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Tashmoo Pond
Dredging Feasibility Assessment

Town of Tisbury, Massachusetts

May 20, 2016

Prepared for:
Town of Tisbury
400 West Spring Street
Tisbury, MA 02568

Prepared by:
Horsley Witten Group, Inc.

DREDGING FEASIBILITY ANALYSIS
TASHMOO POND
TISBURY, MASSACHUSETTS

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1.0 INTRODUCTION

Horsley Witten Group, Inc. (HW) is pleased to provide this feasibility assessment for dredging Tashmoo Pond in the Town of Tisbury (the Town), Massachusetts (Figures 1 &2). The scope and fee estimate is intended to identify significant project elements, dredging options, approximate timelines for completion, and estimated construction costs. Costs provided herein are based on best professional judgement exercised by HW and contractors with expertise in dredge operations and sediment management practices. HW has included construction and permitting cost contingencies to provide a conservative total project cost for planning purposes. The project scope and fee estimate was primarily a desktop planning project that included limited field work. Sediment sampling, more detailed survey, and other field work will be required before the project can be permitted.

As part of this project, HW has evaluated both conventional mechanical and hydraulic dredging techniques. Mechanical dredging necessitates drawing the water level of the Pond down to allow for the sediment to "dewater" within the pond, after which conventional excavation and earthmoving equipment is utilized to physically excavate sediment from the pond bottom and transport it to a disposal location. Hydraulic dredging is performed "in the wet", utilizing a high volume suction pump and transfer lines to move sediment and water to the upland disposal location. The water is then removed from the sediment slurry and returned to the Pond via a transfer pipe. Secondary dewatering then occurs over the course of several weeks to months, during which time the sediment dries to a point where it can be managed with conventional earthmoving equipment. In consideration of the project goals and site constraints, and after discussing the project with several dredging contractors, mechanical dredging does not appear to be a suitable approach for this site. The basis for our recommendation of a hydraulic dredging approach is provided herein.

2.0 PROJECT BACKGROUND

Tashmoo Pond is an approximately two-acre fresh water pond connected to the 270-acre Lake Tashmoo salt pond by a herring run fish ladder (Figure 3). From the late nineteenth century into the 1970's Tashmoo Pond was a drinking water supply source. As part of that Victorian era legacy, the Tashmoo Spring Pump House has recently been restored and is available for rental/public events in its idyllic natural setting.

The Pond is reported to suffer from algal blooms, sediment accumulation, and other symptoms of eutrophication that threaten the viability of the herring run and other habitat functions, as well as the Pond's aesthetic appeal for public functions. Aeration has been used in the pond in an effort to improve water quality but the issues of eutrophication remain. The Town proposes to dredge the Pond in order to remove the built up sediment and improve water quality and habitat conditions. Reportedly a limited amount of sediment has been removed from the Pond in the past, but details about the timing of those actions or the amount of sediment removed are uncertain. Similarly unclear is the extent to which the sediment built up in the Pond has accumulated over many centuries as a result of natural processes as opposed to accelerated "cultural eutrophication" due to excessive loading of nutrients from the watershed.

3.0 CAD AND GIS ANALYSES

Based on a Bathymetric Plan of Tashmoo Pond prepared by Vineyard Land Surveying and Engineering, Inc., (Vineyard) dated April 9, 2012, HW utilized AutoCAD to estimate that there is approximately 4,300 cubic yards (c.y.) of sediment in the pond to be dredged (Figure 4). The 4,300 c.y. includes areas identified by Vineyard as "Choked with Vegetation" along the northwest side of the pond. The Town may, or may not, wish to include this vegetated area in the dredging program as the majority of this area is not Town owned, and therefore would require cooperation from landowners for equipment access and staging. In addition, removal of the vegetated area would require including a mechanical excavation component, as the hydraulic dredging methods contemplated in this scope and fee estimate are only capable of removing sediment from beneath the waterline, and are not well suited for removal of heavilly vegetated areas.

HW identified potential sediment disposal areas for the sediment based on Light Detection and Ranging (LIDAR) topographic contours downloaded from Massachusetts Geographic Information Systems (MassGIS) (Figure 5). HW utilized AutoCAD to quantify the storage capacity of two potential disposal areas in close proximity to the pond. Area 1 is located in the open field to the south of the pond and has an estimated capacity of approximately 5,600 c.y., more than enough to accommodate the pond dredge material (Figure 6). Area 2 is located in the central west portion of the open field, and could also be utilized for sediment disposal for approximately 2,200 c.y. (Figure 7). Area 2 was included as a potential disposal location as sediment dewatering utilizing geotextile bags would require construction of a dewatering pad closer to the Pond, and utilizing Area 2 would reduce costs associated with final sediment disposal and site restoration.

MassGIS indicates that a portion of the project site is located within Priority Habitat of a Massachusetts listed rare species (Figure 8). HW contacted the State Natural Heritage and

Endangered Species Program (NHESP) to identify concerns with rare or threatened species that might complicate the dredging activity or use of either potential disposal site. Both potential sediment disposal areas are outside of the designated Priority Habitat of the Massachusetts listed rare species (Imperial Moth), however, a small portion of the project site on the southern side of the Pond is within the mapped habitat area. Formal consultation with NHESP during project permitting would be necessary to confirm if project design or schedule would require elements to avoid or eliminate potential impacts to habitat. MassGIS data were also utilized to evaluate additional project considerations, including identified soil types (Figure 9) and flood zone designation (Figure 10). The feasibility analysis did not identify any special considerations with regard to these criteria.

4.0 FIELD EVALUATION

On January 11, 2016 HW staff visited the Site to collect field measurements and conduct a visual assessment of site conditions that could potentially impact project design, contractor access and staging areas, and also have an effect on project permitting.

Photo 1. Near shore sediment sample collection.

During the field visit, HW collected a near shore sediment sample (Photo 1) to provide information on the physical characteristics of sediment in the pond bottom. The sediment sample was submitted to NETLab of West Warwick, RI, for laboratory analysis of grain size and total phosphorous.

To evaluate the rate of influx of groundwater into Tashmoo Pond, HW measured the velocity of water being discharged to Lake Tashmoo via the herring run structure on the north side of Tashmoo Pond. Velocity measurements were collected at the weir board utilizing a Marsh McBirney Model 2000 Portable Flow Meter. HW also collected measurements of the earthern berm separating Tashmoo Pond from Lake Tashmoo, as this structure could potentially be utilized for equipment staging and access, and the water level at the shoreline of the Pond and Lake Tashmoo.

HW then conducted a visual assessment of the pond shore and upland areas located to the south of Tashmoo Pond. The pond shore areas would be utilized for equipment staging and access to the Pond during dredging operations, and the upland areas as sediment dewatering areas for hydraulic dredging operations. Access to the Ponds southern shore was determined to be feasible via a grassed pathway located to the west of the Pump House. HW's visual

observations of the site topography were consistent with the MassGIS data, and did not identify any limiting factors for the proposed sediment disposal areas.

5.0 FIELD EVALUATION RESULTS

Sediment Quality

HW's field observations and the laboratory grain size analysis of the near shore sediment sample indicates that the pond bottom in that area is comprised of brown sandy silt. The physical composition of the sediment is favorable for hydraulic dredging and sediment dewatering techniques, which are best suited for finer grained and organic materials. Sediment in the deeper portion of the Pond may include increased levels of organic material (i.e., decomposing vegetation and waterfowl excrement), but is expected to be similarly well suited for hydraulic removal and dewatering.

Accelerated cultural eutrophication of freshwater bodies is generally attributed to an excessive supply of phosphorous. This is because phosphorous is generally the "limiting" nutrient in freshwater bodies that controls the ability of the algae to utilize other nutrients to fuel growth. It is also common for a significant portion of annual phosphorous load to a pond to consist of the regeneration of "legacy" phosphorous from the pond bottom sediments. Laboratory analysis of the Tashmoo Pond sediment sample revealed moderately high concentrations of total phosphorous in the near shore sediment sample, at approximately 1,400 milligrams per kilogram (mg/kg). The observed concentration of total phosphorous is consistent with conditions observed by HW and others in sediment samples collected from other ponds throughout Massachusetts (e.g. Lovell's Pond in Barnstable, MA). Laboratory analytical results are included as Attachment A.

Pond Discharge and Water Level Management

The management of water level during any dredging project is a critical component to the success of the project. This is particularly true for mechanical dredging approaches, as the water level must be drawn down and maintained at level that would allow free water to drain from the sediment prior to excavation and transport. As a basic evaluation of the scope of dewatering that would be necessary to allow for mechanical excavation, HW performed a baseline analysis of discharge from Tashmoo Pond, described below.

To develop a basic understanding of groundwater inflow into the Pond, HW measured discharge from Tashmoo Pond to Lake Tashmoo at the herring run structure. The concrete herring run channel structure opening is two feet wide and approximately 3.8 feet high at the Tashmoo Pond opening. Several weir boards were in place raising the Tashmoo Pond water

level to approximately 1.6 feet above the bottom of the channel structure. Based on velocity measurements of water flowing over the top of the weir board, HW calculated a discharge rate of approximately 105 gallons per minute (GPM), or 150,000 gallons per day (GPD).

