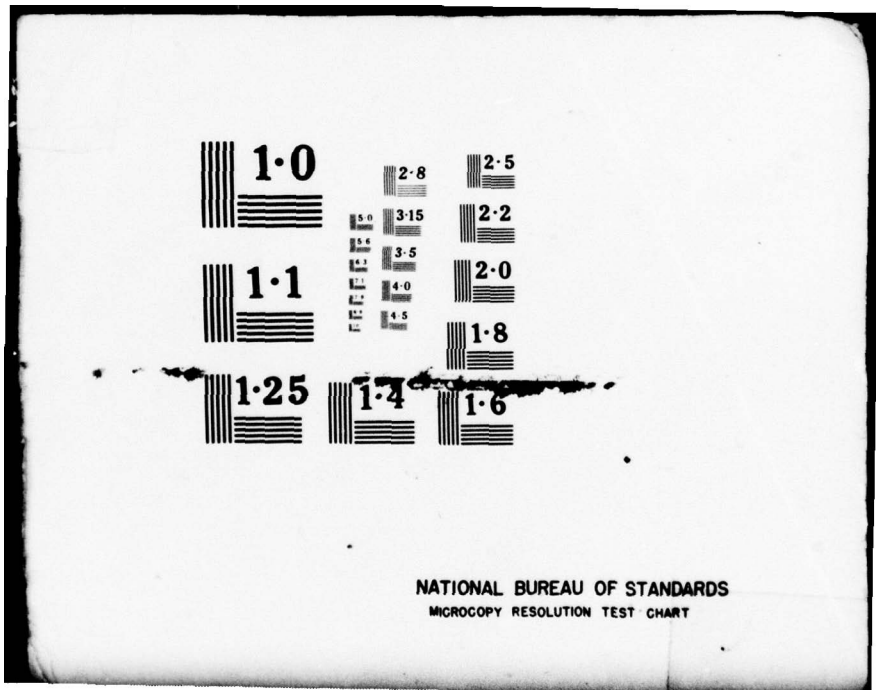
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(1)

PASSAIC RIVER BASIN

LEVEL III

PEQUANNOCK RIVER, PASSAIC COUNTY

NEW JERSEY

(10) Robert/Gershowitz

(11) Aug 78

RIVER WALL DAM

(12) 25p.

(9) Final rept.,

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

(6) National Dam Safety Program. River Wall Dam (NJ-00547), Passaic River Basin, Pequannock River, Passaic County, New Jersey. Phase I Inspection Report.

NJ 00547

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PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

28 SEP 1978

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for River Wall Dam in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, River Wall Dam, a high hazard potential structure, is judged to be in good overall condition. This dam is a non-overflow ancillary structure to Charlotteburg Dam (NJ00316). River Wall Dam is hydraulically adequate since it will not be overtopped by the Probable Maximum Flood (PMF). To insure adequacy of the concrete structure, the following actions as a minimum, are recommended:

a. Within three months from the date of approval of this report, engineering investigations and studies should be undertaken by a qualified, professional consultant, engaged by the owner, to determine the cause of the monolith misalignment, joint leakage and establish the foundation soil strength parameters. These parameters should be used to perform a stability analysis at the most critical points along the wall. These investigations and studies should be completed within six months from their initiation and corrective measures, if required, should be completed within calendar year 1979.

b. The owner should initiate the following programs within three months from the date of approval of this report.

(1) An annual inspection of the dam utilizing a visual check list similar to that used in this inspection report.

(2) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

(3) Survey seepage and leakage at monoliths and monolith joints.

(4) Surveys of concrete surfaces for surface deterioration and/or cracking.

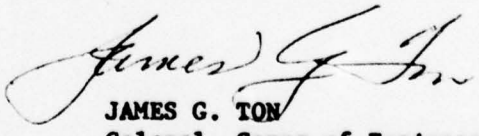
(5) Remove all brush and scrub trees at the riverward face of the wall and replace with suitable ground cover, to prevent undermining of the wall footing.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Robert A. Roe of the Eighth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia, 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy furn:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box 2809
Trenton, NJ 08625

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RIVER WALL DAM (NJ00547)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 1 and 6 May and 3 August 1978 by Harris-ECI under contract to the State of New Jersey. The state, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

The River Wall Dam, a high hazard potential structure, is judged to be in good overall condition. This dam is a non-overflow ancillary structure to Charlotteburg Dam (NJ00316). River Wall Dam is hydraulically adequate since it will not be overtopped by the Probable Maximum Flood (PMF). To insure adequacy of the concrete structure, the following actions as a minimum, are recommended:

a. Within three months from the date of approval of this report, engineering investigations and studies should be undertaken by a qualified, professional consultant, engaged by the owner, to determine the cause of the monolith misalignment, joint leakage and establish the foundation soil strength parameters. These parameters should be used to perform a stability analysis at the most critical points along the wall. These investigations and studies should be completed within six months from their initiation and corrective measures, if required, should be completed within calendar year 1979.

b. The owner should initiate the following programs within three months from the date of approval of this report.

(1) An annual inspection of the dam utilizing a visual check list similar to that used in this inspection report.

(2) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

(3) Survey seepage and leakage at monoliths and monolith joints.

(4) Surveys of concrete surfaces for surface deterioration and/or cracking.

(5) Remove all brush and scrub trees at the riverward face of the wall and replace with suitable ground cover, to prevent undermining of the wall footing.

DATE: 28 Sep 78 APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	River Wall Dam, I.D. NJ 00547
State Located:	New Jersey
County Located:	Passaic
Stream:	Pequannock River
Date of Inspection:	May 1 and 6, and August 3, 1978

Assessment of General Condition of Dam

The general condition of the River Wall Dam is good. The River Wall Dam is a non-overflow structure ancillary to Charlotteburg Dam, NJ 00316, which has the spillway and outlet works for the reservoir system. The Charlotteburg Dam will pass the Probable Maximum Flood (PMF) -Spillway Design Flood (SDF).

The stability of the River Wall Dam is good. The major condition requiring action is the monolith vertical joint leakage at approximate Sta. 16 + 60. The cause of this leakage should be determined and corrected. In addition, there is a horizontal misalignment of the river wall in the direction away from the reservoir at the approximate location of the joint leakage. The available engineering data for the foundation soils is inadequate to permit assessment of the dam stability.

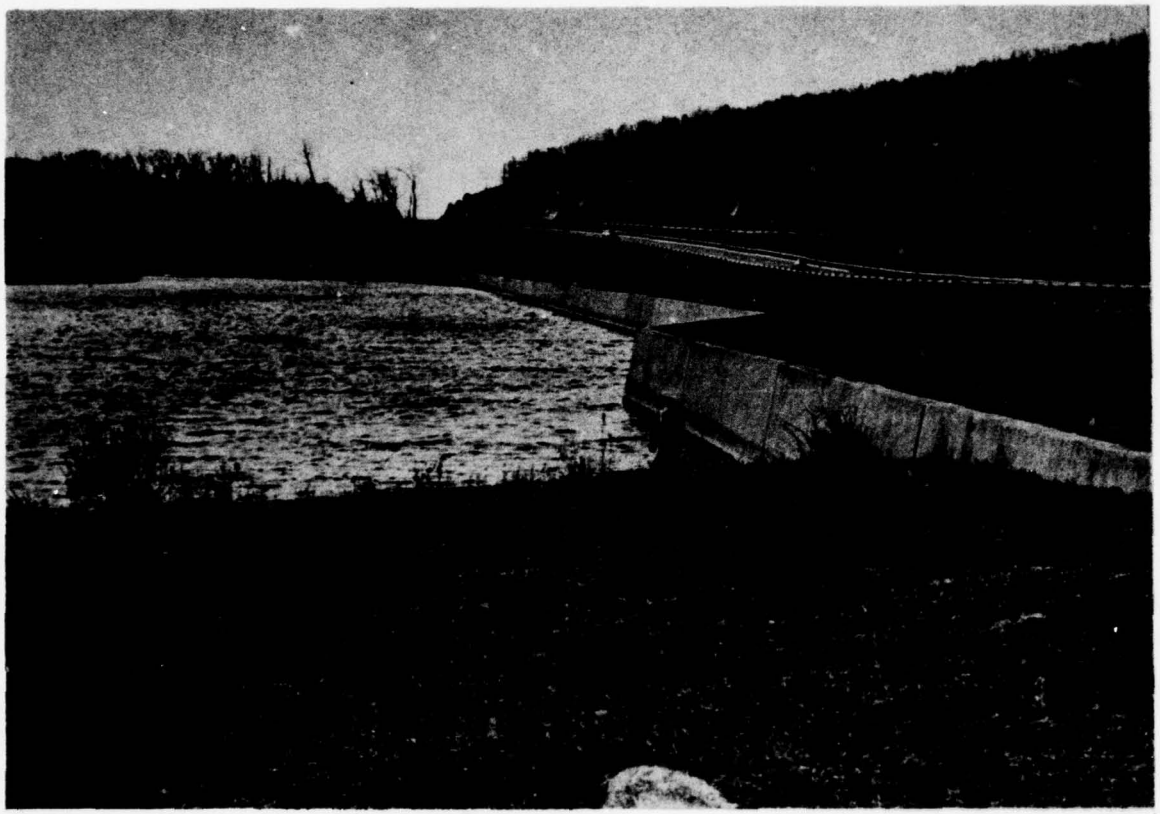
It is recommended that a study be undertaken to determine the cause of horizontal misalignment and to find out if there is any correlation between the misalignment and the joint leakage. This study should be completed within 6 months and corrective measures, if required, completed within one year.

In addition, a study sould be undertaken by the owner to establish the foundation soil strength parameters. This study should be accomplished within 6 months. These parameters should be used to perform or check if original data is found, a stability analysis at the most critical point along the wall as determined from the plans.

Robert Gershowitz, P.E.

Robert Gershowitz, P.E.





May 1978

RIVER WALL DAM

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

RIVER WALL DAM, I.D. NJ 00547

SECTION 1

1. PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August 1972 authorizes the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Dam Inspections. Inspections for the River Wall Dam were carried out under Contract DACW61-78-C-0100 to the Department of the Army, Philadelphia District, Corps of Engineers, by the engineering firm of Harris-ECI Associates of Woodbridge, New Jersey.

b. Purpose of Inspection

The purpose of the inspection and evaluation is to identify conditions which threaten the public safety and thus permit the correction of the conditions in a timely manner by the owners.

1.2 Description of Project

a. General Description of Dam and Appurtenances

The River Wall Dam, whose main impounding structure is Charlotteburg Dam, NJ 00316 for which an inspection report has been previously issued, is located at the northeastern reach of the Charlotteburg Reservoir. River Wall Dam is 2,020-ft. long and has a maximum height of 26 feet. The northwesterly 420 ft. of the wall is of precast concrete crib units, backfilled with granular material; the remaining 1,600 ft. is a cast-in-place concrete gravity wall. The wall which follows the alignment of

the New York Susquehanna and Western Railroad connects into a rock fill embankment at the western end and into the existing slope at the eastern end.

The top of the gravity wall is 18-inch wide, with a slope on the river side of 1 horizontal on 6 vertical, on the north side the slope is 1 horizontal on 2 vertical. The crib wall is 6-ft. wide with a river side slope of 1 horizontal on 6 vertical. The embankment behind the cribwall has a top width of 8 ft., with a back slope of 1.5 horizontal on 1 vertical down to a swale.

The swale is connected to a stone drainage ditch that runs the entire length behind the gravity wall and empties into a natural ditch at the intersection of the railroad and the Old Hamburg Turnpike. The ground on the riverward side is protected by a combination of heavy vegetation and an impervious blanket. The impervious blanket has been placed approximately between Sta. 8 + 60 and Sta. 15 + 00 and is covered with 12 inches of gravel and 18 inches of riprap. The blanket covers the area where the existing river channel was filled in.

The River Wall Dam is founded on silty soil and fine sand. The reservoir created by the Charlotteburg Dam, I.D. NJ 00316, is "U" shaped, and covers 350 acres. Its maximum depth is 80 feet, and the impounded volume is 2.9 billion gallons or 8,950 acre-feet derived from a drainage area of 56.3 square miles.

The reservoir rim slopes are generally mildly to moderately sloping with no apparent sloughing or slumping. The soil cover is relatively shallow underlain by competent rock formations covered by deciduous trees. River Wall Dam lies downstream of another reservoir on the Pequannock River, Oak Ridge and is also fed by waters of Clinton Reservoir on Clinton Brook and by Canistear Reservoir on Pacock Brook. Downstream of Charlotteburg Reservoir, the Pequannock is impounded at Macopin Dam. All these reservoirs are part of the City of Newark Water Supply System.

b. Location

River Wall Dam is located on the Pequannock River in Passaic County, New Jersey, approximately 12 miles upstream from its confluence with the Pompton River and approximately 6 miles upstream of Butler, New Jersey, the nearest downstream population center. Pequannock River is part of the greater Passaic River Basin. The reservoir is adjacent to State Route 23.

c. Classification

According to the "Recommended Guidelines for Safety Inspection" by the U.S. Department of the Army, Office of the Chief of Engineers, the dam is classified as Small based on its height which is less than 40 feet. It is classified as being Intermediate in size on the basis of its reservoir volume which is greater than 1,000 acre-feet but less than 50,000 acre-feet. The overall size classification is governed by the larger of these two determinations, and accordingly, the River Wall is classified as being Intermediate in size.

d. Hazard Classification

The dam has not been previously classified in the National Inventory of Dams maintained by the Corps of Engineers. On the basis of the visual inspection, the hazard potential is considered high for the following reasons:

1. The dam is founded on a pervious and erodible foundation and the impounded storage volume above its foundation grade is significant.

2. In case of the failure of the River Wall Dam, water in the Charlotteburg Reservoir would flow out and rejoin the Pequannock River Channel downstream of Charlotteburg Dam. Significant damage could occur to the water treatment

facility belonging to the City of Newark located within a half mile downstream of the dam.

The community of Butler would also suffer significant community damages and possible high loss of life by the released reservoir waters in case of dam failure.

e. Ownership

The dam and reservoir are owned by the City of Newark.

f. Purpose of Dam

River Wall was built as a closure dam for the Charlotteburg Reservoir, and to avoid inundation of railroad trackage originally belonging to N.Y. Susquehanna and Western Railroad. This trackage is not currently in active use.

g. Design and Construction History

The dam was designed for the City of Newark by the private engineering firm of Parsons, Brinkerhoff, Hall, and MacDonald, New York, New York, in the period 1957-1958. Construction started in 1959 and the dam was put into service in 1961.

h. Normal Operational Procedure

There is no operational procedure at the River Wall Dam but the procedure at the Charlotteburg Dam is as follows:

The purpose of the dam is to store water for subsequent treatment and use by the City of Newark. On the May 3 inspection date, 82 million gallons per day were being drawn off for this use. Normally, the reservoir level is kept at a level designed to capture the maximum volume of water from the Pequannock River. Normally, the 5-ft high bascule gates are kept closed above the fixed concrete spillway crest at elevation of 738.0

above M.S.L., so that the top of the bascule gate extends up to elevation 743.0. With increasing flood waters, the gate is automatically lowered, so that the reservoir level remains between 743.5 and 744.0 until discharges reach 11,000 cubic feet per second. At 11,000 cfs, the bascule gate is completely lowered automatically, and rests on the fixed concrete spillway forming a smooth ogee shaped crest profile. During the summer low flow periods, the reservoir level is drawn down according to the water needs of the Newark Water Supply System, and can be down as much as 8 to 10 feet below top of gate level for extended periods of time. Water level records are recorded and kept; currently being recorded manually from a staff gage on the left abutment. A review of the recorded reservoir water levels for the sample year 1971, show that the water level did not exceed 743.30 at any time. The sample year 1971 included the extratropical storm Doria, a significant storm event in Passaic County. The amount of water being discharged over the spillway at Charlotteburg is not being recorded. Stream gaging records are available at the U.S.G.S. gage at Macopin Dam some 1.3 miles downstream of the Charlotteburg Reservoir.

1.3 Pertinent Data

a. Drainage Areas

At Charlotteburg Dam axis, drainage area is 56.3 square miles.

b. Discharge at Charlotteburg Dam Site:

Maximum known flood at dam site: 5,850 cfs on October 10, 1903.

Warm water outlet at pool elevation: NA

Diversion tunnel low pool outlet at pool elevation:	NA
Diversion tunnel outlet at pool elevation:	NA
Gated spillway capacity at pool elevation (Charlotteburg Dam):	743; capacity 5,600 cfs 744; capacity 11,000 cfs
Gated spillway capacity at maximum pool elevation (Charlotteburg Dam):	747.2; capacity 20,500 cfs
Ungated spillway capacity at maximum pool elevation:	NA
Total spillway capacity at maximum pool elevation (Charlotteburg Dam):	747.2; capacity 20,500 cfs

c. Elevation (feet above MSL)

Top of Dam (Charlotteburg Dam):	750.0
Maximum flood control pool:	NA
Full flood control pool:	Elevation 743 (elev. of gate lip)
Recreation pool:	NA
Spillway crest (gated), (Charlotteburg Dam):	Elevation 738 (bascule gate in fully lowered position)
Upstream portal invert diversion tunnel:	NA
Downstream portal invert diversion tunnel:	NA

Streambed at centerline of dam:	Not applicable, River Wall Dam runs parallel to relocated channel of Pequannock River. The foundation grade varies from Elev. 743 to Elev. 728
Maximum tailwater:	Not applicable, River Wall Dam is a non-overflow structure

d. Reservoir

Length of maximum pool:	12,730 feet
Length of recreation pool:	NA
Length of flood control pool:	NA

e. Storage (acre-feet)

Recreation pool:	NA
Flood control pool:	NA
Design surcharge:	Elevation 747;(storage 10,400 AF)
Top of dam (Charlotteburg Dam):	Elevation 750;(storage 11,500 AF)

f. Reservoir Surface (acres)

Top of Dam (Charlotteburg Dam):	Elevation 750;(area = 575 acres)
Maximum pool:	Elevation 748;(area = 450 acres)
Flood-control pool:	NA
Recreation pool:	NA
Spillway crest (Charlotteburg Dam):	Elevation 738 (area = 312 acres)

g. Dam (River Wall)

Type:	Gravity concrete/crib wall
Length:	2,020 feet
Height:	26 feet maximum
Top width:	18-inch gravity concrete
Side slopes,Upstream:	1.0 H on 2.0 V
Downstream(Riverward):	1.0 H on 6.0 V
Top of dam:	Elevation 750.0

Zoning:	NA
Impervious core:	NA
Cutoff:	NA
Grout curtain:	NA

h. Diversion and Regulating Tunnel

Type:	NA
Length:	NA
Closure:	NA
Access:	NA
Regulating Facilities	NA

i. Spillway (Not applicable, dam is non-overflow; data is given for Charlotteburg Dam, the main impounding structure)

Type:	Concrete ogee surmounted by bascule gate
Length of weir:	200 feet
Crest elevation:	738.0
Gates:	200-ft long x 5-ft wide, single leaf bascule
U.S. Channel:	NA
D/S Channel:	Stilling basin

j. Regulating Outlets (Not applicable for River Wall Dam. Data is given for Charlotteburg Dam, the main impounding structure)

• Bypass Outlet:	48-inch
Controls:	48-in. square slide-gate, electrically operated from floor elevation 750.5
Emergency gate:	48-in. square Broome gate with lifting beam placed with aid of crane located above operating floor, elevation 750.5
Outlet:	30 in. hollow cone valve discharging into stilling basin through left stilling basin wall; centerline elevation of the pipe is 677 at the upstream end and 675.5 at the discharing hollow cone valve
• Raw Water Conduit:	Twin 48-in. diameter passages converging into a single 54-in. diameter pipe
Controls:	30-in. diameter cone valve and 48-in. square slide gate on each 48-in. dia. pass
Emergency gate:	Same Broome gate used for 48-in. bypass line (One Broome gate for three passages)
Outlet:	54-in. diameter line to water treatment plant

SECTION 2

2. ENGINEERING DATA

2.1 Design

A complete set of as-built drawings exists for River Wall Dam showing in detail all the pertinent features on which a safety evaluation can be based on.

In addition to the contract plans, a "Memorandum of Design of Charlotteburg Dam" dated December 3, 1957, exists and is available, describing the derivation of the spillway design flood.

2.2 Construction

The only available data on construction uncovered for this report are the reports in the files of the N.J. Department of Environmental Protection (NJ-DEP) relating to the quality of the foundation. The River Wall, according to the report, is founded on materials of a "sound nature" consisting of large boulders, various sized stones, and a silty soil mixed with fine sand materials.

2.3 Operation

There is no operational procedure for the River Wall Dam, but the procedure at the Charlotteburg Dam directly affects the water level at the wall. The following is the procedure at the Charlotteburg Dam:

Daily records are kept of the water level behind the dam. The recording device at the time of the inspection visit was not operating and water levels were read from a staff gage on the left abutment. Rainfall amounts at the dam site are also recorded on a daily basis.

The operation of the dam is based on keeping the reservoir at a level designed to capture the maximum volume of water. The automatic operation of the bascule gate limits the level of the reservoir, and an inspection of the water level records, for a sample year 1971, showed that a pool elevation of 743.3 was not exceeded during the year. Typically, 82 mgd of raw water is being withdrawn from the reservoir for water supply use for the City of Newark.

The Charlotteburg Reservoir receives water from the Pequannock River and its tributaries. There is another reservoir upstream of Charlotteburg Dam on the main stem of the Pequannock River, at Oak Ridge, at elevation 852.5, having a drainage area of 21.7 square miles, a storage of 12,000 AF and a reservoir water surface area of 482 acres. A reservoir exists on Pacock Brook, a tributary of the Pequannock River flowing into it some 3 miles above the Charlotteburg dam axis, at elevation 997.5 with a drainage area of 10.5 square miles, a storage capacity of 10,800 AF and a lake surface of 423 acres. Charlotteburg Reservoir can draw water from Echo Lake Reservoir on the Macopin Creek at elevation 902, having a drainage area of 4.6 square miles, a storage capacity of 4,850 AF, and a water surface area of 280 acres. The overflow water from Echo Lake Reservoir however, flows into Macopin Brook downstream of the Charlotteburg Dam axis.

During the dry summer months, the water supply demand depletes the reservoir, and pool levels 8 to 10 feet below the crest are not uncommon according to the operators.

2.4 Evaluation

a. Availability

The availability of engineering data with the exception of the foundation soil strength parameters has been adequate to assess the safety of the structure for the Phase I inspection.

A check list of engineering construction and maintenance data is included in Appendix A.

b. Adequacy

The engineering data assembled is considered adequate, with the exception of the foundation soil data.

c. Validity

There is no reason to suspect that the engineering data acquired is not valid or representative of the dam as it stands. We have checked the contract plans visually with what is actually built and cannot detect any significant deviations without a full scale detailed as built survey.

SECTION 3

3. VISUAL INSPECTION

3.1 Findings

a. General

This dam and its appurtenances are in good condition having been designed according to modern criteria and controls, being of relatively recent construction, and being attended to, all year round.

b. River Wall

1. Seepage and Leakage

No seepage or leakage could be detected at the toe of the river wall because of backfill at the toe. The concrete gravity section shows some evidence of minor seepage through shrinkage cracks located approximately in the middle of the monoliths from Sta. 13 + 00 to Sta. 18 + 60. The seepage areas were dry, but mineral deposits coat the wall at the cracks.

On the date of the first inspection, when the water level was at 741.5, minor leakage was observed at ground level at the vertical joint, Sta. 16 + 60±. The leakage was from a 3 in. x 6 in. x 3 in. deep hole at the joint (see Photo 12). During the second inspection with the water level at 731.5, there was not any leakage observed. This leakage should be checked and stopped.

2. Structural Cracking

There is no visible evidence of structural cracking.

3. Monolith Joints

All vertical monolith joints are beveled and clearly formed with no signs of spalling.

4. Horizontal Alignment

At approximate Sta. 16 + 50±, there is a horizontal misalignment of the river wall in the direction away from the reservoir which can be detected by sighting along the top of wall. This misalignment is at approximately the same location as the joint leakage. The origin of this misalignment should be investigated to determine if this condition and the monolith joint leakage are related.

5. Crib Wall

The crib wall is in good condition with some slight settlement in a few places evident by the closing of the vertical joints at the top of the wall. There is some minor erosion along the back of the top stretcher and the embankment. The embankment is in good condition, covered with a heavy vegetation growth. The connections of crib wall to the rock fill at the eastern end and the gravity wall at western end were in good condition.

6. Foundation

The river wall is founded on sands and gravels and mixed with silt in some locations. Between Sta. 8 + 50 to 15 + 00, an impervious blanket covered with 12 inches of gravel and 18 inches of riprap was placed to prevent seepage under the wall in that area. The riprap remains in good condition with only some scattering of material at the eastern end.

7. Concrete Surfaces

The concrete surfaces on both sides of the river wall appear well formed and aligned. The surface on the riverward side of the wall is good with less than one percent of local concrete popoff areas over 3-inch aggregate pieces near the high water mark, due to the scouring effect of the water.

The north side of the wall has some isolated areas of minor spalling.

8. Review of the Geological Setting

The general geological setting is shown on Drawing 10, see Plates. The river wall structure is founded on sands and gravels. No seepage through the foundation materials was observed.

The relatively steep hills along the reservoir show no sign of major instability problems. The steeply dipping metamorphic rocks are favorably oriented against major slides although toppling-type failure of joint-defined blocks may occur.

c. Appurtenance Structures - None

d. Reservoir Area

The reservoir rim is generally gentle to moderately sloping, up to about 4 feet above normal maximum pool level, and moderately steeply sloping above that. The rim of the reservoir is lightly vegetated with deciduous trees on a relatively shallow soil cover underlain by competent rock formations. The normal high water reservoir line is clearly discernable at approximately elevation 743.5 ± 0.25.

The sedimentation in the reservoir is said to be light because of the upstream reservoirs (Canistear, Echo Lake, Clinton and Oak Ridge) which intercept and detain the run-off from the Pequannock River and its tributaries.

3.2 Evaluation

The visual inspection revealed that the dam and appurtenances are in overall good condition. Conditions which affect the dam's safety are listed below:

1. Horizontal Misalignment:
   Check misalignment at approximate Sta. 16 + 50. Determine cause.

2. Monolith Joint Leakage:
   Check and correct monolith joint leakage at approximate Sta. 16 + 60. Determine if there is any correlation between the joint leakage and the horizontal misalignment.

The visual inspection check list is included in Appendix A.

Photographs taken during the site inspection are included in Appendix B.

SECTION 4

4. OPERATIONAL PROCEDURES

4.1 Procedures

Charlotteburg and River Wall Dams were built to increase the firm yield of the Pequannock River basin for water supply purposes and to improve the water quality before it enters the Pequannock Aqueduct. The existing impoundments, prior to construction of Charlotteburg Dam, did not have the proper impounding capacity in relation to the size of their drainage areas. As a result, water was wasted over the Macopin Dam before the reservoirs upstream were filled. Water from the existing dams was transmitted to the Macopin Dam in open channels, with the result that the water quality in the Macopin reservoir was poorer than that on the upstream reservoirs. With the construction of Charlotteburg Dam and the River Wall a properly sized impoundment was installed to capture as much water as possible from the Pequannock watershed. The water quality was maintained by extending the Pequannock Aqueduct upstream from Macopin Dam to Charlotteburg Dam and interposing a screening chamber and an aeration and chemical conditioning facility along the extension.

Charlotteburg Dam, the River Wall Dam and the reservoir are operated and maintained in conjunction with the screening, aeration and chemical treatment facilities downstream of the Charlotteburg dam axis.

4.2 Maintenance of Dam

The area in back of River Wall Dam appears to be occasionally maintained by mowing and maintenance of the paved drainage gutter.

4.3 Maintenance of Operating Facilities

There are no operating facility for this non-overflow structure.

4.4 Description of any Warning System in Effect

An emergency procedure has been set up for telephonic notification of officials in Kennelon and Butler in case any failure of the River Wall Dam occurs.

4.5 Evaluation

The operational procedures are based on common sense and are carried out by competent personnel under the supervision of an experienced water supply organization. Operational and maintenance procedures should be more formalized and documented in line with the concern expressed recently over the safety of water impounding structures.

The warning system currently in effect should be improved and made automatic, by actuating a warning system at the dam, at the downstream water treatment plant, and at the downstream communities of Kinnelon and Butler.

SECTION 5

5. HYDRAULIC / HYDROLOGIC

River Wall Dam is a non-overflow structure, ancillary to Charlotteburg Dam. The hydrologic and hydraulic controls are at Charlotteburg Dam, and the determinations made for Charlotteburg Reservoir are applicable to River Wall Dam. The data for Charlotteburg Dam is presented below for completeness of information in Section 5.1.a and Section 5.1.b.

a. Design Data

The Probable Maximum Flood (PMF) hydrograph for the Charlotteburg reservoir in this study was obtained by modifying the published PMF for the Intake Dam on the Pequannock River. The PMF for the Macopin Intake Dam is published in the "Passaic River Basin - New Jersey and New York - Survey Report for Water Resources", dated June 1972, by the New York District, Corps of Engineers as 16,100 cfs, having a drainage area of 63.7 square miles.

