

Annual Monitoring Report 2017 (Year 1)

Exeter River Great Dam Removal Project

PREPARED FOR



Town of Exeter, New Hampshire
10 Front Street
Exeter, New Hampshire, 03833
603-778-0591

PREPARED BY



2 Bedford Farms Drive, Suite #200
Bedford, New Hampshire 03110
603-391-3900

December 2017



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Report Narrative

1.0 Project Overview

Removal of the Great Dam and restoration of the Exeter River in Exeter, New Hampshire, commenced in July 2016 and was completed in October 2016.

The dam removal project was subject to the conditions of NH Department of Environmental Services (NHDES) Wetlands Permit 2015-00887.

The former dam presented an obstacle to fish passage along the Exeter River and had been identified as structurally deficient by the NHDES Dam Bureau. Following the completion of a feasibility study in 2013, the Town of Exeter determined that the complete removal of the Great Dam was the preferred option.

The project involved the removal of the existing dam structure and associated fish ladder and weir; restoration and enhancement of approximately 200 linear feet of stream channel upstream of the former dam location; and accessory work to mitigate impacts to nearby structures and water intakes resulting from dam removal. The project is located on the Exeter River immediately downstream of the High Street Bridge in Exeter, New Hampshire at Lat/Long 42.98134 N, 70.94452 W. Refer to **Figure 1** – USGS Project Location Map.

The NHDES Wetlands Permit (2015-00887) issued for the Exeter Great Dam Removal project contains conditions relative to the monitoring of the restored reach of the Exeter River Restoration Site. Specifically, Condition #32 requires that a qualified professional shall conduct a follow-up post-construction inspection after the completion of construction to review the success of the restoration work and to schedule remedial actions, if necessary. VHB prepared a post-construction report in accordance with this condition; the final report was submitted to NHDES on February 3, 2017. Condition #34 also requires similar inspections, reports and remedial actions documented in an annual monitoring program for at least three years following completion of construction. Based on discussions with the Town of Exeter, NHDES, NHFGD, and NOAA, VHB identified eight (8) success standards to quantify compliance with these permit conditions for the annual monitoring program. These standards were identified in the “Great Dam, Exeter, NH, Monitoring Plan” prepared by VHB and dated November 8, 2016.

This document shall serve as the 1st Annual Monitoring Report submitted to NHDES in accordance with Condition #34. The purpose of this document is to address whether the Great Dam Removal Site has met the eight success-standards outlined in the 2016 Great Dam Monitoring Plan. A summary of these success standards is included in Appendix B. Based on



observations made during inspections conducted by VHB in 2017, the Great Dam Removal Site is progressing as intended towards meeting all eight success standards. Additional data supporting this conclusion is discussed in **Section 3.0** of this report.

2.0 Site History and Project Rationale

The Great Dam impounded the Exeter River about 4.5 miles upstream, including a portion of the Little River. The Exeter River rises in Chester, NH, and flows approximately 33 miles to downtown Exeter, where it is called the Squamscott River. The Exeter/Squamscott River becomes a tidal river and a primary tributary to Great Bay. Its watershed above the Great Dam site covers approximately 107 square miles, including substantial portions of the towns of Brentwood, Chester, Danville, East Kingston, Exeter, Fremont, Kensington, Kingston, Raymond, and Sandown. The Exeter/Squamscott River is an extremely significant coastal ecological resource. The river flows into the Great Bay Estuary, a tidally-dominated system that, at more than 6,000 acres, is one of the largest and most important estuaries on the Atlantic Coast.

VHB prepared a feasibility study of the Great Dam for the Town of Exeter in 2013, identifying potential benefits of dam removal:

- Reduce Exeter's vulnerability to climate change by reducing the likelihood and magnitude of upstream flooding along the Exeter and Little Rivers.
- Increase public safety by eliminating unsafe and unnecessary dam infrastructure.
- Strengthen the natural ecosystem of the Exeter River for the benefit of fish and wildlife by eliminating a barrier to fish passage.
- Strengthen the natural ecosystem of the Exeter River by decreasing thermal stratification and improving dissolved oxygen conditions, creating a substantial net benefit on water quality.

The removal of the Great Dam and associated stream channel restoration were designed with these benefits in mind, and they were incorporated into grant funding and permitting for the project as permit conditions. The success standards detailed in this report have been selected for this purpose.

3.0 Approval Conditions and Restoration Site Success Standards

The Exeter River Great Dam removal project is subject to Conditions 32-36 of the NHDES Wetlands Permit No. 2015-00887, as well as Condition 4 of the ARM Fund Project Agreement executed by the Town of Exeter and NHDES, and Special Award Condition 8 of the National Oceanic and Atmospheric Administration (NOAA) Coastal Ecosystem Resiliency Grant issued



to the Town (Award NA16NMF4630012). The individual approval conditions are outlined below, along with a discussion of efforts to date to comply with each approval condition.

Additionally, the Town of Exeter, in coordination with NHDES, NH Fish and Game Department (NHFGD), and NOAA, developed a set of eight monitoring success-criteria. The success standards were outlined in the Great Dam Monitoring Plan, prepared by VHB and dated November 2016, and are summarized as follows:

1. Design Meets Fish Passage Criteria
2. Streambank Stability & Vegetation Cover
3. Site Passability: Channel Width
4. Site Passability: Channel Depth
5. Site Passability: Average Channel Slope – Lower Riffle (Main Channel)
6. Site Passability: Average Channel Slope – Upper Riffle (Main Channel)
7. Site Passability: Max Jump Height
8. Alewife Presence/ Absence (Adult)

A summary of the eight success criteria is provided in the Exeter Great Dam Removal Success Standards and Criteria Evaluation Table included as [Appendix B](#).

3.1 NHDES Permit Condition No. 32

The qualified professional shall submit a follow-up report including photographs of all stages of construction from designated photo stations and an as-built plan, with water depth within the restoration area, which shall be submitted to the DES Wetlands Program within 60 days of final site stabilization.

VHB conducted regular construction inspections in conjunction with Paul Vlasich, Town of Exeter. Based on VHB observations, final site stabilization was achieved by October 31, 2016. Following completion of construction, VHB prepared a post-construction completion report incorporating the requirements of Condition 32, including a narrative discussion, a catalog of construction-phase photographs, and the final as-built plan depicting water depths within the restoration area. This report was submitted to NHDES on July 26, 2017, and is included as Appendix C.

3.2 NHDES Permit Condition No. 33

The Town of Exeter shall establish and submit to DES for approval at least five (5) permanent monumented cross-sections throughout the stretch of the Exeter River, two of which shall be in locations within 100 feet of the location of the existing dam.

On behalf of the Town, VHB survey staff established five (5) cross-sections with permanent monuments in the locations depicted in **Figure 2**. Cross sections were proposed in locations



that would provide good long-term monitoring of stream geomorphology and would allow safe access by survey teams. The locations were discussed with NHDES, NHFGD and NOAA habitat restoration specialists and approved by NHDES on November 8, 2016.

The first cross section is located downstream of the String Bridge through a gravel bar within the tidal reach of the Squamscott River. The second and third cross sections are located at the downstream and upstream limits of the restored upper riffle, and will allow long term evaluation of the restored stream slope through this section. The fourth cross section is located at the end of the Franklin Street in a section of river that was identified as a geomorphic area of concern during development of the Feasibility Study. This location was previously surveyed during the design phase of the project and will provide a baseline for long-term monitoring. The fifth cross section is located at the Town water supply intake, which is a critical interest area for the Town, and this location was also previously surveyed and will provide a baseline for long-term monitoring.

At each cross-section, horizontal coordinates were surveyed in New Hampshire State Plane coordinates (NAD 1983) and vertical elevations in the North American Vertical Datum of 1988 (NAVD 1988) to 0.1 foot or better vertical accuracy using either traditional or Global Positioning System (GPS) methods. For each cross section, the survey collected data at the following locations: Top of bank; Edge of water (on date of survey); Bottom of bank; Thalweg; Points of inflection.

VHB survey staff re-surveyed all five monumented cross-sections on October 9, 2017. Survey profiles indicate that the channel is stable at all cross-sections, with minimal aggradation and/or degradation observed. Cross-section profiles and data in tabular x, y, z format for each cross-section comparing the 2017 monitoring survey to the 2016 baseline survey is included in **Appendix D**.

3.3 NHDES Permit Condition No. 34

The restoration shall be monitored for the first three (3) years following the dam removal/stream channel restoration to ensure the maintenance and success of the stream restoration work and successful fish passage. The annual report shall include cross section data, fish counts at the Pickpocket Dam (provided by NHFGD) and any other notable changes to the project area.

This report represents the first year of monitoring in accordance with this condition. Under this condition, the Town of Exeter will conduct monitoring of the project for a minimum of three years (2017 through 2019). In addition to survey of the five monumented cross-sections required by Condition 32, this monitoring report includes photographic documentation of each cross-section, information on efforts by the NHFGD to obtain fish counts at the Pickpocket Dam, and visual assessment of vegetation plantings (see Condition 35). Monumented cross-



section data is included in **Appendix C**, and Photographic documentation is included in **Appendix E**.

Monitoring parameters and success criteria for the restoration reach, based on guidance provided from the NOAA Restoration Center and tied to the Coastal Ecosystem Resiliency Grant, are outlined in **Appendix B**. The data collected for this first year during the monitoring period is compared to the parameters listed in **Appendix B** to evaluate the success of the project restoration.

Monitoring parameters include measurements of channel width and depth during low-flow periods. “Low-flow” is considered to be below the 95% exceedance probability daily flow, typically occurring between the months of July and October: 32 cfs at the Project location. Channel survey was performed on October 9, 2017; measured flow on this date was 6 cfs at USGS Stream Gage 01073587 (Exeter River at Haigh Rd, Brentwood, NH). This corresponds to a value of 10 cfs at the Project location, applying a 1.69 scale factor to account for the larger watershed than the USGS gage. Photo documentation by Paul Vlasich, Exeter Town Engineer during similar low-flow conditions on July 24, August 1, and August 15, 2017 (USGS gage flows of 12, 14, and 5 cfs, respectively), indicates channel dimensions consistent with the measured survey values on October 9.

It is important to bear in mind that rivers are dynamic systems, and some changes in the streambed may occur (in both the restored reach and the channel upstream and downstream of our project) which would not present an issue for fish passage or adjacent infrastructure. Thus, the criteria contained in **Appendix B** are intended to provide a frame of reference for the monitoring assessment and are focused on the restoration reach. The key criteria, however, are whether fish can pass through the restoration reach under normal conditions and whether adjacent infrastructure is stable.

At the time of this first monitoring report, no fish count data was available from NHFGD. According to an October 20, 2017 email from Mike Dionne, NHFGD Marine Biologist, so many sea lamprey passed through the automated fish counter at the designated Pickpocket Dam monitoring location that the fish count was discounted due to thousands of false counts on the fish counter each day. Because of the large number of lamprey, NHFGD staff were not able to observe river herring in the ladder or pass through the tube during daily calibration counts. However, one river herring was observed swimming in the impoundment above the fish ladder during a calibration count. There was also anecdotal evidence of large schools of river herring below the Linden Street bridge from a local fisherman.

The NHFGD has since worked to make minor modifications to the Pickpocket ladder, intended to allow operation of the fish ladder as a swim through with a counter or as a trap. NHFGD plans to operate it mostly as a trap in 2018 to collect bio samples of fish and get a firm idea of the number of fish reaching Pickpocket Dam.



3.4 NHDES Permit Condition No. 35

Restoration of temporary impact areas shall have at least 75% successful establishment of vegetation after three (3) growing seasons, or they shall be replanted and reestablished in a manner satisfactory to the DES Wetlands Program.

Planting of the temporary impact areas included seeding of upland areas using the upland seed mix included in the specifications, seeding of riparian areas with a riparian restoration mix, and planting of one 8-inch maple in Founders Park.

At the time of the most recent VHB site visit on October 25, 2017, visual observation of temporary impact areas indicates that percent cover exceeds the 75% success criterion. Plantings were completed by the contractor by the completion of construction in October 2016 and informal observation of vegetation establishment indicated that vegetation was fully established by Summer 2017. Based on these observations, the Town of Exeter and VHB believe this success criterion has been met.

3.5 NHDES Condition No. 36

The Town shall review the project reach during the first three (3) spring anadromous fish migration seasons following completion of the project (i.e., spring 2017) with staff from the NHFGD and NOAA to perform a visual evaluation of fish passage conditions. This review will determine whether any adjustments to boulder cluster placement or river micro-grades are necessary to allow upstream fish passage. If necessary, such adjustments shall be made during low flow conditions in 2017 in accordance with agreed upon methodology by DES, ACOE, NOAA, and NHFGD.

In accordance with Wetland Permit Condition 36, the Town of Exeter, together with representatives from NHDES, NOAA, NHFGD, and VHB conducted a joint inspection of the restoration site on April 14, 2017 to assess fish passage conditions.

River flows at the time of the visit were approximately 480 cfs, after peaking at an estimated 1,700 cfs during the previous week. This flow was at the high end of the range under which fish passage is expected. (D₉₅ for April-June is 609 cfs.) No fish were observed in the restored reach at the time of the joint meeting. Mike Dionne, NHFGD Marine Biologist, reported that 12 alewives were sampled in the Squamscott on April 13, 2017, but that upstream migration had not yet begun. Some concerns were expressed that passage through the reach under these flow conditions would be challenging, particularly on river left, but no specific modifications were identified during the meeting. (The river left channel served as the river bypass channel during construction, and was not specifically designed to accommodate fish passage.) Eric Hutchins suggested that warm weather in the forecast would raise water temperatures to 11-12 degrees, which would trigger upstream migration, which may provide more information on upstream passage capability.



Based on further observations in the spring and summer of 2017, NHFGD and NOAA performed minor modifications in summer of 2017 to improve fish passage at the former dam location. According to Mike Dionne, these modifications consisted of:

- Rolling a large stone into the left side secondary channel, intending to slow the flow through the channel at the stone location and backing water up behind the stone to help fish re-entering the channel after ascending the center ledge.
- Removing some ledge in a few areas of the zig-zag center ledge channel, intending to make ascending the zig-zag section smoother for fish.
- Moving a few of the large stones along the edge of the right channel, intending for fish to be better able to stay within the roughened edge when they move through that section of channel.

Refer to **Appendix E** for photographs depicting a stable stream bed and banks as well as permanent stabilization of the surrounding restoration zones.

3.6 ARM Fund Grant Condition No. 4

That the Property involved in the project will be monitored by the Town, or their designee, on an annual basis for five years post construction to ensure the success of the activities taken and to ensure that no actions are occurring which could be detrimental to the project objectives outlined in Exhibit A (to remove the Great Dam from the Exeter River to improve aquatic organism passage and habitat, reduce vulnerability to storm-related floods, and improve water quality), or to surrounding properties.

The ARM Fund Grant Agreement requires monitoring of the river beyond the three-year period stipulated in the NHDES Wetlands Permit. We note that the language of the wetland permit incorporates the recommendations of reviewers from the NHDES Coastal Program, NHFGD and NOAA, and post-dates the standard monitoring language included in the ARM Fund Grant. In accordance with the grant condition, the Town of Exeter will perform up to five years of monitoring (2017 through 2021). However, if performance standards are met following the third year of monitoring (2019), the five-year monitoring period may be reduced with the approval of NHDES.

At the time of this first monitoring report, all eight success standards have been met, and no significant deficiencies observed have been observed. Given this progress to date, it is likely that all performance standards will continue to be met by the time of the third monitoring report. The Town proposes to coordinate with reviewers from the NHDES Wetlands Bureau, NHDES Coastal Program, NHFGD, NOAA, and the US Army Corps of Engineers following completion of the third year of annual monitoring in 2019 to evaluate the effectiveness of the Project and discuss whether an additional two years of monitoring in 2020 and 2021 would be necessary to document project success. This monitoring effort will include photo-



documentation and a quantitative assessment of the Monitoring Criteria outlined in **Appendix B** to identify any issues related to fish passage or infrastructure stability.

4.0 Conclusion

After one full growing season, the Exeter Great Dam Removal site was determined to be successfully meeting all the eight monitoring success standards for the project. Continued monitoring will be conducted to ensure that the success standards continue to be met for the remainder of the monitoring period.

The next scheduled annual monitoring report is scheduled to be completed by December 31, 2018. The status of the eight monitoring success standards will be tracked in that report.

A summary table is provided in **Appendix B**, containing data and commentary on each of the eight success standards to support these conclusions.



Figures

Figure No. Description

- | | |
|---|---|
| 1 | USGS Project Location Map |
| 2 | Exeter Great Dam Monitoring Cross-Sections Plan |



Appendices

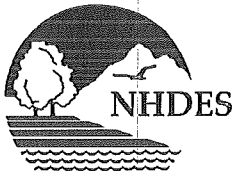
Appendix	Description
A	NHDES Wetlands Permit 2015-00887
B	Exeter Great Dam Success Standards and Criteria Evaluation Table
C	Post-Construction Completion Report
D	Representative Monitoring Cross-Sections and Data
E	Representative Site Photographs



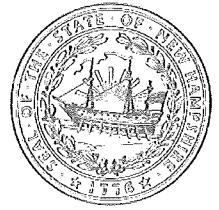
Appendix A

NHDES Permit





The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

APPROVAL LETTER

March 17, 2016

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Town of Exeter
Dept. of Public Works
c/o Paul Vlasich
13 Newfields Road
Exeter, NH 03833

RE: NH DES Wetlands Bureau File No. 2015-00887, Great Dam, Exeter

Dear Mr. Vlasich:

Attached please find Wetlands Permit 2015-00887 to dredge and fill a total of 34,200 square feet within the bed and banks of the Exeter River to include 23,520 square feet of permanent impact and 10,680 square feet of temporary impact to remove Great Dam and its appurtenances, reshape the river channel to ensure migratory fish passage through the restored reach, install a dry hydrant at Franklin Street, and modify the existing municipal water intake to maintain the existing water supply withdrawal.

The decision to approve this application was based on the following findings:

1. The Exeter River Great Dam does not comply with DES Dam Safety regulations as indicated in a Letter of Deficiency issued by DES on July 25, 2000 to the Town of Exeter.
2. The Exeter River Great Dam Removal Feasibility and Impact Analysis (VHB, 2013) explored and identified alternatives to resolving the dam deficiencies.
3. Following this study, in March 2014, the Town of Exeter voted to approve the Great Dam Removal Project.
4. The structure was built in 1914 and has deteriorated with age and poses a safety hazard and liability for the Town of Exeter.
5. The Exeter-Squamscott River is a major tributary to Great Bay and has a total of eight tributaries above the Great Dam.
6. This is a minimum impact project per Administrative Rule Env-Wt 303.04(t) Restoration of altered or degraded wetlands provided the project:
 - (1) Receives financial support and direct supervision of a New Hampshire state agency, the US Environmental Protection Agency, the US Army Corps of Engineers, the US Natural Resources Conservation Service, or the US Fish and Wildlife Service;
 - (2) Shall not be used to perform restoration in cases where the applicant is subject to a removal or restoration order;
 - (3) Is not located in or adjacent to prime wetlands; and
 - (4) Does not meet the criteria of Env-Wt 303.02(k).
7. The dam removal and stream restoration has been overseen by NHDES Watershed Management Bureau, NH Fish and Game (NHFG), and The National Oceanic and Atmospheric Administration (NOAA).


8. The need for the proposed impacts has been demonstrated by the applicant per Env-Wt 302.01 as this project is being conducted to remove an unsafe dam, however, the focus of the project is also to restore the impaired surface water created by the dam and to improve fish passage within the Exeter-Squamscott River.
9. The applicant has provided evidence which demonstrates that this proposal is the alternative with the least adverse impact to areas and environments under the department's jurisdiction per Env-Wt 302.03. There will be limited direct impacts to the river by removal of accumulated sediments, existing concrete, and the creation of the new stream channel and banks. It is expected that any indirect impacts to wetlands from lowering the proposed water levels may change wetland cover types.
10. The applicant has demonstrated by plan and example that each factor listed in Env-Wt 302.04(a) Requirements for Application Evaluation, has been considered in the design of the project.
11. In accordance with Env-Wt 304.04, the applicant has received written concurrence from seven of eight abutters whose properties are within 20-feet of the proposed impacts.
12. The applicant requested a waiver of Env-Wt 304.04(a) as the applicant was unable to obtain written concurrence from the abutter identified as Exeter Tax Map 072 Lot 037.
13. DES hereby grants the waiver of Env-Wt 304.04(a) in accordance with Env-Wt 204.04(a) as granting the request will not result in an adverse effect to the environment or natural resources of the state, public health, or public safety; or an impact on abutting properties that is more significant than that which would result from complying with the rule. Furthermore, granting the request is consistent with the intent and purpose of the rule being waived. Strict compliance with the rule will provide no benefit to the public.
14. The applicant has agreed to install a riprap revetment and granite buttress along the length of the abutter's wall at additional expense. Crack gauge monitoring and vibration monitoring will occur throughout the project to ensure the structural integrity of the abutter's wall is not compromised.
15. Furthermore, the Town of Exeter has obtained liability insurance and the selected contractor will also be required to provide proof of liability insurance.
16. The Exeter River from Great Dam to Pickpocket Dam is listed as an impaired water under Section 303(d) of the Clean Water Act due to dissolved oxygen saturation levels. The removal of the dam is expected to improve dissolved oxygen levels.
17. The applicant has conferred with NH Fish and Game and NOAA to implement fish passage monitoring to ensure passage goals are being met.

Any person aggrieved by this decision may appeal to the N.H. Wetlands Council ("Council") by filing an appeal that meets the requirements specified in RSA 482-A:10, RSA 21-O:14, and the rules adopted by the Council, Env-WtC 100-200. The appeal must be filed **directly with the Council within 30 days** of the date of this decision and must set forth fully **every ground** upon which it is claimed that the decision complained of is unlawful or unreasonable. Only those grounds set forth in the notice of appeal can be considered by the Council. Information about the Council, including a link to the Council's rules, is available at <http://nhec.nh.gov/> (or more directly at <http://nhec.nh.gov/wetlands/index.htm>.) Copies of the rules also are available from the DES Public Information Center at (603) 271-2975.

Your permit must be signed, and a copy must be posted in a prominent location on site during construction.

If you have any questions, please contact me at (603) 559-1515 or via email at eben.lewis@des.nh.gov.

Sincerely,



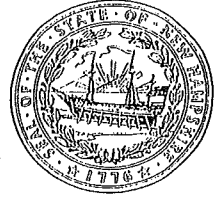
Eben M. Lewis
Compliance Specialist
DES Wetlands Bureau

enclosures

cc: Peter Walker, Principal, VHB
Kristen Murphy, Exeter Conservation Commission
William Meserve, Chair, Exeter-Squamscott River Local Advisory Committee
Cheri Patterson, Supervisor of Marine Programs, NH Fish and Game Department
Eric Hutchins, Fisheries Biologist, NOAA
Melinda Bubier, Wetland Mitigation Program Specialist, DES Wetlands Bureau
Lori Sommer, Wetland Mitigation Coordinator, DES Wetlands Bureau
Frank D. Richardson, Ph.D., Senior Wetlands Inspector, DES Wetlands Bureau
Collis G. Adams, Administrator, DES Wetlands Bureau
Ted Diers, Administrator, DES Watershed Management Bureau
Keyin Lucey, NHDES Coastal Program
Sally Soule, NH DES Watershed Assistance Section
Gregg Comstock, P.E., Supervisor, DES Water Quality Planning Section
James R. Weber, P.E., DES Dam Bureau



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

NOTICE TO RECIPIENTS OF MINIMUM IMPACT N.H. WETLANDS PERMITS

Your permit was approved by the New Hampshire Wetlands Bureau as a minimum impact project, and your project is automatically approved under the Army Corp's New Hampshire Programmatic General Permit.

For the purpose of the NH PGP, Minimum Impact Projects do not include new construction of:

Dams,

Dikes,

water withdrawal or diversion projects which require fill in wetlands or surface waters,

wetlands restoration projects, or any projects which involve work in other than low flow conditions (July 1-September 30),

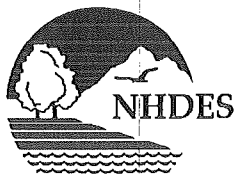
any projects involving more than 3,000 square feet of a water body or wetland fill and secondary impacts.

Also, not included under Minimum Impact Projects are those projects that include the reconstruction or replacement of currently unserviceable structures/fills. The projects must be reviewed through the screening procedures for minor impact projects. The activities in section 10 waters not regulated by the Wetlands Bureau, formerly authorized under the Nationwide Permit Program and listed in Appendix A of this document are designated non-reporting activities.

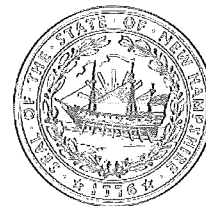
These approvals do not relieve you from obtaining any necessary local permits that may be required by your town.

If you have any questions, feel free to give us a call at 603-271-2147

This notice was sent with minimum impact permit



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

WETLANDS AND NON-SITE SPECIFIC PERMIT 2015-00887 PAGE 1 OF 4

Permittee: Town Of Exeter
Dept Of Public Works
c/o Paul Vlasich
13 Newfields Rd
Exeter, NH 03833

Project Location: Chestnut Street, Exeter

Waterbody: Exeter River

**NOTE --
CONDITIONS**

APPROVAL DATE: 03/17/2016

EXPIRATION DATE: 03/17/2021

Based upon review of the above referenced application, in accordance with RSA 482-A and RSA 485-A:17, a Wetlands Permit and Non-Site Specific Permit was issued. This permit shall not be considered valid unless signed as specified below.

PERMIT DESCRIPTION: Dredge and fill a total of 34,200 square feet within the bed and banks of the Exeter River to include 23,520 square feet of permanent impact and 10,680 square feet of temporary impact to remove Great Dam and its appurtenances, reshape the river channel to ensure migratory fish passage through the restored reach, install a dry hydrant at Franklin Street, and modify the existing municipal water intake to maintain the existing water supply withdrawal.

THIS APPROVAL IS SUBJECT TO THE FOLLOWING PROJECT SPECIFIC CONDITIONS:

1. All work shall be in accordance with plans by VHB dated December 7, 2015, as received by the NH Department of Environmental Services (DES) on December 10, 2015.
2. The permittee shall schedule a pre-construction meeting with DES Land Resources Management Program staff, US Army Corps of Engineers (ACOE), Town of Exeter, NOAA Fisheries Service (NOAA), and the NH Fish and Game Department (NHFGD) to occur at least 48 hours prior to the start of any work authorized by this permit to review the conditions of this wetlands permit. The meeting may be held on-site or at the DES offices in Concord or the Pease International Tradeport. The meeting shall be attended by the permittee; the professional engineer(s); wetlands scientist(s), environmental consultant(s), and/or qualified professional(s); and the contractor(s) responsible for performing the work.
3. The permittee shall notify the DES Wetlands Program in writing of the qualified professionals, as applicable, that will be responsible for monitoring and ensuring that the restoration/enhancement/construction areas are constructed in accordance with the approved plans.
4. The dam removal/stream restoration project shall be performed and/or supervised by the qualified professional with expertise and demonstrated success in the field of stream restoration. The permittee shall re-notify the DES Wetlands Program if the identity of the qualified professional changes during the project.
5. The qualified professional shall monitor the project during construction to verify that all work is done in accordance with the approved plans and narratives, adequate siltation and erosion controls are properly implemented, and no water quality violations occur.
6. Any further alteration of areas on this property that are subject to RSA 482-A jurisdiction will require a new application and further permitting.

