Known for excellence. Built on trust.

EXPANDED ENVIRONMENTAL NOTIFICATION FORM

Whites Pond Dam Removal and Stream Restoration Project
Winchendon, Massachusetts

Owner and Applicant:
The Mill Farm Initiative
155 Mill Circle
Winchendon, Massachusetts 01475

Prepared by:
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, Massachusetts 02062

February 2019
GZA File No. 01.0173542.10

GZA
Known for excellence.
Built on trust.

Geotechnical
Environmental
Ecological
Water
Construction Management

249 Vanderbilt Avenue
Norwood, MA 02062
T: 781.278.3700
F: 781.278.5701
F: 781.278.5702
www.gza.com

February 15, 2019
File No. 173542.10

Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Attn: MEPA Office, Secretary Matthew A. Beaton

Re: Expanded Environmental Notification Form
Whites Mill Pond Dam Decommissioning & Stream Restoration Project
Winchendon, Massachusetts

Dear Secretary Beaton:

On behalf of our client, The Mill Farm Inititive, GZA GeoEnvironmental, Inc. (GZA) is hereby submitting an Expanded Environmental Notification Form (EENF) for the proposed decommissioning of Whites Mill Pond Dam on the North Branch of the Miller's River in Winchendon, Massachusetts. The Mill Farm Initiative is a non-profit organization that purchased the property and dam in 2015. At the time of purchase, The Mill Farm Initiative assumed responsibility for the dam, which has been out of compliance with the Massachusetts Office of Dam Safety since 1980.

According to the Massachusetts Office of Dam Safety, Whites Mill Pond Dam is in **POOR** condition, meaning that it is at risk of uncontrolled failure. The purpose of the project is to protect the public safety and help bring the Dam into compliance with Massachusetts Dam Safety regulations (302 CMR 10.00). The dam is classified as an Intermediate size, **High Hazard** (Class I) potential dam, meaning that failure of the dam will likely cause loss of life and serious damage to downstream properties and infrastructure.

The proposed project involves dam decommissioning through partial breaching of the dam and restoration of the associated reach of the North Branch of the Millers River. The project has been designed to protect and restore the existing waterway resources at the site and to minimize temporary construction impacts to the surrounding resource areas.

Based on the results of the dam safety inspections, the Owner believes breaching of the dam will benefit both the habitat of North Branch of the Miller's River and the safety of the public in the Town of Winchendon. Therefore, we request a waiver of the requirement to prepare an Environmental Impact Report (EIR), which is normally necessary for any decrease in impoundment capacity of a dam. Accordingly, this EENF has been prepared to address the anticipated environmental issues that would otherwise be addressed by the EIR process. We believe this project meets the waiver criteria in 301 CMR 11.11(1) and (3) for the following reasons:

1. *"The project is likely to cause no damage to the environment."*

In our opinion, an EIR is not necessary because the effects of the proposed, properly-constructed dam breach are an overall positive environmental impact. Decommissioning the Whites Mill Pond Dam will provide an overall environmental benefit by reconnecting upstream and downstream sections of North Branch of the Miller's River, a Massachusetts Division of Fisheries and Wildlife coldwater fishery resource.

2. *"…strict compliance with the provision or requirement [for filing an EIR] would…result in an undue hardship for the Proponent, unless based on delay in compliance by the Proponent.*

The Owner has already dedicated a large amount of resources in inspections and investigations to address the condition of the Dam, and the additional cost to prepare an EIR would be a financial burden to the Owner. Additionally, the Owner is required to comply with an outstanding Dam Safety Order to address the condition of the dam in an expedient manner. The time necessary for the preparation of an EIR could result in potential non-compliance with the Dam Safety Order and would delay implementation of important dam safety remedial measures at the dam site.

3. *"Ample and unconstrained infrastructure facilities and services exist to support the Project (in the case of a Project undertaken by an Agency or involving Financial Assistance) or those aspects of the Project within subject matter jurisdiction (in the case of a Project undertaken by a Person and requiring one or more Permits or involving a Land Transfer but not involving Financial Assistance)."*

The project consists of a dam removal and does not require new or improved infrastructure facilities or services to support it.

If you have any questions regarding this EENF please feel free to contact Chad Cox, P.E., at GZA at (781) 278-5787.

Very Truly Yours,

GZA GEOENVIRONMENTAL, INC.

Derek J. Schipper, P.E.
Senior Project Manager

Chad W. Cox, P.E.
Principal in Charge

cc: John and Amelia Giovanoni

J:\170,000-179,999\173542\173542-10.DJS\Permits\MEPA\MEPA Cover Letter.docx

EXPANDED ENVIRONMENTAL NOTIFICATION FORM
for the
WHITES MILL POND DAM DECOMMISSIONING
AND RIVER RESTORATION PROJECT
WINCHENDON, MA

TABLE OF CONTENTS

Environmental Notification Form

Figures & Drawings

Figure 1: Site Locus
Figure 2: Orthophoto Site Locus
Figure 3: Drainage Area Map
Figure 4: Downstream Area Map
Figure 5: MassDEP Resource Area Map
Figure 6: FEMA "FIRMette" Flood Map
Other: Site Soil Map, Groundwater Well Map

Permit Drawings 1 through 11

Appendices

Appendix A: Project Narrative
Appendix B: Site Photographs
Appendix C: Sediment Evaluation
Appendix D: Wetland Evaluation
Appendix E: ENF Circulation List
Appendix F: 6-Month Follow-Up Inspection Report and DCR Order
Appendix G: Public Notice
Appendix H: Hydrologic & Hydraulic Analysis

Environmental Notification Form

For Office Use Only

EEA#: ____________________

MEPA Analyst: ______________

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: Whites Mill Pond Dam Removal and Stream Restoration		
Street Address: 155 Mill Circle		
Municipality: Winchendon	Watershed: North Branch Millers River	
Universal Transverse Mercator Coordinates: 18 N 744750 4731164	Latitude: 42.69408° north Longitude: 72.012262° west	
Estimated commencement date: August 2019	December 2019	
Project Type: Dam removal	Status of project design: 80 %complete	
Proponent: The Mill Farm Initiative		
Street Address: 155 Mill Circle		
Municipality: Winchendon	State: MA	Zip Code: 01475
Name of Contact Person: John and Amelia Giovanoni		
Firm/Agency: The Mill Farm Initiative	Street Address: 155 Mill Circle	
Municipality: Winchendon	State: MA	Zip Code: 01475
Phone: 508-942-2952	Fax:	E-mail: ameliagiovanoni@outlook.com

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☒Yes ☐No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8)) ☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09) ☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11) ☒Yes ☐No
a Phase I Waiver? (see 301 CMR 11.11) ☐Yes ☒No
(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

The Whites Mill Pond Dam Removal Project is required to follow Greenhouse Gas Emission Policy and Protocol as it exceeds a MEPA threshold requiring an Environmental Impact Report (or a waiver of an EIR). Emissions will be limited to the operation of construction equipment on-site and there will be no long term effects as a result. Emissions will only take place during the construction phase of the project. The project will result in the ecological restoration of the site and river, the removal of a dam, and includes the dredging/excavation of a waterway; therefore the project qualifies for a de minimis exemption since all three of those projects are provided as examples of projects that typically qualify for a de minimis exemption according to the Greenhouse Gas Emission Policy and Protocol.

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?

11.03 (3)(a)4. Structural alteration of an existing dam that causes an expansion or 20% or any decrease in impoundment capacity

11.03 (3)(b)1.b. alteration of 500 or more linear feet of bank along a fish run or inland bank.

11.03 (3)(b)(1)(d) alteration of 5,000 or more square feet of bordering or isolate vegetated wetlands; and

11.03 (3)(b)(1)(f) alteration of ½ or more acres of any other wetlands

We are respectfully requesting waiver of an Environmental Impact Report (EIR). Given the engineering and scientific analyses completed to date and the fundamental premise of the project as one of proactive environmental restoration, it is our belief that preparation of an EIR would not "serve to avoid or minimize damage to the environment" as described under 301 CMR 11.11(1). Furthermore, it is our belief that preparation of an EIR would not provide increased benefit to the project and the environment, as described under 301 CMR 11.11(2). The analyses completed to date outlined in the Expanded Environmental Notification Form (EENF) demonstrate that the project meets the EIR waiver thresholds as given in 301 CMR 11.11(3). Specifically, the project does not cause damage to the environment but rather serves to improve the aquatic environment. Also, the project does not require infrastructure and services and, therefore, "ample and unconstrained infrastructure and services" exist to support the project. The information contained in this EENF is intended to provide sufficient information to allow the Secretary to grant the EIR waiver. In the event that the Secretary finds that an EIR continues to be required for this project, we request approval for processing this filing as a Single EIR. The justification for these requests is summarized in greater detail in this filing.

Which State Agency Permits will the project require?

DCR Office of Dam Safety Chapter 253 Sam Safety Permit
MHC PNF
MADEP 401 Water Quality Certification
MADEP Chapter 91 Dredge Permit
USEPA Section 404 Category II Permit
MADEP WPA Form 3 - NOI

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:

No land transfer is proposed. The Executive Office of Energy and Environmental Affairs has awarded the project a grant from the Dam and Seawall Repairs and Removal Program of $250,000 for the design of the removal of Whites Mill Pond Dam. The Owner also intends to apply for other available construction grants including the Dam and Seawall Grant, DER Grant and USDA Grant.

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	42 acres		
New acres of land altered		0.5 acres	
Acres of impervious area	0	0	0
Square feet of new bordering vegetated wetlands alteration		+1,356,000 sf (created)	
Square feet of new other wetland alteration		-1,409,100 sf (Land Under Water exposed)	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage	N/A	N/A	N/A
Number of housing units	N/A	N/A	N/A
Maximum height (feet)	N/A	N/A	N/A
TRANSPORTATION			
Vehicle trips per day	N/A	N/A	N/A
Parking spaces	N/A	N/A	N/A
WASTEWATER			
Water Use (Gallons per day)	N/A	N/A	N/A
Water withdrawal (GPD)	N/A	N/A	N/A
Wastewater generation/treatment (GPD)	N/A	N/A	N/A
Length of water mains (miles)	N/A	N/A	N/A
Length of sewer mains (miles)	N/A	N/A	N/A

Has this project been filed with MEPA before?
☐ Yes (EEA #___________) ☒No

Has any project on this site been filed with MEPA before?
☐ Yes (EEA #___________) ☒No

GENERAL PROJECT INFORMATION – all proponents must fill out this section

PROJECT DESCRIPTION:

Describe the existing conditions and land uses on the project site:

The Mill Farm Initiative, Inc. / The Brandywine Farms, Inc. owns and operates the Whites Mill Pond Dam along the North Branch of the Millers River in Winchendon, Massachusetts. Based on previously performed Phase I dam safety inspections by Pare Corporation and GZA and follow-up inspections performed by GZA, the Whites Mill Pond Dam is judged to be in POOR condition. Key safety deficiencies currently observed at Whites Mill Pond Dam include: cracking and missing mortar in masonry spillway walls; a low area and sinkholes on the top of the embankment to right of the spillway; scarped and unprotected upstream slopes; steep downstream slope to left of the spillway; corroded vertical supports of the spillway foot bridge; missing stones in the downstream masonry face; bulging of the downstream masonry wall to right of the spillway; leakage/seepage at the toe of the dam including a large saturated area near the middle of the dam and a discrete area of seepage at the base of the downstream wall right of the spillway; inadequate discharge capacity to accommodate the Spillway Design Flood (SDF); and inoperable low-level outlet. A separate earthen embankment dike is present to the left of the main dam and has large trees and an overturned tree on the embankment.

The dam is an approximately 375-foot-long earthen embankment with a maximum structural height of about 12.5 feet and a hydraulic height of about 10.5 feet. The dam crest to the right of the spillway is an approximately 16-foot-wide, level, grass surface. The downstream side of the dam to the right of the spillway is a dry set stone masonry wall that runs from the right side of the primary spillway to a building near the right abutment. An approximately 24-foot-wide by 10.5-foot-high concrete broad crested weir is located near the left abutment. The spillway is traversed via a steel-framed pedestrian foot bridge, with wood deck platform. Flow over the spillway cascades onto bedrock downstream of the dam then flows into a stone wall lined channel. The low-level outlet consists of a stone box culvert, 3.2 feet wide by 1.8 feet high, and is controlled by a (inoperable) gate near the centerline of the dam. A concrete sluiceway intake is located at the right abutment. An approximately 150-foot-long, 3-foot-high earthen dike is located to the left of the left dam abutment.

The dam is classified as an Intermediate size, High Hazard (Class I) potential dam, meaning that failure of the dam will likely cause loss of life and serious damage to downstream properties and infrastructure. The proposed project involves dam decommissioning through partial breaching of the dam and stream restoration. The project has been designed to protect the existing waterway resources supported by the dam and to minimize temporary construction impacts to the surrounding resource areas.

The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) issued a Certificate of Non-Compliance and Dam Safety Order on October 9, 2015. The ODS stated that the dam has been determined to be "Structurally Deficient" and in "Poor" condition. The ODS ordered the Owner to bring the dam into compliance through repair, breach, or removal of the structure.

Describe the proposed project and its programmatic and physical elements:

The Owner has elected to partially breach the dam to address the dam safety deficiencies through dam decommissioning and at the same time provide proactive environmental restoration of the riverine ecology in the upstream impoundment area. The dam decommissioning and stream restoration project process is anticipated as follows:

The pond will be initially lowered by passing flow through the existing low-level outlet, if possible. However, the operability of the outlet is unknown so it is anticipated that a more active process to drain the pond will be needed consisting of incrementally removing portions of the existing spillway and then providing a temporary "notch" in the embankment. During this process, the upstream channel in the impoundment is expected to become further defined through natural channel formation. The natural movement of water will enhance and deepen the pre-existing channel which has been observed in the impoundment area during periods of low water. The constructed dam breach channel will be tied into the natural upstream channel immediately upstream of the existing embankment. The remaining sediment will be allowed to naturally re-distribute in the downstream channel over time. The alignment of the upstream channel is anticipated to follow that which has already been observed during the seasonal periods of low water which have occurred in the past.

The dam will be physically decommissioned by creating a breach in the embankment to the right of the existing spillway. An approximate 15-foot-wide primary channel will be excavated through the dam. The primary channel will be shaped such that a thalweg exists to concentrate flow to improve fish passage during low flow periods. Grades to the left and right of the new channel will be about 2 feet higher than the channel bottom for a distance of about 25 feet to provide for overbank areas which will accommodate flood flows. The overbanks will also allow for passage of terrestrial wildlife. Grades will then slope up to the dam crest at an approximate 2.5 horizontal to 1 vertical slope. The 2.5H:1V slope will be armored in rip rap and vegetation. It is expected that some adjustments to the channel geometry may be needed during construction to accommodate the bedrock surface in the area of the existing spillway. The existing spillway catwalk and concrete slab will be fully removed. The new breach channel will confluence with the existing spillway discharge channel immediately downstream of the dam. This will necessitate some removal of stone masonry channel walls on the right side of the channel. Remaining portions of the channel walls, dam embankment, and the existing stone masonry embankment retaining walls will remain. All stone removed from existing dry stone walls will be reused on site as channel or slope stabilization. The sluiceway at the right side of the dam will be filled and decommissioned. The existing dike will be left in place. No modifications to the dike are proposed.

The new channel overbanks will be provided with a topsoil cover, seeded, and revegetated with appropriate materials. Coir rolls will be used as both temporary erosion control and to define channel banks. The channel itself will be formed into the native soil material with no additions to channel bottom. The existing stone channel walls will also be extended upstream for a limited distance through the breach channel to stabilize the channel extents where the channel bends. Random boulders (from disassembled dry-stone walls) will be used to enhance the channel. Limited upstream seeding will be provided in the immediate area of the dam but the majority of the former impoundment will be allowed to naturally revegetate. This natural revegetation approach has been successfully used at a number of other dam removal/breaching projects in Massachusetts. A pedestrian foot bridge will be placed to facilitate public access, and historic displays and environmental enhancements will be installed.

Removal of the entire horizontal extent of the dam was judged not to be required. The design calls for the full vertical extent of the dam to be removed within the limits of the breach section. Under significant floods, the former pond area will act as an overbank area. The breach channel has been specifically designed to pass flood flows without significant re-impoundment. In GZA's opinion, significant impoundment is considered to have not occurred if no more than six (6) vertical feet of temporary differential head exists when comparing water surface elevations immediately upstream and downstream of the breach during peak flows associated with the 100-year flood. Massachusetts dam safety regulations consider structures non-jurisdiction if the structure height (and thus the impoundment height) does not exceed six feet (302 CMR 10.06). The basis of design for the breach of the Whites Mill Pond Dam was taken as the 500-year flood and the above hydraulic criteria have been met, therefore it is GZA's opinion *that the structure will be non-jurisdictional following the completion of this project. Hydrologic and hydraulic analyses have demonstrated that the decommissioning of the dam will not exacerbate downstream flooding.*

The proposed project will not only address the existing safety concerns at the dam but serve to proactively restore the riverine environment at and upstream of the dam. Upon completion of the project, the dam will no longer serve as a barrier to passage of aquatic and other wildlife. Approximately 5,300 linear feet of river channel will be restored to free flowing conditions. In addition, the upstream area in the former artificial impoundment is expected to revert to wetlands conditions, resulting in the creation of approximately 40 acres of new bordering vegetated wetlands resources. The banks of the upstream restored stream channel in the former pond area will be allowed to naturally re-form to a stable or meta-stable configuration. Sediment from within the new stream channel will be allowed to naturally mobilize and restore the typical sediment transport dynamics in the river. The new overbanks will naturally revegetate and stabilize. The habitat capacity of the streambanks will be improved as the bank vegetation in the restored brook will be adjacent to water which is more suited for cold water fisheries. All changes to the project area are expected to provide equal or better wildlife habitat and will result in no adverse effects on wildlife habitat. Specific environmental benefits anticipated to be provided by the project are listed below.

Anticipated Benefits of Dam Removal:

▪ *Removal of significant hazard risk from dam failure*	*Removing the dam will limit the risk of another full, uncontrolled breach occurring in the future, which has an increased likelihood considering that the dam is in Poor condition and the dam has the potential to overtop during the Spillway Design Flood.*
▪ *Restoration of the natural channel*	*Rivers in their natural state are dynamic systems where changing flow levels trigger growth and reproduction cycles in native river species creating a healthier and more biodiverse ecosystem.*
▪ *Restoration of natural dissolved oxygen levels*	*The recreation of a natural riffle-pool stream channel will help increase dissolved oxygen levels in the water, which would result in increased water quality and riverine biodiversity.*
▪ *Restoration of natural water temperatures*	*Water held behind dams is often warmer than in free-flowing rivers. Removing the dam will help restore natural temperature regimes and support the return of cold-water fish species.*
▪ *Improved water quality*	*Restoration of natural flow regimes through dam removal will help increase pollution dilution and transport in the Brook, which will help increase water quality.*
▪ *Improvement of natural sediment transport pathways*	*Natural sediment transport, an essential geomorphological function of the river, will be restored by the dam breach. This will replenish the sediment-starved areas downstream of the dam, and result in a healthier ecosystem.*
▪ *Restoration of Bordering Vegetated Wetlands*	*As this project is a proactive stream restoration project, with a goal of returning the stream to its natural condition, there will be a transformation of wetlands resources. Most of the Land Under Water (LUW) which created due to the impoundment behind the dam is anticipated to transform into Bordering Vegetated Wetlands (BVW).*

	The restored BVW is likely to initially take the form of bog or shrub swamp, with some areas ultimately transforming into wooded coniferous swamp. Stable vegetated stream banks will replace pond banks and provide equivalent or better habitat. Some open water areas will remain, particularly in the upper reaches of the former pond area.

No new infrastructure is required to support this project. The only structure proposed is a small pedestrian footbridge proposed to replace the existing catwalk over the existing spillway. The proposed replacement footbridge will provided connectivity for existing walking trails around the current pond perimeter. The project is taking place solely on private property and there are no anticipated changes to the capacity of or demand on the municipal and/or regional infrastructure.

Describe the on-site project alternatives (and alternative off-site locations, if applicable), considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s)
that they were not selected as the preferred alternative:

An alternatives analysis was conducted in order to recommend a preferred course of action to address the existing dam safety and other deficiencies at the dam. Consideration was also given to the economic, ecological, and legal impacts of each three alternatives considered in the analysis.

1. ***NO ACTION ALTERNATIVE** (Not Selected)*

The existing Whites Mill Pond Dam has been classified as being in Poor condition by the DCR Office of Dam Safety. In addition, the Dam is classified as a High downstream hazard potential structure, meaning that failure of the dam would likely lead to serious damage of downstream infrastructure and property, and possible loss of life. The DCR Office of Dam Safety has issued a Dam Safety Order requiring the owner to bring the dam into compliance with current Commonwealth of Massachusetts Dam Safety Regulations (302 CMR 10.00). The No Action alternative would leave the dam in its current state, which would post a potential risk to downstream life and property, and would be in violation of the Dam Safety Order.

2. ***REPAIR/RECONSTRUCTION (Not Selected)***

Repairing the dam would satisfy the requirements of the Dam Safety Order, would help prevent a potential failure of the dam, and would maintain the dam's impoundment – Whites Mill Pond. Construction cost of the dam repairs would likely far exceed the cost to the Dam Breach Alternative, in GZA's opinion. Dam repairs would require significant modifications to the existing structure which would alter the visual character of the dam. Once the dam is repaired, Brandywine Farms, Inc. would be required to maintain the dam, and also hire a dam safety engineer to perform periodic visual inspections under 302 CMR 10.00. The repaired dam would remain a HIGH hazard structure.

3. ***DAM BREACH (Selected as Preferred Alternative)***

Removal or breaching of the dam would satisfy the requirements of the Dam Safety Order and would restore the natural (pre-dam construction) North Branch of the Millers River stream channel through the current impoundment area to free-flowing conditions. Removal/breach of the dam, if properly constructed, would remove the fish passage barrier created by the current dam, and would improve water quality in the North Branch of the Millers River by restoring natural sediment transport and water *temperatures. Dam breaching would change the character of the existing site by converting significant portions of the existing low-quality pond resources (Land Under Water) into Wetland (BVW) areas and free-flowing river channel.*

Dam decommissioning through partial breaching of the dam is the preferred alternative because it permanently removes dam safety concerns, proactively restores the natural environment within the river, and is more cost effective than repair.

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

Because one of the primary goals of the Whites Mill Pond Dam Removal project is stream restoration and restoration of fish passage, the project was designed with environmental sensitivity to be of primary importance and no mitigation is required. The configuration of the channel section through the dam is designed to safely pass the 100-year and 500-year design storms and reconnect the upstream and downstream portions of the North Branch of the Millers River stream channel, and provide for potential fish passage. Based on typical engineering practice, as informed by Commonwealth of Massachusetts dam safety regulations, it is GZA's opinion that the proposed channel section through the dam should be capable of passing the 100-year flood flow without impounding a significant head of water (assumed to be a differential head of six feet). The proposed channel has been designed to exceed this requirement such that sufficient capacity is provided to pass 500-year flood flows without overtopping remaining portions of the former structure. The reconfigured channel was also sized to maintain existing downstream flows under normal and flood conditions and be conducive to upstream fish passage.

As with any dam removal, the project will involve short-term impacts to regulated resource areas. These impacts have been minimized to the extent possible through careful planning and design, regulatory coordination, and the proposed construction sequencing and monitoring. Standard Best Management Practices (BMPs) will be employed during construction. The net result of the project in the long-term is overwhelmingly positive, and includes public safety/flood damage prevention, restored fish passage, improved habitat, improved water quality, and the restoration of ecological processes that will help sustain a healthy stream into the future.

If the project is proposed to be constructed in phases, please describe each phase: The project is expected to be performed continuously for a duration of about 3 months.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:

Is the project within or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify___________________________________)

☒No

if yes, does the ACEC have an approved Resource Management Plan? ___ Yes ___ No;

If yes, describe how the project complies with this plan.

____

Will there be stormwater runoff or discharge to the designated ACEC? ___ Yes ___ No;

If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.

____

RARE SPECIES:

Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm)

☐Yes (Specify___________________________________) ☒No

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☒Yes (<u>Specify On-site structure: White, N.D. and Sons & Nelson Mills Office – An on-site structure not impacted by the dam decommissioning.)</u> ☐No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? ☐Yes (Specify________________________________) ☒No

<u>WATER RESOURCES:</u>

Is there an Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? ___Yes _X_No; if yes, identify the ORW and its location. ____

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

Are there any impaired water bodies on or within a half-mile radius of the project site? _X__Yes ___No; if yes, identify the water body and pollutant(s) causing the impairment:

<u>Lake Monomonac</u>:Cat 5

- *Non-native aquatic plants * TMDL not required (non-pollutant)*
- *Mercury in fish tissue*

<u>Whites Mill Pond</u>: Cat 4a

- *Aquatic Plans (Macrophytes) * TMDL not required (non-pollutant)*
- *Nutrient/Eutrophication Biological Indicators*

<u>Northern Branch Miller River</u>: Cat 5

- *Mercury in Fish tissue*

Is the project within a medium or high stress basin, as established by the Massachusetts Water Resources Commission? _X_Yes ___No

<u>STORMWATER MANAGEMENT:</u>

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations:

The project will have an overall beneficial effect on site stormwater. Breaching of the dam will restore the North Branch of Miller's River to free-flowing conditions and will help recreate natural Bordering Vegetated Wetlands and vegetated buffer zone along the stream channel. The new BVW and vegetated buffer zone will provide a natural buffer to stormwater discharge into the stream channel from the adjacent watershed. Hydrologic and Hydraulic modeling by GZA indicates that no increase in downstream flooding potential is expected to result from this project.

During construction, temporary erosion, sedimentation, and water controls will be implemented using Best Management Practices. These measures will help protect adjacent wetland and waterway resources from erosion and stormwater runoff during construction.

<u>MASSACHUSETTS CONTINGENCY PLAN:</u>

Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Yes _X__ No __ ; if yes, please describe the current status of the site (including Release Tracking Number (RTN), cleanup phase, and Response Action Outcome classification):__________________

According to review of GIS data maintained by the Commonwealth, Whites Mill Pond does not contain any listed solid waste facilities, BWP Major Facilities or surface and underground discharge locations. The former Mylec mill complex is listed twice as a hazardous waste disposal site ("21e site") under Release Tracking Numbers (RTNs) 2-14319 and 2-19250. Both RTNs appear limited to areas downstream of the dam. RTN 2-14319 is associated with the detection of polychlorinated biphenyls (PCBs) in soil and sediment at and downstream of the mill complex. Response actions included the dredging and off-site disposal of impacted sediments from the mill tail race and Millers River downstream of the dam. Sediment sampling conducted under RTN 2-14319 within Whites Mill Pond did not detect PCBs above laboratory method detection limits. RTN 2-14319 has reach a Permanent Solution under the MCP. RTN 2-19250 is an active site. On July 16, 2014, a release of lubricating oil was reported to MassDEP. The release reportedly impacted an area beneath and/or immediately west of the mill building, downstream from the dam. Response actions for RTN 2-19250 are ongoing under the MCP. There are no sites with Activity and Use Limitations (AUL) in the watershed.

Results of the due diligence study suggest that there are few, if any, point sources of contamination (spills, etc.) that might impact sediment quality in the Whites Mill Pond impoundment. These are the sediments which will be mobilized during the natural channel formation process following the decommissioning of the dam.

Is there an Activity and Use Limitation (AUL) on any portion of the project site? Yes ___ No _X_;
if yes, describe which portion of the site and how the project will be consistent with the AUL:
_____________________.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN?
Yes ___ No _X_ ; if yes, please describe:___________________________________

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood:

(NOTE: Asphalt pavement, brick, concrete and metal are banned from disposal at Massachusetts landfills and waste combustion facilities and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

The project includes the demolition of the existing dam spillway, footbridge, training walls, and a portion of the existing abutment. The concrete will be broken in place and hauled off-site by dump truck to an approved disposal area. Other debris will be removed and disposed of lawfully. Stone masonry from the existing dam embankment walls and spillway training walls will be reused on site for slope and stream channel stabilization. Excavated soil materials will be relocated on site and stabilized.

Will your project disturb asbestos containing materials? Yes ___ No _X_ ;
if yes, please consult state asbestos requirements at http://mass.gov/MassDEP/air/asbhom01.htm

Describe anti-idling and other measures to limit emissions from construction equipment:

Staging areas will be established in upland areas in a manner such that the abutting properties are not affected by construction equipment emissions. Diesel-powered construction equipment will be allowed to idle for a maximum of three minutes unless otherwise necessary.

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally

designated Wild and Scenic River or a state designated Scenic River? Yes ___ No X__ ;
if yes, specify name of river and designation:

River is not designated as Wild and Scenic but is included within the Freedom's Way National Heritage Area (2009 designation). http://www.mass.gov/dcr/stewardship/histland/essex.htm

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state designated Scenic River? Yes ___ No X ___ ; if yes, specify name of river and designation: _____________;
if yes, will the project will result in any impacts to any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River.
Yes ___ No ___ ;
if yes,describe the potential impacts to one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1)
__ Yes _X_ No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	0	0	0
Internal roadways	0	0	0
Parking and other paved areas	0.2 acres	0	0.2 ac
Other altered areas	0.8 acres	0	0.8 ac
Undeveloped areas	37 acres	0	37 ac
(Impoundment, woodland, channel)		(former pond to remain undeveloped)	
Total: Project Site Acreage	42 acres	0	42 ac

B. Has any part of the project site been in active agricultural use in the last five years?
___ Yes _X_ No; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
___ Yes _X_ No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes _X_ No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? ___

____ Yes_X_ No; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes _X_ No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No _X_; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan

1) Winchendon Master Plan, 2006
2) Open Space and Recreation Plan Update, May 2007
3) Winchendon Master Plan Update; Housing Element, January 2015
4) Draft Economic Development Recommendations, November 2014

B. Describe the project's consistency with that plan with regard to:

1) economic development

The project will enhance the town's outdoor attractions by adding recreational opportunities described in the master plan, such as walking trails, fishing and canoeing.

2) adequacy of infrastructure

The dam, which has been out of compliance since 1980, will be removed alleviating the concern of failure to the downstream properties. No municipal or regional infrastructure is needed to support the proposed project.

3) open space impacts

The removal of the dam will allow for incorporation of the area of the former White's Mill Pond into the landscape design for Public Open Spaces. The project proposes to return access to the pond to the residents of Winchendon. This project will also enhance habitat for fish and other aquatic species and provide wetland resource functions and values.

4) compatibility with adjacent land uses

Adjacent properties are privately owned residential properties and open space (e.g. river, woodlands, and wetlands). This project is compatible with adjacent land uses because the goals are to remove the safety threat of a potential dam failure and restore habitat for native species while maintaining open space.

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)

RPA: Montachusett Regional Planning Commission

Title: Montachusett Regional Strategic Framework Plan *Date: April 2011*

D. Describe the project's consistency with that plan with regard to:

1) economic development

The project will provide additional recreational opportunities for promoting tourism in the area and will enhance the region's environment and cultural heritage, as highlighted in Objective 1 of the Economic Development goals in the Strategic framework plan.

2) adequacy of infrastructure

The existing dam poses a threat to property, wildlife, and people downstream of the dam in its current conditions. This project will remove the threat of a dam failure. No municipal or regional infrastructure is needed to support the proposed project.

3) open space impacts

Open space will be created by the removal of the dam. The dam removal will allow for use of the pond for recreational opportunities like fishing and canoeing. Dam removal also enhances habitat for riverine and wetland species. These open spaces fulfill Objective 1 and Objective 2 of the Open Space Preservation goals in the Strategic Framework Plan.

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)

B. Does the project require any state permits related to **rare species or habitat**? __ Yes _X_No

C. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes _X_No.

D. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes **_X_** No. If yes,

1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ___Yes ___No; if yes, have you received a determination as to whether the project will result in the “take” of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.

2. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts

3. Which rare species are known to occur within the Priority or Estimated Habitat?

4. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ___ Yes ___ No

4. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes _X_ No; if yes, provide a summary of proposed measures to minimize and mitigate impacts to significant habitat:

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? _X_ Yes ___ No; if yes, specify, in quantitative terms:

With dam removal, the structure will lose the capacity to impound water because it will be a free-flowing channel, therefore it will exceed the the 20% threshold defined in 11.03(3)(a)4.

The current impoundment is approximately 37 acres. With removal this will become a free-flowing stream and the former impoundment will be transformed into wetland/meadow complex. This will create/alter more than ten acres of wetlands as per the threshold defined in 11.03(3)(a)1.a.

The project will also shift approximately 14,650 feet (both banks) of existing bank inwards within the limits of the existing impoundment as the water surface elevation decreases. This alteration of inland bank exceeds the 500 linear foot threshold defined in 11.03(3)(b)1.b.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? _X_ Yes ___ No; if yes, specify which permit:

- *MADEP Section 401 Water Quality Certification*
- *MADEP Chapter 91 Waterways Dredge Permit*
- *USEPA Section 404 Category II Permit*
- *MADEP WPA Form 3 – NOI – Town of Winchendon*

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? _X__ Yes __ No; if yes, has a Notice of Intent been filed? ___ Yes _X_ No;

(NOI will be submitted within 1 week of project notice in the Monitor)

if yes, list the date and MassDEP file number: ______; if yes, has a local Order of Conditions been issued? ___ Yes ___ No; Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a Variance from the Wetlands regulations? ___ Yes ___ No.

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site:

Currently boarding vegetative wetlands surround the existing Whites Mill Pond and Dam structure. There will be temporary impacts on these wetlands during the construction process. Permanent impacts will include a loss of about 0.1 acres of land under water and a transformation of 40 acres of Land Under Water into Boarding Vegetative Wetland resources as the current impoundment is lowered and this section of the reach becomes riverine in nature.

C. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

<u>Coastal Wetlands</u>	<u>Area (square feet) or Length (linear feet)</u>	<u>Temporary or Permanent Impact?</u>

Land Under the Ocean	N/A	N/A
Designated Port Areas	N/A	N/A
Coastal Beaches	N/A	N/A
Coastal Dunes	N/A	N/A
Barrier Beaches	N/A	N/A
Coastal Banks	N/A	N/A
Rocky Intertidal Shores	N/A	N/A
Salt Marshes	N/A	N/A
Land Under Salt Ponds	N/A	N/A
Land Containing Shellfish	N/A	N/A
Fish Runs	N/A	N/A
Land Subject to Coastal Storm Flowage	N/A	N/A

<u>Inland Wetlands</u>

Bank (lf)	-3,150 LF (net change)	Permanent
Bordering Vegetated Wetlands	+1,356,000 SF (new)	Permanent
Isolated Vegetated Wetlands	N/A	N/A
Land under Water	-1,409,000 SF	Permanent
Isolated Land Subject to Flooding	N/A	N/A
Bordering Land Subject to Flooding	-2,700 SF (net change)	Permanent
Riverfront Area	+2,547,100 SF (new)	Permanent

D. Is any part of the project:

1. proposed as a **limited project**? _X_ Yes ___ No; if yes, what is the area (in sf)?

1,356,000 SF of existing wetland resource areas will be impacted or transformed. The project can be considered "limited" under 310 CMR 10.53 (4) because it "will improve the natural capacity of a resource area(s)". A barrier for fish passage will be removed and additional riverfront area and bordering vegetated wetlands will be created as a result of the dam removal. Other interests of the Wetlands Protection Act and Rivers Protection Act will be provided by the proposed project.

2. the construction or alteration of a **dam**? _X_ Yes ___ No; if yes, describe:

Due to the condition of the dam rated as POOR, a partial removal is necessary to avoid the danger of a failure. To achieve this, an approximately 65-foot-long section of the dam will be removed to prevent the structure from permanently impounding water. The remaining structure is intended to meet the definition of a decommissioned, non-jurisdictional structure.

3. fill or structure in a **velocity zone** or **regulatory floodway**? ___ Yes _X_ No
There is only a FEMA Zone A designation, there is no floodway.

4. dredging or disposal of dredged material? _X_ Yes ___ No; if yes, describe the volume of dredged material and the proposed disposal site:

The portion of the earthen embankment (900 CY) below the impoundment will be excavated as part of the dam breach. This same volume of excavated material will be repositioned on site. The remaining sediment accumulation in the channel upstream of the dam will be allowed to naturally re-distribute in the downstream channel.

5. a discharge to an **Outstanding Resource Water (ORW)** or an **Area of Critical Environmental Concern (ACEC)**? __ Yes _X_ No
6. subject to a wetlands restriction order? ___ Yes _X_ No; if yes, identify the area (in sf):

7. located in buffer zones? ___Yes _X_No; if yes, how much (in sf) ______

E. Will the project:
1. be subject to a local wetlands ordinance or bylaw? _X_ Yes ___ No
2. alter any federally-protected wetlands not regulated under state law? ___ Yes _X_ No; if yes, what is the area (sf)?

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? _X_ Yes __ No; if yes, is there a current Chapter 91 License or Permit affecting the project site? ___ Yes _X_ No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands:

B. Does the project require a new or modified license or permit under M.G.L.c.91? _X_ Yes __ No;

if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use? Current _0_ Change _0_ Total _0_
If yes, how many square feet of solid fill or pile-supported structures (in sf)? **0**

A Chapter 91 permit will be required for dredging; a license won't be required.

C. For non-water-dependent use projects, indicate the following: **N/A**
Area of filled tidelands on the site:____________________
Area of filled tidelands covered by buildings:____________
For portions of site on filled tidelands, list ground floor uses and area of each use:
____
Does the project include new non-water-dependent uses located over flowed tidelands?
Yes ___ No ___
Height of building on filled tidelands________________

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, and interior and exterior areas and facilities dedicated for public use, and historic high and historic low water marks.

D. Is the project located on landlocked tidelands? ___ Yes _X_ No; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations? ___Yes _X_ No; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? _ Yes _X_ No; *(NOTE: If yes, then the project will be subject to Public Benefit Review and Determination.)*

G. Does the project include dredging? _X_ Yes ___ No; if yes, answer the following questions:
What type of dredging? Improvement __ Maintenance __X_ Both ____
What is the proposed dredge volume, in cubic yards (cys) _1,000 cy___
What is the proposed dredge footprint _100 ft_length (ft) _30ft_width (ft)__Variable, No more than 12.5'__depth (ft);

Will dredging impact the following resource areas?

Intertidal Yes__ No_X_; if yes, ___ sq ft

Outstanding Resource Waters Yes__ No_X_; if yes, ___ sq ft

Other resource area (i.e. shellfish beds, eel grass beds) Yes__ No_X_; if yes _ sq ft

If yes to any of the above, have you evaluated appropriate and practicable steps to: 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?

If no to any of the above, what information or documentation was used to support this determination?

The proposed dredging is being performed to recreate the previous river channel within the immediate area of the existing dam that is currently within the former impoundment area. This work will protect downstream wetland and waterway resources from an uncontrolled release of sediment from the impoundment once the breach channel is established. The dredging is being performed in an inland, man-made impoundment, and all dredging will be performed in the dry once the work area has been dewatered.

There are no intertidal resources within the project area as shown in the FEMA flood map. Whites Mill Pond is not an Outstanding Resource Water.There are no other resource areas within the project area.

Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.

See Attachment C

Sediment Characterization

Existing gradation analysis results? _X_Yes __No: if yes, provide results.

Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? _X_Yes ____No; if yes, provide results.

See Attachment C

Do you have sufficient information to evaluate feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

Beach Nourishment ___

Unconfined Ocean Disposal ___

Confined Disposal:

Confined Aquatic Disposal (CAD) ___

Confined Disposal Facility (CDF) ___

Landfill Reuse in accordance with COMM-97-001 ___

Shoreline Placement ___

Upland Material Reuse_X_

In-State landfill disposal____

Out-of-state landfill disposal ____

(NOTE: This information is required for a 401 Water Quality Certification.)

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? ___ Yes _X_ No; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management:

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes _X_ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

No public or permitted private surface water withdrawals are taken from the Pond. "Non-community groundwater well" 2343005-01G is located about 2 miles southeast of Whites Mill Pond. According to MassGIS, this is the closest known public well. There is a well in the Mill building used for commercial purposes. The existing Fire Suppression System is pumped surface water from the Pond. The Dam decommissioning will render it inoperable.

Subsurface conditions / surficial geology in the area of the dam and pond generally consist sand and gravel (stratified drift) with areas of shallow bedrock. Decommissioning of the dam and restoration of the river is not expected to impact groundwater recharge of the area. The overall water balance will not be altered by the breaching of the dam (over than a decrease in evaporation from surface water). Inflow / outflow volumes will remain the same as under existing conditions. Furthermore, the restored stream channel alignment will remain within the sand/gravel soil areas. Therefore, the dam removal project not expected to impact current or future public water supplies. The MassGIS map showing surficial geology and well 2343005-01G is provided in the Figures section.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Municipal or regional water supply	________	________	________
Withdrawal from groundwater	________	________	________
Withdrawal from surface water	________	________	________
Interbasin transfer	________	________	________

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? ___ Yes ___ No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results. ______________

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? _____Will the project require an increase in that withdrawal? ___Yes ___No; if yes, then how much of an increase (gpd)? ____________________

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___No. If yes, describe existing and proposed water supply facilities at the project site:

	Permitted <u>Flow</u>	Existing Avg <u>Daily Flow</u>	<u>Project Flow</u>	<u>Total</u>
Capacity of water supply well(s) (gpd)	________	_________	_________	_________
Capacity of water treatment plant (gpd)	________	_________	_________	_________

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? ___ Yes ___ No
2. a Watershed Protection Act variance? ___ Yes ___ No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	Existing	Change	Total
Discharge of sanitary wastewater	________	________	________
Discharge of industrial wastewater	________	________	________
TOTAL	________	________	________

	Existing	Change	Total
Discharge to groundwater	________	________	________
Discharge to outstanding resource water	________	________	________
Discharge to surface water	________	________	________
Discharge to municipal or regional wastewater facility	________	________	________
TOTAL	________	________	________

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes ___ No; if yes, describe as follows:

	Permitted	Existing Avg Daily Flow	Project Flow	Total
Wastewater treatment plant capacity (in gallons per day)	_______	________	________	________

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?

(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	Existing	Change	Total
Storage	________	________	________
Treatment	________	________	________
Processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

H. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

I. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_______	________	_______
Number of vehicle trips per day	________	________	________
ITE Land Use Code(s):	________	________	________

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. ____________________	________	________	________
2. _____________________	________	________	________
3. _____________________	________	________	________

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement:

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site?

C. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ____ Yes ____ No; if yes, describe if and how will the project will participate in the TMA:

D. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ____ Yes ____ No; if yes, generally describe:

E. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)?

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? ____________
2. Cutting of living public shade trees (number)? ____________
3. Elimination of stone wall (in linear feet)? ____________

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))?
___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	________	________	________
Length of fuel line (in miles)	________	________	________
Length of transmission lines (in miles)	________	________	________
Capacity of transmission lines (in kilovolts)	________	________	________

B. If the project involves construction or expansion of an electric generating facility, what are:
1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	________	________	________
Carbon monoxide	________	________	________
Sulfur dioxide	________	________	________
Volatile organic compounds	________	________	________
Oxides of nitrogen	________	________	________
Lead	________	________	________
Any hazardous air pollutant	________	________	________
Carbon dioxide	________	________	________

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? _Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes __ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Treatment, processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Recycling	________	________	________
Treatment	________	________	________
Disposal	________	________	________

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency

Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? __ Yes X No; if yes, attach correspondence. For project sites involving lands under water, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? ____Yes _X_ No; if yes, attach correspondence

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? _X_ Yes ___ No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes _X_ No; if yes, please describe:

The White, N.D. and Sons factory building, and Nelson Mills Office are located on the site property and are listed in Massachusetts Cultural Resource Information System. However, both are located outside of the project limits.

The Dam is not listed as a historic structure.

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes _X_ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

The project will result in no impact to the listed structures at the site. The dam will be partially breached; however, a significant portion of the existing dam structure will be retained.

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

The project design will maintain a significant portion of the dam at its current location. The retained portion will preserve the historic context of the dam, which served the mill to provide hydromechanical power and water supply. The remaining portion of the dam will include the large stone, dry masonry wall. Access to the top of the former embankment structure will be maintained.

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

   (Name) **The Gardner News** (Date) **2/16/2019**

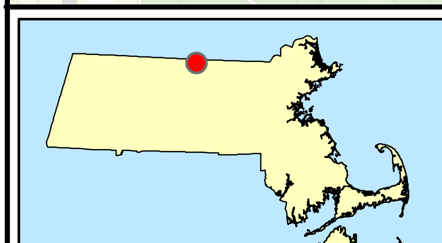
2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

2/14/19	John Giovanoni	2/14/19	Chad Cox
Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing ENF (if different from above)

John Giovanoni	Chad W. Cox, P.E.
Name (print or type)	Name (print or type)
The Mill Farm Initiative	GZA GeoEnvironmental, Inc.
Firm/Agency	Firm/Agency
PO Box 28	249 Vanderbilt Avenue
Street	Street
Winchendon, MA 01475	Norwood, MA 02062
Municipality/State/Zip	Municipality/State/Zip
508-942-2955	781-278-5787
Phone	Phone

FIGURES & DRAWINGS



USGS QUADRANGLE LOCATION

0 1,000 2,000 4,000 6,000 Feet

N W E S

Data Supplied by :

MASS GIS

GZA

PROJ. MGR.: DJS
DESIGNED BY: SMH
REVIEWED BY: DJS
OPERATOR: SMH

DATE: 02-5-2018

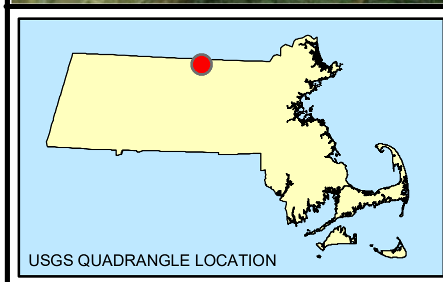
SITE LOCATION MAP
WHITES MILL POND DAM

BRANDYWINE FARMS, INC.
WINCHENDON, MASSACHUSETTS

JOB NO.
01.0173542.00

FIGURE NO.
1

J:\19,000-20,999\19772\19772-40.MAT\Reports\lower roberts meadow res dam\Figures\Figure1-SiteLocus.mxd



Data Supplied by :

MASS GIS

0 375 750 1,500 2,250 Feet

N W E S

PROJ. MGR.: DJS
DESIGNED BY: SMH
REVIEWED BY: DJS
OPERATOR: SMH

DATE: 02-5-2018

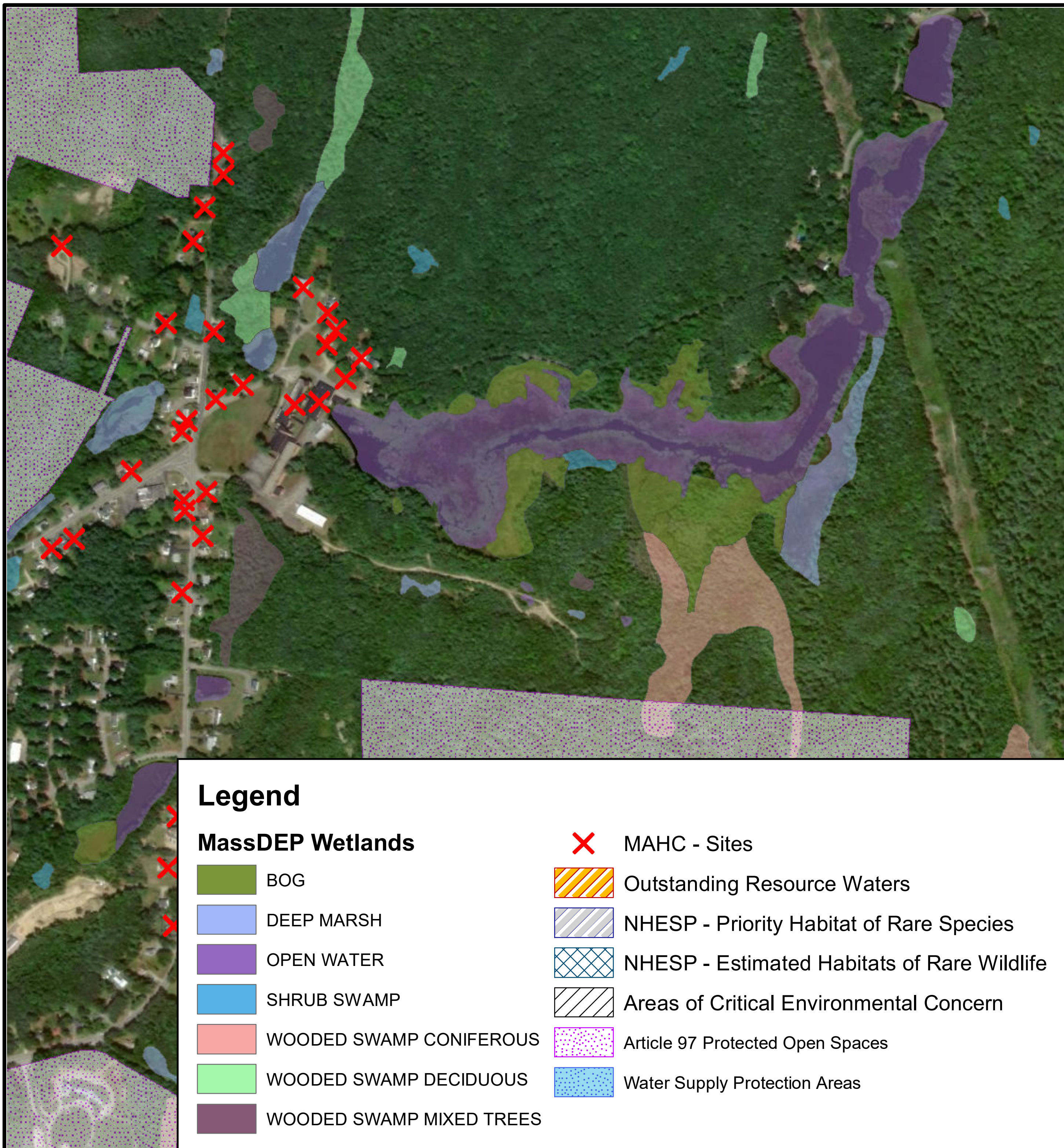
AERIAL PHOTOGRAPH PLAN
WHITES MILL POND DAM

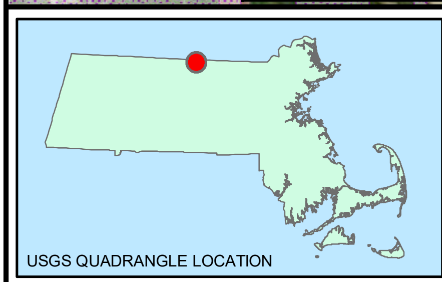
BRANDYWINE FARMS, INC.
WINCHENDON, MASSACHUSETTS

JOB NO.
01.0173542.00

FIGURE NO.
2

J:\19,000-20,999\19772\19772-40.MAT\Reports\lower roberts meadow res dam\Figures\Figure1-SiteLocus.mxd





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by :
esri

0 250 500 1,000 1,500
SCALE IN FEET

N
W E
S

PROJ. MGR.: DJS
DESIGNED BY: ANE
REVIEWED BY: CDC
OPERATOR: ANE

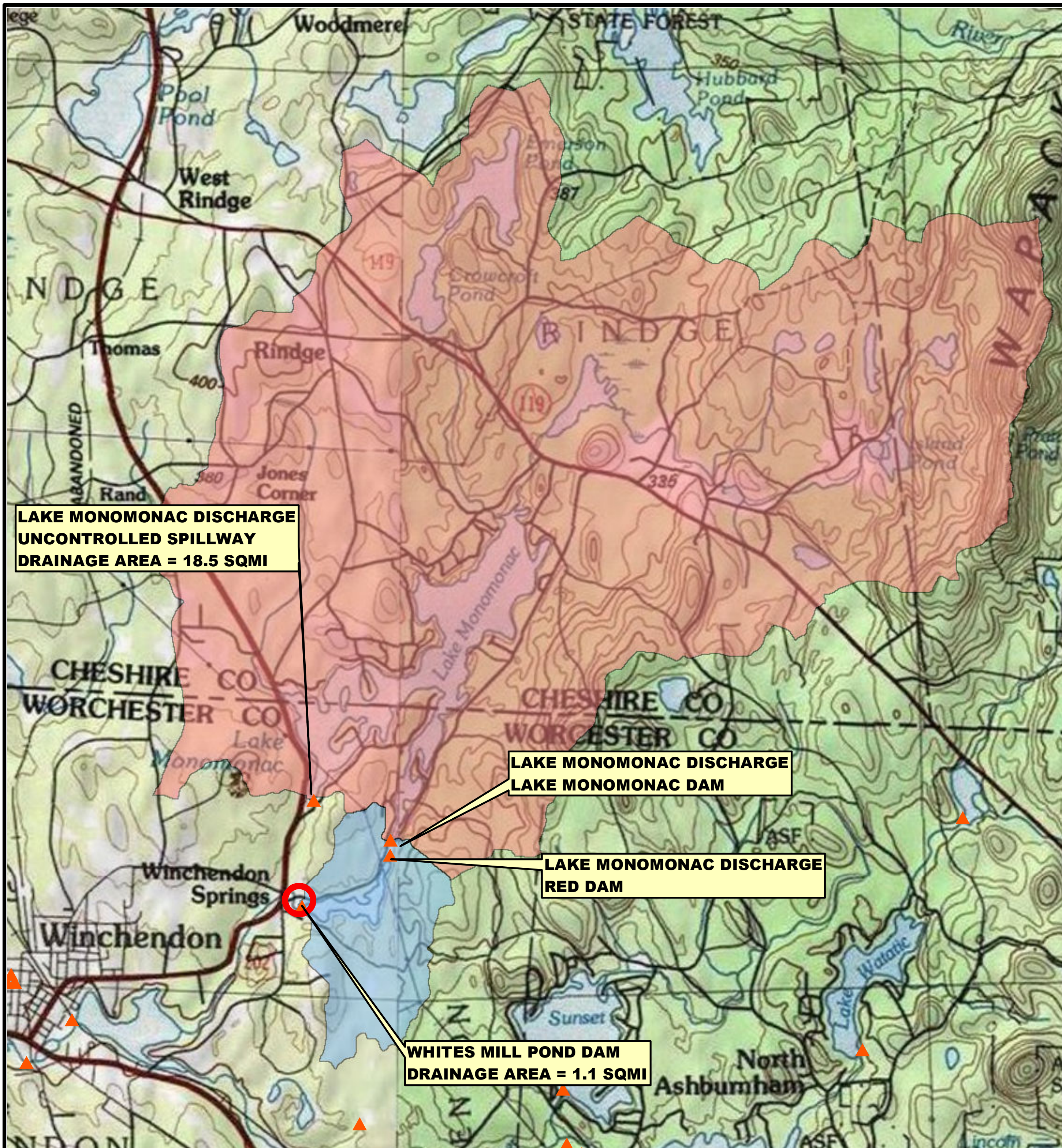
DATE: 11-15-2018

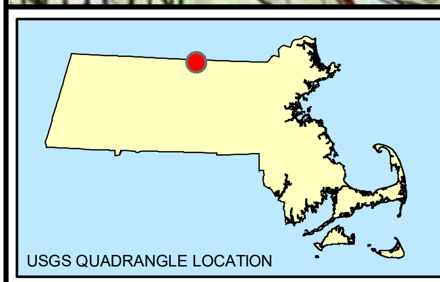
Environmental, Historical, and Cultural Resources

WHITES MILL POND DAM ENGINEERING SERVICES
155 MILL CIRCLE
WINCHENDON, MASSACHUSETTS

JOB NO.
01.0173542.10

FIGURE NO.
3





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

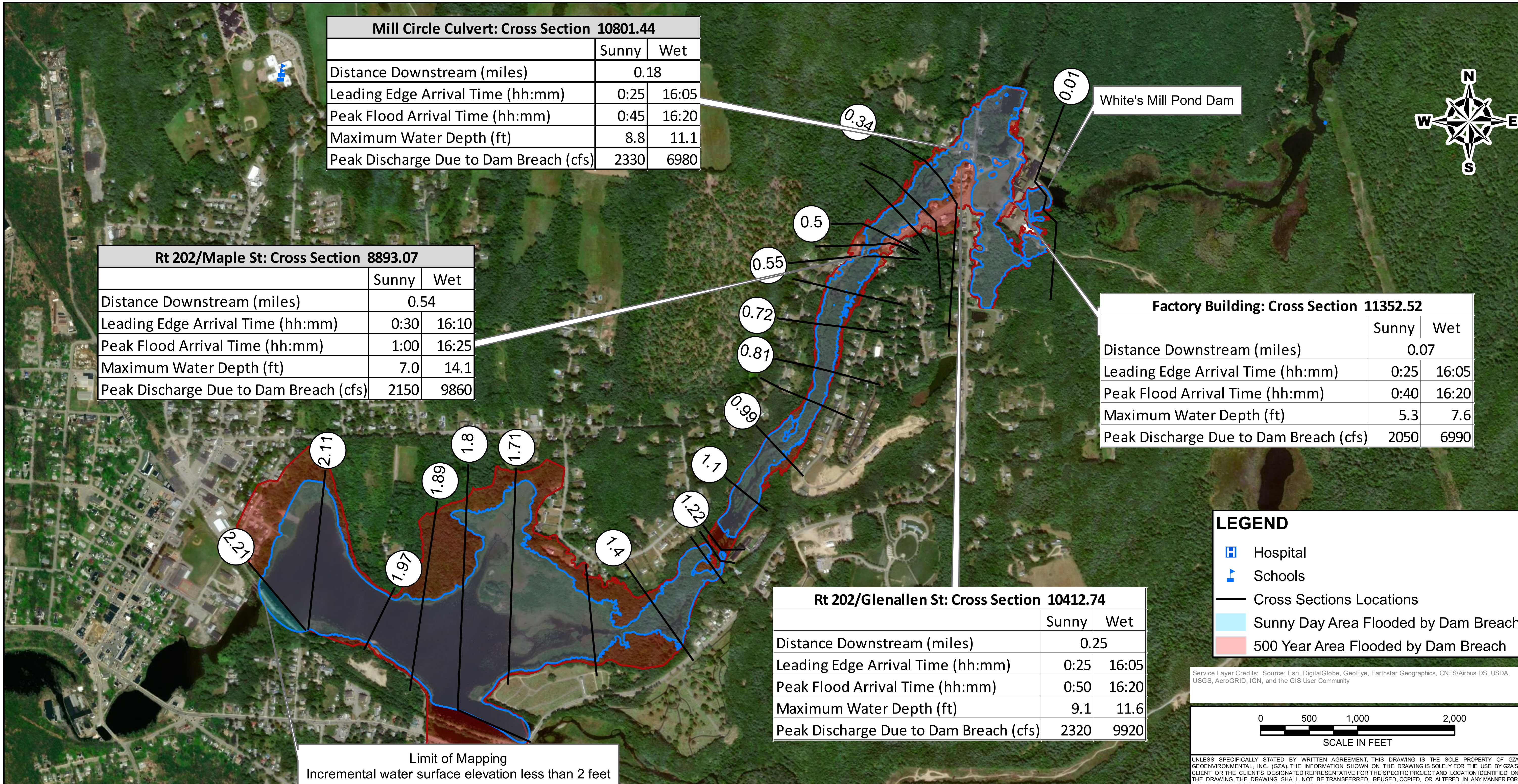
Data Supplied by :

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

PROJ. MGR.: DJS DESIGNED BY: ANE REVIEWED BY: CDC OPERATOR: ANE DATE: 12-21-2018	DRAINAGE AREA MAP	JOB NO. 01.0173542.10
	WHITES MILL POND DAM ENGINEERING SERVICES 155 MILL CIRCLE WINCHENDON, MASSACHUSETTS	FIGURE NO. **3**



Mill Circle Culvert: Cross Section 10801.44		
	Sunny	Wet
Distance Downstream (miles)	0.18	
Leading Edge Arrival Time (hh:mm)	0:25	16:05
Peak Flood Arrival Time (hh:mm)	0:45	16:20
Maximum Water Depth (ft)	8.8	11.1
Peak Discharge Due to Dam Breach (cfs)	2330	6980

Rt 202/Maple St: Cross Section 8893.07		
	Sunny	Wet
Distance Downstream (miles)	0.54	
Leading Edge Arrival Time (hh:mm)	0:30	16:10
Peak Flood Arrival Time (hh:mm)	1:00	16:25
Maximum Water Depth (ft)	7.0	14.1
Peak Discharge Due to Dam Breach (cfs)	2150	9860

Factory Building: Cross Section 11352.52		
	Sunny	Wet
Distance Downstream (miles)	0.07	
Leading Edge Arrival Time (hh:mm)	0:25	16:05
Peak Flood Arrival Time (hh:mm)	0:40	16:20
Maximum Water Depth (ft)	5.3	7.6
Peak Discharge Due to Dam Breach (cfs)	2050	6990

Rt 202/Glenallen St: Cross Section 10412.74		
	Sunny	Wet
Distance Downstream (miles)	0.25	
Leading Edge Arrival Time (hh:mm)	0:25	16:05
Peak Flood Arrival Time (hh:mm)	0:50	16:20
Maximum Water Depth (ft)	9.1	11.6
Peak Discharge Due to Dam Breach (cfs)	2320	9920

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 2,000
SCALE IN FEET

NOTES:
1. THE INUNDATED AREA SHOWN ON THIS MAP REFLECT EVENTS OF AN EXTREMELY REMOTE NATURE.
2. PEAK WATER ELEVATIONS SHOWN ARE APPROXIMATE AND SHOULD BE USED AS A GUIDE FOR ESTABLISHING EVACUATION ZONES.
3. ACTUAL PEAK WATER SURFACE ELEVATIONS WILL DEPEND ON ACTUAL FAILURE CONDITIONS AND MAY DIFFER FROM ELEVATIONS SHOWN ON THSE MAPS.
4. SUNNY DAY AND WET WEATHER CONDITIONS ARE SHOWN ON THIS MAP. SUNNY DAY FAILURE ASSUMES THE RESERVOIR AT SPILLWAY CREST THE WET WEATHER FAILURE ASSUMES THE RESERVOIR AT THE MAXIMUM PEAK WATER SURFACE RESULTING FROM THE 500-YEAR FLOOD AT ONET OF BREACH FORMATION
5. INFLOWS TO WHITES MILL POND DAM FROM LAKE MONOMONAC ARE ASSUMED TO BE 300 CFS FOR WET WEATHER CONDITIONS.
6. WHITNEY POND DAM EXPERIENCES OVERTOPPING DURING A 500-YEAR FLOOD EVENT. FURTHER INUNDATION EXPECTED DOWNSTREAM OF WHITNEY POND

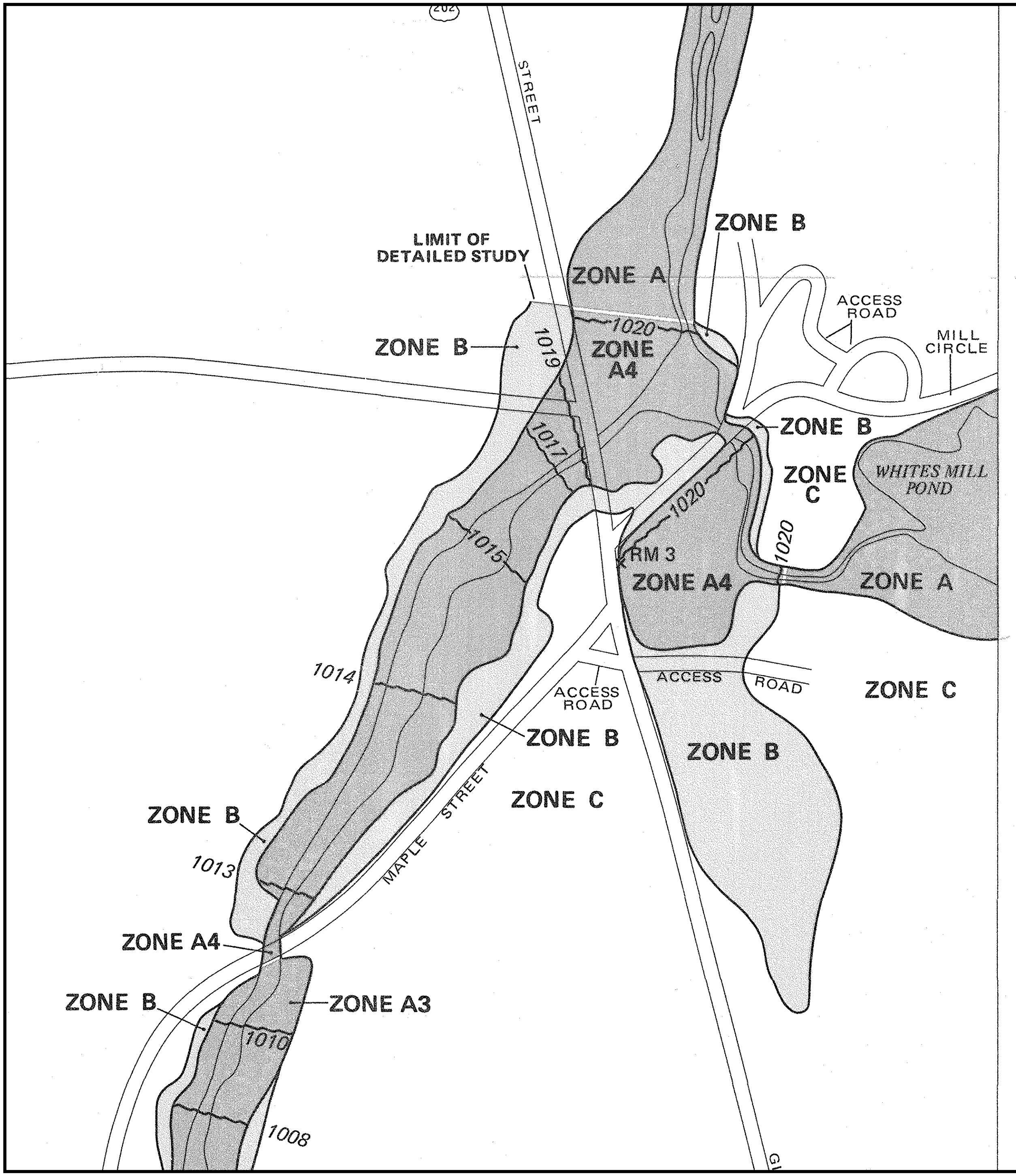
WHITE'S MILL POND DAM REMOVAL
155 MILL CIRCLE
WINCHENDON, MA

DAM FAILURE INUNDATION MAP

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS INC.
155 MILL CIRCLE
WINCHENDON, MA

PROJ MGR: DJS	REVIEWED BY: CWC	CHECKED BY: CR	FIGURE
DESIGNED BY: ANE	DRAWN BY: ANE	SCALE: 1 in = 1,000 ft	4
DATE: 02/14/2019	PROJECT NO: 01.0173542.10	REVISION NO: 1	



APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF WINCHENDON, MASSACHUSETTS WORCESTER COUNTY

PANEL 16 OF 30

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER

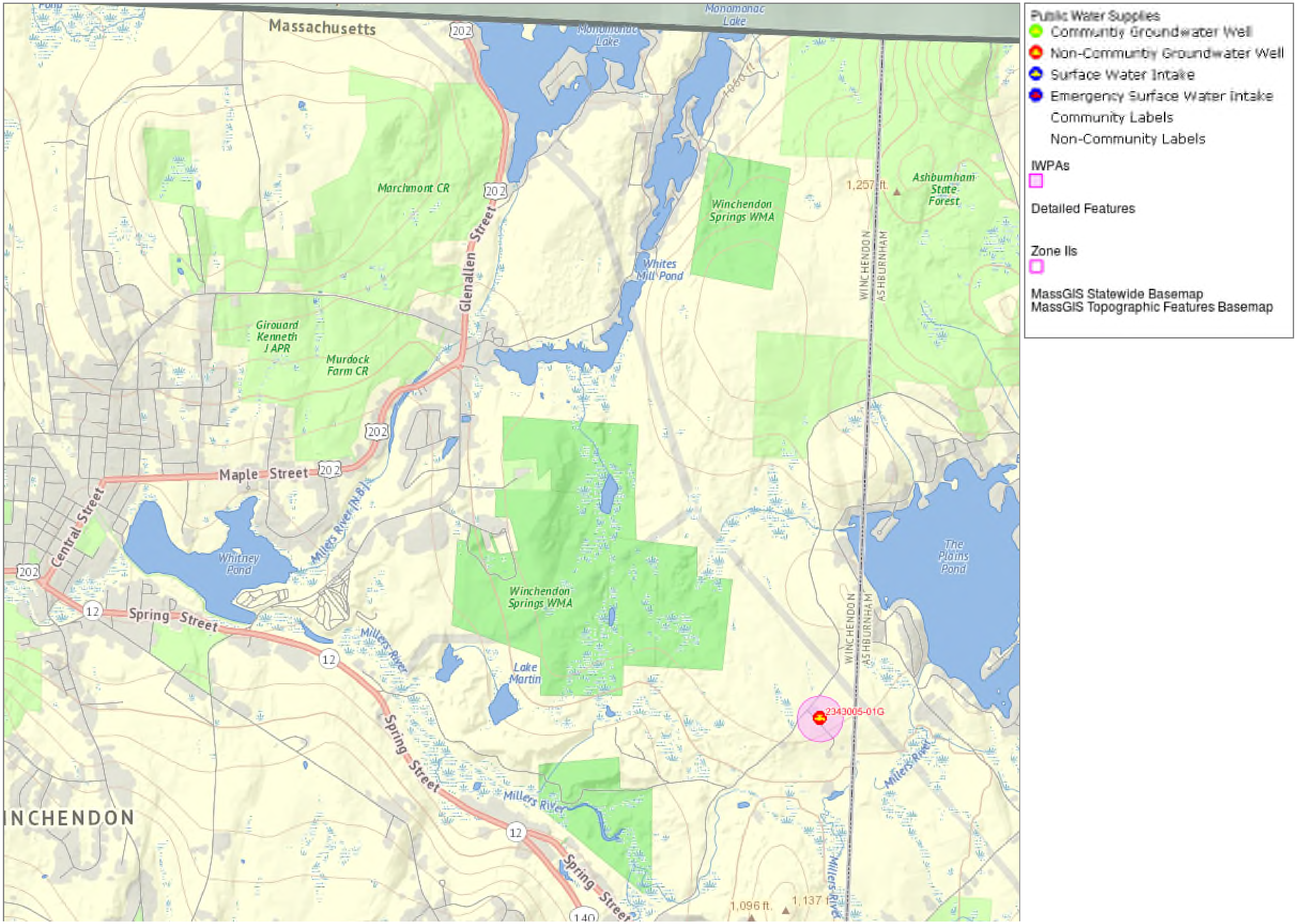
250348 0016 B

EFFECTIVE DATE:

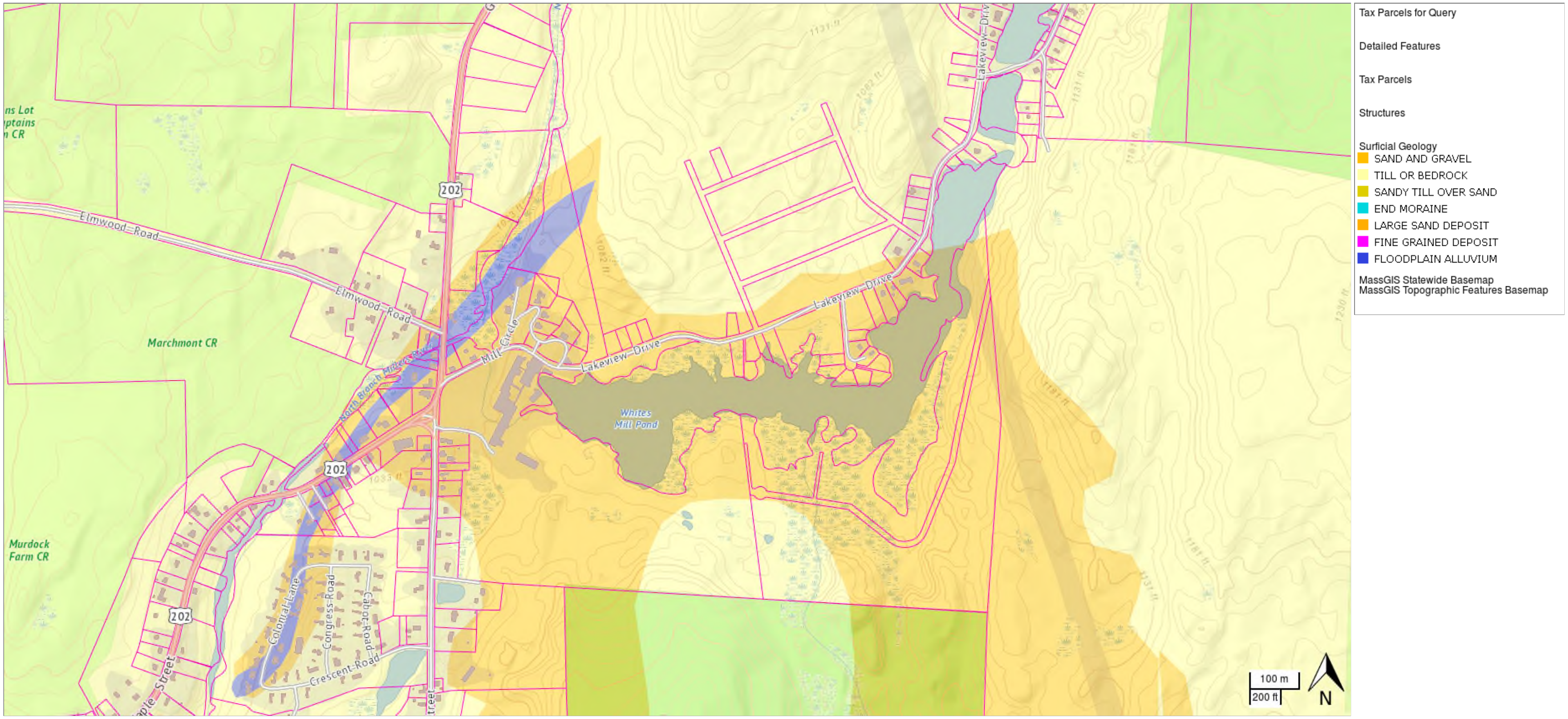
JUNE 15, 1982

Federal Emergency Management Agency

Whites Mill Pond Dam Nearby Wells



Whites Mill Pond Soils



WHITES MILL POND DAM

DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT

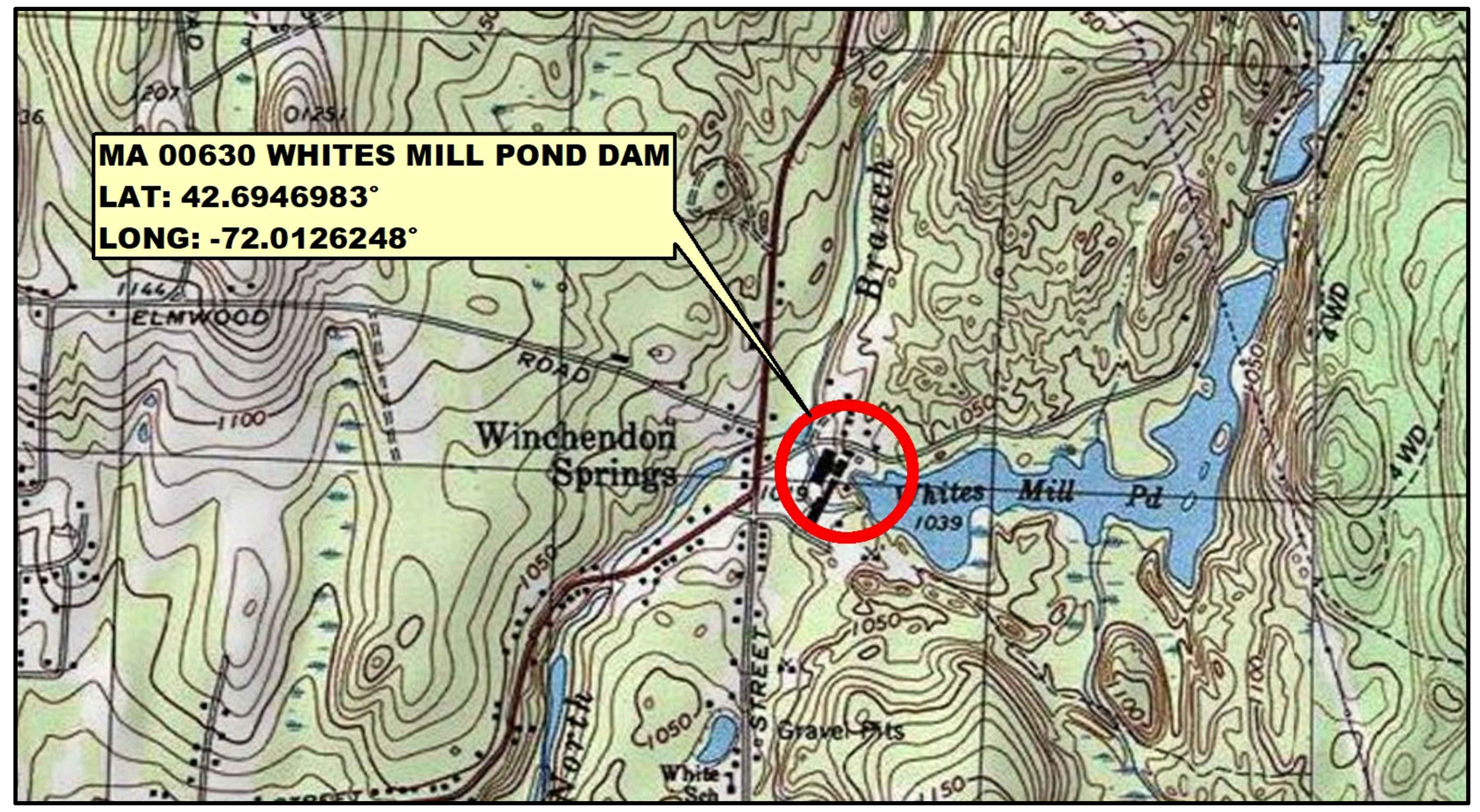
WINCHENDON, MASSACHUSETTS

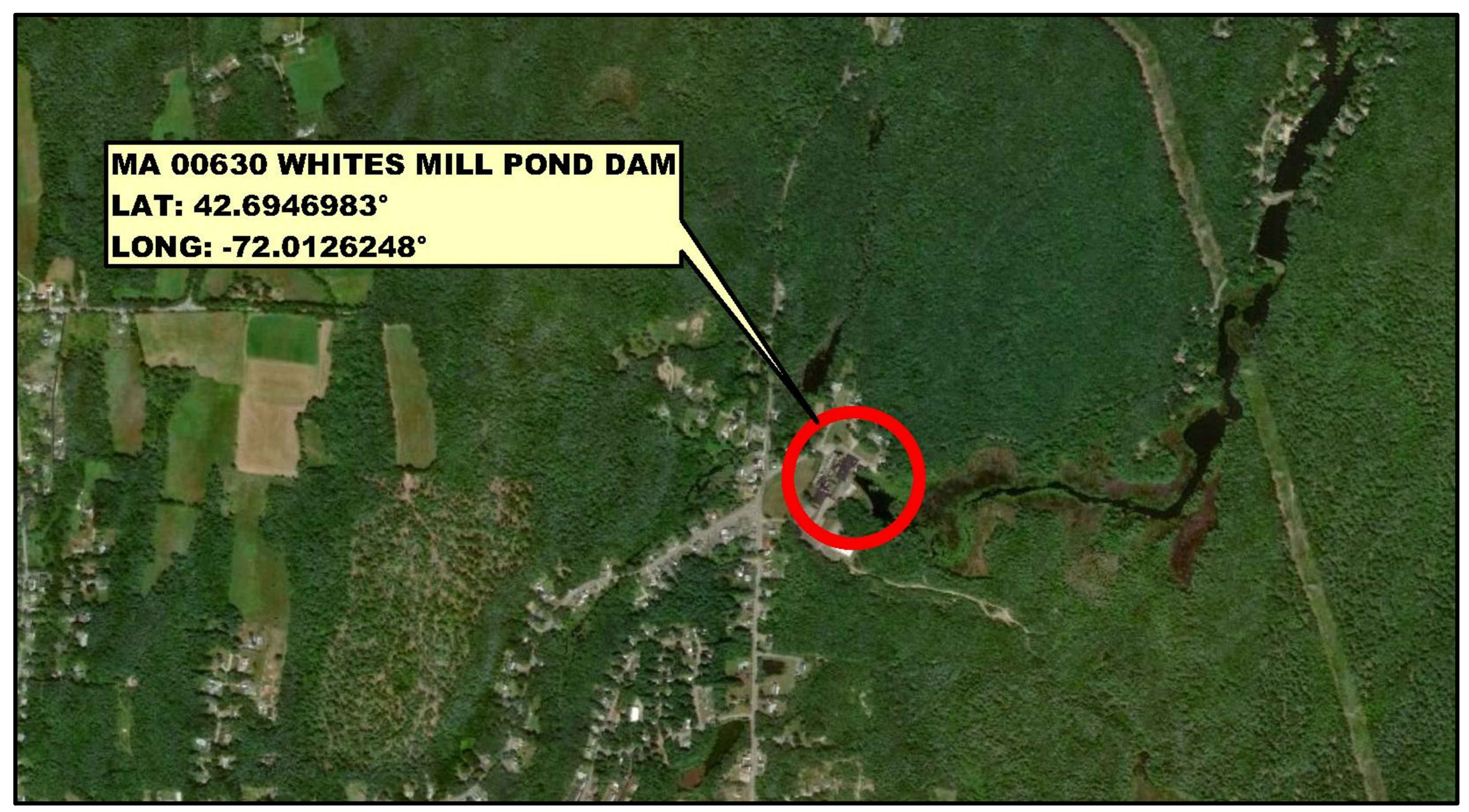
NID # MA 00630

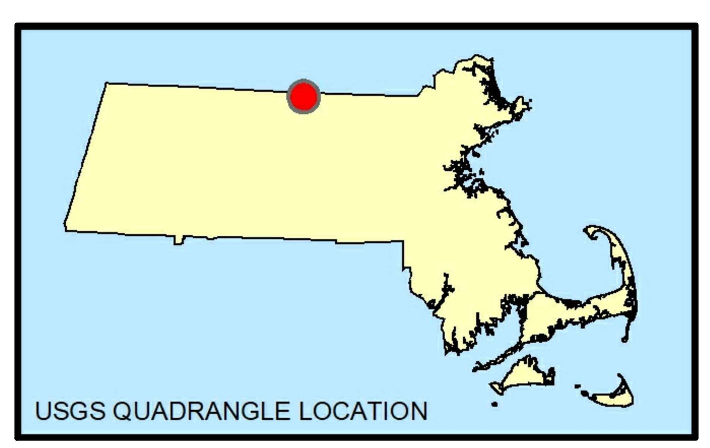
BRANDYWINE FARMS, INC.