The Charlotteburg Dam PMF peak discharge is calculated to be 14,900 cfs as compared with 21,000 cfs adopted in the original design of the dam.

The calculated PMF hydrograph has the following characteristics:

Peak discharge	=	14,900 cfs
Time of peak	=	47 hours
Runoff	=	19.47 inches

No reservoir routing was performed since the original Spillway Design Flood (SDF) is 1.4 times greater than the calculated PMF.

According to "Memorandum on Design of Charlotteburg Dam", dated December 3, 1957 by Parsons, Brinckerhof, Hall and MacDonald, the operating procedure for the bascule gate is that the gate will maintain its vertical position and impound waters to elevation 743 except in times of flood. During a flood, the gate will remain vertical until an elevation between 743.5 and 744 is reached. With increasing flood waters, the reservoir level would tend to rise above this elevation. The gate is then automatically lowered so that the reservoir level remains between elevation 743.5 and elevation 744 until the spillway discharge equals about 11,000 cfs; at this point, the gate is completely lowered. Should the flood flows increase beyond 11,000 cfs, the reservoir level would rise until the peak of the flood occurs. For the design maximum probable flood of 21,000 cfs, the reservoir level would rise to a maximum elevation of 747.1 feet. As the flood recedes, the gate will remain in the lowered position until the reservoir level returns to an elevation between 743.5 and 744, at which time the gate will automatically start to rise to maintain this elevation. At the end of the flood, the gate will once again be vertical and the reservoir full.

The bascule gate consists of a steel torsion cylinder extending the full length of the spillway with steel ribs attached at intervals supporting the plain steel skin on the upstream side. The torsion cylinder extends through armature plates at each end of the gate. The control mechanism is located in the gate chamber. Seals are provided at the end and bottom of the gate so that watertightness is obtained in the vertical position. Electric heaters prevent freezing of the seals. The operating mechanism and controls are hydraulically operated and consists of steel hydraulic cylinders designed for oil pressure not less than 500 pounds per square inch. The oil pressure pumping system consists of duplicate motor driven oil pumps complete with pressure switches and an accumulator sized to hold the gate in position for 24 hours after the loss of electric

power supply. While the gates are normally operated automatically, controls have been provided for manual operation. Failure of operating mechanism will cause opening of the gate resulting in the maximum spillway capacity, if the reservoir is full at the time of such a hypothetical failure.

In the original design, probable maximum railfall values were taken from Hydrometeorological Report #33 with the following distributions:

Duration of Storm	Maximum Probable Rainfall
Hours	Inches
3	18.4
4	20.9
12	23.7
24	25.7

An initial loss of 0.3 inch and an infiltration loss of 0.02 inch per hour were used to determine the runoff producing rainfall.

A one-hour unit hydrograph was derived from analysis of the records available for the floods of October 1903, March 1936 and August 1935 for the entire drainage area and adjusted for application to the area upstream of the Charlotteburg Dam. However, this unit hydrograph has not been included in the design report.

The Reservoir Inflow Hydrograph for the probable maximum flood was obtained by applying the unit hydrograph to the maximum probable rainfall for the storms of 3, 4, 12 and 24 hour durations with initial and infiltration losses rates as mentioned earlier. The peak discharge is 21,100 cfs.

The routing of the PMF through the reservoir, according to the same design memorandum, indicates the maximum outflow through the spillway is 20,500 cfs with the reservoir elevation at 747.1.

b. Experience Data

Records of daily reservoir stage level are maintained since the reservoir was in opreation since 1961. The reservoir water level usually is lower than 743, with only a few occasions where the water level in the reservoir was above 743.25. There is not any record of the water surface exceeding elevation 744.

Stream flow records of the U.S. Geological Survey indicate that the maximum recorded discharge over the Macopin Intake Dam was about 6,100 cfs and occurred on October 10, 1903. Charlotteburg Dam spillway was designed to pass safely a probable maximum flood "inflow" of 21,100 cfs which is considerably greater than the 1903 flood, and the probable maximum flood inflow of 14,900 cfs calculated in this report. The 1903 flood was the most severe of record on the Pequannock River watershed.

c. Visual Observations

No visual observations were made at the River Wall Dam that would affect the hydraulic or hydrologic computations.

d. Overtopping Potential

Since the flood inflow used in the original hydrologic and spillway design is significantly greater than the PMF, the overtopping potential of the River Wall Dam is extremely remote.

e. Reservoir Drawdown

The reservoir drawdown below the spillway crest elevation 738.0, is accomplished by permitting discharge through the 48-inch steel blowoff pipe into the stilling basin and through the 54-inch water supply pipe which discharges approximately 1,500 feet downstream at an approximate invert elevation 670.0. Assuming drawdown to the bottom of the River Wall on the reservoir side which corresponds to elevation 728.0, and

an inflow rate of 107.4 cfs (2 cfs/sq.mi.) the total drawdown time is approximately 1.4 days. Assuming no inflow into the reservoir, the drawdown time is reduced to approximately 1.1 days. To drawdown to elevation 737.0, the top of the granular fill in front of the River Wall on the land or north side, the corresponding times would be between 2 to 3 hours.

SECTION 6

6. STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The features determining the stability of a gravity dam, founded on sand and gravel are the details designed to eliminate or to limit seepage under the dam . Other than the normal stability criteria, piping, which results from uncontrolled seepage, is the most important cause of instability of a gravity dam. The factors which are indicative of the susceptibility to the development of piping are the type of soil, its permeability and non-isotropic properties, the seepage path and the exit gradient of the seepage forces.

In the case of the River Wall, an impervious blanket was placed in the existing streambed where the borings indicate the existence of sand and gravel, the most susceptible soils for seepage and piping. Elsewhere, the foundation sands and gravels are mixed with silt and are generally overlaid by clay and silt. Such soils by their impervious and cohesive nature reduce the piping potential. The blanket apparently has been successful since there are no signs of seepage at the toe of the dam. In this area, one large tree stump has been extensively rotted out. This could result in a breach of the impervious blanket with the resultant establishment of a high flow seepage path.

b. Design and Construction Data

The following information was not available from the owner:

- Design computations for the River Wall Dam section of the reservoir complex.

- Foundation soil parameters for performing sliding and stability analysis and seepage and piping evaluations.

- Construction data or material specifications relating to the impervious blanket.

c. Operation Records

As far as is known, the maximum reservoir level has never reached a level above elevation 743.4.

d. Post Construction Changes

There are no known post construction changes that affect the stability of the dam.

e. Static Stability

A static sability analysis was performed on a gravity section at Sta. 17 + 80 where the downstream toe is at its lowest elevation. Three cases were analyzed and are given in Appendix E. Excepting the case where ice pressure was considered, the resultant always falls in the middle third and sliding resistance is adequate. Sliding resistance was computed by assuming a value of 30 degrees for the granular soils and that the soil below the top of footing was contributing passive resistance. In areas where the foundation soils were silt and clay, there is no data available to determine adhesion properties. Therefore, the stability calculations were made to determine the adhesion values required for a Factor of Safety of 1.5. The required values of adhesion which were determined were quite low for all cases excepting ice loading.

d. Seismic Stability

In general, projects location in Seismic Zone o, 1 and 2 amy be assumed to present no hazard from earthquake, provided the static stability consitions are satisfactory and conventional safety margins exist.

SECTION 7

7. ASSESSMENT / REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for Phase I Report.

- The soil stratum on which the dam is built is competent and, in combination with the impervious layer, has effectively produced a tight headwater barrier. No signs of unusual foundation leakage could be detected visually.

- The spillway is part of the Charlotteburg Dam, NJ 00316 for which the hydrologic investigations have determined that the spillway design flood used is in excess of the PMF by about 38 percent. (SDF 20,500 cfs; PMF 14,900 cfs).

- The stability investigations based upon assumed soil strength parameters for normal loading cases for the dam meets currently acceptable stability criteria.

b. Adequacy of Information

At present, there is not enough information available from the owner to fully evaluate the safety of the River Wall Dam. Required information is the foundation soils strength parameters used to determine the dam's stability. Otherwise, the information available at this report writing is adequate for formulating the assement made above.

c. Urgency

The study to determine the cause of horizontal misalignment at approximate Sta. 16 + 50 and to find out if there is any correlation between the misalignment and the joint leakage should be undertaken and completed within 6 months. Similarly, the foundation soils data should be developed within 6 months.

d. Necessity for Further Investigations

From the standpoint of dam safety with regard to the adequacy of the hydrologic design data used and the procedure and methodology in deriving the spillway design floods, routing of the PMF and the capability of the flood discharge structures, the River Wall Dam is safe from overtopping due to a probable maximum flood inflow into the reservoir.

Since the Charlotteburg Dam has a hydrologic capability which exceeds that required by the Corps, it is our opinion that the hydrologic risk failure of the River Wall as a result of overtopping is extremely minimal.

The owner should provide data on the foundation soil strength parameters.

7.2 Remedial Measures

a. Recommended Action

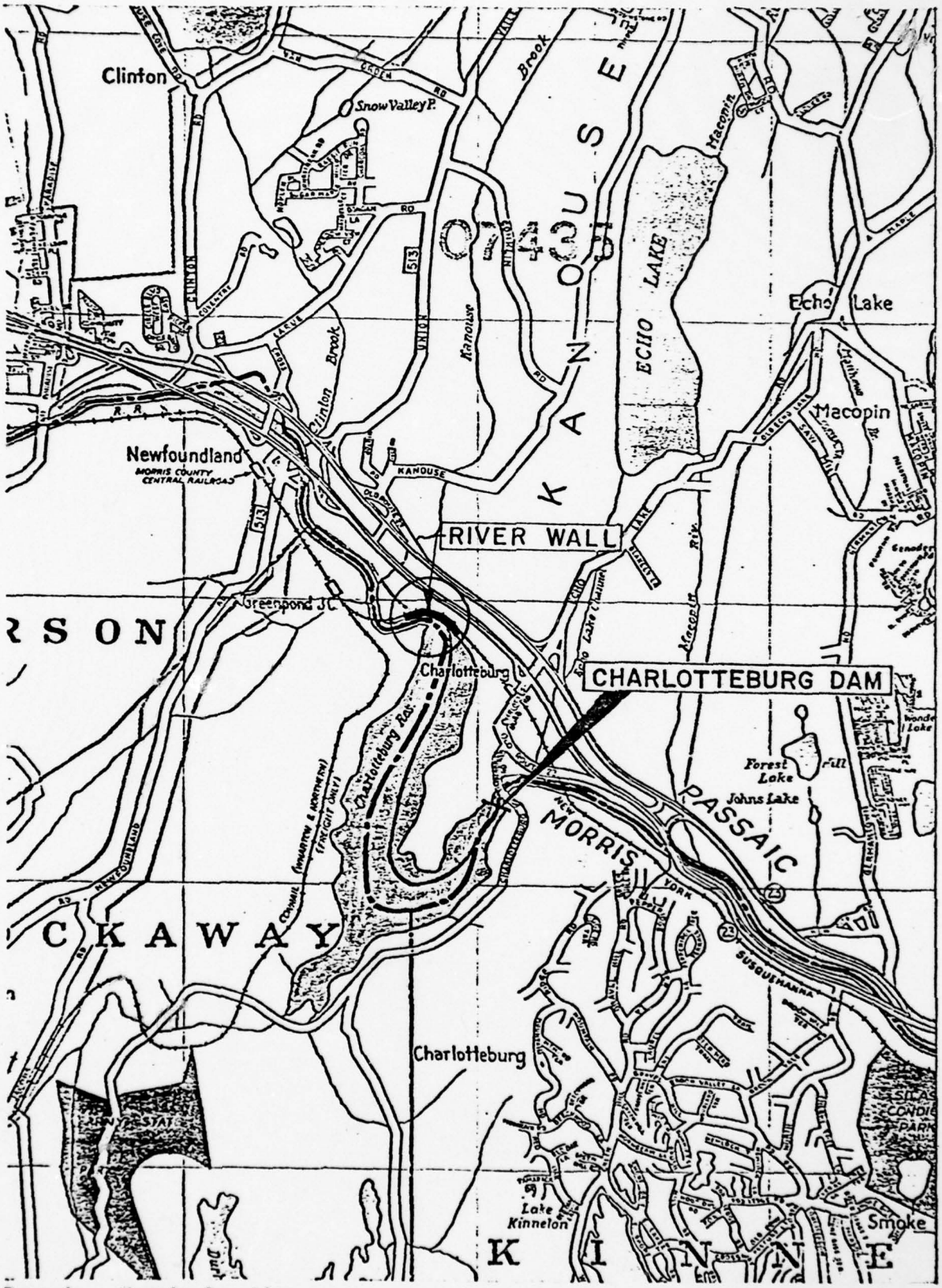
The cause of the monolith misalignment and the joint leakage should be determined and corrected.

b. O & M Procedures

The owner should initiate the following programs:

- An annual inspection of the dam utilizing a visual check list similar to that used in this inspection report.
- Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.
- Survey seepage and leakage at monoliths and monolith joints.
- Surveys of concrete surfaces for surface deterioration and/or cracking.
- Remove all brush and scrub trees at the riverward face of the wall to prevent undermining of footing.

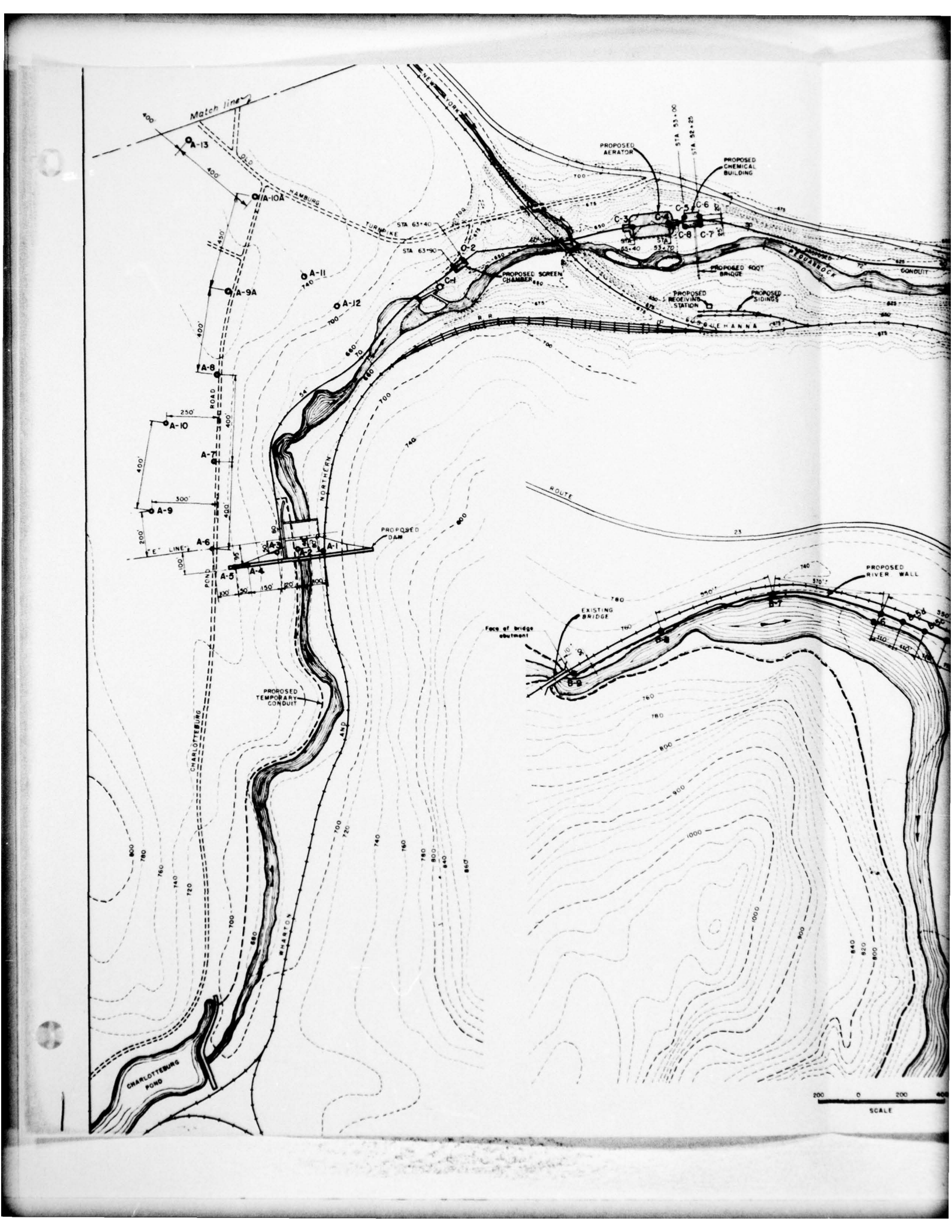
PLATES

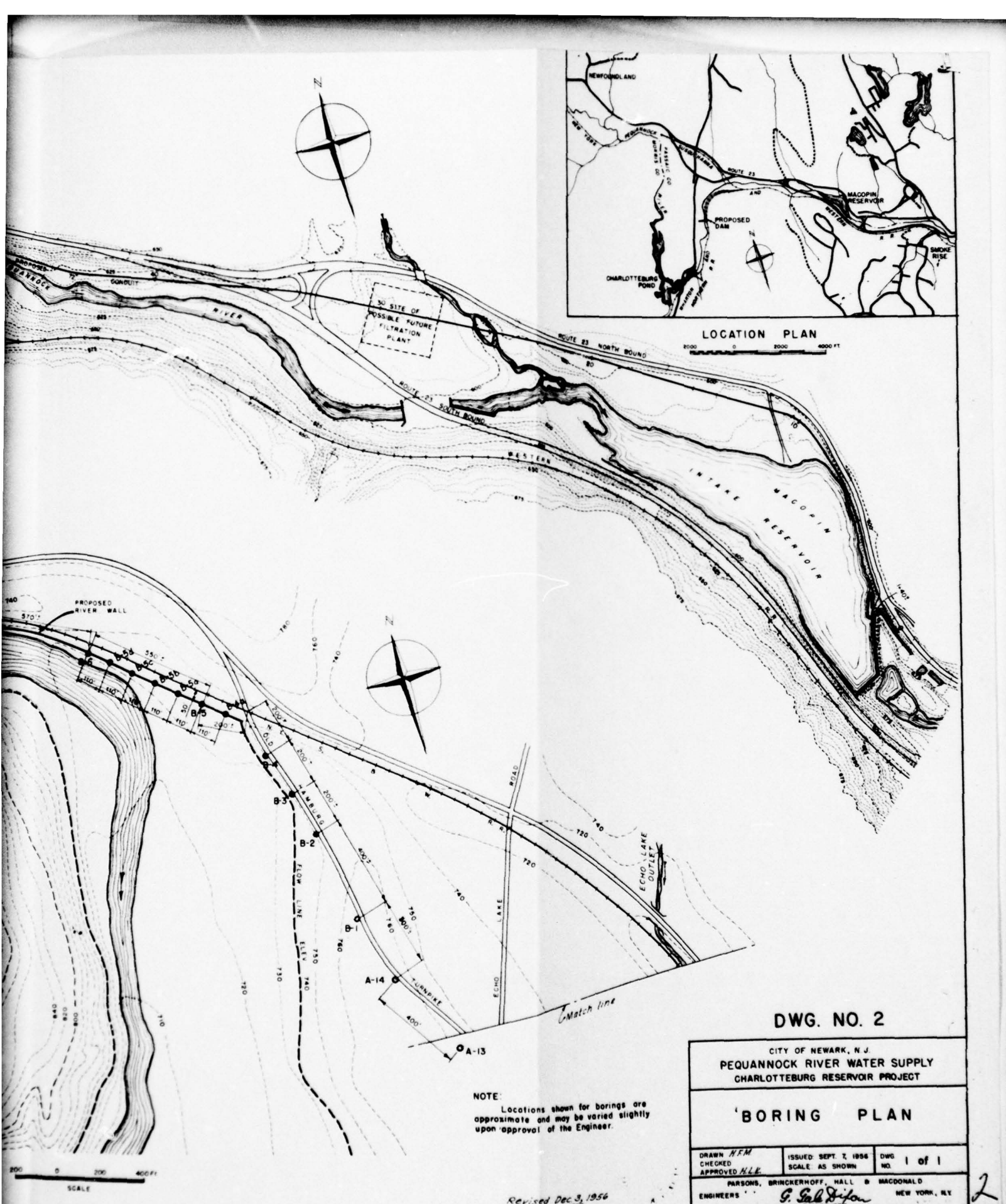


Passaic - Morris Counties
Scale: 1" = 4200'

VICINITY MAP

DWG. NO. 1


Match line
A-13
A-10A
A-11
A-9A
A-12
A-8
A-10
A-7
A-9
A-6
A-5
A-4
A-3
A-2
A-1
400'
450'
250'
300'
200'
100'
150'
120'
ROAD
POND
"E" LINE
NORTHERN
HAMBURG
TURNPIKE
STA 63+40
STA 63+90
O-1
O-2
PROPOSED DAM
PROPOSED TEMPORARY CONDUIT
CHARLOTTEBURG POND
SCHUYLKILL
PROPOSED AERATOR
PROPOSED CHEMICAL BUILDING
STA 53+00
STA 52+25
C-3
C-4
C-5
C-6
C-7
C-8
STA 54+40
STA 53+70
PROPOSED SCREEN CHAMBER
PROPOSED ROOT BRIDGE
PROPOSED RECEIVING STATION
PROPOSED SIDINGS
PROPOSED CONDUIT
SUSQUEHANNA
PENNSYLVANIA
R R
ROUTE 23
PROPOSED RIVER WALL
EXISTING BRIDGE
Face of bridge abutment
B-7
B-8
B-9
570'
550'
440'
110'
70'
SCALE
200 0 200



NOTE:
Locations shown for borings are approximate and may be varied slightly upon approval of the Engineer.

Revised Dec 3, 1956
Revised Jan 15, 1957

DWG. NO. 2

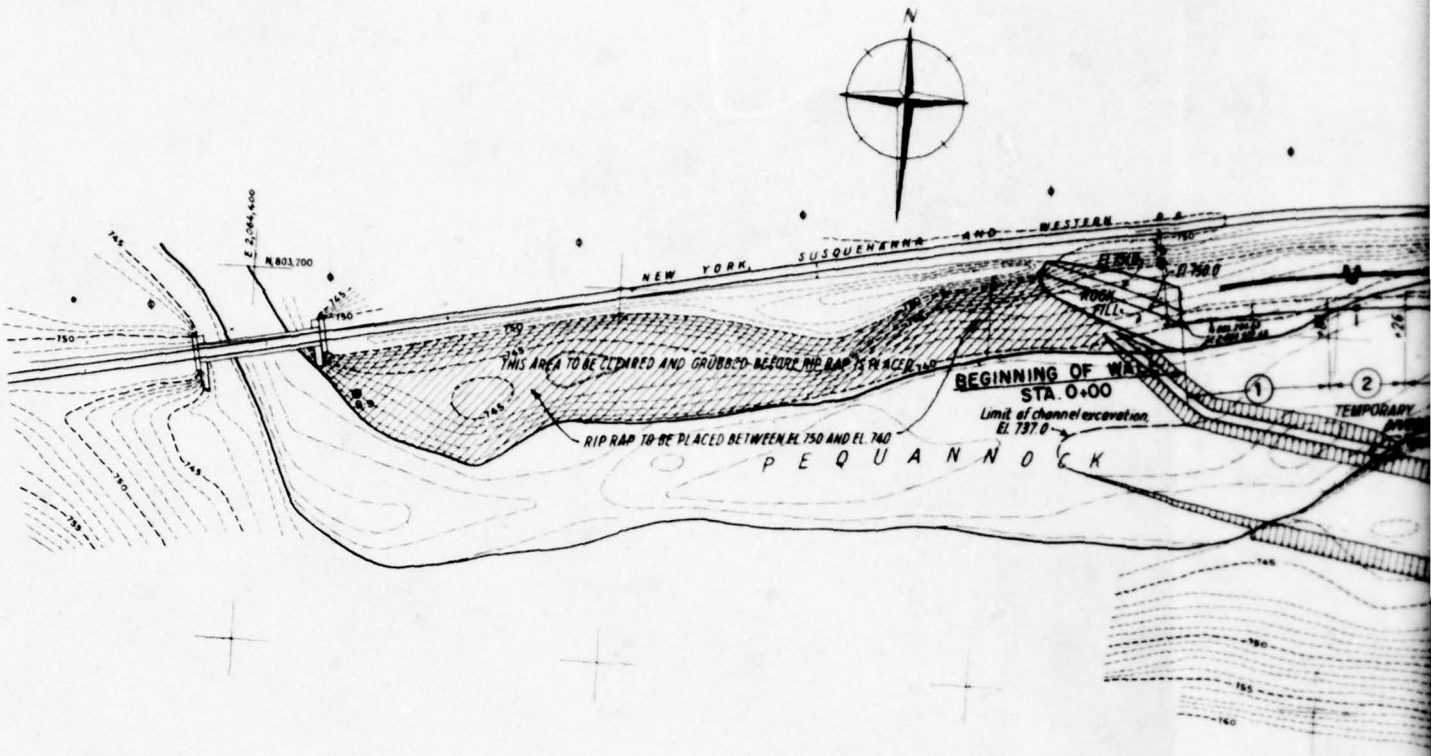
CITY OF NEWARK, N.J.
PEQUANNOCK RIVER WATER SUPPLY
CHARLOTTEBURG RESERVOIR PROJECT

'BORING PLAN

DRAWN H.F.M. CHECKED APPROVED H.L.K.	ISSUED: SEPT. 7, 1956 SCALE: AS SHOWN	DWG NO. 1 of 1

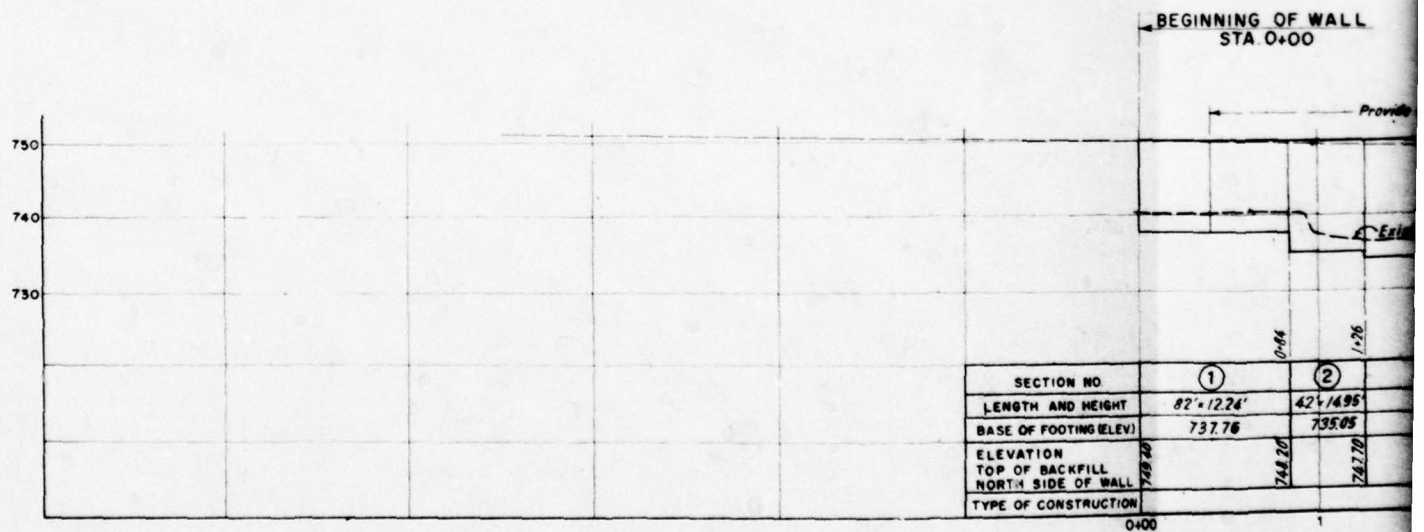
ENGINEERS PARSONS, BRINCKERHOFF, HALL & MACDONALD
G. Gale Tilton ASSOCIATE
NEW YORK, N.Y.

