

COUNTY OF ULSTER
DEPARTMENT OF THE ENVIRONMENT
17 Pearl Street, Kingston NY
P.O. BOX 1800
KINGSTON, NEW YORK 12402
Phone: 845-338-7287

PATRICK K. RYAN
COUNTY EXECUTIVE



AMANDA L. LAVALLE
DIRECTOR

NICHOLAS E. HVOZDA
DEPUTY DIRECTOR

June 16, 2021

Ms. Kristen Cady-Poulin, Environmental Analyst
New York State Department of Environmental Conservation
Division of Environmental Permits
625 Broadway
Albany, NY 12233

SENT VIA EMAIL TO DEPPermitting@dec.ny.gov

Re: Ashokan Release Working Group Comments on the Draft Environmental Impact Statement for the CATALUM SPDES Permit Modification

Dear Ms. Cady-Poulin,

The Technical Working Group of the Ashokan Release Working Group (ARWG) provides the New York State Department of Environmental Conservation (NYSDEC) comments on the *Draft Environmental Impact Statement (EIS) for Modification of the Catalum SPDES Permit* proposed by New York City Department of Environmental Protection (NYCDEP). We appreciate the opportunity to comment on this important document, and urge NYSDEC to consider our comments carefully, particularly the request for a Supplemental Draft EIS as the next step in the State Environmental Quality Review Act (SEQR) process.

We would like to note that while technically both NYCDEP and NYSDEC are members of the ARWG, these comments represent the collective consideration of the non-agency members of the ARWG. We also note that many of the ARWG member organizations intend to file separate comments on the Draft EIS as well.

The non-agency members of the ARWG, who represent a wide variety of entities and interests, have worked diligently to develop these collaborative comments on the Draft EIS. The ARWG comments have the full endorsement of:

Catskill Mountainkeeper
Catskill Mountains Chapter of Trout Unlimited
City of Kingston
Cornell Cooperative Extension - Ulster County
Esopus Creek Conservancy
Hudson River Sloop Clearwater
Hudson Valley Farm Hub
Lower Esopus Watershed Partnership
RCap Solutions

Real World Productions, Inc.
Riverkeeper
Saugerties Lighthouse Conservancy, Inc.
The Kingston Land Trust
Town of Marbletown
Town of Saugerties
Ulster County
Ulster County Soil and Water Conservation District
Village of Saugerties
Woodstock Land Conservancy

We would like to reiterate that our primary concern is the health of the Lower Esopus Creek, Hudson River, and all associated communities and resources. We strongly recommend, based on the multiple reasons presented in our Draft EIS comments, that NYSDEC move forward with the preparation of a Supplemental Draft EIS to more accurately assess potential impacts to the natural and human environments, particularly in response to the December 2020 storm/turbidity event. We are available to discuss our comments on the Draft EIS and look forward to continuing a productive dialogue with NYSDEC and NYCDEP about this important environmental review process.

Sincerely,



Amanda LaValle
Chair
Ashokan Release Working Group Technical Subcommittee

**Ashokan Release Working Group (ARWG) Comments on the Draft
Environmental Impact Statement (EIS) for the CATALUM SPDES Permit
Modification**

June 2021

TABLE OF CONTENTS

TABLE OF CONTENTS	i
1.0 EXECUTIVE SUMMARY.....	1
2.0 BACKGROUND.....	3
3.0 GENERAL COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT.....	4
3.1 ARWG Recommended Measures.....	4
3.2 Need for Supplemental Environmental Impact Statement.....	4
4.0 SPECIFIC COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT.....	9
4.1 Purpose and Need.....	9
4.2 Proposed Action.....	10
4.3 Alternatives	10
4.3.1 Ashokan Reservoir Alternative 1 – West Basin Outlet Structure	12
4.3.2 Ashokan Reservoir Alternative 2 – Dividing Weir Crest Gates.....	13
4.3.3 Ashokan Reservoir Alternative 3 – East Basin Diversion Wall And Channel Improvements	14
4.3.4 Ashokan Reservoir Alternative 4 – Upper Gate Chamber Modifications	15
4.3.5 Ashokan Reservoir Alternative 5 – East Basin Intake.....	16
4.3.6 Ashokan Reservoir Alternative 6 – Changed Release Channel Operations	17
4.3.7 Ashokan Reservoir Alternative 7 – Bypass Of Lower Turbidity Upper Esopus Creek Water Directly To The Ashokan East Basin	20
4.3.8 Ashokan Reservoir Alternative 8 – Bypass Of Upper Esopus Directly To Lower Esopus Creek.....	21
4.3.9 Catskill Aqueduct Alternatives.....	22
4.4 Water Resources	23
4.4.1 The Draft EIS presents conclusions based on inconsistent and unsupported Modeling Analyses	23
4.4.2 DEP’s Models Yield Conflicting Results.....	24
4.4.3 DEP’s Modeling Is Unsupported In The Draft EIS.....	24
4.4.4 Potential Differences Between the Future Without and With the Proposed Action for Lower Esopus Creek	25
4.5 Hydrology	29

Table of Contents (Cont'd)

4.6	Socioeconomics / Tourism / Aesthetics / Recreation.....	37
4.7	Fish and Aquatics.....	38
4.8	Other Natural Resources (Plants, Invertebrates, Herpetofauna, Birds, Mammals).....	40
4.9	Cultural Resources.....	41
4.10	Indigenous Cultural Resources.....	43
4.11	Agriculture.....	44
5.0	CONCLUSIONS.....	46
6.0	REFERENCES.....	48

LIST OF ATTACHMENTS

Attachment A: Hudsonia Report: Comments of biodiversity in lower Esopus Creek, Ulster County, New York, pertinent to the Modification of the Catalum SPDES Permit DEIS, New York City Department of Environmental Protection

Attachment B: Addendum to Section 4.10 on Adverse Impacts on Ancient Indigenous Cultural Resources

1.0 EXECUTIVE SUMMARY

The Ashokan Release Working Group (ARWG) prepared the following comments on the Draft Environmental Impact Statement (EIS) for the Modification of the Catalum State Pollutant Discharge Elimination System (SPDES) Permit. The ARWG is a group of diverse stakeholders consisting of municipalities, businesses, residents, user groups, scientists, and non-governmental organizations (NGOs), formed in 2011, in response to the initial, unauthorized releases of high flow, high turbidity waters to the Lower Esopus Creek from the Ashokan Release Channel (ARC).

In addition to the comments presented here, which are a literal compilation of multiple stakeholder's voices, interests, and concerns, several of the ARWG stakeholders have also submitted comments on the Draft EIS from their individual entities. The ARWG's fundamental concern is the protection and health of the Lower Esopus Creek. The synopsis of ARWG's comments on the Draft EIS includes:

Comment ES-1: Supplemental Draft EIS is the next step in the New York State Environmental Quality Review Act (SEQR) process due to:

- The December 2020 storm/turbidity climate change induced event necessitates the need to revisit and recalibrate the assumptions used in the analyses and the resulting assessment of impacts, particularly ecological and socioeconomic impacts, including the drinking water quality of the Hudson River communities.
- Scope of the Draft EIS should include all of the Lower Esopus and Hudson River communities also impacted by use of the ARC.
- Alternatives analysis presented in the Draft EIS is insufficient and incomplete; alternatives were summarily dismissed without adequate justification/explanation, and alternatives were not considered in combination with each other.
- The Interim Release Protocol (IRP) and Revised Operating Protocol (ROP) should be revised to focus on a mutually beneficial solution for supplying drinking water to New York City residents as well as for the health of the Lower Esopus Creek, including consistent community releases.
- Impacts from climate change are not adequately assessed; the Draft EIS should consider increased frequency and severity of storm events.
- Source documentation used in the assessment of impacts was not provided with release of the Draft EIS. A list of reference material was provided during the last

month of the review period; however, the supporting documentation/modeling information were not available to assist in the review of the Draft EIS.

Comment ES-2: The ARWG is fundamentally opposed to the discharge of turbid water through the ARC as the default release. **The default release under all circumstances through the ARC should be the cleanest water available.** The New York City Department of Environmental Protection (DEP) should immediately implement interim solutions to ensure the Lower Esopus receives the cleanest water available while a Supplemental EIS is being prepared.

Comment ES-3: Regular and consistent community releases should be maintained at a minimum flow that achieves the greatest collective benefit to downstream resources during periods of low inflows and low turbidity in the Ashokan Reservoir. These flows should be adaptively managed to balance water quality standards, maximizing habitat for fish and other important aquatic species, and meeting recreational use needs for the stream. These Adaptive Management approaches need to address shifting conditions and priorities such as implemented in the Delaware River Basin.

Comment ES-4: DEP should provide **long-term funding and technical assistance to Ulster County and individual communities towards understanding the impacts associated with the releases from the ARC and for development and implementation of a Lower Esopus Creek Stream Management Program.** The result would benefit the Lower Esopus Creek, the communities (overall, as well as their individual needs), and the County for use of the Ashokan Reservoir.

2.0 BACKGROUND

The Ashokan Reservoir was constructed to supply drinking water to New York City residents and began operation in 1915. Due to the extent of clays and silts that accumulated on the beds and banks of the Esopus Creek, the reservoir was designed and constructed with two basins: the west basin would be used as a settling basin, and the east basin, where the aqueduct begins, would contain clearer water. For over 100 years, there has been contention between the reservoir operators (New York City Department of Environmental Protection [DEP]) and the local communities surrounding the Ashokan Reservoir and its connecting water bodies (Lower Esopus Creek to the Hudson River).

In 2007, the State Pollutant Discharge Elimination System (SPDES) permit was issued for the Catskill Aqueduct Influent Chamber (Catalum SPDES Permit), that included use of the Ashokan Reservoir to supply water through the aqueduct to the receiving Kensico Reservoir. In October 2010, DEP released turbid water through the Ashokan Release Channel (ARC) into the Lower Esopus Creek for the first time without public involvement in the decision. After the release of turbid water following three major storm events from 2010-2011, DEP was fined by the New York State Department of Environmental Conservation (DEC). A Consent Order was issued in 2013 that directed DEP to prepare an Environmental Impact Statement (EIS) to evaluate modification of the Catalum SPDES Permit to include (1) turbidity control measures, including the Interim Release Protocol (IRP), and (2) delay of dredging of alum floc from Kensico Reservoir until the completion of certain infrastructure projects.

It is also important to recognize that this SPDES Permit is one of several regulatory mechanisms that aim to protect the water quality of the Lower Esopus. The Lower Esopus is also listed as impaired for sediment under Clean Water Act Section 303(d), which requires the state to take measures to address the impairment through the development of a Total Maximum Daily Load. In addition, the applicability of New York Reservoir Release Regulations, Title 6 of New York Code, Rules and Regulations Parts 670-672, to the Ashokan Reservoir releases may merit further investigation outside of this current permitting process.

3.0 GENERAL COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

3.1 ARWG Recommended Measures

The Ashokan Release Working Group (ARWG) understands that the purpose of the Ashokan Reservoir is to be used as part of New York City's (NYC) drinking water supply system, and this use will inevitably have effects on the surrounding geographic area. However, **use of the Ashokan Reservoir, located in Ulster County, New York, should not occur at the expense of Ulster County and the surrounding communities (including the natural and social environments)**. In addition to the specific comments on the Draft EIS (provided in this letter and from each of the local stakeholders), there are fundamental measures that DEP should adhere to that will ensure the Lower Esopus Creek and communities are not forfeited for the sake of NYC drinking water:

- Revise the proposed IRP/Revised Operating Protocol (ROP) in coordination with ARWG to (a) maintain the health of the Lower Esopus Creek that supports flora and fauna, recreation, tourism, and quality of life for the residents of the local communities by ending the turbid water discharges, (b) maintain clean drinking water for the Hudson River communities; and (c) further reduce flood risk along the Lower Esopus Creek;
- Ensure the discharge of clean water to the Lower Esopus Creek is the default;
- Provide community releases of an appropriate flow based on a revised analysis as a stand-alone and consistent protocol;
- Provide long-term commitment of funding and technical assistance for a Lower Esopus Creek Stream Management Program, including continued study of the impacts of releases;
- Implement science-driven Adaptive Management (AM) approaches, such as those applied in the Delaware System, including flexible flows.

3.2 Need for Supplemental Environmental Impact Statement

The ARWG strongly recommends New York DEC prepare a Supplemental Draft EIS as the next step in the State Environmental Quality Review Act (SEQR) process. According to the SEQR Handbook (Fourth Edition, 2020): "A supplemental EIS provides an analysis of one or more significant adverse environmental impacts that were not addressed or were inadequately addressed in a draft or final EIS. A supplemental EIS may be required if: The lead agency discovers new information, not previously available, concerning significant

adverse impacts; A change in circumstances arises that may result in a significant adverse environmental impact". Additionally, according to the SEQR Handbook, the criteria for determining if newly discovered information warrants preparation of a supplemental EIS includes "...the importance and relevance of the information, and the present state of the information provided in the original EIS".

A Supplemental Draft EIS is warranted as the next step in the New York SEQR process due to:

- **December 25, 2020 Storm/Turbidity Climate Change Induced Event.** The Draft EIS was released December 16, 2020. On December 25, 2020, a rain-on-snow climate change induced event resulted in a significant turbidity release from the Ashokan Reservoir. Because this significant turbidity event occurred shortly after the release of the Draft EIS, the assumptions and assessment of impacts presented in the Draft EIS should be updated to include data from the December 2020 event. The modeled assumptions used as references for predictions in the Draft EIS should be recalibrated, and the actual data points should be updated to include the new information from the storm event. This event provides too much relevant and timely information to not be included in the SEQR process; incorporation of this new data would be accomplished via a Supplemental Draft EIS.

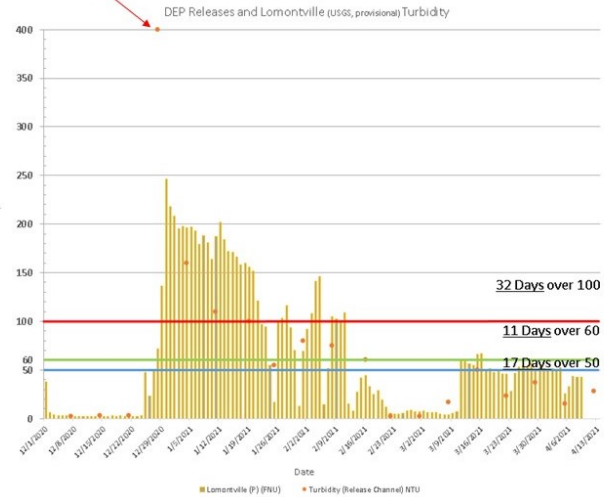
In particular, Table 7.1-2 "*Average Number of Days Per Year of Modeled Turbidity Levels of Flow...*" in the Draft EIS is problematic. The table indicates that the number of days in a given year with turbidity levels over 50 NTU in futures with or without spills and/or releases are less than 1 or 0 days. As shown in Figure 1, from the Christmas storm of 2020 through May 2021, there were 17 days over 50 NTU, 11 days over 60 NTU and 32 Days over 100 NTU at the U.S. Geological Survey (USGS) Lomontville gage on the Lower Esopus Creek from one storm event. This is particularly troubling considering our region is forecast to receive more precipitation in the future due to climate change. The inconsistency between an actual meteorological event and the projections in the table should be re-evaluated. These data mirror turbidity of the ARC. Turbidity in the Ashokan Reservoir at this time was significant as well. The Reservoir, Release Channel and Lower Esopus Creek began to clear in May 2021, *almost six months* after the storm event. Suspended sediment in this case was heavily influenced by the cold-water temperatures of winter and spring. The current model results cannot stand in light of the December 2020 event and **a re-evaluation of the model to more accurately reflect storm events of this magnitude, accurate water temperature, a future in which storms of this type are forecast to become more frequent due to the changing climate is necessary. Further study on the potential lasting impacts of sediment from these events is also warranted.**

Release flows at 400 NTU

Table 7.1-2. Average Number of Days Per Year of Modeled Turbidity Levels of Flow between the Future Without and With the Proposed Action

Turbidity Level (NTU)	Number of Days			
	Future without the Proposed Action (Spill)	Future with the Proposed Action (Releases)	Future with the Proposed Action (Spill)	Future with the Proposed Action (Releases and Spill) 2
0-5	51	259	17	263
5-10	20	54	7	55
10-15	8	18	5	20
15-20	3	10	2	10
20-25	1	5	1	6
25-30	1	2	1	2
30-40	1	1	1	2
40-50	1	1	1	1
50-60	0	<1	<1	<1
60-100	0	<1	<1	<1
>100	0	0	0	0
No Release	NA	15		0
No Spill	279		330	5
Total Days	365	365	365	365

So far by May, 2021...



