DRAFT ENVIRONMENTAL ASSESSMENT

CURWENSVILLE LAKE WATER SUPPLY RELEASES TO WEST BRANCH SUSQUEHANNA AND LOWER SUSQUEHANNA RIVERS, PENNSYLVANIA

JUNE 2017

Curwensville Lake

West Branch Susquehanna River

Lower Susquehanna River

US Army Corps of Engineers
Baltimore District

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ADDITIONAL APPENDIX AVAILABLE BY REQUEST

Worksheets containing calculations used to determine approximate future percent chance of Curwensville Lake drawdowns.

ADDITIONAL REPORTS AVAILABLE

Three additional documents prepared by others were of particular importance in preparing this EA. SRBC (2012) is the source of much of the information presented on Curwensville Lake. TNC (2010) is the source of much of the information presented on the West Branch Susquehanna and Lower Mainstem Susquehanna Rivers. SRBC (2010) contains preliminary plan formulation information. These documents and websites from which they can be downloaded are presented below:

1) Susquehanna River Basin Commission (SRBC). 2012. *Optimizing use of Commission-owned Water Storage at Curwensville Lake, Pennsylvania*, available at http://www.srbc.net/planning/index.htm

2) US Army Corps of Engineers (USACE) and SRBC. 2011. *Addendum to Main Report, Preliminary Assessment of Optimizing Use of Commission-Owned Water Storage at Cowanesque and Curwensville Lakes, Pennsylvania*. Available at http://www.srbc.net/planning/index.htm.

3) The Nature Conservancy (TNC). 2010. *Ecosystem Flow Recommendations for the Susquehanna River Basin*, available at

http://www.srbc.net/policies/docs/TNCFinalSusquehannaRiverEcosystemFlowsStudyReport_Nov10_20120327_fs135148v1.PDF

4) SRBC. 2010. *Preliminary Assessment of Optimizing Use of Commission-Owned Water Storage at Cowanesque and Curwensville Lakes, Pennsylvania*. Available at http://www.srbc.net/planning/index.htm.

SELECT TERMS AND ACRONYMS USED IN THIS DOCUMENT

Term or Acronym	Explanation
Consumptive use	When water is withdrawn from a surface water or groundwater source, the portion which is not returned is referred to as consumptive use.
EA	Environmental assessment (this document).
Q	Shorthand for "flow" for engineers and scientists. Flow of interest in this EA is stream discharge, the volume rate of water flow
Q7-10 flow	The 7-day average low flow expected to occur at a 1-in-10-year frequency and has a 10 percent chance of occurring in any year, on average. Q7-10 is approximately the same as P99 during low-flow months.
P__	A flow that has a statistical probability of being exceeded __% of the time over a time interval of interest (month in this EA) at a gage or gages. Higher P values reflect lower-flow conditions. Lower P values occur in higher flow conditions. For P95, river flow would drop below P95 just five percent of the time, on average.
SAV	Submerged aquatic vegetation
SRBC	Susquehanna River Basin Commission
Trigger value	Flow within a river of interest at a stream gaging (flow measurement) station below which low-flow management measures would be implemented to attempt to maintain flow.
USACE	U.S. Army Corps of Engineers
Water supply release	In this EA, release of water from Curwensville Lake to offset downstream consumptive use

1.0 INTRODUCTION

1.1 PURPOSE AND NEED

Pursuant to the National Environmental Policy Act (NEPA) of 1969, the U.S. Army Corps of Engineers, Baltimore District (USACE) has prepared this Environmental Assessment (EA) to address the potential environmental and socioeconomic impacts associated with a modification of the water control plan for USACE Curwensville Lake in Clearfield County, PA. The proposed action would be a modification of project operations to alter the frequency and duration of water supply releases made under low stream flow conditions to mitigate for impacts of downstream consumptive use[1]. The proposed action would not change the amount or cost of storage already allocated to water supply within Curwensville Lake. However, the proposed action would require a modification of the water control plan for Curwensville Lake to reflect the changed procedures for triggering water supply releases[2]. Any modifications to the plan would occur after finalization of this EA.

Stream flow strongly affects water quality and aquatic habitat conditions. Decreases in flow and increases in the frequency or duration of low flow events reduce habitat availability and connectivity, degrade water quality, increase competition for habitat and food in the remaining stream, and reduce aquatic species abundance and diversity. Consumptive use is of particular ecological concern during low-flow conditions in that it further reduces stream flows. Detrimental impacts from consumptive use under low-flow conditions occur along substantial lengths of rivers and streams in the Susquehanna River basin, including the West Branch Susquehanna and lower Susquehanna Rivers.

The proposed action is evaluated at the request of the Susquehanna River Basin Commission (SRBC) with the objective of establishing a new monthly low flow water supply release trigger for the Curwensville Lake Project to more effectively utilize water supply storage to address downstream low flow conditions. Trigger value is the flow within a river of interest at a stream gaging (flow measurement) station determined to be the lowest threshold to which streamflow will be allowed to drop without implementing low-flow management measures. This proposed trigger, known as "P95[3]" is the flow that is exceeded 95 percent of the time by month at certain gages on the mainstems of the West Branch Susquehanna River or lower Susquehanna River[4]. The Curwensville Lake operating plan by which low flow water supply releases from the project are currently made utilizes a different low flow trigger, known as "Q7-10"[5], as recorded at Harrisburg, PA, U.S. Geological Survey (USGS) streamflow monitoring gage. Q is stream discharge, the volume rate of water flow. Q is shorthand for "flow" for engineers and scientists. The Q7-10 flow is the 7-day average low flow expected to occur at a 1-in-10-year frequency and has a 10 percent chance of occurring in any year, on average.

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[1] Water withdrawn from a surface water or groundwater source and not returned.

[2] Said modifications require approval from USACE North Atlantic Division.

[3] P95 represent the flow (be it a monthly average or an annual average) that is exceeded 95% of the time. P is statistical shorthand for "probability."

[4] Stated another way, river flow would drop below P95 five percent of the time, on average.

[5] Q7-10 is approximately the same as P99 during low-flow months.

Adoption of the P95 trigger, also as recorded at Harrisburg or other alternative gage locations, and the attendant revision of the Curwensville Lake water control plan would allow the SRBC to use the water supply storage it owns there to more effectively mitigate for downstream consumptive water use in the Susquehanna River Basin. SRBC would then be able to make water supply releases that are compatible with current low flow management practices developed for the basin. Consumptive water use is the use of water in such a way that it is not returned to the Susquehanna River system. SRBC is the primary agency regulating consumptive uses of water in the Susquehanna River Basin. SRBC mitigates manmade impacts caused by consumptive use during low flows through a variety of actions: by making water releases from upstream reservoirs (including Curwensville Lake), by releasing water from underground mine pools, and by implementing other regulatory and programmatic actions aimed at reducing or offsetting water use. The proposed plan could offset human consumptive use more effectively during critical low flow events and provide potential benefit to downstream ecosystems of the West Branch Susquehanna River and lower Susquehanna River.

The proposed action is needed because the current Q7-10 low flow trigger value for releasing water from Curwensville Lake is insufficient to meet ecosystem flow needs during low flow conditions, because it allows water quality degradation and dewaters aquatic habitats, and does not comply with current SRBC consumptive use mitigation standards. (Section 1.2.3 provides additional information on SRBC regulations and policies). The Q7-10 standard was developed in the 1970s to ensure the assimilation of wastewater discharges to protect water quality; it does not address the protection of aquatic habitat or other riparian needs. The Q7-10 statistic failed to trigger releases during significant droughts since 1990, with the consequence that instream flows were reduced by consumptive uses to levels potentially harmful to the Susquehanna River aquatic ecosystem. Q7-10 was deemed inadequate and was removed from SRBC regulations in 2006. In 2010, The Nature Conservancy (TNC) recommended for mainstem rivers in the Susquehanna River Basin that there be no human-induced reduction to low flow when streamflow falls below the long-term monthly 95^{th} percent exceedance (P95) flow (see section 1.2.4 for additional information). SRBC's Low Flow Protection policy specifies monthly P95 as the standard threshold for low flow protection in large rivers based upon TNC's ecosystem flow recommendations.

This EA borrows text liberally from several documents and websites of the SRBC, Pennsylvania Fish and Boat Commission (PFBC), USACE, and TNC. Section 8 provides bibliographies for these documents and other documents used in preparation of this EA, and provides links on the world wide web where many of the documents can be accessed.

1.2 Background Information

1.2.1 Curwensville Lake Project Description

Curwensville Lake is located in Clearfield County, PA, on the West Branch of the Susquehanna River approximately 1 mile upstream of the Borough of Curwensville, and 6 miles upstream of the Borough of Clearfield (Figure 1-1). The latter is the Clearfield County seat. Curwensville Lake was formed by damming the West Branch Susquehanna River and lies in the West Branch Susquehanna subbasin of the Susquehanna River Basin (Figure 1-2). At the normal pool elevation of 1162 feet Project Control Datum (PCD)[6] the lake has a surface area of 770 acres and a length of about 5 miles.

Curwensville Lake is a multi-purpose project owned and operated by USACE. USACE operates the Curwensville Project in conjunction with other reservoirs (Stevenson, Bush, and Sayers) for the main purpose of providing flood risk management for downstream communities along the West Branch Susquehanna River in central Pennsylvania. Principal communities benefitted include Curwensville, Clearfield, Renovo, Lock Haven, and Williamsport. USACE is responsible for directing operations of all reservoir projects under its control in the Susquehanna River Basin, directly and indirectly regulating flow in downstream rivers. Project purposes also include providing in-lake recreation (boating, swimming, fishing), providing water storage to compensate for downstream consumptive use during times of low flows, and maintaining/improving downstream water quality (maintaining temperatures appropriate for warmwater fish, and compensating for degradation from acid-mine drainage).

In 1992 USACE issued a lease to the Clearfield County Commission to operate and maintain a 362 acre parcel at the Curwensville Lake Project, the Curwensville Lake Recreation Area, for public park and recreational purposes. The Curwensville Lake Authority (CLA) conducts this work and manages the recreational facilities at the lake for the Clearfield County Commission. The CLA does not have any involvement in managing the operations of the dam, which is handled by USACE. In 2005, the lease was extended until 2030.

Water levels in the lake are manipulated via releases from the dam through the outlet tower directly to the West Branch Susquehanna. The outlet works are located in the left abutment, and consist of systems of bottom flood and upper bypass gates. The bypass gates invert (lowest) elevation is at 1153.5 feet, while the floodgates invert elevation is at 1135.0 feet. Two small bypass gates (30-inch diameter) are located about 8.5 feet below the normal lake surface elevation. The bypass gates are used from mid-spring to mid-fall for making small volume (up to about 240 cubic feet per second [cfs]) warmwater releases with temperatures suitable to maintain state-designated warmwater fish uses downstream of Curwensville Dan. Three large flood gates (5.5-ft by 12-ft each) are located in the outlet tower near the reservoir bottom about 27 feet below the normal lake surface. The flood gates release water from their lowest point. The flood gates are used exclusively from mid-fall to mid-spring (the bypass gates are not used during this period of the year. During the summer, the flood gates are occasionally used to discharge large quantities of water after a high water event, during such discharge events cooler lake water is released to the West Branch Susquehanna River. Outflow is measured at a river gage about 1/2 mile downstream of Curwensville Dam. Outflow is also estimated using a gate rating table/curve that calculates outflow as a function of gate opening and hydraulic head (depth of water in reservoir). Both the measured outflow and the calculated outflow are usually in good agreement.

1.2.2 Curwensville Lake Water Level Management

Filling of the lake is dependent upon inflow from the West Branch Susquehanna River. The permanent pool at Curwensville Lake (elevation 1162.0 feet) contains 7,483 acre-feet of storage

[6] PCD is a datum specific to the project established in reference to USGS topographical data, and is approximately equivalent to what is commonly referred to as elevation above sea level.

volume. Of this amount, 7,413 acre-feet are designated as "conservation storage." This conservation storage is comprised of 4,240 acre-feet allocated to SRBC for water supply storage (to mitigate for downstream consumptive use) and 3,173 acre-feet of Federal conservation storage (reserved for USACE uses such as downstream low-flow regulation to maintain flows in the West Branch Susquehanna River immediately downstream of the dam). The remaining 70 acre-feet of storage within the permanent pool is located beneath the sill of the outlet gate and cannot be released.

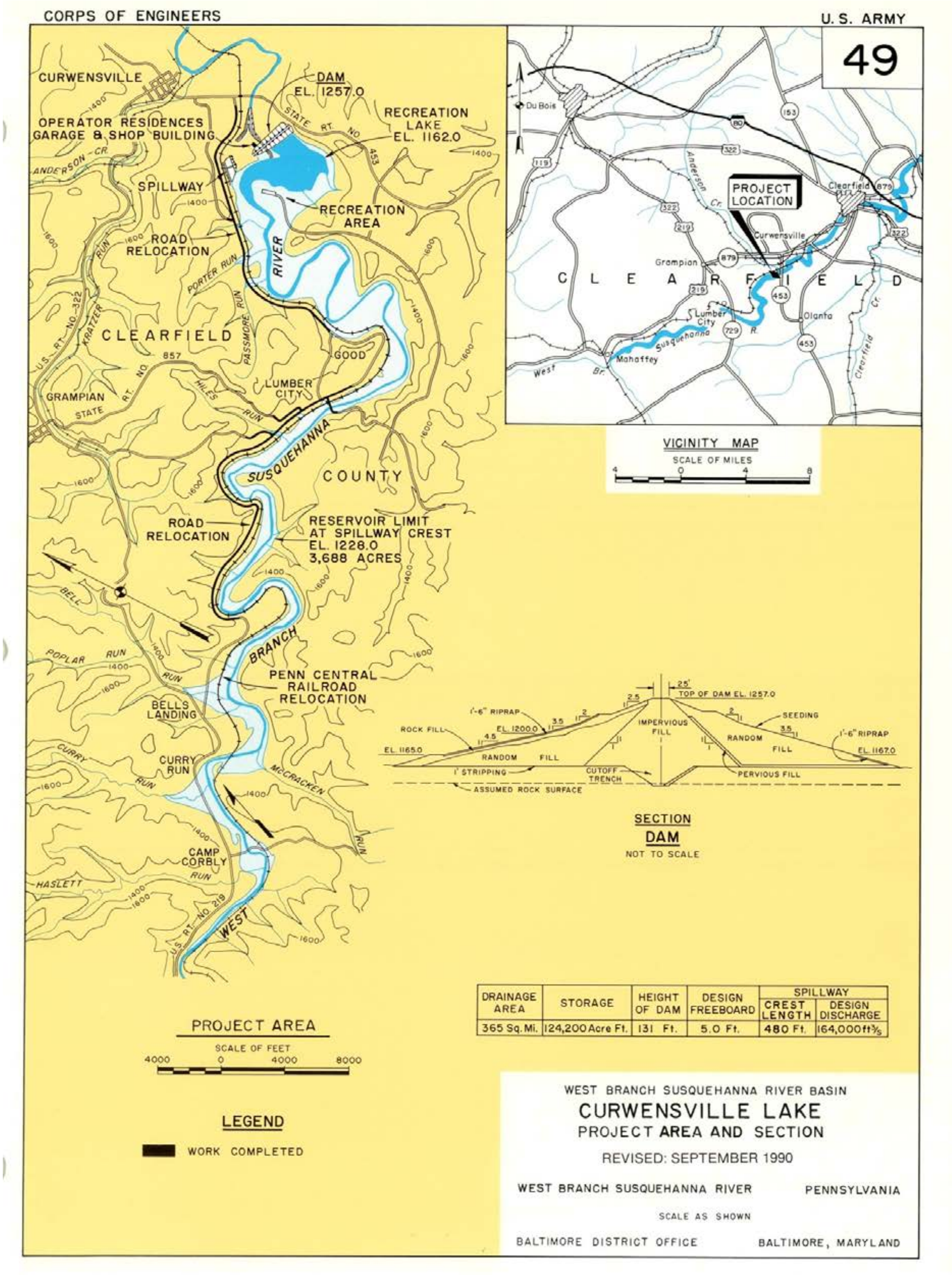

Figure 1-1: Curwensville Lake vicinity map, project map, and dam cross-section.

Figure 1-2: Susquehanna River Basin map.

The Curwensville Lake Project provides 111,984 acre-feet of vacant flood storage above the normal 1162 feet pool. This storage volume is normally not occupied by water, except briefly following major runoff events when water from upstream is captured to reduce downstream flooding along the West Branch Susquehanna River. Flood storage water is gradually released into the West Branch Susquehanna River until the 1162 feet water surface elevation is reestablished.

The regulating objective for Curwensville Lake is to maintain the pool at approximately 1162 feet elevation. This elevation target has been in place since late 1997 when the project's water control plan was modified to maintain a year-round pool at this level. The prior water control plan included a 7-foot drawdown (drop in lake water level) during the winter months. Assuming normal hydrologic conditions, reservoir releases (outflows) are adjusted to maintain the lake surface elevation as close as possible to this normal pool. Data available for 4,650 days over the period from 1998-2015 shows that the lake has been below elevation 1161.5 feet on 47 days, or slightly less than 1 percent of the time. Infrequently, the lake level has been drawn down below elevation 1161.0 feet elevation, usually to undertake project repairs. The maximum drawdown over the period 1998-2015 was to about 1160 feet elevation (2 foot drawdown) for three weeks in October 2001 for project repairs. Normal conservation flow releases (discussed further below) cause lake drawdown during drought conditions when inflow from upstream of the lake is insufficient to maintain the minimum desired outflow.

Curwensville releases vary greatly with the weather, time of year, and condition of the watershed. Over one year between September 2014 and August 2015, releases generally ranged between 70 and 1,000 cfs most of the time. However, releases greater than 1,000 cfs that lasted for weeks occurred twice over this time interval, and the greatest releases were occasionally over 5,000 cfs for short intervals.

Releases from Curwensville Lake are made during low-flow conditions to maintain minimum instream flows in the receiving West Branch Susquehanna River. Recently, in 2007, the reservoir water control plan[7] was revised and the minimum lake release set to 50 cfs (conservation release) plus the discharge from an acid mine drainage (AMD) remediation facility upstream of the lake, the Lancashire 15 (Barnes and Tucker) AMD project in Cambria County, PA. Average daily production from this facility is about 7.7 cfs, but up to 15.5 cfs can be produced if desired under low-flow conditions. The volume of water that is treated by this AMD remediation facility is "passed through" Curwensville Lake undiminished in quantity (except for some minor transit losses between the facility and Curwensville Lake). Thus, actual minimum release from the lake that would contribute to downstream flows in low-flow conditions would likely be in the range between 60 and 65 cfs other than in the most extreme conditions. In extreme low flow conditions, outflow from the lake could drop below that rate if conservation storage set aside to maintain downstream flows is consumed. In that event, outflow from the lake would be set to inflow.

[7] The reservoir water control plan is a strategy to manage water storage and release to satisfy all of the reservoir's authorized purposes. The water control plan is a document within the reservoir regulation manual. The reservoir regulation manual describes project physical layout and history, mechanisms for water data collection and communication, process for developing hydrologic forecasts, effects of reservoir regulation on design storms as well as observed events, and an overview of agencies involved in water management.

Water supply releases (as opposed to conservation releases described above) from Curwensville Lake are intended to offset consumptive uses between the release point (i.e., reservoir) and the trigger gage; the purpose is not to produce a given flow at the trigger gage. Releases from Curwensville are intended to be triggered simply by the observed flow at the Harrisburg gage and be unaffected by what is going on at other potential water supply sources (such as Cowanesque Lake). The present criteria for making water supply releases from Curwensville Lake are keyed to river flows measured at a USGS stream gage located at Harrisburg, PA (Figure 1-2). Based on low flow frequency analysis, the Q7-10 flow at Harrisburg is 2,631 cfs. Whenever the observed river flow at the Harrisburg gage falls below the Q7-10 flow, a water supply release of 27.5 cfs from Curwensville Lake would begin and continue until the observed flow at Harrisburg subsequently rises above the Q7-10 flow. Only one water supply release has been made from Curwensville Lake to offset downstream consumptive use. In August 1999, a water supply release of 560 acre feet was made that constituted 13 percent of the total SRBC water supply storage at Curwensville Lake. This release caused the lake level to drop less than 1 foot.

Maximum drawdowns are limited by the SRBC/USACE water supply contract and USACE Curwensville Lake water control plan. Taken together, if all of the SRBC water supply storage and all the USACE dedicated storage for maintaining the minimum 50 cfs flow were used during an event, the lake would drop about 10 feet to elevation 1152 ft. If that water surface elevation were to be reached, USACE would then manage releases to maintain lake elevation at 1152 ft until inflows increased and the lake level rose. In an extreme prolonged drought, inadequate inflow coupled with lake water loss to evaporation and into groundwater could cause lake water surface elevation to drop below 1152 feet.

USACE completed construction of Curwensville Lake in 1965 and the lake's normal winter pool elevation of 1155 feet was also reached that year. Subsequently, the Pennsylvania Department of Forests and Waters requested that the lake elevation be raised to 1162 ft during the summer season to improve recreational opportunities, and USACE raised the pool to this elevation in 1967. For the next 30 years (1967 to 1997), the project was operated to provide a seasonal recreation pool at 1162 ft from roughly mid-May thru mid-November, and a winter flood control pool at 1155 ft during the remaining months.

In 1989, SRBC requested USACE to consider reallocating a portion of the total storage at Curwensville Lake so that water could be released to compensate for downstream consumptive use. USACE, with SRBC as the non-Federal sponsor, completed a feasibility study in 1992 that identified downstream consumptive users requiring mitigation, consumptive use requirements, and effects of different water release scenarios from Curwensville Lake on the lake and downstream. The study investigated raising the lake elevation for water supply storage reallocation so that Curwensville Lake could serve as a source to mitigate downstream consumptive use during low-flow conditions. The study concluded that Curwensville Lake should be maintained at a pool elevation of 1162 ft all year rather than being drawn down to elevation 1155 ft during the winter.

In 1994, SRBC entered into a contract with USACE to purchase water supply storage that had become available as a result of maintaining the pool at elevation 1162 feet year-round. SRBC purchased 4,240 acre-feet of storage, which is about 3.8% of Curwensville Lake's total storage capacity.

Maintaining the lake at elevation 1162 feet year-round, in accordance with the findings of the 1992 USACE feasibility study, required minor modifications to existing recreational facilities. These modifications were completed in 1996 and 1997, but required no modifications to the dam or outlet works. The then-existing water-based recreation facilities had been constructed to take maximum advantage of the lake at elevation 1162 feet. However, modifications were needed and new construction was completed at the beach and boat launch to accommodate a once in 10-year drawdown down to elevation 1159 feet and a channel was excavated to the permanent mooring area to allow use at that water surface elevation (1159 feet). SRBC paid for these recreational facility modifications. Curwensville Lake has been maintained at its current conservation pool elevation of 1162 feet since late 1997. Subsequent to completing the recreation facility modifications, private boat mooring slips have been added along the shoreline by citizens renting space from the CLA.

1.2.3 Susquehanna River Basin Commission

SRBC is an interstate compact commission charged with coordinating water resources efforts of Pennsylvania, New York, and Maryland, as well as the Federal Government in the Susquehanna River Basin. USACE is the designated federal member of the SRBC and provides input to, and participates in, the approval processes associated with policies adopted and actions taken by the SRBC. The action proposed and evaluated in this EA is consistent with a suite of SRBC policies and actions being undertaken to reduce the effects of consumptive water use on stream ecosystems.

SRBC has coordinated water supply storage capacity and capabilities at key reservoirs in the Susquehanna River Basin for the purpose of making releases to compensate for consumptive use by downstream industrial and municipal users during low flow periods. SRBC currently owns approximately 27,700 acre-feet of water supply storage in two USACE projects: Curwensville Lake and Cowanesque Lake (Figure 1-2). (There is a separate water supply contract between USACE and SRBC for Cowanesque Lake). In addition, Whitney Point Lake in the Upper Susquehanna subbasin in New York was recently modified by a cooperative USACE-SRBC project to provide low flow augmentation for downstream environmental benefits.

Curwensville water supply storage releases are not assigned to specific consumptive use projects. Instead, Curwensville storage is intended to provide consumptive use make-up for approved large-scale projects and numerous smaller users (industrial, commercial, and recreational) spread out along the West Branch Susquehanna and lower Susquehanna Rivers. Large projects for which Curwensville storage provides consumptive use mitigation include the Montour and River Hill power plants, the City of Dubois public water supply, Brunner Island power plant, and York Energy Center. These users pay a fee into an SRBC fund (i.e., they have purchased compliance with the consumptive use regulations) and SRBC in turn agrees to provide the storage necessary to compensate for their consumptive uses during low flow situations. Under the terms of its agreement with USACE, SRBC can request releases from its water supply storage space during low flow periods for the purpose of satisfying established consumptive use mitigation needs.

SRBC policies established in the 1970s identified the Q7-10 flow as measured at USGS stream gages located on the mainstem Susquehanna River as the flow level (i.e., trigger) at which compensation releases should begin. SRBC policy also required that the compensatory water was to be available at the place of withdrawal at the time the observed river flow fell below the Q7-10 trigger and in an amount at least equal to the consumptive use. To help ensure that the compensatory water would offset the consumptive use, the trigger values were increased by a quantity equal to the consumptive use at the appropriate industrial operations. In 2008, SRBC adopted its Consumptive Use Mitigation Plan that identified low flow mitigation needs, presented various mitigation trigger thresholds, and set forth recommendations for mitigating existing and projected consumptive use. The Consumptive Use Mitigation Plan confirmed that the Q7-10 threshold was inadequate and recommended that a basinwide assessment of instream flow needs be conducted. This recommendation led to initiation of a Low Flow Management Study by USACE and SRBC in 2008.

The low-flow study, cost-shared between USACE and SRBC, focused on aquatic ecosystem needs during low-flow conditions and the potential benefits of modified low flow management in the Susquehanna River basin. Phase I of the USACE and SRBC low-flow study incorporated an Ecosystem Flow Study led by TNC working with USACE, SRBC, and federal/state resource agencies. The study culminated in the preparation of the TNC report *Ecosystem Flow Recommendations for the Susquehanna River Basin* in 2010 (additional information presented in Section 1.2.4). The critical low flow recommendation of the TNC report for mainstem rivers in the Susquehanna River Basin is that there be no change to the long-term monthly P95 flow. (These flow recommendations were also contained in the USACE and SRBC *Susquehanna River Basin Ecological Flow Management Study Phase I* report in 2012.) The flow recommendations are one of the original motivations that triggered revisions to SRBC's existing policies related to instream flow protection.

Based on technical studies to optimize use of SRBC-owned water supply storage at Curwensville and Cowanesque Reservoirs, SRBC made application to USACE in May 2012 for revised low flow operations. The preferred alternative identified in the application entails monthly P95 consumptive use mitigation release triggers, consistent with the TNC flow recommendations, at mainstem USGS gages during the low flow months of July through November. Other recent SRBC consumptive use mitigation project efforts have also focused on implementing monthly P95 triggers. These include the previously mentioned Lancashire 15 AMD Treatment Plant, planning/feasibility studies of other mine pool storage projects, and agreements with Pennsylvania Department of Conservation and Natural Resources and PFBC to optimize proposed releases from state-owned impoundments.