2



PLAN

0 40 80



SECTION NO.	①	②
LENGTH AND HEIGHT	82'×12.24'	42'×14.95'
BASE OF FOOTING (ELEV.)	737.76	735.05
ELEVATION TOP OF BACKFILL NORTH SIDE OF WALL	749.80	744.20
TYPE OF CONSTRUCTION		

0.44 1.26 749.70

PROFILE

0 40 80 HORIZONTAL

0 10 20 VERTICAL

FILE

FILE

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND SUPPLY
MAY 29 1958
APPROVED

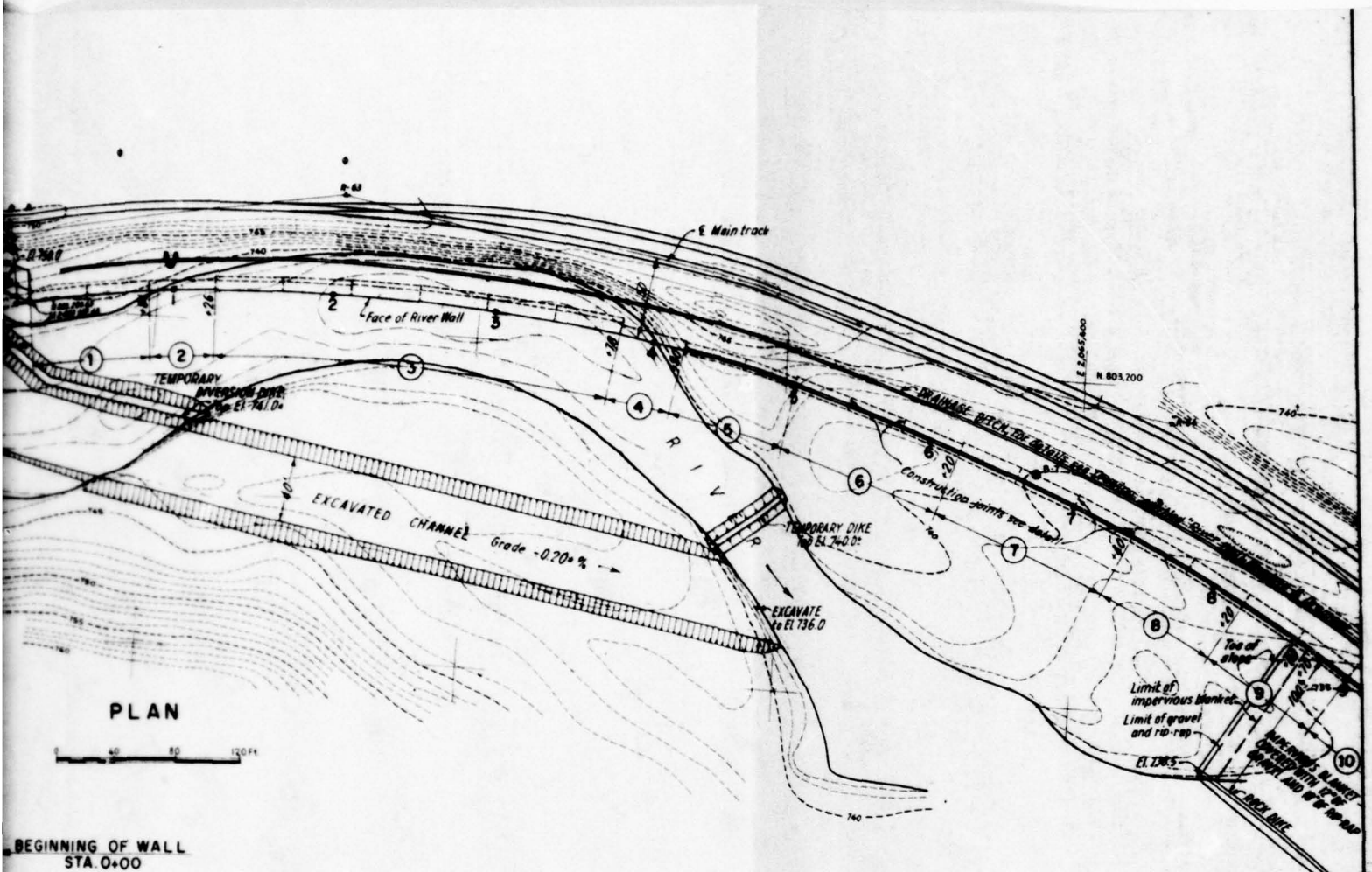
Director and Chief Engineer

DAM APPLICATION No. 516

APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R
Allan Boyle DATE 2/13/58

1

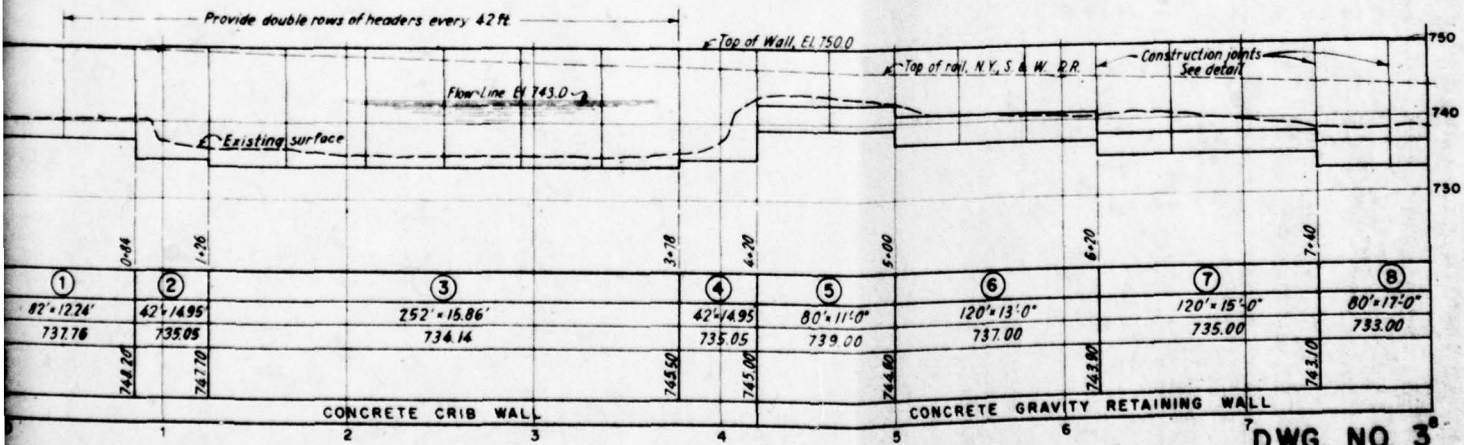
DAM APPLICATION No. 516



PLAN

0 40 80 120 Ft

BEGINNING OF WALL
STA. 0+00



PROFILE

0 40 80 120 Ft HORIZONTAL

0 10 20 30 Ft VERTICAL

NOTES

1. Construction joints for the concrete gravity retaining wall shall be spaced 40 feet apart except between Station 19+00 and Station 19+40 where joints shall be spaced 20 feet apart.
2. Layout of the curved portion of the River Wall between Sta. 0+00 and Sta. 10+20 is based on chord lengths of 42 feet for the crib wall and 40 feet for the gravity wall. Chords terminate on R/W line of railroad.
3. Top of reservoir face of River Wall between Sta. 10+20 and Sta. 17+80 coincides with Right of Way line of railroad.
4. Location of borings shown thus:- ●B-8 For details see Drawing entitled, "Boring Logs"

APPROVED FOR THE CITY OF NEWARK, N. J.

DIVISION ENGINEER, DIVISION OF WATER SUPPLY

DATE Feb. 14, 1958

DATE Feb 14, 1958

DWG. NO. 3

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT
CONTRACT NO. CRP-4

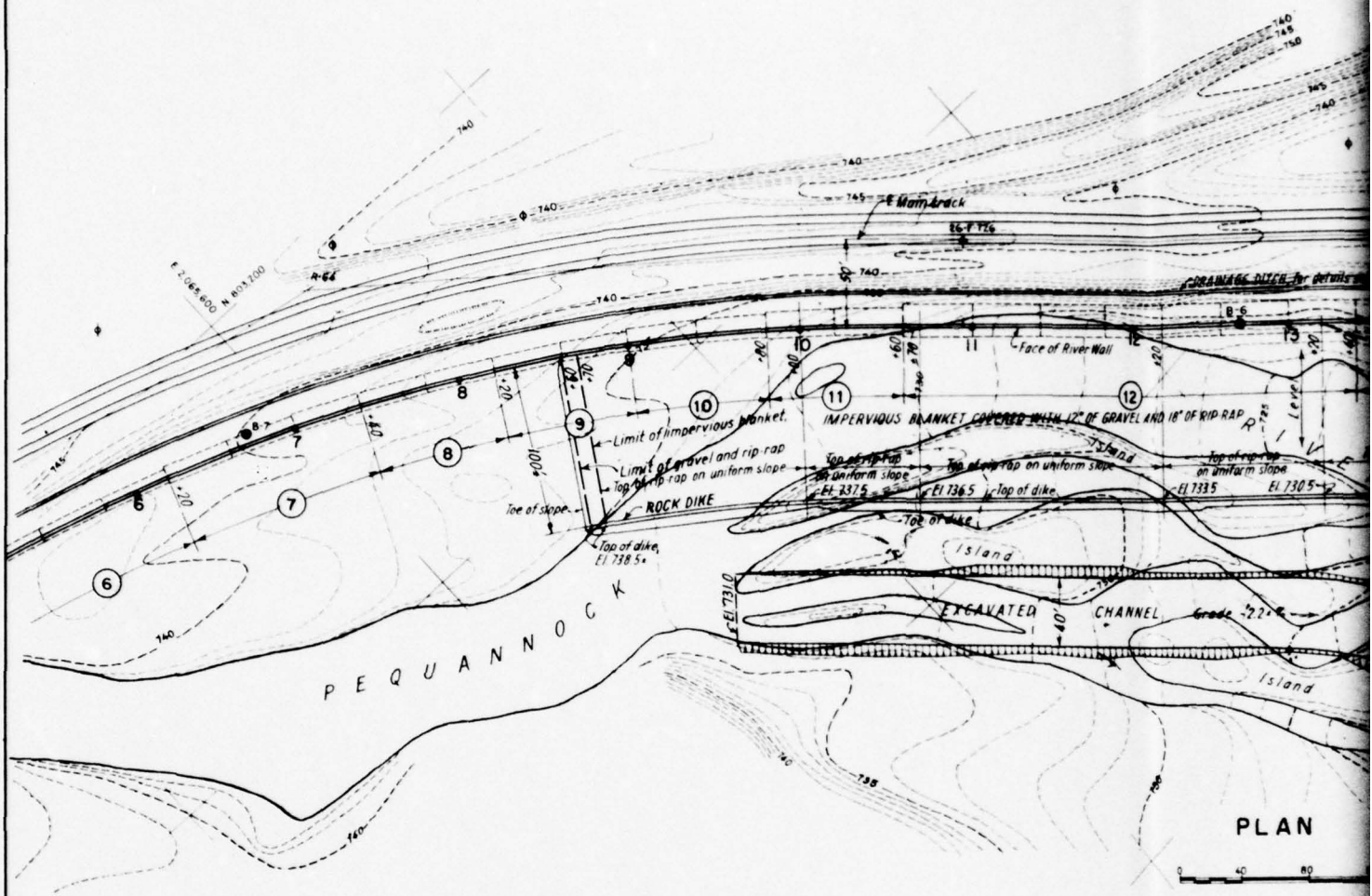
RIVER WALL

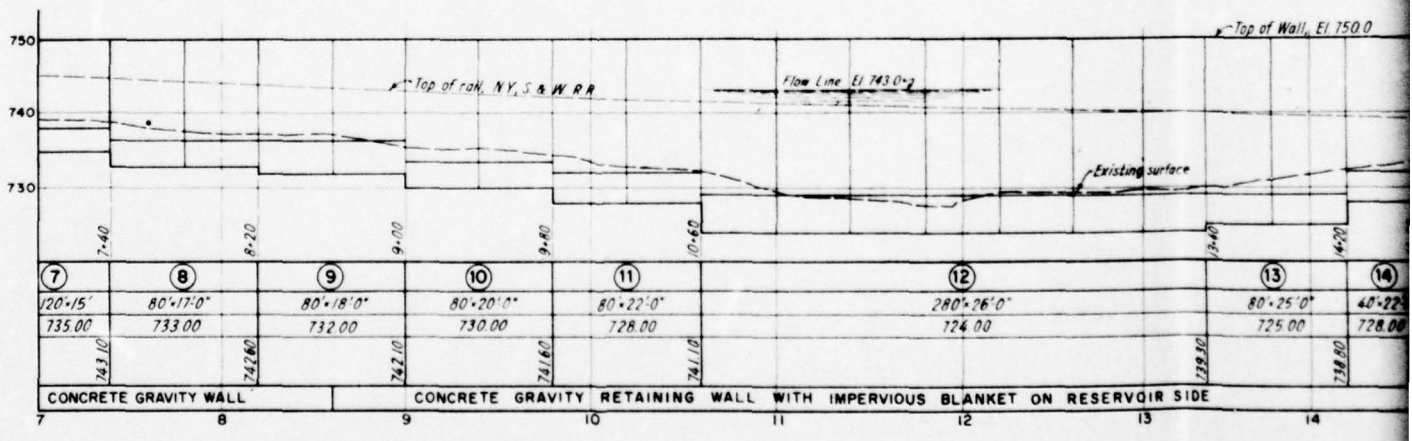
PLAN AND PROFILE
STA. 0+00 TO STA. 8+00

DRAWN J.R.F CHECKED G.S. APPROVED H.L.K.	ISSUED FEB. 12, 1958 SCALE: AS SHOWN	SHT. NO. 1 OF 6

ENGINEERS PARSONS, BRINCKERHOFF, HALL & MACDONALD
NEW YORK, N.Y.
FEB 13 1958

2





FILE FILE

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND SUPPLY

APPROVED MAY 29 1958

Director and Chief Engineer

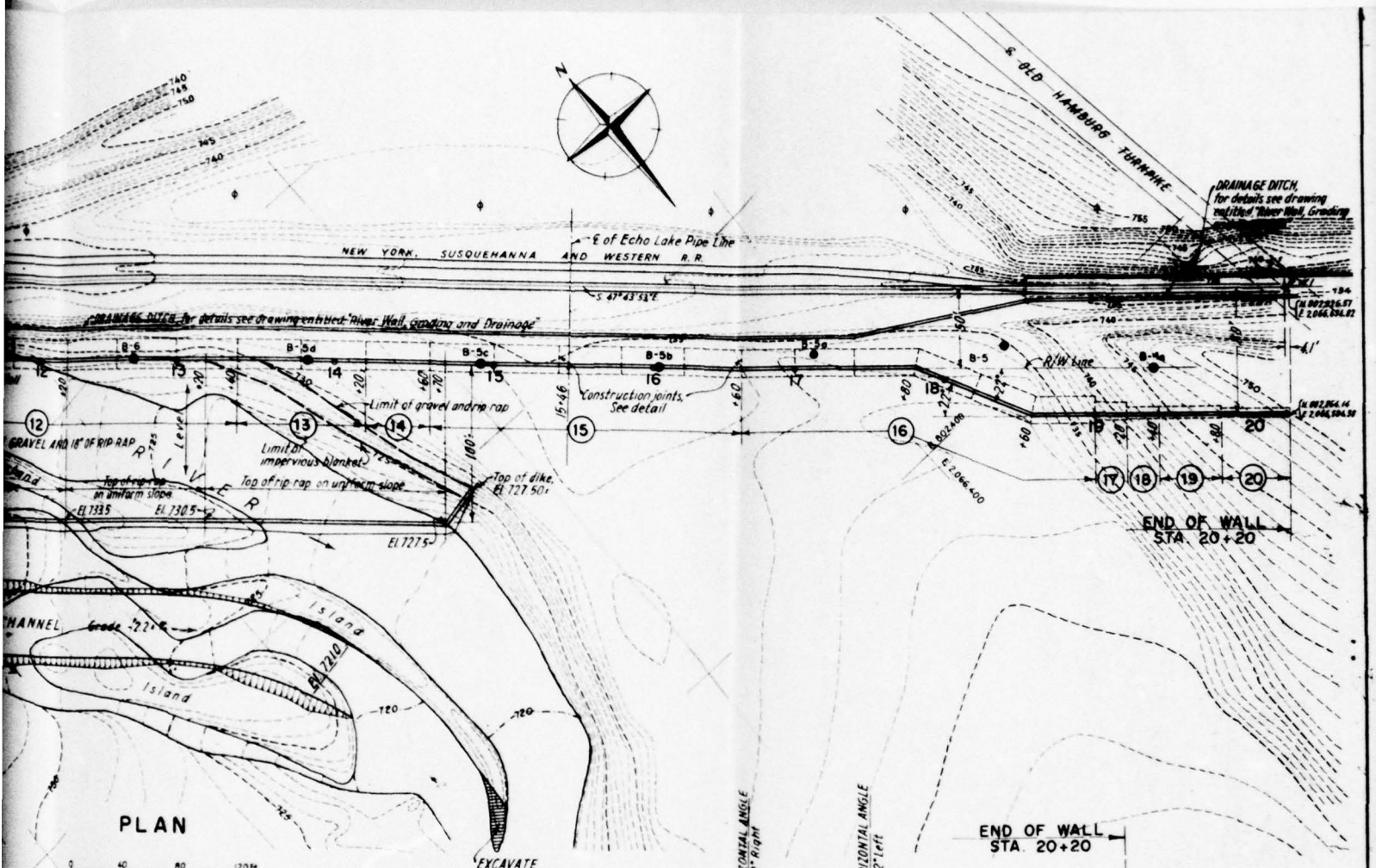
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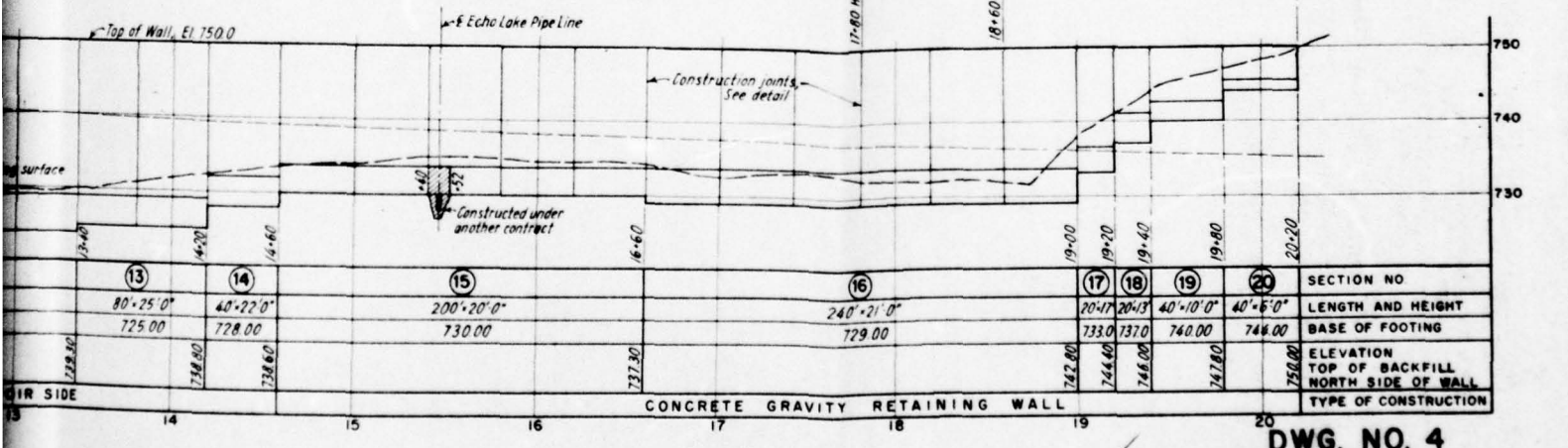
APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R

DATE 2/13/57

DAM APPLICATION No. 516

1





PROFILE

0 40 80 120 Ft. HORIZONTAL

0 10 20 30 Ft. VERTICAL

NOTE
Location of borings shown thus: ● B-5c
For details see Drawing entitled, "Boring Logs"

APPROVED FOR THE CITY OF NEWARK, N. J.

DIVISION ENGINEER, DIVISION OF WATER SUPPLY — DATE Feb. 14, 1958

DIRECTOR, DEPARTMENT OF PUBLIC WORKS — DATE Feb 14, 1958

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT

CONTRACT NO. CRP-4

RIVER WALL

PLAN AND PROFILE STA. 8+00 TO STA. 20+20

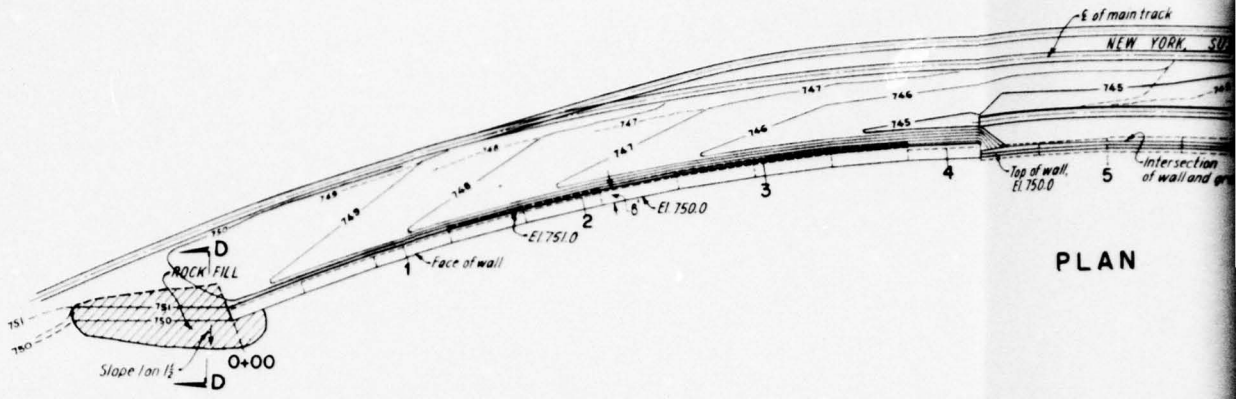
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ISSUED FEB. 12, 1958 SCALE AS SHOWN

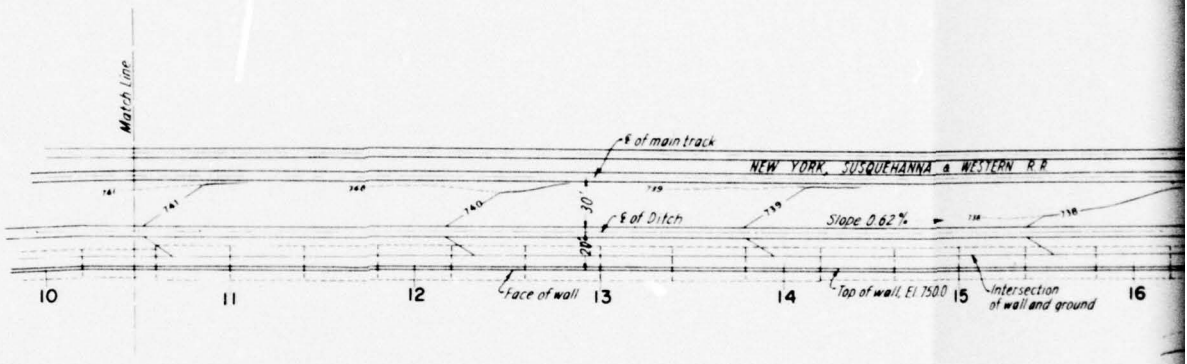
DWG. NO. 2 of 6

ENGINEERS PARSONS, BRINCKERHOFF, HALL & MACDONALD NEW YORK, N.Y. ASSOCIATE

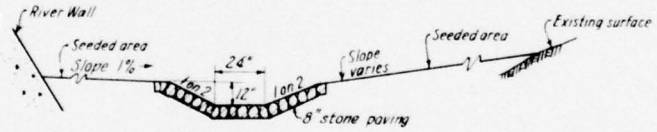
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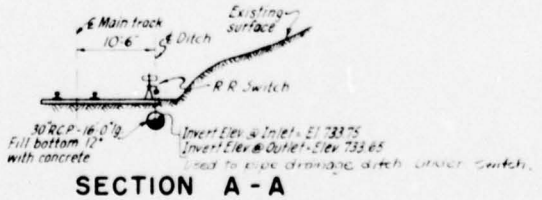
PLAN



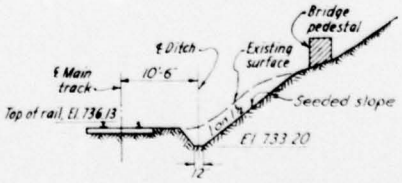
PLAN



DRAINAGE DITCH

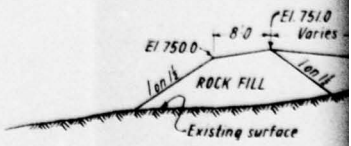


SECTION A - A



SECTION B - B

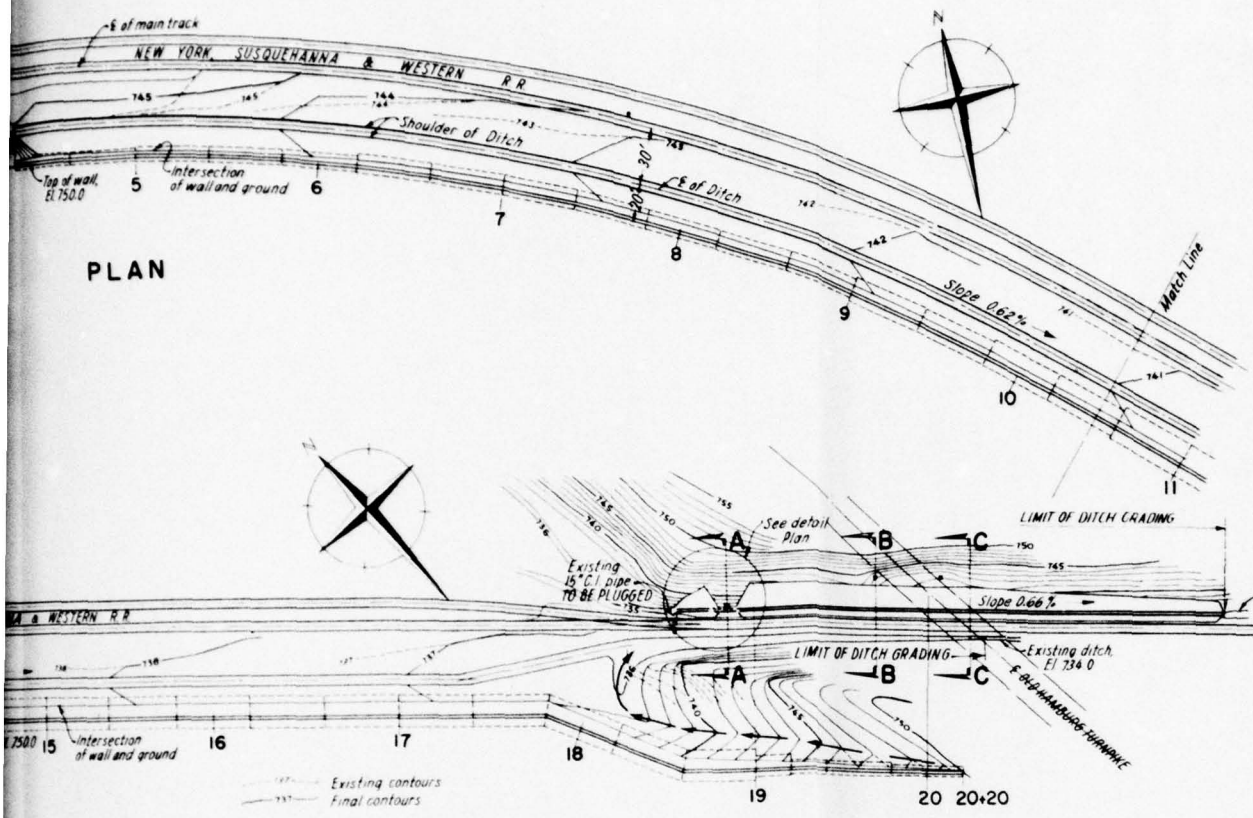
0 10 20 30ft

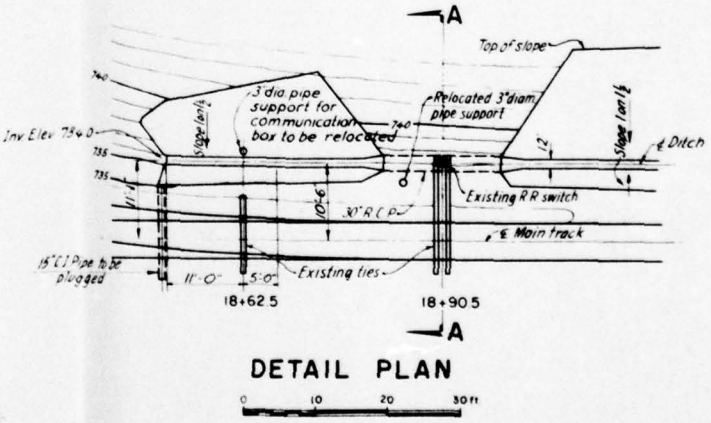


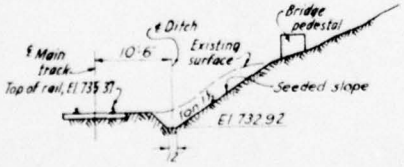
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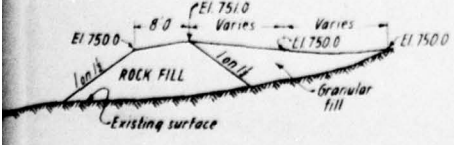
APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R

DATE 2/13/18









DWG. NO. 5

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT

CONTRACT NO. CRP-4

RIVER WALL

GRADING AND DRAINAGE

DRAWN C.S.G. CHECKED G.S. APPROVED H.L.K.	ISSUED FEB. 12, 1958 SCALE: AS SHOWN	DWG. NO. 3 OF 6

ENGINEERS PARSONS, BRINCKERHOFF, HALL & MACDONALD

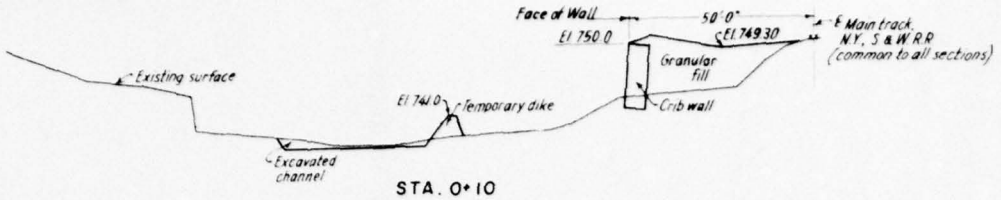
BY G. Galdi Jr. ASSOCIATE NEW YORK, N.Y. FEB.