PROJECT ENGINEER

GZA GEOENVIRONMENTAL, INC.
249 VANDERBILT AVENUE
NORWOOD, MA 02062







WINCHENDON, MASSACHUSETTS

PROJECT LOCUS MAP

SOURCE: USGS TOPOGRAPHIC QUADRANGLES
SCANNED BY MASSGIS AND DISTRIBUTED IN JUNE 2001

0 500 1000 2000 4000
SCALE: 1" = 1000 FEET

INDEX OF DRAWINGS

1. COVER SHEET, SITE LOCUS, AND INDEX OF DRAWINGS
2. LEGEND AND GENERAL NOTES
3. EXISTING CONDITIONS AND RESOURCE DELINEATION PLAN
4. SEDIMENT, SURFACE WATER SAMPLES & UPSTREAM LOCATION PLAN
5. SEDIMENTATION AND EROSION CONTROL, WATER CONTROL, SITE ACCESS AND PREPARATION PLAN
6. EXISTING AND PROPOSED PROFILES A & B
7. EXISTING AND PROPOSED PROFILES C & D
8. EXISTING AND PROPOSED PROFILES E
9. UPSTREAM PROFILE VIEW
10. PROPOSED CONDITIONS PLAN
11. MISCELLANEOUS NOTES AND DETAILS

CONTRACTOR MUST NOTIFY DIG-SAFE AT 811 OR 888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY CONSTRUCTION

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

COVER SHEET, SITE LOCUS, AND INDEX OF DRAWINGS

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		BRANDYWINE FARMS, INC.	
PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: AS NOTED	1
DATE: FEBRUARY 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PLAN REFERENCES

EXISTING SITE FEATURES WERE OBTAINED FROM THE FOLLOWING:

1. BASE MAP WAS DEVELOPED FROM AN ELECTRONIC CAD FILE PROVIDED BY DIPRETE ENGINEERING, DEDHAM, MASSACHUSETTS ENTITLED "TOPOGRAPHIC SURVEY," DATED MAY. 16, 2018, SURVEY PERFORMED NOVEMBER 11, 2016. ORIGINAL SCALE 1"=40'.
2. ELEVATIONS DEPICTED ON DRAWINGS ARE REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) IN UNITS OF FEET.
3. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) IN UNITS OF FEET.

GENERAL CONDITIONS

1. THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE ONLY, AND ARE NOT WARRANTED TO BE CORRECT. ALL EXISTING UTILITIES SHALL BE VERIFIED FOR SERVICE, SIZE, INVERT ELEVATION, LOCATIONS, ETC. PRIOR TO START OF ANY WORK IN THE GENERAL AREA. CONTRACTOR MUST NOTIFY DIG-SAFE AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY CONSTRUCTION. NOTIFY ENGINEER IN WRITING OF ANY AND ALL DISCREPANCIES PRIOR TO COMMENCING ANY WORK.
2. TEMPORARY BENCH MARKS AND STATION PK NAILS AND/OR STAKE/TACKS FOUND OR SET BY SURVEYOR. NO GUARANTEE IS MADE AS TO THE EXISTENCE OR ACCURACY OF SUCH MARKS AT THE TIME OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FINDING, VERIFYING, AND RE-SETTING (IF NECESSARY) CONTROL BENCHMARKS NECESSARY FOR THE WORK OF THE CONTRACT.
3. THE RESPONSIBILITY FOR SAFETY IN, ON, OR ABOUT THE JOBSITE SHALL BE THAT OF THE CONSTRUCTION CONTRACTOR. THESE DRAWINGS DO NOT INCLUDE COMPONENTS WHICH MAY BE NECESSARY FOR CONSTRUCTION SAFETY.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION, EXCEPT WHERE SPECIFICALLY DETAILED IN THE PLANS AND SPECIFICATIONS. LIKEWISE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SEQUENCE OF THE WORK, EXCEPT WHERE SPECIFICALLY DETAILED IN THE PLANS AND SPECIFICATIONS.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURFACE AND GROUNDWATER CONTROL DURING THE WORK OF THE CONTRACT. TEMPORARY WATER CONTROL MEASURES SHALL BE, AT MINIMUM, AS REQUIRED BY THE PROJECT PLANS, SPECIFICATIONS, AND PERMIT CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ADDITIONAL MEASURES NECESSARY FOR WATER CONTROL NECESSARY TO EXECUTE THE WORK OF THE CONTRACT "IN THE DRY." WATER CONTROL MEASURES ARE SUBJECT TO SPECIFIC LIMITS AND CONDITIONS.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY SEDIMENT AND EROSION CONTROL DURING THE WORK OF THE CONTRACT. TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE, AT MINIMUM, AS REQUIRED BY THE PROJECT PLANS, SPECIFICATIONS, AND PERMIT CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL MEASURES NECESSARY FOR THE PREVENTION OF SEDIMENT DISCHARGE OR EROSION AT THE SITE.
7. SPECIFIC AREAS HAVE BEEN DESIGNATED AND DELINEATED ON THE PLANS AS CONTRACTOR STAGING AREAS. THE CONTRACTOR SHALL USE THESE AREAS, AND THESE AREAS ONLY, FOR ON-SITE PARKING, OFFICE TRAILERS, EQUIPMENT AND MATERIAL STORAGE, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY NECESSARY SIGNAGE, FENCING, SAFETY, SEDIMENT/EROSION CONTROL, IMPROVEMENTS, RESTORATIONS ETC. IN THESE AREAS. AREA WITHIN THE LIMITS OF THE WORK MAY BE USED FOR TEMPORARY STORAGE, HAUL ROADS, PARKING, ETC.; HOWEVER, NO ADDITIONAL CONSIDERATION OR PAYMENT WILL BE MADE FOR WORK NECESSARY TO RE-GRADE SUCH AREAS OR RELOCATE ANY MATERIALS OR EQUIPMENT TEMPORARILY STORED WITHIN THE LIMITS OF THE WORK. IF THE CONTRACTOR REQUIRES AND IDENTIFIES ADDITIONAL STAGING AREAS ON THE OWNER'S PROPERTY, THE CONTRACTOR SHALL MAKE A WRITTEN REQUEST TO THE OWNER AND ENGINEER DESCRIBING THE NEED AND LOCATION OF THE PROPOSED AREA. NO GUARANTEE IS MADE THAT ADDITIONAL LAY-DOWN AREAS WILL BE MADE AVAILABLE.
8. THE CONTRACTOR SHALL RESTORE AREAS DISTURBED BY CONSTRUCTION AS PER THE PLANS AND SPECIFICATIONS. WHERE NO SPECIFIC INSTRUCTION IS GIVEN, RESTORATION SHALL BE TO THE ORIGINAL CONDITION AND AT NO ADDITIONAL COST TO THE OWNER.
9. THE CONTRACTOR IS SPECIFICALLY INFORMED THAT THE RESTORATION REQUIREMENT APPLIES TO ALL AREAS DISTURBED AS A RESULT OF THE PROJECT.
10. IN THE EVENT OF THE DISCOVERY OF THE PRESENCE OF AN ENDANGERED PLANT OR ANIMAL IN THE WORK AREA OR STAGING AREAS, ALL WORK IN THE IMMEDIATE AREA OF THE FIND SHALL STOP AND THE OWNER AND ENGINEER SHALL BE NOTIFIED IMMEDIATELY. WORK IN THE IMMEDIATE AREA AND/OR THE ENTIRE SITE (AT THE DISCRETION OF THE OWNER) SHALL BE DISCONTINUED UNTIL CLEARANCE IS GRANTED BY THE OWNER.
11. IN THE EVENT OF THE DISCOVERY OF A PREVIOUSLY UNKNOWN ARCHEOLOGICAL SITE, POTENTIAL CULTURAL ARTIFACTS OR RESOURCES, OR ANY OTHER UNUSUAL ITEMS OR CONDITIONS, ALL WORK IN THE IMMEDIATE AREA OF THE FIND SHALL STOP AND THE OWNER AND ENGINEER SHALL BE NOTIFIED IMMEDIATELY. WORK IN THE IMMEDIATE AREA SHALL BE DISCONTINUED UNTIL CLEARANCE IS GRANTED BY THE OWNER.
12. PRIOR TO THE START OF WORK, THE CONTRACTOR SHALL DEVELOP, SUBMIT, AND MAINTAIN AN EMERGENCY CONTACT LIST WITH NAMES AND PHONE NUMBERS (DAY AND NIGHT) OF ALL KEY PERSONNEL INVOLVED WITH THE PROJECT. THE LIST SHALL SPECIFICALLY INCLUDE THE PERSON FROM THE CONTRACTOR WHO SHALL BE RESPONSIBLE FOR ENVIRONMENTAL COMPLIANCE. THE LIST SHALL BE PROVIDED TO THE OWNER, ENGINEER, AND CONSERVATION COMMISSION AND UPDATED AS NEEDED.
13. IN THE EVENT OF UNANTICIPATED ENVIRONMENTAL AND/OR ARCHEOLOGICAL CONDITIONS WHICH PREVENT CONTINUED WORK, THE OWNER MAY DIRECT THE CONTRACTOR TO STOP WORK AND STABILIZE THE SITE. THE OWNER RESERVES THE RIGHT TO TERMINATE THE CONTRACT IN SUCH A CASE.
14. THE CONTRACTOR IS RESPONSIBLE FOR ALL PENALTIES AND DELAYS DUE TO NON-COMPLIANCE WITH PERMIT CONDITIONS.

GENERAL SCOPE AND ANTICIPATED CONSTRUCTION SEQUENCE

THE GENERAL SCOPE OF WORK INCLUDES THE ENGINEERED REMOVAL/DECOMMISSIONING OF THE DAM STRUCTURE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL MATERIAL, EQUIPMENT, AND LABOR NECESSARY TO CONSTRUCT THE PROJECT IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS AND AS SHOWN ON THE FINAL CONDITIONS PLAN. THE INTENT OF THE ANTICIPATED CONSTRUCTION SEQUENCE IS TO PROVIDE GUIDANCE TO THE CONTRACTOR TOWARDS MEETING THE TERMS AND CONDITIONS OF ENVIRONMENTAL PROTECTION PERMITS AND BEST MANAGEMENT PRACTICES. CERTAIN ASPECTS OF THE ANTICIPATED CONSTRUCTION SEQUENCE MAY BE ALTERED BY THE CONTRACTOR WITH APPROVAL FROM THE OWNER, EXCEPT AS REQUIRED BY PERMIT CONDITIONS AND SPECIFIC INSTRUCTIONS CONTAINED IN THE SPECIFICATIONS. THE FOLLOWING LIST IS NOT COMPREHENSIVE AND DOES NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR EXECUTING ALL REQUIRED WORK AS PER THE CONTRACT PLANS AND SPECIFICATIONS.

1. MOBILIZE TO THE SITE AND DEPLOY TEMPORARY SEDIMENT AND EROSION CONTROLS ASSOCIATED WITH THE ENTIRE PROJECT, INCLUDING PERIMETER EROSION AND SEDIMENT CONTROL BARRIERS, TURBIDITY CURTAIN, AND OTHER BMPS. NOTE THAT SOME BMPS MAY NOT BE ABLE TO BE DEPLOYED UNTIL POND DRAWDOWN HAS BEEN ACCOMPLISHED.
2. COORDINATE WITH OWNER'S REPRESENTATIVE REGARDING SELECTION OF LIMITED NUMBER OF TREES (IF ANY) TO BE CLEARED AND REMOVED TO PROVIDE SITE ACCESS NEEDED FOR THE EXECUTION OF THE WORK. NO TREE REMOVAL MAY BEGIN UNTIL MUTUAL AGREEMENT BETWEEN THE OWNER AND THE CONTRACTOR HAS BEEN OBTAINED AND APPROVAL HAS BEEN GRANTED BY THE CONSERVATION COMMISSION. REMOVE STUMPS ONLY FROM AREAS WHERE EXCAVATION WILL OCCUR. TOPSOIL TO REMAIN TO THE EXTENT POSSIBLE.
3. NOTIFY OWNER, ENGINEER, AND CONSERVATION COMMISSION, SCHEDULE AND CONDUCT SITE WALK TO INSPECT SEDIMENT AND EROSION CONTROL MEASURES AND TREES MARKED FOR SELECTIVE CLEARING. MODIFY SEDIMENT AND EROSION CONTROL MEASURES AS REQUIRED. WORK MAY PROCEED ONCE APPROVAL HAS BEEN GRANTED FROM THE CONSERVATION COMMISSION.
4. REMOVE AND LAWFULLY DISPOSE OF EXISTING SPILLWAY FOOTBRIDGE.
5. SANDBAG PORTION OF THE SPILLWAY CREST SLAB AS PER WATER CONTROL PLAN AND PROGRESSIVELY REMOVE CONCRETE SPILLWAY SLAB.
6. BEGIN CONTROLLED DRAWDOWN OF THE POND AS PER THE WATER CONTROL PLAN. PLACE COFFERDAM MATERIALS AS NEEDED TO TEMPORARILY DIVERT WATER DURING CONSTRUCTION.
7. REMOVE STONES FROM THE EMBANKMENT MASONRY RETAINING WALLS AND STOCKPILE FOR ON-SITE RE-USE.
8. EXCAVATE DAM EMBANKMENT TO FORM BREACH. SHAPE CHANNEL AS PER GRADING PLAN, INCLUDING TYPICAL CHANNEL AND OVERBANKS. COORDINATE WITH OWNER'S REPRESENTATIVE REGARDING BEDROCK SURFACE AND ADJUSTMENTS TO GRADING TO ACCOUNT FOR BEDROCK ELEVATION WHERE ENCOUNTERED.
9. PERIODICALLY MONITOR SEDIMENT VOLUMES BEHIND DOWNSTREAM CULVERTS AND REMOVE AS NEEDED. REDISTRIBUTE MATERIAL ON UPSTREAM SLOPE OF FORMER EMBANKMENT.
10. PLACE COIR LOGS AND RANDOM BOULDERS IN CHANNEL
11. PLACE STOCKPILED STONES FOR PERMANENT EROSION CONTROL AND SLOPE STABILIZATION, AS INDICATED.
12. FILL, STABILIZE, AND PERMANENTLY DECOMMISSION EXISTING SLUICEWAY.
13. LOAM EXCAVATED AREAS OF OVERBANKS. SEED OVERBANKS, INCLUDING IMMEDIATELY UPSTREAM OF THE FORMER EMBANKMENT.
14. PLACE PEDESTRIAN PATH MATERIAL
15. RESTORE AND SEED ALL REMAINING DISTURBED AREAS. PROVIDE TEMPORARY STABILIZATION TO ALL SEEDED AREAS.
16. REMOVE EQUIPMENT AND TEMPORARY FACILITIES. COMPLETE ALL OTHER SITE STABILIZATION.
17. NOTIFY OWNER, ENGINEER, AND CONSERVATION COMMISSION OF FINAL STABILIZATION. SCHEDULE AND CONDUCT SITE INSPECTION. MAKE ADJUSTMENTS AS REQUIRED.
18. UPON APPROVAL BY CONSERVATION COMMISSION, REMOVE PERIMETER EROSION CONTROL BARRIERS. NOTE THAT COMPOST FILTER SOCKS BY BE DISPERSED IN PLACE.
19. COMPLETE DEMOBILIZATION.

GENERAL SEDIMENT AND EROSION CONTROL NOTES

1. TEMPORARY CONTROL OF EROSION AND SEDIMENT DISCHARGE IS REQUIRED THROUGHOUT THE DURATION OF THE PROJECT AND UNTIL FINAL STABILIZATION IS ACHIEVED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT THE AREAS WITHIN THE LIMITS OF WORK AND BEYOND FROM SEDIMENT AND/OR POLLUTANTS ORIGINATING FROM ANY WORK DONE ON OR IN SUPPORT OF THE PROJECT, INCLUDING SEDIMENT DUE TO EROSION FROM STORMWATER RUNOFF.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES NECESSARY TO EXECUTE AND COMPLETE THE WORK OF THE CONTRACT, IN COMPLIANCE WITH THE TERMS AND CONDITIONS CONTAINED IN THE CONTRACT, PROJECT PERMITS AND ALL STATE AND LOCAL ORDINANCES THAT APPLY. CONTROLS SHOWN ON THE CONTRACT DRAWINGS SHALL BE CONSIDERED MINIMUM REQUIREMENTS. THE CONTRACTOR SHALL EMPLOY WHATEVER SUPPLEMENTARY MEASURES NECESSARY TO PROTECT WETLANDS, WATERS, AND ADJACENT AREAS FROM DISTURBANCE OR DISCHARGE OF SEDIMENTS.
3. THE CONTRACTOR SHALL NOT DISTURB VEGETATED AREAS OUTSIDE OF THE WORK ZONE, EXCEPT TO THE MINIMUM EXTENT NECESSARY FOR ACCESS AND ACCOMPLISHMENT OF THE WORK SHOWN.
4. ALL NECESSARY PRECAUTIONS SHALL BE TAKEN TO PREVENT MIGRATION INTO WATER BY SILT, SEDIMENT, FUELS, SOLVENTS, LUBRICANTS, CONCRETE, OR ANY OTHER POLLUTANTS ASSOCIATED WITH CONSTRUCTION PROCEDURES.
5. ACTUAL LOCATIONS OF EROSION CONTROLS AND BEST MANAGEMENT PRACTICES (BMPS) MAY VARY DUE TO FIELD CHANGES, ONGOING CONSTRUCTION, ACCESS NEEDS, WEATHER, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING THESE CHANGES AND ADJUSTING EROSION CONTROLS AND BMP LOCATIONS ACCORDINGLY. IN PARTICULAR, THE CONTRACTOR SHALL COORDINATE THE INSTALLATION AND RELOCATION OF BMPS WITH PROJECT PHASING, AS NECESSARY.
6. ALL EROSION CONTROLS AND BMPS SHALL REMAIN IN PLACE, EXCEPT AS OTHERWISE NECESSARY, UNTIL CONSTRUCTION IS COMPLETED AND FINAL STABILIZATION IS ACHIEVED.
7. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING A PROJECT-SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWPPP) PRIOR TO THE START OF CONSTRUCTION. A COPY OF THE SWPPP SHALL BE KEPT ON SITE AT ALL TIMES.
8. EXCAVATED MATERIALS SUSPECTED OF CONTAMINATION SHALL BE SEPARATED AND STOCKPILED ON SITE FOR EVALUATION BY THE ENGINEER.
9. ADDITIONAL EROSION CONTROL BARRIERS SHALL BE INSTALLED AT THE DIRECTION OF THE ENGINEER TO MINIMIZE THE THREAT OF ADVERSE IMPACT DURING THE CONSTRUCTION PROCESS. AN ADEQUATE SUPPLY OF REPLACEMENT EROSION CONTROL BARRIERS WILL BE AVAILABLE ON-SITE FOR EMERGENCY PURPOSES.

10\. SEDIMENT AND EROSION CONTROLS AND BMPS SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND CONSERVATION COMMISSION. ALL CONTROLS AND BMPS SHALL BE SUBJECT TO INSPECTION BY THE OWNER AND HIS REPRESENTATIVE AT ANYTIME THEREAFTER.

10\. SOME SEDIMENT MIGRATION IS EXPECTED DURING AND FOLLOWING CONSTRUCTION. TURBIDITY AND SEDIMENT RELEASE TO BE MANAGED AS APPROPRIATE.

11\. PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BMPS ARE REQUIRED. ALL CONTROLS AND BMPS SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.5 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE CONTRACTOR WILL BE REQUIRED TO KEEP A WRITTEN, UPDATED SITE MAINTENANCE LOG DOCUMENTING INSPECTION AND MAINTENANCE ACTIVITY.

12\. REPORTING AND RECORD KEEPING: IN ADDITION TO THE AFOREMENTIONED INSPECTION AND MAINTENANCE PROCEDURES, THE CONTRACTOR IS TO KEEP A RECORD OF THE FOLLOWING INFORMATION:

- THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR IN A PARTICULAR AREA;
- THE DATES WHEN CONSTRUCTION ACTIVITIES CEASE IN AN AREA, TEMPORARILY OR PERMANENTLY;
- THE DATES WHEN AN AREAS IS STABILIZED, TEMPORARILY OR PERMANENTLY;
- A COPY OF THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND ALL REPORTS GENERATED DURING CONSTRUCTION ACTIVITIES ARE TO BE RETAINED AS REQUIRED BY REGULATION.

13\. SITE CLEARING: PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS SHALL BE INSTALLED AS INDICATED ON THE PLANS. ALONG THE OUTER LIMIT OF DISTURBANCE. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO CLEARING IS ALLOWED OUTSIDE THE WORK AREA WITHOUT PRIOR APPROVAL FROM THE OWNER.

14\. SEDIMENT AND EROSION CONTROL BARRIERS: SEDIMENT/EROSION CONTROL BARRIERS ARE INTENDED TO TRAP SEDIMENT TRANSPORTED BY RUNOFF BEFORE IT REACHES THE DRAINAGE FEATURES, WATERBODIES, OR WETLANDS, IN ADDITION TO AREAS WHERE HIGH RUNOFF VELOCITIES OR HIGH SEDIMENT LOADS ARE EXPECTED. SAID CONTROLS ARE TO BE REPLACED AS NEEDED AS DETERMINED BY PERIODIC FIELD INSPECTIONS.

15\. DUST CONTROL.: DUST CONTROL SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS.

16\. STAGING AREAS: THE CONTRACTOR MAY ESTABLISH LAYDOWN AND STAGING AREAS IN WHICH TO STORE EQUIPMENT AND MATERIALS ONLY IN THOSE AREAS SPECIFICALLY INDICATED ON THE CONTRACT DRAWINGS OR SPECIFICATIONS OR AS DIRECTED BY THE OWNER. LOCATION OF ADDITIONAL AREAS, IF NEEDED, SHALL BE COORDINATED WITH AND SHALL BE SUBJECT TO APPROVAL BY THE OWNER. STAGING AREAS SHALL BE ENCIRCLED WITH SEDIMENT/EROSION CONTROL BARRIERS AS APPROPRIATE. STAGING AREAS SHALL BE ENCIRCLED BY ORANGE PLASTIC TEMPORARY CONSTRUCTION FENCING OR OTHER MEANS OF DELINEATING THE AREAS. AT THE CONTRACTOR'S OPTION, ADDITIONAL OR MORE STURDY BARRIERS MAY BE INCLUDED.

17\. STOCKPILED MATERIALS: STOCKPILES OF SOIL IN AREAS CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH SEDIMENT/EROSION CONTROL WHERE POSSIBLE. OTHER ALTERNATIVES UTILIZED MAY INCLUDE GRAVEL FILTER BERMS OR SIMILAR MEASURES LAID AROUND THE PERIMETER OF THE STOCKPILE.

18\. TEMPORARY STABILIZATION: WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT/EROSION CONTROL BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MATTING, SUCH AS HAY, JUTE, WOOD FIBER, OR BIO OR PHOTO-DEGRADABLE MESH. IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER. IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AT NO ADDITIONAL COST TO THE OWNER. LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

19\. UPSTREAM CHANNEL FORMATION: THE INTENT OF THE PROJECT IS TO UTILIZE LIMITED ACTIVE EXCAVATION UPSTREAM OF THE FORMER DAM TO ESTABLISH A PILOT CHANNEL WHICH WILL SERVE TO GUIDE ADDITIONAL UPSTREAM NATURAL CHANNEL FORMATION. IT IS EXPECTED THAT DOWNSTREAM SEDIMENT TRANSPORT WILL BE ASSOCIATED WITH THIS PROCESS. MONITOR DOWNSTREAM AREAS FOR EXCESSIVE SEDIMENT ACCUMULATION INCLUDING STREAM CHANNEL AT CULVERT DOWNSTREAM OF THE DAM. IF EXCESSIVE ACCUMULATION IS NOTED, REMOVE BUILDUP OF SEDIMENT AND TRANSPORT TO THE LAYDOWN/DISPOSAL AREA.

20\. SITE RESTORATION: STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, USING HYDRO-SEEDING, BROADCASTING, OR OTHER APPROVED TECHNIQUES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. UNLESS OTHERWISE SHOWN ON DRAWINGS, RESTORATION SHALL CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 6 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY, LIMED, FERTILIZED, GRADED, AND SCARIFIED. WHERE NOT OTHERWISE SPECIFIED, DISTURBED UPLAND AREAS SHALL BE SEEDED WITH AN APPROVED SEED MIX AND AT A RATE SHOWN ON THE PROJECT PLANS AND SPECIFICATIONS. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING.

RESTORED AREAS SHALL BE ROLLED AND THEN APPROPRIATELY MULCHED OR COVERED.

FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED UPLAND AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED UPLAND SURFACES AND PLANTINGS, INCLUDING WATERING, FERTILIZING, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

ALL SLOPES WITHIN THE PROJECT LIMITS WILL BE STABILIZED WITHIN 2 WEEKS OF THE FINAL GRADING. AREAS FAILING TO BE STABILIZED SHALL BE RE-GRADED AND CONTINUED TO BE STABILIZED AS NEEDED.

21\. WETLAND ESTABLISHMENT: WETLAND ESTABLISHMENT IN THE FORMER POND AREA SHALL BE IMPLEMENTED AS PER THE PROJECT SPECIFICATIONS. THE GENERAL APPROACH SHALL INVOLVE NATURAL RECOLONIZATION WITH LIMITED SUPPLEMENTAL SEEDING, POST-COMPLETION MONITORING, AND AN INVASIVE SPECIES CONTROL PLAN.

WATER CONTROL NOTES

1. TEMPORARY WATER CONTROL BY THE CONTRACTOR SHALL BE PERFORMED AS SPECIFIED IN THE CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY WATER CONTROL, SURFACE WATER AND GROUNDWATER CONTROL, NECESSARY TO EXECUTE AND COMPLETE THE WORK OF THE CONTRACT, SUBJECT TO THE RESTRICTIONS CONTAINED IN THE CONTRACT AND PROJECT PERMITS. CONTROLS SHOWN IN THE CONTRACT DRAWINGS AND MENTIONED IN THE TECHNICAL SPECIFICATIONS SHALL BE CONSIDERED MINIMUM REQUIREMENTS. THE CONTRACTOR SHALL EMPLOY WHATEVER SUPPLEMENTARY MEASURES NECESSARY TO PROTECT THE SITE AND THE WORK.
3. ALL TEMPORARY WATER CONTROL MEASURES SHALL BE IMPLEMENTED IN CONJUNCTION WITH APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SO AS TO MINIMIZE TO THE GREATEST EXTENT POSSIBLE RELEASE OF SEDIMENT INTO WATER BODIES AND POTENTIAL EROSION OF SOIL.
4. THE CONTRACTOR IS HEREBY NOTIFIED THAT STRICT ADHERENCE TO THE WATER CONTROL CONDITIONS AND LIMITATIONS AND USE OF BEST MANAGEMENT PRACTICES IS CRITICAL TO PREVENT POSSIBLE IMPACTS TO SENSITIVE ENVIRONMENTAL AREAS.
5. FLOW DOWNSTREAM OF DAM SHALL BE MAINTAINED AT ALL TIMES.
6. WATER SURFACE ELEVATION IN THE FORMER IMPOUNDMENT SHALL BE LIMITED TO NO GREATER THAN APPROXIMATE PRIOR NORMAL POOL ELEVATIONS.
7. THE COFFERDAMS SHALL NOT BE CONSTRUCTED OF UNCONTAINED FILL (SOIL, ROCK, OR ANY OTHER LOOSE MATERIAL).
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATION AND SUBMISSION OF A CONSTRUCTION-PHASE FLOOD CONTROL / EMERGENCY RESPONSE PLAN.
9. ANY TEMPORARY PUMPS UTILIZED AT THE SITE MUST BE PROPERLY BAFFLED AGAINST EXCESSIVE NOISE. PUMPS OR GENERATORS WHICH UTILIZE LIQUID FUEL MUST BE PLACED WITHIN AN IMPERMEABLE SECONDARY CONTAINMENT AREA WITH SUFFICIENT CAPACITY TO CONTAIN THE FULL VOLUME OF THE FUEL TANK.
10. WATER PUMPED FROM EXCAVATIONS MUST BE PASSED THROUGH A PUMPED WATER FILTER BAG OR OTHER SUCH BEST MANAGEMENT PRACTICE (BMP) FEATURE PRIOR TO BEING DISCHARGED BACK TO A SURFACE WATER BODY. DISCHARGE WATER SHALL MEET APPROPRIATE WATER QUALITY STANDARDS.
11. PUMPED WATER DISCHARGE AREAS MUST BE PROPERLY PROTECTED TO PREVENT EROSION BY HIGH VELOCITY FLOW.

ANTICIPATED SEQUENCE FOR WATER CONTROL

1. PULL ALL STOPLOGS AND REMOVE ALL DEBRIS FROM SPILLWAY TO INITIATE POND DEWATERING PROCESS.
2. SANDBAG IN FRONT AND AROUND ONE-THIRD TO ONE-HALF OF LEFT (SOUTH) END OF SPILLWAY TO DIVERT WATER AWAY FROM THAT PORTION OF THE SPILLWAY
3. DEMOLISH AND REMOVE CONCRETE SLAB AND MASONRY INSIDE COFFERDAM AREA TO CREATE NOTCH FOR FLOW.
4. REMOVE SANDBAGS TO ALLOW FLOW TO PASS THROUGH NEWLY CREATED NOTCH IN SPILLWAY AND CONTINUE POND DEWATERING PROCESS.
5. RELOCATE SANDBAG COFFERDAM TO ISOLATE REMAINING RIGHT (NORTH) PORTION OF SPILLWAY.
6. DEMOLISH AND REMOVE REMAINING CONCRETE SLAB AND MASONRY.
7. EXCAVATE LEFT (SOUTH) END OF EMBANKMENT AT SPILLWAY TO CREATE DEEPER TEMPORARY CHANNEL TO PASS FLOW OUT OF POND AREA. TEMPORARILY STABILIZE EXCAVATED CHANNEL AS NEEDED.
8. REMOVE SANDBAGS TO ALLOW FLOW TO PASS THROUGH NEWLY CREATED TEMPORARY CHANNEL AND CONTINUE POND DEWATERING PROCESS.
9. RELOCATE SANDBAGS AS NEEDED TO FACILITATE MAIN BREACHING OF THE EMBANKMENT AND PERMANENT CHANNEL CONSTRUCTION.
10. UTILIZE SANDBAGS AS NEEDED TO DIVERT WATER IN DOWNSTREAM CHANNEL TO PERMIT TIE-IN WITH NEW CHANNEL.
11. UPON COMPLETION OF NEW PERMANENT CHANNEL, REMOVE UPSTREAM COFFERDAM TO ALLOW FLOW INTO NEW PERMANENT CHANNEL.
12. FILL TEMPORARY CHANNEL TO MEET FINAL GRADES.

LEGEND

	WETLAND RESOURCE
WF –A1	WETLAND FLAG
	CATCH BASIN
	DRAIN MANHOLE
D	DRAIN LINE
	SEWER MANHOLE
SS	SEWER LINE
G	GAS LINE
E	ELECTRIC LINE
T	TELEPHONE LINE
W	WATER LINE
	WATER VALVE
OHE	OVERHEAD WIRES
	ELECTRIC VAULT
	LIGHT POLE
EHH	ELECTRIC HAND HOLE
E/T	UNDERGEROUND ELECTRIC & TELEPHONE LINE
XXX	CONTOUR LINE (MNR)
XXX	CONTOUR LINE (MJR)
×78.0	SPOT GRADE
	HYDRANT
	FENCE
	GRAVEL PATH
	TREE LINE
	TREES
	STONE WALL
	APPROXIMATE LIMITS OF LAND UNDER WATER

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

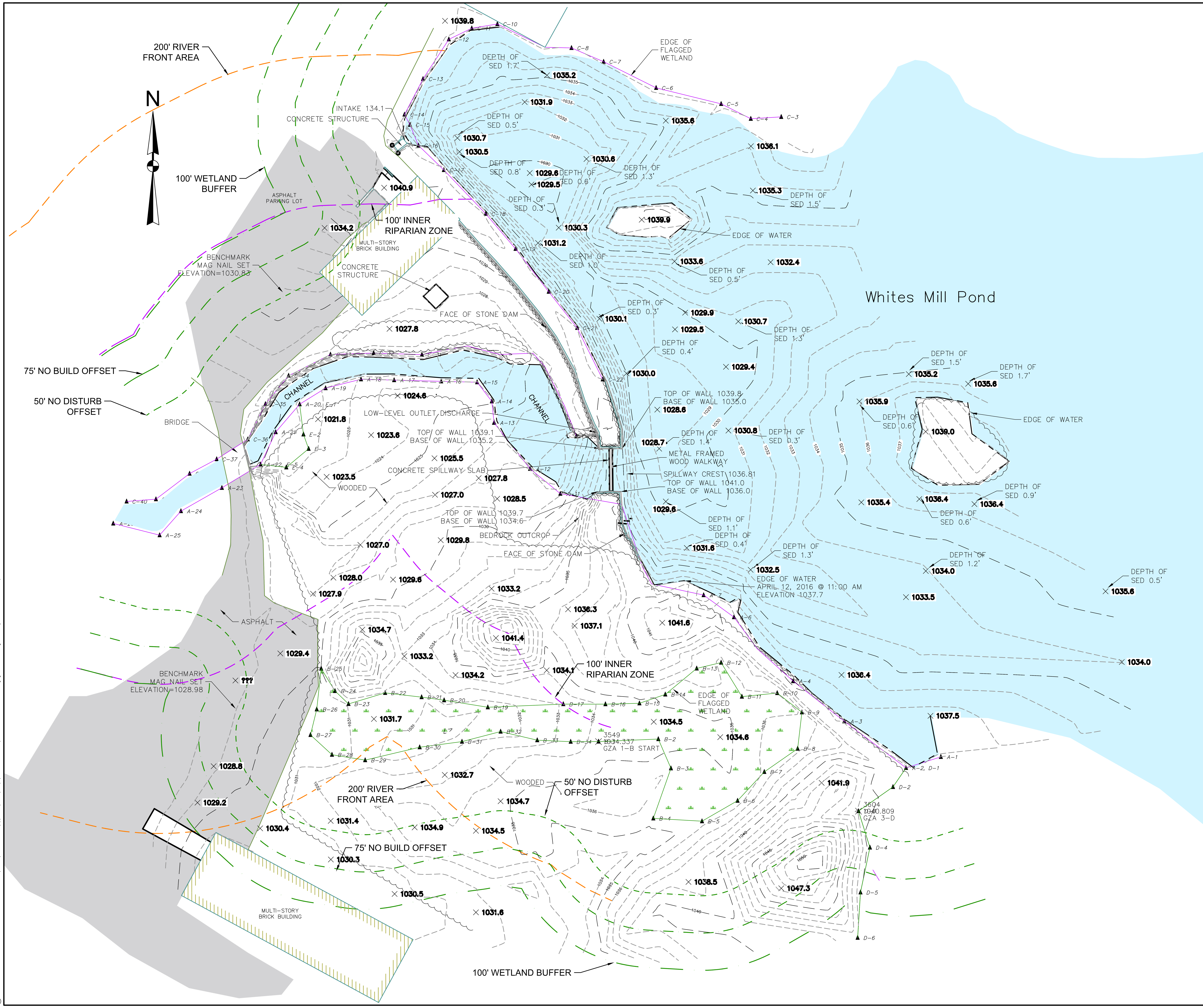
WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

LEGEND AND GENERAL NOTES

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE:	
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO. 2



LEGEND

- EXISTING 1' MINOR CONTOUR
- EXISTING 5' MAJOR CONTOUR
- DEPTH OF SED 0.6' — DEPTH OF SEDIMENT AS MEASURED WITH PROBE (FEET)
- B-1 — RESOURCE AREA DELINEATION - LIMIT OF BVW
- A-1 — RESOURCE AREA DELINEATION - TOP OF BANK OF PERENNIAL STREAMS AND RIVERS
- TREE/ VEGETATION LINE
- EXISTING BUILDING
- BORDERING VEGETATED WETLANDS (BVW)
- WHITES POND / NORTH BRANCH OF MILLER'S RIVER (NORMAL POOL)
- 100' INNER RIPARIAN ZONE
- 200' RIVER FRONT AREA
- 50' NO DISTURB OFFSET
- 75' NO BUILD OFFSET
- 100' WETLAND BUFFER

0 15 30 60 90
SCALE IN FEET

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

EXISTING CONDITIONS PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com
PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: 1" = 30 FEET	3
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

LEGEND

- Sediment sample symbol: SEDIMENT SAMPLE OBTAINED BY GZA. S–1 AND S–2 OBTAINED ON APRIL 26, 2018. S–3 THROUGH S–7 OBTAINED ON OCTOBER 29, 2018.
- Surface water sample symbol: SURFACE WATER SAMPLE OBTAINED BY GZA ON OCTOBER 29, 2018.

GENERAL NOTES

1. SEDIMENT SAMPLES AND SURFACE WATER SAMPLES COLLECTED BY GZA GEOENVIRONMENTAL, INC. ON OCTOBER 29, 2018. SAMPLES LOCATED IN THE FIELD USING A LEICA VIVA SMARTWORX DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) REAL–TIME KINEMATIC (RTK) NETWORK WITH RTK CORRECTIONS FROM THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONTINUOUSLY OPERATING REFERENCE STATION NETWORK (MaCORS).
2. APPROXIMATE POOL ELEVATION AT THE TIME OF THE SURVEY, UPSTREAM OF THE DAM = ±1036.5 NAVD88.
3. APPROXIMATE CHANNEL ALIGNMENT BASED ON AERIAL IMAGERY AND SITE OBSERVATIONS AT THE TIME OF THE SURVEY.
4. BASE MAP FROM BING IMAGES USING AUTOCAD GEOLOCATION FEATURE
5. PROFILES INDICATE TOPOGRAPHIC SURVEY AND SEDIMENT PROBE LOCATIONS UPSTREAM OF DAM

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING & STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

SEDIMENT & SURFACE WATER SAMPLES
LOCATION PLAN & UPSTREAM PROFILES

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CWC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: JJZ	SCALE: AS NOTED	4
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

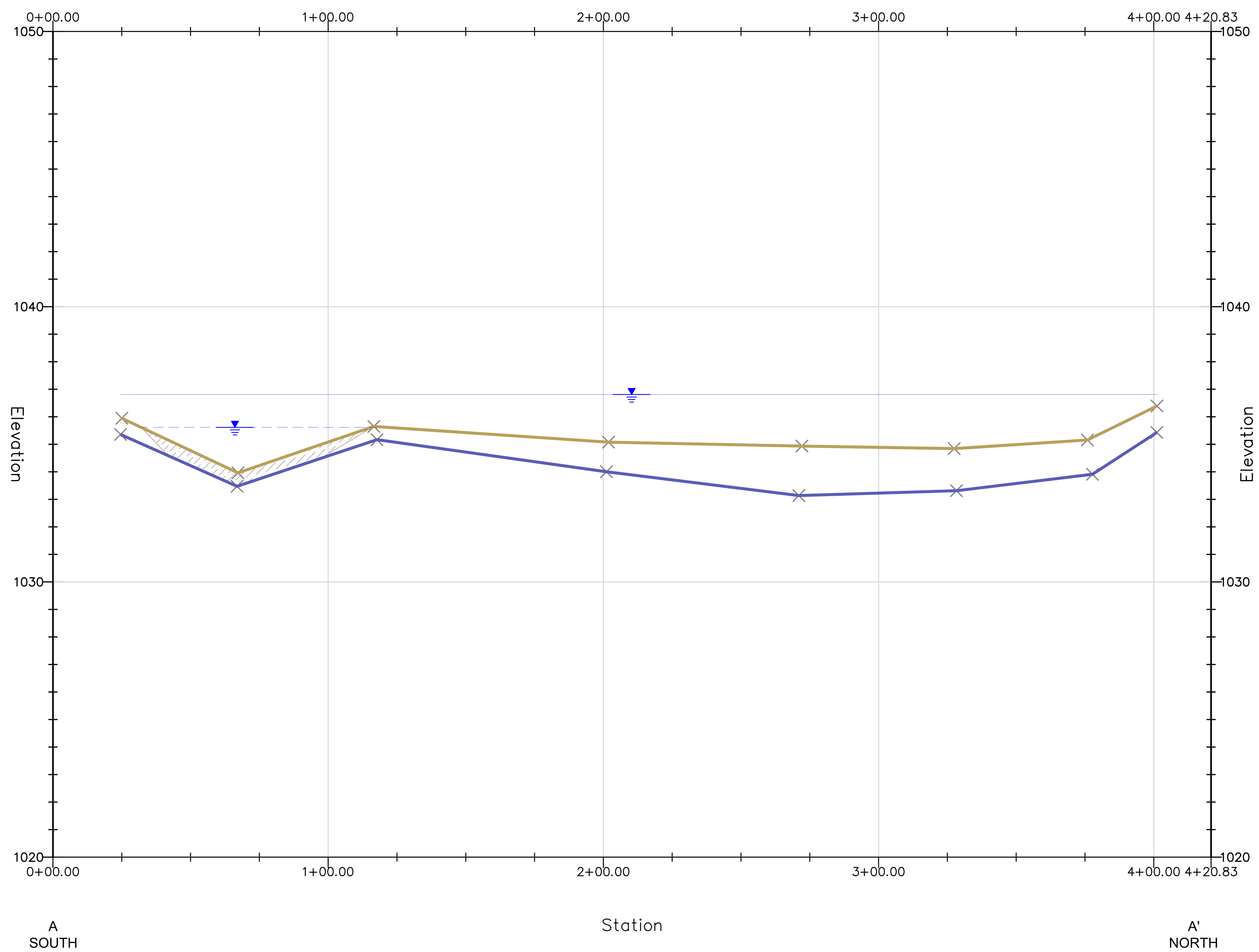
SEDIMENT & EROSION CONTROL, WATER CONTROL, AND SITE ACCESS & PREPARATION

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

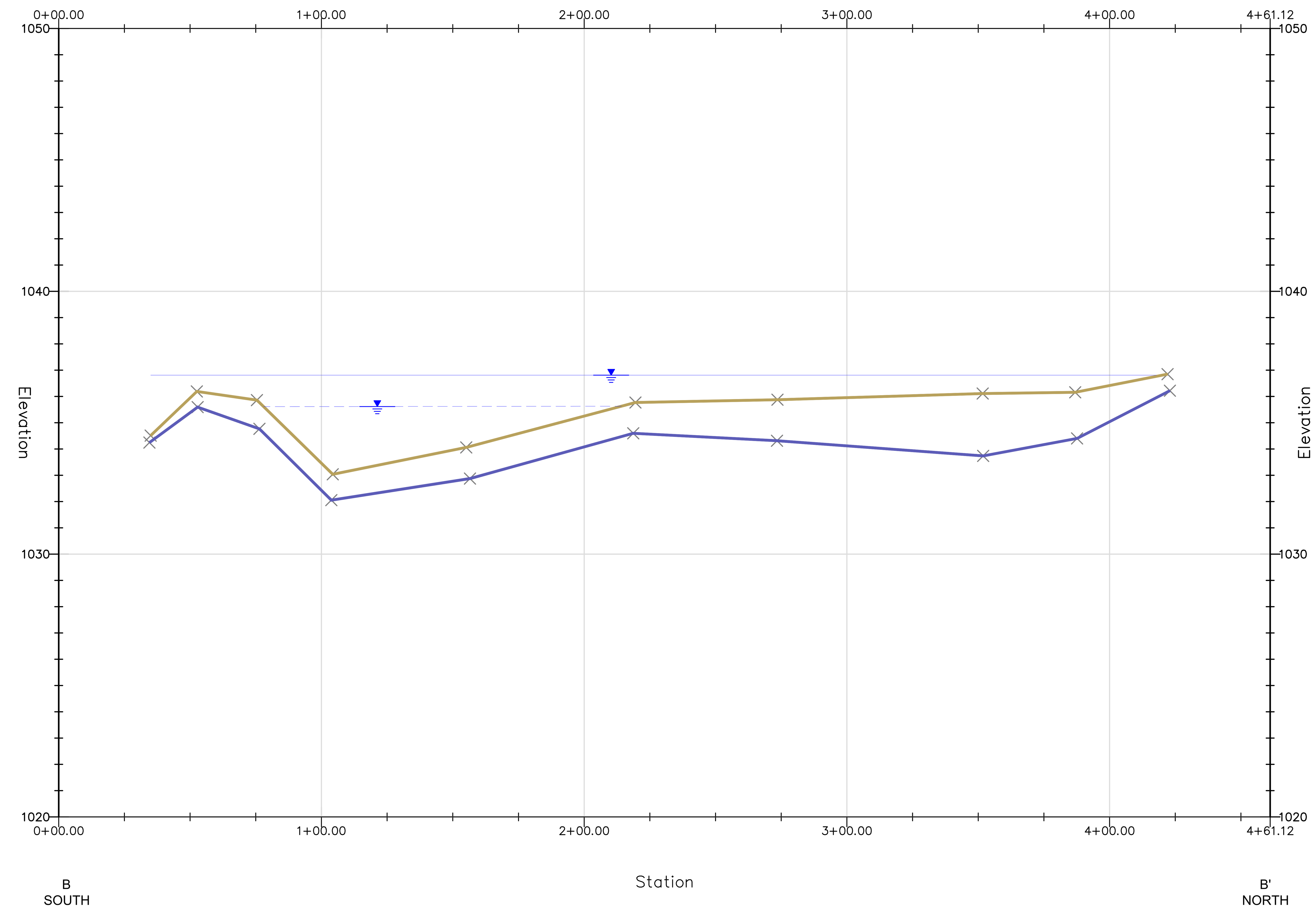
PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: 1" = 30 FEET	5
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PROFILE VIEW OF ALIGNMENT – A



PROFILE VIEW OF ALIGNMENT – B



SOFT BOTTOM / TOP OF SEDIMENT

HARD BOTTOM

APPROXIMATE NORMAL POOL WATER ELEVATION

APPROXIMATE WATER ELEVATION POST BREACH

ANTICIPATED SEDIMENT TRANSPORTED DOWNSTREAM

VERTICAL PROFILE SCALE IN FEET

0 1.5 3 6 9

0 15 30 60 90

HORIZONTAL PROFILE SCALE IN FEET

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

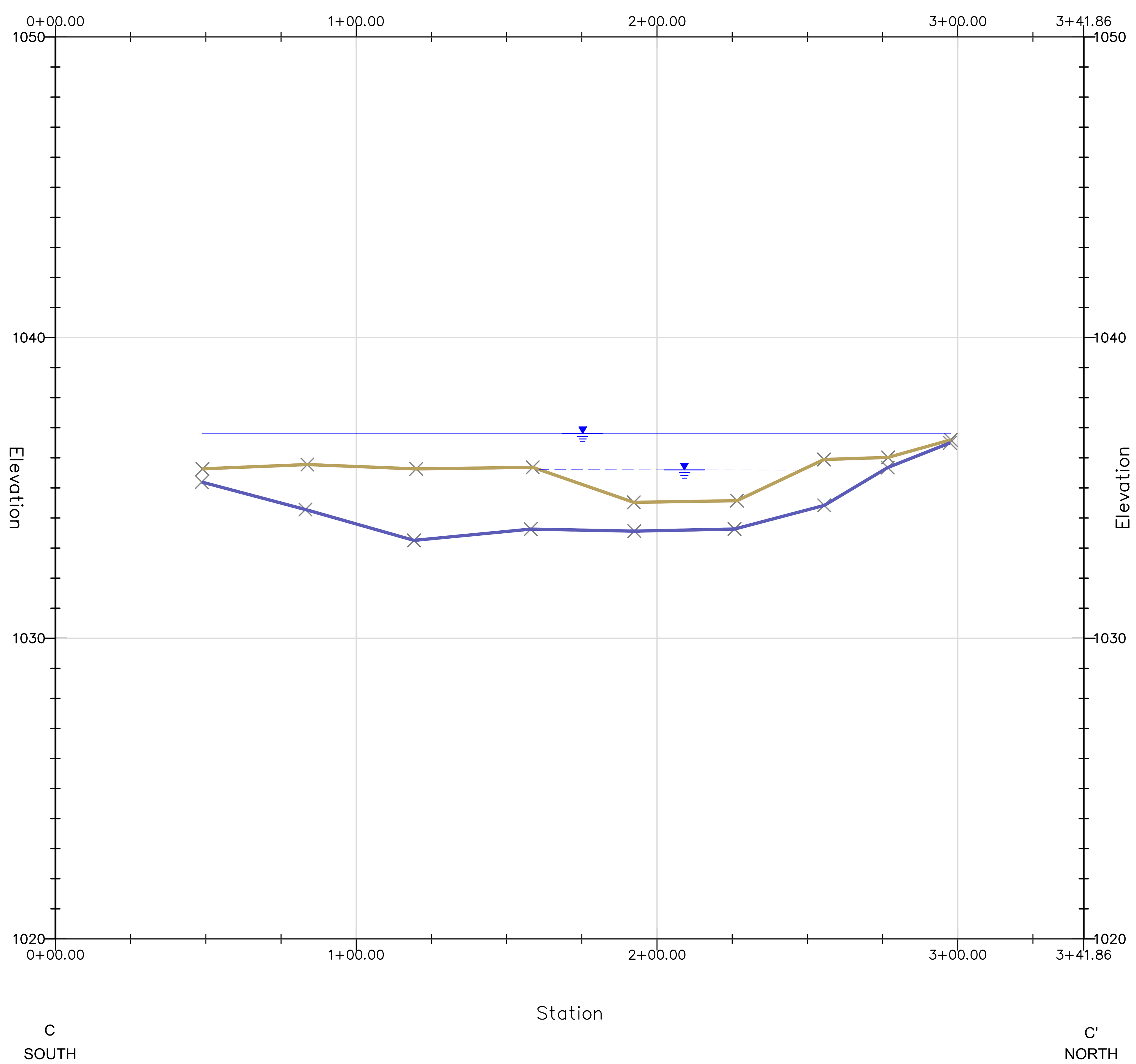
EXISTING AND PROPOSED PROFILES A & B

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

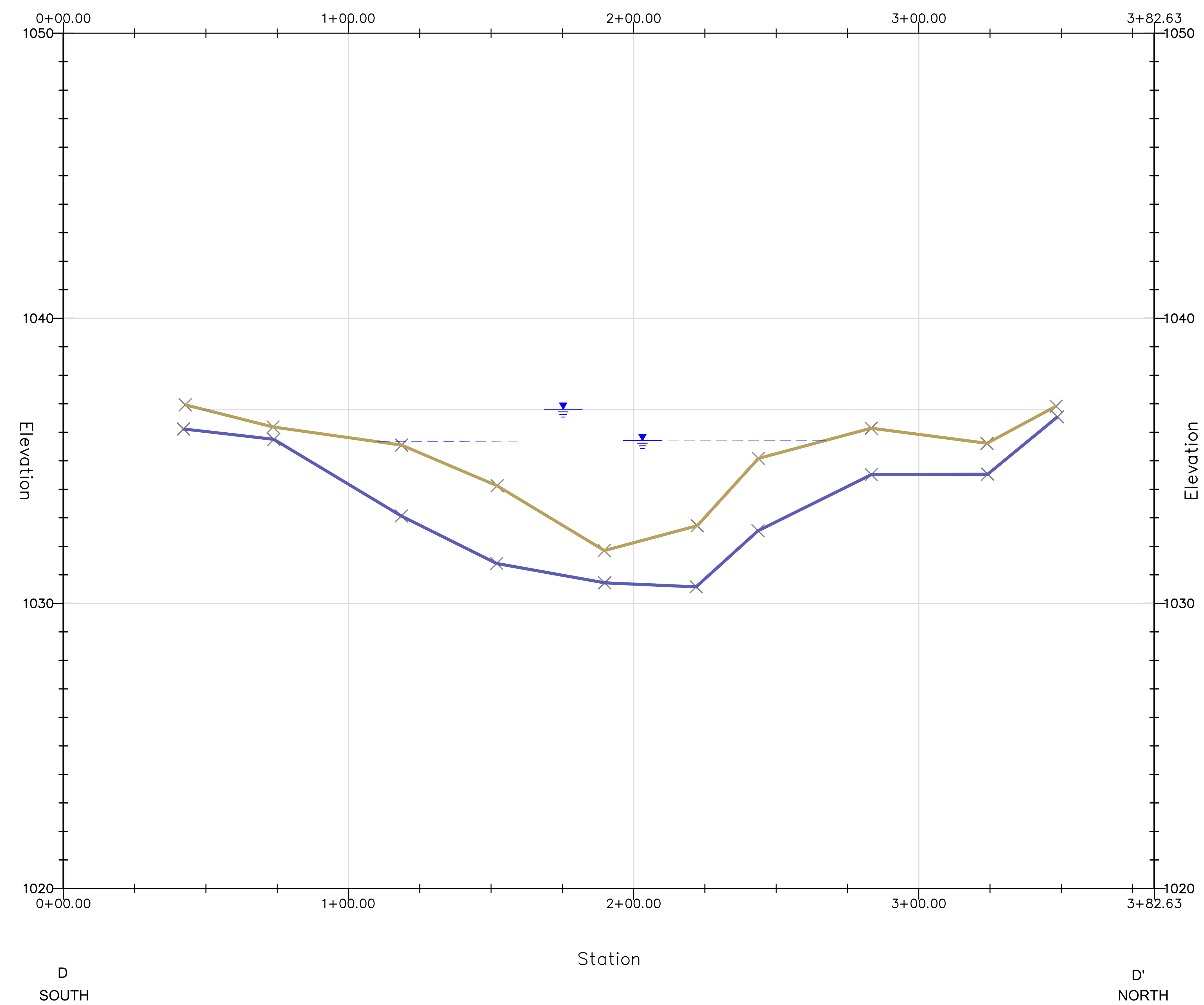
PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: AS NOTED	6
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PROFILE VIEW OF ALIGNMENT – C



PROFILE VIEW OF ALIGNMENT – D



SOFT BOTTOM / TOP OF SEDIMENT

HARD BOTTOM

APPROXIMATE NORMAL POOL WATER ELEVATION

APPROXIMATE WATER ELEVATION POST BREACH

ANTICIPATED SEDIMENT TRANSPORTED DOWNSTREAM

VERTICAL PROFILE SCALE IN FEET
0 1.5 3 6 9
0 15 30 60 90
HORIZONTAL PROFILE SCALE IN FEET

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

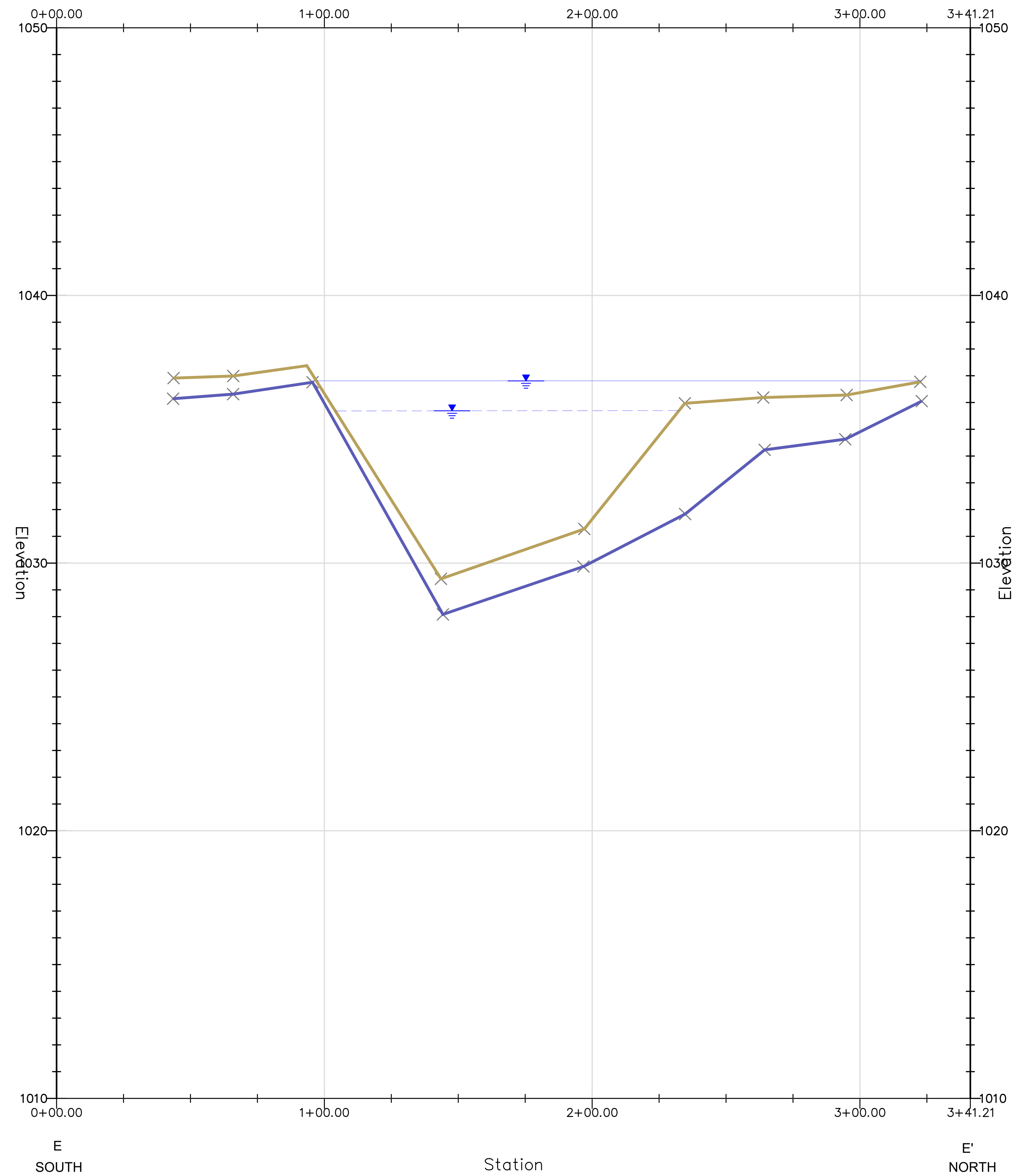
EXISTING AND PROPOSED PROFILES C & D

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: AS NOTED	7
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PROFILE VIEW OF ALIGNMENT – E



SOFT BOTTOM / TOP OF SEDIMENT

HARD BOTTOM

APPROXIMATE NORMAL POOL WATER ELEVATION

APPROXIMATE WATER ELEVATION POST BREACH

ANTICIPATED SEDIMENT TRANSPORTED DOWNSTREAM

VERTICAL PROFILE SCALE IN FEET
0 1.5 3 6 9

0 15 30 60 90
HORIZONTAL PROFILE SCALE IN FEET

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

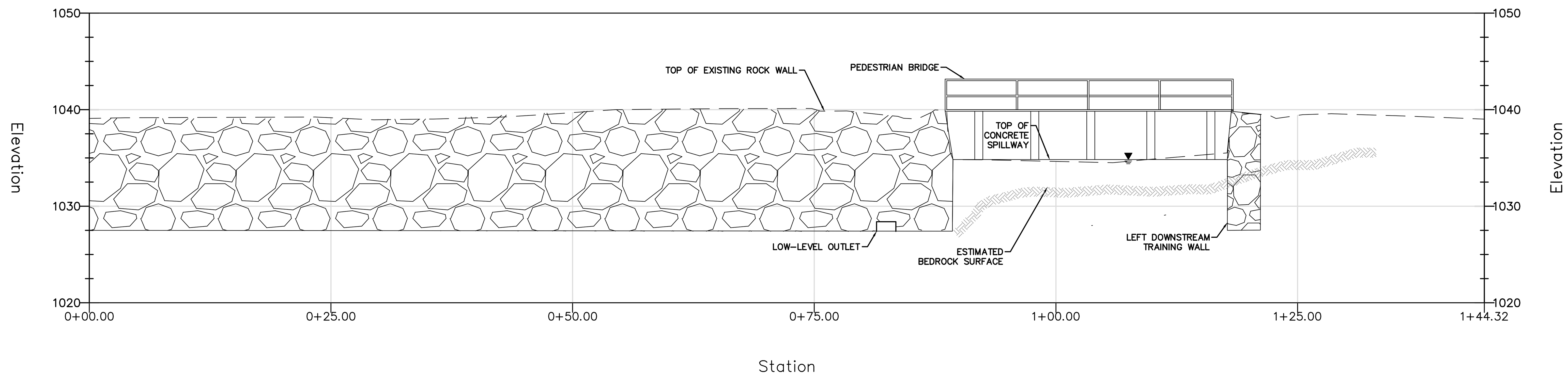
EXISTING AND PROPOSED PROFILES E

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

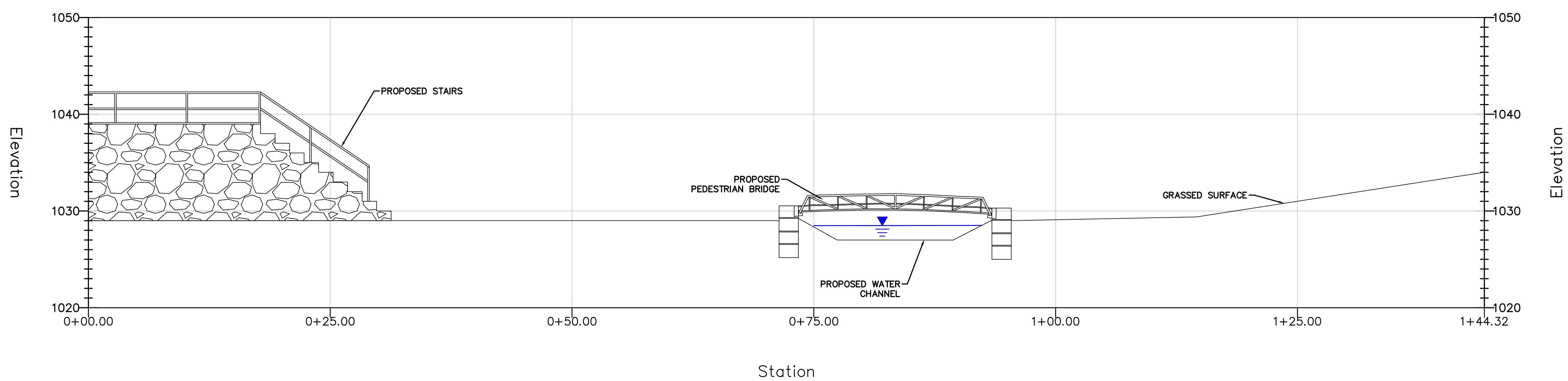
PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: AS NOTED	8
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

PROFILE VIEW OF DAM – EXISTING UPSTREAM PERSPECTIVE



PROFILE VIEW OF DAM – PROPOSED UPSTREAM PERSPECTIVE



PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

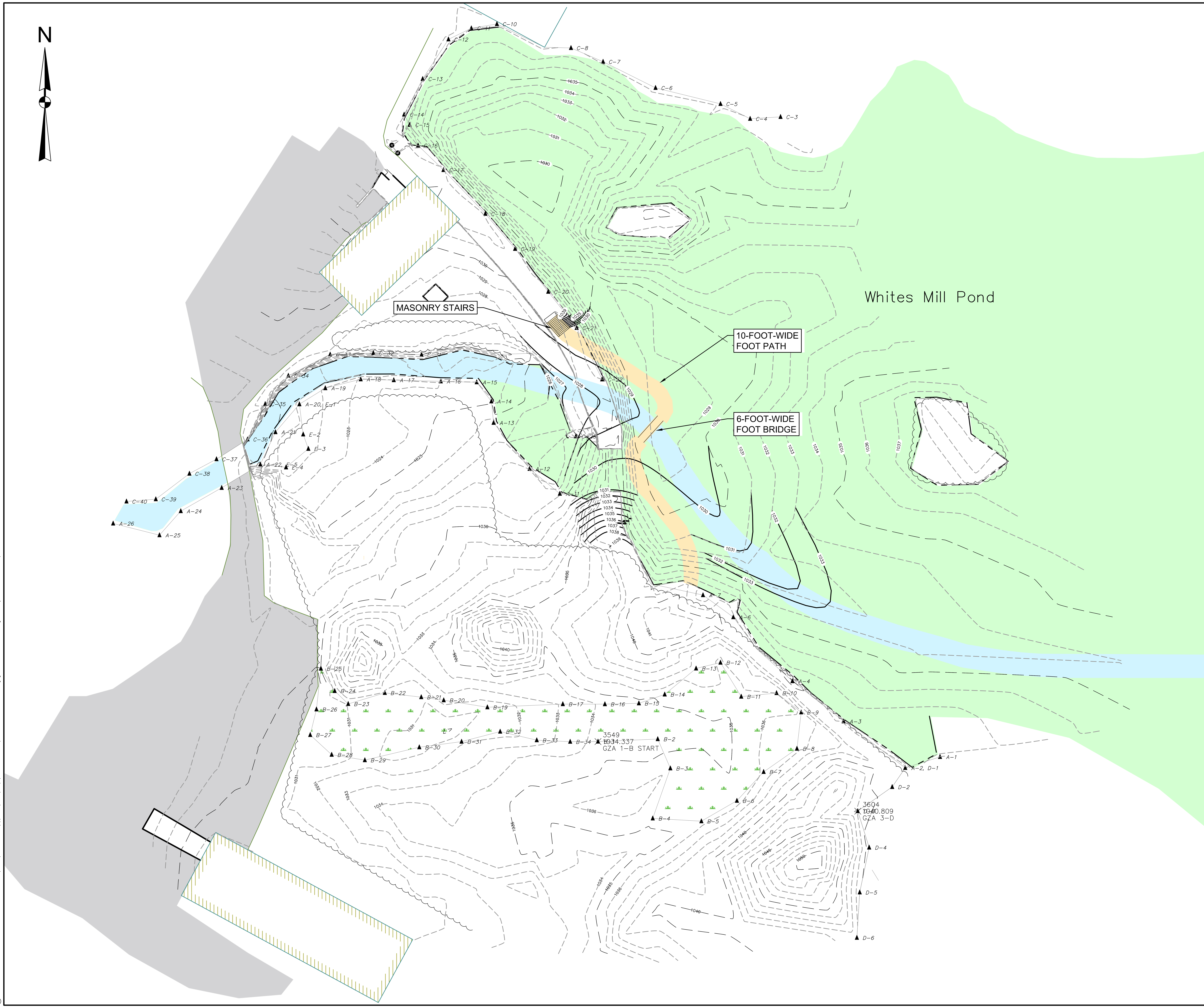
WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

UPSTREAM PROFILE VIEW

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: AS NOTED	9
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.