HW's velocity and discharge measurements were collected approximately one hour after high tide, at 11:00 AM, and one day after approximately 0.75 inches of rain fell. At the time of measurement, the water level in Tashmoo Pond was approximately one foot higher in elevation than the water level in Lake Tashmoo. This single point measurement of discharge should not be relied upon for project design considerations, as discharge will vary significantly based on weather considerations and tide stage. As a conservative measure for assessment of water level management, we have assumed an average discharge of twice the measured volume, or 300,000 GPD.

6.0 PROJECT CONSTRUCTION CONSIDERATIONS

Water Level Management

Based on the bathymetry provided by the 2012 Vineyard survey, the water volume of Tashmoo Pond is approximately 8,500 c.y., or 1.73 million gallons. The estimated discharge from the Pond of 300,000 GPD is assumed to be representative of the influx of groundwater into the Pond for the purposes of this evaluation. As described above, mechanical dredging would require that the Pond level be lowered significantly, and that the water level then be kept at a minimum to allow for the sediment to dewater in place, and allow for equipment access. To overcome the influx of groundwater and remove the latent volume of the Pond would require a minimum of approximately 150 hours of dewatering at a rate of 500 GPM. Removing the weir boards at the herring run would lower the level of the pond by approximately 1.6 feet, significantly reducing the initial volume of water to be removed, however, lowering of the weir boards would not address the continued inflow of groundwater into the project area which would have to be maintained by constant pump operation. It is also important to note that our baseline assumption of groundwater inflow is a rough estimate. Lowering of the pond level could increase groundwater inflow and therefore necessitate larger pump capacity or extended pumping duration, and variations in groundwater inflow should also be expected, based on weather conditions.

Dewatering the Pond at these rates would be problematic on several fronts, and is a primary reason for selecting hydraulic dredging methods over mechanical excavation. The surrounding upland areas to the south of the Pond drain back to Tashmoo Pond and would therefore necessitate discharge of the pond water directly to Lake Tashmoo. Maintaining the water quality of the discharge to Lake Tashmoo during an operation of this magnitude would be difficult given the limited amount of space available for water quality control structures between the Pond and Lake Tashmoo. Additionally, the staging and frequent refueling of a

diesel fueled pump in close proximity to both the Pond and Lake Tashmoo would present an environmental concern.

Pond Shore Staging Area

Based on HW's initial conversations with the Tisbury Water Department, it is our understanding that the paved parking area to the east of the Pump House cannot be utilized as a vehicle and equipment staging area (Figures 6 & 7). A grassed pathway located to the west of the Pump House has therefore been designated as the primary access point to the project site. The sloping pathway would likely need to be stabilized with mud mats to prevent excessive rutting or erosion from vehicles. Several concrete structures were observed in the grassed area between the Pump House and former holding tank. Further consultation with the Tisbury Water Department would be necessary to determine if the observed subsurface structures between the Pump House and holding tank would prevent use of this area as a construction entrance and staging area, or what type of precautions would be adequate.

Water Level Management for Hydraulic Dredging

Prior to the start of hydraulic dredging operations, HW recommends that the water level of the pond be lowered by removal of the weir boards. Once dredging activities commence, the weir boards would be replaced to the highest practical level to prevent discharge to Lake Tashmoo, as the dredging activities are likely to disturb bottom sediment and increase water turbidity. Turbidity curtains would also be implemented to minimize the levels of suspended solids in Tashmoo Pond and the discharge to Lake Tashmoo. During project downtime (e.g. weekends), the weir boards could be removed to lower the Pond level.

The hydraulic dredging operations will function as a closed loop system, where the water removed with the sediment will be collected in the dewatering pad or disposal area and returned to the Pond by a transfer pipe. Consultation with hydraulic dredging contractors indicates that conventional system design and construction will perform in conformance with water quality standards.

6.1 Sediment Dewatering Methods

Two different methods of dewatering sediment hydraulically dredged from the Pond were proposed by contractors consulted during this feasibility assessment. The more commonly utilized approach would involve an intermediate step where the sediment pumped from the Pond is allowed to dewater in geotextile bags prior to final reuse / disposal (Figure 7). The alternative process would utilize a larger pump to transfer the sediment and water slurry directly to the final disposal area, where a chemical amendment process would be utilized to thicken the slurry and promote additional dewatering (Figure 6).

Geotextile Bag Dewatering

Geotextile bags are utilized in many hydraulic dredging applications to contain the sediment pumped from the project area while allowing water to pass through for return to the water body or infiltration on-site. The size and quantity of the geotextile bags specified for a specific project varies based on site considerations and the capacity of the dredge equipment being utilized – hydraulic dredging contractor recommendations varied from two large geotextile bags to 14 smaller bags to suit their specific requirements. The most optimal design for a geotextile bag dewatering pad would be to have a 0% slope area for laying out the bags with a perimeter berm. A plastic liner would be laid across the dewatering area to collect and convey water discharged from the geotextile bags into a drain tube that discharges back to the Pond. The proposed geotextile bag dewatering area (Figure 3) was selected based on proximity to the Pond and available space, but as the selected area is sloped it will require an initial phase of earthwork to create a suitable containment area. The slope in the proposed dewatering area is approximately 1:10. A staging area size of 200 feet by 150 feet would require approximately 2,800 c.y. of material to be cut /placed from the hillside to create a level area for dewatering (Figure 7). After project completion, the sediment would be allowed to dewater in the geotextile bags for approximately four months, after which the sediment could either be distributed across the staging area and adjacent lands, and seeded with an appropriate grass seed to re-establish turf cover, or the material could be excavated and transported to an alternate fill area. Fill Area 2 (Figure 7), located in close proximity to the proposed dewatering pad area, would accept approximately 50% of the estimated 4,300 c.y. of sediment to be removed from the Pond. Any remaining sediment could be distributed across the adjacent areas or transported to Fill Area 1.

Direct Disposal Dewatering

Mineral Processing Services, LLC, (MPS) of South Portland, Maine, proposes to eliminate the intermediate step of dewatering the sediment in geotextile bags through a process of chemical conditioning of the slurry at the Area 1 disposal area to promote dewatering (Figure 6). The Pond shore dredge pump equipment staging area required is approximately 20 feet by 40 feet. The sediment and water slurry would be pumped to the disposal area, where a polymer flocculant would be added prior to processing with a paste clarifier. Water removed from the slurry by the paste clarifier would be returned to the Pond via a discharge transfer line. The conditioned sediment would then dewater over a period of several months prior to being suitable for excavation / grading and reuse. This method would require that the disposal area be fenced off for approximately six months until the dewatering was complete, to minimize potential issues from trespassers or wildlife.

6.2 Alternatives Analysis

Due to site constraints and our baseline evaluation of groundwater inflow into the project area, mechanical excavation was removed from consideration as a dredging method. Pumps with a suitable capacity for dewatering the Pond and maintaining a suitable water level are readily available. However, control of water quality at the discharge point is likely to be an issue. Additional impacts associated with mechanical dredging include having to stage dump trucks on the Pond Shore to transport material, requiring a more substantial construction road to the west of the Pump House, and unavoidable impacts to the Pond shoreline from equipment access. Mechanical excavation would also increase the frequency and quantity of petroleum products stored and transferred within the project area – associated with diesel fueled dewatering pumps and construction vehicles.

Based on our experience with projects of a similar scope and size, the results of HW's analysis indicate that a significant effort would be required to effectively manage the water level to allow for mechanical excavation. The difficulty of dewatering, combined with the limited areas available between the Pond and Lake Tashmoo to remove sediment from the dewatering discharge, do not support the use of mechanical dredging at this location. HW and the dredging contractors contacted during the feasibility assessment believe that hydraulic dredging is the most feasible approach to dredging Tashmoo Pond and will result in the least amount of associated impacts during project completion. The two methods of sediment dewatering proposed by contractors consulted during this assessment have advantages and disadvantages over each other that extend beyond financial costs. While the MPS direct disposal method would eliminate the construction and subsequent restoration of a dewatering pad area on the sloped upland south of the Pond, the increased visibility of the project and need to fence off Fill Area 1 for several months may be undesirable from a community stakeholder perspective. While the construction of a dewatering pad area to allow for the use of geotextile bags would be an additional cost, the impacts associated with using Area 1 (loss of area for sledding, project visibility) would not result.

7.0 PROJECT PLANNING, PERMITTING, AND CONSTRUCTION COST ESTIMATES

7.1 Project Planning and Permitting

Any proposed design to dredge Tashmoo Pond will result in unavoidable alterations to wetland resource areas that are protected and regulated under the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq*.), the Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40), and the Town of Tisbury General Wetland Bylaw. These may include alterations to the pond itself and or to its associated inland Banks and possibly to Bordering Vegetated Wetlands (BVW).

Based on our understanding of the scope of the project and the potential impacts to regulated resource areas, the following permits and/or authorizations are anticipated:

- Massachusetts Environmental Policy Act (MEPA), Environmental Notification Form (ENF) from the Secretary of the Executive Office of Energy and Environmental Affairs (EEA);
- Wetland Protection Act, Order of Conditions (OOC) from the Tisbury Conservation Commission;
- MESA Project Review under the Massachusetts *Endangered Species Act* (M.G.L. Ch. 131A; MESA);
- Department of the Army General Permits for Massachusetts – Preconstruction Notification (PCN) for activities subject to jurisdiction in Waters of the United States;
- 401 Water Quality Certification through the MassDEP; and

Detail permitting requirements include the following:

- Order of Conditions under the Massachusetts Wetlands Protection Act and the Town of Tisbury General Wetlands Bylaw – Alteration of any wetland resource area and/or its associated buffer zone will require the filing of a Notice of Intent (NOI) application with the local Conservation Commission and the MassDEP. The project will likely qualify as a "Limited Project" under the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.53(4) for a resource area improvement limited project.

