Report to Congress for Future Water Resources Development (WRRDA 7001) Submission Package

Proposal Name: Raising Winter Pool Level and Expanding hydroelectric generation capability at the Summersville Hydroelectric Project on the Gauley River in Nicholas County, WV.

Submission Date: 08/22/2019

Proposal ID Number: 0a57feba-5832-485d-b8ff-72c314decadb

Purpose of Proposal: This proposal requests Congress authorize and appropriate funds to the U.S. Army C orps of Engineers (USACE), Huntington District to conduct the following operational flexibility studies for the Summersville Lake and Dam to achieve additional or enhanced hydroelectric generation capability fro m the Summersville hydroelectric project, as follows: 1.A feasibility study to confirm that raising the wi nter pool by up to 50 feet during winter months does not defeat another authorized project purpose. 2.A f easibility study to confirm that specific operational changes in winter to reduce the frequency of valve byp ass flow releases in the Summersville Lake, under certain weather conditions, to minimize the spilling of wa ter that could otherwise be used for additional or enhanced hydroelectric generation capability, do not defe at another authorized project purpose. 3.A feasibility study to confirm that specific models and forecastin g tools are an approved alternative to set the optimum summer pool refill start date rather than adhering t o the fixed April 1 date. For Example, beginning refill date could be based on lake temperature to coordi nate with fish spawning. After completion of the studies, the USACE, Huntington District would be aut horized to make modifications, changes or add deviations to the approved Summersville Lake Water Contr ol Manual, Plan, or practice to add and_or enhance hydroelectric generation capabilities at the Summersvi lle Lake and Dam on the Gauley River in Nicholas County, WV, so long as they do not defeat another aut horized project purpose. Implementing these changes should not require any capital cost.

1. Administrative Details

Proposal Name: Raising Winter Pool Level and Expanding hydro electric generation capability at the Summersville Hydroelectric P roject on the Gauley River in Nicholas County, WV.

by Agency: Summersville Hydroelectric Project (City of Summer sville, WV; Enel Green Power North America, Noah Corp., collec tively, The Parties)

Locations: WV

POC Name: Mayor, City of Summersville, WV

POC Phone:

POC Email:

Date Submitted: 08/22/2019
Confirmation Number: 0a57feba-5832-485d-b8ff-72c314decadb

Supporting Documents

File Name	Date Uploaded
Noah Support Letter, 7001Application,Jul24,19.pdf	08/13/2019
WV DNR letter.pdf	08/13/2019
Location of Summersville Lake map.pdf	08/13/2019
Summersville proposal for additional operational flexibility.pptx	08/13/2019
SumResolutionCityCouncilSept22-09SKMBT-C45109092909340.pdf	08/13/2019
SummModStudy1982Flood Study,p.E-2,Appdx4,pp4-A7to4-A18,Exh.4-4d (16 pages).pdf	08/13/2019
Additional Proposal Background.docx	08/13/2019
Responses to specific requirements that must be met by all applications.docx	08/13/2019
Summary of Study of Higher Winter Pool in Hydropower Study by Huntington District.doc	08/13/2019
Summersville letter of support.pdf	08/13/2019
Nicholas County letter of support.pdf	08/22/2019

2. Provide the name of the primary sponsor and all non-Federal interests that have contributed or are expected to contribute toward the non-Federal share of the proposed feasibility study or modification.

Sponsor	**Letter of Support**
City of Summersville, WV(Primary)	Attached
Gauley River Power Partners, LLC	Attached
West Virginia DNR	Attached
Noah Corp	Attached
Nicholas County	Attached

3. State if this proposal is for new feasibility study authority, a modification to an existing feasibility study authority, a modification to an existing USACE project authority, or a modification to an existing USACE Environmental Infrastructure Program authority. If it is a proposal for a modification to an existing study, project or program authority, provide the authorized water resources development feasibility study or project name.

[x] Modification to a USACE Project Authority : This proposal applies to the Summersville Lake Master P lan and would result in changes to the Summersville Lake Water Control Manual.

4. Clearly articulate the specific project purpose(s) of the proposed study or modification. Demonstrate that the proposal is related to USACE mission and authorities and specifically address why additional or new authorization is needed.

This proposal requests Congress authorize and appropriate funds to the U.S. Army Corps of Engineers (US ACE), Huntington District to conduct the following operational flexibility studies for the Summersville Lak e and Dam to achieve additional or enhanced hydroelectric generation capability from the Summersville hy droelectric project, as follows: 1.A feasibility study to confirm that raising the winter pool by up to 50 f eet during winter months does not defeat another authorized project purpose. 2.A feasibility study to conf irm that specific operational changes in winter to reduce the frequency of valve bypass flow releases in the Summersville Lake, under certain weather conditions, to minimize the spilling of water that could otherwis e be used for additional or enhanced hydroelectric generation capability, do not defeat another authorized project purpose. 3.A feasibility study to confirm that specific models and forecasting tools are an approve d alternative to set the optimum summer pool refill start date rather than adhering to the fixed April 1 dat e. For Example, beginning refill date could be based on lake temperature to coordinate with fish spawnin g. After completion of the studies, the USACE, Huntington District would be authorized to make modif ications, changes or add deviations to the approved Summersville Lake Water Control Manual, Plan, or pr actice to add and_or enhance hydroelectric generation capabilities at the Summersville Lake and Dam on t he Gauley River in Nicholas County, WV, so long as they do not defeat another authorized project purpos e. Implementing these changes should not require any capital cost.

5. To the extent practicable, provide an estimate of the total cost, and the Federal and non-Federal share of those costs, of the proposed study and, separately, an estimate of the cost of construction or modification.

	Federal	**Non-Federal**	**Total**
Study	$650,000	$650,000	$1,300,000
Construction	$0	$0	$0

Explanation (if necessary)

The only changes necessary to accomplish the additional hydroelectric generation described in section 4 ab ove are operating changes, no additional capital construction or cost is necessary. The existing Summ ersville Lake and Dam Water Control Manual, Plan, or practice are reviewed and revised on an annual bas is. After completion of the studies, the USACE, Huntington District would be authorized to make modifica tions, changes or add deviations to the approved Water Control Manual, Plan, or practice to raise winter p ool level and add and_or enhance hydroelectric generation capabilities at the Summersville Lake and Dam on the Gauley River in Nicholas County, WV, so long as they do not significantly impact any authorized p roject purpose.

6. To the extent practicable, describe the anticipated monetary and nonmonetary benefits of the proposal including benefits to the protection of human life and property; improvement to transportation; the national economy; the environment; or the national security interests of the United States.

Currently, the existing hydroelectric production benefits the citizens of Summersville, Nicholas County and the surrounding area by producing about 200,000,000 kilowatt-hours of non-emitting, renewable hydroelect ric power annually. That benefit is expected to increase by an additional 45,000,000 kilowatt-hours annua lly with the implementation of a higher winter pool and the additional operational flexibility to slow the rel ease of winter floods. The increased hydroelectric production would provide additional funding for publi c benefits provided by the City of Summersville, Nicholas County to the West Virginia Department of Nat ural Resources and other public benefits. Numerous benefits to the area have been funded with the power r evenue received by the City of Summersville. Nicholas County receives funds annually from the hydroelec tric project and similarly uses those funds for local improvements and public benefits. The hydroelectric p roject has paid the West Virginia Department of Natural Resources over $1.6 M since production began in 2001, and is expected to pay an additional $2.5 M over the next 25 years. That expenditure has allowed th e West Virginia Department of Natural Resources to significantly improve local wildlife and fishery facilitie s and recreation benefits. Assuming the additional hydroelectric production is achieved, The Parties ex pect to pay an additional royalty to the federal government of approximately $90,000 annually. Presently, The Parties pay about $500,000 annually for use of the dam for hydroelectric generation. Also addition al income taxes will be paid to federal and state governments.

7. Does local support exist? If 'Yes', describe the local support for the proposal.

[x] Yes

Local Support Description

Yes. The City of Summersville supports the request for additional operational flexibility at the Summersvil le Dam, as does Nicholas County and the West Virginia Department of Natural Resources. Their letters ar e attached.

8. Does the primary sponsor named in (2.) above have the financial ability to provide for the required cost share?

[x] Yes

Other Non-Federal Sponsors Letter(s) of Support

(This is as uploaded, a blank page will show if nothing was submitted)

Noah Support Letter, 7001Application,Jul24,19.pdf

Noah Corp.

P.O. Box 903 Phone: (865) 436-0402
Gatlinburg, TN 37738 Fax: (865) 436-0592
E-mail: jimpricehydro@bellsouth.net Cell: (803) 215-4165

July 24, 2019

To the Party Reviewing Section 7001 Applications:

Section 7001 Application Support Statement – Summersville Hydroelectric Project

Noah Corporation began its business of developing hydroelectric power at Corps of Engineers dams in early 1980, shortly after the 1978 PURPA became law and was confirmed by the Supreme Court. After considering several options, we concentrated on finding dams managed by the Corps with good hydropower characteristics, head and flow. The Summersville Dam in WV and one in CA stood far above the rest in their suitability for adding hydroelectric power. We approached the City of Summersville (the City) and offered to prepare a license application with them as licensee to add hydropower to Summersville Lake (the Lake) in spring 1980. We agreed to fund the effort until construction would be necessary; we expected to be able to use Industrial Development Bonds to finance, but their rules changed and made them unavailable for the project financing.

The political aspects of adding hydropower at Summersville Lake were daunting. Over the next eight years, we prepared three license applications, were in federal court twice and coordinated with the Wild and Scenic River study for the Gauley River by National Park Service. The license was issued in 1992; construction began in 1999 after another federal court case.

We reviewed the proposed hydropower study by Huntington District, Summersville Modification Study of 1982. Although it was an excellent plan for federal development, it could not be commercially developed with the same capacity and other features as a federal project could. Working with the City, we entered an agreement with Gauley River Power Partners, a subsidiary of Enel Green Power North America, to install an 80 megawatts hydroelectric project (the Project) and operate it. The plant became operational in July 2001 after 21 years of effort.