Though distinct, consumptive use mitigation and low flow protection standards should be consistent. In 2011, SRBC and its Water Resources Management Advisory Committee (WRMAC) set out to revise SRBC's passby[8] flow/conservation release policy (Policy 2003-01). In December 2012, SRBC adopted a Low Flow Protection Policy containing specifications for determining passby flows and conservation releases associated with approved withdrawals. This policy contains specifications for determining passby flow thresholds. These thresholds are

[8] Passby flows assure that a minimum amount of water is available in a stream for protection of aquatic life. When the passby flow is reached, withdrawals cannot occur until additional flow is restored.

designed to ensure that withdrawals exceeding the SRBC's *de minimis* withdrawal threshold are not operating during critical low flow conditions at which low flow augmentation releases would be made for consumptive use mitigation. Only relatively small water withdrawals considered by SRBC to be *de minimis* in magnitude are excluded from passby flow requirements. The Low Flow Protection Policy passby flow and conservation release thresholds are better aligned with SRBC's contemporary consumptive use mitigation thresholds, particularly for mainstem rivers where consumptive use mitigation is most applicable. Consistency between consumptive use mitigation and low flow protection thresholds ensures that conditions will not occur whereby (1) certain projects are required to suspend withdrawals on a mainstem river at a certain low flow threshold while (2) another project located nearby can continue to withdraw and consumptively use water, unmitigated, until flows decline to a far lower flow threshold. SRBC ensures that approved withdrawals that exceed SRBC's *de minimis* withdrawal threshold, thereby conditioned with passby flow requirements, are required to cease withdrawal operations at specific flow triggers which typically occur prior to initiation of consumptive use mitigation releases elsewhere in the basin.

Limiting future increases in consumptive use in the Susquehanna Basin is an important objective of SRBC's water resource management and regulatory programs. Water availability is generally not a concern during most flow conditions, but becomes an issue during certain low flow periods. Built into SRBC's water use approvals are safeguards, applied on a project-specific basis, to limit the effects of consumptive use during critical low flow periods. The suite of safeguards include: (1) cumulative water use assessments, (2) withdrawal limits, (3) passby flow requirements which necessitate users cease water withdrawals when an identified low flow threshold is reached, (4) conservation release requirements that specify a prescribed quantity of flow from an impoundment structure that must be continuously maintained downstream, (5) the cessation of water dependent operations during critical low flow periods, (6) the provision of low flow augmentation by water users from their own storage facilities, and (7) water conservation measures.

Unlike other withdrawal and consumptive use activities regulated by SRBC, the withdrawal of water by the natural gas industry requires approval in any amount, beginning with "gallon one." As is the case for all water use sectors, natural gas industry approvals issued by the Commission are conditioned with protective requirements to safeguard existing uses and instream flows. As of March 2013, 122 of the 170 (72 percent) approved withdrawal sources for the natural gas industry are conditioned with passby flows, and the remaining 28 percent of withdrawals are conditioned with other protective requirements.

1.2.4 The Nature Conservancy Studies

TNC worked collaboratively in 2009 and 2010 with numerous representatives of federal and state resource agencies, as well as academic scientists and private consultants, to develop flow recommendations for the Susquehanna River and its tributaries based on published literature, existing studies, hydrologic analyses, and expert consultation. TNC's recommendations were published in 2010 in the report *Ecosystem Flow Recommendations for the Susquehanna River Basin*. TNC prepared this report under the auspices of the USACE and SRBC Susquehanna River low flow study described previously (Section 1.2.3). TNC was a member of the low-flow study team and worked under contract to SRBC, but was not a signatory to the study agreement.

The TNC report found that seasonal (monthly) flow recommendations are preferred to year-round flow recommendations (such as Q7-10) as ecosystem flow needs are naturally seasonal. TNC flow recommendations for low flow conditions for large streams and rivers of the Susquehanna River Basin are to limit changes to the monthly low flow range to less than 10 percent and to allow no change to the long-term monthly P95. Aquatic systems can be sustained by preserving the long-term natural hydrologic variability of streams through ecosystem-based flow goals. The TNC set of recommended flows would protect the species, natural communities, and key ecological processes within the various stream and river types in the Susquehanna River Basin.

2.0 ALTERNATIVES CONSIDERED

To address continuing concerns regarding consumptive use and the application of its low flow protection policies, SRBC undertook a number of basinwide investigations covering a variety of options. Some of these options included, but were not limited to: water conservation measures, withdrawal limits, passby flow requirements, cessation of water-dependent operations during critical low flow periods, conservation release requirements, and flow augmentation from storage facilities such as mine pools and surface impoundments. One of the investigations undertaken by SRBC was a proposal to change the criteria it uses to request water supply releases from dedicated storage that it presently owns in USACE's Curwensville Lake.

SRBC initially considered two general options to address low-flow conditions downstream of Curwensville Lake: reduce consumptive water use during low flow conditions, or more effectively use its Curwensville Lake water supply storage. Reducing consumptive use was determined to be infeasible because of public safety and health concerns associated with limiting critical water uses for municipal water supply and electric power generation during droughts (see Section 1.2.3). Instead, SRBC concentrated its efforts on more effectively using its water supply storage within Curwensville Lake. This section of the EA provides a summary of low flow conditions, formulation of water supply release alternatives, and analysis of potential impacts.

The 2012 SRBC technical report *Optimizing Use of Commission-Owned Water Storage at Curwensville Lake, Pennsylvania* provides details regarding alternatives formulation and effects on Curwensville Lake. The SRBC 2010 technical report *Preliminary Assessment of Optimizing Use of Commission-Owned Water Storage at Cowanesque and Curwensville Lakes, Pennsylvania* provides information on preliminary alternative trigger locations and trigger values considered in formulation. Hyperlinks to SRBC websites from which these reports can be obtained are provided in the table of contents of this EA.

2.1 FORMULATION OF ALTERNATIVES

2.1.1 Trigger Values and Locations

SRBC considered a wide range of preliminary alternative trigger values based on both historical annual and monthly streamflow statistics[9]. Trigger values based on annual streamflow data would be constant year round, whereas seasonal trigger values would vary by month. Trigger flows based on flow statistics ranging from monthly P83 – P99, as well as annual Q7-10 and Q30-10[10], were evaluated. Consumptive use mitigation in varying amounts to reflect needs in local watersheds was also considered. Mitigation volume needs were added to trigger values that had been developed based on annual/seasonal flows and flow statistics.

Three trigger locations were evaluated. Due to the proximity of large consumptive users (electric generating utilities) near Harrisburg, PA, flow measurements at the USGS stream gage at that location have been used as an indicator for initiating compensation releases. Currently, the trigger

[9] Additional detailed information on preliminary formulation of alternatives included in SRBC (2010).

[10] The Q30-10 flow is the 30-day average low flow expected to occur at a 1-in-10-year frequency and has a 10 percent chance of occurring in any year, on average.

gage for Curwensville Lake water supply releases is located at Harrisburg, and that site was retained. USGS also maintains a gage at Renovo on the West Branch Susquehanna River (Figure 1-2) and that gage was selected as an additional alternative trigger location because it could represent flows in the middle section of the West Branch Susquehanna River subbasin. Many of the consumptive uses in the West Branch are related to miscellaneous industrial, municipal, and golf course irrigation withdrawals spread throughout the West Branch subbasin. Renovo was identified as a potential alternative trigger point to see if hydrologic modeling might demonstrate significant differences in the timing or volume of water released from Curwensville Lake. Additionally, Marietta, PA (near York, PA), was identified as an alternative trigger location because it is downstream of the current trigger location at Harrisburg (Figure 1-2). Also, SRBC utilizes the Marietta stream gage in its management and regulation of Conowingo Pond and a wide range of other facilities and projects. Use of this downstream gage could potentially facilitate more effective comprehensive management of water supply releases.

2.1.2 Alternatives Screening

Preliminary Screening Conducted by SRBC

SRBC used an iterative process to hydrologically model and screen potential alternatives based on consumptive use mitigation, experience with existing Q7-10 trigger values, and the significance of impacts to environmental or recreational features at Curwensville Lake. To determine the hydrologic impact on Curwensville Lake from the use of alternative trigger values and locations, SRBC used its basinwide hydrologic model, developed by Hydrologics, Incorporated, which uses the Operational Analysis and Simulation of Integrated Systems (OASIS) software program. The model is specifically calibrated for the Susquehanna River Basin. The primary data inputs into the model included daily time-series flow data, consumptive use data, and operational rules for Curwensville Lake and other reservoirs. Modeling was conducted in 2008[11]. The flow input data used were historical hydrologic records from 1930 through 2007 that allowed for analysis of a wider range of wet/dry year conditions than would otherwise be possible since the lake only reached its normal year-round pool level in 1997. A subsequent review of flow data for the years 2008 – 2015 determined that no low flow events occurred during those 8 additional years that would have triggered the use of Curwensville water supply storage, although conditions were close to triggering a release in August 2012[12]. Thus, results of modeling completed in 2008 are still applicable and adequate for the purposes of this EA.

The modeling results for the no action alternative reflect lake conditions that would have occurred over the 78-year modeling period (1930 through 2007) if the lake had been in existence for that full period and if the current trigger components (Q7-10 flow at Harrisburg) were used to guide operation of the lake. Lake drawdowns for project repairs were not included in modeling because such drawdowns are infrequent and occur on as-needed basis so would be inappropriate to forecast. The results of the optional trigger alternatives showed how the lake would have been affected if the alternative trigger values and/or locations had been in effect during the modeling period. The primary outputs from the model included daily water releases from Curwensville Lake, lake

[11] The 2008 modeling results are presented in SRBC (2010).
[12] Flows from 2007 – 2011 are reviewed in SRBC (2012). Flows from 2012 – 2015 were reviewed by the study team that prepared this EA.

elevations, and water supply and conservation storage volumes. Model output includes drawdowns due to normal conservation releases, water supply (from SRBC storage), and the combined effect of both.

SRBC initially identified 43 alternatives for model simulation based on various trigger locations, trigger values, seasonality of triggers, and amounts of consumptive use mitigation flow that would be provided[13]. Generally, the lower the flow statistic percent (i.e., the greater the flow), the more volume of water would be released from the reservoir, and the greater the frequency of days that the lake would be drawn down from no action conditions. SRBC screened these 43 alternatives down to 12 plans based on hydrology, reservoir storage, preference for seasonal (monthly) versus annual hydrologic analyses, experience with Q7-10 historical occurrences, and environmental and recreational effects at Curwensville Lake. Downstream effects were not considered at this time in screening. Trigger flows more frequent than P95 would have greater impact upon Curwensville Lake, while trigger flows less frequent than P95 would have less beneficial effect upon the receiving aquatic ecosystems. Accordingly, trigger flows of P95 which would meet the minimum recommendations of TNC and have less effect on Curwensville Lake than more frequent triggers were retained for further analyses. The proposed trigger flows associated with the alternatives are based on findings of the recently completed study conducted jointly by TNC, SRBC, and USACE described earlier. This study concluded that during a low flow condition, revised standards based on average monthly flows occurring 95 percent of the time would provide better in-stream protection than the annual Q7-10 flow that is currently employed. Alternatives including local compensatory mitigation for the Harrisburg and Marietta trigger locations were dropped from consideration because of potential recreational and environmental impacts in Curwensville Lake, as well as non-conformance with power utility water supply storage contracts. The P95 Renovo alternative that included local consumptive use mitigation remained as a potentially viable plan however, and was retained.

Evaluation of Alternatives by USACE and SRBC

SRBC requested that USACE evaluate the three P95 water supply release alternatives that had passed the screening process described above to potentially identify a plan that would more effectively use Curwensville Lake water supply storage to address downstream low flow conditions (Section 1.1). These three P95 alternatives were compared to the current operating procedure (the no action alternative) (Table 2-1). For all of the alternatives, the triggers would be independent and releases would go "on" and "off" depending on river flow at the trigger gage, regardless of other releases elsewhere in the West Branch Susquehanna or lower Susquehanna River subbasins. The timing of when releases start and finish would differ between alternatives depending on when P95 occurs at the various gages.

[13] Additional detailed information on these 43 alternatives included in SRBC (2010).

Table 2-1: Alternatives passing preliminary SRBC screening. These alternatives are evaluated in this EA[14].

Parameter	Baseline	Alternative R95	Alternative H95	Alternative M95
Trigger location	Harrisburg	Renovo	Harrisburg	Marietta
Trigger flows (see Table 2-2 for values)	Q7-10 value as year-round constant	P95 value for the current month	P95 value for the current month	P95 value for the current month
Months considered for water supply releases	Year-round	July through November	July through November	July through November
Amount of water supply release:	27.5 cfs	31.2 cfs	27.5 cfs	27.5 cfs
Water supply release starts when stream flow is below (+ water supply release):	Q7-10 (+ 27.5 cfs) at Harrisburg.	P95 (+ 31.2 cfs) at Renovo.	P95 (+ 27.5 cfs) at Harrisburg.	P95 (+ 27.5 cfs) at Marietta.
Water supply release stops (unless storage is depleted first) when stream flow is above (+ water supply release):	Q7-10 + 27.5 cfs at Harrisburg for 3 consecutive days or is more than twice Q7-10.	P95 + 31.2 cfs at Renovo for 3 consecutive days or is more than twice P95.	P95 + 27.5 cfs at Harrisburg for 3 consecutive days or is more than twice P95.	P95 + 27.5 cfs at Marietta for 3 consecutive days or is more than twice P95.

The low flow water supply release operations for the three alternatives are based on monthly trigger flows of P95 derived from hydrologic analyses of monthly (seasonal), rather than annual, flow records at the trigger locations shown. SRBC evaluated the flow statistics for the months of July through November, and determined that the months of August through October were the critical times when highest consumptive uses coincided with lowest stream flows. So, it was decided to concentrate primarily on those months for considering altered water supply releases. It was recognized that in July and November P95 values were significantly higher and would trigger many more water supply releases (and potentially exhaust SRBC water supply storage). Accordingly, SRBC elected to utilize triggers for July and November based on August and October triggers, respectively. Table 2-2 presents river flows associated with these trigger value statistics.

[14] Modified from Table 3-4 of SRBC (2012).

Table 2-2: Alternative trigger flows in the Susquehanna River by alternative trigger gage location, time period, and flow statistic alternatives.[15]

Gage	River	Flow Period		Flow Statistic		
				Q7-10 (cfs)	P95[16] (cfs)	Difference Between Q7-10 and P95 (cfs)
Renovo	West Branch Susquehanna	Annual		168	336	168
		Seasonal	July	NA	265*	97*
			August	NA	265	97
			September	NA	183	15
			October	NA	210	42
			November	NA	210*	42*
Harrisburg	Susquehanna	Annual		2,631	4,150	1,519
		Seasonal	July	NA	3,500*	869*
			August	NA	3,500	869
			September	NA	2,980	349
			October	NA	3,120	489
			November	NA	3,120*	489*
Marietta	Susquehanna	Annual		2,718	4,730	2,012
		Seasonal	July	NA	3,750*	1032*
			August	NA	3,750	1,032
			September	NA	2,980	262
			October	NA	3,630	912
			November	NA	3,630*	912*

* July and November P95 statistics were set based on August and October statistics, respectively, as described in paragraph above.

Water supply releases would be triggered whenever flows in downstream rivers at the designated gage sites drop below the monthly P95 values for July through November for more than three consecutive days. Water supply releases would cease when river flows rise above the trigger values for three consecutive days, or rise to more than twice the monthly P95 values.

Curwensville Lake reservoir storage for each alternative includes 7,413 acre-feet[17] of combined USACE conservation storage and SRBC water supply storage. All alternatives were formulated to keep the existing 50 cfs conservation flow release for maintaining minimum downstream flows, plus the Lancashire AMD pass-through flows (see Section 1.2.2). Any of the three new water

[15] Modified from Table 3-3 from SRBC (2012).
[16] Also see Appendix B for information on P95 values presented in some previous documents.
[17] An acre-foot is a volume of water that would cover an acre to a depth of one foot (or 325,829 gallons).

supply release alternatives based on P95 triggers would slightly alter the timing and duration of water supply releases as compared to the existing Q7-10 requirement trigger.

The three proposed water supply alternatives would offset consumptive use more frequently than the current Q7-10 policy (no action alternative) in the months of July, August, September, October, and November. Effects on receiving river ecosystems produced by any of the three new alternatives (Table 2-1) would vary as a function of the location of the trigger gage as well as whether additional volume release was included to offset local use. The greatest reduction in adverse effects of consumptive use from more frequent and longer Curwensville releases would occur downstream to the trigger gage location (Figure 1-2). River lengths to the alternative trigger gage locations are presented in Table 2-3. Downstream of the trigger gage, other consumptive uses would occur that are not compensated for in the release.

Table 2-3: Receiving river lengths divided into segments based on major hydrologic features and proposed trigger gage locations.

Receiving River	Segment		Segment Length (mi)	Total Distance (mi)
	Start Point	End Point		
West Branch Susquehanna	Curwensville Lake Dam	Renovo Trigger Point	85	85
West Branch Susquehanna	Renovo Trigger Point	Confluence of West Branch Susquehanna River with Susquehanna River	101	186
Lower Susquehanna	Confluence of West Branch Susquehanna River with Susquehanna River	Harrisburg Trigger Point	51	237
Lower Susquehanna	Harrisburg Trigger Point	Marietta Trigger Point	26	263
Lower Susquehanna	Marietta Trigger Point	Conowingo Dam*	34	297

*Includes (Lake Clarke [Safe Harbor Dam], Lake Alfred [Holtwood Dam], and Conowingo Pond [Conowingo Dam]

The SRBC modeling described in the alternatives formulation section (Section 2.1) determined change in water elevations at Curwensville Lake that would have resulted over the modeling period from implementation of the water supply release alternatives presented in Table 2-1. SRBC did detailed technical investigations that considered lake-drawdown frequency, depth, duration, and seasonality and compared impacts of the alternatives to the in-lake environment and recreation.

This EA focuses upon drawdowns greater than one foot in its assessment of effects on the environment and recreation features at Curwensville Lake. Lake drawdowns of 0 to 1 foot occur occasionally under normal lake operations. Environmental conditions at the lake are already affected by this range of water levels. Water levels maintained over this range meet recreation needs at the lake as specified in the operations plan.

Environmental effects of drawdowns could occur any time of the year. Impacts on lake recreation could result from drawdowns during the typical recreation season which runs roughly from mid-May to mid-September (May 20th – September 14th for purposes of analysis).

The period simulated covers a lengthy period of time – 78 years, and captures a broad range of climate and streamflow conditions. Based on the assumption that future conditions would be similar to the period of time simulated by modeling, results of the modeling were utilized to characterize future effects of the alternatives at Curwensville Lake.

Based on the simulations, future drawdowns under any of the four alternatives being considered would occur only during dry years when outflow and evaporative loss exceeds inflow. (It should be noted that these drawdowns could occur in repeated future years.) In wetter years, no drawdowns would occur under any of the four alternatives. Thus, characterizing change in frequency of future occurrences of event years is an appropriate means to forecast effects of the alternatives. Percent chance of future years having drawdowns over depth intervals that could affect environmental and recreational conditions of interest were assumed to be represented by the percentage of past years with those drawdown intervals occurring over the simulation period. Data/information available from the simulation was not adequate for the purpose of determining formal percent annual chance according to standard engineering practices.

Adoption of a new water supply release schedule (the topic of this EA) would require revision of the water control plan. Any further revision to the water control plan to address water supply releases would remain in effect until such time as adjustments to the water control plan were determined to be necessary for economic, environmental, or engineering reasons, and the water supply contract between SRBC and USACE revised accordingly.

Drawdown events were divided into medium and extreme severity. The median event year is the event year where the minimum annual lake elevation was the median drawdown for the entire modeling period (a "normal" drawdown event year). An extreme event year is the event year in which the minimum annual lake elevation was the lowest during the entire modeling period. The extreme event represents severely dry conditions (a "worst-case scenario").

Drawdowns greater than one foot would occur in about 14 percent of future years under no action but increase to greater than 20 percent of future years under any of the other three alternatives (Table 2-4). Alternative R95 would have the greatest chance of inducing drawdowns in any future year. Drawdowns would be more likely for most depth intervals for alternatives other than the baseline. However, for H95 and M95 in the 3 to 5 depth interval, the number of future years with drawdowns would be less than under the baseline based on model simulation of historical hydrology.

Table 2-4: Approximate percent chance of future years with drawdown event (maximum drawdown) by depth intervals.[18]

	Drawdown Interval			
Alternative	**1-3 ft**	**3-5 ft**	**> 5 ft**	**Any Drawdown > 1 ft (a)**
Baseline	8%	4%	3%	14%
R95	15%	5%	8%	28%
H95	14%	3%	5%	22%
M95	15%	3%	5%	23%

(a) Note that totals differ from simple sums of individual row entries in some cases because of rounding errors.

Depth and duration of drawdowns during event years that would be expected to occur in the future are presented in Table 2-5. Drawdown events would typically begin in July through September and end by August through February. Drawdown depths among the alternatives would differ by a maximum of one foot during a median event (R95 versus M95). For maximum drawdown conditions, drawdown depth would differ by as much as about 1.6 feet among the four alternatives (baseline versus R95). Average duration of drawdown events would differ between the alternatives depending on event severity and drawdown range considered. For median drawdowns greater than one foot, duration of drawdown would differ by as much as 41 days among the alternatives (H95 versus R95). During median event years, duration of drawdown greater than 3 feet among the alternatives would differ by 9 days with alternatives other than the baseline having no drawdown. Conversely, during extreme events, duration of drawdown would show comparatively little difference among the alternatives.

[18] Information derived from Tables 3-6, 3-7, and 3-8 of SRBC (2012).

Table 2-5: Depth and duration of drawdown events.[19]

Lake Level Drawdown Factors	Alternatives			
	Baseline	R95	H95	M95
1. Depth of Drawdowns				
A. Median drawdown	2.9 feet	3.3 feet	2.5 feet	2.3 feet
B. Maximum drawdown	8.4 feet	10.0 feet	9.7 feet	9.7 feet
2. Duration of Drawdowns				
A. Duration of drawdown > 1 ft for median event	32.5 days	52 days	27 days	11 days
B. Duration of drawdown > 1 ft for extreme event	192 days	197 days	193 days	194 days
C. Duration of drawdown > 3 ft for median event	9 days	0 days	0 days	0 days
D. Duration of drawdowns > 3 ft for extreme event	171 days	185 days	180 days	180 days

The number of days per year in event years that drawdowns would be expected to occur during the recreation season would be less than what would occur during the whole year. This is because drawdowns typically begin midway to late in the recreation season but extend beyond the end of the recreation season in most cases.

The three new alternatives (R95, H95, and M95) would increase the approximate percent chance during any future year that drawdowns greater than one foot would occur during the recreation season over the baseline (Table 2-6). Alternative R95 would produce the greatest increase in the approximate percent chance of future years that drawdowns greater than one foot would occur during the recreation season, increasing from approximately 9 percent to about 22 percent of future years.

Table 2-6: Recreation season approximate percent chance with maximum drawdown by depth intervals each future year [20].

Alternative	**1-3 ft**	**3-5 ft**	**> 5 ft**	**Any Drawdown >1 ft (a)**
Baseline	8%	1%	0%	9%
R95	14%	4%	4%	22%
H95	10%	3%	1%	14%
M95	10%	3%	1%	14%

(a) Note that totals differ from simple sums of individual row entries in some cases because of rounding errors.

[19] Modified from Table 6-1 of SRBC (2012).
[20] Derived from Table 3-12 in SRBC (2012).

2.2 SELECTION OF PREFERRED ALTERNATIVE

To select a recommended plan, the four alternatives were evaluated based on their effects on the physical environment, living resources, and human uses of downstream receiving river ecosystems and Curwensville Lake. In considering environmental impacts, SAV, wetlands, and fish were given focused consideration.

2.2.1 No-Action (Baseline)

The no federal action condition would maintain baseline management practices described previously. The no action alternative represents the base from which changes discussed in this document are measured. The no action alternative would postpone changing the water supply release plan until some future date or abandon changing the plan altogether, and therefore avoid or postpone associated impacts.

The no action alternative would continue the practice of releasing water from Curwensville Lake to compensate for downstream consumptive use whenever the Q7-10 flow trigger conditions are met at the Harrisburg gage (Tables 2-1 and 2-2). Under the baseline alternative, infrequent drawdowns of Curwensville Lake would occur which would induce minor and temporary detrimental environmental impacts to submerged aquatic vegetation (SAV), wetlands, and fish. Approximately 14 percent of future years would have a lake drawdown greater than about 1 foot (Table 2-4). Approximately 9 percent of future years would have a drawdown greater than one foot under no action that would occur during the recreation season and detrimentally impact lake recreation (Table 2-6).

The no action alternative would fail to increase the frequency or duration at which water supply releases are made to compensate for consumptive uses impacting the West Branch Susquehanna and lower Susquehanna Rivers. Vulnerability of aquatic life downstream of Curwensville Lake, including recreationally fished species[21], to adverse effects of consumptive use during extreme low flow conditions would remain unchanged.

2.2.2 Renovo P95 (R95)

Alternative R95 would cause an increase in the percent of future years with drawdown events in Curwensville Lake greater than one foot over the no action alternative (Tables 2-4 and 2-6). Average duration of drawdown in days would also increase over the baseline alternative (Table 2-5). The percentage of future years having drawdown events greater than 1 foot would increase from approximately 14 percent to 28 percent. Percent chance of drawdowns in future years during the recreation season would increase from approximately 9 to 22 percent. In comparison to the baseline alternative, the R95 alternative would induce minor additional adverse effects on SAV, wetlands, and fish, as well as inducing minor additional adverse effects upon lake recreation. It is

[21] Subsistence fishing was not considered, but effects to this would presumably be comparable to effects on recreational fishing.

anticipated that the R95 alternative would have the greatest adverse environmental and recreational impacts to Curwensville Lake among the alternatives considered.

Alternative R95 would provide greater mitigation for consumptive use over the baseline alternative (Table 2-2). Although utilizing the most upstream gage (Table 2-3), alternative R95 incorporates additional release volume to mitigate local consumptive use (Table 2-1). Consequently, alternative R95 would provide the greatest water supply releases of the four alternatives to help support P95 flows. Because R95 would provide greatest compensation for consumptive uses in the West Branch Susquehanna and lower Susquehanna Rivers it would provide the maximum benefit to aquatic life in the receiving rivers of the four alternatives.

2.2.3 Harrisburg P95 (H95)

The percentage of future years having drawdown events greater than 1 foot would increase from approximately 14 percent under the baseline alternative to 22 percent (Table 2-4) with alternative H95. This would cause increased minor detrimental environmental impacts to SAV, wetlands, and fish in Curwensville Lake over the baseline alternative. Alternative H95 would increase the approximate percent chance of drawdowns greater than 1 foot occurring in future years during the recreation season from 9 to 14 percent, thus increasing risk of detrimental impacts to lake recreation over the baseline condition (Table 2-6). However, of the three action alternatives considered, H95 would cause the least environmental and recreational effects at Curwensville Lake.

Alternative H95 would better compensate for consumptive use to benefit aquatic life of the West Branch Susquehanna and lower Susquehanna Rivers than the baseline condition, but not to the extent that R95 would. Alternative H95 would produce about the same frequency and duration of water supply releases as M95 (Table 2-1) and thus provide equivalent mitigation for consumptive use and benefits to downstream aquatic life. In comparing R95 and H95, the Harrisburg gage is situated in the lower Susquehanna River subbasin such that it would serve as a better early warning indicator of low flow conditions in the Susquehanna River Basin than would the more upstream Renovo trigger gage[22]. The Harrisburg gage location has been in use for more than 25 years with a successful track-record serving as the trigger for basin water supply operations.

2.2.4 Marietta P95 (M95)

Alternative M95 would increase the likelihood of lake drawdowns greater than 1 foot occurring from approximately 14 percent of future years under no action to 23 percent of future years (Table 2-4). Chance of drawdowns occurring during the recreation season would increase from approximately 9 percent to 14 percent of future years (Table 2-6). This alternative would produce a minor increase in adverse environmental and recreational effects to Curwensville Lake over the baseline condition. The magnitude of lake effects would be similar to H95 but be less than R95.

