

WATER SURVEY OF CANADA  
CALGARY DISTRICT OFFICE

LIBRARY COPY

DO NOT REMOVE

ALBERTA  
GAUGING STATION  
CONSTRUCTION AND MAINTENANCE  
ANNUAL REPORT  
1992-93

By: L.W. Whitnack  
Construction Head  
Revised: March 5, 1994

TABLE OF CONTENTS

1.0	INTRODUCTION . . . . .	1
2.0	COST-SHARING ARRANGEMENTS . . . . .	2
3.0	THE 1992/93 CONSTRUCTION PROGRAM . . . . .	3
3.1	Distribution of Costs . . . . .	3
3.2	Specific Costs and Site Locations . . . . .	3
	Table 1 - 1992/93 Construction Projects and Cost Distribution . . . . .	4
	Table 2 - Construction Costs . . . . .	5
	Table 3 - Power Installation Costs . . . . .	6
	Figure 1 - Station Locator Map . . . . .	7
3.3	Summary of Maintenance Vote Costs . . . . .	8
	Table 4 - Construction and Maintenance Expenditures Tabulated by Vote . . . . .	8
3.4	Typical Costs . . . . .	9
	Table 5 - Typical Costs of Gauging Station Installation and Equipment . . . . .	9
4.0	STATION COST BREAKDOWN . . . . .	10
4.1	Definitions . . . . .	10
4.2	Site Specific Cost Breakdowns . . . . .	11
	4.2.1 Federal-Provincial (FP) . . . . .	11
	4.2.2 Federal (F) . . . . .	20
	4.2.3 Provincial . . . . .	21
APPENDIX	. . . . .	24
	DESCRIPTION OF CONSTRUCTION PRACTICES . . . . .	25
	PHOTOGRAPHS . . . . .	30
	ENVIRONMENTAL PRE-SCREENING . . . . .	32

## 1.0 INTRODUCTION

Annual gauging station construction reports have been prepared by the Alberta District, Water Survey of Canada Division since 1949. These reports contain financial and construction details for all projects. This report is for the fiscal year April 1, 1992 to March 31, 1993.

The contents of this report include a summary of expenditures incurred during 1992/93 for new station construction, for normal maintenance, and for electrical power installations.

The report also contains details on work performed and expenditures at each site. Cost breakdowns are grouped by gauging station designation; Federal-Provincial, Federal, and Provincial.

Brief descriptions of construction practices, material and equipment are presented in the Appendix. Also in the Appendix are photographs of some of the projects carried out during the year. The Appendix also contains environmental pre-screening forms.

## 2.0 COST-SHARING ARRANGEMENTS

The 1992/93 construction and maintenance program between Canada and the Province of Alberta is managed under the Memorandum of Agreement for hydrometric surveys signed by both governments on April 15, 1975. The annual construction programs established via a joint consultative process between Alberta Environment and Environment Canada.

Under the terms of the agreement each gauging station is designated as Federal, Federal-Provincial or Provincial by a Co-ordinating Committee. Maintenance, power installation upgrading or new construction costs are shared according to the designation of the hydrometric gauging station.

Costs chargeable to the construction program are defined in the Memorandum of Agreement and Schedule B of the agreement. In summary, direct costs such as salaries of construction personnel, field travel expenses, vehicle operation costs, construction materials, contract payments for services and depreciation of construction equipment are chargeable. Stations designated as Federal are the cost responsibility of the Water Survey of Canada; stations designated as Federal-Provincial are cost-shared equally; and stations designated as Provincial are the cost responsibility of the Province of Alberta. The exceptions relate to equipment and instrumentation whereby, under Article VII of the Memorandum of Agreement, the operating agency is responsible for providing and paying the total cost of the basic water level recording equipment. However, beginning with 1983/84, manometer gauges have not been considered to be water level recording equipment and are shared according to designation. Specialized equipment and/or instrumentation is paid for by the party or parties requiring the service.



### 3.0 THE 1992/93 CONSTRUCTION PROGRAM

One new gauging station, Modeste Creek below Buck Lake Creek, was constructed during 1992/93. This site was constructed to house instruments supplied by Alberta Environment at the request of the City of Edmonton.

In all, maintenance was carried out at 41 gauging stations.

This maintenance consisted of the following:

- Removal of 3 stations
- Relocation of 3 stations
- Upgrading of 3 stations
- Installation of a cableway at 1 station
- Cableway repairs at 16 stations
- Minor maintenance at 15 sites

In addition to the normal construction and maintenance program, the decision was made to upgrade the gauging station network by installing electric power at a number of sites. The installation of electric power at a gauging station reduces the incidence of record loss, eases the manual work effort of the field technician and, in general, improves the efficiency of operation. In all, electric power was installed at 6 sites in 1992/93, bringing the total power installations at gauging stations in the Alberta District to 134 sites.

#### 3.1 Distribution of Costs

Table 1, which follows, contains a summary of costs and the numbers of construction projects according to gauging station designation. The costs in Table 1 include instrumentation and supervision, but do not include costs for depreciation.

#### 3.2 Specific Costs and Site Locations

Table 2 contains information on construction costs for each specific site and Figure 1 is a map showing the general location of each of the projects.

New construction in the table and on the map is represented by the letter "C" and normal maintenance by the letter "M". Electrical installation is represented by the letter "E".

**TABLE 1**

**1992/93 CONSTRUCTION PROJECTS AND COSTS**

TYPE	NUMBER OF STATIONS	DESIGNATION	COST
New Gauging Stations	1	Private	\$2,982.79
<b>SUB TOTAL</b>	<b>1</b>		<b>\$2,982.79</b>
<b>NORMAL MAINTENANCE</b>	<b>30</b>	<b>Federal/Provincial</b>	<b>\$71,206.68</b>
	3	Federal	\$9,090.42
		Other Federal *	\$2,500.00
	8	Provincial	\$14,002.27
<b>Sub Total</b>	<b>41</b>		<b>\$96,799.37</b>
<b>TOTAL</b>	<b>42</b>		<b>\$99,782.16</b>

\* Recorder for Provincial station.

