VIA ELECTRONIC FILING

February 24, 2015

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: FirstLight Hydro Generating Company, FERC Project No. 2485
Pilot Dredge Program for Northfield Mountain Pumped Storage Project

Dear Secretary Bose:

The purpose of this letter is to inform the Federal Energy Regulatory Commission (Commission) that FirstLight Hydro Generating Company (FirstLight), licensee of the Northfield Mountain Pumped Storage Project (Project), is planning to conduct a small-scale pilot dredge operation of its Upper Reservoir beginning in April of this year as part of the implementation of its Sediment Management Plan (Plan) and Relicensing Study No. 3.1.3 for the Project. FirstLight developed the Plan, which the Commission approved on March 28, 2012,[1] in consultation with the U.S. Environmental Protection Agency (USEPA) and Massachusetts Department of Environmental Protection (MADEP). The Plan sets forth the methods by which FirstLight will annually assess sediment dynamics in the Project's Upper Reservoir and in the Connecticut River from 2011-2014, and commits FirstLight to developing management measures to minimize entrainment of accumulated silt into the Project works and Connecticut River during drawdown or dewatering.

At the request of USEPA, FirstLight integrated the Plan into the Project's relicensing process as Study No. 3.1.3. FirstLight also agreed to extend its sediment data collection efforts into 2015, and include its proposed sediment management measures in the final report to be filed with the Commission in December 2015.[2] As FirstLight indicated in the approved Plan, as well as in its report of 2014 activities under the Plan filed December 1, 2014, one of the sediment management measures it is evaluating is periodic dredging of the Upper Reservoir. FirstLight is

[1] *FirstLight Hydro Generating Co.*, 138 FERC ¶ 62,305 (2012).
[2] As FirstLight noted in its revised study plan, it will report on the 2015 sediment information collected to date in the Updated Study Report to be filed in September 2015.

John S. Howard
Director FERC Compliance, Hydro

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now prepared to conduct a small-scale pilot dredge of a limited portion of the Upper Reservoir to assess the feasibility of periodic dredging as a long term means of managing sediment.

Accordingly, FirstLight submits for informational purposes a description of the pilot dredge and a manual of best management practices to be implemented during the pilot dredge to minimize the movement of sediment during the test. Among the attachments to these detailed documents are a site plan and technical specifications of the equipment to be used by FirstLight's contractors. As the enclosed documents reflect, the pilot dredge would affect about four acres, or approximately 1.5% of the Upper Reservoir. The dredge will move back and forth across the limited dredging area similar to a lawn mower cutting grass in a small portion of a large field. The depth of the dredge will be limited to approximately three feet during each pass, such that the sediment on the bottom of the Upper Reservoir will remain stable. The pilot plan calls for the removal of approximately 50,000 cubic yards of consolidated dry material over an approximately 90 day period beginning in mid-April. Although several other relicensing studies will be conducted during this timeframe, none will be conducted in the Upper Reservoir, and therefore none will be impacted by this test to be conducted in a minute portion of the Upper Reservoir. Should the need arise for any reason, however, the dredge can be immediately shut down by a single switch.

FirstLight consulted with USEPA and MADEP in the development of the pilot dredging plan and best management practices. In addition, FirstLight has notified the U.S. Fish and Wildlife Service and Massachusetts Division of Fisheries and Wildlife representatives of the pilot dredge.

If you have any questions, or need additional information about FirstLight's plans to undertake this small-scale pilot dredge of the Upper Reservoir, please feel free to contact me.

Sincerely,

John Howard

Attachments

cc: Gerald Cross, Regional Engineer, New York Regional Office

Potential Pilot Dredging Project Description

Northfield Mountain Pumped Storage Project FERC Project No. 2485-063

Prepared For:

FirstLight Power Resources

GDF SUEZ

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Northfield, MA 01360

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Date:

February 24, 2015

Table of Contents

1.0 INTRODUCTION

FirstLight Power Resources Services LLC (FirstLight), as an agent for FirstLight Hydro Generating Company, an affiliate of GDF SUEZ Energy North America, Inc. is continuing its assessment of sediment management techniques for the Northfield Mountain Pumped Storage Project (Project No. 2485), a 1,143-MW pumped storage project located along the east bank of the Connecticut River in the Towns of Northfield and Erving, Massachusetts.

The Project began commercial operation in 1972 and consists of an underground powerhouse, four reversible pump-turbine generators, an underground pressure shaft, four unit penstocks and draft tubes, and a mile-long tailrace tunnel connecting the powerhouse to a 20-mile-long reach of the Connecticut River known as the Turners Falls Impoundment, which serves as the lower reservoir. The manmade upper reservoir (Upper Reservoir) was formed with four earth-core rock fill embankment structures and a concrete gravity dam. The Upper Reservoir is depicted in Figures 1 and 2 of Appendix A.

1.1. Sediment Management Plan

In its Administrative Order dated August 4, 2010 the US Environmental Protecton Agency (US EPA) requested a report identifying measures to prevent discharges of sediments associated with draining the upper reservoir. Subsequently, by letter dated January 20, 2011, Federal Energy Regulatory Commission (FERC or the Commission) staff requested a plan to avoid or minimize the entrainment of sediment into the Project works during Upper Reservoir maintenance drawdowns. FirstLight filed its Sediment Management Plan (the Plan) with FERC on July 15, 2011. The Plan was developed in consultation with the USEPA and the Massachusetts Department of Environmental Protection (MADEP). The Plan contained proposed methods to assess sediment dynamics in the Project's Upper Reservoir and Turners Falls Impoundment (Connecticut River) from 2011 through 2014. The Plan also committed FirstLight, at the conclusion of the data collection and assessment efforts, to propose management measures to minimize entrainment of sediment into the Project works and Connecticut River. The Plan specifically provided that the management measures to be considered could include periodic dredging of the Upper Reservoir. In early 2012, FirstLight proposed certain modifications to the Plan, which FERC approved in March 2012.

During the study plan development phase of the Project relicensing, US EPA requested that FirstLight integrate the work being carried out for the Plan to be fully integrated into the FERC relicensing process. FirstLight agreed, and designated the Plan as relicensing Study No. 3.1.3. FirstLight also committed to extending data collection efforts pursuant to the Plan an additional year, through 2015, and including its proposed sediment management measures in the final report to be filed in December 2015. FERC approved the Plan as Study No. 3.1.3 in September 2013.

By letter dated December 1, 2014, FirstLight filed its Sediment Management Plan – Report of 2014 Activities. The report provides an overview of sampling efforts conducted in 2014. Specific components of the Plan implemented during this report period included an annual bathymetric survey of the Upper Reservoir, collecting Suspended Sediment Concentration (SSC) and Total Suspended Solids (TSS) grab samples from the project area, measuring SSC and particle size distribution (PSD) at three locations in the project area, developing a computational fluid dynamics model of the Upper Reservoir and reporting

requirements. The report also indicated that FirstLight was evaluating the feasibility of potentially conducting a pilot dredge of a portion of the Upper Reservoir, among other potential measures, to support the development of sediment management measures to be included in the December 2015 final report.

1.2. Deep Water Dredge Project

In furtherance of its development of the Plan, FirstLight has retained Dredge America, Inc. to assess and perform limited dredging of the Upper Reservoir. Dredging is one potential mechanism to avoid the entrainment of accumulated silt into the Project works and the Connecticut River at harmful levels during drawdown or dewatering activities. This document sets forth a pilot dredging project, as well as proposed associated best management practices (BMPs) to minimize the risk of sediment entrainment in Project works and the Connecticut River during the pilot program. FirstLight is considering many alternatives, as part of the development of the Sediment Management Plan.

Based on the information supplied by Dredge America, Inc., FirstLight believes that deep water hydraulic dredging may be a physically viable option for removing excess accumulated sediment in the Upper Reservoir. Use of marine deep water hydraulic dredging is not proven in pumped storage facilities, which is why FirstLight is considering a pilot or a test dredge. However, one of the advantages of deep water hydraulic dredging appears to be that it can occur while the Project is available for generation or pumping, which allows for removal of sediments without the need for removing the Project from service. In contrast, other mechanical means of sediment removal may require dewatering of the Upper Reservoir and would likely require an extended outage. The technology employed by Dredge America also inherently avoids disturbance of sediments outside the small area undergoing active dredging.

Because the pilot test could occur during generation, BMP's will be implemented prior to, during and subsequent to any potential pilot dredging to avoid sediment migration from the Upper Reservoir through the Project to Connecticut River. Although some of the proposed BMP's function to reduce or control the re-suspension of sediments in the Upper Reservoir, the objective of the BMP's are not to minimize suspension of sediments in the Upper Reservoir per se, but rather to prevent impacts to the Connecticut River.

2.0 LOCATION OF POTENTIAL PILOT DREDGE

The pilot dredge program would occur in an approximate 300 foot by 600 foot section of the Upper Reservoir, in a location outside of, but nearby the intake channel. The location is shown on Exhibit-1 within Appendix B. The potential pilot dredge would affect about 4 acres (1.5%) of the 274 acre Upper Reservoir. Approximately 50,000 CY of material is proposed to be dredged out of the Upper Reservoir as part of this pilot program.

3.0 DESCRIPTION OF DREDGE PROCESS

The potential pilot dredging project consists of a boat-mounted deep water dredge as the main platform. The unit will utilize a special Ellicot 370 HP dredge. Approximately 80 feet of additional flotation will be added to the front of the dredge in order to extend the ladder line and reach the required 125 foot depth. This depth of dredging will require an underwater pump to lift the slurry off

the bottom of the reservoir. The power unit will be set on a second dredge platform positioned next to the main dredge.

The hybrid dredge setup will be running from a static cable that will reach across and be anchored on opposing shores of the Reservoir. The dredge will ride along the cable and slowly suction an area approximately 8 feet wide per pass. The dredge will be making passes back and forth across the limited dredging area similar to a lawn mower cutting the grass within a large field. The depth of the suction will also be limited to approximately 3 feet so that the sediment on the reservoir bottom will remain stable. The dredged slurry mixture will be incorporated with a polymer additive while being pumped into the Geotube dewatering system, which will be located adjacent to the Upper Reservoir. Sediments from the sediment-water mixture will be substantially captured in the Geotubes, with the filtered effluent out flowing back into the Upper Reservoir at a controlled flow rate.

Should the need arise for any reason, Dredge America will have the ability to immediately shut down the dredge/pump with a single switch. All dredging operations can stop and FirstLight can take any appropriate action to address the conditions, including shutting down the Project. In addition, Dredge America will have several hundred feet of turbidity curtains on site in order to contain any sediment discharges that happened during the course of the pilot dredge. If needed, the curtains may help limit the spread of solids around the dredge operation area. The curtains are made up of a PVC fabric that are wrapped around a flotation collar and extend to a varying depth below the surface. The solids contained within this containment area are given increased time to naturally settle back down to the bottom of the reservoir. Refer to Appendix B for site details.

The polymer additive chosen for this pilot project is Solve 137 manufactured by WaterSolve LLC and is an organic cationic emulsion polymer. Samples of the Upper Reservoir sediment were taken by Northfield Mountain Representatives and coordinated with the Contractor and WaterSolve. Dry samples and 5 gallons of make-down water from the Upper Reservoir, were tested to determine the best polymer for this settling application. The best treatment solution, at a dredge flow rate of 3,500 GPM, with 10% solids during pumping, proved to be 0.6 lbs/dry ton of Solve 137. Specifications on this emulsion polymer are provided within Appendix D.

Dredge America is confident that this proposed design and methodology is suitable for dredging in the Upper Reservoir, as they have used the same process successfully on many projects. Over the past 24 years, Dredge America has performed over 200 projects including one at Northfield Mountain. For more information about Dredge America's qualifications and the proposed pilot dredge equipment, refer to Appendix G for details.

4.0 STAGING OF DREDGED SEDIMENT AND GEOTUBE SYSTEM

The pilot dredging of the Upper Reservoir will include the preparation of a staging area and temporary sediment containment area located on the peninsula adjacent to the Intake Channel. A portion of this area will be utilized by the Contractor for daily operations to position machinery, stockpile operational materials and store supporting parts required for the dredge and Geotube system. Adjacent to the staging area, a temporary excavated containment area will be constructed for the required Geotube system. The excavated area required is approximately 450 feet by 250 feet. FirstLight has already prepared a 460 foot by 210 foot by 10 foot deep excavation in anticipation of the dredging pilot

program. Minimal site preparation and fine grading will be required for the proposed Geotube system within this excavation. Heavy equipment and trucking operations will be designated along the existing gravel access way located along the southerly side of the peninsula and parallel to the intake channel. Refer to Appendix B for details.

A Construction of the Geotube dewatering system will consist of utilizing the roughly 3 acre staging area on the peninsula located on the north side of the Intake Channel (refer to Appendix B). A 3 foot high perimeter containment berm will be constructed around ±10' deep temporary sediment trap in order to contain the tubes and dewatering run-off within.

The bottom of the containment site will be level and large enough for the tubes to be staged and stacked on. The tubes are to be filled one level at a time. A sump will be located in the Northwest corner of the tube staging area and will be roughly 2' below the outflow discharge pipe. This sump area will allow for residual material to settle out before the effluent is returned to the Upper Reservoir. After all of the earth work is complete a 10 mil poly liner or equivalent is to be placed over the top of the entire containment site (berms and all). The liner is designed to prevent undercutting around the tubes during the dewatering process.

A manifold piping system will be set up surrounding the tube area. This system of pipes and valves will feed the tubes with the combined sediment and water mixture removed from the reservoir bottom. In order to keep the tubes stable each tube will be secured to the adjacent tube using the manufactured ties built into the tubes. Each of the outside tubes will be secured to stakes driven into the ground around the perimeter of the staging area. Once the piping system is setup, which would include the organic emulsion polymer injection system, pumping can begin.

The first approach of the dredging process is to pump the denser material into the tubes in order to create a more stable base for stacking the tubes. The first level of tubes will consist of (10) 90' circumference by 100' long tubes and (10) 90' circumference by 150' tubes. Each of the 150' tubes will be paired with a 100' tube in order to make up the 250' base. It was recommended by the manufacturer to use two staggering tubes on each level instead of one 250' tube in order to add interlocking stability as the tubes are stacked. Each additional level of tubes is roughly 20' shorter than the layer before. This will create the inter-layer locking mentioned above, along with creating a working platform when inspecting the tubes. Multiple tubes will be pumped into at one time in order to maximize production and increase the amount of solids that can settle out within the tubes. The contractor anticipates pumping in up to (3) tubes at one time, with the option of pumping in to any of the ten tubes per layer as needed. Each tube will be completely filled several times before it is deemed full. This process of filling and decanting usually happens roughly three times before at tube is considered full. The pipe manifold system is what allows the tubes to be filled one at a time at first and then in multiples to maintain dredging production/operations. The tubes will be filled to a maximum height of 8' in order to maintain integrity of the tube.

The Geotubes that are recommended for this pilot project are TITANTube Geotextile bags. The Standard specifications are included within Appendix C. The rate at which the tubes will be pumped into is within the proposed range of 2500-3500 GPM. TITANTubes are able to return clean effluent water at a rate of 35 GPM/SQFT. This means as each tube is being filled for the first time the dewatering site will be experiencing a return water flow rate equal to the dredge flow rate. This rate will slow down as the

square footage of open tube is replaced with dredged material. At a certain point the tube will no longer be able to return water at the rate which it is being filled. Once this happens, one of the valves in the manifold system will be switched and pumping into a new tube will commence. Once all tubes have been filled at least once there will be a point where the return water flow rate from one tube could be less than the dredge flow. At this time the Contractor plans to reduce the flow into each tube by filling multiple tubes at the same time. The expected outflow for the duration of the project will be very similar to the flowrate out of the dredge. In order to keep up with this flowrate an 18" gravity return line or two 12" gravity lines will be installed in the North West corner/sump area as shown on the Exhibit within Appendix B.

5.0 MONITORING OF THE PILOT DREDGE

Additional testing of the Solve 137 additive will be performed once the contractor has been mobilized on-site. This will reconfirm that the additive is suitable or additional additives will be required for the treatment process. The additive treatment process will begin by incorporating slightly less than the recommended solution. This is done to ensure the polymer is working properly and not settling the material out too quickly with the new flocs breaking up immediately as they enter the tubes. This process will continue throughout the first day of pumping until an optimal dosage rate is established. In order to keep the injection rate at the optimum level daily samples must be taken from a specific point in the discharge line, before the slurry enters the tubes. Monitoring of this sampling point will occur every 3 hours during the dredging operations. The sample point is simply a tapped location in the pipe where a ball valve is installed. This allows for the superintendent or site manager to take a sample from the dredge line directly into a 5 gallon bucket. At this time the employee will visual asses the settling process and determine if the dosage rate should increase, decrease, or stay the same. Note, if the sampling location is in the right spot and if the dosage rate is close to optimum the sediment will begin forming flocs immediately and begin to fall to the bottom of the bucket. This sampling process will occur 4 times a days (every 3 hours) and will be documented on a testing sheet. Copies of these weekly testing sheets will be kept onsite in the event they need to be referenced at any time.

One goal of the pilot dredge is to have no noticeable sediment plumes at the return location within the Upper Reservoir. To meet this target return water quality, the pilot operation shall treat the slurry mixture with the proper additive at the proper dosage rate, properly construct the staging and dewatering area for the Goetube system and construct a sump area at the outflow location. Additional BMP's such as but not limited to the installation of no-woven fabric at the dewatering sump or installation of a turbidity curtain can be deployed as needed. The dredge operators, floc technician, basin monitor and FirstLight representative shall monitor operations for visual plumes at all times. At any visual indication of a plume, dredge operations shall stop, the situation shall be investigated and adjustments shall be made to the equipment in order to correct the issue. In addition to this ongoing monitoring, daily inspections of the return water location will take place every 3 hours, which is the same as chemical dosage testing. The visual observations will be recorded on a weekly log that will be kept onsite for reference throughout the duration of the project. The log shall include the daily events along with any corrective measures if needed. Although the goal is to have no visible plume at the

return water location, if one was to occur, the outfall location is approximately 3,400 linear feet away from the intake channel by means of the reservoir body. Any plume would be diluted by mixing within the reservoir's morphological characteristics and existing water quality. Periodic monitoring of the intake channel will occur throughout the pilot project.

6.0 FUEL STORAGE, SPILL RESPONSE, DREDGE MONITORING, AND EQUIPMENT SAFETY

Dual containment shall be provided for any fuel stored where it could drain into the Upper Reservoir. Storage shall also comply with all other applicable local state and federal regulations. Storage, fueling and lubrication will be completed in a manner that ensures maximum protection against any spillage and evaporation. Any dredging equipment and any support boat(s) mobilized into the Upper Reservoir will be outfitted with a spill kit to contain any petroleum or other hazardous fluid leakage. Contractors will be trained to notify FirstLight in the event of a spill and to make any required regulatory notifications, as well as to take all necessary steps to contain and control the spill.

In the event of an emergency, Dredge America will have the ability to immediately shutdown the dredge/pump with a single emergency switch. In addition to shutting down the dredge several hundred feet of turbidity curtain will be kept on site in order to contain any sediment discharges that happened during the course of the project. These curtains will be next to the water's edge so they can be quickly implemented in the case of an emergency. At all times the outlet discharge pipe will be surrounded by a turbidity barrier in order to contain any returning sediment particles and to assist in identifying any visual sediment plumes caused by the dredging process. Refer to the Dredge America, Combined Health and Safety, Accident Prevent Plan with Appendix F for details.

7.0 REPORTING

The results of the pilot dredge will also be considered in the context of the final report required by the Sediment Management Plan and Study No. 3.1.3 to be filed in September 2015.

Appendix A

Site Location & USGS Maps

Potential Pilot Dredging Project

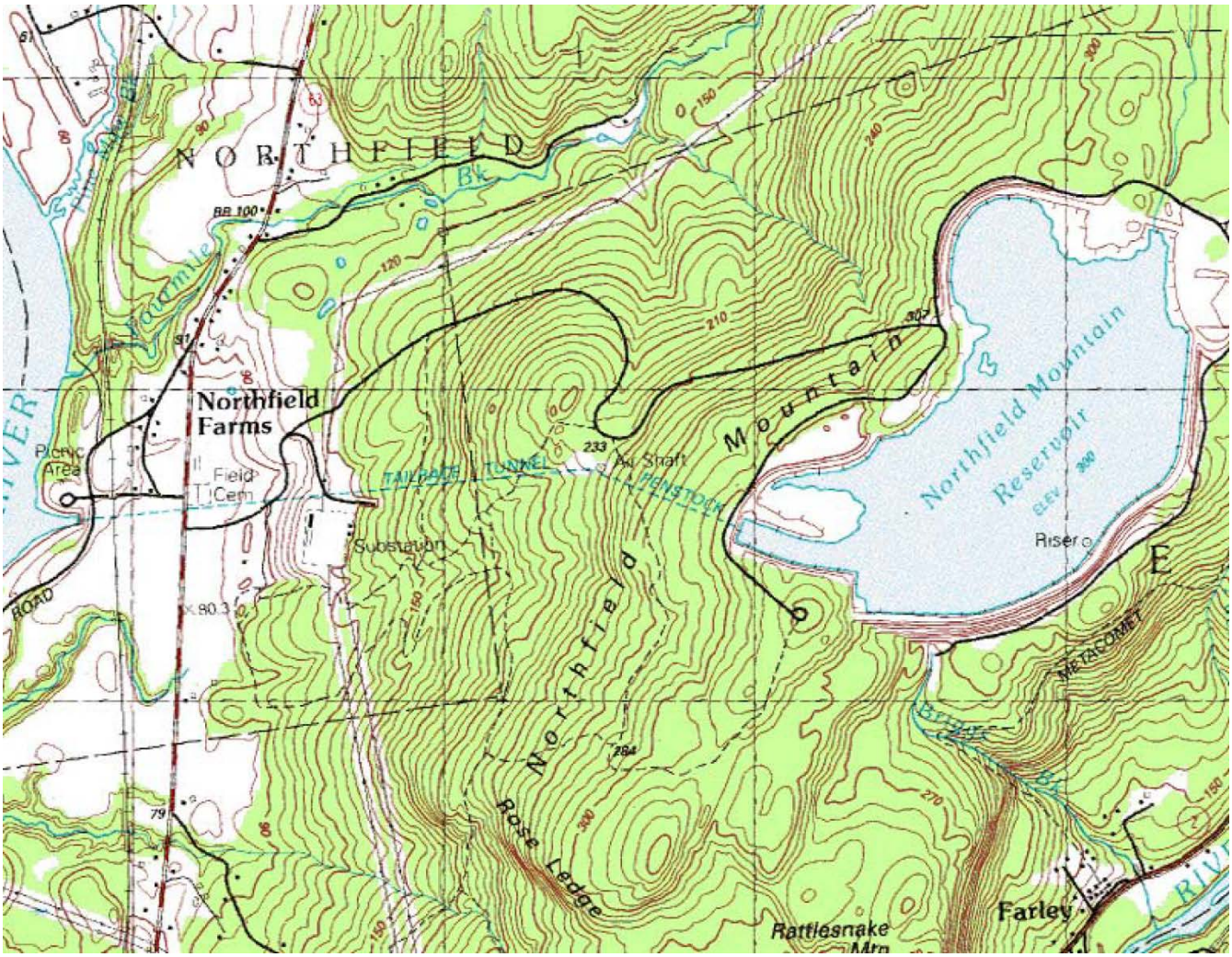
FirstLight Power Resources

GDF SUEZ

Figure - 1

Potential Pilot Dredging Project

Figure – 2

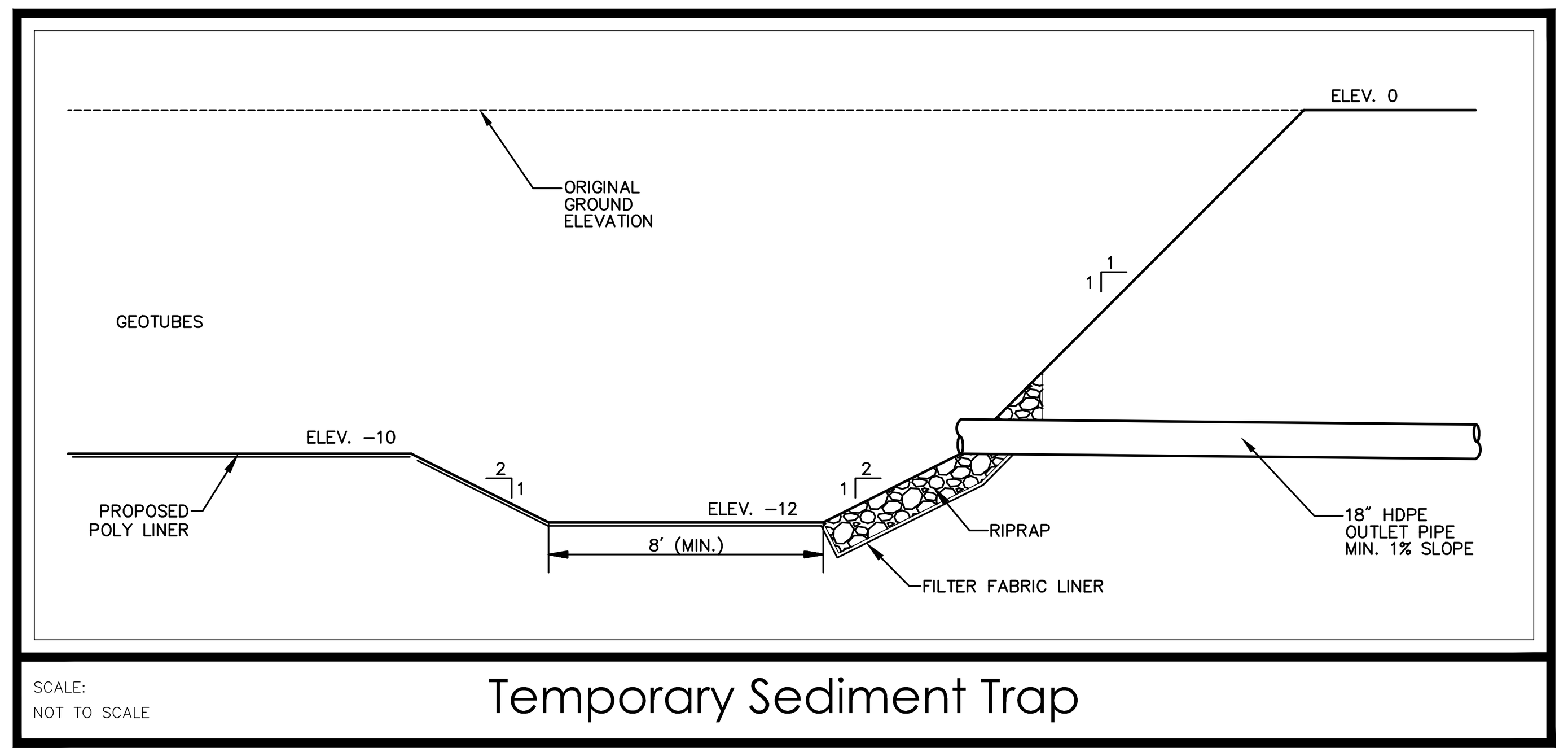


Appendix B

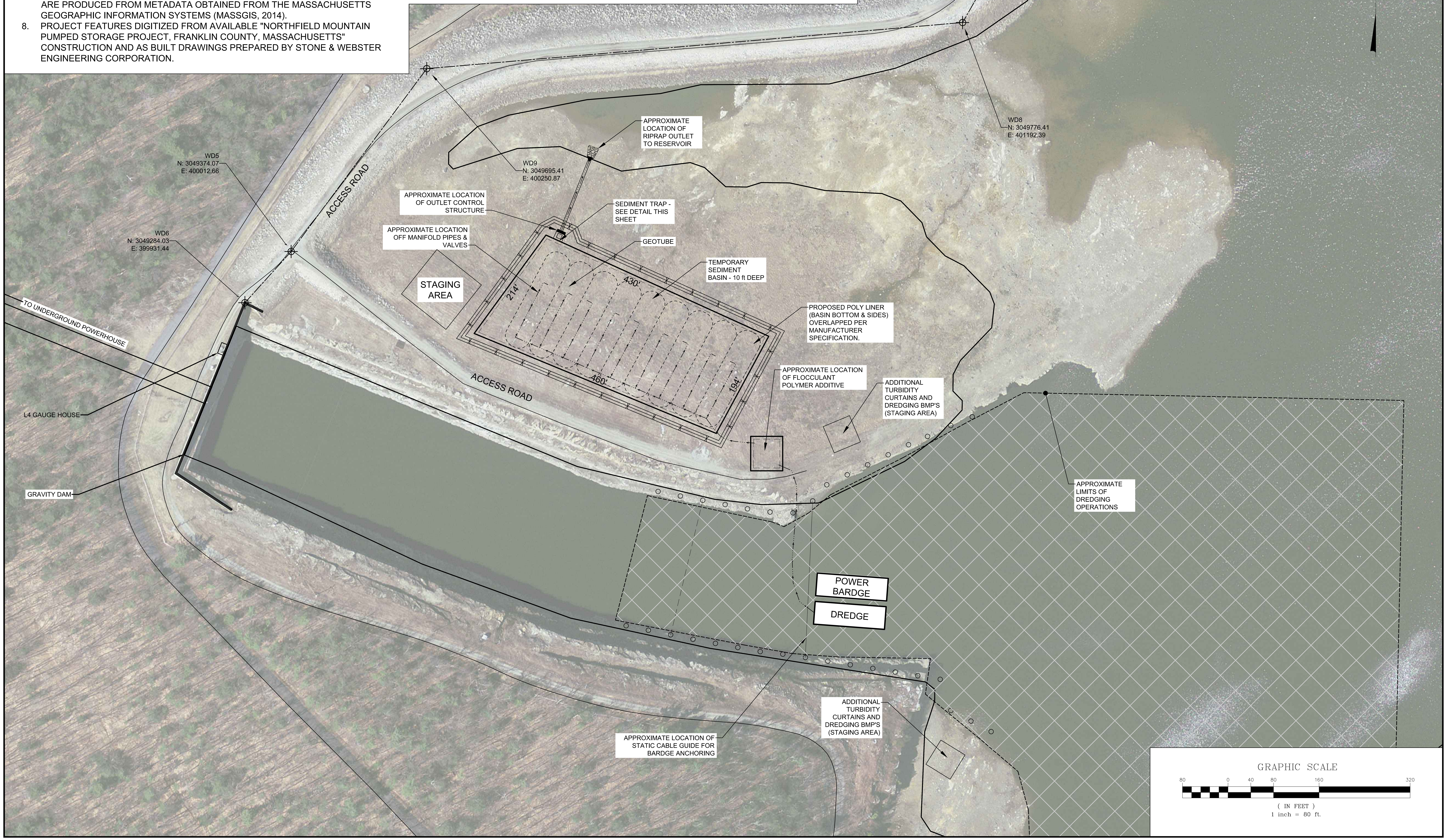
Upper Reservoir, Potential Pilot Dredging Project, Exhibit-1

NOTES:

1. ELEMENTS SHOWN ON THIS PLAN HAVE NOT BEEN ENGINEERED AND WILL BE DESIGNED AND CONSTRUCTED IN THE FIELD.
2. INSPECTORS FROM NEE AND D&A WILL BE ONSITE DURING CONSTRUCTION AND DREDGING OPERATIONS.
3. THE DREDGE OPERATORS, FLOC TECHNICIAN, BASIN MONITOR, AND FIRSTLIGHT REP ON SITE, SHOULD BE MONITORING OPERATIONS FOR VISUAL PLUMES AT ALL TIMES. AT ANY VISUAL INDICATION OF A PLUME, DREDGE OPERATIONS SHOULD STOP, INVESTIGATE, AND ADJUST EQUIPMENT TO CORRECT THE SITUATION. A LOG SHOULD BE KEPT THAT RECORDS: THE EVENT, DURATION, SEVERITY, CONSEQUENCES, CORRECTION, ETC.
4. DREDGE AMERICA SHALL HAVE A WRITTEN SHUT-DOWN PROCEDURE ONSITE AT ALL TIMES SHOULD A PLUME BE VISIBLE AT ANYTIME DURING THE DREDGING OPERATIONS.
5. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE (NAD27, FEET).
6. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88, FEET).
7. BASE INFORMATION, INCLUDING TOPOGRAPHY, ROADWAYS, AND WATERWAYS ARE PRODUCED FROM METADATA OBTAINED FROM THE MASSACHUSETTS GEOGRAPHIC INFORMATION SYSTEMS (MASSGIS, 2014).
8. PROJECT FEATURES DIGITIZED FROM AVAILABLE "NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT, FRANKLIN COUNTY, MASSACHUSETTS" CONSTRUCTION AND AS BUILT DRAWINGS PREPARED BY STONE & WEBSTER ENGINEERING CORPORATION.



