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ANNUAL CONSTRUCTION REPORT 1988 - 89

FIELD INVESTIGATIONS
CONSTRUCTION, UPGRADING
AND MAINTENANCE FOR
ONTARIO REGION

**Direction
générale
des eaux
intérieures
et des terres**

**Région de
l'Ontario**

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1988-89

Canada

DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS DIRECTORATE
WATER RESOURCES BRANCH

ANNUAL CONSTRUCTION REPORT 1988 - 89

FIELD INVESTIGATIONS
CONSTRUCTION, UPGRADING
AND MAINTENANCE FOR
ONTARIO REGION

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APRIL 28, 1989

TABLE OF CONTENTS

	<u>PAGE</u>
TABLE OF CONTENTS	ii
LIST OF FIGURES	iii
LIST OF TABLES	iv
1.0 INTRODUCTION	1
2.0 CONSTRUCTION PROGRAM 1988-89	3
2.1 Definitions for Project Cost Break Down	4
2.2 Equipment and Personnel	5
3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS	
3.1 Field Investigations	15
3.2 New Construction	27
3.3 Upgrading	40
3.4 Maintenance	49
4.0 DESCRIPTION OF CONSTRUCTION METHODS AND PROCEDURES	
4.1 Well Construction	69
4.2 Inlet System	75
4.3 Instrument Shelters	76
4.4 Artificial Controls and Weirs	77
4.5 Cableways	77
5.0 CONSTRUCTION ILLUSTRATIONS	79

LIST OF TABLES

	<u>PAGE</u>
TABLE 1 FIELD INVESTIGATION EXPENDITURES 1988-89	6
TABLE 2 NEW CONSTRUCTION EXPENDITURES 1988-89	7
TABLE 3 UPGRADING EXPENDITURES 1988-89	8
TABLE 4 MAINTENANCE EXPENDITURES 1988-89	9
TABLE 5 BREAKDOWN OF TOTAL EXPENDITURES	11

LIST OF FIGURES

		<u>PAGE</u>
FIGURE 1	CONSTRUCTION COST COMPARISON 1980-81 TO 1988-89	12
FIGURE 2	CAPITAL NON SHAREABLE EXPENDITURES 1988-89	13
FIGURE 3	DISTRIBUTION OF SHAREABLE EXPENDITURES 1988-89	14
FIGURES 4-6	NEW CONSTRUCTION PROJECTS - STATION LOCATION	24
FIGURE 7	UPGRADING PROJECTS - STATION LOCATION	39
FIGURES 8-10	MAINTENANCE PROJECTS - STATION LOCATION	46
FIGURE 11	INBANK STILLING WELL WITH LOOK-IN SHELTER	70
FIGURE 12	INBANK STILLING WELL WITH WALK-IN SHELTER	72
FIGURE 13	STACOM SERVOMANOMETER GAUGE INSTALLATION	73
FIGURE 14	TIDES AND WATER LEVEL GAUGE INSTALLATION	74

1.0 INTRODUCTION

This annual construction report, prepared by the Ontario Region of the Water Resources Branch, is for the fiscal year 1988 - 1989.

The purpose of this report is to detail the construction activities associated with the installation of hydrometric and sediment stations required to compile and provide data for Government, private agencies and the public.

Funds for the construction activities, which include reconnaissance, new construction, upgrading and maintenance, are provided for under the terms of the Federal-Provincial Cost-Share Agreement. Projects and priorities are established with the cooperation of and in consultation with the cost-share agreement members and/or their agencies.

Construction activities are divided into four categories:

1. FIELD INVESTIGATIONS (F)

Reconnaissance, surveys, preparation of plans, meetings and correspondence to obtain approval to construct new hydrometric installations or to upgrade or maintain existing stations.

2. CONSTRUCTION (C)

Installation of stilling wells, intakes, instrument shelters, artificial controls, cableways, access roads, and verticle control markers.

3. UPGRADING (U)

Construction of controls, erection of larger shelters to house more sophisticated instruments, installation of electrical and telephone service at existing stations, installation of sediment sampling apparatus and other appurtenances.

4. MAINTENANCE (M)

General maintenance carried out at existing gauging stations. (Does not include minor repairs done by Hydrometric Field Staff).

2.0 CONSTRUCTION PROGRAM 1988-89

During the fiscal year thirty (30) field investigations were carried out to select new installation sites or to assess current sites for upgrading or maintenance.

Thirty-one (31) new construction projects were completed by WRB staff or were carried out jointly with the requesting agency.

Thirteen (13) upgradings were completed by the installation of artificial controls, by installing and/or erecting larger instrument shelters, or by improving cableways.

Forty-two (42) maintenance projects were carried out that ranged from channel improvements to replacing heating cables.

2.1 DEFINITIONS FOR PROJECT COST BREAKDOWN

The following is an interpretation of the headings used in this report for station cost breakdown.

SALARIES

Engineers, Supervisors, Foreman, Term Employees and Hydrometric Personnel associated with field investigations, construction, upgrading and maintenance of the stations in this report.

MATERIALS/SUPPLIES

Instrument shelter, stilling well, plumbing and electrical materials, concrete, gravel/fill, lumber, steel, excavating machinery, rental equipment, and contract services.

MEALS/ACCOMMODATION

Living expenses for field personnel.

TRANSPORTATION

Cost of operation and depreciation of government owned vehicles, shipping and freight charges, ferry charges, and air fare.

2.2 EQUIPMENT AND PERSONNEL

One standard Suburban equipped with tailgate mounted vice, trailer hitch, heavy duty suspension, and a safety screen installed for personnel protection, and a one ton crewcab pick-up equipped with fiberglass cap, tailgate mounted vice and trailer hitch were used to carry out the construction program.

Two heavy duty boat trailers modified to carry stilling wells, intake pipes, hydro poles, and instrument shelters were used to transport equipment and material to the job site.

Tools include an air operated pavement breaker equipped with a pile driving head, electric "skill" saws, electric drills, hammer drills, pipe threaders, grinders, 3 ton and 3/4 ton pullers, oxy-acetylene cutting torches, 120 Volt gasoline generator and other necessary hand tools.

Work was performed by the Construction Supervisor, two Construction Foremen, labourers and/or Co-op students. Projects carried out by the Hydrometric staff have been noted as such in the project description section. Excavating equipment with operator, compressors, scuba divers, and other specialized services were rented on an hourly basis under service contract. Materials such as fill, concrete, rip-rap and lumber were purchased by service contract, or Field Purchase Authority.

TABLE 1

FIELD INVESTIGATION EXPENDITURES 1988-89

	<u>COST (\$)</u>
1. CREDIT RIVER AT NORVAL.....	\$ 95.00
2. PEPPERLAW BROOK NEAR UDORA.....	230.15
3. MAITLAND RIVER AT BEN MILLER.....	134.41
4. BAYFIELD RIVER NEAR VARNA.....	134.41
5. MAD RIVER BELOW AVENING.....	130.48
6. COPELAND CREEK NEAR PENATANGUISHENE.....	255.52
7. STURGEON RIVER AT STURGEON BAY.....	
8. BEDFORD MILLS CREEK NEAR BEDFORD MILLS.....	124.53
9. NEWBORO LAKE AT CHAFFEY'S LOCK.....	136.08
10. BUELLS CREEK AT BROCKVILLE.....	432.55
11. LYNTHURST CREEK AT LYNTHURST.....	
12. HOLTBY DRAIN AT CONCESSION 7.....	905.50
13. MADTER DRAIN AT CONCESSION 7.....	
14. WEBBER DRAIN AT HWY #59.....	
15. GORING DRAIN AT CONCESSION 13.....	1,088.60
16. 5TH CONCESSION DRAIN NEAR ESSEX.....	
17. 2ND CONCESSION DRAIN NEAR ESSEX.....	
18. WELLAND RIVER NEAR BINBROOK.....	442.95
19. OSWEGO CREEK AT CANBORO.....	
20. MATCHEDASH BAY ABOVE HWY #69.....	726.10
21. MATCHEDASH BAY BELOW HWY #69.....	
22. NORTH RIVER NEAR COLD RIVER.....	
23. NORTH RIVER AT FALLS.....	51.60
24. NORTH RIVER NEAR LOVERING.....	
25. CANAGAGIGUE CREEK NEAR FLORADALE.....	420.01
26. HOG CREEK NEAR VICTORIA HARBOUR.....	409.70
27. TRIBUTARY TO WYE RIVER BELOW ELMVALE.....	
28. DUFFINS CREEK AT PICKERING.....	576.59
29. WEST HUMBER AT HWY #7.....	
30. MIMICO CREEK AT ISLINGTON.....	
TOTAL	\$6,294.18

TABLE 2

NEW CONSTRUCTION EXPENDITURES 1988-89

	<u>COST (\$)</u>
1. HOLTBY DRAIN CONCESSION 7.....	\$29,105.46
2. MADTER DRAIN AT CONCESSION 7.....	
3. WEBBER DRAIN AT HWY #59.....	21,258.93
4. GORING DRAIN AT CONCESSION 13.....	
5. 5TH CONCESSION DRAIN NEAR ESSEX.....	27,593.79
6. 2ND CONCESSION DRAIN NEAR ESSEX.....	
7. MAD RIVER BELOW AVENING.....	7,809.70
8. COPELAND CREEK NEAR PENETANGUISHENE.....	7,787.81
9. STURGEON RIVER AT STURGEON BAY.....	8,333.43
10. HOG CREEK NEAR VICTORIA HARBOUR.....	8,728.81
11. TRIB. TO WYE RIVER BELOW ELMVALE.....	7,666.75
12. MATCHEDASH BAY ABOVE HWY 69.....	28,703.72
13. MATCHEDASH BAY BELOW HWY 69.....	
14. NORTH RIVER NEAR COLDWATER.....	
15. NORTH RIVER AT FALLS.....	
16. NORTH RIVER NEAR LOVERING.....	
17. STONEY CREEK AT STONEY CREEK.....	9,173.17
18. REDHILL CREEK AT ALBION FALLS.....	9,473.34
19. WELLAND RIVER NEAR BINBROOK.....	10,148.79
20. OSWEGO CREEK AT CANBORO.....	15,710.43
21. MAGPIE RIVER AT ESNAGI LAKE.....	12,128.71
22. MOUNTJOY CREEK NEAR TIMMINS.....	4,276.41
23. CREDIT RIVER AT NORVAL.....	12,834.61
24. CURRENT RIVER AT STEPSTONE.....	13,384.35
25. WHITESAND RIVER ABOVE SCHREIBER AT MINOVA MINES.....	8,329.82
26. BUELLS CREEK AT BROCKVILLE.....	9,939.93
27. WEST BRANCH LITTLE CATARAQUI CREEK AT KINGSTON.....	10,664.90
28. NEWBORO LAKE AT CHAFFEYS LOCKS.....	4,319.59
29. DUFFINS CREEK AT PICKERING.....	5,224.34
30. W. DUFFINS CREEK ABOVE GREEN RIVER.....	4,432.96
31. TRIB. TO NORBERG CREEK AT TURKEY LAKE.....	5,343.62

TOTAL

\$282,373.37

TABLE 3

UPGRADING EXPENDITURES 1988-89

	<u>COST (\$)</u>
1. COLD CREEK NEAR BOLTON.....	2,432.63
2. BAYFIELD RIVER NEAR VARNA.....	3,370.26
3. MADAWASKA RIVER AT PALMER RAPIDS.....	5,301.58
4. BONNECHERE RIVER NEAR CASTLEFORD.....	
5. PEPPERLAW BROOK NEAR UDORA.....	3,398.57
6. BATCHAWANA RIVER NEAR BATCHAWANA.....	13,826.41
7. MATTAGAMI RIVER NEAR TIMMINS.....	9,073.30
8. MONTREAL RIVER AT MOUNTAIN CHUTES.....	
9. NORTH SAUGEEEN RIVER NEAR CHESLEY.....	2,040.60
10. MOOSE RIVER ABOVE MOOSE RIVER.....	6,076.33
11. ALBANY RIVER AT HAT ISLAND.....	26,781.87
12. PARKS CREEK NEAR LATTA.....	3,800.63
13. SOUTH CASTOR RIVER AT KENMORE.....	3,348.96
TOTAL	<hr/> \$79,451.14

MAINTENANCE EXPENDITURES 1988-89

	<u>COST (\$)</u>
1. BEAR CREEK AT PETROLIA.....	\$2,106.17
2. MIMICO CREEK AT ISLINGTON.....	9,485.80
3. THREE MILE CREEK AT MOUNT HOPE.....	802.10
4. LUTTERAL CREEK NEAR OUSTIC.....	2,011.23
5. WYE RIVER AT WYEBRIDGE.....	
6. MAD RIVER NEAR GLANCAIRN.....	
7. CANAGAGIGUE CREEK NEAR FLORADALE.....	
8. BAILEY CREEK NEAR BEETON.....	715.21
9. DETROIT RIVER AT AMHERSTBURG.....	244.20
10. GEORGIAN BAY AT COLLINGWOOD.....	964.40
11. LAKE ERIE AT PORT DOVER.....	263.64
12. HIGHLAND CREEK NEAR WESTHILL.....	1,341.50
13. BEAR CREEK NEAR WILKESPORT.....	662.78
14. SHELTER VALLEY BROOK NEAR GRAFTON.....	237.36
15. GORING DRAIN AT CONCESSION 13.....	447.07
16. TURKEY CREEK AT WINDSOR.....	340.00
17. WANBUNO CREEK NEAR DORCHESTER.....	642.61
18. BEATTY SAUGEEN RIVER NEAR HOLSTEIN.....	1,134.61
19. STOKES RIVER NEAR FERNDAL.....	1,267.93
20. CONESTOGO RIVER AT GLEN ALLEN.....	3,668.90
21. CATFISH CREEK NEAR SPARTA.....	3,410.00
22. MCKENZIE CREK NEAR CALEDONIA.....	928.78
23. NITH RIVER NEAR CANNING.....	1,419.00
24. ALDER CREEK NEAR NEW DUNDEE.....	809.34
25. KETTLE CREEK ABOVE ST.THOMAS.....	1,592.48
26. BLACK RIVER NEAR WASHAGO.....	2,363.84
27. BOB CREEK NEAR MINDEN.....	297.58
28. BURNLEY CREEK ABOVE WARKWORTH.....	554.77
29. EELS CREEK BELOW APSLEY.....	\$233.50
30. OUSE RIVER NEAR WESTWOOD.....	753.20
31. ETOBICOKE CREEK BELOW Q.E.W.....	6,990.75
32. REDHILL CREEK AT HAMILTON.....	474.70

MAINTENANCE EXPENDITURES 1988-89

	<u>COST (\$)</u>
33. MISSISSAGI RIVER AT MISSISSAGI CHUTE.....	1,316.71
34. SOUTH RIVER AT SOUTH RIVERS.....	847.29
35. GOULAIS RIVER NEAR SEARCHMONT.....	444.43
36. WHITSON RIVER AT VAL CARON.....	628.85
37. WHITSON RIVER AT CHELMSFORD.....	371.51
38. CONISTON CREEK ABOVE WANAPITEI RIVER.....	424.36
39. VERMILLION RIVER NEAR VAL CARON.....	360.68
40. JUNCTION CREEK BELOW KELLEY LAKE.....	344.23
41. E.BRANCH SCOTCH RIVER NEAR ST.ISADORE DE PRESCOTT.....	1,180.92
42. S. NATION RIVER NEAR PLANTAGENET SPRINGS....	1,055.74
	<hr/>
TOTAL	\$53,138.17

WATER RESOURCES BRANCH
CONSTRUCTION PROGRAM
1988/89

Direct Cost to Agencies

	No. of Projects			Federal			Provincial			Totals			
	F	F/P	P	Salaries	O&M	Capital	Salaries	O&M	Capital	Salaries	O&M	Capital	Total
New Stations	7	4	15	16,902.77	-	55,795.00	28,349.19	-	74,075.84	45,251.96	-	129,870.84	175,122.80
Relocations	3	2	-	4,167.87	-	16,585.38	1,349.89	-	7,632.24	5,517.76	-	24,217.62	29,735.38
Upgrading	1	-	3	952.72	-	1,479.91	2,088.15	-	6,721.28	3,040.87	-	8,201.19	11,242.06
Major Maintenance	1	1	2	604.75	-	6,026.85	1,436.53	-	6,127.75	2,041.28	-	12,154.60	14,195.88
TOTAL	11	7	20	22,628.11	-	79,887.14	33,223.76	-	94,557.11	55,851.87	-	174,444.25	230,296.12