TABLE 2  
CONSTRUCTION COSTS

STATION		TOTAL COST	INSTRUMENTATION		CONSTRUCTION		OTHER
			PROVINCIAL	FEDERAL	PROVINCIAL	FEDERAL	
<b>FEDERAL/PROVINCIAL</b>							
M-01	Alkali Cr. near the Mouth	05CK005	\$1,482.21			\$731.11	\$731.11
M-02	Beaver River near Goodridge	06AA001	\$1,965.49			\$982.75	\$982.75
M-03	Berland River near the Mouth	07AC007	\$885.12			\$442.56	\$442.56
M-04	Brazeau River below Cardinal River	05DD007	\$1,005.82			\$502.91	\$502.91
M-05	Cataract Cr. near Forestry Road	05BL022	\$492.20			\$246.10	\$246.10
M-06	Clearwater River above Limestone Creek	05DB003	\$458.74			\$229.37	\$229.37
M-07	Crowsnest River at Frank	05AA008	\$1,806.72			\$903.36	\$903.36
M-08	Deer Cr. Main Stem near Sundre	05CA003	\$1,158.53			\$579.77	\$579.77
M-09	Eunice Creek near Hinton	07AF005	\$2,011.88			\$1,005.93	\$1,005.93
M-10	Firebag River near the Mouth	07DC001	\$150.00			\$75.00	\$75.00
M-11	Freeman River near Fort Assiniboine	07AH001	\$7,098.33		\$2,500.00	\$2,298.17	\$2,298.17
M-12	James River near Sundre	05CA002	\$5,980.34			\$2,980.17	\$2,980.17
M-13	Jumpingpound Cr. near the Mouth	05BH009	\$118.07			\$59.04	\$59.04
M-14	Kaloxa River near Grande Prairie	07GB002	\$3,807.17			\$1,903.59	\$1,903.59
M-15	Kneehills Cr. near Drumheller	05CE002	\$192.21			\$96.11	\$96.11
M-16	Little Smoky River near Guy	07GH002	\$873.12			\$436.56	\$436.56
M-17	Lloyd Cr. near Bluffton	05CC008	\$2,380.81			\$1,180.31	\$1,180.31
M-18	McLeod River above Emberss River	07AF002	\$2,930.91			\$1,465.46	\$1,465.46
M-19	McGilvary Cr. at Coleman	05AA013	\$885.26			\$442.63	\$442.63
M-20	Muskog River near Grande Cache	07GA002	\$1,081.84			\$540.92	\$540.92
M-21	North Ram River at Forestry Road	05DC011	\$2,459.33			\$1,229.67	\$1,229.67
M-22	Oldman River near Brocket	05AA024	\$7,513.10			\$3,756.55	\$3,756.55
M-23	Ray Cr. near Innisfail	05CE010	\$3,491.85			\$1,745.93	\$1,745.93
M-24	Red Deer River at Drumheller	05CE001	\$3,787.80			\$1,883.90	\$1,883.90
M-25	Redearth Cr. near Redearth	07JC002	\$1,223.47			\$611.74	\$611.74
M-26	Threepoint Cr. near Millarville	05BL013	\$11,248.28		\$2,500.00	\$4,374.14	\$4,374.14
M-27	Wainscott Coulee near Brownvale	07FD014	\$224.70			\$112.35	\$112.35
M-28	Whitemud River near Dortonville	07HA005	\$493.26			\$246.63	\$246.63
M-29	Wildhay River near Hinton	07AC001	\$3,107.91			\$1,553.96	\$1,553.96
M-30	Willow Cr. above Chain Lakes	05AB028	\$473.43			\$236.72	\$236.72
TOTAL F/P MAINTENANCE COSTS.....			\$71,206.68	\$5,000.00		\$33,103.34	\$33,103.34
<b>FEDERAL</b>							
M-31	E.J.D. Main Br. Canal near Bassano	05CJ013	\$2,575.95				\$2,575.95
M-32	E.J.D. North Br. Canal near Bassano	05CJ001	\$5,621.08				\$5,621.08
M-33	W.I.D. Canal near Chestermere Lake	05EM003	\$893.39				\$893.39
TOTAL FEDERAL MAINTENANCE COSTS			\$9,090.42				\$9,090.42
<b>PROVINCIAL</b>							
M-34	Buffalo Lake near Erskine	05CD005	\$8,870.13		\$2,500.00	\$6,170.13	
M-35	Elbow River above Elbow Falls	05BJ006	\$873.47			\$873.47	
M-36	Elder Creek at Highway 686	07HB002	\$671.14			\$671.14	
M-37	Little Smoky Rr. at Little Smoky	07GG002	\$866.12			\$866.12	
M-38	McLeod River near Whitscourt	07AG004	\$875.51			\$875.51	
M-39	Ministik Lake near New Sarepta	05EB013	\$2,393.73			\$2,393.73	
M-40	Pembina River near Entwistle	07BB002	\$1,979.11			\$1,979.11	
M-41	Willow Cr. below Lane Creek	05AB039	\$373.08			\$373.08	
TOTAL PROVINCIAL MAINTENANCE COSTS			\$16,502.27	\$2,500.00		\$14,002.27	
<b>PRIVATE</b>							
C-1	Modeste Cr. below Buck Lake Creek	?	\$2,982.79				\$2,982.79
TOTAL PRIVATE CONSTRUCTION COSTS			\$2,982.79				\$2,982.79
TOTAL COST OF CONSTRUCTION AND MAINTENANCE			\$99,782.18	\$0.00	\$7,500.00	\$47,105.61	\$42,183.78