[22] Except under anomalous lower Susquehanna River subbasin only drought conditions.

Alternative M95 would better offset consumptive use to benefit aquatic life of the West Branch Susquehanna and lower Susquehanna Rivers than the baseline condition, but not to the extent that R95 would. Alternative M95 would produce about the same frequency and duration of water supply releases as H95 (Table 2-1) and thus provide equivalent mitigation for consumptive use and benefits to downstream aquatic life. However, in comparing M95 to H95, the Marietta gage is located downstream of several major water use projects and reflects more substantially regulated conditions than is otherwise typical of the Susquehanna River. Consequently, the Marietta gage location would not likely be as effective an indicator of low flow conditions as the Harrisburg gage location.

2.2.5 Preferred Alternative

Of the alternatives considered, R95 would best offset consumptive use in the West Branch and lower Susquehanna Rivers, but would induce the most frequent and severe drawdowns in Curwensville Lake. Because of concerns over lake environmental and recreational impacts, alternative R95 was rejected from consideration. Alternatives H95 and M95 would provide greater water supply releases to mitigate consumptive use and more greatly benefit the downstream ecosystems and recreational fishing than would the no action alternative. Alternatives H95 and M95 would produce similar minor increases in detrimental environmental and recreational impacts at Curwensville Lake over no action. Because of negligible differences between effects of H95 versus M95 there would not be a compelling reason to change the trigger gage location from Harrisburg to Marietta. Additionally, in comparing H95 and M95, the Marietta gage location would not be as effective an indicator of low flow conditions as the Harrisburg gage location.

Based on the above considerations, a modification of the water control plan at Curwensville Lake using alternative H95 as the proposed low flow trigger for water supply releases is the preferred alternative. Accordingly, SRBC is proposing the following trigger flows at the Harrisburg gage for activating Curwensville Lake water supply releases: July –3,500 cfs, August – 3,500 cfs, September – 2,980 cfs, October – 3,120 cfs, and November – 3,120 cfs instead of the current annual Q7-10 value of 2,631 cfs.

The net effect of these proposed changes is that the frequency and duration of Curwensville Lake water supply releases would be slightly greater with alternative H95 as compared to the no action alternative. The rate of water supply release from Curwensville Lake would be the same when releases are made (Table 2-1). The proposed action would be implemented by modifying the timing of water releases through the existing gates at Curwensville Lake. The proposed action would not require any physical construction.

3.0 AFFECTED ENVIRONMENT

This EA focuses on conditions in Curwensville Lake and the instream and shoreline habitats of the West Branch Susquehanna River and lower mainstem Susquehanna River. These areas would be anticipated to experience the most notable effects from the proposed water supply releases. Where pertinent, this EA also considers conditions outside of these areas.

3.1 PHYSICAL ENVIRONMENT

3.1.1 Topography

The study area crosses several physiographic provinces: the Appalachian Plateau, Ridge and Valley, and Piedmont. The highest elevations occur in the Appalachian Plateau. The plateau is dissected by streams which in some cases form deep valleys. The Ridge and Valley province consists of a series of parallel ridges and valleys. The ridges contain steep slopes, while valley areas are more gently sloped. The Piedmont contains low rolling hills with generally more gentle slopes than the Ridge and Valley or Appalachian Plateau provinces.

The West Branch Susquehanna River originates within the Appalachian Plateau and flows eastward, crossing into the Ridge and Valley Province in Williamsport. The Susquehanna River mainstem flows through the Appalachian Plateau in New York and northeastern Pennsylvania, but then crosses into the Ridge and Valley Physiographic Province near West Pittston, PA. The Susquehanna River crosses onto the Piedmont Province at Harrisburg, PA.

Clearfield County topography is steep rolling to hilly. Valleys and streams dissect ridges and hills. Elevations in the Curwensville Lake project lands range from about 1,900 feet elevation on the higher ridges north and south of the valley to greater than 1,000 feet at the damsite. The West Branch Susquehanna River lies at 790 feet elevation where it leaves Clearfield County and descends to about 425 feet elevation at its confluence with the Susquehanna River. Elevations along the lower Susquehanna River decrease to about 290 feet at Harrisburg, then to 200 feet at Marietta, PA (USGS, 2013).

3.1.2 Geology and Soils

The Appalachian Plateau contains flat layers (i.e., not folded) of sedimentary rock. The Ridge and Valley province contains folded sedimentary rock, with erosion-resistant rocks forming ridges (mountains). The Piedmont contains a complicated mix of igneous, metamorphic, and sedimentary rock types. Glaciers during the Ice Ages pushed southward from Canada into northern Pennsylvania, scouring out geologic materials, as well as depositing sediments. Glacial outwash deposits extend downstream southward of the glaciers' physical position along the Susquehanna River to about Columbia, PA. The West Branch Susquehanna River subbasin was not glaciated.

Underlying rock in Clearfield County consists predominately of shale, siltstone, sandstone, and coal. Clearfield County has cyclic sequences of shale, sandstone, limestone, coal, and conglomerate from the Carboniferous Period. The northwestern part of the county contains reservoirs of deep oil and gas (Schultz, 1999). The Curwensville Lake area is notable geologically for deposits of hard clay that occur. These were historically mined to make fire brick (Berg, 1987).

Substrate on the Curwensville Lake shoreline are rocky, largely comprised of native in place geologic materials, but also possessing rip-rapped areas where people have placed rock. Lake substrates consist primarily of old river and floodplain geologic materials and soils that were drowned in place when the lake was created overlain by more recent deposits. The lake substrate on underwater portions of the dam consists of rip rap of the dam itself.

Substrates in the West Branch Susquehanna and Susquehanna Rivers range from woody debris to loose sediments (mud, sand, gravels) to boulders and bedrock. Large bedrock outcrops occur where the rivers cut through erosion-resistant geologic materials, such as in association with ridges on the adjacent landscape. Cobble and gravel are the predominant substrate types in the riffle and pool habitats throughout the rivers. Sand and silt are largely limited to backwaters, river margins, and other depositional areas of these rivers. Deep pools can contain soft river bed material.

Soils in the Susquehanna River Basin derive from glacial deposits (in the northern geographic regions described above), pre-glacial geologic materials, river deposits, and material from human cut and fill activities. Soils of environmental interest in the context of this assessment include those supporting wetlands (hydric) and farming.

Wetland soils occur naturally in the study area in valleys along rivers and streams, in depressions formed by glaciers (in northern Pennsylvania), and in seepage areas at slope toes. Wetland soils developed locally along the current shoreline of Curwensville Lake following lake creation on flat slopes where lake water level wetted the soils. Additional information on wetlands at Curwensville Lake is available in Section 3.2.3 “Wetlands.” Mapped hydric (wetland) soils along the shoreline of the lake include Atkins silt loam, Philo silt loam, Pope loam, Tyler silt loam, Udifluvents sandy, and Wharton silt loam.

Soils mapped to occur on the margins of Curwensville Lake and in close proximity to the reservoir include a substantial area of soils classified as important farmland soils (prime farmland and farmland of state importance) (USDA, 2015). These soils have combined physical and chemical characteristics best for producing crops and are also available for farming. Inclusion of soils on the important farmland list does not constitute a recommendation for a particular land use. Soil series mapped to occur on the shoreline and vicinity of the reservoir with important farmland map units include Allegheny silt loam, Cavode silt loam, Ernest silt loam, Gilpin channery silt loam, Monongahela silt loam, Philo silt loam, Tyler silt loam, and Wharton silt loam.

3.1.3 Hydrology

Curwensville Lake

Curwensville Lake is manmade with water retained by the dam and level managed by water control structures. The lake is deepest over the historic river channel, with shallower depths occurring in the drowned historic floodplain (Figure 1-1). The lake is deepest near the dam, where maximum water depth is about 33 feet. Depths in the historic channel gradually decrease progressing upstream. About 3.5 miles upstream of the dam following the river channel, depths of the maintained pool are about 25 feet. By 4.8 miles upstream of the dam, water depths in the channel are about 17 feet. Outflow from Curwensville Lake provides principal flow for the West Branch Susquehanna River immediately downstream of the dam.

Over the period 1998-2010, USACE maintained the lake at its normal pool elevation of 1162 ft or higher 92.5 percent of the time. Table 3-1 presents a summary of recorded water levels in the lake over this 13-year period. During this time period, several drawdowns were made to make repairs, and one water supply release was made in 1999. Sections 1.2.1 and 1.2.2 provide additional information on lake water level management.

Table 3-1: Summary of recorded Curwensville Lake drawdowns, 1998-2010[23]. (These are actual measurements, not simulations).[24]

Parameter	Drawdown Range (ft)			
	1-3 ft	3-5 ft	> 5 ft	Total
Number of Years with Drawdown of:	3	0	0	3
Number of Days with Drawdown of:	21	0	0	21

West Branch Susquehanna and Lower Susquehanna Rivers

The West Branch Susquehanna River and its tributaries drain approximately 7,000 square miles of Pennsylvania (West Branch Susquehanna River Task Force, 2005). From its origin in western PA, the West Branch Susquehanna River flows generally eastward and makes its confluence with the mainstem Susquehanna River at Sunbury, PA. The Susquehanna River from this point flows in a southerly direction towards Chesapeake Bay (Figure 1-2; Table 2-3).

Although possessing several low-head dams that provide only minimal storage, the West Branch and mainstem Susquehanna River are primarily large free-flowing rivers from Curwensville Dam until just downstream of Harrisburg, PA. The West Branch Susquehanna River has dams in Clearfield, Shawville, and Williamsport. An inflatable dam lies on the mainstem lower Susquehanna River at Sunbury about two miles downstream of the confluence between the West Branch Susquehanna and Susquehanna Rivers. Then between Harrisburg and the river's mouth at the head of Chesapeake Bay, the lower Susquehanna River has four large hydroelectric dams (York Haven Dam, Safe Harbor Dam, Holtwood Dam, and Conowingo Dam) which create sizable reservoirs.

[23] From Table 4-1 of SRBC (2012).
[24] In this EA, different periods of analysis are used by topic as a function of when the analysis was originally conducted, data availability, and other factors as summarized in Section 2.1.

Streamflow varies seasonally. Winter months have relatively high flows due to the combination of low evapotranspiration and high pulse events driven by snowmelt or rainfall. Streamflows usually peak during spring months as snowmelt increases. High pulse events are highest in magnitude and frequency during this season. The magnitude of median daily streamflow is significantly higher (approximately 10 times) in spring than in the summer and fall when flows are at their lowest because of greater evapotranspiration. For all watershed sizes, the highest median flows occur in spring (April), followed by winter (December). The lowest median flows occur in late summer and early fall (represented by August and October, respectively) (TNC, 2010).

Although streamflow shows pronounced seasonality, flows can be highly variable from month to month; floods and droughts may occur in the same year. Major droughts occurred in the early 1930s and the early 1960s, with thirteen droughts occurring over the past century (SRBC, 2010). SRBC defines a water supply drought as a period when actual or expected supply is insufficient to meet demands. The lowest recorded daily discharge at Harrisburg during the drought of record (September 1964) was approximately 1,750 cfs. Recent drought periods include 1980, 1991-1992, 1995 and 2002.

3.1.4 Water Quality

Curwensville Lake

The West Branch Susquehanna River flowing into Curwensville Lake is degraded by effects of AMD in the subbasin, as well as from nutrient loading from agricultural land use. Overall though, nutrient and AMD loads into the lake are declining and conditions in the lake have been improving over the last couple of decades. The lake, formerly classified as eutrophic (generally containing excess nutrients, excess water column algal growth, and low dissolved oxygen conditions), is now classified as mesotrophic (medium levels of nutrients, algae, and dissolved oxygen) by the Pennsylvania Department of Environmental Protection (PADEP). However, the abundance of nutrients is still substantial enough to promote abundant algal growth. Curwensville Lake typically becomes stratified in July through September, possessing a warm surface layer and cooler deep water. A warm surface layer where water temperatures may reach 75° Fahrenheit (F) during the summer extends down to depths of 10 to 16 feet. Below this depth, cool water with temperatures in the 50°s F occurs. As a consequence of high nutrient inputs algal blooms occur in surface waters. Dead algae subsequently descend into deeper waters to decay, consuming oxygen there. Summer stratification that prevents mixing of oxygenated waters from the surface into deep waters causes dissolved oxygen in the deeper waters of the lake to drop to low levels. Surface waters possess healthy levels of dissolved oxygen all year. Lake outflow is managed to maintain water temperatures supporting a warmwater fishery downstream, as well as to dilute AMD received from downstream tributaries.

West Branch Susquehanna and Lower Susquehanna Rivers

The West Branch Susquehanna River subbasin is impaired by AMD, and contains over 36,800 acres of abandoned mine land. More than 1,200 miles of streams are polluted from AMD. Notably, in terms of impaired stream miles, the West Branch Susquehanna basin is likely the most polluted basin of its size in the nation. The streams in the West Branch Susquehanna River subbasin are more impaired than streams in other subbasins of the Susquehanna River Basin. The West Branch Susquehanna River mainstem is degraded by AMD downstream to the vicinity of about Lock Haven, but is then unimpaired by AMD to its confluence with the Susquehanna River mainstem at Sunbury (West Branch Susquehanna River Task Force, 2005; OTSA, 2009; SRBC, 2010).

The SRBC large river assessment project has determined that most water quality parameters in the mainstem Susquehanna River and the mouths of its large tributaries have fairly good water quality, with measured parameters below established water quality standards or recommended tolerances of aquatic life. Total sodium and phosphorus are the parameters that most often exceed standards. Sodium derives from geologic materials and application of road salt. Excess phosphorus derives from animal and human waste and fertilizer.

Treated wastewater from municipalities is in many cases discharged into the West Branch Susquehanna River. Water is treated prior to discharge, and the discharges are regulated under the National Pollutant Discharge Elimination System to ensure that river water quality is maintained.

Waters of the West Branch Susquehanna and lower Susquehanna Rivers are designated as having protected uses by warmwater fish and migratory fish under state law. Existing instream water uses and the level of water quality necessary to protect the existing uses are regulated by PADEP. Curwensville reservoir releases during warm weather months (in other than flood conditions) are made using the top bypass gates. This releases warm water so as not to disrupt designated use of downstream waters for warmwater fish. Accordingly, the river temperature at any location downstream of the dam throughout the summer remains mostly a function of other factors rather than dam water.

3.1.5 Climate

The Susquehanna River Basin possesses a subtemperate and humid climate. Continental weather conditions include cold winters with snow events and warm to hot summers. Within the basin, precipitation and temperature are largely influenced by latitude and elevation. Both precipitation and temperature increase from north to south and from west to east. Average annual air temperatures are approximately 44°F in the northern portion of the basin and 53°F in the southern portion (SRBC 2010).

Across the Susquehanna River Basin, precipitation events can be severe, ranging from localized thunderstorms to regional hurricanes. Average annual precipitation varies across the basin from 33 to 54 inches. Precipitation is generally least in the northwestern part of the basin and greatest in the east and on higher areas in the center and southwest. An estimated 52 percent of precipitation is lost to evapotranspiration, with the remaining 48 percent infiltrating to groundwater storage or resulting in overland flow and streamflow runoff (SRBC 2010).

Mean annual precipitation recorded in Williamsport (approximately 100 miles east of Curwensville Lake) is 41 inches, with some variation between the winter and summer months. The mean monthly temperature varies from 76°F during the summer months to 28°F in the winter. In light of the low winter temperatures, winters in the Curwensville area are relatively severe.

Climate trends in the last two decades have shown wetter conditions, on average, than in previous decades. Increased precipitation has produced higher annual minimum flows and slightly higher median flows during summer and fall. With forecast global warming, hydrologic simulations predict greater wintertime flows and depressed summer flows (Najjar and others, 2010).

The Susquehanna River Basin at its northern end generally lies within USDA plant hardiness zone 5b (annual minimum temperature about -15°F), while the southerly portion of the basin generally lies in USDA plant hardiness zone 7a (annual minimum temperature about 0°F). Considered at a more detailed scale, hardiness zones show local variation. In the Curwensville Lake area, lower elevations in valleys lie in zone 6a (minimum temperature about -10°F), whereas higher areas on ridges and hilltops lie in 5b.

3.1.6 Air Quality

Curwensville Lake

The lake is located in a rural area of Pennsylvania that exhibits good air quality, when compared to the rest of the state. There are only minor sources of air contamination on the lake, primarily associated with vehicles. Clearfield County is in attainment for all criteria pollutants, as defined by guidance pursuant to the Clean Air Act Amendments.

West Branch Susquehanna and Lower Susquehanna Rivers

The PennEnvironment Research and Policy Center reports that air pollution levels in Pennsylvania meet health standards during much of the year, however smog and soot reach unhealthy levels regularly in many parts of the state and Susquehanna River Basin. On hot summer days, ozone levels routinely exceed U.S. Environmental Protection Agency health standards across most of Pennsylvania. The two largest sources of Pennsylvania's air pollution are vehicles and coal-fired power plants.

3.1.7 Noise

On Curwensville Lake, predominant human-produced noise sources include watercraft engines and vehicular traffic, both of which are greatest during the recreation season. Otherwise, the Curwensville Lake area is rural and there are few intrusive noise sources from around the lake. Noises in the receiving rivers vary as a function of proximity to human noise sources. Portions of the rivers in urban areas and near railroad tracks or highways can have substantial noise from those sources.

3.2 HABITATS, PLANTS, AND ANIMALS

Scientific names for select aquatic organisms are provided in Annex B. Rare species for all categories of living things are discussed in Section 3.2.7.

3.2.1 Open Water and Shorelines

Curwensville Lake

Because the lake is an impoundment, drowned natural and manmade features form the bottom habitat. Drowned natural features include former river channel, floodplain, and valley slope, and the rocks and logs formerly on these positions. Drowned manmade features include railroad and roads. Rip rap of the dam creates complicated bottom surface in the vicinity of the dam. Manmade rock rubble humps, stake trees, crib structures, and fish nesting boxes have been emplaced to enhance fish habitat. A band of shallow water 0-7 feet deep occurs around the perimeter of the lake at normal pool elevation (Table 3-2, Figure 3-1). Established shallow water area varies in size as a function of water surface elevation, with shallow areas becoming progressively less abundant as water levels drop. Shallows contain submerged aquatic vegetation (discussed in Section 3.2.2 below). At times of low water levels, exposed lake bottom forms a band of temporary shoreline barren of vegetation. The shoreline at normal pool elevation is predominantly vegetated with some rocky areas.

Table 3-2: Lake, shallow water, and exposed bottom surface area as function of elevation and drawdown.[25]

Lake Elevation (ft)	Drawdown (ft)	Lake Area (acres)	Area of Established Shallow Water Habitat [(a)] (acres)	Area of Exposed Lake Bottom (acres)
1162	0	770	324	0
1161	1	725	279	45
1160	2	680	234	90
1159	3	635	189	135
1158	4	590	144	180
1157	5	545	99	225
1156	6	500	54	270
1155	7	446	0	324

[25] Modified/derived from Table 5-13 of SRBC (2012)

[(a)] 0-7-ft depth, not including new shallow water habitat created at lower elevations during temporary lake drawdowns.

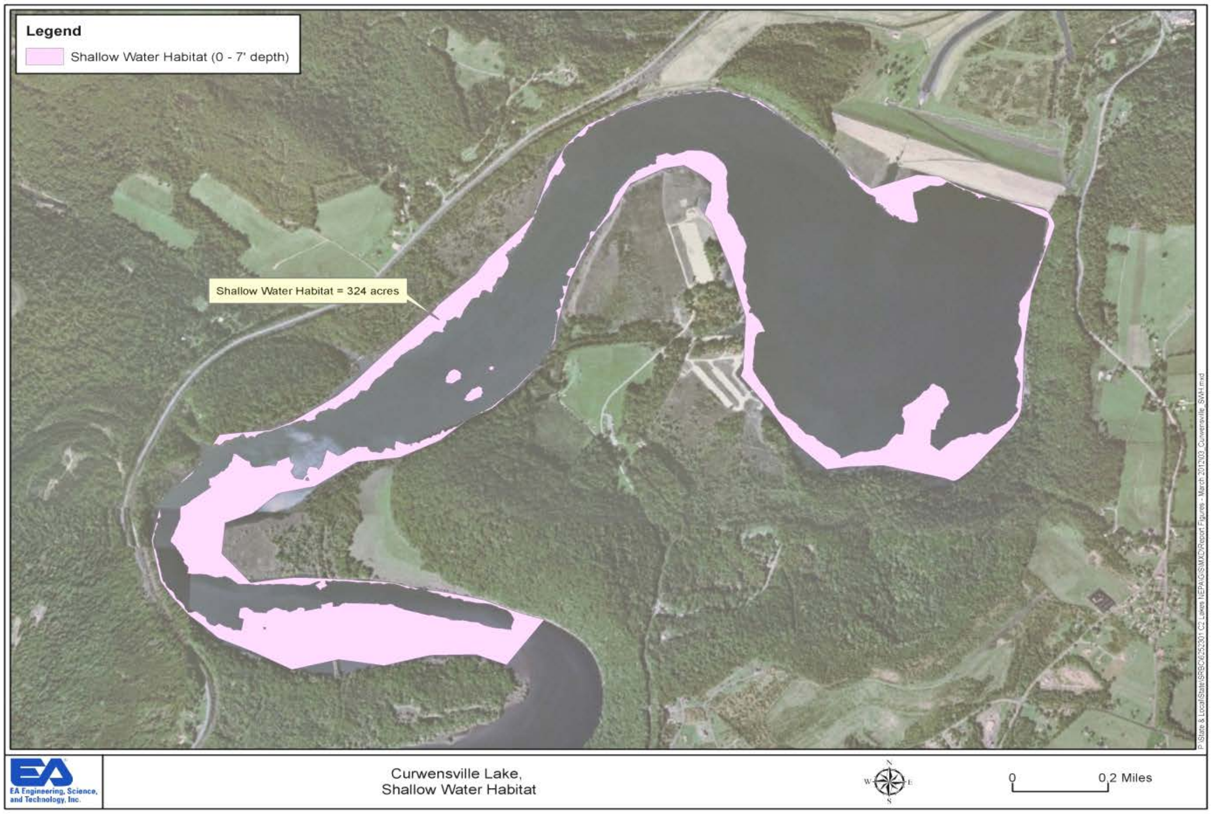

Figure 3-1: Curwensville Lake shallow water habitat map. From SRBC (2012).

<u>West Branch Susquehanna and Lower Susquehanna Rivers</u>

Although several dams occur along the West Branch Susquehanna and lower Susquehanna Rivers (see Section 3.1.3), the majority of the rivers are free-flowing along most of their length until reaching the hydropower impoundments in the mainstem Susquehanna River downstream from the city of Harrisburg, PA. The free-flowing rivers contain riffle-run-pool-glide habitats. Riffles are shallow, high-gradient channel units with moderate current velocities and are characterized by some partially exposed substrate. Runs and glides are characterized by relatively shallow water that flows over a variety of substrates that lack turbulence. Runs are associated with downstream sections of riffles as they lose velocity. Glides are associated with the downstream section of pools as they gain velocity entering a riffle. Pools are deep, low gradient, low velocity stream units. The rivers possess streambanks and shorelines seasonally or perennially devoid of vegetation where vegetation is prevented from growing by ice and water scour, substrate instability, duration of exposure/inundation, or other factors. Where conditions are suitable, shoreline vegetation becomes established seasonally or perennially as discussed in Section 3.2.2.

3.2.2 Submerged Aquatic Vegetation (SAV)

Curwensville Lake

SAV occurs in shallow water with depths of 0 to 7 feet located at multiple locations around the perimeter of the lake (also see Section 3.2.1) (Figure 3-2). SRBC recorded general locations where dense SAV was present in 2011 and mapped approximately 84 acres of dense SAV beds present. In addition to the high density beds, additional low density SAV beds were also present (total acreage of these was not determined). There is probably substantial yearly variation in SAV bed acreage occurring as a consequence of variations in environmental conditions.

SAV species observed in 2011 included common waterweed, European naiad, slender Naiad, and southern naiad. Common waterweed was the dominant species observed. Naiads occurred in small patches throughout the observed SAV beds.

West Branch Susquehanna and Lower Susquehanna Rivers

SAV occurs within portions of the active channel that are permanently inundated during the growing season. SAV requires flows that maintain inundation during the growing season, as growth rates are particularly sensitive to decreases in river stage that expose leaves and stems. One of the Susquehanna River basin's most abundant SAV species is riverweed. Riverweed is a perennial found in moderate to high velocity riffles. Extensive populations have been documented in many tributaries and mainstem reaches within the Susquehanna basin. Riverweed is sensitive to drought because low flows can expose the plants above the water surface, drying out the plants.

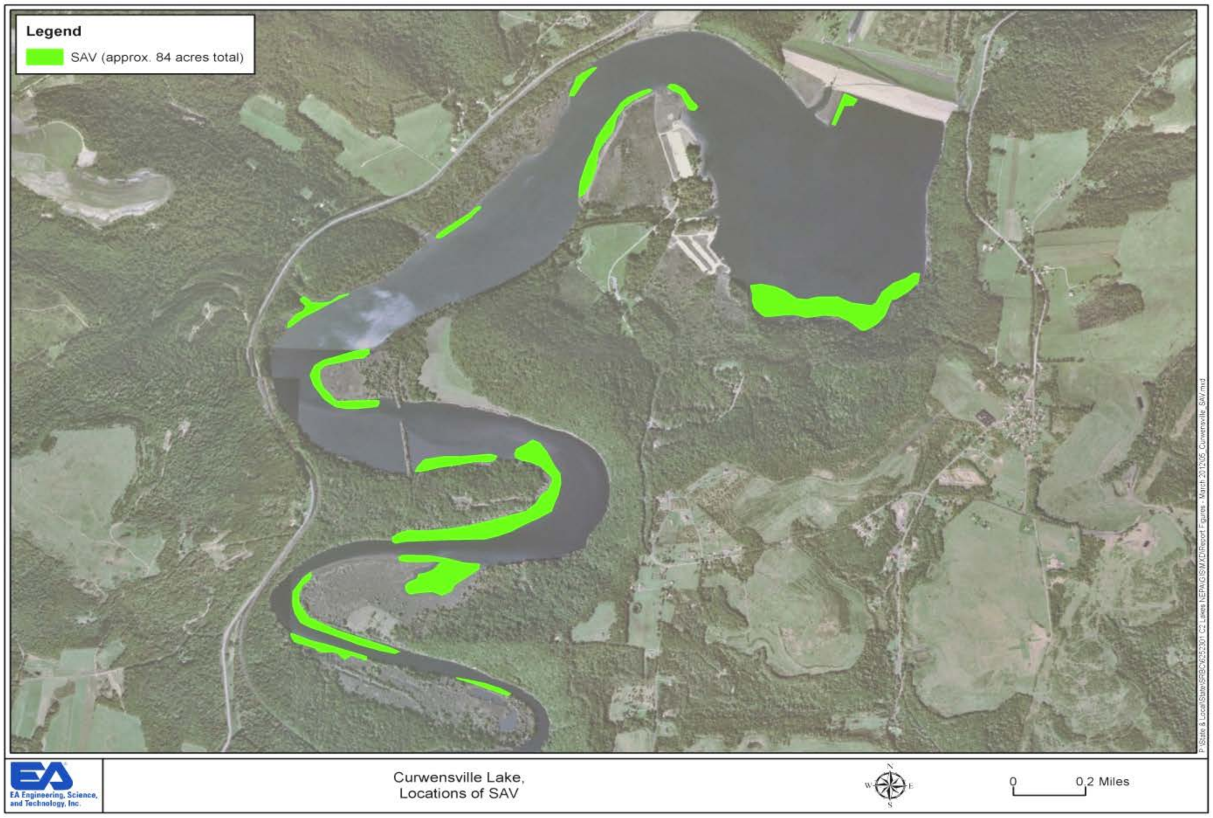

Figure 3-2: Curwensville Lake SAV beds with high density, August 2011. From SRBC (2012).

