

AD-A091 163

WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA

F/G 13/13

NATIONAL DAM INSPECTION PROGRAM. HILLTOWN DAM (NDS ID NUMBER PA--ETC(U)

AUG 80

DACW31-80-C-0018

NL

UNCLASSIFIED

1 of 2

AD
000003



AD A091163

DELAWARE RIVER BASIN

HILLTOWN DAM, BUCKS COUNTY
PENNSYLVANIA

(6) National Dam Inspection Program, Hilltown
Dam (NDS ID Number PA-01065, DER ID Number 9-177,
PA-635),

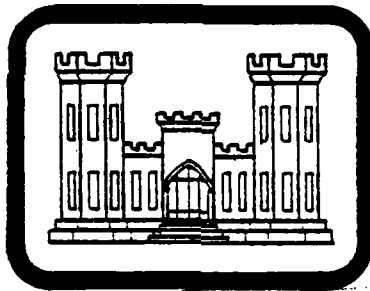
~~NDS I.D. NO. PA 01065~~

~~DER I.D. NO. 9-177~~

~~SCS PA 625~~

Delaware River Basin, Bucks County, Pennsylvania

PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM



11) 1-2-1
12) 1-2-1
13) DAW 31-1-2-1001

Prepared by:

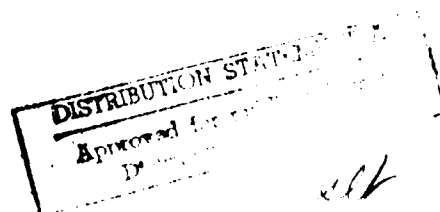
✓
394
WOODWARD-CLYDE CONSULTANTS
5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

AUGUST 1980

394157



PREFACE

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 the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify 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 investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed 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. The spillway design flood provides a measure of relative spillway capacity and serves as an aid 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.

1

Accession 100
NTIS
DTIC
Library
Office
By
Distribution
Available
Dist
A 50

Per 70m 50

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Hilltown Dam (SCS PA 625)
County Located: Bucks County
State Located: Pennsylvania
Stream: Unnamed tributary to the West
Branch of Neshaminy Creek
Coordinates: Latitude 40° 18.0'
Longitude 75° 16.8'
Date of Inspection: July 1, 1980

Hilltown Dam is owned by the Neshaminy Water Resources Authority and maintained by Bucks County. The dam and reservoir are used as a flood control structure for the downstream town of Chalfont, Pennsylvania. The impoundment was designed by the United States Department of Agriculture, Soil Conservation Service, in 1977, and the structure was officially completed in 1980.

The dam and its appurtenant facilities are considered to be in good condition. The dam is classified as an "Intermediate" size structure with a "High" hazard classification, consistent with its potential in the event of failure for extensive property damage and loss of life downstream of the dam and in Chalfont, Pennsylvania.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

The hydrologic and hydraulic computations presented in Appendix D indicate that the spillway structures are capable of discharging the PMF without overtopping the embankment. Therefore, the structure is considered to have an "Adequate" spillway system.

Items (1) and (2) are of a routine nature and should be performed as required. The following items should be investigated in the spring of 1981, to assess changed conditions.

- (1) Debris should be removed from the low stage trash rack in a timely manner.

Newtown Dam (SCS PA 625), NDS ID PA 01065

- (2) Discharge from the artesian well should be monitored for turbidity after the dam has retained a significant head of water.
- (3) A survey should be performed of the dam crest to document that consolidation within the embankment and foundation materials has been essentially completed. If significant additional settlement is noted, the embankment crest should be raised to the design elevation.
- (4) Erosion and gullying at the intersection of the downstream berm and downstream face should be inspected to determine if the condition is stable or whether remedial measures are necessary.

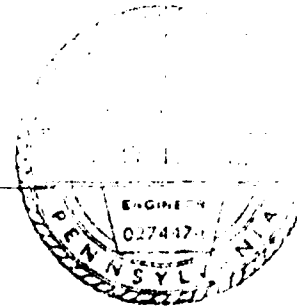
Neshaminy Water Resources Authority has an "Operations Manual" specifying agencies responsible for operation and maintenance of Neshaminy Watershed projects completed by 1977. The manual requires updating to include Newtown Dam. The Operations Manual refers to a "Development, Operation and Maintenance Manual" prepared by SCS for a maintenance inspection checklist, which should be used to insure that all items are periodically inspected and maintained in the best possible condition. It is recommended that these procedures provide for a period of observation during and following impoundment of significant quantities of water behind the embankment. These observations should include monitoring discharge from the embankment drainage system and looking for sources of uncontrolled seepage.

A warning procedure has been developed and approved by the Neshaminy Water Resources Authority. This procedure indicates that the structure should be monitored on a 24 hour basis when the severity of a forecasted storm is predicted to be near, at or above the design capacity of the structure. The procedure also includes emergency telephone numbers and areas downstream of the dam which should be notified in the event a hazardous condition develops.

Hilltown Dam (SCS PA 625), NDS ID PA 01067

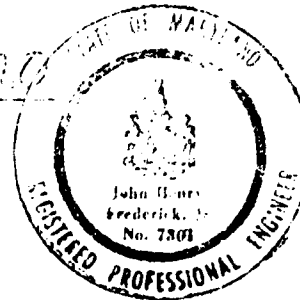
Mary F. Beck
Mary F. Beck, P.E.
Pennsylvania Registration 27447E
Woodward-Clyde Consultants

1/1/80
Date



John H. Frederick, Jr.
John H. Frederick, Jr., P.E.
Maryland Registration 7301
Woodward-Clyde Consultants

8/2/80
Date



APPROVED BY:

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

5 Sep 80
Date



OVERVIEW
HILLTOWN DAM (SCS PA 625), HILLTOWN TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

TABLE OF CONTENTS

	<u>PAGE</u>
Preface	i
Assessment and Recommendations	ii
Overview Photograph	v
 SECTION 1 - PROJECT INFORMATION	
1.1 General	1
1.2 Description of Project	1
1.3 Pertinent Data	3
 SECTION 2 - ENGINEERING DATA	
2.1 Design	6
2.2 Construction	6
2.3 Operational Data	6
2.4 Evaluation	7
 SECTION 3 - VISUAL INSPECTION	
3.1 Findings	8
3.2 Evaluation	10
 SECTION 4 - OPERATIONAL PROCEDURES	
4.1 Procedures	11
4.2 Maintenance of the Dam	11
4.3 Maintenance of Operating Facilities	11
4.4 Warning Systems In Effect	11
4.5 Evaluation	12
 SECTION 5 - HYDROLOGY/HYDRAULICS	
5.1 Evaluation of Features	13
 SECTION 6 - STRUCTURAL STABILITY	
6.1 Evaluation of Structural Stability	15
 SECTION 7 - ASSESSMENT/REMEDIAL MEASURES	
7.1 Dam Assessment	17
7.2 Remedial Measures	17
 APPENDIX	
A Visual Inspection	
B Engineering Data, Design, Construction and Operation	
C Photographs	
D Hydrology/Hydraulics	
E Plates	
F Geology	

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
HILLTOWN DAM
(SCS PA 625)
NATIONAL ID NO. PA 01065
DER NO. 9-177

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Hilltown Dam is a 42 foot high zoned earth embankment about 1,140 feet long with an emergency spillway at the right end of the embankment. The embankment contains an impervious core constructed over a cutoff trench under the dam center line. The core and cutoff trench are composed of materials classified as clays or silty clays of low plasticity (Zone 1), and the core is encompassed on both sides by more permeable materials classified as clayey gravels and silty gravels (Zone 2). The upstream and downstream slopes of the relatively impervious Zone 1 core are 1.5H:1V. The design upstream slope is 3H:1V with a ten foot wide berm at approximately elevation 365. The design downstream slope is 2.5H:1V, and has a ten foot wide berm at approximately elevation 369 at the center line. The downstream berm has a one percent slope to conduct surface runoff to a rock gutter at the left downstream toe. The embankment crest is 14 feet wide, has a design settled elevation of 392.5, and is protected by a gravel road. Both the upstream and downstream slopes are to be protected with Crownvetch, which is becoming established. Embankment seepage is controlled by a trench drain near the downstream toe, which contains eight inch diameter perforated asbestos cement drain pipes that discharge through the impact basin sidewalls at the downstream toe. Flow from a six inch cased well is piped separately to discharge over the impact basin wall; see

Photograph 7, Appendix C. Plan and cross-section views of the dam are shown on Plates 2 through 12, Appendix E, and embankment drainage details are shown on Plate 10.

The principal spillway consists of a concrete drop inlet riser, 234 feet of 36 inch diameter reinforced concrete, steel cylinder pressure pipe, with nine anti-seep collars and an impact basin at the downstream toe. The reservoir drain located at the base of the riser has an invert elevation of 353.5, and the elevation of the riser weirs is 364.5. The design outlet invert and impact basin end sill elevations are 350.5. The reservoir was designed as a dry reservoir; therefore, the pond drain gate is not closed, and water is not normally impounded behind the dam. Typical sections and details of the principal spillway are presented on Plates 13 through 15 in Appendix E.

The emergency spillway is a trapezoidal channel excavated through rock around the right end of the embankment. The 300 foot wide channel has an inside side slope of 3H:1V, an outside side slope of 2H:1V, and the 30 foot wide level section is at elevation 386.4.

b. Location. The dam is located on an unnamed tributary to the West Branch of Neshaminy Creek in Hilltown Township, Bucks County, Pennsylvania, approximately 2.5 miles southeast of Souderton, Pennsylvania. The dam site is located on the USGS Quadrangle entitled "Telford, Pennsylvania", at coordinates N 40° 18.0' W 75° 16.8'. A regional location plan of Hilltown Dam is included as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 42 foot height. The total storage capacity of the reservoir is 900 acre-feet.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life along the stream between the dam and the West Branch of Neshaminy Creek, 2.25 miles downstream, and then farther downstream.

e. Ownership. Hilltown Dam is owned by the Neshaminy Water Resources Authority. All correspondence should be sent to Mr. William Taylor, Neshaminy Water Resources Authority, Post Office Box 6, Cross Keys Office Center, 4259 Swamp Road, Doylestown, Pennsylvania 18901.

f. Purpose of Dam. The purpose of this dam is flood control. The structure is one of ten dams in the Neshaminy Creek Watershed that are scheduled for construction with the assistance of the United States Department of Agriculture,

Soil Conservation Service (SCS). This is the seventh completed project of the series.

g. Design and Construction History. The dam design was completed by the SCS in 1977. An application for a permit to construct the dam was made on July 25, 1977, and the permit was issued October 3, 1977. On September 28, 1977, the dam was approved by the Delaware River Basin Commission. Construction began in the summer of 1978, by Landmark Structures Unlimited, Inc. Work was suspended on November 24, 1978, for the winter, and resumed May 14, 1979. The SCS prefinal inspection was on January 21, 1980, and the final inspection was on April 3, 1980. The structure was accepted by the Neshaminy Water Resources Authority on April 16, 1980.

The dam was constructed at the site of a previous farmstead. During excavation for the trench drain, a six inch well casing and, about ten feet away, a stone structure (apparently a fruit cellar) were uncovered. The well was piped to discharge over the impact basin wall. The stone structure was filled with PennDOT Coarse Aggregate No. 2B, and 90 feet of PVC pipe and 10 feet of steel pipe were installed to drain any water. No flow has been observed from the stone structure.

Documents prepared by SCS personnel and located in Department of Environmental Resources files indicate that the results of in-place density tests on Zone 1 and 2 materials all exceeded the minimum requirement of 95 percent of the standard maximum dry density (ASTM D 698). Compaction of Zone 2 (shell material) was by method specification, in addition to requiring a minimum dry density of 120 cubic pounds per foot. Complete construction records were prepared by the SCS and are in SCS files.

h. Normal Operating Procedures. Reservoir outflow is controlled by the principal and emergency spillways. Under normal conditions, water flows through the principal spillway. The pond drain gate is left open, and no water is impounded behind the embankment. Storm water is stored up to the principal spillway riser weir crest elevation, 364.5, and thereafter to elevation 386.4, the crest of the emergency spillway. Water is discharged through the emergency spillway at the right abutment only during storms with recurrence frequencies of once in 100 years, or less.

1.3 Pertinent Data.

A summary of pertinent data for Hilltown Dam is presented as follows.

a.	Drainage Area (square miles)	2.8
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Dam Site	Unknown
	Design High Water	4,012
	At Top of Dam (elevation 392.3)	11,967
c.	Elevation (feet above MSL)	
	Top of Dam	
	Design	392.5
	Existing	392.3
	Design High Water	389.4
	Emergency Spillway Crest	386.4
	Principal Spillway	
	Weir Crest	364.5
	Pond Drain Inlet Invert	353.5
	Outlet Invert	350.5
	Downstream Toe	354.4
d.	Reservoir (feet)	
	Length at Normal Pool	Dry
	Length at Design High Water	3,600
e.	Storage (acre-feet)	
	Riser Weir Crest	46
	To Top of Dam	855
f.	Reservoir Surface Area (acres)	
	Riser Weir Crest	6.0
	Design High Water	55.5
g.	Dam Data	
	Type	Zoned earth embankment
	Volume	88,900 cubic yards
	Length	1,140 feet
	Maximum Height	42 feet
	Top Width	14 feet
	Side Slopes	
	Upstream	
	Design	3.0H:1V
	Existing	3.2H:1V
	Downstream	
	Design	2.5H:1V
	Existing	2.5H:1V
	Cutoff	Trench under center line
	Grout Curtain	None

h.	Principal Spillway	
	Type	Single stage reinforced concrete drop inlet riser, 36 inch conduit and impact basin
	Reservoir Drain Elevation	At base of riser
	Weirs	364.5
	Pond Drain Inlet Invert	353.5
	Conduit Outlet Invert	350.5
	Downstream Channel Bed	350.4
	Energy Dissipator	Impact Basin
i.	Emergency Spillway	
	Type	Trapezoidal channel excavated through rock
	Width	300 feet
	Side Slopes	2H:1V and 3H:1V
	Crest Elevation	386.4 feet

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of the available engineering data on Hilltown Dam (SCS PA 625) is attached as Appendix B. Engineering data available for review are contained in a several hundred page design folder and a 35 page set of design drawings. The as-built drawings are essentially complete and were provided for review. The design folder and plans are located in Soil Conservation Service (SCS) files and also in Department of Environmental Resources (DER) files. As-built drawings will also be located in the Owner's files. All of these records were prepared by the United States Department of Agriculture, Soil Conservation Service. Additional information was obtained from miscellaneous letters, correspondence, monthly construction reports, and from the SCS project engineer.

b. Design Features. The principal design features of Hilltown Dam are illustrated on the plans and profiles enclosed in Appendix E as Plates 2 through 15. A detailed description of the design features is also described in Section 1.2, paragraph a, and pertinent data relative to the structure are presented in Section 1.3. In addition to the plans of the dam, Plates 16 through 18 are enclosed to show the locations of the test borings, typical test boring logs and the results of typical compaction tests performed as part of the design.

2.2 Construction.

Construction history is presented in Section 1.2, paragraph g. Summary construction records are located in DER files, and complete construction records are located in SCS files and were reviewed for this investigation.

2.3 Operational Data.

There are no operational records maintained. There are no minimum flow requirements for the downstream channel. There are no water level measurements or rainfall records maintained within the watershed, although the Neshaminy Water Resources Authority maintains a rain gauge at their office in Cross Keys, Doylestown, Pennsylvania.

2.4 Evaluation.

a. Availability. All engineering data evaluated and reproduced for this report were provided by either DER or SCS, and supplemented by conversations and data obtained from representatives of the Neshaminy Water Resources Authority.

b. Adequacy. Data included in state files, supplemented with data obtained from the Neshaminy Water Resources Authority, and information received from state and Authority representatives, are considered adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of these data.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix A, and are summarized and evaluated as follows. In general, the dam and its appurtenant structures are considered to be in good condition, with the exception of the vegetative cover to the upstream embankment face, which is considered to be fair. At the time of the inspection, stream flow was passing through the riser of the principal spillway.

b. Dam. The crest of the dam is protected by a gravel road, Photograph 2, which had a uniform appearance, with no ruts caused by vehicle traffic or depressions in which rainwater could pond. The permanent vegetation cover on both the upstream and downstream faces has not yet been established. Crownvetch is becoming established and was noted on both the upstream and downstream faces. The vegetation on the downstream face is in good condition, with the exception of the intersection of the downstream berm and embankment face. The berm is designed with a positive one percent slope towards the left to convey intercepted surface runoff from the embankment face to a rock gutter at the left downstream toe, Photograph 4. Vegetation on the berm is sparse and has the appearance of being intermittently underwater at the junction of the berm and the downstream face. Slight gullying was noted along the intersection from about the midpoint of the dam to the outlet of the berm, Photograph 10. Vegetation on the upstream face is less dense than that on the downstream face. No damage from erosion was noted on the upstream face, however. All junctions between the embankment and abutments were noted to be in good condition. A gravel road parallels the downstream left junction of the embankment and abutment.

The vertical and horizontal alignments of the dam were checked. The vertical alignment is presented on Sheet 5B of 11, Appendix A. Measurements taken for this inspection indicate that the crest is 0.2 foot lower than the design elevation at one location and 0.1 foot lower at another.

At the time of the inspection, no seepage was exiting the embankment drains through the impact basin walls. Water was discharging downstream of the impact basin by a four inch PVC pipe, shown on Photograph 7. Piping was installed to convey flow from the well (discussed in Section 1.2) to discharge over the impact basin wall, rather than permitting

the water to flow through the embankment drains. The flow is about 0.43 gallons per minute.

c. Appurtenant Structures.

1. Principal Spillway. As shown on the plates, the riser is located at the upstream toe of the embankment. The exposed exterior portions and the interior of the riser were inspected and evaluated to be in good condition with no signs of concrete deterioration, spalling or other structural deficiency or defects. At the time of the inspection, the sluice gate was open, which is normal for this dam as it has a dry reservoir. Small debris was beginning to accumulate on the sides of the low stage trash rack, Photograph 11. The impact basin at the downstream toe was inspected and found to be in good condition, with no cracking or spalling of the concrete or erosion adjacent to the structure. The downstream channel was also inspected and found to be in good condition, with no significant erosion or deterioration. About 300 feet below the impact basin, a four foot high concrete dam is across the stream.

2. Emergency Spillway. The grass-lined emergency spillway at the right abutment was inspected and found to be in good condition.

d. Reservoir. The dam will not impound water under normal conditions, and trees were left standing in the reservoir area. A thin layer of sediment indicates that floodwater has already been impounded by the dam. Small and large debris are beginning to accumulate in the reservoir area near the embankment.

e. Downstream Channel. As shown on Plate 1, Appendix E, the creek flows southward and empties into the West Branch of Neshaminy Creek about 2.25 miles below the dam. About 1,000 feet downstream of the dam, the stream flows under Pennsylvania Route 309. About one mile farther downstream is a house about four feet above the left bank of the stream, which is subject to damage in the event of failure of the dam. The Owner reported that, three times in the last ten years, the surrounding yard and field areas have been flooded. A farmhouse is about seven feet above the channel bank at the same location. About 0.4 mile farther downstream is a new housing development, not shown on Plate 1, with three houses about four to five feet above the stream bank and other houses about seven to eight feet above the bank.

Hilltown Dam is part of a comprehensive plan to provide flood protection to developed areas within the Neshaminy Watershed. Hilltown Dam was designed together with

three other flood control structures to provide flood protection for the Borough of Chalfont, approximately 6.8 miles downstream of Hilltown Dam. A "High" hazard classification is justified for Hilltown Dam.

3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal spillway or emergency spillway. The exposed portions of the riser and impact basin were inspected, and the principal spillway is judged to be in good condition. The apparent low point of the embankment may have resulted from consolidation of the embankment materials, which is allowed for in the design and is not considered significant at this time. It is recommended that a survey be performed after another year to document that consolidation has been essentially completed within the embankment materials.

Details of the artesian well (depth, presence of filter) are unknown. Therefore, it is recommended that well discharge be monitored for turbidity after the dam has retained a significant head of water.

It was reported by an SCS representative that, at the end of construction, the downstream berm did not drain into the rock gutter as designed, and it was necessary to alter the condition of the berm at its outlet. This could in part account for the gullied appearance of the intersection of the downstream berm and the downstream slope. The SCS representative further made the observation that rainfall infiltrates the pervious Zone 2 materials and, after a rainstorm, the infiltrated rainwater seeps out of the embankment at the intersection of the embankment and berm. This observation accounts for the appearance of vegetation along this line. As evidences of gullying were noted for half the length of the berm, it is recommended that the condition of the berm be investigated after about a year to determine whether the condition has stabilized or if remedial measures are necessary. The overall condition of the dam is considered to be good.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Operational procedures are discussed in some detail in Section 1.2. Operation of the dam does not require a dam tender. Under normal conditions, flow discharges through the pond drain and through the 36 inch conduit at the base of the embankment. Excess water is stored and then discharged over the principal spillway riser weirs and through the conduit. Additional excess water is then stored and discharged over the crest of the emergency spillway. There have been no large storms since the embankment was completed, and water has never flowed over the emergency spillway. Written operation and maintenance procedures used by the Neshaminy Water Resources Authority are contained in "State of Pennsylvania Watersheds and Resource Conservation and Development Operation and Maintenance Handbook for Projects Installed with Assistance from the Soil Conservation Service", and specific procedures for each site are contained in the "Operations Manual" prepared by William G. Major Associates, Inc., June 1977.

4.2 Maintenance of the Dam.

The dam is maintained by Bucks County personnel who periodically check the embankment, mow the grass and remove woody vegetation. As owner of the dam, the Neshaminy Water Resources Authority monitors the maintenance performed and assists if possible.

4.3 Maintenance of Operating Facilities.

Maintenance of these facilities includes cleaning debris from the trash racks, lubricating the gate hoist and checking the structural integrity of the principal spillway system.

4.4 Warning Systems In Effect.

A draft warning procedure, dated January 1980, has been prepared by the local Civil Defense office. The draft was submitted to both the Neshaminy Water Resources Authority and the Pennsylvania Emergency Management Agency in Harrisburg for review. The warning procedures have been approved by the Neshaminy Water Resources Authority.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities at Hilltown Dam.

The "Operations Manual" prepared by William G. Major Associates, Inc., summarizes the control features and the responsible agency for operation and maintenance of each project constructed by 1977 within the Neshaminy Watershed. Although the operational philosophy for a single-purpose flood control structure is contained in the manual, a "fact sheet" pertaining to Hilltown Dam is required. It is important that individuals responsible for the maintenance and operation of Hilltown Dam are aware of the written procedures to insure that all items are carefully inspected and maintained on a periodic basis.

SECTION 5 HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The complete folder of design calculations was reviewed, and portions of this folder are presented in Appendix D.

The watershed is about 3.4 miles long and averages about one mile wide, having a total area of approximately 2.8 square miles. Elevations range from about 680 in the upper reaches of the watershed to 353.5, the pond drain invert elevation. The watershed is predominantly open/farmland, with less than 15 percent residential development. Residential development can be expected to progress rapidly within the watershed, however.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

b. Experience Data. There are no records of reservoir levels kept for this dam. Rainfall is measured and records are kept at the Neshaminy Water Resources Authority's office in Cross Keys, Doylestown, Pennsylvania. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of the inspection, there were no conditions observed that would indicate a reduced spillway capacity during an extreme event. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix A and are discussed in greater detail in Section 3.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping. The PMF inflow hydrograph and flood routing were done in accordance with procedures in the SCS National Engineering Handbook. The flood routing was originally done by a graphical procedure. Subsequently, the flood routing was checked by the SCS computer program, TR-20, the results of which are included in Appendix D. The computer routing indicated a top of dam of 392.3 feet, 0.2 foot below

the top of dam as computed by the manual flood routing. The peak PMF inflow value computed by TR-20 is 12,369 cfs, and the combined principal and emergency spillway capacities at the top of the dam are 11,967 cfs. The spillway systems for this dam are considered to be "Adequate" as they will discharge the PMF event without overtopping the embankment.

e. Downstream Conditions. Downstream conditions and damage centers have been discussed in Section 3. In general, Hilltown Dam, together with Railroad Creek Dam (also on a tributary to the West Branch of Neshaminy Creek), and Peace Valley Dam and Pine Run Dam, controlling the upper reaches of the North Branch of Neshaminy Creek, provides relief from flooding in a rapidly urbanizing area. However, the SCS Neshaminy Watershed work plan concludes that a high potential for flood damage still exists downstream of these structures in Chalfont. It is estimated that damage from flooding has been reduced but not eliminated through control of the upper reaches of the Neshaminy Watershed by flood control structures. Therefore, a "High" hazard classification is justified for this dam.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of existing or pending embankment instability. Upstream and downstream slopes appear stable, with no surficial slides or erosion. Both the upstream and downstream slopes were seeded with mixtures containing Crownvetch, which will require another year to become well established. There are no exterior signs or other evidence to indicate that the internal drainage systems were not operating properly. It is noted, however, that during this inspection, the reservoir was empty, the embankment was not retaining water, and the performance of the internal drainage system could not be evaluated.

Exposed portions of the principal spillway were inspected and judged to be in good condition.

b. Design and Construction Data. Design documentation is very complete as a several hundred page design folder prepared by the Soil Conservation Service (SCS) was available and reviewed for this investigation. Data included in these files are a foundation report containing permeability test results, shear strength test results and a stability analysis, structural calculations for the principal spillway and a complete set of hydrologic/hydraulic calculations. Portions of the Hydrology/Hydraulics section are presented in Appendix D. Principal features of this structure are presented in the drawings located in Appendix E.

A stability analysis of the embankment was performed by SCS using the ICES-LEASE computer program. Soil parameters were based on a total of four consolidated-undrained triaxial compression tests, with pore pressure measurements, conducted on compacted Zone 1 and Zone 2 embankment materials. The shear strength parameters adopted for design ($\bar{c}$ = 425 psf and $\bar{\phi}$ = 15.5 degrees for both materials) were reviewed and are judged to be conservative, based on the test results. Stability analyses using the Swedish circle method resulted in the following minimum factors of safety:

<u>Slope</u>	<u>Condition</u>	<u>Minimum Factor of Safety</u>
Upstream	Rapid drawdown	1.52
Downstream	Steady seepage	1.49

The recommended minimum factors of safety for these conditions, in accordance with Corps of Engineers EM 1110-2-1902, are 1.2 and 1.5, respectively. Although the obtained factor of safety for the steady seepage condition is slightly less than 1.50, it is concluded that the stability of the embankment is adequate owing to the conservative nature of the analysis, which neglected the higher strength and drainage characteristics of the Zone 2 soils.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. There are no reports, nor is there any evidence, that modifications were made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. As the stability analysis resulted in a minimum factor of safety of 1.49 during steady seepage, the most critical loading condition, it can be assumed that seismic stability requirements are satisfied.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection and review of design and construction documentation indicate that the embankment and appurtenant structures of Hilltown Dam are in good condition.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

The hydrologic and hydraulic computations presented in Appendix D indicate that the spillway structures are capable of discharging the PMF without overtopping the embankment. Therefore, the structure is considered to have an "Adequate" spillway system.

b. Adequacy of Information. The information available for this investigation was adequate to evaluate the structural and hydraulic aspects of the dam.

c. Urgency. It is recommended that the suggestions presented in Section 7.2 be implemented as specified.

7.2 Remedial Measures.

a. Facilities. Items (1) and (2) are of a routine nature and should be performed as required. The following items should be investigated in the spring of 1981, to assess changed conditions.

- (1) Debris should be removed from the low stage trash rack in a timely manner.
- (2) Discharge from the artesian well should be monitored for turbidity after the dam has retained a significant head of water.

- (3) A survey should be performed of the dam crest to determine that consolidation within the embankment and foundation materials has been essentially completed. If significant additional settlement is noted, the embankment crest should be raised to the design elevation.
- (4) Erosion and gullying at the intersection of the downstream berm and downstream face should be inspected to determine if the condition is stable, whether remedial measures are necessary.

b. Operation and Maintenance Procedures. Neshaminy Water Resources Authority has an "Operations Manual" specifying agencies responsible for operation and maintenance of Neshaminy Watershed projects completed by 1977. The manual requires updating to include Hartsdam Dam. The Operations Manual refers to a "Development, Operation and Maintenance Manual" prepared by ECR for a maintenance inspection checklist, which should be used to insure that all items are periodically inspected and maintained in the best possible condition. It is recommended that these procedures provide for a period of observation during and following impoundment of significant quantities of water behind the embankment. These observations should include monitoring discharge from the embankment seepage system, looking for sources of uncontrolled seepage.

A warning procedure has been developed and approved by the Neshaminy Water Resources Authority. This procedure indicates that the structure should be monitored on a 24 hour basis when the severity of a forecasted storm is predicted to be near, at or above the design capacity of the structure. The procedure also includes emergency telephone numbers and areas downstream of the dam which should be notified in the event a hazardous condition develops.

