This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Ashokan Dam was judged to be safe.
HUDSON RIVER BASIN

ASHOKAN DAM
ULSTER COUNTY, NEW YORK
INVENTORY NO. 41

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS
AUGUST 1, 1978
PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: ASHOKAN RESERVOIR (I.D. NO. 41)
State Located: NEW YORK STATE
County Located: ULSTER COUNTY
Stream: HUDSON RIVER BASIN
Date of Inspection: JULY 11 AND 12, 1978

ASSESSMENT

Examination of the available documents and visual inspection of the Olive Bridge Dam, the Ashokan Reservoir Spillway, the Dikes and the appurtenant structures did not reveal any conditions which are unsafe.

The Standard Project Flood inflow to the Ashokan Reservoir is approximately 91,300 cfs while the outflow is only 44,900 cfs. The maximum spillway discharge capacity is estimated to be 209,700 cfs. The project discharge capacity is therefore adequate according to the Corps of Engineers' adopted general principle that structures be designed for the maximum flood characteristic of the region, which is, in practice, the Standard Project Flood.

No remedial measures are required at the present time. Certain measures, however, are recommended regarding:
- Measurement of seepage
- Repairs of curbs, parapet and pavements
- Maintenance of vegetation on embankments
- Repair of a gate valve

Eugene O'Brien
New York No. 29823

Approved By:
Col. Clark H. Benn
New York District Engineer

Date: 10 August 78
HUDSON RIVER BASIN
ASHOKAN RESERVOIR
INVENTORY NO. 41
PHASE 1 INSPECTION REPORT

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ASHOKAN RESERVOIR, INVENTORY NO. 41
HUDSON RIVER BASIN
ULSTER COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority
   The Phase I inspection report herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS, by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection
   The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. General
   Ashokan Reservoir, which is part of the Catskill System supplying water to New York City, is formed by a series of dams, weirs and dikes. The main dam on Esopus Creek is designated as the Olive Bridge Dam. The other water retaining structures are: West, Middle and East Dikes; West Hurley, Woodstock and Glenford Dikes; Dividing Weir, Dividing Weir Dike and Waste Weir. The Dividing Dike and Weir separates the reservoir into two basins, known as the East Basin and the West Basin.

b. Olive Bridge Dam
   The Olive Bridge Dam consists of a cyclopean masonry gravity section extended on each side by earth embankments. The central masonry structure is 1000 ft long; the lengths of the north and south embankment sections (designated as north and south wing), are 2100 and 1550 ft, respectively. According to the documents reviewed (see Section 2) the masonry section is founded entirely on rock and faced upstream and downstream with concrete blocks lain in regular courses. The principal dimensions of the masonry dam are:
Width under coping 23 ft
Width at base (max. section) 190 ft
Maximum height above foundation 252 ft

The top of the masonry dam and earth embankments are used as a two-way highway. There are inlets in the roadway on the top of the masonry dam to drain the surface runoff. The inlets drain to the upper drainage gallery.

The masonry portion of the dam is interrupted by eleven expansion joints each of which is located at an inspection well. There are two additional inspection wells, one at each end of the masonry dam. The internal drainage system consists of the upper and lower drainage galleries which are connected by vertical inspection wells. Inclined drainage wells of hollow, porous concrete blocks drain the upper gallery into the lower gallery. Invert elevation of the upper gallery is at El 590, while the invert of the lower gallery varies by sloping toward the midpoint of the dam. Access to the upper inspection gallery used to be through manholes from the top of dam. (At present, asphalt pavement covers the original brick roadway and the manholes.) The lower gallery connects with a perpendicular access gallery which exits at the toe of the dam. There is a sluice gate at the downstream end of the access gallery which is used to drain the accumulated seepage water from the gallery into the gorge of Esopus Creek. The gate operating stem is accessible from the outside. One 10-inch low level outlet pipe passes through the dam and continues along the access gallery; it terminates in a concrete-lined valve pit at the toe of the dam. Access to the valve is through a metal trap door which is kept locked. It is reported that the outlet pipe was installed to release water for recreational purposes. It is not known if the valve was ever used.

The embankment sections on both sides of the masonry structure have a crest width of 34 ft. The crest elevation is 610 at the upstream side and slopes to El 609 at the downstream side. According to the documents reviewed the upstream slope varies from 1(V): 2(H) at top to 1(V): 2.75(H) at toe; the downstream slope varies from 1(V): 2(H) at top to 1(V): 3(H) at toe. There are 10-foot wide berms at 30 ft intervals on both upstream and downstream slopes. The upstream face below El 570 is covered with a surface layer of riprap placed on a bedding layer of rock fragments. Between El 570 and 600 the upstream face is paved with dry rubble bedded in crushed stone. A concrete masonry core wall, which extends to solid rock, is located 16 ft from the upstream edge of the crest. Its width at the top (El 596) is 4 ft; both faces are evenly battered at 1(V): 0.05(H) from top to the original ground surface and are vertical between ground surface and the rock foundation. On the downstream slope there is a stone and crushed rock layer of varying thickness, which is covered with 24 inches of clayey earth and 12 inches of topsoil.
On each wing there is subsurface drainage system which consists of vitri-
fied drain pipes placed in trenches filled with broken stone and boulders.
Access to the drain pipes is through manholes.

c. West, Middle and East Dikes

The crest elevation and cross section of the West Dike are
identical to the south wing of the main dam. The West Dike contains a
concrete masonry core wall, which, according to the documents is supported
in earth for a distance of approximately 770 ft from its western end and on
rock for the remaining 1020 ft. The maximum height of the Dike from bottom
of core trench is 115 ft. A paved roadway runs along the full length of the dike.

The cross section of the Middle Dike is similar to that of the
West Dike, except that the crest elevation is 607 along the upstream face.
The concrete masonry core wall is supported on rock for a distance of approxi-
mately 3000 ft and in earth for the remaining 4,000 ft. The maximum height
of Middle Dike is 195 ft where the Dike crosses the pre-glacial gorge of
Beaver Kill. A paved road exists along the full length of the dike.

The East Dike is approximately 3340 ft long and its maximum
height above bottom of core trench is 35 ft. The dike has a crest width of
15 ft (El 602); its upstream slope is at 1(V): 2(H) from El 602 to 595, the re-
mainder is at 1 (V): 2,5 (H). The entire downstream slope is at 1 (V): 3 (H).
The crest and the downstream slope are grass covered. The upstream face
below El 595 is covered with paving stones on crushed stone bedding. There
is a downstream rock toe which is covered with 2 ft of clayey earth and is
grassed.

d. Dividing Weir

The Dividing Weir, which separates the West Basin from the
East Basin, has a length of 1100 ft and consists of an uncontrolled overflow
structure. Its cross section is ogee shaped with the crest at El 590. The
height of the maximum section is approximately 30 ft. The upstream slope
of the Weir is constructed as an earth embankment with a slope at 1(V): 2(H),
which is paved with stone set on a crushed rock bedding layer. The down-
stream part of the Weir consists of cyclopean masonry with the straight por-
tion of the slope at 1 (V): 0,6 (H). There is a highway bridge above the Weir;
the bridge piers interrupt the continuity of the Weir.

At the south end of the Dividing Weir is the Dividing Weir Dike
which is interrupted by the Upper Gate Chamber. The Dike ends where the
West and Middle Dikes meet. The crest detail and the cross section of the
Dividing Weir Dike are similar to those of the West Dike except that its down-
stream slope is also paved and that there is only one berm at El 570 on both
upstream and downstream slopes. The crest carries a highway on a paved
roadway.
e. Waste Weir (Ashokan Reservoir Spillway)

The Waste Weir is approximately 955 ft in length, S-shaped in plan and it extends in a northerly direction from the east end of East Dike to a concrete training wall at its north end. The Weir, supported on rock originally consisted of cyclopean masonry with an upstream slope of 1 (V): 2 (H) and a downstream slope of 1(V): 1(H). Only a minor part of the structure was constructed as an earth embankment with paving stone protecting the upstream slope of the embankment. The crest of the Weir is at El 587. The Weir was rehabilitated by applying a gunite surfacing to the structure. The overflow is collected in the Waste Channel located between the toe of the Weir and a concrete retaining wall which is nearly parallel with the weir. The channel widens from the south toward the north, where it makes a 90° turn. A curved ashlar wall acting as a baffle projects into the channel from the center pier of the highway bridge (Rte 28A) which crosses over the channel. Downstream of the bridge the Waste Channel runs on exposed bedrock into a gully which enters the Esopus Creek valley 1.4 miles from the bridge.

f. West Hurley Dike

According to the documents reviewed, the West Hurley Dike is approximately 3450 ft long and 55 ft high (at maximum section). The earth embankment includes a concrete masonry core wall which is supported on bedrock. Top of the core wall is at El 593. The crest of the Dike is at El 607 and carries a two-lane paved roadway. The upstream slope is at 1(V): 2(H) above El 587, and at 1 (V): 2.5(H) below El 587. There is a zone of rockfill of minimum 5 ft thickness on the upstream slope from El 597 to the toe. The rockfill is protected by stone paving between El 567 and 597. The downstream slope is at 1(V): 2 (H) from crest to a 10-ft wide berm at El 577, then continues at a slope of 1(V): 2-3/4(H) to the toe. Below the berm the slope consists of rockfill which is covered with 24 inches of clayey earth and is grassed.

g. Woodstock Dike

According to the documents reviewed, the Woodstock Dike is approximately 2500 ft long and maximum 30 ft high. The crest of the dike is at El 602, has a width of 15 ft and is grassed. The upstream slope is 1(V): 2(H) and 1(V): 2.5(H); downstream slope is 1(V): 3(H). The upstream slope is stone protected. The Dike has a concrete masonry core wall.

h. Glenford Dike

The Glenford Dike is approximately 2850 ft long and maximum 60 ft high. The crest is at El 607, its width is 36 ft. There is a single abandoned R.R. track along the crest of the Dike. In other respects the Glenford Dike is similar to the West Hurley Dike.
1. **Location**
   Ashokan Reservoir is located about 14 miles west from Kingston, New York, within the drainage basin of Esopus Creek, a tributary of the Hudson River. The principal structures forming the reservoir and the nearest downstream communities are:

<table>
<thead>
<tr>
<th>Facility</th>
<th>Town</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olive Bridge Dam; Waste</td>
<td>Marbletown</td>
<td>6 miles</td>
</tr>
<tr>
<td>Weir; West, Middle, East</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dike</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Hurley Dike</td>
<td>Stony Hollow</td>
<td>1+ mile</td>
</tr>
<tr>
<td>Woodstock Dike</td>
<td>West Hurley</td>
<td>0.25± mile</td>
</tr>
<tr>
<td>Glenford Dike</td>
<td>West Hurley</td>
<td>0.25± mile</td>
</tr>
</tbody>
</table>

j. **Size Classification**
The dam is more than 100 ft high and is therefore considered to be a large dam.

k. **Hazard Classification**
The dam and the dikes are in the "high" hazard potential category. Parts of several communities would be affected by a failure of the dam or a breach of the dikes.

l. **Ownership**
Ashokan Reservoir is owned and operated by the New York City Bureau of Water Supply (BOWS).

m. **Use of Dam**
The impoundment provided by the dam is a water storage reservoir for the City of New York.

n. **Design and Construction History**
The principal structures, including Olive Bridge Dam, West, Middle and East Dikes, Dividing and Waste Weirs, and appurtenances were designed by BOWS. The contract for the construction of the principal structures was awarded on September 5, 1907 to MacArthur Bros. Company and Winston and Company; construction was completed on December 20, 1916.

