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Association Exhibits F (Book of Regulations), G (NJDEP 5/24/2021), H (NJDEP 8/11/2021), J (Princeton Hydro feasibility study, August 2023)

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This copy is the filed or produced document with these changes only: black boxes cover (1) names, addresses, telephone numbers and e-mail addresses of persons who are not parties, (2) personal identifiers and financial account numbers (R. 1:38-7), (3) telephone and e-mail contact details, and (4) plaintiff's personal financial information, marked "Redacted: plaintiff's personal financial information". Withheld pages, if any, are replaced by a notice page. The complete document is available from the Court.

EXHIBIT F

Lake Centerton Park Homeowners Association Book of Regulations

LCPHA BOOK OF REGULATIONS

"Book of Regulations" shall mean the document containing regulations adopted by the Directors of the Association, or a duly authorized [redacted] thereof, as the same may be from time to time amended, for the regulation of The Properties, this Association and such other matters as are required by the Declaration, this Certificate and/or By-Laws of the Association or deemed desirable by the Board of Directors.

1. Any owner who is not current (over 30 days) on their association dues or fines will not be allowed to vote or hold office without the majority consent (vote) of the association.

2. The only individuals allowed to operate the dam gates are members of the Dam [redacted] If the [redacted] decides that the dam must be opened because of pending weather or an abnormal amount of water in the lake two [redacted] members are responsible for making that decision and raising the gates. However, they must first contact an elected official of the Lake Association. No one else is authorized to operate the gates.

3. The Dam [redacted] is solely responsible for filing all appropriate permits for the operation and maintenance of the dam. The Dam [redacted] will also be responsible for the updating of the Emergency Action Plan and Operation and Maintenance Manual.

4. Only the Board of Directors is responsible for conducting the business of the Association and has the authority (by a Board majority) to spend fees up to $500 (five-hundred dollars) in LCPHA matters without first receiving approval from the members of the association.

5. A majority (6) of the LCPHA owners must approve association business or decisions for any expenditure over $500 (five-hundred dollars).

6. LCPHA owners are entitled to have guest on association property. An association owner or a designated person will be responsible for guests under the age of 12. If challenged, all guests will have some form of identification (i.e. business card) from their sponsor. Guests are entitled to all privileges granted them by their sponsor on the LCPHA common grounds only; private property of other owners is excluded. Sponsors of guests are responsible for any damage caused by guests to LCPHA property (private or common).

7. A majority vote by The Board of Directors, is authorized to levy fines against association members up to $250 (two hundred fifty dollars) without a majority vote from the owners. Any fine over $250 (two hundred fifty dollars) must be approved by a two-thirds vote (6) of LCPHA owners.

8. A majority (6) of the LCPHA owners must approve any change or adoption to the LCPHA "Book of Regulations."

EXHIBIT G

May 24, 2021 New Jersey Department of Environmental Protection Letter

SHEILA Y. OLIVER
Lt. Governor

Tel. (609) 984-0859 • Fax (609) 984-1908
http://www.nj.gov/dep/damsafety

May 24, 2021

Lake Centerton Park Homeown[redacted]Assoc., Inc.
23 Lake Centerdon Drive
Pittsgrove, NJ 08318

Re: Centerton Lake Dam, NJ Dam File No. 35-3
Pittsgrove Township, Salem County

Dear Owner/Operator(s):

This letter is in reference to a February 2, 2020 letter submitted on behalf of the Lake Centerton Park Homeowners Assoc., Inc. by Clifford C. Wheaton regarding the overdue dam safety visual inspection report for the Centerton Lake Dam (the Dam), which is required by the Dam Safety Standards, N.J.A.C. 7:20-1.11.

A site inspection of the Dam was made by the Division of Dam Safety and Flood Engineering (Division) on October 28, 2020 in order to verify the lake level and the condition of the structure. Upon inspection it was determined that, while the impoundment remains in a lowered condition, several of the spillway gate channels were clogged with debris which was limiting flow through those areas. The remaining portions of the dam embankment and spillway structure were found to be in a severe state of disrepair.

Please note that even though the Dam has been drained of its normal impoundment for several years, it remains a regulated structure under the Safe Dam Act (N.J.S.A. 58:4-1 et seq.). As such, the dam must be either repaired and brought into compliance with the Dam Safety Standards (N.J.A.C. 7:20), or officially decommissioned in accordance with the provisions of N.J.A.C. 7:20 1.7 (h). Since the above-referenced letter indicates that the Association does not intend to repair the dam, the owners of the dam are hereby directed to provide a schedule for decommissioning the Dam by **July 31, 2021**. As part of the decommissioning, the entire wooden spillway, gate channels, bulkheads, and other appurtenant will likely need to be removed in order to provide for a stable breach opening as required.

SLM-C-000017-26 10/22/2026 10:21:26 PM Pg 10 of 44 Trans ID: CHC2026339507
SLM-C-000017-26 08/28/2026 02:13:01 PM Pg 126 of 150 Trans ID: CHC2026274987

Please note that an application must be filed with this office and a permit issued before any work beyond general maintenance is undertaken. Should you have any questions regarding this matter, please do not hesitate to contact Richard G. Tamagno of this office at (609) 984-0859 or by e-mail at Richard.Tamagno@dep.nj.gov.

Sincerely,

John H. Moyle, P.E., Director
Division of Dam Safety & Flood Engineering

C: Pittsgrove Township Engineer & Clerk
Salem County Engineer

35003rgt21a

SLM-C-000017-26 10/22/2026 10:21:26 PM Pg 11 of 44 Trans ID: CHC2026339507
SLM-C-000017-26 08/28/2026 02:13:01 PM Pg 127 of 150 Trans ID: CHC2026274987

EXHIBIT H

August 11, 2021 New Jersey Department of Environmental Protection Letter

SHEILA Y. OLIVER
Lt. Governor

Tel. (609) 984-0859 • Fax (609) 984-1908
http://www.nj.gov/dep/damsafety

August 11, 2021

Lake Centerton Park Homeowners Assoc., Inc.
23 Lake Centerdon Drive
Pittsgrove, NJ 08318

Re: Centerton Lake Dam, NJ Dam File No. 35-3
Pittsgrove Township, Salem County

Dear Owner/Operator(s):

This letter is in reference to a July 30, 2021 letter submitted on behalf of the Lake Centerton Park Homeowners Assoc., Inc. by Clifford C. Wheaton regarding ongoing efforts to obtain assistance and funding for decommissioning of the Centerton Lake Dam (the Dam).

The Division of Dam Safety and Flood Engineering (Division) is supportive of the efforts noted above and understands that there may be associated delays related to the decommissioning work. However, since the Dam is still currently registered as a Class II (Significant Hazard) structure, an open-ended compliance schedule cannot be allowed unless periodic updates are provided showing that progress is being made towards decommissioning.

In view of the above, an extension to submit a compliance schedule is hereby granted until **December 31, 2021**, provided that a detailed project status update is submitted to the Division by **October 31, 2021**. This extension will also include a waiver of the required regular inspection report for the Dam until the end of 2021. Failure to submit a compliance schedule by the stated deadline may result in the issuance of a Notice of Violation and Offer of Settlement (NVOS) with corresponding monetary penalties. In addition to the imposition of monetary penalties, further enforcement measures may be taken as necessary and additional waivers of the required inspection reports will not be allowed.

Please be reminded that the lake must remain lowered, and the spillway gate channels must be maintained clear of debris until such time that the dam is decommissioned or rehabilitated.

