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STATEMENT OF BASIS FOR AREAS OF CONCERN 501 AND 503 CNC CHARLESTON SC
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STATEMENT OF BASIS FOR AREAS OF CONCERN 501 AND 503

This Statement of Basis addresses two unexploded ordnance (UXO) sites, Areas of Concern (AOCs) 501 and 503, at the former Charleston Naval Complex (CNC) in Charleston, South Carolina. Redevelopment plans for the CNC involve construction of a new container ship port facility, the Charleston Naval Base Container Terminal (CNBCT), which will result in significant intrusive activities at both AOC 501 and AOC 503. These AOCs are included in Appendix B-8 of the U.S. Navy's Resource Conservation and Recovery Act (RCRA) Permit Renewal Application, which designates them as AOCs requiring land use controls (LUCs). LUCs include engineering controls (such as fences, soil caps, building slabs, etc.) and institutional controls (non-physical legal obligations that restrict a land's use and allowable activities) that are implemented to prevent adverse human health or environmental impacts associated with exposure to UXO at each site.

AOC 501 is identified as the location where two AN Mk-47 depth bombs were reportedly dropped into the Cooper River. AN Mk-47 depth bombs were typically loaded with "torpedo explosive" (also known as "Torpex"), which was a combination of trinitrotoluene (TNT), powdered aluminum, and other explosives. AOC 501 is identified on the *Map of U.S. Naval Air Station Charleston, SC Showing Conditions on June 30, 1945* at map coordinates F-16 and F-17 and is noted by the following description: "Two AN Mark 47 Torpex loaded depth bombs dropped in this area 20 November 1943." A copy of the *Map of U.S. Naval Air Station Charleston, SC Showing Conditions on June 30, 1945* is presented as Figure 1.

AOC 503, like AOC 501, was first identified as a single-point map location indicating where two Mk-17 depth bombs were jettisoned from a seaplane into the Cooper River on October 8, 1943. Development of Mk-17 depth bombs preceded the Mk-47 and the Mk-17 was typically loaded with TNT only. AOC 503 was identified on Figure 2 of the *Interim Measures Completion Report for AOC 503* (SPORTENVDETHASN, 1997) and noted by the following description: "Two Mark-17 Depth Bombs Jettisoned 8 October 1943". A copy of the 1997 figure is presented as Figure 2.

PROPOSED REMEDIES

The *Final UXO Risk Assessment and Mitigation Measures Report for Sites AOC 501 and 503 at the Former Charleston Naval Complex* (ADVENT/Shaw, 2007) recommended that LUCs be implemented at AOCs 501 and 503 during construction of the CNBCT. After review of the ADVENT/Shaw report (hereinafter referred to as the Risk Assessment and Mitigation Measures Report, or RAMMR), the South Carolina Department of Health and Environmental Control (SCDHEC) concurred in a letter dated November 19, 2007, letter that implementation of LUCs (specifically, excavation permit applications) would be required of the South Carolina State Ports Authority (SCSPA) and would be reviewed and

approved by the U.S. Navy (Navy), SCDHEC and the U.S. Environmental Protection Agency (USEPA) prior to, and during the construction activities associated with the CNBCT in the area of AOCs 501 and 503. An example of the excavation permit application to be used during all CNBCT construction activities is presented as Attachment 1, and a site map showing the layout of the CNBCT relative to AOCs 501 and 503 is presented as Figure 3.

The proposed location of the retention pond in the southwestern corner of the CNBCT overlies a portion of AOC 503, and the pond cannot be relocated due to design constraints. Per the RAMMR, excavation of the retention pond inside the footprint of AOC 503 requires completion of a survey by UXO Technicians for any areas excavated to greater than 6 feet below ground surface to identify all potential metallic anomalies and to reduce the potential for excavation machinery encountering potential UXO items. The UXO Technicians will screen the excavation with hand-held magnetometers beginning at the 6-foot depth and will continue until the required depth is reached. Any underground utility placement planned for deeper depths (e.g., at or below -3 feet Charleston Low Water [CLW]) in the area of AOC 503, also requires a phased UXO magnetometer survey to identify all potential metallic anomalies and to reduce the potential for encountering potential UXO items.

Also, as part of LUCs implemented at AOC 503 in SCDHEC's November 19, 2007, letter, the SCSPA is required to conduct annual inspections to certify that the following are met at AOC 503:

- The site is not being used for residential purposes.
- The site is not being used for recreational purposes.
- The site is not being used for agricultural purposes.
- Soils/sediments at the site have not been disturbed or have been disturbed only after submittal and approval of the LUC Area Construction Permit.

Upon completion of the annual inspections by SCSPA, copies of the annual inspection report are to be submitted to SCDHEC, USEPA, and the Navy for review and approval. An example of the annual inspection form to be used by SCSPA is presented as Attachment 2. Annual inspections and certification of AOC 501 is not required by SCDHEC because AOC 501 is located in the Cooper River and is normally underwater.

SITE DESCRIPTIONS

AOCs 501 and 503 were initially investigated during the Interim Measure (IM) activities conducted following closure of the Charleston Naval Base in accordance with 1993 Base Realignment and Closure (BRAC) recommendations. The primary objective of the IM activities conducted at AOCs 501 and 503 was to locate, excavate, and remove identified anomalies, UXO, and associated contaminated soil. If

UXO was not detected and recovered, a secondary objective of the IM activities at both AOC 501 or AOC 503 was to perform a due diligence search and verify via a geophysical survey whether the UXO had been previously removed, or was located several feet below the river bottom, and allow for an unrestricted release of the property.

AOC 501

AOC 501 is a rectangular area approximately 400 feet by 1,200 feet (480,000 square feet) in the Cooper River, east of the berthing areas of the CNBCT. The 2006 CNBCT layout, showing the location of AOC 501, is presented as Figure 3.

Reactives Management Corporation performed the IM activities, including search and diving operations, in the AOC 501 area in July and August 1998. Navy Explosive Ordnance Disposal personnel performed the search operations using a boat equipped with magnetometers and underwater metal detectors. Several anomalies were detected during the search at AOC 501; however, follow-up diving and investigation activities found these to be miscellaneous metallic objects (e.g., chain shackles and links, cans, nails, tools, angle iron, metal cable, pipe debris, etc.), with none being ordnance or ordnance related.

AOC 503

The *Final RCRA Facility Investigation (RFI) for Zone H* (which includes AOC 503) was completed by Ensafe/Allen & Hoshall in July 1996. Following issuance of the *Final RCRA Facility Investigation (RFI) for Zone H*, the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) expanded the search area for the depth bombs to include the configuration of the old seaplane runway present at the time and include additional areas where the jettisoned bombs may have landed. Based on the NAVTECHDIV revision, the revised AOC 503 area encompasses approximately 9.85 acres south of the former seaplane runway (at the southern boundary of Zone H) at CNC (see Figure 2). The 2006 CNBCT layout, showing the location of AOC 503, is presented as Figure 3.

NAVEODTECHDIV performed the search activities in 1997 using an Automated Ferrous Ordnance Locator and a magnetometer. NAVTECHDIV's initial search estimated that the sediment in the marsh during the period the bombs were jettisoned was less than 6 feet thick. Periodic dredging of nearby Shipyard Creek resulted in an additional 6 to 8 feet of sediment being deposited in the area of AOC 503 after 1943. Based on the suspected depth bomb trajectories and subsequent emplacement of dredged river bottom materials, NAVTECHDIV concluded that the depth bombs would most likely be located within 14 feet of the ground surface; however, NAVTECHDIV concluded that at that depth, the magnetic signature of an Mk-17 depth bomb would be very difficult to detect using a magnetometer.

A total of nine anomalies at AOC 503 were initially identified by NAVEODTECHDIV and marked for excavation and retrieval. The excavated anomalies consisted of various pieces of sheet metal, metallic fragments, lengths of metal pipe, a corroded metal handle, and other metallic debris. An independent third party, UXB International, Inc. (UXB), was directed by SPORTENVDETCNASN to evaluate the geophysical data, and UXB recommended performance of another geophysical survey over the same area. The resurvey was completed by NAVEODTECHDIV, and the new data eliminated two identified anomalies from further consideration as potential Mk-17 depth bomb locations. Following completion of the resurvey in June 1997, SPORTENVDETCNASN determined that no potential UXO existed within 15 feet below the surface at AOC 503. The IM Completion Report for AOC 503 confirmed this by concluding that SPORTENVDETCNASN had met the intent of performing a due diligent search and verifying via geophysical survey that the ordnance was either previously removed or located at a safe distance below the ground surface of the property.

SUMMARY OF SITE RISK

MUNITIONS EXPLOSIVE HAZARD RISK SUMMARY

Construction activities in the areas of AOCs 501 and 503 have the potential to disturb any UXO items lying on or below the floor of the Cooper River. Construction of the CNBCT requires the dredging and movement of approximately 6.4 million cubic yards of sediment and the installation of wick drains and pilings in the area of AOC 501. The vertical wick drains will be inserted into the sediment to depths ranging from 45 to 80 feet below the riverbed, and if the existing subsurface soils are relatively dense, pre-drilling may also be utilized during installation. Installation of construction pilings at CNBCT is also planned at depths of 40 to 80 feet below existing grades and is typically installed using impact hammers. Construction of the CNBCT also requires the use of equipment such as backhoes and trenching machines for surficial excavation and installation of underground utilities in the area of AOC 503.

