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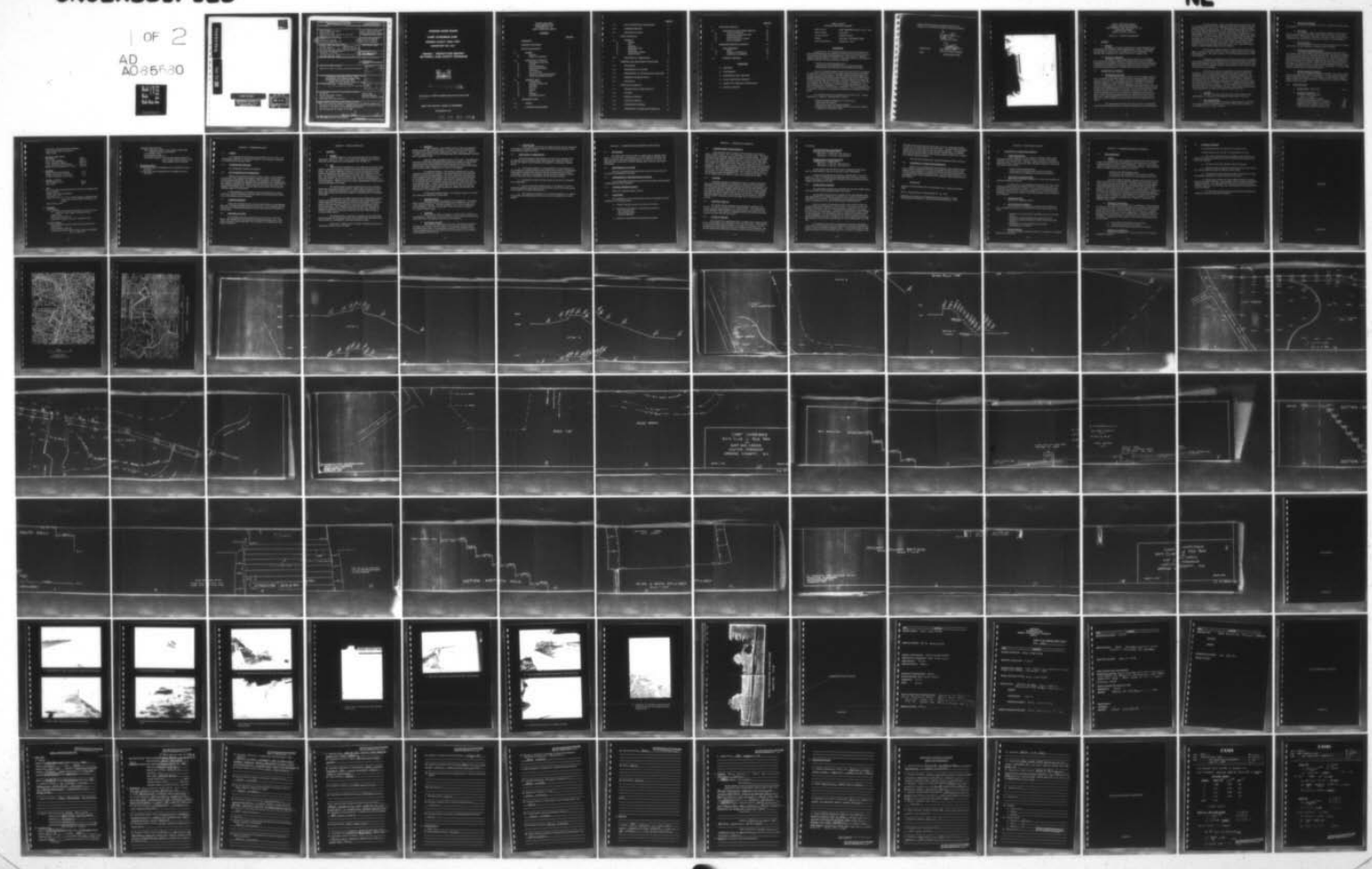

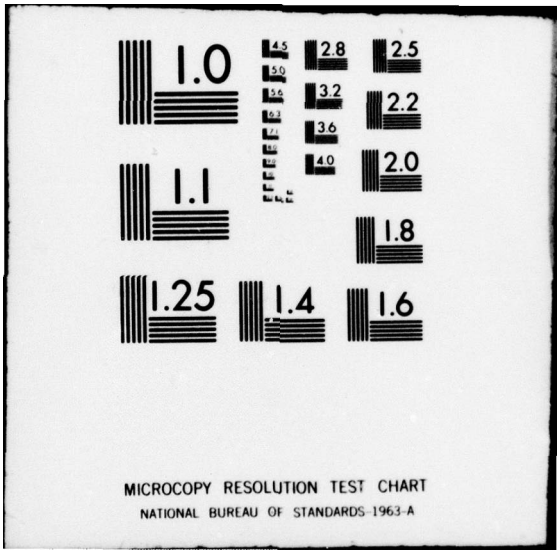
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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Camp Harriman Dam was judged to be safe.

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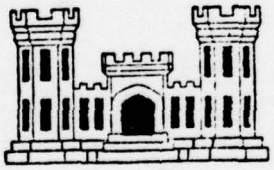
HUDSON RIVER BASIN

CAMP HARRIMAN DAM

GREENE COUNTY, NEW YORK

INVENTORY NO. 552

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

HUDSON RIVER BASIN
CAMP HARRIMAN DAM
INVENTORY NO. 552
PHASE I INSPECTION REPORT

CONTENTS

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam	CAMP HARRIMAN DAM (I.D. NO. 552)
State Located:	NEW YORK
County Located:	GREENE COUNTY
Stream:	EAST KILL, SCHOHARIE CREEK
Date of Inspection:	AUGUST 30, 1978

ASSESSMENT

Examination of the available documents and visual inspection of the Camp Harriman Dam and appurtenant structures did not reveal any conditions which are unsafe at the present time. There do exist, however, several conditions which, if allowed to deteriorate further, could adversely affect the safety of the dam; these are as follows:

- Erosion of the Main Spillway apron
- Deterioration and undermining of the Auxiliary Spillway
- Deterioration and cracking of the pavement atop the dam

The total combined spillway capacity at pool El 2100 is estimated to be 6030 cfs, assuming that the emergency relief channel remains clear of debris and heavy tree growth. The peak outflow discharge during the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) would be 20,550 cfs and 8430 cfs respectively. The dam would be overtopped by 1.55 ft during the PMF and 0.19 ft during the SPF. Performance of the dam and spillways was satisfactory during a recorded overtopping of 1.5 ft. It is considered that overtopping of 0.19 ft during the SPF would result in little or no damage to either the dam or spillways. The Camp Harriman Dam is therefore considered to be adequate to safely pass the Standard Project Flood.

No remedial measures are required at the present time. Certain measures are, however, recommended as follows:

- Repair and maintain pavement on the dam crest
- Repair the main spillway
- Fill cavities under the auxiliary spillway
- Maintain the emergency relief channel in a clear and operable condition for a full 100 ft width

- Remove brush and heavy vegetation from the dam
- Prepare O & M manual and develop inspection program.

Eugene O'Brien
New York No. 29823

Approved By: Col. Clark H. Benn
New York District Engineer

Date: 20 OCTOBER 1978

1. Overview - Main Spillway at center of Camp Harriman Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
CAMP HARRIMAN DAM, INVENTORY NO. 552
HUDSON RIVER BASIN
GREENE COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection

The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam

The Camp Harriman Dam consists of a non-overflow rock section, a centrally located main spillway and an auxiliary spillway located near one end of the dam. The length of the dam, including the main and auxiliary spillways, is approximately 640 feet. The upper 3 to 6 feet of the non-overflow section is, from the appearance of the front face, constructed of hand-placed dry masonry consisting of flat field stones; the lower portion of the downstream face is rock fill. The slope of hand-placed stone is about 4(V):1(H); the slope of the rock fill is about 1(V):1.5(H). The 4(V):1(H) upstream face of the rock section is apparently faced with concrete. Earth fill has been placed against the upstream face to the top of dam level, at approximately El 2100. The crest of the rock section varies from 8 to 13 feet in width and is paved with 6 inches of unreinforced concrete.

The southernmost 50 feet of the dam consists of an apparent cutoff wall which extends from the auxiliary spillway into the left abutment.

The main spillway, which is located near the center of the dam, was originally constructed of dry hand-placed field stone masonry which was "parged" (plastered) with mortar. The downstream face is stepped, having an average slope of approximately 1:1; the upstream slope of the rock section has a slope of about 4(V):1(H). The width of the crest, at El 2097.1, is approximately 11 feet; the crest length is 30 feet and the length of the steps is 34.5 feet. The main spillway has a parged, dry field stone masonry training wall at each side and a 20.8 foot x 34.5 foot mortar apron, which was originally paved with flagstones, at its downstream end. Extensive repairs were made to the main spillway during 1965. These repairs consisted of grouting some areas and guniting the faces of the crest, steps and training walls. A timber walkway spans the main spillway.

The auxiliary spillway, which is located at the left end of the dam, is a broad (12 foot) crested 49 foot long parged stone weir with a slight downstream slope. The crest is about 0.5 to 0.6 feet higher than that of the main spillway.

An emergency spillway has been provided recently by excavating and clearing a 100-foot wide relief channel at a natural low point in the topography approximately 500 feet southeast of the southerly (left) end of the dam. The elevation of this cleared emergency relief channel is now about the same as that of the main spillway.

Flow from the reservoir is regulated at the main spillway by two gates. A 12-inch horizontally mounted sluice gate is located at the downstream end of a conduit which passes through the spillway near its left side at invert El 2086.8; the sluice gate is connected to a gate stand at the top of the left training wall. Another 12-inch sluice is located at the upstream end of a corrugated metal pipe which passes through the spillway near its right side at El 2072.3; this gate is operated from a gate stand at the upstream end of the spillway. It is reported that the intake line for the lower gate is a 24-inch diameter clay pipe, which extends approximately 34 feet upstream of the dam and is partially covered with soil.

b. Location

The dam is located on the East Kill of the Schoharie Creek approximately 1.8 miles east and upstream of East Jewett, New York.

c. Size Classification

The maximum height of the dam is approximately 32 feet and the storage capacity at spillway crest level is 230 acre feet; therefore, it is considered to be a "small" size dam.

d. Hazard Classification

The dam is considered to be in the "significant" hazard potential category.

e. Ownership

The reservoir, which is sometimes referred to as Lake Capra, and the dam are owned by the Boys Club of New York which has its main offices at 287 E. Tenth Street, New York, New York 10009. Operation and maintenance are performed by the full time caretaker of Camp Harriman.

f. Use of the Dam

The impoundment formed by the dam has been used as a recreation facility for Camp Harriman, a summer camp for children.

g. Design and Construction History

It is reported that the dam was constructed circa 1912-1913 by a private owner named Colgate and modified after construction by addition of concrete facing upstream, earth fill and rock fill. The lake was substantially drained for several years during World War II. Around 1962 the dam and main spillway were repaired by refacing part of the dam's upstream face with 12 to 18 inches of concrete, sealing several leaks and placing earth fill against the upstream face. In 1964, pressure grouting was used to seal two areas of leakage in the downstream side of the spillway. Sometime after 1964 the spillway was resurfaced with gunite.

h. Normal Operating Procedures

The pool is usually maintained at spillway crest level, except when an unusually large inflow is anticipated. In such cases the gates are opened and the pool lowered. The lower gate is usually cracked slightly open to provide some downstream flow. Both gates are "exercised" approximately every two months.

1.3 PERTINENT DATA

a. Drainage Area, square miles	4.58
b. Discharge at Dam Site, cfs	
Maximum known flood at site (Aug. 10, 1976)*	
Maximum regulating gate outlets	20±
Ungated Main Spillway, Pool El 2100**	410
Ungated Auxiliary Spillway, Pool El 2100	480
Emergency relief channel, Pool El 2100	6030
Total discharge capacity at Pool El 2100	6920

*Estimated, assuming that the emergency relief channel was not operating
**Top of Dam

c. Elevation (USGS Datum)

Top of Dam	2100±
Crest, Main Spillway	2097.1±
Crest, Auxiliary Spillway	2097.6±
Crest, Emergency relief channel	2097.1±
Stream bed at downstream toe of dam	2072.0±

d. Reservoir

Length of pool, mi (El 2100±)	0.4
Surface area, acres, (El 2100±)	51.2
Length of shoreline, mi (El 2100±)	1.4

e. Storage, acre-feet

Top of spillway crest	230.2
Top of dam	444.2

f. Dam

Type: Dry masonry and rockfill with earth fill on upstream face
Length: 640± ft
Height: 28± ft above foundation
Crest width: 13 ft
Impervious zone: 12" to 18" concrete facing on upstream side of dry masonry (full extent of facing is not known)
Grout curtain: none

g. Spillways

Main Spillway
Type: Parged and gunited dry masonry, broad-crested ungated weir with stepped downstream slope
Length: 30 ft
Crest Elevation: 2097.1±
Downstream Channel: East Kill, Schoharie Creek

Auxiliary Spillway
Type: Parged dry masonry broad-crested ungated weir
Length: 49 ft
Crest Elevation: 2097.6±
Downstream Channel: Short channel, lined with dumped stone, to East Kill

Emergency Relief Channel

Type: Excavated "swale" in low portion of flat ridge between reservoir and East Kill

Crest Length: 100± ft

Crest Elevation: 2097.1±

Downstream Channel: 0.3-mile long channel cleared of brush, nearly uniform slope of 0.02 from spillway crest to East Kill

h. Regulating Outlets

12-inch sluice gate at downstream end of spillway at Invert El 2086.8

12-inch sluice gate at upstream end of spillway at Invert El 2072.3

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

It is reported that the dam was constructed circa 1912-1913. No computations, drawings or other plans relative to the design are available; it is reported that none were made.

2.2 CONSTRUCTION RECORDS

No construction records are available.

2.3 POST CONSTRUCTION INFORMATION

There are no records of the project prior to 1964. A report prepared by Ackerman, Knox, Haywood and Pakan, dated November 1964 includes some historical information, the findings of an inspection, an evaluation of the condition of the dam and spillways and recommendations for rehabilitation. Two drawings (Drawings No. 2806-01 and 2803-03) of the same date, also prepared by Ackerman, et.al., present plans and elevations of the dam and spillway based on a 1964 survey.

A 1965 application to the State of New York Department of Public Works for a permit to reconstruct the dam indicates that borings were made; logs of the borings were not available.

2.4 OPERATION RECORDS

There are no written records of either gate operation or maintenance; there are no written maintenance records for the dam. The caretaker reported that gates were greased approximately annually and exercised bi-monthly in recent years.

2.5 EVALUATION OF DATA

The available data were obtained from the Boys Club, New York Office, the caretaker and from Haywood and Pakan Associates and, in conjunction with the visual inspection, are considered to be adequate for this Phase I inspection.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of the Camp Harriman Dam was made on Wednesday, August 30, 1976. At the time of the inspection the reservoir level was at the level of the main spillway crest, El 2097.1±.

b. Dam

There are minor irregularities in the alignment of the dam; these appear to represent as-built conditions rather than post construction movements. The vertical alignment is uniform at El 2100 except for the reach between the dogleg in the northern portion and the main spillway; in this area, the 1964 survey indicates that the dam may have settled 0.01 to 0.02 feet. The pavement on the dry masonry crest has many longitudinal and transverse cracks open as much as 3/4 inch. There is a longitudinal 2.5-inch depression or "swale" in the crest located approximately 120 feet north of the main spillway at the dogleg.

The exposed nearly vertical downstream face of dry masonry appeared to be in good condition with no visible signs of distress or movement. The rockfill also appeared to be in good condition except for a few areas where stones had been either toppled or dislocated due to overtopping of the dam.

The existence of a nearly vertical 12-to 18-inch thick concrete facing on the upstream side of the dry masonry could be determined from visual inspection of the pavement for most of the dam length. The vertical extent of the concrete wall, however, could not be ascertained from the visual inspection. The condition of the earth fill which had been placed against the upstream face of the masonry section was good; although the earth fill slopes are not protected, there has not been visible damage as a result of wave action.

The upstream face of the dam is generally covered with grass and some brush; the downstream slopes of the rockfill have some grass and brush cover and, occasionally, some trees growing on them.

There are no visible signs of seepage emerging from either the downstream slopes or toe of the dam.

c. Spillways

(1) Main Spillway - The visible portions of the main spillways gunited surface were in good condition. Except for some fine cracks near the bottom of the training walls, there were no signs of distress. There is a visible inward bulge on the north training wall; this bulge apparently existing prior to guniting in 1965.

There has been substantial erosion of the apron. The flagstones have been carried away (possibly after having been loosened by freeze-thaw cycles) and some of the underlying concrete fill has also been eroded. A small amount of soil adjacent to the south (outside) face of the south training wall has been eroded, apparently as a result of overtopping.

(2) Auxiliary Spillway - The auxiliary spillway has not been resurfaced with gunite; the surface of the parged field stone crest and side walls are cracked and deteriorating. There is a protrusion near the center of the spillway crest which appears to be the remnant of an old bridge pier. At the southern half of the spillway, there exists a separation of as much as 2 inches between the upstream vertical wall and the downstream portion of the spillway crest. Stone in the stream bed below the weir has been eroded such that there are some cavities under the 4-foot high weir and also under the side walls. Some small seepage was audible (not visible) near the left side of the spillway toe.

(3) Emergency Relief Channel - The channel consists of a dozed and cleared flat strip about 100 feet wide.

d. Regulating Gates

Both sluice gates were reported to be operational. The visible gate at invert El 2086.8 was shut and leaking; this condition is the result of the sealing adjustment. The gate appeared to be in good condition and well maintained. The lower sluice gate, which could not be inspected, was cracked slightly open.

e. Abutments

There were no signs of seepage or other unusual conditions at the abutments. There were no signs of erosion or other adverse effects which might result from overtopping of the dam at the abutments.

f. Downstream Channel

The channels downstream of the main and auxiliary spillways contained some trees and brush; however, their present condition would not impede flood flows. The downstream channel of the emergency relief swale contained high grass and shrubs and would probably not be efficient in discharging low flood flows.

g. Reservoir Area

In the vicinity of the dam and spillways there were no evidences of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not indicate serious problems which would adversely affect the safety of the dam and require either immediate investigation or immediate remedial action.

a. The cracked condition of and depressions in the pavement do not represent an unsafe condition at the present time; however, the pavement holds together and prevents erosion of the dry masonry top stones during overtopping. Therefore, the pavement should be either repaired or covered with an additional course of pavement and the depressions filled.

b. The growth of trees and heavy brush on the dam is considered to be undesirable.

c. Erosion of the main spillway apron is considered to be an undesirable condition; additional erosion of the apron could cause undermining of the spillway toe and/or training walls.

d. The observed conditions at the auxiliary spillway (i.e. surface deterioration and undermining caused by scour) are considered to be undesirable.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The water level behind the dam is usually kept at spillway crest level. If a major storm is anticipated, the Camp Harriman caretaker will open the gates to lower the reservoir level by as much as 5 or 6 feet. At other times the lower gate is cracked slightly open to provide some water downstream.

4.2 MAINTENANCE OF THE DAM

There is no operation and maintenance manual for the project and no record of maintenance to the dam.

4.3 MAINTENANCE OF THE REGULATING FACILITIES

It is reported that the gates are exercised bi-monthly and maintained at approximately yearly intervals.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect.

4.5 EVALUATION

The maintenance of the Camp Harriman Dam is considered less than adequate in the following areas:

a. Control of brush and trees on portions of the dam.

b. Maintenance and repair of such project features as:
   - the crest pavement
   - Main Spillway apron
   - Auxiliary Spillway

c. Absence of an operation and maintenance manual

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE BASIN CHARACTERISTICS

Camp Harriman Dam is located on the East Kill in the Town of Jewett, Greene County, N.Y. just upstream from Colgate Lake. The drainage basin has a triangular shape and is almost entirely wooded. The drainage pattern with respect to the dam location is such that all runoff would arrive at the lake almost simultaneously, thus causing a high peak inflow, even though the dense vegetal cover would cause some losses and flow retardation. It is expected, however, that flow retardation would be counterbalanced by flow acceleration resulting from the steep slopes encountered in the basin. There is an approximate 1760 ft drop in about one mile distance to the north of the lake (Blackhead Peak) and a 1320-foot drop in about 1.2 mile distance to the east (Stoppel Point). The drainage basin has an area of 4.58 square miles of which 51.2 acres are occupied by the lake.

5.2 SPILLWAY

Discharge capacity is available by means of outflow through the Main and Auxiliary Spillways and through the Emergency Relief Channel. Dimensions and elevations of these structures are given in paragraph 1.3g. It is estimated that the discharge capacities are 410 and 480 cfs for Main and Auxiliary spillways, respectively, and 6030 cfs for the relief channel, when the lake level is equal to that of the top of the dam. The computed discharge capacities of the 12 inch diameter low level outlets, with lake level at El 2097.1 are about 9 cfs for the upper and 12 cfs for the lower conduit.

5.3 RESERVOIR CAPACITY

The normal reservoir capacity corresponding to spillway crest El 2097.1 is 230.2 acre feet,[1/] or 75 million gallons. The computed surcharge storage between spillway crest elevation and top of dam (El 2100) is 151 acre feet. This amount of surcharge storage is equivalent less than one inch of runoff over the entire basin.

5.4 FLOODS OF RECORD

The nearest U.S. Geological Survey complete stream gaging station is No. 3500 located on the Schoharie Creek near Prattsville. "Pipe Gages", to record flood flows only, are located on a number of tributaries, one on the East Kill at East Jewett and one on the Batavia Kill near Windham. The records indicate the following flood flows in 1955 and 1960 for these last

two points.

East Jewett Station on the East Kill
Drainage Area = 35 Square Miles
1955 flood = 10,000 cfs = 285 cfs/sq mi
1960 flood = 8,100 cfs = 230 cfs/sq mi

Windham Station on the Batavia Kill
Drainage Area = 4 Square Miles
1955 flood = 1,700 cfs = 430 cfs/sq mi
1960 flood = 1,690 cfs = 436 cfs/sq mi

It was reported that the dam had been overtopped several times prior to 1964; however, there are no records of such overtopping.

It was also reported that the dam was overtopped by 1.5 feet on August 10, 1976. The reservoir had been lowered by 5 or 6 feet in anticipation of the storm. At that time the emergency relief channel had not been cleared and bulldozed to El 2100.

5.5 OVERTOPPING POTENTIAL

The overtopping potential was evaluated for both the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF).

The Probable Maximum 6 hour rainfall for the Camp Harriman area was determined as 23.5 inches,[2] and based on EC 1110-2-27 was reduced 20 percent to 18.8 inches. The distribution of the rainfall was based on data in a publication of the World Meteorological Organization.[3]

Based on the Soil Conservation Service curve number method the rainfall excess was determined as 16.54 inches. Because of the physical features of the basin, with four streams flowing into the lake, the basin was divided into 4 sub-basins. Triangular unit hydrographs were developed for each sub-basin and subsequently used to compute their respective PMF runoff hydrographs. The flood hydrograph was formed by adding the PMF runoff hydrographs from each sub-basin to the runoff resulting from the rainfall directly on the lake area, and resulted in a flood inflow peak of 20,660 cfs.

The potential of the water overtopping the dam was investigated on the basis of the available surcharge storage and spillway discharge capacities to meet a potential emergency inflow. It was assumed that the lake level at the start of the flood inflow would be at (El 2097.1 (spillway crest).

The PMF would cause the level of the lake to rise to a maximum elevation of 2101.55, 1.55 feet above the top of the dam. The peak outflow discharge would be 20,550 cfs or about 3 times the outflow capacity. The Standard Project Flood, usually taken as one half PMF, would produce a maximum lake level elevation of 2100.19 and a peak discharge of 8430 cfs, 1.2 times the combined spillway capacity.

The low level conduits were assumed inoperable during the floods.

5.6 EVALUATION OF HYDROLOGY/HYDRAULICS

Based on the assumption that the emergency relief channel remains clear of debris, vegetation and heavy tree growth, the dam would be overtopped by approximately 0.2 ft during the Standard Project Flood and about 1.55 ft during the Probable Maximum Flood. The dam safely withstood 1.5 ft overtopping during 1976, at which time the emergency relief channel had not been cleared.

REFERENCES:

1/Report on Lake Harriman Dam, by Ackerman, Knox, Haywood and Pakan, 1964.

2/U.S. Weather Bureau, Technical Paper No. 40, 1961.

3/Manual for Estimation of Probable Maximum Precipitation, World Meteorological Organization, Operation Hydrology Report No. 1973.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual inspection did not indicate conditions which would adversely affect the stability of either the dam or the main and auxiliary spillways at the present time. However, certain conditions, if allowed to deteriorate further, could adversely affect structural stability at some later date; these are as follows:

- Erosion of Main Spillway Apron
- Deterioration and undermining of Auxiliary Spillway
- Deterioration and cracking of the dam crest pavement

b. Design and Construction Data

There exist no design computations or other data regarding the structural stability of the dam.

