

AD A031079

APPENDIX IV

Final Report:

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD
INVESTIGATION OF HIGH WATER DAMAGE
IN OSWEGO COUNTY, NEW YORK

Contract Number
DACW 23-75-C-0033

Submitted to:

Department of the Army
North Central Division, Corps of Engineers
536 South Clark Street
Chicago, Illinois 60605

By:

St. Lawrence-Eastern Ontario Commission
317 Washington Street
Watertown, New York 13601

Project Leader:

Daniel J. Palm, Ph. D.

STATEMENT A
For public release;
Distribution Unlimited

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. (6)	3. RECIPIENT'S CATALOG NUMBER (9) rept.
4. TITLE (and Subtitle) ~~Summary Report of the~~ Pilot Study Program, Great Lakes Shoreland Damage Study, ~~(Final Report, 1972-1974)~~ Appendix IV, Contract for a Damage Survey of Oswego County, New York		5. TYPE OF REPORT & PERIOD COVERED Final July 1972-July 1974
7. AUTHOR(s) Dr. Daniel J. Palm (10)		8. CONTRACT OR GRANT NUMBER(s) (15) DACW23-75-C-0033 <i>neu</i>
9. PERFORMING ORGANIZATION NAME AND ADDRESS St. Lawrence-Eastern Ontario Commission 317 Washington Street Watertown, New York 13601		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS North Central Division, Corps of Engineers 536 S. Clark Street Chicago, Illinois 60605		12. REPORT DATE (11) May 1976
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) (12) 286p. 21		13. NUMBER OF PAGES 70
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release, distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) erosion damage Great Lakes flood damage coastal zone		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is an appendix to the Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study. It is a study of Oswego County, New York, shoreland damages caused by or directly related to the 1972-1974 high water period on the Great Lakes. Aerial photo mosaics of county shorelands are also included.		

- 100-11101
- Main Report Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study.
- Appendix I Great Lakes Shoreline Damage Survey; St. Louis County, Minnesota
- Appendix II Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin
- 100-11101
Appendix III Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan
- 100-11101
Appendix IV Contract for a Damage Survey of Oswego County, New York
- Appendix V Shoreline Damage Survey: An Appraisal with Recommendations
- Appendix VI Engineering - Economic Analysis of Shore Protection Systems: A Benefit/Cost Model
- 100-11101
/ Appendix VII Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan
- Appendix VIII Comparison of Field Data Collection to Data Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan



TABLE OF CONTENTS

	<u>Page</u>
Table of Contents	ii
List of Figures	iv
List of Tables	iv
Introduction	1
Authority and Scope	1
Background Information	1
Acknowledgements	2
Shoreland Description	3
General	3
Physical Description	5
Use, Ownership and Value	15
Shore Protection	19
Damage Areas	24
Extent and Character of Areas Subject to Flood Damages	24
Extent and Character of Areas Subject to Erosion Damages	29
Extent and Character of Areas Not Subject to Erosion and Flooding Damages	33
Recreational and Environmental Losses	39
Beach Recreation	41
Environmental Areas	43
Conclusions	45

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Oswego County, New York	4
2a & b	Shore Profiles - Oswego County	12-13
3	North Sandy Pond Beach Configuration 1965 and 1973	40
4	North Sandy Pond Beach Configuration June 1974	41

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Count of Land Ownership and Use by Reach - Oswego County	7
2	Shoreform Distribution, Oswego County, New York	8
3	Summary of Great Lakes Shoreline Use, Ownership, Value and Problem Identifi- cation - Oswego County, New York, 1974. .	16-17
4	Ownership and Land Use - Oswego County. .	18
5	Summary Analysis of Shore Protective Structures - Oswego County	21-22
6	Shore Protective Action - Oswego County .	23
7	Maximum Height of Lake Ontario Beaches - Oswego County	26
8	Summary of Non-residential Properties and Flood Losses - Monetary Costs	27
9	All Lakeshore Properties: Flood Losses - Monetary Costs	28
10	Long Term Bluff Recession Rates - Oswego County	30

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
11 Physical Erosion Losses - Oswego County, New York	31-32
12 Summary of Non-residential Property Erosion Damages - Oswego County 1972-1974	34
Total Erosion Damages - Oswego County, New York 1972-1974	35
14 Flood and Erosion Damages - Oswego County	36

LIST OF PLATES

<u>Plate</u>	
1-26	Aerial Photograph Mosaics of Oswego County Shoreline (sequence is from northeast to southwest).

- Attachment I - Listing of Riparian Property Owners*
- Attachment II - Analysis of Shore Protection Structures
- Attachment III - High Water Marks
- Attachment IV - Newspaper Articles on Highwater*
- Attachment V - Annotated Photographs of Flood and
Erosion Damages, Protective Works and
Storm Damage
- Attachment VI - Damage Forms (self-administered
questionnaire)*
- Attachment VII - Personal Interview Forms and Field Notes*

*Not printed. On file in North Central Division, U.S. Army Engineers,
536 S. Clark Street, Chicago, Illinois 60605

1.0 Introduction

1.1 Authority and Scope

This study was completed under a contract, number DACW 23-75-C-0033, between the Department of the Army, Chicago District, Corps of Engineers and the St. Lawrence-Eastern Ontario Commission. Details of the work accomplished are provided in Appendix A to the contract, Engineering Studies for a Contract For Field Investigation of High Water Damages in Oswego County, New York. Authority for the study was provided under the survey scope authority of the Great Lakes Water Levels Study.

1.2 Background Information

During the period 1972 through 1974 the entire Great Lakes system experienced record or near record high water levels. These, combined with seasonal storms, resulted in extensive damage to both shore property and the natural environment. Data gathered and analyzed in this study is an attempt to determine the magnitude and incidence of this damage in Oswego County, New York.

Oswego County borders the south eastern end of Lake Ontario. High water levels on Lake Ontario prevailed throughout the entire 1972-1974 period. A major storm that occurred on March 17-19, 1973 combined high winds with the prevailing high water level and a weak ice cover in inflicting most of the damage sustained during the reporting period. Following this storm, requests for public assistance in the New York State portion of the basin amounted to 25 million dollars. Property owners in Oswego County were granted Small Business Administration loans totaling 2.2 million dollars. In addition, there was undetermined amounts of damage to the natural environment of the shoreline.

This contract is a pilot study of Oswego County, New York, shoreland damages caused by or directly related to the 1972-1974 high water period on the Great Lakes. This Study is a cooperative undertaking of the State of New York and the Corps of Engineers to develop representative shore damage data. This information will be made available to other Federal and State agencies. This information will provide a base of information needed for the implementation of many Federal and State programs directed at reducing shoreland damages.

1.3 Acknowledgements

Participating in the study under the direction of the St. Lawrence-Eastern Ontario Commission were the Oswego County Planning Board; Dr. Richard Cutler, Lake Ontario Environmental Laboratory, the State University of New York at Oswego; and Dr. Robert Nugent, Department of Earth Sciences, the State University of New York at Oswego.

The St. Lawrence-Eastern Ontario Commission is a coastal zone planning and management agency serving 23 towns and two cities along Lake Ontario and the St. Lawrence River in St. Lawrence, Jefferson, Oswego and Cayuga Counties in New York State.

2.0 Shoreland Description

2.1 General

Oswego County, New York, lies at the southeastern end of Lake Ontario. County lake shoreline totals about 35.4 miles. In addition, the 15.6 miles of North Pond shoreline were included since the level of this water body is directly dependent on the level of Lake Ontario. The county extends from the International Joint Commission reference coordinated mileage number 119.3 to 154.7. (See Figure 1).

The Oswego County shoreline is generally exposed to the forces of Lake Ontario in that it is lacking in embayed areas. North Pond is the only significant exception to this. From the north end of the county to the south the shoreforms change from primarily low plains erodible to low bluffs erodible to high bluffs non-erodible. The low bluffs are composed primarily of sandy material. The high bluffs are made up of till and are found primarily over bedrock. In most areas the bedrock is of sufficient height or width to provide protection of the overlying erodible toe of the till bluff.

Use and type of ownership of the shoreline are generally the same throughout the entire county. Private seasonal residences are the primary structural developments found along the shoreline. In addition, there are several small marinas and hotels. The City of Oswego is the only significant community directly on the Lake. The majority of the non-residential, non-private properties are concentrated in or near the City (See Table 1).

Due to the uniformity of the land use, land values do not vary greatly along the shoreline and are generally low. Their average ranges from \$8 per foot to \$18 per foot over the four reaches of shoreline excluding the major commercial properties. These properties are of higher value (See Attachment I).

In general the flooding and erosion problems decrease as you move from the northern to the southern portion of the shoreline. This is due primarily to land form differences. Ranges of damage are \$0 to \$30,700 per mile for flooding and \$0 to \$21,700 per mile for erosion (See Table 14, page 37).

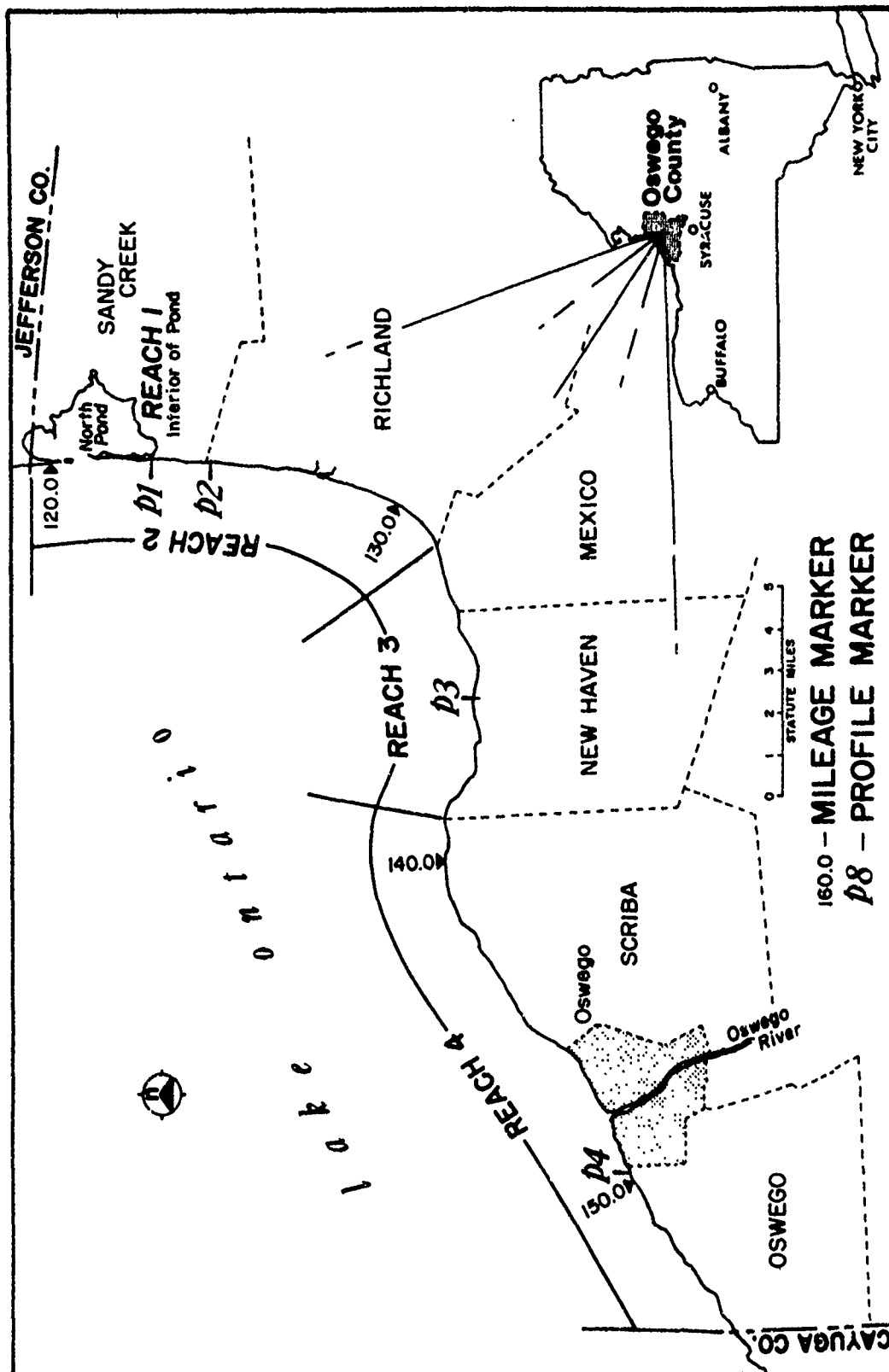


Figure 1. Oswego County, New York

Since most of the Lake shoreline is exposed to the open lake there have been a large number (469) of expedient shore protective devices constructed. Only one significant permanent device is in place. This is the system of breakwaters at the mouth of the Oswego River which provides protection for Oswego Harbor.

2.2 Physical Description

The Oswego County shore forms were mapped utilizing the following classification:

Low Plain Erodible (LPE): A low lying area of erodible material that is subject to flooding during highwater storms. Lake Ontario plains stand less than 6.5 feet above the June 1975 lake level, whereas the plains within North Pond are less than 3.5 feet high.¹

Low Bluff Erodible (LBE): Low erodible bluff, less than 30 feet high.

High Bluff Erodible (HBE): Erodible bluff, 30 feet or higher.

Low Dune (LD): Low sand dune, less than 30 feet high. Where the dune form either was destroyed or was poorly developed (i.e., made up less than 50% of the surface area), the shore form was designated either as a low plain erodible or as a low bluff erodible.

High Dune (HD): Sand dunes, 30 feet or higher.

Low Bluff Erodible Over Bedrock (LBE/BR): Low bluff, less than 30 feet high, that consists of erodible material on top of essentially non-erodible sandstones of either the Oswego or Queenston Formations. In general, the top of the bedrock exceeds 6 feet although rarely it can be as low as 3.5 feet. In every case, the bedrock either was high enough or formed a wide shore platform of sufficient height to protect the overlying unconsolidated material from erosion.

¹The June 15, 1975 lake level at Oswego was 245.8 feet. All references to elevations are relative to this level.

Excluded from this category are areas in which the bedrock exposures are low and narrow, as well as those which only have subaqueous rock platforms. The reason for excluding such areas is that the overlying unconsolidated materials are not completely protected from erosion during high water storms.

High Bluff Erodible Over Bedrock (HBE/BR): High bluffs, 30 feet or higher, of erodible material overlying non-erodible sandstones of the Oswego or Queenston Formations. This category likewise includes only essentially non-erodible areas.

The distribution of the seven basic forms, each of which may occur either with or without a beach, is shown on the accompanying air photo overlays and in Table 2.

For comparison, the study area was subdivided into four reaches. (See Figure 1). An attempt was made to make the reaches as geologically homogeneous as possible, although the actual boundaries were drawn at the nearest township lines.² The proportion of each shore form has been estimated for each reach and is presented in Table 2. Note that a destroyed beach is considered to be a no beach (NB) form.

Following are descriptions of Reaches 1-4. Each Reach is described in terms of shore form, bluff material, beach composition, offshore hydrography and exposure to wave attack within the constraints of data availability.

Reach 1: This reach consists of 16.4 miles of shoreline inside North Pond and along the shores of neighboring streams as far east as Route 3.

Shore Form - The shore forms found within this interval consists primarily of Low Plain Erodible or Low Bluff Erodible with minor amounts of Low or High Dunes (See Table 2). Marshy areas also are common. Except for a short stretch near the North Pond outlet, this reach generally is devoid of beaches.

²Use of political boundry lines in defining reach boundaries allowed merging of economic data with physical data collected in this study.

TABLE 1. COUNT OF LAND OWNERSHIP AND USE BY REACH - OSWEGO COUNTY, NEW YORK

	Ownership ^a																			
	Reach 1			Reach 2			Reach 3			Reach 4			County							
	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	P				
	P			P			P			P			P			P				
Seasonal Residential	0	0	0	32	0	0	0	239	0	0	0	192	0	0	0	160	0	0	0	623
Permanent Residential	0	0	0	0	0	0	0	2	0	0	0	6	0	0	0	10	0	0	0	18
Recreation	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	2	1	1
Wildlife Habitat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural, Forest and Undeveloped	0	0	0	5	0	0	0	70	0	0	0	29	0	0	0	34	0	0	0	138
Commercial/Industrial	0	0	0	8	0	0	0	8	0	0	0	4	0	2	0	14	0	2	0	34
Other	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	4	2	3	1	4
																	2	7	2	818

^aF = Federal; S = State; M = Municipal, P = Private

Source: Data derived from Assessment Rolls, Oswego County, New York.

Table 2. Shoreform Distribution, Oswego Co., New York

Shore Form	Reach 1		Reach 2		Reach 3		Reach 4	
	%	Miles	%	Miles	%	Miles	%	Miles
LPE-B	1.05	.16	18.25	2.08	46.51	3.52	34.57	5.67
LPE-NB	68.33	7.50	.92	.10	2.45	.19	2.34	.38
LBE-B	.75	.07	20.12	2.30	28.71	2.18	28.40	4.67
LBE-NB	20.56	2.25	2.48	.28	10.67	.81	14.09	2.31
HBE-B	---	---	3.63	.41	2.52	.19	11.28	1.85
HBE-NB	---	---	3.08	.35	2.78	.21	---	---
LD-B	3.15	.34	37.16	4.25	---	---	---	---
LD-NB	3.85	.42	.69	.08	---	---	---	---
HD-B	.25	.02	13.49	1.54	---	---	---	---
HD-NB	2.05	.22	.18	.02	---	---	---	---
LBE/BR-B	---	---	---	---	2.52	.19	5.24	.86
LBE/BR-NB	---	---	---	---	3.84	.29	1.93	.32
HBE/BR-B	---	---	---	---	---	---	1.47	.24
HBE/BR-NB	---	---	---	---	---	---	.67	.11
Total	---	11.0	---	11.41	---	7.58	---	16.41

Source: Field Survey, Dr. Robert Nugent, June, 1975.

Bluff Material - Tills and lake sediments comprise about 80 percent of the bluffs, whereas dune sands comprise the remaining 20 percent.

Beach Composition - The beach is restricted to a 3.75 mile stretch along the western shores of North Pond and is composed of sand.

Offshore Hydrography - North Pond is generally less than thirteen feet deep. The outlet is subject to change during any given major storm.

Exposure to Wave Attack - The sand, in its present form of two spits, along the western shore of North Pond provides protection to the entire reach since it buffers the impact of lake storms. The westerly side of these spits are discussed in the description of Reach 2.

Reach 2: This reach extends from mile 120.30 to mile 131.36 and includes the Lake Ontario shoreline of Sandy Creek and Richland Townships.

Shore Forms - Dunes, both low and high, with beaches encompass about half of the reach. The dunes reach a maximum height of 71 feet. The remaining half is primarily Low Plain Erodible and Low Bluff Erodible with beaches. Bluffs within the reach have a peak height of 71 feet and an average height of 18 feet. The entire reach has a beach which ranges up to 125 feet in width and averages 29 feet.

Bluff Material - Three quarters of the bluffs within this reach consist of dune sand, although the dune forms have been destroyed in many places. The remaining one quarter of the bluffs consist of lake sand and gravel overlying till. This nondune material is found at Ramona Beach, Sil Kirk Shores State Park and Rainbow Shores.

Beach Composition - South of the mouth of the Salmon River moderately well sorted beaches are found. North of the Salmon River sand beaches are found except for the gravel beaches between mile 123.90 and mile 125.85.

Offshore Hydrography - Sand bars are quite common in this reach about 100 feet offshore. Water depths gradually increase to about 30 feet at 400 feet offshore.

Exposure to Wave Attack - This reach is directly exposed to wave attack from the primary directions from which storms come - northeast, west and southwest.

Reach 3: This reach extends from mile 131.36 to mile 138.95 and includes the Lake Ontario shoreline in the townships of Mexico and New Haven.

Shore Form - Approximated 90 percent of the shore is classified as Low Plain Erodible with the remainder classed as Low Bluff Erodible over Bedrock. The bluff averages 11 feet in height, but in rare instances does rise to 60 foot heights. Swamps or marshes are quite common in this area.

Bluff Material - Mostly the bluffs are of lake sands and gravels over till, or till with minor amounts of dune sand, or till over bedrock. Non-erodible bluffs are only found near Nine Mile Point.

Beach Composition - The beaches of this reach are of cobbles and pebbles and average 17 feet in width.

Offshore Hydrography - Water depths gradually increase to about 30 feet at 400 feet offshore except in the vicinity of Nine Mile Point where the 30 feet depth is reached at about 200 feet offshore.

Exposure to Wave Attack - This reach is directly exposed to storms coming from the west and northwest.

Reach 4: This reach extends from mile 138.5 to mile 154.7 and includes the shoreline of Scriba and Oswego Townships as well as that of the City of Oswego.

Shore Form - About one third of this reach is Low Plain Erodible with Beach. The remainder is primarily Low Bluff Erodible and High Bluff Erodible with Beach and Low Bluff without Beach. The bluffs average 14 feet in height, but range up to a maximum of 113 feet. Marshes and swamps are also common along the coast and lie immediately behind the beach along at least 10 percent of the reach.

Bluff Material - Till is the most common bluff material, although artificial fill and thin tills overlying non-erodible sandstones also are important. The fill is concentrated inside Oswego Harbor and at Nine Mile Point. Likewise the non-erodible sectors are found either near Oswego City or Nine Mile Point.

Beach Composition - Beaches within the reach average 25 feet in width and are composed of either cobbles, pebbles, or blocks. Bedrock ledges commonly protrude through the beach gravels.

Offshore Hydrography - Slightly submerged rock platforms are a common feature, and may be found in the offshore region of at least 20 percent of the reach. Water depths increase to about 30 feet at 400 feet offshore except at the mouth of Oswego Harbor. The depths here range from 20 to 25 feet into the interior of the Harbor.

Exposure to Wave Attack - This reach is directly exposed to storms from the north and northwest. Oswego Harbor area is protected by a system of breakwaters.

Schematics of four shore profiles are shown as Figure 2a and 2b. Analyses of soil samples taken at each shore profile will be reported in a separate report by the Corps of Engineers, North Central Division Office.

Below are brief descriptions of the four profiles that were considered representative of the Oswego County shoreline:

Profile 1: Mile 123.5, approximately 80 feet north of a limestone block revetment near the north end of Sandy Pond Beach. The profile is located 2.325 inches north of the southern edge of air photo mosaic 11-35-437 to 423.

The coastal form along this profile is that of a high dune with beach. The bluff is about 45 feet high and is composed of well sorted, fine grained sand.

This sand is cross-bedded, although bedding is difficult to detect because of the paucity of ferromagnesium-rich mineral grains. Roots, as well as finely disseminated organic matter, may be found in the sand at the top of the bluff.

The bluff is partially protected by a 40 foot wide beach as well as by a sand bar that lies 80-100 feet offshore. Both the beach and the inshore sediments consist of well sorted, fine grained sand.

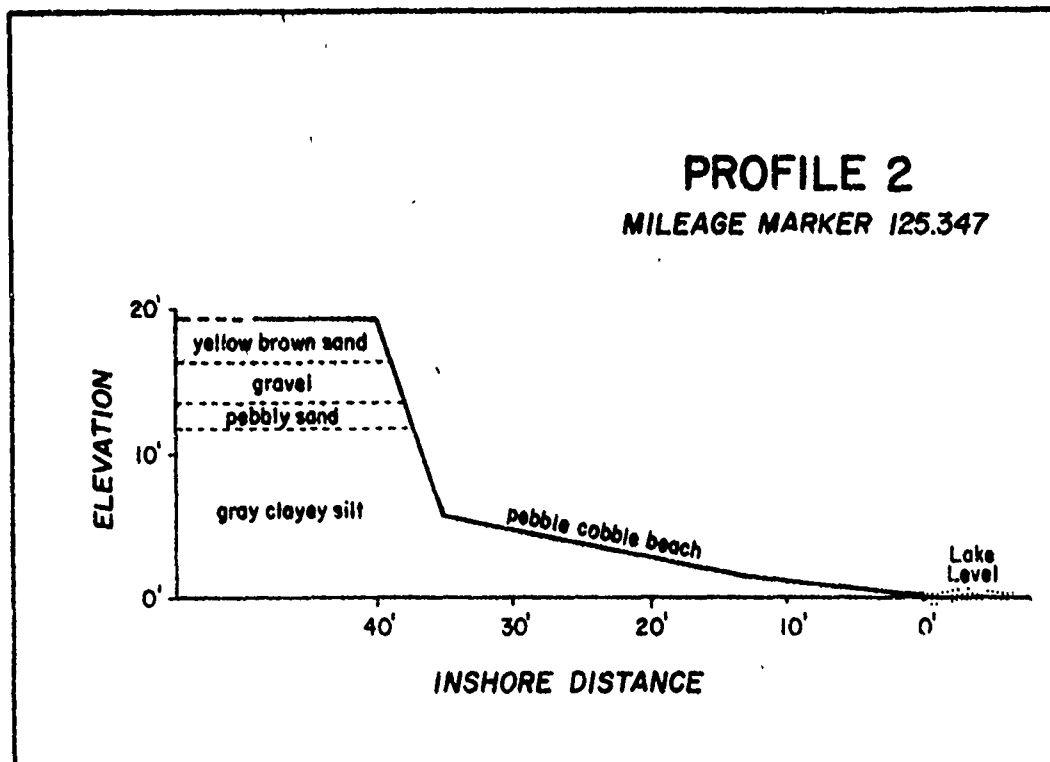
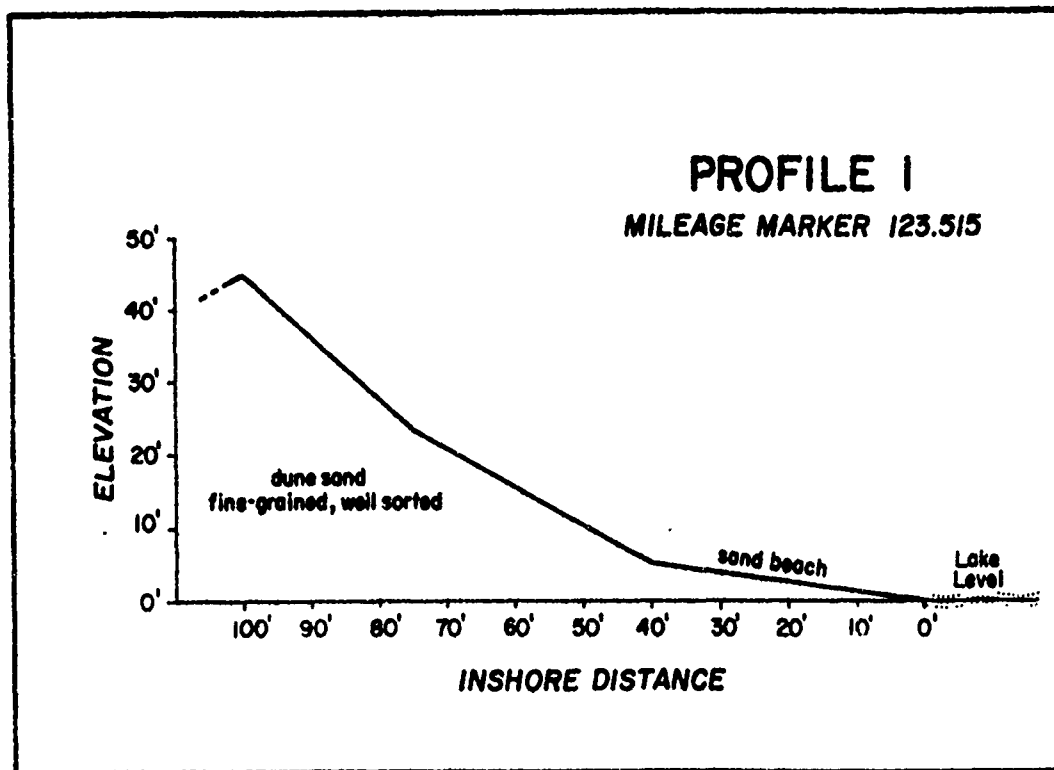


Figure 2a. Shore Profiles -- Oswego County, New York.

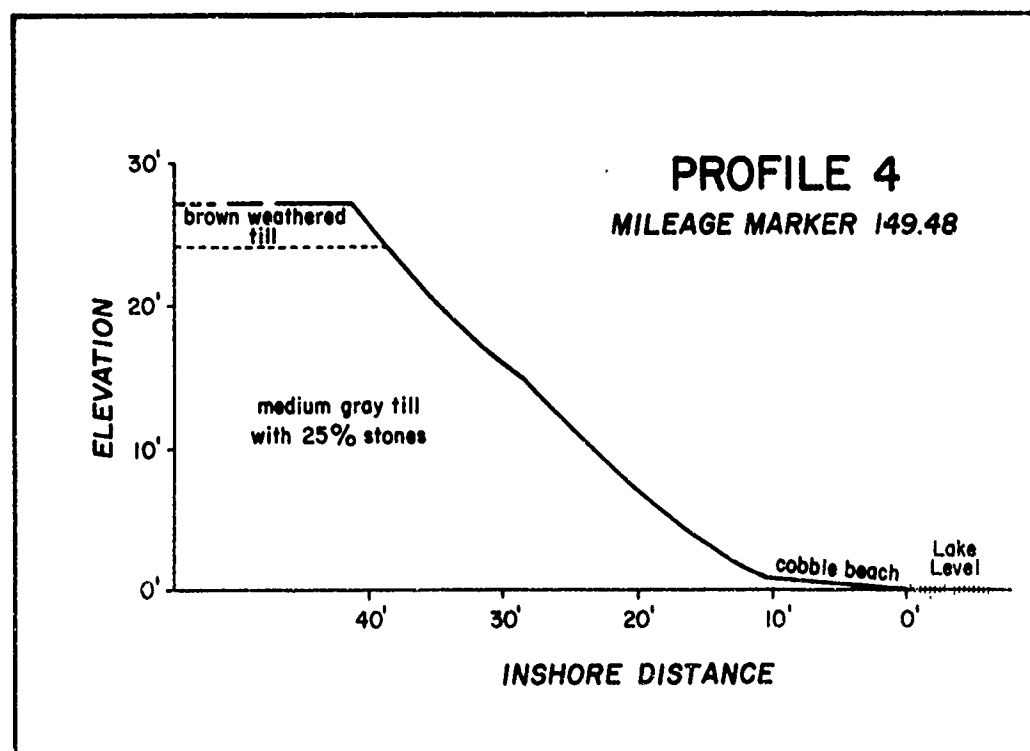
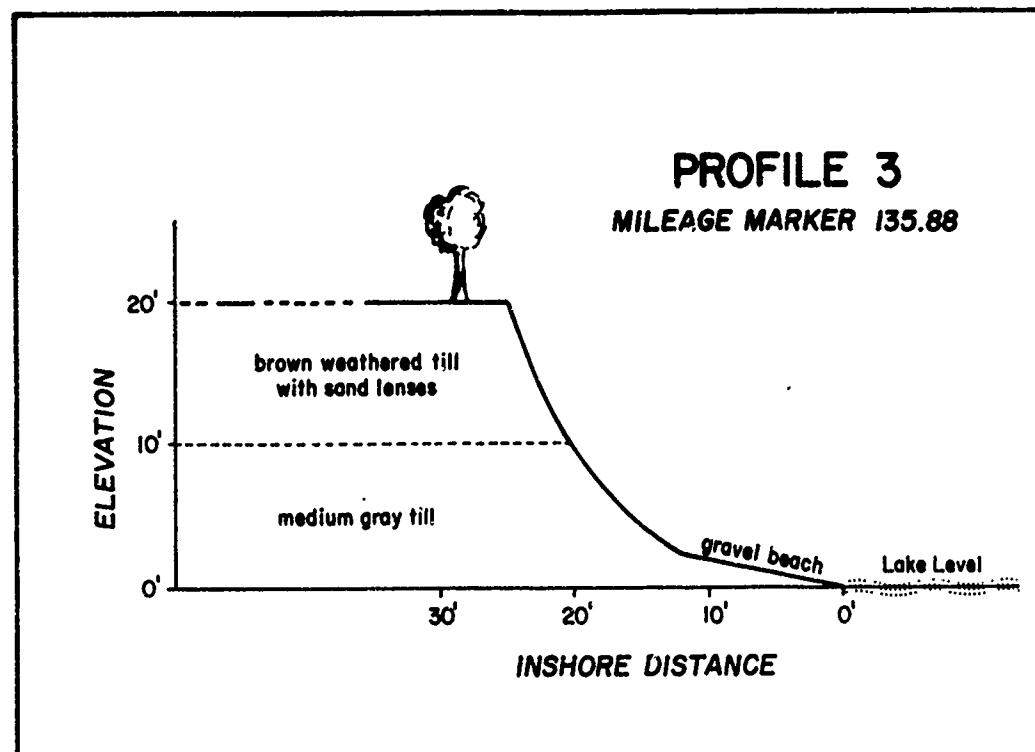


Figure 2b. Shore Profiles -- Oswego County, New York.

Profile 2: Mile 125.3, at Rainbow Shores. The profile was taken at a tree stump on the backbeach, about 60 feet south of a small dirt road (located on airphoto mosaic 11-35-431 to 425; 2.46 inches north of the southern edge).

The bluff is 18 feet high and consists of, in descending order, 3-4 feet of yellow brown silt or very fine grained sand; 2-2.5 feet of moderately sorted, partially indurated, cobbles, with a sandy matrix; 1-1.5 feet of loose, brown, pebbly clayey sand; and 6-7 feet of gray silty clay or clay silt. These stratigraphic units are extremely variable and change suddenly when traced from north to south. Thirty feet south of the profile, the entire bluff consists only of the yellow brown sand (a channel fill deposit).

The bluff is protected by a gravel beach that is 35 feet wide and which rises to a height of 5.6 feet at toe of the bluff. The gravel consists of well sorted, well rounded pebbles and small cobbles.

Profile 3: Mile 135.9, at Hickory Grove (located on airphoto mosaic 11-35-392 to 387, 2.71 inches east of the east bank of Catfish Creek).

The bluff is 20 feet high and consists of about 10 feet of weathered brownish-gray till, containing several thin lenses of sand, over-lying medium gray till. Numerous fresh slump scars may be found along the bluff.

The bluff is protected by a gravel beach that is 15 feet wide and which rises to a height of three feet above lake level. The gravel consists of very poorly sorted pebbles, cobbles and boulders.

Profile 4: Mile 149.5. State University College at Oswego Campus, Oswego, N.Y. The location of the profile is about 40 feet east of Johnson Hall and is marked by an "X" scratched at the base of a fence post (on lake side), which lies 18.3 feet from the cliff edge (0.675 inches east of western edge of airphoto mosaic 11-35-341 to 336).

The bluff is about 26 feet high, above lake level. The bluff material is a medium gray sandy till, which contains about 25 percent stones, and weathers to a brownish color. The upper 2-3 feet is badly weathered. Active slumping has caused this bluff to recede at a rate

of about two feet per year since 1972. Prior to that, the bluff was fairly stable, and receded at a rate of less than 0.4 feet per year.

At the toe of the bluff is a 17-20 feet wide beach of moderately sorted large cobbles. Some small boulders are concentrated at the shoreline. This shore is protected somewhat by a 50-70 feet wide subaqueous rock platform of the resistant Oswego Sandstone that lies east of the site. In general, the water depth is less than 0.5 feet on the platform.

2.3 Use, Ownership and Value

Land use classes of permanent residential (PR); seasonal residential (SR); recreational (R); wildlife habitat (WH); agricultural, forest and undeveloped (U); and commercial and industrial (C & I) were used to delineate primary shoreline land uses.

As is reflected in Tables 3 and 4, Oswego County land use is primarily seasonal residential, 39.0 percent, and agricultural, forest and undeveloped, 38.8 percent. Reaches 1-3 are very similar in shoreline land use. Reach 4, which includes Oswego City, varies in that there is a small proportion of seasonal residences and a large proportion of commercial and industrial usage. Reach 2 has the highest percent of land in recreational use due to the presence of Selkirk Shores State Park.

Ownership classes of federal government (F); state government (S); municipal government (M); and private (P) were used to delineate land ownership.

Ownership of the Oswego shoreline is predominantly private, 92 percent. Reach 4 varies in that portions of the Oswego City shoreline and its environs are owned by the State of New York. The largest parcels are the State University College at Oswego and the Port Authority of Oswego. It is worthy of note that the federal government owns almost no property in the Oswego County. Tables 3 and 4 show the distribution of ownership.

Shoreline values of less than \$50/ft; \$50-\$100/ft; \$100-\$150/ft; \$150-\$200/ft; \$200-\$400/ft; and \$400 and up/ft. were used to show the average assessed value of shoreline land. The values were determined by averaging the assessed total value (land plus improvements) for those properties that assessed values were available for.

TABLE 3: SUMMARY OF GREAT LAKES SHORELINE USE, OWNERSHIP, VALUE AND PROBLEM IDENTIFICATION
OSWEGO COUNTY NEW YORK 1974

Shoreland Use	Miles/Shoreland	Ownership			Aver. Asses. Value/front Foot \$/ft.	Problem Identification						Not Subject to Erosion or Flood Damages Miles	
		Federal State Local Miles Miles Miles				Subject to Erosion		Subject to Flooding					
						Permanent Protection Miles	Expedient Protection Miles	Unpro- tected Miles	Perma. Prot. Miles	Exped. Prot. Miles	Unpro- tected Miles		
Reach 01													
PR	0	0	0	0	18.18	0	0	0	0	b	b	0	0
SR	7.41	0	0	0	7.41	0	3.43	3.98				0	0
R	.48	0	0	0	.48	0	.02	.46				0	0
WH	0	0	0	0	a	0	0	0				0	0
AFU	6.78	0	0	0	6.78	0	.49	6.29				0	0
C&I	.92	0	0	0	.92	0	.22	.70				0	0
Reach 02													
PR	0	0	0	0	0	0	0	0	0	b	b	0	0
SR	5.36	0	0	0	5.36	0	2.46	2.90				0	0
R	1.78	0	.43	0	1.35	0	.85	.93				0	0
WH	0	0	0	0	0	0	0	0				0	0
AFU	2.95	0	0	0	2.95	0	.06	2.89				0	0
C&I	.58	0	0	0	.58	0	0	.58				0	0

PR - Permanent Residential
SR - Seasonal Residential
R - Recreation
WH - Wildlife Habitat
AFU - Ag. Forest & Undeveloped
C&I - Commercial & Industrial

TABLE 3: SUMMARY OF GREAT LAKES SHORELINE USE, OWNERSHIP, VALUE AND PROBLEM IDENTIFICATION
OSWEGO COUNTY NEW YORK 1974

Shoreland Use	Miles/ Shoreland	Ownership			Aver. Asses. Value/front Foot \$/ft.	Problem Identification						Not Subject to Erosion or Flood Damages Miles	
		Federal State Local Priv.				Subject to Erosion		Subject to Flooding					
		Miles	Miles	Miles		Permanent Protection Miles	Expedient Protection Miles	Unpro- tected Miles	Perm. Exped. Prot. Miles	Unpro- tected Miles			
Reach 03													
PR	.19	0	0	0	.19	14.40	0	.16	.03	b	b	0	0
SR	3.94	0	0	0	3.94	14.40	0	1.44	2.45			.05	
R	.31	0	.20	0	.11	16.47	0	.22	.08			.01	
WH	0	0	0	0	0	a	0	0	0			0	
AFU	2.86	0	0	0	2.86	a	0	.29	2.04			.53	
C&I	.46	0	0	0	.46	5.79	0	.32	.14			0	
Reach 04													
PR	.24	0	0	0	.24	8.99	0	.14	.10	b	b	0	
SR	2.74	0	0	0	2.74	8.99	0	1.22	1.32			.20	
R	.34	0	0	.12	.22	5.18	0	0	.34			0	
WH	0	0	0	0	0	a	0	0	0			0	
AFU	6.47	0	0	.14	6.33	a	0	.33	5.92			.22	
C&I	6.12	.05	2.78	.29	3.00	298.30	1.74	1.23	2.32			.83	

PR - Permanent Residential R - Recreation AFU - Ag, Forest & Undeveloped
SR - Seasonal Residential WH - Wildlife Habitat C&I - Commercial & Industrial

^aData not available.

^bAll protective devices were constructed to prevent erosion (See Page 21).

Source: Field Survey, Dr. Robert Nugent, June 1975, Assessment Rolls, Oswego County, New York.

TABLE 4. OWNERSHIP AND LAND USE--OSWEGO COUNTY

Ownership (% of Shoreline)	<u>Reach</u>				<u>Oswego County</u>
	1	2	3	4	
Federal	0	0	0	.2	.1
State	0	4.0	2.6	17.5	6.8
Municipal	0	0	0	3.5	1.1
Private	<u>100</u>	<u>96.0</u>	<u>97.4</u>	<u>78.8</u>	<u>92.0</u>
Total	100	100	100	100	100
Land Use (% of Shoreline)					
Permanent Residential	0	0	2.4	1.5	.9
Seasonal Residential	47.6	50.2	50.8	17.2	39.0
Recreational	3.1	16.7	4.0	2.1	5.8
Wildlife Habitat	0	0	0	0	0
Agricultural, Forest and Undeveloped	43.4	27.7	36.9	40.7	38.8
Commercial/ Industrial	<u>5.9</u>	<u>5.4</u>	<u>5.9</u>	<u>38.5</u>	<u>16.1</u>
Total	100	100	100	100	100

Source: Assessment Rolls, Oswego County, New York.

These values are reflected in Table 3. The primary land use, seasonal residential, is in general low in assessed value and averages less than \$20 per foot throughout the county. These are reflected in Table 3.

Land use, ownership and values are all shown on the overlays of the air photos accompanying this report.

Oswego City (mileage 147-149) is the only community on the shoreline. ALCAN Company (mileage 147) is a major industrial property bordering the lake. Two large nuclear generating facilities (mileage 140-142) are major factors in preventing land use changes in the future for a large portion of the shoreline. Several other areas are currently intensely developed with seasonal residences. Additional growth of seasonal homes is the major change expected along the Oswego shoreline.

To summarize land use and ownership in Oswego County, there are 829 riparian parcels. Of these, 18 are permanent residential; 623 are seasonal residential; 138 agricultural, forest and undeveloped; 36 are commercial and industrial; 1 recreational and 4 miscellaneous. There are 818 parcels owned by private individuals; 2 are owned by federal units of government; and 9 by state and municipal units of government (See Table 1).

2.4 Shore Protection

There are 468 expedient shore protective works in Oswego County (See Table 5). Of these, 155 or 33 percent were found to have no design deficiencies. (This is classification A of Maintenance Requirements in Attachment II). The remainder all have one or more design deficiencies. Thus 182 works on Lake Ontario (Reaches 2-4) and 107 works on North Pond (Reach 1) have limited effectiveness in stabilizing the shore. An additional 116 works on Lake Ontario and 38 on North Pond provide permanent effectiveness in stabilizing the shore. Eleven works were classified as having no effectiveness in stabilizing the shore. One structure, due to the manner in which portions of it were constructed, was classified as having both limited and permanent effectiveness.

The offshore breakwater and contingent structures at Oswego Harbor are the only permanent shore protective works in the shoreline. It appears as if they are adequate and effectively protect the harbor.

For those areas subject to erosion and flooding³ Table 6 reflects the percentage of each land use category for each reach that has either permanent protection, expedient protection or is unprotected. As can be seen, the majority of the expedient protection structures were constructed to provide protection for seasonal residences. The primary areas left unprotected are, as expected, the "lower" value land uses of agriculture, forest and undeveloped.

³All shore protective structures in Oswego County were considered to have been built to provide protection against erosion. None appeared to have been designed to provide protection against flooding.

Table 5. Summary Analysis of Shore Protective Structures
Oswego County, New York

		<u>Reach</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
<u>Type:</u> ^a					
R -		57	42	36	40
SW -		82	59	55	26
B -		5	2	7	12
O -		5	10	7	8
G -		14	1	3	3
Total		<u>163</u>	<u>114</u>	<u>108</u>	<u>89</u>
<u>Condition:</u> ^b					
M -		113	49	56	35
E -		35	45	33	48
P -		15	15	19	6
Total		<u>163</u>	<u>109</u>	<u>108</u>	<u>89</u>
<u>Maintenance Requirement:</u> ^c					
A -		73	45	44	47
B -		2	3	3	2
C -		46	26	16	16
D -		4	5	6	4
E -		20	22	23	17
F -		2	0	5	2
G -		15	10	19	5
H -		1	3	1	0
Total		<u>163</u>	<u>114</u>	<u>117</u>	<u>93</u>
<u>Effects on Shoreline</u>					
<u>Stablization:</u> ^d					
L -		118	63	73	45
P -		42	43	32	44
N -		4	3	3	0
Total		<u>164</u>	<u>109</u>	<u>108</u>	<u>89</u>

Table 5. Summary Analysis of Shore Protective Structures
Oswego County, New York (Cont'd)

^aSW Seawalls, bulkheads
G Groins, Jetties
B Breakwaters
R Revetments
A Artificial Nourishment
O Other

^b E Excellent
M Moderate
P Poor

^c A None Required
B Minor Evident
C Minor Required
D Moderate Evident
E Moderate Required
F Major Evident
G Major Required
H Rebuilding Required

^d P Permanent
L Limited
N None
A Adverse

Source: Field survey, Dr. Robert Nugent, June 1975.

TABLE 6. SHORE PROTECTIVE ACTION - OSWEGO COUNTY

Land Use	Protective Action									
	Permanent Protection (% of Shoreline)				Expedient Protection (% of Shoreline)				Unprotected (% of Shoreline)	
	1	2	3	4	CO ^a	1	2	3	4	CO ^a
Permanent Residential	0	0	0	0	0	0	0	2.1	0	.6
Seasonal Residential	0	0	0	0	0	22.0	23.1	18.6	7.7	17.1
Recreation	0	0	0	0	0	0	8.1	2.8	0	2.2
Wildlife Habitat	0	0	0	0	0	0	0	0	0	0
Agricultural, Forest and Undeveloped	0	0	0	0	0	3.1	1.0	3.7	2.1	2.3
Commercial/Industrial	0	0	0	10.9	3.5	1.4	0	4.1	7.7	3.5
Total ^b	0	0	0	10.9	3.5	26.7	32.1	31.3	17.5	25.7
						40.3	27.1	26.3	37.2	34.3
						4.5	5.4	1.8	14.6	7.5
						73.3	68.5	60.7	62.8	67.0

^aCO means Oswego County^bThese totals equal the percent of shoreline within Oswego County that is subject to flooding or erosion. Areas subject to flooding or erosion are as follows: 100 percent of Reaches 1 and 2; 92.0 percent of Reach 3; 91.2 percent of Reach 4; and 96.2 percent of the County (See Table 3, pages 16-17).

Source: Field Survey, Dr. Robert Nugent, June 1975.

3.0 Damage Areas

Data relative to damage sustained by residential property owners was obtained from a mail questionnaire to all riparian property owners. In Oswego County, 864 properties were identified. Mailing addresses for only 779 could be obtained from the tax rolls. Of the 779 contacted, 543, or 69.7 percent, usable questionnaires were returned. Personal follow-up interviews were conducted with 46 non-respondents and 38 respondents to the mail questionnaire.

Analysis of the data obtained revealed the following concerning property owners:

	<u>percent¹</u> <u>unadjusted</u>	<u>percent²</u> <u>adjusted</u>
Had risk due to erosion and/or flooding	80.1	76.8
Sustained economic damage	80.1	78.5
Attempted preventive or corrective action	55.6	41.4
Covered by flood insurance	07.2	06.1

3.1 Extent and Character of Areas Subject to Flood Damages

Those areas subject to flooding have been mapped as Low Plain Erodible (LPE). Such areas are less than 6.5 feet high in Reaches 2, 3 and 4, and less than 3.5 feet high in Reach 1. These areas subject to flooding are as follows:

¹Unadjusted - respondents to mail questionnaire.

²Adjusted - respondents to mail questionnaire adjusted for respondents to follow-up personal interview.

<u>Reach</u>	<u>Percent LPE</u>	<u>Miles</u>
Reach 1	69.4	7.63
Reach 2	19.2	2.19
Reach 3	49.0	3.71
Reach 4	<u>36.9</u>	<u>6.06</u>
Oswego County Shoreline	42.2	19.59

Attachment III describes nineteen high water marks. Unfortunately, the high water marks of storm-induced floods of 1972-1974 have for the most part been destroyed. Nineteen high water marks are of two types. The first type appears as an abrupt start of moss on trees in coastal swamps. The base of the moss marks the water level in the ponded swamp water. A second type marks the maximum height of gravel beach ridges along a given stretch of beach. These storm ridges at least record the maximum height of waves during the last major storm. Table 7 shows the maximum height of beaches within each one mile interval of the Lake Ontario shoreline.

Non-residential damage due to flooding occurred primarily outside of Reach 4, although the commercial/industrial land use was concentrated in this Reach. This was due primarily to the nature of the land forms occurring in the reach and the protection afforded by the protective works at Oswego Harbor. Of the flooding losses, a large portion was due to loss of business income, 45 percent, and costs of protective structures, 28 percent. Very little was due to damage to structures and contents. Tables 8 and 9 reflect this data.

The high percentages of loss attributed to loss of business income can possibly be explained by the fact that the commercial properties, outside of Reach 4, are primarily hotels, marinas and campgrounds. High water levels themselves and damages to physical facilities that support water-related activities which were caused by the high water levels possibly explains why business incomes were felt to be lower than would have occurred without the high water levels and damages.

Residential property damage was heavy throughout the county. It is interesting to note that damage to

TABLE 7. MAXIMUM HEIGHT OF LAKE ONTARIO BEACHES
IN OSWEGO COUNTY

<u>Mileage Markers</u>	<u>Beach^a Height (ft.)</u>	<u>Mileage Markers</u>	<u>Beach Height (ft.)</u>
120-121	5.0	137-138	7.0
121-122	5.0	138-139	5.0
122-123	5.0	139-140	7.0
123-124	5.5	140-141	7.0
124-125	5.0	141-142	9.5
125-126	5.0	142-143	7.0
126-127	5.0	143-144	8.0
127-128	6.0	144-145	9.5
128-129	6.3	145-146	5.5
129-130	5.5	146-147	8.5
130-131	6.5	147-148	7.0
131-132	6.3	148-149	b
132-133	6.0	149-150	6.0
133-134	6.5	150-151	6.0
134-135	7.0	151-152	8.5
135-136	6.0	152-153	8.0
136-137	7.0	153-154	5.5
		154-155	9.0

^a Heights relative to June 1975 lake level of 245.8 feet.
^b Data not available.

Source: Field Survey, Dr. Robert Nugent, June 1975.

TABLE 8: SUMMARY OF NONRESIDENTIAL PROPERTIES: FLOOD LOSSES - MONETARY COSTS^a

Reporting Unit and Lakeshore Activity	Flood Damage by Source					Costs of Protection of			Financial Losses	
	Total Costs (\$000)	Structure and Contents (\$000)	Grounds and Improvements (\$000)	Clean Up (\$000)	Other Damages (\$000)	Costs of Relocation (\$000)	Costs of Protective Structures (\$000)	Emergency Evacuation (\$000)	Other Costs (\$000)	Net Loss of Business Income (\$000)
Oswego County										
Commercial/Industrial	34.9	1.0	1.8	5.5	0	0	10.0	0.6	0	16.0
Transportation	0	xxx		xxx						
Utilities	0									
Agriculture	0	0	0.1	0.5	0	0	0	0	0	0
Other	0.6									
Reach 01										
Commercial/Industrial	0									
Transportation	0	xxx		xxx						
Utilities	0									
Agriculture	0									
Other	0									
Reach 02										
Commercial/Industrial	28.0	1.0	0	5.5	0	0	10.0	0.6	0	11.0
Transportation	0	xxx		xxx						
Utilities	0									
Agriculture	0									
Other	0									
Reach 03										
Commercial/Industrial	6.8	0	1.8	0	0	0	0	0	0	5.0
Transportation	0									
Utilities	0									
Agriculture	0									
Other	0									
Reach 04										
Commercial/Industrial	0									
Transportation	0									
Utilities	0									
Agriculture	0									
Other	0.6	0	0.1	0.5	0	0	0	0	0	0

^aActual damages reported.

Source: Personal interviews conducted by Dr. Richard Cutler, August 1975.

TABLE 9: ALL LAKESHORE PROPERTIES: FLOOD LOSSES - MONETARY COSTS^a

Reporting Unit and Lakeshore Activity	Flood Damage by Source					Costs of Protection			Financial Losses	
	Total Costs (\$000)	Structure and Contents (\$000)	Grounds and Improvements (\$000)	Clean Up (\$000)	Other Damages (\$000)	Costs of Relocation (\$000)	Protective Structures (\$000)	Emergency Evacuation (\$000)	Other Costs (\$000)	Net Loss of Business Income (\$000)
Oswego County Residential Properties	1,117.8	118.7	494.7	b	258.2	0	103.2	0	133.4	9.7
Nonresidential Properties	35.5	1.0	1.9	6.0	0	0	10.0	0.6	0	16.0
Reach 01 Residential Properties	40.8	.8	19.2	b	2.2	0	12.8	0	6.8	0
Nonresidential Properties	0	0	0	0	0	0	0	0	0	0
Reach 02 Residential Properties	493.8	67.9	187.0	b	125.0	0	30.9	0	77.2	5.8
Nonresidential Properties	28.1	1.0	0	5.5	0	0	10.0	0.6	0	11.0
Reach 03 Residential Properties	190.6	3.9	97.6	b	47.1	0	22.4	0	17.4	2.3
Nonresidential Properties	6.8	0	1.8	0	0	0	0	0	0	5.0
Reach 04 Residential Properties	392.6	46.1	190.9	b	83.9	0	38.1	0	32.0	1.6
Nonresidential Properties	0.6	0	.1	.5	0	0	0	0	0	0

^aActual damages reported.

