1997 Dam Safety Inspection Lockston Development

PUB 3.2
Attachment C

NEWFOUNDLAND POWER
A FORTIS COMPANY

NEWFOUNDLAND POWER

1997 11 03

Memorandum From: J.P. Halliday

To: J.L. Simmons

Subject: 1997 Dam Safety Inspections
Lockston Development

File: ENS-0790.30

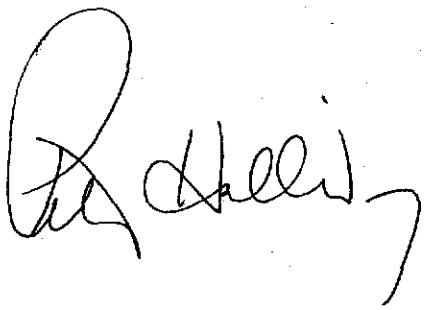
Please find attached the 1997 Dam Safety Inspection Reports for structures located within the Lockston Development. Structures in this development are in generally good condition and should operate safely with general maintenance and minor capital improvements.

Some of the important items noted in the report which will require attention include deteriorated concrete, especially along sections of the power canal, and significant leakage from the penstock.

Since the last inspection during 1995, Trinity Pond Dam and Lockston Intake have been reconstructed and a diversion dam and canal have been built at Copeley's Pond. These structures are all in good condition.

SH/dje

Enclosure



DAM SAFETY INSPECTION

Copeley's Pond Dam

Dam Type: Earthfill Dam

Date & Time of Examination: 97-06-13, 9:00 AM

Operational Status at Time of Examination:

Reservoir Water surface elevation	_____
Releases	N/A
Weather Conditions	Overcast 12°C
Water in storage	_____
Recent Seismic Events	_____

Examining Party

S. Hancock
I. Kerr

INSPECTION CHECKLIST FOR EMBANKMENT DAM

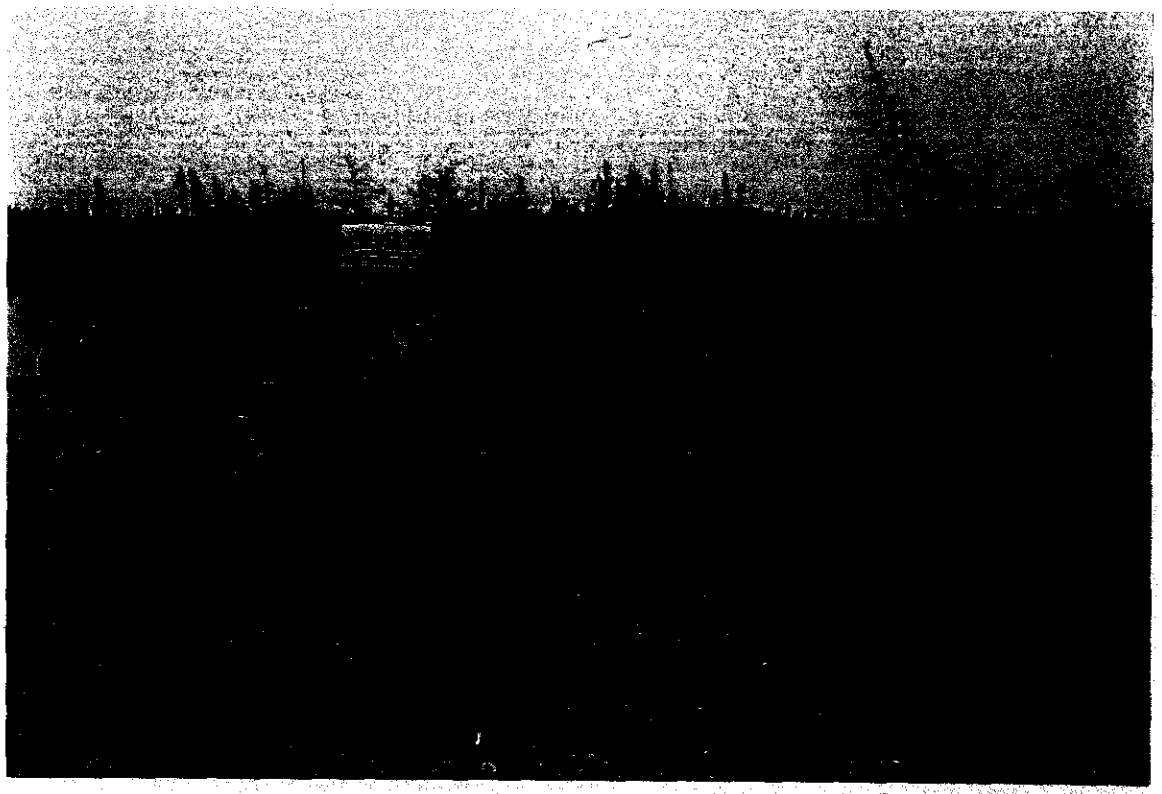
	DAM
Upstream Face	
Slide movements	None Observed
Slope protection	Adequate
Erosion - beaching	None observed
Cracks	None observed
Sinkholes	None observed
Settlement	None observed
Displacement	None Observed
Debris	None observed
Unusual conditions	None Observed
Downstream Face	
Slide movements	None Observed
Signs of movements	None Observed
Cracks	None Observed
Seepage or wet areas	Pond along downstream toe
Unusual conditions	_____
Abutments	
Seepage	None Observed
Cracks, joints, and bedding planes	None Observed

Slides	None Observed
Signs of movement	None Observed

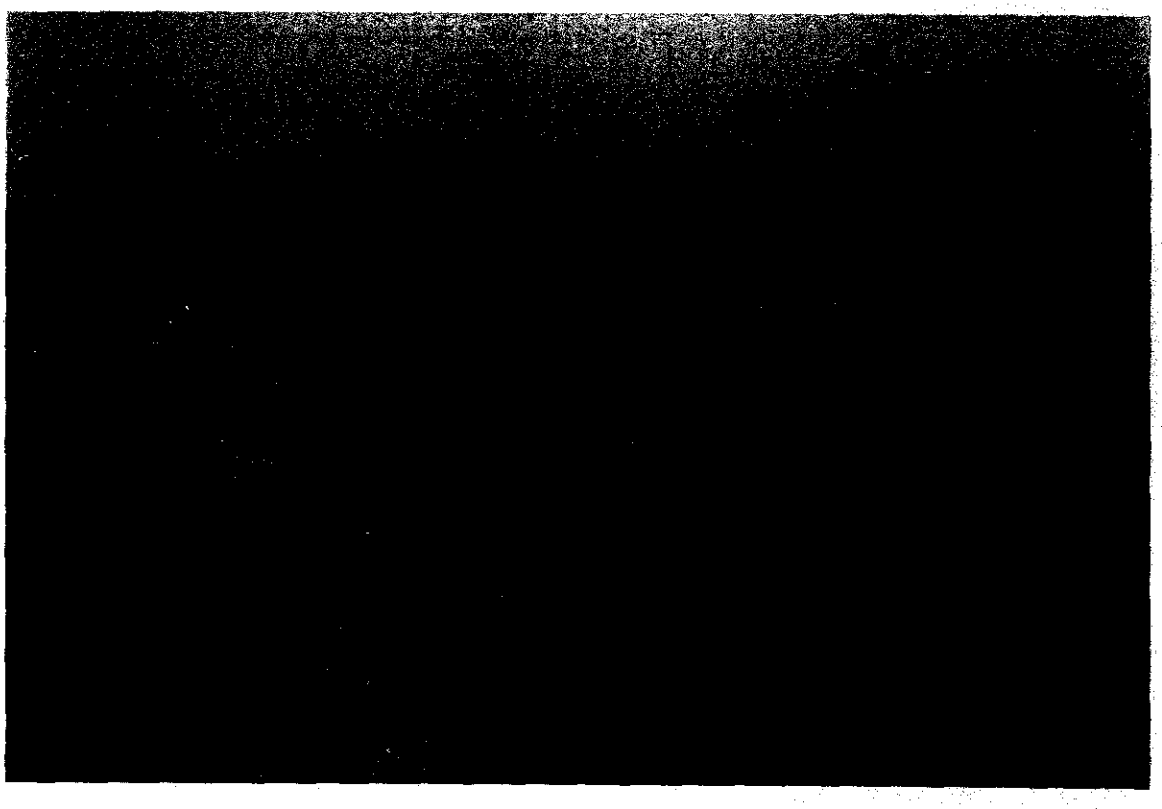
Remarks: Structure is adequate for its function (i.e. divert water into canal). Dam consists of old railway bed with timber culverts removed and backfilled to prevent free flow of water. Structure probably built on bog (resulting in pervious foundation). Flow through foundation varies depending on water elevation in Copeley's Pond.

LOCKSTON DEVELOPMENT
COPELEY'S POND DAM

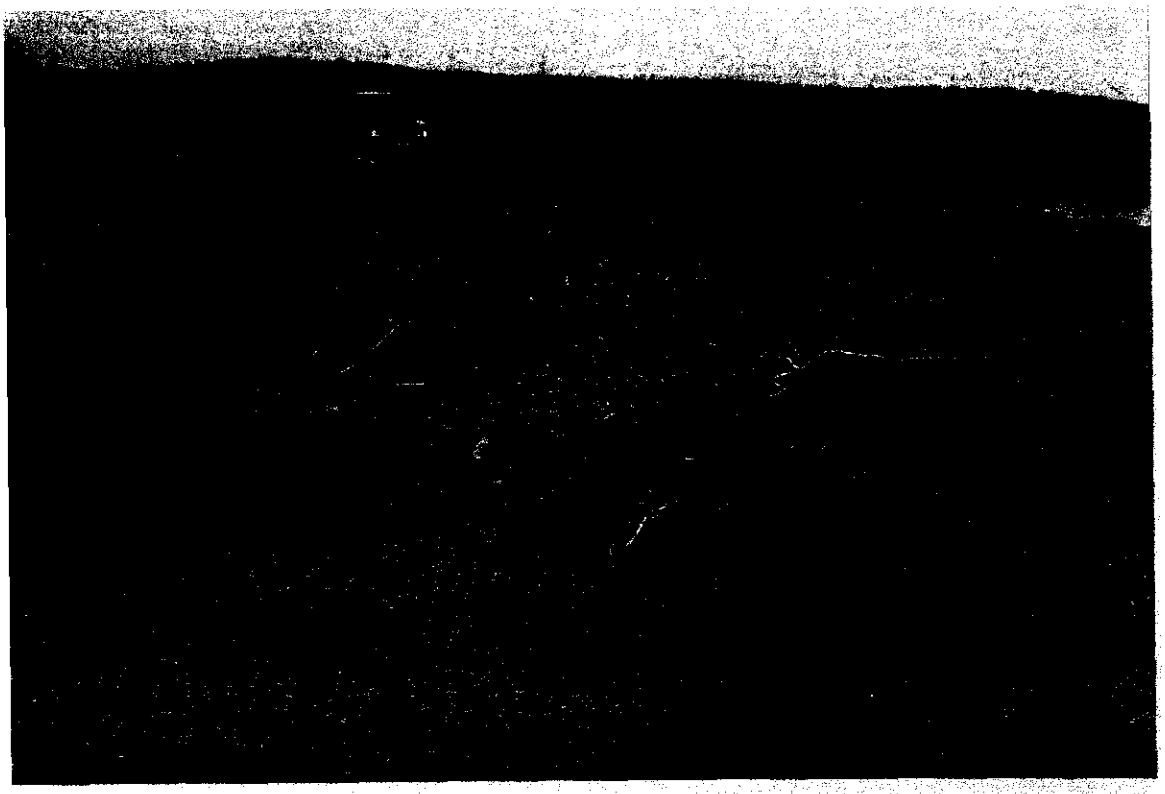
97-06-13



CREST OF STRUCTURE WHERE LARGE BOX CULVERT WAS REMOVED.



UPSTREAM SLOPE WHERE LARGE BOX CULVERT WAS REMOVED



DOWNSTREAM SLOPE WHERE LARGE BOX CULVERT WAS REMOVED.

UPSTREAM SLOPE WHERE SMALL TIMBER BOX CULVERT WAS REMOVED.