Source: Ulster County Department of the Environment

Figure 1 Updates to Table 7.1-2 (Draft EIS) Reflecting Actual Events from December 2020 through May 2021

- Scope of the Draft EIS is inadequate.** The Draft EIS did not include all the communities impacted by use of the ARC. This was especially evident as a result of the December 2020 storm/turbidity event. The Supplemental Draft EIS should include the geographic range and assessment of impacts to all of the Lower Esopus Creek and Hudson River communities impacted by use of the ARC. In particular, the turbidity release had direct impacts to the drinking water supply system of the Hudson River communities just downstream of the confluence with the Lower Esopus Creek. These communities, and impacts thereof, were not included in the Draft EIS. This egregious oversight should be addressed in a Supplemental Draft EIS.
- The Alternatives Analysis presented in the Draft EIS is insufficient.** Potential alternatives were presented then eliminated from further consideration without sufficient justification or explanation. Alternatives were considered in a vacuum, independent from each other. The Supplemental Draft EIS should consider combinations of alternatives as potential means to meet drinking water supply needs without sacrificing the health of the Lower Esopus Creek. There are no alternatives explored that would reduce the level of turbidity entering the West Basin and inherently mitigate some of the issues in the Ashokan Reservoir.
- The presentation of data is deficient.** Data presented is not always characterized as modeled versus observed, which makes it challenging for the public to confirm its validity. The Draft EIS should clearly differentiate whether data presented and used in the analyses are observed or predicted (modeled).

- **The comparative analysis of impacts is bogus.** Under environmental impact assessment (e.g., National Environmental Policy Act [NEPA], SEQRA), there is a 'decision to be made' that is being evaluated. For this EIS, the 'decision to be made' is whether to modify the SPDES permit. The "Action" is to modify the permit to include the IRP/ROP. The No Action is to not modify the permit, but as clearly stated in the Draft EIS, the No Action still includes the IRP. The basis for comparison of impacts in Chapter 7 is the "Future With the Proposed Action" (IRP) versus the "Future Without the Proposed Action" (No IRP). However, there is no actual scenario where the Future Without the Proposed Action is a possibility. So while the analysis of impacts purports to check the box for SEQRA comparative analysis, the analysis is bogus as there is no actual utility of that scenario.
- **The IRP and ROP should be revised to focus on a mutually beneficial solution** for supplying drinking water to New York City residents and for the health of the Lower Esopus Creek, including consistent community releases. DEP should coordinate closely with Ulster County and the ARWG to develop a protocol that provides clean water releases as the default during spill mitigation and/or operational releases, as well as provisions for consistent community releases (at the appropriate volume). This new ROP should be evaluated in the Supplemental Draft EIS. The IRP as proposed was not used during the 2020 storm event (DEP received a variance), so the IRP as proposed is disingenuous. As evidenced by the response to the December 2020 event, there is a distinct lack of parameters that must be adhered to even within the variance framework. Additionally, the default even for the variance scenario is to only spill from the west basin (e.g., turbid water) into the Lower Esopus Creek.
- **The Draft EIS does not fully address climate change in New York State and its influence on DEP's operations and impacts on the Lower Esopus Creek.** The Draft EIS hints that the shifting climate in New York will likely result in a future that will lead to the "wetter scenario" in DEP's operations. The impacts of climate change on DEP's operations appear largely unknown in the context of the Draft EIS as presented. The IRP and ROP are in large part based on past weather data. While climate change is mentioned in the Draft EIS, its incorporation into the discussion on impacts and operational adjustments is largely absent. Some long-term monitoring data do exist on flora and fauna during past years (e.g., fisheries, water quality) but these data sets do not address impacts based on a wetter scenario under climate change. No study or no data does not equal no impact. Even one event like the 2020 Christmas storm, per year, can result in weeks or months of turbid water and higher flows. The ecological impacts of even one storm of this magnitude per year is unknown. This is a research gap that could better inform the Draft EIS and the IRP/ROP. The Expert Panel cautioned DEP to expand the hydrological study parameters to consider future climate change events. The ARWG requests further study and incorporation of climate change data on

ecological and agricultural impacts to account for a future in which climate patterns differ from historic and current weather patterns in a Supplemental Draft EIS.

4.0 SPECIFIC COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

4.1 Purpose and Need

The Purpose and Need of the project determine the scope of the EIS, including the range of alternatives and analysis of impacts evaluated. The Purpose and Need for this Proposed Action, as defined on page 2-1 in the Draft EIS, is myopically focused on the drinking water supply for New York City residents and the reduction of alum in the Kensico Reservoir. Under this context, the impacts upstream to the Lower Esopus Creek and surrounding communities/residents are by default given secondary/inferior consideration, enough so that the discharge of turbid waters into the Lower Esopus Creek is outside the parameters of the Proposed Action. The Purpose and Need for the Proposed Action should be revised to focus on a mutually beneficial solution for supplying drinking water to New York City residents and the health of the Lower Esopus Creek, including consistent community releases. As stated previously, the Lower Esopus Creek should not be sacrificed for the supply of drinking water to NYC.

The 2013 Consent Order between NYSDEC and DEP acknowledges the need for “reducing the impact of flooding events, mitigating potential negative effects of releases, and promoting eco-system-based watershed management...”¹ (in the Lower Esopus Creek watershed). Under terms of the Consent Order, DEP agreed “to implement an Interim Ashokan Reservoir Release Protocol (Protocol) **to enhance benefits to the (Lower Esopus) community, improve flood attenuation, and provide better water quality.**”² (emphasis added)

The purpose of this agreement is further memorialized in the Final Scope for Modification of the Catalum SPDES Permit (Final Scope):

The Interim Ashokan Release Protocol (see Attachment A) included in the Order on Consent dated October 4, 2013 provides for community releases (those that would **provide environmental, recreational, and economic benefits to the Lower Esopus Creek and surrounding community**); discharge mitigation releases that would

¹ 2013 Consent Order, 5.

²*Id.*, App. B, 24.

enhance flood mitigation; and operational releases intended primarily to protect water quality (and which further the potential for flood mitigation)³ (emphasis added)

The Catalum Draft EIS recognizes the same purpose: **“to provide recreational, environmental, and economic benefits to Lower Esopus Creek.”**⁴ (emphasis added) Draft EIS Chapter 14 states that the “objective of Ashokan Reservoir Alternative 6 (Changed Release Channel Operations) would be **to balance water supply needs for DEP, while enhancing benefits to Lower Esopus Creek** as compared to the Proposed Action.” (emphasis added)

Finally, the Draft SPDES permit is conditioned on an operating protocol requiring community releases and reiterates the purpose set forth in the Final Scope: **“to provide environmental, recreational and economic benefits to the Lower Esopus Creek** in a manner that will not adversely impact water supply.⁵ (emphasis added)

It is clear that a fundamental purpose of the Proposed Action as set forth in the 2013 Consent Order, the Final Scope, the Draft EIS and the Draft SPDES permit is **to enhance benefits to the Lower Esopus Creek and communities**. Maintaining the status quo under the existing IRP cannot be considered enhancing benefits; neutrality does not improve the environmental, recreational and economic conditions of DEP’s turbid releases to the Lower Esopus Creek.

4.2 Proposed Action

The IRP and ROP should be revised to ensure a mutually beneficial solution for supplying drinking water to NYC residents and for the health of the Lower Esopus Creek, including consistent community releases. DEP should coordinate closely with Ulster County and the ARWG to develop a protocol that provides clean water releases as the default during spill mitigation and/or operational releases, as well as provisions for consistent community releases (at the appropriate volume). This new ROP should be evaluated in the Supplemental Draft EIS.

4.3 Alternatives

Overall, the Alternatives Analysis presented in the Draft EIS is severely lacking in acceptable content. The alternatives that were presented (and are discussed below) were

³ Final Scope, 7.

⁴ DEIS, ES-10.

⁵ Catalum Draft SPDES Permit, 6.

dismissed without sufficient justification or explanation. Alternatives were evaluated in a vacuum, independent of each other, versus considering combinations of alternatives that may offer more successful solutions.

Alternatives that were not evaluated in the Draft EIS that should be considered include:

- Reducing turbidity at the Schoharie Watershed; and
- Dredging at Kensico Reservoir (e.g., not delaying dredging).

In Section 14.1-Approach of the DEIS it is stated that:

For an alternative to be successful, it must be a practical substitute for the Proposed Action that achieves its original goals and reduces the potential for impacts or enhances benefits when compared to the Proposed Action. Therefore, an analysis was conducted to consider the following criteria to assess each alternative:

- Water Supply Reliability: Ability for DEP to meet multiple objectives for its water supply system (e.g., water supply, water quality, operational flexibility);
- Constructability: Overall feasibility, taking into consideration existing technology, logistics of the project purpose, and construction; and
- Reduced Impacts and Enhanced Benefits: Potential for reducing, mitigating, or eliminating impacts and/or potential for enhancing benefits as compared to the Proposed Action.

Comment

Analyses and statements in the Draft EIS focus more on the NYC Water Supply System and not as much on significant improvements to environmental impacts and water quality downstream. For instance, does the DEP consider that their proposed action satisfies the third bullet above regarding reducing impacts and enhancing benefits as compared to the proposed action? As an example, in the recommendation for revised operating procedures (without any structural alternatives being pursued) there appears to be marginal benefit in reducing the number of high turbidity events for both wet, normal and dry years (reference Figures 14.3-10 and 14.3-11).

Alternatives evaluated in the Draft EIS are summarized as follows:

1. West Basin Outlet Structure
2. Dividing Weir Crest Gates
3. East Basin Diversion Wall And Channel Improvements
4. Upper Gate Chamber Modifications
5. East Basin Intake
6. Changed Release Channel Operations
7. Bypass Of Lower Turbidity Upper Esopus Creek Water Directly To The Ashokan East Basin
8. Bypass Of Upper Esopus Directly To Lower Esopus Creek

4.3.1 Ashokan Reservoir Alternative 1 – West Basin Outlet Structure

Based on the Draft EIS, this alternative would involve construction of a new outlet structure in the west basin of Ashokan Reservoir, consisting of a gated-weir discharging west basin water to Lower Esopus Creek downstream of the Olive Bridge Dam. A west basin outlet structure would be used in a manner similar to the existing Ashokan Release Channel to maintain the Conditional Seasonal Storage Objective (CSSO) and prevent uncontrolled transfer of turbid water from the west basin over the dividing weir to the east basin.

Conclusions in prior studies were that the outlet structure could be constructed without major impacts to operation of the Ashokan Reservoir facilities. However, the designs were not pursued because of demonstrated low to moderate benefits for DEP in addressing turbidity events in Ashokan Reservoir.

The Draft EIS states that this alternative was re-evaluated to identify potential impacts or benefits to Lower Esopus Creek. At the time of prior analyses, a Mount Marion flow trigger had not been established to limit the potential for flooding based on forecasted streamflow at the USGS gage. Releasing flows in the range of 2,000 to 6,000 million gallons per day (MGD) (3,094 to 9,283 cubic feet per second [cfs]) from a west basin outlet either alone or in combination with operation of Ashokan Reservoir in accordance with the IRP would increase the potential for flooding in these low-lying areas along Lower Esopus Creek, particularly when there are localized storms in the downstream watershed that increase the magnitude of local streamflow.

Comments

1. Low to moderate benefits are cited in addressing turbidity events – DEP should quantify in terms of reduction of frequency of high turbidity releases for this alternative.
2. The Value Engineering report cited additional improvements that would result in improved control of turbidity (e.g., locate West Basin spill structure at Olive Bridge Dam and make the outlet a low-level outlet (P 30 of VE report); provide a diversion channel along the north bank of the West Basin (P 36 of VE report) – were these alternatives pursued further and, if so, were the results relating to turbidity control quantified? If they were not pursued further, further evaluation is warranted.
3. Can this alternative be combined with others to provide a more beneficial cumulative impact – perhaps designing for lower flows than the 2,000 to 6,000 MGD mentioned in the Draft EIS?

4.3.2 Ashokan Reservoir Alternative 2 – Dividing Weir Crest Gates

As part of this alternative, gates would be installed on the Dividing Weir crest that could be operated to temporarily increase the west basin overflow elevation by 4 feet which would enhance the storage in the west basin and reduce the uncontrolled transfer of turbid water to the east basin, providing some water quality benefit under certain storm events. As part of prior Catskill Turbidity Control studies, modeling simulations indicated that the crest gates would provide some benefit for the east basin during the onset of a storm event by delaying the transfer of turbid water, but moderate to large storm events would eventually fill the west basin void, resulting in spill of turbid water into the east basin. In particular, flows during large storm events, which often result in the transfer of turbidity to the Reservoir, can exceed 10 billion gallons per day based on historical inflow records at the USGS gage at Coldbrook. The total additional storage provided by Ashokan Alternative 2 would be approximately 3-4 billion gallons per day. Therefore, large storm events would be anticipated to exceed the additional storage capacity provided by the crest gates within a single day (reference pgs 14-6, 14-7 of DEIS).

Comments:

1. Although storage capacity would be exceeded for large storm events, has the frequency been quantified?
2. The discussion refers to large storm events “often” exceeding 10 billion gallons per day. DEP must quantify what “often” means for wet, normal and dry years.

3. How often will storm events exceed 3 and 4 billion gallons per day for wet, normal and dry years?
4. This Draft EIS states that this range (3 to 4 billion gallons per day) represents the additional storage capacity that would be provided by Alternative 2, how many days of high turbidity releases could be avoided if this alternative were implemented?

The Draft EIS states that as a combined alternative with the IRP, releases to Lower Esopus Creek would still be required from the west basin to prevent turbid spill to the east basin, and turbidity levels of these releases would be similar to those that occur in accordance with the IRP. The limited water quality benefits of Dividing Weir crest gates do not outweigh the potential impacts to the Reservoir's shoreline – which would include 33 acres of jurisdictional wetlands. The Draft EIS concluded that the limited increase in storage capacity of the west basin from installation of Dividing Weir crest gates does not outweigh the potential impacts. Based on the assessment above, this alternative was not pursued.

Comments:

1. Can this alternative be combined with others to provide a beneficial cumulative impact including options for west basin overflow elevation less than the 4 feet referred to in the Draft EIS?

4.3.3 Ashokan Reservoir Alternative 3 – East Basin Diversion Wall And Channel Improvements

The Draft EIS states that the existing diversion wall in the east basin is submerged by 20 feet or more and is not a fully effective barrier to flow from the west basin that short-circuits over the Dividing Weir towards the Upper Gate Chamber. Extending the height and length of the Diversion Wall would direct flows from the west basin farther into the east basin and would reduce short-circuiting to the Upper Gate Chamber and increase the travel time and dilution of flows prior to withdrawal for diversion to Kensico Reservoir. As part of prior Catskill Turbidity Control studies, conceptual designs and cost-benefit analyses were developed for three alternative wall lengths (750 feet, 1,700 feet and 2,400 feet) using jetty wall and closed-cell coffer cell construction methods.

Comments

1. The Draft EIS states that as part of prior Catskill Turbidity Control studies, modeling simulations indicated that diversion wall improvements would result in the reduction of peak turbidity levels within Catskill Aqueduct diversions and the time it would take to reach peak levels, with the magnitude of reduction being proportional to the length of the wall. However, for events in which west basin inflow turbidity levels remain high for an extended period, the benefit of diversion wall improvements is limited.

This statement is vague. What is meant by extended period and by limited benefit? Please quantify.

2. It was also stated that overall reductions in the number of days when Catskill Aqueduct diversion turbidity is elevated and the number of days of alum application to water in the Catskill Aqueduct upstream of Kensico Reservoir were minor. This statement is vague. Please quantify what is meant by minor.
3. Although there would be construction-related impacts, the Draft EIS states that there would be marginal reduction in turbidity related to spills. Please quantify (i.e., how many days of high turbidity events could be avoided if this alternative were implemented).
4. This alternative should be modified to examine the use of a turbidity curtain above the existing wall and/or as an extension. The alternative should be characterized for performance during various storm frequencies.
5. The VE study also looked into installing a diversion wall equal to 7/8 the length of the East Basin (approximately 5 miles) citing turbidity would be diluted possibly reducing the frequency and duration of alum feed (ref pg 102 of 263 of VE study). This option should be further investigated, and results quantified in terms of frequency of downstream turbidity events avoided.
6. The VE Study looked at constructing a new diversion from West to East Basin and discharging dirty water further into East Basin. Although it did state that the system would need to be operated (instead of a passive weir), it was also stated that it would be more effective than the proposed diversion structure. This option should be further investigated, and results quantified in terms of frequency of downstream turbidity events avoided.