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SLM-C-000017-26 08/28/2026 02:13:01 PM Pg 129 of 150 Trans ID: CHC2026274987

John H. Moyle

John H. Moyle, P.E., Director
Division of Dam Safety & Flood Engineering

C: Pittsgrove Township Engineer & Clerk
Salem County Engineer

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SLM-C-000017-26 10/22/2026 10:21:26 PM Pg 14 of 44 Trans ID: CHC2026339507
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EXHIBIT J

August 2023 Princeton Hydro Feasibility Study and Supporting Materials



FEASIBILITY STUDY REPORT FOR REMOVAL OF CENTERTON LAKE DAM

PITTSGROVE, SALEM COUNTY, NJ

AUGUST 2023

PREPARED FOR:
CU MAURICE RIVER
ATTN: KARLA ROSSINI
17 E. MAIN STREET
MILLVILLE, NJ 08332

PREPARED BY:
PRINCETON HYDRO
1200 LIBERTY PLACE
SICKLERVILLE, NJ 08081
PRINCETONHYDRO.COM
[redacted]

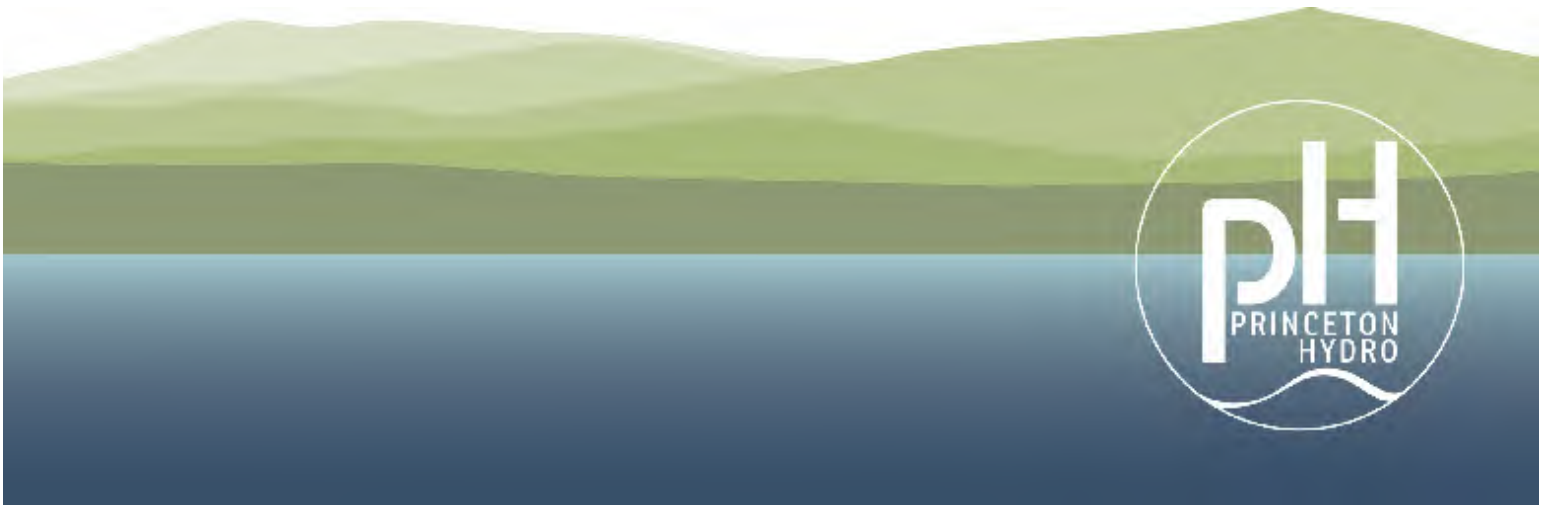


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1 PROJECT OVERVIEW

Princeton Hydro, LLC was contracted by CU Maurice River to perform a feasibility study for the removal of Centerton Lake Dam (NJDEP File No. 35-3 and Nation Inventory of Dams (NID) ID NJ00439), the findings of which are presented herein. This feasibility included the following:

- Background Data Collection and Review
- Preliminary Site Investigation
- Dam Removal Feasibility Report
- Dam Removal Concept Plans
- Concept-Level Cost Estimate

2 ABBREVIATED PROJECT/SITE BACKGROUND

The following background/summary is based on field observations, a review of available documentation, and discussions with members of the Lake Centerton Park Homeowners Association:

- Centerton Lake Dam is an earthen embankment dam with a wooden spillway located along Muddy Run in Pittsgrove, Salem County, NJ.
- Muddy Run is a tributary to the Wild and Scenic Maurice River. There are three other dams between Centerton Lake Dam and the free-flowing Maurice River including (from upstream to downstream): Parvin Lake Dam, Rainbow Lake Dam, and Union Lake Dam. Both Rainbow Lake Dam and Union Lake Dam are understood to have fish ladders supporting fish passage, however Parvin Lake Dam does not.
- Dams in the state of New Jersey are regulated under section 7:20 of the New Jersey Administrative Code (N.J.A.C.). NJDEP Bureau of Dam Safety classifies Centerton Lake Dam as a Class II – Significant Hazard dam. The N.J.A.C. requires that Class II dams be inspected every two years by a professional engineer and provides other guidelines/requirements for compliance with state regulations.
- Operation and maintenance responsibilities for the dam lie with the Lake Centerton Park Homeowners Association.
- The dam was originally constructed to support an adjacent sawmill, which is no longer present, and in recent history has served only in a recreation/aesthetic capacity. Based on a review of historic aerial images, the dam dates back to at least 1930 (via NJ-GeoWeb).
- In 2009, the dam was critically weakened by torrential rain and NJDEP Bureau of Dam Safety subsequently directed the owner to drain the impoundment and maintain it in a lowered condition.
- The owner removed the spillway gates in 2010 and the dam has since remained in a lowered condition, holding back only a 1 to 2-foot water surface differential between the impoundment and downstream channel.
- Since 2010, the former impoundment has undergone natural succession, with vegetation established over the majority of the former footprint, and a stream channel has formed along the eastern (river-left) perimeter of the former impoundment.
- The owner previously hired W.J. Castle, P.E. and Associates, P.C. to complete design and permitting for rehabilitation of the dam. NJDEP Bureau of Dam Safety approved a permit for the dam rehabilitation however the dam rehabilitation proved cost prohibitive and was not implemented.

- At this time, the owner is supportive of removal of the remainder of the dam/spillway. Removal of the dam and restoration of the associated stream channel aligns with the interests/principles of CU Maurice River. CU Maurice River acquired grant funding to support this feasibility study and selected Princeton Hydro as the A/E to perform the work.

3 BACKGROUND DATA COLLECTION AND REVIEW

The section summarizes available documentation pertaining to Centerton Lake Dam obtained from CU Maurice and NJDEP Bureau of Dam Safety, as well as a desktop analysis of other publicly available information pertinent to the removal of Centerton Lake Dam.

3.1 DAM FILE REVIEW

As part of this task, Princeton Hydro reviewed available information associated with Centerton Dam. This included documents provided by CU Maurice River during the proposal phase, as well as files obtained during a visit to NJDEP Bureau of Dam Safety on Friday, December 9, 2022. Available files are summarized below from most to least recent and have been included in Appendix A for future reference.

