DUCK POND DAM FEASIBILITY STUDY

Prepared for:

Mohonk Preserve
P.O. Box 715
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CONTENTS

APPENDICES

1. INTRODUCTION

SLR Engineering, Landscape Architecture, and Land Surveying, P.C. (SLR) has been retained by Mohonk Preserve to assist with feasibility assessment and decision making at Duck Pond Dam. The Mohonk Preserve is located along the Shawangunk Ridge in Ulster County, New York. The preserve is over 8,000 acres, with an extensive network of carriage roads and trails that are used for hiking, cycling, trail running, cross-country skiing, snowshoeing, and horseback riding. The mission of Mohonk Preserve is to protect the Shawangunk Mountains region and inspire people to care for, enjoy, and explore their natural world.

Duck Pond Dam, located within Mohonk Preserve (Figure 1-1), was constructed circa 1908, with a spillway of more recent construction, possibly in the 1950s. The dam is constructed of stacked stone and earthen fill with a historic carriage road crossing it. The spillway is concrete and consists of three openings that pass flow over the dam. These openings occasionally become clogged with debris, sometimes placed there by beaver. The dam is registered with the New York State Department of Environmental Conservation (NYSDEC Dam Number 193-5962) as a Class A (low hazard) dam.

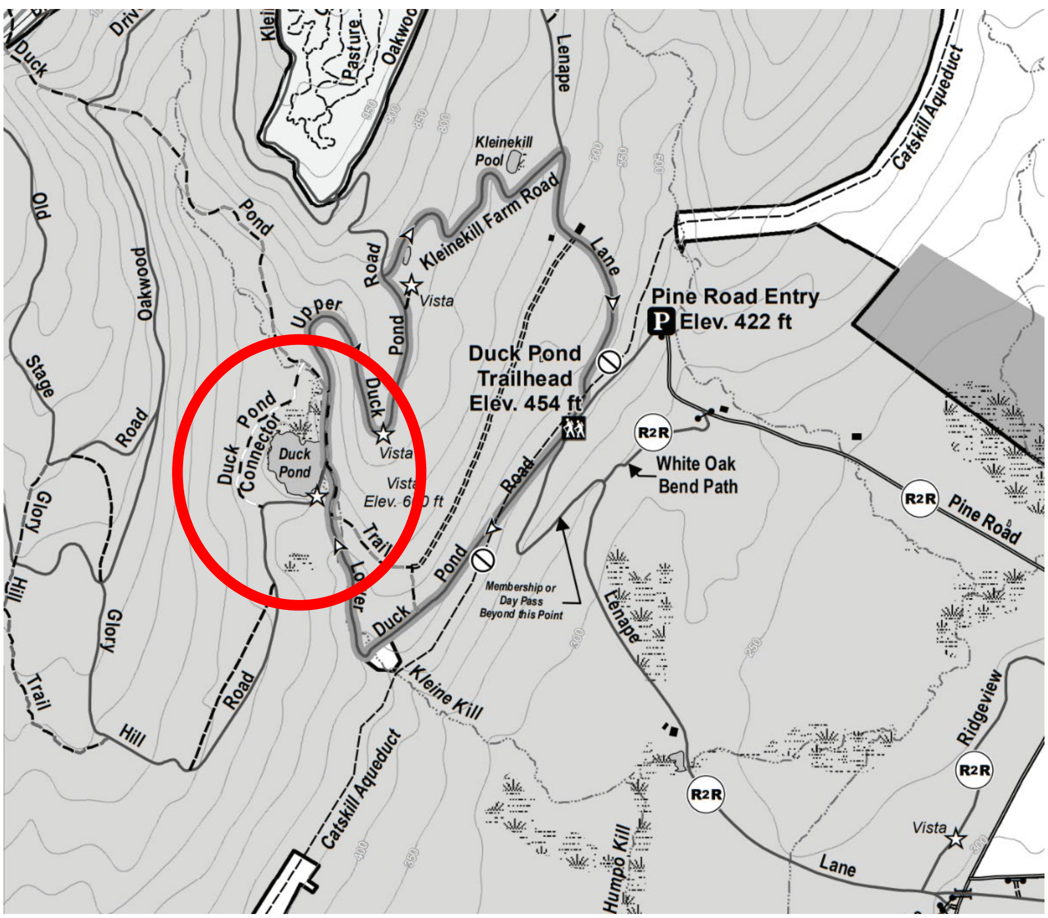

Figure 1-1 Duck Pond Location Map

An inspection of Duck Pond Dam by NYSDEC Dam Safety in November 2018 revealed several deficiencies, including tree growth on the dam, a nonfunctional low-level outlet, and the poor condition of the laid stone on the downstream face of the dam. A letter from NYSDEC Dam Safety specified that any repair or reconstruction of the dam would require a dam safety permit (defined in 6 NYCRR Part 608). A more detailed inspection conducted by SLR in 2022 revealed additional deficiencies, which are detailed in this report.

Mohonk Preserve's goal is to conduct a study to determine the feasibility of four potential approaches at Duck Pond Dam as follows:

1. Rehabilitate the dam to meet NYSDEC dam safety standards
2. Construct a replacement dam that meets NYSDEC dam safety standards
3. Remove all or part of the dam
4. Do nothing

The full replacement of the dam and the "do nothing" alternative were ruled out during a series of discussions with Mohonk Preserve. The scenarios of rehabilitating the dam and removing all or part of the dam were evaluated in detail and are discussed in detail in this report.

To provide context and to assist in decision making about the future of Duck Pond Dam, the following information was collected:

- Photographs of Duck Pond provided by Mohonk Preserve
- Correspondence between Mohonk Preserve and NYSDEC Dam Safety
- Information on the characteristics of the Kleine Kill watershed and watercourse
- Information on the characteristics of Duck Pond, wetlands, and sediments
- Information on the characteristics of Duck Pond Dam
- A hydrologic model was developed to evaluate the adequacy of the Duck Pond Dam spillway

Schematic design drawings and renderings were produced to assist in visualizing each scenario. The scenario of removing all or part of the dam was divided into two scenarios, one in which the dam is removed and the former impoundment is restored to a free-flowing stream, and a second in which the dam is removed and a series of beaver analog structures are installed along the watercourse, creating a series of ponds.

Mohonk Preserve selected the scenario of removing all or part of the dam and installing a series of beaver analog structures along the Kleine Kill watercourse, creating a series of ponds. This scenario is being recommended to the Mohonk Preserve Board for discussion at its June 2022 meeting.

2. KLEINE KILL AND DUCK POND

2.1 KLEINE KILL WATERSHED

The Kleine Kill watershed that contributes flow to Duck Pond is located in Ulster County in southeastern New York. The watershed falls primarily within the town of New Paltz and also encompasses portions of the towns of Rochester and Marbletown. The watershed is roughly rectangular in shape with a drainage area of 0.55 square miles, falls entirely within Mohonk Preserve, and lies within the Hudson Mohawk Lowlands physiographic region of New York State. The watershed boundary extends northward of Duck Pond and runs along the high-elevation Sky Top portion of Shawangunk Mountain, close to the municipal boundary separating the towns of New Paltz and Marbletown. The watershed has a maximum elevation of 1,542 feet at Sky Top. Duck Pond is at an elevation of 600 feet. A raindrop landing on Sky Top would travel an overland distance of just under 1 mile and fall a vertical distance of 942 feet before reaching Duck Pond. The watershed is depicted in Figure 2-1 and photographed in Figure 2-2.

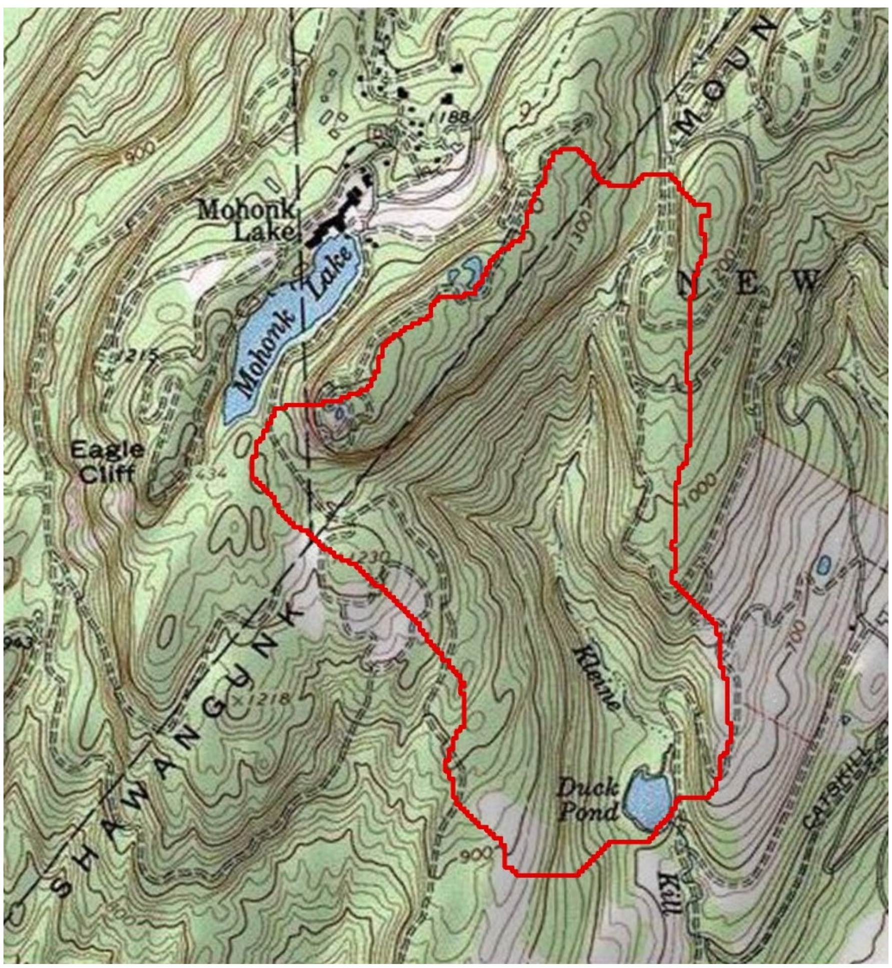

Figure 2-1 Duck Pond watershed

The bedrock underlying the watershed is almost all composed of the Normanskill Formation. The Normanskill Formation formed in the Middle Ordovician Period and consists of a shale, argillite, and siltstone. In the very upper portion of the watershed, forming a small sliver, is an area mapped as Bloomsburg Formation. The Bloomsburg Formation is Upper Silurian Period in age and consists of sedimentary rock. Otherwise known as the Bloomsburg Red Beds, the formation contains two units: the lower Wurtsboro Tongue and the Upper Basher Kill Tongue. The Wurtsboro Tongue consists of red, green, and gray cross-bedded conglomerate, sandstone, siltstone, and shale that occur in upward fining cycles. The upper Basher Kill Tongue is defined by gray very fine-grained to granular, thin- to medium-bedded quartzite, and grayish-red to red-purple shaly siltstone. The surficial geology of the Duck Pond Dam watershed consists of exposed bedrock in the upper part of the watershed and glacial till in the lower portion.

Figure 2-2 Oblique view of the Duck Pond watershed, looking northward toward Sky Top from above Duck Pond (photo by SLR)

During a rainfall event, the proportion of rainfall that runs off directly into the Kleine Kill and Duck Pond, or that infiltrates into the ground, is influenced by the composition of soils within the watershed. Soils are assigned a hydrologic soil group identifier, which is a measure of the infiltration capacity of the soil. These are ranked A through D. A hydrologic soil group A soil is often very sandy, with a high infiltration capacity and a low tendency for runoff except in the most intense rainfall events; a D-ranked soil often has a high silt or clay content or is very shallow to bedrock and does not absorb much stormwater, which instead is prone to runoff even in small storms. A classification of B/D indicates that when dry the soil exhibits the properties of a B soil, but when saturated, it has the qualities of a D soil. Hydrologic soil groups present in the Kleine Kill watershed above Duck Pond consist of hydrologic soil types C and C/D, with type C making up 83 percent of the watershed.

Land cover is another important factor influencing the runoff characteristics of the watershed. The Kleine Kill watershed falls entirely within the Mohonk Preserve, an 8,000-acre area of protected land on a mountain ridge consisting mainly of forests. Land cover within the Kleine Kill watershed can be characterized using the 2016 Multi-Resolution Land Characteristics National Land Cover Database for Southeast New York State. Forested land represents 97 percent of the watershed and consists of deciduous, coniferous, and mixed forest types. Wetlands and open water combined make up 2 percent of the watershed. The remaining 2 percent of the land cover consists of agricultural and barren land.

2.2 KLEINE KILL WATERCOURSE

The Kleine Kill, which feeds Duck Pond, is a second-order tributary that flows to the Wallkill River. It has one unnamed first-order tributary. The Kleine Kill has been classified by the NYSDEC as a Class AA watercourse. All waters of the state are provided a class and standard designation based on existing or expected best usage of each water or waterway segment. The classification AA is assigned to waters used as a source of drinking water.

A reference reach, or a portion of a stream segment that represents a stable channel within a particular valley morphology, was located upstream of Duck Pond Dam to conduct a stream classification assessment. Ideally, a reference reach would be located both upstream and downstream of Duck Pond Dam, but a downstream reference reach was not established due to anthropogenic interference along the downstream portion of the watercourse. Several culverts, gravel roads, and divergence of stream flow into man-made secondary channels found downstream of Duck Pond Dam prevent the Kleine Kill from forming a stable channel that would be naturally found in that area and ultimately cannot be used as a reference reach.

The Kleine Kill above Duck Pond Dam is characterized as a Rosgen “C4” stream type. It has a developed floodplain, is moderately sinuous, and exhibits a riffle/pool bedform morphology. The Kleine Kill has depositional features such as point bars, which is a distinct characteristic of “C4” stream types. It is slightly entrenched, having an established connection with its floodplain on the right channel margin but a tall left bank. A hiking trail is found in close proximity to the top of left bank and may be preventing lateral migration into the left channel margin. The Kleine Kill upstream of Duck Pond was calculated to have a slope of 1.4 percent. Bankfull width was found to be 14.5 feet, and bankfull depth was found to be 1.2 feet. Channel material is predominantly gravel (fine to medium), with the median particle size estimated to be 11.3 millimeters. The gravel is made up of fragments of shale, likely originating from the Normanskill Formation, which underlies the majority of the Kleine Kill and is exposed in the upper half of the watershed. Figure 2-3 is a photograph of the reference reach. Figure 2-4 is a graphical depiction of the reference reach cross section.

Figure 2-3 Photograph reference reach of Kleine Kill channel upstream of Duck Pond (photo by SLR)

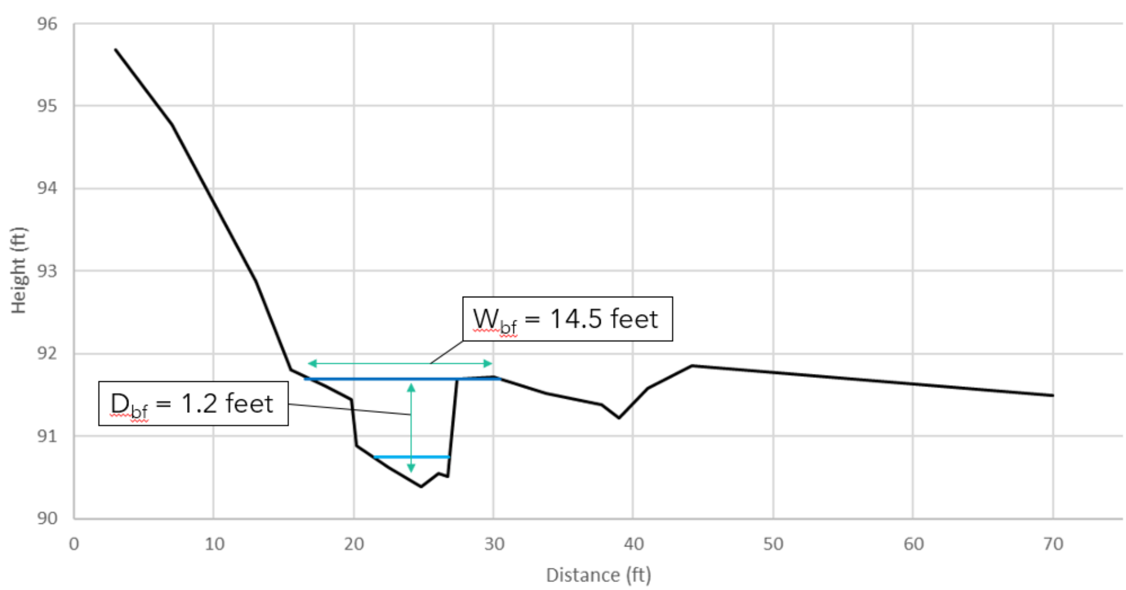

Figure 2-4 Representative cross section of Kleine Kill channel upstream of Duck Pond

2.3 DUCK POND

2.3.1 DUCK POND CHARACTERISTICS

Duck Pond (Figure 2-5) is approximately 4 acres in size, although this varies depending on recent rainfall and the functionality of the low-level outlet valves and on the activities of beaver. The pond has an average depth of 4 to 6 feet and a maximum depth of approximately 12 feet (Figure 2-6). The pond is a scenic feature of Mohonk Preserve, a stopping point for trail users, and a popular short hike destination. It is used as an outdoor classroom and for ecology outings.

Figure 2-5 Aerial view of Duck Pond, with dam and spillway along left side of photo (photo by SLR)

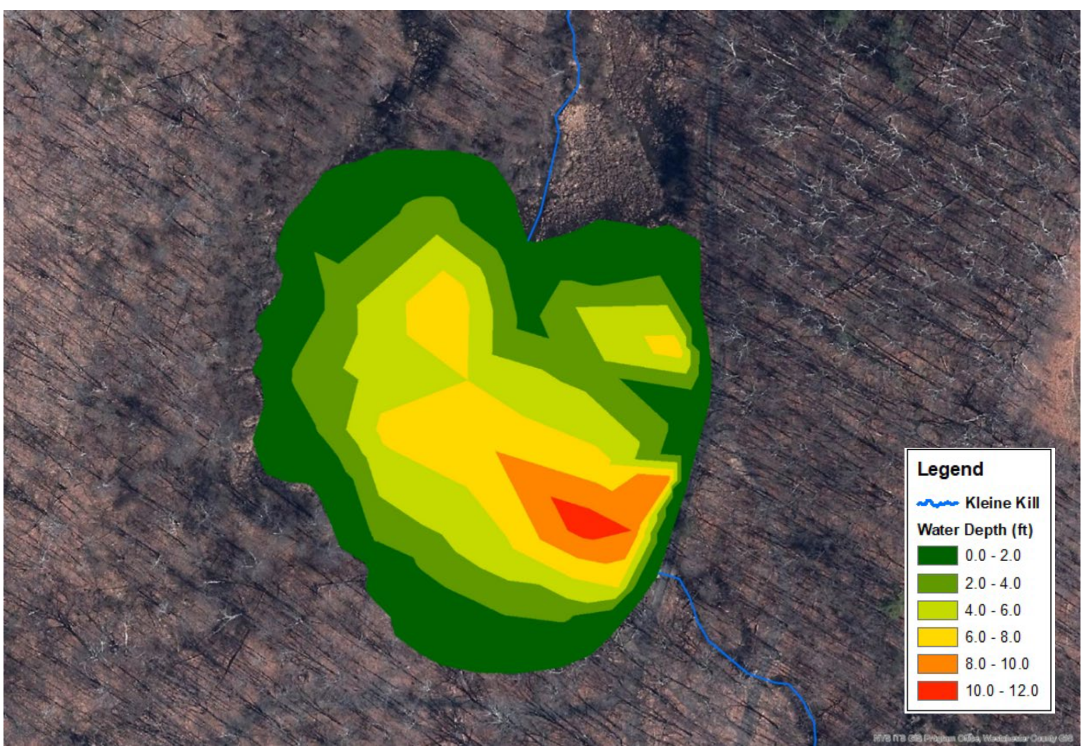

Figure 2-6 Water Depth Map of Duck Pond

2.3.2 DUCK POND SEDIMENTS

Sediment probing was performed by SLR in October 2021 to quantify the approximate depth of the sediment throughout the Duck Pond impoundment. Impoundments are sediment traps by nature, with deposition typically occurring behind the dam and throughout the impoundment.