3.2.3 Wetlands

Curwensville Lake

Curwensville Lake Project lands have wetlands hydrologically connected to the lake and thus dependent upon the lake, as well as wetlands whose water levels are independent of the lake. Of interest to this EA are wetlands occurring along the shoreline of Curwensville Lake that are dependent upon lake water levels. Wetlands dependent upon water from lakes are classified as lacustrine by the U.S. Fish and Wildlife Service (USFWS). Wetlands have colonized the shoreline along the edge of the normal pool in areas where the slope is suitable for vegetation. Management of lake water levels to optimize for recreation also creates conditions suitable for wetlands because these habitats do not experience stresses due to extreme water level changes typical of many reservoirs. Drawdowns greater than 1 foot temporarily dewater the lake edge wetlands.

In 2011, SRBC field investigations documented about 83 acres of wetlands within 11 separate parcels occurring around the immediate margin of Curwensville Lake (Figure 3-3) that are dependent upon water from the lake. Several of these wetlands occur in parcels at the southern end of the lake where sediment from the inflowing West Branch Susquehanna River has formed delta deposits. Plant species occurring in these wetlands include a variety of emergent marsh species such as bulrush, woolgrass, rice cut grass, cattail, reed canary grass and blue flag iris. Shrub and tree wetland species occurring on the parcels include silky dogwood, arrowwood, smooth alder, black willow, red maple and silver maple.

In addition to the lake wetlands described above, other wetland parcels occur further inland away from the lake shore that are maintained by groundwater and inflowing streams. These wetlands are not dependent upon regular water supplied by the lake, and are not further considered in this EA.

West Branch Susquehanna and Lower Susquehanna Rivers

Wetlands occur within portions of the receiving river channels and floodplains with a semi-permanent inundation frequency including on islands, edges of bars, channels and terraces. A variety of plant communities occur within the river channels as a function of ice scour, inundation, and soil development. Where and when severe flood and ice scour occurs, inundation duration is seasonal to temporary flooding, and geologic deposits occur but soil development is minimal, then typically herbaceous (non-woody) plants occur during the growing season. These sites may appear unvegetated early in the growing season and in non-growing season months. A common plant community of this type within the basin are emergent beds of water willow and lizard's tail. During the growing season, emergent beds can tolerate inundation under high flow conditions and exposure under low flow conditions, but the frequency and duration of inundation and exposure can impact the condition of emergent vegetation. Water willow has been shown to decline after eight weeks of desiccation, or exposure of the plant base. Where and when severity of ice scour is moderate, shrub communities often occur on flats, bars and low terraces of islands and banks. Where/when ice scour is low and inundation duration just temporary, floodplain forests occur.

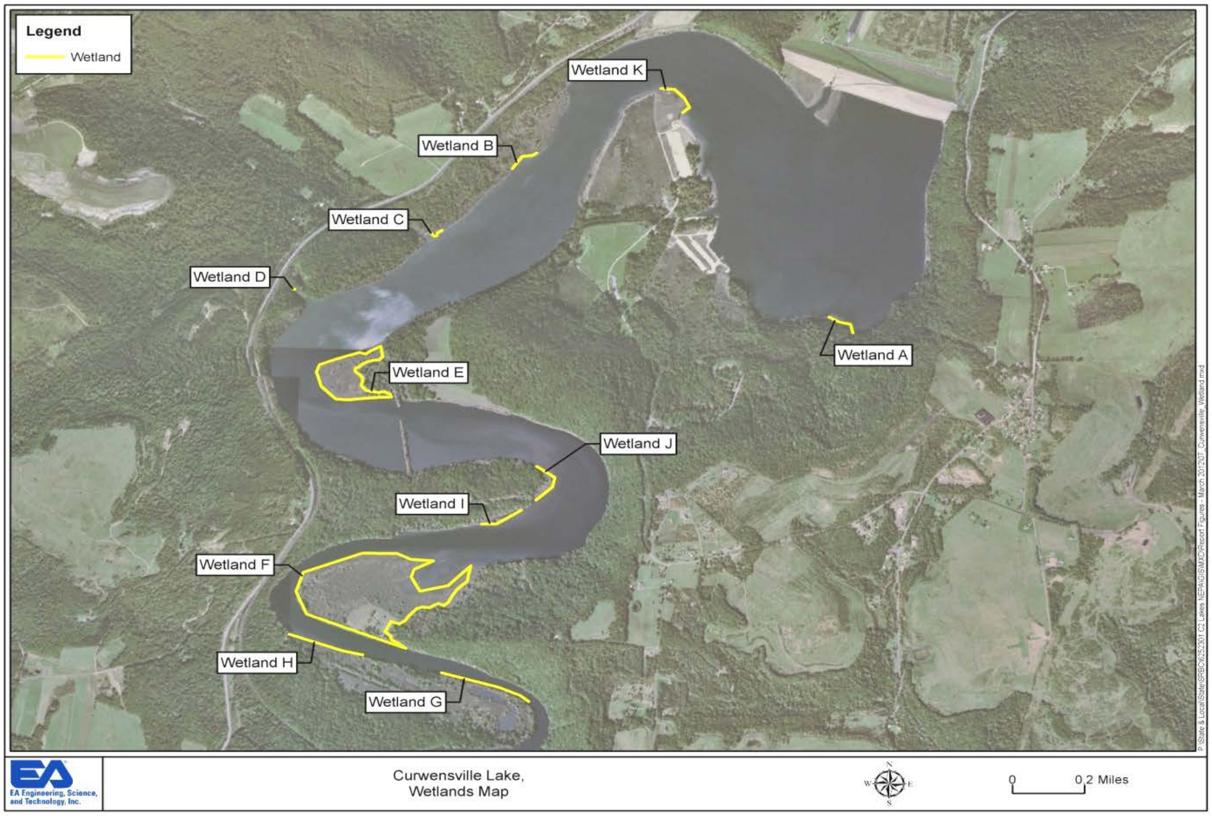

Figure 3-3: Map of lacustrine wetlands at Curwensville Lake. From SRBC (2012).

3.2.4 Upland Vegetation

Curwensville Lake

Lands surrounding Curwensville Lake are comprised of areas of forest, shrubs, and open fields. Landscaped vegetation and mowed lawn occurs in the recreation area and on the dam. Deciduous forest covers the majority of Curwensville Lake project lands. Lands rented by the Pennsylvania Game Commission (see Section 3.3.7) are managed as shrubs and open field.

Forests occurring in the Curwensville Lake vicinity consist primarily of northern hardwoods. This forest type occurs in the northern third of Pennsylvania, but also extends south in the state in areas of high elevation, north-facing slopes, and in cool, moist ravines. This forest type contains a mixture of hardwoods and conifers. Canopy species commonly present include beech, birch, sugar maple, Canada hemlock, and white pine. This forest type in the northwestern part of the state is notable in that it contains numerous mature black cherry. Understory trees present typically include moosewood, witch-hazel, mountain holly, and shadbush.

West Branch Susquehanna and Lower Susquehanna Rivers

Uplands along the receiving rivers are largely rural in character and contain mixes of forest, old fields, and agricultural land. In urban areas, vegetation along the river often includes lawns and a variety of planted landscape shrubs and trees. Upland vegetation occurs along the river where soils rapidly drain and or saturation/inundation is brief during the growing season.

Uplands along the majority of the West Branch Susquehanna and Susquehanna Rivers consist of Appalachian oak forest. This forest type dominates the southern two-thirds of Pennsylvania. Oak forests on lower slopes typically include red and white oaks mixed with tuliptree, red maple, and hickories. On drier upper slopes and ridge tops, white, black, and chestnut oak are common. These forests often have a dense layer of shrubs such as mountain laurel and black huckleberry.

3.2.5 Macroinvertebrates and Finfish

Benthic macroinvertebrates are small spineless bottom-dwelling animals of aquatic habitats visible to the naked eye. These include aquatic insects, crayfish, clams, snails, and worms. They are often used as indicators of water quality and ecological health due to their abundance, known pollution tolerances, and limited mobility. Finfish include commonly fished species as well as species that are not commonly fished; the latter include species eaten by recreational species sometimes called forage fish, as well as large fish that are not sought recreationally sometimes called rough fish. The critical low flow period for aquatic life most commonly occurs in area streams in September.

<u>Curwensville Lake</u>

No specific information on macroinvertebrates occurring in Curwensville Lake were identified in preparation of this EA. Curwensville Lake likely supports macroinvertebrates typical of natural lakes in the vicinity. Zebra mussels, an invasive exotic species, were first discovered at Curwensville in March, 2013. USACE samples macroinvertebrates upstream and downstream of the lake occasionally. The most recent sampling occurred in 2011, but these samples have not yet been analyzed. Prior to that, sampling occurred in 1995. Analysis of these 1995 samples shows macroinvertebrates were present indicating a range of good, moderate, and poor water quality conditions.

Curwensville Lake provides habitat for 23 species of fish, including 11 species of gamefish. Yellow perch and bluegill have been the species most abundantly caught in sampling efforts. Fish health of Curwensville Lake has been improving as efforts to remediate AMD from the watershed have improved water quality and as a consequence of relatively stable water levels following establishment of the year round pool. However, abundance and catch from the lake is relatively low compared to other lakes and reservoirs in the region, presumably because of the short retention time of water and limited primary productivity. A majority of the fish species present in Curwensville Lake spawn between April and July, although some species may spawn into August.

PFBC has stocked the lake with various pan and game fish species to supplement the naturally occurring fish populations. Stocked species in recent years include tiger muskellunge and walleye.

<u>West Branch Susquehanna and Susquehanna Rivers</u>

Benthic macroinvertebrate populations of the West Branch Susquehanna River from the dam downstream to Clearfield, though fairly abundant at some sample locations, indicate that the river is impaired by AMD (OTSA, 2009). Sampling conducted by SRBC at Northumberland, PA, on the West Branch Susquehanna River just upstream of its confluence with the mainstem Susquehanna River found that biota were slightly impaired. Macroinvertebrate community health in the West Branch Susquehanna River mainstem is showing a trend of improvement accompanying AMD remediation efforts in the watershed.

Groundwater flow through stream substrates provides refuge for aquatic insects. Summer baseflows provide thermal refuge for cold-water dependent taxa. Aquatic insects have a number of different feeding strategies, utilized by species as a function of the stream habitat they live in. In riffle habitats, collector/filterer, herbivore, and predators are common. Aquatic insects possess a range of life history traits. Some are able to reproduce more than once per year. Decreasing low flow magnitudes have been associated with changes to aquatic insect abundance and diversity.

TNC determined that at least a dozen species of native mussels occur within the Susquehanna River basin. TNC notes that in addition to these native species, several species of invasive exotic mussels occur, including zebra mussel. Crayfish are a prominent macroinvertebrate species that provide food for numerous other species and are involved in processing instream matter. Several crayfish species occur in the basin.

There are 117 fish species in 26 families within the Susquehanna River mainstem and tributaries (Snyder, 2005). Thirty three of these species have been introduced to the Susquehanna River basin by people. Of the 117 species occurring, three families, carps/minnows (32 species), sunfishes (14 species) and darters/perches (9 species) represent almost half of the species diversity. Sixty species mostly eat insects (insectivores); many of the insectivores are intolerant or sensitive to pollution and other human habitat alterations. The majority of introduced species eat other fish (piscivores) and few are sensitive or intolerant to pollution. Based on habitat use, several groups of fish species are sensitive to flows. Riffle-obligate species spend most of their lives in riffle habitats. Among these are margined madtom, longnose dace, central stoneroller, northern hog sucker, and fantail darter. Riffle-associate species utilize riffles for one or more life history stage. These include: white sucker, shorthead redhorse, and walleye. During the summer months, central stoneroller, margined madtom, northern hog sucker, and fantail darter require flows that maintain swift to moderate current riffle/run habitats. If the magnitude of summer flows is reduced, available riffle habitat may be reduced limiting juvenile and adult growth. Many fish species build nests for spawning, including fallfish, creek chub, river chub, redbreast sunfish, and smallmouth bass. These nests are vulnerable to desiccation and siltation under extreme low flow conditions.

The smallmouth bass population appears to be declining in the West Branch Susquehanna and lower Susquehanna Rivers because of disease and other factors. It has been speculated that recent disease outbreaks of smallmouth bass in the Susquehanna River are linked to water quality impairment exacerbated by severe low flow conditions, to which consumptive use is contributing (SRBC, 2009; PADEP, 2014). High water temperatures are conducive to bacterial growth. Low dissolved oxygen levels cause respiratory stress. Both conditions are exacerbated by excessive low flow conditions.

Several species of herring, striped bass, and American eel migrate between ocean and river habitats (diadromous species) during their life history. Populations of these species are depleted in the Susquehanna River because of fish blockages formed by dams on the lower river. A variety of restoration measures are underway to attempt to restore populations of these species in the Susquehanna River, and individuals of these species occur in the lower mainstem of the river. Egg and larval survival is dependent upon stream velocities being neither too high nor too low during spring and summer.

3.2.6 Wildlife

Curwensville Lake

Typical wildlife species of north western Pennsylvania rural areas that utilize forests, fields, and lakes occur on project lands. Mammal species present include black bear, white-tailed deer, raccoon, gray squirrel, eastern cottontail, woodchuck, white-footed mouse, meadow jumping mouse, and meadow vole. Elk have not been recorded on project lands.

West Branch Susquehanna and Lower Susquehanna Rivers

TNC reports that at least 35 species of reptiles and amphibians, including salamanders (12 species), toads (2 species), frogs (9 species), turtles (8 species), and snakes (4 species), use riverine and riparian habitats in the Susquehanna River basin during various life stages. Dozens of bird species use riparian habitats for nesting and breeding. Waterbirds such as herons and egrets forage in aquatic habitats. Several mammal species are dependent upon river and stream habitats, including shrew, muskrat, river otter, and several species of bats. These species typically nest and forage in close proximity to river habitats.

3.2.7 Rare, Threatened, and Endangered Species

Curwensville Lake

The USFWS reported in a letter dated August 30, 2011 to SRBC that other than for transient individuals, there are no known federally-listed or proposed species in the Curwensville Lake area. (Coordination records are presented in Annex A). However, the letter notes that two bald eagle nests are located in the lake vicinity and that bald eagle feeds on lake waters. Bald eagle is listed as state-threatened in Pennsylvania.

The online Pennsylvania Natural Diversity Inventory (PNDI) was utilized in September 2015 to attempt to identify rare species in the Curwensville Lake and shoreline vicinity. Other than for bald eagle, no federal or state-listed species were identified to occur. Hellbender are not believed to occur in the lake because they occur in swift-moving streams and minimally in slow-moving waters such as lakes (see paragraphs below for additional information).

West Branch Susquehanna and Lower Susquehanna Rivers

No federally listed resident aquatic animal species occur in the receiving river mainstems. However, numerous transient migratory and mobile federally and state-listed vertebrates occasionally utilize aquatic habitats of the receiving rivers.

TNC, SRBC, and PFBC have compiled information on rare animal species occurring in the receiving rivers. A number of aquatic species that are state-listed as rare in Pennsylvania inhabit the Susquehanna River Basin (Table 3-3). In addition to the state listings, several species are recognized to be rare by NatureServe.[26] Of these species, two are of particular interest because they are sensitive to low flow conditions. Green floater mussel and hellbender salamander require good water quality and stronger flows. Green floater is not drought tolerant.

Table 3-3: State-rare resident aquatic animal species in the Susquehanna River Basin.

Taxonomic Group	Common Name	General Occurrence	Status in PA	
			State List	**NatureServe**
Mussel	Yellow lamp-mussel	Streams, rivers, lakes	Unlisted	Vulnerable / Secure (S3/S4)
	Green floater	Rivers	Unlisted	Imperiled (S2)
	Brook floater	Rivers	Endangered	Imperiled (S2)
Amphibian	Hellbender	Rivers	Protected	Vulnerable (S3)

Hickory shad, a migratory fish species, occurs in the lower Susquehanna River. It is state-listed as endangered in Pennsylvania. Its distribution in the river is restricted by fish blockages formed by dams. Efforts are underway to provide fish passage to restore this species numbers.

The hellbender occurs in the mainstem of the West Branch Susquehanna River from Sunbury up to Lock Haven (Petokas, personal communication). Hellbender salamander is adapted to swift water areas of streams with good water quality and complicated habitat conditions created by intermittent rocks.

3.3 COMMUNITY SETTINGS

[26] NatureServe is a non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action. NatureServe and its network of natural heritage programs are the leading source for information about rare and endangered species and threatened ecosystems. USACE maintains a collaborative relationship with NatureServe.

3.3.1 Land Use

Curwensville Lake

The watershed of Curwensville Lake is rural. According to the 1992 feasibility study, forests occupy about half the watershed. Surface mining has affected about 13 percent of the landscape. Small rural residential communities occur locally.

West Branch Susquehanna and Lower Susquehanna Rivers

The West Branch Susquehanna River subbasin contains over 36,800 acres of abandoned mine land. This land use degrades water quality within streams of the subbasin as was described in Section 3.1.4.

The upper portions of the Susquehanna River Basin contain substantial areas of forest. Farmland occurs throughout the basin. Numerous towns and cities occur along the rivers, with a trend towards greatest urbanization in the downstream portions of the basin. The municipalities of Curwensville, Hyde, and Clearfield lie just downstream of Curwensville Lake. Larger municipalities along the West Branch Susquehanna River occurring further downstream include Lock Haven, Jersey Shore, Williamsport, Milton, and Lewisburg. Major municipalities along the lower Susquehanna River mainstem include Sunbury and Harrisburg, PA.

3.3.2 Cultural and Historic Resources

The lands along the West Branch Susquehanna River were hunted and farmed by Native Americans. The river was an important canoe route, providing a means to reach a portage to the Ohio Valley located in Cherry Tree at the upper end of the West Branch Susquehanna River. Initial European settlement in the West Branch Susquehanna valley occurred in the mid-1700s, but battles with Native Americans in the Revolutionary War drove many settlers out of the area. Subsequent to the war, increasing numbers of settlers entered the subbasin and logged and farmed. The West Branch Susquehanna River was an important water route to transport timber out of the area downstream in the 1800s. Lumber City, located just upstream of project lands along the river, was the head of navigable water during that era, and was an important lumbering town. Mills were established locally along waterways to utilize water power. From the mid-1800s onward, coal mining became an activity of substantial economic importance. The lower West Branch Susquehanna valley became part of the industrial heartland of Pennsylvania. Subsequently, logging and coal mining have substantially decreased, and the area has had substantial forest regrowth.

Curwensville dam construction and lake filling destroyed and or required relocation of former small communities, a number of structures, and a cemetery. More recently, cultural and historic investigations conducted in preparation of USACE's 1992 water reallocation study identified 6 prehistoric sites and 7 historic sites of potential interest up to elevation 1171 ft. This includes several inundated archaeological sites and below-ground remains of a number of mills and farmsteads/residences. Above-ground portions of structures were destroyed either by mining or dam/lake construction and are no longer present.

3.3.3 Hazardous, Toxic, and Radioactive Wastes (HTRW)

Curwensville Lake

No recent investigations of HTRW for Curwensville Lake project lands have been conducted. However, a preliminary assessment conducted to prepare a USACE 1992 water reallocation report is still considered adequate because of the rural character of the area and continuous management of project lands by USACE. The potential for HTRW occurring on Curwensville Lake project lands is low.

West Branch Susquehanna and Lower Susquehanna Rivers

Altered low flow conditions in the receiving rivers would have no likelihood of exposing HTRW materials or altering exposure to existing HTRW materials. Thus, this topic is not given further consideration in this EA.

3.3.4 Transportation and Navigation

Curwensville Lake

Interstate 80 passes to the north of Clearfield Borough providing east-west transportation across northern PA. US route 322 parallels Interstate 80 to the south, passing through Clearfield Borough. US Route 219 provides for north-south transportation to the west of Curwensville Lake. The lake is accessible by county road 879 from the north and west, county road 969 from the south, and county roads 729 and 453 from the south and east.

Historically, the West Branch Division of the Pennsylvania Canal system paralleled the West Branch Susquehanna from Farrandsville downstream to the lower Susquehanna River mainstem. The canal passed through Williamsport, Jersey Shore, and Lockport. The Susquehanna Division of the Pennsylvania Canal System paralleled the lower Susquehanna River mainstem from Northumberland to Juniata. No navigation channels are maintained today in the receiving rivers. The historic canals are largely filled in and no longer navigable (Wikipedia, 2015).

Today, because of limited water depths and natural navigation obstructions, the rivers are used primarily by small watercraft. At manmade impoundments where large, deeper water occurs, conditions are suitable for larger boats.

3.3.5 Water Supply and Use

Curwensville Lake

All water that is used at Curwensville Lake project lands, including the recreation areas, is supplied from groundwater. Sanitary waste from project lands is treated in septic tanks.

West Branch Susquehanna and Lower Susquehanna Rivers

In Clearfield County, groundwater provides the main source of drinking water. Approximately 72 percent of the County relies on community water distribution systems for their water supply (Clearfield County, 2006).

People make use of water from the receiving rivers for public water supplies, industry, agriculture, energy development, recreation, and other uses. When water is withdrawn from a surface water or groundwater source, the portion which is not returned is referred to as consumptive use. These demands are managed by SRBC to prevent severe localized impacts such as dewatering, but the cumulative impact of these uses is felt downstream by the aquatic resources, hydroelectric dams, and water supply intakes, among others, that rely on water. These human uses reduce base flows of the major rivers in the basin. The largest water users in the West Branch Susquehanna River subbasin are two power plants: Montour and River Hill. Major municipal water uses include Renovo Borough Water Department, South Renovo Borough, and Montoursville Municipal Waterworks.

At the scale of the whole Susquehanna River Basin, the reported consumptive use for electricity generation is the largest consumptive use at 92.7 million gallons per day, based on SRBC data. The unconventional natural gas industry ranks second, consuming 10.4 million gallons per day. Water supply (8.9 million gallons per day) and manufacturing (8.3 million gallons per day) rank third and fourth, respectively. Nearly half of the annual consumptive use occurs during the typical low flow period of July through November.

Extraction of natural gas using unconventional hydraulic fracturing or hydrofracturing techniques from shale bedrock that underlies much of the Susquehanna River Basin occurs. The hydrofracturing techniques involve the introduction of large volumes of water (4 to 5 million gallons per well) under very high pressures to stimulate the release of the natural gas contained within the bedrock. Rather than a continuous withdrawal, intermittent and short-term withdrawals are conducted to accumulate the water needed for a hydrofracturing job.

3.3.6 Parks and Wild and Scenic Rivers/ American Heritage River

Curwensville Lake

Project lands are park-like in character, and managed as open space to provide recreational opportunities under USACE environmental stewardship policies.

West Branch Susquehanna and Lower Susquehanna Rivers

Federal and state designation of wild and or scenic is done for the purpose of protecting specific rivers from development that would substantially change their wild or scenic nature. Neither the

West Branch Susquehanna River nor Susquehanna River are designated as wild nor scenic by the Federal Government nor Pennsylvania.

American Heritage Rivers are designated by the USEPA to coordinate efforts of multiple governmental entities to further natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The middle Susquehanna River mainstem in Pennsylvania upstream of the confluence with the West Branch Susquehanna River is designated as an American Heritage River. However, the mainstem of the lower Susquehanna River downstream from the confluence with the West Branch Susquehanna River in Sunbury is not designated, nor are any of the rivers within the West Branch Susquehanna River Watershed.

The West Branch Susquehanna and lower Susquehanna Rivers flow through numerous public open space areas (Table 3-4).

Table 3-4: Parks through which receiving rivers flow.

Park Name	River	Nearby Community
Irvin Park	West Branch Susquehanna	Curwensville
Sproul State Forest		Karthaus, Keating
State Game Lands Number 100		Pottersdale
Bucktail State Park		Westport, Hyner
State Game Lands Number 89		Farrandsville
Bald Eagle State Forest		Lock Haven
Susquehanna State Park		Duboistown
State Game Lands Number 126		Duboistown
Tiadaghton State Forest		Williamsport
Milton State Park		Milton
Shikellamy State Park	Susquehanna	Sunbury
State Game Lands Number 233		
State Game Lands Number 254		
State Game Lands Number 290		Duncannon
Riverfront Park		Harrisburg

3.3.7 Recreation and Aesthetics

Curwensville Lake

Curwensville Lake provides recreational opportunities for boating, speed boating, water skiing, fishing, swimming, picnicking, and camping. Curwensville Lake Recreation Area on the southern shore of the lake contains formal recreation facilities. The CLA, formed in 2009 to manage the recreation area, receives income generated from the recreation area and appropriations from Clearfield County, PA. The recreation area contains a beach area, campground with 50 sites, parking areas, boat launches, boat-mooring slips, kayak/canoe launch, bathrooms, and sanitary dumping facilities. There are about 80 seasonal boat-mooring slips which people rent from CLA. Renters are responsible for providing their own dock which they must remove by November.

People fish the lake from shore and boats. Additionally, although the CLA closes recreational facilities during winter, ice fishermen regularly fish at their own risk when the lake is frozen. Information on recreational fish species is provided in Section 3.2.5. PA Fish and Boat Commission stocks the lake annually with tiger muskellunge.

Hunting is permitted on Curwensville Lake project lands except in posted public use areas. Pennsylvania Game Commission leases property from USACE generally on the west side of the entrance road to provide managed hunting opportunities. Game species occurring on project lands include wild turkey, ruffed grouse, white-tailed deer, cottontail rabbit, black bear, gray squirrel, and fox. Information is not available to characterize magnitude of hunting activity in project lands.

Peak recreation season is from mid-May to mid-September, with July and August being peak recreational visitor months. From May through October 2015, approximately 23,000 paid visitors utilized the lake recreation area, and approximately 3,400 people camped in the campground.

In addition to recreation facilities at the lake, there is a fishing access area operated by Pike Township downstream of the lake, and an area upstream of the lake utilized by Bell's Landing Baptist Church for picnicking and ballgames.

The rural character of the area provides for lake, forest, and open field vistas. A trail system crosses the recreation area and adjacent project lands and affords views of the lake.

