

LEVEL II

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**DELAWARE RIVER BASIN
SEELEY BROOK, WAYNE COUNTY**

PENNSYLVANIA

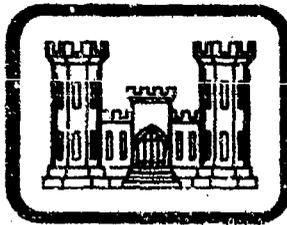
DECKERS DAM

**NDI ID NO. PA-00299
DER ID NO. 64-203**

GERALD DECKER, JR.

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**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



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Prepared by

**Geo-Technical Services, Inc.
CONSULTING ENGINEERS & GEOLOGISTS
851 S. 19th Street
Harrisburg, Pennsylvania 17104**

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

JULY 1981

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SEELEY BROOK, WAYNE COUNTY
PENNSYLVANIA

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DACW31-81-C-0019

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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 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 reasonable 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.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam: Deckers Dam
NDI ID No. PA-00299
DER ID No. 64-203

Size: Small (17 feet high; 343 acre-feet)

Hazard Classification: High

Owner: Gerald Decker, Jr.
Star Route #1, P.O. Box 94
Hawley, Pa. 18428

State Located: Pennsylvania

County Located: Wayne

Stream: Seeley Brook

Date of Inspection: December 12, 1980

↙ Based on visual inspection, the Deckers Dam is judged to be in good condition. Based on size and hazard classification of the dam, the recommended Spillway Design Flood (SDF) is between one-half Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected as the SDF for the Deckers Dam. The dam and dike embankments would not be overtopped by the SDF. Therefore, the spillway capacity of Deckers Dam is rated as adequate.

The unknown condition of the valve, regulating flow through the outlet pipe, precluded assessment of the outlet works. Observations during pressure flow conditions in the outlet pipe are essential to the safety evaluation of the dam. A ready access to an operable valve, or other method of drawing down the reservoir level during emergencies, is required.

Although the dam and appurtenances appear to be in good repair, there is no formal maintenance program for the facility.

There is no warning system and evacuation plan in effect at the present time.

The following investigations and remedial measures are recommended for immediate implementation by the owner:

DECKERS DAM

- (1) Locate and operate the outlet works valve. Observe conditions at the toe of the dam and in the streambed of Seeley Brook during pressure flow through the outlet works. Take appropriate action as necessary.
- (2) Remove trees and brush from the downstream slope and toe of the dam.
- (3) Fill depressions along the left spillway walls.
- (4) Remove the protruding portion of the steel angles from the top of the spillway crest and seed the spillway outlet channel.

In addition, it is recommended that the owner take the following precautionary operational and maintenance measures:

- (1) Develop a detailed emergency operation procedure and warning system to facilitate timely and orderly evacuation of the downstream population if any hazardous conditions at the dam are observed.
- (2) When warnings of a storm of major proportions are given by the National Weather Service, activate the emergency operation and warning system procedures.
- (3) After satisfactory implementation of the remedial measures resulting from the recommended additional investigations, institute a formal inspection and maintenance program for the dam. As presently required by the Bureau of Dams and Waterway Management of PENNSYLVANIA, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspections should be remedied as necessary.

Submitted by:

GEO-TECHNICAL SERVICES, INC.

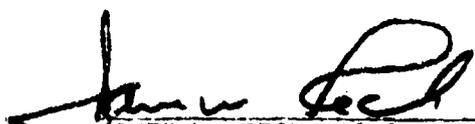

GIDEON YACHIN, P.E.

Date: July 10, 1981



Approved by:

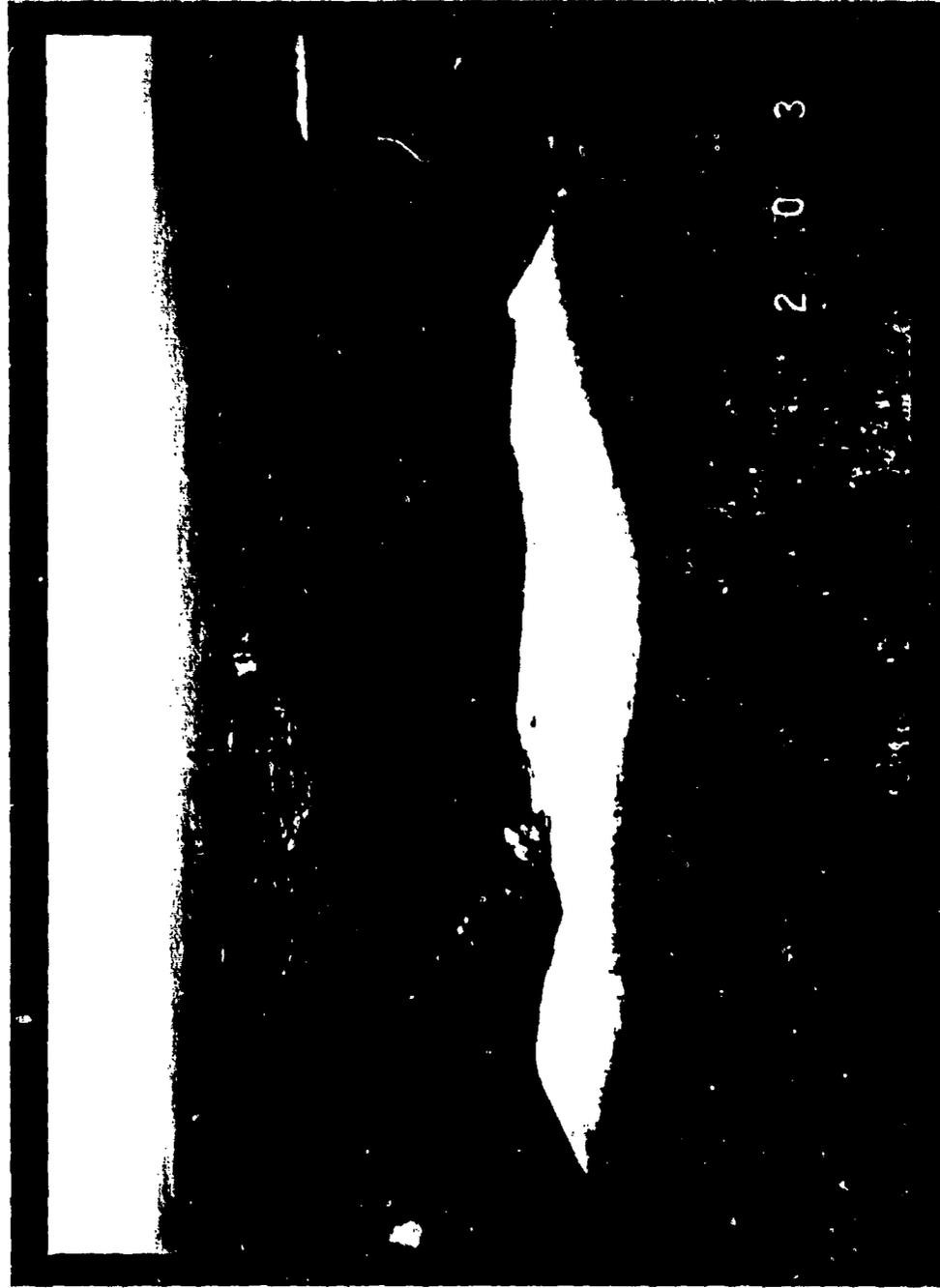
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT,
CORPS OF ENGINEERS


JAMES W. PECK, COLONEL
CORPS OF ENGINEERS
COMMANDER AND DISTRICT ENGINEER

Date: 3 Aug 81

D E C K E R S D A M (P A - 0 0 2 9 9)

(AERIAL VIEW SHOWING MAIN DAM ON RIGHT, DIKE AREA ON LEFT OF PHOTO)



O V E R V I E W

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
DECKERS DAM
NDI# PA-00299, PENNDER# 64-203

SECTION 1
GENERAL INFORMATION

1.1 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.

1.2 Purpose.

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

1.3 Description of Project.

a. Dam and Appurtenances: Deckers Dam is an earthfill embankment, 17 feet high and 550 feet long, including the spillway. An earthfill levee, 8.3-foot high and 500 feet long is located on the north side of the reservoir. The emergency spillway is located near the right abutment and consists of an Ogee type concrete weir with a 4-foot drop into a stilling basin. The crest of the weir is 32 feet long, terminating with vertical concrete endwalls. A service spillway consisting of a 30-inch diameter steel riser pipe and a 24-inch diameter concrete outlet pipe is located near the center of the dam. The crest of the service spillway maintains the normal pool at 1.6 feet below the crest of the emergency spillway. The outlet works consist of an 8-inch diameter steel pipe, extending upstream of the riser pipe and terminating with an 8-inch gate valve at the bottom of the reservoir.

b. Location: Deckers Dam is located on Seeley Brook, approximately 4000 feet upstream of its mouth, in Paupack Township, Wayne County, 1.24 miles northwest of the intersection of State Route 590 with U.S. Route 6 and 1.4 miles southwest of Hawley, Pennsylvania. The dam and reservoir are contained within the Hawley, Pennsylvania 7.5 minute Series USGS Quadrangle Map at Latitude N41°28'02" and Longitude W75°12'34". A Location Map is shown in Exhibit E-1.

c. Size Classification: Small (17 feet high, 343 acre-feet storage capacity at top of dam).

- d. Hazard Classification: High (see paragraph 3.1e).
- e. Ownership: Gerald Decker, Jr., Star Route #1, P.O. Box 94, Hawley, Pennsylvania 18428.
- f. Purpose of Dam: Recreation.
- g. Design and Construction History: Deckers Dam was constructed in 1965 by Lester Soden, Contractor, with technical guidance furnished by the County Soil Conservation Service. On November 3, 1965, the present owner was informed by the Pennsylvania Water and Power Resources Board to remove the unauthorized dam in its entirety since it was constructed in violation of the Pennsylvania Water Obstruction Act (P.L. 555) of June 25, 1913. Inspection of the nearly completed dam in November 1965 revealed that the spillway was inadequate to handle flood flows from the approximately 0.5 square-mile drainage area above the dam. Subsequently, the reservoir was ordered to be drained until a satisfactory spillway was constructed. A spillway was designed by L.F. Burlein, Registered Professional Engineer, of Honesdale, Pennsylvania (see Exhibits E-2 and E-3, Appendix E) to meet the criteria of the Pennsylvania Water and Power Resources Board. The reservoir area was enlarged circa 1966 by removal of the original levee and the construction of a new levee, 2800 feet north of the dam.
- h. Normal Operational Procedure: The pool is maintained at the service spillway crest elevation with excess inflow discharging over the spillway into Seeley Brook. Access to the outlet works valve is by diving, should lowering the reservoir be required.

1.4 Pertinent Data.

a. <u>Drainage Area</u> : (Square miles)	0.53
b. <u>Discharge at Damsite</u> : (cfs)	
Maximum known flood at damsite	Unknown
Outlet Works	
At normal pool, El. 1284.2	5
Spillway capacity, prior to overtopping	1068
c. <u>Elevation</u> : (feet above msl, U.S.G.S. Datum), see Paragraph 3.1a	
Top of Dam	
Design Conditions (top of dam)	1288.8
Existing Conditions (lowest point)	1288.4
Top of Dike	
Design Conditions	Unknown
Existing Conditions	1288.7
Maximum pool	
Design Conditions	1288.8
Existing Conditions	1288.4
Normal pool (at service spillway crest)	1284.2
Upstream invert outlet works	Unknown
Downstream invert outlet works	1271.4
Streambed at toe of dam	1271.4
Maximum tailwater	Unknown

d.	<u>Reservoir Length:(feet)</u>	
	Normal Pool	2800
	Maximum Pool (at top of dam)	2825
e.	<u>Storage: (acre-feet)</u>	
	Normal Pool	151
	Maximum Pool	
	Design Conditions	342
	Existing Conditions	343
f.	<u>Reservoir Surface: (acres)</u>	
	Normal Pool	35
	Maximum Pool	
	Design Conditions	Unknown
	Existing Conditions	48
g.	<u>Dam and North Dike:</u>	
	Type	Earthfill
	Length (feet)	
	Dam (excluding spillway)	518
	Dike	500
	Height (feet)	
	Dam	17
	Dike	8.3
	Top Width (feet)	
	Design Conditions (Dam)	12
	Existing Conditions (Dam) varies from	10 to 12
	Existing Conditions (Dike)	25
	Side Slopes	
	Upstream	
	Design (Dam)	3H:1V
	Existing Conditions (Dam) vary, above and below top of riprap	
	Design (Dike)	3H:1V
	Existing Conditions (Dike)	3H:1V
	Downstream	
	Design (Dam)	3H:1V
	Existing Conditions (Dam) vary from 2.1H:1V to 5.9H:1V	
	Design (Dike)	3H:1V
	Existing Conditions (Dike)	3H:1V
	Zoning	Unknown
	Cut-off - 3 foot deep cutoff trench, 10-foot bottom width along axis of dam, backfilled with compacted clay.	
	Impervious Core - (see cut-off above).	
	Grout Curtain	None
h.	<u>Diversion and Regulating Tunnel:</u>	None
i.	<u>Spillway:</u>	
	Type	
	Service Spillway	30" diameter Riser Pipe
	Emergency Spillway	Ogee Shaped Concrete Weir
	Length of Weir (feet)	32

Spillway (continued)

Crest Elevation

Service Spillway 1284.2

Emergency Spillway 1285.8

Upstream Channel - Riprap faced approach channel

Downstream Channel - Earthen channel below stilling basin.

j. Outlet Works:

Type - 8" diameter inlet (steel pipe), 24" diameter (concrete) outlet pipe.

Length (feet) - 30' (8" diameter) and 72' (24" diameter)

Closure and Regulating Facilities - 8" gate valve at inlet.

Access - by diving.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available: Design data available for review consist of 1966 drawings, inspection reports and photographs obtained from PENNDER files. Design drawings are presented in Appendix E.

b. Design Features:

(1) Embankments: The dam and the dike at the north end of the reservoir were designed as earthfill embankments with 3H:1V (3 Horizontal on 1 Vertical) slopes. The present features of the earthfill embankments vary considerably from the design features, as described in Section 3 of this report.

