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

NAPEN-D

3 JUL 1978

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

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Round Valley North Dam and Round Valley Dyke in Hunterdon 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 and the dyke's condition is given on the first two pages of the report.

Based on visual inspéction, available records, calculations and past operational performance, Round Valley North Dam and Round Valley Dyke are judged to be in fair condition. To insure adequacy of the structures, the following actions, as a minimum, are recommended:

a. Installation of piezometers on both structures should be initiated within one month from the date of approval of this report and a new stability analysis performed if the readings differ significantly from the design assumptions. In addition, the embankments should be monitored continuously for signs of increased seepage and/or turbid water.

b. Within three months from the date of approval of this report, the cracks in the paving on the crest of Round Valley North Dam should be excavated in several locations to determine if they extend below the macadam surface. Alternatively, an acoustic emission monitoring system together with a marking system, such as paint marks at selected cracks and extension of the cracks, could be provided.

c. Within one year from the date of approval of this report, the upstream slope protection should be repaired to provide a suitable well graded riprap layer.

# NAPEN-D Honorable Brendan T. Byrne

Two copies of the report are 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 Congresswoman Helen S. Meyner of the Thirteenth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, thirty 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,

l Incl As stated

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AARRY V. DUTCHYSHYN Colonel, Corps of Engineers District Engineer

Cy Furn: Mr. Dirk C. Hofman, P.E. Department of Environmental Protection

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Name of Dam: Round Valley North Dam and Round Valley Dike County and State: Hunterdon County, State of New Jersey Inventory Numbers: North Dam - NJ 00013; North Dike - NJ 00022

### PHASE I INSPECTION REPORT

# NATIONAL DAM SAFETY PROGRAM

Prepared by: O'Brien & Gere Engineers, Inc. Justin & Courtney Division

For: United States Army Corps of Engineers Philadelphia District

Date: May 24, 1978

# PHASE I REPORT NATIONAL DAM SAFETY PROGRAM

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Name of Dam Round Valley North Dam and Round Valley Dike

State Located <u>New Jersey</u> County Located <u>Hunterdon</u> Stream <u>Tributary to South Branch Rockaway Creek</u> Dates of Inspection <u>April 19 and April 24, 1978</u>

# ASSESSMENT OF GENERAL CONDITIONS

The Round Valley North Dam and Dike appear to be stable. However, areas of surface wetness, standing water, and seepage were observed on the downstream slopes of both structures and were most evident along the berns and lower third of the downstream slopes. These observations indicate that the phreatic line, for both the North Dam and Dike, may intersect the downstream slope above the filter blanket or rock toe. A swamp area immediately downstream of the Dike toe is an indication that seepage may be coming from the rock foundation or active springs in addition to the flow from the embankment. Piezometers should immediately be installed to monitor pore pressures throughout both embankments, and the resulting data evaluated and compared with design assumptions to determine the need for further analysis of embankment stability. Provisions should be made for regular measurement of flow from the embankment drains.

Inspection of the rock riprap used for the upstream slope protection of both embankments revealed signs of rock size segregation and material deterioration. The riprap should be supplemented to provide a well graded, protective layer.

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Vertical cracks, observed along the crest of the North Dam, may be due to temperature changes, and/or lateral movement in the embankment. The area in the vicinity of the cracks should be excavated in several locations to determine if the cracks extend into the embankment material beneath the macadam.

The appurtenant structures associated with the North Dam appear to be sound, and are well maintained.  $4 \frac{23}{3}$ 

O'BRIEN & GERE ENGINEERS; INC JUSTIN & COURTNEY DIVISION, Vice President

Based on visual inspection, abailable records, calculations and past operational performance, Round Valley North Dam and Round Valley Dyke are judged to be in fair condition. To insure adequacy of the structures, the following actions, as a minimum, are recommended:

a. Installation of piezometers on both structures should be initiated within one month from the date of approval of this report and a new stability analysis performed if the readings differ significantly from the design assumptions. In addition, the embankments should be monitored continuously for signs of increased seepage and/or turbid water.

b. Within three months from the date of approval of this report the cracks in the paving on the crest of Round Valley North Dam should be excavated in several locations to determine if they extend below the macadam surface. Alternatively, an acoustic emission monitoring system together with a marking system, such as paint marks at selected cracks and locations, and measurements to provide a means of observing any enlargement and extension of the cracks, could be provided.

c. Within one year from the date of approval of this report, the upstream slope protection should be repaired to provide a suitable well graded riprap layer.