As stated in the RAMMR, the two AN Mk-47 depth bombs dropped at AOC 501 likely fell from a Navy vessel and likely did not have the fuses installed, precluding the potential for arming. Similarly, the two Mk-17 depth bombs jettisoned at AOC 503 may have been armed (although probably fused); however, the standard operating procedure for a jettison event was to release the ordnance in such a manner that the arming wires were retained in the fuse, which maintains the munitions in a relatively safe, unarmed, and less sensitive condition. As a result, detonation of the depth bombs at AOCs 501 and 503 associated with these two events would only be expected to occur if the main charge explosives were to function as a result of sufficient shock and/or high heat. The main charge explosive in the AN Mk-47 was Torpex, and in the Mk-17 the main charge explosive was TNT. Bomb fillers were, by design, relatively insensitive, to safely withstand rough handling during typical military operations.

Several major hurricanes have affected South Carolina and Charleston since 1943, and it is probable that during large storms and periods of increased river flow, the river bottom sediments from the lower Cooper River (including AOC 501) may have been scoured and redeposited downstream in Charleston Harbor. Hurricanes of “major” intensity (such as Hurricane Hazel [October 1954] and Hurricane Hugo [September 1989] – both category 4 storms) are likely to erode, re-entrain, and redeposit riverbed sediments (and deposited UXO items) from the lower reaches of the Cooper River downstream to Charleston Harbor. The torrential hurricane-produced rainfalls (with consequent increases in river discharge levels) and storm surges since 1943 may have also worked to relocate the AN Mk-47 depth bombs to areas beyond the established AOC 501 boundaries.

Although installation of utility line trenches is not anticipated to impact AOC 501 or 503, if the depth bombs are still present at AOC 501 when dredging activity occurs, the AN Mk-47 depth bombs will likely come in contact with the dredge cutter head. However, as previously stated, the likelihood of the bombs residing where they were dropped is remote based on the sediment transport assumed to have occurred since 1943. If UXO items do come in contact with the dredge cutter head, there is a low probability of detonation due to the uncertainty as to whether the bombs were ever armed and based on their assumed condition after more than 60 years under water and buried in sediment.

As stated in the RAMMR, the probability of striking one of the depth bombs during wick drain installation was evaluated in accordance with the Office of the Naval Chief of Naval Operations Instructions (OPNAVINST) 3500.39B, *Operational Risk Management*, and found to be between 11 and 39 percent, depending on orientation of the bomb. The OPNAVINST evaluation was also employed to evaluate the probability of striking a bomb during installation of building piles and pile clusters for light poles, and this activity was estimated to add only a 1 percent to the overall probability of striking one of the depth bombs.

ECOLOGICAL RISK ASSESSMENT SUMMARY

Potential ecological risks attributed to the October 1943 and November 1943 munitions events were not addressed in the RAMMR and, per SCDHEC, are not expected to be a concern at either at AOC 501 or AOC 503.

ANTICIPATED IMPACTS OF CLEANUP ON THE LOCAL COMMUNITY

No significant health risks or impacts to the local community are anticipated with the construction of the CNBCT and implementation of LUC remedies under current and likely future land use scenarios.

REFERENCES

ADVENT/Shaw (ADVENT Environmental, Inc., and Shaw Environmental, Inc.), 2007. *Final UXO Risk Assessment and Mitigation Measures Report for Sites AOC 501 and 503 at the Former Charleston Naval Complex.*

SPORTENVDETCHASN (Supervisor of Shipbuilding, Conversion and Repair, Portsmouth Va., Environmental Detachment Charleston), 1997. *Interim Measures Completion Report for AOC 503.*

Figure 1 – *Map of U.S. Naval Air Station Charleston, SC Showing Conditions on June 30, 1945*