DAM SAFETY INSPECTION

Copeley's Pond Canal

Dam Type: Channel

Date & Time of Examination: 97-06-13 (09:30 AM)

Operational Status at Time of Examination:

Reservoir Water surface elevation	N/A
Releases	
Weather Conditions	Rain
Water in storage	
Recent Seismic Events	

Examining Party

I. Kerr

S. Hancock

CANAL

Approach Channel

Debris	None Observed
Channel side slope stability	Good

Invert

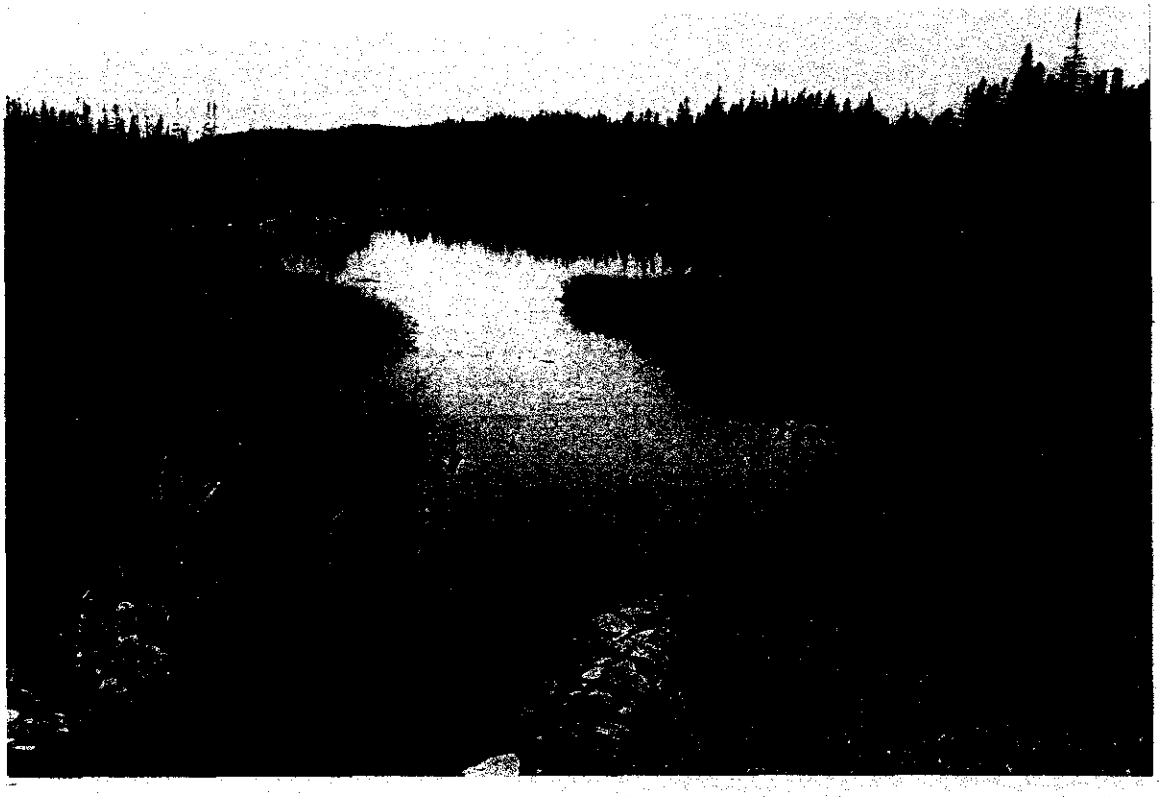
Debris	Some evidence of beavers. Gauge should be installed at entrance to canal to ensure invert elevation remains at design elevation and canal is not blocked by mud and debris.

Channel

Slope Protection	None
Stability of side slopes	Bog has fallen into canal in several areas near upstream end.
Vegetation or other obstructions	Some logs and debris in brook in several locations.

Remarks: Good flow in canal. River diverts and is very swampy just upstream of highway. Operations staff should check canal regularly, especially at upstream end, to ensure water is flowing into canal. As indicated in thesection on Copeley's Pond Dam, the railway bed foundation is pervious and if the canal entrance is partially blocked it could raise the elevation of Copeley's Pond possibly resulting in increased flow through the railway bed foundation and out of the system.

LOCKSTON DEVELOPMENT 1997-06-13
COPELEY'S POND CANAL

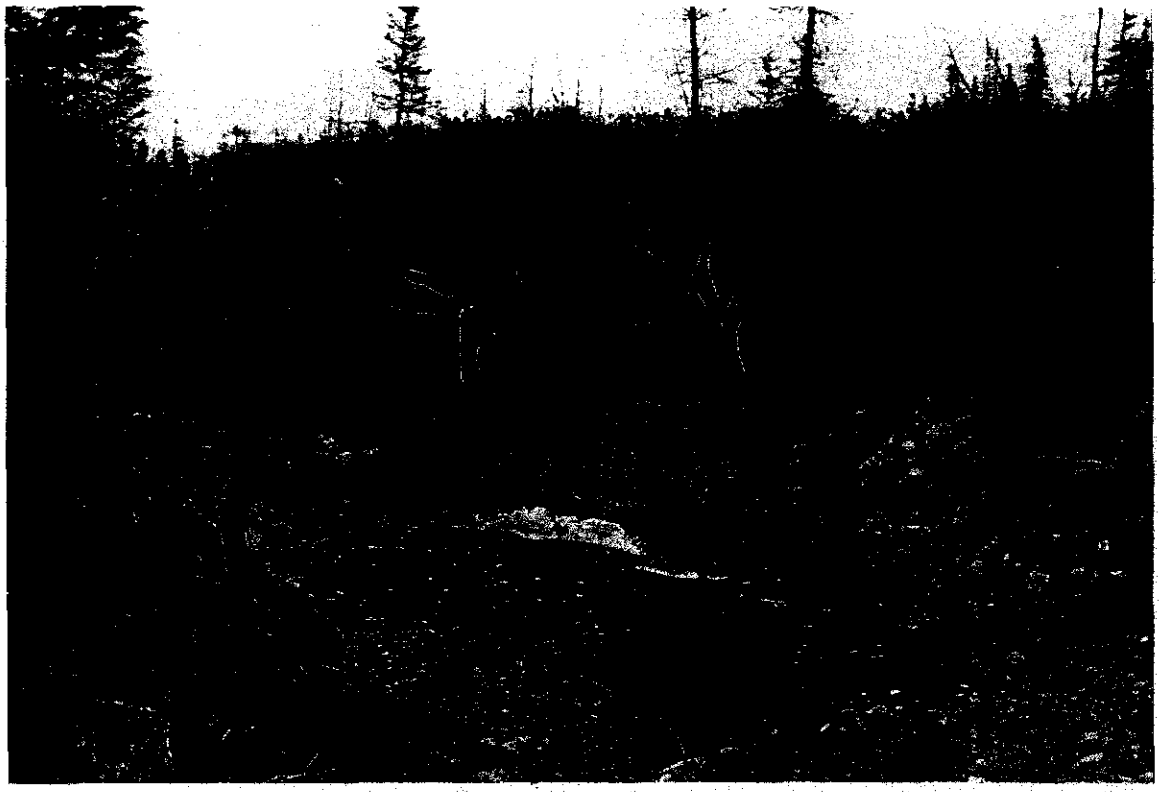


INLET TO CANAL LOOKING UPSTREAM

ENTRANCE TO CANAL LOOKING DOWNSTREAM. THIS AREA SHOULD BE INSPECTED AND CLEARED AS NECESSARY.

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

997-06-13



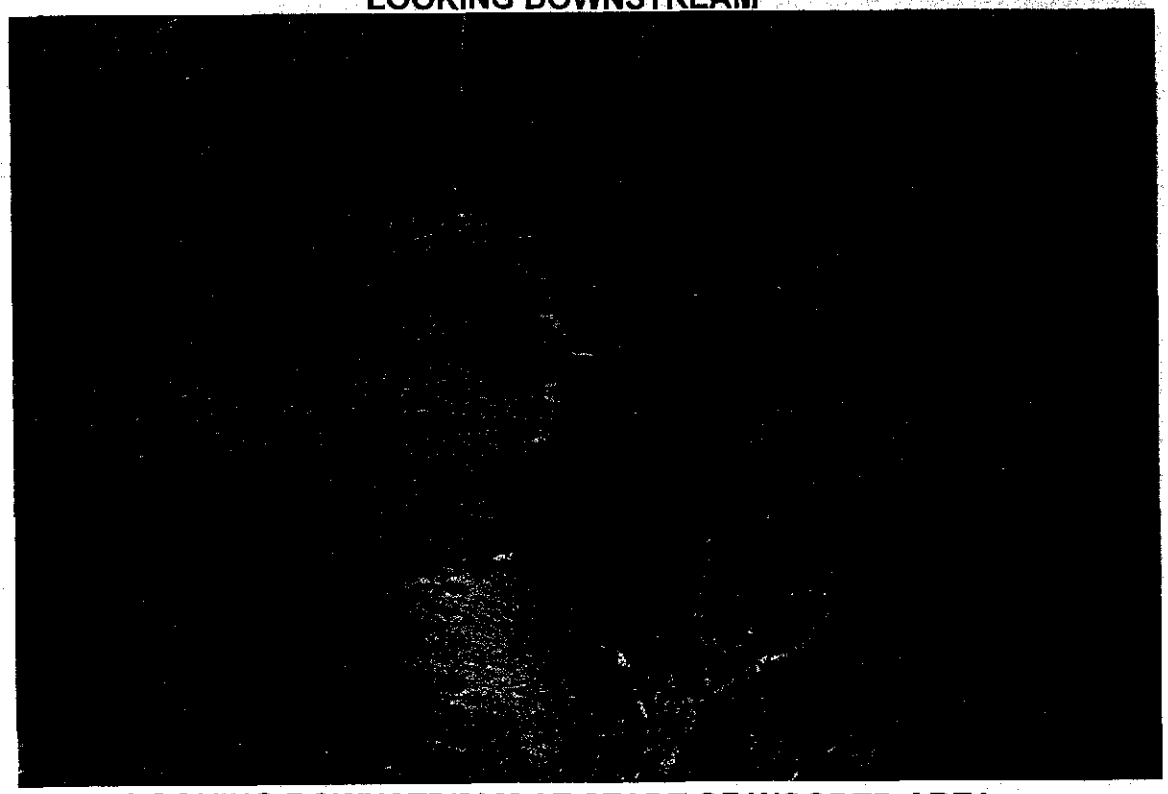
AREA WHERE BOG HAS FALLEN INTO CANAL

LOOKING DOWNSTREAM. NOTE BOG HAS FALLEN INTO STREAM

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13

LOOKING DOWNSTREAM



LOOKING DOWNSTREAM AT START OF WOODED AREA.

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13

LOOKING UPSTREAM AT START OF WOODED AREA

LOOKING DOWNSTREAM

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13

LOOKING UPSTREAM. NOTE STEEPER SLOPE OF STREAM.

LOOKING DOWNSTREAM. NOTE BROKEN TREE BRANCHES IN STREAM.