APPROVED FOR THE CITY OF NEWARK, N. J.

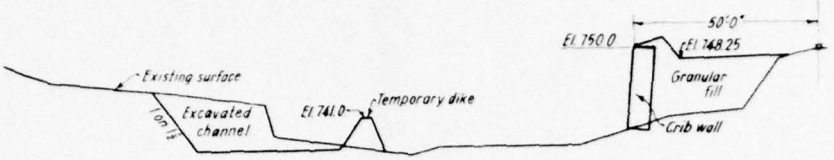
DIVISION ENGINEER, DIVISION OF WATER SUPPLY — DATE Feb. 14, 1958

DIRECTOR, DEPARTMENT OF PUBLIC WORKS — DATE Feb. 14, 1958

2



STA. 0+10



STA. 0+80



STA. 1+40



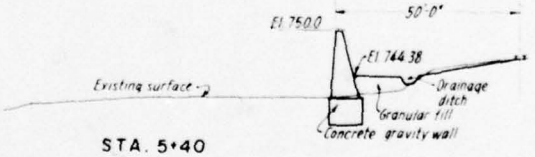
STA. 2+50



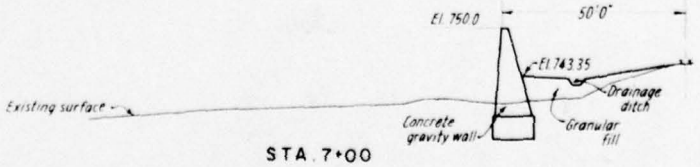
STA. 3+78



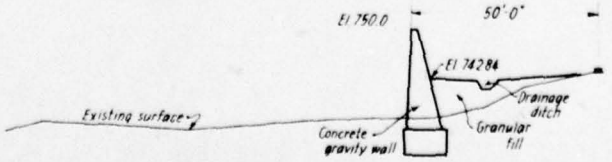
STA. 4+60



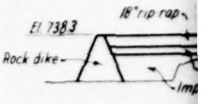
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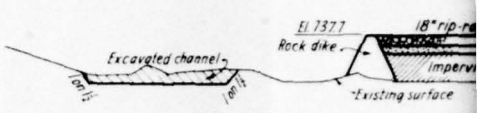


STA. 7+00



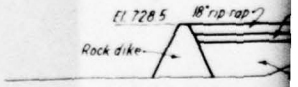
STA. 7+80



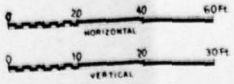






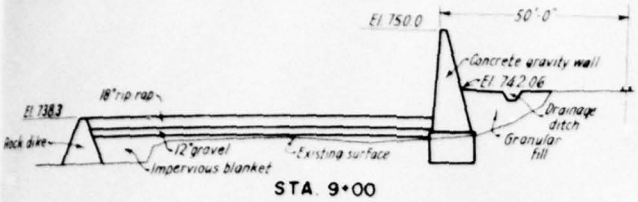




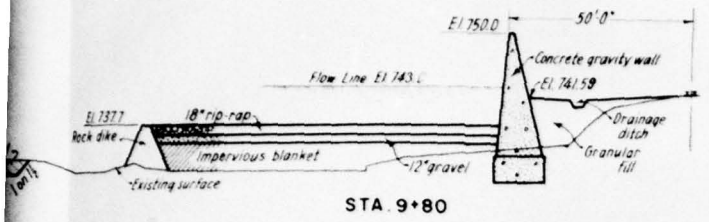


APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R

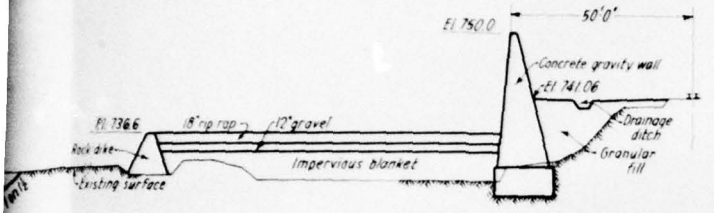
DATE 3/13/58



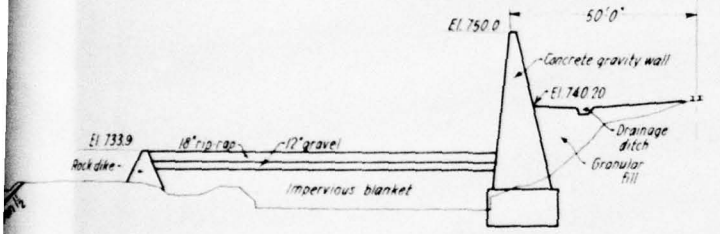
STA. 9+00



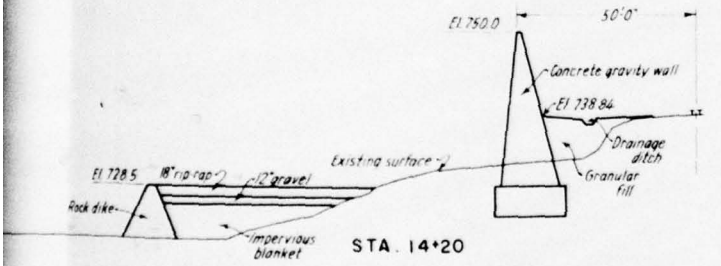
STA. 9+80



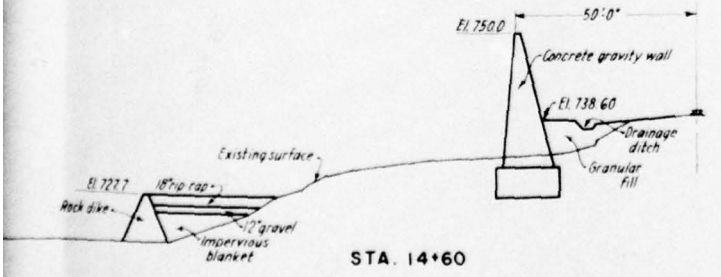
STA. 10+60



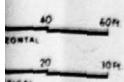
STA. 12+00

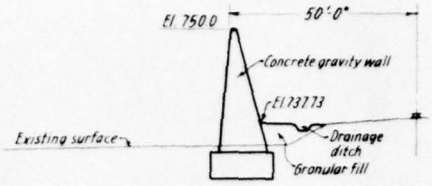


STA. 14+20

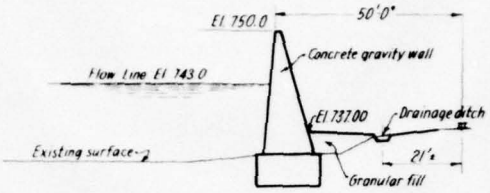


STA. 14+60

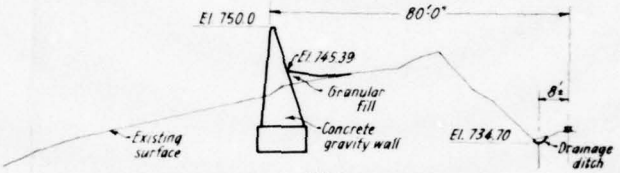




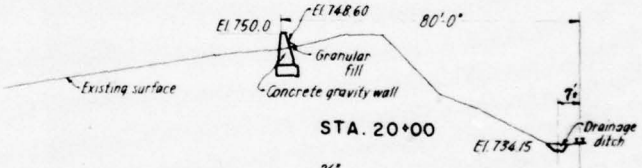
STA. 16+00



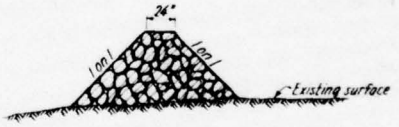
STA. 17+80



STA. 19+20



STA. 20+00



ROCK DIKE



FILE

FILE

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND SUPPLY

APPROVED MAY 29 1958

Acting Director and Chief Engineer

DAM APPLICATION No. 516

DAM APPLICATION No. 516 **DWG. NO. 6**

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT
CONTRACT NO. CRP-4

RIVER WALL
GENERAL SECTIONS

DRAWN E.A.S. CHECKED G.S. APPROVED H.L.K.	ISSUED FEB. 12, 1958 SCALE: AS SHOWN	DWG. NO. 4 OF 6

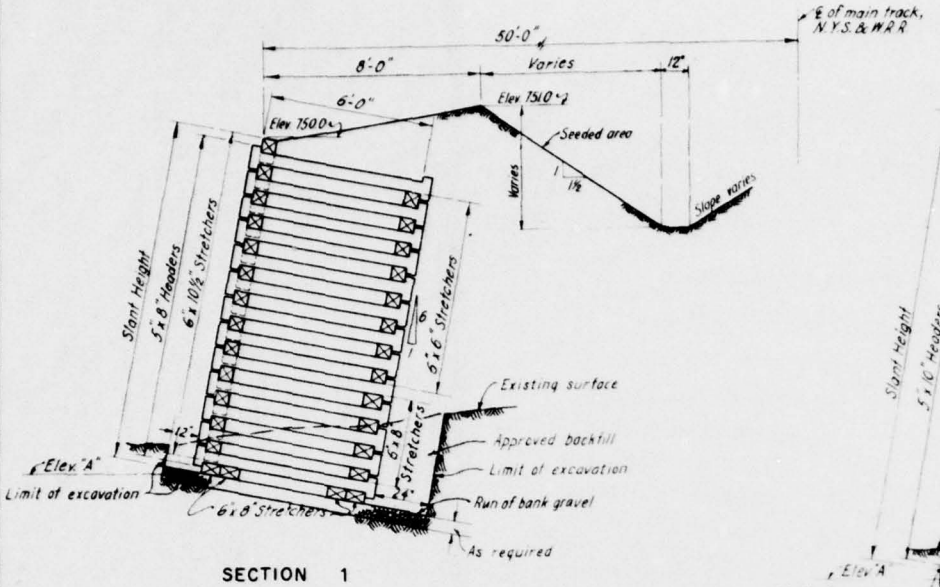
PARSONS, BRINCKERHOFF, HALL & MACDONALD
ENGINEERS G. Gale Dyson ASSOCIATE NEW YORK, N.Y.
FEB 19 1958

APPROVED FOR THE CITY OF NEWARK, N.J.

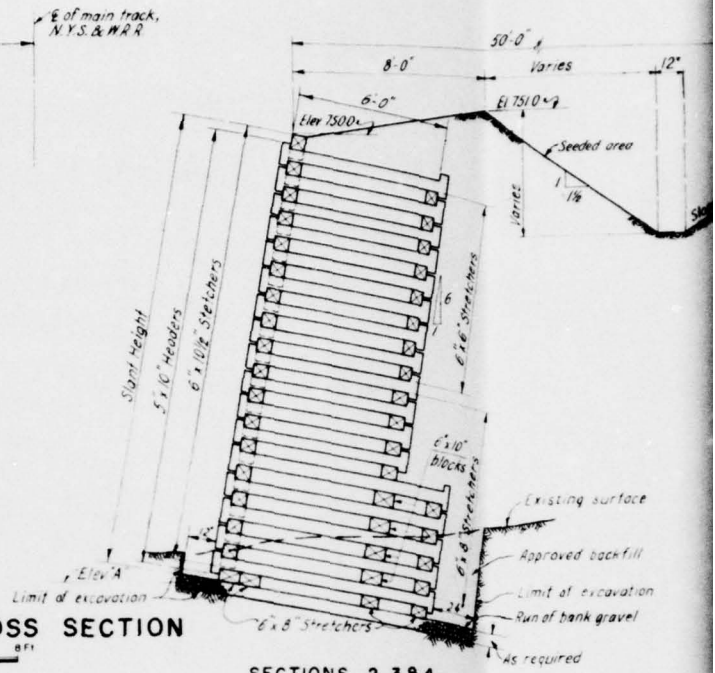
DIVISION ENGINEER, DIVISION OF WATER SUPPLY DATE Feb. 14, 1958

DIRECTOR, DEPARTMENT OF PUBLIC WORKS DATE Feb. 14, 1958

2



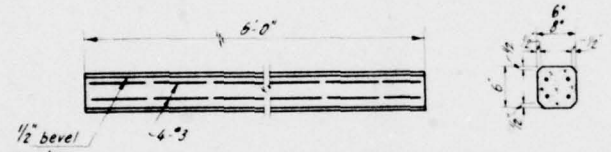
SECTION 1



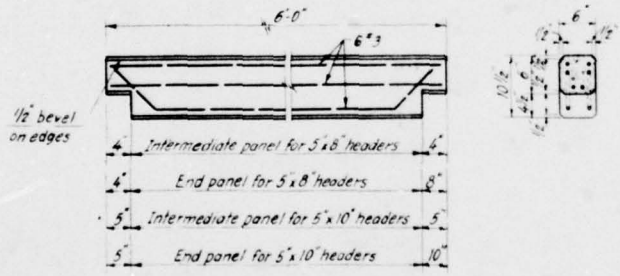
SECTIONS 2,3&4

TYPICAL CRIB WALL CROSS SECTION

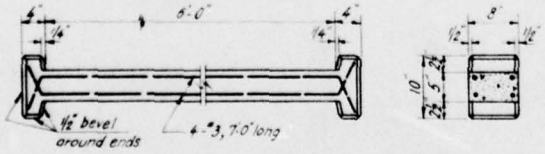
0 1 2 3 4 5 6 7 8 FT



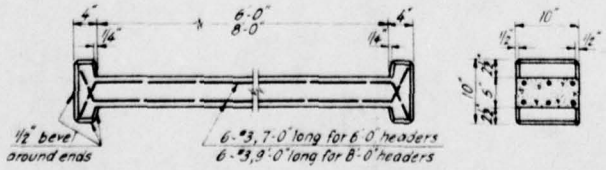
OPEN FACE STRETCHER



CLOSED FACE STRETCHER



5"x8" HEADER



5"x10" HEADER

TYPICAL DETAILS OF STANDARD CRIB WALL UNITS

0 1 2 3 FT

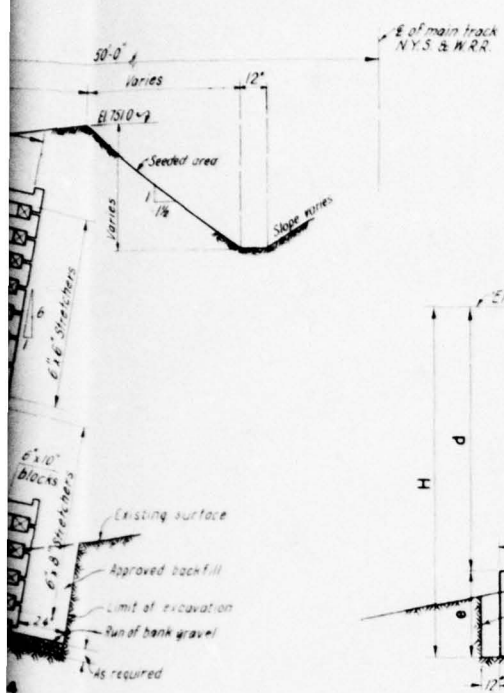
SCHEDULE OF DIMENSIONS AND MATERIAL LIST

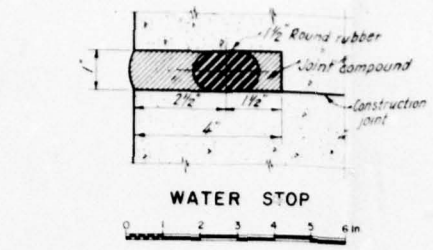
CONCRETE CRIB WALL - STA 0+00 TO STA 4+20

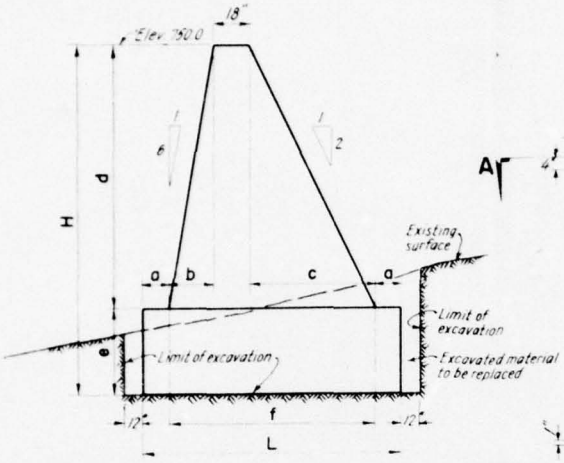
SECTION	STATION FROM	STATION TO	LENGTH FEET	ELEV "A"	HEIGHT OF WALL ABOVE ELEV "A"	SLANT HEIGHT	UNITS REQUIRED FOR 6-0 5"x8"x6'-0" HEADERS	5"x10"x6'-0" HEADERS	5"x10"x8'-0" HEADERS	6"x6"x6'-0" STRETCH
1	0+00	0+84	84	737.76	12.24	12'5"	13	-	-	8
2	0+84	1+26	42	735.05	14.95	15'2	-	12	4	8
3	1+26	3+78	252	734.14	15.86	16'1"	-	12	5	8
4	3+78	4+20	42	735.05	14.95	15'2"	-	12	4	8

APPROVED
FOR NEW YORK SUSQUEHANN

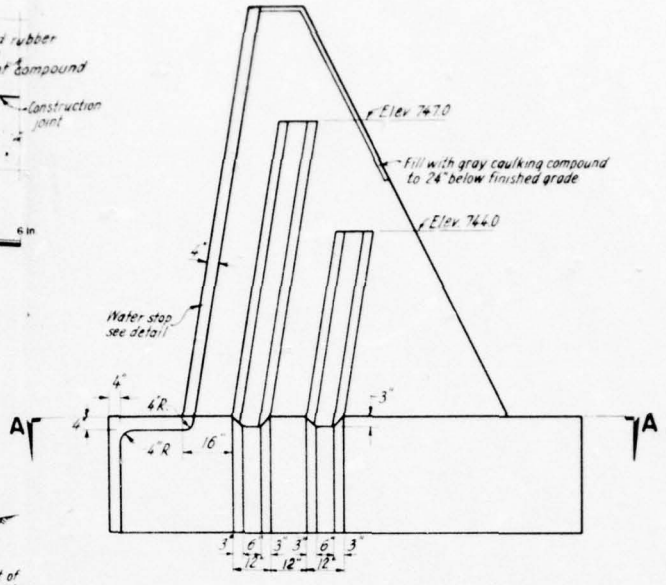
Allen Boyden

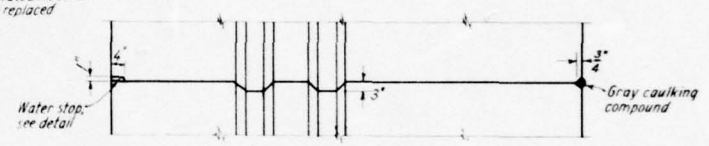






TYPICAL CROSS-SECTION





SECTION A-A

CONSTRUCTION JOINT DETAIL

0 1 2 3 4 5 6 Ft

...IONS AND MATERIAL LIST
– STA. 0+00 TO STA. 4+20

...SLANT ...HEIGHT	UNITS REQUIRED FOR 6-FT WALL LENGTH						
	5'-8"x6'-0" HEADERS	5'-10"x6'-0" HEADERS	5'-10"x8'-0" HEADERS	6'-6"x6'-0" STRETCH	6'-8"x6'-0" STRETCH	6'-10"x6'-0" STRETCH	6"x10"x10" BLOCKS
12'5"	13	-	-	8	8	13	-
15'2	-	12	4	8	11	16	3
16'1"	-	12	5	8	12	17	4
15'2"	-	12	4	8	11	16	3

SCHEDULE OF DIMENSIONS
CONCRETE GRAVITY RETAINING WALL – STA. 4+20 TO STA. 20+20

SECTION	STATION			ELEVATION		DIMENSIONS							
	FROM	TO	LENGTH FEET	BASE OF FOOTING	TOP OF FOOTING	H	L	a	b	c	d	e	f
5	4+20	5+00	80	739.00	742.50	11'-0"	7'-6"	6"	15"	3'-9"	7'-6"	3'-6"	6'-6"
6	5+00	6+20	120	737.00	741.00	13'-0"	8'-6"	6"	18"	4'-6"	9'-0"	4'-0"	7'-6"
7	6+20	7+40	120	735.00	738.00	15'-0"	10'-6"	6"	24"	6'-0"	12'-0"	3'-0"	9'-6"
8	7+40	8+20	80	733.00	736.50	17'-0"	11'-6"	6"	2'-3"	6'-9"	13'-6"	3'-6"	10'-6"
9	8+20	9+00	80	732.00	736.50	18'-0"	11'-6"	6"	2'-3"	6'-9"	13'-6"	4'-6"	10'-6"
10	9+00	9+80	80	730.00	733.50	20'-0"	13'-6"	6"	2'-9"	8'-3"	16'-6"	3'-6"	12'-6"
11	9+80	10+60	80	728.00	732.00	22'-0"	15'-0"	9"	3'-0"	9'-0"	18'-0"	4'-0"	13'-6"
12	10+60	13+40	280	724.00	729.00	26'-0"	19'-0"	21"	3'-6"	10'-6"	21'-0"	5'-0"	15'-6"
13	13+40	14+20	80	725.00	729.00	25'-0"	19'-0"	21"	3'-6"	10'-6"	21'-0"	4'-0"	15'-6"
14	14+20	14+60	40	728.00	732.00	22'-0"	17'-0"	21"	3'-0"	9'-0"	18'-0"	4'-0"	13'-6"
15	14+60	16+60	200	730.00	733.50	20'-0"	17'-0"	2'-3"	2'-9"	8'-3"	16'-6"	3'-6"	12'-6"
16	16+60	19+00	240	729.00	733.50	21'-0"	17'-0"	2'-3"	2'-9"	8'-3"	16'-6"	4'-6"	12'-6"
17	19+00	19+20	20	733.00	736.50	17'-0"	11'-6"	6"	2'-3"	6'-9"	13'-6"	3'-6"	10'-6"
18	19+20	19+40	20	737.00	741.00	13'-0"	8'-6"	6"	18"	4'-6"	9'-0"	4'-0"	7'-6"
19	19+40	19+80	40	740.00	742.50	10'-0"	7'-6"	6"	15"	3'-9"	7'-6"	2'-6"	6'-6"
20	19+80	20+20	40	744.00	745.50	6'-0"	5'-6"	6"	9"	2'-3"	4'-6"	18"	4'-6"

FILE

FILE

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND SUPPLY

APPROVED MAY 29 1958

Acting Director and Chief Engineer

DAM APPLICATION No. 516

DAM APPLICATION No. 516

APPROVED FOR THE CITY OF NEWARK, N.J.

DIVISION ENGINEER, DIVISION OF WATER SUPPLY

DATE Feb. 14, 1958

DATE Feb. 14, 1958

APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R

DATE 2/13/58

DWG. NO. 7

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.
PEQUANNOCK RIVER WATER SUPPLY

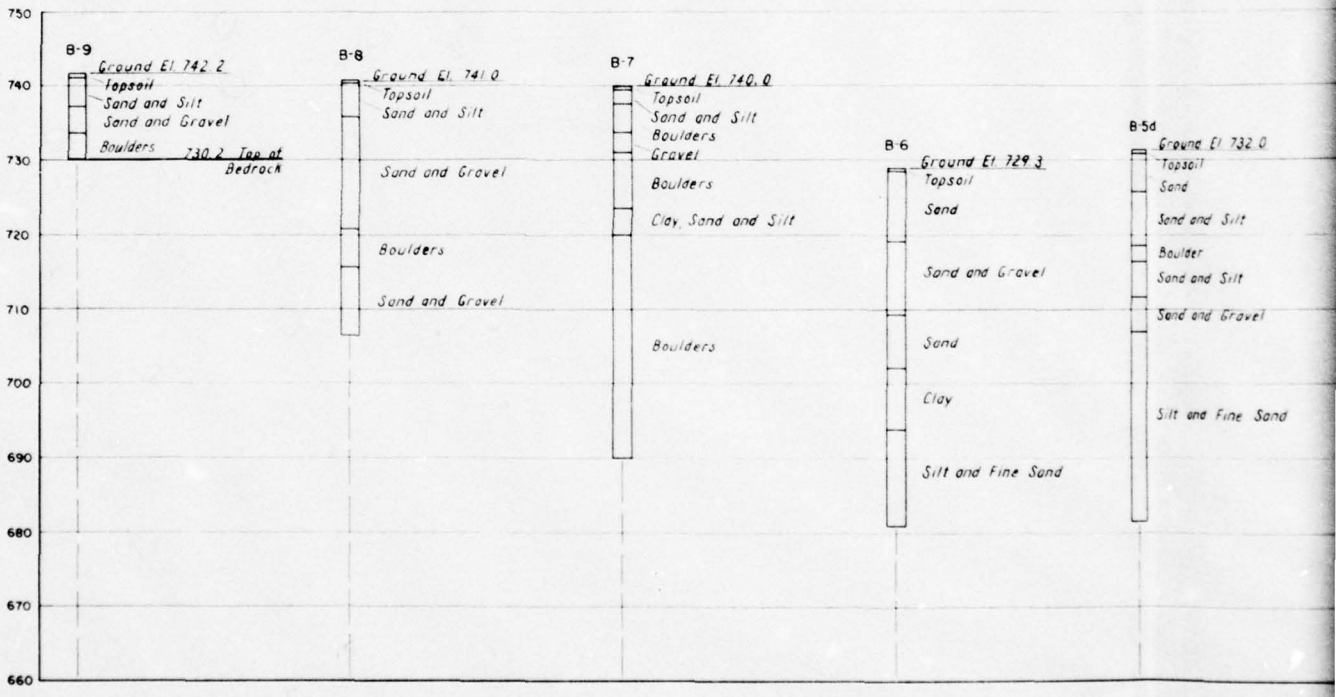
CHARLOTTEBURG RESERVOIR PROJECT
CONTRACT NO. CRP-4

RIVER WALL

WALL SECTIONS, DETAILS AND DIMENSION SCHEDULES

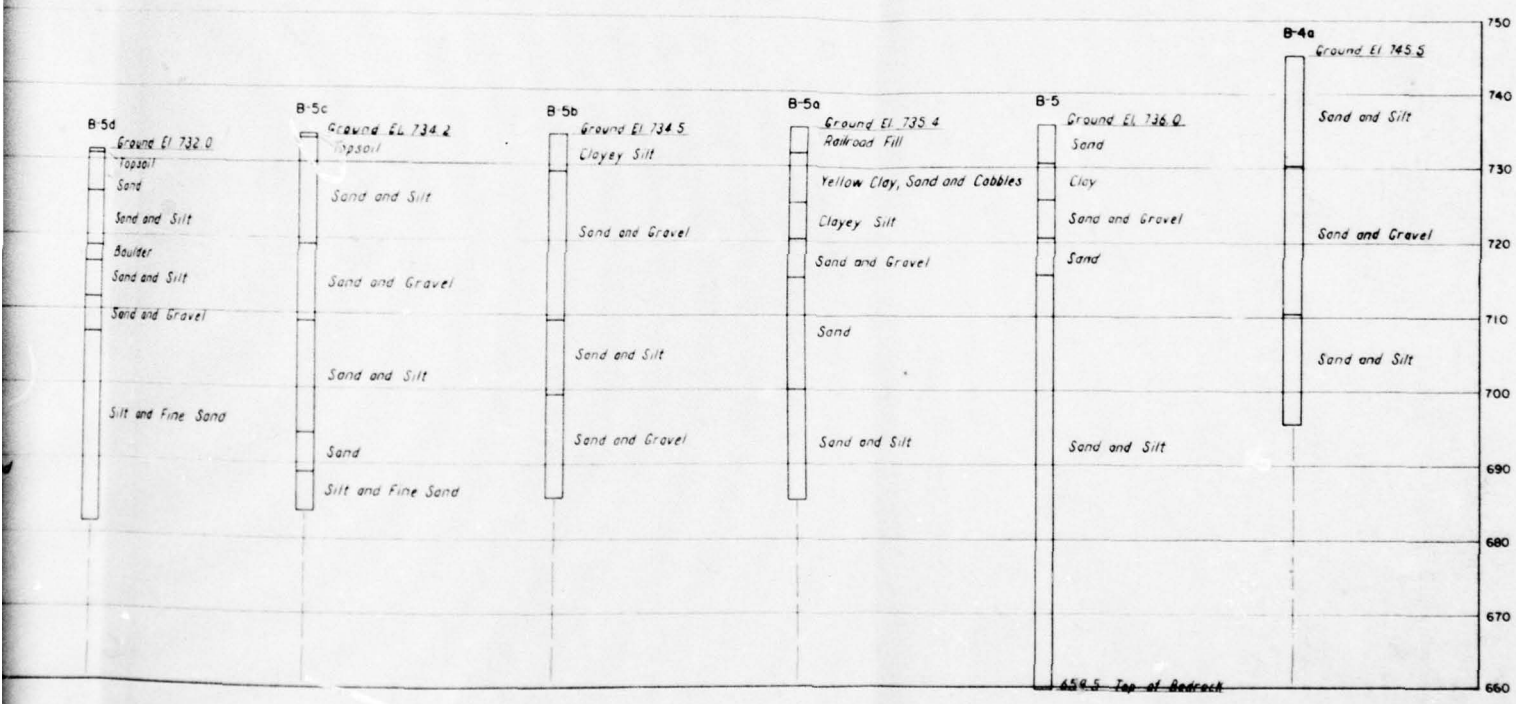
DRAWN J.R.F CHECKED G.S. APPROVED H.L.K	ISSUED FEB. 12, 1958 SCALE AS SHOWN	DWG. NO. 5 OF 6

ENGINEERS PARSONS, BRINCKERHOFF, HALL & MACDONALD NEW YORK, N. Y.