TABLE 3

Power Installation Costs 1992/93

STATION	Power Company Installation Costs	Wiring Costs	Share	
			Prov.	Federal
<u>Federal-Provincial</u>				
E1 Bigknife Cr. nr. Gadsby 05FC002	\$ 1094.61	\$ 695.50		
E2 Ray Cr. nr. Innisfail 05CE010	\$ 2623.64	\$ 695.50		
E3 Ribstone Cr. nr. Edgerton 05FD001	\$ 1968.80	\$ 807.85		
<u>SUB - TOTAL</u>	<u>\$ 5687.05</u>	<u>\$2198.85</u>		<u>\$ 7885.90</u>
<u>Federal</u>				
E4 Lesser Slave River at Slave Lake 07BK001	\$ 255.00	\$ 450.00		
<u>SUB - TOTAL</u>	<u>\$ 255.00</u>	<u>\$ 450.00</u>		<u>\$ 705.00</u>
<u>Provincial</u>				
E5 Coyote Cr. nr. Cherhill 07BB014	\$ 0.00	\$ 998.31		
E6 Killarney Lake Trib. near Chavin 05GA010	\$ 1647.90	\$ 807.85		
<u>SUB - TOTAL</u>	<u>\$ 1647.90</u>	<u>\$1806.16</u>		<u>\$ 3454.06</u>
<u>TOTAL</u>	<u>\$ 7589.95</u>	<u>\$4455.01</u>		<u>\$12044.96</u>

NOTE: POWER INSTALLATIONS IN 1992/93 WERE ENTIRELY PAID BY THE FEDERAL GOVERNMENT.

2

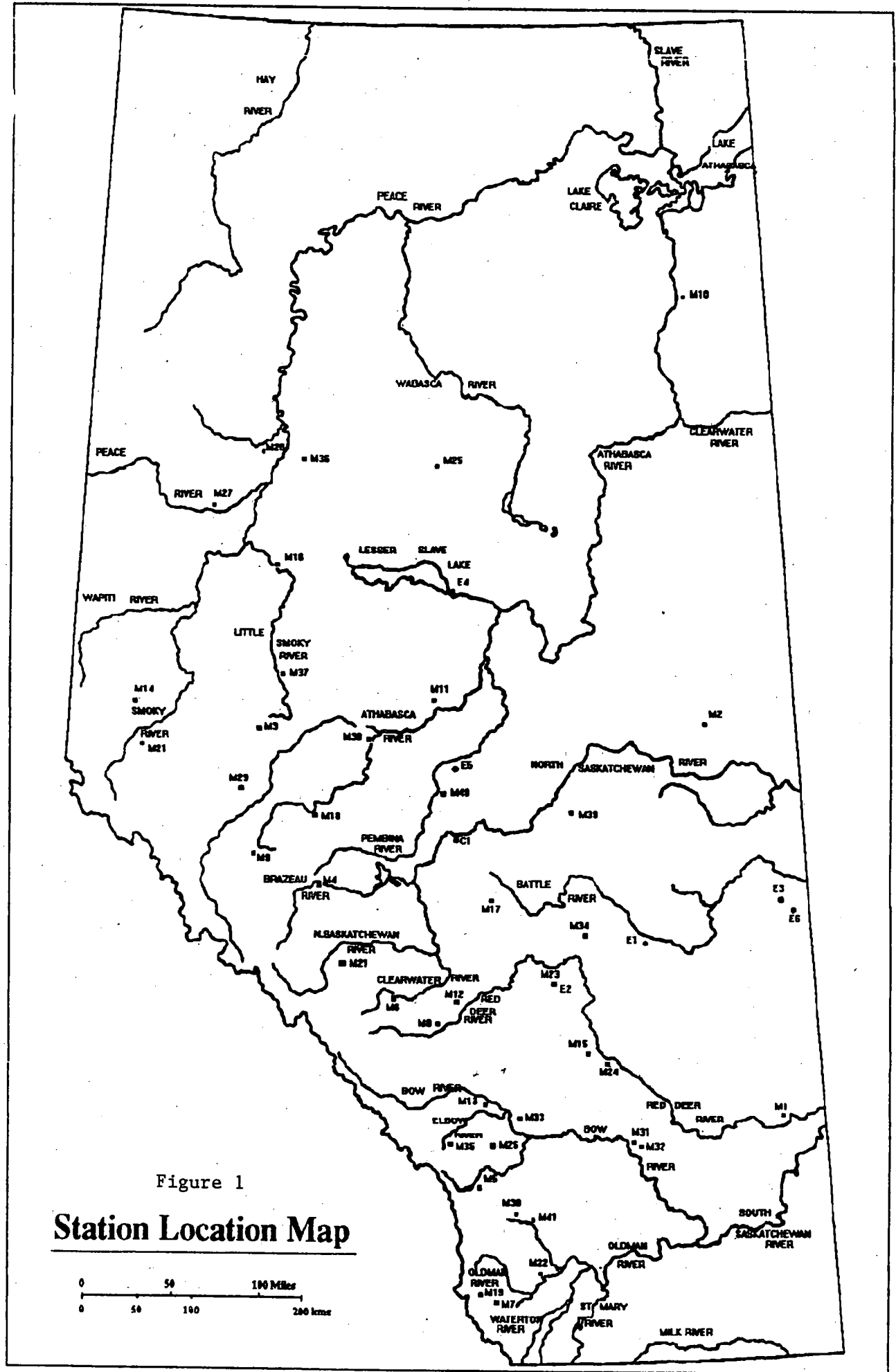
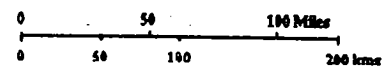


Figure 1

# Station Location Map



3.3 Summary of Maintenance Vote Costs

Utilizing the specific expenditures for each station described in Chapter 4, a total vote (i.e., Capital, Salary, O&M) expenditure is provided for each hydrometric station designation in Table 4 which follows.