(2) Appurtenant Structures:

(a) Service Spillway: A 30-inch diameter steel riser pipe with a 24-inch diameter reinforced concrete outlet pipe were installed by Soden Construction Company, as indicated on the sketch in Exhibit E-4. The riser pipe crest was supposed to terminate 4 feet below the crest of the dam (see Note 5, Exhibit E-4, Appendix E). Two anti-seep collars, 18-feet apart, were constructed around the 24-inch diameter pipe between the riser pipe and the toe of the dam.

(b) Emergency Spillway: The spillway was to consist of an Ogee type concrete weir, 30 feet long with vertical endwalls on each end of the spillway. Spillway details are shown in Exhibit E-3, Appendix E.

(c) Outlet Works: The outlet works was to consist of an 3-inch diameter steel pipe, extending upstream from the riser pipe into the reservoir and terminating with an 8-inch diameter gate valve. Constructed outlet works features are indicated on the Contractor's sketch plan in Exhibit E-4, Appendix E.

(d) Specific Design Data and Criteria: The emergency spillway was to have a maximum capacity of 600 cfs for the original 0.4 square-mile drainage area above the dam.

2.2 Construction Records.

There are no construction records available other than a sketch provided by the contractor, shown in Exhibit E-4, Appendix E. Inspection of the dam between October 10 and November 3, 1965 revealed that the nearly completed dam was constructed without a permit, which was in violation of

the Pennsylvania Stream Obstruction Act (P.L. 555) of June 25, 1913. Subsequently, the partially impounded reservoir was drained by order of the Pennsylvania Water and Power Resources Board. Tree stumps were removed from the reservoir area and an emergency spillway, capable of passing 600 cfs, was constructed. Between 1966 and 1973, a new dike was constructed approximately 600 feet north of the original dike, shown in Exhibit E-2, Appendix E.

2.3 Operational Records.

There are no operational records available, other than the operation between November 1965 and the construction of the emergency spillway in the Fall of 1966.

2.4 Other Investigations.

In addition to the initial inspection of the nearly completed dam, conducted in the Fall of 1965, the dam was inspected in January 1966. The purpose of the latter inspection was to verify compliance with the State order to drain the reservoir.

2.5 Evaluation.

a. Although "as-built" plans for Deckers Dam are not available, data obtained from PENNDER files provide information relative to the operational features of the service spillway and outlet works, as well as the chronology of construction activities.

b. Adequacy: The available data are limited and the assessment must be based primarily on the visual inspection and the hydrologic and hydraulic analysis, presented in Section 5.

c. Validity: As-built embankment conditions vary from the original design plans. There is no reason to question the validity of the other available data.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General: The overall appearance of the dam and its appurtenant structures is good. The locations of observed deficiencies are shown on the sketch plan presented in Exhibit A-1, Appendix A. The profile and typical sections of the dam are presented in Exhibits A-2 and A-3 and are based on field survey made on the day of inspection. The survey datum for this inspection was based on interpolation of U.S.G.S. contour lines. The elevations shown on the design drawings are based on a different datum than that used in the survey. Therefore, to convert the elevations shown on the appended design drawings to the elevations used in this report, it is necessary to add 7.8 feet to the elevations shown on the appended design drawings. On the inspection date (12/12/1980), the level of the reservoir was at the crest of the service spillway (elevation 1284.2), 1.6 feet lower than the crest of the emergency spillway. Deficiencies observed during the field inspection are described below, and are illustrated in Exhibit A-1, Appendix A. Visible features of the dam are shown on photographs presented in Appendix C.

b. Embankments:

(1) Earthfill Dam: Observations made during the inspection indicate that the earth embankment of the main dam appears to be in good condition. The visible upstream slope is protected with riprap, extending above the normal pool elevation to approximately two feet above the crest of the emergency spillway (see photographs 1 and 3, Appendix C). The top of the riprap coincides with a break in slope. The visible riprap protected slope varies from 4.3H:1V (4.3 Horizontal on 1 Vertical) at the center of the dam to 3.2H:1V, midway between the outlet works and the left abutment. Above the top of the riprap, the slope varies from 2.8H:1V, immediately to the right of the outlet works, to 4.7H:1V near the left spillway endwall. The downstream slope varies from 2.1H:1V at the maximum embankment section near the center of the dam to 5.9H:1V near the right abutment. The top width of the dam crest is 10 feet, widening to 12 feet near the right abutment. The crest of the dam at the junction with the spillway endwall settled by 4 to 6 inches, within a distance of 6 to 12 inches from the endwall (see Exhibit A-1, Appendix A). The left half of the crest has a slightly curved horizontal alignment and the top of dam elevations vary, as shown in Exhibits A-1 and A-2, respectively. The lowest point on top of the dam is at elevation 1288.4, which is 0.4-foot lower than the design elevation for the top of the dam. A few small birch trees, approximately 4-inch in diameter, were observed on the lower part of the downstream slope, between the spillway and the outlet works (see Exhibit A-1, Appendix A, and photographs 1 and 2, Appendix C). There was no visible seepage along the toe of the dam. Natural springs,

discharging between 1 to 2 GPM (Gallons Per Minute), are located approximately 50 feet downstream of the dam, emanating from a marshy area.

(2) Earthfill Dike: The dike on the north end of the reservoir is 8.3 feet high and 25 feet wide at the crest with 3H:1V slopes. The crest serves as the access road to the owner's residence, located on the east shore of the reservoir (see photograph 7, Appendix C and Overview of Deckers Dam). The top of the dike is at elevation 1288.7, or 0.3-foot higher than the lowest dam crest elevation. The present location of the dike is 600 feet north of the design location shown in Exhibit E-2. The dike was constructed between 1966 and 1973, as evidenced by the 1973 revision of the USGS Quadrangle Map, shown in Exhibit E-1.

c. Appurtenant Structures:

(1) Service Spillway: The service spillway is located near the center of the dam and consists of a 30-inch diameter steel riser pipe, equipped with trashrack. The crest of the service spillway is at normal pool (El. 1284.2), or 4.2 feet below the lowest crest elevation on the dam. Overflow over the spillway crest is conveyed into Seeley Brook through a 24-inch diameter RCP (Reinforced Concrete Pipe) that also serves the outlet works. A sketch provided by the Contractor (Lester Soden), showing the service spillway and outlet works, is presented in Exhibit E-4, Appendix E. The actual distance between the riser pipe and the 24-inch diameter RCP outlet is approximately 30 feet longer than the distance indicated in Exhibit E-4.

(2) Emergency Spillway: The emergency spillway is located near the right abutment and includes an Ogee type concrete weir with a stilling basin. The 32-foot long weir terminates with vertical endwalls that retain the embankment, on each side of the spillway (see Exhibit E-3, Appendix E and photographs 1, 3, and 4, Appendix C). The stilling basin consists of a 9-inch thick concrete slab, beginning at the toe of the weir, 4 feet below the spillway crest and terminating with a 9-inch high concrete sill, 13 feet downstream of the weir's toe. The approach channel is 32-feet wide with riprap lined bottom, extending from the upstream face of the weir into the reservoir and having an adverse slope of approximately 12% (see Exhibit A-3, Appendix A and photographs 1 and 3, Appendix C). Five 4-inch structural steel angles are embedded in the spillway crest (see photograph 4, Appendix C). The spillway earth lined outlet channel has a trapezoidal cross section with an average bottom width of 30 feet, terminating approximately 60 feet downstream of the stilling basin. The end of the outlet channel is approximately 8 feet above the streambed and 230 feet west of Seeley Brook.

(3) Outlet Works: The outlet of the 24-inch diameter RCP (Reinforced Concrete Pipe) appears to be in good condition. The pipe terminates with an 8-foot long and 1.5-foot high dry masonry wall. The invert of the pipe outlet is at the streambed level (see photograph 6, Appendix C). The condition at the inlet, could not be verified during the field inspection. The 8-inch diameter gate valve, reported to exist at the outlet

works inlet was closed and inaccessible for inspection. A schematic diagram showing the outlet works features is presented in Exhibit E-4, Appendix E.

d. Reservoir Area: The watershed is predominantly wooded. The reservoir is located at the eastern part of the watershed, with the upstream dike forming the upper end of the pool at the northern limit of the watershed. A swamp is located west of the upper end of the reservoir occupying approximately 20 percent of the drainage area. The watershed rises from the normal pool (elevation 1284.2) to the maximum elevation 1480, some 1800 feet southwest from the right abutment of the dam. The watershed is generally flat to moderately sloped. The southwestern part of the watershed is characterized by steeper slopes, reaching 16 percent above the right abutment of the dam. With the exception of the owner's residence and two auxiliary structures located on the east shore of the reservoir, there are no other buildings within the watershed. The top of bank along the first 300-foot of shoreline, upstream of the left abutment of the dam, is 0.9 feet lower than the lowest elevation on the top of the dam. Should the pool level reach the level of the natural bank, overflow from the reservoir will bypass the left abutment of the dam into Seeley Brook. Watershed limits are shown in Exhibit E-1, Appendix E. Geologic features of the area are described in Appendix F.

e. Downstream Channel: The average slope of Seeley Brook, downstream of the dam is about 2.6 percent. Approximately 1800 feet downstream of Deckers Dam, the stream discharges into House Pond (see Exhibit E-1, Appendix E). House Pond Dam (PA-01106) is located immediately upstream of State RTE 590 and approximately 800 feet above the mouth of Seeley Brook. The total drainage area above the House Pond Dam is 0.94 square mile and the storage capacity of House Pond at normal pool (elevation 1223.9) is 27.6 acre-feet. House Pond Dam is an earthfill embankment, 12.6 feet high and 490 feet long, including spillway. The spillway is a sharp crested concrete weir, 24 feet long with a 12-inch wide concrete pier in the middle of the weir. House Pond is maintained at normal pool elevation with excess flow discharging over the spillway and through a culvert under State RTE 590 into Seeley Brook (see photographs 8 and 9, Appendix C). Several residences are located above the shoreline of House Pond. The basement elevation of the lowest residence is 2.5 feet above the top elevation of the House Pond Dam. A mobile home court is located in the flood plain, on the left bank of Seeley Brook, approximately 200 feet downstream of House Pond Dam (see photograph 10, Appendix C). The storage capacity at the normal pool level of the Deckers Dam reservoir is 150 acre-feet and that between the normal pool and the crest elevation of House Pond Dam is 18.3 acre-feet. Consequently, failure of Deckers Dam may result in failure of House Pond Dam by overtopping. Should House Pond Dam fail when the dwellings are occupied, more than a few lives can be lost. Therefore, a high hazard classification is warranted for Deckers Dam.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operating Procedures.

The reservoir is maintained at normal pool level with excess inflow discharging over the service spillway into Seeley Brook.

4.2 Maintenance of Dam.

The appearance of the dam indicates that it is well maintained. Recent removal of trees from the downstream slope was evidenced by fresh slope grading and hay cover. There was no indication of seepage along the downstream slope resulting from the tree removal.

4.3 Maintenance of Operating Facilities.

The operable condition of the 8-inch diameter gate valve, reported to control the flow through the outlet works, could not be verified on the day of the inspection. The normal operating procedure, described in paragraph 4.1, does not require operating the gate valve. The valve should be operated at least once every year to insure that it is in operable condition, should the reservoir level require lowering in emergencies.

4.4 Warning System in Effect.

There is no emergency operation and warning system in effect at the present time.

4.5 Evaluation.

Although the dam is well maintained, verification of the operational condition of the outlet works is essential to the dam safety evaluation. This includes observation of conditions at the toe of the dam when the 24-inch diameter outlet pipe is subjected to pressure flow. Since the normal operating procedure of the reservoir does not require operating the outlet works, the operation of the gate valve should be included in the maintenance program for the dam. Institution of a surveillance program for the dam is necessary to detect any adverse conditions to its safety. A warning system and a formal plan to evacuate downstream population should be prepared and activated if adverse conditions develop at the dam.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 Design Data.

The 1965 design criteria for the emergency spillway was 600 cfs. To obtain this capacity for the design head and spillway length shown in Appendix E, it appears that a spillway discharge coefficient of 3.61 was adopted for spillway design. Hydraulic analysis presented in Appendix D employed discharge coefficients based on the ratio of spillway height to the head over its crest. The derived spillway discharge coefficients vary between 2.9 and 3.7. The actual length of the spillway crest is 32 feet, or 2 feet longer than indicated on the design drawing (Exhibit E-3, Appendix E). The drainage area above the dam is 0.54 square mile, or 0.14 square mile larger than previously reported (see also paragraph 2.1.b.2(d)). The increase in drainage area is attributed to the construction of a new dike, described in paragraph 2.2.

5.2 Experience Data.

The probable flood of record in Seeley Brook is the May 1942 flood, where overtopping of House Pond Dam, located downstream of Deckers Dam, was reported by its present owner. No records are available on the maximum stage attained in the Deckers Dam reservoir since the construction of the dam in 1965.

5.3 Visual Observations.

Based on the visual inspection and field survey, described in Section 3 of this report, the observations relevant to hydrology and hydraulics are evaluated below:

a. Dam: Irregularities in the top of dam elevation are presented in Exhibit A-2, Appendix A. The lowest point on top of the dam is at elevation 1288.4, or 0.4 foot below the design elevation for the top of the dam.

b. Dike: The low point on the crest of the dike is at elevation 1288.7, or 0.3-foot above the lowest point on the crest of the dam. The dike is located in a topographic saddle on the north end of the reservoir and at the drainage divide of Middle Creek, a tributary of the Lackawaxen River (see Exhibit E-1, Appendix E). Discharge over the dike will flow into an unnamed tributary of Middle Creek, in a northeasterly direction, into Middle Creek. Should the dike fail, a single dwelling along the left bank of Middle Creek, 4500 feet downstream of the dike, would be affected and a few lives may be lost.

c. Spillways: Prior to overtopping the dam and dike, discharges from the reservoir are through the service spillway, emergency spillway and a natural depression on the left bank of the reservoir into Seeley Brook. The computed total discharge capacity prior to overtopping is 1068 cfs (cubic feet per second).

d. Reservoir Area: There are no visible indications to suggest drastic changes in the prevailing land use within the watershed which would significantly alter the hydrologic and hydraulic analysis summarized in paragraph 5.5.

e. Downstream Conditions: Spillway discharges are not affected by tailwater condition, prior to overtopping of the dam. Because overtopping of the dike diverts water over the drainage divide, only the discharges over the dam affect downstream conditions in Seeley Brook. The normal pool level of House Pond, located some 1800 feet downstream of Deckers Dam, is at the spillway crest of House Pond Dam. The storage capacity of House Pond Dam, between the normal and maximum pool levels, is only a fraction of the storage capacity in Deckers reservoir. Consequently, failure of Deckers Dam would overtop House Pond Dam. A mobile home park, containing many dwelling units, is located some 200 feet downstream of House Pond Dam. Should failure of Deckers Dam result in failure of House Pond Dam, more than a few lives can be lost and significant damage incurred at the mobile home park. Therefore, the high hazard classification for Deckers Dam is warranted.