Despite the difficulties, the Lake is ideally suited for adding hydropower, principally because the dam release is a pressure tunnel. This allowed the powerhouse to be built immediately downstream of the dam on competent rock. The operation of the plant by Enel for 18 years has been quite successful. However, the original plan by the Corps in 1982 had some features that were missing and resulted in a lessor development than desirable. That feature was raising the pool levels to obtain more head and slowing flood releases. We did not foresee success if the City proposed raising the summer pool, as the Corps had done. Raising only the winter pool to recapture part (50 feet) of the 77 feet of head between the summer and winter pools was the better hydropower approach. Raising the winter pool and slowing flood releases, as proposed in this 7001 application, more fully develop the Lake for public benefits, especially generating significantly more renewable power. This would provide the U.S. government optimum benefits from its investment in Summersville Dam. The City has used a significant amount of the revenue for public recreation benefits and for the lake fishery through contributions made to the WV Department of Natural Resources.

Although raising the winter pool increases the power benefits of the hydroelectric project, the Huntington District of the Corps refused to approve raising the winter pool and slowing flood releases. They stated in their Appraisal Report this is because hydropower is not a federally authorized purpose of the Lake.

Clearly, the two proposed actions to change operation would significantly improve (45 more GWh or 22% increase in annual generation) the hydropower features of the dam and pay taxes and federal use fees to federal, state and local governments.

The operating changes proposed in this Section 7001 application would be good for our country, government revenue and produce optimum use of Summersville Lake. We wholeheartedly support these two operating improvements to add to the annual generation of renewable power.

Yours truly,

James B. Price

James B. Price
President

Other Non-Federal Sponsors Letter(s) of Support

(This is as uploaded, a blank page will show if nothing was submitted)

WV DNR letter.pdf

DIVISION OF NATURAL RESOURCES
324 4th Avenue, Room 342
South Charleston, West Virginia 25303-1228
Telephone 304-558-2754
Fax 304-558-2768
TDD 304-558-1439
TDD 800-354-6087

Stephen S. McDaniel
Director

August 6, 2019

Huntington District
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, WV 25071-2070

RE: Section 7001 Application; Summersville Dam and Hydroelectric Project

To Whom It May Concern:

The Summersville Dam was constructed in 1966 under the authority of the Flood Control Act of 1938 with the primary purpose of providing floodwater storage and reducing flood crests in the Gauley and Kanawha Rivers. It is maintained and operated by the U.S. Army Corps of Engineers (Corps), Huntington District. In 2001, the City of Summersville collaborated with the NOAH Corporation and Enel Green Power to begin hydropower generation. Since the inception of hydropower at the project, the City of Summersville has advocated for increasing the winter pool elevation and for slower releases of water following high flow events. Recently, the City of Summersville has filed a Section 7001 application with the Corps to allow for the relevant hydrologic studies needed to test their proposals in determining what potential impacts to the reservoir and tailwater fisheries may occur through their implementation.

Current operations at Summersville mandate that the pool elevation be drawn down each year from a summer pool elevation of 1652 feet above sea level to a maintained winter pool elevation of 1575 feet above sea level for the purposes of flood retention capabilities at the project. Every 10 years, the winter pool level is drawn down an additional 55 feet to a pool elevation of 1520 feet above sea level for routine maintenance on the dam's intake structures. These draw downs occur in the fall (beginning the first weekend after Labor Day to achieve the final elevation by December 1st) and summer pool levels are restored in the spring (beginning April 1). The City of Summersville is requesting an increase in the winter pool elevation by 50 feet to an elevation of 1625 feet above sea level.

High flow events occurring during the months of winter pool (December 1st to March 31st) may necessitate a corresponding relatively rapid release of water to return the reservoir to winter pool elevation. The City of Summersville has argued that releases during this period are too rapid and are advocating for a reduction in their rate.

The West Virginia Division of Natural Resources (WVDNR) does not oppose exploring the feasibility of raising the reservoir elevation in the winter and would further be receptive to raising the pool elevations provided that the necessary studies are conducted that would indicate that such changes would provide a net positive benefit to the reservoir and tailrace fisheries, and that such changes do not functionally alter the primary purpose of floodwater storage. The WVDNR would further be supportive in examining the feasibility of reducing the rate by which water is discharged from the dam structures following high flow events. Conducting feasibility studies pursuant to Section 7001 would be the first step in understanding how these changes would impact the fishery and the dam's ability to meet its stated purposes.

The WVNDR appreciates your consideration in this matter. If you have any questions regarding this letter or wish to discuss this issue further please feel free to contact Jacob Harrell of my staff at (304) 825-6787, or by email at Jacob.D.Harrell@wv.gov.

Sincerely,

Stephen S. McDaniel
Director, WVDNR

Map Document

(This is as uploaded, a blank page will show if nothing was submitted)

Location of Summersville Lake map.pdf

Figure 1 – Location of Summersville Lake

Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

Summersville proposal for additional operational flexibility.pptx

GRPP & Summersville Hydroelectric Project

- **Gauley River Power Partners, Inc.**
  - **City of Summersville: 3500+ residents and Nicholas County seat.**
  - **Noah Corp.: Original project developer.**
  - **Enel Green Power North America, Inc.: Renewable energy company with 90+ projects in 21 U.S. states and two Canadian provinces.**

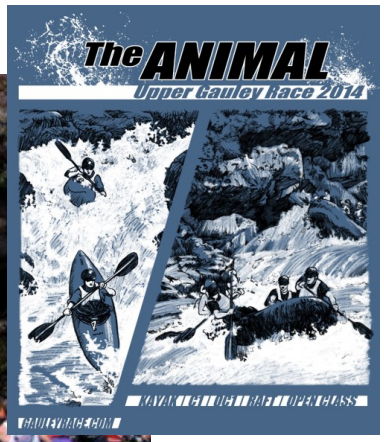
- **Summersville Hydroelectric Project**
  - **50-year license issued by the Federal Energy Regulatory Commission in September, 1992. Project commissioned on July 31, 2001.**
  - **Constructed powerhouse at existing U.S. Army Corps of Engineers outlet works; installed two 40 MW turbine-generator units.**
  - **Turbines operate on flows of 600 to 4,300 cfs at Summersville Lake Dam. Outflows above 4,300 cfs are released via ACoE valves. Average annual generation is approx. 170-206 GWh.**
  - **Pay FERC annual fees averaging $496,000, based on annual generation. About 70% of this money is compensation for use of the Federally-owned Summersville Dam.**

Project Development Timeline

MOA with ACoE in 1991, ACoE Operation Plan and Agreement 2002

Partnership with the Corps and the Community

- **GRPP plays a key role in the operation of Summersville Lake, partnering with the ACoE to maintain lake levels and to release river flows for normal and emergency conditions.**
- **GRPP helps maintain ACoE recreational sites, supports a range of community programs and works to support the important whitewater rafting economy on the Gauley River, including sponsor of The Animal.**