7. All development activities associated with this project shall be conducted in compliance with applicable requirements of RSA 483-B and N.H. Code Admin. Rules Env-Wq 1400 during and after construction.
8. No person undertaking any activity shall cause or contribute to, or allow the activity to cause or contribute to, any violations of the surface water quality standards in RSA 485-A and Env-Wq 1700.
9. The permittee shall notify the NH Fish and Game Department as required by RSA 211:11 prior to drawing down or dewatering the resource.
10. Work shall be carried out in a time and manner to avoid disturbances to migratory waterfowl breeding and nesting areas as well as migratory fish spawning and rearing habitat.
11. The time of year the work should be conducted is between July 1 and October 31 (or before freeze occurs). If work is not completed by October 31 then the river must be drawn down to its lowest capacity before freeze occurs then work can continue until March 1st.
12. The primary construction work in the first year shall be done during drawdown or in the dry only. Consultation with ACOE, DES, NOAA, and NHFGD shall determine methodology for in-river work for additional fish passage construction thereafter if needed.
13. Appropriate siltation and erosion controls shall be in place prior to construction, shall be maintained during construction, and shall remain until the area is stabilized. Temporary erosion controls shall be removed once the area has been stabilized.
14. The qualified professional shall inspect the construction areas and submit a monitoring report to DES after a rain event of 1/2" or greater within a 24 hour period during restoration activities. The monitoring reports shall include, but not be limited to, documentation of erosion control deployment, construction sequencing, construction activities and status of construction at time of initial monitoring report. Photographs taken from previously established locations should depict all stages of restoration sequencing.
15. Appropriate turbidity controls shall be installed prior to construction, shall be maintained during construction such that no turbidity escapes the immediate dredge area, and shall remain until suspended particles have settled and water at the work site has returned to normal clarity.
16. Work shall be conducted in a manner so as to minimize turbidity and sedimentation to surface waters and wetlands.
17. All dredged and excavated material and construction-related debris shall be placed outside of the areas subject to RSA 482-A.
18. The contractor responsible for completion of the work shall use techniques described in the New Hampshire Stormwater Manual, Volume 3, Erosion and Sediment Controls During Construction (December 2008).
19. Construction equipment shall be inspected daily for leaking fuel, oil, and hydraulic fluid prior to entering surface waters or wetlands or operating in an area where such fluids could reach groundwater, surface waters, or wetlands.
20. The permittee's contractor shall maintain appropriate oil/diesel fuel spill kits on site that are readily accessible at all times during construction, and shall train each operator in the use of the kits.
21. All refueling of equipment shall occur outside of surface waters or wetlands during construction. Machinery shall be staged and refueled in upland areas only, unless approved by NHDES prior to refueling.
22. Faulty equipment shall be repaired immediately prior to entering areas that are subject to RSA 482-A jurisdiction.
23. Any turbid discharge from dewatering of work areas shall be to sediment basins that are: a) located in uplands; b) lined with hay bales or other acceptable sediment trapping liners; c) set back as far as possible from wetlands and surface waters, with a preferred undisturbed vegetated buffer of at least 50 feet and a minimum undisturbed vegetative buffer of 20 feet, unless an alternative location is approved by NHDES. Non-turbid water may be discharged directly to the river without treatment.

24. Prior to commencing work on a substructure located within surface waters, the permittee or permittee's contractors shall construct a cofferdam to isolate the substructure work area from the surface waters. The permittee or permittee's contractor shall provide DES with provisions for avoiding/preventing cofferdam failure. If failure occurs a monitoring report shall be submitted to DES to include, but not limited to, documentation of reason of failure, damage to restoration site and environmental damage throughout range of affected area, construction sequencing, construction activities and status of construction at time of initial monitoring report. Photographs taken from previously established locations should depict all stages of restoration sequencing.
25. Cofferdams shall not be installed during periods of high flow, whether due to seasonal runoff or precipitation. Once the cofferdam is fully deployed and effective and reviewed by DES, confined work can proceed without restriction.
26. The temporary cofferdam shall be entirely removed within two (2) days after work within the cofferdam is completed and water has returned to normal clarity.
27. Precautions shall be taken to prevent import or transport of soil or seed stock containing nuisance or invasive species such as Purple Loosestrife, Knotweed, or Phragmites. The contractor responsible for work shall appropriately address invasive species in accordance with the NHDOT Best Management Practices for Roadside Invasive Plants (2008).
28. Area of temporary impact shall be regraded to original contours following completion of work.
29. Areas from which vegetation has been cleared to gain access to the site shall be regraded to original contours and seeding with similar native species.
30. Within three (3) days of final grading or temporary suspension of work in an area that is in or adjacent to wetlands or surface waters, all exposed soil areas shall be stabilized by seeding and mulching during the growing season, or if not within the growing season, by mulching with tackifiers on slopes less than 3:1 or jute matting and pinning on slopes steeper than 3:1.
31. Where construction activities occur between November 30 and May 1, all exposed soil areas shall be stabilized within one (1) day of establishing the grade that is final or that otherwise will exist for more than five (5) days. Stabilization shall include placing 3-inches of base course gravels, or loaming and mulching with tack or jute matting and pinning on slopes steeper than 3:1.

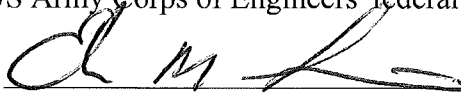
MONITORING:

32. The qualified professional shall submit a follow-up report including photographs of all stages of construction from designated photo stations and an as-built plan, with water depth within the restoration area, which shall be submitted to the DES Wetlands Program within 60 days of final site stabilization.
33. The Town of Exeter shall establish and submit to DES for approval at least five (5) permanent monumented cross-sections throughout the stretch of the Exeter River, two of which shall be in locations within 100 feet of the location of the existing dam.
34. The restoration shall be monitored for the first three (3) years following the dam removal/stream channel restoration to ensure the maintenance and success of the stream restoration work and successful fish passage. The annual reports shall include cross section data, fish counts at the Pickpocket Dam (provided by NHFGD) and any other notable changes to the project area.
35. Restoration of temporary impact areas shall have at least 75% successful establishment of vegetation after three (3) growing seasons, or they shall be replanted and re-established in a manner satisfactory to the DES Wetlands Program.
36. The Town shall review the project reach during the first three (3) spring anadromous fish migration seasons following completion of the project (i.e., spring 2017) with staff from the NHFGD and NOAA to perform a visual evaluation of fish passage conditions. This review will determine whether any adjustments to boulder cluster placement or river micro-grades are necessary to allow upstream fish passage. If necessary, such adjustments shall be made during low flow conditions in 2017 in accordance with agreed upon methodology by DES, ACOE, NOAA, and NHFGD.

GENERAL CONDITIONS THAT APPLY TO ALL DES WETLANDS PERMITS:

1. A copy of this permit shall be posted on site during construction in a prominent location visible to inspecting personnel;
2. This permit does not convey a property right, nor authorize any injury to property of others, nor invasion of rights of others;
3. The Wetlands Bureau shall be notified upon completion of work;
4. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits, and/or consult with other agencies as may be required (including US EPA, US Army Corps of Engineers, NH Department of Transportation, NH Division of Historical Resources (NH Department of Cultural Resources), NHDES-Alteration of Terrain, etc.);
5. Transfer of this permit to a new owner shall require notification to and approval by DES;
6. This project has been screened for potential impacts to **known** occurrences of rare species and exemplary natural communities in the immediate area. Since many areas have never been surveyed, or have received only cursory inventories, unidentified sensitive species or communities may be present. This permit does not absolve the permittee from due diligence in regard to state, local or federal laws regarding such communities or species.
7. Review enclosed sheet for status of the US Army Corps of Engineers' federal wetlands permit.

APPROVED: _____



Eben M. Lewis
DES Wetlands Bureau

BY SIGNING BELOW I HEREBY CERTIFY THAT I HAVE FULLY READ THIS PERMIT AND AGREE TO ABIDE BY ALL PERMIT CONDITIONS.

OWNER'S SIGNATURE (required)

CONTRACTOR'S SIGNATURE (required)



Appendix B

Success Standards and Criteria Evaluation Table





Appendix B: Monitoring Success Standards and Criteria, Great Dam Removal, Exeter River								
Objective/ Goal Description	Baseline (Dam in Place)	Target Year	Target (Post-removal)	As-Built (2016)	Year 1 Status (2017)	Year 2 Status (2018)	Year 3 Status (2019)	Explanation/Comments
Design Meets Fish Passage Criteria	n/a	2017	Y	Y	Y			Criterion Met. Stream restoration design approved by state and federal agencies through the review of the NH Wetlands permit application. Baseline As-Built survey indicates constructed project is consistent with design.
Streambank Stability & Vegetation Cover	n/a	2017	75% Vegetative Cover	0%	> 75% Vegetative Cover			Criterion Met. Restored temporary impact areas have at least 75% vegetative cover (excluding invasive species) and stream banks are stable (no slumping) based on visual inspection.
Site Passability: Channel Width	Dam in Place	2017	4 feet (min)	5.9 feet	11.7 feet			Criterion Met. Minimum channel width observed at monumented Cross-Section 2: As-built observation on 10/14/2016, Year 1 monitoring observation on 10/9/2017. Flows at these dates are 1 cfs and 6 cfs, respectively (measured at USGS Stream Gage 01073587, Exeter River at Haigh Rd, Brentwood, NH). Both are below the 95% exceedance probability flow (18 cfs at the USGS gage).
Site Passability: Channel Depth	Dam in Place	2017	6-9 inches (min)	6 inches	10 inches			Criterion Met. Minimum channel depth observed at monumented cross-section 2: As-built observation on 10/14/2016, Year 1 monitoring observation on 10/9/2017. Flows at these dates are 1 cfs and 6 cfs, respectively (measured at USGS Stream Gage 01073587, Exeter River at Haigh Rd, Brentwood, NH). Both are below the 95% exceedance probability flow (18 cfs at the USGS gage).
Site Passability: Average Channel Slope – Lower Riffle (Main Channel)	Dam in Place	2017	3.0% (max)	2.78%	~2.8%			Criterion Met. Design targets 2.8% average slope. Success criterion: Average channel slope through lower riffle reach (Sta. 1+75 to 2+35) remains less than 3%. Channel is carved into bedrock; no post-construction deterioration anticipated.
Site Passability: Average Channel Slope – Upper Riffle (Main Channel)	Dam in Place	2017	3.0% (max)	2.23%	2.11%			Criterion Met. Design targets 2.5% average slope. Success criterion: Average channel slope remains less than 3.0% through upper riffle reach. Average slope measured between monumented Cross-Sections 2 and 3 (Sta. 2+85 to 3+50).
Site Passability: Max Jump Height	Dam in Place	2017	9 inches (max)	< 6 inches	< 6 inches			Criterion Met. Maximum observed jump height estimated by visual inspection: As-built observation on 10/14/2016, Year 1 monitoring observation on 10/9/2017. Flows at these dates are 1 cfs and 6 cfs, respectively (measured at USGS Stream Gage 01073587, Exeter River at Haigh Rd, Brentwood, NH). Both are below the 95% exceedance probability flow (18 cfs at the USGS gage).
Alewife Presence/ Absence (Adult)	Absent	2018	Present	n/a	Present			Criterion Met. Alewife presence in 2017 observed by representatives of NHFWD, NOAA, and NHDES. Target is documented presence of adult alewives at the Pickpocket Dam.

(Following NOAA Restoration Center, Fish Passage Barrier Removal Performance Measures and Monitoring Worksheet, April 2010). All field measurements will be performed during flow conditions that are safe for persons wading in the river



Appendix C

Post-Construction Completion Report





Memorandum

To: Eben Lewis, NHDES

Date: July 26, 2017

Project #: 52151.04

From: Jake San Antonio

Re: Great Dam Removal and Exeter River Restoration
Construction Completion Report

This report and accompanying attachments detail the construction process for removal of the Great Dam and associated Exeter River restoration in Exeter, NH. This report was developed in accordance with Specific Condition No. 32 and 33 of the NHDES Wetlands Permit No. 2015-00887.

The Great Dam located in the Exeter River impounded water upstream a distance of approximately 4.5 miles and consisted of a spillway, a fish ladder, a fish weir structure, a low-level outlet and a penstock with the associated headworks. The dam itself was approximately 136 feet long by 16 feet high measured from the top of the tallest abutment to the streambed at the downstream face. In 2000, the NHDES Dam Bureau identified safety problems with the Great Dam, most notably that the dam could not safely pass the routed 50-year design storm event with one foot of freeboard and no operations. The New Hampshire Department of Environmental Services (NHDES) issued a Letter of Deficiency (LOD) to the town on July 25, 2000 calling for the dam to be modified in order to meet regulations. VHB analyzed various alternatives during a Feasibility Study and following the completion of the study in 2013, the Town of Exeter determined that the complete removal of the Great Dam was the most preferred option.

The proposed channel design consisted of a roughened channel that was meant to be generally similar to the concept developed during the Feasibility Study. The design employed a natural channel that was designed to be stable under high flow conditions and accommodate fish passage during lower flows expected during the migration period of target fish species. The need to restore the stream channel to conditions that would allow upstream passage for anadromous fish was one of the key issues of the project. VHB designed the restored stream channel to maintain a minimum river elevation during low flows, consistent with the feasibility study, to allow continued use of the Town of Exeter's Municipal Pump Station. The continued use of the pump station is required following removal of the Great Dam and its use is dependent on maintaining a minimum river elevation during low flow periods. The Great Dam Removal / Restoration Project included modifications to the pump station, which included lowering the pump supply gravity intake to the lowest possible elevation based on the building's existing layout. The proposed riffle crest at the upstream limits of the project was designed to maintain a minimum low flow elevation and also has the added benefit of protecting the Great Bridge from potential headcut. The design included placement of fill upstream of the cross vane to provide a smooth transition between the river bed and keystone of the riffle crest. The design also included a stone revetment wall on the western bank of the Exeter River at the base of 37 Water Street to address concern raised by the property owner.

Construction and removal of the Great Dam began the week of July 11, 2016 following drawdown of the Exeter River, which was initiated on July 1, 2016. Construction proceeded steadily throughout the summer until the end of October when all equipment was removed from the site and Founder's Park was fully restored. A severe drought, which occurred throughout eastern New England, resulted in minimal flow in the Exeter River which aided construction. Bi-weekly meetings were held onsite throughout construction and attendees including VHB, the Town of Exeter, the Contractor (SumCo Eco-Contracting, LLC), as well as regulatory agencies, which included staff from NHDES, NHFGD,

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110-6532
P 603.391.3900

and NOAA participated in the weekly meetings. Meeting minutes from the construction meetings are included as Attachment 1.

During construction the channel design was modified based on the exposed bedrock conditions and a secondary channel was added. Attachment 3 details the design modifications.

Photographs of all stages of construction were taken from designated photo stations throughout construction and are included as Attachment 2. Additionally, an As-Built survey of the completed restoration of the Exeter River was completed by an independent survey firm on October 5, 2016. The As-Built details site topography and bathymetry, location of placed boulders and the riffle crest, and the existing water line and depth during low flow conditions at the time of the survey in early October 2016. The As-Built is included as Attachment 4.

In addition to the as-built data, Special Condition 33 required establishment of five (5) permanent monumented cross-sections throughout the study reach. The cross-section locations were approved by DES on November 8, 2016. Attachment 5 includes the xyz data for each cross-section and a plan and section view.



Memorandum

Attachment 1 – Meeting Minutes



Meeting Notes

Place: Public Works Building
13 Newfields Road
Exeter, New Hampshire

Date: June 1, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Great Dam Removal
Contractor Kick-Off Meeting

ATTENDEES

Paul Vlasich, Town of Exeter	Jay Perkins, Town of Exeter	Todd Monson, VHB
Peter Walker, VHB	Chad Sumner, SumCo	Steve Fuller, SumCo
Zach Taylor, SumCo	Sean Arruda, Fuss & O'Neill	

The Town of Exeter, VHB, SumCo, and their consultant, Fuss & O'Neill ("the Project Team") attended a preconstruction kick-off meeting at the Town of Exeter Public Works Department at 1:00pm on June 1, 2016. The following agenda and discussion items outline the content of the meeting:

Agenda

Item	Description	Status	Responsible
A	Introduction and Roles		
	– VHB will update and submit a Contact List to the Project Team	Closed	VHB
	– Paul Vlasich will be the main point of contact on the project, and he should be contacted first in case of emergency. If needed, he will contact Jay Perkins		
	– Town of Exeter Police should be contacted in case of emergency with imminent danger, or if Paul and Jay cannot be reached		
	– Todd Monson will be the main point of contact for the technical engineering aspects of the project for VHB		
	– Both Todd and Paul should be cc'ed on all communication		
	– Fuss & O'Neill will be SumCo's consultant to develop the Water Management and Division Plan and review the Vibration Monitoring Plan to be developed by a specialized consultant		
	– Specific insurance coverage detail in Specifications was missing from SumCo Certificate of Insurance – SumCo to check	Open	SumCo
	– Policy Number and limits for Workers Comp were not provided		
	– Property Damage for Automobile was not provided		
	– Fuss&Oneill (and all responsible for design) will need to carry/provide Professional Liability Insurance		

101 Walnut Street
PO Box 9151
Watertown, MA 02472-4026
P 617.924.1770

B	Project Background		
	<ul style="list-style-type: none"> - Limited information related to soil contamination at the dam – this information is detailed in the Feasibility Report which is publicly available online - There is no known contamination at the site - SumCo will be responsible for managing and disposing (if necessary) soil from the site and will need to adhere to any laws and regulations 		
	<ul style="list-style-type: none"> - Jay Perkins knows the sprinkler system and can help SumCo get in touch with the person who manages the sprinkler system 		
C	Permit Conditions Overview		
	<ul style="list-style-type: none"> - Town of Exeter and SumCo need to sign a copy of the DES permit and keep a copy of the signed permit on site during construction 	Open	SumCo/Exeter
	<ul style="list-style-type: none"> - VHB will provide a letter to DES outlining the qualified professionals responsible for monitoring, per Condition 3 of the DES permit 	Closed	VHB
	<ul style="list-style-type: none"> - VHB to confirm if SumCo can use fish-friendly floc logs for turbidity control 	Open	VHB
	<ul style="list-style-type: none"> - VHB will send the organization logos to SumCo electronically for inclusion on the Project Sign 	Closed	VHB
	<ul style="list-style-type: none"> - VHB to confirm if NOAA / NH Fisheries needs to approve water management plan – they do not need to approve the plan, however, VHB will submit the plan to Mr. Lewis for informational purposes. 	Closed	VHB
	<ul style="list-style-type: none"> - SumCo plans to modify the limit of work on the northeastern bank near the fish weir – these modifications will need to be discussed with NHDES – tentative plan is to discuss this informally with Eban in advance of construction start – VHB will email Mr. Lewis to confirm an amendment is not necessary. 	Open	VHB
D	Discussion Points & Scope of Work		
	<ul style="list-style-type: none"> - VHB confirmed that a red-line markup of as-built conditions shall be kept on site and an As-Built Survey shall be provided at project completion as detailed in Specification Section 105 – Control of Work 		
D-1	Other On-Going Projects		
	<ul style="list-style-type: none"> - The Sidewalk Project is ahead of schedule and will likely be completed by July 1, 2016 - The String Bridge Project is scheduled to start on July 1, 2016 and will likely start mid-July – this will close the String Bridge 		
D-2	River Diversion		
	<ul style="list-style-type: none"> - Water Management Plan is being developed by Fuss & O’Neill 	Open	SumCo

	<ul style="list-style-type: none"> - Plan is similar to the draft discussed a few weeks ago but has been modified slightly – SumCo will resubmit the draft for VHBs review - Water management will consist of sand bags and port-a-dam - If sand bags are proposed that will not be designed to meet the 2-year peak discharge, SumCo needs to provide sufficient detail regarding schedule, timing, action plans, etc. that will allow VHB to fully review and feel comfortable with the plan prior to approval 		
	<ul style="list-style-type: none"> - The coffer dam will need to be inspected by NHDES 		
D-3	Dam Removal		
	<ul style="list-style-type: none"> - SumCo plans to install crack gages prior to construction and establish a baseline for each type of wall for the future work 		
	<ul style="list-style-type: none"> - SumCo plans to use low vibration sawcut process to remove fish ladder near the Green Bean 		SumCo
	<ul style="list-style-type: none"> - SumCo will need to detail how demolition will occur near the Green Bean prior to installation of the granite revetment - SumCo will need to detail how the plans will be modified if vibration thresholds are exceeded 		
	<ul style="list-style-type: none"> - VHB to provide guidance on the number of crack gages required 		VHB
D-4	Stream Restoration		
	<ul style="list-style-type: none"> - Stream restoration aspect of the project is dynamic and will be coordinated between SumCo, Exeter, VHB, and the permitting agencies - Final location of structures will be confirmed in the field 		
	<ul style="list-style-type: none"> - VHB will confirm if a % of angular stone is desired for the stream restoration – 20% is appropriate 	Open	VHB
D-5	Project Schedule		
	<ul style="list-style-type: none"> - The Project Schedule is July 1 – October 30 - Work may be performed from 7:00am to 7:00pm - Equipment may not be started before 7:00am - Weekend work is not expected, and if planned, will need to be coordinated with the Town and VHB 		
	<ul style="list-style-type: none"> - SumCo and VHB will visit the quarry (20 minutes away) to review stone for use in the river restoration during one of the weekly construction meetings 		
D-6	Submittals	Open	SumCo
	<ul style="list-style-type: none"> - SumCo will outline access to the site within the Safety Plan 		
	<ul style="list-style-type: none"> - SumCo will outline phasing / vibration / demolition in the work plan 		

	to properly describe sequencing of the project for VHB's review		
	– SumCo will provide "response plans" within the water diversion and vibration monitoring plans		
	– Tentative dates for submittal of the Vibration Monitoring Plan and the Water Management and Diversion Plan is June 15, 2016		
E	Open Discussion / New Business		
	– SumCo will develop an abutter notice letter for the pre-construction survey and provide to the Town to put on Town letterhead – this letter was submitted to the abutters	Closed	SumCo
	– Once the abutter notice is received, the Town will send the letter to all abutters – this letter was submitted to the abutters	Closed	Exeter
	– Town of Exeter will coordinate a meeting between SumCo and Peter Olney to discuss access to the site – this occurred	Closed	Exeter

Standing Reminders

- A second pre-construction meeting will be held with the permitting agencies (Exeter, DES, ACOE, NOAA, NHFGD) to discuss the permit requirements and proposed phasing and water management plan. The meeting is scheduled for June 13, 2016 at 9:00am and an official invite will follow.
- A "neighborhood meeting" will be held following the pre-construction meeting and will be open to the public. The meeting will provide an overview and greeting to the public. The date and time of the meeting have not been scheduled and an official invite will follow. This is scheduled for 6:30pm on 06/29/16.



Place: Pickpocket Dam
Exeter, New Hampshire

Meeting Notes

Date: June 1, 2016

Notes Taken by: Todd Monson &
Peter Walker

Project #: 52151.04

Re: Pickpocket Dam Fish Trap
Coordination and Scoping Meeting

ATTENDEES

Paul Vlasich, Town of Exeter
Cheri Patterson, NHF&G
Mindy Bubier, NHDES

Eric Hutchins, NOAA
Mike Dionne, NHF&G
Todd Monson, VHB

Hannah Vincent, NOAA
Stephanie Sykes, NHF&G
Peter Walker, VHB

The Town of Exeter, NHF&G, NOAA, NHDES and VHB attended a meeting at the Pickpocket Dam in Exeter, NH at 10:00am on June 1, 2016. The purpose of the meeting was to discuss scoping of a proposed fish trap at the head of the Pickpocket Dam Fish Ladder. The Town of Exeter had previously committed \$20K towards the design/construction of the fish trap as a condition of the NOAA restoration grant.

Discussion of \$75K Funding for Great Dam Removal

NHF&G had previously discussed providing \$75K in non-federal assistance funding to remove the Great Dam. During the June 1 meeting, Ms. Patterson stated that the \$75K in funding could be used only for fisheries habitat restoration, which includes mobilization and limited river restoration in Year 2 of the Great Dam Removal Project or installation of a fish trap at the Pickpocket Dam. The Town sought clarification if the \$75K could be used for other funded and non-funded portions of the Great Dam Removal project, including river restoration for fish passage or pump intake modifications. Ms. Patterson informed the Town that the \$75K could potentially be made available for non-fisheries habitat related scopes of work depending on overall costs for the Pickpocket Dam Fish Trap. The Town of Exeter seeks clarification for the scope of items that could be considered as part of the \$75K funding.

Discussion of Pickpocket Dam Fish Trap

Ms. Patterson informed the group that NHF&G prefers a permanent concrete fish trap, supported on piles, similar to the one built at the Great Dam. The trap would need to be supported on piles due to the depth of water in the impoundment immediately upstream of the fish ladder. The area beneath the fish trap (between the piles) could potentially be filled. Additional design options, which do not require piles, should be evaluated in the future design.

NHF&G would prefer to remove the headworks and gate for the now non-operational low level outlet (assumed to have been replaced with fish ladder). The group acknowledged that removal of the gate or potentially other changes to the dam may trigger NH Division of Historical Resources review under Section 106, and that removing the gate could represent an adverse effect.

VHB informed the group that the Exeter River through the dam has been studied by detailed methods by FEMA as part of the Nation Flood Insurance Program. The area in the immediate vicinity of the dam is within a mapped Zone AE floodplain (100-year floodplain), and there is a designated Floodway for this portion of the river. Work within the floodway might potentially require preparing a "no-rise" analysis to show that installation of a concrete structure would not increase flood heights. Installation of a concrete structure within the flood zone might require providing compensatory storage to mitigate loss of floodplain storage. A temporary structure, or one made of steel mesh may not trigger this requirement.

The Town is required to perform a dam breach analysis of the Pickpocket Dam under a separate requirement, which may require development of a HEC-RAS hydraulic model that could potentially be used to evaluate the hydraulic impacts of a permanent concrete fish trap.

To limit total cost, NHF&G will reach out to USFWS and ask if they can provide design services for a fish trap. Additionally, NHF&G will reach out to NHDES Dam Bureau to ask if they can provide construction services for the trap.

The group expressed a desire to install the fish trap in time for the spring 2017 migration. However, it was acknowledged that the scope of and approach to the project was still being developed, and as a result, could delay installation of the fish trap for at least a year. Mike Dionne stated that he would prefer to take an extra year, if required, to develop a fully functional fish trap.

The group discussed on 06/13/2016 the potential that the project could be delayed. NHDES issued a letter of deficiency for the Pickpocket Dam to the Town of Exeter in 2011, and a breach analysis is still required to be performed. The breach analysis will determine the hazard classification of the dam, which will ultimately determine whether modifications to the dam are required. Modifications could include upgrades to the existing dam or evaluation for removal of the dam. The group acknowledged that it may not be a negative issue if the proposed fish trap is not installed until 2018.

The group decided to meet again in approximately 2 weeks, at the Great Dam Removal Agency meeting, to further discuss the Pickpocket Dam fish trap. The date of the meeting will be confirmed by June 3, 2016.

Design Details for the Fish Trap

- If the top of the fish ladder is utilized as a collection area, the area must be extended approximately 1/3 greater than the existing length of this area.
- The floor elevation of the top of the fish ladder must be the same as the fish trap, unless, the fish trap can be segregated from the top of the fish ladder with a baffle.
- The fish trap would not need two (2) openings as are included in the Great Dam fish trap.
- If the fish trap has a non-removable top, the trap should be at least 6' tall to allow a human sampler access to the interior of the trap.
- If the fish trap utilizes a removable top, the trap could be less than 6' tall, and could be approximately 3'; however the floor elevation would need to remain constant.

- Removal of the old headworks/gate for the now non-operation low level outlet (replaced with fish ladder) would aid with the fish count process.

