

AD-A105 969

STETSON-DALE UTICA NY

NATIONAL DAM SAFETY PROGRAM. LARKIN CREEK DAM (INVENTORY NUMBER--ETC(U)

JUN 81 J B STETSON

F/G 13/13

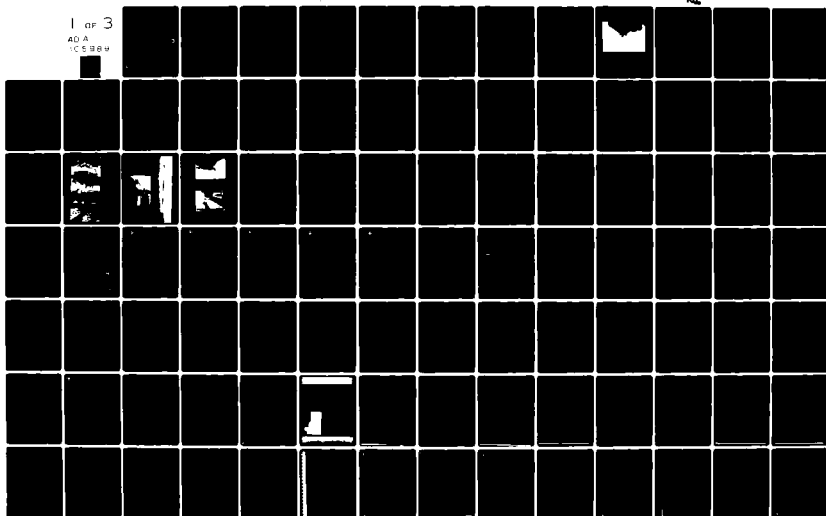
DACW51-81-C-0009

UNCLASSIFIED

NL

1 of 3

ADA
CS 884



REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A105989	
4. TITLE (and Subtitle) Phase I Inspection Report Larkin Creek Dam Lake Ontario Basin, Monroe County, N.Y. Inventory No. 711	5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) JOHN B. STETSON	8. CONTRACT OR GRANT NUMBER(s) DACW51-81-C-0009	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Stetson-Dale 185 Genesee Street Utica, New York 13501	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS Department of the Army 26 Federal Plaza New York District, CofE New York, New York 10287	12. REPORT DATE 30 June 1981	13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Department of the Army 26 Federal Plaza New York District, CofE New York, NY 10287	15. SECURITY CLASS. (of this report) UNCLASSIFIED	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
15. DISTRIBUTION STATEMENT (of this Report) Approved for public release; Distribution unlimited.		
17. DISTRIBUTION STATEMENT (of abstract entered in Block 20, if different from Report) National Dam Safety Program. Larkin Creek Dam (Inventory Number NY 711). Lake Ontario Basin, Monroe County, New York. Phase I Inspection Report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety National Dam Safety Program Visual Inspection Hydrology, Structural Stability Larkin Creek Dam Monroe County Lake Ontario Basin		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The Phase I Inspection of the Larkin Creek Dam did not indicate conditions which would constitute an immediate hazard to human life or property.		

LEVEL

DTIC
ELECTE
OCT 2 2 1981

H

Original contains color
plates: All DTIC reproductions
will be in black and
white

4 25

AD A105989

DTIC FILE COPY

The hydrologic/hydraulic analysis indicates that the spillway is capable of passing the Probable Maximum Flood (PMF) with a foot of freeboard. Therefore, the spillway is assessed as adequate according to the Corps of Engineers' screening criteria.

LAKE ONTARIO BASIN

LARKIN CREEK DAM

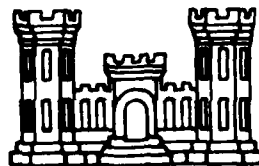
NEW YORK

INVENTORY No. NY 711

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

**APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED**



NEW YORK DISTRICT CORPS OF ENGINEERS

MAY 1981

10 10 19

DISCLAIMER NOTICE

**THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DTIC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Accession For	☒
NTIS	☒
DTIC	☒
Unannounced	☒
Justification	
By	
Distribution/	
Availability Codes	
Dist	
A 23	

TABLE OF CONTENTS

	<u>Page</u>
Preface	
Assessment of General Conditions	i
Overview Photograph	iii
Section 1 - Project Information	1-4
Section 2 - Engineering Data	5-6
Section 3 - Visual Inspection	7-8
Section 4 - Operation and Maintenance Procedures	9
Section 5 - Hydrologic/Hydraulic	10-12
Section 6 - Structural Stability	13-15
Section 7 - Assessment/Remedial Measures	16-17

APPENDIX

Photographs	A
Visual Inspection Checklist	B
Hydrologic/Hydraulic, Engineering Data and Computations	C
References	D
Previous Inspection Reports/Available Documents	E
Drawings:	F
Figure 1 - Location Map	
Figure 2 - Plan View of Dam	
Figure 3 - Plan of Westerly Portion of Dam	
Figure 4 - Plan of Easterly Portion of Dam and Spillway Section	
Figure 5 - Typical Borrow Area Restoration Plan	
Figure 6 - Typical Dam Section and Spillway Section	
Figure 7 - Discharge Control Structure Details	
Figure 8 - Reinforcing Details, Control Structure	
Figure 9 - Miscellaneous Details, Control Structure	

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Larkin Creek Dam I.D. No. NY 711
State Located:	New York
County:	Monroe
Watershed:	Lake Ontario Basin
Stream:	Larkin Creek
Date of Inspection:	November 20, 1980

ASSESSMENT OF GENERAL CONDITIONS

The Phase I Inspection of the Larkin Creek Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis indicates that the spillway is capable of passing the Probable Maximum Flood (PMF) with a foot of freeboard. Therefore, the spillway is assessed as adequate according to the Corps of Engineers' screening criteria.

The Phase I inspection has identified the need for the following investigation to be undertaken within one year.

1. The analysis of the emergency spillway channel under flood discharges indicates that the depths of flow and velocities associated with flows in excess of the 1/2 PMF may result in erosion of the emergency spillway channel with subsequent erosion of the embankment. An investigation of the effect of flow in the emergency spillway channel should be performed to determine whether the erosive effect of high flows would cause damage to the embankment of the dam. Remedial work should be undertaken depending on the results of this investigation.

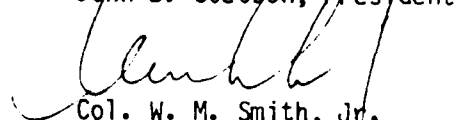
The following remedial work should be undertaken within one year:

1. Motor bike traffic should be restricted on the facility. The erosion due to this traffic should be repaired.
2. A flood warning and emergency evacuation system should be implemented to alert the public should conditions occur which could result in failure of the dam.
3. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility, including the slopes and the area immediately downstream from the toe of the embankment. Deficiencies and the remedial measures undertaken to correct these deficiencies should be well documented to provide historical background on which future evaluations may be made.

Dale Engineering Company


John B. Stetson, President

Approved By:
Date:


Col. W. M. Smith, Jr.
New York District Engineer

30 JUN 1981



1. Overview of the dam. Retention basin on the right. Downstream protected area on the left. Control outlet in the background.

PHASE I INSPECTION REPORT
LARKIN CREEK DAM I.D. NO. NY 711
LAKE ONTARIO BASIN
MONROE COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and the U.S. Army Corps of Engineers.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the existing condition of the Larkin Creek Dam and appurtenant structures, owned by the Town of Greece, New York, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the U.S. Army Corps of Engineers.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Larkin Creek Dam is located in the Town of Greece, west of Elm Grove Road and south of St. Andrews Drive just northwest of the Hamlet of South Greece. The dam is an earth fill structure approximately 2,100 feet long with a maximum height of approximately 12-1/2 feet. The structure is "L" shaped with the short leg facing in a north-south direction to conform to the residential subdivision development in the area. The discharge control structure for this stormwater detention facility consists of a 36 inch diameter concrete pipe outlet with a 36 inch square sluice gate which is used to regulate the outflow from the impoundment during runoff events. The regulating structure is located near the center of the facility. The emergency spillway is located at the extreme easterly end of the structure and consists of a broad crested weir 275 feet long discharging into a grassed channel with riprap protected banks. A concrete sill 5 feet deep and 2 feet wide at the crest of the emergency spillway prevents erosion at this point. The embankment at the junction with the spillway section is protected by a section of riprap. The discharge channel from the emergency spillway runs parallel to the earth fill embankment to the receiving stream.

b. Location

The Larkin Creek Dam is located in the Town of Greece, Monroe County, New York.

c. Size Classification

The maximum height of the dam is approximately 12 feet. The volume of the impoundment is approximately 212 acre feet to the top of dam. Therefore, the dam is in the small size classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The east branch of Larkin Creek, the receiving stream from the impoundment, flows through a heavily developed residential area of the Town of Greece. Several residences are located in close proximity to the structure. Therefore, the dam is in the high hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the Town of Greece, New York.

Contact: James S. Peet, P.E.
Town Engineer
Greece Town Hall
2505 West Ridge Road
Rochester, New York 14626
Telephone: (716) 225-2000

f. Purpose of the Dam

The dam is used as a storm water retention facility to control flows in the east branch of Larkin Creek downstream from the facility.

g. Design and Construction History

The plans included in this report indicate that the dam was designed in 1976 with construction completed in 1977. The dam, as it presently exists, substantially conforms to the plans. No modifications have been made to the facility since its construction.

h. Normal Operational Procedures

The facility is operated by the Town of Greece. Flow is maintained through the outlet control structure during dry weather flow. The facility is monitored twice weekly during these periods. During runoff events, the sluice gate controlling the outlet flow is manipulated to control flow in the receiving stream downstream from the facility. During these runoff events, the facility is monitored every 2 hours or more often if required. Adjustments to the outlet flow are made on an around-the-clock basis until the runoff event is terminated and the impoundment is drained.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of the Larkin Creek Dam is 0.96 square miles (617 acres).

b. Discharge at Dam Site

Maximum recorded reservoir elevation is 453.35, which was accompanied by a discharge of approximately 17 cfs.

Computed Discharges:

Emergency Spillway, top of dam	4,230	cfs
* Gated Drawdown	120	cfs

c. Elevation (feet above MSL)

Top of Dam	459.0
Spillway crest	455.75
Stream bed at centerline of dam	446.5
Invert of 36 inch Pipe	446.6

d. Reservoir

Length of maximum pool	2,400+ ft. (1/2 PMF)
Length of normal pool	Normally dry

e. Storage

Top of Dam	212	acre feet
Spillway Crest	82	acre feet

f. Reservoir Area

Top of Dam	53	acres
Spillway Crest	26	acres

g. Dam

Type - Earth fill
Length - 2,100
Height - 12.5 feet
Freeboard Between Spillway Crest and Top of Dam - 3.25 feet
Top Width - 10 feet
Side Slopes - 3 horizontal:1 vertical, upstream and downstream
Zoning - Homogeneous
Impervious Core - None
Grout Curtain - None

* Discharge through 36 inch diameter pipe with gate fully open and the reservoir at top of dam.

h. Spillway (emergency)

Type - Broad crested weir

Length - 275+ feet

Crest Elevation - 455.75

Gates - none

U/S Channel - Impoundment

D/S Channel - Grassed slope, riprapped banks, concrete sill 5 feet deep,
2 feet wide at crest.

i. Regulating Outlets

36 inch concrete pipe outlet with 36 inch square sluice gate control.

SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

Geologically, Larkin Creek Dam is located in the Eastern Lake section of the Central Lowland Province which is part of the Interior Plains, the major physiographic division. The dam is sited on glacial debris which overlies horizontal beds of either the Grimsby Sandstone of Lower Silurian age, the Queenston Shale of Upper Ordovician age, or is on the contact between the two formations, Grimsby to the south and Queenston to the north of the dam. The Grimsby is made up mostly of thick-bedded red siltstone and includes thin-bedded argillaceous shales, particularly near its base. The underlying Queenston is made up predominantly of thin-bedded, red argillaceous shale and includes beds of siltstone and sandstone, particularly near its top. Thus, without petrographic and grain-size analysis, it is difficult to differentiate between the two formations near their contact. Bedrock is generally within 15 feet of the surface.

The glacial debris was located at the then southern boundary of glacial Lake Iroquois. The debris appears to be mainly of a glacial lake beach which consists of silt, sand, and gravel layers and lenses. Silty sand and sandy silt are most common. A zone or layer of glacial till may be present between the bedrock below and the beach deposits above. On occasion it appears on the surface due to the probable irregularity of its thickness and may represent a covered ground moraine. The beach type covering could be wave reworked moraine.

Glacial till is an unsorted and unstratified deposit. The soil profile along the dam centerline, as shown in Figure 2 in the report by J. P. Collins (See Appendix E), is not suggestive of a till but rather beach and lacustrine deposits along with some till.

Several soil varieties are present in the vicinity of the dam. Permeability varies from moderately rapid to rapid, from 0.63 to more than 6.3 inches per hour, depending upon the soil type.

b. Subsurface Investigations

Detailed subsurface investigations were conducted prior to the design of the facility. The records of these subsurface investigations are included in Appendix E.

2.2 DESIGN RECORDS

The preliminary engineering report and design computations for the construction for the design of this facility are included in Appendix E.

2.3 CONSTRUCTION RECORDS

Although the records kept during construction were not available for review, the design engineer's certification of construction indicates that the facility was constructed under his inspection and that of his soils consultant. A letter summarizing the construction of the facility is included in Appendix E.

2.4 OPERATION RECORDS

The facility is monitored twice weekly during dry weather periods. An inspection check list (See Appendix E) is filled out during each inspection trip. The check list covers security measures at the site and documents the position of the control gate. During runoff events, the facility is monitored every 2 hours or more often if required. Elevations of the water in the impoundment are recorded on a storage curve during each visit. Control gate positions are also documented. Outlet gates are adjusted to maintain optimum flow in the downstream channel.

2.5 EVALUATION OF DATA

The data presented in this report was obtained from the Town Engineer of the Town of Greece and from the files of the New York State Department of Environmental Conservation, Dam Safety Section. The information appears to be reliable and adequate for a Phase I Inspection Report.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

The Larkin Creek Dam was inspected on November 20, 1980. The Dale Engineering Company Inspection Team was accompanied on the inspection by James S. Peet, P.E., Town Engineer of the Town of Greece. At the time of the inspection, a light snow cover partially obscured the ground surface in the area. The weather was fair and sunny and the temperature was in the mid 30's. At the time of the inspection, there was no water in the impoundment. The control gate at the outlet structure was open approximately 8 inches. The flow through the outlet structure was not restricted by the control gate.

b. Dam

The embankment of the facility shows no signs of subsidence, misalignment, or sloughing of the slopes. Since the facility is a stormwater detention basin and no water was impounded at the time of the inspection, there was no evidence in the field of seepage at the toe or on the downstream slope of the embankment. Minor erosion on the slope of the embankment and the sod surface of the spillway channel was detected. This erosion was attributed to motor bike traffic on the facility.

c. Control Outlet

The outlet control structure was in good condition and the control gate was in operating condition and well maintained.

d. Emergency Spillway

The sod surface of the emergency spillway was in good condition although minor erosion from dirtbike traffic was noted downstream in the spillway channel. The remainder of the channel was uniform in cross section with a well established sod cover. The riprapped banks of the emergency spillway channel are in good condition.

e. Reservoir Area

The reservoir area, at the spillway elevation, extends approximately 2,000 feet upstream from the dam structure. The area in the impoundment remains in a natural state with light woods and brush prevailing throughout the area. Slopes at the edge of the impoundment at the maximum pool elevation area are gently sloping and no erosion was noted in the reservoir area.

f. Downstream Channel

The channel downstream from the control outlet is formed in sand and gravel. The channel is severely restricted by a 38 inch by 24 inch elliptical roadway culvert through Andrews Drive located just downstream from the impoundment.

3.2 EVALUATION

The visual inspection revealed that the dam is generally in good condition with only minor erosion due to motor bike traffic in the emergency spillway channel and on the slopes of the embankment. Both the control outlet and the emergency spillway are in good condition and no signs of structural instability were detected.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal operating procedure for this facility is to control the flow in the downstream channel of Larkin Creek to prevent flooding of residential properties during rainfall runoff events. During dry weather the sluice gate at the control outlet is maintained in a position which will allow unrestricted flow through the facility. The position of the gate at the time of the inspection provided an opening of approximately 8 inches. During rainfall events, the gate in this position would begin to impede flow and thereby raise the water level in the impoundment. As runoff continues, the facility is monitored every 2 hours or more often if necessary depending on the extent of runoff. The gate is adjusted to maintain optimum flow in the downstream channel. Around-the-clock surveillance is maintained during runoff events.

4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the Town of Greece. Periodic visits are made to the site to check on the conditions of the facilities. An inspection checklist is completed based on the findings of the monitoring visit.

4.3 MAINTENANCE OF OPERATING FACILITY

The gate controlling the outlet from the impoundment is in good condition and properly maintained.

4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

4.5 EVALUATION

The dam and appurtenances are regularly inspected by representatives of the Town of Greece. The facility is presently in good condition. There is no evidence of deterioration caused by lack of maintenance. Since the dam is in the high hazard classification, a warning system should be implemented to alert the public should conditions occur which could result in failure of the dam.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Larkin Creek Dam is a flood control structure located in the southwestern portion of the Town of Greece, just south of St. Andrews Drive and some 4,400 feet north of the Erie Canal. The dam has a drainage area of 0.96 square miles which is characterized by moderately sloping pastured and wooded terrain. The drainage area is bounded on the south by the canal and the southwestern portion extends into the Town of Ogden. The reservoir has a surface area of approximately 26 acres at the spillway crest. However, due to the operation of the facility as a flood control structure, the reservoir area is normally dry.

5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration of run-off of a specific location that is considered reasonably possible for a particular drainage area.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience and existing data were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF. In the event that the dam could not pass 1/2 the Probable Maximum Flood without overtopping, additional analyses are to be performed on potential dam failures if the dam is designated as a High Hazard Classification. This process was done with the concept that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required.

The U.S. Army Corps of Engineers' Hydrologic Engineering Center's Computer Program HEC-1 DB using the Modified Puls Method of flood routing was used to evaluate the dam, spillway capacity, and downstream hazard.

Unit hydrographs were defined by Snyder coefficients, C_t and C_p . Snyder's C_t was estimated to be 2.0 for the drainage area and C_p was estimated to be 0.625. In this analysis, the reservoir pool was assumed to be at the spillway crest elevation at the start of the storm and outflow through the low level outlet was assumed to be zero.

The Probable Maximum Precipitation (PMP) was 21.6 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin, while loss rates were set at 1.0 inches initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate function yielded 87 percent run-off from the PMF. The peak for the PMF inflow

hydrograph was 2,358 cfs and the 1/2 PMF inflow peak was 1,179 cfs. The storage capacity of the reservoir above the spillway crest only reduced these peak flows to 2,316 cfs for the PMF and 1,134 cfs for the 1/2 PMF flow.

5.3 SPILLWAY CAPACITY

Under normal operation, flood flows are released from the reservoir by controlling the gate opening for the 36 inch diameter low level outlet. If flood flows surpass the control capability provided by the low level outlet and reservoir storage, then excess flows are passed by the emergency spillway. Due to the operator regulation required and the potential for malfunction in the system, the reservoir pool was assumed to be at the spillway crest at the start of the storm, and outflow through the low level outlet was assumed to be zero for this analysis.

The emergency spillway is trapezoidal in section with a 275 foot bottom width and 3:1 side slopes. The control section is formed by a concrete section that is covered with topsoil and grassed. Both upstream and downstream faces are grassed and inclined at shallow slopes from the horizontal. The discharge capacity of the emergency spillway at the top of dam elevation is 4,228 cfs.

EMERGENCY SPILLWAY CAPACITY

<u>Flood</u>	<u>Peak Discharge</u>	<u>Capacity as % of Flood Discharge</u>
PMF	2,316 cfs	183%
1/2 PMF	1,134 cfs	373%

The low level outlet has the capability of adding another 120 cfs to the total discharge capacity of the structure with its gate fully opened and the reservoir level at the top of dam.

The emergency spillway channel runs along the toe of the embankment and tapers from a width of 275 feet at the spillway crest to about 30 feet at its nearly 90 degree confluence with the receiving stream just beyond the toe of slope. Due to this configuration and proximity to the embankment, the emergency spillway channel was investigated to determine its adequacy under flood discharges. This analysis indicates that in the lower (narrow) reach of the channel, the depth of flow will rise above the two feet height of riprap for the 1/2 PMF and larger discharges. Accompanying velocities for these flows could be in the range of 10 feet per second. This condition could lead to erosion of the embankment.

5.4 RESERVOIR CAPACITY

The reservoir storage capacity was obtained from "Preliminary Engineering Report - Larkin Creek Watershed, Retention Basin Number One" (Ref. 20) and USGS mapping. The resulting estimates of the reservoir storage capacity are shown below:

Top of Dam	212 Acre Feet
Emergency Spillway Crest	82 Acre Feet

5.5 FLOODS OF RECORD

The maximum recorded reservoir elevation was 453.35 and occurred on February 21, 1981. The discharge associated with this reservoir elevation was approximately 17 cfs.

5.6 OVERTOPPING POTENTIAL

The HEC-1 DB analysis indicates that the spillway can pass the PMF with 1.0 feet of freeboard and the 1/2 PMF with 1.75 feet of freeboard.

5.7 EVALUATION

The hydrologic/hydraulic analysis indicates that the spillway is capable of passing the Probable Maximum Flood (PMF) with a foot of freeboard. Therefore, the spillway is assessed as adequate according to the Corps of Engineers' screening criteria.

The investigation of the emergency spillway channel under flood discharges indicates that the depth of flow in the lower (narrow) reach of channel will rise above the riprap for the 1/2 PMF and larger discharges. The accompanying velocities for these flows will be in the range of 10 feet per second, which could lead to erosion of the embankment. Due to this erosion potential, further investigations should be undertaken to analyze the effect of flow through the emergency spillway channel on the stability of the spillway channel and dam embankment.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The Larkin Creek Dam is a flood retention facility consisting of an earthen embankment and spillway section. The spillway section comprises the easterly most section of the dam and ties into the right earthen abutment. The earthen embankment portion of the dam extends from the left side of the spillway section some 1,460 feet in a westerly direction and then 650 feet in a northerly direction to the left abutment where it ties into natural ground.

The slopes of the earthen embankment are grassed and an access road runs along the entire crest of the embankment. The embankment is well maintained, adequately mowed, and void of any brush or tree growth. The slopes are generally uniform with no evidence of structural movement or cracking. The crest and some areas of the slope of the embankment have been subjected to motor bike travel. This has led to some localized surface erosion of the slopes.

The emergency spillway, according to the plans, consists of a 2 feet wide concrete control section that is covered with topsoil and grassed. The bottom of the emergency spillway channel is grassed, whereas the side slopes are riprapped to a height of approximately 2 feet above the channel bottom. The spillway channel extends from the right abutment, along the toe of the embankment, to its junction with the receiving stream which normally flows through the low level outlet. This channel, which is some 275 feet wide at the spillway crest, tapers down to 20 to 30 feet at its confluence with the receiving stream. The spillway channel flows into the receiving stream at a nearly 90 degree angle to the axis of the outlet channel. Due to the undesirable hydraulic characteristics of this junction and the tapered spillway channel, floodwaters discharging through the emergency spillway channel may very well flow past the outlet channel and/or rise above the channel riprap. Velocities in the spillway channel would approach 10 feet per second and could result in erosion of the channel invert, displacement of the bank protection and eventually cause damage to the downstream face of the embankment. In either of these situations, contact of the flood flows with the unprotected embankment could lead to erosion of the downstream slope with a resulting decrease in stability.

b. Design and Construction Data

No information regarding the slope stability of the structure was located. Drawings included in Appendix F substantially conform to the present facility. The drawings indicate the embankment was specified to be a homogeneous earth fill dam, compacted to 90% of modified proctor maximum density. The embankment crest was specified as 10 feet wide and the side slopes as 3:1 (horizontal to vertical), both upstream and downstream. The emergency spillway was to be constructed in natural ground. A 2 feet wide concrete sill serves as the control section running the entire crest

length. This concrete sill is covered with sod. The spillway channel is trapezoidal with 3:1 side slopes and a bottom width that varies from 275 feet at the spillway crest to about 30 feet at its junction with the outlet channel.

Construction drawings for the project are dated April 1976 and available correspondence indicates the project was completed in 1977.

c. Operating Records

The only formal operating records pertain to pool elevations, gate openings of the low level outlet, and security measures.

d. Post Construction Changes

There is no field evidence or available information indicating post construction changes to the facility.

e. Seismic Stability

No known faults or lineaments suggesting faults are present in the immediate area. The area is located within Zone 2 of the Seismic Probability Map but is only 25 miles northeast of an active Zone 3 which has had earthquakes with intensities as great as VIII on the Modified Mercalli Scale. Only a few earthquakes have been recorded in the vicinity of the reservoir and are tabulated below:

<u>Date</u>	<u>Intensity Modified Mercalli</u>	<u>Location Relative to Dam</u>
1931	I	8 miles E
1931	II	8 miles E
1944	II	8 miles SE
1977	IV	19 miles SE

6.2 STRUCTURAL STABILITY ANALYSIS

The earthen embankment appeared to be generally uniform in section with no signs of structural instability in evidence. The emergency spillway channel extends along the toe of the embankment from the spillway crest to its nearly 90 degree junction with the outlet channel. At the confluence with the outlet channel the spillway channel tapers to a bottom width of about 20 to 30 feet. The emergency spillway channel and outlet channel may be inadequate to safely convey flood discharges on the order of magnitude of the 1/2 PMF safely beyond the dam. This condition should be investigated further to determine if flood flows discharging from the emergency spillway channel constitute a potential hazard to the structural integrity of the embankment. The appropriate measures necessary to remedy this problem should be undertaken if the structural integrity is threatened.

The entire embankment, as well as areas beyond the toe of the slope, should be regularly inspected as a part of a formalized inspection program to detect deficiencies. Any deficiencies and the remedial measures undertaken to correct these deficiencies should be well documented to provide historical background on which future evaluations may be based.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The Phase I Inspection of the Larkin Creek Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis indicates that the spillway will pass 183% of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is assessed as adequate.

The visual inspection did not reveal conditions which would indicate evidence of structural displacement or instability.

The following specific safety assessments are based on the Phase I visual examination and analysis of hydrology and hydraulics, and structural stability:

1. The spillway channel flows into the receiving stream at a nearly 90° angle to the axis of the outlet channel. The tapered configuration of the emergency spillway channel would cause high flow velocities during spillway discharge which could result in erosion of the spillway channel, displacement of the bank protection and eventually erosion of the downstream slope of the embankment with a resulting decrease in stability.
2. Minor surface erosion due to motor bike traffic was detected on the slopes of the embankment and in the channel of the emergency spillway.
3. No warning system is presently in effect to alert the public should conditions occur which could result in failure of the dam.
4. Although the facility is inspected regularly, the inspection program does not include a formalized inspection of the entire embankment and areas beyond the toe of slope.

b. Adequacy of Information

The information available is adequate for this Phase I investigation.

c. Urgency

Items 1 through 4 of the safety assessment should be addressed by the Owner and appropriate actions taken within one year of this notification.

d. Need for Additional Investigation

Further investigation should be undertaken to analyze the effect of flow through the emergency spillway on the stability of the spillway channel and embankment downstream from the emergency spillway crest.

7.2 RECOMMENDED MEASURES

The following is a list of recommended measures to be undertaken to insure safety of the facility:

1. An investigation of the effect of flow in the emergency spillway channel should be performed to determine whether the erosive effect of the high flows would cause damage to the embankment of the dam. Remedial work should be undertaken depending on the results of this investigation.
2. Motor bike traffic should be restricted on the facility. The erosion due to this traffic should be repaired.
3. A flood warning and emergency evacuation system should be implemented to alert the public should conditions occur which could result in failure of the dam.
4. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility including the slopes and the area immediately downstream from the toe of the embankment. Deficiencies and the remedial measures undertaken to correct these deficiencies should be well documented to provide historical background on which future evaluations may be made.

APPENDIX A
PHOTOGRAPHS



2. Trash rack at inlet to control outlet. Note gate operator at top of photo.



3. Inlet to control outlet. Note staff gage at left of stream.



4. Outlet of control outlet.



5. Outlet stream showing downstream hazard.



6. Emergency spillway as viewed from downstream. Note slope protection in light brush to left.



7. View down emergency spillway channel. Note slope protection left and right. Channel terminates at outlet stream at right foreground of Photo #5.



8. Outlet channel on downstream side of first downstream road crossing. Note gabions on right bank.

APPENDIX B
VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST1) Basic Data

a. General

Name of Dam LARKIN CREEK DAM
 Fed. I.D. # NY 711 DEC Dam No. 40A-4227
 River Basin LAKE ONTARIO
 Location: Town GREECE County MONROE
 Stream Name LARKIN CREEK
 Tributary of BUCK POND
 Latitude (N) 43-12.1 Longitude (W) 77-44.4
 Type of Dam EARTH
 Hazard Category HIGH
 Date(s) of Inspection NOV. 20, 1980
 Weather Conditions FAIR (LIGHT SNOW COVER)
 Reservoir Level at Time of Inspection NO WATER IMPOUNDED AT TIME
OF INSPECTION

b. Inspection Personnel F.W. BYSZEWSKI, B. COLWELL, J.A. GOMEZ
H. MUSKATT, - DALE ENGINEERING COMPANY JAMES PEET - TOWN
OF GREECE

c. Persons Contacted (Including Address & Phone No.)
JAMES PEET P.E. TOWN ENGINEER
GREECE TOWN HALL TELEPHONE 716-225-2000
2505 W. RIDGE RD.
ROCHESTER, N.Y. 14626

d. History:

Date Constructed 1977 Date(s) Reconstructed _____
 Designer WILLIAM C. LARSEN P.E.
 Constructed By _____
 Owner TOWN OF GREECE

93-15-3(9/80)

2) Embankment

a. Characteristics

- (1) Embankment Material GLACIAL TILL - SANDY SILT - SILTY SAND
- (2) Cutoff Type NONE
- (3) Impervious Core NONE
- (4) Internal Drainage System NONE
- (5) Miscellaneous N/A

b. Crest

- (1) Vertical Alignment NO MISALIGNMENT OBSERVED
- (2) Horizontal Alignment NO MISALIGNMENT OBSERVED
- (3) Surface Cracks NONE OBSERVED (LIGHT SNOW COVER AT TIME OF INSPECTION)
- (4) Miscellaneous MINOR EROSION DUE TO MOTOR BIKE TRAFFIC

c. Upstream Slope

- (1) Slope (Estimate) (V:H) 1:3
- (2) Undesirable Growth or Debris, Animal Burrows NONE OBSERVED
- (3) Sloughing, Subsidence or Depressions NONE OBSERVED

(4) Slope Protection WELL ESTABLISHED SOD

(5) Surface Cracks or Movement at Toe NONE OBSERVED.

d. Downstream Slope

(1) Slope (Estimate - V:H) 1 : 3

(2) Undesirable Growth or Debris, Animal Burrows NONE OBSERVED

(3) Sloughing, Subsidence or Depressions NONE OBSERVED
MINOR EROSION FROM MOTOR BIKE TRAFFIC.

(4) Surface Cracks or Movement at Toe NONE OBSERVED

(5) Seepage NONE OBSERVED - NO WATER WAS
IMPOUNDED AT THE TIME OF THE INSPECTION.

(6) External Drainage System (Ditches, Trenches; Blanket) DITCH ALONG
TOE OF SLOPE TO CARRY LOCAL DRAINAGE -
GOOD CONDITION NO SLOUGHING

(7) Condition Around Outlet Structure RIP RAP COMPOSED OF
STONE FILL AT OUTLET - SOME DISPLACEMENT OF STONES BY
VANDALS.

(8) Seepage Beyond Toe NONE OBSERVED. - NO WATER WAS
IMPOUNDED AT THE TIME OF THE INSPECTION.

e. Abutments - Embankment Contact

NO PROBLEMS OBSERVED

93-15-3(9/80)

(1) Erosion at Contact NONE OBSERVED

(2) Seepage Along Contact NONE OBSERVED. - NO WATER
IMPOUNDED AT TIME OF

3) Drainage System

a. Description of System NONE -

b. Condition of System —

c. Discharge from Drainage System —

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs,
Piezometers, Etc.) NONE

5) Reservoir

- a. Slopes THE SLOPES ARE VERY FLAT - IMPOUNDMENT AREA
IS NORMALLY DRY.
- b. Sedimentation NEGLECTABLE
- c. Unusual Conditions Which Affect Dam NONE

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) HEAVILY DEVELOPED
RESIDENTIAL SUBDIVISION, SEE PHOTOS.
- b. Seepage, Unusual Growth NONE OBSERVED
- c. Evidence of Movement Beyond Toe of Dam NONE OBSERVED
- d. Condition of Downstream Channel RESTRICTED BY SMALL
ROADWAY CULVERTS.

7) Spillway(s) (Including Discharge Conveyance Channel)

DRY WEATHER FLOW PASSES THROUGH 36" PIPE WITH
36" SQUARE SLUICE GATE TO CONTROL FLOW.

- a. General GATE WAS OPEN APPROX 8 INCHES AT TIME
OF THE INSPECTION

- b. Condition of Service Spillway GOOD CONDITION (RECENT
CONSTRUCTION 1977) CONTROL GATE IN GOOD CONDITION

- c. Condition of Auxiliary Spillway GOOD CONDITION - NO EROSION
OBSERVED, SOME MINOR DAMAGE TO SOD COVER
DUE TO MOTOR BIKE TRAFFIC. (LIGHT SNOW COVER
AT TIME OF INSPECTION) BROAD CRESTED WEIR - SIDE
SLOPES RIPRAPPED. 275 FT WIDE 5 ft deep x 2 ft wide concrete
SECTION AT CREST.
- d. Condition of Discharge Conveyance Channel FLOW CHANNEL IS
RESTRICTED BY SMALL CULVERTS DOWN STREAM.
CHANNEL FROM CREST OF SPILLWAY TO OUTLET STREAM
GOOD CONDITION, WELL MAINTAINED - FLOW THROUGH AUXILIARY
CHANNEL HAS NEVER OCCUR.

8) Reservoir Drain/Outlet

Type: Pipe 36" Conduit _____ Other _____

Material: Concrete ✓ Metal _____ Other _____

Size: 36" Length _____

Invert Elevations: Entrance 446.63 Exit 446.35

Physical Condition (Describe): _____ Unobservable _____

Material: CONCRETE IN GOOD CONDITION

Joints: NOT OBSERVED Alignment GOOD

Structural Integrity: NO EVIDENCE OF STRUCTURAL
PROBLEMS OBSERVED IN THE FIELD.

Hydraulic Capability: 36" INLET CONTROL SEE HYDROLOGY
AND HYDRAULICS

Means of Control: Gate ✓ 36" x 36" Valve _____ Uncontrolled _____

Operation: Operable ✓ Inoperable _____ Other _____

Present Condition (Describe): EXCELLENT - IN GOOD
OPERATING CONDITION - WELL MAINTAINED.