NOTE: Above costs include: 1) Field investigations
2) Only expenditures incurred by WRB

Other Costs

	Totals			
	Salaries	O&M	Capital	Total
Minor Maintenance (Included in station unit cost)	34,589.93	24,642.78	43,789.81	103,022.52
Field Investigations	313.39	132.15	-	445.54
Instrumentation (Basic Recorder)	-	-	77,515.20	77,515.20
Tides and Water Level Stations	375.54	1,096.70	-	1,472.24
TOTALS (other costs)	35,278.86	25,871.63	121,305.01	182,455.50
TOTAL CONSTRUCTION PROGRAM COST	91,130.73	25,871.63	295,749.26	412,751.62

TABLE 5
BREAKDOWN OF TOTAL EXPENDITURES 1988-89

CONSTRUCTION COSTS

1980/81 - 1988/89

- Field Investigations
- New Construction
- Upgrading
- Maintenance

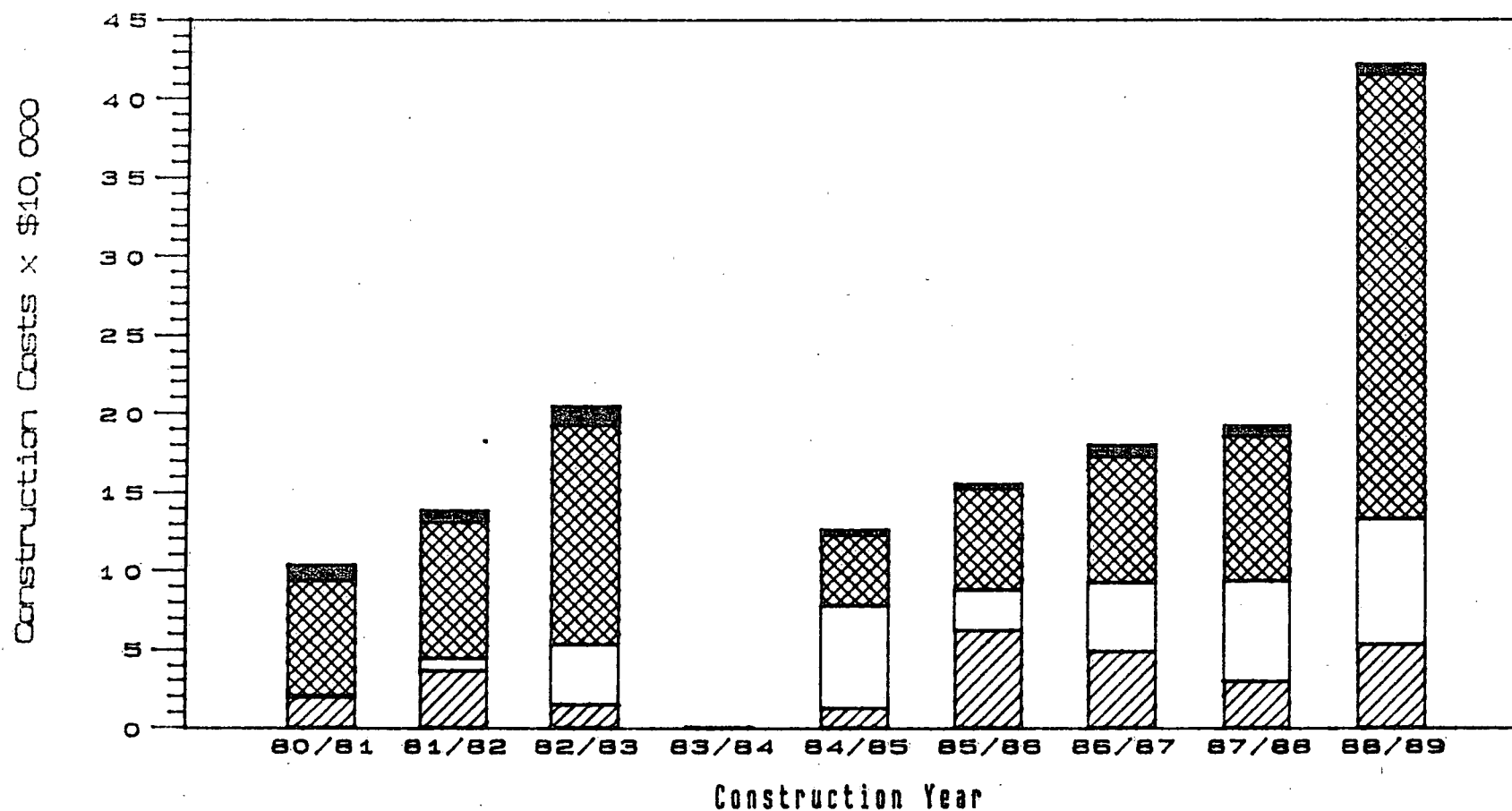
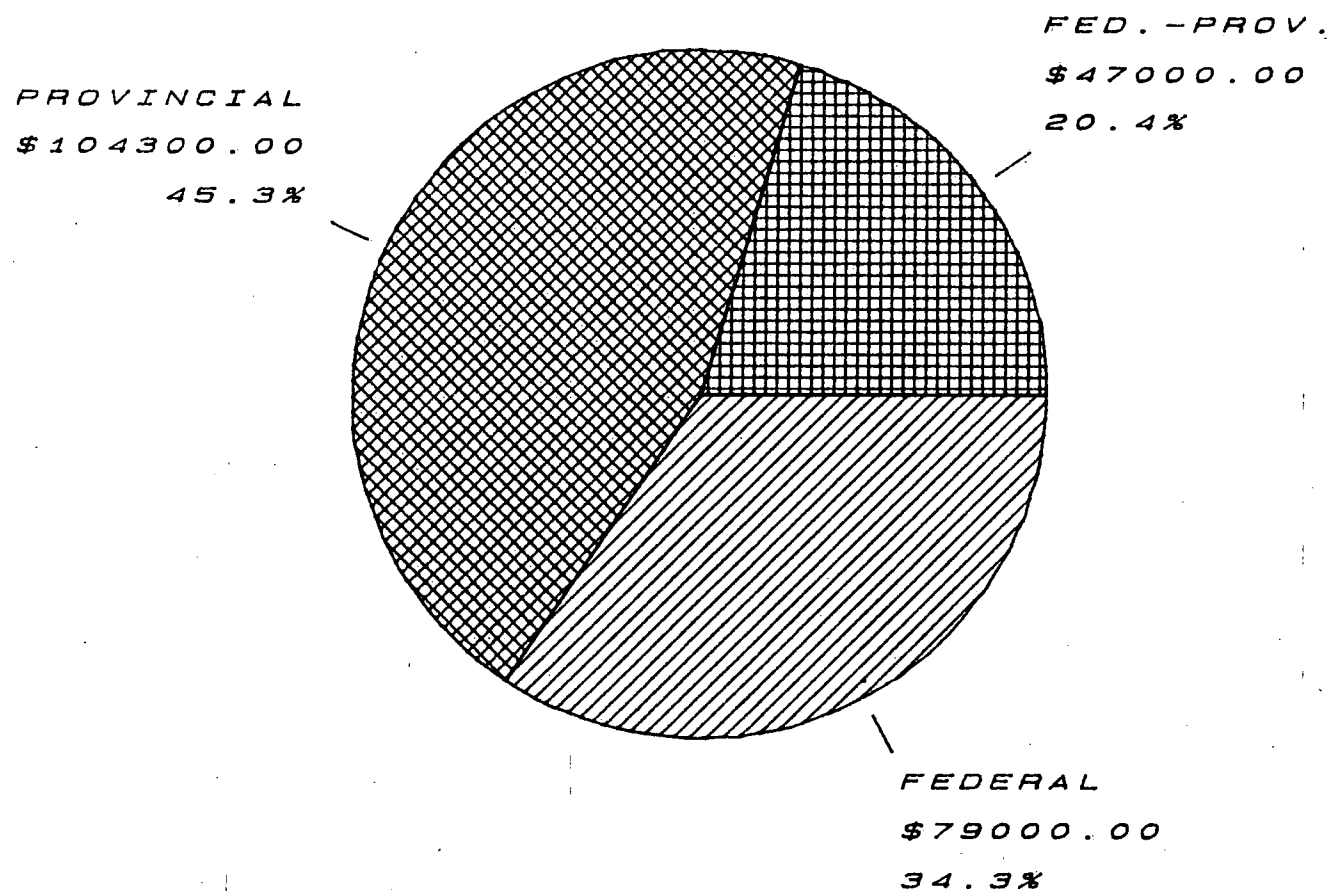
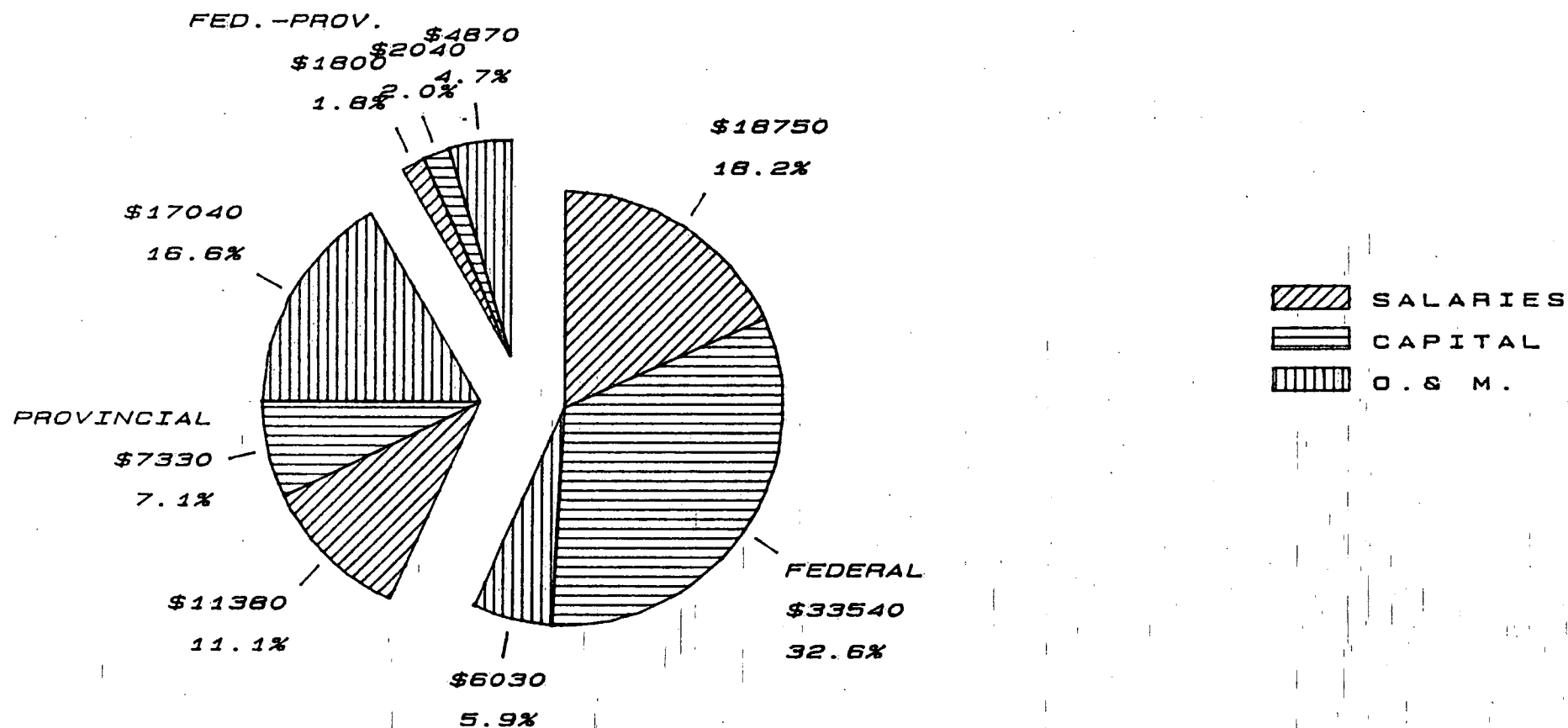


FIGURE 1 CONSTRUCTION COST COMPARISON 1980-81 TO 1988-89

CONSTRUCTION COSTS 1988-89
CAPITAL NON-SHAREABLE EXPENDITURES



CONSTRUCTION COSTS 1988-89 DISTRIBUTION OF SHAREABLE EXPENDITURES



3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS

3.1 FIELD INVESTIGATIONS

1. CREDIT RIVER AT NORVAL - 32431P

The Construction Supervisor met with a representative of the Credit Valley Conservation Authority to select a suitable site for a hydrometric gauging station. The installation will be used for flood forecasting and flow monitoring.

Cost: Salaries	\$ 75.00
Meals/Lodging	--
Transportation	20.00
	<hr/>
TOTAL	\$ 95.00

2. PEPPERLAW BROOK NEAR UDORA - 32431P

The Construction Supervisor carried out a site inspection for the upgrading of this station. A larger shelter is required for real time data acquisition.

Cost: Salaries	\$ 152.25
Meals/Lodging	8.50
Transportation	69.40
	<hr/>
TOTAL	\$ 230.15

3. MAITLAND RIVER AT BEN MILLER - 32431P

An on-site meeting was held with a Maitland Valley Conservation Authority representative and the Huron Country Engineer to confirm the site location for a hydrometric gauging station.

Cost: Salaries	\$ 95.16
Meals/Lodging	4.25
Transportation	35.00
	<hr/>
TOTAL	\$ 134.41

4. BAYFIELD RIVER NEAR VARNA - 32431P

The above gauging site was visited to assess construction requirements to upgrade the shelter to an Armco building.

Cost: Salaries	\$ 95.16
Meals/Lodging	4.25
Transportation	35.00
	<hr/>
TOTAL	\$ 134.41

5. MAD RIVER BELOW AVENING - 32431P

The Construction Supervisor met with representatives from the Nottawasaga Valley and Saugeen Valley Conservation Authorities to select a suitable hydrometric gauging site.

Cost: Salaries	\$ 91.35
Meals/Lodging	8.73
Transportation	30.40
	<hr/>
TOTAL	\$ 130.48

6. COPELAND CREEK NEAR PENATANGUISHENE - 32431P
7. STURGEON RIVER AT STURGEON BAY

Gauging site reconnaissance were carried out for the above proposed stations by the Construction Supervisor and a Ministry of the Environment staff member. The stream flow quantity and quality will be monitored as part of the Remedial Action Plan (RAP).

Cost: Salaries	\$ 182.70
Meals/Lodging	16.22
Transportation	56.60
	<hr/>
TOTAL	\$ 255.52

8. BEDFORD MILLS CREEK NEAR BEDFORD MILLS - 32431P

The Construction Supervisor met with representatives from the Ministry of the Environment to select a site for a gauging station. No suitable location could be found. The creek was affected by backwater conditions from a downstream lake and a cascading section from an upstream dam.

Cost: Salaries	\$ 76.13
Meals/Lodging	28.40
Transportation	20.00
	<hr/>
TOTAL	\$ 124.53

9. NEWBORO LAKE AT CHAFFEY'S LOCK - 32433F

An on-site meeting was held with Parks Canada officials regarding an installation to monitor lake levels. The gauge would be linked to a data logger at the hydrometric station downstream of the Newboro Lake dam.

Cost: Salaries	\$ 76.13
Meals/Lodging	33.95
Transportation	26.00
	<hr/>
TOTAL	\$ 136.08

10. BUELLS CREEK AT BROCKVILLE - 32431P
11. LYNDHURST CREEK AT LYNDHURST

A field investigation was carried out with a Cataraqui Region Conservation Authority official to select hydrometric gauging sites at the above locations.

Cost: Salaries	\$ 274.05
Meals/Lodging	69.30
Transportation	89.20
	<hr/>
TOTAL	\$ 432.55

12. HOLTBY DRAIN AT CONCESSION 7 - 32367F
13. MADTER DRAIN AT CONCESSION 7
14. WEBBER DRAIN AT HWY #59
15. GORING DRAIN AT CONCESSION 13

Reconnaissance and site visits were carried out by the Construction Supervisor, Assistant Regional Engineer, Area Engineer, Area Head and a representative from Beak Consultants Limited to examine the proposed sites for the SWEEP study (Soil and Water Environmental Enhancement Program).