Action Items:

- Ms. Patterson will follow up with Carol Henderson, of NHF&G, to provide a response to the Town of Exeter regarding drawdown of the Exeter River impoundment upstream of the Great Dam for the Dam Removal Project.
- Ms. Patterson will research the actual cost for installation of the Great Dam Fish trap, but it was noted that this information may not be easily found or interpreted since that project included scope items not needed for the Pickpocket project.
 - Ms. Patterson was unable to locate any costs associated with the Great Dam Fish Trap construction or design.
- Ms. Bubier will find and provide the Pickpocket Dam As-Built plans and reach out to NHDES Dam Bureau to determine whether they could act as the contractor for the project.
 - Ms. Bubier and the Dam Bureau were unable to locate any construction or as-built documents for the Pickpocket Dam. NHDES indicated that they do not expect to find any plans.
 - The Dam Bureau indicated they would not be able to commit to providing construction services for the proposed Pickpocket Dam Fish Trap due to workload. They are concerned about the amount of work they are currently obligated to perform and are fully committed through 2017.
 - Ms. Patterson indicated that she would reach out to Mr. James Gallagher of the NHDES Dam Bureau to discuss the issue further.
 - Ms. Patterson contacted the USFW to inquire whether USFW could provide design services for the proposed Pickpocket Dam. USFW indicated they understood the needs of the project and they would review what they can provide, but Ms. Patterson has not heard back from the USFW. Preliminary indication appeared that USFW would be able to provide some support for the project.
- VHB will inform SumCo that NHF&G would like to save portions of the Great Dam Fish trap, including the metal grating and the baffles.
- VHB will confirm the date of the Agency pre-construction meeting for the Great Dam Removal Project. (*Note: this was later confirmed for June 13, 2016 at 9:00am*)



Place: Public Works Department
Exeter, New Hampshire

Meeting Notes

Date: June 13, 2016

Notes Taken by: Todd Monson &
Peter Walker

Project #: 52151.04

Re: NHDES Pre-Application Meeting

ATTENDEES

Paul Vlasich, Town of Exeter	Jay Perkins, Town of Exeter	Eben Lewis, NHDES
Kevin Lucey, NHDES	Bill Thomas, NHDES	Cheri Patterson, NHFGD
Eric Hutchins, NOAA	Todd Monson, VHB	Peter Walker, VHB
Jake SanAntonio, VHB	Steve Fuller, SumCo	Zach Taylor, SumCo

The Town of Exeter (the Town), NHDES, NHFGD, NOAA (the Agencies), VHB, and SumCo attended a meeting at the Exeter Public Works Department at 9:00 AM on June 13, 2016. The purpose of the meeting was to discuss the Wetlands and Non-Site Specific Permit 2015-00887 issued by NHDES on 03/17/2016 as well as discuss the draft water management and diversion plan developed by SumCo. Each of the permit conditions was discussed in detail and questions were addressed during the meeting. Key discussion items include the following:

Pre-Construction Conditions:

- VHB will serve at the "qualified professional" for purposes of Conditions 3 and 4. Todd Monson will serve as the primary monitor, with Kris Wilkes available for wetland-specific issues. Todd Monson is expected to perform weekly inspections, with Paul Vlasich available on a day-to-day basis, if needed. A letter designating VHB as environmental monitor was submitted to Eben at the meeting. Monitoring reports in compliance with Condition 14 (relative to storm event monitoring) may be issued by VHB, or may be issued directly by Paul Vlasich, depending on the circumstances.
- VHB will distribute a project Contact List, and will send the Pre-Qualification Package submitted by SumCo to Eben Lewis.
- The Town will communicate proposed changes to the project impact areas or plans, if any arise, to Mr. Lewis prior to initiating changes. Mr. Lewis will evaluate the ability to approve the changes under the current permit or make a determination if an amendment is required.
- NHFGD has received a drawdown notification letter submitted by the Town (see Condition 9) and is currently finalizing a response letter. NHFGD will issue the response letter by the end of the week (06/17/16), and the letter will dictate the water drawdown start date of July 1, 2016 and recommended drawdown proceed at a rate of 0.5 feet per day or less.

Work Sequencing and Construction:

- Eben Lewis indicated that Condition 12 allows for limited restoration of the river to occur in-the-wet at the approval of DES, NHFGD and NOAA. The Town, VHB and SumCo will coordinate with the agencies to determine methodology for in-river work. The work sequencing and water management plans detailed during

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the meeting were consistent with the permit conditions and no changes were requested by the review agencies.

- Condition 21 requires equipment to be removed from the river prior to refueling unless approved by NHDES Wetlands. Steve Fuller indicated that should not be a problem. However, SumCo would request permission if necessary.
- The group identified that the streambed may shift based on the design / construction and SumCo has phased the work to allow water to flow through the channel during the last phase of work (Phase 4); this will provide the opportunity to make adjustments to boulders and the streambed if necessary while the Contractor is still on site. Eric Hutchins emphasized the need to address problems caused by shifting prior to the Spring 2017 fish run. Steve Fuller agreed that SumCo would fix any problems that arise from construction issues to ensure project success.
- SumCo plans to install the vibration monitors and crack gages one week prior to drawdown of the river (expected installation is week of 06/20 – 06/24). Vibration monitors will be removed following completion of Phase 3. SumCo plans to leave some crack gages through the season to provide additional monitoring records.
- NHDES, NHFGD and NOAA indicated the preferred sequencing should allow notching of the Great Dam to allow flows to pass without raising the hydraulic grade line of the entire river. Notching the dam will aid in lowering of the river following rain events. The Agencies indicated that notching of the dam could occur without establishing a coffer dam due to the limited possibility for turbidity since the work would involve only concrete demolition and not require dredging of the stream bottom or disturbance of soils. SumCo indicated that notching of the dam could occur during Phase 1 and this would benefit all parties.
- SumCo indicated that site access for the Year 2 Modifications would likely be on the river-right bank immediately upstream of the existing fish weir.
- SumCo will submit a formal Dewatering and Water Management Plan by 06/17/2016 which VHB will review. VHB will provide the plan to Eben Lewis and Jim Webber of the NHDES Dam Bureau for review, and a copy will be provided to NOAA and NHFGD.
- SumCo will install a "Warning Boom" upstream of the High Street Bridge to notify potential users of the river of construction downstream and prevent access to the site via the river.

Erosion Controls:

- Erosion control inspection will occur after rain events of 0.5" or greater, and the qualified professionals (Mr. Vlasich from the Town or Mr. Monson / Mr. Wilkes from VHB) will submit a monitoring report to NHDES in a reasonable time. The qualified professionals will aim to submit the monitoring reports weekly, if possible, but not longer than 2 weeks after a rain event occurs. If the inspection identifies issues with erosion controls the Town, VHB and SumCo will coordinate with NHDES to address the issues as soon as possible.
- It is expected that stockpiles of excavated material will be kept on-site in upland areas outside of the river. Proper erosion controls will be established to stabilize and mitigate erosion resulting from the stockpiles.

- It is expected that construction equipment will be removed from the river daily, and equipment will not be left within the river overnight.
- Cheri Patterson indicated concern that the first silt barrier, located at the fish weir opening, would have a high potential for blowing out. SumCo indicated that the barrier was sized properly to handle river flows by a leading manufacturer in New England. SumCo indicated that the silt barrier will be pinned to the fish weir and heavily reinforced to reduce the possibility the barrier blows out. Additionally, during high flows, the turbidity barriers will be removed from the river.
- SumCo will monitor noise from the pumps used for dewatering. SumCo utilizes special pumps that are hospital grade to mitigate noise and typically does not have issues with noise pollution.

Monitoring:

- The location of the five (5) permanent monumented cross sections will be established by VHB. Following drawdown of the river, VHB will locate suitable areas with accessibility for cross sections that will provide the ability to monitor stream changes over time and propose the five locations drawn on an aerial for Mr. Lewis to review and approve.

Construction Schedule and Site Visitation:

- SumCo will communicate their construction schedule on a weekly basis and provide updated "three-week look-aheads" every Friday. Bi-weekly meeting will be held to discuss the construction sequencing, progress and review any environmental topics related to the stream restoration. NHDES, NHFGD and NOAA all indicated they will try and attend the bi-weekly meetings, and SumCo requested that the Agencies notify the Contractor before coming on site to keep communication open.
- VHB will work with SumCo and the Town to set the meeting dates and times in advance and provide the meeting schedule to the Agencies. Invited attendees will include Eben Lewis, Eric Hutchins, Cheri Patterson, Bill Thomas, Mike Dionne and Kevin Sullivan.

Bi-Weekly Construction Meetings:

- Held every other Wednesday at 10:00AM, starting on July 13, 2016, in the Construction Trailer located along Pleasant Street adjacent to Founders Park.



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: July 6, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Great Dam Removal
Site Visit

ATTENDEES

Todd Monson, VHB

Steve Fuller, SumCo

VHB and SumCo met on-site to review Water Level Management of the River, Site Staging, and Site Access and also visited two locations off-site to review cobble material and boulders to be used for the river restoration. VHB arrived on site at 8:00am and left the site at 11:30am.

The following agenda and discussion items outline the content of the meeting:

Agenda

Item	Description	Status	Responsible
A	Site Staging		
	– Construction / Safety Fence is installed around the perimeter of the site		
	– SumCo was beginning to strip the loam / topsoil from Founder’s Park		
	– SumCo was awaiting the electrician to provide electricity to the Site		
	– SumCo will try their best to avoid having to cut down the large 24” tree in Founders Park – SumCo plans to trim additional branches on the north side of the tree to prevent damaging the tree		
	– Vegetation Clearing along the river-right bank, downstream of the Great Dam was planned for Thursday / Friday of this week		
B	Water Level Monitoring		
	– Flows in Exeter River were minimal – VHB / SumCo estimated flows to be no more than 5 cfs		
	– With the gate open, the river drops rapidly – the river was at approximately elevation 16.2, which is about 5.5’ below the Dam		

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	Crest – VHB recommended that SumCo close the gate to allow the river to pond back up closer to 3’ below the Dam Crest in accordance with the 6” / day draw down rate		
C	Cobble / Boulder Material		
	– VHB / SumCo visited a first location (Rollins Farm Dr Development) to review large boulders and small cobble for the stream; the boulders met the size, color, shape indicated in the Plans		
	– VHB / SumCo visited the second location (quarry in Raymond, NH) to review large cobble and Cross Vane stone for the stream; the cobble and large stone met the size, color, shape indicated in the Plans		

Upcoming Schedule

- July 7–8: Begin vegetation clearing on river-right
- July 11-15: Begin installing access road near lower fish weir

Standing Reminders

- The first bi-weekly construction meeting will occur on July 13, 2016 at 10:00AM at **Founders Park**. Meeting attendees will include the Town, VHB, SumCo, and Regulatory Agencies.



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: July 13, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Great Dam Removal
Bi-Weekly Meeting 1

ATTENDEES

Paul Vlasich, Town of Exeter	Jay Perkins, Town of Exeter	Eben Lewis, NHDES
Mindy Bubier, NHDES	Bill Thomas, NHDES	Cheri Patterson, NHFGD
Mike Dionne, NHFGD	Kevin Sullivan, NHFGD	Eric Hutchins, NOAA
Bjorn Lake, NOAA	Bryan Sojkowski, USFWS	Brett Towler, USFWS
Todd Monson, VHB	Steve Fuller, SumCo	Zach Taylor, SumCo
Chad Sumner, SumCo		

The Town of Exeter (the Town), NHDES, NHFGD, NOAA, USFWS (the Agencies), VHB, and SumCo attended a meeting at the Construction Site at 10:00 AM on July 13, 2016. This meeting was the first scheduled bi-weekly meeting. Key discussion items include the following:

Agenda

Item	Description	Status	Responsible
A	H&S Update		
	– Construction Site has limited space and is in an urban setting; Proper PPE must be worn at all times	Ongoing	All
	– All persons visiting the Site, should please contact SumCo in advance, via email to ensure safety at the site	Ongoing	All
B	Recently Completed & Upcoming Work		
	– Fish weir was sawcut in preparation for removal on 7/12		
	– Removal of the Fish Ladder will begin 07/13 – 07/14; sections will be removed whole and broken up in Founders Park		
	– Begin installation of granite revetment this week		
	– Initial demolition /breakthrough of the Great Dam may occur next week		

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C	Project Schedule		
	<ul style="list-style-type: none"> – SumCo will have a more accurate schedule for the project at the end of next week 		
	<ul style="list-style-type: none"> – Alternate Phasing may adjust the schedule to include 2 to 3 phases instead of 4 phases – Alternate Phasing will be further developed by SumCo and the plan will be reviewed by the Town and VHB prior to approval – VHB will submit the revised Phasing Plan to NHDES, Eben Lewis, for approval prior to implementation – The revised Phasing would involve 10 day plans, and weather will be updated to ensure dry weather prior to beginning each sub-phase – The revised plan will include provision to stabilize the site and remove equipment from flood areas prior to storm events – The revised plan could reduce up to 3 weeks of schedule – No concerns related to the Alternate Phasing were brought up during the meeting 	Open	SumCo
D	Site Staging and Access		
	<ul style="list-style-type: none"> – Access Road was being installed throughout the week 		
	<ul style="list-style-type: none"> – Safety Fence / Safety Notices were added to notify pedestrians to keep out of work zone 		
E	Construction Materials		
	<ul style="list-style-type: none"> – Cobble and Boulders for the stream restoration were on site or being delivered to the site and looked good 		
F	RFI's & Submittals		
	<ul style="list-style-type: none"> – SumCo was providing submittals to VHB and all submittals were reviewed / approved to date 		
G	Permit Compliance / Erosion Controls	Open	SumCo
	<ul style="list-style-type: none"> – SumCo will place 1 ½" stone for construction entrance on 7/14/16 – SumCo will place catch basin inlet filters in catch basins on Pleasant Street on 7/14/16 – SumCo will stake the straw wattles at the end of each day – Erosion controls will be monitored daily by SumCo and/or VHB/Town of Exeter; any signs of erosion or rutting will be repaired immediately 		
H	Pre-Construction Surveys	Open	SumCo
	<ul style="list-style-type: none"> – Surveys were complete and ready for submittal to VHB for review 		

I	Neighborhood Concerns		
	– Small group of residents visited the site on 7/8 to vocalize their opinions, but no issues have occurred since		
J	Water Drawdown and Pump Intake		
	– Water impoundment at High Street Bridge was approximately 16.6 on 7/13		
	– Town was currently using 60% river water and 40% groundwater wells for the town water supply, indicating a heavy reliance on maintained water levels in the Exeter River at the Pump Station		
	– Town tested withdrawal to 1.0 MGD, which resulted in slight signs of swirling at the intake		
K	Environmental Issues		
	– NOAA noted that the impoundment continued upstream to Linden Street Bridge, where a riffle was evident (NOAA)		
	– Three (3) new beaver dams had been constructed within the river, which artificially/naturally raised water levels by up to 2 feet (dams were approximately 12", 8" and 6" in height) (NOAA)		
	– No diversion or secondary channels were evident during a kayak tour up the river; no surprises within the river were noted (NOAA)		
	– The Town of Exeter was currently spreading \$8,000 of wetland mix seed along the exposed banks, focusing on the lower portions of the river that receive the most attention from the public		
	– There was good vegetation cover and overhang along the exposed banks in the upstream portions of the river		
K	New Items		
	– Erosion was noted at the Exeter Elm Campground boat ramp; the owner planned to install more sand; Eben Lewis would contact the owner regarding the issue	Open	NHDES

Upcoming Schedule

- July 15th: Complete access road installation; begin installation of granite buttress; begin removal of fish ladder
- July 22nd: Begin demolition / breakthrough of Great Dam; continue work on river left

Standing Reminders

- The second bi-weekly construction meeting will occur on July 27, 2016 at 10:00AM at Founders Park.



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: July 29, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Great Dam Removal
Site Visit

ATTENDEES

Todd Monson, VHB
Zach Taylor, SumCo

Paul Vlasich, Exeter

Steve Fuller, SumCo

During the 2nd Bi-Weekly Construction Meeting held on July 27, 2016 the Project Team and Regulatory Agencies evaluated site conditions and newly exposed bedrock. During and following the meeting, NOAA fish biologists raised some concerns and questions related to the exposed bedrock and the feasibility for potential modifications to the original design to enhance fish passage at the site. Eric Hutchins, Matter Bernier, and James Turek, all of NOAA, sent a emails to the group requesting changes be made to the design. In general, NOAA fish biologists believed that more competent bedrock was exposed than was originally mapped, which provided the opportunity to lower the riffle crest and decrease the slope of the restored stream. Additionally, NOAA requested that VHB evaluate the feasibility for removing the riffle crest, as they believed bedrock upstream of the High Street Bridge provided sufficient control on water levels at the Town Water Supply Intake.

VHB and the Town of Exeter (Project Team) met on site at 12:30pm on July 29, 2016 to further investigate the bedrock and evaluate its competency for maintaining water levels long-term. The Project Team identified discontinuous portions of exposed bedrock beneath the High Street Bridge to a location approximately 60 feet upstream of the bridge. The Project Team determined that bedrock was likely competent throughout much of the reach. For most of the channel width, bedrock elevations were measured at or above elevation 15.5 ft (NAVD88). Bedrock was most competent within the center of the channel, and the Project Team identified small channels on either side (left and right) of the channel that could degrade over time. The Project Team hand dug test pits and probed the channels and identified small continuous pockets where bedrock elevations were as low as approximately 14.7 ft NAVD 88.

Due to the small size of the pockets and the overall coverage of exposed bedrock throughout this reach, the Project Team developed a comfort level that the riffle crest elevation could be lowered somewhat without much additional risk to critical surface elevations near the water supply intake. The Project Team determined that there was opportunity to lower the riffle crest elevation by 6 inches to elevation 15.0 ft. The Project Team determined that lowering the weir elevation by 12 inches to 14.5 ft would increase the extent of channel restoration and upstream project limits by up to 30 to 40 feet to properly tie into the existing

The following agenda and discussion items outline the content of the meeting:

Agenda

Item	Description	Status	Responsible
A	Evaluate Competency of Bedrock Upstream of High St Bridge	Complete	VHB
	– Evaluated soundness of bedrock upstream of bridge – determined exposed bedrock was sound, but some loose pockets existed (2-3' wide)		
	– Dug test pits by hand with shovel to estimate pocket depths (12"-17" deep)		
	– Felt comfortable that bedrock provided control on water levels		

Upcoming Schedule

- August 1: Begin excavation of bedrock immediately upstream of former dam to develop the low-flow channel
- August 1 – 5: Finish removal of concrete dam and haul concrete offsite
- August 1 – 5: Excavate surface material within proposed river reach and set the subgrade for the riffle crest



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: August 3, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Great Dam Removal
Site Visit

ATTENDEES

Todd Monson, VHB
Steve Fuller, SumCo

Paul Vlasich, Exeter
Zach Taylor, SumCo

Jay Perkins, Exeter

VHB submitted a response to comments memorandum to the Project Team and Regulatory Agencies on 08/02/16 which addressed concerns raised by fisheries biologists from NOAA. In response to comments / concerns developed by NOAA, VHB evaluated the feasibility of modifying the permitted design to lower the riffle crest and reduce the stream slope of the restored channel. Additional modifications are detailed in the memo. VHB included a revised grading plan with the response to comments which includes the modifications.

VHB and SumCo met on-site at 8:00am to review the revised grading plan submitted by VHB on 08/02/16. VHB then met with the Town of Exeter at 9:30am to review the memorandum and proposed modifications, as well as, discuss construction methodology for work to be completed over the next week.

The following agenda and discussion items outline the content of the meeting:

Agenda

Item	Description	Status	Responsible
A	Revised Design and Upcoming Construction Work	Ongoing	SumCo/VHB
	– Reviewed the revised grading plan (Revision 1)		
	– Discussed the risks associated with leaving the temporary low-flow channel on river left: 1) Potential for scour and undermining the concrete retaining wall/footing; 2) Increased costs resulting from necessity to install granite revetment; 3) Increased level of effort / cost for remodeling and redesigning the secondary channel		
	– Discussed exposed bedrock conditions from station 1+75 – 2+25; bedrock outcrops will be left in place at higher elevations than shown on plans and will be substituted in place of boulder clusters where possible		

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	– Low flow channel from station 1+75 to 2+25 will be carved into bedrock and follow low conditions as applicable		
	– The proposed pool shape will likely change and be based on existing bedrock conditions in the area		
	– The CMU penstock closure will be built directly inside of the wooden gates, and at the immediate end of the penstock; the concrete blocks will overhang the penstock by a few inches		
	– Cross vane boulders will be based on specifications in plans; minimum thickness is 2 feet; cross vane will be installed at-grade with no drop within the channel		
B	Existing Work		
	– Saw cutting to be finished on 8/3/16		
	– Concrete to be removed by 8/5/16		
	– SumCo to perform pebble count of test cobble mix by 8/5/16		
	– SumCo to begin cross vane on Monday 8/8/16		
C	Erosion Controls		
	– No erosion or turbidity issues noted; turbidity barriers were filtering fines at downstream limit of work		

Upcoming Schedule

- August 3 – 5: Finish removal of concrete dam and haul concrete offsite
- August 3 – 5: Excavate surface material within proposed river reach and set the subgrade for the riffle crest
- August 8 - 10: Begin installation of the riffle crest
- August 10 - 12: Begin excavation of exposed bedrock at “lower falls” at site of historic dam

Standing Reminders

- The third bi-weekly construction meeting will occur on August 10, 2016 at 10:00AM at Founders Park. Meeting attendees will include the Town, VHB, SumCo, and Regulatory Agencies, as well as multiple fisheries biologists from NOAA.



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: August 8, 2016

Notes Taken by: Jill Baumbach

Project #: 52151.04

Re: Great Dam Removal
Site Visit

ATTENDEES

Todd Monson, VHB

Paul Vlasich, Exeter

Jill Baumbach, VHB

Zach Taylor, SumCo

VHB was present at the site on 08/08/2016 from 8am to 2:30 pm and discussed several items with The Town of Exeter and SumCo. VHB also witnessed the completion of the dam demolition.

The following items were discussed on site:

Agenda

Item	Description	Status	Responsible
A	CMU Wall	Ongoing	SumCo
	– While on site, VHB noticed that the CMU wall at the penstock opening was nearly complete but vertical reinforcing bars were not visible and the cells did not seem to be filled with grout		
	– VHB discussed the issue with SumCo & their subconsultant; the vertical rebar will be placed after the wall is built up and the bars will be grouted in place		
B	Concrete Patching		
	– The sawcut from the dam removal has visibly damaged part of the concrete wall, The Town of Exeter discussed with VHB how this will be remediated and paid for.	Ongoing	SumCo
	– VHB and SumCo discussed the restoration of the wall- SumCo will restore where the sawcut damaged the wall but will not restore the sections that had been damaged long ago (the difference is visible due to color variation). This item is paid for under the dam removal		
C	Bed Material Mix	Ongoing	SumCo
	– The cobble/boulder mix for the bed material started to arrive on site and to ensure that the material met the require standards,		

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	SumCo made a 15'x15' test plot and performed a 50 count pebble count.		
	– VHB directed SumCo how to properly place the material so that the large boulders and small cobbles were thoroughly mixed		
	– The pebble count on the test plot showed that the mix had an adequate number of large diameter boulders and an adequate number of small diameter boulders but was low in the 10"-15" diameter range.		
	– Material with diameters in the 10' to 15" range were brought on site and mixed in. The test plot looked visibly correct, SumCo will perform a full pebble count before proceeding. The town of Exeter was present to see what the bed material mix should look like.		
D	Cross Vane	Ongoing	SumCo
	– VHB discussed with the town what the cross vane should look like and how the layers of boulders should be offset and overlap.		
	– SumCo started to install the cross vane in the afternoon. SumCo was very precise about ensuring that the top elevation of the boulders were at the exact elevation of the finished bed and in the correct location as shown on plans.		
	– VHB helped guide SumCo on how close together the boulders need to be; large gaps cannot exist between the boulders.		

Upcoming Schedule

- August 9-12: Finish installing the cross vane and continue to place bed bacterial in the main section of the channel.

Standing Reminders

- The third bi-weekly construction meeting will occur on August 10, 2016 at 10:00AM at Founders Park. Meeting attendees will include the Town, VHB, SumCo, and Regulatory Agencies, as well as multiple fisheries biologists from NOAA.



Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Date: September 2, 2016

Notes Taken by: Jill Baumbach

Project #: 52151.04

Re: Great Dam Removal
Site Visit

ATTENDEES

Todd Monson, VHB
Jill Baumbach, VHB

Paul Vlasich, Exeter
Zach Taylor, SumCo

VHB was present at the site on 09/02/2016 from 8am to 11:30 am and discussed several items with The Town of Exeter and SumCo. VHB also witnessed the removal of the construction road material.

The following items were discussed on site:

Agenda

Item	Description	Status	Responsible
A	Rip-Rap	Approved	
	– River left was to have seeding go all along the top of bank, while on site VHB noticed a 10' width of rip-rap was placed instead of loam and seed.		
	– VHB discussed the issue with SumCo, who placed rip-rap there to protect the bank from erosion due to a PVC drain. This drain carries stormwater from rooftops with force as noticed by SumCO on Thursday 9/1/2016, during a 30 minute intense rain shower.		
	– VHB and the Town of Exeter are fine with this change.		
B	Change Orders	Ongoing	VHB/SumCo
	– The Town of Exeter discussed two change orders with VHB. VHB to make slight tweaks to the change order amounts (drawing funds from the project savings) and will send the revised Cost to the town this afternoon.		
	– As part of CO #2, SumCo needs to provide VHB with quantities and estimates for the difference in cobble mix and ledge excavation due to the second channel		

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C	Vibration Monitoring	Ongoing	SumCo/VHB
	– VHB was informed of an exceedance with the vibration monitoring. SumCo to provide VHB with details of the event and VHB will provide the Town of Exeter a summary of what transpired, including that SumCo followed exceedance protocol.		
D	Second Channel Design Memo	Ongoing	VHB
	– The Town of Exeter informed VHB the need for a memorandum on the second channel summarizing VHB’s modeling efforts and findings.		
E	Fine Material On Bedrock	Ongoing	SumCo
	– While on site, VHB noticed a large amount of fine sediments and small pieces of loose ledge on top of the exposed bedrock. These will be washed away during a large storm but will remain in smaller events. VHB is okay with this. SumCo is going to wash the second channel and the bottom of the revetment so they are free of fines. SumCo to send pictures to VHB during/after the wash.		
F	Pump In-Take	Completed	
	– VHB visited the pump in-take site with the Town of Exeter. VHB took photographs of the existing conditions. SumCo to start mobilizing to this site on Tuesday 9/6/2016.		

Upcoming Schedule

- Pump in-take to be started next Wednesday, September 7th. SumCo should also be done with the channel on that same date.
- Punch List walk to occur next week.

Standing Reminders



Place: Conference Call

Meeting Notes

Date: November 1, 2016

Notes Taken by: Todd Monson

Project #: 52151.04

Re: Monitoring Protocol

ATTENDEES

Paul Vlasich, Town of Exeter

Kevin Lucey, NHDES

Mindy Bubier, NHDES

Cheri Patterson, NHF&G

Mike Dionne, NHF&G

Kevin Sullivan, NHF&G

Eric Hutchins, NOAA

Todd Monson, VHB

Jake San Antonio, VHB

Peter Walker, VHB

The Town of Exeter, NHDES, NHF&G, NOAA, and VHB participated in a conference call on November 1, 2016 at 3:00PM to discuss the Monitoring Protocol Memorandum developed by VHB on behalf of the Town of Exeter. The memo outlines the Town of Exeter's approach to post-construction monitoring of the Great Dam Removal project and to clarify proposed success standards. Monitoring is guided by Conditions 32-36 of the NHDES Wetlands Permit No. 2015-00887, as well as Condition 4 of the ARM Fund Project Agreement executed by the Town of Exeter and NHDES, and Special Award Condition 8 of the NOAA Coastal Ecosystem Resiliency Grant issued to the Town (Award NA16NMF4630012). The memorandum was originally submitted for review on October 7, 2016 and revised on October 26, 2016 to address comments provided by NOAA. NHDES submitted additional comments / edits on October 28, 2016, and these edits served as the basis for the conference call.

Key discussion items included the following:

- The follow-up construction report will include a plan showing the photo stations and surveyed cross section locations.
- The cross sections will be surveyed with a 0.1 ft or better vertical accuracy, and data tables including x, y, and z coordinates associated with the transects will be provided, in addition to CAD / PDF plans.
- In accordance with the Federal Mitigation Rule and USACOE requirements, monitoring will be performed for 5-years, unless it is determined that all performance measures have been met following completion of year 3 monitoring. The Town of Exeter, and its consultant VHB, will meet with the regulatory agencies following the third year of monitoring to evaluate site conditions and the performance based monitoring criteria to determine if all the performance standards have been met and the monitoring period can be reduced.
- The monitoring protocol will be updated to indicate that invasive species will not be counted in evaluating the monitoring criteria requiring 75% establishment of vegetation cover. The 75% establishment of cover requirement applies to the restored reach.
- In accordance with Wetland Permit Condition 36, the Town of Exeter will coordinate a joint inspection of the restoration site in mid-April 2017 to assess fish passage conditions with NHDES, NOAA and NHFGD. The meeting is currently scheduled for April 14, 2017, but confirmation of the meeting date will be dependent on evaluation of flow conditions within the Exeter River. During the first week of April 2017, the Town of Exeter, NHFGD, and NOAA will review flows to confirm they fall within the range of typical fish passage flows (95-

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Watertown, MA 02472-4026

percent to 5-percent exceedance probability flows between April and June), which should allow the presence of fish within the river during the joint inspection. It is expected that the Town of Exeter will review gage records to estimate flows in the river, and NOAA and/or NHFGD may visit the site prior to the joint inspection to set expectations and review water conditions.

