Susquehanna River Basin, Inventory
Number NY-575. Nanticoke Creek Watershed
Project Site 9E. Broome County, New York,
Phase I Inspection Report.
DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DDC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.
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. Nanticoke Creek Watershed Protection Project Dam Site 9E was found to have no conditions which would render the dam unsafe.
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 Test flood is based on the estimated "Probably 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.
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PHASE 1 REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Nanticoke Creek Watershed Protection Project Dam Site No. 9E
I.D. No. NY 575 (#85D-3646)

State Located: New York
County Located: Broome
Watershed: Susquehanna River Basin
Stream: Unnamed tributary of Nanticoke Creek
Date of Inspection: November 8, 1978

ASSESSMENT

The Nanticoke Creek Watershed Protection Project, Dam Site No. 9E, is a floodwater retarding structure. Examination of available documents and a visual inspection of the dam did not reveal conditions which are considered to be unsafe.

The total discharge capability of the spillway is adequate for the Probable Maximum Flood (PMF).

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Col. Clark H. Benn
New York District Engineer

Date: 17 April 79
SECTION 1: PROJECT INFORMATION

1.1 GENERAL
a. Authority
The Phase 1 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
This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT
a. Description of the Dam and Appurtenant Structures
The Nanticoke Creek Watershed Protection Project Dam No. 9E consists of an earth dam with a principal spillway pipe passing through the embankment and two emergency spillways on the southern end of the dam.

The dam consists of two compacted earth, zoned embankments. The northern embankment is 42 feet high, has a crest length of 520 feet and a crest width of 15 feet. The southern embankment section is 15 feet high, has a crest length of 295 feet and a crest width of 15 feet. The upstream slopes are 1 vertical on 3 horizontal and the downstream slopes are 1 vertical on 2 1/2 horizontal. The crest and exposed slopes are grass covered. An earth cutoff trench of varying depth and width keys both embankments into the foundation soils.

The principal spillway consists of a two stage reinforced concrete drop inlet structure, a 36 inch diameter reinforced concrete pipe with anti-seepage collars, and an impact basin to dissipate energy at the outlet end of the conduit. A reservoir drain consisting of a 12 inch corrugated metal pipe extends from the upstream toe of the embankment to the base of the principal spillway riser. A vertical slide gate mechanism mounted along the inside of the riser controls the flow through the reservoir drain. The emergency spillways are two grass lined channels each 150 feet wide, located in earth cuts on the southeastern end of the dam.

An internal drainage system consisting of a gravel and sand drain fill with perforated 8 inch diameter corrugated metal collector pipes is located at the base of the embankment near the downstream toe. Seepage is collected and conducted through this drain and outleted into the impact basin.
b. Location
Dam No. 9E of the Nanticoke Creek Project is located on an unnamed tributary of the Nanticoke Creek, approximately 1.5 miles north of the Village of Nanticoke. The site is off Cadwell Hill Road in the Town of Nanticoke, New York.

c. Size Classification
This dam is 42 feet high and is classified as an "intermediate" size dam (between 40 and 100 feet high).

d. Hazard Classification
The dam is classified in the "high" hazard category because of the presence of several homes and the Village of Nanticoke downstream of the dam.

e. Ownership
This dam is owned by the County of Broome, New York.

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

g. Design and Construction History
This dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS). Construction of the dam was completed in 1967. The SCS Office for Broome County, located at the Broome County Airport, has a design folder containing hydrologic, hydraulic, and structural design information, and the as-built plans and documents. These as-built plans were included in the Appendix G.

h. Normal Operating Procedures
Normal flows are discharged through the principle spillway. This structure has sufficient capacity to store and discharge a 100 year flood without flow occurring in the emergency spillway. For storms greater than the 100 year flood, flow will discharge through the emergency spillway.

1.3 PERTINENT DATA

a. Drainage Area (acres) 1827

b. Discharge at Dam (cfs)

<table>
<thead>
<tr>
<th>Description</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle Spillway at Maximum High Water</td>
<td>165</td>
</tr>
<tr>
<td>Principle Spillway at Emergency Spillway Crest Elevation</td>
<td>156</td>
</tr>
<tr>
<td>Reservoir Drain at Principle Spillway Crest El.</td>
<td>14</td>
</tr>
<tr>
<td>Maximum Known Flood</td>
<td>152</td>
</tr>
<tr>
<td>Emergency Spillway at Maximum High Water</td>
<td>11754</td>
</tr>
</tbody>
</table>

c. Elevation (USGS datum)

