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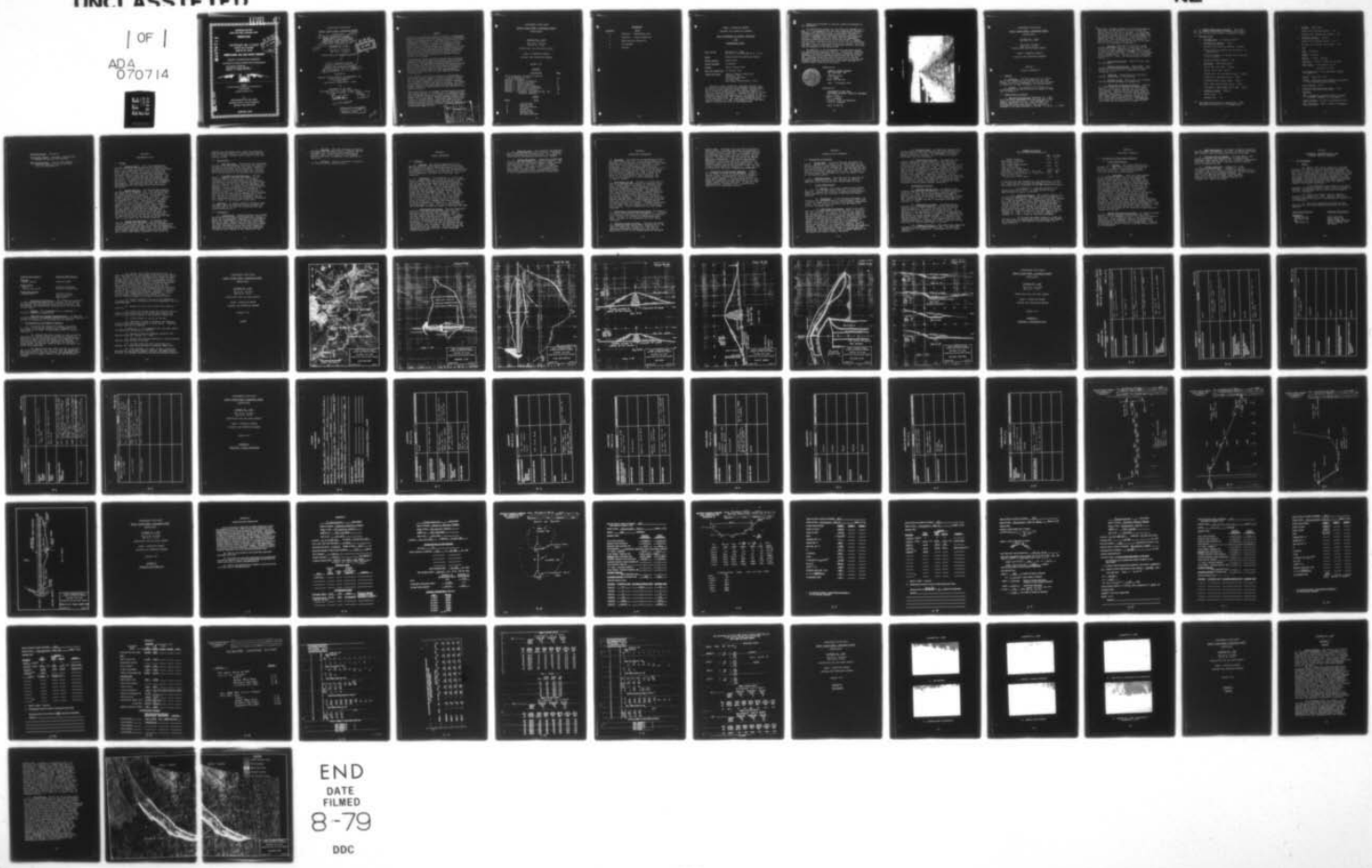

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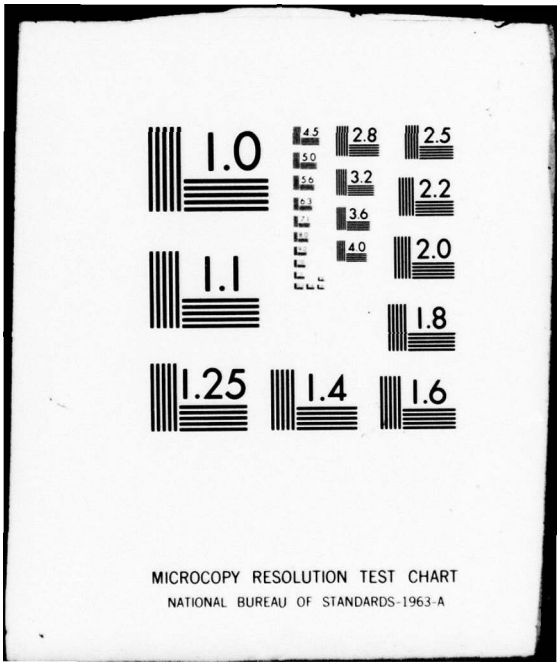
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SUSQUEHANNA RIVER BASIN
GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID NO. PA-00381
DER ID NO. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

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

JANUARY 1979

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

(6) National Dam Inspection Program. Olyphant Number 3 Dam (NDI-PA-ØØ381) (DER-35-Ø3), Susquehanna River Basin, Grassy Island Creek, Lackawanna County, Pennsylvania. Pennsylvania Gas and

I.D.

I.D.

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

(15) DACW31-79-C-ØØ15

Prepared by

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
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P.O. Box 1963
Harrisburg, Pennsylvania 17105

For

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

(11) JANUARY 1979

(12) 85p.

411004

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 Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. 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.

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

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PHASE I INSPECTION REPORT

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BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Olyphant No. 3 Dam NDI ID No. PA-00381/DER ID No. 35-03
Owner:	Pennsylvania Gas and Water Company
State Located:	Pennsylvania
County Located:	Lackawanna
Stream:	Grassy Island Creek
Date of Inspection:	23 October 1978
Inspection Team:	Gannett Fleming Corddry and Carpenter, Inc. Consulting Engineers P.O. Box 1963 Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations and past operational performance and according to criteria established for these studies, Olyphant No. 3 Dam is rated as unsafe because the spillway capacity is rated as seriously inadequate. Although the dam is in fair condition, the spillway can pass only 15 percent of the Probable Maximum Flood (PMF) without overtopping of the dam. If the dam should fail, the resulting floodflows would overtop Olyphant No. 2 Dam. Overtopping of this dam would cause its failure and loss of life downstream.

There is no evidence of serious stability problems on the embankment.

In view of the concern for the safety of Olyphant No. 3 Dam, it is recommended that the Owner immediately perform a hydraulic and hydrologic study to determine the measures necessary to make the spillway hydraulically adequate. It is also recommended that the Owner perform other measures, such as: removing trees and brush from the embankment; installing observation wells; monitoring bulges, seepage, and wet areas; extending riprap to the top of the embankment; ensuring both that the outlet works valve operates correctly and that a plug is available for upstream closure; and studying the adequacy of the access road.

In addition, it is recommended that the Owner modify his operational procedures, such as: developing a detailed emergency warning and operation system; modifying snowplow operations to avoid removing material from the top of the dam; providing round-the-clock surveillance of the dam during periods of unusually heavy rains; and activating the emergency operation and warning system when warnings of a storm of major proportions are given.

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

A. C. HOOKE
Head, Dam Section

Date: 9 February 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date: 4 Mar 79

OLYPHANT NO. 3 DAM

Overview

b

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03
PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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. Olyphant No. 3 Dam is an earthfill embankment 760 feet long and 37 feet high at its maximum section. The embankment has a puddled impervious core and riprap on both the upstream and downstream slopes. The spillway is located at the right abutment of the dam. It is an

excavated, riprapped channel with irregular geometry. The invert of the channel is 2.6 feet below the design level of the top of the dam. A 12-inch diameter cast-iron pipe with a valve at the downstream end extends through the center of the embankment and regulates flows. Olyphant No. 2 Dam is 0.5 mile downstream. The various features of Olyphant No. 3 Dam are shown on the Plates at the end of the report and on the Photographs in Appendix D.

b. Location. The dam is located on Grassy Island Creek approximately 1.7 miles east of the Village of Winton, Pennsylvania. Olyphant No. 3 Dam is shown on USGS Quadrangle, Olyphant, Pennsylvania, with coordinates N41° 28'20" - W75° 31'45" in Lackawanna County, Pennsylvania. The dam is 0.3 mile upstream of Olyphant No. 2 Dam. The location map is shown on Plate 1.

c. Size Classification. Small (37 feet high, 151 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Olyphant No. 3 Dam (Paragraph 5.1c.).

e. Ownership. Pennsylvania Gas and Water Company, Wilkes-Barre, Pennsylvania.

f. Purpose of Dam. Water supply for Olyphant, Pennsylvania and surrounding communities.

g. Design and Construction History. Olyphant No. 3 Dam was built in 1898 by the Winton Water Company. Frank Wolfe, Engineer for the Scranton Coal Company, designed the dam and supervised the construction. The contractor was Martin Cawley of Archbald, Pennsylvania. In 1915, the Pennsylvania Water Supply Commission prepared a report on the dam. This report resulted in the recommendation to increase the spillway capacity. The embankment was raised and the spillway was widened in 1927.

h. Normal Operational Procedure. The reservoir is normally maintained at spillway crest level. The valve on the outlet conduit is normally closed.

1.3 Pertinent Data.

a. Drainage Area. 0.6 square mile[1]

b. Discharge at Damsite. (cfs.)

Maximum known flood at damsite - unknown.

Outlet works at maximum pool elevation - 14 (approximate)

Spillway capacity at maximum pool elevation - 180 (low area).

Design spillway capacity - 420.

c. Elevation. (Feet above msl.)

Top of dam (low area) - 1468.9

Design top of dam - 1470.0

Maximum pool (top of dam low area) - 1468.9

Normal pool (spillway crest) - 1467.4

Upstream invert outlet works - 1442.0

Downstream invert outlet works - 1434.3

Streambed at downstream toe of dam - 1433.0

d. Reservoir Length. (Miles.)

Normal pool - .17

Maximum pool - .18

(1) Penn DER records show 0.7 square mile. GFCC determined the area to be 0.6 square mile.

e. Storage. (Acre-feet.)

Normal pool (spillway crest) - 122.

Maximum pool (design top of dam) - 151.

f. Reservoir Surface. (Acres.)

Normal pool (spillway crest) - 10.4

Maximum pool (design top of dam) - 11.6

g. Dam.

Type - Earthfill.

Length - 760 feet.

Height - 37 feet. (design).

Top width - Varies (13 feet to 16 feet).

Side slopes - Downstream 1V on 2H

Upstream 1V on 3H

Impervious core - Clay and Gravel "Puddle Core".

Zoning - Impervious core.

Cutoff - Impervious core foundation excavated below natural ground surface.

Grout curtain - None.

h. Diversion and Regulating Tunnel. None.

i. Spillway.

Type - Riprapped excavated channel at right abutment, geometry is not regular.

Length of weir - 46 feet at Elevation 1470.0.

Crest elevation - 1467.4 (invert of channel).

Upstream channel - Reservoir.

Downstream channel - Riprapped, supercritical channel of varying cross section.

j. Regulating Outlets. - One 12-inch diameter cast-iron pipe with one 12-inch gate valve at downstream toe.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Very little engineering data was available for review for the original structures. In a study performed in 1914 by the Pennsylvania Water Supply Commission, an account of design concepts, geology, construction materials and methods, and design features was prepared from interviews with the Owner, visual inspection, and other sources. The 1914 study also included analyses for hydrology, and hydraulics. A summary of the results of the analyses are on file. That study was the basis for recommended improvements to the spillway that were made in 1927. No design data for this modification was available for review.

b. Design Features. The dam and appurtenances are described in Paragraph 1.2a. The design features are shown on the Plates at the end of the report and on the Photographs in Appendix D. The general arrangment of the features is shown on Plate 2. Details of the embankment are shown on Plates 3 and 4 and on Photographs A, B, and C. The outlet works profile is shown on Plate 5 and on Photograph E. Spillway details are shown on Plates 6 and 7 and on Photographs C and D. The plates are not dated. Therefore, it cannot be determined if the plates represent the dam before or after the 1927 modifications. Furthermore, the top elevation of the dam that is shown on the profile on Plate 3 does not agree with the top elevations that are shown on Plates 4 and 5. An elevation of 1470.0 for the top of the dam has been used in this report for the design elevation.

c. Design Considerations. The drawings show that the puddled clay and gravel core extends only 3 feet below original ground. No further information was available concerning the description and soil gradation of the puddled clay and gravel core. The 1914 Pennsylvania Water Supply Commission report indicates that there was a 3-foot wide trench, excavated 5 feet below the

puddled clay and gravel core, which was backfilled with impervious material to provide a more positive cutoff. Present standards would require a more substantial cutoff.

2.2 Construction.

a. Data Available. Construction data available for review for the original structures was limited to information contained in the 1914 report prepared by the Pennsylvania Water Supply Commission. That information was obtained by interviews with the Owner, and it gives details of the construction operations.

b. Construction Considerations. The 1914 report, in general, praises the quality of construction used in the structure. For example, information is cited that indicates the impervious core material was carefully selected and was of high quality. However, it notes that the embankment was compacted only by the normal travel of earth hauling equipment. During construction, a spring was encountered at the left abutment and treated as detailed on Plate 3. In general, the accounts of construction are such that it appears that reasonable care was used in construction of Olyphant No. 3 Dam. Review of the available information for the 1927 improvements did not yield pertinent information with respect to the character of that work.

2.3 Operation. No formal records of operation were reviewed. Based on information from the Owner and the caretaker of the dam, all structures have performed satisfactorily.

2.4 Evaluation.

a. Availability. Engineering data was provided by the Division of Dams and Encroachments, Bureau of Water Quality Management, Department of Environmental Resources, Commonwealth of Pennsylvania (Penn DER), and by the Owner, Pennsylvania Gas and Water Company. The Owner made available a senior construction supervisor for information during the visual inspection. The Owner also researched his files for additional information upon request of the inspection team.

b. Adequacy. The type and amount of design data and other engineering data is limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

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

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The overall appearance of the dam was fair, with some deficiencies as noted herein. The locations of some of these deficiencies are shown in Appendix B on Plate B-1. Survey data acquired during this inspection is presented in Appendix B. On the day of the inspection, the pool was at spillway crest elevation.

b. Embankment. The embankment is in fair condition. Mature trees are growing at the toe. Smaller trees and brush cover the entire downstream slope and the upstream slope above normal pool elevation (Photographs A and B). The top of the riprap on the upstream slope is about 6 to 12 inches below the existing top of the dam. Some of the soil at the top of the dam has apparently been scraped off and pushed onto the embankment slopes. Two 6-inch high bulges were noted at the downstream toe. The survey revealed that almost the entire top of the embankment is below design elevation. The lowest point is 1.1 feet below the design elevation of 1470.0. Three wet areas and a seepage area were observed, as shown in Appendix B on Plate B-1. The seepage was clear and about 0.5 gpm. Much of the ground along the downstream toe does not appear to have good drainage.

c. Appurtenant Structures. The only deficiency observed in the spillway was some brush and trees growing in the spillway outlet channel. About 100 feet downstream from the embankment axis, the spillway channel becomes poorly defined. It appears that some flow would travel in a direction parallel to the toe of dam during periods of high spillway discharge. No deficiencies were observed at the outlet works. A valve crew was not available during the inspection and, therefore, the operation of the outlet works was not observed. The pipe through the embankment was under pressure, without upstream closure facilities.

d. Reservoir Area. The reservoir has generally mild slopes, but much outcrop is visible. The watershed is uninhabited and undeveloped. It is owned and controlled by Pennsylvania Gas and Water Company.

e. Downstream Channel. Immediately downstream from the dam, the channel is slightly overgrown. The channel continues downstream through a steep, wooded and undeveloped valley for 0.3 mile to Olyphant No. 2 reservoir. The access road to the dam generally parallels the stream. It is passable by a high ground clearance vehicle during good weather. It may be impassable during periods of high runoff.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at spillway crest, Elevation 1467.4, with excess inflow discharging over the spillway and into Grassy Island Creek, which flows into Olyphant No. 2 Reservoir 0.3 mile downstream. A 12-inch diameter cast-iron pipe discharges water from the reservoir at Elevation 1434.3. Streamflows in Grassy Island Creek can be increased by releases from Olyphant No. 3 Dam. Since streamflow is usually augmented only when Olyphant No. 2 Reservoir is below spillway crest elevation, the valve on the Olyphant No. 3 water discharge line is usually closed.