  The NOI process will require notification of property abutters and public hearings, as required. Depending upon the final design and the project impacts, mitigation measures may be required to address alterations to wetland resource areas, and wildlife habitat assessments may be required by the issuing authority.

- Massachusetts Endangered Species Act (MESA). Portions of the Pond and the proposed staging and sediment disposal areas are mapped as *Priority Habitat of Rare Species* (Figure 8). As a result of these designations, this project will require, at a minimum, additional review through the Natural Heritage and Endangered Species Program (NHESP). The MESA Regulations at 321 CMR 10.00 prohibit the "Take" of any plant or animal listed as Endangered, Threatened, or Species of Special Concern (collectively "rare species"). This screening process involves the filing of a standard form along with a filing fee and additional, sufficient information for NHESP to render a decision as to whether or not the project would result in a "Take." There is a streamlined NOI process for projects requiring both filing under the Wetland Protection Act and MESA. The applicant will be required to demonstrate that the proposed project will have no adverse impact on these species or their habitats. Based upon the information submitted under the MESA Project Review, NHESP will determine either that:
  a) the project will avoid a "Take" (as proposed or with conditions) and may proceed without further review; or

b) the project will result in a "Take" and cannot proceed as proposed, i.e., a Denial (for which there is an appeal process). There is an opportunity to request a consultation with NHESP that may allow for pursuing a Conservation and Management Permit to address a potential denial. However, the need for a Conservation and Management Permit is not anticipated at this time.

Based on the small portion of the project area that is designated as Priority Habit of the Imperial Moth and the relatively short term impacts that would result from the dredging operations, HW does not believe that the Priority Habitat designation will lead to significant design impacts. Project scheduling could likely be utilized as a means to minimize potential impacts to the Imperial Moth based on consultation with NHESP.

- Environmental Notification Form through the Massachusetts Environmental Policy Act (M.G.L. c. 30 §§ 61 through 62H, inclusive or MEPA) – Dredging 10,000 C.Y. or more of material or alteration of 0.5 acres or more of any other resource area (e.g., Land Under Waterbodies and Waterways) will require State agency review through an ENF. Based upon our understanding of the project, it does not appear that mandatory review through an Environmental Impact Report (EIR) would be required. Attendance at one mandatory on-site meeting is anticipated.

- General Permit (GP) under Section 404 of the federal *Clean Water Act* – Alterations exceeding 1/2 Acre would require the filing of an Individual Permit application with the U.S. Army Corps of Engineers (ACOE).

- Water Quality Certification (WQC) under Section 401 of the federal *Clean Water Act* (33 U.S.C. 1251, *et seq*.) – Alterations within BVW and/or land under water (e.g., the pond) that cumulatively exceed 5,000 SF and/or dredging greater than 100 C.Y. will require a WQC issued by the MassDEP.

- Correspondence with Town Conservation Commission staff indicated that Area 1 would need to be cleared with Tribal interests but that, since no or minimal subsurface disturbance is anticipated, use of Fill Area 1 would be unlikely to impact any potential buried cultural resources. We agree with that assessment and recommend that communication with Tribal interests continue, and that the Massachusetts Historical Commission (MHC) be contacted for a preliminary consultation.

Sediment Sampling Plan

As a part of the 401 Water Quality Certification Regulations (310 CMR 9.07(9)) administered by MassDEP, a sediment sampling program must be completed at the Pond. Samples would submitted for analysis of key contaminants of concern to confirm that the material is suitable

for upland disposal / reuse on the property. Per 310 CMR 9.07(9), upland material reuse under a 401 WQC is permitted, provided the concentrations of oil and hazardous material in the dredged material are less than the Reportable Concentrations (RCS-1) soil standards established in the Massachusetts Contingency Plan (MCP 310.CMR 40.0000).

Sediment that does not meet the RCS1 criteria cannot be disposed of in upland areas and must be managed through a Beneficial Use Determination (BUD) or disposed of at a Massachusetts permitted landfill facility for reuse as cover material in accordance with MassDEP's "*Reuse and Disposal of Contaminated Soil at Massachusetts Landfills – Policy #COMM-97-001"* (COMM-97-001) and *"Interim Policy for Sampling, Analysis, Handling and Tracking Requirements for Dredged Sediment Reused or Disposed at Massachusetts Permitted Landfills - Interim Policy COMM-94-007"* (COMM-94-007).

Three sediment samples collected from the Pond by the Town in 2002 and analyzed for metals and polychlorinated biphenyls (PCBs) indicate that the sediment meets MCP RCS1 standards. Based on the analytical results from the 2002 sediment samples, a preliminary evaluation indicates that sediment dredged from the Pond can be disposed of on-site, and is not subject to MCP or sediment re-use regulations established. This limited set of sediment quality data is insufficient to meet the permitting requirements under the 401 WQC program, which specifies the number of samples collected based on the proposed volume of sediment to be dredged and includes additional analysis of contaminants that were not analyzed in the 2002 sediment sampling event. Furthermore, the 401 WQC sediment sampling criteria require that the sediment samples be collected within three years prior to the permitting process.

7.2 Project Construction Cost Estimates

During the completion of the feasibility analysis, three cost estimates were obtained from contractors with dredging expertise. All of the contractors providing estimates utilize hydraulic dredging techniques. Two of the contractors recommended the use of geotextile bags for sediment containment and dewatering, and one contractor recommends utilizing a proprietary dewatering process that would negate the use of geotextile bags and transfer dewatered sediment directly to the Area 1 disposal location. The estimated costs presented below include all material costs, mobilization, and demobilization from the project site.

None of the dredging contractors consulted during the feasibility evaluation carried costs associated with the construction of staging areas or dewatering pads, costs associated with final placement of sediment following the several month long dewatering process, and final restoration of the site. The labor and equipment involved in these elements of the project would be most cost effective if provided by general contractors operating on Martha's Vineyard through a competitive bid process and would be highly dependent upon final design considerations with respect to site restoration.

Total estimated project costs are summarized in Tables 1, 2, and 3, below, and include a contingency reflective of the preliminary nature of the proposed work. Estimated costs are to be used for initial project planning purposes and are subject to change based on project design and scope considerations not accounted for in this feasibility assessment

Sediment Dewatering with Direct Disposal

Mineral Processing Services, LLC
PMB 128, 50 Market Street
South Portland, ME 04106
Contact: Jim Meagher
207-741-2955 / jim@main.rr.com

MPS proposes to utilize a floating, unmanned hydraulic dredge to remove sediment from the Pond. Sediment and water slurry would be direct pumped to Fill Area 1, where a paste clarifier would remove water from the slurry and return it to the pond (Figure 6). The sediment would continue to dewater over several months and would need to be fenced off during that time to prevent tresspassers and wildlife concerns.

Summary Cost Table 1. Mineral Processing Services		
Item	**Duration**	**Estimated Cost**
Project Design, Sampling, and Permitting	4-6 Months	$30,000 - $40,000
Staging Area Construction	1 Week	$10,000
Disposal Area Fencing	6 Months	$11,000
Dredging and Direct Disposal Operations	4 Weeks	$220,000
Construction Oversight (weekly monitoring)	4 Weeks	$4,000
Sediment Management / Site Restoration	1-2 Weeks	$20,000
Contingency (15%)	N/A	$45,750
Summary Cost Table 1 Total		**$350,750**

Sediment Dewatering with Geotextile Bags

AE Commercial Diving
100 Jennifer Lane
Manchester Center, VT 05255
Contact: Chris Sheldon
802-558-2985 / aediving@gmail.com

AE Commercial Diving proposes to use a manually positioned hydraulic dredge to remove sediment from the Pond. Sediment and water slurry would be pumped into geotextile bags for dewatering (Figure 7). AE Commercials costs do not include initial site preparation costs associated with constructing a suitably sized dewatering pad, or final site earthwork and site restoration.

Summary Cost Table 2. AE Commercial Diving		
Item	**Duration**	**Estimated Cost**
Project Design, Sampling, and Permitting	4-6 Months	$30,000 - $40,000
Dewatering Pad Construction (Geotextile Bag)	1-2 Weeks	$28,000
Dredging Operations	4-8 Weeks	$220,000
Construction Oversight (weekly monitoring)	4-8 Weeks	$8,000
Sediment Management / Site Restoration	1-2 Weeks	$40,000
Contingency (15%)	N/A	$50,400
Summary Cost Table 2 Total		**$386,400**

New England Aquatic Services
37 Route 37 E
Sherman, CT 06784
Contact: Matt Vogt
203-885-2318 / matthew@newenglandaquatic.com

New England Aquatic Services (NEAS) proposes to use a manually positioned hydraulic dredge to remove sediment from the Pond. Sediment and water slurry would be amended with a non-toxic polymer flocculent prior to being pumped into geotextile bags for dewatering (Figure 7). NEAS costs do not include initial site preparation costs associated with constructing a suitably sized dewatering pad, or final site earthwork and site restoration.