Document Source:
RDA Plan Room, former Charleston Naval Complex

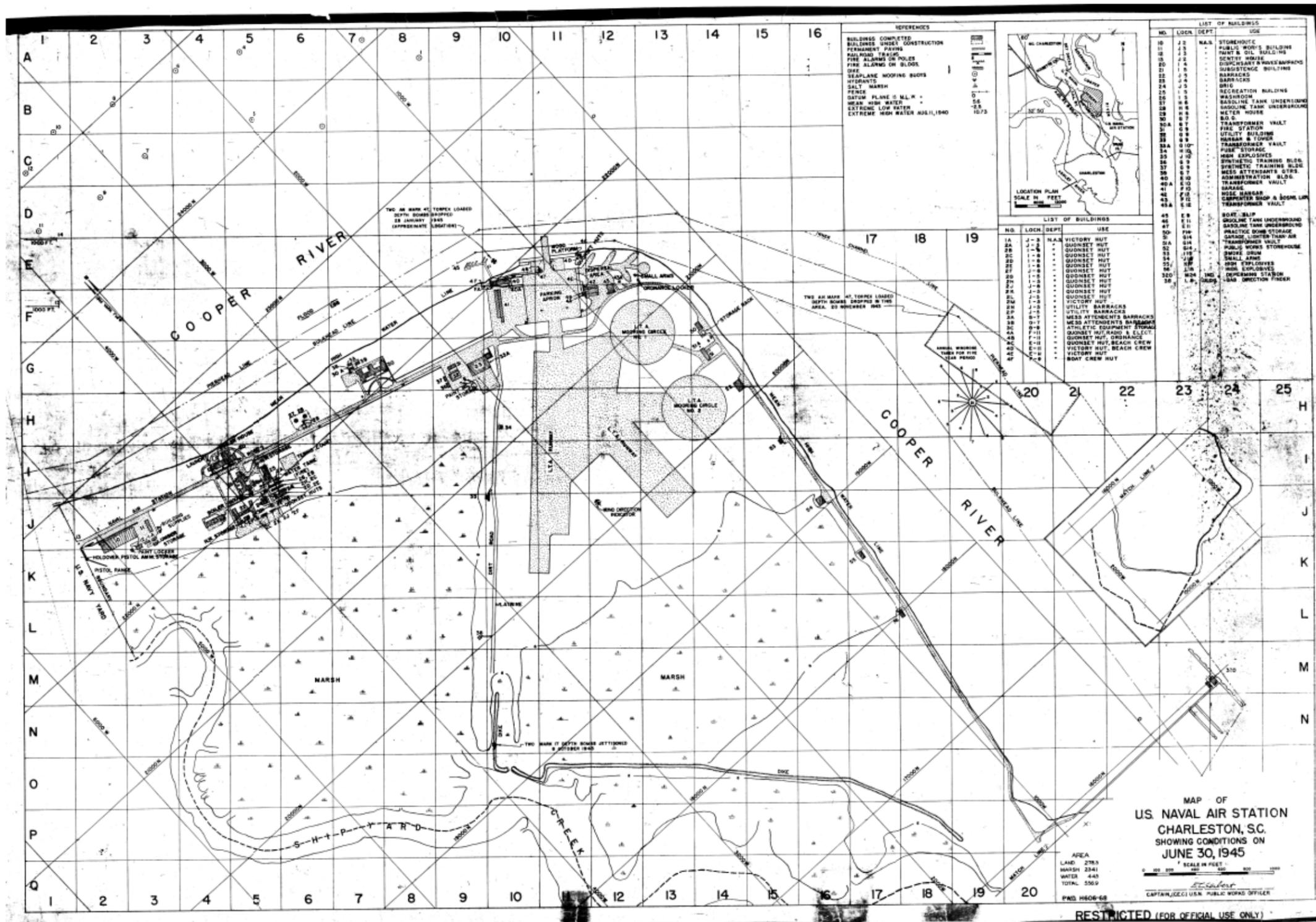


Figure 2 – AOC 503 Site Map - *Interim Measures Completion Report for AOC 503*

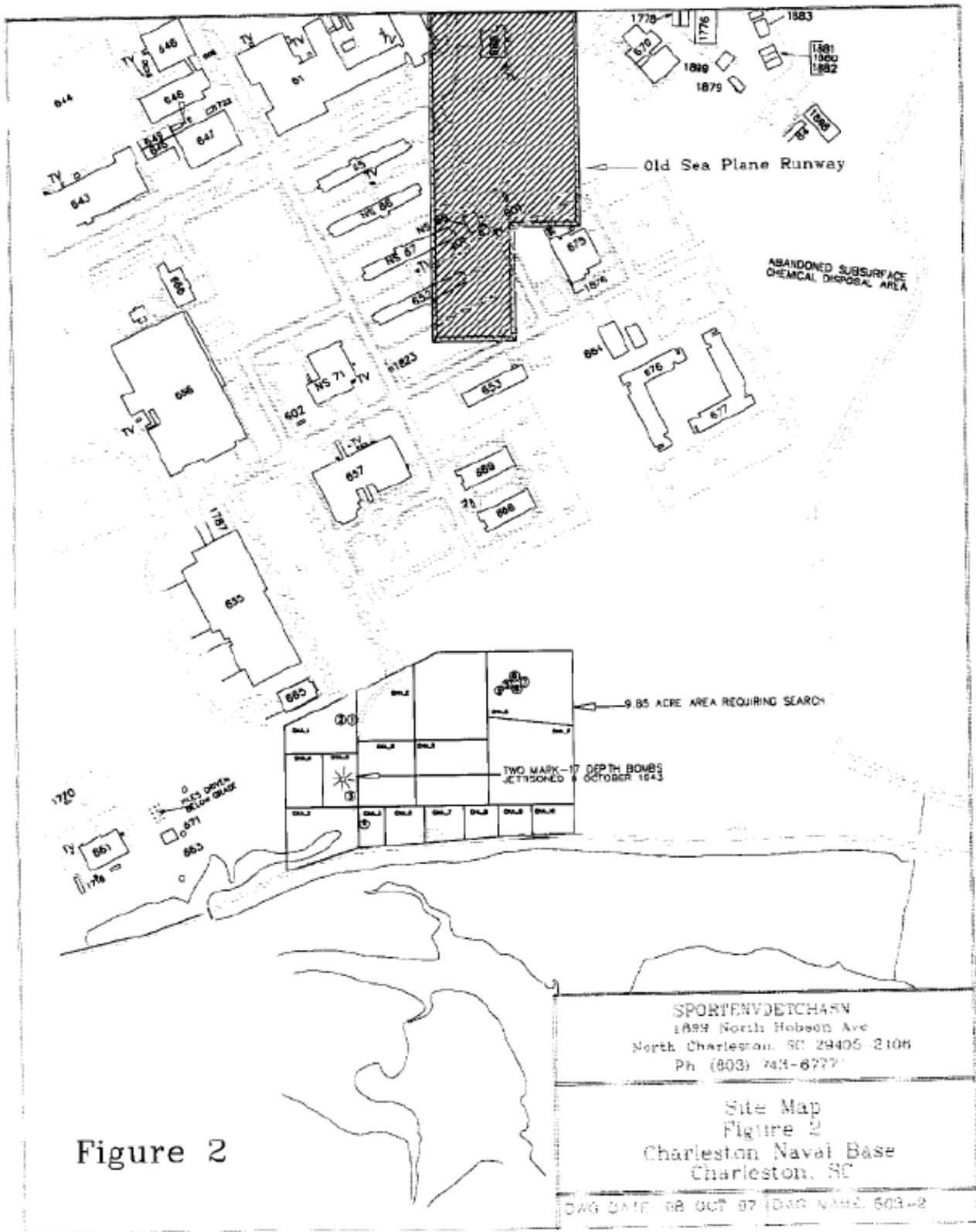
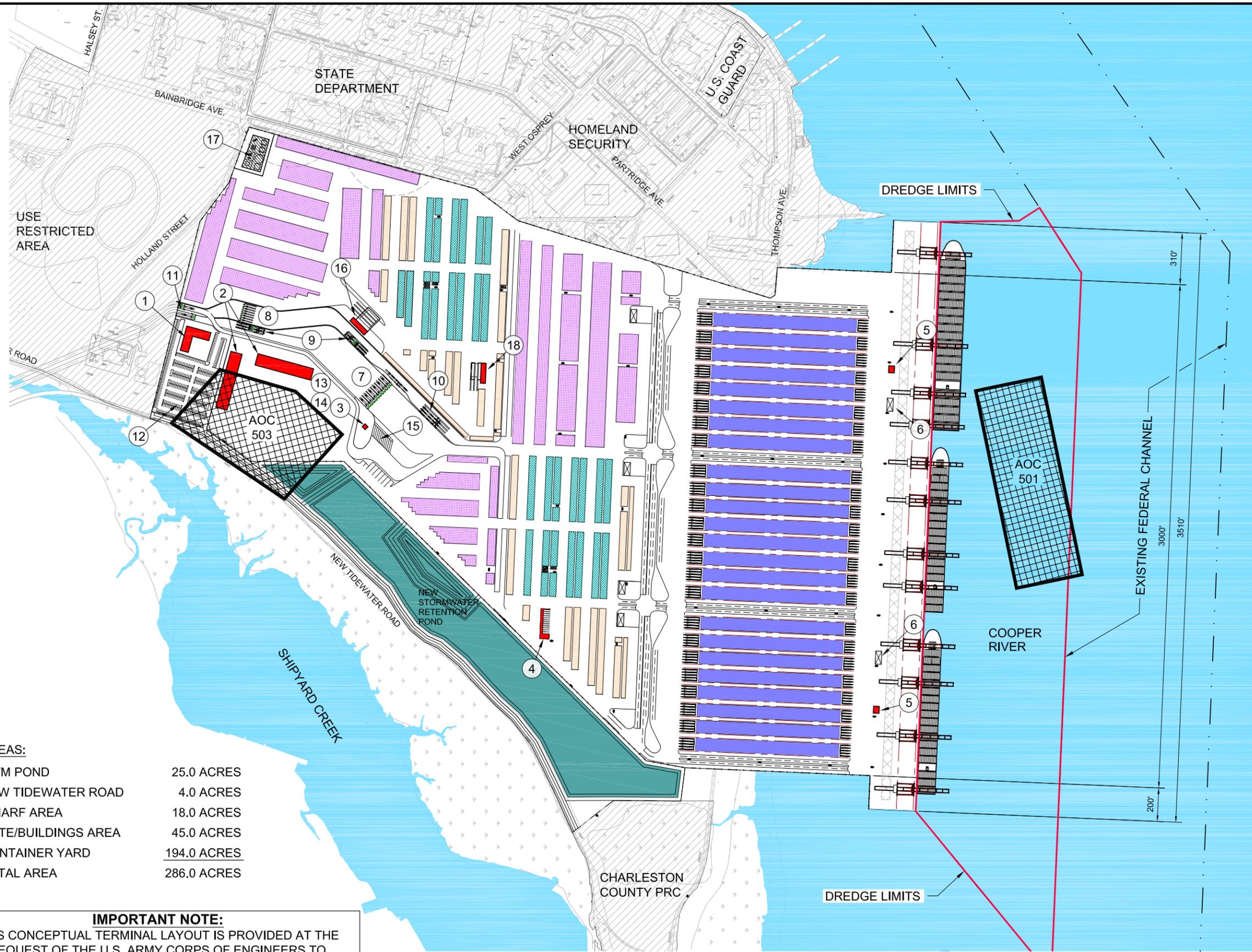


Figure 2

Figure 3 – CNBCT Conceptual Terminal Layout



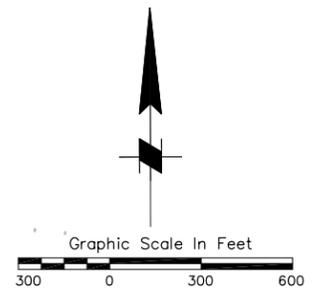
- LEGEND**
- STORM WATER MANAGEMENT POND
 - NEW BUILDINGS
 - R.M.G. STORAGE
 - EMPTY STORAGE
 - WHEELED STORAGE
 - REEFER STORAGE

- KEY NOTES:**
- ① ADMINISTRATION BUILDING
 - ② M & R BUILDING / CRANE MAINTENANCE
 - ③ DRIVER RESOLUTION BUILDING
 - ④ REEFER WASH
 - ⑤ MARINE BUILDING / LONGSHORE FACILITIES
 - ⑥ CRANE POWER
 - ⑦ RECEIVING GATE
 - ⑧ DELIVERY GATE
 - ⑨ O.C.R. PORTAL
 - ⑩ R.P.M. PORTAL
 - ⑪ SECURITY
 - ⑫ POV PARKING
 - ⑬ ILA PARKING
 - ⑭ EQUIPMENT PARKING
 - ⑮ TROUBLE PARKING
 - ⑯ ROADABILITY FACILITY
 - ⑰ MAIN ELECTRICAL SUBSTATION UTILITY HOOKUPS
 - ⑱ GEN-SET OPERATION

AREAS:

SWM POND	25.0 ACRES
NEW TIDEWATER ROAD	4.0 ACRES
WHARF AREA	18.0 ACRES
GATE/BUILDINGS AREA	45.0 ACRES
CONTAINER YARD	194.0 ACRES
TOTAL AREA	286.0 ACRES

IMPORTANT NOTE:
 THIS CONCEPTUAL TERMINAL LAYOUT IS PROVIDED AT THE REQUEST OF THE U.S. ARMY CORPS OF ENGINEERS TO ILLUSTRATE THE TYPES OF FACILITIES THAT MAY BE EXPECTED AT THE PROPOSED CONTAINER TERMINAL. THE ACTUAL TERMINAL LAYOUT WILL BE BASED ON SPECIFIC OPERATING AND CLIENT REQUIREMENTS AND MAY CHANGE OVER THE LIFE OF THE FACILITY. IT IS NOT INTENDED THAT THIS LAYOUT WILL BE USED TO LIMIT THE EFFICIENT USE OF THE FACILITY.