- During the Spring 2017 visit, the Town will take photos of the restored reach to capture water depths in relation to bedrock, boulders, and other site features as reference points, and then survey the area during low flow conditions, likely in the summer, and compare water depths to the photos.
- The tentative April 14, 2017 meeting will be used to identify if modifications to the restored reach are required and develop a plan for modifications, if necessary. If required, modifications to the restored reach may be paid in part by the NHFGD Fish Habitat Funds. Based on email communication in August 2017, the Town currently does not have funds for year 2 river bed adjustments within the Town's capital monies request.
- The ARM Fund Grant Condition 4 included in the monitoring protocol will be updated to include the condition noted in the signed agreement dated January 15, 2016 and approved by the Governor & Council on March 23, 2016.
- Streambank slope and vegetation standards, as well as, channel depth will be added to the Monitoring Criteria (Table 1).
- Evaluation of the presence of juvenile Alewife will be removed from the Monitoring Criteria, as this was determined to be unnecessary for this project.
- The Monitoring Protocol will be updated to indicate that a longitudinal profile through the restored reach (Sta. 1+25 to 3+75) will be collected each year, in addition to the 5 permanent cross sections.
- The cross section located immediately upstream of High Street Bridge will be replaced with a cross section downstream of the String Bridge, through the gravel bar within the tidal reach of the Squamscott River. VHB will provide a revised figure detailing the location of the new cross section, as well as a figure detailing the proposed final locations of all 5 cross sections.



Memorandum

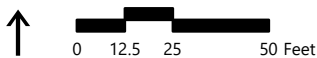
Attachment 2 – Construction Photos



\\vhb\check\Watertown\52.151.04.Exeter.Dam.Removal\GIS\Project\PostConstructionCompletionReport\52.151.04.PostConstructionPhotos.mxd

Photo Location: 8, Not depicted and located at the water intake structure upstream.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Great Dam Removal & Exeter River Restoration

Exeter, NH



 Photo Location

Completion Report Photo Documentation

Photo Log Documentation

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH

Construction: July 11, 2016 – October 31, 2016



Photo #1:	Location: 1 – Downstream of Dam
	Description: Taken 10/1/2014

Photo #2:	Location: 1 – Downstream of Dam
	Description: Taken 7/6/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

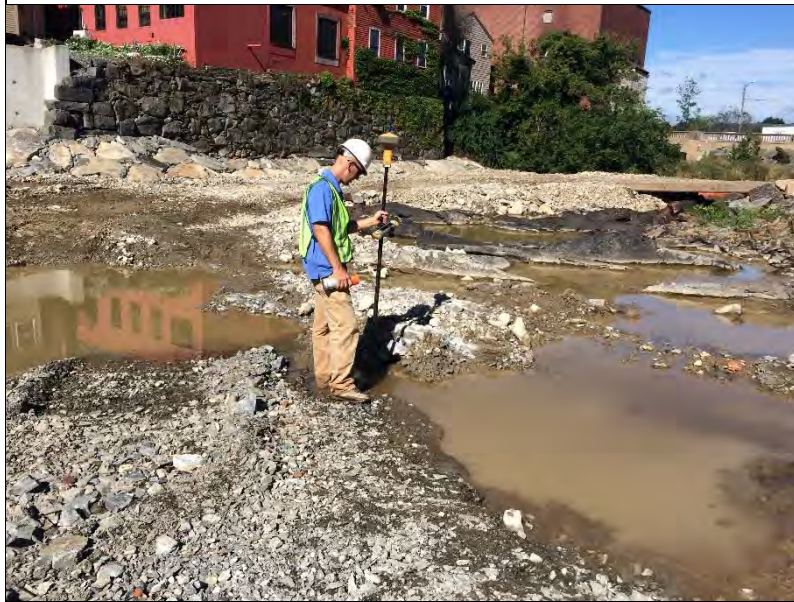
Photo #3:



Location: 1 – Downstream of Dam

Description: Taken 7/13/2016

Photo #4:



Location: 1 – Downstream of Dam

Description: Taken 8/15/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016



Photo #5:	Location: 1 – Downstream of Dam
	Description: Taken 9/7/2016

Photo #6:	Location: 1 – Downstream of Dam
	Description: Taken 9/21/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #7:

Location: 2 – From Dam Towards Left Bank

Description: Taken 10/1/2014



Photo #8:

Location: 2 – From Dam Towards Left Bank

Description: Taken 7/13/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #9:



Location: 2 – From Dam Towards Left Bank

Description: Taken 8/3/2016

Photo #10:



Location: 2 – From Dam Towards Left Bank

Description: Taken 8/19/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #11:



Location: 2 – From Dam Towards Left Bank

Description: Taken 9/2/2016

Photo #12:



Location: 2 – From Dam Towards Left Bank

Description: Taken 9/30/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016



Photo #13:	Location: 3 – From Dam Towards High Street
	Description: Taken 10/1/2014

Photo #14:	Location: 3 – From Dam Towards High Street
	Description: Taken 7/6/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #15:

Location: 3 – From Dam Towards High Street

Description: Taken 7/13/2016



Photo #16:

Location: 3 – From Dam Towards High Street

Description: Taken 7/13/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016


Photo #17:	Location: 3 – From Dam Towards High Street
	Description: Taken 8/2/2016

Photo #18:	Location: 3 – From Dam Towards High Street
	Description: Taken 8/18/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #19:

Location: 3 – From Dam Towards High Street

Description: Taken 9/7/2016



Photo #20:

Location: 3 – From Dam Towards High Street

Description: Taken 12/14/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #21:

Location: 4 – Looking Downstream

Description: Taken 10/1/2014



Photo #22:


Location: 4 – Looking Downstream

Description: Taken 7/13/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #23:	Location: 4 – Looking Downstream
	Description: Taken 7/29/2016

Photo #24:	Location: 4 – Looking Downstream
	Description: Taken 8/15/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #25:

Location: 4 – Looking Downstream

Description: Taken 8/18/2016



Photo #26:

Location: 4 – Looking Downstream

Description: Taken 8/23/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #27:



Location: 4 – Looking Downstream

Description: Taken 9/21/2016

Photo #28:



Location: 4 – Looking Downstream

Description: Taken 12/14/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016



Photo #29:	Location: 5 – From High Street Looking Downstream
	Description: Taken 10/1/2014

Photo #30:	Location: 5 – From High Street Looking Downstream
	Description: Taken 7/13/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #31:

Location: 5 – From High Street Looking Downstream

Description: Taken 7/29/2016



Photo #32:

Location: 5 – From High Street Looking Downstream

Description: Taken 8/8/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #33:

Location: 5 – From High Street Looking Downstream

Description: Taken 8/18/2016



Photo #34:

Location: 5 – From High Street Looking Downstream

Description: Taken 8/24/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #35:

Location: 5 – From High Street Looking Downstream

Description: Taken 8/24/2016



Photo #36:

Location: 5 – From High Street Looking Downstream

Description: Taken 9/21/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #37:

Location: 5 – From High Street Looking Downstream

Description: Taken 9/30/2016



Photo #38:

Location: 5 – From High Street Looking Downstream

Description: Taken 12/14/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #39:

Location: 6 – From Right Bank Looking Upstream

Description: Taken 7/13/2016



Photo #40:

Location: 6 – From Right Bank Looking Upstream

Description: Taken 7/29/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #41:

Location: 6 – From Right Bank Looking Upstream

Description: Taken 7/29/2016



Photo #42:


Location: 6 – From Right Bank Looking Upstream

Description: Taken 8/7/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #43:	Location: 6 – From Right Bank Looking Upstream
	Description: Taken 8/19/2016

Photo #44:	Location: 6 – From Right Bank Looking Upstream
	Description: Taken 9/21/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #45:

Location: 7 – Looking Upstream

Description: Taken 7/13/2016



Photo #46:

Location: 7 – Looking Upstream

Description: Taken 7/29/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #47:

Location: 7 – Looking Upstream

Description: Taken 8/2/2016



Photo #48:

Location: 7 – Looking Upstream

Description: Taken 8/10/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #49:	Location: 7 – Looking Upstream
	Description: Taken 8/15/2016

Photo #50:	Location: 7 – Looking Upstream
	Description: Taken 8/18/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #51:

Location: 7 – Looking Upstream

Description: Taken 8/23/2016



Photo #52:

Location: 7 – Looking Upstream

Description: Taken 9/21/2016



Project: Great Dam Removal / Exeter River Restoration, Exeter, NH

Construction: July 11, 2016 – October 31, 2016

Photo #53:



Location: 8 – Water Intake

Description: Taken 9/21/2016

Photo #54:



Location: 8 – Water Intake

Description: Taken 10/03/2016

Project: Great Dam Removal / Exeter River Restoration, Exeter, NH
Construction: July 11, 2016 – October 31, 2016

Photo #55:

Location: 8 – Water Intake

Description: Taken 10/12/2016



Photo #56:

Location: 8 – Water Intake

Description: Taken 12/12/2016, Tee Installation





Memorandum

Attachment 3 – Design Modification Memorandum



Memorandum

To: Paul Vlasich, PE
Exeter Town Engineer

Date: February 3, 2017

Project #: 52151.04

From: Jake San Antonio, VHB

Re: Great Dam Removal and Exeter River Restoration
Design Modification and Updated Hydraulics Analysis

Background

Following drawdown of the Exeter River during July 2016, VHB and the Town of Exeter (Project Team) were provided an updated understanding of the streambed material and mapping of the surficial bedrock. Generally, mapping of bedrock represented conditions similar to those identified during the design phase of the project and confirmed the intent of the original design. Two additional pieces of information were identified following drawdown, including:

- 1) There was additional bedrock at higher elevations between River Station 1+75 and 2+25, and
- 2) There was exposed bedrock beneath and immediately upstream of the High Street Bridge.

During bi-weekly construction meetings held on July 26, 2016 and August 10, 2016, the Project Team and Regulatory Agencies (NHDES, NHFGD, NOAA) discussed project progress and evaluated the exposed portions of the bedrock within the stream. During the meetings, and in follow up email communication, the Regulatory Agencies requested that the Project Team and the Contractor, SumCo Eco Contracting, evaluate the feasibility of incorporating the following design modifications during construction:

- Lower the riffle crest elevation and reduce the stream slope.
- Adjust stream alignment and reduce stream slope immediately upstream of the former dam.
- Modify the shape and slope of the riffle crest.
- Reduce the amount of instream fill.
- Substitute existing bedrock outcrops for boulder clusters where feasible.
- Modify stream restoration to leave the temporary secondary bypass channel and stabilize adjacent slopes.

Design Modifications

On July 29, 2016, the Project Team reviewed bedrock conditions upstream of the riffle crest and concluded that, although the bedrock was discontinuous and included some pockets of non-competent ledge, the bedrock would likely provide control on water surface elevations (WSE) upstream of the project above elevation 15.5 ft-NAVD88. *(Note: All elevations included in this memorandum reference the North American Vertical Datum of 1988 (NAVD88) in feet).* The Project Team determined that the keystone of the riffle crest could be lowered from elevation 15.5 ft to 15.0 ft, which could reduce the upper riffle slope from 3.0% to 2.5%. Lowering the riffle crest also allowed a reduction in both the left and right arm lengths by approximately 15 to 20 feet on both sides.

Based on the newest information for exposed bedrock between stations 1+75 and 2+50, the alignment of the restored channel was adjusted by moving the stream centerline approximately 4 to 6 feet to river right of the original centerline, which lengthened and reduced the lower riffle slope from 3.0% to 2.8%. The stream centerline was cut directly into the bedrock to the maximum extent practicable, and exposed bedrock outcrops were left as replacements

for boulder clusters between stations 1+75 to 2+50 to maximize streambed stability. The design modifications were in accordance with the original intent of the project to modify the alignment of the low-flow channel to make use of bedrock conditions to the extent practical. The modifications followed an adaptive management construction approach, which allowed the final restoration to best utilize natural conditions within the river. Lowering the stream slope will enhance fish passage success by increasing depth and decreasing water velocities, as well as increasing stability of the restored channel. These modifications were incorporated within a revised channel grading design issued by VHB on August 2, 2016 (see Attachment 1).

In August 2016, The Project Team and Regulatory Agencies discussed potential benefits associated with modifying the channel restoration design to include a secondary channel along river left. Benefits included opportunity for passage of eels, increased cross sectional area to convey high flows, and long term stability of the river bed. Preliminary evaluation of the secondary channel identified a risk for scour at the retaining wall along the property at 23 Water Street. To mitigate the risk for scour, the Project Team modified the granite revetment design to extend an additional 60 feet upstream along river-left. Additionally, based on conversations with NOAA, the low flow channel near station 2+00 was modified to reduce bedrock removal because NOAA indicated that pinch points had been removed and they were comfortable with the constructed channel grade and width. The Project Team and Regulatory Agencies all agreed that modifying the design to include a secondary channel would be a substantial change in the hydraulics of the restored river reach, and this change would require a revised hydraulic analysis to be performed by VHB.

Revised Hydraulic Modeling

The lower riffle, pool, and upper riffle have lengths of approximately 70 feet, 50 feet, and 65 feet, respectively, resulting in an overall passage distance of approximately 185 feet. VHB revised the final design (March 2016) hydraulic model developed in HEC-RAS to include the updated channel design in the August 29, 2016 grading plan. VHB used HEC-RAS to evaluate five flow scenarios and estimate water velocities through the project reach during the spring fish migration period (April through June). VHB then compared the estimated velocities through the project reach to those included in the design basis memorandum dated September 4, 2015, developed by VHB, and summarized in the table below. Additionally, velocity distribution within the cross sections of the restoration reach for the April-June 5% flow are provided in Attachment 2. The April-June 5% flow is characterized as the upper limit for fish passage flows, and has an estimated value of 609 cubic feet per second (cfs) for the Exeter River at the restoration site.

Table 1: Migration Season Flow and Velocity Summary

Flow Scenario	Flow (cfs)	Average Velocity (feet/sec) ¹	
		Approved Design (March 2016)	Revised Design (August 29, 2016)
April-June 5%	609	5.9	5.5
April Median	327	4.9	4.6
May Median	162	4.0	3.9
June Median	105	3.5	3.6
April-June 95%	32	2.4	2.8

¹ Average velocity within restoration reach (STA 1+45 to 3+50)

Evaluation of Fish Passage Criteria

The Technical Memorandum "Federal Interagency Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes" published in May 2016 and provided by NOAA, provides a maximum velocity guideline for passage of river herring species (Blueback Herring, Alewife) and sea lamprey of 6 feet/sec. While these target species can dart at higher speeds, they cannot sustain higher speeds for long distances. Results from the revised hydraulic modeling indicate that average speeds within the restoration reach are below the target maximum speed for even the highest flows. Additionally, the attached water velocity distributions show water velocities are predicted to be less than 6 feet/sec within the stream fringes for all cross sections within the restoration reach for the highest fish passage flow scenario.

Review of the original Design Basis Memorandum by NOAA staff, including James Turek and Matthew Bernier, indicated that the estimated fish passage success rates detailed in the memo were pessimistic, and actual passage rates would be higher. NOAA staff indicated that in a natural system fish will move out to the stream margins and use velocity shelters behind placed boulders where water velocities were lower. As a result, NOAA staff indicated that the approved final design (March 2016) would likely provide successful fish passage for the target species. Results from the updated analysis of the revised design from August 29, 2016 predict decreased velocities and increased channel depths during typical migration flows. Therefore, it is anticipated that the revised design will provide better fish passage success than that originally approved, and meets design expectations outlined by multiple fish passage specialists throughout the project.

Evaluation of Peak Water Surface Elevations

The revised design (August 29, 2016, see Attachment 3) will result in decreases in the regulatory base flood elevations as compared to the Preliminary FEMA Flood Insurance Study (FIS) for Rockingham County, NH at the upstream limits of the stream restoration. Model results indicate that the peak water surface elevations (WSE) for the 1% annual chance flood event (100-year flood) at the upstream limit of the restoration and immediately downstream of the High Street Bridge will decrease from 27.9 ft as stated in the Preliminary FIS to 24.9 ft as predicted by this analysis. Peak WSE upstream of the High Street Bridge will also likely decrease and the estimated decreases in WSE upstream of the bridge will be detailed in a later analysis associated with the Letter of Map Revision (LOMR) to be performed in accordance with National Flood Insurance Program (NFIP) guidelines.



Memorandum

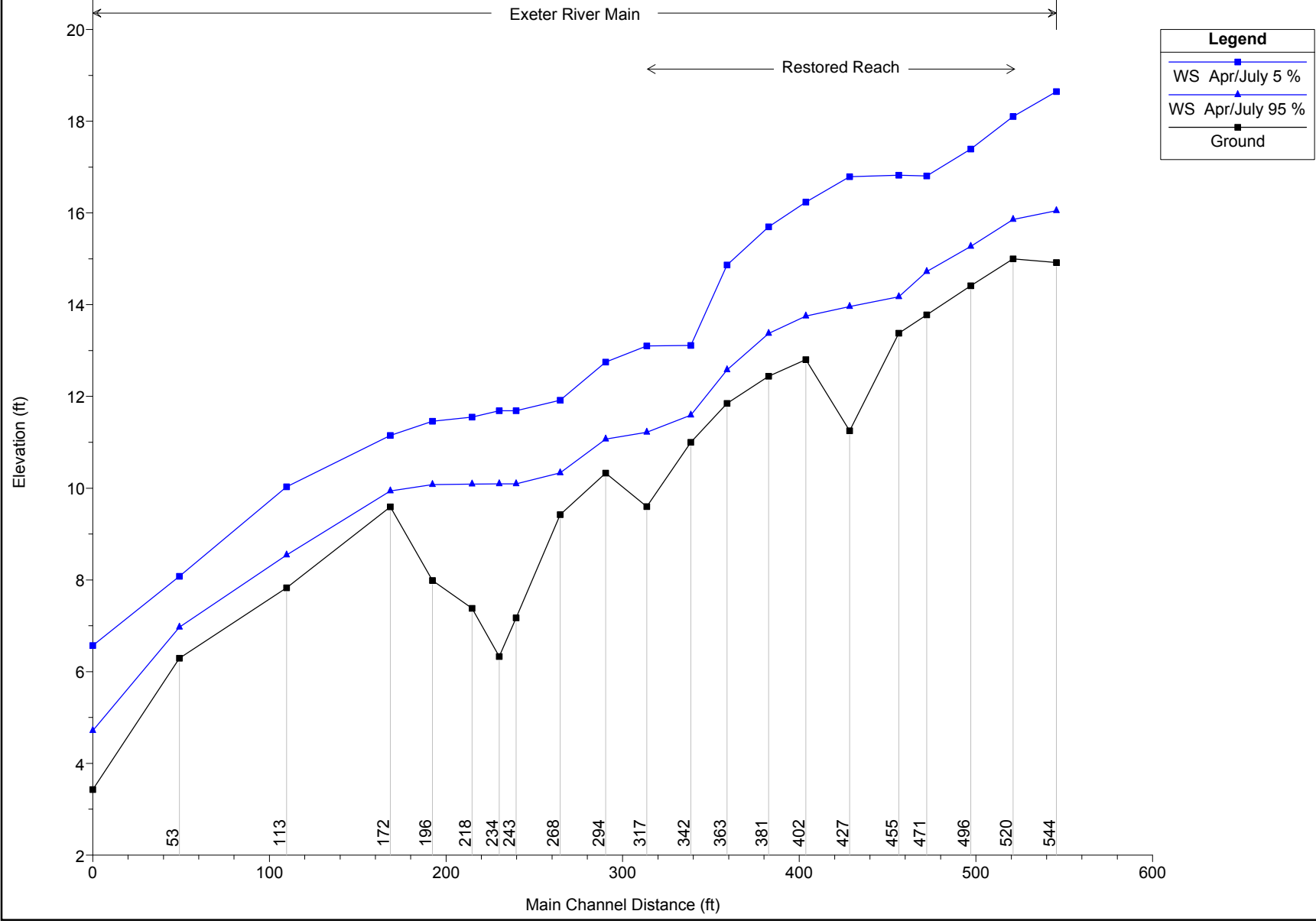
Attachment 1
Revised Grading Plan 1 (August 2, 2016)



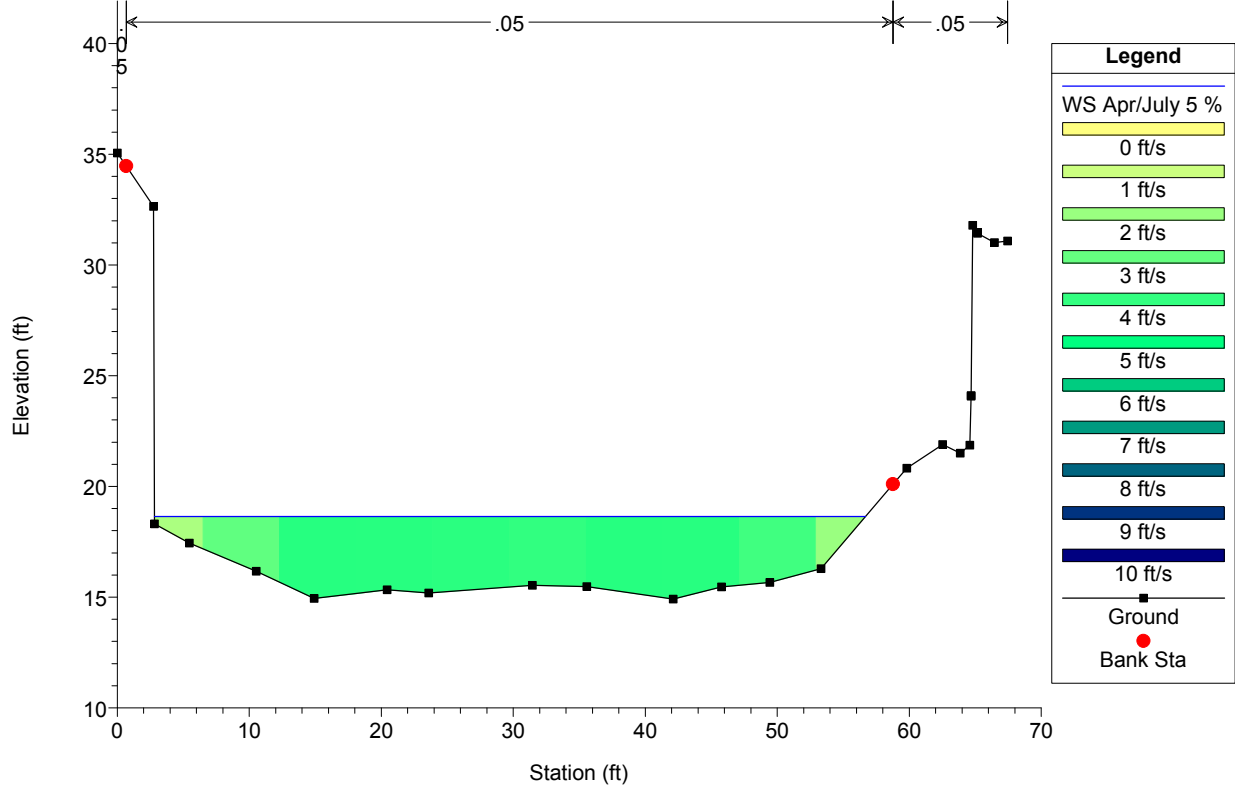
Memorandum

Attachment 2
Revised Hydraulic Analysis (Revision 2)
River Profile and Cross Sections

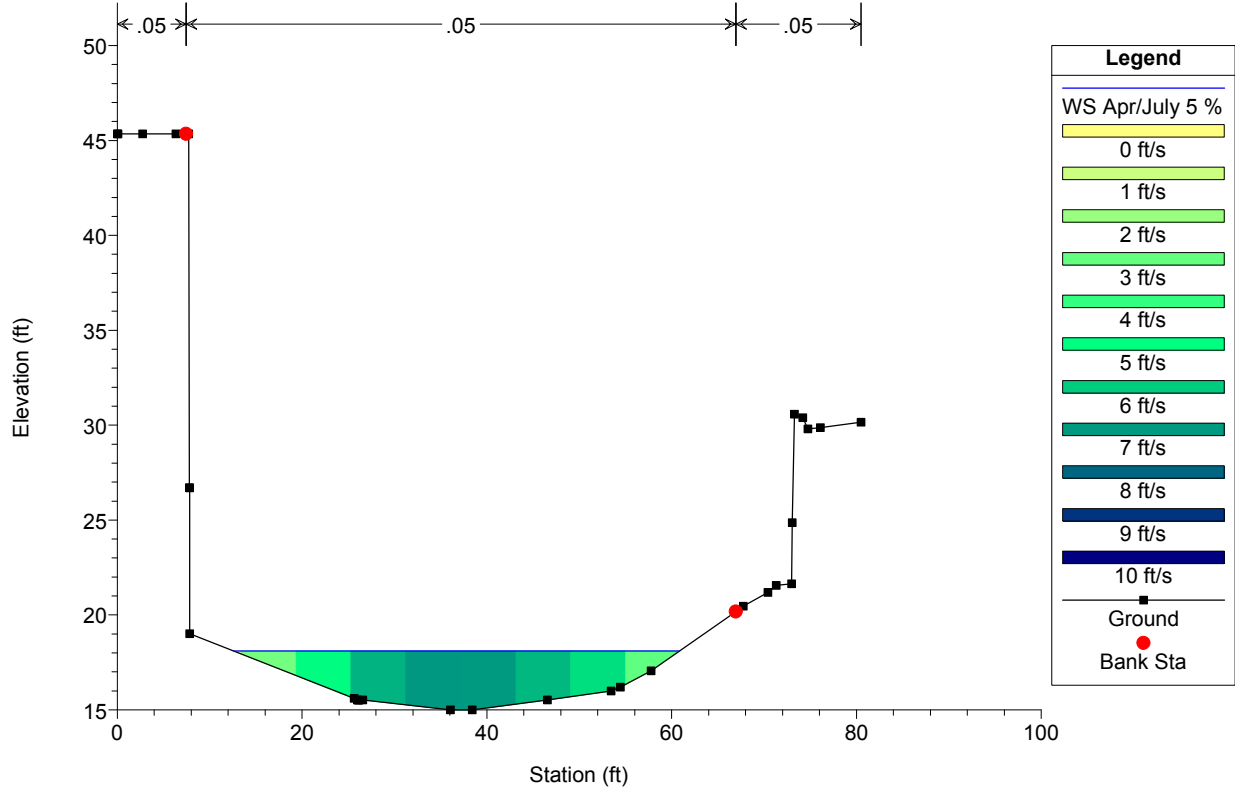
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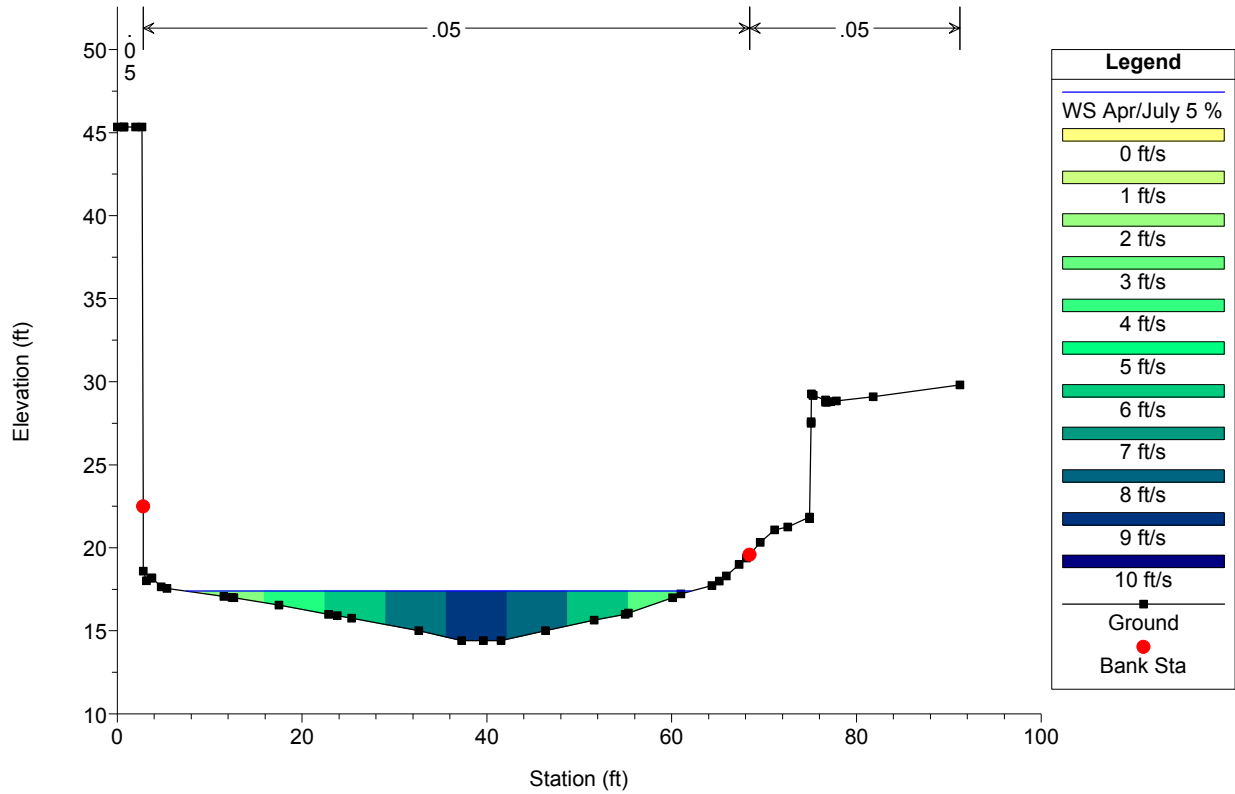
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RS = 544