APPENDIX

A

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Hilltown Dam County Bucks State Pennsylvania National ID # PA 01065
Type of Dam Earth Hazard Category High
Date(s) Inspection July 1, 1980 Weather Sunny Temperature 80's

Pool Elevation at Time of Inspection Dry M.S.L. Tailwater at Time of Inspection 350.4 M.S.L.

Inspection Personnel:

Mary F. Beck (Hydrologist) Raymond S. Lambert (Geologist)

Arthur H. Drinoff (Geotechnical/Civil) (7/14/1980)

Vincent McKeever (Hydrologist)

Mary F. Beck Recorder

Remarks:

Mr. William Taylor of Neshaminy Water Resources Authority was on site and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

Sheet 2 of 11	
VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A
DRAINS	N/A
WATER PASSAGES	N/A
FOUNDATION	N/A

CONCRETE/MASONRY DAMS

Sheet 3 of 11	
VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A
STRUCTURAL CRACKING	N/A
VERTICAL AND HORIZONTAL ALIGNMENT	N/A
MONOLITH JOINTS	N/A
CONSTRUCTION JOINTS	N/A

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SURFACE CRACKS

None observed.

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

None observed.

SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

Crest protected by gravel. The berm on the downstream face is designed to intercept surface runoff and discharge the runoff to a rock gutter at the toe between the berm elevation and discharge channel. Sparse vegetation was at the intersection of the downstream face and berm, also having the appearance of vegetation subject to standing water. Some gullying was observed between dam station 8+00 and rock gutter.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

Vertical alignment is shown on Sheet 5B of 11. Horizontal alignment is good.

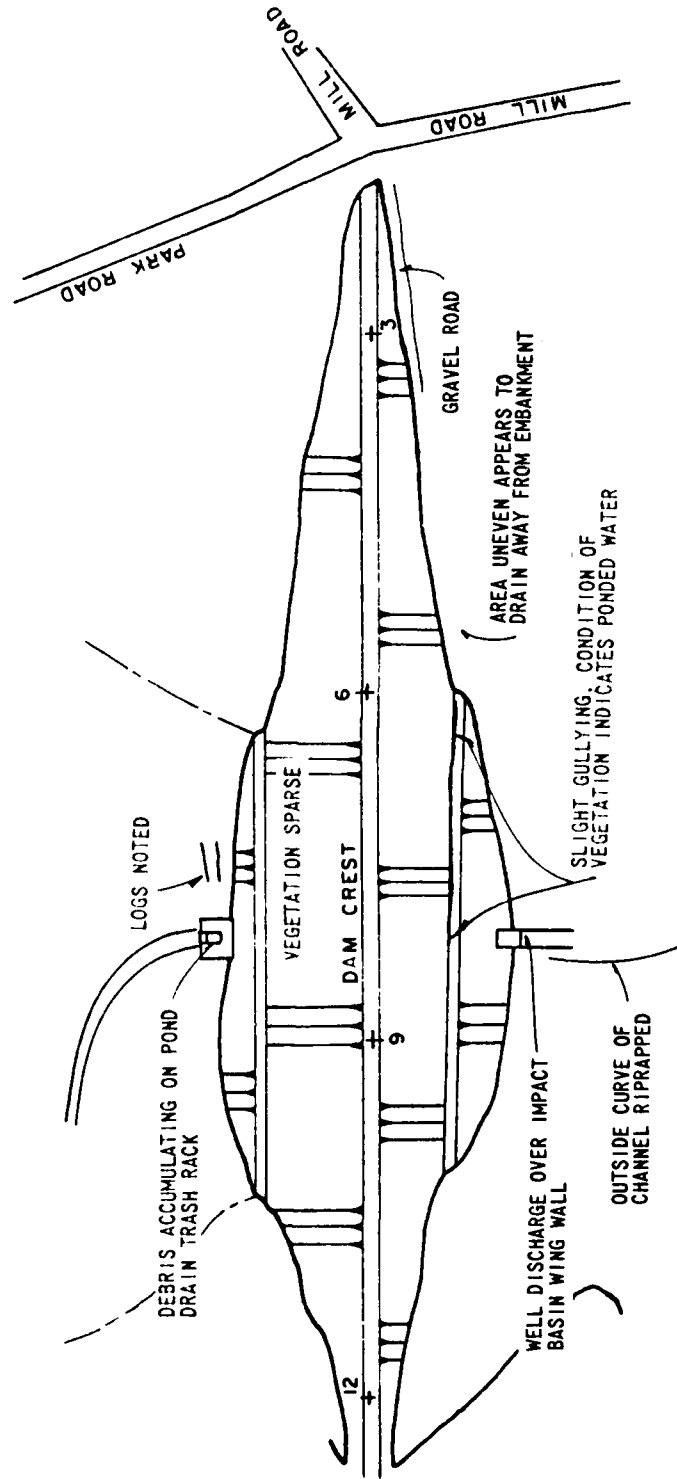
RIPRAP FAILURES

None, riprap limited to immediately adjacent to riser and downstream along discharge channel.

EMBANKMENT

Sheet 5 of 11

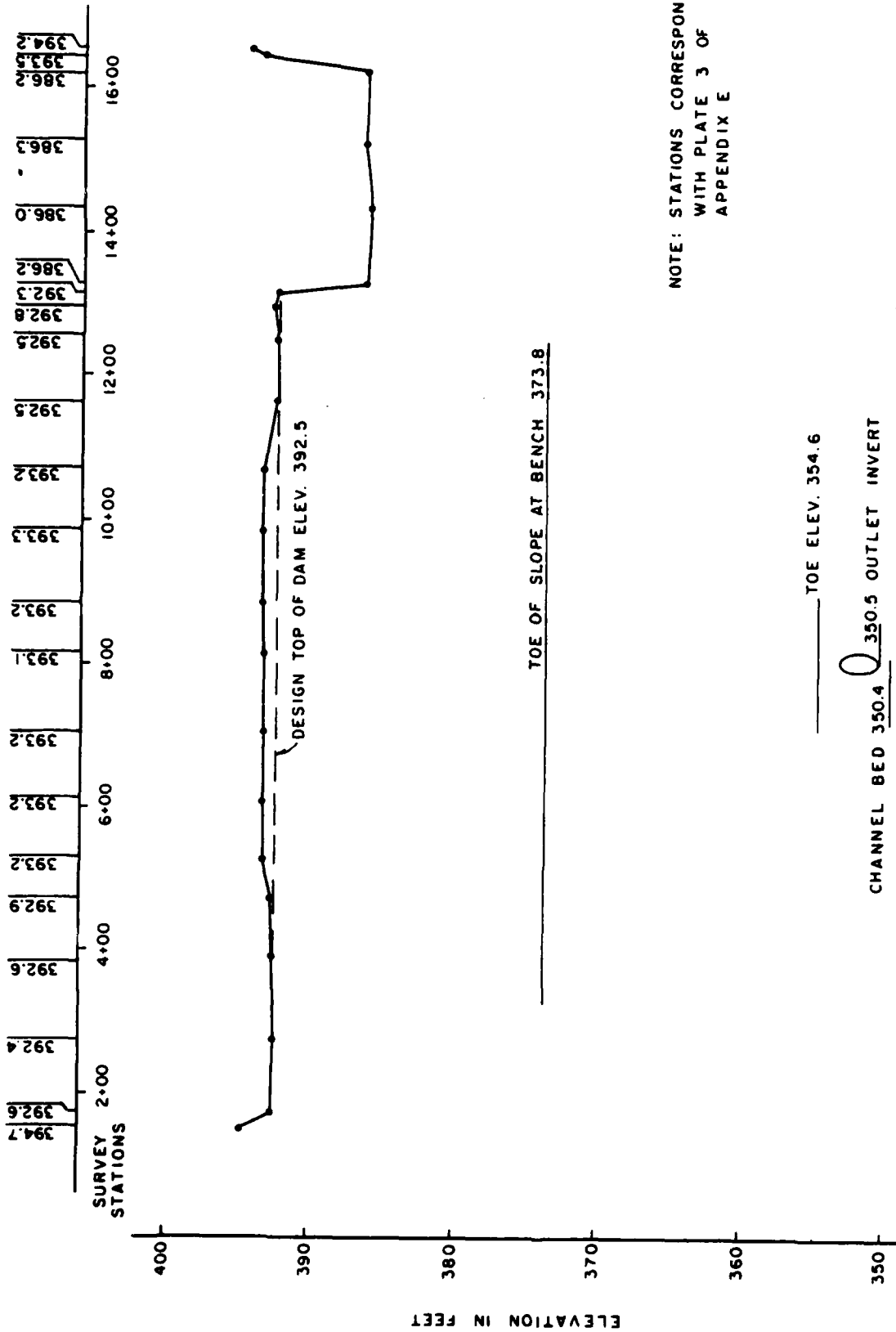
VISUAL EXAMINATION OF VEGETATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	The upstream and downstream embankment faces, and emergency spillway were dormant seeded and mulched in 1979. Crownvetch is becoming established. Cover was good on downstream face and not quite as good on upstream face.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	All junctions of embankment and abutments are in good condition.	
ANY NOTICEABLE SEEPAGE	None, reservoir was dry at time of inspection.	
STAFF GAGE AND RECORDER	None	
DRAINS	Embankment drains outletting through impact basin walls were dry. A flowing well uncovered during construction was piped and discharges over the impact basin wall. Moss on the rock indicates the well flows most, if not all of the time. Discharge was measured to be 0.43 gpm.	



DOWNSTREAM

FIELD OBSERVATION PLAN
HILLTOWN DAM
(SCS PA 625)

SHEET 5A OF 11



NOTE: STATIONS CORRESPOND
WITH PLATE 3 OF
APPENDIX E

FIELD OBSERVATION PROFILE
HILLTOWN DAM
SCS PA 625

SHEET 5B OF 11

LOOKING DOWNSTREAM

PRINCIPAL SPILLWAY

Sheet 6 of 11	
VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Conduit through embankment was not inspected.
INTAKE STRUCTURE	Exposed concrete surfaces show no signs of cracking, spalling or other defects.
OUTLET STRUCTURE	Exposed concrete surfaces show no signs of cracking, spalling or other defects.
OUTLET CHANNEL	Good condition, channel curves downstream of impact basin and outside bank is protected with riprap.
EMERGENCY GATE	Sluice gate was exercised and operates easily.

EMERGENCY SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	None, the downstream edge of a 30 foot level section is the control section.	
APPROACH CHANNEL	Good condition.	
DISCHARGE CHANNEL	Good condition.	
BRIDGE AND PIERS	None	

GATED SPILLWAY

Sheet 8 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CONCRETE STILL

N/A

APPROACH CHANNEL

N/A

DISCHARGE CHANNEL

N/A

BRIDGE AND PIERS

N/A

PILES AND OPERATION
EQUIPMENT

N/A

INSTRUMENTATION

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION

MONUMENTATION/SURVEYS

None

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

RESERVOIR

Sheet 10 of 11	
VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
SLOPES	

Reservoir side slopes are flat to moderate. As the reservoir is dry, trees have been left.

SEDIMENTATION

A thin covering of sediment indicates water has been impounded.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The channel is about 18 feet wide with 4.5 feet high banks on a 3H:1V slope. The flood plain adjacent to the stream is wooded with underbrush.	
SLOPES	The valley gradient is about 0.008.	
APPROXIMATE NO. OF HOMES AND POPULATION	About 1,000 feet downstream of the dam the stream flows through an 11 ft. x 22 ft. bridge opening under St. Rt. 309. About one mile further downstream is a house 4 feet above the left bank subject to damage in the event of failure. A farm house is about 7 feet above the channel bank. About 0.4 mile further downstream is a new housing development with three houses about 4.5 feet above the stream bank and other houses about 7 to 8 feet above the bank.	

APPENDIX

B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Hilltown Dam
ID # PA 01065

REMARKS

Sheet 1 of 4

ITEM

AS-BUILT DRAWINGS

"As-built" drawings were provided for this investigation and will be on file with DER, SCS and the Owner.

REGIONAL VICINITY MAP

Plate 1, Appendix E.

CONSTRUCTION HISTORY

See Section 1.2 of text.

TYPICAL SECTIONS OF DAM

See Appendix E.

OUTLETS - PLAN

DETAILS

CONSTRAINTS

DISCHARGE RATINGS

RAINFALL/RESERVOIR RECORDS

Appendix E

Appendix D.

Rainfall is measured by Neshaminy Water Resources Authority at their office in Cross Keys, Doylestown, Pennsylvania.

ITEM	REMARKS
DESIGN REPORTS	<i>Design folder on file with DER and SCS.</i>
GEOLOGY REPORTS	<i>Included in design folder, see also Appendix F.</i>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<i>See discussion in Sections 5 and 6 of text.</i>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<i>Complete records in SCS files.</i>
POST-CONSTRUCTION SURVEYS OF DAM	<i>A final crest profile survey was performed for "as-built" drawings.</i>
BORROW SOURCES	<i>Data located on SCS drawings.</i>

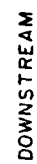
ITEM	REMARKS
MONITORING SYSTEMS	<i>None</i>
MODIFICATIONS	<i>No post construction modifications.</i>
HIGH POOL RECORDS	<i>None</i>
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	<i>None</i>
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	<i>None</i>
MAINTENANCE OPERATION RECORDS	<i>Neshaminy Water Resources Authority maintain these files.</i>

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Appendix E for details.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E for details.
The following information is located in DER files. 1. "Report Upon the Application of the Neshaminy Water Resources Authority" submitted by the State of Pennsylvania, September 28, 1977. 2. Permit issued by the State of Pennsylvania, October 3, 1977. 3. 35 sheet set of design drawings prepared by SCS, 1977. 4. Erosion and Sediment Control Plan prepared by SCS, August 1977. 5. Progress Reports by Fredernck Schuetz, Project Engineer, SCS. Also available from SCS were complete construction records.	

APPENDIX

C

C



PHOTOGRAPH LOCATION PLAN
HILLTOWN DAM
(SCS PA 625)
PLATE C-1



UPSTREAM FACE AND PRINCIPAL SPILLWAY RISER.
AS THE RESERVOIR IS DRY, TREES HAVE BEEN
LEFT STANDING.

PHOTOGRAPH NO. 1



VIEW OF CREST. DOWNSTREAM FACE IS
TO THE RIGHT.

PHOTOGRAPH NO. 2

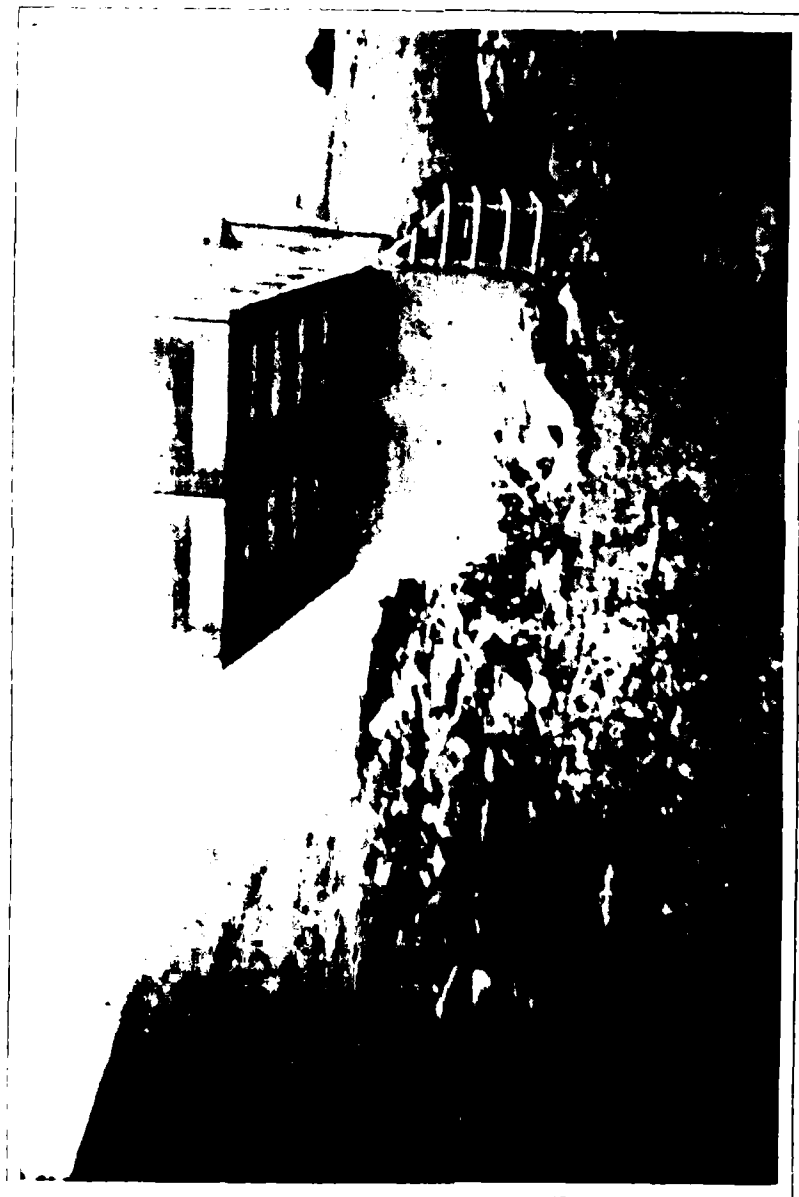


OVERALL VIEW OF DOWNSTREAM SLOPE.
NOTE BERM ON SLOPE.

PHOTOGRAPH NO. 3

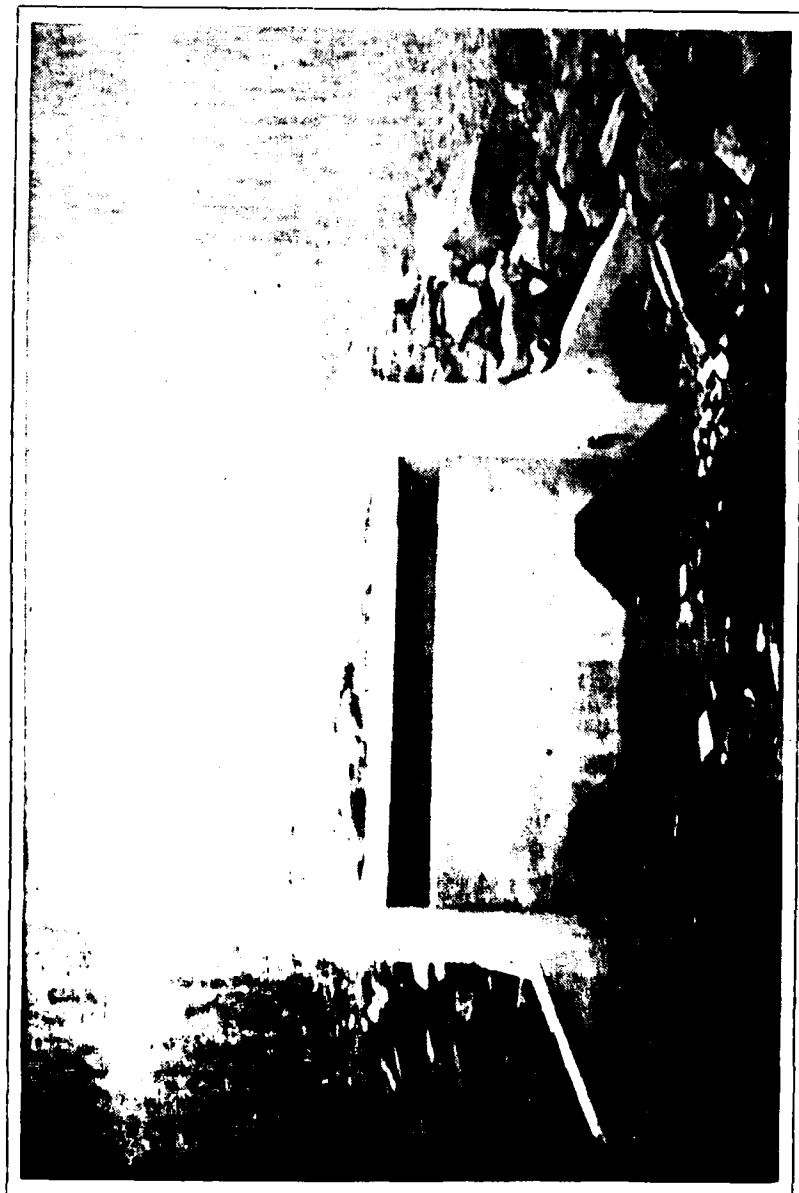


VIEW OF ROCK GUTTER AT DOWNSTREAM
TOE.



PRINCIPAL SPILLWAY RISER AT UPSTREAM
TOE.

PHOTOGRAPH NO. 5



IMPACT BASIN AT DOWNSTREAM TOE.

PHOTOGRAPH NO. 6



CLOSE-UP OF WELL DISCHARGE PIPE.
ROCK GUTTER SHOWN IN BACKGROUND

PHOTOGRAPH NO. 7

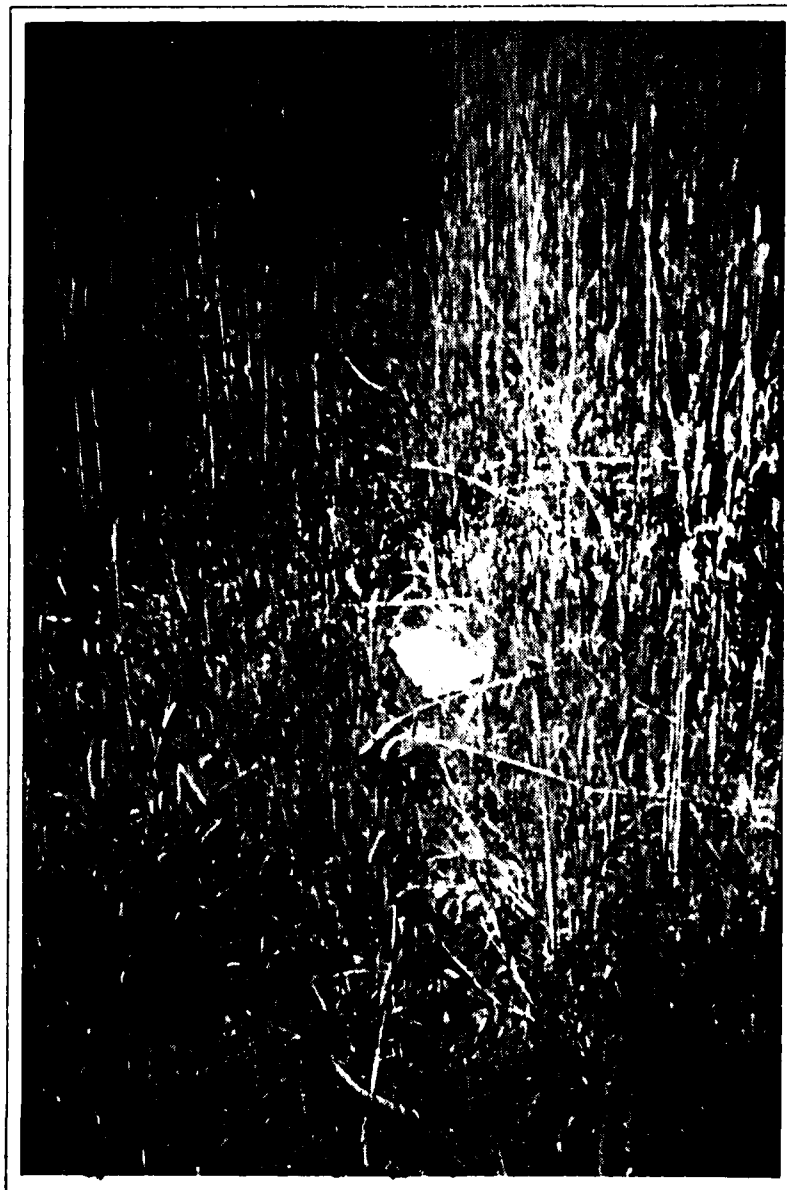


EMERGENCY SPILLWAY LOOKING UPSTREAM.

PHOTOGRAPH NO. 8



EMERGENCY SPILLWAY DOWNSTREAM OF
LEVEL SECTION. SPUR DIKE TO PREVENT
DISCHARGE FROM FLOWING AGAINST
EMBANKMENT TOE IS SHOWN.



SLIGHT EROSION AT THE
INTERSECTION OF THE
DOWNSTREAM FACE AND BERM.

PHOTOGRAPH NO. 10



DEBRIS ACCUMULATING IN
TRASH RACK.

PHOTOGRAPH NO. 11



FIRST DOWNSTREAM DAMAGE CENTER. YARD
AND ADJACENT FIELD REPORTEDLY HAVE
BEEN FLOODED THREE TIMES IN THE LAST
10 YEARS.

PHOTOGRAPH NO. 12

APPENDIX

D

HILLTOWN DAM
(SCS PA 625)

Sheet 1 of 9

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominantly open farm land, less than 15% residential development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): Dry

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 392.3 feet (890 Acre-Feet).

ELEVATION MAXIMUM DESIGN POOL: 392.3 feet.

ELEVATION TOP DAM: 392.5 feet design, 392.3 feet existing.

EMERGENCY SPILLWAY

a. Elevation 386.4 feet.

b. Type grass lined trapezodial channel.

c. Width 300 feet.

d. Length 1,100 feet.

e. Location Spillover Right abutment.

f. Number and Type of Gates None

PRINCIPAL SPILLWAY

a. Type Drop inlet riser, 36 inch conduit and impact basin.

b. Location Dam station 8+10, maximum section.

c. Entrance inverts 364.5 feet.

d. Exit inverts 350.5 feet.

e. Emergency draindown facilities 36 inch orifice at base of riser.

HYDROMETEOROLOGICAL GAGES:

a. Type None within watershed.

b. Location N/A

c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE: Not determined.

HILLTOWN DAM
HYDROLOGIC AND HYDRAULIC
BASE DATA

Sheet 2 of 9

DRAINAGE AREA: (1) 2.8 square miles.

PROBABLE MAXIMUM PRECIPITATION (PMP)
USED IN DESIGN: (1) 25.5 inches

HYDROGRAPH PARAMETERS: (1)
Runoff Curve Number 80
Time of Concentration 2.08 hours

SPILLWAY CAPACITY AT MAXIMUM
WATER LEVEL: (1) 11,967 cfs

(1) From SCS Design Folder

Hilltown Dam
(SCSPA625)
Hydrology/Hydraulics

Classification (Ref.-Recommended Guidelines for Safety
Inspection of Dams)

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed.
2. The size classification is "Intermediate" based on its 42 foot height.
3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

Hydrologic/Hydraulic Analysis

The complete H & H design folder was available for review. The PMF inflow hydrograph was determined according to procedures in the SCS National Engineering Handbook, Section 4 (NEH-4). The routing was done according to procedures in NEH-5 (not available for review) and, later, checked by SCS computer program, TR-20. The computer routing indicates a lower (0.2 feet) maximum water elevation than the original flood routing. The original flood routing was retained as basis of design.

Original design parameters were checked against current information and/or criteria. The drainage area of 2.8 square miles is verified by current USGS maps.

Calculations for the PMF inflow hydrograph were based on a 6-hour rainfall of 25.5 inches and a Runoff Curve Number of 80. Rainfall criteria established for this investigation by the Corps of Engineers indicate a 26.6 inch rainfall (Ref. Hydrometeorological Report No. 33) and the use of Hop Brook factor, a point rainfall reduction factor. For a watershed of this size, the point rainfall is reduced by 20%, to 21.2 inches. Thus, the design rainfall is conservative compared to Corps of Engineers criteria. The Runoff Curve Number 80 (CN 80) is based on the hydrologic soil group classification and expected future land use within

the watershed. The future land use was based on projections of the Bucks and Montgomery Planning Commission to year 2010. Projected land use includes farm/open, 52.5%; wooded, 10%; and residential, 37.5%. The estimated current developed areas are less than 20% from the 1973 USGS map.

The elevation-storage data was checked and found adequate. The emergency spillway discharge was checked according to current SCS criteria, TR-39. The maximum emergency spillway discharge was estimated as 11,850 cfs (see sheet 5), about the same as emergency spillway discharge used in the SCS computer routing

The spillway is rated as "Adequate" as the spillways will pass the PMF without overtopping the embankment.

BY MFB DATE 7/3/80 SUBJECT _____ SHEET 5 OF 9
CHKD. BY 100 DATE 7/15/80 Hilltown Dam JOB No. _____
Hydrology / Hydraulics

Emergency Spillway Capacity ref SCS TR-39

bottom width = 300 ft

level section = 30 ft

total length to downstream edge of level section = 570 ft

approach channel slope = 0.02

assume $Q = 11,850$ cfs, estimated emergency spillway cap.