4.3.4 Ashokan Reservoir Alternative 4 – Upper Gate Chamber Modifications

The Draft EIS states that “Multi-level withdrawal capability at the Upper Gate Chamber is currently provided by an arrangement of fixed stop shutters and open ports in the four bays on the east and west sides of the intake. Adjustment of intake elevation in response

to water quality conditions is feasible but involves a labor-intensive and time-consuming stop shutter removal process. As part of this alternative, modifications to the Ashokan Reservoir Upper Gate Chamber would be implemented to improve multi-level withdrawal capability, which would allow for greater flexibility in choosing optimal withdrawal elevations.

This alternative would provide limited additional reduction in turbidity levels of spills and releases to Lower Esopus Creek as a stand-alone alternative or in combination with operation of Ashokan Reservoir, in accordance with the IRP. As a combined alternative, flows from Ashokan Reservoir would be comparable to those in the future with the Proposed Action.”

Comment:

1. Like other alternatives, this alternative seems to have been dismissed too readily based on qualitative statements. For instance, the Value Engineering study proposes improvements that would result in easier and timelier removal of stop shutters stating that “These improvements will facilitate easier and timelier rearrangement/placement/ removal of the stop shutters, resulting in the ability to selectively withdraw from either basin in times when the water is “borderline” around 5 NTU at various elevations in the water column such that the best quality water can be drafted to the Catskill Aqueduct” (P 102 of 263 of VE study). Please provide additional quantitative details to support the conclusion that this alternative should not be pursued as a measure in combination with other operational and structural alternatives.

4.3.5 Ashokan Reservoir Alternative 5 – East Basin Intake

The Draft EIS investigated the alternative of construction of a new intake towards the center of the east basin, where water quality is less susceptible to elevated turbidity conditions, as an alternative withdrawal location to the existing Upper Gate Chamber.

This option was not further pursued based on the following conclusions:

- Prior modeling identified the potential for a small to moderate benefit for reducing alum application to water in the Catskill Aqueduct upstream of Kensico Reservoir.
- Construction of a new East Basin Intake would be a major undertaking with several construction-related impacts (e.g., suspension of withdrawals from the east basin

of Ashokan Reservoir, increases in traffic, and air and noise emissions) and have the potential to cause impacts to land above and below water.

- When considered as a stand-alone alternative, a new East Basin Intake would result in spill from Ashokan Reservoir to Lower Esopus Creek with water quality similar to the future without the Proposed Action. In combination with releases via the Ashokan Release Channel, spills, releases, and water quality from Ashokan Reservoir to Lower Esopus Creek would be similar to the future with the Proposed Action since conceptual designs developed during the prior Catskill Turbidity Control studies indicated a new East Basin Intake could not be connected to the existing Ashokan Release Channel.

Comment:

- Value Engineering study considered relocating the intake to the eastern end of the east basin and installing a conduit to the aqueduct, noting the following: “The cost of a 5 mile, 12’ diameter tunnel is significant. However, the benefit of this proposal is the anticipated continuous operation during high turbidity in the West Basin and lower reaches of the East Basin. Furthermore, even when turbidity reaches the east end of the East Basin, the concentration is expected to be low (3NTU or less). As a result, delivering this lower turbid water to Kensico most likely would not trigger an Alum addition (P 133 of 263 of VE study)”

Although it is noted that it would be costly, was the option of relocating the intake to the eastern end of the east basin (as mentioned in the VE study) further pursued? If so, please provide details. If it was not evaluated, please provide additional details to support the conclusion that this alternative should not be pursued either alone or as a measure in combination with other operational and structural alternatives.

4.3.6 Ashokan Reservoir Alternative 6 – Changed Release Channel Operations

The Draft EIS states that in Ashokan Reservoir Alternative 6, operation of Ashokan Release Channel would be adjusted as compared to the IRP. The objective of Ashokan Reservoir Alternative 6 would be to balance water supply needs for the DEP, while enhancing benefits to Lower Esopus Creek as compared to the Proposed Action. This alternative has the potential to benefit DEP operations as compared to the Proposed Action. Additionally, there would be no construction impacts associated with this alternative. This alternative was modeled using Operations Support Tool (OST) to identify potential differences between changes to release channel operations and the Proposed Action. A Revised

Operating Protocol based on this alternative is presented in Section 14.3, "Ashokan Reservoir Alternative 6 – Revised Operating Protocol."

Comment:

- Figures 14.3-10 and 14.3-11 from the Draft EIS detail the marginal benefits as they relate to reducing turbidity events for wet, normal and dry years. This solution does not satisfy the objective to enhance benefits of the Lower Esopus Creek. It is also important to note that the actual days of turbidity experienced after the December 2020 storm event completely obliterates the model results presented in the figures below.
- In line with the objective to provide a benefit to Lower Esopus discussed above and our initial comments on the goal that the releases to the Lower Esopus are from the best quality of water available, the ROP should be rejected absent a requirement that operational releases be made from the best water quality available. This alternative should be modeled in terms of its impact to the NYS water supply. Of importance in this effort is the operation of the Catskill Aqueduct in conjunction with the ROP. We note that often when high turbidity events occur, the City reduces or eliminates its use of the Catskill Aqueduct even when clean water is available in the east basin so as to require the use of operational releases in order to maintain the CSSO. A full evaluation of the ability to blend water from the east and west basin as well as the operation of the Catskill Aqueduct is needed.
- The document suggests there would be no benefit from higher community flows but fails to demonstrate such in the data and analysis provided. It remains unclear how increased flows might mimic natural high flow cycles for the benefit of aquatic and riparian species, geomorphic processes, and water quality.

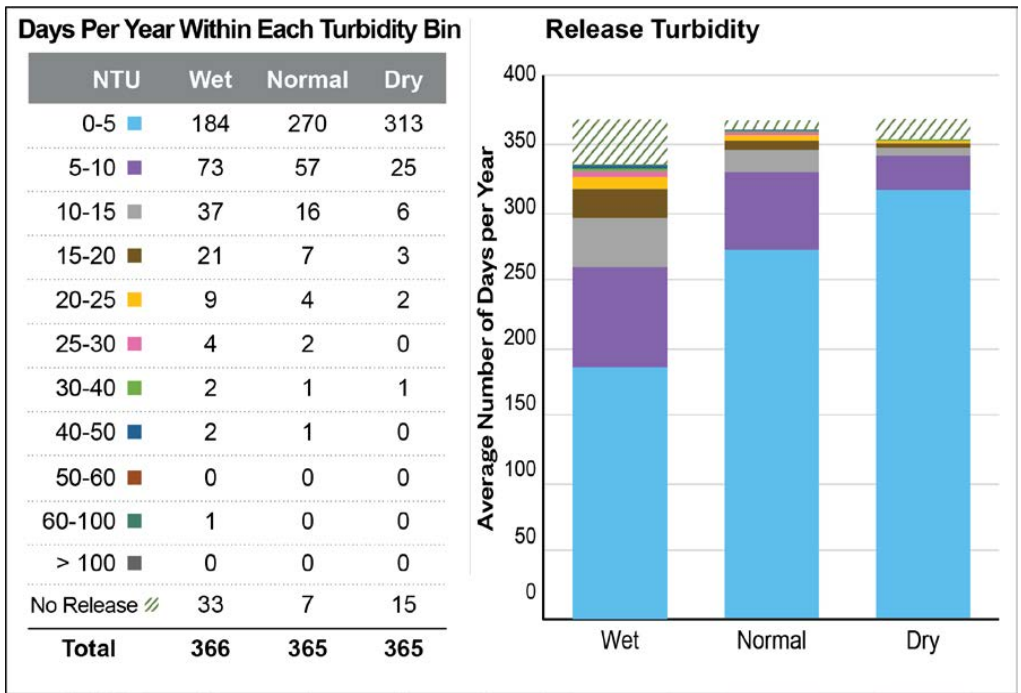


Figure 14.3-10 (from the DEIS). Occurrence of Release Turbidity Levels by Type of Year with the IRP

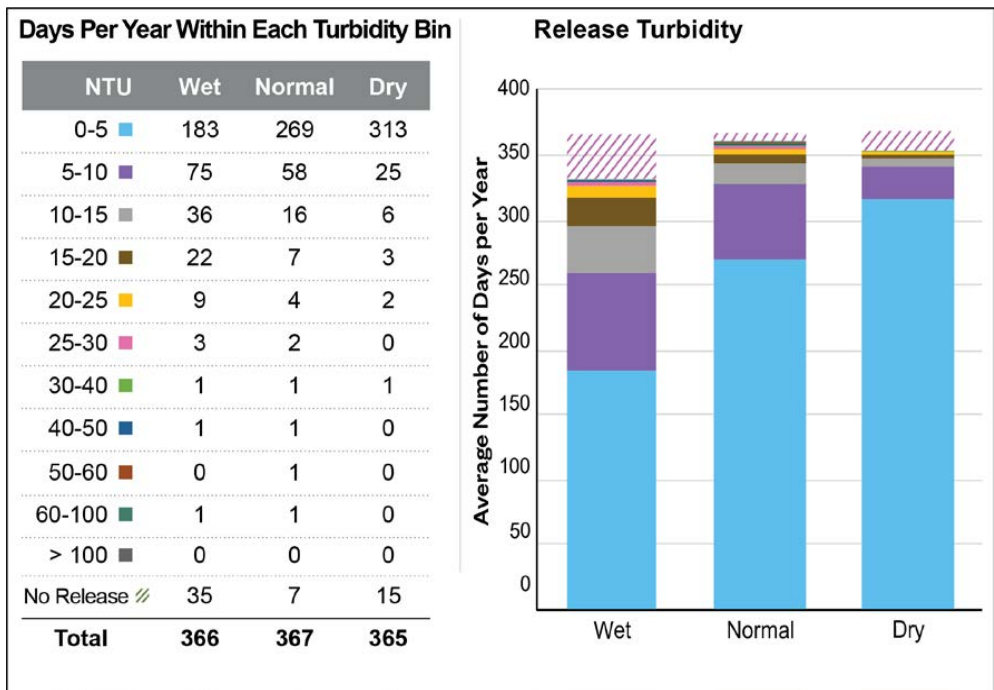


Figure 14.3-11 (From the DEIS). Occurrence of Release Turbidity Levels by Type of Year with the ROP

4.3.7 Ashokan Reservoir Alternative 7 – Bypass Of Lower Turbidity Upper Esopus Creek Water Directly To The Ashokan East Basin

For Alternative 7 the Draft EIS states that

“As part of Ashokan Reservoir Alternative 7, a bypass tunnel or other structural improvement would be constructed to enable the routing of low turbidity Ashokan Reservoir inflow from upper Esopus Creek directly to the east basin of Ashokan Reservoir which would allow for the isolation of the west basin following a turbidity event when turbidity in the west basin would be high. As a result, particles in the west basin would have more time to settle, while low turbidity water would be routed to the east basin.

This alternative could be effective in reducing the turbidity load of water diverted from Ashokan Reservoir to Kensico Reservoir when there is sufficient time between turbidity-causing storm events for west basin turbidity to settle. However, if an upper Esopus Creek turbidity event were to occur when the west basin was full of turbid water, turbid inflows would not be diverted and instead would enter the west basin, resulting in spill of turbid water into the east basin over the Dividing Weir, increasing turbidity in the east basin ...”

Comments:

1. The Draft EIS rejects this alternative based on the substantial size of the structure to convey the upper Esopus Creek flows, significant environmental impacts and limited effectiveness for turbidity management. Use of qualitative terms like “substantial, significant, and limited effectiveness” are too general to support whether the cost and impacts would be worth the benefit of implementing this type of solution. Although there would be times when high turbidity in the upper Esopus Creek would restrict the use of the bypass. These “times” should be quantified as well as what the benefit would be in terms of how many days of high turbidity discharges could be saved in wet, normal and dry years if the bypass were constructed and operating.
2. Statements regarding cost and significant environmental impact are based on conveying flows in the range of 15,000 to 45,000 MGD. Given that the ROP contemplates a maximum discharge of 600 MGD as providing sufficient isolation for the West Basin, this magnitude of bypass should be evaluated. The Upper Esopus is a “peaky” stream with large storm events followed by periods of much smaller discharges and fairly rapid clearing of turbidity. A smaller bypass to the Lower Esopus or to the East Basin would allow much better water quality in releases

and would establish a more natural rise and fall of turbidity levels over the course of a year. The alternative should be closely studied with figures such as 14.3-10 and 14.3-11 provided in support of its adoption or rejection.

4.3.8 Ashokan Reservoir Alternative 8 – Bypass Of Upper Esopus Directly To Lower Esopus Creek

The Draft EIS states that:

“As part of this alternative, a bypass tunnel or similar structure would be constructed to enable movement of Ashokan Reservoir inflow from upper Esopus Creek around or through Ashokan Reservoir, discharging to Lower Esopus Creek below the Reservoir. This tunnel would be used during turbidity events to route high turbidity water around Ashokan Reservoir preserving low turbidity water in the Reservoir. This alternative would increase DEP’s operational flexibility and potentially reduce turbidity load in water transferred through the Catskill Aqueduct. Similar to the assessment provided for Ashokan Alternative 7, the size of a structure to convey natural creek flows in the range of 15,000 to 45,000 MGD (23,208 to 69,625 cfs) around Ashokan Reservoir to Lower Esopus Creek would be substantial. The project would be a major undertaking and the environmental impacts from a construction project of this magnitude would be significant ...”

This alternative was rejected based on the loss of flood and turbidity attenuation and the potential for significant adverse impacts due to construction.

Comments:

1. Although high flow events are typically associated with turbidity and there could be implications associated with downstream flooding, was this alternative sufficiently pursued to compare benefits of maintaining integrity and water quality in the west and east basins which in turn would result in better quality of releases and spills following the storm events? Please elaborate.
2. Use of qualitative terms like “substantial and significant” are vague in helping to evaluate whether the cost and impacts would be worth the benefit of implementing this alternative. Please quantify what the benefit would be in terms of how many days of high turbidity discharges could be saved in wet, normal and dry years if the bypass were constructed and operating?
3. As noted in our comments on Alternative 7 the proposed ROP provides a maximum discharge of 600mgd associated with preserving water quality in the Reservoir.

This should be considered sufficient for the size of any bypass and then the alternative should be reevaluated.

4.3.9 Catskill Aqueduct Alternatives

In the Draft EIS, alternatives for operation of the Catskill aqueduct were evaluated that consisted of multiple options to discharge water from the Catskill aqueduct prior to discharge to Kensico Reservoir. Each alternative would move some level of turbidity load out of Ashokan Reservoir which could reduce turbidity in Ashokan Reservoir and prevent turbid water from entering Kensico Reservoir. The Catskill Aqueduct Alternatives would be used during episodic turbidity events.

Since connections between the Catskill Aqueduct and supporting infrastructure exist or are under repair, there would be no construction related impacts for the Catskill aqueduct alternatives. However, a major shortcoming associated with these alternatives would be inability for DEP to provide drinking water to communities that it currently serves that are upstream of the discharges from the Catskill Aqueduct.

The alternatives evaluated include:

- Catskill Aqueduct Alternative 1 – Use Of The Hudson River Drainage Chamber
- Catskill Aqueduct Alternative 2 – Use Of The Croton Lake Siphon
- Catskill Aqueduct Alternative 3 – Use Of The Rondout Pressure Tunnel Siphon Drain
- Catskill Aqueduct Alternative 4 – Use Of The Wallkill Pressure Tunnel Siphon Drain or the Wallkill Blow-Off Chamber

Comments:

1. Were analyses performed that would combine any of the Catskill Aqueduct Alternatives with the Ashokan Reservoir Alternatives?
2. If performed in conjunction with Ashokan Reservoir Alternatives, could releases from the Catskill Aqueduct be managed such that service could be maintained for communities currently being served that are upstream of Kensico Reservoir?

Resource Specific Comments

4.4 Water Resources

4.4.1 The Draft EIS presents conclusions based on inconsistent and unsupported Modeling Analyses

Draft EIS Section 7.1 includes “an evaluation of how a range of anticipated future hydrologic conditions (i.e., during wet, normal, and dry years) would affect flows from Ashokan Reservoir (spills and releases) and streamflow within Lower Esopus Creek.”⁶ Based on a series of modeling exercises analyzing reservoir spill and release frequencies, volumes and turbidities; streamflow, turbidity and flood magnitude in the Lower Esopus; and alum days with and without the proposed action, DEP has proposed the following conclusions:

1. Peak attenuation, magnitude, duration and turbidity level of spills will be reduced with Proposed Action;
2. Turbidity will be lowest for community releases, highest for spill mitigation releases with the Proposed Action;
3. In the spring, the Proposed Action would reduce peak streamflow in Lower Esopus Creek as compared to the future without the Proposed Action;
4. Community releases would provide sustained flow to lower Esopus Creek year-round;
5. Flood magnitude will be reduced with the Proposed Action;
6. Episodic turbidity events will occur with or without Proposed Action;
7. There will be a sizable reduction in the number of days of alum application (alum days) during episodic turbidity events;
8. Turbid spills would occur in the future with and without the Proposed Action, transferring a similar amount of turbidity to Lower Esopus Creek;
9. During episodic turbidity events, the magnitude, duration, and quality of flows to Lower Esopus Creek are comparable between the future without and with the Proposed Action;
10. Modeling for the April 2005 and September 2011 turbidity events shows no difference in alum days with and without the Proposed Action;

⁶ *Id.*, 7-1.