4.2 Maintenance of Dam. The dam is visited twice a week by a caretaker who records the reservoir elevation. Weekly reports are mailed to the Owner's Engineering Department. This information is used by the Owner's Engineering Department for regulating flows in the distribution system. The caretaker is also responsible for observing the general condition of the dam and appurtenant structures and for reporting any changes or deficiencies to the Owner's Engineering Department. A Pennsylvania Gas and Water Company engineer makes a formal inspection of the dam each year, and the records are filed and used for determining priority of repairs. Informal inspections are also made when the engineer is on the site for other reasons. Brush is apparently cut when deemed necessary.

4.3 Maintenance of Operating Facilities. The valve on the outlet works pipe is operated annually. In response to the Phase I Dam Inspection Program of the previous year, the Owner is revising his maintenance procedures. Details of the procedures are still being developed.

4.4 Warning Systems in Effect. The Owner furnished the inspection team with a verbal description of the chain of command for Olyphant No. 3 Dam and of a generalized emergency notification list that is applicable for all of the Pennsylvania Gas and Water

Company dams. The Owner said that during periods of heavy rainfall, available personnel are dispatched to the dams to observe conditions. All company vehicles are equipped with radios, and the personnel can communicate with each other and with a central control facility. Evaluation of risk is made by the Owner's Engineering Department. The Owner's Engineering Department is also responsible for notification of emergency conditions to the local authorities. Detailed emergency operational procedures have not been formally established for Olyphant No. 3 Dam, but are as directed by the Owner's Engineering Department.

4.5 Evaluation of Operational Adequacy. Judging by the amount of brush on the embankment, a more frequent brush cutting schedule would be warranted. The maintenance precedures for the outlet works valve appear adequate. The procedures used by the Owner for inspecting the dam are adequate, but some needed repairs have not been made. In general, the warning system is adequate, but it would be more effective if it were more detailed.

SECTION 5

HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. No design data was available for review. During 1914, a report on the dam was made by the Pennsylvania Water Supply Commission. This study resulted in the recommendation to increase the spillway capacity from the then existing 100 cfs to 325 cfs. The spillway was modified to its present configuration in 1927. No analysis of the modification was available in either the Owner's files or the PennDER records.

b. Experience Data. The Owner has not reported any hydraulic problems with the dam. He does not have any experience data concerning flows during times of flood.

c. Visual Observations.

(1) General. The visual inspection of Olyphant No. 3 Dam, which is described in Section 3, resulted in a number of observations relevant to hydraulics and hydrology. These observations are evaluated herein for the various features.

(2) Embankment. If the dam were overtopped, the riprap on the downstream face of the embankment would cause a slightly longer time of failure than a similar unprotected slope. The low areas on the top of the dam reduce the spillway discharge capacity.

(3) Appurtenant Structures. Brush in the spillway outlet channel could raise the tailwater at the spillway, but the amount of brush at the time of the inspection was insignificant. The geometry of the spillway makes an accurate determination of its discharge capacity difficult. The poorly defined spillway channel is not considered a deficiency, since the erosion potential is low because the channel is a sufficient distance from the embankment. Since a valve crew was not available to operate the valve during the inspection, its operational adequacy cannot be assessed. The Owner stated that an in-house diving capability and various size plugs are available to provide upstream closure for the outlet works. This is deemed adequate, if the proper size plug is readily available.

(4) Reservoir Area. No conditions were observed in the reservoir area or watershed that might present significant hazard to the dam. The assessment of the dam is based on existing conditions, and the effects of future development are not considered.

(5) Downstream Conditions. No conditions were observed immediately downstream of the dam that might present significant hazard to the dam. The downstream conditions indicate that the only hazard presented by the dam is the hazard to Olyphant No. 2 Dam. A Phase I Inspection Report for the National Dam Inspection Program has previously been prepared for Olyphant No. 2 Dam, which is of intermediate size. Olyphant No. 2 Dam was classified as high hazard, with a seriously inadequate spillway. As the failure of Olyphant No. 3 Dam could cause the overtopping of Olyphant No. 2 Dam, a high hazard classification is warranted for Olyphant No. 3 Dam. The condition of the access road indicates that access to Olyphant No. 3 Dam may not always be possible during severe weather conditions.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE) for the size (Small) and hazard potential (High) of Olyphant No. 3 Dam, the spillway design flood (SDF) is between one-half of the probable maximum flood (PMF) and the PMF. Because Olyphant No. 2 Dam, 0.5 mile downstream, has a SDF equal to the PMF, the PMF is selected as the SDF for Olyphant No. 3 Dam.

(2) Description of Model. The watershed was modeled with the HEC-1DB computer. The HEC-1DB computer program computes a PMF runoff hydrograph and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. The PMF inflow to Olyphant No. 3 Reservoir was determined and routed through the dam. The outflow from the dam was routed downstream to Olyphant No. 2 Reservoir and through Olyphant No. 2 Dam. It was assumed that no runoff occured downstream of Olyphant No. 3 Dam. Identical methods were used for various percentages of the PMF.

(3) Summary of Results. The table below summarizes the results for the PMF and one-half PMF. The total PMF rainfall over the Olyphant No. 3 watershed is 24.7 inches; Appendix C.

SUMMARY OF RESULTS
(Dam with Existing Conditions)

	PMF	1/2 PMF
Runoff (inches)	22.2	11.1
Peak Inflow to Olyphant No. 3 Dam (cfs)	1,668	834
Peak Outflow from Olyphant No. 3 Dam (cfs)	1,664	831
Depth of overtopping, Olyphant No. 3 Dam (feet)	0.80	0.45
Peak Inflow to Olyphant No. 2 Dam (cfs)	1,662	829
Peak Outflow from Olyphant No. 2 Dam (cfs)	1,654	798
Depth of overtopping, Olyphant No. 2 Dam (feet)	0.52	--

No dam failures were assumed with the above data. Olyphant No. 3 Dam, with its existing top elevation of 1468.9, can pass approximately 15 percent of the PMF without overtopping.

If Olyphant No. 3 Dam were raised to its design elevation of 1470.0, it would be able to pass approximately 29 percent of the PMF.

(4) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix C. To determine the adequacy of Olyphant No. 3 spillway, Olyphant No. 3 Dam was assumed to start failing when water was 0.2 feet over the dam. The 20-foot wide breach was assumed to develop completely within 0.2 hour. The computed peak outflow is 13,080 cfs. Because of limitations in the model, a peak outflow of 3,250 cfs was used as flow from the dam. When routed downstream, this lesser discharge will overtop Olyphant No. 2 Dam by 0.89 feet; this will cause failure of Olyphant No. 2 Dam. As such, the spillway capacity of Olyphant No. 3 Dam is rated as seriously inadequate.

If the peak dam-break outflow of 13,080 cfs had been used, the computations would indicate that Olyphant No. 2 Dam would be overtopped by a greater depth for a longer duration.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Olyphant No. 3 Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for various features.

(2) Embankment. Trees and brush growing on the embankment and at the toe are undesirable. Riprap terminating below top of dam presents an erosion hazard from wave action. The Owner stated that the soil that was scraped off and pushed onto the embankment slopes was caused by snow plow operations during the winters. This condition has hydraulic significance, and is part of the cause for the lowered top of dam elevation. Settlement of the embankment may also have contributed to the lower elevation. The bulges at the toe of the dam are probably caused by uneven grading during construction and are not considered to indicate stability problems. The seepage and wet areas, although not excessive, are of some concern because of their potential for piping. The wet area near the left abutment might be caused by water from the spring noted in Paragraph 2.2. The outlet of the drain from the spring, which is shown on Plate 3, could not be located during the visual inspection. Positive drainage along the toe would aid in assessing the seepage from the dam.

b. Design and Construction Data. No record of design data or stability analysis was available for review. Analysis of the embankment stability is beyond the scope of this study. Also, sufficient data on the engineering properties of the embankment material would have to be acquired before the analysis could be performed. There is no evidence of previous stability problems having occurred on the embankment.

c. Operating Records. No formal records of operation were reviewed. According to the Owner, no stability problems have occurred over the operational history of the dam.

d. Postconstruction Changes. As noted herein, very little information was available for the spillway and embankment modifications made in 1927. However, the modifications were made sufficiently long ago that any problems should be apparent by now.

e. Seismic Stability. Olyphant No. 3 Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. However, since there are no formal static stability analyses, the theoretical seismic stability of Olyphant No. 3 Dam is not known.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety.

(1) Based on the visual inspection, available records, calculations, and past operational performance, Olyphant No. 3 Dam is judged to be in fair condition. However, the existing spillway will pass only 15 percent of the PMF without overtopping of the dam. The failure of the dam will cause failure of the high hazard Olyphant No. 2 Dam downstream. The spillway is rated as seriously inadequate. According to criteria established for these studies by OCE, the dam must be rated as unsafe because the spillway capacity is seriously inadequate.

If the embankment were raised to its design elevation, the spillway would be able to pass 29 percent of the PMF. The spillway capacity would still be rated as seriously inadequate.

(2) There is no formal stability analysis available for Olyphant No. 3 Dam. However, there is no evidence of problems presently threatening the stability of the embankment.

(3) The visual inspection resulted in some deficiencies, which are summarized below for the various features.

Feature and Location	Observed Deficiencies
Embankment:	
Slopes and toe	Trees and brush
Upstream slope	Riprap below top
Top	Below design elevation
Downstream toe	Bulges, seepage, and Wet areas

Feature and Location	Observed Deficiencies
Spillway:	
Outlet channel	Brush and trees
Outlet Works:	
Valve	Uncertain operation
Closure facilities	Uncertain availability
Downstream Channel:	
Access road	Uncertain access during periods of high runoff.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. In view of the concern for safety of Olyphant No. 3 Dam, the following measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform additional studies to more accurately ascertain the spillway capacity required for Olyphant No. 3 Dam as well as the nature and extent of mitigation measures required to make the spillway hydraulically adequate. If the existing low areas of the embankment are restored to design grade, the spillway capacity would be increased; this should be accomplished.

(2) Remove brush and trees that are in the spillway outlet channel and that are on or near the embankment. When the brush and trees are removed, the embankment should be inspected on a regular basis to check for wet areas or seepage.

(3) Install six or more observation wells, or other instrumentation, downstream of the axis of the embankment. One well, or other instrumentation, should be located in the vicinity of each of both the two wet areas and the seepage area. The others should be at appropriate locations to determine general water levels in the downstream embankment. Data collected from observation wells or other instrumentation should be utilized in evaluating the stability of the structures and assessing piping potential in the future. The area along the downstream toe should be graded to provide positive drainage. Continue to observe wet areas and seepage downstream of embankments. If conditions worsen, appropriate action should be taken to control apparent seepage with properly designed drains.

(4) Monitor bulges at the toe of the embankment. If changes are noted, an evaluation of the embankment stability should be made.

(5) Ensure that the outlet works valve operates correctly.

(6) Ensure that proper plugs are available for upstream closure facilities on the outlet works pipe in the event the pipe should rupture or for periodic inspections.

(7) Extend riprap to the top of the dam.

(8) Undertake a study to determine the adequacy of the access road during periods of high runoff. Undertake remedial measures as required.

b. In addition, it is recommended that the Owner modify his operational procedures as follows:

(1) Develop a detailed emergency operation and warning system for Olyphant No. 3 Dam.

(2) Modify snow plowing operations to avoid removing material from the top of the dam.

(3) Provide round-the-clock surveillance of Olyphant No. 3 Dam during periods of unusually heavy rains.

(4) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

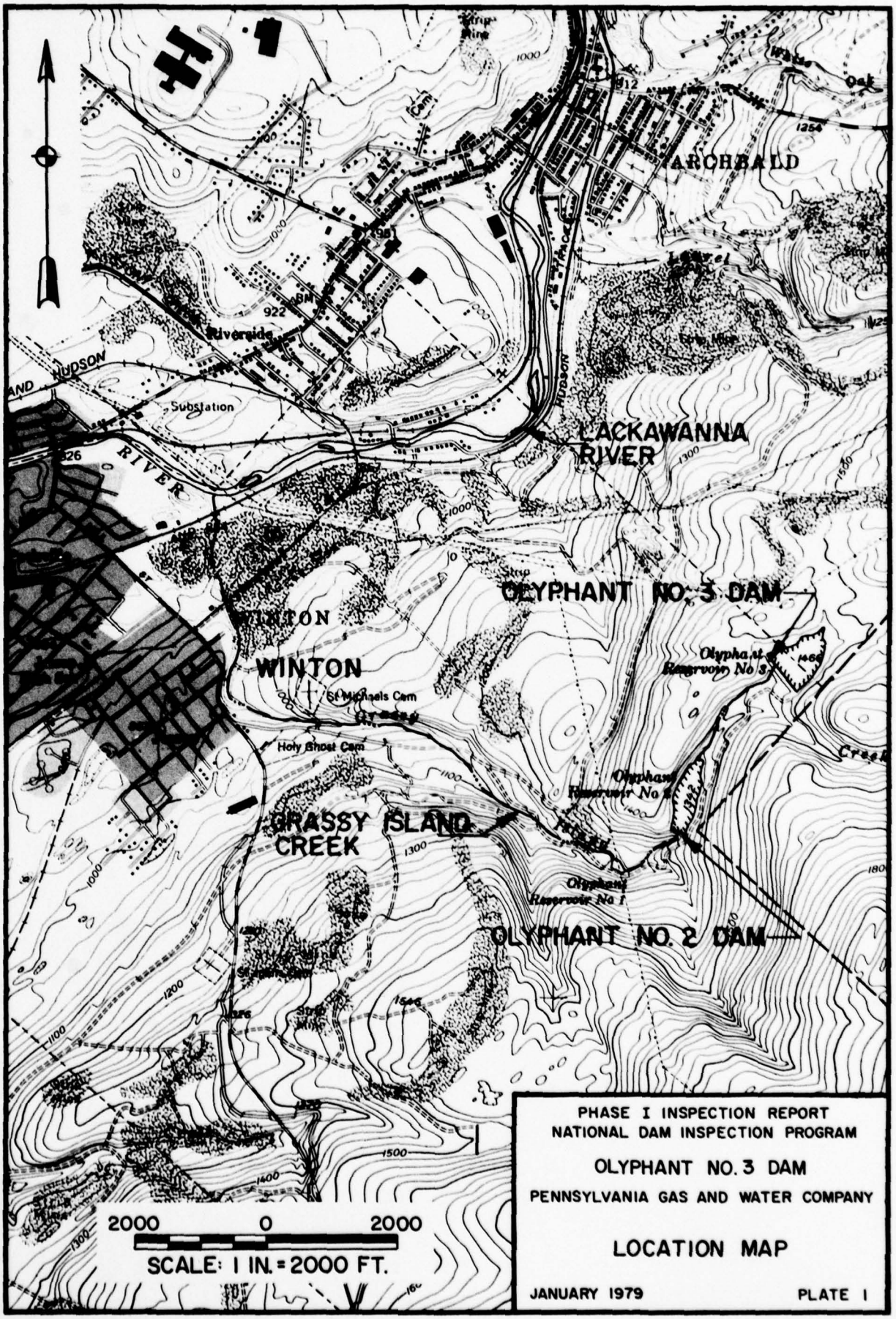
PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