APPROVED: . DUTCHYSHYN

HARRY N. DUTCHYSHYN Colonel, Corps of Engineers District Engineer

DATE



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### PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM NAME OF DAMS <u>ROUND VALLEY NORTH DAM</u> ID# 00013 ROUND VALLEY DIKE ID# 00022

# SECTION I - PROJECT INFORMATION

# 1.1 GENERAL

a. <u>Authority</u> - This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with contract #DACW61-78-C-0052 between O'Brien & Gere Engineers, Inc., Justin & Courtney Division, and the United States Army Corps of Engineers, Philadelphia District.

b. <u>Purpose of Inspection</u> - The purpose of this inspection is to evaluate the structural and hydraulic conditions of Round Valley North Dam, Round Valley Dike, and appurtenant structures, and to determine if the Dam or Dike constitutes a hazard to human life or property.

1.2 <u>DESCRIPTION OF PROJECT</u> (from information supplied by New Jersey Department of Environmental Protection)

a. <u>Description of Dam, Dike, and Appurtenances</u> - Round Valley reservoir is located in the foothills of Hunterdon County, about one mile south of Lebanon, New Jersey. The impoundment area was formed by the construction of two dams (North and South) and a dike. The North Dam is constructed across a tributary of the South Branch of Rockaway Creek, which drains to the North Branch of the Raritan River. The Dike, which is about one-half mile west of the North Dam, is constructed across a swale which drains toward the South Branch of Rockaway Creek. The South Dam is constructed across Prescott Brook.

According to the design drawings, by Porter, Urquhart, McCreary & O'Brien, Round Valley North Dam and Round Valley Dike are rolled earth embankments which consist of the following types of materials:

1) Zone I Impervious Fill forms the core of the embankments and the backfill of the impervious core trenches.

2) Zone 2 Fill forms a portion of the outer shells of the embankments. Specified compaction requirements are similar to those required for Zone I, but the specified gradation requirements are suitable to a more pervious material than Zone I.

3) Zone 3 Random Fill forms the remainder of the embankment shell of the North Dam. Specified compaction requirements vary depending on the degree of earth or rock fragments contained in the excavation from the borrow areas.

filter.

4) Downstream filter blanket and slope protection

5) Rock toe and dumped rock slope protection.

The Dam has a maximum height of about 134 feet and is approximately 1,460 feet long. The top width of the Dam is 30 feet, and consists of an 11 foot wide bituminous surfaced roadway with 9.5foot wide, grass covered shoulders on each side. The upstream slope is 3:1 (horizontal:vertical); the downstream slope is 2.5:1 and is provided with three gutter berms and a wide, Random Fill toe berm sloped at approximately 5 percent (20:1). Refer to Figure 5 for details concerning transverse sections of the embankment.

The Dike has a maximum height of about 78 feet and is approximately 2,335 feet long. The top width is 40 feet, and consists of a 22-foot wide macadam roadway with 6-foot wide macadam shoulders and grassed berms on each side. The upstream slope of the Dike is 3:1 (horizontal:vertical); the downstream slope is 2.5:1 and is provided with a gutter berm and a toe ditch. Refer to Figure 8 for details of Dike sections.

A rectangular concrete Outlet Tower (35 feet by 29 feet) is located at the upstream toe of the North Dam. The tower houses two outlet shafts with sluice gates located at three levels for water quality control. Seventy-two (72) inch diameter conduits, located at the base of each outlet shaft, are used for water releases. The conduits are steel encased in concrete, extending about 1,000 feet from the Outlet Tower to a rectangular concrete valve vault. The vault is located just downstream of the Random Fill toe berm.

The Dam, Dike and Appurtenant Structures are owned and operated by the New Jersey Department of Environmental Protection, Division of Water Resources. The primary purpose of the structures is impoundment of water to supplement the water supply for north central New Jersey. The reservoir area has also been developed as a recreational area.