^bFor residential properties damages to protective structures and clean up costs are included in "Other Damages."

Source: Data tabulated from personal interviews and mail questionnaires.

structures and contents was only 11 percent of the total damage due to flooding, while damage to grounds and improvements was 44 percent (See Table 9). Loss of business income, which was less than 1 percent, reflects that few seasonal residences are rented out for a portion of the year.

Other costs, which were 9.7 percent of the total residential property flood losses, consisted of miscellaneous damages (roads, furnaces, gravel removal), damages to protective structures and clean up costs. Due to the nature in which these damages were reported, it was not possible to separate the various categories. Therefore, they were combined as "other costs". As could best be determined it appeared as if the majority of the losses were related to damages to protective structures.

3.2 Extent and Character of Areas Subject to Erosion Damages

Reflected in Table 10 are the long term (1938-1974) bluff recession rates for each reach. They were determined at 17 locations by comparing 1938 and 1974 aerial photographs of the shoreline. In addition, data was obtained at mileages 138.16 and 136.00 by remeasurement of property lines and comparison to original land surveys. Information was also provided by land owners at mileage 136.10 and 136.20. The information obtained compared favorably with that derived through aerial photograph interpretation.

The long term recession rates were used to estimate the volumetric rates of bluff recession. These are summarized by reach below and in Table 11.

The bluffs along Reach 1 average 4.8 feet in height (based on 100 measurements) and are eroding at an average long term rate of 1.04 feet per year. According to the volumetric erosion rates provided by the Corps of Engineers, erosion of this 99,950 feet of shoreline annually produces about 1,098,000 cubic feet of sediment.

The bluffs of Reach 2 average 18.6 feet in height (based on 182 measurements) and are eroding to an average long term rate of 1.86 feet per year. Erosion of the 56,628 feet of shoreline annually produces about 3.2 million cubic feet of sediment.

TABLE 10. LONG TERM BLUFF RECESSION RATES --
OSWEGO COUNTY (DETERMINED BY COMPARISON
OF 1938 AND 1974 AERIAL PHOTOGRAPHS)

<u>Reach</u>			<u>Recession Rates</u> <u>(feet/year)</u>
4	Mileage marker	154.100	1.71
4	" "	154.825	0.68
4	" "	153.780	0.71
4	" "	149.480	0.12
4	" "	143.900	0.92
3	" "	138.160	0.23
3	" "	136.200	1.67
3	" "	136.100	1.87
3	" "	136.000	1.10
3	" "	135.710	0.21
3	" "	132.250	2.19
2	" "	125.347	0.96
2	" "	123.515	2.35
2	" "	120.870	2.26
1	North Pond Shore, opposite mileage marker 120.87		0.09
1	North Pond Shore, adjacent to structure N-34		0.13
1	North Pond Shore, adjacent to structure N-103		2.90

Table 11: Physical Erosion Losses Oswego County, New York 1972-1974

Reporting Unit (IJC Mileage)	Physical Losses		Number of Residences Located Within Feet of Edge of Bluff						Number of Residences Destroyed
	Amount of Beach Area Lost (000 sq.ft.)	Amount of Bluff Volume Lost (000 cu.ft.)	Feet of Edge of Bluff						
			0-25	26-50	51-75	76-100	101-150	151+	
North Pond									
121	26,400	400,000	5	6	4	2		3	0
122	672,500	5,800,400	1	2	1	2		3	0
123	42,900	251,500	2	2	1	2		3	0
124	50,700	1,068,100	6	3				1	1
125	32,400	257,900	10	4	1	1			0
126	65,400	568,400	4	5	1				0
127	300	16,000		1					0
128	50,100	335,200	7	4	2	2		1	0
129	13,300	56,900	2	3					0
130	12,200	1,600	4						1
131	30,900	254,900	9	10	2				0
132	42,000	189,000	12	12	1	1	2		0
133	116,100	185,700	16	7	1		1	1	0
134	287,500	580,000	2	4	1				0
135	5,000	30,200	1	2					0
136	54,000	817,100	9	13	9	4	2		0
137	36,300	401,800	4	2	3		2		0
138	19,600	666,700	5	5	3		1		0
139	8,700	542,300	4	6	3				0
140	16,400	159,300	5	9					0
141	0	0							0
142	0	0							0
143	40,100	16,800		1	1				0
	7,100	30,400	0	3	2	1			0

Table 11: Physical Erosion Losses Oswego County, New York 1972-1974

Reporting Unit (IJC Mileage)	Physical Losses		Number of Residences Located Within Feet of Edge of Bluff						Number of Residences Destroyed
	Amount of Beach Area Lost (000 sq.ft.)	Amount of Bluff Volume Lost (000 cu.ft.)	0-25	26-50	51-75	76-100	101-150	151+	
144	39,000	71,700	6	5	1	1			0
145	40,400	36,100	2	2	4	1	1		0
146	15,200	154,800	1	2	2	1			0
147	2,500	5,200	1	1	1				0
148	0	0							0
149	0	0							0
150	0	18,000							0
151	1,600	243,200	2	3	1				0
152	500	922,200	1				1	1	0
153	6,700	1,104,300	1	3			1	1	0
154	44,100	280,900	1	1			1		0
Misc*	5,000	17,900	1	2	1		1	1	0
Total	1,785,200	15,485,200	123	123	46	18	13	14	2

*Sixteen respondents who did not locate property on the map provided.

Source: Developed from returned mail questionnaires.

Reach 3 bluffs average 11.0 feet in height (based on 189 measurement) and are eroding at an average long term rate of 1.21 feet per year. Erosion of the shoreline, 43,665 feet in length, annually produces 1,213,000 cubic feet of sediments.

The bluffs of Reach 4 have an average height of 14.4 feet (based on 286 measurements) and are eroding at an average long term rate of 0.83 feet per year. Erosion of the shoreline, 82,415 feet in length, annually produces 1,806,000 cubic feet of sediments.

Thus, assuming that the long term erosion rates determined are representative of conditions within each reach, the county is losing, on the average, about 7,341,000 cubic feet of sediment each year. Short term losses determined through survey of the riparian property owners in Oswego County indicate that 15.5 million cubic yards were lost through bluff erosion between 1972 and 1974. These two figures are not comparable in that responses were not received from all of the riparian owners.

Non-residential losses due to erosion were inflicted primarily on grounds and improvements, 72 percent, and structures and contents, 19 percent. The majority of the damage occurred on commercial/industrial properties (See Table 12).

Residential erosion damages was distributed between grounds and improvements, 40 percent and other damages, costs of protective structures and other costs of protection, with each of these three categories accounting for just under 20 percent of the total erosion damage (See Table 13).

Other costs under costs of protection include those reported costs that were not felt to be related to protection. Many of these resulted from improper filling out of the questionnaire. Examples of these reported costs are: repair of boat house and ramp; replacement of concrete patio; placement of fill on eroded beach area and other such activities that are not related to the provision of protection.

Table 14 reflects the distribution of damages by mile. It reflects that certain areas are more prone to damage--both erosion and flooding--than others.

TABLE 12: SUMMARY OF NONRESIDENTIAL PROPERTY EROSION DAMAGES OSWEGO COUNTY NEW YORK 1972-1974^a

Reporting Unit and Lakeshore Activity	Total Costs (\$000)	Flood Damage by Source				Costs of Protection			Financial Losses	
		Structure and Contents (\$000)	Grounds and Improvements (\$000)	Clean Up (\$000)	Other Damages (\$000)	Costs of Relocation (\$000)	Protective Structures (\$000)	Emergency Evacuation (\$000)	Other Costs (\$000)	Net Loss of Business Income (\$000)
Oswego County										
Commercial/Industrial	555.0	117.2	370.9	0	0	10.0	16.2	5.0	1.0	34.9
Transportation	0									
Utilities	0									
Agriculture	0									
Other	902.6	166.0	677.9	48.7	0	0	10.0	0	0	0
Reach 01										
Commercial/Industrial	99.6	34.1	55.6	0	0	0	0	0	0	9.9
Transportation	0									
Utilities	0									
Agriculture	0									
Other	0									
Reach 02										
Commercial/Industrial	229.2	2.9	185.3	0	0	10.0	0	5.0	1.0	25.0
Transportation	0									
Utilities	0									
Agriculture	0									
Other	360.0	0	350.0	0	0	0	10.0	0	0	0
Reach 03										
Commercial/Industrial	91.2	2.8	77.2	0	0	0	11.2	0	0	0
Transportation	0									
Utilities	0									
Agriculture	0									
Other	250.0	0	250.0	0	0	0	0	0	0	0
Reach 04										
Commercial/Industrial	135.2	77.3	52.9	0	0	0	5.0	0	0	0
Transportation	0									
Utilities	0									
Agriculture	0									
Other	292.6	166.0	77.9	48.7	0	0	0	0	0	0

^aDamages are reported damages.

Source: Personal interviews conducted by Dr. Richard Cutler, August 1975.

TABLE 13: TOTAL EROSION DAMAGES OSWEGO COUNTY NEW YORK 1972-1974^a

Reporting Unit and Lakeshore Activity	Total Costs (\$000)	Flood Damage by Source				Costs of Protection			Financial Losses		
		Structure and Contents (\$000)	Grounds and Improvements (\$000)	Clean Up (\$000)	Other Damages (\$000)	Costs of Relocation (\$000)	Costs of Protective Structures (\$000)	Emergency Evacuation (\$000)	Other Costs (\$000)	Rental Income (\$000)	Net Loss of (\$000)
Oswego County Residential Properties	1,939.3	68.2	757.4	b	319.7	0	391.5	0	399.6	2.9	
Nonresidential Properties	1,457.6	283.4	1,048.8	48.7	0	10.0	26.2	5.0	1.0	34.9	
Reach 01 Residential Properties	57.7	.5	15.5	b	8.1	0	11.0	0	22.5	0	
Nonresidential Properties	99.6	34.1	55.6	0	0	0	0	0	0	9.9	
Reach 02 Residential Properties	649.2	23.4	232.2	b	198.0	0	84.8	0	109.9	.8	
Nonresidential Properties	589.2	2.9	350.0	0	0	10.0	10.0	5.0	1.0	25.0	
Reach 03 Residential Properties	744.6	21.2	315.4	b	84.0	0	216.8	0	105.1	2.1	
Nonresidential Properties	526.5	2.8	327.2	0	0	0	11.2	0	0	0	
Reach 04 Residential Properties	487.8	23.0	194.3	b	29.6	0	78.9	0	162.0	0	
Nonresidential Properties	755.0	939.0	130.3	48.7	0	0	5.0	0	0	0	

^aDamages are reported damages.^bClean up and damage to protective structures included in "Other Damages."

Source: Personal interviews conducted by Dr. Richard Cutler, August 1975 and returned mail questionnaires.

Table 14. Flood and Erosion Damages - Oswego County^a

<u>Mile</u>	<u>Flood Damage (\$)</u>	<u>Erosion Damage (\$)</u>
121	3,250	600
122	1,100	100
123	29,225	17,200
124	550	1,708
125	1,300	650
126	0	300
127	5,000	3,000
128	100	500
129	18,200	12,800
130	30,700	1,800
131	10,400	3,750
132	9,900	14,775
133	1,200	4,800
134	225	5,000
135	7,450	18,950
136	275	6,000
137	1,900	10,345
138	3,300	250
139	6,900	21,700
140	0	0
141	0	0
142	250	950
143	500	0
144	17,953	12,460
145	17,750	10,300
146	6,250	550
147	0	0
148	0	0
149	0	0
150	0	0
151	650	1,100
152	0	0
153	200	1,575
154	1,150	0
North Pond	450	92

^aDamages are reported damages.

Source: Data reported on returned mail questionnaires.

3.3 Extent and Character of Area Protected or Not Subject to Erosion and Flooding Damage

Areas in their natural state that are not subject to significant erosion are confined to portions of Reaches 3 and 4. The land forms considered as such are low erodible bluffs and high erodible bluffs over bedrock of significant height. Significant height generally refers to heights that exceed 6 feet but rarely it can go as low as 3.5 feet above water level. This height is felt to be adequate to provide protection for the erodible material forming the bluff.

The extent of these land forms is summarized below:

	Reach 3		Reach 4	
	%	miles	%	miles
LBE/BR-B	--	--	5.2	.31
LBE/BR-NB	--	--	1.9	.12
HBE/BR-B	2.5	.09	1.5	.09
HBE/BR-NB	3.8	.14	.7	.04

Areas not subject to erosion due to action taken by man are those areas for which a protective structure has been constructed and which were classified as having no design deficiencies (Design Deficiencies, Category A, Analysis of Shore Protection Methods form - see Attachment II). These areas are indicated on the overlay showing shore protective structures by an asterick following the shore protection structure map number reference.

Of the 469 protective structures in Oswego County, there are 155 or 33 percent that are classified as A, having no design deficiencies. By reach this number is broken down as follows:

Reach	No. of Protective Structures	No. of Cat. A	% of Total
1	163	37	23
2	99	38	38
3	118	32	27
4	89	48	54
Oswego County	469	155	33

The areas described in Section 3.1 are the areas in their natural state that are subject to flooding in Oswego County. Man-made protective structures have not been constructed to prevent flooding, only erosion. Thus there has been little, if any, modification to the flood prone areas by man's activities.

Extent and Character of Protected Areas:

The areas protected from erosion are those areas which have adequate defensive structures, as well as those areas classed as Low Erodible Bluff over Bedrock or High Erodible Bluff over Bedrock. The Erodible Bluff over Bedrock shore-forms were defined in such a way as to include only areas which are generally immune to erosion. The areas subject to flooding are those areas classed as Low Plain Erodible. All such areas are shown on the accompanying overlays.

4.0 Recreational and Environmental Losses

Assessment of the impact of the high water levels on the natural environment of Oswego County had to be acquired primarily through field observation since no published sources could be located that report such data. Negative impacts are observed in the form of bluff, sand dune and general beach erosion at rates that appear to be in excess of the historic rate. River mouths clogged with sediment deposits are another example of the impact. Destruction of vegetation, including mature trees, indicates the severity of the erosion.

These actions have been attributed to the high water levels since erosion at rates greater than normal have occurred. This in turn has provided the supply of sediments that were deposited across the mouths of the Salmon River and Little Salmon River. The undercutting and uprooting of mature trees indicates that the water action was occurring in places not normally subjected to this type of action.

Figure 3 depicts the changing sand spit configuration of North Sandy Pond, Oswego County, New York, for the period 1965 to 1973. Figure 4 shows an aerial view of the beach in June 1974. As can be seen, the high levels in the past few years have accelerated the rate of erosion of this sand spit. Changes have occurred in its shape and a new channel has been formed, to the north of the old one. In addition other openings have developed during storm periods (See Attachment IV).

No estimate of the impact of this destruction on the natural environment of the area has been made to date by federal, state or local governments.

On the positive side, the high water may have helped water quality in many locations, as well as increasing the productivity of adjacent wetlands by providing improved conditions for nesting and spawning during critical periods. It may also have allowed the postponement of dredging operations in some harbors and rivers. This impact in terms of dollars has not yet been determined. The value of recreational losses will be estimated in future county studies of the Great Lakes Shoreland Damage Study beginning in fiscal year 1976.

In summary, evaluation of the impact of the high water levels on the natural environment of Oswego County has been given limited consideration. Effects on fish

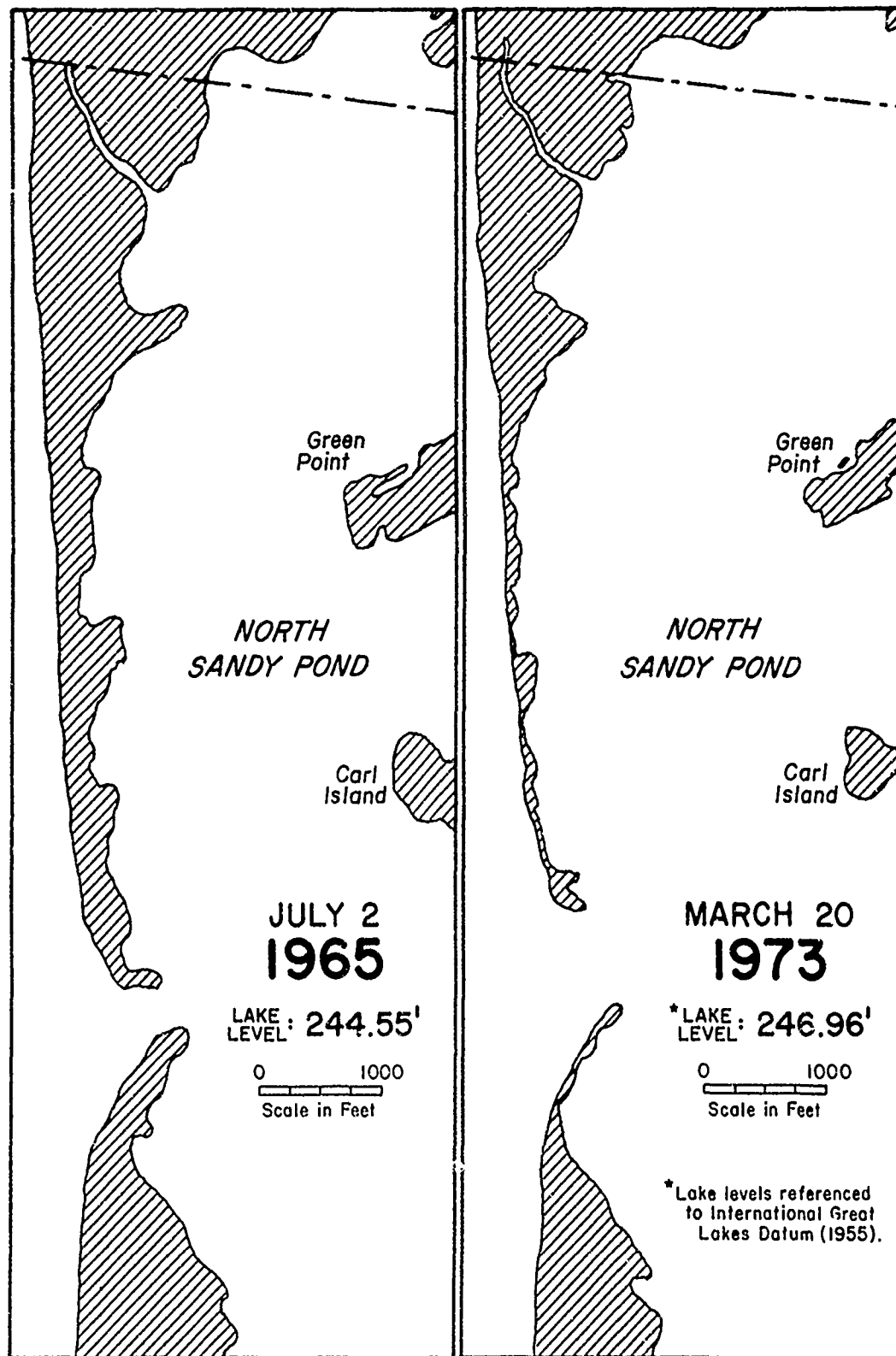


FIGURE 3. North Sandy Pond Beach Configuration: 1965 and 1973

spawning beds, wetlands, littoral drift rates, etc., have been left unstudied.



Figure 4. North Sandy Pond Beach Configuration:
June 1974

4.1 Beach Recreation

Since the majority, 97 percent, of the shoreline is in private ownership and used by seasonal residents, it is difficult to derive reliable figures on the loss of beach recreation opportunities resulting from the high water. Most people interviewed indicated that use of their beach was curtailed somewhat. Loss of either structures, such as docks, or loss of the beach itself were the most common reasons given for such curtailment. The private beach area reported lost amounted to 1.8 million square feet. Estimates of public beach lost at Selkirk Shores State Park could not be provided by park officials.

Specific data on use of commercial beach areas was not available since the owners did not keep records on attendance. In general, operators felt that their business had suffered decreases in visitor days due to the high water levels and the damage inflicted by the same. Attendance records for the only state park, Selkirk Shores, shown below reflect that attendance actually increased in fiscal year 1973-74, the year following the major storm of March 1973.

Selkirk Shores State Park

<u>Fiscal Year</u> (April 1 - March 31)	<u>Attendance</u>
1972-73	145,110
1973-74	166,158
1974-75	163,852
1975-76 (April 1 - Sept. 30)	133,381

The attendance at Selkirk Shores fluctuated considerably over the reported period. The long term trend of increasing attendance was interrupted in fiscal year 1974-75. This was possibly due to the combined affect of the energy crisis and the state of the national economy. The trend reflected in attendance is typical for the majority of state parks bordering Lake Ontario.

Recreational Boating

Again, because many of the seasonal residents have their own private facilities for boat launching, it was not possible to obtain complete data on boat days lost for this sector. It was the general feeling that there were significant amounts of user days lost, primarily by those who lost their boat launch facilities as a result of the high water.

Estimates of net business losses are shown on Tables 8 and 12. In Reaches 1, 2 and 3, the non-residential properties are primarily marinas and hotels. The figures reflected as net business losses are therefore close approximations of the impact on the recreation related industry due to the high water. This is not true for Reach 4 where non-recreation oriented land uses prevail.

The public boat launch facilities in Oswego County do not keep records of the number of boats using the facilities and therefore comparison of pre-1972 and 1972-

1974 period usage was not possible. It should be noted that the public boat launch facility at Mexico Point was rendered useless. A sand bar developed across the mouth of the Little Salmon River due to deposition of eroded material. This effectively prevented access to Lake Ontario. Other public facilities were not negatively impacted by the high water.

High water levels had a positive effect on some private facilities by reducing weed growth and by maintaining increased water depth during that portion of the recreation season when the lake is normally declining. The extent of this could not be determined.

4.2 Environmental Areas

As stated above, detailed studies have not been undertaken to determine the impact of the high water on marshes and wetlands. New York State Department of Environmental Conservation officials have stated that there could have been positive effects resulting from the high water in terms of spawning areas and waterfowl nesting areas. However, this has not been verified to date.

Significant damage to dune areas has occurred as is indicated on Figure 4. The loss of these dunes has a negative impact on the marsh and wetland inland which are normally shielded from storms by the dunes. The North Pond area has undergone dramatic change as have other dunal areas to the north. These changes are in the form of erosion and deposition of erodible material; changes in channel locations; increase in exposure to storm wave attack and destabilization of formerly stabilized sand dunes.

Shoreline blight of a temporary nature occurred throughout the entire period of high water. This consisted primarily of uprooted vegetation and other storm derived debris. More permanent blight has been created by man's efforts to prevent additional damage (See Attachment V). This is in terms of shore protection devices that have negative aesthetic impact.

Analysis of the shore protective devices currently in place indicated that about 10 percent of the Oswego County shoreline had been reduced in its usefulness. This was due primarily to covering of beaches with riprap and by limiting access to the lake through the construction of protective devices.

In summary, although not quantifiable, it is felt that the impact on the environmental areas of the shoreline was negative. This evaluation results from the fact that increases in spawning and nesting areas are the primary benefit of high water levels. However, such increases are most likely small increments to the existing spawning and nesting areas. On the other hand, the losses of sand beaches and dunes and the increased siltation caused by increased rates of erosion are felt to outweigh the positive effect. This is due to the limited extent of the former and the impact the sedimentation caused by the latter has on spawning beds within the lake. Again, it should be pointed out that this evaluation has not been substantiated at this point in time.

5.0 Conclusions

This study revealed that the shoreline of Oswego County, New York, is primarily in private ownership. The predominant use was found to be for seasonal residences and agricultural, forest and undeveloped. Commercial and industrial uses are concentrated in and around the City of Oswego. Land values are generally low due to the predominance of seasonal residences and undeveloped land.

The entire shoreline has been impacted by flooding and erosion. The magnitude depended primarily on land form and land use. Extensive action by man, reflected by the number of expedient shore protective works, has been undertaken to reduce these impacts. In doing so, a large portion of the shoreline has been modified. This modification is in terms of its surface characteristics, ease of access, ability to support wildlife and aquatic life and its aesthetics.

Damages occurred over the entire shoreline. The majority were sustained by seasonal residences and commercial and industrial users. The most severe damages were to grounds and improvements for seasonal residences and net business losses for commercial and industrial uses.

The findings of this study reflect that information on damage to structures and physical property is available. Information on the impact on the natural environment of erosion and flooding accompanying high lake levels is not available. Research in this area is required in order to ensure that this aspect of our total environment is given due consideration. In Oswego County this is important because in Reaches 1, 2 and 3, the economy is based on recreation and tourism. A question worthy of consideration is whether or not the protective devices that are so prolific on the Oswego shoreline have in total impacted the natural environment in a beneficial or negative manner?

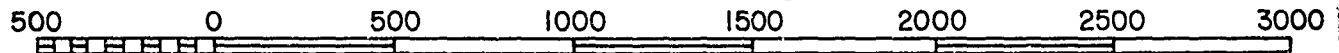
LAND USE

PR	Permanent Residential	WH	Wildlife Habitat
SR	Seasonal Residential	C&I	Commercial and Industrial
R	Recreational	A,F,U	Agriculture, Forest, and Undeveloped

OWNERSHIP

FEDERAL STATE MUNICIPAL PRIVATE

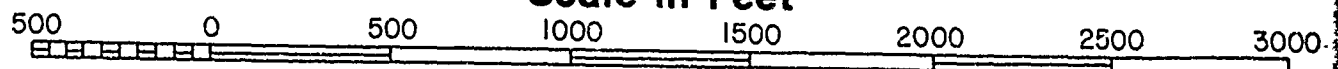
Scale in Feet



SHORE FORMS

LD-B	Low Dune with beach	LBE-BR/B	Low Bluff Erodible over bedrock with beach
LD-NB	Low Dune without beach	LBE-BR/NB	Low Bluff Erodible over bedrock without beach
HD-B	High Dune with beach	HBE-B	High Bluff Erodible with beach
HD-NB	High Dune without beach	HBE-NB	High Bluff Erodible without beach
PE-B	Low Plain Erodible with beach	HBE-BR/B	High Bluff Erodible over bedrock with beach
PE-NB	Low Plain Erodible without beach	HBE-BR/NB	High Bluff Erodible over bedrock without beach
LBE-B	Low Bluff Erodible with beach		
LBE-NB	Low Bluff Erodible without beach		

Scale in Feet



2

SHORELINE DAMAGE

STRUCTURAL DAMAGE

Mile...
Mile 159-160 \$500; \$500
Mile...

MILEAGE
REFERENCED TO
IJC COORDINATED
MARKERS

STRUCTURAL
DAMAGE DUE
TO EROSION ;
IN DOLLARS

STRUCTURAL
DAMAGE DUE
TO FLOODING
IN DOLLARS

Industrial
, and Undeveloped

PRIVATE

PERSONAL INTERVIEWS

SHORELINE INTERVIEWS

Mile...
Mile 159-160 5
Mile...

MILEAGE
REFERENCED TO
IJC COORDINATED
MARKERS

PERSONAL
INTERVIEWS
ADMINISTERED
BY MILE

SHORELINE VALUE

SHORELINE VALUE

Reach 5 \$15.51

SHORELINE
SECTION

AVERAGE VALUE
PER LINEAR FOOT

In addition, values are given for certain shoreline sections within each reach. These values are recorded inshore of each selected section.

2500 3000

EROSION

With the exception of those areas underlain by bedrock, Oswego County shoreline is vulnerable to wave action. Shore form types LBE-BR/B, LBE-BR/NB, HBE-BR/B and HBE-BR/NB have a bedrock base of sufficient height and composition to effectively inhibit erosion by wave action.

PROTECTIVE WORKS

Seawall, Bulkhead Breakwater Other
Groin, Jetty Revetment

89 Lake Ontario Site } Numbers correspond with those of Table 2.
N89 North Pond Site }

+ Work which provides adequate protection against erosion by wave action.

FLOODING

Areas inland of shore form types PE-B and PE-NB are subject to possible flooding.

2500 3000

DAMAGE

STRUCTURAL
DAMAGE DUE
TO EROSION
IN DOLLARS

STRUCTURAL
DAMAGE DUE
TO FLOODING
IN DOLLARS

REVIEWS

PERSONAL
INTERVIEWS
ADMINISTERED
BY MILE

VALUE

AVERAGE VALUE
PER LINEAR FOOT

Sections within each reach. These

rock, Oswego County shoreline
R/B, LBE-BR/NB, HBE-BR/B
height and composition to

WORKS

water
ment



Other

h those of Table 2.

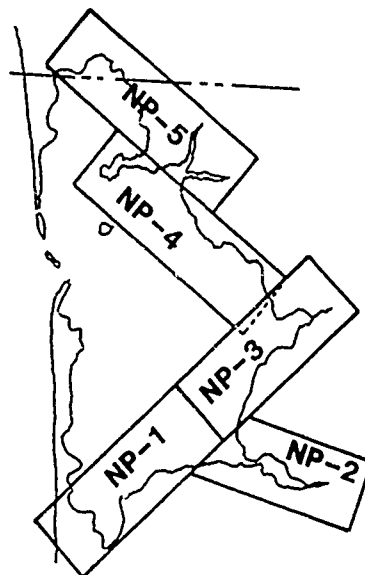
against erosion by wave action.

are subject to possible flooding.

MISCELLANEOUS

► IJC Coordinated Mileage Marker

North Pond
Coverage

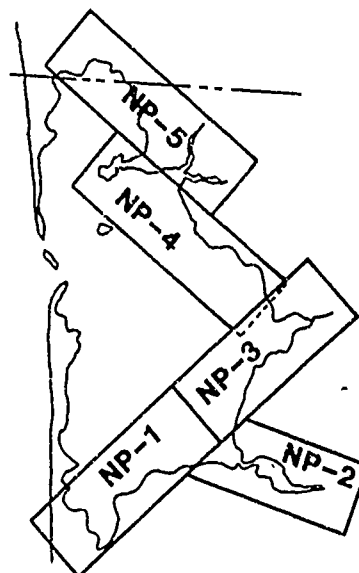


MISCELLANEOUS

► IJC Coordinated Mileage Marker

► Location of shoreline profile

North Pond
Coverage



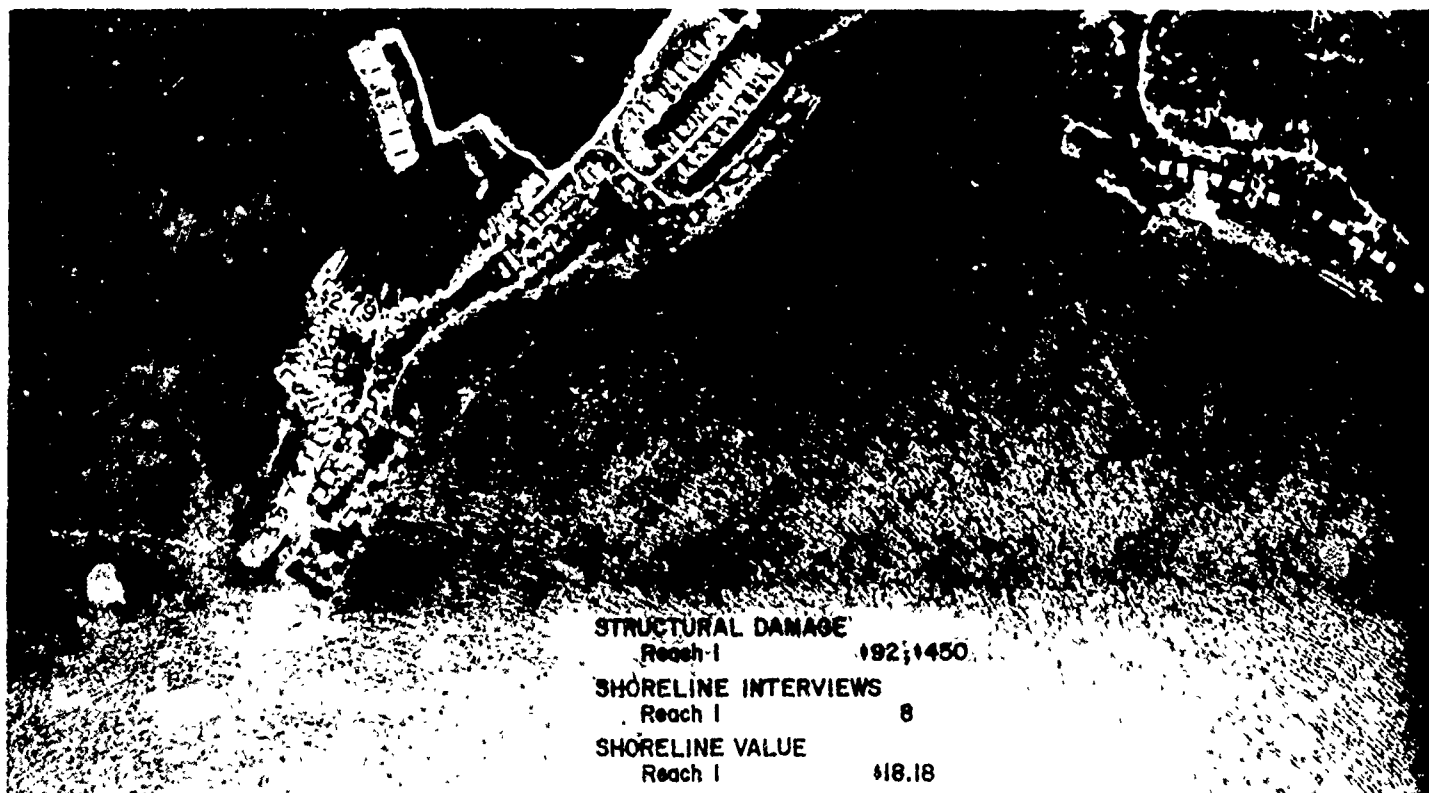
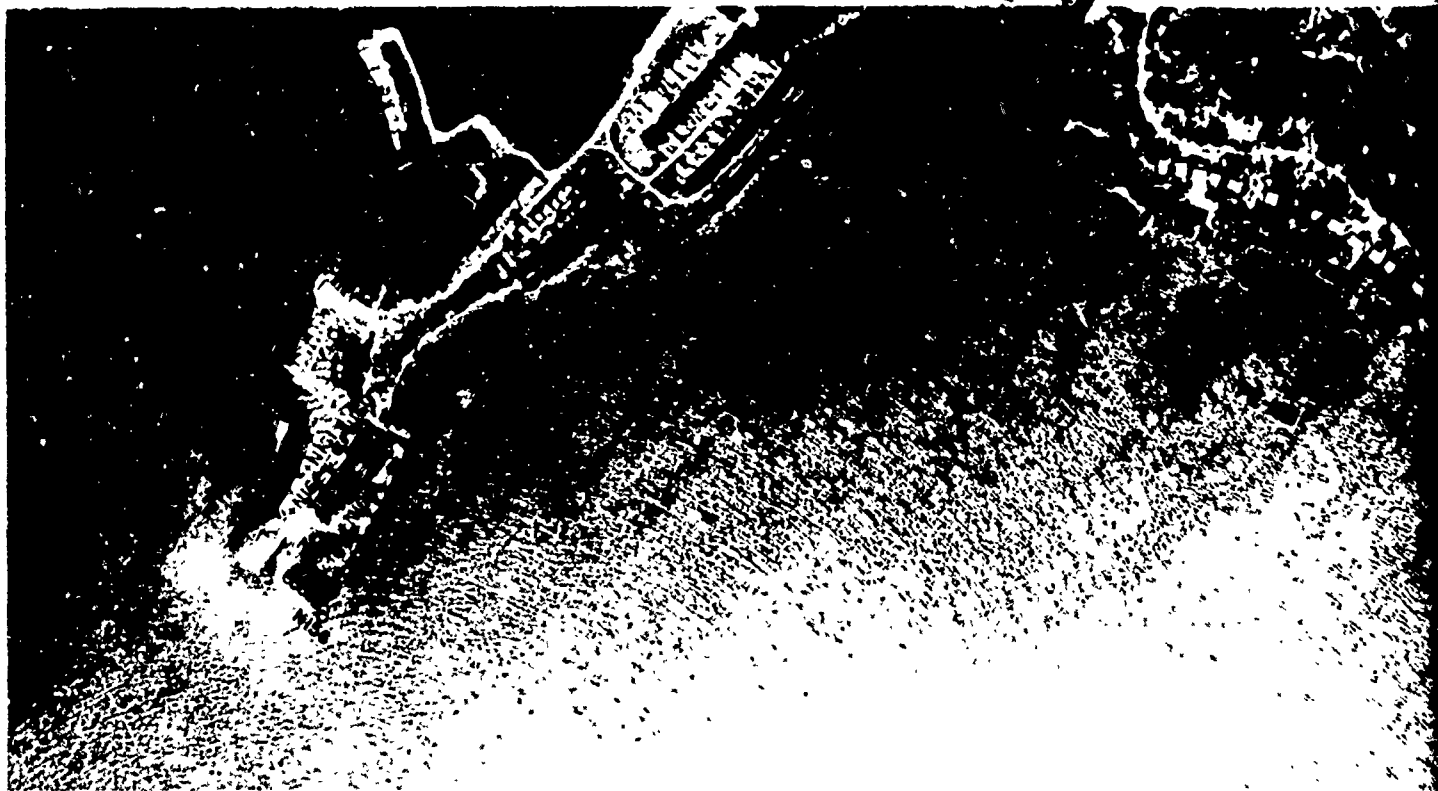


NOTE: All shoreline properties are in PRIVATE ownership.