<table>
<thead>
<tr>
<th>Description</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Dam</td>
<td>1191.8</td>
</tr>
<tr>
<td>Emergency Spillway Crest (Auxiliary Spillway)</td>
<td>1186.7</td>
</tr>
<tr>
<td>Principle Spillway Crest (Service Spillway)</td>
<td>1176.7</td>
</tr>
<tr>
<td>Invert of Reservoir Drain Inlet</td>
<td>1153.0</td>
</tr>
</tbody>
</table>
d. Reservoir (acres)
   Surface area at Top of Dam 41.0
   Surface area at Crest of Emergency Spillway 32.2
   Surface area at Crest of Principle Spillway 16.2

e. Storage Capacity (acre-feet)
   Top of Dam 538
   Emergency Spillway Crest 353
   Principle Spillway Crest 120

f. Dam
   Embankment Type: A two zoned compacted earth
                   fill in two sections with an
                   earth keyed cutoff trench under
                   each section
   Embankment Length (ft.)
     Northern Embankment Section 520
     Southeastern Embankment Section 295
   Slopes: Both Embankments
     Upstream 1 vertical on 3 horizontal
     Downstream 1 vertical on 2.5 horizontal
   Crest Elevation (USGS datum)
     Both Embankments 1191.8
   Crest Width (ft.)
     Both Embankments 15

g. Principal Spillway (Service)
   Type: Uncontrolled, reinforced concrete
         two stage drop inlet (3x9 ft.)
         rising 26.2 feet; 36 inch reinforced
         concrete pressure conduit 207.58
         feet long; concrete impact basin
   Length (ft.) Weir 18

   Emergency Spillway (Auxiliary)
   Type: Two grass-lined channels
         having trapezoidal cross sections.
   Bottom Width(ft.)
     Northwestern Channel 150
     Southeastern Channel 150
   Side Slopes: Both Channels (V : H) 1 on 3
   Length of level section (in profile) (ft.)
     Both Channels 30
   Exit Slope: Both Channels .028
h. Reservoir Drain

Type: 12 inch diameter corrugated metal pipe with a reinforced concrete inlet.

Control: Mechanically operated vertical slide gate mounted along the inside of the principal spillway riser.
SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Geology
The Nanticoke Creek Watershed Project Dam No. 9E is located in the "Glaciated Allegheny Plateau" physiographic province of New York State. Bedrock underlying the site is mapped as Cashaqua Shale of the Upper Devonian Age. This rock was formed approximately 400 million years ago.

Glacial ice was instrumental in smoothing the topography of the area. The present surficial deposits have resulted primarily from glaciations during the Cenozoic Era, the last of which was the Wisconsin glaciation, approximately 11,000 years ago. Glacial deposits such as outwash plains and eskers are major features of the landscape in parts of this region.

b. Subsurface Investigations
A subsurface investigation program was conducted by the Soil Conservation Service in 1965. This program consisted of 17 test pits. The maximum depth of the explorations was 12 feet. Applicable subsurface information is included in Appendix G.

In general, the subsurface conditions on both abutments consist of a thin layer of topsoil underlain by glacial till. In the floodplain, the topsoil layer is underlain by a layer of relatively clean gravel, four to six feet thick. The glacial till is beneath this layer. The cutoff trench was designed to impede seepage through this layer of gravel. Bedrock was not encountered in the exploration program.

c. Embankment and Appurtenant Structures
The dam was designed by the Soil Conservation Service who prepared a design report. Fifteen drawings, several of which have been included in Appendix G, were prepared for the construction of the dam.

The embankment has two zones. Zone 1 is a longitudinal drainage blanket under the downstream slope of the dam, constructed using the clean gravel removed from the cutoff trench excavation. Zone 2 is the relatively impervious glacial till which forms the major portion of both embankments.

2.2 CONSTRUCTION RECORDS
Complete as-built contract plans and documents are available from the SCS Office in Broome County. No major construction changes were made on this job. The as-built plans are included in the Appendix of this report.

2.3 OPERATION RECORD
Since the dam is an uncontrolled, floodwater retarding structure, no operating records are maintained regarding water levels. However, during periods of heavy rainfall, SCS personnel do monitor reservoir levels.
2.4 EVALUATION OF DATA
The data presented in this report has been compiled from information obtained from the Soil Conservation Service as well as the New York State Department of Environmental Conservation files. It appears to be adequate and reliable for the purpose of the Phase I Inspection.
SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General
Visual inspection of Dam Site No. 9E was conducted on November 8, 1978. The weather was clear and the temperature was around 50°F. The water surface was several inches above the invert of the low stage inlet on the riser. There was a small flow from the principal spillway pipe spilling into the impact basin.

b. Embankment
The earth embankment showed no signs of distress. The vertical and horizontal alignment of the crest of both embankments appeared to be satisfactory, with no visible surface cracks appearing on the crest or embankment slopes. There were no areas of serious sloughing or subsidence noted. Some minor sloughing was observed on the upstream slope in the range of fluctuation of the water surface level.

Inspection of the downstream face did not reveal any signs of seepage. The collection pipes from the internal drainage system were dry. There were rock lined trenches to collect surface runoff along the intersection of the downstream toe of the slope with each abutment on the northern embankment section.