PLATES



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

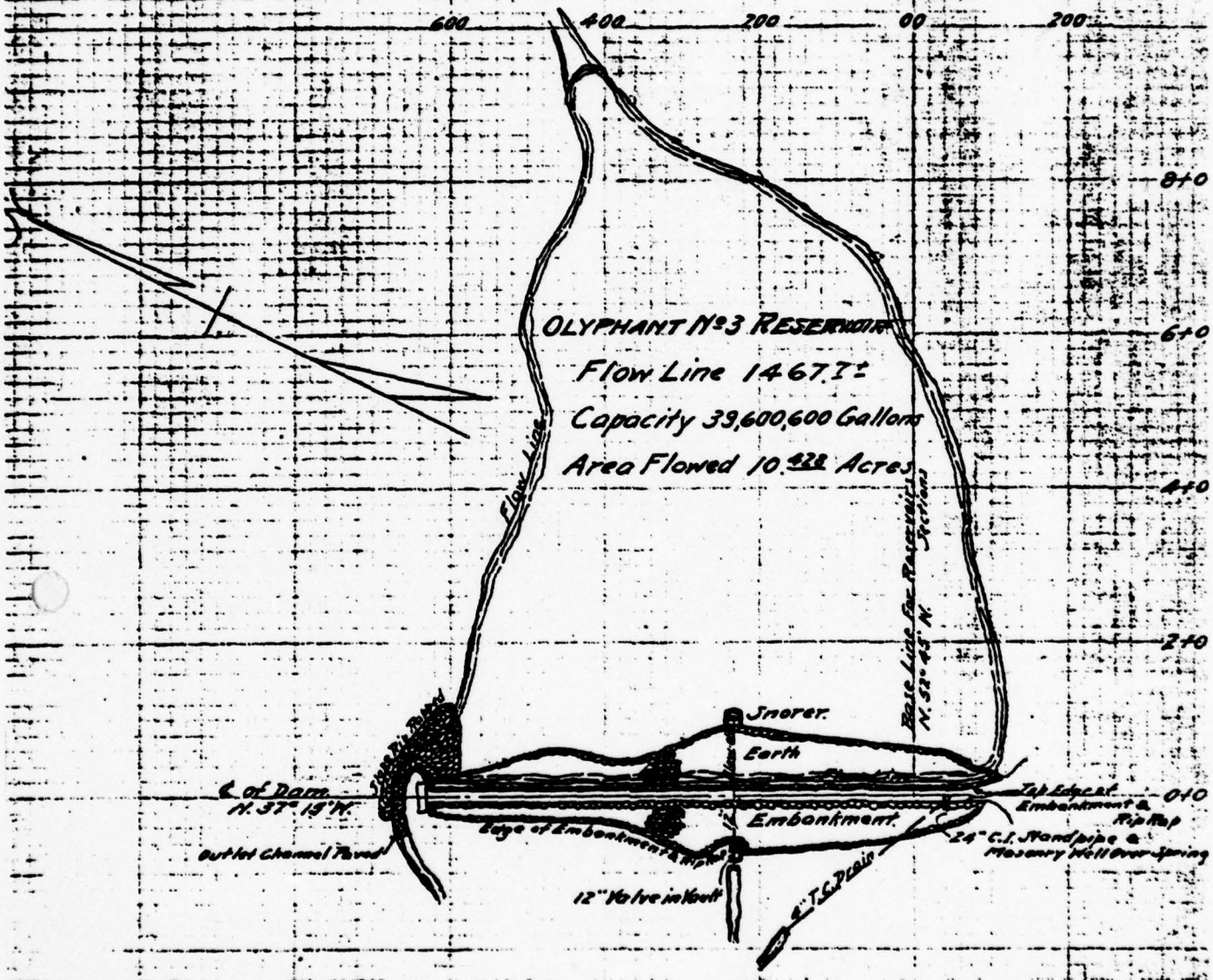
OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

LOCATION MAP

JANUARY 1979 PLATE 1

Sheet No 36



Scale: 1" = 200'

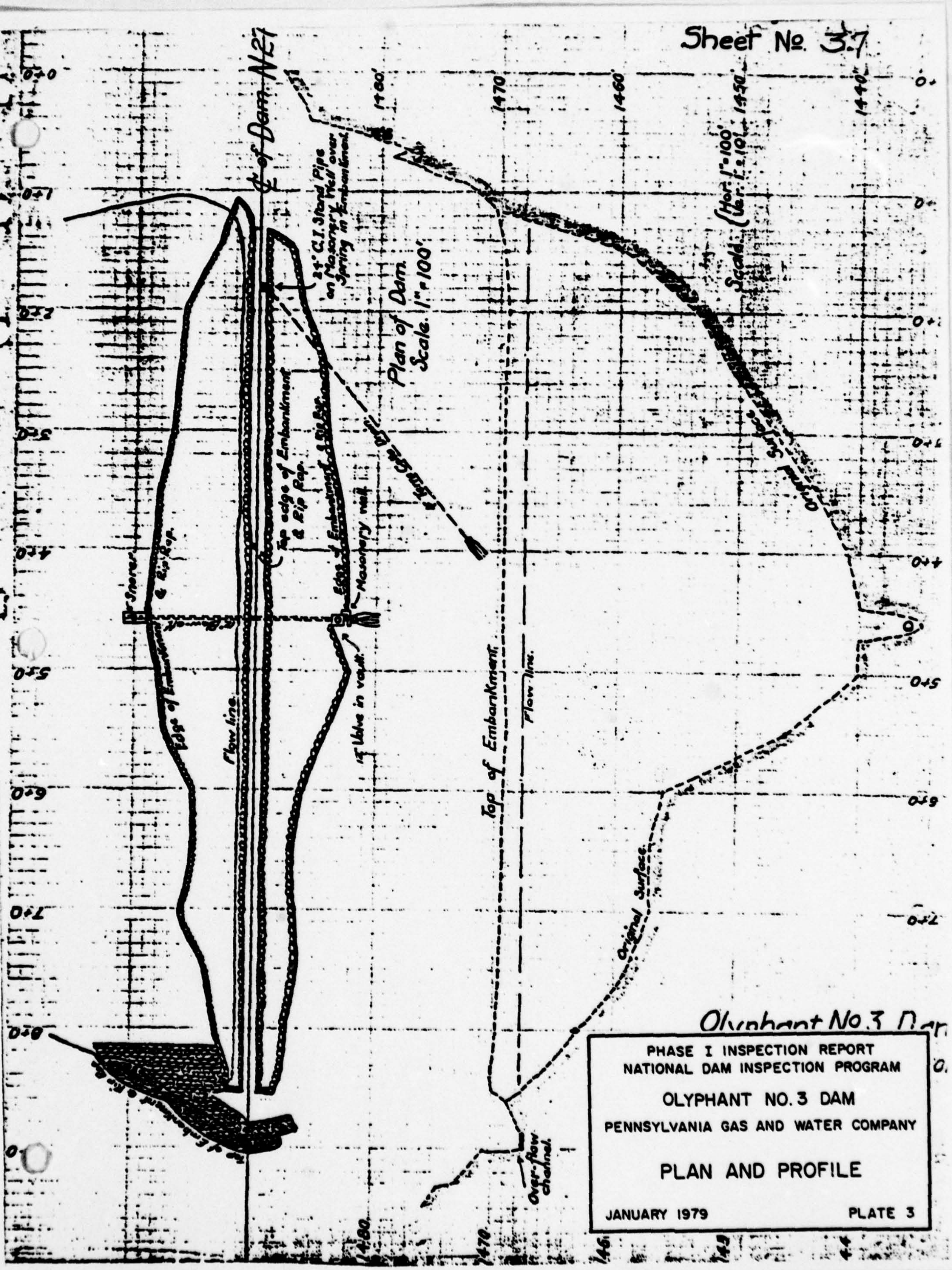
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

GENERAL PLAN

JANUARY 1979 PLATE 2



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

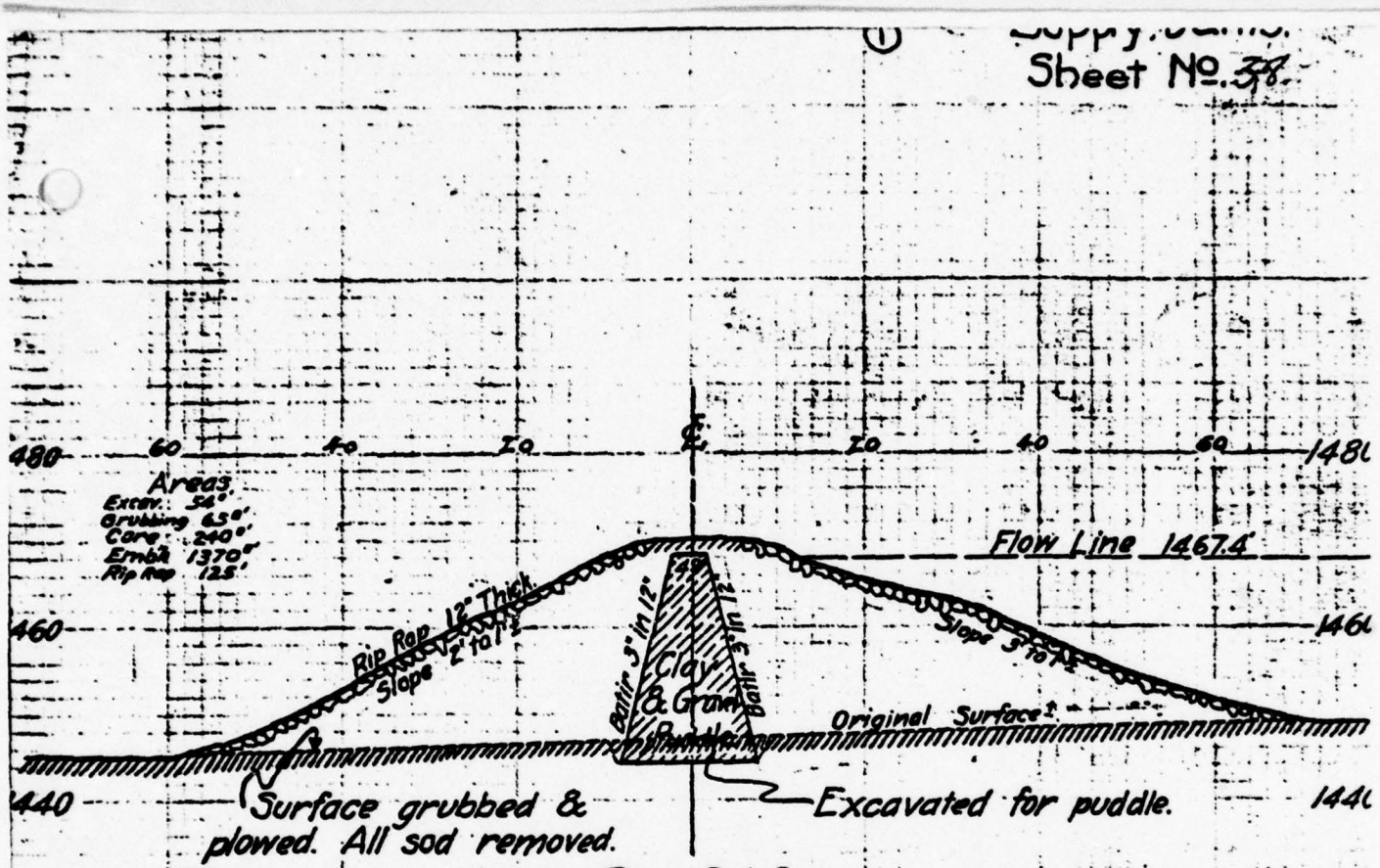
OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

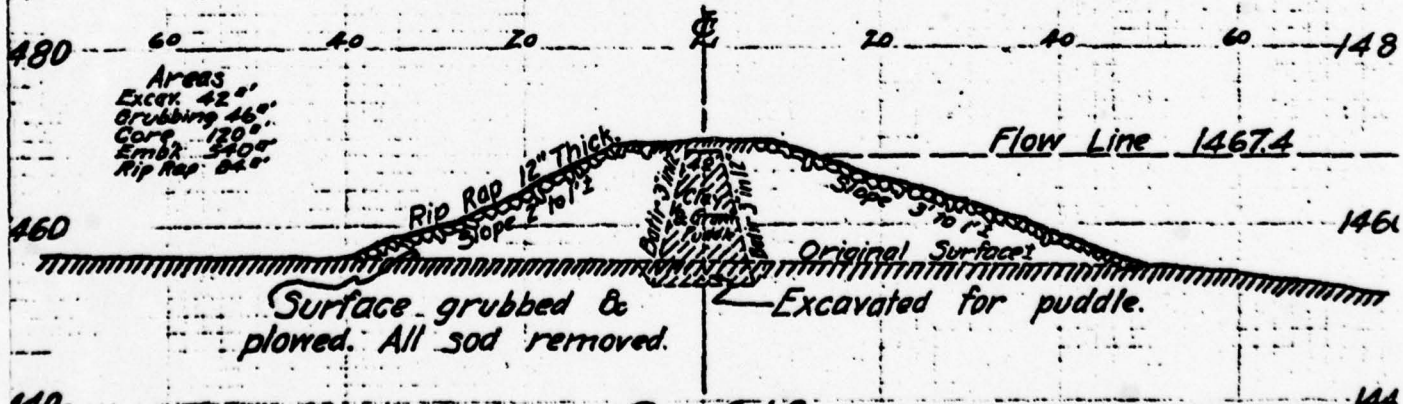
PLAN AND PROFILE

JANUARY 1979 PLATE 3

Sheet No. 38



Sec. 3+0



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Scale: 1" = 20'