- **Coordination Letter** from Lake Centerton Park Homeowners Association, Inc to NJDEP Bureau of Dam Safety dated October 3, 2021
- **Dam Safety Letter** referencing July 30, 2021 HOA letter by NJDEP. Dated August 11, 2021.
- **Coordination Letter** from Lake Centerton Park Homeowners Association, Inc to NJDEP Bureau of Dam Safety dated July 30, 2021
- **Dam Safety Letter** referencing recent site visit and compliance schedule by NJDEP. Dated May 24, 2021.
- Memo Regarding Inspections/Acquisitions by NJDEP. Dated November 9, 2020.
- **Dam Safety Inspection Report** from NJDEP Bureau of Dam Safety, prepared by Rick Tamango. Dated October 28, 2020.
- **Coordination Letter** from Lake Centerton Park Homeowners Association, Inc to NJDEP Bureau of Dam Safety dated February 2, 2020
- **Coordination Letter** from Lake Centerton Park Homeowners Association, Inc to NJDEP Bureau of Dam Safety dated November 25, 2016
- **Dam Safety Construction Permit** for the Dam Reconstruction Plans last revised August 19, 2014. Dated July 28, 2015.
- **NJDEP Engineering Report** which summarizes the history of the dam, coordination between stakeholders/regulators, and the proposed dam improvements. Recommends approval of the dam construction permit. Dated July 6, 2015
- The following files were included in electronic files from NJDEP in a folder labeled "2015-03-30 CD"
    - **Dam Reconstruction Plans** prepared by W.J. Castle PE & Associates. Original issue date of February 20, 2012, with most recent revision date of March 4, 2015.
    - **Technical Specifications** prepared by W.J. Castle PE & Associates. Dated March 23, 2015.
    - **Emergency Action Plan** for Centerton Lake Dam prepared by W.J. Castle PE & Associates. Dated October 2014.
    - **Operations and Maintenance Manual** for Centerton Lake Dam prepared by W.J. Castle PE & Associates. Dated October 9, 2014.
- The following files were included in electronic files from NJDEP in a folder labeled "2014-10-17 CD"
    - **Permit Application Cover Letter** for the Permit Application Package above prepared by W.J. Castle PE & Associates. Dated October 16, 2014.



  - **Permit Application Package** (Permit Application Form, Technical Specifications, Plans, Design Report with Calculations, O&M Manual, EAP, and H&H Study) for Dam Rehabilitation prepared by W.J. Castle PE & Associates. Dated October 2014.
  - **Data for "2 through 100-year storm routings"** for Centerton Dam, originally prepared by Taylor Wiseman and Taylor, with updates from W.J. Castle PE & Associates. Dated January 22, 2011.
- **Plan Set (3 Sheets) for Dam Rehabilitation** prepared by W.J. Castle PE & Associates. Dated March 14, 2012.
- **Design Report Calculations** for Centerton Lake Dam prepared by W.J. Castle PE & Associates. Dated March 5, 2012.
- **Bid Specifications** prepared by W.J. Castle PE & Associates. Dated March 5, 2012.
- **Memo to NJDEP DF&W** regarding proposed dam rehabilitation from NJDEP Bureau of Dam Safety. Dated February 22, 2012.
- **Permit Application Package** including application form, location map, and 3 plan sheets prepared by W.J. Castle PE & Associates. Dated January 2012.
- **Design Report Calculations** for Centerton Lake Dam prepared by W.J. Castle PE & Associates. Dated January 13, 2012.
- **NJDEP Engineering Report** providing commentary on the H&H Study below. Dated July 11, 2011.
- **Hydrologic and Hydraulic Study** for Centerton Lake Dam prepared by W.J. Castle PE & Associates. Dated January 2011.
- **2009 Emergency Inspection Report** by Rick Tamango of NJDEP. Dated December 24, 2009.
- **2009 Emergency Inspection Report** by Clint Oman and Sarah Hatala of NJDEP. Dated December 10, 2009.
- **2007 Dam Inspection Report** by Taylor Wiseman and Taylor. Dated October 30, 2007.
- **2002 Dam Inspection Report** by All Systems Engineering, LLC. Dated December 4, 2002.
- **2000 Dam Inspection Report** by Taylor Wiseman and Taylor. Dated November 3, 2000.

3.2 DESKTOP EVALUATION OF NEARBY WELLS

As part of this feasibility study, Princeton Hydro performed a desktop evaluation of nearby wells to inform future design and coordination efforts. The construction of dams/impoundments generally results in an artificial and localized uplift/rise of the groundwater table and, similarly, removal of a dam can result in a localized drop. It is possible for shallow wells installed within the footprint of the dam's influence on the local groundwater table to be adversely impacted by the dam's removal. As part of this exercise, the following data sources were reviewed: the GIS Database for Well Head Protection Areas for Public Non-Community Water Supply Wells in New Jersey hosted by the NJDEP Bureau of GIS and a list of well permits issued in Pittsgrove Township between 1970 and present generated from NJDEP DEP DataMiner.

The Well Head Protection Area database returned two records within close proximity to Centerton Lake Dam. Both records had Well Head Protection Areas that overlap with Centerton Lake as shown below in Figure 3-1 with 2008 aerial imagery to show their extents relative to the former impoundment.

The list of well permits from NJDEP Data Miner were filtered to identify parcels within Pittsgrove Township Block 1503, which would include all parcels along the lake's perimeter. This search returned records for well permits associated with three parcels along Centerton Lake Dam's eastern shoreline, specifically Block 1503 Lots 64, 69, and 72, however none of these records specified the finished depth to which the wells were installed. For context, among well permit records which included the installation depth, the shallowest was installed to a depth of 36-

feet with an average installation depth of 120-feet. Parcels in the general vicinity of Centerton Lake Dam with well permit records are shown below in Figure 3-2.

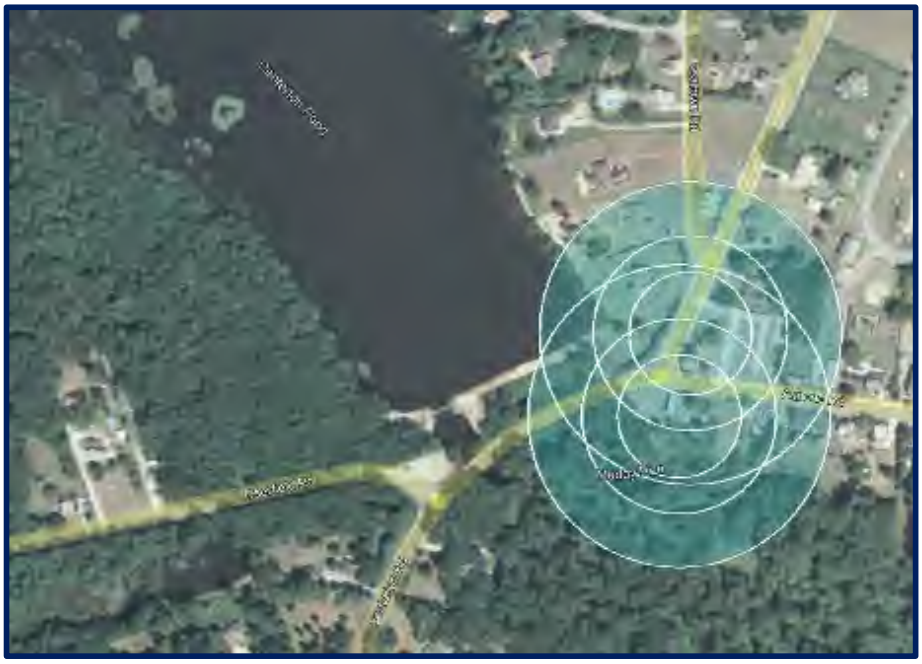


Figure 3-1- Local Results from Well Head Protection Area Database



Figure 3-2 – Parcels (yellow) with Well Permits Accessed via NJDEP Data Miner

It is noted that the databases reviewed as part of this exercise are not exhaustive and would not reflect wells installed prior to 1970. Further, wells installed prior to1970 would be more likely to be shallow/surficial and could be more easily impacted by subtle changes in groundwater levels. However, based on a review of historic

aerials, many of the homes close to Centerton Lake were constructed after 1970, so we feel the available information is sufficiently accurate for the purposes of this feasibility study.