On the basis of the performance experience of the dam and the auxiliary spillway under flood flows which have overtopped the dam, both structures are considered to be stable. On the basis of stability analyses performed during the course of this investigation, as well as performance experience, the structural stability of the Main Spillway is also considered to be adequate.

c. Operating Records

There are no operating records.

d. Post Construction Changes

No records of post construction changes were available for this investigation; however, it is reported that the following repairs were made:

- Addition of concrete facing on upstream side of dry masonry section.
- Placement of earth fill upstream of masonry section.
- Sealing by pressure grouting of several leaks at the main spillway.
- Resurfacing of the main spillway using gunite.
- Rehabilitation of the gates.

e. Seismic Stability

The dam is located in Seismic Zone No. 1; therefore, no seismic analyses are warranted.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Examination of the available documents and visual inspection of the Camp Harriman Dam and appurtenant structures did not reveal any conditions which are unsafe at the present time. There do exist, however, several conditions which, if allowed to deteriorate further, could adversely affect the safety of the dam; these are as follows:

- Erosion of the Main Spillway apron.
- Deterioration and undermining of the Auxiliary Spillway.
- Deterioration and cracking of the pavement atop the dam.

The total combined spillway capacity at pool El 2100 is estimated to be 6030 cfs, assuming that the emergency relief channel remains clear of debris and heavy tree growth. The peak outflow discharge during the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) would be 20550 cfs and 8430 cfs respectively. The dam would be overtopped by 1.55 ft during the PMF and by 0.19 ft during the SPF. Performance of the dam and spillways were satisfactory during a recorded overtopping of 1.5 ft. It is considered that overtopping of 0.19 ft during the SPF would result in little or no damage to either the dam or spillways. The Camp Harriman Dam is therefore considered to be adequate to safely pass the Standard Project Flood.

b. Adequacy of Information

The information available were not adequate to fully determine the nature of dam section and the full extent of the upstream concrete facing on the masonry section. Although leakage was reported to have occurred, efforts have been made to seal it and there were no evidence of seepage at the time of the inspection. The available data, in conjunction with the findings of the visual inspection, are adequate for performance of this investigation. Inadequacies with regard to operation and maintenance data are as follows:

1. Up-to-date record drawings of the project.
2. Operating and maintenance manuals.
3. Records of water levels inspection and operation.

c. Additional Investigations

Additional investigations to assess the safety of the dam do not appear necessary.

7.2 REMEDIAL MEASURES

No remedial measures are required at the present time.

Certain measures are, however, recommended as follows:

a. The cracked pavement atop the spillway crest should be repaired or covered by an additional course of pavement and the depressions filled with concrete.

b. The apron of the main spillway should be repaired.

c. Cavities under the auxiliary spillway should be filled and the toe of the spillway protected by additional stone riprap.

d. The emergency relief channel should be maintained in a clear and operable condition for a full 100 ft width at all times.

e. Heavy brush, shrubs and young saplings should be removed from all locations on the dam. Large conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be monitored for seepage.

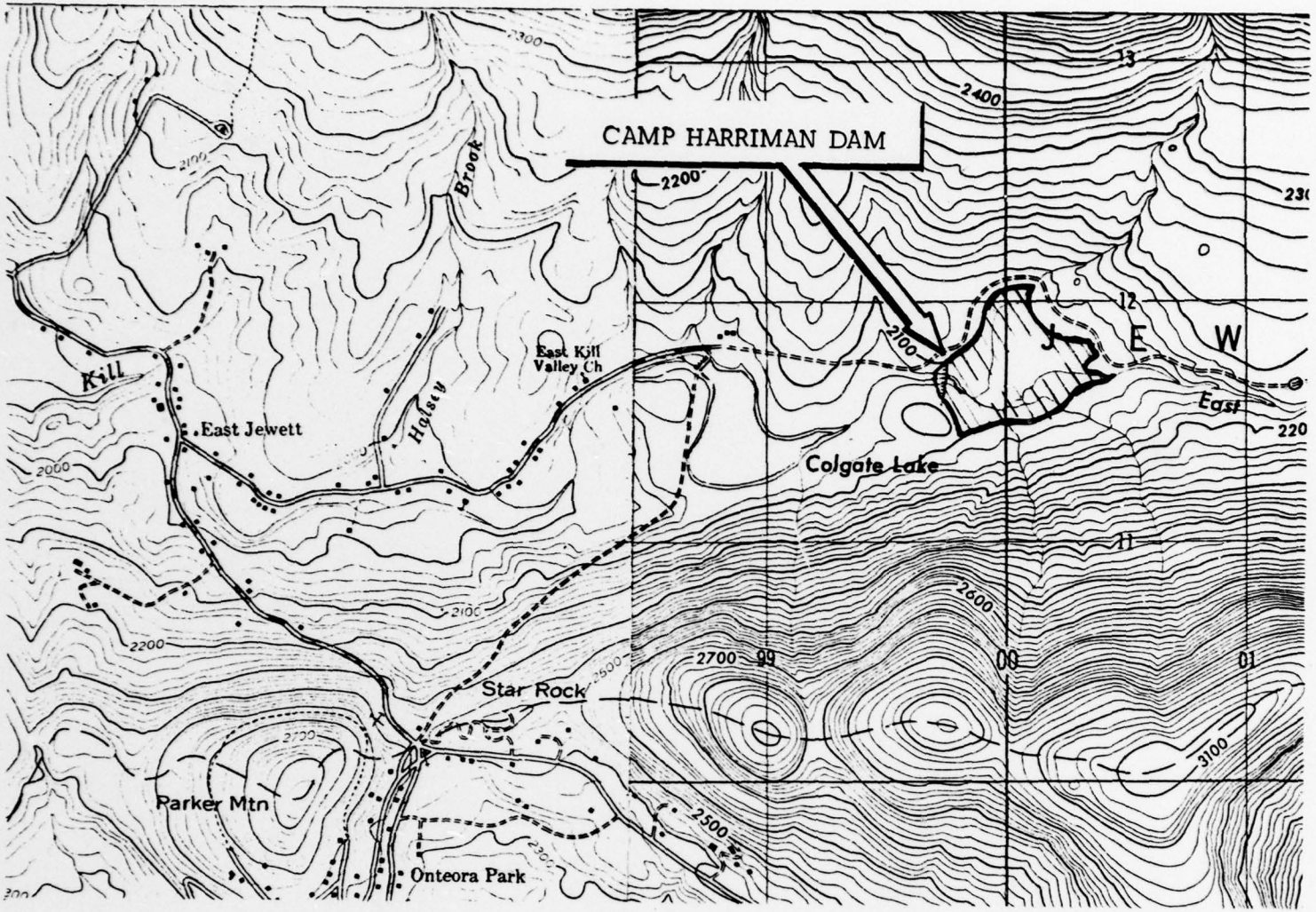
f. An operation and maintenance manual should be prepared and a program of periodic inspections developed.

DRAWINGS

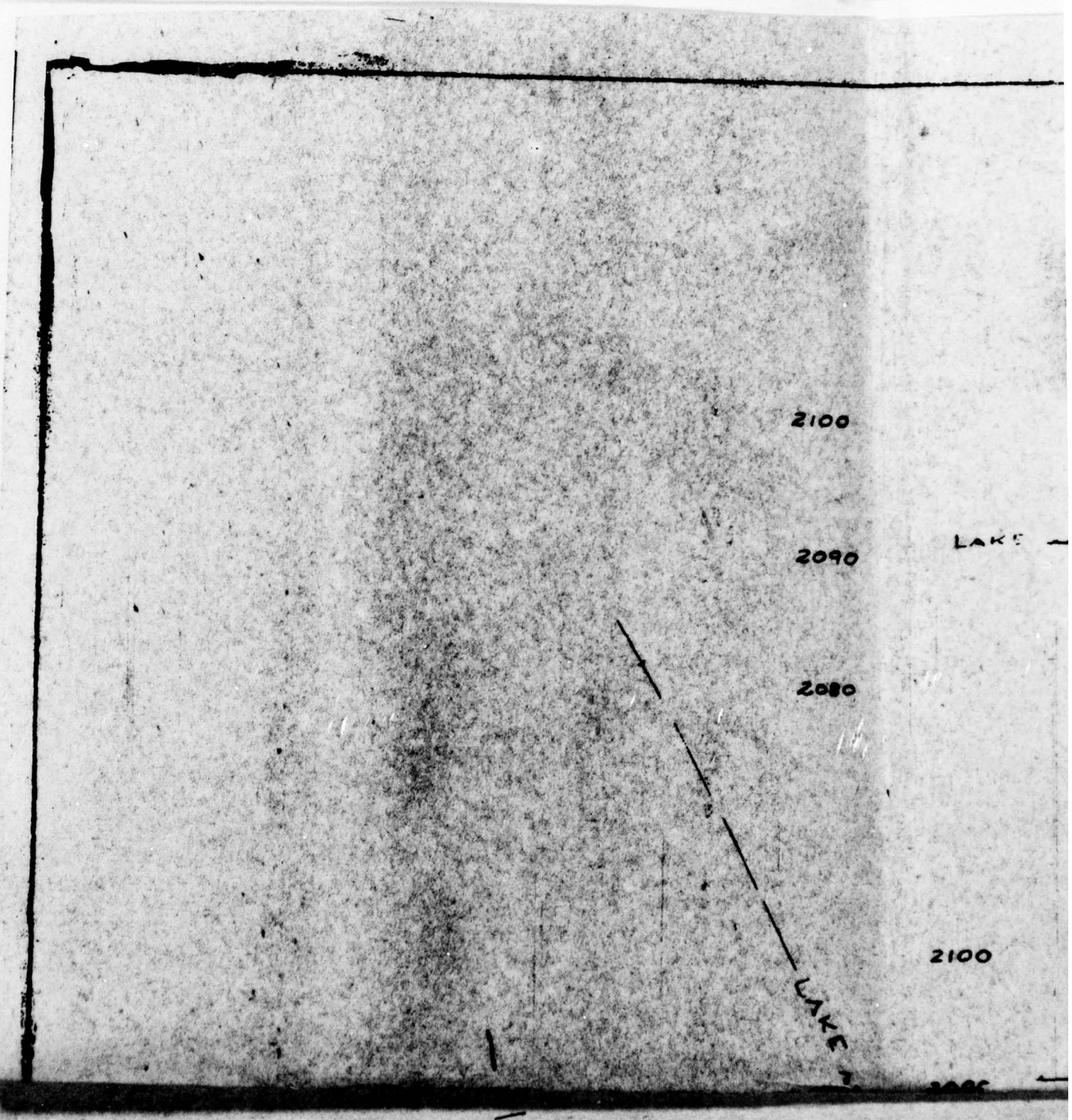
APPENDIX A

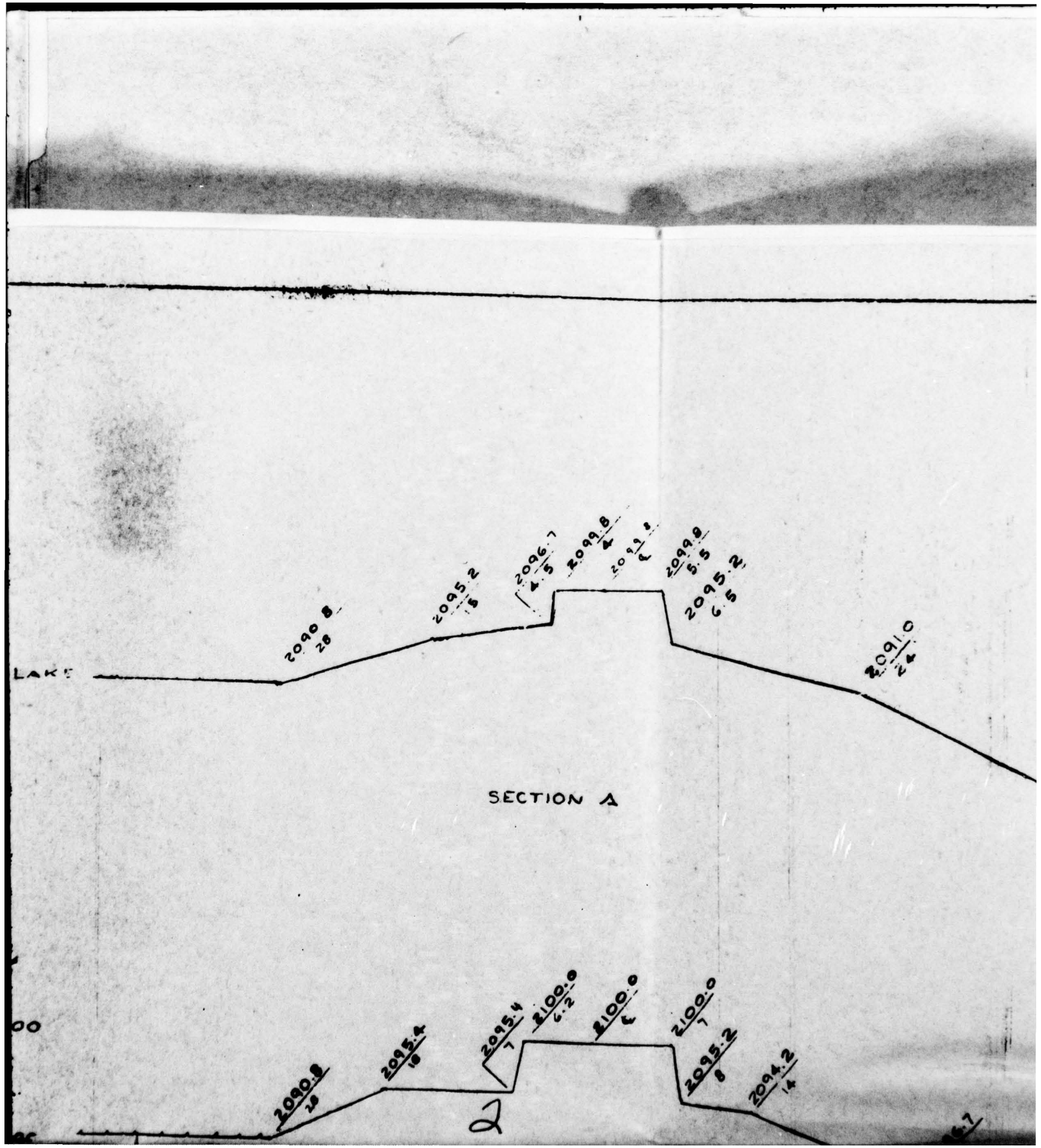
0 MILES 25

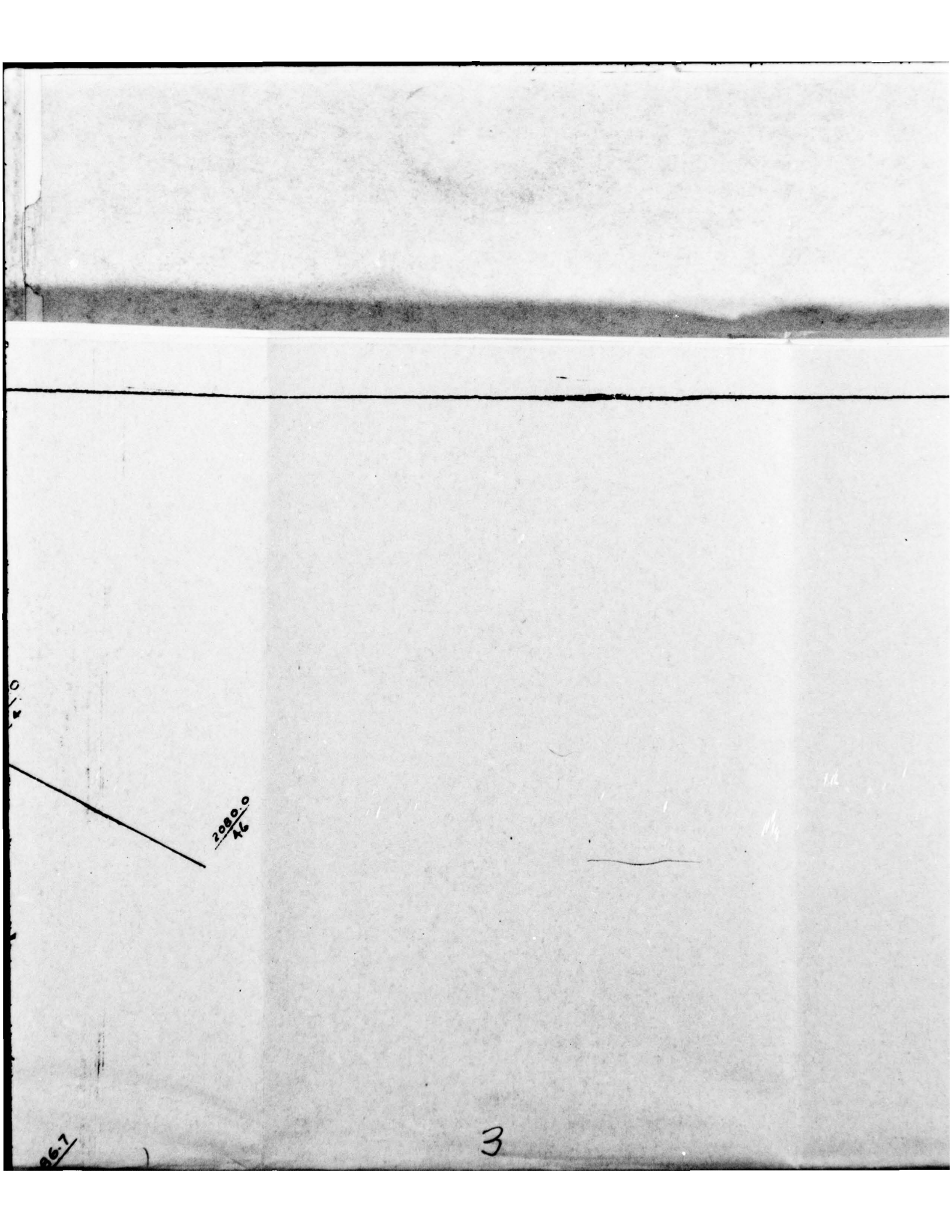
VICINITY MAP
CAMP HARRIMAN DAM

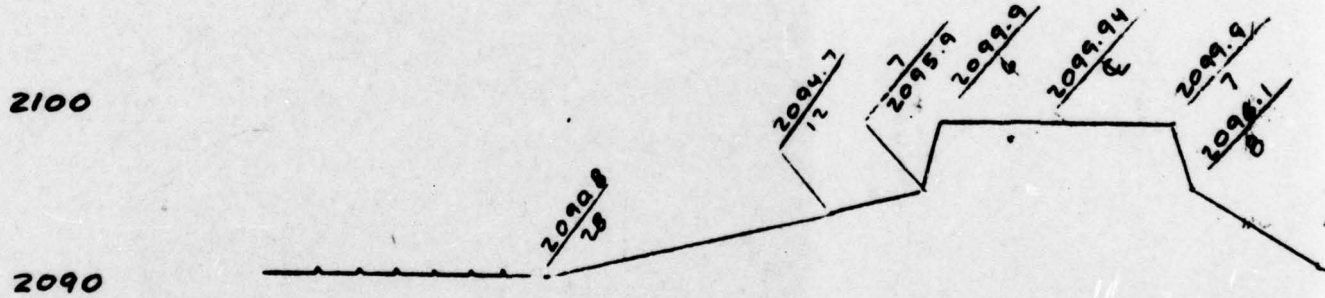


CONTOUR MAP : CAMP HARRIMAN DAM

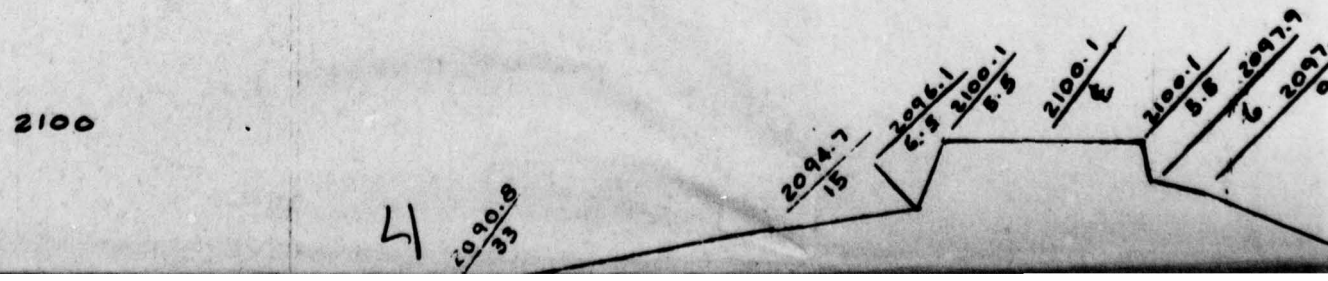

2100
2090
LAKE
2080
2100
LAKE

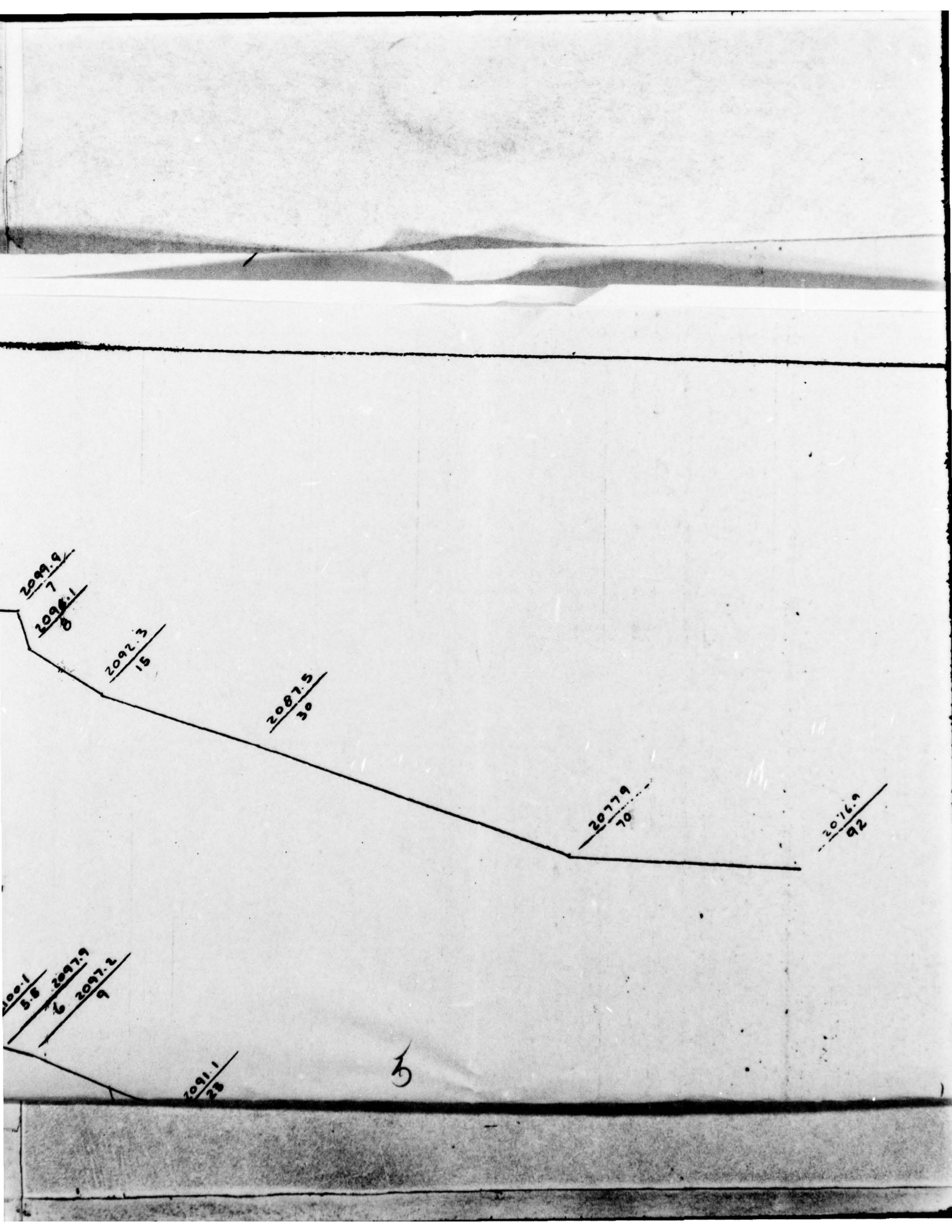

LAKE
2090.8
2.8
2095.2
1.5
2096.7
4.5
2099.8
4
2099.8
5.5
2095.2
6.5
2091.0
2.4
SECTION A
2090.8
2.8
2095.4
1.8
2095.4
1
2100.0
2.2
2100.0
2100.0
1
2095.2
8
2094.2
1.4
2


2080.0
46
96.7
3


2100
2090
2094.7
12
2095.9
7
2099.9
6
2099.94
6
2099.9
7
2096.1
8
2090.8
28

SECTION D


2100
2094.7
15
2096.1
6.5
2100.1
6.5
2100.1
6
2100.1
5.8
2097.9
6
2090.8
33


2099.9
7
2096.1
8
2092.3
15
2087.5
30
2077.9
70
2076.9
92
2097.9
2097.2
9
2091.1
28
3

EL 2090.8

Conc Float Anchor

B.M. EL 2098.29 (A.K.H & P.)