Temporary Sediment Trap



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NO.	DATE	REVISION	APP.
1			
2			
3			
4			
5			
6			

Upper Reservoir
Potential Pilot Dredging
Project - Exhibit 1

First Light
Northfield Mountain
Millers Falls Road (Route 63)
Northfield, MA

Scale: 1" = 80'
Designed: LAR
Drawn: JBB
Reviewed: TJH
Date: February 13, 2015

SHEET
1
1 OF 1

Project No:
655-017

Appendix C

Geotube Specifications

TITANTube®

TITANTube® Hi-Flo OS425 is composed of high-tenacity polypropylene (PP) yarns, which are woven into a network in such a manner that the yarns retain their relative position to each other for the high demands required. **TITANTube® Hi-Flo OS425** is inert to biological degradation and resistant to most naturally encountered chemicals alkalis and acids.

TITANTube® Hi-Flo OS425

Properties	Test Method	Unit	MARV
Fabric Strength (MD x CMD)	ASTM D4595	Lbs/in	425 x 650
Fabric Elongation (MD x CMD)	ASTM D4595	%	20 x 20 (max)
Factory Seam Strength	ASTM D4884	Lbs/in	425
Apparent Opening Size - AOS	ASTM D4751	US Sieve	40
Water Flow - Rate	ASTM D4491	gpm/ft^2	35 (min)
UV Resistance – Retained after 500 hrs	ASTM D4355	%	95
Angle of Friction – Fabric to Sand Fabric to Fabric	ASTM D5321	Degrees	30 18
Color – MD/CMD	na	na	Sand/Sand

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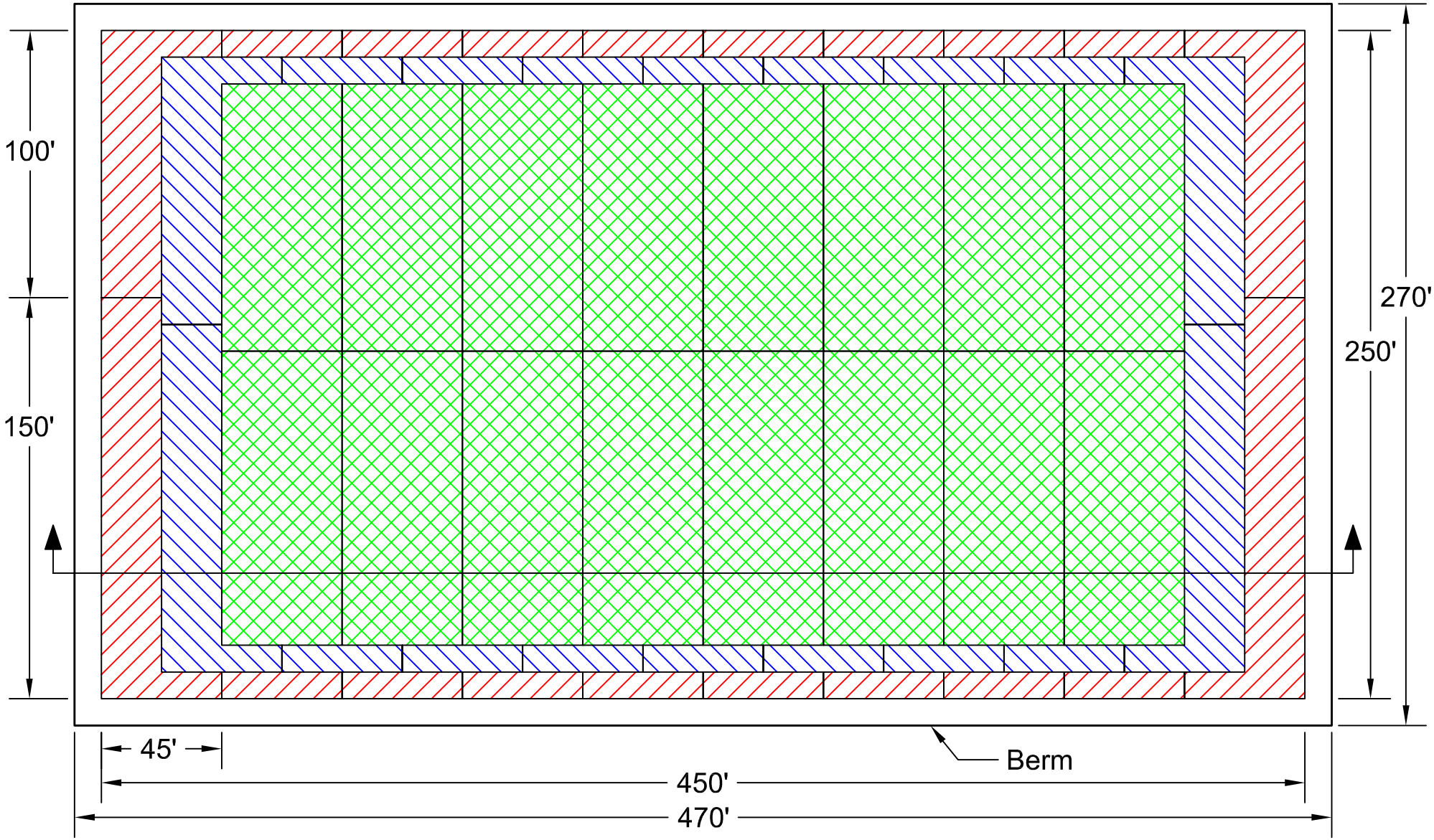
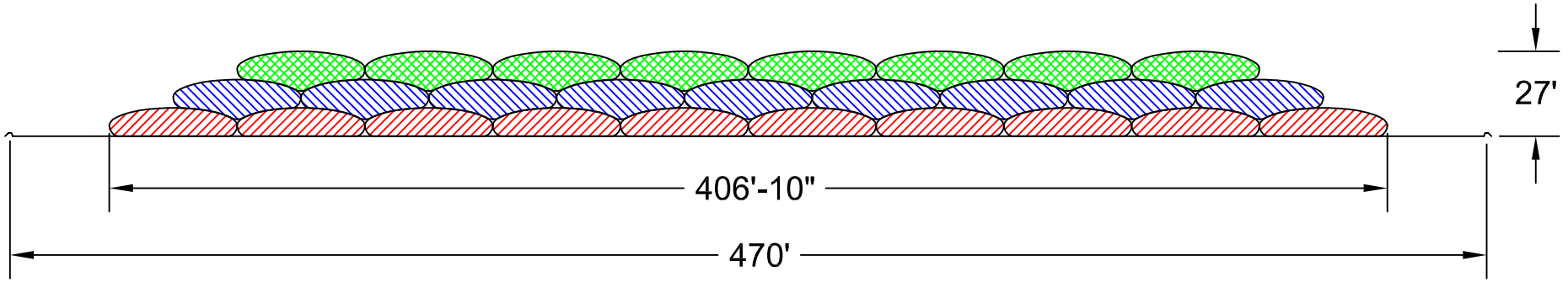
Layflat Top View



Pump Tubes Cross-cut Section



Tier #1			Tier #2			Tier #3		
90' Circ X 100' Long	10	1,000 LF	90' Circ X 100' Long	9	900 LF	90' Circ X 100' Long	8	800 LF
90' Circ X 150' Long	10	1,500 LF	90' Circ X 130' Long	9	1,170 LF	90' Circ X 110' Long	8	880 LF
		2,500 LF			2,070 LF			1,680 LF
TOTAL CY @ 8' T = (6250 LF) X (8 CY per LF) = 50,000 CY								

Appendix D

WaterSolve Geotube Dewatering Performance Trials and Cone Tests

DEWATERING TRIAL PERFORMANCE
DREDGE AMERICA
NORTHFIELD MOUNTAIN SEDIMENT

For:
Sam Robinson
Dredge America Inc.
9555 NW Highway N,
Kansas City, MO 64153

By:
WaterSolve, LLC
5031 68th St., SE
Caledonia, MI 49316
www.gowatersolve.com
616-575-8693

November 26, 2014

1. Scope of Work

WaterSolve, LLC was tasked to perform Geotube® dewatering performance trials and Cone Tests on a sediment sample from Storage Facility Lake in Northfield, MA. The objectives of these dewatering trials were to identify chemical conditioning program(s), identify polymer flocculant(s), and dosing rate(s) for a potential Geotube® dewatering application. The objectives of subsequent Cone Tests were to measure total solids (TS) of the flocculated, contained, and dewatered residual after passage through Geotube® GT500D fabric.

2. Materials & Methods

Two five-gallon buckets (one containing sediment, the other containing site water) were received at WaterSolve's laboratory (Caledonia, MI) on November 24, 2014. Preliminary testing determined dilution would be necessary. A 1:5 dilution (sediment: site water) was used to identify the correct chemical conditioning program. Samples of residual were diluted 1:5, homogenized, and 150-mL samples were placed in graduated, glass jars.

Several polymers (emulsions) were "made-down" at a 0.5% concentration for this dewatering trial. Polymer (0.5 to 2-mL; 17 to 67-ppm) was added to a sample with a 10-mL plastic syringe and moderately tumbled five to seven times. Observations of water release rate, water clarity, and flocculent appearance were recorded on appropriate data sheets (Appendix A). Polymer(s) that flocculated and dewatered these residuals most effectively were re-evaluated with lower doses in order to isolate the most efficient dewatering and flocculating polymer(s).

Percent total solids (dry weight) of the initial residual samples, diluted residual samples, and dewatered cake samples (captured on Geotube® GT500D fabric) were measured.

3. Results

Chemical conditioning with Solve 137 was determined to flocculate and dewater the residual most effectively compared to the other products (Appendix A). Water release volume and flocculent appearance were good to excellent when a 1-mL (33-ppm, 0.6-lbs/dry ton) dose of Solve 137 was added to a 150-ml diluted sample.

The provided sample was 86.4-percent dry weight solids. The diluted sample (1:5, sediment: site water) was 12.1-percent dry weight solids. After dewatering a 1000-mL diluted and conditioned sample using Geotube® GT500D fabric, percent solids increased to 55.5-percent after sixty minutes of dewatering time. From this 1000-mL diluted and conditioned sample, 500-mL and 650-mL of water was released in one minute and sixty minutes, respectively, through the fabric. Total suspended solids (TSS) and Turbidity readings were taken on the filtrate after passage through the Geotube® fabric. TSS and Turbidity on the filtrate was 12-mg/L and 10 NTU, respectively.

4. Recommendations

We recommend a product application of Solve 137 for dewatering the residuals in a Geotube® application in order to pass a paint filter test for subsequent disposal. Additional evaluation is recommended for determining optimal inline percent solids thresholds for Geotube® performance including filtrate release and solids consolidation over time.

Solve 137 is required to be made-down at 0.5% with a polymer make-down unit or aged in batch/feed tanks prior to injection into the residual line. Moderate to high mixing energy is required between the polymer injection points and the Geotube® containers (e.g., two to three bends in the discharge line and/or inline static mixers).

Expected time to being able pass a Paint Filter Test is unpredictable in a Geotube® container from these bench-scale experiments. An onsite or laboratory hanging bag or Geotube® dewatering trial (GDT) may be used and is recommended if the timeline for achieving project goals of dry weight solids and if Geotube® filtrate characteristics are in question for this application. Additional dewatering evaluations over time are recommended if project objectives for consolidation are greater than passing a Paint Filter Test.

Please note, while a composite sample may give us an indication of an average treatment scenario, it does not indicate pockets of concern for treatment effectiveness or areas that may require a higher or lower dose of chemistry, or contain higher in situ solids, since the areas of concern may be masked by factors of dilution from other areas.

Due to potential variability of the material, daily on-site testing and chemical conditioning verification are recommended during pumping operations.

Page 1 of 1

WaterSolve, LLC

Clearly thinking about your water treatment!

DEWATERING PERFORMANCE TRIAL

Date: 11/24/14
Analyst: Kyle F

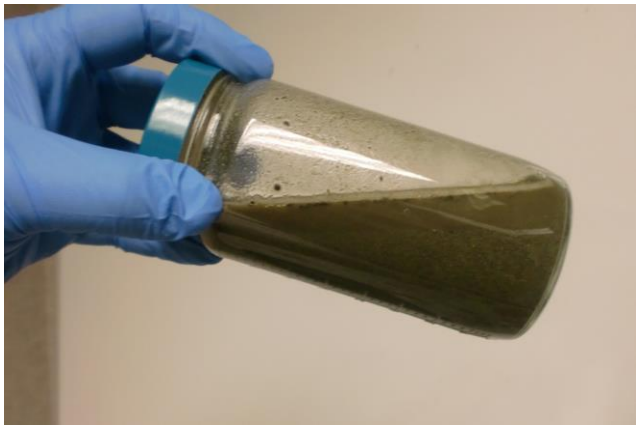
Customer: Dredge America
Location: Northfield Mountain
Equipment in Service: Geotube

1=Best 6=Worst

Jar Number	Polymer Name	Polymer Dosage (mL)	Sample Size (mL)	Water Rel. Rate (1 - 6)	Water Clarity (1 - 6)	Floc Appearance (1 - 6)	Comments
	Polymer make-down concentration = 0.5 % Dilution of test sample = 1:5 (sediment : site H_2O)						
1	163	1 mL	150 mL	6	6	5	
2		2 mL		2	5-6	2-3	
3	137	1 mL	150 mL	1-2	1-2	1-2	No good treatment best
4	153	2 mL	150 mL	1-2	2-3	1-2	
5	161	2 mL	150 mL	5-6	6	5	
6	2230C	2 mL	150 mL	3-4	5	3	
7	2200A	2 mL	150 mL	1-2	2	2-3	
8	9310	2 mL	150 mL	2-3	3	2	
9	9330	2 mL	150 mL	6	6	5	
10	9350	2 mL	150 mL	3-4	4	3	
11	151	2 mL	150 mL	1-2	1-2	2	
12	216P	1 mL	150 mL	1-2	1-2	1-2	
13	9244	1 mL	150 mL	2	1-2	2	
14	9245	1 mL	150 mL	2-3	2	2	
15	426/151	1 mL/1 mL	150 mL	1-2	1-2	1-2	No good treatment, best dual treatment
16		1 mL/2 mL	150 mL	1-2	1-2	1-2	
17		2 mL/2 mL	150 mL	1-2	1-2	1-2	
18	426/2200A	1 mL/2 mL	150 mL	1-2	2	1-2	
19		2mL/2 mL	150 mL	1-2	1-2	1-2	
20							
21	137	0.5mL	150 mL	1-2	2	2-3	
22	151	1 mL	150 mL	1-2	2-3	2-3	
23							
24							
25							
26							
27							
28							

Cone Test / RDT: 1000 mL sample conditioned with 6.7 mL of 137 poured thru GT500D Geotube® filter.
Filtrate Quality: TSS- 12 mg/L Turbidity- 10 NTU Filtrate collected @ 1min: 500 mL 60min: 650 mL

Appendix B-



One hundred fifty milliliters of diluted sample prior to conditioning is on the left. One hundred fifty milliliters of diluted sample, conditioned with Solve 137 is on the right.

One thousand milliliters of diluted and conditioned sediment sample was dewatered using Geotube® GT500D fabric. The captured solids and filtrate are shown above.

Appendix C-

Total Solids Determination - Percent Dry Weight

Customer Name/Application: Dredge America / Northfield Mountain

Date: 11/24/14 Technician: Kyle F Oven Temperature: 105°C

Sample ID: Raw Soil Dish Number: 1 Dilution: Ø

Dish (dry) = 49.076 g Dish, Sample (wet) = 120.099 g Dish, Sample (dry) = 110.439 g

Dish, sample (wet) – Dish (dry) = 71.023 (A) Dish, sample (dry) – Dish (dry) = 61.363 (B)

Total Solids B ÷ A x 100 = 86.4 % Dry Weight Solids

Sample ID: Diluted 1 Dish Number: 2 Dilution: 1:1 (sample : site H_2O)

Dish (dry) = 50.711 g Dish, Sample (wet) = 176.392 g Dish, Sample (dry) = 124.949 g

Dish, sample (wet) – Dish (dry) = 125.681 (A) Dish, sample (dry) – Dish (dry) = 74.238 (B)

Total Solids B ÷ A x 100 = 59.1 % Dry Weight Solids

Sample ID: Diluted 2 Dish Number: 3 Dilution: 1:5 (sample : site H_2O)

Dish (dry) = 50.302 g Dish, Sample (wet) = 142.938 g Dish, Sample (dry) = 61.536 g

Dish, sample (wet) – Dish (dry) = 92.636 (A) Dish, sample (dry) – Dish (dry) = 11.234 (B)

Total Solids B ÷ A x 100 = 12.1 % Dry Weight Solids

Sample ID: 1 Hour Cake Dish Number: 2 Dilution: 1:5 (sediment : site H_2O)

Dish (dry) = 45.903 g Dish, Sample (wet) = 196.267 g Dish, Sample (dry) = 129.386 g

Dish, sample (wet) – Dish (dry) = 150.364 (A) Dish, sample (dry) – Dish (dry) = 83.483 (B)

Total Solids B ÷ A x 100 = 55.5 % Dry Weight Solids

Sample ID: _____ Dish Number: _____ Dilution: _____

Dish (dry) = _____ g Dish, Sample (wet) = _____ g Dish, Sample (dry) = _____ g

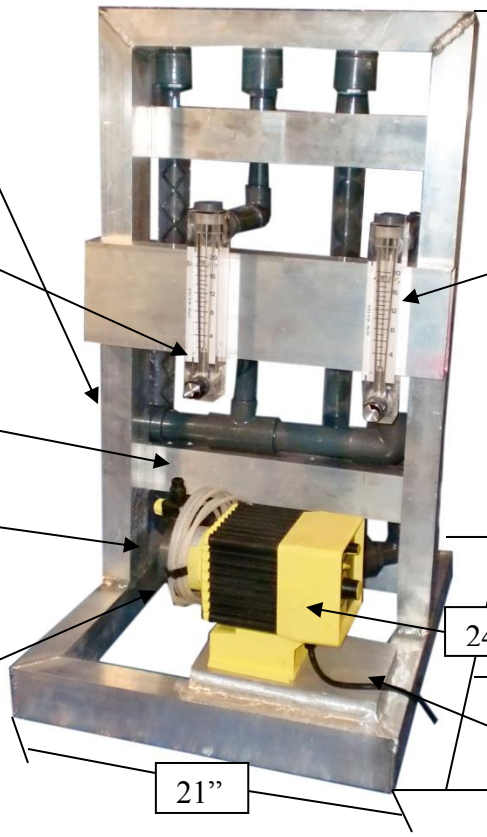
Dish, sample (wet) – Dish (dry) = _____ (A) Dish, sample (dry) – Dish (dry) = _____ (B)

Total Solids B ÷ A x 100 = _____ % Dry Weight Solids

MSDS - Available at www.gowatersolve.com or upon request.

WSLP1000V2

FRONT



SYSTEM REQUIREMENTS:

WATER SUPPLY-

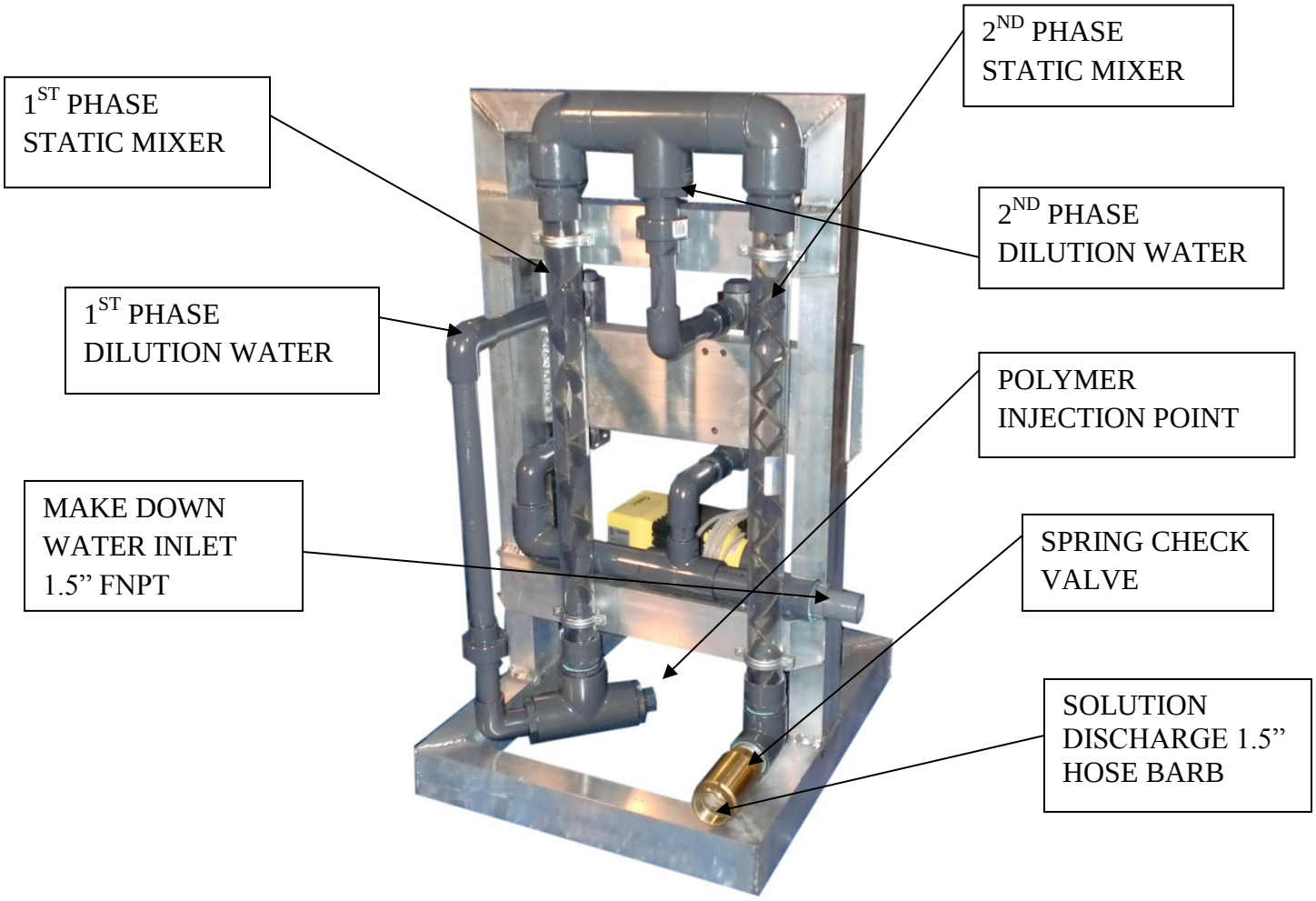
- ✓ MAX 65.0 PSI MIN 40.0 PSI
- ✓ MAX 40.0 GPM MIN 6 GPM

NOTE: FLOW AND PRESSURE REQUIREMENTS MAY VARY BASED ON POYMER FEED RATE, RESIDUAL FLOW CHARACTERISTICS AND OTHER FACTORS

ELECTRICAL – 120V a.c. 50/60 Hz 1.50A

Shown with LMI pump

BACK


1ST PHASE STATIC MIXER
2ND PHASE STATIC MIXER
2ND PHASE DILUTION WATER
1ST PHASE DILUTION WATER
POLYMER INJECTION POINT
MAKE DOWN WATER INLET 1.5” FNPT
SPRING CHECK VALVE
SOLUTION DISCHARGE 1.5” HOSE BARB

Appendix E

SeaVision Bathymetric Survey

SeaVision Underwater Solutions, Inc.
151 Martine Street, Suite 103
Fall River, MA 02723
508-250-0605 (phone)
401-633-7113 (fax)
jsnyder@seavisionmarine.com

VIA ELECTRONIC DELIVERY

November 10, 2014

Brian Sousa
GDF Suez / First Light
99 Millers Falls Road
Northfield, MA 01360

Subject: **GDF-Suez/FirstLight**
2014 Northfield Mountain Bathymetric Survey – Upper Reservoir/Intake Channel

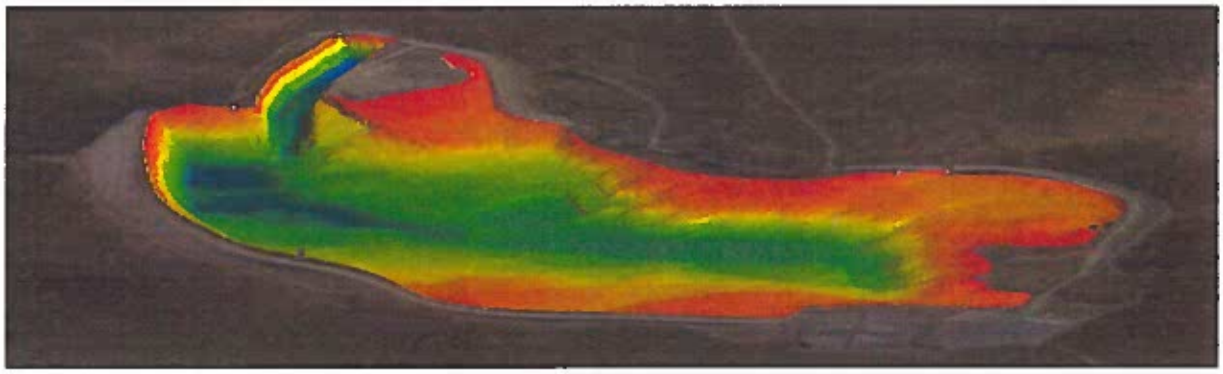
Mr. Sousa,

Thank you for contacting SeaVision Underwater Solutions, Inc. (SeaVision) regarding the bathymetric survey and underwater investigation services you required at the Northfield Mountain Pumped Storage Hydroelectric Facility in Northfield, MA. This is a site with which SeaVision is intimately familiar and we recently completed our survey and investigation services during the planned outage on October 11 – 12, 2014. The following letter report discusses our activities and our findings.