Summary Cost Table 3. New England Aquatic Services		
Item	**Duration**	**Estimated Cost**
Project Design, Sampling, and Permitting	4-6 Months	$30,000 - $40,000
Dewatering Pad Construction (Geotextile Bag)	1-2 Weeks	$28,000
Dredging Operations	4-8 Weeks	$389,000
Construction Oversight (weekly monitoring)	4-8 Weeks	$8,000
Sediment Management / Site Restoration	1-2 Weeks	$40,000
Contingency (15%)	N/A	$75,750
Summary Cost Table 3 Total		**$580,750**

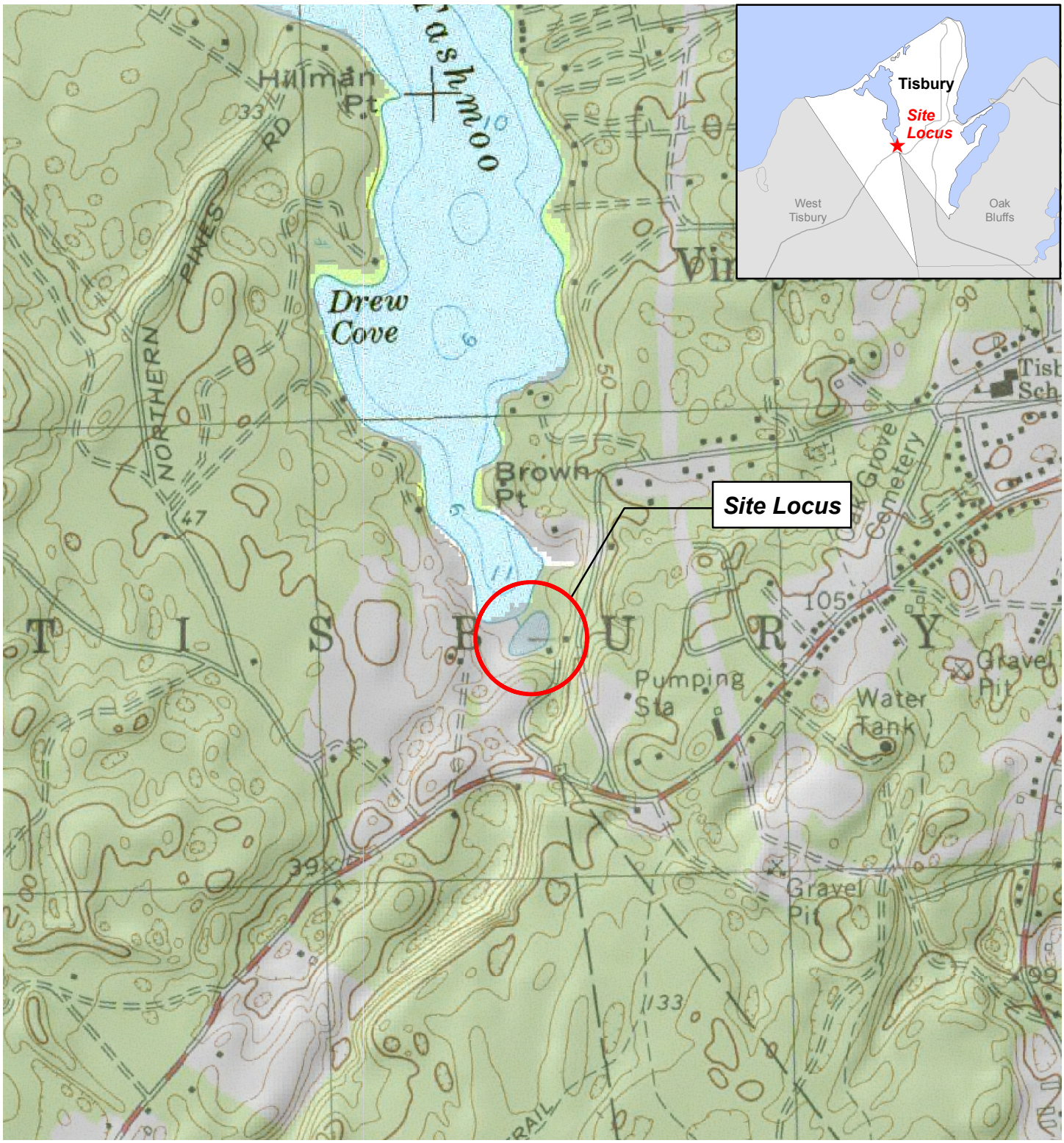
8.0 ADDITIONAL CONSIDERATIONS

More active management of the water level of Tashmoo Pond should be evaluated as a cost effective alternative or compliment to dredging activities. Annual, or more frequent, drawdown of the water level could prove beneficial in limiting near shore vegetative growth. Increased flushing of Tashmoo Pond would reduce the residence time of nutrients in the Pond and their ability to fuel algal growth. Further consultation with the Tisbury Water Department and Massachusetts Department of Environmental Protection (MassDEP) should be considered to evaluate the potential benefits and permitting requirements of more active water level management. It should be noted that during peak high tides and prevailing northeasterly wind conditions, the water level of Lake Tashmoo would likely be higher than Tashmoo Pond and some infiltration of saltwater would likely occur in the absence of a properly designed flow control structure.

Other management techniques that could improve water quality and minimize sediment accumulation in Tashmoo Pond include:

- Increasing the vegetative buffer surrounding Tashmoo Pond
- Minimization of nutrient applications for turf management adjacent to the Pump House
- Deterrents to minimize the presence of waterfowl
- Replacing the existing herring run with a more functional box culvert
- Minimization of stormwater runoff from surrounding areas

FIGURES



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*Vineyard Haven Topographic Quadrangle

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

N

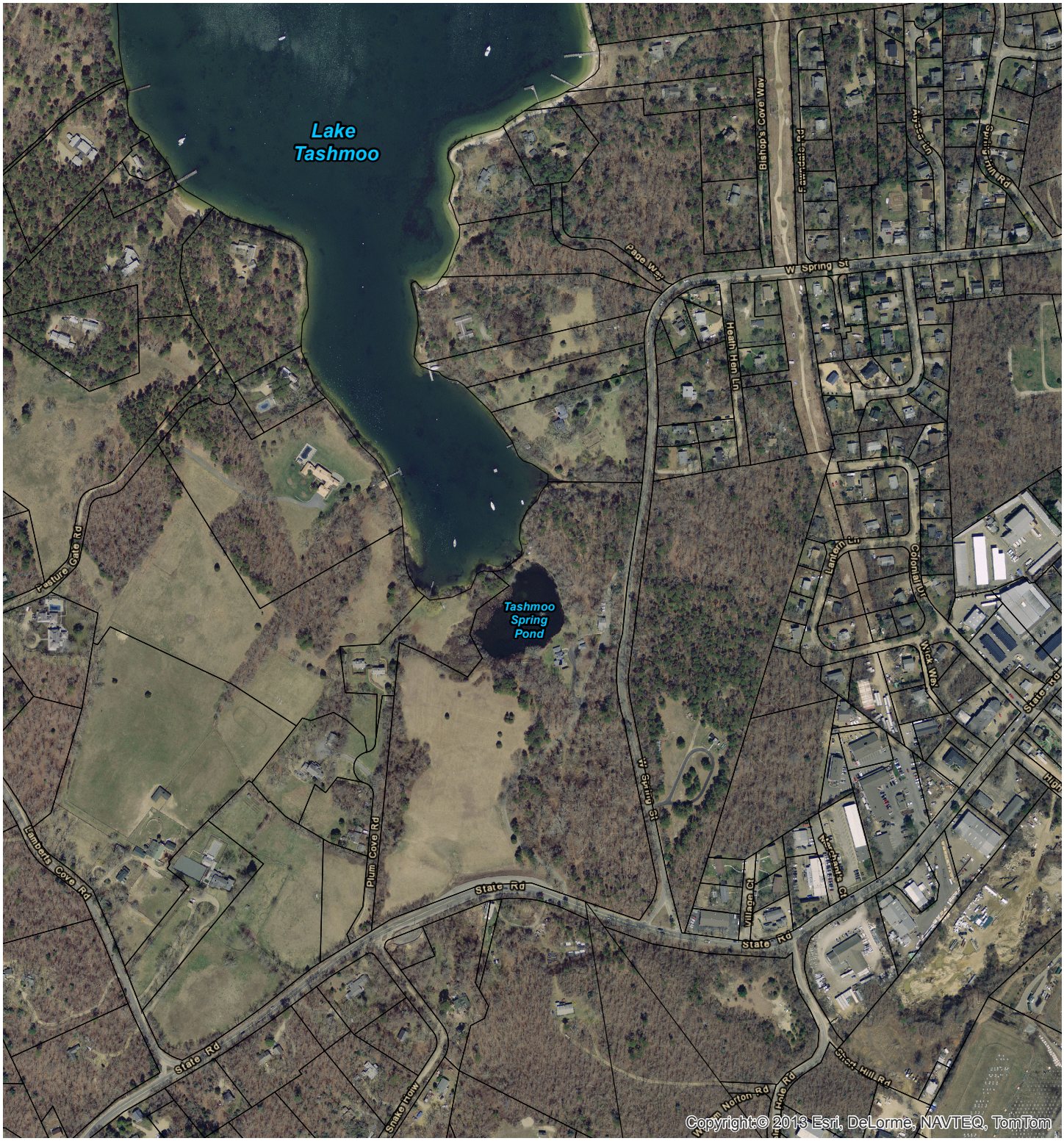
0 1,000

1" = 1,000 feet

USGS Topographic Quadrangle Tashmoo Pond Town of Tisbury, MA

Date: 10/13/2015

Figure 1



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\Aerial.mxd

*Aerial Image - MassGIS 2014

Legend

Parcels

N

0 500

1" = 500 feet

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Aerial Photo
Tashmoo Pond
Town of Tisbury, MA