LEGEND

- EXISTING 1' MINOR CONTOUR
- EXISTING 5' MAJOR CONTOUR
- PROPOSED CONTOUR
- B-1 RESOURCE AREA DELINEATION - LIMIT OF BVW
- A-1 RESOURCE AREA DELINEATION - TOP OF BANK OF PERENNIAL STREAMS AND RIVERS
- TREE/ VEGETATION LINE
- EXISTING BUILDING
- BORDERING VEGETATED WETLANDS (BVW)
- PROPOSED MILLER'S RIVER
- FORMER POND AREA
- PROPOSED PEDESTRIAN PATH

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

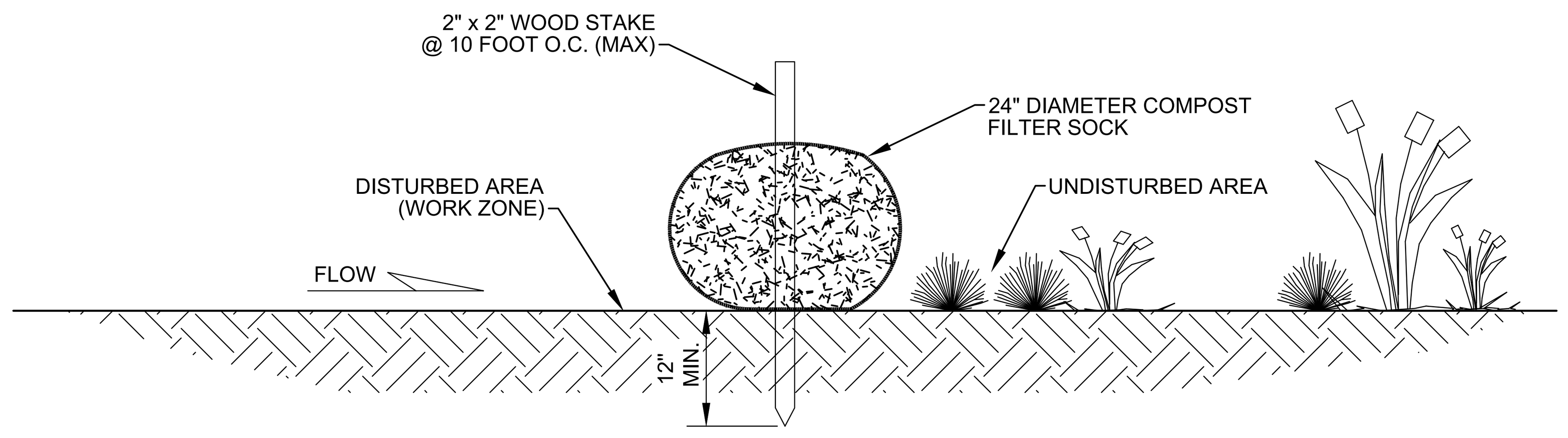
WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

FINAL CONDITIONS PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE: 1" = 30 FEET	10
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.



NOTES:

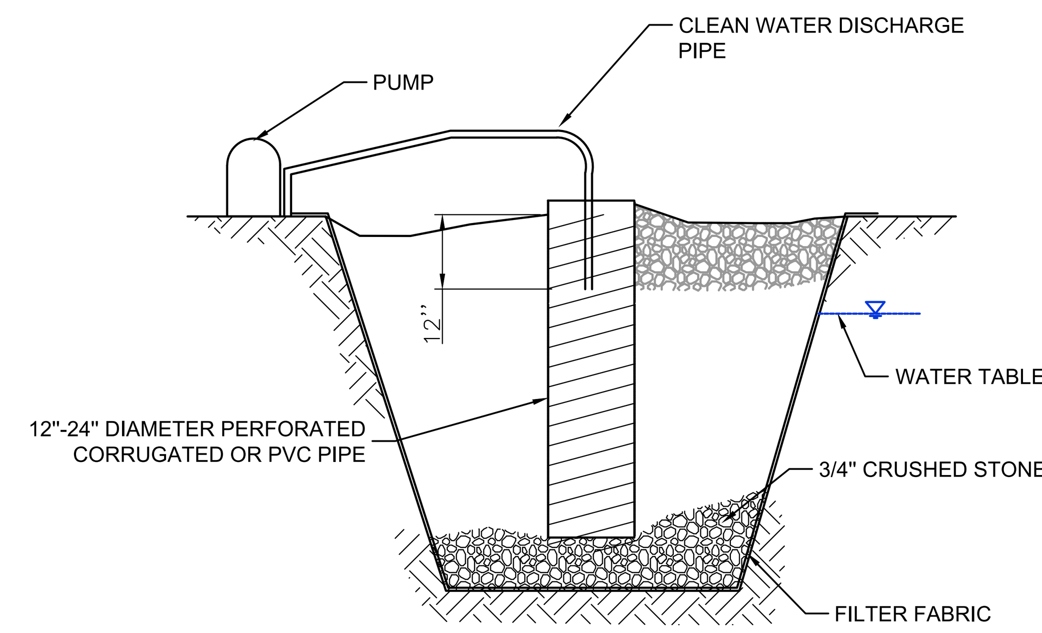
1. FILTER SOCK SHALL BE MADE OF 100% ORGANIC HESSIAN FABRIC (BURLAP) OR BIO-DEGRADABLE 5 MIL HDPE (NO LONGER THAN 6 MONTHS). REPLACEMENT NEEDED AFTER 6 MONTHS.
2. ORGANIC MATTER CONTENT SHALL BE BETWEEN 20 -100% (DRY WEIGHT BASIS) AS DETERMINED BY ASTM D2974 (METHOD A) STANDARD TEST METHODS FOR MOISTURE, ASH, AND ORGANIC MATTER OF PEAT AND OTHER ORGANIC SOILS.
3. MOISTURE CONTENT SHALL BE <150% BY DRY WEIGHT (<60% BY WET WEIGHT) AS MEASURED BY ASTM D2216 STANDARD TEST METHOD FOR LABORATORY DETERMINATION OF WATER CONTE
4. PARTICLE SIZE IS MEASURED BY SIEVING SHALL BE AS FOLLOWS:

SIEVE SIZE	% PASSING
75MM	100%
19MM	70-100%
#4	30- 75%
#20	20-40%

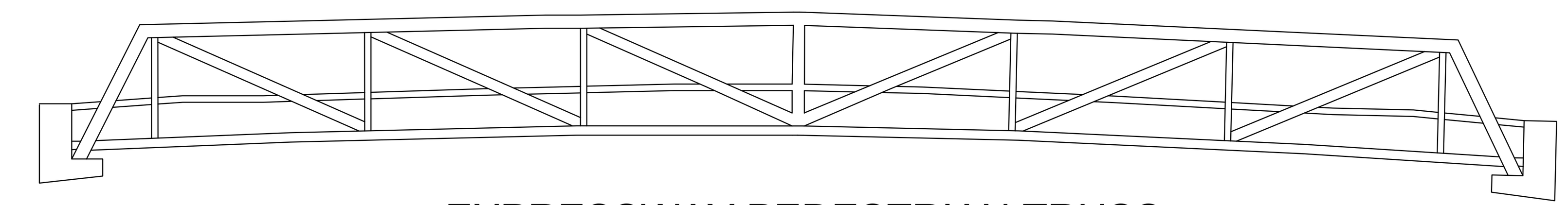
NO PARTICLE MAY BE LONGER THAN 150MM

5. SOLUBLE SALTS SHALL BE <5.0 MMHOS/CM (DS/M).
6. THE PH SHALL BE BETWEEN 5.5 AND 8.0.
7. FILTER SOCKS MUST BE PLACED PARALLEL TO CONTOUR WITH BOTH ENDS OF THE SOCK EXTENDED UPSLOPE AT A 45 DEGREE ANGLE TO THE REST OF THE SOCK TO PREVENT END-AROUNDS.
8. THE CONTRACTOR SHALL MAINTAIN THE FILTER TUBES IN A FUNCTIONAL CONDITION AT ALL TIMES, INCLUDING INSPECTIONS AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL.
9. FOR REMOVAL, THE CONTRACTOR SHALL RAKE OUT SO THAT FILTER MATERIAL IS NO GREATER THAN 3" IN DEPTH ON SOIL SUBSTRATE.

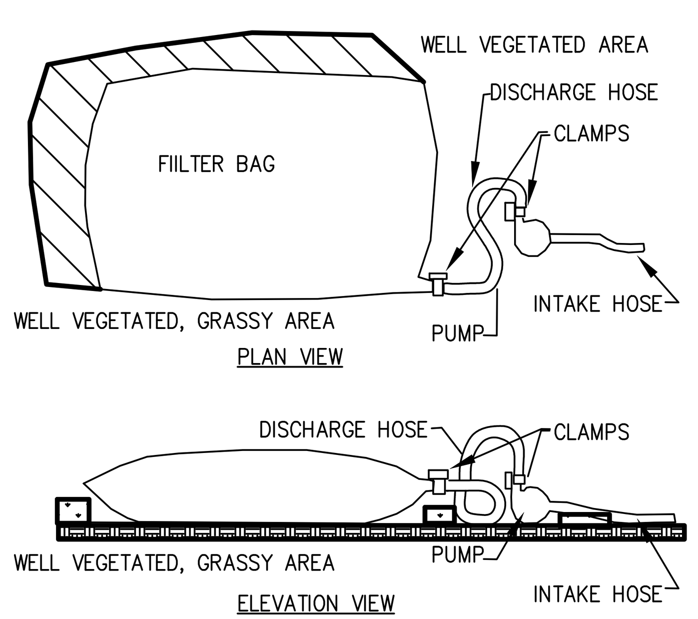
TEMPORARY SEDIMENTATION AND EROSION CONTROL
BARRIER COMPOST FILTER SOCK/TUBE DETAIL
NOT TO SCALE



SCHEMATIC WATER CONTROL SUMP PIT DETAIL
NOT TO SCALE



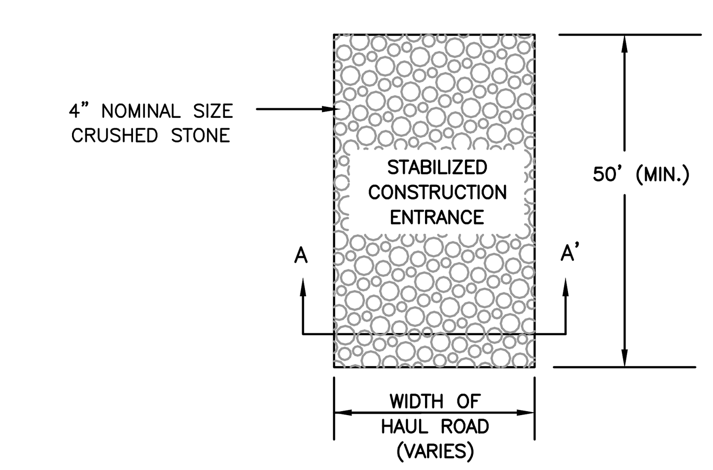
EXPRESSWAY PEDESTRIAN TRUSS

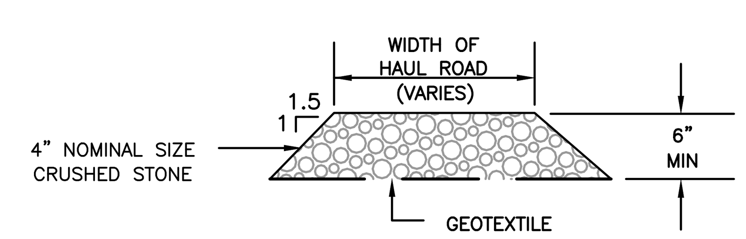


NOTES

1. CONTRACTOR SHALL LOCATE FILTER BAG TO COMPLY WITH REQUIREMENTS BELOW. LOCATION IS SUBJECT TO APPROVAL BY OWNER'S CONSULTANT.
2. FILTER BAGS SHALL BE USED TO FILTER WATER PUMPED FROM DISTURBED AREAS PRIOR TO DISCHARGING TO WATERS OF THE COMMONWEALTH.
3. FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. CONTRACTOR SHALL PROVIDE A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY (FOR DISPOSAL PURPOSES).
4. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL.
5. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED.
6. BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE FLOW PATH SHALL BE PROVIDED. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%.
7. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED.
8. THE PUMPING RATE SHALL BE NO GREATER THAN 100 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHOULD BE FLOATING AND SCREENED.
9. FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

PUMPED WATER FILTER BAG DETAIL
NOT TO SCALE





CROSS-SECTION A-A'

STABILIZED CONSTRUCTION ENTRANCE (TYPICAL)
NOT TO SCALE

PERMIT DRAWING SET

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

MISCELLANEOUS NOTES AND DETAILS

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.

PROJ MGR: DJS	REVIEWED BY: CDC	CHECKED BY: DJS	DRAWING
DESIGNED BY: DJS	DRAWN BY: SMW	SCALE:	11
DATE: FEBRUARY, 2019	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

APPENDIX A

PROJECT NARRATIVE
& ALTERNATIVES ANALYSIS

PROJECT NARRATIVE AND ALTERNATIVES ANALYSIS

BACKGROUND INFORMATION

The Mill Farm Initiative, Inc. / The Brandywine Farms, Inc. owns and operates the Whites Mill Pond Dam along the North Branch of the Millers River in Winchendon, Massachusetts. Based on previously performed Phase I dam safety inspections by Pare Corporation and GZA and follow-up inspections performed by GZA, the Whites Mill Pond Dam is judged to be in **POOR** condition. Key safety deficiencies currently observed at Whites Mill Pond Dam include: cracking and missing mortar in masonry spillway walls; a low area and sinkholes on the top of the embankment to right of the spillway; scarped and unprotected upstream slopes; steep downstream slope to left of the spillway; corroded vertical supports of the spillway foot bridge; missing stones in the downstream masonry face; bulging of the downstream masonry wall to right of the spillway; leakage/seepage at the toe of the dam including a large saturated area near the middle of the dam and a discrete area of seepage at the base of the downstream wall right of the spillway; inadequate discharge capacity to accommodate the Spillway Design Flood (SDF); and inoperable low-level outlet. A separate earthen embankment dike is present to the left of the main dam and has large trees and an overturned tree on the embankment.

The dam is classified as an Intermediate size, High Hazard (Class I) potential dam, meaning that failure of the dam will likely cause loss of life and serious damage to downstream properties and infrastructure. The proposed project involves dam decommissioning through partial breaching of the dam and stream restoration. The project has been designed to protect the existing waterway resources supported by the dam and to minimize temporary construction impacts to the surrounding resource areas.

The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) issued a Certificate of Non-Compliance and Dam Safety Order on October 9, 2015. The ODS stated that the dam has been determined to be “Structurally Deficient” and in “Poor” condition. The ODS ordered the Owner to bring the dam into compliance through repair, breach, or removal of the structure.

The most recent follow-up inspection report from January 16, 2019 (performed by GZA) and the ODS Order are included as **Attachment F**.

Whites Mill Pond Dam is located in the Town of Winchendon, Worcester County, Massachusetts. The dam impounds water along the North Branch of Miller’s River and forms Whites Mill Pond. The dam and impoundment are shown on the Winchendon, Massachusetts USGS quadrangle map at latitude 42.69408° north and longitude 72.012262° west as estimated from Google Earth.

To navigate to the dam, head north on MA 140 N, continue on MA 140N as it becomes MA 12 N (9.4 miles), turn right onto Glenallen Street (1.4 miles), turn right onto Lakeview Drive/Mill Circle (1.7 miles), follow the drive along the western mill buildings and turn right to a small parking area near the right abutment of the dam.

DESCRIPTION OF EXISTING DAM

The dam is an approximately 375-foot-long earthen embankment with a maximum structural height of about 12.5 feet and a hydraulic height of about 10.5 feet. The right and left abutments tie into higher ground. The dam crest to the right of the spillway is an approximately 16-foot-wide, level, grass surface. The downstream side of the dam to the right of the spillway is a dry set stone masonry wall that runs from the right side of the primary spillway to a building near the right abutment. The downstream side of the dam to the left of the spillway is an approximately 1.5 horizontal to 1 vertical (1.5H:1V) sloped earth embankment which is covered with small rip rap stone. The upstream side of the dam consists of mortared stone walls to the left of the spillway and to about 30 feet to the right of the spillway. The remainder of the upstream side of the dam is an unprotected earthen slope. An approximately 150-foot-long, 3-foot-high earthen dike is located to the left of the left dam abutment.

An approximately 24-foot-wide by 10.5-foot-high concrete broad crested weir is located near the left abutment. The spillway is traversed via a steel-framed pedestrian foot bridge, with wood deck platform. The vertical supports of the foot bridge also form six, 4-foot-wide bays for wooden stop logs. Stone masonry training walls are located on both sides of the spillway. Flow over the spillway cascades onto bedrock downstream of the dam then flows into a stone wall lined channel. The channel continues to a bridge and through a culvert beneath a mill building. The channel is again open at the downstream side of the mill building. The channel passes through a culvert at Lakeview Drive before discharging to the North Branch of Millers River.

The low-level outlet consists of a stone box culvert, 3.2 feet wide by 1.8 feet high, and is controlled by a gate near the centerline of the dam. The outlet is 6 feet right of the spillway. A 4-inch diameter steel pipe riser that presumably contains a valve which operates the low-level outlet has been inoperable since 2012 according to previous inspection reports. A concrete intake is located at the right abutment. The intake structure is reportedly 4-feet-wide by 10-feet deep by 8-feet-long. A wire-mesh screen is located on the upstream face of the structure. The intake structure reportedly feeds a 10-inch-diameter pipe which splits to a 6-inch-diameter pipe to the factory and to a 10-inch-diameter pipe to a fire hydrant at the mill. It is unknown if the structure is still operational.

HISTORIC SIGNIFICANCE OF DAM

According to the Massachusetts Historical Commission (MHC), the dam removal project is not likely to affect historical or archaeological resources.

PROPOSED PROJECT

The Owner has elected to partially breach the dam to address the dam safety deficiencies through dam decommissioning and at the same time provide proactive environmental restoration of the riverine ecology in the upstream impoundment area. The dam decommissioning and stream restoration project process is anticipated as follows:

The pond will be initially lowered by passing flow through the existing low-level outlet, if possible. However, the operability of the outlet is unknown so it is anticipated that a more active process to drain the pond will be needed consisting of incrementally removing portions of the existing spillway and then providing a temporary “notch” in the embankment. During this process, the upstream channel in the impoundment is expected to become further defined through natural channel formation. The natural movement of water will enhance and deepen the pre-existing channel which has been observed in the impoundment area during periods of low water. The constructed dam breach channel will be tied into the natural upstream channel immediately upstream of the existing embankment. The remaining sediment will be allowed to naturally re-distribute in the downstream channel over time. The alignment of the upstream channel is anticipated to follow that which has already been observed during the seasonal periods of low water which have occurred in the past.

The dam will be physically decommissioned by creating a breach in the embankment to the right of the existing spillway. An approximate 15-foot-wide primary channel will be excavated through the dam. The primary channel will be shaped such that a thalweg exists to concentrate flow to improve fish passage during low flow periods. Grades to the left and right of the new channel will be about 2 feet higher than the channel bottom for a distance of about 25 feet to provide for overbank areas which will accommodate flood flows. The overbanks will also allow for passage of terrestrial wildlife. Grades will then slope up to the dam crest at an approximate 2.5 horizontal to 1 vertical slope. The 2.5H:1V slope will be armored in rip rap and vegetation. It is expected that some adjustments to the channel geometry may be needed during construction to accommodate the bedrock surface in the area of the existing spillway. The existing spillway catwalk and concrete slab will be fully removed. The new breach channel will confluence with the existing spillway discharge channel immediately downstream of the dam. This will necessitate some removal of stone masonry channel walls on the right side of the channel. Remaining portions of the channel walls, dam embankment, and the existing stone masonry embankment retaining walls will remain. All stone removed from existing dry stone walls will be reused on site as channel or slope stabilization. The sluiceway at the right side of the dam will be filled and decommissioned. The existing dike will be left in place. No modifications to the dike are proposed.

The new channel overbanks will be provided with a topsoil cover, seeded, and revegetated with appropriate materials. Coir rolls will be used as both temporary erosion control and to define channel banks. The channel itself will be formed into the native soil material with no additions to channel bottom. The existing stone channel walls will also be extended upstream for a limited distance through the breach channel to stabilize the channel extents where the channel bends. Random boulders (from disassembled dry-stone walls) will be used to enhance the channel. Limited upstream seeding will be provided in the immediate area of the dam but the majority of the former impoundment will be allowed to naturally revegetate. This natural revegetation approach has been successfully used at a number of other dam removal/breaching projects in Massachusetts. A pedestrian foot bridge will be placed to facilitate public access, and historic displays and environmental enhancements will be installed.

Removal of the entire horizontal extent of the dam was judged not to be required. The design calls for the full vertical extent of the dam to be removed within the limits of the breach section. Under significant floods, the former pond area will act as an overbank area. The breach channel has been specifically designed to pass flood flows without significant re-impoundment. In GZA's opinion, significant impoundment is considered to have not occurred if no more than six (6) vertical feet of temporary differential head exists when comparing water surface elevations immediately upstream and downstream of the breach during peak flows associated with the 100-year flood. Massachusetts dam safety regulations consider structures non-jurisdiction if the structure height (and thus the impoundment height) does not exceed six feet (302 CMR 10.06). The basis of design for the breach of the Whites Mill Pond Dam was taken as the 500-year flood and the above hydraulic criteria have been met, therefore it is GZA's opinion that the structure will be non-jurisdictional following the completion of this project. Hydrologic and hydraulic analyses have demonstrated that the decommissioning of the dam will not exacerbate downstream flooding.

The proposed project will not only address the existing safety concerns at the dam but serve to proactively restore the riverine environment at and upstream of the dam. Upon completion of the project, the dam will no longer serve as a barrier to passage of aquatic and other wildlife. Approximately 5,300 linear feet of river channel will be restored to free flowing conditions. In addition, the upstream area in the former artificial impoundment is expected to revert to wetlands conditions, resulting in the creation of approximately 40 acres of new bordering vegetated wetlands resources. The banks of the upstream restored stream channel in the former pond area will be allowed to naturally re-form to a stable or meta-stable configuration. Sediment from within the new stream channel will be allowed to naturally mobilize and restore the typical sediment transport dynamics in the river. The new overbanks will naturally revegetate and stabilize. The habitat capacity of the streambanks will be improved as the bank vegetation in the restored brook will be adjacent to water which is more suited for cold water fisheries. All changes to the project area are expected to provide equal or better wildlife habitat and will result in no adverse effects on wildlife habitat. Specific environmental benefits anticipated to be provided by the project are listed below.

Conceptual design drawings are attached.

HYDRAULIC AND HYDROLOGIC ANALYSES

The existing spillway at the dam is approximately 24 feet wide. The recent normal pool elevation has been maintained at 1036.8' (NAVD88) by use of single 9-inch stop logs in each bay. The fixed spillway crest is elevation 1036.0'. Historically, up to 2 feet of stop logs have been in place at times. The top of dam is at elevation 1040.0', but a low area on the embankment is as low as 1039.5'. (Note that currently all stop logs have been removed due to concerns about seepage.) Normal pool (elev. 1036.8') storage volume is estimated as 148 acre-feet.

The maximum spillway capacity at top of dam (1040.0'), assuming a single 9-inch stop log (elev. 1036.8') and a weir co-efficient of 3.1, is approximately 426 cfs.

The direct drainage area for the Whites Mill Pond Dam is approximately 1.1 square miles. A portion of the 18.5 square mile drainage area contributing to Lake Monomonac upstream of White's Mill Pond discharges into White's Mill Pond Dam via the spillway at Lake Monomonac Dam. Other discharge from Lake Monomonac bypasses Whites Mil Pond by flowing over the uncontrolled spillway at the western downstream arm of the Lake.

The Spillway Design Flood for the dam in its current configuration is the ½ PMF. Using the previously developed USACE ½ PMF peak inflow of 846 cfs for the immediate watershed plus an estimated controlled outflow from the upstream lake of 300 cfs, a total ½ PMF peak inflow of 1,146 cfs was estimated.

The existing spillway therefore is capable of passing only 37 percent of the estimated ½ PMF inflow without generally overtopping the dam (assuming the recent normal pool and neglecting reservoir storage). Note that local overtopping will occur sooner unless the low area on the top of the embankment is repaired.

The existing conditions at the dam were modeled neglecting impoundment storage due to the potential for prestorm releases from the upstream reservoir. Under these conditions, the 1/2 PMF was found to overtop the dam by approximately 0.5 feet. At this maximum flood pool elevation of 1040.5', the estimated impoundment storage volume is approximately 272 acre-feet.

The preferred alternative for addressing the dam safety concerns at the dam is to breach the dam to permanently un-water the pond and minimize re-impoundment during floods. GZA performed a hydraulic and hydrologic (H&H) analysis of the North Upper Millers River to evaluate the impact on river hydraulic profiles of the proposed breaching Whites Mill Pond Dam. The flood used as the design basis for the analysis was the 500-year flood (0.2% annual return period). The 2-,10-, 50-, and 100-year floods were also assessed in this analysis. The proposed breach profile resulted in a differential water surface elevation (upstream versus downstream of former dam) of no more than 2.5 feet during floods of up to a 500-year return period. In GZA's opinion, this will result in conditions such that the remaining structure no longer meets the definition of a regulated dam and thus can be reclassified as "non-jurisdictional". The analysis package is included in **Attachment H**.

ALTERNATIVES ANALYSIS

GZA performed an alternatives analysis in order to recommend a preferred course of action to address the existing dam safety and other deficiencies at the dam. Consideration was also given to the economic, ecological, and legal impacts of each three alternatives considered in the analysis.

1. NO ACTION ALTERNATIVE (Not Selected)

The existing Whites Mill Pond Dam has been classified as being in Poor condition by the DCR Office of Dam Safety. In addition, the Dam is classified as a High downstream hazard potential structure, meaning that failure of the dam would likely lead to serious damage of downstream infrastructure and property, and possible loss of life. The DCR Office of Dam Safety has issued a Dam Safety Order requiring the owner to bring the dam into compliance with current Commonwealth of Massachusetts Dam Safety Regulations (302 CMR 10.00). The No Action alternative would leave the dam in its current state, which would post a potential risk to downstream life and property, and would be in violation of the Dam Safety Order.

2. REPAIR/RECONSTRUCTION (Not Selected)

Repairing the dam would satisfy the requirements of the Dam Safety Order, would help prevent a potential failure of the dam, and would maintain the dam's impoundment – Whites Mill Pond. Construction cost of the dam repairs would likely far exceed the cost to the Dam Breach Alternative, in GZA's opinion. Dam repairs would require significant modifications to the existing structure which would alter the visual character of the dam. Once the dam is repaired, Brandywine Farms, Inc. would be required to maintain the dam, and also hire a dam safety engineer to perform periodic visual inspections under 302 CMR 10.00. The repaired dam would remain a HIGH hazard structure.

3. DAM BREACH (Selected as Preferred Alternative)

Removal or breaching of the dam would satisfy the requirements of the Dam Safety Order and would restore the natural (pre-dam construction) North Branch of the Millers River stream channel through the current impoundment area to free-flowing conditions. Removal/breach of the dam, if properly constructed, would remove the fish passage barrier created by the current dam, and would improve water quality in the North Branch of the Millers River by restoring natural sediment transport and water temperatures. Dam breaching would change the character of the existing site by converting significant portions of the existing low-quality pond resources (Land Under Water) into Wetland (BVW) areas and free-flowing river channel.

Dam decommissioning through partial breaching of the dam is the preferred alternative because it permanently removes dam safety concerns, proactively restores the natural environment within the river, and is more cost effective than repair.

Anticipated Benefits of Dam Removal:

▪ Removal of significant hazard risk from dam failure	Removing the dam will limit the risk of another full, uncontrolled breach occurring in the future, which has an increased likelihood considering that the dam is in Poor condition and the dam has the potential to overtop during the Spillway Design Flood.
▪ Restoration of the natural channel	Rivers in their natural state are dynamic systems where changing flow levels trigger growth and reproduction cycles in native river species creating a healthier and more biodiverse ecosystem.
▪ Restoration of natural dissolved oxygen levels	The recreation of a natural riffle-pool stream channel will help increase dissolved oxygen levels in the water, which would result in increased water quality and riverine biodiversity.
▪ Restoration of natural water temperatures	Water held behind dams is often warmer than in free-flowing rivers. Removing the dam will help restore natural temperature regimes and support the return of cold-water fish species.
▪ Improved water quality	Restoration of natural flow regimes through dam removal will help increase pollution dilution and transport in the Brook, which will help increase water quality.
▪ Improvement of natural sediment transport pathways	Natural sediment transport, an essential geomorphological function of the river, will be restored by the dam breach. This will replenish the sediment-starved areas downstream of the dam, and result in a healthier ecosystem.
▪ Restoration of Bordering Vegetated Wetlands	As this project is a proactive stream restoration project, with a goal of returning the stream to its natural condition, there will be a transformation of wetlands resources. Most of the Land Under Water (LUW) which created due to the impoundment behind the dam is anticipated to transform into Bordering Vegetated Wetlands (BVW). The restored BVW is likely to initially take the form of bog or shrub swamp, with some areas ultimately transforming into wooded

	coniferous swamp. Stable vegetated stream banks will replace pond banks and provide equivalent or better habitat. Some open water areas will remain, particularly in the upper reaches of the former pond area.

SEDIMENT AND EROSION CONTROL PLAN AND CONSTRUCTION SEQUENCE:

Creating a project specific construction sequence with respect to proper handling of water, sediment and erosion control particularly at the beginning stages and throughout construction of the proposed development is of high importance. Final details for such are typically determined by the Contractor as part of their means and methods. However, the Contractor responsible for the construction will be contractually obligated to fulfill all applicable provisions of the Order of Conditions and the general sequence presented below. A draft construction sequence (to describe the construction process and controls that the Contractor will be required to follow during the construction phase) has been compiled.

The general overall anticipated construction sequence associated with the entire project is presented on **Drawing 2**, and a Sediment and Erosion Control, Water Control, and Site Access and Preparation Plan is included as **Drawing 6**. Best Management Practices (BMPs) including erosion control barriers will be used to mitigate against the erosion and discharge of on-site sediment. The general construction sequence associated with work to take place is presented below:

1. Mobilize to the site and deploy temporary sediment and erosion controls associated with the entire project, including perimeter erosion and sediment control barriers, turbidity curtain, and other BMPs. Note that some BMPs may not be able to be deployed until pond drawdown has been accomplished.
2. Coordinate with owner's representative regarding selection of limited number of trees (if any) to be cleared and removed to provide site access needed for the execution of the work. No tree removal may begin until mutual agreement between the owner and the contractor has been obtained and approval has been granted by the conservation commission. Remove stumps only from areas where excavation will occur. Topsoil to remain to the extent possible.
3. Notify owner, engineer, and conservation commission, schedule and conduct site walk to inspect sediment and erosion control measures and trees marked for selective clearing. Modify sediment and erosion control measures as required. Work may proceed once approval has been granted from the conservation commission.
4. Remove and lawfully dispose of existing spillway footbridge.
5. Sandbag portion of the spillway crest slab as per water control plan and progressively remove concrete spillway slab.
6. Begin controlled drawdown of the pond as per the water control plan. Place cofferdam materials as needed to temporarily divert water during construction.
7. Remove stones from the embankment masonry retaining walls and stockpile for on-site re-use.
8. Excavate dam embankment to form breach. Shape channel as per grading plan, including typical channel and overbanks. Coordinate with owner's representative regarding bedrock surface and adjustments to grading to account for bedrock elevation where encountered.

9. Periodically monitor sediment volumes behind downstream culverts and remove as needed. Redistribute material on upstream slope of former embankment.
10. Place coir logs and random boulders in channel.
11. Place stockpiled stones for permanent erosion control and slope stabilization, as indicated.
12. Fill, stabilize, and permanently decommission existing sluiceway.
13. Loam excavated areas of overbanks. Seed overbanks, including immediately upstream of the former embankment.
14. Place pedestrian path material.
15. Restore and seed all remaining disturbed areas. Provide temporary stabilization to all seeded areas.
16. Remove equipment and temporary facilities. Complete all other site stabilization.
17. Notify owner, engineer, and conservation commission of final stabilization. Schedule and conduct site inspection. Make adjustments as required.
18. Upon approval by conservation commission, remove perimeter erosion control barriers. Note that compost filter socks by be dispersed in place.
19. Complete demobilization.

Please note that specific details of the construction sequence are typically means-and-methods issues that are addressed by the eventual Contractor engaged to conduct the work. Similarly, the project schedule is typically directed by the Contractor, as guided by the permit conditions to be issued by applicable regulatory authorities. Currently it is envisioned that the work will occur during the typically low flow period of late summer early fall of 2019.

<u>Construction Period Pollution Prevention Measures:</u>

The following erosion and sediment control techniques will be employed to minimize erosion and transport of sediment to downstream areas, and to protect against pollution from hazardous materials during the construction phase of the project. Additional notes are included on **Drawing 2**.

Site Clearing and Excavation

During the site clearing stage (primarily tree removal on a limited portion of the embankment), existing vegetation within the site work zones will be cleared and removed as indicated on the Plans. Limited tree removal will take place where necessary to perform the work. Prior to any site clearing activities, erosion control barriers will be placed around the perimeter of site work zones. Clearing will be limited only to those areas necessary to complete the proposed work. Disturbed areas will be kept to a minimum so as to maintain the existing site environment. Cleared trees may be chipped for use as on-site mulch.

Erosion Control Barriers

Erosion control barriers will be placed to trap sediment transported by overland runoff before it leaves the construction site, or enters into the stream channel area. During the course of construction, additional rows of barriers will be placed at intermediate locations if required to prevent the formation of preferential flow channels along the upstream slopes. The barriers will be continuously monitored throughout construction and will be repaired/replaced as necessary. Approved barriers shall be compost socks or approved equivalent. Additionally a turbidity curtain will be hand placed in the stream channel downstream of the existing primary spillway.

Construction Site Entrance and Access Roads

To reduce the tracking of sediment from the construction site onto public ways, as well as the production of airborne dust, a stabilized construction entrance will be established. The entrance will consist of a 6-inch thick pad of 3-inch-minus stone underlain with a geotextile filter fabric filter cloth and will be constructed on level ground. The reduction of trackout sediments and other pollutants onto paved roads will minimize the release of sediment off-site and the production of airborne dust.

Stockpiled Materials

Stockpiles (if any) created during construction activities will be surrounded with erosion control barriers, as appropriate. Stockpiles will be graded to shed water and covered as necessary with plastic prior to the onset of inclement weather.

Equipment Fueling

Equipment fueling and other activities including petroleum, oil and other potentially hazardous substances will be performed at pre-approved, designated areas with appropriate spill prevention and control measures. These areas will be located on mill property away from catch basins and other drainage structures and outside of BVW resource areas. Portable secondary containment will be used, and sorbent materials will typically be placed around the perimeter of the fueling area as necessary and appropriate during all fueling activities. Non-liquid hazardous materials will be stored in a protected area and covered.

Operations and Maintenance of Erosion and Sedimentation Controls:

Inspection and maintenance will be conducted to ensure that the BMPs installed on-site have been installed correctly and are functioning as intended. Areas disturbed by the construction, including construction entrances, will be inspected to ensure that the Erosion and Sediment Control measures are correctly installed and maintained. Inspections of the active work area will occur weekly and after every significant precipitation event (exceeding ½-inch precipitation). Specific inspection and maintenance items are discussed below.

- Erosion control barriers: The erosion control barriers will be installed prior to commencement of construction and inspected as described above. The integrity of the installation will be assessed based on visible damage to its components and sediment accumulation behind the installation. Portions of the barrier will be remedied as necessary to prevent erosion.

- Construction entrance apron: The construction entrance aprons will be installed prior to commencement of construction. The entrance will be replaced when debris becomes noticeable on the existing pavement surfaces adjacent to the construction site.

- Slope stabilization: The slope stabilization controls will be installed immediately upon obtaining final grades as shown on the plans. Areas in failure will be regraded to final grade and stabilized as necessary.

- Construction dewatering: Active dewatering may be necessary to maintain a dry, dewatered work area, and the Contractor will be required to have on-site dewatering equipment (i.e. pumps, hoses, etc.,) capable of controlling groundwater encountered in the excavations such that all work can be performed "in the dry." In addition, the Contractor will provide adequate pumping and drainage facilities to keep all excavations and work sufficiently dry from surface runoff so as not to adversely affect construction products or procedures. If performed, construction dewatering must also utilize discharge BMPs.

- Construction completion: All site restoration areas and erosion control measures implemented to enhance re-establishment of vegetation will be inspected upon completion of construction.

SEEDING AND SITE RESTORATION PLAN:

GZA anticipates that a net gain in wetland resources will result due to the transformation of the area from the former impoundment to a natural free-flowing active stream.

Seed Mix: The Contractor will be contractually obligated via performance specification to restore adjacent conditions and properties to pre-construction conditions or better at the conclusion of the project. Restoration will include a seeding program consisting of the placement of a series of specially formulated seed mixes made available by New England Wetland Plans, Inc., of Amherst, Massachusetts.

Two seed formulations have been specifically chosen for site restoration efforts to address disturbance from construction in the following areas:

- New England Conservation/Wildlife Mix - for Upland Areas
- New England Moist Area Conservation Mix - for Banks and Slopes.

New England Wet Mix seed formulation has been chosen for restoration of this area. It is anticipated that use of this mix will more quickly promote the re-establishment of full growth in this area and reduce the tendency for open un-vegetated channel remnants. Areas further upstream in the former pond area will be allowed to naturally re-vegetate with the seed base already present in the sediment.

APPENDIX B

SITE PHOTOGRAPHS

Photographic Log

Client Name: DCR	Site Location: Whites Mill Pond Dam, Winchendon, MA	Project No.: 173542.10.

Photo 1	**Date:** 5/1/2018
Direction Photo Taken: Left	
Description: Overview of impoundment from right abutment.	

Photo 2	**Date:** 5/1/2018
Direction Photo Taken: Right	
Description: Looking downstream, overview of the upstream side of the dam from across the impoundment.	

Photographic Log

Client Name:	Site Location:	Project No.:
DCR	Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
3	5/30/2018

Direction Photo Taken:
Left

Description:
Top of dam from right abutment.

Photo	Date:
4	5/30/2018

Direction Photo Taken:
Left

Description:
Top of dam from spillway.

Photographic Log

Client Name:	Site Location:	Project No.:
DCR	Whites Mill Pond Dam Winchendon, MA	173542.10.

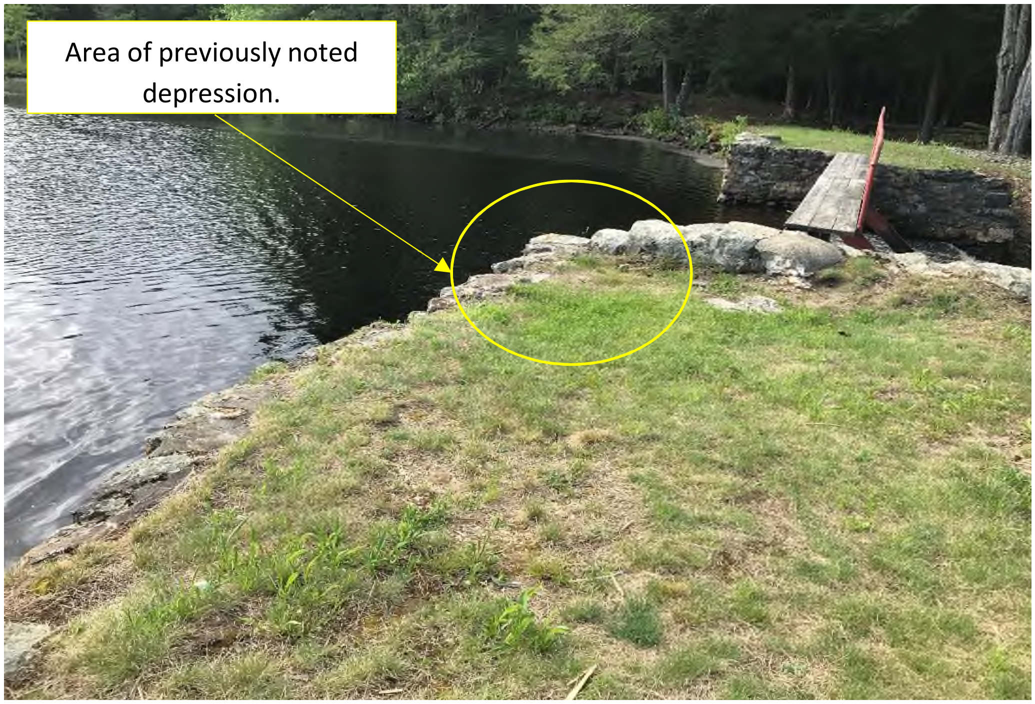
Photo 5 **Date:** 5/30/2018	
Direction Photo Taken: Left	
Description: View of spillway.	

Photo 6 **Date:** 5/1/2018	
Direction Photo Taken: Right	
Description: Discharge channel from spillway.	

Photographic Log

Client Name:	Site Location:		Project No.:
DCR		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:	
7	5/30/2018	
Direction Photo Taken: Upstream		
Description: Cleared spillway from previous woody debris pile in January.		

Photo	Date:	
8	5/30/2018	
Direction Photo Taken: Left		
Description: View of spillway from left abutment.		

Photographic Log

Client Name: DCR	**Site Location:** Whites Mill Pond Dam Winchendon, MA	**Project No.:** 173542.10.

Photo 9	**Date:** 5/30/2018

Direction Photo Taken:
Left

Description:
Corrosion of spillway bridge support.

Photo 10	**Date:** 5/30/2018

Direction Photo Taken:
Downstream

Description:
Dam from left abutment.

Photographic Log

Client Name: DCR	**Site Location:** Whites Mill Pond Dam Winchendon, MA	**Project No.:** 173542.10.

Photo 11	**Date:** 5/1/2018

Direction Photo Taken:
Upstream

Description:
Upstream face of dam from left abutment.

Photo 12	**Date:** 5/1/2018

Direction Photo Taken:
Right

Description:
View from downstream of spillway.

Photographic Log

Client Name:	Site Location:	Project No.:
DCR	Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
13	

Direction Photo Taken:
Right

Description:
Right downstream side of spillway.

Photo	Date:
14	5/1/2018

Direction Photo Taken:
Upstream

Description:
Uprooted trees along upstream side of dike.

Photographic Log

Client Name:	Site Location:		Project No.:
DCR		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:	
15	5/1/2018	
Direction Photo Taken: Left		
Description: Discharge channel.		

Photo	Date:	
16	5/1/2018	
Direction Photo Taken: Downstream		
Description: Bridge over discharge channel downstream of dam.		

Photographic Log

Client Name: DCR	Site Location: Whites Mill Pond Dam, Winchendon, MA	Project No.: 173542.10.

Photo	Date:
17	5/1/2018

Direction Photo Taken:
Left

Description:
Downstream face of dam right of spillway.

Photo	Date:
18	5/30/2018

Direction Photo Taken:
Downstream

Description:
Downstream face of dam from right abutment.

Photographic Log

Client Name: DCR	Site Location: Whites Mill Pond Dam, Winchendon, MA	Project No.: 173542.10.

Photo	Date:
19	5/1/2018

Direction Photo Taken:
Left

Description:
Sluiceway at right abutment.

Photo	Date:
20	5/1/2018

Direction Photo Taken:
Downstream

Description:
Downstream discharge under mill building.

APPENDIX C

SEDIMENT EVALUATION

PROPOSED PARTIAL BREACH
WHITES MILL POND DAM, WINCHENDON, MASSACHUSETTS
SEDIMENT MANAGEMENT PLAN

Brandywine Farm, Inc. (Owner) proposes to perform a partial breach of Whites Mill Pond Dam to address conditions infrastructure conditions at the dam, to improve ecological conditions of the North Branch of the Miller's River in the dam vicinity, and to restore floodplain functionality.

To determine management options of impounded sediment with dam removal, GZA assessed sediment for quality and quantity in 2018. Transport of fine sediments can be expected during typical annual floods within the channel; however, it is anticipated that the overall area of the former pond bottom will be generally stable during flood conditions once vegetation has re-established. It is also expected that the channel bottom through the reconfigured section will extend into naturally occurring alluvial and glacial till soil, and rock-rubble from the dam will also be generally stable. Concentrations of metals and compounds are similarly low in both the upstream (current pond) area and the receiving areas downstream of the dam.

The partial breach will remove 900 cubic yards of material from the channel area, approximately 100 cubic yards will be material that is dredged (sediment removed below the top of bank). Materials generated from excavation/dredging activities will be relocated along the right upstream bank of Whites Pond (post breach). Post breach, this area will be upland area located about 150 north of the anticipated river channel. The remaining sediment will be managed using a passive release sediment management strategy. Approximately 250 CYs of sediment are expected to distribute downstream during precipitation events over the first year. The breakdown of sediment volumes can be found in **Table 1**.

Table 1: Estimated Volume of Impounded Sediment for Each Management Strategy

Sediment Source	Volume (CY)	Notes
Total Sediment	1,250	Total, active and passively managed
Sediment excavated at the impoundment	900	Active, includes dredged materials
Sediment dredged at the impoundment	100	Active
Sediment to redistribute downstream	250	Passive, over the first year

BACKGROUND

Whites Mill Pond Dam is an approximately 12.5-foot-high dam. In accordance with Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Whites Mill Pond Dam is an Intermediate Size structure. Given the presence of residential structures and public roads downstream of the dam, the dam is considered a high hazard structure. Based on previous Phase I dam inspections performed by GZA and others, the Dam is considered to be in Poor condition. Historic documentation indicates that the primary purpose of the dam was to impound water for a mill located at the dam. The dam does not currently serve any specific purpose.

Currently, Whites Mill Pond Dam does not include a fish passage structure and prevents wild brook trout and other species from moving upstream from Miller's River. These fish would benefit from access to the upper reaches and the tributaries.

The removal of the dam would address the observed deteriorated condition of the dam, reduce liability for the dam owner, and provide environmental benefits by restoring the impoundment areas to a natural wetland and a free-flowing stream system.

SEDIMENT CHARACTERIZATION

The preferred alternative for sediment management involves a combination of active removal and passive release. This approach is described in depth below.

Sediment Volume

Based on dimensions of the proposed channel, the dam removal project will require limited active excavation of sediment and will also result in additional passive natural downstream sediment transport during channel formation. Construction of the proposed new channel configuration to the right of the existing primary spillway will require excavation and disposal of approximately 900 cubic yards of earthen fill from upland areas (i.e. that material associated with the dam embankment portion to be removed). This fill material is believed to generally consist of a heterogeneous mixture of fine to course grained soils and rock material from the dam spillway and embankment. This material was placed as part of the construction of the dam and is not characterized as sediment. To begin the restoration of the stream upgradient from the existing dam, a pilot channel will be excavated to guide flows into the breach channel. Approximately 100 CY of active excavation of material which is currently sediment will be necessary to shape the channel immediately upstream of the breach location. This material will also be relocated on-site. The Owner proposes passively managing an additional 250 CY of impounded sediment.

Due Diligence Review

As part of the Feasibility Study conducted for the dam removal, and in accordance with in 314 CMR 9.07(2), GZA completed a due diligence review to demonstrate if the area is likely to contain anthropogenic concentrations of oil or hazardous materials. The results of a due diligence review are useful in scoping subsequent efforts to comply with 314 CMR 9.1.

GZA conducted a review for the Whites Mill Pond which included a review of aerial photography of the watershed, analysis of Commonwealth GIS and web-based data, discussion with the dam owner, and site reconnaissance.

The site reconnaissance included qualitative assessment of existing stream bank stability, stream substrate and sediment conditions, vegetation conditions (including the potential presence of invasive species such as purple loosestrife), and general stream channel alignment in the vicinity of the dam and the portion of the downstream reach judged by GZA to be potentially influenced by the dam's removal.

Historic record of a mill at the site indicates the potential for contaminants which would be likely found in the sediment downstream of the dam. Available historical information indicates that that the area of the dam was initially developed circa 1860 in association with development of the White Brothers Mill for denim/cotton manufacturing. The mill operated as such from 1860 until 1960, and was then occupied by Ray Plastics (plastic goods manufacturing) from 1960 to 1992, and Mylec Corporation (plastic sports equipment) from 1992 until 2011.

Based on a review of publicly-available aerial photographs, remaining properties in the immediate vicinity of Whites Mill Pond have been either undeveloped or residential since at least the 1930s. An aboveground electric transmission easement has been located immediately east of Whites Mill Pond since at least 1938.

GZA used GIS and web-based data include using the MassGIS Oliver tool and the Energy and Environmental Affairs Data Portal to assess potential contamination events within the vicinity of Whites Mill Pond.

According to review of GIS data maintained by the Commonwealth, Whites Mill Pond does not contain any listed solid waste facilities, BWP Major Facilities or surface and underground discharge locations. The former Mylec mill complex is listed twice as a hazardous waste disposal site ("21e site") under Release Tracking Numbers (RTNs) 2-14319 and 2-

19250. Both RTNs appear limited to areas downstream of the dam. RTN 2-14319 is associated with the detection of polychlorinated biphenyls (PCBs) in soil and sediment at and downstream of the mill complex. Response actions included the dredging and off-site disposal of impacted sediments from the mill tail race and Millers River downstream of the dam. Sediment sampling conducted under RTN 2-14319 within Whites Mill Pond did not detect PCBs above laboratory method detection limits. RTN 2-14319 has reach a Permanent Solution under the MCP. RTN 2-19250 is an active site. On July 16, 2014, a release of lubricating oil was reported to MassDEP. The release reportedly impacted an area beneath and/or immediately west of the mill building, downstream from the dam. Response actions for RTN 2-19250 are ongoing under the MCP. There are no sites with Activity and Use Limitations (AUL) in the watershed.

Results of the due diligence study suggest that there are few, if any, point sources of contamination (spills, etc.) that might impact sediment quality in the Whites Mill Pond impoundment. These are the sediments which will be mobilized during the natural channel formation process following the decommissioning of the dam.

SEDIMENT SAMPLING

Per findings from the due diligence review, GZA conducted a sediment sampling program. Sediment samples were obtained by GZA engineers. Samples S-1 and S-2 were collected on April 26, 2108. Samples S-3 through S-7 were collected on October 29, 2108. Samples S-1 through S-5 were obtained from within Whites Pond. Samples S-1, S-3, S-4 and S-5 were obtained from within the existing stream channel. Sample S-6 was obtained just downstream of the spillway. Sample S-7 was obtained from the discharge channel downstream of the mill buildings. Refer to attached **Figure 1** for the sediment sample locations.

The sediment samples were submitted to Alpha Analytical of Cranston, Rhode Island for analysis. The samples were tested for parameters required for the 401 Water Quality Certification. Per 314 CMR 9.07, the samples were tested for the following required parameters:

- Metals - Arsenic, Cadmium, Total Chromium, Chromium V, Copper, Lead, Mercury, Nickel, Zinc.
- Extractable Petroleum Hydrocarbons (EPH),
- Volatile Organic Compounds (VOCs),
- Polycyclic Aromatic Hydrocarbons (PAHs),
- Polychlorinated Biphenyls (PCBs),
- Pesticides 8081
- Total Petroleum Hydrocarbons (TPH) 8100
- Total Organic Carbon (TOC),
- Percent Water,
- Grain size

Although reporting requirements are not associated with sediment, results of all analytical tests are below the levels established under the Massachusetts Department of Environmental Protection (DEP) Method 1, S-1/GW-1 Standards or Massachusetts Contingency Plan (MCP) Reportable Concentrations for RCS 1 soils (MCP values used for cases where Method 1 levels have not been established).

Laboratory results are presented in **Appendix A**.

SURFACE WATER SAMPLING

GZA engineers obtained two surface water samples from Whites Mill Pond Dam on October 29, 2018. Sample SW-1 was obtained along the upstream end of the dam. Sample SW-2 was obtained at the northern end of the pond. The samples were analyzed for the following:

- Extractable Petroleum Hydrocarbons (EPH),
- Volatile Organic Compounds (VOCs), and
- RCRA 8 metals.

Laboratory results are presented in **Appendix B**.

SEDIMENT MANAGEMENT APPROACH

Alternatives for managing excavated sediment as part of the Whites Mill Pond Dam removal are based on MassDEP guidance, the general approach to post-dam removal stream restoration favored by the MassDER, and the Sediment Analysis. The Owner proposes minimal excavation and channel forming upstream of the former dam to remove limited quantities of sediment. The excavated embankment material and sediment will be relocated to the right and upstream of the dam post breach (after the impoundment has been lowered.)

The uncontaminated nature of the impounded sediment indicates that controlled natural release of the remaining impounded sediment would provide benefit to biodiversity efforts. With the gradual removal of fine sediment, favorable cobble and gravel substrates will become available for colonization by benthic macroinvertebrates. The downstream channel is likely “sediment starved” and the channel formation in the former impoundment will be good for downstream habitat due to a restoration of the sediment transport balance and filling of the interstitial spaces which would prevent flow from going subsurface during dry periods.

Alternatively, physical removal of large quantities of relatively uncontaminated sediment in the upstream former impoundment area would require a larger proposed limit of work footprint and increase associated temporary impacts. Passive sediment management techniques have been employed at several recent dam removals in Massachusetts and is the preferred alternative for sediment transport for this project.

TABLES

TABLE 2

SUMMARY OF ANALYTICAL TESTING RESULTS
SEDIMENT SAMPLES
Whites Mill Pond Dam Decommissioning
Winchendon, Massachusetts

	COMM-97 Lined Landfills Reuse Levels (mg/kg)	COMM-97 Unlined Landfills Reuse Levels (mg/kg)	Upstream Samples					Downstream Samples	
			SED-1 (mg/kg)	SED-2 (mg/kg)	S-3 (mg/kg)	S-4 (mg/kg)	S-5 (mg/kg)	S-6 (mg/kg)	S-7 (mg/kg)
Volatile Organic Compounds (VOCs) EPA Method 8260									
Acetone			0.608	0.287	0.0141	0.0263	0.419	0.0649	0.0093
Total VOCs	10	4	0.608	0.287	0.0141	0.0263	0.419	0.0649	0.0093
Organochlorine Pesticides EPA Method 8081B			NA	NA	BDL	BDL	BDL	BDL	BDL
Polychlorinated Biphenyls Congeners (NOAA 18 List)									
BZ#101			0.00089	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.0138
BZ#105			<0.00085	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.00499
BZ#118			NA	NA	<0.00035	<0.00038	<0.00076	<0.00084	0.0188
BZ#128			<0.00085	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.00417
BZ#138			0.00179	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.0198
BZ#153			NA	NA	<0.00035	<0.00038	<0.00076	<0.00084	0.01
BZ#170			NA	NA	<0.00035	<0.00038	<0.00076	<0.00084	0.00235
BZ#180			NA	NA	<0.00035	<0.00038	<0.00076	<0.00084	0.00282
BZ#187			<0.00085	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.0013
BZ#44			NA	NA	<0.00035	<0.00038	<0.00076	<0.00084	0.00184
BZ#52			<0.00085	<0.00082	<0.00035	<0.00038	<0.00076	<0.00084	0.00406
Total PCBs	2	2	0.00268	BDL	BDL	BDL	BDL	BDL	0.08393
Total Petroleum Hydrocarbons Modified EPA Method 8100	5000	2500	47.6	56.8	34.1	25.3	140	79.2	55.9
Percent Moisture (%)			NA	NA	22	28	81	68	18
Total Organic Carbon (Average) EPA			95300	75600	<353	490	118000	71300	<401
Extractable Petroleum Hydrocarbons MADEP									
Acenaphthene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.084
Anthracene			<0.028	<0.020	<0.010	<0.011	<0.021	<0.018	0.11
Benzo(a)anthracene			<0.028	<0.020	<0.010	<0.011	<0.021	<0.018	0.3
Benzo(a)pyrene			<0.028	<0.020	<0.010	<0.011	0.053	<0.018	0.278
Benzo(b)fluoranthene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.332
Benzo(g,h,i)perylene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.165
Benzo(k)fluoranthene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.174
C11-C22 Aromatics			NA	NA	<19.6	<21.0	<39.7	<33.8	20.5
C11-C22 Unadjusted Aromatics1			38.4	<17.5	<19.2	<20.6	<39.0	<33.2	25.3
C19-C36 Aliphatics1			<24.1	<17.5	20.9	21.7	97.5	89.1	34.7
Chrysene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.369
Dibenzo(a,h)Anthracene			<0.028	<0.020	<0.010	<0.011	<0.021	<0.018	0.075
Fluoranthene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.894
Fluorene			<0.028	<0.020	<0.010	<0.011	<0.021	<0.018	0.096
Indeno(1,2,3-cd)Pyrene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.164
Naphthalene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.053
Phenanthrene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.923
Pyrene			<0.069	<0.050	<0.026	<0.028	<0.052	<0.044	0.761
Metals 401 Water Quality Certification									
Arsenic	40	40	4.25	1.64	<0.87	<0.98	2.89	5.83	6.77
Cadmium	80	30	0.32	0.24	<0.17	<0.20	0.43	<0.19	0.71
Chromium	1000	1000	2.81	2.21	2.81	2.39	4.09	9.13	6.18
Copper			6.02	2.89	1.92	1.48	5.82	5.56	15.4
Lead	2000	1000	20.3	15.5	2.82	2.2	15	37.7	26.5
Mercury	10	10	0.119	0.288	<0.009	<0.009	0.053	0.032	<0.009
Nickel			2.76	2.19	2.78	1.88	4.35	3.44	3.31
Zinc			29.2	23.7	10.8	8.9	42.4	23.1	36.4

Notes:
1. Samples SED-1 and SED-2 collected April 26, 2018, and samples SED-3 through SED-7 collected October 29, 2018. Analyses performed by ESS Laboratory in Cranston, RI.
2. BDL = Below detection limits, NA = Not Applicable. All results are in mg/kg dry (parts per million) unless otherwise noted.
3. Constituents that were not detected in any samples were omitted from this table.

J:\170,000-179,999\173542\173542-10.DJS\Sediment and Surface Water Samples\[Sed 1-7 Summary Table_2018-12-06.xlsx]Summary Table

Table 3
SUMMARY OF ANALYTICAL TESTING RESULTS OF SEDIMENT SAMPLES
Sediment Quality Spreadsheet for Dam Removal Projects
WHITES MILL POND DAM DECOMMISSIONING
WINCHENDON, MASSACHUSETTS

Recommended Analyses for Dam Removal Projects		MA DEP BWSC Soil Standards and Guidance Values				Sediment Thresholds	Dam Impoundment Samples	Downstream Samples Results		Upstream Samples				Summary Calculations				
Parameters	Units	Cleanup Standard (S-1/GW-1)	"Natural Soil" Background	"Urban Soil" Backgrond	Upper Concentration Limit (UCL)	Freshwater PEC	S2	S6	S7	S1	S3	S4	S5	Impoundment Min	Impoundment Max	Impoundment Mean	Downstream Mean	Upstream Mean
Metals, Total [mg/kg or ppm]																		
Arsenic (ppm)	mg/kg (ppm)	20	20	20	500	33	1.64	5.83	6.77	4.25	0.435	0.49	2.89	1.64	1.64	1.64	6.30	2.02
Cadmium (ppm)	mg/kg (ppm)	70	2	3	1,000	4.98	0.24	0.095	0.71	0.32	0.085	0.1	0.43	0.24	0.24	0.24	0.40	0.23
Chromium (TOTAL)(ppm)	mg/kg (ppm)	100	30	40	2,000	111	2.21	9.13	6.18	2.81	2.81	2.39	4.09	2.21	2.21	2.21	7.66	3.03
Chromium VI (ppm)	mg/kg (ppm)	100	30	40	2,000									N/A	N/A	N/A	N/A	N/A
Copper (ppm)	mg/kg (ppm)		40	200		149	2.89	5.56	15.4	6.02	1.92	1.48	5.82	2.89	2.89	2.89	10.48	3.81
Lead (ppm)	mg/kg (ppm)	200	100	600	6,000	128	15.5	37.7	26.5	20.3	2.82	2.2	15	15.50	15.50	15.50	32.10	10.08
Mercury (ppm)	mg/kg (ppm)	20	0	1	300	1.06	0.288	0.032	0.0045	0.119	0.0045	0.0045	0.053	0.29	0.29	0.29	0.02	0.05
Nickel (ppm)	mg/kg (ppm)	600	20	30	10,000	48.6	2.19	3.44	3.31	2.76	2.78	1.88	4.35	2.19	2.19	2.19	3.38	2.94
Zinc (ppm)	mg/kg (ppm)	1,000	100	300	10,000	459	23.7	23.1	36.4	29.2	10.8	8.9	42.4	23.70	23.70	23.70	29.75	22.83
PAHs (ug/kg or ppb)																		
Anthracene (ppb)	ug/kg (ppb)	1,000,000	1,000	4,000	10,000,000	845	10	9	110	14	5	5.5	10.5	10.00	10.00	10.00	59.50	8.75
Benzo[a]anthracene (ppb)	ug/kg (ppb)	7,000	2,000	9,000	3,000,000	1050	10	9	300	14	5	5.5	10.5	10.00	10.00	10.00	154.50	8.75
Benzo[a]pyrene (ppb)	ug/kg (ppb)	2,000	2,000	7,000	300,000	1450	10	9	278	14	5	5.5	0.053	10.00	10.00	10.00	143.50	6.14
Benzo[b]fluoranthene (ppb)	ug/kg (ppb)	7,000	2,000	8,000	3,000,000	13400	25	22	332	34.5	13	14	26	25.00	25.00	25.00	177.00	21.88
Chrysene (ppb)	ug/kg (ppb)	70,000	2,000	7,000	10,000,000	1290	25	22	369	34.5	13	14	26	25.00	25.00	25.00	195.50	21.88
Dibenz[a,h]anthracene (ppb)	ug/kg (ppb)	700	500	1,000	300,000	260	10	9	75	14	5	5.5	10.5	10.00	10.00	10.00	42.00	8.75
Fluoranthene (ppb)	ug/kg (ppb)	1,000,000	4,000	10,000	10,000,000	2230	25	22	894	34.5	13	14	26	25.00	25.00	25.00	458.00	21.88
Fluorene (ppb)	ug/kg (ppb)	1,000,000	1,000	2,000	10,000,000	536	10	9	96	14	5	5.5	10.5	10.00	10.00	10.00	52.50	8.75
Naphthalene (ppb)	ug/kg (ppb)	4,000	500	1,000	10,000,000	561	25	22	53	34.5	13	14	10.5	25.00	25.00	25.00	37.50	18.00
Phenanthrene (ppb)	ug/kg (ppb)	10,000	3,000	20,000	10,000,000	1170	25	22	923	34.5	13	14	10.5	25.00	25.00	25.00	472.50	18.00
Pyrene (ppb)	ug/kg (ppb)	1,000,000	4,000	20,000	10,000,000	1520	25	22	761	34.5	13	14	10.5	25.00	25.00	25.00	391.50	18.00
Total PAHs (ppb)	ug/kg (ppb)	4,100,700	22,000	89,000	76,600,000	22800	200	177	4191	277	103	111.5	151.553	200.00	200.00	200.00	2184.00	160.76
PCBs (mg/kg or ppm)																		
Total PCBs (ppm)	mg/kg (ppm)	1			100	0.676	BDL	BDL	0.08393	0.00268	BDL	BDL	BDL				0.08	0.00
Pesticides (ug/kg)																		
2-4' DDD (ppb)	ug/kg (ppb)							0	0		0	0	0				0.00	0.00
4-4' DDD (ppb)	ug/kg (ppb)	8,000			600,000			1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
Sum DDD (ppb)	ug/kg (ppb)					28		1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
2-4' DDE (ppb)	ug/kg (ppb)							0	0		0	0	0	0.00	0.00	0.00	0.00	0.00
4-4' DDE (ppb)	ug/kg (ppb)	6,000			600,000			1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
Sum DDE (ppb)	ug/kg (ppb)					31.3		1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
2-4' DDT (ppb)	ug/kg (ppb)							0	0		0	0	0				0.00	0.00
4-4' DDT (ppb)	ug/kg (ppb)	6,000			600,000			1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
Sum DDT (ppb)	ug/kg (ppb)					62.9		1.9	1.55		1.6	1.4	3.3	0.00	0.00	0.00	1.73	2.10
Total DDTs (ppb)	ug/kg (ppb)					572		5.7	4.65		4.8	4.2	9.9	0.00	0.00	0.00	5.18	6.30
Chlordane (ppb)	ug/kg (ppb)	5,000			600,000	17.6		15.2	12.5		12.8	13.75	26.25	0.00	0.00	0.00	13.85	17.60
Dieldrin (ppb)	ug/kg (ppb)	80			30,000	61.8		1.9	1.55		1.6	1.7	3.3	0.00	0.00	0.00	1.73	2.20
Endrin (ppb)	ug/kg (ppb)	10,000			200,000	207		1.9	1.55		1.6	1.7	3.3	0.00	0.00	0.00	1.73	2.20
gamma-BHC (Lindane) (ppb)	ug/kg (ppb)					4.99		1.15	0.95		0.95	1.05	1.95	0.00	0.00	0.00	1.05	1.32
Heptachlor epoxide (ppb)	ug/kg (ppb)	100			10,000	16		1.9	1.55		1.6	1.7	3.3	0.00	0.00	0.00	1.73	2.20
TPH and EPH (mg/kg or ppm)																		
Total Petrolem Hydrocarbons [TPH] (ppm)	mg/kg (ppm)	1,000			10,000		**56.8**	**79.2**	**55.9**	**47.6**	**34.1**	**25.3**	**140**				67.55	61.75
C9-C18 Aliphatic Hydrocarbons (ppm)	mg/kg (ppm)	1,000			20,000		8.75	16.6	0.0095	12.05	9.6	10.3	19.5	8.75	8.75	8.75	8.30	12.86
C19-C36 Aliphatic Hydrocarbons (ppm)	mg/kg (ppm)	3,000			20,000		8.75	89.1	34.7	12.05	20.9	21.7	97.5	8.75	8.75	8.75	61.90	38.04
C11-C22 Aromatic Hydrocarbons (ppm)	mg/kg (ppm)	1,000			10,000		9.05	16.6	20.5	38.4	9.8	10.5	19.85	9.05	9.05	9.05	18.55	19.64
Physical Characteristics																		
Total Organic Carbon (%)	%													N/A	N/A	N/A	N/A	N/A
Percent Water (%)	%													N/A	N/A	N/A	N/A	N/A
Sieve No. 4 (% passing)	% passing													N/A	N/A	N/A	N/A	N/A
Sieve No. 10 (% passing)	% passing													N/A	N/A	N/A	N/A	N/A
Sieve No. 40 (% passing)	% passing													N/A	N/A	N/A	N/A	N/A
Sieve No. 60 (% passing)	% passing													N/A	N/A	N/A	N/A	N/A

Table 3
SUMMARY OF ANALYTICAL TESTING RESULTS OF SEDIMENT SAMPLES
Sediment Quality Spreadsheet for Dam Removal Projects
WHITES MILL POND DAM DECOMMISSIONING
WINCHENDON, MASSACHUSETTS

Recommended Analyses for Dam Removal Projects		**MA DEP BWSC Soil Standards and Guidance Values**				**Sediment Thresholds**	**Dam Impoundment Samples**	**Downstream Samples Results**		**Upstream Samples**				**Summary Calculations**				
Parameters	Units	Cleanup Standard	"Natural Soil"	"Urban Soil"	Upper Concentration	Freshwater	S2	S6	S7	S1	S3	S4	S5	Impoundment			Downstream	Upstream
Sieve No. 200 (% passing)	% passing													N/A	N/A	N/A	N/A	N/A
Volatile Organic Compounds (VOCs) EPA Method 8260																		
1,1,1,2-Tetrachloroethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,1,1-Trichloroethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,1,2,2-Tetrachloroethane	mg/kg dry						0.0041	0.0016	0.0006	0.00715	0.00065	0.0007	0.0056	0.00	0.00	0.00	0.00	0.00
1,1,2-Trichloroethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,1-Dichloroethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,1-Dichloroethene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,1-Dichloropropene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2,3-Trichlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2,3-Trichloropropane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2,4-Trichlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2,4-Trimethylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2-Dibromo-3-Chloropropane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2-Dibromoethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2-Dichlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2-Dichloroethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,2-Dichloropropane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,3,5-Trimethylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,3-Dichlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,3-Dichloropropane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,4-Dichlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
1,4-Dioxane	mg/kg dry						0.02055	0.0081	0.0308	0.03575	0.03175	0.036	0.02995	0.02	0.02	0.02	0.02	0.03
2,2-Dichloropropane	mg/kg dry						0.0103	0.0405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.02	0.01
2-Butanone	mg/kg dry						0.02055	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
2-Chlorotoluene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
2-Hexanone	mg/kg dry						0.02055	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
4-Chlorotoluene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
4-Isopropyltoluene	mg/kg dry						0.003	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.00	0.00	0.00	0.00	0.01
4-Methyl-2-Pentanone	mg/kg dry						0.0205	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
Acetone	mg/kg dry						0.287	0.0649	0.0093	0.608	0.0141	0.0263	0.419	0.29	0.29	0.29	0.04	0.27
Benzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Bromobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Bromochloromethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Bromodichloromethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Bromoform	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Bromomethane	mg/kg dry						0.02055	0.0081	0.00155	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.00	0.02
Carbon Disulfide	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Carbon Tetrachloride	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Chlorobenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Chloroethane	mg/kg dry						0.02055	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
Chloroform	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Chloromethane	mg/kg dry						0.02055	0.00081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.00	0.02
cis-1,2-Dichloroethene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
cis-1,3-Dichloropropene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Dibromochloromethane	mg/kg dry						0.0041	0.0016	0.0006	0.00715	0.00065	0.0007	0.00056	0.00	0.00	0.00	0.00	0.00
Dibromomethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Dichlorodifluoromethane	mg/kg dry						0.02055	0.00081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.00	0.02
Diethyl Ether	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Di-isopropyl ether	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Ethyl tertiary-butyl ether	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Ethylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01

Table 3
SUMMARY OF ANALYTICAL TESTING RESULTS OF SEDIMENT SAMPLES
Sediment Quality Spreadsheet for Dam Removal Projects
WHITES MILL POND DAM DECOMMISSIONING
WINCHENDON, MASSACHUSETTS

Recommended Analyses for Dam Removal Projects		**MA DEP BWSC Soil Standards and Guidance Values**				**Sediment Thresholds**	**Dam Impoundment Samples**	**Downstream Samples Results**		**Upstream Samples**				**Summary Calculations**				
Parameters	Units	Cleanup Standard	"Natural Soil"	"Urban Soil"	Upper Concentration	Freshwater	S2	S6	S7	S1	S3	S4	S5	Impoundment			Downstream	Upstream
Hexachlorobutadiene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Isopropylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Methyl tert-Butyl Ether	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Methylene Chloride	mg/kg dry						0.02055	0.00081	0.00155	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.00	0.02
Naphthalene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
n-Butylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
n-Propylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
sec-Butylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Styrene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
tert-Butylbenzene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Tertiary-amyl methyl ether	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Tetrachloroethene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Tetrahydrofuran	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Toluene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
trans-1,2-Dichloroethene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
trans-1,3-Dichloropropene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Trichloroethene	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Trichlorofluoromethane	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Vinyl Chloride	mg/kg dry						0.02055	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
Xylene O	mg/kg dry						0.0103	0.00405	0.00155	0.01785	0.0016	0.0018	0.01395	0.01	0.01	0.01	0.00	0.01
Xylene P,M	mg/kg dry						0.02055	0.0081	0.0031	0.03575	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.02
Xylenes (Total)	mg/kg dry						0.02055	0.0081	0.0031	0.01785	0.00315	0.0036	0.02995	0.02	0.02	0.02	0.01	0.01
Total VOCs	mg/kg dry						0.287	0.0649	0.0093	0.304	0.0141	0.0263	0.419	0.29	0.29	0.29	0.04	0.19

Division of Ecological Restoration

TABLE 4

SUMMARY OF ANALYTICAL TESTING RESULTS
SURFACE WATER SAMPLES
Whites Mill Pond Dam
Winchendon, Massachusetts

	SW-1 (ug/L) 1810853-01 10/29/2018 13:45	SW-2 (ug/L) 1810853-02 10/29/2018 14:45
Analyte		
Volatile Organic Compounds (VOCs) EPA Method 8260		
Total VOCs	BDL	BDL
Extractable Petroleum Hydrocarbons MADEP	BDL	BDL
Metals 401 Water Quality Certification		
Arsenic	<0.5	**0.6**
Barium	**5.6**	**7.7**
Cadmium	<0.2	<0.2
Chromium	<2.0	<2.0
Lead	<2.0	<2.0
Mercury	<0.20	<0.20
Selenium	<1.0	<1.0
Silver	<1.0	<1.0

Notes:
1. Samples SW-1 and SW-2 collected on October 29, 2018. Analyses performed by ESS Laboratory in Cranston, RI.
2. BDL = Below detection limits. All results are in ug/L (micrograms per liter) unless otherwise noted.
3. VOC, EPH, and Metals constituents that were not detected were omitted from this table.

J:\170,000-179,999\173542\173542-10.DJS\Permits\MEPA\Attachments\Appendix C - Sediment Evaluation\[TABLE 4.xls]Summary Table

FIGURE

LEGEND

- SEDIMENT SAMPLE OBTAINED BY GZA. S-1 AND S-2 OBTAINED ON APRIL 26, 2018. S-3 THROUGH S-7 OBTAINED ON OCTOBER 29, 2018.
- SURFACE WATER SAMPLE OBTAINED BY GZA ON OCTOBER 29, 2018.