No undesirable vegetative growth of animal penetrations into the slopes were observed. However, on the date of the inspection, the grass on the embankments had not been mowed.

c. Principal Spillway
The principal spillway consists of the vertical drop inlet structure, a reinforced concrete pressure pipe through the embankment, an impact basin and an outlet channel. All of these components were in satisfactory condition. There was a small gap around the principal spillway pipe at its joint with the headwall of the impact basin.

d. Emergency Spillway
Two grass lined emergency spillways in earth cut sections are located beyond the southern end of the embankment. The spillway had been mowed and appeared to be in satisfactory condition. A small portion had not been mowed because of several logs which had been deposited in the channel.

e. Drain
The reservoir drain conduit and slide gate may be used to lower the reservoir when the pool level is below the principal spillway crest. The slide gate is located within a pipe sleeve which extends to the top of the riser.

f. Downstream Channel
The outlet channel beyond the end of the impact basin was in satisfactory condition. No severe side-slope erosion or debris obstructions were in evidence.
g. Reservoir

There were no signs of soil instability in the reservoir area.

3.2 EVALUATION OF OBSERVATIONS

Visual observations did not reveal any problems which would adversely affect the safety of the dam.
SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES
The normal water surface elevation is approximately at the low stage inlet elevation. Downstream flows are limited by the capacity of the 36 inch diameter reinforced concrete pipe. The reservoir provides 328 acre feet of storage between the normal water level and the crest of the emergency spillway.

4.2 MAINTENANCE OF DAM
The dam is maintained by the owner and is in satisfactory condition. Normal maintenance consists of mowing the bottom of the emergency spillway channels.

4.3 WARNING SYSTEM IN EFFECT
No apparent warning system is present

4.4 EVALUATION
The dam and appurtenant structures are satisfactorily maintained.
SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

Delineation of the watershed draining into the reservoir pool area was made using the USGS 7.5 minute quadrangle for Lisle, N.Y. The watershed consists of woodlands and lightly forested area situated in a rural section. Relief ranges from moderate to steep with the steeper slopes occurring on the western side of the watershed. The slopes on the western side range from 10 to 15%, and on the eastern side they range from 5 to 10%. The oval shaped drainage area is about 1827 acres.

5.2 ANALYSIS CRITERIA

The analysis of the spillway capacity of the dam was performed using the Corps of Engineer's HEC-1 computer program, incorporating the "Snyder Synthetic Unit Hydrograph" method and the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the PMF in accordance with recommended guidelines of the U.S. Army Corps of Engineers.

5.3 SPILLWAY CAPACITY

The principal and emergency spillways are uncontrolled structures. The principal spillway operates under weir or orifice flow conditions depending upon the floodwater inflow to the reservoir pool. During orifice flow operation, pressure flow develops in the 36 inch conduit. The emergency spillway was analyzed as a broad-crested weir having a discharge coefficient (C) of 3.087.

The spillways have sufficient capacity for discharging the peak outflow from the PMF. Due to the limited storage capacity, there will be little attenuation of the storm flows. For this storm, the peak inflow and the peak outflow, are both 4905 cfs. When the spillways are discharging the peak outflow, the water surface will be 2.2 feet below the top of the dam.

5.4 RESERVOIR CAPACITY

Normal flood control storage capacity of the reservoir between the principal and emergency spillways is 233 acre-feet which is equivalent to a runoff depth of 1.5 inches over the drainage area. Surcharge storage capacity to the maximum high water elevation is an additional 185 acre-feet; equivalent to a runoff depth over the drainage area of 1.2 inches. Total storage capacity of the dam is 538 acre-feet; equivalent to 3.5 inches of direct runoff.

5.5 FLOODS OF RECORD

The maximum known flood occurred during Hurricane Eloise during September, 1975. The pool level at this time was reported to be about 8' feet above the principal spillway crest. The calculated discharge for this flood is as follows:

<table>
<thead>
<tr>
<th>Elevation (ft)</th>
<th>Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1184.7</td>
<td>152</td>
</tr>
</tbody>
</table>

-10-
5.6 OVERTOPPING POTENTIAL
Analysis indicates the total discharge capability is sufficient to prevent overtopping from the PMF.

5.7 EVALUATION
This dam has sufficient capability to impound and adequately discharge floodwaters expected to result from the PMF.
SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
No signs of major distress of the dam were observed during the inspection.

b. Design and Construction Data
Design data was obtained from the Soil Conservation Service Office in Binghamton. Stability analyses were performed by SCS using a modification of the Swedish Circle Method. The soil parameters assumed for the stability analyses were a friction angle of 31 degrees and a cohesion of 500 pcf. These parameters appear to be appropriate for the type of soil involved. The stability analyses were performed assuming 1 on 3 upstream and 1 on 2.5 downstream slopes with no berms (a berm was used in the final design, but this would increase the safety factor). The results of the analyses are as follows:

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>MINIMUM FACTOR OF SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UPSTREAM SLOPE</td>
</tr>
<tr>
<td>Full Drawdown</td>
<td>2.3</td>
</tr>
<tr>
<td>Long Term Steady State</td>
<td></td>
</tr>
<tr>
<td>Seepage from Emergency Spillway Crest</td>
<td></td>
</tr>
</tbody>
</table>

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

A summary of the analyses and sections showing the failure arcs are included in Appendix E.