Cost: Salaries	\$ 804.00
Meals/Lodging	41.50
Transportation	60.00
	<hr/>
TOTAL	\$ 905.50

16. 5TH CONCESSION DRAIN NEAR ESSEX - 32367F
17. 2ND CONCESSION DRAIN NEAR ESSEX

The Construction Supervisor, Assistant Regional Engineer, and representatives from Beak Consultants Limited visited the proposed SWEEP station sites. Discussions were held with Township officials and property owners regarding the construction of the two gauges.

Cost: Salaries	\$ 667.55
Meals/Lodging	50.45
Transportation	370.60
	<hr/>
TOTAL	\$ 1,088.60

18. WELLAND RIVER NEAR BINBROOK - 32431P
19. OSWEGO CREEK AT CANBORO

A representative from the Niagara Peninsula Region Conservation Authority and the Construction Supervisor selected sites for hydrometric gauging sites. The first site will monitor water levels only until existing backwater problems can be resolved.

An on-site meeting was held with a Township official and Ontario Hydro regarding the location of the Binbrook Gauge shelter.

Cost: Salaries	\$ 304.25
Meals/Lodging	25.50
Transportation	113.20
	<hr/>
TOTAL	\$ 442.95

- 20. MATCHEDASH BAY ABOVE HWY #69
- 21. MATCHEDASH BAY BELOW HWY #69
- 22. NORTH RIVER NEAR COLD RIVER
- 23. NORTH RIVER AT FALLS
- 24. NORTH RIVER NEAR LOVERING - 32421P

The Construction Supervisor carried out two site visits with officials from the Ministry of Transport to ascertain construction requirements and to meet with Township representatives regarding the construction of the above stations.

An after construction inspection was completed by W.R.B. and M.T.O. staff.

Cost: Salaries	\$ 507.50
Meals/Lodging	34.00
Transportation	184.60
	<hr/>
TOTAL	\$ 726.10

- 25. CANAGAGIGUE CREEK NEAR FLORADALE - 32430P

The discontinued gauging site was assessed for removal of the Armco shelter and filling in of the stilling well.

Cost: Salaries	\$ 40.60
Meals/Lodging	--
Transportation	11.00
	<hr/>
TOTAL	\$ 51.60

26. HOG CREEK NEAR VICTORIA HARBOUR
27. TRIBUTARY TO WYE RIVER BELOW ELMVALE - 32421P

The Construction Supervisor, Assistant Regional Engineer and representatives from the Ministry of the Environment carried out a field reconnaissance to select hydrometric gauging sites at the above locations. The gauging stations will be part of the Remedial Action Plan (RAP).

Cost: Salaries	\$ 311.01
Meals/Lodging	17.00
Transportation	92.00
	<hr/>
TOTAL	\$ 420.01

28. DUFFINS CREEK AT PICKERING
29. WEST HUMBER RIVER AT HWY #7 - 32433F

The Construction Supervisor and the Area Head South selected new monitoring sites for the above existing stations. At present channel conditions make it difficult to collect good quality data.

A subsequent on-site meeting was held with Ajax Hydro and Metropolitan Toronto and Region Conservation Authority to discuss Construction requirements at the New Duffins Creek site.

Cost: Salaries	\$ 284.20
Meals/Lodging	25.50
Transportation	100.00
	<hr/>
TOTAL	\$ 409.70

30. MIMICO CREEK AT ISLINGTON - 32431P
32433F

Several on-site visits involving the Construction Supervisor, Area Head South, Area Hydrometric Supervisor and officials from the City of Etobicoke and Metropolitan Toronto and Region Conservation Authority were held.

It was decided that the collapsed concrete weir should be removed and a new control constructed further downstream in lieu of relocating the station.

Cost: Salaries	\$ 377.59
Meals/Lodging	51.00
Transportation	148.00
	<hr/>
TOTAL	\$ 576.59

FIGURE 4

NEW CONSTRUCTION PROJECTS

- STATION LOCATION

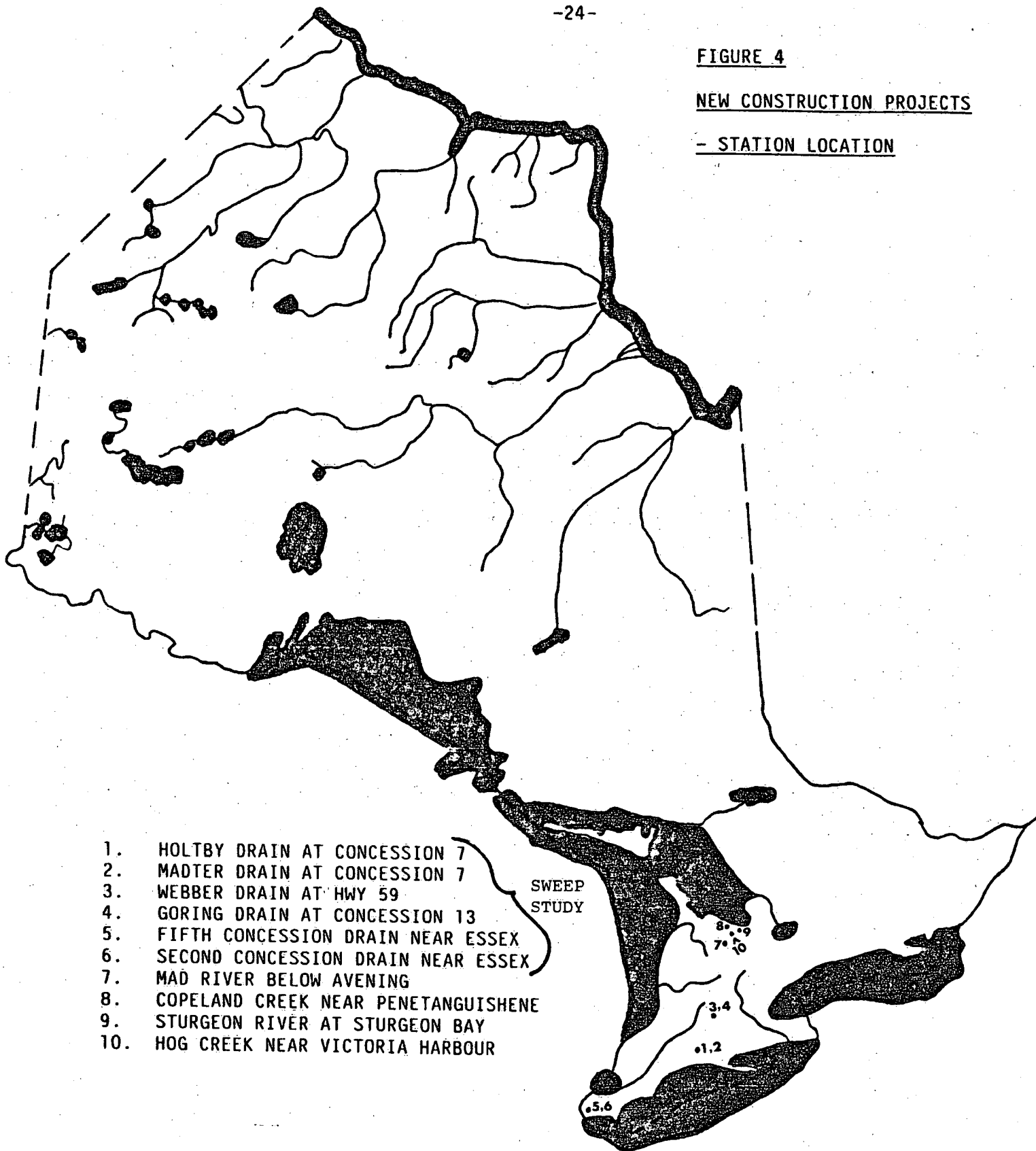


FIGURE 5

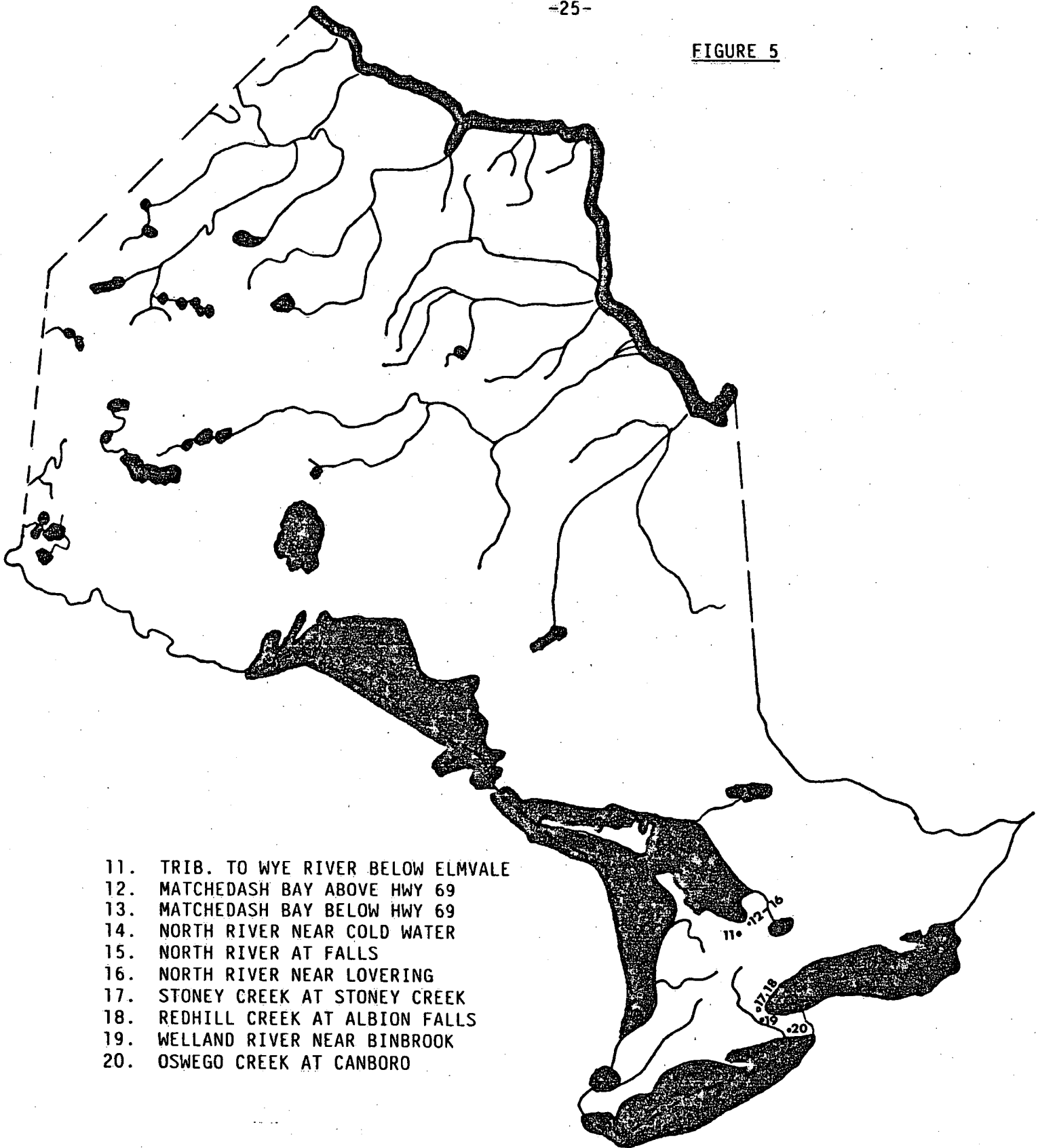
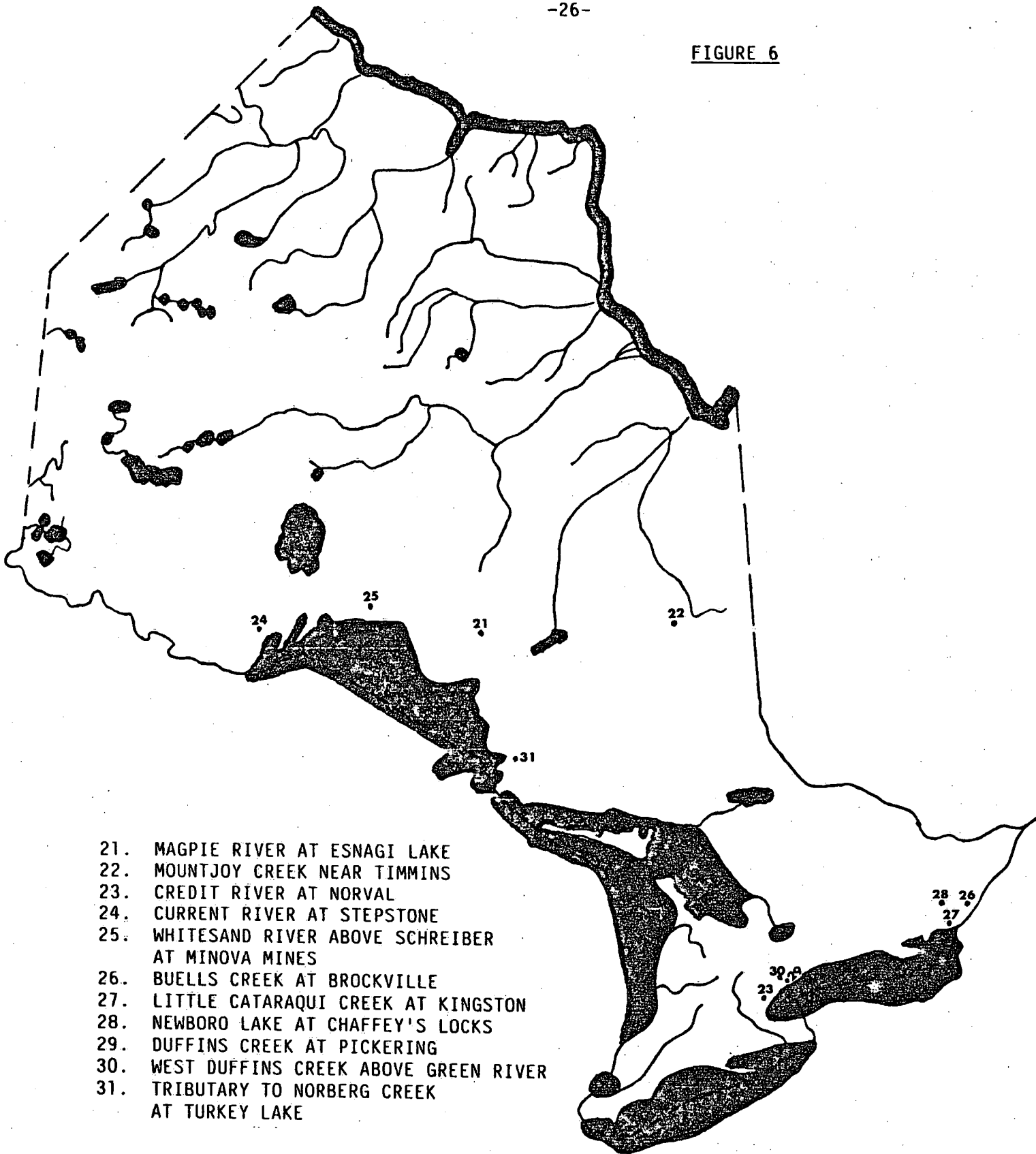


FIGURE 6



3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS

3.2 NEW CONSTRUCTION

1&2 SWEEP STUDY - HOLTBY DRAIN AT CONCESSION 7
(BELMONT) - MADTER DRAIN AT CONCESSION 7 - 32367F

Stilling wells complete with intakes and heating cables were installed. Armco shelters, 5'4" x 8' x 8', were erected on concrete pads over the stilling wells. Oversized shelters were used to accommodate water quality and quantity, and meteorology monitoring equipment. Shelters were insulated, panelled and electrically wired with 60 ampere services. Low water concrete weirs with 120⁰ galvanized steel V notches were constructed. SWEEP signs, 4' x 8', were erected within the basin.

Cost: Salaries	\$ 4,855.17
Materials/Supplies	14,682.70
Meals/Lodging	2,420.49
Transportation	687.50
Instrumentation	6,459.60

TOTAL \$29,105.46

NOTE: Included in total is a cost of \$5,900.00 to service first site with hydro.

3&4 SWEEP STUDY - WEBBER DRAIN AT HWY #59 - 32367F
(TAVISTOCK) - GORING DRAIN AT CONCESSION 13

Stilling wells complete with intakes and heating cables were installed. Armco shelters, 5'4" x 8' x 8', were erected on concrete pads over the stilling wells. Oversized shelters were used to accommodate water quality and quantity, and meteorology monitoring equipment. Shelters were insulated, panelled and electrically wired with 60 ampere services. Low water concrete weirs with 120⁰ galvanized steel V notches were constructed.