The structures for Round Valley Reservoir project were designed by Porter, Urquhart, McCreary, & O'Brien, Consulting Engineers, of Newark, New Jersey. The construction application was submitted to the State of New Jersey Department of Conservation, Division of Water Policy and Supply, on March 1, 1961, and approval

was granted on May 31, 1961. On March 30, 1961 the construction contract for the North Dam, the South Dam, and the Dike was awarded to C.J. Langenfelder & Son, Inc., of Baltimore, Maryland. Information on the construction of the North Dam and Dike included extensive commentary concerning the inability of the contractor to meet specified compaction criteria during the initial stages of construction. The specifications required that "each layer of the embankment shall be compacted ... to secure a dry density of not less than 95 percent of the maximum dry density as determined by the AASHO Method T99 as modified herein, for Zone I and Zone 2." Compaction tests generally gave results ranging from 88 to 95 percent of the modified AASHO requirements. The embankment compaction was observed by Mr. Thomas Fluhr, Engineering Geologist with the State of New Jersey. In a Progress Memorandum dated October 26, 1961, he stated that the embankment "is being thoroughly compacted."

The original stone rubble gutter berms were found to be unacceptable and in 1970 were replaced with concrete gutters.

b. <u>Size Classification</u> - The Round Valley Reservoir was designed for a storage volume of 55 billion gallons (168,000 acre-feet) at the maximum operating pool elevation of 385 feet mean sea level (MSL). The maximum heights of the North Dam and the Dike are 134 feet and 78 feet respectively. Since the normal storage volume exceeds 50,000 acre-feet, the dam and dike are in the large size category as defined by the <u>Recommended Guidelines for Safety</u> Inspection of Dams.

c. <u>Hazard Classification</u> - The Town of Lebanon, New Jersey is located within a mile of both the North Dam and the Dike. The topography downstream of both structures is such that flow would be directed towards the Town of Lebanon. A failure of either the North Dam or Dike could result in the loss of many lives and extensive economic losses. Therefore, both structures are in the high hazard category as defined by the <u>Recommended Guidelines for</u> Safety Inspection of Dams.

1.3 <u>PERTINENT DATA</u> (from information supplied by New Jersey Department of Environmental Protection)

a. <u>Drainage Area</u> - The drainage area of the Round Valley Reservoir is about 5.4 square miles, as determined by use of United States Geological Survey quadrangle sheets (7.5 minute), for Flemington, New Jersey, and Califon, New Jersey. The surface area of the reservoir at maximum operating pool (Elevation 385.0) is about 3.6 square miles.

b. <u>Discharges</u> - Discharge from the reservoir is accomplished through operation of sluice gates located in the North Dam Outlet Tower. Each of the two outlet shafts is equipped with three rectangular sluice gates: a 3-foot by 5-foot gate at Elevation 357.0, and 5-foot by 6-foot gates at Elevations 307.0 and 270.0.

A statutory conservation discharge of 0.17 million gallons per day must be maintained to the tributary to South Branch Rockaway Creek.

Round Valley is a pumped-storage water supply reservoir; therefore, construction of a spillway was not considered necessary.

c. Reservoir Data

Maximum Operating Pool (Reservoir at Elevation 385.0) Length - 8,000 feet (maximum) Area - 2,300 acres Volume - 168,000 acre-feet

Top of Dam and Dike (Elevation 395.5) Length - 8,000 feet (maximum Area - 2,400 acres Volume - 193,000 acre-feet

Maximum Pool (PMF - Elevation 388.0) Length - 8,000 feet (maximum) Area - 2,300 acres Volume - 175,000 acre-feet

d. Dam Data

Type - earth embankment

Top elevation - 395.5 feet (North Dam), 395.65 (Dike)

Streambed elevation at centerline of dam - 262.0 feet (North Dam)

Length - 1,460 feet (North Dam), 2,335 feet (Dike)

Top width - 30 feet (North Dam), 39 feet (Dike)

Side slopes - upstream slope 3:1 (horizontal to vertical); downstream slope 2.5:1

Zoning - three zones as explained in Section 1.2.a Impervious core - Zone 1 material

Cutoff - 4-foot thick concrete cutoff from the bottom of the core trench to sound rock.

Grout Curtain - Grouting of the rock foundation was specified along the centerline axis of both the North Dam and Dike. Specified grout holes were spaced at 10-foot centers along each axis and staggered 1.5 feet about the axis. The specified depth of zoned grouting varied from 10 feet to 50 feet across the North Dam, and from 30 feet to 150 feet across the Dike.

e. Outlet Works - See Section 1.3.b.

