# Phase I Inspection Report

**Newton-Hoffman Watershed Project Dam**

**Chemong River Basin, Chemung County, NY**

**Inventory No. 700**

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## Title

**Visual Inspection**

**Hydrology, Structural Stability**

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### Abstract

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.

Based on the evaluation of the existing conditions, the condition of the Newton-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.
The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated as adequate.
This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.
# PHASE I INSPECTION REPORT
## NATIONAL DAM SAFETY PROGRAM
### NEWTOWN-HOFFMAN CREEKS WATERSHED PROJECT - FLOODWATER RETARDING DAM SITE 18
#### N.Y. 700
##### DEC I.D. NO. 61D-4285
###### CHEMUNG RIVER BASIN
####### CHEMUNG COUNTY, NEW YORK

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G  STABILITY ANALYSES

H. REFERENCES
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 N.Y. 700

State Located: New York
County Located: Chemung
Stream: Hoffman Brook (a tributary of Chemung River)
Date of Inspection: June 24, 1981 and July 15, 1981

ASSESSMENT

Based on the evaluation of the existing conditions, the condition of the Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated as adequate.

The following recommendation should be implemented within three months from notification to the owner:

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.
Assessment - Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18

Lawrence D. Andersen, P.E.
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Col. W. M. Smith, Jr.
New York District Engineer

Date: 11 Sep 81
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NEWTOWN-HOFFMAN CREEKS WATERSHED PROJECT -
FLOODWATER RETARDING DAM SITE 18
N.Y. 700
DEC I.D. NO. 61D-4285
CHEMUNG RIVER BASIN
CHEMUNG COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

The inspection was to evaluate the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property, and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances

Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 consists of an earth embankment approximately 780 feet long with a maximum height of about 71 feet from the downstream toe. The embankment has a design crest width of 20 feet and an upstream slope of 3 horizontal to 1 vertical, with a 10-foot-wide berm near the normal pool level. The downstream slope is 2.5 horizontal to 1 vertical. The upstream and downstream faces of the dam are covered with grass.

The spillway facilities for the dam consist of two vegetated earth emergency channels, one on each abutment, and a riser-type primary spillway located near the right abutment (looking downstream). The emergency spillways are trapezoidal channels with base widths of 180 feet on the left abutment and 74 feet on the right abutment. The side slopes of the channels are 3 horizontal to 1 vertical for the left abutment spillway and 1 horizontal to 1 vertical for the right abutment spillway. The control sections of the emergency spillways are located in line with the axis of the dam at approximately eight feet below the dam crest level.

The primary spillway structures are comprised of a reinforced concrete intake riser which discharges into a 30-inch-diameter
reinforced concrete pipe, terminating at a reinforced concrete impact basin at the downstream toe. The discharge pipe is equipped with reinforced concrete antiseep collars.

The reservoir drain facilities consist of a 16-inch-diameter cast iron pipe extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated upstream sluice gate. The gate stem extends along the upstream face of the dam to a hoist, about five feet above the normal pool level, located approximately 25 feet to the left of the primary spillway riser.

b. Location
The dam is located on Hoffman Brook, a tributary of Chemung River, approximately one mile northwest of the city limits of Elmira in Chemung County, New York. Plate 1 illustrates the location of the dam.

c. Size Classification
The dam is classified to be of intermediate size based on its 71-foot height and 750 acre-feet maximum storage capacity.

d. Hazard Classification
The dam is classified to be in the high hazard category. Elmira Reservoir, an earth dam with an approximate height of 34 feet and storage capacity of 420 acre-feet, is located immediately below the dam. Downstream from Elmira Reservoir, Hoffman Brook flows through residential areas of Elmira before joining Chemung River approximately 2.5 miles below the dam.

It is estimated that failure of the dam under maximum pool level would cause loss of more than a few lives and significant property damage in this area.

e. Ownership
The dam is owned and operated by Chemung County, New York. Mr. Stanley Benjamin, County Executive, J. H. Hazlett Building, 205 Lake Street, Elmira, New York 14901, (607) 739-3009.

f. Purpose of Dam
The dam is a floodwater retarding structure.

g. Design and Construction History
The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in 1976. Construction of the dam was completed in October 1978.

h. Normal Operating Procedure
The reservoir is normally maintained at the crest level of the primary spillway riser at Elevation 1130.9 (USGS Datum). The emergency spillway crests are at Elevation 1153.5.
1.3 PERTINENT DATA

Elevations referred to in this section and subsequent sections of the report were obtained from design and as-built drawings.

a. Drainage Area (sq. mi.) 3.6

b. Discharge at Dam (cfs)
- Principal spillway at top of dam 160
- Auxiliary spillway at top of dam 17970
- Reservoir drain at top of dam 40
- Total spillway capacity at top of dam 18130

c. Elevation (USGS Datum) (feet)
- Top of dam 1161.6(1)
- Auxiliary spillway crest 1153.5
- Principal spillway crest 1130.9
- Reservoir drain, invert 1102.5

d. Reservoir (acres)
- Surface area at top of dam 32.0
- Surface area at crest of auxiliary spillway 21.0
- Surface area at crest of principal spillway 11.0

e. Storage Capacity (acre-feet)
- Top of dam 750
- Auxiliary spillway crest 515
- Principal spillway crest 137

f. Dam
- Type Earth embankment
- Length 780 feet
- Height 71 feet
- Top width 20 feet
- Side slopes Downstream: 2.5H:IV
- Upstream: 3H:1V
- Zoning Yes
- Impervious core No
- Cutoff Yes
- Grout curtain No

(g. Primary Spillway
- Type Drop Inlet
- Length 15 feet (weir length)
- Crest elevation 1130.9

(1) Design crest elevation.
h. Emergency Spillway
Type
Length
Crest elevation

i. Regulating Outlet
Type
Length
Access
Regulating facilities

Two trapezoidal earth channels
180 feet (left abutment)
74 feet (right abutment)
1153.5

16-inch cast iron pipe
72 feet
Accessible through riser
Sluice gate
SECTION 2: ENGINEERING DATA

2.1 DATA AVAILABLE

Available information was obtained from New York State Department of Environmental Conservation, Dam Safety Division files, and from the files of the SCS in Syracuse, New York. Available information includes design, as-built drawings, and engineering reports.

2.2 GEOLOGY

The Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 is located in the glaciated Allegheny Plateau section of the Appalachian Plateau Province. This section is characterized as a maturely dissected plateau with the features modified by continental glaciation. The modification consists of rounding off of high areas and deposition of glacial till in the valleys.

The dam site is near the axis of a northeast trending syncline (trending approximately north 70 degrees east). The folding is gentle with the maximum dip of the limbs one to two degrees. The dip of the strata are affected locally by the folding; however, regionally, the rock strata dip south to southwest at approximately 50 to 100 feet per mile. The most prominent fracture orientations in the region have a strike of north 30 degrees west with a vertical dip. A secondary fracture trace strikes north 70 degrees east with a vertical dip, while less prominent fractures strike north-south and north 75 degrees west.

The rock strata in the area consist of unconsolidated Pleistocene glacial till (Wisconsin Drift) underlain by strata of the Lower West Falls Group (Upper Devonian Age). The glacial till consists of a mixture of clay and silt with varying quantities of gravel. The glacial till is relatively thin on hilltops and slopes and up to 40 feet thick in the valleys. The bedrock consists of a thick sequence of interbedded very dark gray to black shale and siltstone which may be up to 2,000 feet thick. The upper portion of the hills west of the dam consists of interbedded very dark gray shales and thin gray siltstone.

The abutment slopes are relatively gentle and not susceptible to landslide slope movement, except near the valley where minor sloughing may occur in the glacial till.

2.3 SUBSURFACE INVESTIGATION

A subsurface investigation was conducted by the SCS in 1971. This program consisted of 19 borings and 63 test pits. Boring and test pit logs are available in SCS files.
The subsurface conditions were described as two to six feet of alluvial gravel over glacial till in the left half of the valley and bedrock near the surface in the right side of the valley. The right abutment rock was classified as shale and siltstone with 0 to 8 feet of silty sand covering the upper slopes. In the left abutment, bedrock was not encountered within the 52-foot investigation depth.

2.4 EMBANKMENT AND APPURtenANT STRUCTURES

Plates 2 and 3 show the plan and the typical cross section of the dam. As shown in Plate 3, the dam consists of a zoned embankment incorporating a centrally located cutoff trench and an internal drainage system consisting of a chimney drain connected to a trench drain beneath the downstream slope. Plate 4 shows the layout and the details of the trench drain.