While further coordination/investigation regarding local, shallow wells should be included under future design effort towards removal of Centerton Lake Dam, this Feasibility Study considers risk of adverse impacts to local wells associated with a localized drop in the groundwater table from the removal of the dam's spillway to be low. Adverse impacts would have been far more likely to manifest during the previous lowering of the impoundment, which resulted in a much larger change in the water surface than is anticipated from the removal of the remainder of the spillway.

For reference during future iterations of the project, Appendix B: Findings of Local Well Research includes a localized .kmz file from the Well Head Protection Area database and the summary table from the NJDEP Data Miner search, in Microsoft Excel format.

3.3 EVALUATION OF EXISTING DRY HYDRANT

Under existing conditions there is a deep pool located immediately downstream of Centerton Lake Dam that supports a dry hydrant operated by the local fire company (see Figure 3-3, below). The shoreline along the downstream extent of the pool is formed by concrete walls on either side of the channel, with the dry hydrant anchored to the river-right wall and access for firefighting equipment by the adjacent gravel parking lot. Based on a review of historic aerial images, these concrete walls were abutments for an old bridge/roadway alignment (it appears that between 1940 and 1951 the roadway was shifted further south to its current location and the abutments were abandoned in place).



Figure 3-3 - Dry Hydrant Located Immediately Downstream of Centerton Lake Dam

Based on the existing conditions survey presented in the plans developed by W.J. Castle, and generally consistent with observations made in the field by Princeton Hydro, the section of Muddy Run immediately around the dam's

spillway maintains a steep slope, with the low point in the pool downstream of the dam being about 10-feet lower than the channel invert a short distance upstream of the dam. A snapshot of this survey is included below in Figure 3-4.

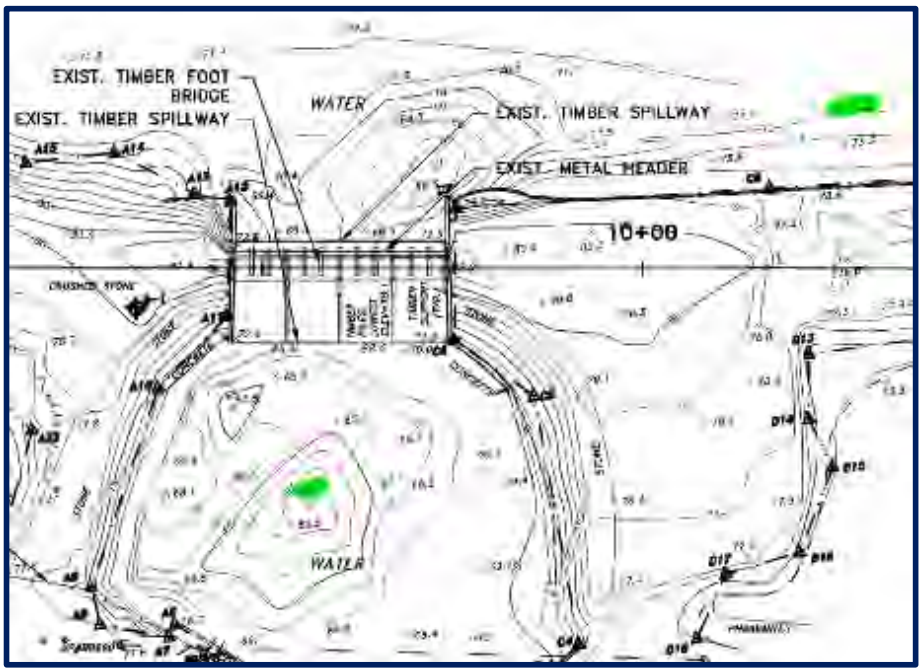


Figure 3-4 - Survey Snapshot Showing Significant Drop in Channel Invert Around Spillway

The dam's spillway likely plays a significant role in maintaining this dramatic (relative to the slope observed within Muddy Run upstream and downstream of the dam) change in elevation. With the removal of the dam, it is anticipated that a gentler slope will establish along Muddy Run over time. In that context, removal of the dam's spillway carries the risk of sediment deposition within the pool and obstruction of the dry hydrant.

Additional site survey, H&H modelling, and design effort is required to better understand how the removal of the dam's spillway will interact with the dry hydrant. Future design efforts may include design of grade controls and channel geometry to support maintenance of the dry hydrant in its current location or relocation of the dry hydrant to draw water from beneath the bridge/culvert on Centerton Road, which is more likely to be self-scouring in the long term. While the scope of this feasibility study did originally call for coordination with the local fire company regarding potential reconfiguration of the dry hydrant, the A/E now feels that would be premature and would be more appropriate in a future phase of the project.

3.4 ECOLOGICAL CONSIDERATIONS FOR DAM REMOVAL

As part of this feasibility study, a preliminary evaluation of ecological risks and benefits was performed, with a specific focus on uplift to native species or potential further spread of invasive species.

Considerations for Uplift to Native Species

Directly downstream of Centerton Lake is Parvin State Park which has been identified as a New Jersey Natural Heritage Priority Site, containing a relatively rare Atlantic white cedar and red maple swamp, in addition to a population of the endangered swamp pink flower. Additionally, Centerton Lake and its vicinity have been identified as habitat for the

owl (*Strix varia*); and state species of concern Cooper's hawk (*Accipter cooperii*) and Eastern box turtle (*Terrapene carolina carolina*). Removing the remainder of the dam and restoring the former impoundment would provide an opportunity to enhance the already valuable habitat in the area.

Considerations for Northern Snakehead and Other Invasive Fish

Centerton Lake is located on the Muddy Run upstream of three impoundments: Parvin Lake, Rainbow Lake, and Union Lake. The dams at Rainbow Lake and Union Lake have fish ladders installed, while no record could be found of a fish ladder at Parvin Lake. As a result, the removal of the dam at Centerton Lake at this time would not be likely to facilitate upstream travel of invasive fish species such as the Northern snakehead (*Channa argus*). Further, it is noted that Northern snakehead can travel/survive on dry land for up to 4 days, covering distances up to ¼ mile, so regardless the spillway at Centerton Lake may not be able to serve as a functional barrier in its current condition.

Considerations for Common Reed

Common reed (*Phragmites australis*) is a widespread invasive species within the Maurice River and is currently found throughout the former impoundment of Centerton Lake, as well as downstream of the dam. Removing the remainder of the dam is not expected to cause an increased spread of *Phragmites* in the area.

4 FINDINGS OF PRELIMINARY SITE INVESTIGATION

4.1 DAM INVESTIGATION

Princeton Hydro performed an investigation of the project site between February 24 and March 2, 2023 to evaluate the site in the context of dam removal. Noteworthy observations are presented herein.

4.1.1 DAM DESCRIPTION AND OBSERVATIONS

Centerton Lake Dam is an earthen embankment dam with a wooden spillway/outlet structure. The earthen embankment was likely constructed utilizing local borrow material, based on the age of the structure and the depression paralleling the embankment, upstream of the dam. The embankment shows signs of deterioration and erosion from previous overtopping events, with significant erosion observed immediately around the dam's spillway. A wooden bulkhead runs the length of the upstream face of the embankment. With the exception of a steel piece of C-channel running along its upstream face, the entire spillway appears to be constructed of wood, much of which has deteriorated significantly. At the downstream face, the spillway is flanked by concrete stabilization features on both the river-right and river-left. These concrete features appear to have used chain link fence material for reinforcement and show signs of deterioration and undermining. During the site assessment, Princeton Hydro used rebar to probe the soil underneath the spillway apron. The soil in this location offered very little resistance and the probe was able to be pushed up to 9.5-feet below the spillway apron by hand. Both previous survey data and field observations showed significant depressions upstream and downstream of the spillway and significant flow was observed to pass under/through the dam's spillway, further indicating that the structure has been compromised. While the spillway gates have been removed, the vertical columns and wooden bracing are still present at the current/normal water surface elevation. The owner noted that these portions of the structure regularly accumulate debris and need to be cleared. The regular debris flowing downstream is likely associated with the very active beaver community within and upstream of the former impoundment.