MOFFATT & NICHOL ENGINEERS		SOUTH CAROLINA STATE PORTS AUTHORITY	
DESIGNED BY —		CHECKED BY AJ	
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NO.		DATE	
REVISION		BY	
DATE		DWS. FILE P:\5640 SCSA-Charleston Naval Base Container Terminal\CADD\Phase1-Design\Dig-Permit\564000-0_FIG1.dwg	
SCALE		DATE	
1" = 300'		5/06	
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FIGURE 1		CONCEPTUAL TERMINAL LAYOUT SOUTH GATE ALTERNATIVE	

Attachment 1 – Example of Excavation Permit Application

October 13, 2006

Mr. Gene Knisley, Operations Director
Charleston Naval Complex Redevelopment Authority
1360 Truxton Avenue, Suite 300
North Charleston, 29405-2005

Dear Mr. Knisley:

Subject: Charleston Caretaker Site Office Excavation Permit
Charleston Naval Base Container Terminal

The South Carolina State Ports Authority is proceeding with the construction of a container terminal at the south end of the former Charleston Naval Complex. Please find attached a Charleston Caretaker Site Office Excavation Permit application for the associated work. Attachments to the application include a detailed project description; drawings of the conceptual layout and construction details; and information regarding the pile and vertical wick materials and installation equipment.

Given the history of the site and the nature of the construction, there are expected to be areas that will require additional evaluation before a permit can be granted. Therefore, we request a partial permit be issued for those areas where there are no outstanding issues or concerns. This will serve to identify the outstanding problem areas and focus efforts towards addressing any construction limitations and/or land use restrictions.

We are continuing with permitting and design of the terminal, therefore, we appreciate your efforts in facilitating the approval process. If you have any questions or require any additional information, please do not hesitate to contact me at (843) 856-7049.

Sincerely,



David N. Smith, P.E.
Senior Project Engineer

cc (via email): Joe Bryant, Philip Lawrence – SCSPA
Dudley Patrick, David Criswell, Steve Beverly – U.S. Navy
David Scaturo, Jerry Stamps, Stacy French - SCDHEC
Tommy Lavender, Joan Hartley – Nexsen Pruet
Chuck Black, Andrew Wertz – S&ME

CHARLESTON CARETAKER SITE OFFICE EXCAVATION PERMIT

Requester: Fill out top portion, Sign and date.

Location: Former Charleston Naval Complex	Contractor: Owner: SCSPA / Contractor: TBD	Date of Request: October 13, 2006
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Has the proposed work been staked out? Yes No

Facility/ Work involved (Please check below)

Excavation <input checked="" type="checkbox"/>	Drainage Ditches <input checked="" type="checkbox"/>	Railroad Tracks <input type="checkbox"/>
Pavements <input checked="" type="checkbox"/>	Other: <u>see attached</u> <input checked="" type="checkbox"/>	
Overhead Lines :	Utilities <input checked="" type="checkbox"/>	Communications <input checked="" type="checkbox"/>
Underground Lines :	Utilities <input checked="" type="checkbox"/>	Communications <input checked="" type="checkbox"/>
Method of Excavation:	Hand <input checked="" type="checkbox"/>	Power Shovel <input checked="" type="checkbox"/>
	Ditcher <input checked="" type="checkbox"/>	Auger <input checked="" type="checkbox"/>

Other: see attached

Scope Of Work: (Depth, width, length, location & sketch as applicable, road closure, service interruption, etc.)

The scope of work includes the complete construction of a marine container terminal as described in the attached documents.

Excavator(s) must establish locations and depths of utilities in work area prior to digging. Locations of utilities as shown on drawing(s), are approximate and must be field verified by hand digging, cable/pipe locators or other approved methods

Date Permit Required: November 30, 2006	Termination Date of Permit: NA
Signature of Requesting Official: 	Date: October 13, 2006 Phone Number: (843) 884-5114

Caretaker Site Office Review

<p>Points of Contact:</p> <p>CPW : Robert Sagasser (work) 529-0653 (page) 570-0390</p> <p>SCE&G: R.W. Smith (work) 745-6381</p> <p>RDA: Gene Kniesley Sewer POC: (work) 747-0010</p>	<ol style="list-style-type: none"> 1. Who is the current Land Owner/ Leasee? _____ 2. Is the Area inside the CIA? <input type="checkbox"/> Yes <input type="checkbox"/> No 3. Are any SWMU(s) impacted? If yes, list. <input type="checkbox"/> Yes <input type="checkbox"/> No (_____) 4. Are any AOC(s) impacted? If yes, list. <input type="checkbox"/> Yes <input type="checkbox"/> No (_____) 5. Has DHEC been notified? <input type="checkbox"/> Yes <input type="checkbox"/> No 6. Will soil need to be temporarily stockpiled? <input type="checkbox"/> Yes <input type="checkbox"/> No 7. What constituents will soil be tested for? _____ 8. Soil Test results above residential background? <input type="checkbox"/> Yes <input type="checkbox"/> No 9. Soil Test results above industrial background? <input type="checkbox"/> Yes <input type="checkbox"/> No 10. Area where soil is to be stockpiled? <u>(See Attached Map)</u> 11. What is the serial # of forwarding letter to RDA? _____
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Permit Approved? Yes No

CSO Authorizing Signature: _____	Date out: _____
CH2MHILL/J.A. Jones Signature: _____	
BEC Signature: _____	Serial Number: _____
CSO Officer Signature: _____	



DIG PERMIT PROJECT DESCRIPTION

1.0 PROJECT OVERVIEW AND LOCATION

The South Carolina State Ports Authority (SCSPA) proposes to construct and operate a new marine container terminal in North Charleston, South Carolina. The proposed site for building the terminal is the former Charleston Naval Complex (CNC) South site, along Shipyard Creek and the west bank of the Cooper River. The project site is bordered by Tidewater Road on the south, Bainbridge Avenue on the north, Holland Street to the west and the existing shoreline on the east (see attached Figures 1 and 2). The CNC-South site is mostly undeveloped. There are some existing buildings, roads and facilities within the site which are part of the existing Federal Law Enforcement Training Center. Current access to the site is from Bainbridge Avenue.

The neighboring properties can be seen in Figure 1. Approximately 206 acres of the existing site are uplands and approximately 15 acres are wetlands. Filling open waters (or tidelands) and constructing a 3,510-ft long wharf structure will create the remaining area.

A portion of the uplands area is an inactive dredge material disposal basin with elevations varying from about 21 ft Charleston Low Water (CLW) at the northern end of the basin to 12 ft CLW near the southern end of the basin. The southern part of the dredge spoil basin is surrounded by a dike that has crest elevations varying from about 15 ft CLW to 18 ft CLW. The dike is wooded with small to medium sized trees, and the central portion of the spoil basin is covered by thick brush. The northern portion of the site is developed and generally covered by buildings, pavement, and grass fields. The elevations across the developed portions of the site range from about 8 ft CLW to 16 ft CLW.

2.0 EXCAVATIONS AND UNDERGROUND ITEM DESCRIPTIONS

Figure 1 shows the conceptual container terminal layout and the various terminal features with the areas of concern (AOC) overlaid on the layout. Figure 2 shows the project site with the AOC's and the areas where there will be pile installations, wick drain installations, utility and storm drain system installations, and site excavations. Figure 3 shows a typical cross section of the container terminal with the items described in Figure 2 shown in the section along with some wick drain and surcharge details. Figure 4 shows a detail of the proposed wharf and fill containment structures and the associated piling and excavation. Figure 5 shows a detail of the side fill containment structure and piling.

2.1 PILE SUPPORTED STRUCTURES

Pile supported structures could be located any where on the proposed terminal footprint. Based on similar projects in the area and the preliminary designs, the deep foundations and retaining walls anticipated on this project will consist of steel pipe and HP-section piles, steel sheet piles, and square pre-stressed concrete (PSC) piles. Sheet pile retaining walls are typically constructed with "Z" sections. However, for this project, some walls may include "king" piles to



resist both axial and lateral loads. Depending on the size of the PSC pile, HP-section “stingers” may be spliced to the bottoms. Timber piles are also an option for small building applications. Specifications for various pile types are included.

Lightly loaded landside structures may be supported on 7-in. (minimum) tip diameter timber piles, while more moderately loaded structures will require 10 to 14-in. square PSC or HP10 to HP12 section steel piles. Axial compressive structural loads transmitted to the piles are typically up to 30 tons for timber piles and up to 100 tons for the concrete or steel piles. These piles are installed into the underlying Cooper Marl bearing strata with impact hammers having maximum rated energies in the range of 15 to 40 ft-kips. The marl depth varies across the site from about 40 to 80 ft. Dynamic forces at the pile head from pile driving may reach as high as 500 kips. This impact force travels down the pile and dissipates within the soil as skin friction and end bearing components are developed. Track mounted crawler cranes capable of lifting 35 to 65 tons are typically used for pile installation. Attached are specifications for a typical air (Conmaco 65), hydraulic (ICE 75), and diesel (APE/Delmag D19-42) hammers used for this application. Cranes are typically required to carry 35 to 65 ton loads. Specifications for a 50-ton Link Belt crane are also included.