$q = Q/b = 39.5$ cfs/ft

depth at upstream edge of level section = 4.5 ft

ES-158, sh. 1 of 10

depth at entrance to approach channel = 16.1 ft

ES-158, sh. 3 of 10

velocity head at entrance = 0.051 ft

ES-159, sh. 1 of 2

total head at entrance to approach channel

elevation + water depth + velocity head

376 + 16.1 + 0.05 = 392.2 ft

close to 392.3 ft,

maximum water
elevation

WORK PLAN - DESIGN COMPARISON (DAMS)

ITEM	UNIT	WORK PLAN	DESIGN	COMMENTS
DRAINAGE AREA	SQ MI	2.8	2.8	
STORAGE CAPACITY				
PERCENT (UNC AERATED)	AC FT	46	46	dry dam
BENEFICIAL	AC FT	-		
RETARDING	AC FT	525	514	
TOTAL	AC FT	571	560	
BETWEEN HIGH & LOW S	AC FT			
SURFACE AREA				
NORMAL POOL	ACRE	6	0	dry dam
RETARDING POOL	ACRE	48	46.5	
DESIGN HIGH WATER	ACRE		55.5	
VOLUME OF FILL	CU YD	88,900		
TOP OF DAM ELEV	FEET	392.6	392.5	
MAX HEIGHT OF DAM	FEET	40.6	40.5	
EMERGENCY SPILLWAY				
CREST ELEVATION	FEET	386.7	386.4	
BOTTOM WIDTH	FEET	300	300	
TYPE	-	veg	veg	
PERCENT CHANCE OF USE	-	1	1	
AVE CURVE NO COND II	-	80	80	
EM SP HYDROGRAPH				
STORM RAINFALL	IN	10.5	10.5	
STORM RUNOFF	IN	8.0	8.0	
VELOCITY OF FLOW - V	FPS	7.0	7.4	
PEAK DISCHARGE RATE	CFS	2,460	4,012	
MAX WATER SURFACE EL	FEET	389.1	389.4	
FREEBORD HYDROGRAPH				
STORM RAINFALL	IN	25.5	25.6	
STORM RUNOFF	IN	22.73	22.73	
VELOCITY OF FLOW - V _e	FPS	11.7	11.0	
PEAK DISCHARGE RATE	CFS	11,550	12,568	
MAX WATER SURFACE EL	FEET	392.6	392.5	
PRINCIPAL SPILLWAY				
PIPER SIZE	FT	0x30	0x30	
MAX LOW STAGE FLOW	CFS			
ORIFICE SIZE	FT			
MAX HIGH STAGE FLOW	CFS	123	191	
PIPE SIZE	DIA	30"	36"	
CAPACITY EQUIVALENTS				
TOTAL SEDIMENT VOL.	IN	0.31	0.31	
RETARDING STORAGE	IN	3.52	3.44	
OW SPILLWAY STORAGE				
TO TOP OF DAM	IN	2.24	2.28	
CLASS OF STRUCTURE	-			
CONSTRUCTION COSTS	-			
	-		389.0	

C-Curve

PA-625 NESHAMINY, W/SS CLASS C EM SPW CRIST SET AT 386.4 1/27/77

CURVE NO. 80. IC 2.00 STORM DURATION 6.00

EMER. SPW. RAINFALL 10.50 FREEBOARD RAINFALL 25.50

CASE NO. 2. DRAINAGE AREA 2.80 EMER. SPW. CREST 386.4

ECL 300. LI 400. B02 0. L2 0. H03 0. L3 0.

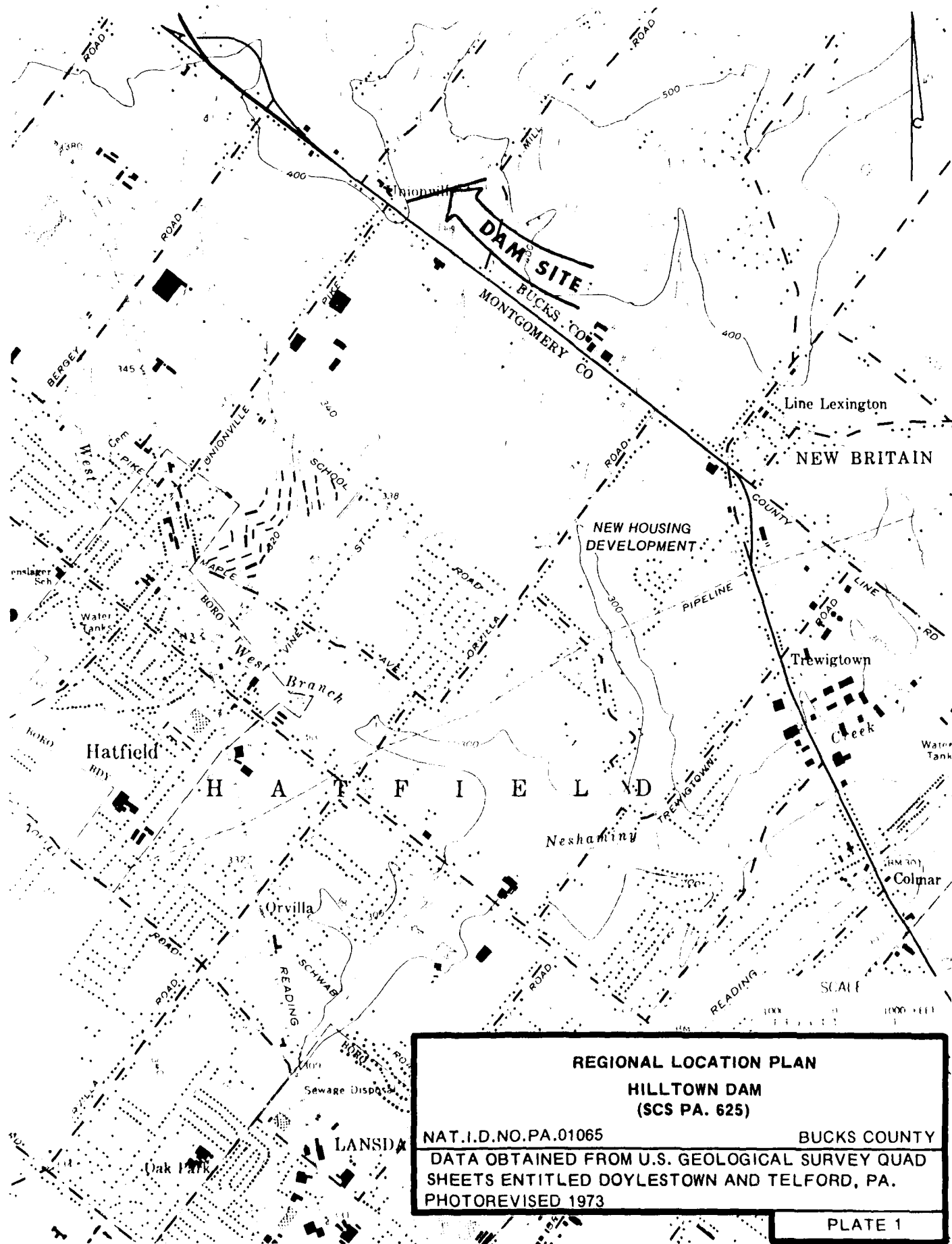
ELEVATION	STORAGE	CFS	CFS	CFS
364.50	46.	0.	0.	0.
364.90	46.	12.	0.	0.
365.50	46.	47.	0.	0.
365.90	46.	77.	0.	0.
366.06	46.	84.	0.	0.
366.30	46.	84.	0.	0.
366.50	46.	85.	0.	0.
367.20	46.	86.	0.	0.
370.00	75.	93.	0.	0.
374.00	140.	102.	0.	0.
380.00	306.	116.	0.	0.
386.00	540.	125.	0.	0.
386.40	560.	125.	0.	0.
386.90	585.	294.	0.	0.
387.40	610.	709.	0.	0.
387.90	635.	1301.	0.	0.
388.40	660.	2051.	0.	0.
388.90	685.	2934.	0.	0.
389.40	710.	4012.	0.	0.
390.40	760.	6297.	0.	0.
391.40	810.	9268.	0.	0.
392.00	840.	11061.	0.	0.
392.40	860.	12255.	0.	0.
393.00	1140.	38117.	0.	0.
403.99	1440.	73719.	0.	0.

REF - SCS DESIGN FOLDER

ROADBOARD ROUTING									
TIME	IN/CM	AVE	IN/CM	OUT/CM	FLEV.	TIME	IN/CM	AVE	IN/CM
0.25	0.0	0.0	0.0	0.0	314.50	0.25	0.0	0.0	0.0
0.50	0.0	0.0	0.0	0.0	314.75	0.50	0.0	0.0	0.0
0.75	0.0	0.0	0.0	0.0	315.00	0.75	0.0	0.0	0.0
1.00	0.0	0.0	0.0	0.0	315.25	1.00	0.0	0.0	0.0
1.25	0.0	0.0	0.0	0.0	315.50	1.25	0.0	0.0	0.0
1.50	0.0	0.0	0.0	0.0	315.75	1.50	0.0	0.0	0.0
1.75	0.0	0.0	0.0	0.0	316.00	1.75	0.0	0.0	0.0
2.00	0.0	0.0	0.0	0.0	316.25	2.00	0.0	0.0	0.0
2.25	0.0	0.0	0.0	0.0	316.50	2.25	0.0	0.0	0.0
2.50	0.0	0.0	0.0	0.0	316.75	2.50	0.0	0.0	0.0
2.75	0.0	0.0	0.0	0.0	317.00	2.75	0.0	0.0	0.0
3.00	0.0	0.0	0.0	0.0	317.25	3.00	0.0	0.0	0.0
3.25	0.0	0.0	0.0	0.0	317.50	3.25	0.0	0.0	0.0
3.50	0.0	0.0	0.0	0.0	317.75	3.50	0.0	0.0	0.0
3.75	0.0	0.0	0.0	0.0	318.00	3.75	0.0	0.0	0.0
4.00	0.0	0.0	0.0	0.0	318.25	4.00	0.0	0.0	0.0
4.25	0.0	0.0	0.0	0.0	318.50	4.25	0.0	0.0	0.0
4.50	0.0	0.0	0.0	0.0	318.75	4.50	0.0	0.0	0.0
4.75	0.0	0.0	0.0	0.0	319.00	4.75	0.0	0.0	0.0
5.00	0.0	0.0	0.0	0.0	319.25	5.00	0.0	0.0	0.0
5.25	0.0	0.0	0.0	0.0	319.50	5.25	0.0	0.0	0.0
5.50	0.0	0.0	0.0	0.0	319.75	5.50	0.0	0.0	0.0
5.75	0.0	0.0	0.0	0.0	320.00	5.75	0.0	0.0	0.0
6.00	0.0	0.0	0.0	0.0	320.25	6.00	0.0	0.0	0.0
6.25	0.0	0.0	0.0	0.0	320.50	6.25	0.0	0.0	0.0
6.50	0.0	0.0	0.0	0.0	320.75	6.50	0.0	0.0	0.0
6.75	0.0	0.0	0.0	0.0	321.00	6.75	0.0	0.0	0.0
7.00	0.0	0.0	0.0	0.0	321.25	7.00	0.0	0.0	0.0
7.25	0.0	0.0	0.0	0.0	321.50	7.25	0.0	0.0	0.0
7.50	0.0	0.0	0.0	0.0	321.75	7.50	0.0	0.0	0.0
7.75	0.0	0.0	0.0	0.0	322.00	7.75	0.0	0.0	0.0
8.00	0.0	0.0	0.0	0.0	322.25	8.00	0.0	0.0	0.0
8.25	0.0	0.0	0.0	0.0	322.50	8.25	0.0	0.0	0.0
8.50	0.0	0.0	0.0	0.0	322.75	8.50	0.0	0.0	0.0
8.75	0.0	0.0	0.0	0.0	323.00	8.75	0.0	0.0	0.0
9.00	0.0	0.0	0.0	0.0	323.25	9.00	0.0	0.0	0.0
9.25	0.0	0.0	0.0	0.0	323.50	9.25	0.0	0.0	0.0
9.50	0.0	0.0	0.0	0.0	323.75	9.50	0.0	0.0	0.0
9.75	0.0	0.0	0.0	0.0	324.00	9.75	0.0	0.0	0.0
10.00	0.0	0.0	0.0	0.0	324.25	10.00	0.0	0.0	0.0
10.25	0.0	0.0	0.0	0.0	324.50	10.25	0.0	0.0	0.0
10.50	0.0	0.0	0.0	0.0	324.75	10.50	0.0	0.0	0.0
10.75	0.0	0.0	0.0	0.0	325.00	10.75	0.0	0.0	0.0
11.00	0.0	0.0	0.0	0.0	325.25	11.00	0.0	0.0	0.0
11.25	0.0	0.0	0.0	0.0	325.50	11.25	0.0	0.0	0.0
11.50	0.0	0.0	0.0	0.0	325.75	11.50	0.0	0.0	0.0
11.75	0.0	0.0	0.0	0.0	326.00	11.75	0.0	0.0	0.0
12.00	0.0	0.0	0.0	0.0	326.25	12.00	0.0	0.0	0.0
12.25	0.0	0.0	0.0	0.0	326.50	12.25	0.0	0.0	0.0
12.50	0.0	0.0	0.0	0.0	326.75	12.50	0.0	0.0	0.0
12.75	0.0	0.0	0.0	0.0	327.00	12.75	0.0	0.0	0.0
13.00	0.0	0.0	0.0	0.0	327.25	13.00	0.0	0.0	0.0
13.25	0.0	0.0	0.0	0.0	327.50	13.25	0.0	0.0	0.0
13.50	0.0	0.0	0.0	0.0	327.75	13.50	0.0	0.0	0.0
13.75	0.0	0.0	0.0	0.0	328.00	13.75	0.0	0.0	0.0
14.00	0.0	0.0	0.0	0.0	328.25	14.00	0.0	0.0	0.0
14.25	0.0	0.0	0.0	0.0	328.50	14.25	0.0	0.0	0.0
14.50	0.0	0.0	0.0	0.0	328.75	14.50	0.0	0.0	0.0
14.75	0.0	0.0	0.0	0.0	329.00	14.75	0.0	0.0	0.0
15.00	0.0	0.0	0.0	0.0	329.25	15.00	0.0	0.0	0.0
15.25	0.0	0.0	0.0	0.0	329.50	15.25	0.0	0.0	0.0
15.50	0.0	0.0	0.0	0.0	329.75	15.50	0.0	0.0	0.0
15.75	0.0	0.0	0.0	0.0	330.00	15.75	0.0	0.0	0.0
16.00	0.0	0.0	0.0	0.0	330.25	16.00	0.0	0.0	0.0
16.25	0.0	0.0	0.0	0.0	330.50	16.25	0.0	0.0	0.0
16.50	0.0	0.0	0.0	0.0	330.75	16.50	0.0	0.0	0.0
16.75	0.0	0.0	0.0	0.0	331.00	16.75	0.0	0.0	0.0
17.00	0.0	0.0	0.0	0.0	331.25	17.00	0.0	0.0	0.0
17.25	0.0	0.0	0.0	0.0	331.50	17.25	0.0	0.0	0.0
17.50	0.0	0.0	0.0	0.0	331.75	17.50	0.0	0.0	0.0
17.75	0.0	0.0	0.0	0.0	332.00	17.75	0.0	0.0	0.0
18.00	0.0	0.0	0.0	0.0	332.25	18.00	0.0	0.0	0.0
18.25	0.0	0.0	0.0	0.0	332.50	18.25	0.0	0.0	0.0
18.50	0.0	0.0	0.0	0.0	332.75	18.50	0.0	0.0	0.0
18.75	0.0	0.0	0.0	0.0	333.00	18.75	0.0	0.0	0.0
19.00	0.0	0.0	0.0	0.0	333.25	19.00	0.0	0.0	0.0
19.25	0.0	0.0	0.0	0.0	333.50	19.25	0.0	0.0	0.0
19.50	0.0	0.0	0.0	0.0	333.75	19.50	0.0	0.0	0.0
19.75	0.0	0.0	0.0	0.0	334.00	19.75	0.0	0.0	0.0
20.00	0.0	0.0	0.0	0.0	334.25	20.00	0.0	0.0	0.0
20.25	0.0	0.0	0.0	0.0	334.50	20.25	0.0	0.0	0.0
20.50	0.0	0.0	0.0	0.0	334.75	20.50	0.0	0.0	0.0
20.75	0.0	0.0	0.0	0.0	335.00	20.75	0.0	0.0	0.0
21.00	0.0	0.0	0.0	0.0	335.25	21.00	0.0	0.0	0.0
21.25	0.0	0.0	0.0	0.0	335.50	21.25	0.0	0.0	0.0
21.50	0.0	0.0	0.0	0.0	335.75	21.50	0.0	0.0	0.0
21.75	0.0	0.0	0.0	0.0	336.00	21.75	0.0	0.0	0.0
22.00	0.0	0.0	0.0	0.0	336.25	22.00	0.0	0.0	0.0
22.25	0.0	0.0	0.0	0.0	336.50	22.25	0.0	0.0	0.0
22.50	0.0	0.0	0.0	0.0	336.75	22.50	0.0	0.0	0.0
22.75	0.0	0.0	0.0	0.0	337.00	22.75	0.0	0.0	0.0
23.00	0.0	0.0	0.0	0.0	337.25	23.00	0.0	0.0	0.0
23.25	0.0	0.0	0.0	0.0	337.50	23.25	0.0	0.0	0.0
23.50	0.0	0.0	0.0	0.0	337.75	23.50	0.0	0.0	0.0
23.75	0.0	0.0	0.0	0.0	338.00	23.75	0.0	0.0	0.0
24.00	0.0	0.0	0.0	0.0	338.25	24.00	0.0	0.0	0.0
24.25	0.0	0.0	0.0	0.0	338.50	24.25	0.0	0.0	0.0
24.50	0.0	0.0	0.0	0.0	338.75	24.50	0.0	0.0	0.0
24.75	0.0	0.0	0.0	0.0	339.00	24.75	0.0	0.0	0.0
25.00	0.0	0.0	0.0	0.0	339.25	25.00	0.0	0.0	0.0
25.25	0.0	0.0	0.0	0.0	339.50	25.25	0.0	0.0	0.0
25.50	0.0	0.0	0.0	0.0	339.75	25.50	0.0	0.0	0.0
25.75	0.0	0.0	0.0	0.0	340.00	25.75	0.0	0.0	0.0
26.00	0.0	0.0	0.0	0.0	340.25	26.00	0.0	0.0	0.0
26.25	0.0	0.0	0.0	0.0	340.50	26.25	0.0	0.0	0.0
26.50	0.0	0.0	0.0	0.0	340.75	26.50	0.0	0.0	0.0
26.75	0.0	0.0	0.0	0.0	341.00	26.75	0.0	0.0	0.0
27.00	0.0	0.0	0.0	0.0	341.25	27.00	0.0	0.0	0.0
27.25	0.0	0.0	0.0	0.0	341.50	27.25	0.0	0.0	0.0
27.50	0.0	0.0	0.0	0.0	341.75	27.50	0.0	0.0	0.0
27.75	0.0	0.0	0.0	0.0	342.00	27.75	0.0	0.0	0.0
28.00	0.0	0.0	0.0	0.0	342.25	28.00	0.0	0.0	0.0
28.25	0.0	0.0	0.0	0.0	342.50	28.25	0.0	0.0	0.0
28.50	0.0	0.0	0.0	0.0	342.75	28.50	0.0	0.0	0.0
28.75	0.0	0.0	0.0	0.0	343.00	28.75	0.0	0.0	0.0
29.00	0.0	0.0	0.0	0.0	343.25	29.00	0.0	0.0	0.0
29.25	0.0	0.0	0.0	0.0	343.50	29.25	0.0	0.0	0.0
29.50	0.0	0.0	0.0	0.0	343.75	29.50	0.0	0.0	0.0
29.75	0.0	0.0	0.0	0.0	344.00	29.75	0.0	0.0	0.0
30.00	0.0	0.0	0.0	0.0	344.25	30.00	0.0	0.0	0.0
30.25	0.0	0.0	0.0	0.0	344.50	30.25	0.0	0.0	0.0
30.50	0.0	0.0	0.0	0.0	344.75	30.50	0.0	0.0	0.0
30.75	0.0	0.0	0.0	0.0	345.00	30.75	0.0	0.0	0.0
31.00	0.0	0.0	0.0	0.0	345.25	31.00	0.0	0.0	0.0
31.25	0.0	0.0	0.0	0.0	345.50	31.25	0.0	0.0	0.0
31.50	0.0	0.0	0.0	0.0	345.75	31.50	0.0	0.0	0.0
31.75	0.0	0.0	0.0	0.0	346.00	31.75	0.0	0.0	0.0
32.00	0.0	0.0	0.0	0.0	346.25	32.00	0.0	0.0	0.0
32.25	0.0	0.0	0.0	0.0	346.50	32.25	0.0	0.0	0.0
32.50	0.0	0.0	0.0	0.0	346.75	32.50	0.0	0.0	0.0
32.75	0.0	0.0	0.0	0.0	347.00	32.75	0.0	0.0	0.0
33.00	0.0	0.0							

APPENDIX

E



REGIONAL LOCATION PLAN

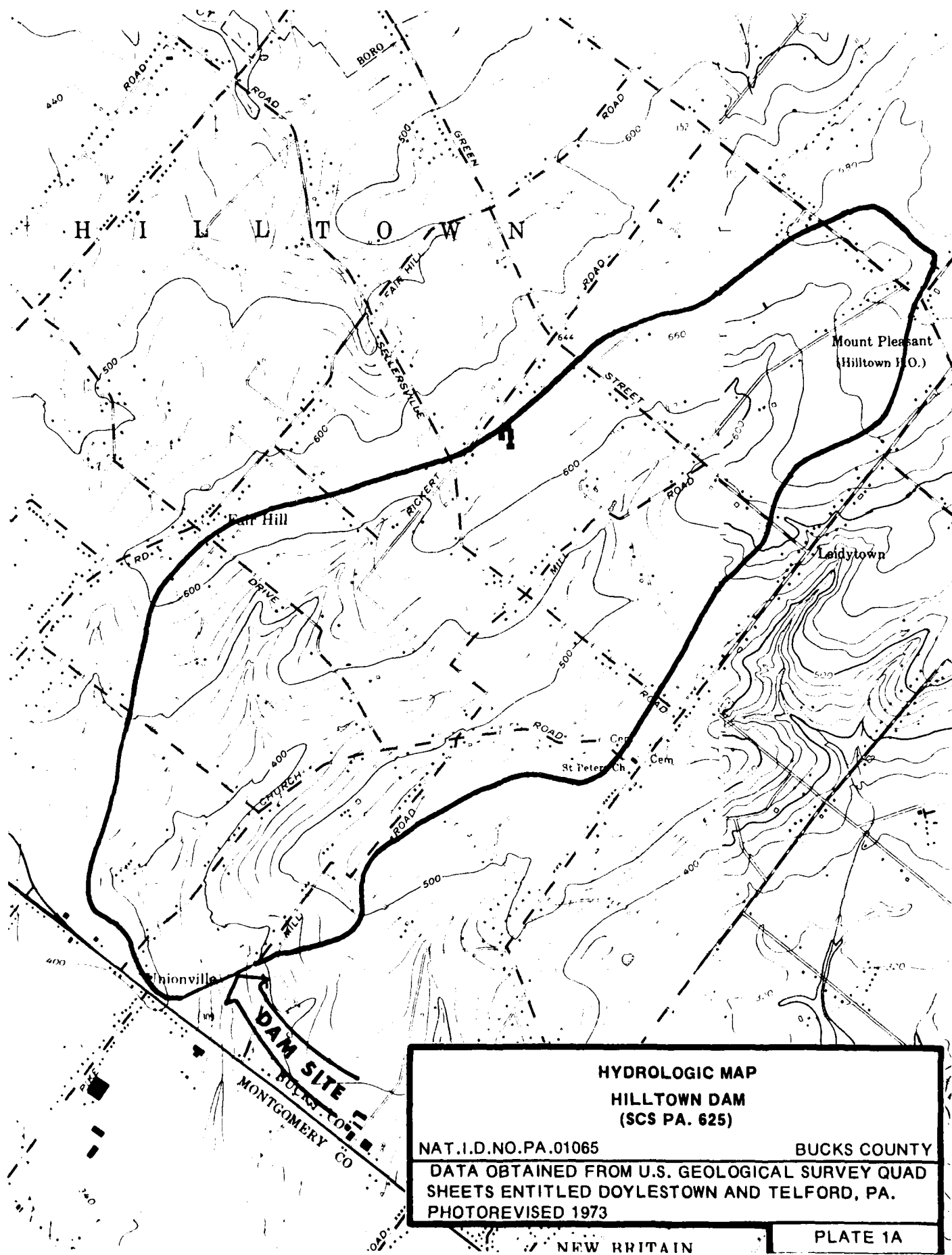
HILLTOWN DAM
(SCS PA. 625)

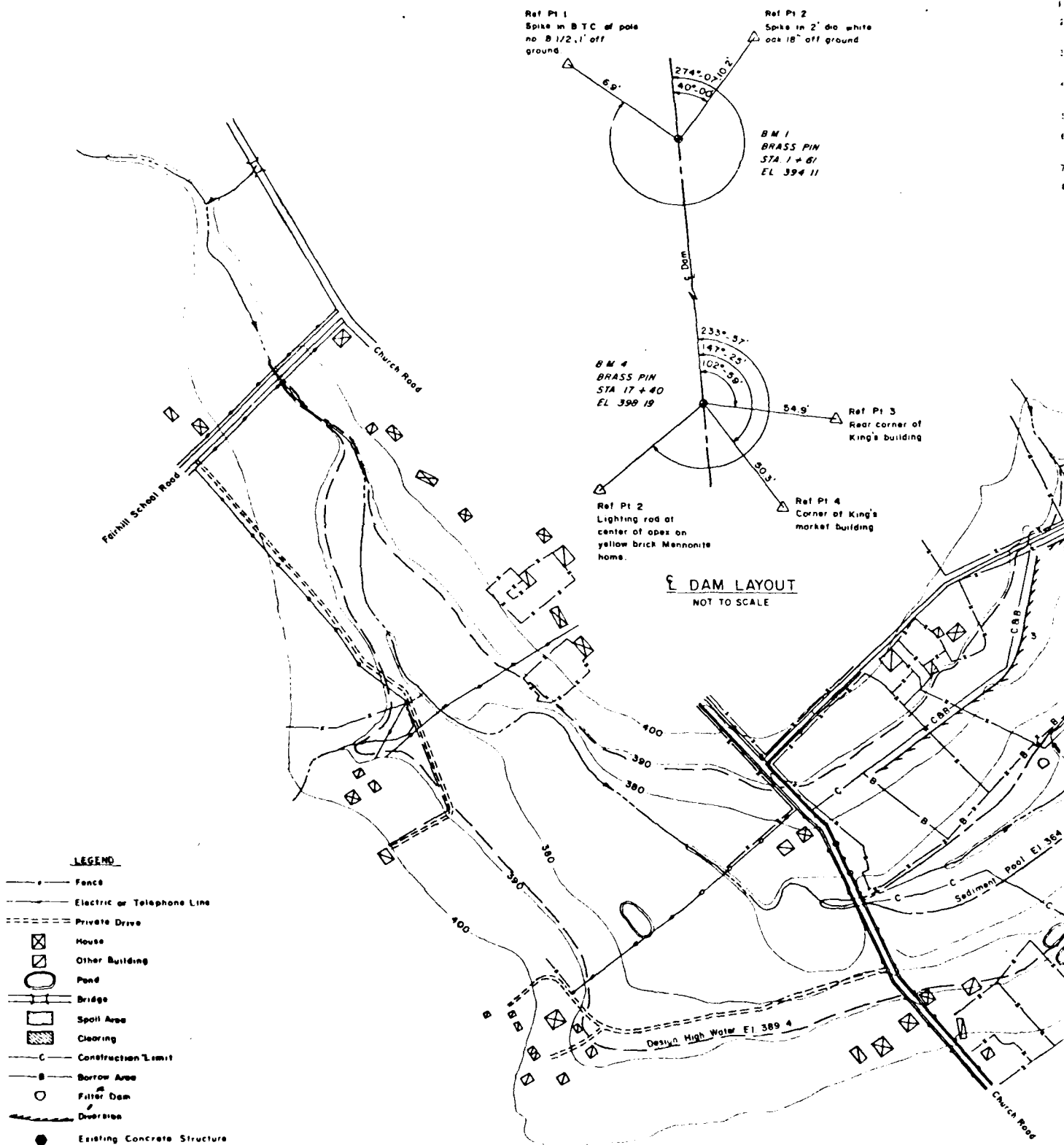
NAT.I.D.NO.PA.01065

BUCKS COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD
SHEETS ENTITLED DOYLESTOWN AND TELFORD, PA.
PHOTOREVISED 1973

PLATE 1





CONSTRUCTION NOTES

1. Borrow Area to be used only as directed by the Engineer.
2. Clearing shall extend 200' upstream of the dam to elevation 384.5 and upstream of the Emergency Spillway entrance channel as shown on the drawings.
3. Dam, Dikes, Emergency Spillway, Borrow Area, Inlet Channel and Outlet Channel shall be cleared and grubbed.
4. Location of Filter Dams, Stream Crossings and Diversions are approximate. Final locations will be as directed by the Engineer. Details sheet Y.
5. Sideslopes of Borrow Area and Spoil Areas shall be no steeper than 3:1.
6. Spoil Areas shall be left with at least two feet of cover over any brush, trees, stumps or boulders. They shall be shaped to provide positive drainage.
7. Spoil Areas shall be cleared as directed by the Engineer.
8. Fences, foundations and existing concrete structures within Construction Limits shall be removed and disposed in a Spoil Area as directed by the Engineer. (Includes existing buildings and their foundations.)