Cost: Salaries	\$ 4,010.71
Materials/Supplies	9,260.12
Meals/Lodging	625.30
Transportation	903.20
Instrumentation	6,459.60

TOTAL \$21,258.93

5,6 SWEEP STUDY - FIFTH CONCESSION DRAIN NEAR ESSEX
(ESSEX) - SECOND CONCESSION DRAIN NEAR ESSEX - 32367F

Stilling wells complete with intakes and heating cables were installed. Armco shelters, 5'4" x 8' x 8', were erected on concrete pads over the stilling wells. Oversized shelters were used to accommodate water quality and quantity, and meteorology monitoring equipment. Shelters were insulated, panelled and electrically wired with 60 ampere services. Low water concrete weirs with 120⁰ galvanized steel V notches were constructed. SWEEP signs, 4' x 8', were erected within the basin. A wooden foot bridge was constructed across the drainage ditch to improve access to the second site.

Cost: Salaries	\$ 5,277.70
Materials/Supplies	10,701.77
Meals/Lodging	3,293.57
Transportation	1,861.15
Instrumentation	6,459.60

TOTAL \$27,593.79

7. MAD RIVER BELOW AVENING - 32431P
32433F

A stilling well, complete with intakes and heating cable was installed. An insulated and panelled aluminum look-in shelter was mounted on top of the stilling well. An underground 30 ampere service was installed and connected to the shelter.

Cost: Salaries	\$ 1,116.00
Materials/Supplies	2,802.26
Meals/Lodging	474.14
Transportation	187.50
Instrumentation	3,229.80

TOTAL \$ 7,809.70

8. COPELAND CREEK NER PENETANGUISHENE - 32431P 32433F

A stilling well, complete with intakes and heating cable, was installed. A Guelph type look-in shelter was placed on top of the stilling well. A 30' hydro pole was installed to provide a 30 ampere service to the shelter. The station will be used to monitor flows for the "RAP" study.

Cost: Salaries	\$ 839.03
Materials/Supplies	2,949.22
Meals/Lodging	612.36
Transportation	157.40
Instrumentation	3,229.80

TOTAL \$ 7,787.81

9. STURGEON RIVER AT STURGEON BAY - 32431P 32433F

A stilling well, complete with intakes and heating cable, was installed. A Guelph type look-in shelter was placed on top of the stilling well. A 30' hydro pole was installed to provide a 30 ampere service to the shelter. The station will be used to monitor flows for the "RAP" study.

Cost: Salaries	\$ 1,035.03
Materials/Supplies	3,117.63
Meals/Lodging	733.17
Transportation	217.80
Instrumentation	3,229.80

TOTAL \$ 8,333.43

10. HOG CREEK NEAR VICTORIA HARBOUR - 32431P 32433F

A stilling well, complete with intakes and heating cable, was installed. A Guelph type look-in shelter was placed on top of the stilling well. A 30' hydro pole was installed to provide a 30 ampere service to the shelter. The station will be used to monitor flows for the "RAP" study. Existing rocks were place across river to form a control and a gauge pool.

Cost: Salaries	\$ 862.23
Materials/Supplies	3,798.28
Meals/Lodging	618.90
Transportation	219.60
Instrumentation	3,229.80

TOTAL \$ 8,728.81

11. TRIB. TO WYE RIVER BELOW ELMVALE - 32431P 32433F

A stilling well, complete with intakes and heating cable, was installed. A Guelph type look-in shelter was placed on top of the stilling well. A 30' hydro pole was installed to provide a 30 ampere service to the shelter. The station will be used to monitor flows for the "RAP" study. Sheet steel was driven into the streambed to form a low water artificial control.

Cost: Salaries	\$ 1,226.45
Materials/Supplies	2,420.22
Meals/Lodging	634.48
Transportation	155.80
Instrumentation	3,229.80

TOTAL \$ 7,666.75

12. MATCHEDASH BAY ABOVE HWY 69
13. MATCHEDASH BAY BELOW HWY 69
14. NORTH RIVER NEAR COLDWATER
15. NORTH RIVER AT FALLS - 32431P

Stilling wells and intakes were installed at the above sites. Guelph type look-in shelters were mounted on top of the wells. 30 ampere electrical services were provided to all sites except North R. near Coldwater.

16. NORTH RIVER NEAR LOVERING

A staff gauge was installed at this site.

NOTE: The above stations were constructed for the Ministry of Transportation in order to monitor water levels in the Matchedash Bay area.

Cost: Salaries	\$ 3,489.24
Materials/Supplies	9,214.10
Meals/Lodging	2,011.18
Transportation	1,070.00
Instrumentation	12,919.20

TOTAL \$28,703.72

11. STONEY CREEK AT STONEY CREEK - 32431P

A stilling well, complete with intakes and heating cable was installed. An insulated and panelled aluminum shelter was placed on top of the stilling well. A hydro pole and 30 ampere electrical service was installed. A low water concrete weir was constructed to provide a stable control.

Cost: Salaries	\$ 1,097.56
Materials/Supplies	4,588.21
Meals/Lodging	83.35
Transportation	174.25
Instrumentation	3,229.80

TOTAL \$ 9,173.17

18. REDHILL CREEK AT ALBION FALLS - 32431P

A stilling well, complete with intakes and heating cable was installed. An insulated and panelled aluminum shelter was mounted atop the well. A 30 ampere underground service was provided to the shelter.

Cost: Salaries	\$ 1,124.99
Materials/Supplies	4,744.70
Meals/Lodging	199.60
Transportation	174.25
Instrumentation	3,229.80
	<hr/>
TOTAL	\$ 9,473.34

19. WELLAND RIVER NEAR BINBROOK - 32431P

A complete inbank installation with an Armco shelter was constructed. The shelter was transported from a discontinued site. A 100 ampere underground service was installed.

Cost: Salaries	\$ 1,952.84
Materials/Supplies	4,360.75
Meals/Lodging	194.40
Transportation	411.00
Instrumentation	3,229.80
	<hr/>
TOTAL	\$10,148.79

20. OSWEGO CREEK AT CANBORO - 32431P

A complete bank installation with an Armco shelter was constructed. An overhead 60 ampere electrical service was installed. Modifications and repairs were carried out to an existing concrete weir in order to improve low water rating of the station. A wading section was constructed of crushed stone.

Cost: Salaries	\$ 3,244.96
Materials/Supplies	5,769.55
Meals/Lodging	2,656.12
Transportation	810.00
Instrumentation	3,229.80

TOTAL \$15,710.43

21. MAGPIE RIVER AT ESNAGI LAKE - 32431P

An Armco shelter was erected on a wooden base. The shelter was insulated and panelled. A helicopter was used to transport the building to the remote gauging site. An armoured orifice line was installed from the shelter to the River. The shelter was vandalized prior to equipment being installed. This resulted in an additional trip to carry out repairs.

Cost: Salaries	\$ 5,486.47
Materials/Supplies	1,759.29
Meals/Lodging	1,263.25
Transportation	3,619.70
Instrumentation	—

TOTAL \$12,128.71

22. MOUNTJOY CREEK NEAR TIMMINS - 32431P

An Armco shelter was erected on a pressure treated wooden base. Instrument shelves and an orifice line were installed.

Cost: Salaries	\$ 1,567.98
Materials/Supplies	1,747.48
Meals/Lodging	609.75
Transportation	351.00
Instrumentation	--

TOTAL \$ 4,276.41

NOTE: Total includes the cost of installing instrumentation.

22. CREDIT RIVER AT NORVAL - 32431P

A stilling well, complete with intakes and heating cable was installed. An Armco shelter was erected on a concrete pad over the well. The shelter was insulated, panelled and electrically wired with a 60 ampere overhead service. Gabion baskets were installed on the bank to support the backfill around the well and concrete pad.

Cost: Salaries	\$ 2,007.68
Materials/Supplies	6,858.23
Meals/Lodging	168.90
Transportation	570.00
Instrumentation	3,229.80

TOTAL \$12,834.61

24. CURRENT RIVER AT STEPSTONE - 32431P 32433F

A stilling well, complete with intakes and heating cable was installed. The construction of the brick and concrete block shelter, insulating, panelling, and electrical wiring was carried out by contract. The shelter and well at the old site was removed.

Cost: Salaries	\$ 1,583.77
Materials/Supplies	10,476.02
Meals/Lodging	712.06
Transportation	612.50
Instrumentation	--

TOTAL	\$13,384.35
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25. WHITESAND RIVER ABOVE SCHREIBER AT MINOVA MINES - 32431P

A complete inbank installation was constructed. A Guelph type look-in shelter was installed. An underground 30 ampere electrical service was connected to the shelter.

Cost: Salaries	\$ 1,525.65
Materials/Supplies	2,412.31
Meals/Lodging	712.06
Transportation	450.00
Instrumentation	3,229.80

TOTAL	\$ 8,329.82
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26. BUELLS CREEK AT BROCKVILLE - 32431P

A complete inbank installation and Armco shelter were constructed.
An overhead 60 ampere electrical service was installed.

Cost: Salaries	\$ 2,795.50
Materials/Supplies	1,918.58
Meals/Lodging	1,564.85
Transportation	431.20
Instrumentation	3,229.80

TOTAL	\$ 9,939.93
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27. WEST BRANCH LITTLE CATARAQUI CREEK AT KINGSTON - 32431P

A stilling well, complete with intakes and heating cable was installed. An Armco shelter was erected on a concrete pad over the stilling well. The shelter was insulated, panelled, and electrically wired with a 60 ampere service. A key was broken across the bedrock stream and a low water concrete weir was constructed.

Cost: Salaries	\$ 2,074.95
Materials/Supplies	3,534.14
Meals/Lodging	1,193.21
Transportation	632.80
Instrumentation	3,229.80

TOTAL	\$10,664.90
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28. NEWBORO LAKE AT CHAFFEY'S LOCKS - 32433F

A 600 mm diameter stilling well and intake were installed. A concrete pad was poured around the well and a 0.75 x 0.75 x 0.75 metre aluminum shelter was achored to the pad. The shelter will house a pulse generator for a datalogger unit. Electrical wiring and transmission lines will be installed during the following year.

Cost: Salaries	\$ 777.82
Materials/Supplies	2,625.95
Meals/Lodging	488.61
Transportation	427.21
Instrumentation	--
	<hr/>
TOTAL	\$ 4,319.59

29. DUFFINS CREEK AT PICKERING - 32433F

A stilling well complete with intakes and heating cable were installed. An aluminum shelter was fabricated and insulated with urethane foam. 350 metres of NMWU electrical cable was purchased for underground electrical service. The project will be completed during the next construction period.

Cost: Salaries	\$ 547.50
Materials/Supplies	4,427.59
Meals/Lodging	42.50
Transportation	206.75
Instrumentation	--
	<hr/>
TOTAL	\$ 5,224.34

30. WEST DUFFINS CREEK ABOVE GREEN RIVER - 32433F

A concrete pad was poured around the previously installed stilling well (1987-88). A relocated Armco building was placed on the pad. Ground rods were installed and connected to the existing service. A 40 foot hydro pole was installed by an electrical contractor.

Cost: Salaries	\$ 1,387.20
Materials/Supplies	2,248.69
Meals/Lodging	595.82
Transportation	201.25
Instrumentation	--

TOTAL \$ 4,432.96

31. TRIB. TO NORBERG CREEK AT TURKEY LAKE - 32548F

The look-in shelter and stilling well were relocated downstream. The well was insulated by the addition of an outer casing and styrofoam. The wooden metering section and weir structure was rebuilt and modified. Fill was placed around the well and weir structure.

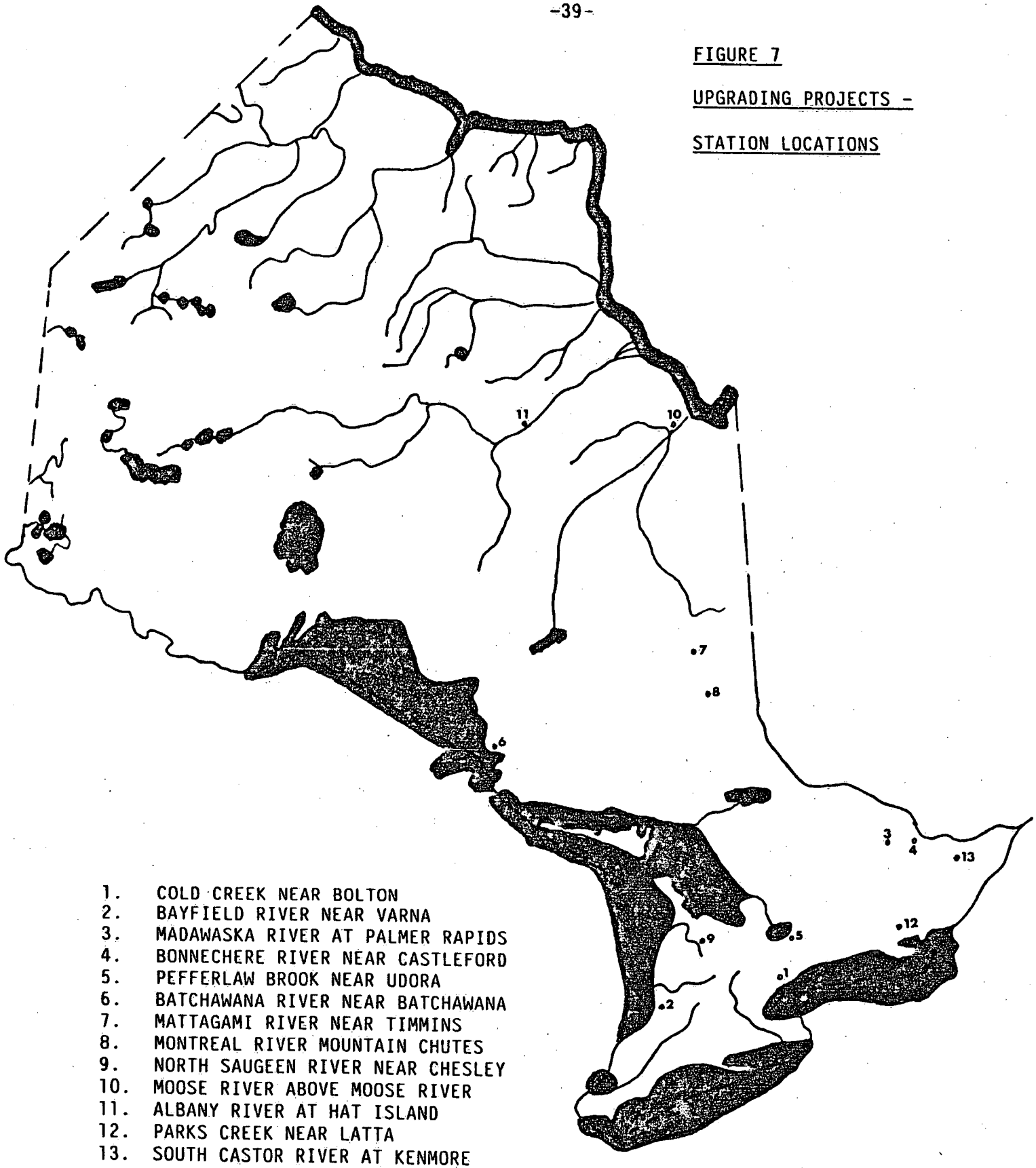
Cost: Salaries	\$ 883.28
Materials/Supplies	278.34
Meals/Lodging	574.00
Transportation	378.20
Instrumentation	3,229.80

TOTAL \$ 5,343.62

FIGURE 7

UPGRADING PROJECTS -

STATION LOCATIONS



3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS

3.3 UPGRADING

1. COLD CREEK NEAR BOLTON - 32433F

An interlocking sheet steel weir and rip rap were installed.

NOTE: Majority of materials were purchased the previous year.

Cost: Salaries	\$ 952.72
Materials/Supplies	626.07
Meals/Lodging	671.34
Transportation	182.50

TOTAL	\$ 2,432.63
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2. BAYFIELD RIVER NEAR VARNA - 32433F

The existing Guelph type look-in shelter was replaced with an Armco walk-in shelter. The shelter was erected on a concrete pad over the stilling well.

Cost: Salaries	\$ 1,623.15
Materials/Supplies	1,122.11
Meals/Lodging	209.20
Transportation	415.80

TOTAL	\$ 3,370.23
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3. MADAWASKA RIVER AT PALMER RAPIDS - 32494
4. BONNECHERE RIVER NEAR CASTLEFORD

Cableways at the above sites were upgraded to meet National Standards. Platforms complete with railings, ladders, ladder guards, and warning signs were installed.