11. Modeling for March 2011 turbidity event shows DEP infrastructure would reduce or eliminate alum days.

4.4.2 DEP's Models Yield Conflicting Results

It is clear from the foregoing wide-ranging conclusions that there are inconsistencies in DEP's modeling conclusions. DEP proposes that: 1) flood magnitude and peak attenuation, duration and turbidity level of spills will be reduced with Proposed Action; and 2) the magnitude, duration, and quality of flows to Lower Esopus Creek will be comparable between the future without and with the Proposed Action. These claims are contradictory; flood impacts cannot be simultaneously reduced with the Proposed Action and similar in the future with and without the Proposed Action. This discrepancy must be remedied in the Final EIS or a supplemental Draft EIS.

DEP further proposes that: 1) the turbidity level of spills will be reduced with the Proposed Action; and 2) turbid spills would occur in both the future without and with the Proposed Action, transferring a similar amount of turbidity to Lower Esopus Creek. These claims are contradictory; as with flood impacts, turbidity cannot be simultaneously reduced and similar in the future with and without the Proposed Action. This discrepancy must be remedied in the Final EIS or a supplemental Draft EIS.

In addition, modeling for the April 2005 and September 2011 turbidity events provide no difference in alum days in the future with and without the Proposed Action, yet DEP infrastructure (stop shutters, Shaft 4, Croton WFP) would reduce or eliminate alum days during the March 2011 turbidity event. These models indicate that the Proposed Action would be unable to manage some turbidity events (no difference in the future with and without the Proposed Action) and unnecessary to manage others (DEP infrastructure alone reduces or eliminates alum days). It is unclear why the Proposed Action has not been designed to capture enough Ashokan inflow that would have reduced or eliminated alum days in the April 2005 and September 2011 turbidity events by increasing the West Basin storage capacity with structural and/or operational practices.

4.4.3 DEP's Modeling Is Unsupported In The Draft EIS

Compounding the confusion with DEP's conflicting modeling conclusions, the DEIS fails to identify the models used and presents none of the supporting data used to derive modeling conclusions. Section 7.1 contains 24 tables and graphs that neither identify the

model used nor provide any supporting data.⁷ The List of Underlying Studies, Reports, EISs, and Other Information Obtained and Considered in Preparing the Modification of the Catalum SPDES Permit DEIS⁸ identifies only three documents DEP used in preparing the Water Resources and Water Quality section of the DEIS: *The Delaware System Flexible Flow Management Program*, *DEP Water Supply Reliability Metrics*, and *Bank and Near-bank Processes in an Incised Channel*.⁹ There is no way to review or validate any of the modeling conclusions liberally distributed throughout Section 7.1 but wholly unsupported by any underlying data for informed public review. This deficiency renders informed review of the DEIS impossible. DEP must identify the models used and provide supporting data for the conclusions presented in the Water Resources and Water Quality tables and figures.

4.4.4 Potential Differences Between the Future Without and With the Proposed Action for Lower Esopus Creek¹⁰

4.4.4.1 Magnitude

DEP proposes that a community release of 15 MGD “would result in the most pronounced difference in streamflow between the future without and with the Proposed Action for Valley Reach 1A, which does not receive flow from Ashokan Reservoir in the future without the Proposed Action.”¹¹ However, in the future without the Proposed Action, Valley Reach 1A would continue to receive flow from the Little Beaverkill, to which releases flow from the Ashokan Release Channel, in addition to flows from Tongore Creek, groundwater baseflow and surface runoff.¹² DEP has not quantified the contribution of flows to Valley Reach 1A from sources other than the Ashokan Release Channel under the community release. Without that information **there is no support for DEP’s claim that the Proposed Action would provide a pronounced difference in streamflow to Valley Reach 1A of the Lower Esopus**. Therefore, **the Proposed Action would not provide any enhanced benefit between the future with and without the Proposed Action** regarding increased Ashokan release flows to Valley Reach 1A.

⁷ See Figures 7.1-1 to 7.1-2, 7.1-24 to 7.1-26, 7.1-29 to 7.1-31, 7.1-37, 7.1-38; Tables 7.1-1, 7.1-2, 7.1-4.

⁸ <https://www1.nyc.gov/assets/dep/downloads/pdf/environmental-reviews/catskill-influent-chamber/list-studies-reports-modification-catalum-spdes-permit-deis.pdf>

⁹ Simon, A., et al. (2000) *Geomorphology*. 335:193-217.

¹⁰ DEIS, Figure ES-9.

¹¹ *Id.*, 7-11.

¹² *Id.*, 6-1.

4.4.4.2 Frequency

DEP proposes that the future with the Proposed Action would “further enhance flood attenuation provided by Ashokan Reservoir.” The Conditional Seasonal Storage Objective (CSSO) has been shifted under the Proposed Action from its current fill period (May 1—July 1) to mid-April to mid-June. During that two-month period the Ashokan Reservoir will be spilling routinely and therefore will provide zero flood attenuation benefit to the Lower Esopus. If DEP’s objective is to “enhance flood attenuation,” then maintaining reservoir storage at 100% is precisely the wrong way to go about it. Maintaining a 5-10% (or greater) void in the reservoir would provide storage to enhance flood attenuation while reserving ample storage for potential drought conditions.

In addition, Figures 14.3-10 and 14.3-11 show negligible difference in the occurrence of release turbidity levels between the IRP and the ROP. With no significant difference in turbidity levels, neither protocol provides enhanced benefit.

Although DEP proposes that “community release[s] would provide additional flow to Lower Esopus Creek in the range of 15 MGD (23 cfs) more frequently in the future with the Proposed Action,” the DEIS proffers no scientific basis to assume that community releases of 15 MGD would be adequate to support the riparian ecosystem of the Lower Esopus. While we appreciate DEP’s effort to restore some degree of hydrology to the Lower Esopus, that effort must be supported by evidence that 15 MGD is adequate to sustain aquatic life and biochemical processes in the Lower Esopus.

4.4.4.3 Duration

“In the future with the Proposed Action, the IRP could convert shorter duration, higher flow spill events into lower flow releases of longer duration...” DEP does not explain how longer-term, lower turbid flows are more beneficial than shorter-term, higher turbid flows. Reducing variability of streamflow in Lower Esopus does not benefit the Creek if it requires sustained turbid flows. Both flow regimes are adversely impactful. Therefore, **DEP’s conversion from higher flow spill events into lower flow, turbid releases would not provide any enhanced benefit to the Lower Esopus.**

4.4.4.4 Seasonality

DEP proposes that the “community release would provide a sustained flow to Lower Esopus Creek year-round...”¹³ DEP also proposes “the community release would occur 71% of the time”¹⁴ in the future with the Proposed Action. It is unclear how DEP equates year-round with 71% of the time. This discrepancy must be remedied.

DEP further proposes that seasonality of “spills and releases in the future with the Proposed Action would be the same as spills in the future without the Proposed Action...” Therefore, **the Proposed Action would provide no enhanced seasonal flood attenuation benefit to the Lower Esopus beyond the existing IRP.**

4.4.4.5 Water Depth and Velocity

DEP proposes that “[d]ifferences in the velocity and depth of streamflow between the future without and with the Proposed Action would be greatest in Valley Reach 1A...” However, Valley Reach 1A currently receives flow from the Ashokan Release Channel under the No Action alternative, so there would be no difference with the Proposed Action. DEP further proposes that “[m]edian velocities in the future with the Proposed Action would be comparable to those in the future without the Proposed Action,” which indicates that **the Proposed Action would provide no enhanced benefit to the Lower Esopus for these parameters.**

4.4.4.6 Erosion and Deposition

DEP proposes that with and without the Proposed Action there will be no anticipated differences in streambed aggradation and degradation, streambank erosion, or channel stability. Therefore, **the Proposed Action would provide no enhanced protection for streambed, streambank and channel stability beyond the current No Action Alternative.**

4.4.4.7 Inundation

DEP proposes that streamflows up to 4,000 MGD “are not anticipated to flood infrastructure or roadways.” DEP further proposes that streamflows of up to 1,000 MGD “would inundate but not substantially reshape” the stream’s inner berm. If a 1,000 MGD streamflow would not “substantially” reshape the inner berm, then it follows that a

¹³ *Id.*, 7-9.

¹⁴ *Id.*, ES-21.

streamflow four times as great could *severely* reshape it. This disparity suggests that **predicted increases in streamflows would provide no enhanced benefits to the Lower Esopus.**

4.4.4.8 Turbidity

DEP proposes that “[t]urbidity levels of flow from Ashokan Reservoir in the future with the Proposed Action would be comparable to those in the future without the Proposed Action and within the range and variability of turbidity levels that occur in Lower Esopus Creek streamflow.” This statement assumes that months-long discharges of turbid Ashokan West Basin water, such as occurred from December 2020 through April 2021, are within the range and variability of the natural flow regime of the Lower Esopus, which is simply not the case. The Lower Esopus tributaries and the Upper Esopus itself cleared long before the Ashokan Release Channel discharges cleared.

It is also disingenuous for DEP to claim that “turbidity levels in streamflow are primarily influenced by the localized conditions of the Lower Esopus Creek watershed, as opposed to flows from Ashokan Reservoir” when DEP is discharging up to 600 MGD of turbid Ashokan West Basin water to the Lower Esopus for months. Even if turbidity levels of flow from Ashokan Reservoir would be comparable in the future with and without the Proposed Action, then the **Proposed Action would provide no enhanced benefit for the Lower Esopus regarding turbidity in Ashokan Releases.**

4.4.4.9 Temperature, pH, DO

DEP proposes that releases under the Proposed Action “are anticipated to cool Lower Esopus Creek temperatures in summer.” If significant, the lower water temperatures would benefit the aquatic biota by increasing the concentration of dissolved oxygen (DO). However, in the future with and without the Proposed Action, there is “no anticipated difference” in DO (or pH) within Lower Esopus Creek. Therefore, **the Proposed Action would provide no enhanced benefit for these water quality parameters in the Lower Esopus.**

4.4.4.10 Summary and Conclusions

DEP’s water resource models are contradictory, unidentified and unsupported by any data provided in the DEIS for informed public review. DEP’s narrative explicitly concedes that virtually all Ashokan release parameters would be comparable to future conditions with or without the Proposed Action, or are lacking any supporting data to conclude otherwise.

Importantly, the Proposed Action would result in releases of longer duration with turbidity comparable to conditions under the existing IRP, contrary to the stated objective of the Consent Order, Final Scope, DEIS and Draft SPDES permit **“to enhance benefits to Lower Esopus Creek and communities.”**

It is evident that implementation of the Proposed Action to manage turbid Ashokan releases would be inadequate to achieve that primary objective. To enhance benefits to the Lower Esopus as required, DEC must: 1) reject the Proposed Action; 2) deny DEP’s application for modification of the Catalum SPDES Permit; and 3) require DEP to revise the ROP and properly analyze effective structural alternatives—alone and in combination with each other and with the revised ROP—to manage turbid releases to Lower Esopus Creek. DEP must make its further studies and analyses available for public review and comment in a supplemental DEIS.

4.5 Hydrology

Natural Range of Turbidity, Water Quality

PP 7-15 through 7-42

The document states that turbid reservoir releases fall within the natural baseline and range of variability of turbidity and therefore do not represent a negative impact.

There is little evidence presented in the DEIS to substantiate this, and there is little in the scientific literature on this topic. Studies suggest Catskill streams can exhibit a higher sediment rating curve relative to other regional mountain systems due to glacial clay deposits that become entrained as stream channels meander and cut, however, the natural baseline and range of variation of turbidity is not well established.

Specifically, the DEIS compares turbidity between the release channel and Lomontville and Mt Marion in Figure 7.1-15 and states there is little difference between turbidity at these locations suggesting that turbid releases are within the natural range and variability of the downstream gages. There are several issues with this methodology and conclusion:

- The graphic appears to suggest there is no statistical difference between the release channel and the downstream gages (e.g., there is overlap in the box and whisker plots). Therefore, the conclusion that downstream gages are more affected by tributaries below the reservoir is not valid.

- These data are not normally distributed and violate the statistical assumptions of the ostensible test applied (the actual tests for means or variances is not stated or reported).
- One would expect autocorrelation in these data because the release channel is affecting downstream turbidity.
- This is a very limited timeseries dataset for determining baseline conditions and cannot be used to draw conclusions about management impacts of a hydrologic system.
- Why not consider the data from Coldbrook for a baseline assessment (while accounting for the interbasin transfers of turbid discharge from the Schoharie)? This gage has a longer time series and represents a more natural stream condition upstream of any impoundments.
- One would expect the release channel to have less variability in turbidity due to the impoundment; natural conditions within a wild stream channel will express more variability than a dam but this does not inherently represent a benefit as is implied in the DEIS.

The DEIS should provide all of the raw water quality data, from all gages and from the samples collected by DEP at other locations from 2013 including the Sawkill and Plattekill. The analysis should include all of these sites for all periods collected. A more rigorous statistical and scientific study should be conducted to understand the baseline turbidity conditions in order to make more accurate and precise assessment of the impacts.

Further, it should be acknowledged that the releases from a reservoir impoundment create a sustained level of turbidity that is not present in the natural record. During large flow events turbidity appears, under natural conditions, to correspond with a discharge hydrograph that includes steep rising and falling limbs. This results in a rapid increase and high peak turbidity that quickly recedes and returns to baseline over days or weeks. The curve of turbidity due to a reservoir release creates a different profile that results in a high turbidity that is sustained over the period of the release. See Figure 2.

It is likely that this sustained turbidity has different impacts than natural high flow events, as the sediment load is de-coupled from the associated storm flows, and warrants more study.

PP 7-33 and ES-7

The document references the graph on page 7-33 and page 7 of the Executive Summary as representative of the range of natural variability in turbidity. However, those data are not provided outside of that graph nor are they available in the scientific literature to our knowledge. The closest dataset we found is from Ahn, et al (2017)¹⁵ which is ostensibly from the same location over the same time period but does not match the high turbidity values presented in the DEIS. The data from this graph should be provided, including methods of collection, and the analysis used to determine any baseline rates of turbidity need to be shared.

It should be noted that any data collected at the Coldbrook gage cannot be used to determine the natural rates of turbidity unless accounting for the inter-basin transfer from the Schoharie watershed that is introduced via the Shandaken Tunnel. This inter-basin transfer is used to move water from the Schoharie Reservoir to the Ashokan Reservoir and allows the discharge into the upper Esopus of waters up to a turbidity level of 50 NTU. Further, it appears that monitoring of this maximum turbid discharge is modeled and not observed. It is unclear how much impact the Schoharie transfer has on the Esopus turbidity. This requires additional study within the DEIS.

PP 7-24

The document states there is no apparent pattern and therefore no impact on dissolved oxygen or pH. However, it appears in Figures 7.1-21 and 7.1-22 that these data were collected for less than one year at locations below the reservoir (Saugerties Beach and Above Sawkill). This is clearly not enough data to draw any conclusions about baseline conditions and environmental impacts. A more rigorous data collection and analysis is required.

Hudson River and Drinking Water Impacts

The reservoir has extended turbid flows under the current release protocol. See Figure 3 where clear water is seen entering the reservoir at Coldbrook after returning to baseline after a large event but turbid water continues to spill into the Lower Esopus and can be

¹⁵ Ahn, K.-H., B. Yellen, and S. Steinschneider (2017), Dynamic linear models to explore time-varying suspended sediment-discharge rating curves, *Water Resources Research.*, 53, doi:10.1002/2017WR020381.

seen passing relatively clear water contributions from tributaries and spilling into the Hudson at Saugerties, forming a turbid plume within the main river channel.

Figure 4 shows a possible correlation between turbid flows within the Esopus and several points downstream in the Hudson River including at water treatment plant intakes at the Town of Esopus, Rhinebeck and the City of Poughkeepsie. It is clear that the releases from the reservoir are directly contributing to high turbidity within the Hudson River and at drinking water source locations, as the DEP states on pg. ES-25 "Given the size of turbidity particles transferred through flows from Ashokan Reservoir, it is not anticipated that turbidity within spill mitigation releases that has not settled in the Reservoir under quiescent conditions would settle in the faster moving water of Lower Esopus Creek." If no sediment is anticipated to settle in the lower Esopus, the only other place the sediment load would travel to is the Hudson River Estuary. As seen in the photos in Figure 3, the Reservoir's turbidity is clearly contributing to Hudson River Estuary turbidity. As a source of drinking water for over 100,000 people, and home to multiple listed endangered species, impacts to the Hudson River Estuary require further study.