Based on discussions with SCS representatives, the dam was built essentially according to the plans.

c. Post Construction Changes
The SCS representatives were not aware of any changes which have been made on the dam.

d. Seismic Stability
This dam is located in Seismic Zone No. 1. Therefore, a seismic stability analysis is not warranted.
SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety
The Phase 1 Inspection of the Nanticoke Creek Dam No. 9E did not reveal conditions which constitute a hazard to human life or property. The earth embankment is considered to be stable structurally, and capable of safely retarding floodwaters resulting from the PMF.

The design of this dam includes an internal drainage system to control the phreatic surface and to provide a safe outlet for foundation seepage.

b. Adequacy of Information
Information concerning the design and performance of this dam is considered adequate for the purpose required for Phase 1 Inspection Reports.

c. Need for Additional Investigations
No additional investigations are necessary at this time.

7.2 RECOMMENDED MEASURES
The following tasks should be undertaken by maintenance forces:

a. Periodic operation and lubrication of the mechanically operated slide gate mechanism to insure the ease of operation of the reservoir drain conduit.

b. A schedule for periodic maintenance should be established which would include items such as mowing the grass on the embankment slopes and crest.
RISER - PRINCIPAL SPILLWAY INLET

RISER - NOTE LOG LODGED IN TRASH RACK
EMERGENCY SPILLWAY LOOKING DOWNSTREAM

DOWNSTREAM SLOPE OF NORTHERN EMBANKMENT
IMPACT BASIN — LOOKING UPSTREAM

OUTLET TO PRINCIPAL SPILLWAY PIPE
APPENDIX B

ENGINEERING DATA CHECKLIST
<table>
<thead>
<tr>
<th>Item</th>
<th>Plans</th>
<th>Details</th>
<th>Typical Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Spillway(s)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Outlet(s)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Design Reports: Yes

Design Computations: Yes

Discharge Rating Curves: 

Dam Stability: Yes

Seepage Studies: Yes

Subsurface and Materials Investigations: Yes
<table>
<thead>
<tr>
<th>Item</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction History</td>
<td>ONLY INFORMATION AVAILABLE OBTAINED THROUGH DISCUSSIONS WITH PROJECT INSPECTOR</td>
</tr>
<tr>
<td>Surveys, Modifications, Post-Construction Engineering Studies and Reports</td>
<td>NONE REPORTED</td>
</tr>
<tr>
<td>Accidents or Failure of Dam Description, Reports</td>
<td>NONE REPORTED</td>
</tr>
<tr>
<td>Operation and Maintenance Records Operation Manual</td>
<td>NONE</td>
</tr>
</tbody>
</table>
APPENDIX C

VISUAL INSPECTION CHECKLIST
1) Basic Data
   a. General
      Name of Dam  NANTICOKE CREEK SITG 9E
      I.D. #    N.Y. 575 (*85D-3446)
      Location: Town NANTICOKE County BROOME
      Stream Name  UNNAMED
      Tributary of NANTICOKE CREEK
      Longitude (W), Latitude (N) W76°3.1' N42°17.5'
      Hazard Category  C
      Date(s) of Inspection  11/8/78
      Weather Conditions  SUNNY 45°-50°
   b. Inspection Personnel  R. WARRENDER, W. LYNICK
   c. Persons Contacted  H. HIRTH, SCS SYRACUSE
                         G. PAGE & D. KOLESAK, SCS BROOME Co.
   d. History:
      Date Constructed  1966-67
      Owner  BROOME COUNTY
      Designer  SCS
      Constructed by  McDougall Const. Co.

2) Technical Data
   Type of Dam  EARTH
   Drainage Area  183.7 ACRES
   Height  42'  Length  NORTH SECTION 520'  SOUTH 295'
   Upstream Slope  1 ON 3  Downstream Slope  1 ON 2.5
2) **Technical Data (Cont'd.)**

<table>
<thead>
<tr>
<th>External Drains: on Downstream Face</th>
<th>@ Downstream Tee</th>
<th>Rip Rap</th>
</tr>
</thead>
</table>

**Internal Components:**

- Impervious Core
- Drains: 8" CMP Drain Pipe in Sand & Gravel Drain
- Cutoff Type: Compacted Earth Fill
- Grout Curtain
3) Embankment

**EARTH FILL WITH GOOD VEGETATIVE COVER**

a. Crest

(1) Vertical Alignment **OKAY**

(2) Horizontal Alignment **OKAY**

(3) Surface Cracks **NONE**

(4) Miscellaneous **Crest Had Not Been Mowed**

b. Slopes

(1) Undesirable Growth or Debris, Animal Burrows **Slopes Had Not Been Mowed**

(2) Sloughing, Subsidence or Depressions **Minor Sloughing on Upstream Slope at Water Surface Elevation**

(3) Slope Protection **Unmowed Grass**

(4) Surface Cracks or Movement at Toe **NONE**

(5) Seepage **NONE**

(6) Condition Around Outlet Structure **Satisfactory**
c. Abutments

(1) Erosion at Embankment and Abutment Contact \textbf{NONE}

(2) Seepage along Contact of Embankment and Abutment \textbf{NONE}

(3) Seepage at toe or along downstream face \textbf{NONE}

d. Downstream Area - below embankment

\textbf{FARM FIELDS}

(1) Subsidence, Depressions, etc. \textbf{NONE}

(2) Seepage, unusual growth \textbf{NONE}

(3) Evidence of surface movement beyond embankment toe \textbf{NO EVIDENCE}

(4) Miscellaneous

\textbf{Miscellaneous}

e. Drainage System

\textbf{2" DIA. CMP IN SAND & GRAVEL DRAIN FILL}
(1) Condition of relief wells, drains, etc.