The wharf and crane rails are typically supported on 20-in. to 30-in. square PSC piles, which extend from the Cooper Marl bearing strata to the structural connection at the pile top. Steel HP sections are spliced to the PSC sections and penetrate into the Cooper Marl to obtain the axial capacity. These piles are designed to support axial compressive loads of about 100 to 250 tons and hammers having rated energies in the range of about 40 to 100 ft-kips are required to install the piles and mobilize the required capacity. Steel pipe piles (30-in. diameter) may also be used to support the crane rail as well as act as “king piles” in the retaining wall which will contain the upland fill from the berthing area. Dynamic impact forces generated by pile driving may reach as high as 1700 kips near the pile top. However, these forces dissipate within the soil as the wave travels down the pile. The cranes used in these applications are typically in the range of 100 to 200 tons. Sample specifications for 150- and 200-ton Link Belt cranes are attached, as are specifications for an APE D36-32 and a Berminghammer B-5505 diesel hammer (also please refer to the Conmaco 200E5 hammer specification as a potential air hammer for this application).

It is anticipated that vibratory driver/extractors will also be used during construction. Typically, these pieces of equipment are used to install steel HP, pipe, or sheet sections, which may be incorporated into permanent structures or used for temporary templates, guides, or shoring applications. These vibratory driver/extractors are also useful in removing temporary piles, or existing piles which may hinder new construction. Specifications of several vibratory driver/extractors are included.

Pile and Equipment Specification Attachments:

Spiral Weld Steel Pipe Pile Specifications

Rolled & Welded Steel Pipe Pile Specifications



Steel HP-section Pile Specifications
AASHTO/PCI Standard Pile Products and Specifications
AZ Hot Rolled Steel Sheet Piling Specifications
Pipe / AZ (PA) Combined Wall System Specifications
Southern Pine Foundation Piling Specifications
Conmaco Air Hammer Specifications
ICE Model 75 Hydraulic Hammer Specifications
APE/Delmag D19-42 Diesel Hammer Specifications
Link-Belt 50, 150, and 200-ton Lattice Boom Crawler Crane Specifications
APE/Delmag D36-32 Diesel Hammer Specifications
Birmingham B-5505 Diesel Hammer Specifications
MKT V-20B/HP-325B Vibratory Driver/Extractor Specifications
HPSI Vibratory Hammer Specifications
ICE Model 216 and 44-30 Hydraulic Vibratory Driver/Extractor Specifications

2.2 WICK DRAIN INSTALLATION AND SITE CONSOLIDATION

In order to develop the existing site into the proposed container terminal, portions of the site will be raised with fill to final subgrade elevations of about 14 ft to 16 ft Charleston Low Water (CLW). Much of the upland portion of the site is filled marshland and existing ground surface elevations range from about 8 to 20 ft CLW. In general, the existing subsurface conditions consist of a cohesive “crust” or sand underlain by soft soil deposits. The soft soil varies in thickness from approximately 30 to 75 feet and is underlain by relatively incompressible sands, clays, and marl. In addition to the weight of the new fill, surface pressures from pavements, containers, and equipment are expected to be 500 to 850 psf. To limit post construction settlement to ≤ 6 in. of primary settlement, a surcharge program with wick drains has been proposed.

As part of the site consolidation program, prefabricated vertical drains, commonly called wick drains, are planned for the entire footprint of the container terminal, except in the area of the storm water management pond and the wharf. The following paragraphs discuss the spacing and layout of the wick drains, the drain materials, and the construction equipment and installation methods.

Wick Drain Spacing and Layout

Wick drains are planned at 5-ft center to center spacing across the site. See Figure 2 and 3 for details. Wick drains will be installed to depths of approximately 45 ft to 80 ft to fully penetrate the soft soils near the surface and terminate in stiff incompressible soil deposits.



Materials

Wick drains consist of the prefabricated drain material and an anchor. The drain material is a stiff plastic core wrapped with a filter fabric, and is designed to allow water infiltration to the drain and then flow along the drain. A photograph of a typical wick drain is attached. The anchor is generally a thin steel plate or a small steel bar.

Construction Equipment and Methods

Wick drains are installed by specialized installation rigs. A schematic of a typical wick drain rig is attached. Installation rigs are typically crawler-mounted or crane mounted and photographs of each type are attached. Considering the depths of the wick drains, crawler-mounted rigs will likely be used. Ground pressures of 5 to 10 psi are typical for the tracks on a wick drain rig. Wick drains are then threaded into a steel mandrel and installed by pressing the mandrel into the ground. The steel mandrel is rhombic-shaped and typically has a cross-sectional area of about 10 square inches or less. Installation proceeds rapidly with the mandrel being inserted into the ground at velocities of up to about 2½ feet per second. Anchors are secured to the bottom of a wick prior to installation to help prevent soil from entering the mandrel and to provide an anchor to hold the wick drain in place while the mandrel is withdrawn. Wick drain rigs typically can produce a downward force of up to 20 tons to press the mandrel into the ground. When the existing surface soils are relatively dense, loosening by pre-drilling may be necessary. Alternatively, vibratory attachments are available to aid in penetration of the mandrel. The use of pre-drilling and vibration is generally not expected to be necessary for this project.

Surcharge and Site Settlement

The surcharge will be required over the majority of the proposed terminal area, except in the area of the storm water management pond and the wharf. The surcharge heights are proposed to range from 20 ft CLW to 30 ft CLW. The anticipated settlement of the existing ground in the project site ranges from 1 ft to 10 ft.

Wick drain and Equipment Specification Attachments:

Schematic of Wick Drain Installation

Photograph of Typical Wick Drain

Photograph of Excavator-Mounted Wick Drain Rig

Photograph of Crane-Mounted Wick Drain Rig

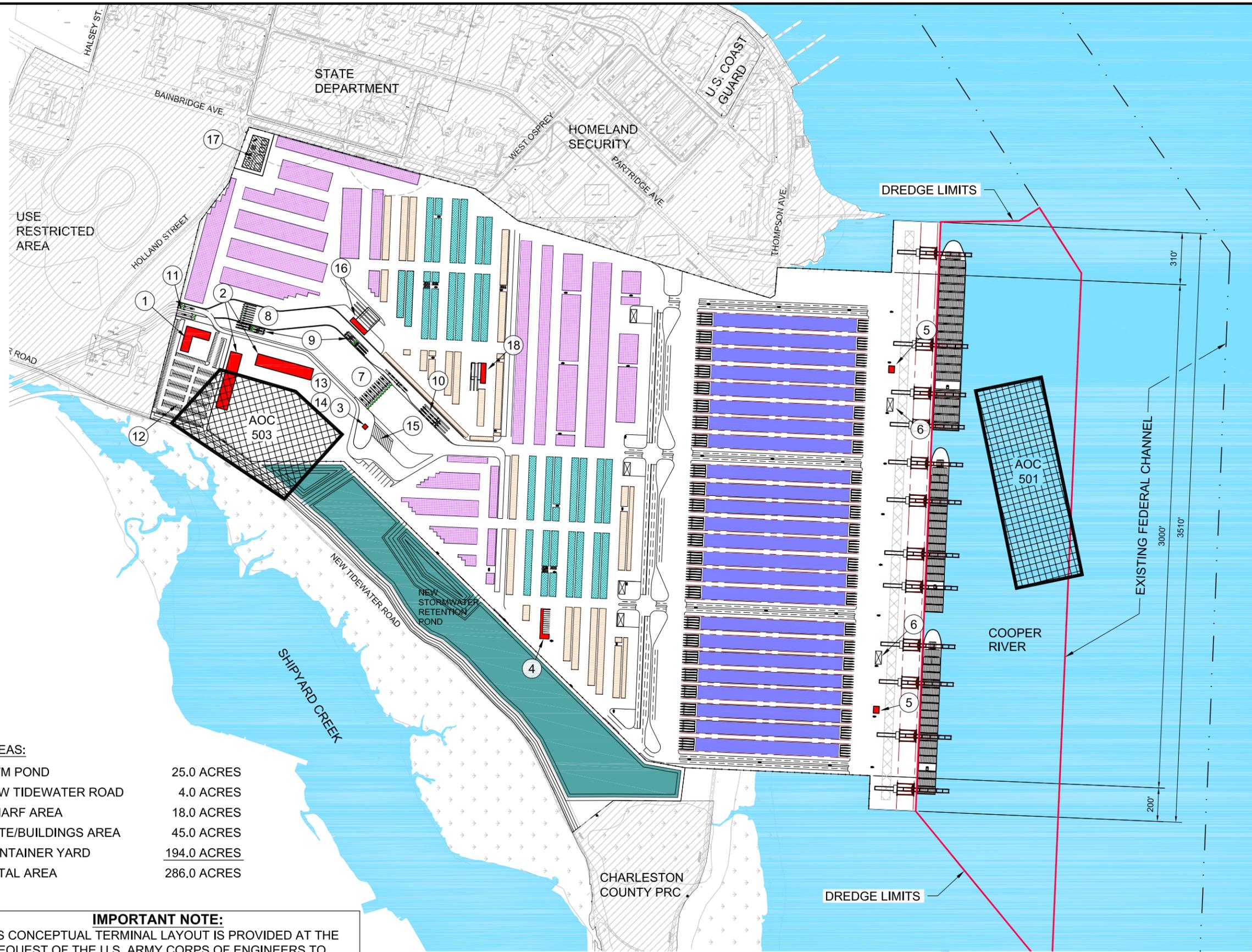
2.3 UNDERGROUND SITE UTILITIES AND STORM DRAIN SYSTEM

After the project site soil consolidation program is complete, the construction of the proposed terminal infrastructure will begin. (See Figures 1, 2 and 3) Underground utilities for the terminal shall include electrical conduits and distribution systems, data and communication systems and



conduits, water lines, gas lines and sanitary sewer lines. These types of utilities would be installed approximately 3 ft to 10 ft below finished grades through out the terminal. These utilities would be installed by conventional methods such as a trenching with a back hoe or trenching machine.