LIGHT WOODS

2098.89

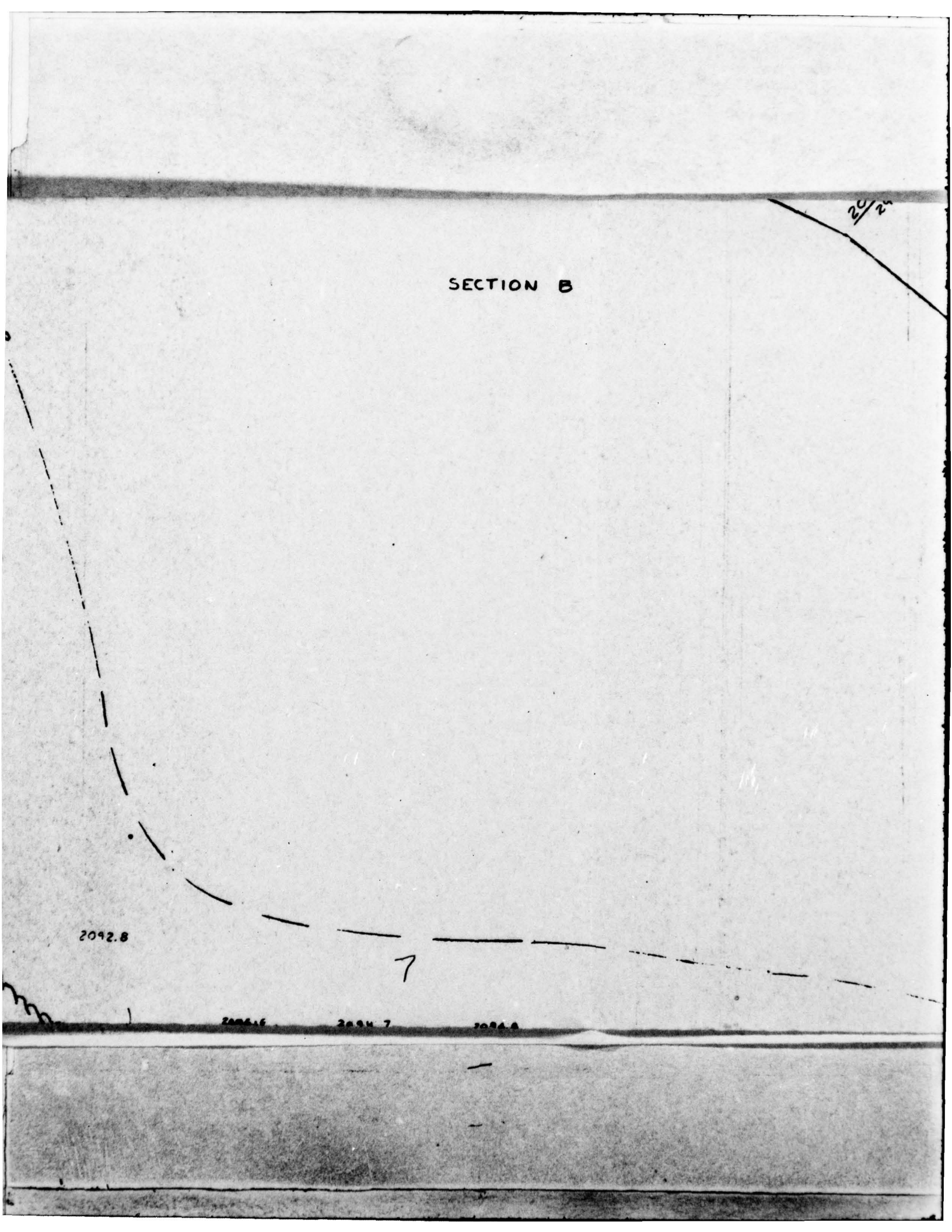
2097.9

2094.2

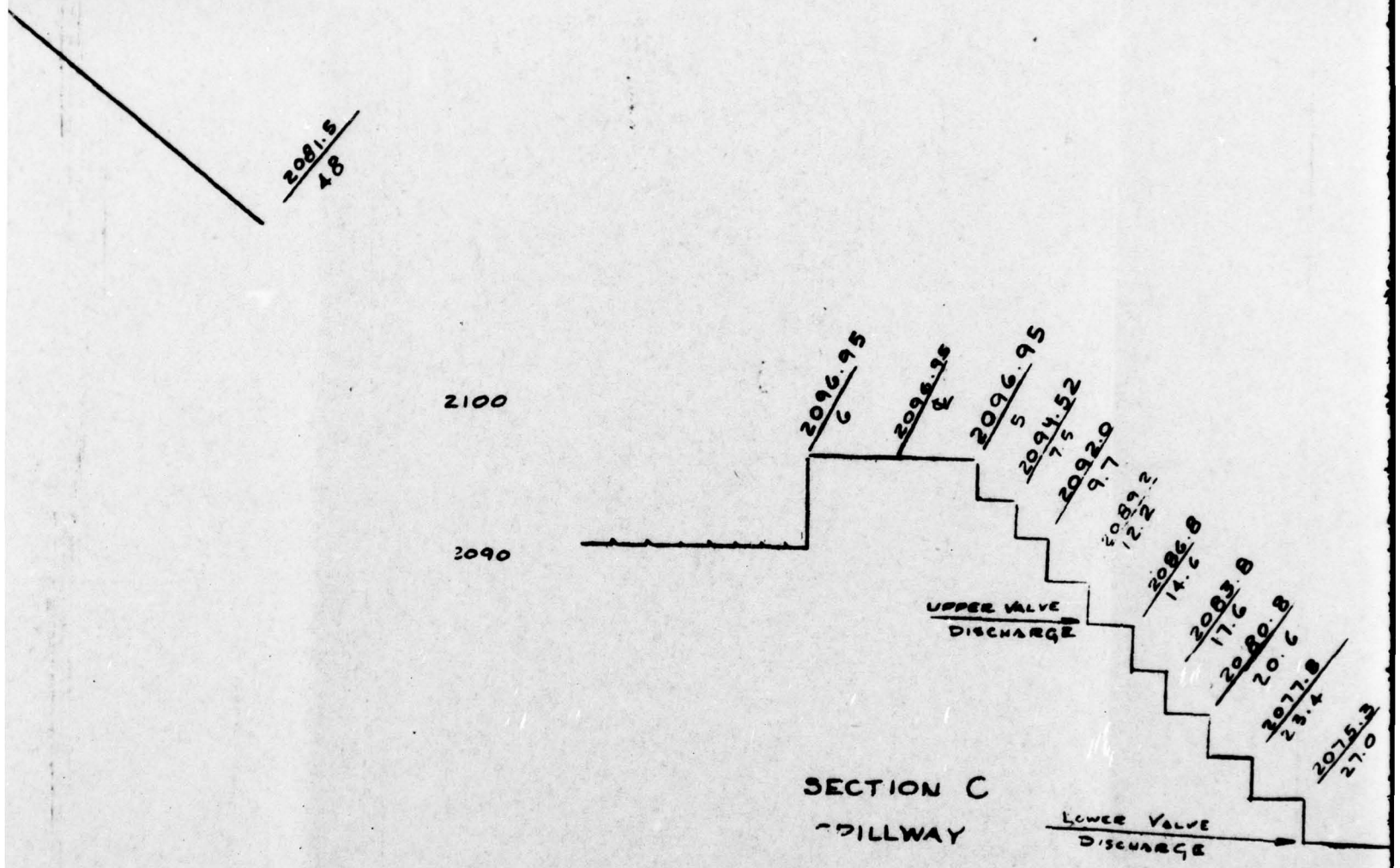
2095.5

2092.8

6

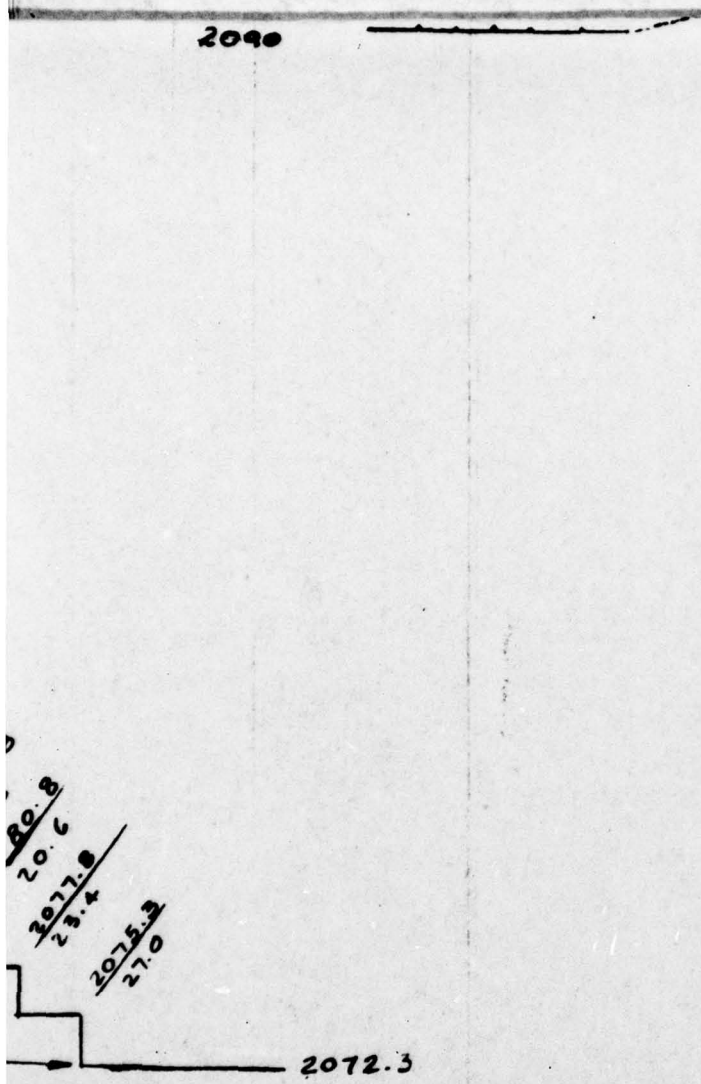

SECTION B
2092.8
7

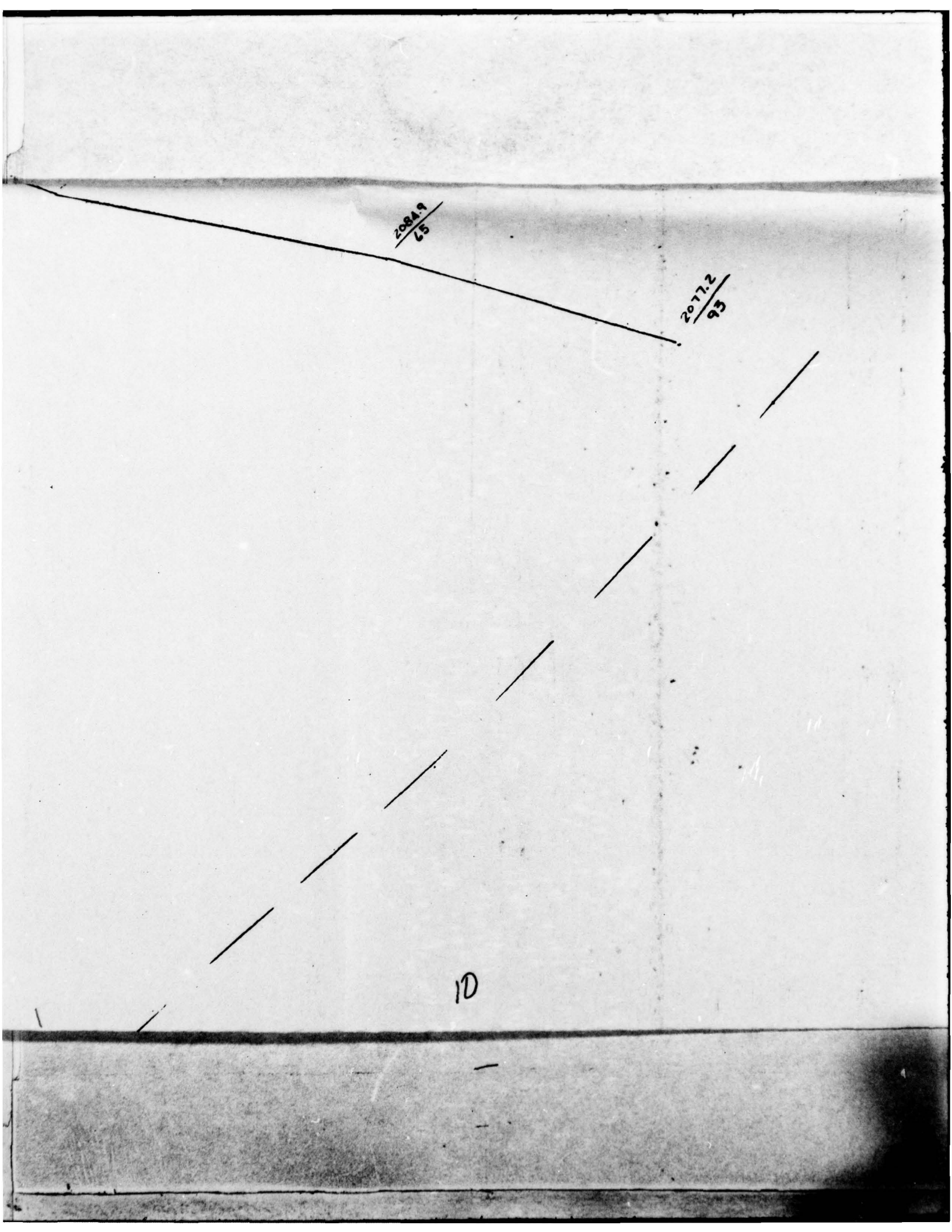
SECTION SCALE 1"=10'