Most of the embankment is reported to consist of gravelly glacial till. As shown in Plate 3, this material was placed in the cutoff trench and was extended to the crest level through a 20-foot-wide zone at the center line of the embankment. A portion of the upstream slope and the section of the downstream slope consist of rock fill.

Plate 5 shows the plan and the typical cross section of the primary spillway and reservoir drain facilities. Plates 6, 7, and 8 include selected subsurface investigation boring logs.

The spillway facilities were designed based on hydrologic and hydraulic analyses conducted by the SCS. The design calculations are available in SCS files.

2.5 CONSTRUCTION RECORDS

The dam was constructed under the supervision of the SCS. Complete construction records are available in SCS files. No major post-construction changes were instituted.

2.6 OPERATING RECORDS

Because the dam is an ungaged flood-retarding structure, no operating records are maintained for the dam. During severe weather conditions, the dam is monitored by the SCS and Chemung County personnel.

2.7 EVALUATION OF DATA

The information obtained from the state and SCS files is considered to be adequate for Phase I inspection purposes.
SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General
Visual inspections of the dam were conducted on June 24 and July 15, 1981. On both dates, the pool level was approximately at the primary spillway crest.

b. Embankment
No signs of distress, seepage, or misalignment were observed. While the crest of the dam is covered with grass, the upstream and downstream faces are covered with crown-vetch. It appears that a portion of the upstream slope in the vicinity of the berm may have settled slightly. The upstream berm, while above water level in the area near the abutments, was submerged at the center of the dam. There are two internal drainage pipes which discharge into the stream from each side of the primary spillway impact basin. The pipe right of the impact basin was found to be discharging approximately 10 to 15 gallons per minute, while the pipe on the left was dry. The top of the dam was surveyed relative to the emergency spillway crest elevation and was found to be in conformance with as-built elevations.

c. Primary Spillway
The primary spillway facilities consist of a concrete drop inlet structure discharging into a 30-inch reinforced concrete pipe terminating at an impact basin at the downstream toe. Components of the primary spillway were in satisfactory condition.

d. Emergency Spillway
The emergency spillways are trapezoidal vegetated earth channels with one located on the left abutment and the other on the right abutment. The channels are in good condition. The grass cover is well established and adequately maintained. The approach and discharge channels were free of brush and trees or debris which could pose a potential for blockage of the spillways.

e. Reservoir Drain
The reservoir drain facilities consist of a 16-inch-diameter cast iron pipe, extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated sluice gate. The gate was partially opened by county personnel and observed to be functional.

f. Downstream Channel
The downstream channel below the primary spillway concrete impact basin is the natural stream bed. The channel appears to be stable in the near vicinity of the dam.
g. Reservoir
There are no visible signs of instability or sedimentation problems within the reservoir area.

3.2 EVALUATION

The dam was found to be in good condition. At this time, no conditions were observed that would require remedial action.
SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The reservoir is normally maintained at the crest level of the primary spillway. The dam is a flood-retarding structure and has no formal operating procedure.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by Chemung County Soil and Water Conservation District and the maintenance condition of the dam is considered to be satisfactory.

4.3 WARNING SYSTEM IN EFFECT

No formal warning system exists for the dam.

4.4 EVALUATION

The maintenance condition of the dam is considered to be good. Development of an emergency action plan is considered to be advisable. It is reported by the SCS, Broome County office, that such a plan is currently being prepared.
SECTION 5: HYDRAULIC/HYDROLOGY

5.1 DRAINAGE AREA CHARACTERISTICS

Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 has a drainage area of 3.6 square miles. The watershed is comprised of woodlands and farmlands. Relief ranges from moderate to steep.

5.2 ANALYSIS CRITERIA

As previously stated, the dam is classified as an intermediate dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass full PMF.

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers. The data used for the computer input are presented in Appendix D.

5.3 SPILLWAY CAPACITY

The spillway facilities for the dam consist of a primary and two emergency spillways. The emergency spillways are trapezoidal earth channels with one located on each abutment. The combined base width of the channels is 254 feet. Based on the available head relative to the dam crest, the combined capacity of the primary and emergency spillways is calculated to be 18130 cfs.

5.4 RESERVOIR CAPACITY

The dam impounds a reservoir with a storage capacity of 137 acre-feet at the primary spillway crest level (Elevation 1130.9), 515 acre-feet at the emergency spillway crest level (Elevation 1153.5), and 750 acre-feet at the top of the dam (Elevation 1161.6).

5.5 FLOODS OF RECORD

No data available.

5.6 OVERTOPPING POTENTIAL

The PMF inflow hydrograph was determined according to the recommended criterion and was found to have a peak discharge of 7655 cfs. The hydrograph was routed through the dam using the capacity rating data included in the design files and the dam was found to pass full PMF with the reservoir at Elevation 1158.5, leaving 3.1 feet of freeboard to the design dam crest level.
5.7 EVALUATION

The spillway can pass the recommended spillway design flood of full PMF without overtopping the embankment; therefore, the spillway capacity is classified to be adequate according to the recommended criteria.
SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam at this time. However, it should be understood that because the dam is a flood control facility and was at normal low pool level at the time of inspection, it was not under maximum loading conditions which would occur only during the passage of major floods.

b. Design and Construction Data
The dam was designed based on geological and geotechnical studies, which included subsurface investigations, laboratory materials testing and engineering analyses. A SCS memorandum, dated March 13, 1972 and included in Appendix G, summarized the findings and results of the design investigation.

The stability analyses were performed using the Swedish Circle Method. The total stress strength parameters used were: internal friction angle, 16 degrees; cohesion, 850 pounds per square foot; saturated and submerged unit weights, 145 and 82.5 pounds per cubic foot, respectively.

Factors of safety were reported to be 1.57 for the 3 horizontal to 1 vertical upstream slope under rapid drawdown conditions, and 1.5 for the 2.5 horizontal to 1 vertical downstream slope under steady state seepage conditions. The available information was reviewed and found to be adequate.

The calculated factors of safety for this dam are in excess of the minimum factors of safety recommended by the Corps of Engineers. The dam is, therefore, considered to have adequate stability.

c. Postconstruction Changes
None reported.

d. Seismic Stability
The dam is located in Seismic Zone 1. Based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard from earthquakes.
7.1 ASSESSMENT

a. Safety
Visual observations indicate that Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18 is in good condition. No conditions were observed that would significantly affect the overall performance of the structure at this time. However, as previously noted, the dam was not inspected under its maximum loading condition which would occur when the reservoir is filled during major storms.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of full PMF without overflowing the embankment; therefore, the spillway capacity is classified to be adequate.

b. Adequacy of Information
Available information, in conjunction with visual observations, is considered to be sufficient to make a Phase I evaluation.

c. Need for Additional Investigations
No additional investigation is considered to be required at this time.

d. Urgency
The action recommended below should be implemented within three months from notification to the owner.

7.2 RECOMMENDATION

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.
APPENDIX A

PHOTOGRAPHS
PHOTOGRAPH NO. 3
Right Abutment Emergency Spillway Channel

PHOTOGRAPH NO. 4
Left Abutment Emergency Spillway Channel
PHOTOGRAPH NO. 5
Primary Spillway Intake Riser

PHOTOGRAPH NO. 6
Reservoir Drain Sluice Gate Hoist
PHOTOGRAPH NO. 7
Primary Spillway Impact Basin

PHOTOGRAPH NO. 8
Elmira Reservoir Dam
(0.5 mile downstream)
APPENDIX B

VISUAL INSPECTION CHECKLIST
APPENDIX B
VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18

Name of Dam: Newtown-Hoffman Creeks Watershed Project - Floodwater Retarding Dam Site 18
Fed. I.D. #: N.Y. 700  DEC Dam No. 61D-4285
River Basin: Chemung River Basin
Location: One mile northwest of Elmira, in Chemung County
Stream Name: Hoffman Brook
Tributary of: Chemung River
Latitude (N): 42° 06.9'  Longitude (W): 76° 51.5'
Type of Dam: Earth
Hazard Category: High
Date(s) of Inspection: June 24, 1981 and July 15, 1981
Weather Conditions: Sunny, Temp. 80 degrees
Reservoir Level at Time of Inspection: El. 1131.1 ±

b. Inspection Personnel: Lawrence Andersen, P.E.; James Poellot, P.E.; Bilgin Erel, P.E.; and Michael Bort

c. Persons Contacted (Including Address & Phone No.):