The storm water drainage system is proposed to consist of 24" to 108" diameter reinforced concrete pipe and manholes. The maximum trench depth for the storm drain pipe is anticipated to be approximately -3 ft CLW. The storm drain pipes will outfall into the storm water management detention pond located on the project site. The maximum depth anticipated for the detention pond is -5 CLW.



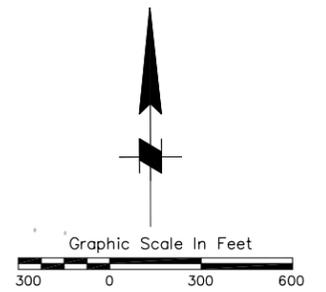
- LEGEND**
- STORM WATER MANAGEMENT POND
 - NEW BUILDINGS
 - R.M.G. STORAGE
 - EMPTY STORAGE
 - WHEELED STORAGE
 - REEFER STORAGE

- KEY NOTES:**
- ① ADMINISTRATION BUILDING
 - ② M & R BUILDING / CRANE MAINTENANCE
 - ③ DRIVER RESOLUTION BUILDING
 - ④ REEFER WASH
 - ⑤ MARINE BUILDING / LONGSHORE FACILITIES
 - ⑥ CRANE POWER
 - ⑦ RECEIVING GATE
 - ⑧ DELIVERY GATE
 - ⑨ O.C.R. PORTAL
 - ⑩ R.P.M. PORTAL
 - ⑪ SECURITY
 - ⑫ POV PARKING
 - ⑬ ILA PARKING
 - ⑭ EQUIPMENT PARKING
 - ⑮ TROUBLE PARKING
 - ⑯ ROADABILITY FACILITY
 - ⑰ MAIN ELECTRICAL SUBSTATION UTILITY HOOKUPS
 - ⑱ GEN-SET OPERATION

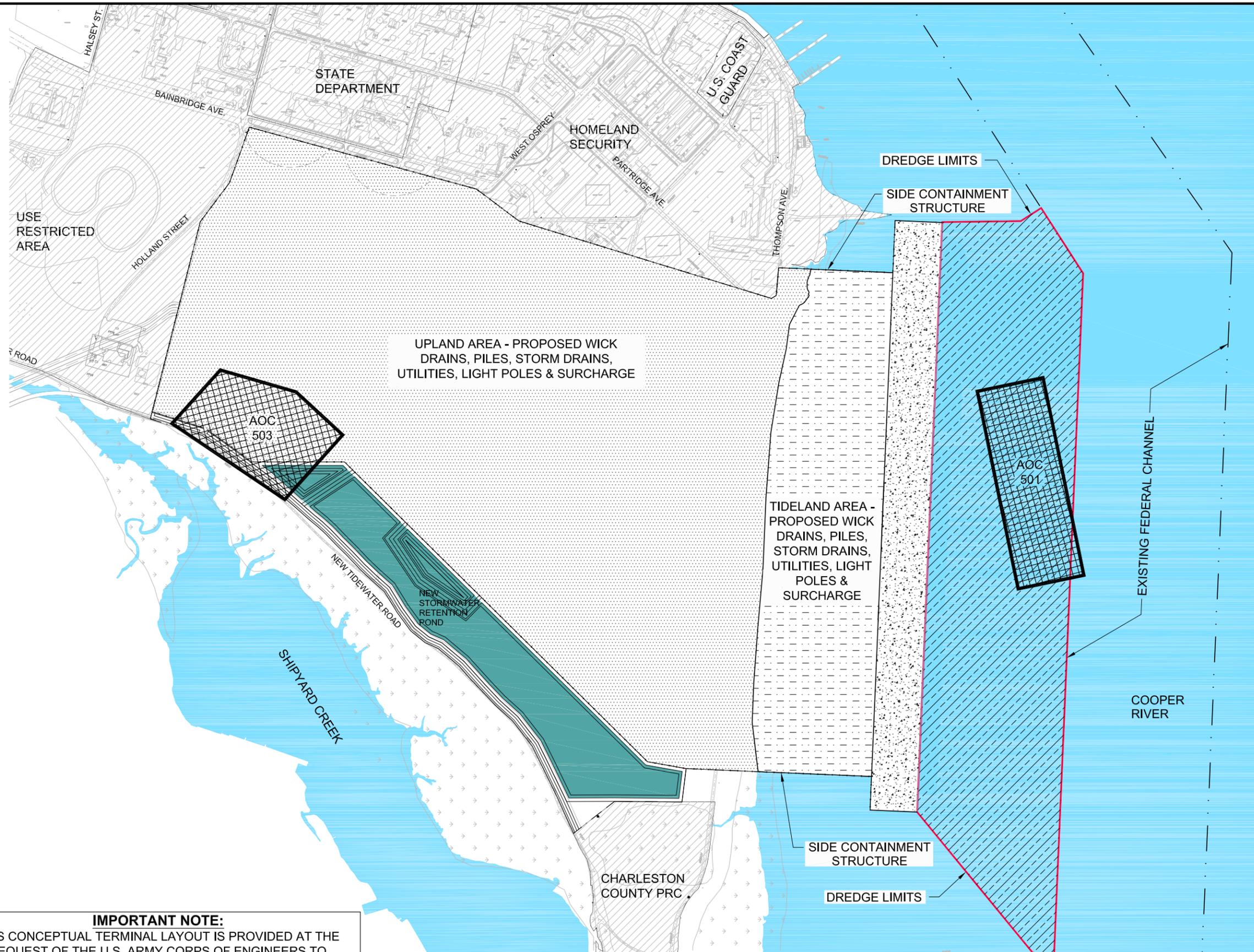
AREAS:

SWM POND	25.0 ACRES
NEW TIDEWATER ROAD	4.0 ACRES
WHARF AREA	18.0 ACRES
GATE/BUILDINGS AREA	45.0 ACRES
CONTAINER YARD	194.0 ACRES
TOTAL AREA	286.0 ACRES

IMPORTANT NOTE:
 THIS CONCEPTUAL TERMINAL LAYOUT IS PROVIDED AT THE REQUEST OF THE U.S. ARMY CORPS OF ENGINEERS TO ILLUSTRATE THE TYPES OF FACILITIES THAT MAY BE EXPECTED AT THE PROPOSED CONTAINER TERMINAL. THE ACTUAL TERMINAL LAYOUT WILL BE BASED ON SPECIFIC OPERATING AND CLIENT REQUIREMENTS AND MAY CHANGE OVER THE LIFE OF THE FACILITY. IT IS NOT INTENDED THAT THIS LAYOUT WILL BE USED TO LIMIT THE EFFICIENT USE OF THE FACILITY.