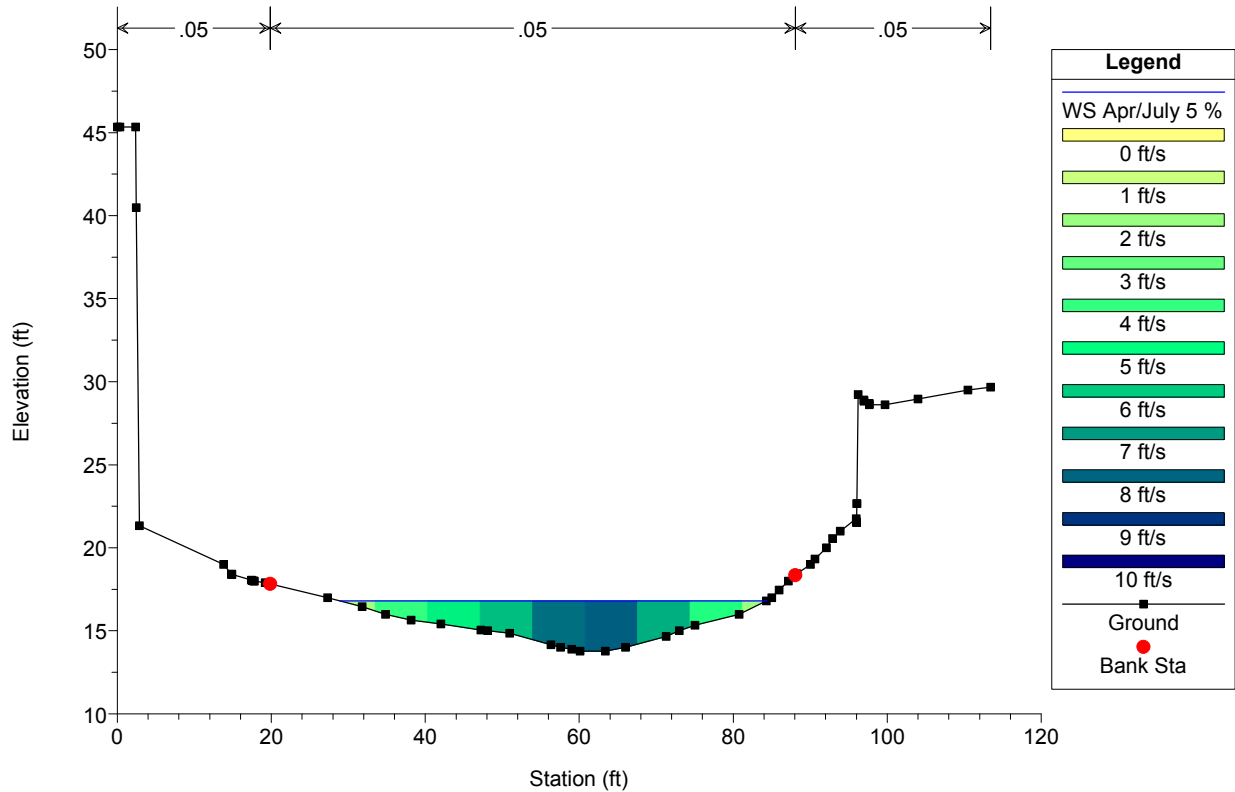
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RS = 520



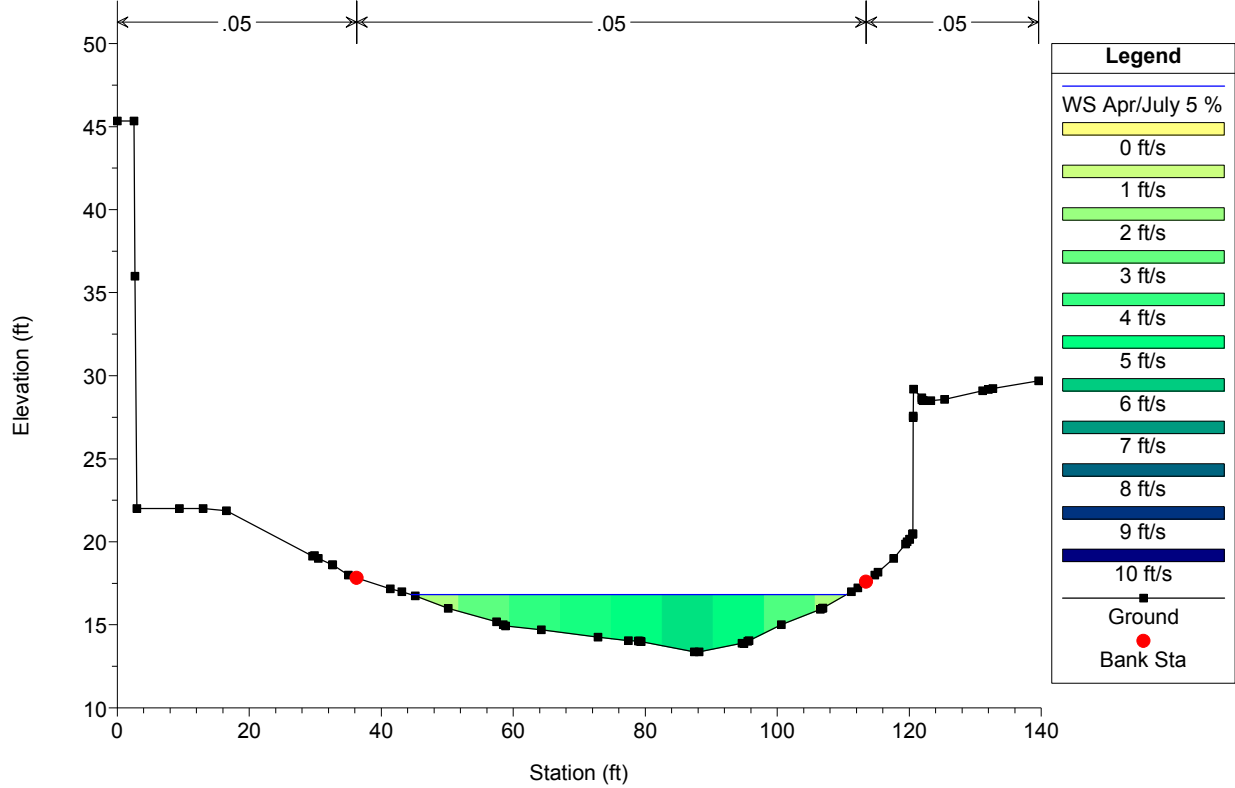
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RS = 496



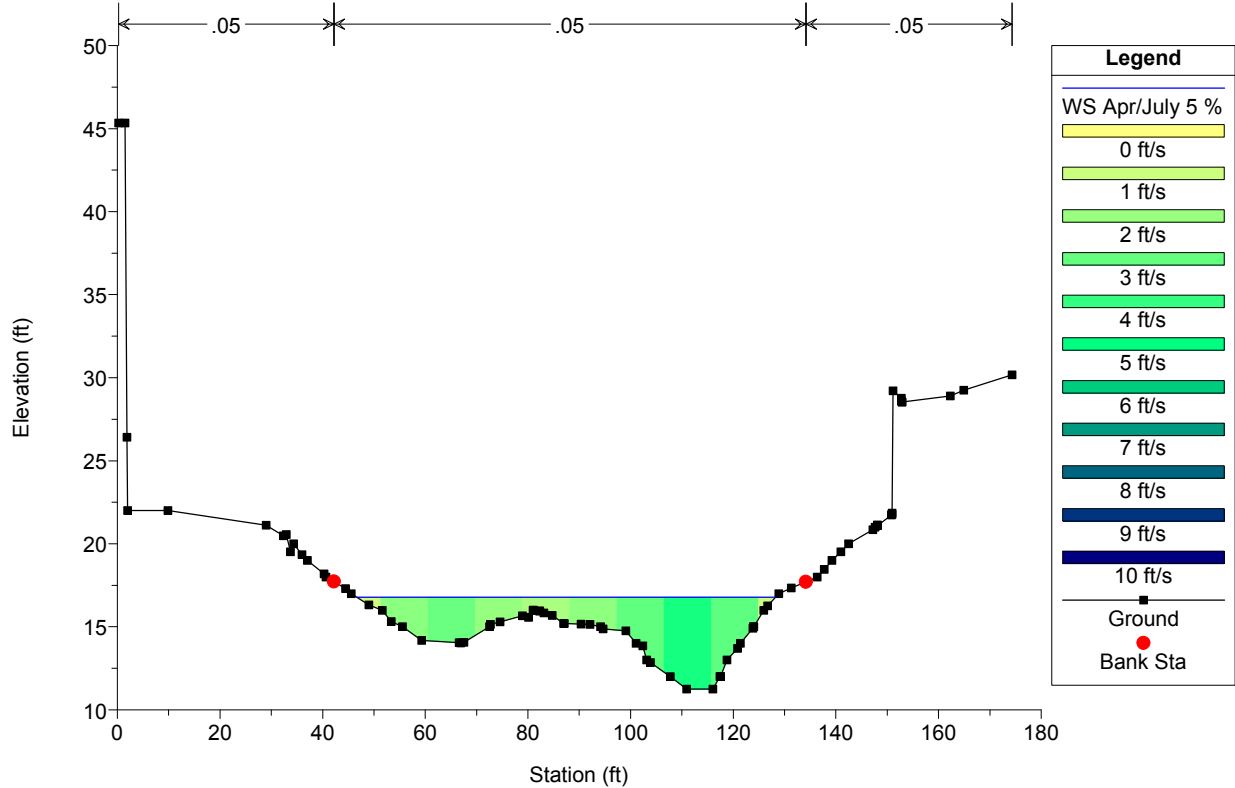
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RS = 471



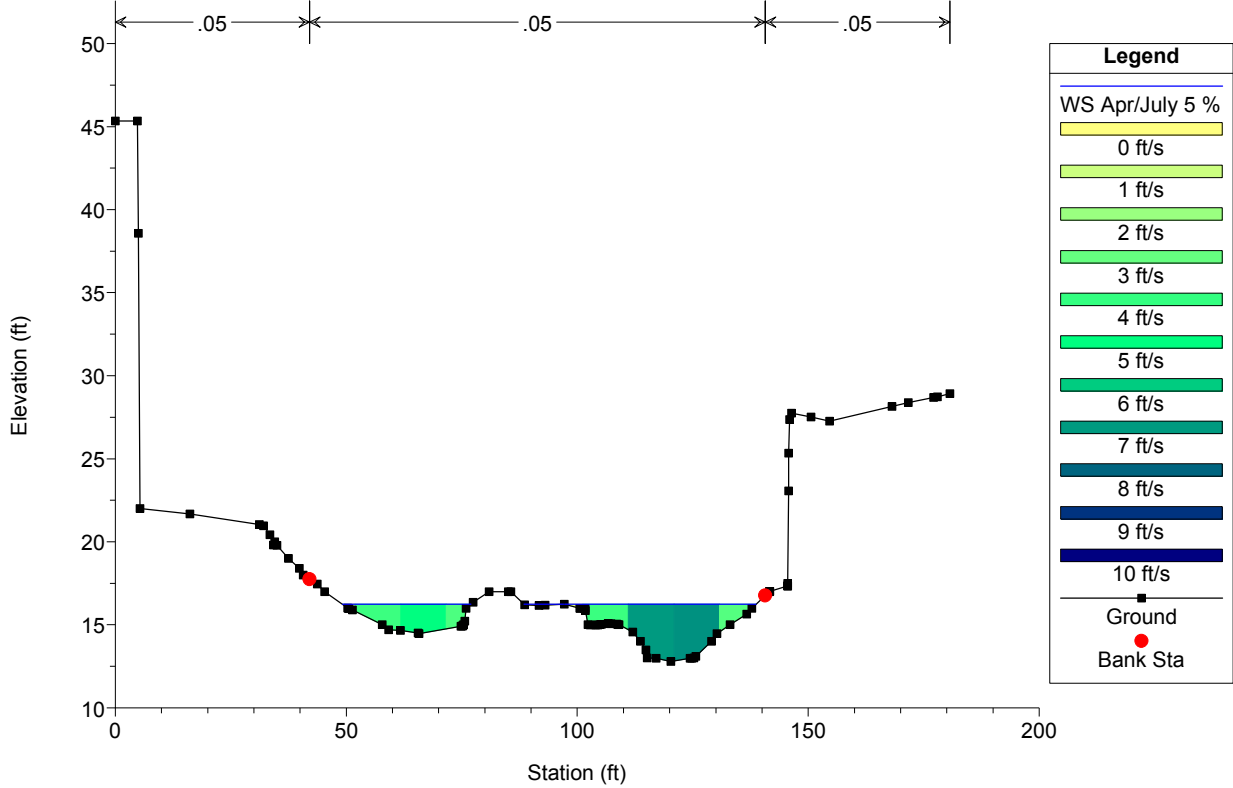
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RS = 455



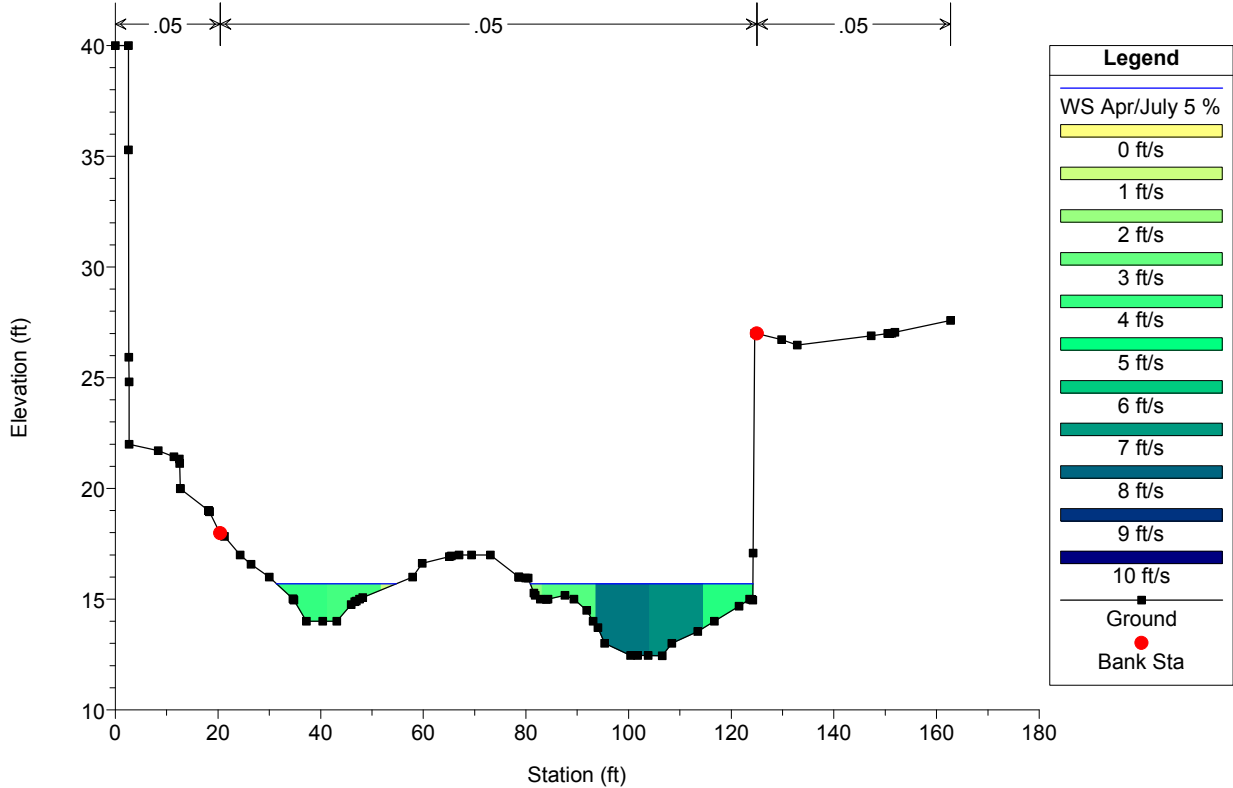
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RS = 427



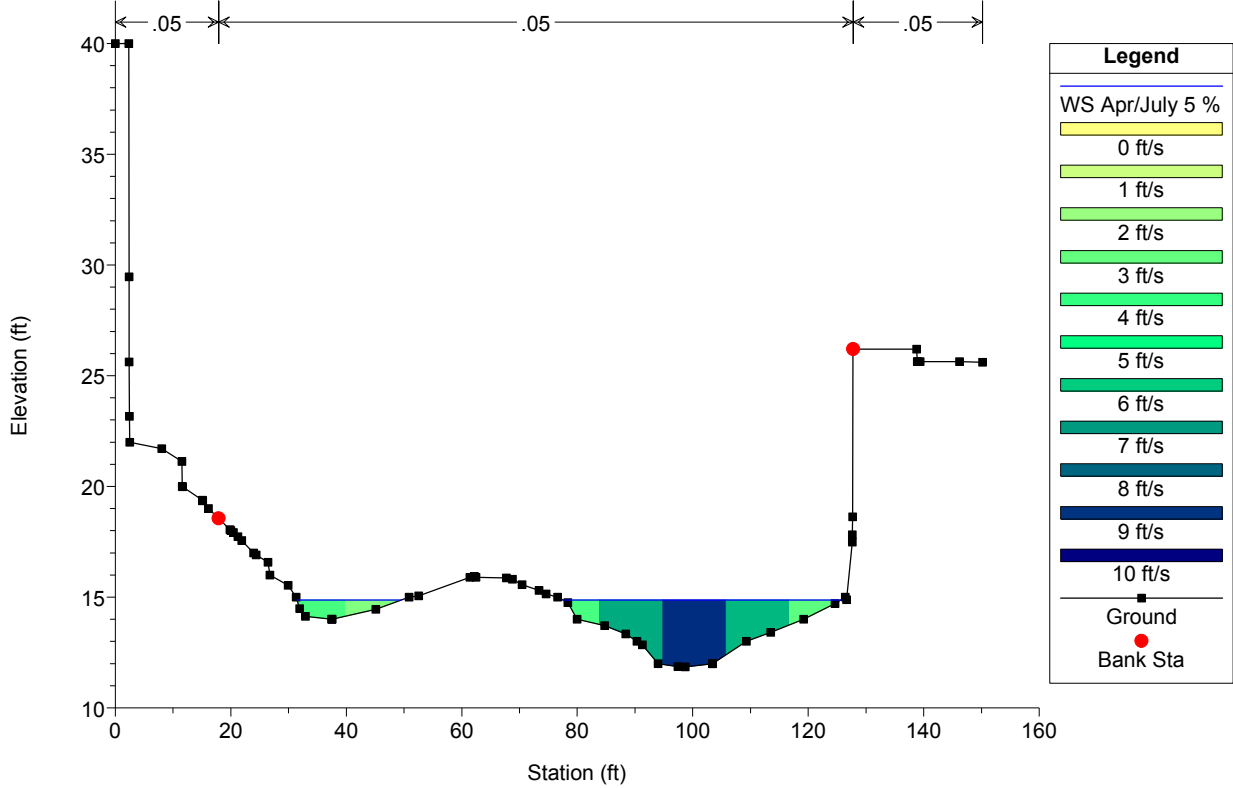
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RS = 402



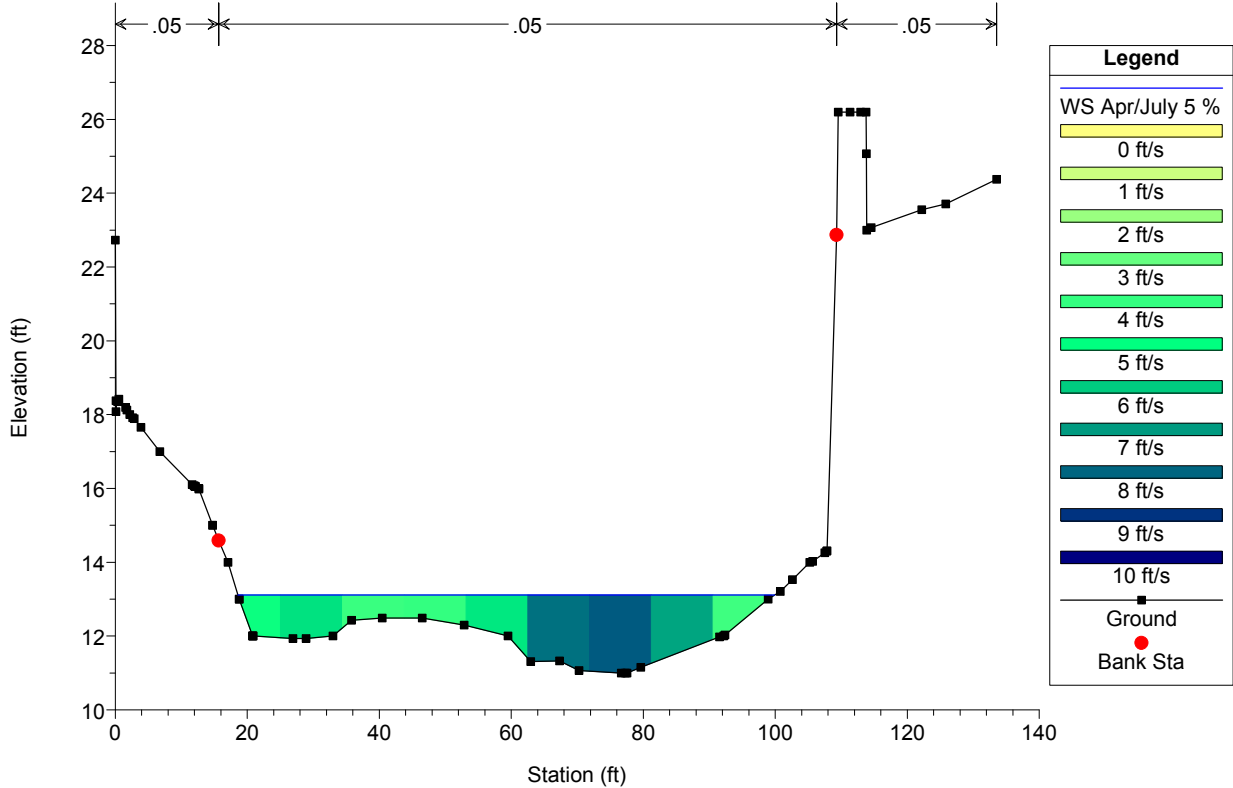
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RS = 381



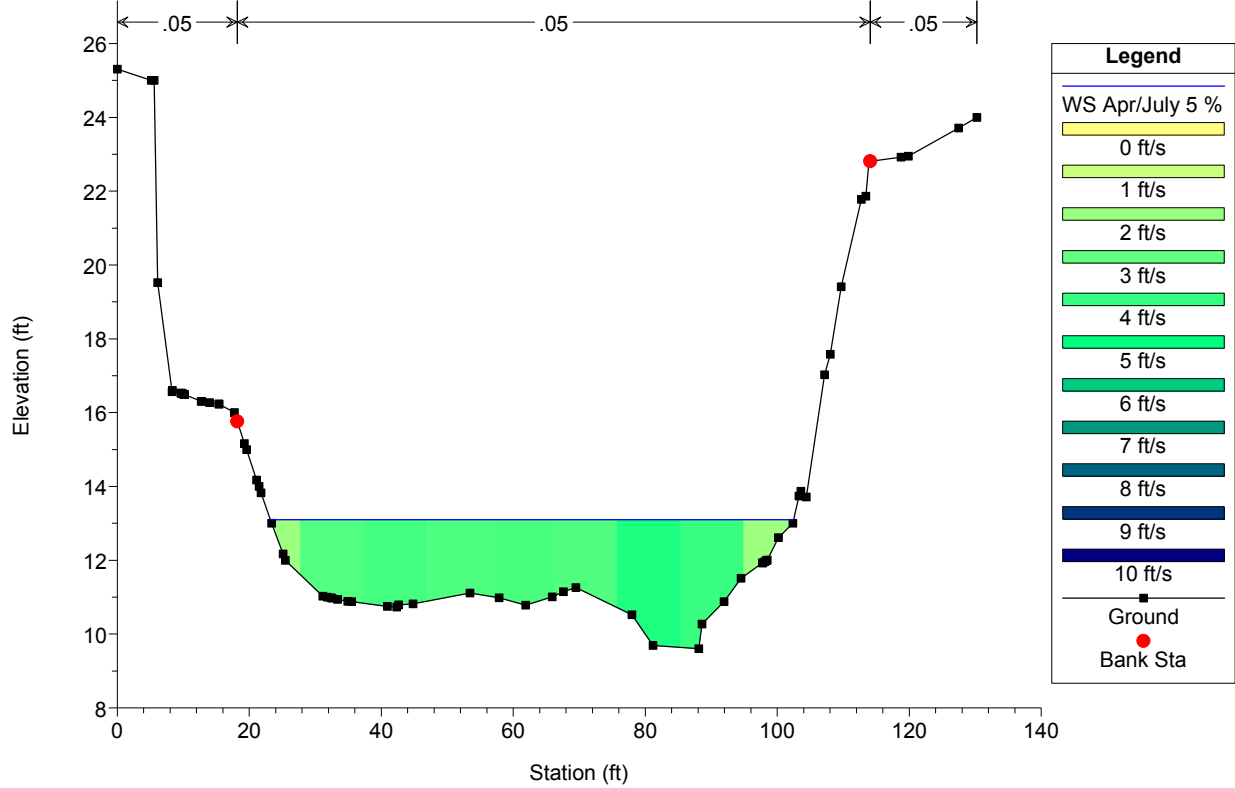
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RS = 363