Cost: Salaries	\$ 1,352.99
Materials/Supplies	2,555.80
Meals/Lodging	910.79
Transportation	482.00
	<hr/>
TOTAL	\$ 5,301.58

5. PEPPERLAW BROOK NEAR UDORA - 32431P

The existing Guelph type look-in shelter was replaced with an insulated and panelled aluminum shelter.

Cost: Salaries	\$ 465.00
Materials/Supplies	2,403.57
Meals/Lodging	405.00
Transportation	125.00
	<hr/>
TOTAL	\$ 3,398.57

6. BATCHAWANA RIVER NEAR BATCHAWANA - 32494

The existing Guelph type look-in shelter was replaced with an insulated and panelled aluminum shelter. The stilling well was extended and insulated by installing an outer well casing and insulation. The cableway was upgraded to National Standards by replacing towers, cable, one anchor, platform, ladder and cable car.

Cost: Salaries	\$ 4,298.37
Materials/Supplies	7,557.74
Meals/Lodging	1,493.50
Transportation	476.80

TOTAL	<u>\$13,826.41</u>
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7. MATTAGAMI RIVER NEAR TIMMINS - 32494

8. MONTREAL RIVER AT MOUNTAIN CHUTES

Cableways at the above sites were upgraded to National Standards by installing new platforms, ladders, ladder guards, safety loops, and aluminum cable cars.

Cost: Salaries	\$ 1,678.60
Materials/Supplies	6,698.80
Meals/Lodging	485.30
Transportation	210.60

TOTAL	<u>\$ 9,073.30</u>
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9. NORTH SAUGEEN RIVER NEAR CHESLEY - 32431P

An insulated aluminum shelter was supplied to the Saugeen Valley Conservation Authority for installation at the above gauging station.

Cost: Salaries	\$.
Materials/Supplies	2,040.60
Meals/Lodging	.
Transportation	.
	<hr/>
TOTAL	\$ 2,040.60

10. MOOSE RIVER ABOVE MOOSE RIVER - 32542

A used 6'8" x 6'8" x 8' Armco shelter was flown in by helicopter and erected on a wooden base. The Stacom and recorder were relocated from the personnel shelter to the newly installed building.

Cost: Salaries	\$ 1,989.01
Materials/Supplies	2,807.22
Meals/Lodging	673.90
Transportation	606.20
	<hr/>
TOTAL	\$ 6,076.33

NOTE: This project was carried out by the North Bay sub-office staff.

11. ALBANY RIVER AT HAT ISLAND - 32543

The existing wooden shelter was replaced with a 5'4" x 5'4" x 8' Armco shelter. A 12' x 12' x 8' Armco shelter was also constructed to house personnel. The buildings were erected on pressure treated wooden bases.

Cost: Salaries	\$ 8,922.36
Materials/Supplies	6,515.81
Meals/Lodging	2,058.30
Transportation	9,285.40

TOTAL \$26,781.87

NOTE: This project was carried out by the North Bay sub-office staff.

12. PARKS CREEK NEAR LATTA - 32550

A low flow concrete weir was constructed to stabilize the streambed and provide increased data accuracy.

Cost: Salaries	\$ 907.83
Materials/Supplies	2,332.80
Meals/Lodging	464.00
Transportation	96.00

TOTAL \$ 3,800.63

NOTE: This project was carried out by the Ottawa sub-office staff.

13. SOUTH CASTOR RIVER AT KENMORE - 32551

A low flow concrete weir was constructed to improve data accuracy at this site. Fill was placed around the stilling well and shelter.

Cost: Salaries	\$ 973.96
Materials/Supplies	2,259.00
Meals/Lodging	68.00
Transportation	48.00

TOTAL \$ 3,348.96

NOTE: This project was carried out by the Ottawa sub-office staff.

FIGURE 8

MAINTENANCE PROJECTS

-STATION LOCATION

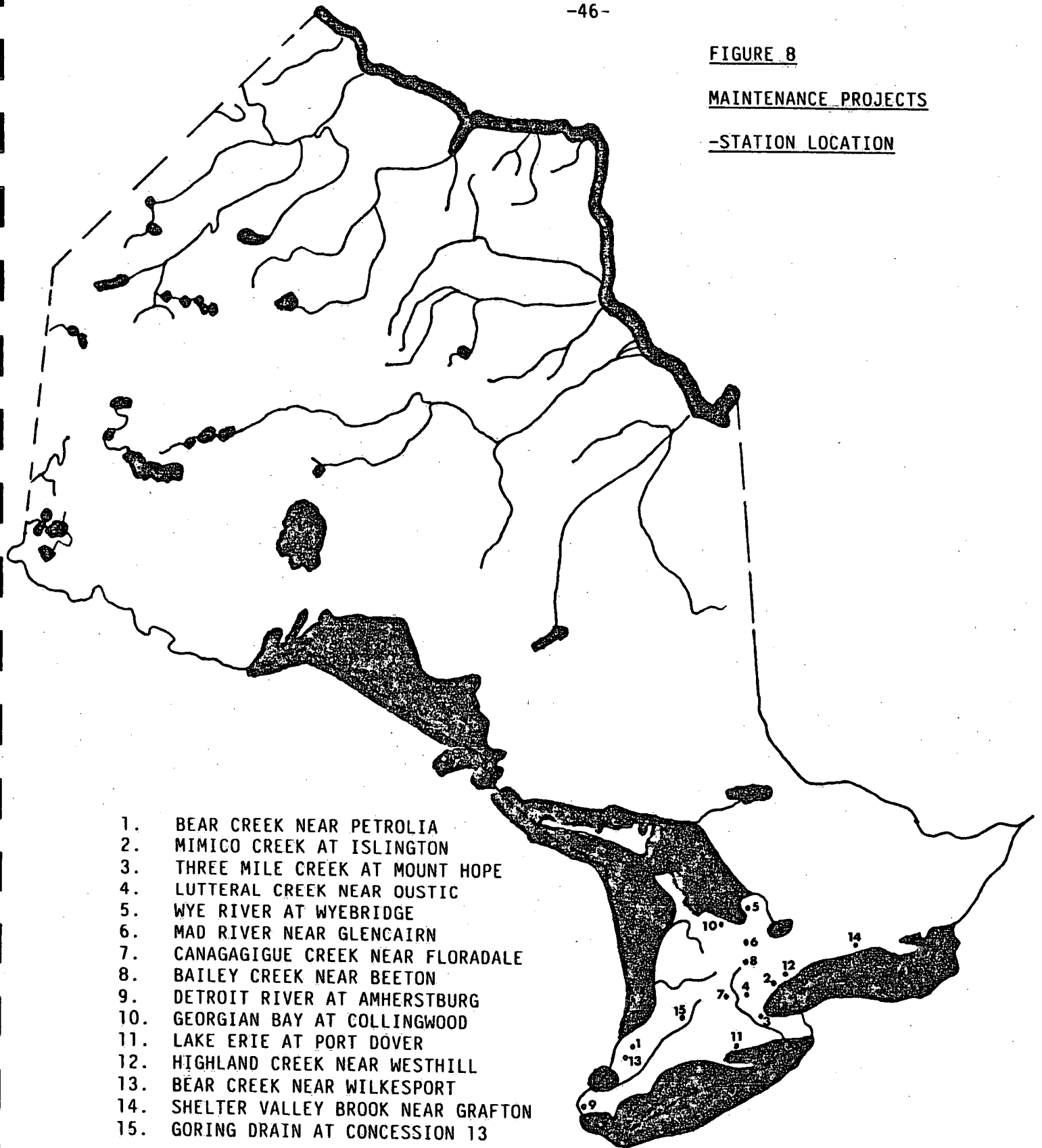


FIGURE 9

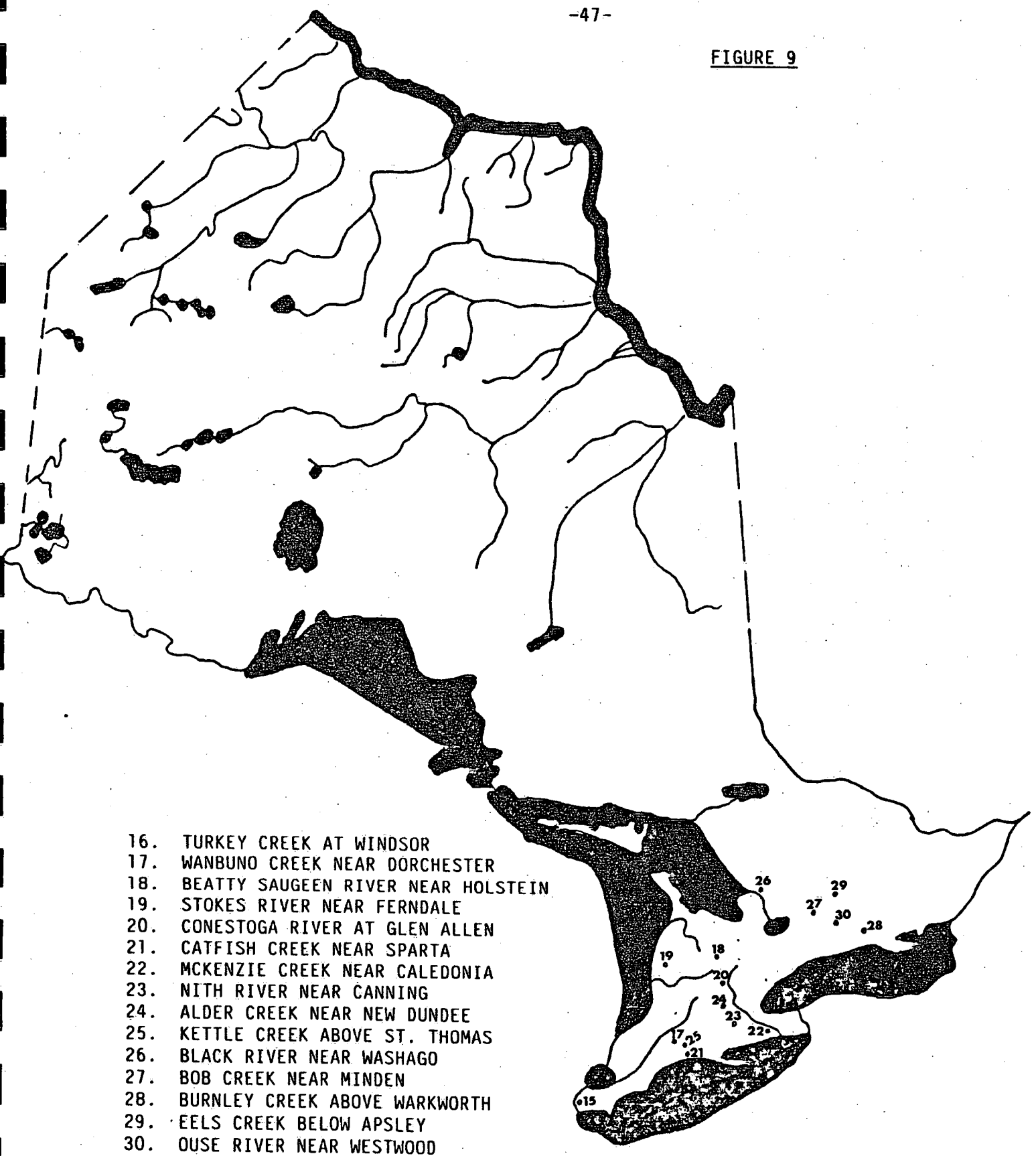
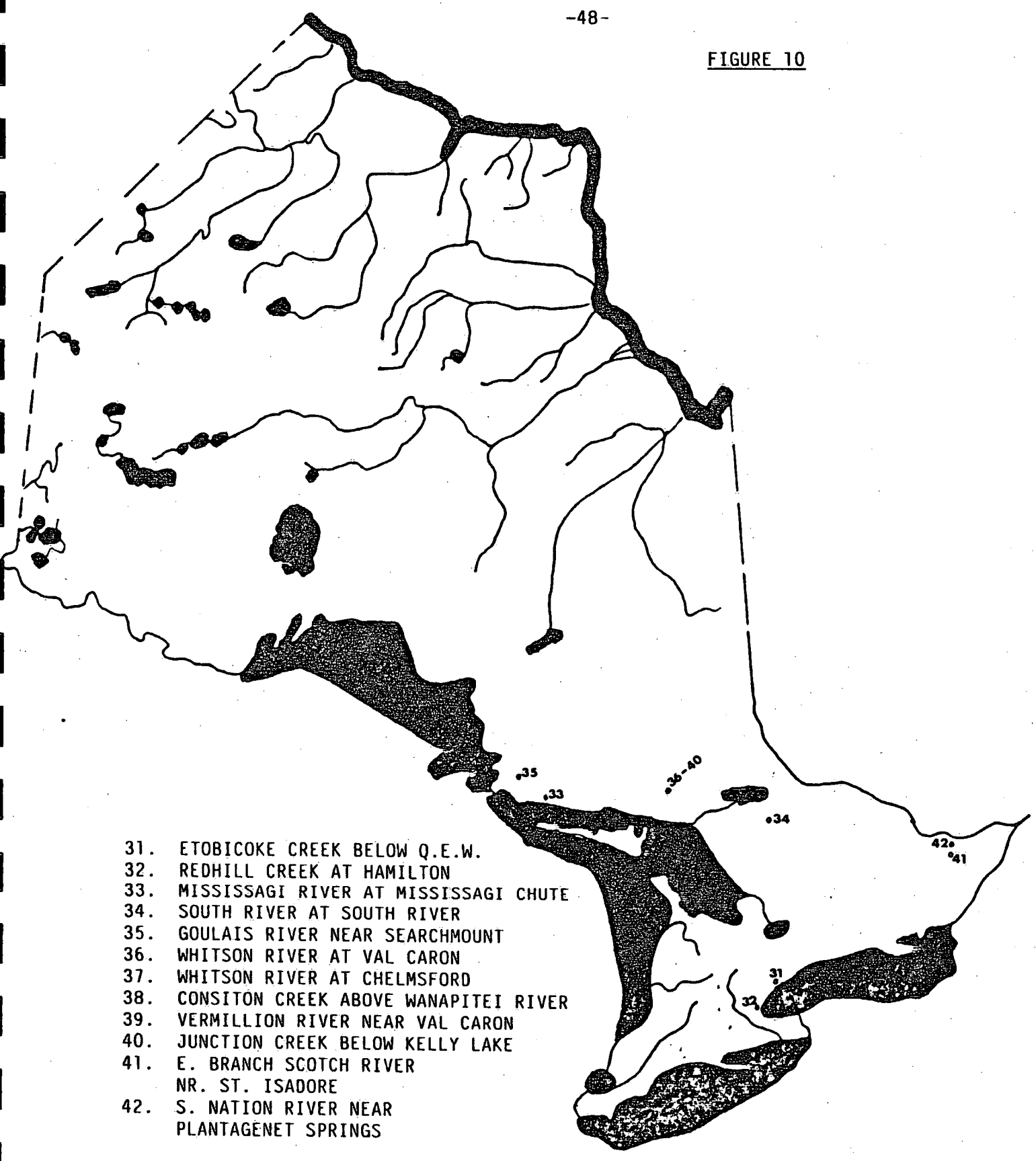
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16. TURKEY CREEK AT WINDSOR
 17. WANBUNO CREEK NEAR DORCHESTER
 18. BEATTY SAUGEEN RIVER NEAR HOLSTEIN
 19. STOKES RIVER NEAR FERNDAL
 20. CONESTOGA RIVER AT GLEN ALLEN
 21. CATFISH CREEK NEAR SPARTA
 22. MCKENZIE CREEK NEAR CALEDONIA
 23. NITH RIVER NEAR CANNING
 24. ALDER CREEK NEAR NEW DUNDEE
 25. KETTLE CREEK ABOVE ST. THOMAS
 26. BLACK RIVER NEAR WASHAGO
 27. BOB CREEK NEAR MINDEN
 28. BURNLEY CREEK ABOVE WARKWORTH
 29. EELS CREEK BELOW APSLEY
 30. OUSE RIVER NEAR WESTWOOD

FIGURE 10

- 
- A map of a river system, likely the Ottawa River, showing various tributaries and specific locations marked with numbers. The map is oriented with North at the top. The main river flows from the top right towards the bottom right. Several tributaries join from the left. The locations are marked with numbers 31 through 42, corresponding to the list below. The map uses solid lines for rivers and dashed lines for boundaries. Some areas are shaded with stippling, possibly indicating specific land use or features.
- 31. ETOBICOKE CREEK BELOW Q.E.W.
 - 32. REDHILL CREEK AT HAMILTON
 - 33. MISSISSAGI RIVER AT MISSISSAGI CHUTE
 - 34. SOUTH RIVER AT SOUTH RIVER
 - 35. GOULAIS RIVER NEAR SEARCHMOUNT
 - 36. WHITSON RIVER AT VAL CARON
 - 37. WHITSON RIVER AT CHELMSFORD
 - 38. CONSITON CREEK ABOVE WANAPITEI RIVER
 - 39. VERMILLION RIVER NEAR VAL CARON
 - 40. JUNCTION CREEK BELOW KELLY LAKE
 - 41. E. BRANCH SCOTCH RIVER
NR. ST. ISADORE
 - 42. S. NATION RIVER NEAR
PLANTAGENET SPRINGS

3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS

3.4 MAINTENANCE

1. BEAR CREEK NEAR PETROLIA - 32431P

Repairs were made to the sheet steel control. Geoweb and rip rap were installed to prevent bank erosion.