The Hurley Dikes, including West Hurley, Woodstock and Glenford Dikes, were designed also by BOWS. Bids for construction were opened on November 24, 1909. The contractor's name and the completion date are unknown.
0. Normal Operating Procedures

The flow into Ashokan Reservoir consists of surface runoff from the Esopus Creek watershed and water releases from Schoharie Reservoir via Shandaken Tunnel. The maximum release from Schoharie is limited to 1040 cfs (672 mgd). Between June 1 and October 30 the releases are regulated so that the combined flow in Esopus Creek below the confluence is at least 300 mgd.

Water releases from Ashokan Reservoir are passed through the upper or lower intakes located in the Dividing Weir Gate House. The upper level intakes are normally used in the summer, the lower level intakes in the winter to supply clearest water. Flow regulation is provided by the inlet regulating valves at the Upper Gate Chamber. Flow is further controlled by gate valves at the Lower Gate Chamber. Most of the water passes through screens in the Screen Chamber and then into the Catskill Aqueduct. Discharges to New York City are kept generally below 600 mgd. Excess water is directed over internal weirs at El 510 into the Waste Tunnel, then via the Beaverkill Waste Channel into Esopus Creek.

1.3 Pertinent Data

a. Drainage Area (sq mile) 257

b. Discharge at Damsite (cfs)
   Maximum known flood at site (March 30, 1951) 46,000
   Spillway (ungated) capacity at El 602 209,000

c. Elevation (ft above MSL)
   Top of masonry dam, south wing, north wing embankments and West Dike) 610
   Top of Middle, West, Hurley Glenford Dike 607
   Top of East and Woodstock Dike 602
   Streambed at centerline of dam 397±
   Spillway crest 587.0

d. Reservoir
   Length of maximum pool, miles 12
   Combined surface area at El 587 in East Basin and El 590 in West Basin, acres 8314

e. Storage (acre-feet)
   Top of spillway crest (El 587) 392,400
   Top of East Dike (El 602) 512,500
f. Dam

1. Masonry Section
   Type: Cyclopean masonry with cut stone facing
   Length: 1000 ft
   Height: 252 ft above foundation
   Top width: 23.0 ft under coping
   Side Slope: Upstream: Vertical from El 610 to El 500 and 1(V): 0.10 (H) from El 500 to toe.
   Downstream: Curved at radius 86 ft from El 610 to El 566.2; 1(V): 0.6 (H) from El 566.2 to El 532.5; 1(V): 0.7 (H) from El 532.5 to El 500; and 1(V): 0.92 (H) from El 500 to toe.

2. Embankment Section
   Type: Earth embankment with concrete masonry core wall.
   Length: 1550± ft south wing
            2100± ft north wing
   Height: 220± ft above foundation
   Crest Width: 34 ft
   Side Slopes: Upstream: 1(V): 2 (H) from El 610 (top of crest) to El 590; 1(V): 2.5 (H) from El 590 to El 540; 1(V): 2.75 (H) from El 540 to toe.
   Downstream: 1(V): 2 (H) from El 609 (top of crest) to El 580; 1 (V): 2.75 (H) from El 580 to El 550; 1(V): 3 (H) from El 550 to toe.
   Zoning: Earth dam with central vertical impervious concrete masonry core wall.
   Impervious core:
           Concrete masonry, top at El 596 and bottom on solid rock; top width 4 ft and sides sloping 1(V): 0.05 (H) to original ground surface and then vertical to the rock foundation.
   Cutoff: Unknown
   Grouting: Unknown
3. Dikes

Beaver Kill Dikes (West, Middle and East)

West Dike -
Type: Earth embankment with concrete masonry core
Length: 1790± ft
Height: 115 ft
Crest Width: 34± ft
Side Slopes: Upstream: 1(V): 2(H) from El 610 to El 590; 1(V): 2.5 (H) from El 590 to El 540; and 1(V) to 2.75 from El 540 to toe.
Downstream: 1(V): 2(H) from El 609 to El 580; 1(V): 2.75 (H) from El 580 to El 550; and 1(V): 3(H) from El 550 to toe.
Zoning: Earth embankment with central vertical concrete masonry core wall.
Impervious Core: Concrete masonry, top at El 596 and bottom on solid rock; top width 4 ft; and sides battered at 1(V): 0.05 (H) to original ground surface and then vertical to earth or rock foundation.
Cutoff: Unknown
Grouting: Unknown

Middle Dike -
Type: Earth embankment with concrete masonry central core.
Length: 7000± ft
Height: 195± ft
Crest width: 34± ft
Side Slopes: Upstream: 1(V): 2(H) from El 607 to El 587; 1(V): 2.5 (H) from El 587 to El 537 and 1 (V): 2.75 (H) from El 537 to toe of dike.
Downstream: 1(V): 2(H) from El 606 to El 577; 1(V): 2.75 (H) from El 577 to El 547; and 1(V) to 3(H) from El 547 to toe of dike.
Zoning: Earth embankment with central concrete masonry core wall.
Impervious Core: Concrete masonry, top at El 593 and top width 4 ft and side slopes 1(V): 0.05 (H) to original ground surface, then vertical to earth or rock foundation, except between Sta 24+25 and 25+80, where bottom section of core wall is stepped and widened.
Cutoff: Unknown
Grouting: Unknown
<table>
<thead>
<tr>
<th>Dike</th>
<th>Type</th>
<th>Length</th>
<th>Height</th>
<th>Crest Width</th>
<th>Side Slopes</th>
<th>Zoning</th>
<th>Impervious Core</th>
<th>Cutoff</th>
<th>Grouting</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Dike</td>
<td>Earth embankment with concrete masonry core wall.</td>
<td>3340± ft</td>
<td>35 ft</td>
<td>15 ft</td>
<td>Upstream: (1(V): 1(V):2 (H)) from El 602 to El 595 and (1(V): 2.5 (H)) from El 595 to toe of dike. Downstream: (1(V): 3 (H))</td>
<td>Earth embankment with central vertical concrete masonry core wall.</td>
<td>Concrete masonry, top at El 593 and other data same as West Dike.</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>West Hurley Dike</td>
<td>Earth embankment with concrete masonry central core.</td>
<td>3450± ft</td>
<td>55± ft</td>
<td>34± ft</td>
<td>Upstream: (1(V):2 (H)) from El 607 to El 587 and (1(V): 2.5 (H)) from El 587 to toe of dike. Downstream: (1(V): 2 (H)) from El 607 to El 577 and (1(V): 2.75 (H)) from El 577 to toe of dike.</td>
<td>Earth embankment with a central vertical concrete masonry core wall.</td>
<td>Concrete masonry, top at El 593 and other data same as West Dike.</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Woodstock Dike</td>
<td>Earth embankment with concrete masonry central core.</td>
<td>2500± ft</td>
<td>30± ft</td>
<td>15 ft</td>
<td>Upstream: (1(V): 2 (H)) from El 602 to El 587 and (1(V): 2.5 (H)) from El 587 to toe of dike. Downstream: (1(V): 3 (H))</td>
<td>Earth embankment with central vertical concrete masonry core wall.</td>
<td>-9-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Impervious Core: Concrete masonry, top at El 593 and other data same as West Dike.

Cutoff: Not known
Grouting: Not known

Glenford Dike -
Type: Earth embankment with concrete masonry central core.
Length: 2850± ft
Height: 60± ft
Crest Width: 36 ft
Zoning: Earth embankment with vertical concrete masonry central core wall.
Impervious Core: Concrete masonry, top El 593 and other data same as West Dike.
Cutoff: Unknown
Grouting: Unknown

g. **Spillway**
Type: Ogee spillway with stepped bottom section
Length of weir: 955± ft
Crest Elev. 587 ft above MSL
Gates: Ungated
Upstream Channel: None
Downstream Channel: Waste Channel is paved with rubble to Route 28A bridge, from there the channel floor is on rock; the channel joins the Esopus Creek Valley 1.4 miles from the bridge.

h. **Regulating Outlets**

Regulating outlets for the Ashokan Reservoir are discussed below:

1. Catskill Aqueduct has a maximum discharge capacity of 640 mgd. Releases are limited to 600 mgd to maintain gravity flow in the Aqueduct. Some restriction to flow may result from overloaded screens but the screens are removable for cleaning purposes.
2. The maximum discharge capacity of the Waste Tunnel is 1150 mgd.

3. Excess flow would be discharged over the Waste Weir (Ashokan Reservoir Spillway). Crest of weir is at El 587.
SECTION 2: ENGINEERING DATA

2.1 DESIGN

The main dam and dikes were designed by BOWS of the City of New York prior to 1907. There are no design data or specific design memoranda available for the project features.

The available information on the main dams, dikes and appurtenant structures consist of:

a. Contract Drawings and Specifications (Contract No. 3) for construction of "Main Dams for the Ashokan Reservoir in the towns of Olive and Marbietown, Ulster County, N.Y." prepared by BOWS, dated June 20, 1907.


c. Various working and record drawings for Contract No. 3.

d. It has been reported that in the late sixties or early seventies the 18-inch high flash boards were removed from the Waste Weir. In 1975 the Waste Weir structure was resurfaced with gunite. The details of the modifications are shown on the drawings entitled "Rehabilitation of Ashokan Reservoir," prepared by Amman & Whitney in 1974.