The sediment depth was measured at 26 locations within the impoundment, undertaken at roughly evenly spaced transects approximately 100 feet apart throughout the length of impoundment. Sediment probing was performed to refusal to enable detailed sediment mapping. Probing was completed using a manually operated steel rod, and sample locations were recorded with a Trimble Global Positioning System (GPS) unit that was calibrated and corrected using Wide Area Augmentation System (WAAS) technology such that all points were recorded at submeter accuracy. A map of sediment depths was created (Figure 2-7).

The depth of sediment was found to be relatively uniform throughout the impoundment at between 0.5 and 1.5 feet, with four pockets of greater sediment thickness noted throughout the pond. The greatest depth of 4.5 feet was encountered near the inlet delta in the northeast corner of the impoundment. The shallowest depth of 0.25 feet was encountered just northwest of the spillway. There is very little accumulated sediment just upstream of the dam, likely due to higher velocities and turbulent forces during larger flow events that scour out this area.

The sediment encountered throughout most of the impoundment can be classified as fine to very fine sand with some coarse sand and gravel and some silt and clay as well as a high organic content. The sediment is reflective of the low velocities within most of the impoundment that allow smaller particles to settle. The sediment was very loose in nature, especially closer to the water surface. At most probing locations, the refusal of the probe was soft. At some sediment sampling locations, rocky refusal was encountered during probing prior to refusal. This was likely the location of native bed material, which is primarily sandy in nature.

SLR personnel collected three sediment samples from within the impoundment on October 14, 2021. The sample locations were determined in the field based upon measurements of accumulated sediment thickness and the assumed location of the restored stream channel if the dam were to be removed. The locations of the sediment samples are presented in Figure 2-8.

The sediment sampling and subsequent analysis served to classify the chemical composition of the sediment within the impoundment. In the absence of gross contamination, the design goal is to maximize in-situ sediment stabilization and minimize the risk of downstream sediment migration both during and following dam removal or rehabilitation.

A small aluminum flat-bottom watercraft was used to navigate between sampling locations within the pond, and sample locations were recorded and calibrated with a GPS unit. The sediment samples to be analyzed for all listed compounds and elements were collected with a sediment core sampler device equipped with plastic sleeves to contain each sample. The plastic coring sleeves were replaced after each sediment sample was obtained to ensure a representative sample from each location and to avoid any potential cross contamination. The plastic sleeves were driven by hand to a depth of approximately 2 to 5 feet below the surface of the sediment. All samples were obtained directly from the sleeve, and clean, nitrile sample gloves were used to obtain each sample. Samples were stored in precleaned, sterile glassware containers supplied by a certified laboratory and preserved in accordance with proper procedure for each analyte. Samples were immediately stored on ice following collection and remained on ice until delivery to the laboratory. Each sample jar was labeled with the date of collection, sample location, sample depth, and time of sample collection. Three samples (Sed-101, Sed-102, Sed-103) were delivered to Complete Environmental Testing, Inc. of Stratford, Connecticut, a NY-certified environmental laboratory for analysis.

The character and chemical composition of the sediment are influenced by the undeveloped nature of the watershed upstream of the dam. Within the watershed, most of the land exists as forestland or open fields as it is part of the Mohonk Preserve. Regardless, there is always the potential for isolated spills, illegal dumping, or contamination from past land use practices. Therefore, the analytical methods/analytes chosen for the preliminary sediment evaluation included the following:

- Total (by mass) metals (RCRA 8 Metals)
- Leachable metals by Toxicity Characteristic Leaching Procedure (TCLP) method (Resource Conservation and Recovery Act [RCRA] 8 metals)
- Polyaromatic hydrocarbons (PAHs)
- Polychlorinated biphenyls (PCBs), aroclor method and Soxhlet extraction
- Organochlorine pesticides
- BTEX VOCs by EPA 8260C

Additional physical evaluation of the sampled sediment included the following:

- Total organic carbon (TOC)
- Percent water (% solids)
- Grain size (Sieve Nos. 4, 10, 40, 60, and 200)

The primary purpose of the sampling program was to help determine the potential sediment management strategies to be employed during and after the removal of the dam or dam rehabilitation. Options typically considered include the following:

- Removal and offsite disposal of all or a portion of the erodible sediment
- Removal and onsite reuse of all or a portion of the erodible sediment
- In-place stabilization of sediment
- Downstream release of sediment

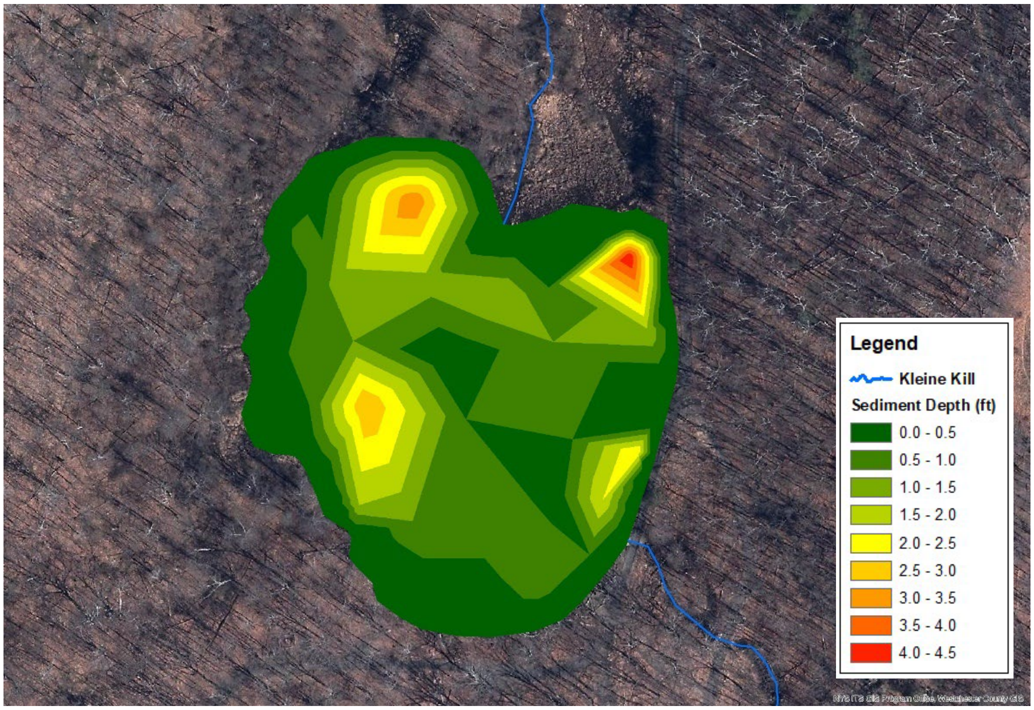

Figure 2-7 Sediment Depth Map of Duck Pond

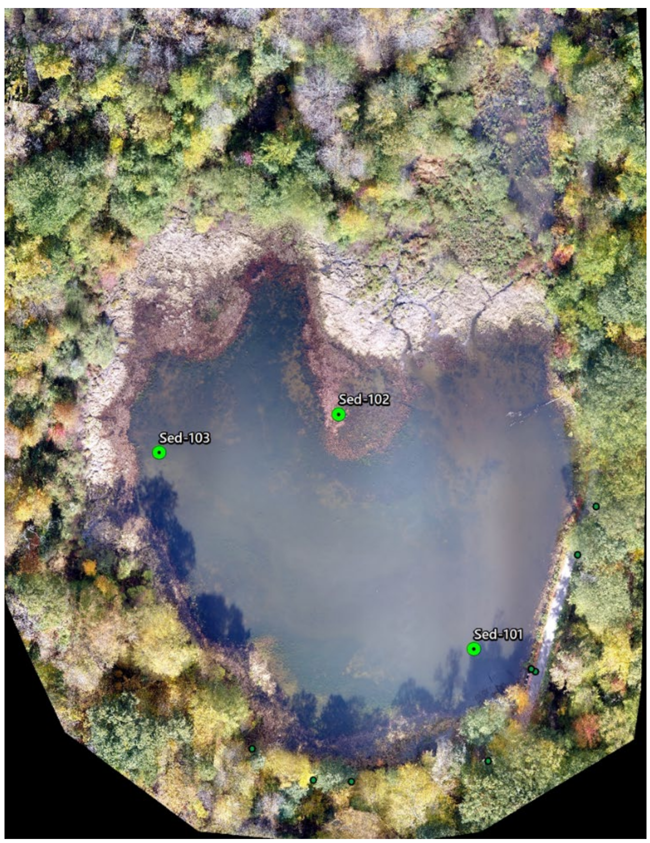

Figure 2-8 Sediment Sample Locations

The management of sediment during dam removal or dam rehabilitation projects often depends upon characterization of the sediment and the chemical constituents found therein as compared with established and/or analogous regulatory limits. The specific regulatory criteria to which the results are compared is ultimately dictated by the intended sediment management approach. As such, the comparison is often an iterative approach whereby the sediment sample results are compared to a variety of regulatory limits to help determine the most cost-effective approach.

The analytical results were initially compared to the Consensus Based Sediment Quality Guidelines (MacDonald, 2000). These values include the Threshold Effect Level and the Probable Effect Level (PEL). In SLR's experience with dam and dredging projects, the PEL is the more appropriate level for determining if actual effects are likely to exist due to sediment contaminants within a waterway and/or impoundment. The lab data from the samples collected data suggests that the sediment is free of any contamination that meets or exceeds any established threshold. Additionally, none of the collected samples contained leachable (TCLP) metals in excess of RCRA limits. Lab analysis results are included in Appendix D.

The grain size of the impounded sediment was analyzed as presented in Table 2-1.

Table 2-1 Grain Size Analysis

Sediment Characterization	Sed-101	Sed-102	Sed-103	Average
% Gravel	25.2	19	30.5	24.9
% Coarse Sand	18.1	17.4	14.6	16.7
% Medium Sand	0.131	<0.00	0.174	0.1525
% Fine Sand	43.7	51.8	46.3	47.2
% Fines (Silt/Clay)	12.8	11.8	8.46	11.02

The grain size analysis results indicate that the samples are primarily composed of fine sand with some coarse sand and gravel and some silt and clay. All samples had relatively similar ratios of substrate type. It should be noted that this grain size analysis is only representative of the sediment that has accumulated behind the dam since its installation, not of the native substrate.

2.3.3 DUCK POND WETLANDS

Duck pond is ringed by a narrow band of wetlands along much of its perimeter. The wetlands have been mapped by the NYSDEC and as part of the National Wetlands Inventory. The most extensive wetlands extend across the delta that has formed where the Kleine Kill enters Duck Pond. Beaver have constructed a series of dams across the Kleine Kill as it enters Duck Pond, increasing ponding of water in this area. The wetlands at Duck Pond can be categorized into distinct zones, which are shown in Figures 2-9 and 2-10. Appendix E includes a list of the dominant plants observed in the Duck Pond wetlands during fall 2021.

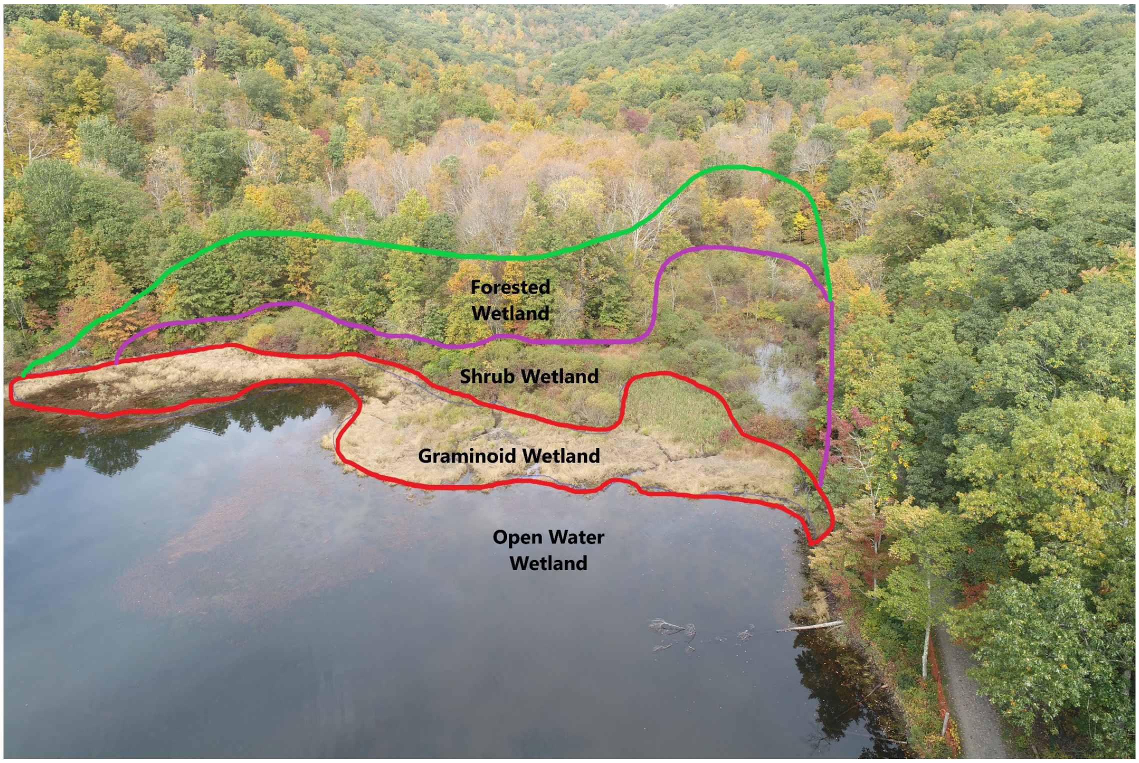

Figure 2-9 Overhead view of Duck Pond showing wetland zones where Kleine Kill enters pond (photo by SLR)

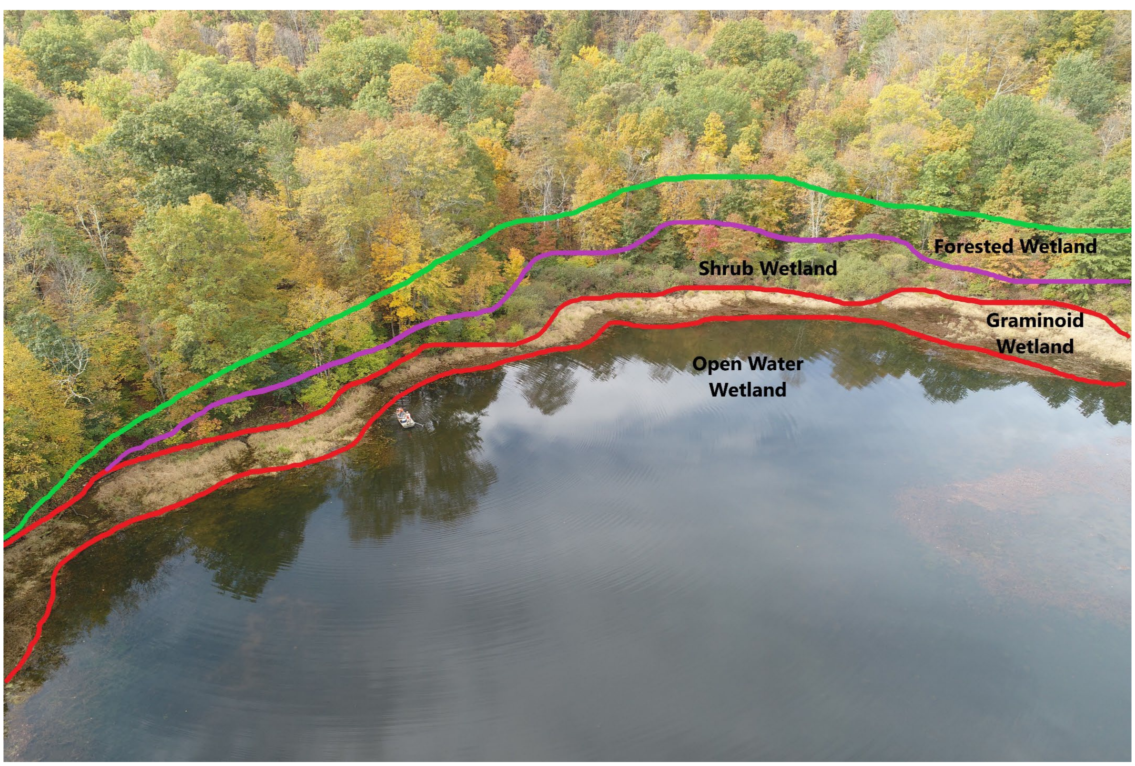

Figure 2-10 Overhead view of Duck Pond showing wetland zones around perimeter (photo by SLR)

3. DUCK POND DAM

3.1 DUCK POND DAM COMPONENTS

Duck Pond Dam was constructed circa 1908, with a spillway of more recent construction, possibly in the 1950s. The main dam is constructed of stacked stone and earthen fill with a historic carriage road crossing it. The spillway is concrete and consists of three openings that pass flow over the dam. The dam is registered with NYSDEC (NYSDEC Dam Number 193-5962) as a Class A (low hazard) dam. An inspection of Duck Pond Dam by NYSDEC Dam Safety in November 2018 revealed several deficiencies, including tree growth on the dam, a nonfunctional low-level outlet, and the poor condition of the laid stone on the downstream face of the dam. A letter from NYSDEC Dam Safety specified that any repair or reconstruction of the dam would require a dam safety permit (defined in 6 NYCRR Part 608). Correspondence from NYSDEC Dam Safety is included in Appendix A.

The dam consists of several components, described below and depicted graphically in Figure 3-1.

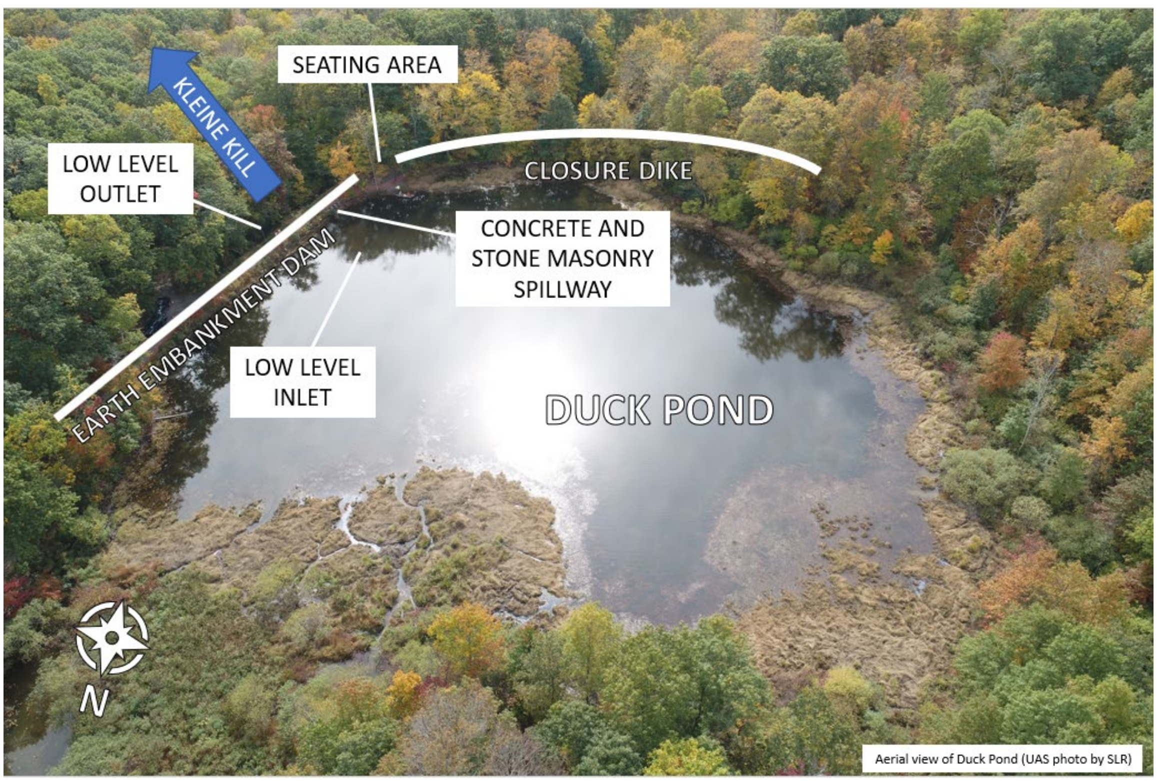

Figure 3-1 Components of Duck Pond Dam

3.1.1 EARTH EMBANKMENT DAM (MAIN DAM)

The earth embankment makes up the main component of Duck Pond Dam and is constructed of stacked stone and earthen fill with a historic carriage road crossing it. The dam extends in a north-south direction along the eastern edge of pond for approximately 180 feet, ranging in height from 15 to 20 feet. The dam crest is approximately 13 feet wide and consists of the 10-foot-wide gravel carriage road centered on the earth embankment (Figure 3-2). The upstream (west) face of the dam slopes at 2:1 horizontal to vertical slope into the pond while the downstream (east) face slopes at 1:1 for approximately 5 feet before transitioning to a 5-foot vertical section consisting of larger stacked boulders. The lower embankment slope consists of a riprap face constructed at a 1.6:1 horizontal to vertical slope (Figure 3-3). Figure 3-4 is a sketch of a typical cross section of the dam.