Mr. Stanley Benjamin, Chemung County Executive, J. H. Hazlett Building, 205 Lake Street, Elmira, New York 14901,
(607) 739-3009
d. History:

Date Constructed 1978
Date(s) Reconstructed N/A
Designer USDA Soil Conservation Service
Constructed by Bestway Construction, Inc., Endicott, New York
Owner Chemung County, New York

2) Embankment

a. Characteristics

(1) Embankment Material Earth
(2) Cutoff Type Trapezoidal cutoff trench, 20 to 30 feet wide at the base, to varied depths.
(3) Impervious Core None
(4) Internal Drainage System A chimney drain connected to a trench drain equipped with two 8-inch-diameter perforated drainage pipes.
(5) Miscellaneous --

b. Crest

(1) Vertical Alignment Good (0.2 to 0.8 foot above design dam crest elevation)
(2) Horizontal Alignment Good
(3) Surface Cracks None
(4) Miscellaneous --

c. Upstream Slope

(1) Slope (Estimate) 3H:1V (as designed and as measured)
(2) Undesirable Growth or Debris, Animal Burrows None
(3) Sloughing, Subsidence or Depressions None
(4) Slope Protection  Vegetated Slope

(5) Surface Cracks or Movement at Toe  None

d. Downstream Slope

(1) Slope (Estimate)  \(2.5H:1V\) (as designed and as measured)

(2) Undesirable Growth or Debris, Animal Burrows  None

(3) Sloughing, Subsidence or Depressions  None

(4) Surface Cracks or Movement at Toe  None

(5) Seepage  None

(6) External Drainage System (Ditches, Trenches, Blanket)  None

(7) Condition Around Outlet Structure  Good

(8) Seepage Beyond Toe  None

e. Abutments - Embankment Contact

   No problems observed.
(1) Erosion at Contact  None

(2) Seepage Along Contact  None

3) Drainage System
   a. Description of System  A chimney drain connected to a trench drain located under the downstream toe of the dam. The trench drain is equipped with two 8-inch-diameter perforated pipes, one for each side of the dam.
   b. Condition of System  Only the downstream end of the pipes were visible.
   c. Discharge from Drainage System  Left pipe dry, right pipe discharging approximately 10 to 15 gpm (estimated).

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, etc.)  None
5) Reservoir
   a. Slopes __ Moderate slopes, no problems observed.
   b. Sedimentation __ No problems observed.
   c. Unusual Conditions Which Affect Dam __ None observed.

6) Area Downstream of Dam
   a. Downstream Hazard (No. of Homes, Highways, etc.) Elmira
      Reservoir, an earth dam approximately 34 feet high with a
      storage capacity of 420 acre-feet, is immediately downstream
      of the dam. Downstream of Elmira Reservoir, Hoffman Brook
      flows through residential areas of Elmira to the confluence
      with Chemung River, 2.5 miles downstream from the dam.
   b. Seepage, Unusual Growth __ None
   c. Evidence of Movement Beyond Toe of Dam __ None
   d. Condition of Downstream Channel __ Good

7) Spillway(s) (Including Discharge Conveyance Channel)
   a. General __ Service Spillway: Concrete riser discharging into
      a 30-inch-diameter reinforced concrete pipe.
      Auxiliary Spillways: Two trapezoidal vegetated
      earth channels located at each abutment. The base
      width of the left spillway is 180 feet and the base
      width of the right spillway is 74 feet.
   b. Condition of Service Spillway __ Good
c. Condition of Auxiliary Spillway  Good


d. Condition of Discharge Conveyance Channel  Good


8) Reservoir Drain/Outlet

Type:  Pipe  X  Conduit  ____  Other  ____

Material:  Concrete  ____  Metal  ____  Other  Cast iron  pipe, Class 25

Size:  16-inch-diameter  Length  72 feet

Invert Elevations: Entrance  1102.5  Exit 1102.15 (as built)

Physical Condition (Describe):  Not observable.

Material:  --

Joints:  --  Alignment  --

Structural Integrity:  --

Hydraulic Capability:  --

Means of Control:  Gate  X  Valve  ____  Uncontrolled  ____

Operation:  Operable  X  Inoperable  ____  Other  ____

Present Condition (Describe):  The reservoir drain was observed operating.
9) **Structural**

a. Concrete Surfaces The concrete riser and outlet structure appear to be in good condition.

b. Structural Cracking The outlet structure had some cracking on the baffle slab.

c. Movement - Horizontal & Vertical Alignment (Settlement) None observed.

d. Junctions with Abutments or Embankments No problems observed.

e. Drains - Foundation, Joint, Face No problems observed.

f. Water Passages, Conduits, Sluices N/A

g. Seepage or Leakage None observed.
h. Joints - Construction, etc.  
   No problems observed.

i. Foundation  
   Not visible.

j. Abutments  
   N/A

k. Control Gates  
   Operable

l. Approach & Outlet Channels  
   Good

m. Energy Dissipators (Plunge Pool, etc.)  
   Good condition.

n. Intake Structures  
   Good

o. Stability  
   N/A

p. Miscellaneous  
   ---
10) **Appurtenant Structures** (Power House, Lock, Gatehouse, Other)

   a. Description and Condition  
   
   None
APPENDIX C

ENGINEERING DATA CHECKLIST
APPENDIX C
ENGINEERING DATA CHECKLIST
NAME OF DAM: NEWTOWN-HOFFMAN CREEKS WATERSHED
PROJECT - FLOODWATER RETARDING DAM SITE 18

AREA-CAPACITY DATA:

<table>
<thead>
<tr>
<th></th>
<th>Elevation (feet)</th>
<th>Surface Area (acres)</th>
<th>Storage Capacity (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Top of Dam</td>
<td>1161.6</td>
<td>32.0</td>
<td>750.0</td>
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<tr>
<td>2) Design High Water (Max. Design Pool)</td>
<td>1158.5</td>
<td>27.1</td>
<td>652.0</td>
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<td>3) Auxiliary Spillway Crest</td>
<td>1153.5</td>
<td>21.0</td>
<td>515.0</td>
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<td>4) Service Spillway Crest</td>
<td>1130.9</td>
<td>11.0</td>
<td>137.0</td>
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DISCHARGES

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<th>Discharge (cfs)</th>
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<td>1) Average Daily</td>
<td>6 +</td>
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<tr>
<td>2) Auxiliary Spillway at Maximum High Water (Top of Dam)</td>
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<tr>
<td>3) Auxiliary Spillway at Design High Water (El. 1158.5)</td>
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<td>4) Principal Spillway at Auxiliary Spillway Crest Elevation 1153.5</td>
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<td>5) Low Level Outlet</td>
<td>40 +</td>
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<tr>
<td>6) Total of All Facilities at Maximum High Water</td>
<td>18170</td>
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<tr>
<td>7) Maximum Known Flood</td>
<td>Unknown</td>
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<tr>
<td>8) At Time of Inspection</td>
<td>10 +</td>
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</table>
DAM: Newtown-Hoffman Creeks Watershed Project - Floodwater

Retarding Dam Site 18

CREST ELEVATION: 1161.6

Type: Earth embankment.

Width: 20 feet  Length: 780 feet

Spillover: Concrete riser and vegetated earth channels.

Location: Concrete riser near the right abutment, earth channels at both abutments.

SPILLWAY:

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>AUXILIARY</th>
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<tbody>
<tr>
<td>1130.9</td>
<td>Elevation 1153.5</td>
</tr>
<tr>
<td>Concrete drop inlet</td>
<td>Type 3H:1V, right side 1H:1V</td>
</tr>
<tr>
<td>15-foot weir</td>
<td>Width Left side 180 feet,</td>
</tr>
<tr>
<td></td>
<td>Right side 74 feet</td>
</tr>
</tbody>
</table>

Type of Control

Uncontrolled  Uncontrolled  Uncontrolled

Controlled

N/A  Type N/A (Flashboards; Gate)

N/A  Number N/A

N/A  Size/Length 300+ feet

Invert Material Vegetated Earth

Anticipated Length of Operating Service Unknown

280+ feet  Chute Length N/A

30+ feet  Height Between Spillway Crest and Approach Channel Invert 7+ feet (Weir Flow)
Hydrometeorological Gages:

Type: None

Location: N/A

Records:

Date - N/A

Max. Reading - N/A

FLOODWATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (Mechanisms):

None
DRAINAGE AREA: 3.6 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forest and farmlands

Terrain - Relief: Moderate to steep slope

Surface - Soil: Low permeability

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Moderate to high runoff potential (SCS Hydrological Curve Number (CN) 75 was used in the original design calculations).