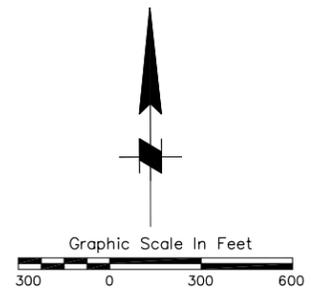


	 MOFFATT & NICHOL ENGINEERS		SOUTH CAROLINA STATE PORTS AUTHORITY CHARLESTON NAVAL BASE CONTAINER TERMINAL CONCEPTUAL TERMINAL LAYOUT SOUTH GATE ALTERNATIVE
	DESIGNED BY: — CHECKED BY: AJ DRAWN BY: — IN CHARGE: LWN		SCALE: 1" = 300' DATE: 5/06 JOB NO.: 5640 SHEET: — FIGURE 1
NO.	REVISION	BY	DATE
DWG. FILE: P:\5640\SCSPA-Charleston Naval Base Container Terminal\CADD\Phase1-Design\Dig-Permit\564000-0_FIG1.dwg			



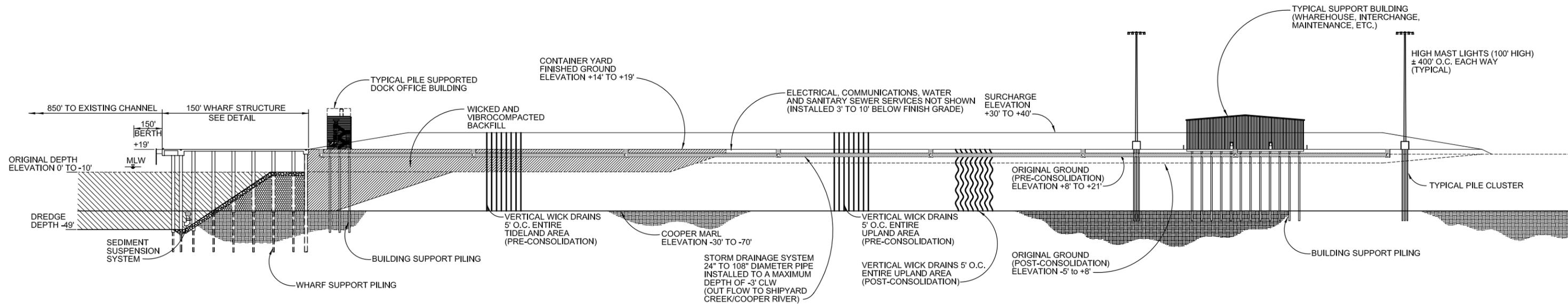
- LEGEND**
- STORM WATER MANAGEMENT POND TO DEPTH OF -5' CLW
 - WICK DRAINS & PILES - UPLAND AREA
 - WICK DRAINS & PILES - TIDELAND AREA
 - PILES - WHARF STRUCTURE
 - BERTHING AREA & TURNING BASIN DREDGING TO DEPTH -49' CLW

IMPORTANT NOTE:
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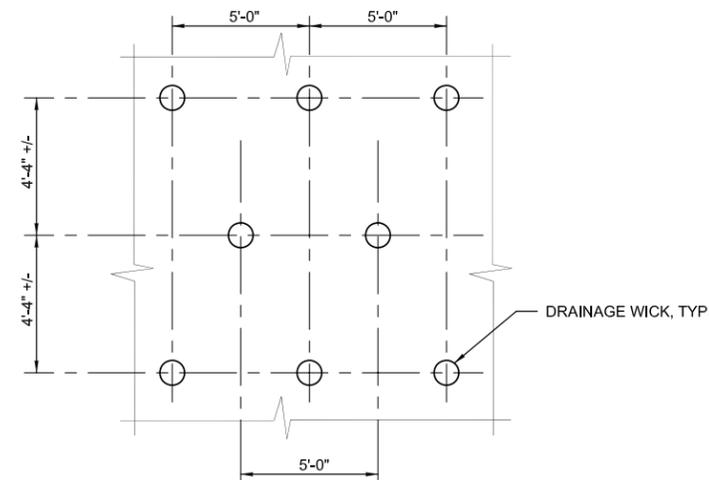
MOFFATT & NICHOL ENGINEERS				SOUTH CAROLINA STATE PORTS AUTHORITY CHARLESTON NAVAL BASE CONTAINER TERMINAL CONCEPTUAL TERMINAL LAYOUT SOUTH GATE ALTERNATIVE		SCALE 1" = 300'	DATE 5/06
				DESIGNED BY: — CHECKED BY: AJ DRAWN BY: — IN CHARGE: LWN		JOB NO. 5640	
NO.	REVISION	BY	DATE	DWG. FILE P:\5640 SCSA-Charleston Naval Base Container Terminal\CADD\Phase1-Design\Dig-Permit\564000-0_FIG2.dwg			

FIGURE 2



TYPICAL SECTION

NOT TO SCALE
(ELEVATIONS BASED ON CLW)



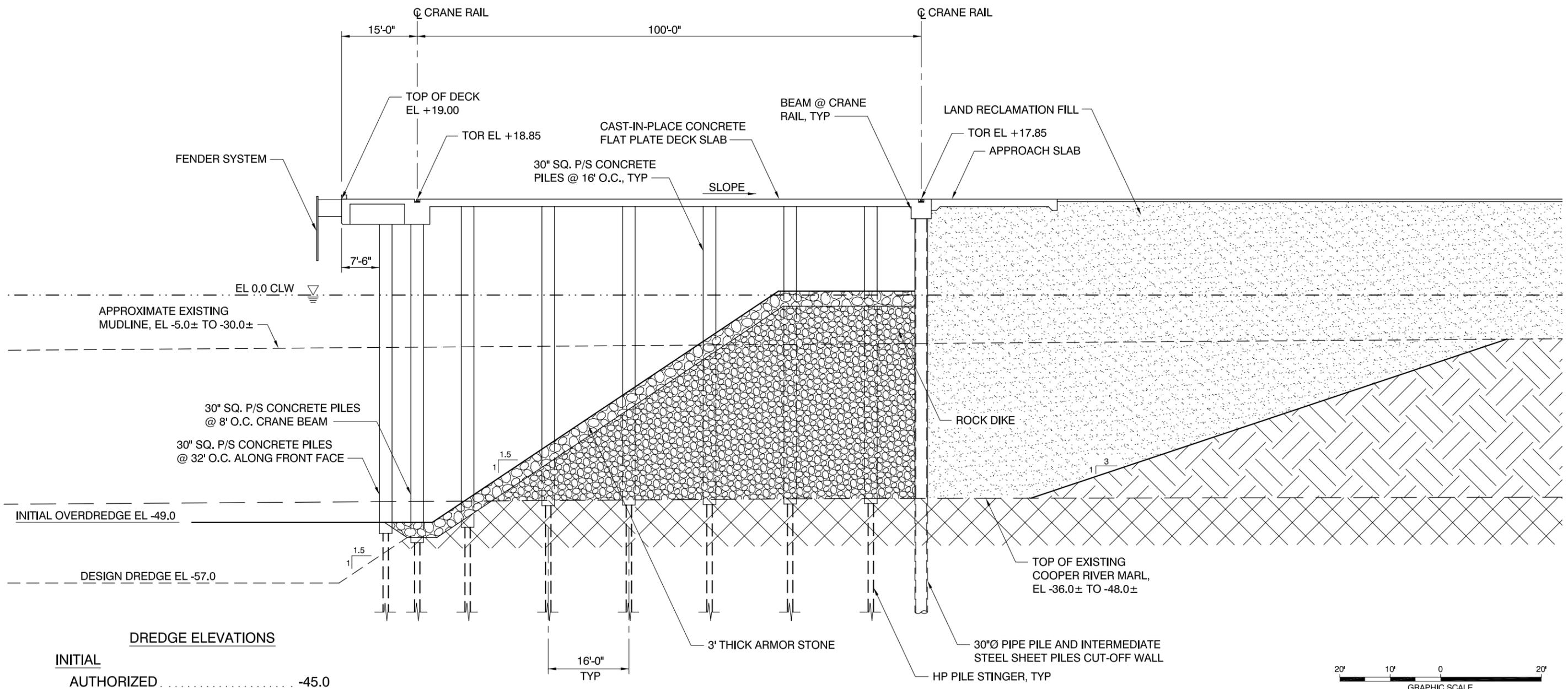
WICK DRAIN SPACING DETAIL

NOT TO SCALE

IMPORTANT NOTE:

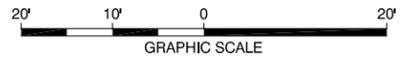
THIS CONCEPTUAL TERMINAL LAYOUT IS PROVIDED AT THE REQUEST OF THE U.S. ARMY CORPS OF ENGINEERS TO ILLUSTRATE THE TYPES OF FACILITIES THAT MAY BE EXPECTED AT THE PROPOSED CONTAINER TERMINAL. THE ACTUAL TERMINAL LAYOUT WILL BE BASED ON SPECIFIC OPERATING AND CLIENT REQUIREMENTS AND MAY CHANGE OVER THE LIFE OF THE FACILITY. IT IS NOT INTENDED THAT THIS LAYOUT WILL BE USED TO LIMIT THE EFFICIENT USE OF THE FACILITY.