Figure 3-2 View along carriage road on crest of dam, looking south (photo by SLR)

Figure 3-3 View of downstream face of dam, looking north (photo provided by Chuck Reid)

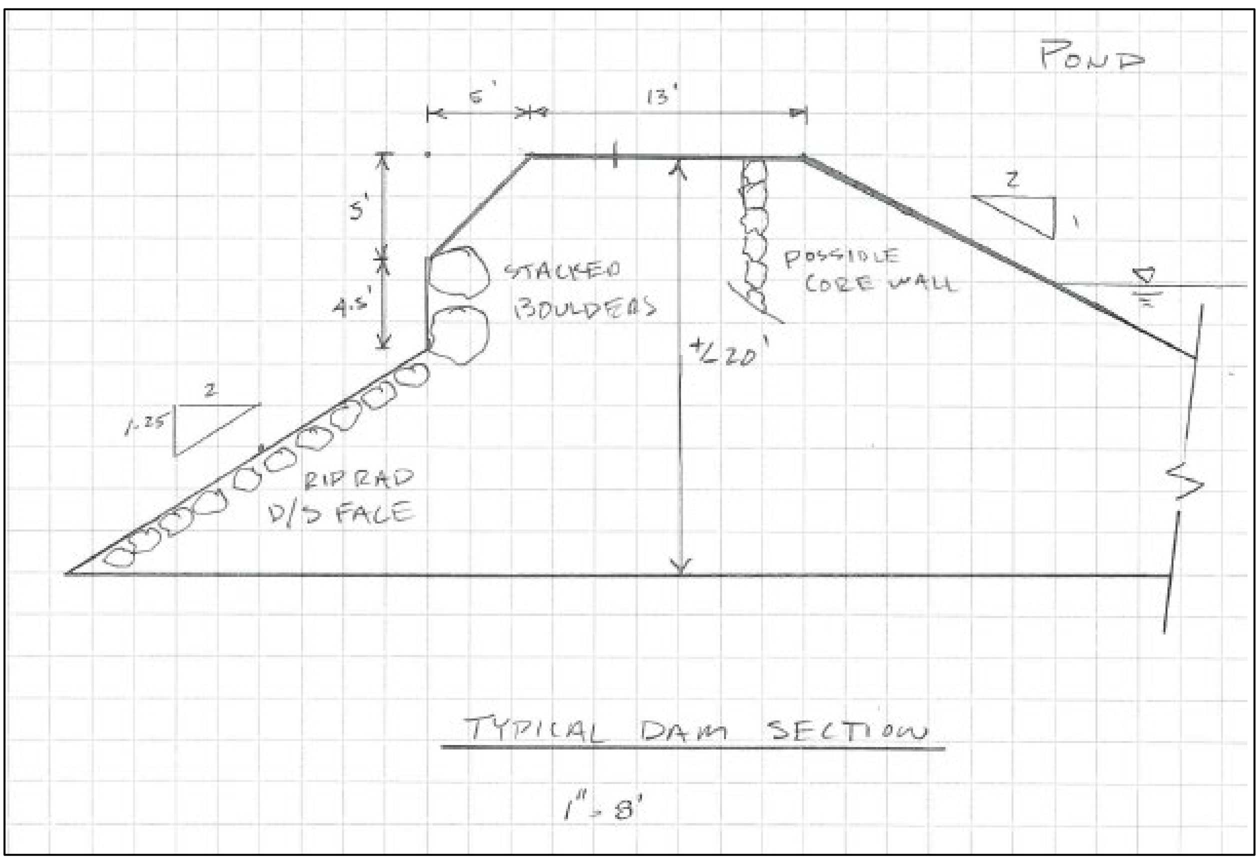

Figure 3-4 Engineer's sketch of a typical cross section of the main section of dam

3.1.2 CLOSURE DIKE

The closure dike is a second earth embankment that extends from the main dam in a westerly direction around the southern end of Duck Pond, tying into high ground on the west side of the pond. The closure dike is 4 feet wide at the crest and is 2 to 3 feet high. It slopes at 2.67:1 horizontal to vertical, in both the upstream and downstream directions. This dike prevents flow from escaping the pond to the low-lying areas to the south of the pond (Figures 3-5 and 3-6).

Figure 3-5 View along closure dike from seating area, looking west (photo by SLR)

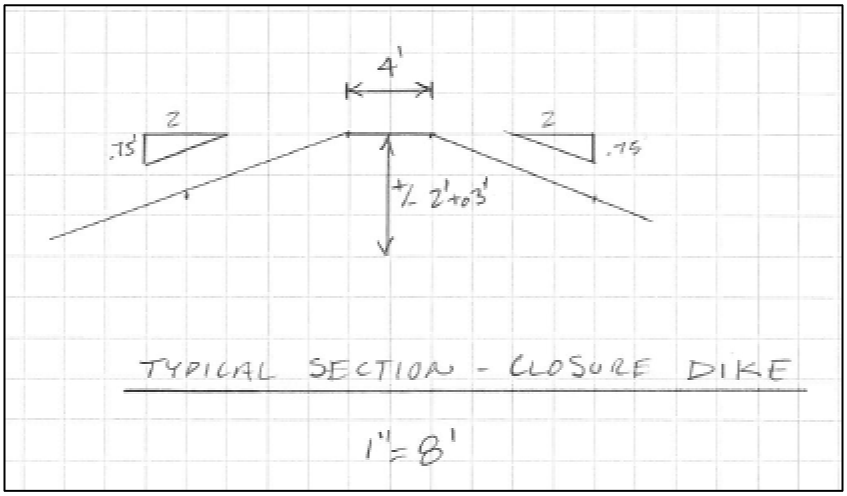

Figure 3-6 Engineer's sketch of a typical cross section of closure dike

3.1.3 SPILLWAY

The spillway is located at the southeastern corner of Duck Pond. The spillway consists of three rectangular concrete and stone masonry culverts that convey flow under the carriage road (Figure 3-7). Very little cover fill is present on the top slab. The three culverts are approximately 2.5 feet high and range in width from 2.65 feet to 2.95 feet. The culverts slope at 8.5 percent from upstream to downstream. It is unknown if this slope has increased due to a drop or settlement at the outlet side of the spillway. The top concrete slab that carries the carriage road across the spillway was presumably level when constructed but is now visibly inclined in the downstream direction. Downstream of the spillway the earth embankment consists of two sections of vertical stepped dry-laid stone masonry below the spillway discharge. Water flowing though the spillway drops straight down almost 15 feet to toe of dam (Figure 3-8). The spillway culverts' openings occasionally become clogged with debris, sometimes placed there by beaver. Figure 3-9 is a sketch of the spillway.

Figure 3-7 Duck Pond Dam spillway inlet

Figure 3-8 Downstream face of dam with spillway outlet (photo by SLR)

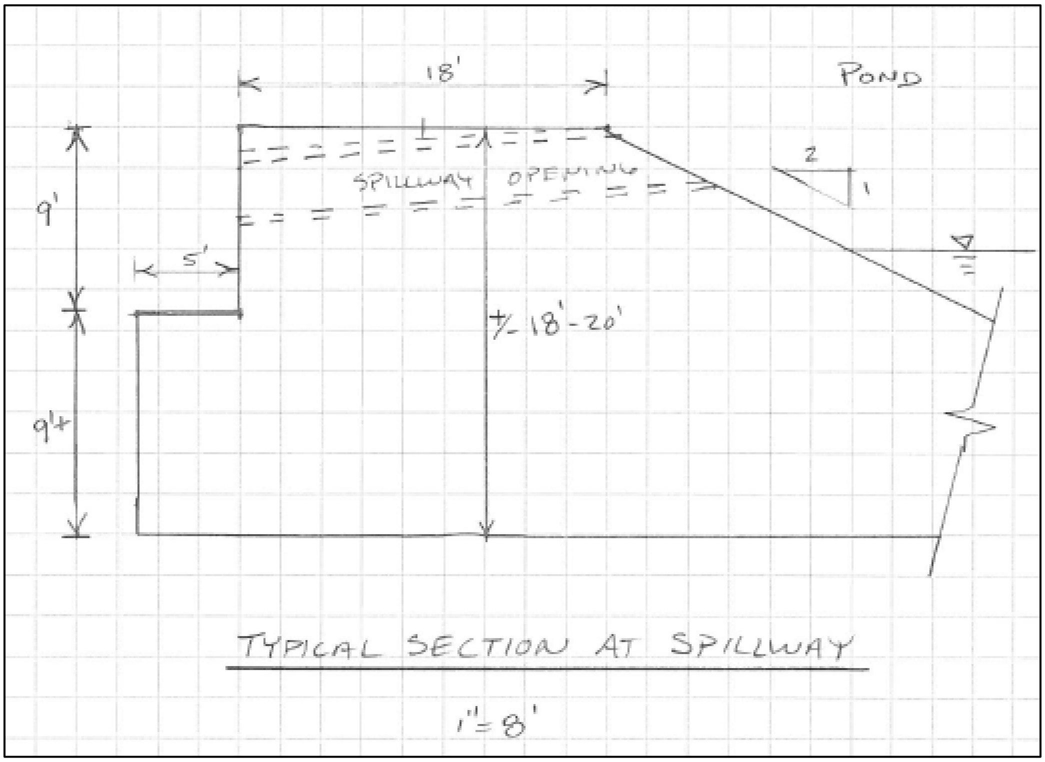

Figure 3-9 Engineer's sketch of spillway

3.1.4 LOW-LEVEL OUTLET

The low-level outlet works are visible in a chamber on the downstream face of the embankment (Figure 3-10 and Figure 3-11). The valves are inoperable, and the outlet pipes are live with water within the earth embankment. The inlet structure is below the surface of Duck Pond and is not visible but can be seen in a historic photo (Figure 3-12).

Figure 3-10 Low-level outlet chamber in downstream face of main dam (photo by SLR)

Figure 3-11 Inoperable low-level outlet valves (photo from Mohonk files)

Figure 3-12 Low-level inlet structure (Mohonk archives, November 1932)

3.2 SPILLWAY ANALYSIS

NYSDEC hydraulic requirements for dam spillways specify that a low-hazard (Class C) dam must have sufficient capacity to safely pass the 100-year flood event with a minimum of 1 foot of freeboard. Sources of discharge data for Kleine Kill were limited because the stream is ungauged, and a Flood Insurance Study (FIS) has not been performed by the Federal Emergency Management Agency (FEMA) for the watercourse. A hydrologic model was developed for the Duck Pond watershed to generate discharge hydrographs and calculate peak flood flows for various return periods. The model, which was developed using the *HydroCAD Stormwater Modeling* program (Version 10.0), is a TR-20 type rainfall-runoff model (SCS, 1992) that simulates the processes of runoff generation and discharge routing in a watershed using a dendritic network of nodes.

The Kleine Kill hydrologic model is composed of two nodes: 1) a subbasin node used for runoff calculations and 2) a reservoir node used for hydrograph routing calculations. Runoff volume calculations are performed using the Curve Number (CN) method, developed by the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS). Runoff hydrographs are developed using the

SCS Standard Unit Hydrograph. The various input parameters for the runoff calculation, including the watershed area, time of concentration, and area-weighted CN value, are presented in Table 3-1. The CN value for the Duck Pond watershed is representative of a forested watershed with Hydrologic Soil Group (HSG) C and D soils and was calculated based on recommendation from the draft publication *Hydrologic Soil-Cover Complexes* in the National Engineering Handbook (NRCS-USDA 2017). Water levels and discharges for Duck Pond Dam are determined by routing the runoff hydrographs through Duck Pond using the reservoir node, which implements a dynamic Storage-Indication Routing methodology. The stage-storage and stage-discharge curves for the pond and dam are based on field measurement and area present in Appendix B.

Table 3-1 Hydrologic Model Input Parameters

Model Input Parameter	Value
Watershed Area (acre)	368
Time of Concentration (minutes)	58
Curve Number	64

The hydrologic model was used to estimate pond water levels and discharges for various rainfall events. Rainfall data for the Kleine Kill watershed were obtained from the point precipitation frequency data from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 (Perica et al., 2019). The 24-hour duration rainfall depths for the 2-, 5-, 10-, 25-, 50-, and 100-year return period events are presented in Table 3-2. The rainfall distribution for each event was modeled according to the 24-hour, second quartile distribution with a 50 percent occurrence probability published by NOAA Atlas 14. NRCS recommends the use of the Atlas 14 rainfall distributions because they are based on local rainfall data and can better represent the regional characteristics of storm events compared to the traditional SCS Type-II distribution (NRCS 2019).

Table 3-2 Precipitation Frequency Estimates from NOAA Atlas 14

Return Period (years)	24-Hour Rainfall Depth (inches)
2	3.30
5	4.32
10	5.17
25	6.33
50	7.20
100	8.13

The estimated peak water surface elevations and discharges from the model for each storm event are presented in Table 3-3. For reference, Figure 3-13 graphically presents the dam crest, primary spillway outlet, and peak water surface elevation during the 100-year storm event. Several low points along the dam crest and the closure dike limit the maximum water surface elevation within the pond to 601.1 feet. Based on the modeling results, the existing spillway has the hydraulic capacity to pass the 10-year storm event, but all larger storm events exceed the capacity causing the dam to be topped. Duck Pond Dam does not have sufficient spillway capacity to pass the 100-year flood with at least 1 foot of freeboard, as is required by NYSDEC regulations. Under current conditions, the pond water surface elevations exceed the minimum freeboard requirement during all simulated storm events.

The results of the spillway analysis were compared with observations made by Mohonk Preserve and SLR staff. Tropical Storm Irene, which impacted the region on September 28, 2011, dropped approximately 8 inches of rain during a 24-hour period, which equates to close to a 100-year rainfall event. Mohonk Preserve confirmed that the capacity of the spillway was exceeded during Tropical Storm Irene and that the dam was overtopped. More recently, during Tropical Storm Ida on September 2, 2021, and during an intense rainfall event on April 8, 2022, the capacity of the Duck Pond Dam spillway was once again exceeded, the low areas of the main dam and closure dike was overtopped. Logs, branches, and other debris, possibly placed there by beaver, clogged up the spillway and likely contributed to the overtopping.

Table 3-3 Hydrologic Model Results for Various Storm Events

Return Period (years)	Peak Water Surface Elevation (feet)	Peak Discharge (cubic feet per second)
2	600.2	48
5	600.7	75
10	601.1	99
25	601.5	139
50	601.5	168
100	601.6	200

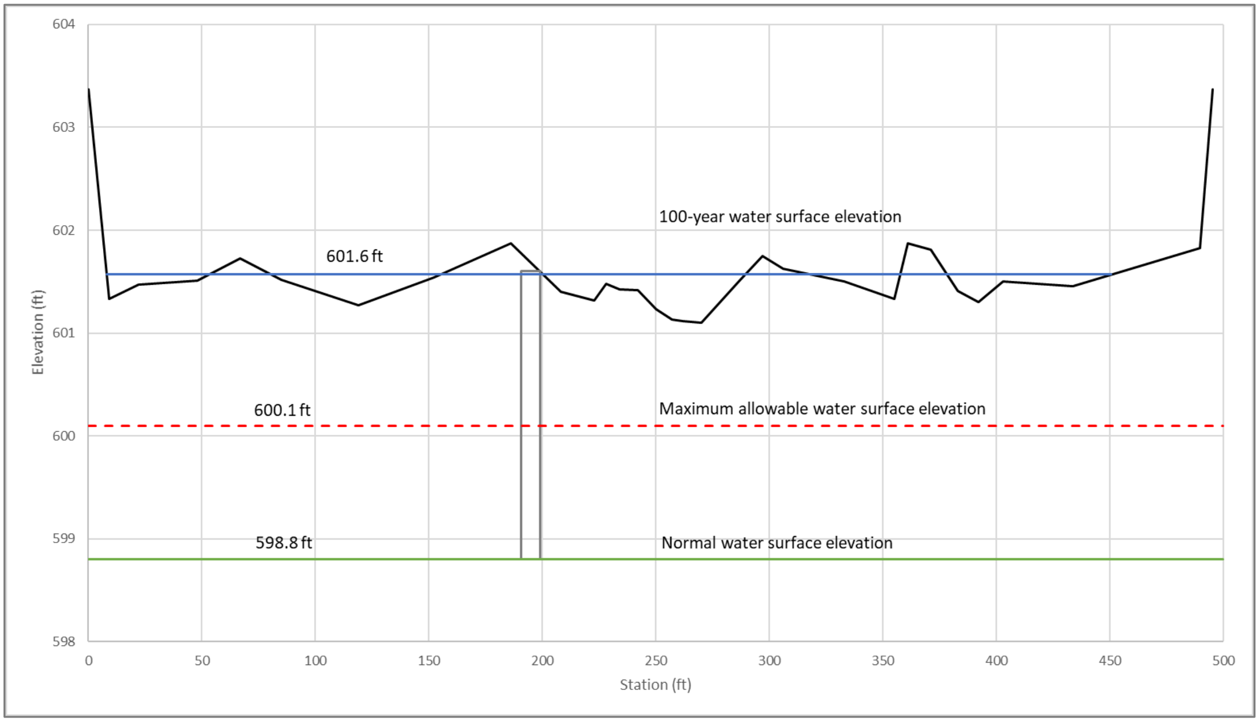

Figure 3-14 Hydraulic modeling results at Duck Pond Dam spillway

3.3 DUCK POND DAM DEFICIENCIES

Following is a summary of deficiencies at Duck Pond Dam, broken down by dam component.

3.3.1 EARTH EMBANKMENT DAM (MAIN DAM)

- Trees and shrubs growing below toe of downstream face of dam.
- Downstream face of embankment has many dislodged or missing stones, which have created voids or weak points in the dam structure.
- Significant leakage along right half of embankment from low-level outlet chamber to right abutment.
- Dam crest elevation is uneven.
- Evidence of overtopping (most recently in April 2022).

3.3.2 CLOSURE DIKE

- Trees and shrubs growing on closure dike.
- Evidence of overtopping (most recently in April 2022).

3.3.3 SPILLWAY

- Spillway inadequately sized to pass spillway design flood; hydraulic modeling indicates that the dam is overtopped during the 100-year flood event.
- Concrete and stone masonry has large cracks, spalling, and deterioration of mortar.
- Spillway slipped or tilted in downstream direction.
- Large transverse cracks present within spillway conduits.
- Erosion at toe due to the spillway flows dropping 15 feet vertically as it discharges through the dam.

3.3.4 LOW-LEVEL OUTLET

- Low-level outlets are not functional and are charged with water within the embankment structure.

4. ANALYSIS OF ALTERNATIVES

Mohonk Preserve's goal at the onset of this study was to determine the feasibility of various approaches at Duck Pond Dam. Four scenarios were investigated as follows:

1. Rehabilitate the dam to meet NYSDEC dam safety standards
2. Construct a replacement dam that meets NYSDEC dam safety standards
3. Remove all or part of the dam
4. Do nothing

A series of discussions took place among Mohonk Preserve board members, Mohonk Preserve staff, and SLR's engineers and scientists. The full replacement of the dam and the "do nothing" alternative were ruled out as viable long-term solutions.