APPROVED
FOR NEW YORK SUSQUEHANNA & WESTERN R R
A. Van Reykle DATE 2/19/58

1



DWG. NO. 8

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT

CONTRACT NO. CRP-4

RIVER WALL

BORING LOGS

DRAWN P.C.
CHECKED G.S.
APPROVED B.L.K.

ISSUED FEB. 12, 1958
SCALE AS SHOWN

DWG. NO. 6 OF 6

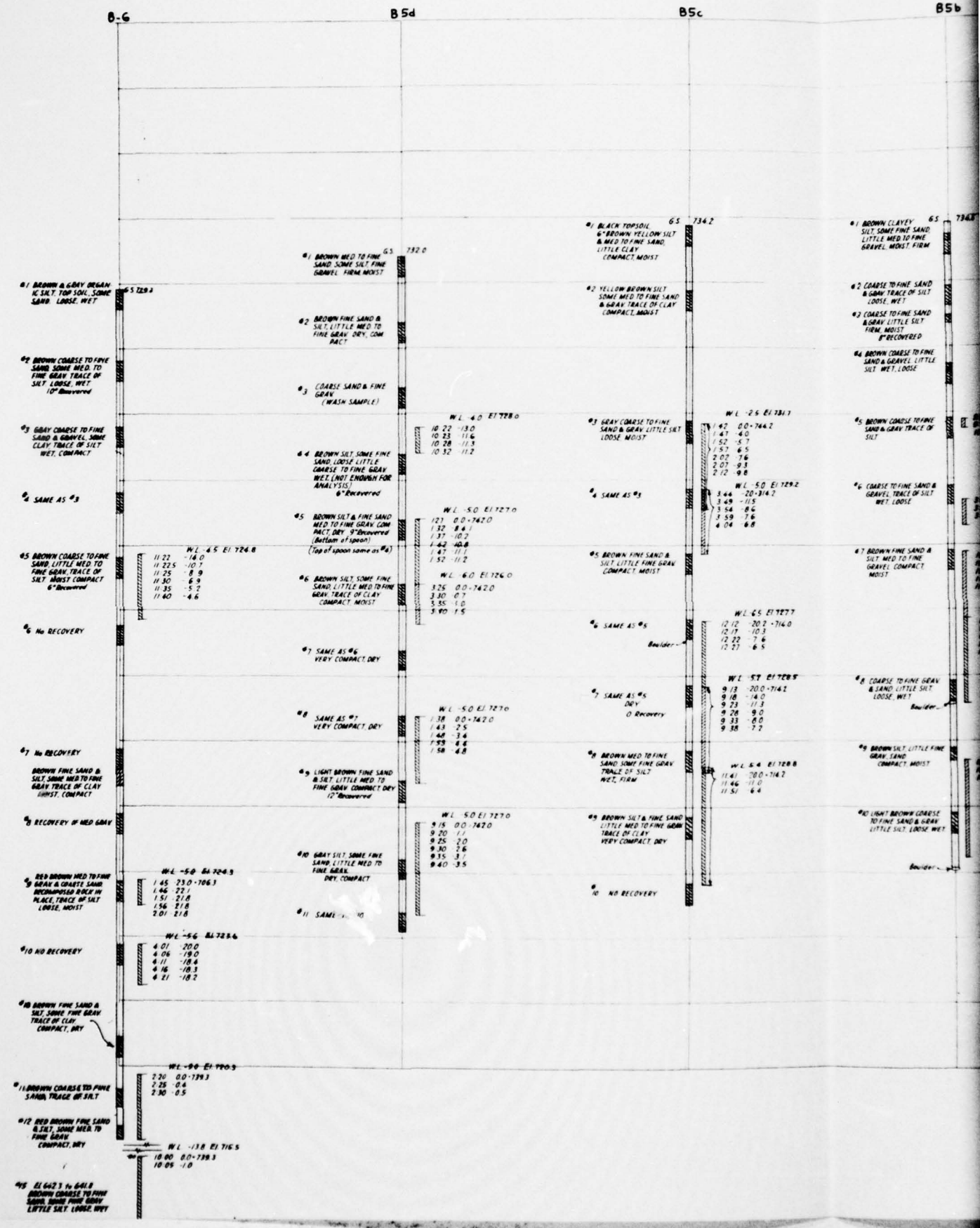
PARSONS, BRINCKERHOFF, HALL & MACDONALD
ENGINEERS
NEW YORK, N. Y.

APPROVED FOR THE CITY OF NEWARK, N. J.

DIVISION ENGINEER, DIVISION OF WATER SUPPLY

DATE Feb. 14, 1958

DATE Feb 14, 1958


B-6
B5d
B5c
B5b
#1 BROWN & GRAY ORGANIC SILT, TOP SOIL, SOME SAND, LOOSE, WET
#2 BROWN COARSE TO FINE SAND, SOME MED. TO FINE GRAV, TRACE OF SILT, LOOSE, WET, 10" Recovered
#3 GRAY COARSE TO FINE SAND & GRAVEL, SOME CLAY, TRACE OF SILT WET, COMPACT
#4 SAME AS #3
#5 BROWN COARSE TO FINE SAND, LITTLE MED. TO FINE GRAV, TRACE OF SILT, ALMOST COMPACT 6" Recovered
#6 No RECOVERY
#7 No RECOVERY
BROWN FINE SAND & SILT, SOME MED TO FINE GRAV, TRACE OF CLAY (HMST, COMPACT
#8 RECOVERY OF MED GRAV
#9 GRAY & CREAMY SAND, DECOMPOSED ROCK IN PLACE, TRACE OF SILT LOOSE, MOIST
#10 NO RECOVERY
#11 BROWN COARSE & FINE SAND, TRACE OF SILT
#12 RED BROWN FINE SAND & SILT, SOME MED. TO FINE GRAV, COMPACT, DRY
#15 EL 662.3 to 641.8 BROWN COARSE TO FINE SAND, SOME FINE GRAV, LITTLE SILT, LOOSE, WET
#1 BROWN MED TO FINE SAND, SOME SILT, FINE GRAVEL FIRM, MOIST
#2 BROWN FINE SAND & SILT, LITTLE MED TO FINE GRAV, DRY, COMPACT
#3 COARSE SAND & FINE GRAV (WASH SAMPLE)
#4 BROWN SILT, SOME FINE SAND, LOOSE, LITTLE COARSE TO FINE GRAV, WET, (NOT ENOUGH FOR ANALYSIS) 6" Recovered
#5 BROWN SILT & FINE SAND MED TO FINE GRAV, COMPACT, DRY 9" Recovered (Bottom of spoon) (Top of spoon same as #6)
#6 BROWN SILT, SOME FINE SAND, LITTLE MED TO FINE GRAV, TRACE OF CLAY COMPACT, MOIST
#7 SAME AS #6 VERY COMPACT, DRY
#8 SAME AS #7 VERY COMPACT, DRY
#9 LIGHT BROWN FINE SAND & SILT, LITTLE MED TO FINE GRAV, COMPACT, DRY 12" Recovered
#10 GRAY SILT, SOME FINE SAND, LITTLE MED TO FINE GRAV, DRY, COMPACT
#11 SAME AS #10
#1 BLACK TOPSOIL 6" BROWN YELLOW SILT & MED TO FINE SAND, LITTLE CLAY COMPACT, MOIST
#2 YELLOW BROWN SILT, SOME MED TO FINE SAND & GRAV, TRACE OF CLAY COMPACT, MOIST
#3 GRAY COARSE TO FINE SAND & GRAV, LITTLE SILT LOOSE, MOIST
#4 SAME AS #3
#5 BROWN FINE SAND & SILT, LITTLE FINE GRAV, COMPACT, MOIST
#6 SAME AS #5
Boulder
#7 SAME AS #5 DRY 0 Recovery
#8 BROWN MED TO FINE SAND, SOME FINE GRAV TRACE OF SILT WET, FIRM
#9 BROWN SILT & FINE SAND LITTLE MED TO FINE GRAV TRACE OF CLAY VERY COMPACT, DRY
#10 NO RECOVERY
#1 BROWN CLAYEY SILT, SOME FINE SAND, LITTLE MED TO FINE GRAVEL, MOIST, FIRM
#2 COARSE TO FINE SAND & GRAV, TRACE OF SILT LOOSE, WET
#3 COARSE TO FINE SAND & GRAV, LITTLE SILT FIRM, MOIST 8" RECOVERED
#4 BROWN COARSE TO FINE SAND & GRAVEL, LITTLE SILT WET, LOOSE
#5 BROWN COARSE TO FINE SAND & GRAV, TRACE OF SILT
#6 COARSE TO FINE SAND & GRAVEL, TRACE OF SILT WET, LOOSE
#7 BROWN FINE SAND & SILT, MED TO FINE GRAVEL, COMPACT, MOIST
#8 COARSE TO FINE GRAV & SAND, LITTLE SILT LOOSE, WET
Boulder
#9 BROWN SILT, LITTLE FINE GRAV, SAND COMPACT, MOIST
#10 LIGHT BROWN COARSE TO FINE SAND & GRAV, LITTLE SILT, LOOSE, WET
Boulder

DWG. NO. 9

REVISION	DATE	DESCRIPTION	BY

CITY OF NEWARK, N. J.

PEQUANNOCK RIVER WATER SUPPLY

CHARLOTTEBURG RESERVOIR PROJECT

CONTRACT NO.

PERMEABILITY TESTS - RIVER WALL

DRAWN CHECKED APPROVED	ISSUED SCALE:	DWG. NO.	BY

PARSONS, BRINCKERHOFF, HALL & MACDONALD

ENGINEERS — NEW YORK, N. Y.

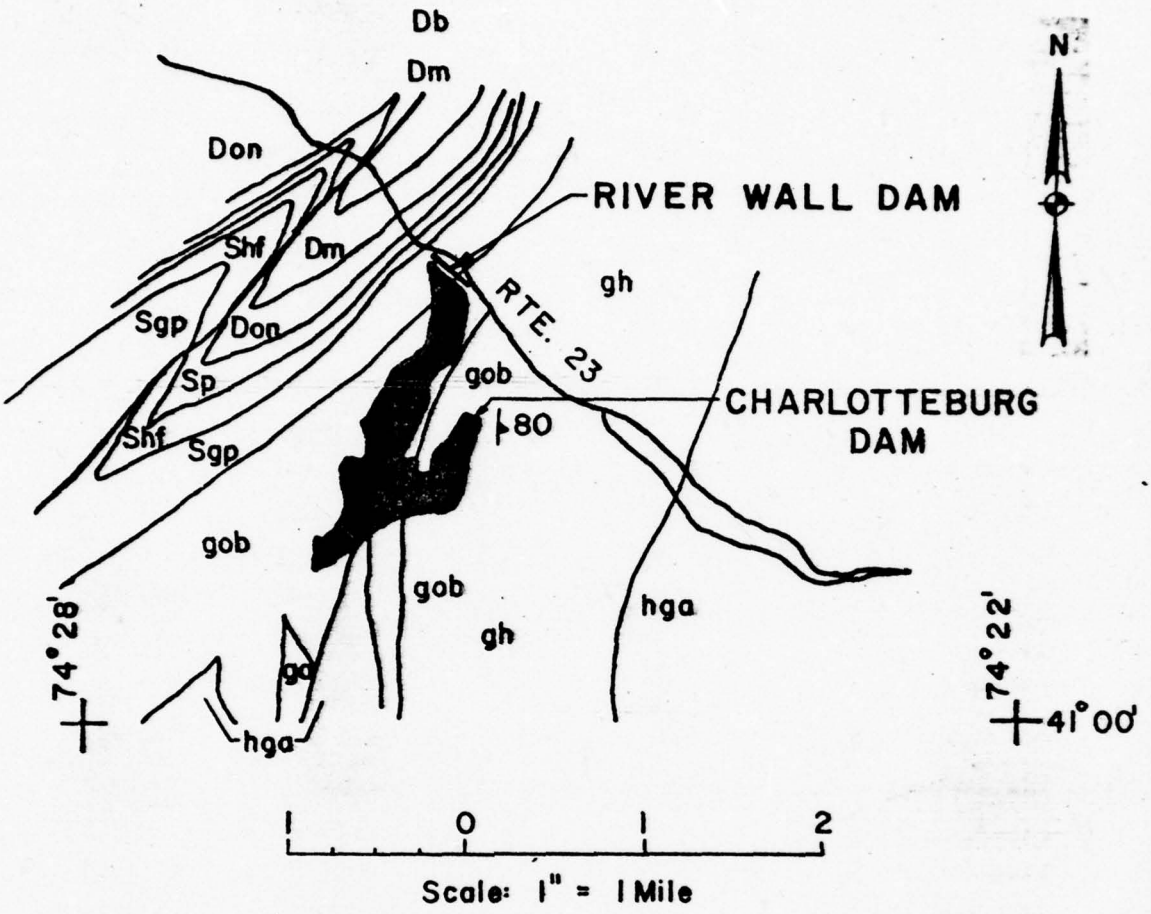
ASSOCIATE

APPROVED FOR THE CITY OF NEWARK, N. J.

DIVISION ENGINEER, DIVISION OF WATER SUPPLY — DATE

DIRECTOR, DEPARTMENT OF PUBLIC WORKS — DATE

2



LEGEND:

	DEVONIAN		PRE-CAMBRIAN
Db	Bellvale Sandstone	gh	Hornblende Granite & Gneiss
Dm	Marcellus Shale	ga	Alaskite
Don	Onondaga Limestone	hga	Andesine Gneiss
	SILURIAN	gob	Biotite Gneiss
Sp	Poxono Island Formation (Shale)		
Shf	High Falls Formation (Sandstone and Shale)		
Sgp	Green Pond Conglomerate		

——— Contact

– – – Fault, dashed where inferred

80 Strike and dip of foliation

GEOLOGIC MAP
RIVER WALL DAM

DWG. NO. 10

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION MAINTENANCE DATA

CHECK LIST
VISUAL INSPECTION
PHASE 1

Name Dam Charlotteburg Reservoir River Wall Dam County Passaic State New Jersey Coordinators

Date(s) Inspection May 1, 1978; May 6, 1978; August 3, 1978 Weather Sunny, Fair; Raining; Partly Cloudy, Showers Temperature 50°F; 85°F

Pool Elevation at Time of Inspection 741.5; 731.5 M.S.L. Tailwater at Time of Inspection _____ M.S.L.

Inspection Personnel:

Seymour Roth, May 1
Yin Au-Yeung, May 1
David Kerkes, May 1 and 5
Lynn Brown, May 6
Joseph Sirianni, August 3
Henry King, August 3
Larry Woscyna, May 1
N.J. Dept of Environmental Protection

Recorders: Seymour M. Roth
Joseph E. Sirianni

Owner: Newark Water Department

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Shrinkage cracks, approximately at the center of monoliths Sta. 13 + 00 to 18 + 60 show some leaching but are dry. Cracks occurs 3 to 4 feet above the ground and go through the wall. Joint leakage in vertical joints between monolith, approx. Sta. 16 + 60, were observed on May 1, 1978.	No action required. Joint leakage should be stopped.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Apparently, there is good contact and no visible leakage.	No action required.
DRAINS	Not applicable	
WATER PASSAGES	Not applicable	
FOUNDATIONS	The River Wall is founded on sand and gravel.	No action required.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	There is light deterioration of the riverward face of the wall, some popping off of concrete over large aggregate pieces at the high water mark. Some light deterioration north side of wall; minor cracking top of wall.	No action required.
STRUCTURAL CRACKING	Vertical shrinkage cracks, approximately at center of monoliths show some leaching but are dry. Cracks extend from ground to 4 feet ± above on the north side, and from ground to 6 feet ± on reservoir side.	Regular inspection of dam should be made to detect new or renewed seepages.
VERTICAL & HORIZONTAL ALIGNMENT	A slight horizontal misalignment in monoliths at approximately Sta. 16 + 50 is visible when sighting along top of wall.	Cause of misalignment should be investigated further.
MONOLITH JOINTS	Vertical monolith joint, approximately Sta. 16 + 60 was observed leaking at low head on May 1, 1978	Should be monitored.
CONSTRUCTION JOINTS	Vertical construction joints are dry. No horizontal construction joints are visible.	No action required.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Not applicable	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Not applicable	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion back face of top stretcher of crib wall and embankment.	Not considered serious.
VERTICAL & HORIZONTAL ALIGNMENT OF THE CREST	Not applicable	
RIPRAP FAILURES	Riprap protection of impervious blanket riverward side of wall, in good condition.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junction to cribwall on left and to gravity wall section on right abutment appear sound and dry.	
ANY NOTICEABLE SEEPAGE	Not applicable	
STAFF GAGE AND RECORDER	Not applicable	
DRAINS	Not applicable	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CRACKING & SPALLING OF CONCRETE SURFACES IN STILLING BASIN	Not applicable	
INTAKE STRUCTURE	Not applicable	
OUTLET STRUCTURE	Not applicable	
OUTLET FACILITIES	Not applicable	
EMERGENCY GATE	Not applicable	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE WEIR	Not applicable	
APPROACH CHANNEL	Not applicable	
DISCHARGE CHANNEL	Not applicable	
BRIDGE AND PIERS	Not applicable	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE SILL	Not applicable	
APPROACH CHANNEL	Not applicable	
DISCHARGE CHANNEL	Not applicable	
BRIDGE AND PIERS	Not applicable	
GATES & OPERATION EQUIPMENT	Not applicable	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
MONUMENTATION/ SURVEYS	Not applicable	
OBSERVATION WELLS	Not applicable	
WEIRS	Not applicable	
PIEZOMETERS	Not applicable	
OTHER	Not applicable	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENTATIONS
SLOPES	Slopes on reservoir rim mild to moderately steep, no apparent sloughing or slumping evident. Rim of reservoir is lightly vegetated with deciduous trees. There is a slight soil cover over predominantly competent rock formations. A clearly identifiable high water line can be seen at elevation 743.50 ± 0.25.	No action required.
SEDIMENTATION	Alledged to be light due to presence of upstream reservoirs (Canistear, Echo Lake, Clinton and Oak Ridge reservoirs).	No action required.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Not applicable	
SLOPES	Not applicable	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Access to the dam is above flood stage. There is a large chlorination and aeration facility 2,600 feet downstream. No homes are located in immediate downstream reach.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available.
REGIONAL VICINITY MAP	Available.
CONSTRUCTION HISTORY	River Wall built and operating by 1961. Some inspection reports on the foundation are in N.J. Department of Environmental Protection files.
TYPICAL SECTIONS OF DAM	Available.
HYDROLOGIC/HYDRAULIC DATA	Pool levels being recorded daily. Local rainfall data available. Flow data (USGS gage) prior to construction on Pequannock River at Macopin Dam are available; flow records after construction are also available. Rating curve at dam site prior to construction available.
OUTLETS - PLAN	Not applicable
- DETAILS	
- CONSTRAINTS	
- DISCHARGE RATINGS	
RAINFALL / RESERVOIR RECORDS	Same as above under Hydrologic/Hydraulic Data.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
DESIGN REPORTS	Hydrology report available for determination of Spillway Design Flood for Charlotteburg Dam.
GEOLOGY REPORTS	Geologic boring logs at dam available as part of contract documents.
DESIGN COMPUTATIONS	No design computations uncovered.
HYDROLOGY & HYDRAULICS	Hydrologic design memorandum on project available.
DAM STABILITY	No stability analysis available.
SEEPAGE STUDIES	No seepage studies available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Boring records available.
POST-CONSTRUCTION SURVEYS OF DAM	None uncovered.
BORROW SOURCES	No data uncovered.
SPILLWAY PLAN - SECTIONS - DETAILS	Not applicable.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	Not applicable.
MONITORING SYSTEMS	None installed.
MODIFICATIONS	None.
HIGH POOL RECORDS	Daily pool elevation records available from 1961 on.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None uncovered.
PRIOR ACCIDENTS OF FAILURE OF DAM - DESCRIPTION - REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not applicable.

APPENDIX B

PHOTOGRAPHS

PHOTOGRAPHS TAKEN DURING MAY & AUGUST 1978

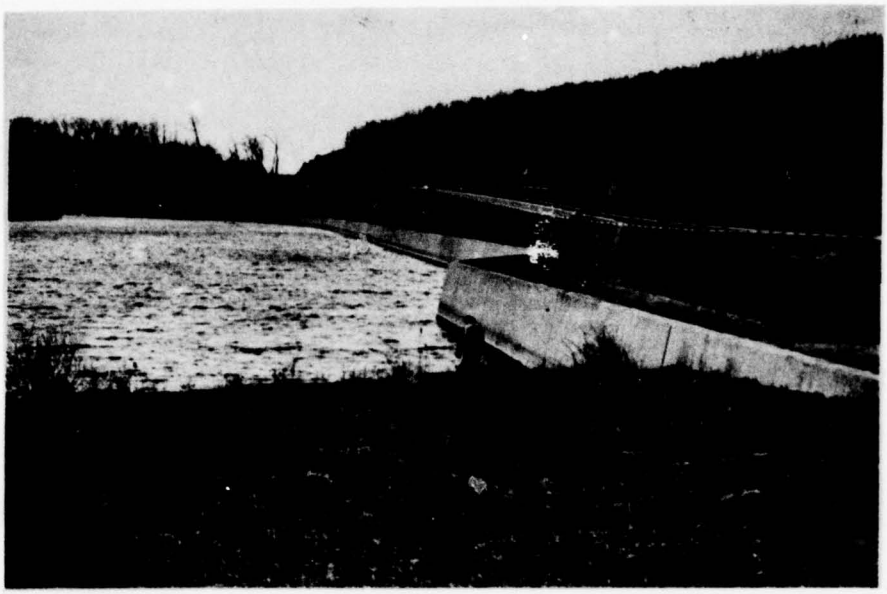


Photo 1 - View of reservoir side of wall from right embankment; water level at 741.5 (Photo taken May 1, 1978)

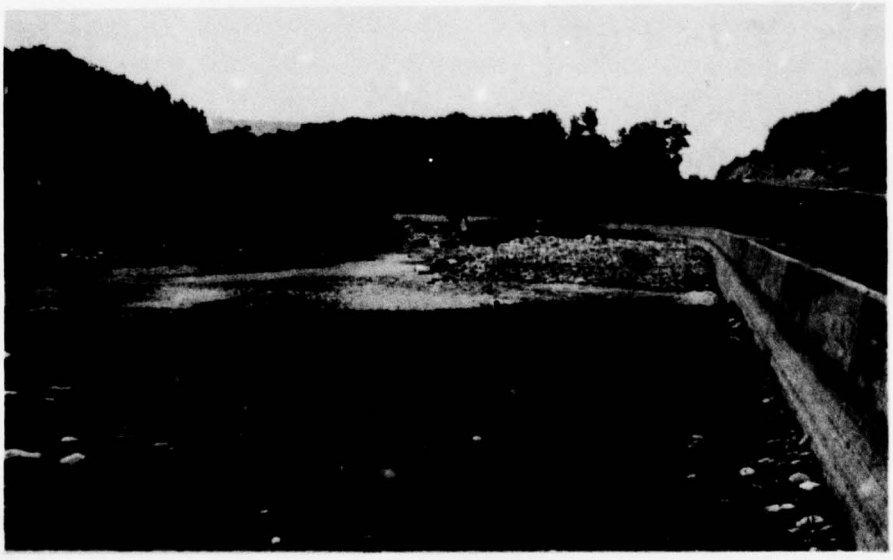


Photo 2 - View of reservoir side of wall from top of right end of wall; water level at 731.5. Riprap protection for impervious blanket can also be seen (Photo taken August 3, 1978)

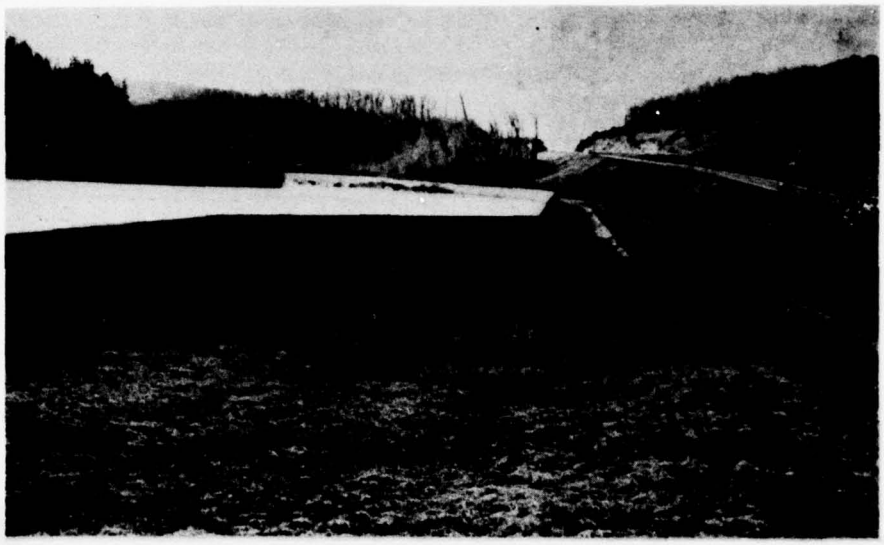


Photo 3 - View of north side of wall taken from right abutment. White spots on face of wall are seepage areas. Drainage ditch, abandoned tracks, and Route 23 can also be seen (Photo taken May 1, 1978)

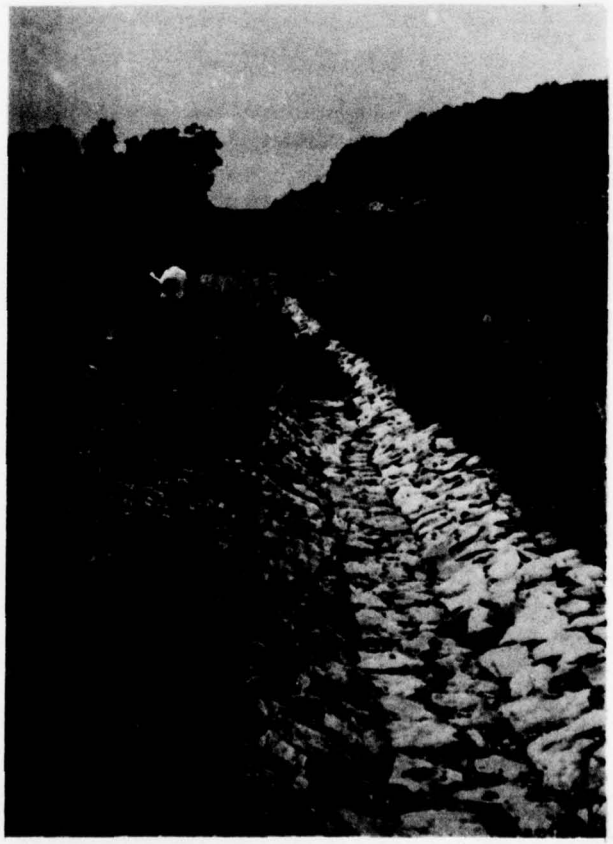


Photo 4 - View of stone paved drainage ditch on north side of wall (Photo taken August 3, 1978).