(2) Discharge from Drainage System **No Discharge**
4) Instrumentation

(1) Monumentation/Surveys  N/A

(2) Observation Wells  N/A

(3) Weirs  N/A

(4) Piezometers  N/A

(5) Other

5) Reservoir

a. Slopes  FORESTED UP TO WATER'S EDGE

b. Sedimentation
a. General **Riser, Outlet Pipe & Impact Basin in Satisfactory Condition**

b. Principle Spillway **26.2' High Rectangular RC Drop Inlet; 36" Dia RC Pressure Pipe; Concrete Impact Basin - A 10" Dia. Log was lodged in the Riser's Trash Rack. All in Satisfactory Condition - Very Slight Separation Around RC Pipe at junction with Impact Basin Headwall.**

c. Emergency or Auxiliary Spillway **Two Grass Lined Trapezoidal Open Channels in Earth Cut. Bottom of Channels Mowed - One Section not Mowed because of a Log Lying in the Channel.**

d. Condition of Outlet channel **Satisfactory**

e. Stability of Channel side/slopes **Satisfactory**
7) Downstream Channel

a. Condition (debris, etc.)  **Normal Growth - Tree Lined**  
   - Above Stream Banks

b. Slopes  **Satisfactory - Outlet into Level Farm Field**

c. Approximate number of homes  **About 12-15 in the Village of Nanticoke Plus a Church w/ Meeting House.**

8) Miscellaneous
3) Structural

a. Concrete Surfaces **Satisfactory**

b. Structural Cracking **NONE**

c. Movement - Horizontal & Vertical Alignment (Settlement) **NONE**

d. Junctions with Abutments or Embankments **N/A**

e. Drains - Foundation, Joint, Face **N/A**

f. Water passages, conduits, sluices **Satisfactory**

g. Seepage or Leakage **NONE**
h. Joints - Construction, etc. **Some Mortar Was Missing**
   **At Impact Basin - Conduit Gasket**

i. Foundation

j. Abutments

k. Control Gates **Reservoir Drain Has Slide Gate**

l. Approach & Outlet Channels

m. Energy Dissipators (plunge pool, etc.) **Impact Basin - Okay**

n. Intake Structures

o. Stability

p. Miscellaneous
APPENDIX D

HYDROLOGIC/HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS
### Check List for Dams

**Hydrologic and Hydraulic Engineering Data**

#### Capacity Data:

<table>
<thead>
<tr>
<th>Description</th>
<th>Elevation (ft.)</th>
<th>Surface Area (acres)</th>
<th>Storage Capacity (acre-ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Top of Dam</td>
<td>1191.8</td>
<td>41.0</td>
<td>538</td>
</tr>
<tr>
<td>2) Design High Water</td>
<td>1189.4</td>
<td>37.0</td>
<td>446</td>
</tr>
<tr>
<td>(Max. Design Pool)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Auxiliary Spillway Crest</td>
<td>1186.7</td>
<td>32.2</td>
<td>353</td>
</tr>
<tr>
<td>4) Pool Level with Flashboards</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Service Spillway Crest</td>
<td>1176.7</td>
<td>16.2</td>
<td>120</td>
</tr>
</tbody>
</table>

#### Discharges

<table>
<thead>
<tr>
<th>Description</th>
<th>Volume (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Average Daily</td>
<td>N/A</td>
</tr>
<tr>
<td>2) Spillway @ Maximum High Water</td>
<td>165</td>
</tr>
<tr>
<td>3) Spillway @ Design High Water</td>
<td>161</td>
</tr>
<tr>
<td>4) Spillway @ Auxiliary Spillway Crest Elevation</td>
<td>156</td>
</tr>
<tr>
<td>5) Low Level Outlet</td>
<td>14</td>
</tr>
<tr>
<td>6) Total (of all facilities) @ Maximum High Water</td>
<td>11920</td>
</tr>
<tr>
<td>7) Maximum Known Flood</td>
<td>152</td>
</tr>
</tbody>
</table>
CREST:

Type: LEVEL; GRASSED EARTH
Width: 15
Length: NORTH SECTION 520
SOUTH 295
Spillover: N/A
Location: 

SPILLWAY:

PRINCIPAL

1176.7
RC Drop Inlet w/ Trash Rack
3' x 9'

EMERGENCY

1186.7
Type
2 Trapezoidal Channels
Width
Each 150' with 1 on 3 slopes

Type of Control

Uncontrolled

Controlled:

N/A
(Flashboards; gate)

N/A
Number

N/A
Size/Length

Invert Material
Mowed Grass

Anticipated Length
of operating service
< 1 PER 100 YRS

36" Dia RC 208 ft

Length
NORTH 450' SOUTH 750'