The scenarios of rehabilitating the dam and removing all or part of the dam were evaluated in detail. Schematic design drawings and renderings were produced by SLR to assist in visualizing each scenario. The scenario of removing all or part of the dam was divided into two scenarios, one in which the dam is removed and the former impoundment is restored to a free-flowing stream, and a second in which the dam is removed and a series of beaver analog structures are installed along the watercourse, creating a series of ponds. Each scenario is described in more detail below. The renderings are included in the narrative below and are also included at a larger scale in Appendix C.

4.1 REHABILITATION OF DUCK POND DAM

One scenario that was evaluated is the rehabilitation of Duck Pond Dam to repair deficiencies and meet NYSDEC Dam Safety standards. The following repairs would be necessary:

Earthen Embankment Dam (Main Dam)

- Remove trees and shrubs from the dam and within the clear zone extending a minimum of 10 to 15 feet out from toe of dam.
- Raise and level the dam crest.
- Buttress the dam with grouted riprap slope on the downstream face.

Closure Dike

- Remove trees and shrubs from the dike and within the clear zone extending a minimum of 10 to 15 feet out from toe of dike.
- Raise and level the closure dike crest.

Spillway

- Abandon the current spillway, fill void in the dam with compactable fill.
- Install a drop inlet structure to pass the 100-year flood with 1’ freeboard (6’ x 6’ box with 4’-diameter pipe).
- Maintain the same spillway crest elevation as the existing spillway.

Low-Level Outlet Works

- Install new operational gate valve and outlet pipe integrated with the drop inlet spillway.

A schematic drawing depicting the components of dam rehabilitation are depicted in Figure 4-1. Duck Pond in its existing condition is shown in an aerial in Figure 4-2, and an artistic rendering of the dam rehabilitation scenario is shown in Figure 4-3.

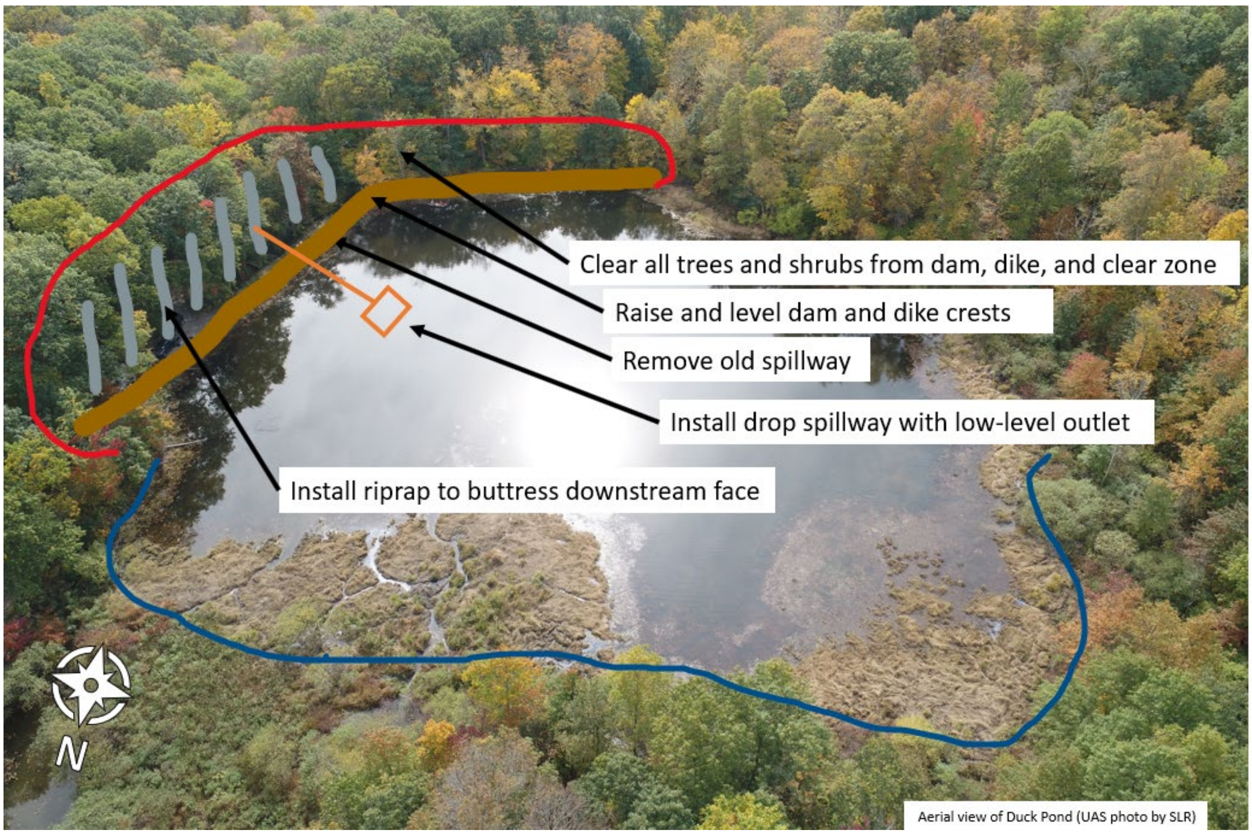

Figure 4-1 Schematic drawing depicting components of Duck Pond Dam rehabilitation

Figure 4-2 Aerial showing Duck Pond in its existing condition

Figure 4-3 Artistic rendering of the Duck Pond Dam rehabilitation scenario

4.2 REMOVAL OF DUCK POND DAM WITH RESTORATION OF FREE-FLOWING STREAM

A second scenario that was evaluated was the removal of Duck Pond Dam and the restoration of a free-flowing stream through the former Duck Pond impoundment. This would begin with draining the pond and removing the existing spillway and a portion of the earthen dam. A single-thread channel would be established through the former impoundment and connected to the channel downstream of the dam. The former impoundment would be restored with native plantings. If necessary, a new bridge would be constructed over the Kleine Kill or at a location farther downstream.

A schematic drawing depicting this scenario is shown in Figure 4-4. An artistic rendering is shown in Figure 4-5.

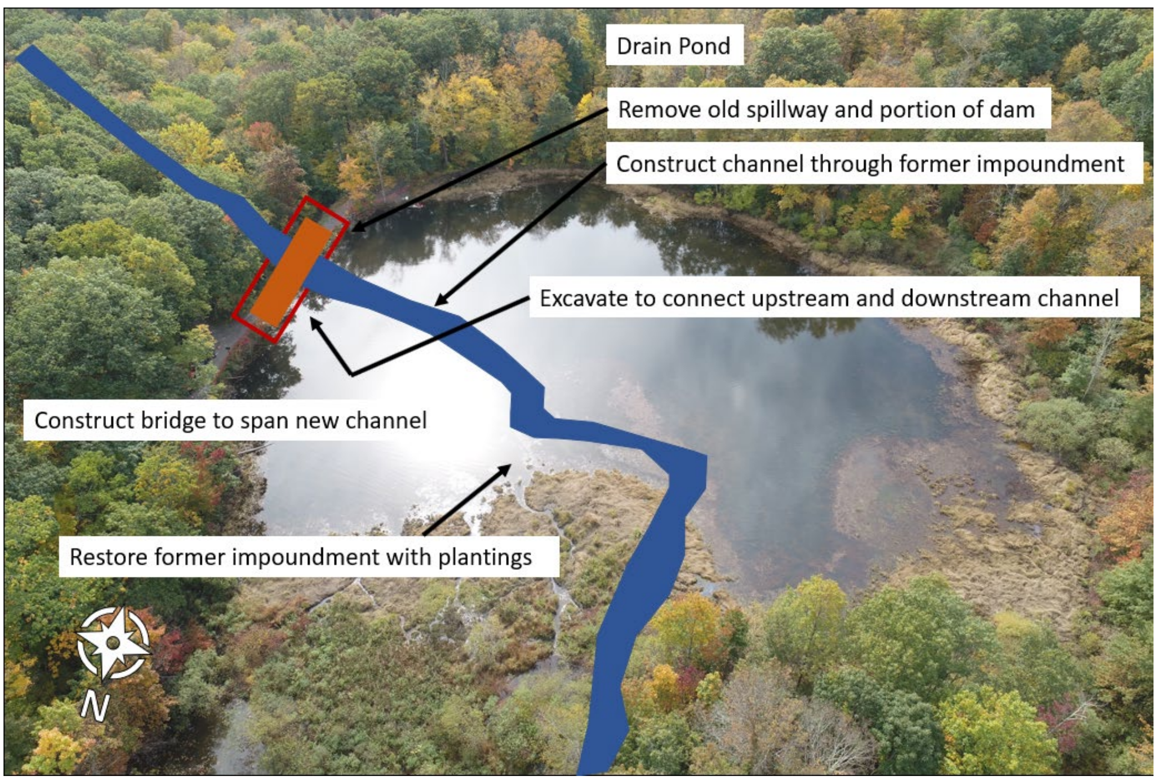

Figure 4-4 Schematic depicting removal of Duck Pond Dam with restoration of free-flowing stream

Figure 4-5 Artistic rendering of removal of Duck Pond Dam with restoration of free-flowing stream

4.3 REMOVAL OF DUCK POND DAM WITH BEAVER ANALOG STRUCTURES

A third scenario is a variation of the previous scenario and would entail removal of Duck Pond Dam and the installation of beaver analog structures within the former Duck Pond impoundment. The purpose of the beaver analog structures is to replicate the activities of beaver and would create a series of ponds and wetlands in the area that is currently Duck Pond.

This scenario would begin with draining the pond and removing the existing spillway and a portion of the earthen dam. A channel would be established through the former impoundment and connected to the channel downstream of the dam. A series of beaver analog structures would be installed across the stream channel. The former impoundment would be restored with native plantings. If necessary, a new bridge would be constructed over the Kleine Kill or at a location farther downstream.

A schematic drawing depicting this scenario is shown in Figure 4-6. An artistic rendering is shown in Figure 4-7.

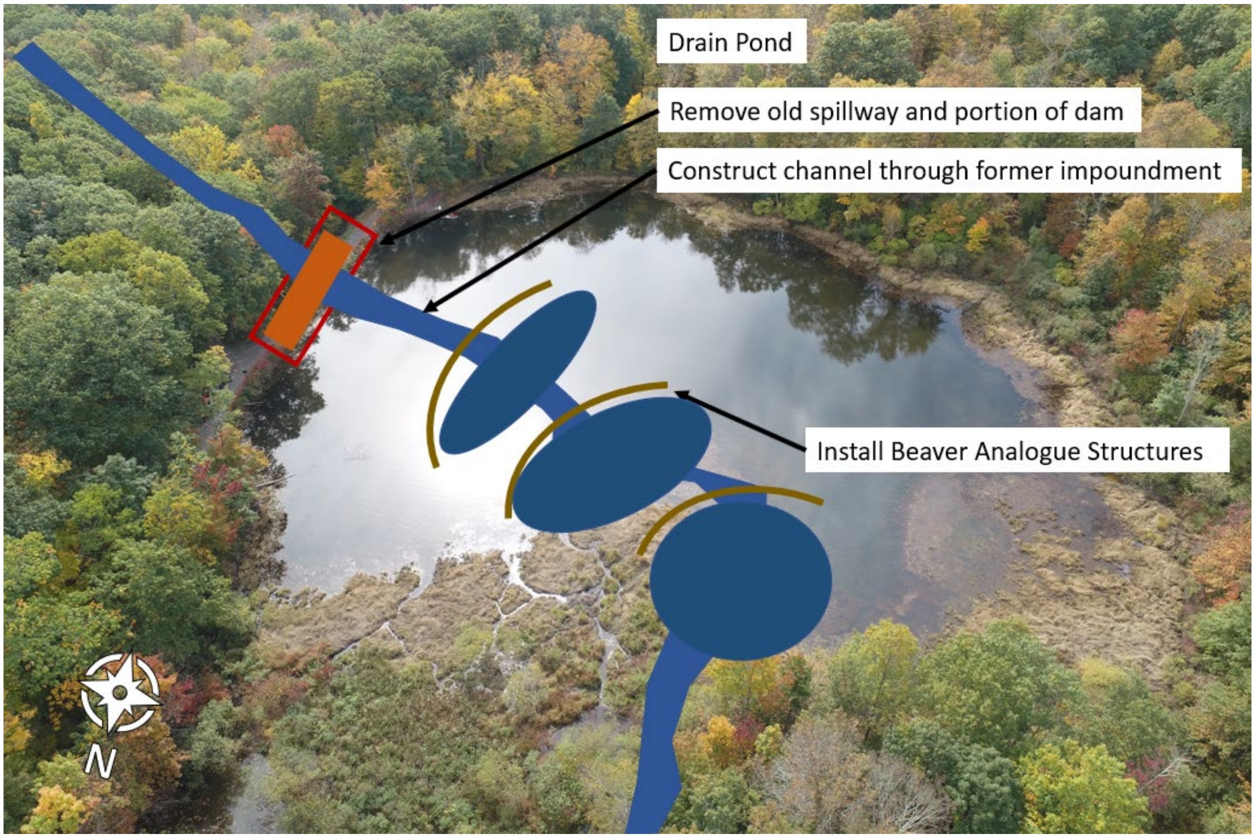

Figure 4-6 Schematic depicting removal of Duck Pond Dam with beaver analog structures

Figure 4-7 Artistic rendering of removal of Duck Pond Dam with beaver analog structures

4.4 ENGINEER'S OPINION OF COST

The engineer's opinion of cost for design and permitting and for project construction of each of the scenarios described above is presented in Table 4-1.

Table 4-1 Summary Table of Cost Opinions

Scenario	Design/Permitting	Construction
Rehabilitate dam to meet NYSDEC dam safety standards	\$75,000 - \$80,000	\$600,000 - \$750,000 [1, 2]
Remove dam and restore free-flowing stream	\$75,000 - \$80,000	\$300,000 - \$400,000
Remove dam and install beaver analog structures	\$75,000 - \$80,000	\$300,000 - \$400,000

1 - Rehab of dam requires certification of as-built plans by NY-licensed PE.

2 - All options require construction-phase involvement by engineer (will vary depending on duration of project and whether part- or full-time inspection; for budgetary purposes, assume additional 10% to 20% of construction budget).

4.5 MAINTENANCE CONSIDERATIONS

Table 4-2 is a summary of short-term and long-term maintenance considerations for each scenario.

Table 4-2 Summary Table of Maintenance Considerations

Scenario	Short-Term	Long-Term
Rehabilitate dam to meet NYSDEC dam safety standards	• Inspection and Maintenance (I&M) Plan • Mowing of clear zone • Removal of woody vegetation • Exercise low-level outlet valve	• Inspection and Maintenance (I&M) Plan • Regular inspection by staff • Inspection every 10 years by engineer • Periodic repair of dam components • Mowing of clear zone • Woody vegetation removal • Exercise low-level outlet valve
Remove dam and restore free-flowing stream	• Tree and shrub planting • Seeding • Invasive species control • Monitoring	• Bridge maintenance (if installed) • Invasive species control • Supplemental plantings • Monitoring
Remove dam and install beaver analog structures	• Tree and shrub planting • Seeding • Invasive species control • Maintain/repair beaver analogs • Monitoring	• Bridge maintenance (if installed) • Invasive species control • Supplemental plantings • Monitoring

4.6 REGULATORY PERMITTING REQUIREMENTS

According to the National Wetlands Inventory, Duck Pond is mapped as Freshwater Pond habitat, the wetland just upstream of the pond is mapped as Freshwater Forested/Shrub Wetland, and the Kleine Kill channel upstream and downstream of the pond is mapped as Riverine habitat. Any disturbance within these mapped wetland areas or below the Ordinary High Water Line (OHWL) of the Kleine Kill will require a Section 404 Clean Water Act permit from the US Army Corps of Engineers.

A NYSDEC-mapped wetland (M-15, Class 2) surrounds the northern half of Duck Pond. Any proposed work within the mapped wetland habitat or its 100-foot adjacent area would require an Article 24 Freshwater Wetlands permit from NYSDEC. Requirements may place limitations on when work can take place and when the pond can be drained or refilled.

The Kleine Kill channel upstream and downstream of Duck Pond, referred to as Trib. of the Wallkill River (Reg # 855.5-21. Water Index # H-139-13-11 portion and trib. 7), is listed as a Class AA stream. An Article 15 Protection of Waters permit will be required from NYSDEC for any work to the bed or banks of this stream.

The Duck Pond Dam (Fed ID # NY17134, State ID: 193-5962) is classified as an 'A' low hazard dam with a dam height of 20 feet, according to NYSDEC records. Repairs would trigger the need for a Dam Safety permit. To remove the dam, a permit through the Protection of Waters program will be required from NYSDEC.

The Duck Pond Dam and the area surrounding Duck Pond are not within an archaeologically sensitive area. The Mohonk Mountain House is not listed on the National Register of Historic Places, but it is recognized as a National Historic Landmark. While Duck Pond is over a mile through the woods from the Mohonk Mountain House, as an adjacent parcel, consultation with the State Historic Preservation Office is advised for the proposed work.

There are no known New York State-listed endangered or threatened animal species listed as occurring within or in the vicinity of the project site. There is conflicting information provided on the two NYSDEC environmental mappers, with the EAF Mapper indicating that the project site is in the location of a rare plant species. It is advisable to consult with the New York Natural Heritage Program. The project site is within or in the vicinity of an identified natural community, the Chestnut Oak Forest.

Local Floodplain Development permit would not be required by the town as work would be located outside of the special flood hazard area.

4.7 PREFERED SCENARIO

Mohonk Preserve's goal in undertaking this analysis is to determine the feasibility of various approaches at Duck Pond Dam. Initially, the following four scenarios were investigated:

1. Rehabilitate the dam to meet NYSDEC dam safety standards
2. Construct a replacement dam that meets NYSDEC dam safety standards
3. Remove all or part of dam
4. Do nothing

A series of discussions took place among Mohonk Preserve board members, Mohonk Preserve staff, and SLR's engineers and scientists. The full replacement of the dam and the "do nothing" alternative were ruled out as viable long-term solutions. The scenarios of rehabilitating the dam and removing all or part of the dam were evaluated in more detail as documented in this report. Schematic design drawings and renderings were produced by SLR to assist in visualizing each scenario. The scenario of removing all or part of the dam was divided into two scenarios, one in which the dam is removed and the former impoundment is restored to a free-flowing stream, and a second in which the dam is removed and a series of beaver analog structures are installed along the watercourse, creating a series of ponds.

Mohonk Preserve selected the scenario of removing all or part of the dam and installing a series of beaver analog structures along the Kleine Kill watercourse, creating a series of ponds. This scenario is being recommended to the Mohonk Preserve Board for discussion at its June 2022 meeting.

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APPENDIX A
NYSDEC DAM SAFETY CORRESPONDENCE

Duck Pond Dam Feasibility Study

Mohonk Preserve
P.O. Box 715
New Paltz, NY 12561

May 2022

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water, Bureau of Flood Protection and Dam Safety
625 Broadway, Albany, New York 12233-3504
P: (518) 402-8185 | F: (518) 402-9029
www.dec.ny.gov

July 3, 2018

Chuck Reid, Director of Land Protection
Mohonk Preserve
P.O. Box 715
New Paltz, New York 12561

Re: Duck Pond Dam
DEC Dam ID#: 193-5962
New Paltz (T), Ulster County

Dear Mr. Reid:

During our conversation on June 21, 2018, it was determined that the dam at Duck Pond is a previously non-inventoried dam. The dam has been assigned the name of Duck Pond Dam and the DEC Dam ID# 193-5962.

I have assigned a Class A – Low Hazard classification to the Duck Pond Dam. This classification is based on a downstream analysis which showed if the dam were to fail, it is unlikely to result in damage to anything more than isolated farm buildings, undeveloped lands, or town and/or county roads. The dam safety regulations presented in 6 NYCRR Part 673 require owners of Class A – Low Hazard Dams to:

1. Operate and maintain the dam and all appurtenant structures in a safe condition at all times;
2. Maintain in good order all available records regarding the dam, and provide those records to any new owner;
3. Develop and implement an Inspection and Maintenance (I&M) Plan. A template that can be used to develop an inspection and maintenance plan can be downloaded from: http://www.dec.ny.gov/lands/58691.html.