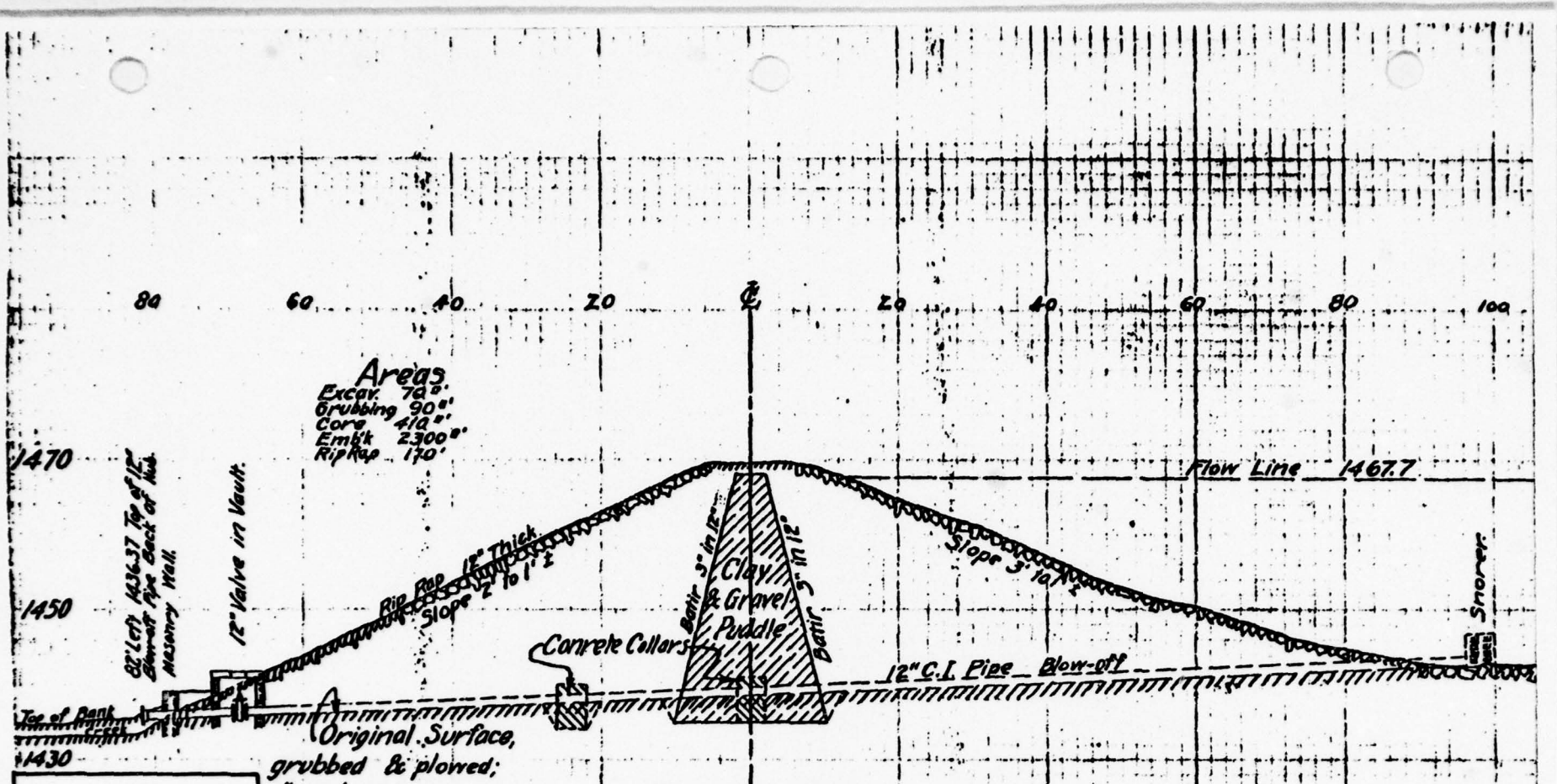
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

SECTIONS

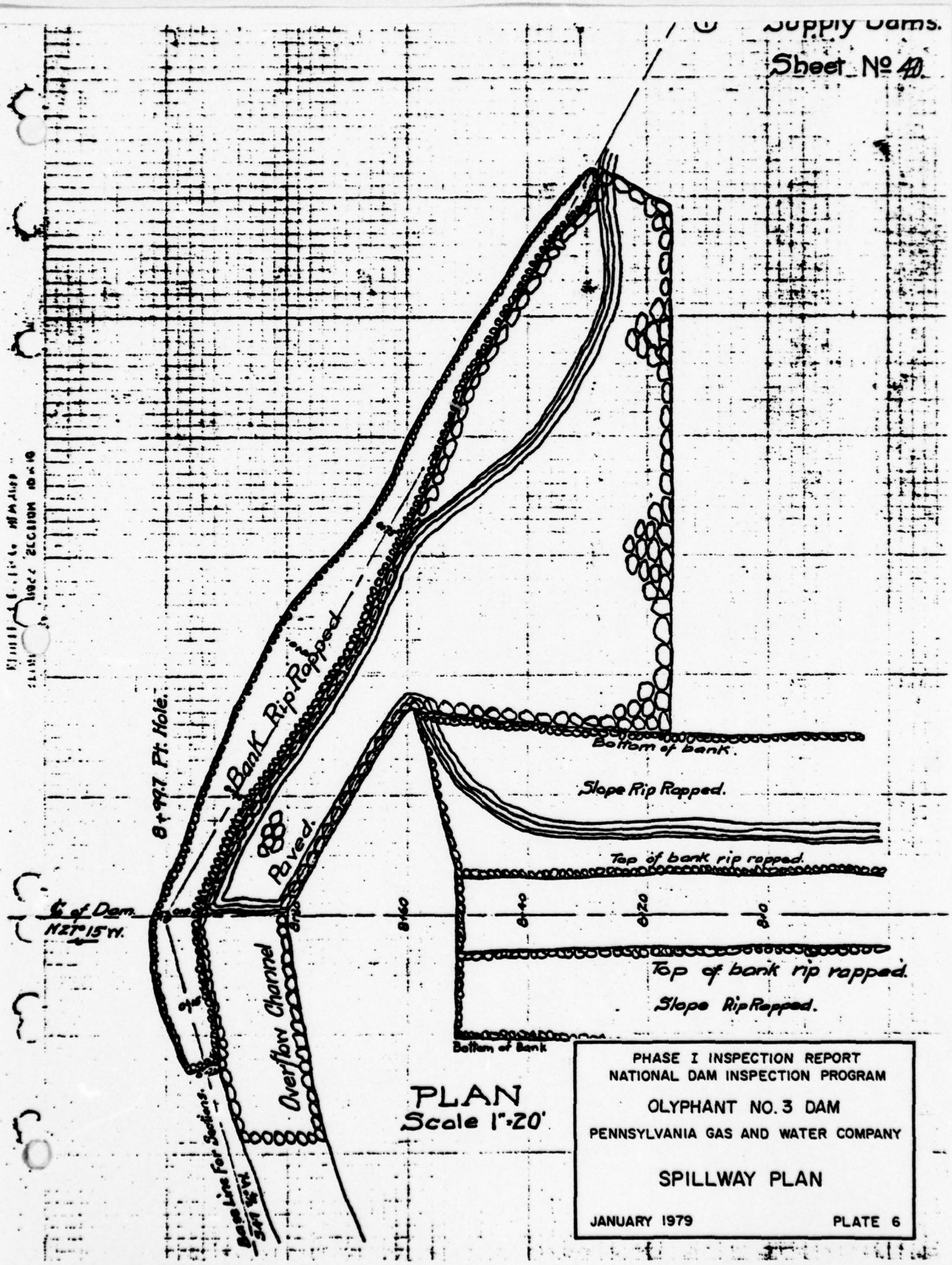
JANUARY 1979 PLATE 4



nt No. 3 Dam.
Sections.
e 1"=20'

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
OLYPHANT NO. 3 DAM
PENNSYLVANIA GAS AND WATER COMPANY
OUTLET WORKS
JANUARY 1979
PLATE 5

Sheet No 34



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

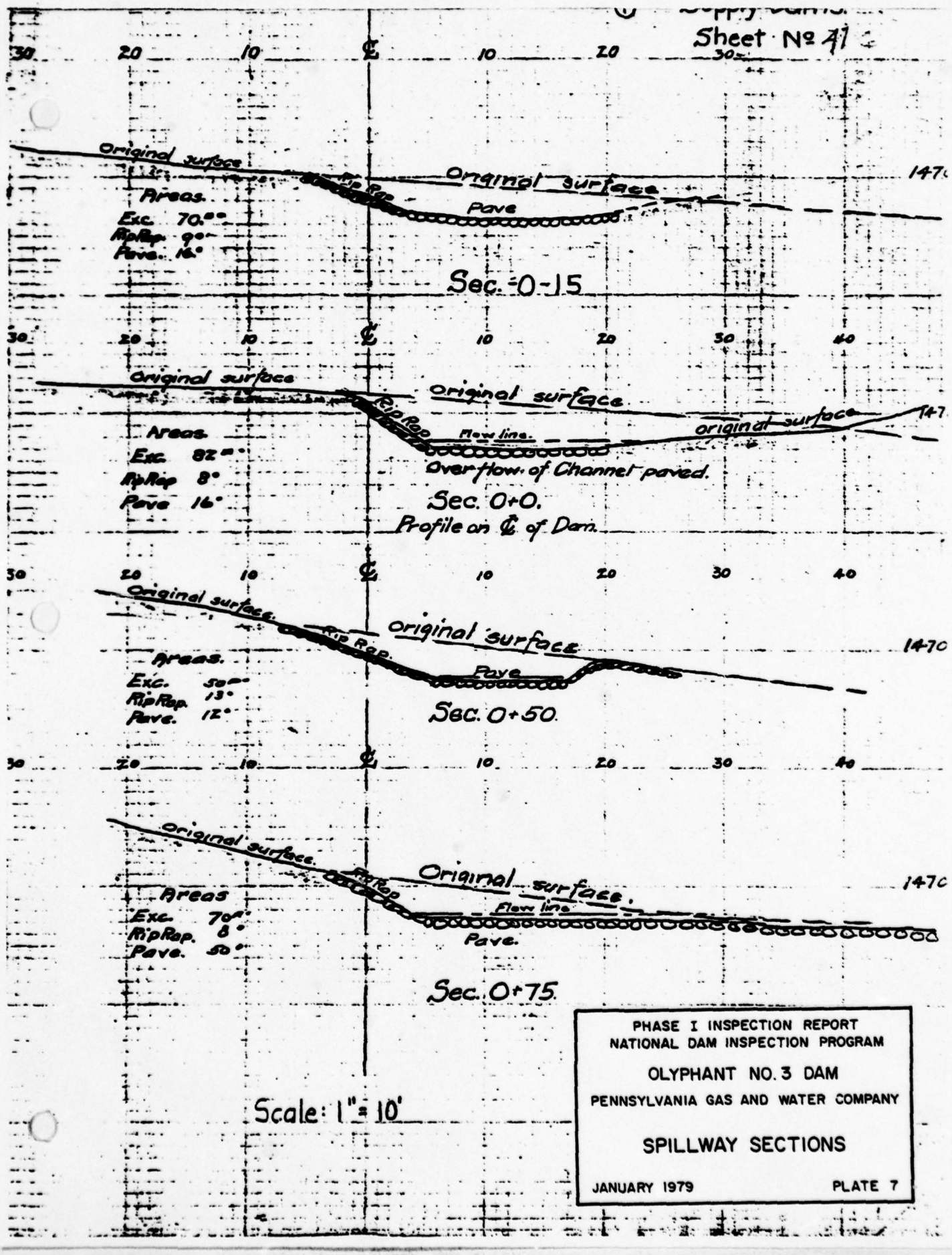
OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

SPILLWAY PLAN

JANUARY 1979 PLATE 6

Sheet Nº 47



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

SPILLWAY SECTIONS

JANUARY 1979 PLATE 7

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: OLYPHANT NO. 3

NDS ID NO.: PA-00398 DER ID NO.: 35-03

ITEM	REMARKS
AS-BUILT DRAWINGS	NOT STRICTLY "AS BUILT" - DATE UNKNOWN. SEE PLATE 2 TO PLATE 7.
REGIONAL VICINITY MAP	SEE PLATE 1.
CONSTRUCTION HISTORY	BUILT - 1898 SPILLWAY WIDENED AND EMBANKMENT RAISED - 1927.
TYPICAL SECTIONS OF DAM	SEE "AS-BUILT DRAWINGS" ABOVE.
OUTLETS: Plan Details Constraints Discharge Ratings	SEE PLATE 5 NO OTHER INFORMATION AVAILABLE

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	1914 WATER SUPPLY COMMISSION OF PENNSYLVANIA REPORT.
GEOLOGY REPORTS	1914 WATER SUPPLY COMMISSION OF PENNSYLVANIA REPORT.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	NONE
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	NONE
POSTCONSTRUCTION SURVEYS OF DAM	SEE "AS-BUILT DRAWINGS" ON PAGE A-1.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	NOTED AS FROM LEFT HILLSIDE OF RESERVOIR.
MONITORING SYSTEMS	NONE
MODIFICATIONS	1927 -
HIGH POOL RECORDS	NONE
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	NONE

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	NONE
SPILLWAY: Plan Sections Details	SEE "AS-BUILT DRAWINGS" ON PAGE A-1
OPERATING EQUIPMENT: Plans Details	SEE "AS-BUILT DRAWINGS" ON PAGE A-1
PREVIOUS INSPECTIONS Dates Deficiencies	1914 - TREES AND BRUSH ON EMBANKMENT AND IN SPILLWAY CHANNEL. SPILLWAY TOO SMALL. 1919 - NOTED NON-COMPLIANCE WITH ORDER TO ENLARGE SPILLWAY. LARGE AMOUNT BRUSH ON EMBANKMENT. 1925 - NOTED NON-COMPLIANCE WITH ORDER TO ENLARGE SPILLWAY. TOP OF DAM APPEARED TO BE LOW. 1928 - NOTED RAISING AND SPILLWAY MODIFICATIONS. SLIGHT BULGE AT TOE, ESPECIALLY NEAR LEFT END. SMALL FLOW FROM TOE NEAR
(CONTINUED)	RIGHT END, SMALL FLOW AT TOE NEAR LEFT ABUTMENT. 1930 - TOP OF DAM LEVELLED; TOPWIDTH = 11 FEET. SMALL FLOW AT LEFT END. STANDING WATER AT RIGHT END.

A-4

ENGINEERING DATA

ITEM	REMARKS
PREVIOUS INSPECTIONS (CONTINUED)	1933 - CONSIDERABLE LEAKAGE FROM TOE AT RIGHT END. SLIGHT LEAKAGE 60 FEET RIGHT OF OUTLET AND AT LEFT END. 1941 - LOW BRUSH ON DOWNSTREAM SLOPE. WET AREA AT LEFT END TOE. SLIGHT LEAKAGE 70 FEET RIGHT OF OUTLET WORKS.
(CONTINUED)	1945 - DEFICIENCIES AS IN 1941. 1953 - SMALL AMOUNT OF LEAKAGE AT LEFT END TOE. 1957 - SMALL AMOUNT OF LEAKAGE AT TOE. MAINTENANCE - POOR.
(CONTINUED)	1965 - TREES AND BRUSH ON EMBANKMENT.