Bathymetric Survey Methodology

SeaVision Underwater Solutions, Inc. (SeaVision) performed a swath ***multibeam bathymetric survey*** of the reservoir in accordance with the U.S. Army Corps of Engineers Hydrographic Survey Manual (EM 1110-2-1003). SeaVision provided an American Congress of Surveying and Mapping (ACSM) Certified Hydrographer to perform all field data acquisition activities and process all bathymetric survey data.

SeaVision performed a multibeam bathymetric survey of the project area by utilizing a 19-foot aluminum workboat. Multibeam bathymetric surveys are preferred for this type of project because they supply nearly 100% coverage of the basin bottom in the project footprint and therefore highlight any critical features that might otherwise be missed between profiles when performed with a singlebeam echosounder.



Horizontal Reference Datum

The horizontal reference datum for the project is the North American Datum of 1983 (NAD 83). The reference ellipsoid associated with NAD 83 is based on the Geodetic Reference System of 1980 (GRS 80). The coordinate system is the North American Datum of 1983, Massachusetts (Mainland) State Plane, a conformal projection system based on NAD 83. In Massachusetts the SPCS 83 is based on the Lambert conformal map projection (zone 2001). Horizontal coordinates are expressed in U.S. Survey Feet.

Vertical Reference Datum

All reservoir depths are represented as elevations referenced to the Northfield Mountain Pumped Storage Facility (NMPSF) site vertical datum. According to the Hydrographic Survey Bid Specifications document, dated April 4, 2013, provided by FirstLight Power Resources, "….the local site datum was previously calculated to be +0.398 feet to the North American Vertical Datum of 1988 (NAVD 88)." Elevations are expressed in U.S. Survey Feet. The vertical benchmark held for this survey is a lead plug and tack located on the north west corner of the concrete MDC intake structure and is known as CP9 (Elev. = 1009.94 ft. NMPSF datum). During all survey operations on October 11 – 12, 2014, water level elevations were consistently recorded at 1000.4 feet relative to the NMPSF datum.

Positioning System

To record horizontal and vertical positioning during all survey operations, SeaVision utilized an SBG Systems Ekinox Inertial Navigation System / GNSS Global Positioning Satellite Receiver System. The inertial navigation system integrates a tactical grade inertial measurement unit with a dual-receiver survey-grade GPS system to provide accurate horizontal and vertical positioning, and heading, pitch, and roll information continuously during all survey operations.

Real-Time Kinematic (RTK) GPS corrections were supplied by the KeyNetGPS Subscription Virtual Reference Station (VRS) service, which models corrections based on a network of base stations throughout the northeastern United States. The VRS service therefore relieves the requirement of establishing a local base station by delivering the corrections via cellular network modems with a periodicity of 1 to 2 seconds. By calculating the height of the primary antenna phase center relative to the water line and periodically comparing the GPS-observed water level with the actual observed water level at the facility, it is possible to maintain vertical control near 0.2 feet during all survey operations.

Sonar System

Soundings were obtained using a Norbit WBMS 455 kHz wideband precision multibeam echosounder. The echosounder has an accuracy of ±1 cm (±0.03 ft.) ±0.1% of depth and a resolution of 0.1 feet. The principle difference between this sonar and a traditional singlebeam echosounder is that this multibeam echosounder transmits and receives 256 beams simultaneously (rather than one beam). The echosounder operates at a frequency of 455 kHz. Digitized depths were obtained at a rate of approximately ten (10) to twenty (20) sweeps per second using commercially available software operated on a compact Core i5 computer

System Calibration

Proper survey operations require several periodic tests. For the profile of sound velocity in water, SeaVision utilized a Sontek/YSI Castaway CTD to perform periodic (twice daily) sound velocity profiles in the intake channel as a means of compensating for any changes in sound velocity during the survey operations.

Multibeam bathymetric surveys require that the commissioning of the system onboard the system compensate for both linear offsets between GPS antennas, inertial measurement units, and the sonar, as well as any angular offsets that may exist. Linear offsets were measured with survey grade measurement tapes on a

level surface (prior to arrival on-site), while angular offsets were measured via "patch test" calibration methods that are prescribed by survey technical manuals and automated with the hydrographic survey software package. After determination of all offsets, the values for roll, pitch, and yaw bias angles are entered into the configuration files for the hydrographic survey software. Latency between instruments is managed by synchronizing all instruments to the GPS time stamp and the 1 pulse per second (1PPS) signal generated by the GPS/INS.

Data Collection

SeaVision utilized a compact, Core i5 computer with a Windows 7 64-Bit Professional operating system, and loaded with the Hypack 2014 Hydrographic Survey software to collect all data and monitor vessel navigation and survey progress throughout all survey operations. The multibeam echosounder and the Inertial Navigation System / GPS were interfaced to this computer and recorded via the Hypack software package onboard the survey vessels. To assist the vessel operator with maintaining proper vessel stationing and monitoring survey progress, pre-defined track lines and coverage maps were observed during all survey operations. Track line spacing throughout the survey has been set in order to maintain 150% overlap of the survey swath between adjacent survey lines.

Data Processing

All post-processing of hydrographic survey data has been performed using the Hypack 2014 software package. All raw data has been recorded and saved for archival purposes.

Processing of multibeam bathymetric survey data generally consists of a four (4) phase process. In the first phase, position, orientation, water level, and sound velocity profiles for all survey lines are loaded and reviewed for errors. In the second phase, individual survey files are reviewed in a series of sweeps (usually 50 to 200 at a time) in order to review the swath data and identify any noise, spurious points, or erroneous soundings that may exist in the data. Manual editing of stray data points, and some automatic filters that search for and remove erroneous data, is performed on all data. In the third phase of processing, all data is delivered into a matrix and reviewed as "area-based" such that cross-sections throughout the entire survey area are reviewed simultaneously. This allows us to review the overlaps between adjacent survey lines and confirm that the data at the overlaps is consistent (thus building in a quality assurance step to the processing phase). At the end of the third phase or processing, the data is binned for export to a grid. In the case of this work, we generated a grid of data spaced 3-feet by 3-feet such that the sounding assigned to each grid cell represented the average of all soundings collected inside of that cell.

In the final phase of processing, the ASCII XYZ grid file (with cells sized at 3-feet by 3-feet) is subjected to a TIN (triangulated irregular network) surface algorithm to generate color-shaded relief imagery and contours. Additionally, the TIN network is used in order to generate decimated grids with soundings spaced at 10-feet, 25-feet, and 50-feet.

Plan Preparation

The 2014 Bathymetric Survey data results for the entire Upper Reservoir have been prepared on three 11 x 17 figures (attached) that display the color-shaded relief imagery from the bathymetric survey digital terrain model (DTM) overlaid on publicly available digital aerial photographs and the as-built drawing for the upper reservoir intake channel.

SeaVision Figure 14-051-01: General Condition Color Shaded Relief
SeaVision Figure 14-051-02: Color Shaded Relief with Bathymetric Soundings (on 50-feet by 50-feet grid)
SeaVision Figure 14-051-03: Color Shaded Relief with Bathymetric Contours (on 5-feet interval)

While SeaVision surveyed the Upper Reservoir, we also took the opportunity to better ascertain the sediment thickness in the intake channel. By utilizing a gravity core with a four (4) foot rigid plastic barrel, we could deploy the sampling unit (pictured) from the survey vessel at pre-planned locations in the Intake Channel. We pre-marked the barrel with black electrical tape at each location so that, once the sampler had been lowered to the reservoir bottom and driven into the bottom sediments, we could deploy our ROV to the bottom in order to identify the degree of penetration into the bottom (examples below).

In the still video grabs above, we can observe the barrel penetrated into the sediments at least 2-feet (the black marking tape is at the 2-foot elevation mark) at each station. We investigated six (6) such locations in the intake channel with **observed sediment thickness of 2.0 to 2.5 feet.**

SeaVision Figure 14-051-04: Color Shaded Relief with Gravity Core Location Stations

Volume calculations have been performed to assess the amount of material deposited or eroded throughout the Intake Channel since the 2012 survey. To define the Intake Channel, we have utilized the original as-built plans of the facility (supplied by GDF Suez) to approximately define the base of the intake channel. We believe that this is the most appropriate means of assessing the sediment volume behavior in the intake channel while reducing the impacts that the sheer, bounding, sidewalls (ie, the cut rock wall faces on the north and south sides of the intake channel) can have on the survey data and thus the volume calculations. Using the Hypack 2014 software package's TIN utility program, we generated TIN digital terrain model surfaces for the 2012 (SeaVision), 2013 (CHA), and 2014 (SeaVision) surveys and compared the surfaces to calculate volumes and to estimate the change in elevation between each surface model. The elevation changes have been represented on Figure 5.

SeaVision Figure 14-051-05: 2012/2013/2014 Changes

Intake Channel Volume Calculations

The summary of volume changes (accumulation/loss) calculated by comparing each bathymetric data set are listed as follows. All volumes are listed in cubic yards.

2012 versus 2014*

Total accumulation: 20,203
Total loss: 4,126
Net Change: +16,077 cubic yards accumulation

2013 versus 2014

Total accumulation: 8,006
Total loss: 8,435
Net Change: -429 cubic yards loss

2012 versus 2013

Total accumulation: 17,229
Total loss: 2,625
Net Change: +14,604 cubic yards accumulation

* Only the 2012 versus 2014 comparison includes the comparison of two multibeam bathymetric surveys.

If we consider that the overall area of the intake channel is approximately 210,135 square feet, and the average depth of sediment accumulation is approximately 2-feet (as observed in the six (6) gravity core locations), then the total volume of sediment accumulated at the bottom of the intake channel is approximately 15,566 cubic yards.

If we assume that the reservoir had experienced minimal accumulation in the Intake Channel prior to the 2012 survey (after the 2011/2012 remediation program), and we only utilize the 2012 versus 2014 comparison, then the results suggest that approximately 16,077 cubic yards of material has been deposited in the intake channel but the channel experiences periodic episodes of sediment loss and accumulation. The presence of approximately **16,077 cubic yards of material** in the intake channel appears to be supported by the empirical approximation derived by the gravity core observations.

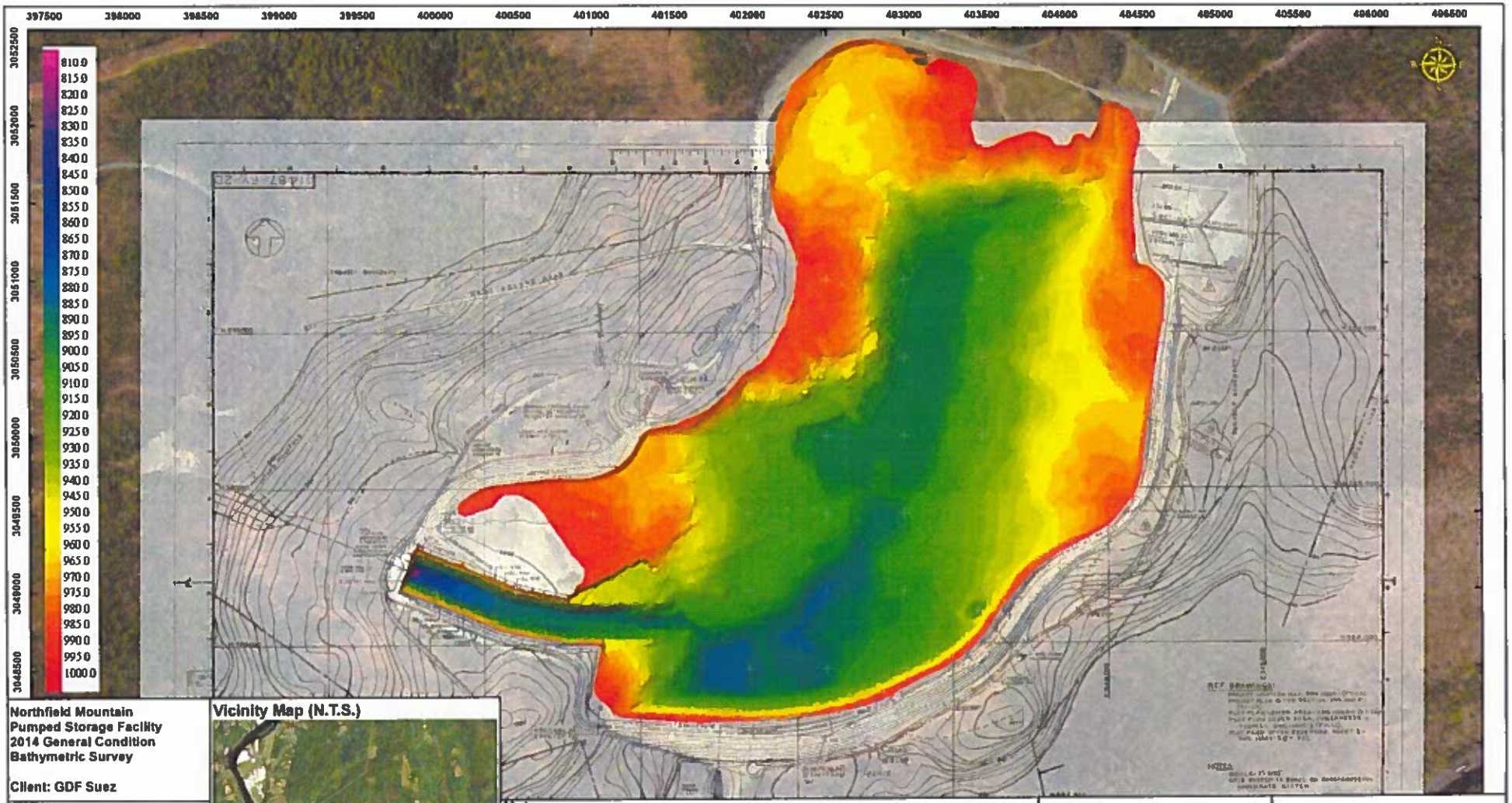
Our recommendation is that annual surveys of the intake channel and the reservoir as a whole, with focused monitoring of the sediment accumulation in the intake channel, should continue.

If you have any questions regarding this report, the survey data, or the deliverable products, please do not hesitate to contact the undersigned.

Best regards,

SeaVision Underwater Solutions, Inc.

Jeffrey Z. Snyder, President
ACSM Certified Hydrographer, #243



Northfield Mountain
Pumped Storage Facility
2014 General Condition
Bathymetric Survey

Client: GDF Suez

Figure 1

General Condition
Multibeam Bathymetric Survey
Color Shaded Relief

SeaVision Figure 14-051-01
Drawn by: J. Snyder
Date: 11/4/2014

Vicinity Map (N.T.S.)

Notes

1. The bathymetry depicted on this drawing represents the results of a survey performed by SeaVision Underwater Solutions, Inc. on October 12, 2014 and can only be considered to indicate the general conditions existing at that time.

2. The multibeam bathymetry data was collected using a SBG Ekinox Inertial Navigation / Global Positioning System with Real-Time Kinematic corrections transmitted from the KeyNet GPS Virtual Reference Station Network. SeaVision utilized a Norbit 455 kHz WBMS Multibeam Echosounder to collect the data.

3. Horizontal positioning is expressed in feet and references the North American Datum of 1983, Massachusetts (Mainland) State Plane (Feet). Elevations are expressed in feet and reference the Northfield Mountain Pumped Storage Facility (NMPSF) Site Datum.

4. The NMPSF Site Datum is assumed to be an elevation of +0.389 feet relative to the North American Vertical Datum of 1988 (NAVD 1988).

5. Background aerial photographs have been taken from the publicly available digital imagery available through MassGIS and from electronic drawings provided by GDF Suez / FirstLight.

Scale

0 300 600 1,200
Feet

1 inch = 600 feet

Check Graphic Scale

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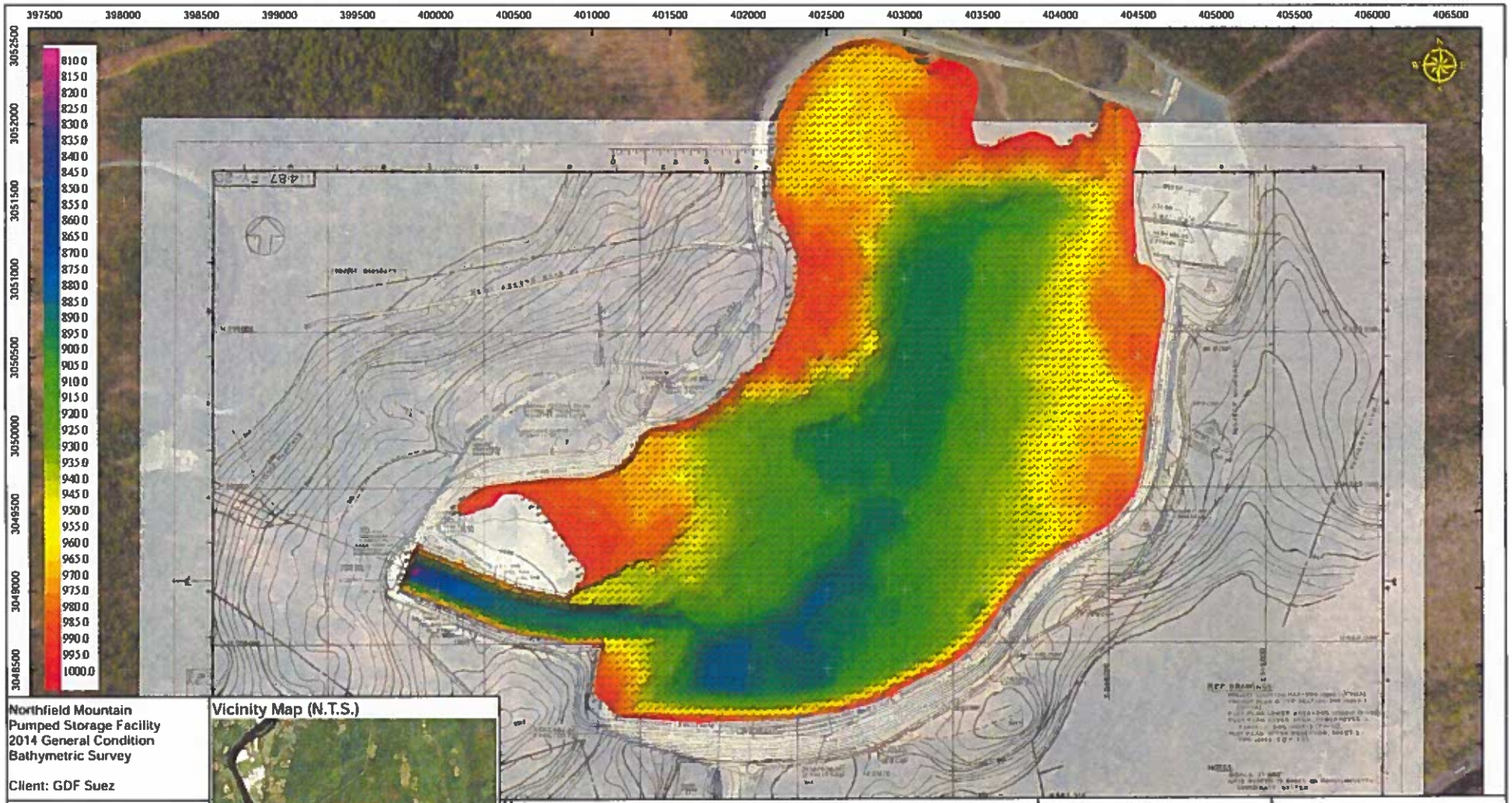
Phone 508-258-0650
Fax 401-633-7113



Northfield Mountain
Pumped Storage Facility
2014 General Condition
Bathymetric Survey

Client: GDF Suez

Figure 2

General Condition
Multibeam Bathymetric Survey
Soundings

SeaVision Figure 14-051-02
Drawn by: J. Snyder
Date: 11/4/2014

Vicinity Map (N.T.S.)

Notes

1. The bathymetry depicted on this drawing represents the results of a survey performed by SeaVision Underwater Solutions, Inc. on October 12, 2014 and can only be considered to indicate the general conditions existing at that time.

2. The multibeam bathymetry data was collected using a SBG Ekinox Inertial Navigation / Global Positioning System with Real-Time Kinematic corrections transmitted from the KeyNet GPS Virtual Reference Station Network. SeaVision utilized a Norbit 455 kHz WBMS Multibeam Echosounder to collect the data.

3. Horizontal positioning is expressed in feet and references the North American Datum of 1983, Massachusetts (Mainland) State Plane (Feet). Elevations are expressed in feet and reference the Northfield Mountain Pumped Storage Facility (NMPSF) Site Datum.

4. The NMPSF Site Datum is assumed to be an elevation of +0.389 feet relative to the North American Vertical Datum of 1988 (NAVD 1988).

5. Background aerial photographs have been taken from the publicly available digital imagery available through MassGIS and from electronic drawings provided by GDF Suez / FirstLight.

Scale

0 300 600 1,200
Feet

1 inch = 600 feet

Check Graphic Scale

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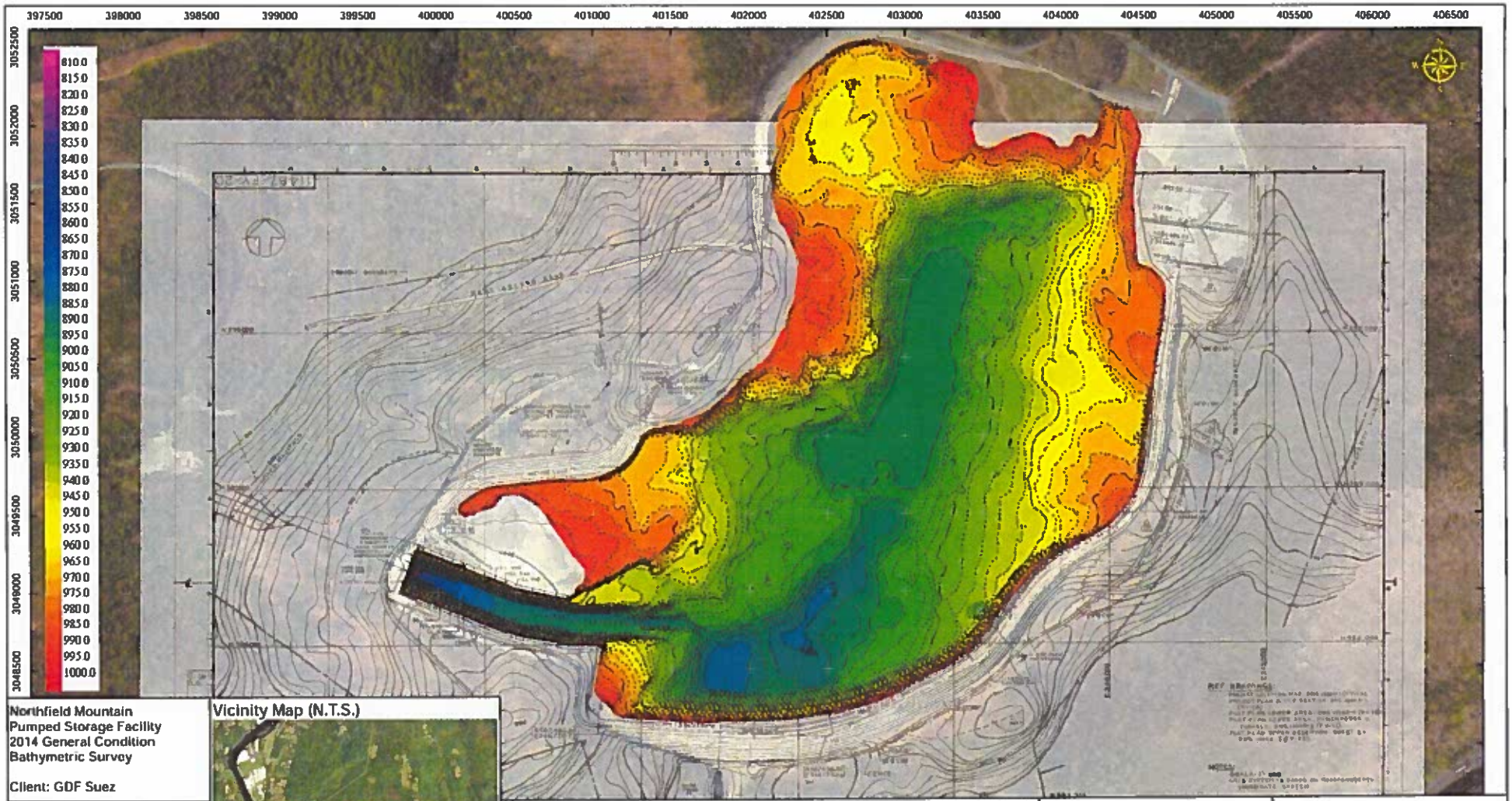

Northfield Mountain
Pumped Storage Facility
2014 General Condition
Bathymetric Survey

Client: GDF Suez

Figure 3

General Condition
Multibeam Bathymetric Survey
Contours

SeaVision Figure 14-051-03
Drawn by: J. Snyder
Date: 11/4/2014

Vicinity Map (N.T.S.)

Notes

1. The bathymetry depicted on this drawing represents the results of a survey performed by SeaVision Underwater Solutions, Inc. on October 12, 2014 and can only be considered to indicate the general conditions existing at that time.

2. The multibeam bathymetry data was collected using a SBG Ekinox Inertial Navigation / Global Positioning System with Real-Time Kinematic corrections transmitted from the KeyNet GPS Virtual Reference Station Network. SeaVision utilized a Norbit 455 kHz WBMS Multibeam Echosounder to collect the data.

3. Horizontal positioning is expressed in feet and references the North American Datum of 1983, Massachusetts (Mainland) State Plane (Feet). Elevations are expressed in feet and reference the Northfield Mountain Pumped Storage Facility (NMPSF) Site Datum.

4. The NMPSF Site Datum is assumed to be an elevation of +0.389 feet relative to the North American Vertical Datum of 1988 (NAVD 1988).

5. Background aerial photographs have been taken from the publicly available digital imagery available through MassGIS and from electronic drawings provided by GDF Suez / FirstLight.

Scale

0 300 600 1,200
Feet

1 inch = 600 feet

Check Graphic Scale

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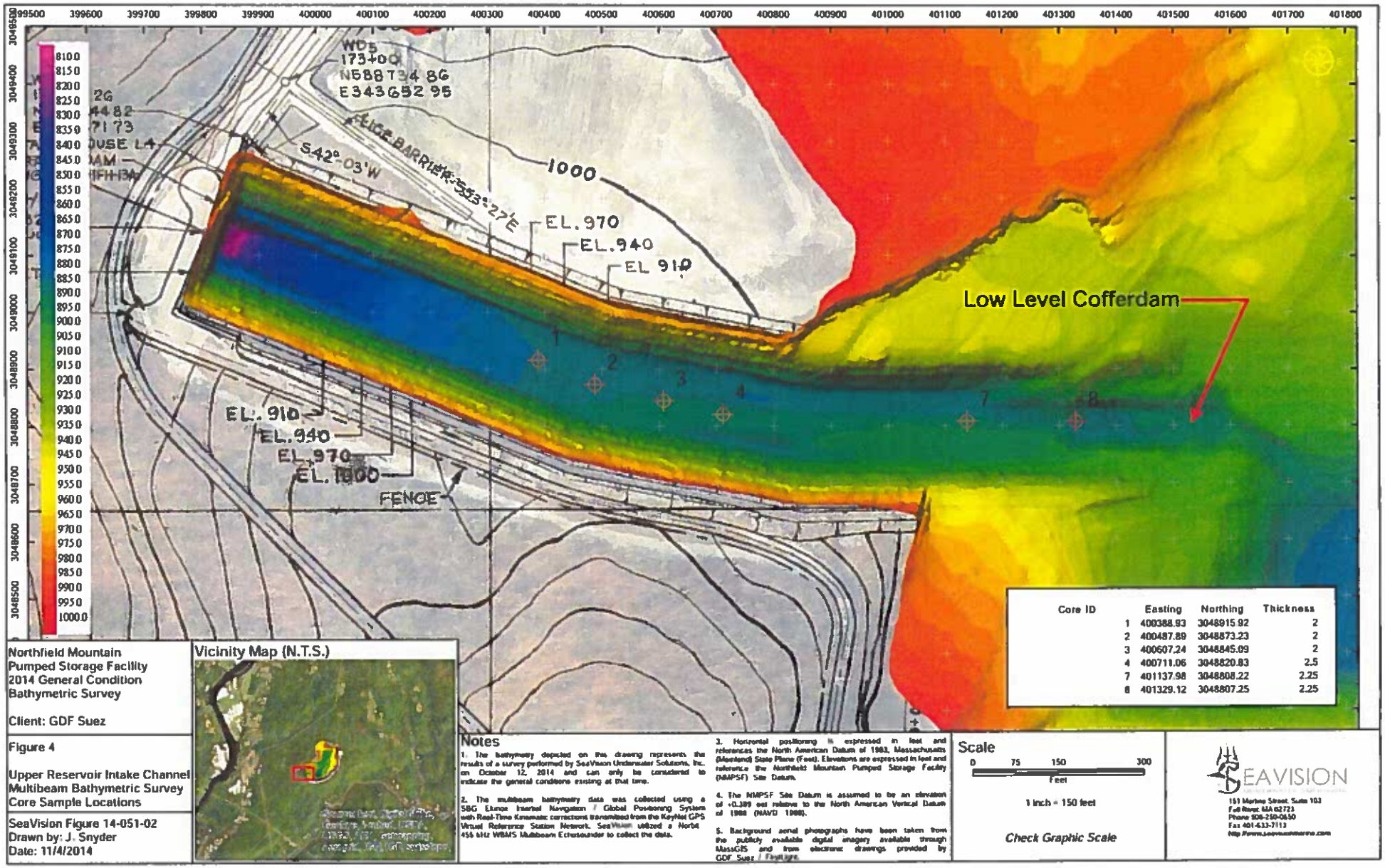

Core ID	Easting	Northing	Thickness
1	400388.93	3048915.92	2
2	400487.89	3048873.23	2
3	400607.24	3048845.09	2
4	400711.06	3048820.83	2.5
7	401137.98	3048808.22	2.25
8	401329.12	3048807.25	2.25

Northfield Mountain
Pumped Storage Facility
2014 General Condition
Bathymetric Survey

Client: GDF Suez

Figure 4

Upper Reservoir Intake Channel
Multibeam Bathymetric Survey
Core Sample Locations

SeaVision Figure 14-051-02
Drawn by: J. Snyder
Date: 11/4/2014

Vicinity Map (N.T.S.)