9) Structural

- a. Concrete Surfaces NO PROBLEMS NOTED - NO SPALLING
OR CRACKING (OUTLET STRUCTURE)
- b. Structural Cracking NONE OBSERVED (OUTLET STRUCTURE)
- c. Movement - Horizontal & Vertical Alignment (Settlement) NONE OBSERVED
(OUTLET STRUCTURE)
- d. Junctions with Abutments or Embankments N/A
- e. Drains - Foundation, Joint, Face N/A
- f. Water Passages, Conduits, Sluices N/A
- g. Seepage or Leakage N/A

- h. Joints - Construction, etc. N/A
- i. Foundation N/A
- j. Abutments N/A
- k. Control Gates N/A
- l. Approach & ~~Outlet~~ Channels SEE PHOTOS - FREE FLOWING
NO PROBLEMS.
- m. Energy Dissipators (Plunge Pool, etc.) N/A
- n. Intake Structures TRASH RACK CLEAR, NO
OBSTRUCTIONS SEE PHOTO
- o. Stability —
- p. Miscellaneous —

93-15-3(9/80)

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

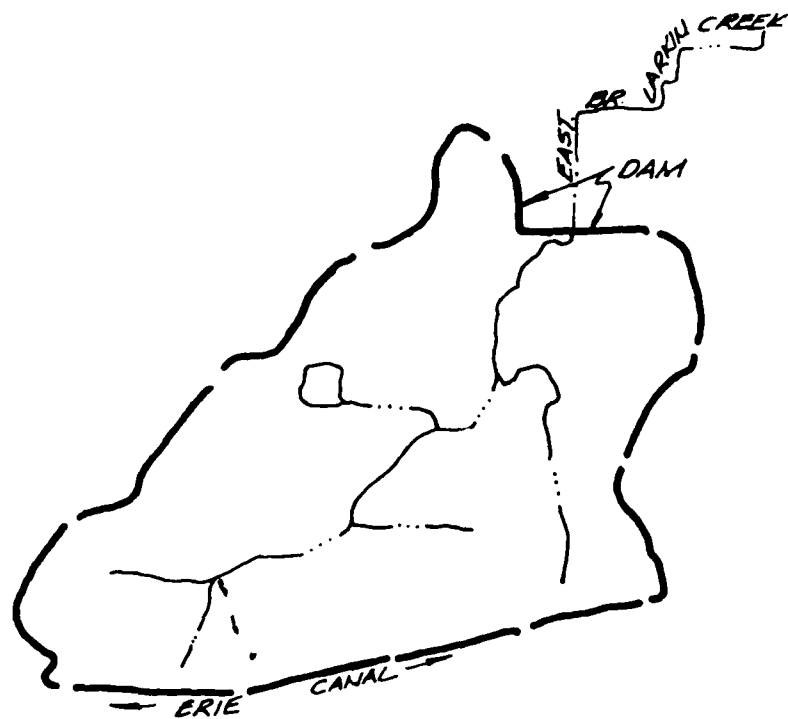
a. Description and Condition NONE

11) Operation Procedures (Lake Level Regulation):

THE FACILITY IS MONITORED TWICE WEEKLY DURING DRY
WEATHER. DURING RAINFALL EVENTS THE FACILITY IS
MONITORED EVERY TWO HOURS OR, IF REQUIRED, EVERY HOUR.
OUTLET GATES ARE ADJUSTED TO MAINTAIN OPTIMUM FLOW
DOWN STREAM AT GAGES IN THE RECEIVING STREAM

APPENDIX C

HYDROLOGIC/HYDRAULIC, ENGINEERING DATA AND COMPUTATIONS



SCALE: 1" = 2000'

LEGEND

- WATERSHED AREA
- - - - SUB AREA

DRAINAGE BASIN



STETSON • DALE

BANKERS TRUST BUILDING
UTICA • NEW YORK • 13501
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-28-81
SUBJECT LARKIN CREEK Dam PROJECT NO. 2520
Hydrologic Parameters DRAWN BY JAC

Drainage Area = 0.96 mi²

$$L = 8500' = 1.61 \text{ mi}$$

$$L_{CA} = 4000' = 0.76 \text{ mi}$$

$$C_t = 2.0 \text{ (Assumed)}$$

$$t_1 = C_t (L \times L_{CA})^{0.3}$$

$$t_1 = 2.12 \text{ hr.}$$

$$C_p = 0.625 \text{ (Assumed)}$$

Reservoir area ~ 26 acres @ spillway crest

**STETSON • DALE**BANKERS TRUST BUILDING
UTICA • NEW YORK • 13501
TEL 315-797-5800**DESIGN BRIEF**

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 12-19-80
SUBJECT LARKIN CREEK Dam, ID # 711 PROJECT NO. 2520
Depth-Area-Duration DRAWN BY JAG

PMP

FROM HMR # 33
FOR Lat. ~ 43°12' Long. ~ 77°44'
Index Rainfall = 21.6" FOR 200 mi², 24 hr
Zone 2

<u>Duration</u>	<u>% Index*</u>	<u>Depth</u>
6 hrs.	117	25.3"
12 hrs.	127	27.4
24 hrs	141	30.5
48 hrs	151	32.6

* Adjusted for site area, Drainage Area = 0.96 mi²
(which is less than the lower limit of
the areal adjustment graph, 10 mi², therefore
these values were adjusted for this
lower limit.)



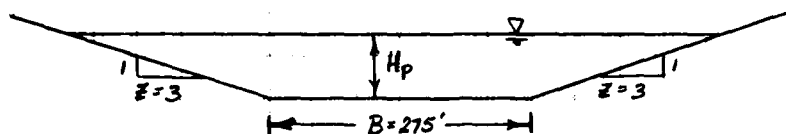
STETSON • DALE

BANKERS TRUST BUILDING
UTICA • NEW YORK • 13501
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-23-81
 SUBJECT Larkin Creek Dam PROJECT NO. 2520
Spillway Rating Curve DRAWN BY JAG

Trapezoidal Spillway
 275' bottom width
 3:1 Side Slopes
 Spillway Crest @ 456
 Top of Dam @ Elev. 459



$$Q = 8.03 C h_v^{1/2} (H_p - h_v) [B + z (H_p - h_v)]$$

Ref.: "Design of
Low Dams"

$$\text{where } h_v = \frac{3(2z H_p + B) - (16z^2 H_p^2 + 16z B H_p + 9B^2)^{1/2}}{10z}$$

$$C = 0.95, z = 3$$

<u>Elevation</u>	<u>H_p (ft.)</u>	<u>Q (cfs)</u>
456	0	0
456.25	0.25	101
456.5	0.5	287
456.75	0.75	527
457	1.0	814
457.25	1.25	1139
457.5	1.5	1500
457.75	1.75	1894
458	2.0	2318
458.5	2.5	3251
459	3	4288
459.5	3.5	5423
460	4	6650
460.5	4.5	7963
461	5	9360

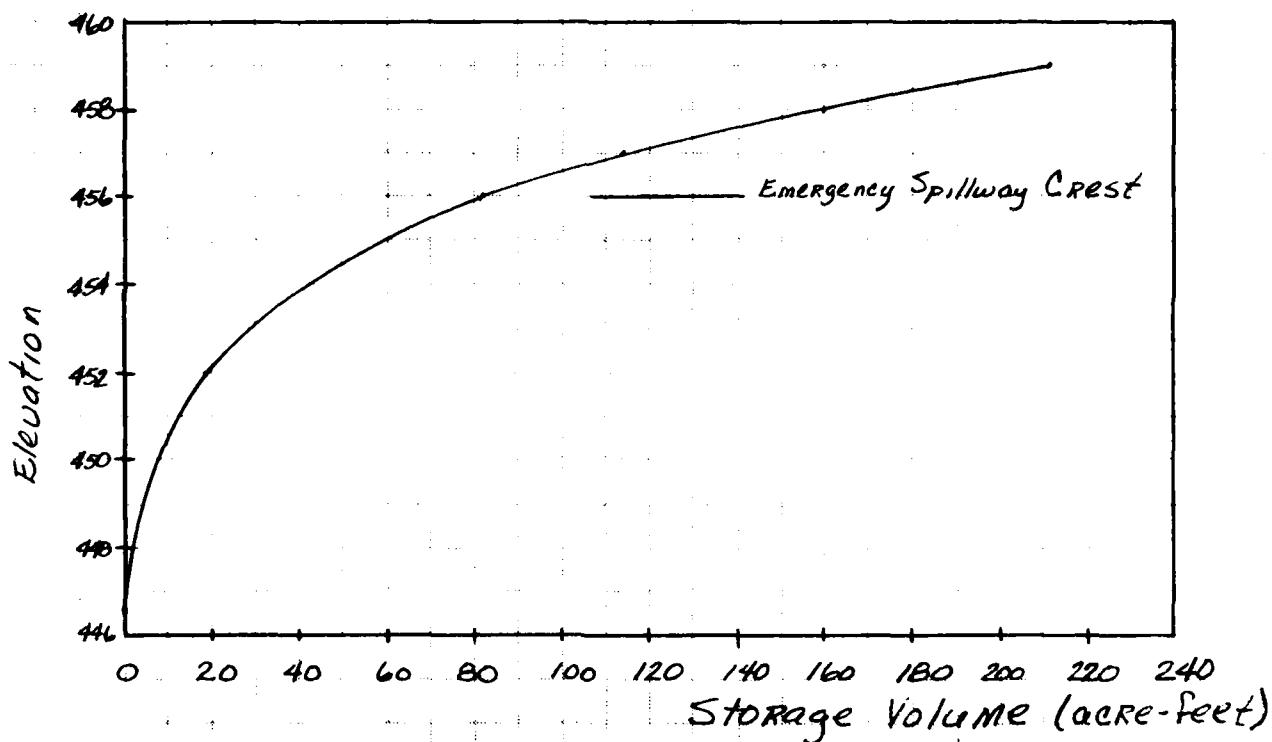


STETSON • DALE

BANKERS TRUST BUILDING
UTICA • NEW YORK • 13501
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-29-81
SUBJECT Larkin Creek Dam PROJECT NO. 2520
Stage-Storage Curve DRAWN BY JAF



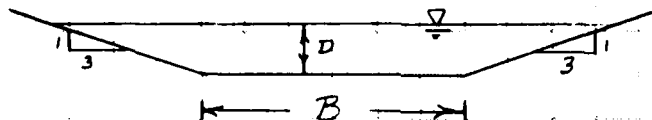


STETSON • DALE

BANKERS TRUST BUILDING
UTICA • NEW YORK • 13501
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 2-11-81
 SUBJECT Larkin Creek Dam PROJECT NO 2520
Spillway Channel Depth & Flow, etc. DRAWN BY JAG



Height of Riprap above channel bottom $\sim 2'$

$n \sim 0.035$

Channel Slope varies from 1% at upper end to $\sim 2\%$ near confluence with receiving stream.

Bottom width varies from 275' at upper end to $\sim 30'$ in $S=2\%$ region (lower end)

$1/2$ PMF discharge ≈ 1135 cfs

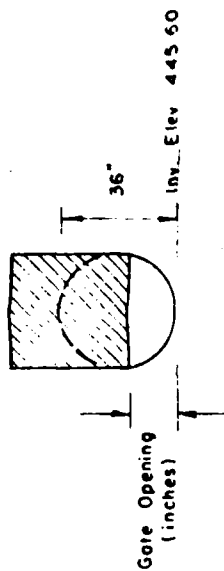
B	$K' = \frac{Qn}{B^{5/3} S^{1/2}}$	D/B^*	D	A	V
30'	0.0323	.0944	2.83'	109.4 ^{1/2}	10.4 fps
50'	0.00828	.0431	2.15'	121.7	9.3

In both cases flow will exceed the height of riprap and the velocities are in excess of permissible velocities of the channel material slope protection. This analysis neglects tailwater and transitional effects. Freeboard requirements would increase height of riprap beyond the depths of flow calculated here.

* From "Handbook of Hydraulics" - 5th ed. E. Brooker

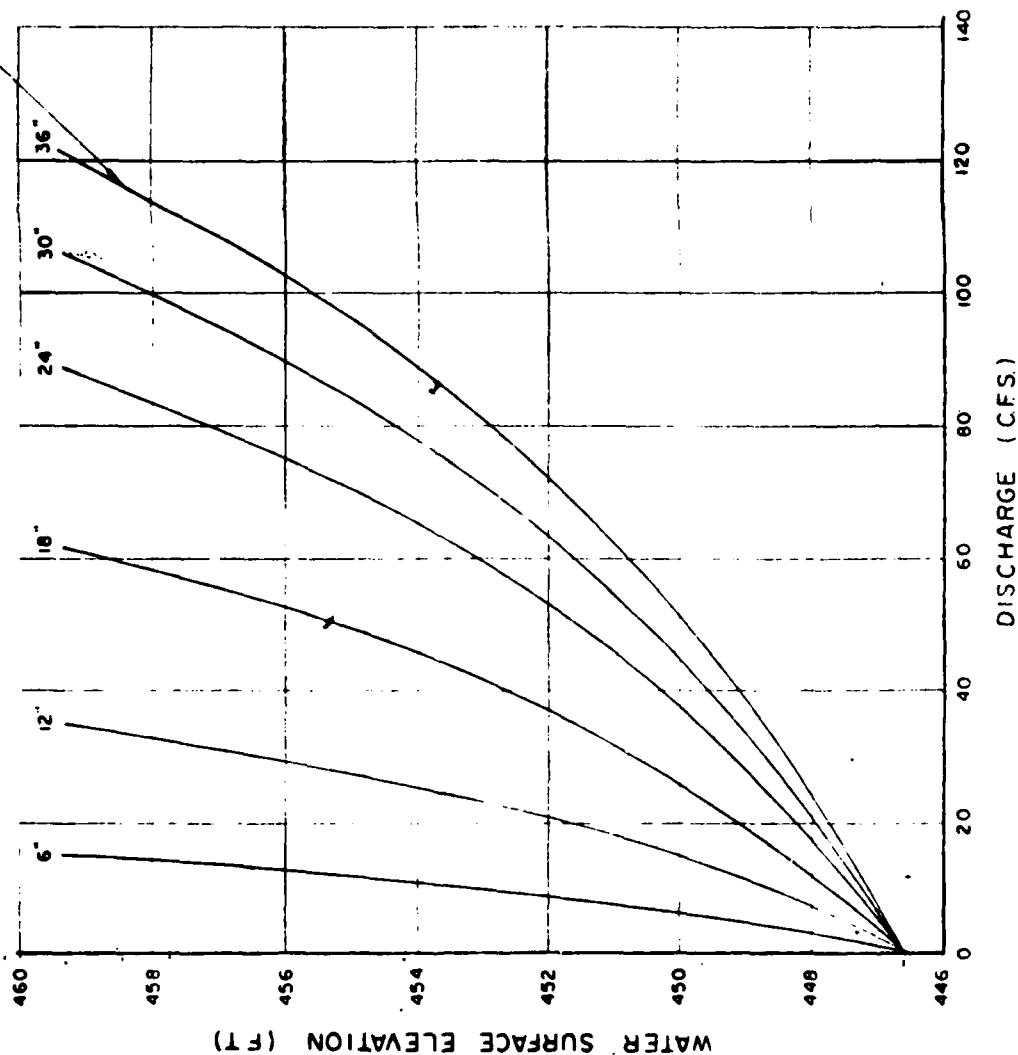
Gate Opening Curves (See Sketch Below)

NOTE
CHART INDICATES THEORETICAL FLOW
BASED ON FREE DISCHARGE GRAPH
BASED ON DATA FROM "LIMITATIONS OF
METERGATES" ASCE JOURNAL OF IRRIGATION
& DRAINAGE, DEC 1962, PG 26.
PAPER # 3359; AND SOIL CONSERVATION
SERVICE NOMOGRAPH FOR FREE
DISCHARGE THRU PARTIALLY OPEN GATES.
ACTUAL VALUES MAY VARY FROM THOSE
INDICATED



$$Q = 6.32 C_v D^2 H^{3/2}$$

Q = Design discharge rate
C_v = Gate discharge coefficient
D = Diameter in feet
H = Head in feet measured to the
centerline of conduit



STAGE - DISCHARGE CURVES

LARKIN CREEK
DETENTION FACILITY NO. 1
ST ANDREWS DRIVE

William C. Larsen, P.E., P.C.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING
44 SAGINAW DRIVE - ROCHESTER NY 14623
AREA CODE 716 473-3400

LUNN CREEK DAM
NY # 711

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

1

AREA-CAPACITY DATA:

	<u>Elevation</u> (ft.)	<u>Surface Area</u> (acres)	<u>Storage Capacity</u> (acre-ft.)
1) Top of Dam	<u>459</u>	<u>53</u>	<u>212</u>
2) Design High Water (Max. Design Pool)	<u>458</u>	<u>—</u>	<u>—</u>
3) ^{Principal} ~~Spillway~~ Spillway Crest	<u>446.5</u>	<u>0</u>	<u>0</u>
4) Pool Level with Flashboards	<u>N/A</u>	<u>—</u>	<u>—</u>
5) Service Spillway Crest	<u>455.75</u>	<u>26</u>	<u>82</u>

DISCHARGES

	<u>Volume</u> (cfs)
1) Average Daily	<u>Unknown</u>
2) Spillway @ Maximum High Water	<u>4290</u>
3) Spillway @ Design High Water	<u>2300</u>
4) Spillway @ Auxiliary Spillway Crest Elevation	<u>N/A</u>
5) Low Level Outlet (@ top of dam elev.) w/ gates fully open	<u>120</u>
6) Total (of all facilities) @ Maximum High Water	<u>4410</u>
7) Maximum Known Flood	<u>—</u>
8) At Time of Inspection	<u>Unknown</u>

Res. @ Elev. 4533
Q ~ 17 cfs
outflow

CREST:

ELEVATION: 459Type: Earth FillWidth: 10'Length: 2100'Spillover N/A

Location _____

SPILLWAY:

PRINCIPAL

446.5

Elevation

455.7536"Ø RCP

Type

TrapezoidalBottom
Width275'

Type of Control

Uncontrolled

✓

Controlled:

Sluice gate

Type

(Flashboards; gate)

Number

36" square

Size/Length

Invert Material

Anticipated Length
of operating service

Chute Length

Height Between Spillway Crest
& Approach Channel Invert
(Weir Flow)

HYDROMETEROLOGICAL GAGES:

Type : Staff gage
Location: Just upstream of 36" ϕ pipe inlet
Records: On file with Town of Greece,
Engineer's office
Date - _____
Max. Reading - Unknown

FLOOD WATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (mechanisms):

Through sluice gated 36" ϕ RCP
low level outlet

DRAINAGE AREA: 0.96 mi²

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Pasture & wooded

Terrain - Relief: moderately sloped

Surface - Soil:

Runoff Potential (existing or planned extensive alterations to existing
(surface or subsurface conditions)

Existing plans call for majority of
drainage to stay undeveloped.

Potential Sedimentation problem areas (natural or man-made; present or future)

None known

Potential Backwater problem areas for levels at maximum storage capacity
including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the
Reservoir perimeter:

Location: No low reaches known

Elevation:

Reservoir:

Length @ Maximum Pool 0.45 ± (Miles)

Length of Shoreline (@ Spillway Crest) 1.2 ± (Miles)

A1	(0001)	LAKKIN CREEK DAM	FILE IS ABPX																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
----	--------	------------------	--------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

[illegible]

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	100
ROUTE HYDROGRAPH TO	100
ROUTE HYDROGRAPH TO	454
ROUTE HYDROGRAPH TO	452
ROUTE HYDROGRAPH TO	450
ROUTE HYDROGRAPH TO	449
END OF NETWORK	

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE: WED. FEB 11 1981
 TIME: 15:26:12

LARKIN CREEK DAM FILE IS ABPX
 HEC-1DB (SNYDER PARAMETERS)
 PMF - DAM OVER TOPPING ANALYSIS

JOB SPECIFICATION									
NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	JPLT	IPRT	NSTAN
90	1	0	0	0	0	0	0	4	0
		JOPER	NWT	LROPT	TRACE				
		5	0	0	0				

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTIO= 7 LRTIO= 1
 RTIOS= 0.20 0.30 0.40 0.50 0.60 0.80 1.00

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 1									
ISTAG	ICOMP	IECON	ITAPE	JPLT	JFRT	INAME	ISTAGE	IAUTO	
100	0	0	0	0	0	1	0	0	

HYDROGRAPH DATA									
IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.96	0.00	0.96	0.00	0.000	0	1	0

PRECIP DATA									
SPE	PMS	R6	R12	R24	R48	R72	R96		
C.C.	21.00	117.00	127.00	141.00	151.00	0.00	0.00		

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA									
LROPT	STKR	DLTKR	RTIOL	ERAIN	STKRS	RTIOK	STRTL	CNSTL	ALSMX
0	0.01	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00

UNIT HYDROGRAPH DATA

UNIT HYDROGRAPH 11

RECESSION DATA
STRTO= -2.10 QRCN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 11 END-OF-PERIOD ORDINATES, LAG= 2.12 HOURS, CP= 0.63 VOL= 1.00
46. 142. 171. 117. 65. 36. 20. 11. 6. 3.
2.

MO.DA NR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MA PERIOD RAIN EXCS LOSS COMP Q
0
SUM 26.09 22.64 3.45 17908.
(663.)(575.)(88.)(507.10)

HYDROGRAPH ROUTING

ROUTE THRU RESERVOIR AND OVER SPILLWAY
ISTAQ ICOMP IRECON ITAPE JPLT JPRP INAME ISTAGE IAUTO

100 1 0 0 0 0 0 1 0 0
ROUTING DATA
GLSS CLSS AVG IRES ISAME IOPT IFMP LSTR
0.0 0.00 0.00 1 1 0 0 0 0

HSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT
1 0 0 0.000 0.000 -456. -1

STAGE 456.00 456.25 456.50 456.75 457.00 457.25 457.50 457.75 458.00
459.00 459.50 460.00 460.50 461.00
FLOW 0.00 101.00 267.00 527.00 814.00 1139.00 1500.00 1894.00 2318.00
4288.00 5423.00 6650.00 7963.00 9360.00

CAPACITY= 0. 11. 82. 114. 160. 212. 265.
ELEVATION= 447. 452. 456. 457. 458. 459. 460.

CREL SPWID COBW EXPW ELEV COQL CAREA EXPL
456.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA
TOPEL COQL EXPD DAMWID
459.0 2.6 1.5 2110.

PEAK OUTFLOW IS 457. AT TIME 42.00 HOURS
PEAK OUTFLOW IS 695. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 913. AT TIME 42.00 HOURS
 PEAK OUTFLOW IS 1134. AT TIME 42.00 HOURS
 PEAK OUTFLOW IS 1373. AT TIME 42.00 HOURS
 PEAK OUTFLOW IS 1845. AT TIME 42.00 HOURS
 PEAK OUTFLOW IS 2316. AT TIME 42.00 HOURS

HYDROGRAPH ROUTING

SPILLWAY CHANNEL ROUTE
 IETAQ ICOMP 1
 454
 ROUTING DATA
 IRES ISAME 1
 1
 0.000 0.00
 0.000 0.00
 NSTPS NSTDL 1 5
 LAG AMSKK X
 0 0.000 0.000
 JPLT 0
 JPR1 0
 INAME 1
 ISTAGE 0
 IAU0 0
 IPFP 0
 LSTR C
 ISPRAT C

NORMAL DEPTH CHANNEL ROUTING

GN(1) GN(2) GN(3) ELNVT ELMAX RLNTH SEL
 0.0350 0.0350 0.0350 455.0 459.0 310. 0.00650

CROSS SECTION COORDINATES--STA=ELEV/STA=ELEV--ETC

100.00 460.00 107.00 458.00 113.00 456.00 116.00 455.00 315.00 455.00
 318.00 456.00 324.00 458.00 326.00 459.00

STORAGE	0.00	0.30	0.60	0.90	1.21	1.51	1.82	2.13	2.45
	3.00	3.39	3.71	4.04	4.36	4.68	5.01	5.34	5.67
OUTFLOW	0.00	50.92	161.81	318.31	514.60	747.84	1017.54	1319.91	1653.57
	2410.38	2831.77	3280.87	3757.07	4259.84	4788.86	5343.57	5923.52	6528.37
STAGE	455.00	455.21	455.42	455.63	455.84	456.05	456.26	456.47	456.68
	457.11	457.32	457.53	457.74	457.95	458.16	458.37	458.58	458.79
FLOW	0.00	50.92	161.81	318.31	514.60	747.84	1017.54	1319.91	1653.57
	2410.38	2831.77	3280.87	3757.07	4259.84	4788.86	5343.57	5923.52	6528.37

FLOW	0.00	92.60	294.49	579.85	943.35	1376.81	1875.48	2436.43	3057.44
	4460.69	5260.13	6155.85	7127.00	8168.33	9277.11	10451.26	11689.04	12989.02

MAXIMUM STAGE IS	453.8
MAXIMUM STAGE IS	454.0
MAXIMUM STAGE IS	454.2
MAXIMUM STAGE IS	454.4
MAXIMUM STAGE IS	454.6
MAXIMUM STAGE IS	454.9
MAXIMUM STAGE IS	455.1

HYDROGRAPH ROUTING

SPILLWAY CHANNEL ROUTE		*****		*****	
ISTAQ	ICOMP	BECON	ITAPE	JPLT	JFRT
450	1	0	0	0	0
ROUTING DATA					
QLOSS	CLLOSS	AVG	IRCS	ISAME	IOPR
0.0	0.000	0.00	1	1	0
MSTPS					
1	0	LAG	AMSKK	X	TSK
		0	0.000	0.000	0.000
STORA					
		-1.	ISPRAT		
			0		

NORMAL DEPTH CHANNEL ROUTING

QW(1)	QW(2)	QW(3)	ELNVT	ELMAX	RLNTH	SEL
0.0350	0.0350	0.0350	451.0	459.0	195.	0.01030

CROSS SECTION COORDINATES--STA/ELEV,STA/ELEV--ETC

60.00	454.50	100.00	454.00	106.00	452.00
205.00	452.00	216.00	456.00	227.00	459.00

STORAGE	0.00	0.18	0.36	0.55	0.74	0.94	1.14	1.35	1.58
	2.16	2.45	2.75	3.05	3.35	3.65	3.96	4.27	4.58

OUTFLOW	1.00	00.00	100.00	200.00	300.00	400.00	500.00	600.00	700.00
---------	------	-------	--------	--------	--------	--------	--------	--------	--------

[illegible][illegible]

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.0350	0.0350	0.0350	449.0	459.0	100.	0.02000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC				
60.00	451.30	120.00	451.00	104.00
153.00	450.00	177.00	454.00	192.00
				459.00
			107.00	449.00
				150.00
				449.00

STORAGE	0.00	0.05	0.11	0.17	0.25	0.36	0.49	0.62	0.75
	1.03	1.17	1.32	1.47	1.62	1.77	1.92	2.07	2.23
OUTFLOW	0.00	89.75	289.51	593.05	987.56	1552.99	2314.46	3241.58	4324.36
	6945.46	8483.61	10157.55	11964.04	13900.47	15964.72	18155.05	20470.02	22908.43
STAGE	449.00	445.53	450.05	450.58	451.11	451.63	452.16	452.68	453.21
	454.26	454.79	455.32	455.84	456.37	456.89	457.42	457.95	458.47
FLOW	1.00	85.75	289.51	593.05	987.56	1552.99	2314.46	3241.58	4324.36
	6945.46	8483.61	10157.55	11964.04	13900.47	15964.72	18155.05	20470.02	22908.43

MAXIMUM STAGE IS 450.3

MAXIMUM STAGE IS 450.7

MAXIMUM STAGE IS 451.0

MAXIMUM STAGE IS 451.2

MAXIMUM STAGE IS 451.5

MAXIMUM STAGE IS 451.8

MAXIMUM STAGE IS 452.2

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

OPERATION	STATION	AREA	PLAN	RATIO	RATIOS APPLIED TO FLOWS						
					1	2	3	4	5	6	7
					0.20	0.30	0.40	0.50	0.60	0.80	1.00
HYDROGRAPH AT	100	0.96 (2.50)	1	472. (13.36)	708. (20.03)	943. (26.71)	1179. (33.39)	1415. (40.07)	1887. (53.43)	2358. (66.78)	
ROUTED TO	100	0.96 (2.50)	1	457. (12.94)	695. (19.67)	913. (25.85)	1134. (32.11)	1373. (38.88)	1845. (52.25)	2316. (65.59)	
ROUTED TO	454	0.96 (2.50)	1	454. (12.87)	695. (19.67)	914. (25.88)	1133. (32.09)	1370. (38.78)	1843. (52.19)	2316. (65.58)	
ROUTED TO	452	0.96 (2.50)	1	455. (12.87)	694. (19.65)	914. (25.87)	1133. (32.08)	1369. (38.76)	1842. (52.15)	2316. (65.57)	
ROUTED TO	451	0.96 (2.50)	1	455. (12.86)	693. (19.63)	913. (25.86)	1133. (32.07)	1368. (38.74)	1841. (52.13)	2315. (65.56)	
ROUTED TO	449	0.96 (2.50)	1	455. (12.88)	693. (19.62)	913. (25.86)	1132. (32.06)	1368. (38.73)	1841. (52.12)	2315. (65.56)	

PLAN 1

ELEVATION
STORAGE
OUTFLJW

INITIAL VALUE
456.00
82.
0.

SPILLWAY CREST
456.00
82.
0.

TOP OF DAM
459.00
212.
4288.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.25	456.68	0.00	104.	457.	0.00	42.00	0.00
0.30	456.90	0.00	111.	695.	0.00	42.00	0.00
0.40	457.06	0.00	118.	913.	0.00	42.00	0.00
0.50	457.25	0.00	125.	1134.	0.00	42.00	0.00
0.60	457.41	0.00	133.	1373.	0.00	42.00	0.00
0.80	457.72	0.00	147.	1845.	0.00	42.00	0.00
1.00	458.00	0.00	160.	2316.	0.00	42.00	0.00

PLAN 1 STATION 454

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	454.	455.8	42.00
0.30	695.	456.0	42.00
0.40	914.	456.2	42.00
0.50	1133.	456.3	42.00
0.60	1370.	456.5	42.00
0.80	1645.	456.8	42.00
1.00	2316.	457.1	42.00

PLAN	STATION	452
------	---------	-----

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
0.20	455	453.8	42.00
0.30	694	454.0	42.00
0.40	914	454.2	42.00
0.50	1133	454.4	42.00
0.60	1369	454.6	42.00
0.80	1842	454.9	42.00
1.00	2316	455.1	42.00

PLAN 1	STATION	450
--------	---------	-----

7041
7042
7043
7044
7045
7046
7047
7048
7049
7050
7051
7052
7053
7054
7055
7056
7057
7058
7059
7060
7061
7062
7063
7064
7065
7066
7067
7068
7069
7070
7071
7072
7073
7074
7075
7076
7077
7078
7079
7080
7081
7082
7083
7084
7085
7086
7087
7088
7089
7090
7091
7092
7093
7094
7095
7096
7097
7098
7099
7100
7101
7102
7103
7104
7105
7106
7107
7108
7109
7110
7111
7112
7113
7114
7115
7116
7117
7118
7119
7120
7121
7122
7123
7124
7125
7126
7127
7128
7129
7130
7131
7132
7133
7134
7135
7136
7137
7138
7139
7140
7141
7142
7143
7144
7145
7146
7147
7148
7149
7150
7151
7152
7153
7154
7155
7156
7157
7158
7159
7160
7161
7162
7163
7164
7165
7166
7167
7168
7169
7170
7171
7172
7173
7174
7175
7176
7177
7178
7179
7180
7181
7182
7183
7184
7185
7186
7187
7188
7189
7190
7191
7192
7193
7194
7195
7196
7197
7198
7199
7200
7201
7202
7203
7204
7205
7206
7207
7208
7209
7210
7211
7212
7213
7214
7215
7216
7217
7218
7219
7220
7221
7222
7223
7224
7225
7226
7227
7228
7229
7230
7231
7232
7233
7234
7235
7236
7237
7238
7239
7240
7241
7242
7243
7244
7245
7246
7247
7248
7249
7250
7251
7252
7253
7254
7255
7256
7257
7258
7259
7260
7261
7262
7263
7264
7265
7266
7267
7268
7269
7270
7271
7272
7273
7274
7275
7276
7277
7278
7279
7280
7281
7282
7283
7284
7285
7286
7287
7288
7289
7290
7291
7292
7293
7294
7295
7296
7297
7298
7299
7300
7301
7302
7303
7304
7305
7306
7307
7308
7309
7310
7311
7312
7313
7314
7315
7316
7317
7318
7319
7320
7321
7322
7323
7324
7325
7326
7327
7328
7329
7330
7331
7332
7333
7334
7335
7336
7337
7338
7339
7340
7341
7342
7343
7344
7345
7346
7347
7348
7349
7350
7351
7352
7353
7354
7355
7356
7357
7358
7359
7360
7361
7362
7363
7364
7365
7366
7367
7368
7369
7370
7371
7372
7373
7374
7375
7376
7377
7378
7379
7380
7381
7382
7383
7384
7385
7386
7387
7388
7389
7390
7391
7392
7393
7394
7395
7396
7397
7398
7399
7400
7401
7402
7403
7404
7405
7406
7407
7408
7409
7410
7411
7412
7413
7414
7415
7416
7417
7418
7419
7420
7421
7422
7423
7424
7425
7426
7427
7428
7429
7430
7431
7432
7433
7434
7435
7436
7437
7438
7439
7440
7441
7442
7443
7444
7445
7446
7447
7448
7449
7450
7451
7452
7453
7454
7455
7456
7457
7458
7459
7460
7461
7462
7463
7464
7465
7466
7467
7468
7469
7470
7471
7472
7473
7474
7475
7476
7477
7478
7479
7480
7481
7482
7483
7484
7485
7486
7487
7488
7489
7490
7491
7492
7493
7494
7495
7496
7497
7498
7499
7500
7501
7502
7503
7504
7505
7506
7507
7508
7509
7510
7511
7512
7513
7514
7515
7516
7517
7518
7519
7520
7521
7522
7523
7524
7525
7526
7527
7528
7529
7530
7531
7532
7533
7534
7535
7536
7537
7538
7539
7540
7541
7542
7543
7544
7545
7546
7547
7548
7549
7550
7551
7552
7553
7554
7555
7556
7557
7558
7559
7560
7561
7562
7563
7564
7565
7566
7567
7568
7569
7570
7571
7572
7573
7574
7575
7576
7577
7578
7579
7580
7581
7582
7583
7584
7585
7586
7587
7588
7589
7590
7591
7592
7593
7594
7595
7596
7597
7598
7599
7600
7601
7602
7603
7604
7605
7606
7607
7608
7609
7610
7611
7612
7613
7614
7615
7616
7617
7618
7619
7620
7621
7622
7623
7624
7625
7626
7627
7628
7629
7630
7631
7632
7633
7634
7635
7636
7637
7638
7639
7640
7641
7642
7643
7644
7645
7646
7647
7648
7649
7650
7651
7652
7653
7654
7655
7656
7657
7658
7659
7660
7661
7662
7663
7664
7665
7666
7667
7668
7669
7670
7671
7672
7673
7674
7675
7676
7677
7678
7679
7680
7681
7682
7683
7684
7685
7686
7687
7688
7689
7690
7691
7692
7693
7694
7695
7696
7697
7698
7699
7700
7701
7702
7703
7704
7705
7706
7707
7708
7709
7710
7711
7712
7713
7714
7715
7716
7717
7718
7719
7720
7721
7722
77

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	455.	452.1	42.00
0.30	693.	452.4	42.00
0.40	913.	452.6	42.00
0.50	1133.	452.8	42.00
0.60	1368.	453.0	42.00
0.80	1841.	453.4	42.00
1.00	2315.	453.8	42.00

PLAN 1 STATION 449

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	455.	450.3	42.00
0.30	693.	450.7	42.00
0.40	913.	451.0	42.00
0.50	1132.	451.2	42.00
0.60	1368.	451.5	42.00
0.80	1841.	451.8	42.00
1.00	2315.	452.2	42.00

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES

1. Department of the Army, Office of the Chief of Engineers. National Program of Investigation of Dams; Appendix D: Recommended Guidelines for Safety Inspection of Dams, 1976
2. U.S. Nuclear Regulatory Commission: Design Basis Floods for Nuclear Power Plants, Regulating Guide 1.59, Revision 2, August 1977
3. Linsley and Franzini: Water Resources Engineering, Second Edition, McGraw-Hill (1972)
4. W. Viessman, Jr., J. Knapp, G. Lewis, 1977, 2nd Edition, Introduction to Hydrology
5. Ven Te Chow: Handbook of Applied Hydrology, McGraw-Hill, 1964
6. The Hydrologic Engineering Center: Computer Program 723-X6-L2010, HEC-1 Flood Hydrograph Package, User's Manual, Corps of Engineers, U.S. Army, 609 Second Street, Davis, California 95616, January 1973
7. The Hydrologic Engineering Center, Computer Program: Flood Hydrograph Package (HEC-1) Users Manual For Dam Safety
8. Soil Conservation Service (Engineering Division): Urban Hydrology for Small Watersheds, Technical Release No. 55, U.S. Department of Agriculture, January 1975
9. H.W. King, E.F. Brater: Handbook of Hydraulics, McGraw-Hill, 5th Edition, 1963
10. Ven Te Chow: Open Channel Hydraulics, McGraw-Hill, 1959
11. Bureau of Reclamation, United States Department of the Interior, Design of Small Dams: A Water Resources Technical Publication, Third Printing, 1965
12. J.T. Riedel, J.F. Appleby and R.W. Schloemer: Hydrometeorological Report No. 33, U.S. Department of Commerce, U.S. Department of Army, Corps of Engineers, Washington, D.C., April 1956. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
13. North Atlantic Regional Water Resources Study Coordinating Committee: Appendix C, Climate, Meteorology and Hydrology, February 1972

14. Sherard, Woodward, Gizienski, Clevenger: Earth and Earth - Rock Dams, John Wiley and Sons, Inc., 1963
15. U.S. Soil Conservation Service, Stillwater Outdoor Hydraulic Laboratory: Handbook of Channel Design for Soil and Water Conservation, SCS-TP-61, March 1974; revised June 1954
16. The University of the State of New York - The State Education Department, State Museum and Science Service, Geological Survey: Geologic Map of New York, 1970
17. C.A. Hartnagel, 1907, Geologic Map of the Rochester and Ontario Beach Quadrangles, New York State Museum Bulletin 114
18. Soil Survey of Monroe County, New York, 1977, United States Department of Agriculture, Soil Conservation Service
19. Guidebook for Field Trips in Western New York, 1956, New York State Geological Association 28th Annual Meeting at the University of Rochester, N.Y.
20. William C. Larsen, P.E.: Preliminary Engineering Report; Larkin Creek Watershed Retention Basin Number One, St. Andrews Drive, August 1974; revised April 1975.
21. Erdman, Anthony, Associates: Detailed Drainage Study, Buck Pond Watershed, Town of Greece, New York, July 1978
22. Federal Emergency Management Agency, Federal Insurance Administration: Flood Insurance Study, Town of Greece, New York, Monroe County, September 1979

APPENDIX E

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

William C. Larsen, P.E.
John F. Karle, P.E.
Richard N. Passero, P.E.