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: OLYPHANT NO. 3 **County:** LACKAWANNA **State:** PENNSYLVANIA

NDS ID No.: PA-00381 **DER ID No.:** 35-03

Type of Dam: EARTHFILL **Hazard Category:** HIGH

Date(s) Inspection: OCTOBER 23, 1978 **Weather:** OVERCAST **Temperature:** 60°F±

SOIL CONDITIONS: MOIST

MANY NEWLY FALLEN LEAVES ON GROUND

Pool Elevation at Time of Inspection: 1467.4 msl/**Tailwater at Time of Inspection:** N/A msl

Inspection Personnel:

D. WOLF (GFCC)

D. EBERSOLE (GFCC)

J. BODNAR (PGW)

A. WHITMAN (GFCC) **Recorder**

B-1

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	2- 6" BULGES NEAR TOE	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	TOP APPARENTLY PUSHED OFF ONTO EMBANKMENT SLOPES	OWNER REPORTS AS SNOWPLOWING. SOIL: SANDY SILT
CREST ALIGNMENT: Vertical Horizontal	SEE SURVEY INFORMATION ON SHEETS B-9 TO B-11.	
RIPRAP FAILURES	NONE TOP OF RIPRAP IS 6 TO 12 INCHES BELOW TOP OF DAM.	

B-2

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	No deficiencies except seepage below	
ANY NOTICEABLE SEEPAGE	SEE PLATE B-1	
STAFF GAGE AND RECORDER	NONE	
DRAINS	NONE VISIBLE	
BRUSH	UPSTREAM SLOPE - 3'± HIGH ALONG TOP DOWNSTREAM SLOPE - 8' HIGH, 1" DIAMETER ALL OVER	MATURE TREES AT TOE.

B-3

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	12" DIAMETER CIP SLIGHTLY SCALING	
INTAKE STRUCTURE	SUBMERGED	
OUTLET STRUCTURE	MASONRY VALVE PIT	
OUTLET CHANNEL	NATURAL STREAM - SLIGHTLY OVER GROWN	
EMERGENCY GATE	12" GATE VALVE AT DOWNSTREAM TOE.	PIPE UNDER PRESSURE THROUGH EMBANKMENT.

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	NONE EXCAVATED CHANNEL HAS CONTROL SECTION	
APPROACH CHANNEL	RESERVOIR	
DISCHARGE CHANNEL	SUPERCRITICAL 6" TO 12" STONE PAVING UPSTREAM AND DOWNSTREAM OF CONTROL SECTION. 2' HIGH x 6' WIDE STONE WALL ON LEFT.	BRUSH AND TREES IN CHANNEL.
BRIDGE AND PIERS	NONE	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE	
OBSERVATION WELLS	NONE	
WEIRS	NONE	
PIEZOMETERS	NONE	
OTHER	NONE	

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	ESTIMATED 1V ON 3H ± WITH OUTCROP VISIBLE	
SEDIMENTATION	NO OBSERVED OR REPORTED PROBLEMS.	
WATERSHED DESCRIPTION	WOODED UNINHABITED POSTED	

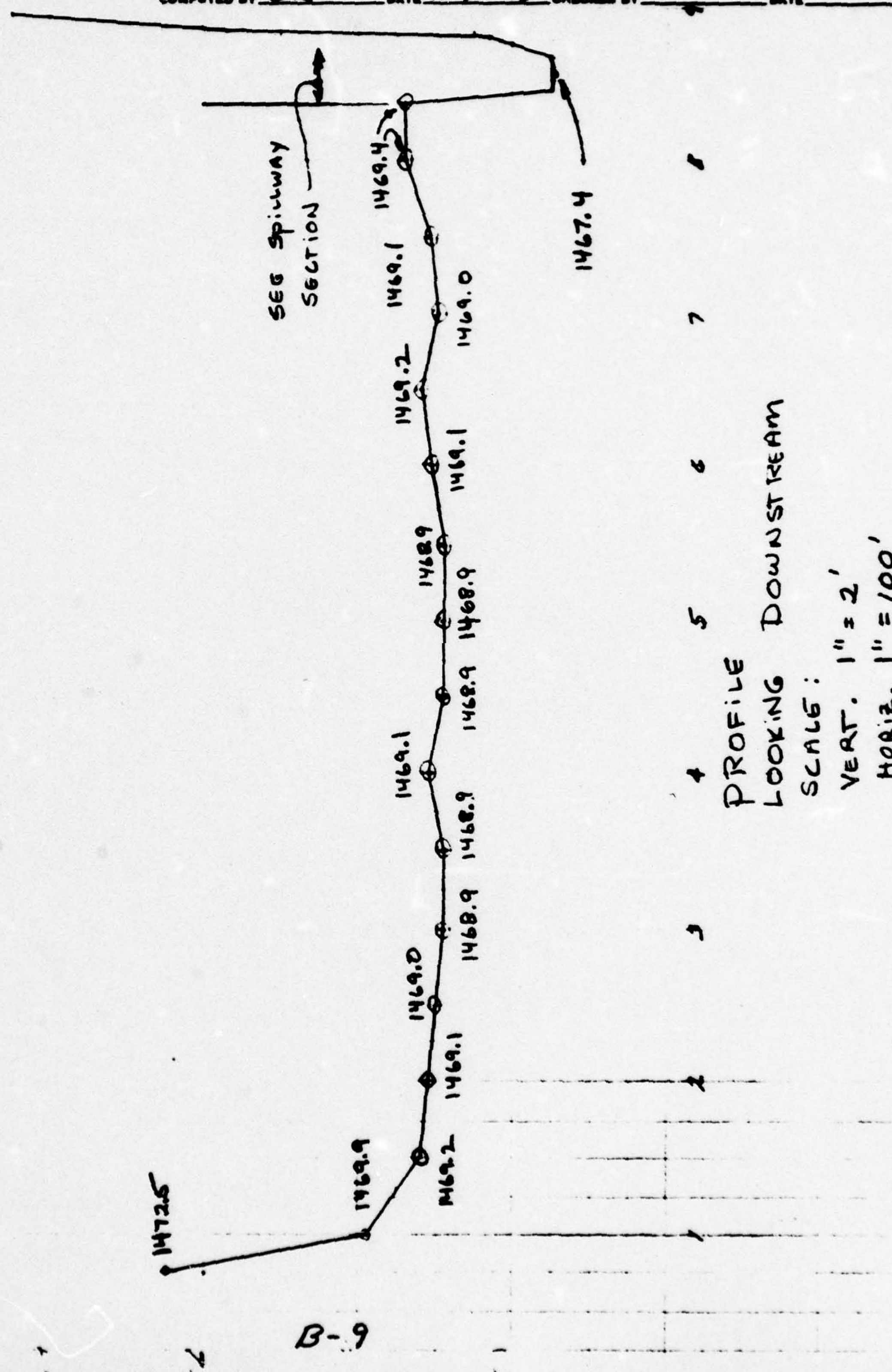
DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: **Obstructions** **Debris** **Other**	SLIGHTLY OVERGROWN, MATURE TREES ON OVERBANK.	
SLOPES	STEEP	
APPROXIMATE NUMBER OF HOMES AND POPULATION	NONE TO OLYPHANT NO. 2 RESERVOIR 0.3 MILE DOWNSTREAM	

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

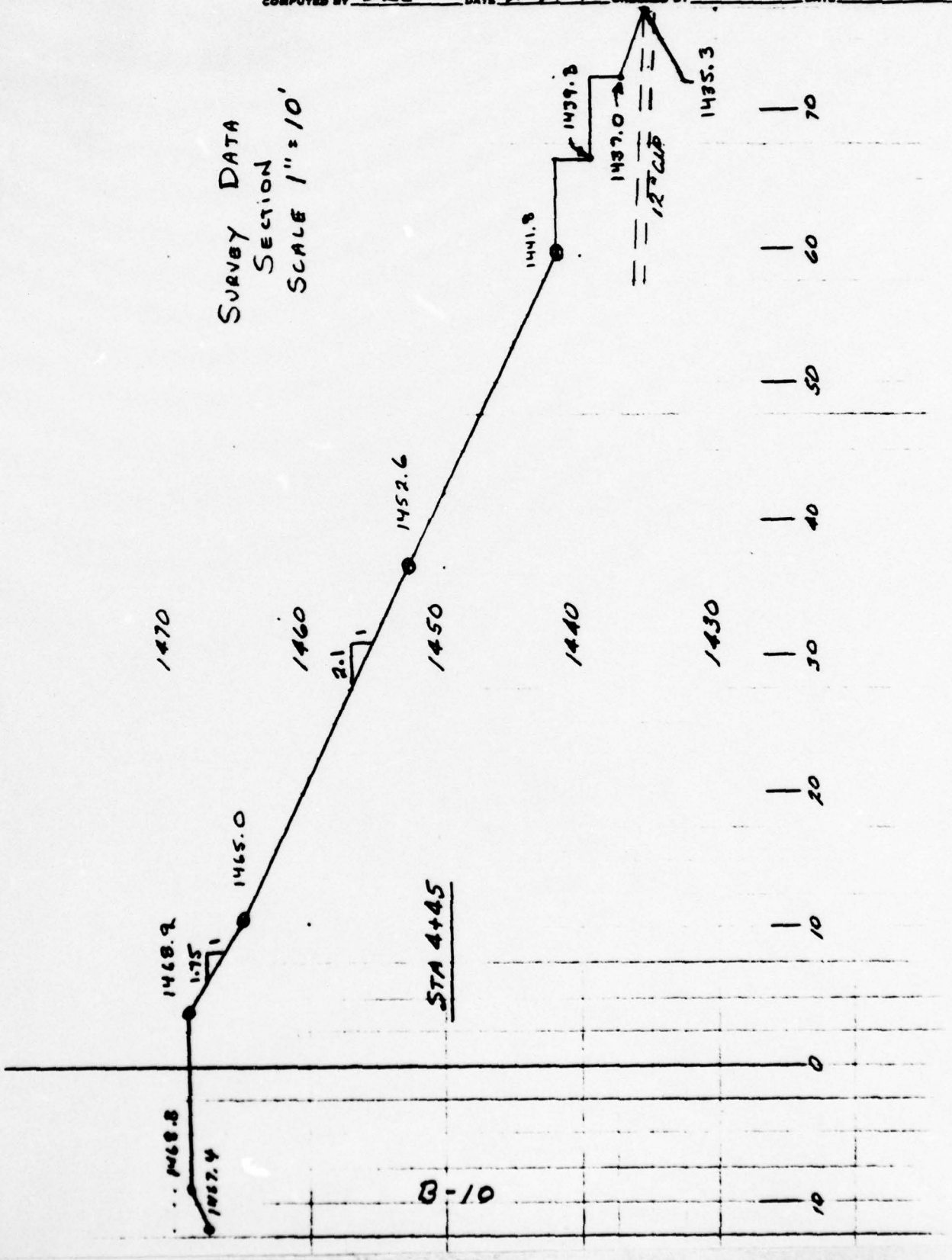
SUBJECT *Olyphant No. 3 Dam* FILE NO. *7832*
Profile - Top of Dam SHEET NO. ____ OF ____ SHEETS
FOR
COMPUTED BY *DRE* DATE *11-20-78* CHECKED BY ____ DATE ____



9919

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT OLYPHANT NO. 3 DAM — FILE NO. 7832
EMBANKMENT SECTION — SHEET NO. ___ OF ___ SHEETS
FOR
COMPUTED BY DRE — DATE 11-12-78 — CHECKED BY ___ — DATE ___