Notes

1. The bathymetry depicted on this drawing represents the results of a survey performed by SeaVision Underwater Solutions, Inc. on October 12, 2014 and can only be considered to indicate the general conditions existing at that time.

2. The multibeam bathymetry data was collected using a SBG Ekinox Inertial Navigation / Global Positioning System with Real-Time Kinematic corrections transmitted from the KeyNet GPS Virtual Reference Station Network. SeaVision utilized a Norbit 456 kHz WBMS Multibeam Echosounder to collect the data.

3. Horizontal positioning is expressed in feet and references the North American Datum of 1983, Massachusetts (Mainland) State Plane (Feet). Elevations are expressed in feet and reference the Northfield Mountain Pumped Storage Facility (NMPSF) Site Datum.

4. The NMPSF Site Datum is assumed to be an elevation of +0.389 feet relative to the North American Vertical Datum of 1988 (NAVD 1988).

5. Background aerial photographs have been taken from the publicly available digital imagery available through MassGIS and from electronic drawings provided by GDF Suez / Fay Spofford.

Scale

0 75 150 300

Feet

1 inch = 150 feet

Check Graphic Scale

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Discussion

Bathymetry from the 2012, 2013, and 2014 surveys of the Upper Reservoir and Intake Channel have been compared with specific focus on the intake channel.

Changes in volume in the intake channel based on these comparison are as follows:

Volume (Cubic Yards)

2012 versus 2014
Total accumulation: 20,203
Total loss: 4,126
Net Change: +16,077

2013 versus 2014
Total accumulation: 8,006
Total loss: 8,435
Net Change: -429

2012 versus 2013
Total accumulation: 17,229
Total loss:2,625
Net Change: +14,604

Scale

0 100 200 400
Feet

1 inch = 200 feet

Check Graphic Scale

Northfield Mountain
Pumped Storage Facility
2014 General Condition
Bathymetric Survey

Client: GDF Suez

Figure 5

Upper Reservoir Intake Channel
Bathymetric Survey
2012/2013/2014 Change

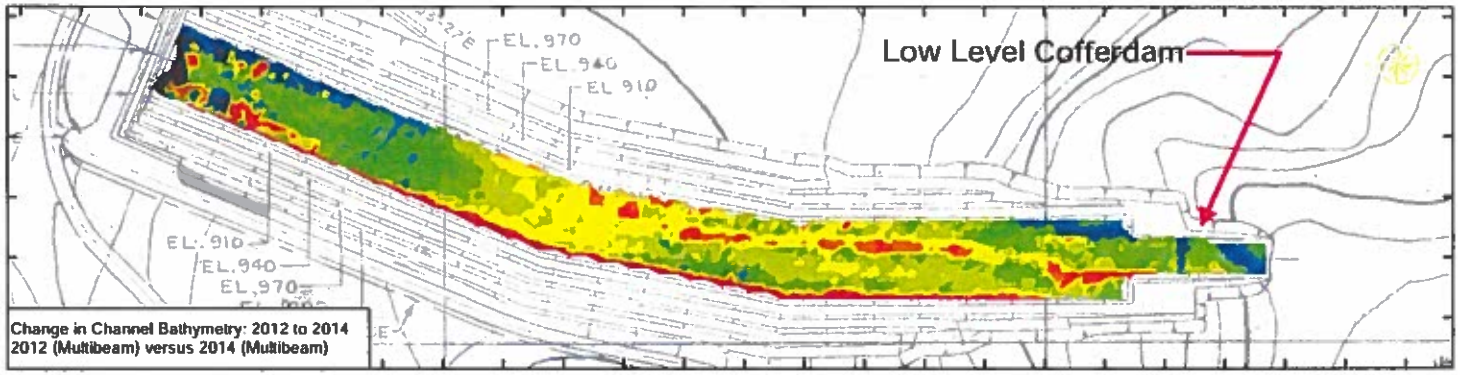
SeaVision Figure 14-051-05
Drawn by: J. Snyder
Date: 11/4/2014

SEAVISION
151 Martine Street, Suite 103
Fall River, MA 02723
Phone 508-210-0630
Fax 401-633-7113
http://www.seavisionmarine.com

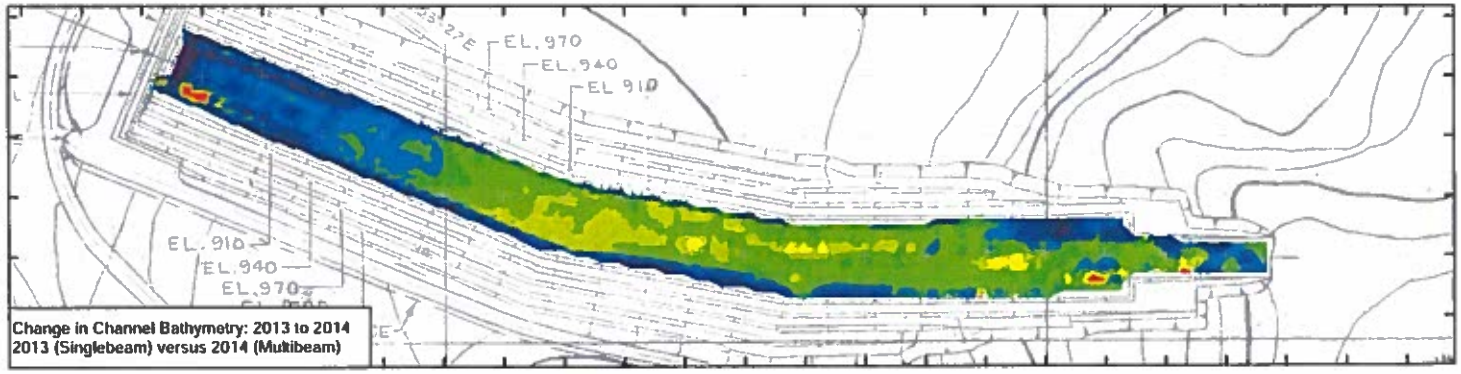
Loss in Materal (Feet)

-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0

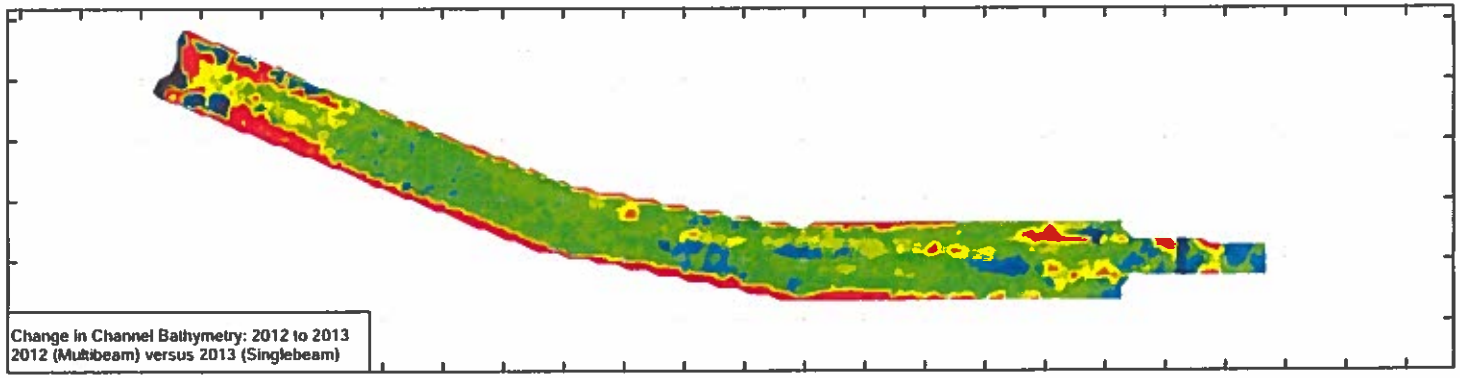
Gain in Materal (Feet)



Change in Channel Bathymetry: 2012 to 2014
2012 (Multibeam) versus 2014 (Multibeam)



Change in Channel Bathymetry: 2013 to 2014
2013 (Singlebeam) versus 2014 (Multibeam)



Change in Channel Bathymetry: 2012 to 2013
2012 (Multibeam) versus 2013 (Singlebeam)

Appendix F

Dredge America, Combined Health, Safety and Accident Prevention Plans

9555 NW HIGHWAY N
Kansas City, MO 64153
www.dredgeamerica.com

Combined Health and Safety and Accident Prevention Plans

Northfield Mountain
Upper Reservoir Dredging
GDF SUEZ Energy Generation NA, LLC
Northfield Mountain, MA

January 31, 2015

Table of Contents

Table of Contents

Table of Contents

REFERENCES

1.) Corps. Of Engineers, Health and Safety Manual 385-1-1, section 01.A.07

2.) NAVFAC guide specifications, section 01525 paragraph 1.6 Accident Prevention Plan

3.) NAVFAC guide specifications, section 01525 paragraph 1.5.4.2 Activity Hazard Analysis

4.) FAR Clause 52.236-13 Accident Prevention

5.) OSHA 29 CFR 1910.120

6.) MSHA Part 46

ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CON. REP.	Construction Representative
CQC	Contractor Quality Control
COM	Corporate Operations Manager
EM	Engineering Manual
HSM	Health & Safety Manager
MSHA	Mine Safety & Health Administration
NAVFAC	Naval Facilities Engineering Command
NAS	Naval Air Station
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PTL	Project Team Leader
ROICC	Resident Officer in Charge of Construction
SS	Site Supervisor, Superintendent
SDS	Safety Data Sheet
SSO	Site Safety Officer
USACE	United States Corps. Of Engineers

SIGNATURE SHEETS

Plan Prepared By:

Name:	Dan McDougal
Title:	President (PRES)
Company:	Dredge America
Telephone:	(816) 330-3100
Fax:	(816) 330-3103

This Health and Safety Plan / Accident Prevention Plan has been prepared by:

Signature: _____

Plan Approved By:

Name:	Dan McDougal
Title:	President (PRES)
Company:	Dredge America
Telephone:	(816) 330-3100
Fax:	(816) 330-3103

I hereby acknowledge that I have received and reviewed the tenets of this Health and Safety /Accident Prevention Plan and have approved this plan as noted.

Signature: _____

Dan McDougal, President

Plan Concurrence:

Name:	Jason Collene
Title:	Operations Manager (OM) Health and Safety Manager (HSM)
Company:	Dredge America
Telephone:	(816) 330-3100
Fax:	(816) 330-3103

I hereby acknowledge that I have reviewed and fully understand the tenets of this Health and Safety / Accident Prevention Plan and my responsibilities as they are specified herein.

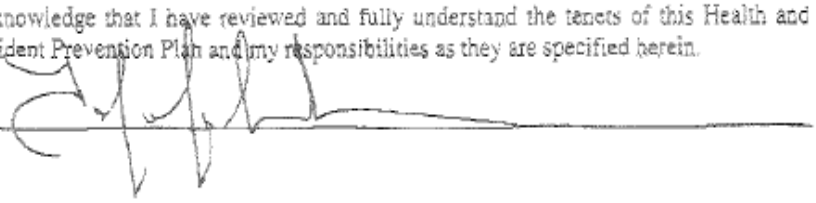
Signature: _____

Dredge America
HEALTH AND SAFETY PLAN / ACCIDENT PREVENTION PLAN
SIGNATURE SHEETS
7

Plan Concurrence:

Name:	Tommy McBride
Title:	Superintendent, Site Safety Officer (SSO)
Company:	Dredge America
Telephone:	(816) 330-3100
Fax:	(816) 330-3103

I hereby acknowledge that I have reviewed and fully understand the tenets of this Health and Safety / Accident Prevention Plan and my responsibilities as they are specified herein.

Signature: 

PROJECT SPECIFIC BACKGROUND INFORMATION

1.) Contractor: Dredge America. Dredge Americas office location is 9555 NW Highway N, Kansas City, Mo 64153. On the internet at www.dredgeamerica.com

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2.) Project I.D. 2015-01-05-00

3.) Project Name: Northfield Mountain Dredging

4.) Project Description: The project includes providing all equipment, materials and crew to dredge approximately 40,000 CY from the Northfield Mountain Upper Reservoir. The sediment will be removed with a custom built deep digging dredge. All material removed from the lake will be conveyed via HDPE pipeline to a sediment dewatering area provided by the owner. At this area the slurry mixture will be discharged into geotubes, where the sediment will separate from the water using chemical polymers. The water quality will be monitored throughout the project and will be maintained so no visible sediment plumes are present at the return line in the CT River.

Phase 1: Mobilization of Dredge and Dewatering Equipment
Phase 2: Dredging Sediment
Phase 3: Demobilization and Sediment Dewatering Period
Phase 4: Haul Material Offsite (To be Performed by Others)

STATEMENT OF HEALTH AND SAFETY POLICY

Objective

To integrate the general tenets and policies of the Dredge America Health and Safety Program with this project's specific requirements as an active Health and Safety Plan (HASP) by which Dredge America can administer the project in order to provide a Safe Work Place for all Dredge America employees, subcontractors' workers, visiting customers, and the general public.

Purpose

This HASP describes the responsibilities of the supervisors, employees, and subcontractors involved with the work processes required to provide the specified goods and services of the contract. It will address applicable United States Occupational Safety and Health Administration (OSHA) standards set forth in 29 CFR 1910 and 29 CFR 1926 as well as various consensus standards and TMS policies by the use of referenced procedures.

Primary Health and Safety Plan Functions

The primary functions of the Health and Safety Plan are:

Define the health and safety responsibilities of Dredge America personnel.
Administration of the medical surveillance program, if applicable.
Preparation of the site safety plans
Providing safety training/maintaining training records
Providing safety procedures and protocols to be used at project sites, shops, and offices
Conduct accident investigations and maintaining records
Verifying OSHA compliance under 29 CFR 1910 and 1926
Providing guidance and assistance with preparation of safety protocols for specific tasks
Promoting safety and health consciousness within the company
Designating the functional organization of safety committees to serve corporate and project specific safety and health program needs

Safety Organization And Responsibility

At Dredge America the safety and protection of employees, clients, and the community is our ***First Priority***. This concern for safety is not restricted to field operations but extends to the offices, and shop facilities. ***If an activity or condition is unsafe, the task will not proceed until the situation is corrected.***

The Company President (PRES) is the primary safety official in the company.

The Operations Manager/Health and Safety Manager (OM)/(HSM) monitors and integrates safety, quality control, and operating procedures and administers health and safety plan. The (OM)/(HSN) reports to the (PRES). The (OM)/HSM) or his designee,

shall support and assist superintendent (SSO) in executing the Health and Safety Program.

The Site Safety Officer (SSO) is responsible for administration and enforcement of the safety procedures and protocols on project sites. The SSO is the primary safety official at the working level. The responsibility for safety is delegated and shared by project managers, site safety officers, crew leaders, and subcontractor supervisors. At a minimum, the SSO must perform, or otherwise supervise the performance of, the following:

A. Motivating employees and supervisors of subcontractors to adhere to Dredge Americas safety policy in each work situation.

B. Schedule, organize, and lead preparatory phase meetings prior to all activities relevant to definable features of work and have a working knowledge of the safe procedure for all jobs and tasks under their supervision. When in doubt, they shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

C. Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.

D. Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks. New employees will not be allowed to perform any task until required training is completed.

E. Immediately correct unsafe conditions.

F. Ensure that employees are outfitted with and wear personal protective equipment as specified by this plan, EM385-1-1, and other Dredge America procedures.

G. Set a good safety example.

H. Obtain the cooperation of employees, sub-contractors, customers, and visitors. Sub-contractor safety performance records will be verified prior to contract award and will be continually monitored during operations.

I. Report all accidents, near misses and property damage.

Every Employee, regardless of job title, shares the responsibility for safety and should report any unsafe work condition without fear of reprisal. It is imperative that employees observe the following minimum requirements in order to achieve a safe and healthful workplace:

A. Each employee must be familiar with this Accident Prevention Plan and the general safety rules herein.

B. Each employee shall practice safe procedures and follow all safety rules and regulations for the successful completion of any job task.

C. All employees shall wear the necessary personal protective equipment required for the job or task as specified by this plan, EM385-1-1, and other TMS procedures.

D. The employee shall notify the immediate supervisor of any potential hazard or unsafe work practice that could result in injury or destruction of property.

E. The employee shall report all accidents to an immediate supervisor regardless of whether injury or property damage resulted. This includes all near misses (accidents without injury or damage). This requirement serves to bring unsafe conditions to the attention of management.

F. Each employee shall be subject to contraband search for safety purposes and for the safety of fellow employees.

G. Violations of published safety policies and procedures may be cause for disciplinary actions up to and including dismissal.

H. All employees who are taking prescribed medications that could affect work performance or might alter the manner in which they could be treated in an emergency shall so advise their supervisor prior to beginning work.

Regulatory Compliance Policy

The policy of Dredge America will be to comply with all federal, state, local, and client regulations. It is the responsibility of all personnel to perform all work in full compliance with appropriate regulations. Safety and health personnel will immediately bring any condition regarding safety and health compliance to the attention of supervisory operating personnel.

Dredge America will insure regulatory compliance by all of its subcontractors, including OSHA 300 forms, safety records, OSHA training, and medical surveillance, when applicable.

Safety Goals

The goal of the safety and health program is to ensure a safe working environment, protect workers from harm, and protect the company from liability associated with an unsafe working environment.

Other goals are to eliminate workplace accidents, gain worker acceptance through cooperation and training, and provide our clients with a responsible, well-trained, safety-oriented work force.

Dredge America has adopted a "zero accidents" goal for all operations. All activities will be planned and performed with this goal foremost.

Safety Training

Dredge America engages in dredging, and other services, and must comply with numerous health and safety training requirements, mandated by governmental agencies, clients, and internal policies. The Health and Safety Manager (HSM) will primarily be responsible for determining and coordinating these training requirements.

All personnel will be provided sufficient training to execute their jobs in a safe and healthy manner.

Direct supervisors are responsible to determine the training requirements of a task and ensure employees have the necessary training to complete the task safely. Environmental health and safety personnel will assist with this determination and training.

The corporate personnel department will maintain training records and documentation.

Medical Surveillance

All employees who perform work at hazardous waste sites or perform emergency response will be subject to the Dredge America medical surveillance program. This program conforms to the requirements established by 29 CFR 1910.120/1926.65 (f) Medical Surveillance.

Accident Investigation

All accidents will be thoroughly investigated by the supervisor of the person(s) involved in the accident. The employee and the site supervisor will forward a signed copy of the accident investigation form to the health and safety office to comply with Dredge America requirements.

All accidents must be reported to the COE within 24 hours and the appropriate documentation completed and submitted.

The HSM may investigate serious accidents, such as those involving hospitalization or injuries requiring more than one visit to a physician. The HSM may also request that a specific written accident investigation be conducted in case of an unusual or serious injury or accident.

Position Statement On Modified Work

Dredge America will attempt to eliminate all accidents through strict compliance with OSHA regulations and Dredge Americas health and safety procedures, as well as supervisor and employee safety training, safety audits, and constant attention to safety. Should an employee be injured or become ill in the course of and arising from his employment, Dredge America will attempt to provide modified work. Modified work (light duty) will be made available in order to bring the injured employee back to the work environment, for the benefit of the employee and the company, whenever medically appropriate.

Employees are expected to return to modified work when medically capable. The work assigned to the injured employee will meet the restrictions set forth by the treating and/or company physician. Examples of modified work include but are not limited to office work, dispatching, and light shop work.

Field Safety Inspections

Weekly safety inspections will be made of the work area. The inspection will be made by the HSM, Project Manager and/or the SSO, or a designated representative. Discrepancies found during inspections will be corrected as soon as practicable. Serious safety violations will be corrected immediately. Inspection records will be maintained on site.

Additionally, the HSM or his designated representative may make periodic unannounced inspections of work sites on their own discretion or at the request of an employee, supervisor, manager, or client.

First Aid

Each facility and work location must be evaluated to determine the potential requirement for medical emergencies. At a minimum, an industrial first-aid kit will be provided. An adequate number of employees with current certification in first aid and cardio-pulmonary resuscitation (CPR) will be maintained on the project sites.

The SSO shall ensure that emergency medical attention is readily available. For emergency response and remediation operations, the SSO shall establish the requirement for medical emergency response and identify an emergency medical facility. If site conditions require, a subcontract emergency medical technician (EMT) and/or the availability of ambulance service on site will be implemented.

Review of Health And Safety Statistics

The HSM, and Personnel Department will review and tabulate safety statistics as necessary:

Specific Written Safety Procedures / Permits

In order to provide a safe work place and communicate specific work requirements for regulatory compliance, specific tasks are incorporated by reference to this procedure. These procedures deal with specific areas such as confined space, hot work, lock out tag out, etc.

All Dredge America personnel who may be subject to these procedures will receive appropriate training and will be held accountable for compliance with procedure requirements.

State, OSHA, and Other Regulations

Where state regulations differ from federal regulation cited in this manual, the more stringent regulation will apply.

Changes

Any user of this plan is welcome to recommend changes. Changes normally result from finding errors, regulatory changes, equipment modification, new equipment purchases, and changes to operation procedures or site conditions. The format for making a recommended change is:

A. Submit a written recommendation to the HSM via your immediate supervisor.

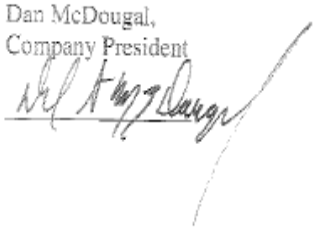
B. The HSM will review the recommendation.

C. After review, the HSM will determine if the suggestion should be included as an amendment or new procedure in this plan. Changes to this plan will be distributed immediately upon approval.

Dredge America has appointed Tommy McBride, Site Safety Officer (SSO), under direct supervision of Jason Collene, Corporate Operations Manager, Health and Safety Manager (OM)/(HSM) to be accountable to monitor and enforce the policies and procedures as set forth in this Health and Safety / Accident Prevention Plan.

Any and all Dredge America personnel shall have the authority to intervene and suspend work in the interest of safety policy compliance;

Dan McDougal,
Company President



SUBCONTRACTORS AND SUPPLIERS

Subcontractors and Suppliers List: ***See (Attachment A)***

Objective

When it is necessary for Dredge America to hire contractors, all contractor personnel will adhere to all policies and procedures outlined in this Accident Prevention Plan. Subcontractors and suppliers that must coordinate on-site deliveries are encouraged to develop and submit to the HSM for approval their own project specific Accident Prevention Plan. Such plans must meet or exceed the requirements of the Dredge America Accident Prevention Plan.

In lieu of a formal plan submitted by a contractor or supplier, the contractor or supplier must subscribe to the tenets of the Dredge America Accident Prevention Plan. All contractor and supplier personnel that work or visit at the project site shall be required to acknowledge the Dredge America HASP and accept as the governing site authority the Dredge America Superintendent/SSO. A copy of this plan will be provided upon request to all contractors.

The term Contractor, as used in this plan, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written to provide goods or services to Dredge America.

The Contractor is responsible for informing its lower tier subcontractors and suppliers of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. Dredge America may request the Contractor to provide proof of its subcontractors' adherence to all rules and regulations and will prohibit access to Dredge America property or job sites or our client's property for those contractors not in compliance.

Purpose

It is the responsibility of Dredge America contractors to work in a manner so as not to endanger themselves, fellow employees, Dredge America employees, authorized work site visitors and customers, the general public, the environment and Dredge America equipment or property.

Procedure

Safety is a prime consideration in all work operations conducted by Dredge America. With regards to contractors, Dredge America is equally interested in their safe operations. The detailed means employed by the contractor to meet that end are the contractor's sole responsibility.

Contractors performing work at Dredge America facilities and work sites are required to comply with all federal, state and local environmental, safety and health laws and regulations and to equal or exceed Dredge America safety rules and regulations.

General Requirements

Where the Dredge America SSO deems appropriate, the contractor will provide a safety representative to monitor work practices. The contractors' safety representative may be required to remain on site at all times while work is in progress.

Contractors noting any unsafe practices, dangerous or unsafe conditions, must immediately report the unsafe practice or condition to the Dredge America Site Safety Officer, or Site Supervisor, before commencing or continuing work.

Contractors and their employees working at the site are required to comply with Dredge Americas Accident Prevention Plan, Occupational Safety and Health Administration (OSHA), COE 385-1-1, or their own site specific approved accident prevention plan, whichever is most stringent.

Training and Orientation

Each Contractor or subcontractor selected for a project will be responsible for informing their respective employees of Dredge Americas safety rules and any other applicable health-and-safety rules. The Dredge America Site Safety Officer is responsible for ensuring contractor compliance with this plan.

Hazard Communications (Right-To-Know) (29 CFR 1910.1200)

Each Contractor must have a Hazard Communication Program in compliance with 29 CFR 1910.1200 or 29 CFR 1926.59.

Dredge America SSO will be responsible for ensuring that hazard communication training for the contractor is part of the site safety orientation.

Contractors will provide Dredge America with SDS's for all chemicals or otherwise hazardous materials they introduce to the project site.

Dredge America will provide the following information to the Contractor supervisor who will be responsible for Contractor crew training.

A. A description of hazardous materials that exist in the area in which they will be working.

B. A copy of the Safety Data Sheet (SDS) for the hazardous materials in the work area.

C. Training on the SDS and the hazardous material labeling system in effect at the location.

D. Training on the local emergency response procedures.

Emergency Response Plan

The Dredge America SSO will be responsible for ensuring that Contractor supervisors are properly trained regarding alarms, evacuation plans, location of area rally points, and personnel accounting. Contractor supervision shall be responsible for training their employees and ensuring their compliance. Any site emergency should be called into the Northfield Control Room (413) 659-4421 for assistance. This phone is manned 24/7.

Safety Plan

Safety glasses/goggles with side shields, hard hats and steel-toed safety shoes, personal floatation devices, and appropriate work clothing shall be worn in all Dredge America locations by the Contractor and his employees. No tennis shoes, tank top shirts or shorts will be permitted. Failure to wear the necessary equipment will result in the immediate removal of the employee from the work location. Continued failure to comply with this rule will result in the Contractor being removed from the site.

Contractor Tool Policy

All contractors working at Dredge America facilities and project sites shall provide adequate tools and equipment for the safe performance of the work. Such conformity shall be considered mandatory and pursuant to the Contractor's agreement to comply with such standards as a consideration of the contract.

Dredge America will not normally provide or loan tools or safety equipment to Contractors except in cases of emergency. Contractor's equipment will ***NOT*** be loaned to Dredge America employees.

Housekeeping

Contractor work areas must be clean and orderly at all times, especially at the conclusion of each day's work. Oily or greasy rags must be kept in metal containers. All combustible waste material will be controlled and disposed of in Contractor supplied hoppers. Nails in scrap lumber must be controlled immediately. Debris and particles on deck will be strictly prohibited and enforced by all supervisors. ***If the work is being conducted on or near a flight line and debris is found on deck, all work will stop and a sweep of the area will be executed.***

Combustible materials and construction debris shall be cleaned up daily and placed in a trash container or hauled away from the job site. Trash containers shall be emptied off site periodically to keep from over filling.

Fire Alarm

The Dredge America SSO will explain the procedure for activating emergency alarms. Contractors, as well as Dredge America personnel, shall be responsible for activating alarms in the event of a fire.

Flammable and Combustible Liquids

Flammable liquids must be dispensed from safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.

Material Safety Data Sheets for materials used by the Contractor shall be maintained by the Contractor and a copy provided to the Dredge America SSO. All flammable and combustible liquids must be dispensed in OSHA approved safety cans and properly labeled in compliance with OSHA standards.

Compressed Gas

Gas cylinders shall not be used or stored in operating buildings except by permission of the Dredge America SSO. All compressed gas cylinders shall be securely fastened in the upright position. The safety cap shall be secured in place on the gas cylinder if the cylinder is not in use. Empty and full cylinders must be stored separately. All cylinders should be permanently marked or stenciled to identify the type of gas in the cylinder.

If a cylinder must be transported a short distance by an employee, the following requirements must be followed:

- A suitable vehicle, such as a truck, must be used to transport the cylinder.
- The valve cap must be on the cylinder to protect the valve stem.
- The cylinder must be secured in an upright position in the back of the truck to prevent cylinder damage, especially the valve stem, during transport. Inspect the cylinder for existing damage prior to attempting transport.
- The cylinder must be secured in the back of the truck by racks or straps.
- The cylinder must be located in the back of the truck to provide adequate ventilation in event of a leak. Direct sunlight or excessive temperatures can result in a release of the cylinder contents.
- Do not smoke during transport.
- Take a direct route to the new location and do not make any intermediate stops along the way. Avoid heavy traffic routes.
- Remove the cylinder from the vehicle as soon as you have reached your destination. Place it in proper storage.