Dam safety regulations can be downloaded from the Department's website at: http://www.dec.ny.gov/regulations/regulations.html.

From our conversation, the dam's height is estimated to be 20 feet, and from the March 1989 Report by the Adirondack Lake Survey Corp, the volume is estimated to be 3.9 million gallons. As such, this dam is considered to be above the thresholds for requiring a dam safety permit for any repair or reconstruction as defined in 6 NYCRR Part 608.

Ordinary maintenance does not require a dam safety permit as the owner is expected to conduct ordinary maintenance as necessary.

Please keep mind that any repair or construction related to the dam may require a permit from the Department. Well in advance of beginning any work, please check with the Regional Permit Administrator in the New Paltz office (845-256-3054) to see if a permit is needed.

If you have any questions, please feel free to contact Alon Dominitz by phone at 518-402-8185, or by e-mail at alon.dominitz@dec.ny.gov.

Sincerely,

Michael Caseiras

Michael Caseiras.
Assistant Engineer (Environmental)
Dam Safety Section

ec: Berhanu Gonfa, P.E., NYSDEC, Water, White Plains
Shohreh Karimipour, P.E., NYSDEC, Water, Region 3, White Plains
John Petronella, NYSDEC, Permits, Region 3, New Paltz
Alon Dominitz, NYSDEC, Water, Dam Safety

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water, Bureau of Flood Protection and Dam Safety
625 Broadway, Albany, New York 12233-3504
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January 22, 2019

Chuck Reid, Director of Land Protection
Mohonk Preserve
P.O. Box 715
New Paltz, New York 12561

Re: Duck Pond Dam
DEC Dam ID#: 193-5962; Class A (Small, Low Hazard Dam)
Town of New Paltz, Ulster County

Dear Mr. Reid:

I conducted a routine inspection the Duck Pond Dam on November 13, 2018 as part of the Department of Environmental Conservation's (Department) ongoing Dam Safety program. I would also like to thank you, along with Mr. Winans and Mr. Koplinger for meeting with me on-site and discussing the particulars of the dam during my inspection.

I am writing to you because it is my understanding that, as the Director of Land Protection, you represent the owner of this structure. A copy of the visual observations generated from the inspections are enclosed. The left/right nomenclature used in this letter and in the enclosed Visual Observation Reports are based on looking downstream from the middle of the dam.

Inspection

The inspection revealed that there is undesirable growth (trees, brush and tall weeds) on the upstream and downstream faces of the dam along with old stumps. These features are not desirable on dams for the following reasons:

- If the vegetation is left in place it will continue to grow, and the roots will penetrate further into the embankment.
- Extensive root systems can provide seepage paths for water, which can lead to internal erosion and failure of the dam.
- Trees that blow down or fall over can leave large holes in the embankment that will weaken the embankment and can shorten seepage paths.
- Brush and tall weeds obscure the surface, thereby limiting visual inspection, provide a haven for burrowing animals, and retard growth of grass vegetation.

The Department generally recommends a well-mowed, erosion-resistant cover such as grass for earth embankments or stone rip rap, and that all trees and brush be cut at your earliest opportunity. Stumps less than 4-inch diameter should be cut off at ground level and the roots left in place. Tree cutting and slope clearing is typically considered ordinary maintenance, depending on the magnitude of the operations. Stumps and root balls for larger trees should also be removed, but under the guidance of a professional engineer, and may require a dam safety permit. All undesirable vegetation should be cleared to 10-ft beyond the toe of the embankment, and all cut materials should be removed. Removal of undesirable vegetation from beyond the toe will promote equipment access and the monitoring of seepage.

The inspection also revealed two (2) non-functional low-level drain pipes. The valve on one of the pipes is frozen shut and the valve on the second pipe is broken off and unable to close. An open low-level outlet pipe with a non-operable valve creates the risk of creating seepage paths, if the pipe should corrode or joints open, without providing the benefit of having the ability of lowering the pond. The low-level outlet should either be repaired, or the pipe should be filled with grout and an alternate plan using temporary pumps and/or siphons should be developed for inclusion in the Inspection and Maintenance Plan discussed below. Repair or abandonment of the low-level outlet may require a dam safety permit.

Lastly, it was also noted during the inspection that the downstream laid stone face of the dam and spillway were not uniform with areas/voids of potentially missing stones/material and undercutting of the laid stone in some locations. You should hire a professional engineer (P.E.), registered in New York State and with experience in dam safety, to fully evaluate the structure and recommend alternatives for repair and to bring the dam fully into compliance with applicable safety criteria, as discussed in the Department's Guidelines for Design of Dams.

Deficiencies may exist beyond those identified during this visual inspection. The Department's visual inspections are not intended to take place of a comprehensive engineering evaluation by a professional engineer. The Department's inspection observations and notes should not be relied on for "risk management/assessment" or other financially based determinations.

Regulations

You were notified via correspondence dated July 3, 2018 from the Department that the Duck Pond Dam was assigned a downstream hazard classification of a Class A-Low Hazard dam. Owners of Class A - Low Hazard dams are minimally required to:

1. Always operate and maintain the dam and all appurtenant structures in a safe condition at all times;
2. Maintain in good order all available records regarding the dam, and provide those records to any new owner;
3. Develop and implement an Inspection and Maintenance (I&M) Plan for each structure. An I&M Plan template can be downloaded from: http://www.dec.ny.gov/lands/58691.html.

The full text of the revised 6 NYCRR Part 608 and Part 673, along with technical guidance, templates and forms can be downloaded from the Dam Safety webpage at: http://www.dec.ny.gov/lands/4991.html.

Permitting

Based on your prior conversations with the Department, the March 1989 Report by the Adirondack Lake Survey Corp., and confirmed from my visual observations made during the site visit, the dam would be considered above the thresholds for requiring a dam safety permit for any repair or reconstruction as defined in 6 NYCRR Part 608. The dam height is estimated to be approximately 20-feet and the volume of the impoundment is estimated at 3.9 million gallons. However, work considered to be "ordinary maintenance of a dam" does not require a dam safety permit as the owner is expected to conduct ordinary or routine maintenance as necessary. If you have a question as to whether proposed work at the dam is considered ordinary maintenance, please contact the Department.

Please keep mind that any repair or construction related to the dam may require additional permits from the Department. Well in advance of beginning any work, please check with the Regional Permit Administrator in the New Paltz office (845-256-3801) to see if a permit is needed.

If you have any questions regarding the above or the Dam Safety program in general, please contact me at 518-402-8252 or by e-mail at Warren.Shaw@dec.ny.gov.

Sincerely,

Warren Shaw

Warren Shaw, P.E.
Professional Engineer I (Environmental)
Dam Safety Section

ec: Alon Dominitz, NYSDEC, Dam Safety Section, Chief
Berhanu Gonfa, NYSDEC, Region 3, Water
Lorraine Holdridge, NYSDEC, Region 3 Water Engineer

L:\DOW\BFPDS\DAM SAFETY\Dam Inventory\Region 3\Ulster\193-5962 Duck Pond Dam\2018-11-13 Inspection\letter.dam.193-5962.2019-01-22.DuckPondDam.docx

New York State Department of Environmental Conservation
Bureau of Flood Protection and Dam Safety

Visual Observations

DAM NAME	DUCK POND DAM		
STATE ID	193-5962 SECTION C	*HAZARD CODE*	A
COUNTY	Ulster	*INSPECTION DATE*	11/13/2018
NEAREST DS CITY/TOWN		*INSPECTOR(S)*	WTS
OWNER'S NAME	MOHONK PRESERVE INC		
DOWNSTREAM HAZARD	Low	*TOWNSHIP*	Town of New Paltz
WATER LEVEL BEHIND DAM	approx. 4-inch flow over spillway		
DRAIN OPERATION	reported not operational (see notes below)		

DEFICIENCIES

☐ *1)Seepage*	☒ *4)Maintenance*	☐ *7)Cracking*
☒ *2)Slope Stability*	☒ *5)Surficial Deterioration*	☐ *8)Movement/Misalignment*
☒ *3)Undesirable Growth*	☒ *6)Voids*	☐ *9)Data*

General:

–Dam recently added to NYSDEC inventory database (June 2018)
–Accompanied by Chuck Reid, Jon Winans, and Bill Koplinger during the inspection.
–There are 2 low level drain valves; one is reported frozen shut the other is reported broken open. Reported pond will and has drained several times (5-6) during low rain periods this past summer.

Upstream:

–Upstream slope has tall weeds and brush.
–Vertical scarping was observed along the upper portion of the slope exposing the vertical stone wall face. Appears the upper portion of the slope is eroding away particularly in the area around the spillway.

Dam Crest:

–Gravel path along the top of the dam, with maintained grass along the downstream shoulder. Both upstream and downstream crest edges appear to drop off with vertical dried laid stone walls.
–Crest appears level and maintained.
–Several stumps (approx. 3-5), from recent tree cutting operations, along the downstream edge of the crest towards the left end of the dam.

Downstream:

–Upper portion of the downstream slope is near vertical laid stone face. The lower portion of the slope appears to be comprised of loose rip rap stone.
–The downstream slope towards the left end of the dam is not uniform with several places of voids in the stones and there appears to be some missing material and undercutting of the laid stones.
–The slope appears to have been recently cleared of trees/saplings. Observed 8-10 stumps on the downstream slope) Debris/branches from clearing operation still on the downstream slope. Several larger trees (approx. 5) at the downstream toe remain.
–Minor vegetation growing up between the stones.
–Observed flow at the right downstream toe to the right of the spillway. Possible flow from spillway under stones or seepage (?)

Service Spillway:

–Service spillway is comprised of three (3) concrete box culverts formed by 2 intermediate concrete piers for the crest to pass over the spillway.

–Could not access for detailed observations. Noted concrete deterioration at the bottom of the concrete piers at the stone interface. Flow through the spillway obscured observation of the downstream face, however it appears there may be some missing material and possible undercutting on the downstream spillway face.

–Woody debris, logs and branches along the downstream outlet channel.

Low Level Valve:

–Low level drains are comprised of two (2) 8-inch pipes.

–The two valves are located on the downstream side of the dam. Reported one valve is seized (frozen) shut, the other valve end is broken off and open. Reported that open outlet pipe flows, becomes clogged then will "let go", flowing full draining the impoundment.

–The low level outlet located at the downstream toe to the left of the service spillway.

Photo 1 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Upstream slope
View looking right from left end of dam

Photo 2 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Upstream crest/slope interface
View looking right

Photo 3 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Dam crest
View looking right from left end of dam

Photo 4 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Downstream slope
View looking right from left end of dam

Photo 5 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Left downstream slope
View looking left from spillway toe

Photo 6 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Downstream outlet channel and spillway face
View looking upstream

Photo 7 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Service spillway downstream face
View looking upstream

Photo 8 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Downstream spillway face
View looking right from downstream toe

Photo 9 Dam ID# 193-5962 Duck Pond Dam 11/13/2018
Low level drain outlet

New York State Department of Environmental Conservation
Division of Water
Bureau of Flood Protection and Dam Safety, 4th Floor
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Website: www.dec.ny.gov

A Template for an Inspection And Maintenance Plan for Dams

Purpose:

Pursuant to New York State Environmental Conservation Law Article 15-0507: **Dam owners shall at all times operate and maintain the dam and all appurtenant works in a safe condition**. The purpose of this document is to assist dam owners in developing a Dam Safety Inspection and Maintenance Plan (I&M Plan) as required by NYCRR Part 673.6. The I&M Plan should be used by the owner and kept on file, but does not need to be submitted to the Department unless requested.

This template reflects the general components of an I&M plan for the average dam. Use of this format does not guarantee acceptance of the Inspection and Maintenance Plan by the Department. Dam owners may use other guidance and formats so long as the plan complies with 6 NYCRR Part 673.6.

Additional narrative space should be added as needed.

TEMPLATE

An I&M Plan should indicate who prepared it, when it was last revised and where the Plan is located, as in the following:

Prepared By: Name: ______________________________
Title: ______________________________
Company: ______________________________

Date Last Revised: ______________________________

Location of Dam Inspection and Maintenance Plan: ______________________________
____
____

Part 1: Dam Data

Dam Name: ____________________
Dam State Identification Number: ____________________
Federal Energy Regulatory Commission Identification Number, if applicable: ____________
Dam Hazard Classification: ____________________
(C-High Hazard, B-Intermediate Hazard, A-Low Hazard)
Date of last Hazard Class Verification: ____________________

Dam Location: County: ____________ Town/City/Village: ____________
Latitude: ____________ Longitude: ____________
Dam Type: ____________ (embankment, concrete, combination, other)

Year of original construction: ________ Year of last construction activity: ________
Name of last Engineer and Builder: ____________________
Dam Use(s): ____________________
(water supply, flood control, energy generation, recreation, irrigation, pollution control, other)

Dam Owner(s) Name: ____________________
Dam Owner(s) Mailing Address: ____________________
Dam Owner(s) Telephone Number: ____________________
Dam Owner(s) Facsimile Number: ____________________
Dam Owner(s) E-Mail: ____________________

Reservoir and stream (inflow and outflow) name and class (and/or navigability?):
____

Associated wetlands and other natural resources of special concern:
____

Dam height: ____________________ feet
(as measured from downstream toe at lowest point to top of dam)
Dam Crest length: ____________________ feet
Dam Crest width: ____________________ feet
Maximum Impoundment Volume: ____________________ gallons
All Counties/Towns/Cities/Villages within downstream inundation zone:
(B and C Hazard Class dam owners should refer to their Emergency Action Plans)
____
____
Normal Pool Elevation: ____________________
(set by crest of service spillway)
Auxiliary/Emergency Spillway Elevation: ____________________
Maximum Design Water Surface Elevation: ____________________
(specify vertical datum used: local, barge canal, NGVD 29, NAVD 88, IGLD)

Part II: Dam Inspection and Maintenance

Primary person responsible for Dam Operations: ____
(name, title, phone number)

INSPECTION - This section of your I&M Plan should indicate who, how frequent, and what is involved in an inspection. A form or forms should be developed and included which can be used for each type of inspection or items to be monitored. Each dam will typically have specific features which will require monitoring. Such features may be adapted from past inspection reports that were either prepared by NYSDEC or the owner's engineer. Include a table, such as the following, to identify the various type of inspections.

INSPECTION TYPE	FREQUENCY	ITEMS TO INSPECT/MONITOR	PERSONNEL
Informal (i.e. storm events, snow melts)	As needed, after event	Spillway/Aux. Spillway/Seepage	Damtender/Owner
Informal	Monthly/Bi-Monthly/Other	Seepage/Wet Areas/ Toe Drain Flow/ Pool Level/ Trash Rack Debris/ Slides/Cracks/ Rodent Activity/ Vegetation/ Concrete Surfaces/ Vandalism/ Piezometers	Damtender/Owner
Maintenance	Semi-Annually/ Annually/ Other	*In addition to above items*: Slope Protection/Riprap Erosion/ Condition of Vegetative Cover/ Spillway and embankment Condition/ Lake Drain Conditions/ Settlement Monuments	Damtender/Owner/ Engineer
Technical	Periodic*	Safety Inspection (See Part 673.12)	Engineer
Technical	Periodic (After initial, every 10 years)	Engineering Assessment (See Part 673.13)	Engineer

* For Class C dams, typical Safety Inspection frequency should be every 2 years,
For Class B dams, typical Safety Inspection frequency should be every 4 years

MAINTENANCE – Indicate in your I&M Plan the items which will require periodic maintenance. Particular attention should be given to conditions noted on past inspection reports. Examples of typical maintenance are given below. Your dam may consist of some or all of these items and/ or require additional measures, or modified frequencies.

ITEM	FREQUENCY
Mow embankment and emergency spillway	2 times/year
Lubricate and repair as needed lake drain valve mechanism	Annually
Re-establish proper vegetative cover	As needed
Address erosion	As needed
Address rodent damage	As needed
Clean trash rack	As needed
Concrete Maintenance	As needed
Maintain other mechanical equipment	Annually
Replace/ replenish riprap	Annually

OPERATION - Give a summary of all your operation procedures for the dam. Specific procedures for operation of mechanical equipment such as valves should be included here, or attached. Emergency operation should be covered in an Emergency Action Plan (EAP).

Some examples of items that would require operational/ procedural descriptions may include:

- pool level drawdown for the winter season
- exercise (specified frequency – i.e. 2x/year), lubrication of valves
- record keeping (who is maintaining, location)

SAFE RATE DRAWDOWN PLAN - This section should include the method to be used for drawing the impoundment down under emergency and non-emergency conditions. This could include the maximum release rate which will not cause downstream flooding or rapid drawdown damage. Alternative ways to provide for drawdown if needed (i.e. portable pumps, temporary siphons) should also be included. (Hasty, unplanned action during emergency situations could increase the dam failure rate or actually cause failure)

Part III: Training

List of procedures and frequency for training personnel regarding the I&M Plan. Also note other training needs, such as confined space entry procedures per OSHA requirements.

Part IV: Notifications

List of Items Requiring Notification and Notification Procedures pursuant to ECL Part 673. This should consist of at a minimum the following:

Form	Submittal Date
Annual Certification	By January 31, of each year
Incident Report Form (EAP Activation, Flow in Erodible Spillway)	Within 5 days of incident
Notification of Property Transfer	Sale of property where dam is located

Part V: Appendices

Examples of typical appendices include the following:

1. Inspection Forms
2. Past Inspection Reports
3. Reduced Size As-Built Drawings
4. Spillway Rating Curve
5. Drain Rating Curve
6. Pictures

Part VI: Available References

1. *An Owners Guidance Manual for the Inspection and Maintenance of Dams in New York State, DEC June 1987.* http://www.dec.ny.gov/docs/water_pdf/damguideman.pdf

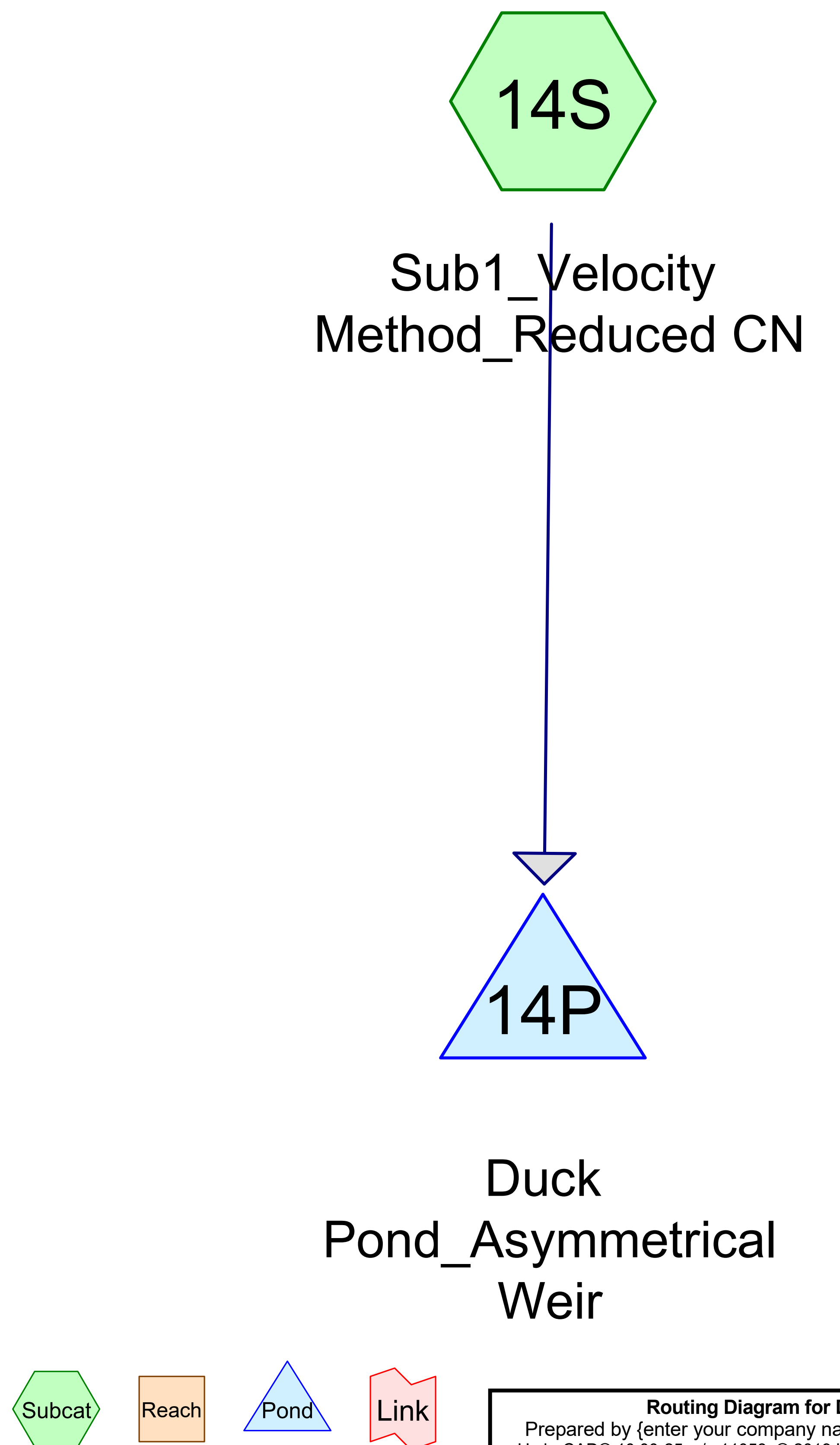
2. *Guidelines for Design of Dams, DEC Revised January 1989.* http://www.dec.ny.gov/docs/water_pdf/damguideli.pdf