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13

NOTE DEBRIS IN STREAM

TYPICAL CANAL SECTION

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

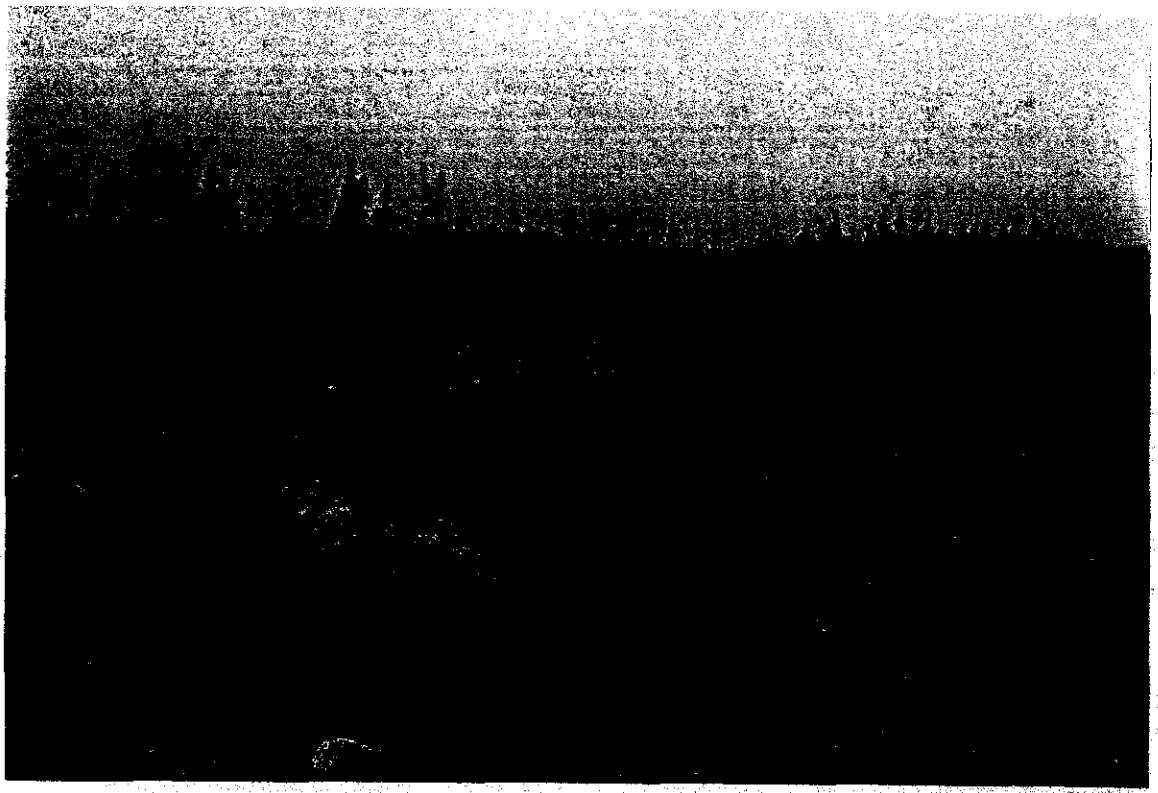
1997-06-13

TYPICAL CANAL SECTION

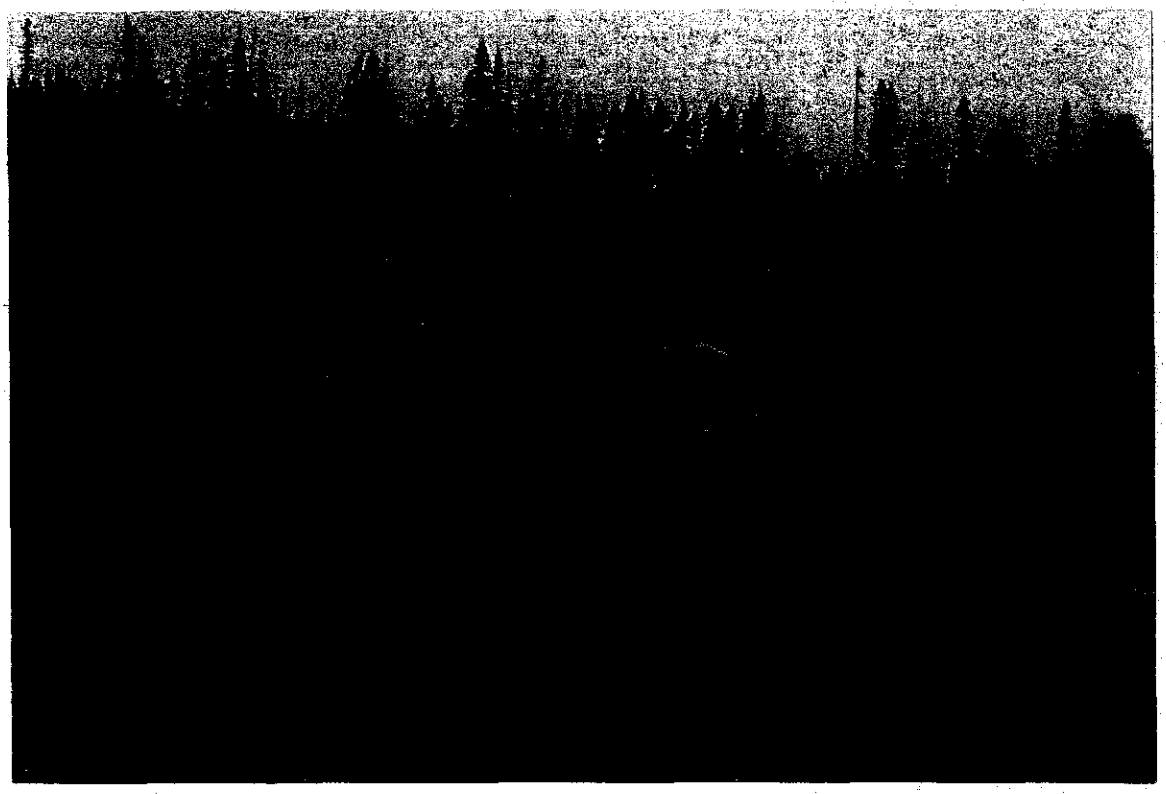
STREAM SECTION JUST UPSTREAM OF HIGHWAY.

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13



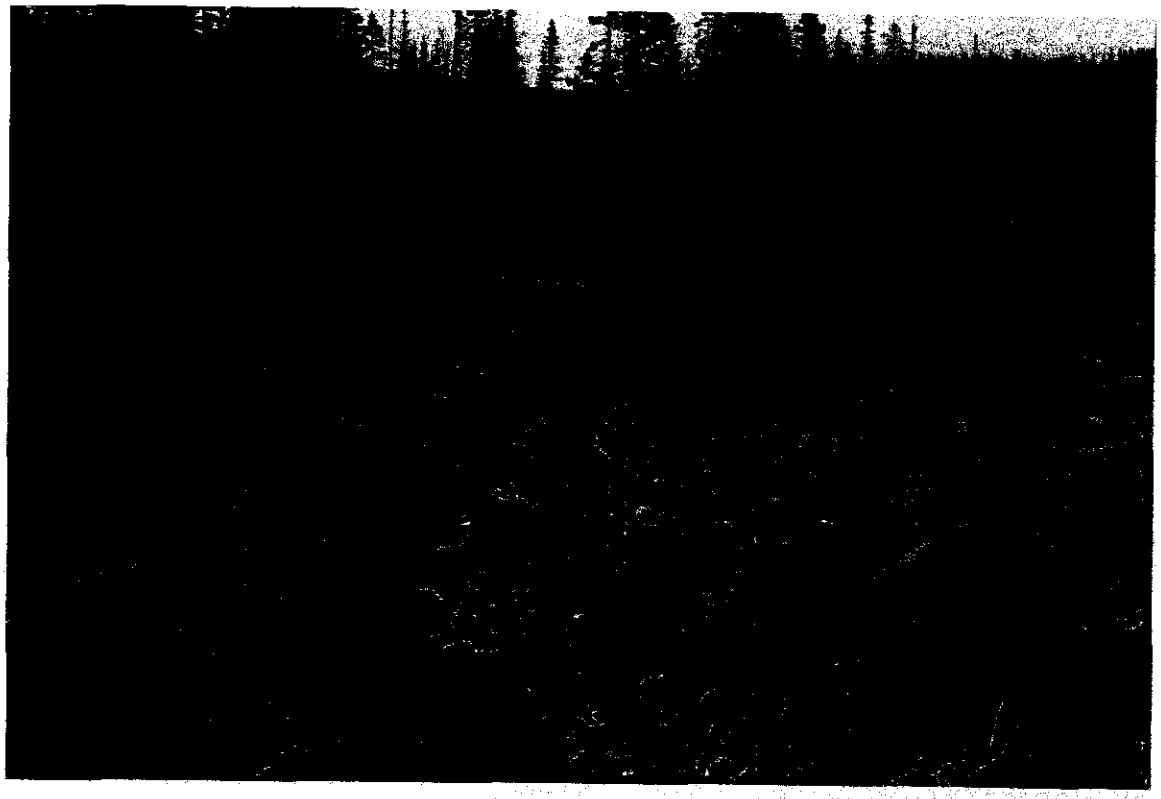
CANAL EMBANKMENT JUST UPSTREAM OF HIGHWAY.



NEW CULVERT IN HIGHWAY

LOCKSTON DEVELOPMENT
COPELEY'S POND CANAL

1997-06-13



STREAM SECTION JUST DOWNSTREAM OF HIGHWAY

DAM SAFETY INSPECTION

Trinity Pond Dam and Outlet

Dam Type: Concrete

Date & Time of Examination: 97-06-13 (10:20 AM)

Operational Status at Time of Examination:

Reservoir Water surface elevation	11.0'
Releases	Gate open
Weather Conditions	Overcast
Water in storage	
Recent Seismic Events	