William C. Larsen, P.E., P.C.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING

44 SAGINAW DRIVE - ROCHESTER, N.Y. 14623
AREA CODE 716/473-3460

Franklin Jack Buholtz, P.E.
Dale F. Green, P.E.
James R. Greens, P.E.
Hakim A. Hakim, P.E.
Shree R. Shrivastava, P.E.
Iqbal M. Singh, P.E.
Peter J. Smith, P.E.
Yash P. Wadhwa, P.E.
LaVern R. Celestino, P.L.S.
Edward T. Nicoletta, P.L.S.

JGT 1570
December 21, 1977

Mr. Louis M. Concra, Jr., P.E.
Central Permit Agent
NYS DEC
50 Wolf Road
Albany, NY 12233

RE: CERTIFICATION OF CONSTRUCTION
PERMIT #828-75-1152

Dear Mr. Concra:

Please be advised that the construction authorized under the above referenced permit in the Town of Greece has been completed. In accordance with the conditions of the permit issuance, this letter shall therefore serve as certification that the construction was performed under constant inspection by our office. We also subcontracted the services of a soils engineering firm to provide additional inspection services with regard to embankment construction.

The construction was completed in accordance with the plans and specifications as approved, with the following exceptions:

1. The cut-off trench from the centerline station 1+65 to centerline station 7+0 was deleted. During excavation and subgrade preparation in this area, it was determined that no defined sand layer actually existed in this area. Our soils consultant was called upon to field inspect this area and he recommended deletion of the cut-off wall as the existing soil was determined to be sufficiently impervious. Several isolated sandy soil pockets were excavated and backfilled with embankment material.
2. A crusher run access roadway was constructed along the top of the embankment from the end of the existing roadway to the discharge control structure. A vehicle by-pass around the structure was also constructed and a turn-around installed east of the discharge control structure. This was added to the project in order to facilitate access to the sluice gate controls by the Town maintenance personnel.

Mr. Louis M. Concra, Jr., P.E.
Central Permit Agent
NYS DEC
Albany NY

12/21/77

Upon completion of the as-built plans for this project, we will submit a copy to your office for review and filing. In the meantime, if you have any questions or comments regarding the project, please do not hesitate to call us.

Very truly yours

WILLIAM C. LARSEN, P.E., P.C.

William R. VanAlst
William R. VanAlst, P.E.

WRV:pd

cc: Don Riley, Supervisor
Town of Greece Engineering Dept.
Curt Rossow, Town Planner

STATE OF NEW YORK)
COUNTY OF MONROE) SS

On this 22 day of December 1977, personally appeared William R. VanAlst, P.E., Project Engineer for the firm of William C. Larsen, PE, PC, and acknowledged that he executed the foregoing instrument.

Bridget L. Shaw
Notary Public

Commission Expires: 3/30/79

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATER RESOURCES COMMISSION
ALBANY, NEW YORK 12201

APPLICATION FOR PERMIT SUPPLEMENT
CONSTRUCTION OF EARTH DAM & APPURTENANCES

LARKIN CREEK (TRIB. 0-122-2)

TOWN OF GREECE, NEW YORK

Description of Downstream Area

Situated immediately downstream (north) of the proposed construction on Larkin Creek (Tributary 0-122-2) is the Country Club View Subdivision, a 150 lot development of single-family homes constructed in 1963. Larkin Creek is conducted through this subdivision in a grassed channel and series of elliptical concrete pipe culverts.

From this area, the stream flows across Elmgrove Road and through the Ridgmont Country Club. It then continues northward under Ridge Road (U.S. Route 104) and through wooded and open areas and along the rear of developed lots on North Avenue to a point just south of Mill Road, where it joins with another main tributary. Larkin Creek continues northward through relatively undeveloped lands, finally emptying into Lake Ontario through Buck Pond.

With the exception of Country Club View Subdivision, the western portion of which has had numerous flooding and erosion problem associated with the stream (approximately 20 lots), there is no appreciable development downstream along Larkin Creek.

DAM INSPECTION REPORT
(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
40A-4227	W. Ontario	Greece	Monroe	C	7/5/77 KDH

Stream =

Owner = Town of Greece

Type of Construction

- ☒ Earth w/Concrete Spillway
- ☐ Earth w/Drop Inlet Pipe
- ☐ Earth w/Stone or Riprap Spillway
- ☐ Concrete
- ☐ Stone
- ☐ Timber
- ☐ Other _____

Use

- ☐ Water Supply
- ☐ Power
- ☐ Recreation - ☐ High Density
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned
- ☒ Flood Control
- ☐ Other _____

Estimated Impoundment Size

0.52 Acres

Estimated Height of Dam above Streambed 11.5 Ft.

Condition of Spillway

- ☒ Service satisfactory
- ☐ In need of repair or maintenance
- ☒ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Condition of Non-Overflow Section

- ☒ Satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Condition of Mechanical Equipment

- ☒ Satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Siltation

☐ High

☒ Low

Explain: _____

Remarks: _____

Evaluation (From Visual Inspection)

- ☐ Repairs req'd. beyond normal maint.
- ☒ No defects observed beyond normal maint.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
 ION REPORT
 (Inspection)

nty	Hazard Class	Date & Inspector
12	C	7/5/77 KWT

- Town of Greece.

Use

- ☐ Water Supply
☐ Power
☐ Recreation - ☐ High Density
☐ Fish and Wildlife
☐ Farm Pond
☐ No Apparent Use-Abandoned
☒ Flood Control
☐ Other

- ☐ Stone
☐ Timber
☐ Other

Estimated Impoundment Size 0.752 Acres 11-5 Height of Dam above Streambed 11-5 Ft.

Condition of Spillway

- ☒ Service satisfactory
☐ In need of repair or maintenance
☒ Auxiliary satisfactory
☐ In need of repair or maintenance

Explain: _____

Condition of Non-Overflow Section

- ☒ Satisfactory
☐ In need of repair or maintenance

Explain: _____

Condition of Mechanical Equipment

- ☒ Satisfactory
☐ In need of repair or maintenance

Explain: _____

Siltation

- ☐ High
☐ Low

Explain: _____

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATER RESOURCES COMMISSION
ALBANY, NEW YORK 12201

MS

APPLICATION FOR PERMIT

for the Construction, Reconstruction or Repair of a Dam or
Other Impoundment Structure under Conservation Law, Section 429 (c).

CONSERVATION DEPARTMENT USE ONLY

Application No. 828-75-1152

Dam No. 40A-4227

Watershed W. Ontario

and instructions on the reverse side before completing this application. Please type or print clearly in ink.

1. NAME AND ADDRESS OF APPLICANT		2. NAME AND ADDRESS OF OWNER (if different from applicant)	
First Name	M.I.	First Name	M.I.
Last Name		Last Name	
Town of Greece			
Street Address		Street Address	
505 Ridge Road West			
Post Office	State	Post Office	State
Rochester	New York		
Zip Code		Zip Code	
14625			

TYPE OF PROJECT	4. IS STATE-OWNED LAND TO BE USED?	5. PROPOSED STARTING DATE	EXPECTED COMPLETION DATE
☒ Construction ☐ Reconstruction ☐ Repair	☐ Yes ☒ No	June 1976	Nov. 30, 1976

PROJECT DESCRIPTION

LOCATION OF DAM	County	Town	Give distance and direction from commonly accepted landmark
Stream or Body of Water			
Larkin Creek	Monroe	Greece	4400' + north of Barge Canal

LOCATION ON U.S. GEOLOGICAL SURVEY MAP	8. PROPOSED USE FOR IMPOUNDED WATER	9. STATE THE HEIGHT ABOVE SPILLCREST OF THE LOWEST PART OF THE IMMEDIATE UPSTREAM ADJOINING PROPERTY OR PROPERTIES
Name of Map		
Latitude	Temporary Stormwater storage	
Longitude		
Chester West		9.5 Feet
43°12'10" N		
77°44'30" W		

IS THIS PROPOSED POND OR LAKE PART OF A PUBLIC WATER SUPPLY?	11. SIZE OF AREA DRAINING INTO POND OR LAKE (Acres or Square Miles)
If not, where is nearest downstream public water supply intake?	
☐ Yes ☒ No	852 acres
No intakes on stream	

12. THE DRAINAGE AREA IS COMPOSED OF: (Total = 100%)

11 % Forest	23 % Cropland	28 % Pasture	13 % Other	13 % Swamp	12 % Suburban Lands	0 % Urban Lands
-------------	---------------	--------------	------------	------------	---------------------	-----------------

13. TYPE OF SPILLWAY	14. DESIGNER'S ESTIMATE OF CLASS OF HAZARD (As described in "Guidelines for Small Earth Dam Designs")
Service Spillway - Auxiliary Spillway Combination	☐ Class "a" ☐ Class "b" ☒ Class "c"
☐ Single Spillway	NOTE: Provide descriptive information on character of downstream area.
☐ Pipe Riser ONLY	
☒ Other Gated conduit - Emergency spillway	

15a. SPILLWAY INFLOW DESIGN FLOOD	15b. SERVICE SPILLWAY INFLOW DESIGN FLOOD
Frequency	Frequency
40% of MRE	50yr
Flood Peak	Flood Peak
2400 c.f.s.	290 c.f.s.
Runoff Volume	Runoff Volume
23 in.	5.10

16. THE SINGLE SPILLWAY OR AUXILIARY SPILLWAY IS COMPOSED OF:	17. SINGLE OR AUXILIARY SPILLWAY DISCHARGE AT DESIGN HIGH WATER	18. TYPE OF ENERGY DISSIPATER PROVIDED ON SINGLE SPILLWAY
☐ Vegetated Earth ☐ Concrete ☐ Timber ☐ Rock-filled Crib ☐ Masonry ☒ Other Gated Conduit		
MAXIMUM VELOCITY WITHIN THE SINGLE OR AUXILIARY SPILLWAY	20 c.f.s.	☐ Hydraulic Jump Basin ☐ Drop Structure ☒ Other see plans
3 f.p.s.		

19. POND OR LAKE WILL BE DRAINED BY MEANS OF	20. WATER WILL BE SUPPLIED TO RIPARIAN OWNERS DOWNSTREAM BY MEANS OF	21. HEIGHT OF DAM ABOVE STREAM BED
Gated Conduit	Gated Conduit	11.5' Feet

22. AREA-CAPACITY DATA	ELEVATION, Referred To Assumed Benchmark	SURFACE AREA	VOLUME STORED
Answer 1, 2 and 3, OR 1, 2, 4, 5			
1. Top of Dam	458.0 Feet	51.7 Acres	160 Acro-Feet
2. Design High Water -	456.0 Feet	26.3 Acres	82 Acro-Feet
3. Single Spillway Crest -	446.5 Feet	0 Acres	0 Acro-Feet
4. Auxiliary Spillway Crest			
5. Service Spillway Crest			

23. TYPE OF ENERGY DISSIPATER AT OUTLET OF CONDUIT:	24. IS PIPE RISER PROVIDED WITH AN ANTI-VORTEX DEVICE?
☐ Impact Basin ☐ Plunge Pool ☐ Hydraulic Jump Basin ☒ Other see plans	☐ Yes ☐ No N.A.

25. DRAWDOWN TIMES: Answer 1 and 2, or 1, 3 and 4

1. Has provision been made to evacuate 90% of the storage below the lowest spillway crest within fourteen days?	☒ Yes ☐ No
2. Can the single spillway evacuate 75% of the storage between the maximum design high water and the spillway crest within 48 hours?	☒ Yes ☐ No
3. Can the Service Spillway evacuate 75% of the storage between the auxiliary spillway and the Service Spillway crests within seven days?	☐ Yes ☐ No
Can the Service Spillway and the Auxiliary Spillway in combination evacuate the storage between the design high water and the auxiliary spillway crest within 12 hours?	☐ Yes ☐ No

SOIL DATA — State the character of the bed and banks in respect to natural types of soil materials, hardness, perviousness, water bearing, effect of exposure to air and water, uniformity, etc.

See Report of James P. Collins, P.E.

If an earth dam, describe the material to be used in the embankment.

See Report of James P. Collins, P.E.

What is the source of embankment fill material(s)?

on-site borrow

Are there porous seams or fissures beneath the foundation of the proposed dam? ☐ Yes ☒ No Method used to obtain the above soil data ☒ Soil Borings ☐ Test Pits

DESIGN ENGINEER

Name of Agency or Individual

William C. Larsen, P.E.

P.E. License No. of Individual

27718

Address

44 Saginaw Dr., Rochester, NY 14623

Title

Owner

26. CONSTRUCTION ENGINEER OR CONTRACTOR

Name of Agency or Individual

P.E. License No. of Individual

Address

Title

NAME AND ADDRESS OF OFFICIAL NEWSPAPER OF LOCALITY WHERE PROPOSED WORKS ARE LOCATED

Greece Post

4 South Main St.

Pittsford, NY 14534

CERTIFICATION

Application is hereby made to the Conservation Department acting in behalf of the Water Resources Commission pursuant to Sections 429(c) of the Conservation Law.

The applicant certifies that the above statements are true and agrees that the issuance of the permit is based on the accuracy thereof. As a condition to the issuance of a permit, the applicant accepts full legal responsibility for all damage, direct or indirect, of whatever nature and by whomever suffered, arising out of the project described herein and agrees to indemnify and save harmless the State from suits, actions, damages and costs of every name and description resulting from the said project.

6-24-75
Date

James P. Collins
Signature

INSTRUCTIONS

1. Type or print in INK.

2. Five (5) copies of all papers including detail construction plans and specifications must be filed.

3. The plans and specifications submitted with the application must include the following information:

(a) A plan showing proposed dam, dam appurtenances, bench marks, topographic contours at dam and around the anticipated reservoir area, including 2-foot contours to 6 feet above high water level.

(b) A profile along the dam axis and a transverse section of the dam at its maximum height.

(c) A profile along the center line and transverse section, or sections, of the spillways including stilling basins, outlet work, and other details, if necessary, in design of the structures.

(d) A topographical plan to a suitable scale showing drainage area, normal water level in the lake or pond and owners property line notes and bounds.

(e) Specifications for materials and methods of construction.

(f) A log of all soil information available to the design engineer or conservationist and location of drill holes, test pits or other foundation exploration, location of borrow area, horizontal and vertical controls, if necessary.

(g) Additional drawings should be included to clearly show all details of the proposed works.

4. NO WORK of construction, reconstruction or repairs of the structure or structures SHALL BE STARTED UNTIL A PERMIT therefor has been issued by the New York State Water Resources Commission.

5. The design, preparation of plans, estimates and specifications and the supervision of the erection, reconstruction and repair of all the structures herein applied for shall be done by a licensed professional engineer, or in the case of farm ponds by an engineer or conservationist employed by a governmental agency cooperating with a soil conservation district, or by an engineer employed by the Department of Environmental Conservation.

6. A "Notice of Application" must be published by the applicant. The form of notice and instructions for publication will be furnished to the applicant by the Local Permit Agent to whom the application is delivered.

7. An information circular "Guidelines for Small Earth Dam Designs" is available upon request from the Water Resources Commission or the Local Permit Agent.

8. Samples of foundation, embankment and construction materials need not be furnished unless requested.

- ENVIRONMENTAL STUDIES
- LAND PLANNING
- SOLID WASTE MANAGEMENT
- WATER POLLUTION CONTROL

- WATER WORKS
- DRAINAGE
- HIGHWAYS
- ENGINEERING SURVEYS

William C. Larsen, P.E.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING

44 SAGINAW DRIVE - ROCHESTER, N.Y. 14623

AREA CODE 716 473-3460

Nov. 26, 1975

John F. Karle, P.E.
Richard N. Passero, P.E.
JGT 1570

Mr. Stanford J. Zeccolo,
Senior Hydraulic Engineer
Environmental Analysis
N.Y.S.D.E.C.
50 Wolf Road
Albany, N.Y.

RE: CONTRACT FOR CONSTRUCTION OF EARTH
DAM AND APPURTENANCES
LARKIN CREEK STORMWATER DETENTION FACILITY
NUMBER ONE - ST. ANDREWS DRIVE
TOWN OF GREECE DRAINAGE DISTRICT NO. 24
MONROE COUNTY, NEW YORK

Dear Mr. Zeccolo:

In regard to your letter of October 21, 1975 and our subsequent discussion with George Koch, we are enclosing the following material to constitute a revised submittal for the proposed Larkin Creek stormwater Detention Facility to be located in the Town of Greece:

- (1) 3 copies of revised construction drawings
- (2) 3 copies of St. Andrews Drive Profile
- (3) 3 copies of Spillway Capacity Calculations

In addition, it is our understanding that you have in your possession the following supporting data submitted on Sept. 29, 1975:

- (1) Application for permit
- (2) Specifications
- (3) Addendum to soils report including covering letter, test pit logs, revised site plan and revised soil profile
- (4) Letter from Geotechnical Engineers in connection with subgrade preparation.

Mr. Stanford J. Zeccolo,
Senior Hydraulic Engineer

Nov. 26, 1975

- (5) Larsen letter of September 29, 1975 explaining previous revisions.

Basically, this submittal consists of a revised auxiliary spillway of a size and alignment to satisfy your various requirement. In addition we have raised the top of the embankment from elevation 458.0 to 459.0 to provide the required 1' of freeboard at a flow through the spillway of 2150 cfs. As a matter of explanation, we have attached a copy of sheet 4 #3 of the construction drawings to the spillway calculations. The drawing has been marked to show locations of the calculated sections and other pertinent data. From field survey and office calculations it has been determined that at design flow (2150 cfs) water will pond in the spillway at elevation 452.87. Accordingly analysis of the spillway below that elevation should not be necessary.

We have analyzed the flow characteristics at the control section and at two separate transitions between the control section and the ponding surface. In all cases, the channel has sufficient capacity to carry the design flow. Velocities in the vicinity of transition section #2 are slightly greater than 8 ft/sec and as a result surge pile stone channel lining has been shown in that area.

With this revised submittal, it is our feeling that we have complied with all D.E.C. requirements.

If, upon your review there are any questions or any suggested modifications, please call us at once to set up a meeting to discuss these matters in detail.

May we hear from you at your earliest convenience.

Very truly yours,

DFG:pd

Dale F. Green, P.E.

Enc.

cc: Louis M. Concra
George Koch ✓

Nov 29, 1975

PROPOSED ST. ANDREWS DR. RETENTION BASIN
TOWN OF GREECE

SPILLWAY CAPACITY CALCULATIONS

- I. Compute ponding elevation of spillway discharge based on outflow of 2150 CFS and attached profile of Saint Andrews Drive.

$$Q = CLH^{3/2}_{Avg.} \quad \text{where} \quad H = 2H_{Avg} = \text{height of water above low point in road.}$$

$$\text{try } H_{Avg} = 1.0'$$

$$Q = CLH^{3/2}_{Avg.}$$

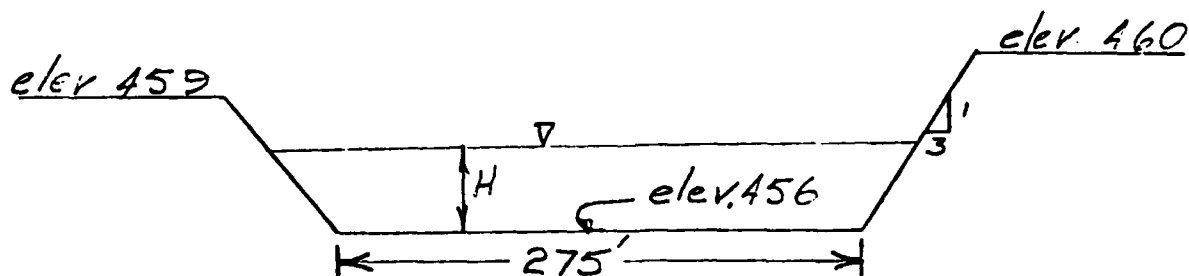
$$2150 = 2.8 \times L \times 1.0$$

$$L = 768'$$

$$\text{for } H_{Avg} = 1.0 \text{ ponded water surface} = 452.87'$$

$$\text{from road profile, for W.S.} = 452.87, L = 770' \text{ check}$$

- II. Calculate water surface at control section



$$Q = CLH^{3/2}$$

$$2150 = 2.8 \times 275 H^{3/2}$$

$$Q = 2150 \text{ CFS}$$

$$H^{3/2} = 2.79$$

$$H = 1.99'$$

$$\text{Water Surface Elevation} = 457.99$$

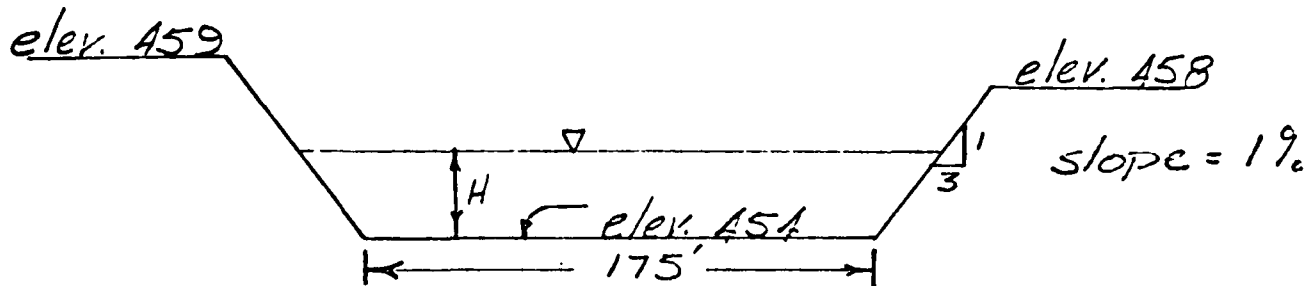
$$\text{Area of channel} = \frac{275 + 286.94}{2} \times 1.99 = 559.1 \text{ S.F.}$$

$$\text{Velocity} = \frac{Q}{A} = \frac{2150}{559.1} = 3.85 \text{ ft/sec} < 8 \text{ ft/sec}$$

$$A = 2 + 275 = 550$$

$$V = \frac{2150}{550} = 3.9' / \text{sec} (0.11)$$

III. Calculate Water Surface at Transition Section #1



$$Q = \frac{A}{N} \times 1.49 R^{2/3} S^{1/2} \quad \text{try } H = 1.60'$$

$$R = \frac{A}{P} = \frac{1/2 (175 + 184.6) \times 1.6}{175 + 2 (5.1)}$$

$$= \frac{287.7}{185.1} = 1.55$$

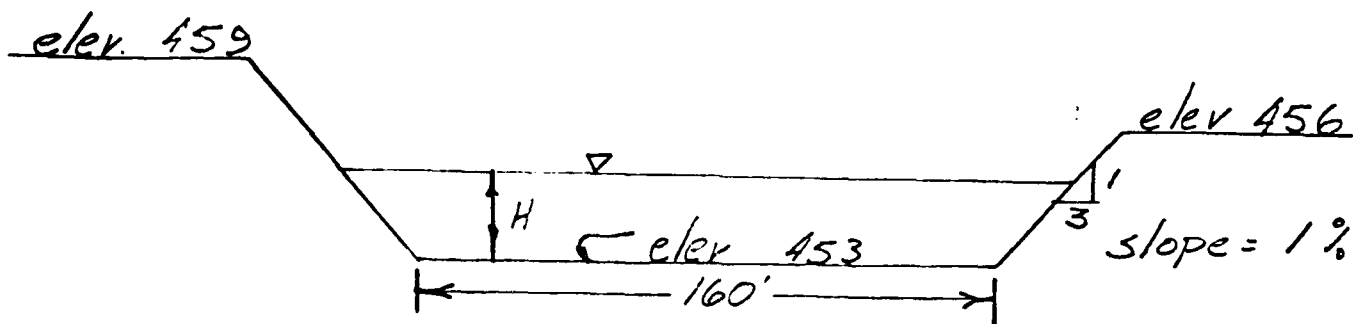
$$Q = \frac{287.7}{.025} \times 1.49 \times (1.55)^{2/3} (0.01)^{1/2}$$

$$Q = 2299 \text{ CFS} > 2150 \text{ CFS}$$

find velocity at transition section

$$V = \frac{2299}{287.7} = 7.99 \text{ ft/sec}$$

IV. Calculate Water Surface at Transition Section #2



try $H = 1.65'$

$$R = \frac{A}{P} = \frac{\frac{1}{2} (160 + 169.9) \times 1.65'}{160 + 2 (5.2)} = \frac{272.2}{170.4} = 1.60$$

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

$$Q = \frac{272.2}{.025} \times 1.49 \times 1.37 \times 0.1 = 2222 \text{ CFS}$$

Find velocity

$$V = \frac{2222}{272.2} = 8.16 \text{ ft/sec} > 8.0 \text{ ft/sec}$$

Install surge Pile stone channel lining

L. Casero/S. Zaccaro - Environ. Analysis
W. Richter/G. Koch - F&C
Review of Revised Plans for Proposed Larkin Creek Retention Basin,
Town of Grecco - Application No. 828-75-1132

October 17, 1975

We have reviewed the revised plans and the Engineer's letter submitted September 29, 1975. Following are our comments:

1. The top of dam must be raised so that there is 1 foot of freeboard above design high water.

Auxiliary Spillway Crest	= El. 456.0
Depth of Flow of Peak Discharge =	2.5 Ft.
Design High Water	= El. 458.5
Freeboard	= 1.0 Ft.
Required El. for Top of Dam	= El. 459.5

Item 21 on the permit should reflect the correct elevations.

2. At the meeting of September 26, 1975 we indicated that an earth spillway with a transition to a narrow channel was not acceptable because of the high velocities and the resulting erosion to the spillway channel in the vicinity of the adjacent homes. We indicated that if an earth spillway was still desired it would have to be revised so that the channel transition took place further downstream where the alignment was straight. We also indicated that in order to design such a channel a water surface profile is required to determine the depths of flow and the resulting velocities in the channel.

Our review indicates that the spillway channel shown is not acceptable because of the erosive velocities in the vicinity of lots #185 and #197, and that in some locations the depth of flow exceeds the channel height.

Please submit backwater computations with a profile of the water depths and velocities.

NOTE:

Phone conversation 12 Nov 75 between

L. Casero and Dale Green.

WR:GK:bt

1. Engr. will raise Final Spillway so that transition will occur further downstream.

2. Engr. will submit a backwater curve to determine W.S. and velocities

G. Koch
12 Nov. 75

ENVIRONMENTAL STUDIES
LAND PLANNING
• SOLID WASTE MANAGEMENT
• WATER POLLUTION CONTROL

• WATER BARRS
• DRAINAGE
• HIGHWAYS
• ENGINEERING SURVEYS

William C. Larsen, P.E.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING
44 SAGINAW DRIVE - ROCHESTER, N.Y. 14623
AREA CODE 716 473-3460

September 29, 1975

John F. Karle, P.E.
Richard N. Passero, P.E.

JGT 1570

Mr. Louis M. Concra, Jr., P.E.
Assistant Director for Conservation Engineering
NYS DEC
50 Wolf Rd
Albany, N.Y. 12233

RE: CONTRACT FOR CONSTRUCTION OF
EARTH DAM AND APPURTENANCES
LARKIN CREEK STORMWATER DETENTION FACILITY
NUMBER ONE - ST ANDREWS DRIVE
TOWN OF GREECE DRAINAGE DISTRICT NO. 24
MONROE COUNTY, NEW YORK

Dear Mr. Concra:

Reference is made to our recent meetings and correspondence in connection with the above referenced Stormwater Detention Facility to be located in the Town of Greece. Subsequent to our last meeting, we have revised the plans and have performed additional subsurface investigations. Accordingly, we are enclosing 5 copies of:

Application For Permit

Construction Drawings (under separate cover)

Addendum to Soils Report including covering letter, test pit logs, revised site plan and revised soil profile.

Letter from Geotechnical Engineers in connection with subgrade preparation

The following is a list and explanation of revisions to the original submittal:

1. The eastern portion of the embankment has been relocated approximately 200' to the south of its original position. The emergency spillway has been relocated to provide a more gradual turn into the exit channel and a concrete control section has been provided to prevent excessive erosion.

CONSTRUCTION MANAGEMENT

OCT 9 1975

NEW YORK STATE

Mr. Louis M. Concra, Jr., P.E.

9/29/75

2. Payment Item No. 4 specifies that the maximum diameter of particles to be used in the embankment fill is 6".

3. The Application for Permit has been revised to reflect a spillway inflow design flood of 2400 cfs. Further, the proposed starting date is now shown as June 1976.

4. The emergency spillway is shown to be constructed in a "cut-section".

5. Since velocities over the emergency spillway for the design flow are less than 8 f.p.s. the surge pile stone channel lining has been eliminated. It has been retained in Sections of the spillway channel where erosion protection is required.

6. Centerline stationing has been provided along the axis of the dam.

7. Angle iron stops have been shown to prevent the sluice from being lowered more than 9" from the bottom.

8. In response to your request for a cut-off trench along the entire length of the dam, we offer the following comments: In those areas where granular material (less than 30% passing the #200 sieve) is encountered the specifications require that material be removed and replaced with suitable material from the borrow area. Such is the case with the granular deposit located between centerline stations 1+50-6+85. In addition, a minimum of 2' of native soil will be removed along the entire axis of the dam under Payment Item #2 - Subgrade Preparation. If any unsuitable soil is encountered in this "mucking out" operation, it too will be removed and replaced.

In effect, a minimum 2' deep cut off trench will be provided unless otherwise necessary. Our geotechnical consultants indicate that this can be done maintaining an acceptable factor of safety. Further, a qualified soils engineer will be present for the subgrade preparation and will have authority to order the contractor to remove and replace any questionable subgrade material.

Mr. Louis M. Concra, Jr., P.E.

9/29/75

It is our hope that the above revisions will satisfy the questions that you have raised in the past and that DEC approval of this project will be forthcoming shortly.

If you have any questions, please do not hesitate to call us.

Very truly yours,

DFG/pr

Dale F. Green, P.E.

Enc.

cc: Stanford J. Zeccolo
/George Koch

Louis Cocca/S. Zeccolo
George Koch
Review of proposed Larkin Creek Retention Basin
Town of Greece Application No. 822-75-1152
July 16, 1975

I have reviewed the hydrology and hydraulics for the proposed structure. Following are my comments.

Auxiliary Spillway

1. The alignment for the auxiliary spillway is not acceptable. The spillway channel should be perpendicular to the spillway crest. Discharge leaving the channel should be directed away from the embankment so there is no erosive effect on the embankment toe. The fact that homes are located within 50 feet of the spillway channel makes the alignment feature especially critical.
2. The auxiliary spillway does not have sufficient capacity to discharge the Spillway Inflow Design Flood (40% MFF). Our investigation indicated that the peak inflow for the design flood is 2800 cfs. Reservoir storage will reduce the peak outflow to 2150 cfs.

Service Spillway

The engineering report indicates that the discharge structure is designed to restrict flow out of the pond to a maximum discharge of 20 cfs. When the water surface is at the crest of the auxiliary spillway (El. 456) the discharge through the 36 inch pipe will be about 100 cfs.

OK/S

Meeting 5 Aug 75

Dick Green } Larkin Eng
Van Alst }
Zeccolo
Robt. McWade
G. Koch

1. Will change alignment of Emerg Spillway
From Serv Spillway will swing away from
Homes. Will also increase Emerg. Spillway capacity.
2. Allowed Eng. to keep gate on Serv. Spillway.

- ENVIRONMENTAL STUDIES
- LAND PLANNING
- SOLID WASTE MANAGEMENT
- WATER POLLUTION CONTROL

William C. Larsen, P.E.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING

44 SAGINAW DRIVE - ROCHESTER, N.Y. 14623

AREA CODE-716 473-3460

July 2, 1975

John F. Karle, P.E.
Richard N. Passero, P.E.

JGT 1570

- WATER WORKS
- DRAINAGE
- HIGHWAYS
- ENGINEERING SURVEYS

DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
RECEIVED
JUL 11 1975
OFFICE OF
ENVIRONMENTAL ANALYSIS

Mr. William MacGregor
NYS Department of Environmental Conservation
P.O. Box 57
Avon, N.Y. 14414

RE: CONTRACT FOR THE CONSTRUCTION OF EARTH DAM AND
APPURTENANCES - LARKIN CREEK STORMWATER DETENTION
FACILITIES - TOWN OF GREECE DRAINAGE DISTRICT #24
TOWN OF GREECE, MONROE COUNTY, NEW YORK

Dear Mr. MacGregor:

Pursuant to our recent telephone conversations, our meeting at your office on June 19th and our meeting in Albany on June 25, we are enclosing herewith five copies of the "Application Package" for the above referenced project under the requirements of Section 429(C) of the Conservation Law.

Each of the five packages contains:

1. Form - "Application for Permit"
2. Engineering Report
3. Soils Report prepared by the firm of Jas P Collins, PE
4. Construction Drawings
5. Specifications
6. Description of Downstream Area
7. Plan showing dam, appurtenances, contours and property lines as required under Item 3 of the instructions.

Since our initial discussions, several revisions to the plans have been made as a result of recommendations given at our meeting in Albany.

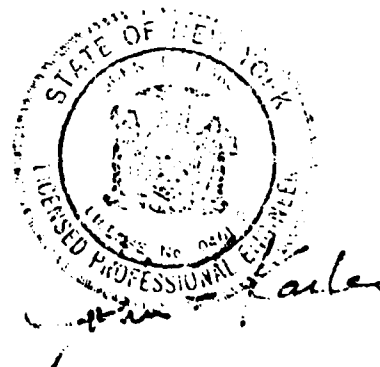
PRELIMINARY ENGINEERING REPORT

LARKIN CREEK WATERSHED
RETENTION BASIN NUMBER ONE
ST. ANDREWS DRIVE

*Town of Greece Natural Stream
Improvement and Protection
Implementation Program
(I.P.I.P.)*

AUGUST 1974

Revised April 7, 1975



ENVIRONMENTAL STUDIES
AND PLANNING
AND WASTE MANAGEMENT
AND POLLUTION CONTROL

CONCRETE WORKS
DRAINAGE
ROADWAYS
ENGINEERING SURVEYS

William C. Larsen, P.E.

CIVIL - SANITARY - MUNICIPAL
ENGINEERING

44 SAGINAW DRIVE - ROCHESTER, N.Y. 14623

AREA CODE 716 473-3460

August 29, 1974

John F. Karle, P.E.
Richard N. Passero, P.E.

Mr. Donald J. Riley, Supervisor
and Greece Town Board
2505 Ridge Rd. W.
Rochester, N.Y. 14626

RE: PRELIMINARY ENGINEERING REPORT
LARKIN CREEK WATERSHED
RETENTION BASIN NO. 1
TRIBUTARY 0-122-2
ST. ANDREWS DRIVE

TOWN OF GREECE NATURAL STREAM
IMPROVEMENT AND PROTECTION IMPLEMENTATION PROGRAM (IPIP)

Gentlemen:

We submit herewith our Preliminary Engineering Report on subject Retention Basin in accordance with your Resolution of July 2, 1974, based upon our Proposal of July 2, 1974.