Driving On Site

Parking will be permitted in designated areas only as assigned by Dredge America
Contractors will not ride on tractors, forklifts, or similar vehicles unless specific seats and safety belts are provided.

Operators of mobile equipment on the site must observe all site traffic rules such as speed limits and the right-of-ways of pedestrians.

First Aid

The contractor is solely responsible to arrange for his employees' first aid and hospital requirements. In an emergency, Dredge America first-aid supplies and personnel will be made available for Contractor use.

Injury Reports

The Contractor must notify the Dredge America SSO as soon as possible after an incident at a Dredge America project or facility. Copies of completed incident investigation reports shall be provided to the Dredge America HSM within 24 hours of the occurrence of an injury.

Floor Openings / Elevated Work

Floor openings must be barricaded by a rigid barrier capable of supporting all anticipated loads. All such openings will be made safe and inspected by the Dredge America SSO upon creation or at the end of each working day. The opening will be permanently closed as soon as possible.

Dropping or throwing materials or equipment from elevated work areas will not be permitted. Contractors and subcontractors will be required to use appropriate fall protection when working on roofs or elevated work areas and display a "Men Working Overhead" sign at the work site. All ladder work will be performed with OSHA approved ladders, and all straight and extension ladders will be tied off.

Respiratory Protection

Any contractor who has employees working in an area that requires respiratory protection must have a respiratory protection program as required by 29 CFR 1910.134. All contractor personnel who may be required to wear a respirator which relies on a tight fitting face piece, are required to successfully pass a fit test, in accordance with 29 CFR 1910.134 (e)(5) and provide written certification to Dredge America. Facial hair that lies along the sealing area of the respirator, such as beards, sideburns mustaches, or even a few days' growth of stubble, will not be permitted on persons who may be required to wear respirators that rely on a tight face piece fit to achieve maximum protection.

Security Requirements

Firearms, alcoholic beverages, drugs, and cameras are not permitted on Dredge America facilities.

The Contractor is responsible for the security of his equipment, all necessary sanitary facilities, and for the necessary changing and locker facilities unless provided by Dredge America. Dredge America assumes no liability for lost or stolen equipment or supplies of the contractor or personal property of contractor's employees. Additional safety rules may be added by the Dredge America SSO as required by a specific job or situation.

General Safety Rules

Contractor employees will be expected to follow all other General Safety Rules outlined in this Accident Prevention Plan.

Pre-Construction Requirements

Contractors are required to provide to Dredge America the following information prior to beginning work at a Dredge America project site:

Scope of Work. A synopsis of the contracted scope of work shall be submitted to the Dredge America Project Manager. The scope of work should outline the work that is intended to be accomplished, the tools and equipment necessary to effect the work, and the general types of materials that the contractor expects to use.

Activity Hazard Analyses. Contractors and subcontractors are required to submit to the Dredge America Project Manager appropriate Activity Hazard Analyses, a Phased Safety Plan, or Job Safety Analysis (JSA) for the intended Scope of Work. The selected analysis format is not as important as the content of the analysis. In general, the scope of work is to be broken down into specific tasks (definable features of work), the hazards associated with each task are to be identified, and the methods the contractor intends to use to control each of the hazards are proposed.

Equipment Inspections. Contractors are expected to provide documentation that all necessary inspections of equipment, such as cranes, earth moving equipment, process equipment, and vehicles, have been performed.

Rented Equipment: If the Contractor utilizes rented equipment he shall be responsible for daily safety inspections of such equipment and operator training and certification.

Additional Project Requirements

Contractors are required to address the following while working on a Dredge America project site:

Regular Safety Meeting: Contractors are required to hold regular Safety Meetings and document the subject matter, as well as the attendance record. These meetings shall be held at intervals no longer than weekly and may be required to be more frequent by the Dredge America SSO. Contractors may be required to attend the weekly Safety Meetings conducted by the Dredge America Site Safety Officer. Depending on the safety matters

discussed at the meeting held by the Dredge America SSO and at the sole discretion of the SSO, the meeting may take the place of the Contractor's regular meeting.

Daily Equipment Inspections. Contractors are required to inspect their equipment on a daily basis. Inspections for heavy, lift, or scaffolding equipment are to be documented. Deficiencies found during the inspection, which have a direct impact on safety, must be corrected immediately.

Project Inspections. Contractors shall periodically inspect their work-sites to identify poor employee safety performance, hazardous conditions, or unsafe equipment. Deficiencies noted during these inspections shall be corrected immediately.

TRAINING

Safety Indoctrination Requirements

Dredge America employees shall be provided safety and health indoctrination at the beginning of their employment, and shall receive periodic training to enable them to perform their work in a safe manner.

Employees shall receive an overview of this accident safety plan with emphasis on medical facilities and their location, emergency response procedures, activity hazard analysis, and the availability of Safety Data Sheets (SDS).

Mandatory Training Requirements

All personnel entering active work zones will be trained in the provisions of this Accident Prevention Plan and be required to sign an acknowledgement form ***(See Attachment H).*** Site-specific training for, Hazard Communication as per 29 CFR 1910.1200/1926.59, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SSO before any site work activities begin. Site specific training, including rescue procedures, and health and safety indoctrination as described in COE 385-1-1 will be conducted before any confined space entry is performed.

Emergency Response Training

Selected Dredge America personnel who have completed 40 hour HAZWOPER Training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

Supervisory And Employee Safety Meetings

The SSO will conduct safety meetings weekly for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the Dredge America safety meetings. Safety meetings will comply with COE 385-1-1(01.B.05).

Red Cross Certifications

The Designated American Red Cross Certified Attendants for this project as per COE 385-1-1(03.A.02) can be found in ***(Attachment D)***.

HEALTH AND SAFETY INSPECTIONS

Safety Inspections

The Dredge America OM/HSM, and/or SSO are required to conduct periodic inspections of their sites. The SSO will discuss any necessary corrective actions with the OM and review new procedures.

The OM/HSM or his designated representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Kansas City office.

External Inspections / Certifications

Dredge America does not anticipate, but may consider the use of outside sources, to provide safety inspections on an as necessary basis.

As required, Dredge Americas safety equipment will comply with appropriate OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), and US Coast Guard or other recognized certification organizations.

SAFETY AND HEATH EXPECTATIONS, INCENTIVE PROGRAMS AND COMPLIANCE

Goals & Objectives

The goals & objectives of Dredge America are to provide a safe and healthful work environment for all employees. Dredge America considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At Dredge America, it is believed all accidents and injuries are preventable. Dredge America will take every reasonable step to reduce the possibility of injury, illness, or accident.

Safety Procedures / Non-Compliance

Employees and supervisors are informed through training and administrative correspondence that safe behaviors and practices are required on all jobs and during all Dredge America activities. Failure to work safely could affect the offending individual, coworkers, the environment or Dredge Americas assets, and supervisors are authorized to discipline workers who compromise safety by ignoring or attempting to defeat safety requirements. The H&S department along with superintendents are authorized to stop unsafe work practices, if necessary, until risks of severe injury or illness are adequately mitigated.

Exposure Data (Man Hours Worked)

The HSM and Dredge America Personnel Department track and maintain incident records at the Kansas City office.

Accident Investigations, Reports, And Logs

The SSO conducts Accident/Incident investigations. A report is completed by the SSO and is required to be reviewed and signed by the Project Manager. The report must be forwarded to the HSM within 24 hours.

Immediate Notification Of Major Incidents

Dredge America will immediately notify the PC Construction of any major incident, including injury, fire, equipment/ property damage and environmental incident. Dredge America will also report same to the COE Operations Project Office as soon as possible but no later than 24 hours after the occurrence. A full report will be provided within 24 hours. In addition fatal accidents will be reported to both parties immediately. The following procedure will be followed in response to any major personal injury:

A. The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

B. The work crew supervisor will immediately determine the following:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the injury, if known

C. The following actions will then be taken depending on the severity of the incident:

- **Life-Threatening Incident** If an apparent life-threatening condition exists, the crew supervisor will immediately contact local Emergency Response Services (EMS) and the Site Safety Officer. An on-site person will be appointed who will meet the (EMS) and have him/her quickly taken to the victim. Dredge America personnel will evacuate injured personnel, injury permitting, within the active work zone to a clean area for treatment by (EMS) personnel.

- **Non Life-Threatening Incident** If it is determined that no threat to life is present, the crew supervisor will immediately contact the Site Safety Officer who will direct the injured person through procedures appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

*NOTE: The area surrounding an accident site must not be disturbed until the SSO has cleared the scene.

Any personnel requiring emergency medical attention will be evacuated from active work zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. ***Personnel will not enter the area to attempt a rescue if their own lives would be threatened***.

In addition the superintendent will fill out the Contractor Emergency Contact Form (ECF), located in ***(Attachment G).***

MEDICAL SUPPORT

Prior to the start of work, Dredge America shall arrange for medical facilities personnel to provide timely attention to any injured person at the work site. Primary Emergency attention will be conducted by Baptist Health Medical Center. A detailed map with the directions to, and contact numbers of the primary medical facility can be found in (***Attachment B***).

Primary Medical Facility

Baystate Franklin Medical Center
164 High Street
Greenfield MA, 01301
Phone: 413-773-0211

Emergency* Cell or Non-Base Phone Dial*
911

Emergency response information will be conspicuously posted on the job site identifying, fire response, hot work permit contact, ambulance, military police, and directions to the secondary medical facility. Other State and federal Employee Notices such as, but not limited to; Right to Work, Equal Opportunity is the Law, Minimum Wage, and Workers Compensation carrier identification, etc., will be posted along with other data required for emergency response.

No less than two first aid CPR trained personnel certified to render aid in the event of an injury shall be provided on the job site at all times. Copies of current personnel first aid and CPR certificates shall be retained on file by the Dredge America personnel department.

PERSONAL PROTECTIVE EQUIPMENT

Dredge America will oversee the proper use of protective equipment (PPE), including PPE for eyes, face, head, and extremities, protective clothing, protective shield and barriers, and fall protection by Dredge America personnel as the job dictates. The Dredge America SSO and/or any supervisors designated by the SSO shall be responsible to oversee the proper use of safety equipment by their respective personnel.

All personnel shall wear hard hats on the job site, as per EM 385-1-1.

Safety glasses with side shields are required. Specific tasks may require goggles or face shields to be worn in addition to safety glasses with side shields. The Activity Hazard Analysis for each definable feature of work will dictate such usage.

Minimum foot protection required on the job site is leather work shoes or boots. Steel-toed or rubber boots shall be worn by all persons exposed to hazards to the feet.

The use of respirators will only be used by personnel medically qualified and monitored under a respirator program.

For levels of PPE the following will be defined as:

- LEVEL A

  Positive pressure, full face-piece self-contained breathing apparatus (SCBA, or positive pressure supplied air respirator (SAR) with escape (SCBA), approved by the National Institute for Occupational Safety and Health (NIOSH).
  Totally encapsulating, chemical protective suit (TECP) with inner and outer chemical resistant gloves and chemical resistant steel-toe and shank boots.

- LEVEL B

  Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator (SAR) with escape (SCBA), approved by the National Institute for Occupational Safety and Health (NIOSH).
  Hooded chemical-resistant clothing (overalls and long sleeved jacket; coveralls; one or two piece chemical-splash suit; disposable chemical-resistant overalls).
  Chemical resistant inner and outer gloves with chemical-resistant, steel shank and steel toed boots.

- LEVEL C

  Full-face or half-mask, air purifying respirator with hooded chemical-resistant clothing. Inner and outer chemical resistant gloves with steel toed, steel shank, chemical resistant boots.

- LEVEL D

  Coveralls or normal work clothes steel-toed boots, hard hat, gloves, safety glasses.
  Level D personal protective equipment will be the designated level of protection for this project.

Hazard Communication Program

The Dredge America Hazard Communication Program complies with 29 CFR 1926.59/1910.1200. Safety Data Sheets (SDS) can be obtained from the Superintendent/SSO. The SDS Inventory and Site Map will be gathered and updated as the job unfolds. These items will be located on site throughout the contract.

Chemical and hazardous material containers shall be properly labeled or tagged. Chemicals and hazardous materials transferred to other containers shall be properly labeled to indicate the product stored within.

Safety Data Sheets (SDS) for all chemicals and hazardous materials used on the project shall be maintained on the job site and made available to all personnel and interested parties.

All personnel shall be provided training in reading and interpreting SDS and labels. Personnel working with chemicals and/or hazardous materials shall consult the SDS and labels prior to using these materials.

Each sub-contractor shall be responsible for maintaining its Hazard Communications Program, list of chemicals and hazardous products, SDS, and training.

Emergency Response Plan

Prior to engaging in construction/project activities at the job site, Dredge America will plan for possible emergencies and have available adequate supplies and manpower to respond. In addition, site personnel will be instructed on their duties and responsibilities by the SSO. All personnel will be instructed on where to find the emergency response information. The following situations would warrant implementation of the emergency response plan; Fire/Explosion, Spill or Release of Hazardous Materials, Natural Disaster, and/or Medical Emergencies.

Emergency response information required to be located on the job site at all time is as follows:

- Name of medical facilities
- Address of the medical facilities
- Map/directions to the medical facilities
- Fire response contacts
- Military police contacts
- Base emergency numbers (ambulance)
- Hot work permit contact

This information can be found in **(*Attachment B).***

The emergency coordinator for all activities will be the Site Safety Officer. No single recommendation can be made for evacuation or safe distances because of the variety of emergencies that could occur. Safe distances can only be determined at the time of an emergency

based on a combination of site and incident-specific criteria. The SSO will know the layout of the job site and its surrounding areas. The SSO will notify the proper authorities depending on the emergency situation

The SSO will notify the construction representative of all incidents that occur for the duration of the contract within 24 hours.

The job site shall be equipped with a conspicuously located, large capacity first aid kit. The job site shall be equipped with an ABC-rated fire extinguisher.

Any person observing a spill or release of possible chemical or hazardous materials will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate.

The Site Safety Officer will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Notification procedures will be followed to inform on-site personnel and off-site agencies. The Site Safety Officer will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature and size of the spill/release, measures may include;

- Construction of temporary containment berms utilizing on-site materials.

- Digging a sump, installing a polyethylene liner and diverting the spill/release material into the sump.

- Placing drums or containers under the leak to collect the spilling material before it flows over onto the ground.

- Transferring the material from its original container to another container.

The Site Safety Officer will notify the construction representative of the spill/release as soon as the emergency response measures are in place, and will then seek direction from the construction representative for further actions.

All fire fighting equipment shall be conspicuously located and access to such equipment shall be kept clear at all times.

All fire fighting equipment shall be periodically inspected and maintained in operational condition. All defective equipment shall be removed from the job site and replaced with equipment in good working order.

The numbers for base fire response units will be located with the emergency response information along with hot work permit contacts. A hot work permit shall be required daily for all hot work operations. All hot work operations shall provide a fire watch for the duration of the hot work.

Contingency Plan For Severe Weather ***(See Attachment F)***

Dredge America shall be responsible for regular monitoring of job site weather conditions in an effort to avoid hazardous conditions caused by severe weather. In the event of severe weather conditions, procedures shall be done in a timely manner to reduce job site danger. Dredge America, will insure all personnel are made aware of base severe weather procedures. Based upon the type of weather condition, action measures may include but are not limited to the following;

- Immediate evacuation of job site.
- Notification to personnel, in transit or prior to, of hazardous job site conditions.
- Securing of all equipment and materials in place or stored on the job site.
- Use of hazardous condition protection facilities as required, e.g., shelters.
- Notification of contracting agencies and project representatives.
- The dismantling and removal of all tools and equipment located at the work site.

Respiratory Protection Plan
Not applicable

Lead Abatement Plan
Not applicable

Asbestos Abatement Plan
Not applicable

Abrasive Blasting Plan
Not Applicable

Confined Space Entry Plan
A confined space plan will be submitted if needed.

Critical Lift Procedures
A critical lift plan will be submitted separately if the need arises.

Access And Haul Road Plan
An access and haul road plan will be submitted separately if needed.

Emergency Rescue Plan (Tunneling)
Not Applicable

Underground Construction Fire Prevention And Protection Plan
Not Applicable

Compressed Air Plan
Not Applicable

Form Work And/Or Shoring Erection And Removal Plan
Not Applicable

Lift Slab Plan
Not Applicable

Blasting Plan
Not Applicable

Diving Plan
Not Applicable

MEETING THE MAJOR REQUIREMENTS OF EM385-1-1

In addition to this Accident Prevention Plan, a subcontractor or independent company for Dredge America will prepare an Asbestos Control and Lead Abatement Plan, if applicable or requested by the client to meet the major requirements of USACE Manual 385-1-1.

An Activity Hazard Analysis (AHA) will be prepared to outline safe practices and procedures for the various phases of work involved in this project. If project scopes of work change or if new hazards are identified, additional or revised AHA's will be developed and added to this plan.

Copies of the AHA's shall be retained on the job site for personnel review. Personnel shall have free access to the AHA's to review specific safe practices and procedures outlined for hazardous activity contemplated.

MISCELLANEOUS SAFETY REQUIREMENTS

Drinking Water

An adequate supply of potable water will be supplied to all employees on site.

A typical water cooler with lid and dispenser will be used on site.

Cups will be made available to all employees on the job site. No one will be permitted to drink directly from the dispenser and the sharing of cups will be prohibited.

Toilets

The placement of temporary toilets will coincide with the number of employees on the job site.

The rental supplier for the toilet will perform the cleaning and servicing of the toilet.

Head Protection

All employees on the job site will wear a hard hat that meets the requirements of COE 385-1-1(05.D.01).

All entryways to the work zone will have proper signage requiring that hard hats be worn.

Fire Extinguisher

A fire extinguisher will be maintained on the job site, and the number of extinguishers will be evaluated according to COE 385-1-1(09.E.01).

The SSO will be responsible for training TMS employees on site, in the use of a fire extinguisher and its functions.

Flammable Liquids

The SSO will supervise the storage, handling, and use of flammable and combustible liquids.

The SSO will ensure that fuel is carried in and stored in containers that meet the requirements of COE 385-1-1(09.B).

Grounding

Ground Fault Circuit Interrupters will be used with applicable cords and tools.

House Keeping

Daily clean-up will be performed to ensure the job site and its entryways are safe and orderly.

Machinery and Mechanized Equipment

All machinery and mechanized equipment will be inspected and tested before it is put into use. All machinery and mechanized equipment will be inspected prior to work every morning and inspection log turned into Dredge America Superintendent immediately upon completion.

Ladders

Ladders will be inspected prior to use. Defective ladders will be tagged not for use or placed in the trash. Folding ladders must be fully deployed prior to using. Employees must face the ladder for ascent and descent. ***Ladders are not to be used in front of doors unless the door is secured.***

ATTACHMENT A

Subcontractors and Suppliers:

WaterSolve
Polymer Supplier
Caledonia, MI
616-575-8693

Flint Industries
Geotube Supplier
Metter, GA
912-685-3375

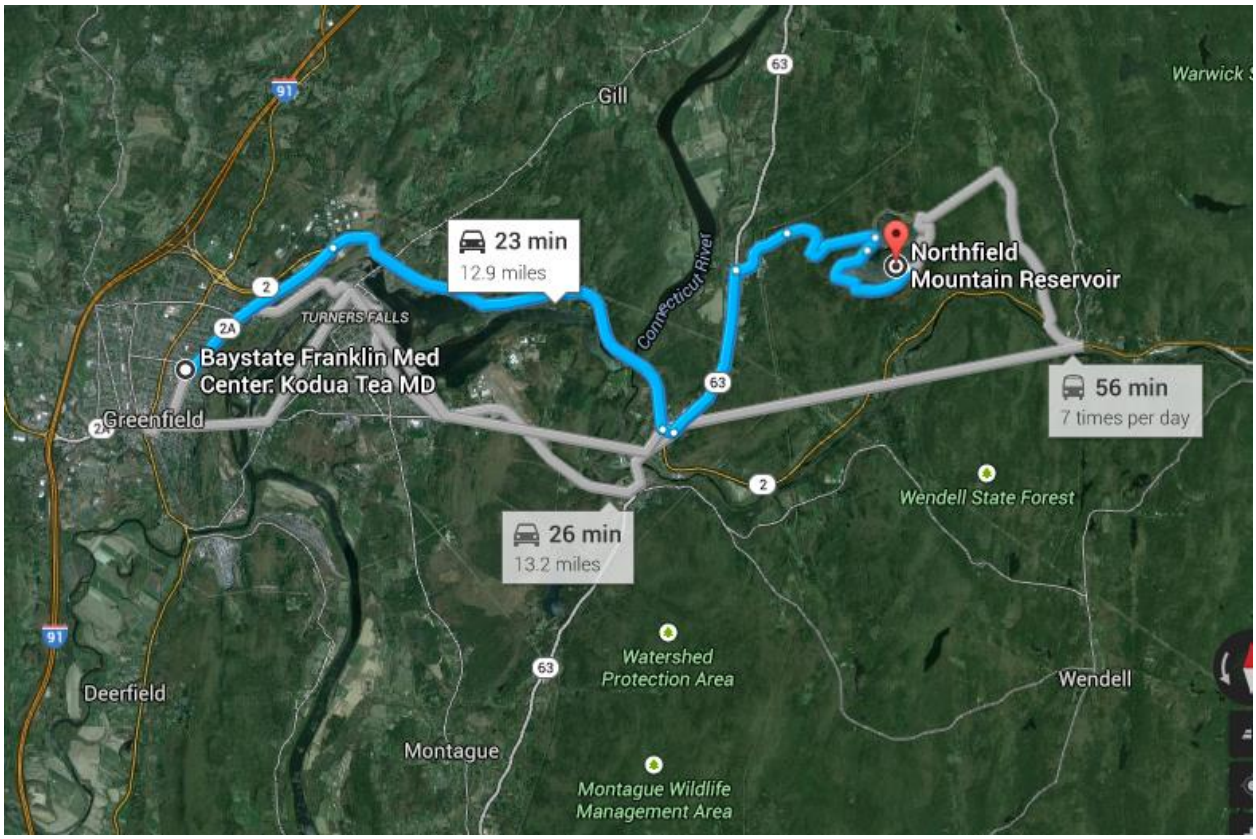
ATTACHMENT B

Emergency Response Facilities

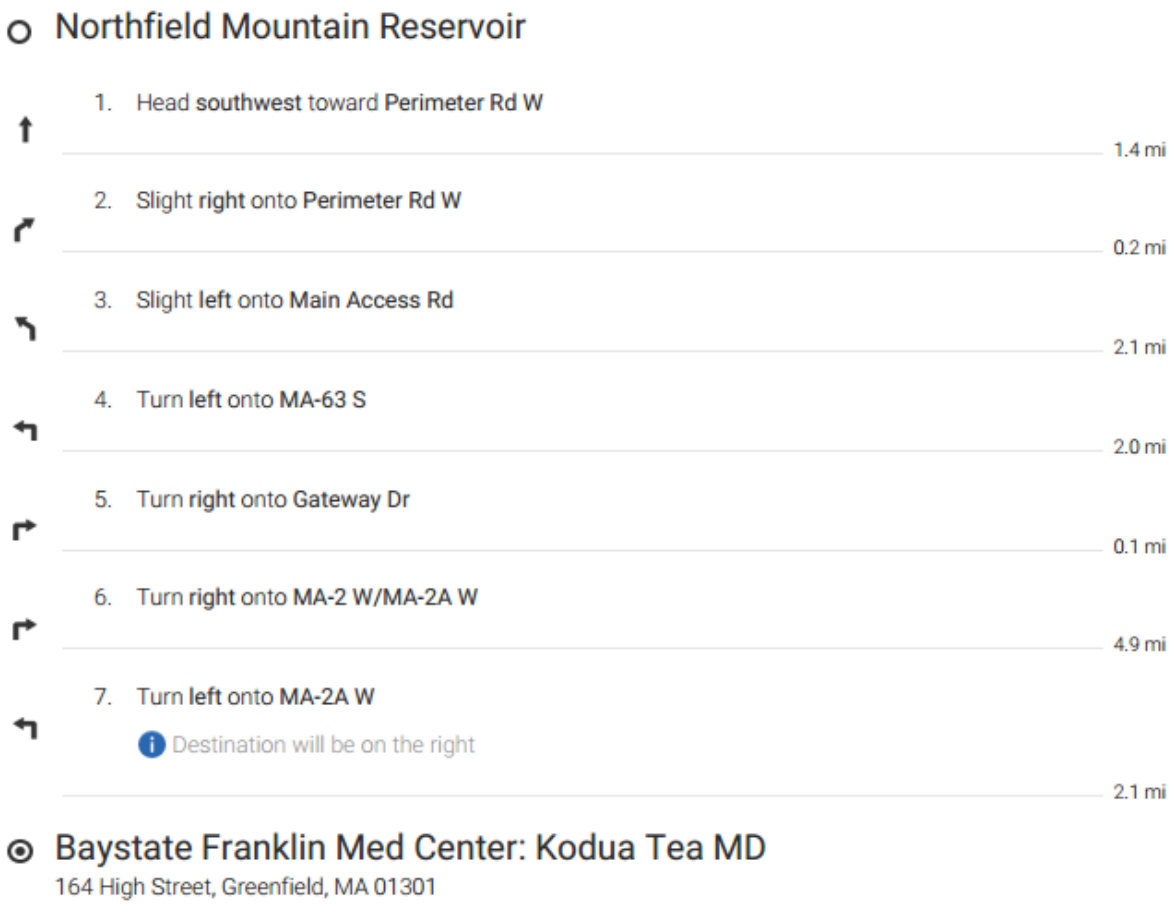
Primary Medical Facility

Baystate Franklin Medical Center
164 High Street
Greenfield MA, 01301
Phone: 413-773-0211

PRIMARY MEDICAL FACILITY



DIRECTIONS TO Community Hospital



ATTACHMENT C

Activity Hazard Analyses – Site Specific

Activity Hazard Analysis

Activity: Working over the water and dewatering dredged sediment using geotubes/polymers.	**Date:** 1-31-2015
	Project: Northfield Mountain Upper Reservoir Dredging
Description of the work: All work on the project will involve working over water from either a boat, barge, or the dredge. Also, any work pertaining to geotubes, either on top of or around.	**Site Supervisor:** Tommy McBride
	Site Safety Officer: Tommy McBride
	Review for latest use: Before the job is performed.