GENERAL NOTES

1. SEDIMENT SAMPLES AND SURFACE WATER SAMPLES COLLECTED BY GZA GEOENVIRONMENTAL, INC. ON OCTOBER 29, 2018. SAMPLES LOCATED IN THE FIELD USING A LEICA VIVA SMARTWORX DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) REAL-TIME KINEMATIC (RTK) NETWORK WITH RTK CORRECTIONS FROM THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONTINUOUSLY OPERATING REFERENCE STATION NETWORK (MaCORS).
2. APPROXIMATE POOL ELEVATION AT THE TIME OF THE SURVEY, UPSTREAM OF THE DAM = ±1036.5 NAVD88.
3. APPROXIMATE CHANNEL ALIGNMENT BASED ON AERIAL IMAGERY AND SITE OBSERVATIONS AT THE TIME OF THE SURVEY.
4. BASE MAP FROM BING IMAGES USING AUTOCAD GEOLOCATION FEATURE

NO.	ISSUE/DESCRIPTION	BY	DATE

WHITES MILL POND DAM
DAM DECOMMISSIONING & STREAM RESTORATION PROJECT
WINCHENDON, MASSACHUSETTS

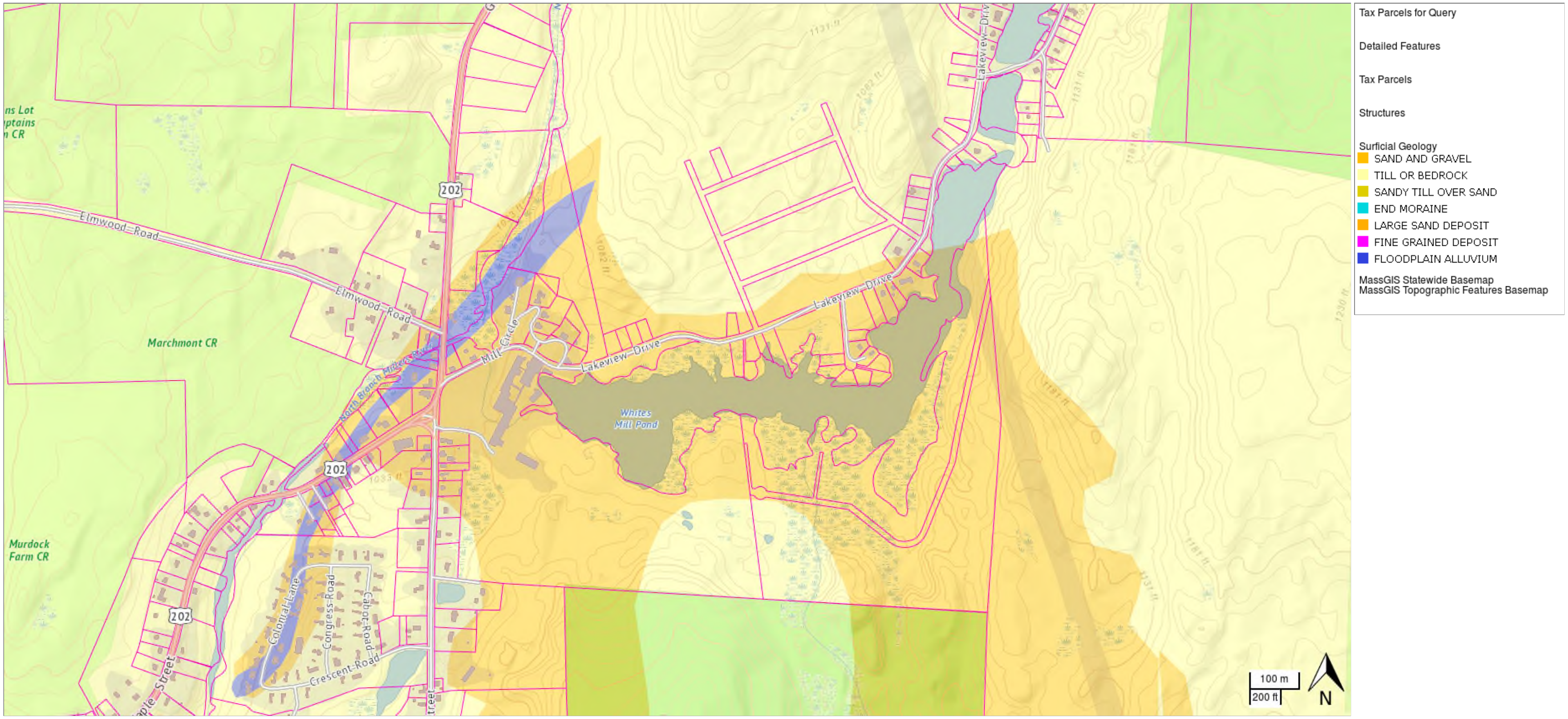
SEDIMENT & SURFACE WATER SAMPLES LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:

PROJ MGR: DJS	REVIEWED BY: CWC	CHECKED BY: DJS	FIGURE
DESIGNED BY: DJS	DRAWN BY: JJZ	SCALE: AS NOTED	1
DATE: DECEMBER, 2018	PROJECT NO. 01.0173542.10	REVISION NO.	SHEET NO.

Whites Mill Pond Soils



APPENDIX A

SEDIMENT

ENVIRONMENTAL CHEMISTRY LABORATORY RESULTS

CERTIFICATE OF ANALYSIS

Derek Schipper
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Whites Mill Pond Dam (01.0173542.10)
ESS Laboratory Work Order Number: 1804826

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:12 pm, May 08, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analvses

CTS - Cranston, RI	Grain Size Analysis, Organic Content

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

SAMPLE RECEIPT

The following samples were received on April 27, 2018 for the analyses specified on the enclosed Chain of Custody Record.

Low Level VOA vials were frozen by ESS Laboratory on April 27, 2018 at 19:36.

Lab Number	Sample Name	Matrix	Analysis
1804826-01	SED-1	Soil	§, 2540G, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1804826-02	SED-2	Soil	§, 2540G, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1804826-03	SED-1 Air Dried - Metals	Soil	6010C, 7471B
1804826-04	SED-2 Air Dried - Metals	Soil	6010C, 7471B
1804826-05	SED-1 Air Dried - PCB	Soil	8082
1804826-06	SED-2 Air Dried - PCB	Soil	8082

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

PROJECT NARRATIVE

5035/8260B Volatile Organic Compounds / Low Level

C8D0492-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**

1,1,2-Trichloroethane (23% @ 20%), 1,2-Dichloroethane (28% @ 20%), 2-Butanone (30% @ 20%), 4-Methyl-2-Pentanone (23% @ 20%), Acetone (25% @ 20%), Bromodichloromethane (23% @ 20%), Dibromomethane (24% @ 20%)

8082 Polychlorinated Biphenyls (PCB) / Congeners

1804826-05 **Lower value is used due to matrix interferences (LC).**

BZ#101 , BZ#153 [2C]

1804826-05 **Percent difference between primary and confirmation results exceeds 40% (P).**

BZ#101 , BZ#153 [2C]

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1804826

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00
Percent Solids: 14
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1,1-Trichloroethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1,2,2-Tetrachloroethane	ND (0.0143)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1,2-Trichloroethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1-Dichloroethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1-Dichloroethene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,1-Dichloropropene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2,3-Trichlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2,3-Trichloropropane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2,4-Trichlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2,4-Trimethylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2-Dibromo-3-Chloropropane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2-Dibromoethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2-Dichlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2-Dichloroethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,2-Dichloropropane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,3,5-Trimethylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,3-Dichlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,3-Dichloropropane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,4-Dichlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
1,4-Dioxane	ND (0.715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
2,2-Dichloropropane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
2-Butanone	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
2-Chlorotoluene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
2-Hexanone	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
4-Chlorotoluene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
4-Isopropyltoluene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
4-Methyl-2-Pentanone	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Acetone	**0.608** (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Benzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Bromobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Bromochloromethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00
Percent Solids: 14
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Bromoform	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Bromomethane	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Carbon Disulfide	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Carbon Tetrachloride	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Chlorobenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Chloroethane	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Chloroform	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Chloromethane	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
cis-1,2-Dichloroethene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
cis-1,3-Dichloropropene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Dibromochloromethane	ND (0.0143)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Dibromomethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Dichlorodifluoromethane	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Diethyl Ether	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Di-isopropyl ether	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Ethyl tertiary-butyl ether	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Ethylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Hexachlorobutadiene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Isopropylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Methyl tert-Butyl Ether	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Methylene Chloride	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Naphthalene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
n-Butylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
n-Propylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
sec-Butylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Styrene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
tert-Butylbenzene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Tertiary-amyl methyl ether	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Tetrachloroethene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Tetrahydrofuran	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Toluene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00
Percent Solids: 14
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
trans-1,3-Dichloropropene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Trichloroethene	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Trichlorofluoromethane	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Vinyl Chloride	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Xylene O	ND (0.0357)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Xylene P,M	ND (0.0715)		8260B Low		1	04/28/18 22:15	C8D0492	CD82802
Xylenes (Total)	ND (0.0715)		8260B Low		1	04/28/18 22:15		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*129 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*89 %*		*70-130*
Surrogate: Dibromofluoromethane	*117 %*		*70-130*
Surrogate: Toluene-d8	*101 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00
Percent Solids: 14
Initial Volume: 50.8
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: SMR
Prepared: 4/30/18 14:08

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**47.6** (41.4)		8100M		1	05/01/18 14:05	C8D0505	CD83011

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*106 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)								
Organic Content	**See Attached** (N/A)								
Percent Moisture	**86** (1)		2540G		1	CCP	04/27/18 21:30	%	CD82752
Total Organic Carbon (Average)	**95300** (335)		LK		1	CCP	05/02/18 22:38	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1
Date Sampled: 04/26/18 13:00
Percent Solids: 14
Initial Volume: 50.8
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-01
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 4/30/18 17:45

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (24.1)		MADEP-EPH		1	ZLC	05/01/18 18:57	C8E0018	CD83005
C19-C36 Aliphatics1	ND (24.1)		MADEP-EPH		1	ZLC	05/01/18 18:57	C8E0018	CD83005
C11-C22 Unadjusted Aromatics1	**38.4** (24.1)		EPH8270		1	VSC	05/01/18 21:50	C8E0022	CD83005
C11-C22 Aromatics1,2	**38.4** (25.1)		EPH8270			IBM	05/04/18 17:11		[CALC]
2-Methylnaphthalene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Acenaphthene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Naphthalene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Phenanthrene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Acenaphthylene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Anthracene	ND (0.028)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Benzo(a)anthracene	ND (0.028)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Benzo(a)pyrene	ND (0.028)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Benzo(b)fluoranthene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Benzo(g,h,i)perylene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Benzo(k)fluoranthene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Chrysene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Dibenzo(a,h)Anthracene	ND (0.028)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Fluoranthene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Fluorene	ND (0.028)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Indeno(1,2,3-cd)Pyrene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005
Pyrene	ND (0.069)		EPH8270SIM		1	IBM	05/04/18 17:11	C8E0075	CD83005

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*70 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*105 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*97 %*		*40-140*
Surrogate: O-Terphenyl	*86 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30
Percent Solids: 25
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1,1-Trichloroethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1,2,2-Tetrachloroethane	ND (0.0082)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1,2-Trichloroethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1-Dichloroethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1-Dichloroethene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,1-Dichloropropene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2,3-Trichlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2,3-Trichloropropane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2,4-Trichlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2,4-Trimethylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2-Dibromo-3-Chloropropane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2-Dibromoethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2-Dichlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2-Dichloroethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,2-Dichloropropane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,3,5-Trimethylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,3-Dichlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,3-Dichloropropane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,4-Dichlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
1,4-Dioxane	ND (0.411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
2,2-Dichloropropane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
2-Butanone	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
2-Chlorotoluene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
2-Hexanone	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
4-Chlorotoluene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
4-Isopropyltoluene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
4-Methyl-2-Pentanone	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Acetone	**0.287** (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Benzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Bromobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Bromochloromethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30
Percent Solids: 25
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Bromoform	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Bromomethane	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Carbon Disulfide	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Carbon Tetrachloride	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Chlorobenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Chloroethane	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Chloroform	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Chloromethane	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
cis-1,2-Dichloroethene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
cis-1,3-Dichloropropene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Dibromochloromethane	ND (0.0082)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Dibromomethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Dichlorodifluoromethane	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Diethyl Ether	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Di-isopropyl ether	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Ethyl tertiary-butyl ether	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Ethylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Hexachlorobutadiene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Isopropylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Methyl tert-Butyl Ether	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Methylene Chloride	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Naphthalene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
n-Butylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
n-Propylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
sec-Butylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Styrene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
tert-Butylbenzene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Tertiary-amyl methyl ether	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Tetrachloroethene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Tetrahydrofuran	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Toluene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30
Percent Solids: 25
Initial Volume: 4.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
trans-1,3-Dichloropropene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Trichloroethene	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Trichlorofluoromethane	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Vinyl Chloride	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Xylene O	ND (0.0206)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Xylene P,M	ND (0.0411)		8260B Low		1	04/28/18 22:40	C8D0492	CD82802
Xylenes (Total)	ND (0.0411)		8260B Low		1	04/28/18 22:40		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*126 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*86 %*		*70-130*
Surrogate: Dibromofluoromethane	*118 %*		*70-130*
Surrogate: Toluene-d8	*103 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30
Percent Solids: 25
Initial Volume: 40.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: SMR
Prepared: 4/30/18 14:08

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**56.8** (29.9)		8100M		1	05/01/18 14:39	C8D0505	CD83011

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*94 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Grain Size	**See Attached** (N/A)								
Organic Content	**See Attached** (N/A)								
Percent Moisture	**75** (1)		2540G		1	CCP	04/27/18 21:30	%	CD82752
Total Organic Carbon (Average)	**75600** (267)		LK		1	CCP	05/02/18 22:38	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2
Date Sampled: 04/26/18 13:30
Percent Solids: 25
Initial Volume: 40.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-02
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 4/30/18 17:45

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (17.5)		MADEP-EPH		1	ZLC	05/01/18 19:45	C8E0018	CD83005
C19-C36 Aliphatics1	ND (17.5)		MADEP-EPH		1	ZLC	05/01/18 19:45	C8E0018	CD83005
C11-C22 Unadjusted Aromatics1	ND (17.5)		EPH8270		1	VSC	05/02/18 0:30	C8E0003	CD83005
C11-C22 Aromatics1,2	ND (18.1)		EPH8270			IBM	05/04/18 17:59		[CALC]
2-Methylnaphthalene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Acenaphthene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Naphthalene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Phenanthrene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Acenaphthylene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Anthracene	ND (0.020)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Benzo(a)anthracene	ND (0.020)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Benzo(a)pyrene	ND (0.020)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Benzo(b)fluoranthene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Benzo(g,h,i)perylene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Benzo(k)fluoranthene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Chrysene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Dibenzo(a,h)Anthracene	ND (0.020)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Fluoranthene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Fluorene	ND (0.020)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Indeno(1,2,3-cd)Pyrene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005
Pyrene	ND (0.050)		EPH8270SIM		1	IBM	05/04/18 17:59	C8E0075	CD83005

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*64 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*88 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*83 %*		*40-140*
Surrogate: O-Terphenyl	*78 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1 Air Dried - Metals
Date Sampled: 04/26/18 13:00
Percent Solids: 99

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**4.25** (0.90)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Cadmium	**0.32** (0.18)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Chromium	**2.81** (0.36)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Copper	**6.02** (0.90)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Lead	**20.3** (1.79)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Mercury	**0.119** (0.009)		7471B		1	MJV	05/01/18 13:56	2.13	40	CD83041
Nickel	**2.76** (0.90)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039
Zinc	**29.2** (0.90)		6010C		1	KJK	05/01/18 15:08	5.65	100	CD83039

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2 Air Dried - Metals
Date Sampled: 04/26/18 13:30
Percent Solids: 99

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**1.64** (0.94)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Cadmium	**0.24** (0.19)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Chromium	**2.21** (0.38)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Copper	**2.89** (0.94)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Lead	**15.5** (1.88)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Mercury	**0.288** (0.079)		7471B		10	MJV	05/01/18 14:35	2.51	40	CD83041
Nickel	**2.19** (0.94)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039
Zinc	**23.7** (0.94)		6010C		1	KJK	05/01/18 15:12	5.36	100	CD83039

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-1 Air Dried - PCB
Date Sampled: 04/26/18 13:00
Percent Solids: 96
Initial Volume: 10
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 5/4/18 16:31

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#18	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#28	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#44 [2C]	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#52	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#66	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#101	**LC, P 0.00089** (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#105	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#118 [2C]	**0.00163** (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#128	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#138 [2C]	**0.00179** (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#153 [2C]	**LC, P 0.00111** (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#170 [2C]	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#180 [2C]	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#187	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#195	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#206	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413
BZ#209	ND (0.00085)		8082		1	05/08/18 4:02	C8E0107	CE80413

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*68 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*69 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SED-2 Air Dried - PCB
Date Sampled: 04/26/18 13:30
Percent Solids: 99
Initial Volume: 10
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1804826
ESS Laboratory Sample ID: 1804826-06
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 5/4/18 16:31

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#18	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#28	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#44	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#52	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#66	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#101	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#105	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#118 [2C]	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#128	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#138	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#153	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#170	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#180	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#187	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#195	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#206 [2C]	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413
BZ#209	ND (0.00082)		8082		1	05/08/18 4:37	C8E0107	CE80413

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*47 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*49 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CD83039 - 3050B										
Blank										
Arsenic	ND	2.50	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Copper	ND	2.50	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Arsenic	58.5	8.47	mg/kg wet	59.00		99	85-115			
Cadmium	86.0	1.69	mg/kg wet	98.70		87	84-116			
Chromium	230	3.39	mg/kg wet	240.0		96	85-115			
Copper	92.7	8.47	mg/kg wet	89.60		103	83-117			
Lead	272	16.9	mg/kg wet	276.0		99	84-116			
Nickel	276	8.47	mg/kg wet	298.0		93	84-116			
Zinc	531	8.47	mg/kg wet	590.0		90	85-115			
LCS Dup										
Arsenic	59.2	7.14	mg/kg wet	59.00		100	85-115	1	20	
Cadmium	89.5	1.43	mg/kg wet	98.70		91	84-116	4	20	
Chromium	242	2.86	mg/kg wet	240.0		101	85-115	5	20	
Copper	99.5	7.14	mg/kg wet	89.60		111	83-117	7	20	
Lead	267	14.3	mg/kg wet	276.0		97	84-116	2	20	
Nickel	289	7.14	mg/kg wet	298.0		97	84-116	5	20	
Zinc	554	7.14	mg/kg wet	590.0		94	85-115	4	20	
Batch CD83041 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	13.7	1.87	mg/kg wet	23.70		58	27-81			
LCS Dup										
Mercury	14.3	1.77	mg/kg wet	23.70		61	27-81	4	20	
Reference										
Mercury	0.993	0.174	mg/kg wet	1000		0.1	0-200			
5035/8260B Volatile Organic Compounds / Low Level										
Batch CD82802 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CD82802 - 5035										
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CD82802 - 5035										
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Xylenes (Total)	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0591*		mg/kg wet	*0.05000*		*118*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0461*		mg/kg wet	*0.05000*		*92*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0538*		mg/kg wet	*0.05000*		*108*	*70-130*			
Surrogate: Toluene-d8	*0.0494*		mg/kg wet	*0.05000*		*99*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0479	0.0050	mg/kg wet	0.05000		96	70-130			
1,1,1-Trichloroethane	0.0532	0.0050	mg/kg wet	0.05000		106	70-130			
1,1,2,2-Tetrachloroethane	0.0559	0.0020	mg/kg wet	0.05000		112	70-130			
1,1,2-Trichloroethane	0.0614	0.0050	mg/kg wet	0.05000		123	70-130			
1,1-Dichloroethane	0.0570	0.0050	mg/kg wet	0.05000		114	70-130			
1,1-Dichloroethene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130			
1,1-Dichloropropene	0.0567	0.0050	mg/kg wet	0.05000		113	70-130			
1,2,3-Trichlorobenzene	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
1,2,3-Trichloropropane	0.0482	0.0050	mg/kg wet	0.05000		96	70-130			
1,2,4-Trichlorobenzene	0.0475	0.0050	mg/kg wet	0.05000		95	70-130			
1,2,4-Trimethylbenzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
1,2-Dibromo-3-Chloropropane	0.0449	0.0050	mg/kg wet	0.05000		90	70-130			
1,2-Dibromoethane	0.0512	0.0050	mg/kg wet	0.05000		102	70-130			
1,2-Dichlorobenzene	0.0515	0.0050	mg/kg wet	0.05000		103	70-130			
1,2-Dichloroethane	0.0629	0.0050	mg/kg wet	0.05000		126	70-130			
1,2-Dichloropropane	0.0606	0.0050	mg/kg wet	0.05000		121	70-130			
1,3,5-Trimethylbenzene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,3-Dichlorobenzene	0.0513	0.0050	mg/kg wet	0.05000		103	70-130			
1,3-Dichloropropane	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CD82802 - 5035										
1,4-Dichlorobenzene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
1,4-Dioxane	1.05	0.100	mg/kg wet	1.000		105	70-130			
2,2-Dichloropropane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
2-Butanone	0.319	0.0100	mg/kg wet	0.2500		128	70-130			
2-Chlorotoluene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130			
2-Hexanone	0.260	0.0100	mg/kg wet	0.2500		104	70-130			
4-Chlorotoluene	0.0510	0.0050	mg/kg wet	0.05000		102	70-130			
4-Isopropyltoluene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130			
4-Methyl-2-Pentanone	0.308	0.0100	mg/kg wet	0.2500		123	70-130			
Acetone	0.306	0.0100	mg/kg wet	0.2500		123	70-130			
Benzene	0.0583	0.0050	mg/kg wet	0.05000		117	70-130			
Bromobenzene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
Bromochloromethane	0.0559	0.0050	mg/kg wet	0.05000		112	70-130			
Bromodichloromethane	0.0586	0.0050	mg/kg wet	0.05000		117	70-130			
Bromoform	0.0396	0.0050	mg/kg wet	0.05000		79	70-130			
Bromomethane	0.0620	0.0100	mg/kg wet	0.05000		124	70-130			
Carbon Disulfide	0.0585	0.0050	mg/kg wet	0.05000		117	70-130			
Carbon Tetrachloride	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
Chlorobenzene	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			
Chloroethane	0.0575	0.0100	mg/kg wet	0.05000		115	70-130			
Chloroform	0.0590	0.0050	mg/kg wet	0.05000		118	70-130			
Chloromethane	0.0613	0.0100	mg/kg wet	0.05000		123	70-130			
cis-1,2-Dichloroethene	0.0591	0.0050	mg/kg wet	0.05000		118	70-130			
cis-1,3-Dichloropropene	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
Dibromochloromethane	0.0426	0.0020	mg/kg wet	0.05000		85	70-130			
Dibromomethane	0.0593	0.0050	mg/kg wet	0.05000		119	70-130			
Dichlorodifluoromethane	0.0603	0.0100	mg/kg wet	0.05000		121	70-130			
Diethyl Ether	0.0601	0.0050	mg/kg wet	0.05000		120	70-130			
Di-isopropyl ether	0.0610	0.0050	mg/kg wet	0.05000		122	70-130			
Ethyl tertiary-butyl ether	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
Ethylbenzene	0.0485	0.0050	mg/kg wet	0.05000		97	70-130			
Hexachlorobutadiene	0.0495	0.0050	mg/kg wet	0.05000		99	70-130			
Isopropylbenzene	0.0466	0.0050	mg/kg wet	0.05000		93	70-130			
Methyl tert-Butyl Ether	0.0549	0.0050	mg/kg wet	0.05000		110	70-130			
Methylene Chloride	0.0582	0.0100	mg/kg wet	0.05000		116	70-130			
Naphthalene	0.0453	0.0050	mg/kg wet	0.05000		91	70-130			
n-Butylbenzene	0.0491	0.0050	mg/kg wet	0.05000		98	70-130			
n-Propylbenzene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130			
sec-Butylbenzene	0.0496	0.0050	mg/kg wet	0.05000		99	70-130			
Styrene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
tert-Butylbenzene	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
Tertiary-amyl methyl ether	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
Tetrachloroethene	0.0440	0.0050	mg/kg wet	0.05000		88	70-130			
Tetrahydrofuran	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
Toluene	0.0553	0.0050	mg/kg wet	0.05000		111	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CD82802 - 5035										
trans-1,2-Dichloroethene	0.0554	0.0050	mg/kg wet	0.05000		111	70-130			
trans-1,3-Dichloropropene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
Trichloroethene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130			
Trichlorofluoromethane	0.0553	0.0050	mg/kg wet	0.05000		111	70-130			
Vinyl Chloride	0.0632	0.0100	mg/kg wet	0.05000		126	70-130			
Xylene O	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
Xylene P,M	0.0977	0.0100	mg/kg wet	0.1000		98	70-130			
Xylenes (Total)	0.150	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0627*		mg/kg wet	*0.05000*		*125*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0492*		mg/kg wet	*0.05000*		*98*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0589*		mg/kg wet	*0.05000*		*118*	*70-130*			
Surrogate: Toluene-d8	*0.0474*		mg/kg wet	*0.05000*		*95*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0468	0.0050	mg/kg wet	0.05000		94	70-130	2	20	
1,1,1-Trichloroethane	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	1	20	
1,1,2,2-Tetrachloroethane	0.0564	0.0020	mg/kg wet	0.05000		113	70-130	0.9	20	
1,1,2-Trichloroethane	0.0608	0.0050	mg/kg wet	0.05000		122	70-130	1	20	
1,1-Dichloroethane	0.0567	0.0050	mg/kg wet	0.05000		113	70-130	0.4	20	
1,1-Dichloroethene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	2	20	
1,1-Dichloropropene	0.0570	0.0050	mg/kg wet	0.05000		114	70-130	0.6	20	
1,2,3-Trichlorobenzene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	3	20	
1,2,3-Trichloropropane	0.0499	0.0050	mg/kg wet	0.05000		100	70-130	3	20	
1,2,4-Trichlorobenzene	0.0491	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
1,2,4-Trimethylbenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
1,2-Dibromo-3-Chloropropane	0.0480	0.0050	mg/kg wet	0.05000		96	70-130	7	20	
1,2-Dibromoethane	0.0502	0.0050	mg/kg wet	0.05000		100	70-130	2	20	
1,2-Dichlorobenzene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
1,2-Dichloroethane	0.0620	0.0050	mg/kg wet	0.05000		124	70-130	1	20	
1,2-Dichloropropane	0.0597	0.0050	mg/kg wet	0.05000		119	70-130	2	20	
1,3,5-Trimethylbenzene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	1	20	
1,3-Dichlorobenzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130	2	20	
1,3-Dichloropropane	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	5	20	
1,4-Dichlorobenzene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
1,4-Dioxane	1.08	0.100	mg/kg wet	1.000		108	70-130	3	20	
2,2-Dichloropropane	0.0487	0.0050	mg/kg wet	0.05000		97	70-130	0.7	20	
2-Butanone	0.323	0.0100	mg/kg wet	0.2500		129	70-130	1	20	
2-Chlorotoluene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	0.5	20	
2-Hexanone	0.267	0.0100	mg/kg wet	0.2500		107	70-130	3	20	
4-Chlorotoluene	0.0518	0.0050	mg/kg wet	0.05000		104	70-130	2	20	
4-Isopropyltoluene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
4-Methyl-2-Pentanone	0.320	0.0100	mg/kg wet	0.2500		128	70-130	4	20	
Acetone	0.318	0.0100	mg/kg wet	0.2500		127	70-130	4	20	
Benzene	0.0580	0.0050	mg/kg wet	0.05000		116	70-130	0.6	20	
Bromobenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	1	20	
Bromochloromethane	0.0558	0.0050	mg/kg wet	0.05000		112	70-130	0.2	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CD82802 - 5035										
Bromodichloromethane	0.0581	0.0050	mg/kg wet	0.05000		116	70-130	0.8	20	
Bromoform	0.0395	0.0050	mg/kg wet	0.05000		79	70-130	0.3	20	
Bromomethane	0.0608	0.0100	mg/kg wet	0.05000		122	70-130	2	20	
Carbon Disulfide	0.0586	0.0050	mg/kg wet	0.05000		117	70-130	0.03	20	
Carbon Tetrachloride	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	0.2	20	
Chlorobenzene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	3	20	
Chloroethane	0.0574	0.0100	mg/kg wet	0.05000		115	70-130	0.2	20	
Chloroform	0.0581	0.0050	mg/kg wet	0.05000		116	70-130	2	20	
Chloromethane	0.0604	0.0100	mg/kg wet	0.05000		121	70-130	1	20	
cis-1,2-Dichloroethene	0.0591	0.0050	mg/kg wet	0.05000		118	70-130	0.07	20	
cis-1,3-Dichloropropene	0.0567	0.0050	mg/kg wet	0.05000		113	70-130	0.5	20	
Dibromochloromethane	0.0415	0.0020	mg/kg wet	0.05000		83	70-130	3	20	
Dibromomethane	0.0585	0.0050	mg/kg wet	0.05000		117	70-130	1	20	
Dichlorodifluoromethane	0.0592	0.0100	mg/kg wet	0.05000		118	70-130	2	20	
Diethyl Ether	0.0605	0.0050	mg/kg wet	0.05000		121	70-130	0.7	20	
Di-isopropyl ether	0.0606	0.0050	mg/kg wet	0.05000		121	70-130	0.6	20	
Ethyl tertiary-butyl ether	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	0.9	20	
Ethylbenzene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130	0.9	20	
Hexachlorobutadiene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130	0.6	20	
Isopropylbenzene	0.0475	0.0050	mg/kg wet	0.05000		95	70-130	2	20	
Methyl tert-Butyl Ether	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	1	20	
Methylene Chloride	0.0576	0.0100	mg/kg wet	0.05000		115	70-130	1	20	
Naphthalene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130	6	20	
n-Butylbenzene	0.0499	0.0050	mg/kg wet	0.05000		100	70-130	2	20	
n-Propylbenzene	0.0511	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
sec-Butylbenzene	0.0504	0.0050	mg/kg wet	0.05000		101	70-130	2	20	
Styrene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130	2	20	
tert-Butylbenzene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130	2	20	
Tertiary-amyl methyl ether	0.0513	0.0050	mg/kg wet	0.05000		103	70-130	0.9	20	
Tetrachloroethene	0.0429	0.0050	mg/kg wet	0.05000		86	70-130	2	20	
Tetrahydrofuran	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	4	20	
Toluene	0.0557	0.0050	mg/kg wet	0.05000		111	70-130	0.8	20	
trans-1,2-Dichloroethene	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	0.2	20	
trans-1,3-Dichloropropene	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Trichloroethene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	0.6	20	
Trichlorofluoromethane	0.0549	0.0050	mg/kg wet	0.05000		110	70-130	0.7	20	
Vinyl Chloride	0.0628	0.0100	mg/kg wet	0.05000		126	70-130	0.7	20	
Xylene O	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
Xylene P,M	0.0969	0.0100	mg/kg wet	0.1000		97	70-130	0.8	20	
Xylenes (Total)	0.148	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0612*		mg/kg wet	*0.05000*		*122*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0476*		mg/kg wet	*0.05000*		*95*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0572*		mg/kg wet	*0.05000*		*114*	*70-130*			
Surrogate: Toluene-d8	*0.0458*		mg/kg wet	*0.05000*		*92*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CE80413 - 3540C										
Blank										
BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							
Surrogate: Tetrachloro-m-xylene	*0.00288*		mg/kg wet	*0.003333*		*87*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00277*		mg/kg wet	*0.003333*		*83*	*30-150*			
LCS										
BZ#101	0.00282	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#101 [2C]	0.00283	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#105	0.00304	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#105 [2C]	0.00303	0.00027	mg/kg wet	0.003333		91	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CE80413 - 3540C										
BZ#118	0.00294	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#118 [2C]	0.00293	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#128	0.00312	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#128 [2C]	0.00298	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#138	0.00294	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#138 [2C]	0.00304	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#153	0.00287	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#153 [2C]	0.00288	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#170	0.00309	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#170 [2C]	0.00313	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#18	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#18 [2C]	0.00278	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#180	0.00309	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#180 [2C]	0.00302	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#187	0.00304	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#187 [2C]	0.00289	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#195	0.00313	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#195 [2C]	0.00323	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#206	0.00330	0.00027	mg/kg wet	0.003333		99	40-140			
BZ#206 [2C]	0.00340	0.00027	mg/kg wet	0.003333		102	40-140			
BZ#209	0.00301	0.00027	mg/kg wet	0.003333		90	40-140			
BZ#209 [2C]	0.00311	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#28	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#28 [2C]	0.00277	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#44	0.00306	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#44 [2C]	0.00275	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#52	0.00294	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#52 [2C]	0.00267	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#66	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#66 [2C]	0.00276	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#8	0.00330	0.00027	mg/kg wet	0.003333		99	40-140			
BZ#8 [2C]	0.00341	0.00027	mg/kg wet	0.003333		102	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00291*		mg/kg wet	*0.003333*		*87*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00277*		mg/kg wet	*0.003333*		*83*	*30-150*			
LCS Dup										
BZ#101	0.00255	0.00027	mg/kg wet	0.003333		76	40-140	10	50	
BZ#101 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	11	50	
BZ#105	0.00266	0.00027	mg/kg wet	0.003333		80	40-140	13	50	
BZ#105 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140	16	50	
BZ#118	0.00255	0.00027	mg/kg wet	0.003333		77	40-140	14	50	
BZ#118 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	14	50	
BZ#128	0.00267	0.00027	mg/kg wet	0.003333		80	40-140	15	50	
BZ#128 [2C]	0.00253	0.00027	mg/kg wet	0.003333		76	40-140	16	50	
BZ#138	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	14	50	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch CE80413 - 3540C										
BZ#138 [2C]	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	16	50	
BZ#153	0.00260	0.00027	mg/kg wet	0.003333		78	40-140	10	50	
BZ#153 [2C]	0.00248	0.00027	mg/kg wet	0.003333		74	40-140	15	50	
BZ#170	0.00265	0.00027	mg/kg wet	0.003333		80	40-140	15	50	
BZ#170 [2C]	0.00263	0.00027	mg/kg wet	0.003333		79	40-140	18	50	
BZ#18	0.00273	0.00027	mg/kg wet	0.003333		82	40-140	8	50	
BZ#18 [2C]	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	8	50	
BZ#180	0.00261	0.00027	mg/kg wet	0.003333		78	40-140	17	50	
BZ#180 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	18	50	
BZ#187	0.00262	0.00027	mg/kg wet	0.003333		79	40-140	15	50	
BZ#187 [2C]	0.00250	0.00027	mg/kg wet	0.003333		75	40-140	14	50	
BZ#195	0.00263	0.00027	mg/kg wet	0.003333		79	40-140	17	50	
BZ#195 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140	18	50	
BZ#206	0.00277	0.00027	mg/kg wet	0.003333		83	40-140	18	50	
BZ#206 [2C]	0.00278	0.00027	mg/kg wet	0.003333		83	40-140	20	50	
BZ#209	0.00253	0.00027	mg/kg wet	0.003333		76	40-140	17	50	
BZ#209 [2C]	0.00263	0.00027	mg/kg wet	0.003333		79	40-140	17	50	
BZ#28	0.00272	0.00027	mg/kg wet	0.003333		82	40-140	8	50	
BZ#28 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	9	50	
BZ#44	0.00286	0.00027	mg/kg wet	0.003333		86	40-140	7	50	
BZ#44 [2C]	0.00250	0.00027	mg/kg wet	0.003333		75	40-140	10	50	
BZ#52	0.00230	0.00027	mg/kg wet	0.003333		69	40-140	24	50	
BZ#52 [2C]	0.00243	0.00027	mg/kg wet	0.003333		73	40-140	9	50	
BZ#66	0.00267	0.00027	mg/kg wet	0.003333		80	40-140	10	50	
BZ#66 [2C]	0.00252	0.00027	mg/kg wet	0.003333		75	40-140	9	50	
BZ#8	0.00312	0.00027	mg/kg wet	0.003333		94	40-140	5	50	
BZ#8 [2C]	0.00314	0.00027	mg/kg wet	0.003333		94	40-140	8	50	
Surrogate: Tetrachloro-m-xylene	*0.00258*		mg/kg wet	*0.003333*		*77*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00245*		mg/kg wet	*0.003333*		*73*	*30-150*			
8100M Total Petroleum Hydrocarbons										
Batch CD83011 - 3546										
Blank										
Decane (C10)	ND	0.2	mg/kg wet							
Docosane (C22)	ND	0.2	mg/kg wet							
Dodecane (C12)	ND	0.2	mg/kg wet							
Eicosane (C20)	ND	0.2	mg/kg wet							
Hexacosane (C26)	ND	0.2	mg/kg wet							
Hexadecane (C16)	ND	0.2	mg/kg wet							
Nonadecane (C19)	ND	0.2	mg/kg wet							
Nonane (C9)	ND	0.2	mg/kg wet							
Octacosane (C28)	ND	0.2	mg/kg wet							
Octadecane (C18)	ND	0.2	mg/kg wet							
Tetracosane (C24)	ND	0.2	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8100M Total Petroleum Hydrocarbons										
Batch CD83011 - 3546										
Tetradecane (C14)	ND	0.2	mg/kg wet							
Total Petroleum Hydrocarbons	ND	15.0	mg/kg wet							
Triacontane (C30)	ND	0.2	mg/kg wet							
Surrogate: O-Terphenyl	*4.87*		mg/kg wet	*5.000*		*97*	*40-140*			
LCS										
Decane (C10)	2.0	0.2	mg/kg wet	2.500		81	40-140			
Docosane (C22)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Dodecane (C12)	2.1	0.2	mg/kg wet	2.500		86	40-140			
Eicosane (C20)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Hexacosane (C26)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Hexadecane (C16)	2.2	0.2	mg/kg wet	2.500		86	40-140			
Nonadecane (C19)	2.2	0.2	mg/kg wet	2.500		88	40-140			
Nonane (C9)	1.8	0.2	mg/kg wet	2.500		70	30-140			
Octacosane (C28)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Octadecane (C18)	2.1	0.2	mg/kg wet	2.500		86	40-140			
Tetracosane (C24)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Tetradecane (C14)	2.1	0.2	mg/kg wet	2.500		86	40-140			
Total Petroleum Hydrocarbons	29.7	15.0	mg/kg wet	35.00		85	40-140			
Triacontane (C30)	2.2	0.2	mg/kg wet	2.500		86	40-140			
Surrogate: O-Terphenyl	*4.98*		mg/kg wet	*5.000*		*100*	*40-140*			
LCS Dup										
Decane (C10)	2.1	0.2	mg/kg wet	2.500		85	40-140	4	50	
Docosane (C22)	2.3	0.2	mg/kg wet	2.500		91	40-140	5	50	
Dodecane (C12)	2.2	0.2	mg/kg wet	2.500		89	40-140	4	50	
Eicosane (C20)	2.3	0.2	mg/kg wet	2.500		91	40-140	5	50	
Hexacosane (C26)	2.3	0.2	mg/kg wet	2.500		91	40-140	5	50	
Hexadecane (C16)	2.2	0.2	mg/kg wet	2.500		90	40-140	4	50	
Nonadecane (C19)	2.3	0.2	mg/kg wet	2.500		92	40-140	4	50	
Nonane (C9)	1.8	0.2	mg/kg wet	2.500		74	30-140	5	50	
Octacosane (C28)	2.3	0.2	mg/kg wet	2.500		91	40-140	4	50	
Octadecane (C18)	2.2	0.2	mg/kg wet	2.500		89	40-140	4	50	
Tetracosane (C24)	2.3	0.2	mg/kg wet	2.500		91	40-140	5	50	
Tetradecane (C14)	2.2	0.2	mg/kg wet	2.500		89	40-140	4	50	
Total Petroleum Hydrocarbons	31.1	15.0	mg/kg wet	35.00		89	40-140	4	50	
Triacontane (C30)	2.3	0.2	mg/kg wet	2.500		90	40-140	5	50	
Surrogate: O-Terphenyl	*5.02*		mg/kg wet	*5.000*		*100*	*40-140*			
Classical Chemistry										
Batch CE80231 - General Preparation										
Blank										
Total Organic Carbon (1)	ND	100	mg/kg							
Total Organic Carbon (2)	ND	100	mg/kg							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CE80231 - [CALC]										
Total Organic Carbon (Average)	ND	100	mg/kg							
LCS										
Total Organic Carbon (1)	9390	100	mg/kg	10000		94	80-120			
Total Organic Carbon (2)	9530	100	mg/kg	10000		95	80-120			
Total Organic Carbon (Average)	9460	100	mg/kg							
LCS Dup										
Total Organic Carbon (1)	9650	100	mg/kg	10000		96	80-120	3	200	
Total Organic Carbon (2)	9590	100	mg/kg	10000		96	80-120	0.6	200	
Total Organic Carbon (Average)	9620	100	mg/kg							
Reference										
Total Organic Carbon (Average)	1.50		mg/kg							
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CD83005 - 3546										
Blank										
C19-C36 Aliphatics1	ND	7.0	mg/kg wet							
C9-C18 Aliphatics1	ND	7.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.57*		mg/kg wet	*2.000*		*78*	*40-140*			
Blank										
C11-C22 Aromatics1,2	ND	7.00	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	7.00	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*42.9*		mg/L	*50.00*		*86*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*40.2*		mg/L	*50.00*		*80*	*40-140*			
Surrogate: O-Terphenyl	*1.86*		mg/kg wet	*2.000*		*93*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.020	mg/kg wet							
Acenaphthene	ND	0.020	mg/kg wet							
Acenaphthylene	ND	0.020	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CD83005 - 3546										
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.020	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.020	mg/kg wet							
Benzo(k)fluoranthene	ND	0.020	mg/kg wet							
C11-C22 Aromatics1,2	ND	0.280	mg/kg wet							
Chrysene	ND	0.020	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.020	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.020	mg/kg wet							
Naphthalene	ND	0.020	mg/kg wet							
Phenanthrene	ND	0.020	mg/kg wet							
Pyrene	ND	0.020	mg/kg wet							
LCS										
C19-C36 Aliphatics1	18.6	15.0	mg/kg wet	16.00		116	40-140			
C9-C18 Aliphatics1	10.2	15.0	mg/kg wet	12.00		85	40-140			
Decane (C10)	1.2	0.5	mg/kg wet	2.000		58	40-140			
Docosane (C22)	2.1	0.5	mg/kg wet	2.000		107	40-140			
Dodecane (C12)	1.3	0.5	mg/kg wet	2.000		65	40-140			
Eicosane (C20)	1.9	0.5	mg/kg wet	2.000		96	40-140			
Hexacosane (C26)	1.8	0.5	mg/kg wet	2.000		90	40-140			
Hexadecane (C16)	1.6	0.5	mg/kg wet	2.000		80	40-140			
Hexatriacontane (C36)	1.7	0.5	mg/kg wet	2.000		84	40-140			
Nonadecane (C19)	1.8	0.5	mg/kg wet	2.000		91	40-140			
Nonane (C9)	0.9	0.5	mg/kg wet	2.000		46	30-140			
Octacosane (C28)	1.8	0.5	mg/kg wet	2.000		88	40-140			
Octadecane (C18)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Tetracosane (C24)	1.9	0.5	mg/kg wet	2.000		94	40-140			
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		71	40-140			
Triacontane (C30)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Surrogate: 1-Chlorooctadecane	*1.90*		mg/kg wet	*2.000*		*95*	*40-140*			
LCS										
C11-C22 Aromatics1,2	30.6	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	30.6	15.0	mg/kg wet	34.00		90	40-140			
Surrogate: 2-Bromonaphthalene	*45.6*		mg/L	*50.00*		*91*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*43.0*		mg/L	*50.00*		*86*	*40-140*			
Surrogate: O-Terphenyl	*1.84*		mg/kg wet	*2.000*		*92*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CD83005 - 3546										
2-Methylnaphthalene	1.16	0.100	mg/kg wet	2.000		58	40-140			
Acenaphthene	1.34	0.100	mg/kg wet	2.000		67	40-140			
Acenaphthylene	1.42	0.100	mg/kg wet	2.000		71	40-140			
Anthracene	1.54	0.040	mg/kg wet	2.000		77	40-140			
Benzo(a)anthracene	1.47	0.040	mg/kg wet	2.000		74	40-140			
Benzo(a)pyrene	1.67	0.040	mg/kg wet	2.000		84	40-140			
Benzo(b)fluoranthene	1.75	0.100	mg/kg wet	2.000		87	40-140			
Benzo(g,h,i)perylene	1.84	0.100	mg/kg wet	2.000		92	40-140			
Benzo(k)fluoranthene	1.64	0.100	mg/kg wet	2.000		82	40-140			
C11-C22 Aromatics1,2	ND	1.40	mg/kg wet							
Chrysene	1.51	0.100	mg/kg wet	2.000		75	40-140			
Dibenzo(a,h)Anthracene	1.44	0.040	mg/kg wet	2.000		72	40-140			
Fluoranthene	1.63	0.100	mg/kg wet	2.000		81	40-140			
Fluorene	1.44	0.040	mg/kg wet	2.000		72	40-140			
Indeno(1,2,3-cd)Pyrene	1.87	0.100	mg/kg wet	2.000		94	40-140			
Naphthalene	1.27	0.100	mg/kg wet	2.000		64	40-140			
Phenanthrene	1.54	0.100	mg/kg wet	2.000		77	40-140			
Pyrene	1.74	0.100	mg/kg wet	2.000		87	40-140			
LCS Dup										
C19-C36 Aliphatics1	16.8	15.0	mg/kg wet	16.00		105	40-140	10	25	
C9-C18 Aliphatics1	9.0	15.0	mg/kg wet	12.00		75	40-140	13	25	
Decane (C10)	1.0	0.5	mg/kg wet	2.000		49	40-140	17	25	
Docosane (C22)	1.7	0.5	mg/kg wet	2.000		85	40-140	23	25	
Dodecane (C12)	1.1	0.5	mg/kg wet	2.000		55	40-140	17	25	
Eicosane (C20)	1.7	0.5	mg/kg wet	2.000		83	40-140	15	25	
Hexacosane (C26)	1.7	0.5	mg/kg wet	2.000		83	40-140	7	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		73	40-140	9	25	
Hexatriacontane (C36)	1.6	0.5	mg/kg wet	2.000		78	40-140	8	25	
Nonadecane (C19)	1.7	0.5	mg/kg wet	2.000		84	40-140	8	25	
Nonane (C9)	0.8	0.5	mg/kg wet	2.000		39	30-140	16	25	
Octacosane (C28)	1.6	0.5	mg/kg wet	2.000		82	40-140	7	25	
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		80	40-140	8	25	
Tetracosane (C24)	1.7	0.5	mg/kg wet	2.000		85	40-140	10	25	
Tetradecane (C14)	1.2	0.5	mg/kg wet	2.000		61	40-140	15	25	
Triacontane (C30)	1.6	0.5	mg/kg wet	2.000		79	40-140	8	25	
Surrogate: 1-Chlorooctadecane	*1.84*		mg/kg wet	*2.000*		*92*	*40-140*			
LCS Dup										
C11-C22 Aromatics1,2	31.0	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	31.0	15.0	mg/kg wet	34.00		91	40-140	1	25	
Surrogate: 2-Bromonaphthalene	*45.7*		mg/L	*50.00*		*91*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*43.3*		mg/L	*50.00*		*87*	*40-140*			
Surrogate: O-Terphenyl	*1.89*		mg/kg wet	*2.000*		*94*	*40-140*			
LCS Dup										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				MADEP-EPH Extractable Petroleum Hydrocarbons						
Batch CD83005 - 3546										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.23	0.100	mg/kg wet	2.000		62	40-140	6	30	
Acenaphthene	1.38	0.100	mg/kg wet	2.000		69	40-140	3	30	
Acenaphthylene	1.48	0.100	mg/kg wet	2.000		74	40-140	4	30	
Anthracene	1.61	0.040	mg/kg wet	2.000		80	40-140	5	30	
Benzo(a)anthracene	1.49	0.040	mg/kg wet	2.000		74	40-140	1	30	
Benzo(a)pyrene	1.69	0.040	mg/kg wet	2.000		85	40-140	1	30	
Benzo(b)fluoranthene	1.70	0.100	mg/kg wet	2.000		85	40-140	3	30	
Benzo(g,h,i)perylene	1.84	0.100	mg/kg wet	2.000		92	40-140	0.04	30	
Benzo(k)fluoranthene	1.64	0.100	mg/kg wet	2.000		82	40-140	0.09	30	
C11-C22 Aromatics1,2	ND	1.40	mg/kg wet							
Chrysene	1.54	0.100	mg/kg wet	2.000		77	40-140	2	30	
Dibenzo(a,h)Anthracene	1.52	0.040	mg/kg wet	2.000		76	40-140	5	30	
Fluoranthene	1.73	0.100	mg/kg wet	2.000		86	40-140	6	30	
Fluorene	1.47	0.040	mg/kg wet	2.000		74	40-140	2	30	
Indeno(1,2,3-cd)Pyrene	1.86	0.100	mg/kg wet	2.000		93	40-140	0.5	30	
Naphthalene	1.36	0.100	mg/kg wet	2.000		68	40-140	7	30	
Phenanthrene	1.59	0.100	mg/kg wet	2.000		79	40-140	3	30	
Pyrene	1.76	0.100	mg/kg wet	2.000		88	40-140	1	30	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1804826

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
P	Percent difference between primary and confirmation results exceeds 40% (P).
LC	Lower value is used due to matrix interferences (LC).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1804826

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

THIELSCH ENGINEERING

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
http://www.thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
Norwood, MA
PM: Heather Masse
Assigned By: Heather Masse
Collected By: Client

Project Information:
White's Mill Pond Dam
Massachusetts
ESS Project Number: 1804826
Summary Page: 1 of 1
Report Date: 05.04.18

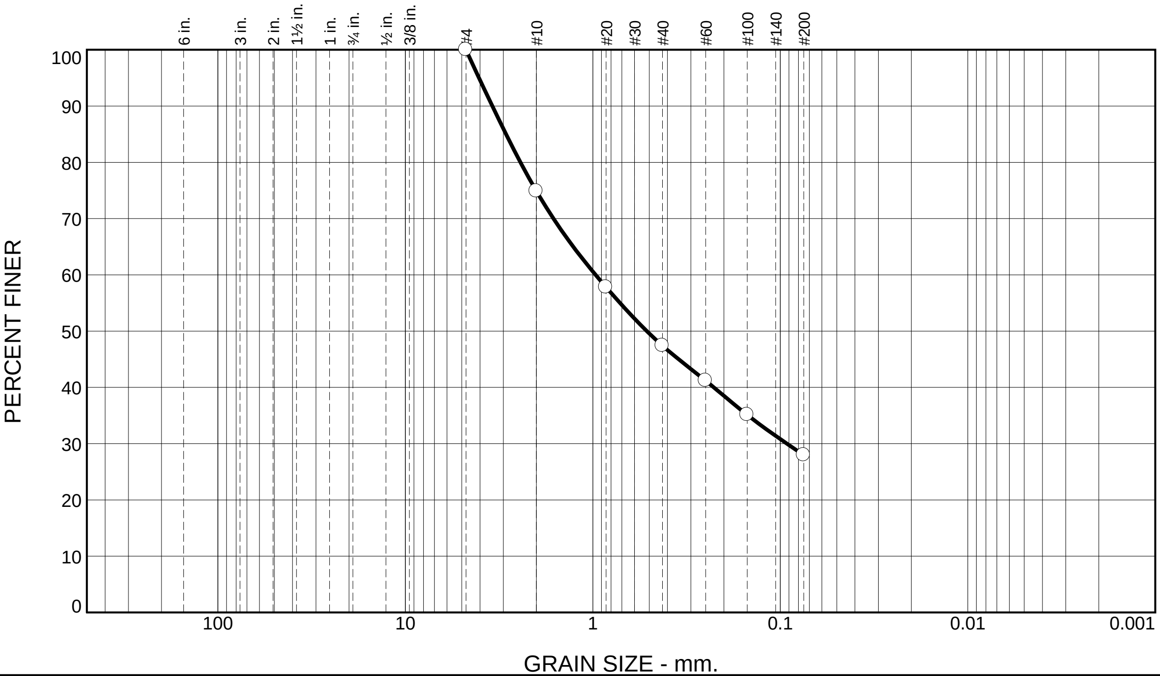
LABORATORY TESTING DATA SHEET

ESS Sample #	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
			Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Perme-ability cm/sec	
1804826-01		18-S-532				0.0	72.0	28.0	33.8										Brown f-c SAND, some Silt
1804826-02		18-S-533				10.1	76.3	13.6	11.4										Brown f-m SAND, little Silt, little fine Gravel

Reviewed By

Date Reviewed 05.04.18

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	25.1	27.5	19.4	28.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	74.9		
#20	57.8		
#40	47.4		
#60	41.2		
#100	35.1		
#200	28.0		

* (no specification provided)

Material Description

Brown f-c SAND, some Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 3.4358 D_{85}= 2.9039 D_{60}= 0.9667
D_{50}= 0.5147 D_{30}= 0.0922 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 04.30.18 **Date Tested:** 05.03.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Manager

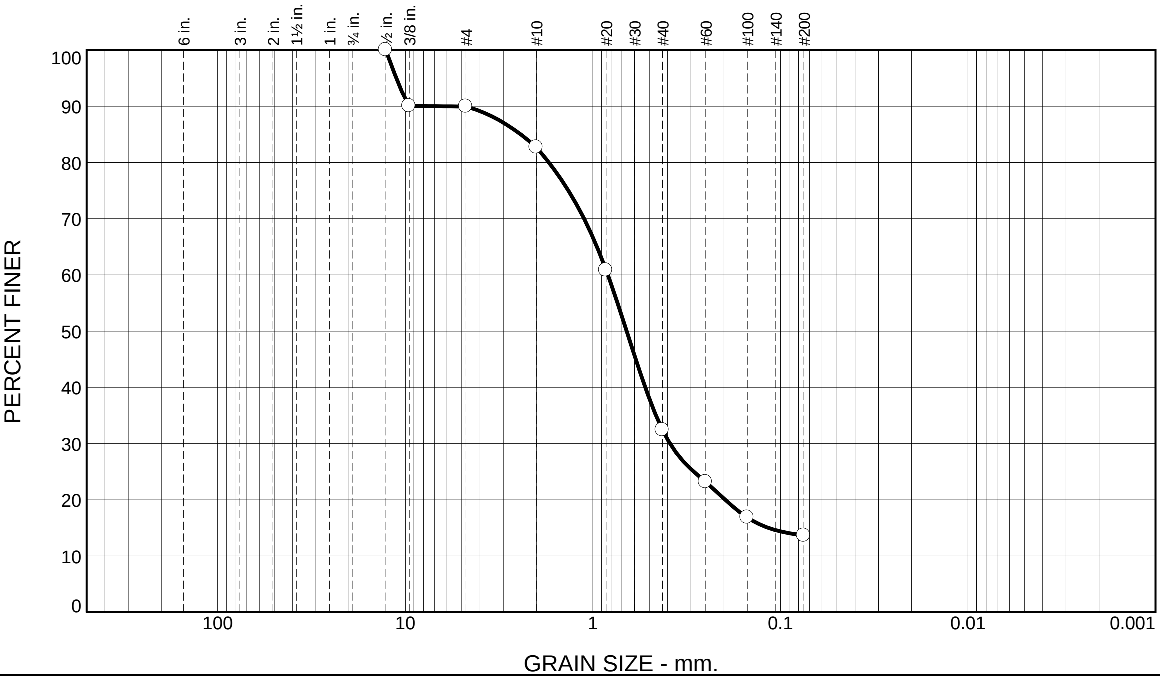
Source of Sample: 1804826 **Date Sampled:**
Sample Number: 1804826-01

Thielsch Engineering Inc.

Cranston, RI

Client: ESS- GZA Norwood
Project: White's Mill Pond Dam
Project No: 1804826 **Figure** 1804826-01

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.1	7.2	50.3	18.8	13.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5	100.0		
0.375"	90.0		
#4	89.9		
#10	82.7		
#20	60.8		
#40	32.4		
#60	23.2		
#100	16.8		
#200	13.6		

* (no specification provided)

Material Description

Brown f-m SAND, little Silt, little fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 7.3121 D_{85}= 2.4261 D_{60}= 0.8321
D_{50}= 0.6605 D_{30}= 0.3878 D_{15}= 0.1157
D_{10}= C_u= C_c=

Remarks

Date Received: 04.30.18 **Date Tested:** 05.03.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Manager

Source of Sample: 1804826
Sample Number: 1804826-02

Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: ESS- GZA Norwood
Project: White's Mill Pond Dam
Project No: 1804826 **Figure** 1804826-02

SOILS LABORATORY TESTING ASSIGNMENT SHEET

THIELSCH ENGINEERING

195 Frances Ave., Cranston, RI 02910
401-467-6454

Project Name **White's Mill Pond Dam**
ESS Project No. 1804826
Project Manager Heather Masse
Date Received 4/27/2018 (by)

Client Company GZA Norwood
Client Email
Site Location
Date Assigned

Collected By
Date Required 5/4/2018

Sample Information				Lab No.	Identification Tests								Permeability		Compaction			Soil Strength			Consol.		Notes
Boring/ Test Pit No.	Sample or depth	Sample date	ESS Sample ID		Water Cont. %	LL & PL %	Org. %	Bulk	Sieve -200 %	Hyd -2µ %	G_s	Tube Den-sity	Sand	Clay	Mod.	Std.	CBR	Un-con-fined	UU	CIU	Stand ard	E.O.P.	
					D2216	D4318	D2974		D422		D854		D2434	D5084	D1557	D698	D1883	D2166	D2850	D4767	D2435	D2435	#
		4/26/18	1804826-01						X														**
		4/26/18	1804826-02						X														**

Notes: **Organic Content (hdm 5/1/18)

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1804826
Date Received: 4/27/2018
Project Due Date: 5/4/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.3 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about <u>short holds & rushes</u>?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs: **1--2**
    Analysis: **Grain size**
    TAT: **5 day**
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: 4/27/18 Time: 1936 By: [signature]

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / ~~No~~
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	222792	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	222793	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	222794	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	222795	Yes	NA	Yes	VOA Vial - Other	Other	
01	222796	Yes	NA	Yes	VOA Vial - Other	Other	
01	222797	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
01	222798	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
01	222799	Yes	NA	Yes	Driller Jar	NP	
01	223063	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	222800	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	222801	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	222802	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	222803	Yes	NA	Yes	VOA Vial - Other	Other	
02	222804	Yes	NA	Yes	VOA Vial - Other	Other	
02	222805	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
02	222806	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
02	222807	Yes	NA	Yes	Driller Jar	NP	
02	223062	Yes	NA	Yes	8 oz. Jar - Unpres	NP	

2nd Review
Are barcode labels on correct containers? Yes / No

Completed

ESS Laboratory Sample and Cooler Receipt Checklist

Client:	GZA - Norwood, MA - GZA/MM	ESS Project ID:	1804826
		Date Received:	4/27/2018
By:		Date & Time:	4/27/18 1926
Reviewed By:		Date & Time:	4/27/18 1937
Delivered By:			4/27/18 1937

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time	Days
Regulatory State	
Is this project for any of the following?:	○CT RCP ○MA MCP ○RGP
ESS Lab #	1804826
Reporting Limits	401 Water Quality
Electonic Deliverables	☐Data Checker ☐Excel ☐Other (Please Specify →)

Company Name	GZA
Project #	173542.10
Project Name	White's Mill Pond Dam
Contact Person	Derek Schipper
Address	Winchendon, MA
City	
State	RI
Zip Code	
PO #	
Telephone Number	
FAX Number	
Email Address	Derek.Schipper@gza.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	~~Metals and~~ Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TVS	TPH	*Metals	hdm 5/1/18
1	4/26/18	1300	~~Soil~~ Composite	S	SED-1	X	X	~~X~~	X	X	X	X	X	X		
2	4/26/18	1330	~~Soil~~ Composite	S	SED-2	X	X	~~X~~	X	X	X	X	X	X		
3					SED-1 Air Dried			X							X	
4					SED-2 Air Dried			X							X	

hdm 5/2/18

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial	AG	AG	AG	V	V	AG	O		
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*	10	10	10	7	7	8	11		
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*	1	1	1	10	6	1	1		
Number of Containers per Sample:	1	1	1	2	1	1	1		

Laboratory Use Only

Cooler Present: ✓ ○Drop Off
Seals Intact: NA ⦿Pickup
Cooler Temperature: °C ice temp: 0.3

Sampled by: Chris Tsinidis

Comments: Please specify "Other" preservative and containers types in this space

* Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
[signature] 4/26/18 1715	[signature] 4/27/18 10:00	[signature] 4/27/18 18:47	[signature] 4/27/18 1902
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time	Days
Regulatory State	
Is this project for any of the following?:	○CT RCP ○MA MCP ○RGP

ESS Lab #	1804826
Reporting Limits	401 Water Quality
Electonic Deliverables	☐Data Checker ☐Excel ☐Other (Please Specify →)

Company Name: GZA	Project #: 173542.10	Project Name: White's Mill Pond Dam	
Contact Person: Derek Schipper	Address: Winchendon, MA		
City	State: RI	Zip Code	PO #
Telephone Number	FAX Number	Email Address: Derek.Schipper@gza.com	

Analysis

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TVS	TPH
1	4/26/18	1300	~~Soil~~ Composite	S	SED-1	X	X	X	X	X	X	X	X	X
2	4/26/18	1330	~~Soil~~ Composite	S	SED-2	X	X	X	X	X	X	X	X	X
Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial						AG	AG	AG	V	V	AG	O		
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*						10	10	10	7	7	8	11		
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*						1	1	1	10	6	1	1		
Number of Containers per Sample:						1	1	1	2	1	1	1		

Laboratory Use Only

Cooler Present: ✓ ○Drop Off
Seals Intact: NA ⦿Pickup
Cooler Temperature: °C ice temp: 0.3

Sampled by: Chris Tsinidis

Comments: Please specify "Other" preservative and containers types in this space

* Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
[signature] 4/26/18 1715	[signature] 4/27/18 10:00	[signature] 4/27/18 18:47	[signature] 4/27/18 1902
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Derek Schipper
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Whites Mill Pond Dam (01.0173542.10)
ESS Laboratory Work Order Number: 1810852

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:31 pm, Nov 13, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

CTS - Cranston, RI	Grain Size Analysis

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810852

SAMPLE RECEIPT

The following samples were received on October 30, 2018 for the analyses specified on the enclosed Chain of Custody Record.

Low Level VOA vials were frozen by ESS Laboratory on October 30, 2018 at 18:20.

Revision 1 December 11, 2018: This report has been revised to include subcontracted lab results.

Lab Number	Sample Name	Matrix	Analysis
1810852-01	S-3	Sediment	2540G, 8081B, 8082, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
1810852-02	S-4	Sediment	2540G, 8081B, 8082, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
1810852-03	S-5	Sediment	2540G, 8081B, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
1810852-04	S-6	Sediment	2540G, 8081B, 8082, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH, SUB
1810852-05	S-7	Sediment	2540G, 8081B, 8082, 8100M, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1810852-06	S-3 Air Dried	Sediment	6010C, 7471B
1810852-07	S-4 Air Dried	Sediment	6010C, 7471B
1810852-08	S-5 Air Dried	Sediment	6010C, 7471B
1810852-09	S-6 Air Dried	Sediment	6010C, 7471B
1810852-10	S-7 Air Dried	Sediment	6010C, 7471B
1810852-11	S-5 Air Dried	Sediment	8082

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810852

PROJECT NARRATIVE

8081B Organochlorine Pesticides

C8K0006-CCV5	**Continuing Calibration %Diff/Drift is below control limit (CD-).**
	Decachlorobiphenyl (21% @ 20%)

8082 Polychlorinated Biphenyls (PCB) / Congeners

1810852-05	**Lower value is used due to matrix interferences (LC).**
	BZ#105 , BZ#153 [2C] , BZ#187 , BZ#52 [2C]
1810852-05	**Percent difference between primary and confirmation results exceeds 40% (P).**
	BZ#105 , BZ#153 [2C] , BZ#187 , BZ#52 [2C]

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 10.1
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1,1-Trichloroethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1,2,2-Tetrachloroethane	ND (0.0013)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1,2-Trichloroethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1-Dichloroethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1-Dichloroethene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,1-Dichloropropene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2,3-Trichlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2,3-Trichloropropane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2,4-Trichlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2,4-Trimethylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2-Dibromo-3-Chloropropane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2-Dibromoethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2-Dichlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2-Dichloroethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,2-Dichloropropane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,3,5-Trimethylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,3-Dichlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,3-Dichloropropane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,4-Dichlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
1,4-Dioxane	ND (0.0635)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
2,2-Dichloropropane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
2-Butanone	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
2-Chlorotoluene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
2-Hexanone	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
4-Chlorotoluene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
4-Isopropyltoluene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
4-Methyl-2-Pentanone	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Acetone	**0.0141** (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Benzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Bromobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Bromochloromethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 10.1
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Bromoform	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Bromomethane	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Carbon Disulfide	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Carbon Tetrachloride	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Chlorobenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Chloroethane	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Chloroform	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Chloromethane	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
cis-1,2-Dichloroethene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
cis-1,3-Dichloropropene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Dibromochloromethane	ND (0.0013)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Dibromomethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Dichlorodifluoromethane	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Diethyl Ether	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Di-isopropyl ether	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Ethyl tertiary-butyl ether	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Ethylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Hexachlorobutadiene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Isopropylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Methyl tert-Butyl Ether	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Methylene Chloride	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Naphthalene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
n-Butylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
n-Propylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
sec-Butylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Styrene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
tert-Butylbenzene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Tertiary-amyl methyl ether	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Tetrachloroethene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Tetrahydrofuran	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Toluene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 10.1
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
trans-1,3-Dichloropropene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Trichloroethene	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Trichlorofluoromethane	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Vinyl Chloride	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Xylene O	ND (0.0032)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Xylene P,M	ND (0.0063)		8260B Low		1	11/02/18 15:58	C8K0038	CK80230
Xylenes (Total)	ND (0.0063)		8260B Low		1	11/02/18 15:58		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*117 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*99 %*		*70-130*
Surrogate: Dibromofluoromethane	*107 %*		*70-130*
Surrogate: Toluene-d8	*97 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 20
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 11/1/18 11:30

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
4,4´-DDE	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
4,4´-DDT	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Aldrin	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
alpha-BHC	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
alpha-Chlordane	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
beta-BHC	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Chlordane (Total)	ND (0.0256)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
delta-BHC	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Dieldrin	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Endosulfan I	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Endosulfan II	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Endosulfan Sulfate	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Endrin	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Endrin Ketone	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
gamma-BHC (Lindane)	ND (0.0019)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
gamma-Chlordane	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Heptachlor	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Heptachlor Epoxide	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Hexachlorobenzene	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108
Methoxychlor	ND (0.0032)		8081B		1	11/02/18 19:10	C8K0029	CJ83108

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*81 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*83 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*80 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*87 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 29.3
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 11/8/18 16:38

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#18	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#28	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#44	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#52	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#66	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#101	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#105	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#118	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#128	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#138 [2C]	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#153	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#170	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#180	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#187	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#195	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#206	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848
BZ#209	ND (0.00035)		8082		1	11/09/18 16:06	C8K0175	CK80848

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*82 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*87 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 19.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: SMR
Prepared: 11/1/18 13:05

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**34.1** (19.8)		8100M		1	11/05/18 23:22	C8K0067	CK80115

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*78 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**22** (1)		2540G		1	CCP	10/30/18 19:13	%	CJ83025
Total Organic Carbon (Average)	ND (353)		LK		1	CCP	11/01/18 15:54	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30
Percent Solids: 78
Initial Volume: 25
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/1/18 14:15

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (19.2)		MADEP-EPH		1	SMR	11/05/18 20:51	C8K0069	CK80109
C19-C36 Aliphatics1	**20.9** (19.2)		MADEP-EPH		1	SMR	11/05/18 20:51	C8K0069	CK80109
C11-C22 Unadjusted Aromatics1	ND (19.2)		EPH8270		1	VSC	11/01/18 21:46	C8K0001	CK80109
C11-C22 Aromatics1,2	ND (19.6)		EPH8270			IBM	11/07/18 5:48		[CALC]
2-Methylnaphthalene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Acenaphthene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Naphthalene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Phenanthrene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Acenaphthylene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Anthracene	ND (0.010)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Benzo(a)anthracene	ND (0.010)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Benzo(a)pyrene	ND (0.010)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Benzo(b)fluoranthene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Benzo(g,h,i)perylene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Benzo(k)fluoranthene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Chrysene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Dibenzo(a,h)Anthracene	ND (0.010)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Fluoranthene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Fluorene	ND (0.010)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Indeno(1,2,3-cd)Pyrene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109
Pyrene	ND (0.026)		EPH8270SIM		1	IBM	11/07/18 5:48	C8K0122	CK80109

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*62 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*105 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*98 %*		*40-140*
Surrogate: O-Terphenyl	*89 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3
Date Sampled: 10/29/18 11:30

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-01
Sample Matrix: Sediment
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	Sequence	F/V	Batch
Grain Size	**See Attached** (N/A)										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 9.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1,1-Trichloroethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1,2,2-Tetrachloroethane	ND (0.0014)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1,2-Trichloroethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1-Dichloroethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1-Dichloroethene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,1-Dichloropropene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2,3-Trichlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2,3-Trichloropropane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2,4-Trichlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2,4-Trimethylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2-Dibromo-3-Chloropropane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2-Dibromoethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2-Dichlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2-Dichloroethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,2-Dichloropropane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,3,5-Trimethylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,3-Dichlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,3-Dichloropropane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,4-Dichlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
1,4-Dioxane	ND (0.0720)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
2,2-Dichloropropane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
2-Butanone	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
2-Chlorotoluene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
2-Hexanone	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
4-Chlorotoluene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
4-Isopropyltoluene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
4-Methyl-2-Pentanone	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Acetone	**0.0263** (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Benzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Bromobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Bromochloromethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 9.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Bromoform	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Bromomethane	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Carbon Disulfide	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Carbon Tetrachloride	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Chlorobenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Chloroethane	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Chloroform	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Chloromethane	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
cis-1,2-Dichloroethene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
cis-1,3-Dichloropropene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Dibromochloromethane	ND (0.0014)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Dibromomethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Dichlorodifluoromethane	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Diethyl Ether	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Di-isopropyl ether	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Ethyl tertiary-butyl ether	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Ethylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Hexachlorobutadiene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Isopropylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Methyl tert-Butyl Ether	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Methylene Chloride	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Naphthalene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
n-Butylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
n-Propylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
sec-Butylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Styrene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
tert-Butylbenzene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Tertiary-amyl methyl ether	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Tetrachloroethene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Tetrahydrofuran	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Toluene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 9.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
trans-1,3-Dichloropropene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Trichloroethene	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Trichlorofluoromethane	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Vinyl Chloride	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Xylene O	ND (0.0036)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Xylene P,M	ND (0.0072)		8260B Low		1	11/02/18 16:24	C8K0038	CK80230
Xylenes (Total)	ND (0.0072)		8260B Low		1	11/02/18 16:24		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*121 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*92 %*		*70-130*
Surrogate: Dibromofluoromethane	*112 %*		*70-130*
Surrogate: Toluene-d8	*100 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 20.3
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 11/1/18 11:30

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
4,4´-DDE	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
4,4´-DDT	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Aldrin	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
alpha-BHC	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
alpha-Chlordane	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
beta-BHC	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Chlordane (Total)	ND (0.0275)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
delta-BHC	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Dieldrin	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Endosulfan I	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Endosulfan II	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Endosulfan Sulfate	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Endrin	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Endrin Ketone	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
gamma-BHC (Lindane)	ND (0.0021)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
gamma-Chlordane	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Heptachlor	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Heptachlor Epoxide	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Hexachlorobenzene	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108
Methoxychlor	ND (0.0034)		8081B		1	11/02/18 19:42	C8K0029	CJ83108

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*72 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*75 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*71 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*78 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 29.5
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 11/6/18 17:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#18	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#28	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#44	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#52	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#66	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#101	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#105	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#118	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#128	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#138	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#153	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#170	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#180	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#187	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#195	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#206	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609
BZ#209	ND (0.00038)		8082		1	11/08/18 4:02	C8K0128	CK80609

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*74 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*75 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 19.1
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: SMR
Prepared: 11/1/18 13:05

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**25.3** (21.9)		8100M		1	11/06/18 0:59	C8K0067	CK80115

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*77 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**28** (1)		2540G		1	CCP	10/30/18 19:13	%	CJ83025
Total Organic Carbon (Average)	**490** (451)		LK		1	CCP	11/01/18 17:07	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15
Percent Solids: 72
Initial Volume: 25.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/1/18 14:15

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (20.6)		MADEP-EPH		1	SMR	11/05/18 21:37	C8K0069	CK80109
C19-C36 Aliphatics1	**21.7** (20.6)		MADEP-EPH		1	SMR	11/05/18 21:37	C8K0069	CK80109
C11-C22 Unadjusted Aromatics1	ND (20.6)		EPH8270		1	VSC	11/01/18 22:23	C8K0001	CK80109
C11-C22 Aromatics1,2	ND (21.0)		EPH8270			IBM	11/07/18 8:09		[CALC]
2-Methylnaphthalene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Acenaphthene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Naphthalene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Phenanthrene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Acenaphthylene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Anthracene	ND (0.011)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Benzo(a)anthracene	ND (0.011)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Benzo(a)pyrene	ND (0.011)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Benzo(b)fluoranthene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Benzo(g,h,i)perylene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Benzo(k)fluoranthene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Chrysene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Dibenzo(a,h)Anthracene	ND (0.011)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Fluoranthene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Fluorene	ND (0.011)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Indeno(1,2,3-cd)Pyrene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109
Pyrene	ND (0.028)		EPH8270SIM		1	IBM	11/07/18 8:09	C8K0123	CK80109

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*62 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*107 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*99 %*		*40-140*
Surrogate: O-Terphenyl	*93 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4
Date Sampled: 10/29/18 11:15