Watershed Area and Tributary Impacts

PP ES-19

The document states that the watershed contribution of the spillway is relatively small compared to the watershed contribution area of the other tributaries in the lower reaches. However, this does not account for the reservoir which represents the accumulated discharges of the entire 256 square mile Upper Esopus watershed in addition to the 314 square mile watershed of the Schoharie River as part of the inter-basin transfers at the Shandaken Tunnel. The DEIS should acknowledge the accumulated watershed contribution of the upper Esopus reaches and Schoharie when assessing the impacts to the Lower Esopus – the map on ES-20 should be updated to include the upper Esopus and Schoharie watersheds.

The DEIS also suggests that surface water inflows from tributaries in the lower reaches represent a large portion of discharge; however, groundwater is largely ignored. The lower reaches represent a highly complex hydrogeology with gaining and losing reaches¹⁶. The impact of this on flood attenuation, environmental flows and other stream characteristics, both with and without future proposed scenarios, needs to be assessed.

¹⁶ Steven Winkley, 2005. Saugerties Ground Water Protection Plan, New York Rural Water Association, Hudson, NY

PP 5-5

To assess the influence of the proposed action, the DEIS assumes that interannual wet and dry climate conditions could be assumed to represent future climate scenarios. Therefore, the period of record was binned into dry, normal and wet years in order to model varying conditions. However, it is not clear that there is a statistically significant difference between these years within the period of record. Figure 5.2-1 shows an analysis of variance for both average and peak flows, but the categories may represent distinct populations. Further, it is likely the data are not normally distributed and require transformation or a non-parametric test. A more sophisticated climate change analysis should be conducted. The DEIS references comprehensive studies that have been conducted by DEP on future climate and presents conclusions based on those studies. Those data and analyses should be shared.

PP 7-9

The document states that turbid releases will have limited impact because they represent a small percentage of time within the total flow regime. For example, Table 7.1-2 presents the average number of days with modeled turbidity for futures with and without the proposed actions. The table states zero (0) days per year, on average, would occur with turbidities greater than 100 NTU and less than one (1) day per year on average would occur with turbidities over 50 NTU. However, over the last several months there have been 32 days over 100 NTU and 60 days above 50 NTU, see Figure 5. **The modeling and assumptions used to derive Table 7.1-2 need to be reevaluated, any conclusions based on this modeling need to be reevaluated, and the impact of this level of turbid release needs to be accurately assessed.**

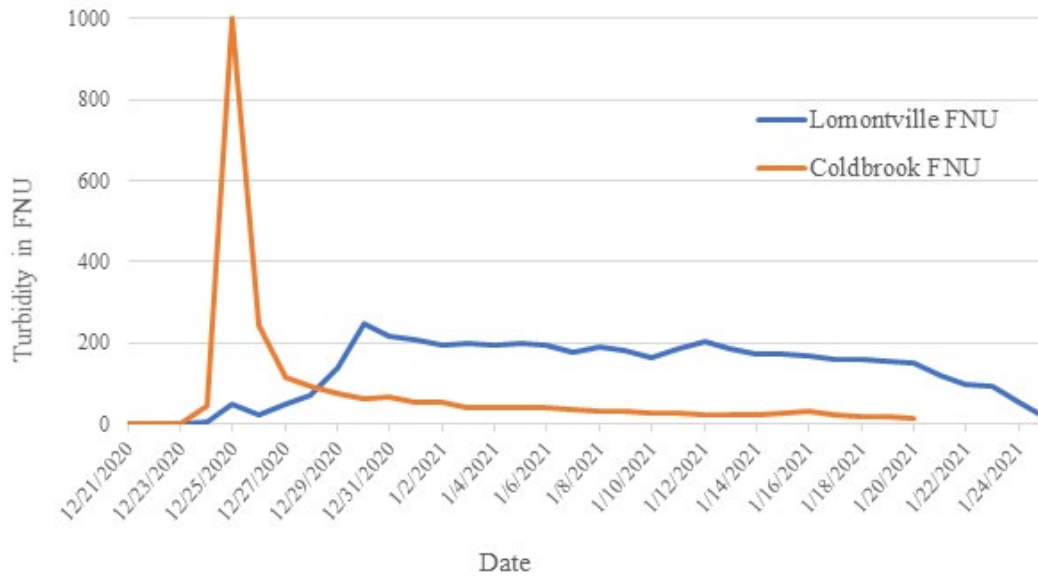


FIGURE 2: Turbidity over time at Coldbrook and Lomontville Stream Gages from Dec 2020 through Jan 2021. The Coldbrook gage sits just upstream of the reservoir while Lomontville sits below the reservoir about halfway to the outlet at the Hudson River. The 'Christmas Flood' resulted in a spike of turbidity due to the high flows. At Coldbrook the rise in turbidity was steep and peaked within days, followed by an equivalent steep recession in turbidity. Within one week the turbidity was well below 50 FNU and approaching baseline conditions. In contrast the curve at Lomontville shows a curve that rises and plateaus around 200 FNU for three weeks as the reservoir releases produce a constant sediment load over a longer period of time. Source: USGS



FIGURE 3: Aerial images of the Esopus Creek from October 2011 showing effects of reservoir releases on turbidity after a large rainfall event. From upper left (A), the upper Esopus can be seen entering the reservoir where it has started to return to a lower level of turbidity after a large event, seen as clear water entering the highly turbid reservoir. From upper right (B), the release from the reservoir can be seen entering the Lower Esopus channel. From lower left (C), the turbid water can be seen along the length of lower reaches including the Hurley Flats and that other tributaries are not contributing highly turbid water. From lower right (D), finally, the highly turbid water can be traced all the way to the Hudson River where it can be seen creating a turbid plume, in this case flowing up-river with the rising tide. All images oriented north with approximately equal scale; source: Google Earth.

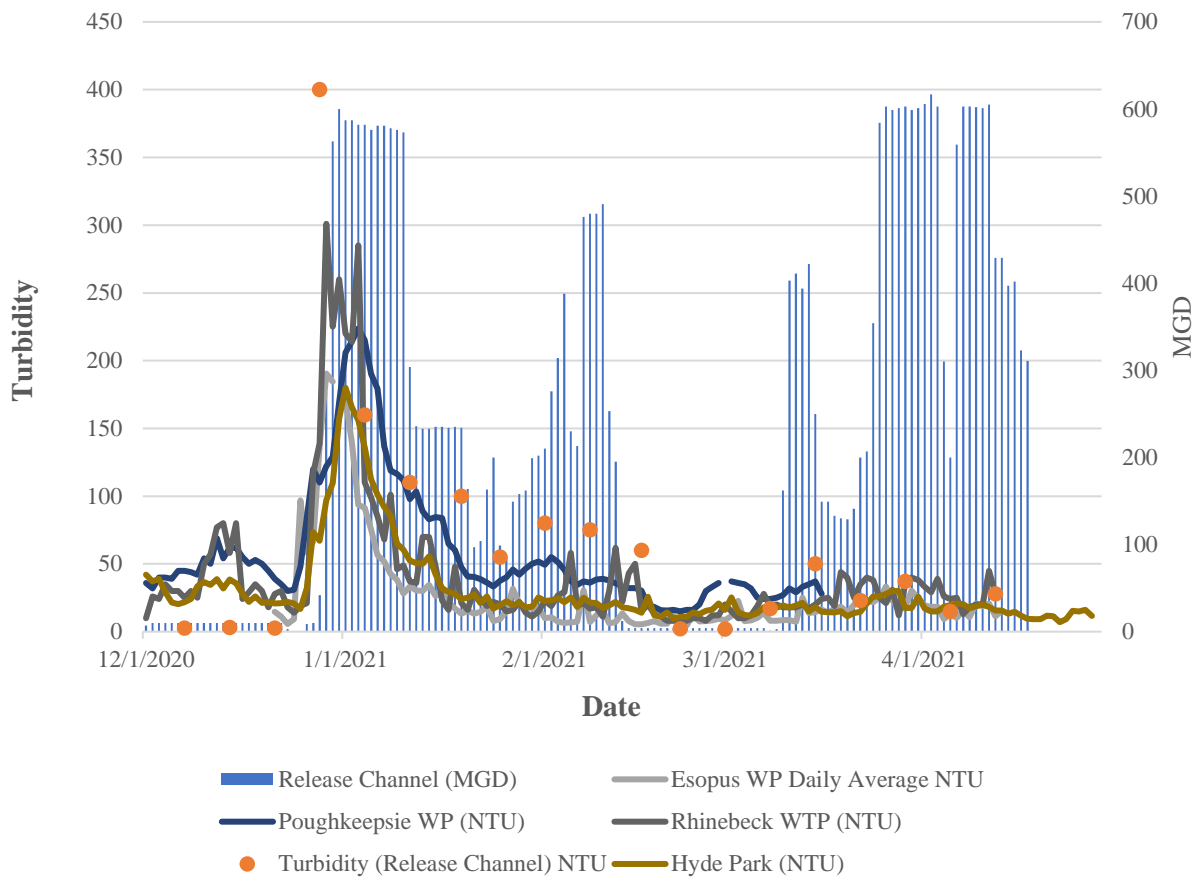


FIGURE 4: Turbidity over time from the release channel and several downstream stations, gages and water intakes within the Hudson River. Source: USGS

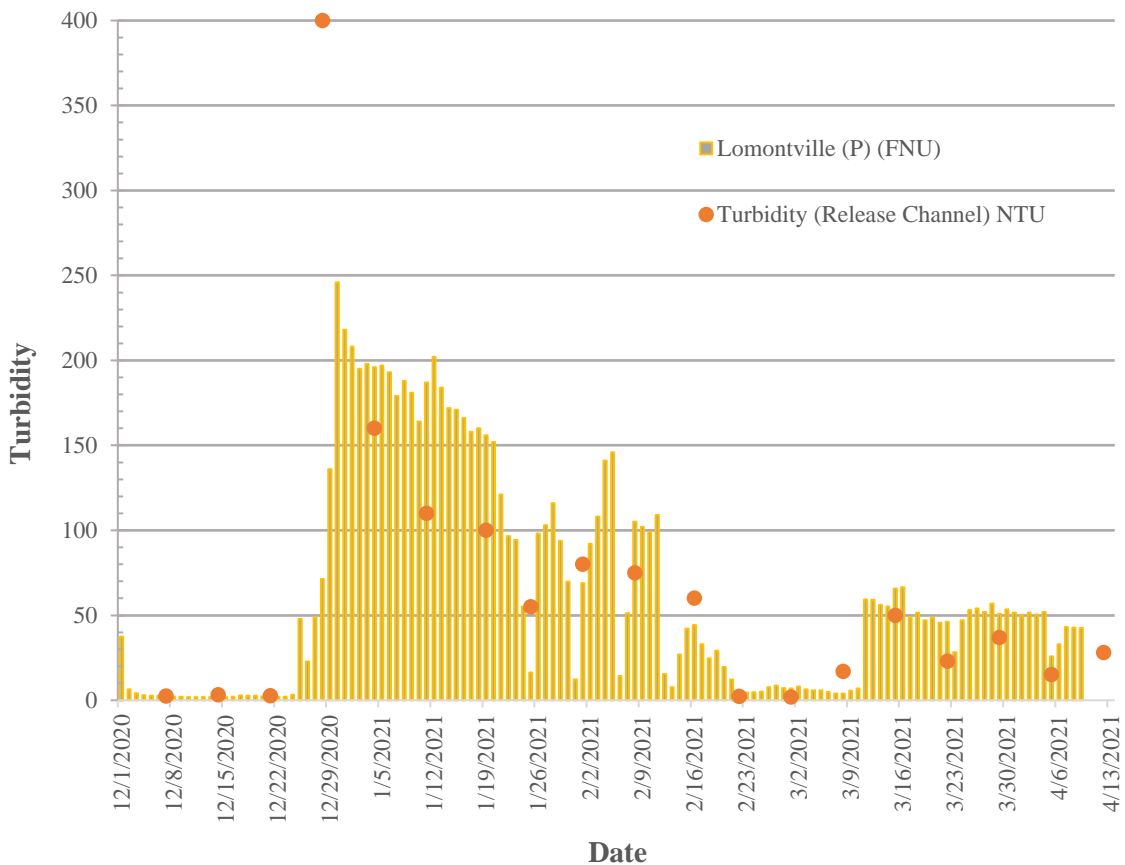


FIGURE 5: Turbidity over time at Lomontville and within the release channel showing 32 days above 100 NTU, and an additional 11 days over 60 NTU, and an additional 17 days over 50 NTU. Source: USGS

4.6 Socioeconomics / Tourism / Aesthetics / Recreation

- Additional and broader socioeconomic studies are needed for the analysis in the EIS.
- Recreation and tourism have been severely negatively impacted by the December 2020 storm/turbidity event (e.g., ice fishing, spring fishing, kayaking). These localized impacts related to tourism, aesthetics, community character, and recreation (trout fishing, kayaking, boating) and property values need to be included in the EIS.
- As more community members and visitors are turning to outdoor recreation, municipalities and organizations along the Lower Esopus are increasing creek access. As a matter of public safety, the DEP must be held responsible for implementing an advance notice system of releases detailing discharge rates and water quality. Currently, there is no way for stream users to know about releases in

advance and this creates potentially fatal conditions, particularly when releases are not necessarily related to weather events (such as DEP operational testing). Advance notice of releases is essential to enable users to adjust plans, farms to move equipment, and landowners to prepare for higher water.

4.7 Fish and Aquatics

- The Draft EIS should provide a more detailed explanation regarding the source of turbidity that enters the West Basin of the Ashokan Reservoir and the Lower Esopus Creek.
- Comments regarding timing, magnitude, and frequency of releases:
 - How was the community release (baseflow) amount (10-15 mgd (15-23 cfs)) determined?
 - There are better models than HEC-RAS to use for this analysis. HEC-RAS is too coarse because it only provides an average velocity across where each transect is located, rather than point velocities within each transect which are more relevant for assessing habitat suitability.
 - Other models, such as *Physical Habitat Simulation* (PHABSIM), are more scientifically accepted and therefore more appropriate to determine the baseflow/community release ranges (e.g., the model divides the river into pixels and flow increments that are highly suitable can more accurately be seen).
 - There is no documentation, especially regarding Habitat Suitability Criteria (HSC) (rating curve of 0 → 1.0 for depth and velocity) for:
 - Basis for selection transect location.
 - Range of flows modeled.
 - The Habitat Suitability Criteria appear to be archaic; and there is no inclusion of analysis or Habitat Suitability Criteria for trout in the upper reaches of the Lower Esopus Creek.
 - Overall, the analysis did not sufficiently justify 10-15 MGD (15-23 cfs) as the 'right answer' for community flows (baseflow); this range appears arbitrary in light of drainage area size and poor modeling documentation. There are a number of reference documents, particularly developed by The Nature Conservancy, to assist with the establishment of an appropriate baseflow (see References section).

- Seasonal flows will vary – including temperature, velocities, and stages:
 - May/June -- fish spawn (aquatic fauna are adapted to this);
 - Summer – fish larvae need warm, shallow water; if high releases occur it can wash away the fish larvae and young-of-year lifestage population and result in year class failures;
 - Therefore high magnitude peak flow releases in the summer would have an adverse impact; but this is not addressed in the Draft EIS.
- Assessment of impacts to trout in the Lower Esopus Creek is deficient:
 - The Draft EIS did not evaluate macro-habitat for trout (i.e., thermal and water quality effects of releases).
 - Trout are sight-feeders; it is difficult for them to feed in turbid water.
 - Trout bury their fertilized eggs in gravel beds (redds) where they incubate for months prior to hatching. During incubation, the eggs require well oxygenated water to circulate through the redds or they will die. Fines such as suspended silt will clog the interstitial spaces between gravel particles cause the eggs to suffocate. Abrupt high flows can potentially wash away the redds.
 - Aquatic insects are the basis of food chain – these are not addressed in the Draft EIS.
- Stream statistics – USGS for watersheds in North America (Streamstats):
 - USFWS guidance: Natural Aquatic Base Flow should be ‘drainage area / 2 = X cfs’ for natural baseflow (August) – since the Ashokan watershed’s drainage basin is 256 miles, the proposed baseflow (community release) of 15 MGD (23 cfs) is way too low. A study is necessary to determine the actual appropriate baseflow for the area.
 - Higher community flow would be potentially beneficial to the turbidity issue, and would likely buffer effects from high magnitude releases.
- The study area needs to be expanded to include the Hudson River for potential impacts to protected species, including Atlantic and Short-nose Sturgeon (ESA species) and River Herring and American Eel (former candidate species for listing under the ESA).
- Overall, the DEIS lacks a comprehensive analysis of the impacts of turbid releases and the IRP on the biota of the Lower Esopus. No sampling data is provided in the DEIS and the NYSDEC sample data is not analyzed. A Supplemental EIS should present a sample-based analysis of the impacts of the turbid releases as well as any notable impacts perhaps beneficial from the

ongoing community releases. If data is not available, a long-term commitment to this analysis and modification of the Permit, if issued, is needed.