Cost: Salaries	\$ 472.32
Materials/Supplies	1,400.95
Meals/Lodging	176.50
Transportation	56.40
	<hr/>
TOTAL	\$ 2,106.17

2. MIMICO CREEK AT ISLINGTON - 32431P 32433F

The existing concrete weir which had collapsed due to erosion was removed. A new concrete weir was constructed fifty feet further downstream. Bank protection will be installed by the local Conservation Authority.

Cost: Salaries	\$ 1,209.50
Materials/Supplies	7,864.00
Meals/Lodging	120.30
Transportation	292.00
	<hr/>
TOTAL	\$ 9,485.80

3. THREE MILE CREEK AT MOUNT HOPE - 32494P

The Armco shelter was removed for installation at a new site. The stilling well and the well at Welland River near Mount Hope were filled with crushed stone. The Welland River shelter had been removed the previous year and a steel plate had been secured over the well.

Cost: Salaries	\$ 217.60
Materials/Supplies	540..5
Meals/Lodging	17.00
Transportation	27.50
	<hr/>
TOTAL	\$ 802.10

- 4. LUTTERAL CREEK NEAR OUSTIC
- 5. WYE RIVER AT WYEBRIDGE - 32494
- 6. MAD RIVER NEAR GLENCAIRN
- 7. CANAGAGIGUE CREEK NEAR FLORADALE

Shelters at the discontinued sites were removed. The wells were cut off below ground level and were filled with crushed stone.

Cost: Salaries	\$ 906.08
Materials/Supplies	817.30
Meals/Lodging	155.35
Transportation	132.50
	<hr/>
TOTAL	\$ 2,011.23

8. BAILEY CREEK NEAR BEETON - 32431P

The stilling well at this discontinued site was cut off below grade and filled with crushed stone. The cableway towers, cable, car and anchors were removed.

Cost: Salaries	\$	359.46
Materials/Supplies		150.00
Meals/Lodging		152.50
Transportation		53.25
		<hr/>
TOTAL	\$	715.21

9. DETROIT RIVER AT AMHERSTBURG - 32433F

The malfunctioning 750 watt baseboard heater was replaced.

Cost: Salaries	\$	120.00
Materials/Supplies		25.80
Meals/Lodging		20.90
Transportation		77.50
		<hr/>
TOTAL	\$	244.20

10. GEORGIAN BAY AT COLLINGWOOD - 32433F

The electrical service entrance to the shelter was replaced by an electrical contractor.

Cost: Salaries	\$	60.90
Materials/Supplies		875.00
Meals/Lodging		8.50
Transportation		20.00
		<hr/>
TOTAL	\$	964.40

11. LAKE ERIE AT PORT DOVER - 32433F

Repairs were carried out to the shelter door and frame.

Cost: Salaries	\$	194.64
Materials/Supplies		5.00
Meals/Lodging		17.00
Transportation		47.00
		<hr/>
TOTAL	\$	263.64

12. HIGHLAND CREEK NEAR WESTHILL - 32494

Concrete was placed on the washed out end and apron of the existing concrete weir.

Cost: Salaries	\$ 486.60
Materials/Supplies	691.00
Meals/Lodging	66.90
Transportation	97.00
	<hr/>
TOTAL	\$ 1,341.50

13. BEAR CREEK NEAR WILKESPORT - 32494

The Guelph type shelter was removed. The stilling well was cut off below grade and was filled with crushed stone. The hydro pole was removed.

Cost: Salaries	\$ 314.88
Materials/Supplies	115.00
Meals/Lodging	176.50
Transportation	56.40
	<hr/>
TOTAL	\$ 662.78

14. SHELTER VALLEY BROOK NEAR GRAFTON - 32494

The static tube was re-installed on the end of the lower intake pipe by using a pressure coupling.

Cost: Salaries	\$	120.00
Materials/Supplies		23.26
Meals/Lodging		8.50
Transportation		85.60
		<hr/>
TOTAL	\$	237.36

15. GORING DRAIN AT CONCESSION 13 - 32494

Concrete rubble was placed below and adjacent to the weir to arrest erosion.

Cost: Salaries	\$	168.57
Materials/Supplies		171.00
Meals/Lodging		8.50
Transportation		99.00
		<hr/>
TOTAL	\$	447.07

16. TURKEY CREEK AT WINDSOR - 32561P

Under contract a gate was installed in the chainlink fence in order to provide easy and safe access to the stream.

Cost: Salaries	\$.
Materials/Supplies		340.00
Meals/Lodging		.
Transportation		.
		<hr/>
TOTAL	\$	340.00

17. WANBUNO CREEK NEAR DORCHESTER - 32563

Brush was cleared from the gauge shelter and bridge area. A backhoe was used to improve channel conditions in the gauging area.

Cost: Salaries	\$	302.61
Materials/Supplies		273.00
Meals/Lodging		17.00
Transportation		50.00
		<hr/>
TOTAL	\$	642.61

NOTE: These projects were carried out by Hydrometric staff.

18. BEATTY SAUGEEN RIVER NEAR HOLSTEIN - 32562

Geoweb was used to stabilize the streambed and provide a low water control.

Cost: Salaries	\$ 302.61
Materials/Supplies	775.00
Meals/Lodging	17.00
Transportation	40.00

TOTAL \$ 1,134.61

19. STOKES RIVER NEAR FERNDAL - 32560

Geoweb was used to stabilize the streambed and provide a low water control.

Cost: Salaries	\$ 221.93
Materials/Supplies	766.00
Meals/Lodging	200.00
Transportation	80.00

TOTAL \$ 1,267.93

NOTE: These projects were carried out by Hydrometric staff.

20. CONESTOGO RIVER AT GLEN ALLEN - 32571

The wooden walkway leading to the gauge shelter was re-built.

Cost: Salaries	\$ 1,658.48
Materials/Supplies	1,619.22
Meals/Lodging	199.20
Transportation	192.00
	<hr/>
TOTAL	\$ 3,668.90

21. CATFISH CREEK NEAR SPARTA - 32573

Rip rap was placed below and on the ends of the weir to replace eroded material and to arrest further erosion.

Cost: Salaries	\$ 448.04
Materials/Supplies	2,627.81
Meals/Lodging	246.15
Transportation	88.00
	<hr/>
TOTAL	\$ 3,410.00

NOTE: These projects were carried out by Hydrometric staff.

22. MCKENZIE CREEK NEAR CALEDONIA - 32581

Wooden steps and railing were built and installed to provide easier access to the gauge shelter.

Cost: Salaries	\$ 453.92
Materials/Supplies	276.86
Meals/Lodging	34.00
Transportation	164.00
	<hr/>
TOTAL	\$ 928.78

23. NITH RIVER NEAR CANNING - 32582

Intermediate and toe rails were installed on both sides of an existing railing that is part of a 130 metre long metering/walkway bridge.

Cost: Salaries	\$ 756.83
Materials/Supplies	539.17
Meals/Lodging	51.00
Transportation	72.00
	<hr/>
TOTAL	\$ 1,419.00

NOTE: These projects were carried out by Hydrometric staff.

24. ALDER CREEK NEAR NEW DUNDEE - 32583

A backhoe was used to remove built up bed material from above the control. A retaining wall was constructed to protect the gauge shelter and well.

Cost: Salaries	\$ 375.33
Materials/Supplies	376.51
Meals/Lodging	25.50
Transportation	32.00
	<hr/>
TOTAL	\$ 809.34

25. KETTLE CREEK ABOVE ST. THOMAS - 32584

A backhoe was contracted to improve the metering section and to re-align the channel. Crushed rock was placed on the streambed in the wading section area.

Cost: Salaries	\$ 302.61
Materials/Supplies	1,228.87
Meals/Lodging	17.00
Transportation	44.00
	<hr/>
TOTAL	\$ 1,592.48

NOTE: These projects were carried out by Hydrometric staff.

26. BLACK RIVER NEAR WASHAGO - 32572

The upper and lower intakes were replaced and a heating cable was installed.

Cost: Salaries	\$ 677.94
Materials/Supplies	1,170.00
Meals/Lodging	499.50
Transportation	16.40
	<hr/>
TOTAL	\$ 2,363.84

27. BOB CREEK NEAR MINDEN - 32580

Fill was placed around the control to prevent leakage.

Cost: Salaries	\$ 232.00
Materials/Supplies	48.58
Meals/Lodging	17.00
Transportation	--
	<hr/>
TOTAL	\$ 297.58

NOTE: These projects were carried out by Hydrometric staff.

28. BURNLEY CREEK ABOVE WARKWORTH - 32588

A backhoe was contracted to assist in carrying out repairs to the lower intake pipe.

Cost: Salaries	\$	352.00
Materials/Supplies		185.77
Meals/Lodging		17.00
Transportation		--
		<hr/>
TOTAL	\$	554.77

29. EELS CREEK BELOW APSLEY - 32574

The existing heating cable was replaced with a pyrotenax unit.

Cost: Salaries	\$	67.00
Materials/Supplies		158.00
Meals/Lodging		8.50
Transportation		--
		<hr/>
TOTAL	\$	233.50

NOTE: These projects were carried out by Hydrometric staff.

30. OUSE RIVER NEAR WESTWOOD - 32575

Repairs were made to the concrete weir.

Cost: Salaries	\$ 215.00
Materials/Supplies	521.20
Meals/Lodging	17.00
Transportation	--
	<hr/>
TOTAL	\$ 753.20

31. ETOBICOKE CREEK BELOW Q.E.W. - 32577

Repairs were made to the concrete weir and the channel was modified to improve the collection of data. A pyrotenax heating cable was installed.

Cost: Salaries	\$ 1,241.50
Materials/Supplies	5,463.75
Meals/Lodging	93.50
Transportation	192.00
	<hr/>
TOTAL	\$ 6,990.75

NOTE: These projects were carried out by Hydrometric staff.

32. REDHILL CREEK AT HAMILTON - 32589

A backhoe was contracted to carry out repairs to the sheet steel control.

Cost: Salaries	\$ 135.00
Materials/Supplies	312.00
Meals/Lodging	8.50
Transportation	19.20
	<hr/>
TOTAL	\$ 474.70

33. MISSISSAGI RIVER AT MISSISSAGI CHUTE - 32541

The wooden frame gauge shelter was re-insulated and panelled. A contract was let to upgrade the electrical service.

Cost: Salaries	\$ 436.05
Materials/Supplies	597.66
Meals/Lodging	157.00
Transportation	126.00
	<hr/>
TOTAL	\$ 1,316.71

NOTE: These projects were carried out by Hydrometric staff.

34. SOUTH RIVER AT SOUTH RIVER - 32547

The stilling well was extended and insulated from grade level to the base of the look-in shelter.

Cost: Salaries	\$	436.30
Materials/Supplies		316.99
Meals/Lodging		34.00
Transportation		60.00
		<hr/>
TOTAL	\$	847.29

35. GOULAIS RIVER NEAR SEARCHMONT -

The stilling well was cut off at the shelter floor level and a new wooden floor was installed.

Cost: Salaries	\$	145.35
Materials/Supplies		119.58
Meals/Lodging		148.00
Transportation		31.50
		<hr/>
TOTAL	\$	444.43

NOTE: These projects were carried out by Hydrometric staff.

36. WHITSON RIVER AT VAL CARON - _____

The pyrotenax heating cable was replaced. New floor boards were installed over the well.

Cost: Salaries	\$	230.94
Materials/Supplies		271.96
Meals/Lodging		92.25
Transportation		33.70
		<hr/>
TOTAL	\$	628.85

37. WHITSON RIVER AT CHELMSFORD - _____

A new floor was installed over the well by using pressure treated lumber.

Cost: Salaries	\$	197.95
Materials/Supplies		47.61
Meals/Lodging		92.25
Transportation		33.70
		<hr/>
TOTAL	\$	371.51

NOTE: These projects were carried out by Hydrometric staff.

38. CONISTON CREEK ABOVE WANAPITEI RIVER - _____

The stilling well was cut off at the shelter floor level.
Insulation and floor boards were installed.

Cost: Salaries	\$	219.87
Materials/Supplies		108.92
Meals/Lodging		67.17
Transportation		28.40
		<hr/>
TOTAL	\$	424.36

39. VERMILLION RIVER NEAR VAL CARON - _____

The stilling well was cut off at the shelter floor level. Pressure
treated lumber was installed for floor boards over the well.

Cost: Salaries	\$	186.89
Materials/Supplies		78.22
Meals/Lodging		67.17
Transportation		28.40
		<hr/>
TOTAL	\$	360.68

NOTE: These projects were carried out by Hydrometric staff.

40. JUNCTION CREEK BELOW KELLEY LAKE -

The stilling well was cut off at the shelter floor level. Pressure treated lumber was installed for floor boards over the well.

Cost: Salaries	\$ 170.40
Materials/Supplies	78.26
Meals/Lodging	67.17
Transportation	28.40
	<hr/>
TOTAL	\$ 344.23

41. E.BRANCH SCOTCH RIVER NEAR ST.ISADORE DE PRESCOTT - 32557

Gabion baskets were installed to stabalize the stream bank adjacent to the stilling well. Rip-Rap was placed below the concrete weir.

Cost: Salaries	\$ 411.32
Materials/Supplies	682.00
Meals/Lodging	34.00
Transportation	53.60
	<hr/>
TOTAL	\$ 1,180.92

NOTE: These projects were carried out by Hydrometric staff.

42. S.NATION RIVER NEAR PLANTAGENET SPRINGS - 32553

A modified aluminum ladder was installed to provide access to the cableway platform.

Cost: Salaries	\$ 274.18
Materials/Supplies	702.46
Meals/Lodging	25.50
Transportation	53.60

TOTAL	<u>\$ 1,055.74</u>
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NOTE: This project was carried out by Hydrometric staff.