Potential Sedimentation Problem Areas (natural or man-made; present or future)

None observed.

Potential Backwater Problem Areas for Levels at Maximum Storage Capacity Including Surcharge Storage:

None observed.

Dikes - Floodwalls (overflow and nonoverflow) - Low Reaches Along the Reservoir Perimeter:

Location: None

Elevation: ___________________________

Reservoir:

Length at Maximum Pool: 2,500± feet; at normal pool, 700± feet

Length of Shoreline at Normal Pool: 1,800± feet
APPENDIX D

HYDROLOGY AND HYDRAULIC ANALYSES
NAME OF DAM: Newtown-Hoffman Creeks Watershed Project–Floodwater Retarding Dam Site 18 (NY DEC 61D-4285)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.8 INCHES/24 HOURS(1)

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<thead>
<tr>
<th>STATION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Station Description</td>
<td>Site 18 Drainage Area</td>
<td>Site 18 Dam</td>
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<td>Drainage Area (square miles)</td>
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<td>Adjustment of PMF for Drainage Area (2)</td>
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<td>12 Hours</td>
<td>123</td>
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<td>24 Hours</td>
<td>132</td>
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<td>48 Hours</td>
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<td>72 Hours</td>
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<td>$C_p/C_t^2$(2)</td>
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<td>L (miles)(3)</td>
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<td>Lcs (miles)(3)</td>
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<tr>
<td>$t_p = C_p(L\cdot Lcs)^{0.3}$ (hours)</td>
<td>3.1</td>
<td>—</td>
<td></td>
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<td>Spillway Data</td>
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<td>Crest Length (ft)</td>
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<td>See spillway capacity calculations</td>
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<td>Exponent</td>
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</table>

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.
(2) Snyder's Coefficients (see attached calculations).
(3) L = Length of longest water course from outlet to basin divide. Lcs = Length of water course from outlet to point opposite the centroid of drainage area.

PAGE D1 OF 8
FLOOD HYDROGRAPH PACKAGE (HEC-11)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 31 APR 80

***************
SNYDER UNIT HYDROGRAPH, SpILLWAY AND DAM OVERTOPPING ANALYSES
A2 NEWTOWN-HOFFMAN SITE-18 DAM, NY 41D-42851 CHEMUNG CO, NY, PROJ NO 80-7/8-11
A3 FOR 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, AND 100% PROBABLE MAXIMUM FLOODPHR
B 200 0 10 0 0 0 0 -4 0
B1 5
J 9 1
J1 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00
K 1 2
K1 CALC OF SNYDER INFLOW HYDROGRAPH TO NEWTOWN-HOFFMAN SITE-18 DAM, NY 61C-62851
K2 ROUTING FLOW THROUGH NEWTOWN-HOFFMAN SITE-18 DAM, NY 41D-42851
M 1 1 3.60 3.60
N 1 1
P 21.8 111 123 132 142
Q 1.0 0.05 0.0048
R 5.07 0.70
S -1.5 -0.05 2.0
T 1 2
V 1 1
V1 -1130.9 -1
V2 1133.5 1132.5 1134.0 1140.0 1144.0 1152.0 1153.5 1154.0 1154.5
V3 1155.0 1156.0 1156.5 1157.0 1157.5 1158.0 1160.5 1164.0
V4 1214.0 1242.0 147.0 149.0 284.0 609.0
V5 1636.0 2355.0 3232.0 4167.0 5234.0 764.0 12153.0 13646.0 27417.0
W 60.0 21.0 25.0 32.0
X 11130.9 1153.5 1157.0 1161.6
Y 811130.9
Z 0.5
sa 2.65 1.5 820.0
k 99

NOTE: Emergency spillway rating curve per design calculations.
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<th>OPERATION</th>
<th>STATION</th>
<th>AREA</th>
<th>PLAN RATIO 1</th>
<th>RATIO 2</th>
<th>RATIO 3</th>
<th>RATIO 4</th>
<th>RATIO 5</th>
<th>RATIO 6</th>
<th>RATIO 7</th>
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<td>3062.</td>
<td>3848.</td>
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<td>3816.</td>
<td>4582.</td>
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FLOOD ROUTING ANALYSIS
PAGE D3 OF 8
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<th>PLAN 1</th>
<th>INITIAL VALUE</th>
<th>SPILLWAY CREST</th>
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<th>RATIO OF RESERVOIR</th>
<th>MAXIMUM DEPTH</th>
<th>MAXIMUM STORAGE</th>
<th>MAXIMUM OUTFLOW</th>
<th>DURATION OVER TOP</th>
<th>TIME OF MAX OUTFLOW</th>
<th>TIME OF FAILURE</th>
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<tr>
<td>PMF</td>
<td>W.S.ELEV</td>
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<td>AC-FT</td>
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WEIR FLOW

\[ Q_1 = c L \left( H \right)^{1.5} \]
\[ = (3.22)(15) (W.L.EL - 1130.9)^{1.5} \]
\[ = 48.3 (W.L.EL - 1130.9)^{1.5} \quad \text{EQ-5} \]

PIPE FLOW (FROM P567 DESIGN = SMALL DAM, 3rd EDITION)

\[ H_T = \frac{(2500)(14 KE)}{D^4} + \frac{2601212^2}{D^{1.5}} \quad (2.5) \]
\[ = \left[ \frac{(3.55+1.5)}{D^{1.5}} + \frac{200}{D^{1.5}} \right] \quad (2.5) \]

\[ Q_2 = (19.5539) \sqrt{W.L.EL-1090} \quad \text{EQ-6} \]

<table>
<thead>
<tr>
<th>LAKE ELEV</th>
<th>( Q_1 ) cfs</th>
<th>( Q_2 ) cfs</th>
<th>PRIMARY SPILLWAY QS @cfs</th>
<th>LAKE ELEV</th>
<th>( Q_1=Q_{bs} ) cfs</th>
<th>EQ-6</th>
<th>LAKE ELEV</th>
<th>( Q_2=Q_{gs} ) cfs</th>
<th>EQ-6</th>
<th>LAKE ELEV</th>
<th>( Q_2=Q_{gs} ) cfs</th>
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PAGE D5 OF 8
EMERGENCY SPILLWAYS

SPILLWAY CAPACITY RATING

REFERENCE: DESIGN OF SMALL DAMS, 2nd EDITION. P553

A) LEFT SPILLWAY

ASSUMPTION (1) SPECIFIC ENERGY $H_e = d + \frac{V^2}{2g}$

(2) CRITICAL FLOW AT CONTROL SECTION.

$d = d_c$; $V = V_c$ and $H_e = \text{LAKE LEVEL}$

NO OTHER MINOR LOSSES ARE CONSIDERED

(3) D/S SLOPE IS STEEPER THAN CRITICAL SLOPE.