Examining Party

I. Kerr

S. Hancock

INSPECTION CHECKLIST FOR CONCRETE DAM

Upstream Face

Cracks	None Observed
Joint Offsets	N/A

Downstream Face

Cracks	None Observed
Joint Offsets	N/A

Seepage on Downstream Face: None Observed

Downstream Toe

Cracks	Gate open - not visible
Undercutting from erosion	Gate open - not visible

Crest

Roadway	N/A
Walks	Good
Parapet Wall	Handrail low
Lighting, etc.	N/A

ABUTMENTS

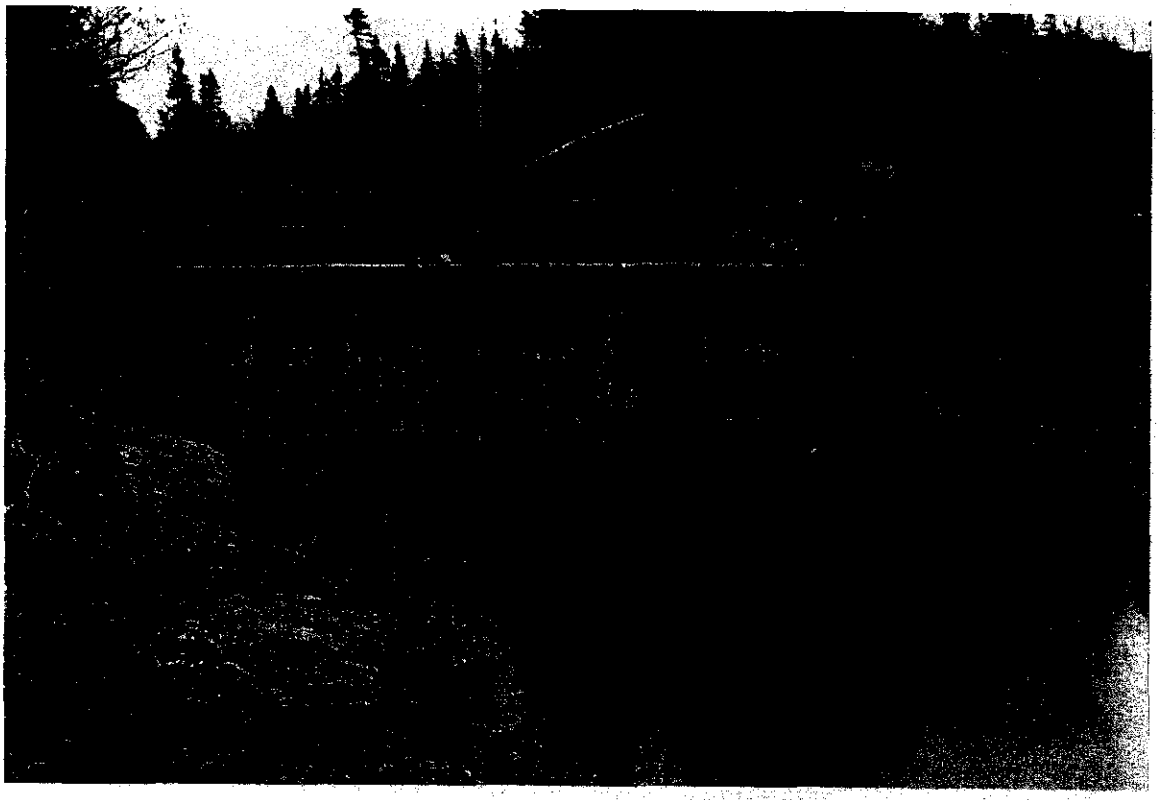
Foundation at Downstream Toe of Dam

Seepage around dam

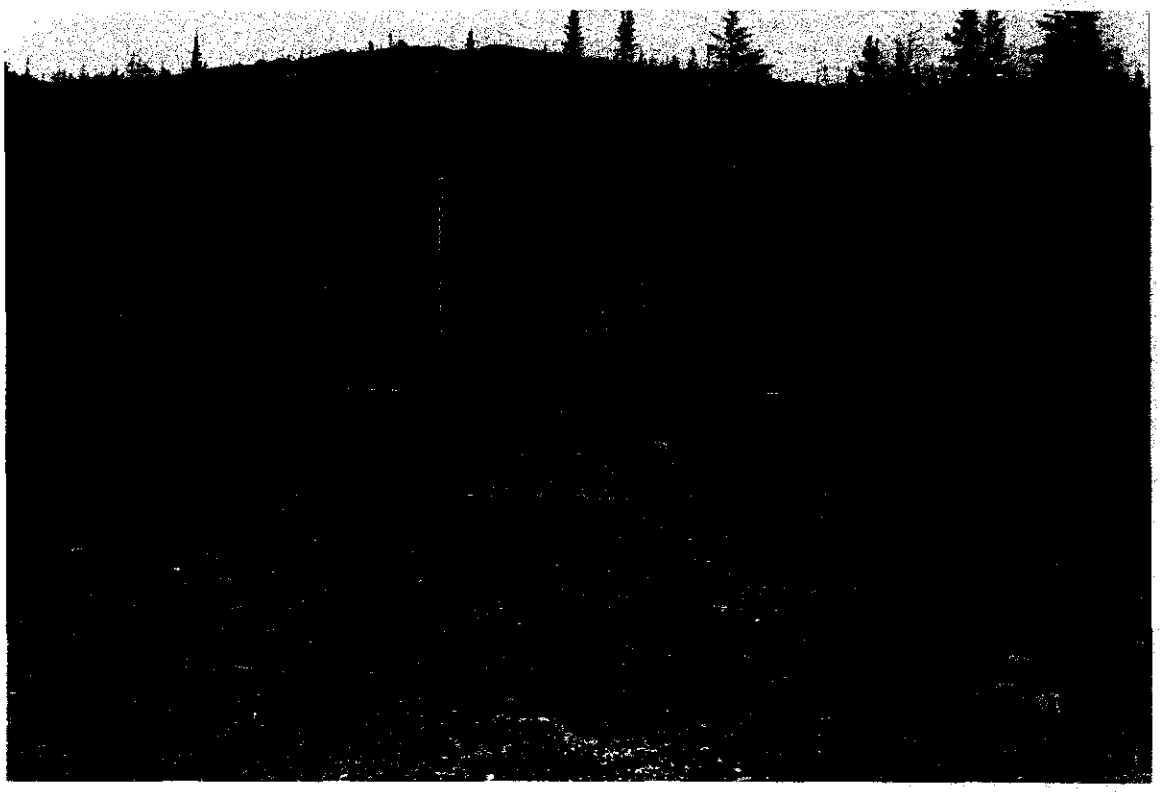
Location	None Observed
Amount	None Observed
Measurement methods	_____

Remarks: Dam recently reconstructed. In excellent condition.

LOCKSTON DEVELOPMENT 1997-06-13
TRINITY POND DAM



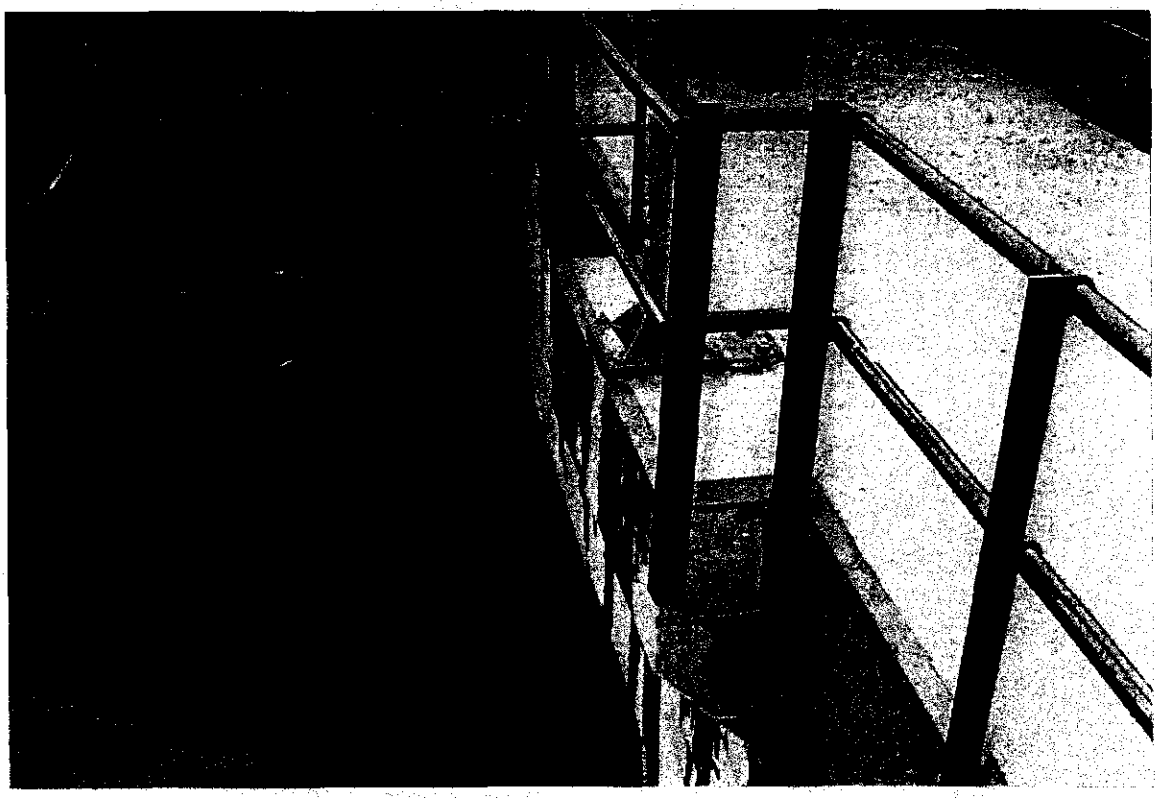
GENERAL VIEW FROM UPSTREAM



VIEW FROM RIGHT ABUTMENT

LOCKSTON DEVELOPMENT
TRINITY POND DAM

1997-06-13



GATE LIFT AND STEM ON UPSTREAM FACE

DOWNSTREAM FACE OF DAM

DAM SAFETY INSPECTION

Rattling Pond Spillway

Dam Type: Concrete

Date & Time of Examination: 97-06-13 (10:45 AM)

Operational Status at Time of Examination:

Reservoir Water surface elevation	_____
Releases	_____
Weather Conditions	Showers
Water in storage	_____
Recent Seismic Events	_____

Examining Party

I. Kerr

S. Hancock

INSPECTION CHECKLIST FOR CONCRETE DAM

Upstream Face

Cracks	Good - minor hairline cracks
Joint Offsets	Expansion joints sealed with cement grout

Downstream Face

Cracks	Good - minor hairline cracks
Joint Offsets	Expansion joints sealed with cement grout.

Seepage on Downstream Face: None Observed

Downstream Toe

Cracks	
Undercutting from erosion	Prevalent along much of toe

Crest

Roadway	N/A
Walks	N/A
Parapet Wall	N/A
Lighting, etc.	N/A

ABUTMENTS

Foundation at Downstream Toe of Dam

Seepage around dam

Location	Through rock on right abutment in highly fractured rock.
Amount	Not measured
Measurement methods	N/A

Remarks: Erosion at toe and seepage through abutment should be monitored until repairs are completed.

SPILLWAY

Approach Channel

Debris	None Observed
Slides above channel	None Observed
Channel side slope stability	Good, some fractured rock at right abutment.
Log boom	N/A
Slope Protection	N/A

Control structures (Observed Operation)

Crest

Cracks or areas of distress	N/A
Signs of movement	

Walls

Movement (offsets)	N/A
Cracks or areas of distress	
Settlement	
Joints	
Drains	
Backfill	

Apron
- Movement
- Settlement
- Joints
- Cracks

Walkway
- Condition of piers
- Condition of decking and beams
- Condition of rails

Chute
- Debris: N/A

Walls
- Movement (offsets): N/A
- Settlement
- Joints
- Cracks or areas of distress

Floor
- Movement: N/A
- Settlement
- Joints
- Cracks
- Drains
  - Amount of flow
  - Location of seepage drain

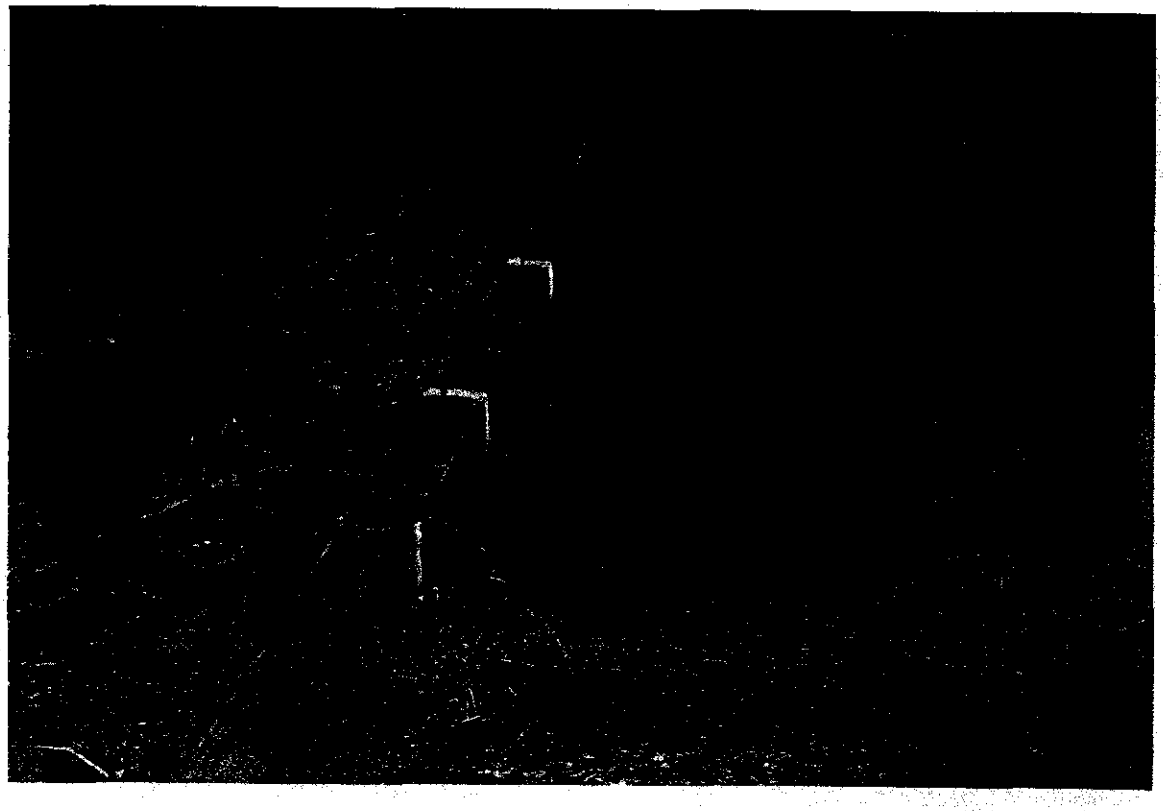
Stilling Basin (Observed Operation)
- Debris in basin: Some driftwood

Walls
- Movement (offsets): N/A
- Settlement
- Joints
- Cracks or areas of distress