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f. <u>Engineering Data</u> - The information available for review of Round Valley North Dam and Dike included:

1) A set of 52 drawings for the Round Valley Reservoir Project, North Dam, Dike, and Appurtenant Structures (Contract RV-2).

2) Special Report 15, State of New Jersey, Department of Conservation and Economic Development, August 1958.

3) Contract RV-2, State of New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply.

4) Correspondence, Construction Inspection Reports, and Miscellaneous Reports.

5) Documents supplied by the Bureau of Water Facility Operations, Clinton, New Jersey (see page A10).

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# 2.1 FINDINGS

a. <u>General</u> - The field inspection of the embankments of the North Dam and Dike took place on April 24, 1978. The outlet works associated with the North Dam were inspected on April 19, 1978. The reservoir water surface elevation was about 381 feet MSL during both inspection visits. No underwater areas were inspected.

b. North Dam - The riprap on the upstream face of the dam is a poorly graded mix of large angular rocks (2 to 4 feet in diameter) and small rocks (6 inches or less in diameter). There is little uniformity in the distribution and placement of the rocks. The upper portion of the embankment appears to differ from the design drawings. The drawings indicate a 3:1 slope for the upstream face with no benches. The visible portion of the upstream face appeared to have a steeper slope (about 2:1) and a 10 to 15-foot bench just below the water surface. Some driftwood was noted within 2 to 3 feet of the top of the dam. On the east side of the embankment is an area of about 25 square feet that is free of riprap.

Small vertical cracks were observed in the macadam roadway on the top of the dam. The cracks are parallel to the crest of the dam, and appear to be continuous from the Outlet Tower Bridge to about 200 feet from the east abutment. Settlement up to 12 inches was observed in an area on the roadway near the bridge.

Standing water was noted at several locations, above the top berm, on the downstream slope of the dam. The wet spots were located where it was reported that grass mowing equipment had left impressions in the slope. An area of local settlement was observed above the top berm opposite the Outlet Tower. This area may be over the alignment of the twin 72 inch pipes that are constructed under the dam. On the downstream slope, and area of standing water was observed just above the middle (second) berm, approximately 200 feet from the west abutment. The area is at least 200 feet long and extends above the berm for about 30 feet. There was also evidence of water flowing out of the embankment about 3 feet above the middle berm, approximately 100 feet from the east abutment. A broad undulating depression was observed along the west abutment drainage gutter. It extended from the bottom (third) berm to the middle berm, and is about 100 feet wide. A number of springs were observed along the east abutment. Discharge from the springs has been directed into the drainage ditch. A discharge in excess of 1 cfs from the filter blanket drain and rock toe was observed.

c. <u>North Dike</u> - The riprap protection on the upstream face of the Dike is very similar to the riprap on the North Dam. Small trees that had started growing on the upstream slope have been cut at rock level.

X

The central 300 to 400 feet of the downstream slope below the berm was generally very moist with a significant growth of reeds. The area immediately downstream from the embankment was marshy and overgrown with reeds. A local settlement area was observed on the downstream slope near the center of the embankment just above the toe.

Three drop inlets were observed: one at each abutment along the toe, and one at the center of the embankment berm. Runoff and seepage is directed from each of the drop inlets to a common basin near the center of the embankment toe. A corrugated metal pipe extends from the central basin to the marshy area located just downstream from the toe. At the time of inspection, water was flowing into each of the inlets.

d. Outlet Tower and Appurtenances (See Figure 6) - The condition of the Outlet Tower and bridge appeared to be excellent. The gates could not be operated during the inspection, but Mr. Chase, Supervising Engineer at the Bureau of Water Facilities Operations, in Clinton, New Jersey, stated that no problems have been encountered during gate operation. The assemblies and motors showed no external signs of wear or deterioration. A mobile gasoline operator is available for use, in case of an electrical failure. Stoplogs are available for use. The valve vault located about 1,000 feet downstream of the embankment also appeared in good condition. The inspection team walked the 72 inch diameter discharge pipes to the base of the Outlet Tower. The 72 inch lines are normally pressurized only during testing at the release works. At the base of the Outlet Tower, an insignificant amount of seepage was noted through the tower wall, as well as minor honeycombing of the concrete. The pipes are coated with coal tar epoxy enamel. At the joints, some rust had broken through the coating, but it is not serious.