4.8 Other Natural Resources (Plants, Invertebrates, Herpetofauna, Birds, Mammals)

The following comments are from the attached report “Comments on biodiversity in Lower Esopus Creek, Ulster County, New York, pertinent to the *Modification of the Catalum SPDES Permit DEIS*, New York City Department of Environmental Protection” by Erik Kiviat, PhD PWS, Hudsonia. These are the conclusions presented in the report, but the report in its entirety is submitted as part of the ARWG comments (see Attachments).

- Most of the biota using the Lower Esopus Creek is poorly known. New York City has had a decade of reservoir releases, and a century of the existence of the reservoir itself, to thoroughly study the biological resources of the Lower Esopus Creek and the impacts of reservoir management on those resources. The DEIS shows clearly this has not been done.
- The reservoir releases are likely having at least two adverse impacts on wood turtles: flooding eggs deposited in bars, and washing juveniles downstream. Other potential impacts are harder to assess.
- A guaranteed minimum instream flow to support water quality, fish, benthos, and other organisms is needed, and there must be a fixed minimum even in drought conditions. An upper limit on flow and turbidity, and a cap on the rate of acceleration of flow, are also needed. LEWP (2010) urged guarantee of minimum and maximum limits a decade ago.
- There is an opportunity for the DEP to innovate and lead by properly studying biodiversity and managing Esopus Creek accordingly. It would be constructive if the DEP could figure out how to remove excess water and sediment from the Ashokan Reservoir while protecting the habitats and species that are, or were formerly, in the Lower Esopus Creek – and protecting the economic, agricultural, recreational, aesthetic, and other cultural values of the creek for landowners and the public.
- At a minimum, the following biological surveys of the Lower Esopus Creek are recommended:
 - Plants of the stream bed, banks, and floodplain and the tidal wetlands and shallows, with emphasis on rarities. (The DEIS, section 7, reports the wetland flora but not the rest of the study area flora.)

- Amphibians and reptiles (herpetofauna) of the same area as above. Breeding, summer, and winter habitats should be documented.
- Aquatic, semi-aquatic, wetland, and fish-eating birds including herons, common merganser, other waterfowl, bald eagle, osprey, spotted sandpiper, solitary sandpiper, American woodcock, other shorebirds, and belted kingfisher.
- Odonates (damselflies and dragonflies), both larvae and adults.
- Invertebrates of temporary pools (including vernal pools) within the "100-year floodplain."
- The establishment of a monitoring program (or expansion of an existing program) is also recommended to include longterm monitoring of the above groups of organisms, as determined by the findings of the surveys recommended.

4.9 Cultural Resources

The cultural impacts on the Lower Esopus Creek resulting from the major turbid water discharges from the Ashokan Reservoir stretch the length of the creek and spill into the Hudson River setting of scenic significance designated by the New York State Department of State.

The change in color alone has a significant impact on the community character. As Patrick Landewe of the Saugerties Lighthouse has pointed out, the "visual appeal of the water is often the most important factor considered when people choose a location for recreation." Objectional deposits, color or turbidity harm the visual resource and enjoyment of the aquatic environment; an extended term of such impacts can have the effect of eliminating the attractiveness of a location altogether. Since the Esopus Creek is a unifying feature of the landscape, any visible degradation of water quality impairs the beauty and sends people away. That has been the case even during periods when the turbid flow has ended because "the word has gone around" and visitors no longer come to Saugerties in the belief or feeling that one of its principal attractions, the water, has changed for the worse.

The kayak and boating economy, special events such as weddings or parties, and the use of the stream for relaxation and appreciation of nature is damaged because of the turbid waters.

The DEIS not only fails to adequately assess the impacts of the turbidity on the cultural richness of the Lower Esopus Creek, but goes so far as to assert that "turbidity levels"

created by the discharges from the Ashokan Reservoir “fall within the range and variability of turbidity levels in lower Esopus Creek streamflows.” This is a particularly egregious example of gaslighting the public with a falseness that goes against common sense as well as reality.

The tidal Esopus extending to part of the impoundment behind the Cantine Dam falls within the Ulster North Scenic Area of Statewide Significance (SASS) identified by the New York Department of State, yet is ignored as such in the DEIS. This was initially denied by NYSDEC in its public notice during the DEIS comment period, but later in June the Department clarified through the local press that the DEIS does in fact impact the local SASS. The designation recognizes the aesthetic value of the Saugerties waterfront. The Esopus Creek Subunit of the SASS relates to Coastal Policy #24 of the Coastal Zone Management plan, which specifically cautions against impairment of scenic resources of statewide significance.

There is a clear relationship between the economic based dependence on the aesthetic quality of recreational water areas and the degradation of the visual appeal through prolonged dumping of turbid waters, not just at the SASS confluence but in the other reaches of the Lower Esopus as well. The brown waters have discouraged and made virtually impossible trout fishing, a cultural as well as a recreational phenomenon of the Lower Esopus. The spring 2021 season was permanently harmed by the months of heavy discharges, yet even before then trout fishermen abandoned the Lower Esopus because of previous events. Some left the creek altogether and refused to return to fish on clear-water days out of an uncertainty over how badly the resource was damaged and, for those who eat their catch, their own safety.

In his testimony for Saugerties, Dr. Harvey Flad, Vassar College professor emeritus¹⁷ conducted a cultural landscape study that reviewed and analyzed a wide array of documents and websites, including the history of community character and visual resources treatment in a SEQR environmental impact setting, to illuminate the history and self-image of the regional Esopus and local Saugerties communities and their core

¹⁷ Harvey K. Flad, Ph.D. Community Character Analysis: Aesthetic and Visual Impact Assessment: NYCDEP Catalam SPDES Permit Modification DEIS Ashokan Reservoir Turbidity Discharges, Esopus Creek and Town of Saugerties, New York. Poughkeepsie, June 2021.

character. It is a side of SEQR with which Dr. Flad is familiar, having trailblazed the topic in previous efforts.¹⁸

The cultural significance and its impact on environmental quality extends to other environmental issues as well, including the loss of fishery resources, degradation of scenic and recreational resources for property owners, nature preserve impacts, and economic consequences to the communities so deprived.

4.10 Indigenous Cultural Resources¹⁹

In Section 7.5 of the DEIS, assessment of archaeological and historical sensitivity was arbitrarily restricted to a maximum width of a quarter-mile along the present course of Esopus Creek. This coverage limitation is woefully inadequate when one considers that much of its alluvial bottomlands are one (1) mile wide. These flats are known to contain Indigenous cultural resources that may not have been filed with the New York State Office of Parks, Recreation and Historic Preservation (NYS OPRHP). The stream has been located at times in various other places within the floodplain and could meander again, not simply with gradual lateral shifts but by carving out wholly new channels.

The DEIS has not considered the numerous significant archaeological sites that may rest hidden in the bottomlands and adjacent uplands. As examples of sites known to science, at a spring not far from the floodplain, a local avocational (non-professional) archaeologist excavated traces of an Indigenous house foundation that a State University at New Paltz professor dates back 400 years based on the beads and pottery it contained. The avocationalist found similar soil stains and associated artifacts on the floodplain, and the professor reported another site on the bottomlands nearby.

Four-miles away, on the first terrace above the Esopus flats at Hurley, hundreds of corn storage pits from three periods 750 to 300 years ago have been recently analyzed by the

¹⁸ For example, in Basil Seggos, "Decision of the Commissioner, Final Supplemental Environmental Impact Statement, and SEQRA Findings Statement," in matter of Finger Lakes Storage, LLC application, DEC permit ID No 8-4432-00085; Flad, "Community Character," in Visual Impact Assessment of St. Lawrence Cement Proposal, Hudson NY (Albany: Department of State, 2005), which contributed to the Department of State's denial of a permit based on the incompatibility of the St. Lawrence plant with the area's economic future in heritage tourism. His work on the 1988 PASNY nuclear plant proposal at Cementon led to the formal acceptance of visual resources as a legitimate NYS SEQR issue.

¹⁹ The following section was written by Christopher R. Lindner, Ph.D. His 1987 doctoral dissertation concerns culturally induced flood impacts on archaeological sites, specifically along the lower reaches of Schoharie Creek. Dr. Lindner served four terms as President of the New York Archaeological Council (NYAC), the state's professional organization. He co-wrote with the late State Archaeologist Emeritus, Robert E. Funk, 'Standards for Deep Testing' that NYAC adopted in 1996 as site discovery protocols for cultural resource investigations in alluvial environments.

New York State Museum. This work finally overturned a persistent stereotype of Algonquian people from the Hudson Valley east to Massachusetts Bay as but marginally agricultural. Now these farmers' cultivation of corn and beans appears equal to that of the famous *Haudenosaunee* Iroquoians from the Mohawk Valley west to Ontario. The Esopus floodplain would have been a highly valued resource in ancient times and likely contains even much earlier archaeological sites.

Increasingly, there are Ulster County residents and others who are interested in the region's historical development. These include the Stockbridge-Munsee Community / Mohican Nation, now based on a reservation in Wisconsin and with newly donated land ownership of a large nature preserve near Albany, who want to learn more about their ancestors among the *Esopus* people, who around 1660 were forcibly removed by the Dutch, taking control of the fertile bottomlands near Kingston (*Wiltwyck* they called it or 'Town in the Wilds' with a connotation erasing Indigenous presence).

4.11 Agriculture

Discussion of Agricultural impacts in the DEIS was minimal. There are a number of impacts not accurately represented in the DEIS. **We request a more thorough evaluation of agricultural impacts in the EIS** in order to meet DEPs Sustainability Value to "maximize the economic, environmental, and social benefits of our investments and responsibilities". Specific comments related to agricultural concerns include:

- Periods of increased flow/turbidity can be problematic to growers irrigating out of the creek for several reasons:
 - Typically during 600 MGD release periods, the creek is too high and current too swift to safely have irrigation equipment in the water, which means irrigating crops is not possible. Prolonged periods without irrigation can, and have, resulted in significant crop losses.
 - Often there is little or no advance notice given when adjustments are made to the release channel. There have been numerous instances when notice was only given hours or days *after* an adjustment has been made. If significant adjustments are made and there is insufficient time to remove irrigation equipment, there is a risk that the equipment becomes submerged and possibly washed downstream. This poses a significant environmental risk from engine fluids leaking, a safety hazard for anyone involved with retrieval of the equipment from high water, and the risk of property damage to equipment and anything in its path.

- In addition to high flow, periods of high turbidity can impact irrigation. Filters and drip lines can become quickly clogged with turbid water. Clogged drip lines are unusable and need to be replaced at significant cost and time.

In addition to high flow periods impacting irrigation systems, periods of low flow can be equally detrimental. Periods of low flow often coincide with periods of drought and during the hottest months, which is when irrigation is perhaps most critical. When the creek is very low, equipment cannot be submerged far enough under water to be able to pull water into the suction pipe, rendering irrigation impossible. When the creek becomes very low, irrigation equipment will not work properly in existing irrigation ponds and irrigation can again become impossible.

5.0 CONCLUSIONS

Overall, the much-awaited Draft EIS does little to alleviate the concerns that the Lower Esopus and the drinking water supplies of those that use the Hudson River will not continue to be impacted in a manner inconsistent with environmental norms established and utilized by New York State to protect its water resources. The West Basin of the Ashokan Reservoir concentrates turbidity that is then released to the Lower Esopus over long periods of time under the guise of maintaining a CSSO, while the waters in the Upper Esopus run clear and the Catskill Aqueduct remains shut down or underutilized so that the operational releases are justified. As the December 2020 event exemplified, the Revised Operating Protocol (ROP) - the sole mitigation proposed - will make little difference to the turbid releases that will occur in the future.

As our comments have shown, there are major inaccuracies with the Draft EIS that should be corrected and studied further, and there are major deficiencies where studies should be initiated. Our overarching recommendations and suggested foci for both NYSDEC and DEP are:

Initiate a Supplemental EIS with the following areas to be addressed:

- Analysis of impacts of turbidity events on the drinking water supplies that utilize the Hudson River;
- A comprehensive review of the alternatives presented in the DEIS with an understanding that a conclusion that operational releases from the West Basin of turbid water to maintain a CSSO is not an option. Included in this review should be:
 - examination of the operating protocols for Catskill Aqueduct and the availability of water from the Croton Filtration Plant as a means to maintain a CSSO and supplement water supply available;
 - analysis of an alternative that requires release of the best water available to the Lower Esopus or a blend of water at a given turbidity level;
- More in-depth studies on the fishery and economic impacts from turbid releases and the opportunities associated with community releases;
- A comparative analysis of reservoir voids by amount and time of year as it relates to flood mitigation.

Much like the historic Memorandum of Agreement that allowed New York City to move forward with Watershed Regulations within its watershed, we stand now at a crossroads of how New York City and State regulatory agencies address legitimate and ongoing concerns associated with what has and is occurring on the Lower Esopus. As such we also call on NYSDEC and DEP to make a long-term commitment to the Lower Esopus both in terms of continued studies of the impact on any solution agreed upon as part of the Permit process and as recognition for the past on ongoing impacts that the Reservoir has had on the communities below the dam. In addition, we ask that the process for any continued effort to find solutions to the Lower Esopus turbid release and flood protection efforts be fundamentally altered to become an inclusive iterative collaboration among key stakeholders. The process should be formalized as part of the mission of the AWRG and would serve as a way to continue the collaboration for a longer-term commitment that we hope will be forthcoming.

6.0 REFERENCES

- Cassedy, Daniel, and Paul Webb 1999 New data on the chronology of maize horticulture in eastern New York and southern New England. In *Current Northeast Paleoethnobotany*, edited by John P. Hart, 85-100. Albany: New York State Museum Bulletin 494, University of the State of New York.
- DePhilip, M. and T. Moberg. 2013. Ecosystem flow recommendations for the Delaware River basin. The Nature Conservancy. Harrisburg, PA.
- DePhilip, M. and T. Moberg. 2010. Ecosystem flow recommendations for the Susquehanna River basin. The Nature Conservancy. Harrisburg, PA.
- Diamond, Joseph P. 1996 Terminal Late Woodland/Contact period settlement patterns in the Mid-Hudson Valley. In *A Northeastern Millennium: History and Archaeology for Robert E. Funk*, edited by Christopher Lindner and Edward V. Curtin, 95-111. Journal of Middle Atlantic Archaeology 12.
- Hart, John P., Hetty Jo Brumbach, Lisa M. Anderson, and Susan Winchell-Sweeney 2017 Maize and Pits: Late Prehistoric Occupations of the Hurley site in the Esopus Creek Valley, Ulster County, New York. *Archaeology of Eastern North America* 45:133-160.
- Hart, John P., Hetty Jo Brumbach, and Robert Lusteck 2007 Extending the Phytolith Evidence for Early Maize (*Zea mays ssp. mays*) and Squash (*Cucurbita sp.*) in Central New York. *American Antiquity* 72: 563-583.
- Lavin, Lucianne, Marina E. Mozzi, J. William Bouchard, and Karen Hartgen 1996 The Goldkrest site: An undisturbed, multi-component site in the heart of Mahikan territory. In *A Northeastern Millennium: History and Archaeology for Robert E. Funk*, edited by Christopher Lindner and Edward V. Curtin, 113-29. Journal of Middle Atlantic Archaeology 12.
- Lindner, Christopher 1987 *Geoarchaeology of Culturally Induced Flood Impacts: Schoharie Valley, Eastern New York*. Unpublished Doctoral Dissertation, State University of New York at Albany.
- Lindner, Christopher, and Lisa Folb 1998 Lopuch 3 and Microdrills: Site Report and Use-wear Analysis. *Archaeology of Eastern North America* 26: 107-132.
- Lindner, Christopher, and Robert E. Funk 1996 *Standards for Deep Testing Research*. Report to the New York Archaeological Council.