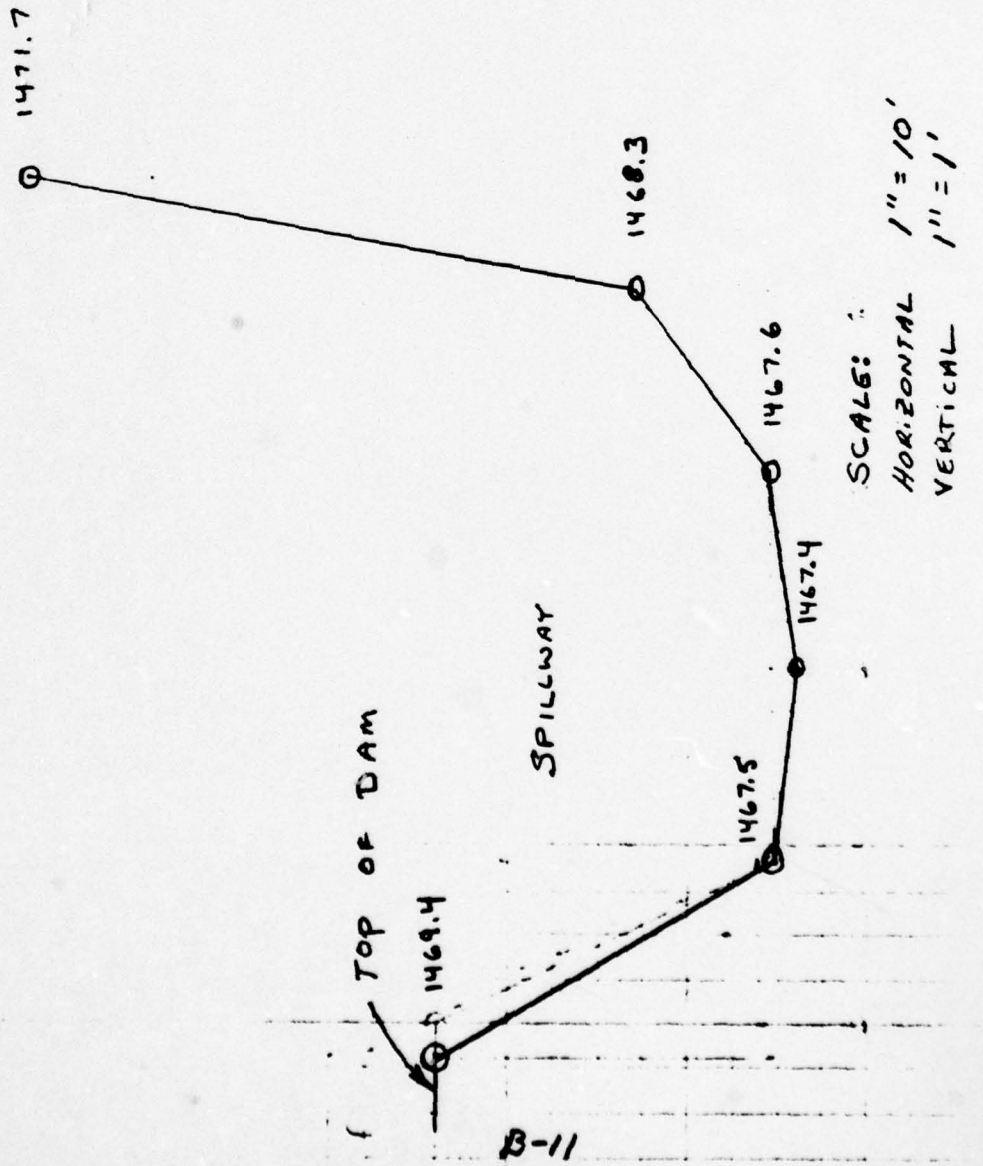


B-10

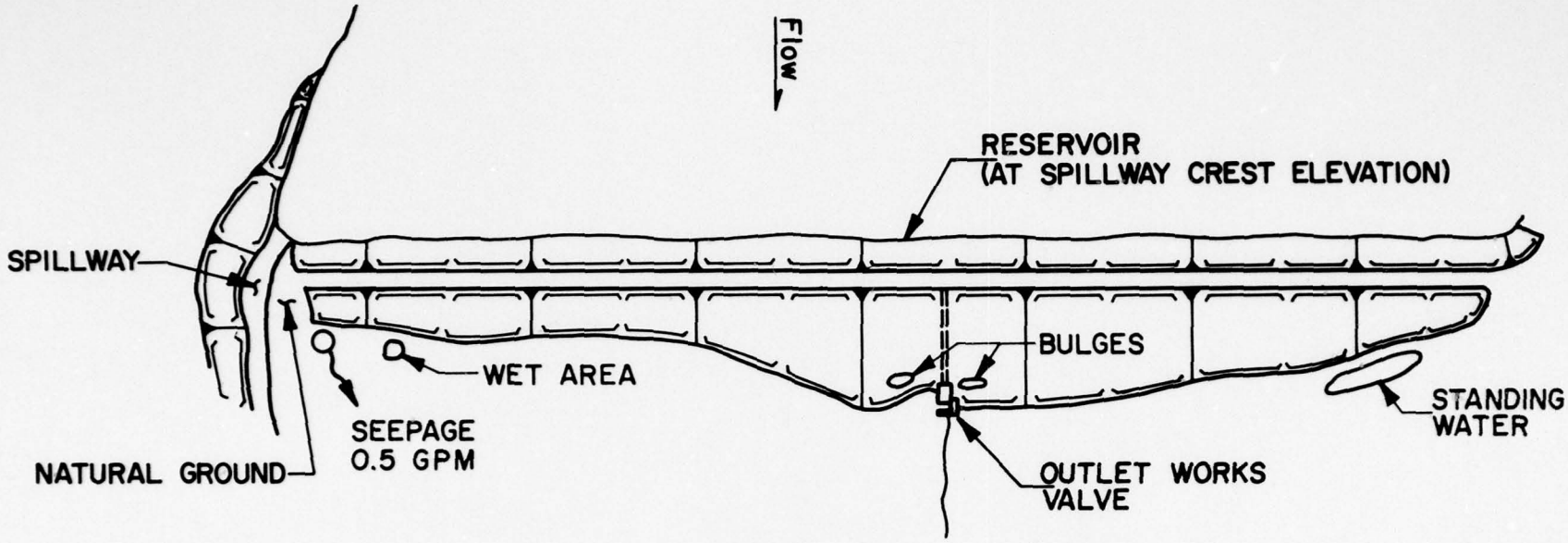
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT Olyphant No. 3 Dam — FILE NO. 7832
Spillway Crest — SHEET NO. ___ OF ___ SHEETS
FOR
COMPUTED BY DRE — DATE 11-20-78 — CHECKED BY ___ — DATE ___

Survey Data
Spillway
Looking Downstream



B-11



NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

RESULTS OF VISUAL INSPECTION

JANUARY 1979

PLATE B-1

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

APPENDIX C

HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

APPENDIX C

SUSQUEHANNA River Basin

Name of Stream: GRASSY ISLAND CREEK

Name of Dam: OLYPHANT NO. 3

NDI ID No.: PA-00381

DER ID No.: 35-03

Latitude: N 41° 28' 20" Longitude: W 75° 31' 45"

Top of Dam (low spot) Elevation: 1468.9

Streambed Elevation: 1433.0 Height of Dam: 37* ft

Reservoir Storage at Top of Dam Elevation: 151 acre-ft

Size Category: SMALL

Hazard Category: HIGH (see Section 5)

Spillway Design Flood: 1/2 PMF TO PMF. USE PMF

* BASED ON DESIGN TOP ELEVATION OF 1470.0

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
NONE				

DOWNSTREAM DAMS

OLYPHANT NO. 2	0.5	74	220	PHASE 1 REPORT PREPARED FY '78
OLYPHANT NO. 1 (DER ID 35-05)	0.7	20	6 (APPROX.)	IGNORED IN ANALYSIS

SUSQUEHANNA River Basin

Name of Stream: GRASSY ISLAND CREEK

Name of Dam: OLYPHANT NO.3

NDI ID No.: PA-00381

DER ID No.: 35-03

Latitude: N 41° 28' Longitude: W 75° 32'

DETERMINATION OF PMF RAINFALL

For Area A

which consists of Subareas A1 of 0.58 sq. mile

Total Drainage Area 0.58 sq. mile

PMF Rainfall Index = 22.15 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone	N/A	N/A
Geographic Adjustment Factor	96%	1.0
Revised Index Rainfall	21.3	N/A

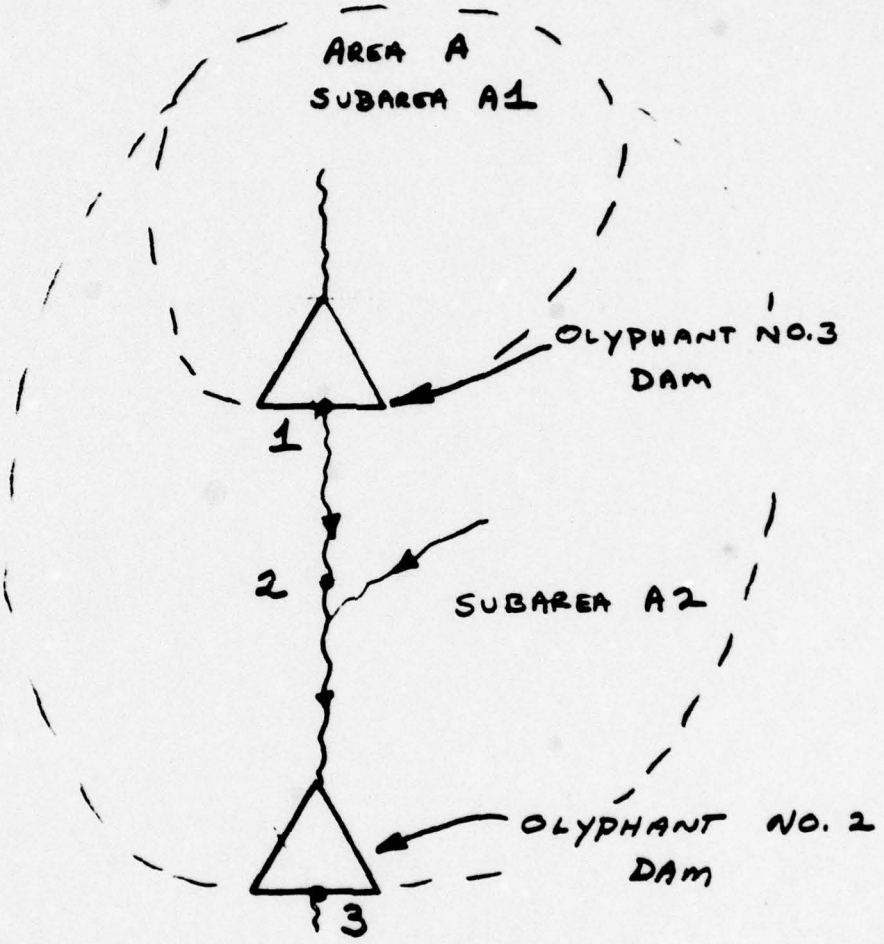
RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	118
12 hours	127
24 hours	136
48 hours	142
72 hours	145
96 hours	N/A

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT OLYPHANT NO. 3 FILE NO.
SHEET NO. OF SHE
FOR
COMPUTED BY DATE CHECKED BY DATE

SKETCH OF SYSTEM



Data for Dam at Outlet of Subarea A1
(see Sketch on Sheet C-4)

Name of Dam: OLYPHANT NO.3 Sheet 1 of 4

Height: 36 (existing)

Spillway Data:	Existing Conditions	Design Conditions
Top of Dam Elevation	1468.9	1470.0
Spillway Crest Elevation	1467.4	1467.4
Spillway Head Available (ft)	1.5	2.6
Type Spillway	EXCAVATED CHANNEL WITH CONTROL SECTION	
"C" Value - Spillway	2.7	2.7
Crest Length - Spillway (ft)	SEE NEXT SHEET	
Spillway Peak Discharge (cfs)	179 ≈ 180	417 ≈ 420
Auxiliary Spillway Crest Elevation	NONE	NONE
Auxiliary Spillway Head Available (ft)	-	-
Type Auxiliary Spillway	-	-
"C" Value - Auxiliary Spillway	-	-
Crest Length - Auxiliary Spillway (ft)	-	-
Auxiliary Spillway Peak Discharge (cfs)	-	-
Combined Spillway Discharge (cfs)	180	420

Spillway Rating Curve:

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1467.4	0	N/A	0
1467.5	1	-	1
1467.6	4	-	4
1468.5	93	-	93
1470.0	420	-	420
1471.7	1654	-	1654

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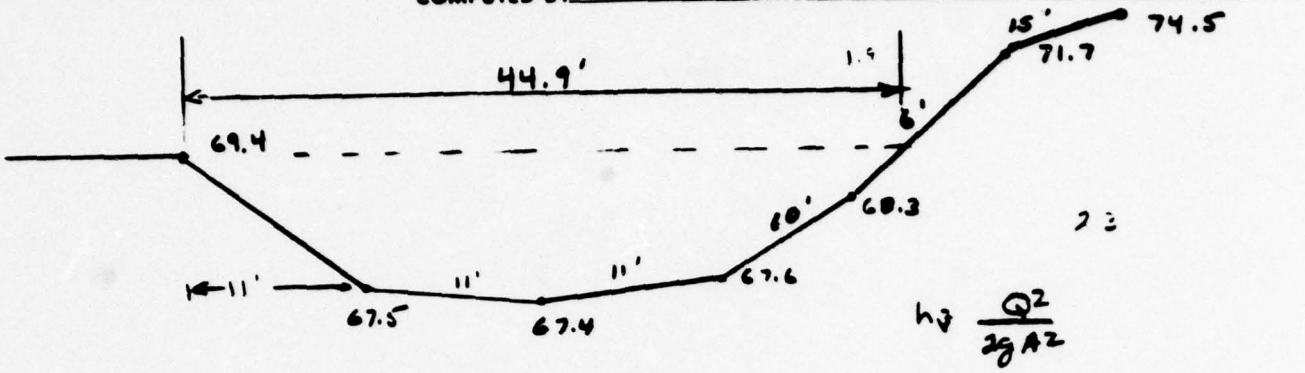
HARRISBURG, PA.

SUBJECT Olyphant No.3 FILE NO.
Spillway Rating Curve SHEET NO. 1A OF 4 SHI
FOR
COMPUTED BY DATE CHECKED BY DATE



W.S ELEV	Topwidth FT	Area FT^2	$Q' = \sqrt{\frac{A^2g}{T}}$ CFS	$Q = \frac{2.7Q'}{3.1}$ CFS	h_v FT	Pool ELEV
1467.4	0	0	0	0	0	1467.4
1467.5	16.5	.825	1.0	.9	.02	1467.5
1467.6	22.6	2.23	4.0	4	.04	1467.6
1468.3	36.6	23.50	107	93	.24	1468.5
1469.4	44.9'	68.3	478	417	.58	1470.0
1471.7	49.0	176.4	1899	1654	1.37	1473.1
1474.5	64.0	334.6	4340	3780	1.98	1476.5

INTERPOLATION NEAR TOP OF DAM ELEV.

ELEV	Q
1468.9	179
1469.0	201
1469.1	223
1469.2	244
1469.3	266
1469.4	287

Data for Dam at Outlet of Subarea A1

Name of Dam: OLYPHANT NO. 3 Sheet 2 of 4

Outlet Works Rating:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1434.3		
Invert of Inlet	1442.0		
Type	12" DIA CIP		
Diameter (ft) = D	1		
Length (ft) = L	180		
Area (sq. ft) = A	.785		
N	.014		
K Entrance	0.5		
K Exit	1.0		
K Friction* $= 29.1_N{}^2L/R^{4/3}$	6.52		
Sum of K	8.02		
$(1/K)^{0.5} = C$	.353		
Maximum Head (ft) = HM	35		
$Q = C\ A\ \sqrt{2g(HM)}$ (cfs)	14		
Q Combined (cfs)	14		

* R = Hydraulic Radius = (Area/Wetted Perimeter) = D/4 for Circular Conduits.

Data for Dam at Outlet of Subarea A1

Name of Dam: OLYPHANT No. 3 Sheet 3 of 4

Storage Data:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1431.7 = ELEVO*	0	0	0	
1467.4 = ELEV1	10.2 = A1	39.6	122 = S1	NORMAL POOL
1469.0	11.2	45.2	139	
1470.0	11.6	49.2	151	DESIGN TOP OF DAM
1480.0 **	16.5			
**				

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at ~~Top of Dam~~ NORMAL POOL is 3 percent of watershed.

Remarks: _____

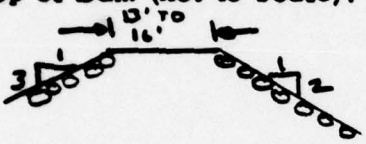
Data for Dam at Outlet of Subarea A1

Name of Dam: OLYPHANT NO. 3 DAM Sheet 4 of 4

Breach Data:

Sketch of Dam Profile (not to scale):

Sketch of Top of Dam (not to scale):



Soil Type from Visual Inspection: SANDY SILT

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 2 fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) $A = L \cdot d$

HMAX = $(4/9\ V^2/C^2)$ = .20 ft., C = 2.7

HMAX + Top of Dam Elev. = 1469.1 = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 20 ft (width of bottom of breach)

Z = 1 (1V on 1H) (side slopes of breach)

ELBM = 1432.0 (bottom of breach elevation, minimum of zero storage elevation)

WSEL = 1467.4 (normal pool elevation)

T FAIL = 12 mins USING Q/H CURVES FOR EACH 25' OF HEIGHT

= 0.2 hrs (time for breach to develop)

SUSQUEHANNA River Basin

Name of Stream: GRASSY ISLAND CREEK

Name of Dam: OLYPHANT NO. 3

NDI ID No.: PA-00381

DER ID No.: 35-03

Latitude: N 41° 28' 20" Longitude: W 75° 31' 45"

Drainage Area: 0.58 sq. mile

Data for Subarea: A1 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: OLYPHANT NO.3

Drainage Area of Subarea: 0.58 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = 1.591 mile s

L_{CA} = Length of Main Watercourse to the centroid = 0.758 mile

From NAB Data: AREA 11 PLATE E

Cp = 0.62

C_T = 1.5

$Tp = C_T \times (L \times L_{CA})^{0.3}$ = 1.59 (hrs)

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 0.9 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

Data for Dam at Outlet of Subarea A2
(see Sketch on Sheet C-4)

Name of Dam: OLYPHANT NO. 2 Sheet 1 of 3

Height: 74 FT (existing)

Spillway Data:	Existing Conditions	Design Conditions
Top of Dam Elevation	1343.2	N/E
Spillway Crest Elevation	1273.2	
Spillway Head Available (ft)	5.1	
Type Spillway	FLAT CREST WEIR	
"C" Value - Spillway	3.2	
Crest Length - Spillway (ft)	33.5	
Spillway Peak Discharge (cfs)	1140	
Auxiliary Spillway Crest Elevation	N/A	
Auxiliary Spillway Head Available (ft)	N/E	
Type Auxiliary Spillway	N/E	
"C" Value - Auxiliary Spillway	N/E	
Crest Length - Auxiliary Spillway (ft)	N/E	
Auxiliary Spillway Peak Discharge (cfs)	N/E	
Combined Spillway Discharge (cfs)	1140	

Spillway Rating Curve: NOT REQUIRED

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

Data for Dam at Outlet of Subarea A2

Name of Dam: OLYPHANT NO.2 Sheet 2 of 3

Outlet Works Rating:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1280.0		
Invert of Inlet	1285.9		
Type	18" CIP		
Diameter (ft) = D			
Length (ft) = L			
Area (sq. ft) = A			
N			
K Entrance			
K Exit			
K Friction* = $29.1_N{}^2L/R^{4/3}$			
Sum of K			
$(1/K)^{0.5}$ = C			
Maximum Head (ft) = HM			
Q = C A $\sqrt{2g(HM)}$ (cfs)			
Q Combined (cfs)	60 FROM PHASE 1 REPORT		

* R = Hydraulic Radius = (Area/Wetted Perimeter) = D/4 for Circular Conduits.