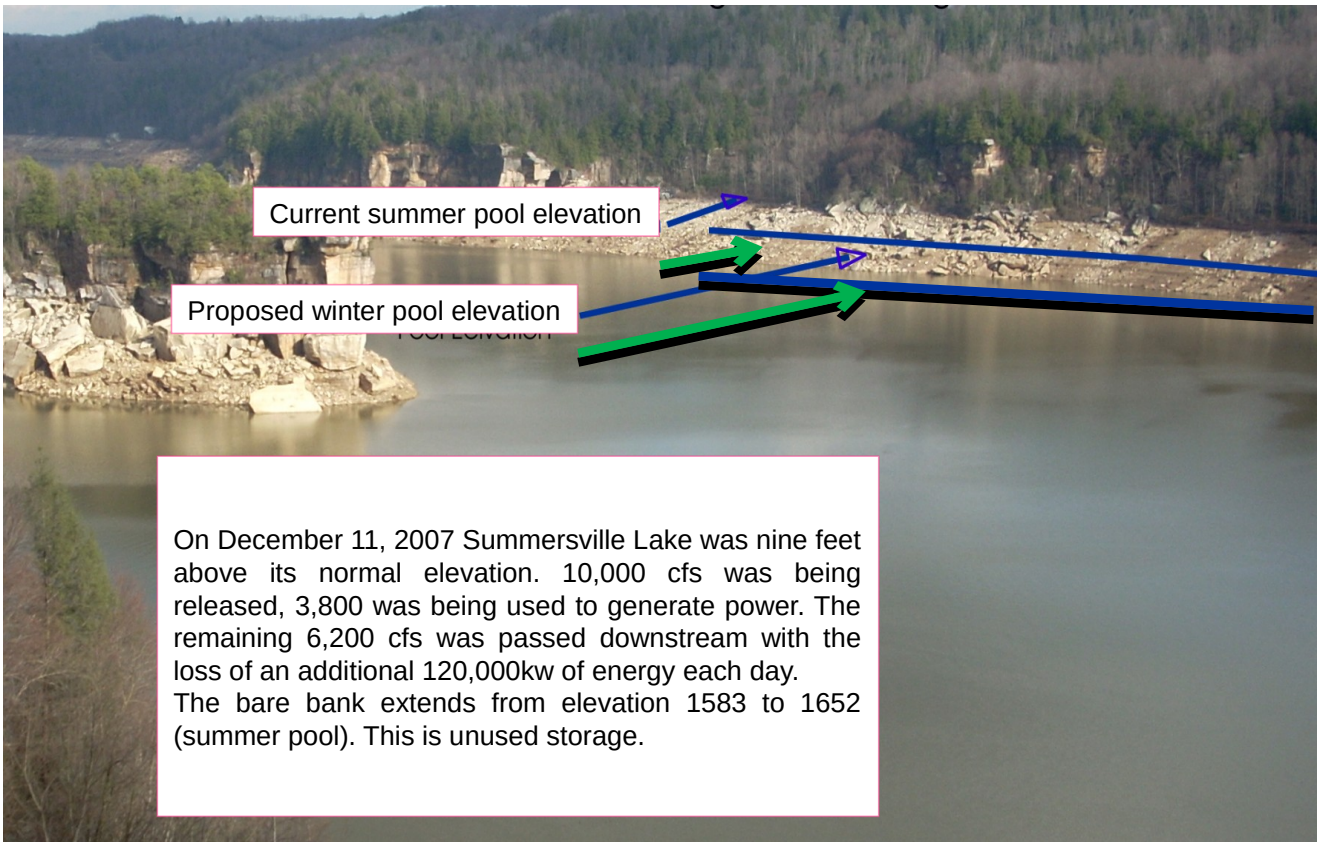


Hydropower Project at Summersville Dam

Issues, Solutions, Benefits

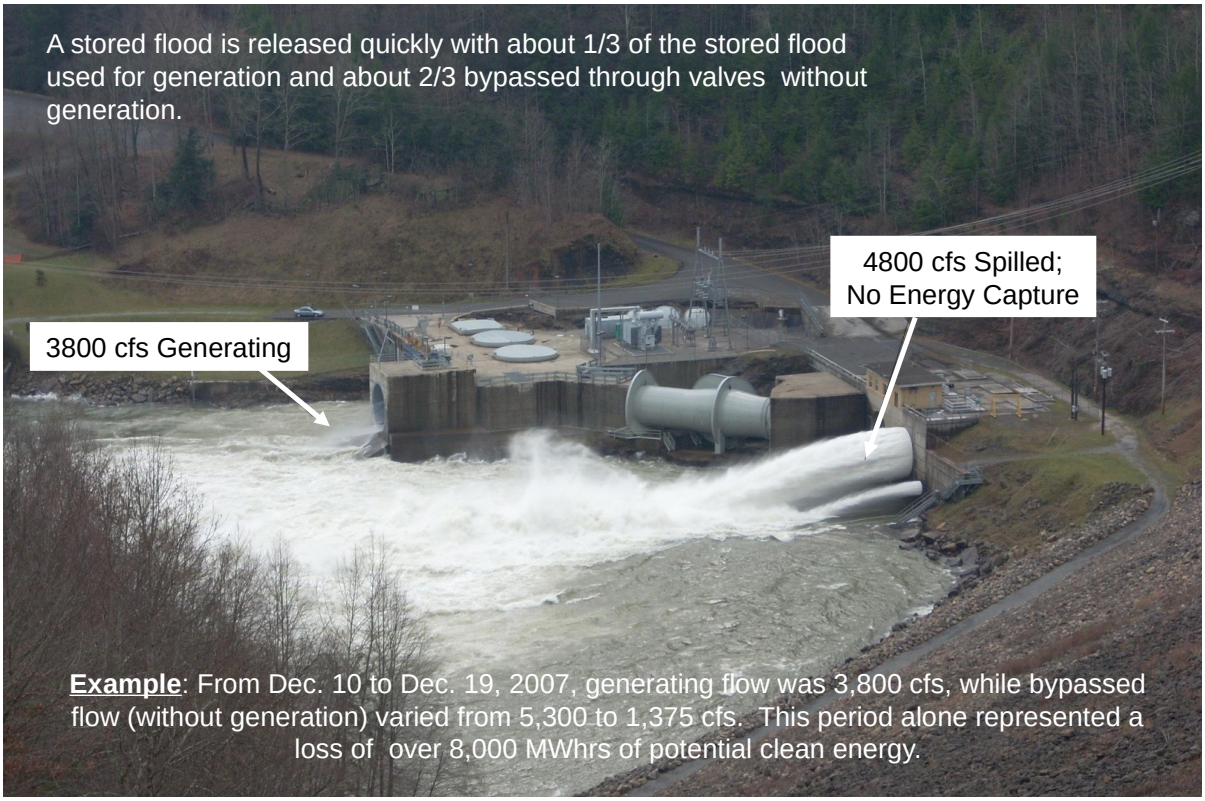
- **Issues:** *Current Policy and Guidelines can waste resource for clean green energy*
  - Fixed date of Apr. 1 lake refill can miss a timely refill of Summersville Lake with snow melt.
  - Clean energy is lost by strictly maintaining lake elevations, ie. hydro units are bypassed, even when no risk of flood exists.
- **Solutions:** *Update policies and guidelines to be based on current technology and operating data*
  - Use of updated models and forecasting to set the optimum refill date rather than adhere to fixed date.
  - Revisit the 1981 study of hydropower at Summersville Lake to verify sufficient winter (Dec-March) flood storage, and allow additional electricity generation without reducing other public benefits, such as whitewater recreation, fish and wildlife, and low flow augmentation.
  - Provide a window of 36 hours to refill pond to required elevation when storm flow is not imminent.
- **Benefits:** *Additional renewable energy for 4500 homes each year*
  - Raising the winter pool 50 feet could generate an additional 30 GWh of electricity
  - Slowing flood release (not bypassing hydro) could generate an additional 15 GWh of renewable power on an annual basis, based on past years.

Benfits of Higher Winter Pool Elevation

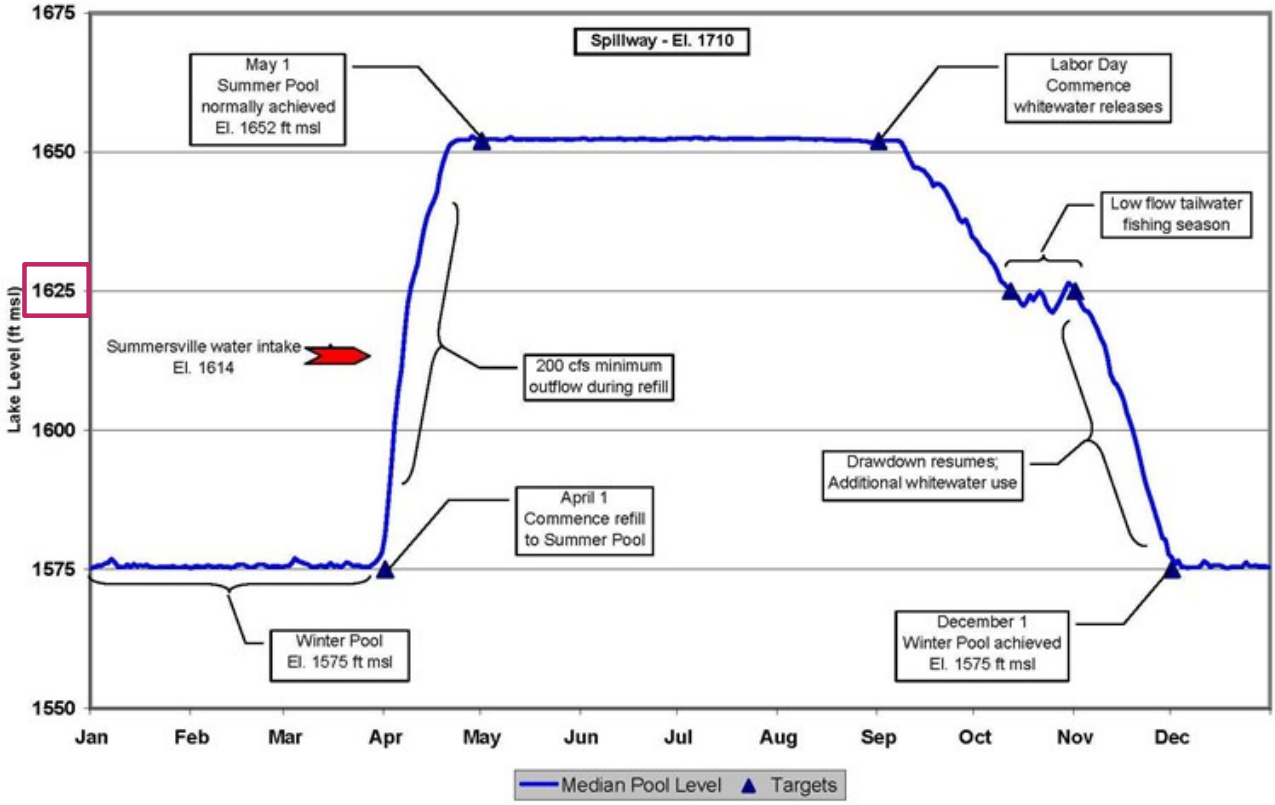


On December 11, 2007 Summersville Lake was nine feet above its normal elevation. 10,000 cfs was being released, 3,800 was being used to generate power. The remaining 6,200 cfs was passed downstream with the loss of an additional 120,000kw of energy each day.
The bare bank extends from elevation 1583 to 1652 (summer pool). This is unused storage.

Bypass events – lost clean energy each year



Current Lake Level Management
2001 to 2016



Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

SumResolutionCityCouncilSept22-09SKMBT_C45109092909340.pdf

Resolution for Support of Increased Renewable Generation by Summersville Hydroelectric Project

Whereas, the Congress of the United States has recently enacted several laws to promote increased electric generation by renewable resources to improve air quality and provide for energy independence.

Whereas the City of Summersville owns an 80 megawatt hydroelectric facility at the federally owned Summersville Dam on the Gauley River, which generates approximately 200 million kilowatt hours of electricity each year from a renewable resource.

Whereas, by raising the lake level in the winter and slowing flood releases during the winter could increase renewable generation in excess of 30 million kilowatt hours.

Whereas, the additional renewable energy is enough to supply about 30,000 homes with electricity.

Whereas, the Corps of Engineers, U.S. Army, the manager of Summersville Dam did a study in 1981 indicating that the lake level could be raised in the winter without adversely affecting the flood storage capability of Summersville Lake.

Therefore, in the interest of significantly increasing renewable generation in our vicinity and country, this Council directs its Mayor and other officials to take necessary steps to promote increased renewable generation through the Summersville Hydroelectric Project by raising the lake level in winter and slowing flood releases during the winter to the extent that other uses of Summersville Dam are not significantly reduced as determined by the Corps of Engineers and other appropriate state and federal agencies.

It is expected that the Mayor will enlist the support of local lake users and other interested parties and state and federal elected officials.

This action should be taken in a timely manner to support the national interest in increasing renewable generation.

Enacted this 28th day of September, 2009 by the Common Council of the City of Summersville.