e. <u>Reservoir Area</u> - The natural valley walls surrounding the reservoir have moderate slopes and are well covered with trees and brush. A dike has been constructed across a narrow portion of the reservoir in the north-west corner. The dike separates a swimming area from the main body of the reservoir.

f. <u>Downstream Channel</u> - A tributary to South Branch Rockaway Creek originates at the North Dam. A railroad spans the channel about 2,000 feet downstream of the embankment. Drainage downstream of the North Dike is directed toward a minor tributary of the South Branch Rockaway Creek.

### SECTION 3 - HYDROLOGY/HYDRAULICS

The design flood used for the Round Valley Reservoir structures is the Probable Maximum Flood (PMF), according to the <u>Recommended Guidelines for Safety Inspection of Dams</u>. The reservoir surface at the maximum operating level (Elevation 385.0), comprises about two-thirds of the drainage area. Spillways were not considered necessary in any of the project structures, since the freeboard included allowance for storage of the PMF. The PMF was derived from the adjusted 48 hour Probable Maximum Precipitation (PMP). The volume of rainfall (PMP) that falls on the land portion of the basin was added to storage after adjustment for losses. The volume of rainfall (PMP) that falls on the reservoir portion of the basin was added to storage assuming no losses. The 48 hour PMP would raise the reservoir water surface about 3 feet. The minimum allowable freeboard at maximum pool is estimated at 4.4 feet.

The embankments are provided with 10.5 feet of freeboard above the maximum operating pool. Therefore, no difficulty is to be anticipated in adequately storing the rainfall excess of a storm less than or equal to the PMP.

According to Mr. Chase, water releases are restricted to a maximum of 600 million gallons per day (mgd) through the release works on the North Branch Rockaway Creek, and 20 mgd through a bypass line in the pump station on the Raritan River. Mr. Chase added that the maximum discharge into Rockaway Creek could cause severe downstream erosion. Therefore, the reservoir can be drawn down about one foot per day. If a large drawdown were immediately necessary, the pumps at the Raritan River pump station would have to be removed.

# SECTION 4 - STRUCTURAL STABILITY

4.1 VISUAL OBSERVATIONS AND DATA REVIEW - Design analyses for both the North Dam and the Dike were provided by personnel of the New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Water Facility Operation, Clinton, New Jersey. Flow net and stability analyses were performed by the design engineering firm (Porter, Urguhart, McCreary & O'Brien) for maximum operating pool condition (Elevation 385.0) and for rapid drawdown from Elevation 385.0 to Elevation 300.0. Sliding circles with various radii were analyzed for both the upstream and the downstream slopes, with the downstream slope analyzed for permeability ratios  $(K_h/K_v)$  of 2.25 and 9.0. Determination of the most critical circle was made by assuming friction angles of 15, 20, and 25 degrees for circle groups of various radii. Cohesion values necessary to give a constant factor of safety were computed using an abbreviated method of slices for the stability analyses. For a given friction angle, the maximum required cohesion value indicated the radius of the most critical circle. The conventional method of slices was then applied to the critical circle. For the downstream slope, factors of safety were computed as 1.33 for the North Dam and 1.93 for the Dike, with the ratio of horizontal to vertical permeability  $(K_{L}/K_{..})$  assumed to be 9. For the upstream slope, factors of safety were computed as 1.11 for the North Dam, and 1.71 for the Dike.

The flow nets for the North Dam and Dike were constructed by a graphical method, assuming a homogenous embankment and the filter blanket drains to be operable. The design discharge for the drain in each embankment was three times the computed seepage (.0015 cfs or .7 gallons per minute). During the inspection, the flow from the drains of both the North Dam and Dike was in excess of the design discharge.

The design calculations for the Outlet Tower appeared to be satisfactory. The structural loadings used in the design of the tower were for the reservoir at Elevation 300.0 and a wind velocity of 70 miles per hour, and for the maximum ultimate water level of 410.0 feet based on future expansion (See Figure 4).

A comprehensive review of the structural design calculations was beyond the scope of this investigation.