The information available on subsurface conditions is limited to rock elevations at borings which were made during design and are shown on the Contract Drawings referred to in a. and b. above.

2.2 CONSTRUCTION RECORDS

No detailed construction records are available; however, there are brief narratives pertaining to the construction of the dam and other structures in the annual reports of BOWS.

2.3 OPERATION RECORDS

Records of gate operations, maintenance and repair work orders, as well as records of pool elevation, rainfall, air and water temperatures for both the Ashokan and Schoharie Reservoirs are available at the Brown Station of BOWS. There is no operation and maintenance manual for the operating facilities, but there are some operating instructions posted in each gate operation building.
2.4 EVALUATION OF DATA

Existing information was made readily available at the BOWS' New York City office and Brown Station office.

The available data reviewed are considered adequate for this Phase I inspection and evaluation of safety.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of Ashokan Reservoir was made on Tuesday and Wednesday, July 11 and 12, 1978. At the time of the inspection the West Basin level was at El 590.31, East Basin level at 584.80. The weather was sunny with temperatures between 70° and 80°F. Rainfall reportedly occurred the night before the inspection.

b. Olive Bridge Dam

The masonry portion of the Olive Bridge Dam appears to be in generally good condition. There were no visible signs of distress or movement. There was some growth, including a sapling, on the downstream face. There were some spalling and minor cracks on the concrete surfaces of the downstream face.

The manholes to the upper drainage gallery were covered with asphalt and were closed. An inspection of the lower gallery was made. The drainage wells and inspection wells were observed discharging water into the lower drainage gallery. Some inspection wells were quite active, especially No 10 which was discharging approximately 3.5 gpm into the lower gallery, while No 11 and No 13 each were discharging approximately 1/3 gpm. The opening at the base of the far wall in the No 10 inspection well was about 2 inches. The total leakage from the gallery is reported as 15± gpm.

There were no visible holes or sizable cracks in the lower drainage gallery walls. Some wall surfaces were covered with deposits, especially near No 8 drainage well.

Salt used in snow removal appears to be the probable cause of some deterioration and spalling of the concrete surfaces of the parapets and upper ledges on the downstream face.

The north and south wings (earth embankments) appear to be in generally good condition; the horizontal and vertical alignments of the crest are also good. There were no visible signs of sloughing, erosion, cracking or other distress on the north and south wings except for some cracks on the paved roadway. Off the north end of the masonry dam, the curb of the roadway is damaged near the downstream wingwall and surface runoff appears to have washed out a small channel which exits at the contact with the downstream face of the masonry dam.

The downstream slope and the upper portion of the upstream slope (above the stone paving) are grass covered on both north and south wings. There
is a bush at the level of the uppermost of paving stone course on the upstream slope of the south wing.

It has been reported that in 1956 the paving stones on the upstream slope of the north wing, near the masonry dam, was damaged by heavy wave action. The damage was repaired by setting the paving stones in concrete. The length of the repaired area is approximately 150 ft.

There is no visible evidence of seepage emerging from the slopes or toes of the north and south wings.

c. West Dike

The West Dike appears to be in generally good condition; the horizontal and vertical alignments of the crest are good except for the pavement depression near the south end of the Dike as described below.

The downstream and the upper portion of the upstream slope (above the stone paving) are grass covered. There was no sign of sloughing, erosion, cracking or other distress on the upstream slope and visible portion of the riprap.

It is reported that during the winter or early spring of 1978 the downstream slope near the south end of the Dike was affected by sloughing which was caused by heavy surface runoff. It appears that the sloughing occurred downslope of an area where the roadway pavement has undergone cracking and differential settlement. The maximum settlement in the area is as much as 2 inches. From the observed signs it appears that pavement deterioration in this area may have been occurring gradually or periodically after each rainy season causing the cracks to open wider and the roadway to tilt toward the downstream slope, thereby collecting more and more surface runoff during major storms. The sloughing may have been triggered by the buildup of water pressure in the layer of crushed rock which, according to the contract drawings, underlies the topsoil and clayey earth layer on the downstream slope. Uplift pressure on the underside of the impervious soil cover would then result in sloughing. The area affected by sloughing is 100 ft wide at the top of slope and 50 ft at its downslope limit. The slope was repaired by placing fill and turf on the slope. The pavement distress has not been corrected.

There is no visible evidence of seepage emerging from the slope or toe of the Dike.

d. Middle Dike

The Middle Dike appears to be in generally good condition; the horizontal and vertical alignments of the crest are also good. There was no sign of sloughing, erosion, cracking or other distress on the upstream and downstream slopes, nor on the visible portion of the riprap. There are minor
cracks in the roadway pavement. Both longitudinal and transverse pavement grades are good. The downstream slope and the upper portion of the upstream slope are grass covered. There is no visible evidence of seepage emerging from the slope or toe of the Dike. Some flow was emerging from the subsurface drain at its low point.

e. East Dike
The East Dike appears to be in generally good condition; the horizontal and vertical alignments of the crest are also good. There was no sign of sloughing, erosion, cracking or other distress on the crest, upstream or downstream slopes. The crest and slopes are grass covered and free of bushes or shrubs.

There is no visible evidence of seepage emerging from the slopes or toe of the Dike.

f. Waste Weir
At the time of the inspection, water was not spilling over the crest. There was no evidence of distress or movement. The spillway was rehabilitated in 1976-7.

There were signs of leakage and some minor seepage from the joints of the central and northern portions of the Waste Weir, and there were at least two leaks on the southern portion.

Although most of the floor surface has been repaired there were some loose stones in the floor.

The ashlar baffle wall near the center of the spillway bridge appeared to be in good condition even though it has not been rehabilitated.

Holes for flash board supports were not restored to the crest surface.

There was no evidence of erosion along the Waste Channel, but there are areas in the rubble-paved channel floor where vegetation exists. These areas may be indicative of minor underseepage from the East Basin. The channel downstream of the Waste Channel is on bedrock. Although further away from the Weir there are trees and other vegetation in the channel, they are not considered to be an impediment to discharges from the East Basin.

g. West Hurley Dike
The Dike appears to be in generally good condition; the horizontal and vertical alignments of the crest are good except for a minor pavement
depression described in the next paragraph. There were no visible signs of sloughing, erosion or cracking on the crest or on either slope of the Dike. Some shrubs and overgrown grass exist on both slopes. The crest serves as a paved two-lane highway.

Approximately at mid-length of the Dike near the easterly edge of the roadway, the pavement is slightly depressed, even though it has been patched. Adjacent to the patch, the curb along the roadway is interrupted, probably to provide an exit for surface runoff which would pond otherwise in the low area. A shallow swale leading to the top of the downstream slope and a soft zone of 25-foot width were noticed at the toe downslope of the curb opening. Similar soggy areas were noted downslope from two other breaks in the curb and also at a location 400 ft from the north end of the Dike. It is not known if the wet conditions were due to rainfall during the previous night or to minor seepage. No sign of sloughing or distress was observed.

An estimated 3 to 5 gpm was emerging from a 14-inch cast iron pipe which is presumably the outlet of the subsurface drainage system.

h. Woodstock Dike

The Dike which has a curved alignment appears to be in generally good condition; the horizontal and vertical alignments of the crest are also good. There were no visible signs of sloughing, erosion, cracking or other distress on the crest and upstream slope. The riprap is in good condition and has not been displaced. Near the maximum curvature along the Dike there are trees and bushes as well as some debris at the level of the top riprap paving stones. The crest and the upper part of the upstream slope are grass covered.

Approximately 250 ft east of the bend in the Dike, the ground adjacent to the downstream toe is swampy. There is heavy vegetation on the downstream slope near the east end of the Dike.

West of the bend, the cross section of the Dike appears to be wider than shown on the Contract Drawings. There is an abandoned railroad track on the widened area which is 120 ft in width and about 15 ft below crest level. The track is located approximately 90 ft from the downstream edge of the widened area. The downstream slope is overgrown with trees and bushes. There is no visible evidence of seepage emerging from the slopes or toe of the Dike, but there is a small pond of stagnant water beyond the toe.

i. Glenford Dike

The Glenford Dike appears to be in generally good condition; the horizontal and vertical alignments are also good. There were no visible signs of sloughing, erosion, cracking or other distress on the crest or on either slope. The riprap slope protection is in good condition. The upstream slope above the riprap is overgrown with trees, bushes and saplings. There is a 4-foot high
masonry wall along the upstream edge of the crest approximately 10 ft from the
dike centerline.

An unused single railroad track exists on the crest, which is over-
grown with trees, bushes and saplings on both sides of the track. On the down-
stream slope there is a heavy growth of trees and bushes.

j. Regulating Gates
The regulating gates are at the Upper Gate Chamber. Eight sixty
inch diameter gate valves can control the water releases; from each Basin two
gate valves admit water into the Upper Aqueduct and two into the Lower
Aqueduct. At the Lower Gate Chamber, Upper Aqueduct Gate Valves Nos 2
and 4 or Lower Aqueduct Gate Valves Nos 1, 3, 5 and 7 regulate water into
the Screen Chamber. The water then flows into the Catskill Aqueduct; excess
water is diverted into the Waste Tunnel. Gate Valves Nos 6, 9, 12 and 14
are used to bypass water into emergency turbine generators, Gate Valves Nos
8, 10, 11 and 13 to bypass water to the Aerator Gate Valves Nos 15, 16, 17,
18, 19 and 20. The bypass water then returns to the Screen Chamber.

k. Abutments
There were no signs of seepage or other unusual conditions at the
abutments of the masonry dam, Dikes and the Waste Weir.

l. Downstream Channel
The channel downstream of the masonry dam is the Esopus Creek.
Although the channel contained trees and dense bushes, its present condition
would not impede discharges from the reservoir. The findings at waste weir
channel are described in Paragraph 3.1 f.

m. Reservoir Area
In the vicinity of the Olive Bridge Dam; West, Middle and East
Dikes; Waste Weir; and the Hurley Dikes, there was no evidence of sloughing,
potentially unstable slopes or other unusual conditions which would adversely
affect the dam. It is also reported that there have been no adverse reports by
motor patrols who examine the reservoir rim.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not
indicate any serious problems which would adversely affect the safety of the
dam and require either immediate investigation or immediate remedial action.