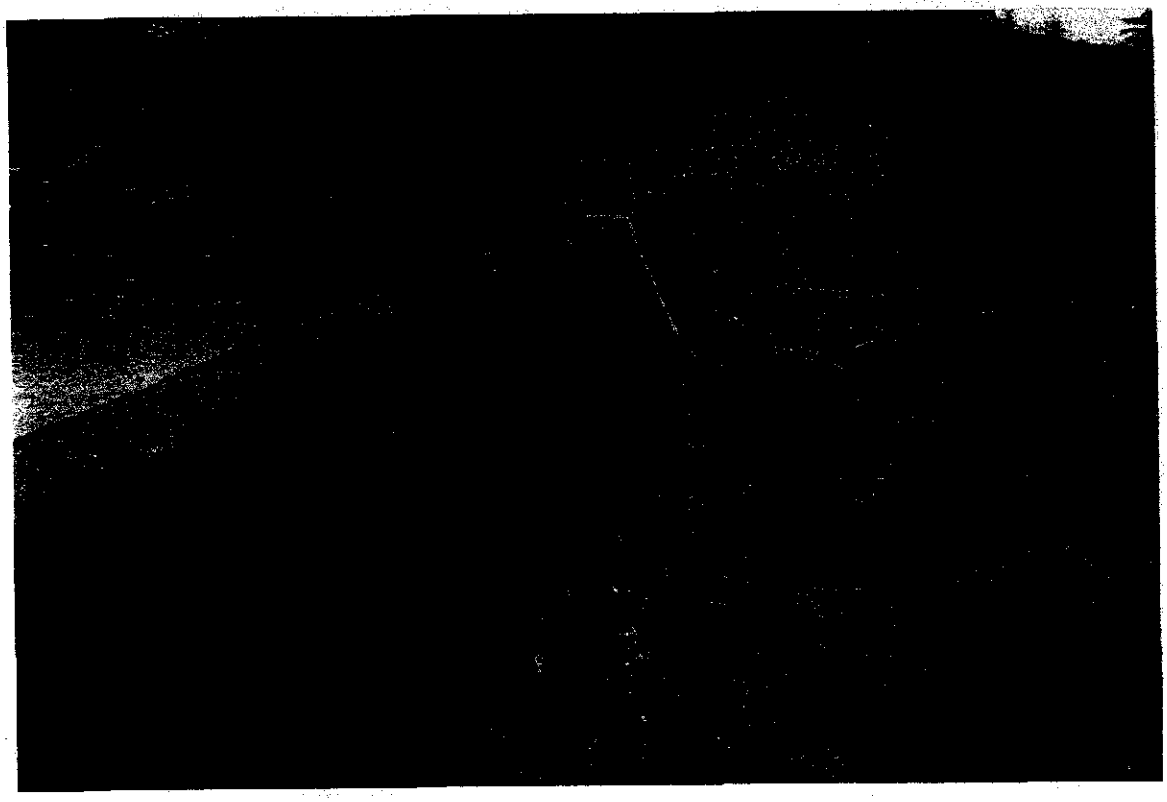
Floor (if visible): Small rock along toe could be displaced by significant flood.
- Cracks or areas of distress
- Movement
- Joints
- Erosion

Outlet Channel
- Slope Protection: N/A
- Stability of side slopes: Good, except at right abutment
- Vegetation or other obstructions: OK

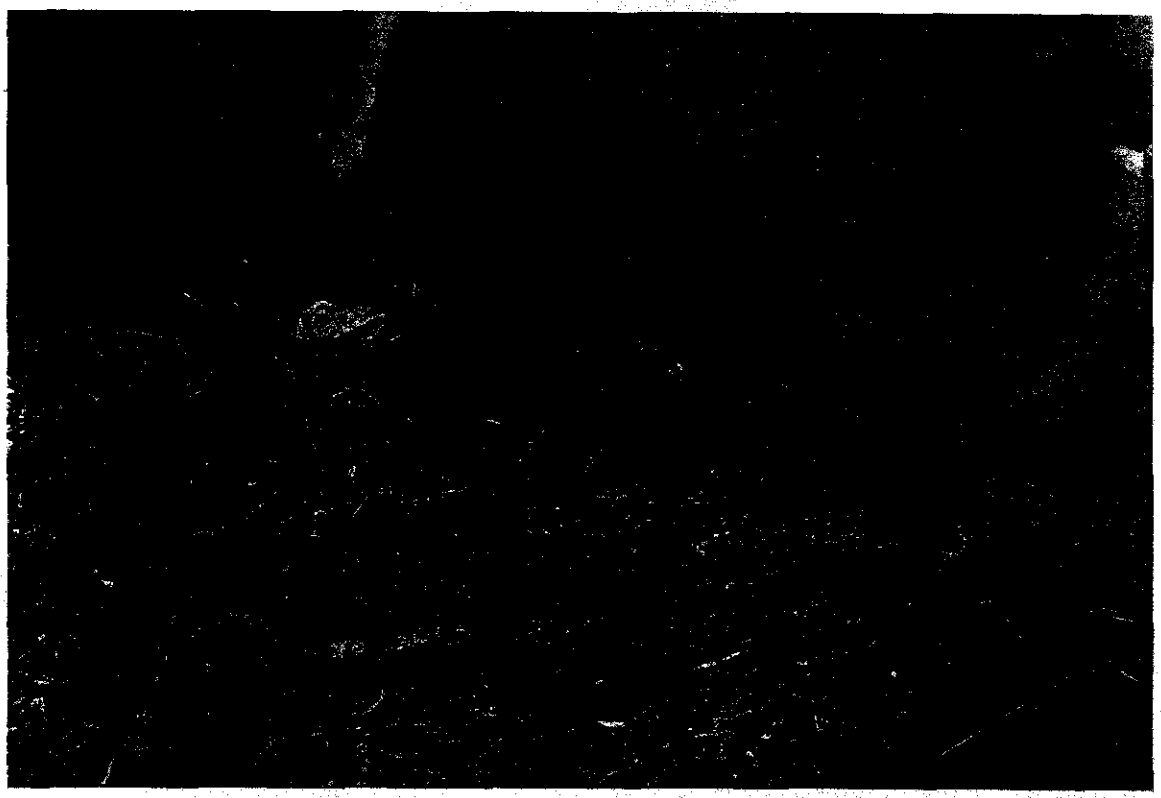
LOCKSTON DEVELOPMENT 1997-06-13
RATTLING POND SPILLWAY



GENERAL VIEW OF STRUCTURE. NOTE GROUTED JOINTS



DOWNSTREAM SLOPE OF SPILLWAY



UNDERCUTTING ALONG TOE OF SPILLWAY

RIGHT ABUTMENT WHERE WATER IS LEAKING THROUGH ROCK

DAM SAFETY INSPECTION

Rattling Pond Dam, Outlet, and Sluice gate

Dam Type: Concrete

Date & Time of Examination: 97-06-13 (10:50 AM)

Operational Status at Time of Examination:

Reservoir Water surface elevation	100mm below top of dam
Releases	Outlet gate open
Weather Conditions	Showers
Water in storage	
Recent Seismic Events	

Examining Party

I. Kerr

S. Hancock

INSPECTION CHECKLIST FOR CONCRETE DAM

Upstream Face

Cracks	Face recently repaired. Good condition except some honey combing
Joint Offsets	Good

Downstream Face

Cracks	Worst areas were recently patched. Minor cracking and leaching
Joint Offsets	Good

Seepage on Downstream Face	None Observed

Downstream Toe

Cracks	None Observed
Undercutting from erosion	None Observed

Crest

Roadway	N/A
Walks	N/A
Parapet Wall	Good
Lighting, etc.	N/A

ABUTMENTS

Foundation at Downstream Toe of Dam

Seepage around dam

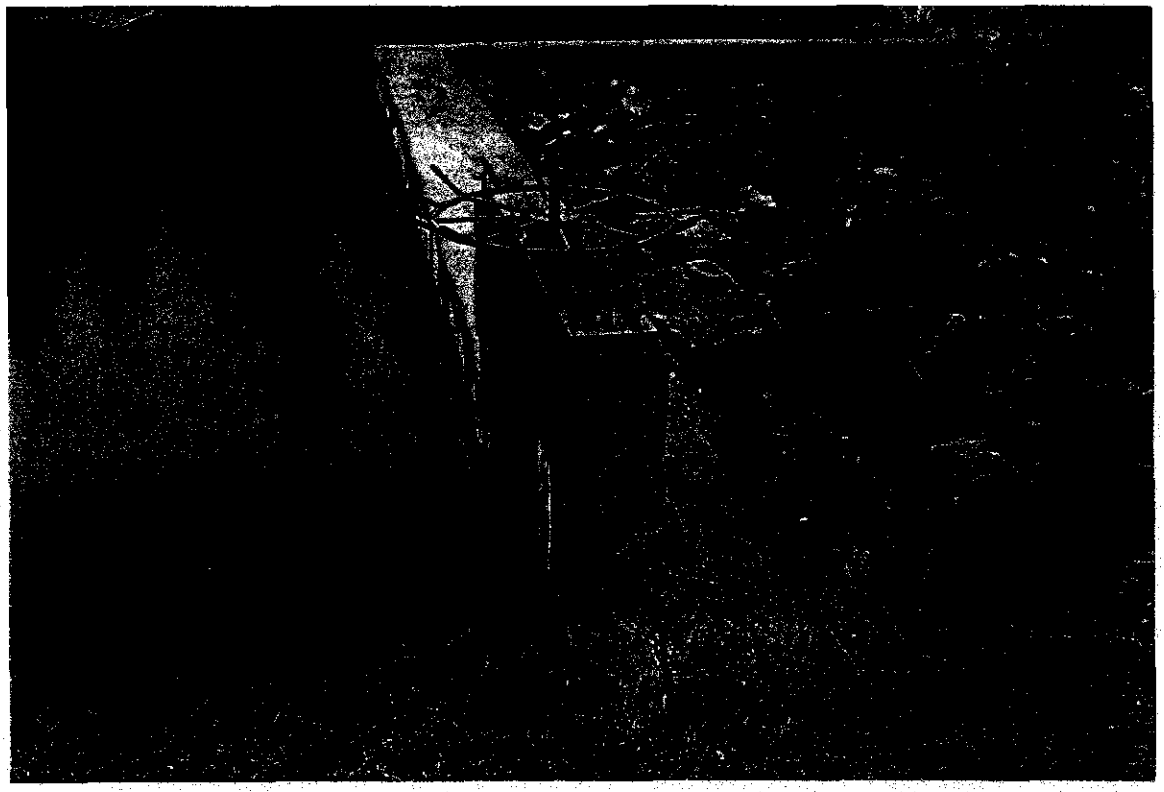
Location None Observed

Amount _____

Measurement methods _____

Remarks: Freeboard varies by 70mm. Should be checked. Gate in outlet and sluice appear to be in relatively good condition.

LOCKSTON DEVELOPMENT 1997-06-13
RATTLING POND DAM



GENERAL VIEW OF DAM. SLUICE GATE IN FOREGROUND

UPSTREAM FACE. NOTE NEW CONCRETE

DOWNSTREAM FACE. NOTE GROUT PATCHES. SLUICEWAY ON LEFT.

OUTLET GATE STRUCTURE

DAM SAFETY INSPECTION

Lockston Canal, Intake and Penstock

Dam Type: Concrete

Date & Time of Examination: 97-06-13 (11:15 AM)

Operational Status at Time of Examination:

Reservoir Water surface elevation	near FSL
Releases	
Weather Conditions	Rain
Water in storage	
Recent Seismic Events	

Examining Party

I. Kerr

S. Hancock

INSPECTION CHECKLIST FOR CONCRETE DAM

Upstream Face

Cracks	Good near intake, but poor along several sections of canal.
Joint Offsets	Good

Downstream Face

Cracks	Just replaced near intake, but poor condition in several sections along canal.
Joint Offsets	Good

Seepage on Downstream Face	Three significant leaks in canal were noted (likely others deeper down) with estimated flow of 100 litres/minute. Two small leaks in repaired section were noted (near sluice and on left side of intake) approximate flow is 2-4 litres/minute

Downstream Toe

Cracks	Rockfill in place. Not visible.
Undercutting from erosion	N/A

Crest

Roadway	N/A
Walks	N/A
Parapet Wall	Repaired near intake. Poor condition in some areas along canal.
Lighting, etc.	N/A

ABUTMENTS

Foundation at Downstream Toe of Dam

Seepage around Dam

Location — None Observed

Amount

Measurement methods

Remarks: Concrete along much of canal in poor condition with several significant leaks. Should be dewatered and inspected to determine the extent of repairs required. (Note - it is not good practice to frequently dewater the canal due to the poor condition of the old concrete along the canal. When dewatered, the concrete wall must act as a retaining wall to support the rockfill on the upstream side. The deteriorated concrete may not be adequate to resist this force and it is possible that a section of the wall could fail while dewatered and fall into the empty canal).