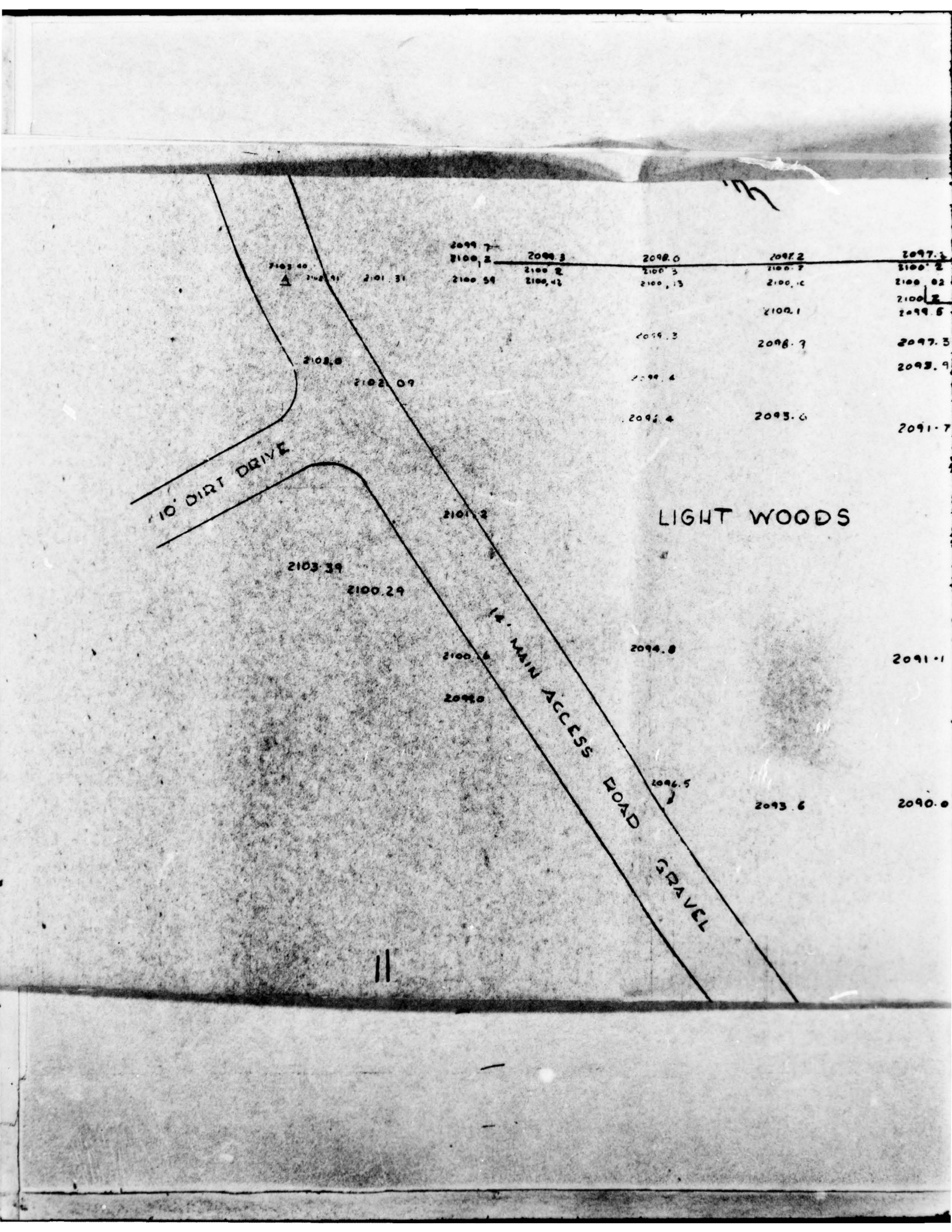


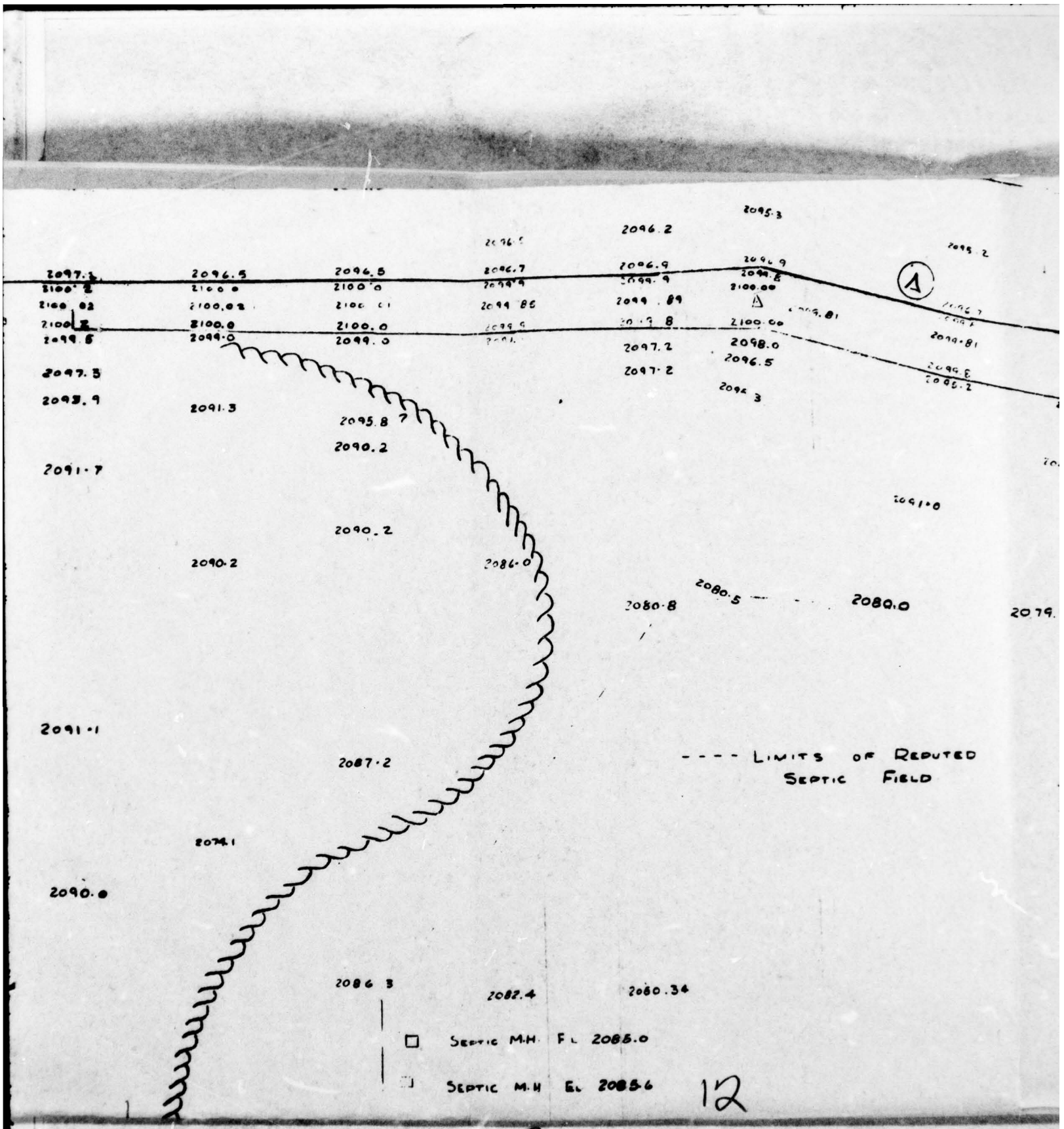
SECTION C
SPILLWAY

8

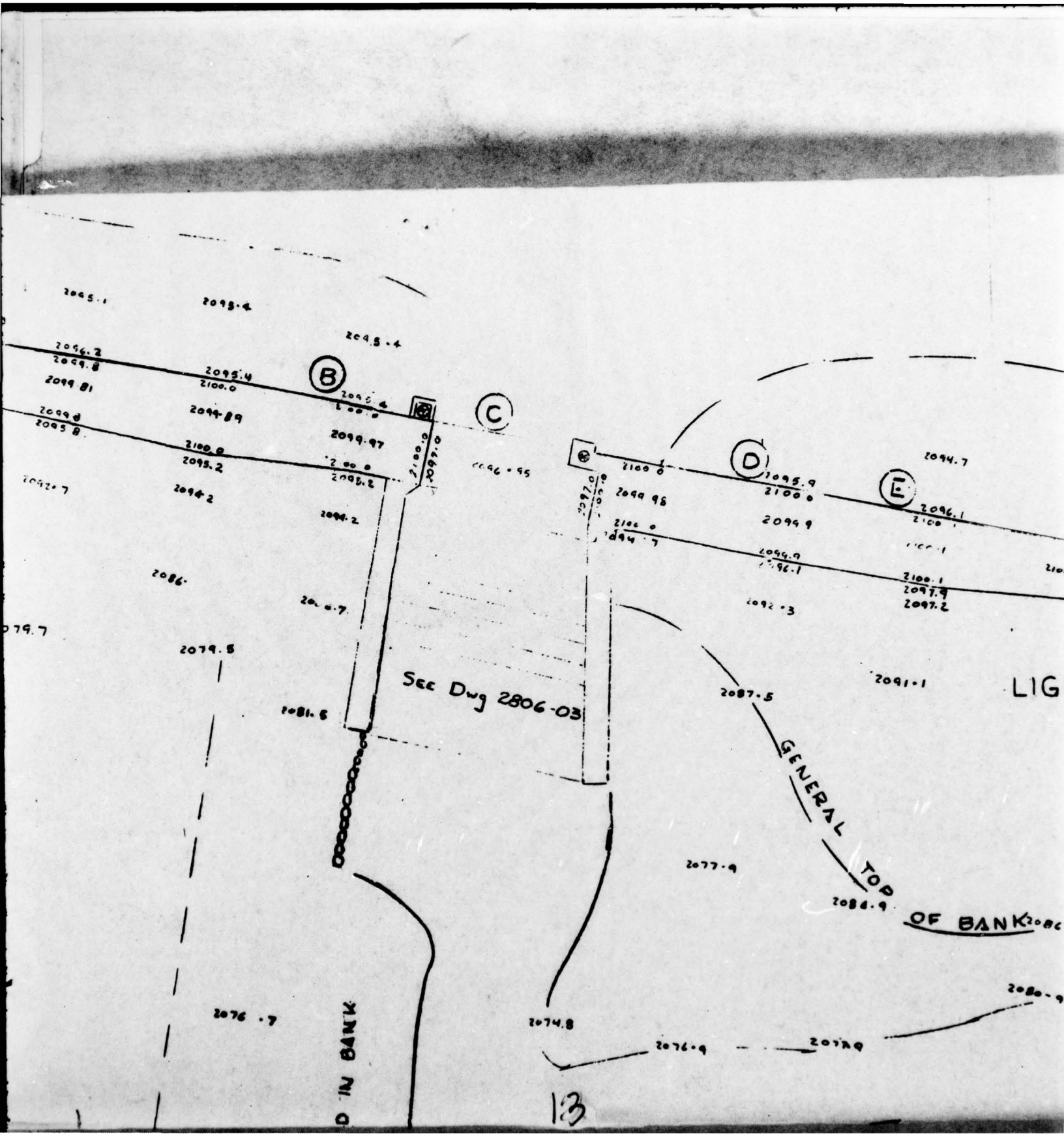

2090
80.8
20.6
2077.8
23.4
2075.3
27.0
2072.3

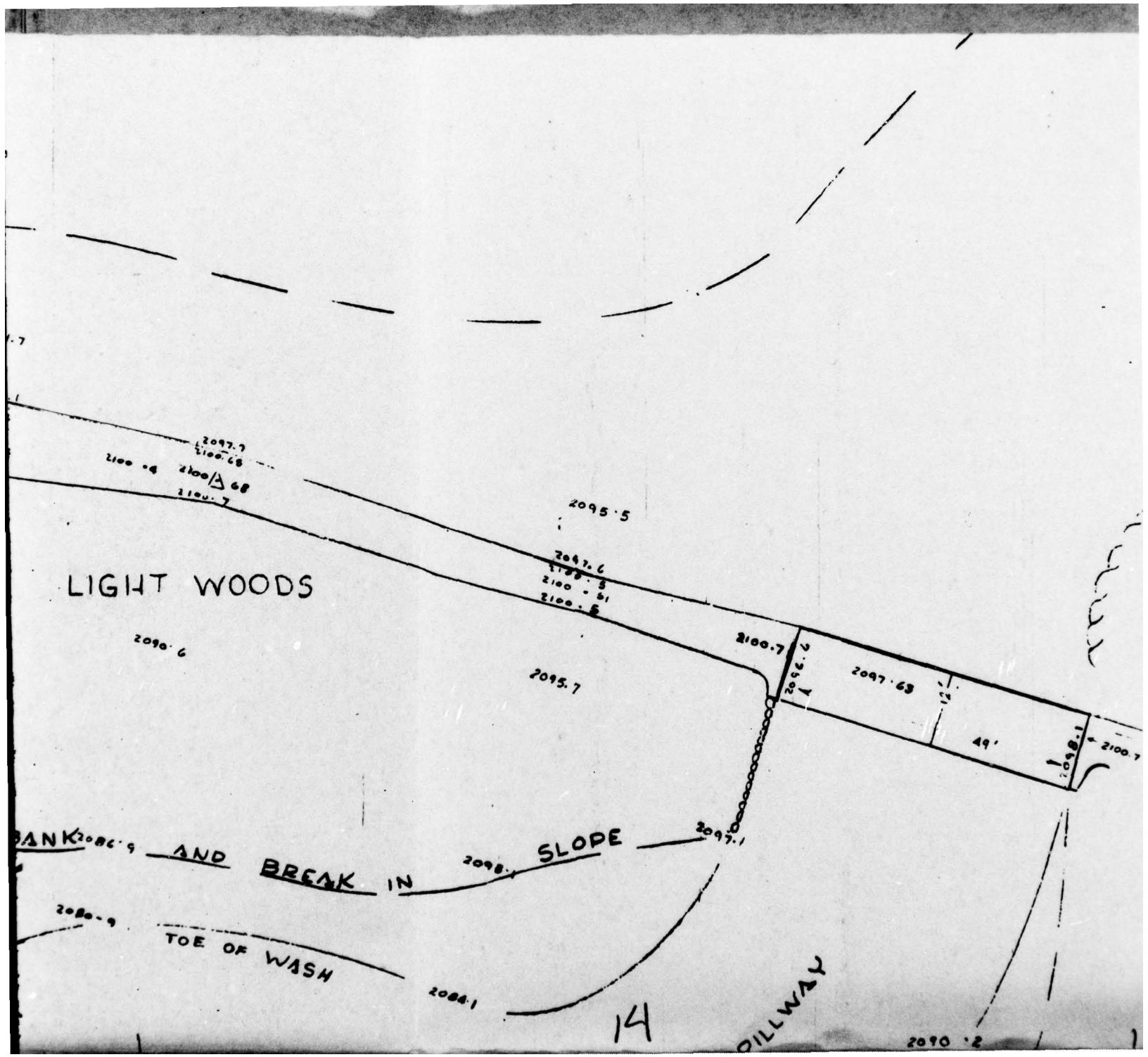

2084.9
45
2077.2
93
10


2103.40
2101.31
2100.59
2099.7
2100.2
2098.5
2100.2
2100.43
2098.0
2100.3
2100.13
2097.2
2100.2
2100.02
2100.2
2099.5
2102.1
2099.3
2098.9
2097.3
2093.9
2099.4
2096.4
2093.6
2091.7
2102.09
2103.8
10' DIRT DRIVE
2101.2
LIGHT WOODS
2103.39
2100.29
14' MAIN ACCESS ROAD GRAVEL
2100.6
2094.8
2091.1
2096.5
2093.6
2090.0
11


2095.3
2096.2
2095.2
2097.1
2096.5
2096.5
2096.7
2096.9
2096.9
2100.0
2100.0
2100.0
2100.0
2100.0
2100.02
2100.02
2100.0
2100.0
2100.0
2099.8
2099.0
2099.0
2099.8
2097.2
2098.0
2096.5
2097.2
2097.3
2098.9
2091.3
2095.8
2090.2
2091.7
2091.0
2090.2
2090.2
2086.0
2080.8
2080.5
2080.0
2079.
2091.1
2087.2
2074.1
2090.0
2086.3
2082.4
2080.34
LIMITS OF REDUTED SEPTIC FIELD
SEPTIC M.H. FL 2085.0
SEPTIC M.H EL 2085.6

12


B
C
D
E
2095.1
2095.4
2096.2
2099.8
2099.81
2095.4
2100.0
2099.89
2099.8
2095.8
2100.0
2095.2
2099.97
2100.0
2097.0
2096.95
2092.7
2094.2
2094.2
2086.
2079.7
2079.5
2081.6
2095.4
2100.0
2094.7
2100.0
2095.9
2100.0
2099.95
2094.9
2094.7
2096.1
2100.
2094.9
2096.1
2100.1
2097.9
2097.2
2092.3
2091.1
2087.5
2077.9
2084.9
2076.7
2074.8
2076.9
2078.9
2080.9
Sec Dwg 2806-03
GENERAL TOP OF BANK
D IN BANK
LIG


LIGHT WOODS
2097.7
2100.68
2100.4
2100.68
2100.7
2095.5
2097.6
2100.8
2100.51
2100.6
2100.7
2090.6
2095.7
2097.63
49'
2098.1
2100.7
BANK 2086.9
AND BREAK IN SLOPE
2098.
2097.1
2080.9
TOE OF WASH
2084.1
14
OILLWAY
2090.2

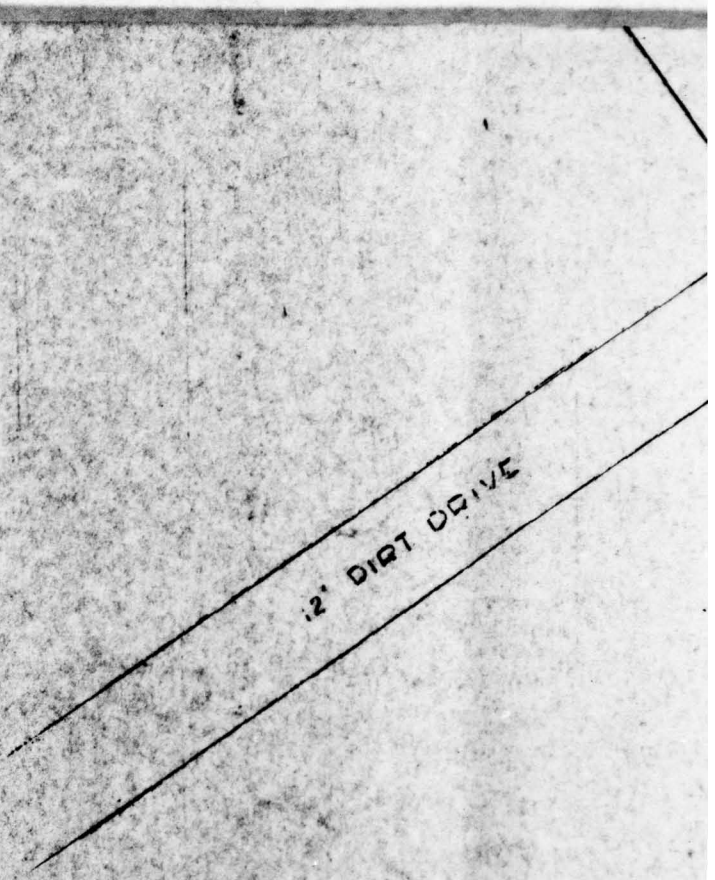
WOODED SHORELINE

2100.7

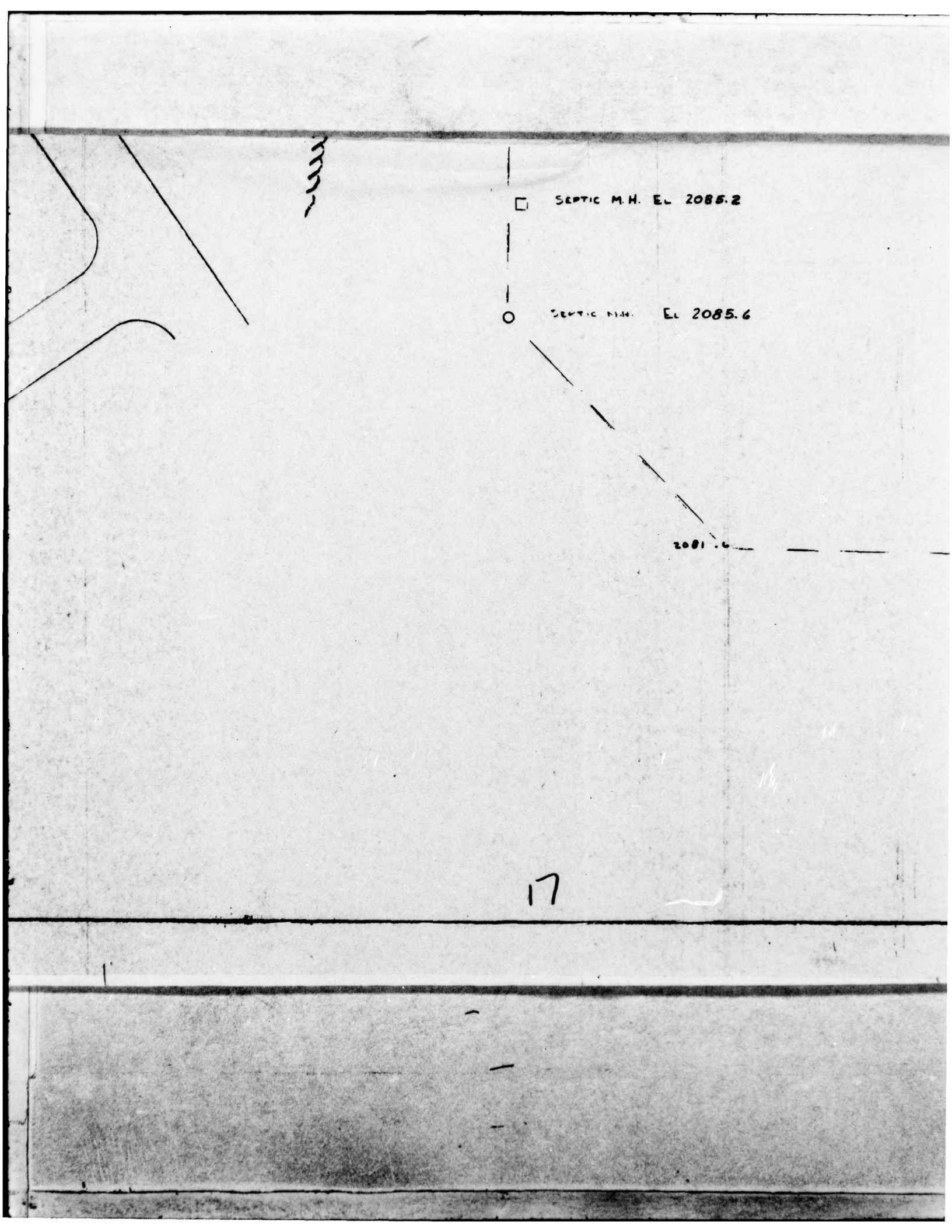
2100.2

2100.4

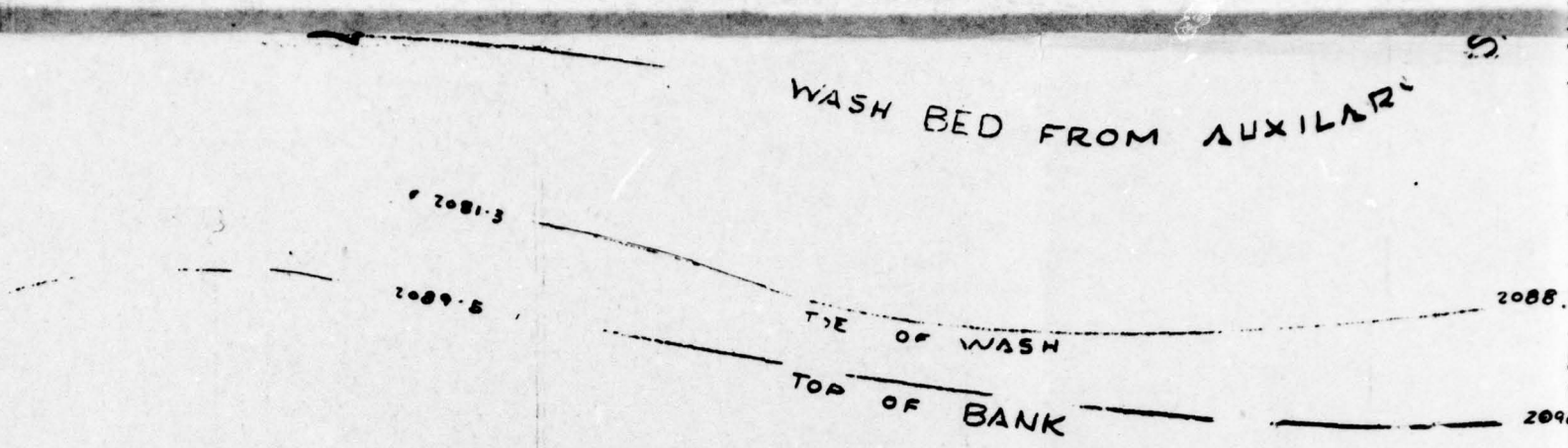
15



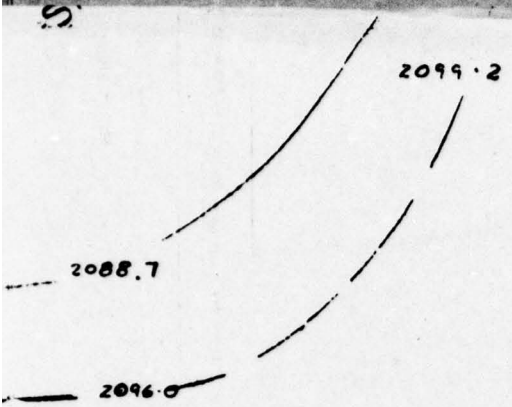
BY ACKERMAN·KNOX·HAYWARD & PAKAN
CONSULTING ENGINEERS
POUGHKEEPSIE, N.Y.
NOVEMBER 1964


SEPTIC M.H. EL 2085.2
SEPTIC M.H. EL 2085.6
2081.6

SCALE 1"=20'


WASH BED FROM AUXILAR
2081.3
2089.5
TOE OF WASH
2088.
TOP OF BANK
209

DENSE WOODS



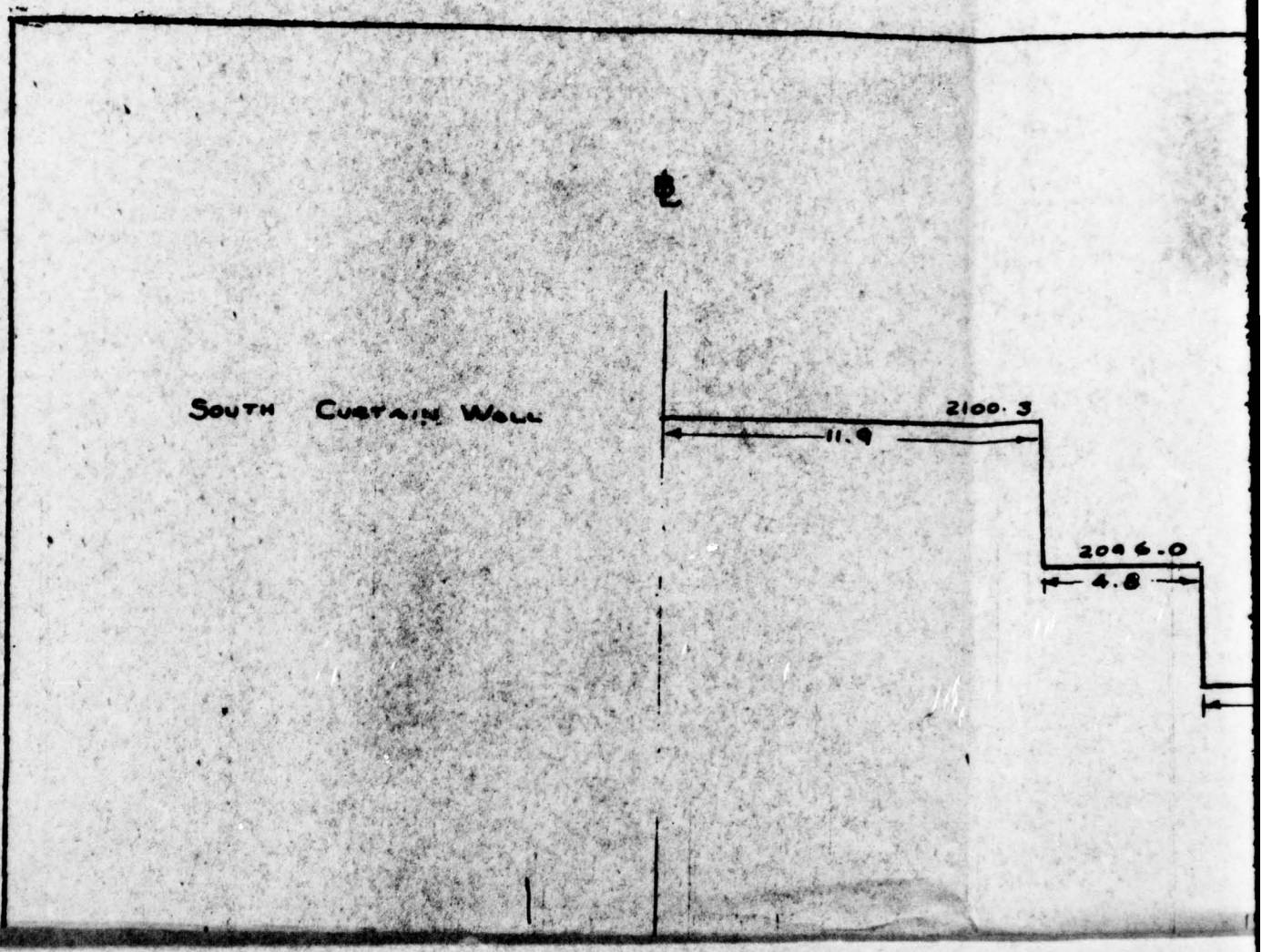
CAMP HARRIMAN
BOYS CLUB of NEW YORK
ON
EAST KILL CREEK
HUNTER TOWNSHIP
GREENE COUNTY, N.Y.

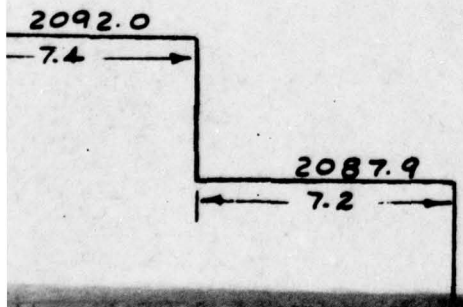
SCALE 1" = 20'

DRAWN: R.

20

Dwg No


SOUTH CURTAIN WALL
2100.3
11.9
2096.0
4.8


2092.0
7.4
2087.9
7.2

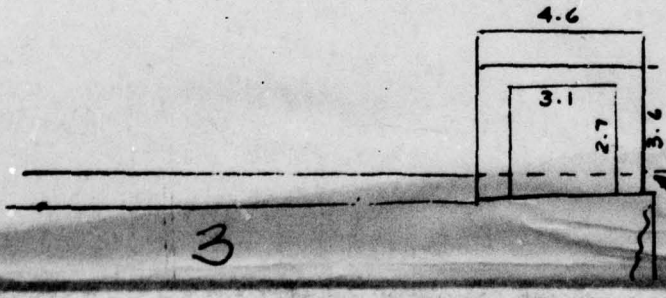
2:1

N

DAM

100'