Ref Pt 2
Spike in 2" dia white
oak 18" off ground

74° 02' 10.2"
10° 00'

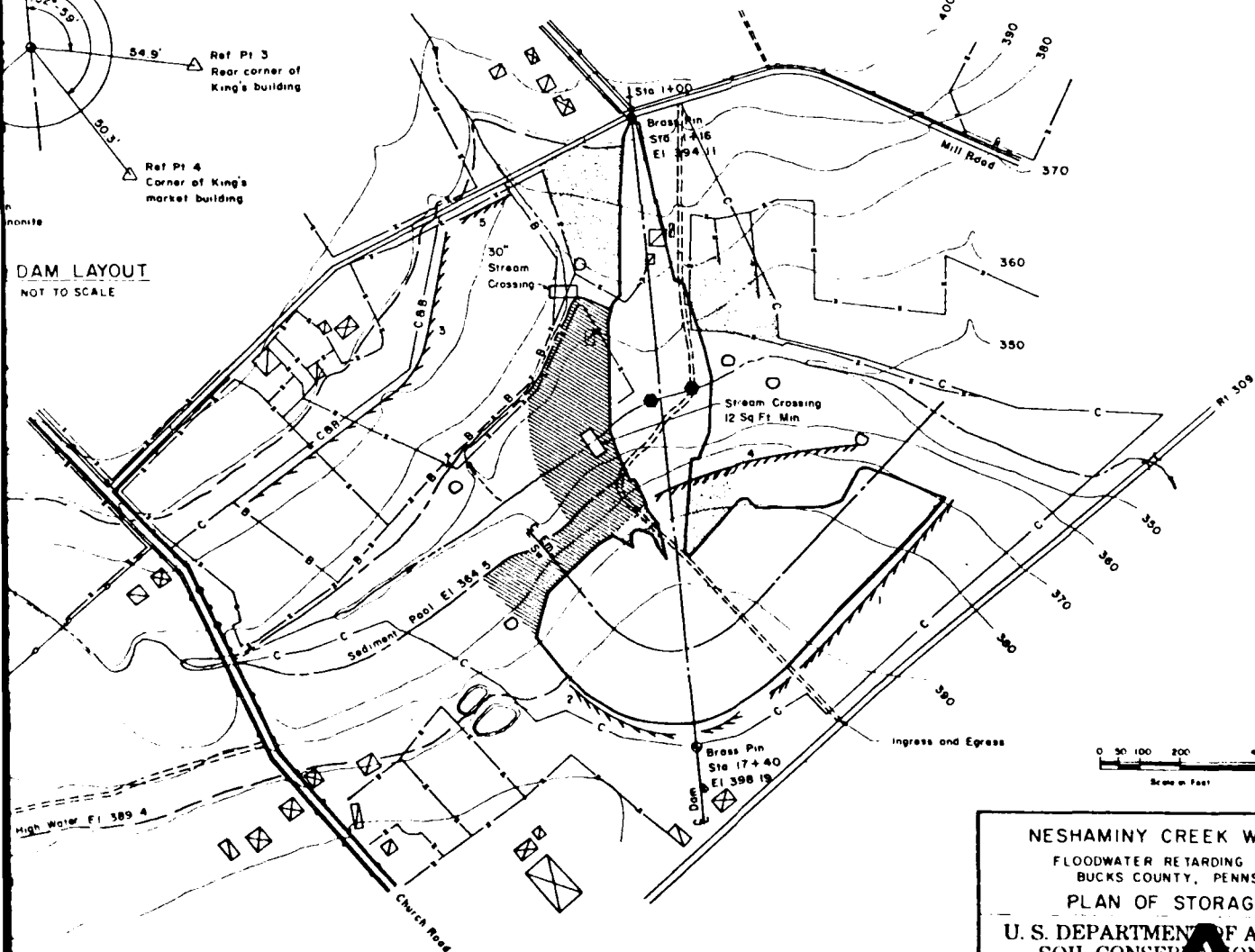
B.M. 1
BRASS PIN
STA 1 + 61
EL. 394.11

232° 57'
147° 25'
102° 58'

54.9' Ref Pt 3
Rear corner of
King's building

50.3' Ref Pt 4
Corner of King's
market building

DAM LAYOUT
NOT TO SCALE



NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
PLAN OF STORAGE AREA

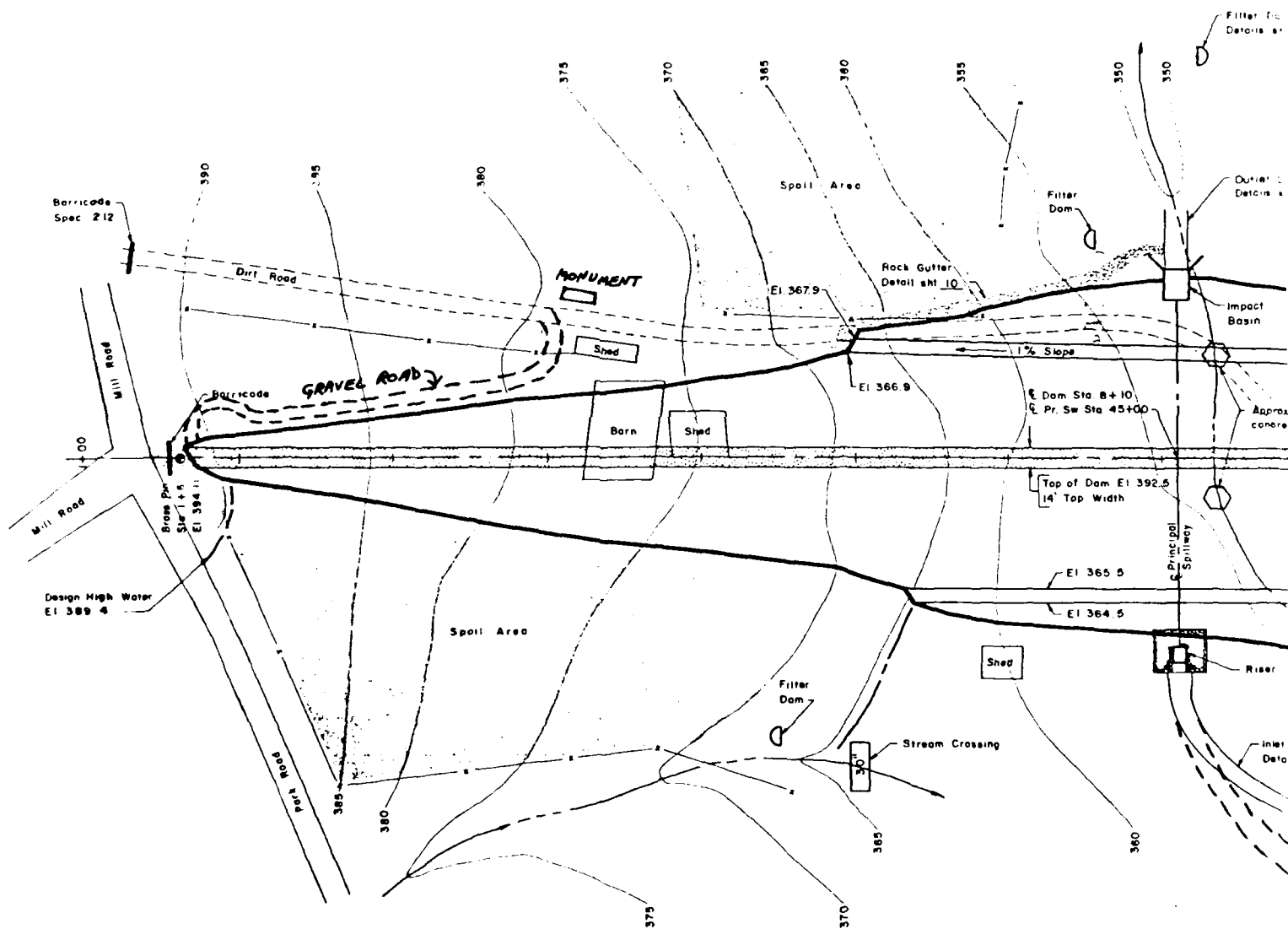
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

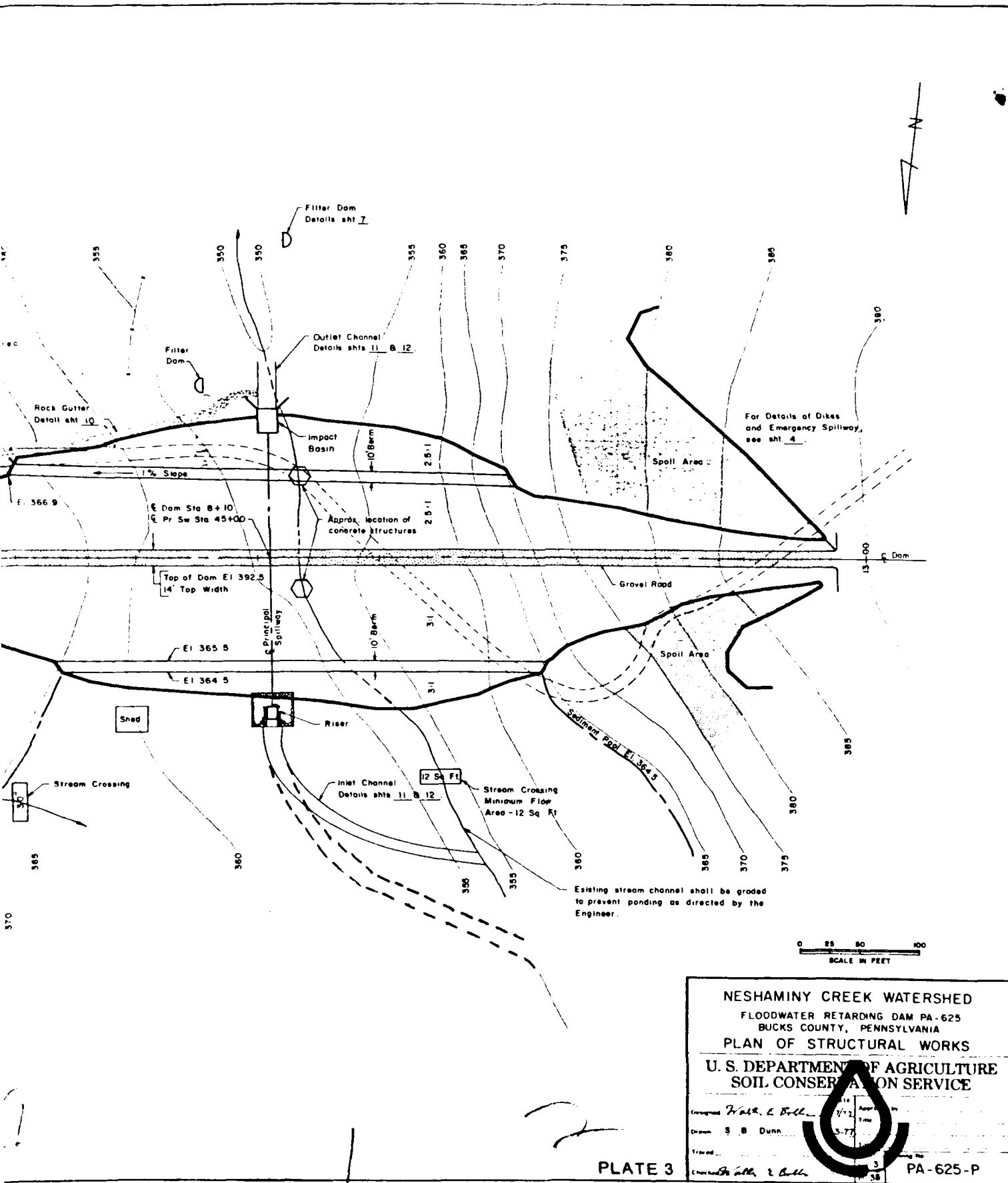
Designed *John A. Hall*
Drawn *M. Usner, S. Dunn*
Traced
(checked *John A. Hall*)

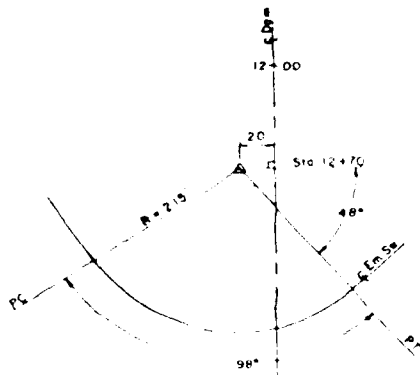


PA-625-P

PLATE 2



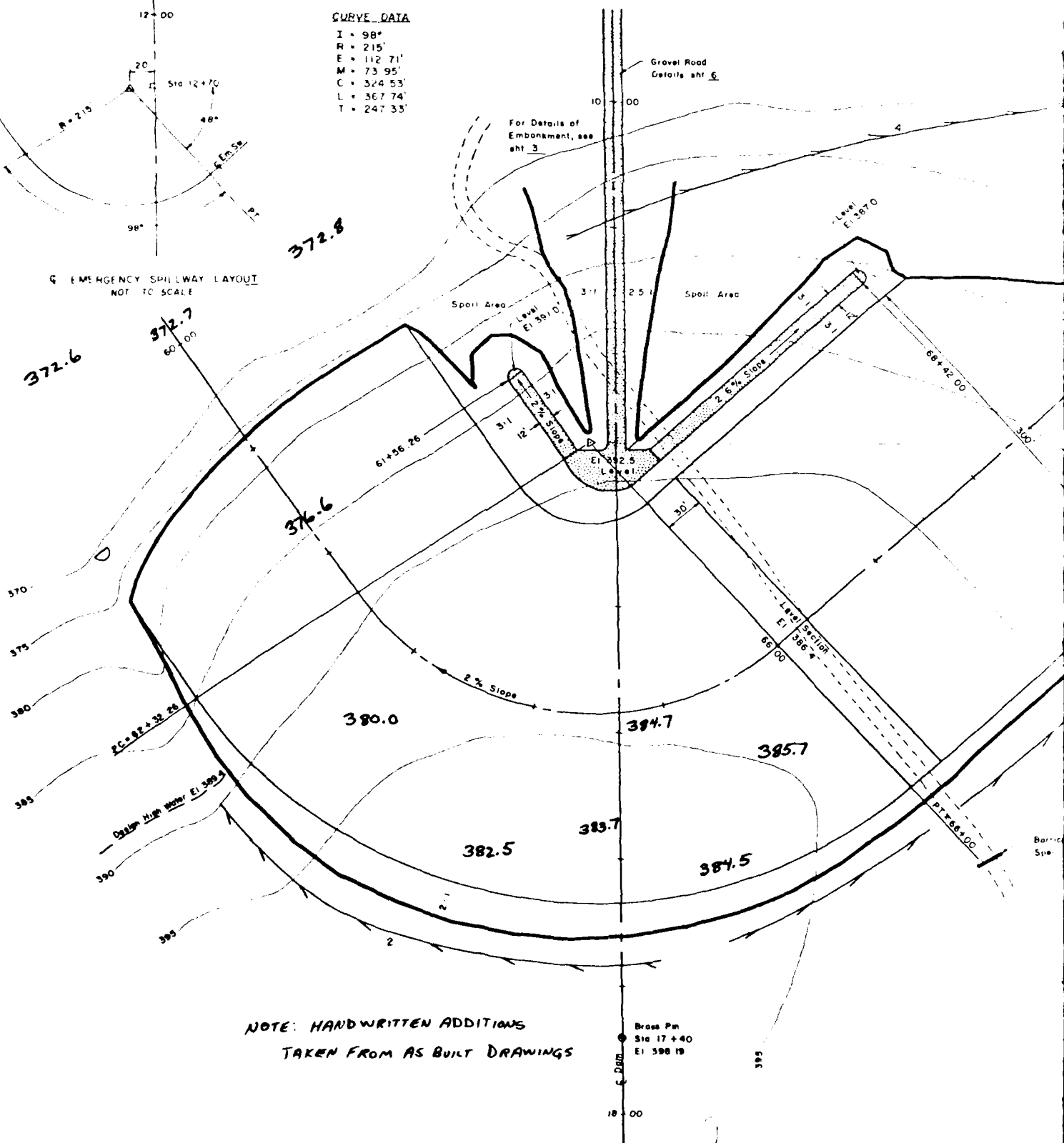


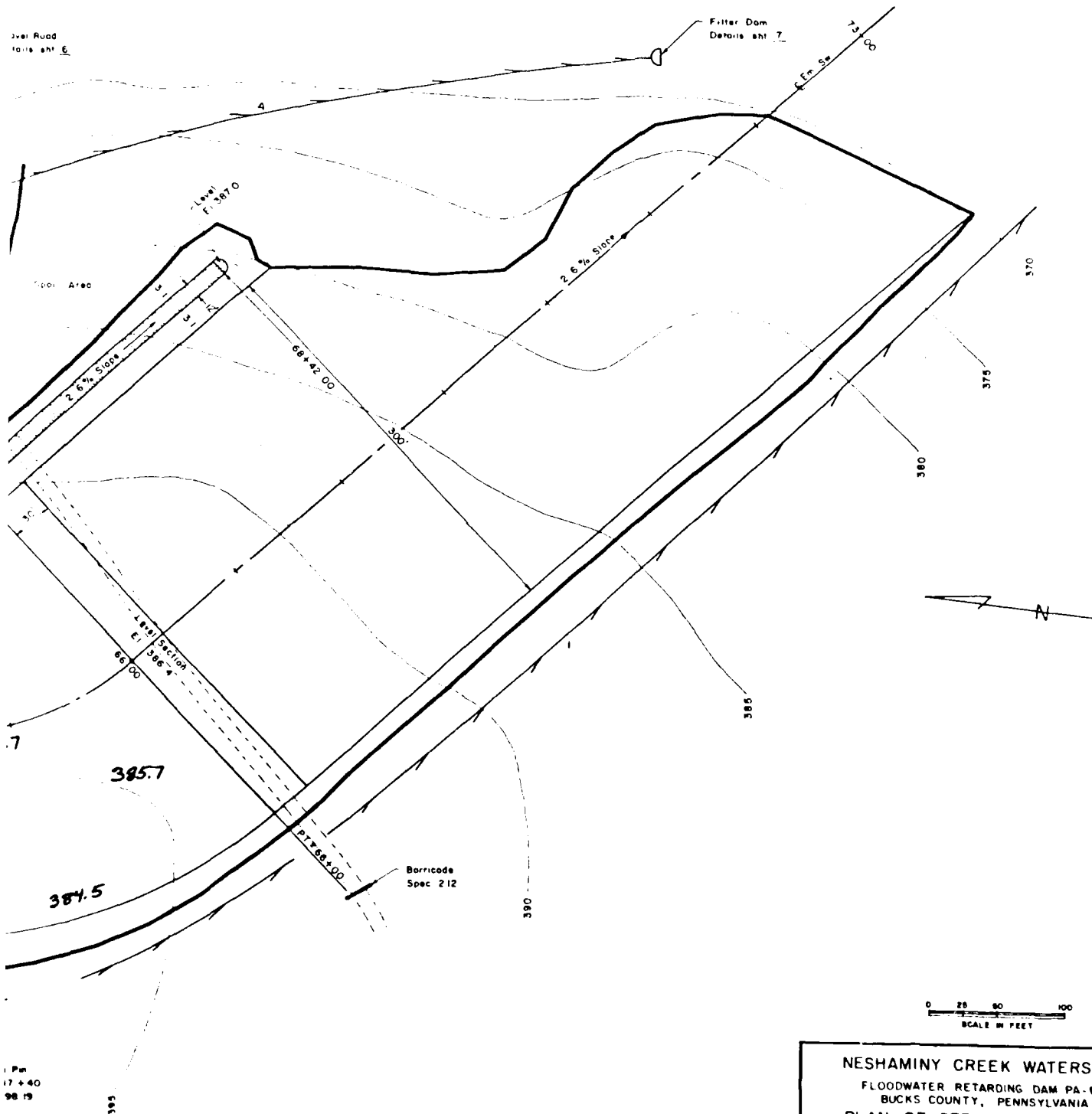


CURVE DATA

I = 98°
R = 215'
E = 112.71'
M = 73.95'
C = 324.53'
L = 367.74'
T = 247.33'

EMERGENCY SPILLWAY LAYOUT
NOT TO SCALE





Filter Dom
Details are 7

Level 3870

7-1011 A700

26% slope

68-42 00

398.

380

575

041

305

590

385.7

384.5

Barricade
Spec 212

PTV 66-0

Section 386

66

0 25 50 100
SCALE IN FEET

1. Part
17 + 40
98 19

595

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
PLAN OF STRUCTURAL WORKS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Answers 2 all... 2 Bell

Dean S. B. Dunn

T: 00000

over 2500 : 1000

112.

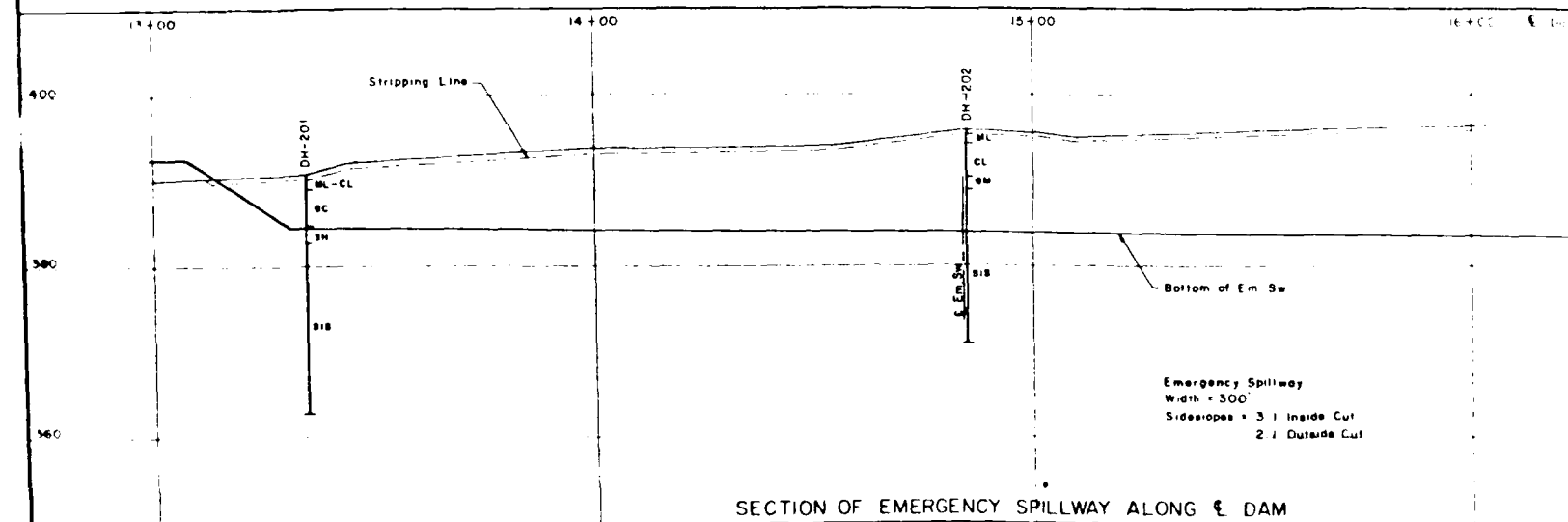
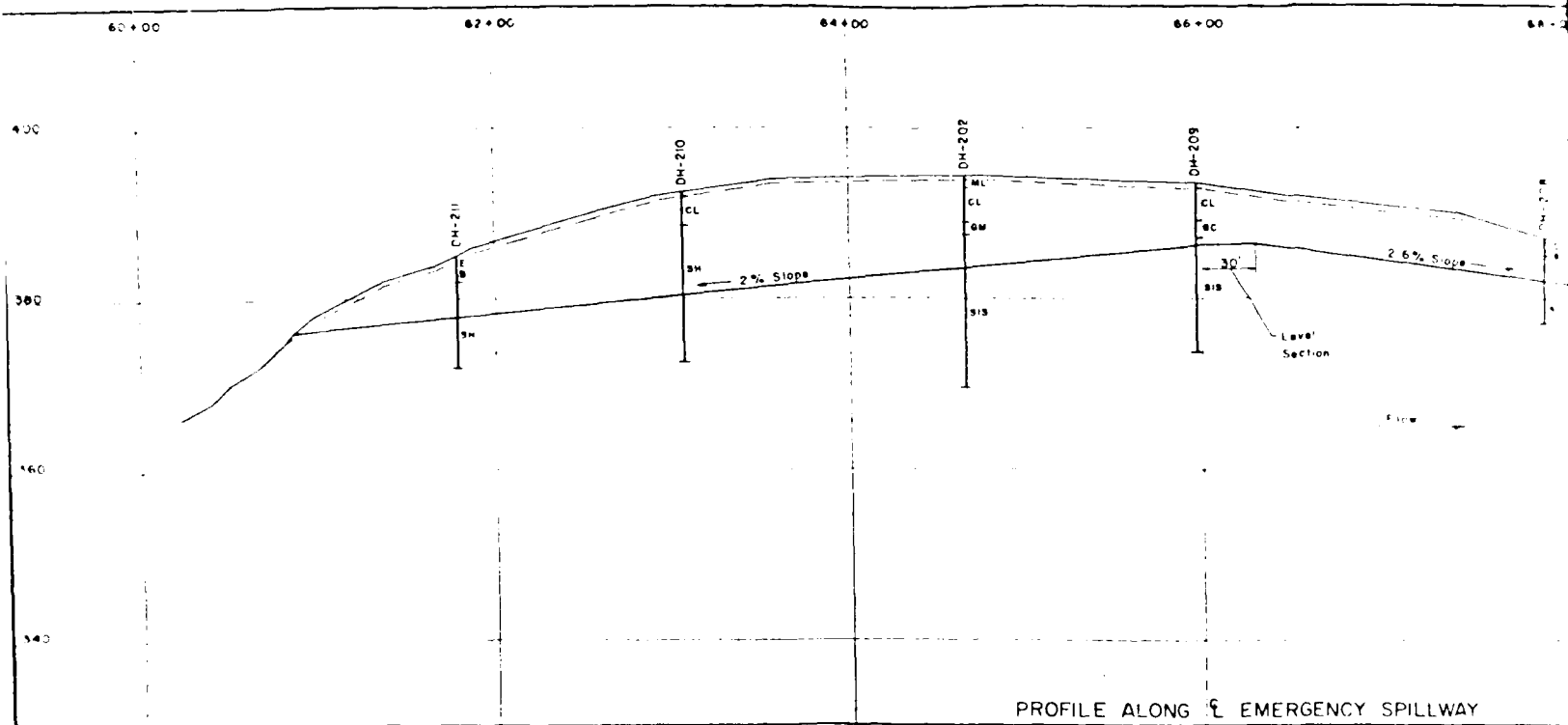
3-77

1

10

PA-625-P

PLATE 4

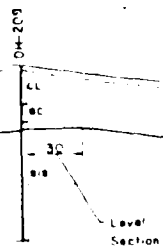


66+00

68+00

70+00

72+00 E. M. Stations



2.6% Slope



Original Ground

Stripping Line

42'

36'

36'

34'

PROFILE ALONG E. EMERGENCY SPILLWAY

16+00 E. Dam Stations

17+00

Original Ground



Bottom of Em. Sw

Emergency Spillway
Width = 300'
Slopesides = 3:1 Inside Cut
2:1 Outside Cut

420'

380'

360'