2 1

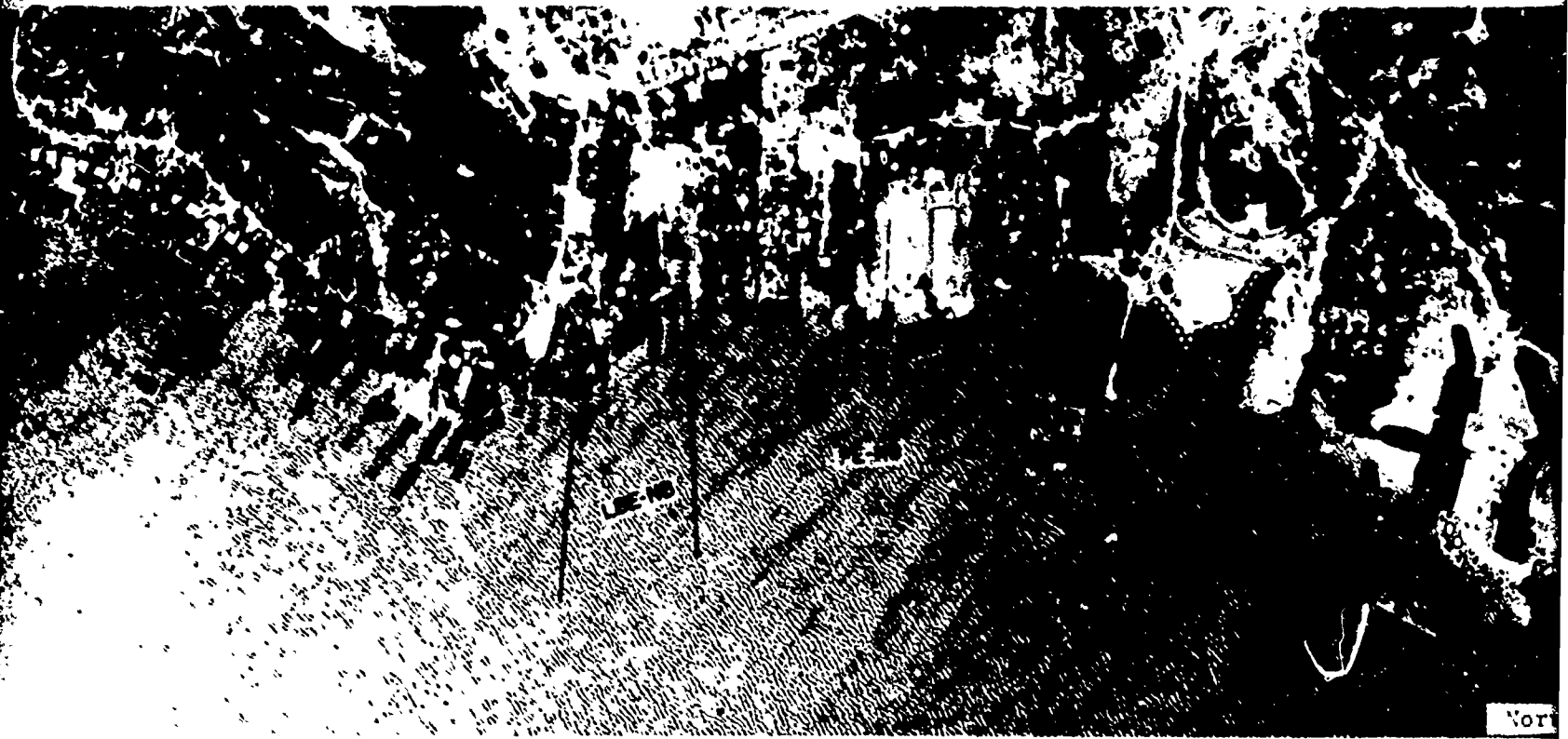




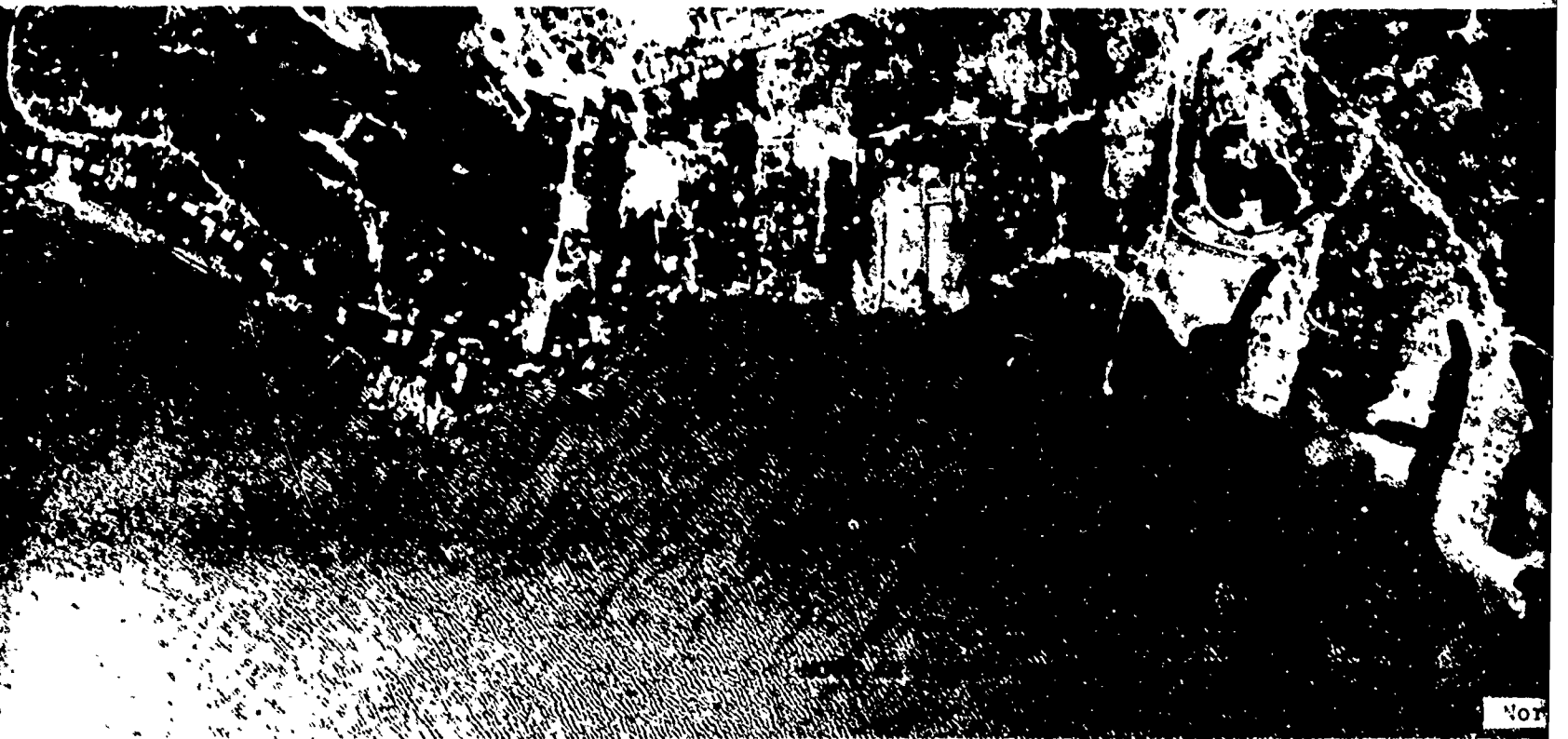


STRUCTURAL DAMAGE
Reach 1 192,1450
SHORELINE INTERVIEWS
Reach 1 8
SHORELINE VALUE
Reach 1 118.18

2



Vor



Vor

3



North Pond - 4

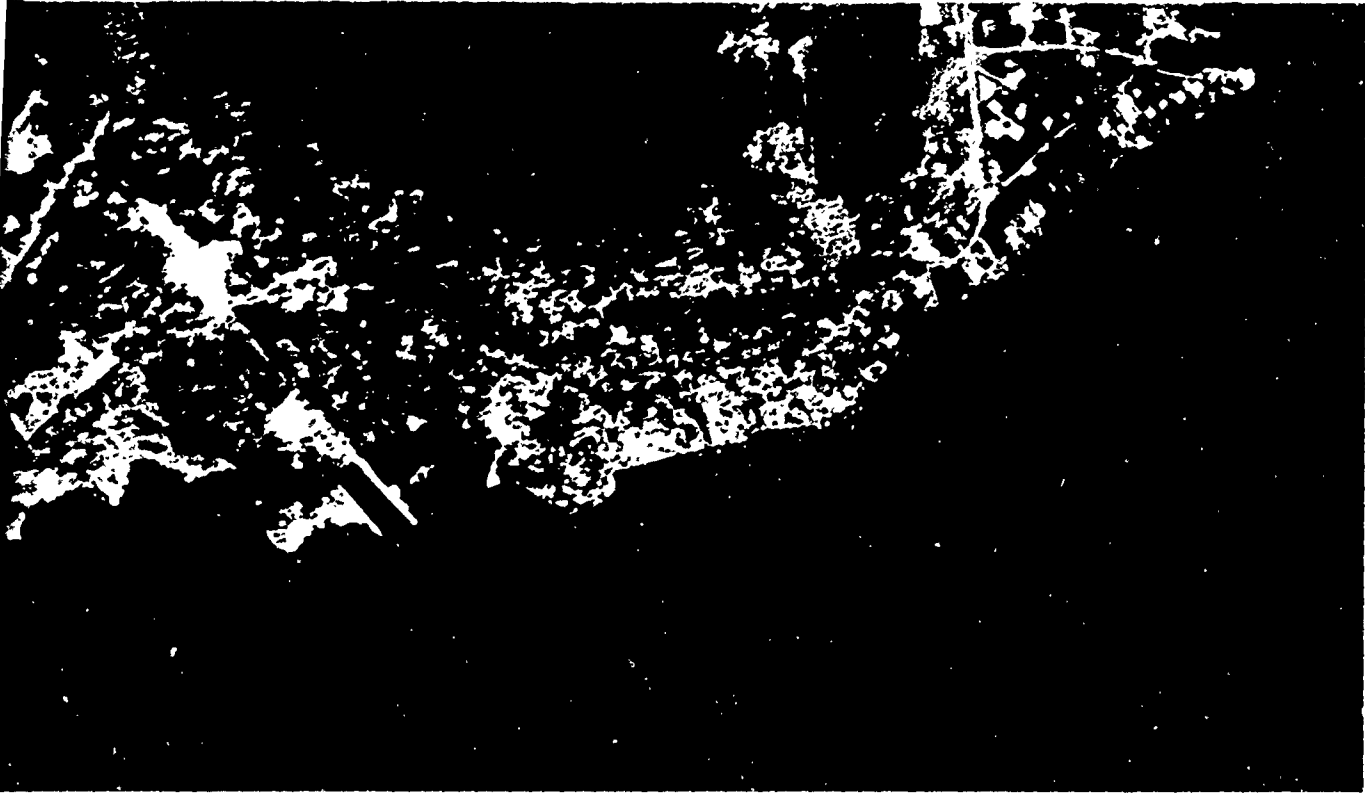


North Pond - 4

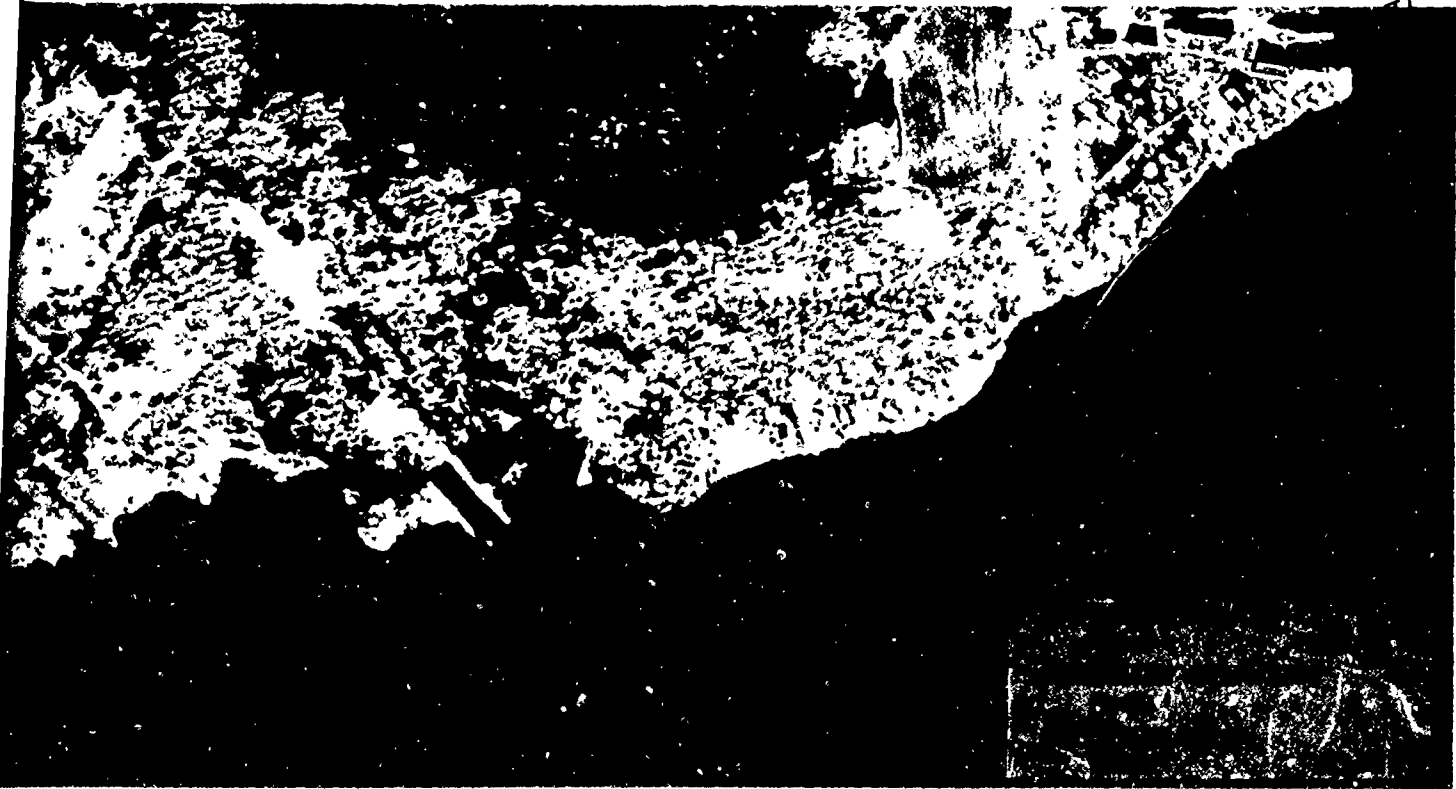


2

1



U.F.U

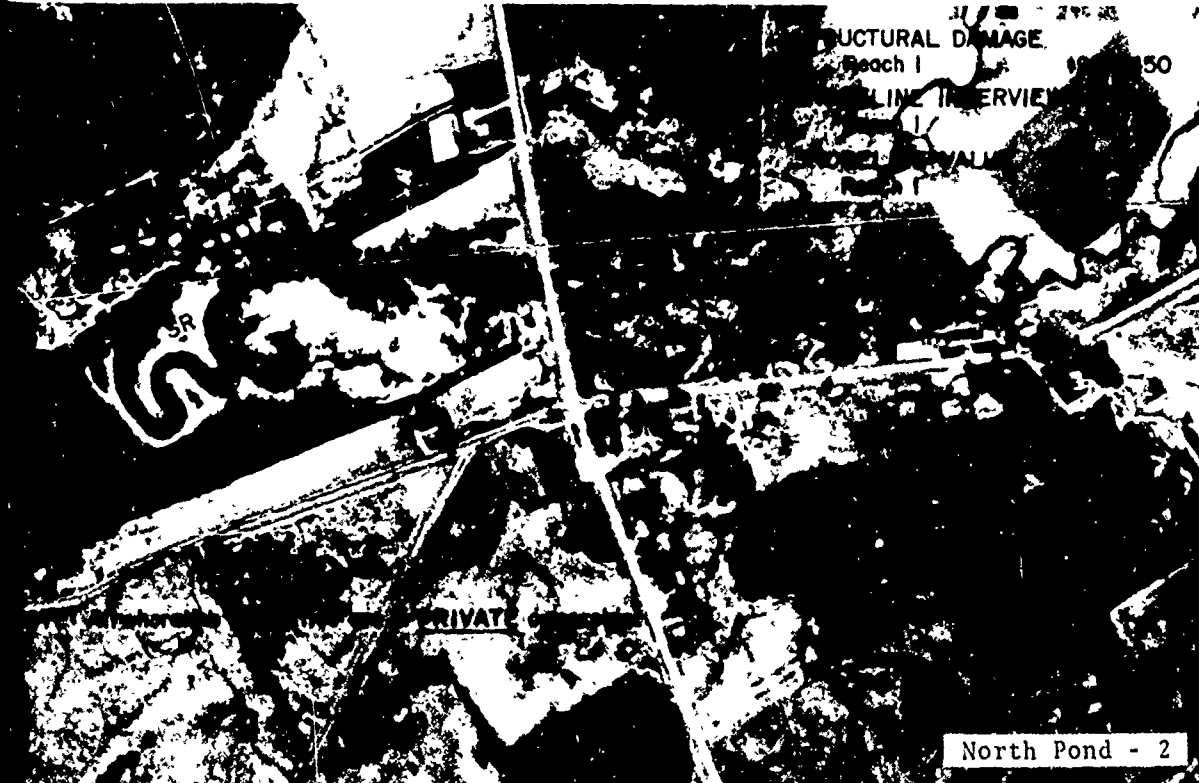




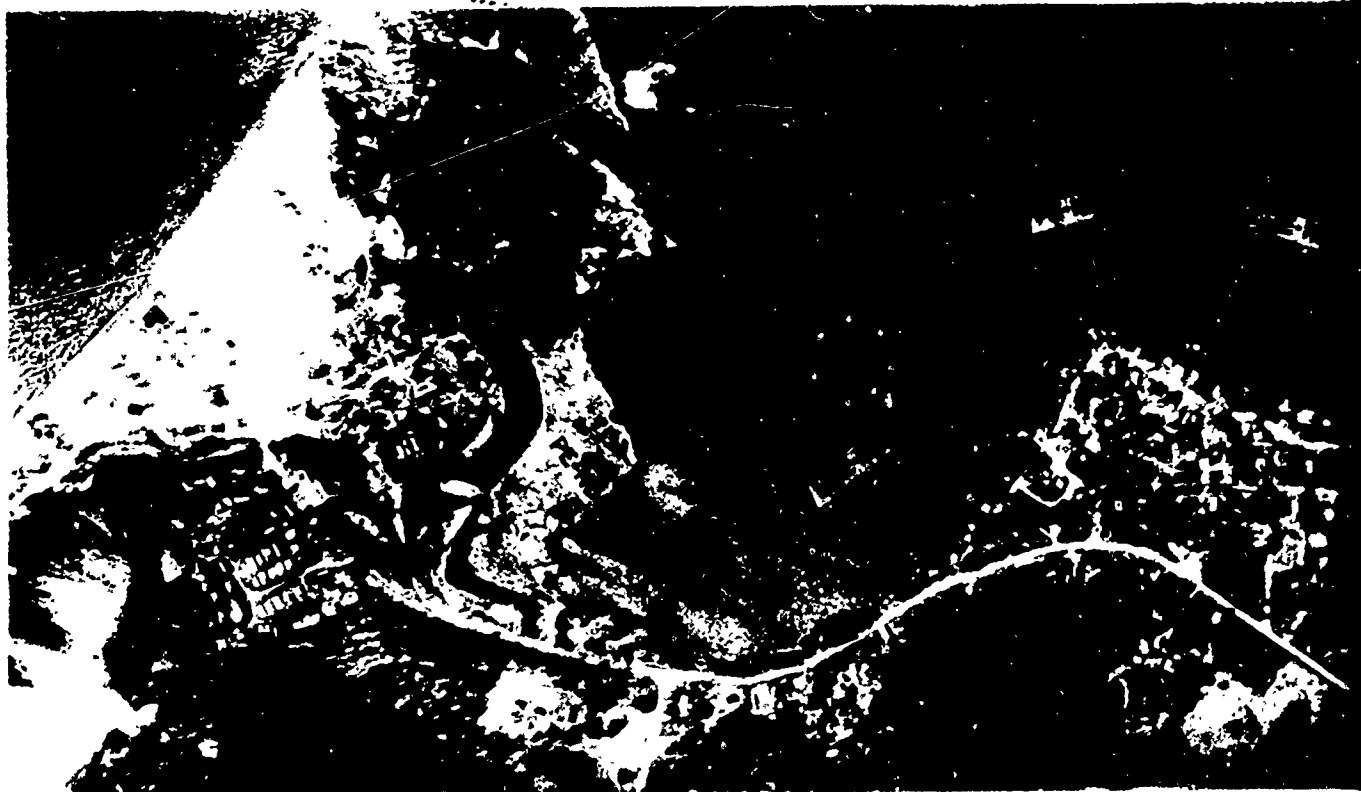
2

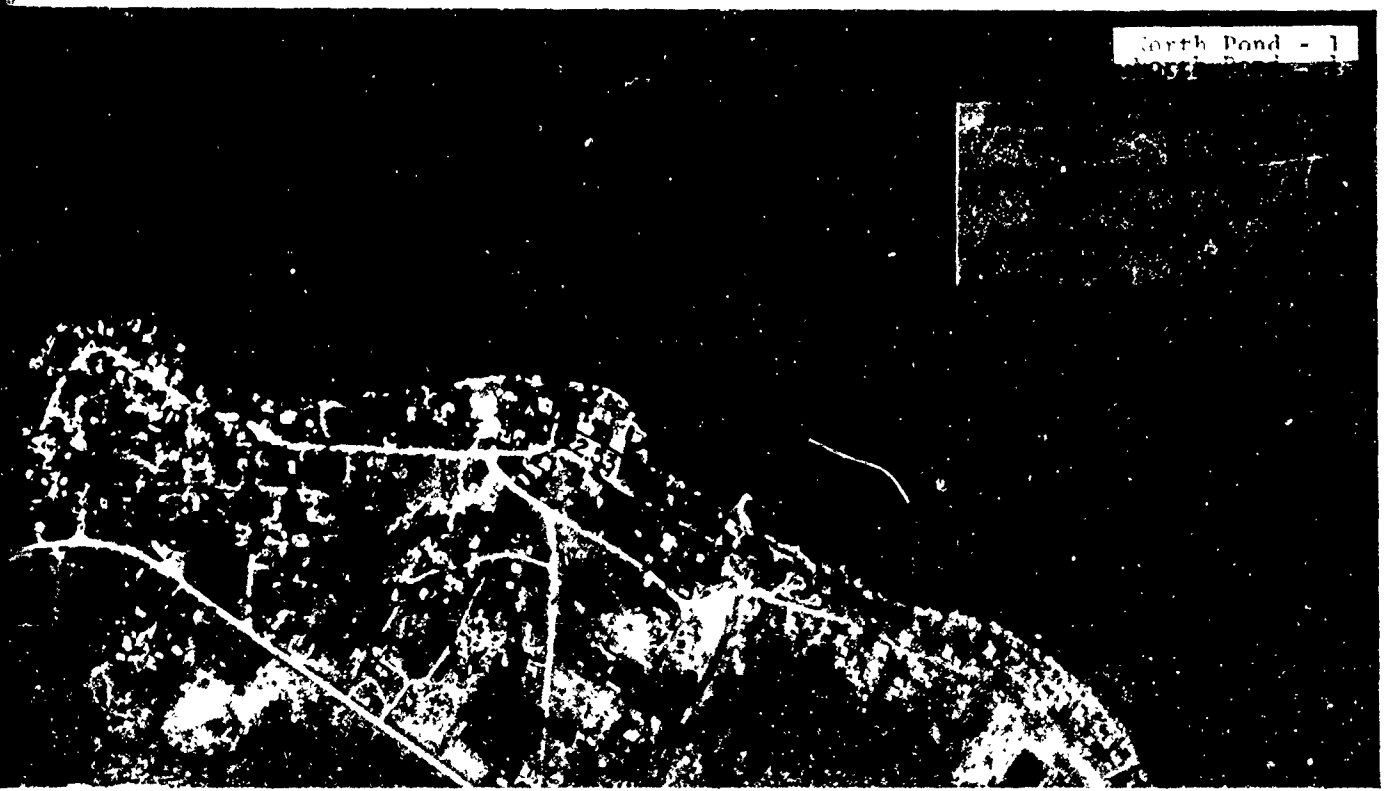
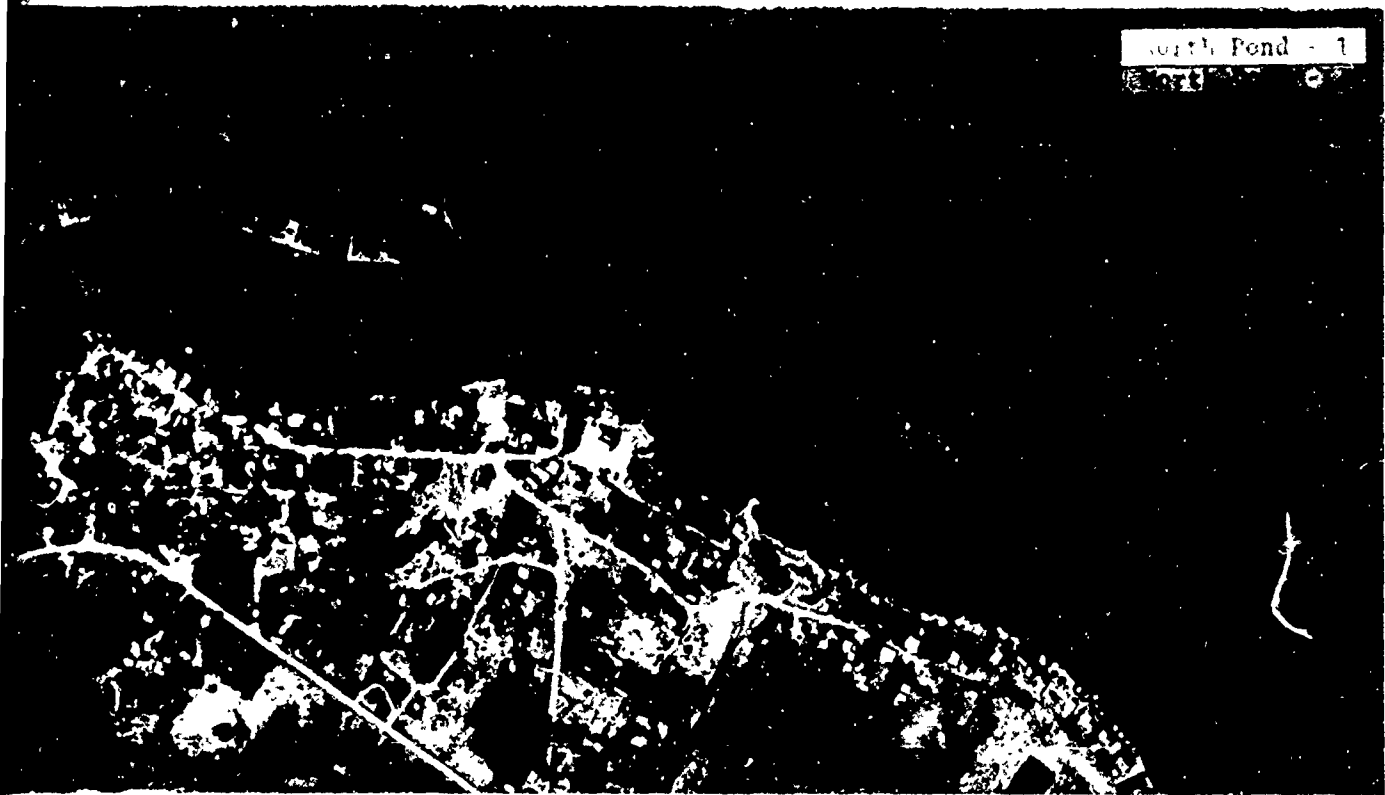


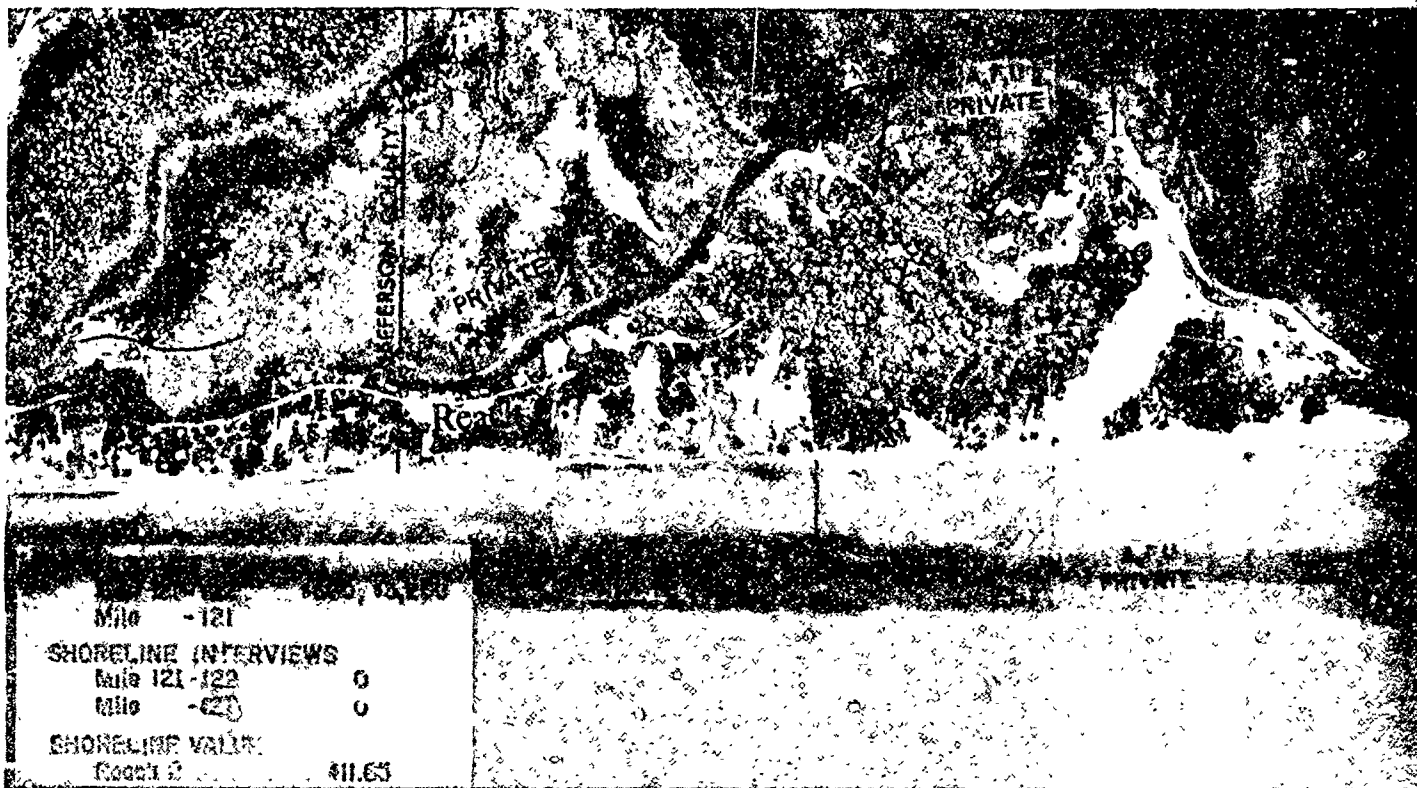
North Pond - 2

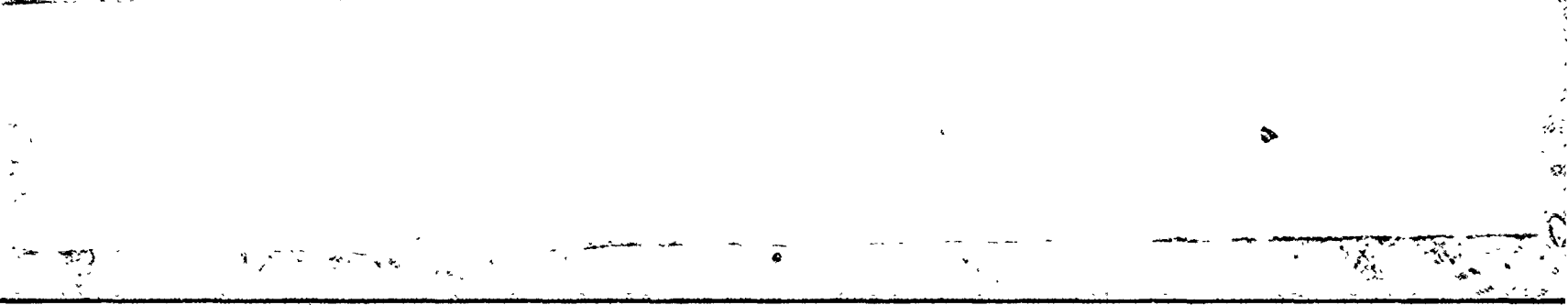
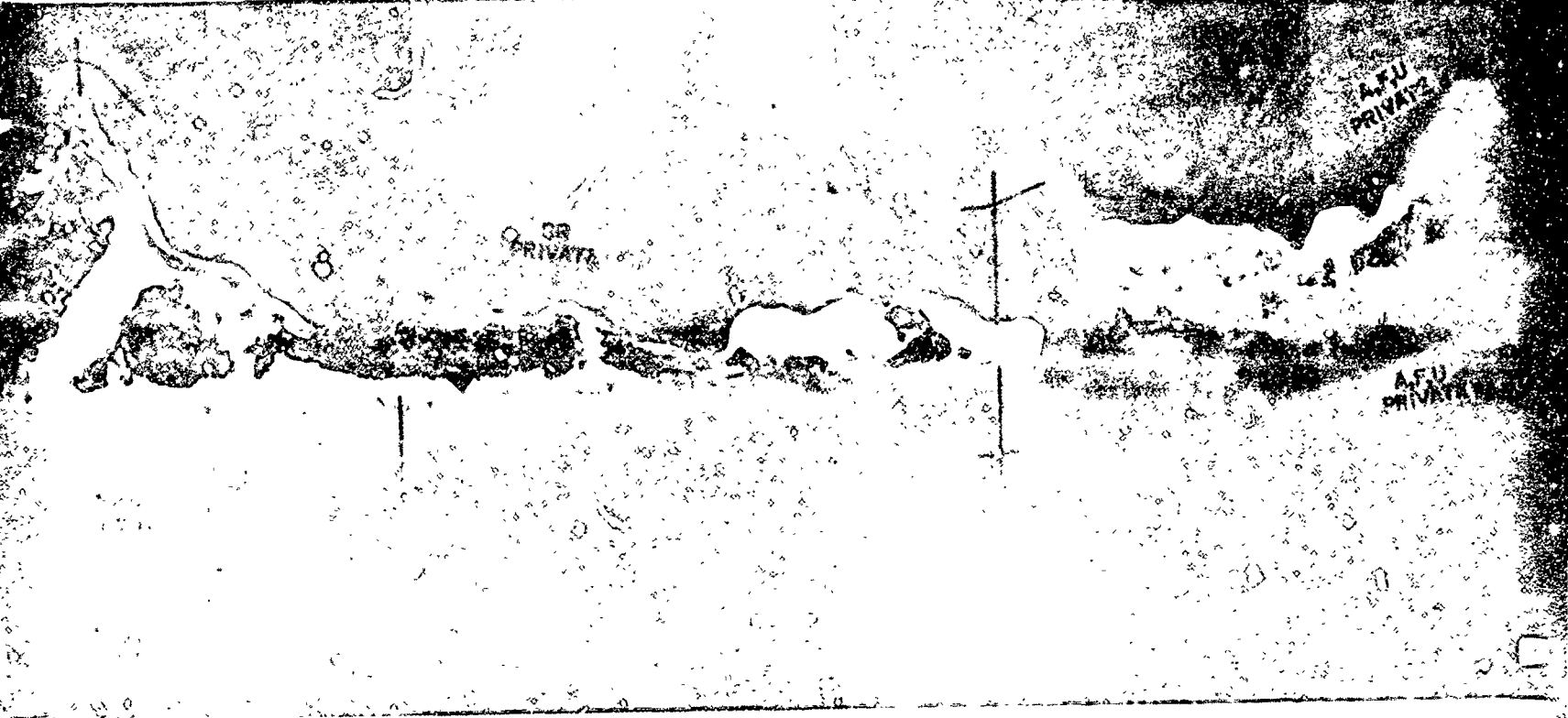
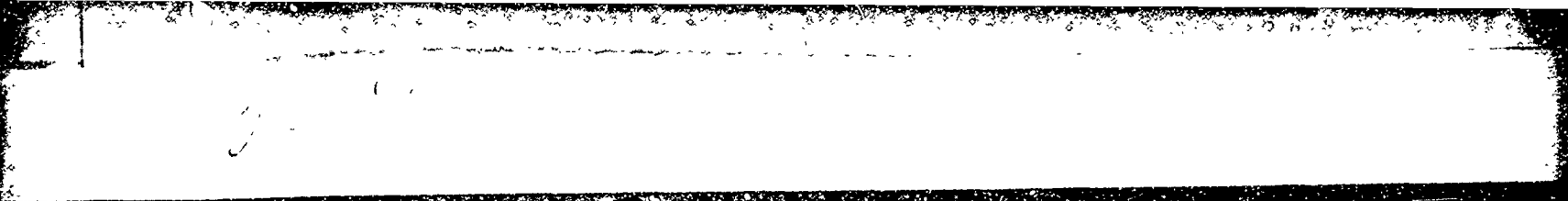


North Pond - 2







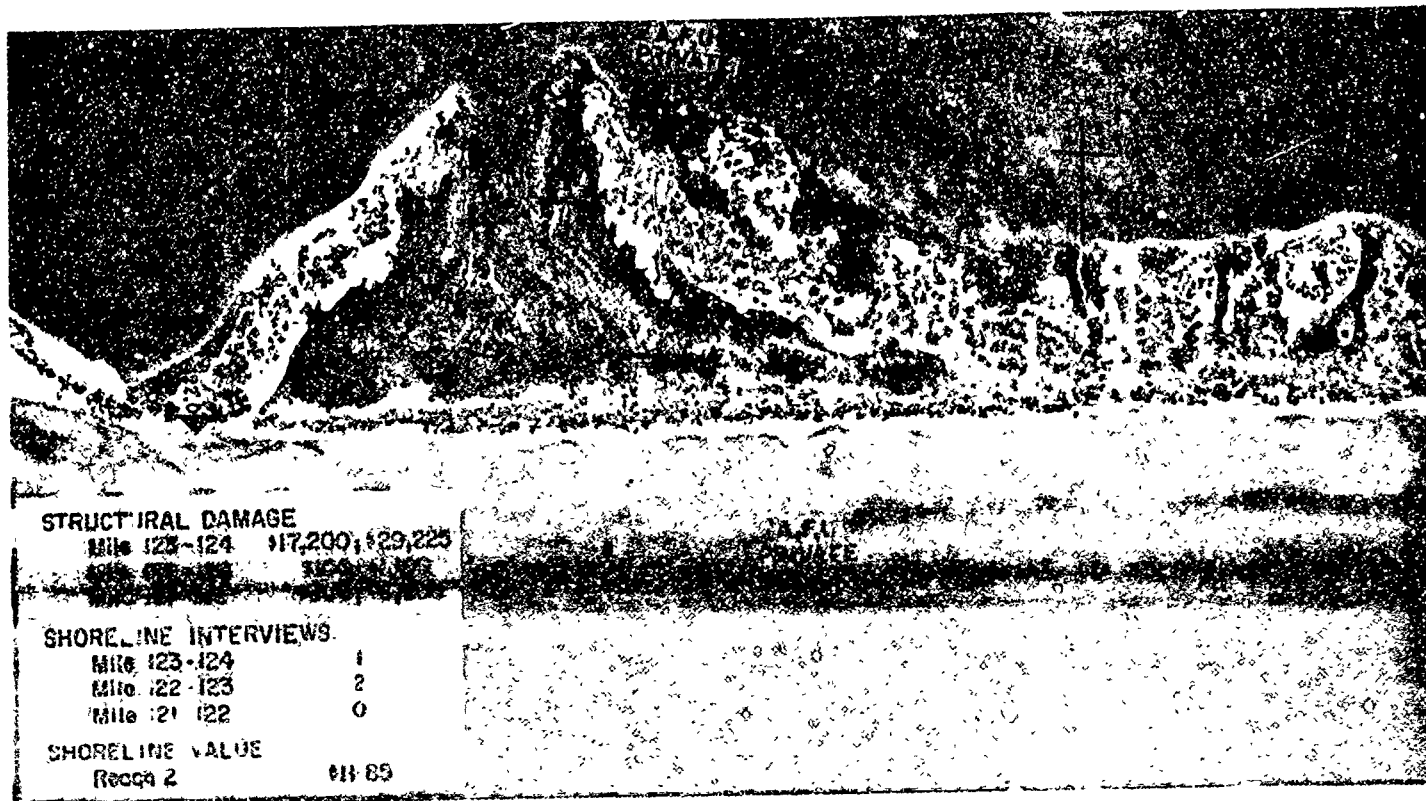
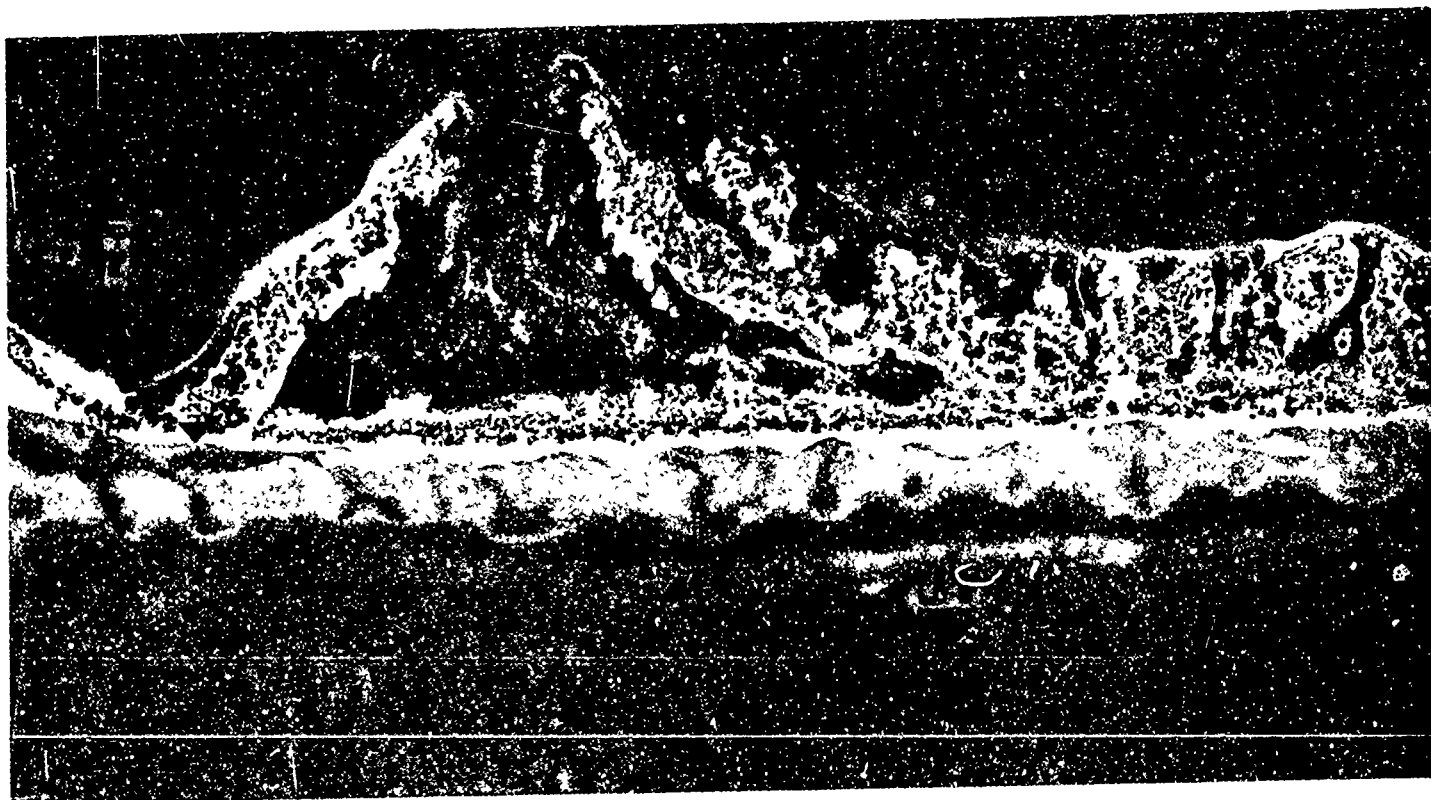




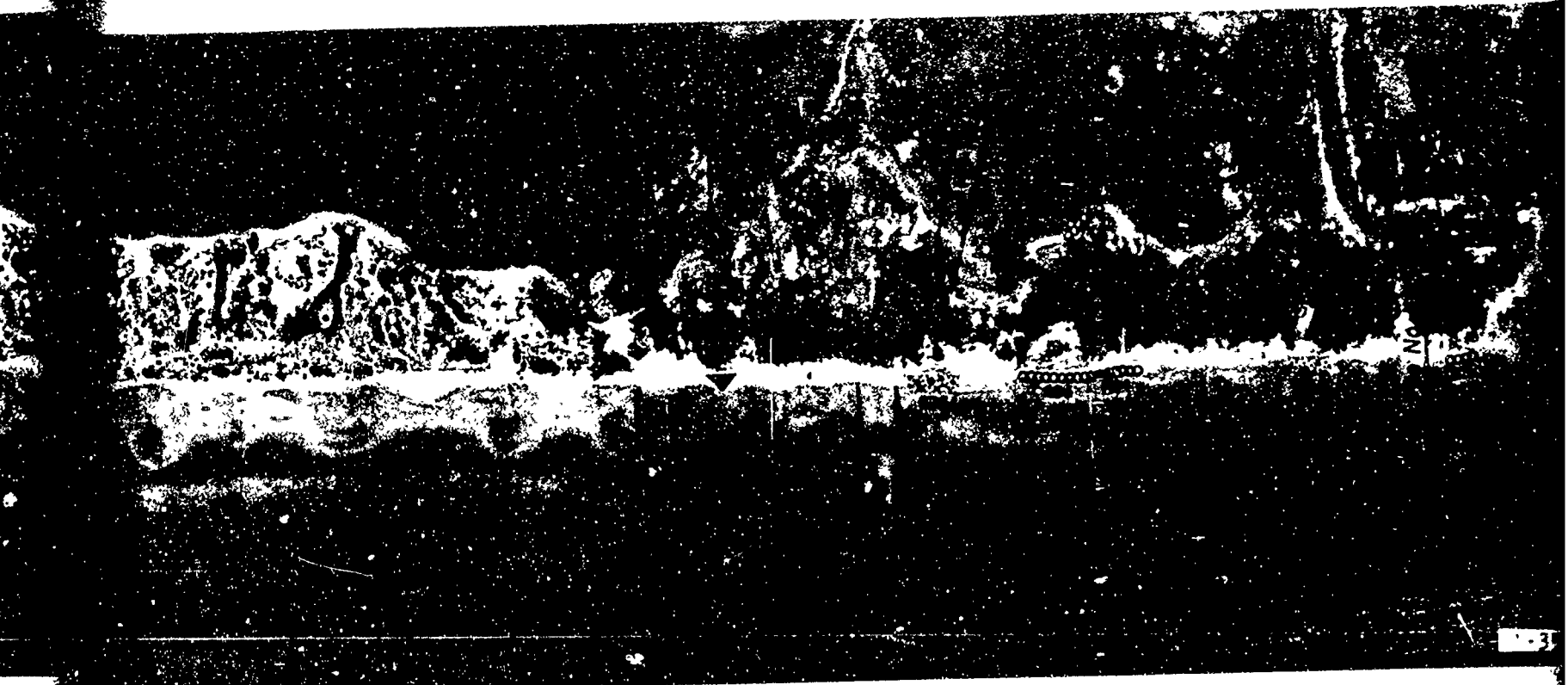
11-5-44 TO 43



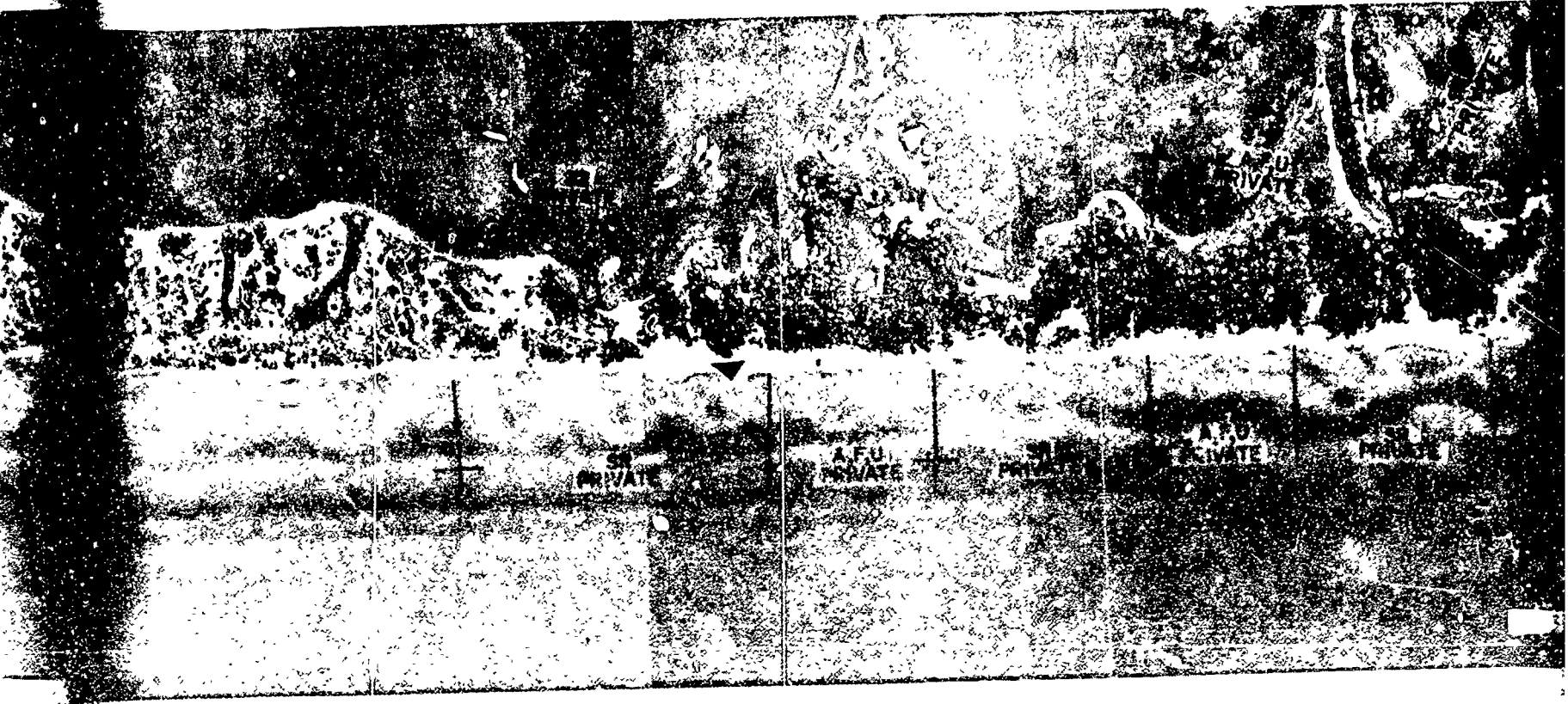
11-5-44 TO 438



2



3



SR
PRIVATE

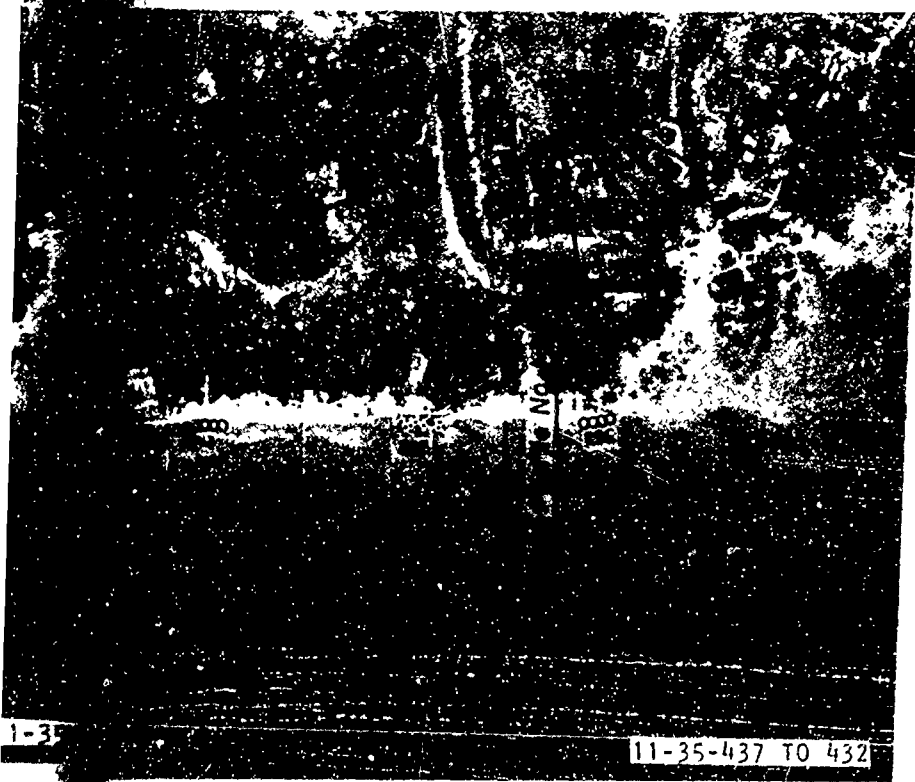
A.F.U.
PRIVATE

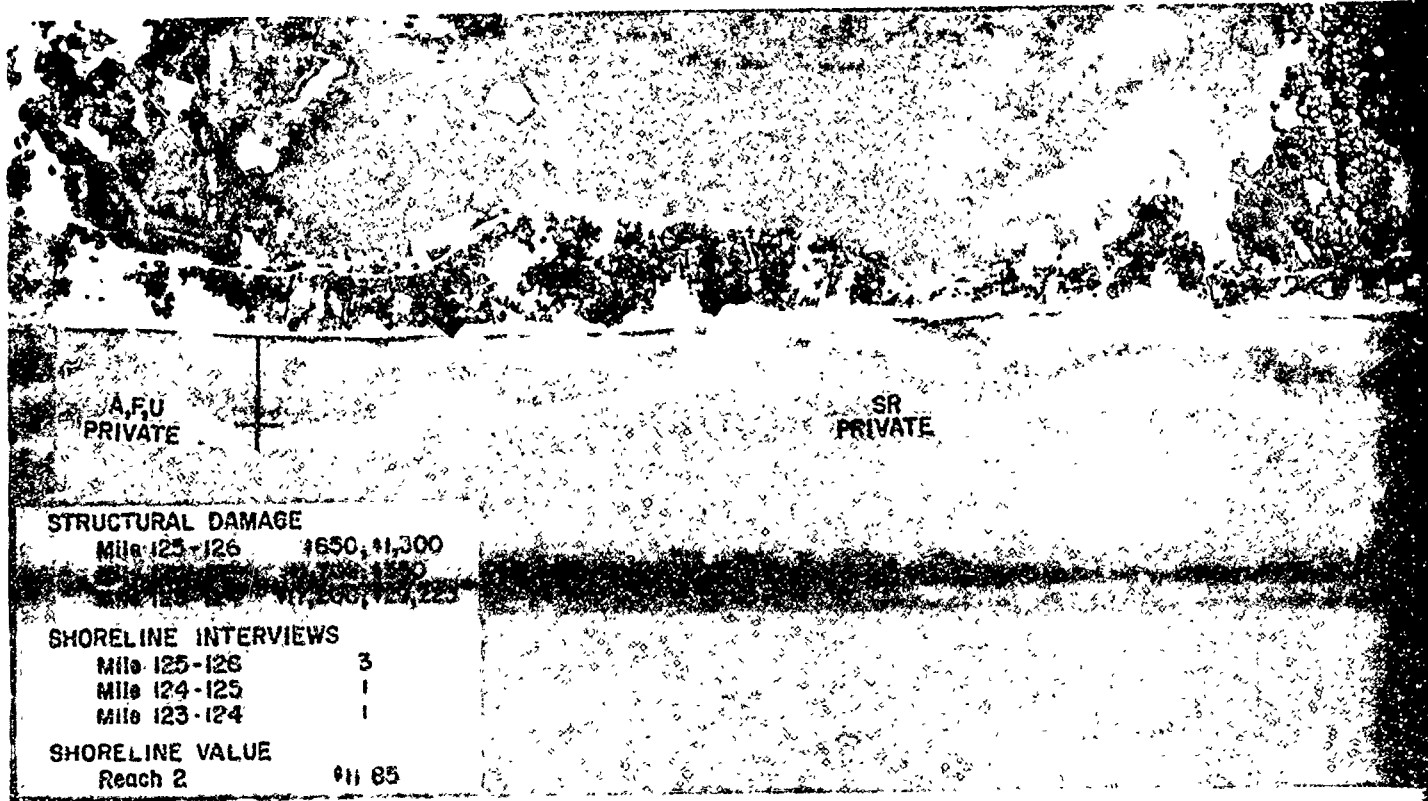
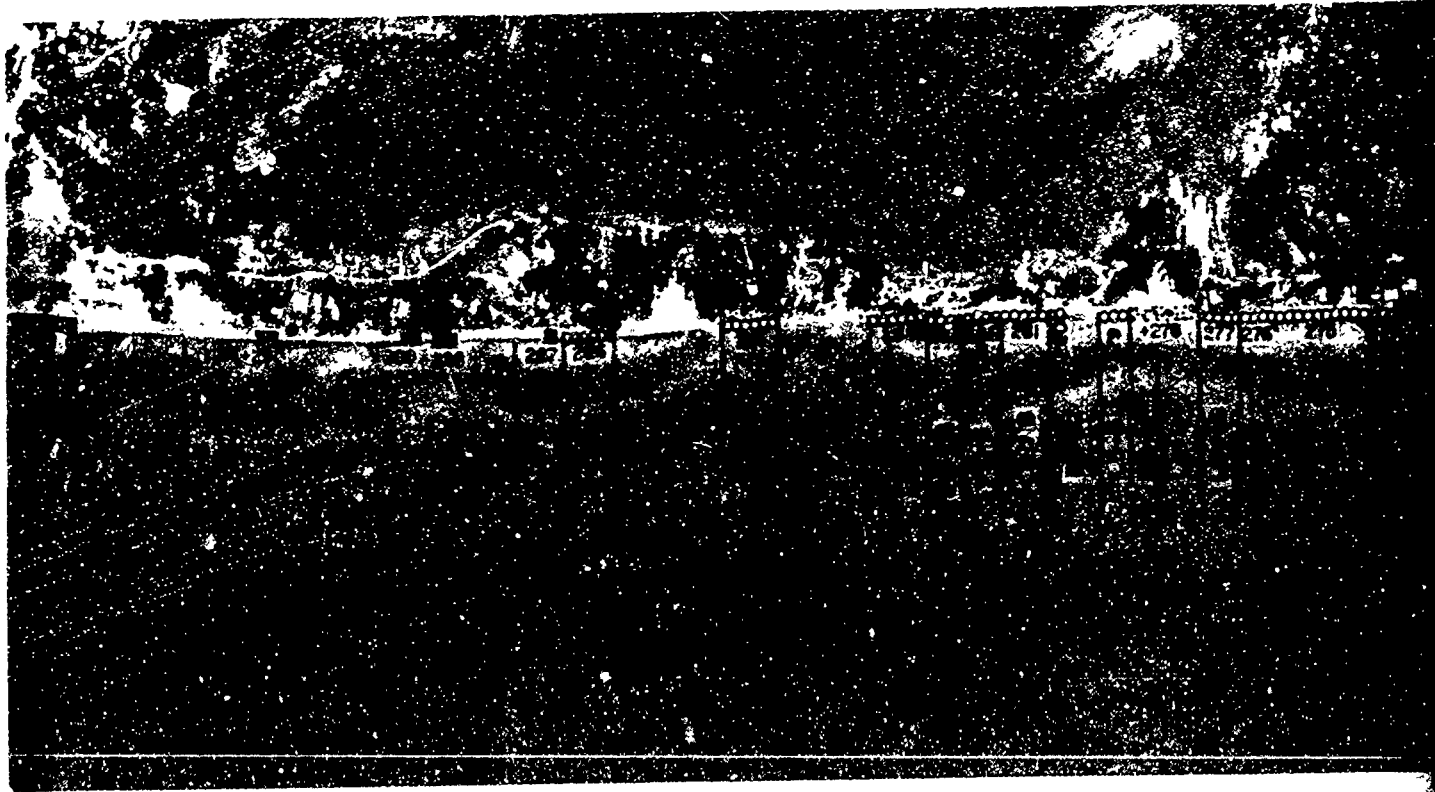
SR
PRIVATE

A.F.U.
PRIVATE

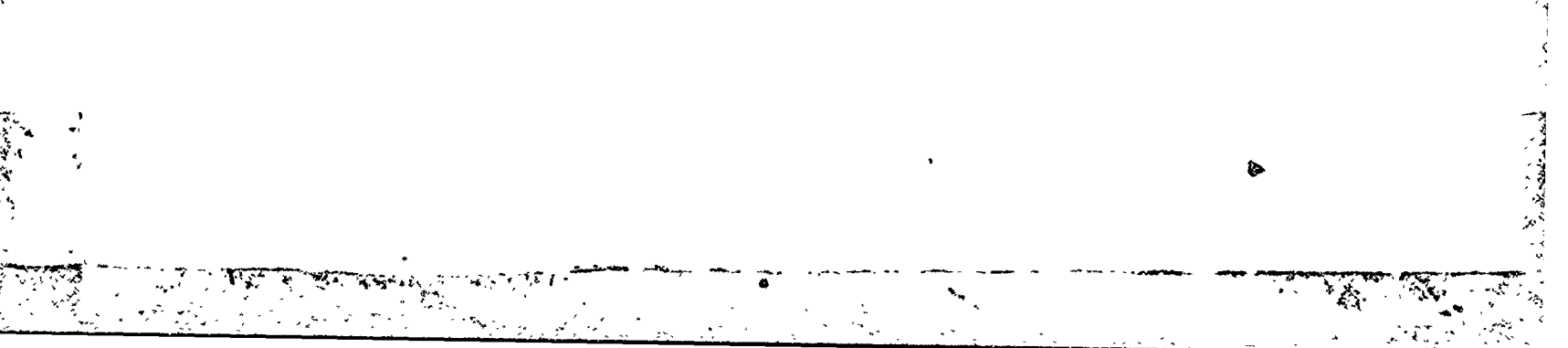
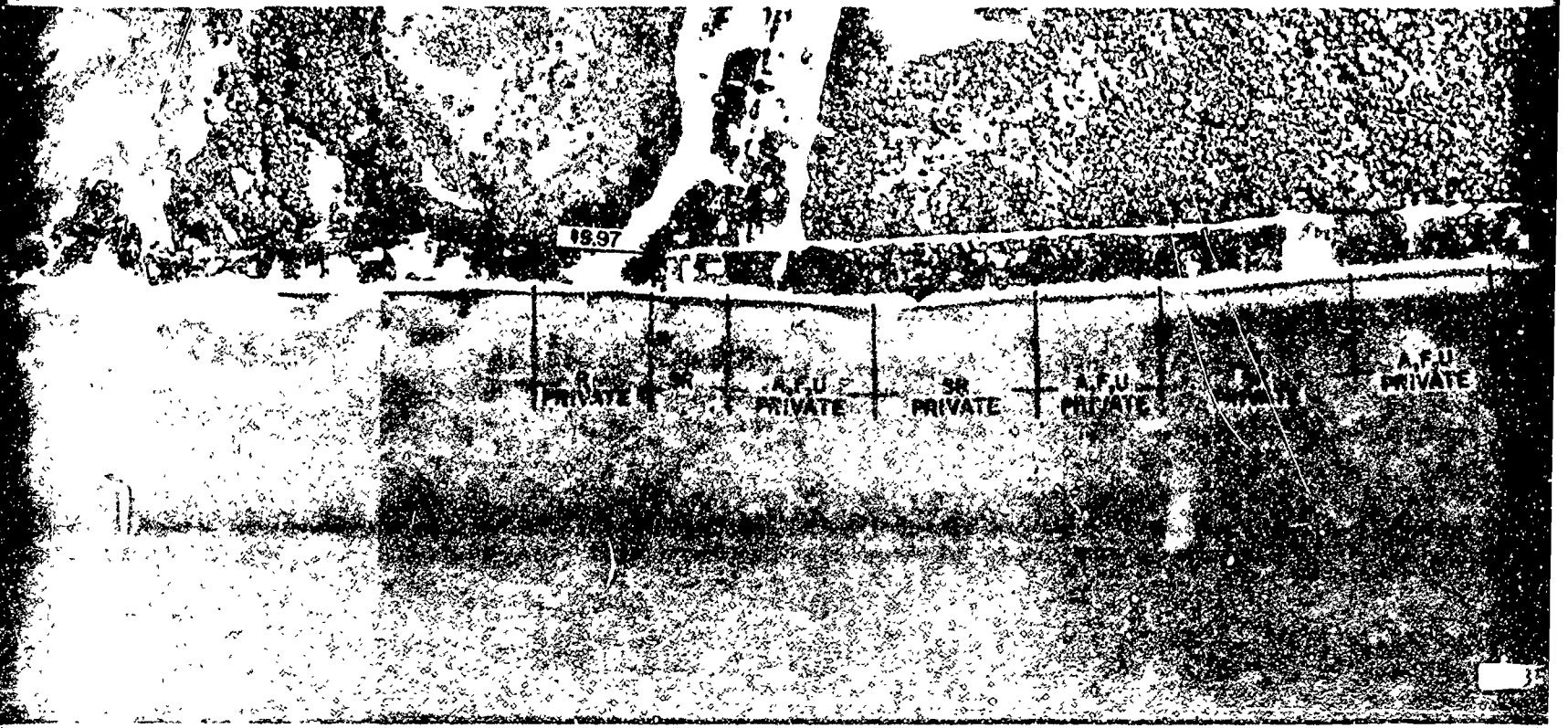
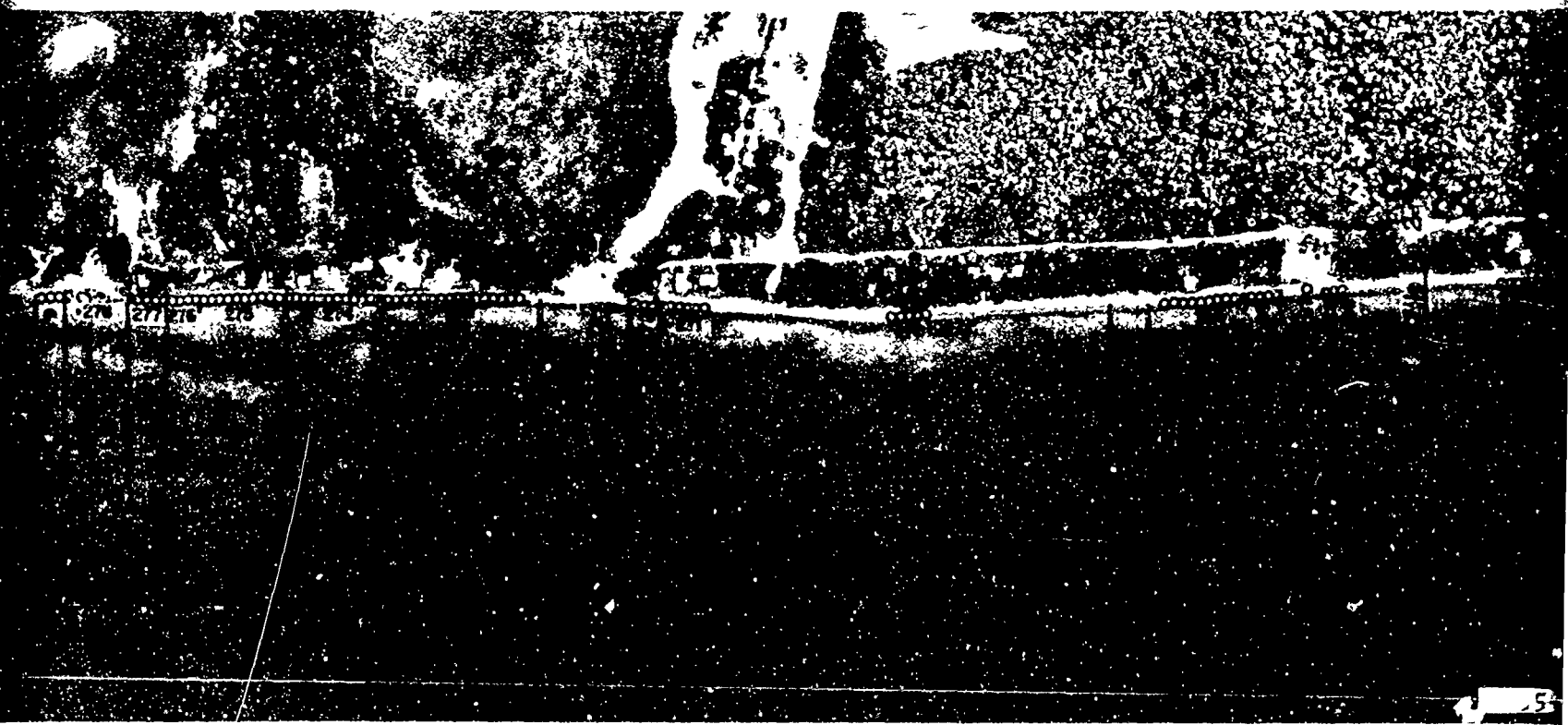
SR
PRIVATE