The purpose of the Study and subsequent Report was to determine, in appropriate detail, a recommended solution for the drainage problems being encountered in the St. Andrews-Pine Valley-Old Meadow area, consistent with the goals outlined in the Greece Town-wide Drainage Study of July 1974. Because of the substantial flooding which has occurred late Spring and early Summer in this area we have moved ahead expeditiously to furnish solutions.

While the July 1974 Drainage Study furnished conceptual answers to this problem, it was the wish of the Town Board and the residents to explore alternative possibilities and to determine firm cost figures adequate to permit the Town Board to move ahead with a definite program if it seemed appropriate. To accomplish this it was necessary for us to insist upon the expenditure of sufficient money to permit rather detailed soil investigation and field survey work because of our very real concern of the presence of rock and the possibility of dewatering problems. This concern

Mr. William MacGregor

7/2/75

Generally, the proposed stormwater detention facility is intended to eliminate flooding in the vicinity of St Andrews Dr and alleviate erosion and siltation problems which presently occur during periods of heavy rainfall.

It is proposed to retain water on an intermittent basis only and to permit the "dry weather flow" to pass unrestricted.

Ponding limits have been shown to elevation 456.0 representing a maximum depth of water of 9.5 feet. This extent of ponding would result from a 50-year storm of critical duration with full upstream development of the entire watershed area.

Please be advised that the Town of Greece is most anxious to begin work on this project in order that it can be completed and placed in operation this construction season. Any assistance you could render in expediting the review and approval of this would be greatly appreciated.

If you have any questions or if you require any additional information, please do not hesitate to call us.

Very truly yours,

DFG/pr

Dale F. Green, P.E.

Enc.

cc: ✓ Eugene Penzimer

Mr. Donald J. Riley, Supervisor
and Greece Town Board

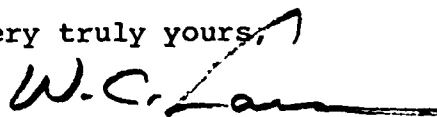
August 29, 1974

was justified when substantial amounts of high-elevation bedrock were encountered which prevented any further consideration of a retention pond north of the subdivision plus a relief channel around the subdivision.

Accordingly, this Report recommends a return to our original recommendation to construct a Retention Reservoir south of St. Andrews Drive on Monroe County land. We recommend that the embankment be constructed to an elevation which will permit a maximum storage of 81 acre feet with a freeboard of 2.0'.

While every effort has been made to expedite the submittal of this Report you are cautioned that the plans for the retention works recommended herein must be approved by the Department of Environmental Conservation. We are advised that such review normally takes sixty days. We must regretfully advise that this would preclude construction this Fall under the best of intentions by the Town. It does make the point, however, that decision-making must nevertheless move ahead rapidly if the project is to be designed and reviewed, and financing established, in time to permit a start after the first of the year. Clearing and grubbing could take place in late Spring with construction following in the Summer.

Very truly yours,



William C. Larsen, P.E.

WCL/pr

cc: Gene Penzimer

PRELIMINARY
ENGINEERING REPORT

LARKIN CREEK
WATERSHED
RETENTION BASIN NO. 1

ST. ANDREWS DRIVE

A RECOMMENDED FACILITY
UNDER THE
TOWN OF GREECE NATURAL STREAM
IMPROVEMENT AND PROTECTION
IMPLEMENTATION PROGRAM
(I.P.I.P.)

TOWN OF GREECE
MONROE COUNTY, NEW YORK

AUGUST 1977

WILLIAM C. LARSEN, P. E.
Civil-Sanitary-Municipal
ENGINEERING
44 Saginaw Drive - Rochester, N.Y. 14623

TABLE OF CONTENTS

<u>ITEM</u>	<u>PAGE</u>
Letter of Transmittal	
Title Page	
I General Background and Authorization	1
II The Problem	2
III Discussion of Alternative Solutions	4
IV Recommended Alternative Solution	10
V Cost Estimates	12
VI Cost Vs. Benefit	13
VII Compatibility and Correlation with Town Wide Drainage Study	14
VIII Scheduling	16
IX Appendices	18
Location Plan	19
Engineering Data Sheet	20
Estimated Storage Requirement-South Pond	21
Estimated Storage Requirement-North Pond	22
South Pond Storage Graph	23
South Pond Simplified Hydrograph	24

TABLE OF CONTENTS (CONT'D)

Appendices (cont'd)

Engineer's Estimate-South Retention Basin	25
Engineer's Estimate-North Retention Basin and Diversion Channel	26
Engineer's Estimate-Highway Culvert Replacement and Channel Improvement	27
Preliminary Subsurface Test Hole Logs	28
Overall Plan	

N.B.: 1"=50' scale topo plans were also prepared under this Proposal but have not been included in the Report. They are on file in the Engineer's Office. These mapping sheets will form the basis for the project when undertaken.

I GENERAL - BACKGROUND

This Study is related to the recurring flooding problems which have been experienced in the vicinity of Saint Andrews Drive in the Town of Greece. This office became aware of the flooding problem and resulting property damage during our routine field investigations while preparing the Townwide Drainage Study. In addition, we were present at the preliminary discussions between the homeowners in the area and representatives of the Town concerning the problem.

As a result of our initial recommendation that a storm water retention pond be constructed to alleviate these problems the Town Board has authorized this more detailed Engineering Study in accordance with our proposal dated July 2, 1974.

II THE PROBLEM

The area in which flooding occurs is within the Larkin Creek Watershed, Tributary 0-122-2.

There are 852 acres tributary to the Saint Andrews Drive culvert, 206 of which are located in the Town of Ogden. The remaining area is within the Town of Greece. During periods of heavy runoff, tributary 0-122-2 overtops its banks and causes flooding in the backyards and basements of the houses located on the south side of Saint Andrews Drive. In addition the excess storm water flows over Saint Andrews Drive and continues down the channel causing severe erosion and, in some cases, additional property damage. The problem itself can be attributed to several factors the combination of which result in the severe flooding:

First, portions of the development were constructed within the natural flooding limits of the creek. To compound the problem these houses have walkout basements which also become flooded.

AD-A105 989

STETSON-DALE UTICA NY

F/G 13/13

NATIONAL DAM SAFETY PROGRAM. LARKIN CREEK DAM (INVENTORY NUMBER--ETC(U)

JUN 81 J B STETSON

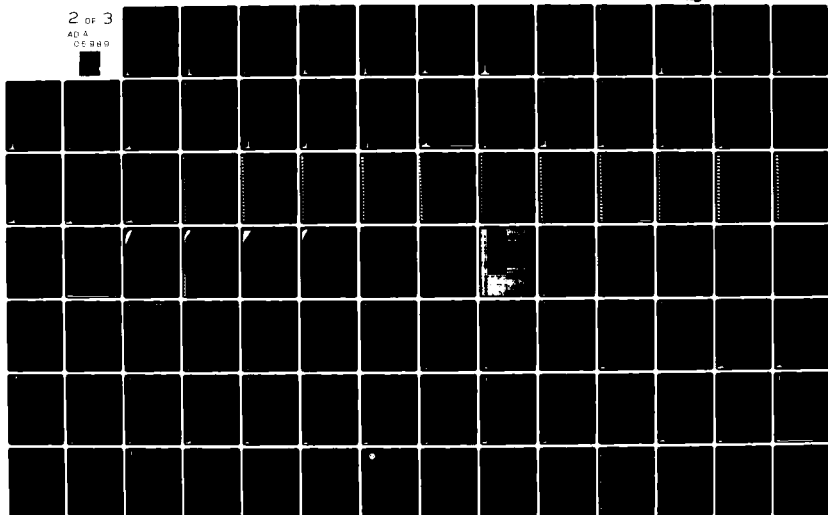
DACW51-81-C-0009

UNCLASSIFIED

NL

2 OF 3

AD A
05880



Second, the culverts under Saint Andrews, Pine Valley and Old Meadow Drive are undersized and as a result the water "backs up" in the vicinity of Saint Andrews Drive and Pine Valley.

Third, based upon interviews with homeowners it appears that this tributary reaches its "peak" rather quickly in a rainstorm....in a matter of two to four hours. This is faster than would be anticipated during a normal investigation of this watershed. Whether or not the various wetlands upstream of this point are indicative of high bedrock elevation (or impervious sub-soils), causing little percolation and subsequently high run-off, is simply a matter of conjecture. Nevertheless run-off is fast and intense.

Specifically, the following cases of nuisance and damage have been documented:

Cellar wall collapse

Cellars flooded and personal belongings ruined

Backyards flooded

Erosion of channel and adjacent yards

Destruction of private retaining walls

Undermining and erosive damage to town-owned drainage facilities.

III DISCUSSION OF ALTERNATIVE SOLUTIONS

The immediate problem which generated the need for this Preliminary Engineering Report was the aforementioned flooding occurring in Country Club View Subdivision. The larger problem, of which this is a part of course, is the recommended Improvement and Protection of the Natural Streams of the Town. While an immediate solution might be found for the Country Club Estates problem we feel that this solution (whatever it might be) should also be able to show benefit to the Town (or at least the watershed) at large, since a considerable expenditure of funds would be required in any event.

Four possible solutions to the immediate problem presented themselves:

1. A Retention Pond south of the subdivision which would discharge at a much reduced rate, permitting the Town to continue using all, or some, of the culverts existing under the subdivision streets.
2. A Diversion Channel around the subdivision which would by-pass the existing street culverts and channel. (However, this should also include a retention basin north of the subdivision to retard discharge since the "ponding effect" south of St. Andrews Drive would now be lost.)

3. Replace the culverts under the three east-west streets with large box culverts capable of passing the future anticipated peak flows at a rate which would prevent backup on the south side of St. Andrews Drive; and provide erosion protection works along the channel banks.
4. Continue to permit flooding to take place, and either provide flood protection works at the various effected homes, or purchase the homes and tear them down.

Engineering-wise it would be rather a simple matter to enlarge the subdivision culverts or to divert the creek around the subdivision and thus to let the high rates of runoff pass through or around the area without causing any appreciable damage in the immediate vicinity. The net effect would be to release the water which is now retained in the backyards and wooded area south of Saint Andrews Drive and to allow this water to continue downstream at higher rates of flow than are experienced today.

This type of solution, while it would alleviate the flooding in the Saint Andrews Drive area, would simply transfer flooding and erosion problems downstream. It is for this reason that we have discarded this type of solution as not being in the best interest of the Town of Greece.

The fourth alternative, that of "flood-proofing" existing properties or else removing the homes, is not looked upon with favor by our office nor, we judge, would it be morally or politically acceptable. The work would consist of sealing off cellar windows and walk-out doors and filling backyards to prevent floodwaters from encroaching into the yards and basements. The flood waters would continue to overtop St. Andrews Drive. Downstream, water would continue to flood the backyards since they must be directly drained by gravity to the stream bank. The use of dikes and flood gates in this area would, in our opinion, be unrealistic and unsightly.

Therefore, it is our feeling that the most acceptable solution to this type of problem is to "hold back" the runoff in some type of retention facility during periods of heavy rainfall and then to discharge the water over a long period of time at low rates. The result would be to eliminate flooding problems in the immediate area, reduce erosion problems along the channel, and to substantially reduce the peak rates of flow downstream as well as downstream ecological damage and siltation.

The land adjacent to the study area will ultimately become part of the Monroe County Parks System. Portions of that future park are already owned by the County and other parcels remain in the hands of individual owners. A retention facility sized and located so as to be most effective must, by necessity, be located on lands which will someday be part of the County Park.

Accordingly, the following alternative locations have been investigated in an effort to not only solve the problem but to do so in a manner which would be compatible with the long range plans for the surrounding property:

1. Construct a retention pond south of Saint Andrews Drive. This could be accomplished by building a dam just to the south of the properties which now flood. The proposed elevation of the dam would be such as to allow ponding to elevation 456.0. This would provide adequate storage for a 50 year recurrence interval storm under fully developed upstream conditions. The discharge structure

would be designed so as to restrict flows out of the
pond to a maximum of 20 cfs. The ponding
which would occur upstream would be then sufficient to
alleviate the downstream flooding conditions under
ultimate conditions of upstream development. This pond
would be designed to hold water only during periods of
heavy rainfall and would be "dry" during normal conditions.
Since the ponding would only be intermittent, it would
not be necessary to remove the majority of the trees or to
strip the topsoil south of the subdivision.

2. Construct a diversion ditch around the sub-
division in conjunction with a retention pond to be
located to the north of the subdivision on lands owned
by the County. The diversion ditch would allow the in-
creased flows to bypass the "trouble area" and the re-
tention pond would then control the discharge to protect
the downstream areas. The disadvantages connected with
this alternative are that:

- a. A substantial amount of excavation would be
required. Since the test holes have indicated
that rock is near the surface in this area,
the resulting excavation and rock removal would
be quite costly.

- b. Some residents have indicated a desire to maintain moderate flow in the existing channel. This would require that special discharge works be constructed at additional expense. Also, the diversion ditch would require deep excavations which might result in rather unsightly conditions.

Our original recommendation had been to locate the facility to the south of Saint Andrews Drive. However, concern over the availability of land coupled with a concern for the trees in that area led to the investigation of the northern location as an alternative.

As a result of these more detailed studies, the economics of the alternatives indicate that the southern location should be reconsidered.

IV RECOMMENDED ALTERNATIVE SOLUTION

It is the recommendation of this office that the Town pursue the possibility of constructing the storm water retention facility south of Saint Andrews Drive using the existing creek bed as the point of discharge from the pond. The estimated cost for this work is \$200,000. The facility and flooding area would be on land now owned, or proposed to be purchased, by the County of Monroe.

Representatives of the Monroe County Parks Department have expressed their general approval of this scheme. They did indicate that the responsibility for all construction and future maintenance would rest with the Town of Greece, however.

The most desirable volume of storage based upon a recurrence interval of 50 years is 81 acre feet. The volume of storage at the southern location on the above mentioned Park lands is approximately 81 acre feet and it is felt that this storage would be sufficient to significantly reduce the problems that now exist in the area. Further, the cost estimates of the alternative schemes indicate that the southern location is the only alternative which would

be economically feasible. Further, as additional Park lands are purchased to the south the service spillway and embankment could be raised, thereby providing additional storage capacity. Our recommended design is to provide an embankment to elevation 458 which will permit overflow at elevation 456. These elevations could be increased to 467 and 465, respectively, at some time in the future, should creation of a permanent lake or additional storage be desired.

V COST ESTIMATES

Cost Estimates for the various Alternatives are shown in the Appendices. It will be noted that the cost of the recommended alternative is in line with the original estimates of the 1974 Drainage Study.

It should also be pointed out that the cost of the alternative which would include a Diversion Channel and north-side Retention Pond is extremely high because of the amount of earth and rock excavation. We have taken the position that this material would be removed from the site which, of course, substantially increases the cost. Even if the County would permit the depositing of this excavated earth on the Park lands the cost is still excessive far beyond the benefits to be obtained.

This raises the question (as do the remaining alternatives) of the relationship of cost-to-benefit and therefore the following Section VI has been included.

See Appendices for Cost Estimates.

VI COST VS. BENEFIT

An analysis of the cost of the proposed retention facility versus the benefit derived in the immediate vicinity would seem, on the surface, to indicate a poor economic justification for this project. The value of the properties subject to flood damage in the area may not be much higher than the cost of the remedial work necessary to alleviate the problem.

It is our feeling, however, that there are other considerations which should enter into the decision-making which are not strictly economic. For example, construction of the retention facility would result in more "steady" flow in the creek, reduction of erosion all along the length of the stream, reduction of silt deposition in the stream bed and the decrease in the amount of debris travelling downstream; ecological damage would also be minimized.

Although it is difficult to assign cost values to these items, it should be recognized that the proposed project would result in these additional benefits which should be consistent with the goals for long range planning for the Improvement and Protection of Natural Streams in the Town.

VII COMPATIBILITY AND CORRELATION WITH TOWN-WIDE DRAINAGE STUDY

This Natural Stream Improvement and Protection Implementation Project is the first of those recommended under the July 1974 Town-wide Drainage Plan. Consequently it is particularly important to establish how it fits in with the Plan and whether it is following the goals established herein.

Reference is made to the Drainage Study Report, particularly the following:

- Section One - Page 35, relative to Retention Basins
- Section Two - Page 164, and following, relative
to the St. Andrews Drive problem
- Section Three - Relative to the Implementation of
the Improvement and Protection Program

In summary, the Drainage Study recommends the use of retention basins as a solution to present drainage and flooding problems, and particularly recommends one south of St. Andrews Drive. Further, the Plan recommends that this be undertaken as a "high priority" item. This more detailed study, which included the necessary sub-surface investigation and surveys sees no reason to modify or change those original recommendations.

We conclude that this Proposal is compatible with the master Drainage Plan of 1974. It would also appear that if this project is undertaken with a view towards construction during the 1975 season that the costs will correlate fairly closely with the 1974 Drainage Study.

IT IS IMPORTANT to point out that this proposed basin is to serve the primary function of preventing future flood damage and nuisance to the developed properties in the St. Andrews-Pine Valley-Old Meadow area. It is also to serve the secondary function of reducing peak discharge rates downstream which cause flooding and erosion. HOWEVER, it must be borne in mind that this Retention Basin accommodates only approximately 18% of the entire Larkin Creek watershed (measured at Latta Road Control Point). Consequently its significance as an "anti-flood" device diminishes the further one moves down the watershed to the north. Therefore, to obtain maximum protection benefit from this expenditure it is important that other retention basins be built as development takes place in the Larkin Creek basin and that no building or filling take place within the downstream flood plain.

VIII SCHEDULING

We recognize that certain pressures will be brought to bear on the Town Officials to undertake this project immediately. However, there are certain other factors to consider in establishing a schedule for a project of this nature. Earth dam construction can best be performed when the ground is dry and not frozen - usually between the months of May and December. We would not recommend that an earthwork project of this size be undertaken during the Winter months.

In addition to the time required for the detailed design, bidding and the establishment of financing, time must be allotted for review of the detailed plans and specifications by the Department of Environmental Conservation. We have been advised that this generally takes approximately 60 days.

We bring these items to your attention in order that you will be aware of the time required to implement a project such as this.

Respectfully submitted,

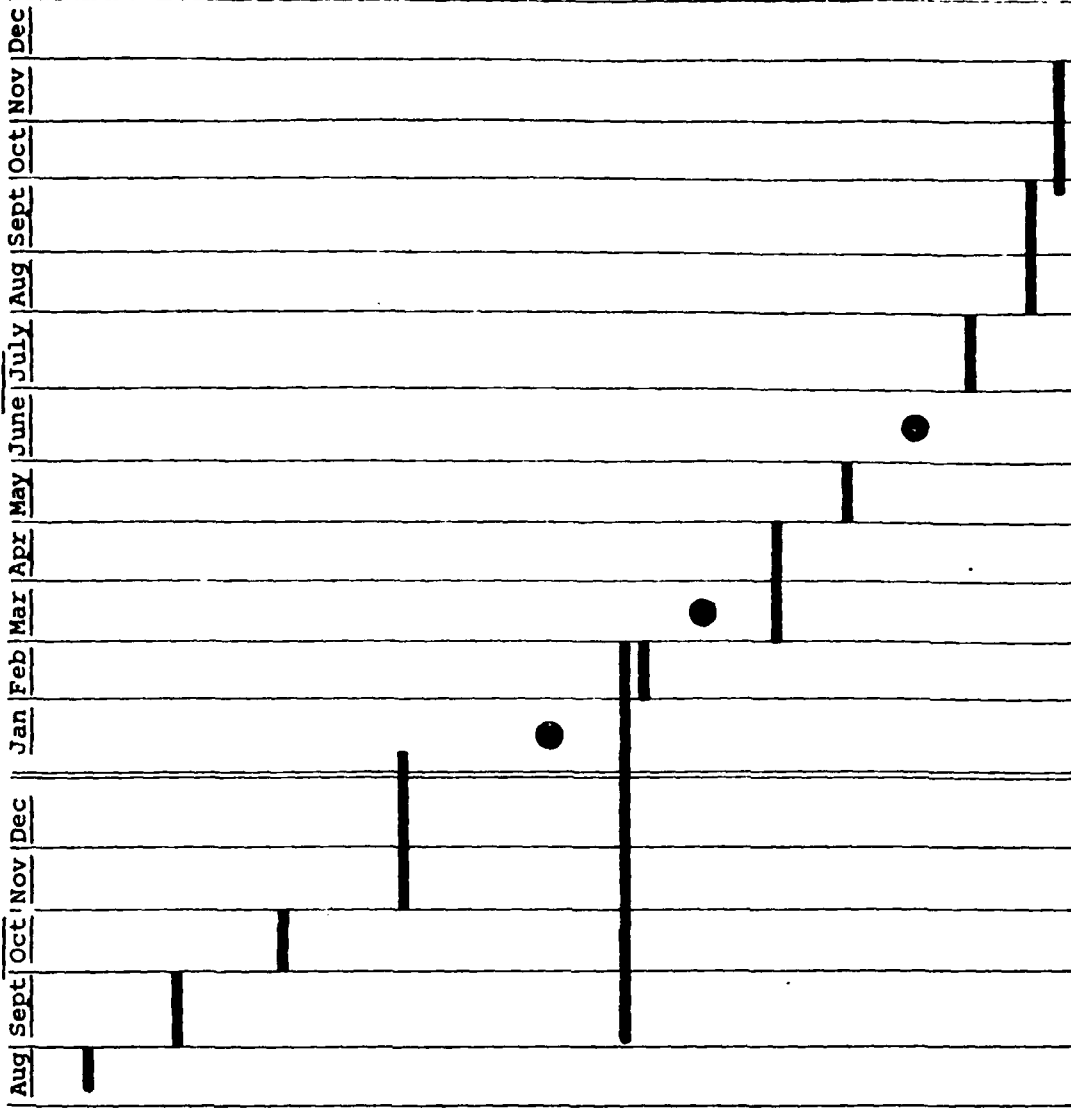


William C. Larsen, P.E.

WCL/pr

1974

1975



Preparation of Preliminary Engineering Report by Consulting Engineer

Review by Town Engineer, Town Board, and Conservation Commission

Report by Finance Committee and Town Attorney relative to financing under Town-wide Drainage District or otherwise

Creation of Town-wide Drainage District, including advertisement, public hearings, approval of financing, and establishment of District....

Authorization to undertake detailed engineering, preparation of plans and specifications

17 Town-County negotiations
Detailed engineering, plans and specs

Submittal to Town Board

Submittal to DEC for approval under Section 429(c) of the Conservation Law

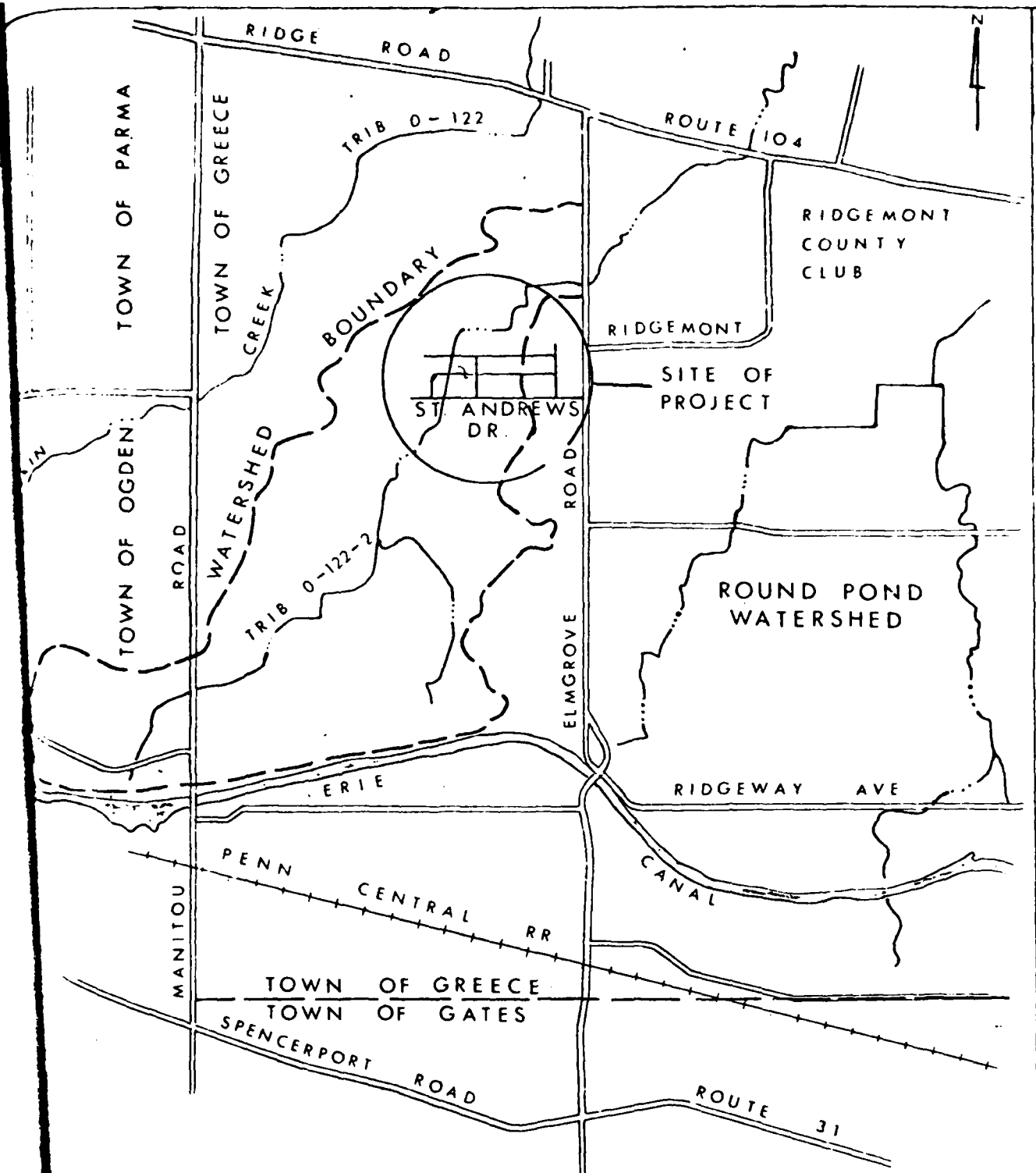
Advertise for Bids

Award Contract

Construct

Clearing and Grubbing
Earthwork and structures
Seeding & Site Restoration

IX APPENDICES



TOWN OF GREECE NATURAL STREAM
IMPROVEMENT AND PROTECTION
IMPLEMENTATION PROGRAM

LARKIN CREEK WATERSHED
RETENTION BASIN No 1

LOCATION PLAN

ENGINEERING DATA SHEET

Allowable discharge through St. Andrews Dr Culvert = 20 cfs

Critical storm duration = 3.5 hours

Required volume of storage = 81 acre-feet

Storage available with dam elevation of 456 = 81 acre-feet

Rainfall Data: Rochester-Monroe County Rainfall Intensity Curves

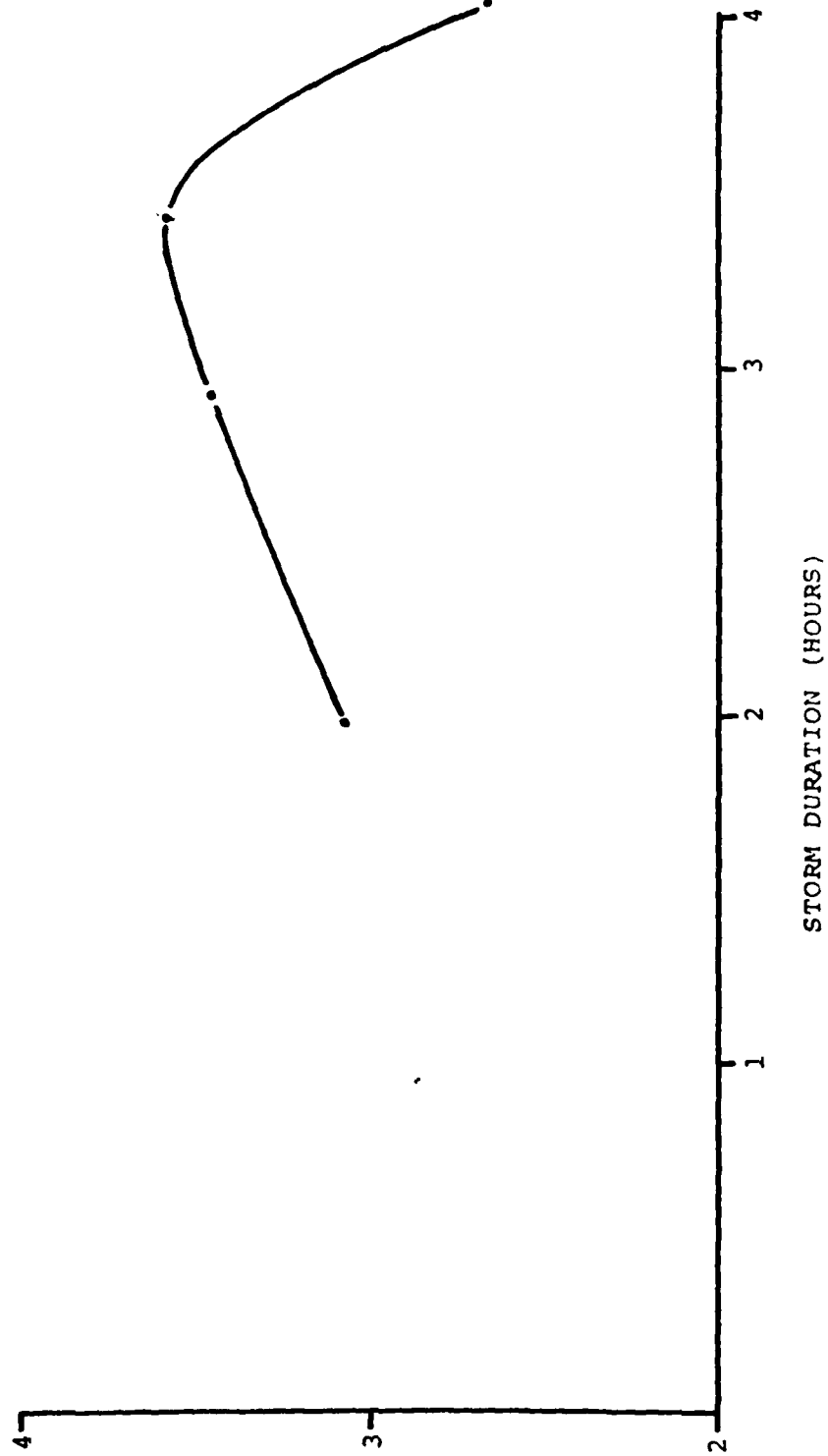
Runoff Coefficient: .40%

ESTIMATED STORAGE
REQUIREMENTS (Million Cu. Ft.)

POND SOUTH OF ST. ANDREWS DRIVE

Factors

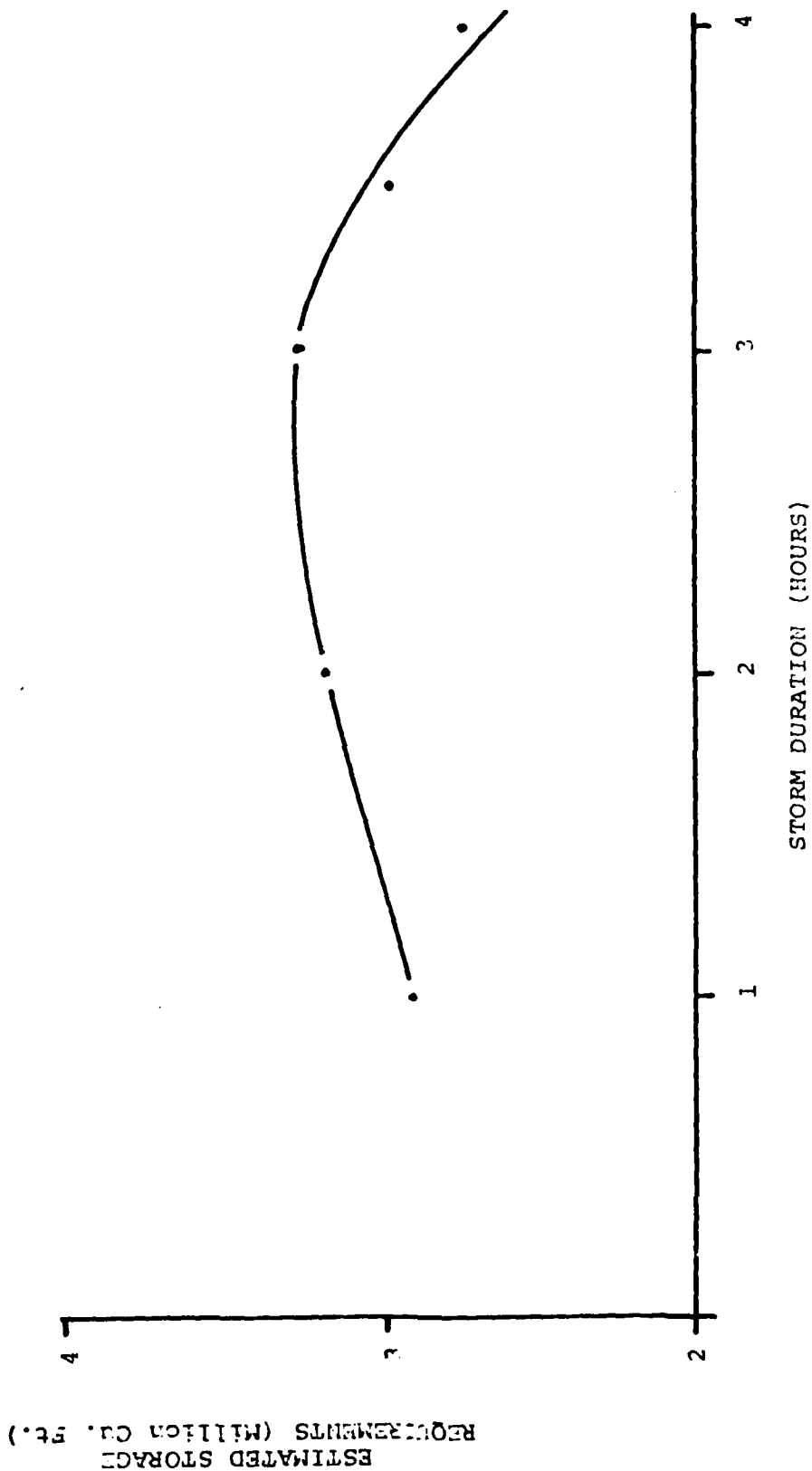
- 1) Two hour Tc
- 2) Monroe County 50-yr return interval
- 3) 0.4 Runoff factor
- 4) 852 + Acres
- 5) Output 20 cfs permitted