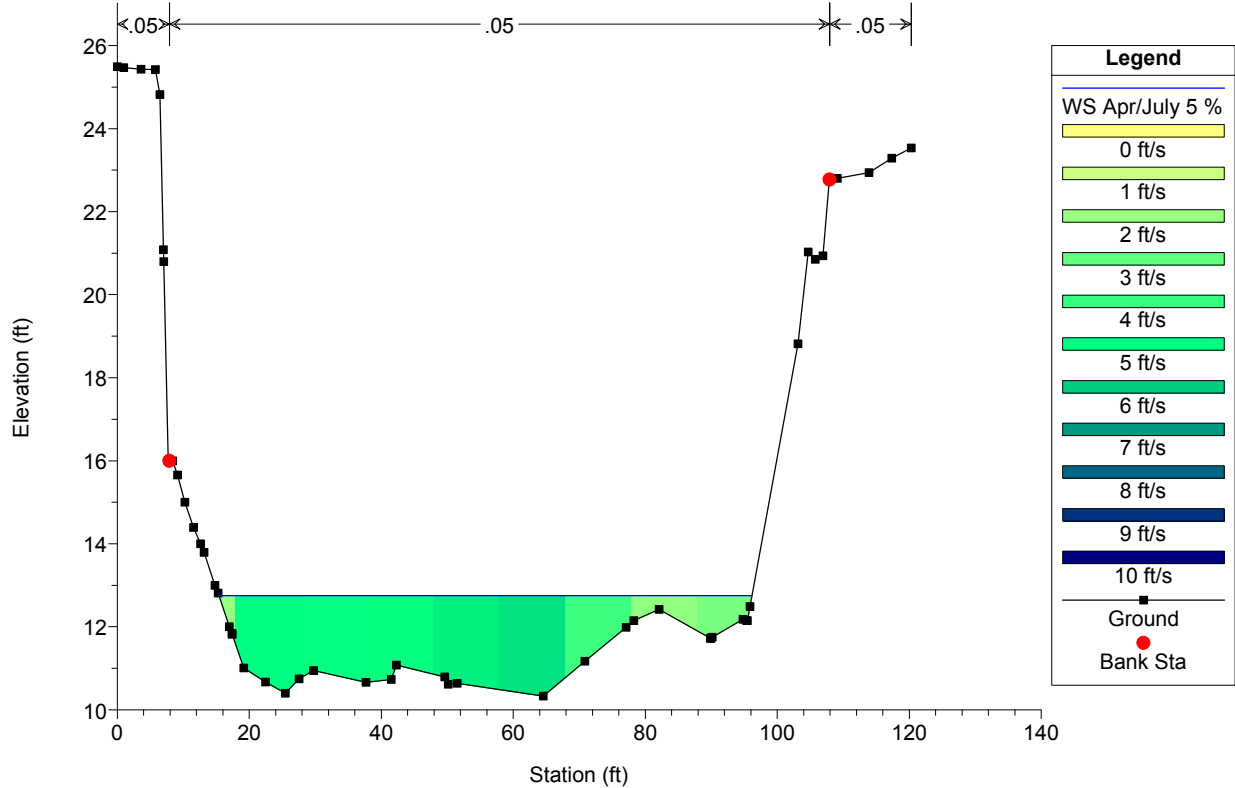
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RS = 342



Final_Design Plan: Proposed_v9B 1/4/2017
RS = 317



Final_Design Plan: Proposed_v9B 1/4/2017
RS = 294





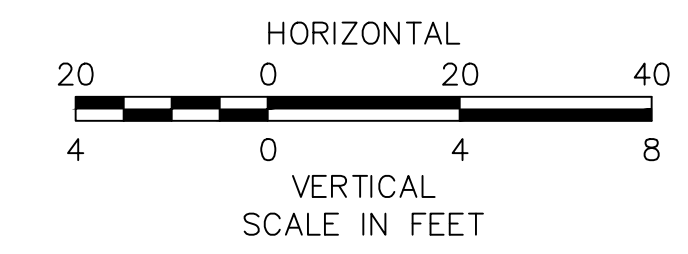
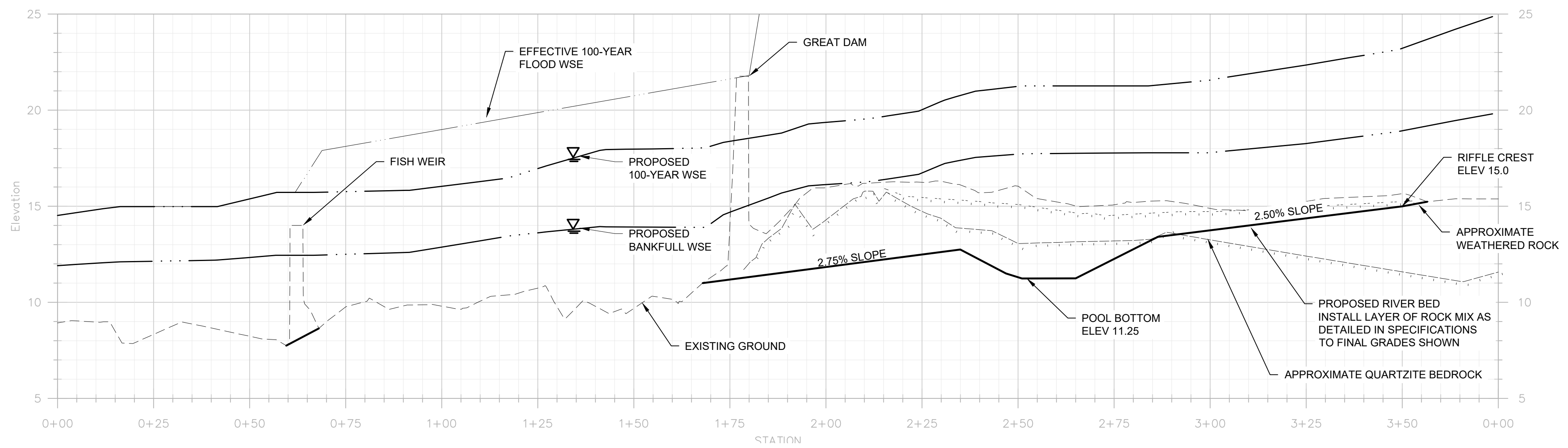
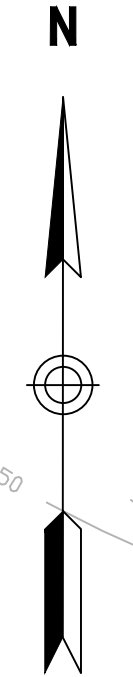
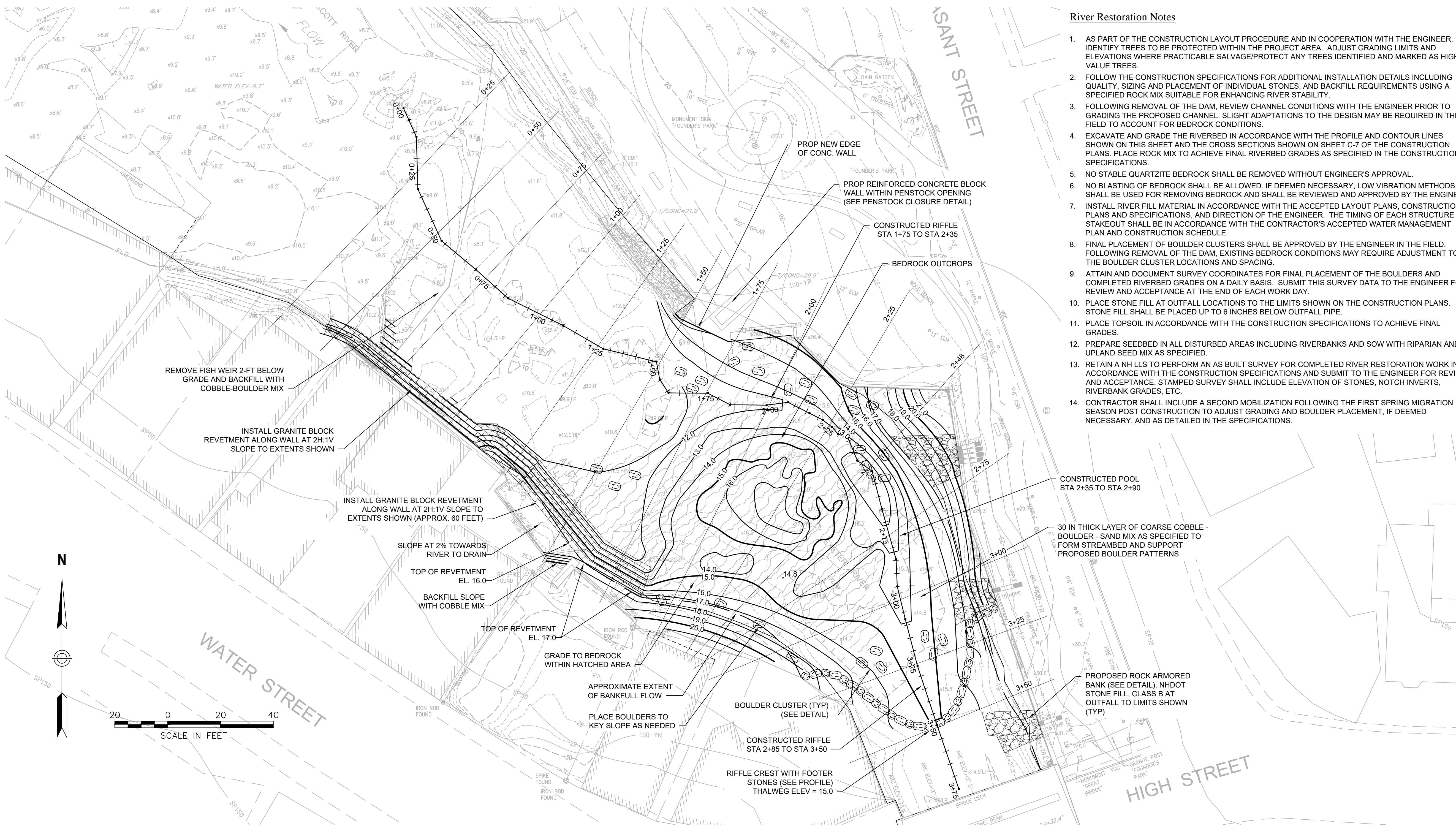
Memorandum

Attachment 3
Revised Grading Plan 2 (August 29, 2016)



River Restoration Notes

- AS PART OF THE CONSTRUCTION LAYOUT PROCEDURE AND IN COOPERATION WITH THE ENGINEER, IDENTIFY TREES TO BE PROTECTED WITHIN THE PROJECT AREA. ADJUST GRADING LIMITS AND ELEVATIONS WHERE PRACTICABLE SALVAGE/PROTECT ANY TREES IDENTIFIED AND MARKED AS HIGH VALUE TREES.
- FOLLOW THE CONSTRUCTION SPECIFICATIONS FOR ADDITIONAL INSTALLATION DETAILS INCLUDING QUALITY, SIZING AND PLACEMENT OF INDIVIDUAL STONES, AND BACKFILL REQUIREMENTS USING A SPECIFIED ROCK MIX SUITABLE FOR ENHANCING RIVER STABILITY.
- FOLLOWING REMOVAL OF THE DAM, REVIEW CHANNEL CONDITIONS WITH THE ENGINEER PRIOR TO GRADING THE PROPOSED CHANNEL. SLIGHT ADAPTATIONS TO THE DESIGN MAY BE REQUIRED IN THE FIELD TO ACCOUNT FOR BEDROCK CONDITIONS.
- EXCAVATE AND GRADE THE RIVERBED IN ACCORDANCE WITH THE PROFILE AND CONTOUR LINES SHOWN ON THIS SHEET AND THE CROSS SECTIONS SHOWN ON SHEET C-7 OF THE CONSTRUCTION PLANS. PLACE ROCK MIX TO ACHIEVE FINAL RIVERBED GRADES AS SPECIFIED IN THE CONSTRUCTION SPECIFICATIONS.
- NO STABLE QUARTZITE BEDROCK SHALL BE REMOVED WITHOUT ENGINEER'S APPROVAL.
- NO BLASTING OF BEDROCK SHALL BE ALLOWED. IF DEEMED NECESSARY, LOW VIBRATION METHODS SHALL BE USED FOR REMOVING BEDROCK AND SHALL BE REVIEWED AND APPROVED BY THE ENGINEER.
- INSTALL RIVER FILL MATERIAL IN ACCORDANCE WITH THE ACCEPTED LAYOUT PLANS, CONSTRUCTION PLANS AND SPECIFICATIONS, AND DIRECTION OF THE ENGINEER. THE TIMING OF EACH STRUCTURE STAKEOUT SHALL BE IN ACCORDANCE WITH THE CONTRACTOR'S ACCEPTED WATER MANAGEMENT PLAN AND CONSTRUCTION SCHEDULE.
- FINAL PLACEMENT OF BOULDER CLUSTERS SHALL BE APPROVED BY THE ENGINEER IN THE FIELD. FOLLOWING REMOVAL OF THE DAM, EXISTING BEDROCK CONDITIONS MAY REQUIRE ADJUSTMENT TO THE BOULDER CLUSTER LOCATIONS AND SPACING.
- ATTAIN AND DOCUMENT SURVEY COORDINATES FOR FINAL PLACEMENT OF THE BOULDERS AND COMPLETED RIVERBED GRADES ON A DAILY BASIS. SUBMIT THIS SURVEY DATA TO THE ENGINEER FOR REVIEW AND ACCEPTANCE AT THE END OF EACH WORK DAY.
- PLACE STONE FILL AT OUTFALL LOCATIONS TO THE LIMITS SHOWN ON THE CONSTRUCTION PLANS. STONE FILL SHALL BE PLACED UP TO 6 INCHES BELOW OUTFALL PIPE.
- PLACE TOPSOIL IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS TO ACHIEVE FINAL GRADES.
- PREPARE SEEDBED IN ALL DISTURBED AREAS INCLUDING RIVERBANKS AND SOW WITH RIPARIAN AND UPLAND SEED MIX AS SPECIFIED.
- RETAIN A NH LLS TO PERFORM AN AS BUILT SURVEY FOR COMPLETED RIVER RESTORATION WORK IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS AND SUBMIT TO THE ENGINEER FOR REVIEW AND ACCEPTANCE. STAMPED SURVEY SHALL INCLUDE ELEVATION OF STONES, NOTCH INVERTS, RIVERBANK GRADES, ETC.
- CONTRACTOR SHALL INCLUDE A SECOND MOBILIZATION FOLLOWING THE FIRST SPRING MIGRATION SEASON POST CONSTRUCTION TO ADJUST GRADING AND BOULDER PLACEMENT, IF DEEMED NECESSARY, AND AS DETAILED IN THE SPECIFICATIONS.



No.	Revision	Date	Appr.
2	REVISED GRADING 2	08/29/16	JSA
1	REVISED GRADING	08/01/16	JSA

Designed by TM, Drawn by JEB, Checked by JSA
CAD checked by TM, Approved by JSA
Scale 1"=20', Date 03/23/16

Great Dam Removal and Exeter River Restoration

Exeter, New Hampshire

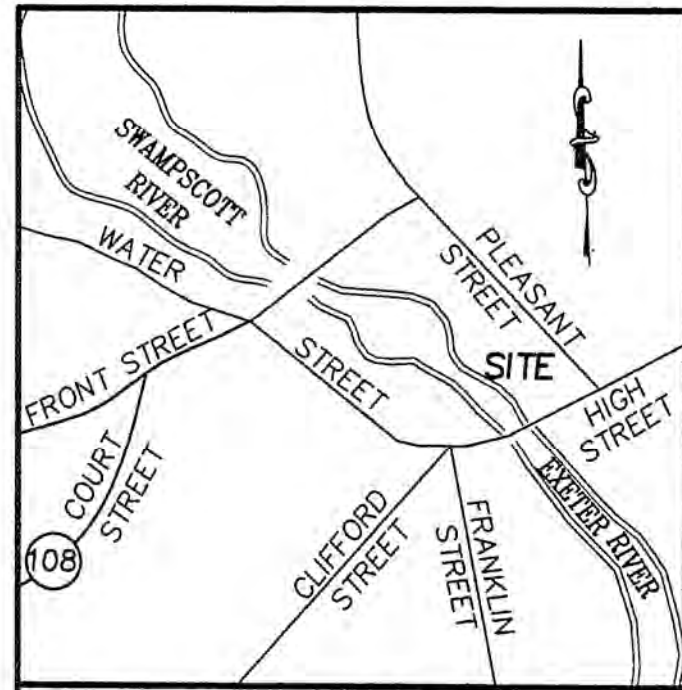
Construction

River Channel Grading Plan

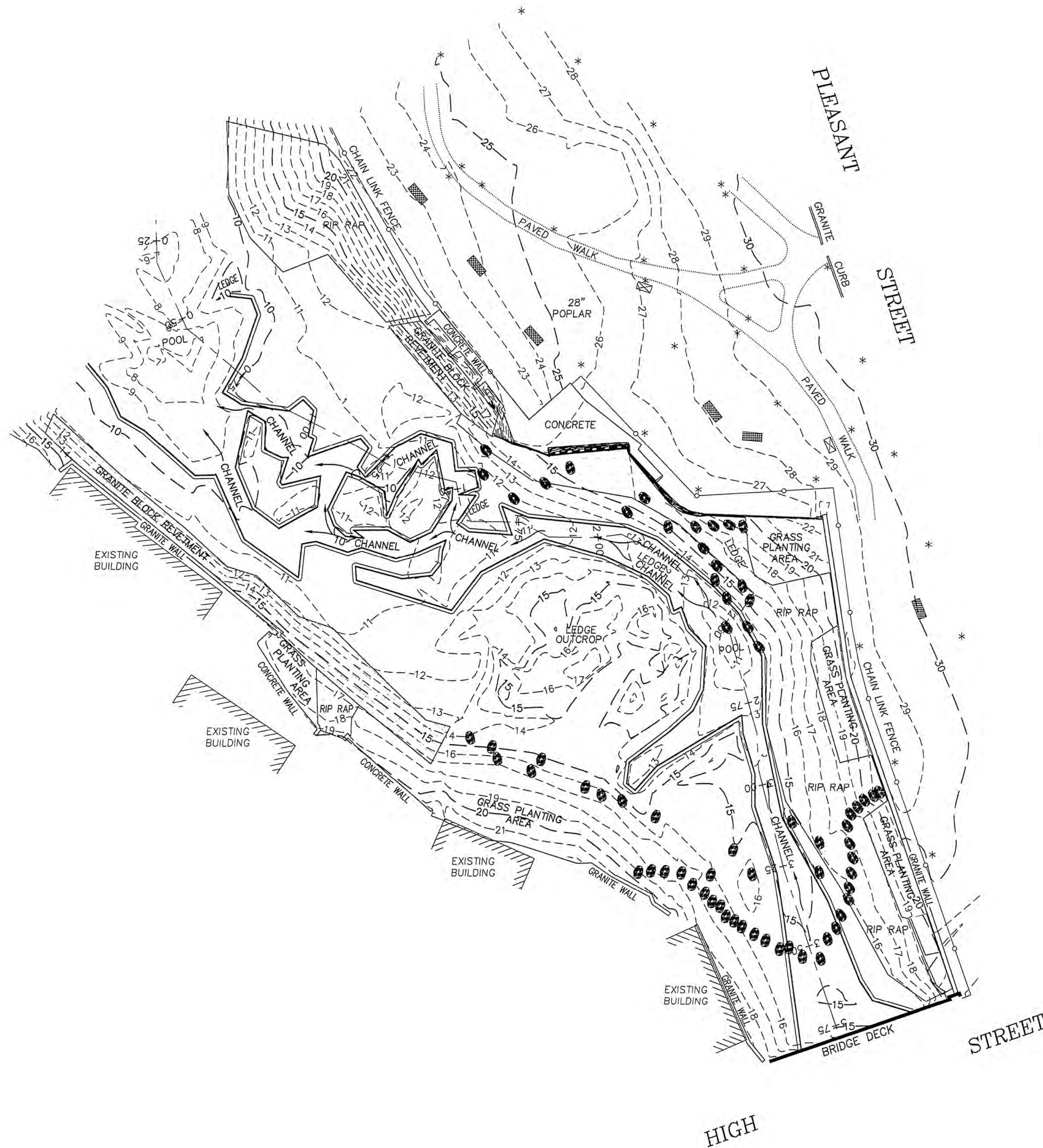


Memorandum

Attachment 4 – Construction As-Built

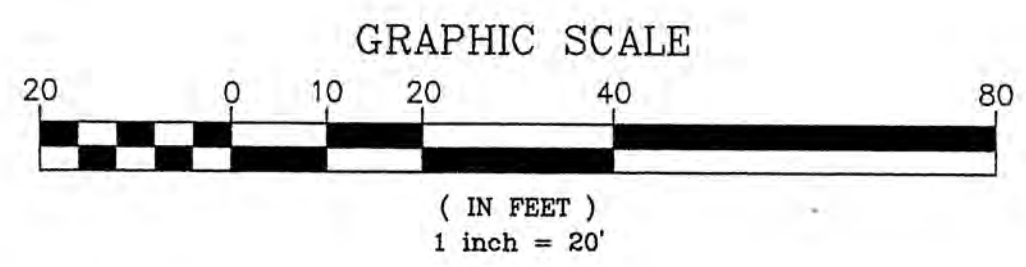


LOCUS MAP
NOT TO SCALE



LEGEND

- PARK BENCH
- IRRIGATION CONTROL BOX
- SPRINKLER HEAD
- BOULDER
- CHAIN LINK FENCE



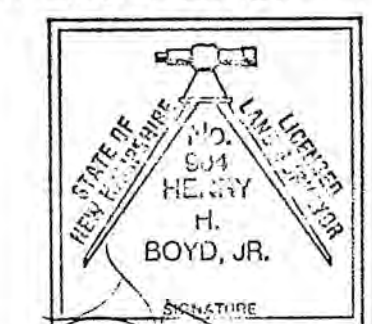
NOTES:

- 1) THE ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988.



I CERTIFY:
THAT THIS ACTUAL SURVEY WAS MADE
ON THE GROUND ON SEPTEMBER 28, 2016.

THAT THIS SURVEY CONFORMS TO THE
REQUIREMENTS FOR ACCURACY FOR
N.H. URBAN SURVEY.



10-11-2016
LICENSED LAND SURVEYOR DATE

AS BUILT PLAN
IN
EXETER, N.H.

SHOWING
EXISTING CONDITIONS
OFF OF PLEASANT STREET & HIGH STREET

PREPARED FOR
SUMCO ECO CONTRACTING
16 FRONT STREET, SUITE 209, SALEM, MA 01970

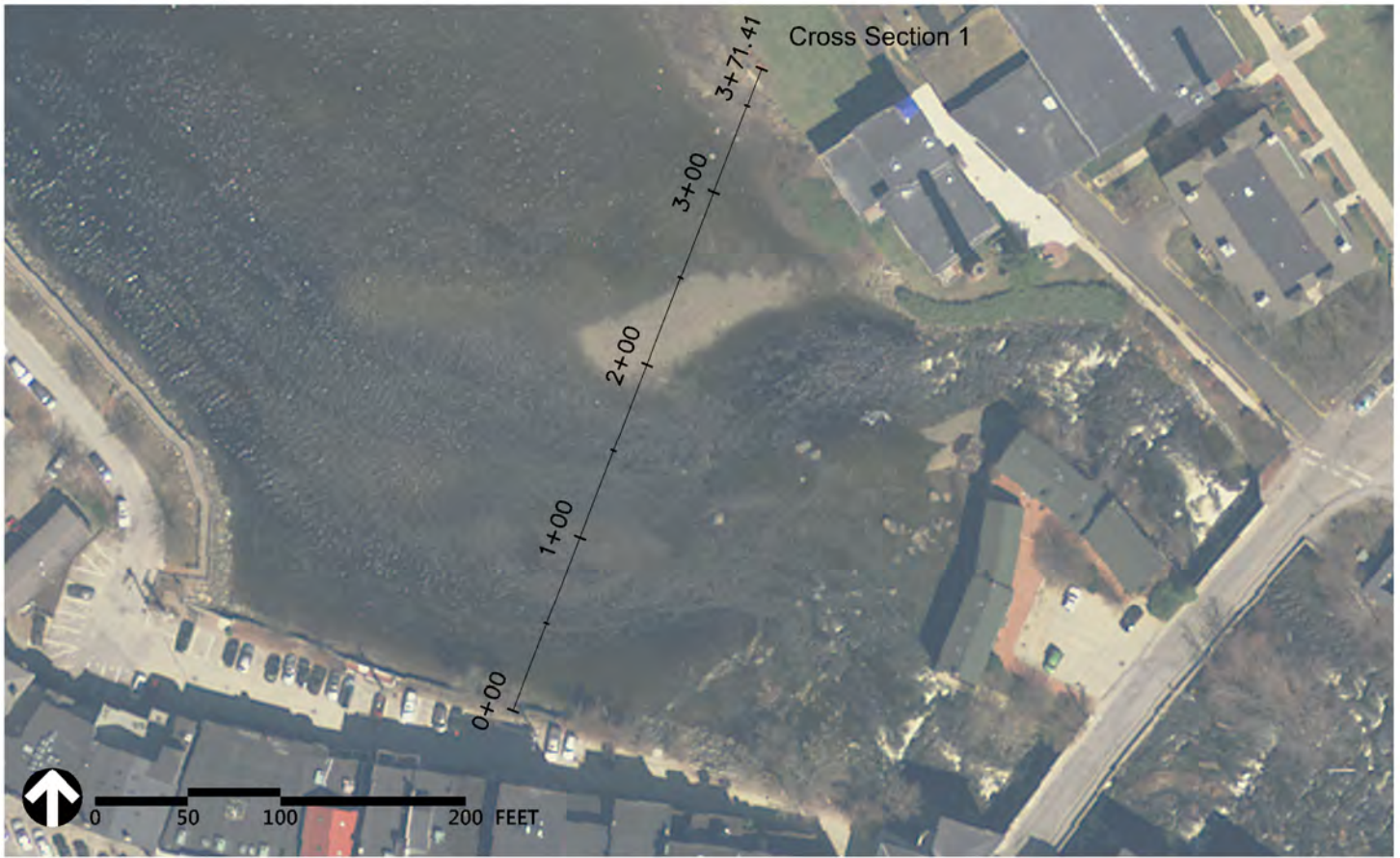
MILLENNIUM ENGINEERING INC.
ENGINEERS AND LAND SURVEYORS
P.O. BOX 745 13 HAMPTON ROAD EXETER, NH 03833
PHONE: (603) 778-0528 FAX: (603) 772-0689 WWW.MEI-NH.COM