Princeton Hydro's overall assessment of the dam agrees with past conclusions drawn by NJDEP Bureau of Dam Safety in that the dam has been compromised, is well beyond its intended service life, and needs to be removed or rehabilitated. Some representative photos documenting the observations presented above are included below in Figure 4-1through Figure 4-4.

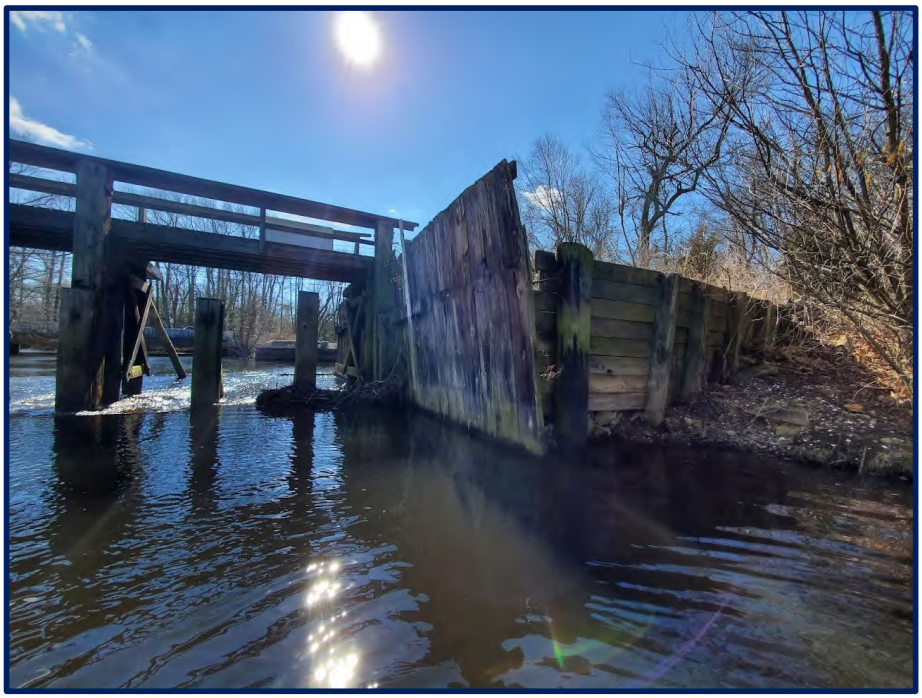


Figure 4-1 - Compromised Wooden Spillway Components and Woody Debris



Figure 4-2 - River-Right Side of Dam Spillway Showing Erosion and Exposed Pilings



Figure 4-3 - Deteriorated and Undermined Stabilization Feature Adjacent to Spillway

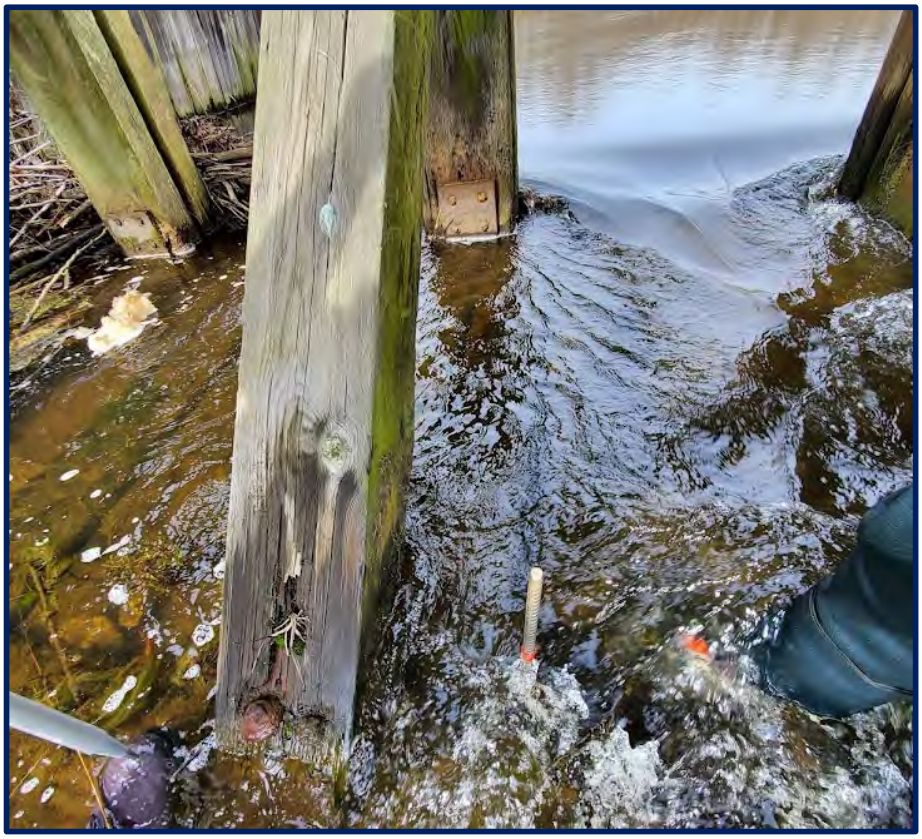


Figure 4-4 - Tip of 10-foot Long Rebar Rod Pushed by Hand into Sediment Under Spillway Apron

4.1.2 CONSTRUCTION ACCESS AND STAGING

The Centerton Lake Dam site has a variety of good options for construction access, summarized below. Construction access would not be envisioned to be overly burdensome from a cost perspective.

- **Construction Access – East:** It is assumed that primary construction access would come off Centerton Road towards the eastern side of the earthen embankment. Access from this location would support demolition of the spillway and regrading of the earthen embankment to establish a new stream channel through the dam's footprint. There is a gate for vehicular access at this location that would then allow equipment to traverse the eastern embankment and access the dam's spillway. Based on the wetland delineation presented in the Dam Reconstruction plans prepared by W.J. Castle, and assuming that a future wetland delineation would yield similar results, there is also an upland area adjacent to this access road that could be used for construction staging, if needed, however clearing would be required. This access location is owned by Lake Centerton Park Homeowners Association and is highlighted on Sheet 2 of the accompanying Dam Removal Concept Plans and can be seen below in Figure 4-5.

- **Construction Access – West:** A secondary construction access location could be established at the western side of the dam's spillway via the gravel lot at the corner of Centerton and Deerfield Roads. Some import of material may be required to facilitate access at this location, as this is currently a relatively narrow spine between Muddy Run and some adjacent wetlands (again, based on the wetland delineation presented on the W.J. Castle plans). Based on a review of parcel data from NJ-GeoWeb, this parcel (Block 1503, Lot 74) appears to be owned by the Centerton Fire Company, as such, access

permission would need to be coordinated with the fire company and provisions would need to be in place for continued access to the dry hydrant at this location. This access location is highlighted on Sheet 2 of the accompanying Dam Removal Concept Plans and can be seen below in Figure 4-5.

- **Construction Access – Upstream:** Should the project scope be expanded to include work in or around the stream channel through the former impoundment, access for equipment is possible via Block 1503, Lot 63, currently owned by Mike Rossi. This location is not depicted on the Concept Plans but was discussed with the property owner during a site walk on February 24, 2023.