Robert L. Shafer, Mayor

Marie Perry Parsons, Recorder

Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

SummModStudy1982Flood Study,p.E-2,Appdx4,pp4-A7to4-A18,Exh.4-4d (16 pages).pdf

To reduce downstream environmental impacts and enhance recreation opportunities, Variation B plans forego peaking power operation over much of the year. This results in a significant economic loss, due both to less total energy production and less peaking power capability, which is of greater economic value.

Variation E operation represents a compromise between Variation A operation and Variation B. LT-IIIE produces the second best power production benefits.

Strictly from a power viewpoint, the ranking for energy capability is shown in Table 12.

Table 12

ENERGY COMPARISONS

Alternative Plan	Ranking
LT-IIIA	1
LT-IIIE	2
ST-IIIA	3
LT-IIIB	4
ST-IIIE	5
ST-IIIB	6
NS-IIC	(None)
NS-ID	(None)

b. Flood Control. All of the alternatives developed in the final array meet the flood control requirements established for the Summerville Project. The contemplated pool adjustments would not cause increases in downstream flood crests.

c. Minimum Flow/Downstream Flow Augmentation. All the alternative plans in the final array meet the minimum flow and downstream flow augmentation requirements established for the Project. Existing project capability is maintained.

An example of one day's test and observations are shown on Exhibit 4-4. The exhibit shows the release schedule, which was designed to favor power production and whitewater boating, for Day 4 of the test, October 4, 1979. Exhibit 4-4 shows the gage height of each of the six sites where readings were made. The exhibit shows that water levels change rapidly at the Dam (Mile 33.7) and the Long Tunnel site (Mile 30.7), but change much less rapidly as the water moves downstream.

5. FLOOD HISTORY

a. Introduction. The Kanawha River Basin and its numerous tributary watersheds have experienced many floods throughout the period 1832 to date, as evidenced by historic data from 1832 to 1870, and after that date by systematic observation of river stages on the Kanawha River at Charleston and at other sites in the basin at later dates. Floods are not limited to any month or season, but have occurred every month of the year. Although winter and spring floods are more frequent, the summer floods are more severe as evidenced by the floods of September 1861 and July 1932. The lower portion of the Kanawha River Basin is subject to backwater from Ohio River floods and to headwater floods. Gauley River floods have frequently synchronized with high stages on the Ohio River. Floods on the Gauley River are of short duration, seldom remaining above flood stage for more than 15 hours.

b. Flood Records. Flood records in the Gauley River Basin, prior to the establishment of the first river gage at Belva in 1928, are meager. Such information that has been obtained consists of high-water marks pointed out and named by residents of the valley, recollections of early settlers as published in county and state histories, and flood notes entered on river and rainfall reports for a few scattered stations in and near the Gauley River Basin. Storm and flood records of a similar nature are available for adjacent or nearby river basins such as the Elk, Little Kanawha and Greenbrier Rivers. Table 4A-3a lists pertinent data relative to high stages at Belva, six miles upstream of the mouth of the Gauley River.

Since the Summersville project became operational, high flows have not exceeded a stage of 16.86 feet at Belva.

(1) Storms and Floods. A brief account of outstanding floods is given in chronological order as background data to provide understanding of the extent, duration and frequency of significant flooding in the Gauley River region.

(2) Storm and Flood of September 1861. The flood of September 1861 is the maximum of record in the adjoining watershed of Elk River, and the third highest known on Gauley River. This flood is of major

Table 4A-3a

HIGH-WATER DATA (Pre-impoundment)
GAULEY RIVER ABOVE BELVA, W.VA.

Date	Height feet(1)	Discharge cfs	Duration days (2)
Mar 1918	32.6	102,000	2.09
Sep 1861	30.3(3)	91,300(3)	1.00(3)
Jul 1932	28.60	83,500	0.65
Sep 1878	26.9(3)	76,300(3)	0.88(3)
Jun 1940	26.35	73,000	0.56
Jul 1954	24.80	67,500	0.30
Mar 1955	22.99	60,400	0.64
Oct 1937	21.37	54,300	0.89
Jan 1946	21.00	52,900	0.53
Feb 1948	20.62	51,600	0.53
Oct 1929	20.32	50,500	0.43
Feb 1939	20.22	50,100	0.45
Jan 1957	20.00	49,400	0.40
Dec 1950	18.97	45,800	0.26
Nov 1926	18.1	42,800	0.10

(1) Present site and datum.
(2) Duration above damage stage, 18.0 feet.
(3) Estimated.

Gauley River Basin are indefinite, and the profile, gage height, peak flow, and volume of runoff at Summersville Dam site cannot be determined with any acceptable degree of accuracy. The estimated crest on the Gauley River above Belva is 30.3 feet. The total volume of runoff at the dam site is estimated as 4.3 inches from the drainage area.

(3) Storm and Flood of May 1889. The flood of May 1889 was a major flood on Elk River, and probably on Gauley River. Two distinct centers of precipitation were recorded, one of which occurred at the West Virginia - Virginia State line. The actual duration of rainfall did not exceed 36 hours at most points, and the meager information available indicates rainfall amounts averaging 2 to 4 inches over the Elk and Gauley River Basins. At Clendenin, West Virginia, on Elk River, a stage of 32 feet above low water was reached. The Kanawha River at Charleston, was slightly above flood stage and reached 30.9 feet. The crest stage of the Ohio River at Point Pleasant was about 35 feet or 5

Table 4A-3a

HIGH-WATER DATA (Pre-impoundment)
GAULEY RIVER ABOVE BELVA, W.VA.

Date	Height feet(1)	Discharge cfs	Duration days (2)
Mar 1918	32.6	102,000	2.09
Sep 1861	30.3(3)	91,300(3)	1.00(3)
Jul 1932	28.60	83,500	0.65
Sep 1878	26.9(3)	76,300(3)	0.88(3)
Jun 1940	26.35	73,000	0.56
Jul 1954	24.80	67,500	0.30
Mar 1955	22.99	60,400	0.64
Oct 1937	21.37	54,300	0.89
Jan 1946	21.00	52,900	0.53
Feb 1948	20.62	51,600	0.53
Oct 1929	20.32	50,500	0.43
Feb 1939	20.22	50,100	0.45
Jan 1957	20.00	49,400	0.40
Dec 1950	18.97	45,800	0.26
Nov 1926	18.1	42,800	0.10

(1) Present site and datum.
(2) Duration above damage stage, 18.0 feet.
(3) Estimated.

Gauley River Basin are indefinite, and the profile, gage height, peak flow, and volume of runoff at Summersville Dam site cannot be determined with any acceptable degree of accuracy. The estimated crest on the Gauley River above Belva is 30.3 feet. The total volume of runoff at the dam site is estimated as 4.3 inches from the drainage area.

(3) Storm and Flood of May 1889. The flood of May 1889 was a major flood on Elk River, and probably on Gauley River. Two distinct centers of precipitation were recorded, one of which occurred at the West Virginia - Virginia State line. The actual duration of rainfall did not exceed 36 hours at most points, and the meager information available indicates rainfall amounts averaging 2 to 4 inches over the Elk and Gauley River Basins. At Clendenin, West Virginia, on Elk River, a stage of 32 feet above low water was reached. The Kanawha River at Charleston, was slightly above flood stage and reached 30.9 feet. The crest stage of the Ohio River at Point Pleasant was about 35 feet or 5 feet below flood stage. Here again, rainfall and runoff data are meager and preclude a detailed study.

streams in Kentucky, North Carolina, Virginia, West Virginia and Pennsylvania. The Elk and Gauley River Basins, located far to the east of the principal storm center at Bellefontaine, Ohio, were in a zone of moderate precipitation, and the average over both basins was about 3 inches. The Gauley River rose to crest stage of about 12 feet at Summersville on 27 March, and the peak flow was about 15,000 cfs. At Belva, near the mouth of Gauley River, the crest stage was about 13 feet, or a flow of 26,400 cfs. The Kanawha River at Charleston crested above flood stage at 34.8 feet on 28 March. The crest stage on the Ohio River at Point Pleasant was 62.7 feet or 22.7 feet above flood stage, the highest of record at that time, but equalled by the great flood of January 1937. The total volume of runoff from the watershed above the dam site is estimated as 2.1 inches.

(5) Storm and Flood of March 1918. The flood of 13-14 March 1918, was general throughout the Elk and Gauley River Basins, and the highest of record on Gauley River at Belva, where a crest stage of 32.6 feet was reached. The estimated peak discharge and the total volume of runoff at the dam site was 81,300 cfs and 6.4 inches from the drainage area, respectively. This flood on the Elk River is second in Magnitude, being exceeded only by the flood of September 1861. Warm weather prevailed from 12 - 14 March, averaging about 60 degrees, and there was numerous thunderstorms and periods of excessive rainfall. The average rainfall over the Gauley River Basin was about 5.5 inches for the 13-14 March period with somewhat heavier rainfall occuring in headwater regions above the dam site. The Kanawha River at Charleston crested above flood stage, reaching 36.1 feet. The Ohio River at Point Pleasant crested at 46.9 feet on the 15th, or 6.9 feet above flood stage.

(6) Storm and Flood of July 1932. The flood of 4-5 July 1932, was the greatest summer flood of record on the Gauley River, and the second greatest summer flood of record on the Elk River, being exceeded only by the flood of September 1861. Thunderstorms on 27 June produced from 2.0 to 2.5 inches of rain over both watersheds and caused moderate rises on all streams. On 4-5 July, rainfall over the Gauley River watershed averaged 5.2 inches, most of which is estimated to have fallen during a 4-hour period on 4 July. A rapid rise resulted on Gauley River, and a record crest stage of 28.75 feet was reached on the Summersville gage, the peak flow being estimated at 77,700 cfs. At Belva, the crest stage was 28.60 feet on 5 July, the estimated discharge being 83,500 cfs. The volume of runoff from the drainage area above the dam site is approximately 4.9 inches. This flood was confined to the Elk and Gauley River Basins and did not cause flood stage to be reached at any point on the Kanawha River.