- Taylor, Jason, Fisher, W., Apse, C., Kendy, E., Klein, D., Schuler, G., Adams, S., Crabtree, D. 2013. Flow Recommendations for the tributaries of the Great Lakes in New York and Pennsylvania, 2013. The Nature Conservancy, Rochester, New York.
- 1991 Archaeological Sites and Historical Floods in the Schoharie Valley, Eastern New York. *Hudson Valley Regional Review* 8:104-138.
- 1997 Eight Rockshelters in the Ashokan Catskills and Comparison with Site Clusters in the Hudson Highlands and Connecticut. *Bulletin of the Archaeological Society of Connecticut* 61: 39-59.
- 1998 Archaeological Reconnaissance for the Proposed Relation of a Driveway across Esopus Creek at the SUNY New Paltz Ashokan Field Campus, Town of Olive, Ulster County, Report for the New York City Bureau of Water Supply.
- 2010 *Representative Native American Archaeological Sites in the Lower Esopus Watershed*, GIS map poster for the Lower Esopus Watershed Partnership, Kingston, NY.
- 2011 The Earliest Thirteen Millennia of Cultural Adaptation along the Hudson River Estuary. In *Environmental History of the Hudson River*, edited by Robert E. Henshaw, 65-76. State University of New York, Albany.

ATTACHMENT A

Hudsonia Report - Comments of biodiversity in lower Esopus Creek,
Ulster County, New York, pertinent to the
Modification of the Catalum SPDES Permit DEIS,
New York City Department of Environmental Protection



HUDSONIA

a nonprofit institute

PO Box 5000, Annandale, NY 12504
Phone: (845) 758-7053
Fax: (845) 758-7033
kiviat@bard.edu
www.hudsonia.org

Comments on biodiversity in lower Esopus Creek, Ulster County, New York, pertinent to the *Modification of the Catalum SPDES Permit DEIS*, New York City Department of Environmental Protection

**by Erik Kiviat PhD PWS
Hudsonia**

Prepared for Friends of the Lower Esopus Creek

8 June 2021

At the request of Friends of the Lower Esopus Creek, Hudsonia reviewed selected portions of the *Modification of the Catalum SPDES Permit DEIS* (hereinafter “DEIS”; New York City Department of Environmental Protection) and assessed existing and potential impacts of the Ashokan Reservoir releases on biodiversity in lower Esopus Creek, Ulster County, New York. Hudsonia does not take advocacy positions for or against environmental management and infrastructure projects. Rather, we collect observations and data, refer to research performed at other institutions, assess impacts of proposed actions on biological resources, and if appropriate make recommendations to reduce impacts. Unrelated to the current technical assistance work for Friends of the Lower Esopus Creek, Hudsonia is a member of the research collaborative at the Hudson Valley Farm Hub on lower Esopus Creek and is conducting research on the relationship between turtles and agriculture.

In this report, I focus on animals and plants of conservation concern, including animal Species of Greatest Conservation Need (New York SGCN), plants ranked as S1, S2, and S3 by the New York Natural Heritage Program, and regionally-rare plants and animals. In the Twenty-first Century, most native biodiversity, including large and small organisms, is under threat. Small, rare, cryptic, or little-known species are as important in many respects (e.g., for their role in ecosystem processes or as genetic resources) as large, officially-recognized, charismatic species. The first steps in species conservation are to know what’s there and analyze its relationship to human alterations of landscapes. Hudsonia’s role in discussions such as this one about water supply management impacts on habitats and species is to draw attention to the biodiversity that would otherwise be “under the radar” of regulators and permit applicants.

The Lower Esopus Creek Environment

Lower Esopus Creek extends for ca. 50 km from the Ashokan Reservoir to the Hudson River at Saugerties. Within this landscape, for example, is a habitat complex comprising an immense area of contiguous stream channel, riparian, and floodplain (the Hurley Flats area). The creek corridor includes active and fallow agricultural lands, limestone gorges, gallery-like forests along the stream channel, wet and dry gravel pits in various phases of use and abandonment, temporary pools and permanent ponds, tributary streams, ditches, large trees, shrub and vine thickets, and more. Wild organisms have space to maintain relatively large populations and the ability to move among habitat types (e.g., in and out of the stream channel, or between forest and open areas). All the same, organisms and their habitats are under stress from land use activities, road traffic, air, soil, and water pollution, noise, night lighting, land use development, and climate change, and many habitats have been altered by drainage, filling, bank stabilization, emplacement of flood control berms, urbanization, water use, and gravel extraction.

For the past decade and continuing in 2021, excess water and suspended sediment have been dumped from the Ashokan Reservoir into lower Esopus Creek at irregular intervals. These releases create high and very turbid flows for days or longer each time. Reservoir releases can increase flow at the reservoir outlet, e.g., from 4 MGD (6 cfs) to 300 MGD (464 cfs) in six hours (NYCDEP email to AWRG dated 10 March 2021). I view this example, and others, as violent flooding of a type very likely to have negative effects on many aquatic and riparian organisms. Below I mention some animals and plants of conservation concern that are likely affected (now or in the past) by these releases.

Many of the physical and chemical aspects of the lower Esopus Creek are described in detail in the DEIS. Much less so the biology of the creek. Lower Esopus Creek is more than “flows and fishes,” to borrow a phrase from Josh Collins of the San Francisco Estuary Institute. Protecting or conserving one group of organisms (e.g., fishes) does not necessarily protect another group (e.g., plants or dragonflies). A very large perturbation of the lower Esopus Creek habitat complex will affect most organisms downstream, and studying a few species will not necessarily predict or explain many others.

It is interesting to note that the description of stream features that may affect bank stability:

Valley Reaches 1B and 2C typically had adequate vegetation in the streambank and “riparian” zone adjacent to the stream that can help hold bank material in place and resist erosion; however, Valley Reach 2C also included numerous examples of local hydraulic conditions that can affect erosion, including embedded logs, large wood accumulations, debris jams, scour pools, tributaries from adjacent developed watersheds that provide flow and sediment contributions from stormwater, mid-channel islands, multiple channels split around mid-channel features, or placement of riprap for stream channel stabilization. Such features are highly variable and were unique to certain locations in lower Esopus Creek. (DEIS page 7-69)

Many of the features described are among the habitat features most important to fish, turtles, invertebrates, birds, and plants that use streams such as lower Esopus Creek.

Plants

In the paragraphs below, the NYNHP rank (S1, S2, etc.) given, with the state legal classification (Endangered, Threatened, Rare). S1 species are those that have been recently documented at the fewest localities in New York.

Numerous rare plant species occur in the tidal wetlands of the mouth of Esopus Creek in Saugerties, and some are especially abundant or vigorous there. Rare species present include awl-leaved arrowhead (*Sagittaria subulata*, S3-Rare), spongy arrowhead (*Sagittaria montevidensis* var. *spongiosa*, S2-Threatened), kidney-leaved mud-plantain (*Heteranthera reniformis*, S3-Rare), heart-leaved plantain (*Plantago cordata*, S3-Rare), and goldenclub (*Orontium aquaticum*, S2-Threatened) (Kiviat et al. 2015, Les and Kiviat 2016). Responses of these populations to episodic sediment deposition or erosion due to reservoir releases are unknown. Most of the rare tidal wetland plants are omitted from consideration in the DEIS (page 221-222) although the DEIS comments on some species that are believed to no longer occur in the tidal wetlands. The DEIS dismissed impacts on the Hudson River seemingly implying that increases in sediment inputs to the river were small relative to the river and quickly dispersed. Water and sediment movements in the estuary are highly complex, and might well deposit or remove substantial amounts of material in local areas of the wetlands.

New York Natural Heritage Program data indicate the presence of several rare plants along nontidal lower Esopus Creek. It isn't clear if these species persist and were or are affected by reservoir releases. Although not reported by NHP, winged monkeyflower (*Mimulus alatus*, S3-Rare) is likely to occur there (based on data from other Hudson Valley streams) where it would be vulnerable to violent flooding.

River birch (*Betula nigra*), with a population that is patchy but well-represented along lower Esopus Creek, for example near the Route 209 crossing in the Town of Ulster, was only down-ranked by NYNHP from the Watch List to S4 in 2020 (Young 2020) and is still legally classified as “Rare” in New York. Esopus Creek may have the largest concentration of this species in the Hudson Valley, which has the largest concentration in the state (NYFA 2021). River birch is typically a stream bank and floodplain species in our region. Establishment and growth are presumably regulated by the flooding regime, but how is unclear.

Dunbar (1959) reported a number of rare plants from the Esopus Creek gorge in Marbletown. Certain of these species could have been, or could be, affected by the reservoir releases or other changes in the

creek. The DEIS (page 221) claims that at least two of these species, alpine cliff fern (*Woodsia alpina*, S1-Endangered) and common redroot (*Rhodiola rosea* = *Sedum rosea*, S1-Endangered) do not occur in the study area, apparently overlooking NYNHP data and Dunbar (1959).

The DEIS (page 221) further asserts no impacts on several other rare plants. In one case, swamp buttercup (*Ranunculus septentrionalis*), the DEIS claims no impact because the wetland extent and Cowardin wetland classification haven't changed during a period of several years. This statement ignores that an individual species can be harmed without the generalized habitat type or size changing.

There are some large trees in the stream corridor. For example, an unusually large hackberry (*Celtis occidentalis*) perhaps 100 cm dbh is just east of the creek on the Hurley Flats. Prolonged (more than a few days) flooding during the growing season can weaken or kill trees that are adapted to non-wetland riparian habitats.

Woodland horsetail (*Equisetum sylvaticum*), reported on DEIS p. 7-203, is in my experience regionally-rare in the Hudson Valley.

Invertebrates

The arrowhead spiketail (*Cordulegaster obliqua*, a SGCN dragonfly) is known from the lower Esopus Creek corridor (NYNHP data). Stream dragonflies require particular habitat conditions in and out of the water (Corbett 1999), and could be adversely affected by the violent flow fluctuations and high turbidity associated with the reservoir releases. This species is typically associated with small streams and muddy seeps in wooded habitats (Paulson 2011); it could be using small tributaries or riparian seeps subject to flooding from reservoir releases. DEIS (page 7-219) asserts that there is no habitat for this species along the creek, which overlooks the likelihood of the habitats just mentioned. The DEIS preparers apparently didn't ask NYNHP for specific habitat data for the documented occurrences of this species.

A rare tiger beetle (*Cicindela ancocisconensis*, S2, see Schlesinger and Novak 2011) occurs on upper Esopus Creek and could be present along the lower creek as well. This beetle is associated with the vegetated margins of cobble bars (*ibid.*) which would be flooded and sometimes physically altered by violent flooding.

The clam shrimp *Eulimnadia agassizii* was found in a temporary pool at the edge of a farm field (Schmidt et al. 2018) in the Town of Ulster in the FEMA 100-year flood hazard zone at about 5 m elevation above Esopus Creek. This species, apparently quite rare in New York although not reviewed by NYNHP or DEC, could also be present in pools lower on the floodplain and subject to high flows with accompanying high turbidity. Clam shrimp habitats in the Northeast, small temporary pools, are highly threatened and in need of conservation; little is known of their water quality tolerances.

In an ongoing study of temporary pool invertebrates in Ulster County, in spring 2021 Hudsonia sampled two pools on the Esopus Creek floodplain in the FEMA 100-year flood hazard zone. One pool is in an inactive gravel pit separated from the stream channel by a flood control berm, and the other pool is in the middle of a large farm field. A horsehair worm (Nematomorpha) was documented in the gravel pit pool by Anne Bloomfeld (video). The field pool supported an unidentified flatworm (Turbellaria); either of these invertebrates could be a rare species and could be in locations affected by reservoir releases. Temporary pools can have a high diversity of invertebrates, and such pools on low floodplain should be surveyed.

Fish

Other experts are commenting on the DEIS coverage of the fish fauna. I only mention a few species here.

Three regionally-rare fish species, log perch, northern hog sucker, and satinfin shiner, were documented in lower Esopus Creek in 1977 (Pierce 1978). Moreover, the American eel (SGCN), now of great conservation concern due to range-wide decline, was widespread and apparently common in the lower creek (*ibid.*, also DEIS page 7-176). Satinfin shiner and northern hog sucker were not reported in the 2009-2017 fish surveys (DEIS page 7-176); however, log perch was still common. Whether the first two species have disappeared from lower Esopus Creek or were scarce and missed in the recent surveys is unknown, and reasons for the change are similarly unknown. Moreover, the current status of these species in the Hudson Valley is not well documented, and any or all of them could be regionally-rare or declining.

Carlson (1993) found that the tidal mouth of Esopus Creek is an important overwintering refuge for largemouth bass and contributes to the economically and recreationally important bass fishery estuary-wide. The effects of high turbid discharge on the bass wintering habitat should be analyzed.

Herpetofauna

Apart from wood turtles (see below), little seems to be known about the amphibians and reptiles of the lower Esopus Creek. A long-tailed salamander (SGCN) larva collected in the Ashokan Reservoir basin prior to reservoir construction is in the herpetological collection of the American Museum of Natural History. Possibly this species occurs along the lower Esopus Creek. The northern red salamander, regionally-rare, could occur in the lower reaches of tributaries or small side-channels, where it would be affected by reservoir releases. On the Hurley flats, there is a population of toads morphologically consistent with Fowler's toad (*Bufo fowleri*, SGCN) or Fowler's toad – American toad (*Bufo americanus*) hybrids. The eastern musk turtle (SGCN) is a likely inhabitant of the lower Esopus Creek; reservoir releases could cause downstream displacement of this species. All of these species should be addressed in the environmental impact analysis.

Wood Turtle. The wood turtle is listed as Special Concern and is a SGCN in New York. Wood turtles spend the cooler months in the stream channel and the warmer months mostly in the riparian area where they bask, forage, and nest. All feeding is believed to occur on land, and mating and copulation in the water. Lower Esopus Creek supports a significant population of this species. Turtles are under many stresses, and added mortality, even in the “cheap” early life stages, can cause population declines. There are at least five ways that reservoir releases could affect wood turtles.

- During aquatic overwintering, freshwater turtles have gas exchange via pharyngeal respiration and cloacal respiration (i.e., they take up oxygen and dispose of carbon dioxide through the digestive system). High levels of suspended sediment might affect respiration or harm the digestive system.
- Violent fluctuations of water levels and flows might stimulate turtles to move away from the creek, potentially exposing them to greater risk of injury and death from road vehicles, farm machinery, and construction equipment.
- Very high flows and rapid acceleration of flows might wash turtles, especially juveniles, downstream out of their home ranges and expose them to hazards.

- High flows during the incubation period from the end of May through August might flood nests created on bars. The DEIS asserts that wood turtles only nest above flood levels caused by reservoir releases (“...wood turtles typically nest in areas at least three feet above the normal water level. Therefore, it is not anticipated that they would nest on in-channel features, such as mid-channel bars, that are frequently wetted.” [DEIS page 7-220]); however, Jason Tesauro (personal communication) has observed nesting on bars in lower Esopus Creek 2019-2020 when we were radio-tracking the turtles. Although the DEIS states that releases will rarely occur during egg incubation (page 220), it only takes one flooding event to kill the year’s eggs and the DEP cannot control the late spring - summer rainfall.

- Flood flows and sediment deposition or erosion from reservoir releases is likely to affect food organisms but it’s unclear which ones would increase or decrease. The wood turtle is a generalist feeder, eating a wide range of invertebrates and plant materials with occasional live or dead vertebrate materials (Ernst et al. 1994). Earthworms, slugs, and snails are believed to be especially important in the diet, as well as fungi and fruits such as blackberries (*Rubus* spp.).

Birds

Bald eagles use the lower Esopus Creek corridor (NYNHP data), presumably for foraging and possibly for roosting and nesting. Bald eagles scavenge dead fish and prey on injured or moribund fish, as well as preying on turtles, ducks, and other small animals and scavenging deer and other species. It is unclear to what extent turbidity inhibits eagle foraging for fish. In cold weather, the energy budget of a bald eagle is critical and anything that reduces foraging efficiency or forces eagle to fly to other foraging areas could be adverse. Granger (1992) implied that turbidity in reservoir waters stimulated bald eagles to forage where clearer water entered. DEIS (page 219) dismisses the possibility of reservoir releases stressing eagle nesting (or by extension roosting) trees, despite that prolonged growing season flooding can weaken trees making them more vulnerable to windthrow, pests, and diseases.

Other visual predators of fish, including great blue heron, common merganser, osprey, and belted kingfisher, visit or breed along lower Esopus Creek. Prolonged high turbidity during breeding season, for example, could interfere with the ability of these species to feed nestlings adequately.

Northern harriers (New York Threatened) are known to use the lower Esopus Creek floodplain (NYNHP data). Harriers principally prey on meadow voles in winter and other seasons, while also hunting small birds. Meadow voles use both upland and wetland habitat with herbaceous vegetation. The lower Esopus Creek flooding regime probably affects meadow vole populations in some areas, as well as harrier foraging habitat and efficiency. DEIS (page 219) dismisses potential impacts of reservoir releases on this species because wetlands in the stream corridor have a tree canopy. Notwithstanding, harriers are using open (non-forested) floodplain habitats near the creek on the Hurley Flats, and this phenomenon deserves attention.