FROM P553 OF REF:

$$V_c = \frac{b+2zdc}{\sqrt{b+2zdc}} d_c g \quad - \text{EQ-1}$$

$$H_e = d_c + \frac{V^2}{2g} = d_c + \left(\frac{b+2zdc}{b+2zdc}\right)^2\left(\frac{V^2}{2g}\right)$$

$$= \left(\frac{3b+5zdc}{2b+4zdc}\right)d_c$$

$$d_c = \frac{-(3b-4Hez)^2+(4Hez)(10b)}{10z}$$

$$A_c = (zdc+b) d_c \quad - \text{EQ-3}$$

$$Q_c = A_c V_c \quad - \text{EQ-4}$$

### Lake Elevation

<table>
<thead>
<tr>
<th>Lake Elevation</th>
<th>HE</th>
<th>d_c</th>
<th>A_c</th>
<th>V_c</th>
<th>Q_c</th>
<th>LEFT EMERGENCY SPILLWAY</th>
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</thead>
<tbody>
<tr>
<td>Feet</td>
<td>FT</td>
<td>FT²</td>
<td>F/D</td>
<td>CF/</td>
<td></td>
<td>CREST EL 1153.5</td>
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<tr>
<td>1153.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>b = 180 FT</td>
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## RIGHT EMERGENCY SPILLWAY CAPACITY RATING

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<th>LAKE ELEVATION</th>
<th>HE</th>
<th>d_c</th>
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<th>V_c</th>
<th>D_c</th>
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<td>0</td>
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<td>z = 20 (AV)</td>
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## COMBINED PRIMARY AND TWO EMERGENCY SPILLWAY CAPACITY

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<th>LAKE ELEVATION</th>
<th>PRIMARY SPILLWAY CFS</th>
<th>EMERGENCY SPILLWAY CFS</th>
<th>COMBINED SPILLWAY CFS</th>
<th>LAKE ELEVATION</th>
<th>PRIMARY SPILLWAY CFS</th>
<th>EMERGENCY SPILLWAY CFS</th>
<th>COMBINED SPILLWAY CFS</th>
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<td>157.0</td>
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<td>1962</td>
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<td>2361</td>
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<td>1140</td>
<td>1383</td>
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<td>1158.5</td>
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<td>141</td>
<td>1159.0</td>
<td>162.4</td>
<td>7614</td>
<td>3245</td>
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<td>1144</td>
<td>143.7</td>
<td>144</td>
<td>144</td>
<td>1159.5</td>
<td>163.0</td>
<td>3722</td>
<td>3728</td>
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<td>1146</td>
<td>146.3</td>
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<td>146</td>
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<td>163.0</td>
<td>3722</td>
<td>3728</td>
</tr>
<tr>
<td>1150</td>
<td>151.5</td>
<td>152</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E

PLATES
REFERENCES:

1. U.S.G.S. 7.5 MIN. SEELEY CREEK N.Y. QUADRANGLE
   DATED: 1969, SCALE 1:24000

2. U.S.G.S. 7.5 MIN. BIG FLATS N.Y. QUADRANGLE
   DATED: 1969, PHOTOINSPECTED 1976, SCALE 1:24000

3. U.S.G.S. 7.5 MIN. HORSEHEADS N.Y. QUADRANGLE
   DATED: 1969, PHOTOREVISED 1978, SCALE 1:24000

4. U.S.G.S. 7.5 MIN. ELMIRA N.Y. QUADRANGLE
   DATED: 1969, SCALE 1:24000
SECTION OF DAM AT STA 10+00
(TYPICAL FROM STA 5+00 TO 13+20)
(NOT TO SCALE)
1. THE PLACEMENT TABLE INDICATES ESTIMATED USE OF MATERIALS. MATERIALS WILL NOT BE SELECTIVELY PLACED OTHER THAN SPECIFIED BELOW FOR ROCK OVERSIZED, TOPSOIL AND STRUCTURE BACKFILL.

2. A. MAXIMUM ROCK SIZE IN STRUCTURE BACKFILL COMPACTED BY MEANS OF MANUALLY DIRECTED POWER TAMPER OR PLATE TAMPER S SHALL BE 36". 
   B. OVERSIZED MATERIAL, OTHER THAN ROCK, PLACED IN THE EARTH FILL SHALL BE VARIED TO THE PORTION OF THE 24" LABELLED RANDOM ROCK ZONE AS SHOWN ON THE SHEAR.
   C. MAXIMUM LIFT THICKNESS PRIOR TO COMPACTION THE MAXIMUM LIFT THICKNESS OF THE RANDOM ROCK SECTION SHALL BE NO GREATER THAN 36" PRIOR TO COMPACTION MAX ROCK SIZE SHALL BE 24".

4. WATER CONTENT AT TIME OF COMPACTION
   5. USE CLASS "C" COMPACT IN AREA OF THE DAM CONTAINING RANDOM ROCK NOT. CLASS "C" COMPACT SHALL CONSIST OF A MINIMUM OF THREE PASSES PER LIFT OF FILL BY A TAMPER ROLLER EXERTING A MINIMUM CONTACT OF 400 PSI ON EQUVALENT AS APPROVED BY THE ENGINEER. FOR LID OF TEST HOLES SEE SHEETS 30 TO 35.
   6. MATERIAL CONTAINING LESS THAN 15% FINE SHALL BE WASTED OR PLACED IN THE COARSE ZONE INDICATED ON THE SHEET

CONSTRUCTION DETAILS

1. RANDOM ROCK ZONE LIMITS ON OUTER LIMITS OF SHEET 26.
   2. MATERIAL PLACED IN THE RANDOM ROCK ZONE SHALL CONSIST OF ROCK EXCAVATION FROM THE EMERGENCY SPILLWAY AND OVERSIZE MATERIAL RAISED TOWARD THE EARTH FILL.
   4. THE LIMITS OF STRUCTURE BACKFILL WILL BE MEASURED TO OUTSIDE FACE OF RISER AT MAXIMUM WALL THICKNESS AS SHOWN ON THIS SHEET.

PLATE 3
<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 13.0</td>
<td>Sand, silty, gravelly. Max. size 15&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown to dry 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 14.0</td>
<td>Sand, silty, gravelly. Max. size 15&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown to dry 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 10.0</td>
<td>gravel, sandy, silty. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 16.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 0.9</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 0.9</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 13.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 10.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
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</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
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</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
<tr>
<td>NOTE:</td>
<td>No sieving.</td>
</tr>
<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
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<tr>
<td>0.0 - 1.0</td>
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<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
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<tr>
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<tr>
<td>0.0 - 0.8</td>
<td>Topsoil, brown.</td>
</tr>
<tr>
<td>0.8 - 15.0</td>
<td>Sand, silty, gravelly. Max. size 1&quot;, flaggy siltstone approx. 7% gravel, 3% sand, 60% slightly plastic fines. Brown dry to 3&quot;, then moist impermeable; dense; homogeneous; glacial till (SI)</td>
</tr>
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**HOUR-A-FOOT SITE 18**

**WELL LOGS**

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<th>Depth (ft)</th>
<th>Description</th>
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<tbody>
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<td>114.5</td>
<td>Sand, gravelly, silty, clayey; well graded; est. 25% gravel, 30% sand, 45% fines; slightly plastic; brown; dry to 2.5% clay; wet 4.2%; slightly permeable; dense to very dense, N=2-5; mostly homogenous; glacial till; (CL-ML)</td>
</tr>
<tr>
<td>13.0</td>
<td>Silt and clay, sandy, gravelly; poorly graded; est. 25% gravel, 25% sand, 50% fines; slightly plastic; brown; dry to 2.5% clay, then moist; slight permeability; dense to very dense, N=2-5; mostly homogenous, but occasional clayey lenses; glacial till; (CL-ML)</td>
</tr>
</tbody>
</table>

**Note:** Water level at surface due to artesian pressure encountered near bottom. Run 8, 34.0-44.0'; 100 rev., 0% RH.

---

<table>
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<th>Depth (ft)</th>
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</thead>
<tbody>
<tr>
<td>32.0</td>
<td>Shale and siltstones; silty texture; moderately weathered; brown to grey; moderately soft to hard; lensed bedding; highly fractured, spacing &lt;1'; essentially horizontal; poor core; Devonian fa.; Devonian; (sh and slate)</td>
</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.

---

<table>
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<th>Depth (ft)</th>
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</thead>
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<td>37.6</td>
<td>Shale and siltstones; silty texture; moderately weathered; brown to grey; moderately soft to hard; lensed bedding; highly fractured, spacing &lt;1'; essentially horizontal; poor core; Devonian fa.; Devonian; (sh and slate)</td>
</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.

---

<table>
<thead>
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<th>Depth (ft)</th>
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<td>1.0</td>
<td>Toleni, argill. clay</td>
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<tr>
<td>1.9</td>
<td>Silt and clay; w/sand and gravel; poorly graded; est. 25% gravel, 25% sand, 50% fines; slightly plastic; brown; dry to 2.5% clay, then moist; slight permeability; dense to very dense, N=2-5; mostly homogenous, but occasional clayey lenses; glacial till; (CL-ML)</td>
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**Note:** No water level observed.

---

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<th>Depth (ft)</th>
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<td>21.0</td>
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</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.

---

<table>
<thead>
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<th>Depth (ft)</th>
<th>Description</th>
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<tbody>
<tr>
<td>31.9</td>
<td>Shale and siltstones; silty texture; moderately weathered; brown to grey; moderately soft to hard; lensed bedding; highly fractured, spacing &lt;1'; essentially horizontal; poor core; Devonian fa.; Devonian; (sh and slate)</td>
</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.