(7) Storm and Flood of March 1936. The flood of March 1936 was one of the major floods on the upper Ohio River, and produced the

total volume of runoff from the watershed above the dam site from 15-31 March is approximately 6.9 inches. Snowfall was unusually heavy in the mountain regions, and melting snow supplemented runoff from rainfall, causing numerous rises of varying magnitude during the month. The maximum stage at Summersville was 17.0 feet and the peak discharge was 32,700 cfs. At Belva, the crest stage was 18.0 feet and the peak discharge was 42,500 cfs. Well defined crests occurred on the 17th and 18th, and again on the 24th and 25th.

(8) Storm and Flood of January 1937. The flood of January 1937 exceeded all known flood heights on the Ohio River below Point Pleasant. Moderately heavy rains had occurred in December, and were followed by an extended period of rainfall from about 15 January to 27 January, inclusive. This storm centered in Kentucky and had other centers in Indiana and Ohio, but did not cause unusual rises on West Virginia streams. The extended duration of the storm produced 5 distinct and minor rises on the Gauley River, and the large volume of water from the Gauley River contributed directly to the recordbreaking flood crest on the Ohio River with approximately 7.5 inches of runoff occurring during the flood period. The highest crest occurred at the dam site on 20 January and reached a crest flow of 15,800 cfs. The estimated volume of runoff from the watershed above the dam site is approximately 4.8 inches for the most critical period of 15-27 January.

(9) Storm and Flood of February 1939. The rise of 3-4 February 1939 on the Gauley River was preceded by a minor rise on 29-30 January. The flood was of minor proportions, reaching a stage of 17.84 feet at Summersville, and a peak flow of 35,500 cfs. The Kanawha River exceeded flood stage at Charleston, cresting at 32.0 feet on 4 February. The Ohio River at Point Pleasant crested at 49.1 feet on the 5th, or 9.1 feet above flood stage. Flow from Gauley River contributed directly to the Ohio River peak flood flow. The estimated volume of runoff from the watershed above the dam site during the two rises is approximately 5.1 inches.

(10) Storm and Flood of June 1940. This flood, while of small consequence on the Ohio and Kanawha Rivers as a whole, had a peak flow of 50,500 cfs at the Summersville gage. The flood was caused by 4 to 5 days of rain over the Gauley River Basin, culminating in 2.0 inches on the 27th and 1.77 inches on the 28th at Richwood. The largest one-day amount recorded near the basin was at Rainelle with 2.94 inches on the 27th. This unusually high flow late in June cannot be considered a rarity as 216,000 cfs was recorded the 15th of August 1940 at Charleston on the Kanawha with only 2,000 cfs recorded at Summersville. These wide variations of discharge in adjoining basins are but further evidence of the flood producing potentialities of the mountainous regions with thunderstorm-type rainfall. The total runoff from the drainage area above the dam site, during the flood of June 1940, is estimated as 2.8

losses, the damage to highways and bridges and to stored farm crops was considerable along the Ohio River and major tributaries. Employees of industrial plants lost much working time either due to flooded plants or inability to reach the plants because of flooded highways. The runoff of Gauley River at Summersville, while considerable, was not of major flood producing magnitude. A maximum daily average flow of 14,700 cfs was recorded at Summersville gage. Extensive and heavy rainfall during the last three days of December produced the high runoff and resultant flood. The relatively lighter rainfall in the Gauley River Basin above Summersville accounted for the comparatively small discharge there. At Richwood, which is a typical rainfall station in the basin, the three-day total was 1.76 inches with the highest single day of 0.80 inch. For this storm, the rainfall, generally, was heavier in the downstream areas as contrasted to the headwater areas. The runoff from the watershed above the dam site for the duration of the flood is estimated as 3.8 inches.

(12) Storm and Flood of March 1945. An unusually warm March accompanied by above normal rainfall combined to produce considerable runoff which resulted in a major flood on the Ohio River. The flood situation was the more serious because of the disruption to war work. In the Gauley and Kanawha River Basins in particular, the flood was important but not critical or unusual for this month of the year. The Gauley River at Summersville reached a maximum average daily discharge of 17,100 cfs on 3 March while Charleston on the Kanawha River recorded a maximum daily average discharge of 85,700 cfs. At Point Pleasant on the Ohio, a peak discharge of 448,000 cfs was reached at a stage of 52.8 feet which is 12.8 feet over flood stage. Moderate rains over the Gauley River Basin produced a local rise. Richwood recorded rainfall on the last three days of February, and the first three days of March culminating with 1.22 inches recorded on 3 March for a total of 3.72 inches for the six days. The rise of January 1945 was the more serious on the Gauley and Kanawha Rivers, reaching maximum flows of 24,300 cfs and 104,000 cfs, respectively, at Summersville and Charleston. Since these flows are not unusual, the storm is not discussed in more detail; but is mentioned to point out that floods can occur during any month and even be repeated in following months of the same year. The estimated volume of runoff from the drainage area above the dam site is about 4.6 inches.

(13) Storm and Flood of January 1946. A major rise was recorded at Summersville and Charleston early in January. On 7 January, Summersville recorded 33,900 cfs peak flow and Charleston recorded 170,000 cfs peak flow. The Ohio River reached bankfull and slightly higher in places, providing a constant flood threat for several days, but lack of continuing rainfall prevented a major flood. The rise on

(14) Storms and floods of February and April 1948. On 14 February, the Summersville gage recorded a peak stage of 17.0 feet, 32,700 cfs, which was caused by moderate rains and by a sudden warm spell melting the snow cover with high water content. A typical rainfall station, Richwood, reported 1.15 inches of precipitation for the period. Gauley River at Belva reached a crest stage of 20.62 feet and the Kanawha River at Kanawha Falls and Charleston 20.08 and 29.5 feet, respectively. Bluestone Reservoir, acting as a retarding basin, effected estimated reductions in stage of 2.7 feet at Kanawha Falls and, in conjunction with existing reservoirs above the confluence of the Kanawha and Ohio Rivers, 3.2 feet at Charleston. The big flood of 1948 occurred in April on the Ohio River. High stages were reached throughout the Ohio and Mississippi River Basins. However, flood stage was exceeded in the Kanawha River Basin only in the lower backwater range of the Ohio River. The crest flow at Summersville was only 12,900 cfs on 14 April, but flows from the Gauley River contributed directly to the flood crest stage on the Ohio River. The volume of runoff from the drainage area above the dam for the February and April floods is estimated as 3.1 and 2.1 inches, respectively.

(15) Storm and flood of July 1954. On the night of 18-19 July, heavy rains in the Cherry River watershed caused considerable damage, the heaviest of which was at Richwood where rainfall of 3.60 inches was reported the morning of the 19th and 5.95 inches for the period 18-22 July. Damages downstream from Richwood were relatively small. Crest stages of 19.8, 25.87 and 24.80 feet were reached on Cherry River at Fenwick and Gauley River at Summersville and Belva, respectively. Heavy rains fell in portions of the Elk River on the 19th and in the headwaters on 20-21 July. The Elk River was almost two feet above flood stage at Sutton. The volume of runoff from the drainage area above Summersville Dam site is estimated as 4.0 inches.

(16) Storm and flood of March 1955. The last two days of February and the first five days of March were unseasonably warm with frequent thunderstorms and heavy rains due to the passage of a series of storms up the Ohio Valley. Rainfall reported from Richwood for the storm period amounted to 5.25 inches with the greatest 24-hour amount of 2.10 inches reported on the morning of the 5th. Crest stages of 22.99, 18.52 and 31.40 feet were reached on Gauley River at Belva and Kanawha River at Kanawha Falls and Charleston, respectively. Regulation of Bluestone Reservoir affected estimated reductions in stage of 4.7 feet at Kanawha Falls and in conjunction with existing reservoirs above the confluence of the Kanawha and Ohio Rivers, 6.0 feet at Charleston. The total volume of runoff from the watershed above Summersville Dam site is estimated as 7.1 inches.

(17) Post-Impoundment Storms. Since completion of Summersville Dam, the storm events have continued, but the reservoir has alleviated

Table 4A-3b

POST-IMPOUNDMENT STORMS
MAXIMUM ANNUAL FLOOD STORAGE USE-SUMMERSVILLE PROJECT

Date	Reservoir Pool Elevation		Belva, WV, Gage Height, feet		
	Normal Pool Elev.	Flood Storage Elev.	Actual	Natural	
1966	1520.00	1711.70*	5.80	12.17	Outlet Clos
1967	1520.00	1693.70	14.65	25.50	HB Valve Repair
1968		None			
1969	1520.00	1693.70	16.7	27.0	HB Valve Repai
1970	1520.00	1564.90	15.6	19.4	
1971		None			
1972	1530.00	1627.64	16.6	18.0	
1973	1535.00	1638.80	11.2	14.0	
1974	1652.00	1666.75	15.8	18.8	
1975	1575.00	1597.00	13.9	15.8	
1976	1652.00	1675.37	13.5	23.9	
1977	1652.00	1652.38	10.2	15.8	
1978	1575.00	1641.13	13.3	20.5	
1979	1575.00	1609.00	12.4	16.4	

*Filling occurred as a result of construction activities.

6. FLOOD PROBABILITY

The probable frequency of occurrence of floods of varying magnitude has been determined to provide an index to flood characteristics in the Kanawha River Basin below Summersville Dam and for use in economic analysis. The basic frequency curve used in hydrologic engineering is the frequency curve of annual maximum events. A basin-wide flow frequency analysis was performed incorporating all recorded and historic flood data available for some 50 gaged stations in the Kanawha Basin. Where flood discharges were regulated by upstream reservoirs, flood peaks were adjusted to preproject conditions by evaluating actual reservoir effects existing at the time of occurrence. The frequency analysis was accomplished using the Log Pearson Type III distribution with expected probability being taken into account. Some difficulty was encountered in the application of statistical procedures to the Kanawha Basin stations inasmuch as the basin is subject to two distinct types of storms, the general winter and summer type storms and those of tropical

Frequency curves for hurricane and non-hurricane floods were correlated regionally by relating the geometric mean and standard deviation to drainage area. Due to the limited amount of data available for hurricane floods, a uniform standard deviation was adopted for these curves. Zero skew was assumed throughout the basin. No one set of generalized relations was adequate for all the respective sub-basins in that the mean and standard deviation vary considerably throughout the basin. It was therefore necessary to develop generalized criteria for each of the major sub-basins.