Date: 10/13/2015

Figure 2

80 0 80 160 240

GRAPHIC SCALE – FEET

Notes:
CB F = concrete bound found
MHB F = Mass. Highway bound found
IP F = iron pipe found
UP = utility pole

Lake Tashmoo

William Hambrecht
Assessor's Parcel
38 A 3

Nstar ROW

N 82°38'21"E
287'±(286.86')pond to sideline–PL
286.86'pond to CB F

N 05°52'22"E
30.84'

CB F

270.76'(CB to CB)

Arc 33.11'
Rad 1188.46

N 76°43'19"E
69.01'

stream

N 27°57'29"E
138.34'

N 09°46'21"W
63.30'

CB F

N 44°55'08"E
117.99'

S 89°34'54"E
77'±(77.41')

herring run

118'±(118.15')
N 49°42'11"W

139.55'
N 54°47'49"E

REBAR F
tipped

pond

Thomas & Virginia Payette, Trustees
Assessor's Parcel
39 A 5

N 17°51'23"E
92.24'

N 25°36'31"W
96.98'

CB F

S 64°52'36"E
115.89'

CB F

S 60°07'22"E
161.22'

N 39°48'09"E
85.73'

CB F
in remnants of wall

CB F

Spring Building

septic system
as per
design plan

office

steps

garage

garage

asphalt parking

asphalt parking

asphalt driveway

UP

S 11°32'57"W 255.06'

edge asphalt

Arc 122.06'
Rad 1123.96'

TEL

S 05°19'36"W 287.29'

West Spring Street

Arc 165.00'
Rad 518.50'

edge asphalt

S 12°11'57"E 621.35'

West Spring Street

Town of Tisbury
Assessor's Parcel
39 B 1

Note:
Property lines east of West Spring Street were compiled and plotted by using a digital version of the Tisbury Assessors Maps.

Lantern Lane

Town of Tisbury
Assessor's Parcel
23 A 39

Tisbury Water Works 20' ROW

Town of Tisbury
Assessor's Parcel
39 B 2.18

Tisbury
Assessor's Parcel
39 A 7
23.2 acres ±

asphalt driveway

vent
septic system
as per
design plan

asphalt driveway

20 ft. wide drainage easement

Arc 315.29'
Rad 505.00'

MHB F

N 44°04'49"W
96.32'

N 69°16'43"W
97.98'

MHB F

stone posts

town line

UP

MHB F

SB F

MHB F

N 71°33'27"W
204.11'

S 34°39'13"W
81.36'

Arc 77.93'
Rad 95.06'

UP

IP F

UP

CB F

IP F

S 39°16'21"W
95.38'

guard rail

"Tashmoo Overlook"

S 68°54'14"W 234.54'

edge asphalt

MHB F

UP

Mass. State Highway

Mass. State Highway

MHB F

N 06°32'14"E

N 03°48'59"E 463.43'

Plum Cove Road

N 30°58'35"W
16.30'

CB F

CB F

Compiled Plan

Plan of Land in
Tisbury, Mass.

Prepared For
the Town of Tisbury &
the Tisbury Water Works

Scale: 1" = 80' January 11, 2012

Schofield, Barbini & Hoehn Inc.
Land Surveying ⊕ Civil Engineering
12 Surveyor's Lane, Box 339
Vineyard Haven, Mass.
508–693–2781
www.sbhinc.net
MV 8582

Figure 3

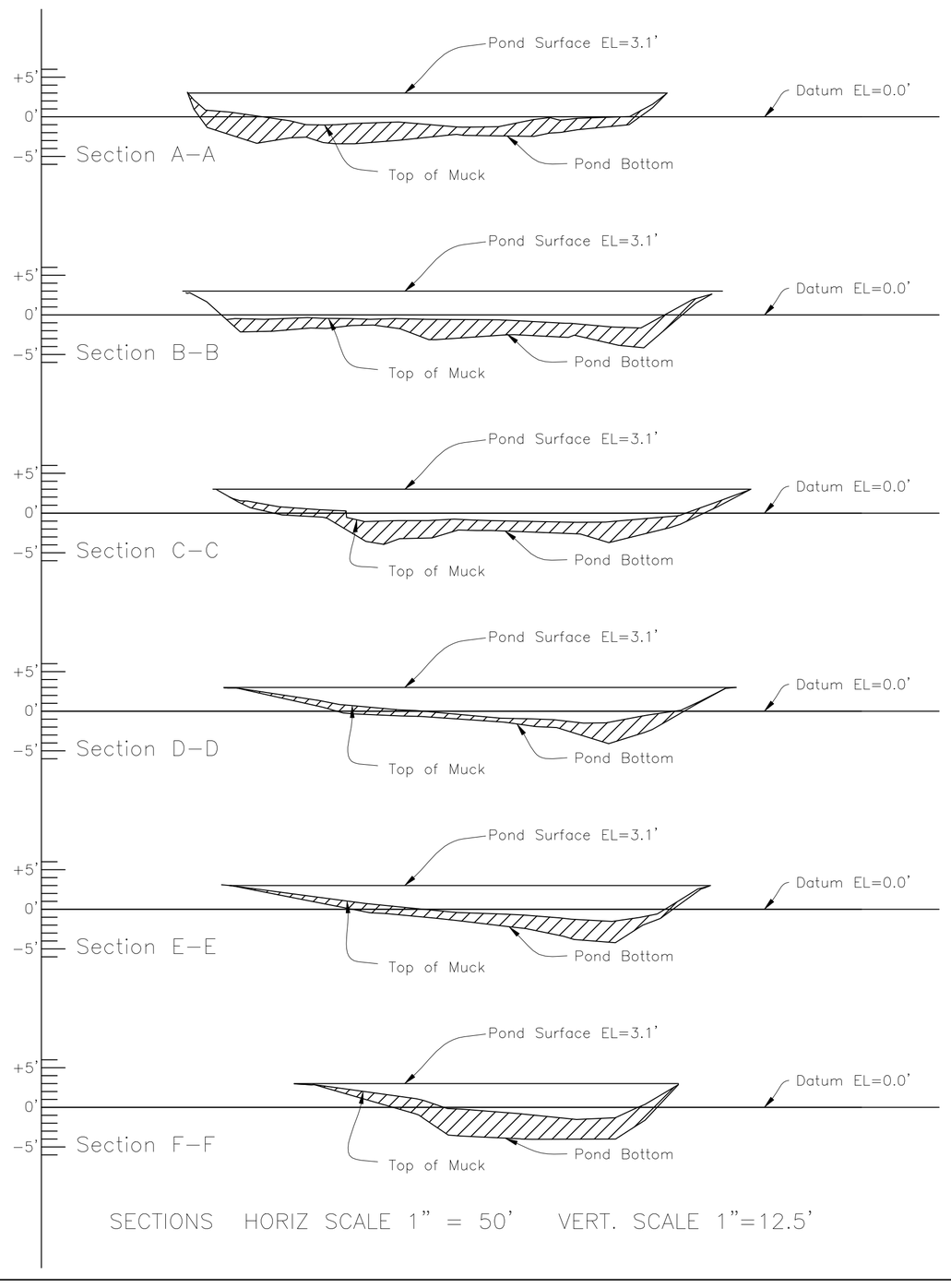
TISBURY WATERWAYS
Job No. 333

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

LAKE TASHMOO



SECTIONS HORIZ SCALE 1" = 50' VERT. SCALE 1"=12.5'

Bathymetric Plan of a Pond in
TISBURY, MASS.
Surveyed For
TASHMOO PRESERVATION
At The
TISBURY WATERWORKS POND
Scale 1" = 30'
April 9, 2012

VINEYARD LAND SURVEYING & ENGINEERING, INC.
12 Cournoyer Road, P.O. Box 421 West Tisbury, MA 02575
P 508.693.3774 F 508.693.8575