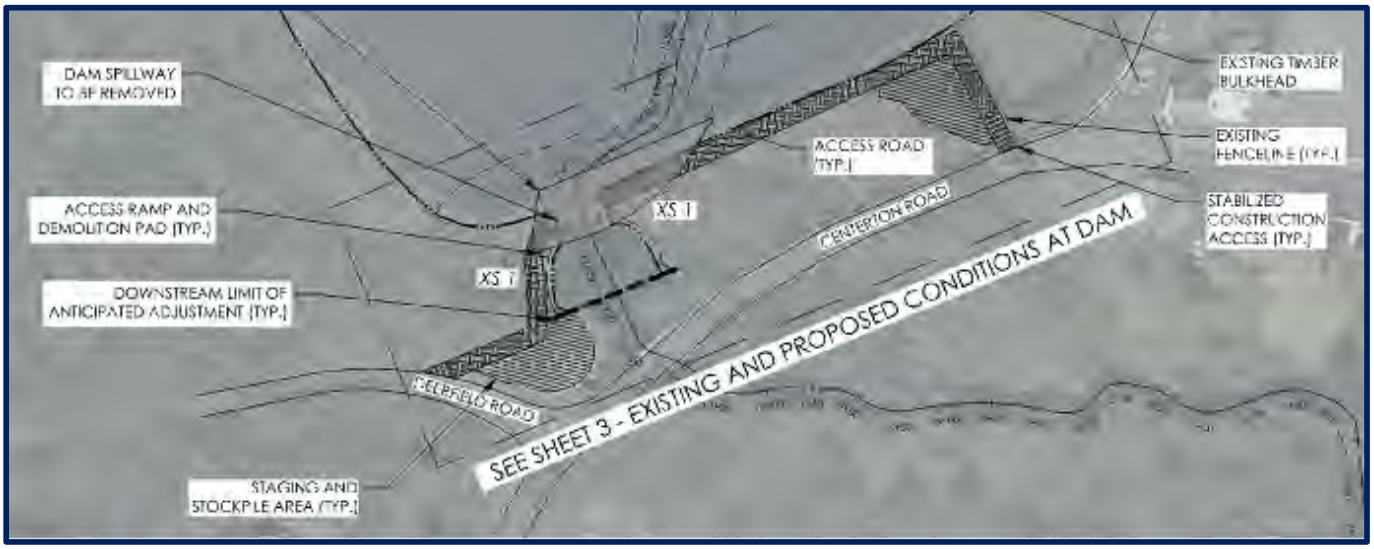


Figure 4-5 - Potential Construction Access and Staging Locations

4.1.3 SITE CONSTRAINTS AND CONSIDERATIONS

During the dam investigation, the site was evaluated for nearby constraints and infrastructure that should be considered in the design and construction process for the removal of Centerton Lake Dam. Noteworthy site features include the following:

- **Dry Hydrant and Local Fire Company Property:** As discussed further in Section 3.3, it appears that the local fire company owns the gravel lot at the corner of Centerton and Deerfield Roads. The dam removal will need to be designed around maintaining the functionality of the dry hydrant and construction access/staging will need to be closely coordinated with the local fire company to ensure access to the dry hydrant is maintained for emergency vehicles/personnel.

- **Wetlands:** Based on the wetland delineation presented in the plans developed by W.J. Castle, wetlands are present immediately downstream of the dam's earthen embankment and in the depression immediately west of the dam's spillway, as seen below in Figure 4-6. Access immediately adjacent to these areas will be coordinated with regulators during the permitting/approval process.

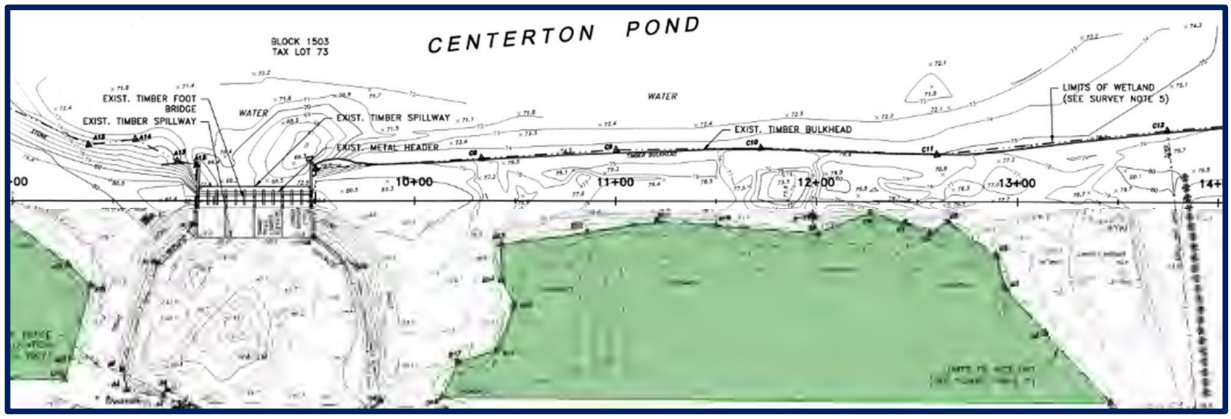


Figure 4-6 - Wetlands (Green Areas) Delineated as Part of Past Survey Efforts

- **Existing Utilities:** A gas main was observed to cross Muddy Run immediately upstream of the Centerton Road bridge/culvert. Overhead utility wires and poles for traffic/intersection signaling are present at the Construction Access – East location discussed above. These overhead wires also span across Muddy Run and pass through the gravel parking lot at the Construction Access – West location discussed above. Utility poles and guy lines are also present in the immediate vicinity of the Construction Access – West location as seen below in Figure 4-7. Future design and construction efforts will need to work around these site features.



Figure 4-7 - Overhead Utilities and Guy Lines Near Construction Access - West

- **Public Access:**
  - Fishing: It was noted that the pool immediately downstream of Centerton Lake Dam is a popular fishing spot for local anglers. Future design efforts may consider provisions to support future fishing access at this location.
  - Canoeing/Kayaking: The reach of Muddy Run downstream of Centerton Lake Dam sees regular use from paddlers launching canoes and kayaks from the lake at Parvin State Park. Currently, paddlers are largely limited to an out-and-back trip leaving Parvin Lake and heading upstream along Muddy Run before floating back downstream. If a public canoe/kayak access point were established at/near Centerton Lake Dam, it would create opportunities for paddlers to launch and paddle the roughly 3-miles of river downstream to Parvin State Park. Further, this would open up another 1+miles of previously inaccessible river up through the Centerton Lake Dam impoundment. This would really enhance recreational opportunities along Muddy Run and at/around Parvin State Park.

- **Property Ownership:** Based on a review of property boundaries and ownership via NJ-GeoWeb, the entire project area is owned by the Lake Centerton Park Homeowners Association, with the exception of a small wedge of property right at the corner of Centerton and Deerfield Roads, which is owned by the local fire company. As such, buy-in from property owners on the proposed design should be relatively streamlined.

4.2 SEDIMENT SAMPLING AND ANALYSIS

Field collection of sediment samples

Princeton Hydro collected grab sediment samples at four (4) representative locations within the former impoundment of Centerton Lake Dam. Muddy Run, in the area of interest, was readily accessible via wading. Samples were collected using a stainless-steel hand auger. The sediment sampling locations were located in the field with a survey grade GPS unit. The sample locations are presented below in Figure 4-8.



Figure 4-8 - Sediment Sample Locations

Sample collection followed established protocols and procedures, consistent with the sediment sampling guidance provided in the NJDEP Field Sampling Procedures Manual 2022. After sediment collection, a visual inspection of the sediment was performed and documented. Depths and observations can be seen below in Table 4-1.