WORKING OVER THE WATER		
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Working over water on a daily basis for the duration of the project.	Drowning	Wear a personal flotation device at all times while working over the water.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Boats, Barges, Dredges, and PFD	Make sure PFD is Coast Guard Approved and all snaps and zippers are functional.	Make all personnel aware of policy that PFD is required at all times while working over the water and must be worn properly.
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)

Equipment will be pushed in place with boat and anchored in work area.	Storms could create rough water and high waves or the release of water from the outlet pipes/dam could cause a quick drop in water level.	Make sure all floating equipment has multiple anchors and all equipment on barges are secured. Superintendent (SSO) will monitor weather and water level on a daily basis. If necessary tow dredge to protected area or tie off at nearest shoreline. All compartments are sealed so splashing across deck will not cause equipment to take on water.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Boats, Barges, and Dredge.	Inspect all anchor lines, ropes, etc.	Train all personnel on securing equipment in case of high winds falling water levels using multiple anchor lines.
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Protecting the public at night	Boats running into work area and floating equipment	All floating equipment will be lighted at night.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Barges, boats, lighted buoys, anchors, dredge discharge pipeline	Inspect all lights daily to ensure all are in working order	Deckhand will be trained on how to ensure all lights are in place and in working order
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
In the event of an oil spill during the course of dredging.	Oil spill could reach water.	Hydraulic oil is biodegradable as an added protection. Spill containment boom and oil absorbent pads will be placed on all barges, boats, and the dredge. In the event of a spill, oil absorbent boom and or turbidity barrier will be used to contain spill. All work will be stopped, when fueling dredge or boat. Land based fuel tank will be double walled and in a containment.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Oil boom, Oil Absorbent Pads, Floating Turbidity Barrier, Barges, Boats, and Dredge.	Inspect hoses daily for signs of wear.	Train all personnel on procedures in event of a spill.
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Boat approaching dredge or barge	Dredge or landbased equipment operator not aware of approaching boat and possible collision	Boat operator will radio equipment or dredge operator each time they are approaching

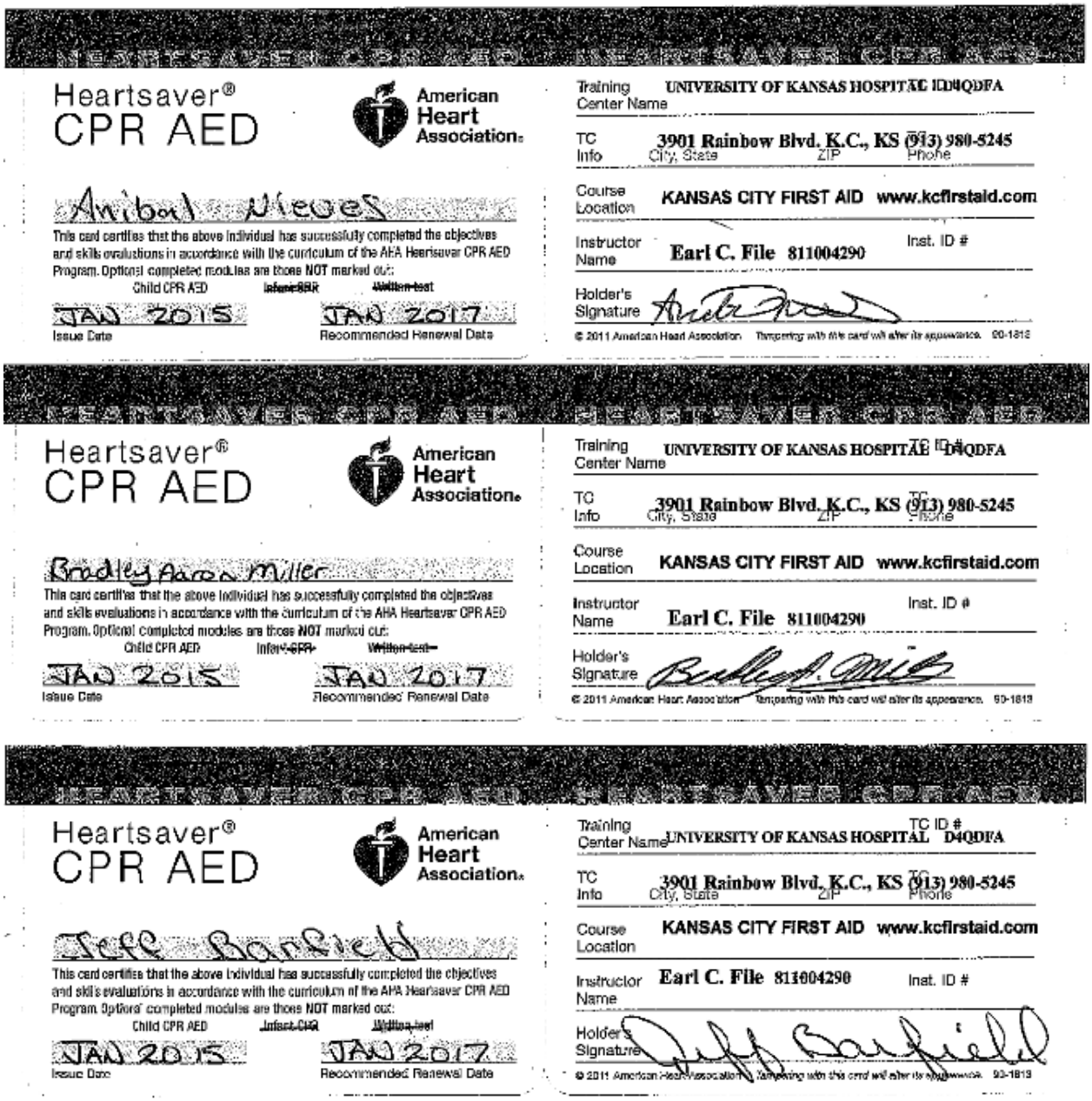
Equipment to be Used	Inspection Requirements	Training Requirements
Boat barge, dredge, radios, cell phones	Make sure all communication devices are functioning priority start of work each day	Train everyone on procedures to follow
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
General handling of anchor lines, rope, and overhead hazards throughout project.	Ropes, or cable cutting hands and overhead object hitting head or hitting head on overhead objects.	Wear hard had at all times on project and wear gloves when handling rope or anchor line.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hard hat and gloves	Ensure gloves are free of wear and holes	Advise all personnel prior to start of policy

WORKING WITH/ON TOP OF GEOTUBES		
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Working next to and on top of geotubes, climbing ladders, hoisting equipment, slippery surfaces.	Tubes could roll while someone is on top or beside, ladder could fall while climbing, equipment being lifted could fall, or surface of tube being wet and slick could cause someone to slip.	Always have a spotter when working near tubes, make sure to wear proper PPE, ensure ladder is secure before climbing and have person below holding in place. Properly rig equipment that is hoisted up on top of tube, mark the edges of the tube layers with paint to show the edge of work area, and wear proper footwear to prevent slipping.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Ladders, forklifts, manlifts, hardhats, and footwear.	Ensure spotters are used when climbing ladders or using manlifts, inspect tube integrity before climbing on top, make sure proper rigging is used when lifting equipment, ensure working area is clearly marked on top of tubes.	Advise all personnel of potential risks working around and on top of tubes. Enforce the use of spotters when working on top of tubes or using ladders. Train everyone on procedures for as described.

WORKING WITH POLYMERS/CHEMICAL ADDITIVES		
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Handling of Anionir/Cationic polymers and injecting it into dredge pipeline.	Polymer could be accidently consumed or splashed/rubbed into the eyes.	Wear gloves and safety glasses when handling chemicals. Have bottles of clean water on site to rinse eyes or mouth if ingested.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Chemical Handling Totes/Barrels, Injection pumps and hoses, dredge pipeline, valves, sampling equipment, gloves and eye protection.	Make sure gloves are free of holes and glasses cover eyes completely. Inspect containment facilities, injection pumps and all equipment associated with chemical additives for leaks defaults or hazards.	Advise all personnel of policy and go train them on procedures to prevent and treat any accidental contact with the chemicals.

ATTACHMENT D

Red Cross Certifications/ Certificates Enclosed



Heartsaver® CPR AED

American Heart Association.

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL TC ID# D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature

Anibal Nieves

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED ~~Infant CPR~~ ~~Written test~~

Issue Date: JAN 2015 Recommended Renewal Date: JAN 2017

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Heartsaver® CPR AED

American Heart Association.

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL TC ID# D4QDFA

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Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature

Bradley Aaron Miller

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Child CPR AED ~~Infant CPR~~ ~~Written test~~

Issue Date: JAN 2015 Recommended Renewal Date: JAN 2017

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Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature

Jeff Barfield

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Child CPR AED ~~Infant CPR~~ ~~Written test~~

Issue Date: JAN 2015 Recommended Renewal Date: JAN 2017

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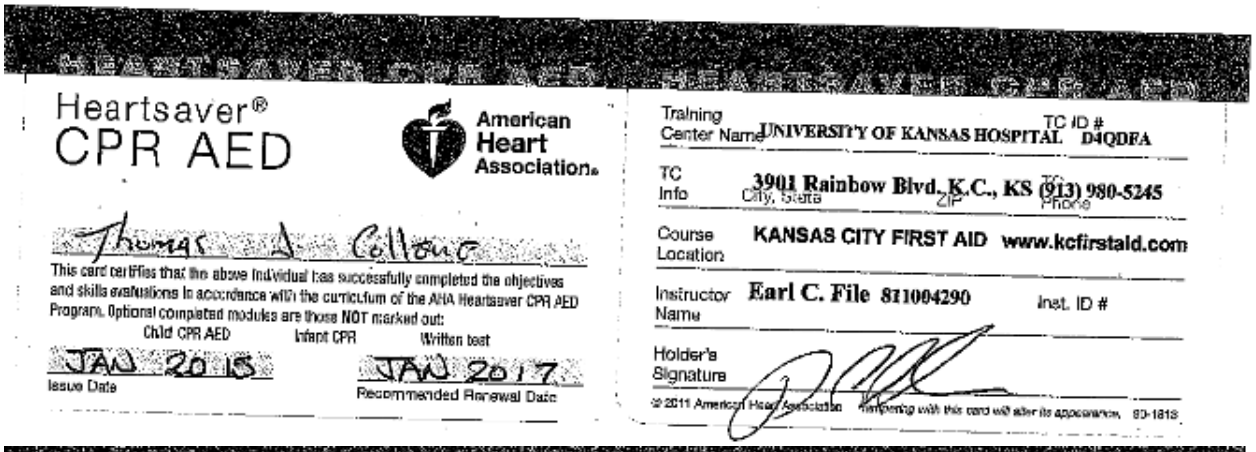

Heartsaver® CPR AED

American Heart Association.

Thomas J. Collins

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Child CPR AED | Infant CPR | Written test

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL — TC ID #: D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 — Inst. ID #

Holder's Signature

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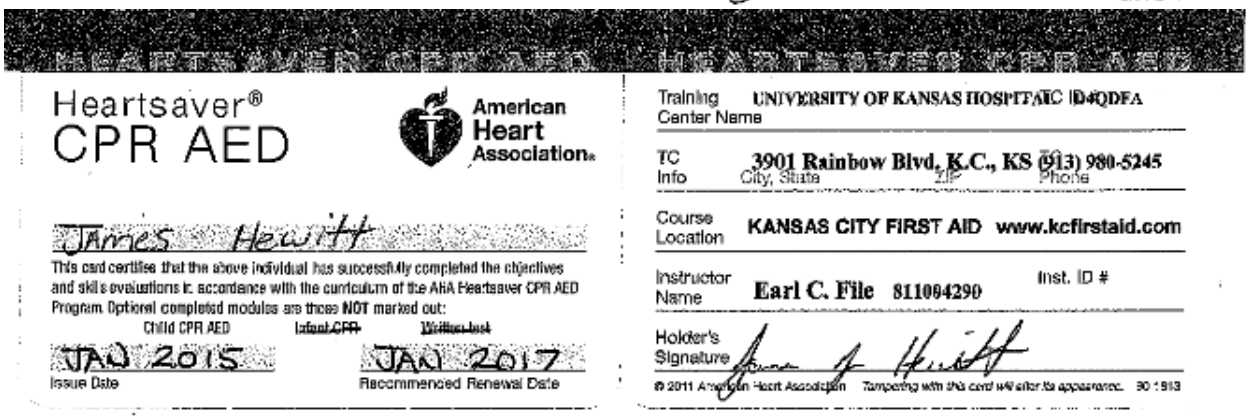

Heartsaver® CPR AED

American Heart Association.

James Hewitt

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Child CPR AED | ~~Infant CPR~~ | ~~Written test~~

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL — TC ID #: D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 — Inst. ID #

Holder's Signature: James J. Hewitt

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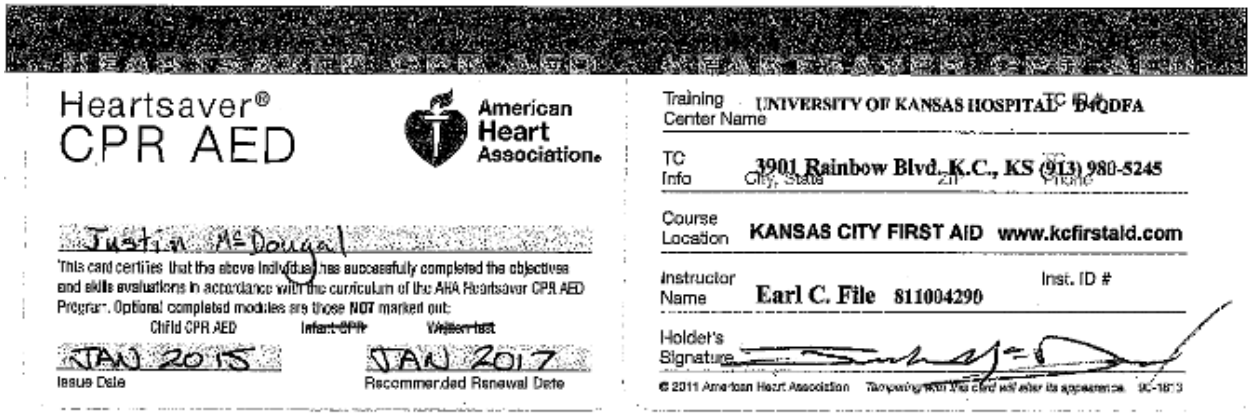

Heartsaver® CPR AED

American Heart Association.

Justin McDougal

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED | ~~Infant CPR~~ | ~~Written test~~

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL — TC ID #: D4QDFA

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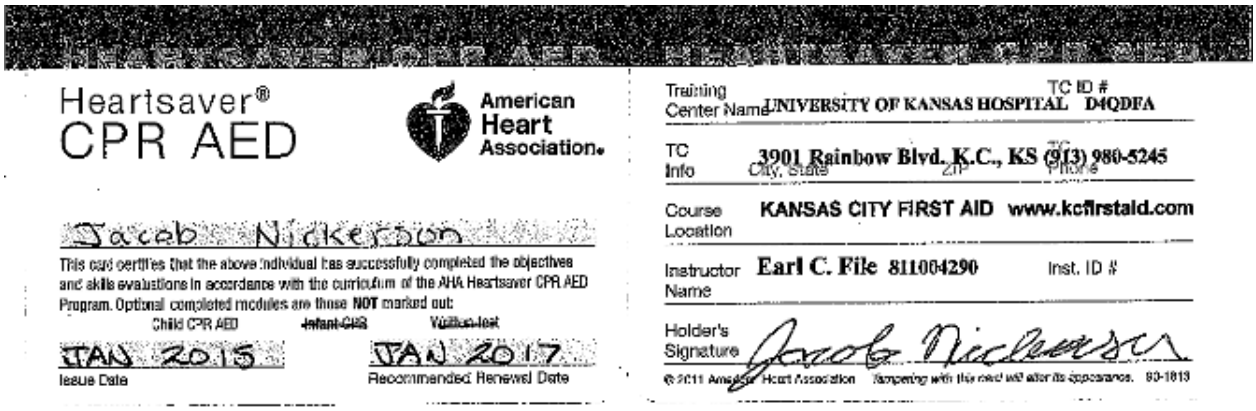

Heartsaver® CPR AED

American Heart Association.

Jacob Nickerson

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED | ~~Infant CPR~~ | ~~Written test~~

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL — TC ID #: D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 — Inst. ID #

Holder's Signature: Jacob Nickerson

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Heartsaver® CPR AED

American Heart Association.

Stacy Mccullough

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED ~~Infant CPR~~ ~~Written test~~

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL TC ID # D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature: Stacy Mccullough

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Heartsaver® [redacted] CPR AED

American Heart Association.

Shawn Stothart

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver ~~First Aid~~ CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED ~~Infant CPR~~ ~~Written test~~

JAN 2015 — Issue Date

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TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature: Shawn Stothart

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Heartsaver® [redacted] CPR AED

American Heart Association.

Thomas McBride

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Child CPR AED ~~Infant CPR~~ ~~Written test~~

JAN 2015 — Issue Date

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TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature: Thomas McBride

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Heartsaver® [redacted] CPR AED

American Heart Association.

Tyler T Russell

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver ~~First Aid~~ CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED ~~Infant CPR~~ ~~Written test~~

JAN 2015 — Issue Date

JAN 2017 — Recommended Renewal Date

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL TC ID # D4QDFA

TC Info: 3901 Rainbow Blvd. K.C., KS (913) 980-5245 (City, State ZIP Phone)

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Holder's Signature: Tyler T Russell

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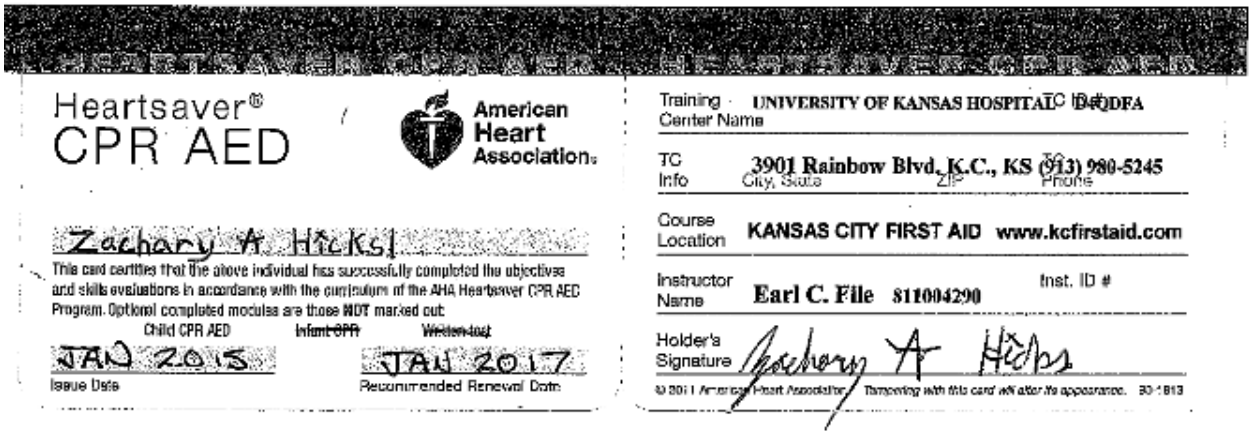

Heartsaver® CPR AED

American Heart Association.

Training Center Name: UNIVERSITY OF KANSAS HOSPITAL TC ID# ODFA

TC Info: 3901 Rainbow Blvd, K.C., KS (913) 980-5245
City, State ZIP Phone

Course Location: KANSAS CITY FIRST AID www.kcfirstaid.com

Instructor Name: Earl C. File 811004290 Inst. ID #

Zachary A. Hicks

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those NOT marked out:

Child CPR AED ~~Infant CPR~~ ~~Written test~~

JAN 2015
Issue Date

JAN 2017
Recommended Renewal Date

Holder's Signature: Zachary A Hicks

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ATTACHMENT E

Workers' Compensation Experience Rating Log

Date	***Exp Mod***	***Effective Date***
2/7/2005	0.81	1/14/2005
1/14/2006	0.83	1/14/2006
12/26/2006	0.84	1/14/2007
10/23/2008	0.96	1/14/2009
11/21/2008	0.85	1/14/2009
11/25/2008	1.14	1/14/2009
8/6/2009	1.16	1/14/2010
12/9/2009	1.19	1/14/2010
11/29/2010	1.16	1/14/2011
12/05/11	0.87	1/14/2012
9/6/2012	0.85	1/14/2013
11/08/2013	0.80	1/14/2014

WORKERS COMPENSATION EXPERIENCE RATING

Risk Name: DREDGE AMERICA INC **Risk ID:** 917659656

Rating Effective Date: 01/14/2014 **Production Date:** 11/08/2013 **State:** INTERSTATE

(A) Wt	(B)	(C) Exp Excess Losses (D - E)	(D) Expected Losses	(E) Exp Prim Losses	(F) Act Exc Losses (H - I)	(G) Ballast	(H) Act Inc Losses	(I) Act Prim Losses
.10		32,778	42,770	9,992	0	23,929	0	0

	Primary Losses	Stabilizing Value	Ratable Excess	Totals
Actual	(I) 0	C * (1 - A) + G 53,429	(A) * (F) 0	(J) 53,429
Expected	(E) 9,992	C * (1 - A) + G 53,429	(A) * (C) 3,278	(K) 66,699

	ARAP	FLARAP	SARAP	MAARAP	Exp Mod
Factors	1.00	1.00			(J) / (K) .80

****
**** REVISED RATING ****
****
THE TENNESSEE CODE ANNOTATED §50-6-501 REQUIRES EVERY PUBLIC OR PRIVATE EMPLOYER THAT IS SUBJECT TO THE WORKERS COMPENSATION STATUTE TO "ESTABLISH AND ADMINISTER A SAFETY COMMITTEE IN ACCORDANCE WITH RULES ADOPTED PURSUANT TO T.C.A. §50-6-502 IF THE EMPLOYER HAS AN EXPERIENCE MODIFICATION RATE EQUAL TO OR GREATER THAN 1.2."
THE ARAP FACTOR SHOWN IS FOR THOSE STATES CONTAINED ON THIS RATING THAT HAVE APPROVED THE ARAP PROGRAM AND IS CALCULATED BASED ON THE STATE WITH THE HIGHEST APPROVED MAXIMUM ARAP SURCHARGE. THE MAXIMUM ARAP SURCHARGE MAY VARY BY STATE. PLEASE REFER TO EACH STATES APPROVED RULES FOR THE APPLICABLE MAXIMUM ARAP SURCHARGE.
RATING REVISED TO REFLECT APPROVED RATING VALUES

ATTACHMENT F

Severe Weather Plan

Hurricane Plan Statement

It is the intent of this document to establish and communicate Dredge America, Inc. General Hurricane Preparation Plan. Project specific instructions are offered on page 2 of this document.

Dredge America Inc. will at all times employ best management practices to ensure that the dredge plant and related support equipment do not pose a threat to public or private property and that measures are taken to minimize potential impacts to local navigation. The following plan describes the timeline and measures to be taken to secure the dredge and plant in advance of an approaching hurricane.

Five levels of readiness:

Level 5 When working in coastal waters, field crews will be aware of the potential for hurricanes and tropical storms. Specific rigging and supplies will be kept on each job site sufficient to secure, tow or recover the floating plant and pipeline. A hurricane preparation plan will be adapted to meet the specific needs of each project and kept on-site prior to mobilization. **(June through the end of October)**

Level 4 In the event that a tropical storm develops that may impact the job site, an inventory of preparation supplies and rigging shall be made to ensure readiness. **(Five days prior)**

Level 3 In the event that a hurricane watch is issued for the project site, a review of the project hurricane preparation plan will be made by the Operations Manager and the Project Superintendent. This plan will then be communicated to the entire crew and client at the first available shift change meeting. All equipment not critical to the operation of the dredge will be removed from the project site or secured. Measures will be taken to reduce fuel storage on the dredge and floating plant. Necessary anchors and rigging will be placed for ready access. **(48 hours)**

Level 2 In the event that a hurricane warning is issued for the project site, dredging will be suspended and all hands will begin securing, stowing or removing remaining plant and equipment in preparation to evacuate the site. **(24 hours)**

Level 1 Entire crew will evacuate the area and meet at prearranged lodging inland. **(12 hours)**

Dredge Anchoring Plan

The hydraulic dredge is a conventional cutter suction dredge equipped with two spuds and two swing anchors. It therefore has four fixed anchoring points. In the event that it becomes necessary to anchor the dredge in advance of an approaching hurricane, both spuds will be put in the down position with sufficient slack in the spud cables to allow free up and down movement of the dredge. Ballast tanks will be pumped out and hatches secured.

Lighting Storm Plan Statement

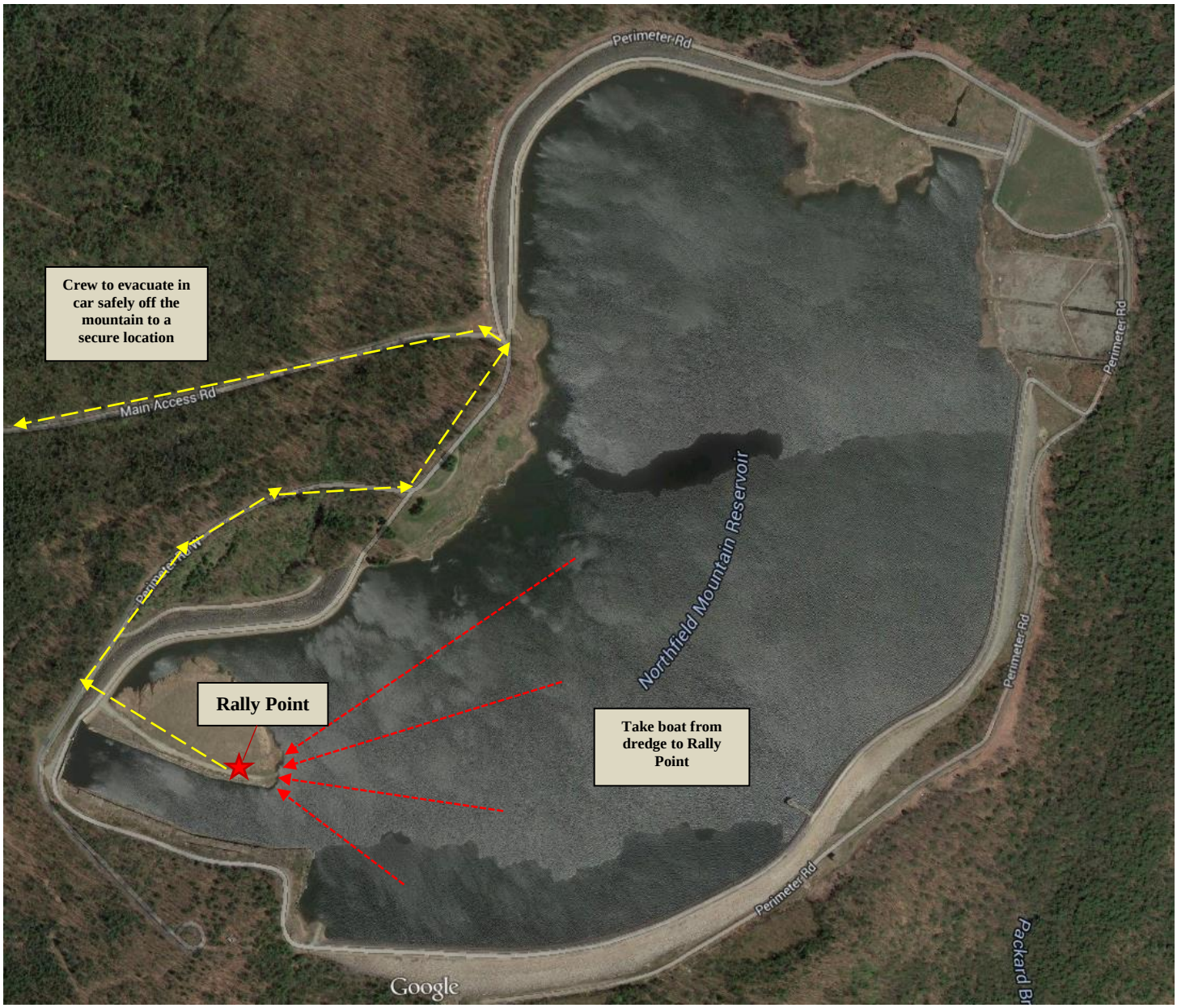
Superintendents and all crew members are responsible for checking the weather every evening for the next day's forecast. If it looks like there will be a thunderstorm the following day, proper preparations will be made in order to safely operate or to delay work until the storm has passed.

In the event of a lighting storm while operations are in progress all crew members will stop operations and promptly anchor the dredge. Once the dredge is anchored crew members will evacuate to their cars to get to a large, safe indoor location. Do not take shelter under trees or somewhere not protected from the lightning. Stay inside at least 30 minutes after the last strike.

If the crew cannot get back to shore safely they are to drop anchor and get as low as possible and retreat to the cabin of the dredge. Once in the dredge cabin, crew members will try to stay away from metal surfaces and off of the radio unless it's an emergency.

Site Specific Evacuation Plan

In the event of an emergency such as a lightning storm or sudden change in water depth, crews are to evacuate onto a boat that will be adjacent to the dredge. Once all crew members on the water have been accounted for they are to meet at the rally point, where their vehicles will be located. At that time if there are any crew members on land this is where they will meet as well. The Superintendent/SSO will ensure that everyone is at the rally point, and then the crew will take the below route down the mountain to a safe and secure location. Note, once everyone is safe call the Northfield Control Room (413) 659-4421.



ATTACHMENT G
EMERGENCY CONTACT FORM (ECF)

Dredge America

Dan McDougal President	(816) 330-3100 (Office) (816) 820-6131 (Cell)
Jason Collene, OM/HSM	(913) 240-7286
Tommy McBride	(417) 664-1174
Base Emergency Number **Northfield Control Room** (Manned 24/7)	(413) 659-4421
Hospital	Baystate Franklin Medical Center 164 High Street Greenfield MA, 01301 Phone: 413-773-0211

ATTACHMENT H
SAFETY PLAN ACKNOWLEDGEMENT FORM

I, _____ have read and will comply with all requirements of the Dredge America Health and Safety Accident Prevention Plan.

_____

Print Name/Date

_____

Signature

ATTACHMENT I
MSHA CERTIFICATES

N/A

ATTACHMENT J
CQM CERTIFICATES

N/A

ATTACHMENT K
OSHA CERTIFICATES

N/A

ATTACHMENT L
BOAT HANDLING LICENSES

N/A

ATTACHMENT M
MISCELLANEOUS FORMS

N/A

Appendix G

Dredge America Proposal

Proposal for:
GDF Suez Energy
Northfield Mountain
Upper Reservoir Maintenance
Dredge Project

SUBMITTED BY: Daniel S. McDougal
Dredge America, Inc.
9555 NW Highway N Kansas City MO 64153
816-330-3100 fax 816-330-3103
dan@dredgeamerica.com
FID 43-1544387

Table of Contents

Introduction

Thank you for allowing us the opportunity to provide a proposal for dredging services. I am confident Dredge America is most qualified to perform these services.

This project capitalizes on the experience and expertise Dredge America has gained over the past twenty three years as one of the leading hydraulic dredging companies in North America. We are uniquely qualified to provide the highest quality services.

Because of our industry leadership and high ethical and professional standards, we are able to provide added benefits beyond just dredging services. One value added service is our problem solving ability. This ability to bring creative solutions is part of our culture and capitalizes on our years of experience with projects similar to yours.

The following presentation will provide complete information outlining the expertise we will bring to the project and the benefits we will provide as added value.

We look forward to the opportunity to discuss our proposal and build a long-term relationship with you.

Ranger Lake, Arlington, Texas

Material stockpiled from shallow upper creek for dredge to pick up and pump 1.5 miles to settling basin.

History

Dredge America was established 24 years ago, as McDougal Construction Company, by Daniel S. McDougal. The company originally focused on civil projects including bridges, wharf facilities and drainage structures for local, state and federal customers, as well as private customers such as railroads and industrial clients.