APPENDIX B
HYDROLOGIC AND HYDRAULIC MODEL OUTPUT

Duck Pond Dam Feasibility Study

Mohonk Preserve
P.O. Box 715
New Paltz, NY 12561

May 2022



Routing Diagram for DuckPondDam
Prepared by {enter your company name here}, Printed 5/20/2022

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
368.140	64	Area weighted CN calculated based on SSURGO soil type and Ulster County landcover data. (14S)
368.140	**64**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
368.140	Other	14S
368.140		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.000	0.000	0.000	0.000	368.140	368.140	Area weighted CN calculated based on SSURGO soil type and Ulster County landcover data.
0.000	**0.000**	**0.000**	**0.000**	**368.140**	**368.140**	**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	14P	598.80	597.10	20.0	0.0850	0.017	33.6	30.6	0.0
2	14P	598.77	597.12	20.0	0.0825	0.017	31.8	30.6	0.0
3	14P	598.77	597.08	20.0	0.0845	0.017	35.4	30.4	0.0

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=32.38 cfs 21.844 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=599.87' Storage=17.970 af Inflow=34.98 cfs 28.722 af
Primary=30.60 cfs 22.226 af Secondary=2.47 cfs 6.364 af Tertiary=0.00 cfs 0.000 af Outflow=33.07 cfs 28.590 af

Total Runoff Area = 368.140 ac Runoff Volume = 21.844 af Average Runoff Depth = 0.71"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=1.05"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=47.39 cfs 32.343 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=600.19' Storage=19.159 af Inflow=49.99 cfs 39.221 af
Primary=45.26 cfs 32.691 af Secondary=2.50 cfs 6.390 af Tertiary=0.00 cfs 0.000 af Outflow=47.76 cfs 39.080 af

Total Runoff Area = 368.140 ac Runoff Volume = 32.343 af Average Runoff Depth = 1.05"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=1.69"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=75.00 cfs 51.782 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=600.71' Storage=21.193 af Inflow=77.60 cfs 58.660 af
Primary=72.02 cfs 52.078 af Secondary=2.54 cfs 6.430 af Tertiary=0.00 cfs 0.000 af Outflow=74.56 cfs 58.508 af

Total Runoff Area = 368.140 ac Runoff Volume = 51.782 af Average Runoff Depth = 1.69"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=2.27"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=100.26 cfs 69.738 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=601.12' Storage=22.986 af Inflow=102.86 cfs 76.616 af
Primary=96.48 cfs 69.993 af Secondary=2.58 cfs 6.463 af Tertiary=0.02 cfs 0.001 af Outflow=99.08 cfs 76.457 af

Total Runoff Area = 368.140 ac Runoff Volume = 69.738 af Average Runoff Depth = 2.27"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=3.13"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=137.12 cfs 96.151 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=601.45' Storage=24.492 af Inflow=139.72 cfs 103.029 af
Primary=116.18 cfs 92.009 af Secondary=2.60 cfs 6.501 af Tertiary=20.28 cfs 4.351 af Outflow=139.07 cfs 102.862 af

Total Runoff Area = 368.140 ac Runoff Volume = 96.151 af Average Runoff Depth = 3.13"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=3.82"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=166.12 cfs 117.074 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=601.53' Storage=24.910 af Inflow=168.72 cfs 123.952 af
Primary=120.56 cfs 104.314 af Secondary=2.61 cfs 6.523 af Tertiary=45.28 cfs 12.942 af Outflow=168.46 cfs 123.779 af

Total Runoff Area = 368.140 ac Runoff Volume = 117.074 af Average Runoff Depth = 3.82"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Time span=0.00-32.00 hrs, dt=0.01 hrs, 3201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 14S: Sub1_Velocity Runoff Area=368.140 ac 0.00% Impervious Runoff Depth=4.57"
Flow Length=7,497' Tc=58.0 min CN=64 Runoff=198.12 cfs 140.263 af

Pond 14P: Duck Pond_Asymmetrical Peak Elev=601.60' Storage=25.215 af Inflow=200.72 cfs 147.142 af
Primary=123.57 cfs 115.133 af Secondary=2.62 cfs 6.543 af Tertiary=74.27 cfs 25.289 af Outflow=200.46 cfs 146.964 af

Total Runoff Area = 368.140 ac Runoff Volume = 140.263 af Average Runoff Depth = 4.57"
100.00% Pervious = 368.140 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: Sub1_Velocity Method_Reduced CN

Runoff = 198.12 cfs @ 11.02 hrs, Volume= 140.263 af, Depth= 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs
NOAA Atlas 14 Q2 - 50% 100-yr_Q2_50% Rainfall=8.13", Ia/S=0.05

	Area (ac)	CN	Description
*	368.140	64	Area weighted CN calculated based on SSURGO soil type and Ulster County landcover data.
	368.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	85	0.1377	0.09		**Sheet Flow, Sheet flow** Woods: Dense underbrush n= 0.800 P2= 3.30"
21.7	767	0.0553	0.59		**Shallow Concentrated Flow, Shallow concentrated flow** Forest w/Heavy Litter Kv= 2.5 fps
7.2	1,144	0.0344	2.64	4.50	**Trap/Vee/Rect Channel Flow, Segment 1** Bot.W=2.00' D=0.55' Z= 2.0 '/' Top.W=4.20' n= 0.055
2.9	1,401	0.2106	8.05	28.72	**Trap/Vee/Rect Channel Flow, Segment 2:** Bot.W=3.70' D=0.70' Z= 2.0 '/' Top.W=6.50' n= 0.055
5.5	1,875	0.0700	5.73	45.41	**Trap/Vee/Rect Channel Flow, Segment 3** Bot.W=7.00' D=0.90' Z= 2.0 '/' Top.W=10.60' n= 0.055
3.4	1,579	0.0451	7.76	76.06	**Trap/Vee/Rect Channel Flow, Segment 4** Bot.W=7.80' D=1.00' Z= 2.0 '/' Top.W=11.80' n= 0.035
2.4	646	0.0130	4.41	49.44	**Trap/Vee/Rect Channel Flow, Segment 5** Bot.W=8.00' D=1.10' Z= 2.0 '/' Top.W=12.40' n= 0.035
58.0	7,497	Total			

Summary for Pond 14P: Duck Pond_Asymmetrical Weir

[58] Hint: Peaked 0.70' above defined flood level

Inflow Area = 368.140 ac, 0.00% Impervious, Inflow Depth > 4.80" for 100-yr_Q2_50% event
Inflow = 200.72 cfs @ 11.02 hrs, Volume= 147.142 af, Incl. 2.60 cfs Base Flow
Outflow = 200.46 cfs @ 11.16 hrs, Volume= 146.964 af, Atten= 0%, Lag= 8.7 min
Primary = 123.57 cfs @ 11.16 hrs, Volume= 115.133 af
Secondary = 2.62 cfs @ 11.16 hrs, Volume= 6.543 af
Tertiary = 74.27 cfs @ 11.16 hrs, Volume= 25.289 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-32.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 598.80' Surf.Area= 3.322 ac Storage= 14.275 af
Peak Elev= 601.60' @ 11.16 hrs Surf.Area= 4.860 ac Storage= 25.215 af (10.940 af above start)
Flood Elev= 600.90' Surf.Area= 4.316 ac Storage= 22.020 af (7.745 af above start)

Plug-Flow detention time= 150.8 min calculated for 132.688 af (90% of inflow)
Center-of-Mass det. time= 53.9 min (785.5 - 731.6)

Volume	Invert	Avail.Storage	Storage Description
#1	588.00'	32.667 af	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
588.00	0.011	0.000	0.000	0.011
589.00	0.060	0.032	0.032	0.060
590.00	0.147	0.100	0.133	0.147
591.00	0.252	0.197	0.330	0.253
592.00	0.500	0.369	0.699	0.501
593.00	0.891	0.686	1.385	0.892
594.00	1.295	1.087	2.472	1.296
595.00	1.759	1.521	3.993	1.761
596.00	2.395	2.069	6.061	2.397
597.00	2.882	2.635	8.696	2.885
600.00	3.633	9.751	18.447	3.642
600.50	4.006	1.909	20.356	4.015
601.00	4.395	2.099	22.456	4.404
601.50	4.799	2.298	24.753	4.809
602.00	5.123	2.480	27.233	5.133
603.00	5.751	5.434	32.667	5.763

Device	Routing	Invert	Outlet Devices
#1	Tertiary	601.10'	**Asymmetrical Weir, C= 2.66** Offset (feet) 0.00 6.00 62.00 92.00 103.00 112.00 124.00 134.00 140.00 162.00 189.00 198.00 208.00 225.00 233.00 238.00 245.00 253.00 261.00 267.00 272.00 287.00 309.00 343.00 376.00 410.00 428.00 447.00 473.00 486.00 495.00 Height (feet) 2.27 0.73 0.36 0.40 0.20 0.31 0.71 0.77 0.23 0.40 0.53 0.65 0.41 0.00 0.02 0.03 0.13 0.32 0.33 0.38 0.22 0.30 0.77 0.44 0.17 0.42 0.63 0.41 0.37 0.23 2.27
#2	Primary	598.80'	**33.6" W x 30.6" H Box Culvert**

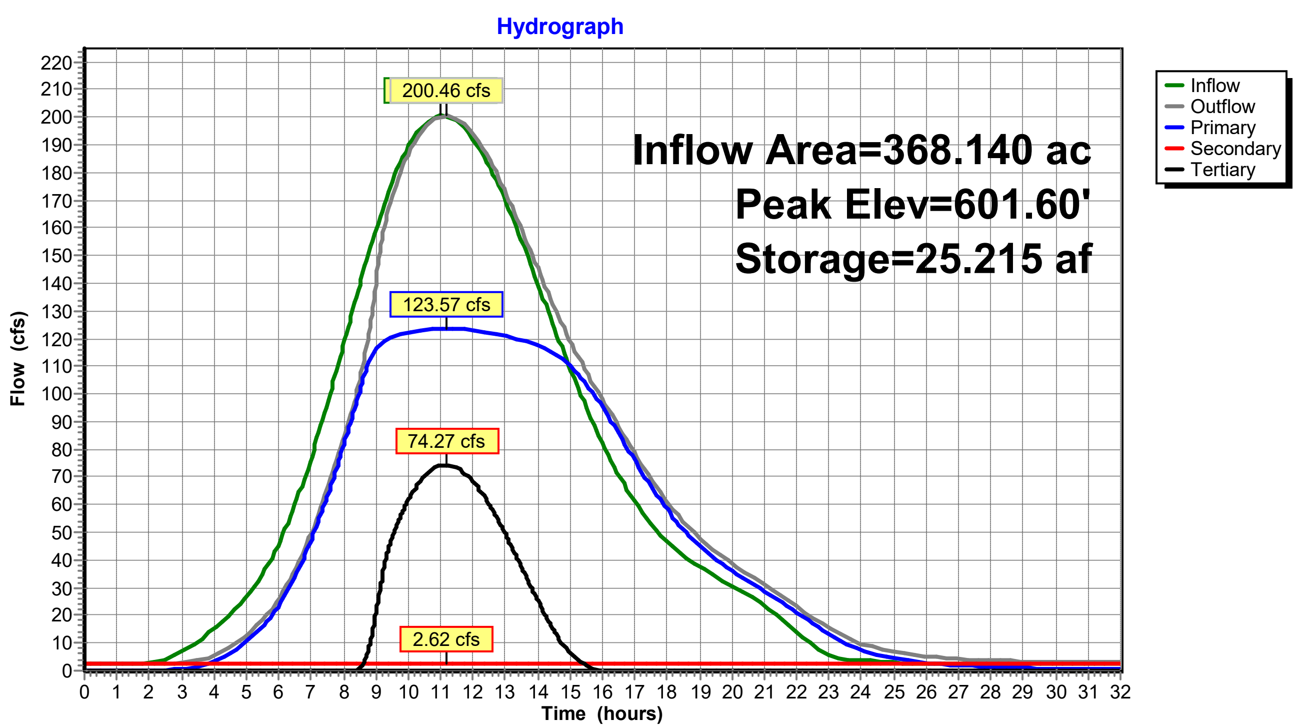
			L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 598.80' / 597.10' S= 0.0850 '/' Cc= 0.900 n= 0.017, Flow Area= 7.14 sf
#3	Primary	598.77'	**31.8" W x 30.6" H Box Culvert** L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 598.77' / 597.12' S= 0.0825 '/' Cc= 0.900 n= 0.017, Flow Area= 6.76 sf
#4	Primary	598.77'	**35.4" W x 30.4" H Box Culvert** L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 598.77' / 597.08' S= 0.0845 '/' Cc= 0.900 n= 0.017, Flow Area= 7.47 sf
#5	Secondary	590.99'	**6" Low Flow Outlet** 6.000" Diameter, C= 0.600 40.0' Long Tube, Hazen-Williams C= 85 Inlet / Outlet Elev. = 590.99' / 585.17'

Primary OutFlow Max=123.57 cfs @ 11.16 hrs HW=601.60' (Free Discharge)
2=Culvert (Inlet Controls 40.92 cfs @ 5.73 fps)
3=Culvert (Inlet Controls 39.17 cfs @ 5.80 fps)
4=Culvert (Inlet Controls 43.48 cfs @ 5.82 fps)

Secondary OutFlow Max=2.62 cfs @ 11.16 hrs HW=601.60' (Free Discharge)
5=6" Low Flow Outlet (Tube Controls 2.62 cfs @ 13.32 fps)

Tertiary OutFlow Max=74.27 cfs @ 11.16 hrs HW=601.60' (Free Discharge)
1=Asymmetrical Weir (Weir Controls 74.27 cfs @ 0.89 fps)

Pond 14P: Duck Pond_Asymmetrical Weir



APPENDIX C
FULL-PAGE ARTISTIC RENDERINGS

Duck Pond Dam Feasibility Study

Mohonk Preserve
P.O. Box 715
New Paltz, NY 12561

May 2022

SLR

APPENDIX D
SEDIMENT SAMPLING LAB ANALYSIS RESULTS

Duck Pond Dam Feasibility Study

Mohonk Preserve
P.O. Box 715
New Paltz, NY 12561

May 2022

80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
e-mail: cet1@cetlabs.com

Client: Mr. Matthew Rose
SLR Incorporated
45 Glastonbury Blvd
Glastonbury, CT 06033

Analytical Report

CET# 1100436

Report Date:October 26, 2021
Project: Duck Pond Dam, New Paltz, NY
Project Number: 20261.00001

Connecticut Laboratory Certificate: PH 0116
Massachusetts Laboratory Certificate: M-CT903
Rhode Island Laboratory Certificate: 199

New York NELAP Accreditation: 11982
Pennsylvania Laboratory Certificate: 68-02927

SAMPLE SUMMARY

The sample(s) were received at 5.0°C.

This report contains analytical data associated with following samples only.

Sample ID	Laboratory ID	Matrix	Collection Date/Time	Receipt Date
Sed-101	1100436-01	Soil	10/14/2021 11:30	10/15/2021
Sed-102	1100436-02	Soil	10/14/2021 11:50	10/15/2021
Sed-103	1100436-03	Soil	10/14/2021 12:15	10/15/2021

Analyte: Percent Solids [SM 2540 G] **Analyst: MV**

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1100436-01	Sed-101	28	1.0	%	1	B1J2044	10/20/2021	10/22/2021 09:15	
1100436-02	Sed-102	32	1.0	%	1	B1J2044	10/20/2021	10/22/2021 09:15	
1100436-03	Sed-103	38	1.0	%	1	B1J2044	10/20/2021	10/22/2021 09:15	

Analyte: Mercury [EPA 7471B] **Analyst: EAS**

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1100436-01	Sed-101	ND	0.44	mg/kg dry	1	B1J2007	10/20/2021	10/20/2021 13:52	
1100436-02	Sed-102	ND	0.39	mg/kg dry	1	B1J2007	10/20/2021	10/20/2021 14:04	
1100436-03	Sed-103	ND	0.31	mg/kg dry	1	B1J2007	10/20/2021	10/20/2021 14:06	

Testing Performed at: NY11301

Analyte: Total Organic Carbon [EPA 9060A] **Analyst: subcontract**

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1100436-01	Sed-101	54000	100	mg/kg	1	[none]	10/18/2021	10/18/2021 00:00	
1100436-02	Sed-102	50300	100	mg/kg	1	[none]	10/18/2021	10/22/2021 00:00	
1100436-03	Sed-103	35900	100	mg/kg	1	[none]	10/18/2021	10/22/2021 00:00	

Client Sample ID Sed-101
Lab ID: 1100436-01

Grain Size Distribution **Analyst: JWF**
Method: ASTM C 136-01 **Matrix: Soil**

Analyte	Result (% Retained)	RL (% Retained)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Sieve Size 4	**0.131**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 10	**25.2**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 40	**43.7**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 200	**18.1**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size Pan	**12.8**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	

Total Metals **Analyst: SS**
Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**42**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Selenium	ND	8.6	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Cadmium	ND	1.7	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Chromium	**31**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Arsenic	**4.6**	3.4	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Barium	**260**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Silver	ND	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Copper	**30**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Nickel	**34**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	
Zinc	**150**	6.8	1	EPA 3051A	B1J1905	10/19/2021	10/20/2021 15:43	

TCLP Metals **Analyst: SS**
Method: EPA 6020A-1311 **Matrix: Extract**

Analyte	Result (mg/L)	RL (mg/L)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**0.015**	0.013	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Selenium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Cadmium	ND	0.0050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Chromium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Arsenic	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Barium	**0.67**	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Silver	ND	0.020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	
Mercury	ND	0.0020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:06	

Client Sample ID Sed-101

Lab ID: 1100436-01

Chlorinated Pesticides **Analyst: JTS**

Method: EPA 8081B **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Alpha-BHC	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Gamma-BHC	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Heptachlor	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Aldrin	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Beta-BHC	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Delta-BHC	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Heptachlor Epoxide	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endosulfan I	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
4,4-DDE	ND	3.5	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Dieldrin	ND	3.5	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endrin	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
4,4-DDD	ND	3.5	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endosulfan II	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
4,4-DDT	ND	3.5	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endrin Aldehyde	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
4,4-Methoxychlor	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endosulfan Sulfate	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Endrin Ketone	ND	17	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Chlordane	ND	100	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Toxaphene	ND	350	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Alachlor	ND	170	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:34	
Surrogate: TCMX [1C]	*96.0 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:34*	
Surrogate: DCB [1C]	*77.8 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:34*	
Surrogate: TCMX [2C]	*90.2 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:34*	
Surrogate: DCB [2C]	*70.3 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:34*	

PCBs by Soxhlet **Analyst: KML**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1221	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1232	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1242	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	