---

<table>
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<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.0</td>
<td>Silt and clay; w/sand and gravel; poorly graded; est. 25% gravel, 25% sand, 50% fines; slightly plastic; brown; dry to 2.5% clay, then moist; slight permeability; dense to very dense, N=2-5; mostly homogenous, but occasional clayey lenses; glacial till; (CL-ML)</td>
</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.

---

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>Shale and siltstones; silty texture; moderately weathered; brown to grey; moderately soft to hard; lensed bedding; highly fractured, spacing &lt;1'; essentially horizontal; poor core; Devonian fa.; Devonian; (sh and slate)</td>
</tr>
</tbody>
</table>

**Note:** Water level 3.0'; 9/7/71, 98 rev., 1% EHG.
LEGEND

CANADAWAY GROUP
800-1200 ft (240-370 m)

JAVA GROUP
300-700 ft (90-210 m)
- Winisco Formation—sandstone, shale; Hanover and Pipe Creek Shales.

WEST FALLS GROUP
1100-1600 ft (340-490 m)
- Nunda Formation—sandstone, shale.
- West Hill and Gardeau Formations—shale, siltstone.
- Roricks Glen Shale, upper Beers Hill Shale, Grimes Siltstone.
- Lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.
- Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone. Corning Shale
- "New Milford" Formation—sandstone, shale
- Gardeau Formation—shale, siltstone; Roricks Glen Shale.
- Slide Mountain Formation—sandstone, shale, conglomerate.
- Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales.

SONYEA GROUP
200-1000 ft (60-300 m)
- In west: Cashqua and Middlesex Shales.
- In east: Rye Point Shale, Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft (60-300 m)
- West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.
- Oneonta Formation—shale, sandstone
- Unadilla Formation—shale, siltstone
- Tully Limestone.

LOCKPORT GROUP
80-175 ft (25-55 m)
- Oak Orchard and Penfield Dolostones, both replaced eastwardly by Sconondoa Formation—limestone, dolostone.

GEOLOGY MAP LEGEND

REFERENCE
GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET
DATED 1970, SCALE 1:250,000

D'APPOLONIA
APPENDIX C
STABILITY ANALYSES
INTRODUCTION

The proposed 71-foot high, Class "C" hazard dam is located in the Allegheny Plateau physiographic area of south central New York.

The major engineering problems appear to be controlling seepage from the high water tables in the abutments, under the dam, and through possible differential settlement cracks at the base of the right abutment.

DISCUSSION

FOUNDATION

A. Classification. Two to 6 feet of alluvial gravel overlie the glacial till in the left half of the flood plain and the shale bedrock in the right side of the flood plain.

The right abutment consists of shale and siltstone of the Chemung formation with 0 to 2 feet of silty sand blanketing the upper slopes. The surface of the bedrock is weathered to depths 4 to 6 feet.

The left abutment consists of glacial till to the depths investigated (up to 52'). The upper portion in the surface 6 to 18 feet is SM and SS-3M, and the underlying till is CL-ML.

B. Dry Unit Weight. Standard penetration tests yield blow counts of 20 to 37 blows per foot in the gravely alluvium and the glacial till in the flood plain. Most of the blow counts were in the range of 20 to 30 blows per foot.
Blow counts in the glacial till in the left abutment were generally greater than those in the till underlying the flood plain.

C. Shear Strength. The high-blow-count gravelly flood plain alluvium is expected to have minimum shear parameters of $\phi = 35^\circ$ and $c = 0$ psf. The underlying dense till is expected to be as strong or stronger than the gravelly alluvium.

D. Permeability. Low to moderate artesian pressures were reported in the emergency spillway test holes. Field permeability tests in the bedrock of the right abutment gave permeability rates up to 5 fdp.

The gradation of the alluvial material "A" with a $D_{50}$ size of 0.6 to 0.8 mm indicates permeability rates of 300 to 600 fdp.

**EMBANKMENT**

A. Classification. Most of the embankment material will consist of gravelly glacial till from the borrow area and emergency spillway excavations. The 2 samples submitted to the SML were GC materials with 28% and 30% gravel, 25% and 24% sand, and 47% and 46% fines. Liquid limits of the 2 samples were 25 and 27 and the plasticity indices were 8 and 10.

The deeper glacial till in the emergency spillway excavation is finer textured than the above GC samples. Sample 504.1 was classified as CL-ML in the New York laboratory.

Some shale and siltstone will be available from the right emergency spillway excavation.

B. Compacted Dry Density. Standard Proctor compaction tests (ASTM D-698, Method A) were made on the minus No. 4 fraction of the 2 gravelly borrow samples. Maximum dry densities of 125.0 pcf and 125.5 pcf were obtained from the tests. Optimum moisture contents were 11% for both tests.

C. Shear Strength. Consolidated undrained triaxial shear tests were made on the minus No. 4 fractions of both of the GC samples. The 1.4-inch diameter shear specimens were molded to 92% of Standard density at moisture contents approximately 2% wet of optimum. The test specimens were back pressured in the shear machines from 3 to 1,077 psi to obtain full saturation. Pore pressures were measured, and effective stress parameters were determined. The shear test data was interpreted to give the following values:

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Field</th>
<th>Laboratory</th>
<th>Dry Density</th>
<th>$D_{50}$</th>
<th>$\sigma_s$</th>
<th>Shear Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>pcf</td>
<td>%</td>
<td>psi</td>
<td>$\phi$</td>
</tr>
<tr>
<td>213.1</td>
<td>72W1287</td>
<td>122.2</td>
<td>98</td>
<td>13</td>
<td>1325</td>
<td>28.5</td>
</tr>
<tr>
<td>Composite</td>
<td>72W1288</td>
<td>122.6</td>
<td>98</td>
<td>16</td>
<td>0</td>
<td>2000</td>
</tr>
</tbody>
</table>

PAGE G2 OF 17
D. Consolidation. A one-dimensional consolidation test was made on the minus No. 4 fraction at 18% of Standard density (122.0 pcf). The 2.5-inch diameter test specimen was molded slightly wet of optimum and then saturated at the start of the loading in the consolidation test. The test specimen was loaded to 16,000 psf. Under the 10,000 psf load for the base of the proposed 71-foot high embankment the test specimen consolidated approximately 2%. The average embankment settlement across the flood plain is estimated to be approximately 1%.

E. Permeability. A falling head permeability test on the consolidation test specimen shows an initial permeability rate of approximately 0.0025 ft/day.

STABILITY ANALYSIS

The stability of the proposed 71-foot high, Class "C" hazard embankment was analyzed using a modified Swedish circle method (Fellenius) and a sliding block analysis.

Total stress shear parameters of $\phi = 16^\circ$ and $c = 850$ psf for the compacted embankment materials gave the lowest safety factors in the embankment-only analysis of the maximum section. The full drawdown analysis of the 3:1 upstream slope gave a safety factor of 1.57 (trial No. 4). The steady seepage analysis of the $2\frac{1}{2}:1$ downstream slope with a drain at c/b = 0.6 shows a minimum safety factor of 1.56 (trial No. 2).

A sliding block analysis of the $2\frac{1}{2}:1$ downstream slope, using shear parameters of $\phi = 35^\circ$ and $c = 0$ psf for the flood plain alluvium, gave a higher safety factor than the embankment-only Swedish circle analysis.

CONCLUSIONS AND RECOMMENDATIONS

A. Site Preparation and Centerline Cutoff. Actual test values for the consolidation potential of the foundation alluvium and glacial till are not available. Past experience indicates SM material with blow counts of 10 to 30 blows per foot can be expected to have consolidation potentials of 2% to 5% under the 10,000 psf load of the proposed 71-foot high embankment. Settlement calculations were made assuming an average foundation consolidation of 3% for the upper 20 feet of the flood plain. Compressibility of the material below 20 feet was considered negligible.