SPILLWAY ALONG E. DAM

NESHAMINY CREEK WATERSHED

FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA

EMERGENCY SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by S. B. Dunn

Drawn by S. B. Dunn

Traced

Checked by S. B. Dunn

1:1

1:1

1:1

1:1

1:1

1:1

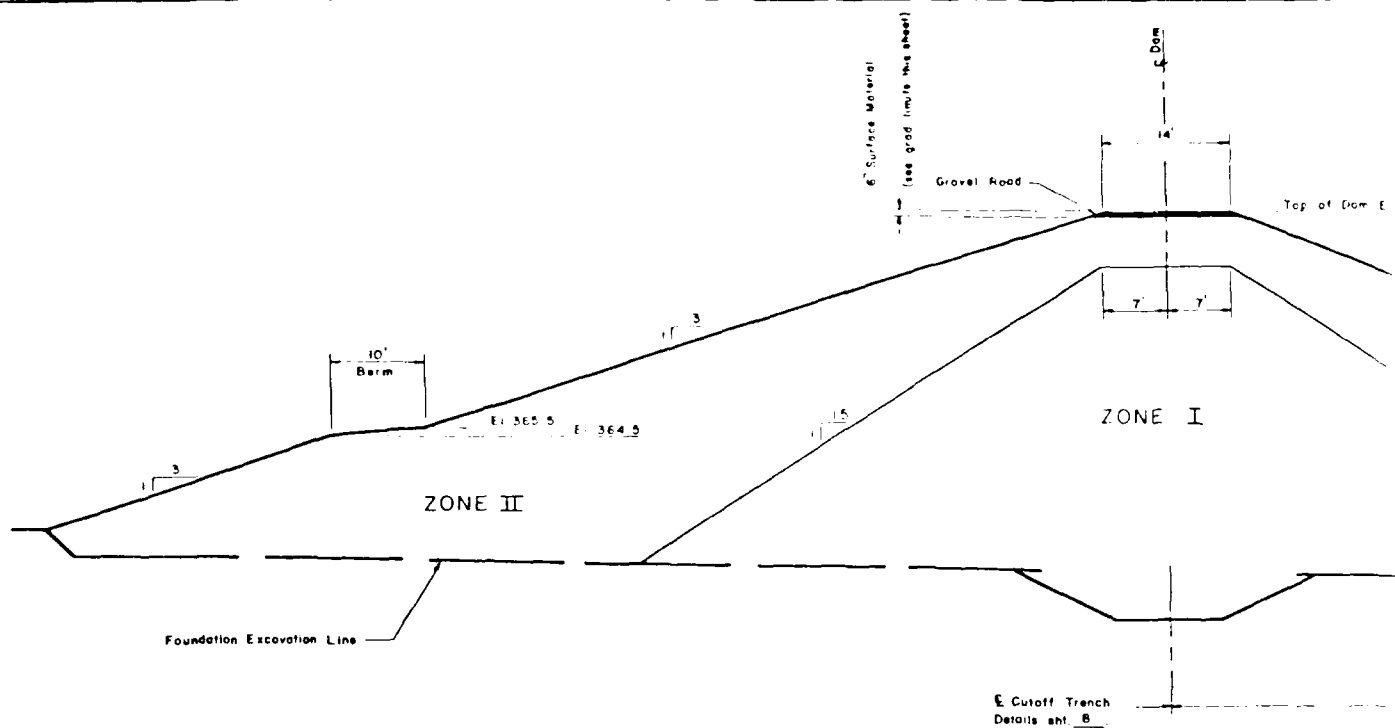
1:1

1:1

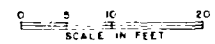
1:1

PLATE 5

PA-625-P



TYPICAL SECTION OF DAM

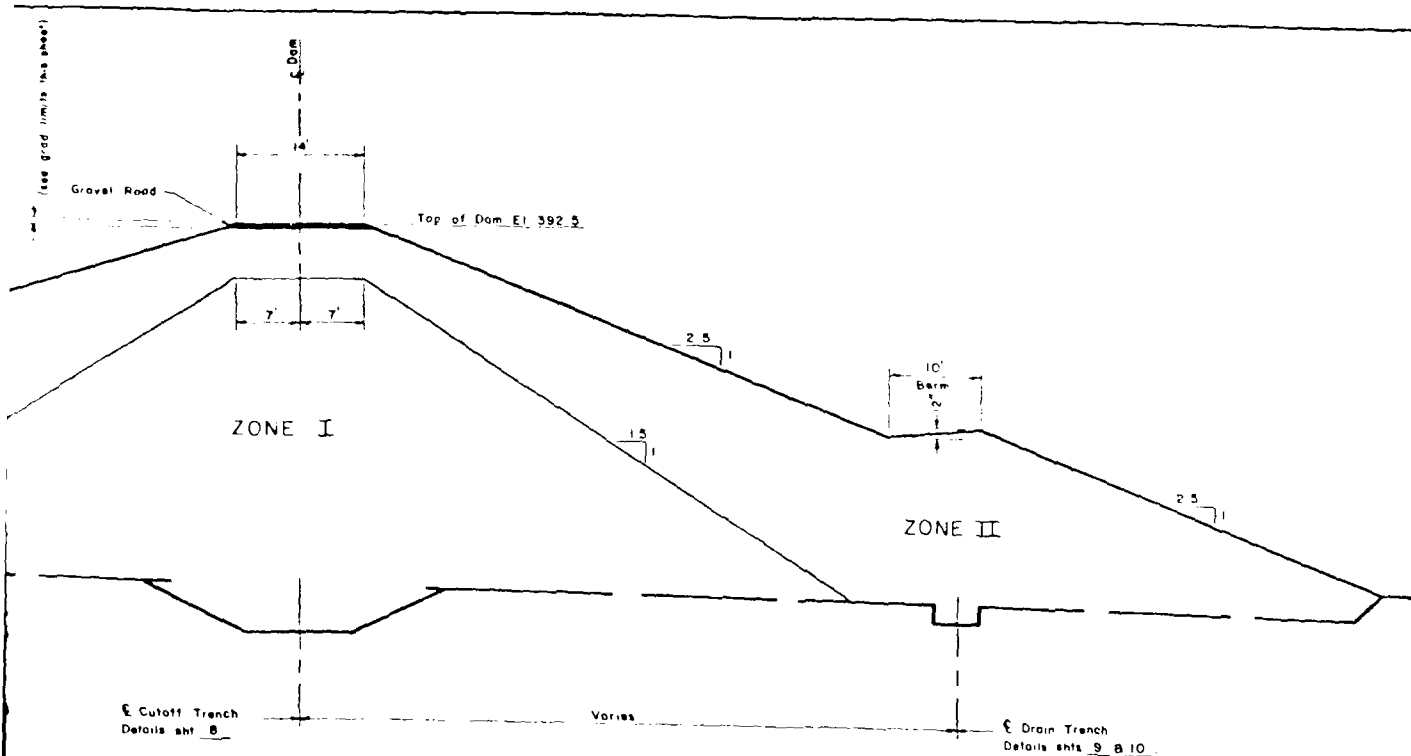


SELECTIVE PLACEMENT	MATERIAL	MAX ROCK SIZE	MAX LIFT	REQ'D WATER CONTENT	COMPACTION	
					CLASS	DEFINITION
ZONE I	Material as represented by TP-109, 0.5' to 4.0', classified as CL; TP-111, 0.8' to 3.5', classified as CL-ML; TP-217, 0.6' to 4.0' classified as CL.	6"	9"	Optimum $\pm 3\%$	A	95% Standard density by ASTM D-698, Method "A"
ZONE II	Material as represented by TP-217, 4.0' to 5.5' classified as GC; TP-220, 1.3' to 5.5', classified as GM.	12"	18"	-2% to +2% of Optimum on Minus $3/4"$ material ASTM D-698 Method "D"	C	Minimum 6 passes with a 450 psi tamping roller per lift

- ¹ Maximum permissible lift thickness before compaction.
² Water content of fill matrix at time of compaction. Variation from water content shown may be approved by the Engineer.
³ For typical compaction curves, see sheet 35.
⁴ For hand compacted backfill, the maximum rock size shall not exceed 3" and lift thickness shall not exceed 4".

GRADATION LIMITS	
SEIVE NO.	% PASSING (Based on Dry Weight)
2"	100
1 1/2"	95-100
3/4"	52-100
3/8"	36-70
no. 4	16-38
no. 30	0-24
no. 50	0-18
no. 100	4-10

NOTE: Gravel surface shall be placed in 3" lifts & each lift shall be compacted by a minimum of 3 passes of a 450 psi tamping roller or approved method.



TYPICAL SECTION OF DAM

SCALE IN FEET

CONSTRUCTION NOTES

1. For constructed fill elevations, see sheet 8.
2. For berm elevations and slopes, see sheet 3.
3. For location and logs of test holes, see sheets 28 thru 34.
4. Constructed slopes are:
2.94:1 Upstream
2.45:1 Downstream

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA 625
BUCKS COUNTY, PENNSYLVANIA
FILL PLACEMENT

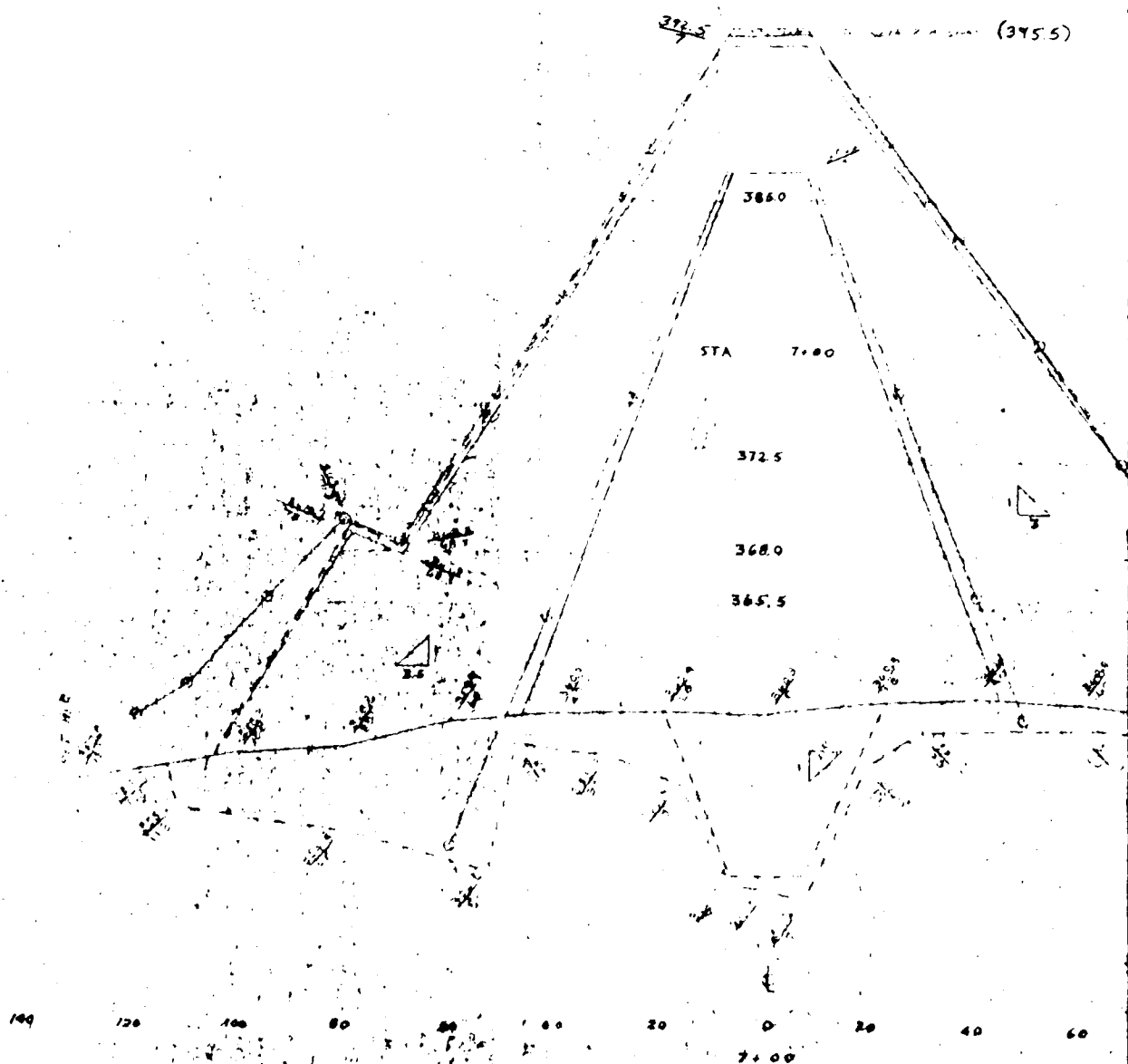
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by Arthur C. Smith
Drawn by S. B. Dunn
Checked by Arthur C. Smith
Approved by S. B. Dunn

PLATE 6

PA-625-P

390
385
380
375
370
368
360
355
350

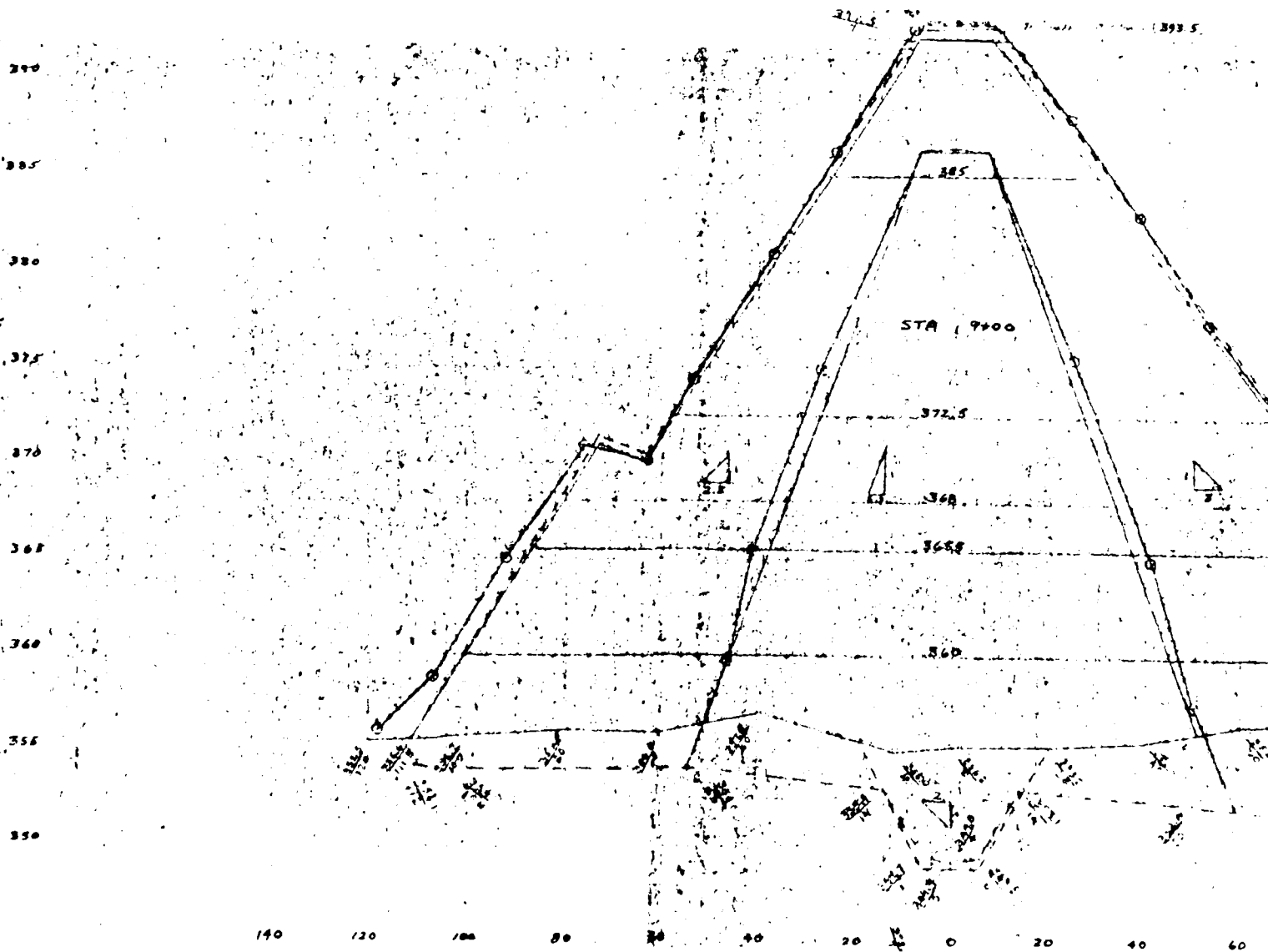


(3955)

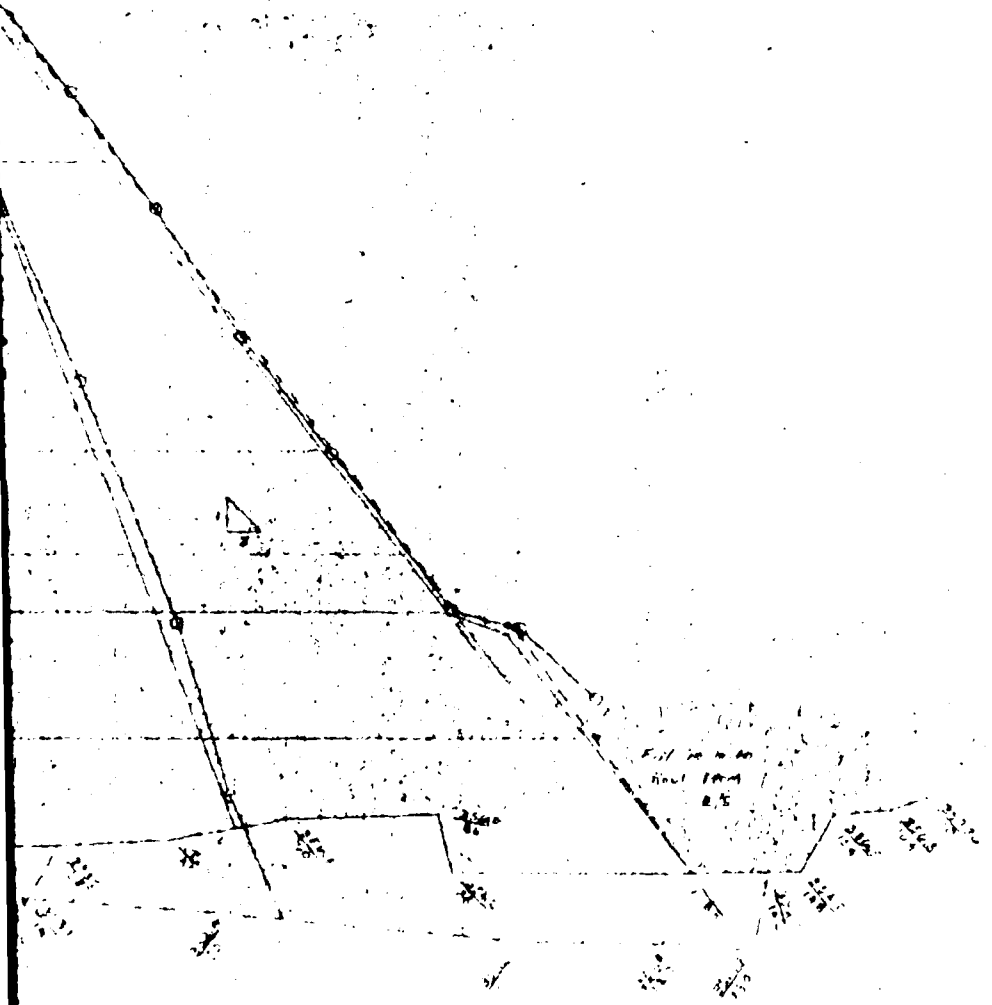
AS BUILT PLANS

File No. PA 026 25 0000	
Scale 1" = 100'	
Date of Survey 1920	
174 700 100 00 500	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by	Approved by
Drawn by	Field
Traced by	IT
Reduced by	IT

PLATE 7



7. 1945 (1993.5)

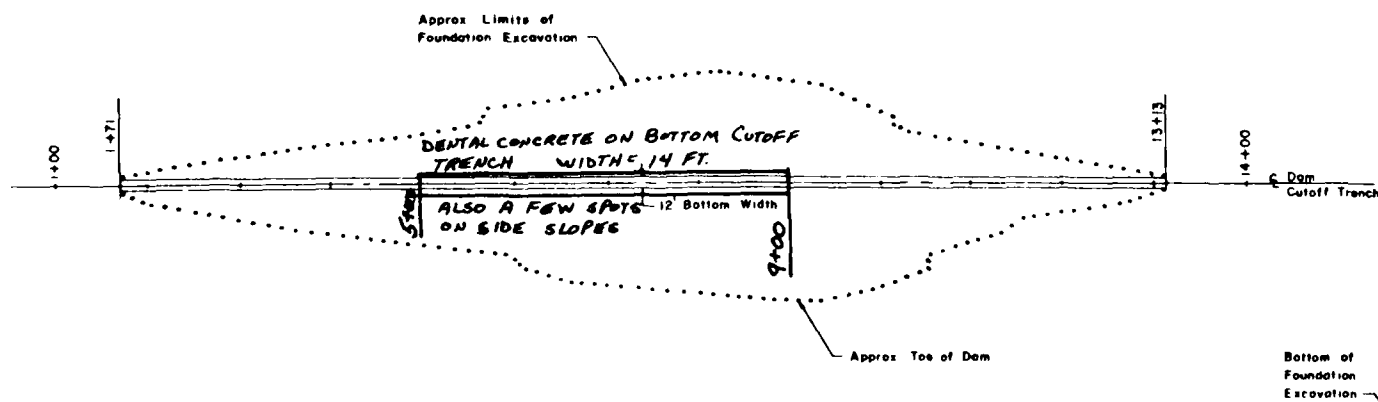
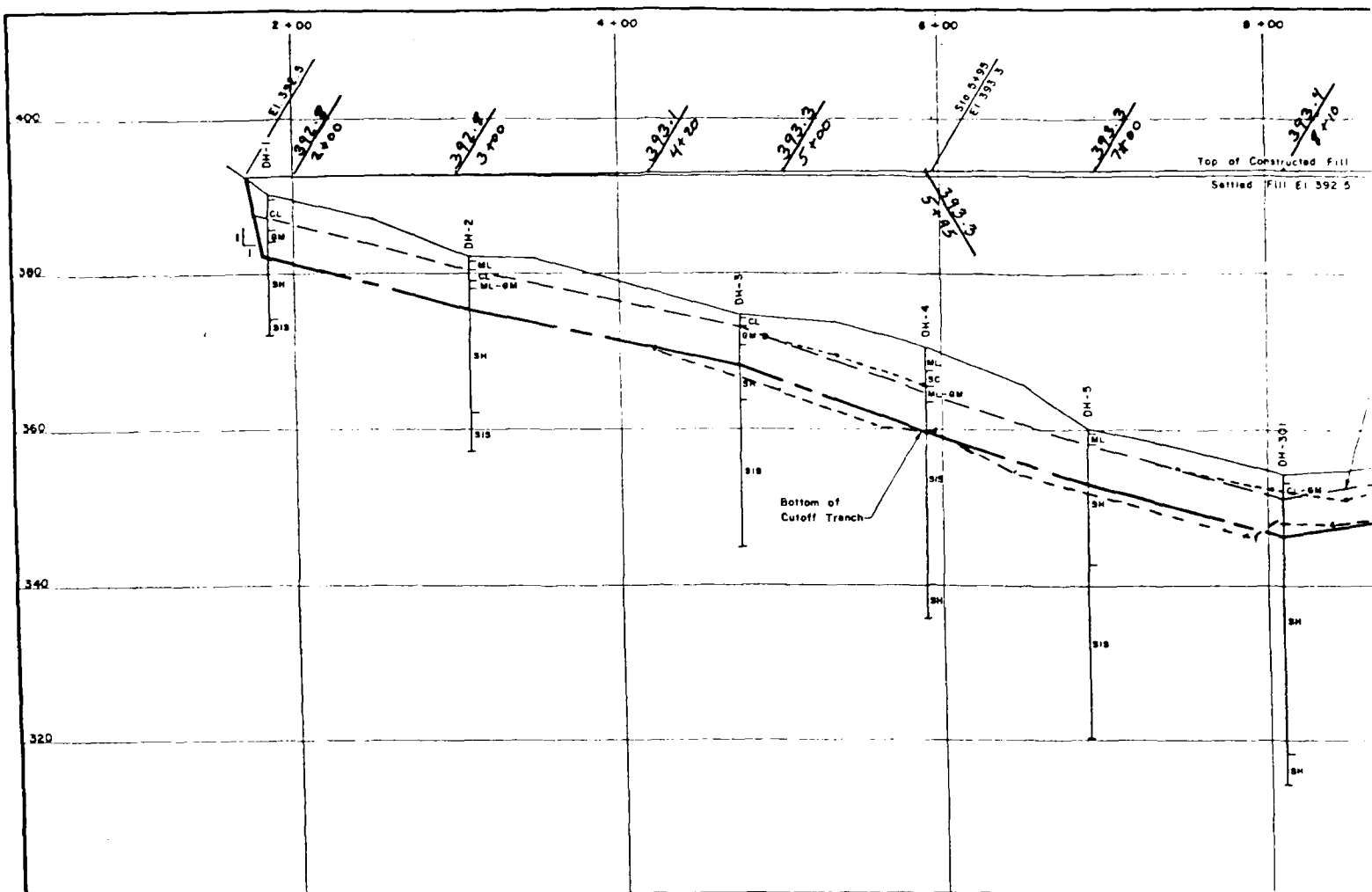


SE. 1/4 Section
Full 100m
2.5
Full 100m
2.5

20 40 60 80 100 120 140 160 180

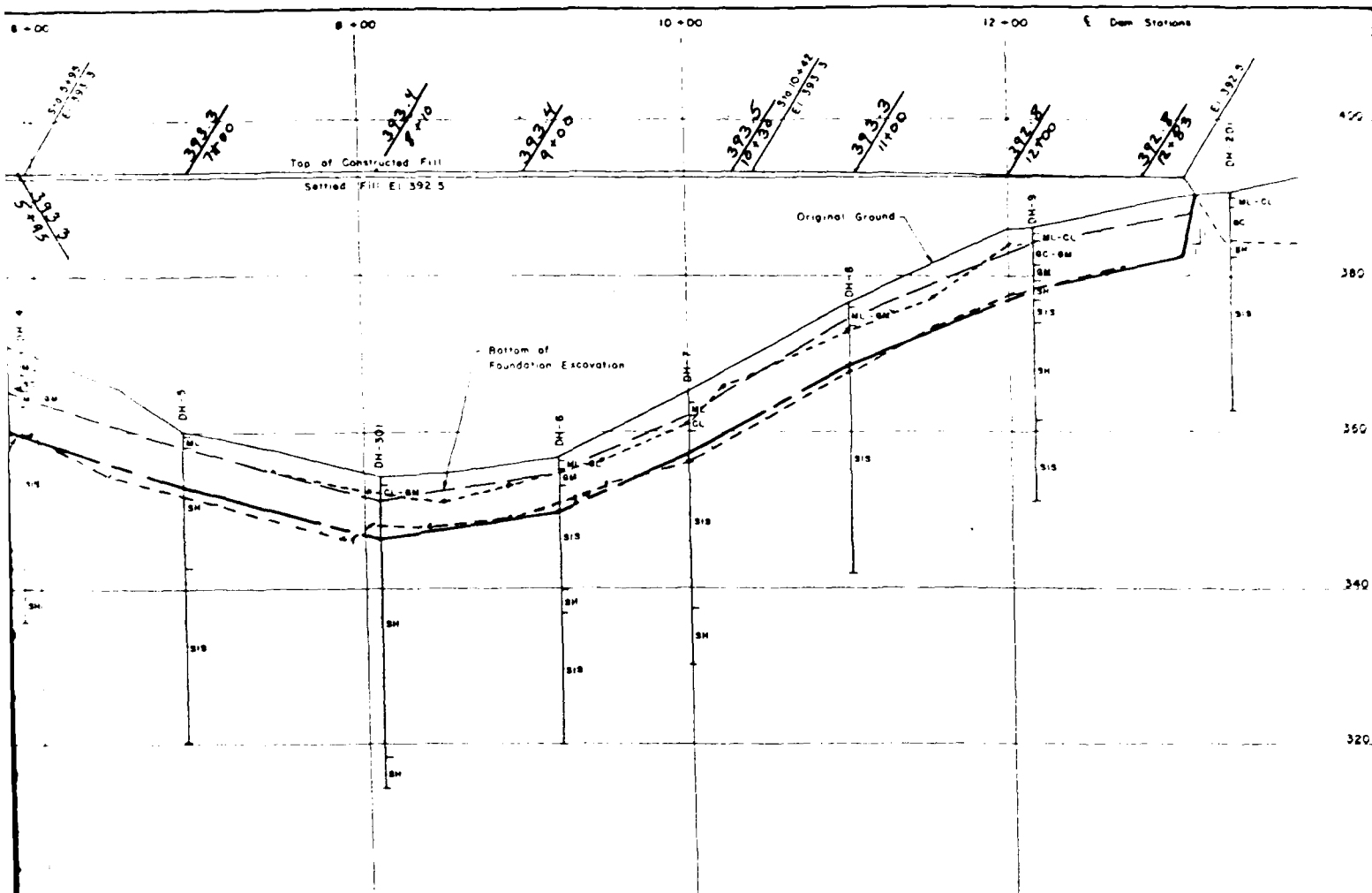
PLATE 8

2



PLAN VIEW

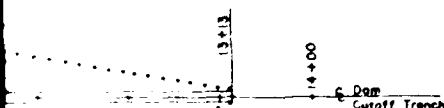
0 20 40 60 80 100 Feet



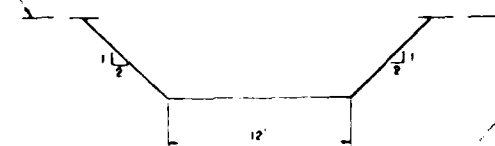
NOTE: HANDWRITTEN ADDITIONS
TAKEN FROM AS BUILT DRAWINGS

CONSTRUCTION NOTES

1. E Dam = E Cutoff Trench
2. For Logs of Test Holes, see sheets 33 thru 34
3. The depth of Cutoff Trench shown is approximate. The final depth will be determined by the Engineer after examination of materials encountered
4. Rock Surface Treatment shall be required where rock is exposed during Foundation Excavation and Cutoff Trench Excavation as directed by the Engineer
5. Preparation, cleaning and Rock Surface Treatment shall be done in accordance with Construction Spec 216