5.4 Method of Analysis.

Hydrologic and hydraulic evaluation was made in accordance with the procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, Phase I Safety Inspection of Dams. The analysis has been performed utilizing the HEC-1DB program developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California. A brief description of program capabilities as well as the input and output data used specifically for this analysis, is presented in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF): According to criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (small) and hazard potential (high) of the Deckers Dam is between the one-half Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected as the SDF for the Deckers Dam.

b. Results of Analysis: Pertinent results are tabulated in Appendix D. The analysis reveals that the 1/2 PMF (754 cfs) will pass through the combination of the emergency spillway and the natural low bank of the reservoir without overtopping the dam or dike embankments.

c. Spillway Adequacy: The combined discharges can pass the 0.5 PMF without overtopping the embankments and is rated as adequate.

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations.

The visual inspection of Deckers Dam is described in Section 3. Observations that are relevant to structural stability of the dam and the appurtenant structures are evaluated below:

a. Embankments: The main dam and the dike appear to be in good conditions. There are no indications to suggest unstable conditions of the main dam and dike embankments.

b. Spillway: The 24-inch diameter RCP at the outlet of the service spillway discharges directly into the streambed of Seeley Brook. Hydraulic analysis indicates that the service spillway exit velocities may reach 20 feet per second (see Appendix D). Due to the recent grading in Seeley Brook channel, immediately downstream of the dam, there was no evidence of streambed or bank erosion at the toe of the dam. However, it is judged that the present earthen channel of Seeley Brook will not withstand the computed service spillway exit velocities without being severely eroded. Erosion of the streambed and banks of Seeley Brook at the toe of the dam may result in undermining the toe of the outlet works endwall as well as the toe of the dam and affect the stability of the embankment. Consequently, consideration should be given to protect the outlet channel against erosion.

Although the emergency spillway outlet channel is an unlined earth channel, the velocity range downstream of the stilling basin is between 3 to 5 feet per second. Such velocities can be sustained by grassed waterways and insure an erosion free spillway channel. Therefore, consideration should be given to develop an erosion resistant grass stand in the presently earth lined outlet channel. Severe erosion in the outlet channel can undermine the downstream toe of the dam.

c. Outlet Works: The access to the gate valve is by diving. On the day of the inspection, the valve was closed and the reservoir was at normal pool. The operable condition of the valve and the conditions at the toe of the dam during pressure flow in the conduit could not be verified. Observations during pressure flow conditions in the outlet works are essential to the safety evaluation of the dam.

6.2 Design and Construction Data.

Available design and construction data are inadequate to assess the present stability of the dam; thus, the evaluation is predominantly based on the visual inspection.

6.3 Past Performance.

The available data do not indicate any previous occurrences of structural problems in the dam, dike and appurtenant structures.

6.4 Seismic Stability.

The dam is located in Seismic Zone I and may be subject to minor earthquake induced dynamic forces. As the dam and dike appear to be stable under static loading conditions, it is judged that both structures are able to withstand minor earthquake loadings in this Seismic Zone.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety:

(1) Based on visual inspection, the Deckers Dam is judged to be in good condition. Based on size and hazard classification of the dam, the recommended Spillway Design Flood (SDF) is between one-half Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected as the SDF for the Deckers Dam. The dam and dike embankments would not be overtopped by the SDF. Therefore, the spillway capacity of Deckers Dam is rated as adequate.

(2) The unknown condition of the valve, regulating flow through the outlet pipe, precluded assessment of the outlet works. Observations during pressure flow conditions in the outlet pipe are essential to the safety evaluation of the dam. A ready access to an operable valve or other method of drawing down the reservoir level during emergencies is required.

(3) A summary of the features and observed deficiencies is listed below:

<u>Feature and Location</u>	<u>Observed Deficiencies</u>
Downstream slope of dam, right half.	Scattered small trees on the lower part of the slope.
Crest of dam, near spillway endwall.	4 to 6 inch embankment settlement near contact with wall.
Emergency Spillway crest.	Five 4-inch structural steel angles are embedded in the crest. These protrusions may trap debris during floods and obstruct spillway flow.

(4) Although the dam and appurtenances appear to be in good repair, there is no formal maintenance program for the facility.

(5) There is no warning system and evacuation plan in effect at the present time.

b. Adequacy of Information: The data collected from previously

cited dam inspection reports, past performance, visual inspection and computations performed as part of this study are sufficient for Phase I dam safety assessment.

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 will be necessary.

7.2 Recommendations and Remedial Measures.

a. The following investigations and remedial measures are recommended for immediate implementation by the owner:

(1) Locate and operate the outlet works valve. Observe conditions at the toe of the dam and in the streambed of Seeley Brook during pressure flow through the outlet works. Take appropriate action as necessary.

(2) Remove trees and brush from the downstream slope and toe of the dam.

(3) Fill settlement depressions along the left spillway wall.

(4) Remove the protruding portion of the steel angles from the top of the spillway crest and seed the spillway outlet channel.

b. In addition, it is recommended that the owner take the following precautionary operation and maintenance measures:

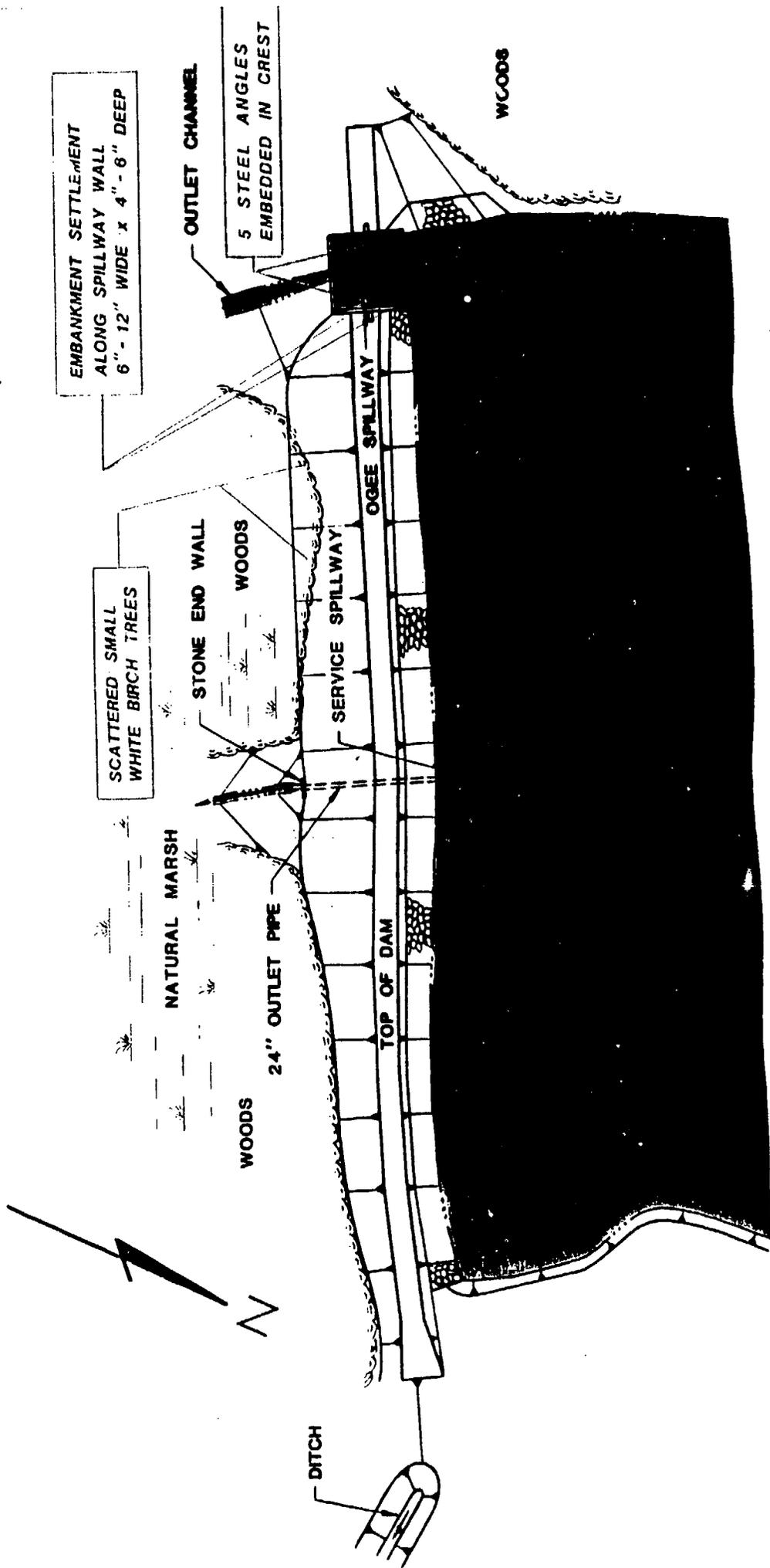
(1) Develop a detailed emergency operation procedure and warning system to facilitate timely and orderly evacuation of the downstream population if any hazardous conditions at the dam are observed.

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

(3) After satisfactory implementation of the remedial measures resulting from the recommended additional investigations, institute a formal inspection and maintenance program for the dam. As presently required by the Bureau of Dams and Waterway Management of PENNDA, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspections should be remedied as necessary.

APPENDIX A

VISUAL INSPECTION - CHECKLIST AND FIELD SKETCHES



EMBANKMENT SETTLEMENT
ALONG SPILLWAY WALL
6" - 12" WIDE x 4" - 6" DEEP

SCATTERED SMALL
WHITE BIRCH TREES

NATURAL MARSH

STONE END WALL

WOODS

WOODS

24" OUTLET PIPE

DITCH

TOP OF DAM

SERVICE SPILLWAY

OGEE SPILLWAY

OUTLET CHANNEL

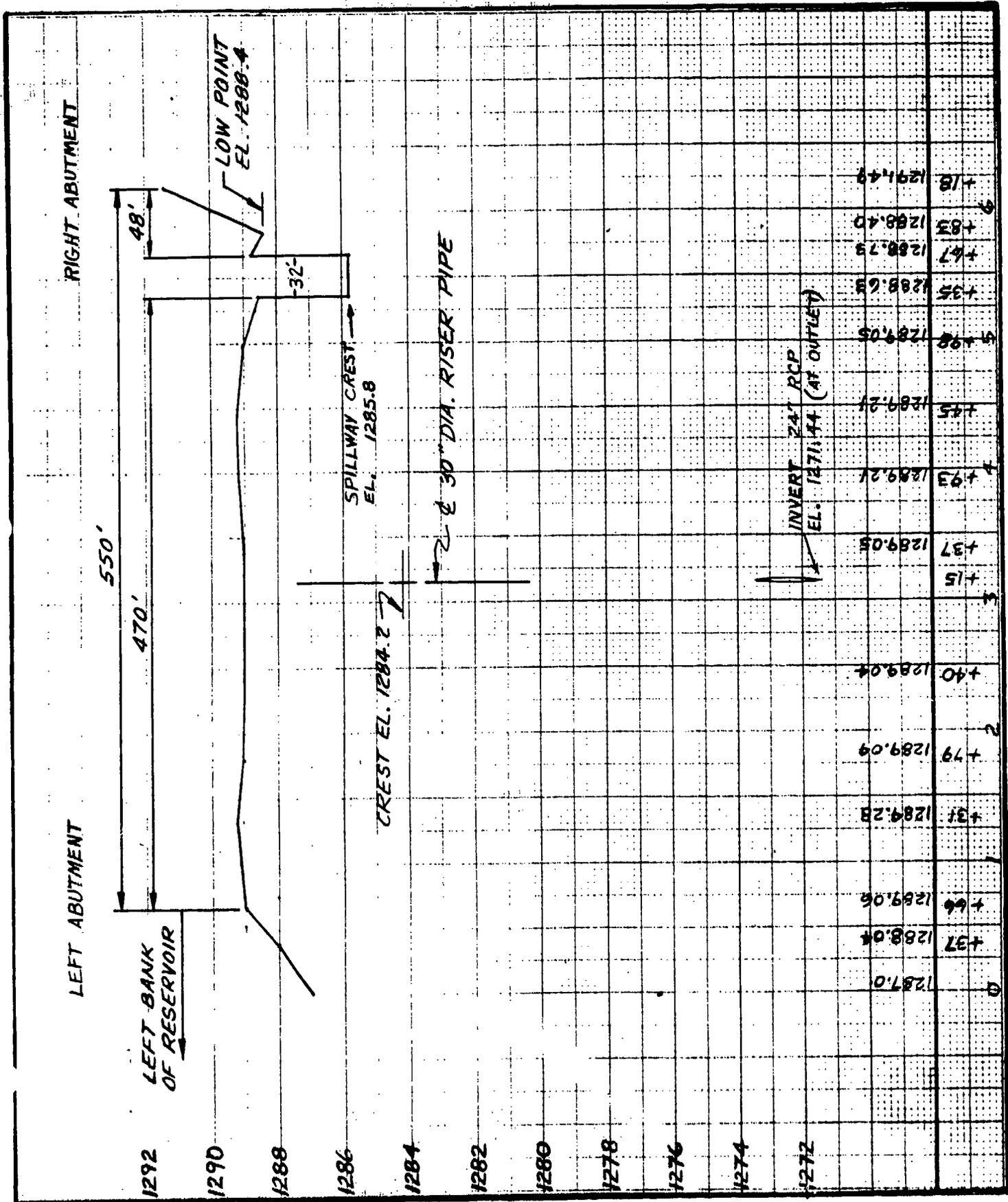
5 STEEL ANGLES
EMBEDDED IN CREST

WOODS

**DECKERS DAM
GENERAL PLAN - FIELD INSPECTION NOTES**

GEO-TECHNICAL SERVICES
 Consulting Engineers & Geologists

SHEET NO _____ OF _____
 CALCULATED BY _____ DATE 1-6-81
 CHECKED BY _____ DATE _____
 SCALE HORZ. 1"=100' VERT 1"=4'



CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Deckers Dam STATE Pennsylvania COUNTY Wayne
NDI # PA - 00299 PENNDR # 64-203
TYPE OF DAM Earthfill (Main Dam & Dike) SIZE Small HAZARD CATEGORY High
DATE(S) INSPECTION 12/12/1980 WEATHER _____ TEMPERATURE 16° F or 8:00 a.m.
POOL ELEVATION AT TIME OF INSPECTION 1284.2 M.S.L.
TAIL WATER AT TIME OF INSPECTION 1271.4 M.S.L.

