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MEMORANDUM

TO: Bart Chadwick, Victoria Kirtay
CC:
FROM: Rob Webb, Rich May
DATE: November 2, 2012
SUBJECT: Reactive Amendment Treatability Study – AquaGate Placement

OVERVIEW

Between October 16th and October 19th 2012, SPAWAR Systems Center Pacific conducted a study for the placement of 119 super sacks of activated carbon amendment (AquaGate™) over an approximate 1/2 acre area. The study was conducted at Pier 7 located on the Puget Sound Naval Shipyard in Bremerton, Washington. The purpose of the study was to see if a relatively uniform, approximate 2 inch thick layer of amendment could be placed on the waterway bottom both under Pier 7 and within the berthing area of the pier at an active naval facility. Placement was performed by Envirocon, Inc. and their subcontractor, Quigg Brothers, Inc.

EQUIPMENT

A telebelt truck with a 130 foot reach, mounted on board a 120 foot by 40 foot spud barge was used for placement of the amendment media. Barge was held in place by spuds during placement. The telebelt was equipped with a custom fabricated scatter plate at the belt discharge which allowed the media to be placed across an approximate area of eight foot wide by 2 foot deep. Tracking of amendment placement was accomplished through the use of a DGPS mounted to the discharge end of the telebelt's boom during open water placement and by tracking belt advance rate in underdock areas. Positioning information was then transmitted to a FTP site where it was processed for any gaps in coverage. Supporting the telebelt, a small 16-ton excavator, with bucket removed and equipped with a lifting shackle, was used to supply super sacks, weighing approximately 2,200 lbs. each, to the telebelt's feed hopper. Supporting the operation an auxiliary tug maneuvered the barge between placement positions.

OPEN WATER PLACEMENT

Open water placement of amendment was accomplished by extending the telebelt boom approximately 60' off the end of the barge and spreading the amendment in a zigzag arc pattern across the 65' width of the berth area. (See Figure 1) Boom radius was decreased by approximately 2 feet at the end of each swing. Application rate was approximately 2 super sacks for every three swings across the berth area. Amendment placement was done in two lifts over the area. Boom extended 60 feet from the end of the barge and worked back to the barge constituting one lift. Advantage of placement in several lifts instead of in a single lift is to decrease the potential for windrows between adjoining swings. Once the telebelt boom radius was decreased during the placement pattern, such that the telebelt could no longer efficiently reach lateral extents of the placement area, the spud barge was relocated to the next placement position and the process repeated. In the berth area a total of 77 super sacks were placed.

UNDERDOCK PLACEMENT

Under dock placement occurred during low tides, when water's surface was between 0' and -2.5' MLLW, in order to have sufficient clearance under the dock. Since GPS positioning is not effective under the dock, placement was done with operator using fender piles as a visual guide for placement. From bollard 22 to the South end of the dock fender piles were at approximate 8 foot spacing. The spacing allowed for the operator to extend the telebelt boom over the side of the barge and between the fender piles placing amendment in a zigzag pattern similar to that used during open water placement. Placement rate was calculated using the area between fender piles to the centerline of Pier 7. While working under Pier 7 tide levels were only adequate during a short time window to allow for placement to the midline of the dock as shown on the plans without submerging the end of the telebelt and DGPS. Depending upon tide level, the distance from pier centerline to the extent of placement varied between zero and 15 feet (i.e. 15 feet short of pier centerline). For projects of a larger scale, the Lessons Learned & Progress Forward section of this memo addresses possible remedies to this issue under Spud Barge Freeboard. In the underdock area from bollard 22 to the South end of the dock, 26 super sacks of amendment were placed.

Between bollards 20 and 22 fender pile spacing was very limited, averaging approximately three feet. Prior to working in this area, the scatter plate required modification in the form of trimming the sides of the plate to fit between the fender piles. Placement of amendment was accomplished by extending the telebelt straight off the side of the spud barge and through the fender piles until the boom tip was close to the water's surface. Telebelt was extended for several passes but not in a zigzag fashion as used South of bollard 22 or in the berth area. Close proximity of the fender piles required that the spud barge be repositioned each time before proceeding between the next set of fender piles. Two super sacks of amendment were placed during application across each swath between piles for a total of 18 sacks.

LESSONS LEARNED & PROGRESS FORWARD

Recognizing that the scope of this study was to place amendment over an approximate 1/2 acre area during three shifts the following recommendations may not be cost-effective for small areas, but should be considered if the scale of the placement is increased.

Positioning Instrumentation: Graphic real-time positioning data should be available to the telebelt operator, similar to that used for environmental mechanical dredging, where the operator can visually see, on an LCD screen or similar, the placement pattern and current location of telebelt discharge. While the operator did an adequate job by visual reference working close to the dock on a limited project, on a larger project, positioning software would be expected to increase accuracy, production, and track placement where visual references are not available.

Inconsistent Feed Rate: There was a distinct difference in the consistency of the amendment within super sacks which was dependent upon when it was bagged during the batching process. Amendment produced at the beginning of the batch (which could be determined by the production numbers on the sack) was tackier in consistency (similar to that of caramel corn) than that from the middle and end of the batch. As a result, amendment in sacks packaged during the beginning of the batching process would stay clumped within the sack even with a large portion of the bottom of the sack removed. Workers feeding the hopper had to be wary not to remove too much of the bottom of the sack or the media would fall onto the hopper as a clump, clogging the hopper and halting placement. Amendment produced during the middle and end of the batch were not nearly as cohesive and flowed much easier from the super sack into the hopper. Quantitatively, cycle times for feeding super sacks into the hopper varied from 5 min. or longer per sack for material at the beginning the beginning of the batch to 2 to 2.5 min. per sack for material from the end of the batch. A possible remedy for dealing with amendment produced during the beginning of the batch would be the addition of a grizzly to the feed hopper which would prevent large clumps of media from clogging the hopper.

Spud Barge Freeboard: Efficiency of under dock placement on a larger project can be greatly improved by ballasting the spud barge, decreasing freeboard, thus lowering the height of telebelt above water's surface. During under dock placement at Pier 7, the telebelt had to be angled down towards the water's surface in order to reach under the dock. As a result of this, as the telebelt reached farther out from its center of rotation, it would lose height above water. A barge with too much freeboard not only decreased the working time that the telebelt could be used under the dock but also a resulted in a decrease in the spread width of media between the time it left the scatter plate and entered the water. While the limited time allotted for the study project did not warrant the ballasting of the spud barge, on a larger project this practice would be beneficial.

Scatter Plate: Upon completion of amendment, Navy divers swam the project area to survey the condition of the as-placed media. Particularly during under dock placement, media appeared to be uniform at all sides the piling. Particular attention was paid to placement at the backside of the piles, opposite of the barge. One concern was that there would be "shadowing" across the backside of the piling where amendment was not placed. Based upon diver observations it

appears that spreading of amendment off the scatter plate was sufficient to get good coverage behind the piling.