**TABLE 4**  
**1992/93 CONSTRUCTION AND MAINTENANCE EXPENDITURES**  
**TABULATED BY VOTE**

STATION DESIGNATION	TOTAL COSTS			
	CONSTRUCTION CAPITAL	INSTRUMENTATION CAPITAL	O&M	SALARY
Federal-Provincial Maintenance	\$26,671.54	\$5,000.00	\$15,829.55	\$23,705.59
Private Construction	\$1,588.89		\$650.22	\$743.68
Federal Maintenance	\$5,847.32		\$684.10	\$2,559.00
Provincial Maintenance	\$4,184.58	\$2,500.00	\$4,051.75	\$5,765.94
<b>TOTALS</b>	<b>\$38,292.33</b>	<b>\$7,500.00</b>	<b>\$21,215.62</b>	<b>\$32,774.21</b>

Recorder provided by Federal funding

### 3.4 Typical Costs

Table 5 indicates the average cost of various types of installations without instruments, for stations installed in Alberta during 1992/93. Costs are for standard access sites. Remote installation costs would be approximately double the cost shown. This table also provides a breakdown of the costs of various types of frequently used instrumentation.

TABLE 5

#### TYPICAL COSTS OF GAUGING STATION INSTALLATIONS AND EQUIPMENT

ITEM	AVERAGE COST
Insulated steel shelter 1.63m x 1.63m x 2.44m on wooden base for manometer installation	\$ 2,390.00
Gauge well 2.44m x 1.52m dia. with 1.63m x 1.63 x 2.44 standard steel shelter	\$ 4,200.00
Cableway 40m span with two 1.83m A-Frames	\$ 3,090.00
Recorder A-71	\$ 2,500.00
Manometer 10.67m stage	\$ 4,273.00
Boat	\$ 800.00
Fluid Gauge (new small type)	\$ 6,654.00
Data Collection Platform (complete)	\$ 7,268.00
Electric Contact Gauge	\$ 135.00
Wire Weight Gauge	\$ 500.00
Steel Shelter 1.63m x 1.63m x 2.44m	\$ 1,075.00

4.0 STATION COST BREAKDOWN

4.1 Definitions

The following are definitions and/or lists of items included in this report.

Labour:	The cost includes salaries for the construction foreman, assistant and actual on-site time for the construction supervisor. Salaries of hydrometric staff are not included.
Board:	Construction Head's, Foreman's and assistant's room, meals, incidentals, etc.
Materials, Supplies Contracts:	Culvert, shelter, lumber, pipe, and cement, gravel, freight cable, hardware, etc.  Electric power installation poles, wire, service connection.  Equipment rental - boat, truck, etc.  Aircraft charter.  Excavation: rental of backhoe, bulldozer, dragline, etc.  Telephone installation.  Concrete, etc.
Equipment:	Stevens A-71 recorder (weight, negator, electric).  Manometer (10.67 or 15.24m), including servocontrol, etc.  Telemark & adapter (Code-a-Phone).  Electric contact gauge.  Heating unit (stove, pipes, thermostat, etc.- Cata-Dyne).



4.2 Site Specific Cost Breakdowns

For each gauging station site at which either a new station was established and built, normal maintenance was carried out, or electric power was installed, the cost breakdowns are contained in this section and divided according to designation.

4.2.1 Federal-Provincial (FP)

M-1: Alkali Creek near the Mouth (05CK005) (FP)

Repair fence and paint towers.

Costs as Constructed:

Labour .....	\$ 773.00
Board .....	\$ 415.12
Travel .....	\$ 166.50
Material .....	\$ 107.59

Total: \$ 1426.21

M-2: Beaver River Near Goodridge (06AA001) (FP)

Dug out and lowered lower intake, replaced 2" upper intake with new 3" X 3 meter intake.

Costs as Constructed:

Labour .....	\$ 927.82
Board .....	\$ 414.90
Travel .....	\$ 148.25
Supplies .....	\$ 180.27
Contracts .....	\$ 294.25

Total: \$ 1965.49

M-3: Berland River near the Mouth (07AC007) (FP)

Tighten main cable

Costs as Constructed:

Labour .....	\$ 451.89
Board .....	\$ 345.00
Travel .....	\$ 88.23

Total: \$ 885.12

M-4: Brazeau River below Cardinal River (05DD007) (FP)

Install new cablecar.

Costs as Constructed:

Labour .....	\$	296.60
Board .....	\$	193.22
Travel .....	\$	118.00
Supplies .....	\$	398.00

Total: \$ 1005.82

M-5: Cataract Creek near Forestry Road (05BL022) (FP)

Cableway repairs (lower platform)

Costs as Constructed:

Labour .....	\$	188.16
Board .....	\$	85.12
Travel .....	\$	30.00
Supplies .....	\$	188.92

Total: \$ 492.20

M-6: Clearwater River above Limestone Creek (05DB003) (FP)

Installed elevator weight, armoured orifice line and stainless steel W.W.G.. Installed A-71 recorder, fluid gauge 2, sight feed, N2 tank. Orifice line, weight and solar panel were in the 1991/92 construction costs.

Costs as constructed:

Labour .....	\$	385.14
Board .....	\$	17.60
Travel .....	\$	56.00

Total: \$ 458.74

M-7: Crowsnest River at Frank (05AA008) (FP)

Installed new main cable. Installed new left bank deadman. Dug out right bank deadman. Established B.M. 92-1 in left bank deadman.