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-02
Sample Matrix: Sediment
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Sequence	Batch
Grain Size	**See Attached** (N/A)										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 4.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1,1-Trichloroethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1,2,2-Tetrachloroethane	ND (0.0112)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1,2-Trichloroethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1-Dichloroethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1-Dichloroethene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,1-Dichloropropene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2,3-Trichlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2,3-Trichloropropane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2,4-Trichlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2,4-Trimethylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2-Dibromo-3-Chloropropane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2-Dibromoethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2-Dichlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2-Dichloroethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,2-Dichloropropane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,3,5-Trimethylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,3-Dichlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,3-Dichloropropane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,4-Dichlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
1,4-Dioxane	ND (0.559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
2,2-Dichloropropane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
2-Butanone	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
2-Chlorotoluene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
2-Hexanone	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
4-Chlorotoluene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
4-Isopropyltoluene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
4-Methyl-2-Pentanone	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Acetone	**0.419** (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Benzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Bromobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Bromochloromethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 4.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Bromoform	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Bromomethane	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Carbon Disulfide	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Carbon Tetrachloride	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Chlorobenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Chloroethane	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Chloroform	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Chloromethane	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
cis-1,2-Dichloroethene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
cis-1,3-Dichloropropene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Dibromochloromethane	ND (0.0112)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Dibromomethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Dichlorodifluoromethane	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Diethyl Ether	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Di-isopropyl ether	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Ethyl tertiary-butyl ether	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Ethylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Hexachlorobutadiene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Isopropylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Methyl tert-Butyl Ether	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Methylene Chloride	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Naphthalene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
n-Butylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
n-Propylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
sec-Butylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Styrene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
tert-Butylbenzene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Tertiary-amyl methyl ether	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Tetrachloroethene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Tetrahydrofuran	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Toluene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 4.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
trans-1,3-Dichloropropene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Trichloroethene	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Trichlorofluoromethane	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Vinyl Chloride	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Xylene O	ND (0.0279)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Xylene P,M	ND (0.0559)		8260B Low		1	11/02/18 16:49	C8K0038	CK80230
Xylenes (Total)	ND (0.0559)		8260B Low		1	11/02/18 16:49		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*121 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*90 %*		*70-130*
Surrogate: Dibromofluoromethane	*111 %*		*70-130*
Surrogate: Toluene-d8	*102 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 40
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 11/1/18 11:30

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
4,4´-DDE	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
4,4´-DDT	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Aldrin	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
alpha-BHC	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
alpha-Chlordane	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
beta-BHC	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Chlordane (Total)	ND (0.0525)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
delta-BHC	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Dieldrin	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Endosulfan I	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Endosulfan II	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Endosulfan Sulfate	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Endrin	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Endrin Ketone	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
gamma-BHC (Lindane)	ND (0.0039)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
gamma-Chlordane	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Heptachlor	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Heptachlor Epoxide	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Hexachlorobenzene	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108
Methoxychlor	ND (0.0066)		8081B		1	11/02/18 20:13	C8K0029	CJ83108

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*71 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*78 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*66 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*75 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 50.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: SMR
Prepared: 11/1/18 13:05

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**140** (31.3)		8100M		1	11/02/18 8:13	C8K0014	CK80115

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*79 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**81** (1)		2540G		1	CCP	10/30/18 19:13	%	CJ83025
Total Organic Carbon (Average)	**118000** (458)		LK		1	CCP	11/01/18 15:21	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45
Percent Solids: 19
Initial Volume: 50.5
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/1/18 14:15

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (39.0)		MADEP-EPH		1	SMR	11/05/18 22:25	C8K0069	CK80109
C19-C36 Aliphatics1	**97.5** (39.0)		MADEP-EPH		1	SMR	11/05/18 22:25	C8K0069	CK80109
C11-C22 Unadjusted Aromatics1	ND (39.0)		EPH8270		1	VSC	11/01/18 22:59	C8K0001	CK80109
C11-C22 Aromatics1,2	ND (39.7)		EPH8270			IBM	11/07/18 8:57		[CALC]
2-Methylnaphthalene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Acenaphthene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Naphthalene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Phenanthrene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Acenaphthylene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Anthracene	ND (0.021)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Benzo(a)anthracene	ND (0.021)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Benzo(a)pyrene	**0.053** (0.021)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Benzo(b)fluoranthene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Benzo(g,h,i)perylene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Benzo(k)fluoranthene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Chrysene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Dibenzo(a,h)Anthracene	ND (0.021)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Fluoranthene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Fluorene	ND (0.021)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Indeno(1,2,3-cd)Pyrene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109
Pyrene	ND (0.052)		EPH8270SIM		1	IBM	11/07/18 8:57	C8K0123	CK80109

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*60 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*98 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*93 %*		*40-140*
Surrogate: O-Terphenyl	*85 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5
Date Sampled: 10/29/18 10:45

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-03
Sample Matrix: Sediment
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Sequence	Batch
Grain Size	See Attached (N/A)										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 9.6
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1,1-Trichloroethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1,2,2-Tetrachloroethane	ND (0.0032)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1,2-Trichloroethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1-Dichloroethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1-Dichloroethene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,1-Dichloropropene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2,3-Trichlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2,3-Trichloropropane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2,4-Trichlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2,4-Trimethylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2-Dibromo-3-Chloropropane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2-Dibromoethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2-Dichlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2-Dichloroethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,2-Dichloropropane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,3,5-Trimethylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,3-Dichlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,3-Dichloropropane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,4-Dichlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
1,4-Dioxane	ND (0.162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
2,2-Dichloropropane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
2-Butanone	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
2-Chlorotoluene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
2-Hexanone	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
4-Chlorotoluene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
4-Isopropyltoluene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
4-Methyl-2-Pentanone	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Acetone	**0.0649** (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Benzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Bromobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Bromochloromethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 9.6
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Bromoform	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Bromomethane	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Carbon Disulfide	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Carbon Tetrachloride	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Chlorobenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Chloroethane	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Chloroform	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Chloromethane	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
cis-1,2-Dichloroethene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
cis-1,3-Dichloropropene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Dibromochloromethane	ND (0.0032)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Dibromomethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Dichlorodifluoromethane	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Diethyl Ether	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Di-isopropyl ether	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Ethyl tertiary-butyl ether	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Ethylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Hexachlorobutadiene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Isopropylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Methyl tert-Butyl Ether	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Methylene Chloride	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Naphthalene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
n-Butylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
n-Propylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
sec-Butylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Styrene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
tert-Butylbenzene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Tertiary-amyl methyl ether	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Tetrachloroethene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Tetrahydrofuran	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Toluene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 9.6
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
trans-1,3-Dichloropropene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Trichloroethene	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Trichlorofluoromethane	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Vinyl Chloride	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Xylene O	ND (0.0081)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Xylene P,M	ND (0.0162)		8260B Low		1	11/02/18 17:15	C8K0038	CK80230
Xylenes (Total)	ND (0.0162)		8260B Low		1	11/02/18 17:15		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*105 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*89 %*		*70-130*
Surrogate: Dibromofluoromethane	*107 %*		*70-130*
Surrogate: Toluene-d8	*103 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 40.9
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 11/1/18 11:30

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
4,4´-DDE	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
4,4´-DDT	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Aldrin	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
alpha-BHC	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
alpha-Chlordane	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
beta-BHC	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Chlordane (Total)	ND (0.0304)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
delta-BHC	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Dieldrin	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Endosulfan I	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Endosulfan II	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Endosulfan Sulfate	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Endrin	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Endrin Ketone	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
gamma-BHC (Lindane)	ND (0.0023)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
gamma-Chlordane	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Heptachlor	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Heptachlor Epoxide	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Hexachlorobenzene	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108
Methoxychlor	ND (0.0038)		8081B		1	11/02/18 20:45	C8K0029	CJ83108

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*70 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*80 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*67 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*71 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 29.9
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 11/8/18 16:38

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#18	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#28	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#44	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#52	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#66	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#101	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#105	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#118 [2C]	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#128	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#138	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#153 [2C]	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#170 [2C]	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#180 [2C]	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#187	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#195	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#206	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848
BZ#209	ND (0.00084)		8082		1	11/09/18 16:40	C8K0175	CK80848

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*77 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*86 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 35.6
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: SMR
Prepared: 11/1/18 13:05

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**79.2** (26.2)		8100M		1	11/02/18 8:45	C8K0014	CK80115

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*83 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**68** (1)		2540G		1	CCP	10/30/18 19:13	%	CJ83025
Total Organic Carbon (Average)	**71300** (451)		LK		1	CCP	11/01/18 17:09	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30
Percent Solids: 32
Initial Volume: 35.2
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/1/18 14:15

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (33.2)		MADEP-EPH		1	SMR	11/05/18 23:12	C8K0069	CK80109
C19-C36 Aliphatics1	**89.1** (33.2)		MADEP-EPH		1	SMR	11/05/18 23:12	C8K0069	CK80109
C11-C22 Unadjusted Aromatics1	ND (33.2)		EPH8270		1	VSC	11/01/18 23:36	C8K0001	CK80109
C11-C22 Aromatics1,2	ND (33.8)		EPH8270			IBM	11/07/18 12:01		[CALC]
2-Methylnaphthalene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Acenaphthene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Naphthalene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Phenanthrene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Acenaphthylene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Anthracene	ND (0.018)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Benzo(a)anthracene	ND (0.018)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Benzo(a)pyrene	ND (0.018)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Benzo(b)fluoranthene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Benzo(g,h,i)perylene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Benzo(k)fluoranthene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Chrysene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Dibenzo(a,h)Anthracene	ND (0.018)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Fluoranthene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Fluorene	ND (0.018)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Indeno(1,2,3-cd)Pyrene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109
Pyrene	ND (0.044)		EPH8270SIM		1	IBM	11/07/18 12:01	C8K0123	CK80109

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*69 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*108 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*96 %*		*40-140*
Surrogate: O-Terphenyl	*106 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6
Date Sampled: 10/29/18 12:30

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-04
Sample Matrix: Sediment
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Sequence	Batch
Grain Size	**See Attached** (N/A)										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 9.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1,1-Trichloroethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1,2,2-Tetrachloroethane	ND (0.0012)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1,2-Trichloroethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1-Dichloroethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1-Dichloroethene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,1-Dichloropropene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2,3-Trichlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2,3-Trichloropropane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2,4-Trichlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2,4-Trimethylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2-Dibromo-3-Chloropropane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2-Dibromoethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2-Dichlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2-Dichloroethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,2-Dichloropropane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,3,5-Trimethylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,3-Dichlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,3-Dichloropropane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,4-Dichlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
1,4-Dioxane	ND (0.0616)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
2,2-Dichloropropane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
2-Butanone	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
2-Chlorotoluene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
2-Hexanone	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
4-Chlorotoluene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
4-Isopropyltoluene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
4-Methyl-2-Pentanone	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Acetone	**0.0093** (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Benzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Bromobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Bromochloromethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 9.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Bromoform	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Bromomethane	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Carbon Disulfide	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Carbon Tetrachloride	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Chlorobenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Chloroethane	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Chloroform	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Chloromethane	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
cis-1,2-Dichloroethene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
cis-1,3-Dichloropropene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Dibromochloromethane	ND (0.0012)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Dibromomethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Dichlorodifluoromethane	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Diethyl Ether	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Di-isopropyl ether	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Ethyl tertiary-butyl ether	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Ethylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Hexachlorobutadiene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Isopropylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Methyl tert-Butyl Ether	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Methylene Chloride	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Naphthalene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
n-Butylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
n-Propylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
sec-Butylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Styrene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
tert-Butylbenzene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Tertiary-amyl methyl ether	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Tetrachloroethene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Tetrahydrofuran	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Toluene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 9.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
trans-1,3-Dichloropropene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Trichloroethene	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Trichlorofluoromethane	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Vinyl Chloride	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Xylene O	ND (0.0031)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Xylene P,M	ND (0.0062)		8260B Low		1	11/02/18 17:41	C8K0038	CK80230
Xylenes (Total)	ND (0.0062)		8260B Low		1	11/02/18 17:41		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*119 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*94 %*		*70-130*
Surrogate: Dibromofluoromethane	*112 %*		*70-130*
Surrogate: Toluene-d8	*98 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 19.5
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 11/1/18 11:30

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
4,4´-DDE	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
4,4´-DDT	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Aldrin	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
alpha-BHC	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
alpha-Chlordane	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
beta-BHC	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Chlordane (Total)	ND (0.0250)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
delta-BHC	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Dieldrin	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Endosulfan I	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Endosulfan II	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Endosulfan Sulfate	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Endrin	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Endrin Ketone	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
gamma-BHC (Lindane)	ND (0.0019)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
gamma-Chlordane	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Heptachlor	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Heptachlor Epoxide	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Hexachlorobenzene	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108
Methoxychlor	ND (0.0031)		8081B		1	11/02/18 21:16	C8K0029	CJ83108

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*75 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*89 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*75 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*85 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 29.4
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 11/8/18 16:38

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#18	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#28 [2C]	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#44	**0.00184** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#52 [2C]	**LC, P 0.00406** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#66	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#101 [2C]	**0.0138** (0.00336)		8082		10	11/09/18 18:24	C8K0175	CK80848
BZ#105	**LC, P 0.00499** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#118	**0.0188** (0.00336)		8082		10	11/09/18 18:24	C8K0175	CK80848
BZ#128 [2C]	**0.00417** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#138	**0.0198** (0.00336)		8082		10	11/09/18 18:24	C8K0175	CK80848
BZ#153 [2C]	**LC, P 0.0100** (0.00336)		8082		10	11/09/18 18:24	C8K0175	CK80848
BZ#170 [2C]	**0.00235** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#180 [2C]	**0.00282** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#187	**LC, P 0.00130** (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#195	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#206	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848
BZ#209	ND (0.00034)		8082		1	11/09/18 17:15	C8K0175	CK80848

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*80 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*92 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 20.9
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: SMR
Prepared: 11/1/18 13:05

8100M Total Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Total Petroleum Hydrocarbons	**55.9** (17.5)		8100M		1	11/02/18 9:18	C8K0014	CK80115

	%Recovery	Qualifier	Limits
Surrogate: O-Terphenyl	*82 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**18** (1)		2540G		1	CCP	10/30/18 19:13	%	CJ83025
Total Organic Carbon (Average)	ND (401)		LK		1	CCP	11/01/18 17:34	mg/kg	[CALC]

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7
Date Sampled: 10/29/18 09:00
Percent Solids: 82
Initial Volume: 24
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-05
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 11/1/18 14:15

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (19.0)		MADEP-EPH		1	SMR	11/05/18 23:59	C8K0069	CK80109
C19-C36 Aliphatics1	**34.7** (19.0)		MADEP-EPH		1	SMR	11/05/18 23:59	C8K0069	CK80109
C11-C22 Unadjusted Aromatics1	**25.3** (19.0)		EPH8270		1	VSC	11/02/18 0:12	C8K0001	CK80109
C11-C22 Aromatics1,2	**20.5** (19.4)		EPH8270			IBM	11/07/18 12:49		[CALC]
2-Methylnaphthalene	ND (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Acenaphthene	**0.084** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Naphthalene	**0.053** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Phenanthrene	**0.923** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Acenaphthylene	ND (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Anthracene	**0.110** (0.010)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Benzo(a)anthracene	**0.300** (0.010)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Benzo(a)pyrene	**0.278** (0.010)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Benzo(b)fluoranthene	**0.332** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Benzo(g,h,i)perylene	**0.165** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Benzo(k)fluoranthene	**0.174** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Chrysene	**0.369** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Dibenzo(a,h)Anthracene	**0.075** (0.010)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Fluoranthene	**0.894** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Fluorene	**0.096** (0.010)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Indeno(1,2,3-cd)Pyrene	**0.164** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109
Pyrene	**0.761** (0.025)		EPH8270SIM		1	IBM	11/07/18 12:49	C8K0123	CK80109

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*59 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*107 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*101 %*		*40-140*
Surrogate: O-Terphenyl	*94 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-3 Air Dried
Date Sampled: 10/29/18 11:30
Percent Solids: 100

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-06
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (0.87)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Cadmium	ND (0.17)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Chromium	**2.81** (0.35)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Copper	**1.92** (0.87)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Lead	**2.82** (1.73)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Mercury	ND (0.009)		7471B		1	MJV	11/02/18 11:30	2.29	40	CK80161
Nickel	**2.78** (0.87)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160
Zinc	**10.8** (0.87)		6010C		1	KJK	11/02/18 18:02	5.78	100	CK80160

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-4 Air Dried
Date Sampled: 10/29/18 11:15
Percent Solids: 100

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-07
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (0.98)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Cadmium	ND (0.20)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Chromium	**2.39** (0.39)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Copper	**1.48** (0.98)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Lead	**2.20** (1.96)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Mercury	ND (0.009)		7471B		1	MJV	11/02/18 11:32	2.31	40	CK80161
Nickel	**1.88** (0.98)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160
Zinc	**8.90** (0.98)		6010C		1	KJK	11/02/18 18:06	5.11	100	CK80160

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5 Air Dried
Date Sampled: 10/29/18 10:45
Percent Solids: 100

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-08
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2.89** (0.93)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Cadmium	**0.43** (0.19)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Chromium	**4.09** (0.37)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Copper	**5.82** (0.93)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Lead	**15.0** (1.86)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Mercury	**0.053** (0.009)		7471B		1	MJV	11/02/18 11:34	2.19	40	CK80161
Nickel	**4.35** (0.93)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160
Zinc	**42.4** (0.93)		6010C		1	KJK	11/02/18 18:10	5.38	100	CK80160

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-6 Air Dried
Date Sampled: 10/29/18 12:30
Percent Solids: 100

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-09
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.83** (0.96)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Cadmium	ND (0.19)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Chromium	**9.13** (0.38)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Copper	**5.56** (0.96)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Lead	**37.7** (1.91)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Mercury	**0.032** (0.010)		7471B		1	MJV	11/02/18 11:36	2.05	40	CK80161
Nickel	**3.44** (0.96)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160
Zinc	**23.1** (0.96)		6010C		1	KJK	11/02/18 18:14	5.23	100	CK80160

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-7 Air Dried
Date Sampled: 10/29/18 09:00
Percent Solids: 100

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-10
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**6.77** (0.87)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Cadmium	**0.71** (0.17)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Chromium	**6.18** (0.35)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Copper	**15.4** (0.87)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Lead	**26.5** (1.74)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Mercury	ND (0.009)		7471B		1	MJV	11/02/18 11:38	2.12	40	CK80161
Nickel	**3.31** (0.87)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160
Zinc	**36.4** (0.87)		6010C		1	KJK	11/02/18 18:18	5.76	100	CK80160

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: S-5 Air Dried
Date Sampled: 10/29/18 10:45
Percent Solids: 93
Initial Volume: 11.5
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1810852
ESS Laboratory Sample ID: 1810852-11
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 11/8/18 16:38

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#18	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#28	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#44	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#52	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#66	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#101	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#105	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#118	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#128	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#138	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#153 [2C]	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#170	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#180 [2C]	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#187	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#195	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#206	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848
BZ#209	ND (0.00076)		8082		1	11/09/18 17:50	C8K0175	CK80848

	%Recovery	Qualifier	Limits
Surrogate: Tetrachloro-m-xylene	*34 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*38 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CK80160 - 3050B										
Blank										
Arsenic	ND	2.50	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Copper	ND	2.50	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Arsenic	61.7	9.26	mg/kg wet	59.00		105	85-115			
Cadmium	93.0	1.85	mg/kg wet	98.70		94	84-116			
Chromium	259	3.70	mg/kg wet	240.0		108	85-115			
Copper	91.8	9.26	mg/kg wet	89.60		103	83-117			
Lead	302	18.5	mg/kg wet	276.0		109	84-116			
Nickel	341	9.26	mg/kg wet	298.0		114	84-116			
Zinc	636	9.26	mg/kg wet	590.0		108	85-115			
LCS Dup										
Arsenic	59.0	9.62	mg/kg wet	59.00		100	85-115	4	20	
Cadmium	89.5	1.92	mg/kg wet	98.70		91	84-116	4	20	
Chromium	251	3.85	mg/kg wet	240.0		104	85-115	3	20	
Copper	90.3	9.62	mg/kg wet	89.60		101	83-117	2	20	
Lead	284	19.2	mg/kg wet	276.0		103	84-116	6	20	
Nickel	331	9.62	mg/kg wet	298.0		111	84-116	3	20	
Zinc	610	9.62	mg/kg wet	590.0		103	85-115	4	20	
Reference										
Cadmium	419	1.89	mg/kg wet	500.0		84	70-130			
Chromium	482	3.77	mg/kg wet	500.0		96	70-130			
Copper	495	9.43	mg/kg wet	500.0		99	70-130			
Lead	502	18.9	mg/kg wet	500.0		100	70-130			
Batch CK80161 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	12.1	1.83	mg/kg wet	12.00		101	80-120			
LCS Dup										
Mercury	11.7	1.83	mg/kg wet	12.00		97	80-120	4	20	
Reference										
Mercury	1.02	0.183	mg/kg wet	1000		0.1	0-200			
5035/8260B Volatile Organic Compounds / Low Level										
Batch CK80230 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80230 - 5035										
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80230 - 5035										
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0579*		mg/kg wet	*0.05000*		*116*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0466*		mg/kg wet	*0.05000*		*93*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0537*		mg/kg wet	*0.05000*		*107*	*70-130*			
Surrogate: Toluene-d8	*0.0494*		mg/kg wet	*0.05000*		*99*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,1,1-Trichloroethane	0.0504	0.0050	mg/kg wet	0.05000		101	70-130			
1,1,2,2-Tetrachloroethane	0.0468	0.0020	mg/kg wet	0.05000		94	70-130			
1,1,2-Trichloroethane	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,1-Dichloroethane	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
1,1-Dichloroethene	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
1,1-Dichloropropene	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
1,2,3-Trichlorobenzene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130			
1,2,3-Trichloropropane	0.0470	0.0050	mg/kg wet	0.05000		94	70-130			
1,2,4-Trichlorobenzene	0.0476	0.0050	mg/kg wet	0.05000		95	70-130			
1,2,4-Trimethylbenzene	0.0482	0.0050	mg/kg wet	0.05000		96	70-130			
1,2-Dibromo-3-Chloropropane	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
1,2-Dibromoethane	0.0467	0.0050	mg/kg wet	0.05000		93	70-130			
1,2-Dichlorobenzene	0.0473	0.0050	mg/kg wet	0.05000		95	70-130			
1,2-Dichloroethane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				5035/8260B Volatile Organic Compounds / Low Level						
Batch CK80230 - 5035										
1,2-Dichloropropane	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			
1,3,5-Trimethylbenzene	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
1,3-Dichlorobenzene	0.0467	0.0050	mg/kg wet	0.05000		93	70-130			
1,3-Dichloropropane	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
1,4-Dichlorobenzene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130			
1,4-Dioxane	0.987	0.100	mg/kg wet	1.000		99	70-130			
2,2-Dichloropropane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
2-Butanone	0.238	0.0100	mg/kg wet	0.2500		95	70-130			
2-Chlorotoluene	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			
2-Hexanone	0.239	0.0100	mg/kg wet	0.2500		96	70-130			
4-Chlorotoluene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130			
4-Isopropyltoluene	0.0492	0.0050	mg/kg wet	0.05000		98	70-130			
4-Methyl-2-Pentanone	0.253	0.0100	mg/kg wet	0.2500		101	70-130			
Acetone	0.236	0.0100	mg/kg wet	0.2500		94	70-130			
Benzene	0.0493	0.0050	mg/kg wet	0.05000		99	70-130			
Bromobenzene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130			
Bromochloromethane	0.0495	0.0050	mg/kg wet	0.05000		99	70-130			
Bromodichloromethane	0.0498	0.0050	mg/kg wet	0.05000		100	70-130			
Bromoform	0.0524	0.0050	mg/kg wet	0.05000		105	70-130			
Bromomethane	0.0544	0.0100	mg/kg wet	0.05000		109	70-130			
Carbon Disulfide	0.0507	0.0050	mg/kg wet	0.05000		101	70-130			
Carbon Tetrachloride	0.0547	0.0050	mg/kg wet	0.05000		109	70-130			
Chlorobenzene	0.0460	0.0050	mg/kg wet	0.05000		92	70-130			
Chloroethane	0.0502	0.0100	mg/kg wet	0.05000		100	70-130			
Chloroform	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
Chloromethane	0.0502	0.0100	mg/kg wet	0.05000		100	70-130			
cis-1,2-Dichloroethene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
cis-1,3-Dichloropropene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
Dibromochloromethane	0.0474	0.0020	mg/kg wet	0.05000		95	70-130			
Dibromomethane	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
Dichlorodifluoromethane	0.0520	0.0100	mg/kg wet	0.05000		104	70-130			
Diethyl Ether	0.0507	0.0050	mg/kg wet	0.05000		101	70-130			
Di-isopropyl ether	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
Ethyl tertiary-butyl ether	0.0454	0.0050	mg/kg wet	0.05000		91	70-130			
Ethylbenzene	0.0462	0.0050	mg/kg wet	0.05000		92	70-130			
Hexachlorobutadiene	0.0472	0.0050	mg/kg wet	0.05000		94	70-130			
Isopropylbenzene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130			
Methyl tert-Butyl Ether	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
Methylene Chloride	0.0454	0.0100	mg/kg wet	0.05000		91	70-130			
Naphthalene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130			
n-Butylbenzene	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
n-Propylbenzene	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
sec-Butylbenzene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
Styrene	0.0475	0.0050	mg/kg wet	0.05000		95	70-130			
tert-Butylbenzene	0.0485	0.0050	mg/kg wet	0.05000		97	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80230 - 5035										
Tertiary-amyl methyl ether	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
Tetrachloroethene	0.0442	0.0050	mg/kg wet	0.05000		88	70-130			
Tetrahydrofuran	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
Toluene	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
trans-1,2-Dichloroethene	0.0465	0.0050	mg/kg wet	0.05000		93	70-130			
trans-1,3-Dichloropropene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130			
Trichloroethene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130			
Trichlorofluoromethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
Vinyl Chloride	0.0610	0.0100	mg/kg wet	0.05000		122	70-130			
Xylene O	0.0475	0.0050	mg/kg wet	0.05000		95	70-130			
Xylene P,M	0.0942	0.0100	mg/kg wet	0.1000		94	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0523*		mg/kg wet	*0.05000*		*105*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0495*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0521*		mg/kg wet	*0.05000*		*104*	*70-130*			
Surrogate: Toluene-d8	*0.0489*		mg/kg wet	*0.05000*		*98*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130	0.9	20	
1,1,1-Trichloroethane	0.0478	0.0050	mg/kg wet	0.05000		96	70-130	5	20	
1,1,2,2-Tetrachloroethane	0.0478	0.0020	mg/kg wet	0.05000		96	70-130	2	20	
1,1,2-Trichloroethane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	2	20	
1,1-Dichloroethane	0.0474	0.0050	mg/kg wet	0.05000		95	70-130	3	20	
1,1-Dichloroethene	0.0466	0.0050	mg/kg wet	0.05000		93	70-130	4	20	
1,1-Dichloropropene	0.0476	0.0050	mg/kg wet	0.05000		95	70-130	4	20	
1,2,3-Trichlorobenzene	0.0476	0.0050	mg/kg wet	0.05000		95	70-130	2	20	
1,2,3-Trichloropropane	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	3	20	
1,2,4-Trichlorobenzene	0.0464	0.0050	mg/kg wet	0.05000		93	70-130	3	20	
1,2,4-Trimethylbenzene	0.0460	0.0050	mg/kg wet	0.05000		92	70-130	5	20	
1,2-Dibromo-3-Chloropropane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
1,2-Dibromoethane	0.0478	0.0050	mg/kg wet	0.05000		96	70-130	2	20	
1,2-Dichlorobenzene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130	2	20	
1,2-Dichloroethane	0.0499	0.0050	mg/kg wet	0.05000		100	70-130	0.2	20	
1,2-Dichloropropane	0.0492	0.0050	mg/kg wet	0.05000		98	70-130	1	20	
1,3,5-Trimethylbenzene	0.0464	0.0050	mg/kg wet	0.05000		93	70-130	5	20	
1,3-Dichlorobenzene	0.0455	0.0050	mg/kg wet	0.05000		91	70-130	3	20	
1,3-Dichloropropane	0.0491	0.0050	mg/kg wet	0.05000		98	70-130	0.6	20	
1,4-Dichlorobenzene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130	4	20	
1,4-Dioxane	1.02	0.100	mg/kg wet	1.000		102	70-130	4	20	
2,2-Dichloropropane	0.0469	0.0050	mg/kg wet	0.05000		94	70-130	4	20	
2-Butanone	0.244	0.0100	mg/kg wet	0.2500		98	70-130	3	20	
2-Chlorotoluene	0.0451	0.0050	mg/kg wet	0.05000		90	70-130	4	20	
2-Hexanone	0.255	0.0100	mg/kg wet	0.2500		102	70-130	7	20	
4-Chlorotoluene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130	4	20	
4-Isopropyltoluene	0.0462	0.0050	mg/kg wet	0.05000		92	70-130	6	20	
4-Methyl-2-Pentanone	0.270	0.0100	mg/kg wet	0.2500		108	70-130	7	20	
Acetone	0.241	0.0100	mg/kg wet	0.2500		96	70-130	2	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
			5035/8260B Volatile Organic Compounds / Low Level							
Batch CK80230 - 5035										
Benzene	0.0475	0.0050	mg/kg wet	0.05000		95	70-130	4	20	
Bromobenzene	0.0469	0.0050	mg/kg wet	0.05000		94	70-130	2	20	
Bromochloromethane	0.0487	0.0050	mg/kg wet	0.05000		97	70-130	2	20	
Bromodichloromethane	0.0494	0.0050	mg/kg wet	0.05000		99	70-130	0.7	20	
Bromoform	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	2	20	
Bromomethane	0.0543	0.0100	mg/kg wet	0.05000		109	70-130	0.3	20	
Carbon Disulfide	0.0485	0.0050	mg/kg wet	0.05000		97	70-130	4	20	
Carbon Tetrachloride	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	6	20	
Chlorobenzene	0.0453	0.0050	mg/kg wet	0.05000		91	70-130	1	20	
Chloroethane	0.0478	0.0100	mg/kg wet	0.05000		96	70-130	5	20	
Chloroform	0.0489	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
Chloromethane	0.0475	0.0100	mg/kg wet	0.05000		95	70-130	5	20	
cis-1,2-Dichloroethene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	3	20	
cis-1,3-Dichloropropene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130	0.3	20	
Dibromochloromethane	0.0479	0.0020	mg/kg wet	0.05000		96	70-130	1	20	
Dibromomethane	0.0505	0.0050	mg/kg wet	0.05000		101	70-130	0.8	20	
Dichlorodifluoromethane	0.0480	0.0100	mg/kg wet	0.05000		96	70-130	8	20	
Diethyl Ether	0.0518	0.0050	mg/kg wet	0.05000		104	70-130	2	20	
Di-isopropyl ether	0.0488	0.0050	mg/kg wet	0.05000		98	70-130	0.08	20	
Ethyl tertiary-butyl ether	0.0459	0.0050	mg/kg wet	0.05000		92	70-130	1	20	
Ethylbenzene	0.0447	0.0050	mg/kg wet	0.05000		89	70-130	3	20	
Hexachlorobutadiene	0.0440	0.0050	mg/kg wet	0.05000		88	70-130	7	20	
Isopropylbenzene	0.0459	0.0050	mg/kg wet	0.05000		92	70-130	5	20	
Methyl tert-Butyl Ether	0.0506	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
Methylene Chloride	0.0444	0.0100	mg/kg wet	0.05000		89	70-130	2	20	
Naphthalene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130	0.3	20	
n-Butylbenzene	0.0465	0.0050	mg/kg wet	0.05000		93	70-130	6	20	
n-Propylbenzene	0.0458	0.0050	mg/kg wet	0.05000		92	70-130	6	20	
sec-Butylbenzene	0.0450	0.0050	mg/kg wet	0.05000		90	70-130	6	20	
Styrene	0.0467	0.0050	mg/kg wet	0.05000		93	70-130	2	20	
tert-Butylbenzene	0.0462	0.0050	mg/kg wet	0.05000		92	70-130	5	20	
Tertiary-amyl methyl ether	0.0497	0.0050	mg/kg wet	0.05000		99	70-130	2	20	
Tetrachloroethene	0.0427	0.0050	mg/kg wet	0.05000		85	70-130	3	20	
Tetrahydrofuran	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	7	20	
Toluene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130	3	20	
trans-1,2-Dichloroethene	0.0452	0.0050	mg/kg wet	0.05000		90	70-130	3	20	
trans-1,3-Dichloropropene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130	0.04	20	
Trichloroethene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130	3	20	
Trichlorofluoromethane	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	6	20	
Vinyl Chloride	0.0565	0.0100	mg/kg wet	0.05000		113	70-130	8	20	
Xylene O	0.0459	0.0050	mg/kg wet	0.05000		92	70-130	3	20	
Xylene P,M	0.0901	0.0100	mg/kg wet	0.1000		90	70-130	4	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0531*		mg/kg wet	*0.05000*		*106*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0495*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0526*		mg/kg wet	*0.05000*		*105*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CK80230 - 5035										
Surrogate: Toluene-d8	*0.0489*		mg/kg wet	*0.05000*		*98*	*70-130*			
8081B Organochlorine Pesticides										
Batch CJ83108 - 3546										
Blank										
4,4´-DDD	ND	0.0025	mg/kg wet							
4,4´-DDD [2C]	ND	0.0025	mg/kg wet							
4,4´-DDE	ND	0.0025	mg/kg wet							
4,4´-DDE [2C]	ND	0.0025	mg/kg wet							
4,4´-DDT	ND	0.0025	mg/kg wet							
4,4´-DDT [2C]	ND	0.0025	mg/kg wet							
Aldrin	ND	0.0025	mg/kg wet							
Aldrin [2C]	ND	0.0025	mg/kg wet							
alpha-BHC	ND	0.0025	mg/kg wet							
alpha-BHC [2C]	ND	0.0025	mg/kg wet							
alpha-Chlordane	ND	0.0025	mg/kg wet							
alpha-Chlordane [2C]	ND	0.0025	mg/kg wet							
beta-BHC	ND	0.0025	mg/kg wet							
beta-BHC [2C]	ND	0.0025	mg/kg wet							
Chlordane (Total)	ND	0.0200	mg/kg wet							
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet							
delta-BHC	ND	0.0025	mg/kg wet							
delta-BHC [2C]	ND	0.0025	mg/kg wet							
Dieldrin	ND	0.0025	mg/kg wet							
Dieldrin [2C]	ND	0.0025	mg/kg wet							
Endosulfan I	ND	0.0025	mg/kg wet							
Endosulfan I [2C]	ND	0.0025	mg/kg wet							
Endosulfan II	ND	0.0025	mg/kg wet							
Endosulfan II [2C]	ND	0.0025	mg/kg wet							
Endosulfan Sulfate	ND	0.0025	mg/kg wet							
Endosulfan Sulfate [2C]	ND	0.0025	mg/kg wet							
Endrin	ND	0.0025	mg/kg wet							
Endrin [2C]	ND	0.0025	mg/kg wet							
Endrin Ketone	ND	0.0025	mg/kg wet							
Endrin Ketone [2C]	ND	0.0025	mg/kg wet							
gamma-BHC (Lindane)	ND	0.0015	mg/kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0015	mg/kg wet							
gamma-Chlordane	ND	0.0025	mg/kg wet							
gamma-Chlordane [2C]	ND	0.0025	mg/kg wet							
Heptachlor	ND	0.0025	mg/kg wet							
Heptachlor [2C]	ND	0.0025	mg/kg wet							
Heptachlor Epoxide	ND	0.0025	mg/kg wet							
Heptachlor Epoxide [2C]	ND	0.0025	mg/kg wet							
Hexachlorobenzene	ND	0.0025	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

8081B Organochlorine Pesticides

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CJ83108 - 3546										
Hexachlorobenzene [2C]	ND	0.0025	mg/kg wet							
Methoxychlor	ND	0.0025	mg/kg wet							
Methoxychlor [2C]	ND	0.0025	mg/kg wet							
Toxaphene	ND	0.125	mg/kg wet							
Toxaphene [2C]	ND	0.125	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0110*		mg/kg wet	*0.01250*		*88*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0118*		mg/kg wet	*0.01250*		*95*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0115*		mg/kg wet	*0.01250*		*92*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0124*		mg/kg wet	*0.01250*		*99*	*30-150*			
LCS										
4,4´-DDD	0.0123	0.0025	mg/kg wet	0.01250		99	40-140			
4,4´-DDD [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
4,4´-DDE	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
4,4´-DDE [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140			
4,4´-DDT	0.0113	0.0025	mg/kg wet	0.01250		90	40-140			
4,4´-DDT [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
Aldrin	0.0134	0.0025	mg/kg wet	0.01250		107	40-140			
Aldrin [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
alpha-BHC	0.0123	0.0025	mg/kg wet	0.01250		99	40-140			
alpha-BHC [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
alpha-Chlordane	0.0122	0.0025	mg/kg wet	0.01250		97	40-140			
alpha-Chlordane [2C]	0.0112	0.0025	mg/kg wet	0.01250		89	40-140			
beta-BHC	0.0132	0.0025	mg/kg wet	0.01250		106	40-140			
beta-BHC [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
delta-BHC	0.0104	0.0025	mg/kg wet	0.01250		83	40-140			
delta-BHC [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
Dieldrin	0.0117	0.0025	mg/kg wet	0.01250		94	40-140			
Dieldrin [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140			
Endosulfan I	0.0117	0.0025	mg/kg wet	0.01250		94	40-140			
Endosulfan I [2C]	0.0111	0.0025	mg/kg wet	0.01250		89	40-140			
Endosulfan II	0.0115	0.0025	mg/kg wet	0.01250		92	40-140			
Endosulfan II [2C]	0.0113	0.0025	mg/kg wet	0.01250		90	40-140			
Endosulfan Sulfate	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
Endosulfan Sulfate [2C]	0.0112	0.0025	mg/kg wet	0.01250		89	40-140			
Endrin	0.0129	0.0025	mg/kg wet	0.01250		103	40-140			
Endrin [2C]	0.0119	0.0025	mg/kg wet	0.01250		95	40-140			
Endrin Ketone	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
Endrin Ketone [2C]	0.0124	0.0025	mg/kg wet	0.01250		99	40-140			
gamma-BHC (Lindane)	0.0124	0.0015	mg/kg wet	0.01250		99	40-140			
gamma-BHC (Lindane) [2C]	0.0135	0.0015	mg/kg wet	0.01250		108	40-140			
gamma-Chlordane	0.0123	0.0025	mg/kg wet	0.01250		99	40-140			
gamma-Chlordane [2C]	0.0116	0.0025	mg/kg wet	0.01250		92	40-140			
Heptachlor	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Heptachlor [2C]	0.0144	0.0025	mg/kg wet	0.01250		115	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				8081B Organochlorine Pesticides						
Batch CJ83108 - 3546										
Heptachlor Epoxide	0.0122	0.0025	mg/kg wet	0.01250		98	40-140			
Heptachlor Epoxide [2C]	0.0126	0.0025	mg/kg wet	0.01250		100	40-140			
Hexachlorobenzene	0.0132	0.0025	mg/kg wet	0.01250		106	40-140			
Hexachlorobenzene [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
Methoxychlor	0.0111	0.0025	mg/kg wet	0.01250		89	40-140			
Methoxychlor [2C]	0.0113	0.0025	mg/kg wet	0.01250		90	40-140			
Surrogate: Decachlorobiphenyl	*0.0113*		mg/kg wet	*0.01250*		*91*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0119*		mg/kg wet	*0.01250*		*95*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0123*		mg/kg wet	*0.01250*		*98*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0129*		mg/kg wet	*0.01250*		*103*	*30-150*			
LCS Dup										
4,4´-DDD	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	3	30	
4,4´-DDD [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140	2	30	
4,4´-DDE	0.0126	0.0025	mg/kg wet	0.01250		100	40-140	1	30	
4,4´-DDE [2C]	0.0115	0.0025	mg/kg wet	0.01250		92	40-140	2	30	
4,4´-DDT	0.0118	0.0025	mg/kg wet	0.01250		95	40-140	5	30	
4,4´-DDT [2C]	0.0124	0.0025	mg/kg wet	0.01250		99	40-140	7	30	
Aldrin	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	3	30	
Aldrin [2C]	0.0124	0.0025	mg/kg wet	0.01250		99	40-140	3	30	
alpha-BHC	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	3	30	
alpha-BHC [2C]	0.0136	0.0025	mg/kg wet	0.01250		109	40-140	2	30	
alpha-Chlordane	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	1	30	
alpha-Chlordane [2C]	0.0109	0.0025	mg/kg wet	0.01250		87	40-140	2	30	
beta-BHC	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	2	30	
beta-BHC [2C]	0.0125	0.0025	mg/kg wet	0.01250		100	40-140	2	30	
delta-BHC	0.0108	0.0025	mg/kg wet	0.01250		86	40-140	4	30	
delta-BHC [2C]	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	0.9	30	
Dieldrin	0.0116	0.0025	mg/kg wet	0.01250		93	40-140	0.9	30	
Dieldrin [2C]	0.0119	0.0025	mg/kg wet	0.01250		95	40-140	2	30	
Endosulfan I	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	0.2	30	
Endosulfan I [2C]	0.0109	0.0025	mg/kg wet	0.01250		87	40-140	2	30	
Endosulfan II	0.0113	0.0025	mg/kg wet	0.01250		90	40-140	1	30	
Endosulfan II [2C]	0.0112	0.0025	mg/kg wet	0.01250		89	40-140	1	30	
Endosulfan Sulfate	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	1	30	
Endosulfan Sulfate [2C]	0.0117	0.0025	mg/kg wet	0.01250		93	40-140	4	30	
Endrin	0.0126	0.0025	mg/kg wet	0.01250		101	40-140	2	30	
Endrin [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140	2	30	
Endrin Ketone	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	2	30	
Endrin Ketone [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140	2	30	
gamma-BHC (Lindane)	0.0121	0.0015	mg/kg wet	0.01250		97	40-140	3	30	
gamma-BHC (Lindane) [2C]	0.0133	0.0015	mg/kg wet	0.01250		106	40-140	2	30	
gamma-Chlordane	0.0122	0.0025	mg/kg wet	0.01250		98	40-140	1	30	
gamma-Chlordane [2C]	0.0113	0.0025	mg/kg wet	0.01250		91	40-140	2	30	
Heptachlor	0.0130	0.0025	mg/kg wet	0.01250		104	40-140	0.4	30	

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CJ83108 - 3546										
Heptachlor [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	2	30	
Heptachlor Epoxide	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	1	30	
Heptachlor Epoxide [2C]	0.0123	0.0025	mg/kg wet	0.01250		98	40-140	2	30	
Hexachlorobenzene	0.0127	0.0025	mg/kg wet	0.01250		102	40-140	4	30	
Hexachlorobenzene [2C]	0.0123	0.0025	mg/kg wet	0.01250		99	40-140	3	30	
Methoxychlor	0.0119	0.0025	mg/kg wet	0.01250		95	40-140	7	30	
Methoxychlor [2C]	0.0119	0.0025	mg/kg wet	0.01250		95	40-140	5	30	
Surrogate: Decachlorobiphenyl	*0.0111*		mg/kg wet	*0.01250*		*88*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0117*		mg/kg wet	*0.01250*		*94*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0114*		mg/kg wet	*0.01250*		*91*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0121*		mg/kg wet	*0.01250*		*97*	*30-150*			
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch CK80609 - 3540C										
Blank										
BZ#101	0.00066	0.00027	mg/kg wet							
BZ#101 [2C]	0.00035	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	0.00040	0.00027	mg/kg wet							
BZ#118 [2C]	0.00032	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	0.00039	0.00027	mg/kg wet							
BZ#18 [2C]	0.00050	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	0.00083	0.00027	mg/kg wet							
BZ#28 [2C]	0.00119	0.00027	mg/kg wet							
BZ#44	0.00073	0.00027	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80609 - 3540C										
BZ#44 [2C]	0.00083	0.00027	mg/kg wet							
BZ#52	0.00090	0.00027	mg/kg wet							
BZ#52 [2C]	0.00086	0.00027	mg/kg wet							
BZ#66	0.00081	0.00027	mg/kg wet							
BZ#66 [2C]	0.00098	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							
Surrogate: Tetrachloro-m-xylene	*0.00231*		mg/kg wet	*0.003333*		*69*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00253*		mg/kg wet	*0.003333*		*76*	*30-150*			
LCS										
BZ#101	0.00295	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#101 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#105	0.00310	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#105 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140			
BZ#118	0.00286	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#118 [2C]	0.00263	0.00027	mg/kg wet	0.003333		79	40-140			
BZ#128	0.00312	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#128 [2C]	0.00265	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#138	0.00287	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#138 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#153	0.00286	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#153 [2C]	0.00257	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#170	0.00263	0.00027	mg/kg wet	0.003333		79	40-140			
BZ#170 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#18	0.00307	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#18 [2C]	0.00275	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#180	0.00267	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#180 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#187	0.00270	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#187 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#195	0.00265	0.00027	mg/kg wet	0.003333		79	40-140			
BZ#195 [2C]	0.00272	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#206	0.00276	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#206 [2C]	0.00277	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#209	0.00281	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#209 [2C]	0.00279	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#28	0.00289	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#28 [2C]	0.00257	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#44	0.00275	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#44 [2C]	0.00290	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#52	0.00239	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#52 [2C]	0.00269	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#66	0.00279	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#66 [2C]	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				8082 Polychlorinated Biphenyls (PCB) / Congeners						
Batch CK80609 - 3540C										
BZ#8	0.00265	0.00027	mg/kg wet	0.003333		79	40-140			
BZ#8 [2C]	0.00256	0.00027	mg/kg wet	0.003333		77	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00251*		mg/kg wet	*0.003333*		*75*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00266*		mg/kg wet	*0.003333*		*80*	*30-150*			
LCS Dup										
BZ#101	0.00290	0.00027	mg/kg wet	0.003333		87	40-140	2	50	
BZ#101 [2C]	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	0.4	50	
BZ#105	0.00291	0.00027	mg/kg wet	0.003333		87	40-140	6	50	
BZ#105 [2C]	0.00290	0.00027	mg/kg wet	0.003333		87	40-140	13	50	
BZ#118	0.00288	0.00027	mg/kg wet	0.003333		87	40-140	1	50	
BZ#118 [2C]	0.00271	0.00027	mg/kg wet	0.003333		81	40-140	3	50	
BZ#128	0.00323	0.00027	mg/kg wet	0.003333		97	40-140	3	50	
BZ#128 [2C]	0.00283	0.00027	mg/kg wet	0.003333		85	40-140	7	50	
BZ#138	0.00280	0.00027	mg/kg wet	0.003333		84	40-140	2	50	
BZ#138 [2C]	0.00275	0.00027	mg/kg wet	0.003333		83	40-140	5	50	
BZ#153	0.00272	0.00027	mg/kg wet	0.003333		82	40-140	5	50	
BZ#153 [2C]	0.00266	0.00027	mg/kg wet	0.003333		80	40-140	4	50	
BZ#170	0.00276	0.00027	mg/kg wet	0.003333		83	40-140	5	50	
BZ#170 [2C]	0.00294	0.00027	mg/kg wet	0.003333		88	40-140	8	50	
BZ#18	0.00284	0.00027	mg/kg wet	0.003333		85	40-140	8	50	
BZ#18 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140	2	50	
BZ#180	0.00277	0.00027	mg/kg wet	0.003333		83	40-140	4	50	
BZ#180 [2C]	0.00296	0.00027	mg/kg wet	0.003333		89	40-140	8	50	
BZ#187	0.00281	0.00027	mg/kg wet	0.003333		84	40-140	4	50	
BZ#187 [2C]	0.00270	0.00027	mg/kg wet	0.003333		81	40-140	4	50	
BZ#195	0.00285	0.00027	mg/kg wet	0.003333		85	40-140	7	50	
BZ#195 [2C]	0.00299	0.00027	mg/kg wet	0.003333		90	40-140	9	50	
BZ#206	0.00297	0.00027	mg/kg wet	0.003333		89	40-140	7	50	
BZ#206 [2C]	0.00309	0.00027	mg/kg wet	0.003333		93	40-140	11	50	
BZ#209	0.00302	0.00027	mg/kg wet	0.003333		91	40-140	7	50	
BZ#209 [2C]	0.00308	0.00027	mg/kg wet	0.003333		93	40-140	10	50	
BZ#28	0.00259	0.00027	mg/kg wet	0.003333		78	40-140	11	50	
BZ#28 [2C]	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	1	50	
BZ#44	0.00262	0.00027	mg/kg wet	0.003333		79	40-140	5	50	
BZ#44 [2C]	0.00283	0.00027	mg/kg wet	0.003333		85	40-140	2	50	
BZ#52	0.00260	0.00027	mg/kg wet	0.003333		78	40-140	8	50	
BZ#52 [2C]	0.00267	0.00027	mg/kg wet	0.003333		80	40-140	1	50	
BZ#66	0.00271	0.00027	mg/kg wet	0.003333		81	40-140	3	50	
BZ#66 [2C]	0.00262	0.00027	mg/kg wet	0.003333		79	40-140	1	50	
BZ#8	0.00233	0.00027	mg/kg wet	0.003333		70	40-140	13	50	
BZ#8 [2C]	0.00248	0.00027	mg/kg wet	0.003333		74	40-140	3	50	
Surrogate: Tetrachloro-m-xylene	*0.00234*		mg/kg wet	*0.003333*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00256*		mg/kg wet	*0.003333*		*77*	*30-150*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80848 - 3540C										
Blank										
BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							
Surrogate: Tetrachloro-m-xylene	*0.00240*		mg/kg wet	*0.003333*		*72*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00244*		mg/kg wet	*0.003333*		*73*	*30-150*			
LCS										
BZ#101	0.00295	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#101 [2C]	0.00261	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#105	0.00303	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#105 [2C]	0.00278	0.00027	mg/kg wet	0.003333		83	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				8082 Polychlorinated Biphenyls (PCB) / Congeners						
Batch CK80848 - 3540C										
BZ#118	0.00283	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#118 [2C]	0.00285	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#128	0.00324	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#128 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#138	0.00293	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#138 [2C]	0.00267	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#153	0.00285	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#153 [2C]	0.00258	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#170	0.00282	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#170 [2C]	0.00289	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#18	0.00259	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#18 [2C]	0.00257	0.00027	mg/kg wet	0.003333		77	40-140			
BZ#180	0.00281	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#180 [2C]	0.00291	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#187	0.00281	0.00027	mg/kg wet	0.003333		84	40-140			
BZ#187 [2C]	0.00265	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#195	0.00291	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#195 [2C]	0.00294	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#206	0.00297	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#206 [2C]	0.00305	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#209	0.00303	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#209 [2C]	0.00304	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#28	0.00264	0.00027	mg/kg wet	0.003333		79	40-140			
BZ#28 [2C]	0.00240	0.00027	mg/kg wet	0.003333		72	40-140			
BZ#44	0.00267	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#44 [2C]	0.00276	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#52	0.00252	0.00027	mg/kg wet	0.003333		75	40-140			
BZ#52 [2C]	0.00260	0.00027	mg/kg wet	0.003333		78	40-140			
BZ#66	0.00265	0.00027	mg/kg wet	0.003333		80	40-140			
BZ#66 [2C]	0.00269	0.00027	mg/kg wet	0.003333		81	40-140			
BZ#8	0.00220	0.00027	mg/kg wet	0.003333		66	40-140			
BZ#8 [2C]	0.00234	0.00027	mg/kg wet	0.003333		70	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00256*		mg/kg wet	*0.003333*		*77*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00259*		mg/kg wet	*0.003333*		*78*	*30-150*			
LCS Dup										
BZ#101	0.00276	0.00027	mg/kg wet	0.003333		83	40-140	7	50	
BZ#101 [2C]	0.00266	0.00027	mg/kg wet	0.003333		80	40-140	2	50	
BZ#105	0.00313	0.00027	mg/kg wet	0.003333		94	40-140	3	50	
BZ#105 [2C]	0.00279	0.00027	mg/kg wet	0.003333		84	40-140	0.3	50	
BZ#118	0.00284	0.00027	mg/kg wet	0.003333		85	40-140	0.4	50	
BZ#118 [2C]	0.00285	0.00027	mg/kg wet	0.003333		86	40-140	0.1	50	
BZ#128	0.00305	0.00027	mg/kg wet	0.003333		92	40-140	6	50	
BZ#128 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140	0.1	50	
BZ#138	0.00294	0.00027	mg/kg wet	0.003333		88	40-140	0.2	50	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80848 - 3540C										
BZ#138 [2C]	0.00267	0.00027	mg/kg wet	0.003333		80	40-140	0.07	50	
BZ#153	0.00285	0.00027	mg/kg wet	0.003333		85	40-140	0.05	50	
BZ#153 [2C]	0.00258	0.00027	mg/kg wet	0.003333		77	40-140	0.1	50	
BZ#170	0.00275	0.00027	mg/kg wet	0.003333		82	40-140	3	50	
BZ#170 [2C]	0.00287	0.00027	mg/kg wet	0.003333		86	40-140	0.6	50	
BZ#18	0.00254	0.00027	mg/kg wet	0.003333		76	40-140	2	50	
BZ#18 [2C]	0.00252	0.00027	mg/kg wet	0.003333		76	40-140	2	50	
BZ#180	0.00270	0.00027	mg/kg wet	0.003333		81	40-140	4	50	
BZ#180 [2C]	0.00287	0.00027	mg/kg wet	0.003333		86	40-140	1	50	
BZ#187	0.00276	0.00027	mg/kg wet	0.003333		83	40-140	2	50	
BZ#187 [2C]	0.00264	0.00027	mg/kg wet	0.003333		79	40-140	0.7	50	
BZ#195	0.00276	0.00027	mg/kg wet	0.003333		83	40-140	5	50	
BZ#195 [2C]	0.00292	0.00027	mg/kg wet	0.003333		88	40-140	0.6	50	
BZ#206	0.00285	0.00027	mg/kg wet	0.003333		85	40-140	4	50	
BZ#206 [2C]	0.00303	0.00027	mg/kg wet	0.003333		91	40-140	0.7	50	
BZ#209	0.00291	0.00027	mg/kg wet	0.003333		87	40-140	4	50	
BZ#209 [2C]	0.00301	0.00027	mg/kg wet	0.003333		90	40-140	0.9	50	
BZ#28	0.00257	0.00027	mg/kg wet	0.003333		77	40-140	2	50	
BZ#28 [2C]	0.00271	0.00027	mg/kg wet	0.003333		81	40-140	12	50	
BZ#44	0.00243	0.00027	mg/kg wet	0.003333		73	40-140	9	50	
BZ#44 [2C]	0.00284	0.00027	mg/kg wet	0.003333		85	40-140	3	50	
BZ#52	0.00249	0.00027	mg/kg wet	0.003333		75	40-140	1	50	
BZ#52 [2C]	0.00257	0.00027	mg/kg wet	0.003333		77	40-140	1	50	
BZ#66	0.00257	0.00027	mg/kg wet	0.003333		77	40-140	3	50	
BZ#66 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140	2	50	
BZ#8	0.00234	0.00027	mg/kg wet	0.003333		70	40-140	6	50	
BZ#8 [2C]	0.00228	0.00027	mg/kg wet	0.003333		68	40-140	2	50	
Surrogate: Tetrachloro-m-xylene	*0.00235*		mg/kg wet	*0.003333*		*70*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00247*		mg/kg wet	*0.003333*		*74*	*30-150*			

8100M Total Petroleum Hydrocarbons

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CK80115 - 3546										
Blank										
Decane (C10)	ND	0.2	mg/kg wet							
Docosane (C22)	ND	0.2	mg/kg wet							
Dodecane (C12)	ND	0.2	mg/kg wet							
Eicosane (C20)	ND	0.2	mg/kg wet							
Hexacosane (C26)	ND	0.2	mg/kg wet							
Hexadecane (C16)	ND	0.2	mg/kg wet							
Nonadecane (C19)	ND	0.2	mg/kg wet							
Nonane (C9)	ND	0.2	mg/kg wet							
Octacosane (C28)	ND	0.2	mg/kg wet							
Octadecane (C18)	ND	0.2	mg/kg wet							
Tetracosane (C24)	ND	0.2	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8100M Total Petroleum Hydrocarbons										
Batch CK80115 - 3546										
Tetradecane (C14)	ND	0.2	mg/kg wet							
Total Petroleum Hydrocarbons	ND	15.0	mg/kg wet							
Triacontane (C30)	ND	0.2	mg/kg wet							
Surrogate: O-Terphenyl	*4.08*		mg/kg wet	*5.000*		*82*	*40-140*			
LCS										
Decane (C10)	1.7	0.2	mg/kg wet	2.500		69	40-140			
Docosane (C22)	2.2	0.2	mg/kg wet	2.500		86	40-140			
Dodecane (C12)	1.8	0.2	mg/kg wet	2.500		73	40-140			
Eicosane (C20)	2.1	0.2	mg/kg wet	2.500		85	40-140			
Hexacosane (C26)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Hexadecane (C16)	2.0	0.2	mg/kg wet	2.500		81	40-140			
Nonadecane (C19)	2.3	0.2	mg/kg wet	2.500		91	40-140			
Nonane (C9)	1.6	0.2	mg/kg wet	2.500		62	30-140			
Octacosane (C28)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Octadecane (C18)	2.1	0.2	mg/kg wet	2.500		84	40-140			
Tetracosane (C24)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Tetradecane (C14)	2.0	0.2	mg/kg wet	2.500		79	40-140			
Total Petroleum Hydrocarbons	29.1	15.0	mg/kg wet	35.00		83	40-140			
Triacontane (C30)	2.2	0.2	mg/kg wet	2.500		87	40-140			
Surrogate: O-Terphenyl	*3.95*		mg/kg wet	*5.000*		*79*	*40-140*			
LCS Dup										
Decane (C10)	1.9	0.2	mg/kg wet	2.500		74	40-140	7	50	
Docosane (C22)	2.2	0.2	mg/kg wet	2.500		89	40-140	3	50	
Dodecane (C12)	2.0	0.2	mg/kg wet	2.500		79	40-140	7	50	
Eicosane (C20)	2.2	0.2	mg/kg wet	2.500		88	40-140	3	50	
Hexacosane (C26)	2.2	0.2	mg/kg wet	2.500		90	40-140	3	50	
Hexadecane (C16)	2.1	0.2	mg/kg wet	2.500		86	40-140	5	50	
Nonadecane (C19)	2.4	0.2	mg/kg wet	2.500		95	40-140	5	50	
Nonane (C9)	1.7	0.2	mg/kg wet	2.500		67	30-140	7	50	
Octacosane (C28)	2.3	0.2	mg/kg wet	2.500		90	40-140	3	50	
Octadecane (C18)	2.2	0.2	mg/kg wet	2.500		87	40-140	4	50	
Tetracosane (C24)	2.3	0.2	mg/kg wet	2.500		90	40-140	3	50	
Tetradecane (C14)	2.1	0.2	mg/kg wet	2.500		83	40-140	6	50	
Total Petroleum Hydrocarbons	30.2	15.0	mg/kg wet	35.00		86	40-140	4	50	
Triacontane (C30)	2.3	0.2	mg/kg wet	2.500		90	40-140	3	50	
Surrogate: O-Terphenyl	*4.01*		mg/kg wet	*5.000*		*80*	*40-140*			
Classical Chemistry										
Batch CJ83157 - General Preparation										
Blank										
Total Organic Carbon (1)	ND	100	mg/kg							
Total Organic Carbon (2)	ND	100	mg/kg							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CJ83157 - General Preparation										
LCS										
Total Organic Carbon (1)	10600	100	mg/kg	10000		106	80-120			
Total Organic Carbon (2)	11100	100	mg/kg	10000		111	80-120			
LCS Dup										
Total Organic Carbon (1)	10900	100	mg/kg	10000		109	80-120	3	20	
Total Organic Carbon (2)	11100	100	mg/kg	10000		111	80-120	0.09	20	
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CK80109 - 3546										
Blank										
C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.34*		mg/kg wet	*2.000*		*67*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*51.2*		mg/L	*50.00*		*102*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*46.6*		mg/L	*50.00*		*93*	*40-140*			
Surrogate: O-Terphenyl	*2.10*		mg/kg wet	*2.000*		*105*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.020	mg/kg wet							
Acenaphthene	ND	0.020	mg/kg wet							
Acenaphthylene	ND	0.020	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.020	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.020	mg/kg wet							
Benzo(k)fluoranthene	ND	0.020	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				MADEP-EPH Extractable Petroleum Hydrocarbons						
Batch CK80109 - 3546										
Chrysene	ND	0.020	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.020	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.020	mg/kg wet							
Naphthalene	ND	0.020	mg/kg wet							
Phenanthrene	ND	0.020	mg/kg wet							
Pyrene	ND	0.020	mg/kg wet							
LCS										
C19-C36 Aliphatics1	16.1	15.0	mg/kg wet	16.00		101	40-140			
C9-C18 Aliphatics1	8.8	15.0	mg/kg wet	12.00		73	40-140			
Decane (C10)	1.0	0.5	mg/kg wet	2.000		48	40-140			
Docosane (C22)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Dodecane (C12)	1.1	0.5	mg/kg wet	2.000		55	40-140			
Eicosane (C20)	1.4	0.5	mg/kg wet	2.000		69	40-140			
Hexacosane (C26)	1.4	0.5	mg/kg wet	2.000		68	40-140			
Hexadecane (C16)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Hexatriacontane (C36)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Nonadecane (C19)	1.4	0.5	mg/kg wet	2.000		69	40-140			
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		37	30-140			
Octacosane (C28)	1.3	0.5	mg/kg wet	2.000		66	40-140			
Octadecane (C18)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Tetracosane (C24)	1.4	0.5	mg/kg wet	2.000		71	40-140			
Tetradecane (C14)	1.2	0.5	mg/kg wet	2.000		62	40-140			
Triacontane (C30)	1.3	0.5	mg/kg wet	2.000		66	40-140			
Surrogate: 1-Chlorooctadecane	*1.46*		mg/kg wet	*2.000*		*73*	*40-140*			
LCS										
C11-C22 Unadjusted Aromatics1	28.0	15.0	mg/kg wet	34.00		82	40-140			
Surrogate: 2-Bromonaphthalene	*50.0*		mg/L	*50.00*		*100*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*47.9*		mg/L	*50.00*		*96*	*40-140*			
Surrogate: O-Terphenyl	*2.10*		mg/kg wet	*2.000*		*105*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	0.986	0.080	mg/kg wet	2.000		49	40-140			
Acenaphthene	1.66	0.080	mg/kg wet	2.000		83	40-140			
Acenaphthylene	1.72	0.080	mg/kg wet	2.000		86	40-140			
Anthracene	1.66	0.032	mg/kg wet	2.000		83	40-140			
Benzo(a)anthracene	1.66	0.032	mg/kg wet	2.000		83	40-140			
Benzo(a)pyrene	1.78	0.032	mg/kg wet	2.000		89	40-140			
Benzo(b)fluoranthene	1.87	0.080	mg/kg wet	2.000		94	40-140			
Benzo(g,h,i)perylene	1.79	0.080	mg/kg wet	2.000		89	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CK80109 - 3546										
Benzo(k)fluoranthene	1.67	0.080	mg/kg wet	2.000		84	40-140			
Chrysene	1.68	0.080	mg/kg wet	2.000		84	40-140			
Dibenzo(a,h)Anthracene	2.00	0.032	mg/kg wet	2.000		100	40-140			
Fluoranthene	1.73	0.080	mg/kg wet	2.000		87	40-140			
Fluorene	1.78	0.032	mg/kg wet	2.000		89	40-140			
Indeno(1,2,3-cd)Pyrene	1.94	0.080	mg/kg wet	2.000		97	40-140			
Naphthalene	1.14	0.080	mg/kg wet	2.000		57	40-140			
Phenanthrene	1.58	0.080	mg/kg wet	2.000		79	40-140			
Pyrene	1.82	0.080	mg/kg wet	2.000		91	40-140			
LCS Dup										
C19-C36 Aliphatics1	15.9	15.0	mg/kg wet	16.00		99	40-140	1	25	
C9-C18 Aliphatics1	8.7	15.0	mg/kg wet	12.00		72	40-140	2	25	
Decane (C10)	0.9	0.5	mg/kg wet	2.000		45	40-140	7	25	
Docosane (C22)	1.4	0.5	mg/kg wet	2.000		69	40-140	2	25	
Dodecane (C12)	1.0	0.5	mg/kg wet	2.000		52	40-140	5	25	
Eicosane (C20)	1.4	0.5	mg/kg wet	2.000		68	40-140	1	25	
Hexacosane (C26)	1.3	0.5	mg/kg wet	2.000		67	40-140	1	25	
Hexadecane (C16)	1.4	0.5	mg/kg wet	2.000		69	40-140	1	25	
Hexatriacontane (C36)	1.4	0.5	mg/kg wet	2.000		71	40-140	1	25	
Nonadecane (C19)	1.4	0.5	mg/kg wet	2.000		68	40-140	0.9	25	
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		36	30-140	4	25	
Octacosane (C28)	1.3	0.5	mg/kg wet	2.000		65	40-140	3	25	
Octadecane (C18)	1.4	0.5	mg/kg wet	2.000		69	40-140	0.8	25	
Tetracosane (C24)	1.4	0.5	mg/kg wet	2.000		69	40-140	2	25	
Tetradecane (C14)	1.2	0.5	mg/kg wet	2.000		60	40-140	3	25	
Triacontane (C30)	1.3	0.5	mg/kg wet	2.000		64	40-140	3	25	
Surrogate: 1-Chlorooctadecane	*1.41*		mg/kg wet	*2.000*		*70*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	28.0	15.0	mg/kg wet	34.00		82	40-140	0.04	25	
Surrogate: 2-Bromonaphthalene	*51.9*		mg/L	*50.00*		*104*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*48.5*		mg/L	*50.00*		*97*	*40-140*			
Surrogate: O-Terphenyl	*2.12*		mg/kg wet	*2.000*		*106*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.02	0.080	mg/kg wet	2.000		51	40-140	3	30	
Acenaphthene	1.67	0.080	mg/kg wet	2.000		84	40-140	0.6	30	
Acenaphthylene	1.74	0.080	mg/kg wet	2.000		87	40-140	1	30	
Anthracene	1.62	0.032	mg/kg wet	2.000		81	40-140	3	30	
Benzo(a)anthracene	1.64	0.032	mg/kg wet	2.000		82	40-140	1	30	
Benzo(a)pyrene	1.78	0.032	mg/kg wet	2.000		89	40-140	0.1	30	
Benzo(b)fluoranthene	1.87	0.080	mg/kg wet	2.000		93	40-140	0.2	30	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				MADEP-EPH Extractable Petroleum Hydrocarbons						
Batch CK80109 - 3546										
Benzo(g,h,i)perylene	1.73	0.080	mg/kg wet	2.000		87	40-140	3	30	
Benzo(k)fluoranthene	1.67	0.080	mg/kg wet	2.000		83	40-140	0.2	30	
Chrysene	1.62	0.080	mg/kg wet	2.000		81	40-140	4	30	
Dibenzo(a,h)Anthracene	2.00	0.032	mg/kg wet	2.000		100	40-140	0.006	30	
Fluoranthene	1.69	0.080	mg/kg wet	2.000		85	40-140	2	30	
Fluorene	1.80	0.032	mg/kg wet	2.000		90	40-140	1	30	
Indeno(1,2,3-cd)Pyrene	1.96	0.080	mg/kg wet	2.000		98	40-140	1	30	
Naphthalene	1.23	0.080	mg/kg wet	2.000		61	40-140	7	30	
Phenanthrene	1.51	0.080	mg/kg wet	2.000		76	40-140	5	30	
Pyrene	1.84	0.080	mg/kg wet	2.000		92	40-140	0.8	30	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810852

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
P	Percent difference between primary and confirmation results exceeds 40% (P).
LC	Lower value is used due to matrix interferences (LC).
D	Diluted.
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810852

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

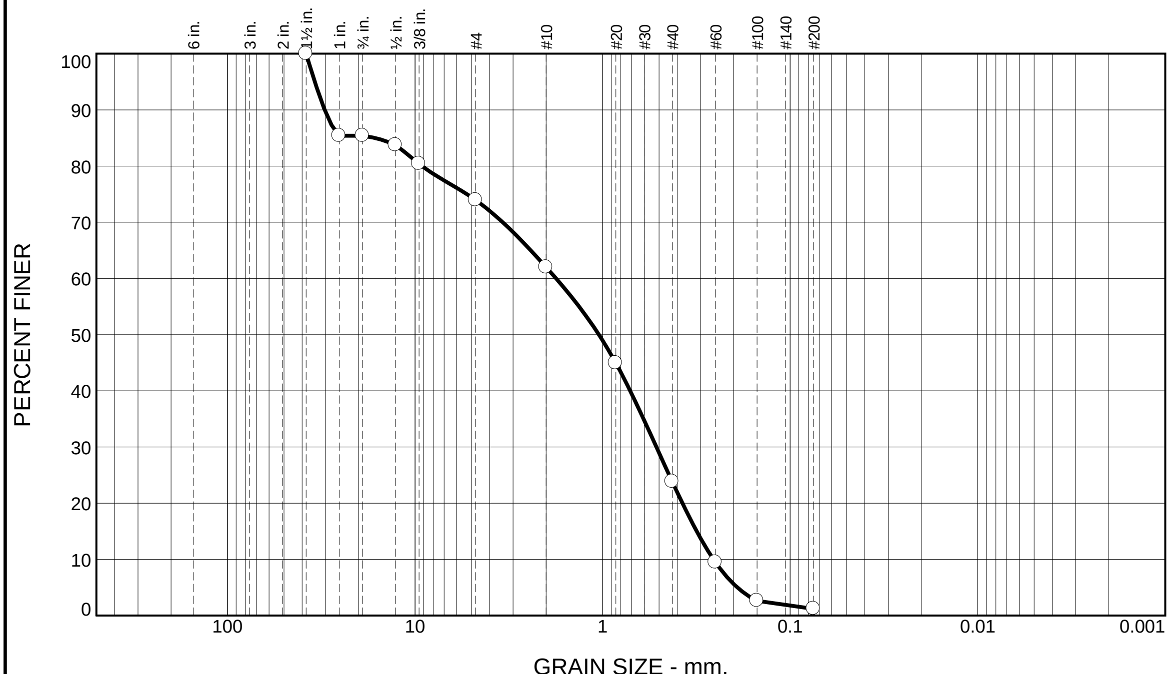
THIELSCH ENGINEERING	195 Frances Avenue Cranston RI, 02910 Phone: (401)-467-6454 Fax: (401)-467-2398 http://www.thielsch.com *Let's Build a Solid Foundation*	Client Information: GZA GeoEnvironmental Norwood, MA PM: Joshua Zall Assigned By: Joshua Zall Collected By: Joshua Zall	Project Information: **White's Mill Pond Dam** **Amesbury, MA** ESS Project Number: 1810852 Summary Page: 1 of 1 Report Date: 11.06.18

LABORATORY TESTING DATA SHEET

ESS Sample No.	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Perme-ability cm/sec	
1810852-01	S-3		18-S-1621				26.1	72.7	1.2											Brown f-c SAND, some f-c Gravel, trace Silt
1810852-02	S-4		18-S-1622				13.1	85.5	1.4											Brown f-c SAND, little fine Gravel, trace Silt
1810852-03	S-5		18-S-1623				0.8	49.1	50.1											Dark Brown organic SILT and f-m SAND, trace fine Gravel
1810852-04	S-6		18-S-1624				68.2	30.4	1.4											Brown f-c GRAVEL, some f-c Sand, trace Silt
1810852-05	S-7		18-S-1625				59.4	39.8	0.8											Brown f-c GRAVEL and f-c SAND, trace Silt

Reviewed By ______________________ Date Reviewed *11.07.2018*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.6	11.5	11.9	38.2	22.6	1.2	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.4		
0.75"	85.4		
0.5"	83.7		
0.375"	80.4		
#4	73.9		
#10	62.0		
#20	44.9		
#40	23.8		
#60	9.5		
#100	2.6		
#200	1.2		

* (no specification provided)

Material Description

Brown f-c SAND, some f-c Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 30.2971 D_{85}= 16.3723 D_{60}= 1.7704
D_{50}= 1.0467 D_{30}= 0.5165 D_{15}= 0.3148
D_{10}= 0.2564 C_u= 6.90 C_c= 0.59

Remarks

Date Received: 10.31.18 **Date Tested:** 11.05.18

Tested By: JD / BC

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Composite **Date Sampled:**
Sample Number: 1810852-01 / S-3

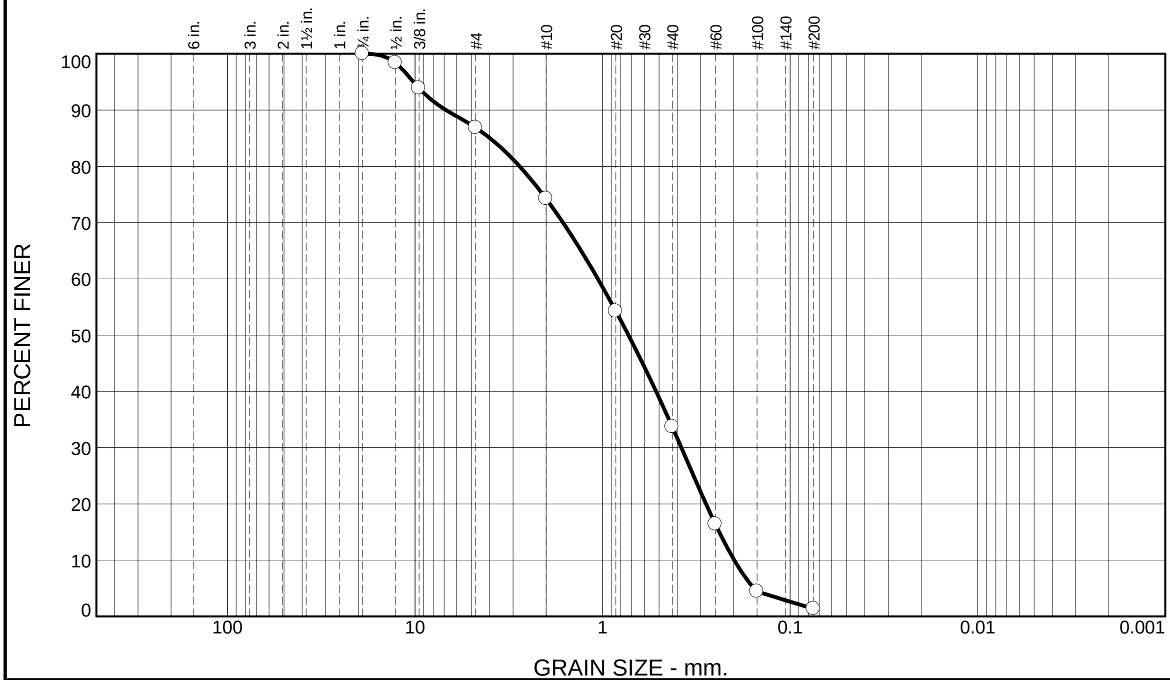
Thielsch Engineering Inc.