Data for Dam at Outlet of Subarea A2

Name of Dam: OLYPHANT No. 2 Sheet 3 of 3

Storage Data:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1279.1 = ELEVO*	0	0	0	
1343.9 = ELEV1	8.2 = A1	58	177 = S1	NORMAL POOL
1349.0	8.8	72	220	TOP OF DAM
1360.0 **	10.3			
FROM PHASE 1 REPORT				

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Top of Dam is N/A percent of watershed.

Remarks: _____

APPENDIX C

SUMMARY

OLYPHANT NO.2 DAM

OLYPHANT NO.2 DAM →

	A1 Subarea	A2 Subarea	Subarea	Subarea	Total
Drainage Area (sq. mile)	0.58	N/A			
PMF:					
Peak Outflow (cfs)	1664	1654			
Total Runoff (inches)					
Dam at Outlet?	YES	YES			
Is Dam Overtopped?	YES	YES			
Depth of Overtopping (ft)	0.8	0.52			
One-Half PMF:					
Peak Outflow (cfs)	831	798			
Total Runoff (inches)					
Dam at Outlet?	YES	YES			
Is Dam Overtopped?	YES	NO (ASSUMING NO FAILURE)			
Depth of Overtopping (ft)	0.45	—			
Does Dam Fail?	YES	IF UPSTREAM FAILS			
Peak Failure Outflow (cfs)	13,084	NOT COMPUTED			
At time (hrs)	39.75	NOT COMPUTED			
Spillway (percent of PMF)	15	N/A			

DOWNSTREAM SUMMARY

	Peak Water Surface Elevation Before Failure	After Failure	Remarks
Cross Section _____	NOT USED TO DETERMINE		
Cross Section _____	ADEQUACY		
Cross Section _____			
Cross Section _____			
Cross Section _____			

SELECTED COMPUTER OUTPUT

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  21 AUG 78
**********
    1          A1            OLYPHANT NO. 3 DAM
    2          A2        GRASSY ISLAND CREEK
    3          A3          GFCC
    4          B   300       0      15       0       0       0       0       0      -4       0
    5          B1    5
    6          J     1       9       1
    7          J1    1      .8      .6      .5      .4      .3      .2      .1     .05
    8          K     0       1                                       1
    9          K1       RUNOFF INTO OLYPHANT NO. 3 DAM
   10          M     1       1     .58             .58                              1
   11          P           21.3     118     127     136     142     145
   12          T                                                 1.0     .05             .03
   13          U  1.59     .62
   14          X    .9    -.05     2.0
   15          K     1       1                                       1
   16          K1       ROUTE THROUGH OLYPHANT NO. 3 DAM
   17          Y                                       1
   18          Y1    1                                                -1467.4      -1
   19          Y41467.4  1467.5  1467.6  1468.5    1470  1473.1  1476.5
   20          Y5    0      .9       4      93     417    1654    3700
   21          9A  .01    10.2    11.2    16.5
   22          9E1431.7  1467.4    1469    1480
   23          9B1467.4
   24          9D1468.9     2.7     1.5     685
   25          K     1       2                                       1
   26          K1       CROSS SECTION BETWEEN OLYPHANT NO 2 AND NO 3
   27          Y                                       1
   28          Y1    1
   29          Y6  .06     .04     .06    1375    1500    1900    .059
   30          Y7    0    1500     500    1400     590    1380     650    1375     660    1375
   31          Y7  710    1380     750    1400    1100    1500
   32          K     1       3                                       1
   33          K1       ROUTE THROUGH OLYPHANT NO 2 DAM
   34          Y                                       1
   35          Y1    1                                                -1343.9
   36          9A  .01     8.2     8.8    10.3
   37          9E1279.1  1343.9    1349    1360
   38          9B1343.9    30.5     3.2     1.5
   39          9D  1349     3.0     1.5     310
   40          K    99

1                    PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                     RUNOFF HYDROGRAPH AT          1
                     ROUTE HYDROGRAPH TO           1
                     ROUTE HYDROGRAPH TO           2
                     ROUTE HYDROGRAPH TO           3
                     END OF NETWORK
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 1.00	RATIO 2 .80	RATIO 3 .60	RATIO 4 .50	RATIO 5 .40	RATIO 6 .30	RATIO 7 .20	RATIO 8 .10	RATIO 9 .05
HYDROGRAPH AT	1	.58	1	1668.	1334.	1001.	834.	667.	500.	334.	167.	83.
	(	1.50)	(	47.22)(	37.77)(	28.33)(	23.61)(	18.89)(	14.17)(	9.44)(	4.72)(	2.36)
ROUTED TO	1	.58	1	1664.	1330.	997.	831.	664.	497.	330.	148.	67.
	(	1.50)	(	47.11)(	37.67)(	28.23)(	23.53)(	18.81)(	14.08)(	9.35)(	4.19)(	1.89)
ROUTED TO	2	.58	1	1662.	1329.	996.	829.	663.	496.	330.	148.	67.
	(	1.50)	(	47.07)(	37.63)(	28.21)(	23.48)(	18.76)(	14.04)(	9.35)(	4.19)(	1.89)
ROUTED TO	3	.58	1	1654.	1323.	960.	798.	636.	472.	306.	137.	62.
	(	1.50)	(	46.83)(	37.46)(	27.20)(	22.60)(	18.00)(	13.37)(	8.68)(	3.88)(	1.76)

1 SUMMARY OF DAM SAFETY ANALYSIS

OLYPHANT NO. 3 DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1467.40	1467.40	1468.90
STORAGE	125.	125.	141.
OUTFLOW	0.	0.	179.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1469.70	.80	150.	1664.	8.50	41.25	0.00
.80	1469.57	.67	149.	1330.	8.00	41.25	0.00
.60	1469.43	.53	147.	997.	7.25	41.25	0.00
.50	1469.35	.45	146.	831.	6.75	41.25	0.00
.40	1469.26	.36	145.	664.	5.75	41.25	0.00
.30	1469.17	.27	144.	497.	4.75	41.25	0.00
.20	1469.06	.16	143.	330.	3.25	41.25	0.00
.10	1468.76	0.00	140.	148.	0.00	42.00	0.00
.05	1468.24	0.00	134.	67.	0.00	42.25	0.00

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	1662.	1375.9	41.25
.80	1329.	1375.7	41.25
.60	996.	1375.5	41.25
.50	829.	1375.4	41.25
.40	663.	1375.4	41.25
.30	496.	1375.3	41.25
.20	330.	1375.2	41.50
.10	148.	1375.1	42.00
.05	67.	1375.0	42.25