TISBURY WATERWAYS
Job No. 333

Figure 4

Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\LiDAR.mxd

Legend

Parcels

**Aerial Image - MassGIS 2014*
LiDAR Imagery - MassGIS 2013-2014 Sandy

N

0 500

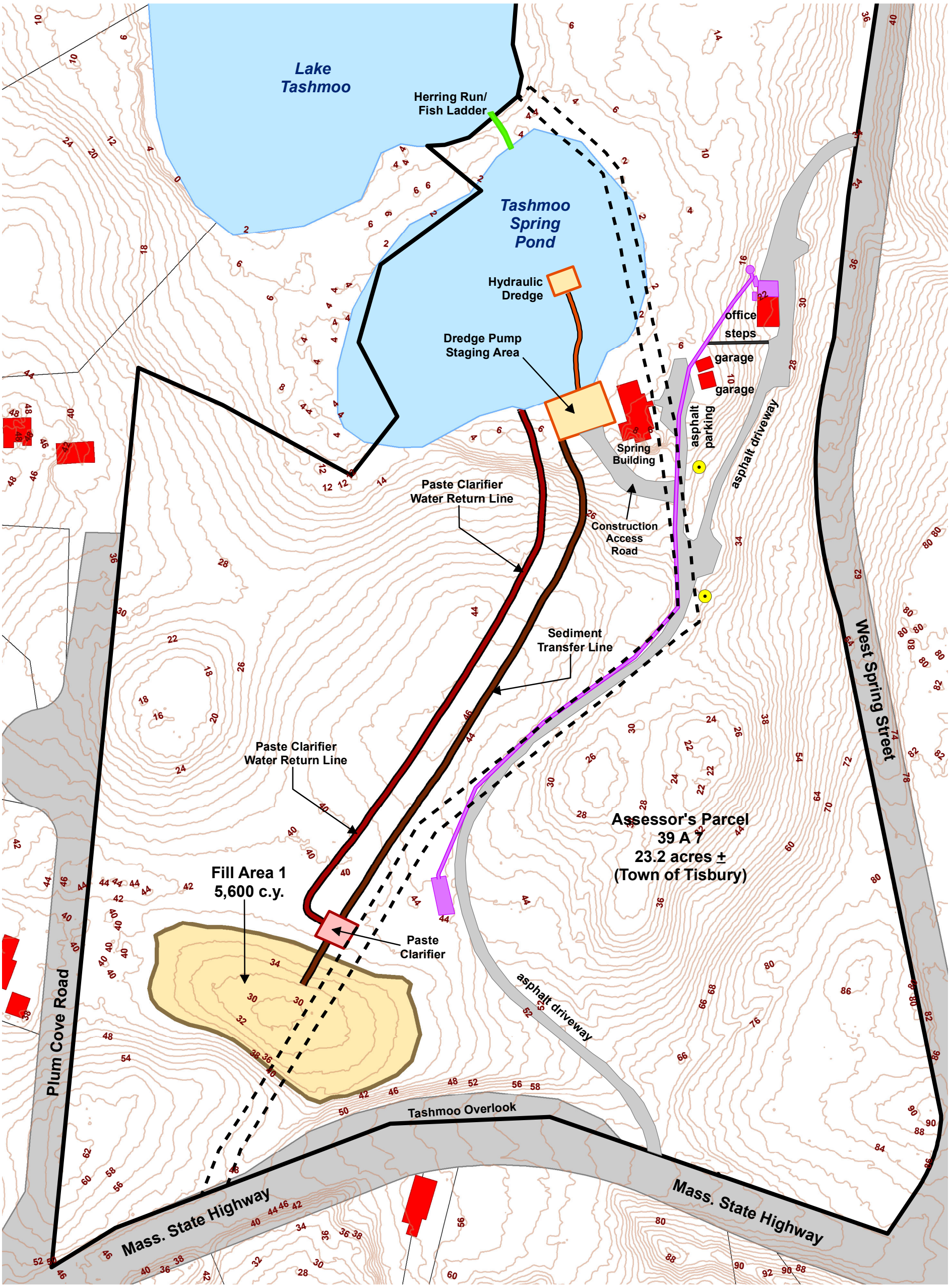
1" = 500 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

LiDAR Imagery
Tashmoo Pond
Town of Tisbury, MA

Date: 5/20/2016

Figure 5



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\160519_DirectSedimentDisposal.mxd

Legend

- Site Parcel
- Parcels
- Buildings
- Septic System Components (per design plans)
- Utility Pole
- Drainage Easement

*GIS Data - MassGIS &
Compiled Plan, Plan of Land in Tisbury, MA, January 2012

N

0 110

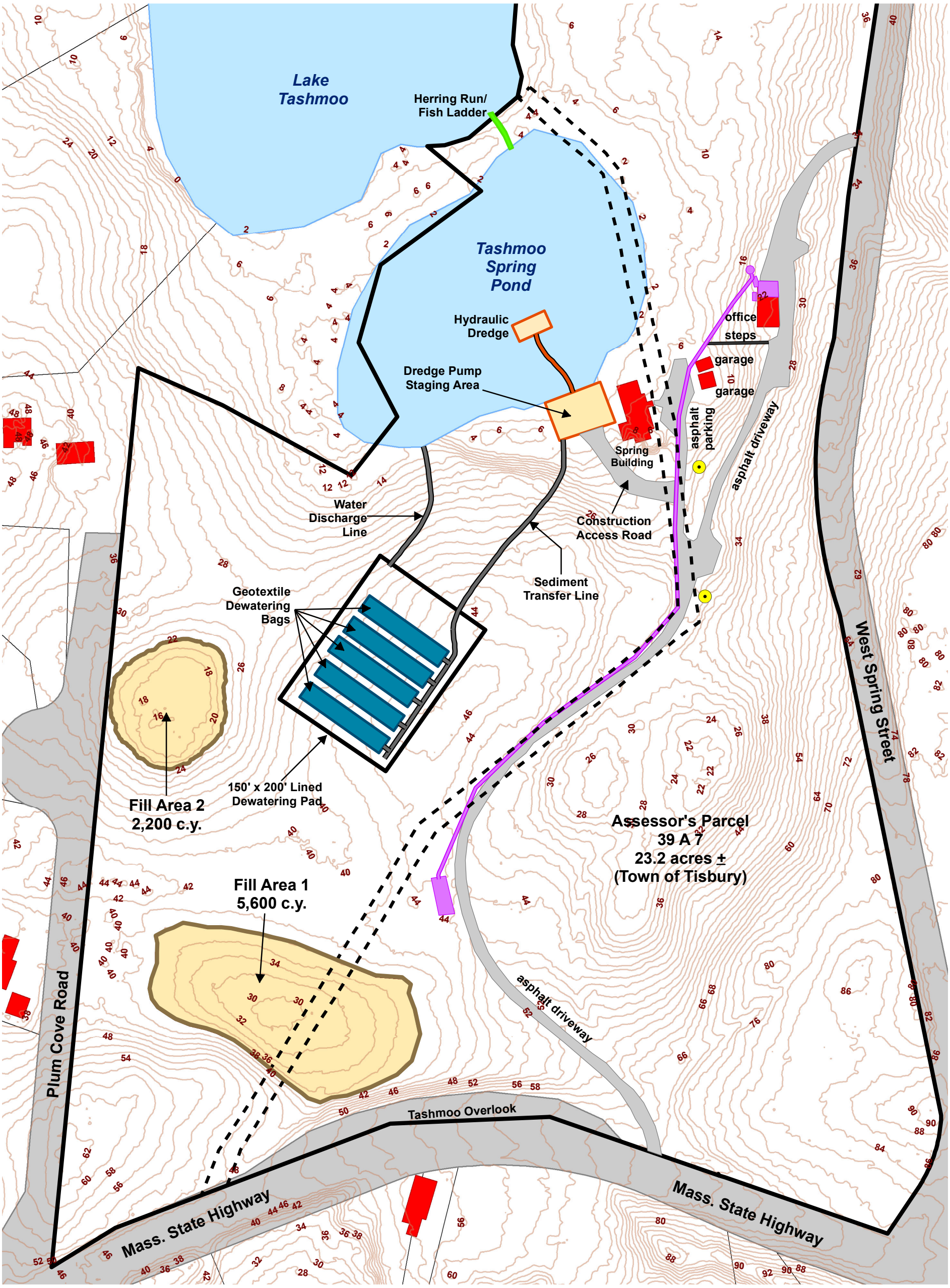
1" = 110 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Direct Sediment Disposal
Tashmoo Pond
Town of Tisbury, MA

Date: 5/20/2016

Figure 6



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\160519_GeotextileBagDewatering.mxd

Legend

- Site Parcel
- Parcels
- Buildings
- Septic System Components (per design plans)
- Utility Pole
- Drainage Easement