4.0 DESCRIPTION OF CONSTRUCTION METHODS AND PROCEDURES

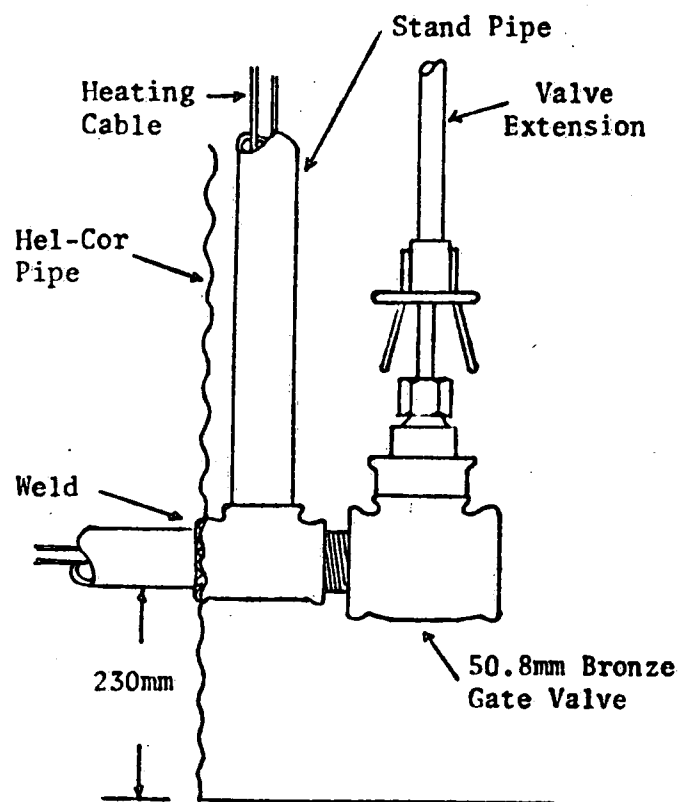
4.1 WELL CONSTRUCTION

STILLING WELLS FOR STREAMFLOW GAUGES

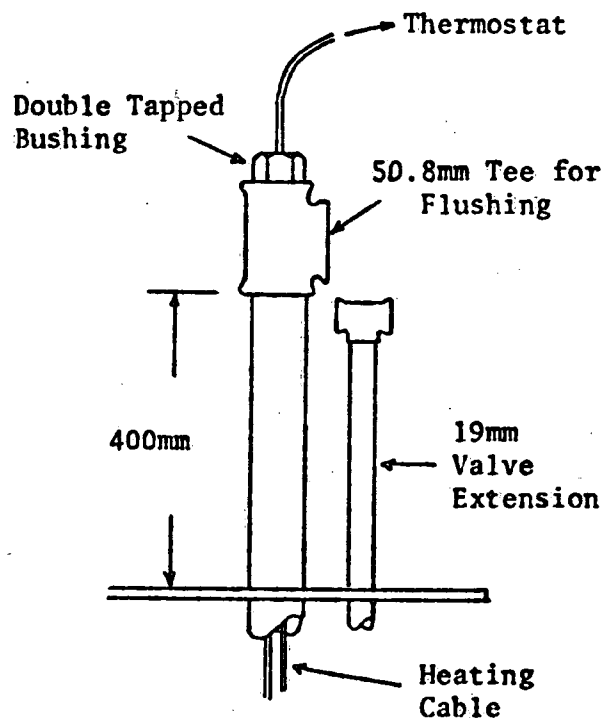
These are in-bank installations of 2.0 mm thickness (14 gauge), 800 mm diameter galvanized "Hel-Cor" pipe. The stilling well is fabricated at a welding shop at the Regional Headquarters and consists of welding in a 5 mm steel bottom and a 51 mm galvanized tee and coupling for attachment of intake pipes, gate valve and stand-pipe. (See Figure 11).

At the job site, while the excavating is underway, the lower intake, valve, valve handle extension and heating cable are attached to the well ready for installation. When the excavation is at the required depth, the complete well assembly, with the intake supported by 3 mm wire, is picked up by the excavating machine and lowered into the hole. The well is held plumb by guylines while the machine places backfill equally around the well. When the backfill reaches the 51 mm coupling, the upper intake is attached and supported by suitable timbers or posts to maintain a horizontal position while the rest of the fill is placed.

When the lower intake exceeds 20 M in length, additional sections of 6 M are connected from a boat or raft before the backfilling is started in order to lift the end of the 20 M length above the water surface to make these connections, after which normal backfilling takes place.



DETAIL "A"



DETAIL "B"

FIG. 11
INBANK STILLING WELL
WITH LOOK-IN SHELTER

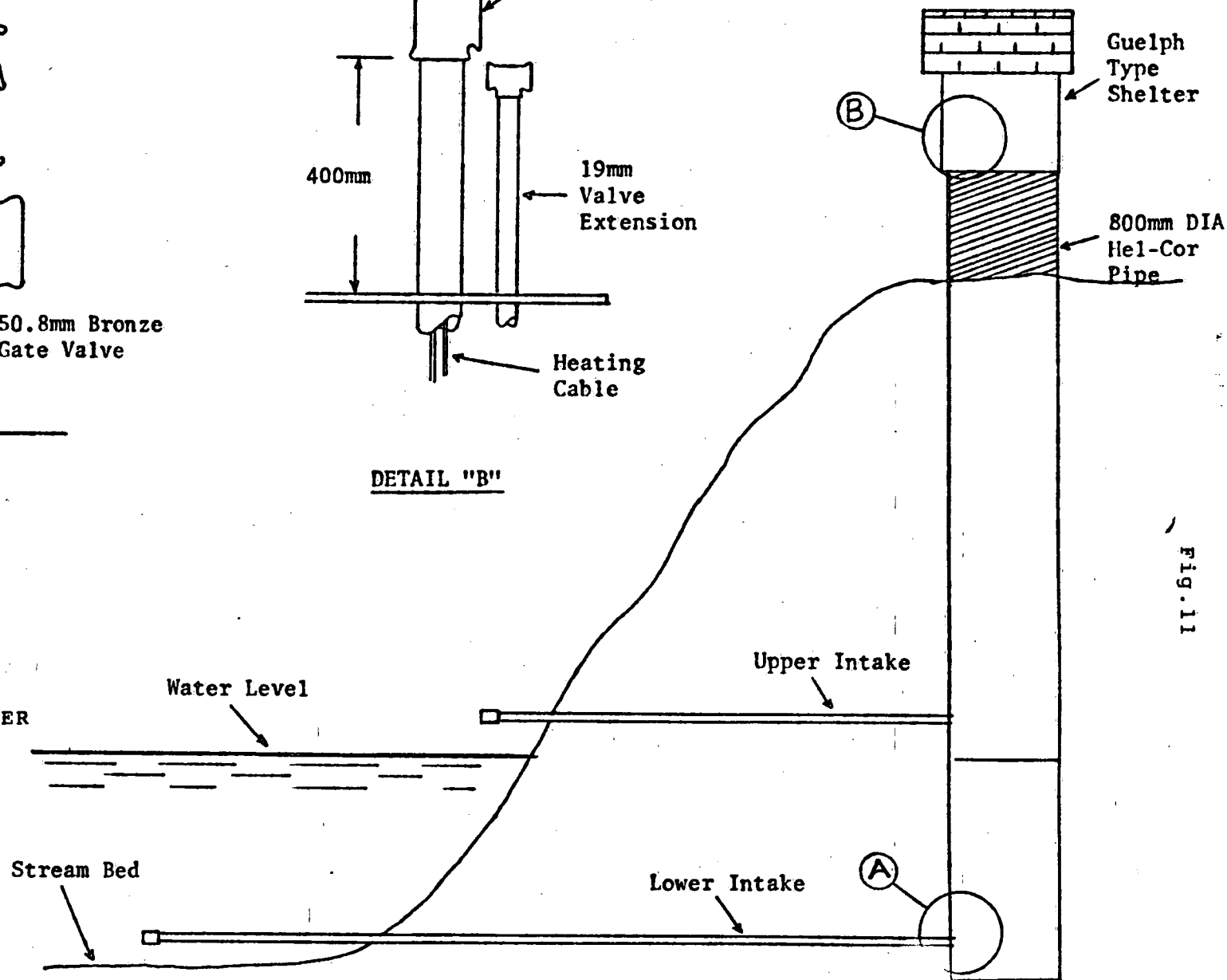


Fig. 11

If a concrete pad is to be poured for the erection of a walk-in shelter, all the backfill above the water line is compacted at 30 cm intervals with a mechanical tamper. (See Figure 12).

WALK-IN SHELTER FOR BUBBLE GAUGES

An "Armco" walk-in shelter mounted on a poured-in-place concrete pad is used for the installation of stacom servomanometer.

The bubble tube is buried in the bank and supported in the river inside a length of steel conduit. This conduit is buried in the bank at one end and fastened securely to two steel fence posts driven into the river bottom or other anchoring structure. (See Figure 13).

STILLING WELLS FOR TIDES AND WATER LEVEL GAUGES

This type is fabricated by welding a 900 mm diameter and a 1600 mm diameter galvanized "Hel-Cor" pipe to a common 5 mm steel bottom. A 1.5 M long 51 mm diameter intake pipe is attached to a 51 mm gate valve and stand-pipe. (See Figure 14).

The stilling well is lowered over the side of the dock and while resting plumb and evenly on the bottom it is secured to the dock by a cable while the top is formed to accommodate an "Armco" house. Concrete is placed and fills the 35 cm space between the two pipes from the bottom of the well to the top of the formwork.

FIG. 12

INBANK STILLING WELL
WITH WALK-IN SHELTER

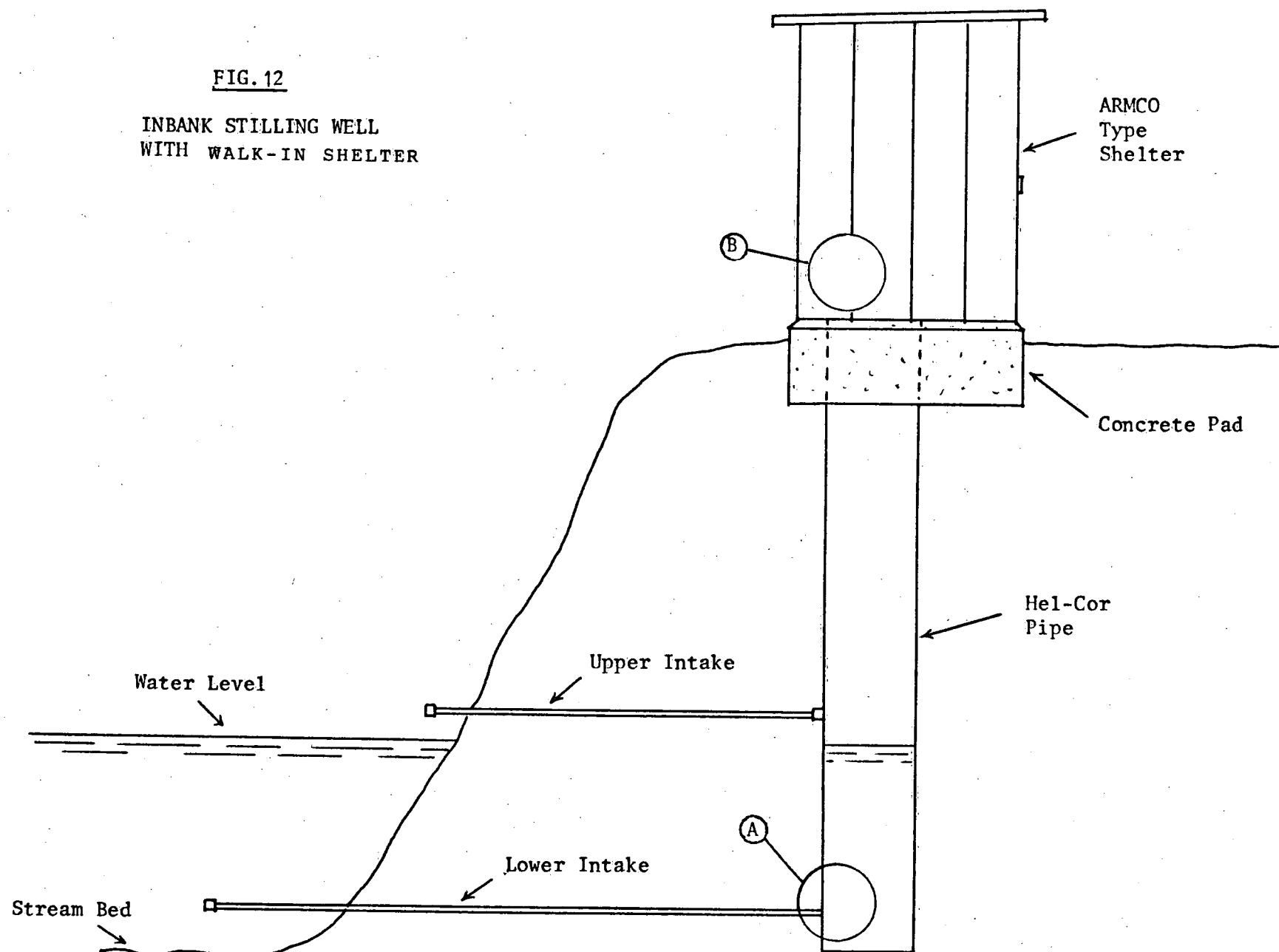


FIG. 13

STACOM SERVOMANOMETER GAUGE
INSTALLATION

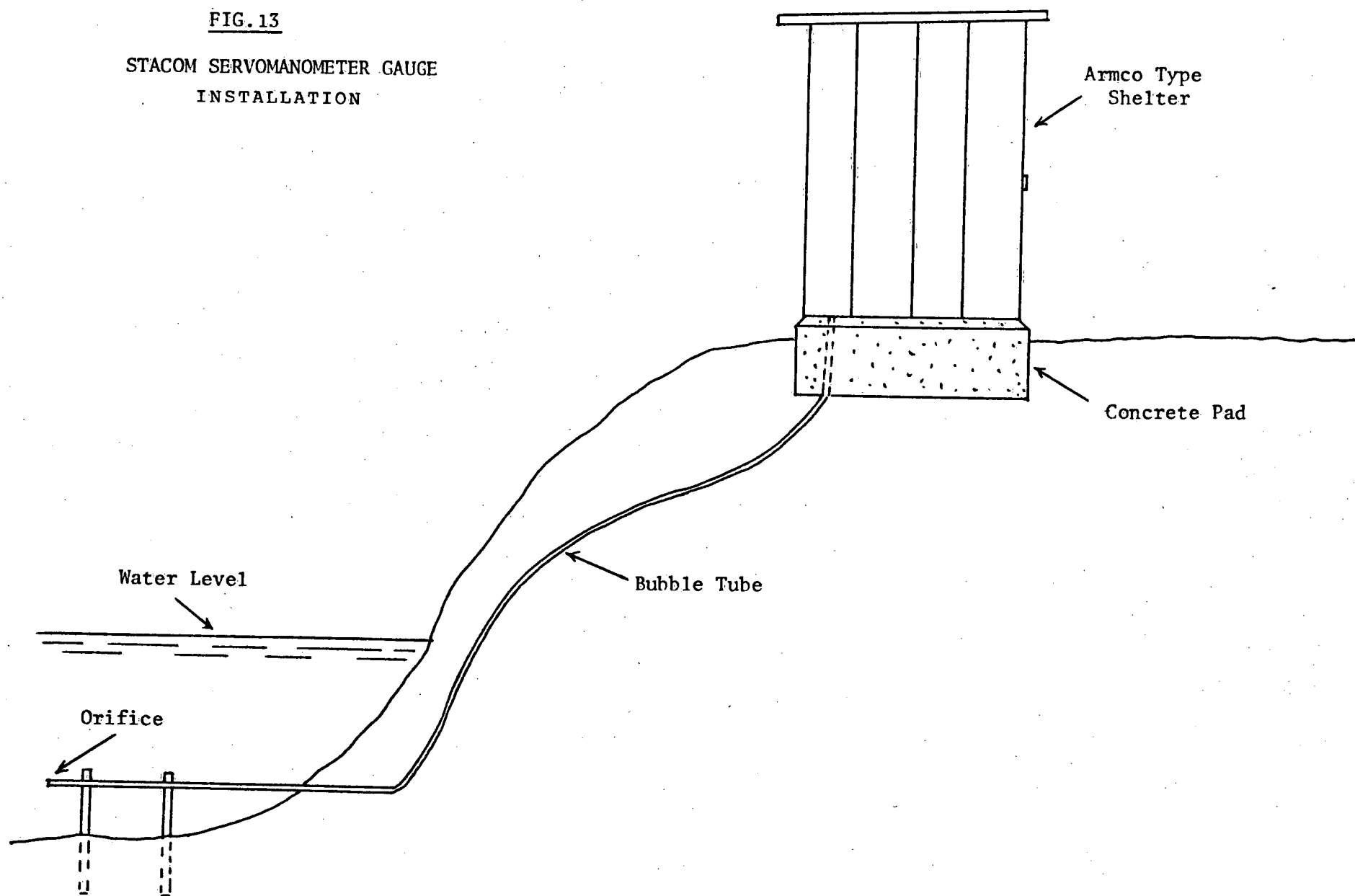
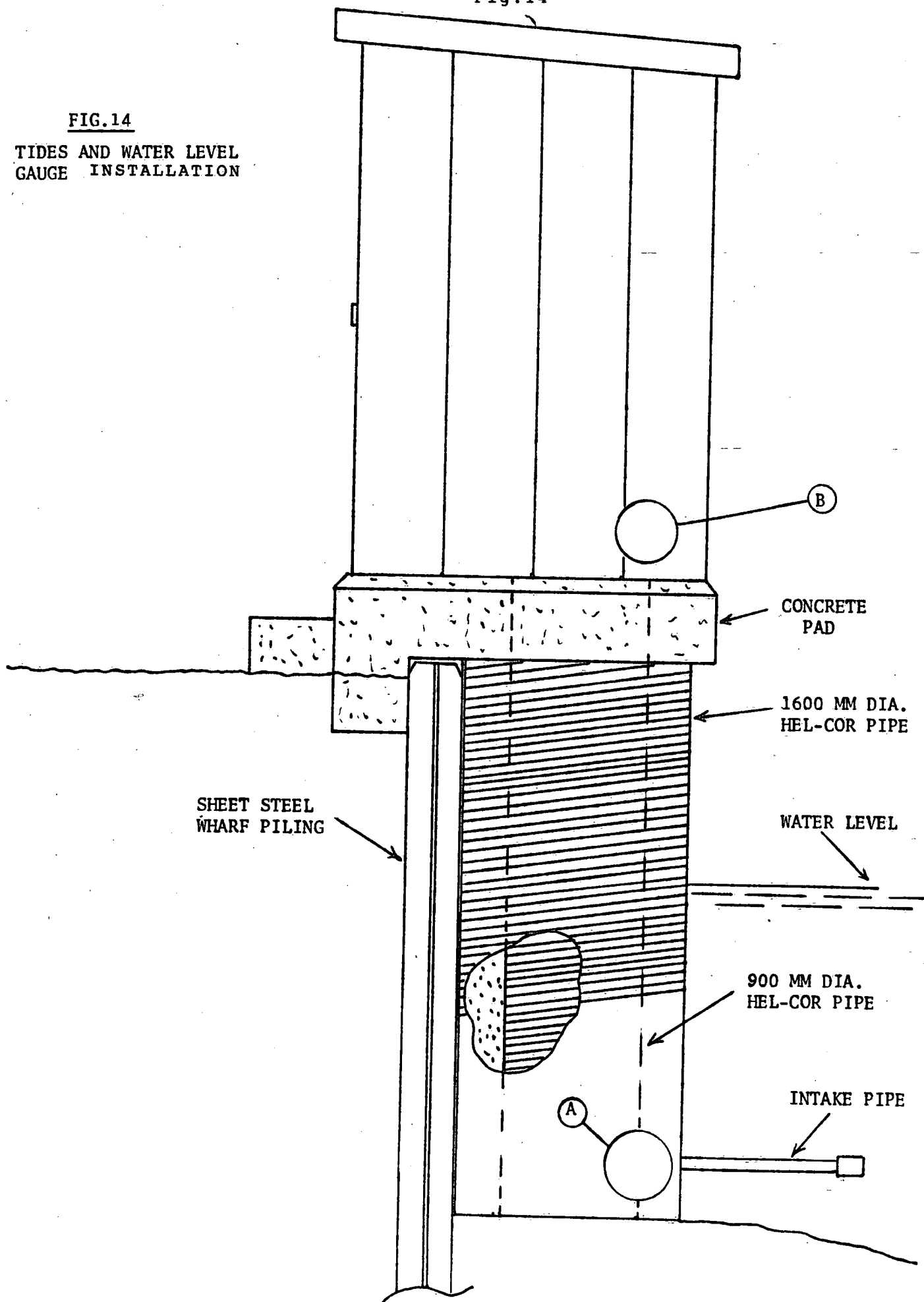


