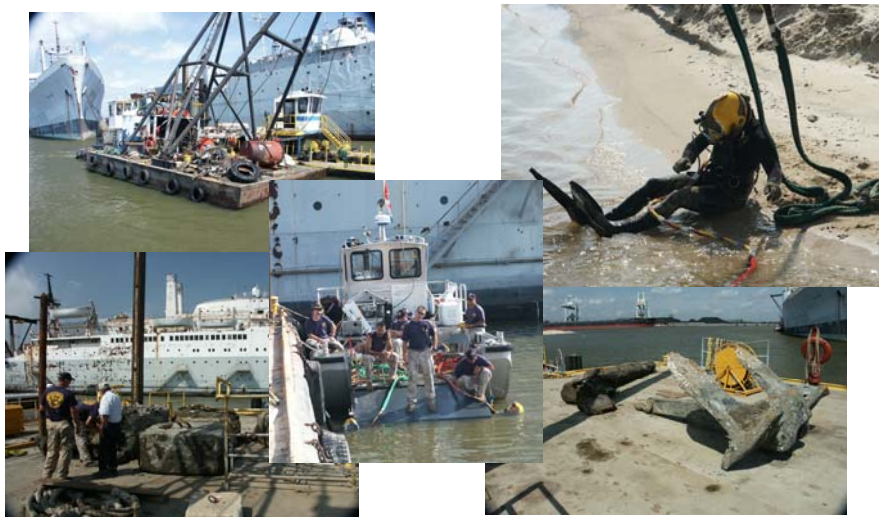
DEBRIS REMOVAL



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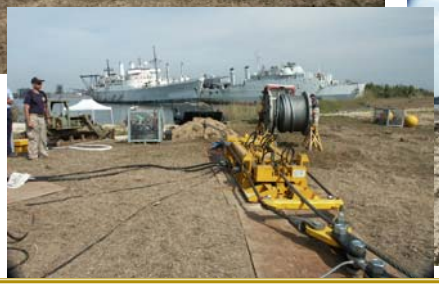
BEACH GEAR SET-UP



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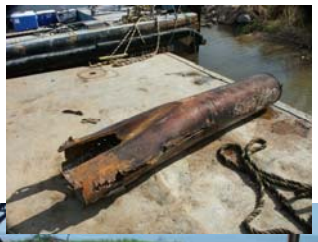
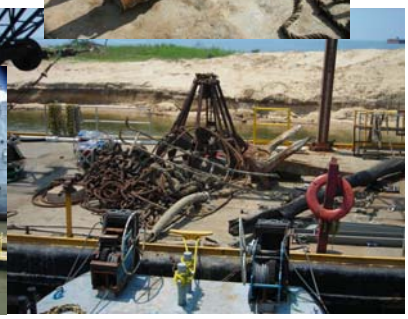
PROBLEMS ENCOUNTERED



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T/V STATE OF MAINE REMOORED

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EX-SHADWELL JETTING

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THE BIG DIG / MOVING THE MOUNTAIN

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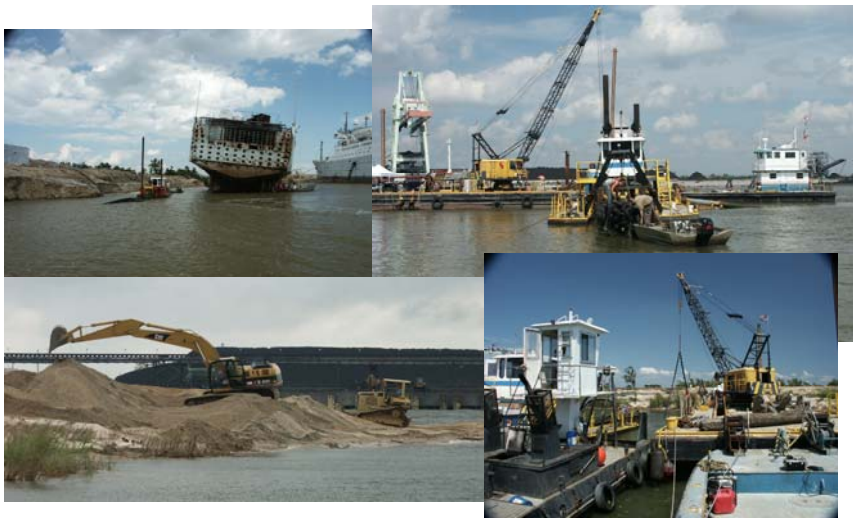
DREDGING CONTINUES WITH 2ND DREDGE