INSPECTION PERSONNEL

Gideon Yachin, Engineer

James Diaz, Geologist

Ronald Mather, Surveyor

OWNER REPRESENTATIVES

Jerald Decker, Owner

Lester Soden, Contractor

OTHERS

RECORDED BY James Diaz

**MAIN DAM AND DIKE
EMBANKMENT**

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDH# PA00299
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Slight curvature in horizontal alignment of Main Dam, left of dam center (see Exhibit A-1, Appendix A). For top of dam profile, see Exhibit A-2, Appendix A. Horizontal alignment of dike is curved, meeting natural ground of shoreline.	
RIPRAP FAILURES	None on Main Dam. No riprap on slopes of dike.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Slight settlement (4" deep, 6 to 12 inches wide) adjacent to the left spillway endwall. No observed settlement at dike.	

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA · 00299
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	Natural marsh area downstream of dam. Dike - none observed.	
ANY NOTICEABLE SEEPAGE	None; Natural springs, approximately 50 feet downstream of dam with total discharge of 1 to 2 GPM.	
STAFF GAGE AND RECORDER	None	
DRAINS	None, other than outlet works	
ROCK OUTCROPS	None	
DAM FOUNDATION TREES, OTHER	Few small (4" dia.) birch trees on lower part of the main dam downstream slope (between the emergency spillway and the outlet works). For slopes and crest width of main dam, see typical sections, Exhibit A-3. The dike is 8.3' high, having a 25' wide crest (access road to residence) and 3H:1V slopes.	

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA · 00299
INTAKE STRUCTURE	Reported 8" diameter steel pipe, extending upstream of a 30-inch diameter riser pipe (see Contractor's Sketch, Exhibit E-4, Appendix E).	
OUTLET CONDUIT (CRACKING AND SPALLING OF CON- CRETE SURFACES)	24" dia. RCP, extending downstream of a 30-inch diameter riser pipe. Invert at outlet is at streambed, elevation (see Contractor's Sketch, Exhibit E-4, Appendix E). Pipe at outlet is in good condition.	
OUTLET STRUCTURE	None other than a vertical dry stone wall (1.5' high and 8' long) at the outlet of the 24" diameter RCP.	
OUTLET CHANNEL	Streambed of Seeley Brook.	
GATE(S) AND OPERA- TIONAL EQUIPMENT	Reported 8" diameter gate valve, approximately 30 feet upstream of the riser pipe. Access to valve by diving.	

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00299
TYPE AND CONDITION	32 feet long Ogee type concrete weir, terminating with vertical concrete endwalls on each side. Walls are 12" thick.	
APPROACH CHANNEL	18 feet long and 32 feet wide, confined between sloping spillway endwalls with adverse channel bottom slope (see Exhibit A-3).	
SPILLWAY CHANNEL AND SIDEWALLS	See Discharge Channel, below.	
STILLING BASIN PLUNGE POOL	Rectangular stilling basin, 13 feet long and 32 feet wide terminating with a 9-inch-high concrete sill. Top of basin's slab is 4 feet below the spillway crest.	
DISCHARGE CHANNEL	Trapezoidal channel 30 feet wide and approximately 60 feet long, terminating 8 feet above the streambed and 230 feet west of Seeley Brook.	
BRIDGE AND PIERS EMERGENCY GATES	None. Five 4-inch angle irons embedded in spillway crest, 1 foot high. Beginning approximately 1.5 feet from each endwall, these profiles are spaced 7.5 feet apart (see Photograph 4, Appendix C).	

SERVICE SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDM# PA - 00299
TYPE AND CONDITION	30" diameter steel riser pipe, maintaining normal pool 1.6 feet below the emergency spillway crest. Overflow is conveyed through a 24" diameter RCP to Seeley Brook.	
APPROACH CHANNEL	None	
OUTLET STRUCTURE	None, other than vertical dry stone wall at the outlet (see also Outlet Works, page 4 of 8).	
DISCHARGE CHANNEL	Streambed of Seeley Brook (first 50 feet appear regraded).	

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDM PA - 00299
MONUMENTATION SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHERS		
OPERATION AND MAINTENANCE DATA	No formal maintenance program. Embankments (Main Dam and dike) are well maintained.	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDIP PA · 00299
SLOPES: RESERVOIR	Gentle wooded slopes. Steep slope (16%) near right abutment.	
SEDIMENTATION	None visible.	
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Natural channel of Seeley Brook. First 50 feet appear to be regraded.	
SLOPES: CHANNEL VALLEY	Broad marshy flood plain with stream channel entrenched, approximately 2 feet.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Several homes around House Pond, 1800 feet downstream of Deckers Dam with lowest basement level 5.5 feet above the normal level of House Pond. Mobile Home Court 200 feet downstream of House Pond Dam.	
WATERSHED DESCRIPTION	Wooded and swampy in part (swamp is west of the upper end of the reservoir). Reservoir is located at the eastern part of the watershed, with an upstream dike terminating at the northern limit of the watershed.	

APPENDIX B

ENGINEERING DATA - CHECKLIST

**CHECK LIST
ENGINEERING DATA
PHASE I**

NAME OF DAM Decker's Dam

ITEM	REMARKS	NDH# PA - 00299
PERSONS INTERVIEWED AND TITLE	Jerald Decker, Jr., Owner; Lester Soden, Contractor.	
REGIONAL VICINITY MAP	See Exhibit E-1, Appendix E.	
CONSTRUCTION HISTORY	Constructed in 1965 by Soden Construction Company, with technical guidance furnished by the County Soil Conservation Service. Emergency spillway designed by L. F. Burlein, P.E. and constructed in the Fall of 1966.	
AVAILABLE DRAWINGS	Original reservoir area limits, cross sections of reservoir, emergency spillway details and contractor sketch of service spillway, including outlet works, on file with PENNDR.	
TYPICAL DAM SECTIONS	For present conditions, see Exhibit A-3, Appendix A.	
OUTLETS. PLAN DETAILS DISCHARGE RATINGS	For outlet works, see Contractor Sketch, Exhibit E-4. For visible portion of outlet works, see Exhibit A-3, Appendix A.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDH# PA - 00299
SPILLWAY PLAN SECTION DETAILS	For design drawings, see Exhibit E-3 and Contractor's Sketch, Exhibit E-4, Appendix E. For present conditions, see Exhibit A-3, Appendix A.	
OPERATING EQUIP. MENT PLANS AND DETAILS	Reported 8-inch diameter gate valve on 8" diameter steel pipe. Access to valve by diving in reservoir. For details of outlet works, see Contractor's Sketch (Exhibit E-4, Appendix E).	
DESIGN REPORTS	None available.	
GEOLOGY REPORTS	None available.	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None available. Correspondence (PENNER file) indicates that the design criteria for the emergency spillway was 600 cfs for 0.4 square mile drainage arch.	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None available.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA - 00299
BORROW SOURCES	From a borrow pit on the right abutment.	
POST CONSTRUCTION DAM SURVEYS	Cross sections of reservoir area by L.F. Burlein, P.E. in 1966, showing the original location of the dike, north of main dam (on file with PENNDR).	
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Inspection Reports (1965 and 1966) on file with PENNDR.	
HIGH POOL RECORDS	None available.	
MONITORING SYSTEMS	None	
MODIFICATIONS	Between 1966 and 1973 a dike was constructed 600 feet north of the original location, shown in Appendix E (Exhibits E-1 and E-2). The present location of the riser pipe, with reference to the axis of the dam is shown in Exhibit A-3, Appendix A.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA. 00299
PRIOR ACCIDENTS OR FAILURES	Not reported.	
MAINTENANCE RECORDS MANUAL	Not available.	
OPERATION RECORDS MANUAL	Not available.	
OPERATIONAL PROCEDURES	The pool is maintained at the level of the Service spillway crest 1.6 feet below the emergency spillway crest. Excess inflow discharges over the spillway into Seeley Brook. Lowering the reservoir level below the normal pool is by means of 8" diameter gate valve, accessible by diving.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	Not provided.	
MISCELLANEOUS		

**CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA**

NDI ID # PA-00299
PENNER ID # 64-203

SIZE OF DRAINAGE AREA: 0.4 square mile
ELEVATION TOP NORMAL POOL 1284.2 STORAGE CAPACITY 151 acre-feet
ELEVATION TOP FLOOD CONTROL POOL 1285.8 STORAGE CAPACITY 210 acre-feet
ELEVATION MAXIMUM DESIGN POOL 1288.8 STORAGE CAPACITY 342 acre-feet
ELEVATION TOP DAM: _____ STORAGE CAPACITY: _____
Design 1288.8 342 acre-feet
Lowest Crest El. 1288.4 323 acre-feet
SPILLWAY DATA

CREST ELEVATION: 1284.2 (service spillway). 1285.8 (emergency spillway)
TYPE: Riser Pipe (30" \emptyset service spillway)
CREST LENGTH: 32 feet Ogee type weir & stilling basin.
CHANNEL LENGTH: 60 feet (excavated outlet channel)
SPILLOVER LOCATION: Near right abutment
NUMBER AND TYPE OF GATES: None

OUTLET WORKS

TYPE: 8" diameter steel pipe (24" diameter RCP outlet)
LOCATION: at center of dam; connected to service spillway outlet.
ENTRANCE INVERTS: Unknown
EXIT INVERTS: Invert of 24" diameter RCP is at elevation 1271.4
EMERGENCY DRAWDOWN FACILITIES: 8" diameter gate valve at reservoir bottom.