Fig. 13

FIG.14
TIDES AND WATER LEVEL
GAUGE INSTALLATION



4.2 INLET SYSTEMS

LOWER INTAKE (ACTIVE)

The lower intake is a 51 mm diameter galvanized steel pipe screwed into a 51 mm galvanized steel tee that is welded onto the inside of the well 230 mm up from the bottom which allows room to screw the 51 mm bronze gate valve on the inside and also leaves a 230 mm sediment sump at the bottom of the well. A pyrotenax heating cable of suitable length is installed from the end of this intake up the stand-pipe through a 51 mm x 13 mm x 13 mm double tapped bushing and connected to a number 4688 "Pyrotenax" thermostat (where electricity is available). The length of this lower intake is determined by the distance the stilling well is set back from the water's edge and may vary from 3 M to 36 M or longer.

UPPER INTAKE (AUXILIARY)

The upper intake is a 51 mm galvanized steel pipe screwed into a 51 mm galvanized coupling that is welded onto the outside of the stilling well at a distance above the lower intake to be about 15 cm above the winter ice cover level.

FLUSHING

Flushing of the active intake is accomplished by attaching the discharge hose of a gasoline driven pump to the 51 mm tee at the top of the stand-pipe and with the valve in the well closed forcing water under pressure through intake system.

4.3 INSTRUMENT SHELTERS

LOOK-IN SHELTER

The standard Guelph-type look-in shelter is installed at all sites where the instrumentation consists of the Stevens A-71 analogue recorder. An aluminum look-in shelter has been designed and fabricated for installation that requires an analogue recorder and a data logger. The shelter is constructed of 6 mm high strength aluminum which provides good protection from vandalism. The interior is insulated with rigid or sprayed insulation and a wooden floor is installed over the well to facilitate instrument placement. Both shelters are mounted on an 800 mm diameter stilling well.

Where electricity is available, a 30 ampere service is installed with well heating cable and thermostat, light, and outlets. Propane "Cata-Dyne" heaters are used at stations where electricity is not available.

WALK-IN SHELTERS

Armco metal buildings from 1,626 mm X 1,626 mm X 2,438 mm to 4,876 mm X 3,658 mm X 2,438 mm in size are used at all sites requiring room for several instruments and/or personnel accommodation. These buildings are insulated, panelled, and where electricity is available, provided with a 60 ampere service complete with well heaters, baseboard heaters, thermostats, lights and outlets. Propane heaters or wood stoves are used where power is not available.

SEDIMENT SHELTERS

Bridge mounted manual sediment sampling equipment is housed in the Guelph-type sediment sampler shelter.

4.4 ARTIFICIAL CONTROLS AND WEIRS

STEEL

Most controls are made from Armco steel sheeting type M581, 690 mm in width, 5 mm thick available in lengths from 1.83 M to 4.88 M.

The sections are cut and pointed on the job and driven into the stream bed with a hand operated pneumatic pile driver. The top is trimmed by flame cutting to approximately a 5 percent grade from the centre to each side and rip-rapped on the downstream side to prevent erosion.

CONCRETE

Some concrete controls and weirs of various design are constructed. They may be formed or free-formed and poured-in-place in the stream bed.

TIMBER

Some timber controls used on small streams are constructed of preservative treated planks and plywood.

4.5 CABLEWAYS

WIRE ROPE

6 X 19 Independent Wire Rope Core right regular lay, preformed, galvanized, improved plow steel wire rope of 19 mm or 22 mm diameter, depending on the span, is used on most installations. Spelter or swaged sockets are installed on the ends of the wire rope at the factory.

Tower backstays are of 10 mm or 13 mm guy strand and attached by means of preformed guy strips or cable clips.

TOWERS

The cable is supported on "A" towers made from 203 mm X 203 mm preservative treated timbers mounted on concrete pedestals or 101 mm X 101 mm galvanized "H" beams (19.35 kg/m wide flange) resting on a concrete footing or steel pad. Wooden or steel landing platforms are constructed where required.

ANCHORS

The cable is anchored at each end to a poured-in-place concrete block, rock anchor or steel deadman and equipped at one end with a turnbuckle for adjustment of sag.

CABLE CARS

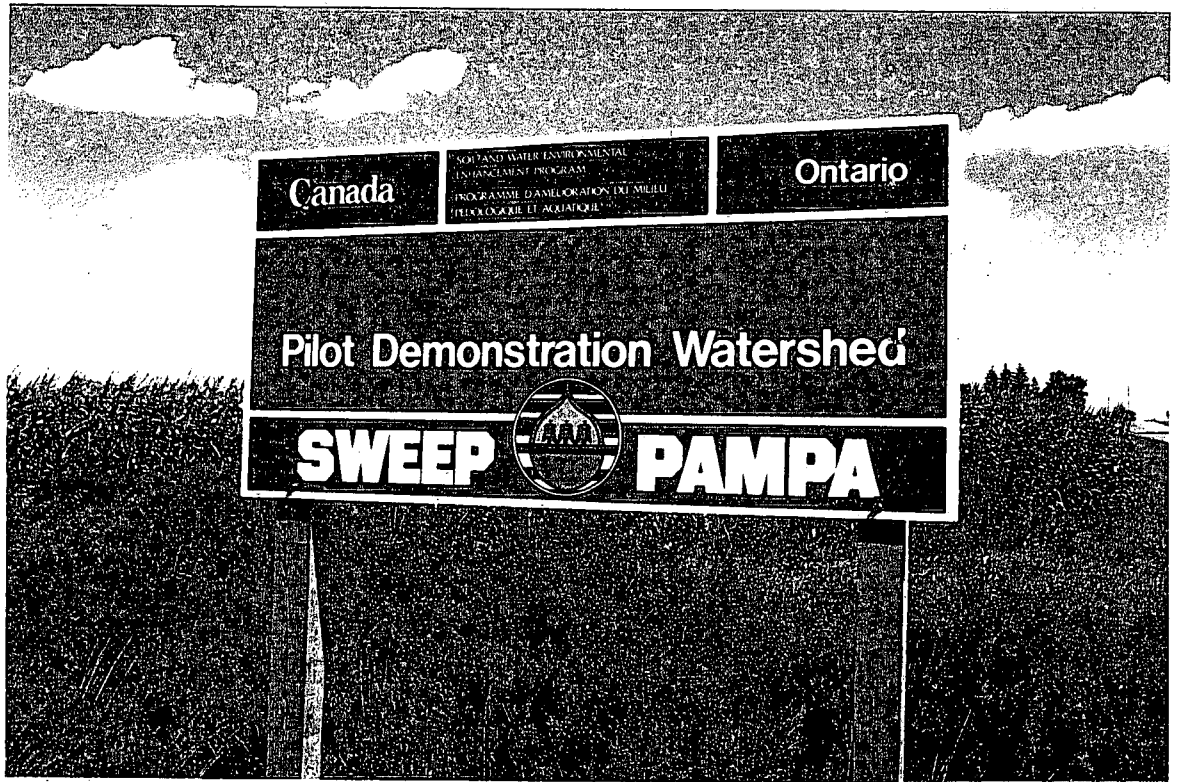
Cable cars are two-man sit-down design constructed of aluminum or galvanized steel and plywood and equipped with safety finger guards.

AIRCRAFT WARNING MARKERS

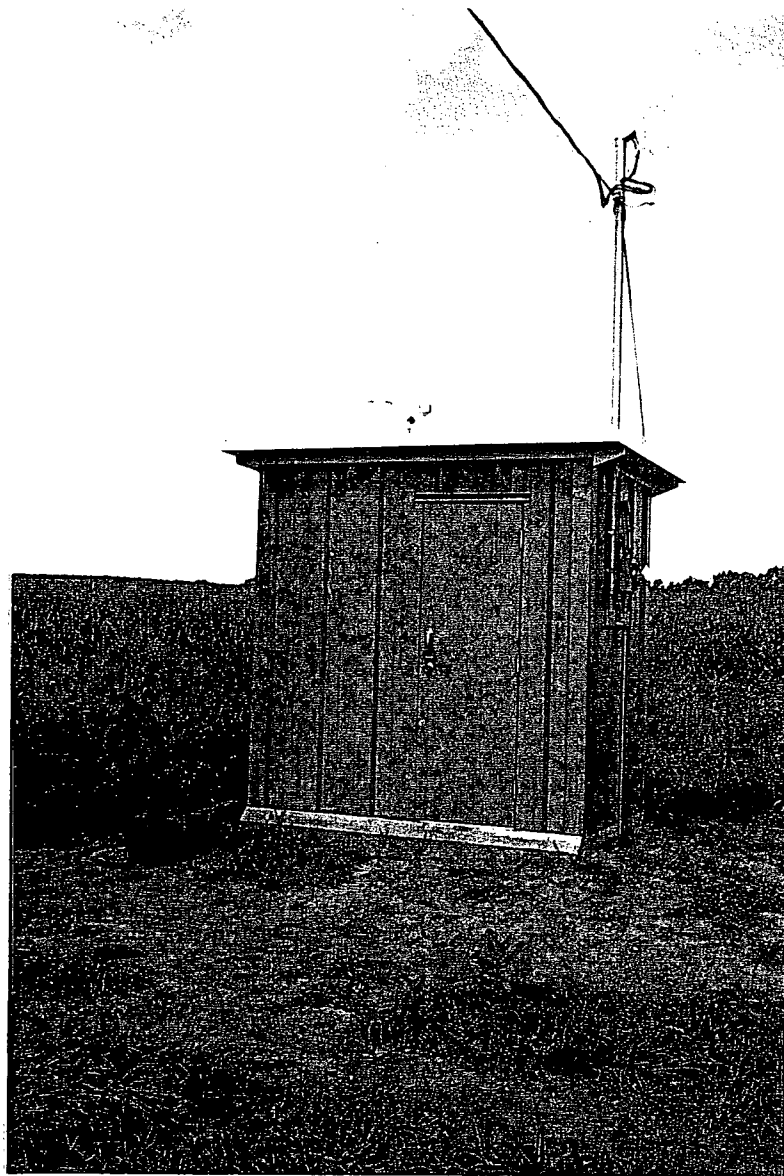
Where required, Department of Transport approved international orange coloured, spherical shaped aircraft warning markers are suspended on separate 10 mm wire rope cable above the main cable. Cable towers are also painted international orange and white to Department of Transport specifications.

FITTINGS

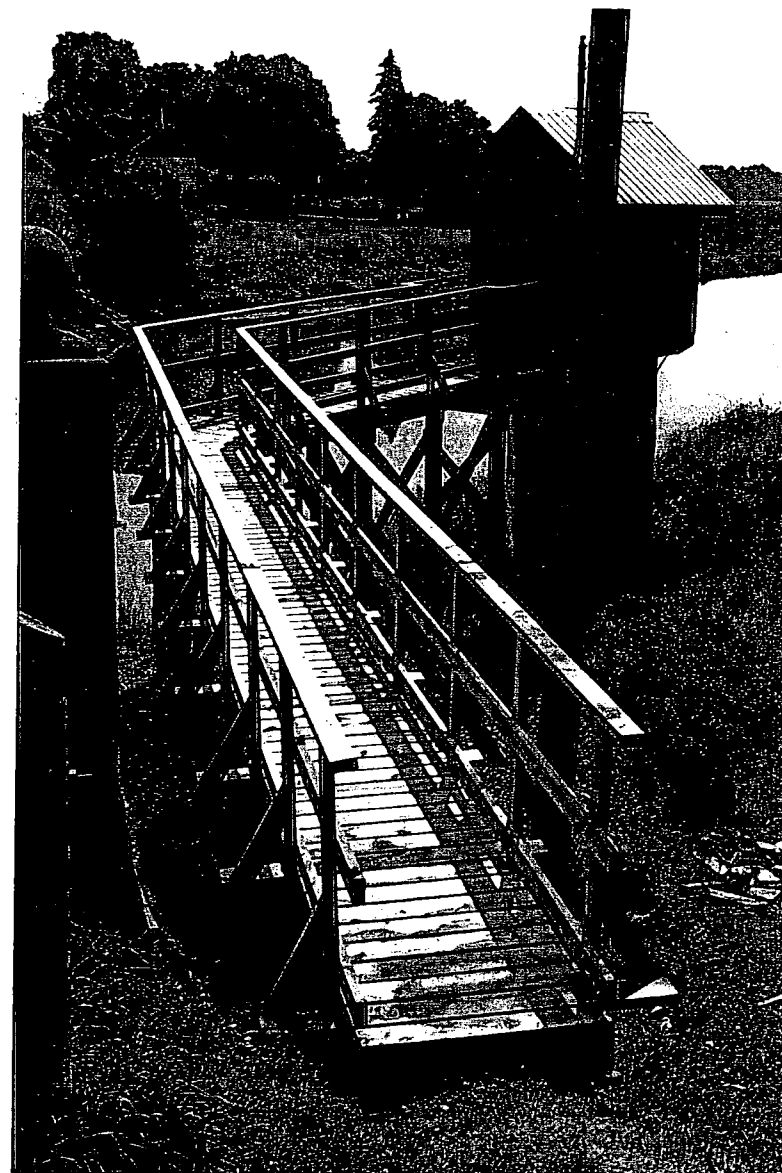
Sockets, turnbuckles, thimbles, shackles, saddles, sheaves, wire rope clips and all other metal parts are hot-dipped galvanized.



TYPICAL SIGN AND "V" NOTCH WEIR
FOR SWEEP WATERSHEDS



TYPICAL SWEEP SHELTER



REBUILT WOODEN WALKWAY

Environment Canada Library, Burlington



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