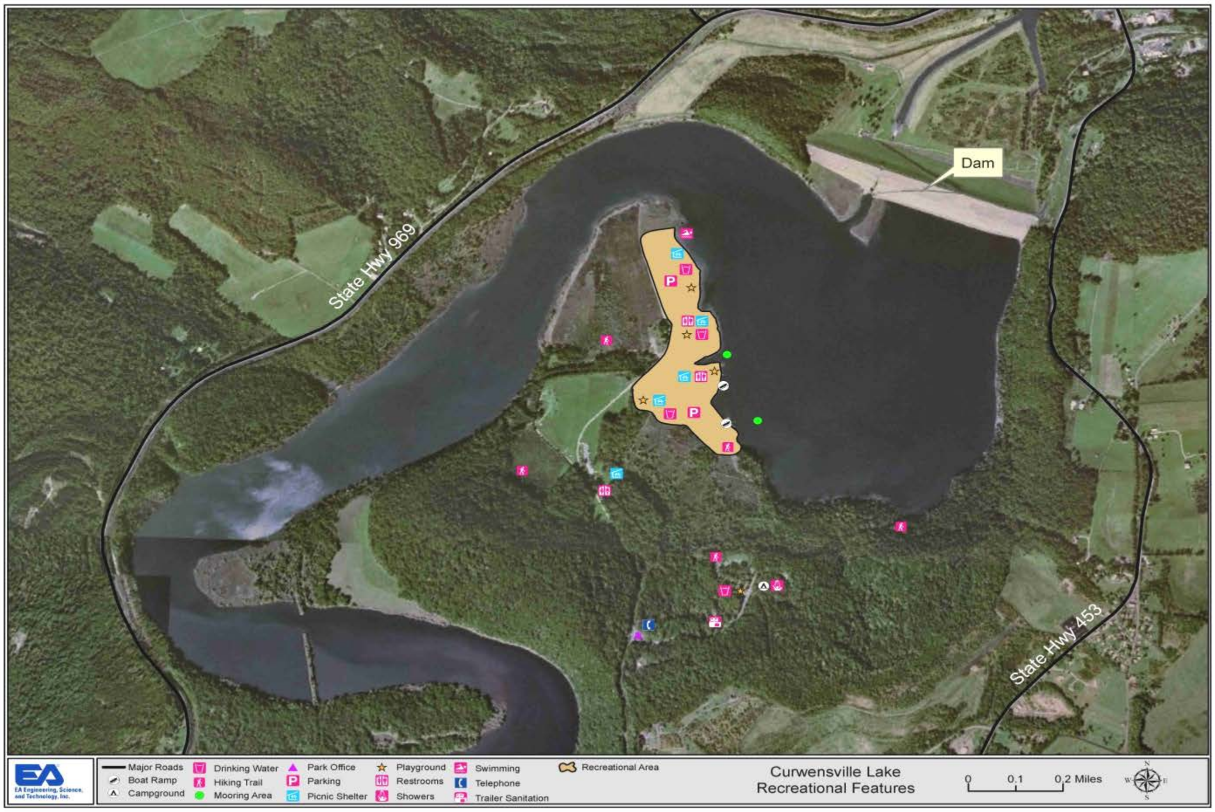

Figure 3-4: Recreational features at Curwensville Lake. From SRBC (2012).

<u>West Branch Susquehanna and Lower Susquehanna Rivers</u>

The West Branch Susquehanna River is becoming increasingly important as a recreational fishing stream. The mainstem from Curwensville Dam downstream to about Lock Haven is degraded by AMD, but still provides recreational fishing opportunities for smallmouth bass and channel catfish. Below Lock Haven, recreational fishing for smallmouth bass, walleye, channel catfish, and muskellunge occurs in the river. Some trout occur in the mainstem (Vuerte, 2010). Trout Unlimited is leading continued efforts to improve environmental conditions in tributaries of the West Branch Susquehanna River to improve fishing opportunities.

Fishing, hunting, power boating, paddling, and swimming are available in the receiving rivers, along with hiking and biking opportunities on nearby trail systems. There are numerous public and private access points for people along the receiving rivers.

Canoeing and kayaking are popular on organized water trails. Susquehanna River Water Trail is a 228-mile long paddling journey starting at Cherry Tree in Indiana County and ending at Shikellamy State Park in Northumberland/Sunbury at the confluence with the mainstem Susquehanna River. The Susquehanna River Water Trail provides canoeists and kayakers with a route on that river. Impoundments created by York Haven Dam, Safe Harbor Dam, Holtwood

Dam and Conowingo Dam hydroelectric generation facilities provide recreational boating opportunities for larger boats.

The Susquehanna River in Pennsylvania is well known for its smallmouth bass fishing. Other popularly fished species include walleye, muskellunge, flathead catfish, and carp. The Susquehanna River is widely considered one of the premier fisheries on the east coast. However, there appears to be a decline in smallmouth bass fish populations underway in some areas, and the future of the fishery was the subject of several public meetings hosted by the PFBC between 2006 and 2010.

3.3.8 Population and Socioeconomic Conditions

Curwensville Lake

Curwensville Lake project lands have no permanent residents. The campgrounds are temporarily populated in the summer by campers. USACE staff includes the Head Dam Operator, the Assistant Dam Operator, and seasonal maintenance worker(s). The CLA typically has about 9 people on its staff. At Curwensville Lake during the recreation season on busy days, CLA typically has 6 to 7 staff working. During the non-recreation season, CLA staff typically perform about a month of fall cleanup and work two months to prepare for the recreation season in the early spring. No CLA staff typically work at the lake during the winter unless there is an emergency. No CLA staff are housed on project lands.

Northwestern Pennsylvania is populated with descendants of early settlers. These included people from New England who themselves were descended from immigrants from England, as well as Welsh and Polish immigrants, and Pennsylvania Germans. The area did not receive the large influx of immigrants that major urban centers of Pennsylvania did in the 19th and 20th centuries. The Clearfield County 2006 master plan reports that historically the economy of the area relied heavily on the extraction of natural resources and the manufacturing industry. Timber harvesting and coal mining still occur in Clearfield County and play an important role in the local economy, but are not as important as they once were. The local economy is showing the same trend which is occurring across Pennsylvania and is transitioning to a service-based economy with lower wages. High unemployment has occurred in Clearfield County for several decades. The working class population has been leaving the County for better employment opportunities, while the remaining County population consists of a high proportion of aging residents who require increased services. Rural areas tend to have higher unemployment rates than urban areas.

The county master plan reports that top employers in the county are healthcare and social service fields, as well as retail trade. Agriculture plays a minor role in Clearfield County's economy. Most of the farms are small, and most farmers also have other jobs to earn a living. Northwestern PA is of national importance for production of high quality hardwood that is cut from regional forests. Coal is produced in the county and the county has a substantial number of surface mine operators, employees, and active mine sites. Coal production was formerly a major industry for

Clearfield County, but declined in the 1980s and 1990s. Clay is mined in the county for brick production. Shale and sandstone are quarried to obtain construction material.

Outdoor recreation, hunting, and fishing are of substantial regional economic importance. The state "Pennsylvania Wilds" initiative is seeking to maintain and improve these opportunities. Curwensville Lake is an important tourist attraction in Clearfield County, and is considered important to sustainability of tourism.

Natural gas drilling is occurring Clearfield County. Drilling activities are currently concentrated north of Interstate 80 in the vicinity of Moshannon State Forest.

The U.S. Census Bureau estimates that Clearfield County had a population of about 81,191 people as of 2014. The county master plan states that the civilian labor force in Clearfield County as of December 2005 was 41,100. Curwensville Borough has been declining in population in accordance with the regional trends described previously, and had a population of 2,650 people as of 2000. Clearfield Borough population has remained somewhat stable. The U.S. Census Bureau estimates Clearfield Borough had a population of 6,064 people as of 2014. The U.S. Census Bureau estimates that 18.9 percent of the population is 65 years in age or older as of 2014. The county master plan estimates that more than 22 percent of the population will be age 65 or older by 2020. As of 2014, the U.S. Census Bureau estimates that Clearfield County's residents were about 95 percent white, 3 percent black, and 3 percent Hispanic or Latino (because of rounding errors these percentages add up to over 100 percent).

The U.S. Census Bureau estimates that over the period 2009-2013, Clearfield County's per capita annual monetary income was $21,273. This was substantially less than estimated per capita annual monetary income in Pennsylvania over the same period of $28,502. The county master plan states that the poverty rate is high compared to state and national standards. As of 2014, the U.S. Census Bureau estimates that 14.5 percent of county residents lived in poverty, while the rate for the entire state was 13.3 percent. The county master plan reports that from 2000 to 2005, participation and eligibility for public assistance increased. As of 2005, 12.3 percent of the population received food stamps. In 2003, 42 percent of county students were eligible for either free or reduced lunches.

West Branch Susquehanna and Lower Susquehanna Rivers

River tourism and recreational use are major contributors to the economy of the region. There are no conventional commercial fisheries presently operating on these rivers. However, there is a substantial guided fishing industry. Numerous guides presently operate on the lower Susquehanna River and this practice has become a substantial part of the fishery and local economies. Some guides also operate on the West Branch Susquehanna River. The PFBC (2009) estimated that recreational angling associated with the Susquehanna River between Sunbury, PA and Holtwood Dam had an annual estimated economic contribution of more than $2.4 million in 2007. Recreational angling in this section of the Susquehanna River also generated an economic impact of more than $975,000 annually, including creation of 16 fulltime jobs created specifically by this use.

4.0 ENVIRONMENTAL CONSEQUENCES

The text below describes effects of alternative H95 (the proposed action/recommended plan) compared to existing (no action) conditions. Effects of the non-recommended alternatives were evaluated in Section 2. The 2012 SRBC technical report *Optimizing Use of Commission-Owned Water Storage at Curwensville Lake, Pennsylvania* provides a detailed analysis of the effects of the recommended and non-recommended alternatives on Curwensville Lake. The 2010 TNC report *Ecosystem Flow Recommendations for the Susquehanna River Basin* provides an overview of benefits of maintaining and restoring instream flows. The table of contents of this EA provides hyperlinks for websites displaying these documents.

Effects of the proposed water supply releases of alternative H95 would all be indirect from an environmental impacts analysis perspective, in that they would occur after and or at a different place from the actual water release gates at Curwensville Lake. Depending on the category, impacts would range from short-term, lasting for up to periods of months, to long-term, lasting for periods of years.

Impacts of the proposed action to non-living components of the physical environment are reported in the "4.1 Physical Environment" subsection below. Value judgments over whether these impacts are positive or negative are included for water quality and air quality based on how these impacts relate to established criteria to protect human beings and aquatic life, but are not included for the other physical environment topics considered. Value judgments over whether impacts of the proposed action are positive or negative to living things (other than people) and people are contained in subsections 4.2 (Living Things) and 4.3 (Community Setting) of Section 4. For living things, magnitude of impact is evaluated based on likely effect on health of individuals, populations, and or communities of plants and animals at Curwensville Lake, receiving rivers, and or greater geographic areas, as appropriate for the topic.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Topography

The H95 alternative would not involve any construction or earth disturbance at Curwensville Lake, nor would water supply releases alter water flows that cause erosion in receiving rivers. The offset in consumptive use and resultant increase in low flows in receiving rivers over no action would have no effect on bottom features within receiving rivers. Therefore, the proposed action would not have any topographic effects.

4.1.2 Geology and Soils

Curwensville Lake

The H95 alternative would not involve any construction or earth disturbance, therefore no direct impacts to geologic materials or soils would occur.

During drawdown events under no action or H95, tens of acres of exposed lakebed would dry out and be vulnerable to increased erosion depending on magnitude of drawdown (Table 3-2). Any materials eroded from the exposed lakebed would be deposited in deeper waters of the lake. Soils in the 83 acres of wetlands dependent upon Curwensville Lake water would dry out during drawdown events. During drawdown years, soil processes dependent upon wet conditions would not occur (impacts to water quality are covered in Section 4.1.4; impacts to wetlands vegetation are covered in Section 4.2.3).

Drawdowns impacting lake bottom and wetland soils would occur in approximately 22 percent of future years under H95 versus 14 percent of future years under no action (Table 2-4). Alternative H95 would thus induce an increase in the frequency that lake bottom and wetland soil processes dependent upon wetness do not occur. However, no loss of lake bottom or wetland soils is expected under H95 compared to no action.

There would be no impact to important farmland soils under either no action or H95 because these lie above the elevation of the water surface of the lake.

<u>West Branch Susquehanna and Lower Susquehanna Rivers</u>

The H95 alternative would not alter erosive water flows. Low flow conditions in receiving rivers in which deposition occurs would not be affected substantially enough to alter deposition patterns or rates from existing conditions.

Under H95 versus no action, duration of releases would lengthen and the frequency of water supply releases in future years would increase. From the longer duration and additional frequency releases, there would be a minor temporary increase in wetness of geologic materials and soils along 186 miles of the West Branch Susquehanna River and 51 miles of the lower mainstem Susquehanna River under H95 versus under no action. Soil processes occurring in river soils and sediments dependent upon wet conditions would show a temporary minor increase over the no action under H95.

There would be no impact to important farmland soils because these lie above the elevation of the receiving rivers. The proposed action would not affect these soils.

4.1.3 Hydrology

<u>Curwensville Lake</u>

Table 2-4 provides a summary of forecast Curwensville Lake water level drawdowns over various depth ranges that would occur with the proposed action versus no action (baseline). The chance of drawdowns greater than or equal to 1 foot occurring would increase from approximately 14 percent of future years under no action to 22 percent under H95. Seasonality of median and extreme drawdown events would not change. Drawdown depths would show little difference between no action and the proposed alternative in median events, but show approximately 1.3 feet greater drawdown under maximum drawdown conditions. Duration of drawdowns would be similar for all drawdowns greater than 1 foot, but extreme drawdown events would last about 5 percent longer (180 days versus 171 days) under the proposed H95 alternative (Table 2-5).

West Branch Susquehanna and Lower Susquehanna Rivers

Water supply releases from the lake under both H95 and no action would partially offset consumptive uses in the West Branch Susquehanna and lower Susquehanna subbasins to the Harrisburg trigger gage location. However, duration of water supply release would increase under H95 versus no action (Q7-10). Frequency of water supply releases from Curwensville Lake under H95 would increase from approximately 14 percent of future years under no action to 22 percent of future years under H95. Benefits of longer duration and increased frequency of releases would extend downstream along 186 miles of the West Branch and 51 miles of the lower Susquehanna mainstem (total length of 237 miles). Offsets would diminish downstream along this length because of the effects of consumptive use and increasing total volume of water in the rivers. Downstream of the trigger gage location, river flows would remain the same between no action and H95 because consumptive use practices may remove and utilize the added flow.

There would be no increased flooding impacting the developed or natural floodplain.

4.1.4 Water Quality

Curwensville Lake

Drawdowns could pose risk to lake water quality if stratification during summer were disrupted, and mixed bottom water with surface water. However, neither the no action nor H95 alternative would be expected to disrupt the thermocline during summer. With lake drawdowns down to 8 feet (just above the elevation of the bypass gates invert), the thermocline would also track downward into the lake to lower elevations. Under severe drought conditions, drawdown depths below the elevation of the bypass gates could be produced under both no action and the H95 alternative in about 3 percent of future years. The H95 alternative would produce somewhat greater maximum drawdown than would occur under no action during severe drought conditions (Table 2-5). At lake levels produced by drawdowns below the bypass gates elevation, releases to maintain downstream low flows would occur from the bottom flood gates (about 19 feet below the lake surface with an 8 foot drawdown). However, this would occur in the fall when the lake is normally destratified, minimizing effects of altered releases on lake circulation and water quality.

The reservoir regulation manual would preclude USACE making releases that would cause water surface elevation to drop below 1152 feet (10 foot lowering). Thus, impacts associated with a drawdown greater than 10 feet that could impact water quality would not occur from water supply releases under either the no action condition or the proposed alternative.

Overall, the proposed action would have no to minimal effect on water quality in the lake compared to the no action alternative.

West Branch Susquehanna and Lower Susquehanna Rivers

Lake drawdowns of less than 8 feet would show no difference in downstream impact between no action and the H95 alternative under low-flow conditions as the bypass gates that draw lake surface water would remain operational in both cases. Quality of water releases from the lake could change if lake levels drop more than 8 feet below the bypass gates invert elevation. Drawdowns of the lake greater than 8 feet could occur under either no action or the H95 alternative during severe drought events. In that case, water would be released through the bottom flood gates (about 19 feet below the lake surface if an 8 foot drawdown occurred) to maintain downstream flows. However, drawdown depths of greater than 8 feet under severe drought conditions would occur in the autumn when the lake is normally destratified, minimizing differences in quality of deeper from surface lake water, and minimizing impacts to downstream water quality.

Augmented low flow water supply releases from Curwensville Lake would be expected to cause minor improvement effects on receiving stream water quality. Increased baseflows under low flow conditions would be expected to somewhat ameliorate stagnant conditions, dilute pollutants, and promote greater water oxygenation in the receiving water bodies.

4.1.5 Climate

The proposed action would have no effect on climate.

Because future climate change would likely have increasing effects the further into the future that is considered, the forecast presented in this EA is most valid for years in the near future, and less valid into the more distant future. Under forecast future climate change conditions, reduced summer flows in the receiving rivers would exacerbate effects of consumptive use. Consumption offset benefits of alternative H95 could thus be reduced. However, these conditions would increase the relative value to aquatic life of the proposed water supply releases. In the event climate change produces substantial changes in river low-flow conditions, the Curwensville Lake water control plan could be revised to address these changes.

4.1.6 Air Quality

Because no earth or soil disturbance would occur, no increased emission of any pollutants would occur that could affect air quality. Accordingly, no direct impacts to air quality are expected from H95 versus no action.

Lake drawdowns could increase production of dust via wind blowing over the exposed lake shoreline, although this was apparently not noted in the limited previous drawdown events. Increased lakebed exposure would occur in approximately 22 percent of future years under H95 versus 14 percent of future years under no action. However, increased area of bottom exposure (Tables 2-4 and 3-2) would be minimal and any increased dust production would also be expected to be minimal. Additionally, because of the rural character of the area, few people would likely be affected.

4.1.7 Noise

The H95 alternative would involve no physical construction, so no construction noise would be produced. There would be minor changes in frequency of operating dam gates under H95 versus no action because of increased frequency of water supply releases. However, water supply releases produce minimal water flow noises. Thus, there would be no effects to wildlife or humans from noise produced from increased low flow water releases.

4.2 Habitats, Plants, and Animals

4.2.1 Open Water and Shorelines

Curwensville Lake

Under either no action or H95, the lakebed would be exposed when the lake is drawn down by 1 foot or greater. Bottom area exposed would increase as drawdown increases. At a 1 foot drawdown, about 45 acres of bottom would be exposed; at a 7 foot drawdown about 324 acres would be exposed (Table 3-2). During drawdowns, the lake bottom and woody debris on it would dry out. Woody debris would be exposed to weather and probably briefly decay at a quicker rate. Detrimental impacts to quality of lakebed habitat of drawdowns would be minor (independent of SAV which is covered in Section 4.2.2). Under the no action alternative, drawdowns greater than 1 foot would be expected in approximately 14 percent of future years. Under alternative H95, the chance of lakebed exposure would increase to approximately 22 percent of future years. This increased frequency of drawdowns would cause an increase in minor temporary adverse impacts to bottom habitat.

West Branch Susquehanna and Lower Susquehanna Rivers

Water supply releases under no action and H95 would partially offset consumptive use of water degrading stream habitats along 186 miles of the West Branch Susquehanna and 51 miles of the lower Susquehanna River mainstem. Shallow, swift-moving riffle habitats are among the first to change velocity and depth in response to changing stream stage. Riffle habitats would be benefitted by increased flows, with reduced adverse effects of consumptive use being most notable in the West Branch Susquehanna River. Benefits to instream habitat would extend into the lower Susquehanna River but dissipate to negligible. As a consequence of longer duration of water supply releases and an increase in frequency at which water supply releases would be made, H95 would produce an increase in minor temporary benefits to instream habitats.

4.2.2 Submerged Aquatic Vegetation

Curwensville Lake

Reduction in shallow water lake habitat up to 7 feet deep could impact SAV. Drawdowns below 7 feet would have no additional effect because it is absent from these depths. Under the no action scenario, the chance of drawdowns occurring that could affect SAV would be approximately 14 percent of future years. Under alternative H95, the chance that lake drawdown greater than 1 foot would occur that could impact SAV would increase to approximately 22 percent of future years (Table 2-4). Thus, the proposed H95 alternative would produce an increase in future years with drawdowns greater than 1 foot that could cause a minor adverse effect on lake SAV during event years.

Drawdowns greater than about 3 feet would likely have a short-term minor adverse impact on SAV in Curwensville Lake because a portion of the lakebed SAV would dry up. However, the SAV would be expected to recolonize in the following year assuming normal precipitation, so there would be no long-term effect from these events. Years with impacts from drawdowns greater than about 3 feet would be infrequent under either no action or H95. Future years with drawdowns in this depth interval would differ by approximately 1 to 2 percent under no action versus alternative H95 (Table 2-4).

Drawdowns of more than 7 feet would likely adversely impact all SAV beds in the lake. There would be an increase of approximately 1 percent of future years that this event would occur under alternative H95 versus no action (Table 4-1). However, the median and maximum number of days that this event would be expected to occur during these infrequent event years would increase. Based on observations of effects of drawdowns at USACE Hammond Lake, severe drawdowns would likely cause losses of substantial portions of SAV at the lake for up to several years. However, SAV would be expected to recover in several years, barring repeat severe drought events.

Table 4-1: Severe impact events to SAV of H95 alternative compared to no action resulting from drawdowns of 7 feet or more.[27]

Alternative	Approximate % Chance Each Future Year With Event	Maximum Days per Event	Median Days per Event	Minimum Days per Event
No Action	3	24	22	19
H95	4	54	31	5

Overall, alternative H95 would cause increased minor and temporary adverse impacts to SAV over no action. However, there would likely be a slight increase of future years in which impacts would be severe and greatly reduce SAV for periods of up to several years (Table 4-1).

<u>West Branch Susquehanna and Lower Susquehanna Rivers</u>

Under water supply releases from Curwensville Lake occurring under no action and H95, SAV in the low flow channels along 186 miles of the West Branch Susquehanna and 51 miles of the lower

[27] Prepared from chart of simulation results for individual years of record from 1930-2007 and days per year over model period provided by SRBC to USACE, July 2015.

Susquehanna Rivers (237 miles total) would be less vulnerable to desiccation and exposure during low flow conditions than if no releases were made, promoting greater health and survival of SAV. However, alternative H95 would produce longer duration releases and an increased frequency of years in which water supply releases occur from the lake over no action. Perennial SAV species, such as river weed, would survive drought periods better, and remain in place following return to higher flows rather than being reduced in area by drought stress and needing to reestablish itself from propagule material. Thus, the proposed action H95 would produce a minor beneficial effect to receiving river SAV over no action.

4.2.3 Wetlands

Curwensville Lake

The 83 acres of wetlands dependent upon Curwensville Lake for water are already affected by lake water level management practices that cause them to be infrequently dewatered when water levels draw down more than one foot. During drawdown years under either no action or alternative H95, wetland vegetation and character at the landward edge could convert to somewhat drier wetlands, favoring wetland woody vegetation encroachment into current marsh vegetation. Upland herbaceous vegetation could temporarily encroach into wetlands. Marsh vegetation recovery could occur during the same year if water levels recover during the growing season. If water levels do not recover until late in or after the growing season, marsh vegetation would not recover until the following growing season. Water quality improvement functions of the wetlands would be lessened in drawdowns greater than 1 foot because of reduced soil wetness and lake/soil interactions. Water quality improvement functions would recover upon recovery of lake water levels.

There would be no difference between no action and alternative H95 in years in which a no-drawdown event occurs. However, frequency of lake level drawdowns greater than 1 foot would differ between no action and H95. Under no action, approximately 14 percent of future years would have lake drawdowns greater than 1 foot, whereas under alternative H95, drawdowns greater than one foot would increase to approximately 22 percent of future years (Table 2-4). Duration of drawdowns affecting wetlands would be similar during event years between no action and H95 other than in severe drought years (Table 4-2). However, in extreme drawdowns greater than 3 feet, duration of the drawdown would increase under H95 than under no action (Table 2-5).

Table 4-2: Duration of drawdowns greater than 1 foot of H95 alternative compared to no action during event years[28].

Alternative	Minimum Days per Drawdown Event	Median Days per Drawdown Event	Maximum Days per Drawdown Event
No Action	1	41	113
H95	2	30	114

Minimum and maximum duration in days of drawdown events greater than one foot would be equivalent under H95 as under no action (Table 4-2). Time of year when drawdowns occur would be the same between the no action alternative and alternative H95.

It is expected that the forecast increase in percent chance of drawdowns greater than one foot occurring would result in increased frequency of minor temporary adverse impacts on the 83 acres of wetlands vegetation and water quality improvement functions as described above.

West Branch Susquehanna and Lower Susquehanna Rivers

Under both no action and H95, in-river wetlands along 186 miles of the West Branch Susquehanna and 51 miles of the lower Susquehanna Rivers (237 miles total) would be provided with a greater supply of water during periods when water supply releases offset consumptive use. However, duration of release would lengthen and frequency of releases would increase under H95, reducing adverse effects of low flows on in-river wetlands. Thus, the proposed action would produce a minor temporary beneficial effect to receiving river wetlands.

4.2.4 Upland Vegetation

There would be no effects to upland vegetation at Curwensville Lake or in receiving rivers under either no action or H95 because all changes in water levels would occur at elevations lower than that at which upland vegetation occurs.

4.2.5 Macroinvertebrates and Finfish

Curwensville Lake

Water level fluctuation is one of the most important disturbances affecting aquatic ecosystems in surface waters (Turner and Mason, 2002). The effects of water level fluctuations on aquatic ecosystems are dependent on species, magnitude, duration, and time of year. Drawdowns cause loss of macroinvertebrates intolerant of drying out and exposure to weather. For fish communities,

[28] Prepared from chart of simulation results for individual years of record from 1930-2007 and days per year over model period provided by SRBC to USACE, July 2015. Results presented in this table cover entire model period rather than identified event years as presented in Table 2-5 "duration of drawdowns."

fluctuating water levels can affect water quality, food availability, spawning success, predator-prey dynamics, and habitat. In particular, drawdown of water level affects fish communities primarily from the reduction in overall surface area and volume of a reservoir. A reduction in shallow water habitat could force littoral zone fish, including forage species, into the deeper channels and pools of the lake. Concentration of predatory fish within a smaller reservoir area could result in increased predation of fish by fish-eating fish. Additionally, juvenile fish could be more vulnerable to predation during drawdown because of a lack of cover from dewatered SAV and other shallow water habitat features. With the exception of a few fish species, drawdown during spring and early summer months could affect overall spawning success of fish and result in a reduction in recruitment and food availability. Drawdown during these times could reduce reproductive success of fish species that have nests exposed as water level drops and or that utilize newly established shallow water habitat that may be less suitable for nesting. Prolonged drawdown during warmer months can result in substantially higher water temperatures and depressed dissolved oxygen concentrations. Indirectly, these degraded water quality conditions can also affect fish communities in the lake and tailwaters downstream of the lake.

Alternative H95 would increase the frequency in which lake drawdown events greater than one foot occur versus no action from approximately 14 percent to 22 percent of future years. This would increase frequency of future years with minor adverse impacts to Curwensville Lake fish as described above.

The seasonal timing of modeled drawdown events were similar for both the no action and H95 alternatives; therefore, no additional impacts to fish spawning of implementing H95 versus no action would be expected in drawdown years. The duration and magnitude of drawdown events would decrease for median drawdown events under H95 compared to no action (Table 2-5). An extreme drawdown event under H95 would be expected to result in greater magnitude and longer duration drawdown, however. This would likely produce greater short-term minor adverse impacts on the fish community in Curwensville Lake in the infrequent years that drawdowns occur than would occur under no action.

Conversely, there could be some minor benefits to recreational fish if the loss of established shallow water habitat caused by infrequent, moderate drawdowns is followed by several years of stable water levels. This can occur via increased availability of bare substrate spawning sites and improved access of predatory game fish to forage fish during the time SAV is recovering.

Overall impacts to lake macroinvertebrates and finfish would be minor and temporary.

<u>West Branch Susquehanna and Lower Susquehanna Rivers</u>

Under both no action and H95, water supply releases during low flow conditions from Curwensville Lake would partially offset consumptive use along 186 miles of the West Branch Susquehanna and 51 miles of the lower Susquehanna Rivers (237 miles total). However, release duration would lengthen and frequency of releases would increase under H95 versus no action.