Louisiana waterthrush (SGCN) has been observed along Esopus Creek in the Town of Hurley during the breeding season (eBird). This species typically nests in stream bank niches such as under exposed tree roots. Nests could be washed out by high flows from reservoir releases.

Mammals

Indiana bat (federally listed as Endangered) occurs near the lower Esopus Creek (NYNHP data) and this species is very likely to forage along the creek and its tributaries. DEIS (page 219) dismisses possible

impacts of reservoir releases on trees used by bats, but does not address impacts of releases on insect prey of bats.

A harbor seal has been resident at the tidal mouth of Esopus Creek for about 1.5 years (see many reports in the *Hudson River Almanac*). Harbor seal use of the Hudson River estuary, including the freshwater tidal reach, has been increasing during the past few decades, and this freshwater-dwelling seal may be a harbinger of additional seal use of the area. Harbor seal is presumably a visual predator on fish, and prolonged turbidity from reservoir releases could force seals to move or adversely affect their food intake.

Nothing seems to be known about muskrats in lower Esopus Creek. The species is undergoing a continent-wide decline and conservation of suitable habitats should be a conservation concern. Muskrats could be affected by collapse or obstruction of bank burrows, or clogging of burrows with sediment, as a result of reservoir releases.

Conclusions

Most of the biota using the lower Esopus Creek is poorly known. New York City has had a decade of reservoir releases, and a century of the existence of the reservoir itself, to thoroughly study the biological resources of the lower Esopus Creek and the impacts of reservoir management on those resources. The DEIS shows clearly this has not been done.

The reservoir releases are likely having at least two adverse impacts on wood turtles: flooding eggs deposited in bars, and washing juveniles downstream. Other potential impacts are harder to assess.

A guaranteed minimum instream flow to support water quality, fish, benthos, and other organisms is needed, and there must be a fixed minimum even in drought conditions. An upper limit on flow and turbidity, and a cap on the rate of acceleration of flow, are also needed. LEWP (2010) urged guarantee of minimum and maximum limits a decade ago.

There is an opportunity for the DEP to innovate and lead by properly studying biodiversity and managing Esopus Creek accordingly. It would be constructive if the DEP could figure out how to remove excess water and sediment from the Ashokan Reservoir while protecting the habitats and species that are, or were formerly, in the lower Esopus Creek – and protecting the economic, agricultural, recreational, aesthetic, and other cultural values of the creek for landowners and the public.

At a minimum, I recommend the following biological surveys of the lower Esopus Creek:

- Plants of the stream bed, banks, and floodplain and the tidal wetlands and shallows, with emphasis on rarities. (The DEIS, section 7, reports the wetland flora but not the rest of the study area flora.)
- Amphibians and reptiles (herpetofauna) of the same area as above. Breeding, summer, and winter habitats should be documented.
- Aquatic, semi-aquatic, wetland, and fish-eating birds including herons, common merganser, other waterfowl, bald eagle, osprey, spotted sandpiper, solitary sandpiper, American woodcock, other shorebirds, and belted kingfisher.
- Odonates (damselflies and dragonflies), both larvae and adults.

- Invertebrates of temporary pools (including vernal pools) within the “100-year floodplain.”

I also recommend the establishment of a monitoring program (or expansion of an existing program) to include longterm monitoring of the above groups of organisms, as determined by the findings of the surveys recommended.

References Cited

- Carlson, D.M. 1992. Importance of wintering refugia to the largemouth bass fishery in the Hudson River estuary. *Journal of Freshwater Ecology* 7(2):173-180.
- Corbett, P.S. 1999. *Dragonflies: Behavior and ecology of Odonata*. Cornell University Press, Ithaca, NY. 829 p.
- Dunbar, H.F. 1959. Notes on the flora of a gorge of Esopus Creek, New York. *Rhodora*, 61(721):21-24.
- Ernst, C.H., R.W. Barbour and J.E. Lovich. 1994. *Turtles of the United States and Canada*. Smithsonian Institution Press, Washing, DC. 578 p.
- Granger, W. 1992. Foraging ecology of bald eagles on a regulated river. *Journal of Raptor Research* 26:243-256.
- Kiviat, E., C. Graham and G. Stevens. 2015. Invasive species threats to rare plants in the Hudson River tidal wetlands: Analysis and recommendations. Report to the Lower Hudson Partnership in Regional Invasive Species Management, Mahwah, NJ. Hudsonia, Annandale, NY. 35 p.
- Les, J.C. and E. Kiviat. 2016. The conservation status of goldenclub (*Orontium aquaticum*) in the freshwater tidal wetlands of the Hudson River. 41 p. in S.H. Fernald, D.J. Yozzo and H. Andreyko (eds.), *Final Reports of the Tibor T. Polgar Fellowship Program, 2014*. Hudson River Foundation.
- LEWP (Lower Esopus Watershed Partnership). 2010. Letter to Willie Janeway, Regional Director, Region 3 New York State Department of Environmental Conservation. 17 p.
- NYFA (New York Flora Association). 2021. New York flora atlas. <https://newyork.plantatlas.usf.edu/>
- Paulson, D. 2011. *Dragonflies and damselflies of the East*. Princeton University Press, Princeton, NJ. 538 p.
- Pierce, R. 1978. Lower Esopus Creek fisheries survey June 28-30, 1977 Ulster County. Unpublished report. New York State Department of Environmental Conservation Fisheries Bureau Region 3. 14 p.
- Schlesinger, M.D. and P.G. Novak. 2011. Status and conservation of an imperiled tiger beetle fauna in New York State, USA. *Journal of Insect Conservation*, 15(6):839-852.
- Schmidt, R.E., E. Kiviat, N. Trigoboff and J. Vanek. 2018. New records of clam shrimp (Laevicaudata, Spinicaudata) from New York. *Northeastern Naturalist* 25(2):N7-N10.

Young, S.M. 2020. New York rare plant status lists. New York Natural Heritage Program, Albany, NY.
120 p.

ATTACHMENT B

Addendum to Section 4.10 on Adverse Impacts on Ancient Indigenous
Cultural Resources

Addendum to Section 4.10 on Adverse Impacts on Ancient Indigenous Cultural Resources¹

Historical Background

The alluvial bottomlands along the lower Esopus Creek recently became the most important environment yet identified for understanding the historical development of the ancient peoples who inhabited the region of southern New England and the Hudson Valley. New research disputes the long held characterization that, in contrast to the *Haudenosaunee* Iroquoian nations westward, northeastern Algonquian farming was minimal before the arrival of Europeans. Archaeological sites near the Esopus Creek can serve as evidence to enable appreciation of this adaptive shift in the Northeast from a mobile forager existence to more sedentary, intensive agricultural lifeways.

An analysis by the New York State Museum (Hart et al. 2017:22) of expert avocationalist (non-professional) excavations at the Hurley Site, on a terrace close to the Esopus floodplain, has revealed that local pre-European maize (corn) cultivation was quite productive and centuries in duration, in three periods during the span from 750 to 300 years ago. This discovery dramatically overturns the previous stereotype of the *Esopus Munsee* (*Lenape*, Delaware), and related communities eastward to Massachusetts Bay and south to Montauk, as too seasonally mobile and small in population to have practiced sustainable agriculture. Clearly, a great deal remains to be learned about how early farming developed east of Iroquoia.

A few years after the Dutch settled *Wiltwyck* (or 'Town in the Wilds' in an erasure of Indigenous presence; soon under the English to be called Kingston) on Esopus Creek in the mid-17th-Century, they fought and won two brief wars. The second war was a genocidal conflict against the *Esopus* people, ancestors of the Stockbridge-Munsee Community / Mohican Nation. The Esopus Wars resulted in the Dutch takeover of a broad valley floor, which enabled them to cultivate vast fertile bottomlands near the middle reaches of the Hudson River along which such flats are lacking.

Comparative Cases

Indications of the potential of the Esopus floodplain to contain significant archaeological sites, important for understanding cultural development, can be gleaned from several projects on other tributaries of the Hudson River. Prior to a large gas pipeline's construction to cross under a tributary to the Hudson eastward opposite Catskill, the Roeliff Jansen Kill, cultural resource investigations found in its floodplain numerous fragments of maize from 1,100 years ago, a century earlier than corn was previously dated in the Northeast (Cassedy and Webb 1999).

Not long afterward, State Museum archaeologists (Hart et al. 2007) found microscopic evidence of maize, in sediments from a site in central New York dating back *two millennia*. At present, sites from several centuries on either side of that age estimate are inexplicably rare in eastern New York and adjacent states. Yet deep testing on the Mohawk's major tributary, Schoharie Creek, found an undisturbed site with a cluster of chipped flint microdrills that could

have made the holes in Atlantic coastal conch shell beads in nearby ritual burials (Lindner and Folb 1998). These mortuary vestiges suggest influences from the ancient heartland in southern Ohio, where elaborate ceremonial societies practiced maize horticulture and the cultivation of Indigenous domesticates on the floodplains of the Scioto and Miami rivers.

A doctoral thesis in anthropology (Lindner 1987; see also Lindner 1991), under the supervision of the New York's State Archaeologist Emeritus, Robert E. Funk, assembled evidence for various flood impacts upon ancient sites, interpreted as diagnostic of extensive bottomland modifications due to Colonialist agriculture's instigation of accelerated soil erosion, a process replicated recently in flood regime changes caused by industrial agriculture. Key examples, again from the lower reaches of Schoharie Creek, were a deeply buried but relatively recent Indigenous site, and a thick layer that contained ancient artifacts but that covered, to a depth well below the reach of the plow, vestiges of an early European trading post.

A test of the predictive power of Lindner's thesis occurred in the mid-1990s on Catskill Creek at the Leeds Flats, near the New York State Thruway. Archaeologists trenching the floodplain, where no ancient artifacts had previously been turned up due to plowing, discovered layer upon layer of debris from ancient sites, the most recent of which was a settlement historically known as *Wechachkeek* or 'Place of Wigwams.' The discovery of human burials at this site finally prompted the State Historic Preservation Office's recommendation to Walmart that it drop plans for a megastore on the 32-acre parcel. These events inspired Lindner and Funk (1996) to formulate '*Standards for Deep Testing Research*' on archaeological sites, adopted by the New York Archaeological Council, the state's professional organization, as protocols to guide cultural resource investigations in environments with thick natural deposits.

Current Situation

The DEIS-proposed quarter-mile width to the area of potential effects, for assessment of archaeological sensitivity along the present course of Esopus Creek, is woefully inadequate when one considers that the stream has been located at times elsewhere in the valley floor, much of it a mile in width. These flats are known to contain Indigenous cultural resources that may not have been inventoried by the NYS Office of Parks, Recreation and Historic Preservation (OPRHP). Lateral movement has left meander scars, undoubtedly many of them hidden by alluvial fill, that as relict channels are primed for destructive reactivation by floods of various magnitudes, under unpredictable conditions given the complex variables.

Numerous archaeological sites on or near the Esopus floodplain are currently known, including an Indigenous house foundation from 400 years ago, excavated by a local avocationalist, as summarized by Diamond (1996). The avocationalist found a roughly contemporaneous site with similar soil stains and associated artifacts on the floodplain, and Diamond reported yet another site in the bottomlands nearby. The potential is high for even earlier ancient sites, some of them undiscovered due to a thick covering of flood sediments along Esopus Creek. Local avocationalists in all likelihood know of more sites not reported in Diamond's study.

The small cultural resource investigation by Lindner (1999), at the Ashokan Center in the Catskills well above the vast floodplain near Hurley, the only such study mentioned by the DEIS in its Section 7.5, was restricted to a proposed driveway's fording place and hence found no evidence of Indigenous presence. But a few hundred feet away, at the upland edge of a fluvial terrace, Lindner (1998) found below a cliff overhang the Little Falls rockshelter that had a firepit from roughly 300 years ago. It contained a European white clay pipe bowl, a cut-brass arrowhead ornament, and numerous flint chips from the manufacture of stone tools. It also had fragments of Indigenous pottery that when whole likely contained parts of a variety of plants and animals that were also recovered: walnuts, bramble berries, fish, raccoon, and white-tailed deer. A map of representative Indigenous archaeological sites (Lindner 2010; see below) includes an array of ancient vestiges along the lower Esopus in the bottomlands near Hurley.

Conclusion

Upstream from the middle reaches of the Hudson Valley, where the river does create alluvial flats, the Goldkrest Site (Lavin et al. 1996) on Papscaene Island, across from the Port of Albany, has become the most extensive archaeologically investigated Mohican habitation. It contained traces of two Indigenous houses from the early 1600s. A large nature preserve nearby, through a notable act of restitution in April 2021, had its ownership deeded by the Open Space Institute to the Stockbridge-Munsee Community / Mohican Nation.

Yet the Hurley Site, with human burials and hundreds of corn storage pits, has even more significance regionally. The alluvial bottomlands from Lomontville to past Kingston, which sustained a farming people for centuries, have great potential to increase knowledge about ancient times. There could also be Dutch and early African American sites in the floodplain, given the prevalence of slavery around Kingston into the 19th Century.

Increasingly, there are Ulster County residents and others who are interested in the region's historical development. These include the Stockbridge-Munsee / Mohicans, now based on a reservation in Wisconsin, who want to learn more about their ancestors among the *Esopus* people. Further consideration of possible adverse impacts on the Esopus Creek floodplain, destructive to archaeological sites of probable regional significance, is strongly advisable.

References Cited

Cassedy, Daniel, and Paul Webb

1999 New data on the chronology of maize horticulture in eastern New York and southern New England. In *Current Northeast Paleoethnobotany*, edited by John P. Hart, 85-100. Albany: New York State Museum Bulletin 494, University of the State of New York.

Diamond, Joseph P.

1996 Terminal Late Woodland/Contact period settlement patterns in the Mid-Hudson Valley. In *A Northeastern Millennium: History and Archaeology for Robert E. Funk*, edited by Christopher Lindner and Edward V. Curtin, 95-111. *Journal of Middle Atlantic Archaeology* 12.

Hart, John P., Hetty Jo Brumbach, Lisa M. Anderson, and Susan Winchell-Sweeney
2017 Maize and Pits: Late Prehistoric Occupations of the Hurley site in the Esopus Creek Valley, Ulster County, New York. *Archaeology of Eastern North America* 45:133-160.

Hart, John P., Hetty Jo Brumbach, and Robert Lusteck
2007 Extending the Phytolith Evidence for Early Maize (*Zea mays ssp. mays*) and Squash (*Cucurbita sp.*) in Central New York. *American Antiquity* 72: 563-583.

Lavin, Lucianne, Marina E. Mozzi, J. William Bouchard, and Karen Hartgen
1996 The Goldkrest site: An undisturbed, multi-component site in the heart of Mahikan territory. In *A Northeastern Millennium: History and Archaeology for Robert E. Funk*, edited by Christopher Lindner and Edward V. Curtin, 113-29. *Journal of Middle Atlantic Archaeology* 12.

Lindner, Christopher
1987 *Geoarchaeology of Culturally Induced Flood Impacts: Schoharie Valley, Eastern New York*. Unpublished Doctoral Dissertation, State University of New York at Albany.

1991 Archaeological Sites and Historical Floods in the Schoharie Valley, Eastern New York. *Hudson Valley Regional Review* 8:104-138.

1997 Eight Rockshelters in the Ashokan Catskills and Comparison with Site Clusters in the Hudson Highlands and Connecticut. *Bulletin of the Archaeological Society of Connecticut* 61: 39-59.

1998 Archaeological Reconnaissance for the Proposed Relation of a Driveway across Esopus Creek at the SUNY New Paltz Ashokan Field Campus, Town of Olive, Ulster County, Report for the New York City Bureau of Water Supply.

2010 *Representative Native American Archaeological Sites in the Lower Esopus Watershed*, GIS map poster for the Lower Esopus Watershed Partnership, Kingston, NY.

2011 The Earliest Thirteen Millennia of Cultural Adaptation along the Hudson River Estuary. In *Environmental History of the Hudson River*, edited by Robert E. Henshaw, 65-76. State University of New York, Albany.

Lindner, Christopher, and Lisa Folb
1998 Lopuch 3 and Microdrills: Site Report and Use-wear Analysis. *Archaeology of Eastern North America* 26: 107-132.

Lindner, Christopher, and Robert E. Funk
1996 *Standards for Deep Testing Research*. Report to the New York Archaeological Council.

¹ The following section was written by Christopher R. Lindner, Ph.D. His 1987 doctoral dissertation concerns culturally induced flood impacts on archaeological sites, specifically along the lower reaches of Schoharie Creek. Dr. Lindner served four terms as President of the New York Archaeological Council, the professional organization.