ESTIMATED STORAGE REQUIREMENT FOR
POND NORTH OF ST. ANDREWS DRIVE

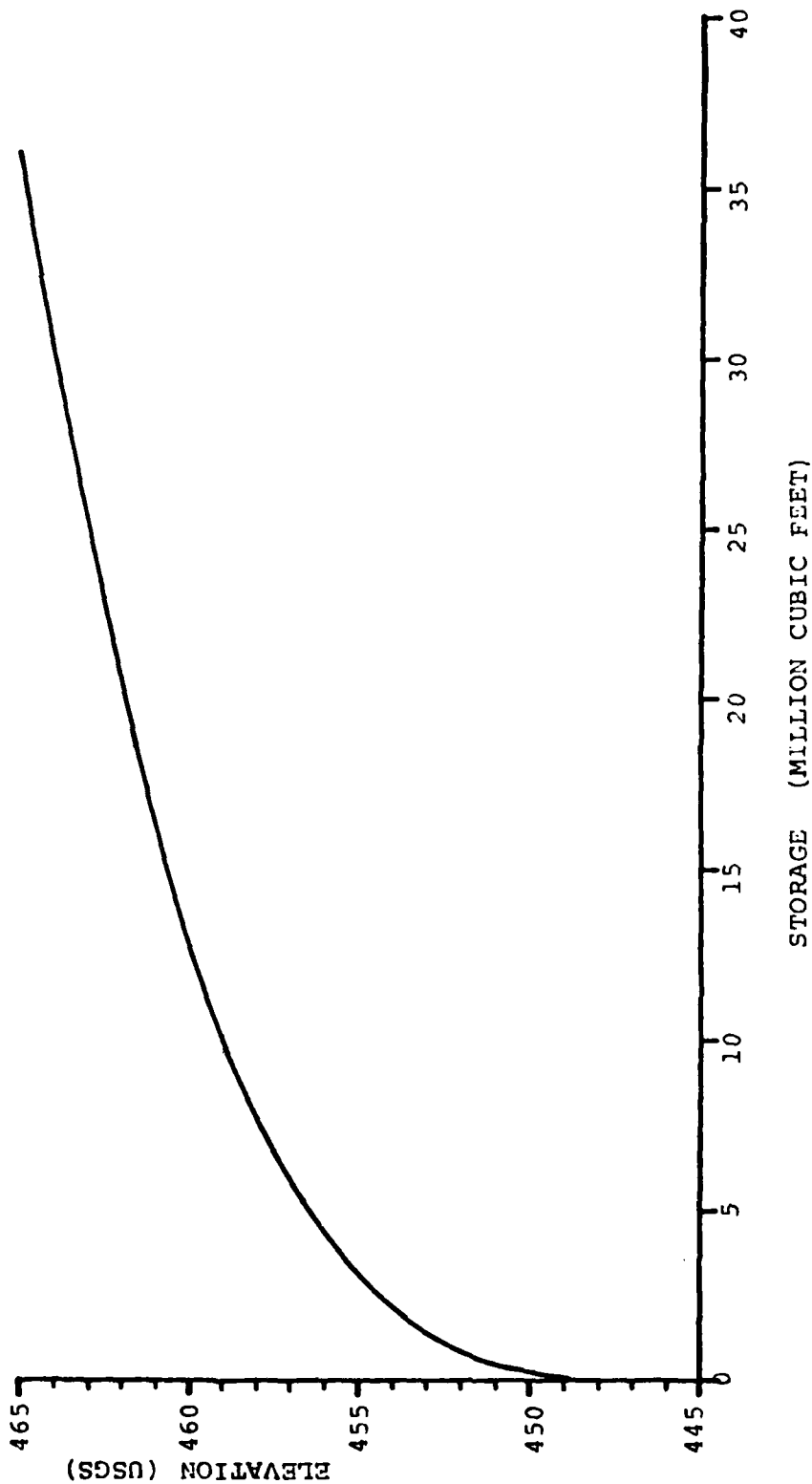
Factors:

- 1) Two hour T_c
- 2) Monroe County 50-yr return inter
- 3) 0.4 Runoff factor
- 4) 852 + Acres
- 5) permitted Output 50 cfs



LARKIN CREEK
RETENTION BASIN NO. 1
ST. ANDREWS DRIVE

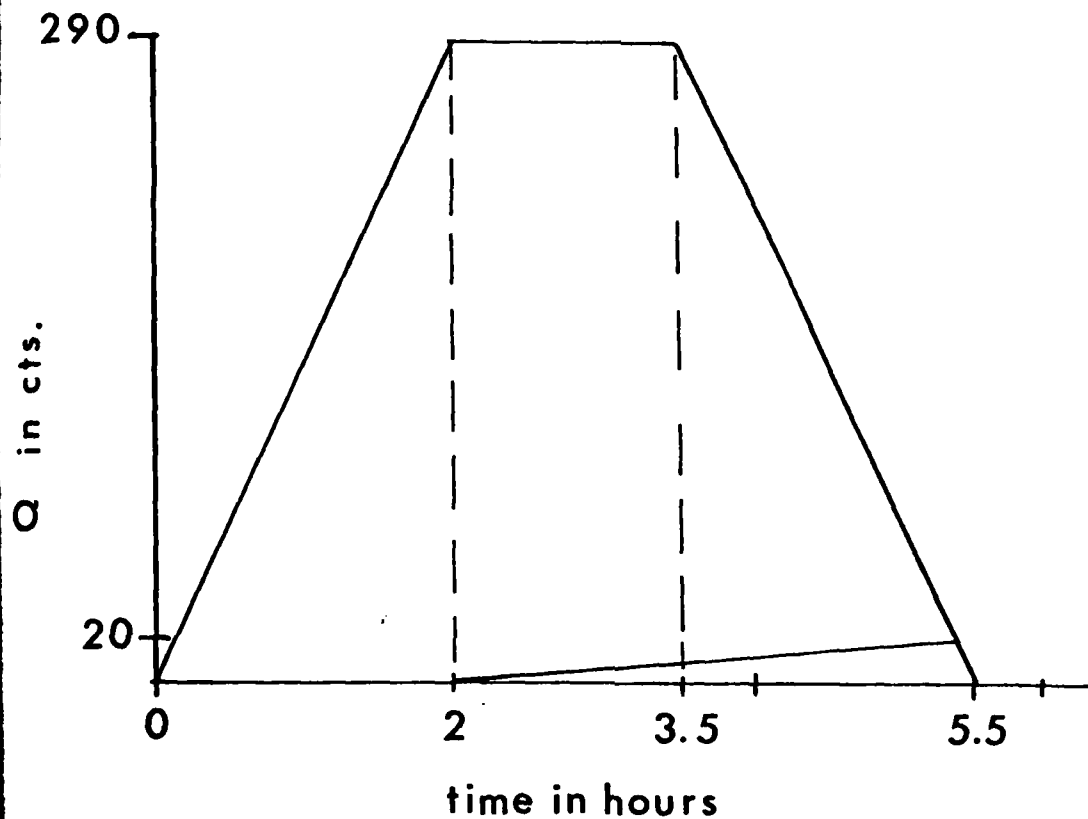
NATURAL POND
APPROXIMATE STORAGE CAPABILITY



Hydrograph

Design Recurrence Interval = 50 years

Storm Duration = 3.5 hours



Volume of Storage required

$$\begin{aligned} V &= 2 \times .5 \times 290 \times 2 \times 3600 + 290 \times 1.5 \times 3600 - .5 \times 20 \times 3.5 \times 3600 \\ &= 2,088,000 + 1,566,000 - 126,000 \\ &= 3,528,000 \text{ CF} = 81 \text{ Acre feet} \end{aligned}$$

LARKIN CREEK
RETENTION BASIN NO. 1
ST. ANDREWS DRIVE

REVISED ENGINEER'S ESTIMATE
RETENTION POND & DISCHARGE STRUCTURE
TO BE LOCATED SOUTH OF SAINT ANDREWS DR.

20,000	CY Berm Construction	4.00	80,000.
LUMP SUM	Clearing & Grubbing		27,000.
LUMP SUM	Emergency Spillway		20,000.
150	LF Discharge Piping	20.00	3,000.
LUMP SUM	Riser Section & Headwall		1,000.
LUMP SUM	Grading and Seeding		<u>15,000.</u>
	Estimated Construction Cost		146,000.
	Plus 10% Contingent		14,600.
	Plus 18% Legal, Admin. Eng., Insp.		<u>26,400.</u>
	TOTAL ESTIMATED COST		\$187,000.
	Budget figure for Bonding use.....		\$200,000.

ENGINEER'S ESTIMATE
DIVERSION DITCH AND RETENTION POND
WITH DISCHARGE STRUCTURE LOCATED NORTH OF
OLD MEADOW DR.

Retention Pond

4500 CY	Berm construction	4.00	18,000.
171500 CY	Additional earth excavation and disposal of material	6.00	1,029,000.
77000 CY	Rock Excavation	30.00	2,310,000.
LUMP SUM	Emergency Spillway		20,000.
150 LF	Discharge Piping	20.00	3,000.
LUMP SUM	Riser Section & headwall		1,000.
LUMP SUM	Grading & Seeding		15,000.

Diversion Ditch

103000 CY	Excavation & disposal of material	6.00	618,000.
8800 CY	Rock Excavation	30.00	264,000.
LUMP SUM	Grading and seeding		<u>15,000.</u>

Estimated Construction Cost	4,293,000.
-----------------------------	------------

10% Contingent	429,300.
----------------	----------

Legal, Admin, Eng., and Inspection	<u>177,700.</u>
------------------------------------	-----------------

TOTAL ESTIMATED COST.....	\$4,900,000.
---------------------------	--------------

ENGINEER'S ESTIMATE
HIGHWAY CULVERT REPLACEMENT
AND CHANNEL IMPROVEMENT

NOTE: This Alternate is not recommended because the expenditure of funds does not provide for any protection of the Natural Streams of the Town nor does the solution have any benefit other than the immediate solution to the local problem. Further, and in fact, the flooding problem would simply be transferred downstream and increased erosion would take place as well as other ecological damage.

This alternative consists of the removal of the existing culverts under the three east-west streets and their replacement with concrete box culverts ten feet wide and five feet high. This is necessary to obtain adequate hydraulic capacity without substantially increased upstream ponding elevation. In addition to the culvert construction the channel banks should be stabilized.

3 - 5 x 10 box culverts at \$30,000 each including present culvert removal and utility modification as required.....	\$90,000.
Stream re-grading, retaining wall construction, and miscellaneous work and restoration.....	80,000.
Estimated construction cost.....	170,000.
Contingent.....	17,000.
Legal, administrative, soils investigations, engineering, inspection and surveys, and contract supervision.....	<u>30,000.</u>
TOTAL ESTIMATED COST.....	\$217,000.

PRELIMINARY
SUBSURFACE TEST HOLE LOGS

The following four pages are the logs of the subsurface investigation carried out to determine the location and elevation of bedrock, and to make preliminary determinations as to soil types and groundwater depths.

This was particularly significant in this Study since inordinate amounts of excavation were going to be required if an alternative pond location was to be used north of Old Meadow Drive, and a Diversion Channel built through the high ground to the west of the subdivision.

It will be readily apparent, from the Engineer's Preliminary Estimates included herein, that rock excavation and removal are a substantial part of the total cost.

Test Hole Numbers are for identification purposes and for reference location on the Overall Plan and the 1"=50' scale plans.

TEST HOLE LOG

Hole #1 Station 13+00 Baseline "A" 18' north Elev 443.0

0-1' topsoil
1'-5½' reddish brown clay - wet - some sand
 water seepage at moderate rate at 2'
5½' sandstone can be broken with shovel

Hole #2 Station 17+00 Baseline "A" 26' north Elev 444.5

0-1' topsoil
1'-6' reddish brown clay & sand - wet - banks stable
6' water entering hole fast rate
 hardpan - sandstone hard - not easily broken

Hole #3 Station 20+88 Baseline "A" 12' north Elev 458.0

0-8" topsoil
8"-2' light brown reddish sand with very little clay
2'-10½' sand dry no water seepage easy digging solid banks

Hole #4 Station 24+00 Baseline "A" 18' north Elev 467.5

0-1' topsoil
1'-9½' reddish-sand-dry-stable banks
 no seepage into hole - some moisture
9½'-10' beginning of gravel or broken rock

Hole #5 P.I. 27+13.55 Baseline "A" 17½' west Elev 468.5

0-1½' topsoil
1½'-7' dry sandy brown soil - no water seepage
7'-9' (hard digging) sandstone very hard

0-10" topsoil
10"-3' sandy soil brown damp
3'-11' medium reddish brown clay soil-damp
no water seepage, also some small rock fragment
easy digging - banks are stable

0-10" topsoil
10"-2½' sandy reddish loam
2½'-11½' moist sand having some clay
stable banks, no visual seepage of water, easy digging

0-1' topsoil
1'-8' clay reddish moist consistency
8'-11' beginning layer of sandstone - can be broken
water seepage at 8' level

0-1' topsoil - black
1'-2½' moist brown reddish sand
2½'-4½' gravel layer moderate to excessive seepage of water
at this level
4½'-11' clay - gravelly sand loam - moisture wet

Hole #10 Station 42+00 445' west 58' south section running west
 Elev 455.3

0-1' topsoil

1'-11' moist clay - solid banks - no water seepage, easy digging.

Hole #11 Station 46+00 198' west & 10' south Elev 453.0

0-10" topsoil
10"-9½' hard clay, very hard banks, no water seepage, very dry

Hole #12 Station 1+51 Baseline "B" going north Elev 438.5

0-10" topsoil
10"-6½' moist clay brown loam solid banks dry - no water seepage

Hole #13 Station 5+42 Baseline "B" going north Elev 436.5

0-10" topsoil
10"-5½' red sandstone (very hard) and some sand, little clay
can break with shovel. Top of hardpan starts at 5½'
slight water seepage noticable.

Hole #14 Station 5+59 Baseline "D" going north Elev 440.0

0-8" topsoil
8"-1½' sandy loam
1½'-8½' small amount of clay - reddish sandstone in
horizontal layers very hard - not easily excavated
top of hardpan at 8½' - moderate water seepage at 8½'

Hole #15 Station 3+52 Baseline "D" going north Elev 439.0

0-8" topsoil
8"-8½' hard reddish sandstone with sand in horizontal
layers - hard going for tractor backhoe
8½' moderate water seepage - moist to wet earth



SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

Subsurface Investigations,
Larkin Creek Retention Facility,
Project No. 76924

Monroe County Department of Public Works
350 East Henrietta Road
Rochester, New York 14620
Attn: Mr. Raymond keefe

ROCHESTER DRILLING COMPANY, INC.
45 Steel Street
Rochester, New York 14606

Carl J. Asprinio, President

April 28, 1976

Job No. 1622



SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

April 28, 1976
Job No. 1622

Monroe County Department of Public Works
350 East Henrietta Road
Rochester, New York 14620

Attention: Mr. Raymond Keefe

Re: Subsurface Investigations,
Larkin Creek Retention Facility,
Project No. 76924

Gentlemen:

The field and laboratory examinations for the project referenced above have been completed. The test borings were begun on April 22, 1976 and were terminated on April 23, 1976. At this time a total of six (6) test holes were explored to specified depths, as indicated by Monroe County Department of Public Works.

Method

The method and procedure followed in making these test borings were in accordance with plans and specifications outlined by Monroe County Department of Public Works. The boring machine used was a C.M.E. 550 an all-terrain type drilling rig. Standard sampling was accomplished utilizing a 2½ inch hollow stem auger casing and a two (2) inch extra heavy duty split spoon sampler. Standard penetration sampling was made using a 140 pound hammer dropping 30 inches each blow, (A.S.T.M. D-1586). It should be noted that no water was induced into the test hole for drilling purposes except for core drilling rock.

Material Encountered

The material encountered was generally a sandy silt or silty fine sand with varying amounts of gravel overlying a reddish brown silt with varying amounts of fine sand and gravel, trace of shale fragments.

Location

The location of all test holes was made in the field by Monroe County Department of Public Works.

Water Levels

The water levels were observed at completion of each test hole with the casing in and out of the boring hole. It should be noted that seasonal and climatic changes will alter the observed water levels.



SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

April 28, 1976
Job No. 1622
Page 2

Classification

The classification of samples was first made in the field by the foreman, Mr. James Hammond. He then forwarded the samples and the field logs to our laboratory to be visually checked by our soil technicians.

Samples

The soil and rock samples have been forwarded to the office of County of Monroe, Department of Public Works, 350 E. Henrietta Rd.

If you have any questions please contact me at your earliest convenience.

Yours very truly,

ROCHESTER DRILLING COMPANY, INC.

(Carl J. Asprinio)

Carl J. Asprinio
President

CJA/dj

BORING TERMS AND SYMBOLS

N	The number of blows from a 140 pound hammer falling 30 inches needed to drive a split-spoon sampler the last 12 inch penetration of the sample.
C	The number of blows from a 300 pound hammer falling 24 inches needed to drive casing 12 inches.
100/1 inch	Number of blows needed to drive sampler or casing the distance shown. Used for indicating refusal.
WR	Sampler advanced by the weight of rods only, indicating very soft material.
WH	Sampler or casing advanced by weight of hammer only, indicating very soft material.
ST	Shelby Tube Sample (piston sample or pressed tube sample).
CS	Continuous sampling
AX	1 1/8" rock core
BX	1 5/8" rock core
NX	2 1/8" rock core
75%	Percentage of rock core recovered
P.L.	Plastic limit
L.L.	Liquid limit
M.C.	Moisture content--Dry, Damp, Moist, Wet, Saturated
H.C.	Boring caved after casing or augers were removed

Note:

WE CANNOT BE RESPONSIBLE FOR INTERPRETATIONS OR OPINIONS MADE BY
OTHERS FROM THE ENCLOSED DATA.

Refusal

Depth in boring where more than 150 blows per foot are needed to advance the sample spoon.

Cohesive Soil

Very fine grain soils with appreciable dry strength. Plastic--can be rolled into a thin thread when damp with no apparent water movement. Clays and silty to sandy clays show cohesion.

Description

Penetration Resistance

Very Soft
Soft
Medium
Stiff
Hard

Blows/Foot

0-2
3-5
6-15
16-25
26 or more

Non-Cohesive Soil

Soils composed of silt, sand, and gravel, show no cohesion and only slight plasticity.

Description

Penetration Resistance

Loose
Firm
Compact
Dense
Very Dense

Blows/Foot

0-10
11-25
26-40
41-50
51 or more

Composition

Estimated Percentage

And

50

Some

30-49

Little

11-29

Trace

0-10



SUBSURFACE GEOLOGICAL INVESTIGATIONS CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

PROJECT NO. 1622 PAGE 1 OF 1 BORING NO. B-1
PROJECT Larkin Creek Retention Facility - Project No. 76924
CLIENT County of Monroe, Dept. of Public Works
ELEVATION 419.65 INSPECTOR _____ WEATHER _____
DATE STARTED 4-23-76 COMPLETED 4-23-76 TECHNICIAN J. Hammond
GROUND WATER - CASING IN - _____ AT COMPLETION / TIME _____
BELOW SURFACE - CASING OUT - 3' 8" 4-23-76 -WELLPOINT AT _____

DEPTH BELOW SURFACE	C	BLOWS ON SAMPLER						SAMPLE NO	DEPTH OF SAMPLE	SOIL AND ROCK CLASSIFICATION REMARKS
		0' 6"	6' 12"	12' 18"	18' 24"	N				
		1	1			2		1	0'0"-2'0"	Very loose brown wet silt, little fine sand, little coarse sand and fine gravel, trace of organic material. 4'0"
5		4	3	5		8		2	4'0"-5'6"	Loose brown saturated fine sand and silt, little fine gravel, trace of organic material. 7'0"
10		32	40	48		88		3	8'0"-9'6"	Very dense reddish brown moist silt, little fine gravel, trace of fine sand.
15		64	100			164		4	12'0"-12'9"	Very dense reddish brown moist silt, little fine gravel, trace of fine sand, many shale fragments noted. 12'9"
		3"				9"				Weathered and decomposed shale and shale fragments. 13'6"
										BORING TERMINATED AT 13'6" (Refusal)
										Note: Advanced test boring with hollow stem auger casing to 13'6".

NOTES: N = NO OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 LB WT 30" EA BLOW
C = NO OF BLOWS TO DRIVE _____ CASING _____ WITH _____ LB WT _____ EA BLOW



SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

PROJECT NO. 1622 PAGE 1 OF 1 BORING NO. B-2
PROJECT Larkin Creek Retention Facility, Project No. 76924
CLIENT County of Monroe, Dept. of Public Works
ELEVATION 418.97 INSPECTOR WEATHER
DATE STARTED 4-23-76 COMPLETED 4-23-76 TECHNICIAN J. Hammond
GROUND WATER - CASING IN - 10'0" AT COMPLETION / TIME
BELOW SURFACE - CASING OUT - 6'1" 4-23-76 -WELLPOINT AT

DEPTH BELOW SURFACE	C	BLOWS ON SAMPLER						SAMPLE NO	DEPTH OF SAMPLE	SOIL AND ROCK CLASSIFICATION REMARKS
		0' 6"	6' 12"	12' 18"	18' 24"	N				
		12				1		1	0'0"-2'0"	Very loose brown wet silt, little fine gravel and sand, trace of organic material.
5		1	1	2		3	2	2	4'0"-5'6"	Very loose brown wet silt, little fine gravel and sand, trace of organic material. 5'0'
										Loose brown wet fine sand and silt, little fine gravel. 7'6"
10		42	47	55		102	3	3	8'0"-9'6"	Very dense reddish brown damp silt, little fine gravel, trace of sand.
										Very dense reddish brown damp silt, little fine gravel, trace of sand, many shale fragments noted.
		100				100	4	4	12'0"-12'5"	Refusal 14'6"
15		5"				5"			Run #1 14'6"-19'6"	Medium hard red with gray mottled fine grained sandstone with few shale partings to soft red shale at 19'0".
									Rec. 3'5"	Core in many pieces from chips to 3" long.
20										19'6"
										BORING TERMINATED AT 19'6"
										Note: Advanced test boring with hollow stem auger casing to 14'6". Core drilled with AX Series "M" double tube core barrel and diamond bit from 14'6"-19'6".

NOTES: N = NO OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 LB WT 30" EA BLOI
C = NO OF BLOWS TO DRIVE CASING WITH LB WT EA BLOI

NOTES: N = NO OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 B WT 30" EA BI
C = NO OF BLOWS TO DRIVE _____ CASING _____ WITH _____ LB. WT _____ EA BI

SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

PROJECT NO. 1622 PAGE 1 OF 1 BORING NO. B-4
PROJECT Larkin Creek Retention Facility, Project No. 76924
CLIENT County of Monroe, Dept. of Public Works
ELEVATION 415.22 INSPECTOR _____ WEATHER _____
DATE STARTED 4-23-76 COMPLETED 4-23-76 TECHNICIAN J. Hammond
GROUND WATER - CASING IN - AT COMPLETION / TIME _____
BELOW SURFACE - CASING OUT - Top of boring is 1'0" below water - WELLPOINT AT _____
surface.

DEPTH BELOW SURFACE	C	BLOWS ON SAMPLER						SAMPLE NO	DEPTH OF SAMPLE	SOIL AND ROCK CLASSIFICATION REMARKS
		0' 6"	6' 12"	12' 18"	18' 24"	N				
		1	2			3		1	0'0"-2'0"	Loose brown saturated silt and coarse to fine sand, little fine gravel, trace of organic material. 3'6"
5		25	39	52		91	2		4'0"-5'6"	Very dense reddish brown fine sand and silt, trace to little fine gravel.
10		100 4"				100 4"	3		8'0"-8'4"	Very dense reddish brown silt, little gravel, trace of sand.
15		100 1"				100 1"	4		12'0"-12'1"	Reddish brown shale and sandstone fragments 12'6"
										BORING TERMINATED AT 12'6" (Refusal)
										Note: Advanced test boring with hollow stem auger casing to 12'6".

NOTES: N = NO OF BLOWS TO DRIVE 2" SPDON 12" WITH 1- LB WT 30" EA BLO
C = NO OF BLOWS TO DRIVE _____ CASING _____ WITH _____ LB WT _____ EA BLO

SUBSURFACE GEOLOGICAL INVESTIGATIONS
CONCRETE AND SOIL-TESTING AND INSPECTION

45 Steel Street • Rochester, New York 14606
716 - 458-0821

PROJECT NO. 1622 PAGE 1 OF 1 BORING NO. B-5
PROJECT Larkin Creek Retention Facility, Project No. 76924
CLIENT County of Monroe, Dept. of Public Works
ELEVATION 415.95 INSPECTOR _____ WEATHER _____
DATE STARTED 4-22-76 COMPLETED 4-22-76 TECHNICIAN J. Hammond
GROUND WATER - CASING IN - _____ AT COMPLETION / TIME _____
BELOW SURFACE - CASING OUT - Boring is 0'6" below water surface -WELLPOINT AT _____

DEPTH BELOW SURFACE	C	BLOWS ON SAMPLER						SAMPLE NO	DEPTH OF SAMPLE	SOIL AND ROCK CLASSIFICATION REMARKS
		0' 6"	6' 12"	12' 18"	18' 24"	N				
		5	6	9		15	1		1'0"-2'6"	Firm brown saturated coarse to fine sand and fine gravel, little silt. Cobbles from 4'0"-4'6" noted.
5		70								
			60	48	108		2		4'6"-6'0"	Very dense reddish brown silt, some fine gravel and coarse sand, trace medium to fine sand.
10		37	100			137	3		8'0"-8'9"	Very dense reddish brown silt and sh fragments.
			3"			9"				
15									Run #1 12'6"-17'6" Rec. 2'6"	Shale fragments and weathered and decomposed shale (refusal) 12' Medium hard red with gray mottled fi grained sandstone with few to many soft shale partings. Core in man pieces from chips to 3" pieces.
20										BORING TERMINATED AT 17'6"
										Note: Advanced test boring with hol stem auger casing to 12'6". Core drilled with AX Series "1 double tube core barrel and diamond bit from 12'6" to 17'

NOTES: N = NO OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 LB WT 30" EA B
C = NO OF BLOWS TO DRIVE _____ CASING _____ WITH _____ LB WT _____ EA B

45 Steel Street • Rochester, New York 14606
716 - 458-0821

PROJECT NO. 1622 PAGE 1 OF 1 BORING NO. B-6
PROJECT Larkin Creek Retention Facility, Project No. 76924
CLIENT County of Monroe, Dept. of Public Works
ELEVATION 917.72 INSPECTOR _____ WEATHER _____
DATE STARTED 4-22-76 COMPLETED 4-22-76 TECHNICIAN J. Hammond
GROUND WATER - CASING IN - _____ AT COMPLETION / TIME _____
BELOW SURFACE - CASING OUT - 10' 3" 4-22-76 -WELLPOINT AT _____

DEPTH BELOW SURFACE	C	BLOWS ON SAMPLER						SAMPLE NO	DEPTH OF SAMPLE	SOIL AND ROCK CLASSIFICATION REMARKS
		0' 6"	6' 12"	12' 18"	18' 24"	N				
		1	1			2		1	0'0"-2'0"	Very loose brown damp silt and fine sand, little fine gravel, trace of organic material. 3'6"
5		18	21	21		42		2	4'0"-5'6"	Dense brown damp fine sand and silt, little medium to fine gravel, trace coarse sand.
10		37	46	48		94		3	8'0"-9'6"	Very dense reddish brown silt, some medium to fine gravel and shale fragments. Shale fragments and weathered and decomposed shale. Refusal 12'6"
15		100				100		4	12'0"-12'1"	Medium hard red/gray mottled fine grained sandstone with few shale partings to soft red shale at 15'0". Core in many pieces from chips to 3" pieces. 17'6"
		1"				1"			Run #1 12'6"-17'6" Rec. 2'5"	
20										BORING TERMINATED AT 17'6"
										Note: Advanced test boring with hollow stem auger casing to 17'6". Core drilled with AX Series "M" double tube core barrel and diamond bit from 12'6" to 17'6" Boring location moved 2' South and 2' West from original stake location to avoid underground R.G.&E. 8" gas main.

NOTES: N = NO OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 LB WT 30" EA. BLO
C = NO OF BLOWS TO DRIVE _____ CASING _____ WITH _____ LB WT _____ EA. BLO

the office of james p. collins, p.e.

474 THURSTON RD., ROCHESTER, N.Y. 14619 / 716-235-8372
CONSULTING GEOTECHNICAL ENGINEERS

September 22, 1975

William C. Larsen, P.E.
44 Saginaw Drive
Rochester, New York 14623

Attention: Mr. Dale Green, P.E.

Reference: AN RET P, 2330.00

Regarding: Embankment Realignment

Gentlemen:

This letter is an addendum to our Larkin Creek Storm Water Detention Pond Report dated June 30, 1975. The east end of the embankment has been moved about 200 feet south. The original test pits were close to this alignment; however, we were interested in fall water table information and we arranged for 4 more test pits.

The new test pits, numbered TP-101 through TP-104, were excavated with a case 580 backhoe on September 10, 1975. We collected soil samples and logged the test pits. The test pit logs, a revised centerline profile, and a revised location plan are attached for inclusion in our earlier report.

The soils are the same and confirm our original profile. The site is much drier now than last spring when the first test pits were excavated. We do not think the

the office of james p. collins, p.e.

William C. Larsen, P.E.
Mr. Dale Green, P.E.
AN RET P, 2330.00
September 22, 1975
Page 2

extensive dew ,ring we first recommended will be necessary if the dam is built during the late summer or early fall. All other recommendations from our June 30, 1975, report remain in effect.

If you have any questions, please call.

Very truly yours,

JAMES P. COLLINS, P.E.


John R. Harnly, P.E.

JRH:gis

enc: 8 copies, Test Pit Logs
8 copies, Revised Soil Profile
8 copies, Revised Location Plan

the office of james p. collins, p.e.

474 THURSTON RD., ROCHESTER, N.Y. 14619 / 716-235-8372
CONSULTING GEOTECHNICAL ENGINEERS

September 22, 1975

William C. Larsen, P.E.
44 Saginaw Drive
Rochester, New York 14623

Attention: Mr. Dale Green, P.E.

Reference: AN RET P, 2330.00

Regarding: Cutoff Trench

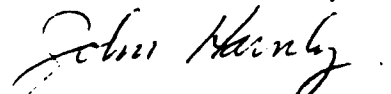
Gentlemen:

This is to confirm our discussion of a week ago in your office on the need to add a cutoff trench to the Larkin Creek Storm Water Detention Pond. We do not believe this is necessary for the integrity of the dam, nor will its omission jeopardize the safety of the embankment. We do recommend that a cutoff be placed in the west embankment as stated in our report. We also reiterate our request that a geologist or soils engineer examine the foundation after stripping to check for irregularities or sand lenses. If clean sand or gravel is found, we recommend a cutoff of the affected zone.

If you have further questions, please call.

Very truly yours,

JAMES P. COLLINS, P.E.


John R. Harnly, P.E.

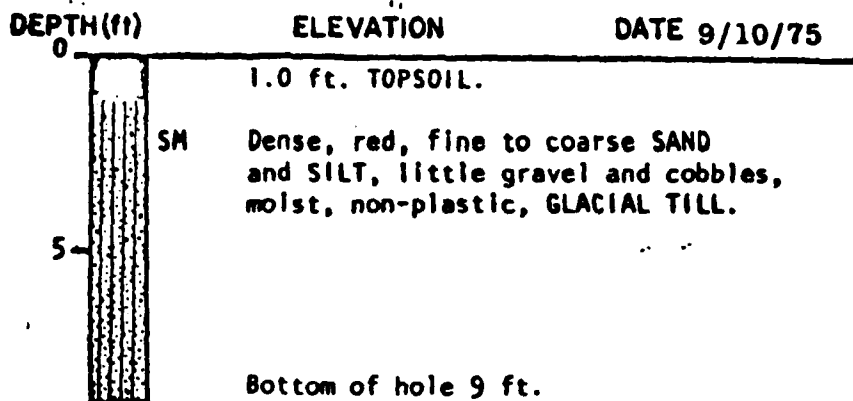
JRH:gis

jpc
pc

LOG OF TEST PIT

No. TH-101

ST ANDREW'S DRIVE STORM
WATER RETENTION POND

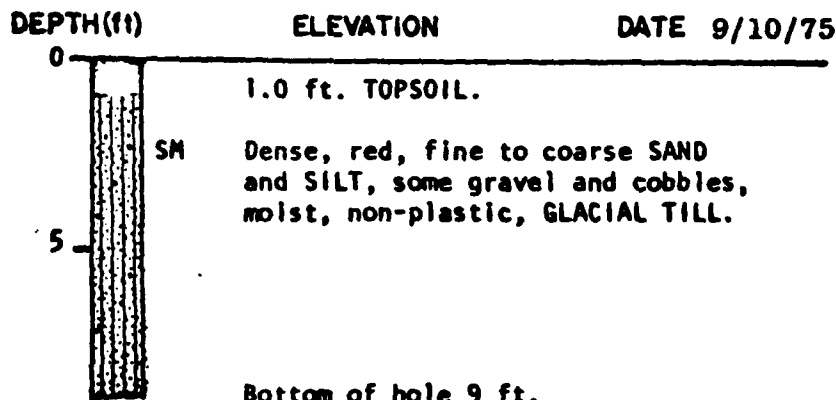


Note: No bedrock encountered.
No water in hole.

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

LOG OF TEST PIT

No. TH-102



Note: No bedrock encountered.
No water in hole.

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

jpc
pc

LOG OF TEST PIT

No. TH-103

ST. ANDREW'S DRIVE STORM
WATER RETENTION POND

DEPTH(ft)	ELEVATION	DATE 9/10/75
0	1.2 ft. TOPSOIL.	
5	SM Dense, red, fine to coarse SAND and SILT, little gravel and cobbles, damp, non-plastic, GLACIAL TILL.	
	Grading to moist.	
	Grading to wet.	
	Grading to some boulders.	
	Bottom of hole 9 ft.	

Note: No water encountered.
No bedrock encountered.

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

LOG OF TEST PIT

No. TH-104

DEPTH(ft)	ELEVATION	DATE 9/10/75
0	1.5 ft. TOPSOIL AND ROOTS.	
5	SM Dense, red, fine to coarse SAND and SILT, some gravel, cobbles and boulders, moist, non-plastic, GLACIAL TILL.	
	Top of rock 5.5 ft.	
	Bottom of hole 5.5 ft.	

Note: Some seepage of water from layer just above rock.
2" of water in bottom of hole after 10 minutes.

