Plan of Remediation for Accumulated Sediment Removal At Lake Hayward Second Lagoon Boat Ramp

Prepared For:
Lake Quality Improvement Committee (LQIC)
Property Owners' Association of Lake Hayward (POALH)
East Haddam, CT

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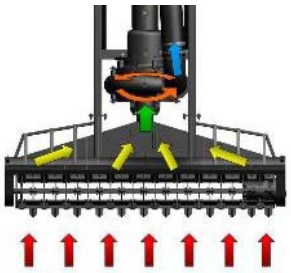
June 19, 2014

Overview

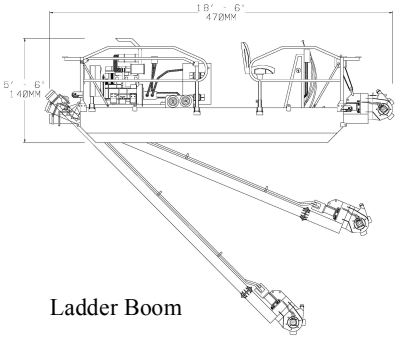
The objective of this project is the removal of accumulated sediment from the Second Lagoon Beach area (the "lagoon"). Natural eutrophication and sedimentation deposited from surface runoff has accumulated in this area. A sediment island is forming within the lagoon and access from the boat ramp out to the open lake is inhibited. Remediation is required to restore normal depth and function of this valuable water resource. This proposal considers the removal of approximately 239 cubic yards of insitu sediment to open a 20 foot wide access lane to enhance boat access from the lagoon.

The work will be accomplished by using a small-scale cutterhead floating hydraulic dredge (the "dredge"). The dredge is equipped with a horizontal auger type cutterhead and hydraulic powered pump that will extract the accumulated sediment from the lagoon bottom and pump it to a nearby dewatering/stockpiling area. The spoils will be dewatered using a series of geotextile fabric tubes (the "geotubes"), which retain spoils material while filtering the water before it is returned to the lagoon in a clarified state. The proposed project intends to dispose of the dewatered spoils off site.

Equipment and Process Design


Dredge Cutterhead

The dredge is equipped with an 85-hp diesel engine, which hydraulically powers the cutterhead, a 6-inch submersible pump and an onboard windlass that controls the dredge's movement through the water along a transit cable. The pump is mounted immediately behind the cutterhead, which is itself mounted at the end of a 13 foot long boom or "swinging ladder", which is lowered to the desired depth by the dredge operator. In order to minimize turbidity when extracting sediment, the cutterhead has been designed with a cowling that allows the hydraulic pump to capture substantially all of the material dislodged by the cutterhead's blades. The sediment material is fed into the cutterhead by the auger where it is vacuumed up by the pump and conveyed through a six-inch discharge hose suspended along the water's surface by floats. Once the discharge line reaches a central shoreline location, it connects to a rigid pipe running to the dewatering stockpiling area. A 6-inch boost pump and additional pipe can extend the range of the dewatering stockpiling area for up to ¼-mile.


Ladder Boom

A steel transit cable strung across the lagoon between two shore anchors controls the dredge's movement. It is threaded through the dredge's windlass and propels the dredge along the cable. The operator will move the dredge slowly from shore to shore extracting all of the sediment in a six-foot wide swath up to 18" deep on each pass. When the desired depth is achieved, the cable is then moved approximately 6 feet parallel to the previous swath to cover the lagoon in a series of parallel swaths. The dredge is equipped with a sonar-mapping device and a GPS guided parallel swathing navigation system to assist the operator in determining which areas of the lagoon are dredged.

The sediment and water forms a slurry, (approx. 15% solids / 85% water), as it is pulled through the pump's impeller and discharged to the upland dewatering system. The discharge is piped into a series of geotubes where the solids are decanted and dewatered as the leachate passes through the geotube's fabric wall. The geotubes will progressively contain more spoils and less water until there is insufficient volume to support pumping capacity. As the primary in line geotube becomes filled to capacity the discharge line is diverted to bring a new geotube on line.


Geotube Dewatering

Leachate Discharge from Dewatering Containment

The dewatering and sediment storage area is prepared by removing all ground obstructions that could puncture the geotextile fabric. The area is graded to a level grade 0º across the width and not more than 0.5% slope along the length of each geotube to provide directional flow. The geotubes are installed on top of an impervious geotechnical fabric liner to improve stability of the drainage surface area and to ensure the leachate water is returned to the lagoon in a clarified state. The perimeter of the dewatering stockpiling area is surrounded by sediment control measures as necessary. The leachate water flowing from the geotubes is returned to the lagoon either by pump or gravity flow system.