These changes produced by H95 would likely reduce impacts of consumptive use to macroinvertebrate density and richness, including taxa sensitive to low flows such as filter feeding and grazing insect taxa. Flow augmentation would reduce exposure and predation of mussel beds, contributing to bed maintenance and individual growth. Natural flow regimes can reduce risk of establishment of non-native mussel species. Crayfish would benefit by increased growth and reduced susceptibility to predation. The recommended plan H95 would provide a minor benefit to downstream riverine macroinvertebrates over no action.

Downstream fish likely to benefit from increased duration and frequency of water supply releases during low flow conditions include water-quality sensitive species, as well as those dependent upon riffles, nest-builders, migratory fishes, and walleye. Nest-builder fish species are sensitive to reduced flows in nesting season that can promote siltation, dessication of eggs, and stranding of larvae. Riffle-obligate and associated fish species depend on this habitat type's presence and persistence and are vulnerable to loss of riffle habitat for spawning and foraging. Trout of the West Branch Susquehanna River could be benefitted by improved water quality. It is possible that better offset of consumptive use during low flow conditions could reduce disease of smallmouth bass.

4.2.6 Wildlife

Curwensville Lake

No wildlife are dependent upon the exact position of the shoreline or areas of bare exposed shoreline at Curwensville Lake, or require a minimum lake surface area or minimum availability of any particular lake depth. Wildlife utilizing the lake and shoreline would be able to move up or down the exposed shoreline during the additional times when it is temporarily exposed. Wildlife at the lake would adjust their behavior to altered lake levels by moving up or down slope, and no negative effects are expected. Reduced area of the lake would reduce lake surface area by a minor amount at times when the lake level is down and alter availability of shallow water foraging habitat (Table 3-2). However, no impact to wildlife is expected because impacts to wildlife prey in the lake would be negligible.

West Branch Susquehanna and Lower Susquehanna Rivers

Several amphibian and reptile species are particularly sensitive to increased frequency and duration of low flow events, which can increase temperature and sediment concentrations, and decrease dissolved oxygen (TNC 2010). These species of herptiles occurring along the 186 miles of the West Branch Susquehanna and 51 miles of the lower Susquehanna River (237 miles total) with increased flow would benefit from greater compensation for consumptive uses. Increase of aquatic habitat area could increase available foraging grounds for river-dependent birds and mammals. Thus, the proposed action would cause a minor beneficial impact to wildlife of the receiving rivers over no action.

4.2.7 Rare, Threatened, and Endangered Species

Curwensville Lake

The proposed action would require no construction or activities outside of normal dam operations, so there would be no disturbance near Bald Eagle nests. Drawdown of the lake under drought conditions would reduce the surface area of the lake available for foraging by Bald Eagles during the additional drawdown years this occurs (Table 3-2). Because lake surface area would still be substantial even during drawdowns, and prey populations would be only minimally impacted, it is anticipated that there would be only negligible to minor adverse effects on Bald Eagle foraging during the additional drawdown years, and no effect otherwise. No effect on Bald Eagle populations would be expected.

West Branch Susquehanna and Lower Susquehanna Rivers

Brook floater and green floater mussels would likely benefit from the H95 alternative via improved water quality and more stable streamflows. Both of these latter conditions would be promoted by increased water flows that reduce stagnant conditions. Longer duration and frequency of water supply releases and increased low flows in receiving rivers would benefit hellbender in the West Branch, because this species prefers water movement and higher dissolved oxygen levels.

4.3 COMMUNITY SETTING

4.3.1 Land Use

The proposed H95 alternative would have no direct or indirect effects on land use at Curwensville Lake or the receiving rivers because no physical construction would occur. Increased low flows would not change land uses along the receiving rivers because the lands with increased flow are at other times of year under water and river bottom anyway. Changes in flow would be imperceptible to most people and not induce desire to change land use or land cover.

4.3.2 Cultural and Historic Resources of Curwensville Lake

A consideration of potential effects on altered water supply releases on cultural/historic resources can be determined based on potential changes in lake levels. If future lake water elevations would be substantially lower as a result of the new water releases than in the past, effects to cultural/historic resources could occur via increased exposure to the air and or perhaps differing wave effects.

As was discussed in Section 1.2, from 1967 to 1997, Curwensville Lake elevation was kept at approximately 1162 feet during the summer (recreation season), but otherwise maintained at 1155 ft elevation for the rest of the year. The lake was drawn down to elevation 1154 ft multiple times for periods of weeks during these three decades. Although this occurred mostly during winter, it occasionally occurred during the fall. The lake is now managed to be at 1162 feet year-round, except for those occasional times when SRBC makes requests for water supply releases to offset downstream consumptive uses. Thus, concerns over potential effects on cultural/historic resources focus on drawdowns lower than elevation 1154 feet, with drawdowns to between elevation 1155 and 1154 feet possibly being of concern.

Based on modeling, the preferred alternative (H95) compared to the no action alternative (baseline) would produce about a 1 percent increase in future years of the lake being drawn down to between 1155 feet and 1154 feet elevation. Below 1154 ft elevation drawdowns under either the no action or preferred alternative would be expected to occur with equal percent annual chance in the future. Thus, effects of without and with project for these larger drawdowns would be identical.

Based on the past drawdown history and minimal difference between no action and the proposed H95 plan, the proposed project would have no effect/no adverse effect on any cultural/historic resources of Curwensville Lake. The PA Bureau of Historic Preservation office sent USACE a letter dated September 4, 2015 stating that no effects upon cultural or historic resources would be expected from altered water supply releases.

Altered low flow conditions in the receiving rivers would have no effect on cultural/historic resources.

4.3.3 Hazardous, Toxic, and Radioactive Wastes (HTRW) of Curwensville Lake

There are no known HTRW materials within Curwensville Lake project lands, including the lake shore and bottom. Changes in lake water levels and wave energy would be within the range of previously occurring conditions. Therefore, no impact to or from HTRW are anticipated.

4.3.4 Transportation and Navigation

Alternative H95 would have no effect on transportation at Curwensville Lake or downstream areas. Water levels at the lake would be within the levels to which infrastructure was designed for and is routinely exposed. The altered water releases would produce increased flows in the receiving rivers that would be imperceptible to water craft and thus would have no effect on downstream navigation.

4.3.5 Water Supply

There would be no effects to water supplies at Curwensville Lake. The proposed low flow releases would increase water quantity in the receiving rivers to the point of the trigger gage location. Any potential uses of this for water supply purposes by downstream users would need to be done consistent with regulations and policies of SRBC. It is not anticipated that releases would alter the volume of water available for downstream consumption. This topic was discussed in Section 1.2 and is discussed further in cumulative effects.

4.3.6 Parks and Wild and Scenic Rivers/ American Heritage River

The altered low flow releases would affect Curwensville Lake project waters and lands as described by individual impact topics throughout this EA. State game lands and other small parks along the receiving rivers would have a minor increase in low flows. The impacts of this condition are described elsewhere under specific subtopics of the Physical Environment and Habitats and Living Things subsections.

Neither Curwensville Lake nor the receiving rivers are Federally designated as Wild and Scenic Rivers nor American Heritage Rivers. Therefore, there would be no impact to designated rivers.

4.3.7 Recreation and Aesthetics

Curwensville Lake

Existing recreation facilities were designed for periodic drawdowns and would be physically unaffected by the proposed water supply releases under the H95 alternative. However, use of these facilities would be affected depending on depth of drawdown. Drawdowns greater than 2 feet would affect boat mooring docks, rendering an increasing number unusable as drawdown depth increases. The boat ramp would become unusable for some boats at a drawdown of 2 to 3 feet. The beach would be closed with a drawdown of 4 feet. Percentages of future years with drawdowns that would be produced are summarized in Table 4-3.

Table 4-3: No action and H95 percentage of future years with drawdowns by one-foot intervals[29].

	Drawdown Elevation Range (ft)		Alternative % of Future Years*	
Drawdown Level (ft)	**Upper**	**Lower**	**Baseline**	**H95**
1 < Drawdown ≤ 2	1161	1160	8	10
2 < Drawdown ≤ 3	1160	1159	0	4
3 < Drawdown ≤ 4	1159	1158	0	0
4 < Drawdown ≤ 5	1158	1157	4	3
5 < Drawdown ≤ 6	1157	1156	0	1
6 < Drawdown ≤ 7	1156	1155	0	0
7 < Drawdown ≤ 8	1155	1154	0	1
8 < Drawdown ≤ 9	1154	1153	0	0
9 < Drawdown ≤ 10	1153	1152	3	3
10 < Drawdown	1152	1151	0	0
Total			13	22

*The data presented in this table differ somewhat from that presented in Table 2-9 because of rounding errors.

Under both no action and the H95 alternative, most drawdowns would begin in August-September and extend until December. Thus, there would be minimal difference in timing of events between alternative H95 and no action. Drawdown events during the recreation season under H95 would be similar in duration to those that would occur under no action (Table 2-5).

The percentage of future years with drawdowns greater than 1 foot occurring during the recreation season would increase by 5 percent from approximately 9 percent under no action to 14 percent under alternative H95 (Table 2-6). During additional drawdown years, there would be adverse impacts to water-based recreation that wouldn't occur under the no action alternative. However, other than for these infrequent drawdown event years, there would be no impacts to Curwensville Lake recreation.

As was summarized above, there would be a minor increase in area and duration at which exposed shoreline devoid of vegetation occurs. Seasonally exposed unvegetated shorelines at reservoirs are often considered unsightly, so this occurrence constitutes an adverse aesthetic effect. Because this would occur, this would constitute a minor and short-term increased adverse aesthetic impact.

[29] Modified from Table 5-1 from SRBC Curwensville (2012): "Table 5-1 Simulated Number of Years (Percentage of Years) Maximum Drawdown Occurs within Selected Drawdown Intervals for the Entire Modeling Period."

West Branch Susquehanna and Lower Susquehanna Rivers

Flow change would generally be imperceptible to watercraft navigation. Accordingly, no recreational effects of changed low flow releases would result. Improved water quality and habitat conditions of the proposed releases would increase carrying capacity of the rivers for recreational fish species, and thus improve fishing opportunities over the long-term. Improved water quality from increased water volume and circulation would likely benefit trout in the West Branch Susquehanna River. If better offset of consumptive use during low flow conditions reduces disease effects on smallmouth bass, it could cause a minor improvement in fishing opportunities for this fish species.

4.3.8 Population and Socioeconomic Conditions

Curwensville Lake

Because changes in recreational use of Curwensville Lake are expected to be minor (Section 4.3.7), economic effects of the action are expected to be minor. Changes in temporary populations of people using the lake and staying at the campgrounds or visiting Clearfield County would also be minor.

West Branch Susquehanna and Lower Susquehanna Rivers

No change in recreational watercraft use of receiving rivers would be expected because the increase in low flows would be generally undetectable by recreational watercraft users. Minor long-term economic effects would occur via improved fishing opportunities resulting from increased carrying capacity of the receiving rivers for recreational fish species, as described above. No adverse impacts to minority or low-income populations would result from the proposed action.

4.4 CUMULATIVE IMPACTS

Cumulative impacts result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal), company, organization, or person undertook or will undertake such actions. USACE operates the Curwensville Project in conjunction with other projects operated for the primary purpose of providing flood protection for downstream communities along the West Branch Susquehanna and lower Susquehanna Rivers in Pennsylvania. Additional USACE reservoirs in New York and Pennsylvania also drain into the Susquehanna River, including Cowanesque Lake and Foster Joseph Sayers Dam, from which changes in releases could affect river low flows. No change in low flow releases are pending for Foster Joseph Sayers Lake at this time. However, SRBC applied to USACE for a change in water supply operations in Curwensville Lake in May 2012. An EA of low flow augmentation considering SRBC-owned storage at Cowanesque Lake was completed in 2013 and the reservoir regulation manual revised in 2015 to implement this change. In addition, there will likely be a broad Susquehanna Basin watershed study started within the next few years (provisionally titled "The Susquehanna River Basin Phase II Low (Ecological) Flow Management Study") that would include consideration of altered low flow releases from Tioga-Hammond, Foster Joseph Sayers Dam, and other USACE reservoirs, as well as other state and privately owned reservoirs. Thus, it is likely that over the next decade or more, low flow augmentation releases from USACE and perhaps other reservoirs would be adjusted to enhance environmental benefits.

Altered consumptive water use by others in the receiving rivers could act cumulatively with the proposed water supply releases from Curwensville Lake. Consumptive water withdrawals in the Susquehanna Basin are governed/regulated by SRBC. Consumptive users must apply for an SRBC permit, and must also report their water usage. In its review of withdrawal application permits, SRBC establishes appropriate limitations, conditions, and mitigation to allow for reasonable water use, while minimizing impacts from regulated withdrawals on downstream uses, including instream uses for aquatic life. Permits typically require that during low flow situations large-scale consumptive users must either: (1) reduce or cease withdrawing water, (2) provide supplemental make-up water on their own in an amount equal to the consumptive use, or (3) pay a fee into an SRBC fund which SRBC uses to acquire supplemental sources of water (such as from Curwensville Lake) for release during droughts. Through these mechanisms, SRBC has substantial capability to compensate for consumption impacts during minimal instream flow conditions. SRBC mandated safeguards, in conjunction with consumptive use mitigation flow releases from Curwensville Lake and other water storage projects, ensure the effects of consumptive use will be limited in the future. During drought conditions however, SRBC is not able to ensure stable instream flows via consumptive use mitigation are adequate to prevent ecological harm.

If the increased frequency of releases from Curwensville Lake are utilized to offset additional consumptive use (rather than existing consumptive uses), mitigation from consumptive use impacts to the aquatic ecosystems of the West Branch Susquehanna and lower Susquehanna Rivers provided by the proposed alternative would be reduced (or eliminated). Additional future consumptive use is anticipated from the future Wildcat Point energy generation facility in Cecil County, MD. Of particular concern recently to citizens has been possible increased water withdrawal by the natural gas industry to be used for hydraulic fracturing. All water withdrawals from the Susquehanna River system by the natural gas industry are regulated by SRBC. Each natural gas extraction project must include water use plans that ensure withdrawals are not harmful to streams during low flow conditions.

SRBC consumptive use approvals are typically issued for a duration of 15 years. All SRBC approvals also contain a standard reopener clause. Over time, and with new SRBC instream flow policies and practices predicated on the findings documented in TNC's "Ecosystem Flow Recommendations for the Susquehanna River Basin" report, SRBC intends to achieve more consistent consumptive use mitigation and low flow protection. Consistent with recommendations in the Consumptive Use Mitigation Plan, SRBC has committed to identifying and securing additional sources of consumptive use mitigation for existing and projected consumptive use in the basin. Those projects will afford the opportunity for SRBC to implement consumptive use mitigation measures based on contemporary thresholds rooted in TNC's ecosystem flow recommendations.

In addition to contributing to maintenance of instream flow quantity during low-flow conditions by more effectively offsetting consumptive use, the proposed water supply releases would serve to contribute cumulatively to voluntary and regulated efforts underway to restore water quality. Of particular importance, continued declines in nutrient loads from watershed management efforts undertaken to meet Chesapeake Bay and West Branch Susquehanna River Total Maximum Daily Load (TMDL) requirements, and AMD load reductions via source remediation efforts undertaken by Pennsylvania in various partnerships, into the West Branch Susquehanna River are likely to lead to continuing improvement in water quality in Curwensville Lake and the West Branch Susquehanna River. Other consumptive use mitigation measures include several water supply releases from AMD remediation efforts (Curwensville Lake and Lancashire 15, Cresson, and Hollywood), as well as coordinating planned state park lake drawdowns for consumptive use mitigation and ecosystem flow protection. Additionally, SRBC is in discussion with other power plants and mines to identify sources of water for consumptive use mitigation. These ongoing and planned consumptive use mitigation measures would further improve water quality conditions in the West Branch Susquehanna River, setting the stage for further improvement in health of aquatic life, including to important recreational fish species such as trout as well as for several state-rare species imperiled by impaired water quality.

5.0 COMPLIANCE WITH ENVIRONMENTAL STATUTES

Normal water releases from dams have been determined not to constitute discharges of pollutants in U.S. Supreme Court cases. Because there is no proposed discharge of dredged or fill material into waters of the United States, no 404(b)(1) Analysis was prepared for this EA. The effect altered Curwensville Lake pool levels would have, including to SAV and wetlands, are not Clean Water Act regulated impacts. No Water Quality Certificate pursuant to Section 401 of the Clean Water Act would be required from Pennsylvania because no withdrawals of water or direct releases of pollutants are proposed. No Clean Air Act conformity analysis is necessary because no physical construction work would occur and changes in operations of the dam would be *de minimis* in nature with regard to energy consumption/ air pollution. While Pennsylvania does regulate the operations of dams in the state under 25 Pennsylvania Code 105.131, the Federal Government would take the view that there is no waiver of sovereign immunity for that statute for a dam that is owned and operated by the Federal Government.

In addition to the environmental impacts discussed in this EA, a review of the proposed action has been made with regard to other potential areas of concern. Table 5-1 presents a summary of pertinent Federal regulations and the proposed action's compliance status.

USACE coordinated with the USFWS during preparation of this EA to ensure compliance with the Endangered Species and Fish and Wildlife Coordination Acts. Records of this coordination are provided in Annex A. Additional coordination with USFWS will occur during agency and public review of this EA.

Table 5-1: Compliance of the Proposed Action With Potentially Pertinent Environmental Protection Statutes and Other Requirements.

Federal Statutes	Expected Level of Compliance[1]
Anadromous Fish Conservation Act	Full
Archeological and Historic Preservation Act	Full
Clean Air Act	Full
Clean Water Act	Full
Comprehensive Environmental Response, Compensation and Liability Act	Full
Endangered Species Act	Full
Estuary Protection Act	Full
Farmland Protection Policy Act	Full
Federal Water Project Recreation Act	Full
Fish and Wildlife Coordination Act	Full
Land and Water Conservation Fund Act	Full
Migratory Bird Treaty Act	Full
National Environmental Policy Act	Full
National Historic Preservation Act	Full
Resource Conservation and Recovery Act	Full
Rivers and Harbors Act	Full
Submerged Land Act	Full
Water Resources Planning Act	Full
Watershed Protection and Flood Prevention Act	Full
Wild and Scenic Rivers Act	N/A
Executive Orders (EO), Memoranda, etc.	
Protection and Enhancement of Environmental Quality (E.O. 11514, 1977)	Full
Protection and Enhancement of Cultural Environment (E.O. 11593)	Full
Floodplain Management (E.O. 11988)	Full
Protection of Wetlands (E.O. 11990)	Full
Environmental Justice (E.O. 12898)	Full
Recreational Fisheries (E.O. 12962)	Full
Protection of Children from Environmental Health Risks and Safety Risks (E.O.13045)	Full
Invasive Species (E.O. 13122)	Full
Chesapeake Bay Protection and Restoration (E.O. 13508)	Full
Stormwater Discharges 40 CFR 122.26 (B)(14), 19 Nov 1990	N/A

1 Levels of Compliance

a. Full Compliance: having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.

b. Partial Compliance: not having met some of the requirements that normally are met in the current stage of planning.

c. Non-Compliance: violation of a requirement of the Statute, E.O., or other environmental requirement.

d. Not-Applicable: no requirements for the statute, E.O., or other environmental requirement for the current stage of planning.

6.0 COORDINATION/PUBLIC INVOLVEMENT

In compliance with the National Environmental Policy Act (NEPA), the proposed action has been coordinated with concerned resource agencies and the public. The purpose of coordination is to ensure that environmental and social factors are considered while planning and executing a prudent and responsible action. Annex A contains a summary of coordination efforts, a copy of the study initiation notice, a copy of the notice announcing the availability of the draft EA for public and agency review, and copies of written responses from resource agencies.

USACE and SRBC communicated throughout the action planning process. USACE is responsible for agency and public coordination for the proposed water supply releases. Previously, SRBC undertook limited external coordination in 2011 during their technical investigations. That coordination is also incorporated into this EA.

SRBC held a public workshop in June 2011 in Clearfield, PA, to present information on the alternative plans under consideration. SRBC sent out a letter on August 4, 2011 informing resource agencies of their proposed study and requested information. SRBC coordinated with the USFWS as part of this effort. These coordination efforts were adopted by USACE for use in this EA to meet requirements of NEPA and the Fish and Wildlife Coordination Act. Written and email responses received by SRBC expressed general support for increased low flow augmentation, but expressed some concern over whether this could increase individual withdrawals from rivers, and withdrawals by gas companies.

USACE mailed out a public notice announcing preparation of the EA by first class mail on July 9, 2015. The public notice was submitted to federal, state, and local agencies, requesting written comments concerning interests within the agency's area of responsibility. Copies of the notice were also sent to a mailing list of nearby residents. Agency responses were received via first class mail and one e-mail response from a citizen to the public notice were received. These generally requested additional information be provided as details develop. Clearfield County Recreation and Tourism Authority expressed opposition to drawdowns that could affect recreation at Curwensville Lake because of its importance to the county.

In addition to SRBC and USACE coordination efforts summarized above, CLA posted the public notice announcing preparation of this EA on their website (http://curwensvillelake.com) in Summer and Fall 2015.

7.0 CONCLUSION

The environmental and social consequences associated with optimizing use of Curwensville Lake water for downstream consumptive mitigation and to support ecological low flows have been evaluated and assessed by USACE (Table 7-1). Alternatives to the proposed action have been described and evaluated in this EA. Alternative H95 was selected as the recommended plan. Alternative H95 would have no effect on storage allocation within Curwensville Lake. The volume of federal flood control storage, SRBC-owned water supply storage, and federal conservation storage would remain unchanged from the Baseline Alternative and incur no additional costs to SRBC or the Federal Government. The project's flood risk management purpose would not be affected. Water supply releases would continue to be made through the existing outlets, and no new construction would be needed. The proposed action would require a modification of the water control plan for Curwensville Lake.

As compared to the no action alternative (current water supply release operations), the H95 alternative would retain the same volume of available water supply storage and provide low-flow augmentation at the same rate (27.5 cfs). However, the duration and frequency of low-flow augmentation releases would be increased because they would be tied to a P95 trigger flow at Harrisburg rather than the currently used Q7-10 trigger flow at Harrisburg. The current Q7-10 trigger flow is based on an analysis of annual flow records and produces a constant year round value. The proposed P95 trigger flows differ in that they are based on average monthly flows which vary by time of the year. Thus, the P95 trigger flow values vary month to month, as would low-flow augmentation releases (see Table 2-2).

The proposed action is expected to make a net positive contribution to the West Branch Susquehanna River and lower mainstem Susquehanna River by partially offsetting flow losses from human consumptive use during low flow conditions. Partial flow offsets would occur along 186 miles of the West Branch Susquehanna River and 51 miles of the lower Susquehanna River. The releases would reduce adverse impacts in the receiving rivers under low flow conditions from consumptive use to a wide array of aquatic plants and animals via improved water quality and increased quantity of water and instream habitat. Two state rare mussels that are vulnerable to low flow conditions would likely benefit. One state rare amphibian species sensitive to impaired water quality would also likely benefit. Improved water quality and instream habitat quantity would provide a minor benefit to recreational fish species and to fishermen on these rivers. While releases would likely occur infrequently, benefits to the receiving rivers' aquatic ecosystem would be long-term because the offsets would reduce adverse effects to populations of aquatic plants and animals that would otherwise occur during stressful conditions that produce longer lasting impacts. Surviving organisms, and their offspring, would remain to maintain higher population levels in the receiving rivers. The increased frequency and duration of water supply release to compensate for consumptive uses would contribute cumulatively to efforts by other agencies and entities to restore the West Branch Susquehanna River.

Forecasting from results of simulation modeling, it would be expected that under no action 14 percent of future years would have water supply releases that would cause Curwensville Lake drawdowns of greater than one foot. With the H95 alternative, it would be expected that the percentage of future years with water supply releases that would cause drawdowns of greater than one foot would increase to approximately 22 percent (Table 2-4). Thus, there would be a minor increase in the frequency when water supply releases would be made from Curwensville Lake under the recommended plan H95. Considering drawdown depth intervals and timing of releases in more detail (Tables 2-4 and 2-6), under the current operational plan, in approximately 8 percent of future years the lake would have drawdowns of one to three feet, and these would occur during the recreation season from July onward. Under the proposed H95 alternative, approximately 14 percent of future years would have drawdowns of one to three feet; approximately 10 percent of future years would have one to three foot drawdowns occur during the recreation season. In comparing the current operational plan with the H95 alternative, there would be a 6 percentage point increase in the chance of future years when Curwensville Lake would be drawn down by one to three feet and a 2 percentage point increase in the chance of future years of drawdowns greater than one foot occurring during the May through September recreation season. Drawdowns of greater than three feet would occur in approximately 7 percent of future years under the current operational plan, but increase by one percentage point to approximately 8 percent of future years under the proposed H95 alternative. The seasonality, duration in days, and depth of lake drawdowns greater than one foot under H95 would be similar to drawdowns under current management practices (Table 2-5).

As a consequence of these changes, minor adverse impacts to SAV, wetlands, fish, and recreational use at Curwensville Lake would occur during the increased infrequent years with lake drawdowns. Negligible to minor adverse effects to Bald Eagle could occur from reduced foraging opportunities during additional drawdown events. No other rare species would be adversely impacted at Curwensville Lake.

Table 7-1: Summary Table of Environmental Consequences

Major Topic		Curwensville Lake		Receiving Rivers	
TallyNo.	**Subtopic**	**Type of Impact (1)**	**Duration of Impact (2)**	**Type of Impact (1)**	**Duration of Impact (2)**
Physical Environment					
1	Topography	*	N/A	*	N/A
2	Geology and Soils	A	M	B	W
3	Hydrology	A	M	B	W
4	Water Quality	*	N/A	B	W
5	Climate	*	N/A	*	N/A
6	Air Quality	*	N/A	*	N/A
7	Noise	*	N/A	*	N/A
Habitats and Living Things					
1	Open Water and Shorelines	A	M	B	W
2	Submerged Aquatic Vegetation	A	M	B	W
3	Wetlands	A	M	B	W
4	Upland Vegetation	N/A	N/A	N/A	N/A
5	Macroinvertebrates and Finfish	A	M	B	W, M
6	Wildlife	*	N/A	B	W, M
7	Rare, Threatened, and Endangered Species	A	M	B	W
Community and Socioeconomic Setting					
1	Land Use	*	N/A	*	N/A
2	Cultural and Historical Resources	*	N/A	*	N/A
3	Hazardous, Toxic, and Radioactive Wastes	*	N/A	*	N/A
4	Transportation and Navigation	*	N/A	*	N/A
5	Water Supply and Use	*	N/A	*	N/A
6	Parks and Wild and Scenic Rivers / American Heritage Rivers	N/A	N/A	N/A	N/A
7	Recreation and Aesthetics	A	M	B	W
8	Population and Socioeconomic Conditions	*	N/A	*	N/A

(1) A = Adverse, B = Beneficial, * = Negligible, C = Change that is neither + or –
(2) Y = Years, M = Months, W = Days/Weeks, N/A = Not Applicable

In light of the minor effects described above, inherently mitigational nature of the proposed action, and the anticipated lack of concerns from federal and state environmental agencies based on responses to the study preparation notice, it has been determined that the preparation of an Environmental Impact Statement is not warranted. A Finding of No Significant Impact (FONSI) was prepared, a copy of which is provided at the beginning of this EA. The water supply releases from Curwensville Lake are meant to help offset, to the greatest extent possible, the downstream ecosystem impacts caused by human activities consumptively using water. These releases are intended to augment, but not maintain, natural stream flows which can continue to drop naturally during dry conditions. Accordingly, it will be incumbent upon SRBC to continue to be vigilant in implementing instream flow protection policies and plans, such as the Low Flow Protection Policy and Consumptive Use Mitigation Plan, to ensure that the revised Curwensville Lake water supply releases meet their intended purpose over time. These increased releases, in combination with other instream flow protection requirements and measures, represent an integrated approach to protecting the aquatic ecosystems of the West Branch Susquehanna and lower Susquehanna Rivers.