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

9-10-75

GRAIN SIZE DISTRIBUTION

PROJECT AN RET P. 2330.00

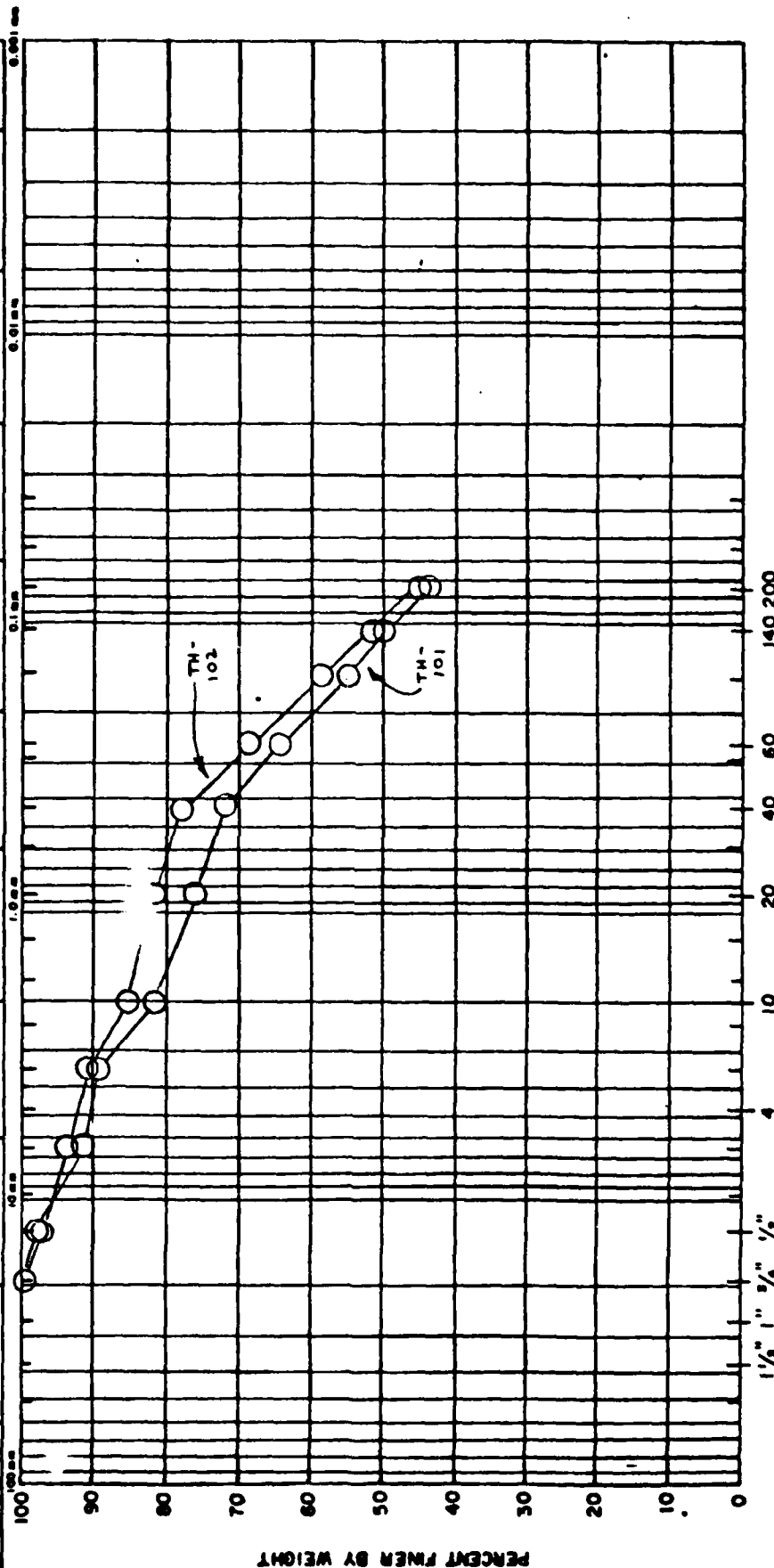
BORING NO. TH-101 DEPTH 4' TEST BY C. Timko

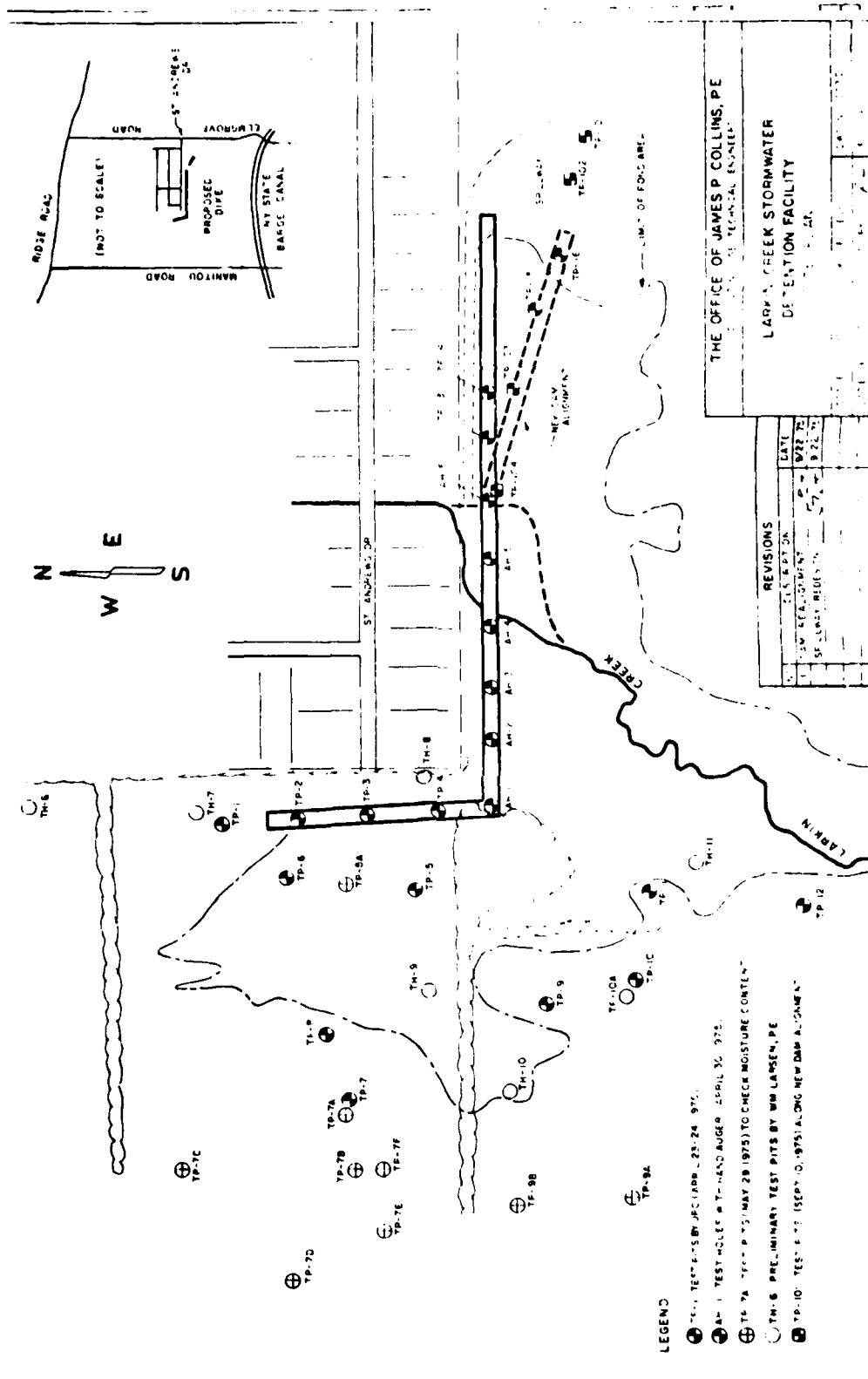
BORING NO. TH-102 DEPTH 1' DATE 9/13/75

REMARKS

SHEET No. ___ OF ___

MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	





THE OFFICE OF JAMES P. COLLINS, P.E.

LARKIN CREEK STORMWATER
DETENTION FACILITY

REVISIONS	DATE
1. PRELIMINARY DESIGN	10/20/75
2. FINAL DESIGN	10/20/75
3. AS-BUILT	10/20/75



TP-1 TEST PITS BY JDC (APRIL 23-24, 1973)
 AM-1 TEST MOLES BY HUG AUGER (APRIL 30, 1973)
 TP-101 TEST MOLES BY OGDARE (MAY 10, 1973)
 TP-102 TEST MOLES BY OGDARE (MAY 10, 1973)
 SEE STEP PLAN FOR REVISIONS (1972/73)

NOTE THIS PROFILE WAS DEVELOPED BY INTERPOLATION BETWEEN WIDELY SPACED TEST MOLES. IT IS ONLY AN INTERPRETATION OF SOIL AND ROCK CONDITIONS. HOWEVER, SOIL CONDITIONS MAY VARY BETWEEN TEST MOLES. LOCATIONS ARE APPROXIMATE. SEE STEP PLAN FOR LOCATIONS.

SCALE
HORIZ 1" = 200'
VERT 1" = 5'

APPROXIMATE CALCULATED TABLE
IMPROVING APRIL 1975,
WIND SPEED FLUCTUATION CAN BE EXPECTED
IN THIS AREA

REVISÉ 9/22/79

THE OFFICE OF JAMES P. COLLINS, P.E.
CONSULTING GEOTECHNICAL ENGINEER

LARKIN CREEK STORMWATER
DETENTION FACILITY

ODAN CENTERLINE - SOIL PROFILE

6-10/79 JAFD	AB URM	6-13/79 WMD	6-13/79 WMD
--------------	--------	-------------	-------------

LARKIN CREEK STORMWATER
DETENTION FACILITY
SOILS REPORT

FOR

WILLIAM C. LARSEN, P.E.
AND
TOWN OF GREECE, NEW YORK

BY *John R. Harnly*
JOHN R. HARNLY, P.E.



JUNE 30, 1975

the office of james p. collins, p.e.

474 THURSTON RD. ROCHESTER, N.Y. 14619 / 716-235-8372

CONSULTING GEOTECHNICAL ENGINEERS



LARKIN CREEK STORMWATER DETENTION FACILITY

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
SUMMARY OF SITE CONDITIONS	1
SUMMARY OF RECOMMENDATIONS	2
SITE CONDITIONS	2
EXPLORATION AND TESTING	3
GEOLOGIC HISTORY	3
SOIL, ROCK, AND GROUNDWATER CONDITIONS	4
RECOMMENDATIONS	5
CONSTRUCTION PROBLEMS	8
	FOLLOWING PAGE
FIGURE 1. SITE PLAN	3
FIGURE 2. DAM CENTERLINE SOIL PROFILE	4
APPENDICES	
Appendix 1. Laboratory Test Data Gradation Curves	
Appendix 2. Test Pit Logs TP-1 through TP-16, AH-1 through AH-6 by The Office of James P. Collins, P.E. Boring Log Legend Test Hole Logs No. 1 through No. 19 by William C. Larsen, P.E.	



LARKIN CREEK STORMWATER DETENTION FACILITY
SOILS REPORT

FOR
WILLIAM C. LARSEN, P.E.

REFERENCE: AN RET P, 2330.00

INTRODUCTION

This soils report is for the proposed Larkin Creek Storm Water Detention Pond. The dam will be west of Elmgrove Road and south of St. Andrews Street in the town of Greece, Monroe County, New York. It will be owned and operated by the town of Greece. The creek has flooded homes along St. Andrews Drive and the new housing development north of St. Andrews Drive several times in the last few years. The dam will regulate the flow to rates that downstream culverts and channels can pass without damage.

The proposed 9-foot-high, 1,700-foot-long dam will hold approximately 100 acre feet of water. The watershed is approximately 1 square mile. The principal spillway will pass a 50-year frequency storm. Larger flows will pass through an emergency spillway in the east abutment.

SUMMARY OF SITE CONDITIONS

The dam site is low and heavily wooded. Drainage is to Larkin Creek and then north to Buck Pond on Lake Ontario. The land to the south and west of the site was farmed about five years ago. Housing developments north of the site were built within the

REFERENCE: AN RET P, 2330.00

SUMMARY OF SITE CONDITIONS (CON'T.)

last three to five years. The soils are well graded, medium dense, sandy silts and silty sands overlying bedrock at 8 to 12 feet. The water table is within 2 feet of the surface for about 1,300 feet along the center section of the dam.

SUMMARY OF RECOMMENDATIONS

We recommend a homogeneous, compacted earth fill embankment. Clearing and grubbing is necessary under the embankment. Acceptable borrow for the embankment is available on site. The natural moisture content of the on-site borrow is high and may require drying. We recommend opening a large borrow area for inplace drying. We recommend the embankment be placed in the summer or early fall when the water table is low and drying conditions best. Dewatering will be necessary along the embankment during construction.

SITE CONDITIONS

The site is on gently rolling land with a maximum relief of 26 feet. The borrow area is on a hill about 500 feet west of the dam.

The dam site is poorly drained and floods several times a year. The local drainage is into Larkin Creek and then north to Lake Ontario. The borrow area is on a low hill draining to Larkin Creek on one side and to the west to another local stream.

REFERENCE: AN RET P, 2330.00

SITE CONDITIONS (CON'T.)

The site was farmed but is not in use now. We do not know of any on-site structures or utilities. The nearest buildings are the homes on St. Andrews Drive, 150 feet north of the dam.

EXPLORATION AND TESTING

Eight test pits and six auger holes were dug along the centerline of the dam. The test pits were dug on April 22 and 23 with a Case 580 backhoe furnished by William Ehrmentraut. The test pits were at least 12 feet deep or to bedrock. Six hand auger holes were drilled in the densely wooded area. Eight additional test pits and ten hand auger holes were dug in proposed borrow areas. Samples were collected, and we logged the test pits. Test pit locations are shown on the site plan on the following page.

The testing program was set up to determine the type of soils in the dam subgrade and the soil types and conditions for embankment fill. The program includes soil classification, natural moisture content, and compaction curves for the soils in the proposed borrow areas. Test data is attached in the appendix.

GEOLOGIC HISTORY

The site is on the contact or transition between the Medina Sandstone and the underlying Queenston Shale. The Medina is a hard, fine-grained, red sandstone; the Queenston is a soft red shale. They are

REFERENCE: AN RET P, 2330.00

GEOLOGIC HISTORY (CON'T.)

horizontally bedded with a slight southerly dip. Both formations are moderately jointed, vertically and horizontally, providing an open channel for lateral movement of water. Decomposed shale layers in the soil are probably blocks displaced from the Queenston by glacial action.

Glacial till, 8 to 12 feet thick, overlies bedrock. The till is an unsorted deposit of sandy silts and silty sands with large amounts of gravel, cobbles, and boulders. The proposed borrow area is on a small drumlin of glacial till with some clean sand and gravel layers. The silty and clayey sands in the low area are stream deposits, filling former channels and covering the surrounding flood plain.

SOIL, ROCK, AND GROUNDWATER CONDITIONS

The soils are generally silty sand and sandy silts with pockets of clay and clean sand. The soils are loose to medium dense. Bedrock is at about elevation 540 feet, 8 to 12 feet below the surface. The bedrock is horizontally bedded and fractured near the surface. The backhoe excavated 1 to 2 feet into the bedrock at test pits 3, 4, 14, 15, and 16. The dam centerline soil profile is on the following page.

The water table is at about elevation 549 feet through the center of the dam site and slightly higher on both

ELEVATION

TP-16

TP-15

TP-14

TP-13

AM-6

AM-5

AM-4

AM-3

AM-2

AM

TP-3

TP-4

TP-5

TP-6

TP-7

TP-8

TP-9

TP-10

TP-11

TP-12

TP-13

TP-14

TP-15

TP-16

TP-17

TP-18

TP-19

TP-20

TP-21

TP-22

TP-23

TP-24

TP-25

TP-26

TP-27

TP-28

TP-29

TP-30

TP-31

TP-32

TP-33

TP-34

TP-35

TP-36

TP-37

TP-38

TP-39

TP-40

TP-41

TP-42

TP-43

TP-44

TP-45

TP-46

TP-47

TP-48

TP-49

TP-50

TP-51

TP-52

TP-53

TP-54

TP-55

TP-56

TP-57

TP-58

TP-59

TP-60

TP-61

TP-62

TP-63

TP-64

TP-65

TP-66

TP-67

TP-68

TP-69

TP-70

TP-71

TP-72

TP-73

TP-74

TP-75

TP-76

TP-77

TP-78

TP-79

TP-80

TP-81

TP-82

TP-83

TP-84

TP-85

TP-86

TP-87

TP-88

TP-89

TP-90

TP-91

TP-92

TP-93

TP-94

TP-95

TP-96

TP-97

TP-98

TP-99

TP-100

TP-101

TP-102

TP-103

TP-104

TP-105

TP-106

TP-107

TP-108

TP-109

TP-110

TP-111

TP-112

TP-113

TP-114

TP-115

TP-116

TP-117

TP-118

TP-119

TP-120

TP-121

TP-122

TP-123

TP-124

TP-125

TP-126

TP-127

TP-128

TP-129

TP-130

TP-131

TP-132

TP-133

TP-134

TP-135

TP-136

TP-137

TP-138

TP-139

TP-140

TP-141

TP-142

TP-143

TP-144

TP-145

TP-146

TP-147

TP-148

TP-149

TP-150

TP-151

TP-152

TP-153

TP-154

TP-155

TP-156

TP-157

TP-158

TP-159

TP-160

TP-161

TP-162

TP-163

TP-164

TP-165

TP-166

TP-167

TP-168

TP-169

TP-170

TP-171

TP-172

TP-173

TP-174

TP-175

TP-176

TP-177

TP-178

TP-179

TP-180

TP-181

TP-182

TP-183

TP-184

TP-185

TP-186

TP-187

TP-188

TP-189

TP-190

TP-191

TP-192

TP-193

TP-194

TP-195

TP-196

TP-197

TP-198

TP-199

TP-200

TP-201

TP-202

TP-203

TP-204

TP-205

TP-206

TP-207

TP-208

TP-209

TP-210

TP-211

TP-212

TP-213

TP-214

TP-215

TP-216

TP-217

TP-218

TP-219

TP-220

TP-221

TP-222

TP-223

TP-224

TP-225

TP-226

TP-227

TP-228

TP-229

TP-230

TP-231

TP-232

TP-233

TP-234

TP-235

TP-236

TP-237

TP-238

TP-239

TP-240

TP-241

TP-242

TP-243

TP-244

TP-245

TP-246

TP-247

TP-248

TP-249

TP-250

TP-251

TP-252

TP-253

TP-254

TP-255

TP-256

TP-257

TP-258

TP-259

TP-260

TP-261

TP-262

TP-263

TP-264

TP-265

TP-266

TP-267

TP-268

TP-269

TP-270

TP-271

TP-272

TP-273

TP-274

REFERENCE: AN RET F, 2330.00

SOIL, ROCK, AND GROUNDWATER CONDITIONS (CON'T.)

ends. The groundwater in May varied from 1 foot below the surface near Larkin Creek to 9 feet below the surface on the west abutment. The groundwater was probably at a seasonal high after the spring rains and snow melted and will probably be 1 to 2 feet lower during the summer and early fall.

RECOMMENDATIONS

We recommend a homogeneous compacted earth fill dam. The slope should be 3 horizontal to 1 vertical (3 on 1) on both the upstream and downstream faces. The factor of safety against this embankment sliding is over 3.0. The available on-site borrow would safely stand on a 2 on 1 slope. However, this would require additional erosion control. Also, these flatter slopes increase the dam cross section in a wooded area where rodents may be a problem. We saw signs of muskrat, a burrowing animal, along the creek. We recommend frequent inspections of the dam and control of these and other rodents.

Seepage through the dam was checked for both volume and piping. The factor of safety against piping is approximately 4.0. Seepage through the clean sand found at test pits 3 and 4 will be a problem. We recommend removal and replacement of any sand with less than 20 percent passing a No. 200 sieve with compacted embankment fill. This core should be a minimum of 10 feet wide and through the entire depth of sand. A

REFERENCE: AN RET P, 2330.00

RECOMMENDATIONS (CON'T.)

drainage swale along the downstream toe should divert any seepage back to the creek.

The area under the dam will have to be cleared of all trees, stumps, roots, brush, and rubbish. Disposal areas should be designated on the plans or the specifications should require off-site disposal. The dam foundation should be inspected by a soils engineer, after clearing and grubbing, then leveled and proof-rolled with at least three passes of approved compaction equipment. Irregularities and old stream channels should be cleaned as directed by the soils engineer.

The embankment fill may be any of the silty sands or sandy silts found near the site. The fill must be well graded and free of debris, organic soil, and rocks over 6 inches in diameter. At least 30 percent shall pass a No. 200 sieve. The fill should be compacted to at least 90 percent of dry density by ASTM D-1557. Compaction equipment should be approved by the engineer. Earth moving equipment, such as pans, scrappers, and tracked vehicles, should not be approved as compaction equipment. One density test (ASTM D-1556, sand cone method) should be made for each 200 cubic yards of fill or as directed by the engineer. A soils technician should be on the site whenever the contractor is placing fill. The technician should be prepared to run the density tests as required and moisture density curves ASTM D-1557 whenever the fill material changes.

REFERENCE: AN RET P, 2330.00

RECOMMENDATIONS (CON'T.)

The moisture content of the in-place soils was high when we tested the site in April. Tests taken in June, 1975, were within a compactible range. We recommend that a relatively large area be designated for borrow material and that the cut be less than 5 feet deep. A large area will allow in-place mixing and drying. The borrow area should be graded to drain at all times.

The site will have to be dewatered during construction of the embankment. We suggest that gravel-filled sump pits be excavated into bedrock. This operation should be started as early as possible since the silts will be slow draining. If the site is not dewatered, we expect serious problems in placing the first few lifts of compacted fill over the natural soil.

We recommend that the old stream channel be filled and that the channel be ripraped where the new channel leaves the old channel. Any on-site clean fill will be satisfactory. Compact the fill with two passes of a tracked vehicle.

The principal spillway through the dam will require special attention. The work area should be dewatered. The pipe and structures should be placed on the natural soil and backfill carefully compacted. We recommend using the most clayey soil available on the site for backfill. Special care should be taken to insure that no voids are left along the pipe or around the structure and cutoffs.



REFERENCE: AN RET P, 2330.00

CONSTRUCTION PROBLEMS

These soils will be difficult to dewater. The first lifts over the natural soil will be difficult to place and compact. We suggest that the contractor use soils several percent dry of optimum in the first few lifts. We also suggest that he build the base at least 2 feet above the surrounding ground as he progresses along the dam. This will reduce the possibility of pumping moisture up from the subsoil and will reduce the probability of saturating the fill during a flash flood.

We recommend that the dam be built during the summer or early fall. The water table will be high during the winter and spring, making the site more difficult to dewater. Also, drying conditions are poor in the Rochester area except in the summer and early fall.

jpc
pe

REFERENCE: AN RET P, 2330.00

Appendix 1. Laboratory Test Data
Gradation Curves

LARKIN CREEK STORMWATER DETENTION FACILITY
LABORATORY DATA SUMMARY

Boring or Test Pit No.	Depth (Feet)	Soil Classification (Unified System)	Natural Moisture (%)	Atterberg Limits			Specific Gravity	Compaction Test--ASTM-D-15	
				L.L.	P.L.	P.I.		Max. Dry Density (PCF)	Optimum Moisture (%)
TP-1	4.0	ML*	16.1						
TP-2	3.5	SM*	17.7						
TP-2	7.0	ML*	13.5						
TP-3	2.0	SP**	18.7						
TP-3	4.0	SP**	21.0						
TP-3	7.0	ML*	10.1						
TP-5	3.0	ML*	13.4						
TP-5A	2.0	ML*	12.3				2.66		9.4
TP-5A	5.5	SM-ML**					2.65	129.2	
TP-6	3.0	ML*	16.9						
TP-7	4.0	ML-SM**							
TP-7	2.5	ML-SM*	15.3				2.65	132.1	8.1
TP-7A	2.3	ML-SM*	10.3						
TP-7B	2.2	ML-SM*	13.6						
TP-7C	2.0	ML-SM*	9.5						
TP-7D	2.0	ML-SM*	14.6						
TP-7E	2.0	ML-SM*							
TP-7F	2.0	ML-SM*	6.2						
TP-7G	2.0	ML-SM*							
TP-9A	2.0	ML*	8.1						
TP-9B	2.0	ML*	15.2						
TP-9B	1.9	ML*	16.4						
TP-9C	2.0	ML*							
TP-10	4.0	ML*	15.6				2.67	129.2	8.5
TP-10A	2.5	ML**					2.65	128.3	10.5
TP-10B	2.0	ML*	14.7						
TP-11	2.5	SM**					2.65	126.8	10.0
TP-13	2.5	SM*	14.4						
TP-13	5.0	ML*	17.5						
TP-13	6.0	ML*	17.0						
TP-14	4.0	SM*	17.9						

LARKIN CREEK STORMWATER DETENTION FACILITY
LABORATORY DATA SUMMARY

Boring or Test Pit No.	Depth (Feet)	Soil Classification (Unified System)	Natural Moisture (%)	Atterberg Limits		Specific Gravity	Compaction Test--ASTM-D-15	
				L.L.	P.L.		Max. Dry Density (PCF)	Optimum Moisture (%)
AH-1	2.0	SM*	21.0					
AH-1	3.0	SM*	17.4					
AH-1	4.0	SM*	16.3			2.65		
AH-1	2.5	SM**						
AH-2	2.0	ML*	23.8					
AH-3	1.7	ML*	29.4					
AH-3	2.0	ML*	30.0					
AH-3	2.8	SM-SC*	19.7		5.1			
AH-4	2.0	SM**	26.3	24.7	19.6	2.65		
AH-4	2.5	SM*	21.4					
AH-5	1.0	SM-SC*	33.9	27.3	19.1			
AH-5	2.3	SM*	25.9		8.2			
AH-5	3.0	SM*	22.0					
AH-5	3.5	SM*	21.4					
AH-6	2.0-2.5	SM*	16.0					
AH-6	3.0-3.5	SM*	17.6					

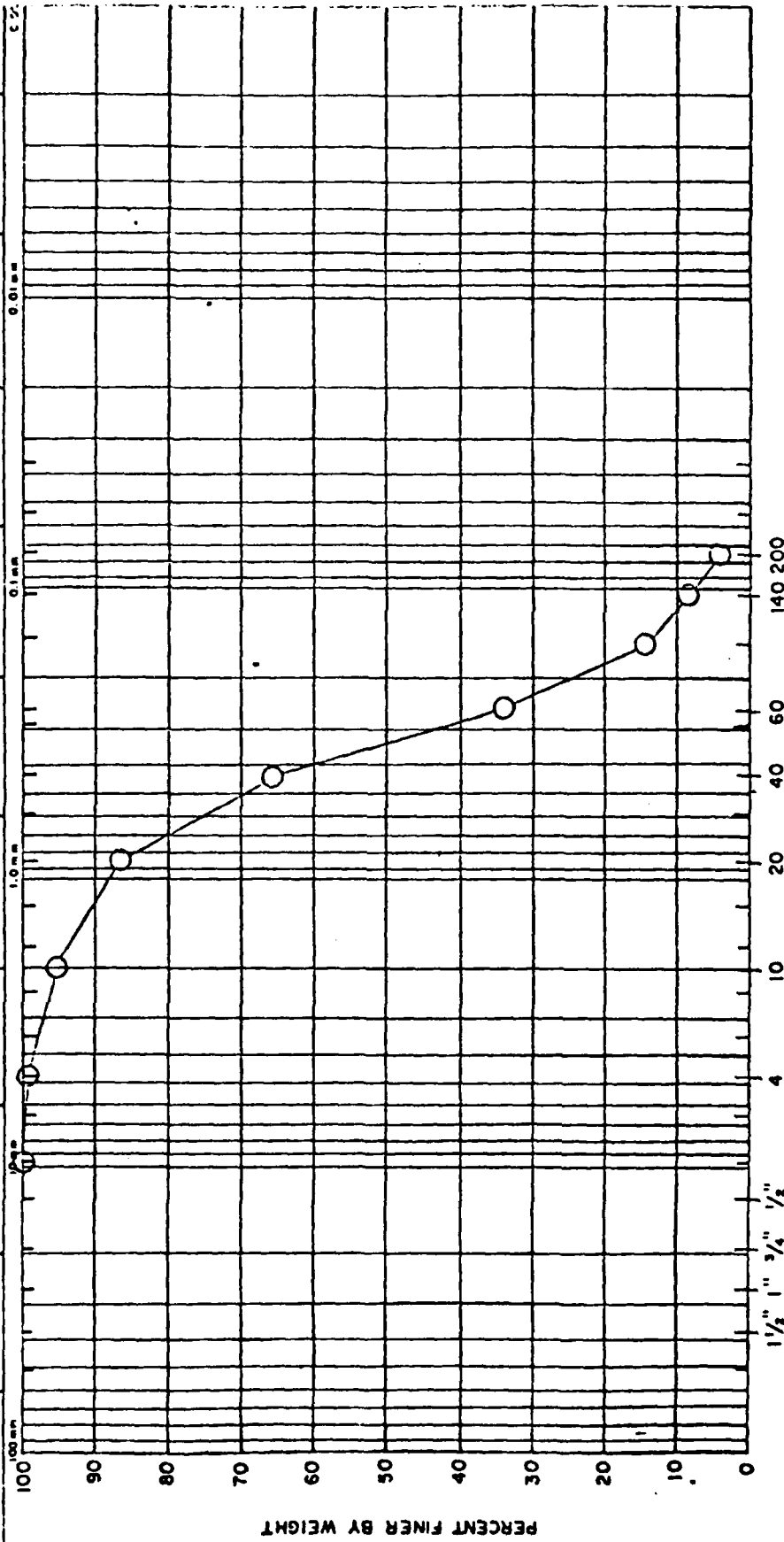
*Visual Classification

**See Appendix 1 for Grain Size Distribution

PROJECT AN RET 1

BORING No. TP-3 SAMPLE No. S-1 TEST BY EJP REMARKS SP Fine to coarse SAND SHEET No. 1 OF 8
 SAMPLE DEPTH 2.0 ft. DATE 5/14/75

MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	



U.S. STANDARD BRASS SIEVE SIZES

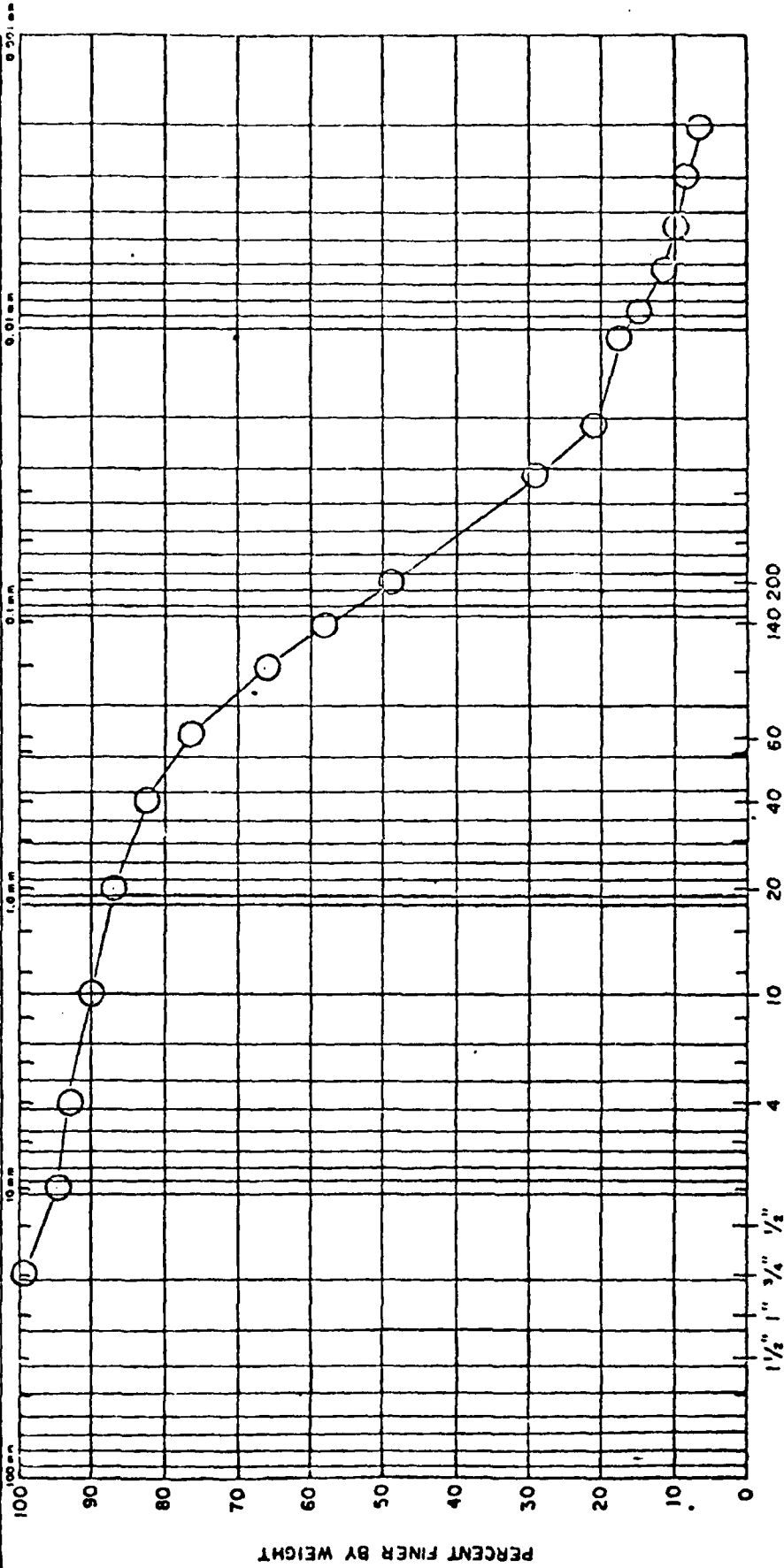
PROJECT 200-100-1

ENTERING NO. A11-1 SAMPLE NO. EJP
 SAMPLE DEPTH 2.5 ft. DATE 5/14/75

REMARKS SM

Fine to coarse sand, sheet no 3 of 8
some silt, trace
gravel.

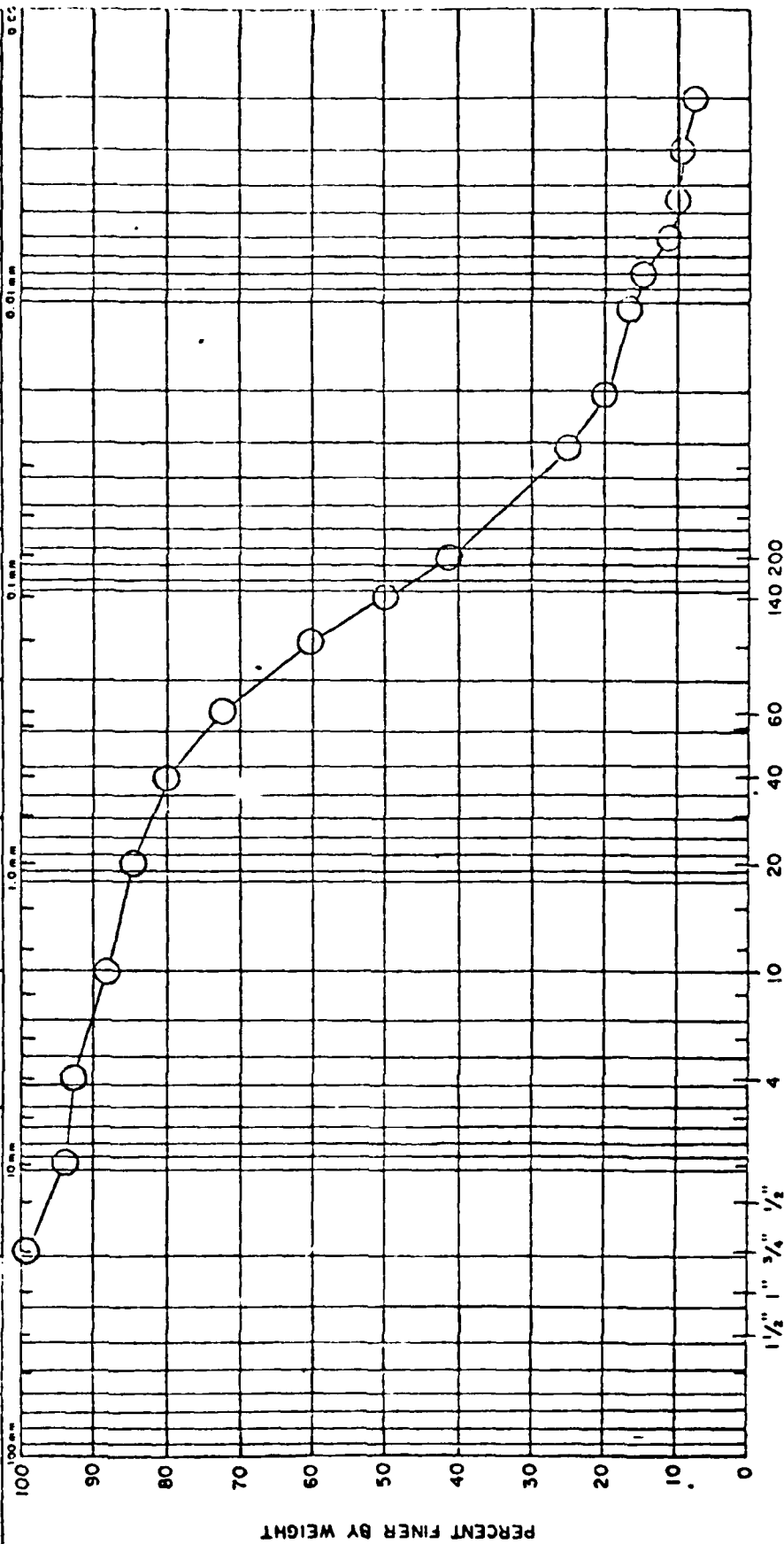
MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	



U.S. STANDARD BRASS SIEVE SIZES

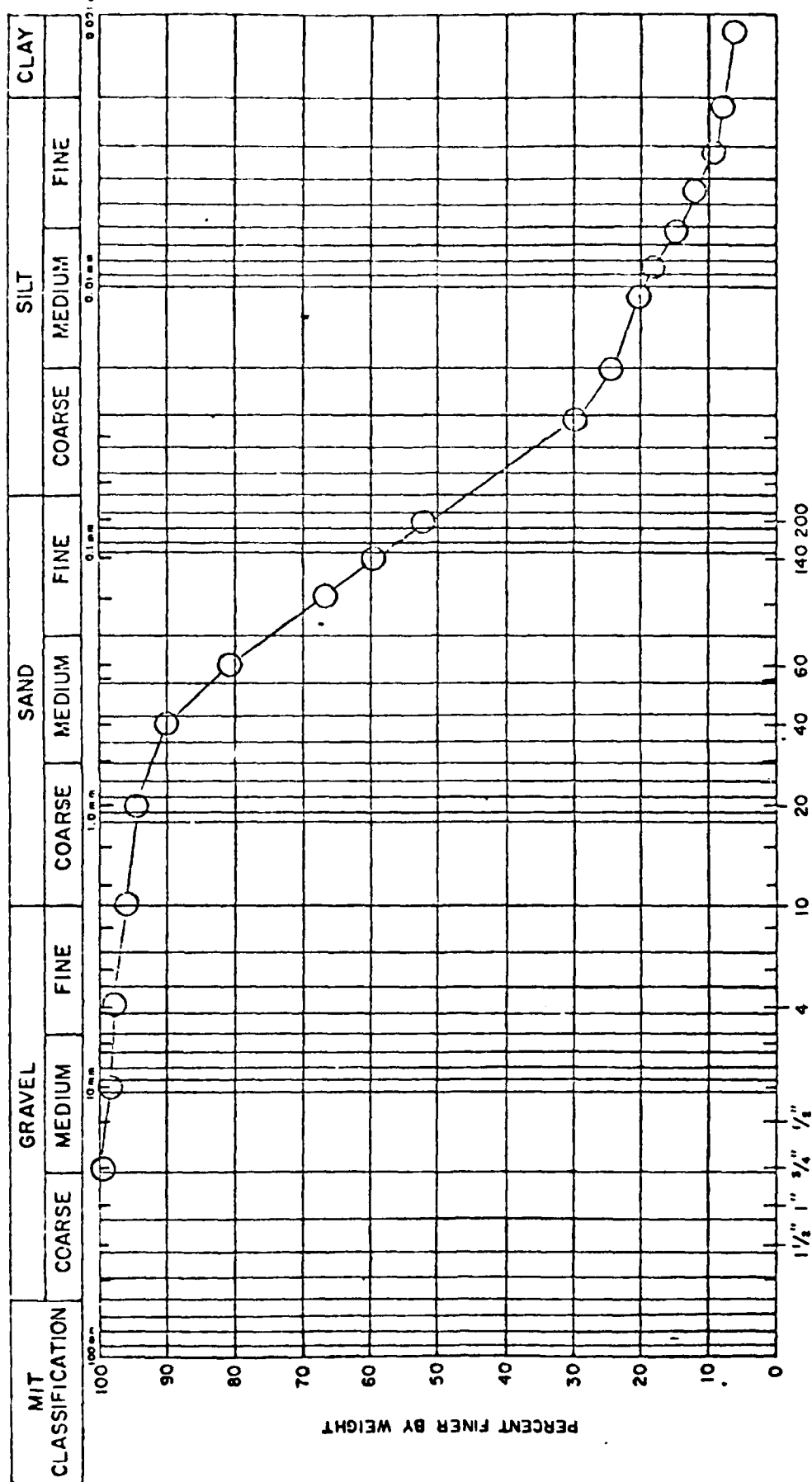
BORING NO. 111-1 SAMPLE NO. EJP TEST BY EJP REMARKS SM SAND, little silt, trace gravel. SHEET NO. 1 OF 8
 SAMPLE DEPTH 2.0 ft. DATE 5/14/75

MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	



U.S. STANDARD BRASS SIEVE SIZES

RECORD NO. 710-01 SAMPLE NO. EJP TEST BY EJP REMARKS SM-NL, Fine to medium SAND and SILT. SHEET No. 5 OF 8
 SAMPLE DEPTH 5.5 ft. DATE 5/14/75



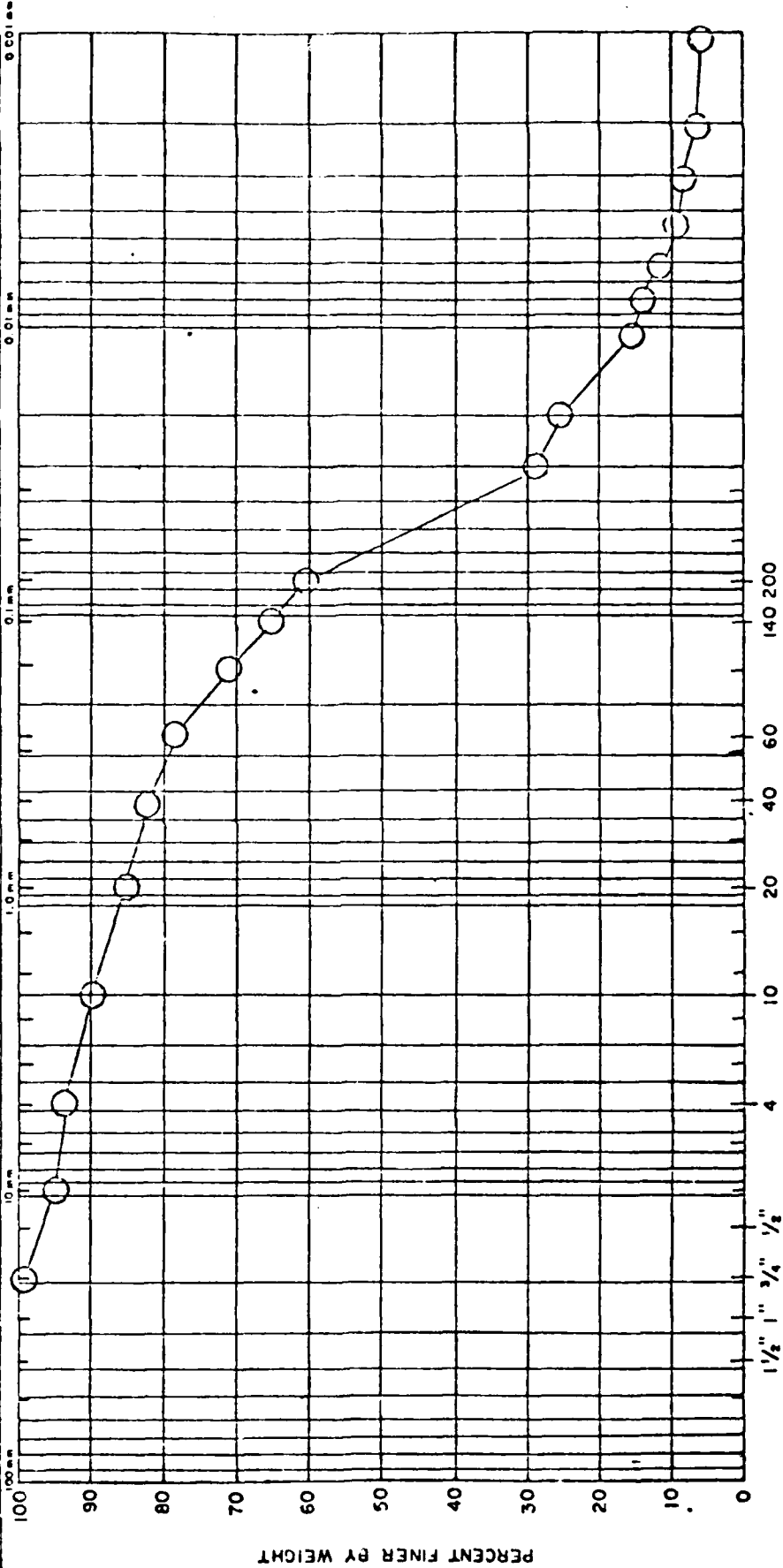
U.S. STANDARD BRASS SIEVE SIZES

PROJECT DA 1111

ENGINE NO. TP-7 SAMPLE NO. EJP
 TEST BY 5/14/75
 SAMPLE DEPTH 2.5-3.0 ft. DATE 5/14/75

REMARKS ML-SM SILT and fine to coarse SAND, trace gravel

MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	



PROJECT NO. 777

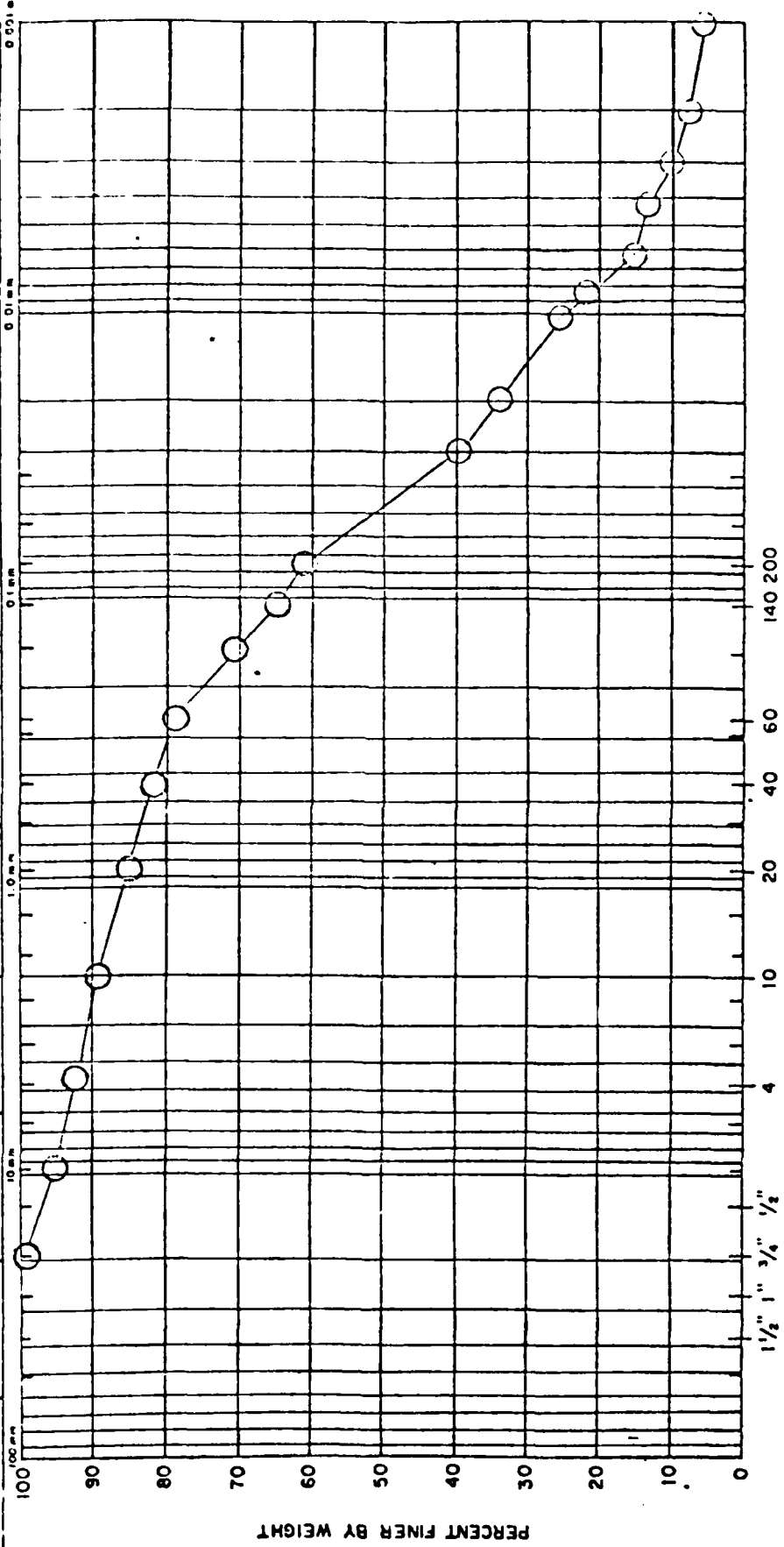
TEST BY EJP DATE 5/14/75

REMARKS ML SILT, some fine to coarse sand, trace gravel

SHEET NO. 7 OF 8

SAMPLE DEPTH 2.5-3.0 ft.

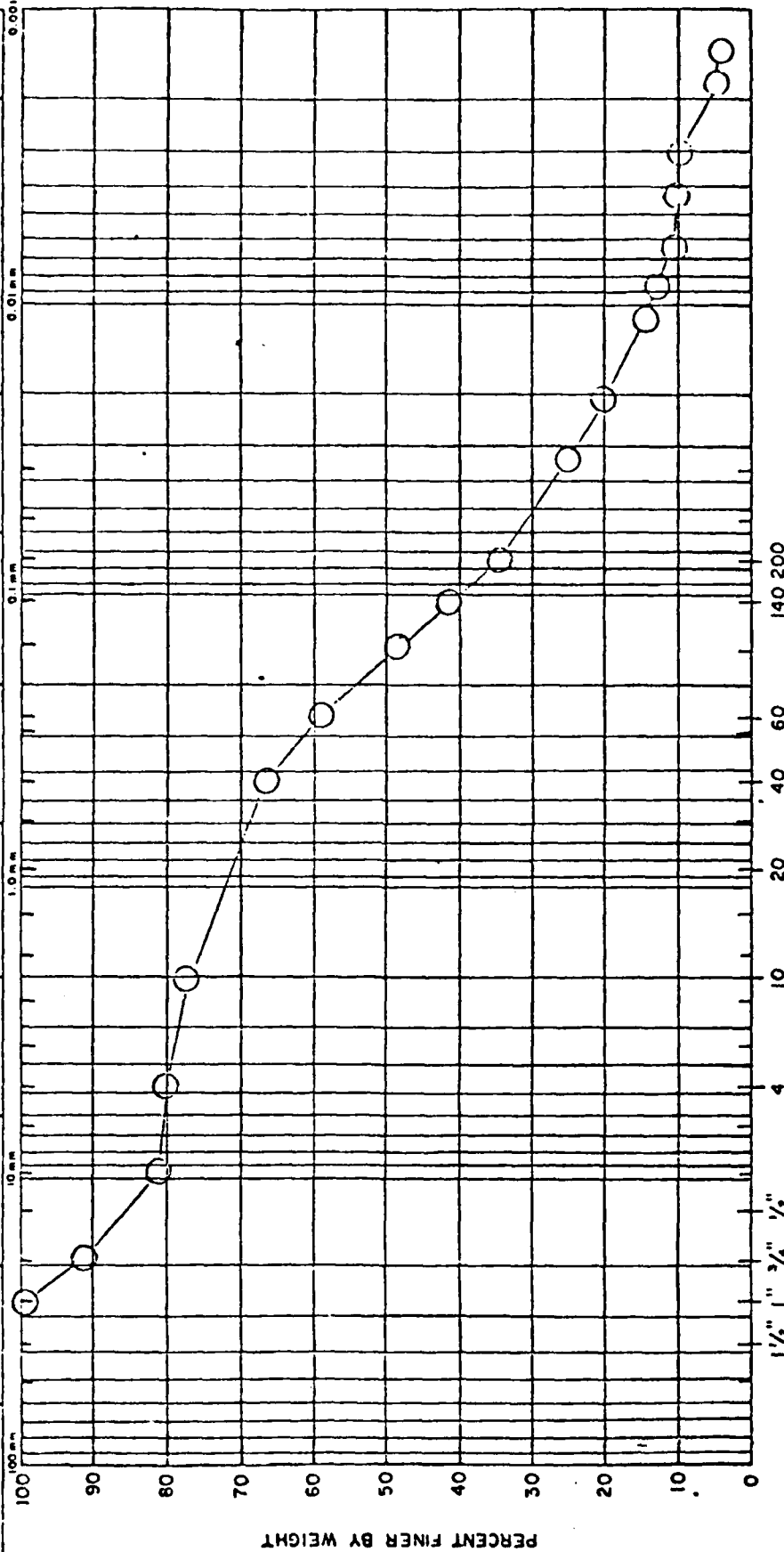
MIT CLASSIFICATION	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	



U.S. STANDARD BRASS SIEVE SIZES

PROJECT NO. 11-11 TEST BY EJP REMARKS SM Silty fine to coarse sand No. 8 of 8
 SAMPLE DEPTH 2.5 ft. DATE 5/14/75 SAND, little gravel

NIT	GRAVEL			SAND			SILT			CLAY
	CLASSIFICATION	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE



U.S. STANDARD BRASS SIEVE SIZES

jpc
pe

REFERENCE: AN RET P. 2330.00

Appendix 2. Test Pit Logs TP-1 through TP-16,
AH-1 through AH-6 by The Office of
James P. Collins, P.E.

Boring Log Legend

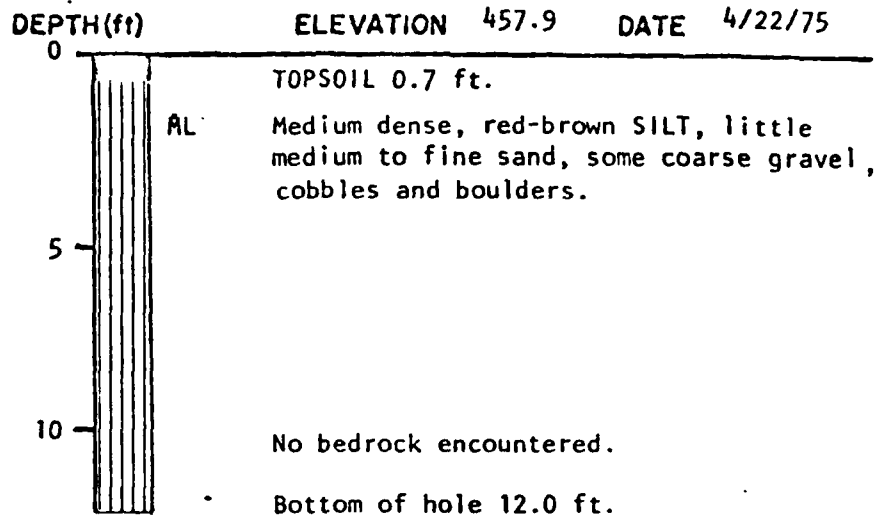
Test Hole Logs No. 1 through No. 19 by
William C. Larsen, P.E.

jpc
pe

LOG OF TEST PIT

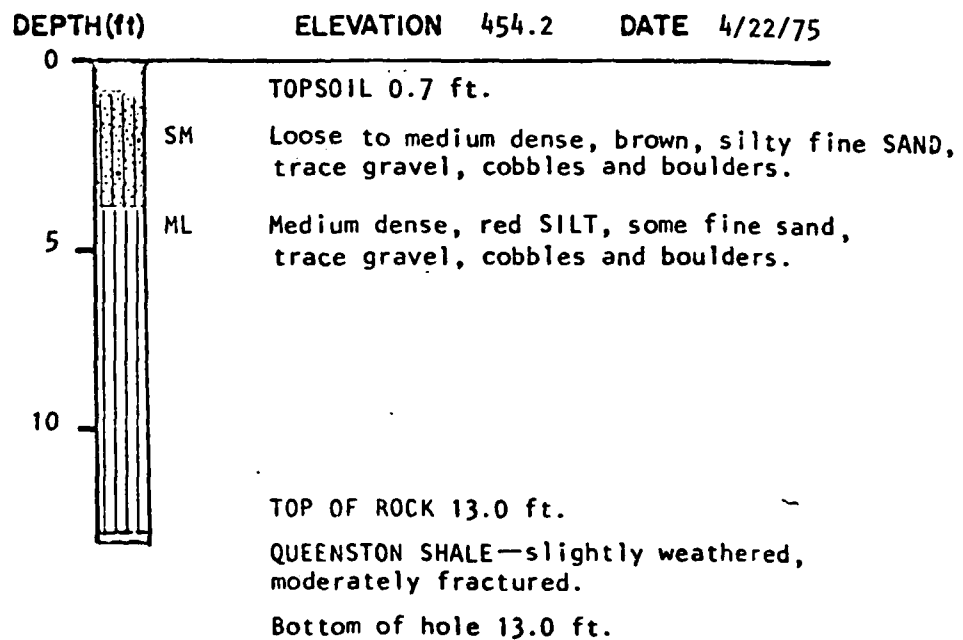
No. TP-1

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK



LOG OF TEST PIT

No. TP-2

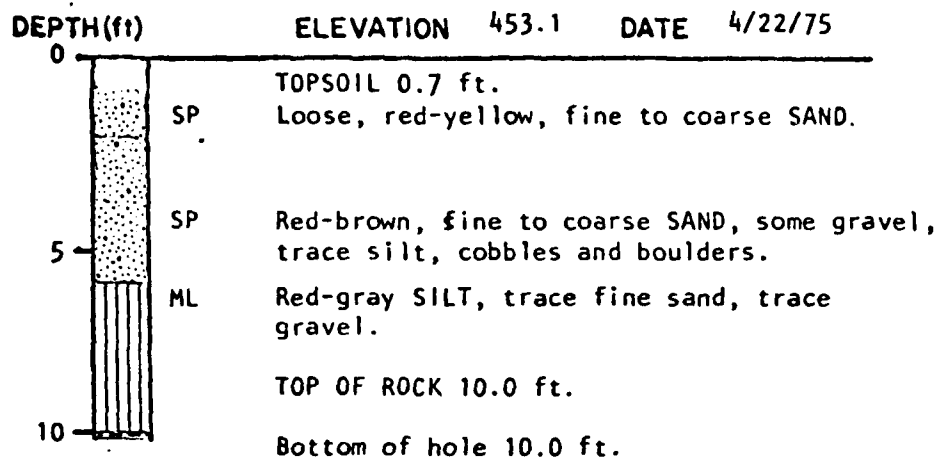


The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

AN RET P, 2330.00

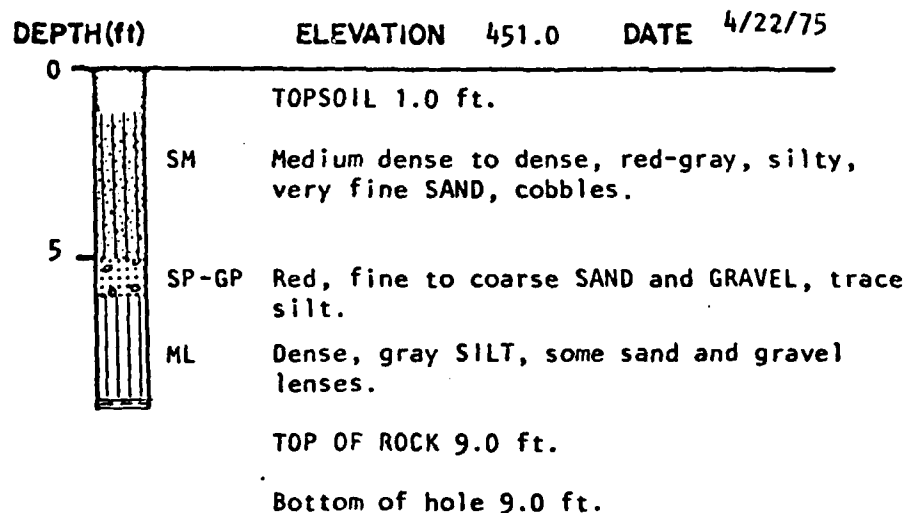
LOG OF TEST PIT

NO. 1P-3

JDC
pcLARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK

LOG OF TEST PIT

No. TP-4



The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

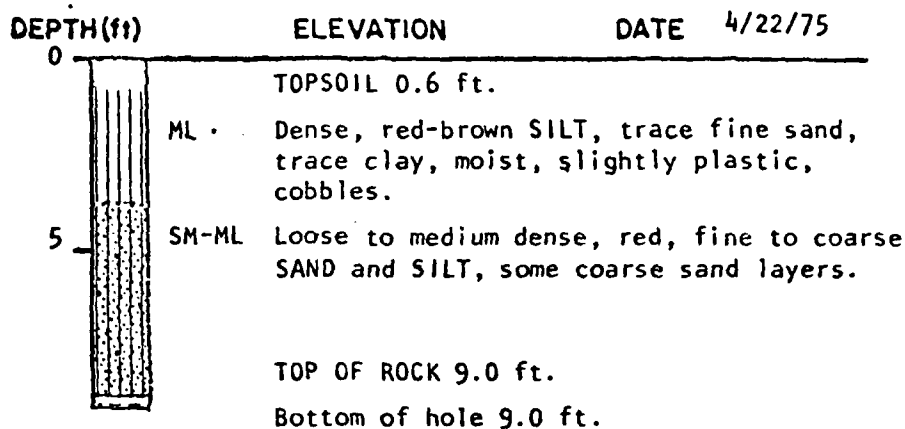
AN RET P, 2330.00

jpc
pe

LOG OF TEST PIT

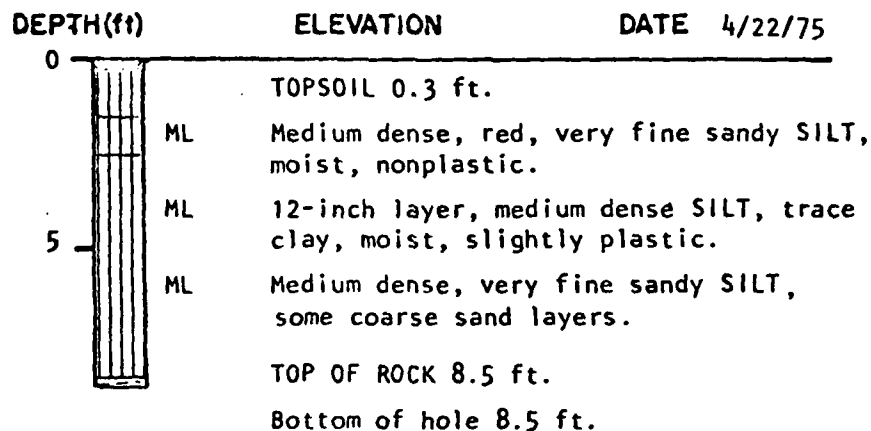
No. TP-5

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK



LOG OF TEST PIT

No. TP-6



The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

jpc
pc

LOG OF TEST PIT

No. TP-7

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK

DEPTH(ft)	ELEVATION	DATE
0	TOPSOIL 1.5 ft.	4/22/75
ML-SM	Loose to medium dense, red SILT and fine to coarse SAND, trace gravel, wet, non-plastic, cobbles.	
5	ML Dense, green, SILT, trace coarse sand, damp, nonplastic.	
SM	Loose, red, silty fine SAND, wet, non-plastic.	
10	No bedrock encountered.	
	Bottom of hole 10.0 ft.	

LOG OF TEST PIT

No. TP-8

DEPTH(ft)	ELEVATION	DATE
0	TOPSOIL 1.0 ft.	4/22/75
SM	Yellow-brown, silty fine SAND, some gravel, cobbles, wet.	
SM-GM	Red, silty fine to coarse SAND and GRAVEL.	
	Bottom of hole 4.0 ft.	

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

jpc
pc

LOG OF TEST PIT

No. TP-9

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK

DEPTH(ft)	ELEVATION	DATE
0		4/22/75
	TOPSOIL 0.7 ft.	
ML	Yellow-brown SILT, trace very fine sand, trace clay, wet, slightly plastic.	
5	Red SILT and DECOMPOSED SHALE layers.	
	TOP OF ROCK 6.0 ft.	
	Bottom of hole 6.0 ft.	

LOG OF TEST PIT

No. TP-10

DEPTH(ft)	ELEVATION	DATE
0		4/22/75
	TOPSOIL 1.0 ft.	
ML	Medium dense, red-brown, fine sandy SILT, trace fine gravel, some cobbles, wet, nonplastic.	
5		
ML	Medium dense to dense, red SILT, trace fine gravel, damp, nonplastic.	
10		
	Bottom of hole 10.0 ft.	

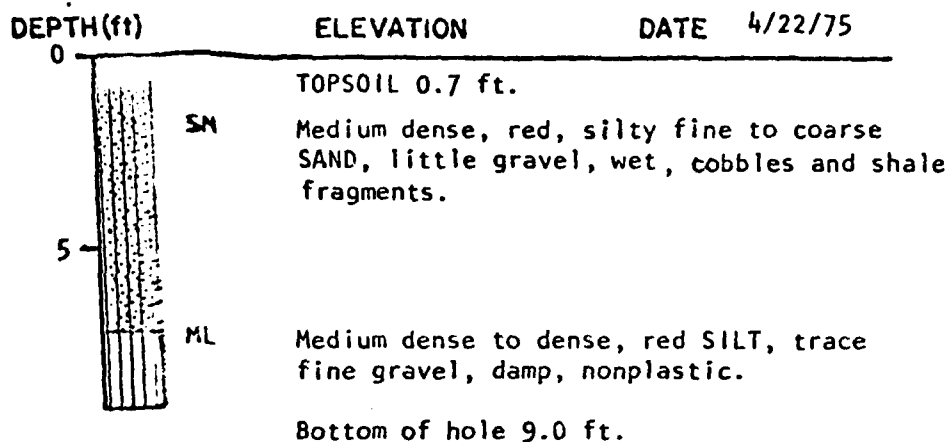
The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

AN RET P, 2330.00

LOG OF TEST PIT

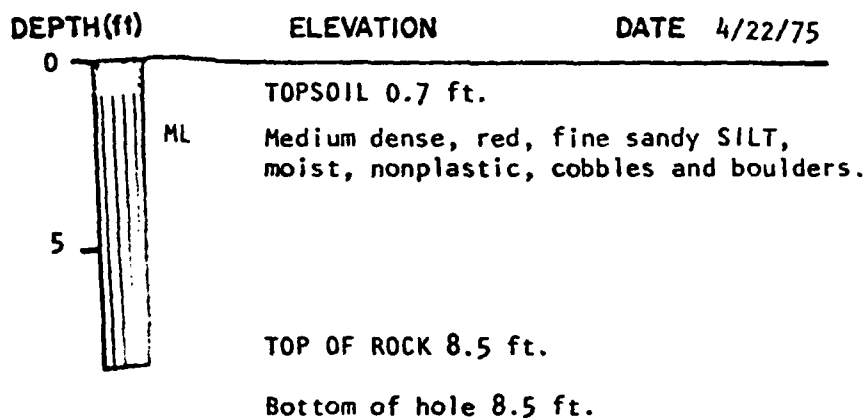
No. TP-11

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREENS, NEW YORK



LOG OF TEST PIT

No. TP-12



The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

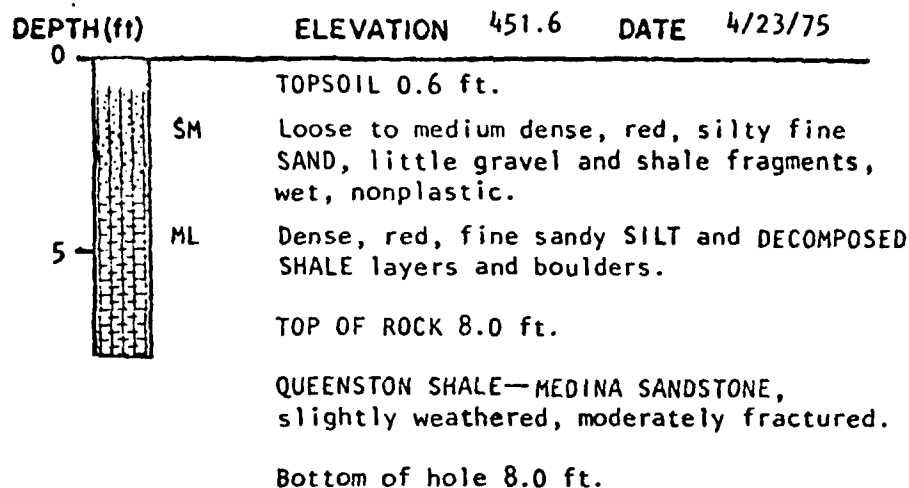
AN RET P, 2330.00

jpc
pc

LOG OF TEST PIT

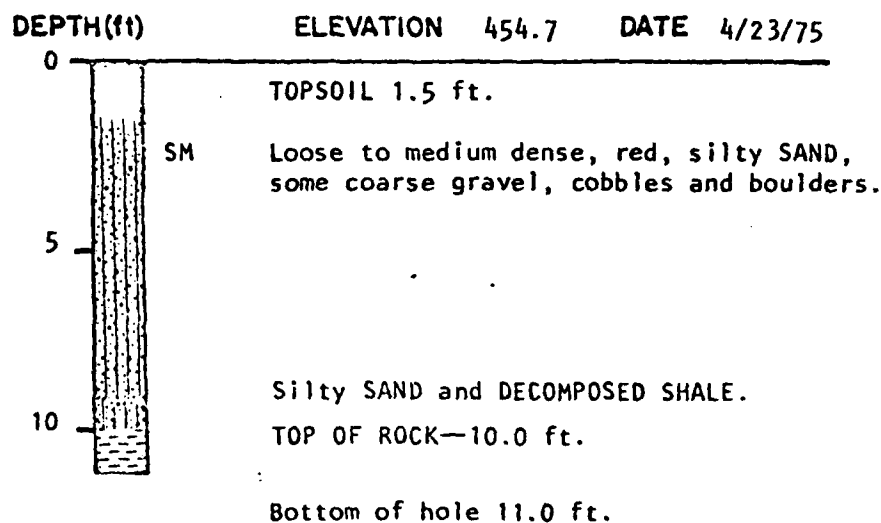
No. TP-13

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK



LOG OF TEST PIT

No. TP-14



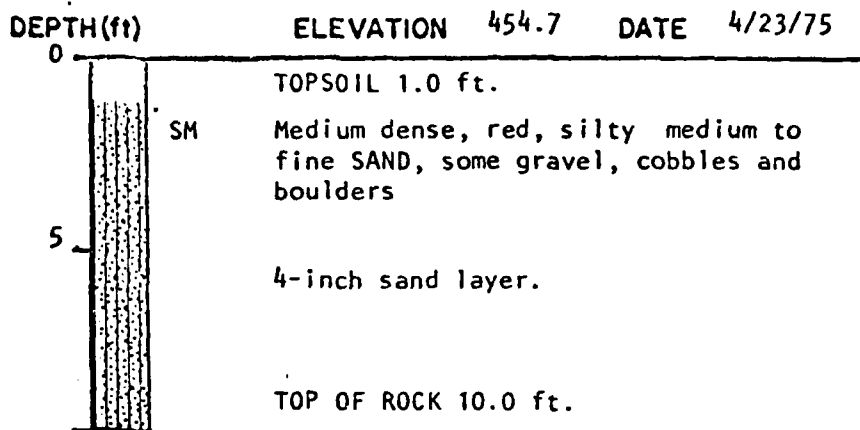
The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

jpc
pe

LOG OF TEST PIT

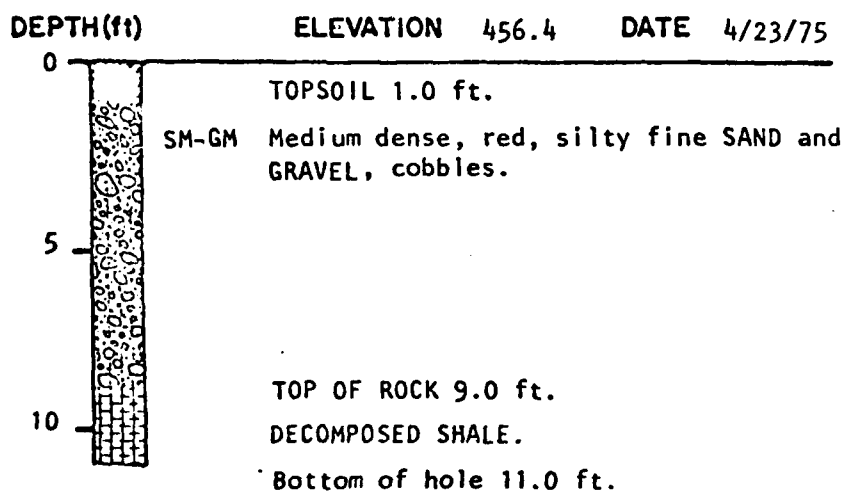
No. TP-15

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK



LOG OF TEST PIT

No. TP-16



The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

jpc
pc

LOG OF TEST PIT

No. AH-1

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK

DEPTH(ft)	ELEVATION	451.0	DATE	4/30/75
0				
	TOPSOIL 1.5 ft.			
	SM-ML	Red-brown, fine to coarse SAND and SILT, trace fine gravel. Grading to very fine, sandy silt.		
	Bottom of hole 4.0 ft.			

LOG OF TEST PIT

No. AH-2

DEPTH(ft)	ELEVATION	450.0	DATE	4/30/75
0				
	TOPSOIL 1.2 ft.			
	ML	Gray-brown SILT, trace fine sand, trace clay, moist, slightly plastic.		
	Bottom of hole 4.0 ft.			

The stratification lines represent the approximate
boundary between soil types. The actual transition
may be gradual.