Bottom of
Foundation
Excavation



TYPICAL SECTION

PLATE 9

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA

CUTOFF TRENCH

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

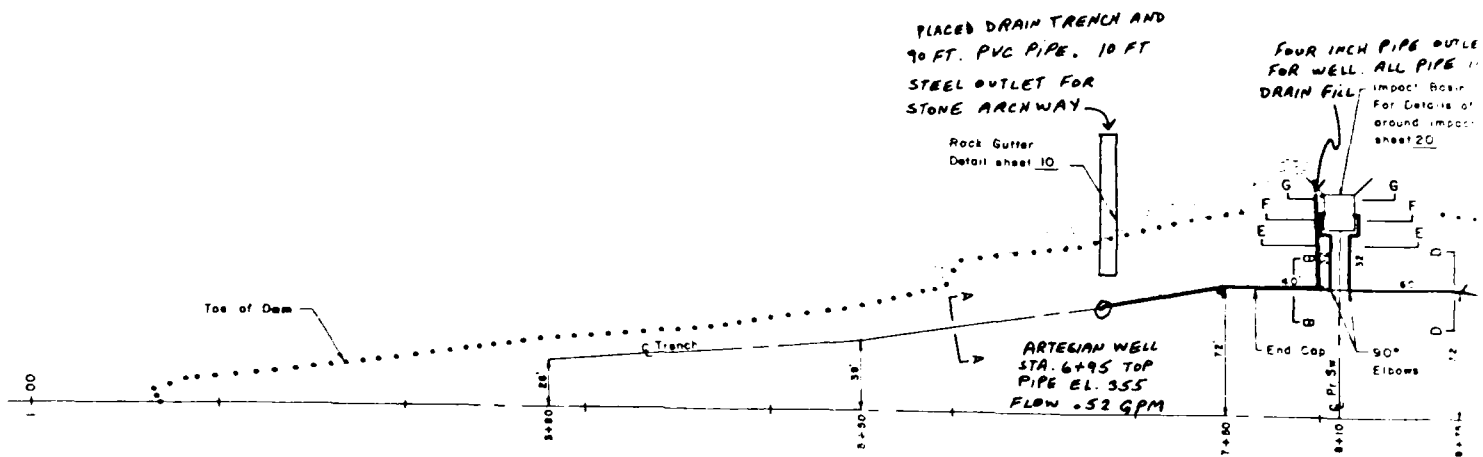
Drawn by: R. E. Dyer

Checked by: R. E. Dyer

Traced by: R. E. Dyer

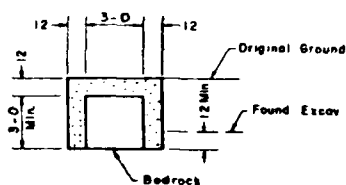
Revised by: R. E. Dyer

PA-625-P

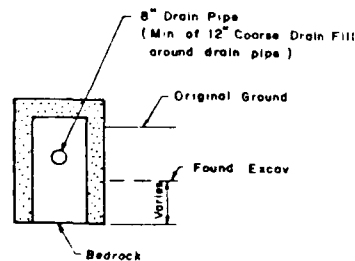


PLAN VIEW

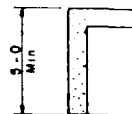
0 25 50 100
SCALE IN FEET



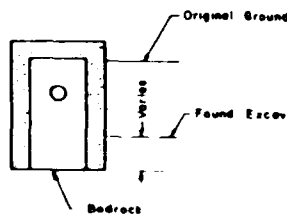
SECTION A-A



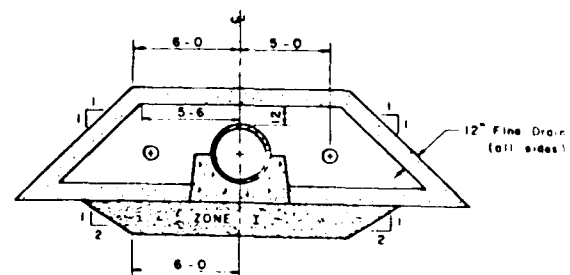
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

PLACES DRAIN TRENCH AND
90 FT PVC PIPE. 10 FT
STEEL OUTLET FOR
STONE ARCHWAY

FOUR INCH PIPE OUTLET
FOR WELL. ALL PIPE IN
DRAIN FILL
Impact Basin
For Details of Drain Pipe
around Impact Basin see
sheet 20

Rock Gutter
Detail sheet 10

ARTESIAN WELL
STA. 6+95 TOP
PIPE EL 355
FLOW .52 GPM

PLAN VIEW

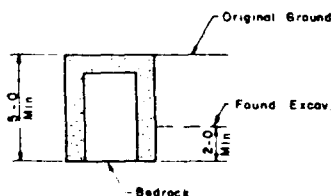
0 25 50 100
SCALE IN FEET

NOTE: HANDWRITTEN ADDITIONS
TAKEN FROM AS BUILT DRAWINGS

8" Drain Pipe
Min. of 12" Coarse Drain Fill
around drain pipe

Original Ground

Found Excav



SECTION C-C

SIEVE NO	% PASSING (Based on Dry Weight)
1 1/2"	100
1"	90-100
1/2"	25-60
NO 4	0-10
NO 8	0-5
NO 200	< 3

COARSE DRAIN FILL

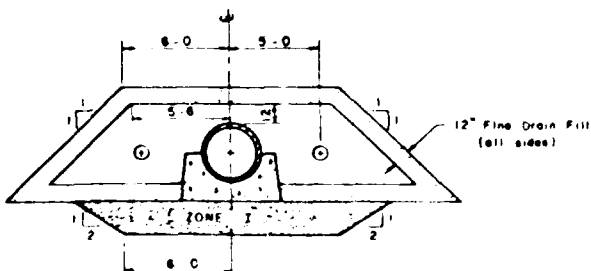
SIEVE NO	% PASSING (Based on Dry Weight)
3/8"	100
NO 4	90-100
NO 8	70-100
NO 16	50-85
NO 30	30-65
NO 50	15-30
NO 100	0-10
NO 200	< 3

FINE DRAIN FILL

GRADATION LIMITS FOR DRAIN FILL

CONSTRUCTION NOTES

1. Drain Pipe shall be 8" Dia., Perforated, Asbestos Cement, Type II, Class 150, Pressure Pipe, Spec 44
2. Cast Iron Pipe shall be 8" Dia. Spec 201
3. For 8" Small Animal Guard, see sheet 10
4. Rock Riprap Bedding shall meet Gradation Limits for Coarse Drain Fill
5. Width and thickness given in Sections B-B, C-C and D-D will be as shown in Section A-A

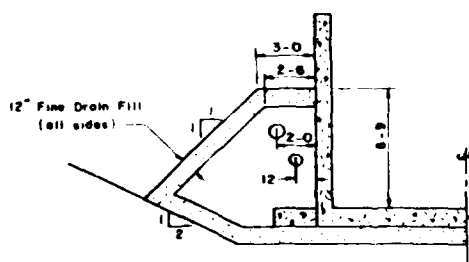
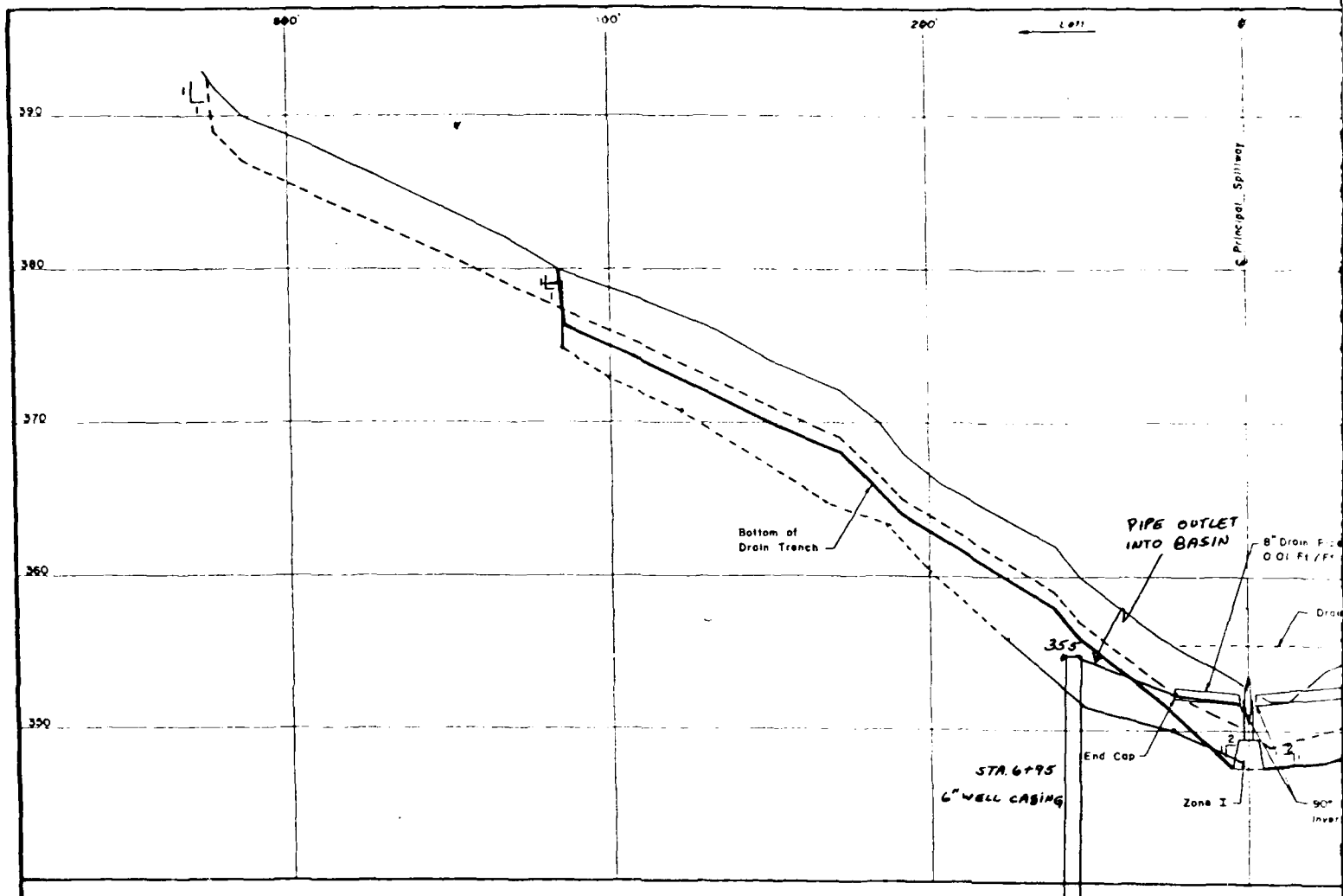


SECTION E-E

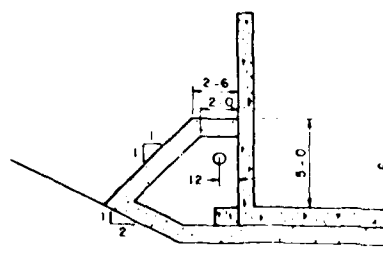
NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
DRAINAGE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by *W. B. Bull*
Drawn by *S. B. Dunn*
Traced by *W. B. Bull*
PA-625-P



HALF SECTION F-F

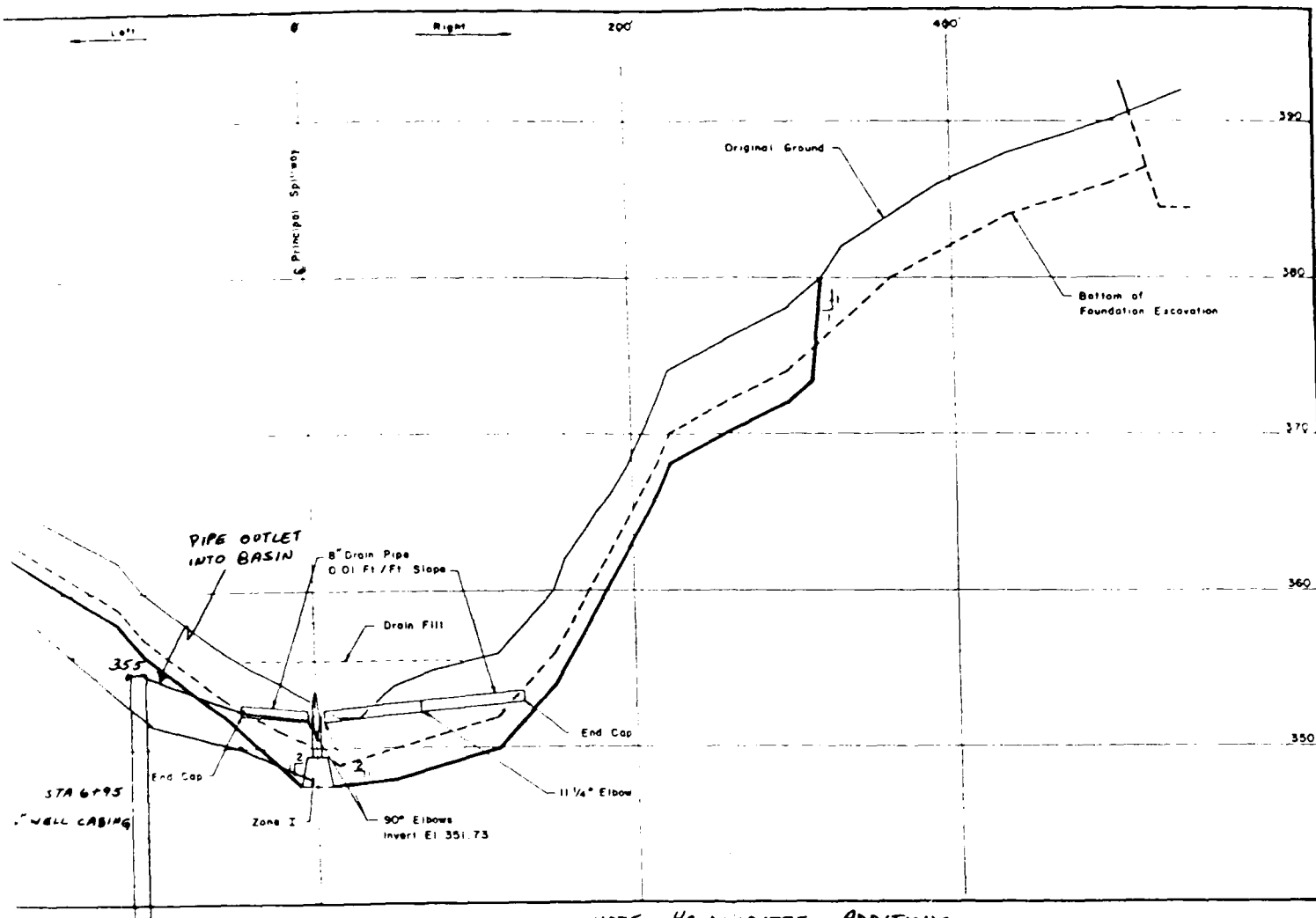


HALF SECTION G-G

NOTE
Drill holes for bolts
2" from end of pipe

8" Cast Iron Pipe

8" S



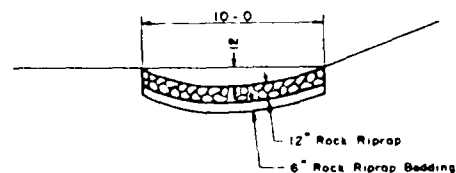
NOTE HANDWRITTEN ADDITIONS
TAKEN FROM AS BUILT DRAWINGS

NOTE
Drill holes for bolts
2" from end of pipe

1/2" Dia stainless steel bolts with
hex nuts & lock washers, 10" long,
placed horizontally, ASTM A-276

8" Cast Iron Pipe

8" SMALL ANIMAL GUARD
2 REQUIRED



ROCK GUTTER

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
DRAINAGE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by *John E. Bollen*

Drawn by *S. B. Dunn*

Traced

Checked by *John E. Bollen*

Scale

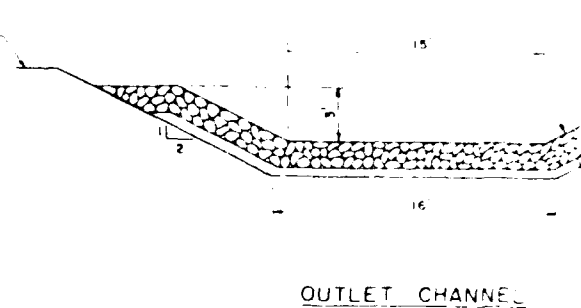
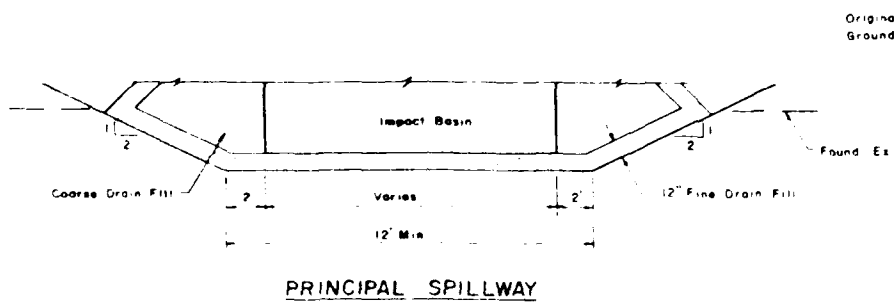
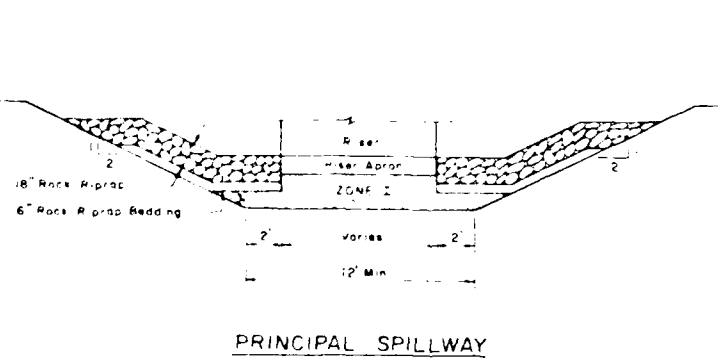
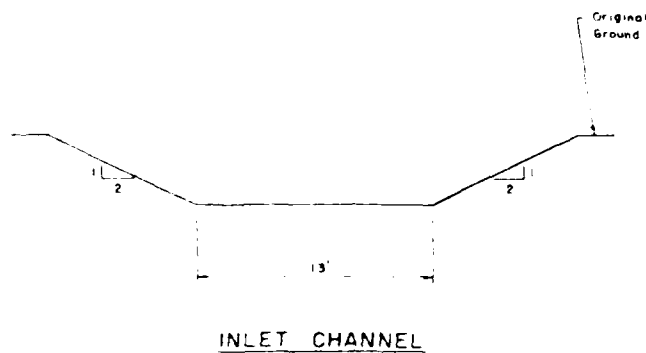
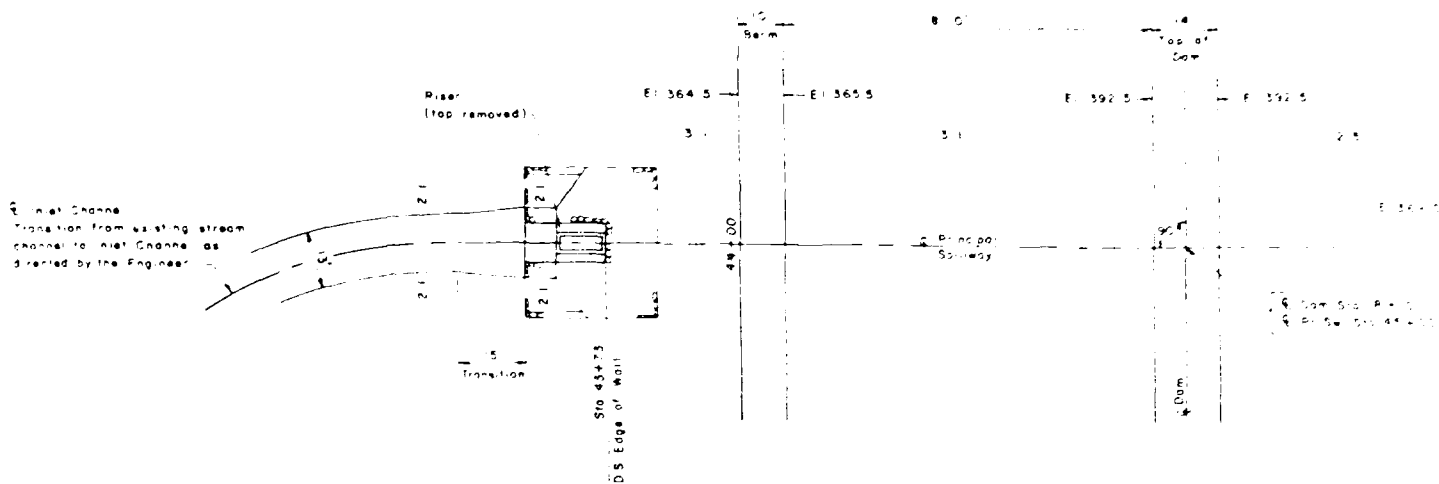
Date

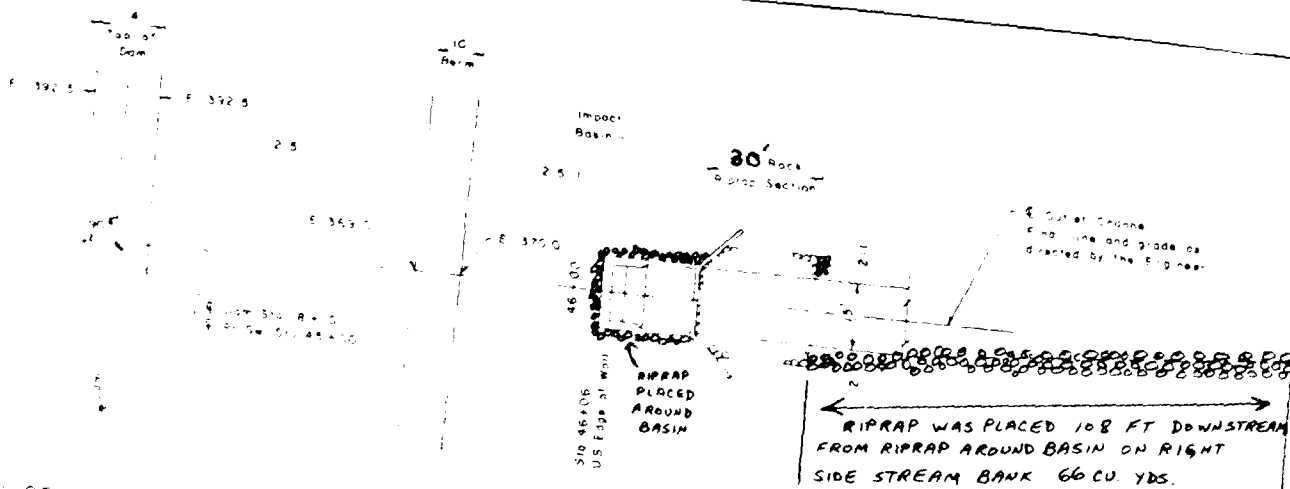
Sheet

38

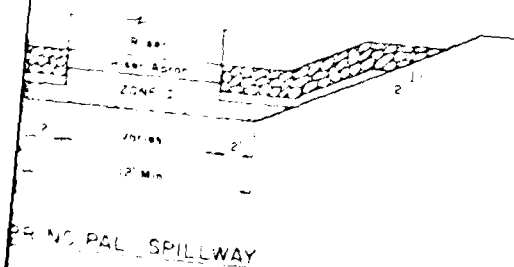
PA-625-P

PLATE 11

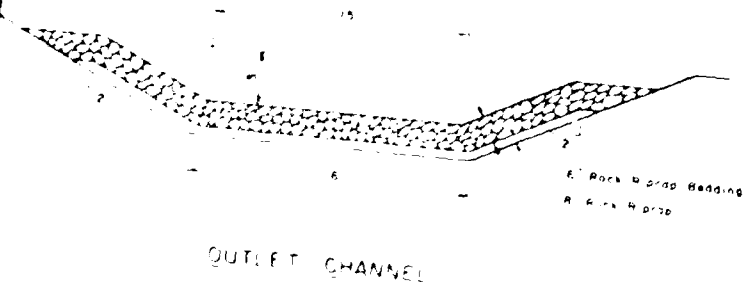




NOTE: HANDWRITTEN ADDITIONS
TAKEN FROM AS BUILT DRAWINGS



PRINCIPAL SPILLWAY



OUTLET CHANNEL

CONSTRUCTION NOTES

1. See sheet 9 for Gradation Limits of drain fill.
2. Rock Riprap Bedding shall meet Gradation Limits for coarse drain fill.
3. Outlet end of the 36" pipe to be finished so that no metal is exposed.
4. Pipe layout data to be furnished by the Engineer.
5. For Logs of Test Holes see sheets 29 thru 34.

NOT TO SCALE

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM NO. 625
BUCKS COUNTY, PENNSYLVANIA
PRINCIPAL SPILLWAY (PLAN)
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE 12

PA-625-P

AD-A091 163

WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. HILLTOWN DAM (NDS ID NUMBER PA--ETC(U)
AUG 80

F/8 13/13

DACW31-80-C-0018

NL

UNCLASSIFIED

2 OF 2

AD
AUG 80



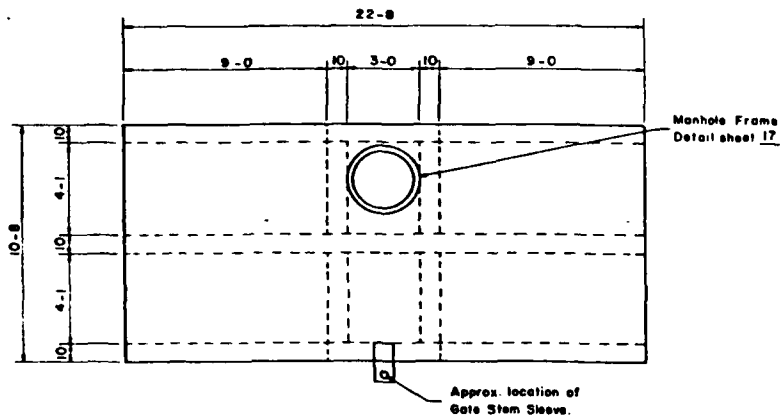
END

DATE

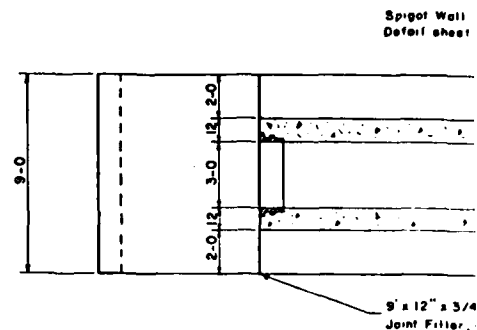
FILMED

11-80

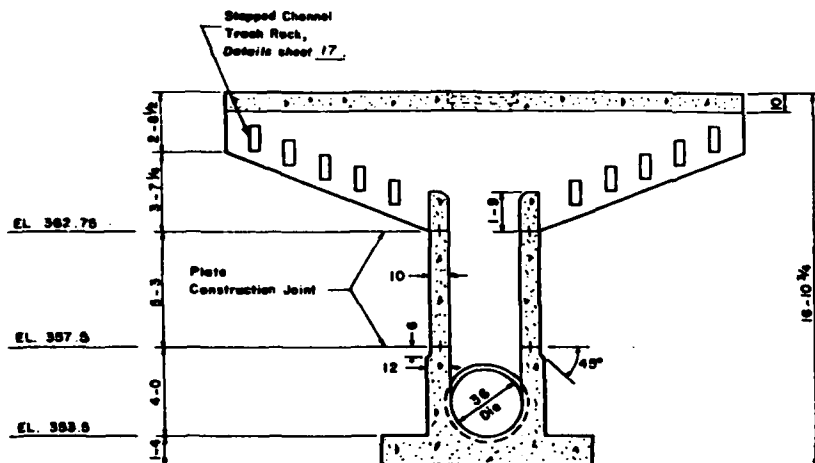
DTIC



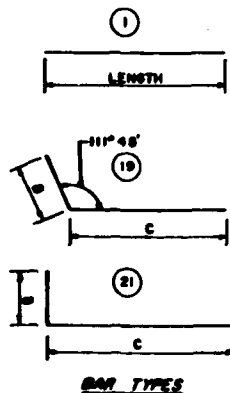
TOP PLAN



SECTION A-A



SECTION B-B



BAR TYPES

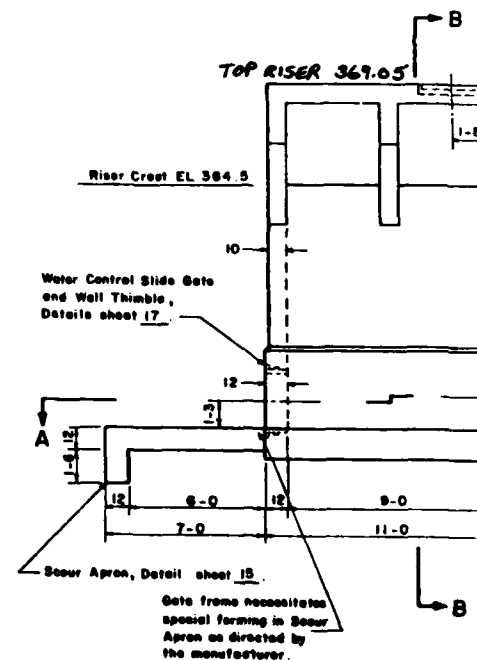
QUANTITIES (Riser Only)

STEEL

No. 4 Bars	953.0 Ft. =	953.2 Lbs.
No. 5 Bars	3194.7 Ft. =	3290.3 Lbs.
No. 6 Bars	441.2 Ft. =	662.6 Lbs.
No. 7 Bars	490.0 Ft. =	1001.6 Lbs.
		5557.7 Lbs.