1 SUMMARY OF DAM SAFETY ANALYSIS

OLYPHANT NO. 2 DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1343.90	1343.90	1349.00
STORAGE	184.	184.	227.
OUTFLOW	0.	0.	1124.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1349.32	.32	231.	1654.	2.50	41.50	0.00
.80	1349.25	.25	229.	1323.	1.50	41.50	0.00
.60	1348.49	0.00	222.	960.	0.00	41.75	0.00
.50	1347.96	0.00	218.	798.	0.00	41.75	0.00
.40	1347.39	0.00	213.	636.	0.00	41.75	0.00
.30	1346.76	0.00	207.	472.	0.00	41.75	0.00
.20	1346.04	0.00	201.	306.	0.00	42.00	0.00
.10	1345.15	0.00	194.	137.	0.00	42.75	0.00
.05	1344.64	0.00	190.	62.	0.00	43.25	0.00

```
1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  21 AUG 78
**********************************
    1          A1            OLYPHANT NO. 3 DAM
    2          A2       GRASSY ISLAND CREEK
    3          A3           BFCC
    4          B   300       0      15       0       0       0       0       0      -4       0
    5          B1    5
    6          J     2       1       1
    7          J1   .5
    8          K     0       1                                       1
    9          K1       RUNOFF INTO OLYPHANT NO. 3 DAM
   10          M     1       1     .58             .58                                      1
   11          P            21.3     118     127     136     142     145
   12          T                                                   1.0     .05             .03
   13          W  1.59     .62
   14          X    .9    -.05     2.0
   15          K     1       1                                       1
   16          K1       ROUTE THROUGH OLYPHANT NO. 3 DAM
   17          Y                                       1       1
   18          Y1    1                                                -1467.4     -1
   19          Y41467.4  1467.5  1467.6  1468.5    1470  1473.1  1476.5
   20          Y5    0      .9       4      93     417    1654    3780
   21          $A   .01    10.2    11.2    16.5
   22          $E1431.7  1467.4    1469    1480
   23          $$1467.4
   24          $D1468.9     2.7     1.5     685
   25          $B   20       1    1432      .2  1467.4  1469.1
   26          $B   50       1    1432      .2  1467.4  1469.1
   27          K     1       2                                       1
   28          K1       CROSS SECTION BETWEEN OLYPHANT NO 2 AND NO 3
   29          Y                                       1       1
   30          Y1    1
   31          Y6  .06     .04     .06    1375    1500    1900    .059
   32          Y7    0    1500     500    1400     590    1380     650    1375     660    1375
   33          Y7  710    1380     750    1400    1100    1500
   34          K     1       3                                       1
   35          K1       ROUTE THROUGH OLYPHANT NO 2 DAM
   36          Y                                       1       1
   37          Y1    1                                                -1343.9
   38          $A   .01     8.2     8.8    10.3
   39          $E1279.1  1343.9    1349    1360
   40          $$1343.9    30.5     3.2     1.5
   41          $D 1349     3.0     1.5     310
   42          K    99
1                    PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           1
                                ROUTE HYDROGRAPH TO           2
                                ROUTE HYDROGRAPH TO           3
                                END OF NETWORK
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT	1	.58	1	834.
		(1.50)	(	23.61)(
			2	834.
			(	23.61)(
ROUTED TO	1	.58	1	3749.
		(1.50)	(	106.15)(
			2	834.
			(	23.60)(
ROUTED TO	2	.58	1	3246.
		(1.50)	(	91.93)(
			2	834.
			(	23.61)(
ROUTED TO	3	.58	1	2215.
		(1.50)	(	62.72)(
			2	797.
			(	22.58)(

NOTE:

ONLY PLAN 1

USED

1 SUMMARY OF DAM SAFETY ANALYSIS

OLYPHANT NO. 3 DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1467.40	1467.40	1468.90
STORAGE	125.	125.	141.
OUTFLOW	0.	0.	179.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1469.12	.22	144.	13084.	1.54	39.94	39.75

1 SUMMARY OF DAM SAFETY ANALYSIS

OLYPHANT NO. 2 DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1343.90	1343.90	1349.00
STORAGE	184.	184.	227.
OUTFLOW	0.	0.	1124.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1349.89	.89	235.	2215.	.25	40.25	0.00

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

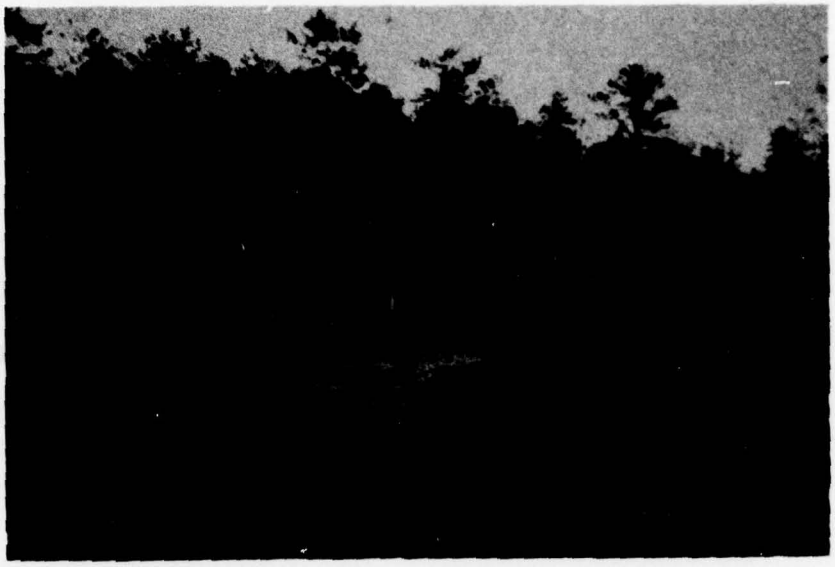
NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

APPENDIX D

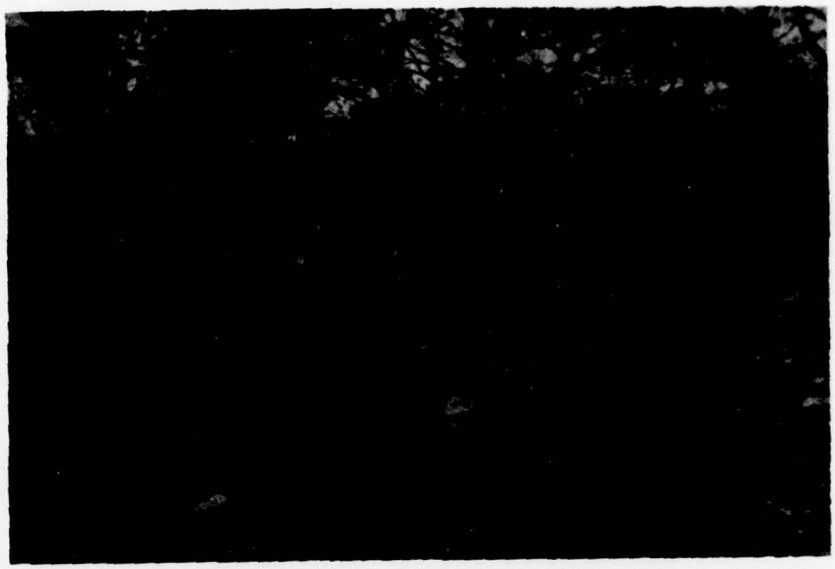
PHOTOGRAPHS

OLYPHANT NO. 3 DAM

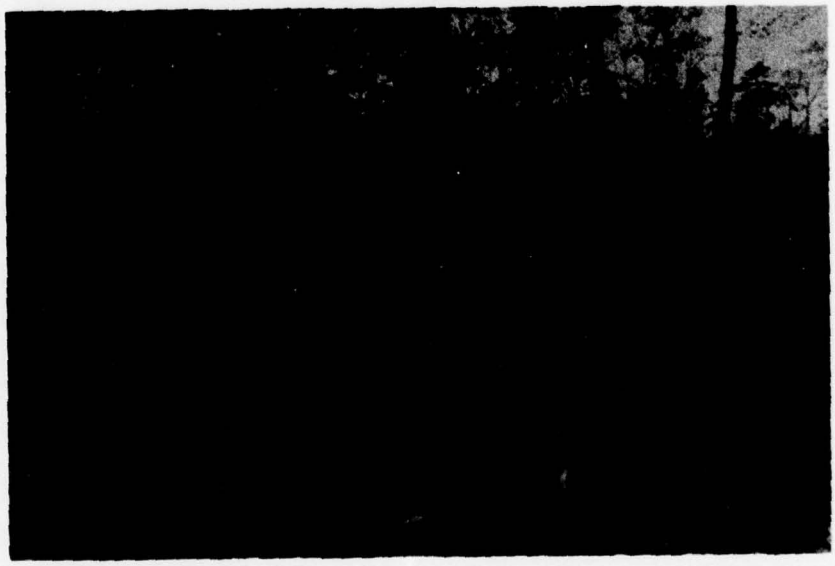


A. Left Abutment.

B. Upstream Slope of Embankment.

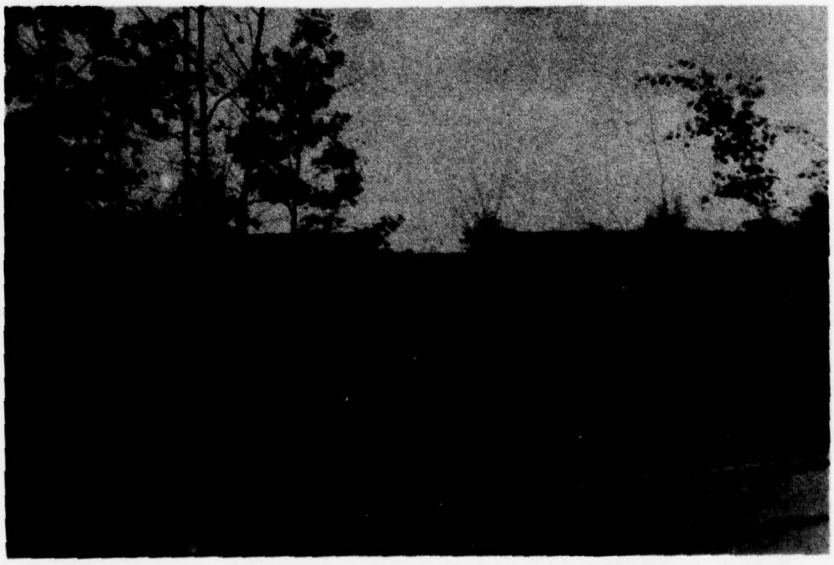


C. Spillway - Looking Downstream.



D. Spillway Outlet Channel.

E. Outlet Works at Downstream Toe of Embankment.



F. Olyphant No. 2 Dam - Downstream of Olyphant No. 3 Dam.

SUSQUEHANNA RIVER BASIN

GRASSY ISLAND CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

OLYPHANT NO. 3 DAM

NDI ID No. PA-00381
DER ID No. 35-03

PENNSYLVANIA GAS AND WATER COMPANY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JANUARY 1979

APPENDIX E

GEOLOGY

OLYPHANT NO. 3 DAM

APPENDIX E

GEOLOGY

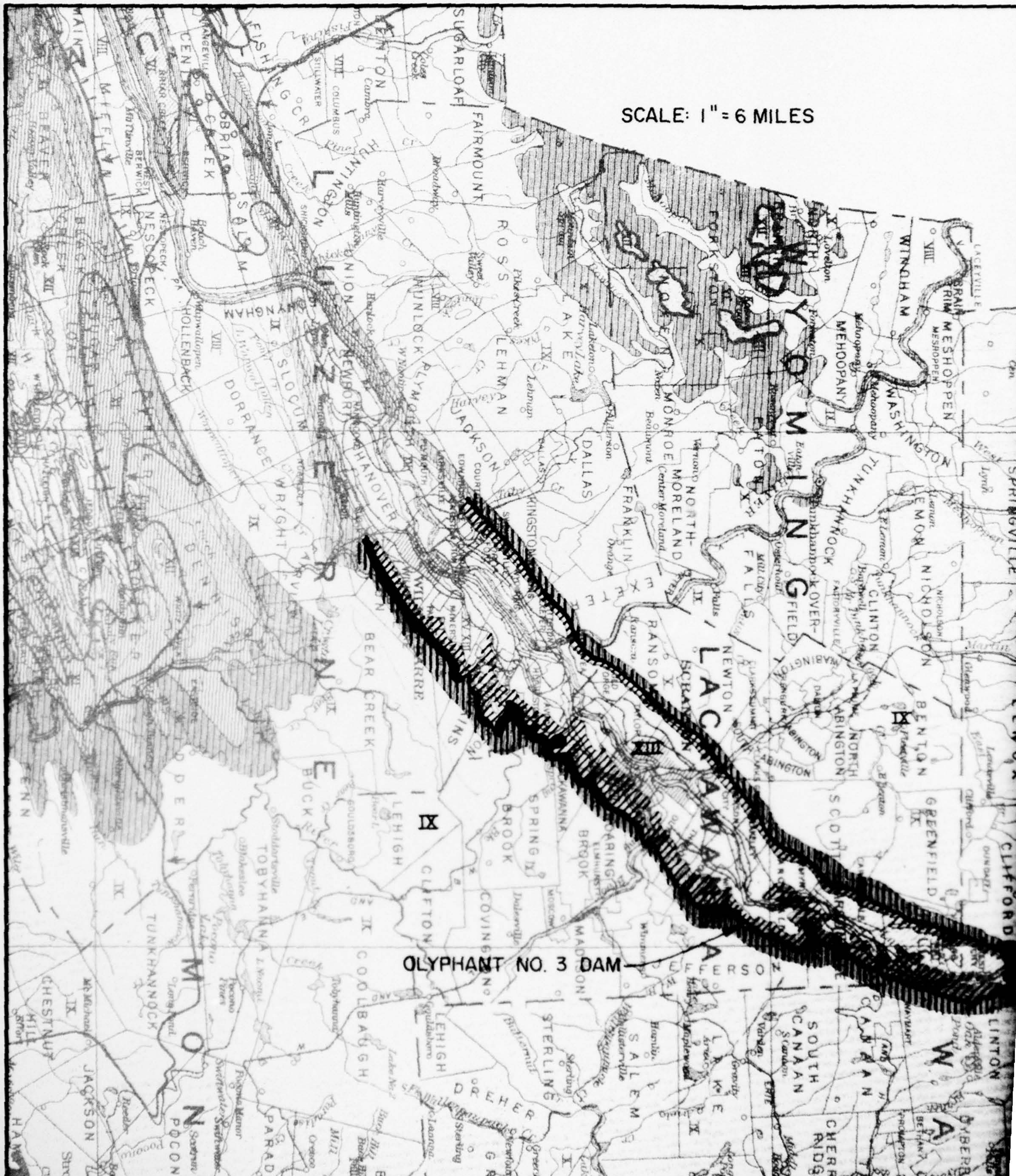
1. General Geology. The damsite and reservoir are located in Lackawanna County. Lackawanna County was completely covered with ice during the last continental glaciation of Pleistocene time. The general direction of ice movement was S 35° - 40° W. Glacial drift covers the entire County, except where subsequent erosion has removed it. Thick deposits of glacial outwash occur in many places along the Lackawanna River, and are 50 to 100 feet thick near Dickson, Scranton, and Moosic.

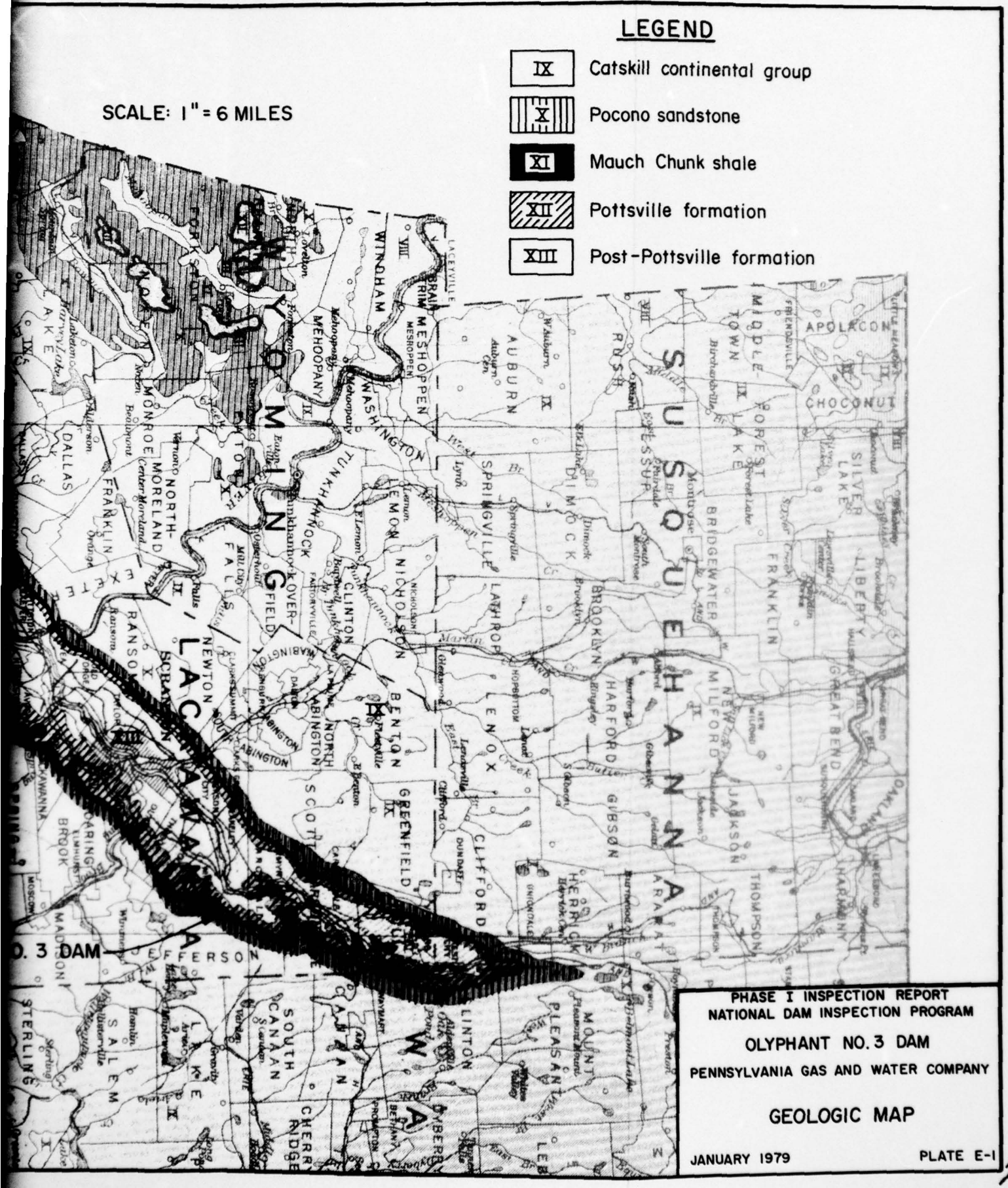
The only important structural feature in Lackawanna County is the Lackawanna Syncline, which traverses the County in a southwesterly direction. The syncline enters the County at the northeast corner as a narrow shallow trough, gradually deepens and broadens toward the southwest, and reaches its maximum development in Luzerne County. The rock formations exposed range from the post-Pottsville formations (youngest) through the Pottsville, Mauch Chunk shale, Pocono sandstone to the Damascus formation of the Catskill group (oldest). The rim rocks, the Pottsville formation and Pocono sandstone, have dips that rarely exceed 10° to 20° and form a rather simple syncline. The core rocks, the post-Pottsville formations, are folded into a series of minor anticlines and synclines which trend about N 70° E. The rocks in the northwestern and southeastern parts of the County, outside of the limits of the Lackawanna Syncline, are generally horizontally stratified.

The Lackawanna River, in general, follows the axis of the Lackawanna Syncline. Southeast of the Lackawanna River, the rise in terrain is quite gradual and the crests of the high mountains are several miles from the Lackawanna River. Streams, such as Roaring Brook, Stafford Meadow Brook, and Spring Brook, have cut deep canyons through the mountains and follow a tortuous course to their confluence with the Lackawanna River near Scranton,

Pennsylvania. Northwest of Lackawanna River, the mountains rise abruptly to a sharp ridge which in most places is somewhat higher than the country to the northwest. Consequently, most of the drainage in this part of the County flows westward by way of Tunkhannock Creek. A few small tributary streams, however, such as Leggetts Creek, flow eastward from this area into Lackawanna River. In the area of interest, the Lackawanna River streambed is founded in post-Pottsville formations. Proceeding uphill from the river, the older Pottsville formation, Mauch Chunk shale, Pocono sandstone, and Catskill continental group are encountered in turn. The tributary streams, in flowing down the mountains, have generally cut through or around the hard sandstone and conglomerate members, and have eroded their streambed into the softer shales and glacial till. The Catskill continental group of rocks underlies the greater part of Lackawanna County.

2. Site Geology. Except for the geologic formations involved, the foundation conditions at Olyphant No. 3 Dam are characteristic of numerous other streams in this section of the Commonwealth The reservoir is located in a natural basin formed by erosion of decomposed shales of the Mauch Chunk formation between the interfaces of the Pocono sandstone and Mauch Chunk formation and the Mauch Chunk and Pottsville formation. The reservoir serves as a collection basin for water flowing down the sandstone hills that rim it and is the headwater source for a branch of Grassy Island Creek which joins the parent stream about 2000 feet below it. At the damsite, the left side of the ravine is covered with hard, gray conglomerate boulders and outcrops of the Pocono formation. This conglomeratic rock, covered with a thick overburden of loam and clay, extends across the valley to about the middle of the creek channel where it rapidly drops off. The remainder of the valley bed and opposite bank are covered by a stiff mixture of yellow clay, sand and gravel containing many boulders. This is either decomposed Mauch Chunk shale or glacial till. Conglomerate rock and coal measures of the Pottsville formation are located about 1000 feet to the right of the dam. Both the embankment and spillway are founded on stiff clay.


SCALE: 1" = 6 MILES
OLYPHANT NO. 3 DAM



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

OLYPHANT NO. 3 DAM

PENNSYLVANIA GAS AND WATER COMPANY

GEOLOGIC MAP

JANUARY 1979 PLATE E-1

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