Assuming a 3% consolidation potential in the alluvium and till at the base of the steep right abutment and zero compressibility in the shale bedrock abutment, a differential settlement of 0.03 ft/ft was calculated for the 1:1 slope of the lower abutment. The low-plasticity embankment materials overlying the steep lower abutment may crack under this...
The differential settlement can be reduced by replacing the questionable alluvium (with an assumed 3% consolidation) with compacted till with a known consolidation potential (2% according to the test data). It may also be possible to spread the differential settlements over a wider area by backsloping the abutments in the steep lower portions. An additional protective measure would be to provide an embankment zone over the lower abutment of broadly graded sand and gravel that would be highly resistant to a concentrated leak. The GP-GC alluvium (Material A) with cobbles up to 6 inches and a D85 size of approximately 2 inches would bridge most cracks that appear likely to occur. The broadly graded gravel is a Class I material for resisting concentrated leaks according to Sherard’s classification in his article “Earthquake Considerations in Earth Dam Design,” Journal of the Soil Mechanics and Foundations Division, Proceedings of the American Society of Civil Engineering, Vol. 93, No. SM4, July 1967.

It is suggested the lower right abutment be backsloped as far as possible with ordinary earth-moving equipment and that the glacial till in the lower left abutment be backsloped to a 3:1 or flatter slope.

A 25 to 40-foot wide cutoff trench through the gravelly alluvium is suggested based on the \( \omega = h - d \) relationship as given in the Bureau of Reclamation’s “Design of Small Dams,” p 168, to reduce the seepage under the dam. Side slopes of the cutoff trench of 1:1 or flatter are adequate. Backfill the cutoff trench with the gravelly till (Material B) and compact to a minimum density of 98% of Standard (ASTM D-698, Method A).

B. Principal Spillway. The sloping bedrock surface under the principal spillway at the proposed location presents a condition that is quite difficult to analyze, and we do not have accurate foundation consolidation information. A simplified situation with a level bedrock surface and 20 feet of compressible foundation material with a 3% consolidation potential was assumed for estimating purposes. The assumed situation was analyzed using the method of Technical Release No. 18 (Rev.). The analysis (see attached Form RTSC-FW-ENG-42) shows a horizontal strain of approximately 0.002 ft/ft. The sloping bedrock situation at the site with 5 feet of compressible material in the upstream portion and 25 feet in the downstream portion is expected to be less severe than the simplified condition that was analyzed.

A \( \theta \) angle of 28° is suggested for conduit loading calculations.

C. Drainage. A foundation trench drain at \( c/b = 0.6 \) is recommended across the flood plain and in the left abutment below permanent pool elevation to control seepage that bypasses the centerline cutoff and to safely outlet seepage from the high water tables in the abutments. A blanket drain is recommended below the permanent pool elevation on the shale bedrock of the lower right abutment from \( z/b = 0.6 \) to \( z/b = 0.8 \).
coarse-grained filter material such as ASTM D-448 - No. 78 or No. 68 will be adequate to drain the alluvial gravels and the gravelly till.

D. Embankment Design. The following are recommended:

1. Place the gravelly GC glacial tills in the center and downstream sections at a minimum density of 98% of Standard (ASTM D-698, Method A or Method C).

2. Provide an embankment zone of the on-site gravelly alluvium (Material A) over the foundation drain and adjacent to the lower right abutment to provide high resistance to concentrated leaks that could develop due to differential settlement. Extending the GP-GM gravel zone all the way across the flood plain will provide a higher level of protection from piping in the entire lower portion of the dam. A massive section (10 feet) will serve as a filter for the gravelly till (Material B) and also be a self-healing material by forming its own filter in a crack.

3. Place the silty till (Material C) in the upstream portion of the embankment at a minimum density of 98% of Standard.

4. Selectively place the shale borrow materials in the upper portion of the downstream section above the phreatic line using a methods specification that gives a firm mass.

5. Provide 3:1 upstream slopes and 2:1 downstream slopes.

6. Provide an overfill of 1.0 foot to compensate for residual foundation and embankment settlement.

E. Emergency Spillway. Horizontal drain into the abutment at the contact between the "B" and "C" tills and at grade in the outer slope of the emergency spillway excavation should be considered in the left abutment to assure a stable slope, as the materials have a local history of slipping.
MATERIALS TESTING REPORT
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CONSOLIDATION TEST

PROJECT and STATE

FIELD SAMPLE NO. DEPTH GEOLOGIC ORIGIN

TYPE OF SAMPLE TESTED AT APPROVED BY

CLASSIFICATION

G5 LL PI β

INITIAL DENSITY γd

INITIAL VOID RATIO e0

COMPRESSION INDEX Cc

TEST SPECIFICATIONS:

CONSOLIDATING PRESSURE

PERCENT CONSOLIDATION

CONSOLIDATING PRESSURE
## Soil Permeability

<table>
<thead>
<tr>
<th>TEST NO</th>
<th>LL</th>
<th>PL</th>
<th>SPECIFIC GRAVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>G_3 (-) ( \rho_g )</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>G_5 (+) ( \rho_g )</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>G_0 (Bulk) ( \rho_g )</td>
</tr>
</tbody>
</table>

### Test Specifications
- Fallin Head Test
- Consolidation Sample

### Remarks
- \( k \) @ initial density = 0.0025 ft³/day

---

**Classification:** GC

**Initial Moisture:**

- **Dry Density:**
  - **Grain:** 0.38 g/cm³
  - **Grain Dense:** 0.37 g/cm³

- **Void Ratio:**
  - Initial: 0.41

- **Permeability Coef:**
  - k = 0.0025 ft³/day

- **Percolation Coef:**
  - h/L during test

---

**PAGE G8 OF 17**
TRIAXIAL SHEAR TEST

FIELD SAMPLE NO. 2.3.1
FIELD LOCATION: ST. LAWRENCE, NEW YORK

GEOL. ORIGIN: GLACIAL TILL

INDEX TEST DATA

USCS: G6 ; LL 25, PI 8
% FINER (mm): 0.002 9 ; 0.005 15 ; 0.074 [*200] 47
G_s (*4) 2.75 ; G_s (**4)
STANDARD: \( \gamma_d \) MAX. 125.0 pcf; \( w_o \) 11.0 %
MODIFIED: \( \gamma_d \) MAX. pcf; \( w_o \) %

DARK DENSITY

INITIAL pcf g/cc
CONSOLIDATED pcf g/cc
Parameter
START OF TEST
MOISTURE CONTENT, %
DEG OF SAT. AT START OF TEST
END OF TEST
TIME OF CONSOLIDATION (hrs)
MINOR PRINCIPAL STRESS \( \sigma_3 \) (psi)
DEVIATOR STRESS \( \sigma_1 - \sigma_3 \) (psi)

\( \gamma_d \) 122.2 0.94 14.1 6.38 10 28.8 6.5
\( \gamma_d \) 122.4 0.96 13.7 6.42 25 28.5 8.1
\( \gamma_d \) 122.1 0.97 13.6 15.92 40 96.0 70

DEViator STRESS \( \sigma_1 - \sigma_3 \), psi

SHEAR PARAMETERS
\[ \theta = 23.1 \text{ deg.} \]
\[ \tan \theta = 0.373 \]
\[ c = 0.030 \text{ psi} \]

REMARKS: BACK-PRESSURE

PAGE G9 OF 17
<table>
<thead>
<tr>
<th>Minor Principal Stress, $\sigma_3$ (psi)</th>
<th>Pore Pressure, u (psi)</th>
<th>Effective Minor Principal Stress, $\sigma_3$ (psi)</th>
<th>Deviator Stress, $\sigma_1 - \sigma_3$ (psi)</th>
<th>Failure Criteria</th>
<th>Axial Strain at Failure, $\varepsilon$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16</td>
<td>8.4</td>
<td>28.8</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>20</td>
<td>110</td>
<td>14.0</td>
<td>38.5</td>
<td></td>
<td>8.1</td>
</tr>
<tr>
<td>40</td>
<td>22.0</td>
<td>16.0</td>
<td>46.0</td>
<td></td>
<td>7.0</td>
</tr>
</tbody>
</table>

**Shear Parameters**
- $\phi = 22.5$ deg
- $\tan \phi = 0.593$
- $C = 575$ psi

**Remarks** Back-Pressured
**MATERIALS TESTING REPORT**

**U.S. DEPARTMENT OF AGRICULTURE**

**SOIL CONSERVATION SERVICE**

**TRIAXIAL SHEAR TEST**

---

**Project and State**

**Field Sample No.**

**Depth**

**GEOLOGIC ORIGIN**

Glacial Till

**Type of Sample**

Compacted

**Tested at**

SMU-Lincoln

**Approved by**

Edgar F. Storm

**Date**

3/1/72

**Index Test Data**

<table>
<thead>
<tr>
<th>USCS</th>
<th>GC</th>
<th>LL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Finer (mm):</td>
<td>0.002</td>
<td>0.005</td>
<td>17</td>
</tr>
<tr>
<td>0.074 (5#200)</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gs (#4)</td>
<td>2.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gs (#4)</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard: ρd Max. 125.5 psf; w=10 %**