LOWER SPILLWAY VALVE WELL
SOUNDED EL 2072



3

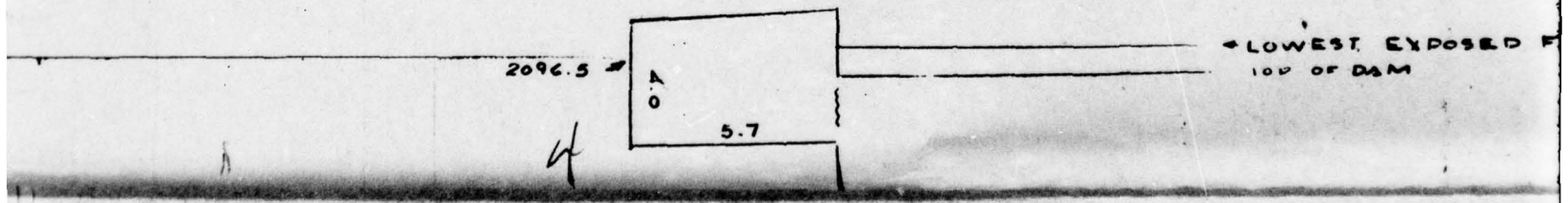
N

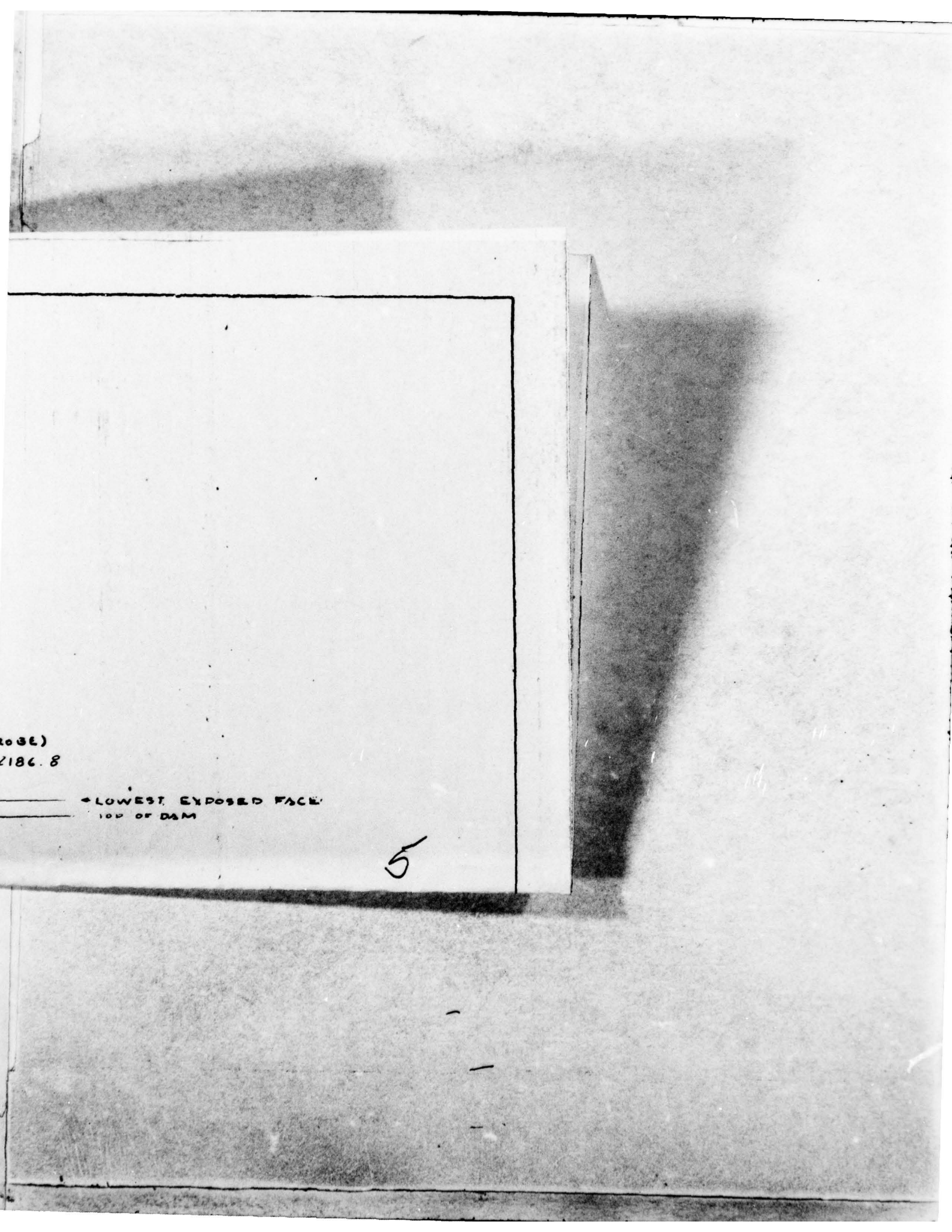
DAM FACE GENRALLY GOOD

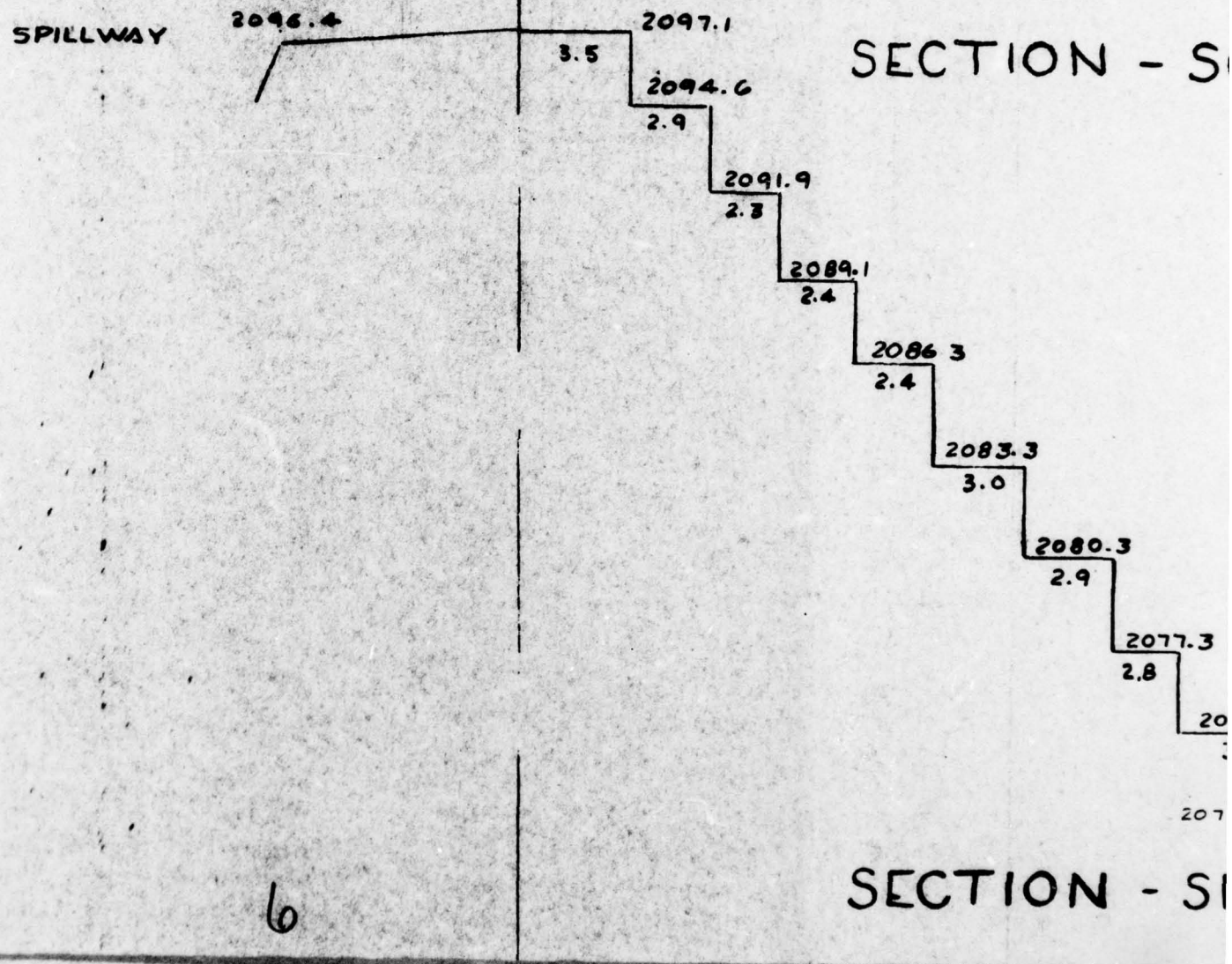
100' ← | → 50

FACE BATTER
1:5' ±

SPILLWAY GATE
3.65 WIDE x 3.4' HIGH (VIA PROBE)
EL. TOP 2190.2 BOT 2186.8

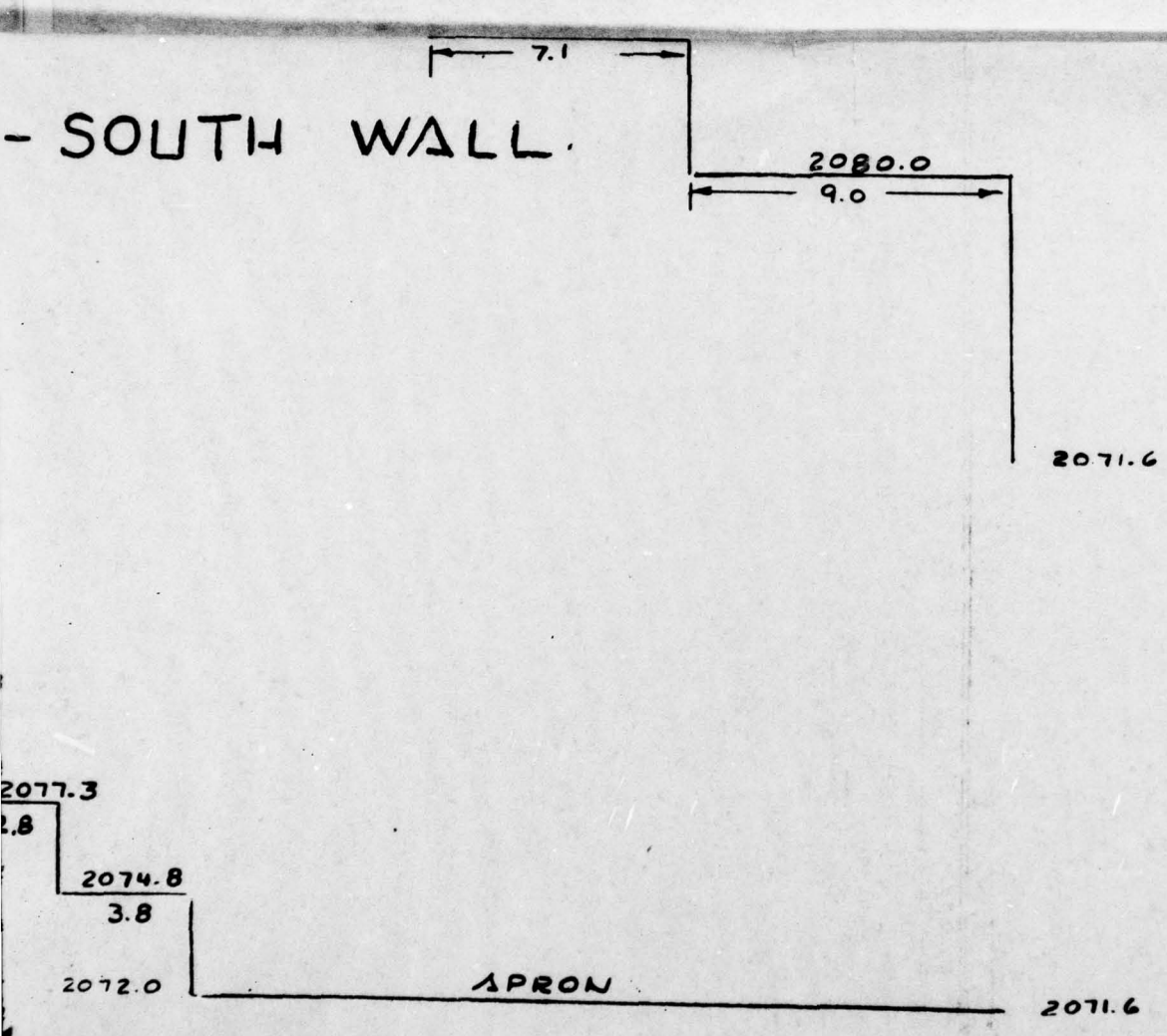



ROSE)
2186.8
LOWEST EXPOSED FACE
TOP OF DAM
5



SECTION - S

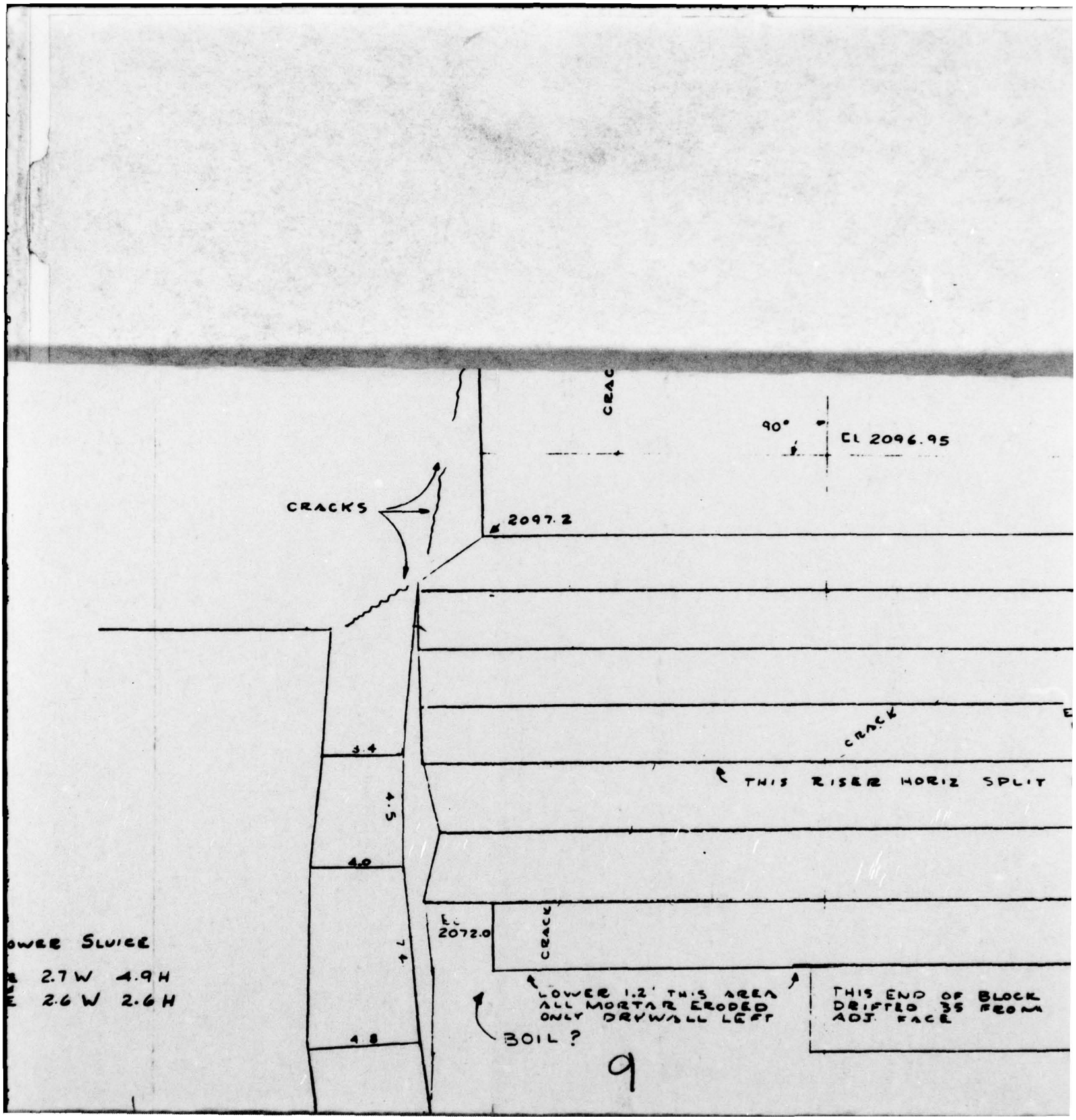
SECTION - S

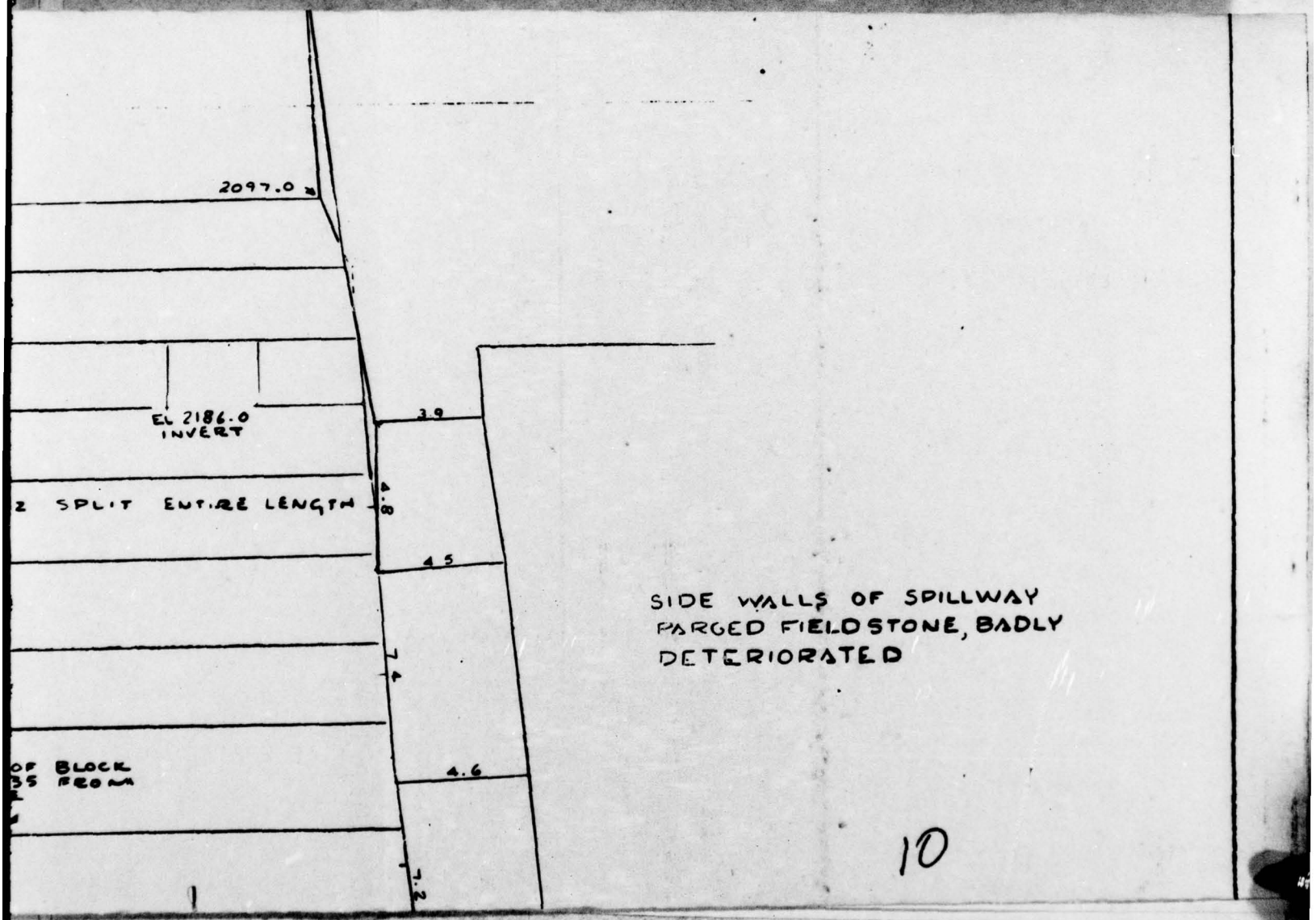

7.1
- SOUTH WALL.
2080.0
9.0
2071.6
2077.3
2.8
2074.8
3.8
2072.0
APRON
2071.6
- SPILLWAY

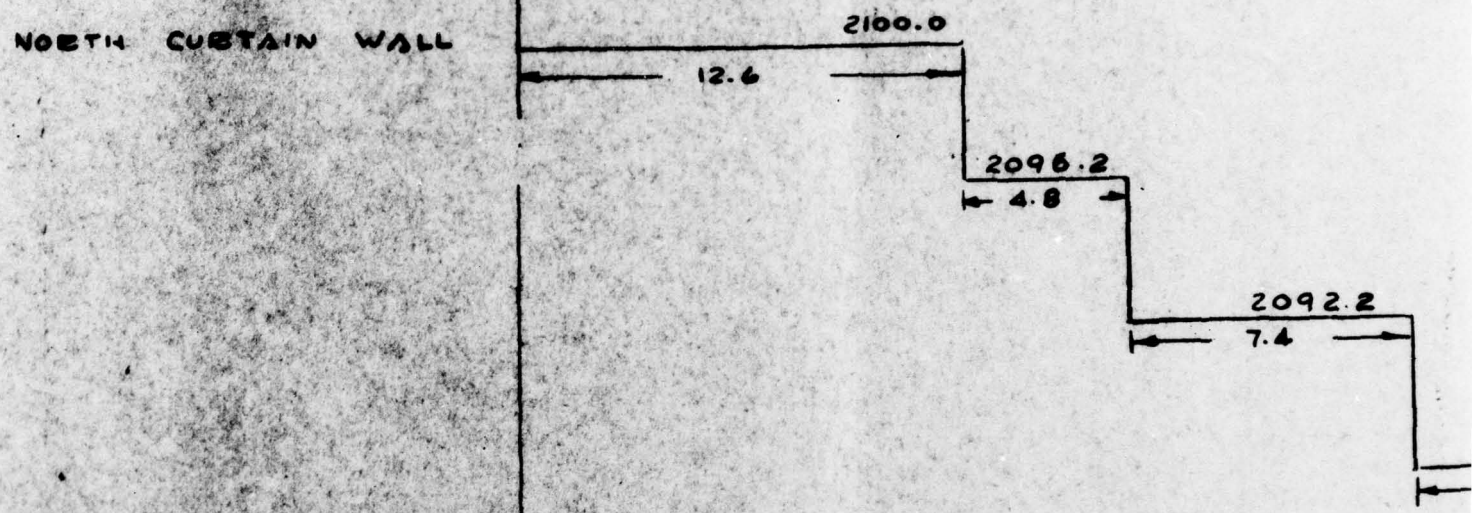
LOWER SU

OUTSIDE 2.7 W

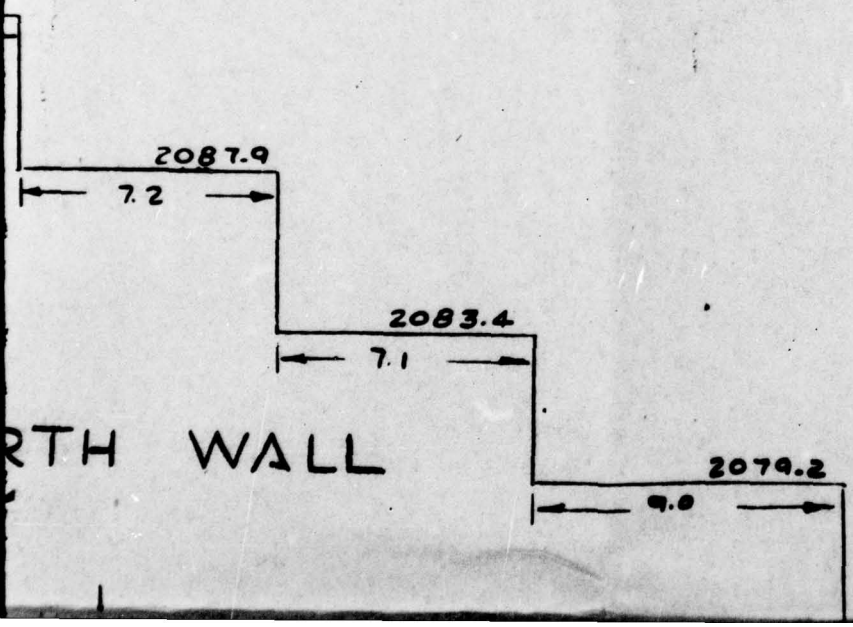
INSIDE 2.6 W


CRAC
90°
EL 2096.95
CRACKS
2097.2
CRACK
THIS RISER HORIZ SPLIT
3.4
4.5
4.0
7.4
4.8
EL 2072.0
CRACK
LOWER 1.2' THIS AREA ALL MORTAR ERODED ONLY DRYWALL LEFT
THIS END OF BLOCK DRIFTED 35 FROM ADJ FACE
BOIL ?
OWER SLUICE
2.7 W 4.9 H
2.6 W 2.6 H
9

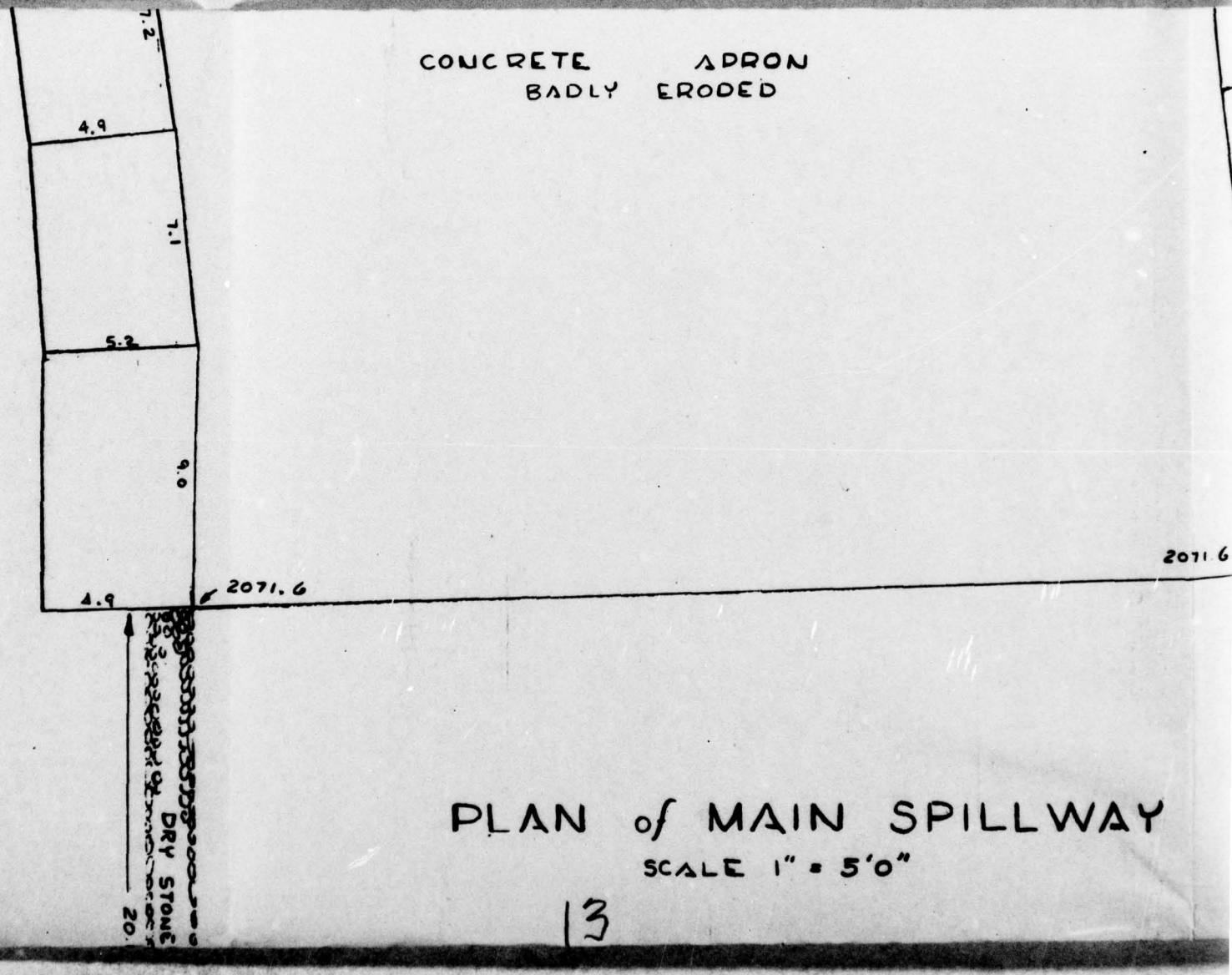

2097.0
EL 2186.0
INVERT
3.9
4.8
4.5
7.4
4.6
7.2
SIDE WALLS OF SPILLWAY
PARGED FIELDSTONE, BADLY
DETERIORATED



SECTION - NORT



RTH WALL



PLAN of MAIN SPILLWAY

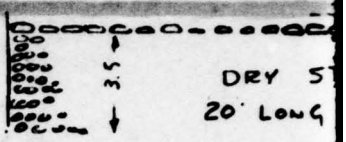
SCALE 1" = 5'0"

13

PILLWAY

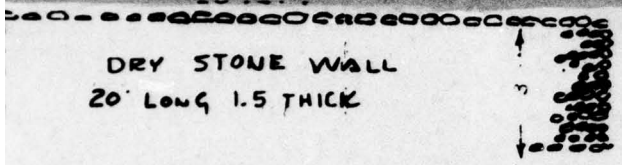
SPILLWAY
SCALE

BY ACKERMAN · KNOX · HAYWARD · DAKAN
CONSULTING ENGINEERS
POUGHKEEPSIE - N.Y.
NOVEMBER 1964



2071.6

PILLWAY SECTIONS
SCALE 1" = 5'0"


DRY STONE WALL
20' LONG 1.5 THICK

CAMP
BOYS CLUB
EAST KI
HUNTER
GREENE C

SCALE 1" = 5'0"

HARRIMAN

of NEW YORK

ON

ILL CREEK

TOWNSHIP

COUNTY, N.Y.