The natural frequency of flooding as modified by the existing system of flood control reservoirs was obtained by correlating the natural and modified flows for representative floods at each evaluation center. Estimated flood frequencies for the Gauley and Kanawha Rivers are presented in Table 4A-3c.

Table 4A-3c

ESTIMATED ELEVATION FREQUENCY AT KEY STATIONS

Exceedence Interval Years	Gauley River above Belva		Kanawha River at Kanawha Falls		Kanawha River at Charleston	
	Natural	Modified	Natural	Modified	Natural	Modified
1000	728.8	719.7	691.2	681.9	617.0	610.4
500	720.8	707.4	678.6	663.0	614.4	606.0
200	710.9	696.3	666.8	649.2	610.2	600.2
100	704.5	689.5	660.5	645.3	607.0	596.0
50	699.0	686.6	655.7	643.2	603.0	591.8
20	694.6	685.0	650.6	641.0	598.2	586.6
10	692.1	684.1	647.6	640.0	595.5	583.0
5	690.0	683.5	644.4	638.7	592.8	580.1
2	687.00	682.6	641.2	637.5	588.8	578.4
1	684.70	681.9	639.1	636.3	585.1	576.6
Gage Zero =	669.00		621.20		558.60	

7. STANDARD PROJECT FLOOD

The standard project storms and floods constitute a standard of design for structures that would provide a high degree of protection as determined by the flood potentialities of the basin without regard to physical or economic considerations. The summer type standard project flood was determined from generalized rainfall criteria and procedures outlined in Civil Engineer Bulletin No. 52-8, and is the type most likely to occur in July or August. The winter type standard project flood consists of the flood of March 1936 followed by winter type SPF

criteria for both the full storage and reduced storage for summer and winter conditions. Exhibits No. 4-4a, 4-4b, 4-4c and 4-4d show results of these routings.

L winter SPF

8. RESERVOIR STORAGE FOR FLOOD CONTROL

a. Plan of Operation for Flood Control. The Summersville Reservoir operates for Ohio River and tributary flood control, its operation is governed by flood conditions on Gauley River, Kanawha River and on the Ohio River at Point Pleasant, West Virginia. The reservoir operates to utilize, as far as possible, the channel capacities up to bankful stage of Gauley River, Kanawha River, and Ohio River during the period of storm runoff. Summersville reservoir operations are in conjunction with existing reservoirs in the Kanawha River Basin. The following operation schedule during flood periods has been formulated:

(1) Pass all inflow at all times except when critical conditions prevail or are predicted at control points but never release more than 15,000 cfs unless the reservoir fills to spillway crest level.

(2) Store that portion of the reservoir inflow which would contribute to stages in excess of the designated control stages at the key stations along the Gauley and Kanawha Rivers as listed in Table 4A-3d.

Table 4A-3d

CONTROL STAGES AT KEY STATIONS

Key Stations (All in W.Va.)	River	Control Stage (feet)	Time of travel from Summersville Dam to indicated Stations (Hours)
Belva	Gauley	18	3
Kanawha Falls	Kanawha	22	4
Old Lock #6 (South Charleston)	Kanawha	36	10
Point Pleasant	Ohio	40	22

(3) Store all reservoir inflow from 48 hours in advance of the predicted time of reaching a forecast crest stage in excess of 40 feet on the Ohio River at Point Pleasant until the Ohio River has crested, fallen one foot and continued recession is indicated.

(4) If the river stage at Point Pleasant is not indicative of downstream flooding conditions along the Ohio River, store all reservoir

(6) If the reservoir fails to completely control the runoff and downstream conditions are critical, keep the outlets closed and utilize available surcharge storage above spillway level.

b. Gauley and Kanawha Rivers Flood Control. The original storage requirements, modified frequency analysis, and resultant cost-benefit analysis were based on detailed analysis of the flooding history for the Gauley and Kanawha Rivers involving all recorded flood periods. The methods used in determining effects of the project at downstream points required analyzing both major and moderate floods including a selected group of floods for determining Ohio River benefits. Any effects due to reduced capability for flood control storage then must be shown by analyzing the effects on these floods at downstream locations.

Detailed reservoir routings, assuming reservoir operation in accordance with the foregoing plan of operation and reduced flood storage capability, were made for historic and recorded floods in the Gauley River Basin. Small and moderate floods of less than 4 inches of volume are unaffected by the reduced storage capacity proposed; however, the frequency of filling of the reservoir was affected as shown in Exhibit No. 4-4e. Only the extreme floods with volumes or multi-rise floods resulting in long storage periods were sufficient to fill the proposed flood pool and result in an early spillage of flood flows. In each case analyzed, however, spillage occurred at such a time that flood crests at downstream points were not affected. It appears from this analysis that no measurable flood control benefits would be lost by the reduced storage proposed in the range of frequencies suggested by historical floods.

Exhibits are presented to demonstrate the point by comparing downstream effects with and without the proposed modification of flood storage. Exhibits 4-4f, -4g and -4h show flood routings of the March 1936 flood at the downstream locations of Belva, Kanawha Falls and Charleston. Similar information for the March 1967 flood is shown on Exhibits 4-4i, -4j and -4k. The results show that no additional flood damages would be incurred.

The use of reservoir storage since project completion is compared in Table 4A-3e with and without the propsed modification of flood storage. The effects at Belva stream gage are also compared, and the results show no additional damages with storage modification.

Table 4A-3e

POST IMPOUNDMENT STORMS
MAXIMUM ANNUAL FLOOD STORAGE USE

SUMMERSVILLE PROJECT

Year	PRESENT				PROPOSED STORAGE MODIFICATION			
	Normal Pool Elev.	Flood Storage Elev.	Belva WV gage Height in feet Actual	Natural	Normal Pool Elev.	Flood Storage Elev.	Belva gage Height in feet Actual	Natural
1966	1520.	1711.7*	5.80	12.17				
1967	1520.	1693.70	14.65	25.50	1638	1713.85*	14.65	25.50
1968		No Significant Flood Event						
1969	1520	1636	16.7	27.0	1638	1680.18	16.7	27.0
1970	1520	1564.9	15.6	19.4	1638	1645.88	15.6	19.4
1971		No Significant Flood Event						
1972	1530	1627.64	16.6	18.0	1638	1674.10	16.6	18.0
1973	1535	1638.80	11.2	14.0	1638	1680.09	11.2	14.0
1974	1652	1666.75	15.8	18.8	1668	1680.57	15.8	18.8
1975	1575	1597.0	13.9	15.8	1638	1647.83	13.9	15.8
1976	1652	1675.37	13.5	23.9	1668	1688.18	13.5	23.9
1977	1652	1652.38	10.2	15.8	1668	1668.32	10.2	15.8
1978	1575	1641.13	13.3	20.5	1638	1673.90	13.3	20.5
1979	1575	1609	12.4	16.4	1638	1654.12	12.4	16.4

* Reservoir shutdown with minimal release from Jan 13 - Mar 23, 1967; crest would be covered 25 ft for 1625 winterpool vs. 163.

*Filling occurred as a result of construction procedures.

As stated in the initial portion of this section, operational studies of past floods contain hindsight factors which tend to produce results that generally indicate lower storage requirements than would be needed under actual operation. To offset this factor, departure from optimal flood control storage has been included in the proposed modification to increase flood control capability. It would be desirable from an operational viewpoint to have sufficient flood control storage to contain hypothetical floods of extreme magnitude as well as the most intense storms of record in adjacent watersheds that could have been centered in the Gauley Basin upstream of the dam. However, an infrequent, major flood of extreme magnitude in the Kanawha River Basin can cause significant downstream damages with or without the Summersville modification of storage. The drainage area controlled by reservoirs in the Kanawha River Basin is not sufficient to provide

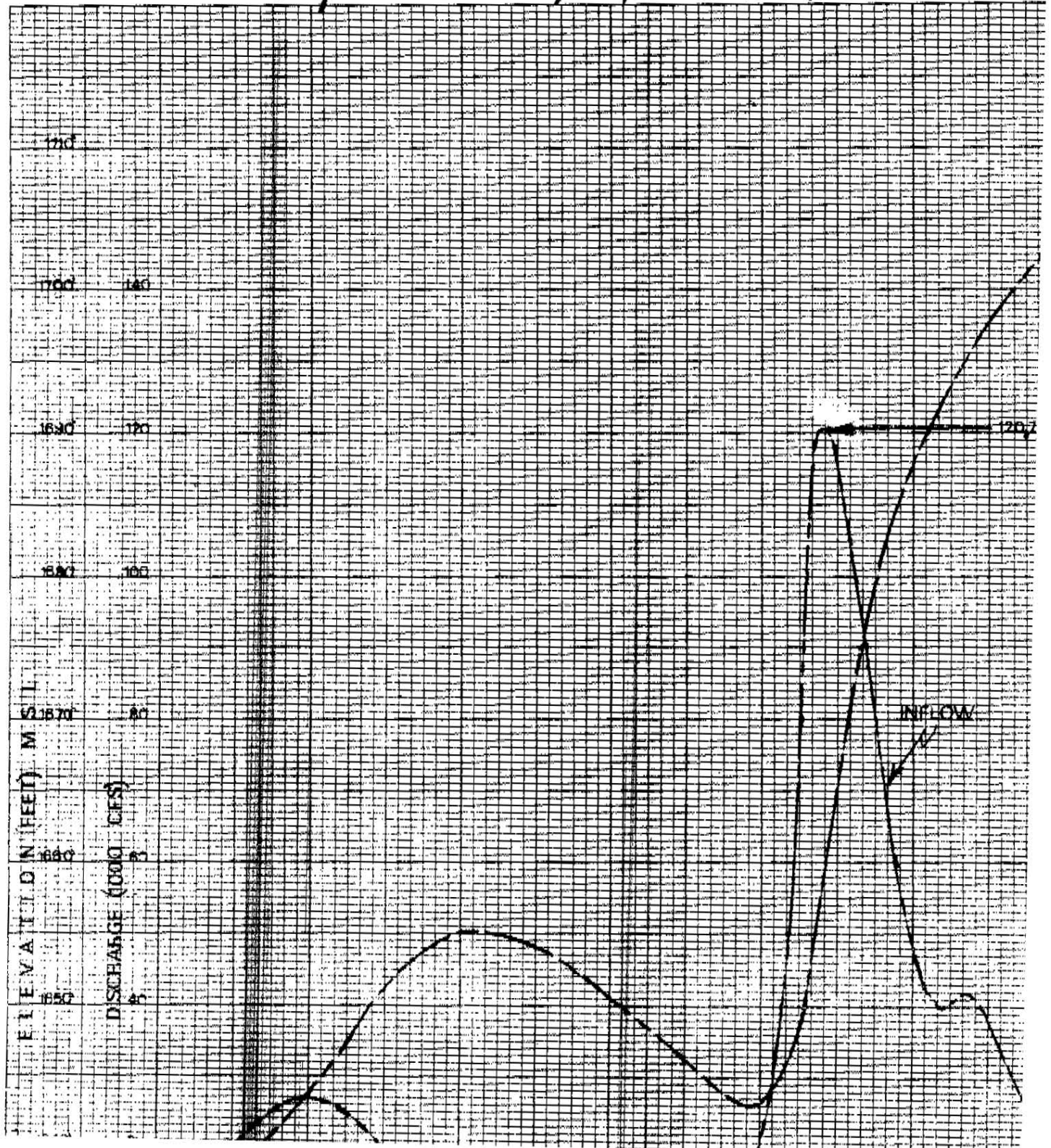
Alternative storage allocations would have no effect on spillway capacity or design. The frequency of use of the spillway was reviewed and the effect of storage modification is shown in Table 4A-3f.