						SOUTH CAROLINA STATE PORTS AUTHORITY CHARLESTON NAVAL BASE CONTAINER TERMINAL CONCEPTUAL TERMINAL LAYOUT TYPICAL CROSS SECTION		SCALE 1" = 300'	DATE 5/06
				DESIGNED BY - DRAWN BY -	CHECKED BY AJ IN CHARGE LWN		JOB NO. 5640		
				DWG. FILE P:\5640 SCSA-Charleston Naval Base Container Terminal\CADD\Phase1-Design\Dig-Permit\564000-0_FIG3.dwg		SHEET -		FIGURE 3	
NO.	REVISION	BY	DATE						



DREDGE ELEVATIONS

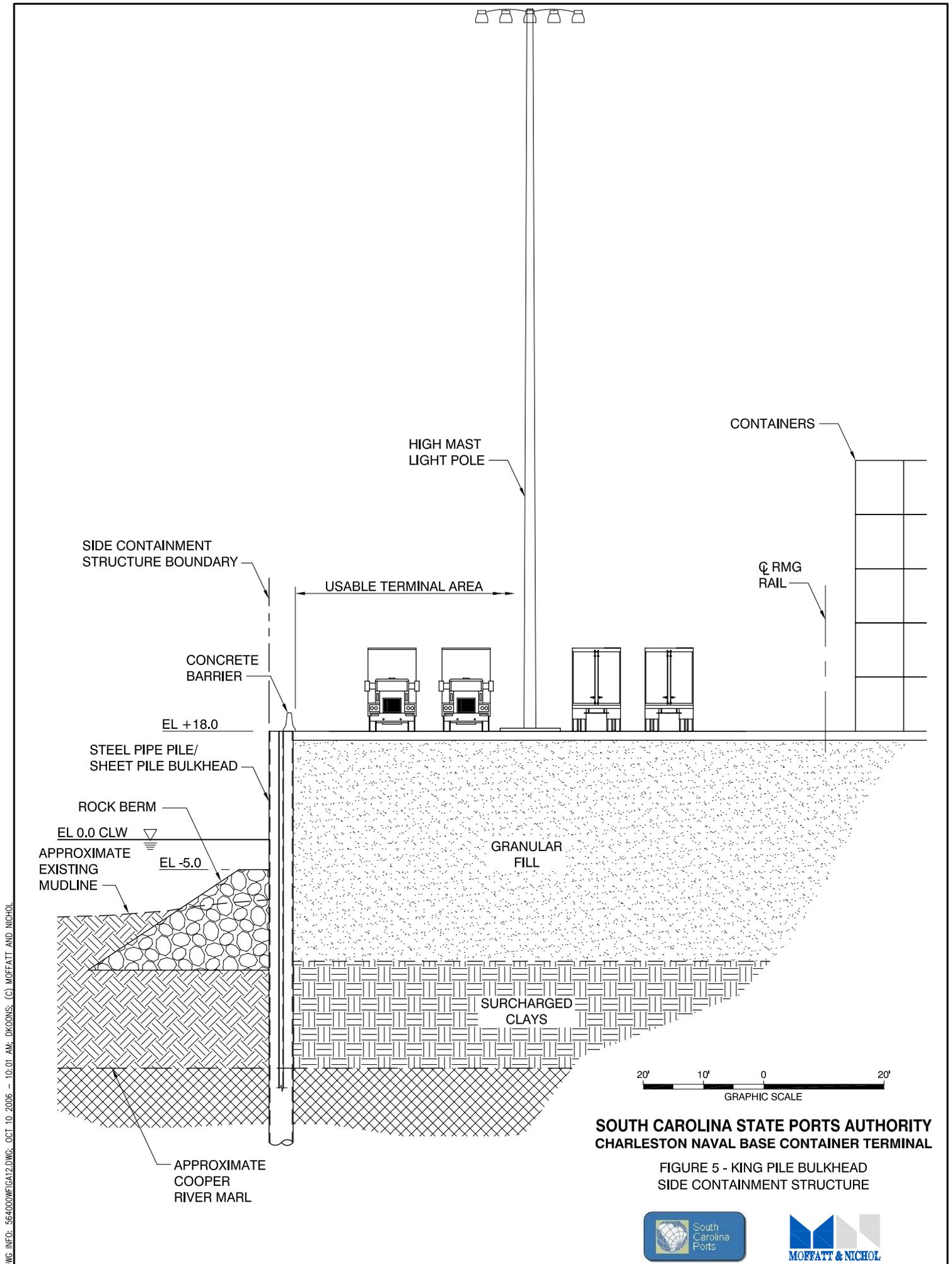
INITIAL	
AUTHORIZED	-45.0
ADVANCED MAINTENANCE	-47.0
OVERDREDGE	-49.0
MAXIMUM	
AUTHORIZED	-52.0
ADVANCED MAINTENANCE	-55.0
OVERDREDGE	-57.0
DESIGN	-57.0



SOUTH CAROLINA STATE PORTS AUTHORITY
CHARLESTON NAVAL BASE CONTAINER TERMINAL
 FIGURE 4 - WHARF DETAIL
 OPEN-TYPE MARGINAL WHARF WITH PILE WALL AND DIKE SECTION



DWG. NO: 56400-D-FIG4.DWG. OCT. 11, 2006 - 03:58 PM. BKDONS. (C) MOFFATT AND NICHOL



DWG INFO: 564000MFGA12.DWG; OCT 10, 2006 -- 10:01 AM; DKOONS; (C) MOFFATT AND NICHOL

SOUTH CAROLINA STATE PORTS AUTHORITY
CHARLESTON NAVAL BASE CONTAINER TERMINAL
 FIGURE 5 - KING PILE BULKHEAD
 SIDE CONTAINMENT STRUCTURE



Attachment 2 – Example of SCSPA Annual LUC Inspection Report for AOC 503

**Annual Land Use Control (LUC) Compliance Certification
Charleston Naval Complex
EPA I.D. No SC0170022560**

Property Owner: **SC STATE PORTS AUTHORITY**

Property Conveyed Since Last Inspection? _____

Check months completed:

(Explain in Comments block)

___ April ___ May ___ June (for semi-annual inspections) **AND** ___ October ___ November ___ December (write in year) _____

Site (SWMU site numbers through 499; AOC site numbers 500 and higher)	Restricted Media		Use Restrictions Communicated in Deed	Any LUC Violations Were Reported Within 3 Business Days of Discovery	Explanation of Actions Taken or to be Taken Provided Within 10 Days of Discovery	Groundwater Not Being Used	Monitoring Wells Not Disturbed	Land Not Being Used for Residential Use	Land Not Being Used for Recreational Use	Land Not Being Used for Agricultural Use	Soils Not Disturbed or Disturbed with Authorization via LUC Area Construction Permit	Engineering Controls Maintained	Landfill Cover Not Disturbed or Disturbed with Authorization via LUC Area Construction Permit	Zone	Notes (Restrictions) W = groundwater use restrictions; U = use restrictions; E = engineering controls; D = digging/excavation restrictions
	Groundwater	Soil													
			"Y" if Yes; "N" if No; "NA" if not applicable			"Y" indicates LUC has been maintained; "N" if LUC has not been maintained (explain in Comments section, pg 2). Shading indicates particular LUC is not applicable.									
5/18/605/621	•	•												E	W, U, E, D
617	•	•												E	W, U, E, D
6/7/635	•													G	W
8/636	•	•	/	/	/	/	/	/	/	/	/	/	/	G	W, U, E, D Semi-annual
633	•	•												G	W, U
637/706	•	•	/	/	/	/	/	/	/	/	/	/	/	G	W, U, E, D Semi-annual
Fac 123	•	•												G	W, U, D
9	•	•	/	/	/	/	/	/	/	/	/	/	/	G & H	W, U, E, D Semi-annual
724	•	•	/	/	/	/	/	/	/	/	/	/	/	G & H	W, U, E, D Semi-annual
503		•												H	U, D

Diagonally split cells indicate a requirement for semi-annual inspections: April-June and October-December.

**Annual Land Use Control (LUC) Compliance Certification
Charleston Naval Complex
EPA I.D. No SC0170022560**

Property Owner: SC STATE PORTS AUTHORITY

Check Type of Inspection: ___ Drive-through ___ Walk-through

I, the undersigned, hereby certify that I am an authorized representative of **SC STATE PORTS AUTHORITY** and that the above described land use controls have been complied with for the calendar year _____. Any known deficiencies and completed or planned actions to address such deficiencies are described in the attached explanation of deficiencies. I have also attached a map to this certification showing the sites and the LUCs in place at each site.

Signature _____ Relationship to Property Owner _____ Date _____

Printed Name _____ Phone Number (_____) _____

Address _____ City _____ State _____ Zip Code _____

Comments: (attach additional sheets as needed)

A map is attached showing the LUCs in place at each site.

Mail original completed certification to SCDHEC (WM), with copies to SC DHEC (SAR), US EPA, and the US Navy at the below addresses:

<p><u>SCDHEC (Waste Management Division)</u> South Carolina Department of Health and Environmental Control Bureau of Land and Waste Management Attn: Director, Waste Management Division 2600 Bull Street Columbia, SC 29201</p>	<p><u>SCDHEC (Site Assessment & Remediation Division)</u> South Carolina Department of Health and Environmental Control Bureau of Land and Waste Management Attn: Director, Site Assessment & Remediation Division 2600 Bull Street Columbia, SC 29201</p>
<p><u>US EPA</u> US Environmental Protection Agency Region 4 Federal Facilities Branch Attn: Charleston Naval Complex RPM 61 Forsyth Street SW Atlanta, GA 30303-8909</p>	<p><u>US Navy</u> BRAC Program Management Office Southeast Attn: Charleston Naval Complex RPM 4130 Faber Place Dr Ste 202 North Charleston, SC 29405</p>