**GIS Data - MassGIS & Compiled Plan, Plan of Land in Tisbury, MA, January 2012*

N

0 — 110

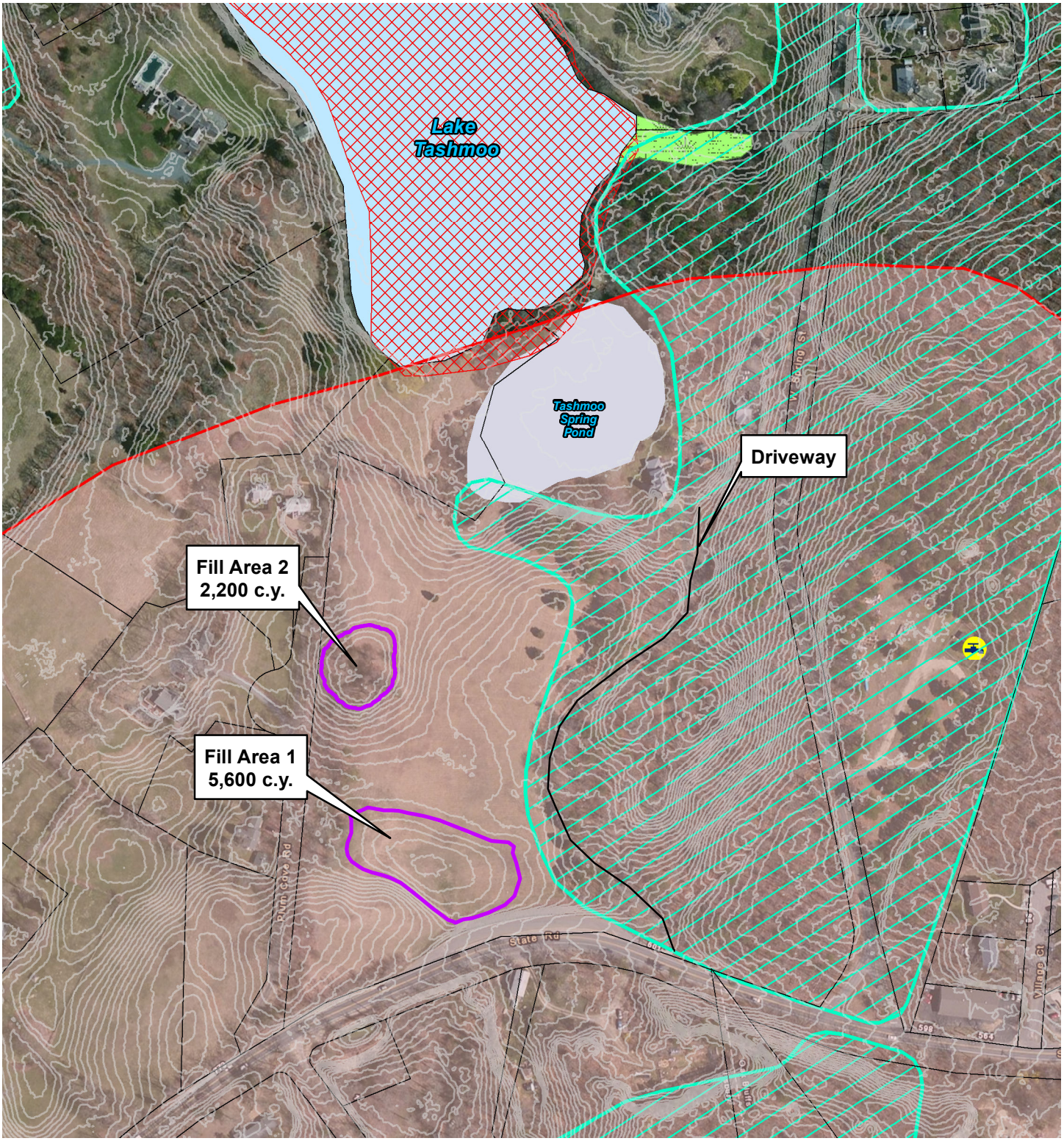
1" = 110 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Geotextile Bag Dewatering
Tashmoo Pond
Town of Tisbury, MA

Date: 5/20/2016

Figure 7



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\Constraints_erk2.mxd

*GIS Data - MassGIS

Legend

- Parcels
- **DEP Wetlands**
  - Salt Marsh
  - Open Water
  - 2ft. Contours
- 2012 Integrated List Data - 305(b)/ 303(d)Impaired - TMDL required
- DEP Approved Zone IIs
- Community Groundwater Source
- NHESP Priority Habitats of Rare Species

N

0 500

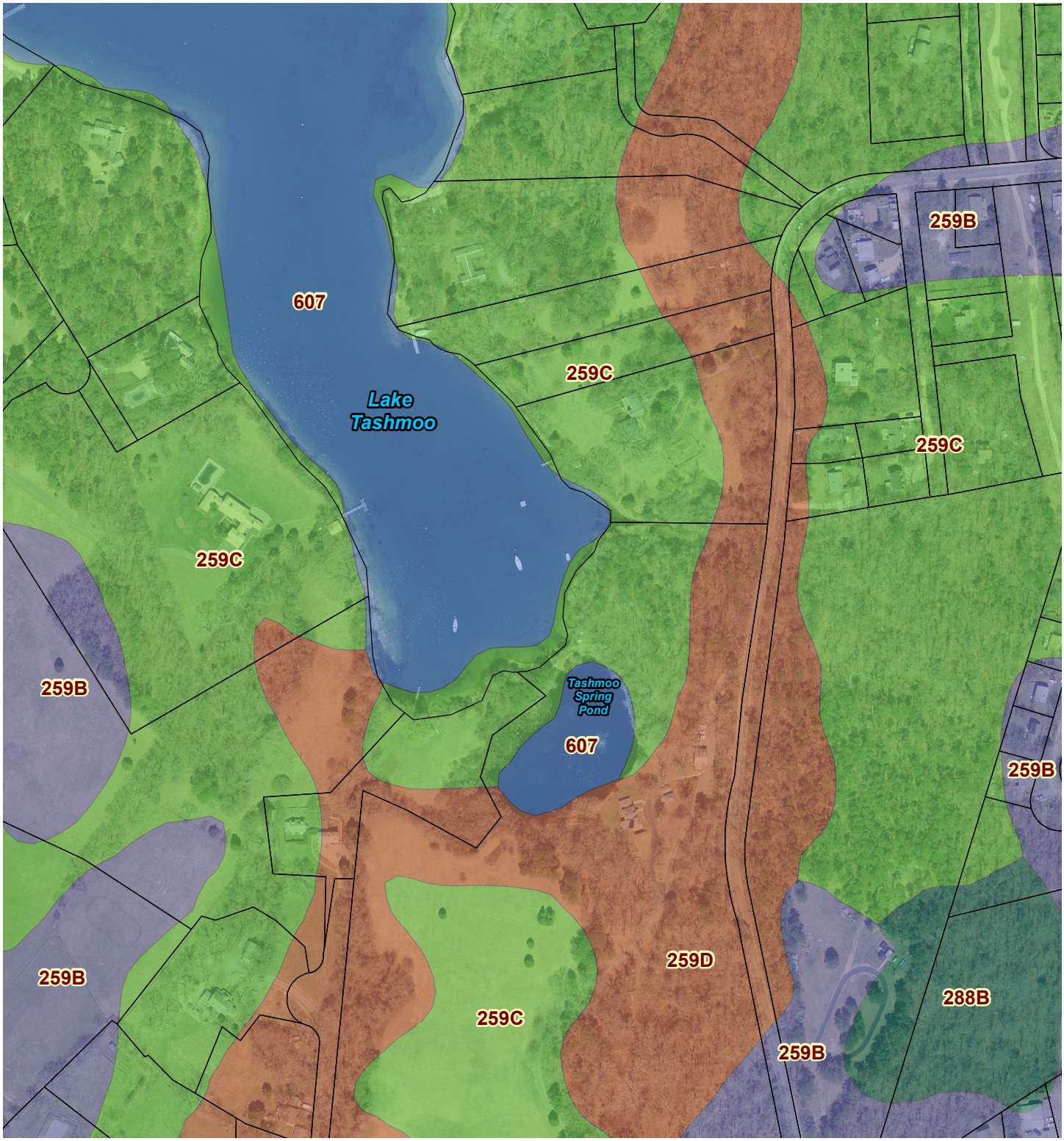
1" = 500 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Existing Constraints Tashmoo Pond Town of Tisbury, MA

Date: 5/20/2016

Figure 8



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\Soils.mxd

Legend

*FEMA's National Flood Hazard Layer, 2010

- Parcels
- 259B, Carver
- 259C, Carver
- 259D, Carver
- 288B, Riverhead
- 607, Water

N

0 300

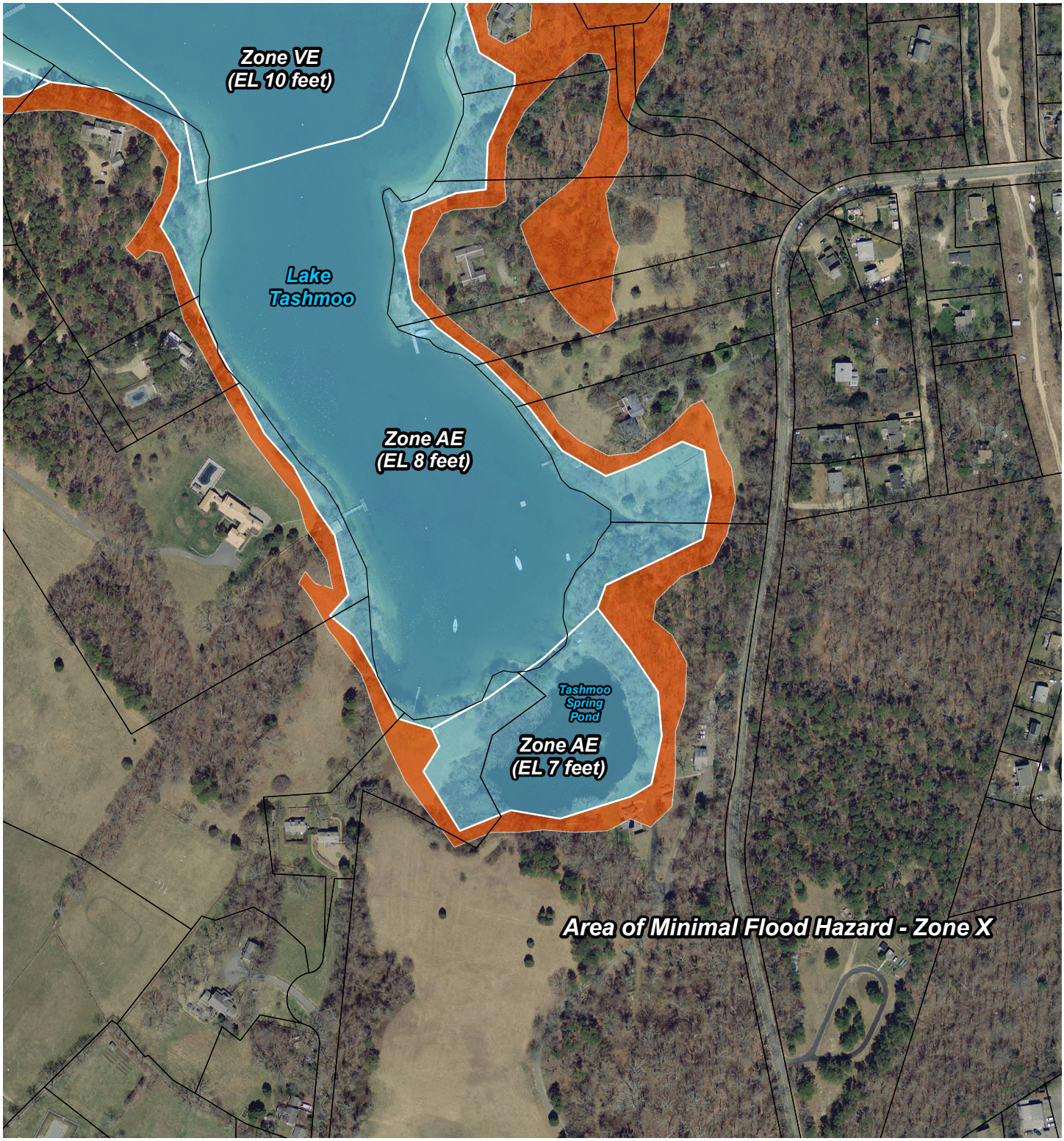
1" = 300 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