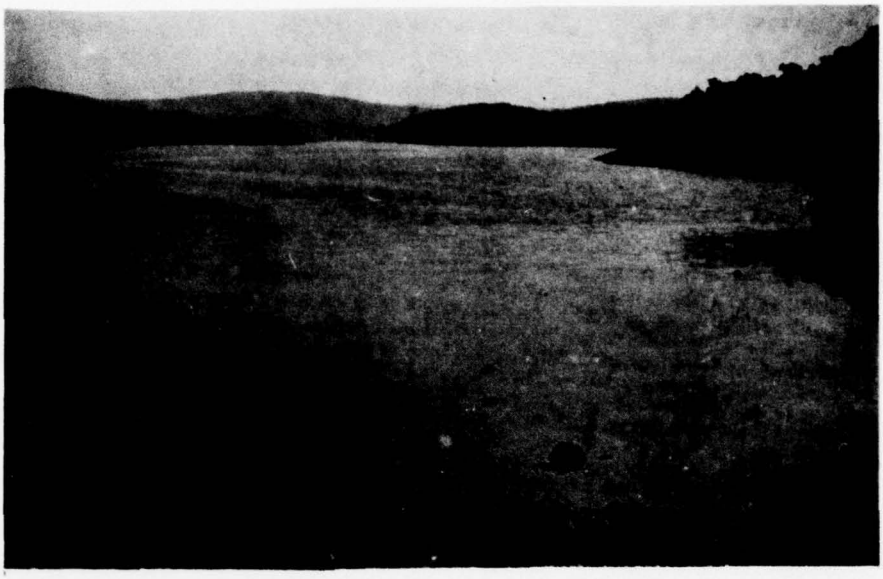


Photo 5 - View of reservoir taken from atop of wall. (Photo taken August 3, 1978).

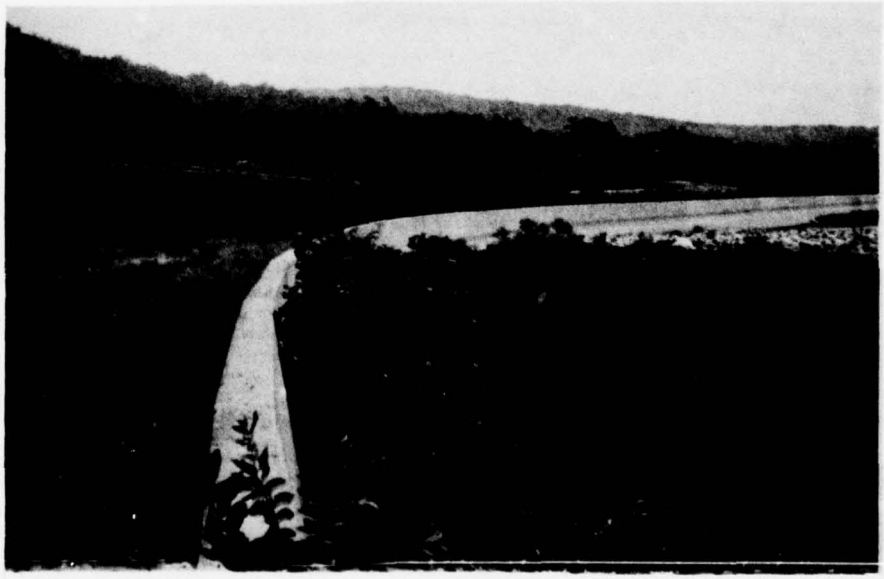


Photo 6 - View of reservoir side of gravity wall looking east from crib wall, showing heavy vegetation growth (Photo taken August 3, 1978).

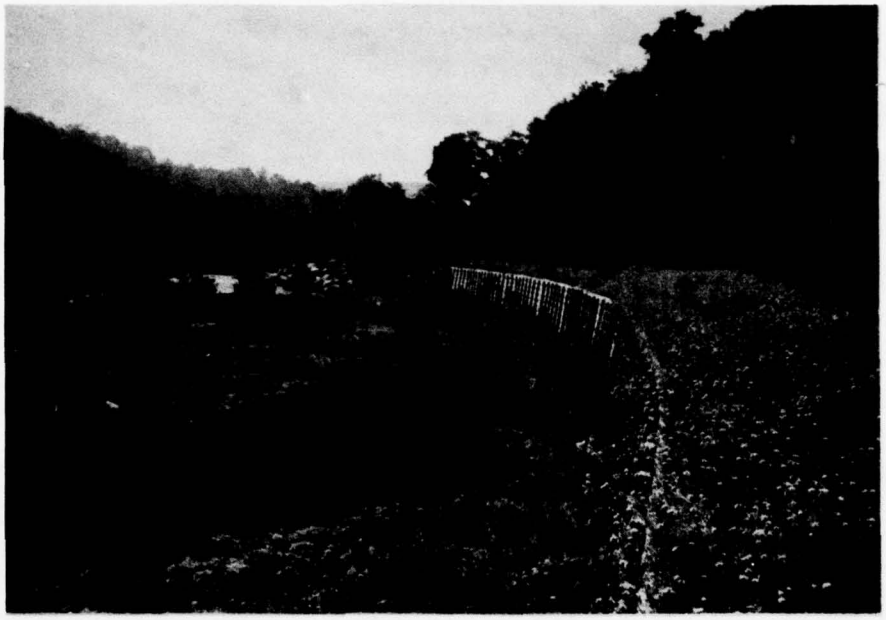


Photo 7 - View of crib wall and embankment from gravity wall. Heavy vegetation on riverward side of wall can also be seen. (Photo taken August 3, 1978).



Photo 8 - View of embankment behind crib wall. (Photo taken August 3, 1978).



Photo 9 - View of crib wall connection with rock fill left embankment taken from river bank. (Photo taken August 3, 1978).



Photo 10 - View of one of shrinkage cracks on reservoir face of wall. (Photo taken August 3, 1978).



Photo 11 - Close up view of shrinkage crack on north side of wall showing leaching. (Photo taken August 3, 1978).



Photo 12 - Close up view of leaking monolith joint on north side face of wall (Photo taken on May 1, 1978)

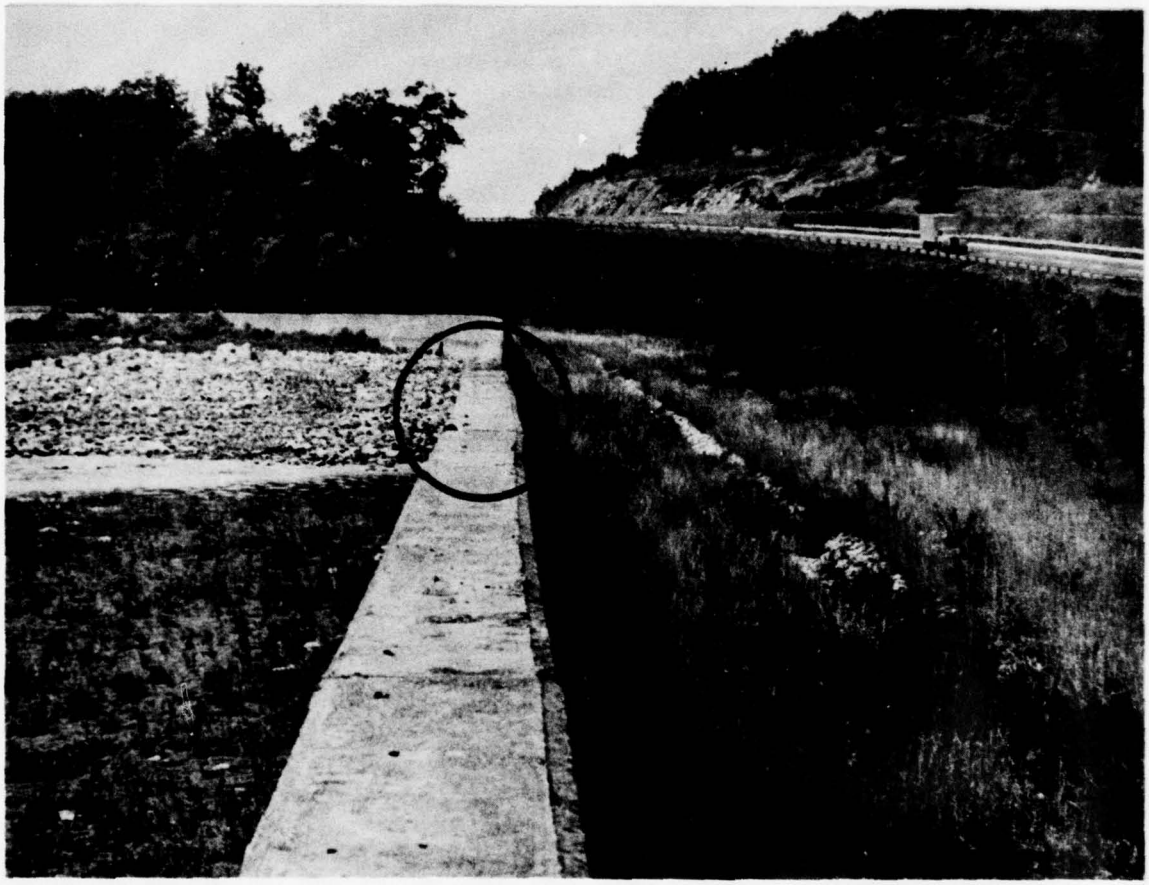


Photo 13 - View of top of wall looking west showing horizontal misalignment of monolith. (Photo taken August 3, 1978).

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: RIVER WALL DAM

Drainage Area Characteristics: On Pequannock River with drainage area of 56.3 square miles

Elevation Top Normal Pool (Storage Capacity): 743

Elevation Top Flood Control Pool (Storage Capacity): Not provided

Elevation Maximum Design Pool: 748

Elevation Top Dam: 750 (Length = 2,020 feet)

SPILLWAY CREST: NOT APPLICABLE

a. Elevation
b. Type
c. Width
d. Length
e. Location Spillover
f. No. and Type of Gates

OUTLET WORK: NOT APPLICABLE

a. Type
b. Location
c. Entrance Inverts
d. Exit Inverts
e. Emergency Draindown Facilities

HYDROMETEOROLOGICAL GAGES:

a. Type USGS gaging station 3825.0 Water level recorder
b. Location Pequannock River at Macopin Intake Dam (8000 ft. from Charlotteburg)
c. Records January 1898 to current year

MAXIMUM NON-DAMAGING DISCHARGE Not applicable

Note: See Sheet 2 for Charlotteburg Dam, NJ 00316 Check List

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: CHARLOTTEBURG DAM

Drainage Area Characteristics: On Pequannock River with drainage area of 56.3 square miles

Elevation Top Normal Pool (Storage Capacity): 743

Elevation Top Flood Control Pool (Storage Capacity): Not provided

Elevation Maximum Design Pool: 748

Elevation Top Dam: 750 (Length = 675 ft.)

SPILLWAY CREST:

a. Elevation 138
b. Type Concrete overflow, ogee weir with bascule gate
c. Width Bascule gate is 5 feet total width
d. Length 200 ft.
e. Location Spillover Center of gravity dam
f. No. and Type of Gates One bascule gate 5 ft. by 200 ft.

OUTLET WORK:

a. Type 48"Ø steel pipe blow off and one 54"Ø steel pipe for water supply
b. Location Gate chamber on left abutment next to spillway crest
c. Entrance Inverts 675.0
d. Exit Inverts 674.0
e. Emergency Draindown Facilities 48-inch steel pipe blow-off line with 30-inch hollow cone valve discharging into stillingbasin

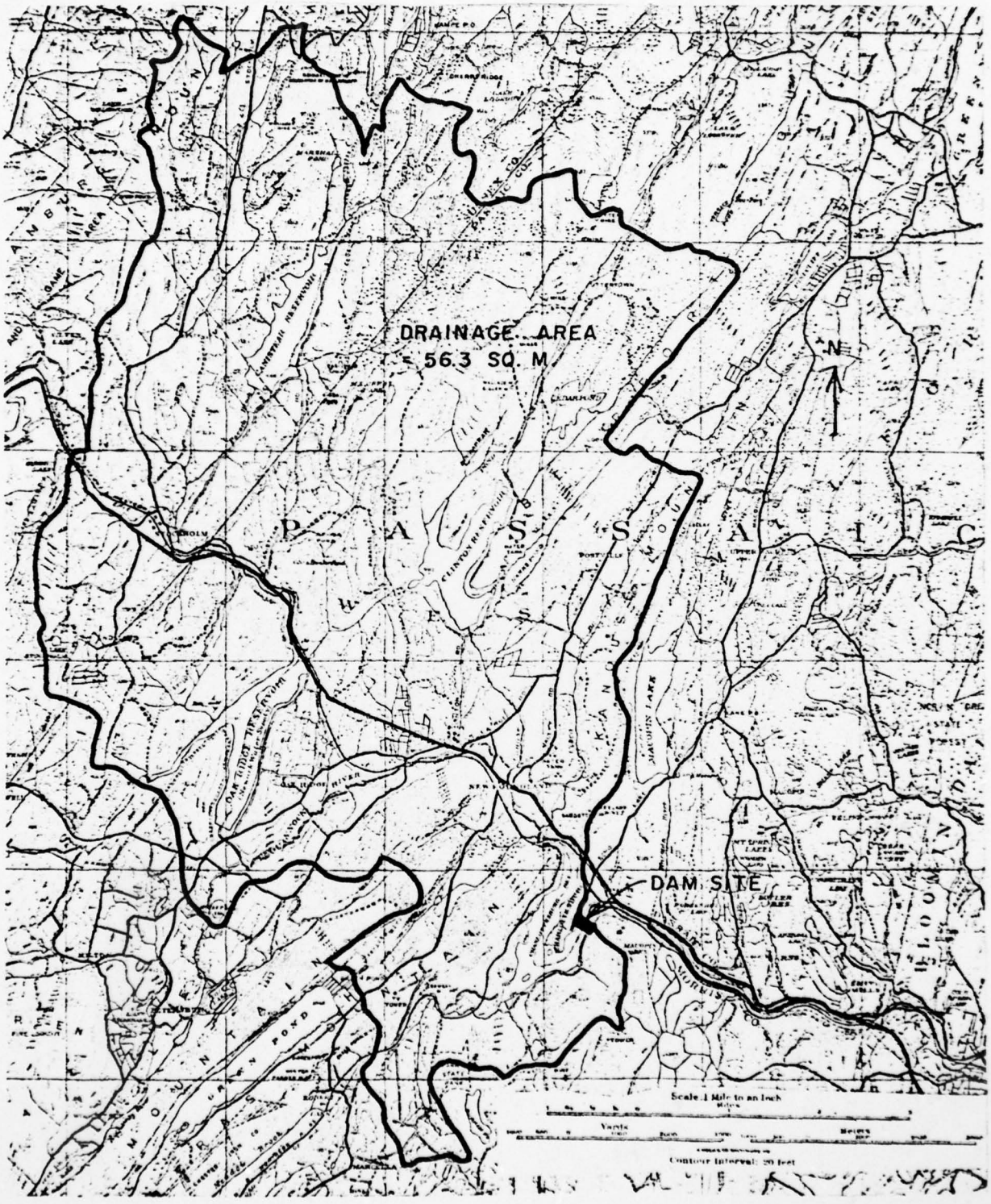
HYDROMETEOROLOGICAL GAGES:

a. Type USGS gaging station 3825.0 Water level recorder
b. Location Pequannock River at Macopin Intake Dam (8000 ft. from Charlotteburg
c. Records January 1898 to current year

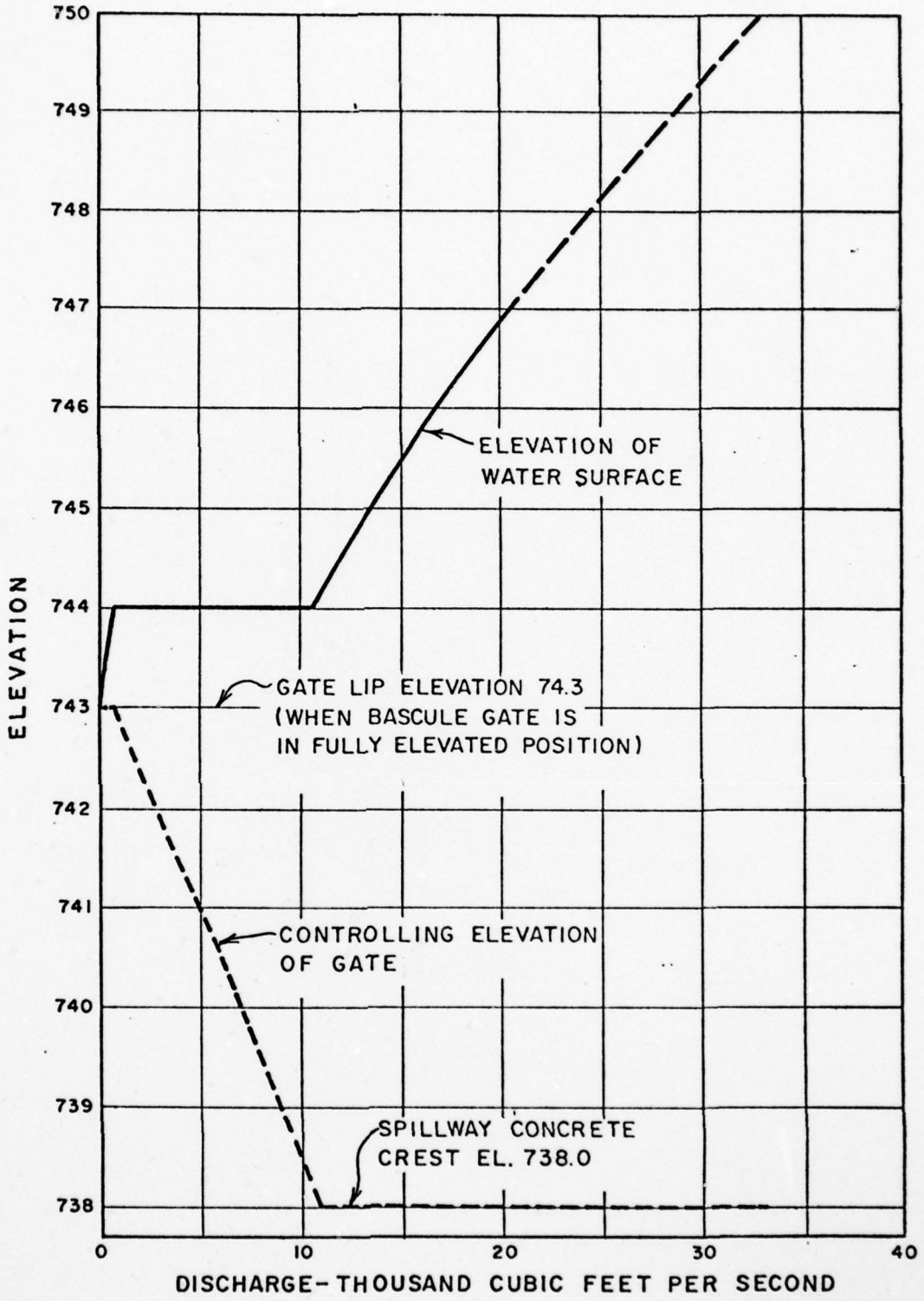
MAXIMUM NON-DAMAGING DISCHARGE Not available

APPENDIX D

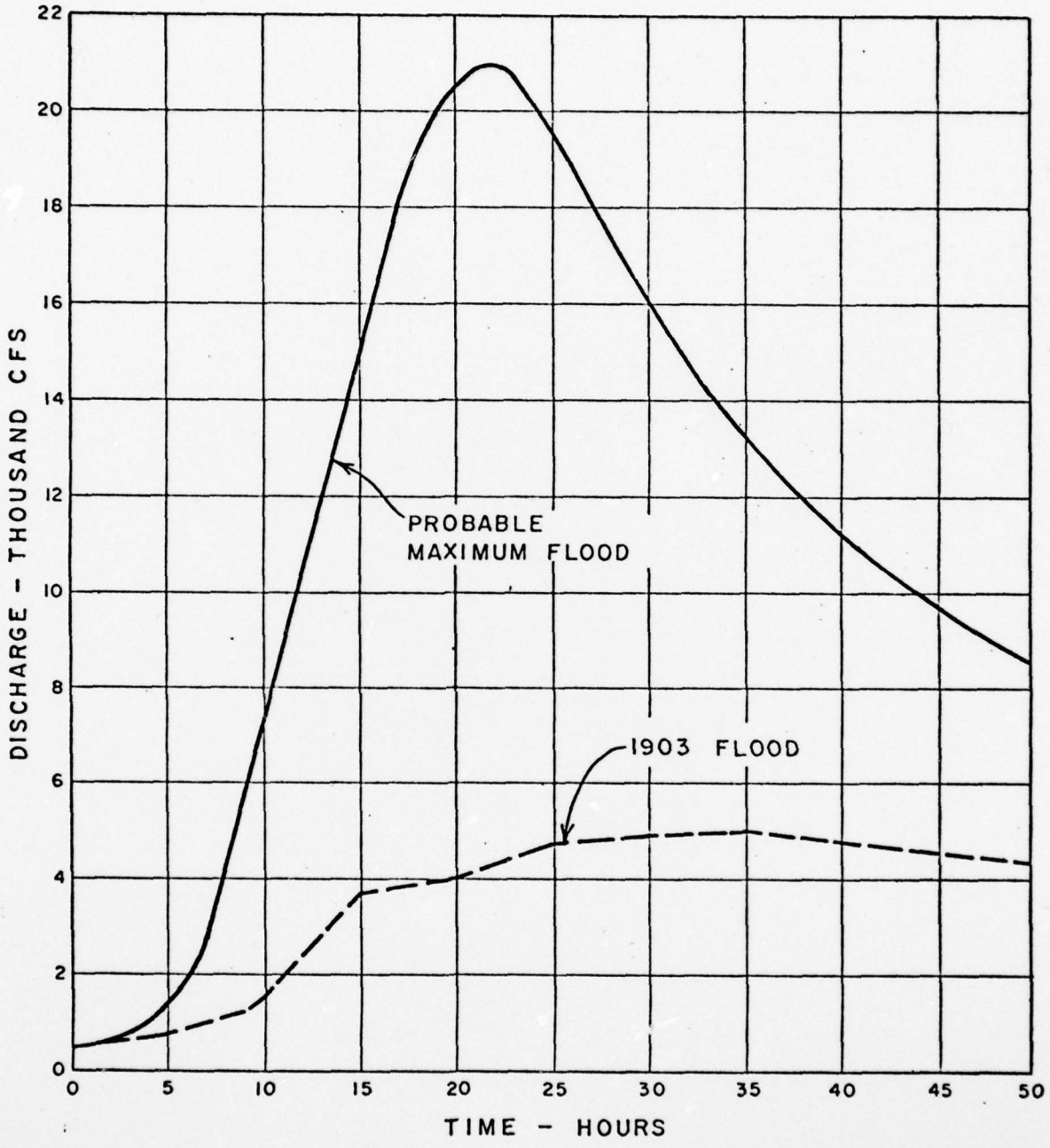
HYDROLOGIC COMPUTATIONS



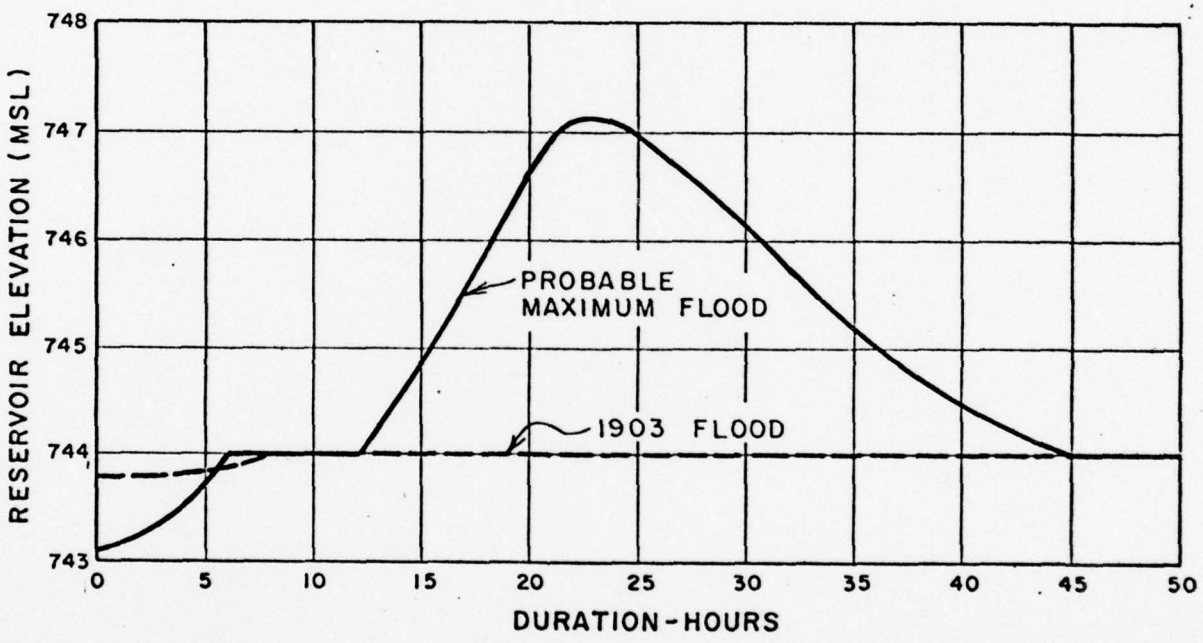
CHARLOTTEBURG DAM
DRAINAGE BASIN



CHARLOTTEBURG DAM
SPILLWAY RATING CURVE



CHARLOTTEBURG DAM
PROBABLE MAXIMUM FLOOD
(USED IN 1958 REPORT)



NOTE: PMP Given in the 1958 report
was used as Reservoir Inflow Design Flood

CHARLOTTEBURG DAM
SPILLWAY ROUTING
(W.S. ELEVATION VS TIME)

APPENDIX

HYDROLOGIC COMPUTATION

PMF Verification - Charlotteburg

Probable Maximum Precipitation.

JOB NO. 5

BY YIN DATE MAY 1

PROBABLE MAXIMUM FLOOD CALCULATION (PMF)

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DRAINAGE AREA = 56.3 Square Miles

From Hydrometeorological Report #33

"Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Duration of 6, 12, 24 and 48 Hours" 1956.

For Drainage Area 10 square Miles

the 6 Hour duration PMP is 24.5 inches for Zone 6 at Charlotteburg watershed.

Since the drainage area is larger than 10 square miles, an area reduction factor of (0.86 is applied.

The reduced 6 Hour PMP is 0.86 × 24.5 = 21.07 inches.

PMP values for rainfall durations of 6, 12, 24, 48 hours are:

Duration (Hrs)	PMP (inches)
6 Hr	1 × 21.07 = 21.07
12 Hr	1.09 × 21.07 = 23.00
24 Hr	1.17 × 21.07 = 24.65
48 Hr	1.34 × 21.07 = 28.23

PMP values shown above are reduced by 15% to account for misalignment of basin and rainfall isohaytals.

The PMP for deriving PMF are therefore as following:

Duration (Hrs)	PMP (inches)
6	17.91
12	19.55
24	20.95
48	24.00

(DAM FAILURE FLOW STUDY INSPECTION) SHEET NO. ____ OF ____
PMF DERIVATION - CHARLOTTEBURG JOB NO. ____
BY Y.I.J DATE MAY 10

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PROBABLE MAXIMUM FLOOD CALCULATION (PMF).

This dam is located on the Pequannock River. From the "Passaic River Report - Volume II Appendices" by the Department of the Army, New York District, Corps of Eng. dated June 1972, the following hydrologic data are obtained:

For Pequannock River at the location of the Macopin Intake dam which is about 800' downstream from the Charlotteburg dam, the Probable maximum flood peak discharge is 16300 cfs.