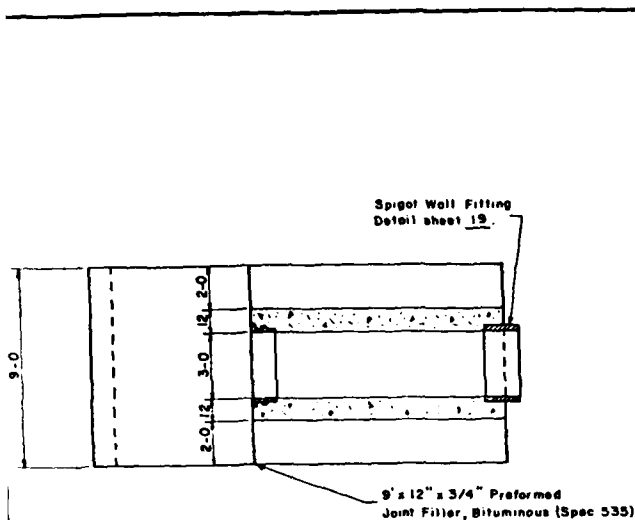
CONCRETE

Class 4000 32.5 Co. Yds. Reinforced

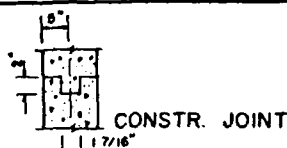


SIDEWALL ELEVATION

7



SECTION A-A



1/4" x 6" Structural steel plate, to conform to Spec 581. Continuous thru constr. joint. Splices shall be either:
1. Butt welded
2. Lapped 3" and bolted
3. Lapped 3" and fillet welded.

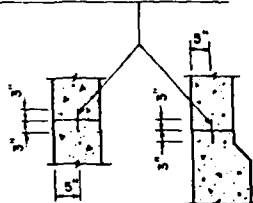
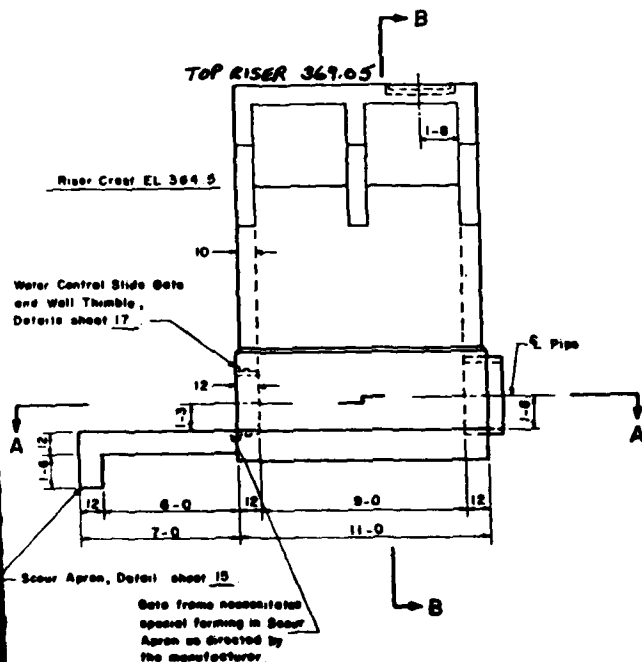


PLATE CONSTR. JOINT

CONSTRUCTION NOTES

1. Bar dimensions are out to out of bar.
2. Radius of bends equals 3 bar diameters for sizes equal to or less than 7.
3. The 2" and 3" dimensions from face of concrete to steel are clear distances.
4. Portland cement Type I-A or 1, with an air-entraining admixture, shall be used.
5. All exposed edges of concrete to have a 1" chamfer, unless otherwise shown.
6. Scour Apron shall be formed to accommodate Gate Frame, as directed by the gate manufacturer.
7. Riser floor to be transitioned from semi-circular at the downstream end to flat at the upstream end to accommodate gate.

NOTE: HANDWRITTEN ADDITIONS TAKEN FROM AS BUILT DRAWINGS



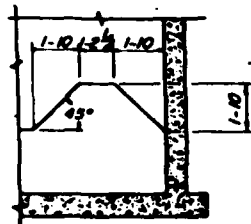
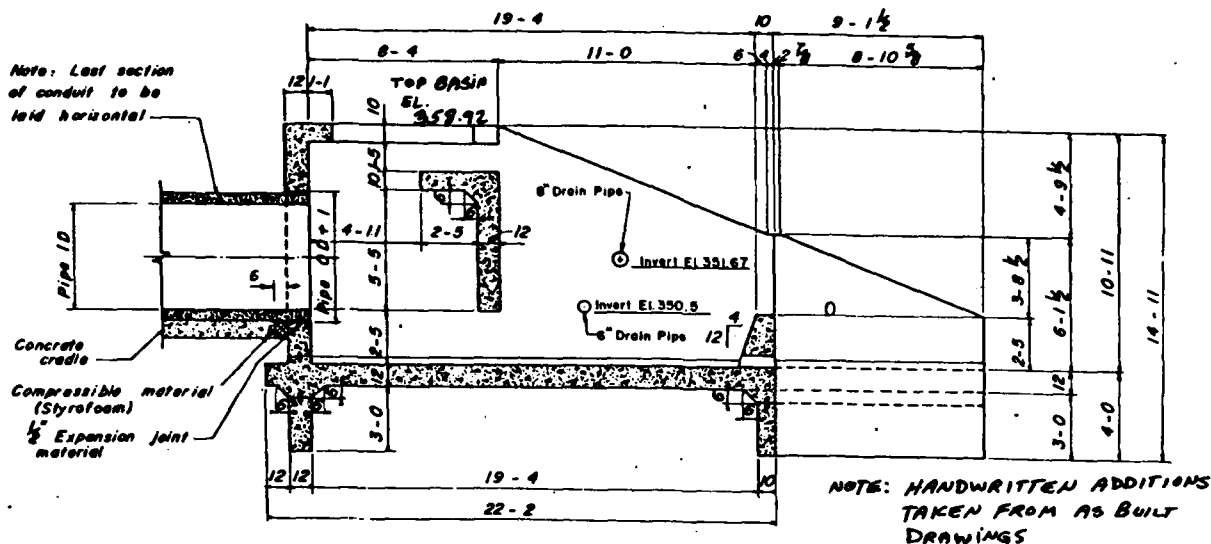
SIDEWALL ELEVATION

		STEEL		SCHEDULE					
MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL	LENGTH	
B 1	6 11	8-6	1	-	-	-	93-6		
B 2	6 9	10-6	1	-	-	-	94-6		
B 3	7 40	7-11	21	3-6	4-5		316-8		
B 4	6 9	10-6	1	-	-	-	94-6		
B 5	6 11	8-6	1	-	-	-	93-6		
B 6	6 2	3-9	1	-	-	-	7-6		
B 7	5 7	5-3	21	0-11	4-4		38-9		
B 8	6 4	7-5	21	1-1	6-4		29-8		
B 9	5 20	7-2	21	0-11	6-5		143-4		
B 10	5 12	9-8	1	-	-	-	118-0		
B 11	5 5	3-8	1	-	-	-	18-4		
B 12	5 14	9-4	21	3-2	6-2		130-8		
B 13	5 4	9-0	21	3-0	6-0		36-0		
B 14	5 2	7-6	21	1-4	6-2		15-0		
B 15	5 4	7-2	21	1-0	6-2		28-0		
B 16	5 4	6-10	21	0-8	6-2		27-4		
B 17	5 4	6-8	21	0-8	6-2		26-8		
B 18	5 2	2-7	1	-	-	-	5-2		
B 19	5 1	2-3	1	-	-	-	2-3		
B 20	5 2	2-4	1	-	-	-	4-8		
B 21	5 2	3-1	1	-	-	-	6-2		
B 22	7 40	4-4	1	-	-	-	173-4		
B 23	5 7	3-8	1	-	-	-	25-8		
R 1	5 16	6-8	1	-	-	-	106-8		
R 2	5 6	6-10	1	-	-	-	41-0		
R 3	5 16	6-10	1	-	-	-	109-4		
R 4	5 8	6-10	1	-	-	-	84-8		
R 5	5 16	9-8	1	-	-	-	154-8		
R 6	5 10	3-8	1	-	-	-	36-8		
R 7	5 38	9-0	21	3-0	6-0		324-0		
S 1	5 19	8-6	1	-	-	-	161-6		
S 2	5 9	8-6	21	2-0	6-6		76-6		
S 3	5 9	7-6	21	1-6	6-0		67-6		
S 4	6 7	4-0	1	-	-	-	28-0		
T 1	6 6	8-6	1	-	-	-	33-0		
T 2	6 6	11-6	1	-	-	-	69-0		
T 3	6 6	18-0	1	-	-	-	108-0		
T 4	6 12	22-3	1	-	-	-	267-0		
T 5	5 12	11-9	19	2-4	9-5		141-0		
T 6	4 12	2-9	1	-	-	-	33-0		
T 7	4 12	3-0	1	-	-	-	36-0		
T 8	4 12	3-3	1	-	-	-	39-0		
T 9	4 12	3-6	1	-	-	-	42-0		
T 10	4 12	3-9	1	-	-	-	45-0		
T 11	4 12	4-3	1	-	-	-	51-0		
T 12	4 12	4-6	1	-	-	-	54-0		
T 13	4 12	4-9	1	-	-	-	57-0		
T 14	4 12	5-0	1	-	-	-	60-0		
T 15	4 12	5-6	1	-	-	-	66-0		
T 16	4 28	5-9	1	-	-	-	149-6		
T 17	4 28	6-0	1	-	-	-	168-0		
T 18	4 10	10-3	1	-	-	-	102-8		
T 19	5 36	10-3	1	-	-	-	369-0		
T 20	5 4	6-3	1	-	-	-	23-0		
T 21	5 14	22-3	1	-	-	-	311-8		
T 22	5 8	9-6	1	-	-	-	76-0		

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
RISER

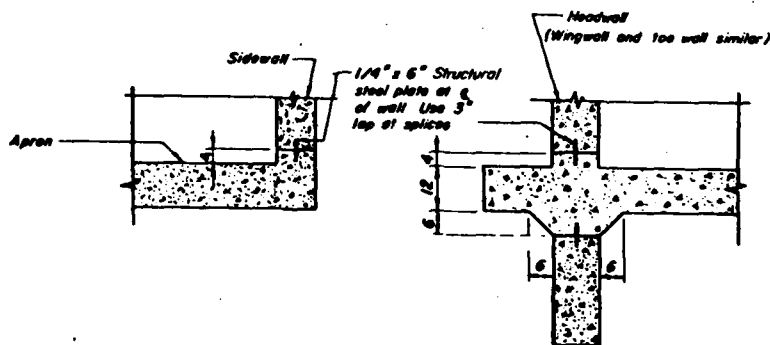
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Project: *PA-625* Date: *7-77*
Drawn: *S. B. Dunn*
Checked: *S. B. Dunn*
PA-625-P



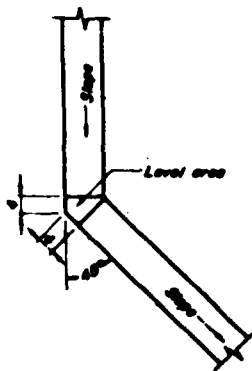
SECTION A

NOT TO SCALE



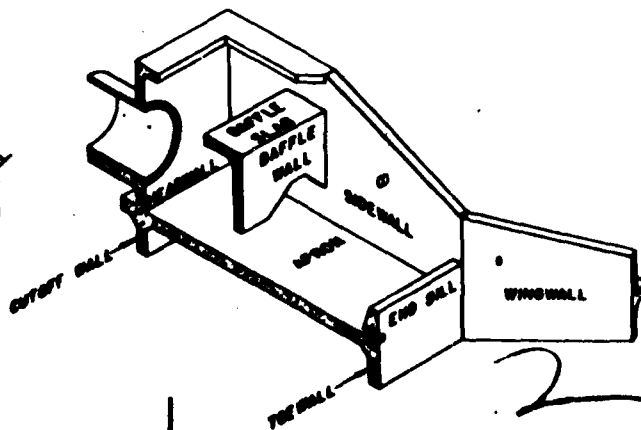
CONSTRUCTION JOINT DETAILS

NOT TO SCALE



PLAN - JUNCTION
SIDEWALL AND
WINGWALL

NOT TO SCALE



ISOMETRIC VIEW

PLATE 16

QUANTITIES

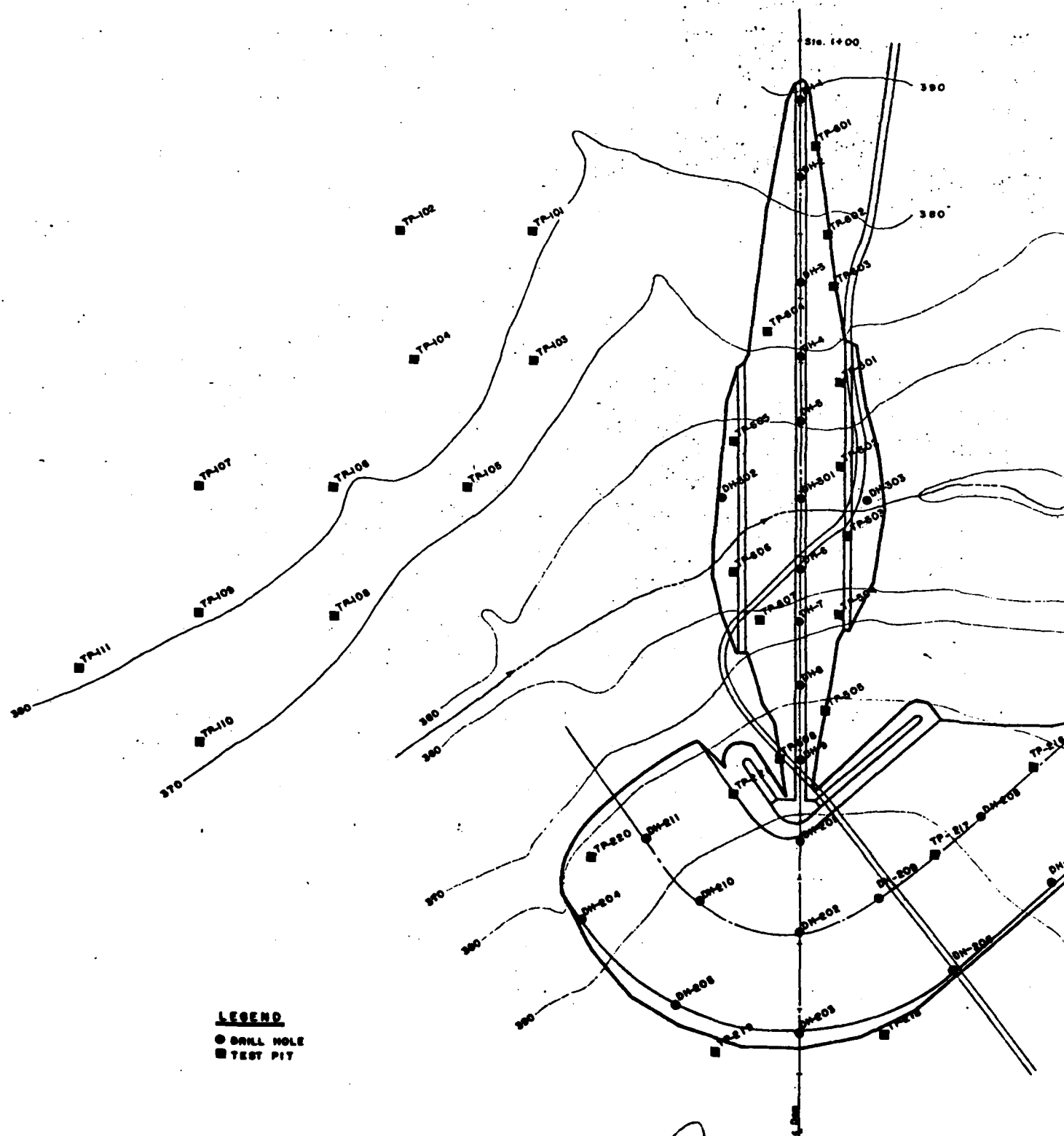
Formwork (Contact area)	2290 Sq Ft
Reinforced Concrete (Class 4000)	51.9 Cu Yds
Reinforcing Steel	8864 lbs
Drainage	
6" Drain Pipe, Perforated, Asbestos-Cement, Type II, Class 150, Pressure Pipe (incl. fittings)	60.59 Lin Ft
6" Cast Iron Pipe, Spec. 201	6.33 Lin Ft
Drain pipe tees	2
Drain pipe 90° elbows	4
Drain pipe 45° elbows	2
Small Animal Guards	4
End Caps	2
Joints	
1/4" x 6" Structural steel plate, Structural grade	835 lbs

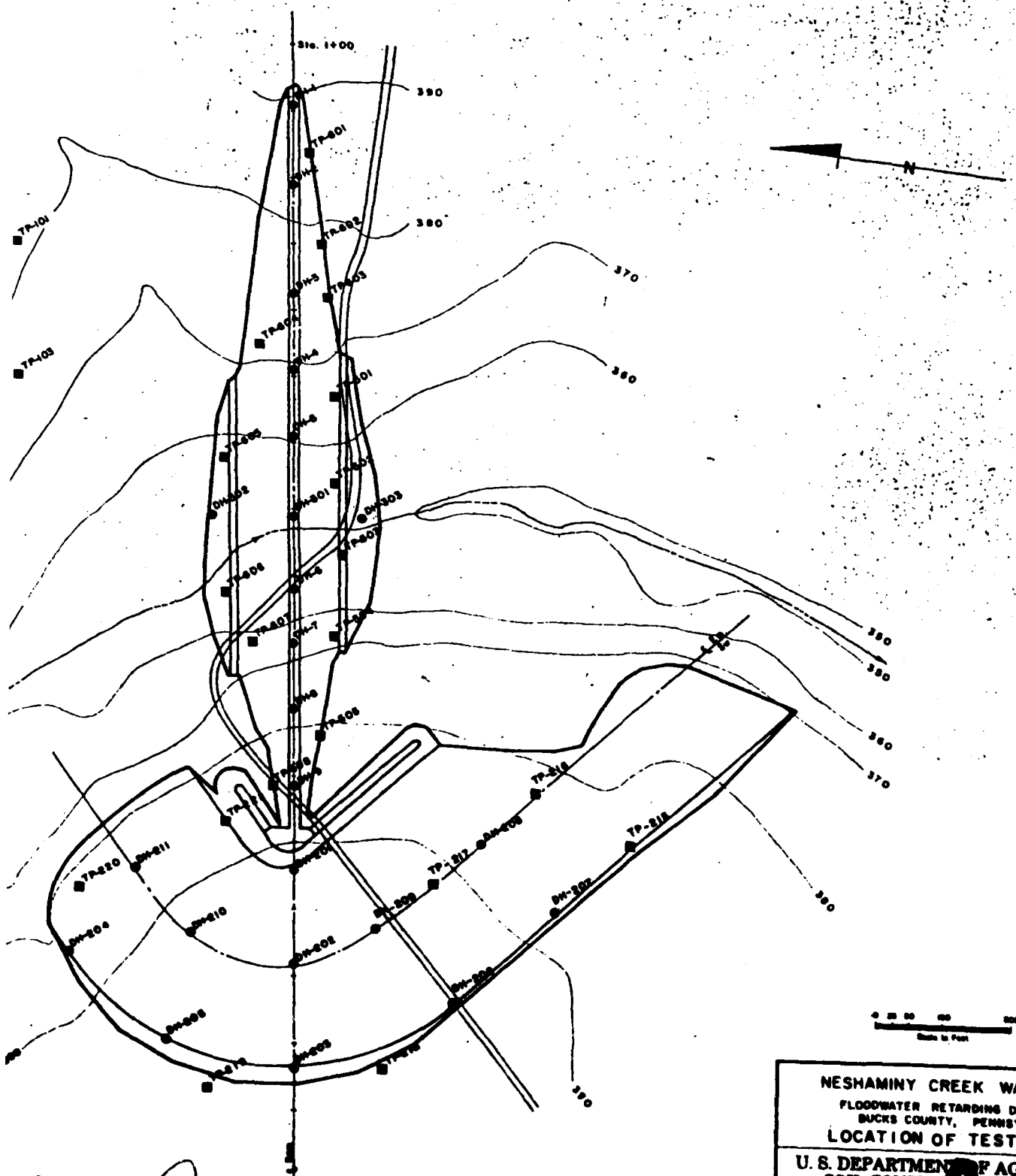
NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-628
BUCKS COUNTY, PENNSYLVANIA
IMPACT BASIN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn by J. E. Smith	Date 7-77
Checked by J. E. Smith	Date 4-77
Approved by [Signature]	Date 7-80
PA-628-B	

SCALE IN FEET
AS NOTED





NESHAMINY CREEK WATERSHED	
FLOODWATER RETARDING DAM PA-625	
BUCKS COUNTY, PENNSYLVANIA	
LOCATION OF TEST HOLES	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Drawn by <i>W. E. Galt</i>	Check by <i>C. Wagner</i>
Date <i>1-27-57</i>	Scale <i>1" = 100'</i>
Plate <i>18</i>	PA-625-P

PLATE 18

DM-1, ELEV. 192.2, 1-20, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG 4-7-72

HOLE DEPTH FROM TO		DESCRIPTION OF MATERIALS	UNIF. SOIL CLASS SYMB.	STANDARD PENETRATION			SAMPLES			
				BLOWS PER 6"	TYPE BIT USED	NO.	TYPE	FROM FT.	TO FT.	PER- CENT REC.
0.0	0.5	TOPSOIL		1-2-3-	SPT	1	JAR	0.0	1.5	60
0.5	4.5	CLAY, SILTY, YELLOW-BRN, WITH GRAY MOTTLENG, MOIST, MOD. PLASTIC, SMALL SHALE FRAGMENTS (25 PERCENT) FROM 3.5 TO 4.5, RESIDUAL GRAVEL, SILTY, RED SHALE, WEAR, MOIST TO WET, 30-40 PERCENT LOW PLASTIC FINES, RESIDUAL	CL	3-6-7 8-10-17 12-18-22	" " "	2 3 4	" " "	1.5 3.0 4.5	3.0 4.5 6.0	80 85 80
6.0	16.0	SHALE, SILTY, RED, MOD. TO HIGHLY WEAR, HARDNESS - 2 TO 2 PLUS, VERY BROKEN FROM 12.0 TO 16.0' WITH SHALY SILTSTONE LAYERS, ONE 6" SILTSTONE LAYER AT 10.5', RDQ-5 PERCENT, ARGILLITE			DIA		NHM	6.0 7.0 9.0 10.5	7.0 9.0 10.5 12.5	90 80 90 100
16.0	18.0	SILTSTONE, RED, HARDNESS-2 PLUS TO 3, SOLID, DENSE, ANGULAR BEDDING PLANES, RDQ-85 PERCENT, ARGILLITE			"		"	12.5 15.5	15.5 16.0	90 90
18.0		BOTTOM OF HOLE - WL (4-6-72) 4.5'			"		"	16.0	18.0	100

DM-2, ELEV. 192.2, 3-10, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG 3-30-72

HOLE DEPTH		DESCRIPTION OF MATERIALS	UNIF. SOIL CLASS SYMB.	STANDARD PENETRATION			SAMPLES			
FROM	TO			BLOWS PER 6"	TYPE BIT USED	NO.	TYPE	FROM FT.	TO FT.	PER- CENT REC.
0.0	0.6	TOPSOIL		1-1-1	SPT	2	JAR	0.0	1.5	65
0.6	1.5	SILT, WET, CLAYEY, MOD. PLASTIC, ROOTS, SOME GRAVEL FRAGMENTS.	ML	4-8-17	"	2	"	1.5	3.0	55
1.5	3.0	CLAY, SILTY, DRY, MOD. PLASTIC, MOTTLED, ANGULAR GRAVEL (5 PERCENT)	CL	16-37-61	"	3	"	3.0	4.5	90
3.0	4.0	RED-BRN SILTY CLAYEY, DRY, HEAVY GRAY MOTTLING, ANGULAR GRAVEL, WEAR, BEDROCK, RESIDUAL	ML-GM		DIA		NHM	4.5	6.0	75
4.0	20.0	RED SHALE, SILTY, HIGHLY WEAR, HARDNESS - 2 TO 2 PLUS, BADLY FRAC., SMALL GRAVELS, TWO PIECES 4" LONG WITH CLAY FILLED, VERT. FRAC., JAMS CORE BARREL, RDQ-10 PERCENT			"		"	6.0	10.0	100
					"		"	10.0	12.0	100
					"		"	12.0	13.0	60
20.0	25.0	SILTSTONE, SHALY, LARGEST PIECE 7" AT 20.5', MOD. WEAR, BROKEN, VERT. AND ANGULAR FRAC. WITH CLAY, RED, HARDNESS-2 PLUS TO 3, DENSE, SDQ FROM 22.2-25.0', ONE PIECE 1.0', RDQ-95 PERCENT.			"		"	13.0	13.5	100
					"		"	13.5	16.0	85
					"		"	16.0	19.0	100
25.0		BOTTOM OF HOLE - WL (4-6-72) 4.5'			"		"	19.0	21.0	90

DM-3, ELEV. 174.7, 4-75, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG 3-30-72

HOLE DEPTH FROM TO		DESCRIPTION OF MATERIALS	UNIF. SOIL CLASS. SYMB.	STANDARD PENETRATION			SAMPLES			
				BLOWS PER 6"	TYPE BIT USED	NO.	TYPE	FROM FT.	TO FT.	PER- CENT REC.
0.0	0.5	TOPSOIL		3-4-2	SPT	1	JAR	0.0	1.5	60
0.5	1.5	CLAY, SILTY, MOIST, LOW TO MOD. PLASTIC, SOME SMALL ANGULAR FRAG- MENTS, BRN, MOTTLED, 5-10 PERCENT SAND & GRAVEL.	CL	3-10-22	"	2	"	1.5	3.0	100
1.5	4.0	GRAVEL, CLAYEY & SILTY, 30-40 PERCENT LOW PLASTIC FINES, MOIST, RED- BRN, WEAR, SHALE, RESIDUAL	GM	22-50	"	3	"	3.0	4.0	65
4.0	11.0	SHALE, SILTY, RED, BROKEN, HIGHLY WEAR, ONE-FOURTH TO ONE INCH IN THICKNESS, HARDNESS-1 PLUS TO 2, SOME SILTSTONE STREAKS, HARDNESS- 2 PLUS, RDQ-5 PERCENT.			TRI		NHM	4.0	4.5	
					DIA		"	4.5	6.0	70
					"		"	6.0	7.5	90
					"		"	7.5	12.0	100
11.0	30.0	SILTSTONE, SHALY, RED, HARDNESS-2 PLUS, THIN TO MED. BEDDED, MOD. WEAR, WITH SOME HIGHLY WEAR, SHALE LAYERS, VERT. & ANGULAR FRAC. AT 12.0', 15.5', 16.0', 18.0', SOLID & DENSE, 1.4" PIECE AT 20.5' AND 1.5' PIECE AT 21.5', RDQ-70 PERCENT, SLIGHTLY WEAR, FROM 20.5-30.0'. BOTTOM OF HOLE - WL (4-6-72) 4.6'			"		"	12.0	17.0	100
					"		"	17.0	21.5	100
					"		"	21.5	24.0	100
					"		"	24.0	30.0	100