OUTLET WORKS

Intake

Trashrack — Not inspected

Concrete — Recently replaced. Good condition except minor honey combing

Outlet Conduit

Metal work

Penstock — See next section

Control Facilities

Gatehouse — Needs paint

Crane: Good

Gate and controls (description):

General condition: Good

Operation at time of examination: Open

Control System Mechanical items: Good

Ventilation: Good

Lighting: Good

Stop logs
- General condition: N/A
- Seals: N/A

Chute

Debris: N/A

Walls
- Movement (offsets):
- Settlement:
- Joints:
- Cracks or areas of distress:
- Condition of backfill:

Floor
- Movement: N/A
- Settlement:
- Joints:
- Cracks:
- Drains
- Amount of Flow:
- Location of seeping drain:

Stilling Basin (Observed Operation)
- Debris in basin:

Walls

Movement (offsets)	_____
Settlement	_____
Joints	_____
Cracks or areas of distress	_____
Condition of backfill	_____

Floor (if visible)

Cracks or areas of distress	_____
Movement	_____
Joints	_____
Erosion	_____

Outlet Channel

Slope Protection	N/A
Stability of side slopes	_____
Vegetation or other obstructions	_____

Remarks: Concrete rebuilt last year and is in good condition.

PENSTOCK

Right of way

Vegetation	Brush cut but left along side Penstock
Drainage ditches	Fair
Culverts	N/A

Condition of Penstock Bed	Good
Alignment	Good
Settlement	None Observed

Penstock Type

Condition of wood,steel, fiberglass	Fair/Poor
Cracks	Prevalent in lower section
Stresses	Several deteriorated staves
Other	_____

Penstock Supports

Cradles	Fair except for one cradle just upstream of the anchor block is tipped over and broken
Saddles	

Anchor Blocks

Condition of concrete	Deteriorated in several sections
Settlement	None Observed
Stress cracks	
Movement	None Observed

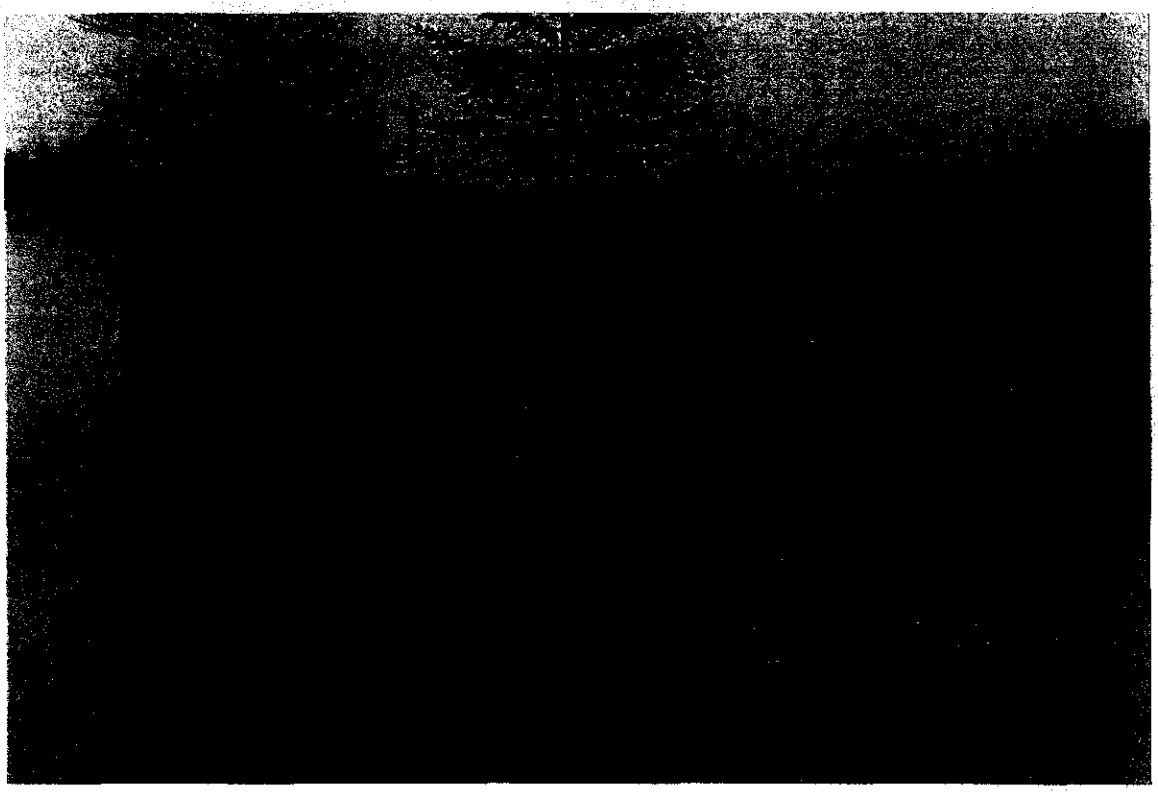
Expansion Joints

Leaks	None Observed

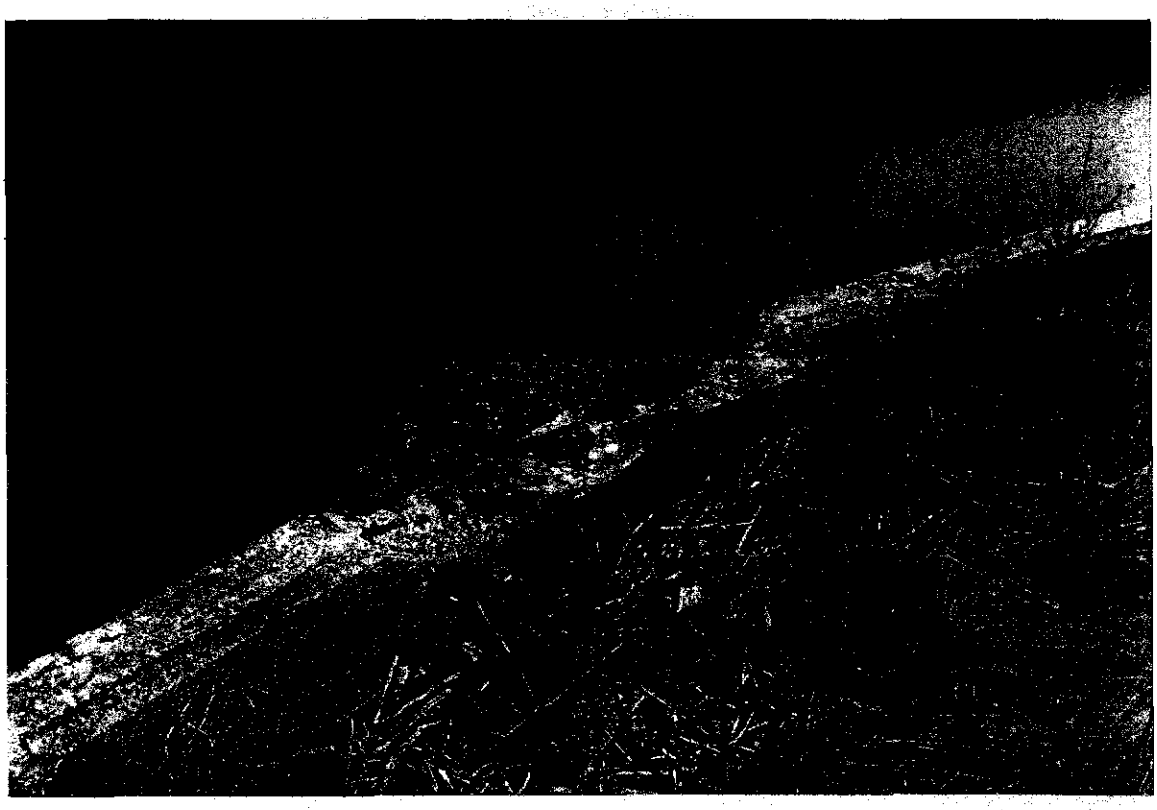
Remarks Penstock is leaking substantially throughout.

LOCKSTON DEVELOPMENT 1997-06-13
POWER CANAL AND INTAKE

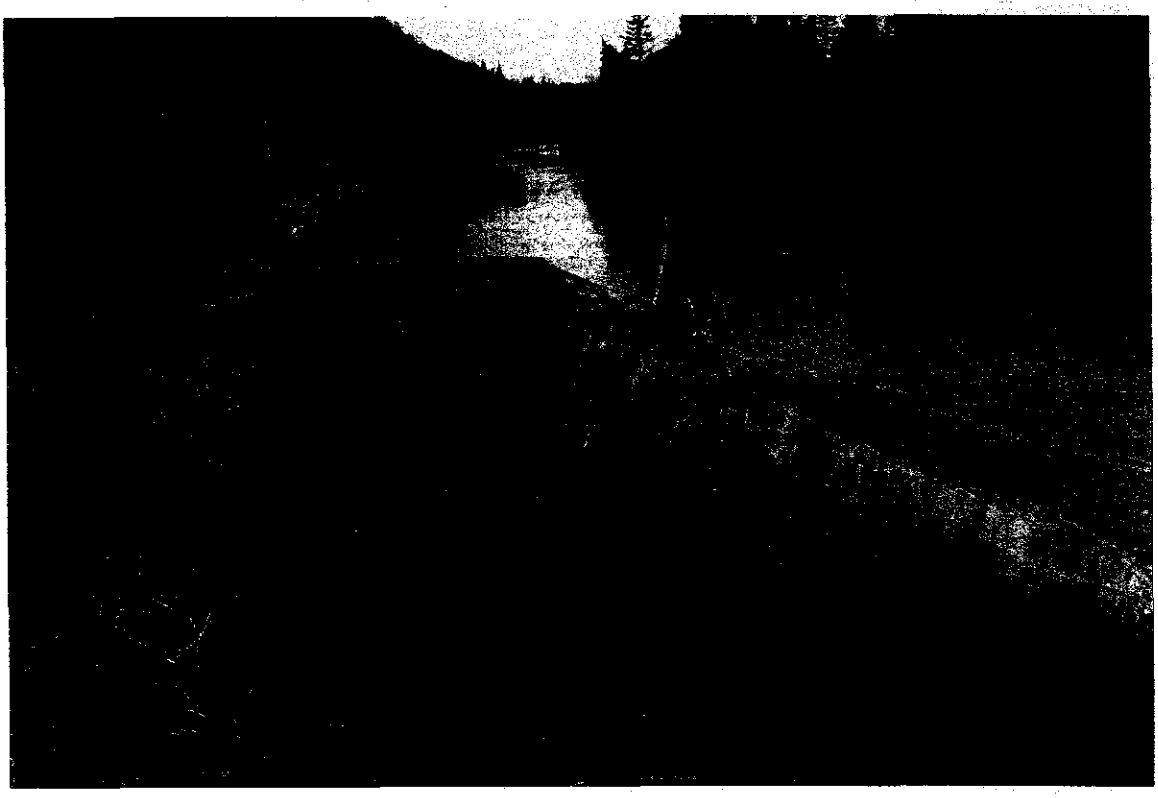
TYPICAL SECTION OF CONCRETE CANAL WALL.