4.2 <u>GEOLOGY AND SEISMIC STABILITY</u> - Both structures are located in the Piemont physiographic province, a lowland containing gently rounded hills and wide valleys. The reservoir is essentially formed by Cushetunk Mountain, a horseshoe shaped Triassic diabase intrusion bounded on the west by Triassic, Paleozolc and older rocks. North Dam lies across a tributary of South Branch Rockaway Creek which follows along a zone of highly fractured, sheared rock in the diabase structure. The foundation of the dam is entirely within the blocky and fractured diabase complex and was thoroughly grouted during construction.

The Dike area is located in a saddle area on a minor tributary of the same creek, noted above, and is underlain by several geologic units along its entire length. Pre-Cambrian gneiss forms the west abutment, and Hardyston quartzite (Cambrian), Triassic Brunswick shale, and Triassic diabase form the valley foundation and right abutment zones. Faulting is the probable mechanism which causes these complex foundation conditions, and the existence of a fault was indicated from borings made during design and shown in geologic profiles in design reports. Extensive foundation treatment was made during construction.

Although several faults are known to exist in the area, and probably beneath the Dam and Dike, they are considered to be very old and inactive. Their occurence should pose no problem regarding the stability of the North Dam or Dike.

Both structures are located within Seismic Risk Zone 1 of the Seismic Zone Map of Contiguous States, and it appears that static stability conditions are satisfactory.

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# SECTION 5 - ASSESSMENT/REMEDIAL MEASURES

ASSESSMENT - The embankments of the North Dam and Dike 5.1 appear to be stable. However, the moisture and wetness of the downstream slopes and seepage associated with the embankments, indicate that the phreatic line may be intersecting the embankment slopes at a point well above the filter blanket or rock toe. It is possible that the rainfall, which occurred previous to the inspection, may have been partially responsible for this condition at the North Dam. The existence of a significant growth of reeds would indicate that the rainfall was not the principal controlling factor for the moist or wet conditions on the downstream slope of the Dike. The existence of a considerable swamp area immediately downstream of the Dike indicates that seepage may be occurring from the foundation rock beneath the embankment, or from active springs in the area. A review of available information shows no evidence of design consideration relating to the drainage of this downstream area.

The riprap on the upstream slopes is poorly graded and inadequate to provide the necessary protection against wave erosion. The rock appears to have been susceptible to stress release or frostwedging against fracture planes. According to Mr. Chase, considerable deterioration of the rock has occurred since its placement at the time of construction. Subsequent wave action has left portions of the embankment unprotected. The vertical cracks along the crest of the North Dam could be simply a sign of temperature change or could indicate a more serious condition relating to lateral movement.

The appurtenances associated with the North Dam appear to be in excellent condition, and should not adversely affect the safety of the embankment.

5.2 <u>REMEDIAL MEASURES</u> - The slope protection for both the North Dam and Dike should be supplemented with large and medium sized rocks to provide a suitable well graded riprap layer.

The embankments of both the North Dam and Dike should immediately be equipped with piezometers to monitor the pore pressure development throughout the embankments.

The area in the vicinity of the vertical cracks along the crest of the North Dam should be excavated in several locations in order to observe if the cracks extend below the macadam surface.

If pore pressures shown by the piezometers differ significantly from those assumed in the design flow nets and stability studies, new embankment stability analyses should be performed using pore pressure distributions (or revised flow nets) based on the piezometer data. The embankments of both the North Dam and Dike should be monitored continuously for signs of increased seepage rates and/or turbid water.

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APPENDIX

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# FIELD INSPECTION REPORT

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Mr. Larry Woscyna Mr. John Garafolo Mr. Albert DePhilippe, Chief of Foundation and Materials Branch, US Army Corps of Engineers, Philadelphia Dist. Mr. A. Gregory Chase, Supervising Engineer, New Jersey Dept. of Environmental Protection, Division of Water Resources New Jersey DEP Walter O'Rourke, Supervisor of Reservoirs, New Jersey Dept. of Environmental Protection, Division of M.S.L. Coordinators -Tailwater at Time of Inspection John Garafolo, Civil Engineer, New Jersey Department of Environmental Protection Larry Woscyna, Civil Engineer, New Jersey Department of Environmental Protection Recorder State New Jersey 450 Temperature Mr. David Campbell Check List Visual Inspection Mr. David Campbell Mr. Albert Depman Phase 1 381 M.S.L. County Hunterdon Rainy Clear Weather \_ Pool Elevation at Time of Inspection 4/19/78 4/24/78 North Dam & Dike Water Resources Mr. John J. Williams Round Valley Inspection Personnel: Mr. Anthony Geiss Mr. George Elias Date(s) Inspection Accompanied by: Name Dam म् म 년년 · A-1