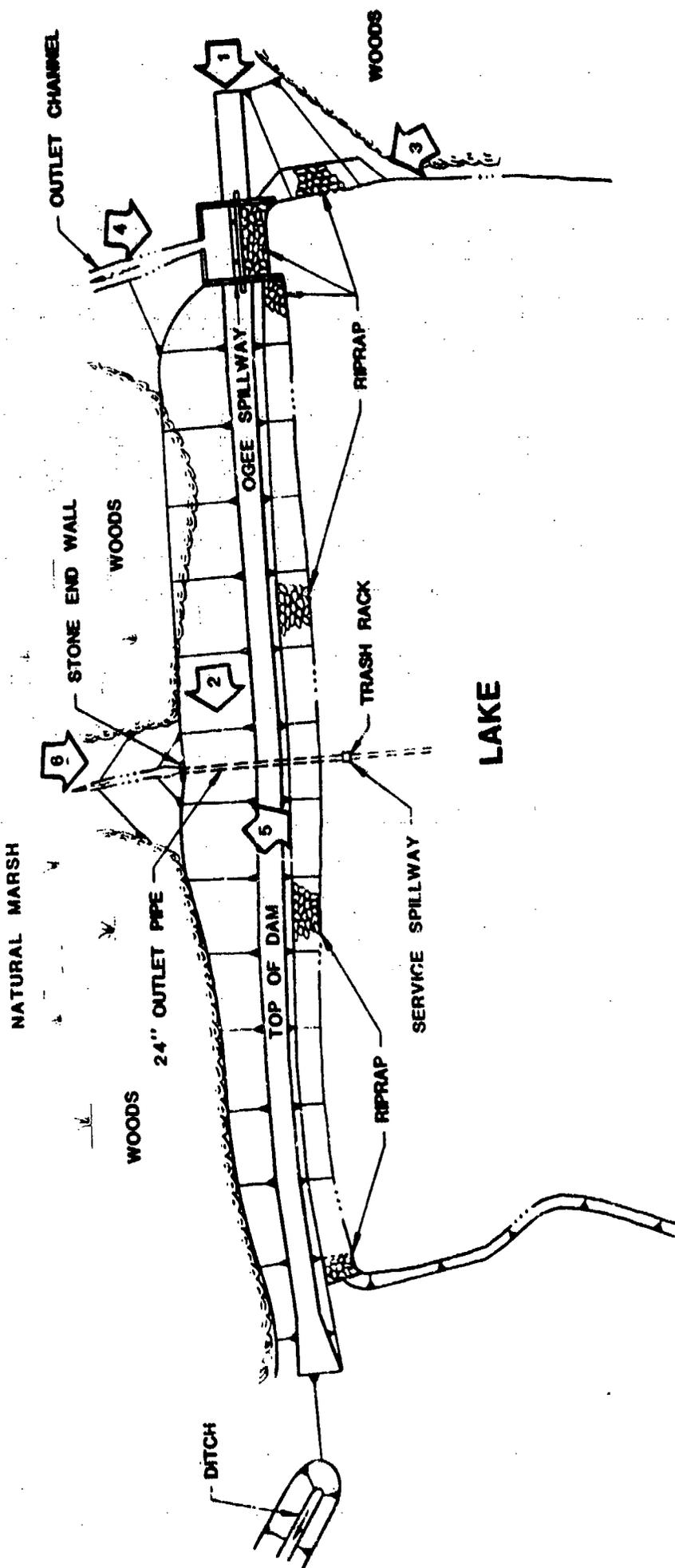
HYDROMETEOROLOGICAL GAGES

TYPE: None
LOCATION: Not applicable
RECORDS: None

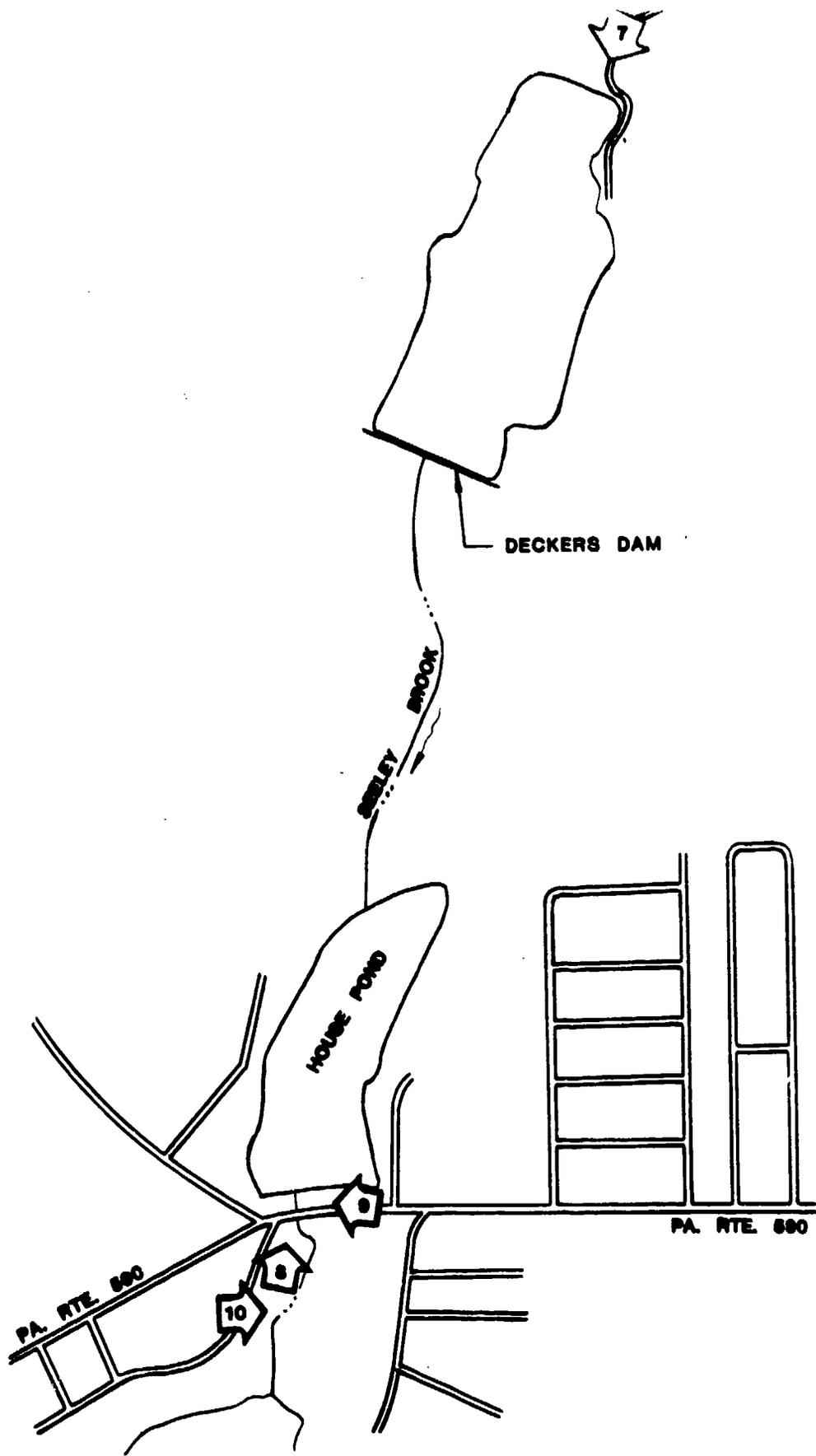
MAXIMUM NON-DAMAGING DISCHARGE: 1068 cfs

APPENDIX C

PHOTOGRAPHS



**DECKERS DAM
PHOTOGRAPHS LOCATION MAP**



DECKERS DAM



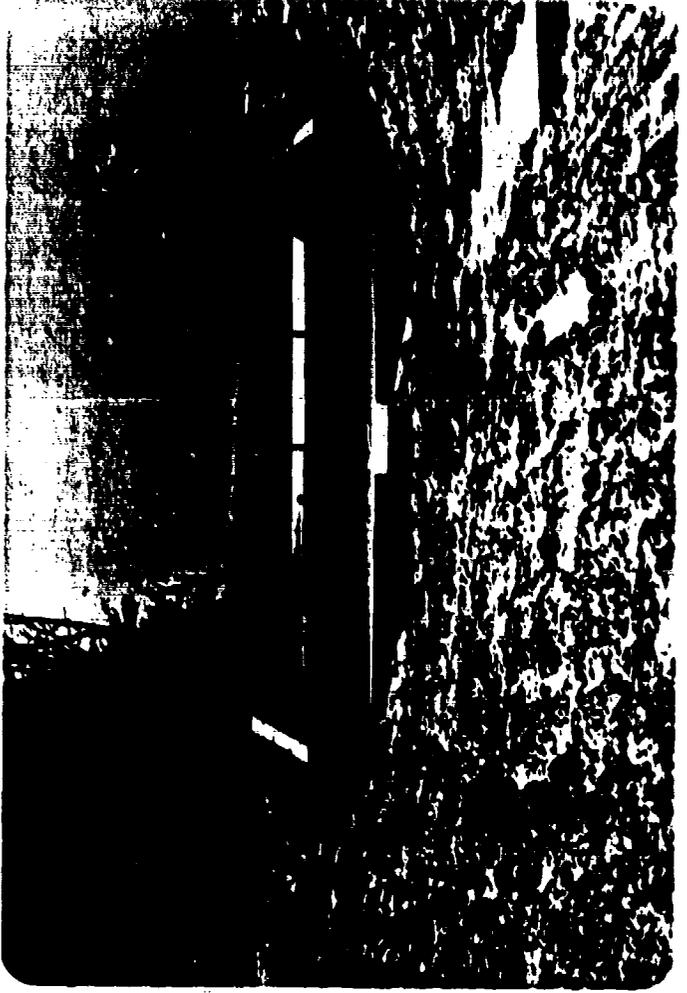
1. CENTERLINE OF DAM FROM RIGHT ABUTMENT



2. DOWNSTREAM SLOPE, FACING LEFT ABUTMENT



3. SPILLWAY CHANNEL



4. OGEE SPILLWAY & OUTLET CHANNEL



5. 36" DIA. SERVICE SPILLWAY



6. DOWNSTREAM SLOPE & OUTLET PIPE



7. NORTH (LANDSIDE) FACE OF UPSTREAM DIKE
VIEW FACING SOUTH , SHOWING ROADWAY ON TOP OF DIKE





8. DOWNSTREAM VIEW OF HOUSE POND DAM
SHOWING SPILLWAY AND CULVERT ENDWALL



9. HOUSE POND DAM , RIGHT SPILLWAY WALL



10. TRAILER COURT ON LEFT BANK OF STREAM,
BELOW CULVERT

DOWNSTREAM HAZARD , BELOW HOUSE POND DAM

APPENDIX D

HYDROLOGY AND HYDRAULICS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY INVESTIGATIONS

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the over-topping potential of the dam, and (2) estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam over-topping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would over-top the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program, refer to the Users Manual for the Flood Hydrograph Package (HEC-1), Dam Safety Investigations prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

GENERAL DATA - DECKER DAM

RIVER BASIN	DELAWARE
STREAM NAME	SEELY BROOK
	trib. to Lake Wallenpaupack
NDI I.D. NO	PA-0299
DER I.D. NO	64-203
OWNER	G. DECKER
LOCATION	PAUPACK TWP.
CO.	WAYNE
QUAD.	HAWLEY
LAT.	41°-28'-08"
LONG.	75°-12'-34"
SIZE	SMALL
HAZARD	HIGH
DRAINAGE AREA	0.53 mi ²

Watershed Features

DOWNSTREAM DAMS - HOUSE POND DAM
LAKE WALLEN PAUPACK

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

NDI - PA

SHEET NO

OF

CALCULATED BY

efw

DATE

5/81

CHECKED BY

DECKER DM

RAINFALL & HYDROGRAPH DATA

Rainfall

Basin - DELAWARE

Ref. - HYDROMETEOROLOGICAL REPORT NO. 33

Zone - 1

PMP - 21.8"

INDEX RAINFALL

<u>Duration</u>	<u>Percent</u>
6 hr.	111
12 hr	123
24 hr	133
48 hr	142

Hydrograph

$C_p = 0.45$

$C_r = 1.23$

DRAINAGE AREA - DECKER DAM

$A = 0.53 \text{ mi}^2$

$L_{ca} = 0.42 \text{ mi}$

$L = 1.25 \text{ mi}$

$T_p = C_T (L L_{ca})^{0.3} = 1.01 \text{ hr.}$

DRAINAGE AREA - HOUSE POND (subarea)

$A = 0.41$

$L_{ca} = 0.27$

$L = 0.74$

$T_p = 1.23 (0.74 + 0.27)^{0.3} = 0.76 \text{ hr.}$

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB NDI - PA DECKER DAM
SHEET NO. _____ OF _____
CALCULATED BY [Signature] DATE 6/81
CHECKED BY _____ DATE _____
SCALE _____

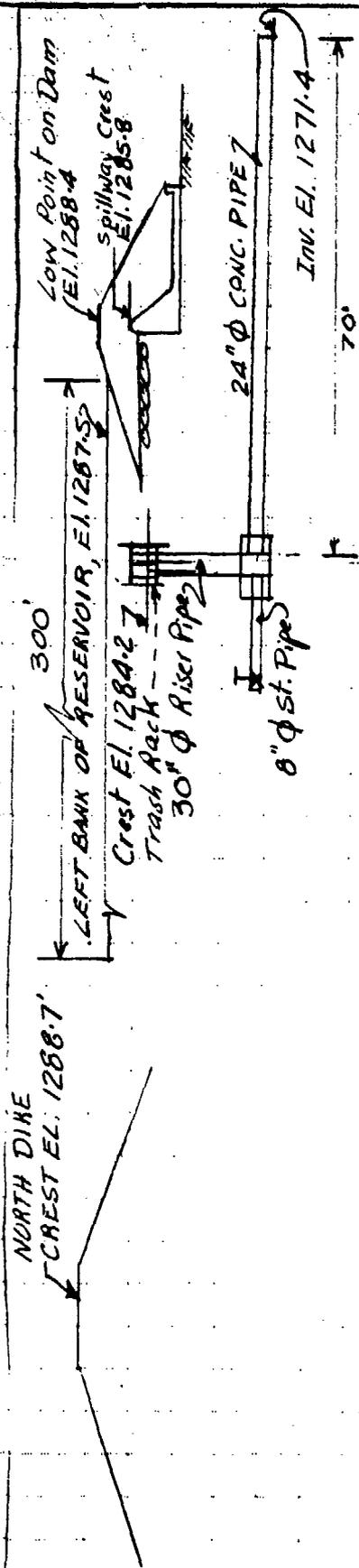
- BOTH DECKER DAM & HOUSE POND DAM ARE CLASSIFIED AS HIGH HAZARD DAMS DUE TO THE DAMAGE CENTER BELOW HOUSE POND

- BOTH DAMS HAVE THE SAME OWNER - G. DECKER

ANALYSIS PROCEDURE - RUN OVERTOPPING ANALYSIS OF DECKER DAM TO SEE IF BREACH ANALYSIS REQUIRED - INCLUDE HOUSE POND IN ANALYSIS IF BREACHING REQUIRED

NOTE: DECKER DAM HAS A DIKE AT ITS NORTHERN END. FLOWS OVERTOPPING THE DIKE DISCHARGE TO A DIFFERENT WATERSHED

FOR THE FIRST TRIAL ASSUME NO LOSS TO ADJACENT WATERSHED - CORRECT AS NECESSARY IF SIGNIFICANT OVERTOPPING OF THE DIKE OCCURS.



DISCHARGE SCHEMATICS
NOT TO SCALE

SUMMARY OF DISCHARGES *

RESERVOIR W.S. ELEV.	RISER PIPE	OGEE SPILLWAY	LEFT BANK	NORTH DIKE	TOTAL CFS
1284.2	0	0	0	0	0
1285.8	49	0	0	0	49
1286.3	51	101	0	0	152
1287.5	56	230	0	0	286
1288.1	57	315	349	0	721
1288.4	58	370	640	0	1068
1288.7	58	430	986	0	1484
1289.2	59	550	1662	480	2751
1289.8	64	720	2616	1558	4958

* Excluding flow over the crest of the dam (overtopping)

SPILLWAY RATING INPUT DATA

SPILLWAY RATING CURVE

30" DIA. RISER PIPE & 24" DIA. OUTLET PIPE

$$Q_p = \frac{A \cdot \sqrt{2g}}{\sqrt{\Sigma K}} \cdot \sqrt{H} \quad \text{Where } A = \pi D^2/4 = 3.14 \text{ ft}^2$$

$$\Sigma K = K_{ent} + K_{exit} + K_f = 2.0 + K_f$$

$$K_f = f L/D; \frac{1}{f} = 2 \log \frac{D}{2k_s} + 1.74$$

For Concrete Pipe $k_s = 0.002$

$$\frac{1}{f} = 2 \log \frac{2}{0.004} + 1.74 = 7.138 \quad f = 0.019627 \quad K_f = 0.687$$

$$\Sigma K = 2 + 0.69 = 2.69$$

Flow over riser pipe $Q_w = 3.1 \pi D H^{3/2}$ For $D = 2.5$ $Q_w = 24.3 H^{3/2}$

H* feet	WATER SURFACE ELEV.		DISCHARGE CFS	
	IN RESERV.	IN RISER	Q _p	Q _w
	1284.2	0	0	0
	1285.8	1282.6	49.3	49.3
12.82	1287.12	1285.4	55	55
13.29	1287.64	1285.9	56	56
13.76	1288.16	1286.4	57	57
15.25	1289.72	1287.9	60	60
17.35	1291.90	1290.0	64	64
20.76	1295.42	1293.4	70	70

* $H = PE - (EI + 0.6D)$ Where PE = Pool Elevation
EI = Invert El. of Conduit at Exit
D = 2.0 feet

$$H = PE - (1271.4 + 1.2)$$

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

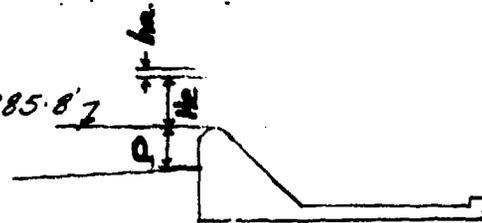
JOB DECRETS DAM; PA-00244
SHEET NO _____ OF _____
CALCULATED BY GY DATE 6/03/1981
CHECKED BY _____ DATE _____
SCALE _____

RATING CURVES (CONT.)