In 1993, McDougal Construction acquired a successful dredge contracting company and opened a new division devoted to hydraulic dredging. After two years, management saw the success and potential of the dredging division and turned the company's focus exclusively to hydraulic dredging and becoming the national industry leader in portable hydraulic dredging.

In 1995, the structures division was sold and the company's name was changed to Dredge America, Inc. The company is a C corporation and is owned 100% by Dan and Renee McDougal.

The current fleet includes six company-owned portable dredges, plus a vast array of state-of-the-art support equipment, including but not limited to boats, barges, miles of HDPE pipe, hydrographic survey equipment, etc.

Dredge America has become the respected name in professional dredging services because hydraulic dredging is our only business. All of our resources are focused on being the best at our core competency.

US Coast Guard Station, Ponce Inlet, Florida

Competencies

Our experience and reputation have been earned one project at a time. Dredge America has dredged an array of materials under varying conditions and solved the challenges we've encountered through superior project management and problem-solving skills.

The variety of materials we have dredged include mine tailings, silts, clays, sands, alum and lime sludge, sewage sludge, animal waste, as well as many others. The varied site conditions include:

- pumping distances up to three miles
- running pipe line under main line ship channels
- being on the forefront of placing dredge spoils in geotubes for dewatering
- island creation and wetland rehabilitation
- being on the forefront in the use of polymers with geotubes for the dewatering of fine grained materials
- dredging in front of nuclear power intake structures with high currents and very sensitive marine wildlife
- dredging near intake structures of water treatment plants with minimum turbidity
- working three miles offshore to extend an island for bird habitat
- dredging mountain lakes without disturbing trophy rainbow and brown trout
- dredging under Navy docks with only five feet of clearance
- dredging under floating barges and casino boats
- cutting channels through phosphate mine tailings ponds
- dredging next to large yachts and behind expensive homes
- dredging inside marina boat slips
- pumping material into scows
- dredging and classifying sand for sale
- as well as many other applications

Our ability to solve problems and perform tasks efficiently is greatly enhanced by our experience with similar projects, sites, and material challenges. The history of our ability to solve problems is a testament to our ability to solve future challenges.

Experienced Crews

At Dredge America, we strongly believe in mobilizing highly qualified people on-site where challenges occur and where problems need to be solved immediately. Our field supervisors are empowered to act as contract representatives for Dredge America and can therefore make critical decisions in the field, lessening potential delays and increasing the adaptability of the field crew.

Our professional field personnel are clean cut, articulate, educated, trained, and experienced project managers in the field. This means that both the project superintendent and professional operators:

- Wear hard hats, uniforms, and life preservers
- Have communication devices on hand at all times
- Have the ability and expertise to troubleshoot problems
- Have years of experience, so they make the work look easy
- Are MSHA and CPR trained
- Conduct themselves professionally at all times with the client and the general public
- Observe security rules of the client
- Are sensitive to the environment

Dredge America also has a professional office staff to support the fieldwork and a vast network of contacts in the dredging industry.

Project Team

Dredge America is large enough to easily perform this project, but small enough to care about how it gets done.

Our field staff work on a rotation schedule working approximately 21 days on and 7 days off. The rotations are staggered so that the job is always fully staffed. Besides managing the project, each of Dredge America's superintendents can efficiently operate the dredge or any other piece of equipment on site and can troubleshoot and perform mechanical work on equipment as needed.

Dan McDougal has worked in every position in the company and can fill in as needed in any position. He will oversee the administration of the project.

Finally as the past president of our national dredging association, the Dredge Contractors of America, DCA, we have very deep roots in the dredging industry and know most of the nations industry leaders. This network of connections means any problem of any kind related to dredging that can not be solved in house is only one or two phone calls away from solution. We help other dredge contractors and engineers on almost a daily basis and have been doing this for years so we know our extended team is there if we need them.

Climax Mine- Leadville, CO

Equipment

Dredge America presently owns and operates six portable dredges ranging in size from 6" to 20".

Equipment ownership, versus rental of specialty equipment like dredges offers many advantages to the customer:

- First, the on-site Project Team is intimately familiar with the dredge, having spent many months or years operating the equipment under a variety of conditions. There is no wasted time learning about unfamiliar equipment.
- Second, Dredge America keeps a large inventory of parts for all of our equipment. Any down time is greatly reduced, which brings the job in on time and on budget.
- Third, we have complete control over our equipment at all times. We can move equipment around with a moments notice and don't have to worry that a third-party may rent it out to another contractor. This also keeps us flexible and able to remain consistent on every job.
- Fourth, the ultimate responsibility for equipment performance lies with Dredge America. You won't hear excuses about a third-party's lack of responsiveness or shoddy equipment.
- Fifth, both our dredge operators and project superintendents participate in the design of our new dredges. As a result we have across the board participation to ensure that our dredges are very efficient to operate.

Support equipment for these dredges includes over 45,000 L.F. of discharge pipe, four custom built barges for moving anchors and performing service work, multiple support boats, booster pumps, a vast array of special rigging and tooling, land based support equipment, 2 hopper barges, a long reach excavator, etc.

Dredges

Dredge America owns the following dredges:

- Eagle One – 20" dredge with 1466 HP on pump, 420 HP auxiliary and 100 KW Power Generator
- Patriot - Swinging ladder dredge 8"x8" underwater pump 250 H.P.
- Aline- Swinging ladder dredge 12"x10" 450 H.P.
- Nations- Auger dredge with 10"x10" 174 H.P.
- Liberty - Conventional cutterhead dredge 12"x10" with 450 H.P. and 50' digging depth
- Dino -6" auger mini dredge 65 H.P.

Dredge America maintains a variety of dredge designs because we believe that one tool does not perform all jobs. Each of the five styles and sizes of dredges that we operate have unique characteristics that must be matched to the individual job in which they are being assigned.

Dredges

Dredge Spirit- Recently sold. Replaced with Eagle One

Eagle One

Risk Management

Dredge America provides proper insurance for marine work. Included are P&I coverage and various other specialized coverage including Long Shore Man's and Jones Act coverage.

A certificate of insurance listing the owner as additional insured is provided in Appendix "E".

Dredge America enjoys an excellent safety record as a result of a proactive safety program. Our crews are trained and OSHA certified. In addition, Dredge America is a drug-free workplace.

Safety training is an on-going commitment by the management of Dredge America. A copy of our safety plan will be provided upon request. We subscribe to an "Incident and Injury Free" workplace where any person on the crew can and is responsible for stopping the project should an unsafe act be observed.

Dredge America has completed over 200 dredging projects and has never left a project uncompleted in our 24 year history. Clients can be assured that their project will be completed.

Dredge America's Experience Modification Rating (EMR) for 2013 is 0.85. A copy of this document is provided in Appendix "F".

As mentioned above, our safety plan is available upon request.

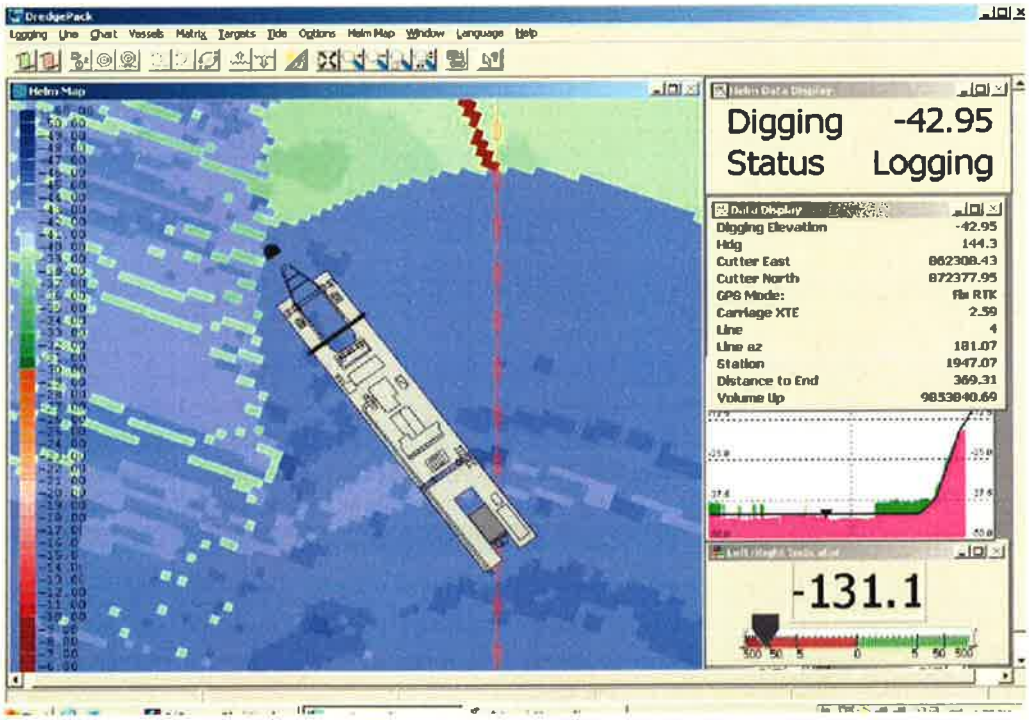
U.S. Army Rangers Training Camp, Dahlonega, GA

Quality Control

Dredge America uses cutting edge hydrographic surveying software (Hypack) and GPS monitoring systems (Dredgepack) to track our dredge production and progression. This software helps us to assure we are excavating at the correct depth while showing the dredge's progression in real time. It also allows us to verify pre and post dredge conditions in order to more accurately identify the quantity of material removed.

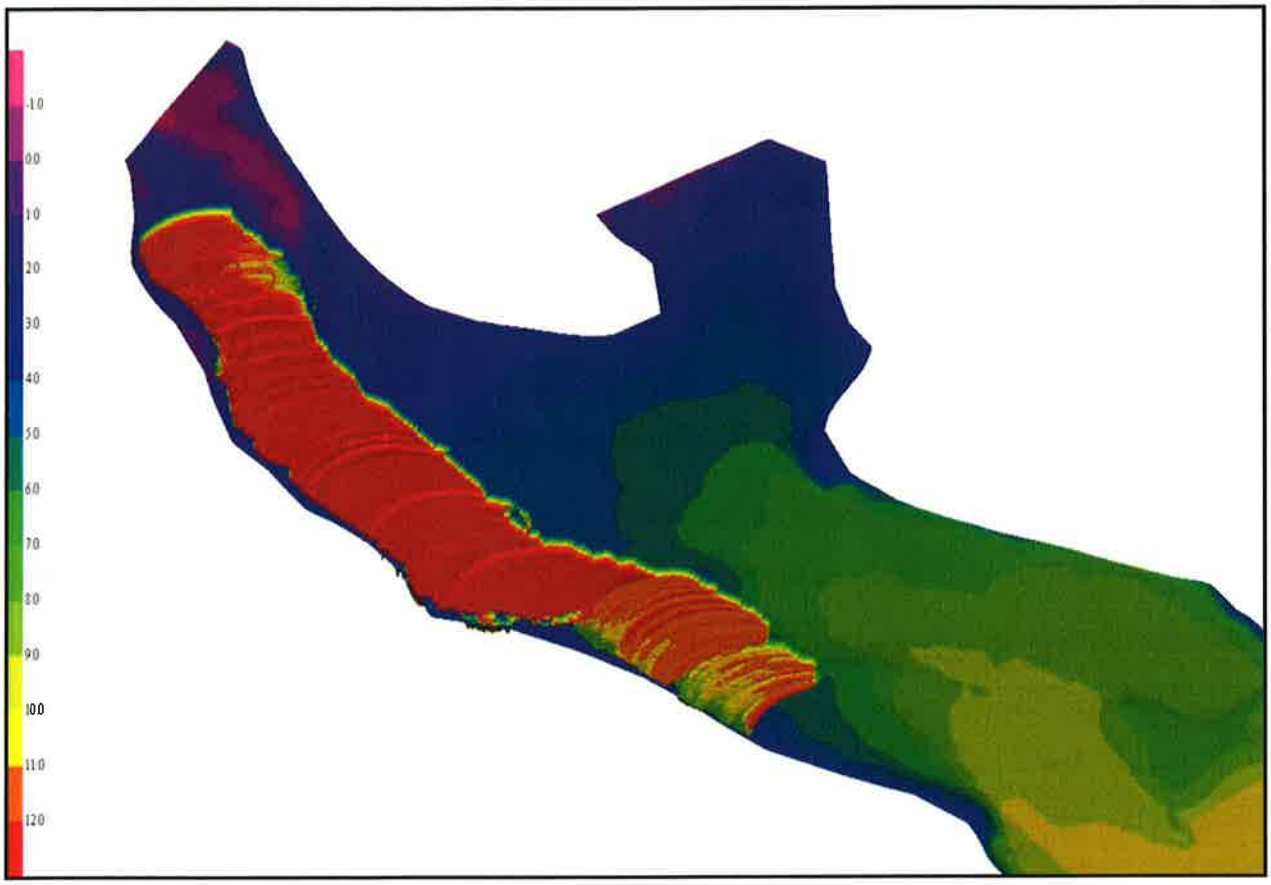
Typically, prior to the beginning of dredging operations, a hydrographic survey will be performed on the area to be dredged. This information will be used to determine the top of sediment and approximate hard bottom. A depth of sediment to be removed will be determined, as well as an approximate area to be dredged. This depth and area will correspond with a pre-determined cubic yard value and corresponding budget. All of this information will be downloaded into Dredgepack, the positioning software utilized on the dredge.

The dredge operator sees a screen similar to the one below and can stay within a pre-determined area and depth. The dredge image on the screen moves as the operator swings the dredge via GPS satellites. The screen color changes, corresponding to a given depth, and this data is logged in real time to record every area and depth that the dredge has covered. This data is accumulated and available for client inspection at any time.



Quality Control

As the dredge advances forward, it produces an image similar to the one below. The red area on the image shows where the dredge has been and what depth the dredge has excavated down too. This particular image is from Mission Lake, in Horton, Kansas, where we removed over 1 million cubic yards of sediment.



In addition to the above software, we also utilize a mass flow nuclear density meter on our 20" dredge to record cubic yards per hour pumped in real time.

Water Quality

Water quality will be monitored and documented on a daily basis to ensure regulatory standards are met. The effluent exiting the dewatering facility (CDF or Geotube) will be sampled to ensure regulatory permit requirements are met.

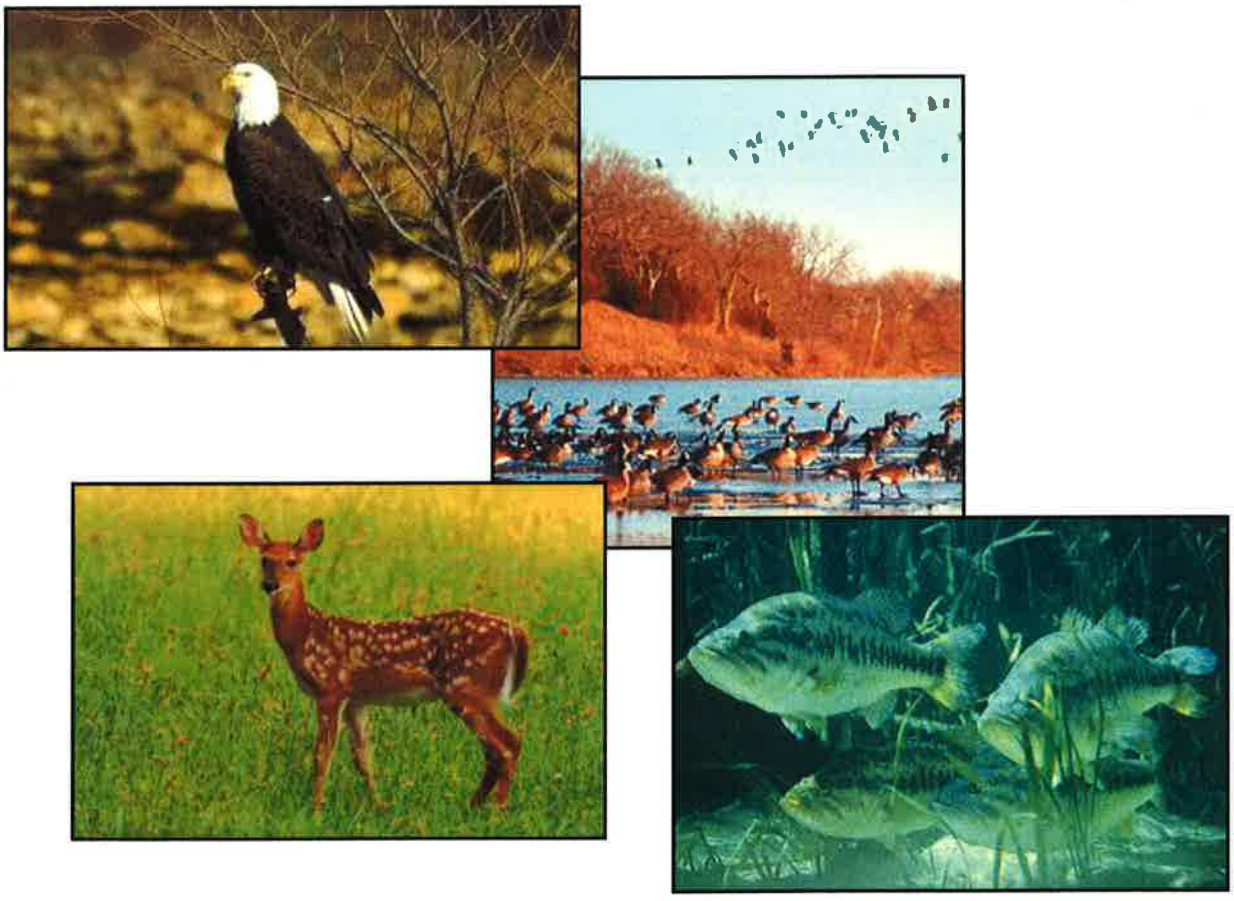
The first photo is of the dredge discharge. The middle photo is discharge from the first settling pond. The last picture is the final discharge.

Environment

Dredge America takes protecting the environment very seriously. We have been involved in numerous environmental restoration projects and have worked in very sensitive ecosystems. These projects involved protection of both endangered plant and animal species.

As an added protection to the environment, Dredge America runs only biodegradable oil in dredges and keeps an oil spill response kit on all projects. Additionally, the projects are kept clean and neat in appearance and trash is disposed of properly. We are frequently complimented by our clients for our clean and well-maintained job sites.

We will address any specific environmental impacts prior to moving on site and we will adapt specific procedures based on your site requirements and requests. We will gladly meet with state or federal environmental officials at any time prior to or during the project to explain and review our policies and procedures to protect the environment and comply with any required regulations.



Scope of Services

Dredge America has looked at several different methods to perform this project in the most cost effective and safe manner. We feel like it is important to discuss the options we did not select and why.

One option was to use a submersible pump hung from a crane. The advantage to this is it would require less equipment and thus less mobilization and a lower hourly costs. On the surface this appears to be a cheaper option. However we have experience with this set up and the production is always much less than anticipated. The reason is the operator is raising and lowering the pump all of the time and the reality is the pump is not actually in the material pumping solids a high percentage of the time. Another issue with this method is when you are in soft material such as that present on this project, the pump "torpedos" into the material once it gains a suction and it can get stuck in the mud as the material caves around it. This can happen instantaneously. It surprisingly can put an extreme and instantaneous stress on the crane and crane boom. This set up is a good option for small quantities and isolated areas such as de-mucking inside cofferdams but does not make sense for larger quantities of material in an open lake.

The second option we looked at was purchasing a conventional cutterhead 14" dredge with a very long ladder. We could not justify the expense of this dredge for the 50,000 CY project and a conventional dredge could have some issues swinging in the main inlet channel as the swing cables are generally ran through the end of the ladder near the cutterhead and the shear walls along the inlet channel would make it difficult to set anchors. The angle of anchoring from the surface on the shore would not work very well as the swing cable would be pulling the ladder up more than sideways.

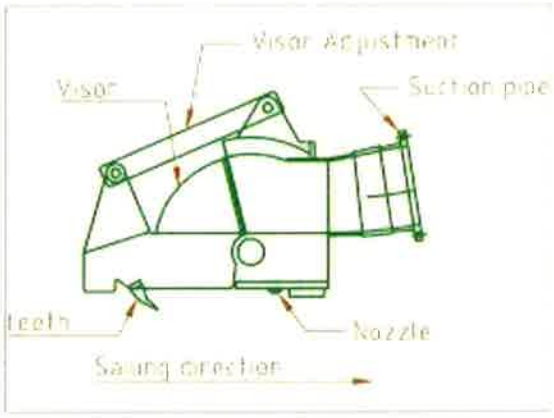
We also considered mechanically excavating material with clamshell and depositing the material in a hopper barge and then slurring material to the confined disposal facility. Again we felt like the production would not be satisfactory to justify the costs.

Since over the last 24 years we have done over 200 projects, including one at Northfield Mountain, we can offer our experience for very unique projects. For this project we have designed a unique dredging system specific for this project. It is based on utilization of two of our dredges and knowledge of deep draft hopper dredge design to create a hybrid deep digging dredge

Scope of Services

Our dredge Liberty is a special Ellicot 370 50' deep digging dredge. We will be using this as the main platform. We will be adding 80' of additional floatation to the front and extending the ladder to reach a 125' depth. This depth of dredging will require an underwater pump. As a result we will utilize the underwater pump, power auger and power unit on our dredge Nations.

We will be running this hybrid dredge from a static cable that will reach across and be anchored on opposing shores. The dredge will ride along this cable similar to our typical dredge projects when using our auger dredge. The only exception is that it will be running in reverse when it is digging as the cutter end will be modified to function as a drag arm similar to a hopper dredge.



Similar design for cutter end of ladder.

Conclusion

Thank you again for the opportunity to provide a proposal for dredging and engineering services. We are confident that Dredge America will provide the best overall value for this project. We look forward to adding you to our long list of satisfied customers.

Sincerely,

Daniel S. McDougal
President

Northfield Mountain Dredging

Potential Pilot Dredging Project
Best Management Practices

Northfield Mountain Pumped Storage Project FERC Project No. 2485-063

Prepared For:

FirstLight Power Resources
GDF SUEZ

99 Millers Falls Road
Northfield, MA 01360

Prepared By:

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Environmental Consulting
15 Research Drive
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Date:

February 24, 2015

Table of Contents

FIGURES

1.0 INTRODUCTION

New England Environmental, Inc. (NEE) and Doucet & Associates, Inc. (Doucet) have prepared this Best Management Practices (BMP) Manual on behalf of FirstLight Power Resources Services, LLC (FirstLight), an agent for FirstLight Hydro Generating Company, an affiliate of GDF SUEZ Energy North America, Inc., for the Northfield Mountain Pumped Storage Project Pilot Dredge Program. This document sets forth BMPs to minimize the risk of adverse impacts to the Upper Reservoir and the Connecticut River due to sediment extraction and storage associated with the dredging operation. The BMPs and procedures included in this plan were developed in consultation with the Massachusetts Department of Environmental Protection (MADEP) and the United States Environmental Protection Agency (USEPA).

It is FirstLight's policy that all construction, operation and maintenance activities be conducted in a safe manner that minimizes impacts on stream and wetlands, wildlife habitat, cultural resources and the human environment. The objective of this Manual is to provide FirstLight's personnel and contractors with the information necessary to perform the dredging activities while minimizing project impacts. FirstLight will meet these objectives by employing the BMPs contained in this Manual. In general, the BMPs are designed to minimize erosion and sedimentation by:

- Minimizing the extent and duration of soil exposure
- Protecting critical areas by reducing the velocity of water and redirecting runoff
- Installing erosion and sediment control BMPs
- Monitoring and maintaining BMPs as necessary throughout the dredging and sediment management activities
- Complete the dredging and sediment management activities in a safe and timely manner

2.0 PROJECT DESCRIPTION

Deep water hydraulic dredging of the Upper Reservoir will be employed as a mechanism to avoid the entrainment of accumulated silt into the intake and ultimately the Connecticut River at harmful levels during operational activities. One of the advantages of deep water hydraulic dredging is that it can occur while the Project is available for generation or pumping, which allows for removal of sediments without the need for removing the Project from service. In contrast, other mechanical means of sediment removal may require dewatering of the Upper Reservoir and would likely require an extended outage.

Because the dredging could occur during generation, BMPs will be implemented prior to, during and post any dredging to avoid sediment migration from the Upper Reservoir through the Project and the Connecticut River.

Dredging of the Upper Reservoir will include the preparation of a staging area. The staging area would receive a slurry of suspended sediment and water pumped from the hydraulic dredge to geotubes. In the staging area, solids are separated from water and collected for processing and removal.

The existing peninsula north of the intake channel will be used for staging. Within this area, dredged material will be processed. The land area required for this is approximately 130,000 square feet. The design of the staging area includes enough workspace for daily operations while allowing for containment of materials.

Before the tubes are pumped into, a manifold piping system will be setup surrounding the tube area. This system of pipes and valves will feed the tubes with the combined sediment and water mixture removed from the lake bottom. In order to keep the tubes stable each tube will be secured to the adjacent tube using the manufactured ties built into the tubes. Each of the outside tubes will be secured to stakes driven into the ground around the perimeter of the staging area. Once the piping system is setup, which would include a polymer injection system, pumping can begin.

3.0 SITE DESCRIPTION

The Northfield Mountain Pumped Storage Project (Project No. 2485) is a 1,143-MW pumped storage project located along the east bank of the Connecticut River in the Towns of Northfield and Erving, MA.

The Project began commercial operation in 1972 and consists of an underground powerhouse, four reversible pump-turbine generators, an underground pressure shaft, four unit penstocks and draft tubes, and a mile-long tailrace tunnel connecting the powerhouse to a 20-mile-long reach of the Connecticut River known as the Turners Falls Impoundment, which serves as the lower reservoir. The manmade upper reservoir (Upper Reservoir) was formed with four earth-core rock fill embankment structures and a concrete gravity dam.

The plant's operation does not affect the river water temperature and is nonpolluting. Power from the plant is quickly available to help maintain system reliability in emergencies or to help meet peak power requirements of over 1.7 million electric customers.

The dredging will occur in an approximately 300 feet by 600 feet section of the Upper Reservoir.

4.0 BEST MANAGEMENT PRACTICES (BMPs)

Erosion occurs whenever water, wind or other forces, such as gravity, remove soil materials. Sedimentation occurs when these materials are deposited in low-lying areas, such as waterbodies and wetlands. The potential for erosion and sedimentation increases during periods of soil exposure and thus are more susceptible to erosion.

FirstLight prepared this BMP Manual to describe measures to be utilized to minimize erosion of disturbed soils and transportation of sediments during the Northfield Mountain Pumped Storage Project Pilot Dredge Program. The procedures developed in this Manual are designed to accommodate varying field conditions while maintaining rigid minimum standards for the protection resources.

This Manual is designed to provide specifications for the installation and implementation of soil erosion and sediment control measures while allowing adequate flexibility to use the most appropriate measures based on site-specific conditions.

The following descriptions are meant to be used in conjunction with the Project Drawings showing the proposed plan for management of sediment on site. There may also be additional measures required based on site activities which would be implemented as the project proceeds.

4.1 Stabilized Construction Exit

Applications:

- A temporary stone stabilized pad located at points of vehicular ingress and egress on a work site.
- Provides a stable entrance and exit from a site in order to keep mud and sediment off public roads and other paved areas.

Advantages:

- Mud and sediment on vehicle tires is significantly reduced which avoids hazards caused by depositing mud on the public roadway and other paved areas.
- Sediment, which is otherwise contained on the construction site, does not enter stormwater runoff elsewhere.

Limitations:

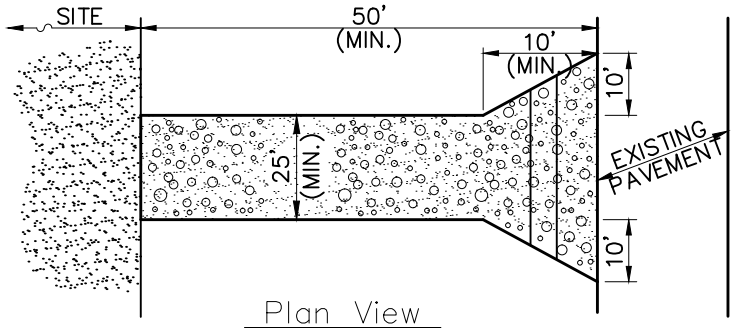
- This practice will only be effective if sediment control is used throughout the rest of the site.

Considerations:

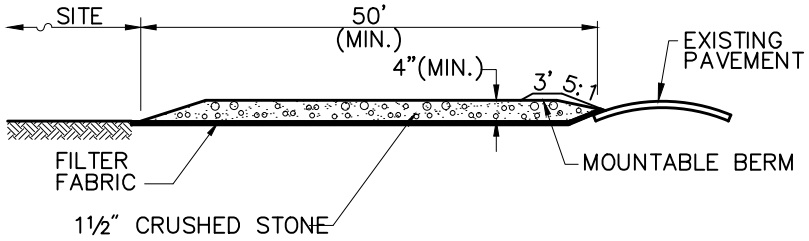
- Avoid locating at curves in public roads or on steep slopes.
- If the action of the vehicle travelling over the gravel pad is not sufficient to remove the majority of the mud, then the tires may need to be washed before entering a public roadway or other paved areas.
- If washing is used, provisions must be made to intercept the wash water and trap the sediment before it is carried off-site. Construction entrances should be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by vehicles.