HIGH SECTION OF CONCRETE CANAL WALL WITH SIGNIFICANT DETERIORATION BELOW WATER LEVEL



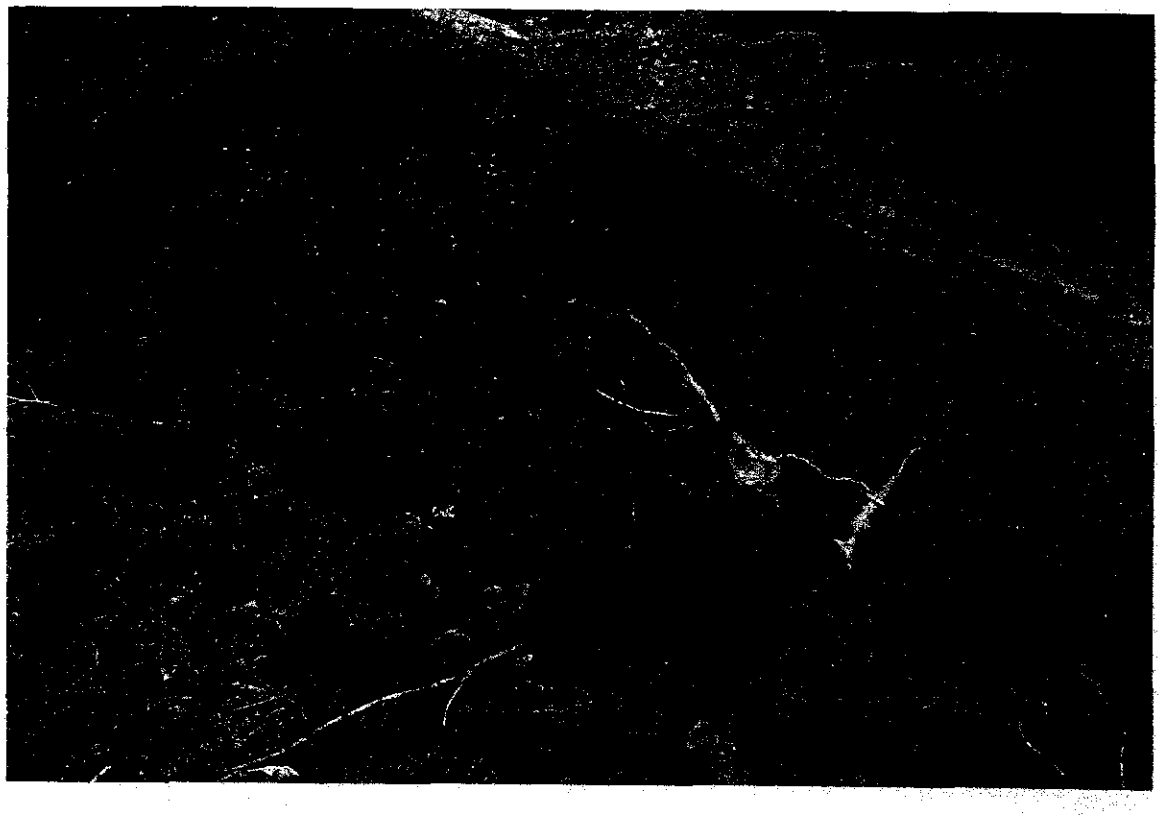
TOP OF CONCRETE WALL BROKEN OFF.



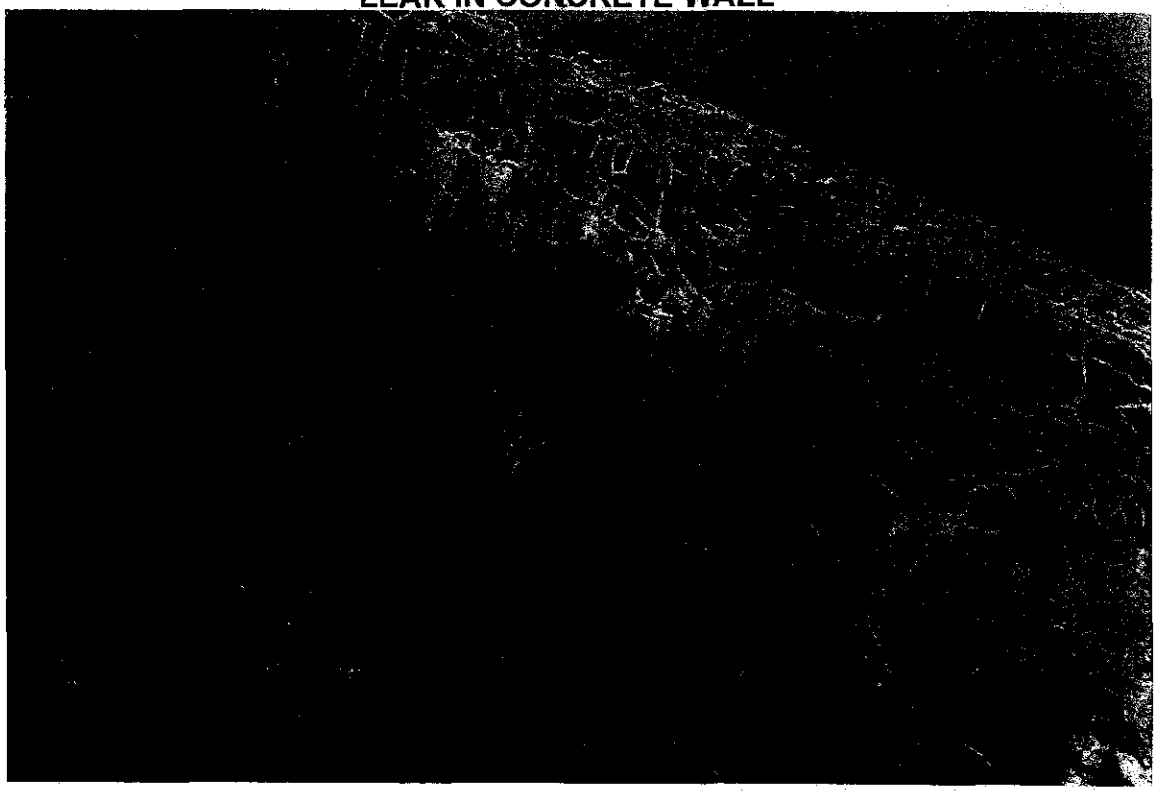
DETERIORATED SECTION OF CONCRETE

LOCKSTON DEVELOPMENT
POWER CANAL AND INTAKE

1997-06-13



LEAK IN CONCRETE WALL

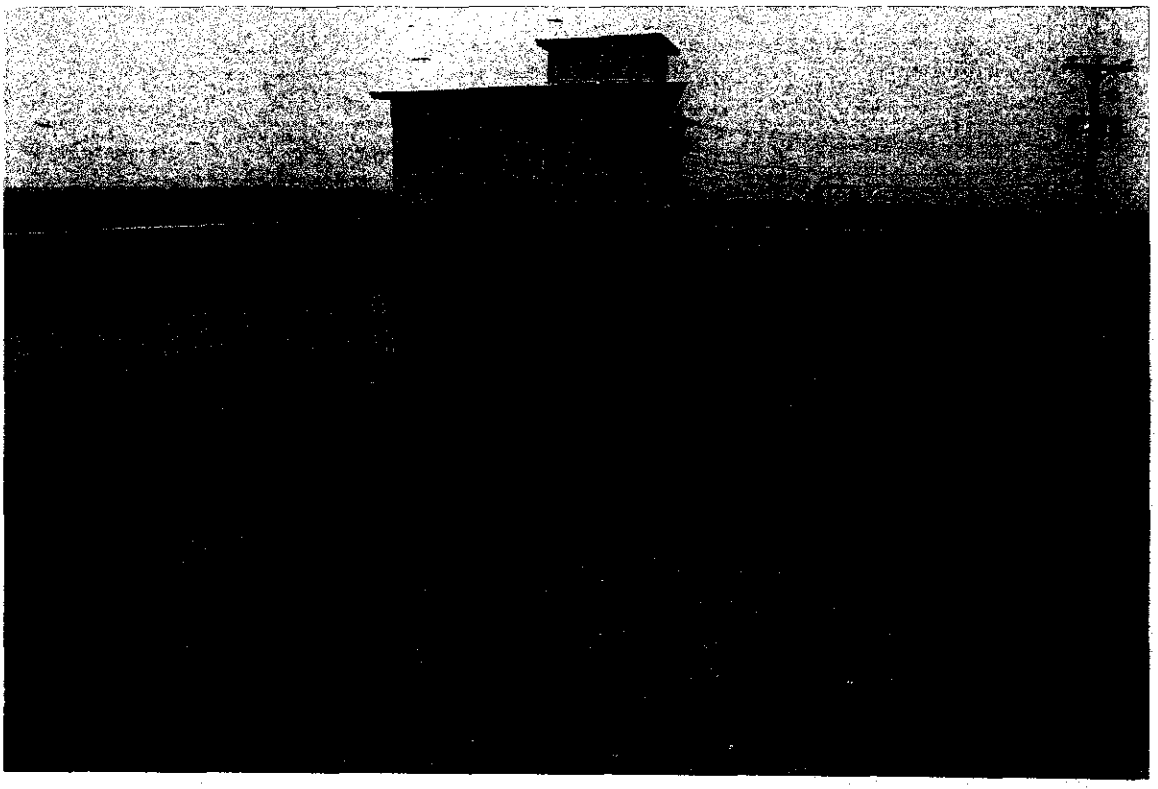


WATER LEAKING THROUGH HOLE IN CANAL WALL. SHOULD BE PATCHED.