The Charlotteburg Dam PMF peak discharge computed from the ratio of drainage area according to the above report is.

$$A_1/A_2 = \frac{\text{D.A for Charlotteburg}}{\text{D.A. for Macopin Intake}} = \frac{56.3}{63.7} = 88.4\%$$

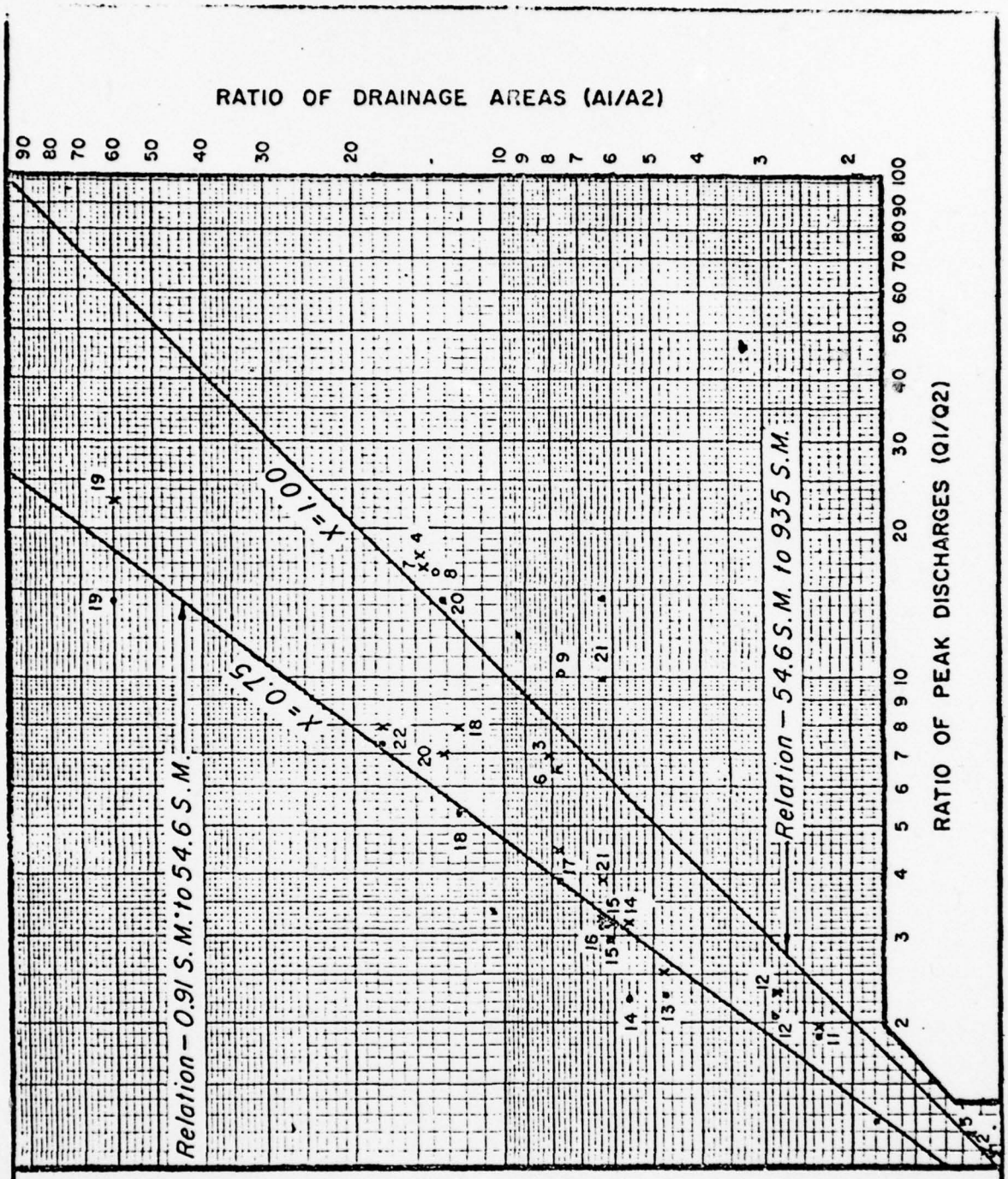
From Fig. A26 of the same report for $A_1/A_2 = 88.4\%$

$$Q_1/Q_2 = 91.5\% \quad \therefore Q_1 = 16300 \times .915 = 14900$$

→ .. PMF peak discharge at Charlotteburg is 14900 cfs

The PMF hydrograph is given in the following pages.

Routing of PMF hydrograph is unnecessary if the spillway capacity exceeds the PMF peak discharge, and the spi



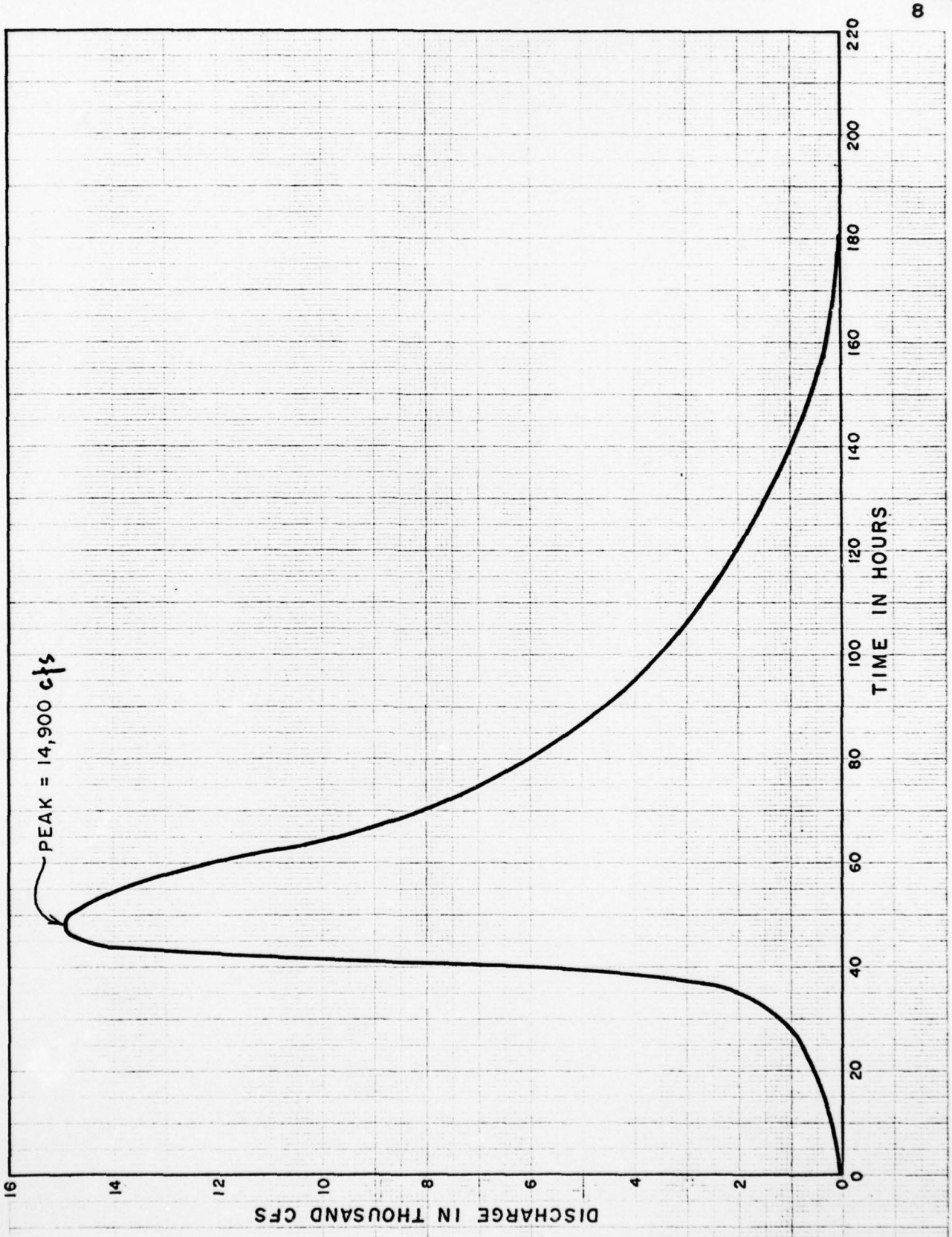
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LEGEND

X Oct. 1903 Flood
• July 1945 Flood
o Oct. 1955 Flood

PASSAIC RIVER BASIN, N. J. AND N. Y.

DRAINAGE AREA RATIOS VS
PEAK DISCHARGES



CHARLOTTEBURG DAM
DERIVED PMF - HYDROGRAPH

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CHECK SPILLWAY CAPACITY.

1. The maximum probable flood peak discharge of 21,100 cfs was used in the original design which is about 1.41 times higher than the PMF calculated in this report.

2. The reservoir elevation is at elevation 747.1 during the maximum probable flood of 21,100 cfs. (the spillway discharge is 20500 cfs)

3. Check the spillway capacity exceeds 14,925 cfs. for Q = 14,925 cfs the reservoir elevation is at 745.5.

4. Assume an extremly conservative case when the Bascule gate in fully elevated position with the lip at elevation 742 when the PMF hits and the Bascule gate not operable. The capacity of the spillway above elevation 742 is.

Add surcharge storage = 0!

$Q = 3.4(200)(h)^{1.5}$, up to elevation 750.

$= 3.4(200)(7)^{1.5} = 12595$ cfs.

which is 85% of the PMF.

Spillway capacity above El. 750.

$Q = 3.4(200)(h)^{1.5} + 3.0(475)(h)^{1.5}$

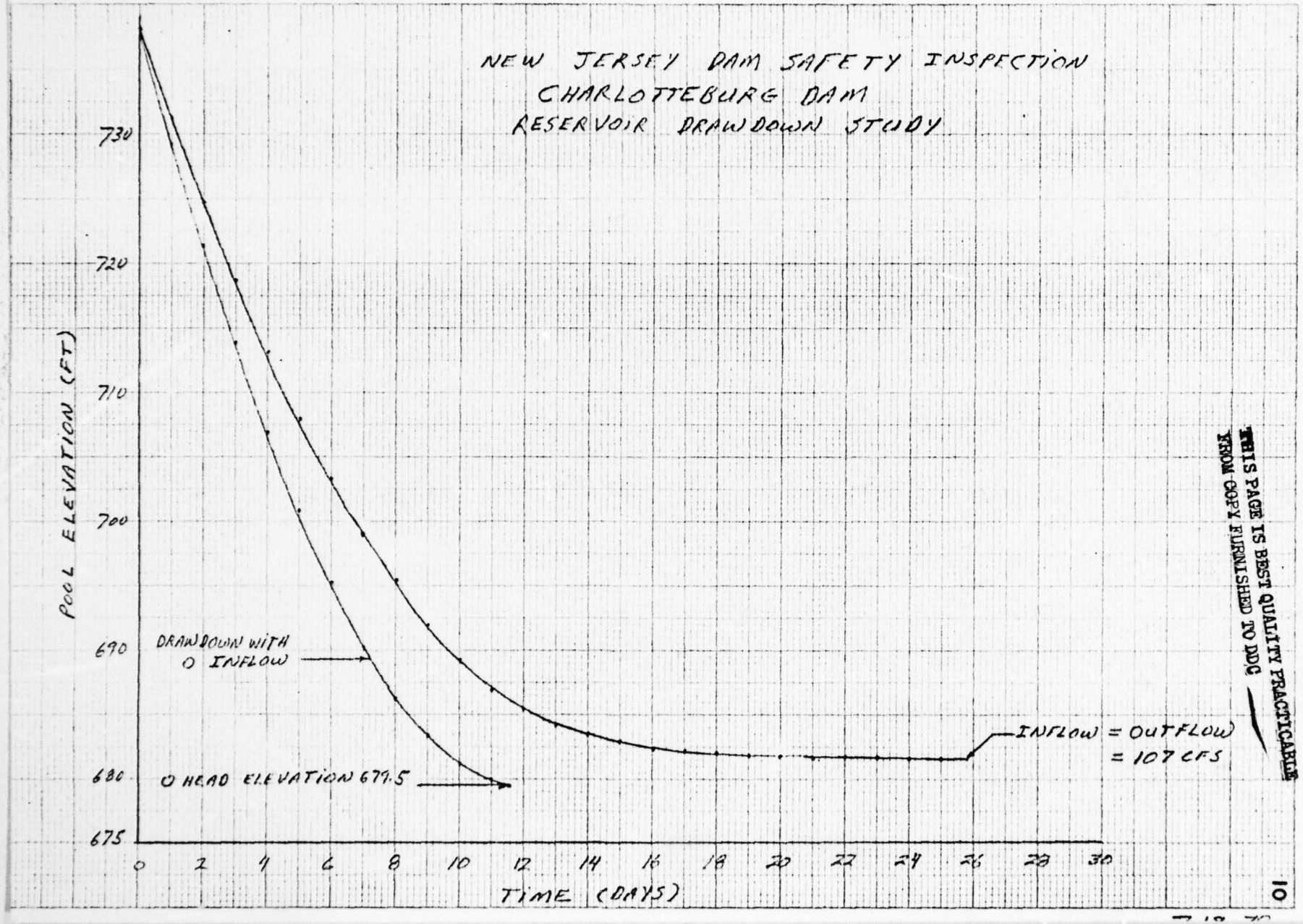
$+12595$

Say, $h = .25'$ at El. 750.1

$= 753 + 1577 + 12595 = 14925$ cfs.

which is equal to the PMF.

5. The spillway capacity is adequate.



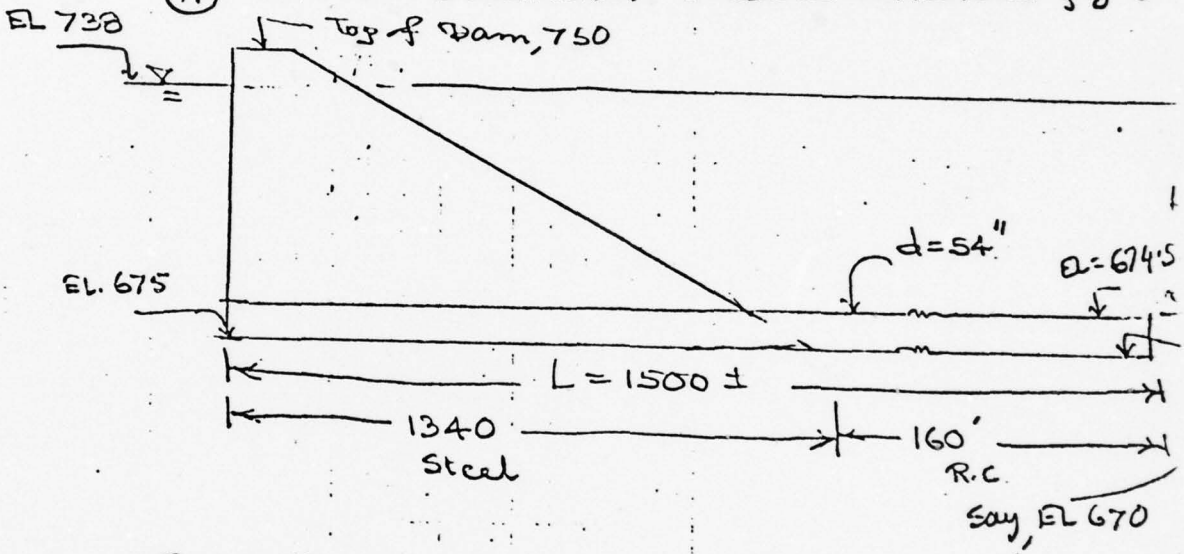
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CHARLOTTESVILLE DAM

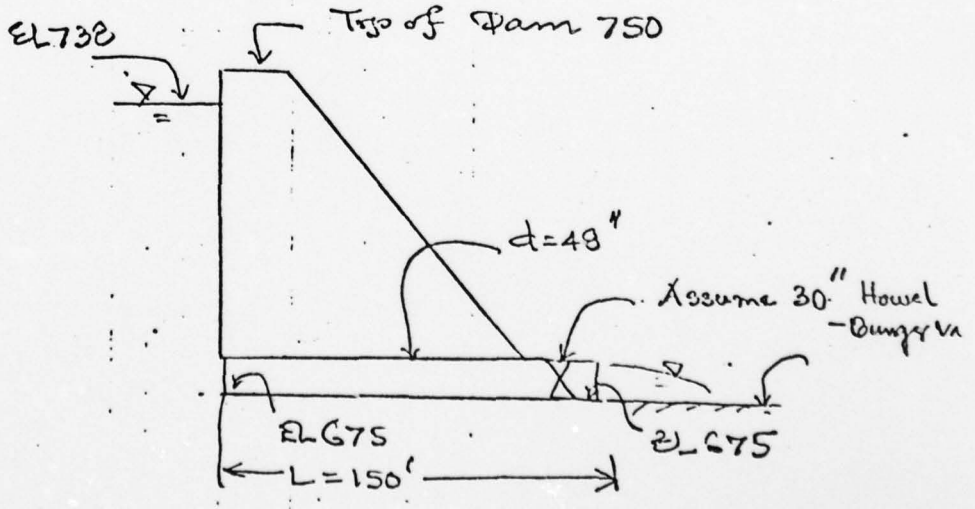
Outlet Works:

Assumed dimensions & Elevations

(A) 54 inch diameter steel & concrete pipe



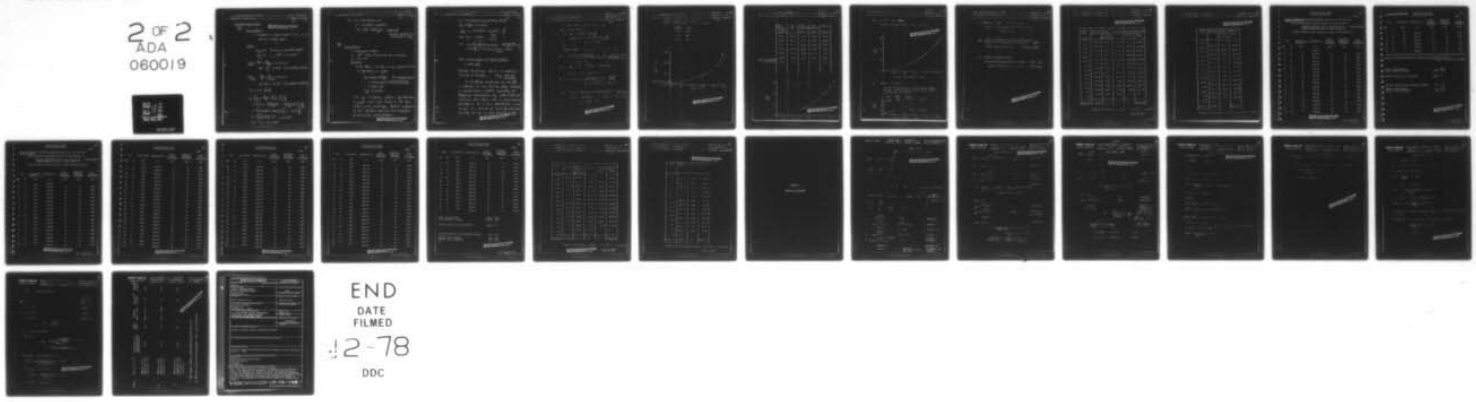
(B) 48 inch Steel blow off



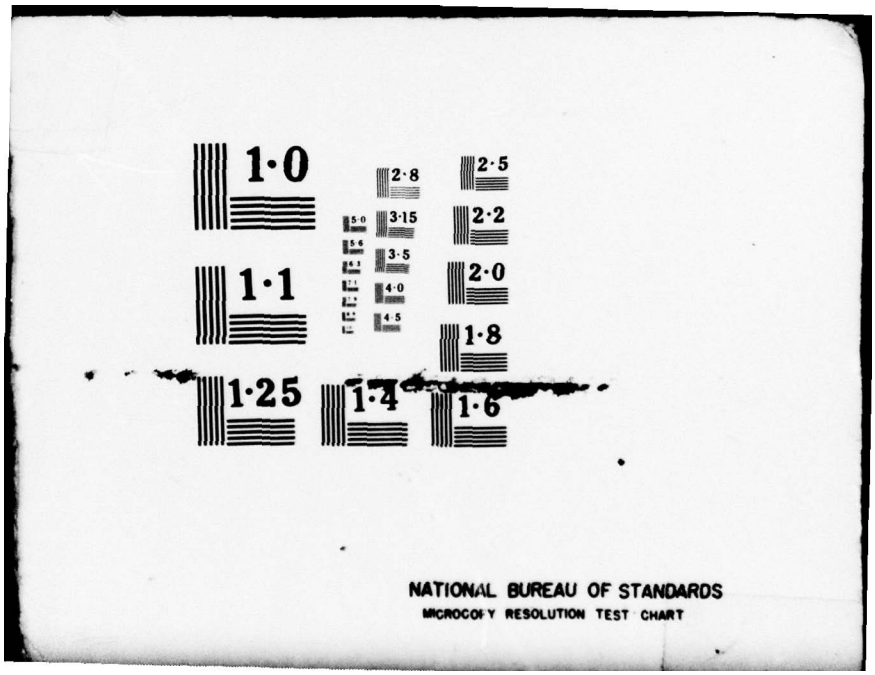
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AD-A060 019 HARRIS ECI ASSOCIATES WOODBRIDGE NJ F/G 13/2
NATIONAL DAM SAFETY PROGRAM. RIVER WALL DAM (NJ-00547), PASSAIC--ETC(U)
AUG 78 R GERSHOWITZ DACW61-78-C-0124
UNCLASSIFIED NL

2 OF 2
ADA
060019



END
DATE
FILMED
12-78
DDC


1·0
1·1
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5·6
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1·8
1·6
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

Outlet Capacity :

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(A)

Assumptions :

1. Outlet is submerged & W.L. is at top of outlet pipe

Soln :

$\epsilon_{steel} = .03$ (assuming riveted steel).

$\epsilon_{Conc} = .01$ (rough concrete)

Steel Pipe $\frac{\epsilon_s}{D} = \frac{.03}{54/12} = 0.0067$

$\Rightarrow f_s = 0.0325$ (Complete turbulence)

Conc Pipe $\frac{\epsilon_c}{D} = \frac{.01}{54/12} = 0.0022$

$\Rightarrow f_c = 0.025$ (Complete turbulence)

$K_e = 0.5$ (Say)

$$\therefore H = \left[K_e + \frac{f_c L_c}{D} + \frac{f_s L_s}{D} + 1\right] \frac{V^2}{2g}$$

$$= \left[0.5 + \frac{0.025 \times 160}{4.5} + \frac{.0325 \times 1340}{4.5} + 1\right] \frac{V^2}{2g}$$

$$= [0.5 + 0.89 + 9.68 + 1] \frac{V^2}{2g} = 12.07 \frac{V^2}{2g}.$$

$$V = \sqrt{\frac{1}{12.07}} \sqrt{2g}\, H^{1/2} = 2.31 \sqrt{H}$$

$$Q = AV = 36.72 \sqrt{H}$$

For $H = 738 - 674.5 = 63.5$

$V = 2.31\sqrt{63.5} = 18.41$ ft/sec

$R_e = \frac{VD}{\nu} = \frac{18.41 \times 4.5}{10^{-5}} = 8.28 \times 10^6$

Complete turbulence assumption is 0.1c.

(B)

Assumptions:

1. Fully open value
2. 30" value (measured from drawing)
3. $K_e = .5$

Solution

First obtain velocity in pipe by assuming no friction in pipe

$\therefore Q = 0.85 A\sqrt{2gH}$ For Howell-Bunger V

$= 0.85 \times .785 \times 2.5^2\sqrt{64.4(738-675)}$

$= 266$ cfs

$V_{48"} = 21$ ft/sec

With $V_{48"} = 21$ ft/sec, obtain friction loss in pipe and net head H at the value and discharge, further refinement of the solution will be unnecessary for preliminary calculation

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$\epsilon = .03$ (assuming riveted steel)

$\therefore \frac{\epsilon}{D} = \frac{0.03}{4} = 0.0075$

$\frac{VD}{\nu} = 21 \times 4 \times 10^5 = 8.4 \times 10^6$

$\Rightarrow f = 0.00345$

$\therefore H = H_T - h_f - K_e \frac{V^2}{2g} = (738-675) - \frac{.00345 \times 150}{4} \times \frac{}{}$
$+.5 \times \frac{21^2}{64.4} = 63 - 8.86 - 3.42 = 50.72$

$\therefore Q = 0.85 \times .785 \times 2.5^2 \sqrt{64.4 \times 50.72}$
$= 238$ cfs

Actual discharge will be in between 226 cfs & 238 cfs, Say 240 cfs.

A constant discharge of 240 cfs is added to the 54-inch pipe discharge to determine outlet capacity at different elevations of water surface behind the dam. This is done because change in Q in the blow off for the range in change of head (from El 738 to El 750) will be on the order of 20 cfs.

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SHEET NO. 6 OF 15

JOB NO. 1202

BY [illegible] DATE 7-13

TELECOM BUILDING

STILL CAPACITY

FOR 48" STILL RISER ONLY

FOR ELEV 708

1) $H = H_T - f \frac{L}{D} \frac{V^2}{2g} - Kc \frac{V^2}{2g}$

$= (708 - 675) - \frac{.00345 \times 150}{4} \times \frac{V^2}{64.4} + .5 \frac{V^2}{64.4}$

Approximate V, assume no friction

2) $Q = 0.95 A \sqrt{2gH}$ for Horiz. Bottom Vena

$= 0.95 \times .785 \times 2.5^2 \times \sqrt{64.4 \times (708 - 675)}$

$= 192$ cfs

3) $V_{48"} = \frac{Q}{A} = \frac{192}{3.2^2} = 15.28$ fps

Replace V in equation 1

4) $H = (708 - 675) - \left(\frac{0.00345 \times 150}{4} \times \frac{15.28^2}{64.4} + .5 \frac{15.28^2}{64.4}\right) = 30.72$

$Q = 0.95 \times .785 \times 2.5^2 \times \sqrt{64.4 \times 30.72} = 185$ cfs

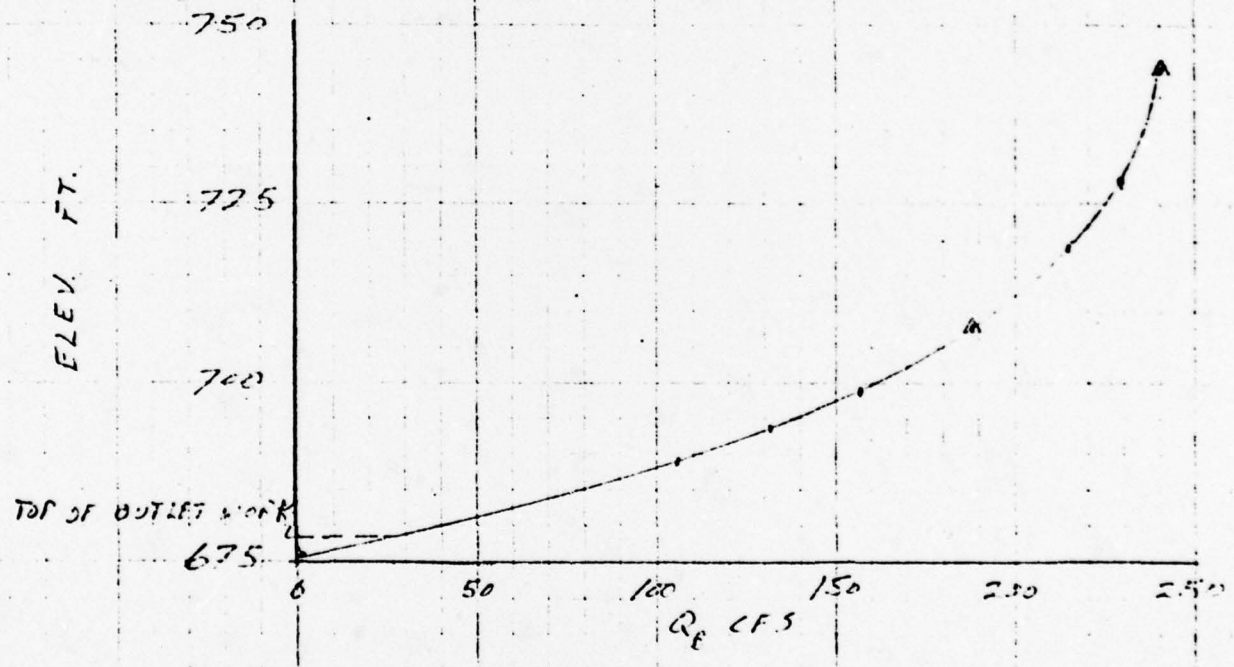
Actual discharge in between 192 and 185

say 187 cfs.

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STEEL BLOCK OFF PIPE
FOR ELEVATIONS ELOW 738

ELEV. (FT)	Q_E
738	740
700	187
675	0



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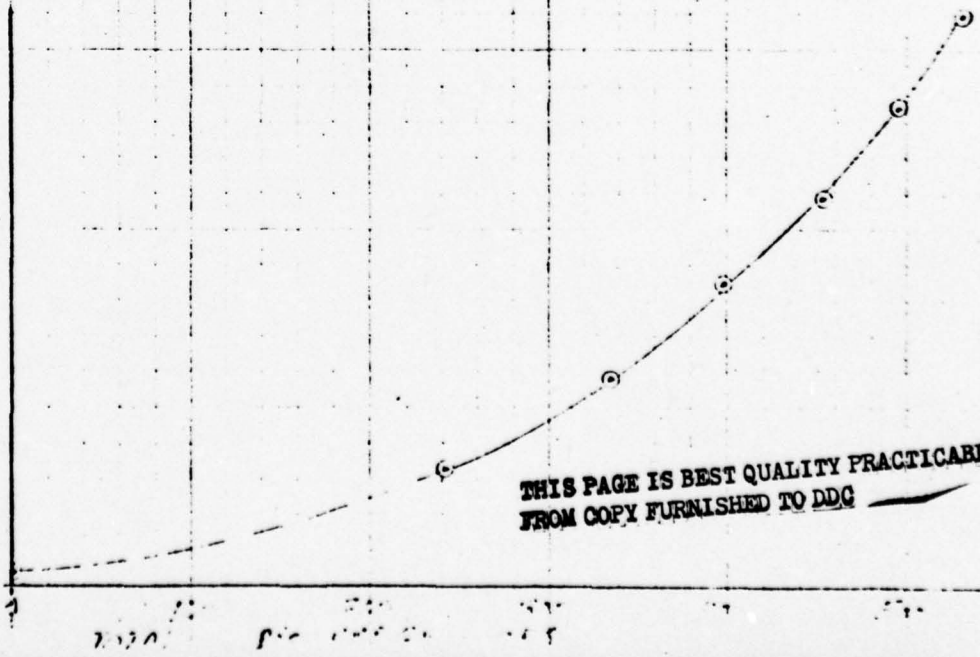
CHILLICOTHE, OHIO

OUTLET CONDUIT

JOB NO.