3

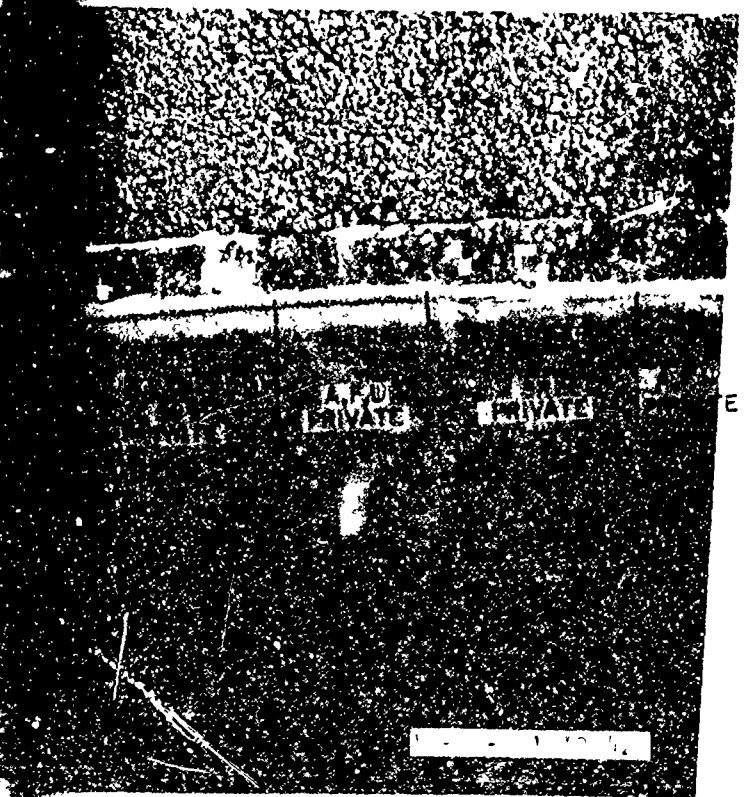
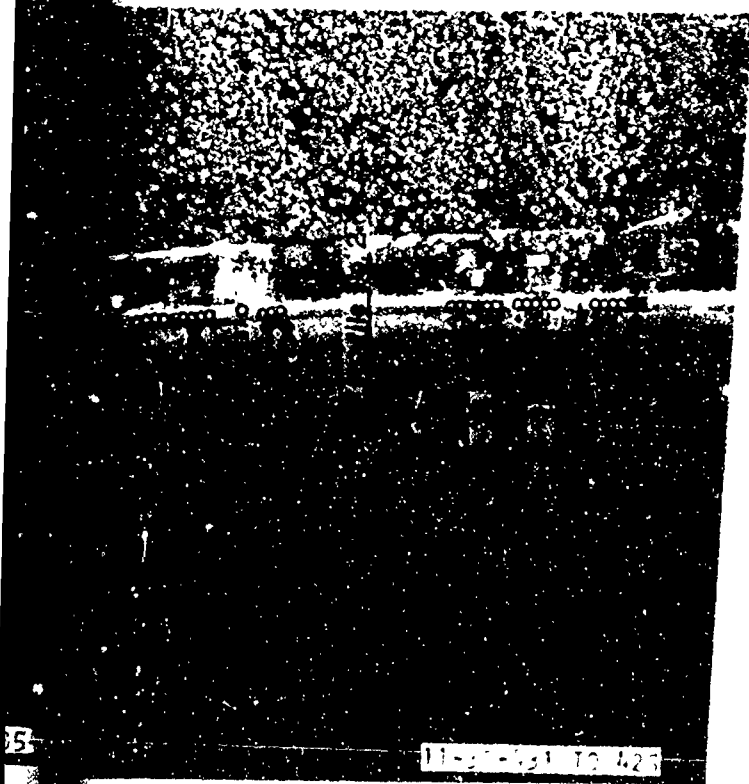


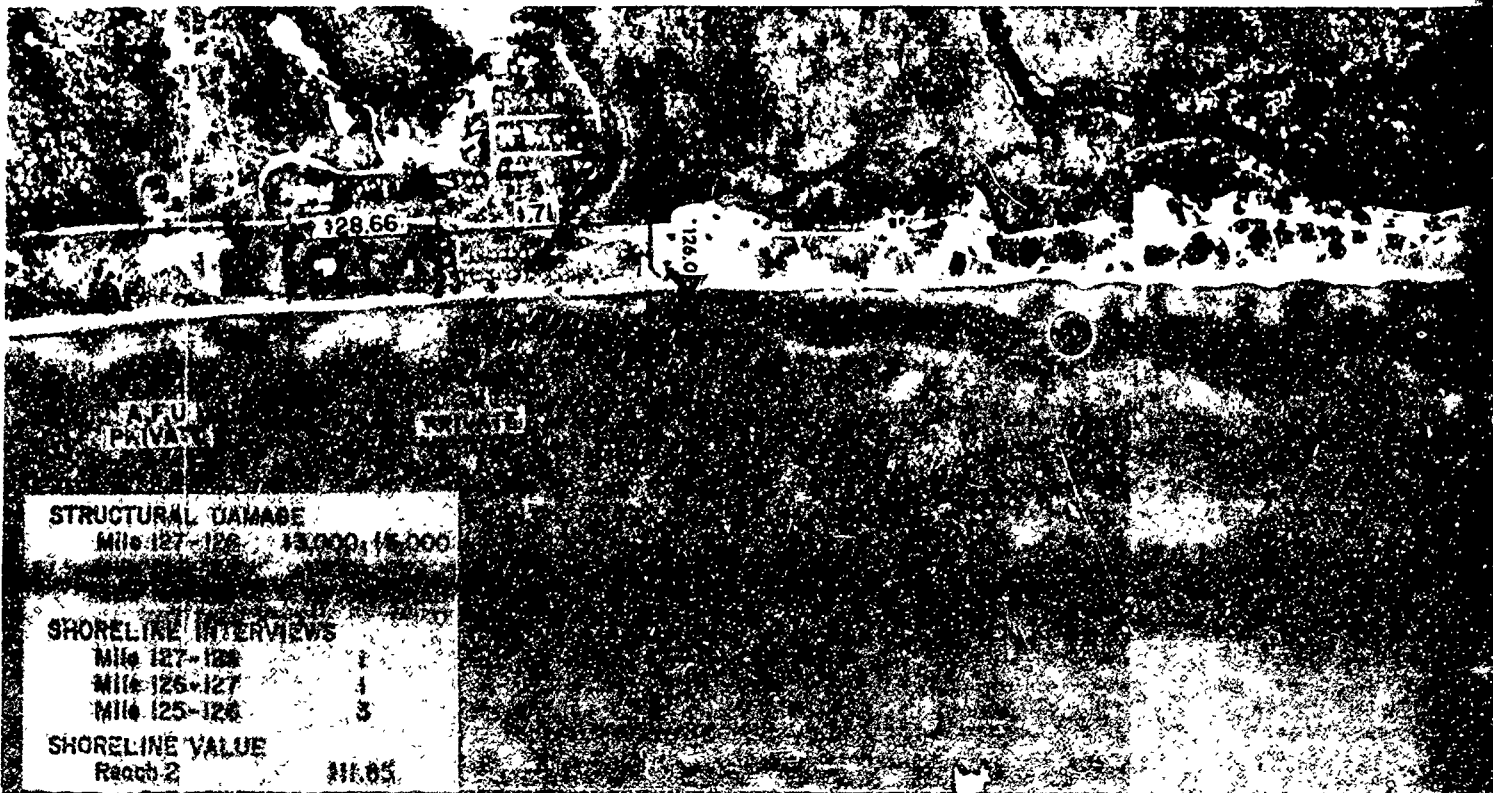
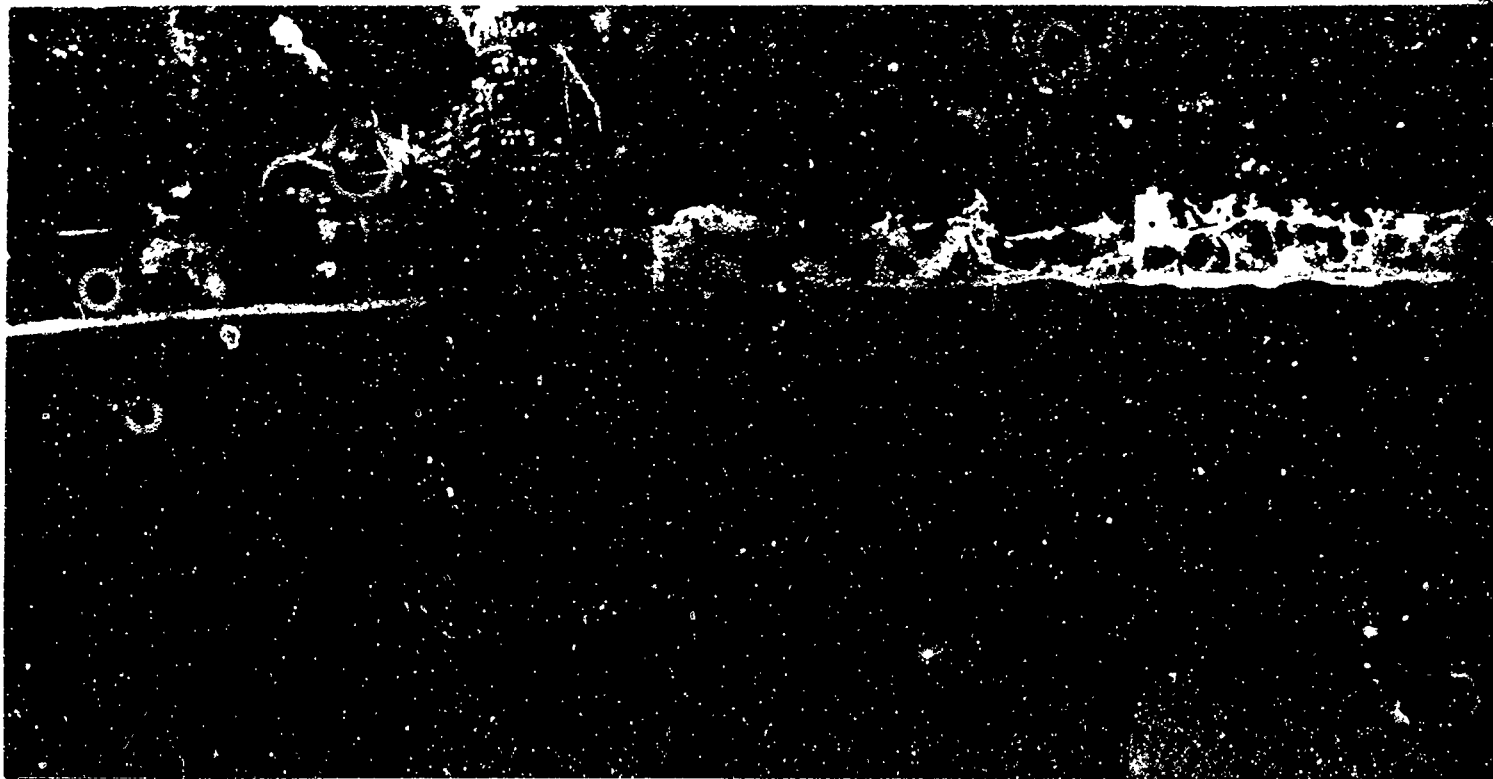


2 1

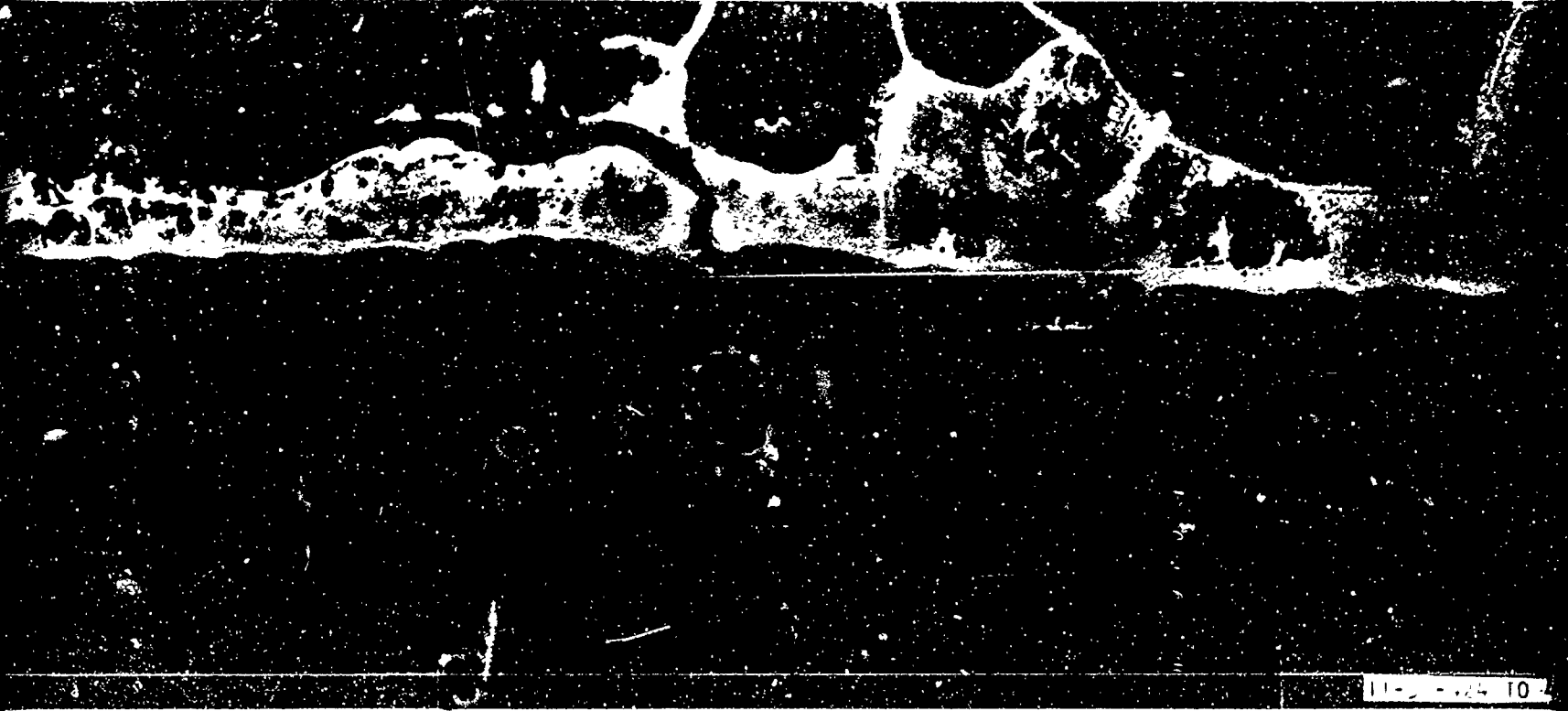


3





2

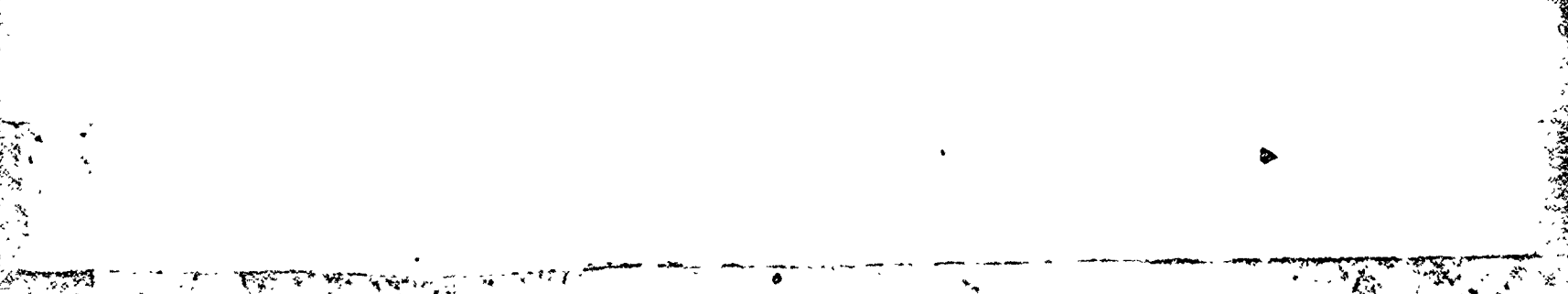
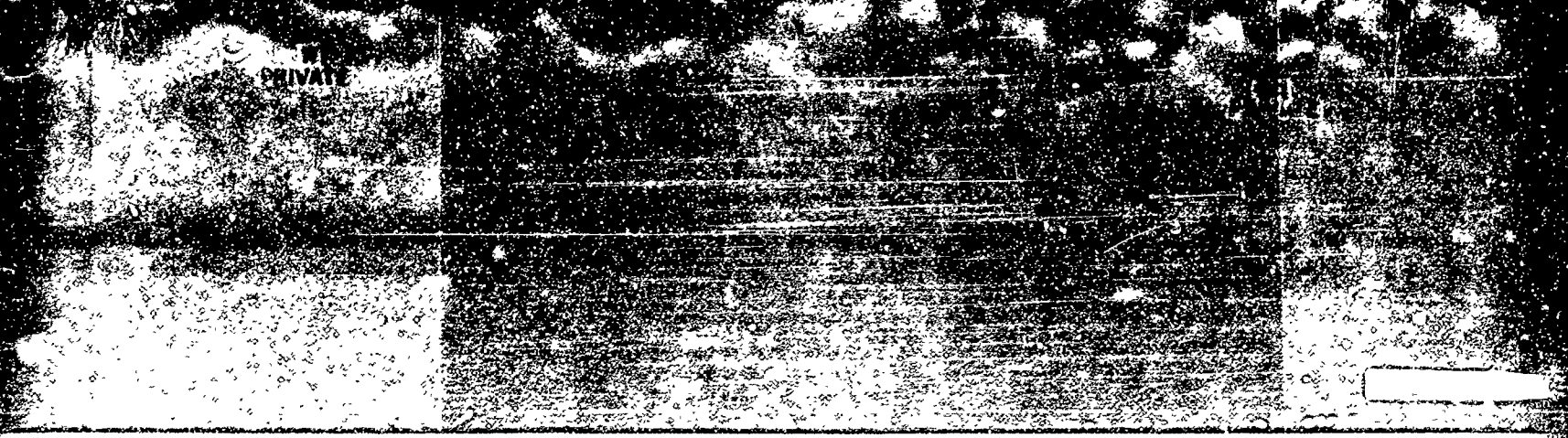


11-5-64 10-4



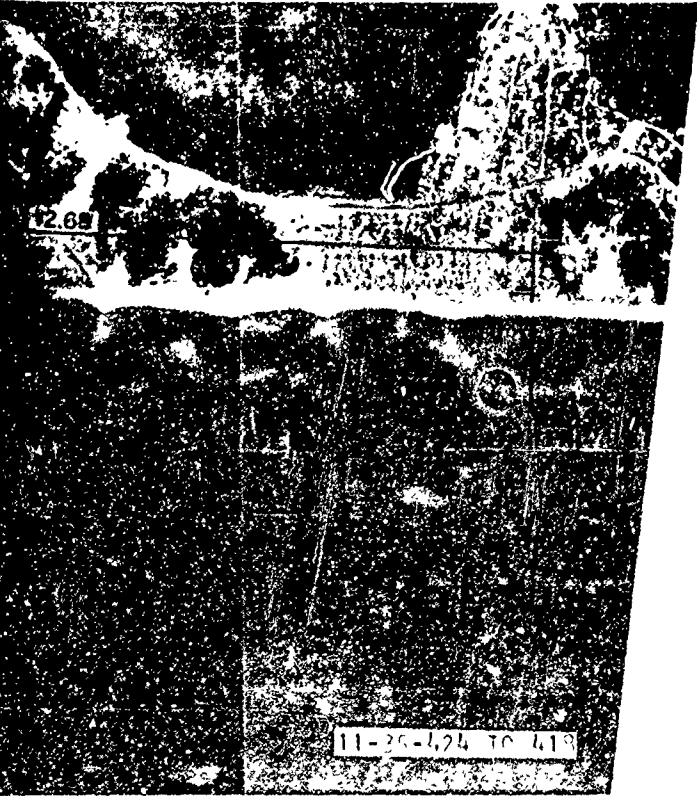
12.68

PRIVATE



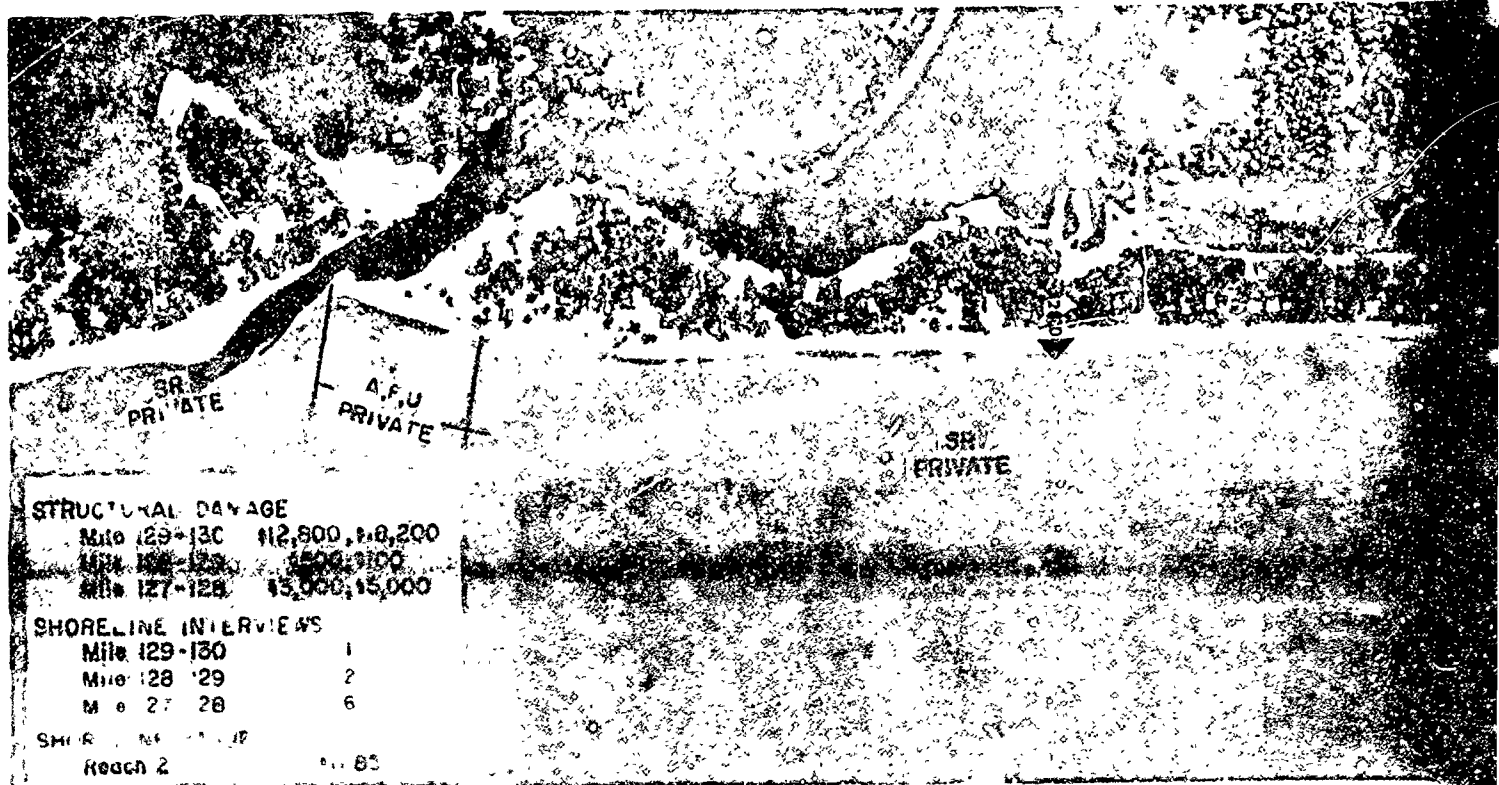


11-25-124 70 413

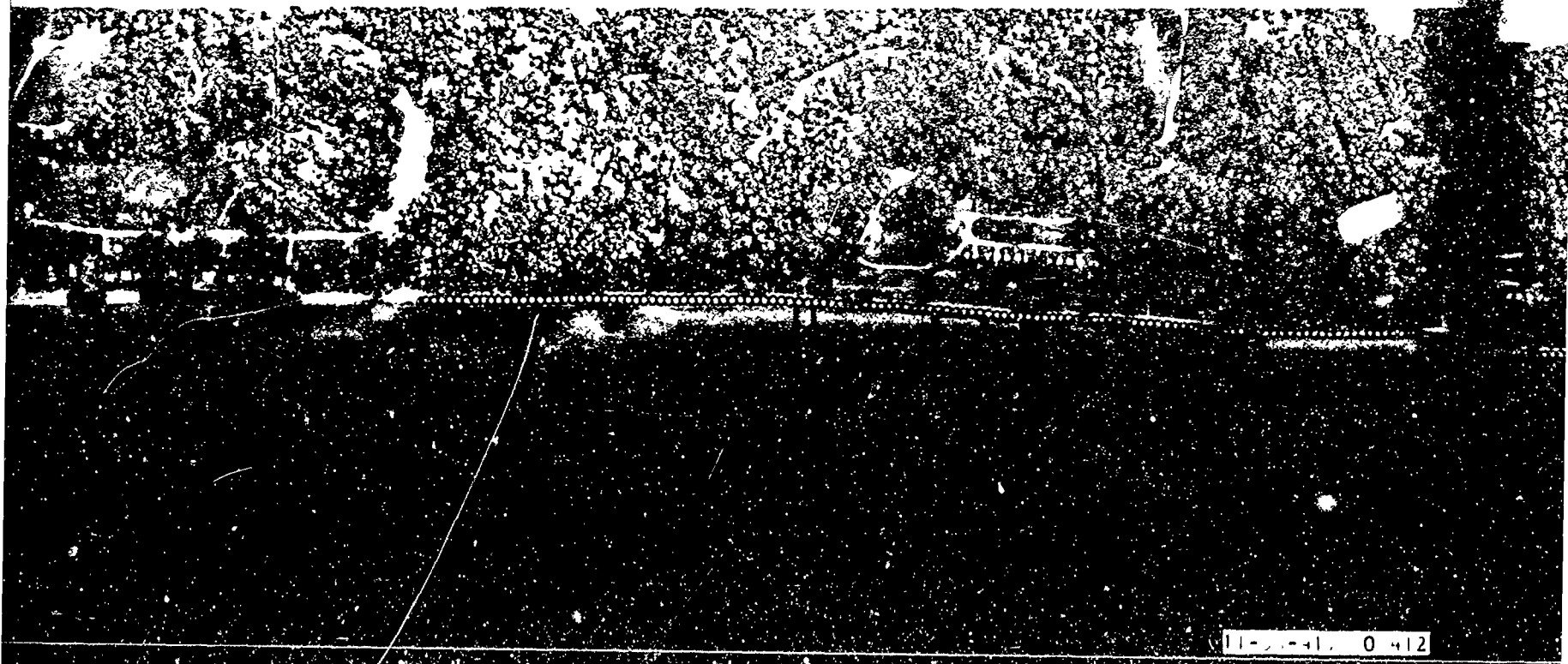


12.68

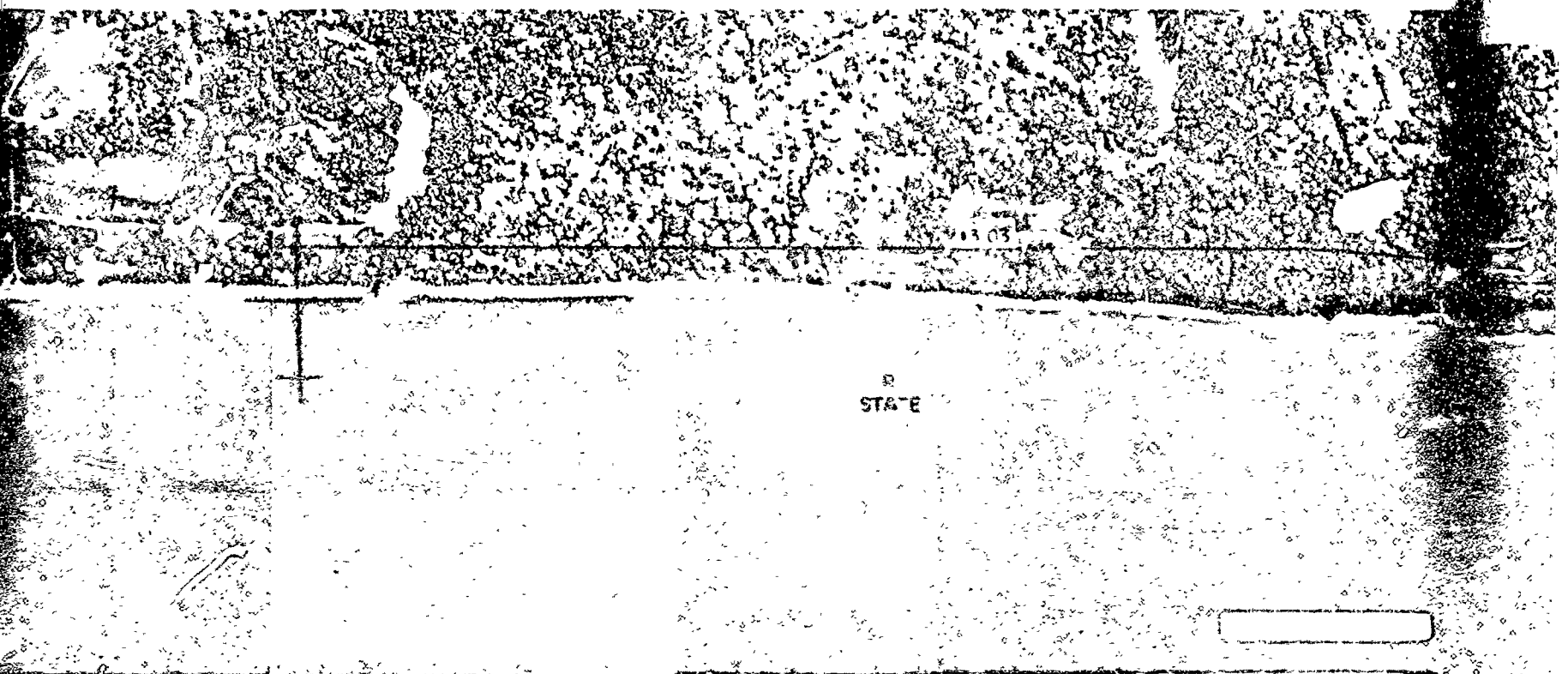
11-25-124 70 413



2'



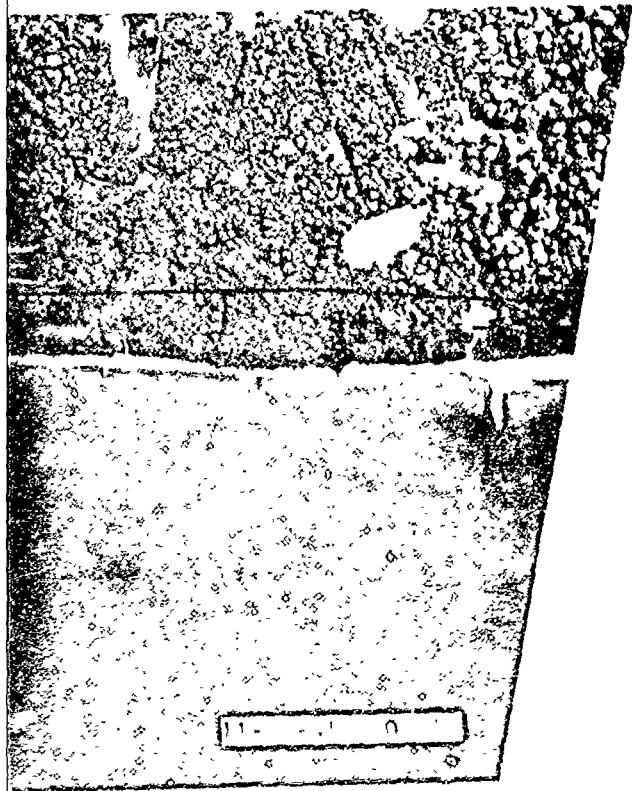
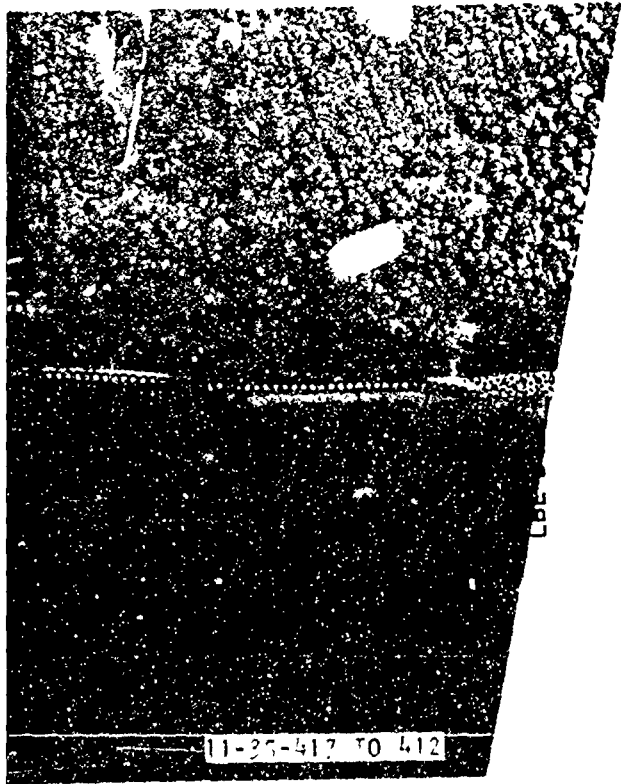
11-2-41 0 412

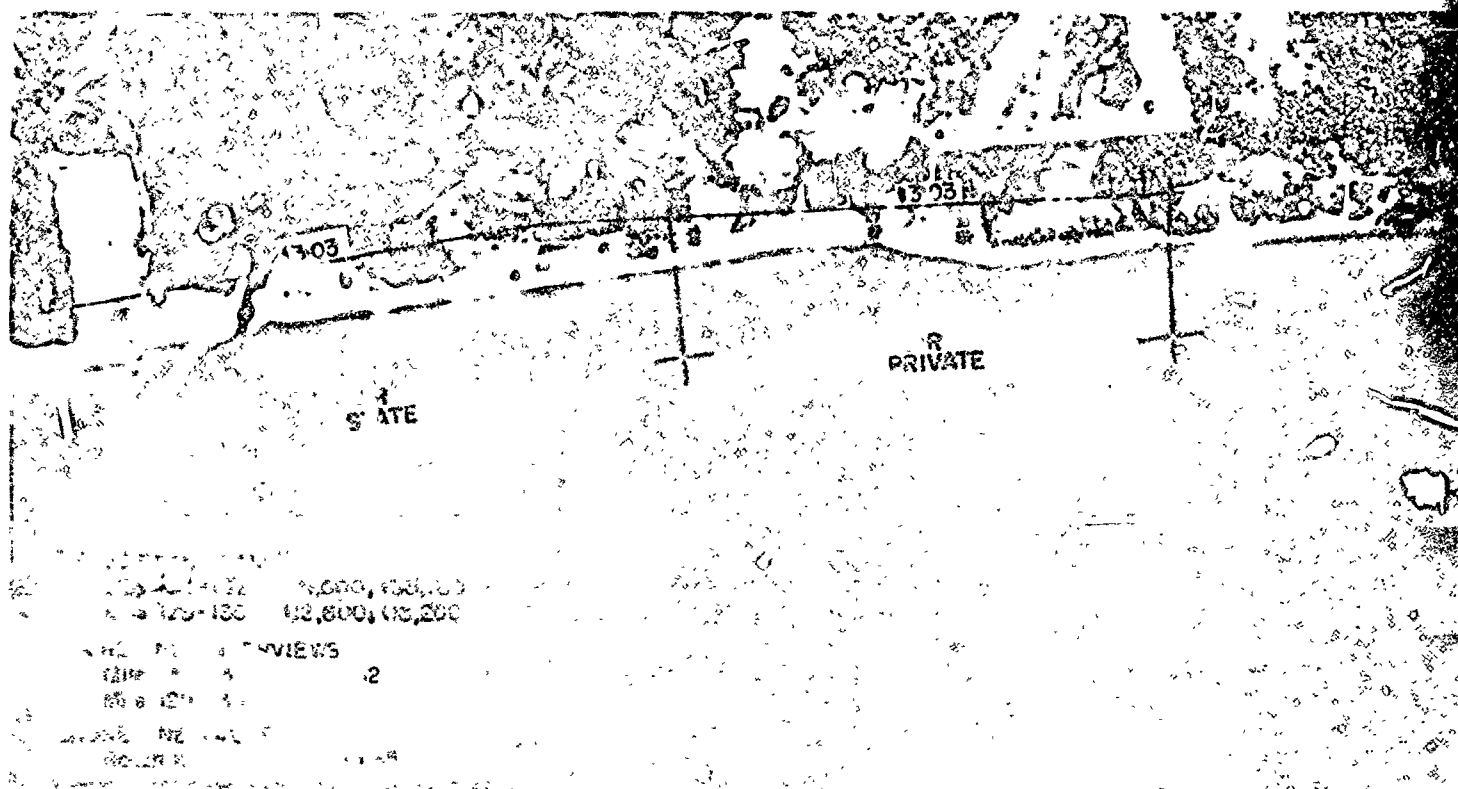
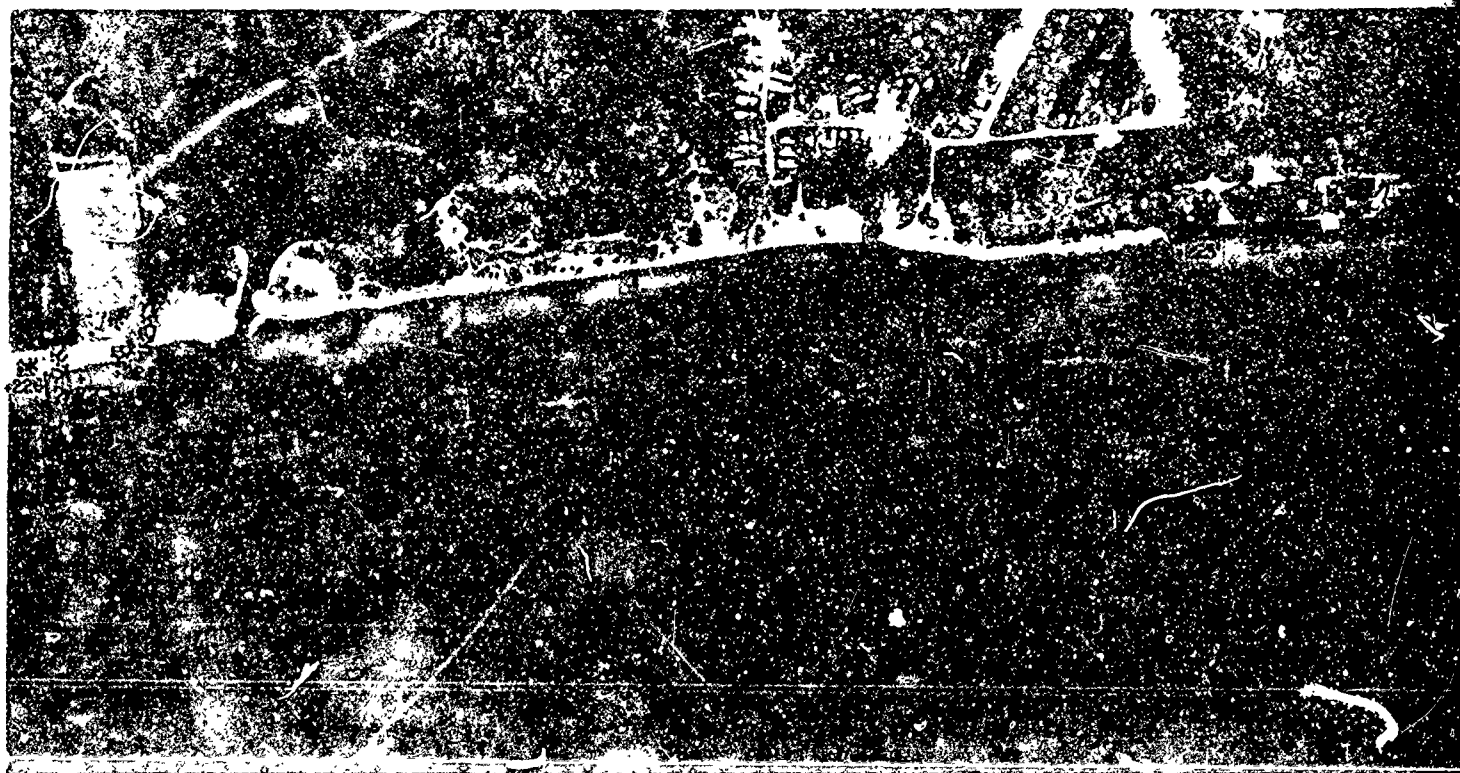


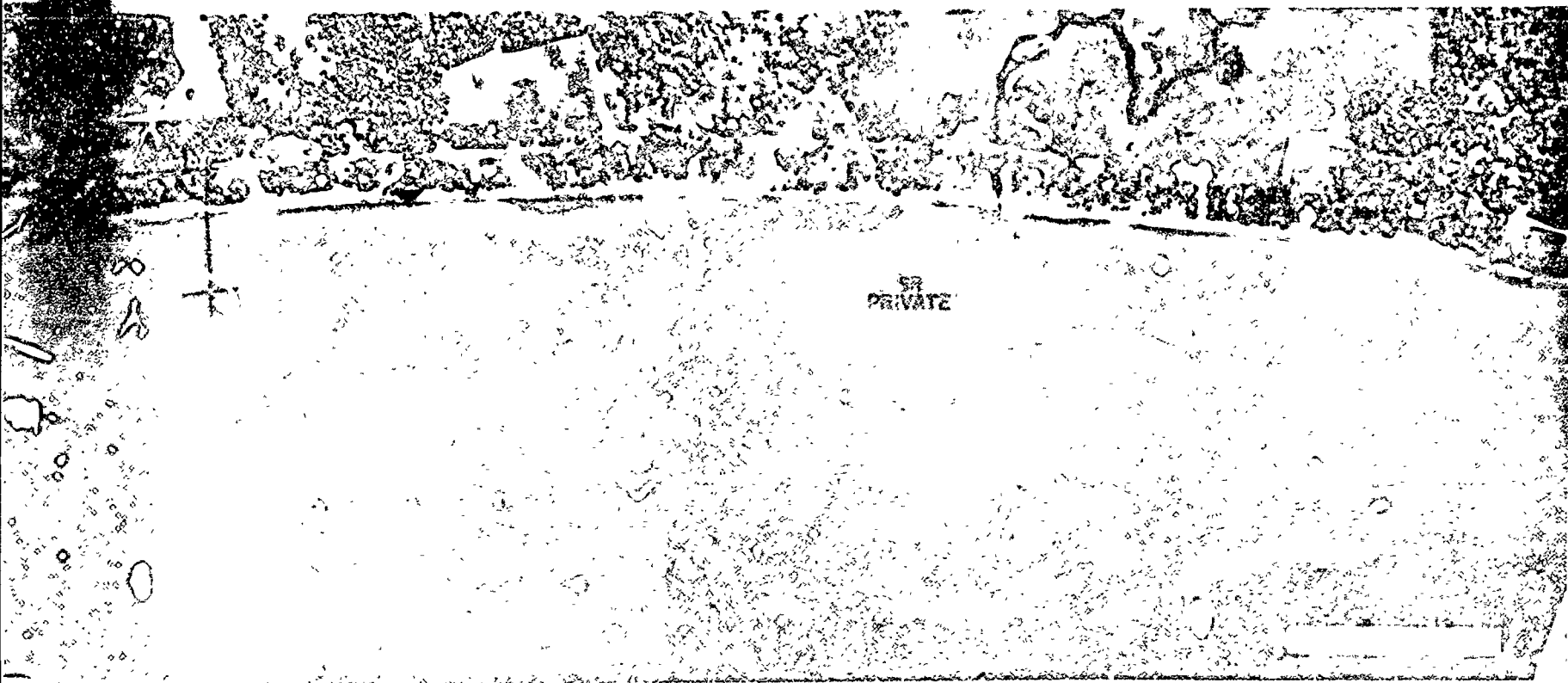
R
STATE

11-2-41 0 412

3

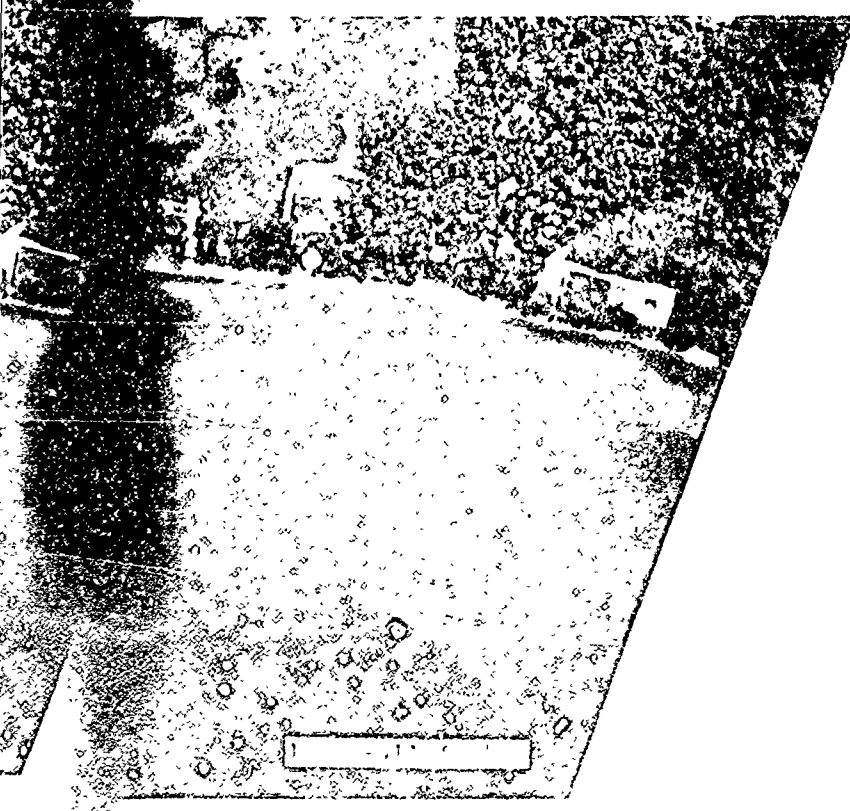




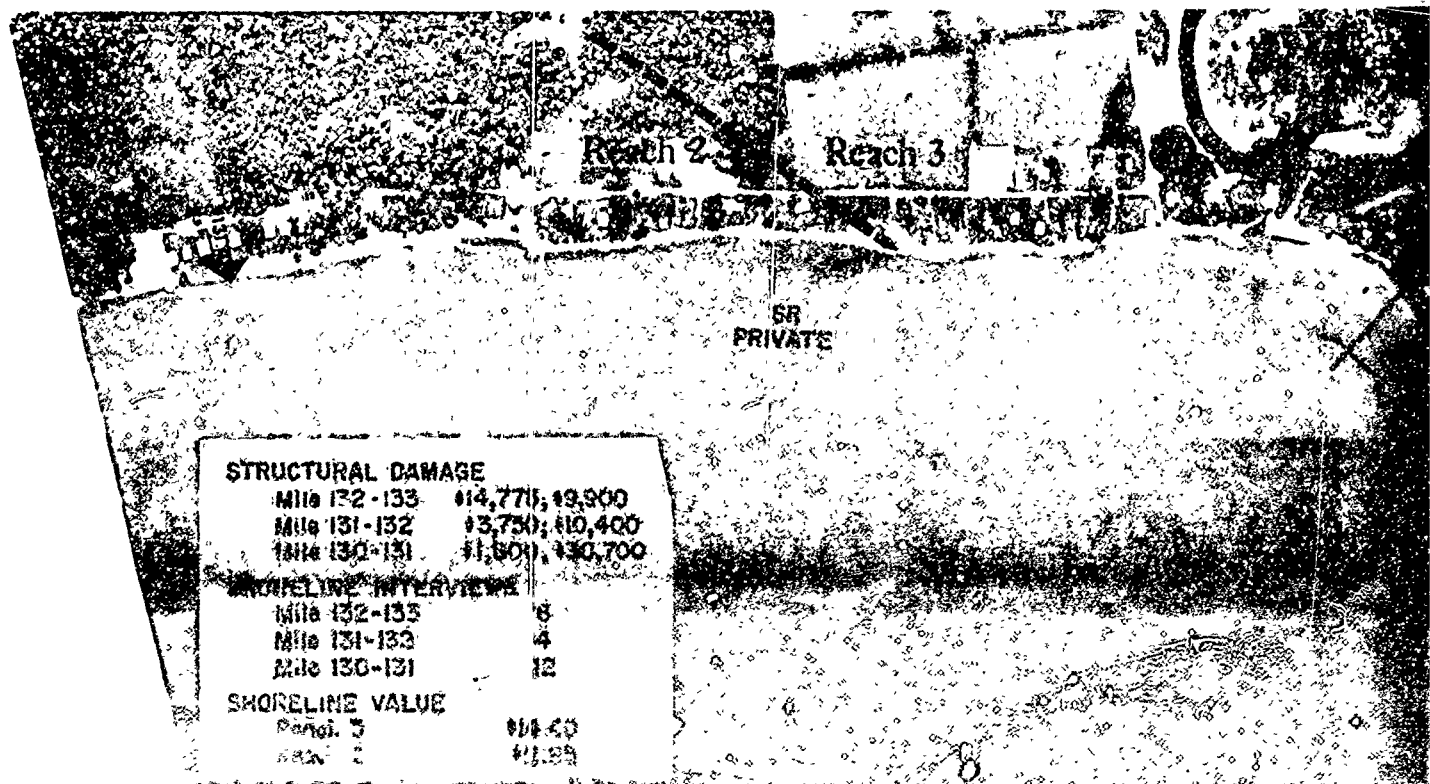
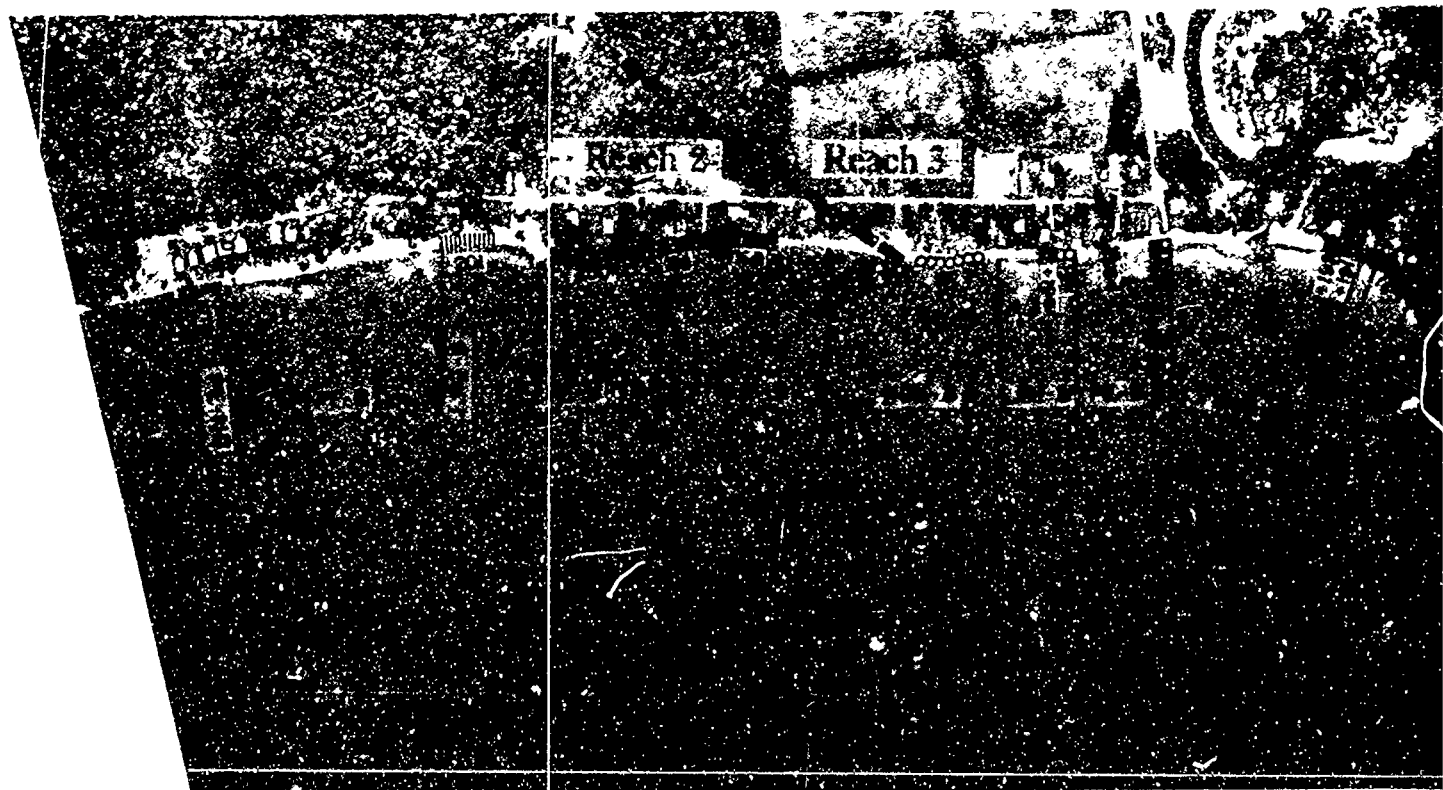