Table 4-1 - Sediment Sample Collection Depths and Observations

Sample ID	Water Depth (FT)	Sediment Depth (FT)	Notes
1	N/A	1.5	Sample taken from impounded sediment above water surface elevation at time of field investigation; mix of fines, sands, and small gravel
2	5.5	1.5	Augur penetrated top layer of small gravel; sample was primarily sand
3	1.5	1.5	Sample predominately clay mixed with some sand
4	1.2	1.8	A mix of fines, sands, and small gravel

Laboratory Analysis

The grab samples were stored in a laboratory-provided cooler and transported to the NJ-certified laboratory Integrated Analytical Laboratories (IAL) Inc. of Randolph, NJ the same day of collection. The analysis followed standard sediment screening protocols. That is, the grab samples received both physical analysis and chemical analysis consistent with the NJDEP Soil Remediation Standards (SRS), which encompass a broad suite of parameters, all of which possess human-health based remediation standards.

Reporting

Princeton Hydro has compared the analytical results to any applicable NJDEP-based standards such as the site remediation standards (SRS) and migration to groundwater (MGW) standards and presented the data in bullet-point format below. It is important to note that any MGW standard exceedances would normally require an additional analysis of the synthetic leaching testing procedure (SPLP) as is standard with sediment characteristic testing. Lastly, analytical results were compared to the NJDEP Ecological Sediment Screening Criteria.

As stated earlier, analytical laboratory results were compared to several New Jersey Department of Environmental Protection (NJDEP) standards:

- NJDEP Site Remediation Standards – Ingestion-Dermal Residential Criteria
- NJDEP Site Remediation Standards – Inhalation Residential Criteria
- NJDEP Site Remediation Standards – Ingestion-Dermal Non-Residential Criteria
- NJDEP Site Remediation Standards – Inhalation Non-Residential Criteria
- NJDEP Migration to Ground Water Criteria
- NJDEP Lowest Effects Level of the Freshwater Sediment Criteria
- NJDEP Severe Effects Level of the Freshwater Sediment Criteria
- NJDEP Lowest Effects Level of the Saline Sediment Criteria
- NJDEP Severe Effects Level of the Saline Sediment Criteria

Please note the samples had no exceedances of these standards. Most Semi-Volatiles, PCBs, and Pesticides were not detected at the Reporting Limit and no analytes were detected above any of the criteria. There were 19 Semi-Volatiles, 1 PCB, 3 Pesticides, and 1 metal where the Reporting Limit was higher than an ecological standard (either the NJDEP Freshwater or Saline Sediment Criteria). However, no Reporting Limits were above any of the human-health standards.

The NJDEP Surface Water Quality Standards (SPLP procedure) were not analyzed as based on the fact that there were no NJDEP-MGW exceedances. Overall, as can be seen above, the sample results were compared to several NJDEP based criteria, with all the detected concentrations below even the most stringent human-health remediation and ecological based standards. Given that there were no exceedances, the material within the impoundment is best suited for on-site management. For the full laboratory report of the results of the chemical analyses please refer to Appendix C: Analytical Data Report by IAL.

Overall, the sediment testing results show the quality of impounded sediment should not be considered a limitation to the feasibility of dam removal and should not restrict sediment management. It is Princeton Hydro's opinion that sediment results do not preclude the passive release of sediment or relocation of sediment on-site. Most importantly from a cost perspective, it is not anticipated that any sediment would need to be hauled off-site for disposal.

4.3 GEOMORPHIC ASSESSMENT

As part of this feasibility study, Princeton Hydro performed a geomorphic assessment of Muddy Run, including the former impoundment and segments of the stream channel upstream and downstream of the influence of Centerton Lake Dam.

The system is low gradient and low energy; the bedload consists primarily of sand and clay with no natural boulders and limited small gravels. The channel is well-connected with the floodplain, with observed evidence of recent overtopping of the stream bank. The channel, through the impoundment, has evolved post-impoundment-lowering with the channel banks being composed of impounded sediment.

Through the former impoundment, a primary channel has evolved, but has been bifurcated in places. The channel through the former impoundment has a well-vegetated river right bank. A combination of trees, shrubs, and phragmites have established. In this area, the river left bank is maintained (mowed) by adjacent landowners. Signs of minor bank erosion are evident where the river-left bank makes up the outer bend of the channel. Limited woody debris was observed in this reach.

Upstream of the former impoundment, beaver dams create a river-wetland corridor. Upstream of the beaver dam, there is a rich, complex wetland system. This area corresponds to a high level of beaver activity, with trees observed that were recently felled by beavers. Here, the channel is well-defined (approximately 2-3 feet deep) but is bifurcated at various points. The floodplain appears to get inundated regularly. Large woody debris was observed in this reach.

Downstream of the dam is a self-scouring pool with a maximum water depth of approximately 10-feet. The tail of the pool occurs where the channel narrows (just upstream of the bridge) where the water depth is 3.5-feet; sand appeared to make up the tail of the pool. The bridge itself also appears to be self-scouring, it appears to be a minor hydraulic constriction, with a maximum water depth of 8-feet. Fine sand appeared to make up the substrate under the bridge.

In the downstream reach, the bedload substrate is larger than through the impoundment; a mix of sand, small gravel, and medium gravel make up the predominant bedload. In this reach, the channel is a pool-riffle sequence where bankfull height appears to be 6-12 inches below the floodplain. Large woody debris was observed in this reach.

During this field effort, Princeton Hydro surveyed a longitudinal profile through the thalweg of Muddy Run, as well as representative cross sections through the current stream channel and adjacent floodplain. These were incorporated into the conceptual design plans. Based on an average of three representative cross sections measured from upstream and downstream of the impoundment, Princeton Hydro estimates the bankfull dimensions to be as shown below in Table 4-2.

Table 4-2 - Estimated Bankfull Dimensions of Muddy Run

Bankfull Width (FT)	Average Bankfull Depth (FT)	Max Bankfull Depth (FT)	Cross Sectional Area (Sq. FT)
36	1.8	2.9	65

While surveying the longitudinal profile, Princeton Hydro staff also probed the sediment within the stream channel to understand the extent of impounded sediment. Princeton Hydro completed sediment probes throughout the impoundment and the upstream reaches. The probes were conducted using a combination of 10-foot length of graduated rebar and survey range rod by probing into the sediment until refusal was reached. The depth of water and sediment were then recorded with the survey-grade GPS. Princeton Hydro observed the probes to penetrate layers of clays and sand. Based on the probes and the anticipated grade shown on the longitudinal

profile, the volume of impounded sediment expected to mobilize upon dam removal is estimated to be on the order of 4,000 to 6,000 cubic yards. This volume of sediment is not anticipated to be a major consideration in the feasibility of the dam removal.

5 DAM REMOVAL CONCEPT

5.1 CONCEPT OVERVIEW/SUMMARY

The concept presented as part of this Feasibility Study focuses on a cost-effective means of removing the dam and in turn eliminating the associated liability and regulatory obligations currently borne by the Owner. Removal of the dam would result in ecological uplift by further enhancing riparian functions and values along Muddy Run. The approach laid out herein is to demolish and remove the dam's spillway; create a pilot channel by grading 'in a new segment of stream channel through the footprint of the former dam; and to allow the surrounding channel (upstream and downstream) to passively adjust and ultimately find equilibrium.