Costs as Constructed:

Labour.....	\$770.34
Board.....	\$513.00
Travel.....	\$57.00
Supplies.....	\$272.38
Contracts.....	\$194.00
Total:	<u>\$1,806.72</u>

M-8: Deer Creek near Sundre (05CA003) (FP)

May 13, 1992 - Temporary repair made to stilling well.  
August 13, 1992 - Installed fluid gauge and solar panel.

Costs as Constructed:

Labour.....	\$743.89
Board.....	\$71.25
Travel.....	\$111.00
Supplies.....	\$233.39
Total:	<u>\$1,159.53</u>

M-9: Eunice Creek near Hinton: (07AF005) (FP)

Station discontinued. Removed well and shelter and reseeded area.

Costs as Constructed:

Labour.....	\$999.65
Board.....	\$634.18
Travel.....	\$378.03
Total:	<u>\$2,011.86</u>

M-10: Firebag River near the Mouth (07DC001) (FP)

Installed new cablecar. Work was done by technologist therefore no labour was charged.

Costs as Constructed:

Supplies.....	\$150.00
Total:	<u>\$150.00</u>

M-11: Freeman River near Fort Assiniboine (07AH001) (FP)

Installed manometer. Installed metal shelter on wooden base. Installed Slabosz block and 35 metres of heavy line. Installed 2 ground rod B.M.,s.

Costs as Constructed:

Labour.....	\$1,135.91
Board.....	\$542.55
Travel.....	\$813.42
Supplies.....	\$2,304.45
Instruments.....	\$2,500.00
Total:	<u>\$7,096.33</u>

M-12: James River near Sundre (05CA002) (FP)

Relocated well and shelter, using new well and old shelter. Installed 10 metre ground rod B.M., 18 metres N.W. of shelter along fence line.

Costs as Constructed:

Labour.....	\$1,906.72
Board.....	\$828.60
Travel.....	\$256.56
Material.....	\$191.34
Supplies.....	\$1,921.42
Contracts.....	\$866.70
Total:	<u>\$5,980.34</u>

M-13: Jumpingpound Creek near the Mouth (05BH009) (FP)

Installed riser on lower intake.

Costs as Constructed:

Labour.....	\$60.64
Board.....	\$17.50
Travel.....	\$25.00
Supplies.....	\$14.93
Total:	<u>\$118.07</u>

M-14 Kakwa River near Grande Prairie (07GB002) (FP)

Installed new tower pedestals on right bank tower. Removed 6 metre tree from right bank deadman. Installed new cablecar and new platform on left bank tower. Tightened main cable.

Costs as Constructed:

Labour .....	\$ 1382.71
Board .....	\$ 849.37
Travel .....	\$ 264.45
Material .....	\$ 209.09
Supplies .....	\$ 1042.70
Contracts .....	\$ 58.85

Total: \$ 3807.17

M-15 Kneehills Creek near Drumheller (05CE002) (FP)

Removed cableway towers and cable as part of a job to remove this station at the request of the landowner.

Costs as Constructed:

Labour .....	\$ 134.61
Board .....	\$ 17.60
Travel .....	\$ 40.00

Total: \$ 192.21

M-16 Little Smoky River Near Guy (07GH002) (FP)

Tightened main cable. Painted left bank tower.

Costs as Constructed:

Labour .....	\$ 451.89
Board .....	\$ 345.00
Travel .....	\$ 76.23

Total: \$ 873.12

M-17 Lloyd Creek near Blufton (05CC009) (FP)

Installed Brytex shelter. Desilted well.

Costs as Constructed:

Labour .....	\$ 1063.76
Board .....	\$ 543.35
Travel .....	\$ 370.05
Supplies .....	\$ 383.45

Total: \$ 2360.61

M-18 McLeod River above Embarrass River (07AF002) (FP)

Repaired warning marker (hit by falling tree).

Costs as Constructed:

Labour .....	\$ 1135.52
Board .....	\$ 595.92
Travel .....	\$ 277.25
Supplies .....	\$ 922.22

Total: \$ 2930.91

M-19 McGillivray Creek <sup>NR.</sup> at Coleman (05AA013) (FP)

Station discontinued. Removed gauge shelter and well.

Costs as Constructed:

Labour .....	\$ 450.86
Board .....	\$ 233.00
Travel .....	\$ 46.00
Contracts .....	\$ 235.40

Total: \$ 965.26

M-20 Muskeg River near Grande Cache (07GA002) (FP)

Installed new cablecar. Installed new marker cone.

Costs as Constructed:

Labour .....	\$ 411.17
Board .....	\$ 209.62
Travel .....	\$ 110.48
Supplies .....	\$ 350.57

Total: \$ 1081.84

M-21 North Ram River at Forestry Road

Straightened tower on right bank. Installed cable safety loop. Installed new cablecar. Installed new pedestals for right bank tower. Pedestals were poured then crew got rained out. Moved right bank tower onto new pedestals. Installed ladder onto tower platform.

Costs as Constructed:

Labour .....	\$ 1112.41
Board .....	\$ 578.08
Travel .....	\$ 190.00
Supplies .....	\$ 578.84
Total:	\$ 2459.33

M-22 Oldman River below Oldman Dam (05AA024) (FP)

Installed 4.88m stilling well with 1.52m Brytex shelter. Installed 3 WSC brass cap B.M.S., 1 in left bank downstream bridge seat, 1 ground rod 36 metres north of shelter and 1 ground rod 86 metres northwest of shelter.

Costs as Constructed:

Labour .....	\$ 1804.94
Board .....	\$ 762.96
Travel .....	\$ 309.73
Material .....	\$ 26.75
Supplies .....	\$ 3886.47
Contracts .....	\$ 722.25
Total:	\$ 7513.10

M-23 Ray Creek near Innisfail (05CE010) (FP)

Removed 1.2m well and recessed recorder compartment. Installed 1.5m well and Brytex shelter.