Table 4A-3f

FLOOD STORAGE FILLING FREQUENCY

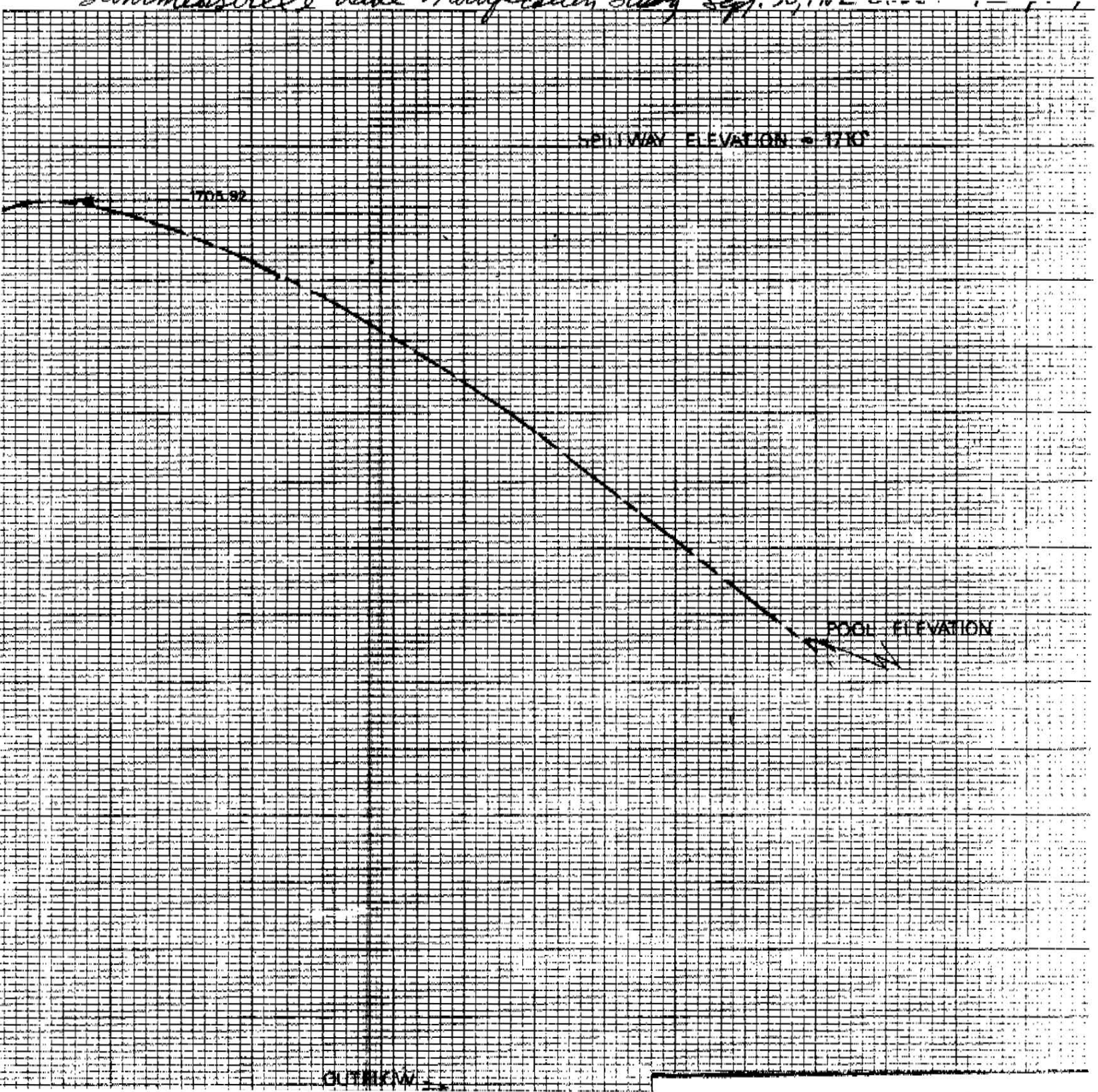
Filling Frequency	Existing Storage Allocation	Modified Storage Allocation
Years	Elev-Ft MSL	Elev-Ft MSL
5	1671.2	1691.7
10	1679.	1698.2
20	1686.	1702.6
30	1690.	1705.4
37	1692.	1706.4
100	1701.	1710.3

Summerville Dam Modification Study Sept 30, 1970 Lyn 7-TC p. 1



47 1970

12 x 20 TO THE INCH • 18 x 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.


SPILLWAY ELEVATION = 17 KT
1705.92
POOL ELEVATION
OUTFLOW

Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

Additional Proposal Background.docx

Additional Background: Summersville Lake is located on the Gauley River in Nicholas County, West Virginia. The dam is 35 miles above the junction of the Gauley with the New River to form the Kanawha and 132 miles above the confluence of the Kanawha with the Ohio River.

Summersville Lake was constructed for flood control, recreation, pollution abatement, and fish and wildlife enhancement by authority of an Executive Order of the President on 12 September 1935, and the Flood Control Acts of 1936 and 1938. Legislation contained in Section 1102 of the Water Resources Development Act (WRDA) of 1986 and Section 6 of WRDA 1988 added authorization for whitewater recreational activities at Summersville Lake. While hydropower is not a congressionally authorized purpose at Summersville Lake, the project accommodates non-Federal hydropower through Federal Energy Regulatory Commission (FERC) license to the City of Summersville (P-10813).

The City of Summersville secured a FERC license in 1992 for 50 years. The hydroelectric power plant was constructed between 1999 and 2001. The two-unit powerhouse was constructed on the right bank of the dam and connected to the existing outlet structure by a 17 ft. diameter steel penstock. A 10 mile long, 69,000 volt electrical line ties the powerhouse to the utility transmission grid. Two vertical Francis turbines rated at 60,000 horsepower (hp) at a net head of 260 ft. discharge water at a rate of 2,200 cu ft./second. The facility generates up to 80-megawatts (MW). The Gauley River Power Partners (GRPP) operate the hydroelectric plant. The GRPP is a union of the City of Summersville, Noah Corporation and Enel Green Power North America.

The hydroelectric power plant has operated almost continuously, since July 2001, approximately 18 years. The Parties would like to increase hydroelectric production by raising the winter pool and slowing flood releases in winter when the District judges that to be practical, as well as use models and forecasting tools as an approved alternative to set the optimum summer pool refill date rather than adhere to a fixed date. These operating changes are expected to increase annual hydroelectric generation by 22% or increase annual generation by 45,000,000 kilowatt-hours. This is enough power to supply 4500 homes.

This additional renewable, hydroelectric generation is in the public interest in the local area and regionally. Revenue from additional power sales would benefit the regional tax base and make additional payments to the U.S. Treasury of about $90,000 annually. It also appears that a higher winter pool elevation is better for City Water Intake, fishery, water quality and recreation purposes as well.

In 1982, the Summersville Lake Modification Study was conducted to evaluate modifications of the Summersville Lake project primarily to consider the addition of hydroelectric power generation capability. Additional considerations for study included limited adjustments in existing project purposes including flood control, recreation, fish and wildlife and streamflow regulation. The study confirmed that raising the winter pool up to 62 feet to facilitate additional or enhanced

hydroelectric generation capability during winter months does not significantly affect any authorized project purpose. The 1982 study was approved by the District Commander and the Division Commander, but was not approved by Headquarters U.S. USACE. It included an Environmental Impact Statement and examined the consequences of less flood storage on the flood management purpose of Summersville Dam and concluded that no significant additional flooding should occur. The Parties believe the conclusions of the 1982 study would directly support the requested study to confirm that raising the winter pool by at least 50 feet during winter months does not defeat another authorized project purpose. See attached conclusion from 1982 Modification Study.

Uploaded is a Power point that further explains the benefits of raising the winter pool and slowing flood releases.

Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

Responses to specific requirements that must be met by all applications.docx

Responses to specific requirements that must be met by all applications:

Section 7001 of the Water Resources Reform and Development Act (WRRDA) of 2014 (33 U.S. Code § 2282d), also directed that the Secretary of the Army include in the annual report only those feasibility reports, proposed feasibility studies, and proposed modifications to authorized water resources development projects and feasibility studies that:

> (i) are related to the missions and authorities of the Corps of Engineers;
>
> (ii) require specific congressional authorization, including by an Act of Congress;
>
> (iii) have not been congressionally authorized;
>
> (iv) have not been included in any previous annual report; and
>
> (v) if authorized, could be carried out by the Corps of Engineers.