DM-4, ELEV. 170.5, 5-20, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG 3-29-72

HOLE FROM	DEPTH TO	DESCRIPTION OF MATERIALS	UNIF. SOIL CLASS. SYMB.	STANDARD PENETRATION			SAMPLES			
				BLOWS PER 6"	TYPE BIT USED	NO.	TYPE	FROM FT.	TO FT.	PER- CENT REC.
0.0	3.0	SILT, CLAYEY, GRAVELLY, ROSE GARDEN FILL.	ML	1-3-4	SPT	1	JAR	0.0	1.5	40
3.0	5.0	SAND, CLAYEY, 40 PERCENT LOW PLASTIC FINES, 10 PERCENT GRAVELS, MOTTLY, GARDEN FILL.	SC	10-5-3	"	2	"	1.5	3.0	35
5.0	7.0	TOP OF ORIGINAL SURFACE AT 5.0'. SILTY, CLAYEY, WEAR, SHALE, SHALE FRAGMENTS, GR	ML-GM	15-4-4	"	3	"	3.0	4.5	10
7.0	30.5	SILTSTONE, SHALY, RED, BROKEN TO 10.0', HIGHLY WEAR, TO 10.5', SLIGHT TO MOD. WEAR, TO 30.5', 10.0-13.5' VERT. FRAC., IRON STAIN, MOD. SOFT TO MED. TURN BEDDED, DENSE, SOLID, PIECES UP TO 2.0", BEDDED JOINT AT 19.5', 23.5', VERT. FRAC. WITH IRON STAIN 23.5-24.5' AND 26.5-27.5', RDQ-67 PERCENT, BEDDED AND RED-GRY FROM 27.5-29.0', GRY FROM 29.0-30.5', ARGILLITE.	5-3-3	"	4	"	4.5	6.0	50	
			7-11-21	"	5	"	6.0	7.5	55	
			22-60	"	6	"	7.5	8.5	45	
			TRI			NHM	8.5	9.0		
			DIA	"	"	9.0	15.0	100		
30.5	35.0	SHALE, GRY, THIN BEDDED, SOME VERTICAL FRAC. AT 32.0' AND BROKEN, SLIGHTLY WEAR, WITH IRON STAIN, RDQ-40 PERCENT.	"	"	"	"	15.0	20.0	100	
			"	"	"	"	20.0	29.5	100	
			"	"	"	"	29.5	35.0	100	
35.0		BOTTOM OF HOLE - WL (5-31-72) 13.2'								

DM-5, ELEV. 160.1, 6-20, CENTERLINE
LOGGED BY - JAMES WETZ & JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG

HOLE DEPTH		DESCRIPTION OF MATERIAL
FROM	TO	
0.0	0.6	DRIVEWAY MATERIAL
0.6	2.0	SILT, GRAVELLY, 40 PERCENT GRAVEL
2.0	17.5	SHALE, SILTY WITH 8.0', ONE TO THREE SLIGHTLY WEAR TO 4" LONG, GRAY MOD. OF CALCITE, SOME V. OF SILTSTONE, SHALY
17.5	40.0	FRAC. LINED WITH C. & ANGULAR JOINTS F. BOTTOM OF HOLE - W
40.0		

DM-6, ELEV. 156.8, 9-20, CENTERLINE
LOGGED BY - J. VAN, W. MALLOCH
DRILLING EQUIPMENT - MOBILE RIG

HOLE DEPTH		DESCRIPTION OF MATERIAL
FROM	TO	
0.0	0.4	TOPSOIL
0.4	1.5	SILT, CLAYEY, 10 P
1.5	3.7	GRAVEL, SILTY & CL
3.7	17.0	SILTSTONE, SHALY & IRON STAIN, SLIGHT SOME CLAY FILLED F
17.0	20.0	SHALE, DARK GRAY TO SLIGHTLY WEAR, 18.2
20.0	37.0	SILTSTONE, SHALY & ANGULAR FRAC. AT 2 LINES, OPEN FRAC. WITH IRON OXIDE AT
37.0		BOTTOM OF HOLE - W

DM-7, ELEV. 165.1, 10-00, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG

HOLE	DEPTH	DESCRIPTION OF MATERIAL
FROM	TO	
0.0	1.5	SILT, BRN, MOIST, 4
1.5	3.0	SILT, CLAYEY, YELL INCH.
3.0	4.5	SILTY CLAY, RED-BRN
4.5	5.0	WEA. SHALE, RED-BN
5.0	27.8	SILTSTONE, SHALY, VERY BROKEN FROM 1 2.3' LONG WITH VERT BROKEN TO 24.5', FA
27.8	35.0	SHALE, SILTY, GRY, GRY, THIN BEDDED, W
35.0		BOTTOM OF HOLE - W

DM-8, ELEV. 176.6, 11-00, CENTERLINE
LOGGED BY - JOE VAN A WOODROW MALLOCH
DRILLING EQUIPMENT - MOBILE RIG

HOLE DEPTH		DESCRIPTION OF MATERIAL
FROM	TO	
0.0	0.4	TOPSOIL
0.4	3.0	SILT, GRAVELLY, LOW & SILTSTONE, RESIDUAL
3.0	35.0	SILTSTONE, SHALY, 8.0', RED WITH WHITE HARDNESS-2 PLUS TO RED, WHITE CALCITE FILLED WITH CALCITE FRAC., MUD OR CALC 24.0-26.3 IS A MARLINE BEDS OF CAR 33.5-34.5' IS GRAY, & SHALY, GRAY, MOD. W
35.0		BOTTOM OF HOLE - W

NOTE - ALL SOIL AND

BM-5. ELEV. 360.1. 6+90. CENTERLINE
LOGGED BY - JAMES METZ & JOE VAN
DRILLING EQUIPMENT - SKID RIG 3-28-72

DRILLING EQUIPMENT - SKID RD				UNIF. SOIL CLASS.		STANDARD PENETRATION				SAMPLES				PER-
PER- CENT REC.	HOLE DEPTH		DESCRIPTION OF MATERIALS	SYMB.	BLWS PER 6"	TYPE BIT USED	NO.	TYPE	FROM	TO	PER- CENT REC.			
	FROM	TO							FT.	FT.				
60	0.0	0.6	DRIVEWAY MATERIAL - CHDERS & BLACKTOP	ML	4-5-6	SPT	1	JAR	0.0	1.5	40			
80	0.6	2.0	S.K.T. GRAVELLY, RED-BRN. MOIST, TRACE FINE SAND, 60 PERCENT SLIGHTLY PLASTIC FINES, 40 PERCENT GRAVEL, MOD. SOFT.		4-50	"	2	"	1.5	2.5	50			
85						TRI			2.5	2.7				
80	2.0	17.5	SHALE, SILTY WITH VERY HARD SILTY STREAKS AND LAYERS, HARDNESS 2 PLUS TO 3 FROM 2.7-8.0', ONE TO THREE INCH PIECES, BROKEN WITH IRON OXIDE & CALCITE LINED VERT. FRAC., SLIGHTLY WEAR. TO 4.7', 6" PIECE AT 8.0' WITH VERT. FRAC. FROM 8.4-9.5' ONLY ONE PIECE 4" LONG, GRAY MOD. WEAR. TO 17.5' AT 10.0', TURNS GRAY-BRN., 11.0-15.0' HEAVY DEPOSITION OF CALCITE, SOME VERT. FRAC. WITH CALCIFICATION. RQD-32 PERCENT.			DIA		NIM	2.7	4.7	40			
90						"		"	4.7	8.5	75			
80						"		"	8.5	15.5	100			
90						"		"	15.5	18.5	100			
100	17.5	40.0	SILTSTONE, SHALY, HARDNESS-2 PLUS TO 3, THIN TO MED. BEDDED, SLIGHTLY WEAR. WITH VERT. FRAC. LINED WITH CALCITE, SLIGHTLY WEAR. 23.0-24.8', DARK RED SHALE WITH VERT. FRAC. & ANGULAR JOINTS FROM 25.2-39.5', RQD-86 PERCENT.			"		"	18.5	22.5	100			
90						"		"	22.5	29.5	100			
100	40.0		BOTTOM OF HOLE - WL (3-31-72) 8.1'			"		"	29.5	35.0	85			
						"		"	35.0	40.0	98			

DM-6, ELEV. 356.8, 9+20, CENTERLINE
LOGGED BY - J. VAN, W. MALLOCH & J. METZ
DRILLING EQUIPMENT - MOBILE RIG #4 3-28-72

PER- CENT REC.	HOLE DEPTH		DESCRIPTION OF MATERIALS	UNIF. SOIL CLASS. SYMB.	STANDARD PENETRATION		SAMPLES		PER- CENT REC.		
	FROM	TO			BLWS PER 6"	TYPE BIT USED	TYPE	FROM FT.		TO FT.	
65	0.0	0.4	TOPSOIL		2-3-17	SPT	1	JAR	0.0	1.5	35
55	0.4	1.5	SILT, CLAYEY, 10 PERCENT SAND, TRACE GRAVEL, LOW PLASTIC, RED-BRN, RESIDUAL.	ML-CL	50/1	"	2	"	1.5	1.6	100
90	1.5	3.7	GRAVEL, SILTY & CLAYEY WITH COBBLES, RESIDUAL.	GM		TRI			1.6	3.5	
75	3.7	17.0	SILTSTONE, SHALY & SANDY, HARDNESS 2 PLUS TO 3, MOD. WEA., BROKEN & FRAC. WITH IRON STAIN, SLIGHT CALCAREOUS, THIN LAMINATED TO MED. BEDDED, LONGEST PIECE IS 8", SOME CLAY FILLED FRAC., VERY SHALY FROM 13.0-17.0', TAN TO LIGHT GRAY, RQD-23 PERCENT.		50/2	SPT	3	JAR	3.5	3.7	100
100						DIA		NXM	3.7	5.0	95
100						"		"	5.0'	7.0	75
60	17.0	20.0	SHALE, DARK GRAY TO BLACK, HARDNESS-1 TO 2, THIN BEDDED, HIGHLY WEA, 17.0-18.7', SLIGHTLY WEA, 18.7-20.0', RQD-25 PERCENT.			"		"	7.0	12.0	80
100						"		"	12.0	18.0	92
85	20.0	37.0	SILTSTONE, SHALY & SANDY, GRAY, HARDNESS-2 PLUS TO 3, DENSE, SOLID, GRAY, MED. BEDDED, ANGULAR FRAC. AT 20.6', 22.0', CLOSE CALCITE FRAC. AT 23.0' AND 24.0', VERT. CALCITE LINES, OPEN FRAC. 27.0-28.3' WITH THIN HAIRLINE VERT. FRAC., OPEN FACE, ANGULAR FRAC. WITH IRON OXIDE AT 35.0', RQD-90 PERCENT.			"		"	22.0	28.0	100
90						"		"	28.0	33.0	96
90						"		"	33.0	37.0	100
100	37.0		BOTTOM OF HOLE - WL (3-31-72) 1.7'								

BM-7, ELEV. 365.3, 10+00, CENTERLINE
 LOGGED BY - JOE VAN & WOODROW MALLOCH
 DRILLING EQUIPMENT - MOBILE RIG #4 3-30-72

PER- CENT REC.	MOLE DEPTH FROM TO DESCRIPTION OF MATERIALS			UNIF. SOIL CLASS. SYMB.	STANDARD PENETRATION			SAMPLES			PER- CENT REC.
					TYPE BIT USED	NO.	TYPE	FROM FT.	TO FT.		
										BLOWS PER 6"	
60	0.0	1.5	SILT, BRN, MOIST, MOD. PLASTIC, SMALL ANGULAR FRAGMENTS.	ML	1-3-6	SPT	1	JAR	0.0	1.5	35
100	1.5	3.0	SILT, CLAYEY, YELLOW-BRN MOTTLED, DRY, ANGULAR FRAGMENTS UP TO THREE-FOURTH INCH.	ML	8-8-10	"	2	"	1.5	3.0	35
65					17-18-33	"	3	"	3.0	4.5	40
	3.0	4.5	SILT CLAY, RED-BRN MOTTLED WITH YELLOW, DRY, ANGULAR FRAGMENTS.	CL	50	"	4	"	4.5	5.0	70
70	4.5	5.0	WEA. SHALE, RED-BRN.			DIA		NXM	5.0	7.0	10
90	5.0	27.0	SILTSTONE, SHALY, VERY BROKEN TO 12.5', FRAC., MOD. WEA., HARDNESS-2 PLUS TO 3 PLUS VERY BROKEN FROM 14.5'-15.3', VERY FRAC. FROM 17.0'-18.3', SOLID, DENSE, RED, ONE PIECE 2.3' LONG WITH VERT. HAMLING CALCITE FRAC., BROKEN 20.3'-21.0', RED, DENSE TO 23.0', BROKEN TO 24.5', FRAC. AT 27.4', RQD-46 PERCENT, IRON OXIDE IN FRACTURES			"	"	"	12.0	15.0	85
100						"	"	"	15.0	18.3	95
100						"	"	"	18.3	21.0	95
100	27.0	35.0	SHALE, SILTY, GRV, MOD. WEA., VERY BROKEN TO 28.0', VERT. AND ANGULAR FRAC. WITH CALCITE, GRV, THIN BEDDED, HARDNESS-2 TO 2 PLUS, RQD-24 PERCENT.			"	"	"	21.0	24.0	100
100						"	"	"	24.0	27.0	90
	35.0		BOTTOM OF MOLE - WL (4-5-72) 7.0'			"	"	"	27.0	35.0	95

BM-B, ELEV. 976.6, 12+00, CENTERLINE
 LOGGED BY - JOE VAN & WOODROW MALLOCH
 DRILLING EQUIPMENT - MOBILE RM 3-31-72

PER- CENT REC.	HOLE DEPTH		DESCRIPTION OF MATERIALS	UNIF. SOL. CLASS. SYMR.	STANDARD PENETRATION		SAMPLES		PER- CENT REC.		
	FROM	TO			TYPE BIT SYMR.	BLOWS PER 6" USED NO.	TYPE	FROM FT.		TO FT.	
40	0.0	0.4	TOPSOIL		1-3-6	SPT	1	JAR	0.0	1.5	25
35	0.4	3.0	1/2 T. GRAVELLY, LOW PLASTIC, 30-40 PERCENT GRAVEL, RED WITH GRAY MOTTLING, WEAK SHALE & SILTSTONE, RESIDUAL	ML-GM	13-20-31	"	2	"	1.5	3.0	90
10	3.0	35.0	SILTSTONE, SHALEY, POOR RECOVERY FROM 3.0-6.0' WITH SOME CLAY SEAMS, MOD. WEAK TO 8.0', RED WITH WHITE BANDED LAMINATIONS, SLIGHT CALCAREOUS, THIN TO MED. BEDDED, HARDNESS-2 PLUS TO 3 PLUS, ANGLITE, 11.5-13.5' IS MOD. WEAK, VERT. & HORIZ. FRAC. RED, WHITE CALCITE LAYERS, 13.5-15.3' IS SLIGHTLY WEAK, A FEW HAZEL VERT. FRAC. FILLED WITH CALCITE, 15.3-21.0' IS MOD. WEAK, HEAVIER CALCITE BEDDING, SOME VERT. FRAC., MUD OR CALCITE FILLED, 21.0-26.3' IS THIN BEDDED, FROM 21.0-22.0' FRAC. FROM 24.0-26.3' IS A GRADUAL TRANSITION FROM RED TO GRAY SILTSTONE, 26.3-29.5' IS GRAY, HAZEL BEDS OF CALCITE, FRAC., MOD. WEAK, 29.5-33.5' IS SHALEY, RED, THIN BEDDED, 33.5-34.5' IS GRAY, THIN BEDDED, WITH THIN CALCITE BEDS THROUGHOUT, 34.5-35.0' IS SHALEY, GRAY, MOD. WEAK, RQD-70 PERCENT.		50 REFUSAL		NEM	3.0	6.0	15	
50						DM			6.0	8.0	55
55						"		"	8.0	10.5	100
45						"		"	10.5	15.0	95
100						"		"	15.0	21.0	100
100						"		"	21.0	27.0	100
100						"		"	27.0	35.0	100
100	35.0		BOTTOM OF HOLE - WL (4-4-72) 8.1'								

NESHAMINY CREEK WATERSHED

NOTE - ALL SON AND ROCK CLASSIFICATIONS WERE DETERMINED BY VISUAL-MANUAL METHOD.

PLATE 17

NESHAMINY CREEK WATERSHED					
FLOODWATER RETARDING DAM PA-625					
DUCKS COUNTY, PENNSYLVANIA					
LOGS OF TEST HOLES					
U.S. DEPARTMENT OF AGRICULTURE					
SOIL CONSERVATION SERVICE					
DATE			APPROVED BY		
SIGNATURE			TITLE		
REMARKS			TITLE		
CHECKED	BY		SHAWING NO.		
<i>J. J. Z...</i>	PA-625		NO. 1A	PA-625-P	

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of Dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands; sand-silt mixtures
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, very fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

BEDROCK SYMBOLS

B	Basalt	Sc	Schist
Gn	Gneiss	Sh	Shale
Gr	Granite	SiS	Siltstone
Ls	Limestone	Sl	Slate
Ma	Marble	Ss	Sandstone

SAMPLES

DS	Disturbed
US	Undisturbed

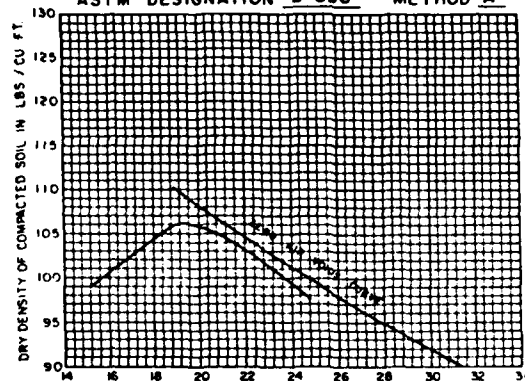
NOTE:

All soil and rock classifications were determined by visual examination, except where otherwise noted.

COMPACTION CURVE

LABORATORY SAMPLE NO. 73W213

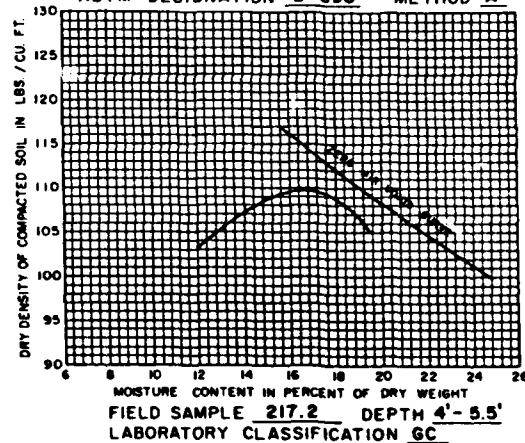
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE

LABORATORY SAMPLE NO. 73W214

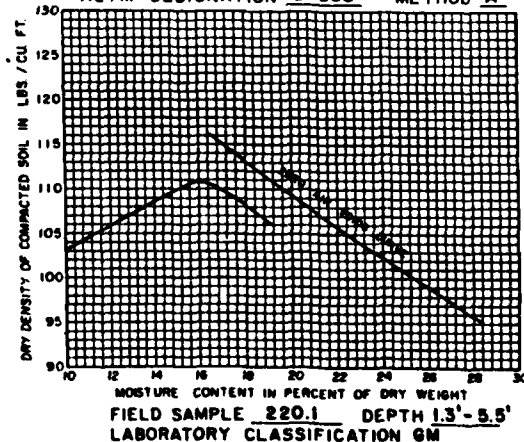
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE

LABORATORY SAMPLE NO. 73W215

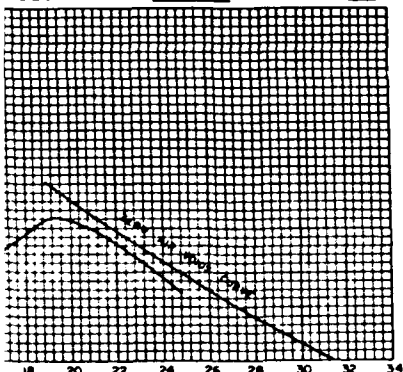
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE

LABORATORY SAMPLE NO. 73W213

DESIGNATION D-698 METHOD A

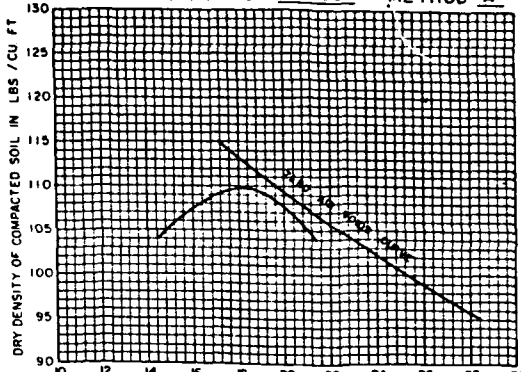


FIELD SAMPLE 217.1 DEPTH 0.6'-4'
LABORATORY CLASSIFICATION CL

COMPACTION CURVE

LABORATORY SAMPLE NO. 73W216

ASTM DESIGNATION D-698 METHOD A

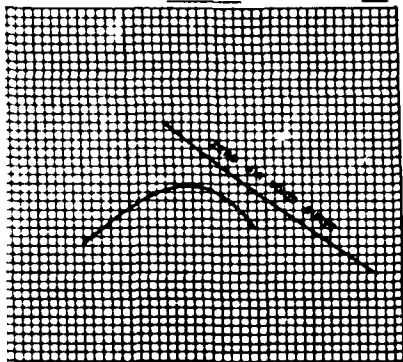


FIELD SAMPLE 109.1 DEPTH 0.5'-4'
LABORATORY CLASSIFICATION CL

COMPACTION CURVE

LABORATORY SAMPLE NO. 73W214

DESIGNATION D-698 METHOD A

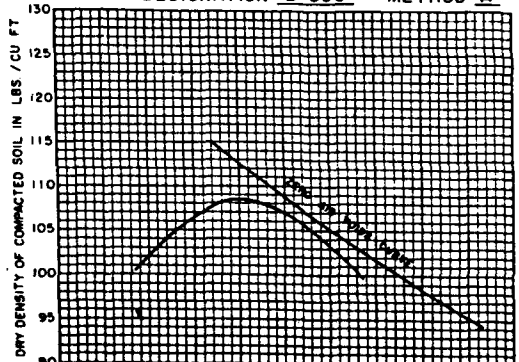


FIELD SAMPLE 217.2 DEPTH 4'-5.5'
LABORATORY CLASSIFICATION GC

COMPACTION CURVE

LABORATORY SAMPLE NO. 73W217

ASTM DESIGNATION D-698 METHOD A

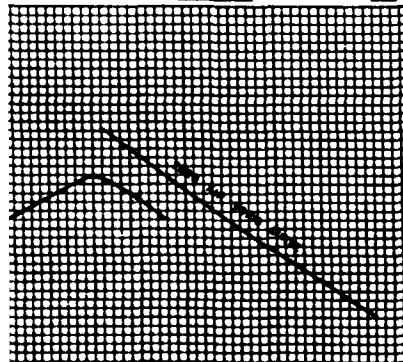


FIELD SAMPLE 111.1 DEPTH 0.8'-3.5'
LABORATORY CLASSIFICATION CL or ML

COMPACTION CURVE

LABORATORY SAMPLE NO. 73W215

DESIGNATION D-698 METHOD A



FIELD SAMPLE 220.1 DEPTH 1.3'-5.5'
LABORATORY CLASSIFICATION GM

NESHAMINY CREEK WATERSHED
FLOODWATER RETARDING DAM PA-625
BUCKS COUNTY, PENNSYLVANIA
COMPACTION DATA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by <u>Walter S. Butler</u>	Date <u>2-7-72</u>	Approved by _____
Drawn _____	Title _____	Scale _____
Typed _____	Checked by <u>Walter S. Butler</u>	PA-625-P

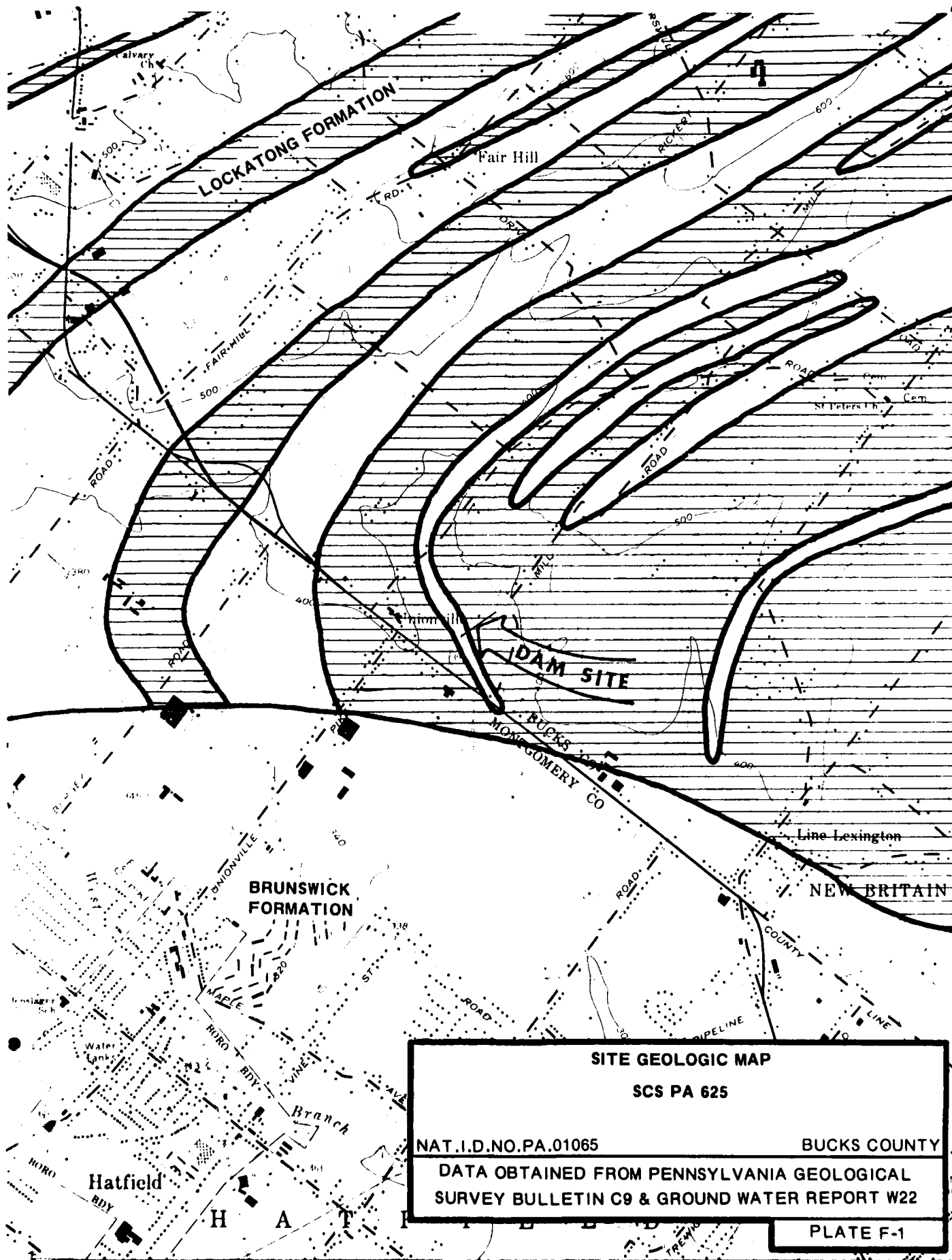
APPENDIX

F

SITE GEOLOGY
HILLTOWN DAM
(SCS PA 625 DAM)

SCS PA 625 Dam is located in the Triassic Lowland Section of the Piedmont Physiographic Province. As shown in Plate F-1, the dam is underlain by the Lockatong Formation of Triassic age and to a lesser extent to the Brunswick Formation also of Triassic age. Bedrock descriptions in the state files include fractured red shale, siltstone and argillite (compact, fine grained sedimentary rock) which is consistent with observed bedrock exposures in the emergency spillway. Bedding reportedly strikes from N10°W to N20°E dipping from 30 to 35 degrees west (toward the right abutment). Rock jointing reportedly strikes N40°E to N55°E and N50°W. As indicated in the as-built drawings, the cutoff trench is entirely founded into bedrock.

Approximately 1,500 feet south of the dam is a regional east-west striking fault which extends across Montgomery and Bucks Counties for over 20 miles.



SITE GEOLOGIC MAP

SCS PA 625

NAT.I.D.NO.PA.01065

BUCKS COUNTY

**DATA OBTAINED FROM PENNSYLVANIA GEOLOGICAL
SURVEY BULLETIN C9 & GROUND WATER REPORT W22**

PLATE F-1

END

DATE
FILMED

11-80

DTIC