Reference: "Design of small dams", Chapter IX C USBR, 1977
Discharge over Ogee spillway

$P = 0.35'$
 $H_0 = \text{Design Head} = 2.5'$
 $C_0 = 3.5$

EI. 1285.82



H_e/H_0	H_e	C/C_0	C	$Q = 32CH_e^{1.5}$	$h_a = \frac{V^2}{2g}$	W.S. Elev. $1285.8 + H_e + h_a$
.1	.25	.82	2.87	11	.01	1285.9
.2	.50	.85	2.98	34	.02	1286.0
.4	1.0	.90	3.15	101	.08	1286.3
.8	2.0	.94	3.29	298	.24	1288.0
1.0	2.5	1.00	3.50	443	.36	1288.7
1.2	3.0	1.02	3.57	594	.47	1289.3
1.6	4.0	1.07	3.75	960	.73	1290.5

Flow over Left bank of Reservoir: $L = 300'$ $C = 2.5$

RESERVOIR ELEVATION	H Feet	$Q = 2.5 \times 300 \times H^{3/2}$ cfs
1287.5	0	0
1288.1	0.6	349
1288.4	0.9	640
1288.7	1.2	986
1289.2	1.7	1662
1289.8	2.3	2616

Flow over North Dike (Crest Elev. 1288.7); $L = 500'$

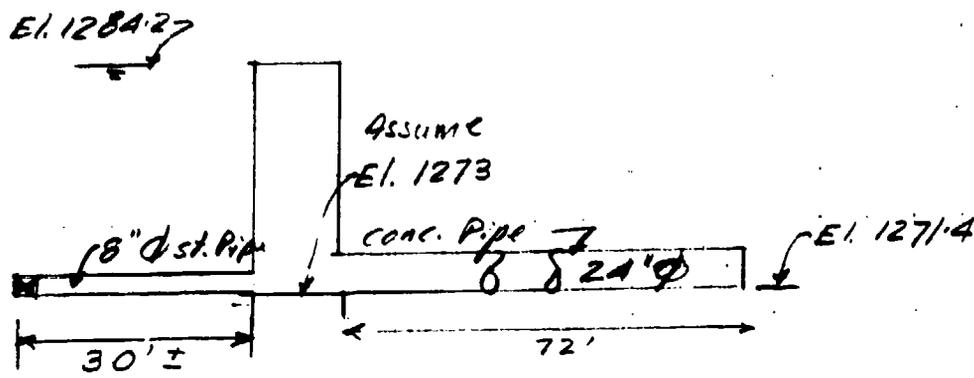
$Q = 2.7 \times 500 \times H^{3/2}$

1288.7	0	0
1289.2	0.5	477
1289.8	1.1	1558

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB DECKERS DAM
SHEET NO _____ OF _____
CALCULATED BY G.Y. DATE 6/08/61
CHECKED BY _____ DATE _____
SCALE _____

Outlet Works Rating Curve



Assuming that the slope of the 24" ϕ Concrete pipe is steeper than the critical slope for all discharges through the 8" ϕ pipe at reservoir elevation \leq El. 1284.2.

$\frac{H_m}{d}$	K_c	$Q = k_e d^{5/2} \sqrt{H_m}$	W.S. El. in Riser
0.2	.1326	0.75	0.4 1273.4
0.3	.291	1.65	0.6 1273.6
0.4	0.503	2.85	0.8 1273.8
0.5	0.764	4.32	1.0 1274.0
0.6	1.068	6.04	1.2 1274.2

Flow through 8" ϕ steel pipe

Use orifice eq. $Q = CA \sqrt{2gH}$

$a = 0.35$
 $C = 0.6$
 $H = \text{Res. El.} - \text{Riser El.}$

H	Q	H	Q
10.8	5.54	10	5.33
10.6	5.49		
10.4	5.43	1.8	226
10.2	5.38		

Reservoir at Low Point on Dam

RESERVOIR AREA-CAPACITY DATA

Computed storage at spillway crest (El. 1285.8) is 210 ac-ft.
Normal pool is at the crest of the 30" ϕ Riser Pipe (El. 1284.2),
or 1.6 feet below the spillway crest.
Surface area at El. 1285.8 is 39 acres.

Applying the Conic Method for reservoir volume

$h = 3 \times 210 / 39 = 16.2 \therefore \text{El. at zero area} = 1285.8 - 16.2 = 1269.6$

ELEVATION	AREA ACRES	STORAGE (AC-FT) INCREM. ACCUM.	COMMENTS
1269.6	0	0	Zero Area
1 (1284.2)	35	(-59)* \rightarrow 151*	Riser Pipe Crest
2 1285.8	39	210	Spillway Crest
3 1287.5 >17'	45	+71 \rightarrow 281	Reserv. left Bank
4 1288.4 >09'	48	+42 323	Low Point on Dam
5 1288.7 >03'	49	+14.5 387.5	Top of dike
6 1300.0 >11.3	92	+784 1121.5	By Planimeter

* $\Delta V_{12} = 1.6/3 \cdot (35 + 39 + \sqrt{35 \cdot 39}) = 59 \text{ ac-ft}; V_{1/2} = 210 - 59 = 151 \text{ ac-ft}$

TRANSFORMED TOP OF DAM

<u>ELEV.</u>	<u>LENGTH</u>
1288.4	0
1288.5	58
1288.7	530

ANALYSIS SUMMARY :

1. THE DAM CAN PASS THE $\frac{1}{2}$ PMF WITHOUT OVERTOPPING & IS STRUCTURALLY SOUND
2. NO BREACH IS REQUIRED

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

RUN DATE: 81/07/03.
 TIME: 14.43.28.

NATIONAL DAM INSPECTION PROGRAM
 OVERTOPPING ANALYSIS
 DECKER & HOUSE PONDS

PAG299 & PA110E

NO NHR NMIN ICAY JOPER NWT LFOPT TRACE
 100 0 15 0 0 0 0 0
 JOP SPECIFICATION METRC
 1.0 0 0 0 0 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NPATIO= 6 LRTICE= 1
 .20 .30 .40 .50 1.00

RTICS=

SUB-AREA RUNOFF COMPUTATION

INFLOW TO DECKER

ISTAQ 1 ICOMP 0 IFCCM 0 ITAPE 0 JFLT 0 JPPT 0 INAME 1 ISTAGE 1 AUTO 0
 IHYD 1 IUMG 1 TAREA .53 SNAP 0.00 HYDROGRAPH DATA PATIO ISNOW ISAME LOCAL 0
 .5% 0.00

PRECIP DATA
 R12 R24 R48 R72 R96
 0.00 21.80 111.00 125.00 133.00 142.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LROPT STRKR DLTKR RTIOL ERAIN STRKS RIIOK STRIL CNSTL ALSMX RTIMP
 0 0.00 0.00 1.00 0.00 0.00 1.00 1.00 .05 0.00 0.00
 UNIT HYDROGRAPH DATA NTA= 0
 TP= 1.01 CPE .45

RECESSION DATA
 STRTQ= -1.50 BRCSME -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 36 END-OF-PERIOD ORDINATES, LAGE 1.02 HOURS, CPE .45 VOL= 1.00
 15. 56. 107. 144. 151. 112. 96. 92. 82.
 49. 51. 43. 37. 27. 23. 20. 17. 13.
 12. 9. 8. 6. 5. 4. 4. 3. 3.

MO.DA HR.MN PERIOD RAIN EXCS LOSS
 0 2. 2. 2. 1. 1. 1.
 END-OF-PERIOD FLOW
 COMP 0 MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP 0
 SUM 24.76 22.38 2.39 30036.
 (629.)(568.)(61.)(850.52)

ROUTE THRU DECKER

ISTAQ 2 ICOMP 1
 GLOSS 0.00 1285.80 1286.30
 0.00 49.00 152.00
 NSTPS 1 NSTDL 0
 SURFACE AREA= 0. 35. 39.
 CAPACITY= 0. 170. 230.
 ELEVATION= 1270. 1284. 1286.

HYDROGRAPH ROUTING

IECCN 0 ITAPE 0 JPLT 0 JPYT 0 INAME 1 IASTG 0 IAUTO 0
 IRES 1 IRAME 1 IOPT 0 IPMP 0 LSTR 0
 LAG 0 AMSKK 0.000 X TSK SIOBA ISPRAT
 0.000 0.000 -1284.

COGN 0.00 SPUID 0.00
 1285.8 0.00
 COGN EXPV ELEVEL COOL CAREA EXPL
 1288.4 0.00 0.00 0.00 0.00 0.00
 TOPFL COGD EXFPO DAMWIO
 1288.4 0.00 1.5 0.

CREST LENGTH 0. 58. 530.
 AT OR BELOW 1288.4 1288.5 1288.7
 ELEVATION
 PEAK OUTFLOW IS 36. AT TIME 44.25 HOURS
 PEAK OUTFLOW IS 134. AT TIME 43.25 HOURS
 PEAK OUTFLOW IS 215. AT TIME 43.25 HOURS
 PEAK OUTFLOW IS 303. AT TIME 43.00 HOURS
 PEAK OUTFLOW IS 511. AT TIME 42.50 HOURS
 PEAK OUTFLOW IS 1370. AT TIME 41.25 HOURS

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 FEET (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN RATIO	RATIOS APPLIED TO FLOWS					
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6
HYDROGRAPH AT	1	53 (1.37)	1	151 (4.27)	302 (8.54)	452 (12.81)	603 (17.08)	754 (21.35)	1506 (42.70)
	2	53 (1.37)	1	36 (1.01)	134 (3.80)	215 (6.09)	303 (8.57)	511 (14.47)	1370 (38.79)

APPENDIX E

EXHIBITS

HAWLEY, PA.

N4122 5 — N7507 5/7.5

1966
PHOTOREVISED 1973

P A L M Y R

LACKAWANEN

Middle

JEEP

Brook

Creek

Red Stage

WATERSHED BOUNDARY

Florence Lake

Ungers Lake

DECKERS DAM

Seeley Bl.