Height Between Spillway Crest & Approach Channel Invert

N/A

BROAD CRESTED WEIR

WEIR LENGTH = 12'
SINK/EMERGENCY DRAINAGE FACILITIES: RESERVOIR DRAIN

Type: Gate [ ] Sluice [ ] Conduit [x] Penstock [ ]
Shape: Gate - Flat Circular Conduit - Round Cast Iron
Size: ____________________________

Elevations: Entrance Invert 1153.0
Exit Invert 1144.5
Tailrace Channel: Elevation 1144.5

HYDROMETEOROLOGICAL GAGES:
Type: None
Location: ____________________________
Records:
Date - ____________________________
Max. Reading - ____________________________

FLOOD WATER CONTROL SYSTEM:
Warning System: None

Method of Controlled Releases (mechanisms):
None except for manually operated reservoir drain slide gate
DRAINAGE AREA: 1827 Acres  286 Sq M

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forest

Terrain - Relief: Moderate - Steep

Surface - Soil: Glacial Till

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

NONE

Potential Sedimentation problem areas (natural or man-made; present or future)

NONE

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

NONE

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: NONE

Elevation:

Reservoir:

Length @ Maximum Pool N/A (Miles)

Length of Shoreline (@ Spillway Crest) N/A (Miles)
D.A. = Drainage area in square miles
L = River mileage from the given station to the upstream limit of the drainage area
LCA = River mileage from the station to the center of gravity of the drainage area
PMP = Probable Maximum Precipitation in inches

\[ t_p = \frac{L}{3.33} (LCA)^{0.3} \]
\[ t_r = \frac{t_p}{5.5} \]
\[ t_{PR} = t_p + 0.25 (t_r - t_r) \]

From HMR 33 - Figure 2, Depth - Area - Duration

6 hour \% 111 = , 12 hour \% 133
24 hour \% 122 = , 48 hour \% 142
# Project Grid

**Subject:** Hydrology & Hydraulic Computations

### Principal Spillway Capacity

**Water Surface at Auxillary Spillway Crest**

\[ q = Av \left( \frac{2gH}{1 + k_a + k_0 + k_p} \right) = 7.06 \sqrt{\frac{2(32.2)(46.7)}{1 + 4.5 + 4.5 + 0.165(2076)}} = 155.98 \text{ cfs} \]

**Water Surface at Design High Water**

\[ q = 7.06 \sqrt{\frac{2(32.2)(46.7)}{1 + 4.5 + 4.5 + 0.165(2076)}} = 160.98 \text{ cfs} \]

**Water Surface at Top of Dam**

\[ q = 7.06 \sqrt{\frac{2(32.2)(45.8)}{1 + 4.5 + 4.5 + 0.165(2076)}} = 165.38 \text{ cfs} \]

### Emergency Spillway Capacity

**Water Surface at Top of Dam**

\[ q = cLH^{3/2} = 3.087(330.6)(5.1)^{3/2} = 1175.2 \text{ cfs} \]

### Reservoir Drain Capacity

**Water Surface at Principle Spillway Crest**

\[ q = 0.78 \sqrt{\frac{2(32.2)(27)}{1 + 4.5 + 0.165(27)}} = 14.34 \text{ cfs} \]

### Depth of Flow in Emergency Spillway During PMF

\[ Q = cLH^{3/2} \Rightarrow H^{3/2} = \frac{Q}{cL} = \frac{4749}{(3.087)(318)} \Rightarrow H = 2.86' \]

\[ Q = 4905 - 156 = 4749 \]

\[ L = 2\left[150 + 15(3.2)\right] = 318 \]
**JOB SPECIFICATION**

<table>
<thead>
<tr>
<th>NO</th>
<th>NHR</th>
<th>NMIN</th>
<th>IDAY</th>
<th>IMHR</th>
<th>IMIN</th>
<th>METRC</th>
<th>IPLT</th>
<th>IPRT</th>
<th>HSTAN</th>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**JOUPER**

| NWT | 5   |

**MULTI-PHASE ANALYSES TO BE PERFORMED**

NPLAN = 1

NRTIO = 2

LRTIO = 1

**RTIOS**

| 0.50 | 1.00 |

**SUB-AREA RUNOFF COMPUTATION**

<table>
<thead>
<tr>
<th>ISTAQ</th>
<th>ICOMP</th>
<th>IECON</th>
<th>ITAPE</th>
<th>JPLT</th>
<th>JPRRT</th>
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**HYDROGRAPH DATA**

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<th>TAREA</th>
<th>SNAP</th>
<th>TRSAD</th>
<th>TRSPE</th>
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**LOSS DATA**

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<th>ERAN</th>
<th>STRKS</th>
<th>RTIDK</th>
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<th>CNSTL</th>
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**UNIT HYDROGRAPH DATA**

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<th>NTA</th>
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<td>3.00</td>
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<td>4.00</td>
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</table>

**APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.71 AND R= 2.44 INTERVALS**

**UNIT HYDROGRAPH 13 END-OF-PERIOD ORDINATES; LAG= 2.98 HOURS, CP= 0.63, VOL= 1.00**

<table>
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<th></th>
<th>62.</th>
<th>216.</th>
<th>357.</th>
<th>374.</th>
<th>284.</th>
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<td>23.</td>
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**END-OF-PERIOD FLOW**

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**HEC-1 VERSION DATED JAN 1973**

**UPDATED AUG 74**

**CHANGE NO. 01**
<table>
<thead>
<tr>
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<th>21.84</th>
<th>18.15</th>
<th>33735.</th>
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</table>

| CFS       | 4905. | 3334. | 1310. | 467. | 33755. |
| INCHES    | 1247.  | 1796.  | 1824.  | 1830. |
| AC-FT     | 1902.  | 2739.  | 2782.  | 2791. |

**HYDROGRAPH AT STA 1 FOR PLAN 1, RTD 1**

| CFS       | 2492.  | 1917.  | 690.   | 234.  | 16877.  |
| INCHES    | 6.23.  | 1309.  | 1391.  | 1396. |
| AC-FT     | 951.   | 1309.  | 1391.  | 1396. |

**PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME**

<table>
<thead>
<tr>
<th>PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME</th>
<th>CFS</th>
<th>INCHES</th>
<th>AC-FT</th>
</tr>
</thead>
<tbody>
<tr>
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<td>21.84</td>
<td>18.15</td>
<td>33735.</td>
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<tr>
<td>CFS</td>
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<td>INCHES</td>
<td>1247.</td>
<td>1796.</td>
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**HYDROGRAPH AT STA 1 FOR PLAN 1, RTD 2**

<p>| CFS       | 4905. | 3334. | 1310. | 467. | 33755. |
| INCHES    | 1247.  | 1796.  | 1824.  | 1830. |
| AC-FT     | 1902.  | 2739.  | 2782.  | 2791. |</p>
<table>
<thead>
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**HYDROGRAPH ROUTING**

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<tbody>
<tr>
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**ROUTING DATA**

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**STORAGE**

| Outflow | 0.0 | 0.0 | 156.0 | 11920 |

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<tr>
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<th>1 PLAN</th>
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<th>PEAK</th>
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<th>24-HOUR</th>
<th>72-HOUR</th>
<th>TOTAL VOLUME</th>
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<tbody>
<tr>
<td>CFS</td>
<td>2527</td>
<td>1850</td>
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<td>INCHES</td>
<td>538</td>
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<td>8.99</td>
<td>9.02</td>
</tr>
<tr>
<td>AC-FT</td>
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<td>1371</td>
<td>1376</td>
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**STATION**

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<th>PEAK</th>
<th>6-HOUR</th>
<th>24-HOUR</th>
<th>72-HOUR</th>
<th>TOTAL VOLUME</th>
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<tr>
<td>CFS</td>
<td>2527</td>
<td>1850</td>
<td>620</td>
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<tr>
<td>INCHES</td>
<td>538</td>
<td>8.07</td>
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<tr>
<td>AC-FT</td>
<td>11920</td>
<td>1371</td>
<td>1376</td>
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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

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<tr>
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<td>1</td>
<td>2452</td>
<td>4905</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<tr>
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<td>2</td>
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<td>0</td>
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APPENDIX E

STABILITY ANALYSES
Classification: Embankment samples are classified GM and GC based on the gradation that includes 20% plus 3-in. material. Actually, the laboratory samples, 65W2924 and 65W2925, contained slightly over 50% fines.

Density: Standard moisture-density tests were made in the minus 3/4-in. fraction. Maximum density ranges from 124.5 to 126.5 p.c.f.

Shear Strength: Sample No. 65W2925 was tested, using the minus 3/4-in. fraction. One hundred percent of standard density was selected because previously tested similar material had relatively low shear strength at lower densities.

Shear values from this CU test are $\phi = 31^\circ$, $c = 500$ p.s.f. Effective stress parameters are $\phi = 32.5^\circ$, $c = 550$ p.s.f., correcting for measured pore pressure.

SLOPE STABILITY ANALYSIS

An embankment only analysis using laboratory charts based on a modification of the Swedish circle method and using shear values of $\phi = 31^\circ$, $c = 500$ p.s.f. indicates that the factor of safety of a 3:1 upstream slope and 2 1/2:1 downstream slope is in the range of 2.0. Drawdown to the base is assumed and the phreatic surface is assumed to emerge on the downstream slope.

It is concluded that more detailed analysis is not justified.

CONCLUSIONS AND RECOMMENDATIONS

A. Site Preparation: It is recommended that the soft surface silts be removed. Most of this soil will be taken out in normal stripping operations.

B. Centerline Cutoff: Cutoff of disturbed surface soil is recommended for the abutments. Cutoff of the alluvial gravels into till is recommended for the floodplain area. A 25-foot bottom width is recommended for this cutoff to reduce the exit gradient into the alluvial gravels. The GC material is satisfactory for backfill.