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VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLMAY AND DAM	No problems noted.	None.
ANY NOTICEABLE SEEPACE	NORTH DAM Seepage from several springs along the east abutment was observed. Discharge from the springs was directed to the drainage gutter. Standing water was noted in the middle berm, about 200 feet from the west abutment, with a saturated area extending about 30 feet. up the slope.	The seepage and saturated areas should be monitored regularly.
A-3	DIKE The central 300 to 400 feet of the embankment below the berm was observed to have a significant growth of reeds and several marshy areas. The ground below the embankment was marshy and overgrown with reeds. Three drop inlets were observed; one at each abut- ment along the toe, and one at the cente of the embankment berm. Each of the dro inlets directs runoff and seepage water to a common basin at the center of the embankment toe. The common basin dis- charges into the marshy area below the toe. Water was observed entering each of the inlets.	The seepage and saturated areas should be monitored regularly.
		A RUNAL OF BOCKSTONE CONTRACT

REMARKS OR RECOMMENDATIONS REMARKS OR RECOMMENDATIONS The North Dam outlet tower is equipped with a Stevens paper chart water level recorder. The paper chart was not oper- ating at the time of inspection.	According to the design drawings, None, the dam and dike are equipped with blanket drains. The drains are beneath the embankment, and could not be observed. However, seepage water noted at the toe of both embankments was clear.		
VISUAL EXAMINATION C STAFF GAGE OR RECORI	ORAINS		

VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT INTAKE STRUCTURE OUTLET STRUCTURE	OUTLET WORKS DBSERVATIONS N/A N/A N/A e outlet tower is in excellent condition. very small amount of seepage was observed, ong with some insignificant honeycombing ong with some insignificant honeycombing the concrete at the base of the tower. I how vault for the twin 72 inch diameter pipes located about 1,000 feet downstream of the	REMARKS OR RECONSIGNDATIONS None None
A-5 OGLUMAN Tenero Corte tenero Outlet channel	the full of the north Dam. The building and purtenances appear to be in excellent multion. The full of the north Dam of the full of the full of the full the conduits are twin 72 inch diameter steel thes encased in concrete. The pipes are in ccellent condition, with the exception of one minor rusting of the pipe joints that is usignificant. None	None None

REMARKS OR RECOMMENDATIONS	None	None		0
RESERVOIR	The slopes are moderate and do not appear to affect the safety of the dam.	The reservoir is pumped storage, so sedimentation would not appear to be a problem.		
VISUAL EXAMINATION OF	SIOPES	SEDITENTION	-6	

	DOWNSTREAM CHANNEL	0
VTSHAT, EXAMINATION OF	OBSERVATIONS	REMARKS OR RECONCENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The Tributary to South Branch Rockaway Creek originates from seepage of the fil- ter drains within the North Dam embankment, and discharge is supplemented when necessary to maintain a minimum flow of .17 million gallons per day.	None
SLOPES	Downstream of the North Dam, the stream enters a wide valley of rolling terrain containing the South Branch Rockaway Creek.	None
APPROXIMATE NO. OF HOYES AND POPULATION	The town of Lebanon, New Jersey is located within a mile of the North Dam. The pop- ulation is approximately 1,000 (250 homes).	Nome

ITEM	REMARKS
MONITORING SYSTEMS	Personnel from the New Jersey Department of Environmental Protection, Division of Water Resources, operate and monitor operation of the reservoir.
MODIFICATIONS	Stone rubble drainage gutters across the berms were replaced with concrete gutters in 1970.
HIGH POOL RECORDS	Maximum pool of record was 385.0 in August of 1975.

None noted. POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS A-8 PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS None noted.

MAINTENANCE OPERATION RECORDS

\* • • • •

None noted.