The spalling of the concrete on the downstream face of the dam, including
the upper ledges and parapets, is probably the result of the action of chloride ion
when snow mixed with salt is disposed of on the downstream face.

There were no visible leaks on the downstream face of the dam but the growth of vegetation and the presence of a sapling are possible indications of moisture at the downstream face.

The leaks in the masonry dam, especially in inspection well No 10, should be monitored on a regular basis and records kept to determine whether the leakage quantities are increasing. Review of the available records indicate that the leakage is relatively stable.

The heavy vegetation, especially trees, on the slopes of the dikes should be discouraged.

Local depressions and cracking of the pavements on the West Dike and West Hurley Dike should be repaired.

Gate Valve No 6 in the Lower Gate Chamber was leaking at a high rate. It is not known whether Gate Valve No 9 is operable at the present. Both of these valves are used for feeding water to emergency turbine generators in case of a power failure.
SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

Ashokan Reservoir stores waters from Esopus Creek along with water diverted from the Schoharie Reservoir. Maximum daily release from Schoharie, by agreement with New York State Power Authority, is 672 mgd. Normally the releases vary between 500 and 600 mgd.

Releases from Ashokan Reservoir to the New York City water supply system through Catskill Aqueduct are controlled by the New York City office of BOWS. The discharge varies between 350 and 600 mgd. To supply the clearest water the upper level intakes are used normally in the summer and the lower level intakes in the winter.

4.2 MAINTENANCE OF THE DAM AND DIKES

It was reported that an operation and maintenance manual is being prepared for the project. There are motor boat patrols to examine the reservoir rim regularly. Although there is no formally established program of inspection for the masonry dam and dikes, major deficiencies would be detected through the constant presence of the project staff of BOWS. The quantity of both leakage at the main dam and seepage from some of the dikes is measured periodically by BOWS engineering personnel.

The dikes and the two wings of the main dam are maintained only by periodic mowing of the grass slope protection. Maintenance of the earth embankment appears to be adequate except for the local growth of brush at the top of riprap of the south wing and the Woodstock Dike. Maintenance of the slopes of the Glenford Dike, which are not as easily accessible, is less than adequate.

4.3 MAINTENANCE OF OPERATING FACILITIES

Although there is no overall operation and maintenance manual for the operating facilities, there are some operating instructions posted at each gate operation building. These instructions do not cover procedures to be followed for preventing vibration effects and in the event equipment becomes inoperative.

The regulating gates appeared to be in operational condition at the time of the inspection. Overload condition is protected by shear pins, which are easily replaceable. Some valve packings were leaking, notably Valve No 6, which feeds water to emergency turbine generators. Regulating valves are moved approximately at three week intervals as directed by BOWS' New York City office.
4.4 WARNING SYSTEMS IN EFFECT

There are no warning systems in effect.

4.5 EVALUATION

The operational and maintenance procedures at Ashokan Reservoir, in general, are considered adequate. The maintenance of Glenford Dike is less than adequate with respect to the control of heavy growth on the slopes of the Dike. A periodic inspection program should be established.
SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 DRAINAGE AREA CHARACTERISTICS

The Ashokan Dam and Reservoir is located on the Esopus Creek, East of Kingston N.Y. The total drainage area of the basin contributing to the Ashokan Reservoir is 257 square miles.

5.2 SPILLWAY CAPACITY

The spillway, which is located on the East Basin, is shaped to conform to the overfall jet, and is 950.0 feet in length. The maximum head possible between the spillway crest (El 587.0 feet) and the top of the dam is 15.0 feet. No data is available on the head-discharge relationship of the spillway. In computing the spillway discharge rating table the coefficient was assumed to vary from 3.1 at 0.5 feet head to 3.8 at 5.0 feet head and above. The computed maximum discharge is 209,700 cfs.

5.3 RESERVOIR CAPACITY

The total reservoir capacity at the spillway crest (El 587.0 feet) is 127.858 billion gallons (392,400 acre-feet). It is estimated that the available surcharge storage, between the spillway crest and the top of the dam, is 120,100 acre feet which is equivalent to a depth of 8.8 inches of runoff over the entire basin.

5.4 FLOODS OF RECORD

A U.S. Geological Survey Gaging station, located 1.5 miles upstream from the reservoir, was operated from January 1914 to current year. The maximum peak discharge flow, for the period of record, was 59,600 cfs on March 30, 1951. Transposed on the basis of the square-root of the drainage areas, the estimated inflow to the Ashokan Reservoir was 71,300 cfs. The maximum head recorded at the spillway for March 1951 was 5.23 feet, equivalent to an outflow discharge of about 46,000 cfs. Data in a report made for the Corps of Engineers on the Lower Hudson River Basin\(^1\), give the following:

<table>
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<tr>
<th>Date</th>
<th>Inflow Peak (cfs)</th>
<th>Outflow Peak (cfs)</th>
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<tr>
<td>Oct. 1955</td>
<td>51,679</td>
<td>22,742</td>
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<tr>
<td>June 1972</td>
<td>62,732</td>
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</tbody>
</table>

5.5 OVERFLOW POTENTIAL

The Standard Project Flood (SPF) inflow to the Ashokan Reservoir is given as 91,286 cfs while the outflow peak is only 44,881 cfs. The computed maximum spillway discharge of 209,700 cfs is 2.3 times the SPF inflow peak and 4.7 times the SPF outflow peak.

5.6 EVALUATION

In view of the fact that the Ashokan Reservoir Spillway is capable of passing the Standard Project Flood, it is considered adequate from a hydraulic and hydrologic viewpoint.

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate either existing or potential problems with the masonry portion of Olive Bridge Dam and the Waste Weir (Ashokan Reservoir Spillway). The observed leakage in the lower inspection gallery of the dam is not detrimental to its stability or safety.

The small amounts of seepage and leaks emerging from several locations along the Waste Weir are not detrimental to its safety.

b. Design and Construction Data

No design computations or other data regarding the structural stability of the dam or spillway are available.

On the basis of the performance experience, as well as engineering judgement the spillway and the masonry portion of the dam are considered to be stable.

Although there are no design computations available, it is likely that the masonry gravity sections were designed by engineers of the BOWS in accordance with procedures presented in E. Wegmann's text, "Design and Construction of Dams." If the masonry sections were designed accordingly, the stability of the gravity section would be considered to be adequate.

c. Operating Records

No major operational problems which would affect the stability of the dam or spillway were reported.

d. Post Construction Changes

A major rehabilitation of the Ashokan Reservoir Spillway was carried out during 1975 and 1976. The details of the major repairs and modifications are shown on the drawings prepared in 1974 by Ammann & Whitney, Consulting Engineers.

e. Seismic Stability

The dam is located in Seismic Zone No. 1, therefore no seismic analyses are warranted.
SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1  DAM ASSESSMENT

a. Safety
   Examination of the available documents and visual inspection of the Olive Bridge Dam, the Ashokan Reservoir Spillway, the Dikes and the appurtenant structures did not reveal any conditions which are unsafe.

   The Standard Project Flood inflow to the Ashokan Reservoir is approximately 91,300 cfs while the outflow is only 44,900 cfs. The maximum spillway discharge capacity is estimated to be 209,700 cfs. The project discharge capacity is therefore adequate according to the Corps of Engineers' adopted general principle that structures be designed for the maximum flood characteristic of the region, which is, in practice, the Standard Project Flood.

b. Adequacy of Information
   The information and data available were adequate for performance of this investigation.

c. Additional Investigations
   Additional investigations to assess the safety of Olive Bridge Dam, Spillway, Dikes and appurtenant structures do not appear necessary.

7.2  REMEDIAL MEASURES

No remedial measures are required at the present time.

It is recommended, however, that deficiencies that are minor at the present be repaired or monitored to assess potential future changes in the performance of the dam and appurtenant structures:

a. The leakage occurring through joints and cracks in the masonry portion of the main dam and spillway should be measured on a systematic basis. The data obtained should be reviewed and evaluated on an ongoing basis.

b. The rate of seepage emerging from the subsurface drainage systems at the various dikes should be measured on a systematic basis and the data should be evaluated after each inspection.

c. The concrete parapet on the top of the masonry portion of the main dam should be repaired. Also a snow clearing procedure should be developed so that snow and ice mixed with de-icing salts is not disposed of on the downstream coping near the top of the dam.
d. Pavement near the south end of West Dike should be restored to original grade by reconstructing both base and surfacing. Similar repair work should be carried out in a localized area on West Hurley Dike.

e. Curb adjacent to the north end of the masonry dam should be repaired.

f. Heavy brush, shrubs and saplings should be removed from the slopes of the Woodstock and Glenford Dikes and the south wing of the main dam. On the downstream slope of the Glenford Dike tree growth is especially heavy. Larger conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be monitored for seepage.

g. Appropriate action should be taken to stop leakage at Gate Valve No 6 in the Lower Gate Chamber.

h. Vegetation growing in the Waste Channel (upstream of the Bridge) of the Waste Weir should be removed.
City of New York
BOARD OF WATER SUPPLY
ASHOKAN RESERVOIR
OLIVE BRIDGE DAM
GENERAL PLAN OF COMPLETED DAM

Edge of Wood

June 30, 1907

Chief Dr. Asst. Eng.

Designing Eng.

Chief Dr. Dept. Eng.

ENRICO MAST. Photog. 99 E 33rd St. N. Y.
This drawing is reproduced from a publication titled "The Water Supply Of the City of New York".