Client Sample ID Sed-101

Lab ID: 1100436-01

PCBs by Soxhlet **Analyst: KML**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1248	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1254	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1260	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1268	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
PCB-1262	ND	0.36	1	EPA 3540C	B1J1814	10/18/2021	10/21/2021 13:09	
Surrogate: TCMX [1C]	*31.1 %*	*30 - 150*			B1J1814	10/18/2021	*10/21/2021 13:09*	
Surrogate: TCMX [2C]	*32.6 %*	*30 - 150*			B1J1814	10/18/2021	*10/21/2021 13:09*	
Surrogate: DCB [1C]	*33.8 %*	*30 - 150*			B1J1814	10/18/2021	*10/21/2021 13:09*	
Surrogate: DCB [2C]	*31.9 %*	*30 - 150*			B1J1814	10/18/2021	*10/21/2021 13:09*	

Semivolatile Organics **Analyst: TWF**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
2-Methyl Naphthalene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Acenaphthylene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Acenaphthene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Fluorene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Phenanthrene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Anthracene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Fluoranthene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Pyrene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Benzo[a]anthracene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Chrysene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Benzo[b]fluoranthene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Benzo[k]fluoranthene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Benzo[a]pyrene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Indeno[1,2,3-cd]pyrene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Dibenz[a,h]anthracene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Benzo[g,h,i]perylene	ND	2100	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 16:36	
Surrogate: Nitrobenzene-d5	*39.6 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 16:36*	
Surrogate: 2-Fluorobiphenyl	*35.5 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 16:36*	
Surrogate: Terphenyl-d14	*64.0 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 16:36*	

Client Sample ID Sed-101

Lab ID: 1100436-01

Volatile Organics
Method: EPA 8260C

Analyst: CED
Matrix: Soil

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Benzene	ND	13	1.41	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:21	
Toluene	ND	13	1.41	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:21	
Ethylbenzene	ND	13	1.41	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:21	
m+p Xylenes	ND	25	1.41	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:21	
o-Xylene	ND	13	1.41	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:21	
Surrogate: 1,2-Dichloroethane-d4	*100 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:21*	
Surrogate: Toluene-d8	*100 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:21*	
Surrogate: 4-Bromofluorobenzene	*95.7 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:21*	

Client Sample ID Sed-102

Lab ID: 1100436-02

Grain Size Distribution **Analyst: JWF**

Method: ASTM C 136-01 **Matrix: Soil**

Analyte	Result (% Retained)	RL (% Retained)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Sieve Size 4	ND	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 10	**19.0**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 40	**51.8**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 200	**17.4**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size Pan	**11.8**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**30**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Selenium	ND	7.6	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Cadmium	ND	1.5	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Chromium	**25**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Arsenic	**3.1**	3.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Barium	**200**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Silver	ND	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Copper	**24**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Nickel	**27**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	
Zinc	**100**	6.0	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:25	

TCLP Metals **Analyst: SS**

Method: EPA 6020A-1311 **Matrix: Extract**

Analyte	Result (mg/L)	RL (mg/L)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**0.021**	0.013	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Selenium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Cadmium	ND	0.0050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Chromium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Arsenic	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Barium	**0.97**	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Silver	ND	0.020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	
Mercury	ND	0.0020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:10	

Client Sample ID Sed-102

Lab ID: 1100436-02

Chlorinated Pesticides **Analyst: JTS**

Method: EPA 8081B **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Alpha-BHC	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Gamma-BHC	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Heptachlor	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Aldrin	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Beta-BHC	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Delta-BHC	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Heptachlor Epoxide	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endosulfan I	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
4,4-DDE	ND	3.1	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Dieldrin	ND	3.1	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endrin	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
4,4-DDD	ND	3.1	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endosulfan II	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
4,4-DDT	ND	3.1	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endrin Aldehyde	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
4,4-Methoxychlor	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endosulfan Sulfate	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Endrin Ketone	ND	15	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Chlordane	ND	93	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Toxaphene	ND	310	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Alachlor	ND	150	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 16:46	
Surrogate: TCMX [1C]	*76.3 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:46*	
Surrogate: DCB [1C]	*78.3 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:46*	
Surrogate: TCMX [2C]	*75.9 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:46*	
Surrogate: DCB [2C]	*89.8 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 16:46*	

PCBs by Soxhlet **Analyst: KML**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1221	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1232	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1242	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	

Client Sample ID Sed-102

Lab ID: 1100436-02

PCBs by Soxhlet **Analyst: KML**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1248	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1254	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1260	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1268	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
PCB-1262	ND	0.31	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:32	
Surrogate: TCMX [1C]	*55.4 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:32*	
Surrogate: TCMX [2C]	*57.2 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:32*	
Surrogate: DCB [1C]	*58.9 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:32*	
Surrogate: DCB [2C]	*56.5 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:32*	

Semivolatile Organics **Analyst: TWF**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
2-Methyl Naphthalene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Acenaphthylene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Acenaphthene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Fluorene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Phenanthrene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Anthracene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Fluoranthene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Pyrene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Benzo[a]anthracene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Chrysene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Benzo[b]fluoranthene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Benzo[k]fluoranthene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Benzo[a]pyrene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Indeno[1,2,3-cd]pyrene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Dibenz[a,h]anthracene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Benzo[g,h,i]perylene	ND	930	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:01	
Surrogate: Nitrobenzene-d5	*38.9 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:01*	
Surrogate: 2-Fluorobiphenyl	*32.7 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:01*	
Surrogate: Terphenyl-d14	*110 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:01*	

Client Sample ID Sed-102

Lab ID: 1100436-02

Volatile Organics **Analyst: CED**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Benzene	ND	10	1.28	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:48	
Toluene	ND	10	1.28	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:48	
Ethylbenzene	ND	10	1.28	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:48	
m+p Xylenes	ND	20	1.28	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:48	
o-Xylene	ND	10	1.28	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 14:48	
Surrogate: 1,2-Dichloroethane-d4	*102 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:48*	
Surrogate: Toluene-d8	*98.9 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:48*	
Surrogate: 4-Bromofluorobenzene	*92.7 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 14:48*	

Client Sample ID Sed-103
Lab ID: 1100436-03

Grain Size Distribution **Analyst: JWF**
Method: ASTM C 136-01 **Matrix: Soil**

Analyte	Result (% Retained)	RL (% Retained)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Sieve Size 4	**0.174**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 10	**30.5**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 40	**46.3**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size 200	**14.6**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	
Sieve Size Pan	**8.46**	0.00	1	Gravimetric	B1J2233	10/22/2021	10/22/2021 14:44	

Total Metals **Analyst: SS**
Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**29**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Selenium	ND	6.4	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Cadmium	ND	1.3	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Chromium	**30**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Arsenic	**9.0**	2.5	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Barium	**260**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Silver	ND	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Copper	**22**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Nickel	**30**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	
Zinc	**120**	5.1	1	EPA 3051A	B1J1926	10/19/2021	10/20/2021 16:42	

TCLP Metals **Analyst: SS**
Method: EPA 6020A-1311 **Matrix: Extract**

Analyte	Result (mg/L)	RL (mg/L)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.013	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Selenium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Cadmium	ND	0.0050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Chromium	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Arsenic	ND	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Barium	**0.79**	0.050	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Silver	ND	0.020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	
Mercury	ND	0.0020	1	EPA 3005A	B1J1931	10/19/2021	10/19/2021 19:15	

Client Sample ID Sed-103
Lab ID: 1100436-03

Chlorinated Pesticides **Analyst: JTS**
Method: EPA 8081B **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Alpha-BHC	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Gamma-BHC	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Heptachlor	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Aldrin	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Beta-BHC	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Delta-BHC	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Heptachlor Epoxide	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endosulfan I	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
4,4-DDE	ND	2.6	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Dieldrin	ND	2.6	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endrin	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
4,4-DDD	ND	2.6	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endosulfan II	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
4,4-DDT	ND	2.6	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endrin Aldehyde	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
4,4-Methoxychlor	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endosulfan Sulfate	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Endrin Ketone	ND	13	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Chlordane	ND	79	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Toxaphene	ND	260	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Alachlor	ND	130	1	EPA 3545A	B1J1847	10/18/2021	10/21/2021 17:02	
Surrogate: TCMX [1C]	*83.4 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 17:02*	
Surrogate: DCB [1C]	*72.1 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 17:02*	
Surrogate: TCMX [2C]	*79.3 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 17:02*	
Surrogate: DCB [2C]	*62.5 %*	*30 - 150*			B1J1847	10/18/2021	*10/21/2021 17:02*	

PCBs by Soxhlet **Analyst: KML**
Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1221	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1232	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1242	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	

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Lab ID: 1100436-03

PCBs by Soxhlet **Analyst: KML**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1248	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1254	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1260	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1268	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
PCB-1262	ND	0.26	1	EPA 3540C	B1J1814	10/18/2021	10/20/2021 12:52	
Surrogate: TCMX [1C]	*49.9 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:52*	
Surrogate: TCMX [2C]	*51.7 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:52*	
Surrogate: DCB [1C]	*50.1 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:52*	
Surrogate: DCB [2C]	*48.1 %*	*30 - 150*			B1J1814	10/18/2021	*10/20/2021 12:52*	

Semivolatile Organics **Analyst: TWF**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
2-Methyl Naphthalene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Acenaphthylene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Acenaphthene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Fluorene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Phenanthrene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Anthracene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Fluoranthene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Pyrene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Benzo[a]anthracene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Chrysene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Benzo[b]fluoranthene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Benzo[k]fluoranthene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Benzo[a]pyrene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Indeno[1,2,3-cd]pyrene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Dibenz[a,h]anthracene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Benzo[g,h,i]perylene	ND	790	1	EPA 3545A	B1J1838	10/18/2021	10/19/2021 17:26	
Surrogate: Nitrobenzene-d5	*40.1 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:26*	
Surrogate: 2-Fluorobiphenyl	*32.6 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:26*	
Surrogate: Terphenyl-d14	*93.4 %*	*30 - 130*			B1J1838	10/18/2021	*10/19/2021 17:26*	

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Volatile Organics **Analyst: CED**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Benzene	ND	6.3	0.95	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 15:15	
Toluene	ND	6.3	0.95	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 15:15	
Ethylbenzene	ND	6.3	0.95	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 15:15	
m+p Xylenes	ND	13	0.95	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 15:15	
o-Xylene	ND	6.3	0.95	EPA 5035A-L	B1J1822	10/18/2021	10/18/2021 15:15	
Surrogate: 1,2-Dichloroethane-d4	*97.9 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 15:15*	
Surrogate: Toluene-d8	*99.8 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 15:15*	
Surrogate: 4-Bromofluorobenzene	*93.9 %*		*70 - 130*		B1J1822	10/18/2021	*10/18/2021 15:15*	

QUALITY CONTROL SECTION

Batch B1J1814 - EPA 8082A

Analyte	Result (mg/kg)	RL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1814-BLK1)					Prepared: 10/18/2021 Analyzed: 10/19/2021				
PCB-1016	ND	0.10							
PCB-1221	ND	0.10							
PCB-1232	ND	0.10							
PCB-1242	ND	0.10							
PCB-1248	ND	0.10							
PCB-1254	ND	0.10							
PCB-1260	ND	0.10							
PCB-1268	ND	0.10							
PCB-1262	ND	0.10							
Surrogate: TCMX [1C]					*76.0*	*30 - 150*			
Surrogate: TCMX [2C]					*78.7*	*30 - 150*			
Surrogate: DCB [1C]					*87.4*	*30 - 150*			
Surrogate: DCB [2C]					*84.5*	*30 - 150*			
LCS (B1J1814-BS1)					Prepared: 10/18/2021 Analyzed: 10/19/2021				
PCB-1016	1.04	0.10	1.000		104	40 - 140			
PCB-1260	0.956	0.10	1.000		95.6	40 - 140			
Surrogate: TCMX [1C]					*66.2*	*30 - 150*			
Surrogate: TCMX [2C]					*68.1*	*30 - 150*			
Surrogate: DCB [1C]					*82.6*	*30 - 150*			
Surrogate: DCB [2C]					*79.3*	*30 - 150*			

Batch B1J1822 - EPA 8260C

Analyte	Result (ug/kg)	RL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1822-BLK1)					Prepared: 10/18/2021 Analyzed: 10/18/2021				
Benzene	ND	2.5							
Toluene	ND	2.5							
Ethylbenzene	ND	2.5							
m+p Xylenes	ND	5.0							
o-Xylene	ND	2.5							
Surrogate: 1,2-Dichloroethane-d4					*93.8*	*70 - 130*			
Surrogate: Toluene-d8					*99.3*	*70 - 130*			
Surrogate: 4-Bromofluorobenzene					*98.6*	*70 - 130*			
LCS (B1J1822-BS1)					Prepared: 10/18/2021 Analyzed: 10/18/2021				
Benzene	55.0	2.5	50.000		110	70 - 130			
Toluene	52.6	2.5	50.000		105	70 - 130			
Ethylbenzene	52.5	2.5	50.000		105	70 - 130			
m+p Xylenes	107	5.0	100.000		107	70 - 130			
o-Xylene	54.7	2.5	50.000		109	70 - 130			
Surrogate: 1,2-Dichloroethane-d4					*95.0*	*70 - 130*			
Surrogate: Toluene-d8					*98.6*	*70 - 130*			
Surrogate: 4-Bromofluorobenzene					*101*	*70 - 130*			

Batch B1J1838 - EPA 8270D

Analyte	Result (ug/kg)	RL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1838-BLK1)					Prepared: 10/18/2021 Analyzed: 10/19/2021				
Naphthalene	ND	300							
2-Methyl Naphthalene	ND	300							
Acenaphthylene	ND	300							
Acenaphthene	ND	300							
Fluorene	ND	300							
Phenanthrene	ND	300							
Anthracene	ND	300							
Fluoranthene	ND	300							
Pyrene	ND	300							
Benzo[a]anthracene	ND	300							
Chrysene	ND	300							
Benzo[b]fluoranthene	ND	300							
Benzo[k]fluoranthene	ND	300							
Benzo[a]pyrene	ND	300							
Indeno[1,2,3-cd]pyrene	ND	300							
Dibenz[a,h]anthracene	ND	300							
Benzo[g,h,i]perylene	ND	300							
Surrogate: Nitrobenzene-d5					*60.3*	*30 - 130*			
Surrogate: 2-Fluorobiphenyl					*56.3*	*30 - 130*			
Surrogate: Terphenyl-d14					*57.4*	*30 - 130*			
LCS (B1J1838-BS1)					Prepared: 10/18/2021 Analyzed: 10/20/2021				
Naphthalene	2370	300	4,000.000		59.2	40 - 140			
2-Methyl Naphthalene	2680	300	4,000.000		67.1	40 - 140			
Acenaphthylene	2740	300	4,000.000		68.4	40 - 140			
Acenaphthene	2890	300	4,000.000		72.1	40 - 140			
Fluorene	3000	300	4,000.000		74.9	40 - 140			
Phenanthrene	3060	300	4,000.000		76.4	40 - 140			
Anthracene	3140	300	4,000.000		78.5	40 - 140			
Fluoranthene	3420	300	4,000.000		85.5	40 - 140			
Pyrene	3380	300	4,000.000		84.5	40 - 140			
Benzo[a]anthracene	3110	300	4,000.000		77.7	40 - 140			
Chrysene	3190	300	4,000.000		79.7	40 - 140			
Benzo[b]fluoranthene	3150	300	4,000.000		78.7	40 - 140			
Benzo[k]fluoranthene	3240	300	4,000.000		81.0	40 - 140			
Benzo[a]pyrene	3230	300	4,000.000		80.8	40 - 140			
Indeno[1,2,3-cd]pyrene	3470	300	4,000.000		86.7	40 - 140			
Dibenz[a,h]anthracene	3320	300	4,000.000		83.1	40 - 140			
Benzo[g,h,i]perylene	3470	300	4,000.000		86.7	40 - 140			
Surrogate: Nitrobenzene-d5					*81.8*	*30 - 130*			
Surrogate: 2-Fluorobiphenyl					*75.6*	*30 - 130*			
Surrogate: Terphenyl-d14					*90.9*	*30 - 130*			

Batch B1J1847 - EPA 8081B

Analyte	Result (ug/kg)	RL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1847-BLK1)					Prepared: 10/18/2021 Analyzed: 10/21/2021				
Alpha-BHC	ND	5.0							
Gamma-BHC	ND	5.0							
Heptachlor	ND	5.0							
Aldrin	ND	5.0							
Beta-BHC	ND	5.0							
Delta-BHC	ND	5.0							
Heptachlor Epoxide	ND	5.0							
Endosulfan I	ND	5.0							
4,4-DDE	ND	1.0							
Dieldrin	ND	1.0							
Endrin	ND	5.0							
4,4-DDD	ND	1.0							
Endosulfan II	ND	5.0							
4,4-DDT	ND	1.0							
Endrin Aldehyde	ND	5.0							
4,4-Methoxychlor	ND	5.0							
Endosulfan Sulfate	ND	5.0							
Endrin Ketone	ND	5.0							
Chlordane	ND	30							
Toxaphene	ND	100							
Alachlor	ND	50							
Surrogate: TCMX [1C]					*118*	*30 - 150*			
Surrogate: DCB [1C]					*115*	*30 - 150*			
Surrogate: TCMX [2C]					*114*	*30 - 150*			
Surrogate: DCB [2C]					*94.0*	*30 - 150*			
LCS (B1J1847-BS1)					Prepared: 10/18/2021 Analyzed: 10/21/2021				
Alpha-BHC	52.0	5.0	50.000		104	40 - 140			
Gamma-BHC	52.5	5.0	50.000		105	40 - 140			
Heptachlor	53.4	5.0	50.000		107	40 - 140			
Aldrin	49.3	5.0	50.000		98.7	40 - 140			
Beta-BHC	54.3	5.0	50.000		109	40 - 140			
Delta-BHC	52.3	5.0	50.000		105	40 - 140			
Heptachlor Epoxide	50.4	5.0	50.000		101	40 - 140			
Endosulfan I	54.9	5.0	50.000		110	40 - 140			
4,4-DDE	53.7	1.0	50.000		107	40 - 140			
Dieldrin	53.4	1.0	50.000		107	40 - 140			
Endrin	52.5	5.0	50.000		105	40 - 140			
4,4-DDD	51.0	1.0	50.000		102	40 - 140			
Endosulfan II	53.0	5.0	50.000		106	40 - 140			
4,4-DDT	55.8	1.0	50.000		112	40 - 140			
Endrin Aldehyde	40.9	5.0	50.000		81.8	40 - 140			
4,4-Methoxychlor	59.1	5.0	50.000		118	40 - 140			
Endosulfan Sulfate	54.2	5.0	50.000		108	40 - 140			
Endrin Ketone	49.4	5.0	50.000		98.8	40 - 140			
Alachlor	127	50	100.000		127	40 - 140			
Surrogate: TCMX [1C]					*107*	*30 - 150*			
Surrogate: DCB [1C]					*109*	*30 - 150*			
Surrogate: TCMX [2C]					*103*	*30 - 150*			
Surrogate: DCB [2C]					*88.6*	*30 - 150*			

Batch B1J1905 - EPA 6010C

Analyte	Result (mg/kg)	RL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1905-BLK1)					Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	ND	2.0							
Selenium	ND	2.5							
Cadmium	ND	0.50							
Chromium	ND	2.0							
Arsenic	ND	1.0							
Barium	ND	2.0							
Silver	ND	2.0							
Copper	ND	2.0							
Nickel	ND	2.0							
Zinc	ND	2.0							
LCS (B1J1905-BS1)					Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	22.7	2.0	24.900		91.3	80 - 120			
Selenium	44.2	2.5	49.801		88.7	80 - 120			
Cadmium	24.0	0.50	24.900		96.5	80 - 120			
Chromium	24.0	2.0	24.900		96.4	80 - 120			
Arsenic	22.7	1.0	24.900		91.1	80 - 120			
Barium	23.4	2.0	24.900		94.0	80 - 120			
Silver	4.36	2.0	4.980		87.4	80 - 120			
Copper	21.4	2.0	24.900		86.0	80 - 120			
Nickel	23.0	2.0	24.900		92.2	80 - 120			
Zinc	24.5	2.0	24.900		98.4	80 - 120			