5.2 DAM REMOVAL CONCEPT PLANS

As part of this feasibility study, a five-page plan set titled "Conceptual Design Plans for the Removal of Centerton Dam" was prepared to convey the design intentions and expectations documented within this report. That plan set should be reviewed in conjunction with this report to present a holistic view of the envisioned dam removal. This plan set includes:

- Title Sheet (Sheet 1 of 5)
- Dam Removal Concept Overview (Sheet 2 of 5)
- Existing and Proposed Conditions at Dam (Sheet 3 of 5)
- Profile (Sheet 4 of 5)
- Cross Sections (Sheet 5 of 5)

5.3 CONCEPT-LEVEL COST ESTIMATE

A construction cost estimate has been prepared to accompany the dam removal concept plans discussed above. This cost estimate is based on quantities derived from or based on the concept plans; Princeton Hydro's past experience with similar projects; and from published construction cost data (R.S. Means). This cost estimate assumes that this will be a non-prevailing wage job and that no sediment will need to be imported to or removed from the project site. The costs presented below are current as of 2023. For financial planning purposes, these costs should be escalated to the anticipated year of construction.

Table 5-1 – Estimated Construction Cost for Removal of Centerton Lake Dam

Cost Item and Description		Estimated Cost
Mobilization/Demobilization		$36,000
Includes:	contractor mobilization and demobilization from construction site; performance, payment, and maintenance bonding	
General Construction		$33,000
Includes:	survey for construction layout; access roads; traffic control	
Demolition		$46,000
Includes:	demolition of the dam's spillway, pedestrian walkway, and a portion of the upstream bulkhead; off-site hauling and disposal of the spillway materials; clearing of the site to facilitate access, staging, and the work	
Earthwork		$70,000
Includes:	excavation around the dam's spillway to establish stable slopes/banks; excavation at the eastern end of the dam's spillway to establish the proposed channel alignment; creation of a new stream channel through the dam's footprint; installation of scour protection measures to support/maintain the new stream channel	
E&S Measures and Site Restoration		$59,000
Includes:	stabilized construction entrances; high-visibility fence to establish the construction site boundary; installation and maintenance of soil erosion and sediment control measures throughout the construction duration; installation of tree protection measures; water control (dewatering and/or bypass system); seeding and stabilization of the site upon completion of construction.	
	Total Estimated Construction Cost	**$244,000**

5.4 CONCEPT VARIATIONS/ADDITIONS FOR CONSIDERATION

As previously discussed, the design concept presented herein focusses on a cost-effective means of removing the dam and in turn eliminating the associated liability and regulatory obligations currently borne by the Owner, which will result in ecological uplift by further enhancing riparian functions and values along Muddy Run. To accomplish further ecological uplift and a more holistic stream restoration in and around Centerton Lake, the following concept variations/additions could be considered, should appropriate funding sources be identified to do so:

- **Enhancement of the Muddy Run Riparian Corridor**: A well-vegetated riparian corridor is an important contributing factor to stream bank stability, water quality, and quality of habitat along/within a stream. Through natural succession, vegetation has begun to establish along the river-right (western) bank of Muddy Run, however the river-left (eastern) bank remains sparsely vegetated. This is likely driven by mowing/clearing efforts from the adjacent homeowners. From an ecological perspective, establishment of native vegetation along the river-left bank would offer considerable uplift. However, it is understood that any such efforts would also need to consider viewshed and access expectations from the adjacent landowners.

- **Stream Habitat Complexity:** The newly formed stream channel through the former impoundment lacks habitat complexity and could be improved to provide better habitat for fish and other aquatic organisms. As-is, much of the channel is relatively shallow, with little aquatic vegetation or shade cover and very little in-stream, woody debris. All of these factors contribute to limited shelter for fish, leaving them vulnerable to predators. Future design efforts could consider proposed features that would offer more shelter and increase habitat value.

- **Adaptive Management Plan - Invasive Species Management and Ecological Restoration Planting:** The former impoundment as well as large areas of Muddy Run's riparian corridor have stands of invasive species including *Phragmites australis* as well as woody, upland species like *Ailanthus altissima* (tree of heaven). As a complement to the dam removal and systems thinking approach, restoring a functioning riparian plant and soil community within the project reach would enhance the overall biological and ecological function of the Maurice River Watershed. Herbicidal treatment of *Phragmites australis* over a two-to-five-year period, combined with planting of new riparian and upland species would increase habitat diversity for birds and all levels of terrestrial and aquatic animal species in the area by providing shelter and foraging opportunities.

6 NEXT STEPS

To see the removal of Centerton Lake Dam through completion, the project will navigate the following phases:

- Phase 1 – Feasibility Study: Complete
- Phase 2 – Site Investigation, Design, and Permitting: Pending
- Phase 3 – Contractor Solicitation and Construction: Pending

Phase 1 has been completed as part of this study. Phases 2 and 3 are beyond Princeton Hydro's current scope of work and will be completed as funding allows.

As to present a holistic view of the anticipated costs to see Centerton Lake Dam removed, estimated costs for engineering services to see the project through Phases 2 and 3 and presented below in Table 6-1. This effort is envisioned to include site investigations, design, permitting, bidding/contractor solicitation, construction, and closeout of the project with NJDEP Bureau of Dam Safety.

Table 6-1 - Total Estimated Cost of Engineering Services for Removal of Centerton Lake Dam

Cost Item and Description		Estimated Cost
Project Management and Coordination		$17,000
Includes:	project management; coordination with the client/owner	
Site Investigations		$33,000
Includes:	topographic and utility survey; wetland delineation; localized bathymetric survey; additional sediment sampling if required by regulators	
Design		$59,000
Includes:	hydraulic and hydrologic analysis; development of construction package documents (engineering plans, regulatory plans, technical specifications); drafting of an engineering report; preparation of a construction cost estimate; coordination and design to incorporate the dry hydrant into proposed conditions	
Permitting		$35,000
Includes:	attendance of a pre-application meeting with applicable regulators; preparation of regulatory submissions to the local soil conservation district and NJDEP (Dam Safety, Freshwater Wetlands, NJPDES)	
Bid and Construction Phase Services		$46,000
Includes:	development of a bid sheet, front end contract documents, and bid package; bid advertisement; contractor coordination; hosting a pre-bid meeting; review of bids and contractor qualifications; contractor selection; construction kick-off meeting; review of construction submittals; construction oversight and preparation of daily field reports; and project close out with NJDEP Bureau of Dam Safety	
	Total Cost of Anticipated Engineering Services:	**$190,000**

Table 6-2, below, summarizes the total estimated costs to see the removal of Centerton Lake Dam through design permitting and construction. The estimated cost for Phase 2 includes the engineering services, above, from Project Management through Permitting. The estimated costs for Phase 3 include the Bid and Construction Phase Services from Table 6-1 in additional to the total construction cost estimate from Table 5-1. The costs presented below are current as of 2023. For financial planning purposes, these costs should be escalated to the anticipated year(s) in which the work would take place.

Table 6-2 - Total Estimated Cost to Remove Centerton Lake Dam

Cost Item	Estimated Cost
Phase 2 – Site Investigation, Design, and Permitting	**$144,000**
Phase 3 – Contractor Solicitation and Construction	**$290,000**
Phase 3A – A/E Bid and Construction Phase Services	$46,000
Phase 3B – Construction	$244,000
Total Project Cost	**$434,000**

7 CONCLUSION

In our opinion, Centerton Lake Dam is a promising candidate for dam removal. The dam is in disrepair and is well beyond its intended service life. The owner is receptive to removing the dam and this feasibility study has not identified any significant site constraints that would prohibit its removal. Estimates of future expenses associated with site investigations, design, permitting, and construction are presented herein to support planning efforts and dam removal concept plans are included as an attachment to this report.

APPENDIX A: DAM FILE REVIEW FINDINGS

APPENDIX B: FINDINGS OF LOCAL WELL RESEARCH

APPENDIX C: ANALYTICAL DATA REPORT BY IAL

APPENDIX D: DAM REMOVAL CONCEPT PLANS