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EX-SHADWELL WORK CONTINUES

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UNDERWAY

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SHADWELL RE-MOORED

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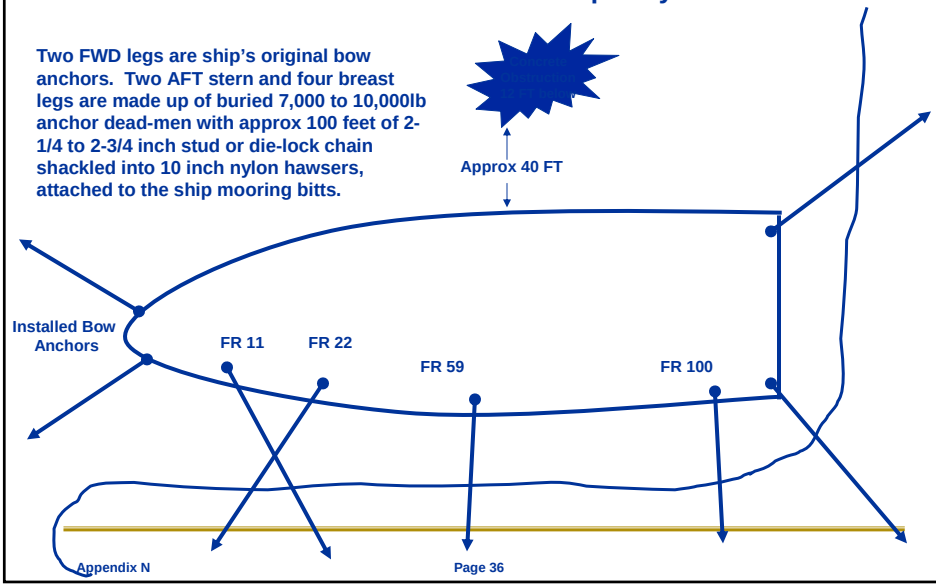
EX-SHADWELL Temporary Moor

Two FWD legs are ship's original bow anchors. Two AFT stern and four breast legs are made up of buried 7,000 to 10,000lb anchor dead-men with approx 100 feet of 2-1/4 to 2-3/4 inch stud or die-lock chain shackled into 10 inch nylon hawsers, attached to the ship mooring bitts.



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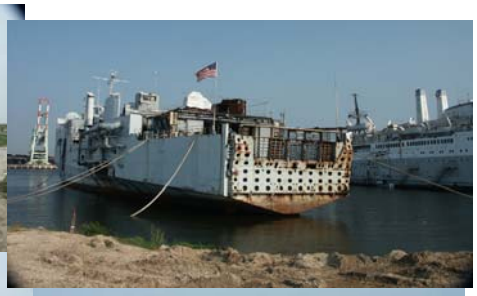
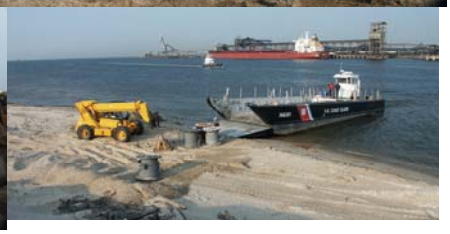
FINISHING UP



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LESSONS LEARNED

- *DREDGE OPS*
  - SOIL SAMPLES: CLAY - VS - SAND
  - DEBRIS: AMOUNT / REMOVAL / EQUIPMENT FAILURE
- *MDSU*
  - TRAINING OPPORTUNITY
  - TIME MANAGEMENT EFFICIENCY
- *ESSM*
  - EQUIPMENT REPAIR KITS: EVALUATE CONFIGURATION
  - RHIB: EQUIPMENT CONFIGURATION & TRAILER
  - SMALL ELECTRIC GENERATORS: PURCHASE
  - PUMP & HOSE FITTINGS: COMPLETE COVERSION
  - SALVAGE RIGGING VAN: DEVELOP FIELD KIT
  - LOCAL FUEL LOADING AND STORAGE REQUIREMENTS
- *OOC*
  - ELECTRONIC EQUIPMENT BOX
    - MARINE VHF
    - GPS
    - DIGITAL CAMERA

Appendix N - Salvage Ops Debrief