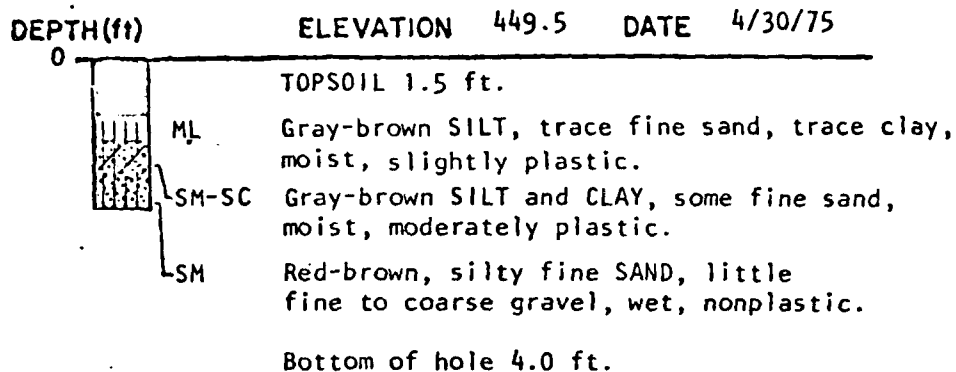
AN RET P, 2330.00

LOG OF TEST PIT

NO. AH-3

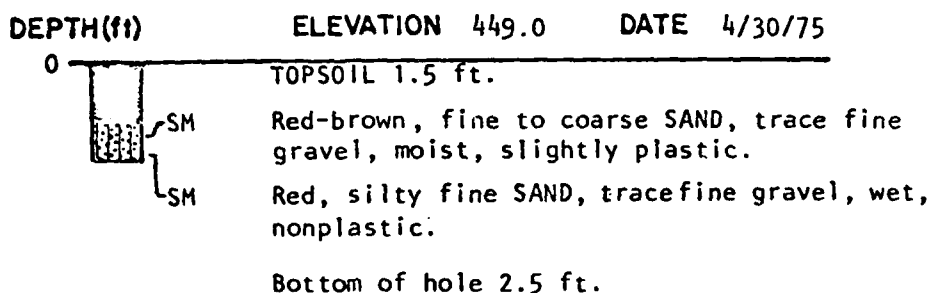
JDC
pc

LARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK



LOG OF TEST PIT

No. AH-4



The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

AN RET P, 2330.00

LOG OF TEST PIT

No. AH-5

jpc
peLARKIN CREEK STORMWATER
DETENTION FACILITY
TOWN OF GREECE, NEW YORK

DEPTH(ft)	ELEVATION	449.0	DATE	4/30/75
0	TOPSOIL 0.8 ft.			
	SM-SC	Gray-brown SILT and CLAY, some fine sand, moist, moderately plastic.		
		Grading to more sand.		
	SM	Yellow-brown, silty fine SAND, trace clay, wet, slightly plastic.		
		Bottom of hole 3.5 ft.		

LOG OF TEST PIT

No. AH-6

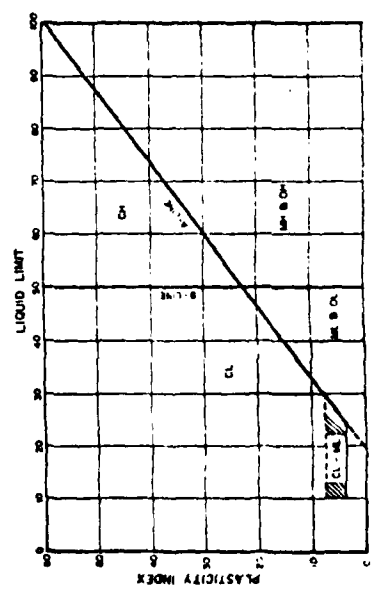
DEPTH(ft)	ELEVATION	449.0	DATE	4/30/75
0	TOPSOIL 1.5 ft.			
	SM	Red, silty fine SAND, trace clay, wet, slightly plastic.		
		Grading to silty, very fine SAND, some medium fine gravel, wet, nonplastic.		
		Bottom of hole 3.5 ft.		

The stratification lines represent the approximate boundary between soil types. The actual transition may be gradual.

MAJOR DIVISIONS		GRAPH SYMBOL	TYPICAL DESCRIPTIONS
FINE GRAINED SOILS	GRAVELS	GW	Well graded gravel with sand and silt in matrix
		GP	Poorly graded gravel with sand and silt in matrix
		GM	Silt, gravel, sand and silt in matrix
	SANDS	SC	Clayey gravel, sand and silt in matrix
		SM	Well graded sand, gravel, silt, and clay in matrix
		SP	Poorly graded sand, gravel, silt, and clay in matrix
FINE GRAINED SOILS	SANDS	SM	Silt, sand, and silt in matrix
		SC	Clayey sand, silt, and silt in matrix
		ML	Impure sand with silt, clay, and silt in matrix
	CLAYS AND CLAYS	CL	Clayey sand, silt, and silt in matrix
		OL	Organic silt and organic clay
		MH	Impure silt with organic matter
FINE GRAINED SOILS	CLAYS AND CLAYS	CH	Clayey silt and organic clay
		OH	Organic clay and organic silt
		PT	Partly organic silt and organic clay
	CLAYS AND CLAYS	CL	Clayey silt and organic clay
		OL	Organic silt and organic clay
		MH	Impure silt with organic matter

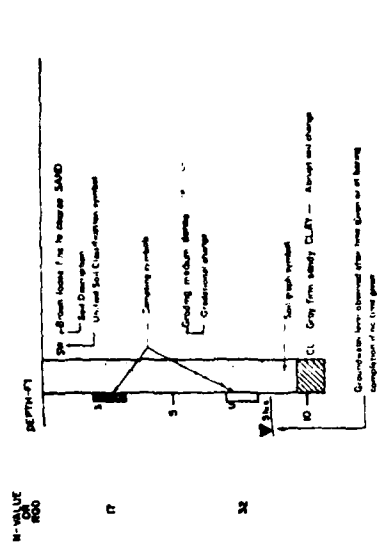
Note: Due to the wide variation in the behavior of soils, the classification system is based on the following assumptions:

SOIL CLASSIFICATION CHART
BASED ON LIQUID LIMIT AND PLASTICITY INDEX



PLASTICITY CHART

BORING LOG LEGEND

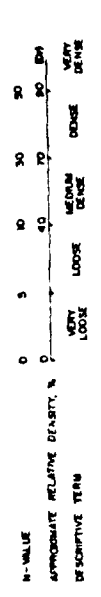


N-VALUE Top of Borehole No. 12 of penetration standard with cone sampler 140 lb weight 30 drops
RQD Read Out to Displacement Modified cone sampler

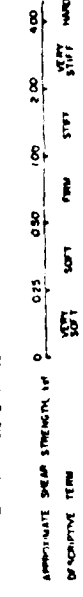
SAMPLING SYMBOLS

- S Standard soil sample
- P Proven sample
- Sample recovered
- Other undisturbed sample
- Other core
- Sample not recovered

KEY TO DENSITY DESCRIPTION, GRANULAR SOILS



KEY TO CONSISTENCY DESCRIPTION, COHESIVE SOILS



NOTE: Due to the wide variation in the behavior of soils, the classification system is based on the following assumptions:

the office of james p. collins, p.e.

TEST HOLE LOG

Hole #1 Station 13+00 Baseline "A" 18' north Elev 443.0

0-1' topsoil
1'-5½' reddish brown clay - wet - some sand
 water seepage at moderate rate at 2'
5½' sandstone can be broken with shovel

Hole #2 Station 17+00 Baseline "A" 26' north Elev 444.5

0-1' topsoil
1'-6' reddish brown clay & sand - wet - banks stable
6' water entering hole fast rate
 hardpan - sandstone hard - not easily broken

Hole #3 Station 20+88 Baseline "A" 12' north Elev 458.0

0-8" topsoil
8"-2' light brown reddish sand with very little clay
2'-10½' sand dry no water seepage easy digging solid banks

Hole #4 Station 24+00 Baseline "A" 18' north Elev 467.5

0-1' topsoil
1'-9½' reddish-sand-dry-stable banks
 no seepage into hole - some moisture
9½'-10' beginning of gravel or broken rock

Hole #5 P.I. 27+13.55 Baseline "A" 17½' west Elev 468.5

0-1½' topsoil
1½'-7' dry sandy brown soil - no water seepage
7'-9' (hard digging) sandstone very hard

Hole #6 Station 30+0 Baseline "A" 12' west Elev 461.5

0-10" topsoil
10"-3' sandy soil brown damp
3'-11' medium reddish brown clay soil-damp
no water seepage, also some small rock fragment
easy digging - banks are stable

Hole #7 Station 34+0 Baseline "A" 15½' west Elev 462.0

0-10" topsoil
10"-2½' sandy reddish loam
2½'-11½' moist sand having some clay
stable banks, no visual seepage of water, easy digging

Hole #8 Station 40+00 Baseline "A" 17½' west Elev 451.5

0-1' topsoil
1'-8' clay reddish moist consistency
8'-11' beginning layer of sandstone - can be broken
water seepage at 8' level

Hole #9 Station 40+00 Baseline "A" 450'+ west Elev 453.0
(corner of first hedge now running north-south)

0-1' topsoil - black
1'-2½' moist brown reddish sand
2½'-4½' gravel layer moderate to excessive seepage of water
at this level
4½'-11' clay - gravely sand loam - moisture wet

Hole #10 Station 42+00 445' west 58' south section running west
Elev 455.0

0-1' topsoil
1'-11' moist clay - solid banks - no water seepage, easy digging.

Hole #11 Station 46+00 198' west & 10' south Elev 453.0

0-10" topsoil
10"-9½' hard clay, very hard banks, no water seepage, very dry

Hole #12 Station 1+51 Baseline "B" going north Elev 438.5

0-10" topsoil
10"-6½' moist clay brown loam solid banks dry - no water seepage

Hole #13 Station 5+42 Baseline "B" going north Elev 436.5

0-10" topsoil
10"-5½' red sandstone (very hard) and some sand, little clay
can break with shovel. Top of hardpan starts at 5½'
slight water seepage noticable.

Hole #14 Station 5+59 Baseline "D" going north Elev 440.0

0-8" topsoil
8"-1½' sandy loam
1½'-8½' small amount of clay - reddish sandstone in
horizontal layers very hard - not easily excavated
top of hardpan at 8½' - moderate water seepage at 8½'

Hole #15 Station 3+52 Baseline "D" going north Elev 439.0

0-8" topsoil
8"-8½' hard reddish sandstone with sand in horizontal
layers - hard going for tractor backhoe
8½' moderate water seepage - moist to wet earth

Hole #16 Station 1+49 Baseline "D" going north Elev 439.0

0-8" topsoil
8"-9½' mixture of sand, clay, and sandstone rock fragments
moist, easy digging

Hole #17 Station 0+50 Baseline "F" going north Elev 445.0

0-8" topsoil
8"-8' mostly sand small fragments of reddish sandstone
8' water seepage top of hardpan found at depth of 8'

Hole #18 Station 6+0 Baseline "E" going west 70' Elev 439.0

0-8" topsoil
8"-2½' solid rock - sandstone

Hole #19 Station 5+47 Baseline "E" going north Elev 441.0

0-10" topsoil
10"-6' very hard digging - dry sandy loam and reddish sandstone
6' depth of hardpan



TOWN of GREECE

2505 RIDGE ROAD WEST
ROCHESTER, NEW YORK, 14626 • 716-225-2000

RECEIVED

March 23, 1981

MAR 24 1981

STETSON-DALE
STETSON-DALE

F.W. Byszewski, P.E., L.S.
Stetson-Dale
185 Genesee Street
Utica, New York 13501

ATTN: Jerry Gomez

RE: Corps of Engineers
Dam Safety Inspections

Gentlemen:

Enclosed, per your request, please find the following information pertaining to the operation, maintenance and performance of two manually-controlled stormwater detention basins located in the Town of Greece:

- 1) Peak stage elevations and date of occurrence
- 2) Sample copies of operation records
- 3) Buck Pond Detailed Drainage Study, Page 83

We are presently revising our Stage-Storage Curve for the Deschel Drive basin to correct the drafting errors which you brought to our attention.

We were unsuccessful in obtaining photographs of either detention basin in a partially-filled condition this spring.

Please contact me if you have additional questions or comments on this matter.

Very truly yours,

James S. Peet, P.E.
Town Engineer

Encl.

Peak Stage Elevations at Larkin Creek Detention Basin
(St. Andrews Drive)

<u>Date</u>	<u>Time</u>	<u>Stage</u> (USGS Elev.)	<u>Control Gate Opening</u>
10-10-77	2:45 P.M.	452.0±	0.5' opened to 0.58'
12-26-79	1:00 P.M.	453.2	0.8' closed to 0.6'
12-27-79	10:30 A.M.	450.0	0.6' opened to 0.8'
2-11-81	3:50 P.M.	450.5	0.75' unchanged
2-17-81	11:00 A.M.	451.2	0.75' unchanged
2-20-81	12:10 P.M.	452.2	0.75' unchanged
2-21-81	11:30 A.M.	453.35	0.75' unchanged

Note: Gage Post Installed and Marked in January, 1979.
Service spillway is 36" dia. RCP with manually
operated sluice gate.

ST. ANDREWS DRIVE DETENTION BASIN INSPECTION CHECK LIST

DATE: 3/9/61

TIME: 3:30

INSPECTED BY: B. J. [Signature]

ITEMS TO BE CHECKED

- 1) GATE AT ST. ANDREWS DRIVE:**

OK

- ## 2) GATE AND LOCK AT CONTROL STRUCTURE:

- 3) OPENING HEIGHT OF CONTROL GATE: .**

EXISTING HEIGHT:

CHANGED TO:

005

- 4) COMMENTS :**

8/18/77

ST. ANDREWS DRIVE DETENTION BASIN
INSPECTION
CHECK LIST

DATE: 3/16/81

TIME: 2:30

INSPECTED BY: B. J. [signature]

ITEMS TO BE CHECKED

1) GATE AT ST. ANDREWS DRIVE:

O.K.

2) GATE AND LOCK AT CONTROL STRUCTURE:

O.K.

3) OPENING HEIGHT OF CONTROL GATE:

EXISTING HEIGHT:

CHANGED TO:

0.75'

4) COMMENTS:

8/18/77

ST. ANDREWS DRIVE DETENTION BASIN INSPECTION CHECK LIST

DATE: 11/18/80

TIME: 11:45

INSPECTED BY: Bj.

ITEMS TO BE CHECKED

- 1) GATE AT ST. ANDREWS DRIVE:**

O.K.

- ## 2) GATE AND LOCK AT CONTROL STRUCTURE:

O.K

- 3) OPENING HEIGHT OF CONTROL GATE: .**

EXISTING HEIGHT:

CHANGED TO:

0.75

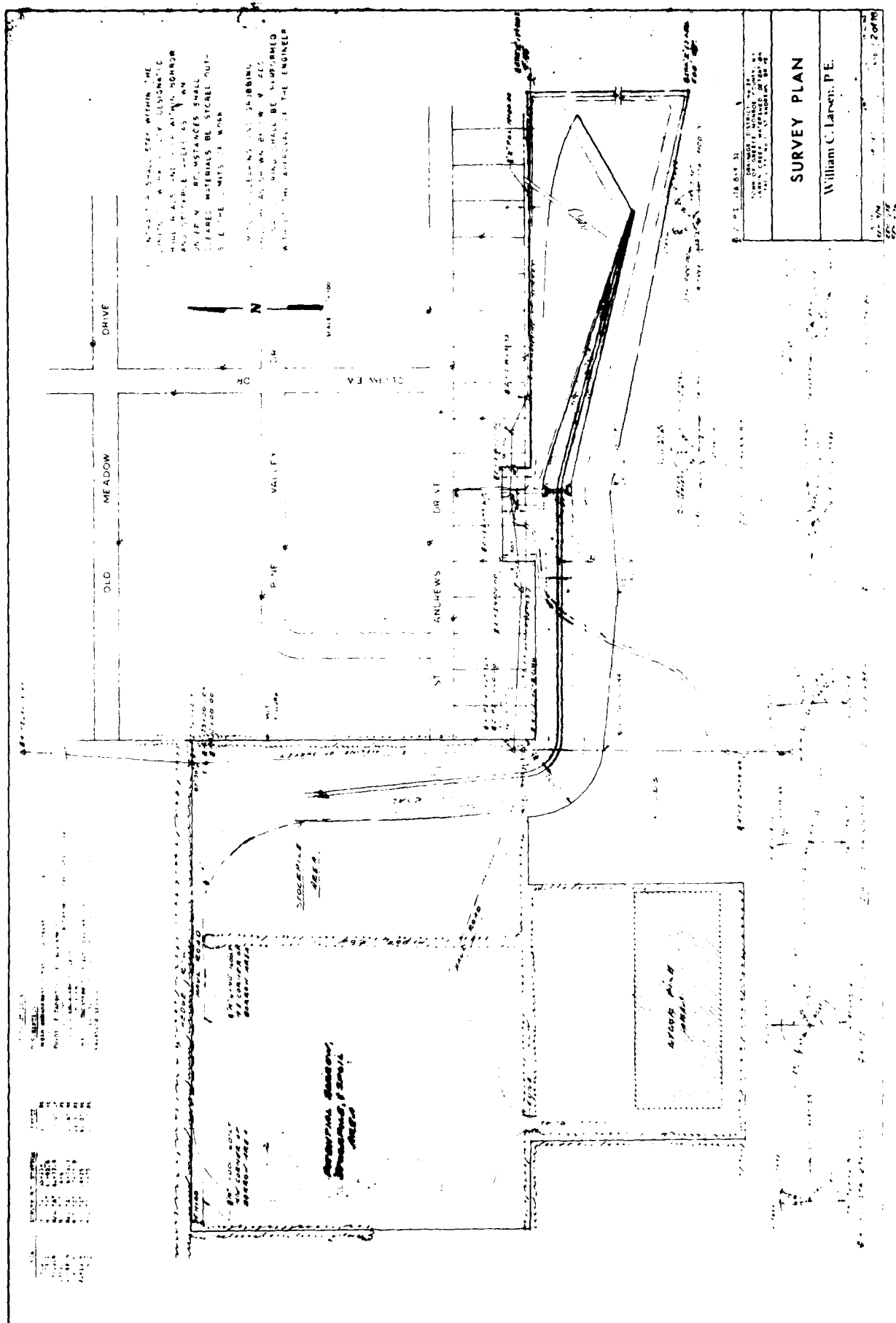
- 4) COMMENTS :**

Slight vibration when control arm
is lowered. No serious problems.

8/18/77

APPENDIX F

DRAWINGS



AD-A105 989

STETSON-DALE UTICA NY

NATIONAL DAM SAFETY PROGRAM. LARKIN CREEK DAM (INVENTORY NUMBER--ETC(U)

JUN 81 J B STETSON

DACW51-81-C-0009

F/G 13/13

NL

UNCLASSIFIED

3 of 3

AD A
10 F 949



END

DATE

FILED

11-81

DTIC

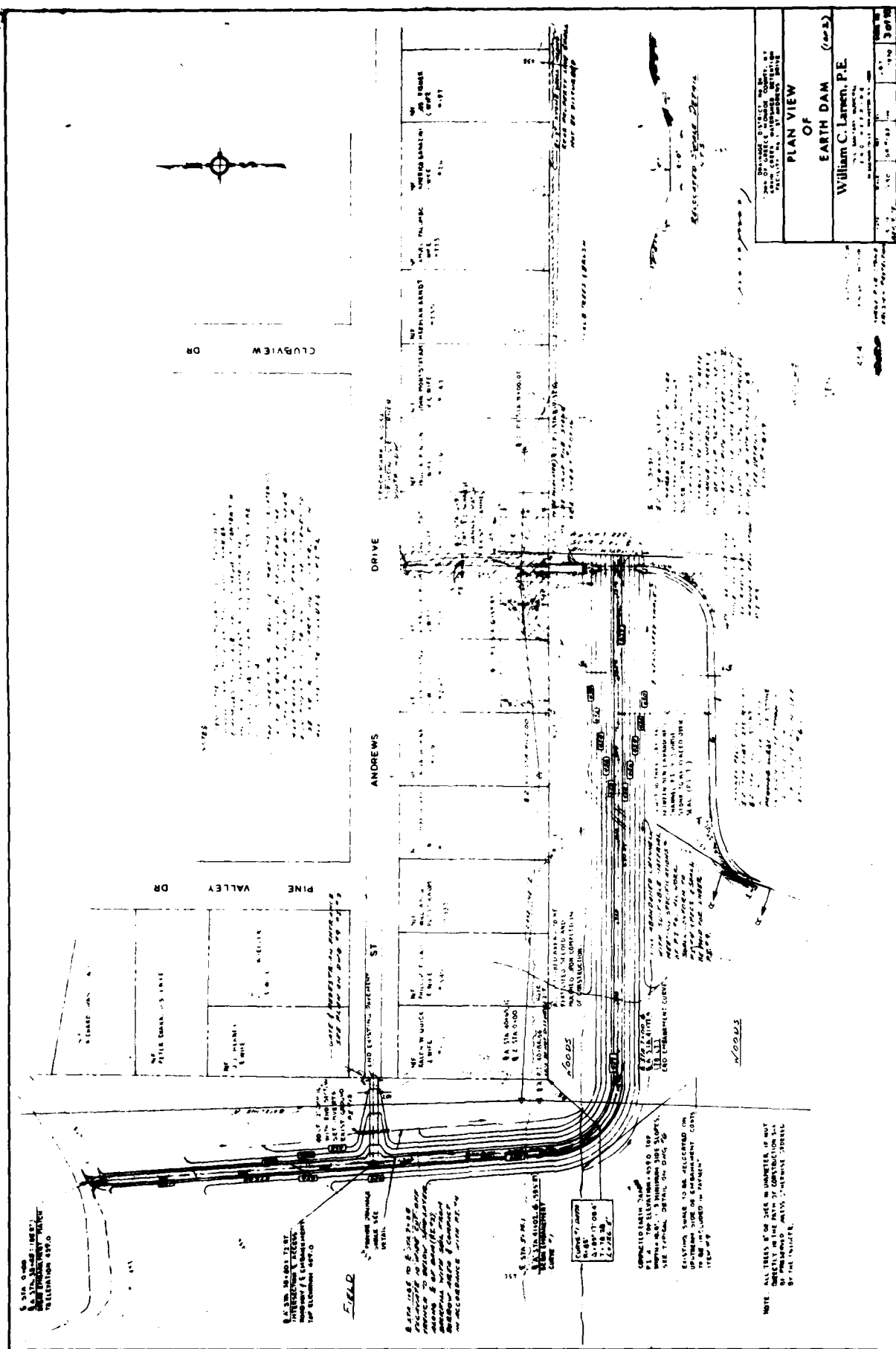
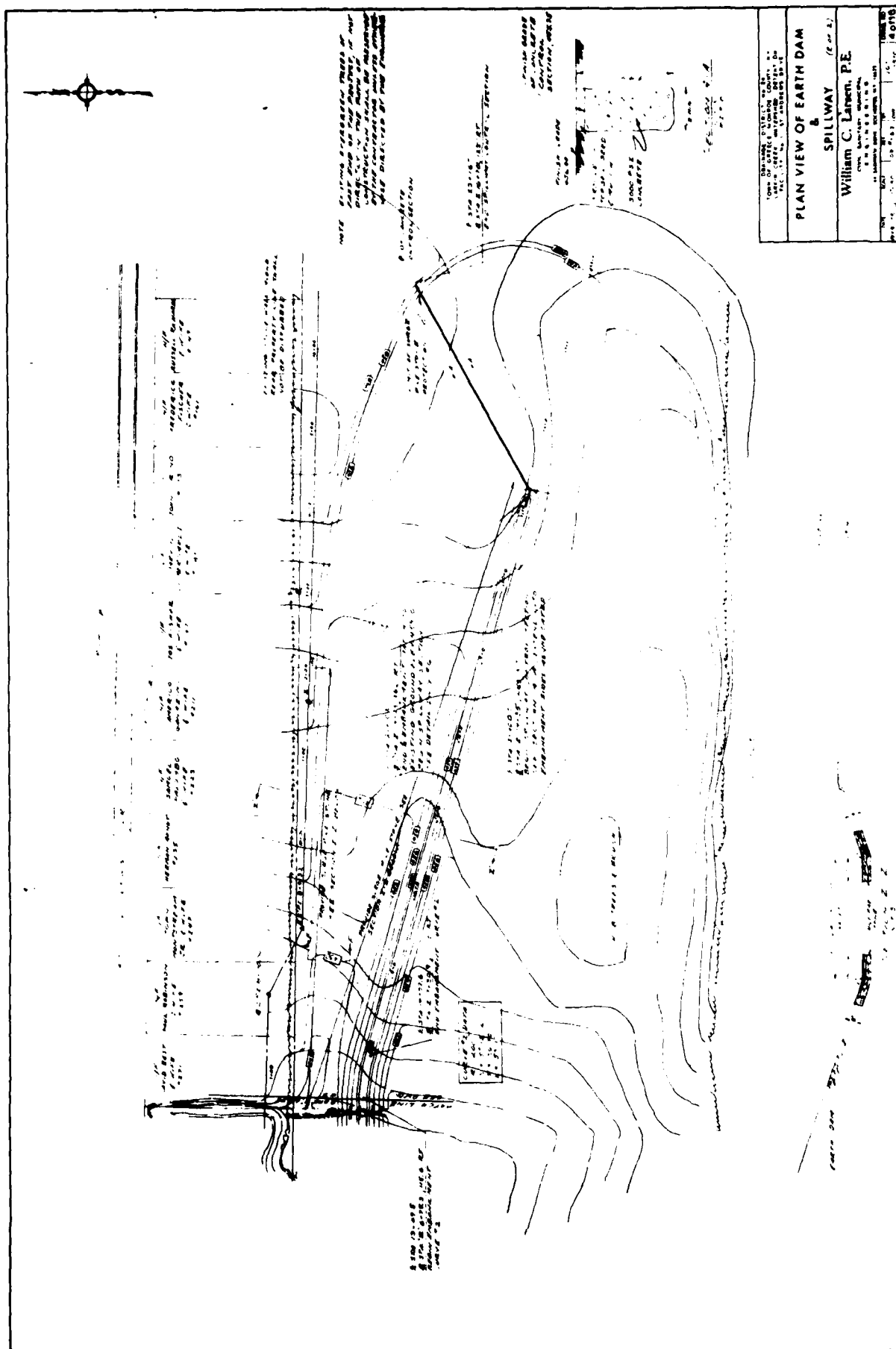


FIGURE 3



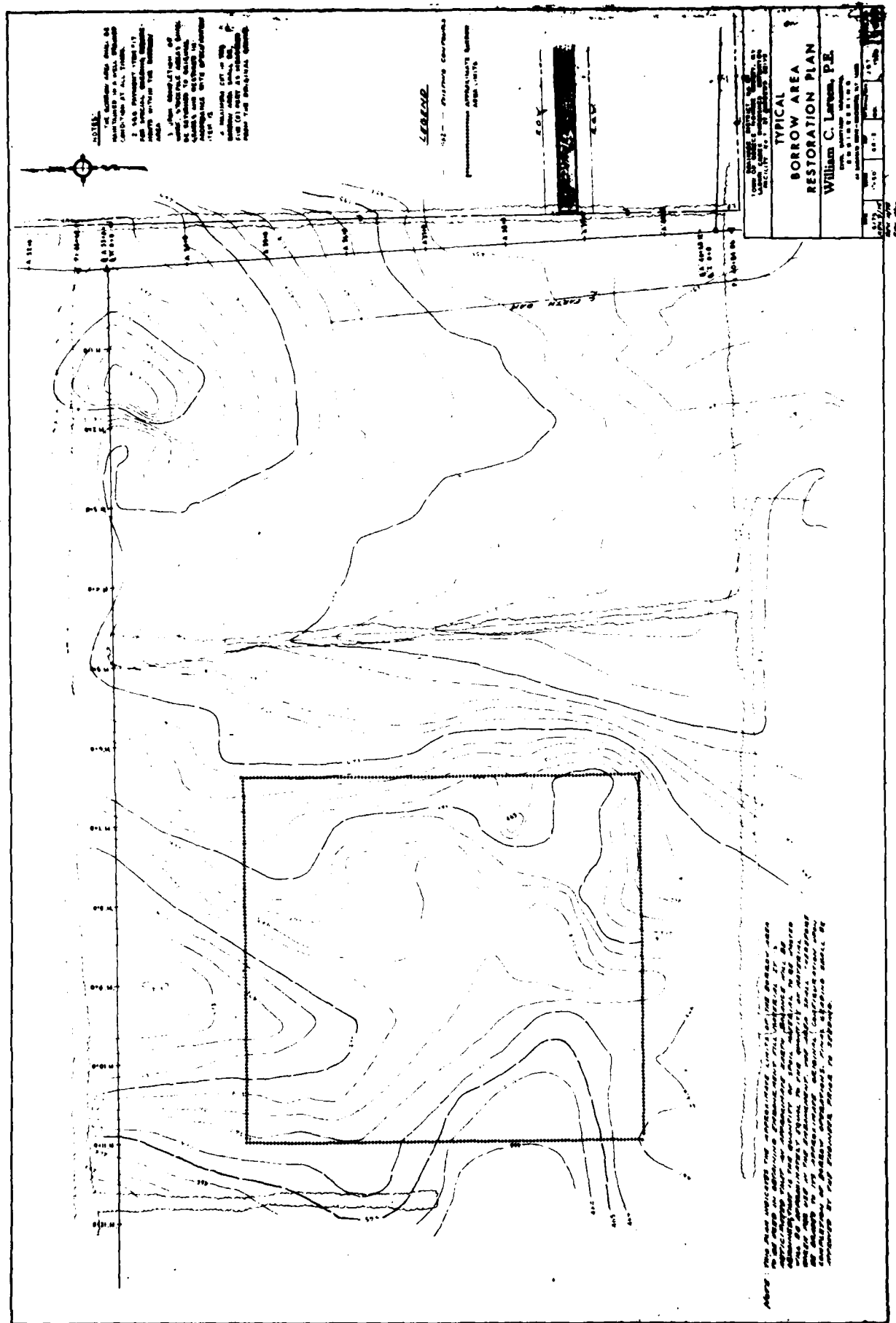
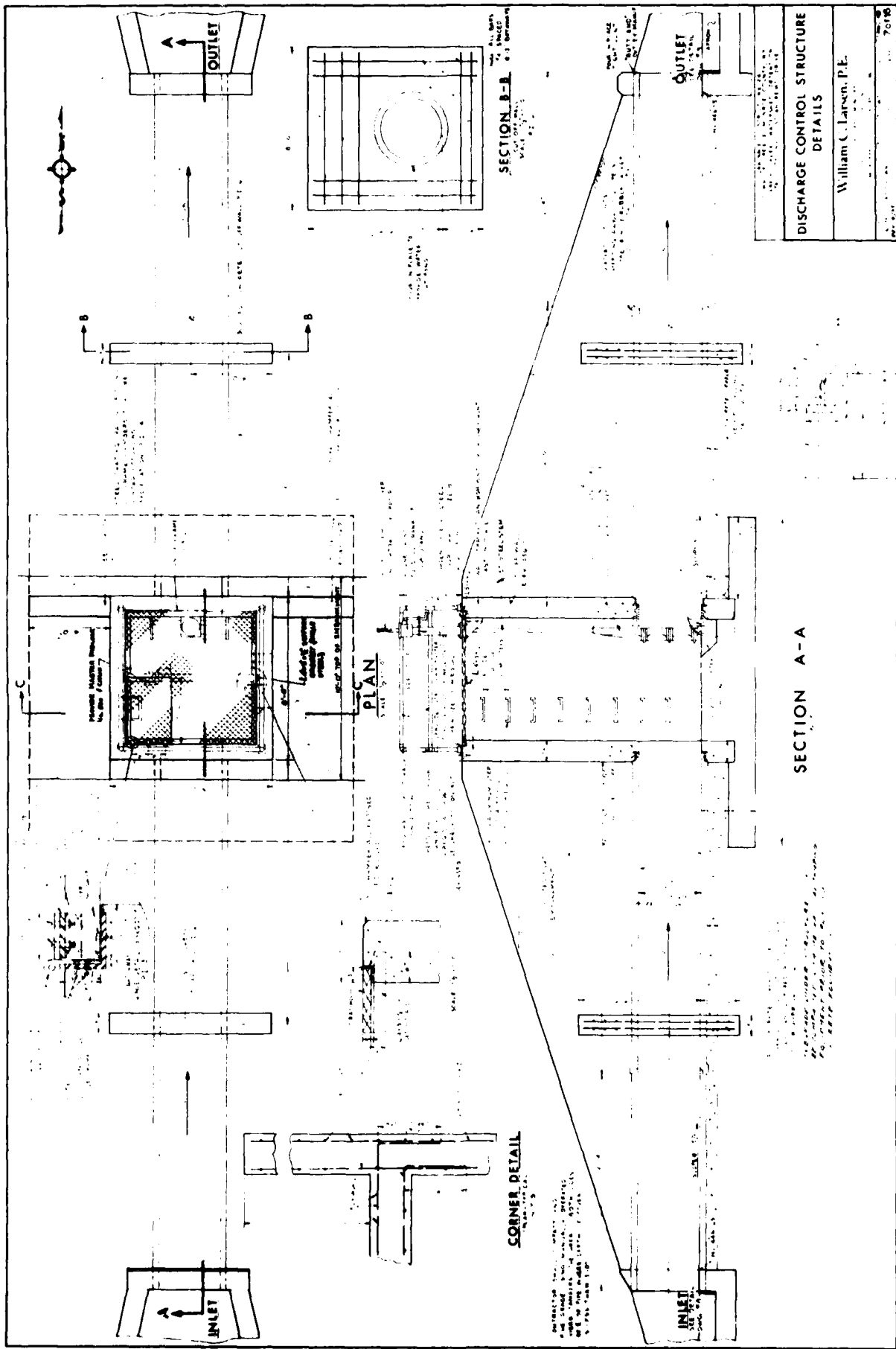
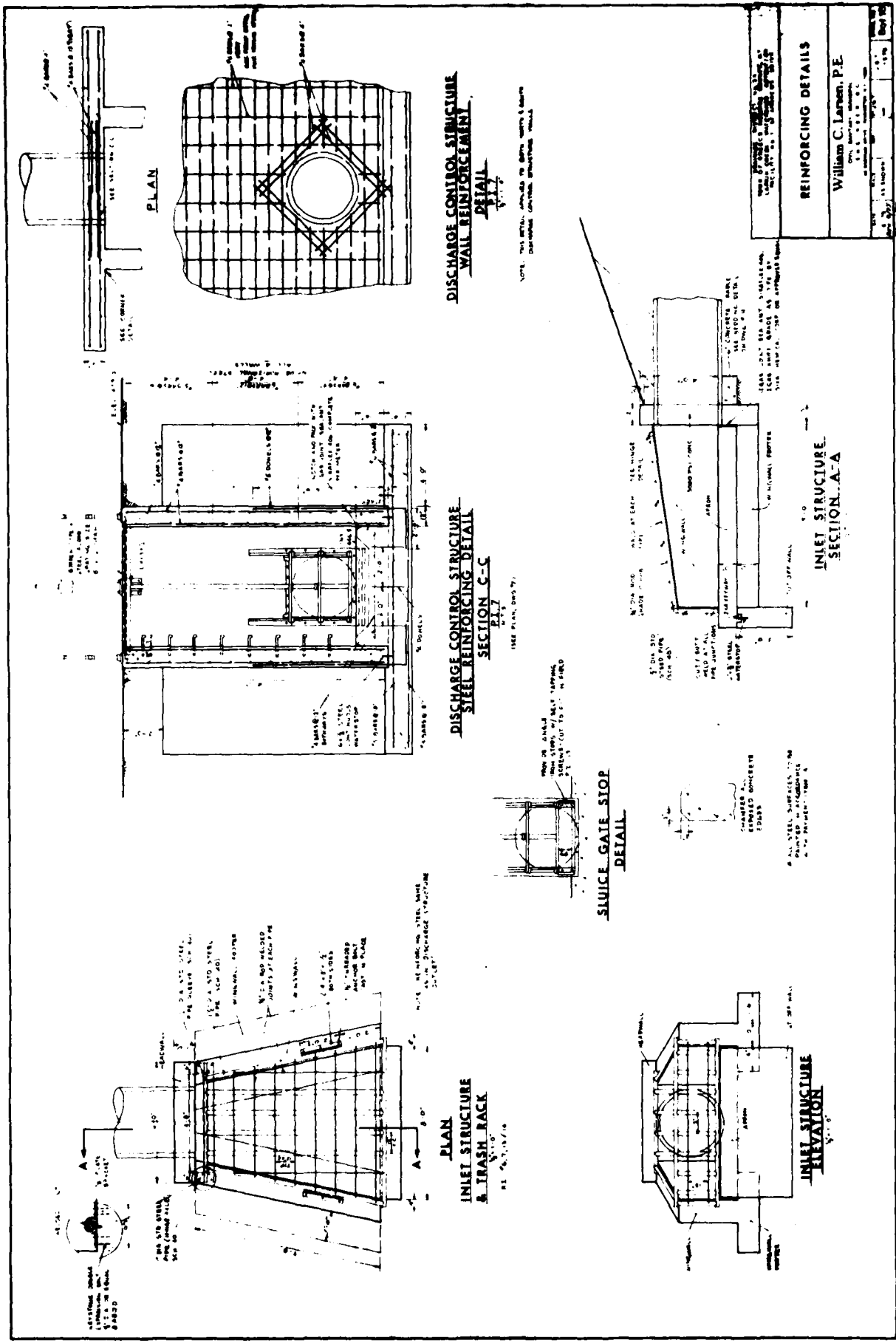


FIGURE 5





DATE
ILME