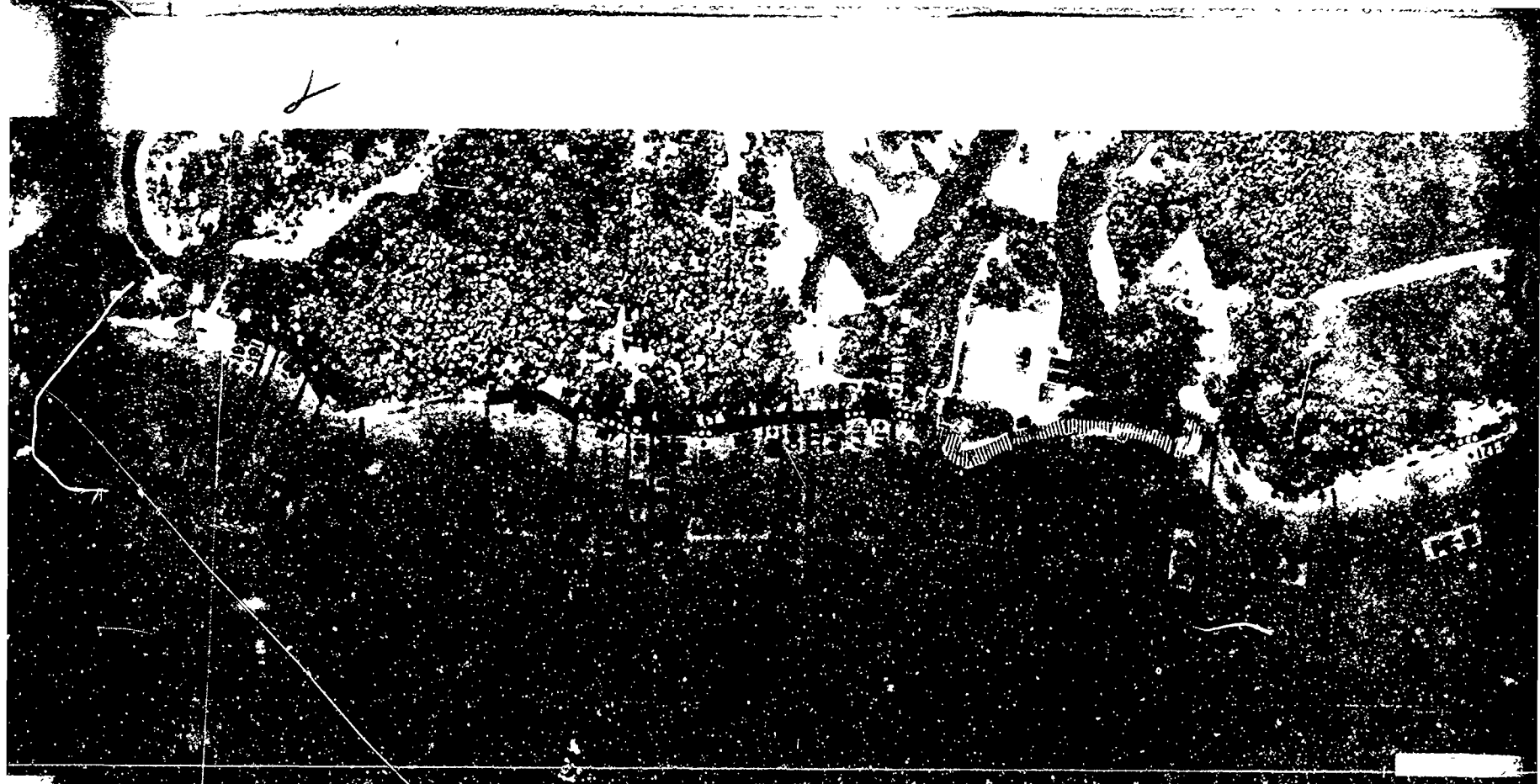


11-26-411 TO 406



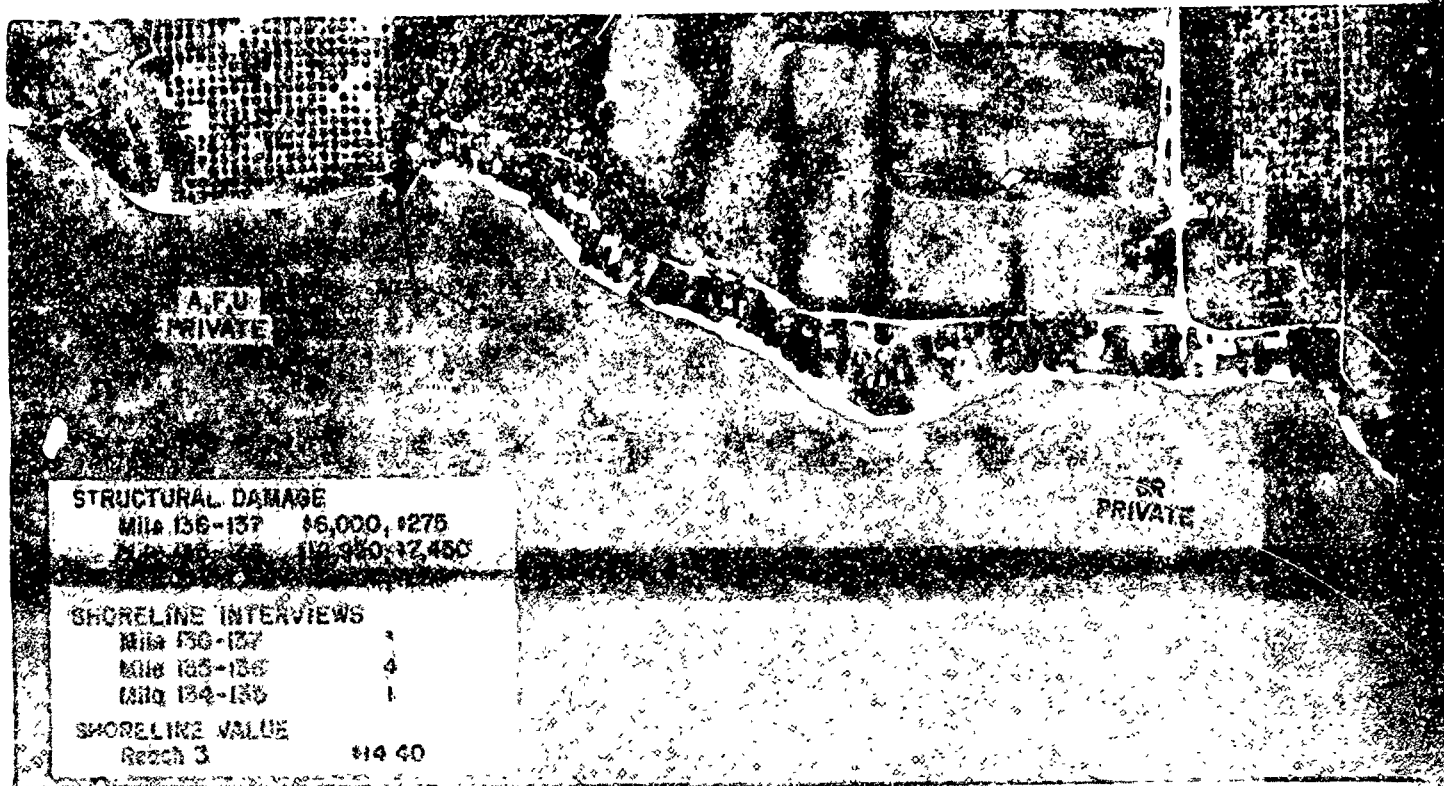
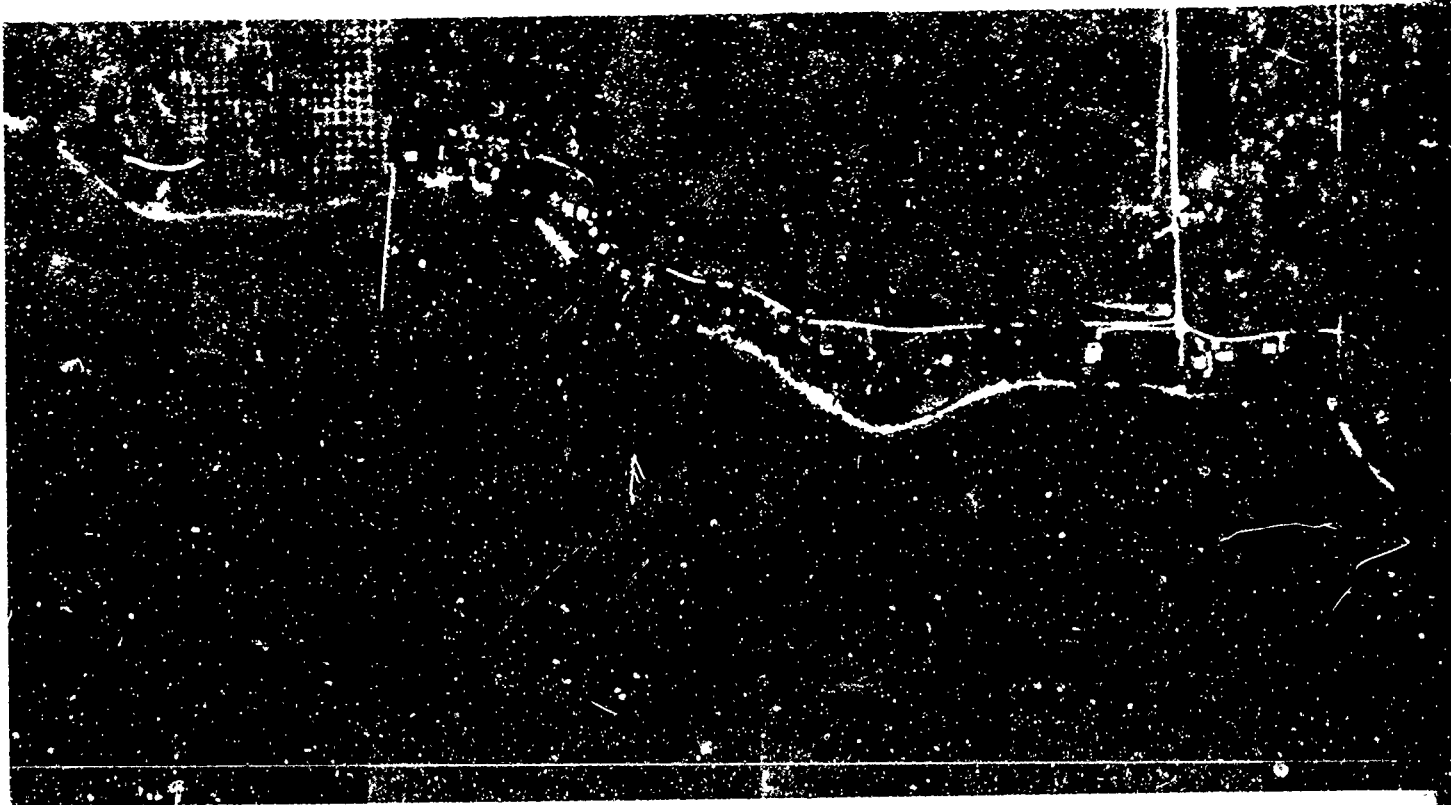
11-26-411 TO 406

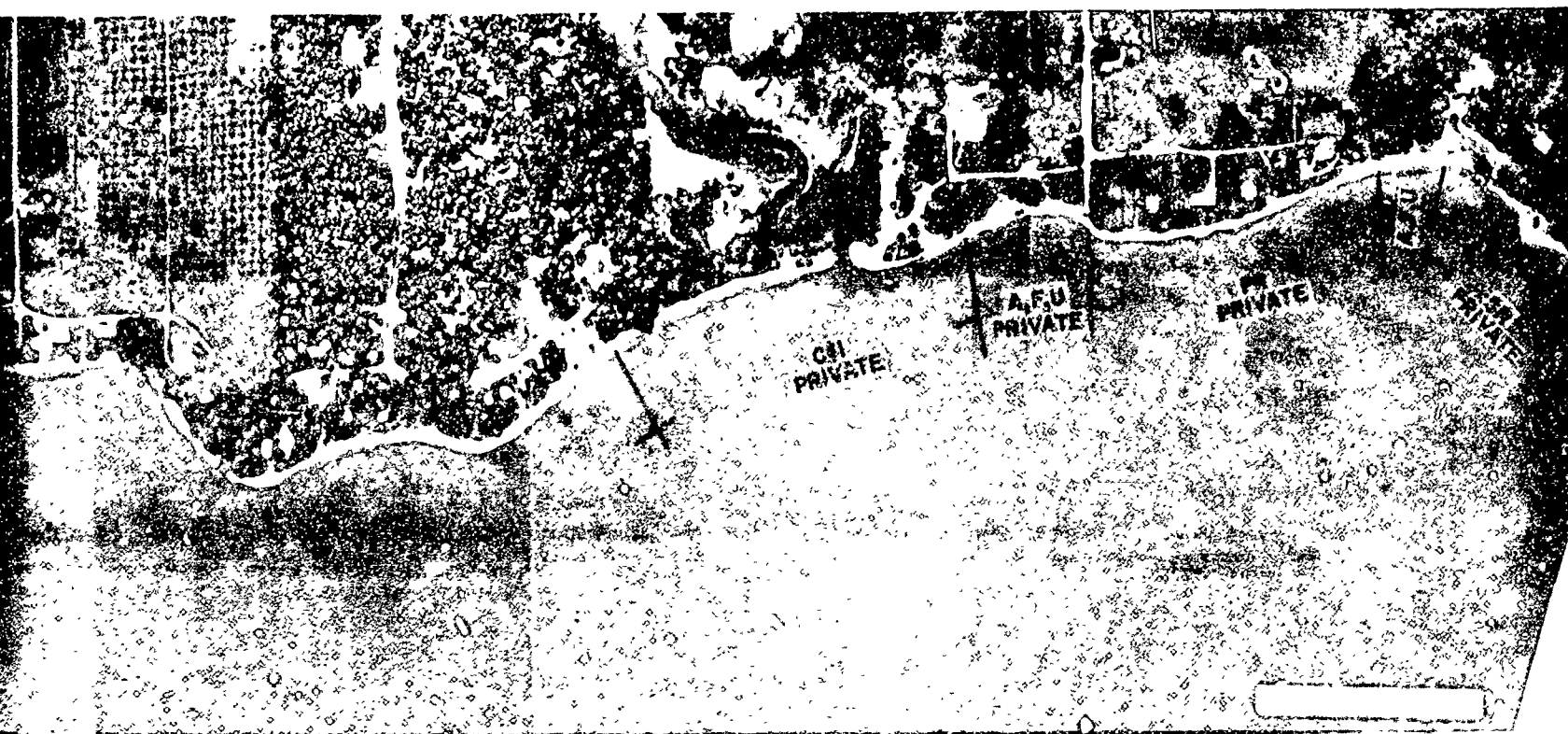
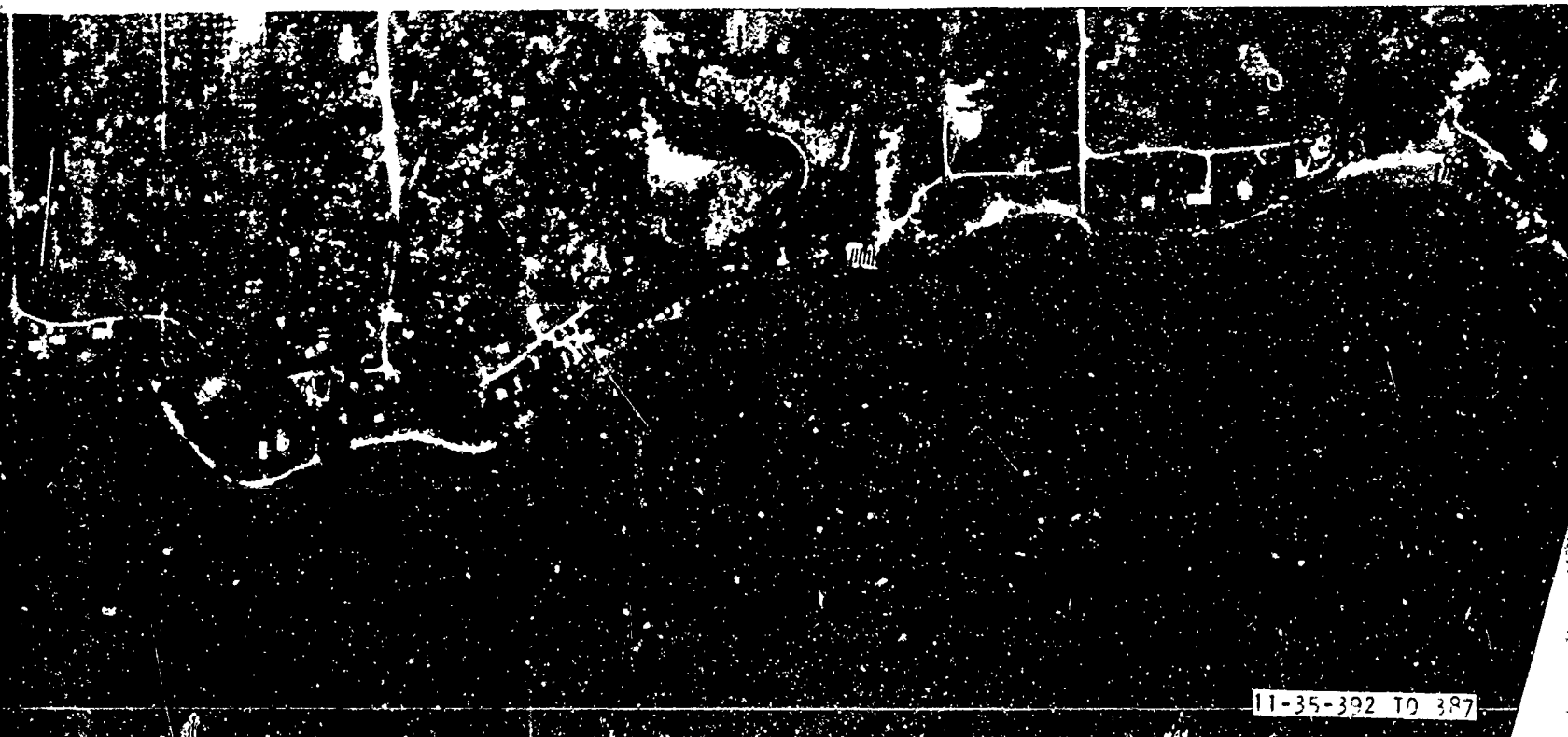




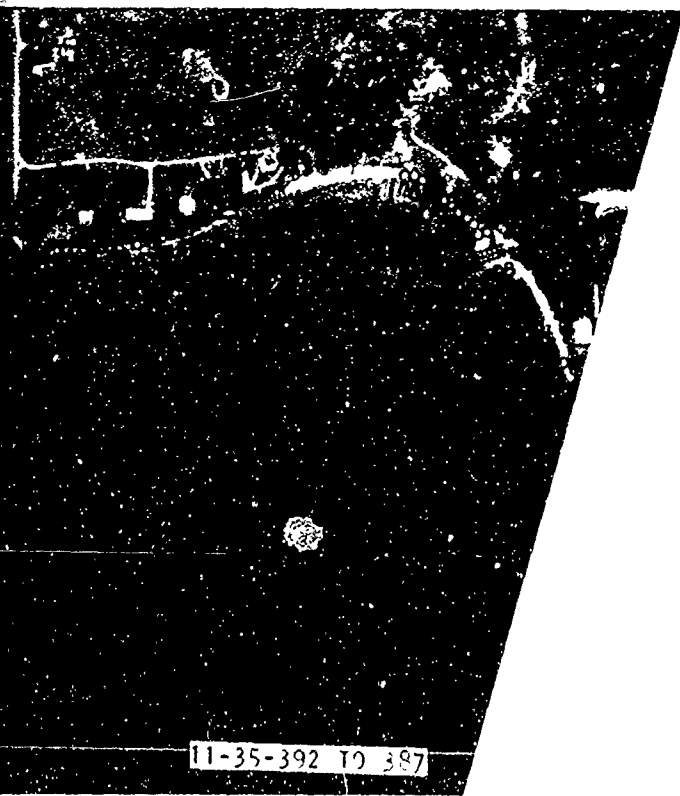
3



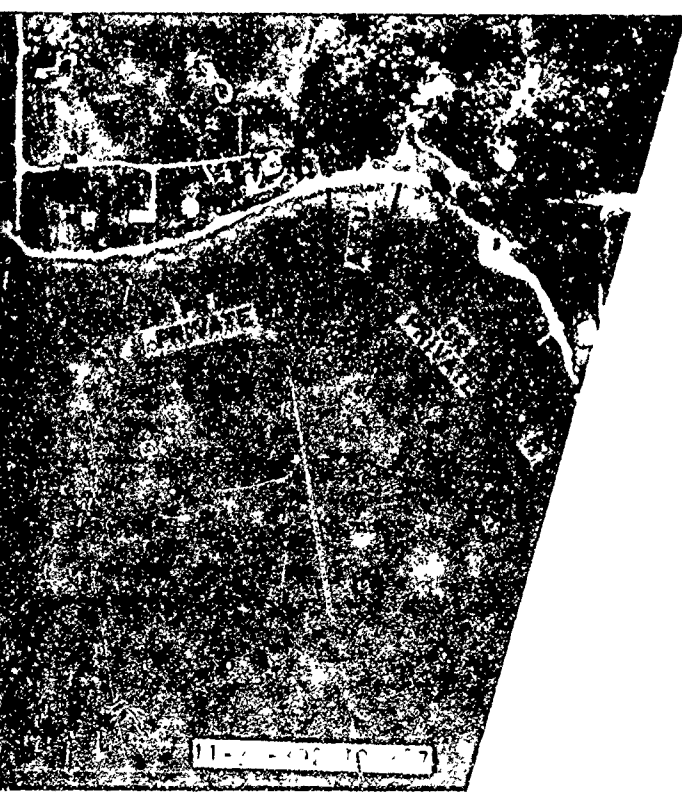




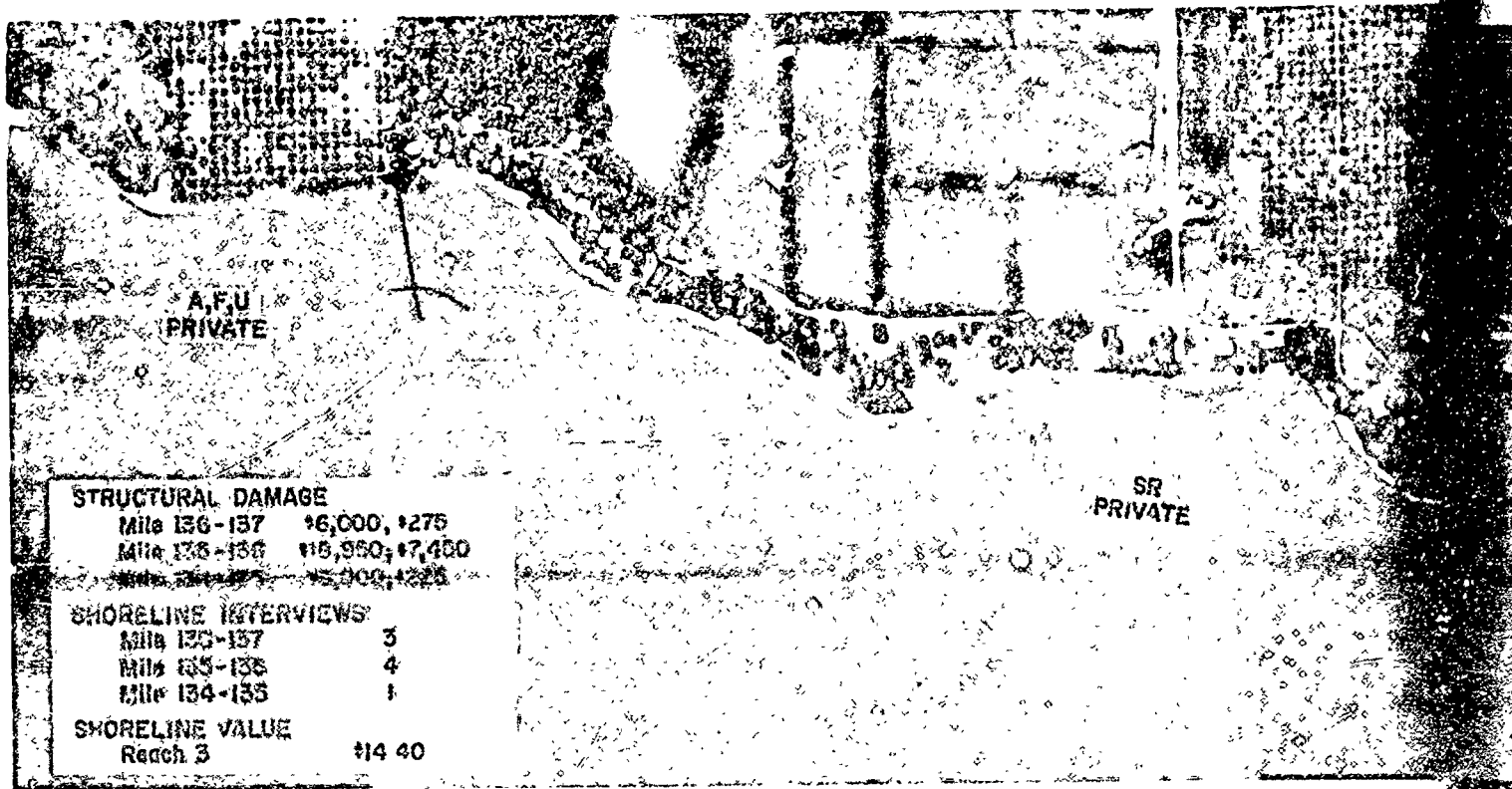
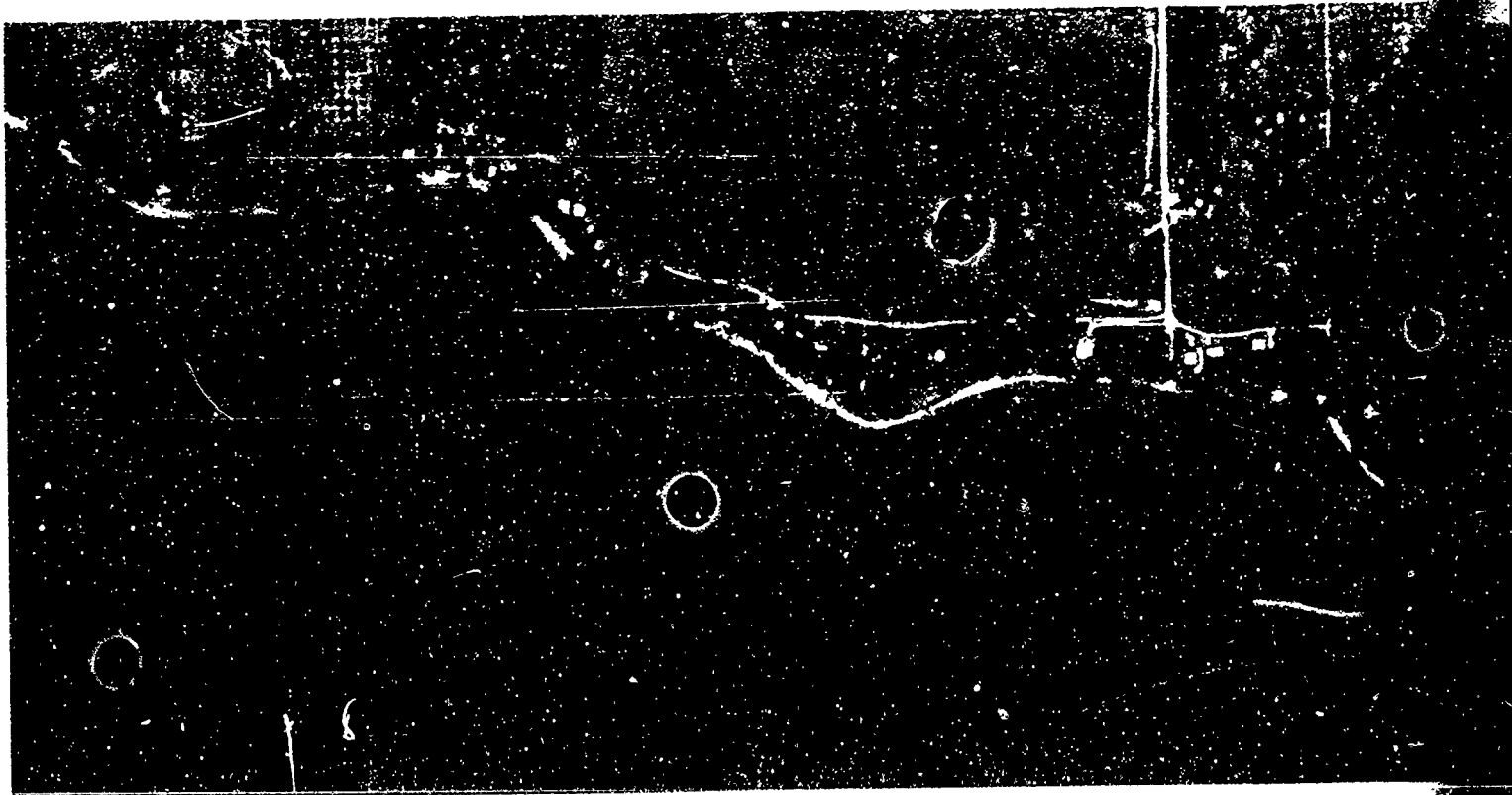
3



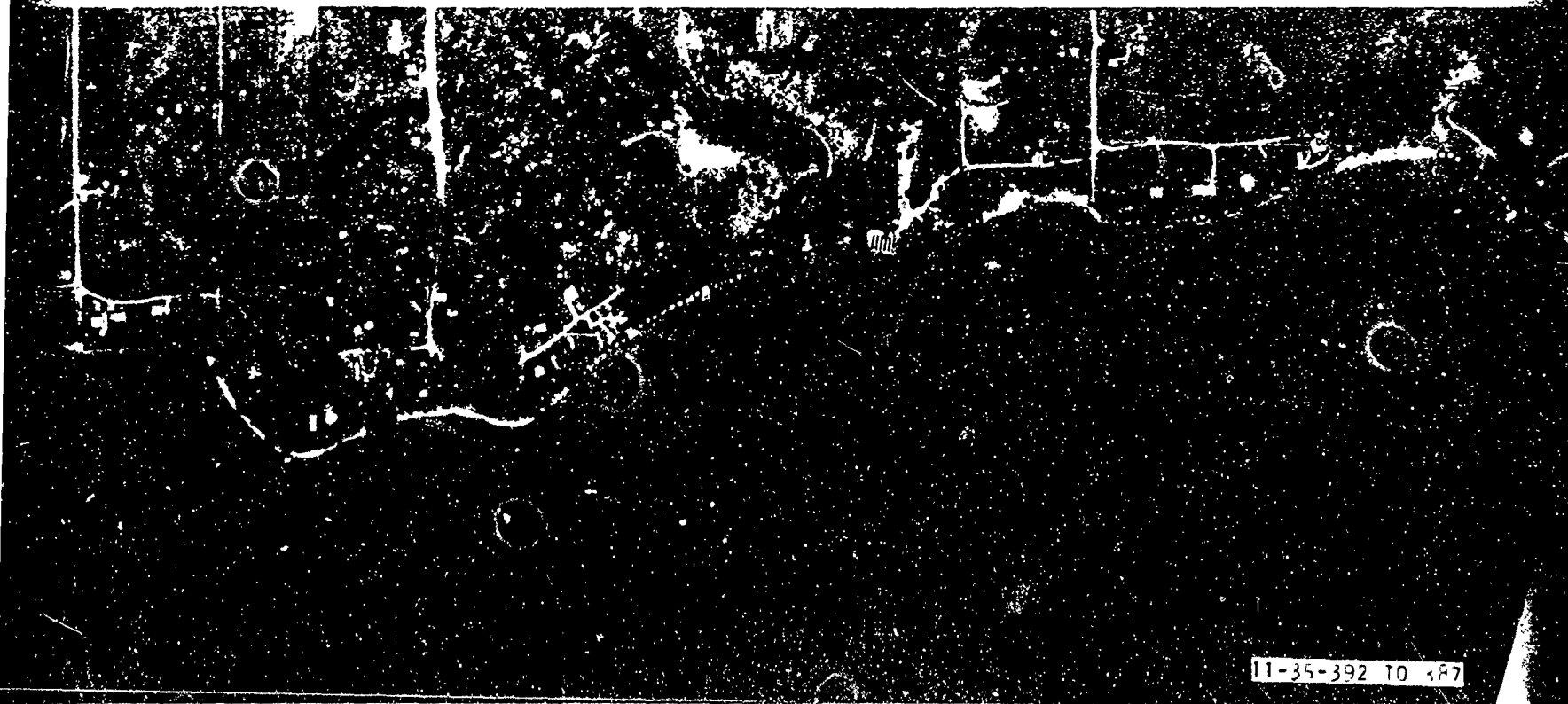
11-35-392 TO 397



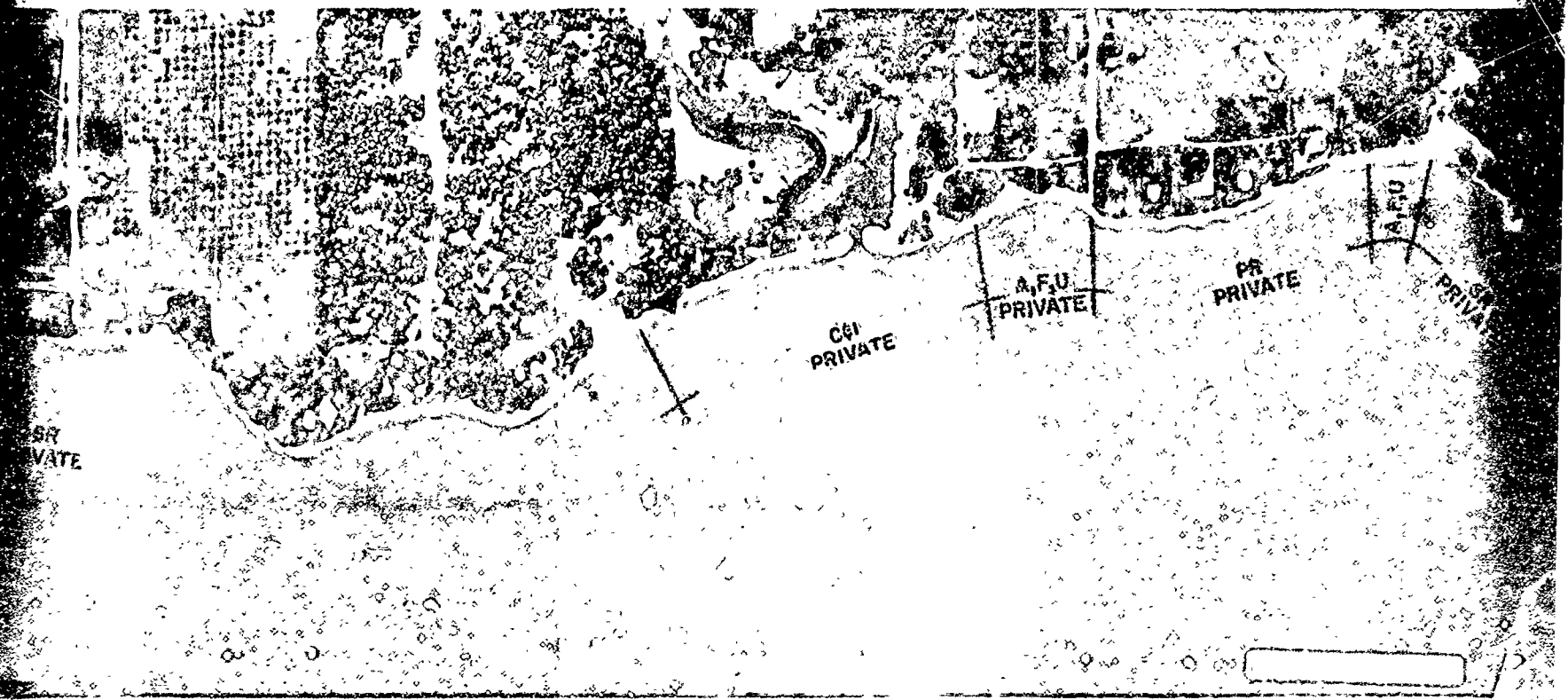
11-35-392 TO 397



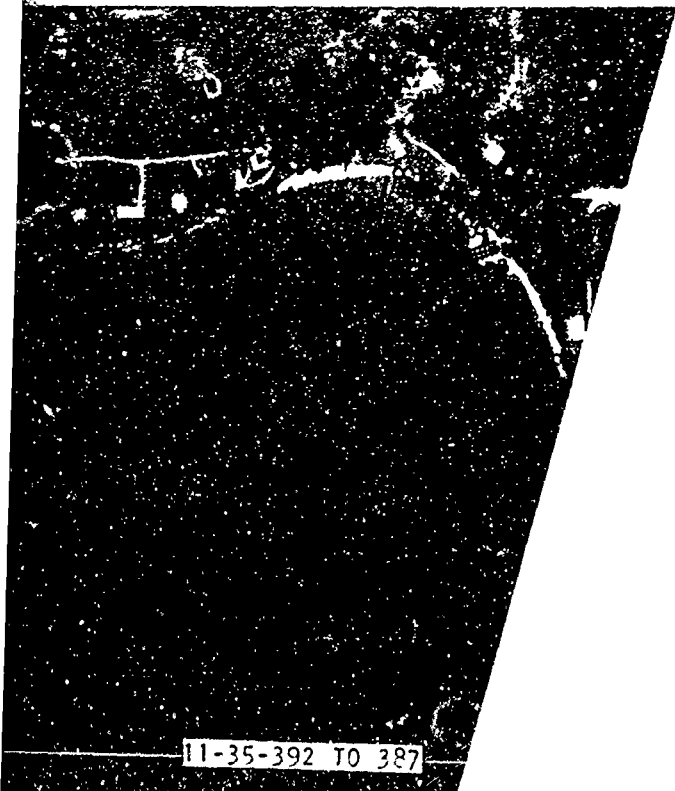
2



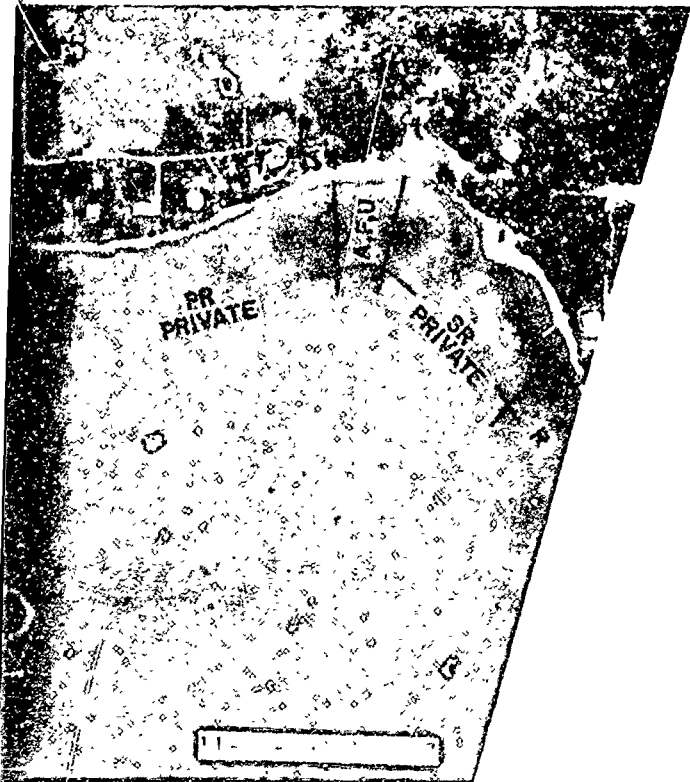
11-35-392 TO 487



3



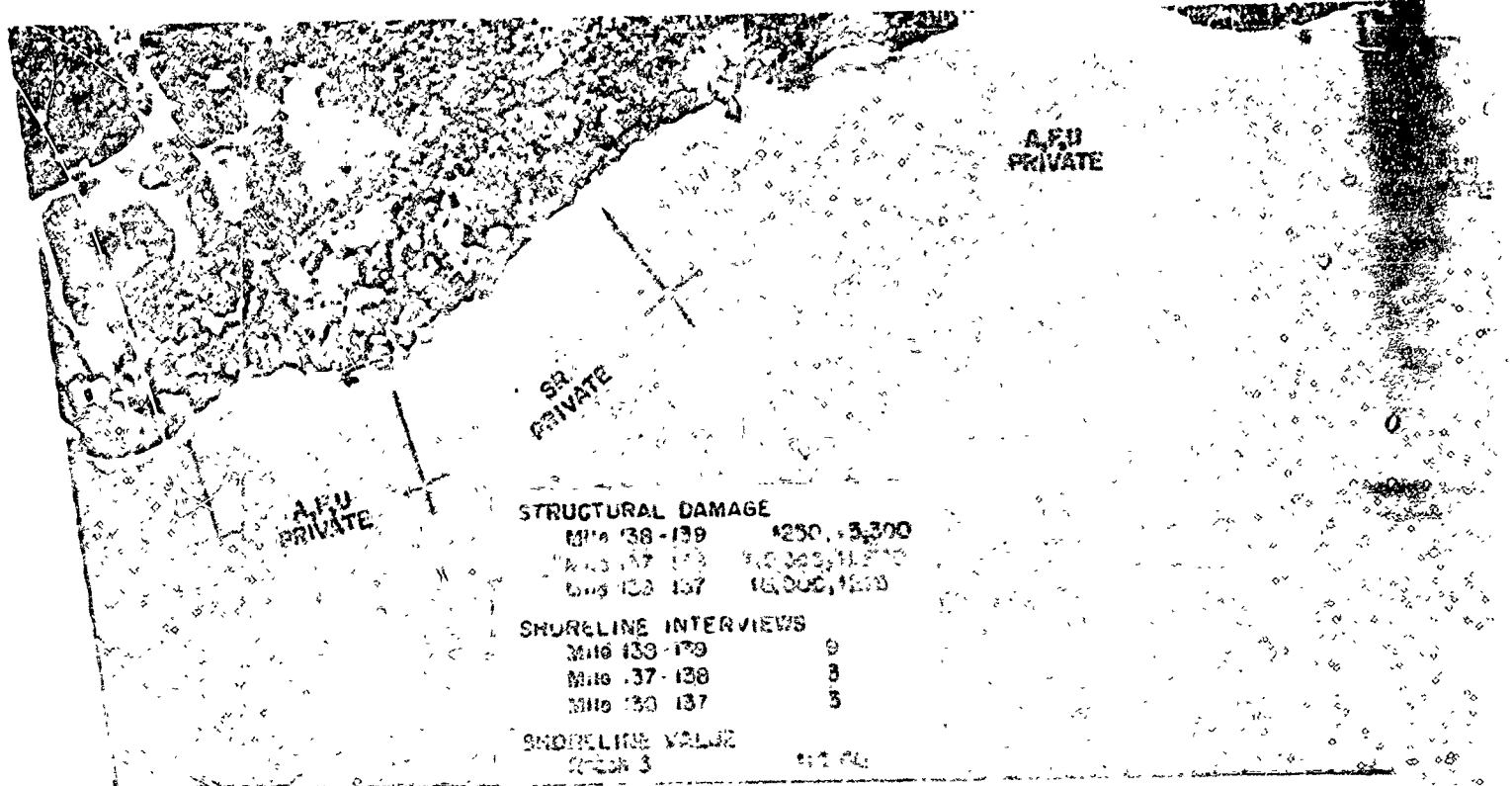
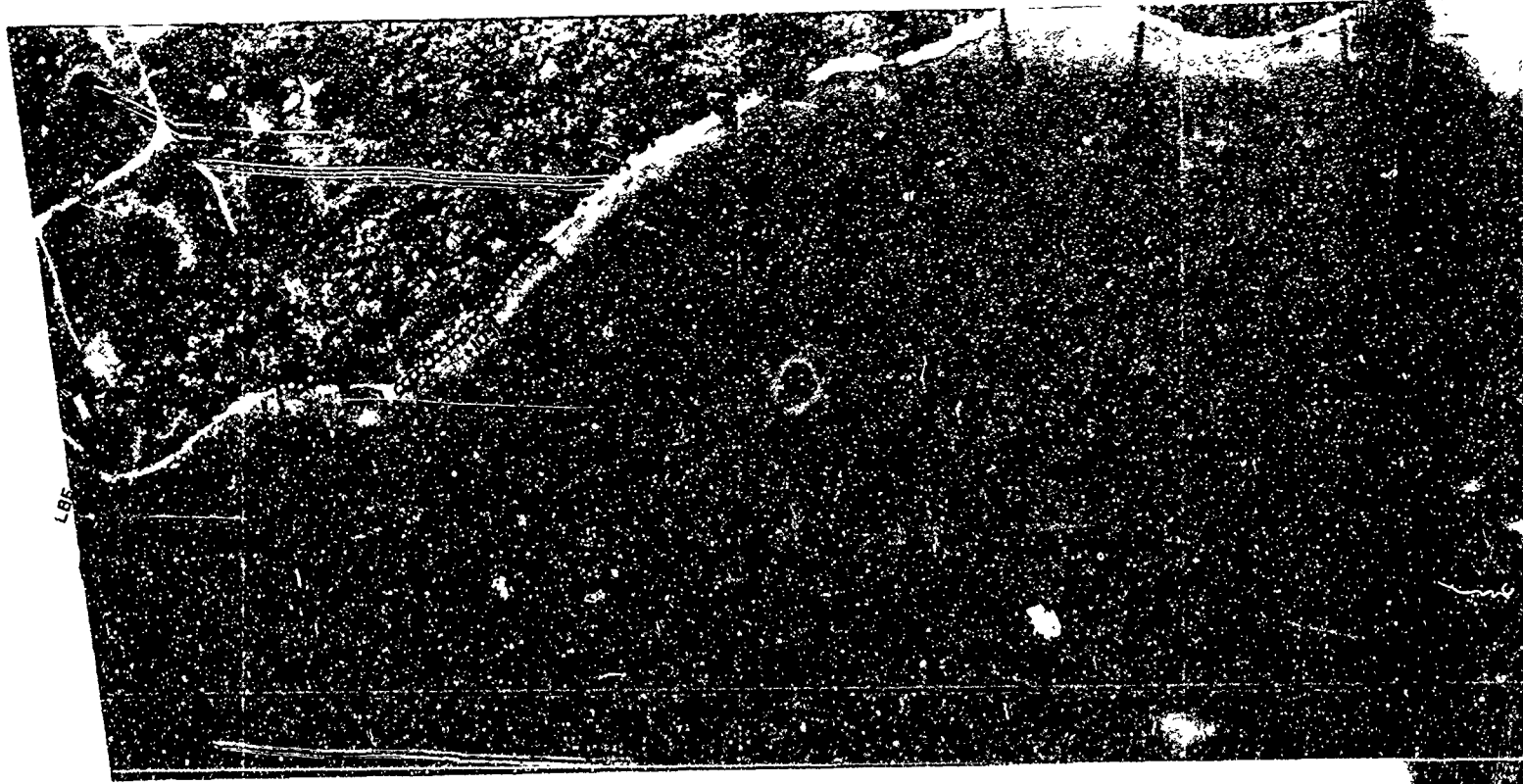
11-35-392 TO 387