Costs as Constructed:

Labour .....	\$ 1207.68
Board .....	\$ 458.57
Travel .....	\$ 254.44
Materials .....	\$ 110.96
Supplies .....	\$ 1460.20
Total:	\$ 3491.85

M-24: Red Deer River at Drumheller (05CE001) (FP)

Moved gauge shelter from downstream side of bridge to upstream side.  
Replaced Brytex shelter with cedar shelter.

Costs as Constructed:

Labour.....	\$ 1750.14
Board.....	\$ 588.90
Travel.....	\$ 261.01
Material.....	\$ 1000.75
Supplies.....	\$ 167.00

Total: \$ 3767.80

M-25: Redearth Creek near Redearth (07JC002) (FP)

Extended lower intake 1.5 metres. Lowered bottom intake 0.10 metres.  
Installed new 5.5 metre heat tape.

Costs as Constructed:

Labour.....	\$ 451.90
Board.....	\$ 345.00
Travel.....	\$ 105.84
Supplies.....	\$ 96.03
Contracts.....	\$ 224.70

Total: \$ 1223.47

M-26: Threepoint Creek near Millarville (05BL013) (FP)

Installed new manometer shelter and manometer and orifice and line.

Costs as Constructed:

Labour.....	\$ 1803.54
Board.....	\$ 105.00
Travel.....	\$ 163.90
Material.....	\$ 92.32
Supplies.....	\$ 5941.52
Contracts.....	\$ 642.00
Instruments.....	\$ 2500.00

Total: \$11248.28



M-27 Wainscott Coulee near Brownvale (07FD014) (FP)

Removal of gravel and silt from gauge pool. Work was done by hydrometric technologists so there were no expenses charged other than the service contract.

Costs as Constructed:

Contracts .....	\$ 224.70
Total:	\$ 224.70

M-28 Whitemud River near Dixonville (07HA005) (FP)

Replaced main cable.

Costs as Constructed:

Labour .....	\$ 236.53
Board .....	\$ 345.00
Travel .....	\$ 62.75
Supplies .....	\$ 248.98
Total:	\$ 893.26

M-29 Wildhay River near Hinton (07AC001) (FP)

Installed new left bank deadman, and new cablecar irons.

Costs as Constructed:

Labour .....	\$ 1398.12
Board .....	\$ 889.72
Travel .....	\$ 194.00
Supplies .....	\$ 317.43
Contracts .....	\$ 308.64
Total:	\$ 3107.91

M-30 Willow Creek above Chain Lakes (05AB028) (FP)

Reshingled shelter.

Costs as Constructed:

Labour .....	\$ 270.05
Board .....	\$ 76.30
Travel .....	\$ 25.00
Material .....	\$ 102.08
Total:	\$ 473.43

4.2.2 Federal (F)

M-31 E.I.D. Main Branch Canal at Bassano Dam (05CJ013) (F)

Constructed retaining wall and installed platform for cableway. Installed AFFRA for season. Installed 300 metre sensor line from shelter for transducer downstream.

Costs as Constructed:

Labour .....	\$ 1398.01
Board .....	\$ 319.65
Travel .....	\$ 109.45
Material .....	\$ 149.79
Supplies .....	\$ 599.05

Total: \$ 2575.95

M-32 E.I.D. North Branch Canal near Bassano (05CJ001) (F)

Installed cableway support towers, 30 metre cable, cablecar and 3 B.M. caps.

Costs as Constructed:

Labour .....	\$ 709.07
Board .....	\$ 43.75
Travel .....	\$ 141.15
Supplies .....	\$ 468.51
Contracts .....	\$ 4258.60

Total: \$ 5621.08

M-33 W.I.D. Canal near Chestermere Lake (05BM003) (F)

Replaced lower intake April 9, 1992. Removed shelter and instrumentation October 16, 1992. Shelter and base not reusable. Instruments stored at warehouse for winter.

Costs as Constructed:

Labour .....	\$ 451.92
Board .....	\$ 35.10
Travel .....	\$ 35.00
Supplies .....	\$ 135.97
Contracts .....	\$ 235.40

Total: \$ 893.39

4.2.3 Provincial

M-34: Buffalo Lake near Erskine (05CD005) (P)

Installed stilling well and cedar style recorder shelter.

Costs as Constructed:

Labour.....	\$ 1768.16
Board.....	\$ 923.83
Travel.....	\$ 317.15
Material.....	\$ 589.47
Supplies.....	\$ 2573.52
Instruments.....	\$ 2500.00
Total:	<u>\$ 8670.13</u>

M-35: Elbow River above Elbow Falls (05BJ006) (P)

Repaired intakes, May 19, 1992. Removed upper intake and flushing system. Reburied lower intake ( washed out in high water) August 20, 1992.

Costs for Repairs:

Labour.....	\$ 420.77
Board.....	\$ 17.50
Travel.....	\$ 99.10
Supplies.....	\$ 136.10
Total:	<u>\$ 673.47</u>

M-36: Elder Creek at Highway 686 (07HB002) (P)

Installed access ramp.

Costs as Constructed:

Labour.....	\$ 215.36
Board.....	\$ 345.00
Travel.....	\$ 39.00
Material.....	\$ 71.78
Total:	<u>\$ 671.14</u>

M-37 Little Smoky River at Little Smoky (07GG002) (P)

Painted towers and cablecar.

Costs as Constructed:

Labour .....	\$ 451.89
Board .....	\$ 345.00
Travel .....	\$ 69.23

Total: \$ 866.12

M-38 McLeod River near Whitecourt (07AG004) (P)

Repaired marker cable (hit by tree).

Costs as Constructed:

Labour .....	\$ 451.90
Board .....	\$ 345.00
Travel .....	\$ 78.61

Total: \$ 875.51

M-39 Ministik Lake near New Sarepta (05EB013) (P)

Installed Brytex shelter. Relocated culvert and recorder farther out into lake.