**Modified: ρd Max. 125.5 psf; w=10 %**

---

**Dry Density**

<table>
<thead>
<tr>
<th>Initial</th>
<th>Consolidated</th>
<th>Parameter</th>
<th>Moisture Content</th>
<th>Time of Consolidation</th>
<th>Minor Principal Stress</th>
<th>Deviator Stress (σ1 - σ3), psi</th>
<th>Axial Strain at Failure, ε (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pcf</td>
<td>pcf</td>
<td>g/cc</td>
<td>g/cc</td>
<td>Start of Test</td>
<td>End of Test</td>
<td>σ1, σ3 (psi)</td>
<td></td>
</tr>
<tr>
<td>122.0</td>
<td>122.0</td>
<td>0.95</td>
<td>0.85</td>
<td>12.0</td>
<td>15.0</td>
<td>311</td>
<td>150</td>
</tr>
<tr>
<td>121.5</td>
<td>121.5</td>
<td>0.96</td>
<td>0.86</td>
<td>12.5</td>
<td>16.0</td>
<td>316</td>
<td>150</td>
</tr>
<tr>
<td>122.5</td>
<td>122.5</td>
<td>0.96</td>
<td>0.86</td>
<td>12.5</td>
<td>15.0</td>
<td>459</td>
<td>150</td>
</tr>
</tbody>
</table>

---

**Deviator Stress (σ1 - σ3), psi**

**Shear Parameters**

- γ: 16 deg.
- tan γ: 207
- c: 950 psi

---

**Remarks**

Back Pressured

**Page 010 of 17**
### Materials Testing Report

**Triaxial Shear Test**

- **Sample Location**: EXEC. 5471 (Site 18, R 3N, T 10S, S 4E)
- **Date**: 3/1/72
- **Sample**: Minor Pore Pressure Measured

<table>
<thead>
<tr>
<th>MINOR PRINCIPAL STRESS, $\sigma_3$ (psi)</th>
<th>PORE PRESSURE, $u$ (psi)</th>
<th>EFFECTIVE MINOR PRINCIPAL STRESS, $\bar{\sigma}_3$ (psi)</th>
<th>DEVIATOR STRESS, $\sigma_1 - \sigma_2$ (psi)</th>
<th>FAILURE CRITERIA</th>
<th>AXIAL STRAIN AT FAILURE, $\varepsilon$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>0.7</td>
<td>9.3</td>
<td>23.1</td>
<td></td>
<td>15.0</td>
</tr>
<tr>
<td>25</td>
<td>8.2</td>
<td>16.8</td>
<td>56.6</td>
<td></td>
<td>15.0</td>
</tr>
<tr>
<td>40</td>
<td>18.1</td>
<td>21.7</td>
<td>45.9</td>
<td></td>
<td>15.0</td>
</tr>
</tbody>
</table>

**Diagram**

- **Pore Pressure ($u$), psi**
- **Shear Stress ($t$), psi**
- **Normal Stress ($\sigma$), psi**

**Shear Parameters**
- $\phi = 27^\circ$
- $\tan \phi = 0.584$
- $C = 250$ psi

**Remarks**: Back-Pressured

---

**Page G12 of 17**
**U.S. DEPARTMENT OF AGRICULTURE**

**SOIL CONSERVATION SERVICE**

**COMPACTING AND PENETRATION RESISTANCE**

**PROJECT No.**

**FIELD SAMPLE NO.**

**LOCATION**

**GEOLOGIC ORIGIN**

**TESTED AT**

**APPROVED BY**

**DATE**

---

**CLASSIFICATION**

G - L L 25 P I 8

**MAX. PARTICLE SIZE INCLUDED IN TEST**

< # 4

**SPECIFIC GRAVITY (G<sub>s</sub>)**

- MINUS NO. 4: 2.75
- PLUS NO. 4: 2.70

**CURVE NO.**

1 of 2

---

**Graphs and Diagrams**

- Penetration resistance vs. density of compacted soil
- Moisture content vs. percent of dry weight

**Remarks**

- Curve is for the minus no. 4 fraction
- Gradation of total sample
- < no. 200: 47, < no. 4: 72, < 3 in: 103

---

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MATERIALS TESTING REPORT
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

COMPACTION AND PENETRATION RESISTANCE

PROJECT AND STATE: Newfane - Hoffman, New York

FIELD SAMPLE NO: 10
LOCATION: Enlarged (left) Material 'C'

GEOLOGIC ORIGIN: SML - LINCOLN

APPROVED BY: [Signature]
DATE: 3/1/72

CLASSIFICATION: GC

MAX. PARTICLE SIZE INCLUDED IN TEST: < 4

SPECIFIC GRAVITY (G_s): MINUS NO. 4: 2.76

CURVE NO. 2 OF 2

CURVE IS FOR THE MINUS NO. 4 FRACTION
GRADIENT OF TOTAL SAMPLE
< NO. 200 C < NO. 4 < 1/16 IN. 162

REMARKS: GRADIENT OF TOTAL SAMPLE

0
500
1000
1500
2000
2500
PENETRATION RESISTANCE, PS

0
150
145
140
135
130
125
120
115
DENSITY OF COMPACTED SOIL, PC

MOISTURE CONTENT, PERCENT OF DRY WEIGHT

PAGE G14 OF 17
<table>
<thead>
<tr>
<th>TRIAL NO.</th>
<th>SLOPE</th>
<th>CONDITIONS</th>
<th>STABILITY ANALYSIS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8:1</td>
<td>_decision</td>
<td>1.98</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>8:1</td>
<td>decision</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>8:1</td>
<td>decision</td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>8:1</td>
<td>decision</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
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<td>decision</td>
<td>1.58</td>
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<td>decision</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>8:1</td>
<td>decision</td>
<td>1.70</td>
<td></td>
</tr>
</tbody>
</table>
**Determination of s and Probable Joint Gaps**

<table>
<thead>
<tr>
<th>State:</th>
<th>Project:</th>
<th>Site:</th>
<th>Determination of s and Probable Joint Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- $\delta = 0.6$ ft. $\phi = 35$ deg. $c = 0$ psf
- $p_c = \text{psf}$ $p = H \gamma_m = 10,000$ psf $\gamma_m = 14,300$ psf

**Determination of s**

$$\bar{p} = \frac{H}{2} \gamma_m + y \gamma_d = \left( \frac{1}{2} \right) \gamma_m = 5000 \text{ psf}$$

$$\bar{p} = 5000 \text{ psf}$$

Then, $\sigma_3 = 2/3 \bar{p} = 3333 \text{ psf}$

$$\sigma_1 = \frac{2c}{\tan(45^\circ - \phi/2)} + \frac{\sigma_3}{\tan(45^\circ - \phi/2)}$$

$$= \frac{2(1)}{\tan(45^\circ - 35/2)} + \frac{3333}{\tan(45^\circ - 35/2)} \approx 12,250 = 12,250 \text{ psf}$$

$$s = \frac{\sigma_1 - \sigma_3}{2} = \frac{(12,250) - (3,333)}{2} = 9,175 \text{ psf}$$

**Joint Gap**

$$B/d = \frac{(4.17)}{20} = 0.208 \ R_1 = 0.14$$

$$B/H = \frac{(4.17)}{70} = 0.06$$

$$R_2 = \frac{2c}{\sigma_3} + 0.1 = \frac{2(10,000)(20)}{(4452)(4.17)} + 0.1$$

$$= \frac{215}{0.1} = 2.15$$

$$\epsilon_{hm} = R_1 \cdot R_2 \cdot \frac{8}{d} = (0.14)(0.315)(0.03) = 0.00164 \text{ ft./ft.}$$

$$g_s = \epsilon_{hm} \cdot 12 \cdot L = (0.00164)(12) = \text{in.}$$

$$g_T = \frac{2.5}{B} \cdot \delta = 2.5 \left( \frac{(1)}{(1)} \right) = \text{in.}$$

$$J = g_s + g_T + \text{F.S.} = \text{in.} + \text{in.} + \text{F.S.}$$

$$= \text{in.} + \text{F.S.}$$
APPENDIX H

REFERENCES