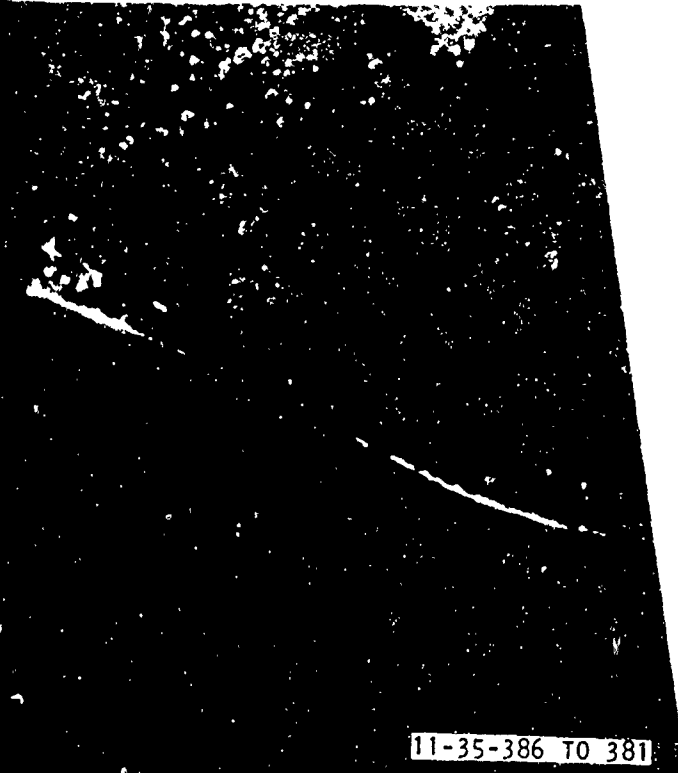
PR
PRIVATE

PR
PRIVATE

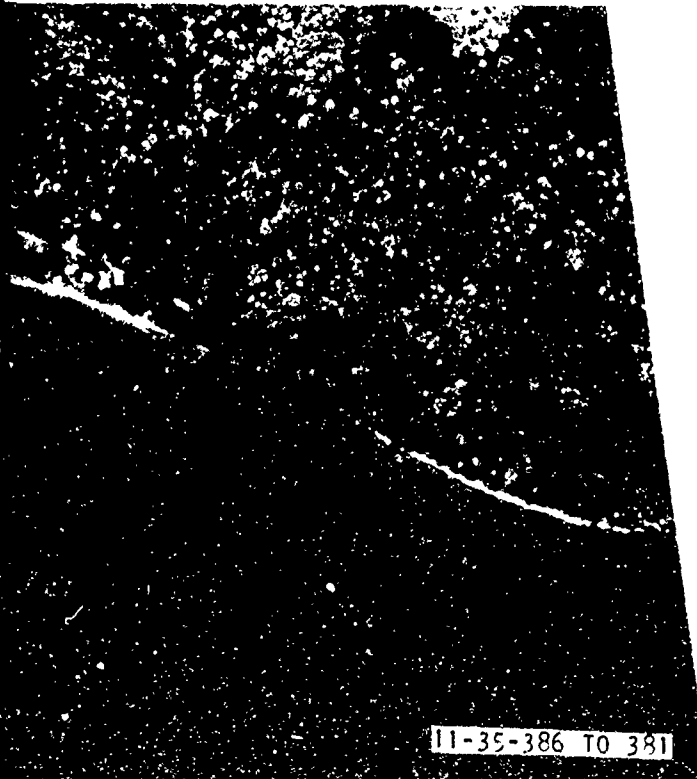
11-35-392 TO 387



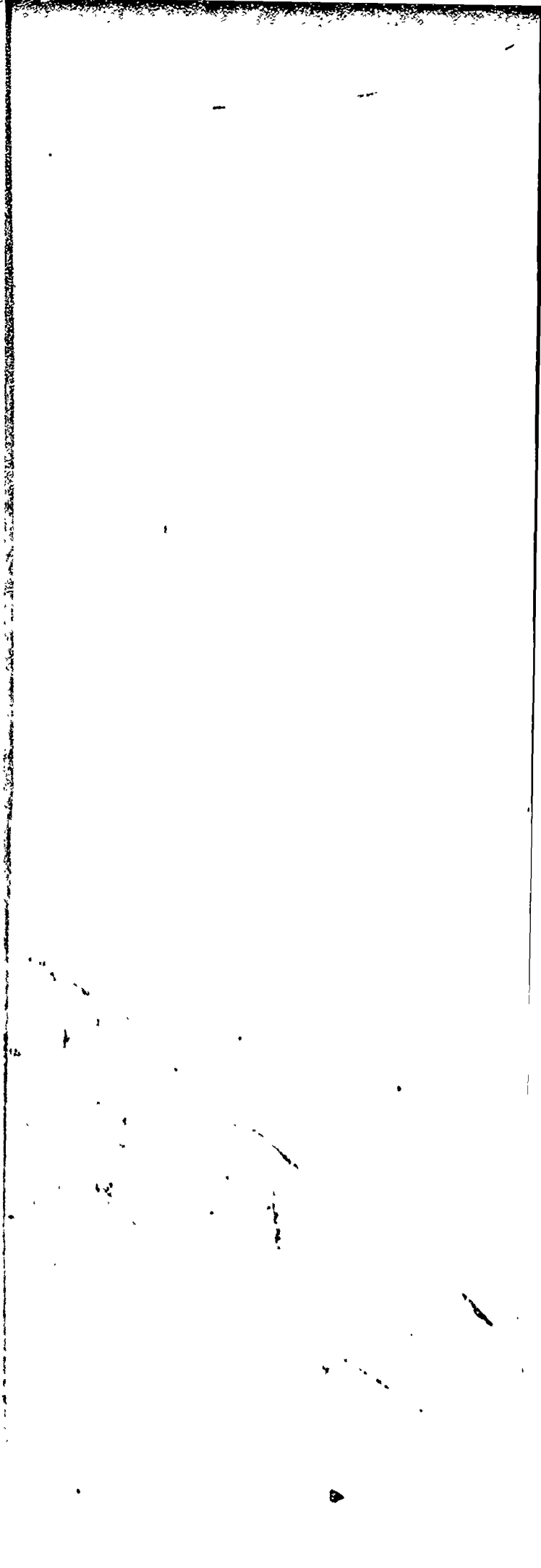
3

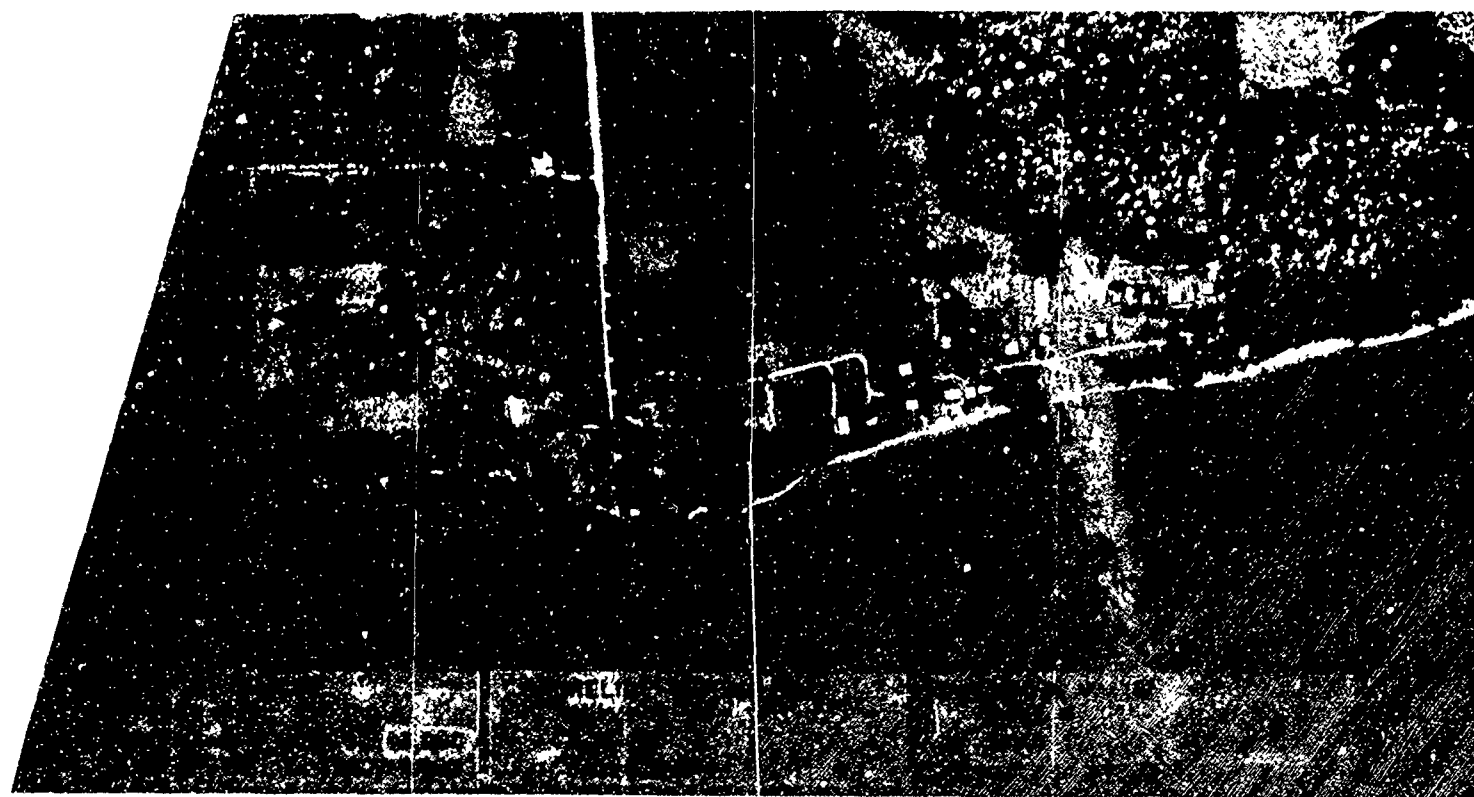


11-35-386 TO 381



11-35-386 TO 381



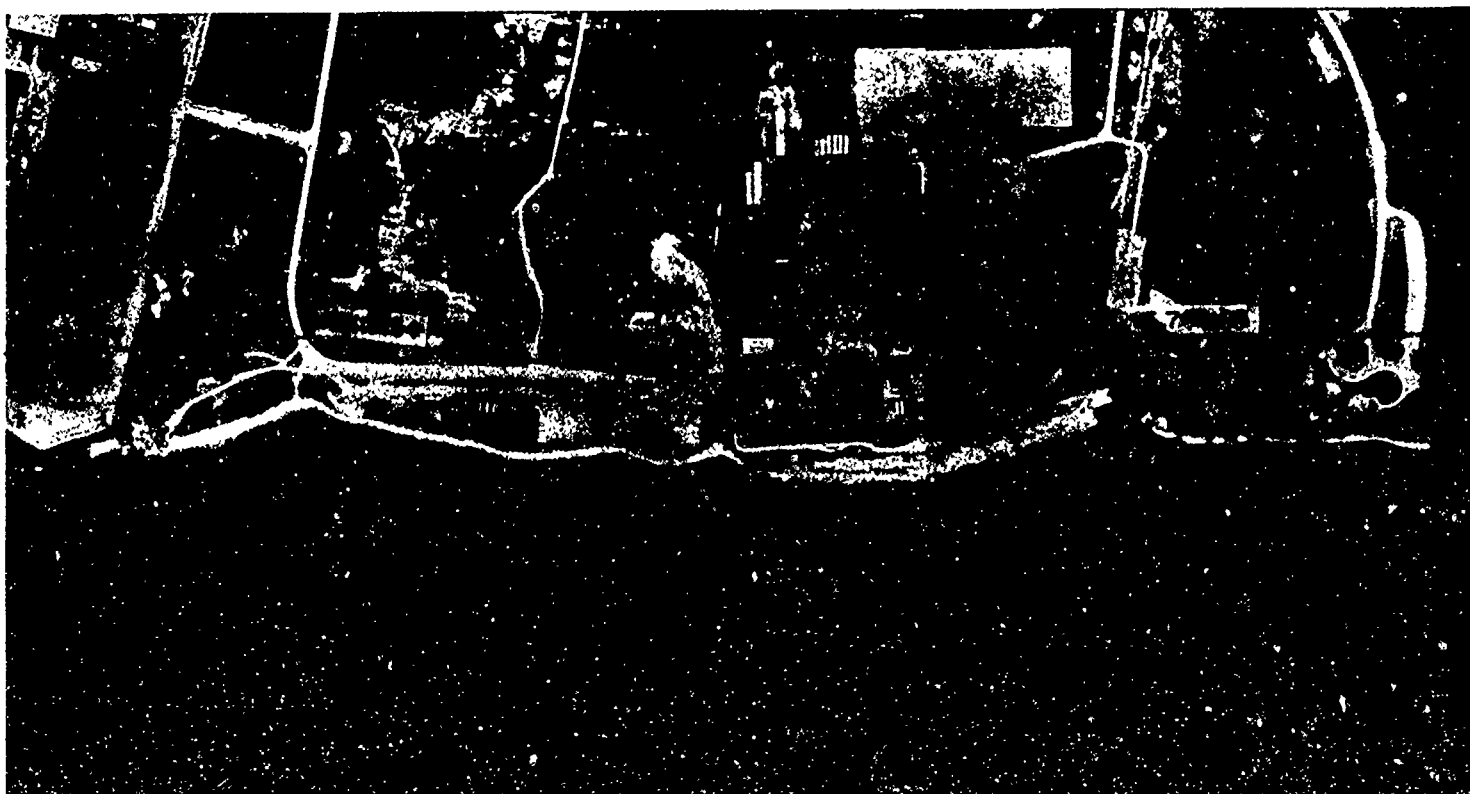
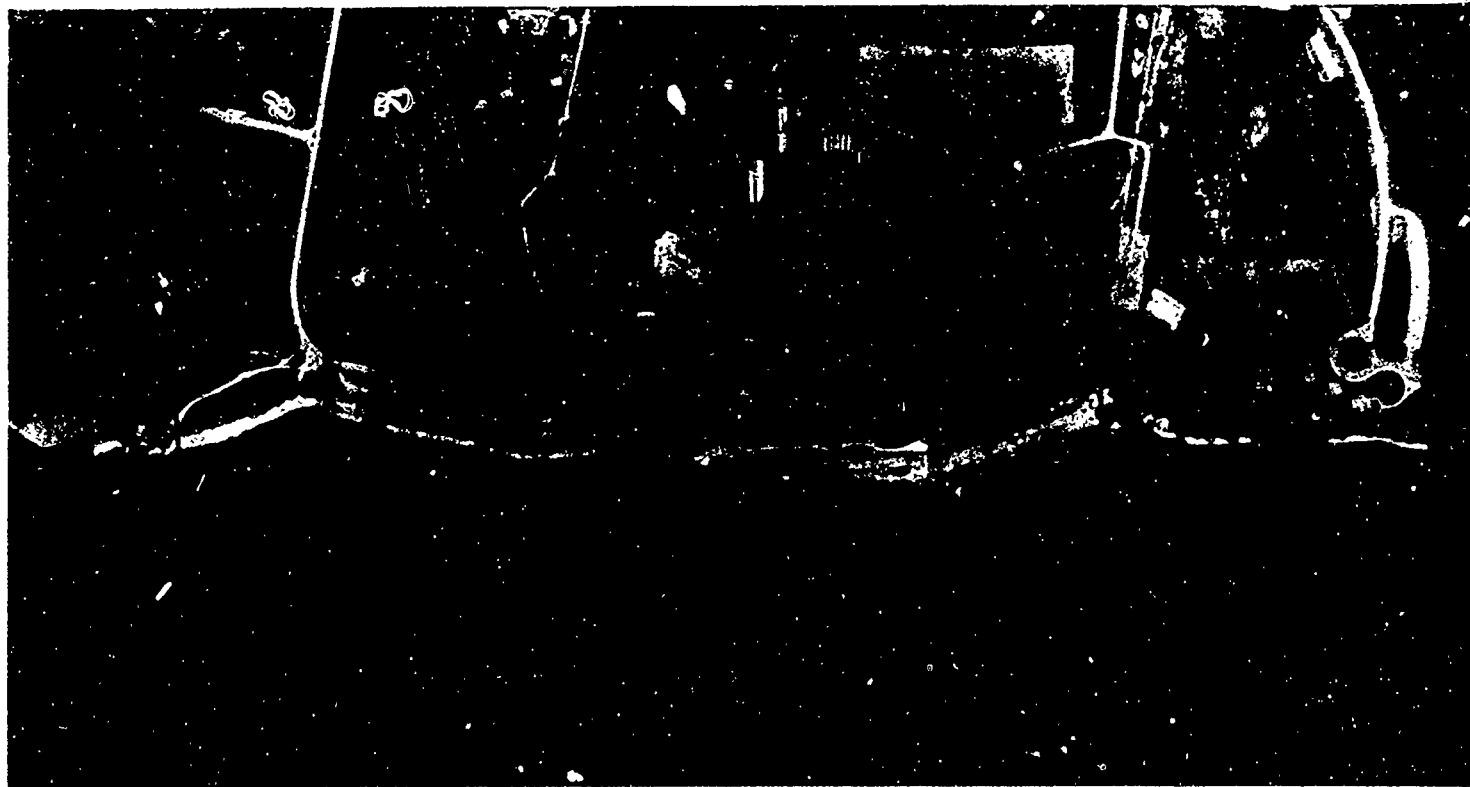




11-35-380 TO 374



11-35-380 TO 374

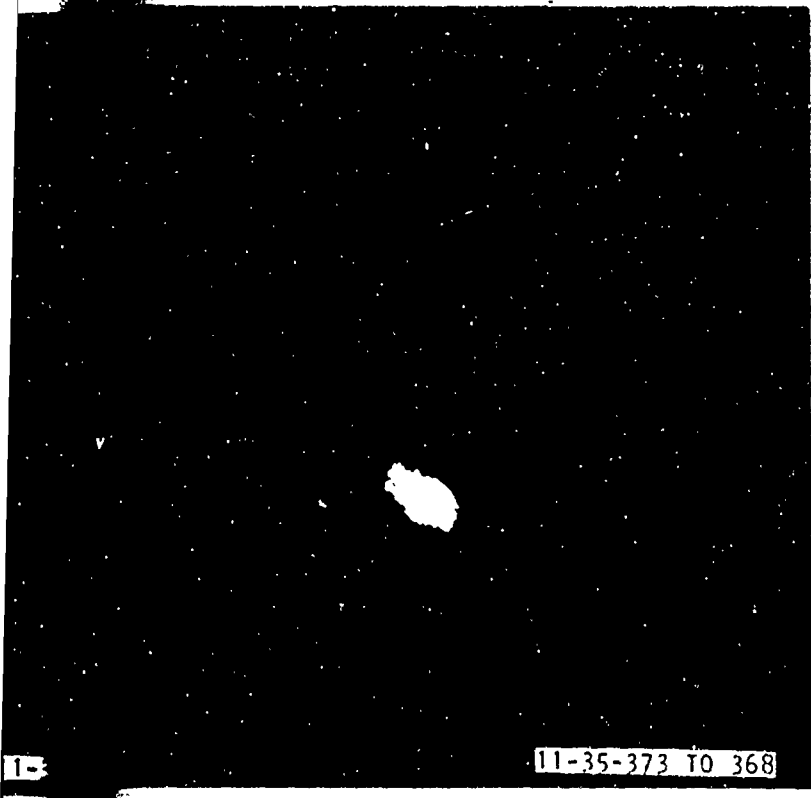


2 1

115

115

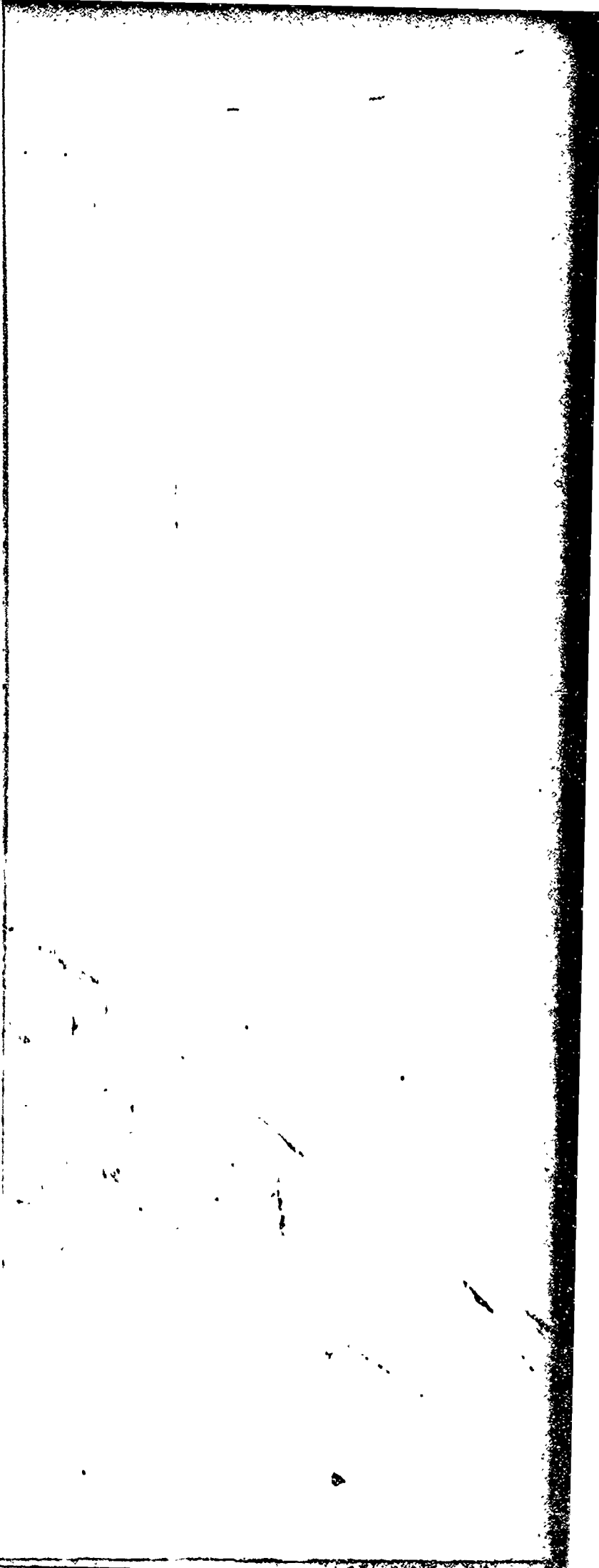
3

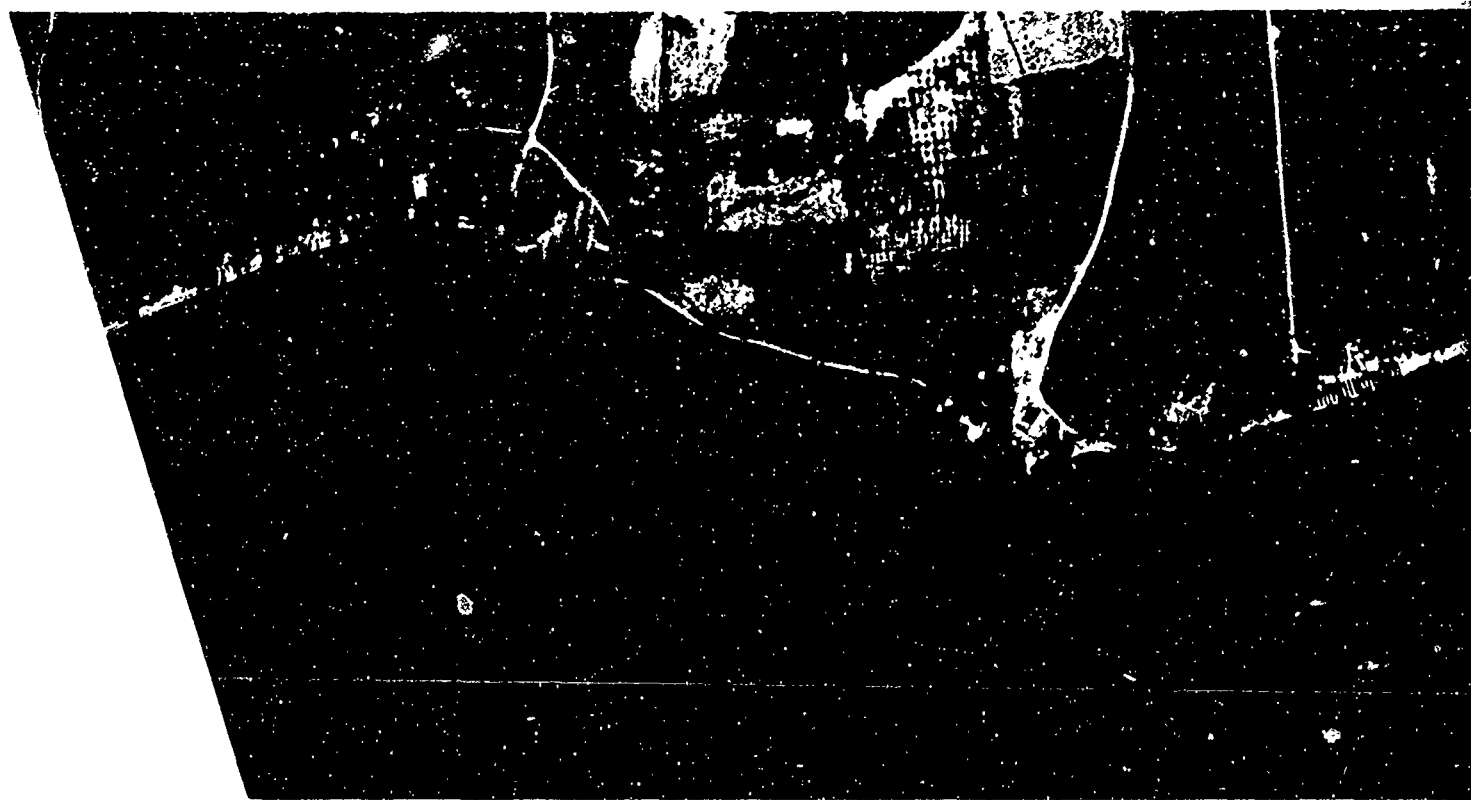


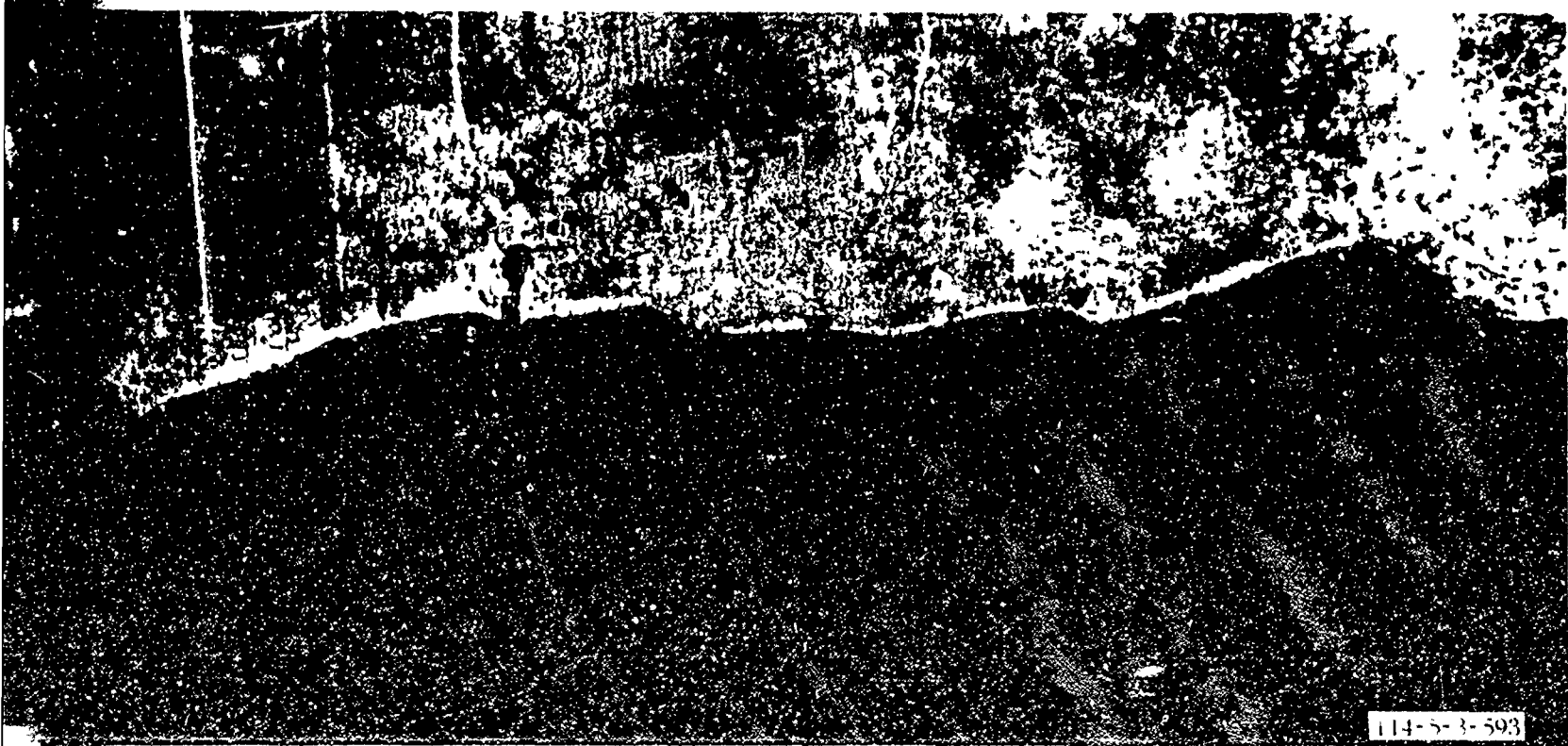
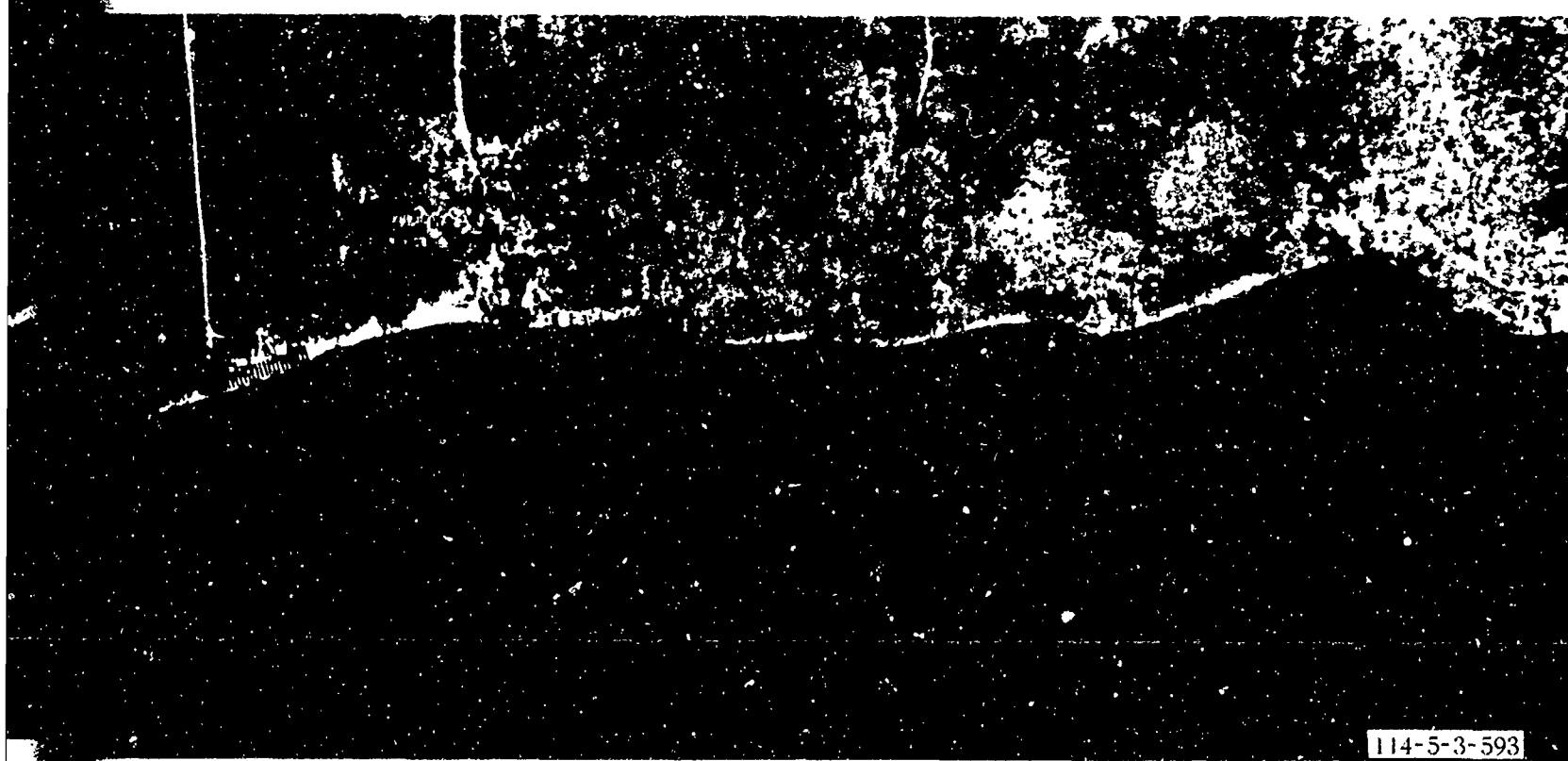
11-35-373 TO 368

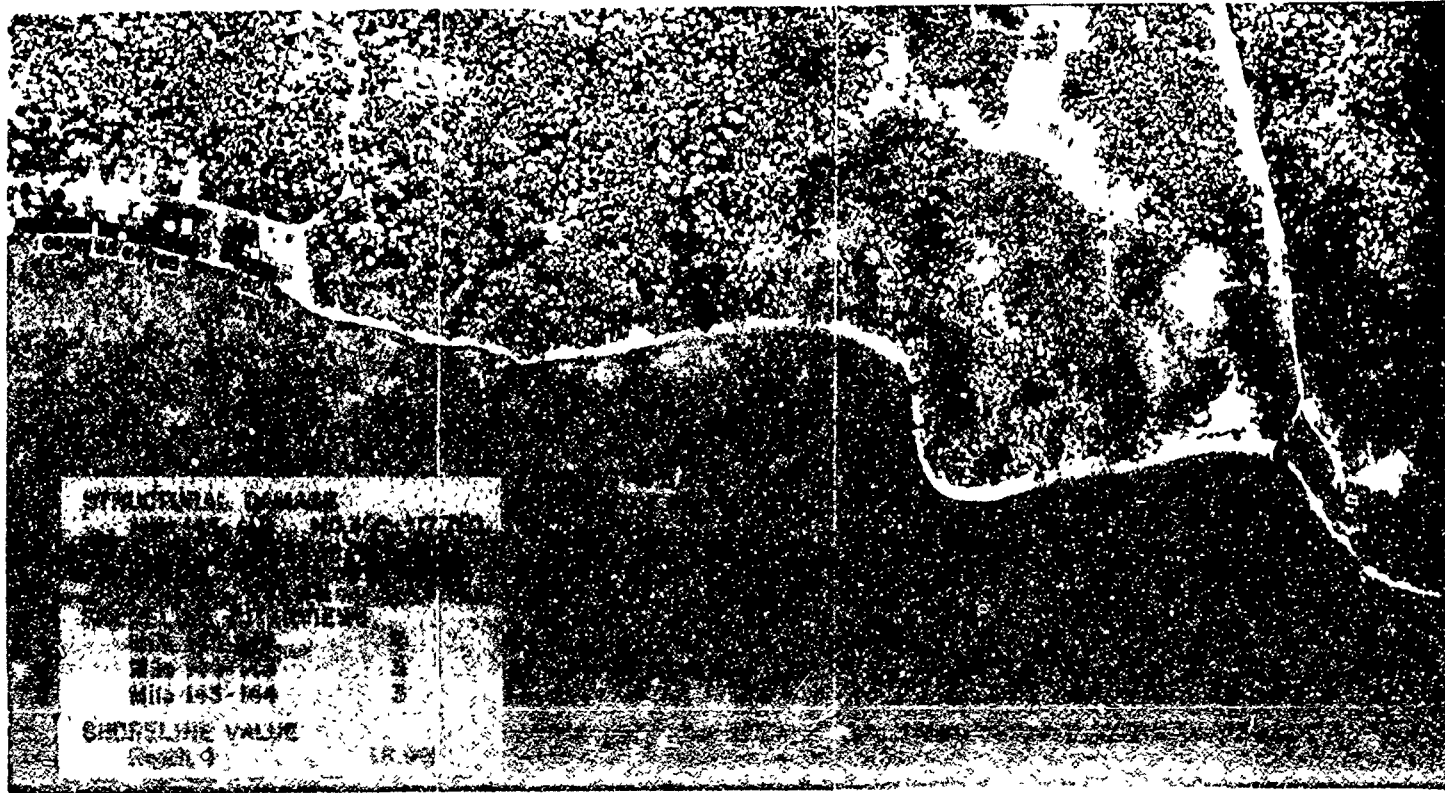
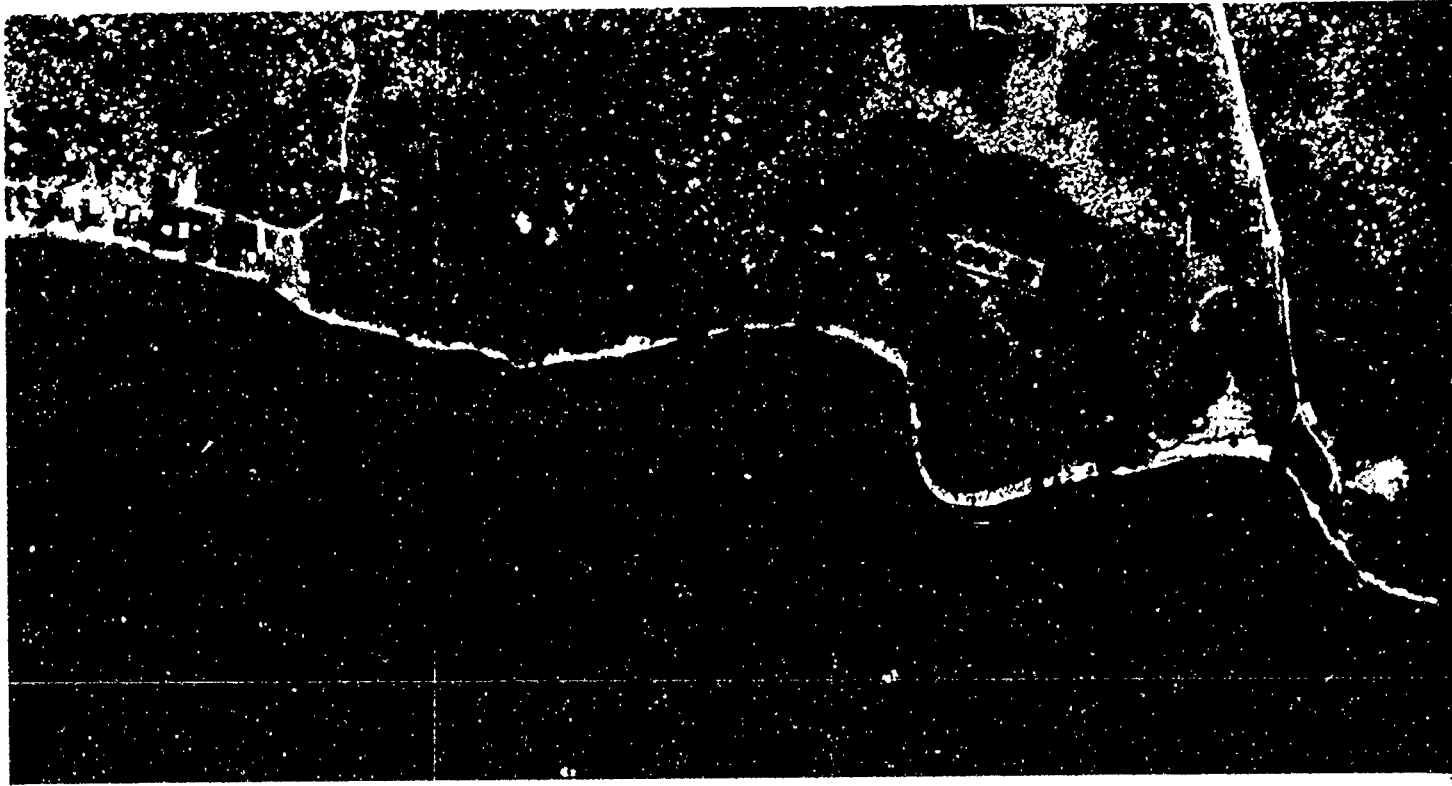


11-35-373 TO 368

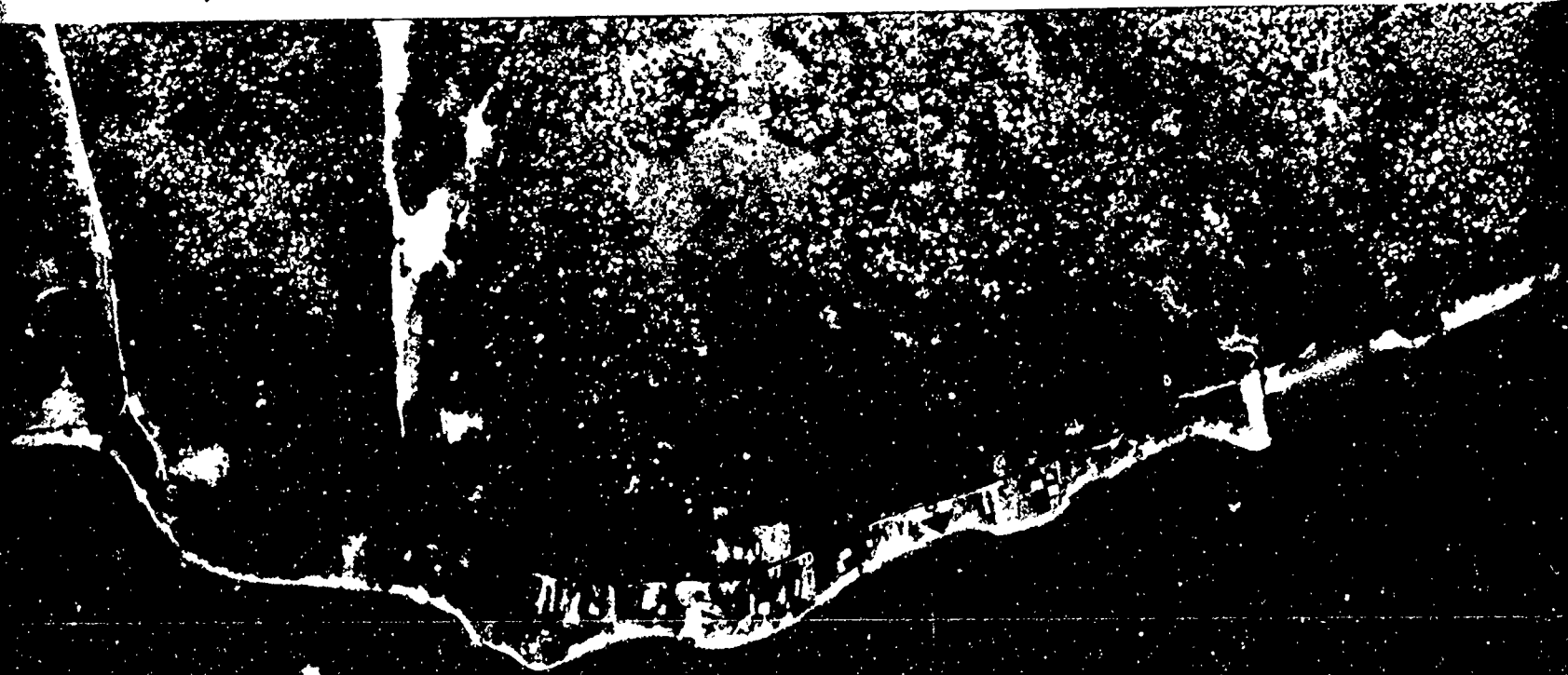




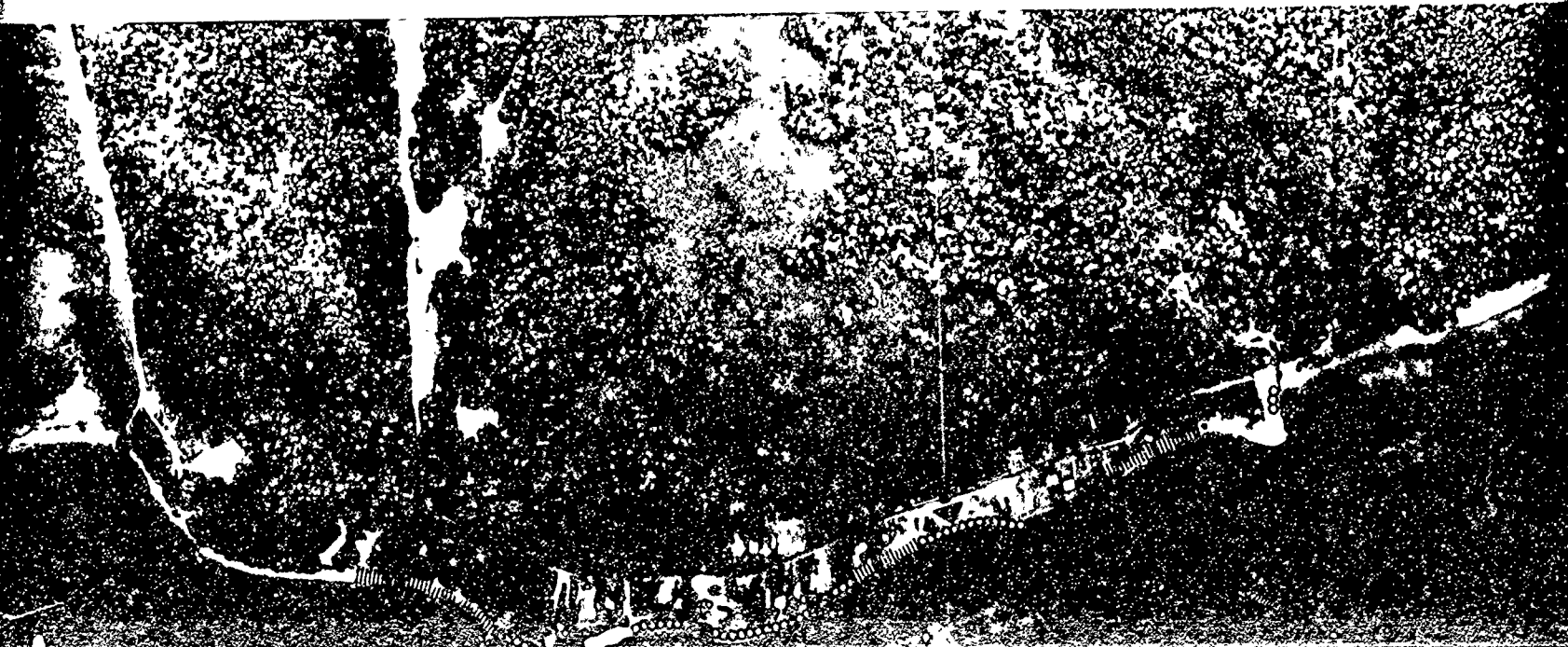




2

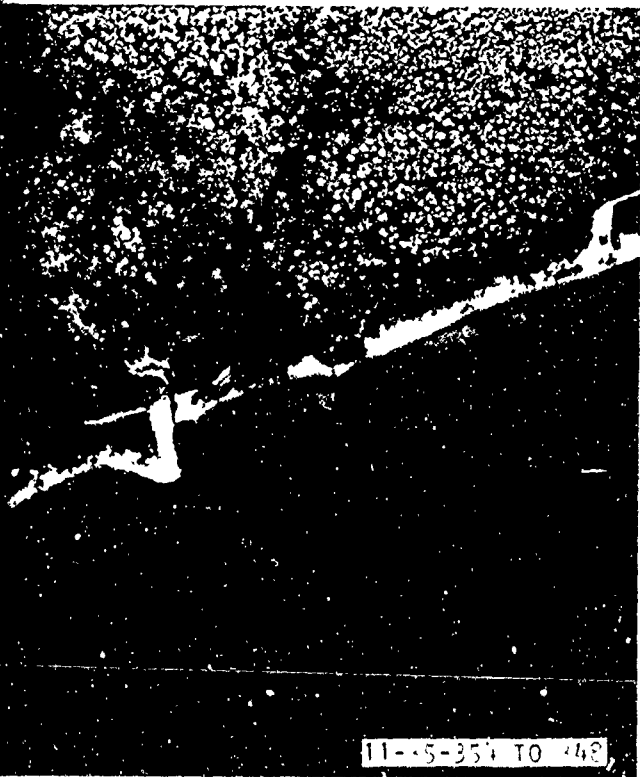


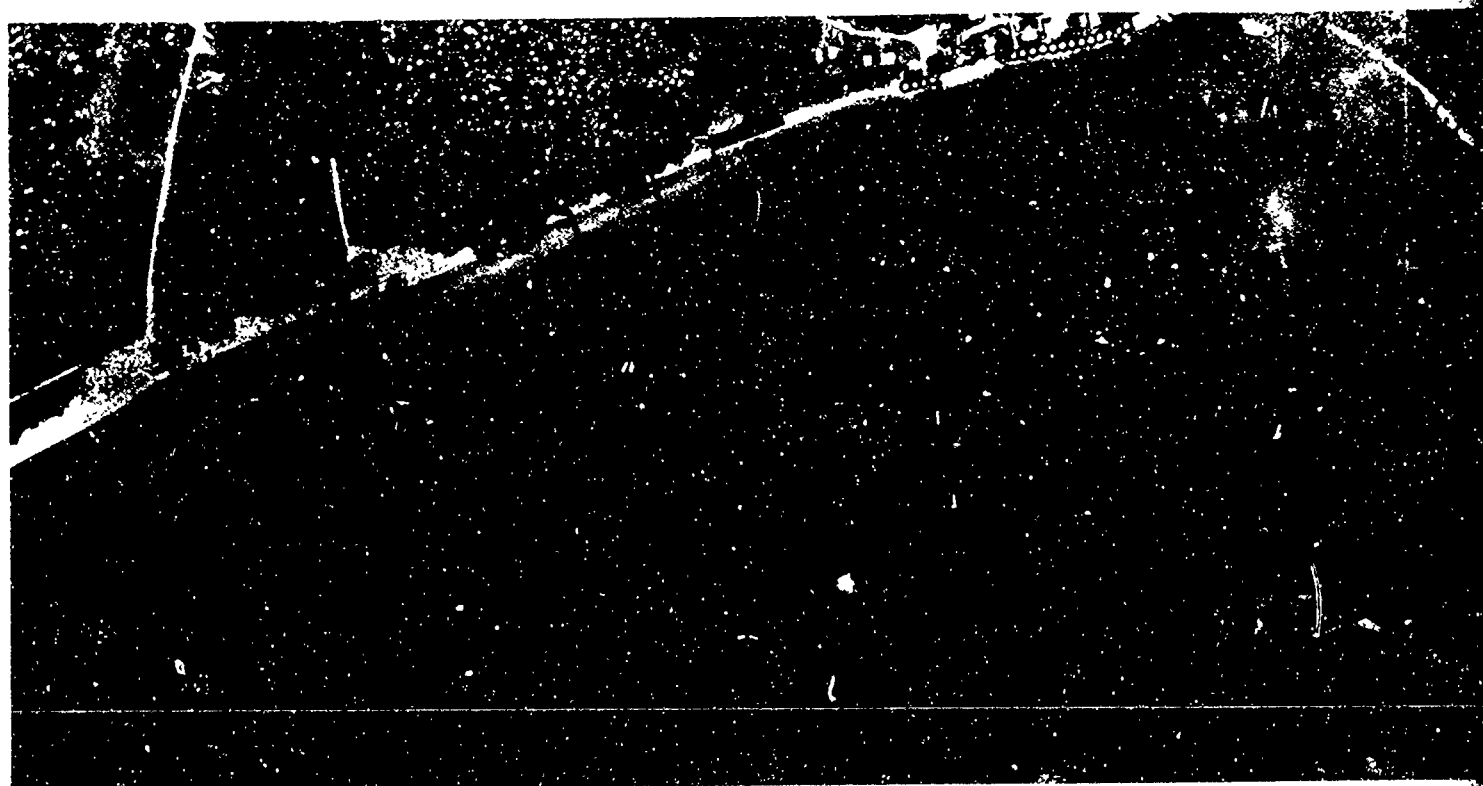
11-35

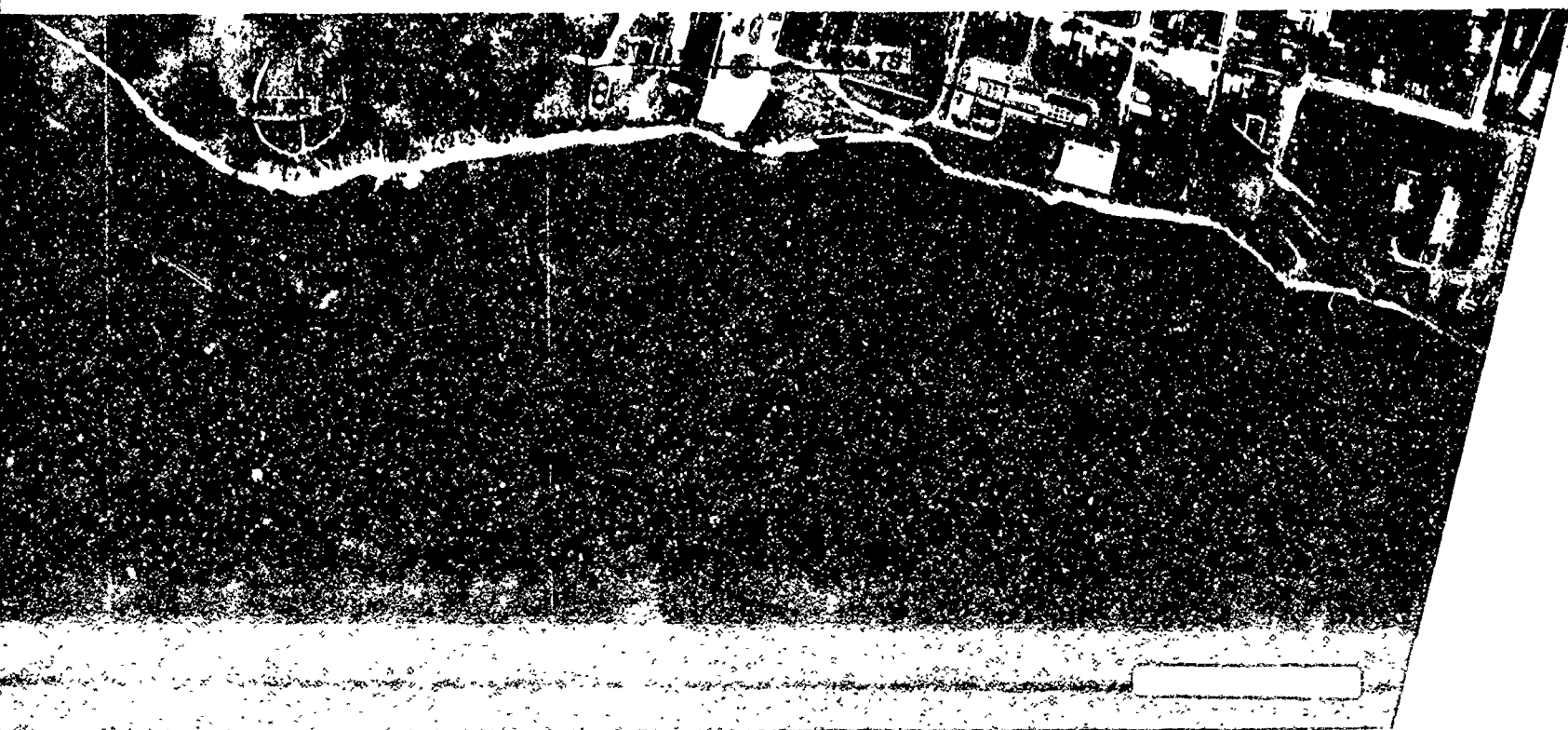


31

3

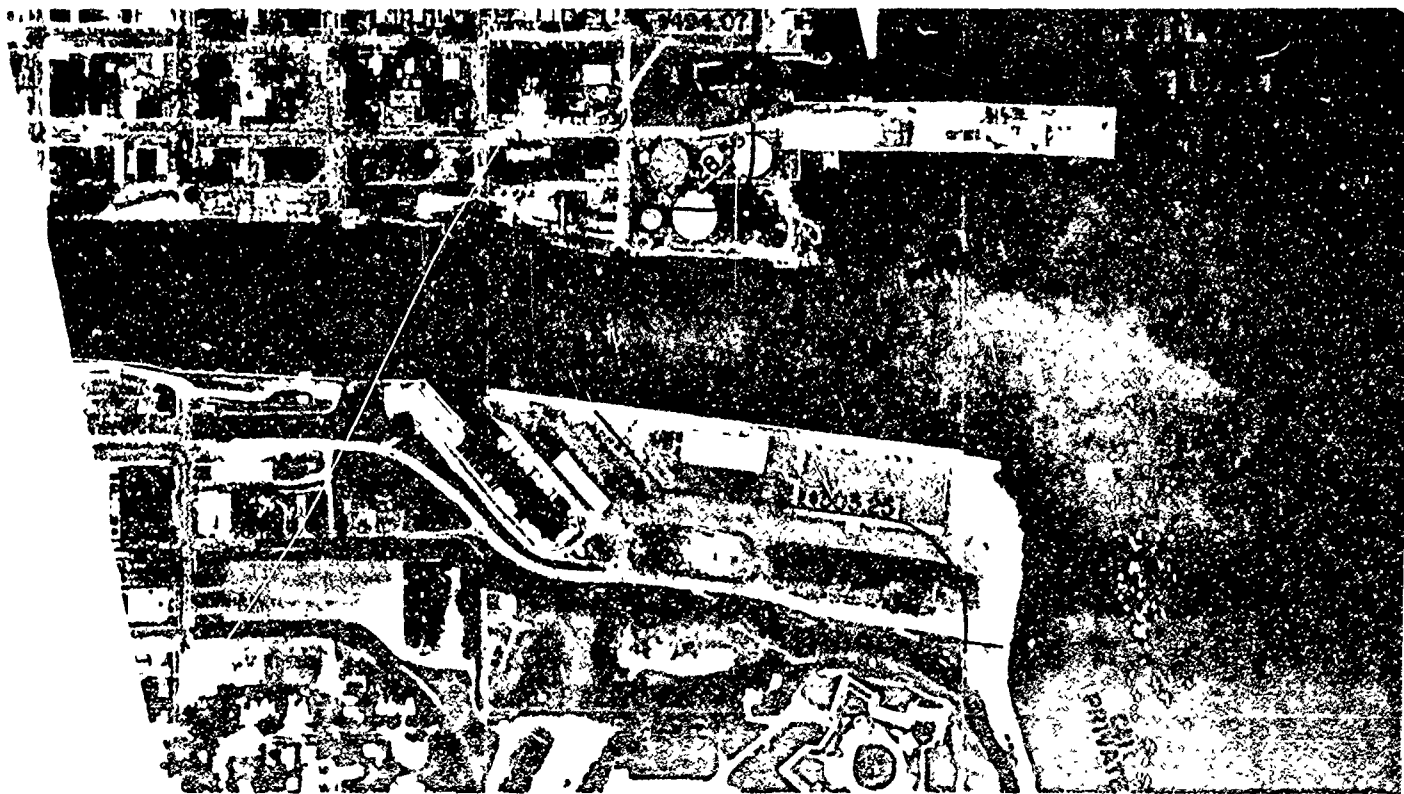
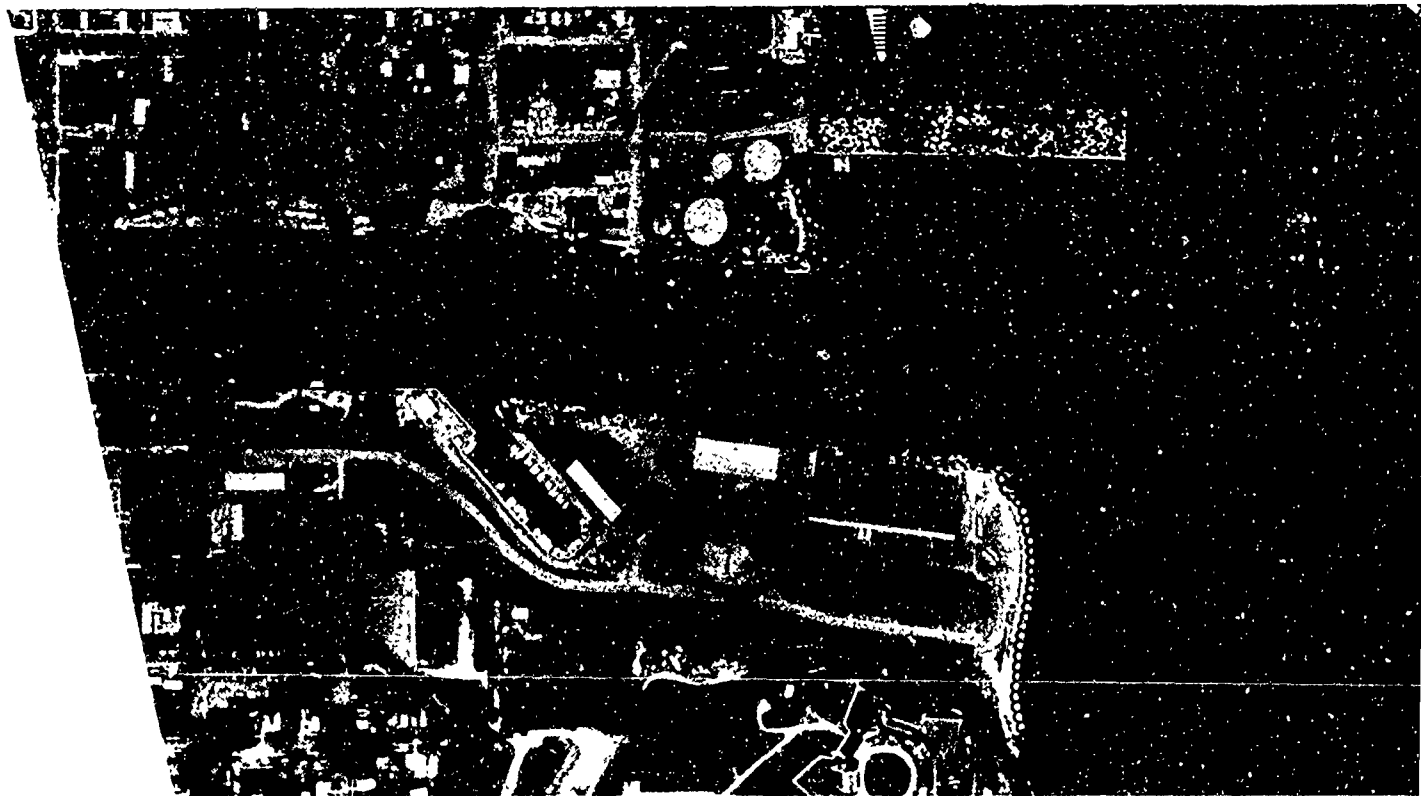