DRAWN: R.H

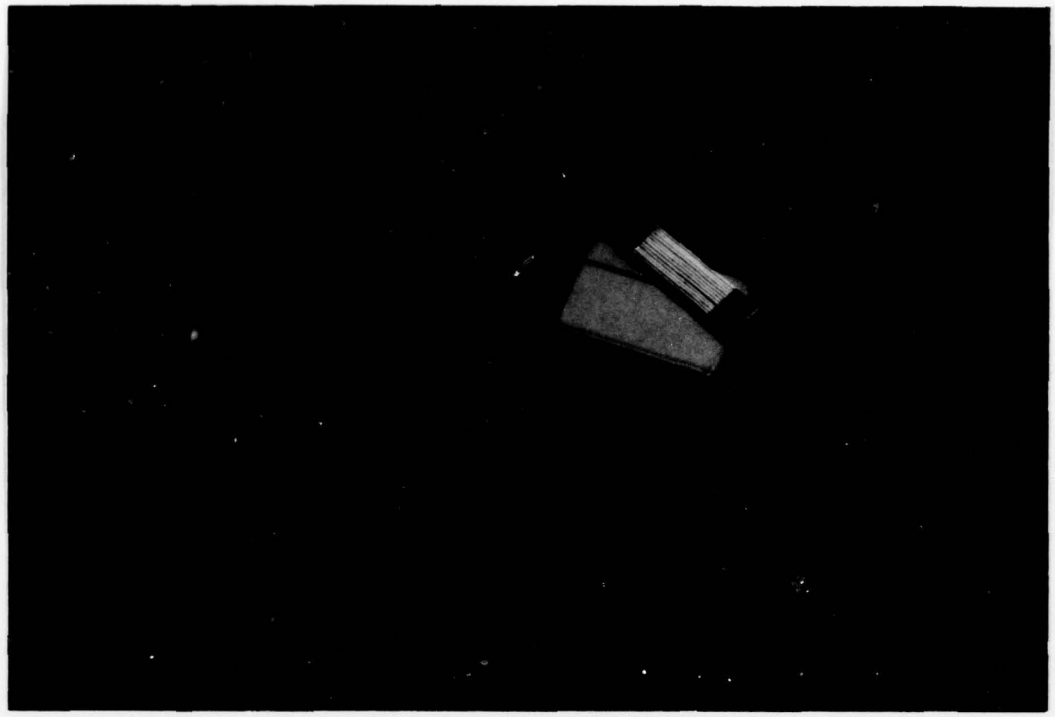
19 Nº 2806-03

PHOTOGRAPHS

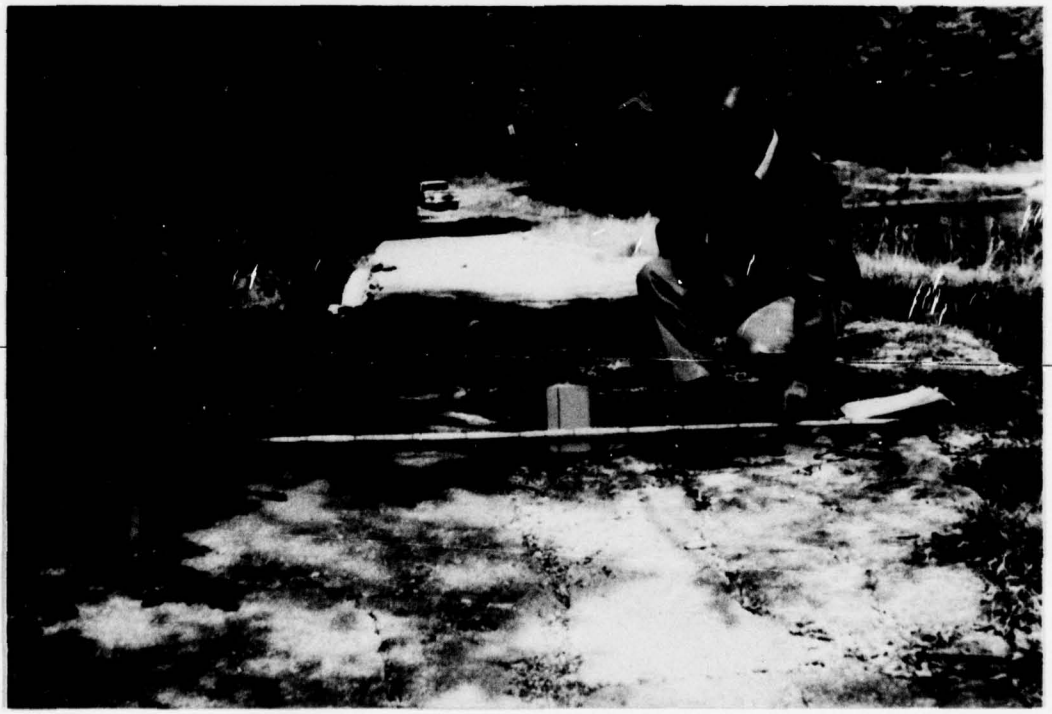
APPENDIX B

2. Downstream face of dam, looking south toward the Main Spillway

3. Crest of dam, looking north from the Main Spillway



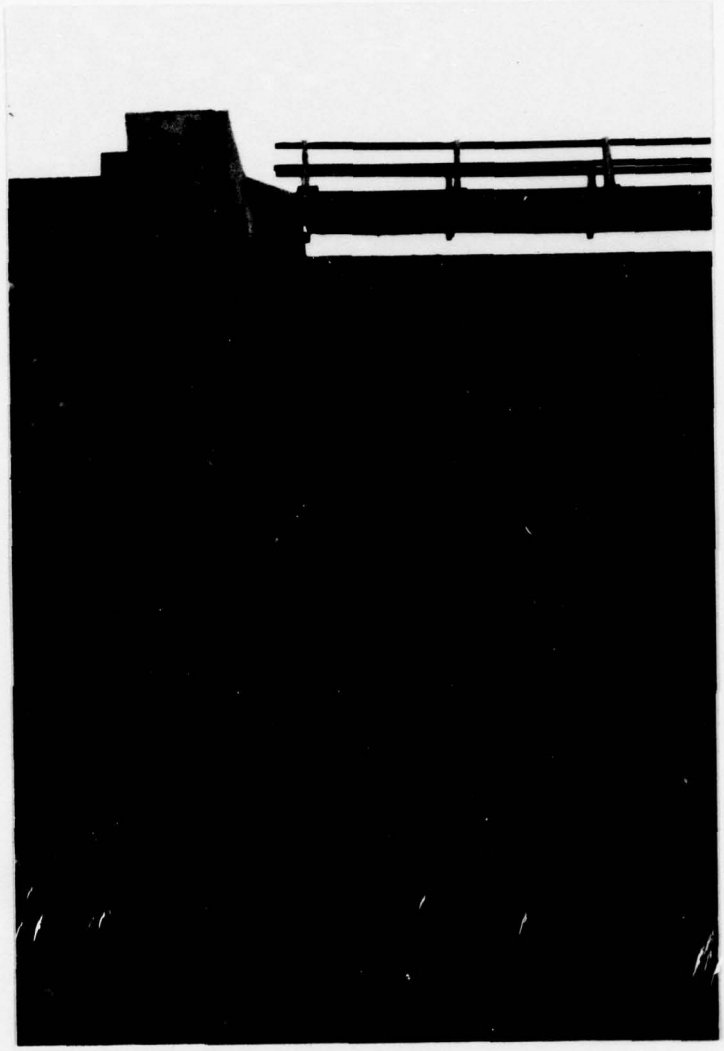
4. Cracked concrete paving on the dam crest



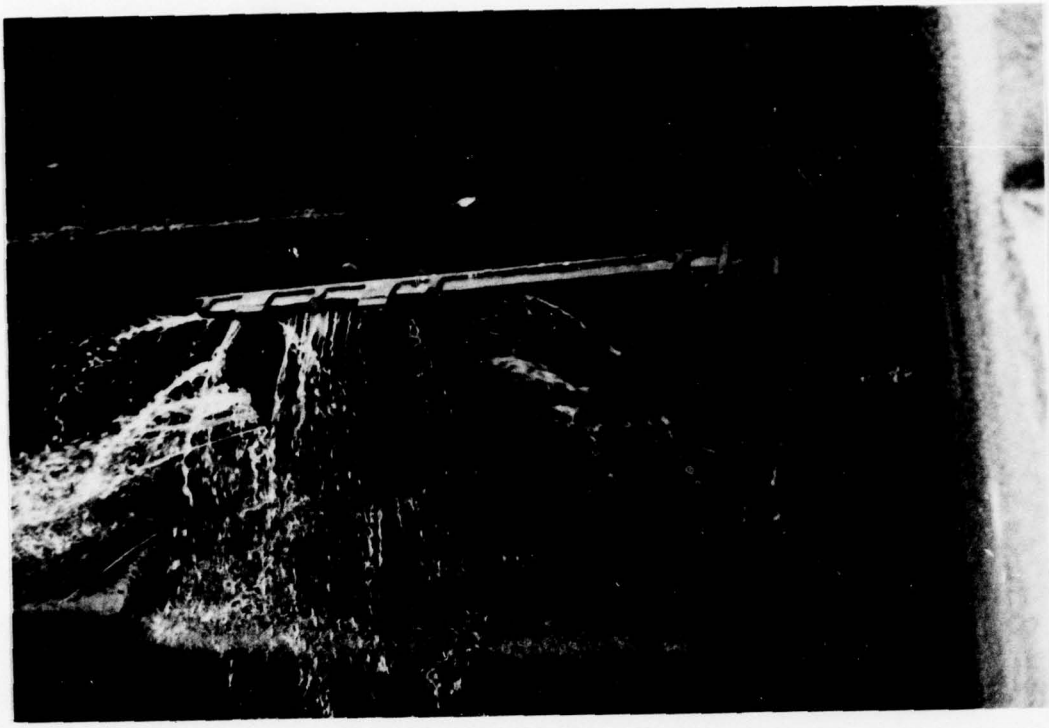
5. Longitudinal depression in crest of dam near dog-leg, looking north

6. Gate operating stand for high level sluice gate, looking northerly

7. North training wall, low level gate outlet and downstream face of Main Spillway



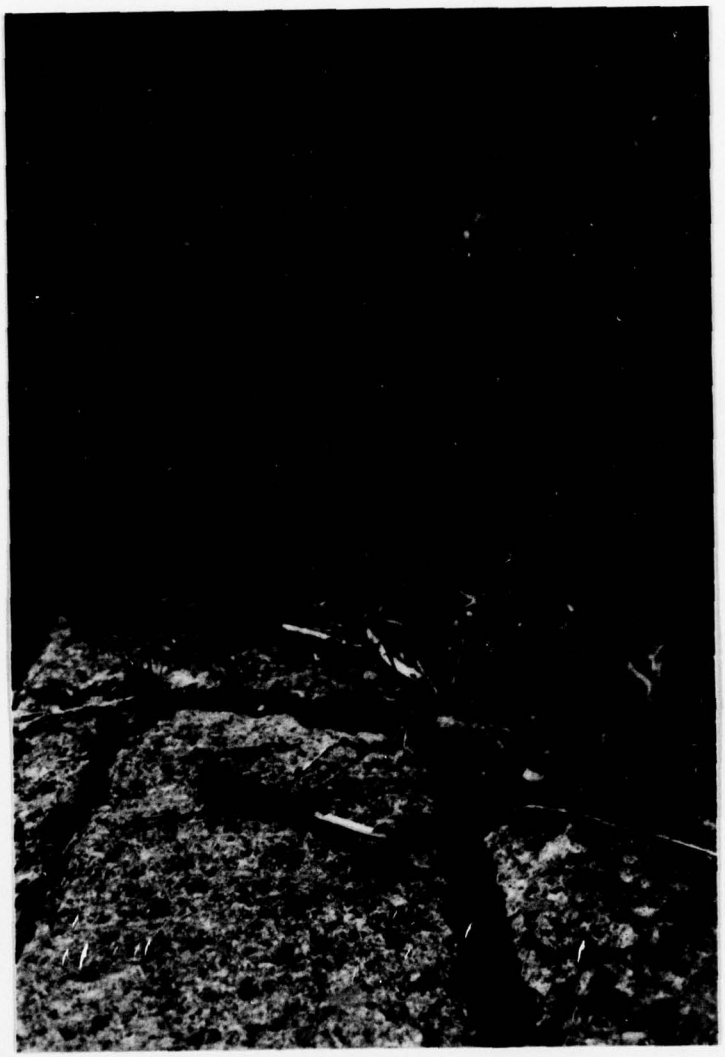
8. Bulge in north training wall at Main Spillway, looking east



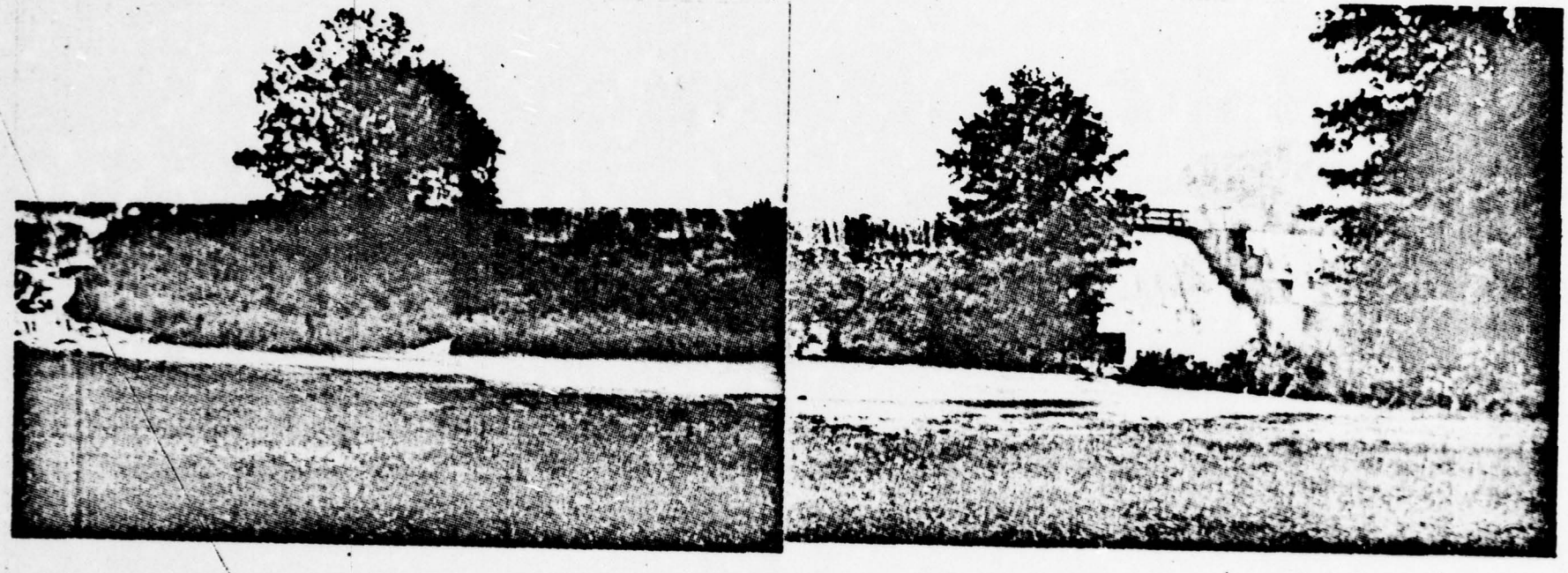
9. High level horizontally mounted sluice gate, Main Spillway

10. View of Auxiliary Spillway showing crest, north wall and toe

11. Erosion cavity under toe of Auxiliary Spillway



12. Separation of upstream concrete wall and parged stone crest of Auxiliary Spillway, looking south



DAM BEING OVERTOPPED WITH 18 INCHES OF WATER

August 10, 1976 7:45 AM

ENGINEERING DATA CHECKLIST

APPENDIX C

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS	None available
HYDROLOGY & HYDRAULICS	Not available
DAM STABILITY	None
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	None
BORING RECORDS	Not available
LABORATORY	None
FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	Surveys by Ackerman Knox Hayward Pakan dated Nov 1964
	Dwg No 2806-01 Plan and Sections of Dam
	Dwg No 2806-03 Plan and Sections, Main Spillway
BORROW SOURCES	None

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Camp Harriman
ID # 552

ITEM	REMARKS
AS-BUILT DRAWINGS	None available
REGIONAL VICINITY MAP	USGS
CONSTRUCTION HISTORY	From report by: Ackerman-Knox Hayward & Pakan, November 1964.
TYPICAL SECTIONS OF DAM	None available
OUTLETS-PLAN	Survey of dam Nov. 1964 by Hayward and Pakan (Spillway)
-DETAILS	
-CONSTRAINTS	None
-DISCHARGE RATINGS	None available.
RAINFALL/RESERVOIR RECORDS	None available at site

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	1964: Spillway gunited, gates replaced, fill placed U/S of dam
HIGH POOL RECORDS	Aug 10 1976
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Report by Ackerman-Knox-Hayward-and Pakan, 54 Market St, Poughkeepsie N.Y. "CAMP HARRIMAN DAM, BOYS CLUB OF N.Y.", dated December 1964
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION	None
REPORTS	Photos of overtopping in 1976
MAINTENANCE OPERATION RECORDS	NONE AVAILABLE

ITEM	REMARKS
SPILLWAY PLAN	1964 Survey by Haynard & Pulcan
SECTIONS	
DETAILS	
OPERATING EQUIPMENT	No data
PLANS & DETAILS	

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. Basic Data

a. General

Name of Dam Camp Harriman Hazard Category High

County Greene ID# 552

Stream Name East Kill Tributary of Schoharie Creek

Location Greene County Nearest Town (P.O.) Jewett

Longitude W 74°06'40" Latitude N42°14'00" Other Directions

Date of Insp 30 AUG 78 Weather Partly Cloudy Temperature 75°

b. Inspection Personnel A. Lange, Water Resources Structural Engineer; A. Dolcimascolo, Geotechnical Engineer

c. Persons Contacted Steve Canfield, Caretaker

d. History: Date Constructed Circa 1912-1913

Present Owner Boys Club of New York

Designed by Unknown

Constructed by Unknown

Recent History Put out of service during WW II
Renovated in 1965

2. Technical Data

Type of Dam Hand Placed and dumped rock Drainage Area 4.58 Sq mi ~~Acres~~

Height 28.5 ft Length 640.'

Upstream Slope ? Downstream Slope Avg 1.0(V):1.5(H)

Crest Width Varies 10' to 18' Freeboard at Spillway Crest 2.9 Ft ±

12" sluice gate at invert El 2086.8

Low Level Control: (Type and Size) 12" sluice gate at invert El 2072.3

Valve Condition Good; operable

Main
~~Emergency~~ Spillway Type (Material) Parged Stone Width 30

Side Slopes Stepped overflow

Height (Crest to Top) 2.9 ft ±

Exit Slope —

Exit Length 20.8 ft Apron

Ponded Surface Area _____ Acres

Capacity (Normal Level) _____ Acre Feet

Capacity Emergency Spillway Level ____ Acre Feet

3. Embankment Hand placed field stone and rock fill D/S section with U/S earth fill.

a. Crest Paved crest - 6" thick conc. paving

(1) Vertical Alignment Not uniform, apparently as result of settlement of stones. Longitudinal 2½" swale in crest 120' right of Main Spill.

(2) Horizontal Alignment Irregular - probably as constructed.

(3) Longitudinal Surface Cracks Longitudinal cracks in pavement open as much as 3/4". apparently not recent

(4) Transverse Surface Cracks some small transverse cracks

(5) General Condition of Surface General condition of surface paving varies from good to poor, especially where cracks occur.

(6) Miscellaneous

(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

None visible except for a few local areas where loosely dumped stones were overturned or moved as a result of overtopping

(3) Surface Cracks on Face of Slope Not applicable

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

None visible

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

None visible

(6) Fill Contact with Outlet Structure generally in good condition except near right end of Main Spillway where V. small pocket eroded as a result of overtopping

(7) Condition of Grass Slope Protection

Not applicable

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

None visible

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

None visible

b. Upstream Slope Earth fill which was placed against stone dam -

(1) Undesirable Growth or Debris Brush and high grass

(2) Sloughing, Subsidence, or Depressions None visible except for some erosion near main spillway

(3) Slope Protection None

(a) Condition of Riprap — Not applicable

(b) Durability of Individual Stones — Not applicable

(c) Adequacy of Slope Protection Against Waves and Runoff
Slopes apparently not affected by waves, and are in relatively good condition

(d) Gradation of Slope Protection - Localized Areas of Fine Material
Not applicable

(4) Surface Cracks Not applicable

c. Downstream Slope Upper 3 to 5 ft, Near Vert. Hand placed stone, lower part is rock fill.

(1) Undesirable Growth or Debris
Trees and brush growing from rock fill section

(7) Stability of Tailrace Channel Sideslopes adequate

(8) Condition of Tailrace Channel Riprap Channel is lined with stone; apparently adequate

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System None

(1) Condition of Relief Wells, Drains and Appurtenances None

(2) Unusual Increase or Decrease in Discharge from Relief Wells None

4. Instrumentation

None

(1) Monumentation/Surveys None

(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

None visible

e. Area Downstream of Embankment, Including Tailrace Channel

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

None visible

(2) Evidence of "Piping" or "Boils"

None visible

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

None

(4) Unusual Muddy Water in Downstream Channel

None visible

(5) Sloughing or Erosion None visible

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

None visible

(2) Observation Wells None

(3) Weirs None

(4) Piezometers None

(Other)

5. Reservoir

a. Slopes Flat slopes in reservoir are apparently stable; no sign of sloughing or other distress

b. Sedimentation Not apparent

6. Spillways Three spillways: Main, Auxiliary and Emergency ("Swale").

a. ~~Principal~~ Main Spillway: Inlet Condition

Pipe Condition

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

Parged Fieldstone stepped spillway with parged fieldstone training walls - Original wall surfacing not visible; 1965 resurfacing in good condition. Erosion of apron

b. ~~Emergency~~ Auxiliary Spillway: General Condition 49 ft wide; crest 0.5 ft lower than Main Spillway. Parged Fieldstone (original) 12' long sill slightly "Ogee"

Tree Growth

Erosion Erosion under toe of aux. Spillway - 2 ft deep

Other Observations Some seepage noted under auxiliary spillway - not visible - heard.

7. Structural (if required) See Attached Appendix

8. Downstream Channel

a. Condition (obstructions, debris, etc.) Narrow rock lined main channel, lined with trees

b. Slopes Relatively flat near dam

c. Approximate No. Homes and Population Several structures near E. Jewett, and road bridge

d. General Colgate Lake (formed by dam) is located 0.3 mi D/S of Dam. Colgate Dam located 0.6 mi D/S of Camp Harriman Dam. Colgate Lake dam had been repaired and lake was drawn down at time of inspection; fresh concrete dated Mar, 1973

TEAM CAPTAIN

STRUCTURAL INSPECTION CHECKLIST

PHASE I DAM INSPECTION

1. Concrete Surfaces Concrete surfaced Main spillway Generally in good condition

2. Structural Cracking None visible except for a few minor hairline cracks. - apparently not related to structural distress.