Cranston, RI

Client: ESS
Project: White's Mill Pond Dam

Project No: 1810852 **Figure** 1810852-01

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.1	12.7	40.5	32.3	1.4	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
0.5"	98.4		
0.375"	93.9		
#4	86.9		
#10	74.2		
#20	54.2		
#40	33.7		
#60	16.4		
#100	4.4		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c SAND, little fine Gravel, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 6.8368 D_{85}= 3.9793 D_{60}= 1.0599
D_{50}= 0.7284 D_{30}= 0.3800 D_{15}= 0.2387
D_{10}= 0.1986 C_u= 5.34 C_c= 0.69

Remarks

Date Received: 10.31.18 **Date Tested:** 11.05.18

Tested By: JD / BC

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Composite **Date Sampled:**
Sample Number: 1810852-02 / S-4

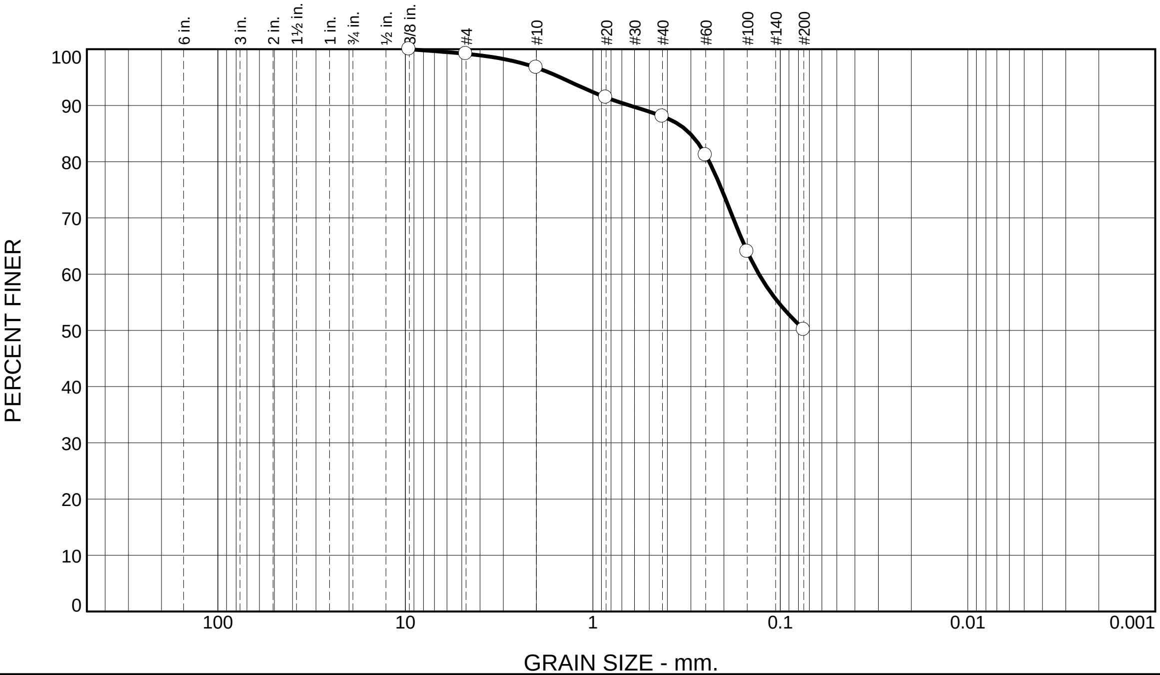
Thielsch Engineering Inc.

Cranston, RI

Client: ESS
Project: White's Mill Pond Dam

Project No: 1810852 **Figure** 1810852-02

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	2.5	8.6	38.0	50.1	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.2		
#10	96.7		
#20	91.4		
#40	88.1		
#60	81.2		
#100	64.0		
#200	50.1		

* (no specification provided)

Material Description

Dark Brown organic SILT and f-m SAND, trace fine Gravel

Atterberg Limits (ASTM D 4318)

PL= 0 **LL=** 0 **PI=** 0

Classification

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

Coefficients

D_{90}= 0.6355 D_{85}= 0.3026 D_{60}= 0.1299
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 10.31.18 **Date Tested:** 11.05.18

Tested By: JD / BC

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Composite
Sample Number: 1810852-03 / S-5

Date Sampled:

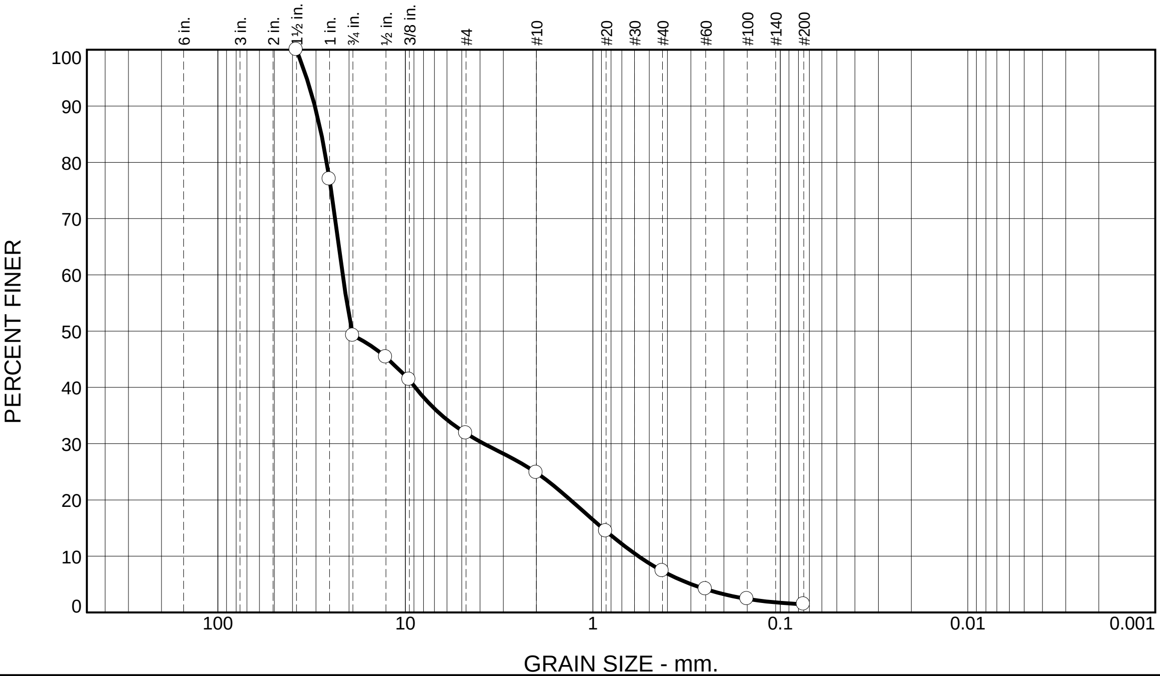
Thielsch Engineering Inc.

Cranston, RI

Client: ESS
Project: White's Mill Pond Dam

Project No: 1810852 **Figure** 1810852-03

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	50.8	17.4	7.0	17.4	6.0	1.4	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	77.0		
0.75"	49.2		
0.5"	45.4		
0.375"	41.4		
#4	31.8		
#10	24.8		
#20	14.4		
#40	7.4		
#60	4.1		
#100	2.4		
#200	1.4		

* (no specification provided)

Material Description

Brown f-c GRAVEL, some f-c Sand, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 30.3577 D_{85}= 28.0220 D_{60}= 21.5739
D_{50}= 19.2783 D_{30}= 3.8097 D_{15}= 0.8893
D_{10}= 0.5709 C_u= 37.79 C_c= 1.18

Remarks

Contains organic material

Date Received: 10.31.18 **Date Tested:** 11.05.18

Tested By: JD / BC

Checked By: Rebecca Roth

Title: Laboratory Coordinator

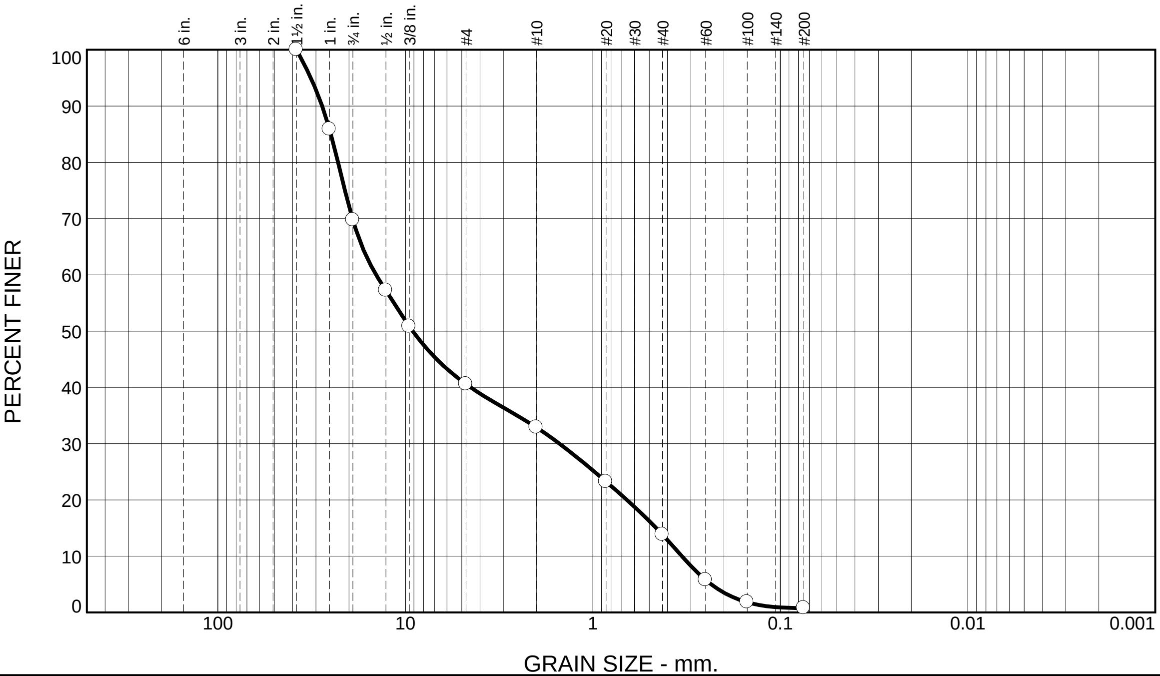
Source of Sample: Composite **Date Sampled:**
Sample Number: 1810852-04 / S-6

Thielsch Engineering Inc.

Cranston, RI

Client: ESS
Project: White's Mill Pond Dam
Project No: 1810852 **Figure** 1810852-04

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.3	29.1	7.7	19.1	13.0	0.8	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.9		
0.75"	69.7		
0.5"	57.2		
0.375"	50.8		
#4	40.6		
#10	32.9		
#20	23.2		
#40	13.8		
#60	5.8		
#100	1.8		
#200	0.8		

* (no specification provided)

Material Description

Brown f-c GRAVEL and f-c SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 27.7686 D_{85}= 24.9699 D_{60}= 14.3219
D_{50}= 9.1321 D_{30}= 1.5062 D_{15}= 0.4591
D_{10}= 0.3348 C_u= 42.78 C_c= 0.47

Remarks

Date Received: 10.31.18 **Date Tested:** 11.05.18

Tested By: JD / BC

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Composite **Date Sampled:**
Sample Number: 1810852-05 / S-7

Thielsch Engineering Inc.

Cranston, RI

Client: ESS
Project: White's Mill Pond Dam
Project No: 1810852 **Figure** 1810852-05

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Amesbury, MA - GZA/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1810852
Date Received: 10/30/2018
Project Due Date: 11/6/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.9 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about <u>short holds & rushes</u>?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / ~~No~~ 10/30/18
    ESS Sample IDs: 1-5
    Analysis: grain size
    TAT: 5 day
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? ~~Yes~~ / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: ______ Time: ______ By: ______
    b. Low Level VOA vials frozen: Date: 10/30/18 Time: 1620 By: ______

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? ______ Date: ______ Time: ______ By: ______

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	284173	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
01	284182	Yes	NA	Yes	VOA Vial - Other	Other	
01	284183	Yes	NA	Yes	VOA Vial - Other	Other	
01	284204	Yes	NA	Yes	Driller Jar	NP	
01	284205	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	284206	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	284207	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	284208	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
01	284217	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
01	284218	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
02	284172	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
02	284180	Yes	NA	Yes	VOA Vial - Other	Other	
02	284181	Yes	NA	Yes	VOA Vial - Other	Other	
02	284199	Yes	NA	Yes	Driller Jar	NP	
02	284200	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	284201	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	284202	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	284203	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	284215	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
02	284216	Yes	NA	Yes	2 oz. Jar - Unpres	NP	
03	284171	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
03	284178	Yes	NA	Yes	VOA Vial - Other	Other	
03	284179	Yes	NA	Yes	VOA Vial - Other	Other	
03	284194	Yes	NA	Yes	Driller Jar	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Amesbury, MA - GZA/MM

ESS Project ID: 1810852
Date Received: 10/30/2018

03	284195	Yes	NA	Yes	8 oz. Jar - Unpres	NP
03	284196	Yes	NA	Yes	8 oz. Jar - Unpres	NP
03	284197	Yes	NA	Yes	8 oz. Jar - Unpres	NP
03	284198	Yes	NA	Yes	8 oz. Jar - Unpres	NP
03	284213	Yes	NA	Yes	2 oz. Jar - Unpres	NP
03	284214	Yes	NA	Yes	2 oz. Jar - Unpres	NP
04	284170	Yes	NA	Yes	VOA Vial - Methanol	MeOH
04	284176	Yes	NA	Yes	VOA Vial - Other	Other
04	284177	Yes	NA	Yes	VOA Vial - Other	Other
04	284189	Yes	NA	Yes	Driller Jar	NP
04	284190	Yes	NA	Yes	8 oz. Jar - Unpres	NP
04	284191	Yes	NA	Yes	8 oz. Jar - Unpres	NP
04	284192	Yes	NA	Yes	8 oz. Jar - Unpres	NP
04	284193	Yes	NA	Yes	8 oz. Jar - Unpres	NP
04	284211	Yes	NA	Yes	2 oz. Jar - Unpres	NP
04	284212	Yes	NA	Yes	2 oz. Jar - Unpres	NP
05	284169	Yes	NA	Yes	VOA Vial - Methanol	MeOH
05	284174	Yes	NA	Yes	VOA Vial - Other	Other
05	284175	Yes	NA	Yes	VOA Vial - Other	Other
05	284184	Yes	NA	Yes	Driller Jar	NP
05	284185	Yes	NA	Yes	8 oz. Jar - Unpres	NP
05	284186	Yes	NA	Yes	8 oz. Jar - Unpres	NP
05	284187	Yes	NA	Yes	8 oz. Jar - Unpres	NP
05	284188	Yes	NA	Yes	8 oz. Jar - Unpres	NP
05	284209	Yes	NA	Yes	2 oz. Jar - Unpres	NP
05	284210	Yes	NA	Yes	2 oz. Jar - Unpres	NP

2nd Review

Are barcode labels on correct containers? Yes / No

Are all necessary stickers attached? Yes / No

Completed By: [signature] Date & Time: 10/30/18 1745

Reviewed By: [signature] Date & Time: 10/30/18 1822

Delivered By: [signature] 10/30/18 1822

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1810852

Turn Time: Standard Rush

Regulatory State

Is this project for any of the following?: ○CT RCP ○MA MCP ○RGP

Reporting Limits

Electonic Deliverables: ☐Limit Checker ☐Standard Excel ☐Other (Please Specify →)

Company Name	Project #	Project Name
GZA GeoEnvironmental, Inc.	01.0173542.10	Whites Mill Pond Dam

Contact Person	Address
Joshua Zall	144 Elm St.

City	State	Zip Code	PO #
Amesbury	MA	01913	

Telephone Number	FAX Number	Email Address
781-278-4808		Joshua.Zall@gza.com

Analysis

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	metals, Eph, PAH SIA, PCB, Pest, TPH	TOC	VOC low	VOC high	Grain Size % Water	Hex Chromium	% Solids
1	10/29/18	11:30	Comp	Sediment	S-3	X	X	X	X	X	X	X
2	↓	11:15	↓	↓	S-4	X	X	X	X	X	X	X
3	↓	10:45	↓	↓	S-5	X	X	X	X	X	X	X
4	↓	12:30	↓	↓	S-6	X	X	X	X	X	X	X
5	↓	9:00	↓	↓	S-7	X	X	X	X	X	X	X
Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer G - Glass O-Other P-Poly S-Sterile V-Vial						AG	AG	V	V	G	AG	AG
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*						10	8	7	7	10	9	8
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Ascorbic Acid 12-Other*						1	1	10	6	1	1	1
Number of Containers per Sample:						4	1	2	1	1	1	1

Sampled by: Josh Zall

Comments:

Please specify "Other" preservative and containers types in this space

Laboratory Use Only

Cooler Present: ✓

Seals Intact: NA

Cooler Temperature: °C Ice temp: 1.9

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
Lucas Zayler, 10/29/18 17:00	GZA cooler Amesbury, MA 10/29/18 17:00	GZA Fridge 10/30/18 12:43	[signature] 10/30/18 12:43
[signature] 10/30/18 16:24	[signature] 10/30/18 1639		

APPENDIX B

SURFACE WATER

ENVIRONMENTAL CHEMISTRY LABORATORY RESULTS

CERTIFICATE OF ANALYSIS

Derek Schipper
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Whites Mill Pond Dam (01.0173542.10)
ESS Laboratory Work Order Number: 1810853

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:08 pm, Nov 07, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810853

SAMPLE RECEIPT

The following samples were received on October 30, 2018 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1810853-01	SW-1	Surface Water	6010C, 6020A, 7010, 7470A, 8260B, EPH8270, EPH8270SIM, MADEP-EPH
1810853-02	SW-2	Surface Water	6010C, 6020A, 7010, 7470A, 8260B, EPH8270, EPH8270SIM, MADEP-EPH

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam   ESS Laboratory Work Order: 1810853

PROJECT NARRATIVE

8260B Volatile Organic Compounds

C8J0698-CCV1 **Continuing Calibration %Diff/Drift is below control limit (CD-).**
Bromomethane (24% @ 20%)

CJ83143-BS1 **Blank Spike recovery is below lower control limit (B-).**
4-Methyl-2-Pentanone (68% @ 70-130%), Tetrahydrofuran (67% @ 70-130%), trans-1,3-Dichloropropene (64% @ 70-130%)

CJ83143-BSD1 **Blank Spike recovery is below lower control limit (B-).**
4-Methyl-2-Pentanone (69% @ 70-130%)

CJ83143-BSD1 **Relative percent difference for duplicate is outside of criteria (D+).**
Tetrahydrofuran (29% @ 20%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-1
Date Sampled: 10/29/18 13:45
Percent Solids: N/A

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-01
Sample Matrix: Surface Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (0.5)		7010		1	KJK	11/01/18 15:19	100	10	CJ83144
Barium	**5.6** (5.0)		6010C		1	KJK	11/01/18 19:05	100	10	CJ83144
Cadmium	ND (0.2)		6020A		1	NAR	11/01/18 16:47	100	10	CJ83144
Chromium	ND (2.0)		6010C		1	KJK	11/01/18 19:05	100	10	CJ83144
Lead	ND (2.0)		6010C		1	KJK	11/01/18 19:05	100	10	CJ83144
Mercury	ND (0.20)		7470A		1	MJV	11/01/18 21:50	20	40	CJ83146
Selenium	ND (1.0)		7010		1	KJK	11/01/18 21:58	100	10	CJ83144
Silver	ND (1.0)		6010C		1	KJK	11/01/18 19:05	100	10	CJ83144

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-1
Date Sampled: 10/29/18 13:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-01
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1,1-Trichloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1,2-Trichloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1-Dichloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,1-Dichloropropene	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2,3-Trichloropropane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2,4-Trimethylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2-Dibromoethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2-Dichloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,2-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,3,5-Trimethylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,3-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,3-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,4-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
1,4-Dioxane - Screen	ND (500)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
2,2-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
2-Butanone	ND (10.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
2-Chlorotoluene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
2-Hexanone	ND (10.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
4-Chlorotoluene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
4-Isopropyltoluene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Acetone	ND (10.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Benzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Bromobenzene	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Bromochloromethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-1
Date Sampled: 10/29/18 13:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-01
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Bromoform	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Bromomethane	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Carbon Disulfide	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Carbon Tetrachloride	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Chlorobenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Chloroethane	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Chloroform	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Chloromethane	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Dibromochloromethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Dibromomethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Dichlorodifluoromethane	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Diethyl Ether	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Di-isopropyl ether	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Ethylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Hexachlorobutadiene	ND (0.6)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Hexachloroethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Isopropylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Methylene Chloride	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Naphthalene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
n-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
n-Propylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
sec-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Styrene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
tert-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Tetrachloroethene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Tetrahydrofuran	ND (5.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-1
Date Sampled: 10/29/18 13:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-01
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Trichloroethene	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Trichlorofluoromethane	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Vinyl Chloride	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Xylene O	ND (1.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Xylene P,M	ND (2.0)		8260B		1	10/31/18 15:22	C8J0698	CJ83143
Xylenes (Total)	ND (2.0)		8260B		1	10/31/18 15:22		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*106 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*84 %*		*70-130*
Surrogate: Dibromofluoromethane	*98 %*		*70-130*
Surrogate: Toluene-d8	*100 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-1
Date Sampled: 10/29/18 13:45
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-01
Sample Matrix: Surface Water
Units: ug/L

Prepared: 11/5/18 16:35

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	11/07/18 12:48	C8K0070	CK80507
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	11/07/18 12:48	C8K0070	CK80507
C11-C22 Unadjusted Aromatics1	ND (93.5)		EPH8270		1	ZLC	11/07/18 2:46	C8K0102	CK80507
C11-C22 Aromatics1,2	ND (93.5)		EPH8270			VSC	11/07/18 4:10		[CALC]
2-Methylnaphthalene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Acenaphthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Naphthalene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Phenanthrene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Acenaphthylene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Benzo(a)anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Benzo(a)pyrene	ND (0.09)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Benzo(b)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Benzo(g,h,i)perylene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Benzo(k)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Chrysene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Dibenzo(a,h)Anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Fluorene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Indeno(1,2,3-cd)Pyrene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Pyrene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:10	C8K0091	CK80507
Preservative:	**pH <= 2**		MADEP-EPH			SMR			CK80507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*66 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*112 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*111 %*		*40-140*
Surrogate: O-Terphenyl	*86 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-2
Date Sampled: 10/29/18 14:45
Percent Solids: N/A

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-02
Sample Matrix: Surface Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**0.6** (0.5)		7010		1	KJK	11/01/18 15:25	100	10	CJ83144
Barium	**7.7** (5.0)		6010C		1	KJK	11/01/18 19:09	100	10	CJ83144
Cadmium	ND (0.2)		6020A		1	NAR	11/01/18 16:52	100	10	CJ83144
Chromium	ND (2.0)		6010C		1	KJK	11/01/18 19:09	100	10	CJ83144
Lead	ND (2.0)		6010C		1	KJK	11/01/18 19:09	100	10	CJ83144
Mercury	ND (0.20)		7470A		1	MJV	11/01/18 22:04	20	40	CJ83146
Selenium	ND (1.0)		7010		1	KJK	11/01/18 22:04	100	10	CJ83144
Silver	ND (1.0)		6010C		1	KJK	11/01/18 19:09	100	10	CJ83144

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-2
Date Sampled: 10/29/18 14:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-02
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1,1-Trichloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1,2-Trichloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1-Dichloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,1-Dichloropropene	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2,3-Trichloropropane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2,4-Trimethylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2-Dibromoethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2-Dichloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,2-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,3,5-Trimethylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,3-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,3-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,4-Dichlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
1,4-Dioxane - Screen	ND (500)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
2,2-Dichloropropane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
2-Butanone	ND (10.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
2-Chlorotoluene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
2-Hexanone	ND (10.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
4-Chlorotoluene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
4-Isopropyltoluene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Acetone	ND (10.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Benzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Bromobenzene	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Bromochloromethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-2
Date Sampled: 10/29/18 14:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-02
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Bromoform	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Bromomethane	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Carbon Disulfide	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Carbon Tetrachloride	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Chlorobenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Chloroethane	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Chloroform	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Chloromethane	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Dibromochloromethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Dibromomethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Dichlorodifluoromethane	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Diethyl Ether	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Di-isopropyl ether	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Ethylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Hexachlorobutadiene	ND (0.6)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Hexachloroethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Isopropylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Methylene Chloride	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Naphthalene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
n-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
n-Propylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
sec-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Styrene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
tert-Butylbenzene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Tetrachloroethene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Tetrahydrofuran	ND (5.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-2
Date Sampled: 10/29/18 14:45
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-02
Sample Matrix: Surface Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Trichloroethene	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Trichlorofluoromethane	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Vinyl Chloride	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Xylene O	ND (1.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Xylene P,M	ND (2.0)		8260B		1	10/31/18 15:48	C8J0698	CJ83143
Xylenes (Total)	ND (2.0)		8260B		1	10/31/18 15:48		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*105 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*86 %*		*70-130*
Surrogate: Dibromofluoromethane	*98 %*		*70-130*
Surrogate: Toluene-d8	*100 %*		*70-130*

ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory
The Microbiology Division
of Thielsch Engineering, Inc.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
Client Sample ID: SW-2
Date Sampled: 10/29/18 14:45
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1810853
ESS Laboratory Sample ID: 1810853-02
Sample Matrix: Surface Water
Units: ug/L

Prepared: 11/5/18 16:35

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	11/07/18 13:36	C8K0070	CK80507
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	11/07/18 13:36	C8K0070	CK80507
C11-C22 Unadjusted Aromatics1	ND (93.5)		EPH8270		1	ZLC	11/07/18 3:29	C8K0102	CK80507
C11-C22 Aromatics1,2	ND (93.5)		EPH8270			VSC	11/07/18 4:59		[CALC]
2-Methylnaphthalene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Acenaphthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Naphthalene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Phenanthrene	ND (0.47)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Acenaphthylene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Benzo(a)anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Benzo(a)pyrene	ND (0.09)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Benzo(b)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Benzo(g,h,i)perylene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Benzo(k)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Chrysene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Dibenzo(a,h)Anthracene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Fluorene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Indeno(1,2,3-cd)Pyrene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Pyrene	ND (0.19)		EPH8270SIM		1	VSC	11/07/18 4:59	C8K0091	CK80507
Preservative:	**pH <= 2**		MADEP-EPH			SMR			CK80507

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*57 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*103 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*107 %*		*40-140*
Surrogate: O-Terphenyl	*82 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CJ83144 - 3005A/200.7										
Blank										
Arsenic	ND	0.5	ug/L							
Barium	ND	5.0	ug/L							
Cadmium	ND	0.2	ug/L							
Chromium	ND	2.0	ug/L							
Lead	ND	2.0	ug/L							
Selenium	ND	1.0	ug/L							
Silver	ND	1.0	ug/L							
LCS										
Arsenic	43.1	12.5	ug/L	50.00		86	80-120			
Barium	49.5	5.0	ug/L	50.00		99	80-120			
Cadmium	22.9	1.0	ug/L	25.02		92	80-120			
Chromium	49.3	2.0	ug/L	50.00		99	80-120			
Lead	48.9	2.0	ug/L	50.00		98	80-120			
Selenium	83.3	25.0	ug/L	99.95		83	80-120			
Silver	24.8	1.0	ug/L	24.98		99	80-120			
LCS Dup										
Arsenic	43.3	12.5	ug/L	50.00		87	80-120	0.5	20	
Barium	47.3	5.0	ug/L	50.00		95	80-120	5	20	
Cadmium	24.2	1.0	ug/L	25.02		97	80-120	5	20	
Chromium	47.2	2.0	ug/L	50.00		94	80-120	4	20	
Lead	49.0	2.0	ug/L	50.00		98	80-120	0.2	20	
Selenium	97.4	25.0	ug/L	99.95		97	80-120	16	20	
Silver	23.7	1.0	ug/L	24.98		95	80-120	4	20	
Batch CJ83146 - 245.1/7470A										
Blank										
Mercury	ND	0.20	ug/L							
LCS										
Mercury	5.93	0.20	ug/L	6.000		99	80-120			
LCS Dup										
Mercury	5.97	0.20	ug/L	6.000		100	80-120	0.7	20	
8260B Volatile Organic Compounds										
Batch CJ83143 - 5030B										
Blank										
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L							
1,1,1-Trichloroethane	ND	1.0	ug/L							
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	1.0	ug/L							
1,1-Dichloroethane	ND	1.0	ug/L							
1,1-Dichloroethene	ND	1.0	ug/L							
1,1-Dichloropropene	ND	2.0	ug/L							
1,2,3-Trichlorobenzene	ND	1.0	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CJ83143 - 5030B										
1,2,3-Trichloropropane	ND	1.0	ug/L							
1,2,4-Trichlorobenzene	ND	1.0	ug/L							
1,2,4-Trimethylbenzene	ND	1.0	ug/L							
1,2-Dibromo-3-Chloropropane	ND	5.0	ug/L							
1,2-Dibromoethane	ND	1.0	ug/L							
1,2-Dichlorobenzene	ND	1.0	ug/L							
1,2-Dichloroethane	ND	1.0	ug/L							
1,2-Dichloropropane	ND	1.0	ug/L							
1,3,5-Trimethylbenzene	ND	1.0	ug/L							
1,3-Dichlorobenzene	ND	1.0	ug/L							
1,3-Dichloropropane	ND	1.0	ug/L							
1,4-Dichlorobenzene	ND	1.0	ug/L							
1,4-Dioxane - Screen	ND	500	ug/L							
2,2-Dichloropropane	ND	1.0	ug/L							
2-Butanone	ND	10.0	ug/L							
2-Chlorotoluene	ND	1.0	ug/L							
2-Hexanone	ND	10.0	ug/L							
4-Chlorotoluene	ND	1.0	ug/L							
4-Isopropyltoluene	ND	1.0	ug/L							
4-Methyl-2-Pentanone	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.0	ug/L							
Bromobenzene	ND	2.0	ug/L							
Bromochloromethane	ND	1.0	ug/L							
Bromodichloromethane	ND	0.6	ug/L							
Bromoform	ND	1.0	ug/L							
Bromomethane	ND	2.0	ug/L							
Carbon Disulfide	ND	1.0	ug/L							
Carbon Tetrachloride	ND	1.0	ug/L							
Chlorobenzene	ND	1.0	ug/L							
Chloroethane	ND	2.0	ug/L							
Chloroform	ND	1.0	ug/L							
Chloromethane	ND	2.0	ug/L							
cis-1,2-Dichloroethene	ND	1.0	ug/L							
cis-1,3-Dichloropropene	ND	0.4	ug/L							
Dibromochloromethane	ND	1.0	ug/L							
Dibromomethane	ND	1.0	ug/L							
Dichlorodifluoromethane	ND	2.0	ug/L							
Diethyl Ether	ND	1.0	ug/L							
Di-isopropyl ether	ND	1.0	ug/L							
Ethyl tertiary-butyl ether	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Hexachlorobutadiene	ND	0.6	ug/L							
Hexachloroethane	ND	1.0	ug/L							
Isopropylbenzene	ND	1.0	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				8260B Volatile Organic Compounds						
Batch CJ83143 - 5030B										
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Methylene Chloride	ND	2.0	ug/L							
Naphthalene	ND	1.0	ug/L							
n-Butylbenzene	ND	1.0	ug/L							
n-Propylbenzene	ND	1.0	ug/L							
sec-Butylbenzene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
tert-Butylbenzene	ND	1.0	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tetrachloroethene	ND	1.0	ug/L							
Tetrahydrofuran	ND	5.0	ug/L							
Toluene	ND	1.0	ug/L							
trans-1,2-Dichloroethene	ND	1.0	ug/L							
trans-1,3-Dichloropropene	ND	0.4	ug/L							
Trichloroethene	ND	1.0	ug/L							
Trichlorofluoromethane	ND	1.0	ug/L							
Vinyl Chloride	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Surrogate: 1,2-Dichloroethane-d4	*26.7*		ug/L	*25.00*		*107*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*21.4*		ug/L	*25.00*		*85*	*70-130*			
Surrogate: Dibromofluoromethane	*24.9*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: Toluene-d8	*23.7*		ug/L	*25.00*		*95*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	9.0		ug/L	10.00		90	70-130			
1,1,1-Trichloroethane	9.0		ug/L	10.00		90	70-130			
1,1,2,2-Tetrachloroethane	9.0		ug/L	10.00		90	70-130			
1,1,2-Trichloroethane	8.3		ug/L	10.00		83	70-130			
1,1-Dichloroethane	8.4		ug/L	10.00		84	70-130			
1,1-Dichloroethene	8.4		ug/L	10.00		84	70-130			
1,1-Dichloropropene	8.5		ug/L	10.00		85	70-130			
1,2,3-Trichlorobenzene	9.5		ug/L	10.00		95	70-130			
1,2,3-Trichloropropane	7.7		ug/L	10.00		77	70-130			
1,2,4-Trichlorobenzene	9.2		ug/L	10.00		92	70-130			
1,2,4-Trimethylbenzene	7.6		ug/L	10.00		76	70-130			
1,2-Dibromo-3-Chloropropane	7.7		ug/L	10.00		77	70-130			
1,2-Dibromoethane	8.4		ug/L	10.00		84	70-130			
1,2-Dichlorobenzene	8.9		ug/L	10.00		89	70-130			
1,2-Dichloroethane	8.7		ug/L	10.00		87	70-130			
1,2-Dichloropropane	7.5		ug/L	10.00		75	70-130			
1,3,5-Trimethylbenzene	7.8		ug/L	10.00		78	70-130			
1,3-Dichlorobenzene	9.0		ug/L	10.00		90	70-130			
1,3-Dichloropropane	8.8		ug/L	10.00		88	70-130			
1,4-Dichlorobenzene	9.6		ug/L	10.00		96	70-130			
1,4-Dioxane - Screen	149		ug/L	200.0		75	0-332			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CJ83143 - 5030B										
2,2-Dichloropropane	9.0		ug/L	10.00		90	70-130			
2-Butanone	38.3		ug/L	50.00		77	70-130			
2-Chlorotoluene	9.0		ug/L	10.00		90	70-130			
2-Hexanone	36.8		ug/L	50.00		74	70-130			
4-Chlorotoluene	9.4		ug/L	10.00		94	70-130			
4-Isopropyltoluene	9.5		ug/L	10.00		95	70-130			
4-Methyl-2-Pentanone	34.2		ug/L	50.00		68	70-130			B-
Acetone	37.8		ug/L	50.00		76	70-130			
Benzene	8.3		ug/L	10.00		83	70-130			
Bromobenzene	8.8		ug/L	10.00		88	70-130			
Bromochloromethane	8.4		ug/L	10.00		84	70-130			
Bromodichloromethane	8.2		ug/L	10.00		82	70-130			
Bromoform	8.9		ug/L	10.00		89	70-130			
Bromomethane	9.7		ug/L	10.00		97	70-130			
Carbon Disulfide	8.0		ug/L	10.00		80	70-130			
Carbon Tetrachloride	9.0		ug/L	10.00		90	70-130			
Chlorobenzene	8.9		ug/L	10.00		89	70-130			
Chloroethane	10.3		ug/L	10.00		103	70-130			
Chloroform	8.5		ug/L	10.00		85	70-130			
Chloromethane	10.7		ug/L	10.00		107	70-130			
cis-1,2-Dichloroethene	8.5		ug/L	10.00		85	70-130			
cis-1,3-Dichloropropene	7.7		ug/L	10.00		77	70-130			
Dibromochloromethane	8.2		ug/L	10.00		82	70-130			
Dibromomethane	8.5		ug/L	10.00		85	70-130			
Dichlorodifluoromethane	10.2		ug/L	10.00		102	70-130			
Diethyl Ether	8.4		ug/L	10.00		84	70-130			
Di-isopropyl ether	7.9		ug/L	10.00		79	70-130			
Ethyl tertiary-butyl ether	7.3		ug/L	10.00		73	70-130			
Ethylbenzene	8.6		ug/L	10.00		86	70-130			
Hexachlorobutadiene	10.6		ug/L	10.00		106	70-130			
Hexachloroethane	8.8		ug/L	10.00		88	70-130			
Isopropylbenzene	8.5		ug/L	10.00		85	70-130			
Methyl tert-Butyl Ether	7.9		ug/L	10.00		79	70-130			
Methylene Chloride	7.4		ug/L	10.00		74	70-130			
Naphthalene	7.3		ug/L	10.00		73	70-130			
n-Butylbenzene	8.7		ug/L	10.00		87	70-130			
n-Propylbenzene	8.4		ug/L	10.00		84	70-130			
sec-Butylbenzene	9.1		ug/L	10.00		91	70-130			
Styrene	9.2		ug/L	10.00		92	70-130			
tert-Butylbenzene	8.2		ug/L	10.00		82	70-130			
Tertiary-amyl methyl ether	7.1		ug/L	10.00		71	70-130			
Tetrachloroethene	8.0		ug/L	10.00		80	70-130			
Tetrahydrofuran	6.7		ug/L	10.00		67	70-130			B-
Toluene	8.7		ug/L	10.00		87	70-130			
trans-1,2-Dichloroethene	7.8		ug/L	10.00		78	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CJ83143 - 5030B										
trans-1,3-Dichloropropene	6.4		ug/L	10.00		64	70-130			B-
Trichloroethene	8.1		ug/L	10.00		81	70-130			
Trichlorofluoromethane	9.5		ug/L	10.00		95	70-130			
Vinyl Chloride	11.5		ug/L	10.00		115	70-130			
Xylene O	8.2		ug/L	10.00		82	70-130			
Xylene P,M	15.9		ug/L	20.00		79	70-130			
Surrogate: 1,2-Dichloroethane-d4	*23.4*		ug/L	*25.00*		*94*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*24.2*		ug/L	*25.00*		*97*	*70-130*			
Surrogate: Dibromofluoromethane	*22.5*		ug/L	*25.00*		*90*	*70-130*			
Surrogate: Toluene-d8	*23.3*		ug/L	*25.00*		*93*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	8.8		ug/L	10.00		88	70-130	2	20	
1,1,1-Trichloroethane	9.2		ug/L	10.00		92	70-130	2	20	
1,1,2,2-Tetrachloroethane	8.4		ug/L	10.00		84	70-130	7	20	
1,1,2-Trichloroethane	8.6		ug/L	10.00		86	70-130	4	20	
1,1-Dichloroethane	8.6		ug/L	10.00		86	70-130	2	20	
1,1-Dichloroethene	8.7		ug/L	10.00		87	70-130	2	20	
1,1-Dichloropropene	9.2		ug/L	10.00		92	70-130	8	20	
1,2,3-Trichlorobenzene	9.0		ug/L	10.00		90	70-130	5	20	
1,2,3-Trichloropropane	7.6		ug/L	10.00		76	70-130	2	20	
1,2,4-Trichlorobenzene	9.0		ug/L	10.00		90	70-130	2	20	
1,2,4-Trimethylbenzene	7.8		ug/L	10.00		78	70-130	2	20	
1,2-Dibromo-3-Chloropropane	7.4		ug/L	10.00		74	70-130	4	20	
1,2-Dibromoethane	8.5		ug/L	10.00		85	70-130	0.8	20	
1,2-Dichlorobenzene	8.8		ug/L	10.00		88	70-130	1	20	
1,2-Dichloroethane	9.3		ug/L	10.00		93	70-130	6	20	
1,2-Dichloropropane	7.8		ug/L	10.00		78	70-130	4	20	
1,3,5-Trimethylbenzene	7.9		ug/L	10.00		79	70-130	1	20	
1,3-Dichlorobenzene	9.0		ug/L	10.00		90	70-130	0.8	20	
1,3-Dichloropropane	8.8		ug/L	10.00		88	70-130	0.7	20	
1,4-Dichlorobenzene	9.5		ug/L	10.00		95	70-130	2	20	
1,4-Dioxane - Screen	167		ug/L	200.0		84	0-332	11	200	
2,2-Dichloropropane	9.2		ug/L	10.00		92	70-130	2	20	
2-Butanone	37.7		ug/L	50.00		75	70-130	1	20	
2-Chlorotoluene	9.1		ug/L	10.00		91	70-130	1	20	
2-Hexanone	37.0		ug/L	50.00		74	70-130	0.4	20	
4-Chlorotoluene	9.4		ug/L	10.00		94	70-130	0.4	20	
4-Isopropyltoluene	9.3		ug/L	10.00		93	70-130	1	20	
4-Methyl-2-Pentanone	34.5		ug/L	50.00		69	70-130	0.8	20	B-
Acetone	39.2		ug/L	50.00		78	70-130	4	20	
Benzene	8.6		ug/L	10.00		86	70-130	3	20	
Bromobenzene	9.0		ug/L	10.00		90	70-130	3	20	
Bromochloromethane	8.5		ug/L	10.00		85	70-130	2	20	
Bromodichloromethane	8.4		ug/L	10.00		84	70-130	2	20	
Bromoform	8.9		ug/L	10.00		89	70-130	0.1	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				8260B Volatile Organic Compounds						
Batch CJ83143 - 5030B										
Bromomethane	9.5		ug/L	10.00		95	70-130	2	20	
Carbon Disulfide	8.5		ug/L	10.00		85	70-130	5	20	
Carbon Tetrachloride	9.7		ug/L	10.00		97	70-130	7	20	
Chlorobenzene	8.9		ug/L	10.00		89	70-130	0.2	20	
Chloroethane	12.2		ug/L	10.00		122	70-130	17	20	
Chloroform	9.0		ug/L	10.00		90	70-130	6	20	
Chloromethane	10.4		ug/L	10.00		104	70-130	3	20	
cis-1,2-Dichloroethene	8.9		ug/L	10.00		89	70-130	5	20	
cis-1,3-Dichloropropene	8.2		ug/L	10.00		82	70-130	6	20	
Dibromochloromethane	8.1		ug/L	10.00		81	70-130	2	20	
Dibromomethane	8.8		ug/L	10.00		88	70-130	3	20	
Dichlorodifluoromethane	10.4		ug/L	10.00		104	70-130	2	20	
Diethyl Ether	8.4		ug/L	10.00		84	70-130	0.4	20	
Di-isopropyl ether	8.3		ug/L	10.00		83	70-130	5	20	
Ethyl tertiary-butyl ether	7.4		ug/L	10.00		74	70-130	1	20	
Ethylbenzene	8.7		ug/L	10.00		87	70-130	1	20	
Hexachlorobutadiene	10.7		ug/L	10.00		107	70-130	1	20	
Hexachloroethane	8.5		ug/L	10.00		85	70-130	4	20	
Isopropylbenzene	8.6		ug/L	10.00		86	70-130	1	20	
Methyl tert-Butyl Ether	8.4		ug/L	10.00		84	70-130	7	20	
Methylene Chloride	7.8		ug/L	10.00		78	70-130	4	20	
Naphthalene	7.4		ug/L	10.00		74	70-130	1	20	
n-Butylbenzene	8.3		ug/L	10.00		83	70-130	5	20	
n-Propylbenzene	8.2		ug/L	10.00		82	70-130	2	20	
sec-Butylbenzene	8.8		ug/L	10.00		88	70-130	3	20	
Styrene	9.1		ug/L	10.00		91	70-130	0.8	20	
tert-Butylbenzene	7.8		ug/L	10.00		78	70-130	5	20	
Tertiary-amyl methyl ether	7.3		ug/L	10.00		73	70-130	2	20	
Tetrachloroethene	8.2		ug/L	10.00		82	70-130	3	20	
Tetrahydrofuran	9.0		ug/L	10.00		90	70-130	29	20	D+
Toluene	8.8		ug/L	10.00		88	70-130	0.8	20	
trans-1,2-Dichloroethene	7.9		ug/L	10.00		79	70-130	1	20	
trans-1,3-Dichloropropene	7.0		ug/L	10.00		70	70-130	9	20	
Trichloroethene	8.5		ug/L	10.00		85	70-130	5	20	
Trichlorofluoromethane	10.1		ug/L	10.00		101	70-130	6	20	
Vinyl Chloride	12.2		ug/L	10.00		122	70-130	5	20	
Xylene O	8.3		ug/L	10.00		83	70-130	0.7	20	
Xylene P,M	16.2		ug/L	20.00		81	70-130	2	20	
Surrogate: 1,2-Dichloroethane-d4	*24.8*		ug/L	*25.00*		*99*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.1*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*		ug/L	*25.00*		*96*	*70-130*			
Surrogate: Toluene-d8	*24.1*		ug/L	*25.00*		*96*	*70-130*			
				MADEP-EPH Extractable Petroleum Hydrocarbons						
Batch CK80507 - 3510C										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CK80507 - 3510C										
Blank										
C19-C36 Aliphatics1	ND	100	ug/L							
C9-C18 Aliphatics1	ND	100	ug/L							
Decane (C10)	ND	5	ug/L							
Docosane (C22)	ND	5	ug/L							
Dodecane (C12)	ND	5	ug/L							
Eicosane (C20)	ND	5	ug/L							
Hexacosane (C26)	ND	5	ug/L							
Hexadecane (C16)	ND	5	ug/L							
Hexatriacontane (C36)	ND	5	ug/L							
Nonadecane (C19)	ND	5	ug/L							
Nonane (C9)	ND	5	ug/L							
Octacosane (C28)	ND	5	ug/L							
Octadecane (C18)	ND	5	ug/L							
Tetracosane (C24)	ND	5	ug/L							
Tetradecane (C14)	ND	5	ug/L							
Triacontane (C30)	ND	5	ug/L							
Surrogate: 1-Chlorooctadecane	*42.7*		ug/L	*50.00*		*85*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	100	ug/L							
Surrogate: 2-Bromonaphthalene	*52.6*		mg/L	*50.00*		*105*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*53.2*		mg/L	*50.00*		*106*	*40-140*			
Surrogate: O-Terphenyl	*45.6*		ug/L	*50.00*		*91*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.50	ug/L							
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.20	ug/L							
Benzo(a)pyrene	ND	0.10	ug/L							
Benzo(b)fluoranthene	ND	0.20	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.20	ug/L							
Chrysene	ND	0.20	ug/L							
Dibenzo(a,h)Anthracene	ND	0.20	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.20	ug/L							
Naphthalene	ND	0.50	ug/L							
Phenanthrene	ND	0.50	ug/L							
Pyrene	ND	0.20	ug/L							
LCS										
C19-C36 Aliphatics1	361	100	ug/L	400.0		90	40-140			
C9-C18 Aliphatics1	188	100	ug/L	300.0		63	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CK80507 - 3510C										
Decane (C10)	23	5	ug/L	50.00		46	40-140			
Docosane (C22)	42	5	ug/L	50.00		83	40-140			
Dodecane (C12)	29	5	ug/L	50.00		57	40-140			
Eicosane (C20)	41	5	ug/L	50.00		82	40-140			
Hexacosane (C26)	41	5	ug/L	50.00		82	40-140			
Hexadecane (C16)	40	5	ug/L	50.00		80	40-140			
Hexatriacontane (C36)	50	5	ug/L	50.00		99	40-140			
Nonadecane (C19)	41	5	ug/L	50.00		82	40-140			
Nonane (C9)	17	5	ug/L	50.00		34	30-140			
Octacosane (C28)	41	5	ug/L	50.00		82	40-140			
Octadecane (C18)	40	5	ug/L	50.00		80	40-140			
Tetracosane (C24)	41	5	ug/L	50.00		83	40-140			
Tetradecane (C14)	36	5	ug/L	50.00		72	40-140			
Triacontane (C30)	41	5	ug/L	50.00		82	40-140			
Surrogate: 1-Chlorooctadecane	*42.9*		ug/L	*50.00*		*86*	*40-140*			
LCS										
C11-C22 Unadjusted Aromatics1	668	100	ug/L	850.0		79	40-140			
Surrogate: 2-Bromonaphthalene	*55.0*		mg/L	*50.00*		*110*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*54.7*		mg/L	*50.00*		*109*	*40-140*			
Surrogate: O-Terphenyl	*48.2*		ug/L	*50.00*		*96*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	2.39	0.50	ug/L	5.000		48	40-140			
Acenaphthene	3.74	0.20	ug/L	5.000		75	40-140			
Acenaphthylene	3.96	0.20	ug/L	5.000		79	40-140			
Anthracene	3.70	0.20	ug/L	5.000		74	40-140			
Benzo(a)anthracene	3.66	0.20	ug/L	5.000		73	40-140			
Benzo(a)pyrene	3.80	0.10	ug/L	5.000		76	40-140			
Benzo(b)fluoranthene	4.12	0.20	ug/L	5.000		82	40-140			
Benzo(g,h,i)perylene	3.87	0.20	ug/L	5.000		77	40-140			
Benzo(k)fluoranthene	3.56	0.20	ug/L	5.000		71	40-140			
Chrysene	3.78	0.20	ug/L	5.000		76	40-140			
Dibenzo(a,h)Anthracene	4.21	0.20	ug/L	5.000		84	40-140			
Fluoranthene	3.81	0.20	ug/L	5.000		76	40-140			
Fluorene	3.94	0.20	ug/L	5.000		79	40-140			
Indeno(1,2,3-cd)Pyrene	4.15	0.20	ug/L	5.000		83	40-140			
Naphthalene	3.16	0.50	ug/L	5.000		63	40-140			
Phenanthrene	3.58	0.50	ug/L	5.000		72	40-140			
Pyrene	3.98	0.20	ug/L	5.000		80	40-140			
LCS Dup										
C19-C36 Aliphatics1	353	100	ug/L	400.0		88	40-140	2	25	
C9-C18 Aliphatics1	189	100	ug/L	300.0		63	40-140	0.8	25	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CK80507 - 3510C										
Decane (C10)	24	5	ug/L	50.00		47	40-140	4	25	
Docosane (C22)	42	5	ug/L	50.00		84	40-140	0.9	25	
Dodecane (C12)	29	5	ug/L	50.00		59	40-140	3	25	
Eicosane (C20)	41	5	ug/L	50.00		83	40-140	1	25	
Hexacosane (C26)	41	5	ug/L	50.00		83	40-140	1	25	
Hexadecane (C16)	41	5	ug/L	50.00		82	40-140	2	25	
Hexatriacontane (C36)	50	5	ug/L	50.00		101	40-140	1	25	
Nonadecane (C19)	42	5	ug/L	50.00		83	40-140	1	25	
Nonane (C9)	18	5	ug/L	50.00		36	30-140	5	25	
Octacosane (C28)	41	5	ug/L	50.00		83	40-140	2	25	
Octadecane (C18)	41	5	ug/L	50.00		82	40-140	2	25	
Tetracosane (C24)	42	5	ug/L	50.00		84	40-140	1	25	
Tetradecane (C14)	37	5	ug/L	50.00		74	40-140	2	25	
Triacontane (C30)	41	5	ug/L	50.00		83	40-140	1	25	
Surrogate: 1-Chlorooctadecane	*37.7*		ug/L	*50.00*		*75*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	685	100	ug/L	850.0		81	40-140	3	25	
Surrogate: 2-Bromonaphthalene	*57.1*		mg/L	*50.00*		*114*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*55.8*		mg/L	*50.00*		*112*	*40-140*			
Surrogate: O-Terphenyl	*46.8*		ug/L	*50.00*		*94*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	2.59	0.50	ug/L	5.000		52	40-140	8	20	
Acenaphthene	4.22	0.20	ug/L	5.000		84	40-140	12	20	
Acenaphthylene	4.46	0.20	ug/L	5.000		89	40-140	12	20	
Anthracene	4.16	0.20	ug/L	5.000		83	40-140	12	20	
Benzo(a)anthracene	4.14	0.20	ug/L	5.000		83	40-140	12	20	
Benzo(a)pyrene	4.31	0.10	ug/L	5.000		86	40-140	13	20	
Benzo(b)fluoranthene	4.92	0.20	ug/L	5.000		98	40-140	18	20	
Benzo(g,h,i)perylene	4.31	0.20	ug/L	5.000		86	40-140	11	20	
Benzo(k)fluoranthene	3.77	0.20	ug/L	5.000		75	40-140	6	20	
Chrysene	4.11	0.20	ug/L	5.000		82	40-140	8	20	
Dibenzo(a,h)Anthracene	4.62	0.20	ug/L	5.000		92	40-140	9	20	
Fluoranthene	4.30	0.20	ug/L	5.000		86	40-140	12	20	
Fluorene	4.45	0.20	ug/L	5.000		89	40-140	12	20	
Indeno(1,2,3-cd)Pyrene	4.59	0.20	ug/L	5.000		92	40-140	10	20	
Naphthalene	3.46	0.50	ug/L	5.000		69	40-140	9	20	
Phenanthrene	3.96	0.50	ug/L	5.000		79	40-140	10	20	
Pyrene	4.34	0.20	ug/L	5.000		87	40-140	9	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam
ESS Laboratory Work Order: 1810853

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
D+	Relative percent difference for duplicate is outside of criteria (D+).
D	Diluted.
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
B-	Blank Spike recovery is below lower control limit (B-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Whites Mill Pond Dam

ESS Laboratory Work Order: 1810853

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Amesbury, MA - GZA/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1810853
Date Received: 10/30/2018
Project Due Date: 11/6/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.6 Iced with: Ice
5. Was COC signed and dated by client? Yes

6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:

12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	284222	Yes	No	Yes	VOA Vial - HCl	HCl	
01	284223	Yes	No	Yes	VOA Vial - HCl	HCl	
01	284224	Yes	No	Yes	VOA Vial - HCl	HCl	
01	284227	Yes	NA	Yes	1L Amber - HCl	HCl	
01	284228	Yes	NA	Yes	1L Amber - HCl	HCl	
01	284230	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	
02	284219	Yes	No	Yes	VOA Vial - HCl	HCl	
02	284220	Yes	No	Yes	VOA Vial - HCl	HCl	
02	284221	Yes	No	Yes	VOA Vial - HCl	HCl	
02	284225	Yes	NA	Yes	1L Amber - HCl	HCl	
02	284226	Yes	NA	Yes	1L Amber - HCl	HCl	
02	284229	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	

2nd Review
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 10/30/18 1637
Reviewed By: Date & Time: 10/30/18 1824
Delivered By: 10/30/18 1824

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1810853

Turn Time: Standard   Rush
Regulatory State
Is this project for any of the following?: ○CT RCP ○MA MCP ○RGP

Reporting Limits
Electonic Deliverables: ☐Limit Checker ☐Standard Excel ☐Other (Please Specify →)

Company Name	Project #	Project Name
GZA GeoEnvironmental, Inc.	01.0173542.10	Whites Mill Pond Dam

Contact Person	Address
Joshua Zall	144 Elm St.

City	State	Zip Code	PO #
Amesbury	MA	01913	

Telephone Number	FAX Number	Email Address
781-278-4808		Joshua.Zall@gza.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	EPH	VOC	RCRA 8 metals
1	10/29/18	13:45	Grab	Surface Water	SW-1	X	X	X
2	↓	14:45	↓	↓	SW-2	X	X	X
Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer G-Glass O-Other P-Poly S-Sterile V-Vial						AG	V	P
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*						6	7	5
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Ascorbic Acid 12-Other*						2	2	4
Number of Containers per Sample:						2	3	1

Laboratory Use Only
Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °C Ice temp: 2.6

Sampled by: Josh Zall
Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
[signature] 1645 10/29/18	GZA COOLER 1645 10/29/18	GZA fridge 10/30/18 12:43	[signature] 10/30/18 12:43
Relinquished by: (Signature, Date & Time)	**Received By: (Signature, Date & Time)**	**Relinquished By: (Signature, Date & Time)**	**Received By: (Signature, Date & Time)**
[signature] 10/30/18 16:21	[signature] 10/30/18 1625		

APPENDIX D

WETLAND EVALUATION

1.0 INTRODUCTION

On April 5, 2018, a Wetland Scientist from GZA GeoEnvironmental, Inc. (GZA) evaluated the jurisdictional wetland resources, as defined by the Massachusetts Wetlands Protection Act (WPA; MGL Chapter 131 §40) and its implementing regulations (310 CMR 10.00 *et seq*; the “Regulations”) and by the Town of Winchendon Wetlands Protection Bylaw and its associated Rules and Regulations (Article 29 of the Bylaws of the Town of Winchendon), associated with the impoundment and dam structure at the Whites Mill Dam on the North Branch Millers River at Whites Mill off of Lakeview Drive in Winchendon, Massachusetts (Site). This wetland resources evaluation was conducted to support a dam breach/river restoration project.

2.0 METHODOLOGY

Delineated MA Wetlands Protection Act regulated (and equivalent wetland bylaw) wetland resource areas at the Site include Bordering Vegetated Wetland (BVW), Inland Bank (Bank), and Mean Annual High Water Line (MAHW) along the North Branch Millers River. The North Branch Millers River is mapped as perennial according to the USGS map and MAHW is delineated for purposes of establishing the extent of Riverfront Area.

The upper limits of each resource type were delineated using sequentially numbered flagging tape with flag numbers and colors as indicated in the table below:

Resource Type	Flag Series	Marker
BANK	1A-26A 1C-40C	Orange flagging tape
MAHW	11A-26A 23C-40C	Orange flagging tape
BVW	1B-33B 1D-6D 1E-5E	Pink flagging tape

BVW at the Site was delineated in accordance with the methodologies outlined in the 1987 Army Corps of Engineers Wetland Delineation Manual and the 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast (Version 2.0) as well as the MassDEP 1995 Massachusetts Handbook for Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act. Both methodologies rely on characterizing the vegetative community through plant identification and classification of dominant species in each stratum by their wetland indicator status as well as on signs of wetland hydrology including the presence of hydric soils, drainage patterns, water marks, etc. The Army Corps of Engineers delineation forms were used to record data collected at the Site since these forms are accepted by MassDEP to document vegetated wetland boundaries.

The plant community and soil profile was documented on the upland and wetland sides of the flagged BVW at 10B. *See the attached field data forms for wetland indicator ratings for plants mentioned in this narrative.*

Bank and MAHW were delineated per definitions found in 310 CMR 10.00.

3.0 RESOURCE AREA DESCRIPTIONS

Wetland resources associated with the Site include Riverfront Area (RA), Land Under Water Bodies and Waterways (LUWW), Bordering Land Subject to Flooding (BLSF), Inland Bank (Bank), and Bordering Vegetated Wetlands (BVW). Additionally, Buffer Zones are associated with the Bank and BVW. These resources are described in the following sections.

3.1 RIVERFRONT AREA

According to 310 CMR 10.58(2)(a), RA is "*the area of land between a river's mean annual high water line and a parallel line measured horizontally. The riverfront area may include or overlap other resource areas or their buffer zones*."

Additionally, per 310 CMR 10.58(2), the MAHW is "*the line that is apparent from visible markings or changes in the character of soils or vegetation due to the prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land*."

The North Branch Millers River is mapped as perennial. Therefore, RA extends 200 feet (ft) outward from the Mean Annual High Water line (MAHW) on each side of the river's channel. At the Site, the MAHW is coincident with the portion of the Bank along the North Branch Millers River. RA at the Site is associated only with the portion of the North Branch Millers River downstream of the dam impoundment; no RA exists at the Site upstream of the dam impoundment.

South of the North Branch Millers River, RA at the Site is comprised of a white pine- and eastern hemlock-dominated forest with a sparsely vegetated understory. North of the North Branch Millers River, RA at the Site consists of Whites Mill, its associated structures, and a mowed lawn. Refer to Section 3.4 for further details about the plant species observed on either side of the North Branch Millers River.

3.2 LAND UNDER WATER BODIES AND WATERWAYS

According to 310 CMR 10.56, LUWW is "*Land under Water Bodies and Waterways is the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. … The boundary of Land under Water Bodies and Waterways is the mean annual low water level*."

Normal pool at White Mill Pond is at elevation of 1036.8 ft NAVD88. Therefore, LUWW exists within White Mill Pond below this elevation.

3.3 BORDERING LAND SUBJECT TO FLOODING

According to 310 CMR 10.57(2)(a), BLSF is "*an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland." BLSF is further defined as the "estimated maximum lateral extent of flood water which will theoretically result of the statistical 100-year frequency storm." This boundary is "determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP)*." The NFIP is currently administered by the Federal Emergency Management Agency (FEMA).

Per Map Number 2503480016B, which was revised on June 15, 1982 (see attached), BLSF in the form of a Zone A Flood Zone exists along portions of either side of Whites Mill Pond and the North Branch Millers River. Downstream of the dam impoundment, the BLSF extends approximately 200 ft south of the river with a Base Flood Elevation of 1020 ft

NAVD88. Upstream of the dam impoundment, a thin margin, less than 50 ft wide, of BLSF extends north of Whites Mill Pond with no Base Flood Elevation shown.

3.4 INLAND BANK

According to 310 CMR 10.54(2)(a), a Bank is "*the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland. A Bank may be partially or totally vegetated, or it may be comprised of exposed soil, gravel or stone*." Furthermore, under 310 CMR 10.54(2)(c), "*the upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower*."

At the Site, Bank exists along Whites Mill Pond and the North Branch Millers River. The upper limit of this resource was demarcated using sequentially numbered orange flagging tape and orange flag stakes. Flags 1A through 26A follow the south bank and flags 1C through 40C follow the north bank.

The A-series and C-series flags are mainly along a near vertical break in slope both upstream and downstream of the dam impoundment. Along both flag series, sparse vegetation exists along the upper portion of the face of the Bank and much of the downstream portion of the C-series consists of a stone wall. Plant species observed down gradient and up gradient of the A-series flags include:

Down Gradient	**Up Gradient**
None observed (open water)	American wintergreen (*Pyrola americana*) Blue-flag iris (*Iris versicolor*)* Eastern hemlock (*Tsuga canadensis*) Gray birch (*Betula populifolia*)* Highbush blueberry (*Vaccinium corymbosum*)* Mountain laurel (*Kalmia latifolia*) Princess pine (*Lycopodium obscurum*) Red oak (*Quercus rubra*) Red-osier dogwood (*Cornus sericea*)* Sensitive fern (*Onoclea sensibilis*)* Sphanum moss (*Sphagnum spp.*)* Sweet birch (*Betula lenta*) Sweet pepperbush (*Clethra alnifolia*)* White pine (*Pinus strobus*)

Plant species observed down gradient and up gradient of the C-series flags include:

Down Gradient	**Up Gradient**
None observed (open water)	Bristly dewberry (*Rubus hispidus*)* Bulrush (*Bolboschoenus fluviatilis*)* Eastern hemlock (*Tsuga canadensis*) Goldenrod species (*Solidago spp.*) Fox grape (*Vitis labrusca*) Japanese barberry (*Berberis thunbergii*)** Poison ivy (*Toxicodendron radicans*)* Red oak (*Quercus rubra*) Soft rush (*Juncus effusus*)*

Down Gradient	Up Gradient
	Sweet birch (*Betula lenta*) Upland grass species (*Graminae spp.*) White pine (*Pinus strobus*)

An asterisk (*) denotes plant species with a Wetland Indicator Status (WIS) of Facultative (FAC), Facultative Wetland FACW, or Obligate (OBL). The presence of these plants, when dominant, generally indicates that hydric conditions are present and that the area may be a wetland.

A double asterisk (**) denotes plant species that are listed as invasive in Massachusetts. These species tend to spread rapidly and to out compete and overtake native vegetation. In the process, they decrease biodiversity within an area and generally lower that area's value to wildlife as habitat. Invasive species are dominant along the A-series flags.

3.5 BORDERING VEGETATED WETLAND

According to 310 CMR 10.55(2)(a), BVW are "*freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs*" and are areas "*where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants*."

BVW exists in a few locations at the Site. The upper limit of this resource was marked using sequentially numbered (1B through 33B, 1D through 6D, and 1E through 5E) pink flagging tape. The B-series is located immediately south of the dike east of the dam impoundment. Flags 1B and 33B connect to each other. The D-series flags are along a very thin margin of BVW adjacent to a small beaver pond to the east of the dike. Flag 1D connects to 2A. The E-series denotes a small patch of BVW downstream of the dam impoundment. Flags 1E and 5E connect to Bank flags 20A and 22A, respectively. The flags follow a clear break in slope and change in plant community.

Plant species observed down gradient and up gradient of the B-series flags include:

Down Gradient	Up Gradient
American wintergreen (*Pyrola americana*) Blue-flag iris (*Iris versicolor*)* Eastern hemlock (*Tsuga canadensis*) Highbush blueberry (*Vaccinium corymbosum*)* Sensitive fern (*Onoclea sensibilis*)* Sphanum moss (*Sphagnum spp.*)* Sweet pepperbush (*Clethra alnifolia*)*	American wintergreen (*Pyrola americana*) Eastern hemlock (*Tsuga canadensis*) Red oak (*Quercus rubra*) White pine (*Pinus strobus*)

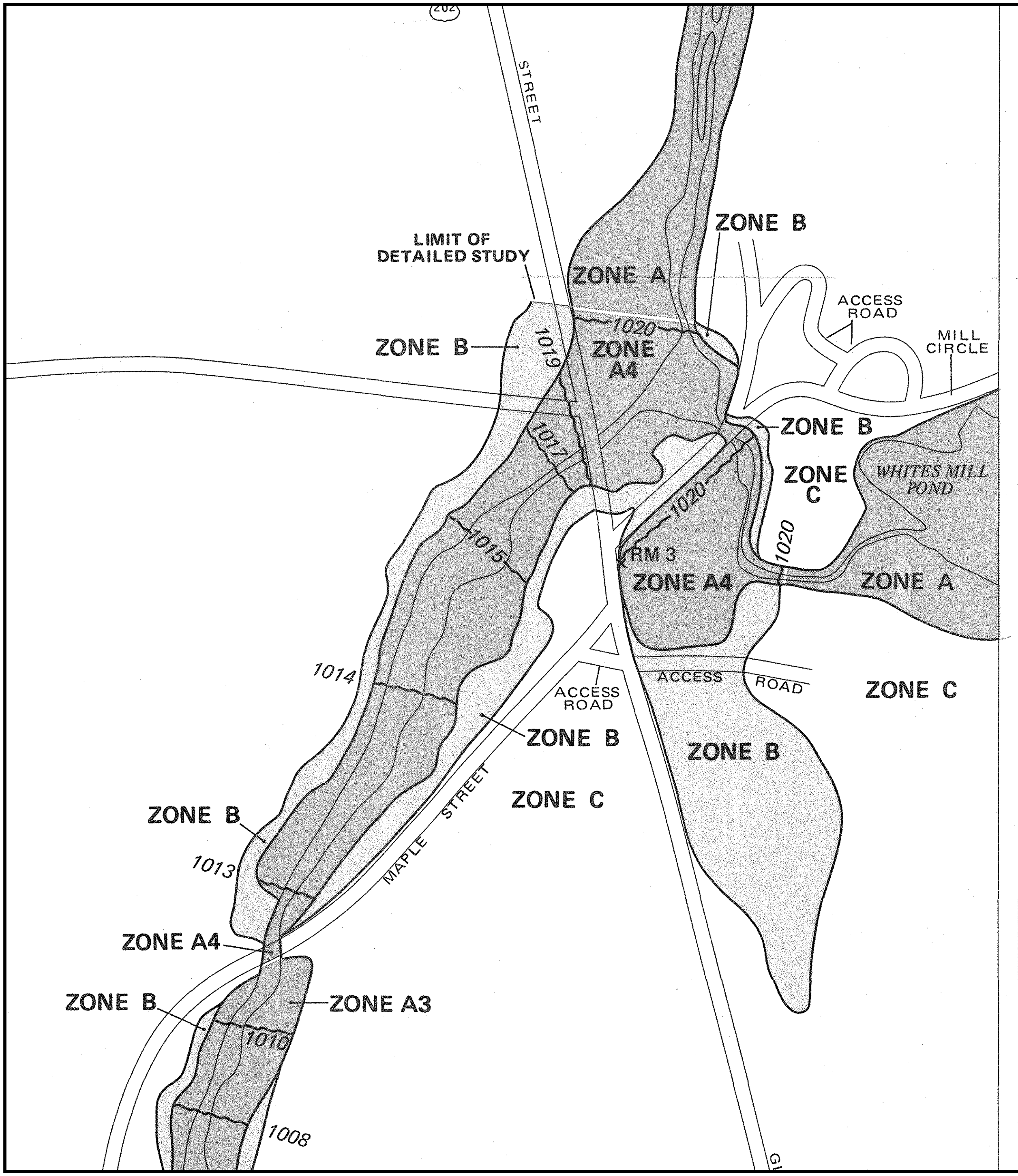
Refer to the attached field data forms for further documentation of the soils and plant community at flag 10B.

3.6 BUFFER ZONE

Under the WPA, a Buffer Zone is associated with the Bank and BVW at the Site. This Buffer Zone extends horizontally outward for 100 ft from the Bank and BVW flags. Additionally, under the Winchendon Wetlands Protection Bylaw, a smaller Buffer Zone, referred to as "Setbacks," extends horizontally outward for up to 75 ft from the Bank and BVW flags. These zones overlap the previously described RA.

4.0 ADDITIONAL REGULATORY INFORMATION

No Outstanding Resource Waters, Areas of Critical Environmental Concern, Estimated or Priority Habitat areas, or Certified Vernal Pools area associated with the Site.



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF
WINCHENDON,
MASSACHUSETTS
WORCESTER
COUNTY

PANEL 16 OF 30
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
250348 0016 B

EFFECTIVE DATE:
JUNE 15, 1982

Federal Emergency Management Agency

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region		
		Wetland
	X	Upland

Project Site: Whites Mill Pond City/County: Winchendon Date 4/5/2018

Applicant/Owner: 0 State: MA Sampling Point: 10B +5 ft

Investigator(s): Maria Firstenberg (GZA) Section/Township/Range:

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR-L Latitude: Longitude: Datum:

Soil Map Unit Name: Colton gravelly loamy sand, 3 to 8 percent slopes NWI Classification: PFO4

Are climatic/hydrologic conditions on site typical for this time of year? Yes X No (explain)

Is vegetation ____ Soil ____ Hydrology ____ Significantly Disturbed? (check if appropriate)

Is vegetation ____ Soil ____ Hydrology ____ Naturally Problematic? (check if appropriate)

Are "Normal Circumstances" present? X Yes ____ No

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No		
Hydrophytic Vegetation Present?		X	Is the Sampled Area within a Wetland?	____ Yes
Hydric Soil Present?		X		
Wetland Hydrology Present?		X		X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B2)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Thin Muck Surface (C7)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Other (Explain in Remarks)

Secondary Indicators (Min. 2 Required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	
Saturation Present? (Includes capillary fringe)		X	

Wetland Hydrology Present? ____ Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - *Use scientific names* 10B Upland

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 *Eastern White Pine (Pinus strobus)*	40	YES	FACU
2 *Northern Red Oak (Quercus rubra)*	5	NO	FACU
3 --	--	--	--
4 --	--	--	--
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
	45	= **Total Tree Cover**	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Status
1 *Eastern Hemlock (Tsuga canadensis)*	20	YES	FACU
2 --	--	--	--
3 --	--	--	--
4 --	--	--	--
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
	20	= **Total Sapling/Shrub Cover**	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Status
1 *American Wintergreen (Pyrola americana)*	15	YES	FAC
2 --	--	--	--
3 --	--	--	--
4 --	--	--	--
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
8 --	--	--	--
9 --	--	--	--
10 --	--	--	--
11 --	--	--	--
12 --	--	--	--
	15	= **Total Herb Cover**	

Woody Vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 --	--	--	--
2 --	--	--	--
3 --	--	--	--
4 --	--	--	--
	0	= **Total Woody Vine Cover**	

Dominance Test Worksheet:

No. of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total No. of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 33.33 (C)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	65	x 4 =	260
UPL species	0	x 5 =	0
Column Totals	80 (A)		305 (B)

Prevalence Index = B/A = 3.8

Hydrophytic Vegetation Indicators:

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test is >50%

____ Prevalence Index is ≤3.0[1]

____ Morphological Adaptations[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata

Tree- Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height

Sapling/shrub - Woody plants less than 3 in. in DBH and greater than 3.28 ft. (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants < 3.28 ft tall

Woody Vines - All woody vines greater than 3.28 ft in height

Hydrophytic Vegetation Present?

____ Yes

X No

Remarks: (Include photo numbers here or on a separate sheet)

SOILS 10B Upland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Horizon	Depth (in)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators

____	Histosol (A1)	____	Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**	____	2cm Muck (A10) (**LRR K, L, MLRA 149B**)
____	Histic Epipedon (A2)			____	Coast Prairie Redox (A16) (**LRR K, L, R**)
____	Black Histic (A3)	____	Thin Dark Surface (S9) **(LRR R, MLRA 149B)**	____	5cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
____	Hydrogen Sulfide (A4)			____	Dark Surface (S7) (**LRR K, L**)
____	Stratified Layers (A5)	____	LOAMY Mucky Mineral (F1) (**LRR K, L**)	____	Polyvalue Below Surface (S8) (**LRR K, L**)
____	Depleted Below Dark Surface (A11)			____	Thin Dark Surface (S9) (**LRR K, L**)
____	Thick Dark Surface(A12)	____	Loamy Gleyed Matrix (F2)	____	Iron-Manganese Masses (F12) (**LRR K, L, R**)
____	Sandy Mucky Mineral (S1)	____	Depleted Matrix (F3)	____	Piedmont Floodplain Soils (F19) (**MLRA 149B**)
____	Sandy Gleyed Matrix (S4)	____	Redox Dark Surface (F6)	____	Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
____	Sandy Redox (S5)	____	Depleted Dark Surface (F7)	____	Red Parent Material (**F21**)
____	Stripped Matrix (S6)	____	Redox Depressions (F8)	____	Very Shallow Dark Surface (**TF12**)
____	Dark Surface (S7) (**LRR R, MLRA 149B**)			____	Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive La Restrictive Layer (if observed)

Type: ____________ Depth: ______ inches

Hydric Soil Present? ____ Yes X No

Remarks:

Unable to recover soils due to high percentage of rocks

Revised: GZA 06/2016

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region	X	Wetland
		Upland

Project Site: Whites Mill Pond City/County: Winchendon Date 4/5/2018

Applicant/Owner: State: MA Sampling Point: 10B -5 ft

Investigator(s): Maria Firstenberg (GZA) Section/Township/Range:

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR or MLRA): LRR-L Latitude: Longitude: Datum:

Soil Map Unit Name: Colton gravelly loamy sand, 3 to 8 percent slopes NWI Classification: PFO4

Are climatic/hydrologic conditions on site typical for this time of year? Yes X No (explain)

Is vegetation ____ Soil ____ Hydrology ____ Significantly Disturbed? (check if appropriate)

Is vegetation ____ Soil ____ Hydrology ____ Naturally Problematic? (check if appropriate)

Are "Normal Circumstances" present? X Yes ____ No

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	X Yes	No	Is the Sampled Area within a Wetland?	X	Yes
Hydric Soil Present?	X Yes	No			
Wetland Hydrology Present?	X Yes	No			No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators

Primary Indicators (minimum of one is required; check all that apply)

X	Surface Water (A1)		Water-Stained Leaves (B9)		Surface Soil Cracks (B6)
X	High Water Table (A2)		Aquatic Fauna (B13)		Drainage Patterns (B10)
X	Saturation (A3)		Marl Deposits (B15)		Moss Trim Lines (B16)
	Water Marks (B1)		Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Thin Muck Surface (C7)		Crayfish Burrows (C8)
	Drift Deposits (B2)		Presence of Reduced Iron (C4)		Saturation Visible on Aerial Imagery (C9)
	Algal Mat or Crust (B4)		Recent Iron Reduction in Tilled Soils (C6)		Stunted or Stressed Plants (D1)
	Iron Deposits (B5)		Oxidized Rhizospheres on Living Roots (C3)		Geomorphic Position (D2)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remarks)		Shallow Aquitard (D3)
	Sparsely Vegetated Concave Surface (B8)				Microtopographic Relief (D4)
					FAC-Neutral Test (D5)

Secondary Indicators (Min. 2 Required) — right column above.