2

1



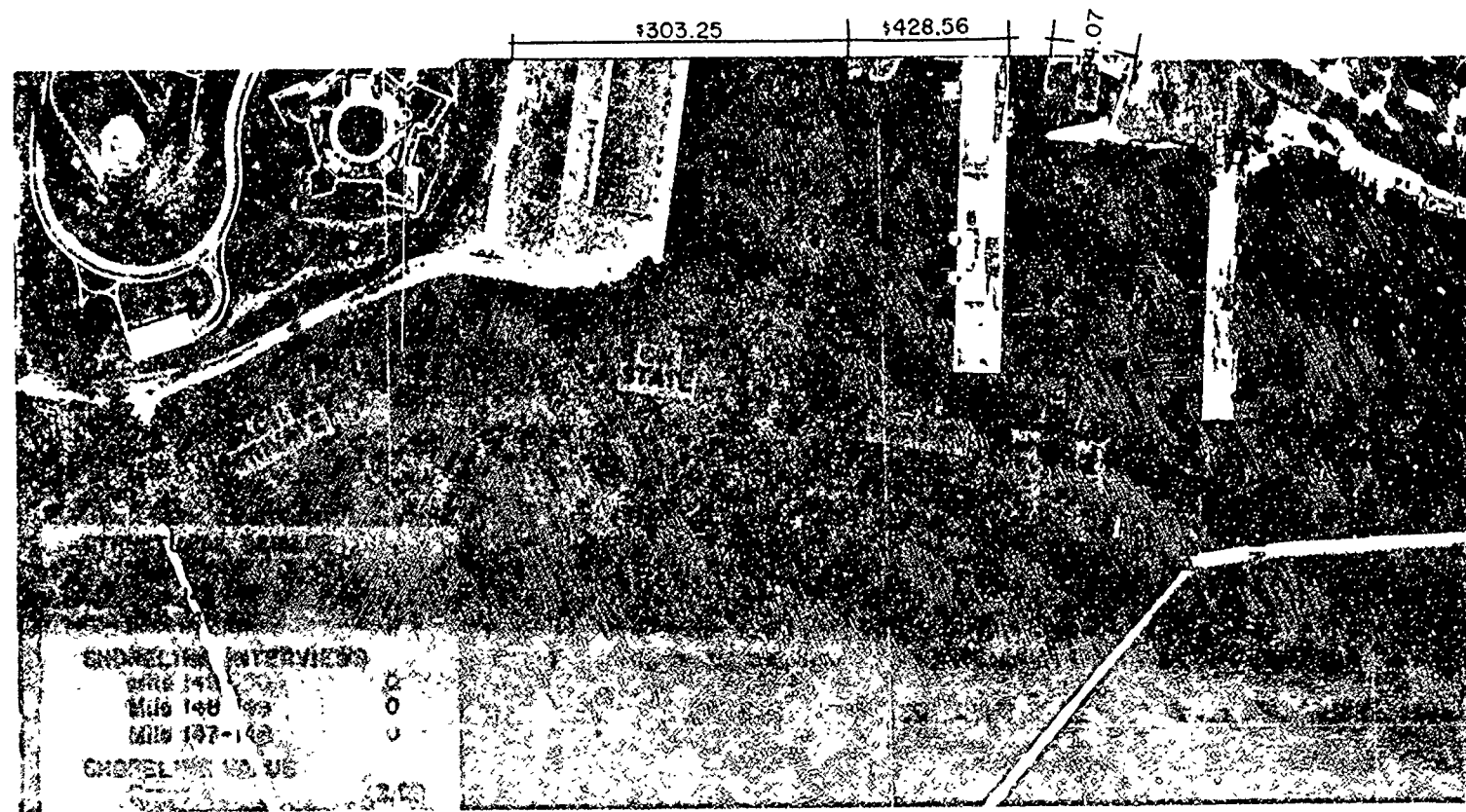
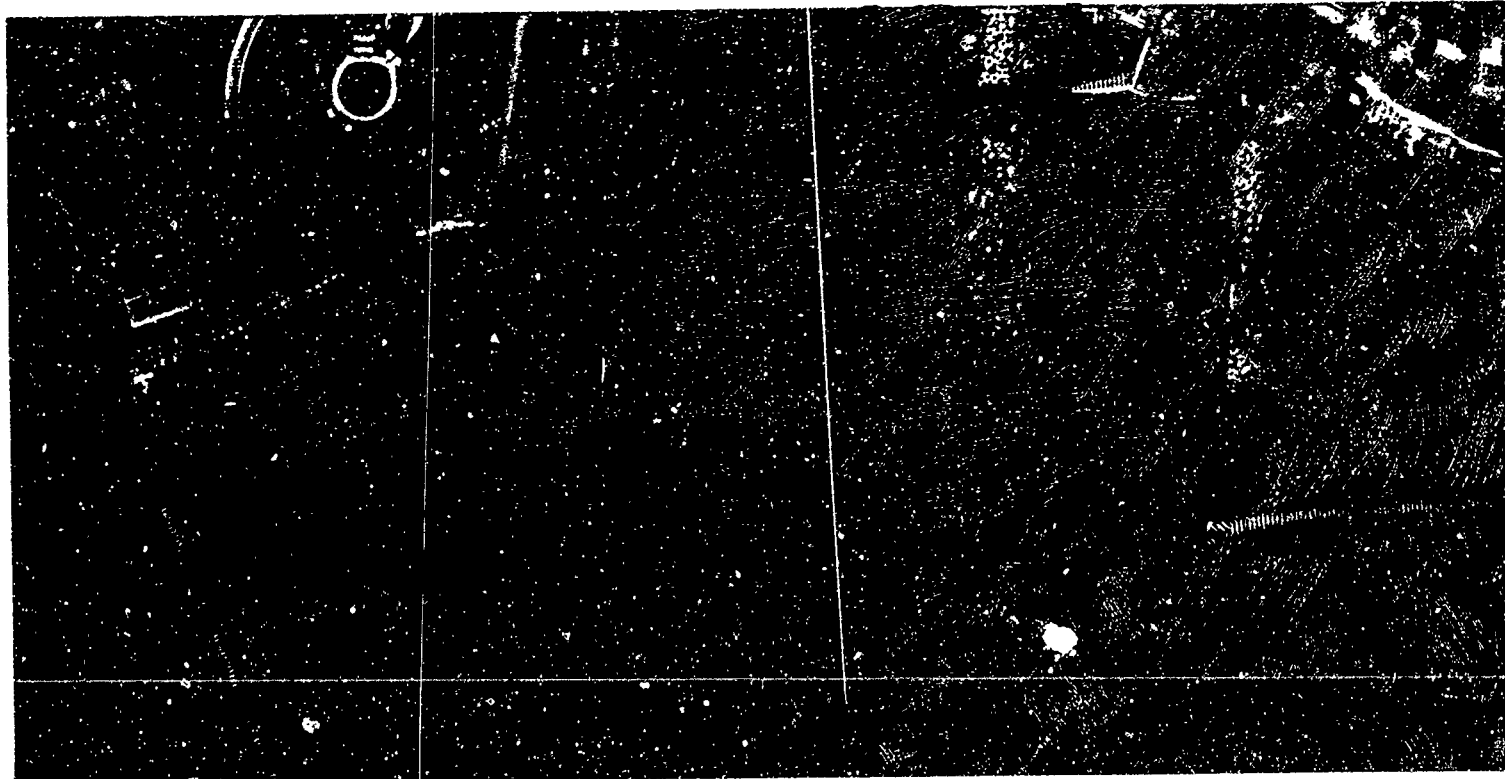
11-35-362 TO 3

STRUCTURAL DAMAGE	
MIN 145-146	0 1 0
MIN 147-148	0 1 0
SHORELINE INTERFACES	
MIN 145-146	0
MIN 147-148	0
SHORELINE VALUE	
Peak 4	10.00

2

1

0 367



\$303.25

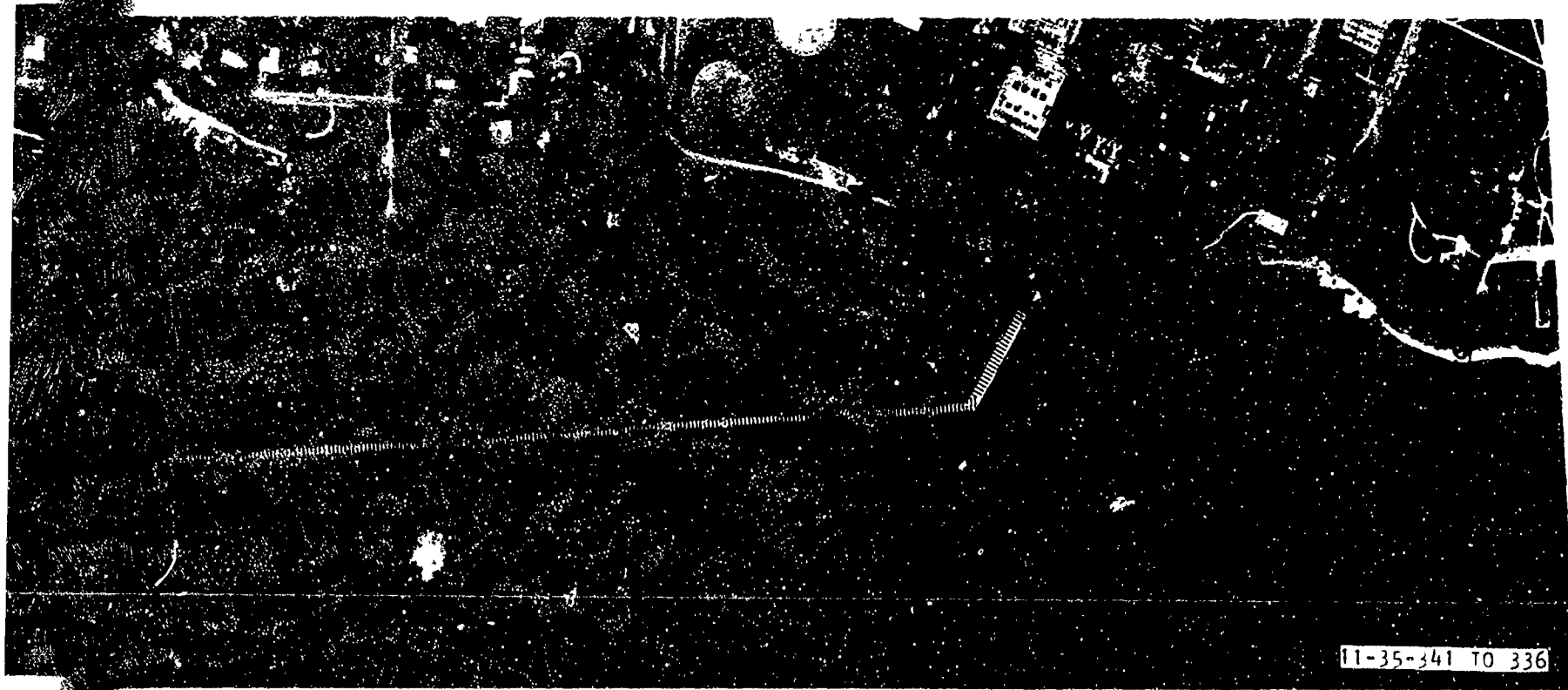
\$428.56

\$354.07

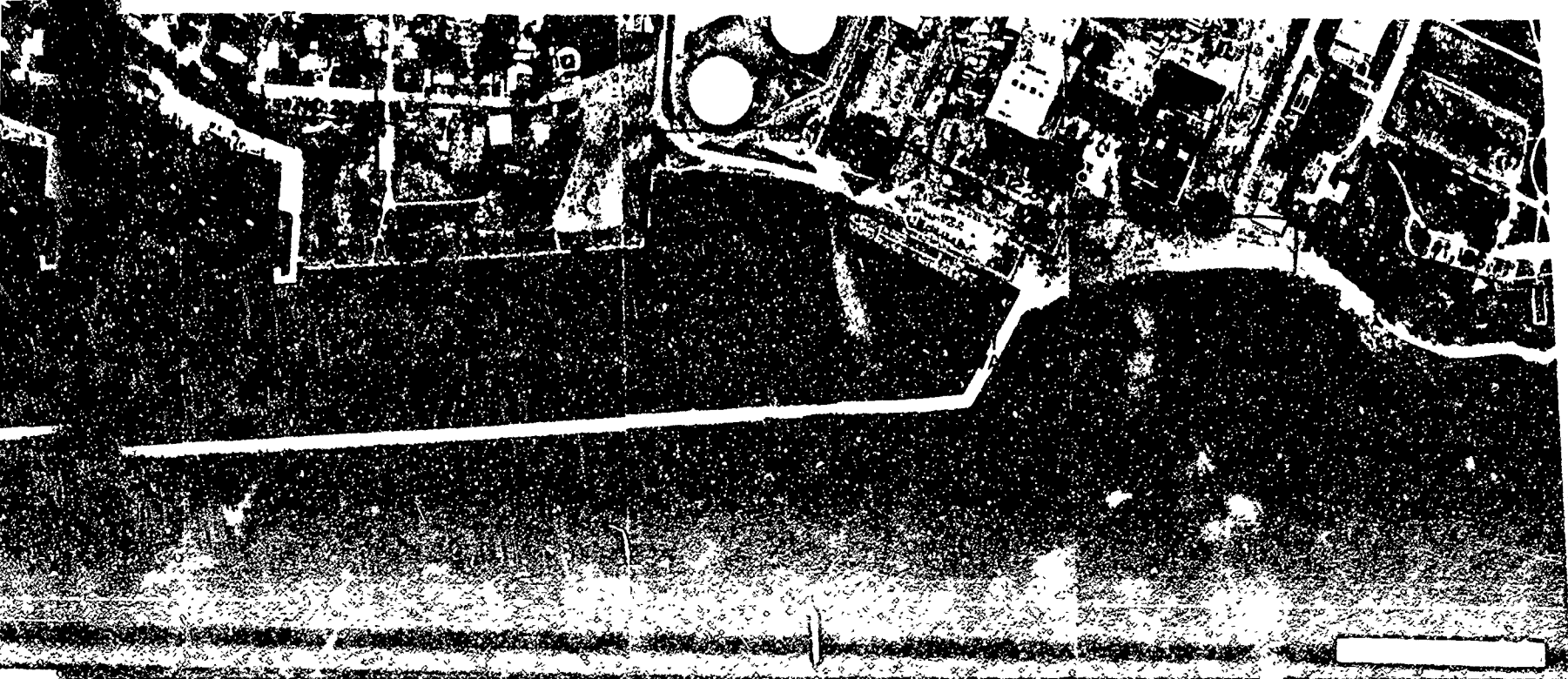
ENGINEERING INTERVIEW
 Mils 140
 Mils 148
 Mils 137-140
 CHORTEL NO. 16

0
 0
 0

2.00

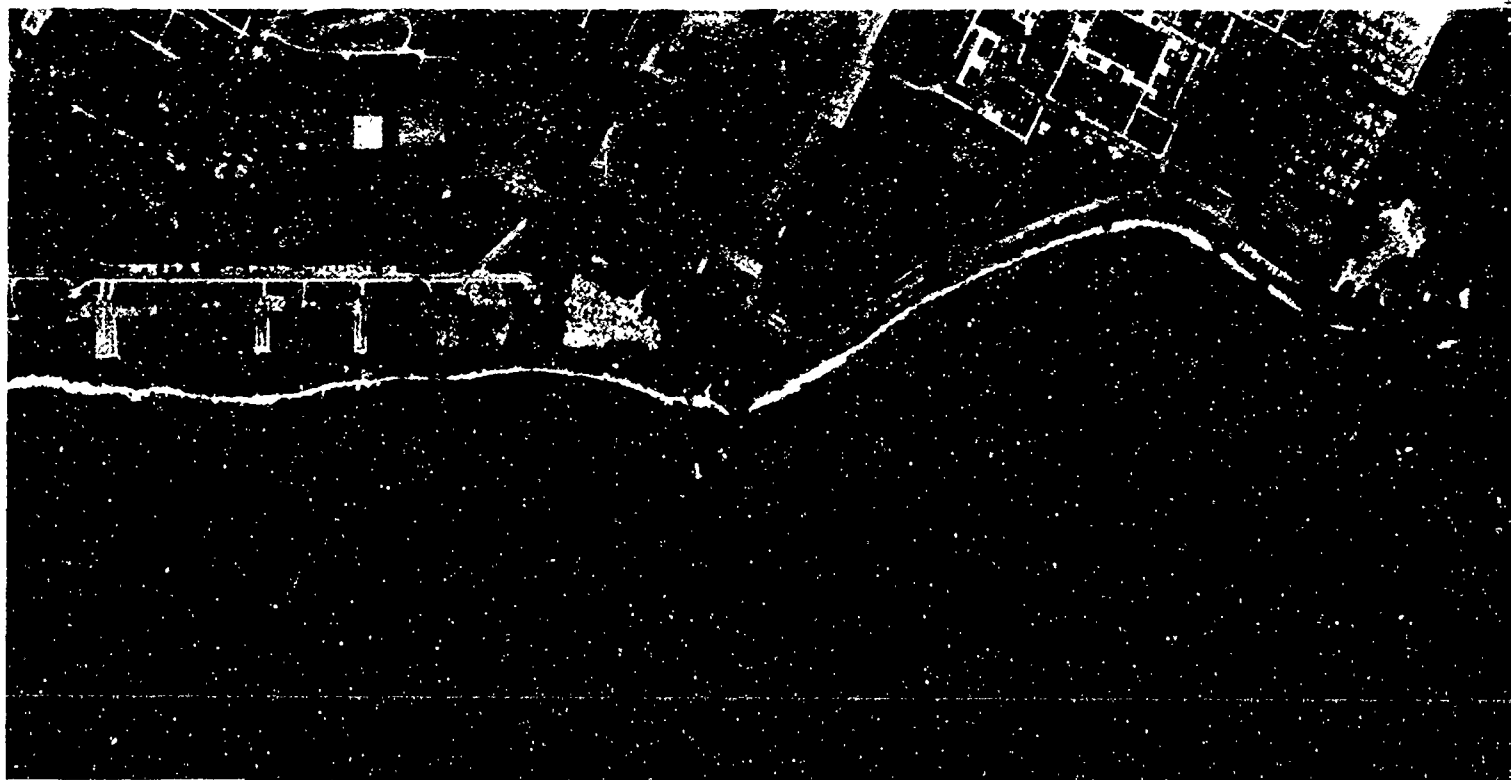


11-35-341 TO 336



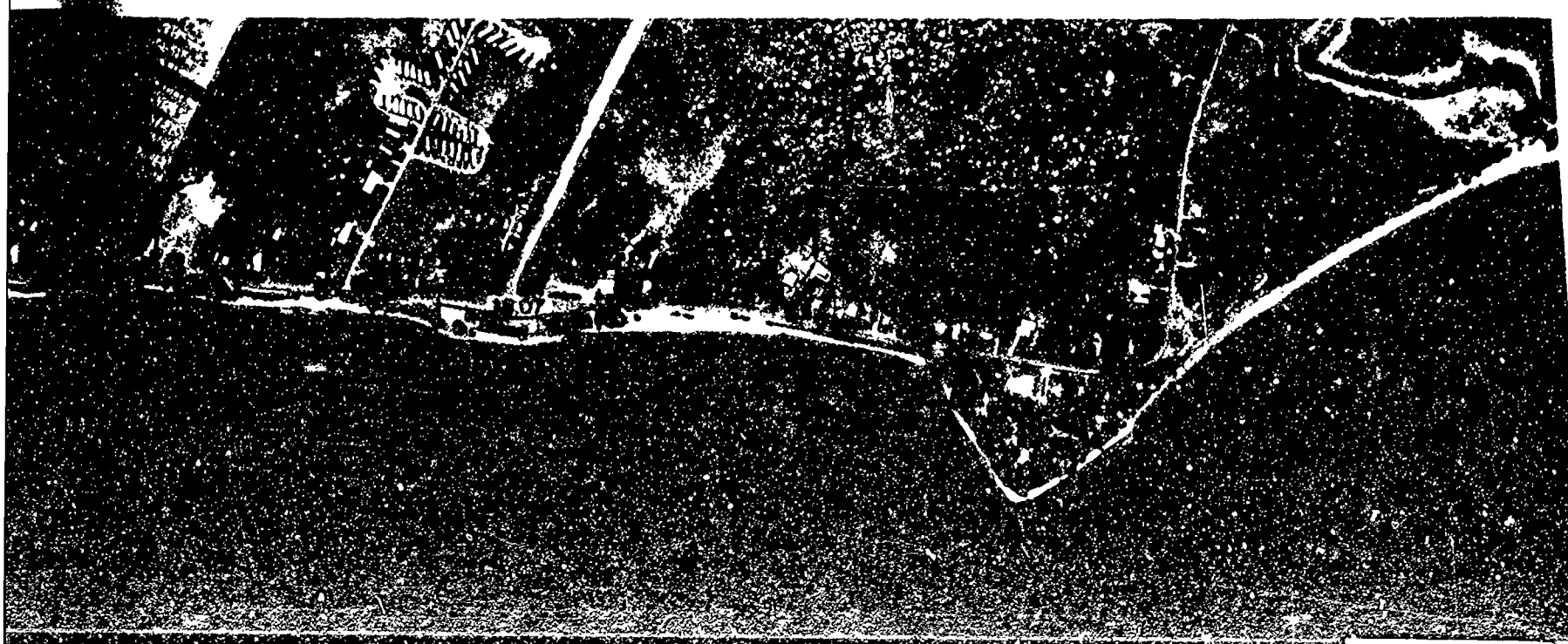
2

1

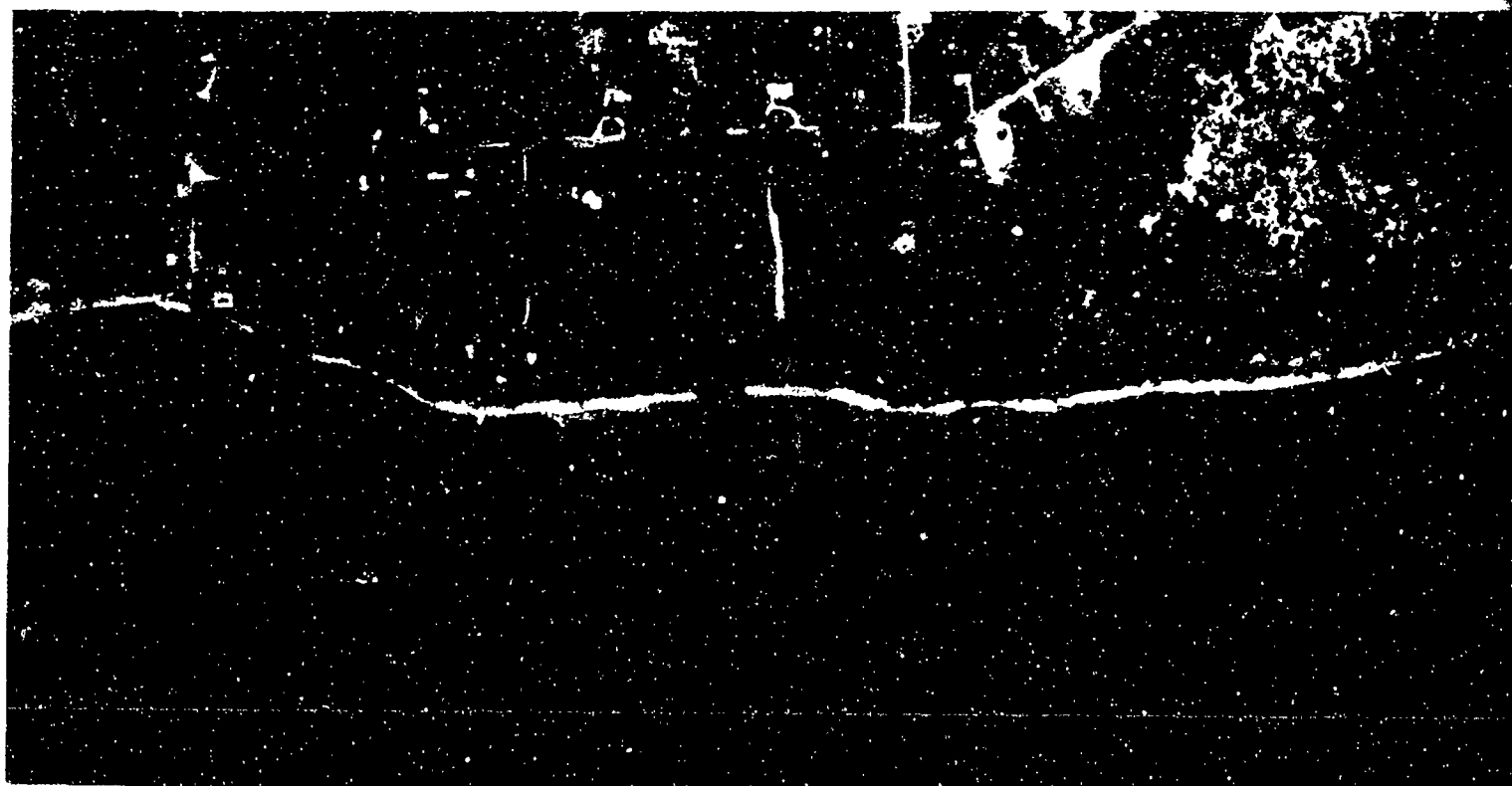


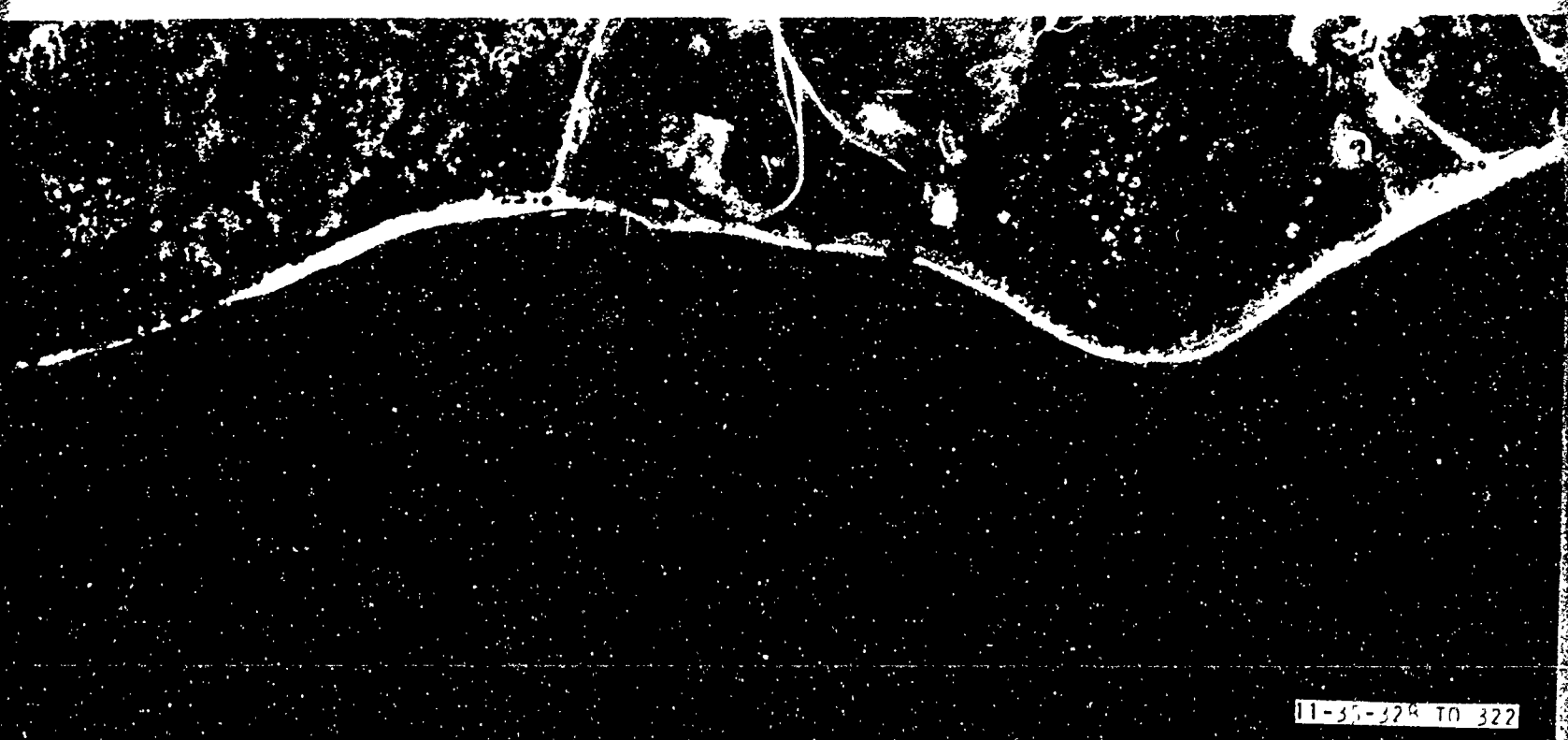


11-5-35 10 429

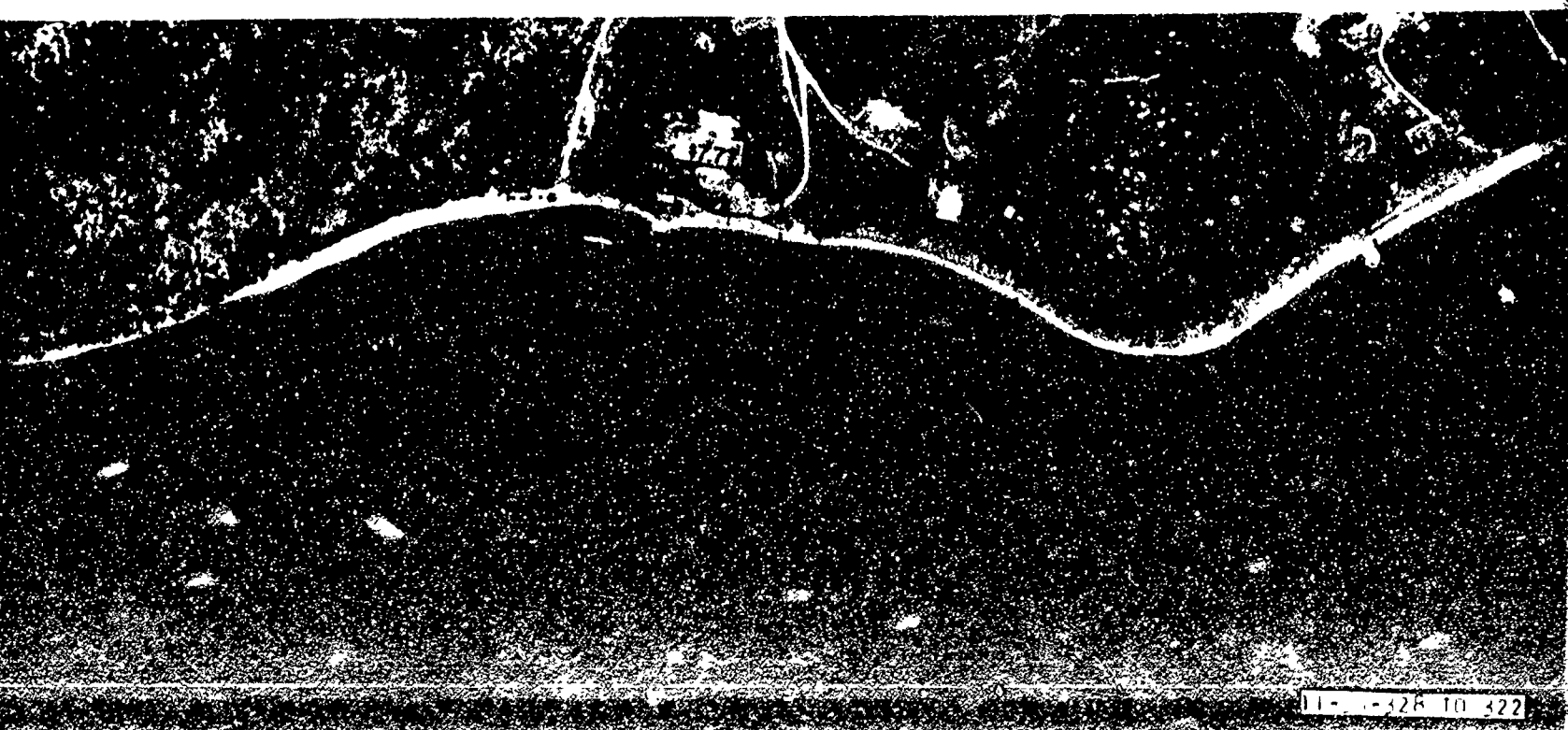


11-5-35 10 429

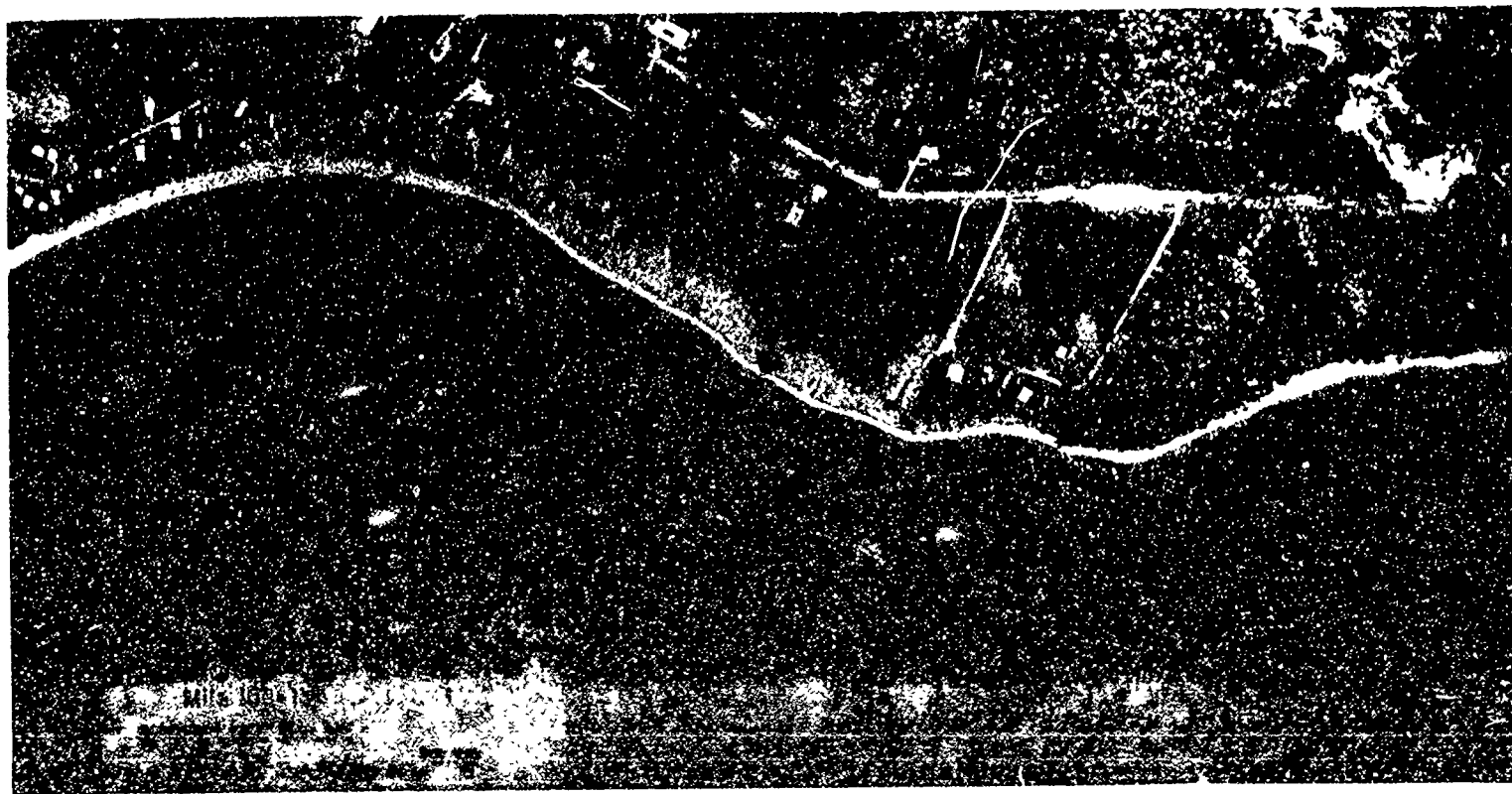
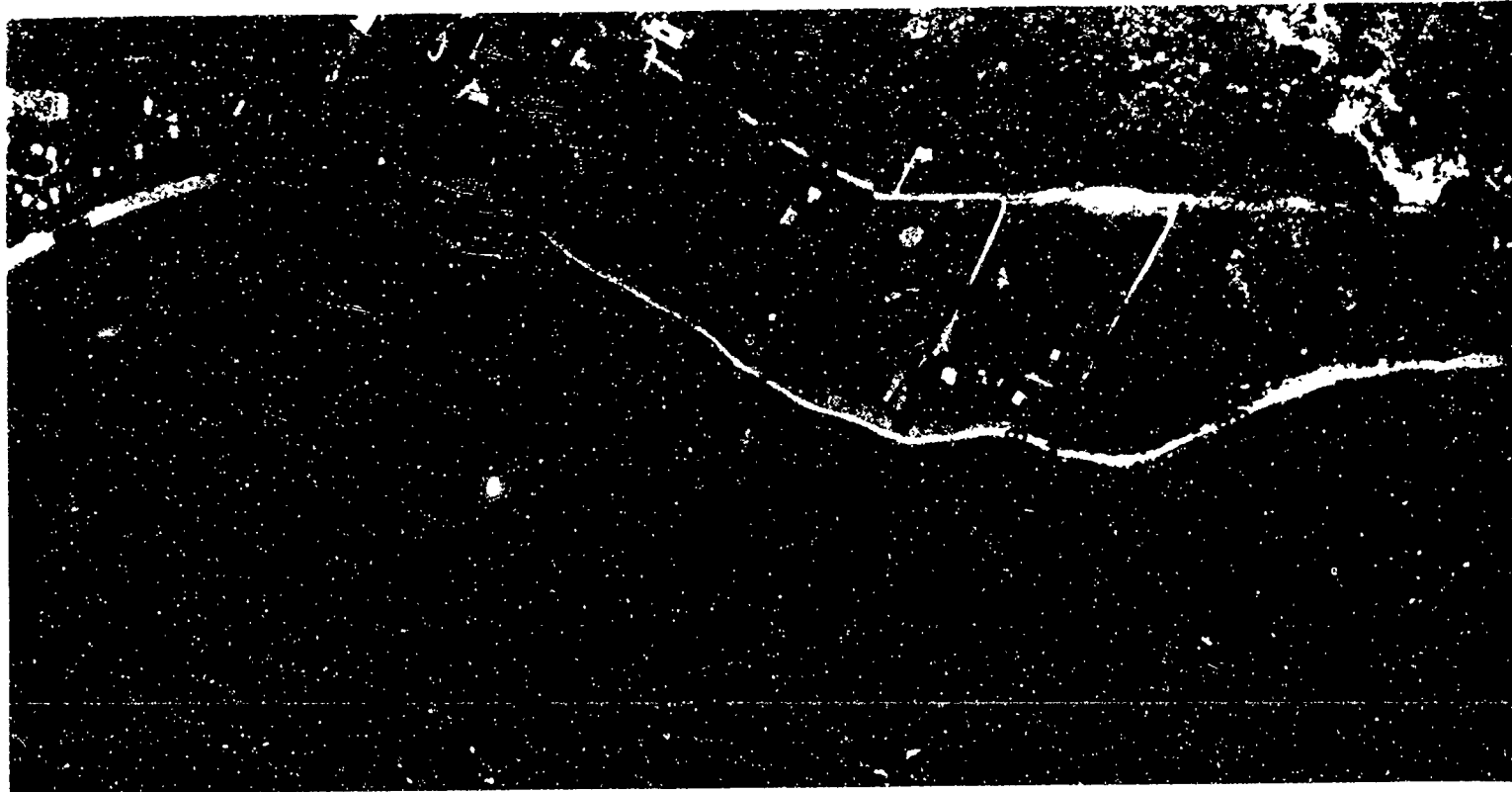


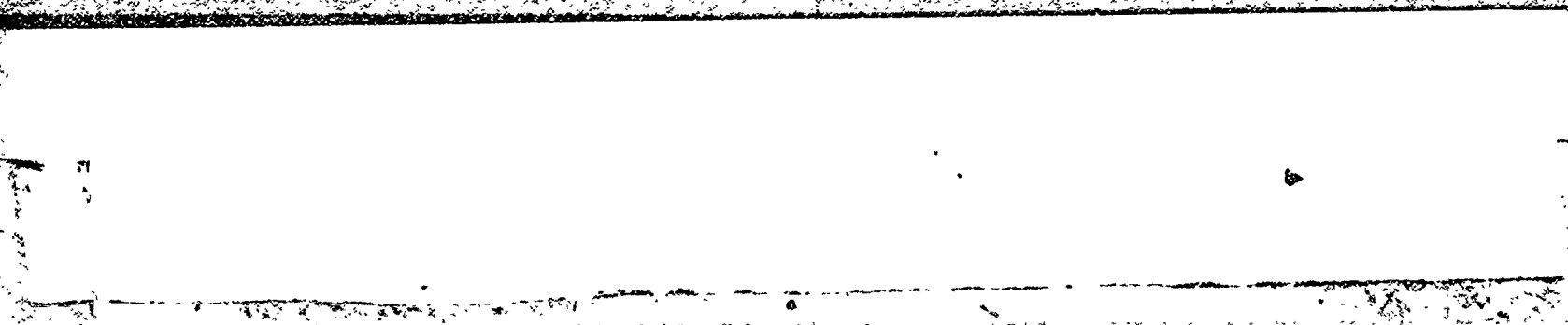
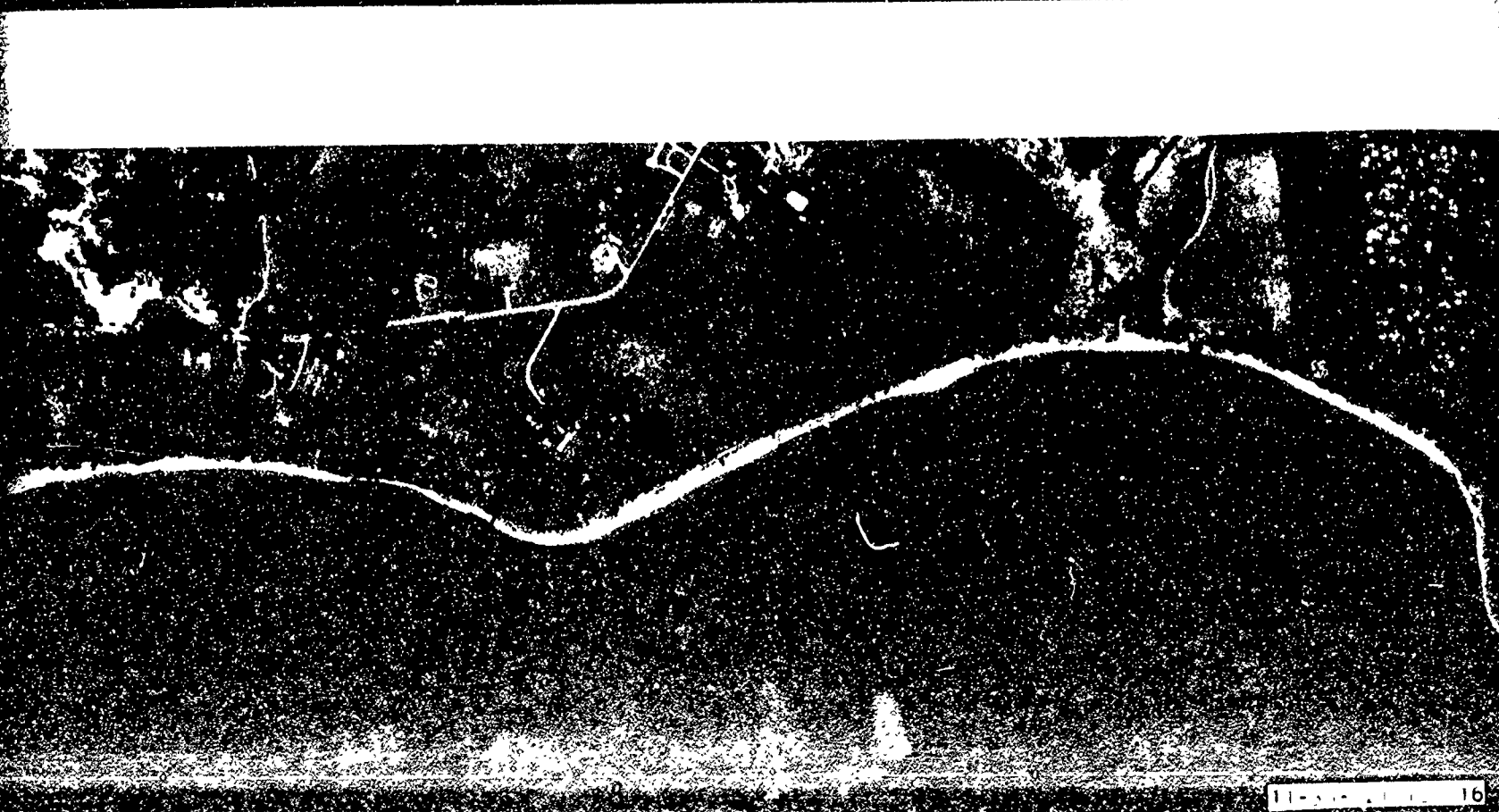
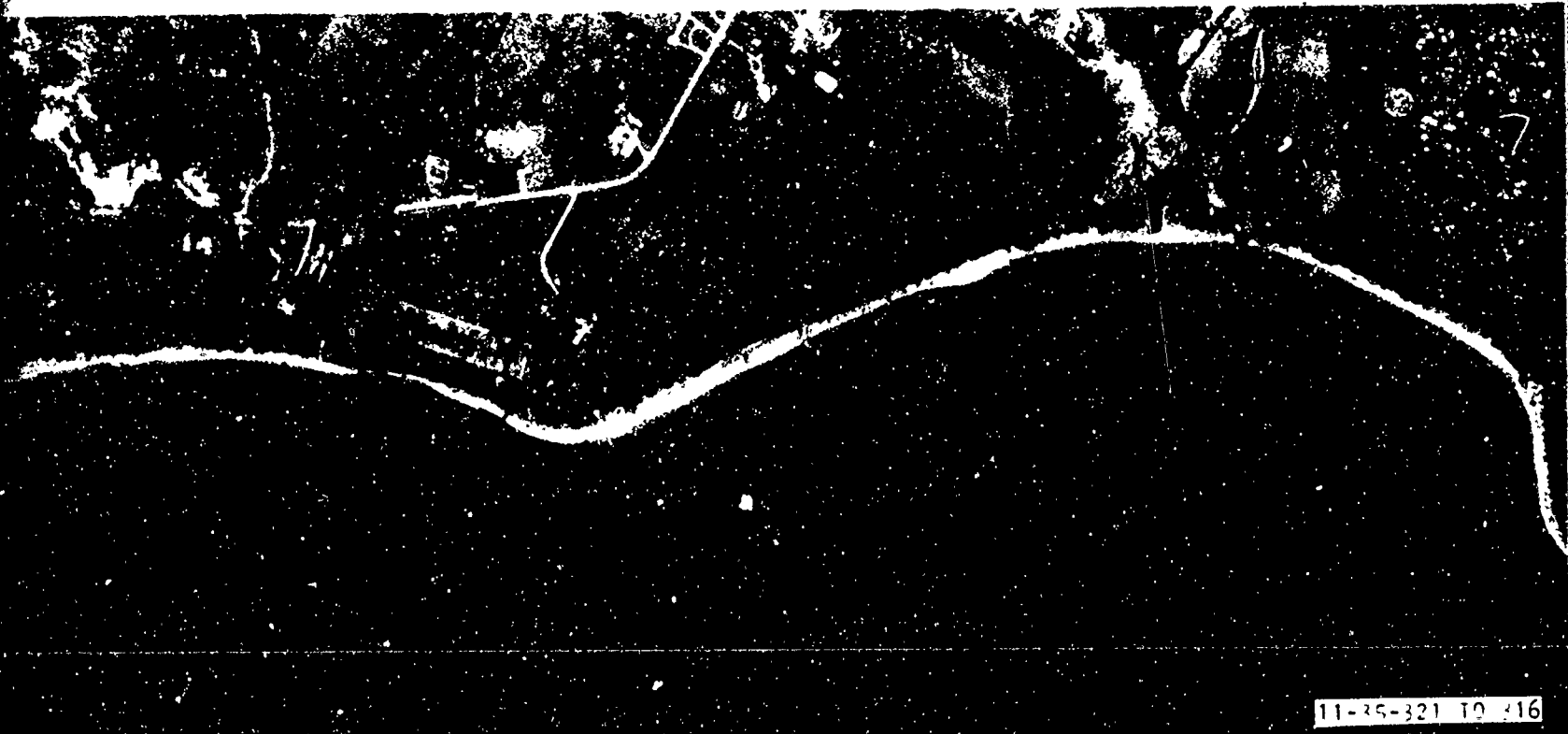


11-35-324 TO 322



11-35-326 TO 322





ATTACHMENT II

Analysis of Shore Protection Structures

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
^a SW	Seawalls, bulkheads		^b E Excellent	^c A None Required	^d p Permanent
G	Groins, Jetties		M Moderate	B Minor Evident	L Limited
B	Breakwaters		P Poor	C Minor Required	N None
R	Revetments			D Moderate Evident	A Adverse
A	Artificial Nourishment			E Moderate Required	
O	Other			F Major Evident	
				G Major Required	
				H Rebuilding Required	

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
154.30	1	R	M	D	L
154.16	2	R	M	A	L
153.52	3	SW	E	A	P
152.83	4	R	M	A	L
151.75	5	R	M	A	L
151.70	6	R	E	A	L
151.19	7	R	E	A	P
151.15	8	R	M	E	L
151.06	9	R	E	A	P
151.04	10	R	M	A	L
151.01	11	R	M	A	L
150.91	12	SW	E	D	P
150.71	13	R	E	A	P
150.63	14	R	E	C	P
150.54	15	R	E	A	L
150.15	16	R	E	G	L
149.32	17	R	M	C	L
149.20	18	R	E	D & E	P
148.60	19	B	E	E & F	P