![](_page_51_Picture_0.jpeg)

May 4, 1978

Mr. Gregory Chase Supervising Engineer **Bureau of Water Facility Operations** P.O. Box 5196 Clinton, NJ 09209

Dear Mr. Chase:

Thank you for your cooperation in the Phase I Inspection of the Round Valley Reservoir structures. Below is a list of the documents on loan from your office for this investigation:

By Porter, Uraquhart, McCreary & O'Brien:

- Report on Experimental Grouting, March, 1960. 1)
- Round Valley Reservoir, Design Analysis for South Dam, December, 1959. Round Valley Reservoir, Design Analysis for Dike, December, 1959. 2)
- 3)
- Round Valley Reservoir, Design Analysis for North Dam, December, 1952. 4)
- 5) Outlet Tower, Design Calculations, December, 1959.
- Intake Tower, Design Calculations, June, 1960. 6)
- Engineering Geology of the Round Valley Reservoir, Books 1 & 2, September, 1960. Report of Laboratory Test Results, December, 1959. 7)
- 8)

By Whitman, Requardt & Associates:

Appendices to the Engineering Report, Spruce Run – Round Valley Reservoir Project, September, 1958.

By Fred L. Fox:

Final Report, Solls Operations & Control, January, 1963.

Sincerely,

O'BRIEN & GERE ENGINEERS, INC. JUSTIN & COURTNEY DIVISION

David B. Comphell Design Engineer

DEC/pc

A-10

PHOTOGRAPHS

the address of the

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POOR GRADATION OF RIP RAP ON NORTH DAM EMBANKMENT

A11

HYDROLOGIC AND HYDRAULIC CALCULATIONS

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OURCT ROUND VALLEY	CHECKED BY		

FMT- HYDROLOGY

PR

DRAINAGE AREA = 5.4 SQUARE MILES

RESERVOIR SURFACE AREA ~3.6 SQUARE MILLES

6-HOUR 10 SQUARE MILE PIMP = 26" ZONE = 6

THE DRAINAGE AREA IS LESS THAN 10 SQUARE MILES, SO NO REDUCTION REFLECTING TASIN SIZE IS INCLUDED.

A REDUCTION OF 20°78 IS INCLUDED TO ACCOUNT TOR IMPERFECT FIT OF BASIN AND STOKIN ISOHYETALS.

:. G-HOUL PMP = 20.8"

48 HOUR PMP = 1,26 × 20.8 = 26"

SINCE 2/3 OF THE BASIH IS RESERVOIR SURFACE, MND NO OUTFLOW IS CONSIDERED, IS 48 HOUR PMT IS APPLIED TO THE RECERVOIR WITH LOSSES CONSIDERED ONLY FOR THE OVER BANK AREA.

"KAINFAIL ON THE RESERVOIR 26"

THINFALL ON THE OVERBANKS 26" LOADED (CN=60) \_\_\_\_\_\_\_\_ [0.5" RUNOFF FROM OVERBANKS \_\_\_\_\_\_\_ 19.5"

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NAME OF CLIENT CORPS OF ENGINEERS PROJECT ROUND VALLEY	COMP. BY DBC
TOTAL RISE IN RESERVOIR ELEVAT	. IOH
3.6 S.M. Y 26" + 1.85.M. × 19.5" = =	

= 3 FEET

2

FREEBOARD CALCULATION FROM DESIGN OF SMALL DAMS, P.273.

FETCH = 1.5 MILES

WIND VELOCITY SO MPA

36 S.M.

: WAVE HEIGHT = 2,9 FEET

AUAURE - Z RUAUR

USATER SURFACE, OR 7.4' ABOVE THE MAKIMUM WATER SURFACE, OR 7.4' ABOVE THE MAY INILIN OPERATING POOL.

THE EMBANKMENT IS PROVIDED WITH 10.5' OF FREEDOARD ABOVE THE MAKIMUM OPERATING FOOL, SO THE FREEDOARD ALLOWANCE IS ADEQUATE.

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![](_page_59_Figure_0.jpeg)

	VISUAL EXAMINATION OF CRACKING AND SPALLING CONCRETE SURFACES IN OUTLET CONDUIT	INTAKE STRUCTURE	OUTLET STRUCTURE	OUTLET CHANNEL	EHERGENCY GATE

![](_page_61_Picture_0.jpeg)

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