3. Movement - Horizontal and Vertical Alignment "Bulging" or "Curved" appearance of Main Spillway Right training wall. Concrete surface is not cracked

4. Junctions with Abutments or Embankments Generally good except for some erosion at left training wall apparently result of overtopping

5. Drains - Foundation, Joint, Face None

6. Water Passages, Conduits, Sluices No seepage encountered near conduits

7. Seepage or Leakage See above

8. Monolith Joints - Construction Joints Not applicable

9. Foundation Reportedly founded on glacial till (Hardpan - clay, gravel)

10. Abutments Abuts with dam

11. Control Gates Two gates; A 12" gate valve at invert El 2072.3; a 12" sluice gate at El 2086.8.

12. Approach and Outlet Channels 20.8 ft long apron originally parged and covered w. flagstones. flagstones eroded. Some surface erosion of

13. ~~Stilling Basin~~ Concrete

14. Intake Structure

15. Settlement

16. Stability

a. Overturning

b. Sliding

c. Seismic

17. Instrumentation

a. Alignment None

b. Uplift "

c. Seismic "

18. Miscellaneous

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E

TAMS

Job No. 1497-15 Sheet 1 of _____

Project CAMP HARRIMAN DAM Date 2/19/78

Subject UNIT HYDROGRAPH COMPUTATIONS By GR

LAKE EL. = 2091' Ch'k. by _____

THIS DRAINAGE BASIN LOCATED IN SOUTHERN N.Y.

WITH A PROBABLE MAXIMUM RAINFALL FOR 6 HRS. OF 23.5 IN.

DRAINAGE BASIN:

AREA #	AREA (MI^2)	L (MI.)	ΔH (FT.)
1	1.096	2.045	1755.
2	2.733	2.331	1303.
3	0.372	0.948	1003.
4	0.301	0.834	933.
LAKE	0.083	-	-

1" = 2000' = 0.379 MI.

AREA # 1 UNIT HYDROGRAPH

$T_c = \left(\frac{11.9L^3}{H}\right)^{0.385}$

T_c = 0.334 HRS. = 20 MIN.

L = 2.045 MI.
H = 1753'
A = 1.096 MI^2

$0.6T_c = 0.20 + L_T$

Use D = 5.0 mins or 0.0833 hrs

$T_p = D/2 + 0.6T_c$ = 0.242 hrs ≈ 15 mins

$Q_p = \frac{484A}{T_p}$ = 2190

$T_b = 2.67T_p$ = 0.65 hr

TAMS

Job No. 1487-15 Sheet 2 of _____

Project CAMP HARRIMAN DAM Date 2/12/78

Subject UNIT HYDROGRAPH COMPUTATION By WR

Ch'k. by _____

AREA #2

$T_c = \left[\frac{11.9(2.331)^3}{1303}\right]^{0.385}$ $L = 2.331$ MI, $H = 1303'$, $A = 2.733$ MI^2

$T_c = 0.436$ HRS. = 26 MIN. $0.6T_c = 0.26$

Use $D =$ .0833 HR. = 5. MIN.

$T_p = D/2 + 0.6T_c = 0.302$ 18 MIN.

$Q_p = \frac{484A}{T_p} = \frac{484(2.733)}{.302} =$ 4380 cfs _____ C.S.

$T_b = 2.67(T_p) = 0.806$ HR = 48 MIN.

AREA #3

$T_c = \left[\frac{11.9(0.948)}{1003}\right]^{3}{}^{0.385}$ $L = 0.948$ MI, $H = 1003'$, $A = 0.372$ MI^2

$T_c = 0.111$ HR = 10.2 MIN $0.6T_c = .10$

Use $D = 0.0833$ hrs or 5 mins

$T_p = D/2 + 0.6T_c = 0.142$ 8.5 min

$Q_p = \frac{484A}{T_p} =$ 1268 cfs

$T_b = 2.67T_p = 0.38$ hrs. 22.8

AD-A065 560 TIPPETTS-ABBETT-MCCARTHY-STRATTON NEW YORK F/G 13/2
NATIONAL DAM SAFETY PROGRAM. CAMP HARRIMAN DAM (INVENTORY NUMBE--ETC(U)
OCT 78 E O'BRIEN DACW51-78-C-0024
UNCLASSIFIED NL

2 OF 2
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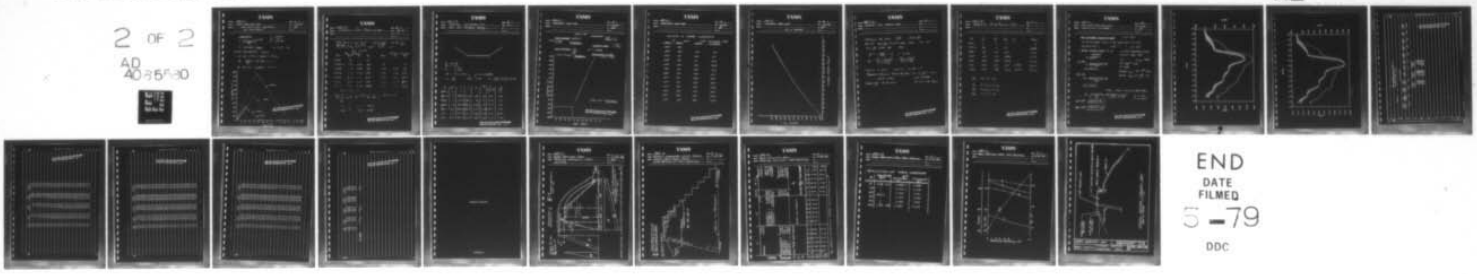
A065560



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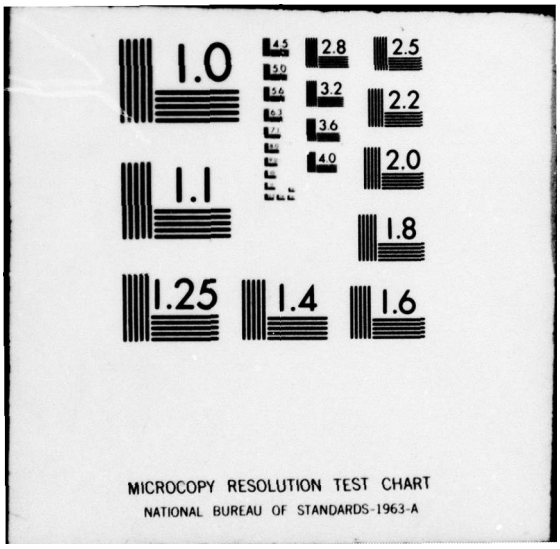
DATE FILMED
5-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TAMS

Job No. 1487-15 Sheet 3 of _____

Project CAMP HARKIMMER DAM Date 9/19/78

Subject UNIT HYDROGRAPH COMPUTATION AND HYDROGRAPHS By WR

Ch'k. by _____

AREA # 4

$L = 0.834$ MI
$H = 933'$
$A = 0.301$ MI^2

$$T_c = \left[\frac{11.9(0.834)^3}{933}\right]^{0.385}$$

$T_c = 0.151$ HRS = 9 MIN.

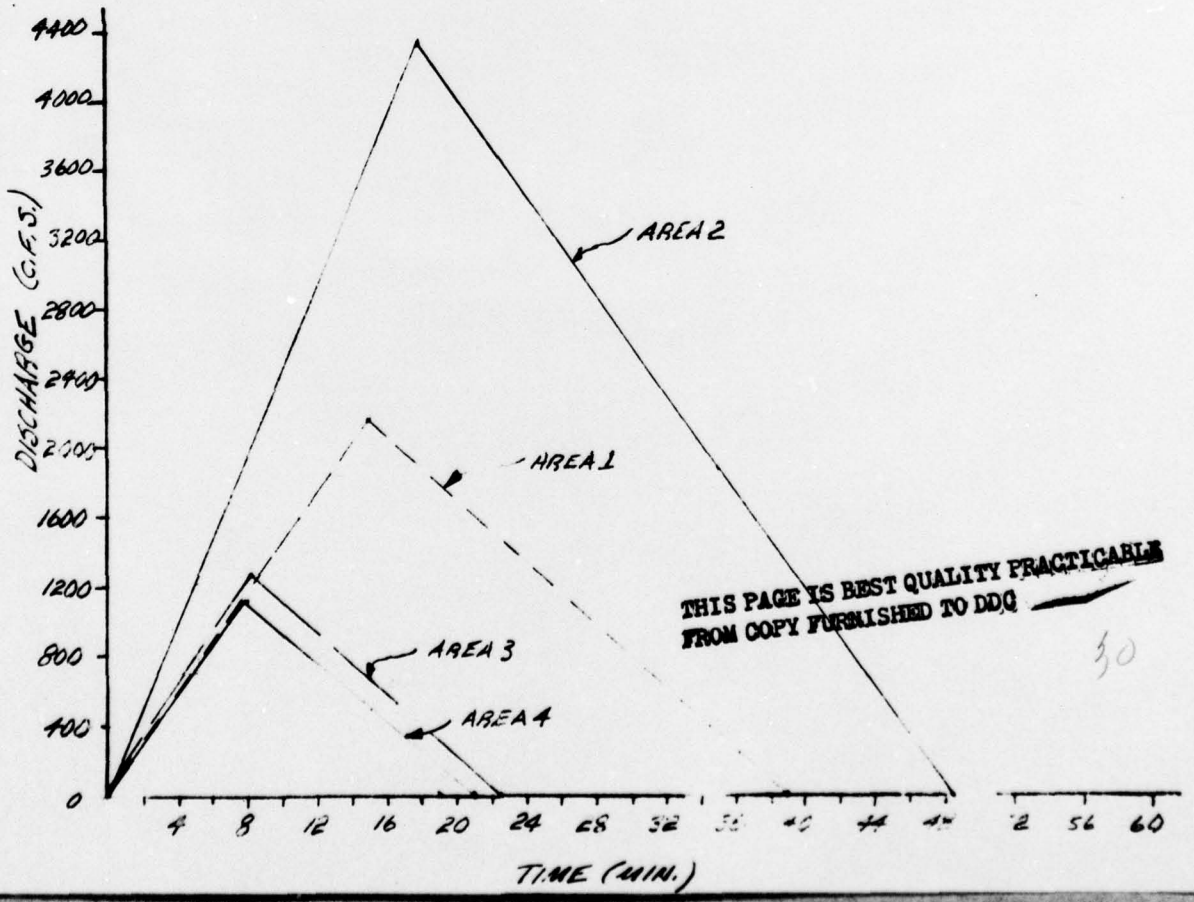
$L_g = 0.6\,T_c = .09$

Use $D = 0.0833$ hrs. 5 mins

$T_p = D/2 + T_c(0.6) = 0.13$ HR ≈ 8 mins

$$Q_p = \frac{484A}{T_p} = .1120 \text{ c/s}$$

$T_b = 2.67\,(T_p)$ 0.35 hr = 21 mins



TAMS

Job No. 1487-15 Sheet 4 of ____
Project INSPECTION CAMP HARRIMAN DAM Date Sep 80
Subject ____ By DLC
Ch'k. by ____

MAIN SPILLWAY - Length 30.0' width ≈ 11 feet max head 3.0'
AUXILLARY " L = 49.0 " ≈ 12 ft' 2.4'
Assume spillway acts as broad crested weir.

$Q = CLH^{3/2}$

Elev	Main Spillway Head	C	Q	Head	Auxillary Spillway C	Q
2097	0		0			
2097.6	0.6	2.70	38	0		0
2098	1.0	2.68	80	0.4	2.62	32
2099	2.0	2.64	224	1.4	2.66	216
2100	3.0	2.64	412	2.4	2.64	481
2101	4.0	2.64	634	3.4	2.64	811
2102	5.0	2.64	885	4.4	2.64	1134

Flow over Dam

Length of dam crest = 740 feet for spillways ≈ 561 feet
Average width of dam ≈ 10 ft.

2100	0		
2101	1	2.64	1504
2102	2	2.64	4189

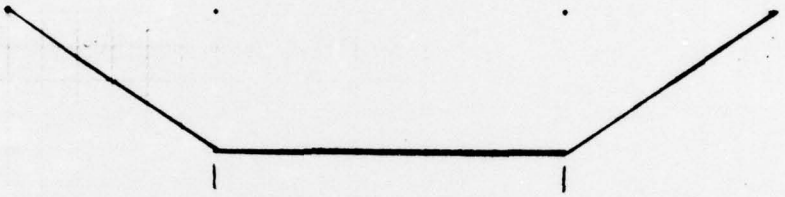
TAMS

Job No. 1487-15 Sheet 5 of _____

Project INSPECTION CAMP HARRIMAN DAM. Date SEP

Subject Flow Thru Emergency Spillway By _____

Ch'k. by _____



b = 100 ft.
$:1 = 15 : 1
S = 0.02
n = 0.035

$A = (b + 15d)d$, $p = b + 2d\sqrt{3.25}$

$r = A/p$ $\quad S^{1/2} = .1414$ $\quad V = \frac{1.486}{n} r^{2/3} S^{1/2}$, $Q = AV$

El.	d	A	p	r	$r^{2/3}$	V $= 6.0 \times r^{2/3}$	Q AxV
2097.1	0	0					0
2097.6	.5	53.75	101.8	.53	.65	3.9	210
2098	.9	102.15	103.2	.99	.99	5.94	607
2099	1.9	240.15	106.9	2.28	1.73	10.4	2539
2100	2.9	416.15	110.5	3.77	2.42	14.5	6030
2101	3.9	618.15	114.	5.42	3.09	18.6	11,500
2102	4.9	850.15	117.6	7.23	3.74	22.5	19,100

TAMS

Job No. 1481-15 Sheet 6 of _____

Project HARRIMAN CAMP DAM Date 9/19/78

Subject _____ By (WR)

_____ Ch'k. by _____

640 Acres = 1 Mi.²

PLANIMETER: 0.99 = X / .143480 Mi.² Mi.²

2100' CONTOUR = 0.083 Mi.²

(ASSUMED LAKE CONTOUR) = 53.12 Acres

LENGTH OF LAKE 1" = 2000' / 1" = 0.379 Mi.

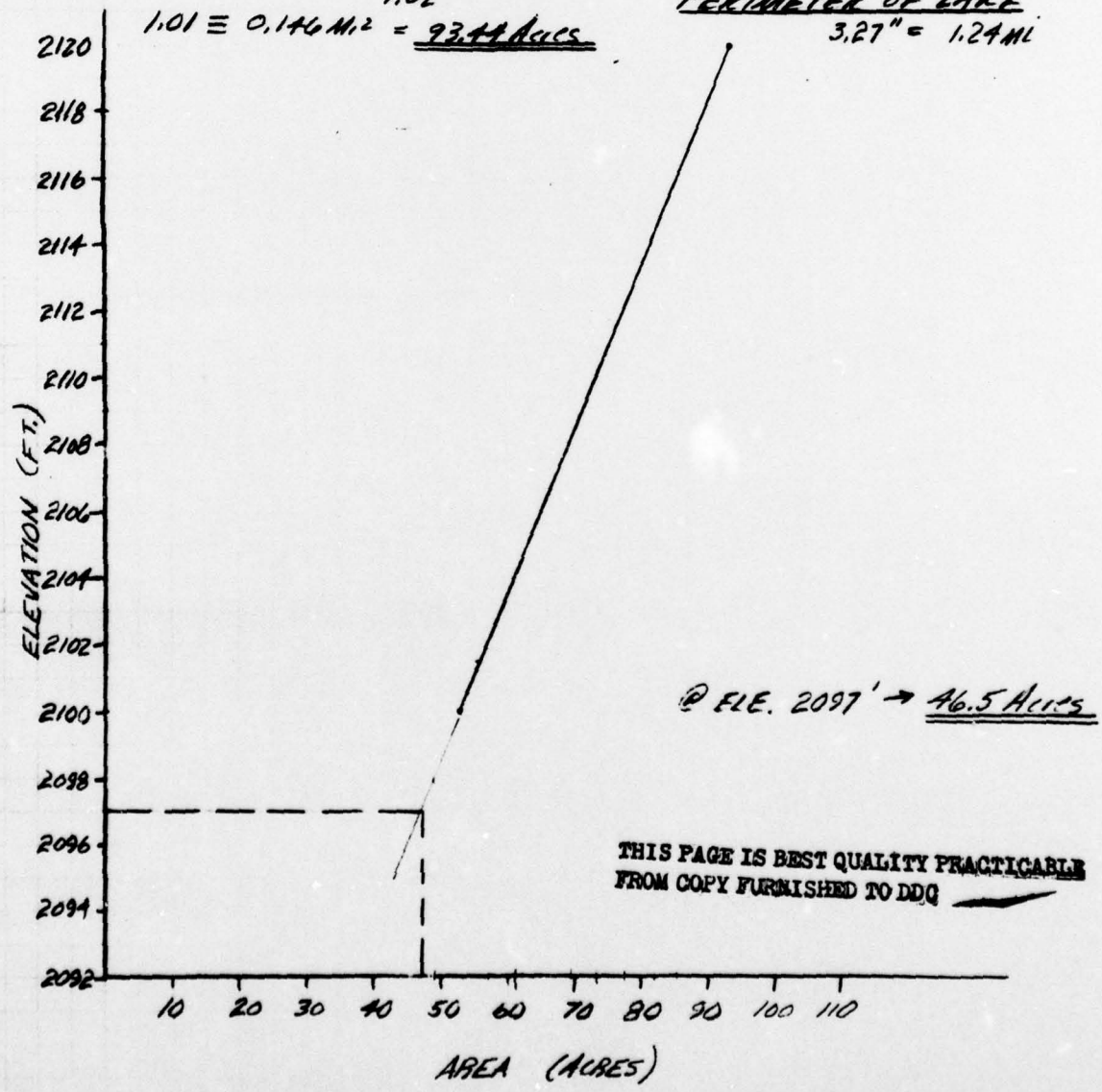
2120' CONTOUR = 2.02 − 1.00 = 1.02

1.15" = 0.436 Mi.

1.01 ≡ 0.146 Mi.² = 93.44 Acres

PERIMETER OF LAKE

3.27" = 1.24 Mi.



@ ELE. 2097' → 46.5 Acres

TAMS

Job No. 1487-15 Sheet 7 of _____

Project HARRIMAN CAMP DAM Date 9/12/78

Subject _____ By WR

_____ Ch'k. by _____

ELEVATION VS STORAGE COMPUTATIONS

ELEV. (Ft.)	AREA (Acres)	VOLUME (A-Ft.)	SURCHARGE STORAGE (A-Ft.)
2097'	47.5	-	-
2098'	49.5	48.5	48.5
2100'	53.1	102.6	151.1
2102'	57.0	111.1	262.2
2104'	61.0	118.0	380.2
2106'	65.0	126.0	506.2
2108'	69.5	134.5	640.7
2110'	73.5	143.0	783.7
2112'	77.5	151.0	934.7
2114'	82.0	159.5	1094.2
2116'	85.5	167.5	1261.7
2118'	89.5	175.0	1436.7
2120'	93.4	182.9	1619.6

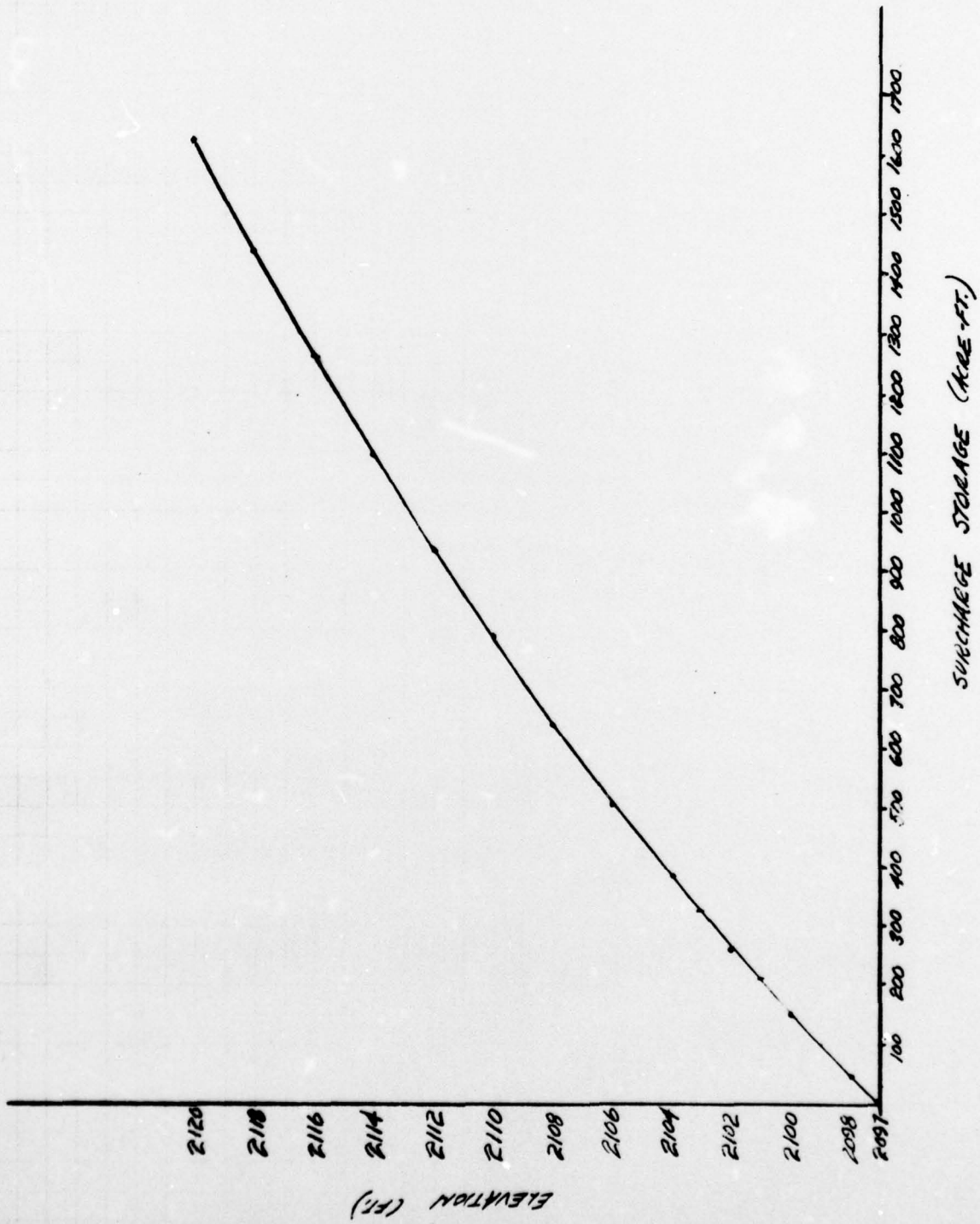
TAMS

Job No. 1487-15 Sheet 9 of _____

Project HARRIMAN CAMP DAM Date 9/19/78

Subject _____ By WP

ELE. VS. STORAGE Ch'k. by _____



TAMS

Job No. 1487-15 Sheet 10 of _____

Project INSPECTION CAMP HARRIMAN DAM Date _____

Subject _____ By _____

_____ Ch'k. by _____

HYDROLOGIC SOIL GROUP C/D AMC II

Forest - Hydrologic Condition class Good CN 65

CN for AMC III 83.

$$S = \frac{1000}{CN} - 10 = 2.05$$

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} = \frac{(P - 0.41)^2}{P + 1.64}$$

LOCATION OF DAM. N 42° 14' W 74° 14'

PROBABLE Maximum 6 Hour Rainfall for 10 square miles

23.5 inches USWB TP #40

Reduced 20% = 18.8 inches EC 1110-2-27 Aug 66

TAMS

Job No. 1487-15 Sheet 11 of _____

Project INSPECTION Camp Harriman Dam Date _____

Subject _____ By _____

_____ Ch'k. by _____

El.	Q_1	Q_2	Q_3	Q_4	-	TOTAL
2097.1	0	0	0			0
2097.6	38	0	210			248
2098	80	32	607			719
2099	224	216	2539			2979
2100	412	481	6030			6923
2101	634	871	11500	1504		14,509
2102	885	1194	19100	4189		25,368

Q_1 Main Spillway

Q_2 Auxiliary Spillway

Q_3 Emergency Spillway

Q_4 Flow over dam

TAMS

Job No. 1487-15 Sheet 12 of ____

Project CAMP HARRIMAN LAKE DAM Date 9/21/78

Subject DETERMINING DISCHARGE By (illegible)

Ch'k. by ____

TWO DISCHARGE CONDUITS @ DAM CREST 2097.1

1ST PIPE @ 2086.8 WHICH IS 10.3' BELOW CREST $\Delta H = 10.3'$

2ND PIPE @ 2072.3 " " 24.8' " " $\Delta H = 24.8'$

- ASSUME UNIFORM SLOPES OF .001

$n = 0.024$ CORRUGATED METAL

$n = 0.017$ STEEL PIPE

MANNING'S

$$Q = \frac{1.49 A R^{2/3} S^{1/2}}{n}$$

$S^{1/2} =$ $D = 12$ IN (BOTH)

$R^{2/3} = (D/4)^{2/3} = 0.397$

$A = 0.785$

ASSUME $L_{1st} = 45'$ $\frac{\Delta H}{L} = 0.229$

ASSUME $L_{2ND} = 60'$ $\frac{\Delta H}{L} = .413$

1ST PIPE

$$Q = \frac{1.49(.785)(.397)(.479)}{.024}$$

$Q = 9.3$ c.f.s.