Field Observations

Surface Water Present?	X Yes	No	Depth (inches)	0	
Water Table Present?	X Yes	No	Depth (inches)	0	**Wetland Hydrology Present?** X Yes ____ No
Saturation Present? (Includes capillary fringe)	X Yes	No	Depth (inches)	0	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - *Use scientific names* 10B Wetland

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 *Eastern Hemlock (Tsuga canadensis)*	15	YES	FACU
2 --	--	--	--
3 --	--	--	--
4 --	--	--	--
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
	15	= **Total Tree Cover**	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Status
1 *Coastal Sweet-Pepperbush (Clethra alnifolia)*	30	YES	FAC
2 *Highbush Blueberry (Vaccinium corymbosum)*	5	NO	FACW
3 *Eastern Hemlock (Tsuga canadensis)*	5	NO	FACU
4 --	--	--	--
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
	40	= **Total Sapling/Shrub Cover**	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Status
1 *Sphagnum Moss (Sphagnum Spp.)*	35	YES	FACW
2 *Sensitive Fern (Onoclea sensibilis)*	15	YES	FACW
3 *Harlequin Blueflag (Iris versicolor)*	10	NO	OBL
4 *American Wintergreen (Pyrola americana)*	5	NO	FAC
5 --	--	--	--
6 --	--	--	--
7 --	--	--	--
8 --	--	--	--
9 --	--	--	--
10 --	--	--	--
11 --	--	--	--
12 --	--	--	--
	65	= **Total Herb Cover**	

Woody Vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Status
1 --	--	--	--
2 --	--	--	--
3 --	--	--	--
4 --	--	--	--
	0	= **Total Woody Vine Cover**	

Dominance Test Worksheet:

No. of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total No. of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 75.00 (C)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	55	x 2 =	110
FAC species	35	x 3 =	105
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals	120 (A)		305 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata

Tree- Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height

Sapling/shrub - Woody plants less than 3 in. in DBH and greater than 3.28 ft. (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants < 3.28 ft tall

Woody Vines - All woody vines greater than 3.28 ft in height

Hydrophytic Vegetation Present? X Yes ___ No

Remarks: (Include photo numbers here or on a separate sheet)

SOILS 10B Wetland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

		Matrix		Redox Features					
Horizon	Depth (in)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
A1	0-16+	10YR 2/2	100	--	--	--	--	mucky peat	Saturated
--	--	0	--	--	--	--	--	--	--
--	--	0	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators

	Histosol (A1)		Polyvalue Below Surface (S8) **(LRR R, MLRA 149 B)**		2cm Muck (A10) (**LRR K, L, MLRA 149B**)
	Histic Epipedon (A2)		Thin Dark Surface (S9) (**LRR R, MLRA 149B**)		Coast Prairie Redox (A16) (**LRR K, L, R**)
	Black Histic (A3)		LOAMY Mucky Mineral (F1) (**LRR K, L**)		5cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Dark Surface (S7) (**LRR K, L**)
	Stratified Layers (A5)		Depleted Matrix (F3)		Polyvalue Below Surface (S8) (**LRR K, L**)
X	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)		Thin Dark Surface (S0) (**LRR K, L**)
	Thick Dark Surface(A12)		Depleted Dark Surface (F7)		Iron-Manganese Masses (F12) (**LRR K, L, R**)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)		Piedmont Floodplain Soils (F19) (**MLRA 149B**)
	Sandy Gleyed Matrix (S4)				Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
	Sandy Redox (S5)				Red Parent Material (**TF2**)
	Stripped Matrix (S6)				Very Shallow Dark Surface (**TF12**)
	Dark Surface (S7) (**LRR R, MLRA 149B**)				Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive La Restrictive Layer (if observed)

Type: ______ Depth: ______ inches

Hydric Soil Present? X Yes ___ No

Remarks:

Revised: GZA 06/2016

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Worcester County, Massachusetts, Northwestern Part

June 15, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.. 2
How Soil Surveys Are Made..5
Soil Map.. 8
Soil Map (Whites Mill Pond Dam)..9
Legend..10
Map Unit Legend (Whites Mill Pond Dam).. 12
Map Unit Descriptions (Whites Mill Pond Dam)..12
Worcester County, Massachusetts, Northwestern Part..14
1—Water.. 14
59A—Bucksport and Wonsqueak mucks, 0 to 2 percent slopes..14
282B—Colton gravelly loamy sand, 3 to 8 percent slopes..16
282D—Colton gravelly loamy sand, 15 to 25 percent slopes..18
600—Pits, gravel.. 19
References..21

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Whites Mill Pond Dam)

Map Scale: 1:2,600 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part
Survey Area Data: Version 11, Oct 6, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 11, 2014—Apr 19, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Whites Mill Pond Dam)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	12.1	40.9%
59A	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes	2.2	7.3%
282B	Colton gravelly loamy sand, 3 to 8 percent slopes	10.6	35.8%
282D	Colton gravelly loamy sand, 15 to 25 percent slopes	0.8	2.7%
600	Pits, gravel	3.9	13.2%
Totals for Area of Interest		**29.7**	**100.0%**

Map Unit Descriptions (Whites Mill Pond Dam)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Worcester County, Massachusetts, Northwestern Part

1—Water

Map Unit Setting

National map unit symbol: 9c1h
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

59A—Bucksport and Wonsqueak mucks, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2ty70
Elevation: 0 to 1,770 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Bucksport and similar soils: 48 percent
Wonsqueak and similar soils: 41 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bucksport

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous organic material and/or woody organic material

Typical profile

Oa1 - 0 to 12 inches: muck
Oa2 - 12 to 25 inches: muck
Oa3 - 25 to 45 inches: muck
Oa4 - 45 to 65 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 21.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Wonsqueak

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous organic material over loamy till

Typical profile

Oa1 - 0 to 8 inches: muck
Oa2 - 8 to 32 inches: muck
2Cg - 32 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very high (about 18.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Peacham, very stony

Percent of map unit: 6 percent
Landform: Mountains, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Brayton, very stony

Percent of map unit: 2 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Telos, very stony

Percent of map unit: 2 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Croghan

Percent of map unit: 1 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

282B—Colton gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9bxn
Elevation: 10 to 2,200 feet
Mean annual precipitation: 39 to 55 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Colton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colton

Setting

Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Loose sandy and gravelly glaciofluvial deposits derived from granite

Typical profile

Ap - 0 to 10 inches: gravelly loamy sand
Bh - 10 to 15 inches: gravelly loamy sand
Bs - 15 to 20 inches: very gravelly loamy sand
BC - 20 to 24 inches: gravelly sand
C - 24 to 33 inches: stratified extremely gravelly coarse sand to extremely gravelly sand
C - 33 to 65 inches: stratified extremely gravelly coarse sand to extremely gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Croghan

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Adams

Percent of map unit: 5 percent
Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Allagash

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex

Across-slope shape: Convex
Hydric soil rating: No

282D—Colton gravelly loamy sand, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9bxq
Elevation: 10 to 2,200 feet
Mean annual precipitation: 39 to 55 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Colton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colton

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loose sandy and gravelly glaciofluvial deposits derived from granite

Typical profile

Ap - 0 to 10 inches: gravelly loamy sand
Bh - 10 to 15 inches: gravelly loamy sand
Bs - 15 to 20 inches: very gravelly loamy sand
BC - 20 to 24 inches: gravelly sand
C - 24 to 33 inches: stratified extremely gravelly coarse sand to extremely gravelly sand
C - 33 to 65 inches: stratified extremely gravelly coarse sand to extremely gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Allagash

Percent of map unit: 10 percent
Landform: Outwash terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Adams

Percent of map unit: 10 percent
Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

600—Pits, gravel

Map Unit Setting

National map unit symbol: 9bzg
Elevation: 100 to 1,870 feet
Mean annual precipitation: 32 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits, gravel: 96 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Gravel

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loose sandy and gravelly glaciofluvial deposits

Typical profile

C - 0 to 65 inches: extremely gravelly sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Water

Percent of map unit: 1 percent

Windsor

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Urban land

Percent of map unit: 1 percent

Hinckley

Percent of map unit: 1 percent
Landform: Outwash plains, kames, eskers, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, crest, head slope, side slope, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX E

ENF CIRCULATION LIST

WHITES MILL POND DAM DECOMMISSIONING AND RIVER RESTORATION

ENF CIRCULATION LIST

Agency	Address
Executive Office of Environmental Affairs MEPA Office	Secretary Matthew Beaton Executive Office of Environmental Affairs Saltonstall Building Attn: MEPA Office 100 Cambridge Street, Suite 900 Boston, Massachusetts 02114
Department of Environmental Protection, Boston Office	Commissioner's Office One Winter Street Boston, MA 02108
Department of Environmental Protection, Appropriate Regional Office and to each program from which a permit will be sought	DEP/Central Regional Office Attn: MEPA Coordinator 8 New Bond Street Worcester, MA 01606
Massachusetts Department of Transportation	Public/Private Development Unit 10 Park Plaza, Suite #4150 Boston, MA 02116
Applicable Massachusetts DOT District Office	District #2 Attn: MEPA Coordinator 811 North King Street Northampton, MA 01060
Massachusetts Historical Commission	The MA Archives Building 220 Morrissey Boulevard Boston, MA 02125
Applicable Regional Planning Agency	Montachusett Regional Planning Commission MART Garage & Maintenance Facility R1427 Water Street Fitchburg, MA 01420
Mass Fish and Game	Department of Fish and Game Attn: River Restore Program Division of Ecological Restoration 251 Causeway Street, Suite 400 Boston, MA 02114
Mass DER	Division of Ecological Restoration 251 Causeway Street, Suite 400 Boston, Massachusetts 02114 Attention: Nick Wildman
In each municipality affected by the Project A listing of municipal agency addresses and contact persons is available through the Commonwealth of Massachusetts cities and towns page	City Council or Board of Selectmen
	Planning Board/Department
	Conservation Commission
	Department/Board of Health

APPENDIX F

6-MONTH DAM FOLLOW-UP INSPECTION REPORT

(January 2019)

And DAM SAFETY ORDER

WHITES MILL POND DAM

FOLLOW-UP
INSPECTION / EVALUATION REPORT

Dam Name:	**Whites Mill Pond Dam**
State Dam ID#:	**3-14-343-1**
NID ID#:	**MA 00630**
Owner:	**Brandywine Farms, Inc.**
Owner Type:	**Private**
Town:	**Winchendon**
Consultant:	**GZA GeoEnvironmental, Inc.**
Date of Inspection:	**January 16, 2019**

GZA

Known for excellence.
Built on trust.

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

249 Vanderbilt Avenue
Norwood, MA 02062
T: 781.278.3700
F: 781.278.5701
F: 781.278.5702
www.gza.com

January 24, 2019
File No. 01.0173542.10

Brandywine Farms
155 Mill Circle
PO Box 28
Winchendon, Massachusetts 01475

Re: Follow-up Inspection/Evaluation Report
Whites Mill Pond Dam – MA00630
Winchendon, Massachusetts

Attn: Ms. Amelia Giovanoni

Dear Ms. Giovanoni:

GZA GeoEnvironmental, Inc. (GZA) is pleased to present Brandywine Farms (Owner) with the attached Follow-Up Inspection/Evaluation Report for the Whites Mill Pond Dam. This follow-up inspection/evaluation report was prepared in accordance with the criteria set forth in the Commonwealth of Massachusetts – Department of Conservation and Recreation Dam Safety Regulations. The visual follow-up inspection was performed under GZA's current contract with Brandywine Farms and Amendment No. 3. The results and recommendations contained herein are subject to the Limitation attached as **Appendix A**. This follow-up inspection report is intended to corroborate the observations made during previous inspections and to document changes since the last inspections.

The follow-up inspection was completed by GZA on January 16, 2019. The current condition of the dam is generally unchanged from the last Phase I inspection (by GZA, dated January 3, 2018), and is considered to be **POOR**.

During the follow-up inspection, particular attention was again paid to an area of active seepage at the toe of the dam to the right of the spillway. This area had been previously observed since at least 2015. A plywood shelter has been constructed over the area to facilitate observations even during periods of snow cover. The seepage was found to still be clear with a much reduced flow rate in comparison to the previous follow-up inspection in August 2018. GZA recommends continued monitoring of the area.

GZA appreciates the opportunity to continue to provide Brandywine Farms with dam engineering consulting services. If you have any questions or comments, please do not hesitate to contact us.

Sincerely,

GZA GeoEnvironmental, Inc.

Chad W. Cox, P.E
Principal-In-Charge

Derek J. Schipper, P.E.
Consultant/Reviewer

PREFACE

The assessment of the general condition of the dam is based upon available data and visual inspections. This follow-up inspection report is intended to corroborate the observations made during previous inspections and document changes since the last inspection. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Prepared by:
GZA GeoEnvironmental, Inc.

1/24/19

Chad W. Cox, P.E.
Massachusetts License No.: 45856
Senior Principal
GZA GeoEnvironmental, Inc.

Commonwealth of Massachusetts
Department of Conservation and Recreation
Office of Dam Safety Poor Condition Dam Follow-up Inspection Form

Dam Name:	Whites Mill Pond Dam
Dam Owner:	Brandywine Farms, Inc.
Nat. ID Number:	MA 00630
Hazard Potential:	High (Class I)
Location of Dam (town):	Winchendon
Coordinate location (lat,long):	42.694055N, -72.012276W
Date of Inspection:	January 16, 2019
Weather:	Cloudy, Upper 20's degrees Fahrenheit
State of Impoundment:	About 5 inches over primary spillway crest slab (all stoplogs removed)

Consultant Inspector(s): GZA GeoEnvironmental, Inc. – Chad W. Cox, P.E.

Others in Attendance at Field Inspection: None

Attachments:	Figure 1:	Locus Map
	Figure 2:	Site Sketch
	Figure 3:	Photograph Locations (Jan. 2019)
	Appendix A:	Limitations
	Appendix B:	January 16, 2019 Photographs

I. Previous Inspection date/Overall Condition:

- **Date of most recent formal Phase I Inspection Report:** January 3, 2018 (by GZA)
- **List the overall condition reported in most recent Phase I Inspection Report:** POOR
- **Date of most recent formal Follow-Up Inspection:** None – August 1, 2018

II. Previous Inspection Deficiencies:

- **List identified deficiencies in the most recent Phase I Inspection Report:**

    1. Large pile of woody debris just downstream of the spillway. At the time of inspection, debris was covered in snow and ice;
    2. Woody vegetation along downstream dam toe and throughout dike. Overturned tree on dike;
    3. Cracking and missing mortar in masonry spillway walls;
    4. Previously noted low area and sinkholes on crest to right of spillway;
    5. Scarped and unprotected upstream slopes;
    6. Steep downstream slope to left of spillway;
    7. Corroded vertical supports of spillway foot bridge;
    8. Bulging of downstream masonry wall to right of spillway;
    9. Previously noted leakage/seepage at the base of the downstream wall right of the spillway;

10. Inadequate discharge capacity to accommodate the Spillway Design Flood (SDF) (based on preliminary evaluation);
11. Inoperable low-level outlet;
12. No Operations and Maintenance Plan.

Additionally, a previous follow-up inspection by GZA in 2012 noted a significant area with standing water was observed downstream of the stone masonry wall approximately 150 feet right of the spillway. This area was not observed in 2015 nor in January 2018 (likely due to snow cover).

III. Overall Condition of Dam at the Time of the Current Follow-up Inspection:

a. State the current condition POOR

b. Have conditions changed since the previous inspection? No

IV. Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:

a. Have any of the deficiencies listed in the previous Phase I Inspection Report worsened? No

b. If yes, list the changes.

c. Are there any additional deficiencies that have been identified in the current inspection? Yes

d. If yes, list the deficiencies and describe.

1. The area at the toe of the dam near the “barn” on the right abutment where standing water and soft ground were previously observed was covered with a thick and solid ice cover. This suggests ongoing seepage in the area.
2. Two locations where large stones were missing from the downstream masonry wall were very evident during the inspection. This is not a new condition, no material was observed at the toe of the dam and the areas are shown in previous photographs, but the lack of vegetation and snow allowed close inspection. The areas behind the missing stones were seen to be dry.
3. Icicles were seen hanging down from the top of the low-level outlet sluiceway downstream of the closure. These were seen from the downstream side and indicated leakage through the embankment discharging from the top of the sluiceway. On the downstream face above the sluiceway, ice formations also suggest seepage discharging through the masonry wall.
4. The discrete area of seepage to the right of the spillway at the base of the stone masonry dam wall has been protected by a small plywood shelter (see below). Seepage flows out of and below the base of the downstream masonry wall into an approximately 1-foot-deep depression at the base of the wall. The seepage has previously been seen to exit below-grade and flows into another smaller depression approximately 2.5 feet downstream. Seepage also exits this smaller hole below-grade and this is believed to flow into the wetland area immediately downstream of the low masonry wall several feet to the west. Clear seepage was observed in the hole immediately at the base of the wall, but at a flow rate of 0.1 to 0.3 gpm, which is substantially less than previously observed. No flow or water was seen in the ground hole just downstream of the first hole, where water had previously been observed.

V. Dam Safety Orders:

- **List dam safety orders that have been issued to the dam owner pertaining to this dam.**

According to information provided by MADCR, ODS has issued:

- Phase I Notice of Failure to Comply on 8/2/2010;
- Phase I Fine Assessment on 1/3/2011;

- Certificate of Non-Compliance and Dam Safety Order on 10/9/2015;
- Notice of Failure to comply with Dam Safety Order 12/01/2016;
- Notice of Non-Compliance with Dam Safety Order to Conduct Phase I Inspection on 11/07/2017.

The Owner has been awarded a Dam and Seawall Grant from the Commonwealth of Massachusetts to design and permit the decommissioning of the dam. The Owner has engaged GZA to assist with this work, which is underway.

VI. Maintenance:

a. Indicate if there exists an operation and maintenance plan for the dam.

According to the previous Phase I report, there is not an Operation and Maintenance Plan for the dam. Note that a draft of an Emergency Action Plan (EAP) has been submitted to the Office of Dam Safety.

b. Indicate if it appears the dam is being maintained.

The vegetation on and at the toe of the dam has been cut and is being maintained. Note that the wetland vegetation beyond the toe on the right bank of the downstream channel is not being disturbed due to permitting concerns. This is judged to be acceptable with respect to dam safety at the current time but should be periodically re-evaluated. The significant pile of woody debris (possibly due to recent/past beaver activity) previously observed just downstream of the spillway stoplogs partially blocking the discharge area has been removed and new debris has not accumulated on the spillway crest. The stop logs have been removed due to concerns about seepage.

Since the last follow-up inspection, a wooden cover has been installed over the low area on the top of the dam adjacent to the right spillway wall in the location of the low-level outlet operator. The area around this cover has been filled to reduce standing water. A plywood and lumber shelter has also been constructed above the discrete seepage area at the toe of the dam to the right of the spillway. This shelter will permit continued observation of the seepage area even with snow on the ground.

VII. Recommendations:

The Whites Mill Pond Dam is judged to be in POOR condition.

The Phase I Inspection Report (GZA, Jan. 3, 2018) contained a number of recommendations for action. These have been re-stated below along with a current status update in **bold** text. Note that based on the Owner's decision to decommission the dam as a means to address the dam safety deficiencies, some of the recommendations no longer are judged necessary or have been altered to be consistent with the goal of breaching the dam.:

Studies and Analyses:

a. A detailed hydrologic and hydraulic study to verify the dam's ability to safely pass the SDF should be conducted. Study should include improved topographic data to assist with spillway capacity analysis and assess potential for possible flow over the low area at right abutment. The SDF for high hazard dams is the ½ Probable Maximum Flood (PMF). **H&H Study underway to assess breach configuration such that significant pond re-impoundment does not occur under 100-year (minimum) flood conditions.**

b. Perform a Phase II dam safety study to better define the scope of work needed to rehabilitate the dam. **Breach Feasibility Study underway in lieu of Phase II.**

c. Investigate condition of sluiceway to right of dam. **Sluiceway to be decommissioned by filling. As part of the proposed dam breach.**

d. Develop an Emergency Action Plan; (Note: Required for a High Hazard Dam) **Draft EAP including inundation map has been submitted to Office of Dam Safety.**

e. Develop an Operations and Maintenance Plan; (Note: Required for a High Hazard Dam) **Pending. Plan should focus on short-term maintenance and monitoring tasks in advance of the breaching of the dam, as per Monitoring Plan described below.**

f. Develop a Monitoring Plan, to include surveillance for:
   - mis-alignment and bulging of the downstream wall;
   - deterioration of upstream walls;
   - depressed/low/eroded areas on the crest and downstream slope;
   - areas of observed leakage/seepage including the low-level outlet;
   - wet areas downstream of masonry wall.

   Owner is monitoring.

<u>Maintenance and Minor Repairs:</u>

a. Clear woody vegetation from the spillway and discharge channel; **Completed and ongoing.**

b. Remove the unsuitable vegetation on the crest of the embankment and on slopes; **Completed and on-going on primary embankment. GZA recommends fallen trees and low vegetation be removed on dike and abutments but stable mature tree be allowed to remain pending breaching of dam.**

c. Monitor for and fill animal burrows. **Ongoing.**

<u>Remedial Measures:</u>

The remedial measures recommended below are on hold as they only apply in the event that the dam is to remain operational. The Owner has selected decommissioning as the preferred alternative.

a. Fill the eroded portions of the upstream slope and provide suitably designed slope protection;
b. Implement repairs to the upstream walls along the upstream side of the dam;
c. Repair or replace structural supports of pedestrian foot bridge;
d. Fill the low/depressed areas and sinkholes noted on the upstream embankment;
e. Reset missing/displaced stones from the downstream masonry wall;
f. Repair the deterioration of the primary spillway;
g. Clear the dam and dike of all trees, brush and other unwanted vegetation;
h. Regrade the downstream slope left of the spillway;
i. Install cut off wall to address seepage/leakage and potential stability issues;
j. Install a blanket drain in conjunction with a toe drain system along the downstream side of the dam;
k. Address hydraulic capacity limitations; and
l. Restore operability to the low-level outlet.

ADDITIONAL RECOMMENDATIONS:

1. GZA previously recommended that consideration be given to removing of some or all stop logs from the spillway, in consultation with the Conservation Commission. In May 2018, apparent increases in the seepage observed at the toe of the dam resulted in GZA recommending to the Owner and Dam Safety that the stop logs be removed to reduce the driving head resulting in the seepage. The Owner caused the stop logs to be removed and the normal pool is reduced (by approximately 18 inches). It is GZA's opinion that this is appropriate in terms of mitigating seepage concerns and improving spillway capacity and the stop logs should remain out.
2. Clear seepage is running out of the base of the downstream wall at a location to the right of the spillway. The seepage is entering a shallow depression at the base of the wall and then flowing out of this depression below grade. Based on the reduced level of seepage recently observed, GZA recommends continued monitoring. The Owner should be prepared to backfill the upstream hole with well-graded sand should significant changes be observed.
3. At the area of diffuse seepage at the base of the dam near the "barn" on the right abutment, soft ground caused by diffuse seepage is hindering vegetation management. GZA recommends that hand tools (i.e. "weed wackers") be used to cut vegetation in the spring in this seepage area to minimize rutting and ground disturbance by heavy vehicles.
4. GZA recommends that equipment be identified which might permit the existing low-level outlet to be operated by opening the gate. <u>HOWEVER, GZA recommends that the low-level outlet NOT be attempted to be opened except in the event of an emergency or except as part of the breaching project with appropriate equipment on site. It is possible that attempts to open the outlet could result in damage to the embankment and/or the inability to close the outlet.</u>
5. GZA recommends the Owner continue with the on-going periodic monitoring.

VIII. Other Comments or Observations:

1. Prior to visiting the dam site, GZA observed conditions at the upstream Lake Monomonac Dam (MA00632). It appeared that stop logs had been removed from the outlet of the structure to provide for a wintertime drawdown of approximately 2 feet. Flow from Lake Monomonac Dam directly enters Whites Mill Pond. At the downstream end of the western arm of Lake Monomonac is a spillway structure with three small "notch" bays. There were no stop logs in these bays. Water flowing through/over the spillway structure does not enter Whites Mill Pond.

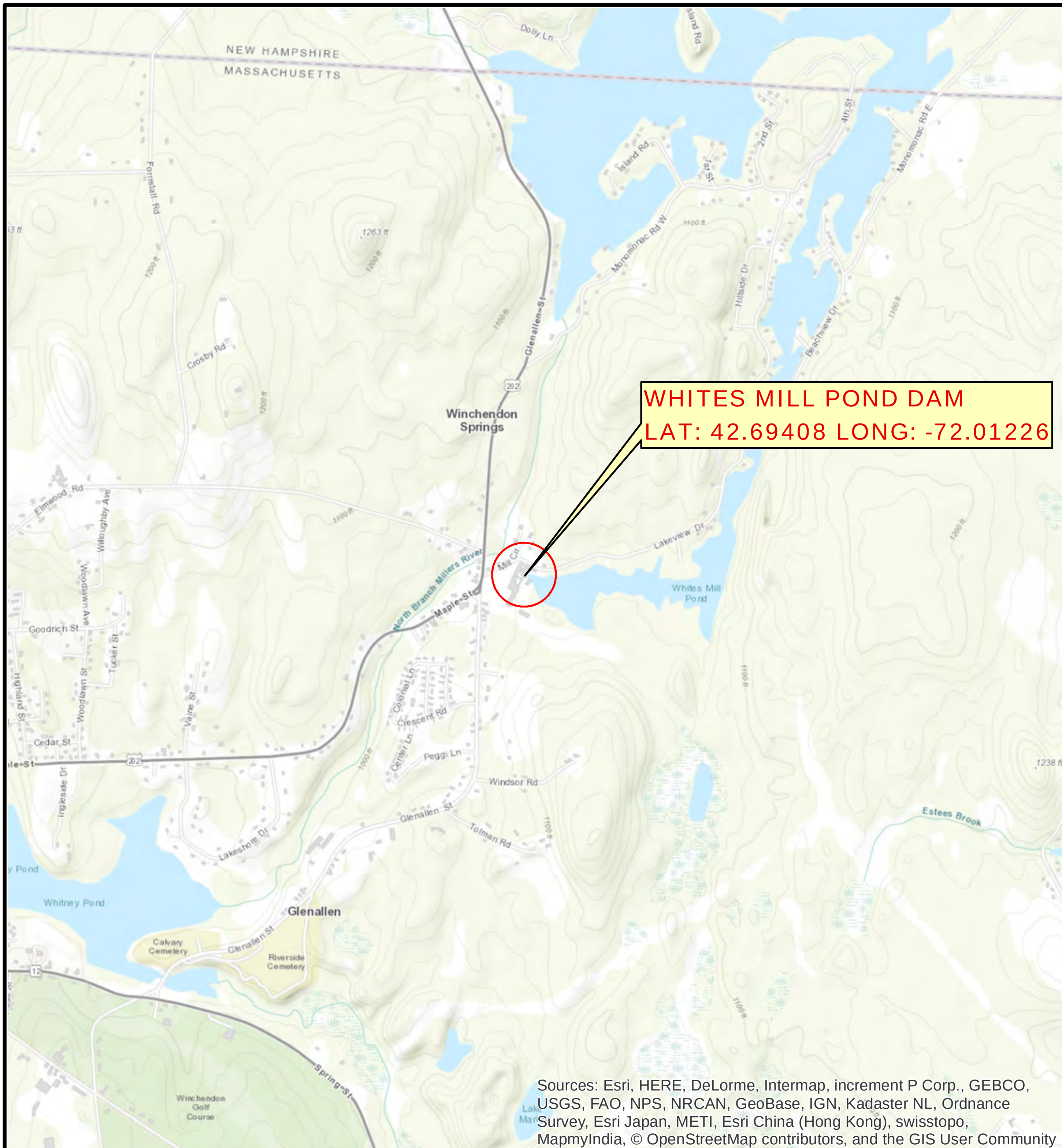
IX. Updated Site Sketch with Photo Locations: Attached Figures 2 and 3.

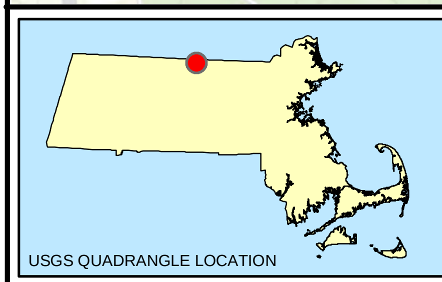
X. Updated Photos: Attached.

XI. Locus Map: Attached as Figure 1.

XII. Other applicable attachments: Preface and GZA Limitations.

FIGURES





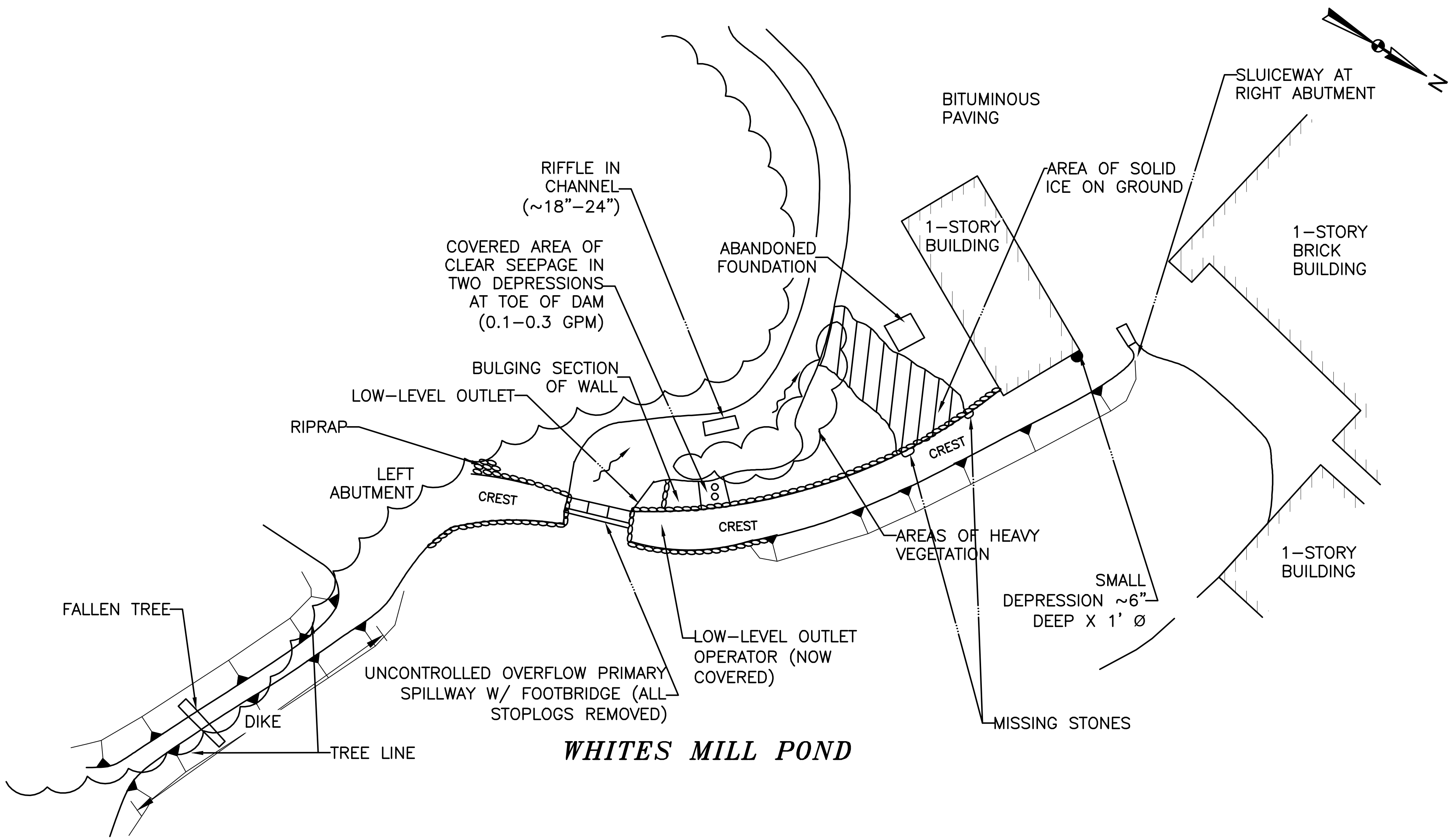
Data Supplied by :

0 1,000 2,000 4,000 6,000 Feet

N W E S

GZA	PROJ. MGR.: DJS DESIGNED BY: SMH REVIEWED BY: DJS OPERATOR: SMH	SITE LOCATION MAP WHITES MILL POND DAM	JOB NO. 01.0173542.00
	DATE: 02-5-2018	BRANDYWINE FARMS, INC. WINCHENDON, MASSACHUSETTS	FIGURE NO. 1

J:\19,000-20,999\19772\19772-40.MAT\Reports\lower roberts meadow res dam\Figures\Figure1-SiteLocus.mxd



NO.	ISSUE/DESCRIPTION	BY	DATE

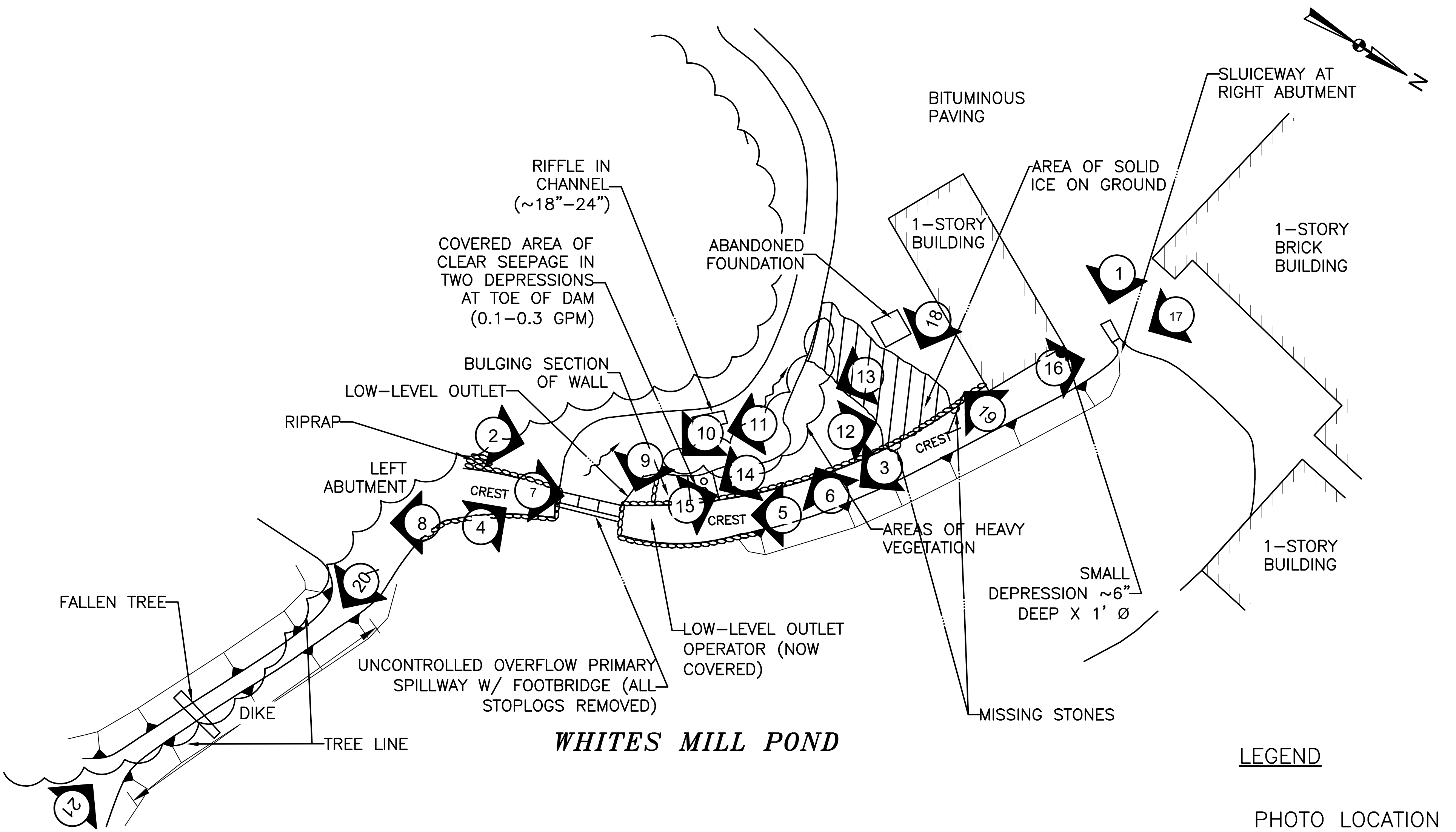
WHITES MILL POND DAM
WINCHENDON, MASSACHUSETTS
STATE DAM ID # 3-14-343-1
NID # MA 00630

SITE SKETCH

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.
WINCHENDON, MASSACHUSETTS

PROJ MGR: DJS	REVIEWED BY: CWC	CHECKED BY: JPG	FIGURE
DESIGNED BY: TEJ	DRAWN BY: EDM	SCALE: Not to Scale	2
DATE: 01/16/2019	PROJECT NO. 01.0173542.10	REVISION NO.	



NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

WHITES MILL POND DAM
WINCHENDON, MASSACHUSETTS
STATE DAM ID # 3-14-343-1
NID # MA 00630

PHOTOGRAPH LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
BRANDYWINE FARMS, INC.
WINCHENDON, MASSACHUSETTS

PROJ MGR: DJS	REVIEWED BY: CWC	CHECKED BY: JPG	FIGURE
DESIGNED BY: TEJ	DRAWN BY: EDM	SCALE: Not to Scale	3
DATE: 01/16/2019	PROJECT NO. 01.0173542.10	REVISION NO.	

APPENDIX A

LIMITATIONS

DAM ENGINEERING REPORT LIMITATIONS

Use of Report

1. GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of the Brandywine Farms, Inc. (Client) for the stated purpose(s) and location(s) identified in the Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. Our services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. If presented, the generalized soil profile(s) and description, along with the conclusions and recommendations provided in our Report, are based in part on widely-spaced subsurface explorations by GZA and/or others, with a limited number of soil and/or rock samples and groundwater /piezometers data and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

5. Water level readings have been made in test holes (as described in the Report), monitoring wells and piezometers, at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the groundwater and piezometer levels, however, occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, reservoir and tailwater levels, the presence of subsurface utilities, and/or natural or artificially induced perturbations.

General

6. The observations described in this report were made under the conditions stated therein. The conclusions presented were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Client.

7. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein available to GZA at the time of the evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

8. Any GZA hydrologic analysis presented herein is for the rainfall volumes and distributions stated herein. For storm conditions other than those analyzed, the response of the site's spillway, impoundment, and drainage network has not been evaluated.

9. Observations were made of the site and of structures on the site as indicated within the report. Where access to portions of the structure or site, or to structures on the site was unavailable or limited, GZA renders no opinion as to the condition of that portion of the site or structure. In particular, it is noted that water levels in the impoundment and elsewhere and/or flow over the spillway may have limited GZA's ability to make observations of underwater portions of the structure. Excessive vegetation, when present, also inhibits observations.

10. In reviewing this Report, it should be realized that the reported condition of the dam is based on observations of field conditions during the course of this study along with data made available to GZA. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued inspection and care can there be any chance that unsafe conditions be detected.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

12. This scope of work does not include an assesment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

Cost Estimates

13. Unless otherwise stated, our cost estimates are for comparative, or general planning purposes. These estimates may involve approximate quantity evaluations and may not be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no

control over the labor and material costs required to plan and execute the anticipated work, our estimates were made using our experience and readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

14. It is recommended that GZA be retained to provide services during any future: site observations, explorations, evaluations, design, implementation activities, construction and/or implementation of remedial measures recommended in this Report. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

JANUARY 16, 2019 PHOTOGRAPHS

Photographic Log

Client Name:	Site Location:	Project No.:
Brandywine Farms, Inc.	Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
1	1/16/2019

Direction Photo Taken:
facing east

Description:
Overview of impoundment and upstream face of dam upstream of right abutment

Photo	Date:
2	1/16/2019

Direction Photo Taken:
facing northwest

Description:
Looking right across spillway discharge onto stone "apron" (Natural stone - boulders or possibly bedrock)

Photographic Log

Client Name:	Site Location:	Project No.:
Brandywine Farms, Inc.	Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
3	1/16/2019

Direction Photo Taken:
facing south

Description:
Top of dam from right abutment.

Photo	Date:
4	1/16/2019

Direction Photo Taken:
facing north

Description:
Top of dam and spillway. Note timber cover of low area at right end of catwalk and over seepage area at base of stone wall.

Photographic Log

Client Name:	Site Location:	Project No.:
Brandywine Farms, Inc.	Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
5	1/16/2019

Direction Photo Taken:
Facing south

Description:
View of top of dam and spillway. Note wooden cover over low area on top of low level outlet at location of presumed valve stem.

Photo	Date:
6	1/16/2019

Direction Photo Taken:
facing west

Description:
Wetland area at toe of dam on right bank of discharge channel. Low stone wall separating area from immediate toe of dam area. Note plywood shelter built over seepage area at toe of wall.

Photographic Log

Client Name: Brandywine Farms, Inc.	**Site Location:**	Whites Mill Pond Dam Winchendon, MA	**Project No.:** 173542.10.

Photo 7	**Date:** 1/16/2019

Direction Photo Taken:
facing north

Description:
Spillway crest. All stoplogs removed. Little or no debris. Ice at base of supports and on d/s training walls.

Photo 8	**Date:** 1/16/2019

Direction Photo Taken:
facing south

Description:
Top of left embankment section and left abutment.

Photographic Log

Client Name: Brandywine Farms, Inc.	**Site Location:** Whites Mill Pond Dam Winchendon, MA	**Project No.:** 173542.10.

Photo 9	**Date:** 1/16/2019
Direction Photo Taken: facing east (u/s)	
Description: Low level outlet discharge portal to right of spillway. Note ice indicating leakage through masonry above the sluiceway lintel stone. Also note (arrow) icicles from top of inside outlet sluice indicating leakage from above.	

Photo 10	**Date:** 1/16/2019
Direction Photo Taken: facing east (u/s)	
Description: Downstream masonry mall and low "training wall" separating low level outlet area from toe of dam. Note two trees which have been lopped.	

Photo	Date:
11	1/16/2019

Direction Photo Taken:
facing south

Description:
(foreground) Low masonry "training wall" separating low level outlet and spillway discharge area from toe of dam. (background) Spillway discharge channel and stone "apron"

Client Name:	Site Location:		Project No.:
Brandywine Farms, Inc.		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
12	1/16/2019

Direction Photo Taken:
facing northwest

Description:
Downstream face of dam near right abutment at area of ice at toe and small "mound" at base of wall

Photographic Log

Photo	Date:
13	1/16/2019

Direction Photo Taken:
facing southeast

Description:
Downstream face of dam and toe area. Note new shelter over area of seepage at toe of wall.

Client Name:	Site Location:		Project No.:
Brandywine Farms, Inc.		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
14	1/16/2019

Direction Photo Taken:
facing east (u/s)

Description:
Area of active seepage in depression at base of downstream wall (clear flow, 0.1-0.3 gpm). Now covered by plywood "shelter."

Photo	Date:
15	1/16/2019

Direction Photo Taken:
facing north

Description:
Small depression in toe area downstream of masonry wall in line with location at toe of wall where active seepage noted. No water observed on this date in downstream hole.

Client Name:	Site Location:		Project No.:
Brandywine Farms, Inc.		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
16	1/16/2019

Direction Photo Taken:
facing east

Description:
Sluiceway at right abutment. Note small low area observed on top of embankment at corner of red "barn"

Photo 17	Date: 1/16/2019	
Direction Photo Taken: facing southeast		
Description: Sluiceway at right abutment		

Client Name: Brandywine Farms, Inc.	**Site Location:** Whites Mill Pond Dam Winchendon, MA	**Project No.:** 173542.10.

Photo 18	Date: 1/16/2019	
Direction Photo Taken: facing northeast		
Description: Downstream masonry wall and toe area. Note solid ice layer in wide area at and beyond toe likely indicating seepage in areas where standing water previously observed. Also note large missing stone.		

Photo	Date:
19	1/16/2019

Direction Photo Taken:
facing southwest

Description:
Area just beyond toe of dam along right side of downstream channel. Note solid ice covering area previously observed to have standing water and/or soft ground.

Client Name:	Site Location:		Project No.:
Brandywine Farms, Inc.		Whites Mill Pond Dam Winchendon, MA	173542.10.

Photo	Date:
20	1/16/2019

Direction Photo Taken:
facing east

Description:
Top of dike to left of spillway. Note large fallen tree across top of dike embankment.

Photographic Log

Photo 21	Date: 1/16/2019	
Direction Photo Taken: facing west		
Description: Top of Dike to left of spillway. Note large trees		

dcr
Massachusetts

October 9, 2015

Certified Mail No. 70140150000216494682
Return Receipt Requested

Brandywine Farm
c/o John & Amelia Giovanoni
48 Athol Road
Roylston, MA 01368

Subject: **CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**

Dam Name:	**White's Mill Pond Dam**
Location:	Winchendon
National ID No:	MA00630
Known Condition:	Poor
Hazard Potential:	High

Dear Mr. & Ms. Giovanoni:

In accordance with 302 CMR 10.08, the Department of Conservation and Recreation (DCR), Office of Dam Safety (ODS) has determined that White's Mill Pond Dam does not meet accepted dam safety standards and is a potential threat to public safety. Therefore, DCR hereby issues a **CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**.

ODS records indicate that Brandywine Farm is the Owner of the White's Mill Pond Dam, National Inventory of Dams No. MA00630. ODS classifies the dam as an **Intermediate Size**, **High Hazard Potential** Structure. High Hazard Potential Dams are dams that will likely cause the loss of life and property damage in the event of dam failure.

On September 19, 2006, an inspection of the White's Mill Pond Dam was performed by engineering consultant Tighe & Bond Inc. As a result of this inspection, the dam was determined to be **STRUCTURALLY DEFICIENT** and in **POOR** condition. On June 22, 2012, an additional inspection was performed by ODS engineering consultant GZA GeoEnvironmental, Inc. As a result of these inspections the dam remains structurally deficient and in Poor condition. The dam has been found to be in need of repair, breaching or removal to bring the dam into compliance with dam safety regulations.

The CERTIFICATE OF NON-COMPLIANCE is based on the above-referenced inspection report results which listed the observance of many deficiencies, including but not limited to:

- Two large trees were observed at the left abutment contrary to ODS Policy on Trees which requires that earth embankment dams be maintained free of existence of trees and woody growth. Such vegetation undermines the dam's stability as tree roots cause serious structural damage to earth embankment and appurtenant dam features such as gate wells, spillway walls and other components. Furthermore, trees are known to accelerate deterioration of dams and can lead to dam failure. The ODS Policy on Trees can be found on the ODS website at http://www.mass.gov/dcr/pe/damsafety/index.htm.
- Sliding was observed along the upstream slope to the right of the stone masonry wall with scarping.
- Erosion of grass was observed at the waterline.
- Uneven vertical alignment of the crest was observed.
- Erosion was observed along crest at locations near downstream edge, both left and right of spillway.
- Small animal burrow was located near sluiceway at right abutment, two sinkholes/depressions 5 ft. to right of spillway near low level outlet stem casing.
- Erosion and slumping were observed near spillway, to the right of the spillway.
- Depressions were observed behind left and right training walls.
- Bulge was observed in wall approximately 25 ft. right of spillway.
- Missing stones were noted right of spillway along downstream face.
- Erosion was observed along spillway abutments.
- Cracking was noted in mortar joints of right stone masonry training wall.
- Inoperable low level outlet.
- A significant wet area with standing water was observed 150 right of the spillway.

ODS staff visited the dam site on July 23, 2015 and observed that the conditions of the dam were substantially similar to the conditions reported at the time of the September 19, 2006 Phase I Inspection Report and the June 22, 2012 Follow-Up Inspection Report, and that accordingly, the dam remains in Poor condition. These foregoing deficiencies compromise the structural integrity of the dam and present a potential threat to public safety. ODS has determined that the dam needs to be repaired, breached or removed in order to bring the dam into compliance with dam safety regulations.

As stated in the September 19, 2006 Phase I Report, White's Mill Pond Dam is located upstream of a factory building under which the channel flows. According to the June 1980 Army Corps of Engineers Phase I Inspection Report, a dam break would cause the discharge flow to rise 13 feet higher than normal. A possible dam failure will likely cause loss of life and property damage.

G.L. c. 253, Sections 44-48 and 302 CMR 10.00 set forth the jurisdiction for ODS and its authority to take action and order actions to be taken. For your information a copy of the Dam Safety Regulation, 302 CMR 10.00 Dam Safety, can be found on the ODS website

DAM SAFETY ORDER:

In accordance with the authority of G.L. c. 253, Section 47, 302 CMR 10.07 and 10.08 you are hereby **ORDERED** to comply with the following:

1) **Conduct Follow-up Inspections:** You shall complete follow-up visual inspections at 6-month intervals, conducted by a registered professional civil engineer qualified to conduct dam inspections, at your cost, until adequate repairs are made or the dam is adequately breached. You shall submit the first Follow-up inspection to ODS no later than **November 17, 2015**.

   Follow-up inspections are to be summary in format and shall provide a written description, including photographs, of any changes in condition. Your engineer is to use the attached ODS Poor Condition Dam Follow-up Inspection Form to report follow-up inspection findings. The form is also available electronically on the ODS web site. Your engineer shall include a cover letter on engineering firm letterhead that briefly summarizes the current follow-up inspection and findings.

   You shall submit one (1) hard copy and one (1) electronic pdf copy of all completed follow-up visual inspection reports to ODS within 30 days of the date of follow-up inspection field work.

2) **Conduct Phase II Inspection and Investigations**. You shall hire at your cost, a qualified registered professional engineer with dam engineering experience (engineer) to conduct a Phase II Inspection and Investigation of the dam to evaluate the structural integrity and spillway hydraulic adequacy of your dam and to develop/implement a plan to bring the dam into compliance with dam safety regulations by adequately repairing, breaching or removing the dam (see attached Phase II Investigation Outline).

   a. You shall commence the Phase II Inspection and Investigation no later than **February 16, 2015**. The Phase II Inspection and Investigation is to conform to the attached Phase II Investigation Outline. You are to, in a letter to ODS, no later than **February 2, 2016,** identify your selected engineer and inform ODS of the start date of the Phase II work.

   B The Phase II Inspection and Investigation is to be completed, signed and stamped by your engineer and copies of the Phase II final report are to be delivered to ODS no later than **April 2, 2016**.

      You shall include a cover letter with the submitted Phase II report which describes your selected alternative to bring the dam into compliance with dam safety regulations. The owner shall submit a statement of your intent to implement inspection report recommendations to address structural and operational deficiencies to ODS upon submission of the required Phase II Inspection and Investigation completed by your engineer.

3) **Bring the dam into compliance and complete all repair, breach or removal work no later than April 2, 2017.** With your Phase II submittal, you must also provide a proposed timeline to design, permit and construct the

selected alternative to repair, breach or remove the dam. The selected alternative must be completed, and the dam brought into compliance with Dam Safety regulations, by April 2, 2017.

4) **Additional Requirements:**
   a. You shall furnish copies of all required submittals listed above via certified mail.

   b. In order to maintain compliance with the Commonwealth's Wetlands Protection Laws you may have to seek requisite approval from your local Conservation Commission in accordance with G.L. c. 131, §40. You are obligated to contact and maintain communication with the Winchendon Conservation Commission and any other local, state or federal permitting agency the ensure compliance with the Wetlands Protection Act and any other regulatory requirements.

   c. You must inform the following parties about the condition of the dam and your developing plans to bring the dam into compliance with dam safety regulations: all abutters of the impoundment upstream; property owners within one-half mile downstream of the White's Mill Pond Dam; Bill Davis, District Manager, Central District, Division of Fisheries & Wildlife, 211 Temple Street, West Boylston, MA 01583; Lee Dillard Adams, Department of Environmental Protection, Central Region, 8 New Bond Street, Worcester, MA 01606; Bernie Lynch, Acting Town Manager, 109 Front Street, Dept. 1, Winchendon, MA 01475; David Koonce, Winchendon Conservation Agent, 109 Front Street, Dept 11, Winchendon, MA 01475; James Abare, Winchendon Emergency Management Director, 109 Front Street, Winchendon, MA 01475.

Please be advised that in accordance with G.L. c. 253, § 47, "any person who fails to comply with the provisions of this chapter or of any order, regulation or requirement of the department relative to dam safety, shall be fined an amount not to exceed $500 for each offense, to be fixed by the court." Furthermore, each violation shall be regarded as a separate and distinct offense and, in case of a continuing violation, each day's continuance thereof shall be deemed to be a separate and distinct offense.

Nothing in this order releases the owner from the requirements of any prior Dam Safety Order issued for this dam, including any Dam Safety Order to submit follow-up inspections on a 6-month schedule.

In accordance with 302 CMR 10.08, this CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER will be recorded at the Registry of Deeds. Issuance of a Certificate of Compliance following adequate repair or breaching of the dam will be required to discharge the CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER.

Please direct any technical questions, correspondence, or submittals to Edward Hughes, Department of Conservation and Recreation, Office of Dam Safety, 251 Causeway Street, Suite 600, Boston, MA 02114. Legal questions should be directed to the DCR Assistant General Counsel, Ariana Johnson, 251 Causeway Street, Suite 600, Boston, MA 02114. Additional dam safety information can be found at the DCR-ODS website.

Thank you for your cooperation.

Sincerely,

Carol I. Sanchez

Carol I. Sanchez
Commissioner

CC:

Senator Anne M. Gobi
Representative Jonathan D. Zlotnik
Bernie Lynch, Winchendon Acting Town Manager
David Koonce, Winchendon Conservation Agent
James Abare, Winchendon Emergency Management Director
Lee Dillard Adams, DEP Central Region
Dave Keddell, U.S. Army Corps
Deidre Buckley, MEPA
Bill Davis, DFW
Rob Lowell, DCR
William Salomaa, DCR
Ariana Johnson, Esq., DCR
Tim Purinton, DER

Department of Conservation and Recreation
Office of Dam Safety
Phase II Inspection and Investigation Outline

I.	**Review of existing information..**
II.	**Updated Detailed Phase I surface inspection in compliance with Office of Dam Safety Phase I Inspection format...**
III.	**Subsurface Investigations – borings, sampling, analysis.................**
IV.	**Topographic Survey, wetlands flagging/delineation, of sufficient detail to support not only the Phase II effort, but sufficient for the future implementation of design phase...**
V.	**Stability and seepage analyses – Seismic and static stability evaluation of dam (upstream and downstream slopes, internal materials), seepage potential, internal erosion potential, piping potential.................**
VI.	**Hydrologic/Hydraulic Analysis and spillway inadequacy resolution..**
VII.	**Alternatives analysis and presentation of conceptual designs and associated estimated design, permitting and construction costs to bring the dam structure into compliance with Chapter 253 Section 44-48 and 302 CMR 10.00 Dam Safety Regulations by either executing selected repair plan or breach plan.....................**
VIII.	**Final Report Presented to the Office of Dam Safety...**

Commonwealth of Massachusetts
Department of Conservation and Recreation
Office of Dam Safety Poor Condition Dam Follow-up Inspection Form

(Complete this inspection form and provide a cover letter on consulting firm letterhead that briefly summarizes the current follow-up inspection and findings. The cover letter shall be signed and stamped by the Registered Professional Engineer in charge of the inspection)

Dam Name:
Dam Owner:
Nat. ID Number:
Hazard Potential:
Location of Dam (town):
Coordinate location (lat, long):
Date of Inspection:
Weather:

Consultant Inspector(s): firm name and name of Registered Professional Engineer in charge of inspection.

Others in Attendance at Field Inspection: include list of names, affiliation and phone numbers.

Attachments: **Updated site sketch with photo locations, Updated photos, and copy of locus map from Phase I report and other applicable attachments.**

I. **Previous Inspection date/Overall Condition:**
- Date of most recent formal Phase I Inspection Report:
- List the overall condition reported in most recent Phase I Inspection Report:

II. **Previous Inspection Deficiencies:**
- List identified deficiencies in the most recent Phase I Inspection Report:

III. **Overall Condition of Dam at the Time of the Current Follow-up Inspection:**
   a. **State the current condition**
   b. **Have conditions changed since the previous inspection? Yes or no.**

IV. **Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:**
   a. **Have any of the deficiencies listed in the previous Phase I Inspection Report worsened?**
   b. **If yes, list the changes.**

c. **Are there any additional deficiencies that have been identified in the current inspection?**
d. **If yes, list the deficiencies and describe.**

V. Dam Safety Orders:

- **List dam safety orders that have been issued to the dam owner pertaining to this dam.**

VI. Maintenance:

1. Indicate if there exists an operation and maintenance plan for the dam.
2. Indicate if it appears the dam is being maintained.

VII. Recommendations:

VIII. Other Comments or Observations:

IX. Updated Site Sketch with Photo Locations:

X. Updated Photos:

XI. Copy of Locus Map from Phase I Report:

XII. Other applicable attachment:

APPENDIX G

PUBLIC NOTICE

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs

MEPA Office

100 Cambridge St., Suite
900 Boston, MA 02114
Telephone 617-626-1020

The following should be completed and submitted to a local newspaper:

PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT:_ Whites Mill Pond Dam Decommissioning and Stream Restoration

LOCATION: Lakeview Drive, Winchendon, Massachusetts

PROPONENT: Brandywine Farms, Inc.

The undersigned is submitting an Environmental Notification Form ("ENF") to the Secretary of Energy & Environmental Affairs on or before February 15, 2019.

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA", M.G.L. c. 30, s.s. 61-62I). Copies of the ENF may be obtained from:

Chad Cox, P.E.,
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue, Norwood, MA 02062
781-278-5787

Copies of the ENF are also being sent to the Conservation Commission and Planning Board of Winchendon, Massachusetts where they may be inspected.

The Secretary of Energy & Environmental Affairs will publish notice of the ENF in the Environmental Monitor, will receive public comments on the project for 20 days, and will then decide, within ten days, if an environmental Impact Report is needed. A site visit and consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit or consultation session, should write to the Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, referencing the above project.

By: John and Amelia Giovanoni *(Proponents)*

APPENDIX H

HYDRAULIC & HYDROLOGIC ANALYSIS BACKUP INFORMATION

WHITES MILL POND DAM DECOMMISSIONING AND STREAM RESTORATION PROJECT

HYDROLOGIC AND HYDRAULIC INVESTIGATION AND DESIGN REPORT

December 2018

GZA performed a hydraulic and hydrologic (H&H) analysis of the North Upper Millers River to evaluate the impact on river hydraulic profiles of the proposed breaching Whites Mill Pond Dam. The flood flow used as the design basis for the analysis was the 500-year flood (0.2% annual return period). The 2-,10-, 50-, and 100-year floods were also assessed in this analysis.

Hydrology

GZA first reviewed peak stream flows for the Whites Mill Pond watershed developed using regression equations for estimating peak stream flows in Massachusetts published by the USGS in 2016 and available from StreamStats 4.0 web Application. This method estimated the 500-year flow for the 1.1 square mile watershed to be 361 cfs. Flows derived from the StreamStats application are presented in **Table 1**.

Table 1: Peak stream flow from StreamStats

Flow Event	Flow (cfs)
2-year	50
10-year	117
50-year	202
100-year	245
500-year	361
Bankfull	44.5

For a more refined analysis, GZA estimated peak stream flows using a watershed rainfall-runoff model developed using the US Army Corps of Engineers (USACE) Hydrological Engineering Center's Hydrologic Modeling System (HEC-HMS) modeling software.

GZA used depth-duration-frequency rainfall data developed by the National Oceanic and Atmospheric Administration (NOAA) and made available from *Atlas 14, Volume 10 for the Northeastern United States Online Tool*, accessed in June 2018. GZA developed site-specific rainfall distributions using the NOAA Atlas 14 rainfall-frequency data. The data was used to develop a 24-hour smoothed distribution, with peak event-based rainfall intensities nested around hour 12. The developed rainfall distribution is consistent with the site-specific distributions developed using WinTR-20 computer program, a watershed scale runoff and routing model.

GZA delineated the total drainage area, 1.1 square miles, using the Massachusetts USGS StreamStats interactive map tool (StreamStats). The HEC-HMS model utilized the NRCS Curve Number method to model losses. Hydrologic soil group data were obtained from digital county soil maps provided by the National Resource Conservation Service (NRCS). GZA developed land use data from aerial imagery. The soil and land use data were then used to compute composite runoff curve numbers. Selected runoff curve numbers represented average antecedent runoff conditions, which is typical of generally accepted engineering practices for design and modeling applications. GZA developed the digital elevation model (DEM) of the Site by combining 2013-2014 New England CMGP Sandy LiDAR and the 2015 Connecticut

River LiDAR. Times of concentration (Tc) were developed for each sub-basin using the DEM and the velocity method based on estimated water velocities for overland and channel flows. Flows were routed through the watershed in the HEC-HMS model to determine inflows to Whites Mills Pond.

The Whites Mill Pond also receives controlled flows from Lake Monomonac outside of the watershed, through a series of two dams. GZA delineated the Lake Monomonac total drainage area, 18.5 square miles, using the StreamStats tool. GZA conservatively estimated flows into Whites Mill pond from Lake Monomonac to be an additional 300 cfs based on the field measurements and photographs of the control structure which releases water towards the Whites Mill Pond. This flow was routed to the reservoir as well. Additional flows from Lake Monomonac flow through an uncontrolled spillway directly into the North Branch Millers River and are not routed through the Whites Mill Pond Reservoir.

The estimated peak flood flows from the direct Whites Mill Pond watershed are presented in **Table 2**.

Table 2: Rainfall totals, HEC-HMS peak stream flow estimates and max pond elevations

Flow Event	24-Hour Rainfall Total (in)	Flow (cfs)	Pond Elevation (ft NAVD88)
2-year	2.9	391	1039.8
10-year	4.42	318	1039.9
50-year	6.1	640	1040.0
100-year	6.83	690	1040.1
500-year	9.34	898	1040.2

GZA selected flood flows from the HEC-HMS model for use in this analysis as they are more conservative than flows estimated using the StreamStats tool after accounting for the difference due to inflows from Lake Monomonac.

The total 100-year peak flow inflow to Whites Mill Pond was thus estimated as 690 cfs. The total 500-year peak flood inflow into Whites Mill Pond was estimated to be 898 cfs.

Pond elevations assume the spillway has one 0.8-foot stoplog and an initial pond elevation of 1036.8 feet NAVD88. In this configuration, the HEC-HMS model indicates that the dam is expected to over top under the 100- and 500-year flow events.

Hydraulics

GZA developed a one-dimensional unsteady hydraulic model using the USACE's Hydrological Engineering Center's River Analysis System (HEC-RAS) Version 5.0.5 model to estimate water surface profiles under various channel/breach configurations. The flood wave was routed approximately 2.4 miles, along the outflow of Whites Mill Pond into the North Branch Millers River into Whitney Pond, where flows are considered to have attenuated.

To develop the cross-section geometry, GZA developed a georeferenced model using HEC-GeoRAS, ArcMap a geospatial information system (GIS) software, and RASMapper. GZA extracted topographic station-elevation data from the above-mentioned digital elevation model to develop cross section geometries. Cross sections were placed no more than 500 feet apart. GZA modified the thalweg of the channel to be equal to the rivers' channel invert as shown in the river profiles published in the Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FIS) for Worcester county. GZA interpolated cross sections in stretches of the reach that were especially steep.

Manning's "n" roughness coefficients used in the HEC-RAS model generally ranged from 0.025 to 0.1. GZA used land use data derived from orthophotography to determine manning's n values at each cross-section. For steep slopes, GZA used Jarrett's equation to estimate manning's n in the river.

Instream structures which were modelled included the dam, the downstream access road culvert, mill building which passes over the channel (forming a culvert), the Lakeview Drive Bridge, the Rt 202 / Glenallen Street Bridge, and the Rt 202 / Maple Street Bridge. GZA used data from the Worcester county FEMA FIS and aerial photography to develop road crossing geometry. The proposed foot bridge was assumed to be washed out during flood conditions and was not modeled.

Whites Mill Pond Dam is a fixed crest dam. The spillway elevation is 1036.0 feet NAVD88. At the time of the survey (April 2018) the normal pool elevation of Whites Mill Pond was 1036.8 feet NAVD88 with stoplogs. Historically up to 2 feet of stop logs have been in place at the spillway. GZA modeled the dam with 0.8 feet of stoplogs for a normal pool of 1036.8 feet NAVD88.

GZA ran the ½ pmf value of 846 cfs for the watershed, as defined in the 1980 United States Army Corps of Engineering report, in the HEC-RAS model under steady state conditions, with the additional 300 cfs from Lake Monomonac for a total ½ pmf flow of 1,146 cfs. Under these flow conditions the water surface elevation (WSE) at the dam is 1040.6, indicating that **the dam would overtop by approximately 0.6 feet under the ½ pmf conditions.**

Dam Break Configuration

The objective of dam break modeling is to estimate downstream inundation areas are corresponding time to flooding, thus identifying critical downstream areas affected by a dam failure (i.e., sudden, uncontrolled release of water) for the purposes of emergency action planning. GZA used the dam break model to calculate various flood wave characteristics such as arrival time, time to peak stage, peak discharge flow rate, and flood crest profile, which are incorporated into an inundation map.

GZA performed with wet weather and sunny day dam break modeling. For the wet weather scenario GZA used the 500-year hydrograph developed in HEC-HMS and the assumed 300 cfs inflow from Lake Monomonac with a peak flow of 898 cfs into Whites Mill Pond. The initial starting water surface elevation of Whites Mill Pond was set at the spillway crest. The dam break failure for the wet weather scenario was initiated at the resulting maximum water surface elevation of the Whites Mill impoundment. The downstream lateral inflow on the North Branch Miller River was assumed to be 2950 cfs based on HEC-HMS flow results under 500-year conditions, less the 300 cfs assumed to be routed through Whites Mill Pond.

Trapezoidal Breach Formation	
Maximum Breach Top Width:	129 feet
Maximum Breach Bottom Width:	79 feet
Final Breach Side Slope:	2 Horizontal: 1 Vertical
Time to Maximum Breach:	0.5 hour
Trigger Elevation:	1039.27 feet
Resulting Maximum Breach Flow:	6,240 cfs

Note that the SDF for a High Hazard dam is the ½ PMF. GZA judges that the 500-year flood is likely to be generally equivalent to the ½ PMF for generating inflows. However, for consistency with the previous Emergency Action Plan which modeled dam break inundation using the specific ½ PMF, GZA adjusted the dam breach parameters to match the previously estimated peak outflow from the 2007 EAP.

For the sunny day dam scenario GZA assumed a 30 cfs constant inflow to Whites Mill Pond Dam, which is less than 1% of the peak breach flow. The initial water surface elevation of Whites Mill Pond Dam was set at the spillway crest. The dam break failure for the sunny day was initiated at the resulting maximum water surface elevation of the Whites Mill impoundment. The downstream lateral inflow on the North Branch Miller River was assumed to be 27 cfs based on an assumed 2 cfs per square mile watershed area.

Trapezoidal Breach Formation	
Maximum Breach Top Width:	43.75 feet
Maximum Breach Bottom Width:	31.25 feet
Final Breach Side Slope:	0.5 Horizontal: 1 Vertical
Time to Maximum Breach:	0.5 hour
Trigger Elevation:	1039.27 feet
Resulting Maximum Breach Flow:	2,450 cfs

Results from both scenarios are presented on the Inundation Maps. The inundation maps cover the North Branch Miller River from the dam to the point where the flood wave has attenuated (incremental increase in water surface elevation is less than 1.5 feet).

The hypothetical wet and sunny day failure of the Whites Mill pond Dam are assumed to occur when the reservoir is at the highest water surface elevation. The maximum discharge through the break opening during wet weather conditions is 7,020 cfs. This outflow is comparable to the dam break flows modeled by Tighe and Bond in 2007 of 6,085 cfs. The maximum discharge through the break opening during sunny day conditions is 2,450 cfs.

For the wet weather failure, the initial failure began at hour 16, with the maximum breach width occurring 0.5 hours later. The arrival time of the leading edge along the North Branch Millers River is estimated to be 5 minutes to Route 202/Glenallen Road about 1,400 feet downstream of the dam. Peak flood depths range from about 7.4 feet at the old factory building to about 13.9 feet at Maple street.

For the sunny day failure, the initial failure began at hour 0.3, with the maximum breach width occurring 0.5 hours later. The arrival time of the leading edge along the North Branch Millers River is estimated to be 5 minutes to Route 202/Glenallen Road. Peak flood depths range from about 5.3 feet at the old factory building to about 9.1 feet at Glenallen street.

Flood flows in Whitney Pond due to dam break have an incremental difference of less than 2.0 feet in both the wet weather and sunny day failure events. Whitney Pond Dam is expected to overtop during the 500-year flood event both with and without dam break of Whites Mill Pond Dam. Flood inundation is expected downstream of Whitney Pond Dam.

Dam Breach Configuration

Under proposed conditions, Whites Mill Pond Dam will have a section removed from the dam such that future flood flows would not be impounded by the resulting structure. In HEC-RAS, GZA made changes from the existing conditions model to the dam configuration and immediate downstream section to reflect the new breach channel geometry.

The proposed cut into the embankment includes a 15-foot-wide channel and a 25-foot overbank area on both sides of the channel. The channel thalweg is proposed to be approximate 12.5 feet lower than the dam crest.

A comparison of model results under the existing and proposed conditions indicates that the breaching of the dam is expected to result in a reduction of upstream peak water surface elevations of approximately 3.4 feet immediately upstream of the dam under the 500-year flood inflow. Water surface elevations downstream of the dam are fundamentally unchanged.

Flows, upstream, and downstream of the dam water surface elevations for the 2-,10-, 50-, 100- and 500-year floods are presented in **Table 3**. The upstream elevation is at a section approximately 44.8 feet from the centerline of the former embankment. The downstream elevation is at a section approximately 53.7 feet from the centerline of the former embankment.

Table 3: Comparison of flows and water surface elevations (WSE) at Whites Mill Pond Dam pre-& post-breach.

Flow Event		Flow through spillway/breached section (cfs)	Upstream WSE (ft NAVD88)	Downstream WSE (ft NAVD88)	Water Surface Differential Depth (ft)
2-year	Existing*	410	1039.7	1027.0	12.7
	Breached	460	1029.5	1027.0	2.5
10-year	Existing*	510	1039.8	1027.1	12.7
	Breached	510	1029.6	1027.1	2.5
50-year	Existing*	630	1039.8	1027.4	12.4
	Breached	670	1029.8	1027.4	2.4
100-year	Existing*	680	1039.9	1027.5	12.4
	Breached	670	1029.8	1027.4	2.4
500-year	Existing*	880	1040.0	1028.0	12
	Breached	880	1030.1	1027.9	2.2

* Assumes 0.8' of stoplogs in spillway and initial normal pool elevation of 1036.8

Results indicate the flood flows will not be significantly impounded under the proposed breach dam configuration and downstream flooding due to a flood event will not be substantially exacerbated.

The results of the analysis also indicate that the proposed breach configuration is adequate to prevent significant differential head at locations upstream and downstream of the former dam during floods up to the 500-year return period. Therefore, in GZA's opinion, the breached dam will no longer meet the criteria for a jurisdictional structure and will be eligible to be re-classified as a non-jurisdictional structure.

Additional results from the hydrologic and hydraulic models are attached for the existing and proposed breach conditions.

Fish Passage Evaluation

Whites Mill Pond Dam represents a barrier to habitat for resident and migratory fish species either now or in the future. Removal of the dam will provide accessibility of these species to upstream habitat. GZA used flow derived from the USGS StreamStats application to assess suitability of fish passage through the proposed restored stream channel at the former embankment location.

GZA reviewed flow, depth, and velocity information through the proposed breach channel to evaluate the potential efficacy of fish passage post dam removal. Under proposed conditions, flows up to the bankfull flow are judged to have sufficiently low velocities to enable fish passage for all target species.

Common New England riverine target species include the American Eel and Brook Trout. Maximum velocities for appropriate inland freshwater target species are based on a joint NOAA, USGS, and USFWS report, Federal Interagency Technical Memorandum Fish Passage Guidelines and are provided in Table 4. The report provides the maximum velocities to allow the safe, timely, and effective passage for the target species.

Table 4 – Fish Passage Parameters

Species	Minimum Weir Depth (ft)	Maximum Velocity (ft/sec)	Maximum Slope
American Eel < 15 cm TL	0.25	0.8	5 %
American Eel >15 cm TL	1.00	1.0	5 %
Brook Trout	1.25	3.8	5 %

The American Eel are not expected to be present at Whites Mill Pond at this time due to its location and the presence of downstream barriers. It is acknowledged that future dam removal and fish passage efforts could facilitate connectivity of the habitat at Whites Mill Pond via the Millers River. Brook trout are a freshwater riverine species that may be present in the North Branch Millers River; GZA has not conducted a study confirming the presence of brook trout.

The slope of the restored channel in the location of the former embankment will be 4.0%. Results from the hydraulic model indicate that the estimated velocity within the breached portion of the channel ranges from 0.8 ft/s during August low flows (4.5 cfs) up to 4.2 ft/s at bankfull flows (94.5 cfs). Velocities are expected to be less on the edges of the channel as compared to the average velocity of the channel allowing for passage at lower speeds. Final design of the restored channel can include placement of boulders to provide velocity shelters if needed. Depths range from 0.4 feet during August low flows and 1.5 feet at bankfull flows through the breached section. It is therefore judged that upstream passage by Brook trout will be possible.