Batch B1J1926 - EPA 6010C

Analyte	Result (mg/kg)	RL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1926-BLK1)					Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	ND	2.0							
Selenium	ND	2.5							
Cadmium	ND	0.50							
Chromium	ND	2.0							
Arsenic	ND	1.0							
Barium	ND	2.0							
Silver	ND	2.0							
Copper	ND	2.0							
Nickel	ND	2.0							
Zinc	ND	2.0							
LCS (B1J1926-BS1)					Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	21.7	1.9	23.148		93.5	80 - 120			
Selenium	41.1	2.3	46.296		88.7	80 - 120			
Cadmium	22.4	0.46	23.148		96.6	80 - 120			
Chromium	23.2	1.9	23.148		100	80 - 120			
Arsenic	20.3	0.93	23.148		87.7	80 - 120			
Barium	22.0	1.9	23.148		94.9	80 - 120			
Silver	4.13	1.9	4.630		89.3	80 - 120			
Copper	21.1	1.9	23.148		91.3	80 - 120			
Nickel	21.6	1.9	23.148		93.3	80 - 120			
Zinc	23.1	1.9	23.148		99.6	80 - 120			
Duplicate (B1J1926-DUP1)		**Source: 1100436-02**			Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	30.7	5.9		29.7			3.41	35	
Selenium	ND	7.4		3.81				35	
Cadmium	ND	1.5		ND				35	
Chromium	28.8	5.9		25.0			14.2	35	
Arsenic	3.00	2.9		3.09			2.83	35	
Barium	226	5.9		198			13.5	35	
Silver	ND	5.9		ND				35	
Copper	27.5	5.9		24.1			12.9	35	
Nickel	30.4	5.9		27.4			10.3	35	
Zinc	110	5.9		105			4.87	35	
Matrix Spike (B1J1926-MS1)		**Source: 1100436-02**			Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	102	5.9	74.291	29.7	97.5	75 - 125			
Selenium	135	7.4	148.582	3.81	88.3	75 - 125			
Cadmium	71.0	1.5	74.291	ND	95.5	75 - 125			
Chromium	106	5.9	74.291	25.0	109	75 - 125			
Arsenic	70.9	3.0	74.291	3.09	91.3	75 - 125			
Barium	#	5.9	74.291	198	#	75 - 125			#
Silver	13.6	5.9	14.858	ND	91.5	75 - 125			
Copper	101	5.9	74.291	24.1	104	75 - 125			
Nickel	102	5.9	74.291	27.4	100	75 - 125			
Zinc	185	5.9	74.291	105	108	75 - 125			
Matrix Spike Dup (B1J1926-MSD1)		**Source: 1100436-02**			Prepared: 10/19/2021 Analyzed: 10/20/2021				
Lead	103	6.1	76.631	29.7	96.0	75 - 125	1.15	35	
Selenium	137	7.7	153.262	3.81	86.6	75 - 125	1.12	35	
Cadmium	71.1	1.5	76.631	ND	92.8	75 - 125	0.175	35	
Chromium	105	6.1	76.631	25.0	104	75 - 125	1.10	35	

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Matrix Spike Dup (B1J1926-MSD1) - Continued		**Source: 1100436-02**			Prepared: 10/19/2021 Analyzed: 10/20/2021				
Arsenic	72.4	3.1	76.631	3.09	90.5	75 - 125	2.13	35	
Barium	#	6.1	76.631	198	#	75 - 125	#	35	#
Silver	13.1	6.1	15.326	ND	85.5	75 - 125	3.62	35	
Copper	105	6.1	76.631	24.1	106	75 - 125	3.90	35	
Nickel	106	6.1	76.631	27.4	102	75 - 125	3.51	35	
Zinc	200	6.1	76.631	105	124	75 - 125	7.63	35	

Batch B1J1931 - EPA 6020A

Analyte	Result (mg/L)	RL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J1931-BLK1)					Prepared: 10/19/2021 Analyzed: 10/19/2021				
Lead	ND	0.013							
Selenium	ND	0.050							
Cadmium	ND	0.0050							
Chromium	ND	0.050							
Arsenic	ND	0.050							
Barium	ND	0.050							
Silver	ND	0.020							
Mercury	ND	0.0020							
LCS (B1J1931-BS1)					Prepared: 10/19/2021 Analyzed: 10/19/2021				
Lead	0.185	0.013	0.200		92.3	80 - 120			
Selenium	0.418	0.050	0.400		104	80 - 120			
Cadmium	0.196	0.0050	0.200		98.2	80 - 120			
Chromium	0.199	0.050	0.200		99.3	80 - 120			
Arsenic	0.197	0.050	0.200		98.3	80 - 120			
Barium	0.186	0.050	0.200		93.0	80 - 120			
Silver	0.0898	0.020	0.100		89.8	80 - 120			
Mercury	0.00446	0.0020	0.005		89.2	80 - 120			
Duplicate (B1J1931-DUP1)		**Source: 1100436-03**			Prepared: 10/19/2021 Analyzed: 10/19/2021				
Lead	0.0135	0.013		ND				20	
Selenium	ND	0.050		ND				20	
Cadmium	ND	0.0050		ND				20	
Chromium	ND	0.050		ND				20	
Arsenic	ND	0.050		ND				20	
Barium	0.769	0.050		0.794			3.20	20	
Silver	ND	0.020		ND				20	
Mercury	ND	0.0020		ND				20	
Matrix Spike (B1J1931-MS1)		**Source: 1100436-03**			Prepared: 10/19/2021 Analyzed: 10/19/2021				
Lead	0.191	0.013	0.200	ND	95.3	75 - 125			
Selenium	0.418	0.050	0.400	ND	104	75 - 125			
Cadmium	0.190	0.0050	0.200	ND	95.1	75 - 125			
Chromium	0.209	0.050	0.200	ND	105	75 - 125			
Arsenic	0.219	0.050	0.200	ND	109	75 - 125			
Barium	0.995	0.050	0.200	0.794	100	75 - 125			
Silver	0.0894	0.020	0.100	ND	89.4	75 - 125			
Mercury	0.00405	0.0020	0.005	ND	81.0	75 - 125			
Matrix Spike Dup (B1J1931-MSD1)		**Source: 1100436-03**			Prepared: 10/19/2021 Analyzed: 10/19/2021				
Lead	0.219	0.013	0.200	ND	110	75 - 125	14.0	20	
Selenium	0.478	0.050	0.400	ND	119	75 - 125	13.3	20	
Cadmium	0.216	0.0050	0.200	ND	108	75 - 125	12.5	20	
Chromium	0.237	0.050	0.200	ND	119	75 - 125	12.6	20	
Arsenic	0.245	0.050	0.200	ND	122	75 - 125	11.3	20	
Barium	1.02	0.050	0.200	0.794	111	75 - 125	2.18	20	
Silver	0.0899	0.020	0.100	ND	89.9	75 - 125	0.570	20	
Mercury	0.00418	0.0020	0.005	ND	83.7	75 - 125	3.18	20	

Batch B1J2007 - EPA 7471B

Analyte	Result (mg/kg)	RL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B1J2007-BLK1)					Prepared: 10/20/2021 Analyzed: 10/20/2021				
Mercury	ND	0.13							
LCS (B1J2007-BS1)					Prepared: 10/20/2021 Analyzed: 10/20/2021				
Mercury	1.25	0.13	1.250		99.6	80 - 120			
Duplicate (B1J2007-DUP1)		**Source: 1100436-01**			Prepared: 10/20/2021 Analyzed: 10/20/2021				
Mercury	ND	0.42		ND				20	
Matrix Spike (B1J2007-MS1)		**Source: 1100436-01**			Prepared: 10/20/2021 Analyzed: 10/20/2021				
Mercury	4.58	0.44	4.443	ND	103	75 - 125			
Matrix Spike Dup (B1J2007-MSD1)		**Source: 1100436-01**			Prepared: 10/20/2021 Analyzed: 10/20/2021				
Mercury	4.51	0.44	4.443	ND	102	75 - 125	1.37	20	

80 Lupes Drive
Stratford, CT 06615

COMPLETE ENVIRONMENTAL TESTING, INC.

Tel: (203) 377-9984
Fax: (203) 377-9952
email: cet1@cetlabs.com

Quality Control Definitions and Abbreviations

Internal Standard (IS)	An Analyte added to each sample or sample extract. An internal standard is used to monitor retention time, calculate relative response, and quantify analytes of interest.
Surrogate Recovery	The % recovery for non-target organic compounds that are spiked into all samples. Used to determine method performance.
Continuing Calibration	An analytical standard analyzed with each set of samples to verify initial calibration of the system.
Batch	Samples that are analyzed together with the same method, sequence and lot of reagents within the same time period.
ND	Not detected at or above the specified reporting limit.
RL	RL is the limit of detection for an analyte after any adjustment made for dilution or percent moisture.
Dilution	Multiplier added to detection levels (MDL) and/or sample results due to interferences and/or high concentration of target compounds.
Duplicate	Result from the duplicate analysis of a sample.
Result	Amount of analyte found in a sample.
Spike Level	Amount of analyte added to a sample
Matrix Spike Result	Amount of analyte found including amount that was spiked.
Matrix Spike Dup	Amount of analyte found in duplicate spikes including amount that was spike.
Matrix Spike % Recovery	% Recovery of spiked amount in sample.
Matrix Spike Dup % Recovery	% Recovery of spiked duplicate amount in sample.
RPD	Relative percent difference between Matrix Spike and Matrix Spike Duplicate.
Blank	Method Blank that has been taken through all steps of the analysis.
LCS % Recovery	Laboratory Control Sample percent recovery. The amount of analyte recovered from a fortified sample.
Recovery Limits	A range within which specified measurements results must fall to be compliant.
CC	Calibration Verification

Flags:

H- Recovery is above the control limits
L- Recovery is below the control limits
B- Compound detected in the Blank
P- RPD of dual column results exceeds 40%
#- Sample result too high for accurate spike recovery.

Connecticut Laboratory Certification PH0116
Massachussets Laboratory Certification M-CT903
Pennsylvania NELAP Accreditation 68-02927

New York NELAP Accreditation 11982
Rhode Island Certification 199

All questions related to this report should be directed to David Ditta, Timothy Fusco, or Robert Blake at 203-377-9984.

Sincerely,

David Ditta
Laboratory Director

This technical report was reviewed by Robert Blake

Project Manager

Report Comments:

Sample Result Flags:
E- The result is estimated, above the calibration range.
H- The surrogate recovery is above the control limits.
L- The surrogate recovery is below the control limits.
B- The compound was detected in the laboratory blank.
P- The Relative Percent Difference (RPD) of dual column analyses exceeds 40%.
D- The RPD between the sample and the sample duplicate is high. Sample Homogeneity may be a problem.
+- The Surrogate was diluted out.
*C1- The Continuing Calibration did not meet method specifications and was biased low for this analyte. Increased uncertainty is associated with the reported value which is likely to be biased low.
*C2- The Continuing Calibration did not meet method specifications and was biased high for this analyte. Increased uncertainty is associated with the reported value which is likely to be biased high.
*F1- The Laboratory Control Sample recovery is outside of control limits. Reported value for this analyte is likely to be biased on the low side.
*F2- The Laboratory Control Sample recovery is outside of control limits. Reported value for this analyte is likely to be biased on the high side.
*I- Analyte exceeds method limits from second source standard in Initial Calibration Verification (ICV). No directional bias.

All results met standard operating procedures unless indicated by a data qualifier next to a sample result, or a narration in the QC report.

For Percent Solids, if any of the following prep methods (3050B, 3540C, 3545A, 3550C, 5035 and 9013A) were used for samples pertaining to this report, the percent solids procedure is within that prep method.

Complete Environmental Testing is only responsible for the certified testing and is not directly responsible for the integrity of the sample before laboratory receipt.

ND is None Detected at or above the specified reporting limit
Reporting Limit (RL) is the limit of detection for an analyte after any adjustment made for dilution or percent moisture.
All analyses were performed in house unless a Reference Laboratory is listed.
Samples will be disposed of 30 days after the report date.

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
EPA 6010C in Soil	
Lead	CT,NY,PA
Selenium	CT,NY,PA
Cadmium	CT,NY,PA
Chromium	CT,NY,PA
Arsenic	CT,NY,PA
Barium	CT,NY,PA
Silver	CT,NY,PA
Copper	CT,NY,PA
Nickel	CT,NY,PA
Zinc	CT,NY,PA
EPA 6020A in Water	
Lead	CT
Selenium	CT
Cadmium	CT
Chromium	CT
Arsenic	CT
Barium	CT
Silver	CT
Mercury	CT
EPA 7471B in Soil	
Mercury	CT,NY,PA
EPA 8081B in Soil	
Alpha-BHC	CT,NY,PA
Gamma-BHC	CT,NY,PA
Heptachlor	CT,NY,PA
Aldrin	CT,NY,PA
Beta-BHC	CT,NY,PA
Delta-BHC	CT,NY,PA
Heptachlor Epoxide	CT,NY,PA
Endosulfan I	CT,NY,PA
4,4-DDE	CT,NY,PA
Dieldrin	CT,NY,PA
Endrin	CT,NY,PA
4,4-DDD	CT,NY,PA
Endosulfan II	CT,NY,PA
4,4-DDT	CT,NY,PA
Endrin Aldehyde	CT,NY,PA
4,4-Methoxychlor	CT,NY,PA
Endosulfan Sulfate	CT,NY,PA
Endrin Ketone	CT,NY,PA
Chlordane	CT,NY,PA
Toxaphene	CT,NY,PA
Alachlor	CT

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
EPA 8082A in Soil	
PCB-1016	CT,NY,PA
PCB-1221	CT,NY,PA
PCB-1232	CT,NY,PA
PCB-1242	CT,NY,PA
PCB-1248	CT,NY,PA
PCB-1254	CT,NY,PA
PCB-1260	CT,NY,PA
PCB-1268	CT,NY,PA
PCB-1262	NY,PA
EPA 8260C in Soil	
Benzene	CT,NY,PA
Toluene	CT,NY,PA
Ethylbenzene	CT,NY,PA
m+p Xylenes	CT,NY,PA
o-Xylene	CT,NY,PA
Naphthalene	CT,NY,PA
EPA 8270D in Soil	
Naphthalene	CT,NY,PA
2-Methyl Naphthalene	CT,NY,PA
Acenaphthylene	CT,NY,PA
Acenaphthene	CT,NY,PA
Fluorene	CT,NY,PA
Phenanthrene	CT,NY,PA
Anthracene	CT,NY,PA
Fluoranthene	CT,NY,PA
Pyrene	CT,NY,PA
Benzo[a]anthracene	CT,NY,PA
Chrysene	CT,NY,PA
Benzo[b]fluoranthene	CT,NY,PA
Benzo[k]fluoranthene	CT,NY,PA
Benzo[a]pyrene	CT,NY,PA
Indeno[1,2,3-cd]pyrene	CT,NY,PA
Dibenz[a,h]anthracene	CT,NY,PA
Benzo[g,h,i]perylene	CT,NY,PA
SM 2540 G in Soil	
Percent Solids	CT

Complete Environmental Testing operates under the following certifications and accreditations:

Code	Description	Number	Expires
CT	Connecticut Public Health	PH0116	03/31/2022
NY	New York Certification (NELAC)	11982	04/01/2022
PA	Pennsylvania DEP	68-02927	05/31/2022

1100436

CET
COMPLETE ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY

Volatile Soils Only:

Date and Time in Freezer

Client:

CET:

80 Lupes Drive
Stratford, CT 06615
Tel: (203) 377-9984
Fax: (203) 377-9952
e-mail: cet1@cetlabs.com
Bottle Request e-mail: bottleorders@cetlabs.com

Sample ID	Sample Depths (Units)	Collection Date/Time	Matrix (A=Air, S=Soil, W=Water, DW=Drinking Water, C=Cassette, Solid, Wipe, Other (Specify))	Same Day *	Next Day *	2-3 Days *	Std (5-7 Days)	8260 CT List	8260 Aromatics	8260 Halogens	624	CT ETPH	8270 CT List	8270 PNAs	PCBs Sox	Pesticides ex. Mirex	13 Priority Poll	8 RCRA see note	TOTAL	TCLP RCRA8	SPLP	Field Filtered	Lab To Filter	BTEX (8260)	PAHs (8270)	TOC	Grain Size	TOTAL # OF CONT.	NOTE #
Sed-101		10/14/21 11:30	S				X								X	X		X		X				X	X	X	X	6	
Sed-102		↓ 11:50	↓				↓								↓	↓		↓		↓				↓	↓	↓	↓	↓	
Sed-103		↓ 12:15	↓				↓								↓	↓		↓		↓				↓	↓	↓	↓	↓	

Turnaround Time ** (check one); Organics; Metals (check all that apply); Additional Analysis

PRESERVATIVE (Cl–HCl, N–HNO_3, S–H_2SO_4, Na–NaOH, C=Cool, O–Other)

CONTAINER TYPE (P–Plastic, G–Glass, V–Vial, O–Other)

Soil VOCs Only (M=MeOH B=Sodium Bisulfate W=Water F=Empty Vial E=Encore) — 18

RELINQUISHED BY: DATE/TIME 10/15/21 1145 RECEIVED BY:

RELINQUISHED BY: DATE/TIME 10/15/21 1500 RECEIVED BY: 10/15/21

RELINQUISHED BY: DATE/TIME RECEIVED BY:

NOTES: 1. RCRA 8 metals plus Cu, Ni, and Zn

Client / Reporting Information

Company Name: SLR International Incorporated

Address: 99 Realty Drive

City: Cheshire State: CT Zip: 06410

Report To: Matthew Rose E-mail: mrose@slrconsulting.com

Phone #: 203 525 6932 Fax #:

Project Information

Project Contact: PO #:

Project: Duck Pond Dam Project #: 20261.00001

Location: New Paltz, NY Collector(s): Matthew Rose

QA/QC ☒ Std ☐ Site Specific (MS/MSD) * ☐ RCP Pkg * ☐ DQAW *

Data Report ☒ PDF ☒ EDD - Specify Format Excel ☐ Other

RSR Reporting Limits (check one) ☒ GA ☐ GB ☐ SWP ☐ Other

Laboratory Certification Needed (check one) ☐ CT ☒ NY ☐ RI ☐ MA

Temp Upon Receipt 5 °C Evidence of Cooling: (Y) N

SHEET 1 OF 1

* Additional charge may apply. ** TAT begins when the samples are received at the Lab and all issues are resolved. TAT for samples received after 3 p.m. will start on the next business day.

REV. 06/14

APPENDIX E
PLANT SPECIES OBSERVED IN DUCK POIND WETLANDS

Duck Pond Dam Feasibility Study

Mohonk Preserve
P.O. Box 715
New Paltz, NY 12561

May 2022

Observed Plant Species in Duck Pond Wetlands (fall 2021)

Common Name	Scientific Name	Notes
Forested Wetland Zone		
American elm	*Ulmus americana*	dominant
red maple	*Acer rubrum*	
pin oak	*Quercus palustris*	dominant
Shrub Wetland Zone		
common winterberry	*Ilex verticillata*	dominant
spicebush	*Lindera benzoin*	dominant
smooth arrowwood	*Viburnum dentatum*	dominant
silky dogwood	*Cornus amomum*	dominant
pussy willow	*Salix discolor*	
multiflora rose	*Rosa multiflora*	non-native, invasive
meadowsweet	*Spiraea alba*	
purple loosestrife	*Lythrum salicaria*	non-native, invasive
common elderberry	*Sambucus nigra*	
American aster species	*Symphyotrichum* spp.	
Devil's begger tick	*Bidens frondosa*	
Graminoid Wetland Zone		
sensitive fern	*Onoclea sensibilis*	
spotted jewelweed	*Impatiens capensis*	
arrow-leaved tearthumb	*Persicaria sagittata*	
wide-leaved cattail	*Typha latifolia*	large stand on delta
Japanese stilt grass	*Microstegium vimineum*	non-native, invasive, dominant on delta
common wool grass	*Scirpus cyperinus*	
spike rush	*Eleocharis* spp.	at least two species present
sedge	*Carex* spp.	several species present
soft rush	*Juncus effusus*	
rice cut grass	*Leersia oryzoides*	dominant around pond perimeter
marsh fern	*Thelypteris palustris*	
Open Water Wetland Zone		
water milfoil	*Myriophyllum* spp.	
water purslane	*Ludwigia palustris*	