2ND PIPE

$$Q = \frac{1.49(.785)(.397)(.643)}{.024}$$

$Q = 12.4$ c.f.s.

CHECK FIGURE 3-10 p. 567 SMALL DAMS...

$$H_T = \left[\frac{2.5204(1+K_e)}{D^4} + \frac{466.18(n^2)L}{D^{16/3}}\right]\left(\frac{Q}{10}\right)^2$$

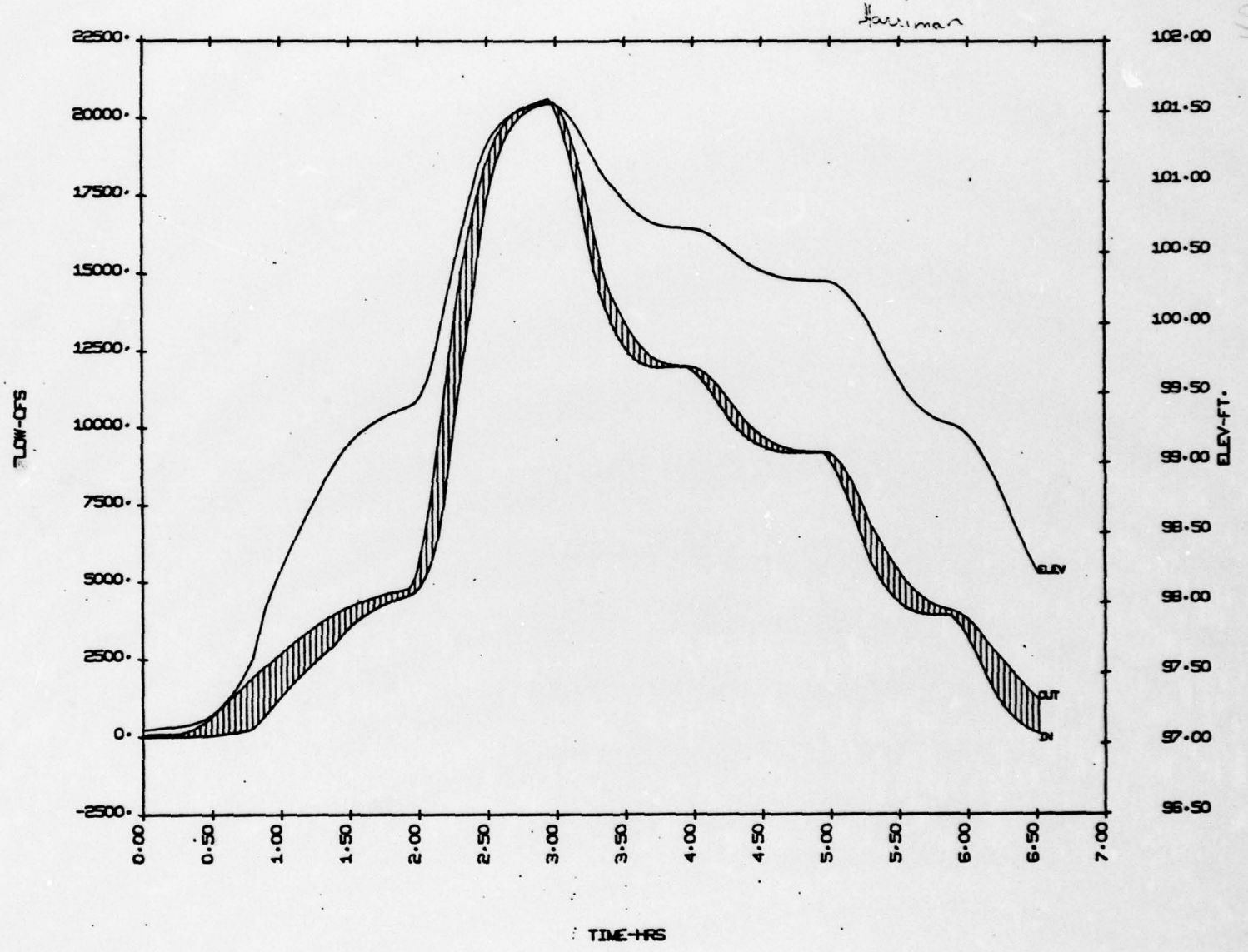
$K_e = .1$ BOTH

$n = .024$ BOTH

1ST DAM $\boxed{12.8 H. = H_T}$

2ND DAM $\boxed{29.0 H. = H_T}$

FLOW-CFS
-2500.
0.
2500.
5000.
7500.
10000.
12500.
TIME-HRS
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
ELEV-FT.
95.00
97.50
97.50
98.00
98.50
99.00
99.50
100.00
100.50
IN
OUT
STOR


Haviman
22500.
20000.
17500.
15000.
12500.
10000.
7500.
5000.
2500.
0.
-2500.
FLOW-CFS
102.00
101.50
101.00
100.50
100.00
99.50
99.00
98.50
98.00
97.50
97.00
96.50
ELEV-FT.
ELEV
OUT
IN
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
TIME-HRS

SAFETY INSPECTION CAMP HARRIMAN DAM
JOB NO. 1487-15
RESERVOIR ROUTING PROGRAM

FULL PMF

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL	GATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
97.10	0.04	0.00	6.58	1	NO	YES	1.000	1.000	1.000	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CFS)
97.10	0.0000	0.00
97.60	35.0000	248.00
98.00	48.5000	719.00
99.00	100.0000	2979.00
100.00	151.1000	6923.00
101.00	214.0000	14509.00
102.00	262.2000	25368.00

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
0.00	0.00		0.0000	97.10
0.04	46.10	0.56	0.0790	97.10
0.08	91.11	2.21	0.3123	97.10
0.13	91.11	4.37	0.6171	97.10
0.17	91.11	6.48	0.9145	97.11
0.21	91.11	8.53	1.2047	97.11
0.25	92.05	10.55	1.4894	97.12
0.29	111.79	12.77	1.8027	97.12
0.34	134.58	15.45	2.1813	97.13
0.38	197.08	19.10	2.6969	97.13
0.42	264.40	24.25	3.4225	97.14
0.46	377.65	31.46	4.4401	97.16
0.50	495.41	41.30	5.8290	97.18
0.55	655.92	54.28	7.6612	97.20
0.59	819.17	70.88	10.0039	97.24
0.63	1002.68	91.29	12.8842	97.28
0.67	1186.54	115.67	16.3244	97.33
0.71	1372.52	143.94	20.3150	97.39
0.76	1557.99	176.04	24.8454	97.45
0.80	1740.38	211.83	29.8964	97.52
0.84	1920.46	263.31	35.4389	97.61
0.88	2088.95	461.93	41.1317	97.78
0.92	2253.60	656.89	46.7198	97.94
0.97	2401.92	878.86	52.1430	98.07
1.01	2552.17	1104.67	57.2885	98.17
1.05	2710.62	1320.38	62.2040	98.26
1.09	2867.85	1527.91	66.9332	98.35
1.13	3020.58	1728.02	71.4932	98.44
1.18	3172.21	1921.35	75.8988	98.53
1.22	3320.32	2108.55	80.1645	98.61
1.26	3466.10	2290.05	84.3007	98.69
1.30	3604.44	2465.99	88.3098	98.77
1.34	3736.57	2636.17	92.1879	98.84
1.39	3851.20	2799.74	95.9152	98.92
1.43	3961.08	2956.06	99.4774	98.98
1.47	4059.12	3189.87	102.7321	99.05
1.51	4153.25	3405.21	105.5222	99.10
1.55	4237.61	3590.92	107.9282	99.15
1.60	4317.79	3752.32	110.0194	99.19
1.64	4388.62	3893.53	111.8490	99.23
1.68	4455.57	4017.75	113.4584	99.26
1.72	4514.73	4127.59	114.8816	99.29
1.76	4571.13	4225.20	116.1462	99.31
1.81	4622.02	4312.47	117.2770	99.33
1.85	4670.98	4390.97	118.2940	99.35
1.89	4716.48	4462.12	119.2159	99.37
1.93	4760.03	4527.01	120.0567	99.39
1.97	4800.43	4586.52	120.8277	99.40
2.02	5140.32	4676.73	121.9965	99.43

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
2.06	5967.13	4882.83	124.6668	99.48
2.10	6942.24	5252.23	129.4529	99.57
2.14	8135.54	5789.61	136.4154	99.71
2.18	9447.34	6495.07	145.5556	99.89
2.23	10917.22	7586.23	156.5993	100.08
2.27	12376.35	8974.74	168.1122	100.27
2.31	13821.14	10384.94	179.8050	100.45
2.35	15062.78	11772.24	191.3079	100.63
2.39	16058.35	13067.65	202.0489	100.81
2.44	16944.57	14241.83	211.7848	100.96
2.48	17710.40	15290.38	219.6877	101.11
2.52	18372.29	17006.71	225.0866	101.23
2.56	18919.76	17892.52	229.0185	101.31
2.60	19363.37	18567.45	232.0143	101.37
2.65	19703.03	19089.30	234.3306	101.42
2.69	19963.98	19491.44	236.1156	101.45
2.73	20153.32	19797.93	237.4760	101.48
2.77	20288.14	20026.39	238.4901	101.50
2.81	20373.39	20190.86	239.2201	101.52
2.86	20449.89	20310.16	239.7497	101.53
2.90	20519.18	20404.38	240.1679	101.54
2.94	20581.12	20483.15	240.5175	101.55
2.98	20637.55	20551.33	240.8201	101.55
3.02	20392.35	20531.67	240.7329	101.55
3.07	19920.72	20328.96	239.8331	101.53
3.11	19299.48	19940.51	238.1089	101.50
3.15	18576.40	19398.76	235.7042	101.45
3.19	17745.67	18729.94	232.7355	101.38
3.23	16848.63	17955.71	229.2990	101.31
3.28	15971.23	17120.43	225.5914	101.24
3.32	15105.93	16265.66	221.7973	101.16
3.36	14439.19	15458.85	218.2161	101.08
3.40	13882.88	14757.57	215.1033	101.02
3.44	13425.29	14298.98	212.2586	100.97
3.49	13017.12	13930.44	209.2028	100.92
3.53	12701.88	13564.23	206.1664	100.87
3.57	12433.16	13223.40	203.3404	100.83
3.61	12253.09	12922.39	200.8445	100.79
3.65	12112.81	12669.54	198.7479	100.75
3.70	12035.05	12465.87	197.0592	100.73
3.74	11982.33	12309.54	195.7630	100.71
3.78	11971.44	12195.78	194.8198	100.69
3.82	11977.29	12120.07	194.1920	100.68
3.86	11982.86	12072.20	193.7951	100.67
3.91	11988.33	12042.58	193.5495	100.67
3.95	11993.47	12024.91	193.4030	100.67
3.99	11999.50	12015.02	193.3209	100.67
4.03	11878.61	11988.87	193.1041	100.66
4.07	11719.60	11923.98	192.5661	100.65
4.12	11499.88	11816.52	191.6751	100.64

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
4.16	11263.57	11667.84	190.4423	100.62
4.20	10984.58	11481.90	188.9006	100.60
4.24	10695.54	11262.42	187.0807	100.57
4.28	10416.05	11020.79	185.0772	100.54
4.33	10138.82	10766.60	182.9696	100.50
4.37	9944.12	10518.64	180.9136	100.47
4.41	9765.96	10291.72	179.0321	100.44
4.45	9628.71	10088.47	177.3468	100.41
4.49	9498.30	9908.96	175.8583	100.39
4.54	9406.16	9752.78	174.5634	100.37
4.58	9320.42	9619.59	173.4591	100.35
4.62	9270.76	9508.80	172.5404	100.34
4.66	9225.99	9419.75	171.8020	100.32
4.70	9206.46	9350.15	171.2250	100.31
4.75	9189.59	9298.13	170.7936	100.31
4.79	9189.55	9261.00	170.4858	100.30
4.83	9191.29	9236.87	170.2856	100.30
4.87	9192.98	9221.57	170.1588	100.30
4.91	9194.66	9212.08	170.0801	100.30
4.96	9196.25	9207.39	170.0330	100.30
5.00	9197.83	9203.20	170.0065	100.30
5.04	8911.46	9152.40	169.5852	100.29
5.08	8610.54	9018.56	168.4755	100.27
5.12	8170.68	8803.83	166.6951	100.24
5.17	7727.37	8511.53	164.2714	100.20
5.21	7187.44	8151.07	161.2827	100.16
5.25	6647.47	7729.23	157.7850	100.10
5.29	6129.99	7270.85	153.9842	100.04
5.33	5616.81	6837.54	149.9928	99.97
5.38	5283.07	6511.44	145.7677	99.89
5.42	4953.51	6184.04	141.5258	99.81
5.46	4708.52	5866.07	137.4060	99.73
5.50	4467.43	5565.70	133.5144	99.65
5.54	4305.31	5288.55	129.9234	99.58
5.59	4148.59	5039.06	126.6910	99.52
5.63	4062.48	4819.67	123.8485	99.46
5.67	3981.28	4632.18	121.4193	99.41
5.71	3946.97	4475.18	119.3852	99.37
5.75	3915.93	4347.40	117.7295	99.34
5.80	3916.15	4246.03	116.4161	99.32
5.84	3916.37	4168.53	115.4120	99.30
5.88	3916.58	4109.29	114.6445	99.28
5.92	3885.33	4060.33	114.0102	99.27
5.96	3464.45	3993.25	113.1410	99.25
6.01	3428.21	3888.22	111.7802	99.23
6.05	3099.36	3741.47	109.8789	99.19
6.09	2757.85	3550.44	107.4039	99.14
6.13	2352.81	3316.58	104.3739	99.08
6.17	1952.73	3043.08	100.8302	99.01
6.22	1573.87	2837.91	96.7851	98.93

	TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
	6.26	1219.98	2634.32	92.1456	98.84
	6.30	972.63	2417.02	87.1938	98.75
	6.34	733.87	2196.43	82.1671	98.65
	6.38	555.09	1977.51	77.1785	98.55
	6.43	386.42	1764.62	72.3273	98.46
	6.47	266.22	1561.41	67.6965	98.37
	6.51	160.93	1370.97	63.3570	98.28
	6.55	97.77	1195.55	59.3594	98.21
MAX. VALUES		20637.55	20551.33		101.55
MIN. VALVES		0.00	0.00		97.10

STABILITY ANALYSIS

APPENDIX F

TAMS

Job No. 1487.15
Project Camp Harriman Dam
Subject Stability analysis - Main Spillway

Sheet 1 of ____
Date 9-26-78
By AHP
Ch'k. by ____

TAMS

Job No. 1487-15 Sheet 2 of _____

Project Phase I Inspection - NYS Dams Date 9-26-78

Subject Camp Harriman Dam By _____

Cross Section of Main Spillway Ch'k. by _____

TAMS

Job No. 1487-15 Sheet 3 of _____

Project Camp Harriman Dam Date 9-26-78

Subject Stability Analyses - Main Spillway By _____

Ch'k. by _____

	V	H	M & $\bar{X}_R$	Arm
	KIPS	KIPS	KIP-ft	
①	Spillway 97.39 ↓		21902 ↺	
②		$\frac{1}{2}(.0625)265^2$ = 21.95 →	193.9 ↻	8.83
③		$\frac{1}{2}(.16)(.4)26.5^2$ = 8.43 →	74.46 ↻	8.83
④		$0.0625(26.5)h$ = 1.66h →	21.95h ↻	13.25
		$\frac{1}{2}.0625(h^2)$ = $0.03125h^2$ ←	$0.0104h^3$ ↺	$\frac{1}{3}h$
⑤*	$\frac{1}{2}(26.5).0625(38.5)$ = *31.88 ↑		*818.32 ↻	$\frac{2}{3}$ 38.5
⑥	.0625(38.5)h = 2.41h ↑		46.32h ↻	19.25
⑦	$.0225\frac{1}{2}6(26.5)$ = 6.74 ↓		335.99 ↺	34.5
⑧	.00625(16.5)h = 1.03h ↓		31.2h ↺	30.25
⑨	$.00625\ h^2\frac{1}{2}$ = $.03125h^2$ ↓		$0.0104h^3$ ↺	$\frac{1}{3}h$
R_V	$107.13 - *31.88 - 1.38h + 0.03125h^2$		$\bar{X}_R$	
R_H		$30.38 + 1.66h - 0.03125h^2$	$\frac{2257.83 - *818.32 - 37.02h + 0.0104h^3}{R_V}$	
$\bar{X}_R$				

h_i	Assump A		Assump B	
	$\bar{X}_R$	#	$\bar{X}_R$	#
0	107.13		75.25	
1.5	105.13		73.25	
3.0	103.27		71.39	
4.5	101.55		69.67	
6.0	99.98		68.10	
10	96.46		64.58	
0	30.38			
1.5	32.80			
3.0	35.08			
4.5	37.22			
6.0	39.22			
10	43.86			
10	21.07	0	19.13	
10	20.95	1.5	18.89	
10	20.79	3.0	18.61	
10	20.61	4.5	18.29	
10	20.40	6.0	17.93	
10	19.77		16.87	

$\bar{X}_R$ = Location of resultant reaction, measured from toe →

TAMS

Job No. 1487-15 Sheet 4 of _____
Project Camp Harriman Dam - Main Spillway Date 9-26-78
Subject _____ By _____
_____ Ch'k. by _____

EVALUATION OF SHEAR STRESSES

h	Avg Stress KSF	H/V Assumption "A"	Assumption "B"
0	0.79 KSF	0.280 ✓	0.403
1.5		0.312 ✓	0.448
3.0	Varies	0.340	0.491
4.5		0.367	0.534
6.0		0.392	0.576
10.0	1.139 KSF	0.453	0.679

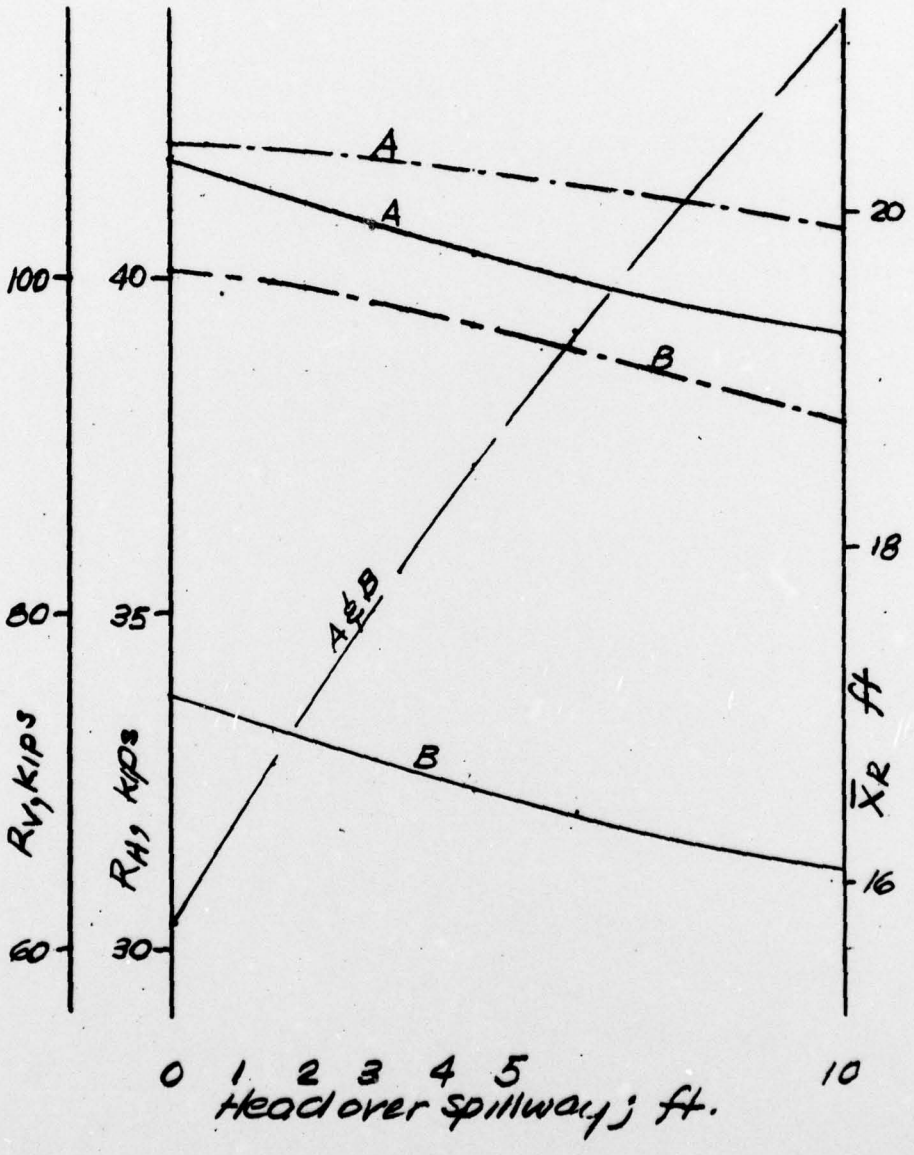
TAMS

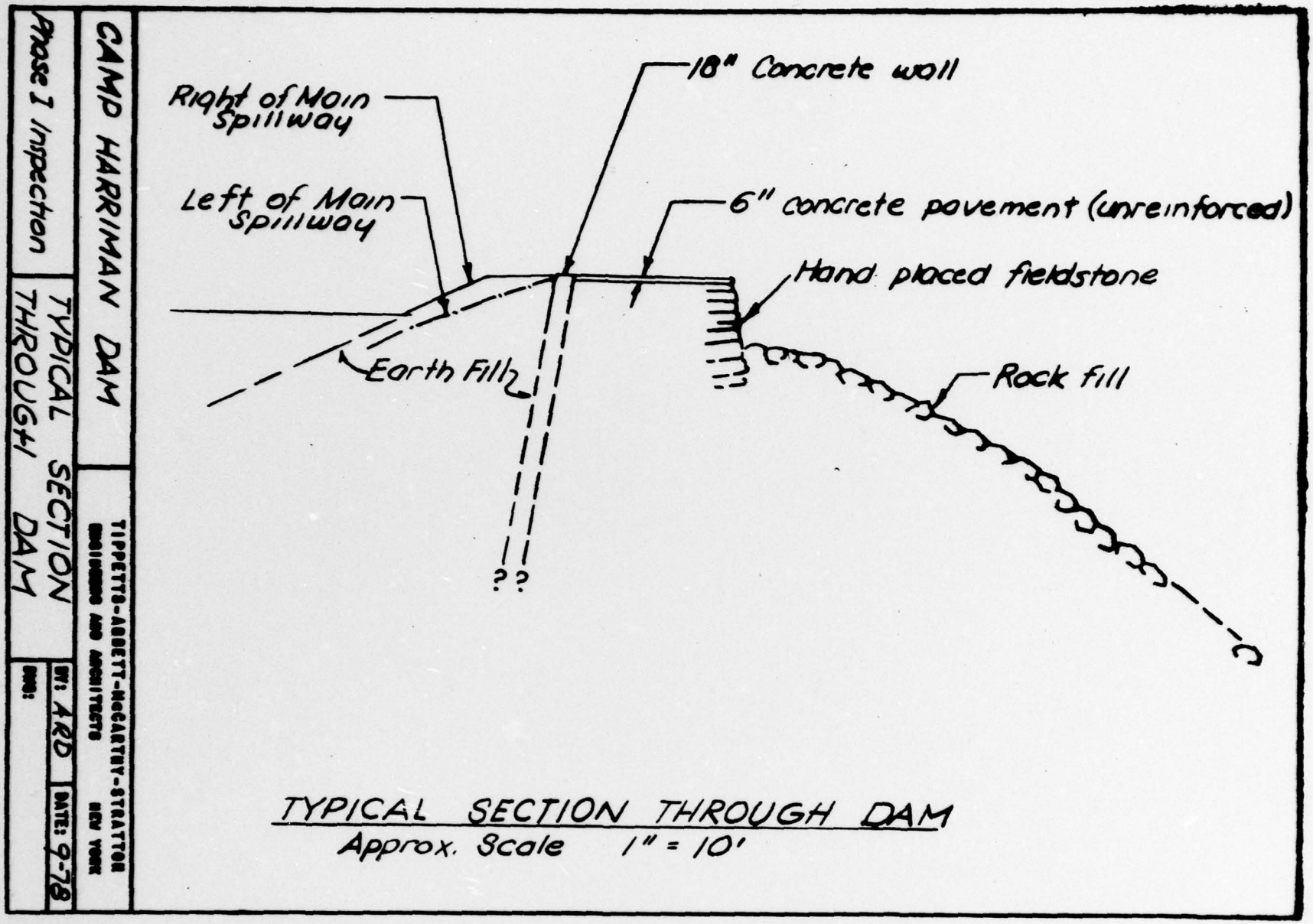
Job No. 1487-15 Sheet 5 of _____

Project Camp Harriman Dam - Main Spillway Date 9-26-78

Subject _____ By _____

_____ Ch'k. by _____





TYPICAL SECTION THROUGH DAM

Approx. Scale 1" = 10'