(i) Response: The requested feasibility studies examining modifications, changes or adding deviations to the approved Summersville Lake Water Control Manual, Plan, or practice to raise the winter pool level and add and/or enhance hydroelectric generation capabilities at the Summersville Lake and Dam on the Gauley River in Nicholas County, WV. These changes are classified as enhancements to hydropower, and thus considered "related to the Corps' missions and authorities" when such function is performed in conjunction with one or more of the primary missions – in this case hydropower generation is performed in conjunction with raising a pool level, flood risk management and aquatic ecosystem restoration.

(ii) Response: The requested feasibility studies require specific Congressional authorization. On March 10, 2017, the USACE, Huntington District released an Initial Appraisal that considered the primary authorities associated with pursuing the requested studies (titled, "Summersville Lake, Nicholas County, West Virginia – Section 216 Initial Appraisal"). It is attached. The USACE, Huntington District findings and conclusion stated,

> *"This Initial Appraisal considered the primary authorities associated with pursuing a future study. After review of current laws and policies, no provisions were found that authorizes the USACE to add non-Federal Hydropower mission to Summersville Lake. All guidance found repeatedly emphasized non-Federal hydropower development must be consistent with authorized project purposes.*
>
> *Based on the qualitative analysis of the areas of consideration presented in this report, the results indicate it is not in the Federal interest to move forward with a feasibility study of Summersville Lake at this time."*

(iii) Response: The requested feasibility studies have not been previously congressionally authorized.

(iv) Response: The requested feasibility studies have not been included in the main table of a previous annual report.

(v) Response: If authorized, the studies can be undertaken by the USACE, Huntington District. The requested feasibility studies are identical to studies undertaken in the past by the USACE for federally-owned hydroelectric power projects.

Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

Summary of Study of Higher Winter Pool in Hydropower Study by Huntington District.doc

Summary of Study of Higher Winter Pool in 1982 Hydropower (Modification} Study by Huntington District

This document summarizes the important points in the attached 16 pages regarding the analysis of the impact of a higher winter pool and reduced flood storage performed by the Huntington District in their Hydropower Study (the Study) in 1982 for Summersville Dam. The Study was comprehensive and thorough. It considered six options for installing power. The option they selected was the best choice from the standpoint of power production; it was called the Long Tunnel (LT-IIIA). It required a new intake tower near the present spillway attached to a new tunnel leading to a powerhouse in the Gauley River about 5 miles downstream of the dam. This powerhouse location increased the gross head from about 270 feet between present summer pool and the tailwater to about 350 feet between the new summer pool level (1668 feet MSL) and the tailwater level at the new powerhouse. The proposed summer pool would have been 16 feet higher than the present pool level of 1652 feet MSL, and the winter pool would have been at 1638 feet MSL, 63 feet higher than the present winter pool at 1575 feet MSL. The electrical capacity was 110 to 130 MW, depending on some variations in design. To increase the value of the power, a peaking operation was planned when flow allowed; this means that the generating flow was varied during the day to maximize the power value during the peak period. It seems quite likely that they would have reduced flood releases to maximize the flow available for generation unless an incoming flood conditions prohibited that. This operation generated the most valuable amount of energy and allowed SEPA to sell the power as firm capacity.

The Study examined all potential impacts of the proposed hydropower installation. It was published in four volumes including a complete Environmental Impact Statement and extensive public comments from a meeting and submitted comments. It was published in September 1982. It was approved by the District Commander and by the Division Commander for the Ohio River Division. It was not approved by the Bureau of Engineers for Rivers and Harbors and not submitted for congressional funding.

Contents of Attachment

The attachment has selected pages from the Study that present the flood analysis associated with the proposed raising of the summer and winter pools as mentioned above. This analysis is provided to show why the study concluded it was acceptable from a flood storage standpoint to raise the summer and winter pools as planned.

The first page of the attachment “SummModStudy1982FloodStudy,p.E-2,Appdx4,pp4-A7to4-A18,Exh4-4d(16 pages).pdf”, is page E-2 from Volume I of the study. It is extracted from the conclusions of the study and indicates flood storage would not be compromised by the higher winter and summer pool levels. Therefore, the proposed higher winter pool (63 feet) did not unacceptably reduce flood storage. See paragraph b on page E-2, which states, “The contemplated pool adjustments would not cause increases in downstream flood crests”.

Pages 2 through 14 of the same attachment are the text of the flood analysis from pages 4A-7 through 4A-18 of Volume 4, Appendix 4 in the hydropower study. Page 4A-8 is copied twice. These pages begin with the flood history before and after impoundment from pages 4A-7 through 4A-13. Pages 4A-13

through 4A-18 describe the flood characteristics and results of flood routings used to establish the conclusion.

Pages 15 and 16 graphically (Exhibit 4-4d) show the results of the postulated Standard Project Flood assembled from a historical flood and a postulated flood to test the raised winter pool level for acceptable flood storage. The peak inflow is 120,000 cfs, and the lake rises from the higher winter pool (1638 ft. MSL) to 1705.9, which is below the spillway crest of 1710 feet MSL. The results of this and other postulated floods were analyzed and summarized on page 4A-16 in the second paragraph of Section 8.b. The analysis states, "In each case analyzed, however, spillage occurred at such a time that flood crests at downstream points were not affected." This analysis justifies the conclusion about no increase in flood crests downstream, as stated on page E-2, the first page in this attachment.

Conclusion

The Summersville Modification Study by the District shows that the winter pool could be raised 63 feet from its present level without adversely affecting the flood storage function of Summersville Lake. That is why we have argued that raising the winter pool as much as 50 feet should not significantly reduce the flood storage function as authorized for Summersville Lake.

Primary Sponsor Letter of Support

(This is as uploaded, a blank page will show if nothing was submitted)

Summersville letter of support.pdf

Summersville
City of Summersville, WV
ROBERT L. SHAFER, MAYOR

July 22, 2019

To Whom It May Concern:

Re: Summersville Lake 7001 Application
Support Letter from City of Summersville, WV

The City of Summersville began its application to add hydropower to Summersville Lake in 1980. We engaged a hydropower developer, Noah Corporation, to prepare the necessary applications and permits and oversee development of the project. The license was issued in 1992. In 1996, we entered an agreement with Gauley River Power Partners, a subsidiary of Enel Green Power North America, to build the 80 megawatts hydropower project and operate it for thirty (30) years.

After eighteen (18) years of successful operation, we can say that the Summersville Hydroelectric Project has been a significant benefit to the City and the surrounding area for several reasons. Not only has it provided and sold more than 3.6 billion kilowatt hours of clean, renewable electricity; it represents a significant accomplishment for our city and Nicholas County. It also more fully develops the Summersville Lake in terms of its public benefits, adding to the benefits provided by the U.S. Army Corps of Engineers. Some of the revenue has benefited the fishery and public recreation through contributions made to the WV Department of Natural Resources. These were enhancement contributions, not required mitigative payments. The lake provides needed flood control, low flow augmentation, water supply to our city, recreation that attracts tourists and provides enjoyment for our local residents. The addition of hydropower has been a win-win situation, adding to the existing benefits of the lake.

In a 1982 study, the Corps of Engineers proposed raising the lake levels to add hydropower, bringing improvement to an already valuable resource. The Corps proposed raising the winter pool level by sixty-two (62) feet to increase generation. They made calculations of potential floods and concluded that the pool level increase would not significantly reduce downstream flood protection benefits. Although the Corps' proposal was not approved by Congress, their analysis showed how raising the winter pool level and reducing flood releases to fully generate using stored water could benefit the hydropower project. We have approached the Huntington District of the Corps asking for their approval to raise the winter pool.

Regrettably, they have refused our request to re-examine the 1982 study to determine if raising the winter pool fifty (50) feet would be acceptable. Their reasoning is that hydropower is not a federally authorized purpose of Summersville Lake. We approached the WV Congressional

400 NORTH BROAD STREET • P.O. BOX 525 • SUMMERSVILLE, WEST VIRGINIA 26651
TELEPHONE (304) 872-1211 • TELECOPY (304) 872-2236

Delegation for their help in seeking approval for these valuable improvements and have prepared this application with their encouragement.

The City of Summersville strongly supports this Section 7001 application to revise the winter lake level and flood storage of Summersville Lake. This application represents improvements that would add about 25% to the annual generation of renewable power. These changes would substantially increase the public benefit and programs for our city, county & state.

Best regards,

Mayor Robert L. Shafer

Other Non-Federal Sponsors Letter(s) of Support

(This is as uploaded, a blank page will show if nothing was submitted)

Nicholas County letter of support.pdf

NICHOLAS COUNTY COMMISSION

700 MAIN STREET, SUITE 1
SUMMERSVILLE, WEST VIRGINIA 26651
ncc_pattyneff@yahoo.com
www.nicholascountywv.org

DR. LLOYD K. ADKINS, President
LYLE NEAL, Commissioner
GARRETT COLE, Commissioner

TELEPHONE: (304) 872-7830
FAX: (304) 872-9602

August 21, 2019

To Whom It May Concern:

Re: Nicholas County Commission Support Letter
7001 Application for Summersville Lake

Nicholas County (the County) has cooperated and supported the City of Summersville (the City), since it began its effort to add hydro power at Summersville Lake in 1980. Hydro power has been a benefit to Nicholas County for the eighteen (18) years of its operation. The hydro power project has introduced revenue and benefits to Nicholas County in many forms. One form of many would be the payments paid to the **WVDNR** have provided increased fishery in the lake and brought additional tourism to our area.

More renewable power generated from the Summersville Hydroelectric Project would certainly be welcomed and supported by the County.

The Nicholas County Commission offers its support of the 7001 Application, which would ultimately create more green energy and increase the public benefits. We urge the Congress and the Corps of Engineers to approve this application that will improve public benefits in Nicholas County.

Regards,

Dr. Lloyd K. Adkins
President

Lyle Neal
Commissioner

Garrett Cole
Commissioner