OLIVE BRIDGE DAM
MAXIMUM SECTION

Note: Elevations refer to mean sea level at Sandy Hook.
For detail see Acc 4124

NORTH CONE
SECTION NEAR UPSTREAM FACE OF MASONRY DAM

City of New York
BOARD OF WATER SUPPLY
ASHOKAN RESERVOIR
OLIVE BRIDGE DAM
CROSS SECTIONS OF EMBANKMENTS

JUNE 30, 1907

Charles Hart, Photographer, 81 Vevers St. N.Y.
City of New York
BOARD OF WATER SUPPLY
ASHOKAN RESERVOIR
EAST DIKE AND WASTE WEIR
GENERAL PLAN OF COMPLETED STRUCTURES

JUNE 20, 1907

CONTRACT NO. 3, SHEET NO. 34
SHEETS IN SET 54
Scale: 4'-1" (Typ all above Sections)

SECTION F-F

SECTION G-G

SECTION N-N

Scale: 4'-1"/10'

Note:
Extent of work shown is approx.
see note A 3014 B

ELEVATION L-L

WALL-NORTH FACE SHOWN
deb: 6'-11/16"
SECTION G-G

- 8" Crushed stone
- Concrete Masonry Wall
- 8" x 12" box drain at 7'-0" OC
- Repair fractured upper portion per work item 23

SECTION H-H

- Original line
- Crest line of waste weir EL 58'100
- Repair coping per work item 23

SECTION N-N

- Scale 1/8" = 1'-0"
- Cyclopean Masonry Wall

SECTION M-M

- Scale 1/8" = 1'-0"
- Replace missing Ashlar blocks to match exist condition

REVISIONS
SECTION D-D

SECTION E-E

DEVELOPED ELEVAT
ASHLAR BAFFLE WALL-NORTH FAC
Scale '6" - 1:0"

CAT-104
ON E-E

SECTION F-F

Scale: 4" = 1'0" (Typ all above Sections)

SECTION G-G

SECTION N-N

Scale: 1" = 1'0"

Replace missing Ashlar blocks to match exist condition

Datum El. 550.0

Note:
Extent of work shown is approx.
see note A Sh#8

ELEVATION L-L

LE WALL-NORTH FACE SHOWN
Scale: 4" = 1'0"

Notes:
For location of Sections D-D, E-E, F-F, G-G, H-H see Sh# 2
For location of Elev L-L see Sh# 2
For Details of work items shown thus 2 see Sh# 8
For location of Section N-N see Sh# 4

Approved by
Edward C. Flandeen
DEPUTY CHIEF ENGINEER
AMMANN & WHIT
CONSULTING ENGINEERS
300 EIGHTH AVENUE NEW YORK, N.Y.
SECTION A-A

Scale: 1"=10'

Note: Repair shown applies from Point A to Point B of weir see note A' sheet # B

Replace missing Rubble lining to match existing condition

Note: Repair shown applies to lower weir see next page

Scale: 1"=10'

Steel Travel Smooth Finish

Wood Floor Smooth Finish

Note: All spalled, spalling, tumbling conc. must be removed prior to resurfacing to original line as per work item 3. Chipped out loose conc. 2 min.
SECTION B-B
Scale: 4"=1'-0"

Replace missing Rubble
paving to match existing
condition.

NOTE
Proper joints in
to morton
joint in.

Crack 26" long @ Point 'X'. See Shl #2.
Repair per Work Item #2

Note: Repair shown applies from Pt. B to Pt. D
of wall, see note A sheet #8.

SECTION C-C
Scale: 4"=1'-0"

Note: Repair shown applies from Pt. D to Pt. E
of lower wall, see note A sheet #8.

New Saw Cut. Jt. Pattern @ 16'-2".
Existing Jt. Pattern @ 20'-3"
SECTION A-B

Scale 1" = 10'

Crack 26" long @ Point 'K' See Sh. #2
Repair per Work Item #2

Crack 26" long @ Point 'X' See Sh. #2
Repair per Work Item #2

Note: Repair shown applies from Pt. 'B' to Pt. 'G'
of weir, see note A sheet No B

NOTED
Maintain Crest line of weir at El 587
For location of Sections A-A, B-B & C-C
See Sh. # 2
For Details of work Items shown Thus #2
See Sh. # B

New Seam OII, Pattern @ 1/2's
Existing Jr Pattern @ 3/8's
Note: Repair shown applies from Pt. 'D' to Pt. 'E' of lower weir, see note A Sheet No. B.

SECTION C-C
Scale: 1"=10'

Note: Repair shown applies from Pt. 'D' to Pt. 'E' of lower weir, see note A Sheet No. B.

PART PLAN X-X
SECTION B-B

Scale 1"=10'

Steel travel smooth finish
Exit Spillway Condition
of apron curve El 502

Chipped out loose cont
2 ft min & Rehab to
original line at per
work item (c)

NOTES
Maintain crest line of weir at El 587
For location of Sections A-A, B-B & C-C
See Sec. 2
For Details of work items shown thus (2)
See Sec. 2

New Saw Cut Jt. Pattern 16'2"
Existing Jt. Pattern 6'8"

THE CITY OF NEW YORK
ENVIRONMENTAL PROTECTION ADMINISTRATION
DEPARTMENT OF WATER RESOURCES
BUREAU OF WATER SUPPLY

REHABILITATION OF
ASHOKAN RESERVOIR SPILLWAY
WEIR SECTIONS & DETAILS

AMMANN & WHITNEY
CONSULTING ENGINEERS
III EIGHTH AVENUE NEW YORK

<table>
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<th>BY</th>
<th>CHK'D APP'D</th>
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REVISIONS

CHIEF ENGINEER

DEPUTY CHIEF ENGINEER

DRAWN CHECKED APPROVED

SCALE 48 SHOWN

43597- X
Note: Stations shown are measured along inside face of wall unless otherwise noted.
Notes:
For sections A-B-C-D, see plan X. For sections D-E-F-G-H, see plan L. For elevator J, see plan G. For below 100, see plan #. For details of work items shown thus ( ), see plan #.
Note: Stations shown are measured along Inside face of Wall unless otherwise noted.
PHOTOGRAPHS

APPENDIX B
DOWNSSTREAM SLOPE OF OLIVE BRIDGE DAM, (LOOKING NORTH)

UPSTREAM SLOPE OF SOUTH EMBANKMENT OF DAM, (LOOKING SOUTH)
Downstream channel of Masonry Creek, showing vegetation and exposed rock.

Note vegetation and spalling on face.
CREST OF OLIVE BRIDGE MASONRY DAM

VIEW OF DOWNSTREAM SLOPE OF WEST DIKE LOOKING NORTH. NOTE PAVEMENT FAILURE AT CREST AND REPAIR OF SLOPE.
VIEW OF UPSTREAM SLOPE OF EAST DIKE. (LOOKING WEST)

VIEW OF DOWNSTREAM SLOPE OF EAST DIKE. (LOOKING WEST)
VIEW OF WEST HURLEY DIKE. (LOOKING SOUTH)

OVERVIEW OF CREST AND UPSTREAM SLOPE OF WOODSTOCK DIKE. (LOOKING EAST) NOTE PATHWAYS AND OVERGROWN GRASS.
OVERVIEW OF CREST AND UPSTREAM SLOPE OF WOODSTOCK DIKE.
(LOOKING WEST) NOTE PATHWAYS AND OVERGROWN GRASS.

VIEW OF CREST OF GLENFORD DIKE. (LOOKING WEST)
NOTE ABANDONED RAILROAD TRACK AND HEAVY VEGETATION
UPSTREAM SLOPE OF GLENFORD DIKE. (LOOKING EAST)
NOTE RIPRAP AND HEAVY VEGETATION.

DOWNSTREAM SLOPE OF GLENFORD DIKE. (LOOKING EAST)
NOTE LOOSE ROCK PROTECTION AND HEAVY VEGETATION.
OVERVIEW OF SPILLWAY CREST AND RESERVOIR. (LOOKING NORTH)
NOTE MINOR VEGETATION.

DOWNSTREAM FACE OF SPILLWAY AND FLOOR CHANNEL
AND MASONRY WALL. (LOOKING SOUTH)
SEEPAGE AT DOWNSTREAM FACE OF SPILLWAY.
NOTE SEEPAGE FROM JOINTS

DOWNSTREAM FACE OF SPILLWAY AND FLOOR OF CHANNEL.
NOTE MINOR VEGETATION.
UPPER GATE CHAMBER - THREE 60 INCHES DIAMETER GATE VALVES AND 3 FAIRS SLUICE GATES.
ENGINEERING DATA CHECKLIST