Maintenance:

- The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic topdressing with additional stone.
- Remove mud and sediment tracked or washed onto public roads.
- Mud and soil particles will eventually clog the voids in the gravel and the effectiveness of the gravel pad will not be satisfactory. When this occurs, the pad should be topdressed with new stone. Complete replacement of the pad may be necessary when the pad become completely clogged.
- If washing facilities are used, the sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.
- All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized onsite. Disturbed soil areas resulting from removal shall be permanently stabilized.



Plan View



Cross–section

Notes:

1. ENTRANCE WIDTH SHALL BE A TWENTY–FIVE (25) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.

SOURCE: DOUCET & ASSOCIATES, INC.

SCALE:
NOT TO SCALE

Stabilized Construction Exit

2/6/03
SED–9

4.2 Construction Road Stabilization

Applications:

- Stabilization of temporary access routes, on-site vehicle transportation routes, and construction parking areas to control erosion.

Advantages:

- Proper grading and stabilization of construction roads and parking areas reduces erosion and minimizes dust problems.
- Road stabilization can significantly speed on-site work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather.

Limitations:

- Measures on temporary roads must be cost-effective not only to install but also to remove.
- May require maintenance to replace aggregate or repair ruts.

Considerations:

- Avoid steep slopes, excessively wet areas, and highly erodible soils.
- Controlling surface runoff from the road surface and adjoining areas is a key erosion control consideration. Provide surface drainage and divert excess runoff to stable areas.
- Areas which are graded for vehicle transport and parking purposes are especially susceptible to erosion. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy which generate significant quantities of sediment that may pollute nearby streams or be transported off-site on the wheels of vehicles.

Maintenance:

- Inspect stabilized areas regularly, especially after large storm events. Add crushed rock if necessary and restabilize any areas found to be eroding.
- All temporary erosion and sediment control measures should be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed.
- Trapped sediment should be removed or stabilized on site. Disturbed soil areas resulting from removal should be permanently stabilized.

4.3 Timber Mats

Applications:

- Used for access where the ground surface is unstable due to saturated soils or other substrates not suitable for heavy vehicles.

Advantages:

- Prevents rutting of unstable ground surfaces.

Limitations:

- Only for temporary use.
- Need to be installed with heavy machinery.
- Equipment operators must remain cautious to not drive or slip off the mats.

Considerations:

- Should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats.
- Should be removed one at a time by backing out of the site. Upon removal of mats, the soil surface should be re-graded and stabilized as necessary.

Maintenance:

- Should be cleaned after use to remove any invasive plant species.
- In winter, mats must be plowed, sanded or heated to prevent equipment from sliding off mats.

4.4 Silt Fence

Applications:

- A silt fence is a temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The silt fence is constructed of stakes and synthetic filter fabric.
- A silt fence intercepts and detains small amounts of sediment from disturbed areas and reduces runoff velocity.
- Applicable where erosion would occur in the form of sheet erosion.

Advantages:

- Removes sediments and prevents downstream damage from sediment deposits.
- Reduces speed of runoff flow.
- Minimal clearing and grubbing required for installation.
- Silt fences trap a much higher percentage of suspended sediments than hay/straw bales.

Limitations:

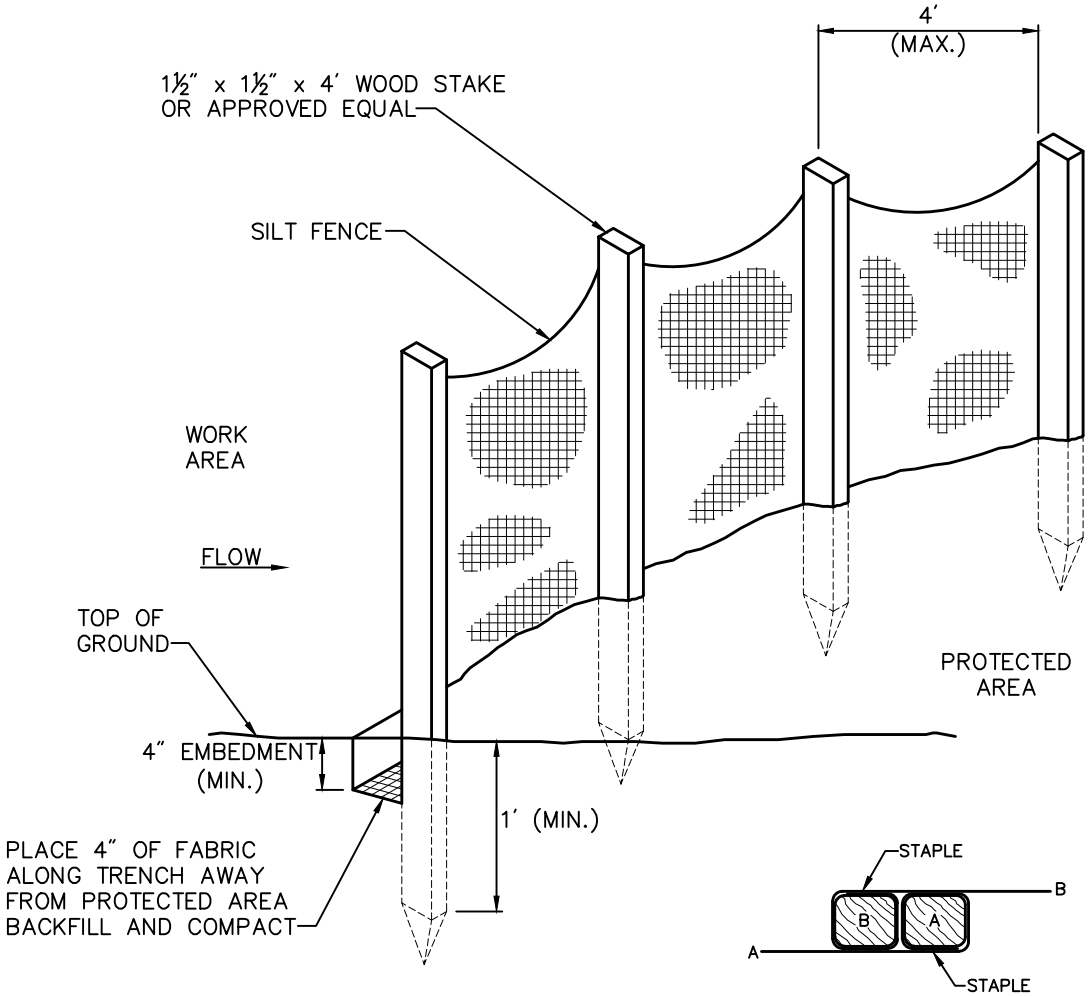
- Silt fences are not practical where large flows of water are involved. Their use is recommended only for small drainage areas, and flow rates of less than 0.5 cfs.
- Flow should not be concentrated.
- Problems may arise from improper installation.

Considerations:

- Silt fences have a low permeability to enhance sediment trapping. This may create ponding behind the silt fence.

Maintenance:

- Silt fences should be inspected after each rainfall and at least daily during prolonged rainfall. Repair as necessary.
- Remove sediment deposits promptly to provide adequate storage volume for the next storm event and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.
- If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.
- Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fence has been removed should be graded to conform with the existing topography and vegetated.



Wood Stake
Joint Detail

SOURCE: DOUCET & ASSOCIATES, INC.

SCALE:
NOT TO SCALE

Silt Fence Barrier

2/6/03
SED–1

4.5 Straw Bale

Applications:

- A temporary sediment barrier consisting of a row of entrenched and anchored straw bales. Used to intercept and detain small amounts of sedimentation from disturbed areas of limited extent to prevent sediment from leaving the site. Decreases the velocity of sheet flows and low-to-moderate level channel flows.
- Downslope of disturbed areas.

Advantages:

- When properly used, straw bale barriers are an inexpensive method of sediment control.

Limitations:

- Straw bale barriers are easy to misuse.
- Straw bale barriers require more maintenance than silt fence barriers and permeability through the bales is slower.

Considerations:

- Straw bale barriers are used similarly to silt fence barriers; especially where the area below the barrier is undisturbed and vegetated.
- Straw bales should be located where they will trap sediment.
- Straw bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.
- Straw bales should be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings.
- The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier. The trench must be deep enough to remove all material which might allow underflow.

Maintenance:

- Straw bale barriers should be inspected immediately after each runoff-producing rainfall and at least daily during prolonged rainfall.
- Close attention should be paid to the repair of damaged bales, undercutting beneath bales, and flow around the end of bales.
- Necessary repairs to barriers or replacement of bales should be accomplished promptly.
- Sediment deposits should be checked after each runoff-producing rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

4.6 Erosion Control Blanket

Applications:

- Porous fabrics used to stabilize the flow in channels/swales and to stabilize slopes subject to the forces of erosion.

Advantages:

- A wide variety of materials are available to match specific needs.
- Fabrics are relatively inexpensive.

Limitations:

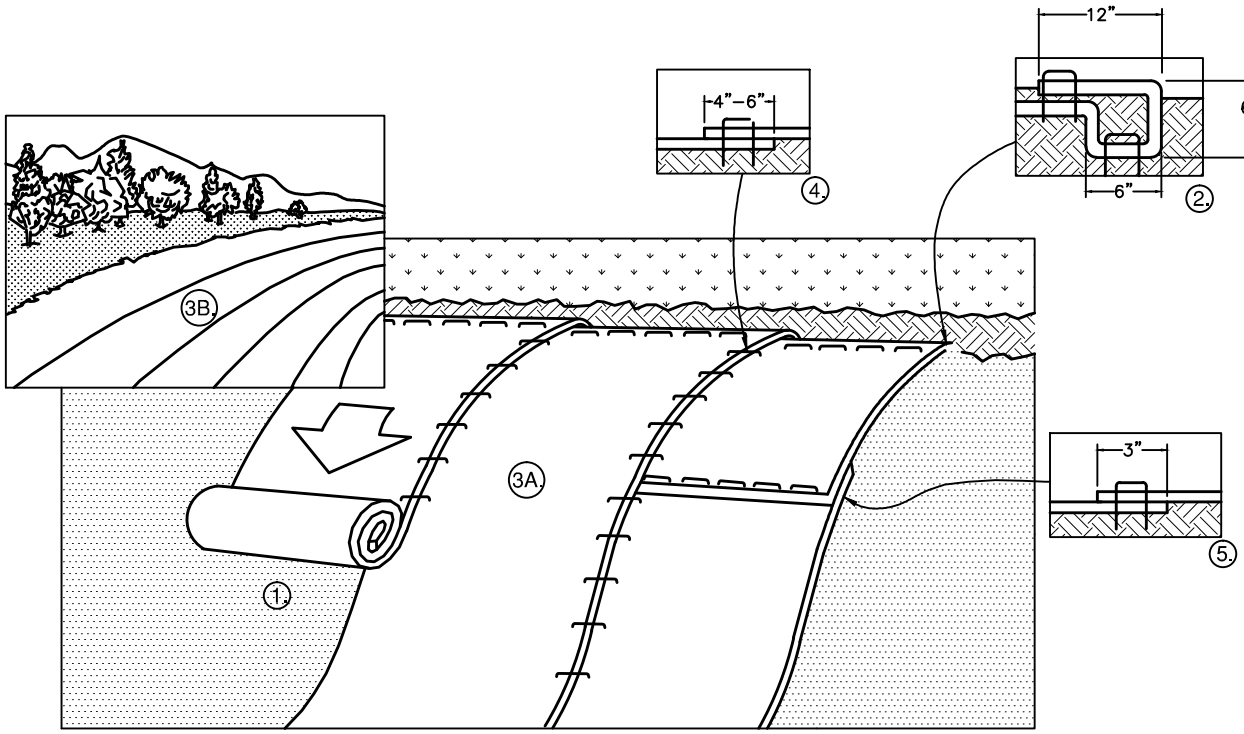
- If the fabric is not properly selected, designed, or installed, the effectiveness may be reduced.
- Many synthetic geotextiles are sensitive to light and must be protected prior to installation.

Considerations:

- Effective netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold and erosion will occur underneath the material.

Maintenance:

- There are numerous types of geotextiles available, therefore the selected fabric should match its purpose. In the field, important concerns include regular inspections to check for cracks, tears, or breaches in the fabric.



Installation

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED

2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6″ DEEP X 6″ WIDE TRENCH WITH APPROXIMATELY 12″ OF BLANKET EXTENDED BEYOND THE UP–SLOPE PORTION OF THE TRENCH AS SHOWN IN DETAIL

3. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12″ APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12″ PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12″ APART ACROSS THE WIDTH OF THE BLANKET.

4. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS PER MANUFACTURES RECOMMENDATION.

5. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH MINIMUM 6″ OVERLAP. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.

6. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3″ OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12″ APART ACROSS ENTIRE BLANKET WIDTH.

7. PLACE STAPLES/STAKES PER MANUFACTURER'S RECOMMENDATION FOR THE APPROPRIATE SLOPE BEING APPLIED.

Notes:

1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6″ MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.

2. FOLLOW EROSION CONTROL TECHNOLOGY COUNCIL SPECIFICATION FOR PRODUCT SELECTION.

SOURCE: DOUCET & ASSOCIATES, INC.

SCALE:
NOT TO SCALE

Erosion Control Blanket Slope Installation

11/1/07
SED–8

4.7 Vegetated Filter Strip

Applications:

- A vegetated filter strip is an area of vegetation for runoff to flow through before it leaves a disturbed site or enters into a designated drainage system.
- This practice applies to sites where adequate vegetation can be established and maintained. Vegetative filter strips can be used effectively:
    - Adjacent to water courses such as waterways and diversions and waterbodies such as streams, ponds, and lakes.
    - At the outlet of stormwater management structures.
    - Along the top and at the base of slopes.
- A vegetative filter strip is designed to provide runoff treatment of conventional pollutants, but not nutrients. This practice is not designed to provide streambank erosion control.

Advantages:

- It improves water quality by removing sediment and other pollutants from runoff as it flows through the filter strip. Some of the sediment and pollutants are removed by filtering, absorption, adsorption and settling as the velocity of flow is reduced.

Limitations:

- A vegetative filter strip should not be used for conveyance of larger storms because of the need to maintain sheet flow conditions.
- If the flow becomes concentrated in rills, the effectiveness of the strip is greatly reduced.

Considerations:

- Filter strips may occur naturally or be constructed . It is important that filter strips be designed and constructed so that runoff flows uniformly across the filter strip as sheet flow.
- Natural filter areas can provide excellent pollutant removal, particularly those areas left adjacent to natural water courses and bodies of water. It is also important to evenly distribute the runoff into these natural areas for best performance.
- To prevent soil compaction, no equipment should be allowed to operate within the filter strip area. Uncompacted soil encourages percolation and minimizes rapid surface runoff.

Maintenance:

- Filter strips should be maintained as natural areas once the vegetation is established. The filter strip should be protected from damage.
- The filter strip should be inspected periodically and after every major rainstorm to determine if the entrance conditions are still uniform and level and to see if rills have formed. Any problem areas should be repaired promptly to prevent further deterioration.

4.8 Grassed Waterway

Applications:

- A natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as need for the safe disposal of runoff water. Used to convey and dispose of concentrated runoff to a stable outlet without damage from erosion, deposition, or flooding.
- This practice applies to sites where:
    - Concentrated runoff will cause damage from erosion or flooding.
    - A vegetated lining can provide sufficient stability for the channel cross section and grade.
    - Slopes are generally less than 5 percent.
    - Typical uses include roadside ditches and outlets for diversions.

Advantages:

- Vegetated swales reduce runoff velocities and reduce potential erosion from the discharge of runoff.
- Vegetated swales may also remove some particulate pollutants from stormwater runoff and increase infiltration.

Limitations:

- Vegetation should be established before runoff is allowed to flow in the waterway.
- During the initial establishment period, flow should be diverted out of the channel if possible to allow for a good stand of grass. If this is not possible use matting.

Considerations:

- Grass-lined channels resemble natural systems and are usually preferred where design velocities are suitable.
- Adequate capacity and sufficient erosion resistance must be considered.

Maintenance:

- During the establishment period, the channel should be checked after every rainfall to determine if the grass is in good condition.
- After the vegetation has become established, the channel should be checked periodically and after every major storm to see if damage has occurred. Any damaged areas should be repaired and revegetated immediately.
- Maintenance of the vegetation in the grassed waterway is extremely important in order to prevent rilling, erosion, and failure of the waterway.
- Mowing should be done frequently enough to control encroachment of weeds and woody vegetation and to keep the grasses in a vigorous condition. The vegetation should not be mowed too closely so as to reduce the erosion resistance in the waterway.
- Remove all significant sediment and debris from channel to maintain the design cross section and grade and prevent spot erosion.

4.9 Silt Curtain

Applications:

- A silt curtain is a temporary sediment barrier installed in a waterbody to contain sediment and prevent the pollution and degradation of waters outside the work areas.

Advantages:

- A silt curtain will contain coarse sediment suspended in water to the work area.

Limitations:

- A silt curtain will not keep water from being muddy during work activities.

Considerations:

- The silt curtain should obstruct the flow as little as possible to reduce the chance of failure.

Maintenance:

- Accumulated sediment must be removed periodically. The curtain must be inspected often. Any damage must be immediately repaired.

4.10 Rock Lined Channel

Applications:

- Rock lined swales are conveyance systems designed, shaped, and lined to convey water in a non-erosive manner.
- Suitable in systems which collect, concentrate, and Convey water at the ground surface.

Advantages:

- Reduce velocities and filter runoff.
- Convey water in a non-erosive manner.

Limitations:

- Converts sheet flow to channel flow, which may increase flow velocities and erosive energy.
- Concentrates the volume of runoff.

Considerations:

- Ensure the swale has sufficient capacity to convey water and is also resistant to erosion during peak flows.
- Determine the capacity of the swale and the velocity of flow from the type of lining, cross-sectional areas and shape, and slop of the swale.
- Use rock lined swales to withstand high velocities (3-10 feet per second), using larger rock for greater flow velocities. Consider incorporating check dams into the swale system at regular intervals to encourage sedimentation where high rates of sedimentation occur.

Maintenance:

- Inspect for dislodged or unstable rocks and any erosion and undercutting, especially along swale bottom and adjacent slopes. Repair as necessary.
- Monitor ongoing effectiveness and determine if another BMP (i.e., check dam) could improve long-term effectiveness.
- If accumulated material has decreased swale capacity, removal of accumulated material is necessary.

4.11 Mulching Exposed Soil Surfaces

Applications:

- Applying a blanket of straw to the soil surface to provide immediate protection to exposed soils.
- In areas that have been seeded either for temporary or permanent cover, mulching should immediately follow seeding.
- Areas which cannot be seeded because of the season, or are otherwise unfavorable for plant growth.

Advantages:

- Mulching offers instant protection to exposed areas.
- Mulches conserve moisture and reduce the need for irrigation.
- Mulching does not require removal; seeds can grow through.
- It's one of the most effective and economical erosion control practices.

Limitations:

- Care must be taken to apply mulch at the specified thickness, and on steep slopes mulch may need to be supplemented with netting.
- Thick mulches can reduce the soil temperature, delaying seed germination.
- Mulch can be blown or washed away by runoff if not secured.

Considerations:

- Inadequate coverage may result in erosion, washout, and poor plant establishment.
- If an appropriate tacking agent is not applied or applied in insufficient amount, then mulch can be lost to wind and runoff.

Maintenance:

- Inspect after rainstorms to check for movement of mulch or erosion. Repair as necessary.
- Blanket mulch that is displaced by flowing water should be repaired as soon as possible.

4.12 Temporary Seeding

Applications:

- Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.
- Temporarily stabilize areas that will exposed for a period of more than 30 working days.
- To stabilize disturbed areas before final grading or in a season not suitable for permanent seeding.
- Temporary seeding controls runoff and erosion until permanent vegetation or other erosion control measures can be established.
- Root systems hold down the soils so that they are less apt to be carried offsite by storm water runoff or wind.
- Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

Advantages:

- Vegetation will not only prevent erosion from occurring, but will also trap sediment in runoff from other parts of the site.
- Temporary seeding offers fairly rapid protection to exposed areas.

Limitations:

- Temporary seeding is only viable when there is a sufficient window in time for plants to grow and establish. It depends heavily on the season and rainfall rate for success.
- If sown on subsoil, growth will be poor unless heavily fertilized and limed. Because overfertilization can cause pollution of stormwater runoff, other practices such as mulching alone may be more appropriate. The potential for overfertilization is an even worse problem in or near aquatic systems.
- Once seeded, areas should not be travelled over.
- Irrigation may be needed for successful growth. Regular irrigation is not encouraged because of the expense and the potential for erosion in areas that are not regularly inspected.

Considerations:

- Temporary seedings provide protective cover for less than one year. Areas must be reseeded annually or planted with perennial vegetation.
- Temporary seeding is used to protect earthen sediment control practices and to stabilize areas that will be exposed for weeks or months. Temporary seeding can provide a nurse crop for permanent vegetation, provide residue for soil protection and seedbed preparation, and help prevent dust production.
- Use low-maintenance native species wherever possible.
- Planting should be timed to minimize the need for irrigation.
- Temporary seeding is effective when combined with phasing so bare areas of the site are minimized at all times.

Maintenance:

- Inspect within 6 weeks of planting to see if stands are adequate. Check for damage after heavy rains.
- Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

4.13 Dewatering Sump

Applications:

- A temporary pit constructed to trap and filter water for pumping into suitable discharge areas.
- When water collects and must be pumped away during excavating, dewatering, maintenance or removal of sediment traps and basins or other areas that collect sediment-laden water and can only be removed by pumping.

Advantages:

- Provides an area from which to dewater and reduce sediment in the discharge.

Limitations:

- The sump pit will become clogged with sediment, oils, and organic matter over time.

Considerations:

- A design is not required for the sump, but consideration should be given to site conditions.

Maintenance:

- It is important to remove material over time to prolong its effectiveness.
- The pit should be checked after every major storm to evaluate its effectiveness. If the pit and filter fabric become plugged with sediment, the pit should be rehabilitated.

4.14 Frac Tank

Applications:

- Can be used in large clean-up operations or simply for temporary storage of water or other liquids.

Advantages:

- They contain a series of baffles that allow fine materials to settle out of the water column.
- Can be used in conjunction with pumps, filters, dewatering units and vacuum boxes as part of a large scale project.
- Can hold 21,000 gallons or more.

Limitations:

- Site specific conditions can limit set-up locations (e.g., slopes, unlevel ground).
- If contents are contaminated, it may require disposal at a regulated facility.

Considerations:

- The use of multiple tanks may be necessary for the management of large volumes.

Maintenance:

- Frac tanks must be monitored to ensure proper functioning.
- Limited onsite maintenance is required.

4.15 Sediment Trap

Applications:

- A sediment trap is formed by excavating a pond or by placing an earthen embankment across a low area or a drainage swale. An outlet or spillway is constructed using large stones or aggregate to slow the release of runoff. The trap retains the runoff long enough to allow silt to settle out.
- To intercept sediment-laden runoff from small disturbed areas (<5 acres) and detains it long enough for the majority of sediment to settle out.

Advantages:

- Reduces sediment deposits downstream.
- Can simplify the design process by trapping sediment at specific spots onsite.

Limitations:

- Effective only if properly maintained.
- Will not remove very fine silts and clays.
- Serves only limited areas.

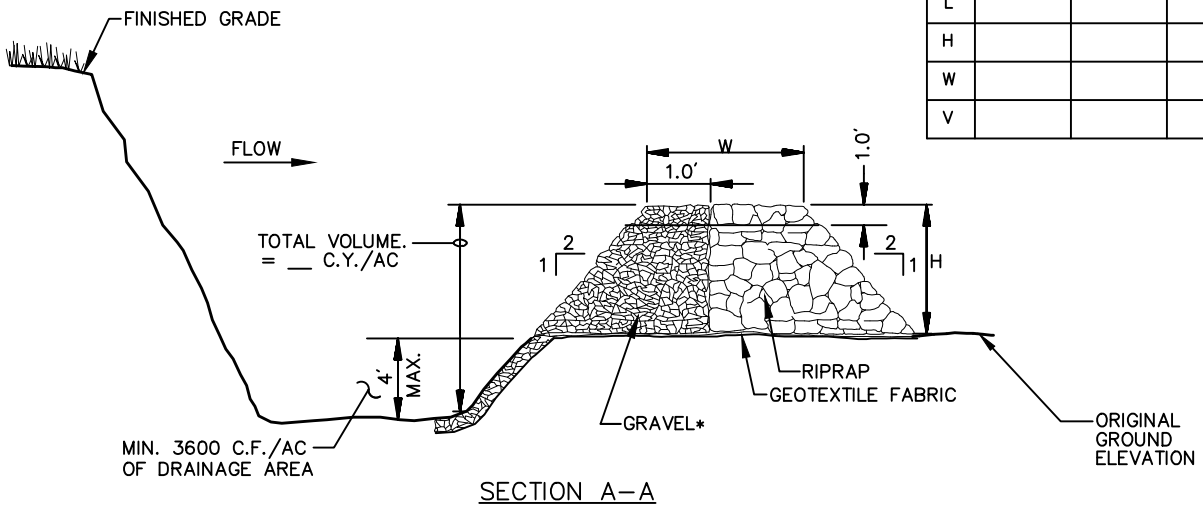
Considerations:

- Locate sediment trap as near the sediment source as topography allows.
- Divert runoff from undisturbed areas away from sediment trap.
- Sediment traps may be installed before land disturbance occurs in the drainage area.

Maintenance:

- The trap should be readily accessible for periodic maintenance and sediment removal.
- Remove sediment when it has accumulated to one-half the design depth.
- Inspect sediment trap after each significant rainfall event.
- Clean or replace spillway gravel facing if clogged.
- Promptly replace any displaced riprap, being careful that no stones in the spillway are above design grade.

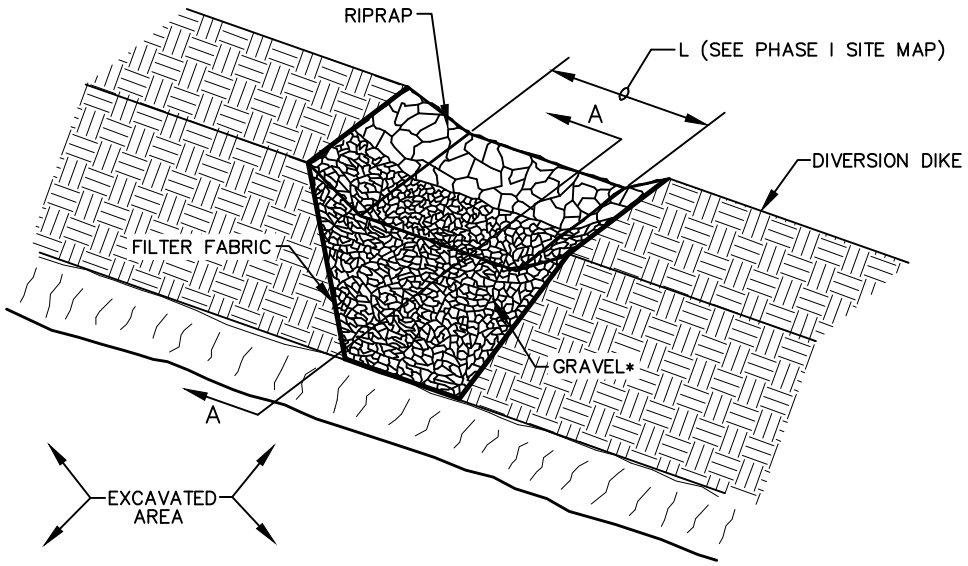
OUTLET DIM (FT).			
	TRAP 1	TRAP 2	TRAP 3
L			
H			
W			
V			



SECTION A–A

* GRAVEL SHALL BE 2"–3" CLEAN STONE

NOTE:
PROVIDE DIMENSIONS AND VOLUME FOR AND LABEL EACH SEDIMENT TRAP LOCATED ON THE PLANS. (SEE SITE MAPS)



OUTLET (PERSPECTIVE)

MAX DRAINAGE AREA:
5 ACRES

L (IN FEET) = 6' OR
1 x DRAINAGE AREA (AC)
WHICHEVER IS LARGER

SOURCE: DOUCET & ASSOCIATES, INC.

SCALE:
NOT TO SCALE

Temporary Sediment Trap

11/1/07
SED–20

4.16 GeoTube

The GeoTube system, proposed for use in this project, is described in more detail in the accompanying "Potential Pilot Dredging Project" document submitted in conjunction with this guide.

4.0 COMPLIANCE MONITORING

To effectively mitigate project-related impacts, the Manual must be properly implemented in the field. Timely and appropriate decisions are essential. Monitoring will be conducted under the direction of a qualified professional. Monitoring of BMP monitoring shall include, but may not be limited to:

- Identify erosion/sediment control and stabilization needs in all areas.
- Ensure that all erosion and sedimentation BMPs are installed and maintained properly.
- Monitor temporary restoration and re-vegetation efforts.
- Identifying potential problem areas and initiating appropriate corrective actions prior to occurrence.
- Ensuring the repair of all ineffective temporary erosion control measures in a timely manner.

5.0 SUMMARY

The BMPs from this guide are potential measures that could be employed to address erosion and sedimentation associated with the disturbance of soil, water, and vegetation from the Northfield Mountain Pumped Storage Project Pilot Dredge Program and related sediment management. This Manual may be modified as the project proceeds, revision dates should be noted on the cover page.