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance ^c Requirement	Effects on Shoreline Stabilization ^d
LAKE ONTARIO					
147.62	20	B	E	A	P
147.65	21	B	E	A	P
149.08	22	O	E	A	P
149.00	23	R	M	C	P
148.90	24	R	M	A	P
148.70	25	R	E	A	P
148.50	26	O	M	A	P
148.32	27	R	M	E	L
148.29	28	O	M	B	L
148.20	29	O	M	C & F	P
148.17	30	B	E	A	P
148.13	31	G	E	A	P
148.07	32	O	M	E	P
148.04	33	R	M	E	P
147.91	34	O	P	G	L
147.82	35	O	E	A	P
147.72	36	R	E	A & D	P
147.64	37	SW	E	A	P
147.56	38	R	E	A	P
147.56	38	R	E	A	P

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
147.53	39	R	E	A	P
147.48	40	R	M	E	P
147.43	41	R	M	E	L
147.34	42	G	E	A	P
147.29	43	R	E	A	P
147.18	44	R	E	C	L
147.12	45	R	E	A	P
146.25	46	R	M	C	L
146.16	47	R	P	C	L
146.05	48	SW	M	E	P
145.25	49	R	P	E	L
145.17	50	B	M	E	L
145.14	51	B	M	B	L
145.10	52	SW	P	E	L
145.07	53	SW	P	G	L
144.99	54	R	M	G	L
144.96	55	B	M	C	L
144.94	56	B	M	E	L
144.88	57	R	M	E	P

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
144.83	58	SW	E	C	L
144.80	59	R	M	E	L
144.72	60	R	P	G	L
144.65	61	B	M	C	L
143.73	62	SW	M	A	L
143.68	63	SW	M	C	L
143.65	64	SW	E	A	L
143.63	65	SW	E	A	L
143.60	66	SW	E	A	L
143.39	67	SW	E	A	L
142.78	68	G	E	A	P
142.77	69	R	E	A	P
142.60	70	B	M	C	L
142.56	71	SW	E	E	L
142.36	72	R	M	A	P
142.00	73	B	P	C	L
141.00	74	B	E	E	P
140.80	75	R	E	A	P
140.13	76	O	M	C	P

LAKE ONTARIO

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
139.43	77	SW	E	A	P
139.36	78	SW	E	A	P
139.33	79	SW	E	A	P
139.29	80	SW	E	A	L
139.27	81	SW	E	A	L
139.26	82	SW	E	A	L
139.25	83	SW	E	A	L
139.23	84	SW	E	A	P
139.21	85	SW	E	A	L
139.20	86	SW	E	A	L
139.18	87	SW	E	A	P
139.15	88	SW	E	A	P
139.14	89	O	M	C	L
138.20	90	SW	M	A	L
138.14	91	O	E	A	P
138.10	92	SW	M	A	L
137.98	93	SW	E	A	P
137.83	94	R	M	A	P
137.79	95	R	P	G	L

LAKE ONTARIO

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
137.78	96	SW	M	A	P
137.69	97	SW	M	D & E	L
137.67	98	R	M	A	P
137.65	99	R	M	A	L
137.63	100	R	M	A	L
137.62	101	O	E	A	P
137.62	102	B	P	G	N
137.00	103	R	M	A	P
136.87	104	R	M	E	P
136.70	105	SW	M	G	L
136.68	106	R	M	A	L
136.66	107	O	M	A	L
136.61	108	G	E	A	L
136.58	109	R	L	C	P
136.54	110	R	P	E	L
136.46	111	B	M	E	L
136.43	112	O	P	E	L
136.40	113	R	P	G	L
136.37	114	R	E	A	P

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
136.33	115	R	M	E	L
136.20	116	R	M	A	L
136.17	117	R	M	A	L
136.15	118	B	E	A	P
136.08	119	R	P	D & G	L
136.03	120	R	P	G	N
135.99	121	R	M	D & G	L
135.95	122	R	M	C	L
135.92	123	R	M	A	P
135.77	124	O	M	C	L
135.60	125	R	P	C	L
135.56	126	SW	E	G	P
135.47	127	O	P	A	L
135.27	128	SW	E	G	L
135.23	129	O	M	A	L
135.20	130	SW	M	E	L
135.18	131	SW	E	A	L
135.16	132	SW	E	A	L
135.15	133	SW	E	A	L

H-18

LAKE ONTARIO

C

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
LAKE ONTARIO					
135.14	134	SW	E	A	L
135.08	135	SW	E	A	L
135.07	136	SW	M	G	L
135.05	137	SW	M	A & B	L
134.23	138	SW	M	A	L
134.21	139	SW	M	E	L
133.52	140	B	M	E	L
133.49	141	B	M	E	L
133.47	142	SW	M	C	L
133.42	143	SW	P	G	L
133.32	144	SW	P	G	L
133.20	145	SW	M	E	L
133.18	146	SW	P	G	L
133.16	147	SW	M	E	L
133.14	148	R	M	C	L
133.13	149	R	M	E	L
133.12	150	SW	P	G	L
133.10	151	G	M	E	L
133.10	152	SW	M	C	L

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
133.10	153	SW	M	E	L
133.06	154	SW	M	A	L
133.03	155	SW	E	B	P
133.02	156	SW	M	E	L
133.01	157	SW	M	A	L
132.98	158	SW	E	A & F	L
132.95	159	SW	E	C & F	P
132.89	160	SW	M	A	L
132.87	161	R	M	E	L
132.86	162	SW	E	A	P
132.81	163	SW	E	F	L
132.80	164	SW	M	F	P
132.78	165	SW	P	G	L
132.75	166	R	E	E	P
132.72	167	R	E	C	P
132.71	168	G	M	C	L
132.70	169	R	M	C	L
132.68	170	R	E	A	P
132.64	171	R	E	B	P

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
132.32	172	B	M	C	P
132.21	173	B	P	H	N
132.20	174	SW	E	A	P
132.19	175	R	E	A	P
132.17	176	SW	M	C & F	L
132.16	177	R	P	G	L
132.14	178	SW	E	C	L
132.13	179	SW	E	A	L
132.12	180	SW	E	C & F	P
132.10	181	SW	M	D & E	P
132.07	182	SW	E	C	P
132.04	183	R	E	A	P
132.03	184	SW	P	F & G	L
132.01	185	SW	M	G	L
132.00	186	R	M	E	L
131.96	187	R	M	E	L
131.90	188	SW	M	D	L
131.72	189	SW	E	A & D	L
131.70	190	SW	M	C	P

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance ^c Requirement	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
131.69	191	SW	E	A	P
131.68	192	SW	M	A	L
131.57	193	SW	P	E	L
131.54	194	SW	M	E	L
131.51	195	R	M	A	P
131.50	196	SW	E	A	P
131.44	197	R	P	G	L
131.31	198	SW	M	E	L
131.26	199	SW	M	A	L
131.21	200	SW	P	H	L
131.15	201	B	M	E	L
130.98	202	R	M	A & D	L
130.85	203	B	M	E	L
130.83	204	SW	M	A	L
130.76	205	SW	E	A	P
130.74	206	SW	M	E	P
130.72	207	SW	E	A	L
130.70	208	SW	E	A	L
130.36	209	SW	M	E	L

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
LAKE ONTARIO					
130.34	210	SW	E	C	P
130.32	211	SW	M	C	L
130.31	212	R	M	E	L
130.28	213	SW	M	A	L
130.25	214	SW	E	C	P
130.16	215	SW	P	G	L
130.13	216	SW	M	E	L
130.04	217	SW	M	B & C	P
130.02	218	SW	P	E	L
130.00	219	SW	E	A	P
129.80	220	SW	M	B & C	L
129.97	221	SW	M	A	L
129.92	222	SW	M	E	L
129.87	223	SW	E	D	P
129.22	224	O	E	A	P
129.17	225	O	E	A	L
129.15	226	O	E	A	L
129.12	227	SW	E	A	P
129.09	228	G	M	A	L

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
129.09	229	R & SW	E	A	P
128.60	230	R	E	A	P
128.26	231	SW	M	C	L
128.25	232	SW	E	A	P
128.24	233	SW	M	C	L
128.23	234	SW	E	A	P
128.22	235	SW	E	A	P
128.18	236	SW	E	A	L
128.16	237	SW	E	G	L
128.12	238	SW	P	A	P
128.10	239	SW	M	A	P
127.97	240	SW	E	C	P
127.90	241	SW	E	A	P
127.85	242	SW	E	A	P
127.82	243	SW	E	A	P
127.81	244	SW	E	A	P
127.78	245	SW	E	A	P
127.64	246	SW	E	A	P
127.61	247	SW	M	C	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance ^c Requirement	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
127.59	248	R	M	C & D	L
127.57	249	R	M	C & D	L
127.56	250	SW	M	C	L
127.55	251	SW	M	E	L
127.54	252	SW	M	C	L
127.53	253	SW	M	E	L
127.52	254	SW	E	A	L
127.51	255	SW	E	C	L
127.47	256	SW	M	C	P
127.45	257	SW	E	A	P
127.40	258	O	M	C	P
125.51	259	SW	E	A	P
125.49	260	R	E	B	P
125.45	261	R	E	A	P
125.43	262	R & SW	P	G	L
125.42	263	R & SW	M	C & F	L
125.41	264	R & SW	M	C	L
125.29	265	R	M	E	L
125.29	266	R	P	H	L

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>LAKE ONTARIO</u>					
125.27	267	O	M	E	L
125.24	268	R	E	C	P
125.21	269	R	E	G	P
125.00	270	R	E	E	L
124.84	271	R	E	C	P
124.81	272	R	M	A	L
124.69	273	R	E	A	P
124.60	274	R	E	C	P
124.54	275	R	M	A	L
124.50	276	R	M	E	L
124.48	277	R	M	E	L
124.45	278	O	E	A	P
124.41	279	R	E	A	P
124.37	280	R	P	G	L
124.35	281	R	M	E	L
124.33	282	O	P	G	L
124.31	283	E	M	C	L
124.28	284	R	M	E	L
124.19	285	R & O	M	E	L

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
124.09	286	R	M	C	L
124.06	287	SW	P	E	L
124.00	288	SW	E	A	P
123.97	289	SW	P	G	L
123.89	290	SW	E	A	P
123.75	291	SW	E	A	P
123.54	292	R	P	E	L
123.43	293	O	M	D	L
123.29	294	R	M	C	L
123.24	295	R	M	C	L
123.16	296	O	M	E	P
121.37	297	R	P	G	L
121.33	298	R	M	A	L
121.01	299	R	P	G	N
121.03	300	R	P	G	N
120.52	301	R	M	C	L
120.47	302	R	E	A	P
120.43	303	R	M	A	L
120.36	304	R	E	A	P

LAKE ONTARIO

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
120.33	305	SW	E	A	P
120.32	306	R	P	H	N
<u>NORTH POND</u>					
*	1	SW	M	B	L
	2	SW	M	C	P
	3**	SW	M	C	L
	4**	SW	M	D	L
	5**	SW	M	E	L
	6**	SW	M	D	L
	7**	R	M	A	L
	8	R	M	A	L
	9	SW	M	G	P
	10	SW	E	C	P
	11	SW	P	G	L
	12	SW	E	A	L
	13	SW	M	A	L
	14	SW	E	C	L
	15	R	M	A	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	16	SW	E	A	L
	17	SW	M	E	P
	18	SW	M	C	L
	19	R	M	C	L
	20	SW	M	A	L
	21	SW	M	C	P
	22	SW	E	A	P
	23	SW	E	A	L
	24	SW	P	H	L
	25	SW	E	A	P
	26	SW	E	A	L
	27	SW	M	C	L
	28	SW	M	C	L
	29	SW	M	C	L
	30	SW	M	C	L
	31	SW	E	D	L
	32	SW	M	A	P
	33	R	E	A	L
	34	SW	M	C	P

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	35	SW	E	A	L
	36	SW	E	A	P
	37	SW	M	E	L
	38	SW	E	A	P
	39	SW	E	A	P
	40	R	M	C	L
	41	R	M	C	L
	42	R	M	A	L
	43	R	M	A	L
	44	SW	P	G	L
	45	SW	M	A	L
	46	SW	M	E	L
	47	SW	M	E	L
	48	R	M	A	L
	49	R	M	C	P
	50	R	M	A	P
	51	R	M	C	L
	52	O	E	A	P
	53	R	M	A	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	54	SW	M	C	L
	55	SW	M	C	L
	56	SW	M	C	L
	57	R	M	C	L
	58	SW	M	E	L
	59	R	M	A	L
	60	SW	M	E	L
	61	SW	M	F	P
	62	SW	M	C	L
	63	SW	E	A	L
	64	SW	M	C	L
	65	R	M	A	P
	66	SW	E	A	P
	67	R	M	C	L
	68	SW	E	B	P
	69	R	M	A	L
	70	R	M	A	L
	71	SW	E	A	P & L
	72	SW	E	A	P

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	73	B	M	E	L
	74	R	P	E	L
	75	SW	E	A	P
	76	B	M	E	L
	77	R	M	C	L
	78	B	M	E	L
	79	R	M	C	L
	80	B	M	A	L
	81	R	M	C	L
	82	R	M	C	L
	83	R	M	A	L
	84	SW	M	E	L
	85	R	M	C	L
	86	SW	P	C	L
	87	R	M	G	N
	88	SW	E	C	L
	89	R	M	A	L
	90	SW	M	A	L
	91	R	M	A	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	92	O	M	A	P
	93	O	E	C	P
	94	SW	M	A	L
	95	SW	M	C	P
	96	SW	M	C	P
	97	R	M	A	L
	98	O	M	C	L
	99	R	M	A	L
	100	R	M	A	L
	101	R	E	A	P
	102	R	M	A	L
	103	B	P	G	L
	104	G	M	E	P
	105	G	M	A	L
	106	G	M	A	L
	107	R	P	G	N
	108	G	P	G	L
	109	G	M	E	L
	110	SW	E	A	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	111	G	M	C	L
	112	G	M	C	L
	113	R	M	C	L
	114	G	P	G	L
	115	R	M	C	L
	116	SW	M	C	P
	117	SW	E	A	L
	118	G	M	G	L
	119	R	M	C	L
	120	R	M	A	L
	121	G	P	G	L
	122	G	M	E	L
	123	G	M	E	L
	124	R	M	C	L
	125	SW	M	A	P
	126	R	E	A	P
	127	G	M	C	P
	128	R	E	A	P
	129	G	M	A	P

Attachment II

ANALYSIS OF SHORE PROTECTION STRUCTURES

Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	130	R	M	A	P
	131	O	E	A	P
	132	SW	E	A	L
	133	R	M	D	L
	134	R	P	G	L
	135	SW	E	A	L
	136	R	M	A	L
	137	R	M	A	L
	138	SW	M	A	L
	139	R	M	A	L
	140	SW	M	C	L
	141	R	M	E	L
	142	R	M	A	L
	143	SW	M	C	L
	144	SW	E	A	P
	145	SW	E	A	L
	146	SW	E	A	L
	147	SW	M	A	L
	148	SW	E	F & G A	L

Attachment II
ANALYSIS OF SHORE PROTECTION STRUCTURES
Oswego County, New York

Location Mile Marker	Map Number Reference	Type of Structure ^a	Condition ^b	Maintenance Requirement ^c	Effects on Shoreline Stabilization ^d
<u>NORTH POND</u>					
*	149	SW	M	E	L
	150	SW	P	G	N
	151	SW	P	G	L
	152	R	P	G	L
	153	R	M	E	L
	154	R	M	C	L
	155	SW	M	A	L
	156	R	M	A	L
	157	SW	M	C	L
	158	R	M	A	L
	159	R	P	E	N
	160	SW	M	E	P
	161	SW	M	A	P
	162	SW	M	A	P
	163	SW	M	C	P

* Map markers are not available for North Pond.

Attachment III

HIGH WATER MARKS

Oswego County, New York

FOOTNOTES

*Determination of the date of the storm creating high water mark was not possible.

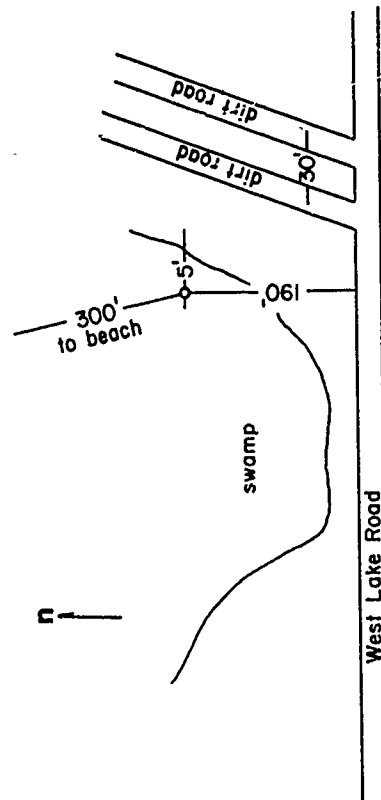
**The elevation of the high water mark was not determined under terms of this contract.

Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. Mark on N side of tree.	#1	*	**	Swamp between mileage posts 154.0 and 154.7 (about 154.35) North of West Lake Rd. (formerly Health Camp Road)	Mark located using start of moss on tree as a criteria. Diameter of tree is 1 foot. Mark is about 1 foot from base of tree.

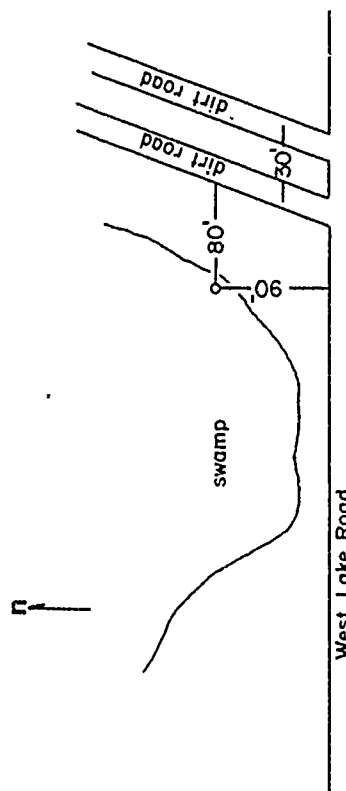


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. Mark on E side of tree.	#2	*	**	Swamp between mileage posts 154.0 and 154.7 (about 154.35). North of West Lake Rd. (formerly Health Camp Road)	Mark located using start of moss on tree as a criteria. Diameter of tree is 0.6 feet. Mark is about 1 foot above base of tree. <u>New</u> moss on young tree.

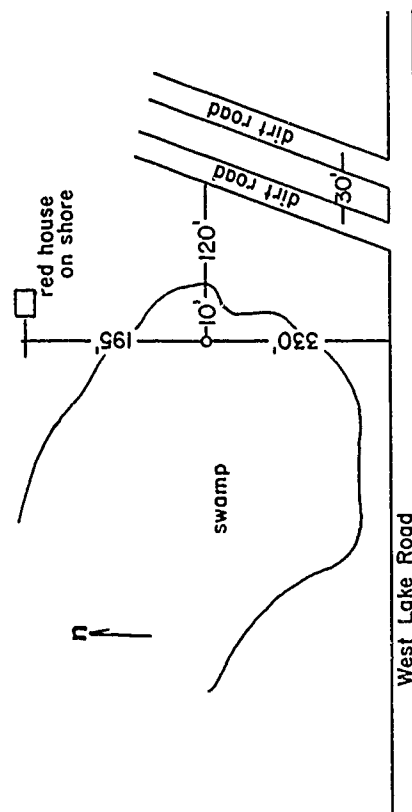


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. Mark on E side of tree.	#3	*	**	Swamp between mileage posts 154.0 and 154.7 (about 154.35). North of West Lake Rd. (formerly Health Camp Road)	We located mark using start of moss on tree as a criteria. Diameter of tree is .4 feet (Maple tree). Location is 140' North of #1 high water mark. Mark is about 1 foot above base of tree.

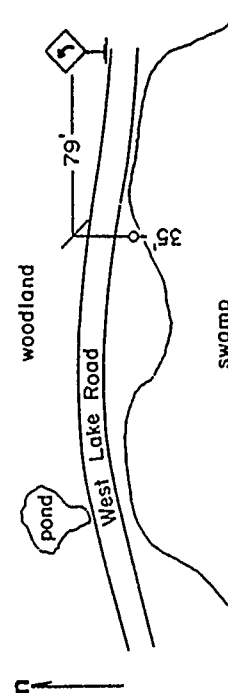


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. Mark on S side of tree.	#4	*	**	Swamp located between mileage posts 154.0 (about 154.4) and 154.7. South of West Lake Road (formerly Health Camp Road)	Mark located using start of moss on tree as a criteria. Diameter of tree is 0.4'. Mark about 1 foot from base of tree.

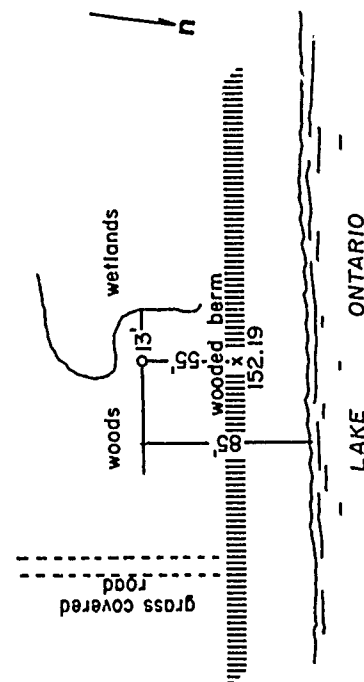


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. North side of tree marked.	#5	*	**	Snake Swamp, mile post 152.19, 1.2' diameter tree located 85' perpendicular from lake shore and 55' from berm crest; 13' east of wetlands, accessible only by walking on grass cove red road west of Dowie's Grove.	Mark is abrupt start of moss 1.4' above ground, many trees in area show same natural markings.

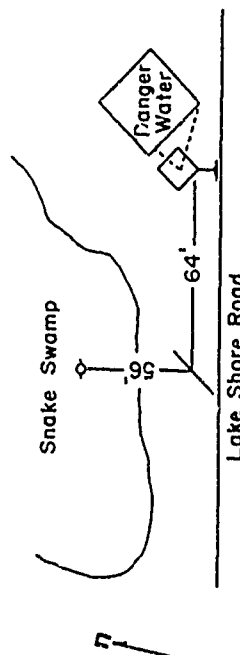


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. North side of tree marked.	#6	*	**	Snake Swamp, marked tree is between mile posts 152 and 153 (about 152.45) on east side of swamp, the tree has 3 trunks and nail is in center one. (0.6' diameter trunk) the tree is 64' West of road sign (Danger Water) and 56' North of sign on Lake Shore Road. The sign is on the Northside of road.	Mark is abrupt start of moss on tree.

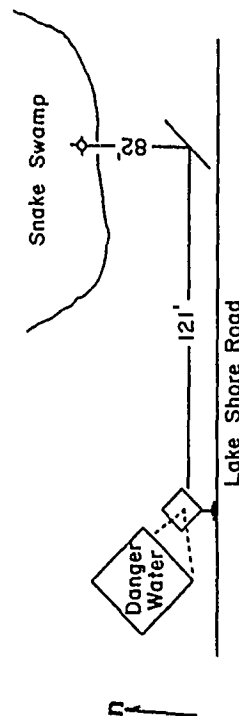


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest on south side of tree, surrounded by ample white paint.	#7	*	**	Snake Swamp, marked tree is between mileage posts 152 and 153 (about 152.7), 0.9' diameter tree; the marked tree is 121' east of "Danger Water" road sign located on south side of road and 82' North into the swamp, this location is approximately 1000' West of the first location on Lake Shore Road.	Mark is abrupt start of moss.

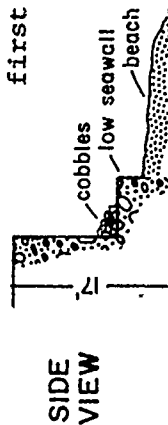
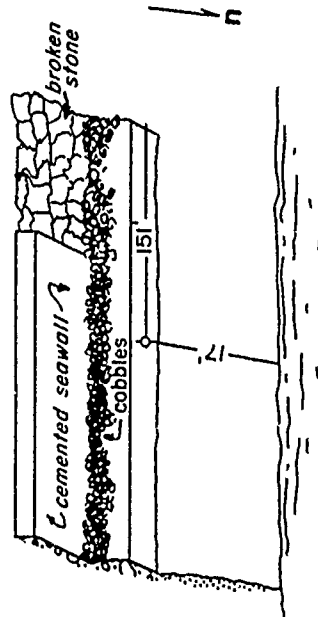


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Chisel mark on lower seawall surrounded by white paint.	#8	*	**	Mileage 146.5, 105 feet from end of seawall.	Determined by storm berm crest level to lower seawall. A second high water mark was determined by a minor storm berm crest formed 5/27/75, this high water mark is 2.2 feet below the first high water mark.



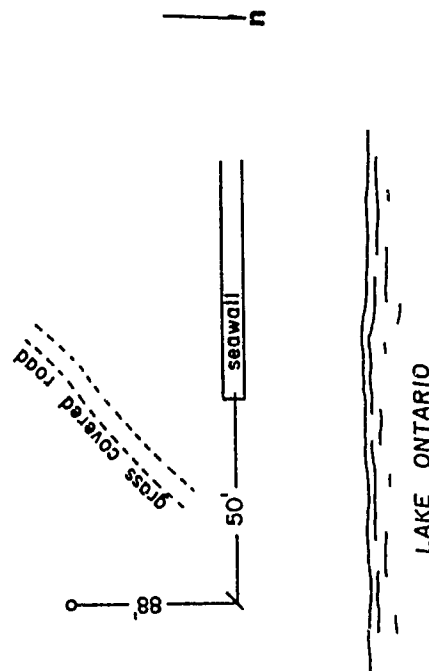
Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at crest of water mark surrounded by ample white paint on north side of tree.	#9	*	**	Mile post 146.0, on west side of swamp. It is 50' east of seawall and 88' back into swamp.	The tree was a maple tree, mark was 1.5' above base of tree, multi-trunk tree (1.8' diameter), marked trunk is .8' in diameter. The identifying mark was the abrupt start of moss on the tree.

III-9



Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
---------------------	------------------	---------------	-------------------	----------	---------

Nail at high water crest on North east side of Maple tree surrounded by white paint.

#10

*

**

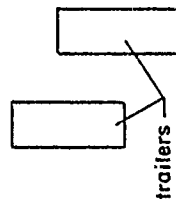
Mileage 145.68

High water mark determined by storm berm crest at the edge of the lake.

LAKE ONTARIO



maple tree



trailers

n

Nail and paint

berm crest

LAKE ONTARIO

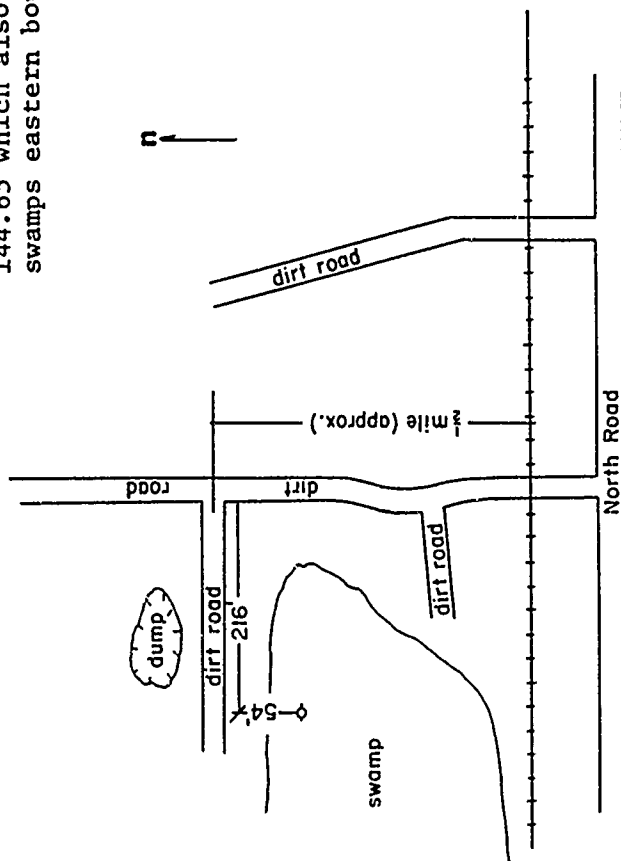
SIDE VIEW

Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint. On North side of maple tree (mark).	#11	*	**	Dirt Road at mileage post 144.65 which also parallels swamps eastern boundary.	Mark located abrupt start of moss on 0.8' diameter maple tree. Mark is about 1.0' from base of tree.

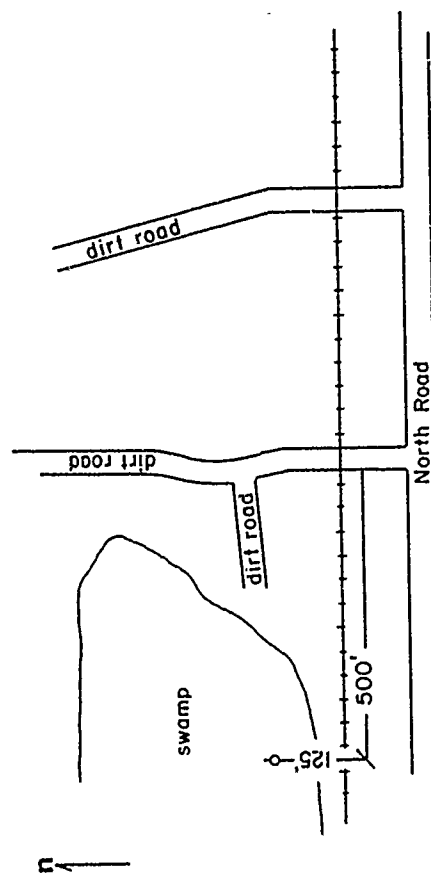


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at water crest surrounded by ample white paint on South side of tree.	#12	*	**	Dirt road at mileage post 144.65 which also parallels swamp's eastern boundary.	Mark located using abrupt start of moss on 1.1' diameter tree, type unknown. Mark is about 0.9' from base of tree.

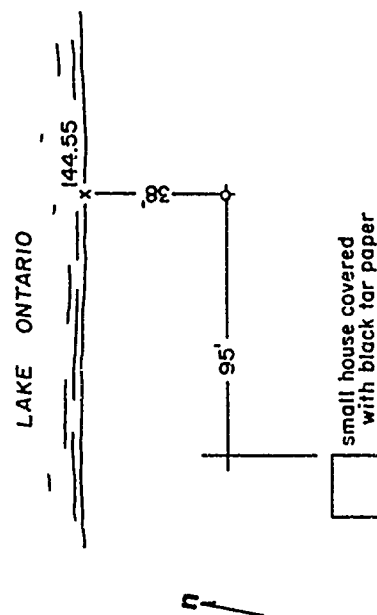


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at crest of high water mark surrounded by ample white paint on north side of tree. Trunk of tree 1.3' in diameter.	#13	*	**	Mileage 144.55, 38' from lake shore, 7 feet above lake level; second high water mark 2' below this, 95 feet east of small house covered by black tar paper.	High water mark was determined by high berm crest caused by storm waves. Second high water mark determined by a lesser storm berm 5' above lake level.



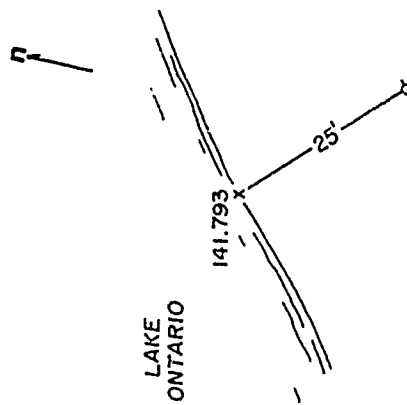
Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail on west side of tree at crest of high water mark surrounded by ample white paint. The tree had a 1.4 foot diameter.	#14	*	**	Mileage 141.793, 25 feet from shore.	First high water mark determined by storm berm crest. Second high water mark 1.3 feet below first high water mark was determined by lower swash bar.

III-14



Attachment III

HIGH WATER MARKS

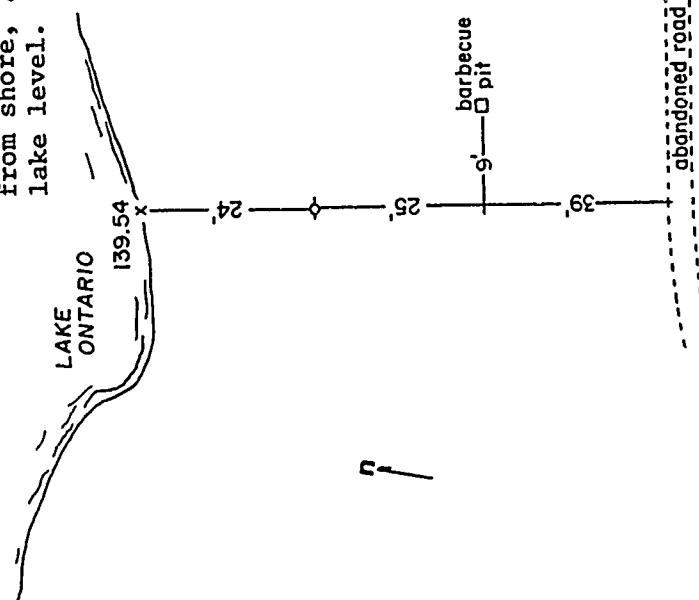
Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached
---------------------	------------------	---------------	-------------------

Nail on north side of tree, at high water crest surrounded by ample white paint.	#15	*	**
--	-----	---	----

Mileage 139.54, 24 feet from shore, 7.8 feet above lake level.

The tree is a 1 foot diameter oak tree. There is a clearing behind the oak tree with a stone pit. There is also an abandoned road behind tree.

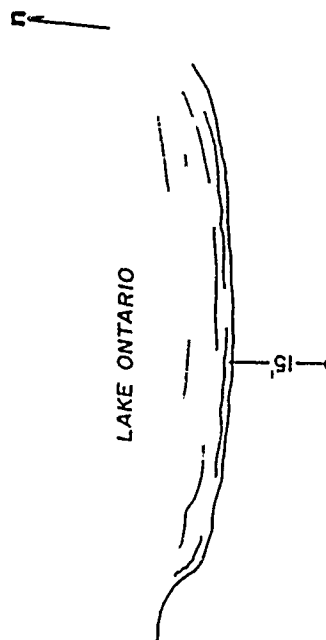


Attachment III

HIGH WATER MARKS

Oswego County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at high water crest on north side of maple tree surrounded by white paint.	#16	*	**	Mileage 137.41, the tree is 15 feet from the waters edge.	High water mark determined by storm berm crest 6 feet high (above lake level); 1.5 foot diameter tree.



Attachment III
HIGH WATER MARKS
Cswegó County, New York

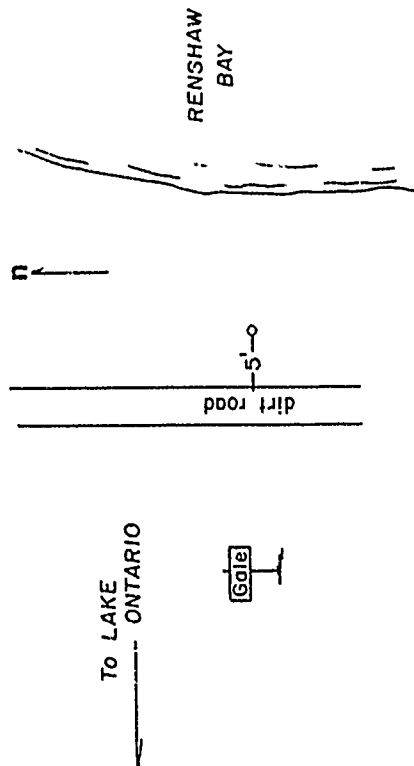
Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Nail at berm crest surrounded by ample white paint. On West side of a multi-trunked tree.	#17	*	**		On berm crest where there is a tree that branches into 4 trunks. On the trunk to the south on west side of it is the mark. Diameter of trunk with mark is 1.3 ft.

Attachment III

HIGH WATER MARKS

Jefferson County, New York

Mark Identification	Description Code	Date of Storm	Elevation Reached	Location	Remarks
Red paint line at base of tree (Maple). Sign on tree indicating high water mark.	#18	*	**	At mileage 120.15 opposite the Gale Property on west side of Peninsula at North Pond.	Found on west side of Dirt Road on 1.0 ft. diameter Maple tree.



ATTACHMENT V

Annotated Photographs of
Flood and Erosion Damages,
Protective Works and Storm Damage

Attachment V

<u>Photograph Number</u>	<u>Date</u>	<u>Description</u>
1	5/15/75	East view of Oswego Harbor's west breakwater
2	5/22/75	3-4 feet of bluff recession undermined 6 ft. fence post at top of bluff (154.17)*
3	5/23/75	West view of Coast Guard breakwater in Oswego
4	5/23/75	Part of Texas Tower which was left in Oswego Harbor at Port Authority dock on west side of Oswego River
5	5/23/75	Coast Guard breakwater in Oswego Harbor
6	5/26/75	West view of undermined abandoned railroad bed (147.46-147.50)
7	5/26/75	East view of storm drain (147.41-147.45)
8	5/28/75	A house 24 feet from shore with gravel bar against door and window broken due to storm tossed pebbles (145.71)
9	5/29/75	Portion of old seawall and limestone riprap (145.12-145.15)
10	5/29/75	Vertical concrete cylinders partially filled with cobbles (145.09-145.12)
11	6/4/75	East view of Niagara-Mohawk's rubble mound breakwater (141.00)

<u>Photograph Number</u>	<u>Date</u>	<u>Description</u>
12	6/4/75	Sandstone revetment at Niagara-Mohawk (140.88)
13	6/4/75	Lakeward view of small harbor behind Fitzpatrick Power Plant. (140.13)
14	6/5/75	West view of seawall (138.19-138.22)
15	6/11/75	Hole in stonewall (136.69-136.70)
16	6/11/75	Gabion and Cobble revetment (136.38-136.42)
17	6/12/75	Eastward view of limestone revetment (136.37)
18	6/12/75	Gabions with broken wires (136.42-136.45)
19	6/12/75	Concrete filled tires lashed together at toe of revetment (136.18-136.21)
20	6/12/75	West view of stone revetment with concrete filled tires at toe of structure (136.20)
21	6/12/75	West view of log revetment (135.93-135.96)
22	--	West view of undermining of east end of revetment. Erosion accelerated by position of groin to west (132.69-132.71)
23	6/16/75	West view of timber bulkhead (132.20-132.21)
24	6/17/75	West view of limestone revetment with old seawall at toe

<u>Photograph Number</u>	<u>Date</u>	<u>Description</u>
25	6/17/75	West view of wooden seawall (132.00-132.04)
26	6/17/75	East view of concrete and wood seawall (130.71-130.73)
27	--	"Lincoln Log" bulkhead of precast concrete slopes (129.09-129.14)
28	6/23/75	Fill beach lined with limestone riprap (124.47-124.43)
29	6/23/75	North view of gabion revetment. Gabions are along the toe of a 13 feet wide, 19 feet high fill (till material) beach which protects high dunes (123.13-123.18)
30	6/24/75	Northward view of a fill beach (10 ft. wide, 11 feet high) fronted by limestone riprap. It is ineffective as there is no beach to dampen waves (120.25- 120.29)
31	6/24/75	Timber bulkhead on high dunes (120.32-120.33)
32	6/24/75	South view of new channel at North Pond

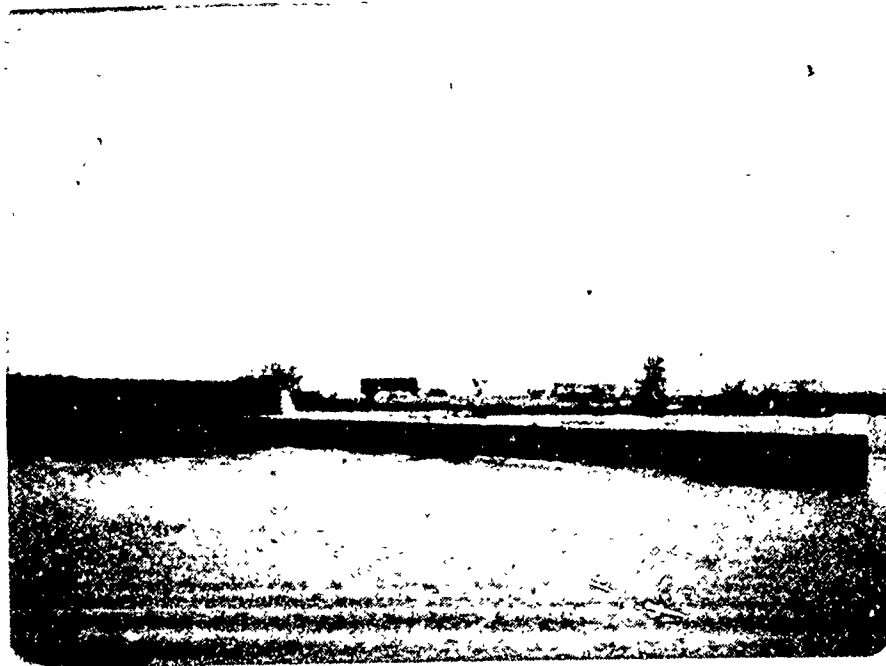
*Numbers in parentheses indicate coordinated mileage.

Negatives were not available for the following photos.

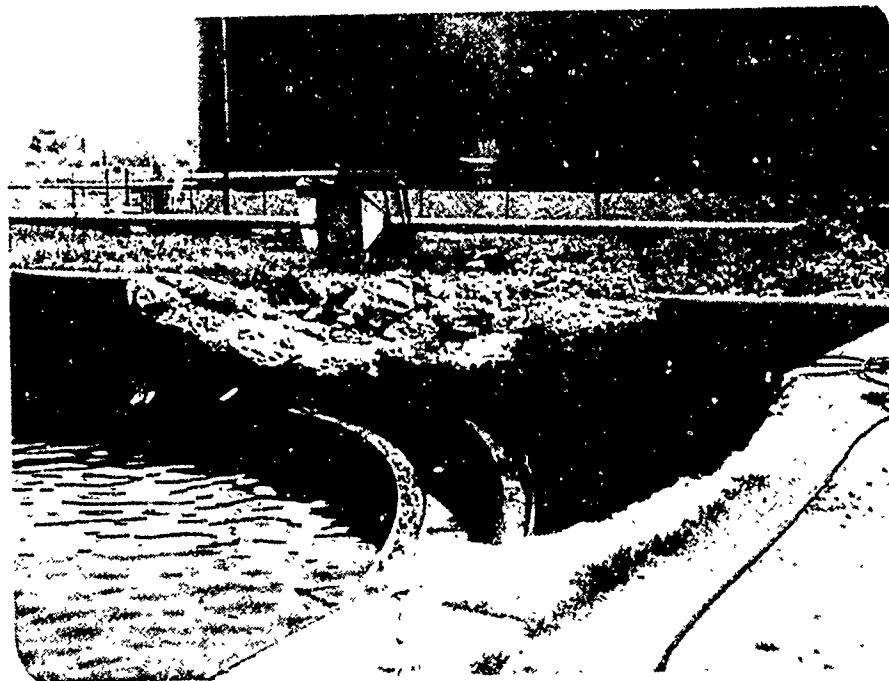
<u>Photograph Number</u>	<u>Date</u>	<u>Description</u>
33 and 34	Spring 1973	North Pond area
35	Unknown	Flooding (130)*
36	Unknown	Erosion of Seawall (130)
37	Unknown	Dowie Dale - flooding over boat docks and road (132)
38	Unknown	Trees shown have since toppled (144)
39	Spring 1973	Flooding (145)
40-49	Spring 1973	Flooding and erosion at Rudy's of Oswego (150)

*Numbers in parenthesis indicate coordinated mileage.





3



4

V O



6





7

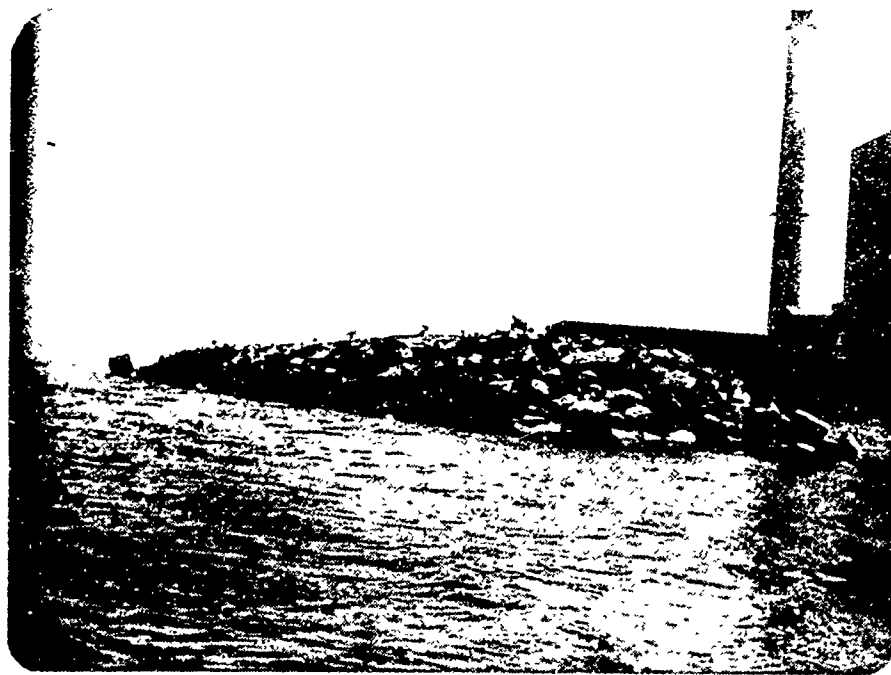




9



10

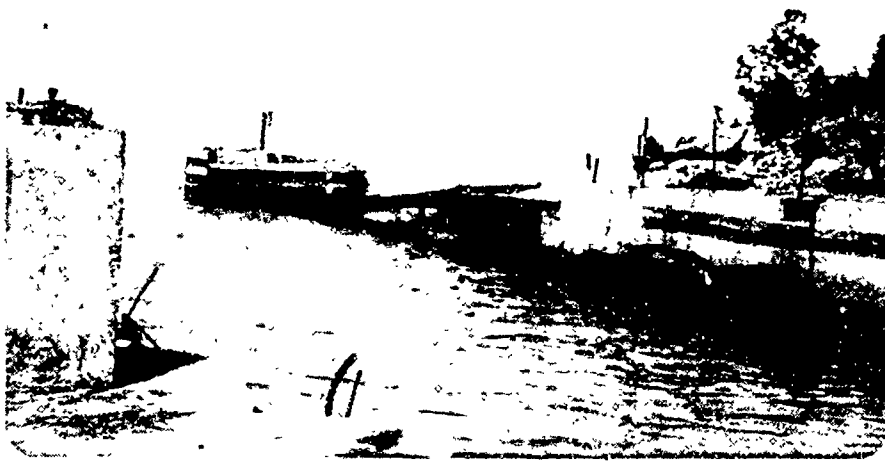


11

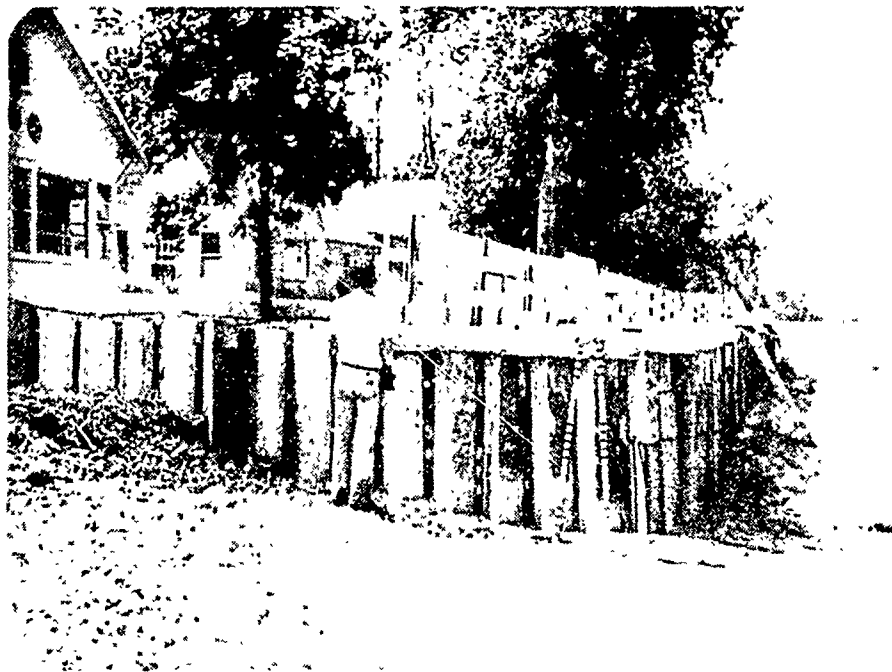
12



13



13



14



15

16



V-12



17



V13

19



20



V-14



21



22

V-11



23

24



V-16



25



26

V-17



27



28

V-18



29



30

1-19

31



32



V-20







37

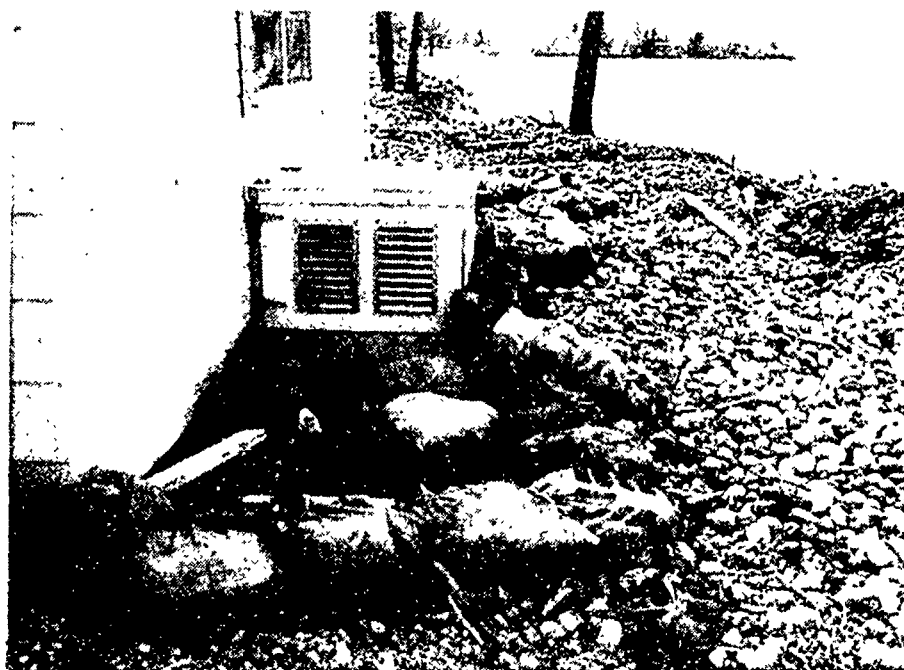


1-25

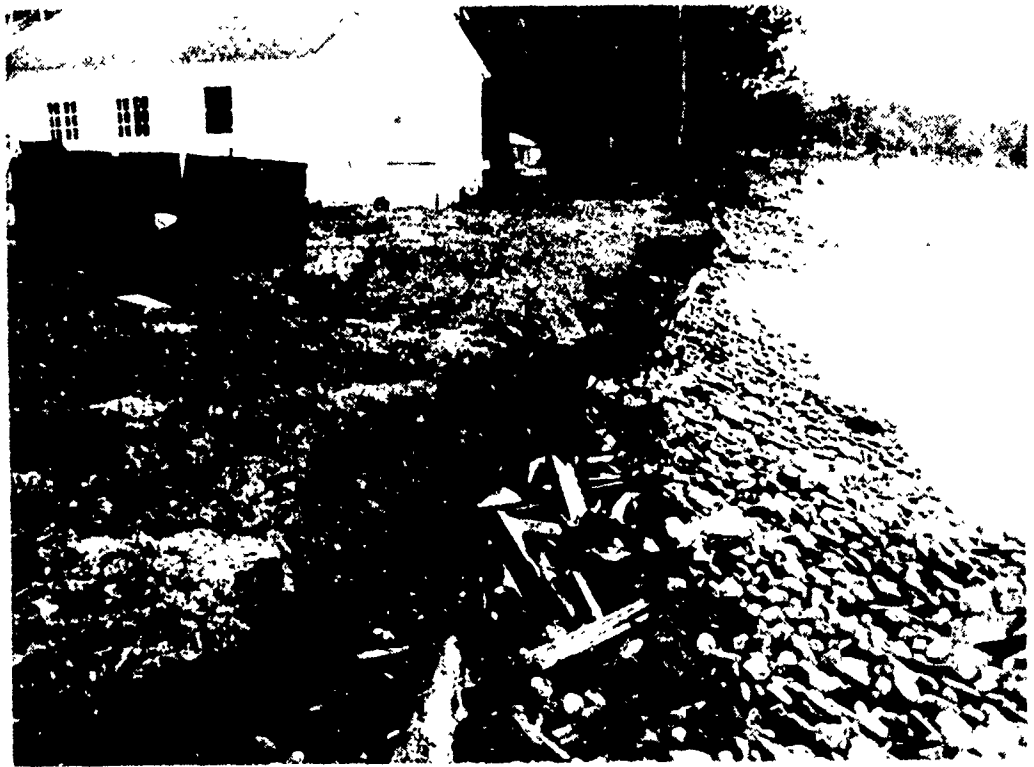




13









15

(Q)



49

(Q)