APPENDIX C
**CHECKLIST.**

**ENGINEERING DATA**

**DESIGN, CONSTRUCTION, OPERATION**

**PHASE I**

**NAME OF DAM:** ASHKOHAN DAM  
**ID #:** 41

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS-BUILT DRAWINGS</td>
<td>NONE AVAILABLE FOR DAM AND DIKES FOR SECTIONS AND DETAILS OF REHABILITATED SPILLWAY SEE AMMANN &amp; WHITNEY DRAWINGS 43595-X TO 43 602-X SHEETS 1 THRU 6 FOR AVAILABLE CONTRACT DRAWINGS &amp; SPECIFICATIONS SEE SECTION 2: ENG'G DATA</td>
</tr>
<tr>
<td>REGIONAL VICINITY MAP</td>
<td>USGS</td>
</tr>
<tr>
<td>CONSTRUCTION HISTORY</td>
<td>SEE ENGINEERING NEWS ARTICLES MAY 9, 1907 AND AUGUST 1, 1907. ALSO DATA IN PUBLICATION &quot;ORIGIN AND ACHIEVEMENTS OF THE BOARD OF WATER SUPPLY CITY OF N.Y.&quot; DATED 1950. ADDITIONAL DATA IS FOUND IN THE ANNUAL REPORTS OF THE BOARD OF WATER SUPPLY CITY OF N.Y.</td>
</tr>
<tr>
<td>TYPICAL SECTIONS OF DAM (OLIVE BRIDGE) AND DIKES AROUND ASHKOHAN RESERVOIR</td>
<td>SEE DRAWINGS IN APPENDIX</td>
</tr>
<tr>
<td>OUTLETS-PLAN</td>
<td></td>
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<tr>
<td>- DETAILS</td>
<td></td>
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<tr>
<td>- CONSTRAINTS</td>
<td></td>
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<tr>
<td>- DISCHARGE RATINGS</td>
<td></td>
</tr>
<tr>
<td>RAINFALL/RESERVOIR RECORDS</td>
<td>AVAILABLE AT THE BOWES OFFICE IN NEW YORK CITY AND AT BROWN STATION, NEW YORK</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
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<td>--------------------------</td>
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<tr>
<td>DESIGN REPORTS</td>
<td><strong>NONE AVAILABLE</strong></td>
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<td>GEOLOGY REPORTS</td>
<td><strong>NONE AVAILABLE</strong></td>
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<td>DESIGN COMPUTATIONS</td>
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<td>HYDROLOGY &amp; HYDRAULICS</td>
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<tr>
<td>DAM STABILITY</td>
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<tr>
<td>SEEPAGE STUDIES</td>
<td><strong>NONE AVAILABLE</strong></td>
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<td>MATERIALS INVESTIGATIONS</td>
<td><strong>NONE AVAILABLE</strong></td>
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<td>BORING RECORDS</td>
<td><strong>NONE AVAILABLE</strong></td>
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<td>LABORATORY</td>
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<tr>
<td>FIELD</td>
<td><strong>NONE AVAILABLE</strong></td>
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<tr>
<td>POST-CONSTRUCTION SURVEYS OF DAM AND DIKES</td>
<td><strong>NONE AVAILABLE</strong></td>
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<tr>
<td>SPILLWAY REHABILITATED IN 1975 - SEE AMMAIN &amp; WHITNEY DRAWINGS 43595-X TO 43602-X SHEETS 1 THRU 8</td>
<td></td>
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<tr>
<td>BORROW SOURCES</td>
<td>INFORMATION NOT AVAILABLE</td>
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<tr>
<td>ITEM</td>
<td>REMARKS</td>
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<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
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<tr>
<td>MONITORING SYSTEMS</td>
<td>NONE USED. SEEPAGE FLOW FROM SUBSURFACE DRAIN IS ESTIMATED BY 90° V NOTCH WEIR AT MIDDLE DIKE.</td>
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<tr>
<td>MODIFICATIONS</td>
<td>MODIFICATIONS WERE DONE AT WASTE WEIR IN 1975. SEE AMMANN &amp; WHITNEY DRAWINGS 43595-X TO 43602-X SHEETS 1 THRU 8 FOR REHABILITATION OF SPILLWAY.</td>
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<tr>
<td>HIGH POOL RECORDS</td>
<td>DATA SHEETS AVAILABLE AT SHOKEN OFFICE OF BOWS</td>
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<td>POST CONSTRUCTION ENGINEERING</td>
<td>SPILLWAY REHABILITATED IN 1975 SEE AMMANN &amp; WHITNEY DRAWINGS 43595-X TO 43602 SHEETS 1 THRU 8 MADE IN 1974.</td>
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<tr>
<td>PRIOR ACCIDENTS OR FAILURE OF DAM</td>
<td>NONE RECORDED</td>
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<td>MAINTENANCE</td>
<td>NO OPERATION AND MAINTENANCE MANUAL IS AVAILABLE</td>
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<tr>
<td>OPERATION</td>
<td>AVAILABLE</td>
</tr>
<tr>
<td>RECORDS</td>
<td></td>
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<tr>
<td>ITEM</td>
<td>REMARKS</td>
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<td>---------------------------</td>
<td>-------------------------------------------------------------------------</td>
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<tr>
<td>SPILLWAY PLAN</td>
<td>FOR REHABILITATED SPILLWAY SECTIONS AND DETAILS SEE AMMANN &amp; WHITNEY DRAWINGS</td>
</tr>
<tr>
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<td>43595-X 43602-X SHEETS 1 THRU 8</td>
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<tr>
<td>DETAILS</td>
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<tr>
<td>OPERATING EQUIPMENT</td>
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</tr>
<tr>
<td>PLANS &amp; DETAILS</td>
<td></td>
</tr>
</tbody>
</table>
VISUAL INSPECTION CHECKLIST
VISUAL INSPECTION CHECKLIST

1. Basic Data
   a. General
      Name of Dam: OLIVE BRIDGE
      Hazard Category: HIGH
      County: ULSTER
      ID#: 41
      Stream Name: ESOPUS CREEK
      Tributary of: HUDSON RIVER
      Location: ULSTER County Nearest Town (P.O.): OLIVE BRIDGE (NEAR DAM)
      Longitude: 74° 13' Latitude: 41° 53' Other Directions: 14 MILES WEST OF KINGSTON
      Approach to BOWS Office: IS THROUGH TOWN OF SHOKAN
      Date of Insp: 11 & 12 July 78
      Weather: SUNNY
      Temperature: 75-80°F
   b. Inspection Personnel
      TAMS PERSONNEL
      E. JONAS GEOTECHNICAL ENG’R
      J. PATEL
      H. LEVENTHAL STRUCTURAL ENG’R
      M. GRANT MECHANICAL ENG’R
   c. Persons Contacted
      L. PROPER ADMINISTRATIVE ENG’R
      L. CAREY ASSISTANT CIVIL ENG’R
      W. SCULLY
      L. DAVIS FORMEN - OPERATION & MAINTENANCE
   d. History:
      Date Constructed: DATE OF CONTRACT: SEPT. 5, 1907
      Date of Completion: DEC. 20, 1916
      Present Owner: BUREAU OF WATER SUPPLY, N.Y.C.
      Designed by: BOWS [CITY OF NEW YORK]
      Constructed by: MAC ARTHUR BROS. CO. AND WINSTON AND CO. BROWN'S STATION, NEW YORK
      Recent History: ASHOKAN RESERVOIR SPILLWAY REHABILITATED IN 1975

2. Technical Data
   - Masonry and Earth Embankment
   - Drainage Area: 165,760 Acres
   - Height: 250 FT
   - Length: 1000 FT
   - Masonry Length: 3650 FT
   - Upstream Slope: BATTERED
   - Downstream Slope: BATTERED
   - Crest Width: 34.80 FT AT EARTH
   - Freeboard at Spillway Crest: 3 FT
Low Level Control: (Type and Size) ________________________________

Valve Condition

Emergency Spillway Type (Material): CONCRETE AND MASONRY Width
ONE SERVICE SPILLWAY; NO EMERGENCY SPILLWAY

Side Slopes: UPPER PORTION CURVED; REMAINING PORTION STEPPED TO WASTE CHANNEL

Height (Crest to Top)

Exit Slope & FOR GEOMETRY OF SPILLWAY AND
Exit Length # 43,950 - Y TO 43,604 - Y SHEETS 17TH B

Ponded Surface Area: 83.15 Acres
Capacity (Normal Level): 392,400 Acre Feet
Capacity Emergency Spillway Level: __________ Acre Feet

3. Embankment

SOUTH WING 1500 FT. AND NORTH WING 2100 FT.

a. Crest 24 FT WIDE; ROADWAY PAVEMENT (TWO LANES)

(1) Vertical Alignment UNIFORM WITH CREST EL. 609.5'

(2) Horizontal Alignment STRAIGHT BOTH WINGS; AND

ALIGNMENT GENERALLY GOOD.

(3) Longitudinal Surface Cracks SOME CRACKS VISIBLE IN
ASPHALT PAVEMENT

(4) Transverse Surface Cracks SOME CRACK VISIBLE IN
ASPHALT PAVEMENT

(5) General Condition of Surface PAVEMENT SURFACE GENERALLY
IN GOOD CONDITION

(6) Miscellaneous GUARD RAILS ON BOTH SIDES OF
ROADWAY STRAIGHT AND IN GOOD CONDITION
b. Upstream Slope: Battered and grassed below EL 594 and above EL 594 to crest grassed

(1) Undesirable Growth or Debris: A bush at level of the uppermost of paving stone course on the South Wing.

(2) Sloughing, Subsidence, or Depressions: None visible

(3) Slope Protection:

(a) Condition of Riprap: Generally good

(b) Durability of Individual Stones: Good

(c) Adequacy of Slope Protection Against Waves and Runoff: Apparently good – little or no damage

(d) Gradation of Slope Protection - Localized Areas of Fine Material: Uniform size stone

(4) Surface Cracks: None visible

c. Downstream Slope: Battered and grassed

(1) Undesirable Growth or Debris: None
(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

NONE

(3) Surface Cracks on Face of Slope

NONE VISIBLE

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

NONE VISIBLE

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

NONE

(6) Fill Contact with Outlet Structure

GENERALLY GOOD

WITH MAJOR DEFECTS

(7) Condition of Grass Slope Protection

GENERALLY GOOD

AT NORTH WING; AND OVERGROWN ON SOUTH WING

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

NONE

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

NONE
(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

NONE

---

e. Area Downstream of Embankment, Including Tailrace Channel

THIS AREA INCLUDES ESOPUS CREEK

---

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

NONE VISIBLE

---

(2) Evidence of "Piping" or "Boils"

NONE

---

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

NONE VISIBLE

---

(4) Unusual Muddy Water in Downstream Channel

NONE VISIBLE

---

(5) Sloughing or Erosion

NONE VISIBLE

---

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

NONE VISIBLE
(7) Stability of Tailrace Channel Sideslopes

____________

GENERALLY GOOD

(8) Condition of Tailrace Channel Riprap

____________

NO RIPRAP

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

____________

(10) Miscellaneous

____________

1. Drainage System SUBSURFACE DRAINS ON DOWNSTREAM SLOPE OF BOTH WINGS.

2. Condition of Relief Wells, Drains and Appurtenances NO RELIEF WELLS, DRAINS ARE SUBSURFACE THEREFORE CONDITION COULD NOT BE ASCERTAINED; GUTTERS LEADING TO AT MANHOLES, ON BERMS ARE COVERED WITH GRASS & DEBRIS

3. Unusual Increase or Decrease in Discharge from Relief Wells

NOT APPLICABLE

4. Instrumentation

(1) Monumentation/Surveys

NONE VISIBLE
(2) Observation Wells  

| NONE |

1

(3) Weirs  

| NONE |

(4) Piezometers  

| NONE |

(Other) **UPSTREAM AUTOMATIC WATER LEVEL INDICATOR AT INLET TO RESERVOIR - RECORD DIRECT INFLOW (MAINTAINED BY U.S.G.S.)**

5. Reservoir

**INSPECTED IN VICINITY OF DAM AND DIKES AND USGS MAPS**

a. Slopes  

**VISIBLE SLOPES IN VICINITY OF DAM DIKES ARE IN GENERALLY STABLE CONDITION AND ALSO IT WAS REPORTED THAT THERE WAS NO INCIDENCE OF CONDITION REPORTED TO MOTOR BOAT PATROL**
6. Spillways

**ONE SPILLWAY (WASTE WEIR) WHICH IS SERVICE SPILLWAY**

a. Principal Spillway: Inlet Condition

Pipe Condition

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

THE ORIGINAL CYCLOPEAN MASONRY SPILLWAY (WEIR) WAS REHABILITATED BY APPLYING A GUNITE SURFACING TO THE STRUCTURE. THERE WERE SOME MINOR LEAKS AND SEEPAGE FROM JOINTS OF THE WEIR. HOLES FOR FLASHBOARDS WERE NOT RESTORED TO THE CREST SURFACE. THERE WERE SOME LOOSE STONES IN THE FLOOR.

b. Emergency Spillway: General Condition

**NO EMERGENCY SPILLWAY**

Tree Growth

Erosion

Other Observations

7. Structural (if required) See Attached Appendix
8. Downstream Channel consist of rubble-paved channel floor (waste channel) up to Route 29A bridge then into a exposed bed rock into a gully which enters the Esopus Creek Valley 1.4 miles from the bridge

a. Condition (obstructions, debris, etc.) Waste channel contains minor vegetation. Some debris contained in rock-lined downstream channel and further away from weir. There are trees and other vegetation. Debris and vegetation are not considered to be an impediment to discharges from the East Basin.

b. Slopes

c. Approximate No. Homes and Population

d. General

TEAM CAPTAIN
STRUCTURAL INSPECTION CHECKLIST

PHASE 1 DAM INSPECTION

1. Concrete Surfaces
   The masonry portions of the Olive Bridge Dam appeared
   in relatively good condition. There was some spalling
   and minor cracks on the downstream face. There
   were some minor cracks and "lime" deposits on the wall of the lower
   inspection gallery. The waste weir (spillway) was rehabilitated in 1975, the
   crest & wall surfaces appeared in good condition. There were some leaks and
   seepage from the stepped waste weir.