Costs as Constructed:

Labour .....	\$ 1396.48
Board .....	\$ 619.43
Travel .....	\$ 129.30
Material .....	\$ 119.52
Supplies .....	\$ 129.00

Total: \$ 2393.73

M-40 Pembina River near Entwistle (07BB002) (P)

Rebuilt walkway and installed handrails.

Costs as Constructed:

Labour .....	\$ 1000.66
Board .....	\$ 464.57
Travel .....	\$ 194.03
Material .....	\$ 263.55
Supplies .....	\$ 56.30

Total: \$ 1979.11

M-41 Willow Creek below Lane Creek (05AB039) (P)

Installed new cablecar.

Costs as Constructed:

Labour .....	\$ 62.72
Board .....	\$ 45.00
Travel .....	\$ 20.00
Supplies .....	\$ 245.34

Total: \$ 373.06

C-1 Modeste Creek below Buck Lake Creek (PRIVATE)

Installed Brytex shelter and heavy orifice line for ADOE at the request of the City of Edmonton.

Costs as Constructed:

Labour .....	\$ 743.68
Board .....	\$ 383.96
Travel .....	\$ 266.26
Material .....	\$ 124.48
Supplies .....	\$ 1464.41

Total: \$ 2982.79

A P P E N D I X

## DESCRIPTION OF CONSTRUCTION PRACTICES

### MATERIAL AND EQUIPMENT

#### Well and Shelter Construction

##### In-Bank Well Installations

Practically all in-bank installations of stilling wells had been, and are being, made with triple C wood staves, radially milled to the internal and external circumference of the pipe size used. They are interlocked by tongue and groove and the edges of the staves are in full bearing with each other. Commonly used soft wood species are the pines, western and eastern hemlock, and Douglas fir. Any soft wood which meets grading specifications and is suitable for pressure treatment may be used. All staves are pressure-treated in accordance with the C.S.A. 080 Specification Group Pentachlorophenol. Standard staves are used (6.5cm thick) for 1.52m inside diameter wells and steel walk-in shelter. Access to the bottom of the well is by two aluminum ladders, one the full well depth and the other one half the well depth.

Hoops are milled steel, rolled to the correct diameter and dipped in tar or asphalt-base paint to give them long life. Their principal function is to keep the staves in tight bearing with each other. Hoops are placed at 0.61m intervals and tightening is accomplished by a 15.6mm bolt and nut working against a bracket welded to the angle.

##### Other Wells

A few wells are installed using 45.7cm diameter, 16-gauge corrugated steel pipe (galvanized) with a look-in shelter to house the recorder. These installations are made by strapping the culvert to suitable bridge abutments, piers, or piles.

##### Stilling Well Inlet System

Inlet systems are 7.6cm steel pipes. Both inlet pipes (7.6cm) are reduced to 5.1cm in the well. The lower inlet (inside the well) is fitted with a four-way flushing system to accommodate a heat tape. In streams where velocity past the pipe could affect stage, the lower inlet is provided with a static tube.

The lower inlet is placed on the stream bed and generally the bottom of the well is excavated 0.3m below the lower inlet. The upper inlet is placed approximately 0.3m above the winter ice level. This pipe is supported before the trench is backfilled to prevent the pipe from sagging.

Box culvert inlets, made of treated fir (50mm x 200mm on top and bottom, and 50mm x 150mm on sides) may be utilized in some cases.

##### Electrical Contact Gauges

All well installations are now equipped with an electric contact gauge. The gauge consists of a stainless steel tape graduated in 1.mm increments. Attached to the tape are: a cylindrical weight, a reel for the tape, an electrical power source

and a device to indicate when an electric circuit is complete. There is an index mark provided on the reel mounting. When the weight touches the water surface the electric circuit is completed producing a deflection of the voltameter. The tape is then read at the index mark.

### Shelters

Metal shelter, 1.63m x 1.63m x 2.44m (walk-in type) are erected on concrete foundations for manometer or pressure-type gauge installations. These are insulated and lined. A wooden base can also be utilized. This base is constructed of .1016m x 1.63m pressure treated wood exterior framing with .1016m and .1016m wooden joints set at .61m and 1.22m for internal support. This framework is covered with 19mm plywood. The floor is anchored to the ground with wooden and/or angle iron stakes driven into the ground.

Metal shelters, 1.63m x 1.63m x 2.44m are also erected on top of 1.524m diameter stilling wells. The shelters are insulated, lined, shelved, have a plywood floor with access trapdoor to the well. The shelter is supported on a 75mm x 75mm x 6.25mm angle iron frame attached to the well.

### Station Bench Marks

Each station has been supplied with two bench marks but the stations are presently being upgraded to 3 bench marks at each site. Former bench marks consisted of a standard bench mark cap set on a 50mm diameter standard pipe 1.524m in length and riveted to the pipe. The pipe was 20mm in diameter with a 6.25mm steel plate welded to the bottom. A hole approximately 304.8mm square was dug to take the length of the pipe. At ground level a 50mm x 100mm x .4064m square frame was built and the hole and square frame was filled with concrete.

Recently bench mark installations have been made utilizing 1.22m lengths of ground rod (19mm diameter) joined by couplings and driven into the ground to refusal. When refusal is attained, the last section of rod is cut off near ground level and a bench mark cap is fastened to the top.

One bench mark is placed near the shelter while the second and third are separated such that if the area is disturbed by construction, or for other reasons, at least one bench mark will remain intact.

### Cableways

#### Towers and Platforms

All cableways are built to standard plan. A 10.16cm fabricated standard steel galvanized pipe is used for A-Frame construction. All steel is painted International orange and white to Department of Transport specifications. Cablecar access platforms are also provided and are made of 63.5mm x 63.5mm x 6.35mm angle iron, 1.31m wide by 1.64m long, with Armco floor plank (50mm rib) interlock leg, 16-gauge, 35 gram galvanized steel, non-skid surface.