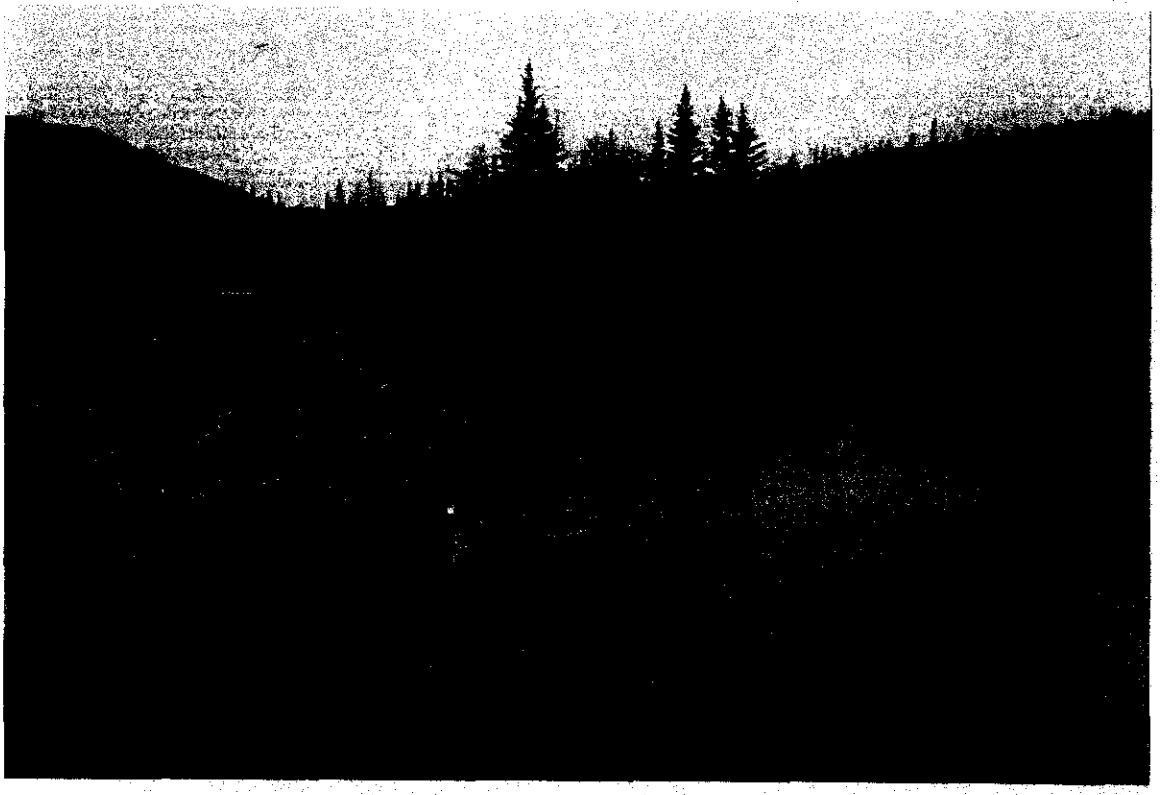
LOCKSTON DEVELOPMENT
POWER CANAL AND INTAKE

1997-06-13

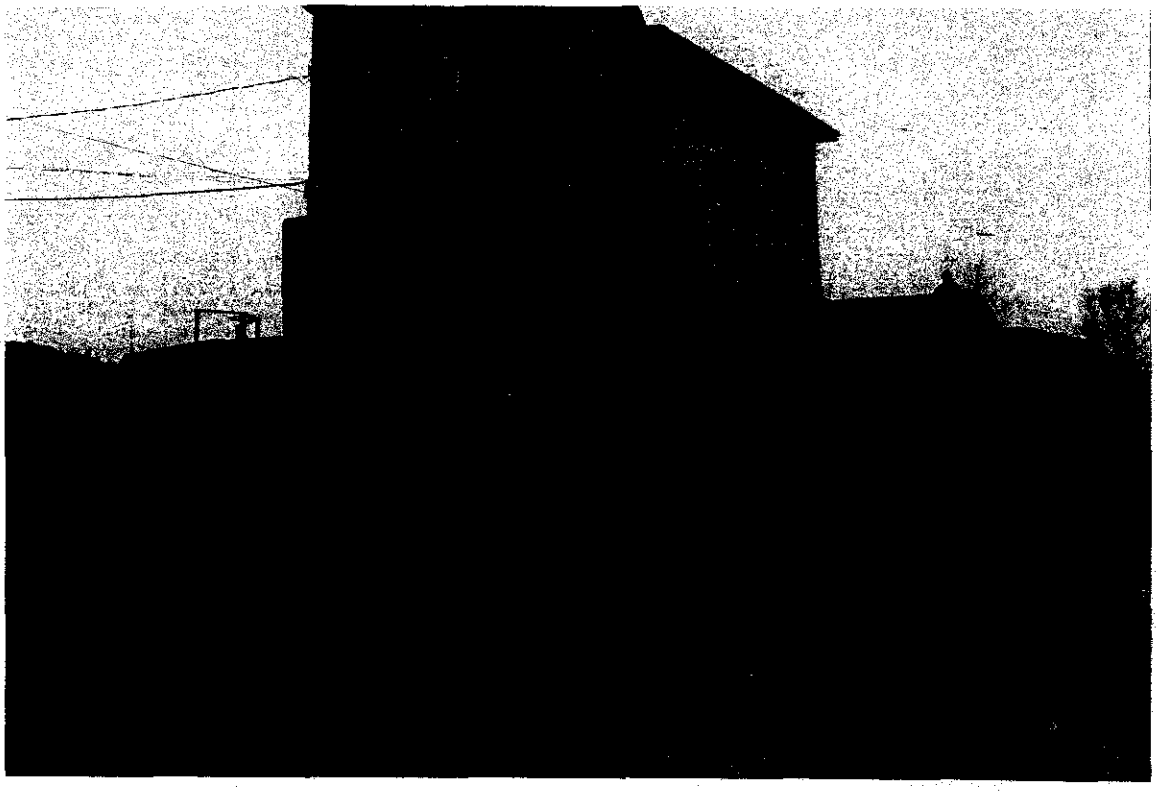
WATER FROM LEAK JUST BELOW SURFACE OF ROCKFILL



VIEW OF CANAL WALL NEAR INTAKE. NOTE NEW CONCRETE AND ROCKFILL.



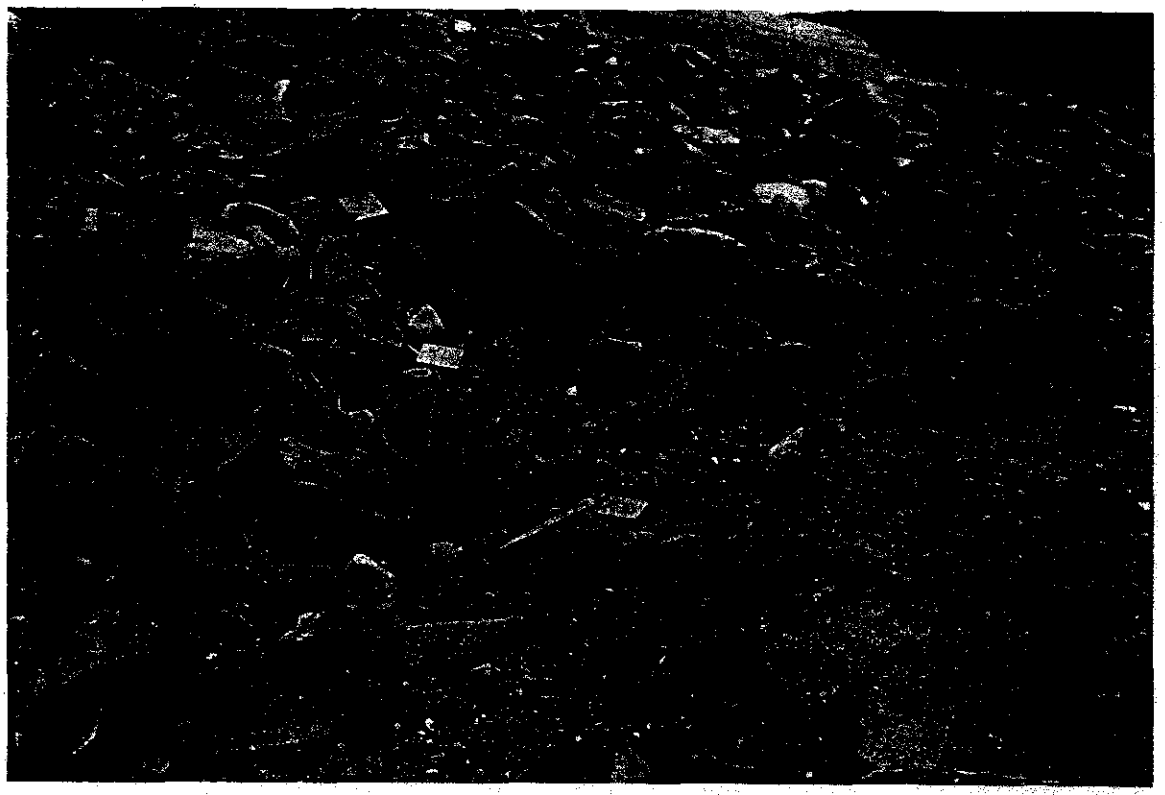
VIEW OF CANAL FROM INTAKE, LOOKING UPSTREAM. NOTE NEW CONCRETE FACE.



NEW CONCRETE INTAKE AND ROCKFILL.

LOCKSTON DEVELOPMENT
POWER CANAL AND INTAKE

1997-06-13



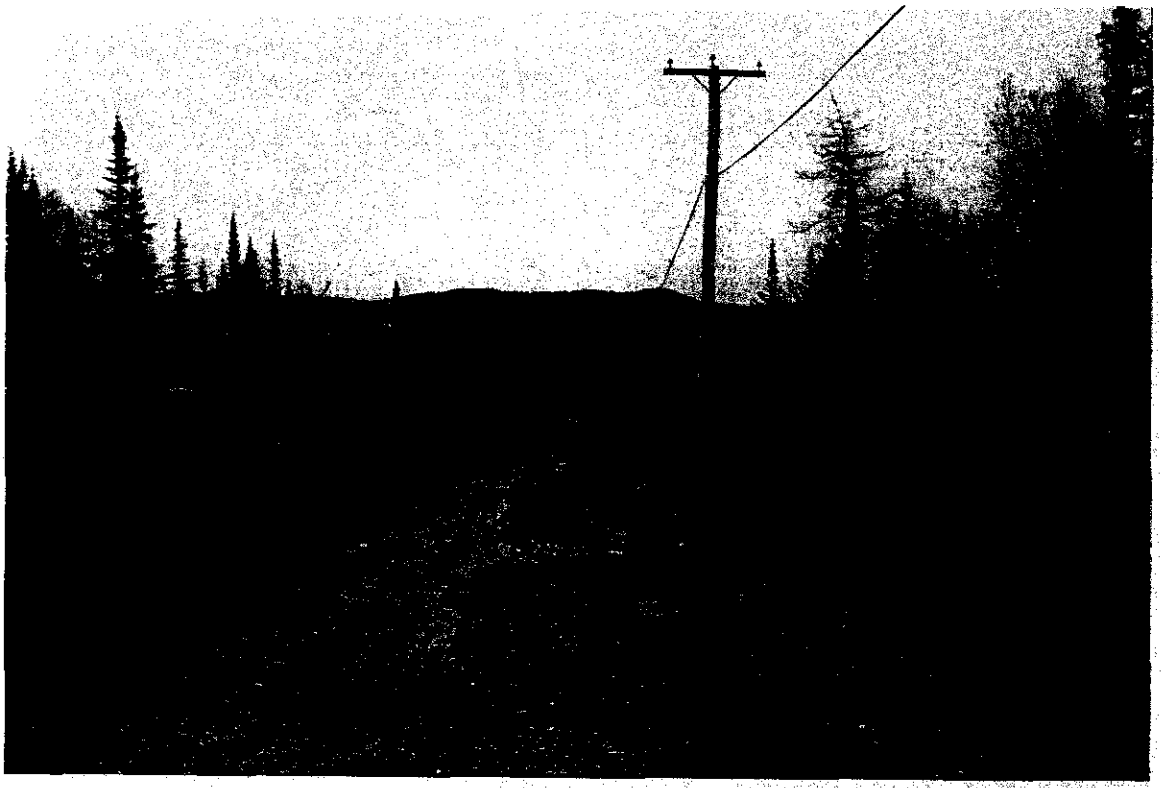
CANAL WALL ON LEFT SIDE OF INTAKE. NOTE SEEPAGE ON RIGHT.

LOCKSTON DEVELOPMENT
LOCKSTON PENSTOCK

1997-06-13

VIEW OF PENSTOCK FROM INTAKE

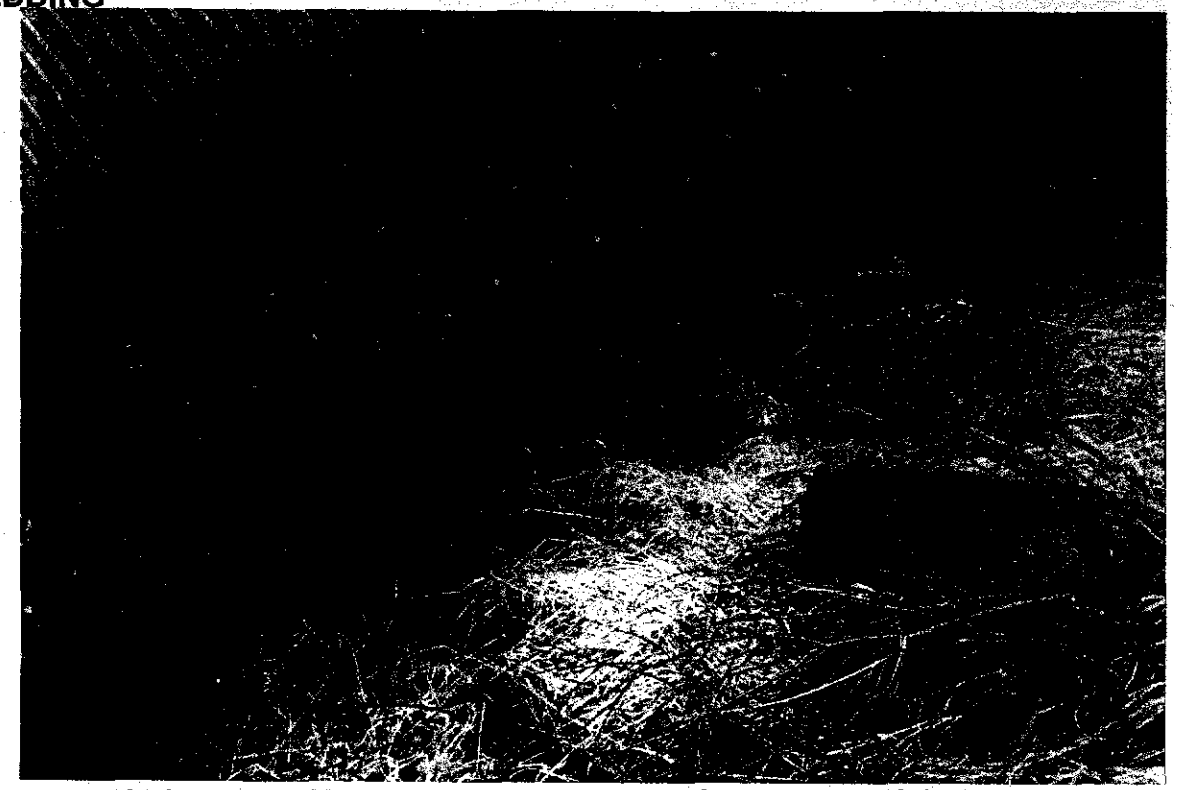
SECTION NEAR MIDDLE OF PENSTOCK. NOTE LEAKAGE.



PENSTOCK SECTION. NOTE WATER IN ROAD DUE TO LEAKAGE.

PENSTOCK SECTION NEAR POWERHOUSE. NOTE LARGE LEAKS.

PENSTOCK SECTION NEAR POWERHOUSE. NOTE WATER FLOWING ON BEDDING



PENSTOCK SECTION NEAR POWERHOUSE. NOTE BROKEN CRADLE TO LEFT.

SECTION NEAR BIFURCATION. NOTE SECTION OF BROKEN CRADLE AND CUT BRUSH

ANCHOR BLOCK AT BIFURCATION. NOTE CONCRETE DETERIORATION.

DETERIORATED CONCRETE AT BASE OF ANCHOR BLOCK