SCALE: 1"=20'	DRWN. BY: P.D.B.	PROJECT: E161877
DATE: OCT. 05, 2016	CHKD. BY: H.H.B.	SHEET: 1 OF 3

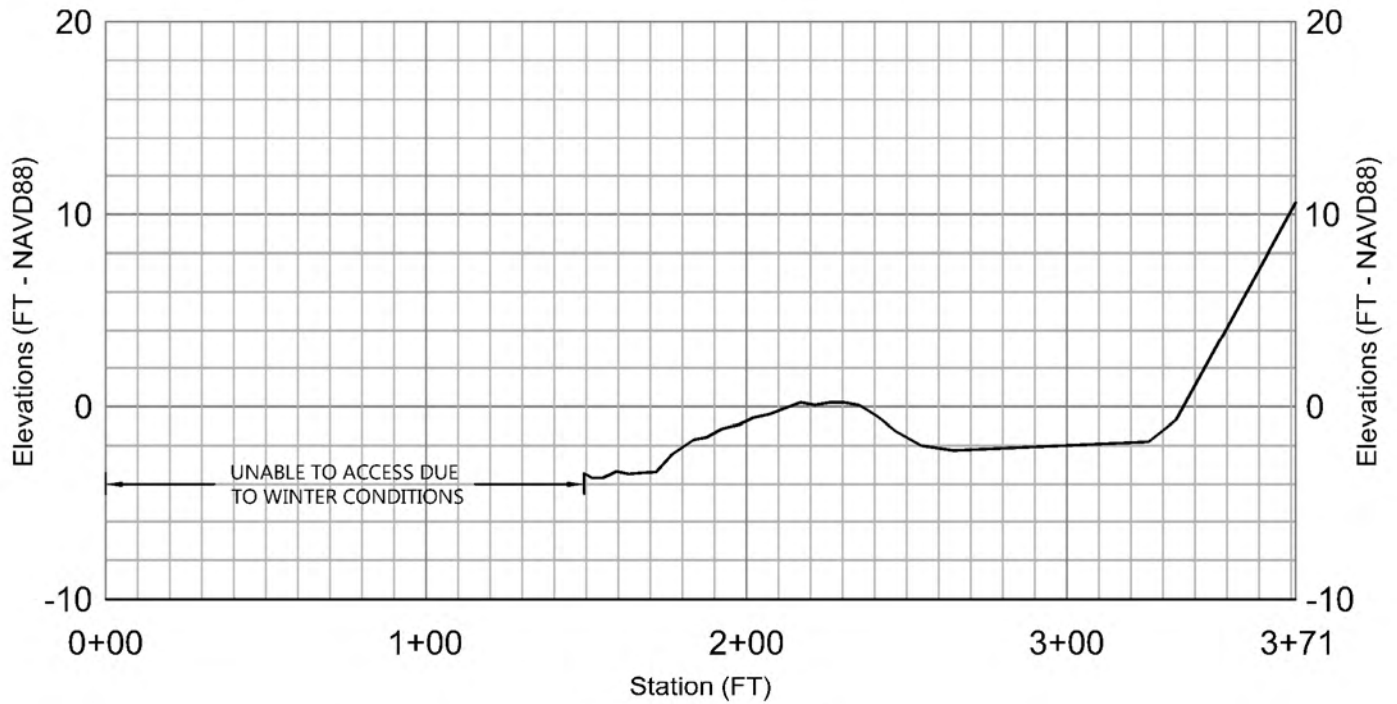


Memorandum

Attachment 5 – Monumented Cross-Sections



Cross Section 1



Cross Sectional Elevation data obtained by VHB Survey, January, 2017

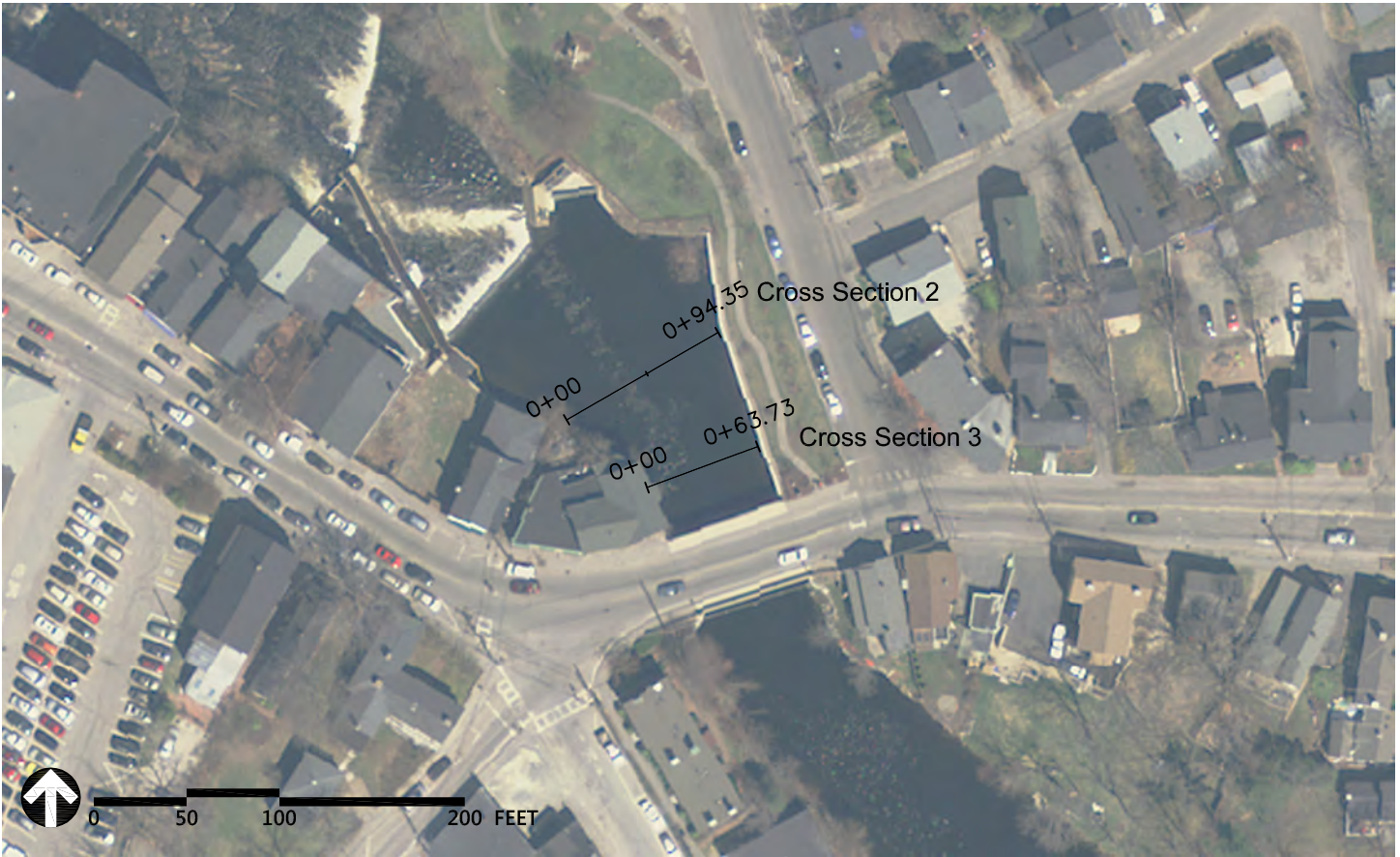
Horizontal Scale: 1" = 60'
Vertical Scale: 1" = 10'



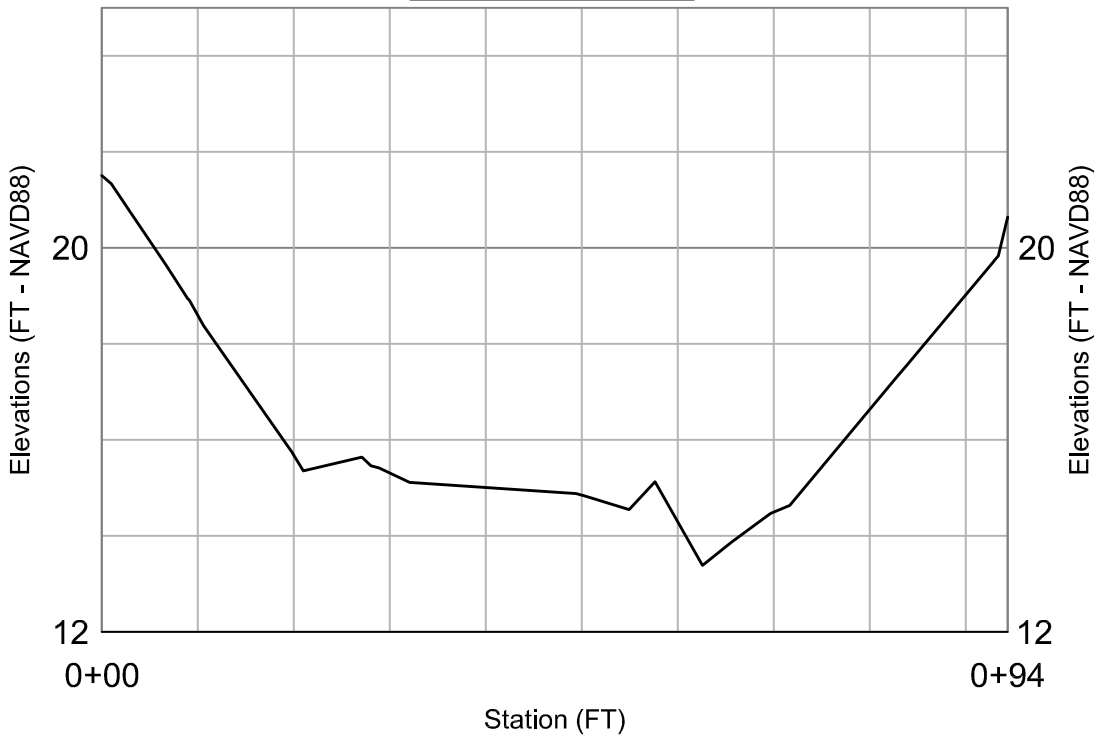
As-Built Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 1

April 11, 2017



Cross Section 2



Cross Sectional Elevation data obtained from As-Built data from SUMCO ECO Contracting, September 28, 2016

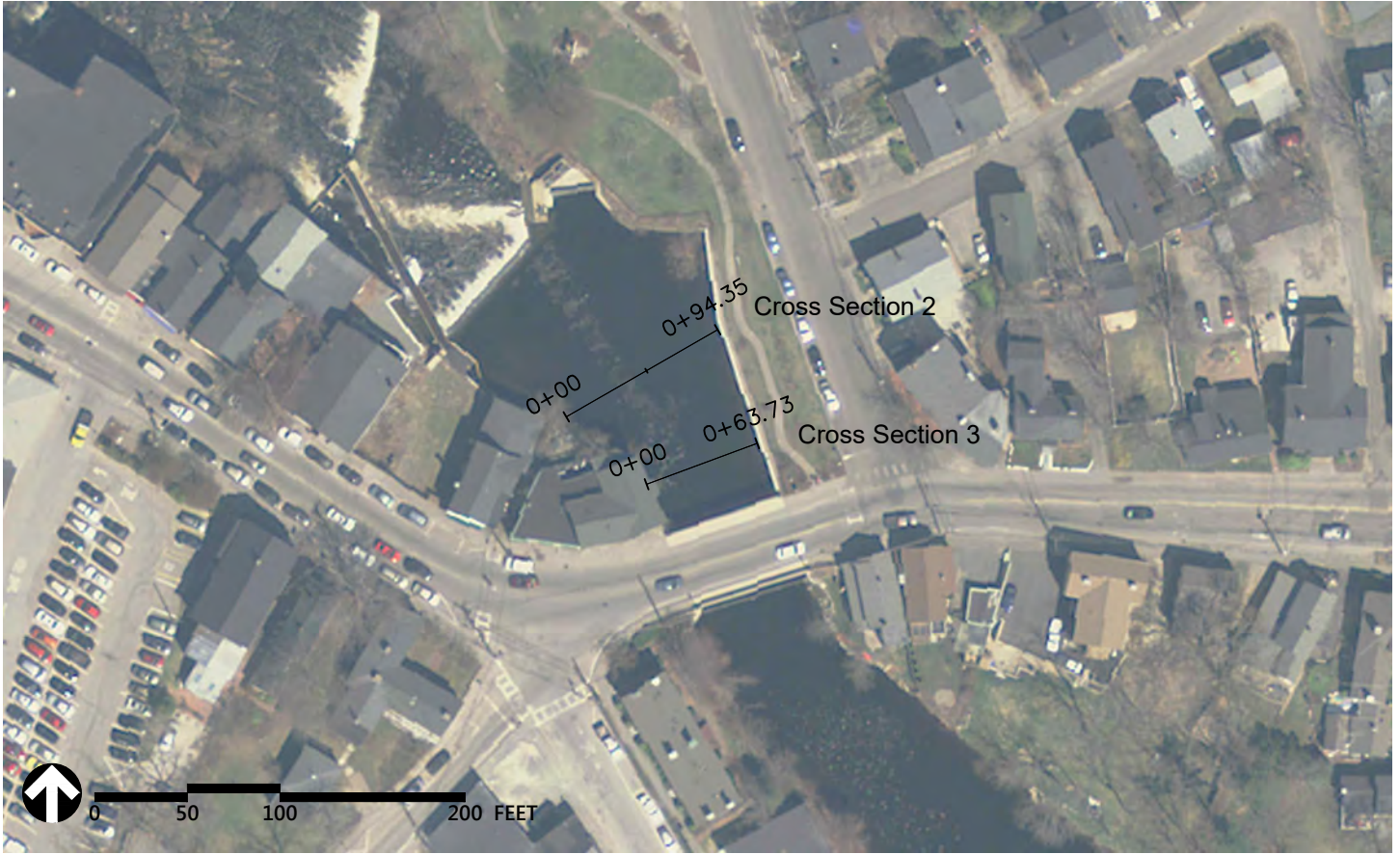
Horizontal Scale: 1" = 20'
Vertical Scale: 1" = 4'



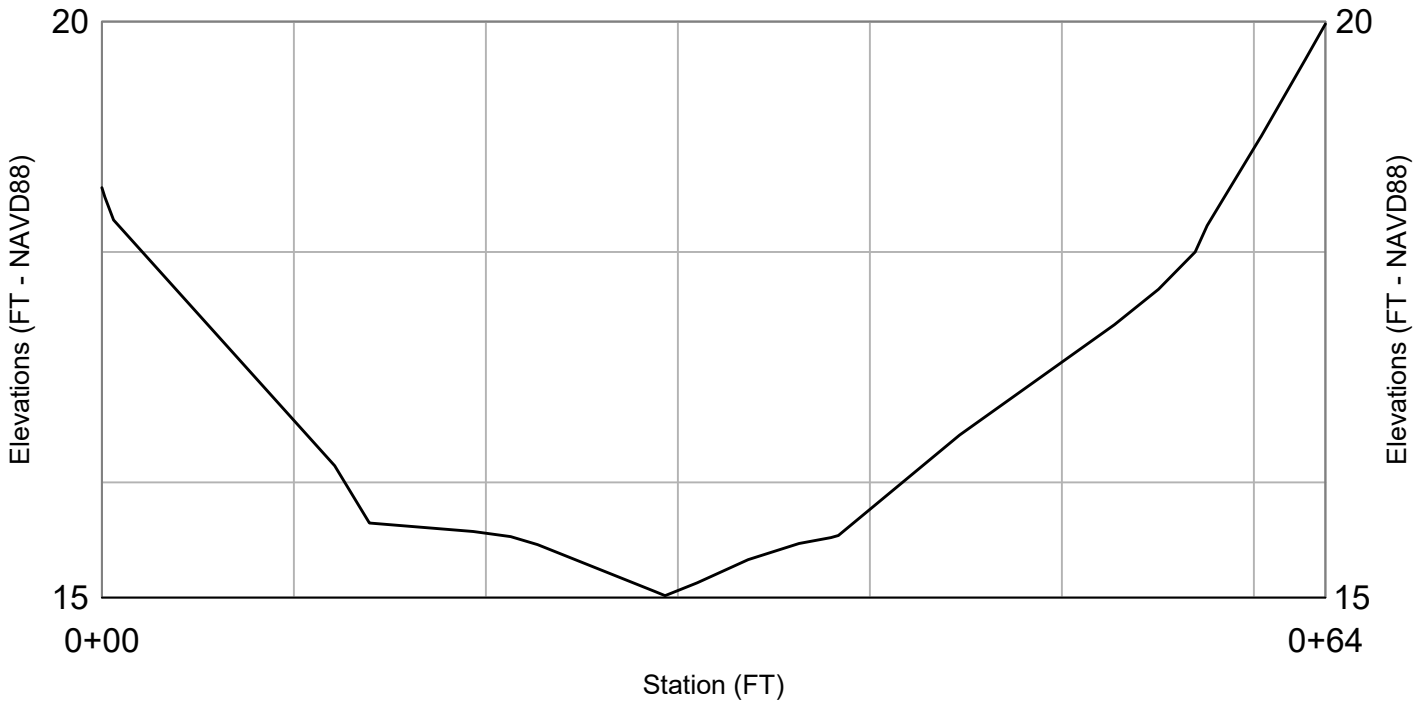
As-Built Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 2

April 11, 2017



Cross Section 3



Cross Sectional Elevation data obtained from As-Built data from SUMCO ECO Contracting, September 28, 2016

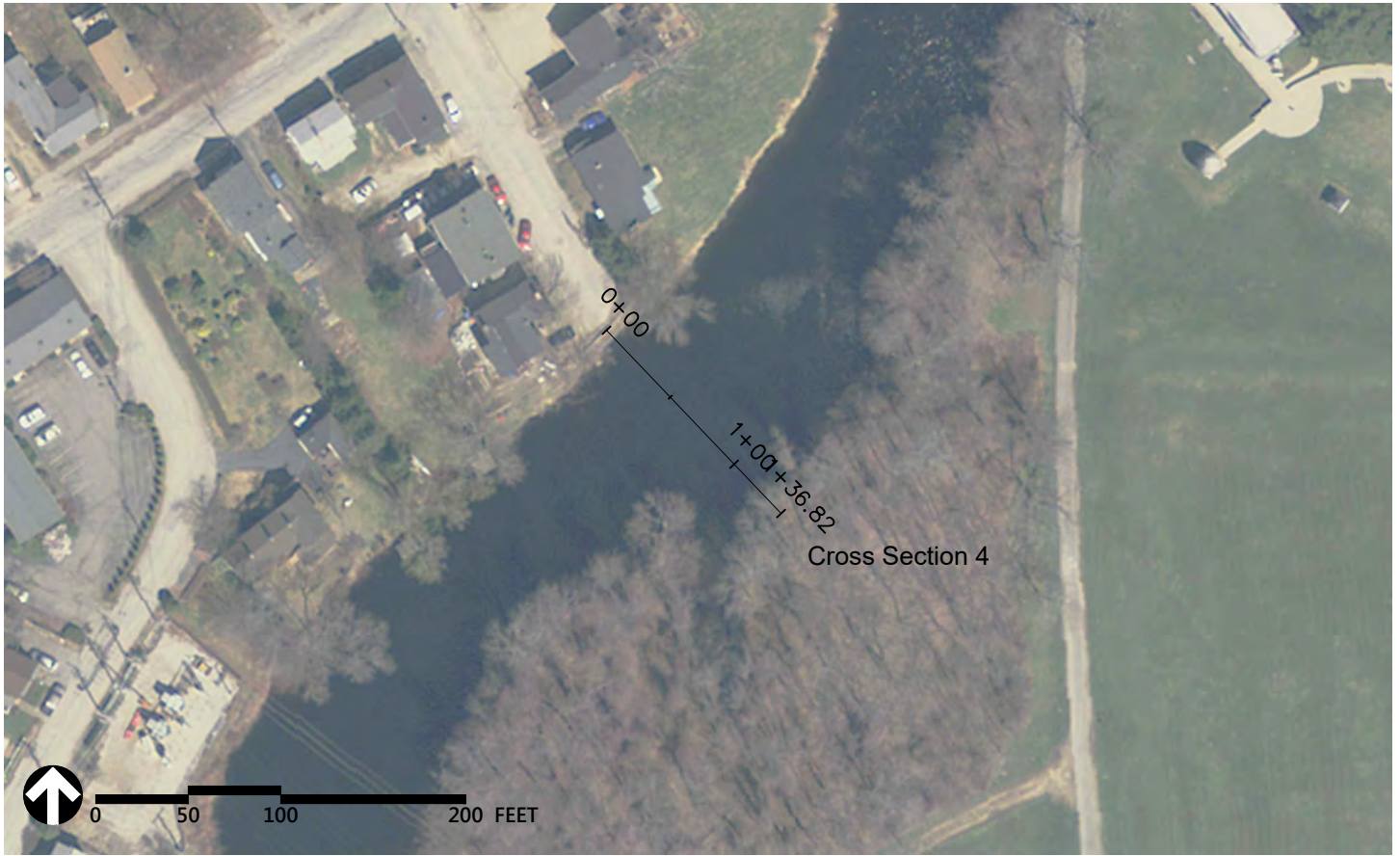
Horizontal Scale: 1" = 10'
Vertical Scale: 1" = 6'



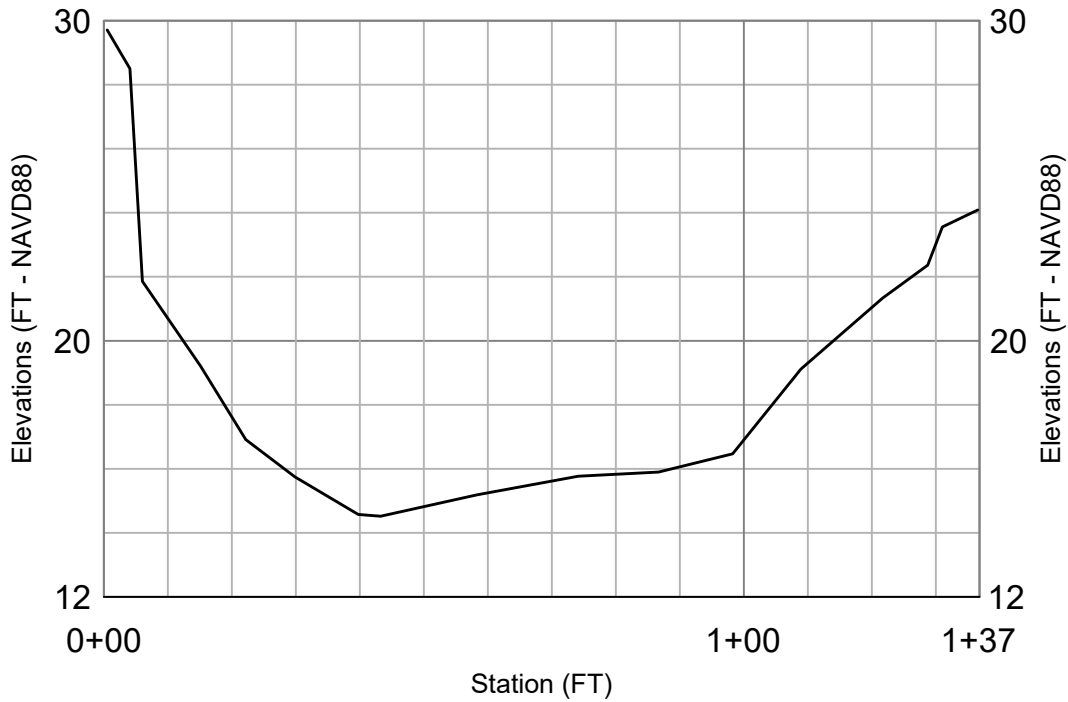
As-Built Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 3

April 11, 2017



Cross Section 4



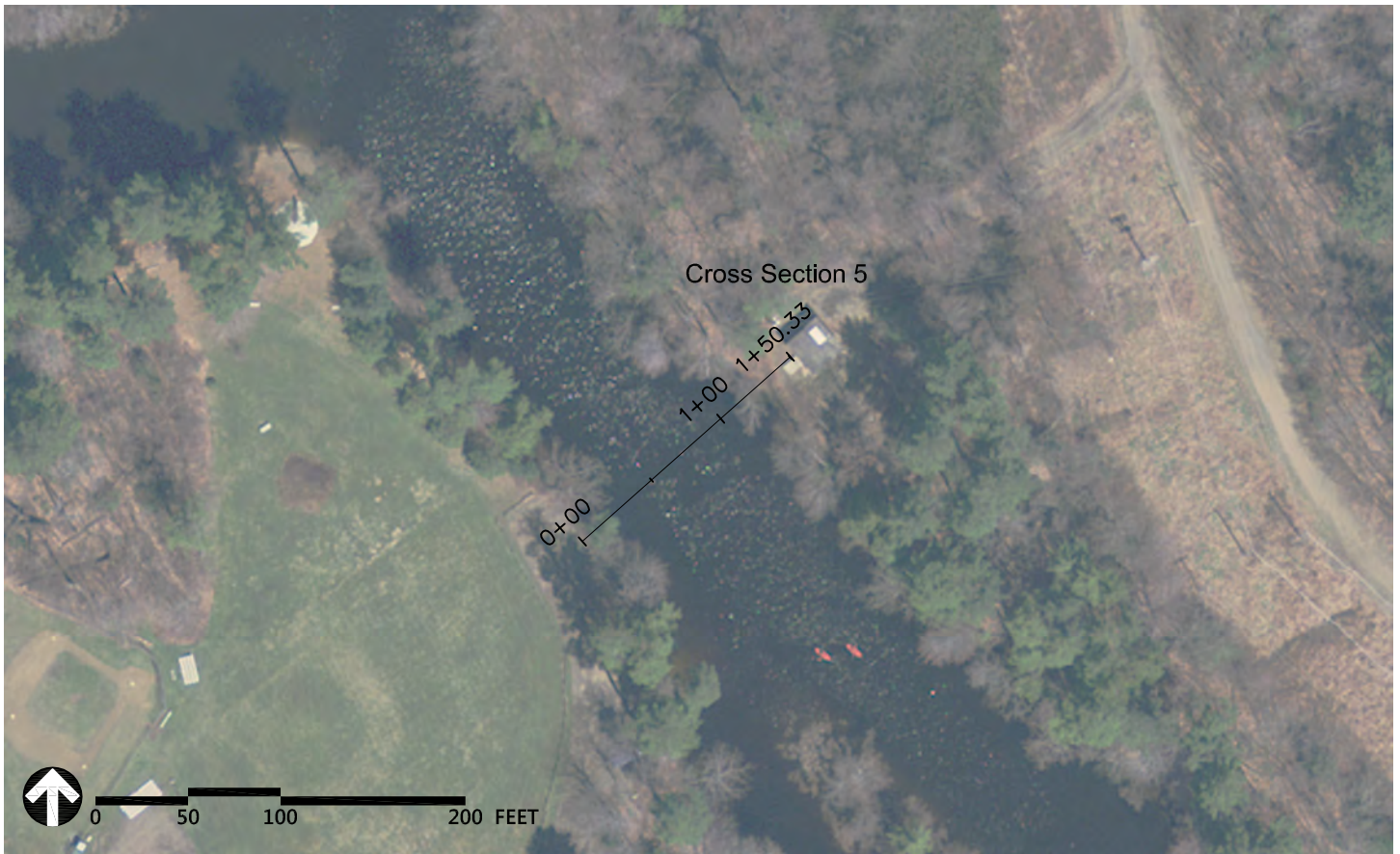
Cross Sectional Elevation data obtained by VHB Survey, January, 2017

Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 6'

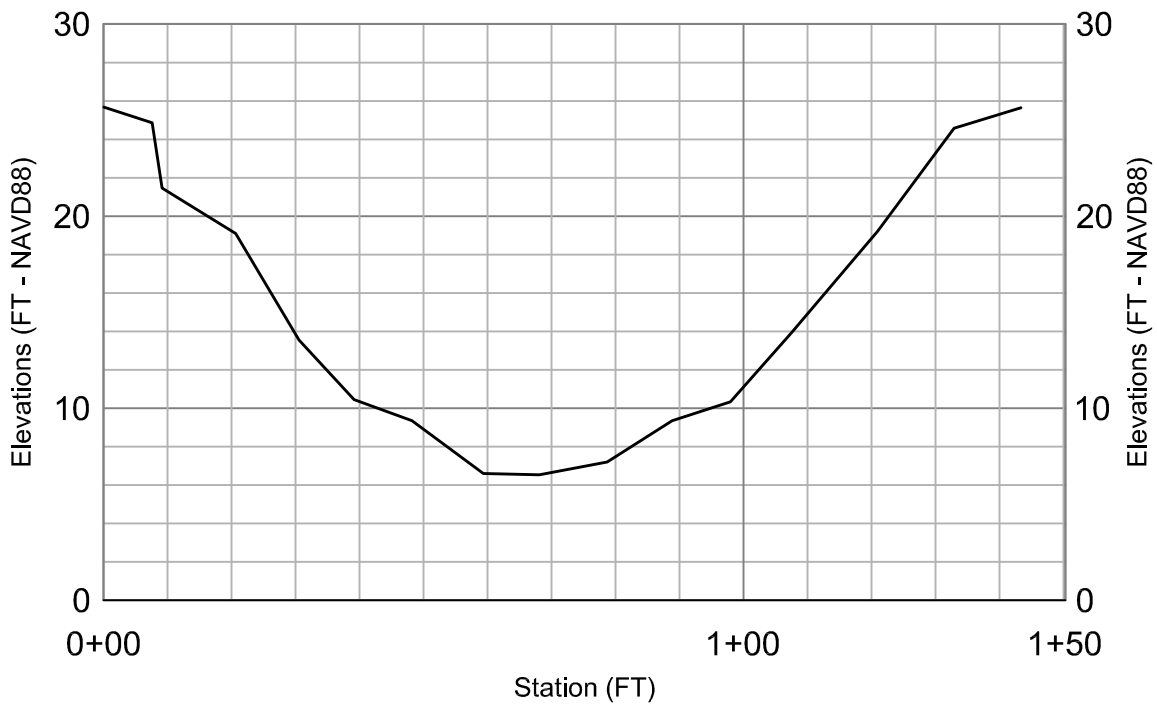


As-Built Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 4
April 11, 2017



Cross Section 5



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

Cross Sectional Elevation data obtained by
VHB Survey, January, 2017



As-Built Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 5

April 11, 2017

Monitoring Cross Section Data
Exeter Great Dam



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: AHF
Checked by: RRL

Cross Section 1

Easting	Northing	Point Elevation	
1176881.3168	176432.9149	4.00	*
1176935.4250	176572.0280	-3.43	
1176936.2780	176574.4220	-3.67	
1176937.3710	176577.6930	-3.67	
1176938.7390	176581.6940	-3.34	
1176940.1300	176585.1900	-3.47	
1176941.8840	176589.4280	-3.40	
1176943.2230	176593.1520	-3.36	
1176945.3240	176597.7740	-2.45	
1176947.5640	176604.0260	-1.70	
1176949.0400	176607.9260	-1.58	
1176950.7000	176612.2630	-1.13	
1176952.7850	176617.3630	-0.92	
1176954.5350	176621.5180	-0.57	
1176956.2490	176626.0430	-0.41	
1176957.8400	176630.4140	-0.11	
1176959.5610	176635.2020	0.22	
1176961.2410	176639.3780	0.08	
1176962.9290	176643.9350	0.21	
1176964.5470	176647.7720	0.21	
1176966.3490	176652.3030	0.06	
1176968.4090	176657.3780	-0.51	
1176970.3220	176663.0160	-1.26	
1176973.2750	176670.3390	-2.00	
1176976.4890	176679.9100	-2.26	
1176998.9050	176736.4550	-1.81	
1177002.0410	176744.4620	-0.68	
1177015.2930	176779.2550	10.58	