Duke's County Soils Map
Tashmoo Pond
Town of Tisbury, MA

Date: 10/13/2015

Figure 9



Document Path: H:\Projects\2015\15080 Tashmoo Pond Dredging\GIS\Maps\FEMA.mxd

Legend

**FEMA's National Flood Hazard Layer, 2010*

- Parcels
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

N

0 300

1" = 300 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

FEMA's National Flood Hazard Layer
Tashmoo Pond
Town of Tisbury, MA

Date: 10/13/16

Figure 10

ATTACHMENTS

REPORT OF ANALYTICAL RESULTS

NETLAB Case Number C0118-17

Prepared for:

Attn: Gary Hedman
Horsley Witten Group
90 Route 6A, Unit 1
Sandwich, MA 02563

Report Date: January 22, 2016

Director
New England Testing Laboratory, Inc.
Lab # RI010

NEW ENGLAND TESTING LABORATORY, INC.
1254 Douglas Avenue, North Providence, RI 02904
(401) 353-3420

SAMPLES SUBMITTED and REQUEST FOR ANALYSIS:

The samples listed in Table I were submitted to New England Testing Laboratory on January 18, 2016. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. This report of analytical results pertains only to the sample(s) provided to us by the client which are indicated on the custody record. The case number for this sample submission is C0118-17

Custody records are included in this report.

Project: Tashmoo Pond Dredging

TABLE I, Samples Submitted

Sample ID	Date Sampled	Matrix	Analysis Requested
Pond Bottom Sediment	1/11/2016	Sediment	Table II

TABLE II, Analysis and Methods

ANALYSIS	DETERMINATIVE METHOD
Total Phosphorus	6010C
Grain Size	*

***** Subcontracted to Thielsch Engineering

These methods are documented in:

Manual of Methods for Chemical Analysis of Water and Water Wastes, EPA-600/4-79-020 (Revised 1983), USEPA/EMSL.

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA-WPCF.

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, Office of Federal Register National Archives and Records Administration.

CASE NARRATIVE

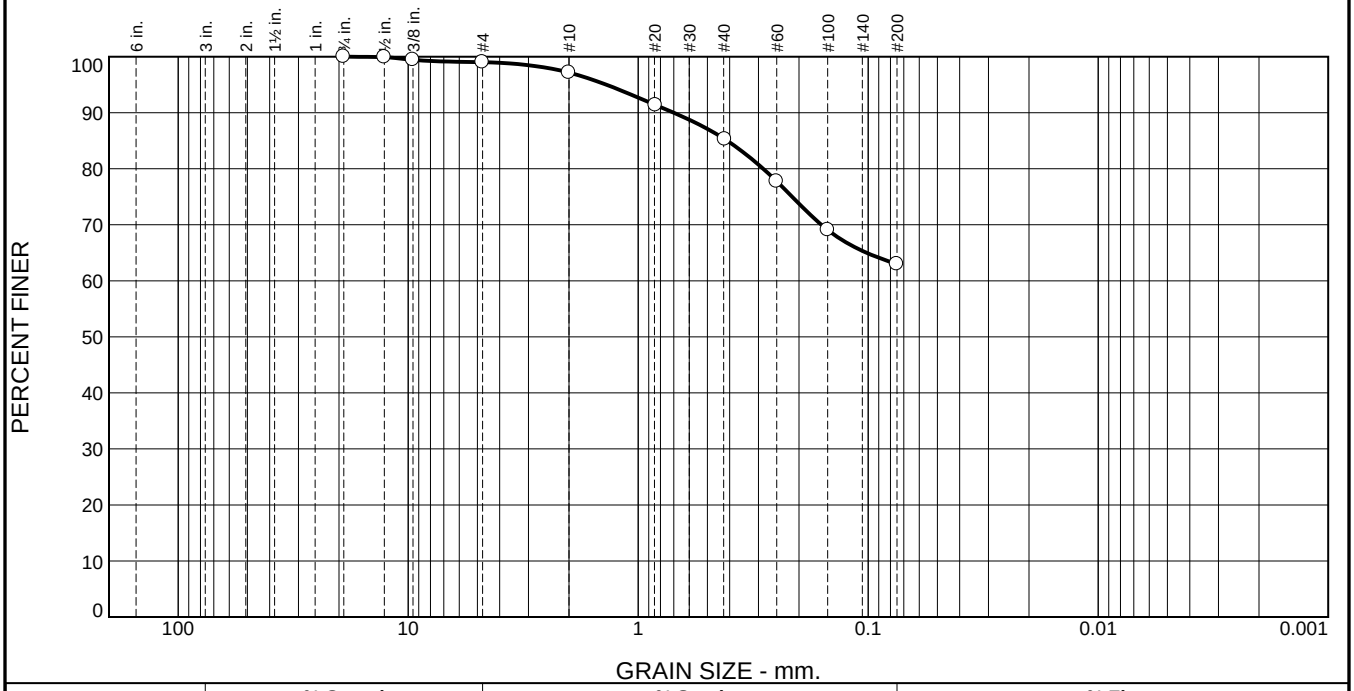
All samples were found to be properly preserved/cooled upon receipt. All analyses were performed within EPA designated holding-times. Procedure/calibration checks required by the designated protocols were within control limits.

Pond Bottom Sediment

Parameter	Result, mg/kg	Reporting Limit	Date Analyzed
Total Phosphorus	1460	1.99	1/22/16

ND = Not Detected

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	1.8	11.8	22.4	63.0	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	99.9		
.375"	99.4		
#4	99.0		
#10	97.2		
#20	91.4		
#40	85.3		
#60	77.8		
#100	69.1		
#200	63.0		

* (no specification provided)

Material Description

Brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.7010 D_{85}= 0.4103 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 1/19/16 **Date Tested:** 1/20/16

Tested By: MK

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: C0118-17 **Depth:** Sediment **Date Sampled:** 1/11/16

Sample Number: Pond Bottom

Thielsch Engineering Inc.

Cranston, RI

Client: New England Testing Laboratory

Project: New England Testing Laboratory

Project No: 74-15-0002.46 **Figure** 16-S-061

C0116-17

NEW ENGLAND TESTING LABORATORY, INC.
1254 Douglas Avenue
North Providence, RI 02904
1-888-863-8522

CHAIN OF CUSTODY RECORD

PROJ. NO. 15080 | PROJECT NAME/LOCATION: Tashmoo Pond Dredging

CLIENT: Horsley Witten Group

REPORT TO: Gary Hedman

INVOICE TO: Tracey Orciuch

DATE	TIME	COMP	GRAB	SAMPLE I.D.	AQUEOUS	SOIL	OTHER	NO. OF CONTAINERS	PRESERVATIVE	TESTS** TOTAL P	TESTS** GRAIN SIZE					REMARKS
1/11/16	11:00	X		POND BOTTOM SEDIMENT			X	1	NA	X	X					X SEDIMENT

	Date/Time		Date/Time	
Sampled by: (Signature)	1/14/16 1600	Received by: (Signature)	1/18/16	2:00
Relinquished by: (Signature)	1-18-16 4:00	Received by: (Signature)		
Relinquished by: (Signature)		Received for Laboratory by: (Signature)	1/18/16	1600

Laboratory Remarks:
Temp. received: 4a
Cooled ☐

Special Instructions:
List Specific Detection Limit Requirements:

Turnaround (Business Days)_____

**Netlab subcontracts the following tests: Radiologicals, Radon, Asbestos, UCMRs, Perchlorate, Bromate, Bromide, Sieve, Salmonella, Carbamates