House Pond

Gravel Pit

Gravel Pits

BM 1217

P A U P A C K

Wallenpaupack
Arms High Sch

LONGEST WATERCOURSE
CENTROID OF DRAINAGE AREA

WALLENPAUPACK

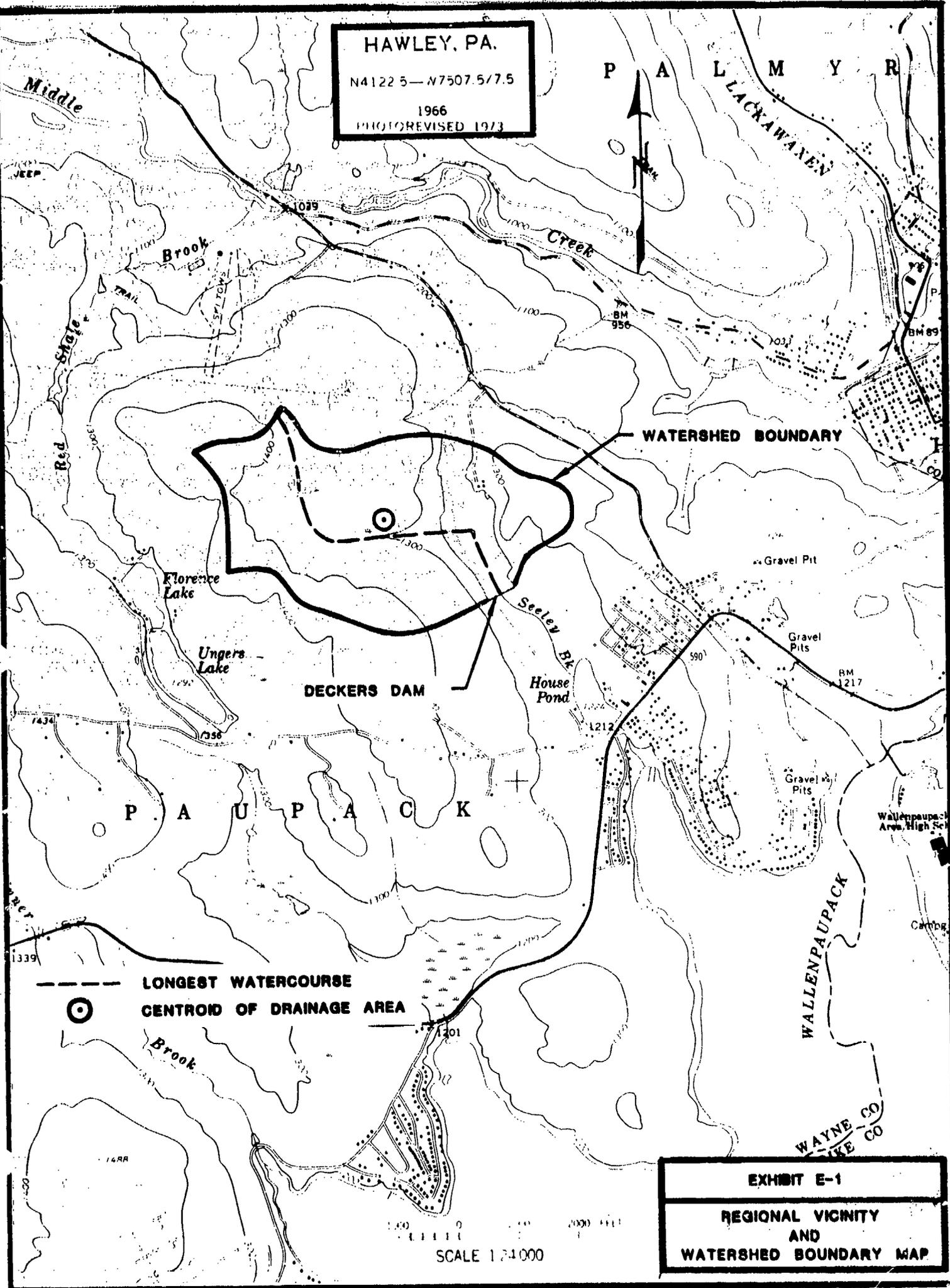
Brook

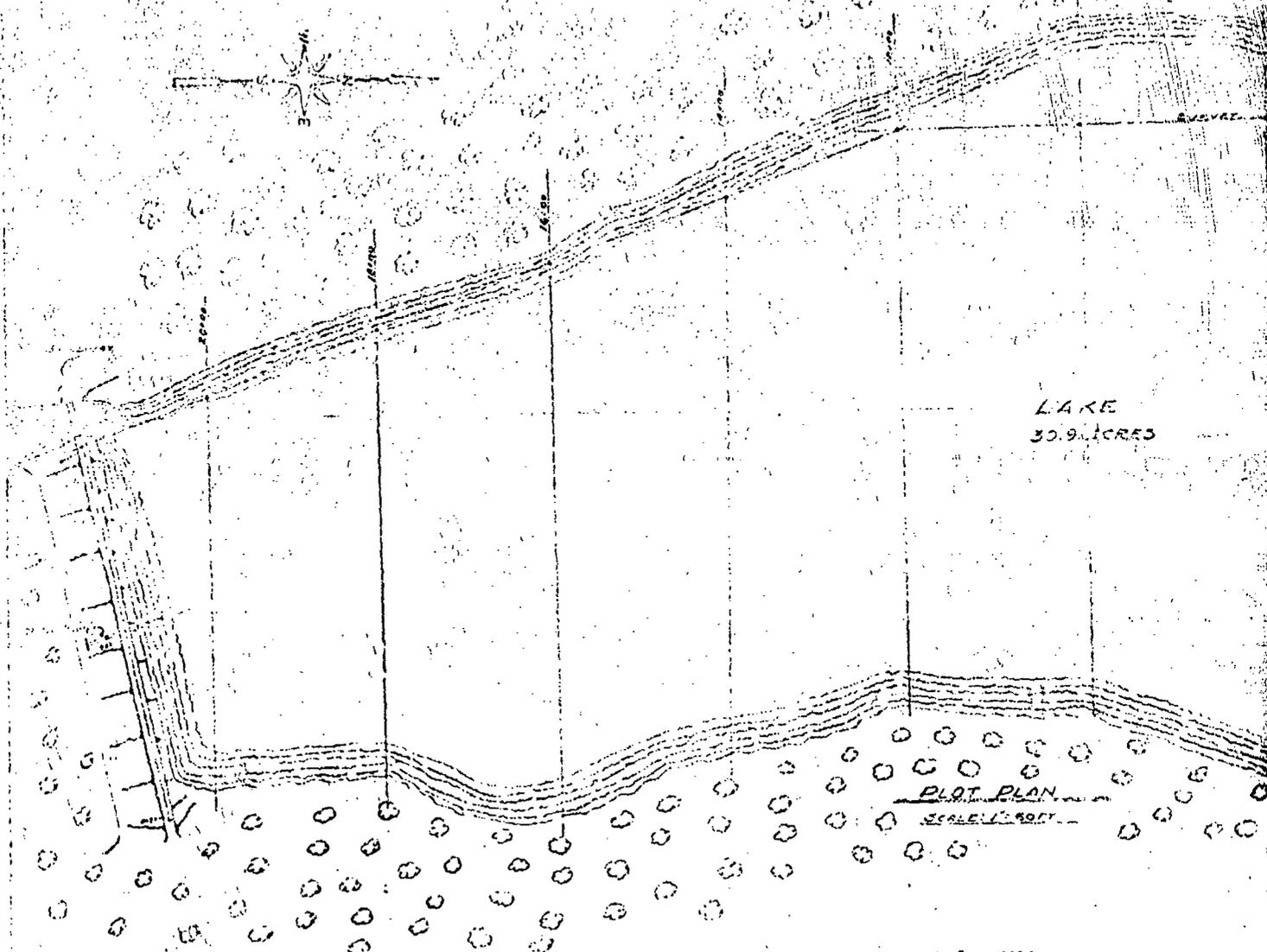
WAYNE CO
LAKE CO

EXHIBIT E-1

REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP

SCALE 1:24,000



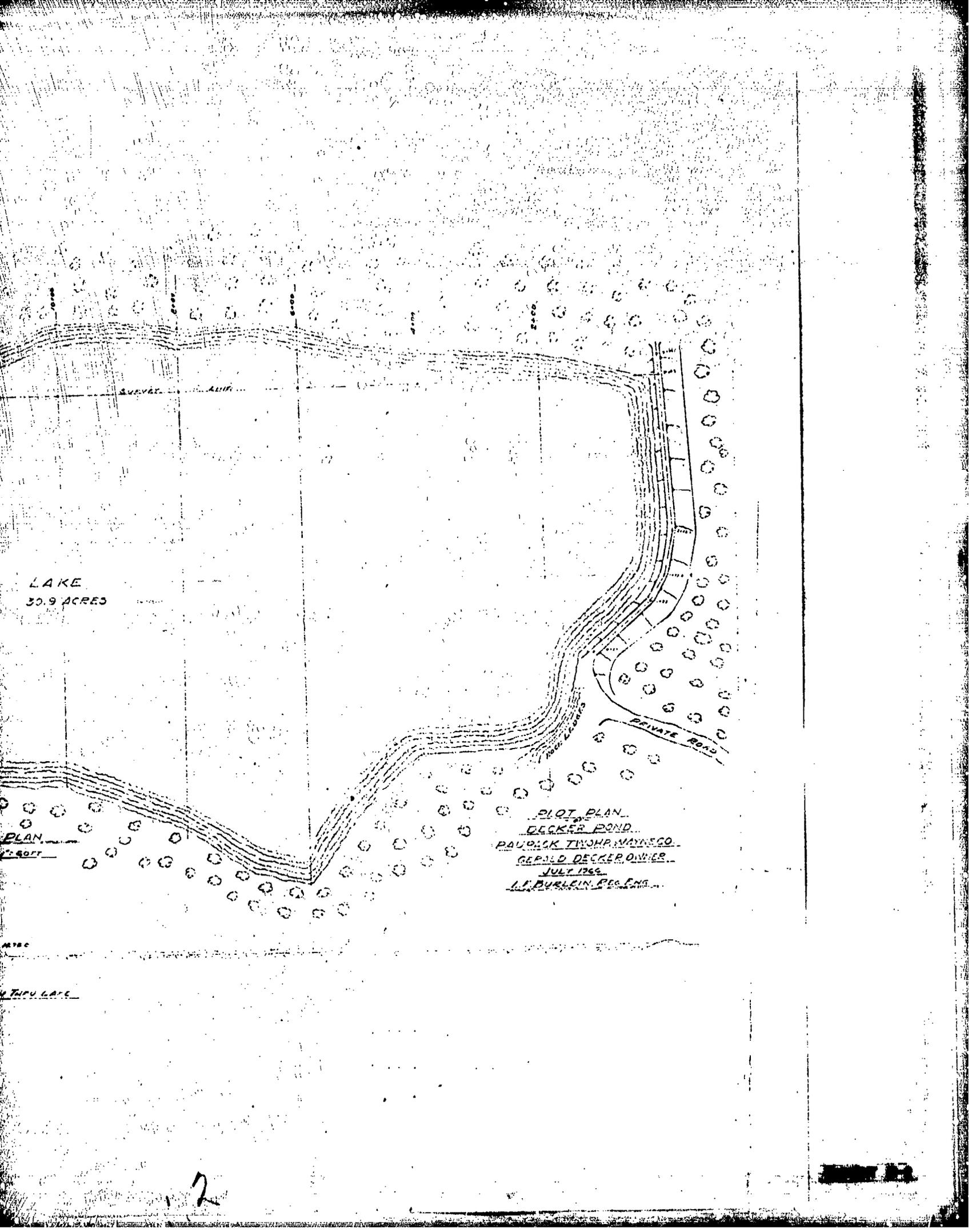


LAKE
30.9 acres

PLANT PLAN
SCALE 1" = 100'

NOV 22 1900

LONGITUDINAL SECTION THRU LAKE

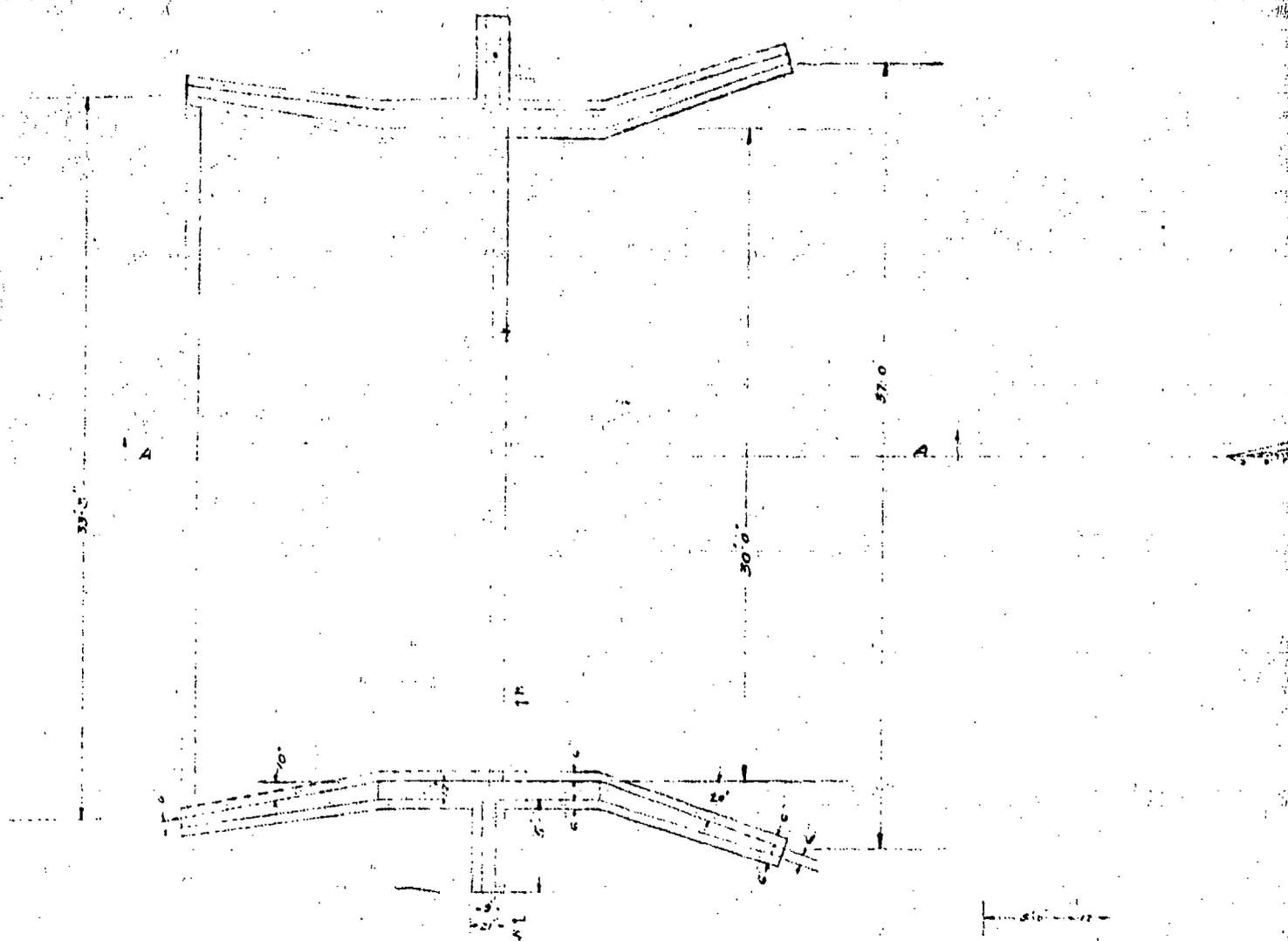


LAKE
30.9 ACRES

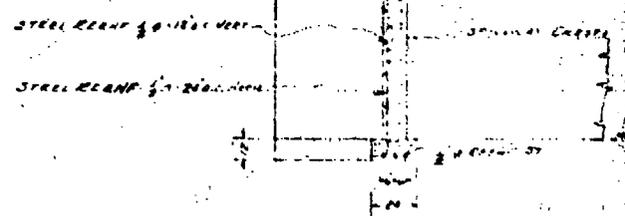
PLAN
1" = 40 FT

PLOT PLAN
DECKER POND
PAULICK THOMPSON & CO.
GERALD DECKER, OWNER
JULY 1966
L.F. DUREIN, P.E.C. ENG.