2. Structural Cracking
   No significant structural cracking is visible
   on the spillway or the Olive Bridge Dam.

3. Movement - Horizontal and Vertical Alignment
   There is no apparent change
   in either the horizontal or vertical alignment of the Olive Bridge
   Dam or Spillway

4. Junctions with Abutments or Embankments
   The junctions of the Olive Bridge
   Dam with the embankments are in good condition. The junctions at ends
   of the spillway, which was rehabilitated in 1975, are
   also in good condition

5. Drains - Foundation, Joint, Face
   An inspection of the lower gallery
   indicated that the drains were
   operative. Measurements were made of leakage from
   inspection galleries. Quantities of leakage were small
   except at No. 10 inspection well where flow was 3.5 gpm.

6. Water Passages, Conduits, Sluices
   Not accessible -
   could not be inspected.

7. Seepage or Leakage
   Seepage and leaks were observed in several
   areas on the steps of the spillway.
   A leak was observed at the base of the wall in No 10
   inspection gallery and other galleries where locations could not be
   ascertainment

8. Monolith Joints - Construction Joints
   Not visible in dam.
   Spillway walls were repaired in 1975 and appeared
   in good condition

9. Foundation
   Not visible - Masonry dam founded on rock.
   The spillway was rehabilitated in 1975 and
   appears in good condition.
10. Abutments:  
EARTH EMBANKMENTS ARE IN GOOD CONDITION.  
THERE ARE NO CONCRETE ABUTMENTS.

11. Control Gates:  
THERE ARE NO STRUCTURAL CONTROL GATES ON  
THE OLIVE BRIDGE DAM OR SPILLWAY.

12. Approach and Outlet Channels:  
THE OUTLET CHANNEL HAS SOME  
VEGETATION AND A SMALL QUANTITY OF DEBRIS, OTHERWISE  
IT APPEARS IN RELATIVELY GOOD CONDITION.

13. Stilling Basin:  
NOT APPLICABLE.

14. Intake Structure:  
UPPER GATE HOUSE - GENERALLY GOOD CONDITION.  
TRASHRACKS AND GATE VALVES ARE NOT VISIBLE - THEY  
ARE UNDER WATER.

15. Settlement:  
NO APPARENT OR DIFFERENTIAL SETTLEMENT OF  
OLIVE BRIDGE DAM OR SPILLWAY.

16. Stability:  
NO CALCULATIONS ARE AVAILABLE; NONE  
a. Overturning:  
ARE REQUIRED FOR PHASE I INVESTIGATION  
b. Sliding:  
DITTO  
c. Seismic:  
ZONE I - NO ANALYSIS IS REQUIRED

17. Instrumentation:  
a. Alignment:  
NONE INSTALLED  
b. Uplift:  
c. Seismic:  

18. Miscellaneous:  
SOME GROWTH, INCLUDING A SAPLING  
ON THE DOWNSTREAM FACE OF MASONRY DAM
VISUAL INSPECTION CHECKLIST
(WEST, MIDDLE AND EAST DIKES)

1. Basic Data
   a. General
      Name of Dam ____________________________ Hazard Category ____________________________
      County ____________________________ ID# ____________________________
      Stream Name ____________________________ Tributary of ____________________________
      Location ____________________________ County Nearest Town (P. O.) ____________________________
      Longitude ____________________________ Latitude ____________________________ Other Directions ____________________________
   b. Inspection Personnel
      E. Jonas 2 Geotechnical
      J. Patel 3 Engineer
   c. Persons Contacted ____________________________
      ____________________________
      ____________________________
   d. History:
      Date Constructed ____________________________
      Present Owner ____________________________
      Designed by ____________________________
      Constructed by ____________________________
      Recent History ____________________________

2. Technical Data
   Type of Dam Earth
   Drainage Area 165,760 Acres
   WEST - 115 FT.
   MIDDLE - 195 FT.
   EAST - 35 FT.
   Upstream Slope Battered
   Downstream Slope Battered
   Crest Width ____________________________ Freeboard at Spillway Crest 2 FT
Low Level Control: (Type and Size)______________________________
Valve Condition____________________________________________
Emergency Spillway Type (Material) __________________________ Width
______________________________
(SEE COMMENTS
OLIVE BRIDGE
DAM CHECKLIST) Side Slopes____________________________________
Height (Crest to Top)__________________________________________
Exit Slope__________________________________________________
Exit Length__________________________________________________
Ponded Surface Area__________________________________________ Acres
Capacity (Normal Level)______________________________________ Acre Feet
Capacity Emergency Spillway Level________________________________Acre Feet

3. Embankment WEST, MIDDLE AND EAST DIKES
LENGTH: WEST DIKE 1190' FT; MIDDLE DIKE 7000' FT; AND EAST DIKE 3340' FT
a. Crest WEST & MIDDLE DIKE 34' FT; EAST DIKE 15' FT.
(1) Vertical Alignment GENERALLY GOOD & UNIFORM
EXCEPT PAVEMENT DEPRESSION NEAR SOUTH END OF
WEST DIKE (DOWNSTREAM SIDE). ALSO SEE COMMENT NO. 6
(2) Horizontal Alignment STRAIGHT AND ALIGNMENT GOOD
FOR ALL DIKES
(3) Longitudinal Surface Cracks SOME CRACKS VISIBLE IN
ROADWAY PAVEMENTS OF WEST & MIDDLE DIKES; NONE
VISIBLE ON EAST DIKE
(4) Transverse Surface Cracks SOME CRACKS VISIBLE IN
ROADWAY PAVEMENTS OF WEST & MIDDLE DIKES; NONE
VISIBLE ON EAST DIKE
(5) General Condition of Surface GENERALLY GOOD EXCEPT
NEAR SOUTH END OF WEST DIKE WHICH IS POOR
(6) Miscellaneous THE DEPRESSION AREA NEAR SOUTH END OF
WEST DIKE HAS SETTLED ABOUT 2 INCHES.
b. Upstream Slope  ALL DIKES BATTERED COVERED WITH STONE PAVING AND GRASS COVERED ABOVE STONE PAVING TO CREST

(1) Undesirable Growth or Debris  **NONE**

(2) Sloughing, Subsidence, or Depressions  **NONE VISIBLE ON ALL DIKES**

(3) Slope Protection

(a) Condition of Riprap  **GENERALLY GOOD AT ALL DIKES**

(b) Durability of Individual Stones  **GOOD AT ALL DIKES**

(c) Adequacy of Slope Protection Against Waves and Runoff  **APPEARENTLY GOOD—LITTLE OR NO DAMAGE**

(d) Gradation of Slope Protection—Localized Areas of Fine Material  **UNIFORM SIZE STONES**

(4) Surface Cracks  **NONE VISIBLE**

c. Downstream Slope  ALL DIKES BATTERED COVERED WITH GRASS

(1) Undesirable Growth or Debris  **NONE**
(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

<table>
<thead>
<tr>
<th>NONE</th>
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(3) Surface Cracks on Face of Slope

<table>
<thead>
<tr>
<th>NONE VISIBILE</th>
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</thead>
</table>

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

<table>
<thead>
<tr>
<th>NONE VISIBILE</th>
</tr>
</thead>
</table>

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Bolls"

<table>
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<tr>
<th>AT MIDDLE DIKE, 2500 FT EAST OF LOWER GATE HOUSE THERE IS SEEPAGE EMERGING FROM SUBSURFACE DRAIN. THIS SEEPAGE IS MONITORED BY BOWS PERSONNEL.</th>
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</table>

(6) Fill Contact with Outlet Structure

<table>
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<th>NO OUTLET</th>
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</thead>
</table>

(7) Condition of Grass Slope Protection

<table>
<thead>
<tr>
<th>GENERALLY GOOD EXCEPT OVERRUN GRASS AT MIDDLE AND EAST DIKES</th>
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</thead>
</table>

d. Abutments

<table>
<thead>
<tr>
<th>NONE VISIBILE</th>
</tr>
</thead>
</table>

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

<table>
<thead>
<tr>
<th>NONE VISIBILE</th>
</tr>
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</table>

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

<table>
<thead>
<tr>
<th>NONE VISIBILE</th>
</tr>
</thead>
</table>
(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

**NONE VISIBLE**

e. Area Downstream of Embankment, Including Tailrace Channel

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

**NONE VISIBLE**

(2) Evidence of "Piping" or "Boils"

**NONE VISIBLE**

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

**NONE VISIBLE**

(4) Unusual Muddy Water in Downstream Channel

**NONE**

(5) Sloughing or Erosion

**NONE VISIBLE**

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

**NONE VISIBLE**
(7) Stability of Tailrace Channel Sideslopes

(8) Condition of Tailrace Channel Riprap

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System

VITRIFIED DRAINS PIPES PLACED IN TRENCH FILLED WITH BROKEN STONE AND BOULDERS. ACCESS TO THESE PIPES IS THROUGH MANHOLES.