C. Principal Spillway: No particular problems are anticipated.

D. Drainage: With the proposed cutoff, the alluvial gravels downstream are expected to function as a drain. You may wish to consider a pick-up trench drain or a small rock toe to outlet this natural drain.
E. Embankment Design:

1. Selection of Material. Material like sample Nos. 65W2924 and 65W2925, GC and GM, can be used anywhere in the embankment. It is suggested that consideration be given to placing the coarser gravel with low-plastic fines, 65W2926 - GM, in the downstream base section provided it is practical to separate it from the other soils. Permeability of this material is expected to be somewhat higher than that of the others.

The recommended density control is 100% of standard based on the minus 3/4-in. fraction. Shear strength at this density is ample based on the test for Sample No. 65W2925. Notify us if you prefer a lower control than 100% of standard and another shear test and slope stability analysis will be made.

2. Slopes. Proposed 3:1 upstream and 2 1/2:1 downstream slopes are adequate.

3. Settlement Allowance. An allowance of 1.0 ft. is suggested to compensate for residual settlement in embankment and foundation; 0.8 ft., 2% average, for the embankment and 0.2 ft. for the foundation.

Prepared by:

Robert E. Nelson

Reviewed and Approved by:

Roland B. Phillips

Attachments

cc: B. S. Ellis, Syracuse, New York
    Henry W. Davis, Penn Yan, New York
    R. J. McClimans, Binghamton, New York
    H. M. Kautz, Upper Darby, Pennsylvania
**SUMMARY - SLOPE STABILITY ANALYSIS**

**State**: New York  
**Project**: Wautage Creek-Site #9-E  
**Date**: 5-18-65  
**Analysis Made By**: G. L.  
**Checked By**: J. W.  
**Method of Analysis**: Swedish Circle

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**UPSTREAM SLOPE**

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<th>Trial</th>
<th>Slope</th>
<th>Conditions</th>
</tr>
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<tbody>
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<td>1</td>
<td>3:1</td>
<td>Fall drawdown - Ne per Arc cat. from 400 solar term eq. (31°-522) only - Sat shear values only</td>
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**DOWNSTREAM SLOPE**

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<td>2</td>
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<td>No drain - Ne form - Arc cat. from top side these emb. (31°-522) only - Sat shear values only</td>
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Supplement to sheet 1 of 2
Nanticoke Creek - Site #9-E
New York

Maximum Section
Sta. 3 + 30
APPENDIX F

REFERENCES
APPENDIX F

REFERENCES


APPENDIX G

DRAWINGS
VICINITY MAP

NANTICOKE CREEK WATERSHED PROTECTION PROJECT
DAM SITE No. 9E
TOPOGRAPHIC MAP
NANTICOKE CREEK WATERSHED PROTECTION PROJECT
DAM SITE No. 9E
CUT-OFF TRENCH NOTES

1. BOTTOM WIDTH VARIES AS FOLLOWS:
   STA 0-45 APPROX TO STA 1-25 = 10' STA 1-25 TO 1-65 TRANSITION
   STA 1-65 TO 3-85 BOTTOM WIDTH
   STA 3-85 TO 4-45 BOTTOM WIDTH
   STA 4-45 TO 10-0 TRANSITION
   DATA BETWEEN THE TWO ENS IN THE MIDDLE ARE SAME ELEV
   B. THE ARGUMENTS OF THE WALL
   C. DEPTH OF CUT-OFF TRENCH IN THE BOTTOM OF THE UP-DAM
   D. 20 TO 60 FEET

2. CUT-OFF TRENCH TO BE BACK-FILLED FROM 1.3 TO 10 FT AND 1.25 FT

PROFILE ALONG E OF DAM
(LOOKING DOWNSTREAM)

TYPICAL CUT-OFF TRENCH EXCAVATION
(TRENCH NOTES)
NOTE

ALL DRAIN PIPE SHALL CONFORM TO MATERIAL SPEC NO. 439.1 AS SHOWN.

CLASS III, TYPE B, PERFORATED PIPE.

ALL PIPE SHALL BE LAYED WITH PERFORATIONS DOWN.

AS BUILT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

[Diagram of drainage system with specifications and notes]

[Grain size distribution graph for drain fill]

[Signature block with dates and names]
BOLT DETAIL NO. 1
GALV. IRON, SUPPLY NUTS & WASHERS

BOLT DETAIL NO. 2
GALV. IRON, SUPPLY NUTS & WASHERS

AS BUILT
NANTICOKE CREEK WATERSHED PROJECT
SITE 9-E
FLOODWATER RETAIING DAM
BROOME COUNTY, NEW YORK
TRASH RACKS AND MISC DETAILS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CONTRACTION CURVES

MORSE CONTENT (IN PERCENT OF DRY WEIGHT)

DRT DENSE < A WATER

CONTRACTION CURVE FOR MATERIAL FROM 0 TO 8 FEET

DRT DENSE < A WATER

MORSE CONTENT (IN PERCENT OF DRY WEIGHT)

LOGS OF TEST HOLES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

AS BUILT

MANTICORE CREEK WATERSHED
SITE-9E

LOGS OF TEST HOLES