2

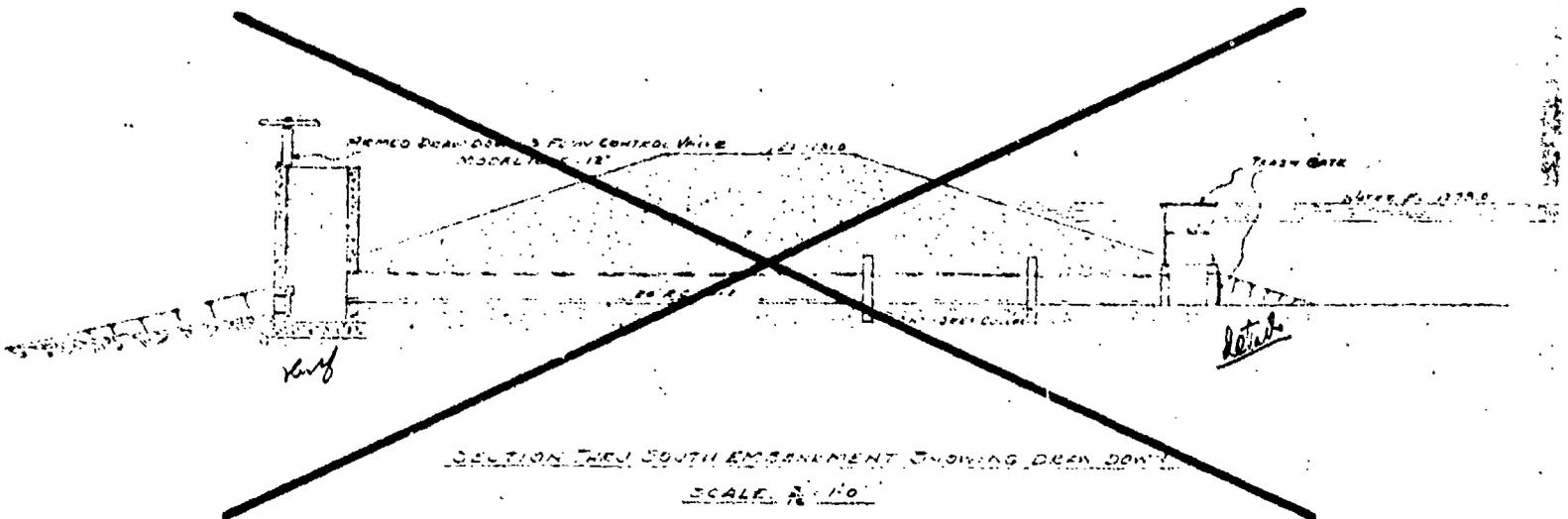


PLAN

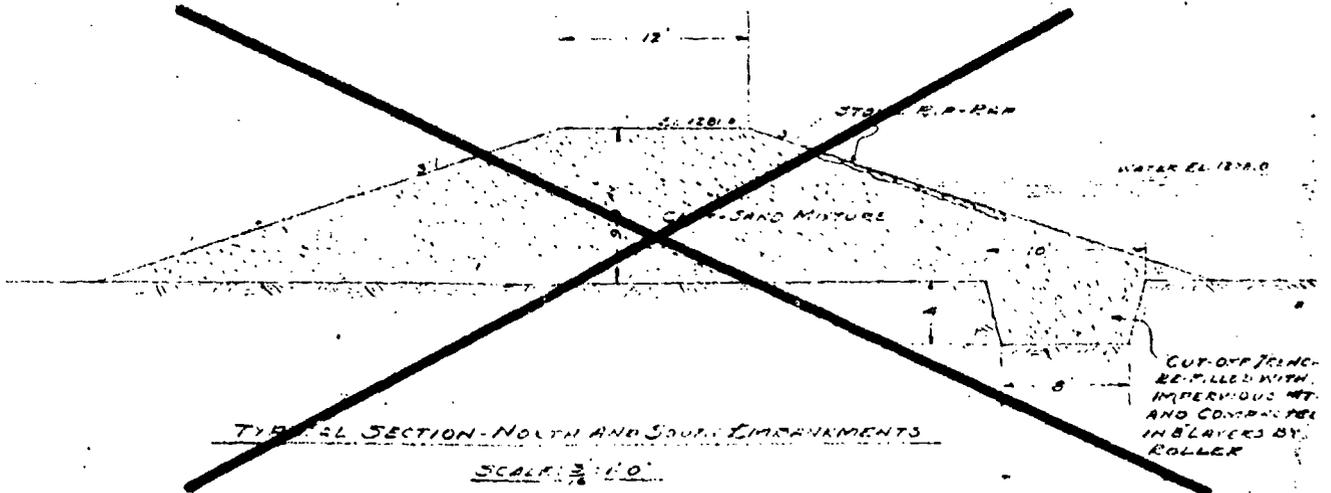


SECTION A-A
SPILLWAY DETAILS
SCALE 1/4" = 1'-0"

ALL IN PLAN 19750



SECTION THRU SOUTH EMBANKMENT SHOWING DRAW DOWN
SCALE: 3/8" = 1'-0"



TYPICAL SECTION - NORTH AND SOUTH EMBANKMENTS
SCALE: 3/8" = 1'-0"

DETAILS

CONCRETE SPILLWAY AND DRAWDOWN
DECKER DAM - GERALD DECKER, OWNER
BRADY TOWNSHIP, WAYNE CO.

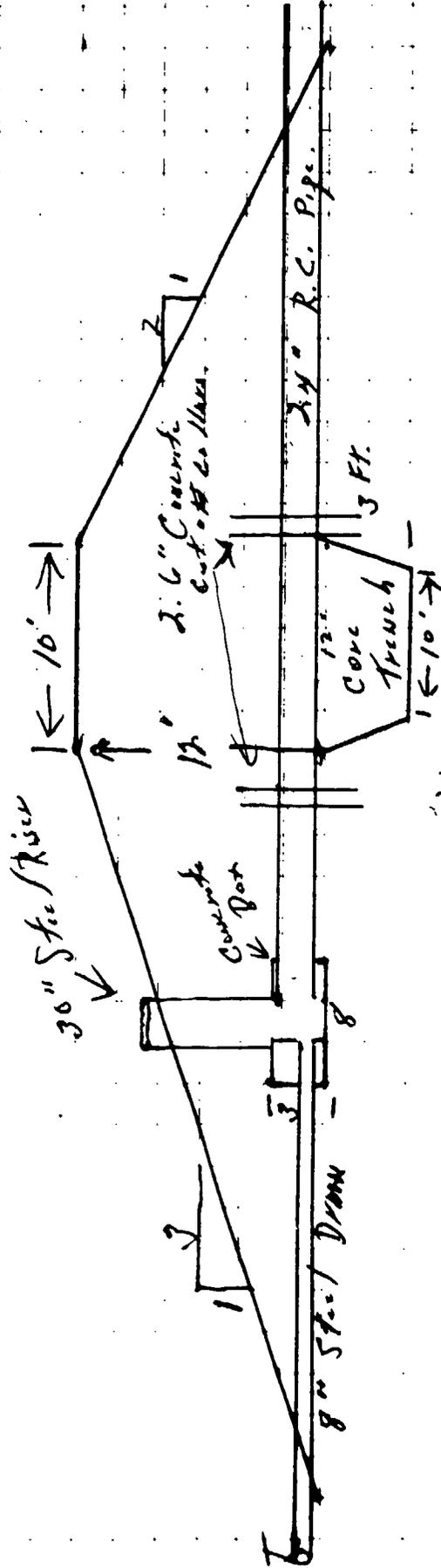
JULY 1966 SCALE: AS SHOWN

L.F. BURLEIN RES. ENG.

DECKERS DAM

1. Dam structure 12 ft. above original ground at highest point made of good compacted fill - slopes 3 to 1 on front - 2 to 1 on back.
2. Draw down pipe 8 in. steel with valve.
Riser 30 in. steel set in concrete box. 5 x 8 x 3 ft.
3. Pipe through dam 24 in. R.C. pipe.
2 cut off collars 16 ft. apart.
4. Core trench dug to depth of 3 feet and filled with compacted clay material. Trench 12 ft. wide.
5. Top of Riser 1/2 ft. below crest of Dam.
6. Emergency spillway 1 ft. above top of Riser and 3 ft. below crest of dam.
7. R.C. pipe laid in concrete 6" under pipe and up sides 12" for a length of 45 ft. in back of riser pipe.

646-250222
600 9/5



CONTRACTOR'S SKETCH

APPENDIX F

GEOLOGY

DECKERS DAM

APPENDIX F

GEOLOGY

Deckers Dam and reservoir area are located within the Glaciated Allegheny Plateau Section of the Appalachian Plateaus Physiographic Province. Deposits of glacial drift of variable thickness cover the entire area. The drift was deposited by the Wisconsin Ice Sheet during the Pleistocene period of geologic time.

The glacial drift is composed primarily of till which is reddish brown, unsorted compact mixture of clay, silt, sand, gravel, and cobbles with occasional boulder sized pieces. The stone pieces are sub-angular to rounded and consist mainly of sandstone and siltstone derived from the Catskill formation, the dominant rock formation in the area. The clay content and compact nature of the till makes it a relatively impervious soil type. The borrow area for the dam on the right abutment is in glacial till.

Some deposits of glacial outwash are also found in the area. The outwash is composed of loose, poorly sorted to stratified deposits of silt, sand, and gravel. The outwash deposits are generally very pervious.

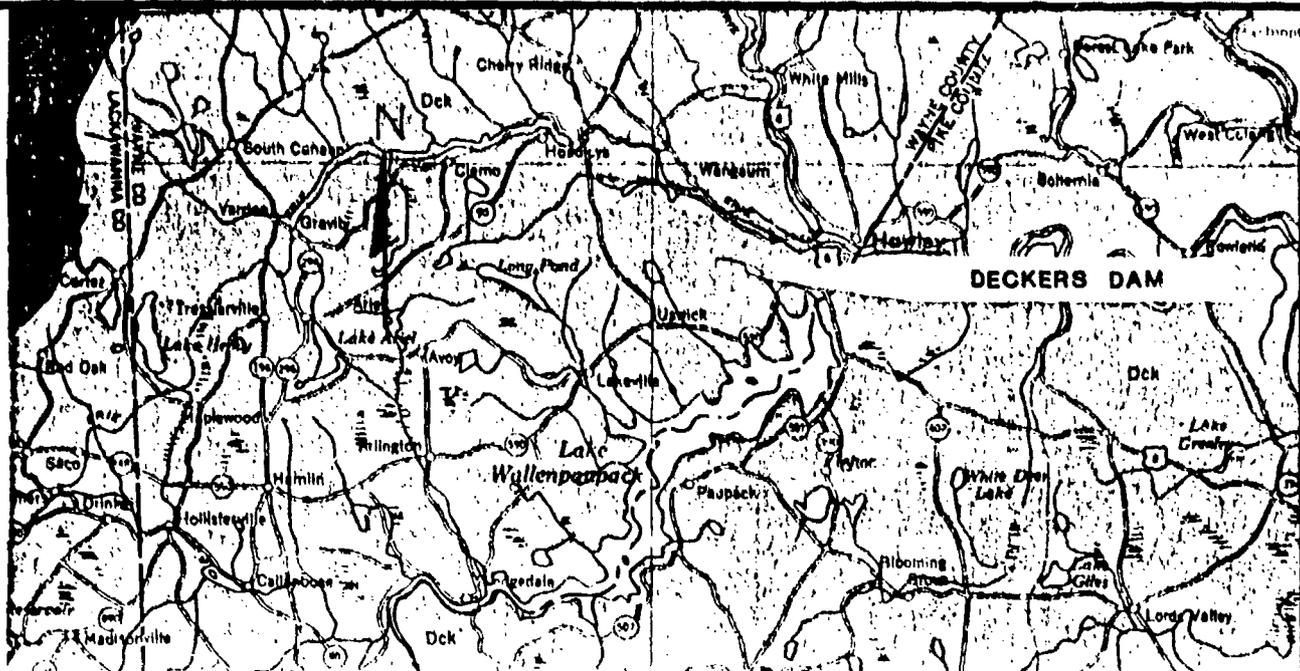
Other loose pervious soils in the area are the recent deposits of alluvial silt, sand, and gravel with some clay. These soils are localized and limited to streambeds and flood plain areas.

The bedrock underlying the entire dam and reservoir area is the Catskill Formation of the Susquehanna Group. This group of formations is of Upper Devonian age. The Catskill Strata generally consists of well-indurated red shale, siltstone, and sandstone layers. Occasional conglomeratic layers are encountered. The red shales are the dominant lithology and the residual soils derived from this rock are usually high in clay and silt and contain numerous flaky and angular fragments and flat, slabby boulders. No outcrops of bedrock were observed at or near the dam or dike area.

The regional structure of the bedrock in the area indicates that the bedrock underlying the dam and reservoir area is near-horizontal. The regional strike of the strata is northeast-southwest.

Although depth to the bedrock at the dam site is unknown, the steep excavated earth slope of the borrow area on the right abutment indicates at least 14 feet of overburden soil.

Ref.: Ground Water of Northeastern Pennsylvania, Stanley W. Lohman 1937, Bulletin W-4, Pennsylvania Geologic Survey.



SCALE: 1" = 4 MILES

LEGEND

PENNSYLVANIAN

ANTHRACITE REGION

- Post-Pottsville Formations**
Brown or gray sandstones and shales with some conglomerate and numerous mineable coals.
- Pottsville Group**
Light gray to white, coarse grained sandstones and conglomerates with some mineable coal; includes Sharp Mountain, Schulkill, and Tummung Run Formations.

MISSISSIPPIAN

- Mauch Chunk Formation**
Red shales with brown to greenish gray thin sandstones; includes Gettysburg Limestone in Fayette, Westmoreland, and Somerset counties; Loupshannon Limestone at the base in southeastern Pennsylvania.
- Pocono Group**
Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale; includes the Appalachian Plateau, Burgoon, Shenango, Cuyahoga, Cussewago, Conyn, and Knapp Formations; includes part of "Oswego" of M. I. Fuller in Potter and Tioga counties.

DEVONIAN

UPPER

- Oswego Formation**
Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses; includes red shales which become more numerous eastward. Relation to type Oswego not proved.
- Catskill Formation**
Chiefly red to brownish shales and sandstones; includes gray and greenish sandstone tongues named Elk Mountain, Honesdale Shale, and Delaware River in the east.
- Marine beds**
Gray to olive brown shales, graywackes, and sandstones; contains "Chester" beds and "Barnack" beds including Buckel, Redlick, Hoell, and Trimmers Rock; Tully Limestone at base.

CENTRAL AND EASTERN PENNSYLVANIA

- Susquehanna Group**
Bashed into 15 "columns" (at least) on east of Second Pennsylvania Survey; County reports, derive on "Chemung" side of line.

NOTE:

GEOLOGIC MAP AND LEGEND OBTAINED FROM GEOLOGIC MAP OF PENNSYLVANIA BY PA. TOPOGRAPHIC AND GEOLOGIC SURVEY, DATED 1960

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

**DECKERS DAM
GEOLOGIC MAP**

GEO - Technical Services, Inc.
HARRISBURG, PA

JUNE, 1981

EXHIBIT F