BY MR DATE

WATER SURFACE ELEVATION (FT)	H (FT)	$Q_{54"} = 36.72\sqrt{H}$ (CFS)	Q_E (FROM FIG 7) (CFS)	Q_{TOTAL} (CFS)
738	63.5	293	240	533
728	53.5	269	229	498
718	43.5	242	214	456
708	33.5	213	187	400
698	23.5	178	157	335
688	13.5	135	106	241
TOP OF OUTLET WORKS ELEV 677.5				
678	0	0	0	0

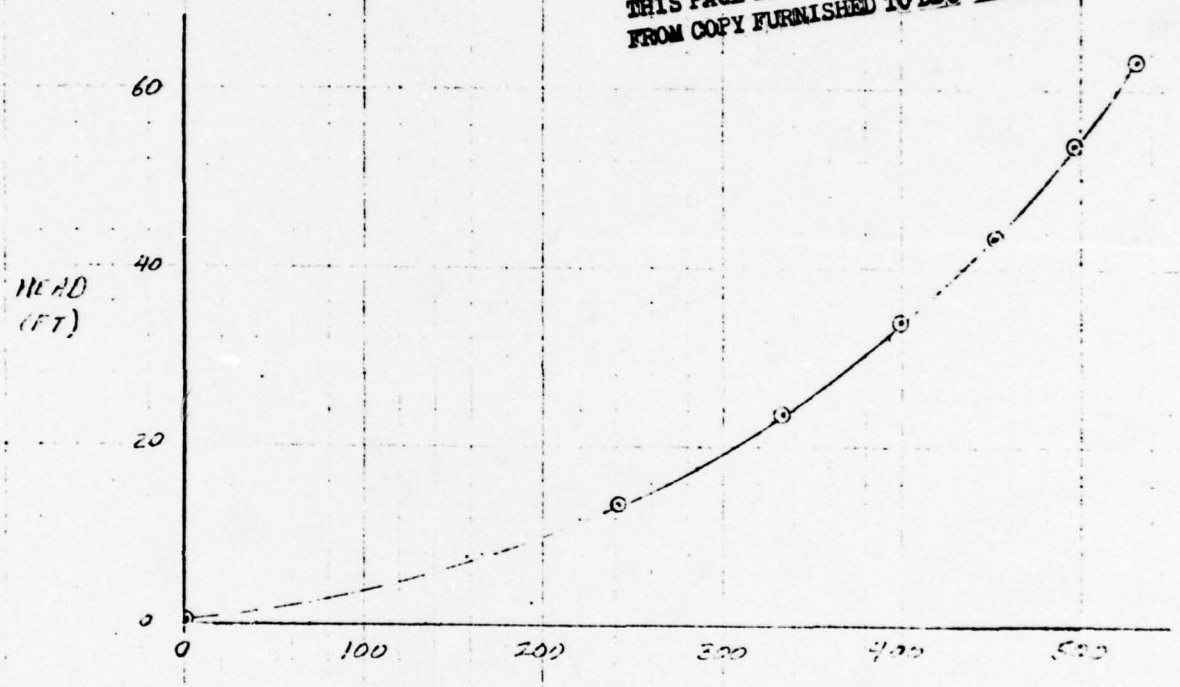


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a) DISCHARGE VS. HEAD

(REFER TO MIS NOTES OF 6-15-72)

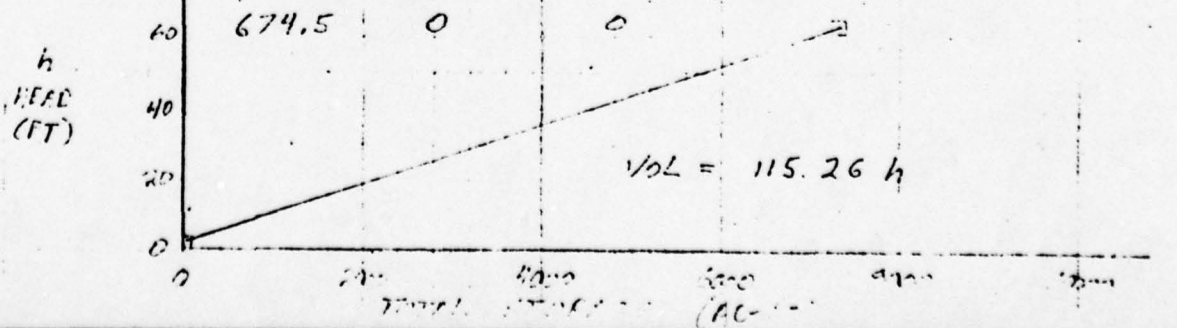
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b) STORAGE VS. HEAD

ASSUME A STRAIGHT LINE RELATIONSHIP FROM NORMAL WATER SURFACE VOLUME TO ZERO VOLUME AT ZERO HEAD

ELEV	HEAD	STORAGE
738	63.5	7219 AC-FT (ASSUMED)
674.5	0	0



c) DRAINAGE AREA = 53.7 SQ. MI

INFLOW = 2 CFS/SQ. MI * 53.7 SQ. MI.

= 107.4 CFS

d) WITH CONSTANT INFLOW = 107.4 CFS
INFLOW ≈ OUTFLOW AFTER 612 HOURS

(FROM COMPUTER PRINTOUT) = 25.5 DAYS

e) WITH ZERO INFLOW

RESERVOIR EVACUATION TIME = 276. HR

(FROM COMPUTER PRINTOUT) = 11.50 DAYS

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HEAD (FT)	VOLUME (AC-FT)	TOTAL DISCHARGE (CFS) (FROM SMITH)	INFLOW (CFS)	AVAILABLE DISCHARGE (CFS)	EVACUATION TIME (HR)
63.5	493.21	525.	107.4	417.6	11.68
60.0	576.30	510.	107.4	402.6	17.32
55.0	576.30	491.	107.4	383.6	18.18
50.0	576.30	472.	107.4	364.6	19.13
45.0	576.30	447.	107.4	339.6	20.53
40.0	576.30	420.	107.4	312.6	22.31
35.0	576.30	392.	107.4	284.6	24.50
30.0	576.30	361.	107.4	253.6	27.50
25.0	576.30	328.	107.4	220.6	31.61
20.0	576.30	287.	107.4	179.6	38.83
15.0	576.30	234.	107.4	126.6	55.09
10.0	576.30	167.	107.4	59.6	117.00
5.0	576.30	70.	107.4	—	—
0.0					
TOTALS	7319.	—	—	—	403.67 HR

INFLOW ≈ OUTFLOW AT THE HEIGHT OF [illegible]

= 16.82 CFS

RESERVOIR EVACUATION ... JOB NO. ... 21

... BY ... DATE ...

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HEAD (FT)	VOLUME (AC-FT)	TOTAL DISCHARGE (CFS) (FROM SPILL)	EVACUATION TIME (HR)
55.5			
	403.21	525.	9.29
60.0			
	576.30	510.	13.67
55.0			
	576.30	491.	14.20
50.0			
	576.30	472.	14.77
45.0			
	576.30	447.	15.60
40.0			
	576.30	420.	16.60
35.0			
	576.30	392.	17.77
30.0			
	576.30	341.	19.32
25.0			
	576.30	328.	21.26
20.0			
	576.30	297.	24.30
15.0			
	576.30	234.	29.80
10.0			
	576.30	167.	41.76
5.0			
	576.30	701	99.62
0.0			
TOTALS	7319.	--	337.98

RESERVOIR EVACUATION TIME = 337.98 HR (14.0) ...

= ... DAYS

CHARLOTTEBURG DAM RESERVOIR DRAWDOWN STUDY (DA = 53.7 SQ. MI.)

1.0000 UNREGULATED DIVERSION CONDUIT AT ELEV 679.50 FT

MAXIMUM OPERATION LEVEL AT ELEV 738.00 FT (FROM OPERATI
MINIMUM OPERATION LEVEL AT ELEV 679.50 FT

ROUTING STARTS AT ELEV 738.00 FT, ENDS AT ELEV 679.50 FT

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		738.00			
		0.				
0	12		733.64	0.	0.	519.
		0.				
1	0		729.41	0.	0.	503.
		0.				
1	12		725.30	0.	0.	488.
		0.				
2	0		721.33	0.	0.	472.
		0.				
2	12		717.49	0.	0.	453.
		0.				
3	0		713.82	0.	0.	434.
		0.				
3	12		710.31	0.	0.	414.
		0.				
4	0		706.95	0.	0.	395.
		0.				
4	12		703.76	0.	0.	376.
		0.				
5	0		700.73	0.	0.	356.
		0.				
5	12		697.37	0.	0.	335.
		0.				
6	0		695.14	0.	0.	325.
		0.				
6	12		692.55	0.	0.	302.
		0.				
7	0		690.17	0.	0.	274.
		0.				
7	12		686.03	0.	0.	242.
		0.				
8	0		686.17	0.	0.	208.
		0.				
8	12		684.58	0.	0.	175.

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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
9	0		683.26	0.	0.	145.
		0.				
9	12		682.17	0.	0.	119.
		0.				
10	0		681.28	0.	0.	97.
		0.				
10	12		680.56	0.	0.	78.
		0.				
11	0		679.97	0.	0.	63.
		0.				
11	12		679.50	0.	0.	51.

****

RESERVOIR ELEVATION WENT UNDER MINIMUM WATERSURFACE ELEVATION
AFTER 11 DAYS AND 12 HOURS

TOTAL INFLOW VOLUME	0.	ACFT
TOTAL DISCHARGE VOLUME	7319.	ACFT
MAXIMUM WATER SURFACE ELEVATION	738.00	FT
MAXIMUM DISCHARGE THRU DIVERSION CONDUIT	519.	CFS
MAXIMUM TOTAL INFLOW	0.	CFS
MAXIMUM TOTAL DISCHARGE	533.	CFS

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CHARLOTTEBURG DAM RESERVOIR DRAWDOWN STUDY (DA = 53.7 SQ. MI.)

1.0000 UNREGULATED DIVERSION CONDUIT AT ELEV 679.50 FT

MAXIMUM OPERATION LEVEL AT ELEV 738.00 FT (FROM OPERAT
MINIMUM OPERATION LEVEL AT ELEV 679.50 FT

ROUTING STARTS AT ELEV 738.00 FT, ENDS AT ELEV 679.50 FT

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		738.00			
		107.				
0	12		734.52	0.	0.	522.
		107.				
1	0		731.13	0.	0.	510.
		107.				
1	12		727.85	0.	0.	497.
		107.				
2	0		724.66	0.	0.	486.
		107.				
2	12		721.56	0.	0.	473.
		107.				
3	0		718.60	0.	0.	459.
		107.				
3	12		715.75	0.	0.	444.
		107.				
4	0		713.02	0.	0.	429.
		107.				
4	12		710.41	0.	0.	414.
		107.				
5	0		707.92	0.	0.	400.
		107.				
5	12		705.55	0.	0.	387.
		107.				
6	0		703.28	0.	0.	373.
		107.				
6	12		701.14	0.	0.	359.
		107.				
7	0		699.12	0.	0.	344.
		107.				
7	12		697.20	0.	0.	333.
		107.				
8	0		695.36	0.	0.	324.
		107.				
8	12		693.61	0.	0.	312.

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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	PAGE Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
9	0	107.	691.98	0.	0.	296.
9	12	107.	690.49	0.	0.	278.
10	0	107.	689.15	0.	0.	259.
10	12	107.	687.97	0.	0.	240.
11	0	107.	686.94	0.	0.	222.
11	12	107.	686.05	0.	0.	206.
12	0	107.	685.30	0.	0.	190.
12	12	107.	684.66	0.	0.	177.
13	0	107.	684.14	0.	0.	165.
13	12	107.	683.70	0.	0.	155.
14	0	107.	683.34	0.	0.	146.
14	12	107.	683.04	0.	0.	139.
15	0	107.	682.79	0.	0.	134.
15	12	107.	682.59	0.	0.	129.
16	0	107.	682.43	0.	0.	125.
16	12	107.	682.29	0.	0.	122.
17	0	107.	682.18	0.	0.	119.
17	12	107.	682.09	0.	0.	117.
18	0	107.	682.02	0.	0.	115.
18	12	107.	681.96	0.	0.	113.
19	0	107.	681.91	0.	0.	112.
19	12	107.	681.87	0.	0.	111.
20	0		681.84	0.	0.	111.

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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
20	12	107.	681.81	0.	0.	110.
21	0	107.	681.79	0.	0.	109.
21	12	107.	681.78	0.	0.	109.
22	0	107.	681.76	0.	0.	109.
22	12	107.	681.75	0.	0.	108.
23	0	107.	681.74	0.	0.	108.
23	12	107.	681.73	0.	0.	108.
24	0	107.	681.73	0.	0.	108.
24	12	107.	681.72	0.	0.	108.
25	0	107.	681.72	0.	0.	107.
25	12	107.	681.71	0.	0.	107.
26	0	107.	681.71	0.	0.	107.
26	12	107.	681.71	0.	0.	107.
27	0	107.	681.71	0.	0.	107.
27	12	107.	681.71	0.	0.	107.
28	0	107.	681.70	0.	0.	107.
28	12	107.	681.70	0.	0.	107.
29	0	107.	681.70	0.	0.	107.
29	12	107.	681.70	0.	0.	107.
30	0	107.	681.70	0.	0.	107.
30	12	107.	681.70	0.	0.	107.
31	0	107.	681.70	0.	0.	107.
31	12		681.70	0.	0.	107.

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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
32	0	107.	681.70	0.	0.	107.
32	12	107.	681.70	0.	0.	107.
33	0	107.	681.70	0.	0.	107.
33	12	107.	681.70	0.	0.	107.
34	0	107.	681.70	0.	0.	107.
34	12	107.	681.70	0.	0.	107.
35	0	107.	681.70	0.	0.	107.
35	12	107.	681.70	0.	0.	107.
36	0	107.	681.70	0.	0.	107.
36	12	107.	681.70	0.	0.	107.
37	0	107.	681.70	0.	0.	107.
37	12	107.	681.70	0.	0.	107.
38	0	107.	681.70	0.	0.	107.
38	12	107.	681.70	0.	0.	107.
39	0	107.	681.70	0.	0.	107.
39	12	107.	681.70	0.	0.	107.
40	0	107.	681.70	0.	0.	107.
40	12	107.	681.70	0.	0.	107.
41	0	107.	681.70	0.	0.	107.
41	12	107.	681.70	0.	0.	107.
42	0	107.	681.70	0.	0.	107.
42	12	107.	681.70	0.	0.	107.
43	0		681.70	0.	0.	107.

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TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	Outlet DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		107.				
43	12		681.70	0.	0.	107.
		107.				
44	0		681.70	0.	0.	107.
		107.				
44	12		681.70	0.	0.	107.
		107.				
45	0		681.70	0.	0.	107.
		107.				
45	12		681.70	0.	0.	107.
		107.				
46	0		681.70	0.	0.	107.
		107.				
46	12		681.70	0.	0.	107.
		107.				
47	0		681.70	0.	0.	107.
		107.				
47	12		681.70	0.	0.	107.
		107.				
48	0		681.70	0.	0.	107.
		107.				
48	12		681.70	0.	0.	107.
		107.				
49	0		681.70	0.	0.	107.
		107.				
49	12		681.70	0.	0.	107.
		107.				
50	0		681.70	0.	0.	107.

TOTAL INFLOW VOLUME	11094.	ACFT
TOTAL DISCHARGE VOLUME	18137.	ACFT
MAXIMUM WATER SURFACE ELEVATION	730.00	FT
MAXIMUM DISCHARGE THRU DIVERSION CONDUIT	522.	CFS
MAXIMUM TOTAL INFLOW	107.	CFS
MAXIMUM TOTAL DISCHARGE	533.	CFS

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CHARLOTTE GURG DAM
RESERVOIR EVACUATION
WITH CONSTANT INFLOW

SHEET NO. 3 OF
JOB NO. 1209-051-1
BY KLB DATE 7-19-79

HEAD (FT)	VOLUME (AC-FT)	TOTAL DISCHARGE (CFS) (FROM GRAPH)	INFLOW (CFS)	AVAILABLE DISCHARGE (CFS)	EVACUATION TIME (HR)
63.5	403.21	525.	107.4	417.6	11.68
60.0	576.30	510.	107.4	402.6	17.32
55.0	576.30	491.	107.4	383.6	18.18
50.0	576.30	471.	107.4	364.6	19.13
45.0	576.30	447.	107.4	339.6	20.53
40.0	576.30	420.	107.4	312.6	22.31
35.0	576.30	392.	107.4	284.6	24.50
30.0	576.30	361.	107.4	253.6	27.50
25.0	576.30	328.	107.4	220.6	31.61
20.0	576.30	287.	107.4	179.6	38.83
15.0	576.30	234.	107.4	126.6	55.08
10.0	576.30	167.	107.4	59.6	117.00
5.0	576.30	70.	107.4	—	—
0.0					
TOTALS	7319.	—	—	—	403.67 HR.

INFLOW ≈ OUTFLOW AFTER 403.67 HR OR 16.82 DAYS

= 16.82 DAYS

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CHARLOTTE RICE DAM
RESERVOIR EVACUATION
WITH ZERO INFLOW

SHEET NO. 4 OF 30
JOB NO. 1209-001-1
BY KLB DATE 7-18-78

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HEAD (FT)	VOLUME (AC-FT)	TOTAL DISCHARGE (CFS) (FROM CURVE)	EVACUATION TIME (DAYS)
63.5			
	403.21	525.	9.29
60.0			
	576.30	510.	13.67
55.0			
	576.30	491.	14.20
50.0			
	576.30	472.	14.77
45.0			
	576.30	447.	15.60
40.0			
	576.30	420.	16.60
35.0			
	576.30	392.	17.79
30.0			
	576.30	361.	19.32
25.0			
	576.30	329.	21.26
20.0			
	576.30	287.	24.30
15.0			
	576.30	234.	29.80
10.0			
	576.30	167.	41.76
5.0			
	576.30	70.	99.62
0.0			
TOTALS	7319.	—	337.98

RESERVOIR EVACUATION TIME = 337.98 HR or 14.08 Days
= 14.08 DAYS

APPENDIX E

STABILITY CALCULATIONS

CONSULTING ENGINEERS

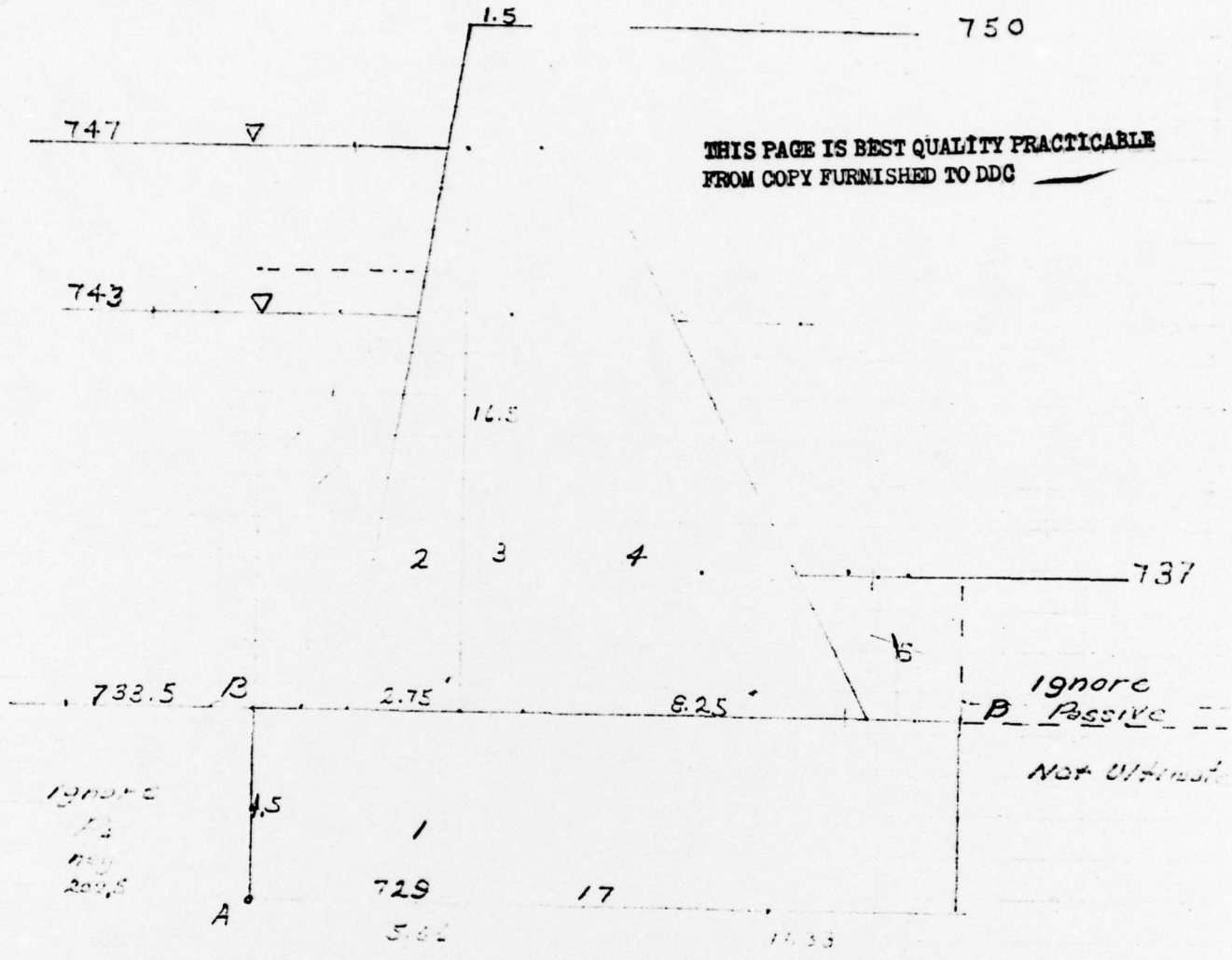
River Wall WEIGHTS

COMPUTED BY HK CHECKED BY TJM

Job No. 10-924-02 1

Date Aug 4, 1975

Sta 17+00



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11475

1	17 X 4.5 X 150	17/2	97537.5 ✓
	3403.1 ✓	4.06	
2	$\frac{2.75}{2}$ X 16.5 X 150	2.25 + 2.75 X 2/3	13896 ✓
	3712.5 ✓		
3	16.5 X 1.5 X 150	5 + 1.5/2	21346.9 ✓
	10209.4 ✓		
4	$\frac{6.25}{2}$ X 16.5 X 150	6.5 + 6.25/3	94437 ✓
	1312.5 ✓ 656.25		10,171.9
5	$\frac{2.25+4}{2}$ X 3.5 X 2.0 60	15.5	~~20343.8~~ ✓
	~~30112.5~~ ✓		~~247561.2~~ ✓
	29456.3	$\bar{x} = \frac{247561.2}{30112.5} = 8.2$	$\frac{237389.3}{29,456.3} = 8.1$

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SUBJECT [illegible] SHEET NO. 2 OF 7
JOB NO. [illegible]
COMPUTED BY [illegible] CHECKED BY TJM DATE 9-1-73

H.W. Elev. 741

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P_{w_1}	$\frac{2.5 \times 13.5 \times 62.5}{2}$ (2.5×7)	1.5 Graphical	5126.9
Σ_1	32,304		2425151
P_{w_1}	$\frac{1}{2} \times 9^2 \times 62.5$ (19.125)	10/3	63,750
			3082451
$-P_{w_1}$	$\frac{1}{2} \times 5^2 \times 62.5$ (2000)	8/3	5333.
			2979321

$$\bar{Y} = \frac{2979321.}{32,304.} = 9.2 \qquad \frac{17}{3} = 5.67 \rightarrow 11.33$$

within middle third

Uplift

$\frac{1}{2} \times 15 \times 17 \times 62.5$ (9562.5)	17/3	541875
$\frac{1}{2} \times 6 \times 17 \times 62.5$ (4250)	$17 \times 2/3$	481541.7
		1023541
-13812.5		
Σ 19491.5		195578

$$\bar{Y} = \frac{195578}{19491.5} = 10.6 < 11.33$$

within middle third

$$\frac{1587.7}{19491.4}\left(1 \pm \frac{12.6}{17}\right) = \begin{matrix} +1692.6 \\ +262.8 \end{matrix}$$

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CONSULTING ENGINEERS

SUBJECT CHARLOTTEBURG RIVERWALL HOR & UPLIFT FORCES
SHEET No. 3 OF 7
JOB No. 10-924-02
COMPUTED BY HK CHECKED BY TJM
DATE 6/14/72

HW ELEV 743

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$P_{w1} = \frac{2.2 \times 18 \times 2.5}{2}$

$\bar{Y} = \frac{263513.1}{31202.2} = 8.4$

Uplift

$\frac{1}{2} \times 14 \times 17 \times 62.5$

$\frac{42.50}{-11697.5}$

$\bar{X} = \frac{173,200.6}{19564.7} = 8.9$

$\Sigma M_y = 173,200.6$

$8.9 - 8.5 = .4$

$\frac{19564.7}{17}\left(1 \pm \frac{6e}{17}\right)$

5.67	9.2	11.33

$1150.86 \times 1.014176 = 1167.1$

$1150.86 \times .985882 = 1134.6$

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SUBJECT Charlottesburg Knowall Sliding
COMPUTED BY MK CHECKED BY TJM
SHEET NO 4 OF 7
JOB NO 1-92406
DATE 2-7-75

HW 1 Nov 74

Sliding without uplift

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S = N tan ϕ + ...

Sheet 2

S = 32304 x .577 = 18639

F.S. = 18639 / 8125 = 2.29 without passive

Sliding with uplift

Sheet 3

S = 18491.5 x .577 = 10669.2

F.S. = 10669.2 / 8125 = 1.31 without passive

Add Passive from footing keyed

7325 - 72 = 4.5'

$\frac{1}{2}$ x 4.5 x ... x 810 = 1822.5 ← ϕ not actually a plan shear case ... should be more

F.S. = 12492 / 8125 = 1.54

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SUBJECT Charlottesburg Retaining Wall Studies
COMPUTED BY W.K. CHECKED BY T.J.A.
SHEET NO. 5 OF 7
JOB NO. [illegible]
DATE [illegible]

H.W. Elev. 747

What cohesion was to be required with a factor of safety of 1.5

With upper 4 coarse from footing level

$$\frac{\Sigma M_{OS} \pm 1822.5}{8125} = 1.5$$

$C_0 = 610$ p.s.f

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SUBJECT Charlotteburg River Wall
COMPUTED BY HK CHECKED BY TJM

SHEET NO. 6 OF 7
JOB NO. [illegible]
DATE 2-4-72

HK Elev +12

Sliding without uplift

S = 9,252.23 x .577 = 15,982.5 Steel

F = 6125 + 2000 = 4125 Steel

F.S = 15,982.5 / 4125 = 4.37

Sliding with uplift

F.S = 12,804.7 x .577 / 4125 = 2.74

Add Passive from footing level

F.S = 11,299.9 + 1822.5 / 4125 = 3.17

What cohesion is required for factor of safety of 1.5

With uplift passive from footing level

1760 + 1822.5 / 4125 = 1.5

C = 237 psf

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SUBJECT Charlottetown Dam Wall
COMPUTED BY HK CHECKED BY TJ

SHEET No. 7 OF 7
JOB No. 12-32-21-32
DATE Aug 4, 1975

Σ = without uplift

10,000		170,000
ΣV	3125.2	Sheet 4
		24,312.5
Pwt. 6.125		25,500
- Pw = 2001.		- 3383
	3125.2	433513.1

$$\bar{X} = \frac{433513.1}{3125.2} = 138.7$$

Σ = with uplift

Sheet 4

$$\bar{Z} = \frac{343,208.6}{433513.1 - 90,312.5} \quad \text{Sheet 4}$$

$$\frac{}{19,544.7}$$

= 17.5 outside dam

Sliding Uplift and passive

$$F.S. = \frac{4299.8 + 1622.5}{10,000 + 4125} = .93 \quad \text{Sheet 7}$$

Using F.S. = 1.5

$$c_a = \frac{1700 + 1622.5}{4125} = 1.5$$

c_a = 1189 p.s.f

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SUBJECT SUMMARY OF CONDITION — SHEET NO. 1 OF 8
CHARLOTTEBURG RIVERWALL — JOB NO. 10-924-01
COMPUTED BY HK — CHECKED BY TJM — DATE 8/25/82

Case	Condition (1)	Location of Resultant (Feet Left of Heel	$\frac{\text{Shear}}{\text{Normal}}$	Stress Heel	Stress Toe	Sliding Resistance Factor (2)	Required (2) c.p.s.f.
1	Station 1740 Headwater 743 Tailwater 737	8.9	.21	998.4	1313.2	3.2	257
2	Station 1740 Headwater 747 Tailwater 737	10.6	.44	252.9	1692.6	1.5	610
3	Station 1740 Headwater 743 Tailwater 737 2'o/Price	12.5	.72	—	—	.93	1139

1 All cases shown, computed using full uplift

2 Passive consideration between e/ow, 733.5 and 729

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7. AUTHOR(s) Robert Gershowitz, P.E.		8. CONTRACT OR GRANT NUMBER(s) DACW61-78-C-0124
9. PERFORMING ORGANIZATION NAME AND ADDRESS Harris-ECI Associates 453 Amboy Ave. Woodbridge, N.J. 07095		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams--N.J.
National Dam Safety Program Phase I
River Wall Dam, N.J.
Dam Safety
Dam Inspection

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

78 10 10 142

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