Preferential Methodology

Using a hydraulic dredge to remove sediment has proven to be a successful approach and, in most cases, it is preferred to excavation for numerous reasons. The dredging process is slow and methodical; it drives water dependent species from the active work area well in advance of the dredge's approach and provides egress to safe refuge areas elsewhere in the water body. Hydraulic dredging is compatible with the inhabiting wildlife species in that it presents the least amount of disruption to the water body. The use of a mechanical excavator generally requires that a lake or pond be drained and a water diversion be maintained for the duration of the project, which is often difficult and problematic. Unless the water body can be fully drained, mechanical excavators must access the targeted work zone from upland areas, requiring the installation of temporary access roads for the excavators and disposal trucks in fragile shoreline and riparian areas. Use of an excavator also requires the creation of stockpiling areas along the shore where the dredged material can be dewatered and stored until it can be loaded into trucks and hauled offsite. The use of mechanical excavators typically results in extensive damage to sensitive shoreline and near-upland areas, which needs to be stabilized and restored at the project's conclusion. The disruption of an excavative restoration significantly impacts the water body system including vegetation, fish, reptiles, amphibians, waterfowl and other species.

Project Scope

<u>Preconstruction Planning and Permitting</u>

A formalized dredging plan must be developed to define a specific scope of work to be conducted, and also to facilitate compliance with the relevant regulatory permitting requirements. Typically a bathymetric survey of the water body is developed using sidescan sonar to map water depth and soft sediment depth contours. A comparative sediment mapping survey, using a ground probe to sample on 25 foot or 50 foot transects, validates the sonar data to determine the actual volume of sediment present and to identify the natural hard bottom depth of the lagoon. The physical properties of several composite sediment samples are analyzed to characterize the ratio of soft organic silt and loam sediments to coarse, sandy sediments, to estimate dewatering consolidation rates. A composite wet sediment sample is screened against a battery of coagulants and flocculants to determine a goodness of fit for conditioners selected to assist consolidation during the dewatering process. A series of additional composite samples are laboratory screened for the presence of heavy metals, extractable total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, PCB's, pesticides and herbicides, to provide an environmental characterization of the sediment in determining its suitability for reuse or handling for disposal.

Permitting is a two-tier process, beginning with an application and hearing before the local Inland Wetlands and Watercourses Commission followed by an application before the state of Connecticut Department of Energy and Environmental Protection for a Construction Dewatering Temporary Discharge Authorization.

Mobilization
Includes transportation of all necessary equipment and materials to the project site, erosion and sedimentation controls, preparation of dewatering area and deployment of geotextile tubes. Set up of all necessary discharge and piping, polymer feed stations, transit grid cables and launching of the hydraulic dredge.

Dredging and Spoils Removal
We have based our estimate for the proposed sediment removal area of approximately 3,277 square feet of the lagoon's surface area. This proposed plan considers a scenario for restoring water depth by 2 feet, as the volume of soft sediment has been estimated. A bathymetric and sediment mapping survey determined the actual volume of sediment present and to identify the natural hard bottom depth of the lagoon. Based on this 2 foot depth specification, we estimate the total in situ volume of sediment to be removed at approximately 239 cubic yards. The physical properties of this sediment has not been specifically characterized to determine the ratio of soft organic silt and loam sediments to coarse, sandy sediments, which would indicate the likely consolidation rates we can expect during the dewatering process. Assuming a conservative consolidation rate of 25%, we can estimate the insitu volumes of sediment will yield consolidated volume values of approximately 180 cubic yards during the dewatering phase of the project. Spoils removed during the dredging phase are intended to be disposed of at an off site location.

Demobilization
Dismantling of all discharge piping, polymer feed stations, transit grid cables, extraction of the hydraulic dredge and removal of all dredging operation related equipment from the site. Post construction cleanup and stabilization, including remediation of construction access areas, removal of erosion and sedimentation controls.

RELEVENT EXPERIENCE:

Town of Cheshire Public Works
Don Nolte
(203) 271-6650
rdnolte@cheshirect.org
700 cu yds. of sediment removed from Weeks Pond, Cheshire, CT

Bristol Myers Squibb
Carl Noonan
203-677-6000
carl.noonan@bms.com
3000 cu. yds. of sediment removed from Stormwater basins on BMS property in Wallingford, CT

O&G Industries
Greg McWhirter
(860) 489-9261
gregmcwhirter@ogind.com
5,200 cu. yds. of sediment removed from UCONN Health Center stormwater basin in Farmington, CT

Glen Oaks Master Condominium Association
Teressa Juliano
(860) 667-8004
1,000 cu. yds. of sediment removed from stormwater management ponds in Newington, CT