8.0 REFERENCES

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[30] Pennsylvania Natural Heritage Program is a partnership between The Department of Conservation and Natural Resources, the Western Pennsylvania Conservancy, the Pennsylvania Game Commission, and the Pennsylvania Fish and Boat Commission

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Annex A

PUBLIC AND AGENCY COORDINATION

Table of Contents

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Coordination for the proposed water supply release modifications was undertaken first by SRBC in 2011 (Table A-2) and then in 2015 (Table A-1) by USACE. USACE coordination occurred during preparation of the draft EA.

Table A1: Summary Record of USACE Coordination Undertaken During Preparation of Draft EA. Asterisk indicates copy of document provided in this EA.

Date	Persons Contacted/ Agencies or Organizations	Mode of Contact	Summary
June 16, 2015	Bill Ammerman (Citizen) to Chris Spaur USACE	Phone call and email.	Expressed concern that any drawdowns which would lower the lake level more than a couple of feet during the spring and summer months would effectively destroy most of the recreational value of Curwensville Lake.
June 24, 2015	Fred Berry Clearfield County Conservation District to Chris Spaur USACE	Letter	Responding to SRBC proposed use of water supply storage at Curwensville Lake. Provided information on previous lake fish sampling efforts. Requested information on how pool lowering could affect lake and downstream aquatic life, SAV, wetlands. Requested information on whether SRBC would be applying for permit to draw water off impoundments from PAF&BC.
July 9, 2015	Dan Bierly USACE to mailing list of agencies, organizations, and citizens	Public notice*	Announced preparation of EA for water supply release plan modification.
July 23, 2015	Barbara Frederick, PA Bureau for Historic Preservation	Form Response*	Requested additional information on project size and effects.
July 27, 2015	Lora Zimmerman USFWS to Dan Bierly USACE	Letter*	Response to EA preparation notice. Noted USFWS efforts to restore American eels and native mussel populations. Requested information as it is being developed. Provided Richard McCorkle as contact.
July 27, 2015	Ashley Rebert PA DCNR to Dan Bierly USACE	Letter*	Response to EA preparation notice. Noted potential benefits to downstream waters of modified releases. Bureau has funded numerous park and recreation projects in vicinity.
August 13, 2015	Rick McCorkle, USFWS	Phone conversation	CS called inquiring about USFWS level of involvement necessary to meet requirements of FWCA. Rick said that informal coordination during pre-draft EA preparation and written response to public-

			release draft could be done without a formal SOW.
August 17, 2015	Robert Conrad, PA DEP to Dan Bierly USACE	Letter*	Response to EA preparation notice. Noted several water suppliers downstream could be affected. Provide additional information for review as it becomes available.
August 17, 2015	Barbara Frederick, PA Bureau for Historic Preservation	Email*	CS email to Barbara informing her that no physical construction would occur but that changed lake levels would occur.
Sept 2, 2015	Holly Komonczi, Director, Clearfield Co. Recreation and Tourism Authority	Letter*	Clearfield County opposes any major lowering of dam water levels because of impacts on lake ecosystem, fishery, recreation, and local economy.
Sept 4, 2015	Douglas McLearen, Chief, Division of Archaeology and Protection	Letter*	There may be historic and or archaeological resources near the project area. However, the activities described would not be expected to affect these resources.
Sept 14, 2015	PNDI Project Environmental Review Receipt	Online*	No rare species identified in Curwensville Lake or shoreline. Bald eagle nest in vicinity though and impacts to them should be considered.
Nov 10, 2015	Jason Detar, PFBC	Phone Conversation	CS discussion on recent PFBC sampling efforts in Curwensville Lake and findings. Last formal report 2009. West Branch Susquehanna would benefit from additional water during low-flows.
Nov 12, 2015	Steve Means, PADEP	Email	CS information exchanges regarding 2006 PADEP Curwensville Reservoir Report.
Dec 2, 2015	Paul Jeffries, CLA	Email	Provided CS information on CLA staffing at Curwensville Lake

Table A2: Summary of Previous Pertinent SRBC Coordination for Curwensville and Cowanesque Lakes

Date	Persons Contacted/ Agencies or Organizations	Mode of Contact	Summary
Aug 30, 2011	Clint Riley USFWS to John Balay SRBC	Letter	Response to letter of Aug 4, 2011. Except for transients, no federally listed or proposed threatened or endangered species known to occur within project area. Bald eagle nests located at Curwensville Lake. Is protected under Bald and Golden Eagle Protection Act. Recommends protecting low flows and mimicking natural seasonal water fluctuations.
Aug. 29, 2011	Dave Garg PADEP to Matthew Shank SRBC	email	Dave offered comments on SRBC letter proposing optimizing use of water supply. There are a number of dischargers below Curwensville Lake. Increasing summer lowflows would dilute these discharges, provided releases aren't consumed by gas companies. Unclear whether lowering lake level would have any effect on upstream discharges. Recommended determining impact on downstream public water supply agencies.
Aug 24, 2011	Tom Randis PADEP to Matthew Shank SRBC	Phone conversation	Tom expressed concerns over any decrease in flows from Q7-10 during drought periods because of inadequate downstream dilution. Any increase in baseflow during lowflow conditions would be a win-win. Tom expressed concern over SRBC allowing other additional withdrawals.
Aug 8, 2011	Jason Deter PAFBC to Matthew Shank SRBC	email	Jason expressed concerns of effects of altered reservoir pool levels to recreational fish populations, fishing, and boating.
Aug 4, 2011	John Balay SRBC to resource agencies on mailing list.	Letter	Informed agencies of SRBC's investigations to optimize use of water supply storage at Cowanesque and Curwensville Lakes and requesting initial input.

Public Notice Announcing EA Preparation

US Army Corps of Engineers
Baltimore District

JUL 09 2015

Planning Division

Public Notice

Curwensville Lake Project
Clearfield County, Pennsylvania

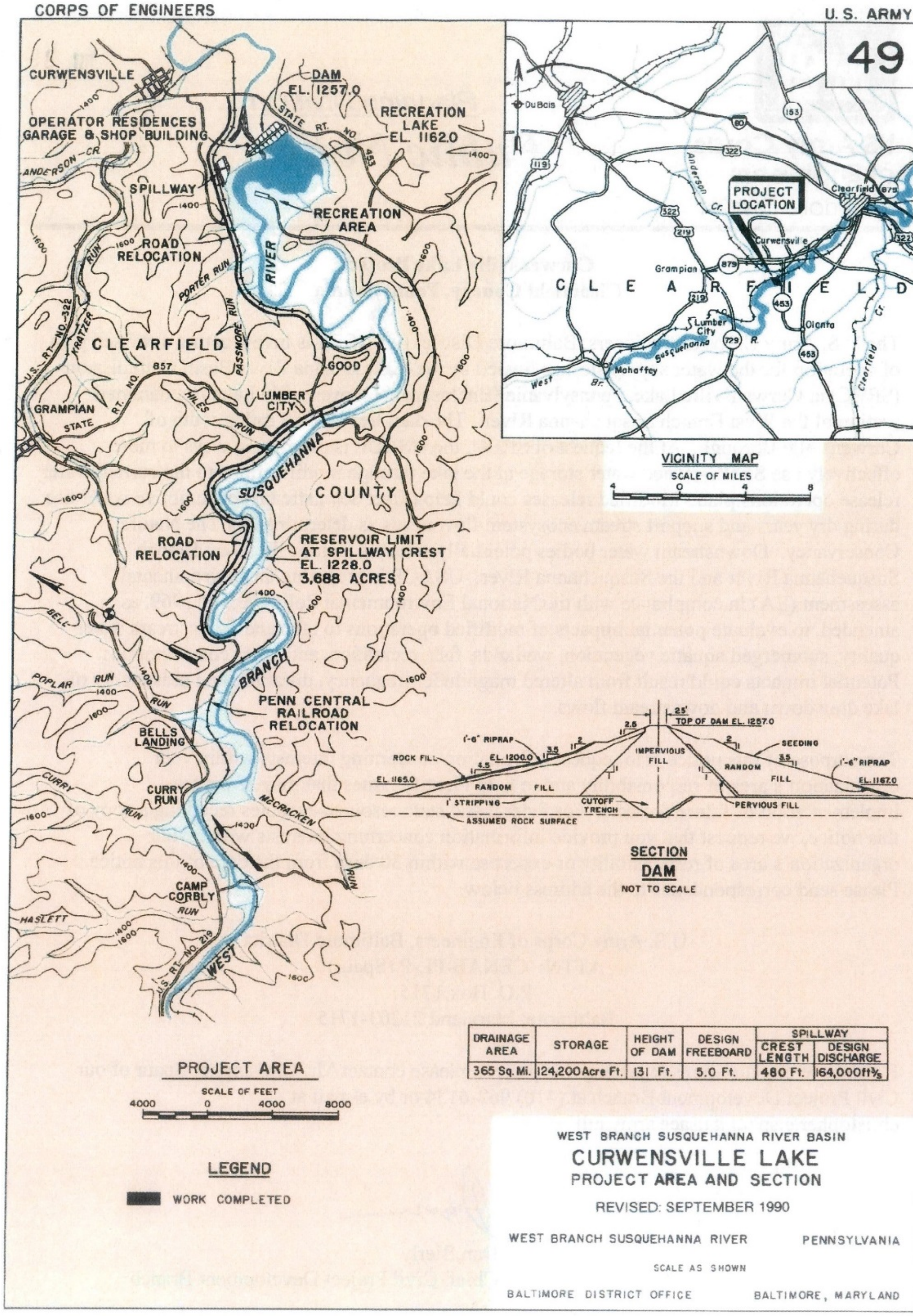
The U.S. Army Corps of Engineers, Baltimore District (USACE), is investigating a revised plan of operation for the water supply storage owned by the Susquehanna River Basin Commission (SRBC) at Curwensville Lake, Pennsylvania (Enclosure). Curwensville Lake is a dammed section of the West Branch Susquehanna River. The dam lies about 2 miles south of Curwensville Borough. At the request of SRBC, the USACE is examining ways to more effectively use SRBC-owned water storage at the lake through modifications to the current water release operations plan. Modified releases could help offset downstream consumptive water use during dry years and support stream ecosystem flow needs as determined by The Nature Conservancy. Downstream water bodies potentially affected include the West Branch Susquehanna River and the Susquehanna River. USACE is preparing an environmental assessment (EA) in compliance with the National Environmental Policy Act of 1969, as amended, to evaluate potential impacts of modified operations to lake and downstream water quality, submerged aquatic vegetation, wetlands, fish, recreation, and other considerations. Potential impacts could result from altered magnitude, frequency, duration, and seasonality of lake drawdown and downstream flows.

The purpose of this notice is to request information concerning interests within your organization's area of responsibility and to help identify issues that may affect the implementation of future projects. For federal and state resource agencies receiving a copy of this notice, we request that you provide information concerning interests within your organization's area of responsibility or expertise within 30 days from the date of this notice. Please send correspondence to the address below.

U.S. Army Corps of Engineers, Baltimore District
ATTN: CENAB-PL-P (Spaur)
P.O. Box 1715
Baltimore, Maryland 21203-1715

If you have any questions regarding this project, please contact Mr. Christopher Spaur of our Civil Project Development Branch at (410) 962-6134 or by e-mail at christopher.c.spaur@usace.army.mil

Dan Bierly
Chief, Civil Project Development Branch


CORPS OF ENGINEERS
U. S. ARMY
49
CURWENSVILLE
OPERATOR RESIDENCES
GARAGE & SHOP BUILDING
DAM
EL. 1257.0
RECREATION
LAKE
EL. 1162.0
STATE RT. NO 453
SPILLWAY
ANDERSON CR
RECREATION
AREA
ROAD
RELOCATION
PORTER RUN
RIVER
CLEARFIELD
KRATZER RUN
US RT NO 322
PASSMORE RUN
GOOD
LUMBER
CITY
GRAMPIAN
STATE RT. NO 879
SUSQUEHANNA
COUNTY
ROAD
RELOCATION
RESERVOIR LIMIT
AT SPILLWAY CREST
EL. 1228.0
3,688 ACRES
BELL
BRANCH
POPLAR RUN
PENN CENTRAL
RAILROAD
RELOCATION
BELLS
LANDING
CURRY
RUN
MCCRACKEN RUN
CAMP
CORBLY
RUN
HASLETT
WEST
US RT NO 219
VICINITY MAP
SCALE OF MILES
Du Bois
PROJECT
LOCATION
Anderson Cr.
Grampian
Curwensville
Clearfield
Lumber City
Mahaffey
West Br.
Susquehanna R.
Olanta
Clearfield Cr.
C L E A R F I E L D
TOP OF DAM EL. 1257.0
1'-6" RIPRAP
ROCK FILL
EL. 1200.0
IMPERVIOUS FILL
RANDOM
SEEDING
1'-6" RIPRAP
EL. 1165.0
RANDOM FILL
FILL
EL. 1167.0
1' STRIPPING
CUTOFF TRENCH
PERVIOUS FILL
ASSUMED ROCK SURFACE
SECTION
DAM
NOT TO SCALE
DRAINAGE AREA | STORAGE | HEIGHT OF DAM | DESIGN FREEBOARD | SPILLWAY CREST LENGTH | SPILLWAY DESIGN DISCHARGE
365 Sq. Mi. | 124,200 Acre Ft. | 131 Ft. | 5.0 Ft. | 480 Ft. | 164,000 ft³/s
PROJECT AREA
SCALE OF FEET
4000 0 4000 8000
LEGEND
WORK COMPLETED
WEST BRANCH SUSQUEHANNA RIVER BASIN
CURWENSVILLE LAKE
PROJECT AREA AND SECTION
REVISED: SEPTEMBER 1990
WEST BRANCH SUSQUEHANNA RIVER
PENNSYLVANIA
SCALE AS SHOWN
BALTIMORE DISTRICT OFFICE
BALTIMORE, MARYLAND

Response Coordination Records

CLEARFIELD COUNTY CONSERVATION DISTRICT

511 SPRUCE STREET, SUITE 6 - CLEARFIELD, PA 16830 - PHONE (814) 765-2629

C/o Christopher C. Spaur
ACE Civil Project Development Branch
USACE, Baltimore District
Attention: CENAB-PL-P
P.O. Box 1715
Baltimore MD, 21203-1715

June 24, 2015

RE: Comments on Susquehanna River Basin Commission Proposal
Optimizing Use of Water Supply Storage at Curwensville Lake for Consumptive Water Use
Curwensville Lake, Clearfield County, Pennsylvania

Dear Mr. Spaur,

This letter is in regard to the SRBC proposed use of water supply storage at USACE Curwensville Lake. The modification to the water release program could have detrimental effects to aquatic life in the impoundment area of Curwensville Lake.

The USACE has asked for comments on the proposed water withdrawal to be submitted to your attention. I am providing the following comments herewith.

1). In May of 2009, the PA Fish and Boat Commission (PAF&BC) conducted trap netting and electrofishing survey of Curwensville Lake. The conclusion of the survey indicated that *"Curwensville Lake has shown considerable improvement as a fishery over the past decade and the improvements can likely be attributed to two major factors. In 1997, the U.S. Army Corp of Engineers implemented a "no winter drawdown" water-level management plan. This allowed for a stable pool elevation during most of the year and consistent year-round shallow water (littoral) habitat..... It is likely a combination of improved habitat and water quality that have resulted in the significant improvements in the reservoir's sport fish populations."* See the attached report from the PAF&BC. Please explain how your proposal for lowering the pool will affect the aquatic life at Curwensville Lake.

2). The SRBC is proposing release of water to protect downstream aquatic ecosystems. Please explain what affect the lowering of the pool of water will have on the aquatic ecosystems at Curwensville Lake and the seven miles of pooled water upstream from the Dam.

3). The proposed drawdown of up to eight feet of water from the normal pool may have an effect on the aquatic vegetation in and around the Lake. The SRBC proposal shows National Wetlands Inventory (NWI) mapping of wetlands. NWI mapping does not show all wetlands considered Waters of the Commonwealth of Pennsylvania. A complete wetland delineation should be conducted as defined by the U.S. Army Corp. of Engineers, 1987 Federal Manual for Identifying and Delineating Jurisdictional Wetlands, to accurately show all wetlands. A study should also be done to determine what affect the drawdown will have on wetlands, submerged aquatic vegetation, and other Waters of the Commonwealth of Pennsylvania.

4). The SRBC proposal does not mention if they would be applying for and obtaining a permit to Draw Off Water from Impoundments, from the PAF&BC and the Pennsylvania Department of Environmental Protection. I suggest you look into the PAF&BC, Fishing and Boating Code, Sect. 3506, Chapter 51, Subchapter I, 51.81, regarding permission for drawdown of impoundments.

These same four comments were mailed to Mr. John Balay of the SRBC, on June 29, 2011. I trust that the USACOE will conduct a National Environmental Policy Act (NEPA) review since it will be a federal action to implement revised reservoir operations. Please consider these comments during the evaluation of the options to optimize water from Curwensville Lake for consumptive use. Please let me know how you will be addressing these comments. If you have any questions please call the above listed number.

Sincerely,

Fred Berry

Conservation Technician
Clearfield County Conservation District

Attachment: PAF&BC Biologist Report

US Army Corps
of Engineers
Baltimore District

Planning Division

Public Notice

Curwensville Lake Project
Clearfield County, Pennsylvania

The U.S. Army Corps of Engineers, Baltimore District (USACE), is investigating a revised plan of operation for the water supply storage owned by the Susquehanna River Basin Commission (SRBC) at Curwensville Lake, Pennsylvania (Enclosure). Curwensville Lake is a dammed section of the West Branch Susquehanna River. The dam lies about 2 miles south of Curwensville Borough. At the request of SRBC, the USACE is examining ways to more effectively use SRBC-owned water storage at the lake through modifications to the current water release operations plan. Modified releases could help offset downstream consumptive water use during dry years and support stream ecosystem flow needs as determined by The Nature Conservancy. Downstream water bodies potentially affected include the West Branch Susquehanna River and the Susquehanna River. USACE is preparing an environmental assessment (EA) in compliance with the National Environmental Policy Act of 1969, as amended, to evaluate potential impacts of modified operations to lake and downstream water quality, submerged aquatic vegetation, wetlands, fish, recreation, and other considerations. Potential impacts could result from altered magnitude, frequency, duration, and seasonality of lake drawdown and downstream flows.

The purpose of this notice is to request information concerning interests within your organization's area of responsibility and to help identify issues that may affect the implementation of future projects. For federal and state resource agencies receiving a copy of this notice, we request that you provide information concerning interests within your organization's area of responsibility or expertise within 30 days from the date of this notice. Please send correspondence to the address below.

U.S. Army Corps of Engineers, Baltimore District
ATTN: CENAB-PL-P (Spaur)
P.O. Box 1715
Baltimore, Maryland 21203-1715

If you have any questions regarding this project, please contact Mr. Christopher Spaur of our Civil Project Development Branch at (410) 962-6134 or by e-mail at christopher.c.spaur@usace.army.mil

ER No. 2015-1523-033-A

SHPO REQUESTS ADDITIONAL INFORMATION (see attached)

Date 7/23/15 Reviewer B. Snedeker

Dan Bierly
Chief, Civil Project Development Branch

CORPS OF ENGINEERS | U. S. ARMY

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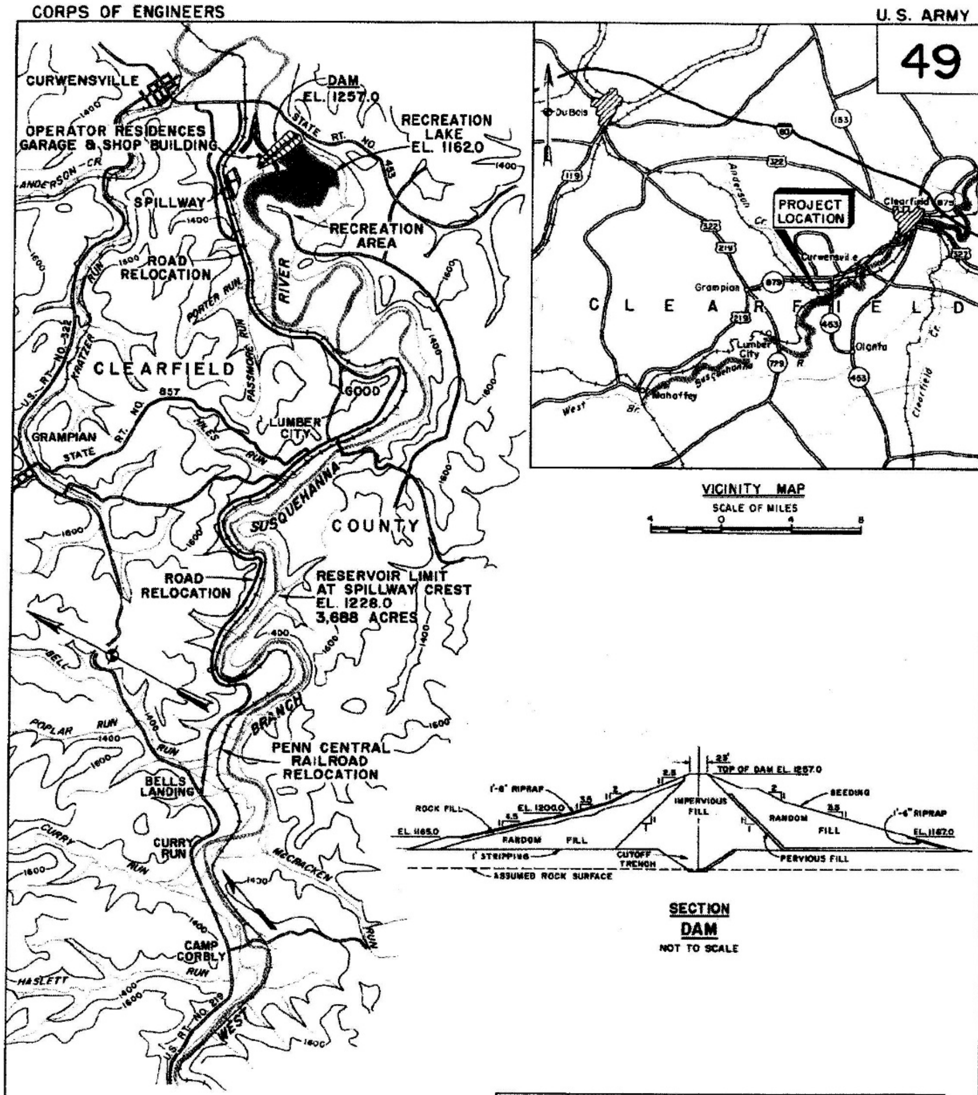

DRAINAGE AREA	STORAGE	HEIGHT OF DAM	DESIGN FREEBOARD	SPILLWAY	
				CREST LENGTH	DESIGN DISCHARGE
365 Sq. Mi.	124,200 Acre Ft.	131 Ft.	5.0 Ft.	480 Ft.	164,000 ft³/s

WEST BRANCH SUSQUEHANNA RIVER BASIN

CURWENSVILLE LAKE

PROJECT AREA AND SECTION

REVISED: SEPTEMBER 1990

WEST BRANCH SUSQUEHANNA RIVER | PENNSYLVANIA

SCALE AS SHOWN

BALTIMORE DISTRICT OFFICE | BALTIMORE, MARYLAND

2015 - 1523 - 033-A

PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION

BUREAU FOR HISTORIC PRESERVATION

http://phmc.info/historicpreservation.

ADDITIONAL INFORMATION REQUEST SHEET

(Revised May 2014)

Please submit checked items for PHMC-BHP to proceed with project review.

A. FUNDING/PERMITTING/LICENSING/APPROVAL PROGRAM
- ( ) 1. Identify the Federal/State Agency and funding program or permit/license

B. PROJECT DESCRIPTION
- ( ) 1. Narrative description of the project and related actions resulting from the project
- ( ) 2. Proposed boundary of the project's Area of Potential Effect (APE). Provide Justification of APE. Remember to consider visual impacts
- ( ) 3. Architectural plans of existing conditions (as-built or as-found)
- ( ) 4. Preliminary architectural drawings or plans (floor plans, elevations, specifications)
- ( ) 5. Work write-ups
- ( ) 6. Site plans of existing conditions
- ( ) 7. Site plans of proposed development
- ( ) 8. For linear project: highlight any portion of the alignment that is located outside of current road/railroad or buried utility Right-of-Way (ROW)

C. PROJECT LOCATION
- ( ) 1. U.S.G.S 7.5 min. series quadrangle with the **PROJECT LOCATION(S) AND LIMITS CLEARLY MARKED** using a colored pen. Please include the name of the quadrangle. Map must include nearest place name.
- ( ) 2. Street map (for properties in densely populated areas)
- ( ) 3. Street map showing location and historic district boundaries (if appropriate)
- ( ) 4. Street address of property
- ( ) 5. Municipality in which project is located (not mailing address location)

D. PROJECT SIZE (supply as appropriate for project)
- ( ) 1. Acreage of project area
- ( ) 2. Miles/feet of project area and Right-of-Way (ROW) width
- (X) 3. Extent and nature of ground disturbing activities (i.e. grading, trenching, foundation excavation)

E. PHOTOGRAPHS (No photocopies. Clear, color, high resolution digital images preferred)
- ( ) 1. Exterior of all building(s)/structures in project area
- ( ) 2. Interior of building(s) in project area
- ( ) 3. Interior of building(s) illustrating the proposed work areas/features
- ( ) 4. Buildings, streetscape, setting of features in Area of Potential Effect (APE)
- ( ) 5. Views of project area

F. CULTURAL RESOURCE IDENTIFICATION
- ( ) 1. Pennsylvania Historic Resource Survey Form(s) for all properties 50 years or older within the Area of Potential Effect (APE) (see our website at: http://phmc.info/historicpreservation, Select "Forms and Guidance")
- ( ) 2. Historical background, context report, information for historic resources identified
  Apply this context, available on our website: ________________________.

G. EFFECTS
- (X) 1. How will the project affect building(s) over 50 years old? (OR NOT?)
- ( ) 2. National Register listed/eligible property(s) exist in project area. How will the project affect this historic property(s)?

(OVER)

H. OTHER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
110 Radnor Road, Suite 101
State College, Pennsylvania 16801-4850

July 27, 2015

U.S. Army Corps of Engineers
Baltimore District
ATTN: CENAB-PL-P (Spaur)
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Curwensville Lake Project, Clearfield County, PA

Dear Mr. Spaur:

The U.S. Fish and Wildlife Service (Service) is writing in response to the July 9, 2015 Public Notice regarding the Curwensville Lake project. The stated purpose of the notice was to request information concerning interests within recipient organizations' areas of responsibility or expertise, and to help identify issues that may affect the implementation of future projects as they relate to a revised plan of operation for water releases from the Curwensville Lake water supply storage owned by the Susquehanna River Basin Commission.

The U.S. Fish and Wildlife Service (Service) is involved in various efforts to restore American shad, river herring, American eel and other migratory fish populations to the Susquehanna River Basin. Changes in river flows can impact the timing and success of fish migration and reproduction. The Service is also working to restore native mussel populations to the Susquehanna River Basin. Healthy mussel beds provide important ecosystem services, including significant water quality benefits due to their filtering capacity. Changes in both flow and water temperature can affect mussel populations and/or efforts to restore them.

Pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*), the Service has a responsibility to coordinate with other water resources development programs in order to ensure that fish and wildlife resources under its jurisdiction are afforded equal consideration. The amendments enacted in 1946 require consultation with the Fish and Wildlife Service and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources".

1

Pursuant to these legal responsibilities and restoration efforts, the Service requests copies of the revised water release operations plan and the environmental assessment (EA) being developed by the USACE, when they become available for public comment, to evaluate potential impacts of modified water release operations to downstream fish and wildlife resources under the Service's jurisdiction.

Please send the requested documents and any related information to Richard McCorkle of my staff. Mr. McCorkle can be reached at 814-234-4090.

Sincerely,

Lora L. Zimmerman
Field Office Supervisor

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF RECREATION AND CONSERVATION

July 27, 2015

U.S. Army Corps of Engineers, Baltimore District
ATTN: CENAB-PL-P (Spaur)
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Curwensville Lake Project
Clearfield County, Pennsylvania

To Whom it May Concern:

The Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation is in receipt of your recent Public Notice regarding proposed modifications to the water release operations at Curwensville Lake in Clearfield County, Pennsylvania. As outlined in the Public Notice, the U.S. Army Corps of Engineers is examining ways to more effectively use the SRBC-owned water storage at the lake through modifications to the current water release operations plan. Modified releases could help offset downstream consumptive water use during dry years and support stream ecosystem flow needs as determined by The Nature Conservancy. The downstream water bodies potentially affected by this project include the West Branch and Main Stem of the Susquehanna River.

The Bureau has an interest in this proposal as it has funded numerous park and recreation acquisition/development projects in the area of Curwensville Lake and wants to ensure the long-term public use and protection of these investments. In reviewing the information presented in the Public Notice, it appears that the proposed water release modifications have the potential to improve downstream hydrologic conditions during periods of low flow. These improved hydrologic conditions would likely constitute an overall benefit to the aquatic ecology and public recreational use of the West Branch and Main Stem of the Susquehanna River. Therefore, the Bureau has no concerns with the implementation of the proposed water release modifications.

If the circumstances of your proposal change, or if greater recreational impacts are anticipated, please submit additional documentation to the Bureau for further consideration. If you have any questions or concerns, please contact me at (717) 772-3322; email arebert@pa.gov.

Sincerely,

Ashley Rebert

Ashley D. Rebert, Chief
Land Conservation, Project Monitoring & Stewardship Section
Bureau of Recreation and Conservation

cc: Erin Moyers, Northwest Regional Office

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United States Department of Agriculture

Natural Resources Conservation Service

Pennsylvania State Office

One Credit Union Place, Suite 340
Harrisburg, PA 17110
Voice 717-237-2100
Fax 717-237-2238

August 5, 2015

Christopher Spaur
CENAB-PL-P
US Army Corps of Engineers, Baltimore District
P.O Box 1715
Baltimore, MD 21203-1715

Subject: Curwensville Lake Project

Dear: Mr. Spaur

Recently our office conducted a review of the above referenced project relating to the National Environmental Policy Act (NEPA), environmental assessment review. Based on the information provided, it appears this project addresses the water release operations plan. The water release operations plan will have no resulting impacts to agricultural lands downstream of the dam.

As there are no impacts to agricultural lands, specifically Prime Farm land and Farmland of Statewide Importance, NRCS has no concerning interest at this time. We appreciate the opportunity to provide input. If you have additional questions or concerns please feel free to contact me at (717)-237- 2207 or e-mail to joseph.kraft@pa.usda.gov.

Sincerely,

Joe Kraft
State Soil Scientist (CPSS/CPSC)

cc. Denise Coleman, State Conservationist, PA NRCS
Hosea Latshaw, State Conservation Engineer, PA NRCS
Dan Dostie, State Resource Conservationist, PA NRCS
Hathaway Jones, Management Analyst (Easements), PA NRCS

Helping People Help the Land

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

August 17, 2015

Mr. Christopher Spaur
US Army Corps of Engineers
PO Box 1715
Baltimore, MD 21203-1715

Re: Curwensville Lake Project
Clearfield County

Dear Mr. Spaur:

The Pennsylvania Department of Environmental Protection has reviewed the information provided regarding the above project.

Before proceeding with this project, please consider the following comment:

1. The Southcentral Safe Drinking Water Program regulates several water suppliers that could be impacted by major changes in release rates to the Susquehanna River. We request that the US Army Corps of Engineers provide updates and drafts to our office for review and consideration as the project progresses.

Thank you for the opportunity to provide comments on this project. If you would like to meet with us to discuss the project, please call me at 717.705.4929.

Sincerely,

Robert E. Conrad
Assistant Regional Director

Assistant Regional Director
Southcentral Regional Office | 909 Elmerton Avenue | Harrisburg, PA 17110-8200 | 717.705.4704 | F 717.705.4930
www.depweb.state.pa.us

Visit ClearfieldCounty PA
backwoods. backroads. backwaters.
511 Spruce Street, Suite 8, Clearfield, PA 16830, www.visitclearfieldcounty.org

September 2, 2015

US Army Corps of Engineers, Baltimore District
ATTN: CENAB-PL-P (Spaur), Christopher Spaur
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Curwensville Lake Water Level Proposal

Dear Mr. Spaur,

This letter is in reference to the US Army Corps of Engineers proposed plans for the Curwensville Lake Recreation Area (CLRA), Clearfield County, PA.

Visit Clearfield County, addressed the issue of how drawing down the lake would affect our long term plan of tourism sustainability. Having weighed all of the possibilities of the impact of this proposal, the Visit Clearfield County opposes any major lowering of the water levels at the dam for several reasons.

- The current eco-system would be adversely affected as well as the current fish habitats which have been implemented,
- The current variety of fish and the current numbers of fish would be adversely affected, as well as the current levels of stocking which would decline,
- Boating, swimming fishing (both normal and ice fishing) would be adversely affected,
- Camping and recreational use of the CLRA would be diminished,
- And to an area that has been hit with severe economic loses over the past number of decades would again be more severely impacted, in a negative way, by such a move by the USACE,
- Visit Clearfield County has awarded CLRA over $70,000 for marketing and tourism improvements.

Statistics prove that visitors to Clearfield County and users of the West Branch Susquehanna River value the fish habitat during their visit. Without these visitors area businesses would be negatively impacted. The CLRA is a vital part of our tourism sustainability in a part of the county that has faced challenging economic times.

Should you have any questions or comments about this, please do not hesitate to contact us at our address and web address listed above.

Sincerely,

Holly Komonczi
Executive Director
Clearfield County Recreation and Tourism Authority

Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us

September 4, 2015

Dan Bierly
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715

TO EXPEDITE REVIEW USE
BHP REFERENCE NUMBER

Re: File No. ER 2015-1523-033-B
COE Environmental Assessment: Curwensville Lake Project, Proposed Modifications to Water Releases from Curwensville Reservoir
Curwensville Borough, Clearfield County

Dear Mr. Bierly:

Thank you for submitting information concerning the above referenced project. The Bureau for Historic Preservation (the State Historic Preservation Office) reviews projects in accordance with state and federal laws. Section 106 of the National Historic Preservation Act of 1966, and the implementing regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation, is the primary federal legislation. The Environmental Rights amendment, Article 1, Section 27 of the Pennsylvania Constitution and the Pennsylvania History Code, 37 Pa. Cons. Stat. Section 500 et seq. (1988) is the primary state legislation. These laws include consideration of the project's potential effects on both historic and archaeological resources.

There may be historic buildings, structures, and/or archaeological resources located in or near the project area. In our opinion, the activities described in your proposal should have no effect on these resources. Should the scope and/or nature of the project activities change, the Bureau for Historic Preservation should be contacted immediately.

If you need further information regarding archaeological resources, please contact Kira Heinrich at (717) 705-0700. If you need further information concerning historic structures, please contact Barbara Frederick at (717) 772-0921.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology &
Protection

DCM/tmw

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Mailing List

The public notice of availability was also sent to seven (7) residences.

Ms. Jodi K. August, Executive Director DuBois Area Chamber of Commerce 3 S. Brady St. #205 DuBois, PA 15801		Mr. John C. Williams, Manager Clearfield Municipal Authority 107 E. Market Street Clearfield, PA 16830
Mr. Josiah Jones, Director Clearfield County Recreation & Tourism 650 Leonard Street Clearfield, PA 16830		Ms. Kelly Williams, Watershed Specialist Clearfield County Conservation District 6395 Clearfield Woodland Highway, Suite 2 Clearfield, PA 16830
Mr. Bob Franssen, Operations General Manager Susquehanna Steam Electrical Station 769 Salem Boulevard (NUCSA3) Berwick, PA 18603		Mr. Alan D. Chaplin A.B. Shaw Heirs, LLC 2515 Meadow Road Clearfield, PA 16830
Mr. George Kutskel, President Allegheny Mountain Chapter of Trout Unlimited 107 Simmons Street DuBois, PA 15801		Mr. Dan Santoro, AICP, Office Manager Herbert, Rowland & Gubric, Inc. 200 West Kinsinger Drive, Suite 400 Cranberry Township, PA 16066
Headwaters Resource Conservation & Development Council 109 North Brady Street, 2nd Floor DuBois, PA 15801		Mr. Earl Smithmyer Clearfield Creek Watershed Association 216 Beldin Hollow Road Ashville, PA 16613
Mr. Ron Sartori, President Mosquito Creek Sportsmen's Watershed Association 1566 Sportsmens Road P.O. Box 208 Frenchville, PA 16836		Anderson Creek Watershed Association P.O. Box 53 Curwensville, PA 16833

Mr. Craig Altemese Penn State Extension, Clearfield County Multi-Service Center, Rm. 210 650 Leonard Street Clearfield, PA 16830	Ms. Anne Mae Pezzulla Emigh Run Lakeside Watershed Association 882 Rolling Stone Road Morrisdale, PA 16858
Ms. Susan Fitzsimmons, Chair Western Pennsylvania Conservancy 800 Waterfront Drive Pittsburgh, PA 15222	Mr. Terry Malloy, President Clearfield, Pennsylvania Heritage Foundation P.O Box 163 Clearfield, PA 16830
Investors Capital Corporation P.O. Box 188 Smithmill, PA 16680	Mr. Wilson Fisher, Jr., Engineering Hess & Fisher Engineers, Inc. 36 N. 2nd Street Clearfield, PA 16830
Cindy Dunn, Secretary Pennsylvania Department of Conservation & Natural Resources 400 Market Street P.O. Box 8475 Harrisburg, PA 17105	Mr. Joseph Bigar, Director Clearfield County Emergency Management Agency 911 Leonard Street Clearfield, PA 16830
Mr. Charlie Charlesworth, President Pennsylvania Council of Trout Unlimited P.O. Box 5148 Bellefonte, PA 16823	Mr. George Bielen, Supervisory Civil Engineer U.S. Army Corps of Engineers 306 Railroad Street Second Floor Danville, PA 17821
Mr. John Pontius, President Hudson-Essex Terraplane Club Inc. 81 Hudson Drive Woodland, PA 16881	Ms. Jodi Brennan, Director Clearfield County Planning Board 212 East Locust Street, Suite 128 Clearfield, PA 16830

Ms. Julie Benamati The Progress P.O. Box 952 Clearfield, PA 16830	Honorable Robert Casey Jr. United States Senator 22 South 3rd Street, Suite 6A Harrisburg, PA 17101
Ms. Judy Hricak, Vice President Gannett Fleming, Inc. P.O. Box 67100 Harrisburg, PA 17106-7100	Honorable Scott Perry United States Representative 730 North Front Street Wormleysburg, PA 17043
Honorable Tom Marino United States Representative 1020 Commerce Park Drive, Suite 1A Williamsport, PA 17701	Honorable Lou Barletta United States Representative 4813 Jonestown Road Suite 101 Harrisburg, PA 17109
Honorable Robert Casey Jr. United States Senator 817 E. Bishop Street, Suite C Bellefonte, PA 16823	Mr. Patrick McDonnell, Secretary Pennsylvania Department of Environmental Protection Rachel Carson State Office Building 400 Market Street Harrisburg, PA 17101
Ms. Denise Coleman, State Conservationist U.S. Department of Agriculture 359 East Park Drive, Suite 2 Harrisburg, PA 17111-2747	Mr. John Potts Clearfield County Senior Environmental Corps 747 Weaver Street Ext. Clearfield, PA 16830
Mr. John Hecker DCNR Moshannon State Forest 3372 State Park Road Penfield, PA 15849	Mr. Antonio Scotto, Commissioner Clearfield County 212 East Locust Street Clearfield, PA 16830

Honorable Matt Gabler Pennsylvania State Representative 1221 E. Dubois Avenue DuBois, PA 15801		Mr. Adam Mattis, Regional Advisor Pennsylvania Department of Conservation And Protection 301 5th Street, Suite 324 Pittsburgh, PA 15222
Mr. Cecil A. Rodrigues, Regional Administrator US Environmental Protection Agency 1650 Arch Street Philadelphia, PA 19103		Mr. Mark McCracken, Commissioner Clearfield County 212 E. Locust Street Clearfield, PA 16830
Ms. Mary Horner, Park Manager Curwensville Lake Recreation Area 1256 Lake Drive Curwensville, PA 16833		Mr. Andrew Shiels, Director Pennsylvania Fish and Boat Commission Fisheries Bureau 450 Robinson Lane Bellefonte, PA 16823
Mr. Greg Podniesinski, Chief Pennsylvania National Heritage Program 400 Market Street Harrisburg, PA 17105		Honorable Glenn Thompson United States Representative 3555 Benner Pike, Suite 101 Bellefonte, PA 16823
Mr. Jared Shippey, District Conservationists U.S. Department of Agriculture Du Bois Service Center 478 Jeffers Street DuBois, PA 15801-2438		Honorable Pat Toomey United States Senator 228 Walnut Street, Suite 1104 Harrisburg, PA 17101
Mr. John Sobel, Commissioner Clearfield County 212 East Locust Street Clearfield, PA 16830		Honorable Pat Toomey United States Senator 538 Spruce Street, Suite 302 Scranton, PA 18503

Ms. Susan Reed, District Manager Clearfield County Conservation District 6395 Clearfield Woodland Highway, Suite 2 Clearfield, PA 16830 *Receives Hard Copy*		Pennsylvania Department of Transportation 1905 Washington Avenue P.O. Box 245 Hyde, PA 16843
Mr. Bryan Burchans, Executive Director Pennsylvania Game Commission 2001 Elmerton Avenue Harrisburg, PA 17110-9797		Honorable Tommy Sankey Pennsylvania State Representative 315 E. Market Street, Suite B Clearfield, PA 16830
Mr. Tony Ross, Wildlife Supervisor Pennsylvania Game Commission P.O. Box 5038 Jersey Shore, PA 17740		Honorable Wayne Langerholc Pennsylvania State Senator 125 East Market Street Clearfield, PA 16830
Mr. Michael Smith, Mining Manager Pennsylvania Department of Environmental Protection 186 Enterprise Drive Phillipsburg, PA 16866		Honorable Tom Marino Representative in Congress 1020 Commerce Park Drive, Suite 1A Williamsport, PA 17701
Honorable Scott Perry Representative in Congress 730 North Front Street Wormleysburg, PA 17043		Honorable Lou Barletta Representative in Congress 4813 Jonestown Road, Suite 101 Harrisburg, PA 17109
Clearfield County Public Library 601 Beech Street Curwensville, PA 16833 *Receives Hard Copy*		Curwensville Borough 900 Susquehanna Avenue Curwensville, PA 16833

Joseph and Elizabeth Shaw Public Library 1 South Front Street Clearfield, PA 16830 *Receives Hard Copy*		Clearfield Borough 108 East Cherry Street Clearfield, PA 16830
Karthaus Township 367 Market Street Karthaus, PA 16845		Keating Township 7160 Route 46 P.O. Box 103 East Smethport, PA 16730
Renovo Library 317 7th Street Renovo, PA 17764 *Receives Hard Copy*		Renovo Borough 128 5th Street Renovo, PA 17764
James Campbell U.S. Geological Survey Pennsylvania Water Science Center 215 Limekiln Road New Cumberland, PA 17070-2424		Ross Library 232 West Main Street Lock Haven, PA 17745 *Receives Hard Copy*
City of Lock Haven 20 E. Church Street Lock Haven, PA 17745		Woodward Township 4910 South Route 220 Highway, Suite 1 Linden, PA 17744
Jersey Shore Library 110 Oliver Street Jersey Shore, PA 17740 *Receives Hard Copy*		Jersey Shore Borough 232 Smith Street Jersey Shore, PA 17740

James V. Brown Library 19 East 4th Street Williamsport, PA 17701 *Receives Hard Copy*		Williamsport City Hall 245 West Fourth Street Williamsport, PA 17701
South Williamsport Borough 329 W. Southern Avenue South Williamsport, PA 17702		Konkle W B Library 384 Broad Street Montoursville, PA 17754 *Receives Hard Copy*
Montoursville Borough 617 N. Loyalsock Avenue Montoursville, PA 17754		Milton Library 541 Broadway Street Milton, PA 17847 *Receives Hard Copy*
Milton Borough 2 Filbert Street Milton, PA 17847		Public Library for Union County 255 Reitz Boulevard Lewisburg, PA 17837 *Receives Hard Copy*
Lewisburg Borough 55 South Fifth Street Lewisburg, PA 17837		Priestley Forsyth Memorial Library 100 King Street Northumberland, PA 17857 *Receives Hard Copy*
Northumberland Borough 175 Orange Street Northumberland, PA 17857		Dugenstein Community Library 40 South 5th Street Sunbury, PA 17801 *Receives Hard Copy*

Sunbury Borough 225 Market Street Sunbury, PA 17801	McCormick Riverfront Library 101 Walnut Street Harrisburg, PA 17101 *Receives Hard Copy*
Exelon Energy Chemistry / Environmental Department Route 441 South P.O. Box 480 Middletown, PA 17057	PPL Susquehanna LLC NUCWH2 769 Salem Road Berwick, PA 18603
Mr. Ian MacFarlane EA Engineering, Science and Technology, Inc. 225 Schilling Circle, Suite 400 Hunt Valley, MD 21031	Kelly Heffner, Executive Deputy Secretary for Programs Pennsylvania Department of Environmental Protection Rachel Carson State Office Building 400 Market Street Harrisburg, PA 17101
Senator Joseph Scarnati, III Pennsylvania State Senator Senate Box 203025 Harrisburg, PA 17120-3025	Senator Donald White Pennsylvania State Senator Senate Box 203041 Harrisburg, PA 17120-3041
John Balay Susquehanna River Basin Commission 4223 N. Front Street Harrisburg, PA 17110-1788 *Receives Hard Copy*	Shane Kelly Curwensville Lake Authority 1256 Lake Drive Curwensville, PA 16833 *Receives Hard Copy*
Fred Berry Clearfield County Conservation District 6395 Clearfield Woodland Highway, Suite 2 Clearfield, PA 16830 *Receives Hard Copy*	Amy Elliott U.S. Army Corps of Engineers Baltimore District 10 South Howard St. Baltimore, MD 21201 *Receives Hard Copy*

Lora Lattanzi U.S. Fish and Wildlife Service Pennsylvania Field Office 110 Radnor Road, Suite 101 State College, PA 16801 *Receives Hard Copy*		James M. Vaughan State Historic Preservation Officer Pennsylvania Historical & Museum Commission 400 North Street Harrisburg, PA 17120-0093
Mr. John A. Arway, Executive Director Pennsylvania Fish and Boat Commission 1601 Elmerton Avenue P.O. Box 8475 Harrisburg, PA 17106		

Annex B

SUPPLEMENTAL INFORMATION

Table of Contents

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Table: Common wetland plant species in Curwensville Lake (SRBC, 2012).

Common Name	***Scientific Name***
Woolgrass	*Scirpus cyperinus*
Rice cut grass	*Leersia oryzhoides*
Cattail	*Typha*
Reed canary grass	*Phalaris arundinacea*
Blue flag iris	*Iris*
Silky dogwood	*Cornus amomum*
Arrowwood	*Viburnum*
Smooth alder	*Alnus serrulata*
Black willow	*Salix nigra*
Red maple	*Acer rubrum*
Silver maple	*Acer saccharinum*

Table: Fish species collected in Curwensville Lake. Sampling conducted from 1998 – 2009 (a,b,c). Compiled by SRBC (2012).

Scientific Name	**Common Name**
Notemigonus crysoleucas	Golden shiner
Cyprinus carpio	Common carp
Luxilus cornutus	Common shiner
Pimephales notatus	Bluntnose minnow
Semotilus atromaculatus	Creek chub
Notropis hudsonius	Spottail shiner
Moxostoma macrolepidotum	Shorthead redhorse
Catostomus commersonii	White sucker
Ameiurus natalis	Yellow bullhead
Ameiurus nebulosus	Brown bullhead
Esox niger	Chain pickerel
Esox masquinongy x lucius	Tiger muskellunge
Ambloplites rupestris	Rock bass
Micropterus salmoides	Largemouth bass
Lepomis macrochirus	Bluegill
Lepomis gibbosus	Pumpkinseed
Micropterus dolomieu	Smallmouth bass
Pomoxis annularis	White crappie
Pomoxis nigromaculatus	Black crappie
Lepomis cyanellus	Green sunfish
Perca flavescens	Yellow perch
Sander vitreus	Walleye
Etheostoma olmstedi	Tesselated darter

[a] (Hollender & Kristine, 1999), [b] (Pennsylvania DEP, 2009), [c] (PFBC, 2009)

Hollender, B., & Kristine, D. (1999). *Curwensville Lake (308B) Management Report.* Pennsylvania Fish and Boat Commission, Bureau of Fisheries, Division of Fisheries Management.

Pennsylvania DEP. (2009, March 5). Fisheries survey of Curwensville Reservoir, File #18668.

Pennsylvania Fish and Boat Commission. (2009, May). Biologists Reports: Curwensville Lake, Clearfield County

Table: Scientific Names of Select Aquatic Plants and Animals of Susquehanna River (TNC, 2010).

Common Name	*Scientific Name*

<u>Plants</u>

Eurasian watermilfoil	(*Myriophyllum spicatum)*
Riverweed	(*Podostemum ceratophyllum*)
Common waterweed	(*Elodea canadensis*)
European naiad	(*Najas minor*)
Slender Naiad	(*Najas gracilliama*)
Southern naiad	(*Najas guadalupensis*)
Water willow	(*Justicia americana*)
Lizard's tail	(*Sarurus cernuus*)

<u>Benthic Macroinvertebrates</u>

Eastern floater	(*Pyganodon cataracta*)
Zebra mussel	(*Dreissena polymorpha*)

<u>Finfish</u>

Black crappie	(*Pomoxis nigromaculatus*)
Smallmouth bass	(*Micropterus dolomieu*)
Largemouth bass	(*Micropterus salmoides*)
Muskellunge	(*Esox masquinongy*)
Tiger muskellunge	(*Esox masquinongy x lucius*)
Sunfish	(*Lepomis spp.*)
Yellow perch	(*Perca flavescens*)
Brown bullhead	(*Ameiurus nebulosus*)
Yellow bullhead	(*Ameiurus natalis*)
Common carp	(*Cyprinus carpio*)
Alewife	(*Alosa pseudoharengus*)

<u>Rare Species</u>

Yellow lamp-mussel	*Lampsilis cariosa*
Green floater	*Lasmigona subviridis*
Brook floater	*Alasmidonta varicosa*
Hellbender	*Cryptobranchus alleganiensis*

Table: Alternative plans' percentage of future years with drawdowns by one foot intervals[31].

Drawdown Level (ft)	Drawdown Elevation Range (ft)		Alternative*			
	Upper	Lower	Baseline	R95	H95	M95
1 < Drawdown ≤ 2	1161	1160	8	12	10	12
2 < Drawdown ≤ 3	1160	1159	0	4	4	4
3 < Drawdown ≤ 4	1159	1158	0	1	0	0
4 < Drawdown ≤ 5	1158	1157	4	4	3	3
5 < Drawdown ≤ 6	1157	1156	0	1	1	1
6 < Drawdown ≤ 7	1156	1155	0	0	0	1
7 < Drawdown ≤ 8	1155	1154	0	0	1	0
8 < Drawdown ≤ 9	1154	1153	0	4	0	0
9 < Drawdown ≤ 10	1153	1152	3	3	3	3
10 < Drawdown	1152	1151	0	0	0	0
Total			13	28	22	23

*The data presented in this table differ somewhat from that presented in Table 2-9 because of rounding errors.

[31] Modified from Table 5-1 from SRBC Curwensville (2012): "Table 5-1 Simulated Number of Years (Percentage of Years) Maximum Drawdown Occurs within Selected Drawdown Intervals for the Entire Modeling Period."

Monthly P95 Values Presented in this EA Versus Some Earlier SRBC and USACE Documents

While preparing this EA, it was identified that monthly P95 values presented in the text of several previous SRBC and USACE reports differ from the P95 trigger values used in the OASIS model. Documents pertaining to Curwensville Lake with this discrepancy are included in Table 1 below:

Table 1: Earlier documents with P95 discrepancies.

Preliminary Assessment of Optimizing Use of Commission-Owned Water Storage at Cowanesque and Curwensville Lakes, Pennsylvania (USACE and SRBC, November 2010)
Addendum to Main Report, Preliminary Assessment of Optimizing Use of Commission-Owned Water Storage at Cowanesque and Curwensville Lakes, Pennsylvania (USACE and SRBC, March 2011)
Optimizing Use of Commission-Owned Water Storage at Curwensville Lake, Pennsylvania (EA Engineering, Science, and Technology, May 2012)
Draft Environmental Assessment, Curwensville Lake Water Supply Releases to West Branch Susquehanna and Susquehanna Rivers, Pennsylvania (USACE, March 2016)
Letter Report, Proposed Change to Water Supply Release Plan, Curwensville Lake, Pennsylvania (USACE, January 2016)

SRBC and USACE investigated this discrepancy. The monthly P95 values were calculated based on gage record start date through to 2007. These values were used to model water supply releases and lake drawdowns, including associated environmental and recreational impacts. SRBC file review revealed that erroneous P95 values presented in the documents in Table 1 linked back to early project model runs which included an additional 120 cfs (adjustment) to trigger flows for gages downstream of the Juniata River to account for existing low flow augmentation at Raystown Lake. Subsequently, because Raystown Lake low flow augmentation had been part of the low flow record for downstream gages for over four decades, it was decided that the 120 cfs trigger flow adjustment was not necessary. The H95 and M95 alternatives included in OASIS modeling efforts were based on actual P95 values, not P95 + 120 cfs values. However, the adjusted P95 values were erroneously included in the reports identified above. Table 2 presents correct P95 and erroneous P95 values for the H95 and M95 alternatives:

Table 2: Correct and Erroneous P95 Values

	H95 Alternative		**M95 Alternative**	
Month	**Correct P95 Values (cfs)**	**Erroneous P95 Values (cfs)**	**Correct P95 Values (cfs)**	**Erroneous P95 Values (cfs)**
July	3500*	3620*	3750*	3870*
August	3500	3620	3750	3870

September	2980	3100	2980	3100
October	3120	3240	3630	3750
November	3120*	3240*	3630*	3750*

*July and November values are modified P95 monthly values of August and October P95, respectively rather than the actual correct P95 values for those months.

In summary, the OASIS modeling forming the basis of impacts assessment for Curwensville Lake in this EA used the correct P95 trigger values, and modeled impacts to Curwensville Lake (drawdown frequency, depth, duration, & timing) are valid. However, incorrect P95 trigger values were reported in earlier documents, and that error was repeated through subsequent documents.