The results of fish passage flows modeled in HEC-RAS are attached.

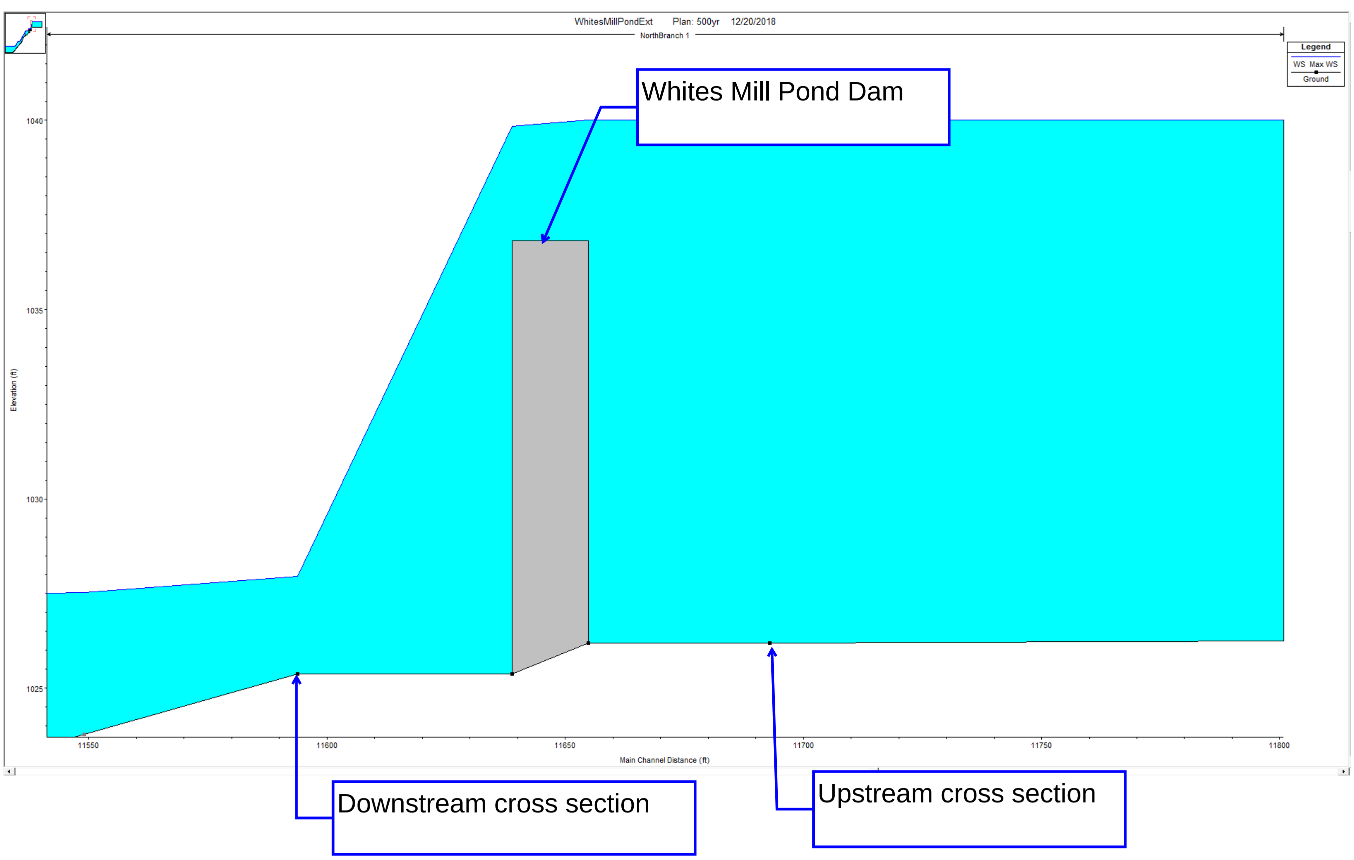
Dam Break Attachment

		500-Year Existing No Breach		500-Year Existing No Breach		500-Year Existing Incremental Increase
River Sta	Profile	Q Total	W.S. Elev	Q Total	W.S. Elev	
		(cfs)	(ft)	(cfs)	(ft)	
16366	Max WS	884.73	1040.48	890.27	1040.04	-0.4
16087	Max WS	882.83	1040.48	889.78	1040.04	-0.4
15602	Max WS	882.02	1040.48	889.74	1040.04	-0.4
15275	Max WS	882.11	1040.46	889.28	1040.02	-0.4
14848	Max WS	880.82	1040.45	889.26	1040.01	-0.4
14592	Max WS	879.41	1040.45	888.46	1040.01	-0.4
14277	Max WS	880.85	1040.45	887.93	1040.01	-0.4
13899	Max WS	880.08	1040.45	887.15	1040.01	-0.4
13705	Max WS	880.36	1040.45	887.07	1040.01	-0.4
13459	Max WS	880.66	1040.45	885.35	1040.01	-0.4
13043	Max WS	880.12	1040.45	883.82	1040	-0.5
12782	Max WS	879.8	1040.45	883.4	1040	-0.5
12345	Max WS	879.41	1040.45	881.54	1040	-0.5
12032	Max WS	879.39	1040.45	880.66	1040	-0.5
11779	Max WS	879.28	1040.45	880.2	1040	-0.5
11745.37		Inl Struct	0	Inl Struct	0	
11680	Max WS	879.35	1027.94	7016.52	1032.98	5.0
11501	Max WS	879.28	1027.03	7015.15	1031.79	4.8
11475.64		Bridge	0	Bridge	0	
11421	Max WS	879.29	1022.56	7010.71	1026.26	3.7
11388	Max WS	879.1	1022.39	6990.06	1024.72	2.3
11352.52		Bridge	0	Bridge	0	
11290	Max WS	879.2	1022.38	6985.45	1024.6	2.2
10834	Max WS	878.98	1022.37	6975.36	1024.55	2.2
10801.44		Culvert	0	Culvert	0	
10741	Max WS	879.01	1022.35	6973.69	1024.46	2.1
10540	Max WS	879.09	1022.35	6974.4	1024.46	2.1
10460	Max WS	3829.03	1022.31	9921.82	1024.39	2.1
10412.74		Bridge	0	Bridge	0	
10358	Max WS	3829.02	1019.36	9912.31	1021.01	1.6
9961	Max WS	3828.45	1017.53	9870.78	1020.19	2.7
9600	Max WS	3827.95	1016.91	9862.85	1019.65	2.7
9393	Max WS	3827.92	1016.63	9859.05	1019.3	2.7
9123	Max WS	3827.88	1016.29	9855.6	1018.75	2.5
8940	Max WS	3827.84	1016.03	9855.11	1018.53	2.5
8893.07		Bridge	0	Bridge	0	
8815	Max WS	3827.86	1012.51	9854.83	1015.47	3.0
8353	Max WS	3827.82	1009.14	9847.96	1011.81	2.7
7962	Max WS	3827.77	1005.52	9843.59	1008.33	2.8
7489	Max WS	3827.77	1001.1	9840.61	1003.76	2.7
7142	Max WS	3827.79	996.41	9839.55	999.04	2.6
6526	Max WS	3827.74	991.73	9810.19	994.74	3.0
5955	Max WS	3827.68	990.62	9794.75	993.41	2.8
5321	Max WS	3827.68	988.13	9788.45	991.21	3.1
5204	Max WS	3827.7	986.32	9788.26	989.06	2.7
5059	Max WS	3827.6	984.42	9787.89	985.99	1.6
4340	Max WS	3817.35	978.97	9469.37	980.1	1.1
3596	Max WS	3805.87	978.69	7728.81	979.67	1.0
2734	Max WS	3804.16	978.69	7736.84	979.67	1.0
2231	Max WS	3804.24	978.69	7748.83	979.67	1.0
1788	Max WS	7794.51	978.68	11736.61	979.65	1.0
1363	Max WS	7793.67	978.65	11735.78	979.6	1.0
1026	Max WS	7793.33	978.64	11740.72	979.59	1.0
618	Max WS	7793.83	978.65	11738.56	979.59	0.9
86	Max WS	7793.47	978.63	11736.08	979.56	0.9

		Sunny Existing No Breach		Sunny Existing No Breach		Sunny Existing Incremental Increase
River Sta	Profile	Q Total	W.S. Elev	Q Total	W.S. Elev	
		(cfs)	(ft)	(cfs)	(ft)	
16366	Max WS	30	1036.81	30	1036.81	0.0
16087	Max WS	29.96	1036.81	29.93	1036.81	0.0
15602	Max WS	29.86	1036.81	29.83	1036.81	0.0
15275	Max WS	29.9	1036.81	29.86	1036.81	0.0
14848	Max WS	29.94	1036.81	30.07	1036.81	0.0
14592	Max WS	29.81	1036.81	30.21	1036.81	0.0
14277	Max WS	30.1	1036.81	30.07	1036.81	0.0
13899	Max WS	30.03	1036.81	30.08	1036.81	0.0
13705	Max WS	30.04	1036.81	29.47	1036.81	0.0
13459	Max WS	29.91	1036.81	29.95	1036.81	0.0
13043	Max WS	29.91	1036.81	29.66	1036.81	0.0
12782	Max WS	29.92	1036.81	29.39	1036.81	0.0
12345	Max WS	30	1036.81	30	1036.81	0.0
12032	Max WS	30	1036.81	30	1036.81	0.0
11779	Max WS	30	1036.81	30	1036.81	0.0
11745.37		Inl Struct	0	Inl Struct	0	
11680	Max WS	30	1026.01	2455.93	1030.79	4.8
11501	Max WS	31.89	1019.97	2449.58	1030.35	10.4
11475.64		Bridge	0	Bridge	0	
11421	Max WS	30	1018.57	2449.4	1023.48	4.9
11388	Max WS	31.47	1018.44	2052.9	1022.42	4.0
11352.52		Bridge	0	Bridge	0	
11290	Max WS	30.43	1017.59	2052.9	1022.35	4.8
10834	Max WS	30	1014.26	2331.74	1022.25	8.0
10801.44		Culvert	0	Culvert	0	
10741	Max WS	30	1014.23	2293	1022.05	7.8
10540	Max WS	30	1014.2	2293.3	1022.04	7.8
10460	Max WS	60	1014.01	2321.52	1022.03	8.0
10412.74		Bridge	0	Bridge	0	
10358	Max WS	55.01	1012.74	2314.86	1018.39	5.6
9961	Max WS	60	1010.86	2274.81	1015.82	5.0
9600	Max WS	60	1009.35	2178.56	1014.61	5.3
9393	Max WS	60	1008.47	2157.73	1013.95	5.5
9123	Max WS	60	1006.61	2150.54	1013.29	6.7
8940	Max WS	60	1005.66	2150.01	1012.17	6.5
8893.07		Bridge	0	Bridge	0	
8815	Max WS	60	1005.22	2149.36	1011.21	6.0
8353	Max WS	60	1003.17	2146.91	1008.07	4.9
7962	Max WS	60	1000	2144.08	1004.45	4.5
7489	Max WS	60	993.21	2141.89	1000.01	6.8
7142	Max WS	60	989.78	2141.14	995.31	5.5
6526	Max WS	60	985.66	2095.28	990.35	4.7
5955	Max WS	60	981.58	2058.12	989.28	7.7
5321	Max WS	59.99	977.25	2054.01	985.5	8.3
5204	Max WS	60	976.53	2053.05	984.34	7.8
5059	Max WS	60	975.61	2050.27	983.47	7.9
4340	Max WS	60	970.62	2040.48	977.94	7.3
3596	Max WS	59.98	968.79	686.43	970.42	1.6
2734	Max WS	59.78	968.79	646.14	970.41	1.6
2231	Max WS	59.75	968.79	646.38	970.41	1.6
1788	Max WS	118.87	968.79	704.36	970.41	1.6
1363	Max WS	118.72	968.79	687.44	970.4	1.6
1026	Max WS	118.66	968.79	689.36	970.4	1.6
618	Max WS	118.69	968.79	690.86	970.4	1.6
86	Max WS	118.53	968.79	689.99	970.4	1.6

Dam Breach Attachment

Flow Event		Flow through spillway/breached section (cfs)	Upstream WSE (ft NAVD88)	Downstream WSE (ft NAVD88)
2-year	Existing	410	1039.7	1027.0
	Breached	460	1029.5	1027.0
10-year	Existing	510	1039.8	1027.1
	Breached	510	1029.6	1027.1
50-year	Existing	630	1039.8	1027.4
	Breached	670	1029.8	1027.4
100-year	Existing	680	1039.9	1027.5
	Breached	670	1029.8	1027.4
500-year	Existing	880	1040.0	1028.0
	Breached	880	1030.1	1027.9



0.5 pmf - steady state

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	1146	1026.31	1040.65	1.16
1	16087	Max WS	1145.94	1026.31	1040.65	0.24
1	15602	Max WS	1146.07	1026.31	1040.65	0.26
1	15275	Max WS	1145.89	1026.31	1040.62	0.85
1	14848	Max WS	1146.11	1026.31	1040.61	0.24
1	14592	Max WS	1146.18	1026.31	1040.61	0.18
1	14277	Max WS	1145.7	1026.31	1040.61	0.16
1	13899	Max WS	1146.08	1026.31	1040.6	0.27
1	13705	Max WS	1146.09	1026.31	1040.6	0.28
1	13459	Max WS	1146.07	1026.31	1040.6	0.18
1	13043	Max WS	1146.17	1026.31	1040.6	0.33
1	12782	Max WS	1146.15	1026.31	1040.6	0.21
1	12345	Max WS	1145.76	1026.31	1040.6	0.11
1	12032	Max WS	1145.72	1026.31	1040.6	0.21
1	11779	Max WS	1146.02	1026.2	1040.6	0.21
1	11745.37		Inl Struct			
1	11680	Max WS	1146.02	1025.37	1029.02	3.14
1	11501	Max WS	1145.99	1019	1028.6	3.04
1	11475.64		Bridge			
1	11421	Max WS	1145.99	1017.43	1022.82	7.38
1	11388	Max WS	1146.05	1017.17	1022.52	1.39
1	11352.52		Bridge			
1	11290	Max WS	1146.05	1016.42	1022.5	0.94
1	10834	Max WS	1146.04	1013.45	1022.49	0.5
1	10801.44		Culvert			
1	10741	Max WS	1146.04	1012.75	1022.46	0.45
1	10540	Max WS	1145.83	1011.75	1022.46	0.35
1	10460	Max WS	4095.98	1012.75	1022.42	1.81
1	10412.74		Bridge			
1	10358	Max WS	4095.98	1011.25	1019.41	9.72
1	9961	Max WS	4095.98	1010	1017.84	3.37
1	9600	Max WS	4096.05	1007.25	1017.28	4.05
1	9393	Max WS	4095.98	1005.75	1017.03	2.45
1	9123	Max WS	4095.97	1005.75	1016.71	3.72
1	8940	Max WS	4096	1004.25	1016.52	4.72
1	8893.07		Bridge			
1	8815	Max WS	4096	1003.75	1012.7	9.53
1	8353	Max WS	4096.02	1002.25	1009.29	6.95
1	7962	Max WS	4095.97	999.25	1005.68	8.02
1	7489	Max WS	4095.98	991.75	1001.24	8.79
1	7142	Max WS	4095.99	988.75	996.56	8.18
1	6526	Max WS	4096.01	984.5	991.9	3.65
1	5955	Max WS	4096.03	980.5	990.78	3.42
1	5321	Max WS	4096.02	976.2	988.3	5.67

1	5204	Max WS	4096	975.4	986.49	13.71
1	5059	Max WS	4095.98	974.4	984.52	5.01
1	4340	Max WS	4096	969.4	979.08	3.32
1	3596	Max WS	4096	964.25	978.8	0.56
1	2734	Max WS	4096.3	964.25	978.8	0.2
1	2231	Max WS	4095.34	964.25	978.8	0.15
1	1788	Max WS	8086.19	964.25	978.79	0.79
1	1363	Max WS	8086.02	964.25	978.76	1.25
1	1026	Max WS	8086	964.25	978.76	0.98
1	618	Max WS	8085.91	964.25	978.76	0.45
1	86	Max WS	8086.04	964.25	978.74	0.94

500-year existing

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	886.23	1026.31	1040.04	0.95
1	16087	Max WS	886.56	1026.31	1040.04	0.19
1	15602	Max WS	887.32	1026.31	1040.04	0.22
1	15275	Max WS	886.25	1026.31	1040.02	0.7
1	14848	Max WS	884.98	1026.31	1040.01	0.2
1	14592	Max WS	883.34	1026.31	1040.01	0.15
1	14277	Max WS	884.53	1026.31	1040.01	0.13
1	13899	Max WS	884.84	1026.31	1040.01	0.22
1	13705	Max WS	884.35	1026.31	1040.01	0.24
1	13459	Max WS	884.13	1026.31	1040.01	0.15
1	13043	Max WS	883.61	1026.31	1040	0.27
1	12782	Max WS	883.07	1026.31	1040	0.17
1	12345	Max WS	883.28	1026.31	1040	0.09
1	12032	Max WS	883.44	1026.31	1040	0.17
1	11779	Max WS	883.15	1026.2	1040	0.17
1	11757	Max WS	Inl Struct			
1	11680	Max WS	883.12	1025.37	1027.95	4.68
1	11501	Max WS	883.08	1019	1027.06	3.05
1	11475.64		Bridge			
1	11421	Max WS	883.09	1017.43	1022.57	6.17
1	11388	Max WS	882.92	1017.17	1022.39	1.11
1	11352.52		Bridge			
1	11290	Max WS	882.94	1016.42	1022.38	0.77
1	10834	Max WS	882.82	1013.45	1022.37	0.4
1	10801.44		Culvert			
1	10741	Max WS	882.82	1012.75	1022.35	0.36
1	10540	Max WS	882.98	1011.75	1022.35	0.28
1	10460	Max WS	3832.83	1012.75	1022.31	1.76
1	10412.74		Bridge			
1	10358	Max WS	3832.71	1011.25	1019.36	9.25
1	9961	Max WS	3832.1	1010	1017.54	3.41
1	9600	Max WS	3831.87	1007.25	1016.91	4.14
1	9393	Max WS	3831.69	1005.75	1016.63	2.48
1	9123	Max WS	3831.67	1005.75	1016.29	3.71
1	8940	Max WS	3831.64	1004.25	1016.04	5.19
1	8893.07		Bridge			
1	8815	Max WS	3831.6	1003.75	1012.52	9.17
1	8353	Max WS	3831.61	1002.25	1009.14	6.85
1	7962	Max WS	3831.57	999.25	1005.53	7.85
1	7489	Max WS	3831.59	991.75	1001.1	8.59
1	7142	Max WS	3831.53	988.75	996.41	7.96
1	6526	Max WS	3831.55	984.5	991.73	3.55
1	5955	Max WS	3831.52	980.5	990.63	3.31
1	5321	Max WS	3831.43	976.2	988.13	5.67

500-year existing

1	5204	Max WS	3831.42	975.4	986.32	13.11
1	5059	Max WS	3831.44	974.4	984.42	4.9
1	4340	Max WS	3820.61	969.4	978.97	3.27
1	3596	Max WS	3811.22	964.25	978.69	0.53
1	2734	Max WS	3809.45	964.25	978.69	0.19
1	2231	Max WS	3809.74	964.25	978.69	0.14
1	1788	Max WS	7799.38	964.25	978.68	0.77
1	1363	Max WS	7798.91	964.25	978.65	1.21
1	1026	Max WS	7798.57	964.25	978.64	0.95
1	618	Max WS	7798.38	964.25	978.65	0.44
1	86	Max WS	7798.24	964.25	978.63	0.92

500-year breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	890.8	1026.31	1031.23	2.96
1	16087	Max WS	890.78	1026.31	1031.24	0.57
1	15602	Max WS	890.24	1026.31	1031.2	0.64
1	15275	Max WS	886.92	1026.31	1030.81	2.48
1	14848	Max WS	880.6	1026.31	1030.46	0.66
1	14592	Max WS	880.25	1026.31	1030.45	0.5
1	14277	Max WS	879.22	1026.31	1030.43	0.44
1	13899	Max WS	878.24	1026.31	1030.37	0.76
1	13705	Max WS	878.19	1026.31	1030.34	0.85
1	13459	Max WS	878.6	1026.31	1030.32	0.55
1	13043	Max WS	877.03	1026.31	1030.23	0.98
1	12782	Max WS	877.05	1026.31	1030.18	0.66
1	12345	Max WS	877.01	1026.31	1030.16	0.31
1	12032	Max WS	876.74	1026.31	1030.13	0.62
1	11779	Max WS	876.72	1026.2	1030.1	0.65
1	11757	Max WS	876.76	1026.31	1029.75	6.79
1	11680	Max WS	876.68	1025.37	1027.93	4.71
1	11501	Max WS	876.68	1019	1027.02	3.05
1	11475.64		Bridge			
1	11421	Max WS	876.69	1017.43	1022.56	6.14
1	11388	Max WS	876.44	1017.17	1022.39	1.1
1	11352.52		Bridge			
1	11290	Max WS	876.27	1016.42	1022.37	0.77
1	10834	Max WS	876.42	1013.45	1022.37	0.4
1	10801.44		Culvert			
1	10741	Max WS	876.42	1012.75	1022.35	0.36
1	10540	Max WS	876.56	1011.75	1022.35	0.28
1	10460	Max WS	3826.49	1012.75	1022.3	1.76
1	10412.74		Bridge			
1	10358	Max WS	3826.48	1011.25	1019.36	9.24
1	9961	Max WS	3825.91	1010	1017.53	3.41
1	9600	Max WS	3825.51	1007.25	1016.9	4.14
1	9393	Max WS	3825.5	1005.75	1016.63	2.49
1	9123	Max WS	3825.37	1005.75	1016.28	3.71
1	8940	Max WS	3825.38	1004.25	1016.03	5.2
1	8893.07		Bridge			
1	8815	Max WS	3825.36	1003.75	1012.51	9.16
1	8353	Max WS	3825.33	1002.25	1009.14	6.85
1	7962	Max WS	3825.32	999.25	1005.52	7.85
1	7489	Max WS	3825.32	991.75	1001.09	8.59
1	7142	Max WS	3825.33	988.75	996.41	7.96
1	6526	Max WS	3825.29	984.5	991.73	3.55
1	5955	Max WS	3825.21	980.5	990.62	3.31
1	5321	Max WS	3825.2	976.2	988.13	5.67

500-year breached

1	5204	Max WS	3825.23	975.4	986.31	13.1
1	5059	Max WS	3825.22	974.4	984.42	4.9
1	4340	Max WS	3815.73	969.4	978.97	3.27
1	3596	Max WS	3804.84	964.25	978.69	0.53
1	2734	Max WS	3804.99	964.25	978.69	0.19
1	2231	Max WS	3803.12	964.25	978.69	0.14
1	1788	Max WS	7792.86	964.25	978.68	0.77
1	1363	Max WS	7792.85	964.25	978.65	1.21
1	1026	Max WS	7793.14	964.25	978.64	0.95
1	618	Max WS	7793.1	964.25	978.64	0.44
1	86	Max WS	7792.51	964.25	978.63	0.92

100-year existing

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	679.22	1026.31	1039.9	0.74
1	16087	Max WS	679.22	1026.31	1039.9	0.15
1	15602	Max WS	680.23	1026.31	1039.9	0.17
1	15275	Max WS	678.71	1026.31	1039.89	0.54
1	14848	Max WS	678.44	1026.31	1039.88	0.15
1	14592	Max WS	678.95	1026.31	1039.88	0.11
1	14277	Max WS	679.41	1026.31	1039.88	0.1
1	13899	Max WS	678.88	1026.31	1039.88	0.17
1	13705	Max WS	678.27	1026.31	1039.88	0.18
1	13459	Max WS	677.79	1026.31	1039.88	0.12
1	13043	Max WS	678.19	1026.31	1039.88	0.21
1	12782	Max WS	677.99	1026.31	1039.88	0.14
1	12345	Max WS	677.95	1026.31	1039.88	0.07
1	12032	Max WS	677.74	1026.31	1039.88	0.13
1	11779	Max WS	677.73	1026.2	1039.88	0.13
1	11745.37		Inl Struct			
1	11680	Max WS	677.74	1025.37	1027.45	5.23
1	11501	Max WS	677.66	1019	1025.74	3.12
1	11475.64		Bridge			
1	11421	Max WS	677.66	1017.43	1022.28	5.22
1	11388	Max WS	677.47	1017.17	1022.16	0.92
1	11352.52		Bridge			
1	11290	Max WS	677.47	1016.42	1022.15	0.71
1	10834	Max WS	677.5	1013.45	1022.14	0.34
1	10801.44		Culvert			
1	10741	Max WS	677.98	1012.75	1022.11	0.3
1	10540	Max WS	677.68	1011.75	1022.11	0.23
1	10460	Max WS	2617.37	1012.75	1022.09	1.31
1	10412.74		Bridge			
1	10358	Max WS	2617.64	1011.25	1018.65	8.26
1	9961	Max WS	2617.59	1010	1016.2	3.4
1	9600	Max WS	2617.37	1007.25	1015.27	4.5
1	9393	Max WS	2617.24	1005.75	1014.8	2.59
1	9123	Max WS	2617.19	1005.75	1014.29	3.74
1	8940	Max WS	2617.15	1004.25	1013.23	8.84
1	8893.07		Bridge			
1	8815	Max WS	2617.17	1003.75	1011.61	7.3
1	8353	Max WS	2617.17	1002.25	1008.4	6.23
1	7962	Max WS	2617.12	999.25	1004.78	6.95
1	7489	Max WS	2617.11	991.75	1000.35	7.58
1	7142	Max WS	2617.09	988.75	995.65	6.86
1	6526	Max WS	2617.08	984.5	990.85	3.03
1	5955	Max WS	2617.05	980.5	989.81	2.8
1	5321	Max WS	2617.09	976.2	986.38	8.86

100-year existing

1	5204	Max WS	2617.07	975.4	985.05	10.62
1	5059	Max WS	2617.03	974.4	983.88	4.38
1	4340	Max WS	2617.02	969.4	978.16	3.74
1	3596	Max WS	2552.24	964.25	976.68	0.45
1	2734	Max WS	2556.7	964.25	976.68	0.15
1	2231	Max WS	2555.64	964.25	976.68	0.11
1	1788	Max WS	5323.84	964.25	976.67	0.64
1	1363	Max WS	5323.02	964.25	976.65	0.99
1	1026	Max WS	5323.72	964.25	976.65	0.78
1	618	Max WS	5322.8	964.25	976.65	0.36
1	86	Max WS	5322.83	964.25	976.63	0.75

100-year breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	682.83	1026.31	1030.73	2.53
1	16087	Max WS	682.83	1026.31	1030.73	0.49
1	15602	Max WS	681.93	1026.31	1030.69	0.55
1	15275	Max WS	677.94	1026.31	1030.39	2.1
1	14848	Max WS	672.85	1026.31	1030.11	0.55
1	14592	Max WS	673.13	1026.31	1030.1	0.42
1	14277	Max WS	672.64	1026.31	1030.08	0.37
1	13899	Max WS	672.21	1026.31	1030.04	0.63
1	13705	Max WS	671.95	1026.31	1030.02	0.71
1	13459	Max WS	671.05	1026.31	1030	0.46
1	13043	Max WS	670.89	1026.31	1029.93	0.81
1	12782	Max WS	670.47	1026.31	1029.9	0.55
1	12345	Max WS	670.33	1026.31	1029.88	0.26
1	12032	Max WS	670.17	1026.31	1029.86	0.51
1	11779	Max WS	670.33	1026.2	1029.83	0.53
1	11757	Max WS	670.29	1026.31	1029.52	5.96
1	11680	Max WS	670.28	1025.37	1027.44	5.22
1	11635.2*	Max WS	670.29	1023.78	1026.48	4.98
1	11590.5*	Max WS	670.28	1022.18	1026.03	3.81
1	11545.7*	Max WS	670.26	1020.59	1025.86	3.15
1	11501	Max WS	670.24	1019	1025.68	3.12
1	11475.64		Bridge			
1	11421	Max WS	670.25	1017.43	1022.28	5.17
1	11388	Max WS	669.96	1017.17	1022.16	0.91
1	11352.52		Bridge			
1	11290	Max WS	670.17	1016.42	1022.15	0.7
1	10834	Max WS	669.9	1013.45	1022.14	0.34
1	10801.44		Culvert			
1	10741	Max WS	670.22	1012.75	1022.11	0.3
1	10540	Max WS	670.17	1011.75	1022.11	0.23
1	10460	Max WS	2609.51	1012.75	1022.09	1.3
1	10412.74		Bridge			
1	10358	Max WS	2610.3	1011.25	1018.64	8.26
1	9961	Max WS	2610.05	1010	1016.19	3.4
1	9600	Max WS	2609.98	1007.25	1015.26	4.51
1	9393	Max WS	2609.84	1005.75	1014.78	2.59
1	9123	Max WS	2609.75	1005.75	1014.28	3.74
1	8940	Max WS	2609.73	1004.25	1013.21	8.83
1	8893.07		Bridge			
1	8815	Max WS	2609.73	1003.75	1011.61	7.28
1	8768.80*	Max WS	2609.72	1003.6	1011.74	3.94
1	8722.60*	Max WS	2609.74	1003.45	1011.55	4.06
1	8676.40*	Max WS	2609.74	1003.3	1011.26	4.28
1	8630.20*	Max WS	2609.72	1003.15	1010.87	4.64

100-year breached

1	8584.00*	Max WS	2607.1	1003	1010.46	5.04
1	8537.80*	Max WS	2607.03	1002.85	1010.03	5.47
1	8491.60*	Max WS	2606.98	1002.7	1009.57	5.95
1	8445.40*	Max WS	2609.66	1002.55	1009.12	6.45
1	8399.20*	Max WS	2609.73	1002.4	1008.69	6.7
1	8353	Max WS	2609.71	1002.25	1008.4	6.23
1	8304.13*	Max WS	2609.75	1001.88	1007.99	6.45
1	8255.25*	Max WS	2609.71	1001.5	1007.57	6.56
1	8206.38*	Max WS	2609.73	1001.12	1007.13	6.67
1	8157.50*	Max WS	2609.76	1000.75	1006.68	6.68
1	8108.63*	Max WS	2609.72	1000.38	1006.24	6.69
1	8059.75*	Max WS	2609.69	1000	1005.78	6.7
1	8010.88*	Max WS	2609.73	999.62	1005.3	6.74
1	7962	Max WS	2609.69	999.25	1004.77	6.94
1	7914.70*	Max WS	2609.74	998.5	1004.34	6.5
1	7867.40*	Max WS	2609.72	997.75	1003.91	6.51
1	7820.10*	Max WS	2609.74	997	1003.48	6.51
1	7772.80*	Max WS	2609.71	996.25	1003.07	6.52
1	7725.50*	Max WS	2609.7	995.5	1002.67	6.51
1	7678.20*	Max WS	2609.71	994.75	1002.27	6.51
1	7630.90*	Max WS	2609.72	994	1001.86	6.56
1	7583.60*	Max WS	2609.69	993.25	1001.44	6.65
1	7536.30*	Max WS	2609.7	992.5	1000.97	6.89
1	7489	Max WS	2609.69	991.75	1000.34	7.57
1	7439.43*	Max WS	2609.69	991.32	999.61	7.77
1	7389.86*	Max WS	2609.73	990.89	998.89	7.84
1	7340.29*	Max WS	2609.7	990.46	998.17	7.81
1	7290.71*	Max WS	2609.69	990.04	997.47	7.7
1	7241.14*	Max WS	2609.66	989.61	996.8	7.52
1	7191.57*	Max WS	2609.73	989.18	996.18	7.2
1	7142	Max WS	2609.67	988.75	995.65	6.85
1	7094.62*	Max WS	2609.69	988.42	995.16	6.66
1	7047.23*	Max WS	2609.7	988.1	994.67	6.49
1	6999.85*	Max WS	2609.73	987.77	994.19	6.32
1	6952.46*	Max WS	2609.72	987.44	993.7	6.17
1	6905.08*	Max WS	2609.7	987.12	993.21	6.04
1	6857.69*	Max WS	2609.67	986.79	992.72	5.91
1	6810.31*	Max WS	2609.68	986.46	992.25	5.75
1	6762.92*	Max WS	2609.72	986.13	991.81	5.5
1	6715.54*	Max WS	2609.71	985.81	991.45	5.11
1	6668.15*	Max WS	2609.7	985.48	991.19	4.6
1	6620.77*	Max WS	2609.7	985.15	991.02	4.02
1	6573.39*	Max WS	2609.72	984.83	990.92	3.45
1	6526	Max WS	2609.68	984.5	990.85	3.03
1	6478.42*	Max WS	2609.67	984.17	990.76	3.04
1	6430.83*	Max WS	2609.66	983.83	990.67	3.04

100-year breached

1	6383.25*	Max WS	2609.67	983.5	990.58	3.03
1	6335.67*	Max WS	2609.7	983.17	990.49	3.01
1	6288.08*	Max WS	2609.64	982.83	990.4	2.99
1	6240.50*	Max WS	2609.67	982.5	990.31	2.96
1	6192.92*	Max WS	2609.63	982.17	990.23	2.93
1	6145.33*	Max WS	2609.65	981.83	990.14	2.9
1	6097.75*	Max WS	2609.63	981.5	990.06	2.87
1	6050.17*	Max WS	2609.61	981.17	989.97	2.85
1	6002.58*	Max WS	2609.61	980.83	989.89	2.82
1	5955	Max WS	2609.64	980.5	989.81	2.79
1	5906.23*	Max WS	2609.62	980.17	989.71	2.83
1	5857.46*	Max WS	2609.6	979.84	989.62	2.87
1	5808.69*	Max WS	2609.6	979.51	989.51	2.92
1	5759.92*	Max WS	2609.65	979.18	989.4	2.97
1	5711.15*	Max WS	2609.57	978.85	989.28	3.04
1	5662.39*	Max WS	2609.64	978.52	989.15	3.11
1	5613.62*	Max WS	2609.62	978.18	989	3.21
1	5564.85*	Max WS	2609.58	977.85	988.84	3.33
1	5516.08*	Max WS	2609.56	977.52	988.64	3.49
1	5467.31*	Max WS	2609.63	977.19	988.4	3.75
1	5418.54*	Max WS	2609.57	976.86	988.05	4.23
1	5369.77*	Max WS	2609.63	976.53	987.21	6.39
1	5321	Max WS	2609.65	976.2	986.37	8.85
1	5282.00*	Max WS	2609.64	975.93	986.26	7.02
1	5243.00*	Max WS	2609.59	975.67	985.86	7.3
1	5204	Max WS	2609.61	975.4	985.04	10.6
1	5155.67*	Max WS	2609.6	975.07	984.81	6.54
1	5107.33*	Max WS	2609.63	974.73	984.33	5.16
1	5059	Max WS	2609.58	974.4	983.88	4.38
1	5011.07*	Max WS	2609.61	974.07	983.45	4.22
1	4963.13*	Max WS	2609.57	973.73	983.05	4.07
1	4915.20*	Max WS	2609.56	973.4	982.65	3.94
1	4867.27*	Max WS	2609.6	973.07	982.27	3.83
1	4819.33*	Max WS	2609.56	972.73	981.89	3.72
1	4771.40*	Max WS	2609.54	972.4	981.52	3.64
1	4723.47*	Max WS	2609.59	972.07	981.15	3.58
1	4675.53*	Max WS	2609.59	971.73	980.78	3.52
1	4627.60*	Max WS	2609.64	971.4	980.43	3.46
1	4579.67*	Max WS	2609.47	971.07	980.07	3.41
1	4531.73*	Max WS	2609.6	970.73	979.72	3.36
1	4483.80*	Max WS	2609.6	970.4	979.38	3.32
1	4435.87*	Max WS	2609.53	970.07	979.02	3.3
1	4387.93*	Max WS	2609.56	969.73	978.65	3.35
1	4340	Max WS	2609.56	969.4	978.15	3.73
1	4290.40*	Max WS	2608.46	969.06	977.6	3.68
1	4240.80*	Max WS	2588.94	968.71	977.15	3.35

100-year breached

1	4191.20*	Max WS	2566.98	968.37	976.89	2.71
1	4141.60*	Max WS	2567	968.03	976.77	2.1
1	4092.00*	Max WS	2567	967.68	976.72	1.65
1	4042.40*	Max WS	2553.95	967.34	976.7	1.34
1	3992.80*	Max WS	2551.01	967	976.69	1.12
1	3943.20*	Max WS	2551.83	966.65	976.69	0.97
1	3893.60*	Max WS	2549.62	966.31	976.69	0.85
1	3844.00*	Max WS	2548.3	965.97	976.68	0.75
1	3794.40*	Max WS	2551.11	965.62	976.68	0.67
1	3744.80*	Max WS	2550.01	965.28	976.68	0.6
1	3695.20*	Max WS	2548.68	964.94	976.68	0.54
1	3645.60*	Max WS	2548.9	964.59	976.68	0.5
1	3596	Max WS	2551.15	964.25	976.68	0.45
1	3548.11*	Max WS	2547.99	964.25	976.68	0.41
1	3500.22*	Max WS	2548.35	964.25	976.68	0.37
1	3452.33*	Max WS	2548.41	964.25	976.68	0.34
1	3404.44*	Max WS	2548.52	964.25	976.68	0.31
1	3356.56*	Max WS	2548.4	964.25	976.68	0.29
1	3308.67*	Max WS	2548.59	964.25	976.68	0.27
1	3260.78*	Max WS	2549.75	964.25	976.68	0.25
1	3212.89*	Max WS	2549.61	964.25	976.68	0.24
1	3165.00*	Max WS	2550.29	964.25	976.68	0.23
1	3117.11*	Max WS	2551.34	964.25	976.68	0.22
1	3069.22*	Max WS	2547.35	964.25	976.68	0.21
1	3021.33*	Max WS	2549.59	964.25	976.68	0.2
1	2973.44*	Max WS	2551.09	964.25	976.68	0.19
1	2925.56*	Max WS	2549.65	964.25	976.68	0.18
1	2877.67*	Max WS	2550.22	964.25	976.68	0.17
1	2829.78*	Max WS	2547.53	964.25	976.68	0.16
1	2781.89*	Max WS	2550.07	964.25	976.68	0.16
1	2734	Max WS	2549.9	964.25	976.68	0.15
1	2566.33*	Max WS	2549.68	964.25	976.68	0.13
1	2398.67*	Max WS	2551.64	964.25	976.68	0.12
1	2231	Max WS	2550.6	964.25	976.68	0.11
1	2083.33*	Max WS	5320.97	964.25	976.68	0.3
1	1935.67*	Max WS	5319.83	964.25	976.68	0.41
1	1788	Max WS	5320.69	964.25	976.67	0.64
1	1646.33*	Max WS	5320.06	964.25	976.67	0.73
1	1504.67*	Max WS	5320.61	964.25	976.66	0.83
1	1363	Max WS	5320.62	964.25	976.65	0.99
1	1194.50*	Max WS	5321.16	964.25	976.65	0.88
1	1026	Max WS	5320.92	964.25	976.64	0.78
1	890.00*	Max WS	5320.69	964.25	976.64	0.57
1	754.00*	Max WS	5319.27	964.25	976.64	0.45
1	618	Max WS	5320.12	964.25	976.64	0.36
1	440.67*	Max WS	5320.32	964.25	976.64	0.44

100-year breached

1	263.33*	Max WS	5319.64	964.25	976.64	0.56
1	86	Max WS	5319.63	964.25	976.63	0.75

50-year existing

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	631.07	1026.31	1039.86	0.69
1	16087	Max WS	631	1026.31	1039.86	0.14
1	15602	Max WS	630.69	1026.31	1039.86	0.16
1	15275	Max WS	630.4	1026.31	1039.85	0.51
1	14848	Max WS	629.28	1026.31	1039.85	0.14
1	14592	Max WS	629.33	1026.31	1039.85	0.11
1	14277	Max WS	630.23	1026.31	1039.85	0.09
1	13899	Max WS	629.08	1026.31	1039.85	0.16
1	13705	Max WS	629.1	1026.31	1039.85	0.17
1	13459	Max WS	629.37	1026.31	1039.85	0.11
1	13043	Max WS	628.89	1026.31	1039.85	0.19
1	12782	Max WS	628.91	1026.31	1039.84	0.13
1	12345	Max WS	628.64	1026.31	1039.84	0.06
1	12032	Max WS	628.69	1026.31	1039.84	0.12
1	11779	Max WS	628.54	1026.2	1039.84	0.12
1	11745.37		Inl Struct			
1	11680	Max WS	628.61	1025.37	1027.36	5.19
1	11501	Max WS	628.52	1019	1025.4	3.11
1	11475.64		Bridge			
1	11421	Max WS	618.91	1017.43	1021.75	5.69
1	11388	Max WS	617.54	1017.17	1021.61	1.03
1	11352.52		Bridge			
1	11290	Max WS	617.2	1016.42	1021.59	0.83
1	10834	Max WS	616.59	1013.45	1021.52	2.14
1	10801.44		Culvert			
1	10741	Max WS	614.41	1012.75	1020.91	0.61
1	10540	Max WS	614.23	1011.75	1020.91	0.36
1	10460	Max WS	1140.16	1012.75	1020.89	1.33
1	10412.74		Bridge			
1	10358	Max WS	1140.14	1011.25	1016.89	7.13
1	9961	Max WS	1140.12	1010	1014.77	2.54
1	9600	Max WS	1140.12	1007.25	1013.35	4.94
1	9393	Max WS	1140.12	1005.75	1012.29	2.69
1	9123	Max WS	1140.08	1005.75	1011.32	3.31
1	8940	Max WS	1140.06	1004.25	1010.46	6.26
1	8893.07		Bridge			
1	8815	Max WS	1140.08	1003.75	1010.08	4.39
1	8353	Max WS	1140.07	1002.25	1007.15	5.16
1	7962	Max WS	1140.06	999.25	1003.6	5.17
1	7489	Max WS	1140.02	991.75	999.15	5.9
1	7142	Max WS	1140.03	988.75	994.37	4.97
1	6526	Max WS	1140.04	984.5	989.31	2.23
1	5955	Max WS	1139.99	980.5	988.04	2.45
1	5321	Max WS	1139.98	976.2	983.61	5.57

50-year existing

1	5204	Max WS	1139.97	975.4	983	6.12
1	5059	Max WS	1139.98	974.4	982.64	3.76
1	4340	Max WS	1139.85	969.4	977.35	3.31
1	3596	Max WS	1090.5	964.25	974.48	0.27
1	2734	Max WS	1090.01	964.25	974.48	0.08
1	2231	Max WS	1089.98	964.25	974.48	0.06
1	1788	Max WS	3408.59	964.25	974.47	0.53
1	1363	Max WS	3408.5	964.25	974.46	0.79
1	1026	Max WS	3408.64	964.25	974.45	0.63
1	618	Max WS	3408.76	964.25	974.45	0.29
1	86	Max WS	3408.19	964.25	974.44	0.61

50-year breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	682.83	1026.31	1030.73	2.53
1	16087	Max WS	682.83	1026.31	1030.73	0.49
1	15602	Max WS	681.93	1026.31	1030.69	0.55
1	15275	Max WS	677.94	1026.31	1030.39	2.1
1	14848	Max WS	672.85	1026.31	1030.11	0.55
1	14592	Max WS	673.13	1026.31	1030.1	0.42
1	14277	Max WS	672.64	1026.31	1030.08	0.37
1	13899	Max WS	672.21	1026.31	1030.04	0.63
1	13705	Max WS	671.95	1026.31	1030.02	0.71
1	13459	Max WS	671.05	1026.31	1030	0.46
1	13043	Max WS	670.89	1026.31	1029.93	0.81
1	12782	Max WS	670.47	1026.31	1029.9	0.55
1	12345	Max WS	670.33	1026.31	1029.88	0.26
1	12032	Max WS	670.17	1026.31	1029.86	0.51
1	11779	Max WS	670.33	1026.2	1029.83	0.53
1	11757	Max WS	670.29	1026.31	1029.52	5.96
1	11680	Max WS	670.28	1025.37	1027.44	5.22
1	11501	Max WS	670.24	1019	1025.68	3.12
1	11475.64		Bridge			
1	11421	Max WS	670.25	1017.43	1022.28	5.17
1	11388	Max WS	669.96	1017.17	1022.16	0.91
1	11352.52		Bridge			
1	11290	Max WS	670.17	1016.42	1022.15	0.7
1	10834	Max WS	669.9	1013.45	1022.14	0.34
1	10801.44		Culvert			
1	10741	Max WS	670.22	1012.75	1022.11	0.3
1	10540	Max WS	670.17	1011.75	1022.11	0.23
1	10460	Max WS	2609.51	1012.75	1022.09	1.3
1	10412.74		Bridge			
1	10358	Max WS	2610.3	1011.25	1018.64	8.26
1	9961	Max WS	2610.05	1010	1016.19	3.4
1	9600	Max WS	2609.98	1007.25	1015.26	4.51
1	9393	Max WS	2609.84	1005.75	1014.78	2.59
1	9123	Max WS	2609.75	1005.75	1014.28	3.74
1	8940	Max WS	2609.73	1004.25	1013.21	8.83
1	8893.07		Bridge			
1	8815	Max WS	2609.73	1003.75	1011.61	7.28
1	8353	Max WS	2609.71	1002.25	1008.4	6.23
1	7962	Max WS	2609.69	999.25	1004.77	6.94
1	7489	Max WS	2609.69	991.75	1000.34	7.57
1	7142	Max WS	2609.67	988.75	995.65	6.85
1	6526	Max WS	2609.68	984.5	990.85	3.03
1	5955	Max WS	2609.64	980.5	989.81	2.79
1	5321	Max WS	2609.65	976.2	986.37	8.85

50-year breached

1	5204	Max WS	2609.61	975.4	985.04	10.6
1	5059	Max WS	2609.58	974.4	983.88	4.38
1	4340	Max WS	2609.56	969.4	978.15	3.73
1	3596	Max WS	2551.15	964.25	976.68	0.45
1	2734	Max WS	2549.9	964.25	976.68	0.15
1	2231	Max WS	2550.6	964.25	976.68	0.11
1	1788	Max WS	5320.69	964.25	976.67	0.64
1	1363	Max WS	5320.62	964.25	976.65	0.99
1	1026	Max WS	5320.92	964.25	976.64	0.78
1	618	Max WS	5320.12	964.25	976.64	0.36
1	86	Max WS	5319.63	964.25	976.63	0.75

10-year existing

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	509.26	1026.31	1039.77	0.56
1	16087	Max WS	509.22	1026.31	1039.77	0.11
1	15602	Max WS	510.84	1026.31	1039.77	0.13
1	15275	Max WS	510.55	1026.31	1039.76	0.41
1	14848	Max WS	509.95	1026.31	1039.76	0.12
1	14592	Max WS	508.3	1026.31	1039.76	0.09
1	14277	Max WS	508.42	1026.31	1039.76	0.08
1	13899	Max WS	509.77	1026.31	1039.76	0.13
1	13705	Max WS	509.69	1026.31	1039.76	0.14
1	13459	Max WS	509.58	1026.31	1039.76	0.09
1	13043	Max WS	509.29	1026.31	1039.76	0.16
1	12782	Max WS	508.8	1026.31	1039.76	0.1
1	12345	Max WS	509.24	1026.31	1039.76	0.05
1	12032	Max WS	509.26	1026.31	1039.76	0.1
1	11779	Max WS	508.77	1026.2	1039.76	0.1
1	11745.37		Inl Struct			
1	11680	Max WS	508.9	1025.37	1027.13	4.98
1	11501	Max WS	508.81	1019	1024.55	3.05
1	11475.64		Bridge			
1	11421	Max WS	508.8	1017.43	1020.35	7.47
1	11388	Max WS	508.78	1017.17	1019.69	2.86
1	11352.52		Bridge			
1	11290	Max WS	508.77	1016.42	1019.16	4.18
1	10834	Max WS	508.71	1013.45	1018.18	4.22
1	10801.44		Culvert			
1	10741	Max WS	508.68	1012.75	1017.56	1.76
1	10540	Max WS	508.68	1011.75	1017.49	1.56
1	10460	Max WS	613.66	1012.75	1017.17	3.72
1	10412.74		Bridge			
1	10358	Max WS	613.67	1011.25	1015.7	5.64
1	9961	Max WS	613.61	1010	1014.06	2.07
1	9600	Max WS	613.59	1007.25	1012.58	4.7
1	9393	Max WS	613.58	1005.75	1011.28	2.55
1	9123	Max WS	613.54	1005.75	1009.94	2.89
1	8940	Max WS	613.53	1004.25	1009.35	4.38
1	8893.07		Bridge			
1	8815	Max WS	613.56	1003.75	1009.09	3.12
1	8353	Max WS	613.53	1002.25	1006.43	4.3
1	7962	Max WS	613.5	999.25	1002.96	4.1
1	7489	Max WS	613.52	991.75	998.08	6.12
1	7142	Max WS	613.51	988.75	993.5	4.15
1	6526	Max WS	613.49	984.5	988.5	1.8
1	5955	Max WS	613.48	980.5	985.14	5.72
1	5321	Max WS	613.47	976.2	981.09	4.76

10-year existing

1	5204	Max WS	613.47	975.4	980.49	5.05
1	5059	Max WS	613.44	974.4	979.39	6.25
1	4340	Max WS	613.22	969.4	975.93	3.82
1	3596	Max WS	573.64	964.25	972.66	0.21
1	2734	Max WS	573.27	964.25	972.66	0.06
1	2231	Max WS	572.69	964.25	972.66	0.04
1	1788	Max WS	1962.66	964.25	972.66	0.39
1	1363	Max WS	1962.55	964.25	972.65	0.58
1	1026	Max WS	1962.65	964.25	972.64	0.46
1	618	Max WS	1962.4	964.25	972.64	0.21
1	86	Max WS	1962.4	964.25	972.63	0.45

10-year breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	512.95	1026.31	1030.27	2.12
1	16087	Max WS	513.06	1026.31	1030.26	0.41
1	15602	Max WS	512.62	1026.31	1030.23	0.46
1	15275	Max WS	510.36	1026.31	1030	1.75
1	14848	Max WS	507.67	1026.31	1029.78	0.46
1	14592	Max WS	506.47	1026.31	1029.77	0.34
1	14277	Max WS	507.24	1026.31	1029.76	0.3
1	13899	Max WS	507	1026.31	1029.72	0.52
1	13705	Max WS	506.84	1026.31	1029.7	0.58
1	13459	Max WS	506.1	1026.31	1029.69	0.38
1	13043	Max WS	505.83	1026.31	1029.64	0.67
1	12782	Max WS	505.75	1026.31	1029.61	0.45
1	12345	Max WS	505.65	1026.31	1029.6	0.21
1	12032	Max WS	505.62	1026.31	1029.59	0.42
1	11779	Max WS	505.53	1026.2	1029.57	0.43
1	11757	Max WS	505.5	1026.31	1029.24	5.45
1	11680	Max WS	505.53	1025.37	1027.12	4.97
1	11501	Max WS	505.52	1019	1024.53	3.05
1	11475.64		Bridge			
1	11421	Max WS	505.52	1017.43	1020.34	7.45
1	11388	Max WS	505.47	1017.17	1019.69	2.85
1	11352.52		Bridge			
1	11290	Max WS	505.51	1016.42	1019.15	4.22
1	10834	Max WS	505.45	1013.45	1018.16	4.23
1	10801.44		Culvert			
1	10741	Max WS	505.44	1012.75	1017.55	1.75
1	10540	Max WS	505.41	1011.75	1017.48	1.56
1	10460	Max WS	610.41	1012.75	1017.16	3.71
1	10412.74		Bridge			
1	10358	Max WS	610.41	1011.25	1015.69	5.63
1	9961	Max WS	610.38	1010	1014.05	2.06
1	9600	Max WS	610.34	1007.25	1012.58	4.7
1	9393	Max WS	610.33	1005.75	1011.27	2.55
1	9123	Max WS	610.31	1005.75	1009.93	2.89
1	8940	Max WS	610.31	1004.25	1009.34	4.37
1	8893.07		Bridge			
1	8815	Max WS	610.31	1003.75	1009.08	3.11
1	8353	Max WS	610.29	1002.25	1006.42	4.3
1	7962	Max WS	610.29	999.25	1002.96	4.1
1	7489	Max WS	610.28	991.75	998.06	6.15
1	7142	Max WS	610.27	988.75	993.49	4.14
1	6526	Max WS	610.25	984.5	988.49	1.8
1	5955	Max WS	610.25	980.5	985.12	5.71
1	5321	Max WS	610.22	976.2	981.07	4.75

10-year breached

1	5204	Max WS	610.2	975.4	980.48	5.04
1	5059	Max WS	610.16	974.4	979.37	6.24
1	4340	Max WS	609.98	969.4	975.88	3.83
1	3596	Max WS	572.34	964.25	972.66	0.21
1	2734	Max WS	572.61	964.25	972.66	0.06
1	2231	Max WS	571.57	964.25	972.66	0.04
1	1788	Max WS	1961.88	964.25	972.66	0.39
1	1363	Max WS	1961.39	964.25	972.64	0.58
1	1026	Max WS	1961.59	964.25	972.64	0.46
1	618	Max WS	1961.13	964.25	972.64	0.21
1	86	Max WS	1961.29	964.25	972.63	0.45

2yr - existing

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	407.43	1026.31	1039.68	0.46
1	16087	Max WS	407.14	1026.31	1039.68	0.09
1	15602	Max WS	407.8	1026.31	1039.68	0.1
1	15275	Max WS	407.76	1026.31	1039.67	0.33
1	14848	Max WS	407.18	1026.31	1039.67	0.09
1	14592	Max WS	406.79	1026.31	1039.67	0.07
1	14277	Max WS	407.22	1026.31	1039.67	0.06
1	13899	Max WS	406.42	1026.31	1039.67	0.1
1	13705	Max WS	406.18	1026.31	1039.67	0.11
1	13459	Max WS	406.78	1026.31	1039.67	0.07
1	13043	Max WS	406.77	1026.31	1039.67	0.13
1	12782	Max WS	406.45	1026.31	1039.67	0.08
1	12345	Max WS	406.1	1026.31	1039.67	0.04
1	12032	Max WS	406.15	1026.31	1039.67	0.08
1	11779	Max WS	405.86	1026.2	1039.67	0.08
1	11745.37		Inl Struct			
1	11680	Max WS	405.96	1025.37	1026.95	4.62
1	11501	Max WS	405.87	1019	1023.78	2.97
1	11475.64		Bridge			
1	11421	Max WS	405.85	1017.43	1020.07	6.66
1	11388	Max WS	405.85	1017.17	1019.56	2.6
1	11352.52		Bridge			
1	11290	Max WS	405.87	1016.42	1018.91	4.93
1	10834	Max WS	405.84	1013.45	1017.56	4.13
1	10801.44		Culvert			
1	10741	Max WS	405.83	1012.75	1016.9	1.82
1	10540	Max WS	405.82	1011.75	1016.73	2.02
1	10460	Max WS	450.78	1012.75	1016.41	3.55
1	10412.74		Bridge			
1	10358	Max WS	450.81	1011.25	1015.15	5.03
1	9961	Max WS	450.67	1010	1013.7	1.97
1	9600	Max WS	450.63	1007.25	1012.3	4.4
1	9393	Max WS	450.63	1005.75	1010.89	2.53
1	9123	Max WS	450.6	1005.75	1009.28	2.82
1	8940	Max WS	450.58	1004.25	1008.72	3.81
1	8893.07		Bridge			
1	8815	Max WS	450.57	1003.75	1008.41	2.93
1	8353	Max WS	450.54	1002.25	1005.35	4.77
1	7962	Max WS	450.52	999.25	1001.95	5.81
1	7489	Max WS	450.52	991.75	996.3	7.82
1	7142	Max WS	450.52	988.75	992.93	3.94
1	6526	Max WS	450.51	984.5	988.2	1.61
1	5955	Max WS	450.51	980.5	984.31	5.15
1	5321	Max WS	450.5	976.2	980.18	4.37

2yr - existing

1	5204	Max WS	450.5	975.4	979.6	4.54
1	5059	Max WS	450.5	974.4	978.54	5.59
1	4340	Max WS	450.37	969.4	974.46	3.78
1	3596	Max WS	413.98	964.25	971.15	0.24
1	2734	Max WS	413.56	964.25	971.15	0.06
1	2231	Max WS	413.5	964.25	971.15	0.04
1	1788	Max WS	1040.17	964.25	971.15	0.26
1	1363	Max WS	1040.25	964.25	971.14	0.39
1	1026	Max WS	1040.19	964.25	971.14	0.31
1	618	Max WS	1039.77	964.25	971.14	0.15
1	86	Max WS	1039.81	964.25	971.13	0.3

2-year breached

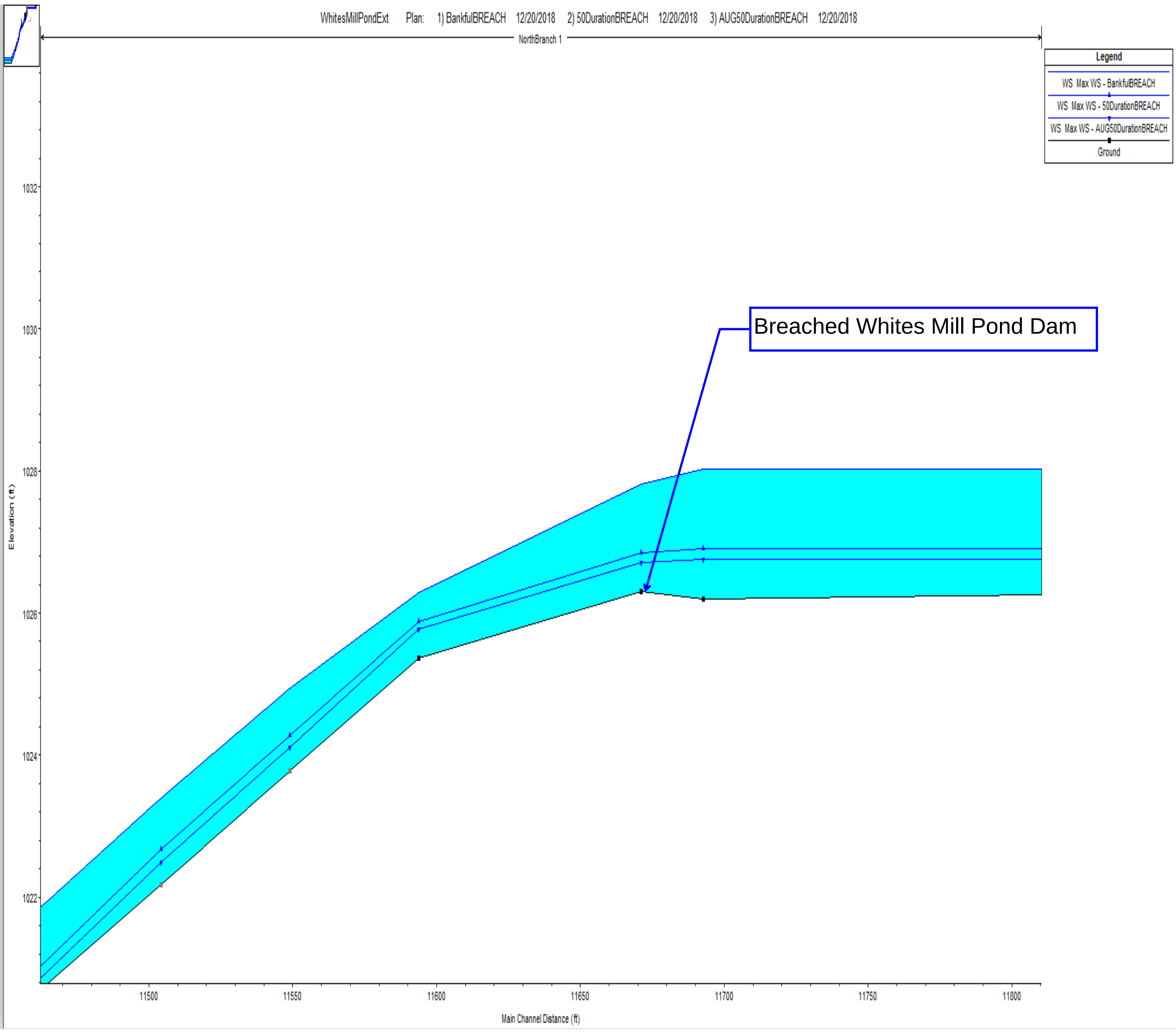
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	413.04	1026.31	1029.96	1.86
1	16087	Max WS	412.57	1026.31	1029.95	0.36
1	15602	Max WS	412.34	1026.31	1029.93	0.4
1	15275	Max WS	409.63	1026.31	1029.74	1.51
1	14848	Max WS	298.16	1026.31	1029.61	0.28
1	14592	Max WS	296.09	1026.31	1029.61	0.21
1	14277	Max WS	294.3	1026.31	1029.61	0.18
1	13899	Max WS	292.24	1026.31	1029.59	0.31
1	13705	Max WS	289.88	1026.31	1029.59	0.34
1	13459	Max WS	284.88	1026.31	1029.58	0.22
1	13043	Max WS	281.98	1026.31	1029.57	0.38
1	12782	Max WS	271.68	1026.31	1029.56	0.24
1	12345	Max WS	262.87	1026.31	1029.55	0.11
1	12032	Max WS	241.89	1026.31	1029.55	0.2
1	11779	Max WS	300	1026.2	1029.53	0.26
1	11757	Max WS	456.91	1026.31	1029.16	5.24
1	11680	Max WS	456.75	1025.37	1027.04	4.82
1	11501	Max WS	452.67	1019	1024.14	3.01
1	11475.64		Bridge			
1	11421	Max WS	452.58	1017.43	1020.2	7.03
1	11388	Max WS	451.4	1017.17	1019.63	2.66
1	11352.52		Bridge			
1	11290	Max WS	434.21	1016.42	1019	4.53
1	10834	Max WS	438.22	1013.45	1017.78	4.15
1	10801.44		Culvert			
1	10741	Max WS	433.45	1012.75	1017.01	1.86
1	10540	Max WS	433.12	1011.75	1016.85	2.03
1	10460	Max WS	478.08	1012.75	1016.53	3.62
1	10412.74		Bridge			
1	10358	Max WS	476.28	1011.25	1015.21	5.2
1	9961	Max WS	462.33	1010	1013.73	1.98
1	9600	Max WS	462.1	1007.25	1012.33	4.4
1	9393	Max WS	461.68	1005.75	1010.91	2.55
1	9123	Max WS	458.2	1005.75	1009.31	2.83
1	8940	Max WS	457.86	1004.25	1008.74	3.84
1	8893.07		Bridge			
1	8815	Max WS	457.4	1003.75	1008.44	2.94
1	8353	Max WS	456.2	1002.25	1005.38	4.77
1	7962	Max WS	455.31	999.25	1001.97	5.82
1	7489	Max WS	455.2	991.75	996.33	7.85
1	7142	Max WS	455.02	988.75	992.95	3.94
1	6526	Max WS	454.4	984.5	988.21	1.61
1	5955	Max WS	455.58	980.5	984.33	5.17
1	5321	Max WS	453.95	976.2	980.2	4.38

2-year breached

1	5204	Max WS	453.82	975.4	979.61	4.56
1	5059	Max WS	453.49	974.4	978.55	5.61
1	4340	Max WS	448.96	969.4	974.44	3.79
1	3596	Max WS	414.04	964.25	971.16	0.24
1	2734	Max WS	413.72	964.25	971.15	0.06
1	2231	Max WS	413.7	964.25	971.15	0.04
1	1788	Max WS	1040.7	964.25	971.15	0.26
1	1363	Max WS	1040.66	964.25	971.15	0.4
1	1026	Max WS	1040.6	964.25	971.14	0.31
1	618	Max WS	1040.42	964.25	971.14	0.15
1	86	Max WS	1040.37	964.25	971.14	0.3

Fish Passage Evaluation Attachment

Flow Event	Flow (cfs)	Velocity (f/s)	Depth (ft)
Bankfull	94.0	4.2	1.5
50% Duration	10.0	1.3	0.5
August 50% Duration	4.9	0.8	0.4



August 50% Duration breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	4.5	1026.31	1026.78	0.16
1	16087	Max WS	4.48	1026.31	1026.78	0.03
1	15602	Max WS	4.46	1026.31	1026.78	0.03
1	15275	Max WS	4.42	1026.31	1026.76	0.13
1	14848	Max WS	1.88	1026.31	1026.75	0.01
1	14592	Max WS	3.82	1026.31	1026.75	0.02
1	14277	Max WS	3.35	1026.31	1026.75	0.02
1	13899	Max WS	3.88	1026.31	1026.75	0.03
1	13705	Max WS	3.31	1026.31	1026.75	0.03
1	13459	Max WS	3.33	1026.31	1026.75	0.02
1	13043	Max WS	2.73	1026.31	1026.75	0.03
1	12782	Max WS	2.57	1026.31	1026.75	0.02
1	12345	Max WS	2.62	1026.31	1026.75	0.01
1	12032	Max WS	1.27	1026.31	1026.75	0.01
1	11779	Max WS	4.5	1026.2	1026.75	0.02
1	11757	Max WS	4.89	1026.31	1026.72	0.8
1	11680	Max WS	4.5	1025.37	1025.77	0.89
1	11501	Max WS	5.51	1019	1019.36	0.77
1	11475.64		Bridge			
1	11421	Max WS	5.36	1017.43	1017.93	0.49
1	11388	Max WS	5.35	1017.17	1017.8	1.53
1	11352.52		Bridge			
1	11290	Max WS	4.5	1016.42	1016.92	1.31
1	10834	Max WS	5.27	1013.45	1013.66	1.35
1	10801.44		Culvert			
1	10741	Max WS	5.17	1012.75	1013.43	0.22
1	10540	Max WS	5.16	1011.75	1013.42	0.1
1	10460	Max WS	9.16	1012.75	1013.31	0.78
1	10412.74		Bridge			
1	10358	Max WS	4.5	1011.25	1012.33	0.24
1	9961	Max WS	9.31	1010	1010.2	1.23
1	9600	Max WS	9.29	1007.25	1007.97	1.16
1	9393	Max WS	9.09	1005.75	1007.67	0.39
1	9123	Max WS	9.51	1005.75	1005.99	1.38
1	8940	Max WS	9.5	1004.25	1004.77	0.79
1	8893.07		Bridge			
1	8815	Max WS	9.49	1003.75	1004.2	0.98
1	8353	Max WS	9.41	1002.25	1002.55	1.16
1	7962	Max WS	9.39	999.25	999.47	1.58
1	7489	Max WS	9.39	991.75	992.24	1.79
1	7142	Max WS	9.38	988.75	989.08	1.19
1	6526	Max WS	9.37	984.5	984.87	1.28
1	5955	Max WS	9.36	980.5	980.84	1.22
1	5321	Max WS	9.36	976.2	976.53	1.18

August 50% Duration breached

1	5204	Max WS	9.36	975.4	975.75	1.19
1	5059	Max WS	9.35	974.4	974.78	1.32
1	4340	Max WS	9.34	969.4	969.77	1.26
1	3596	Max WS	8.56	964.25	968.23	0.05
1	2734	Max WS	8.27	964.25	968.23	0
1	2231	Max WS	8.39	964.25	968.23	0
1	1788	Max WS	18.95	964.25	968.23	0.01
1	1363	Max WS	18.85	964.25	968.23	0.02
1	1026	Max WS	18.95	964.25	968.23	0.01
1	618	Max WS	18.67	964.25	968.23	0.01
1	86	Max WS	18.58	964.25	968.23	0.01

50% duration breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	11.1	1026.31	1027	0.27
1	16087	Max WS	11.05	1026.31	1026.99	0.05
1	15602	Max WS	11.02	1026.31	1026.99	0.06
1	15275	Max WS	10.94	1026.31	1026.96	0.22
1	14848	Max WS	10.86	1026.31	1026.93	0.05
1	14592	Max WS	10.81	1026.31	1026.93	0.04
1	14277	Max WS	10.66	1026.31	1026.93	0.04
1	13899	Max WS	10.61	1026.31	1026.92	0.06
1	13705	Max WS	10.55	1026.31	1026.92	0.07
1	13459	Max WS	10.48	1026.31	1026.92	0.04
1	13043	Max WS	10.36	1026.31	1026.91	0.08
1	12782	Max WS	10.35	1026.31	1026.91	0.05
1	12345	Max WS	10.15	1026.31	1026.91	0.02
1	12032	Max WS	10.03	1026.31	1026.9	0.05
1	11779	Max WS	9.97	1026.2	1026.9	0.04
1	11757	Max WS	9.95	1026.31	1026.84	1.25
1	11680	Max WS	11.1	1025.37	1025.88	1.06
1	11501	Max WS	13.43	1019	1019.59	1.12
1	11475.64		Bridge			
1	11421	Max WS	11.1	1017.43	1018.26	0.61
1	11388	Max WS	12.22	1017.17	1018.09	2.07
1	11352.52		Bridge			
1	11290	Max WS	12.22	1016.42	1017.16	2.12
1	10834	Max WS	13.12	1013.45	1013.83	1.8
1	10801.44		Culvert			
1	10741	Max WS	12.98	1012.75	1013.7	0.38
1	10540	Max WS	12.06	1011.75	1013.69	0.2
1	10460	Max WS	20.67	1012.75	1013.56	1.05
1	10412.74		Bridge			
1	10358	Max WS	19.8	1011.25	1012.29	1.11
1	9961	Max WS	20.59	1010	1010.38	1.44
1	9600	Max WS	20.62	1007.25	1008.33	1.68
1	9393	Max WS	19.8	1005.75	1007.83	0.78
1	9123	Max WS	19.8	1005.75	1006.16	1.65
1	8940	Max WS	20.57	1004.25	1004.99	1.19
1	8893.07		Bridge			
1	8815	Max WS	20.56	1003.75	1004.5	1.26
1	8353	Max WS	19.8	1002.25	1002.73	1.52
1	7962	Max WS	19.8	999.25	999.64	1.93
1	7489	Max WS	20.57	991.75	992.53	2.41
1	7142	Max WS	20.51	988.75	989.28	1.59
1	6526	Max WS	20.45	984.5	985.1	1.69
1	5955	Max WS	20.43	980.5	981.06	1.62
1	5321	Max WS	20.42	976.2	976.74	1.58

50% duration breached

1	5204	Max WS	20.42	975.4	975.97	1.58
1	5059	Max WS	20.42	974.4	975.03	1.77
1	4340	Max WS	20.41	969.4	970.01	1.66
1	3596	Max WS	20.3	964.25	968.45	0.08
1	2734	Max WS	20.26	964.25	968.45	0.01
1	2231	Max WS	20.47	964.25	968.45	0
1	1788	Max WS	49.62	964.25	968.45	0.03
1	1363	Max WS	49.34	964.25	968.45	0.04
1	1026	Max WS	49.36	964.25	968.45	0.03
1	618	Max WS	49.22	964.25	968.45	0.01
1	86	Max WS	49.14	964.25	968.45	0.03

Bankfull breached

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)
1	16366	Max WS	94.5	1026.31	1028.25	0.8
1	16087	Max WS	94.47	1026.31	1028.24	0.15
1	15602	Max WS	94.38	1026.31	1028.23	0.17
1	15275	Max WS	94.39	1026.31	1028.16	0.65
1	14848	Max WS	94.36	1026.31	1028.09	0.17
1	14592	Max WS	94.33	1026.31	1028.09	0.12
1	14277	Max WS	94.29	1026.31	1028.08	0.11
1	13899	Max WS	94.34	1026.31	1028.07	0.19
1	13705	Max WS	94.28	1026.31	1028.07	0.21
1	13459	Max WS	94.23	1026.31	1028.06	0.13
1	13043	Max WS	94.12	1026.31	1028.05	0.24
1	12782	Max WS	94.19	1026.31	1028.04	0.16
1	12345	Max WS	94.08	1026.31	1028.04	0.07
1	12032	Max WS	93.95	1026.31	1028.03	0.15
1	11779	Max WS	93.98	1026.2	1028.03	0.15
1	11757	Max WS	93.98	1026.31	1027.81	4.17
1	11680	Max WS	94.5	1025.37	1026.28	2.55
1	11501	Max WS	96.04	1019	1020.89	2.23
1	11475.64		Bridge			
1	11421	Max WS	94.5	1017.43	1019	2.69
1	11388	Max WS	95.26	1017.17	1018.77	2.21
1	11352.52		Bridge			
1	11290	Max WS	93.97	1016.42	1018.25	3.94
1	10834	Max WS	93.98	1013.45	1016.68	1.29
1	10801.44		Culvert			
1	10741	Max WS	93.98	1012.75	1016.67	0.47
1	10540	Max WS	94	1011.75	1016.66	0.49
1	10460	Max WS	422.97	1012.75	1016.27	3.49
1	10412.74		Bridge			
1	10358	Max WS	422.96	1011.25	1015.05	4.89
1	9961	Max WS	422.95	1010	1013.61	1.99
1	9600	Max WS	422.94	1007.25	1012.23	4.37
1	9393	Max WS	422.94	1005.75	1010.83	2.51
1	9123	Max WS	422.94	1005.75	1009.17	2.81
1	8940	Max WS	422.94	1004.25	1008.61	3.69
1	8893.07		Bridge			
1	8815	Max WS	422.95	1003.75	1008.29	2.89
1	8353	Max WS	422.94	1002.25	1005.22	4.68
1	7962	Max WS	422.93	999.25	1001.82	5.75
1	7489	Max WS	422.93	991.75	996.15	7.65
1	7142	Max WS	422.93	988.75	992.77	3.94
1	6526	Max WS	422.92	984.5	988.14	1.58
1	5955	Max WS	422.9	980.5	984.16	5.04
1	5321	Max WS	422.89	976.2	980.02	4.29

Bankfull breached

1	5204	Max WS	422.89	975.4	979.43	4.45
1	5059	Max WS	422.88	974.4	978.39	5.46
1	4340	Max WS	422.88	969.4	974.18	3.8
1	3596	Max WS	422.75	964.25	970.83	0.28
1	2734	Max WS	422.81	964.25	970.83	0.06
1	2231	Max WS	422.37	964.25	970.83	0.04
1	1788	Max WS	884.07	964.25	970.82	0.24
1	1363	Max WS	883.78	964.25	970.82	0.36
1	1026	Max WS	883.66	964.25	970.81	0.29
1	618	Max WS	883.54	964.25	970.81	0.13
1	86	Max WS	883.5	964.25	970.81	0.28