*Elevation obtained from original VHB Survey January 26, 2012

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: AHF
Checked by: RRL

Cross Section 2

Easting	Northing	Point Elevation
1177534.0132	176149.6058	21.51
1177534.8730	176150.1007	21.34
1177536.6264	176151.1096	20.73
1177539.8187	176152.9466	19.64
1177541.7526	176154.0594	18.95
1177541.9326	176154.1630	18.91
1177543.2047	176154.8951	18.38
1177551.1719	176159.4797	15.75
1177552.2121	176160.0783	15.36
1177557.4997	176163.1210	15.64
1177558.2974	176163.5800	15.46
1177559.0402	176164.0075	15.42
1177561.8022	176165.5968	15.12
1177576.8444	176174.2527	14.88
1177577.1405	176174.4231	14.86
1177577.4890	176174.6236	14.84
1177581.6264	176177.0045	14.55
1177583.9420	176178.3370	15.13
1177588.2543	176180.8184	13.39
1177588.2907	176180.8394	13.40
1177590.8971	176182.3392	13.87
1177594.3717	176184.3386	14.47
1177596.1092	176185.3385	14.64
1177598.1387	176186.5063	15.20
1177605.8054	176190.9180	17.31
1177606.4984	176191.3168	17.50
1177614.5180	176195.9316	19.72
1177614.7273	176196.0521	19.77
1177614.9697	176196.1915	19.85
1177615.7945	176196.6662	20.64

Monitoring Cross Section Data
Exeter Great Dam



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: AHF
Checked by: RRL

Cross Section 3

Easting	Northing	Point Elevation
1177577.3906	176113.1647	18.56
1177577.5419	176113.2207	18.48
1177577.9617	176113.3763	18.28
1177588.7629	176117.3789	16.14
1177590.4593	176118.0076	15.65
1177595.5242	176119.8844	15.57
1177597.3535	176120.5623	15.53
1177598.6683	176121.0496	15.46
1177604.3779	176123.1654	15.06
1177604.8995	176123.3586	15.02
1177606.4580	176123.9362	15.13
1177608.9533	176124.8609	15.33
1177611.4355	176125.7807	15.47
1177613.0038	176126.3619	15.52
1177613.3564	176126.4925	15.54
1177619.2791	176128.6873	16.41
1177626.8472	176131.4918	17.37
1177628.9918	176132.2865	17.68
1177630.7853	176132.9512	18.00
1177631.3727	176133.1688	18.23
1177633.9956	176134.1408	19.00
1177636.1593	176134.9426	19.67
1177636.1767	176134.9491	19.67
1177637.1450	176135.3079	19.98

Monitoring Cross Section Data
Exeter Great Dam



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: AHF
Checked by: RRL

Cross Section 4

Easting	Northing	Point Elevation
1177819.1476	175499.0953	29.71
1177821.7067	175496.6035	28.5
1177822.9357	175495.1002	21.86
1177829.1596	175488.4835	19.21
1177833.9878	175483.3088	16.91
1177839.4039	175477.8705	15.75
1177849.3137	175468.8149	14.52
1177845.5364	175470.0539	14.57
1177858.9921	175457.1615	15.19
1177870.3695	175446.2333	15.77
1177878.2729	175436.4364	15.9
1177886.5965	175428.3605	16.47
1177893.8345	175420.5261	19.12
1177902.6834	175411.3255	21.33
1177907.9805	175406.6633	22.36
1177909.4282	175404.8585	23.56
1177913.2625	175400.8882	24.09

Monitoring Cross Section Data
Exeter Great Dam



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: AHF
Checked by: RRL

Cross Section 5

Easting	Northing	Point Elevation
1178014.1416	173520.7770	25.65
1178006.3650	173513.7377	24.57
1177997.2793	173505.9824	19.21
1177987.2634	173497.0539	13.92
1177980.2987	173490.5189	10.33
1177972.9767	173485.0059	9.36
1177965.5378	173478.1212	7.19
1177957.5193	173471.1919	6.53
1177950.6950	173465.6659	6.61
1177942.8948	173457.7081	9.35
1177936.1550	173451.6193	10.45
1177929.7778	173445.8450	13.54
1177922.0022	173439.6983	19.09
1177913.5945	173431.8908	21.47
1177912.5925	173430.6958	24.87
1177906.8193	173425.8166	25.67



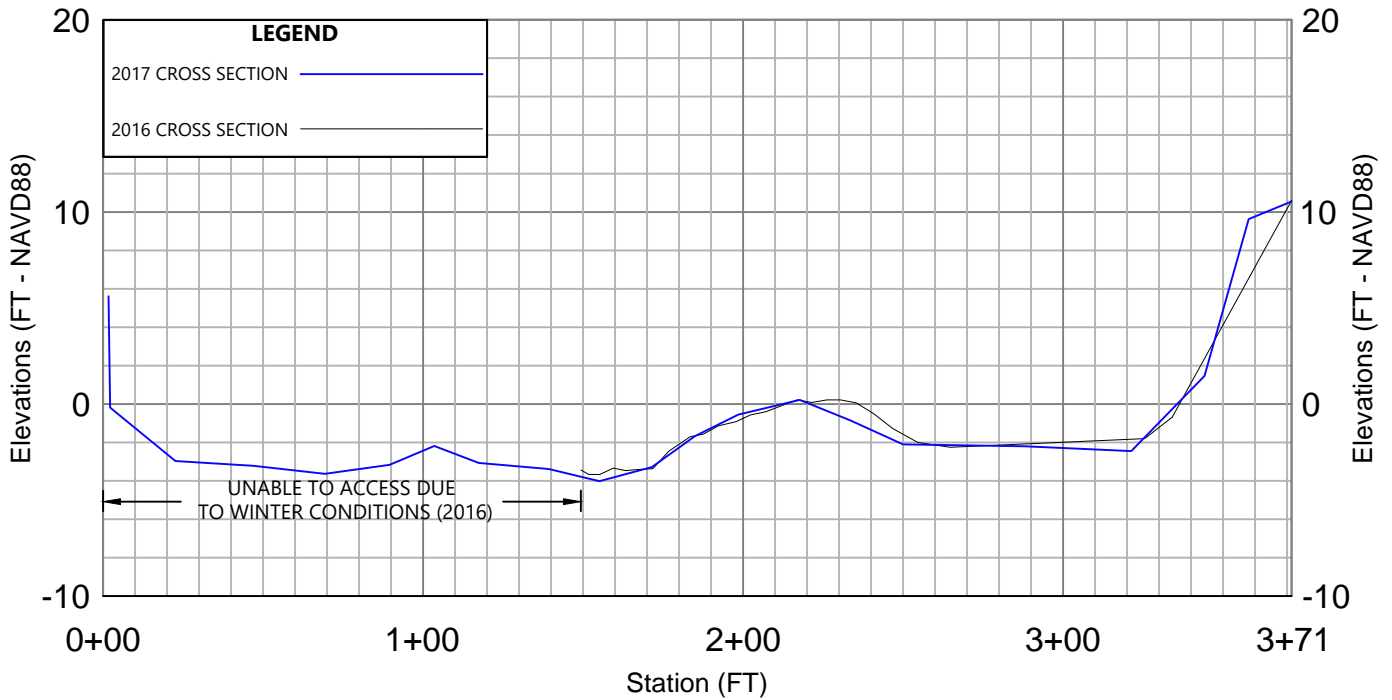
Appendix D

Representative Monitoring Cross-Sections and Data





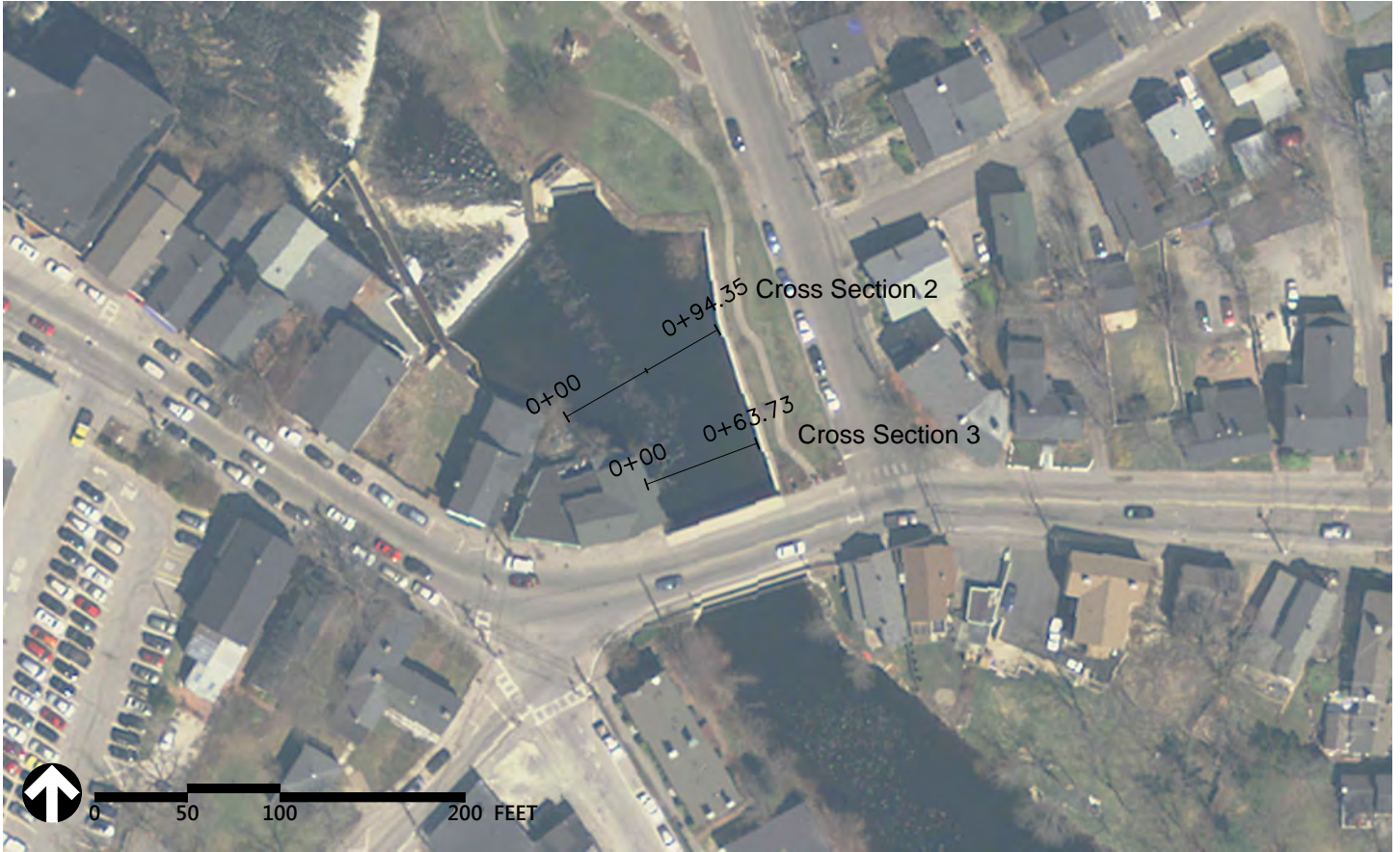
Cross Section 1



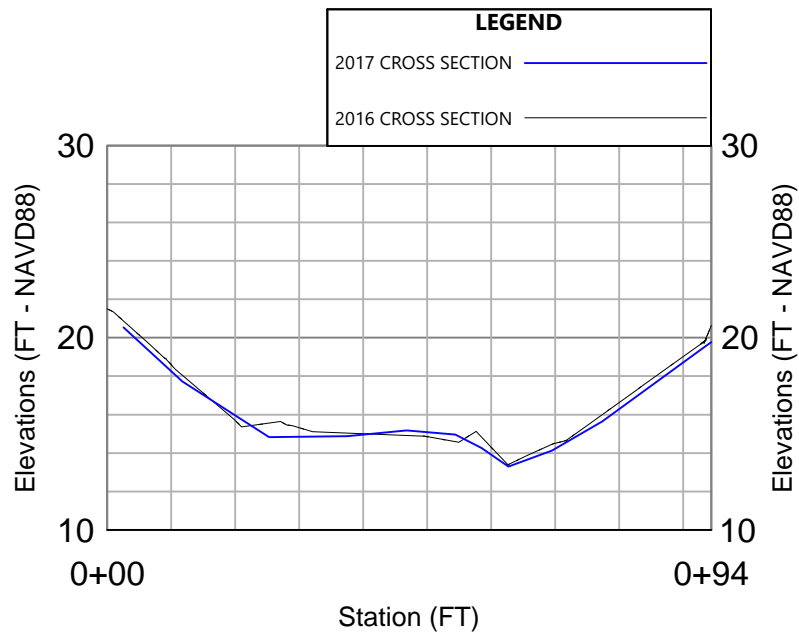
Cross Sectional Elevation data obtained by VHB Survey, October, 2017

Horizontal Scale: 1" = 60'
Vertical Scale: 1" = 10'





Cross Section 2



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

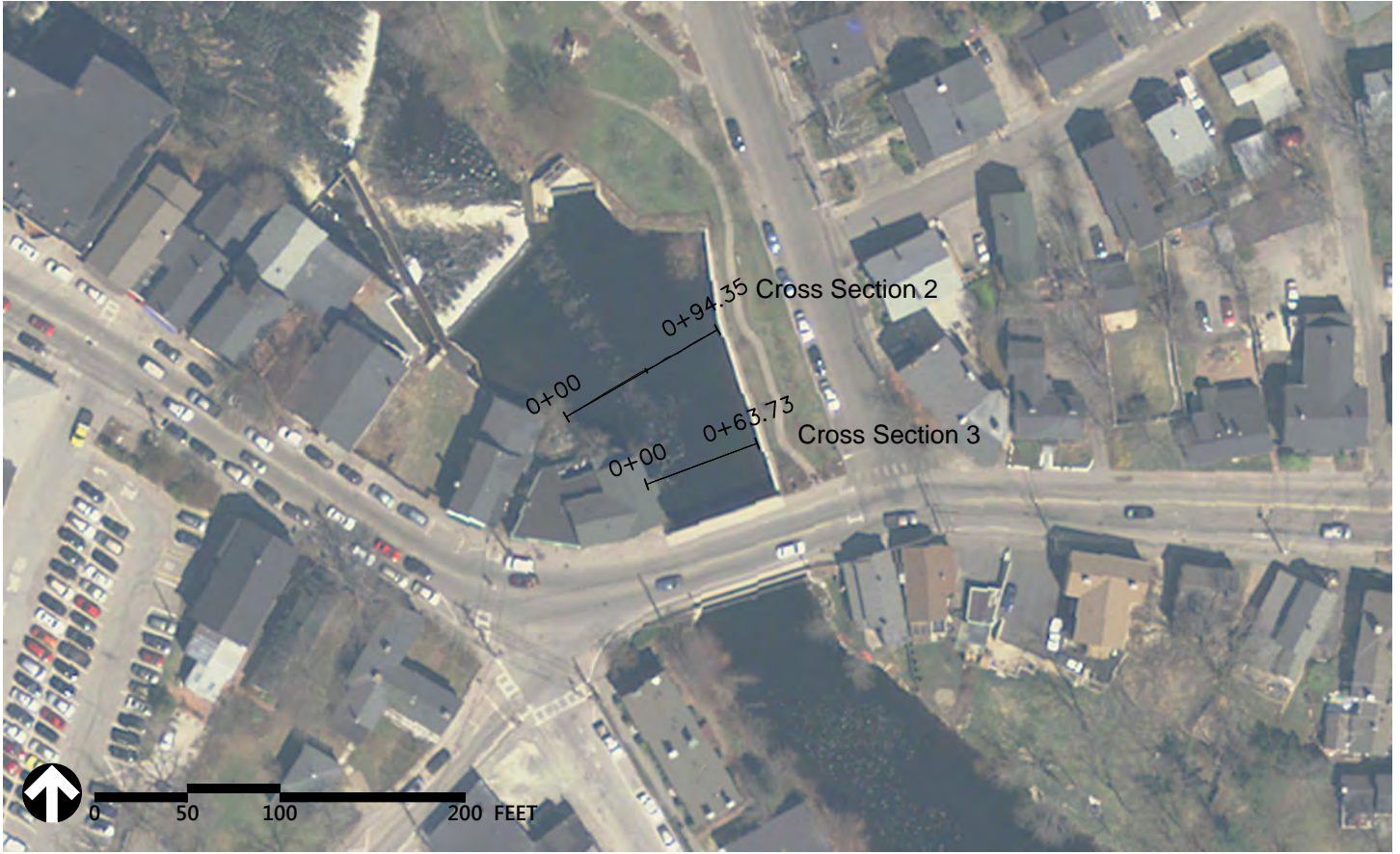
Cross Sectional Elevation data obtained by VHB Survey, October, 2017



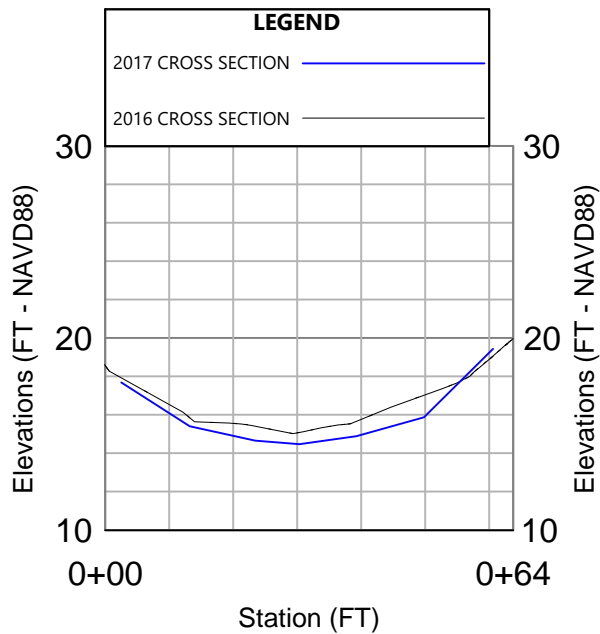
2017 Monitoring Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 2

11/10/2017



Cross Section 3



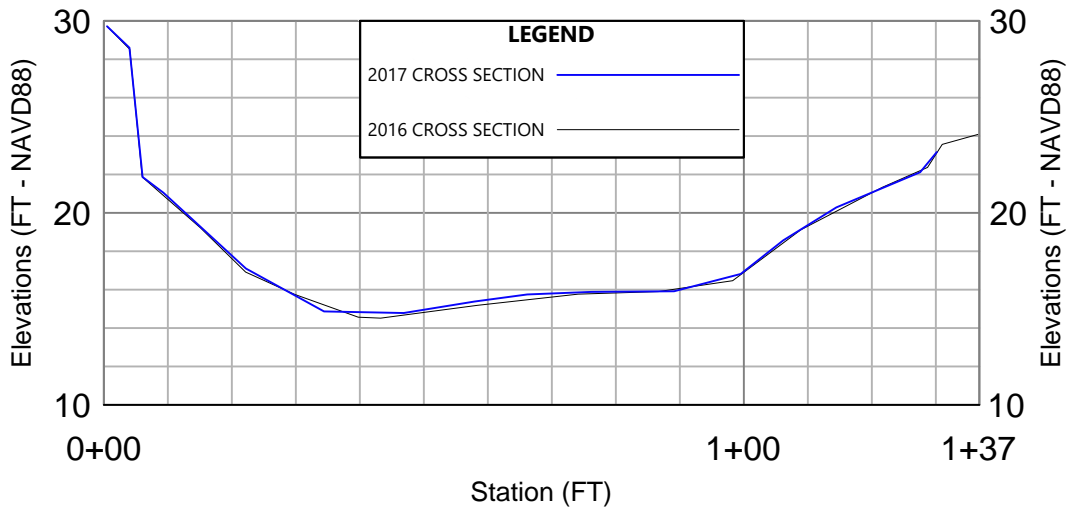
Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

Cross Sectional Elevation data obtained by VHB Survey, October, 2017





Cross Section 4



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

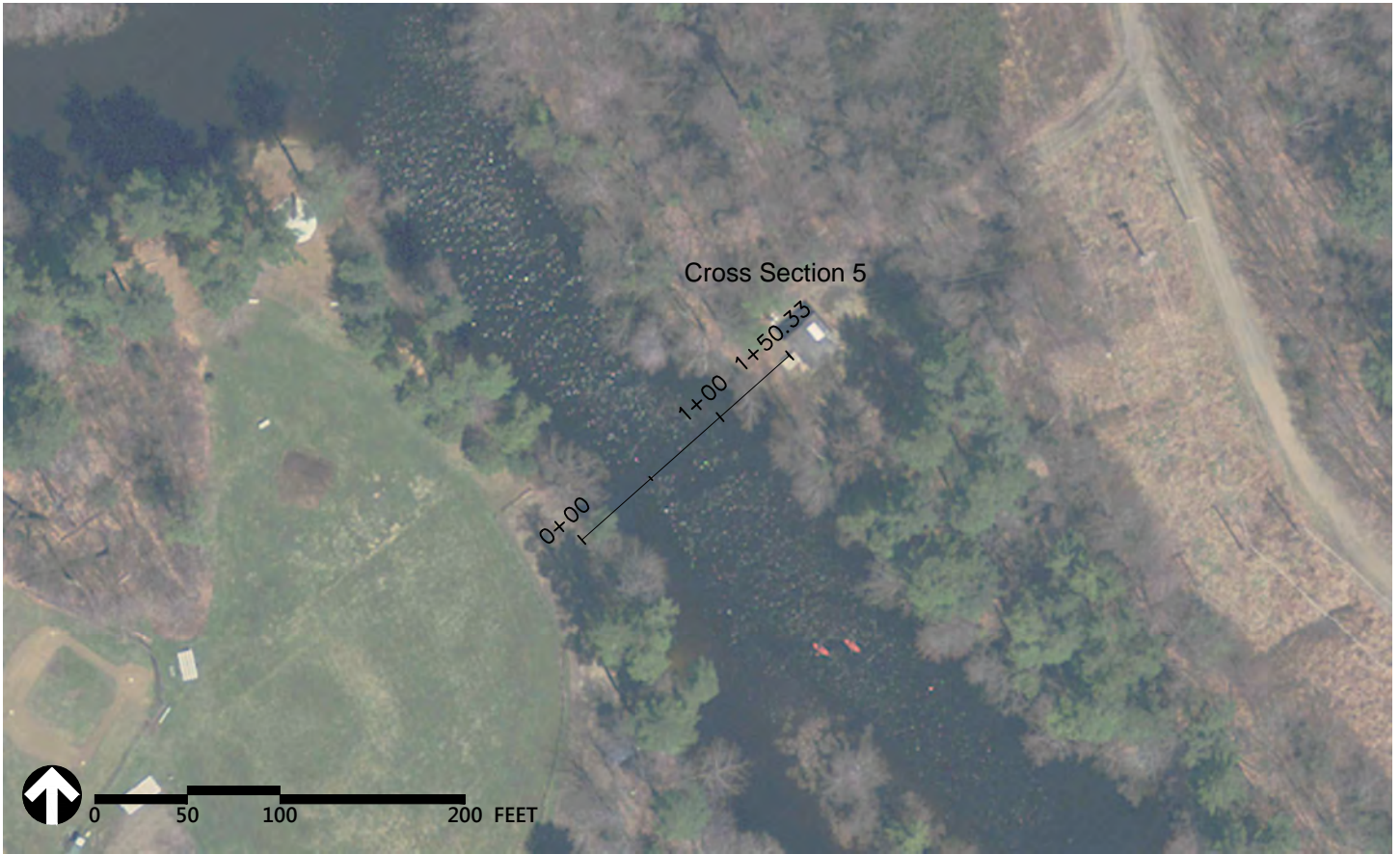
Cross Sectional Elevation data obtained by VHB Survey, October, 2017



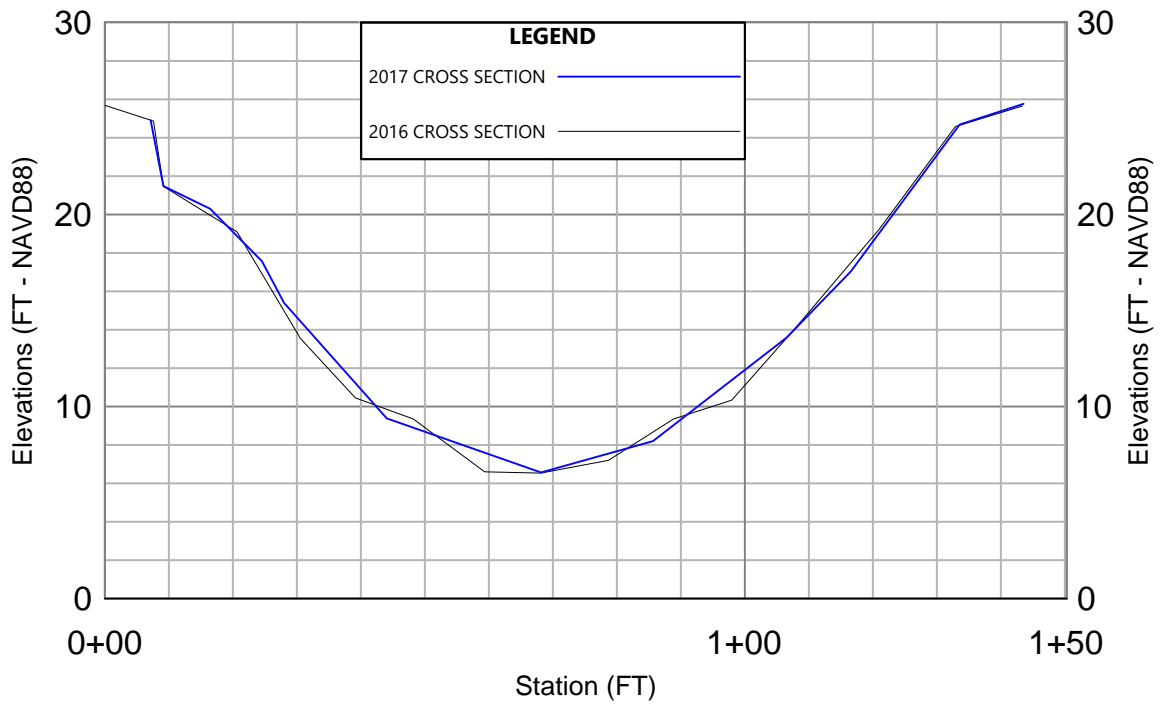
2017 Monitoring Cross-Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 4

11/10/2017



Cross Section 5



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

Cross Sectional Elevation data obtained by VHB Survey, October, 2017



2017 Monitoring Cross-Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 5

11/10/2017



Appendix E

Representative Site Photographs



Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 1 – Downstream of Dam

Photo #1:



Description: Pre-Construction, taken 7/6/2016

Photo #2:



Description: Post-Construction, taken 9/21/2016

Photo #3:



Description: 1-year Monitoring, taken 10/25/2017

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 2 – From Dam Towards Left Bank




Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 3 – From Dam Towards High Street




Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 4 – Looking Downstream




Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 5 – From High Street Looking Downstream

Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 6 – From Right Bank Looking Upstream







Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 7 – Looking Upstream

Photo #1:		Photo #2:
		
Description: Pre-Construction, taken 7/6/2016		Description: Post-Construction, taken 9/21/2016
Photo #3:		
		
Description: 1-year Monitoring, taken 10/25/2017		