(1) Condition of Relief Wells, Drains and Appurtenances

NO RELIEF WELLS; DRAINS ARE SUB-SURFACE THEREFORE CONDITION COULD NOT BE ASCERTAINED.

(2) Unusual Increase or Decrease in Discharge from Relief Wells

NOT APPLICABLE

4. Instrumentation

(1) Monumentation/Surveys

NONE
(2) Observation Wells

NONE

(3) Weirs: See Page Flow at Middle Dike (2500 ft. from lower gate house) from subsurface drain is determined by 90° V notch.

(4) Piezometers

NONE

(Other)

5. Reservoir

See comments Olive Bridge Dam

a. Slopes
b. Sedimentation

_______________________________________________

_______________________________________________

_______________________________________________

_______________________________________________

6. Spillways

SEE COMMENTS OLIVE BRIDGE DAM

a. Principal Spillway: Inlet Condition

Pipe Condition

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

_______________________________________________

_______________________________________________

_______________________________________________

_______________________________________________

b. Emergency Spillway: General Condition

Tree Growth

Erosion

Other Observations

_______________________________________________

7. Structural (if required) See Attached Appendix

SEE COMMENTS OLIVE BRIDGE DAM
8. Downstream Channel

SEE COMMENTS OLIVE BRIDGE DAM.

a. Condition (obstructions, debris, etc.)

b. Slopes

c. Approximate No. Homes and Population

d. General

ERNEST JONAS, GEOTECHNICAL
TEAM CAPTAIN
ENGINEER
VISUAL INSPECTION CHECKLIST

1. Basic Data
   (WEST HURLEY, WOODSTOCK AND GLENFORD DIKES)

   a. General
      (FOR OTHER BASIC DATA SEE COMMENTS ON
      OLIVE BRIDGE DAM)
      Name of Dam ____________________________
      Hazard Category ________________________
      County __________________________________
      ID# ____________________________________
      Stream Name ____________________________
      Tributary of ____________________________
      Location ____________________________
      County Nearest Town (P. O.) ____________
      Longitude ____________________________
      Latitude ____________________________
      Other Directions ________________________
      Date of Insp __________________________
      Weather ______________________________
      Temperature __________________________

   b. Inspection Personnel
      E. JONAS GEOTECHNICAL ENGINEERS
      J. PATEL GEOTECHNICAL ENGINEERS

   c. Persons Contacted
      _______________________________________
      _______________________________________
      _______________________________________
      _______________________________________

   d. History: Date Constructed
      Present Owner __________________________
      Designed by ___________________________
      Constructed by _________________________
      Recent History _________________________

2. Technical Data
   Type of Dike ____________________________
      EARTH ____________________________
      Drainage Area 165,760 Acres
      WEST HURLEY - 56 1/2 FT
      HEIGHT WOODSTOCK - 30 1/2 FT
      LENGTH SEE COMMENTS FOLLOWING
      GLENFORD - 60 1/2 FT
      Upstream Slope BATTERED
      Downstream Slope BATTERED
      Crest Width SEE COMMENTS
      Freeboard at Spillway Crest 2' FT
      FOLLOWING
Low Level Control: (Type and Size) _______________________________

Valve Condition _______________________________

Emergency Spillway Type (Material) ________________ Width ____________

Side Slopes _______________________________

Height (Crest to Top) _______________________________

Exit Slope _______________________________

Exit Length _______________________________

Ponded Surface Area ________________________________ Acres

Capacity (Normal Level) ____________ Acre Feet

Capacity Emergency Spillway Level ____________ Acre Feet

3. Embankment WEST HURLEY, WOODSTOCK, GLENFORD Dikes

Length: WEST HURLEY - 3450 ft; WOODSTOCK - 2500 ft; AND GLENFORD - 2850 ft.

a. Crest Width WEST HURLEY, WOODSTOCK, GLENFORD DIKE ARE APPROXIMATELY 34, 15, AND 36 FT RESPECTIVELY

1) Vertical Alignment _______________________________

   GENERALLY GOOD & UNIFORM ON THREE DIKES EXCEPT
   MINOR PAVEMENT DEPRESSION AT WEST HURLEY DIKE

2) Horizontal Alignment _______________________________

   GOOD FOR ALL DIKE

3) Longitudinal Surface Cracks NONE VISIBLE

4) Transverse Surface Cracks NONE VISIBLE

5) General Condition of Surface GENERALLY GOOD FOR WEST

   HURLEY AND WOODSTOCK DIKES. VERY POOR AT GLENFORD DIKE

6) Miscellaneous ON CREST IS A PAVED ROADWAY AT

   WEST HURLEY DIKE; GRASS COVERED AT WOODSTOCK DIKE;

   AND AN UNUSED SINGLE RAILROAD TRACK, MASONRY WALL (4FT HIGH)

   AND OVERGROWN WITH VEGETATION AT GLENFORD DIKE.
b. Upstream Slope

ON ALL DIKES BATTERED; COVERED WITH STONE PAVING AND GRASS COVERED ABOVE STONE PAVING TO CABER

(1) Undesirable Growth or Debris

SOME SHRUBS AND OVERGROWN GRASS AT WEST HURLEY DIKE, NEAR THE MAXIMUM CURVATURE ALONG THE WOODSTOCK DIKE. THERE ARE TREES AND BUSHES AS WELL AS SOME DEBRIS AT LEVEL OF THE TOP OF PAVING STONE. AT GLENFORD DIKE, OVERGROWN WITH TREES, BUSHES AND SARDINGS ABOVE THE RIPRAP.

(2) Sloughing, Subsidence, or Depressions

NONE VISIBLE

(3) Slope Protection

(a) Condition of Riprap

GENERALLY GOOD

(b) Durability of Individual Stones

GOOD AT ALL DIKES

(c) Adequacy of Slope Protection Against Waves and Runoff

APPARENTLY GOOD – LITTLE OR NO DAMAGE

(d) Gradation of Slope Protection – Localized Areas of Fine Material

UNIFORM SIZE STONES

(4) Surface Cracks

NONE VISIBLE

c. Downstream Slope

ON ALL DIKES BATTERED

(1) Undesirable Growth or Debris

SOME SHRUBS AND OVERGROWN GRASS AT WEST HURLEY DIKE; HEAVY VEGETATION NEAR THE EAST END OF WOODSTOCK DIKE; THE DOWNSTREAM EDGE OF WIDENED AREA, WEST OF THE END OF WOODSTOCK DIKE IS OVERGROWN WITH TREES AND BUSHES, HEAVY GROWTH OF TREES AND BUSHES AT GLENFORD DIKE.
(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

NONE AT WEST HURLEY DIKE. ABOUT 250 FT EAST OF THE
BEND OF WOODSTOCK DIKE, GROUND ADJACENT TO THE TOE IS SWAMPY. AT
GLENFORD DIKE COULD NOT BE ASCERTAINED BECAUSE OF HEAVY VEGETATION
AND RAINFALL PREVIOUS NIGHT.
(3) Surface Cracks on Face of Slope  NONE VISIBLE ON
WEST HURLEY AND WOODSTOCK DIKES. AT GLENFORD DIKE COULD NOT BE ASCERTAINED BECAUSE OF HEAVY VEGETATION.
(4) Surface Cracks or Evidence of Heaving at Embankment Toe  NONE
ON WEST HURLEY AND WOODSTOCK DIKES. AT GLENFORD DIKE COULD NOT BE ASCERTAINED BECAUSE OF HEAVY VEGETATION.
(5) Wet or Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"  (FOR MORE COMMENT SEE BOTT. OF PAGE) AT TOE OF WEST HURLEY DIKE, THREE AREAS WERE NOTED DOWN-SLOPE OF CURB OPENINGS AT CREST. ALSO ANOTHER AREA WAS AT 400 FT FROM NORTH END OF DIKE. IT IS NOT KNOWN IF THE WET CONDITION WAS DUE TO PREVIOUS NIGHT RAINFALL OR MINOR SEEPAGE. AT WOODSTOCK DIKE THERE IS NO VISIBLE EVIDENCE OF SEEPAGE EMERGING FROM TOE OR SLOPES, BUT THERE IS A SMALL POND OF STAGNANT WATER BEYOND TOE OF WIDENED AREA OF DIKE.
(6) Fill Contact with Outlet Structure  NO OUTLET STRUCTURES AT DIKES

(7) Condition of Grass Slope Protection  GENERALLY GOOD
AT WEST HURLEY AND WOODSTOCK (EXCEPT DOWNSTREAM SLOPE OF WIDENED AREA) DIKES. POOR AT GLENFORD DIKE.
d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream  NONE VISIBLE

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments  NONE VISIBLE

5. CONT. AT WEST HURLEY DIKE OUTLET OF THE DRAINAGE SYSTEM (14" CAST IRON) DISCHARGES ESTIMATED 3 TO 5 GPM.
(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

**NONE VISIBLE**

---

e. Area Downstream of Embankment, Including Tailrace Channel

---

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

**NONE VISIBLE**

---

(2) Evidence of "Piping" or "Boils"

**NONE VISIBLE**

---

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

**NONE VISIBLE**

---

(4) Unusual Muddy Water in Downstream Channel

**NONE**

---

(5) Sloughing or Erosion

**NONE**

---

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

**NONE VISIBLE**
(7) Stability of Tailrace Channel Sideslopes

(8) Condition of Tailrace Channel Riprap

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System

(1) Condition of Relief Wells, Drains and Appurtenances

Wells: Drains are sub-surface therefore condition could not be ascertained

(2) Unusual Increase or Decrease in Discharge from Relief Wells

Not Applicable

4. Instrumentation

(1) Monumentation/Surveys

None
(2) Observation Wells  

(3) Weirs  

(4) Piezometers  

(Other)  

5. Reservoir  

   SSEE COMMENTSS OLOUE BRIDGE DAM  

   a. Slopes
b. Sedimentation


6. Spillways  

SEE COMMENTS OLIVE BRIDGE DAM

a. Principal Spillway: Inlet Condition

Pipe Condition

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

b. Emergency Spillway: General Condition

Tree Growth

Erosion

Other Observations

7. Structural (if required) See Attached Appendix
8. Downstream Channel

a. Condition (obstructions, debris, etc.) GENERALLY GOOD
   FOR ALL DIKES.

b. Slopes

c. Approximate No. Homes and Population

d. General
HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E
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**Length** - 950.0'