#### Anchorage and A-Frame Pedestal



Concrete: 20 MPa at 28 days, maximum size of aggregate 25mm is specified. Where necessary, sulphate resistant cement is used in the mixture; otherwise normal Portland cement is used. Anchorage deadmen and pedestals are steel-reinforced. Deadmen are not a standard size, but are designed according to span and soil conditions for each cableway. Transit Mix concrete is used for cableways where available; otherwise, it is mixed on the job.

Two lengths of cold, roll steel, bent in the shape of triangles, are embedded in the concrete deadmen for cableway anchorages. A 3.35m length of 2.54cm diameter steel is used for the main cable anchorage. A 2.13m length of 19mm steel is used for the A-frame tower, "tie back" anchorage. If aircraft warning markers are required, another length of 2.13m of 19mm steel is embedded in the concrete for the warning marker cable anchorage.

The A-frame pedestals are constructed of concrete with 2.54cm diameter redi-rod set in the concrete to which the tower legs are bolted. The concrete forms are: 45.7cm in diameter and 0.91m in length of A-frame towers 1.83m to 3.05m in height. For A-frame towers 3.66m to 6.1m in height, 61cm diameter sonatube is used.

#### Wire Rope

19mm diameter main cableway milled plough steel cable, galvanized 6 x 19 construction with fibre core, regular lay 19 501 kg breaking strength.

12.7mm diameter tie-back cable milled plough steel cable, galvanized 6 x 19 construction with fibre core, regular lay 9 070 kg breaking strength.

9.53mm diameter main aircraft warning cable guy cable 6 x 19 construction, grade 110 galvanized 4 898 kg breaking strength.

4.76mm diameter tag line cable aircraft control cable, 7 x 19 construction, galvanized or tinned 2 490 kg breaking strength.

#### Cable Accessories

Turnbuckle 31.75cm diameter x 60.96cm, jaw and eye galvanized drop forged, approximate strength 24 041 kg.

Turnbuckle 19mm diameter x 45.72cm, jaw and eye galvanized drop forged, approximate strength 8 165 kg.

Crosby clips - 19mm, 12.7mm, 9.53mm drop forged and galvanized.

Wire rope thimbles - 19mm, 12.7mm, 9.53mm regular pattern galvanized.

#### Aircraft Warning Markers

Standard extensions are designed for attachment to the 10.16cm pipe A-Frames. 12.7mm or 9.53mm (6 x 19) cable is used, depending upon the span, to carry the cones. The cable is anchored to the deadmen and is provided with a turnbuckle for adjustment.

Various types of cones are used. Fibreglass-molded cones 76.2cm diameter x 76.2 cm high, painted orange; also .4522m spherical cones constructed in two halves, fabricated or molded fibreglass and painted International orange and white, half-and-half, and both made by commercial firms. Cones 45.7cm in diameter were made by combining polyurethane (Super Secand Resin) approximately 1 kg of each by weight, and pouring the liquid in a 150mm diameter latex meteorological air balloon. This mixture will expand the balloon to a half circle, 45.7cm diameter. The two halves are glued together and a 5cm ready rod is put through the centre of the cone for hanging the cone to the cable. The cone is painted orange and white, half-and-half. These cones are light and durable.

### Cable Cars

#### Standard Sit-Down

A standard sit-down car with two seats and foot rest is 1.83m x 61cm x 27.9cm. The cable car frame is a rectangle made of 5.1cm x 5.1cm x 6.4mm aluminum angle welded together at the corners, 19mm pressure-treated, plywood is bolted to this frame and the top edge is covered with a galvanized 28 gauge metal channel to keep out moisture. Standard cable car and foot rest hangers are made of 50mm x 4.68mm iron specifically shaped for their purpose.

Sheaves are made of an aluminum alloy, 203cm in diameter, cast with a shallow groove to accommodate 19mm cable. The sheaves are equipped with an NSK 6205 DU bearing. The cable car is moved by a hand operated aluminum puller. The interior of the cable car is painted with an oil-based white paint and the outside is painted with oil-based international orange and white to Department of Transport specifications. All cable cars are now equipped with a removable sheave hanger. This is an aluminum bracket which allows the cable car to be hung from the main cable, while enabling the sheave to be removed.

#### Cablecar Puller

Adjustable aluminum cablecar puller is made to standard plan.

#### Cablecar Lock and Car Holder

A standard padlock and chain is used to lock the car.

### Control Construction

#### Gabion

Several gabion controls have been installed for stream bed stabilization. In most cases these were a single row of gabions (.9144m x .3048m x 2.443m) filled with rock in place. Erosion may take place below the gabion control, in the centre of the stream. This can be overcome by placing two rows of gabions with the lower gabion at the stream bed level to dissipate the energy of the water

falling over the upper gabion.

#### Steel Sheet Piling

Built by driving 4.877m splined steel piling. The piling is trimmed to make a .787m head 125' notch weir of angle iron bolted to the piling, or can be cut for desired head and angle of notch. In most cases, log or timber approach sections are installed.

#### Concrete Controls

Various designs and sizes, with V-notches, H-flumes, San Dimas flumes, broad-crested weirs, etc. have been constructed. Standard plans are used for most projects, with special design for projects when required.

### CONSTRUCTION PERSONNEL

#### Labour

The construction in Alberta was carried out by one field crew consisting of a foreman and one term employee, plus hydrometric field technologists, as required.

#### Supervision

Construction supervision is carried out by one full time supervisor.

#### Equipment

During 1992/93, the construction crew used two vehicles, a 9000 kg GVW truck and a heavy duty pickup, to haul staff, materials and tools to the job sites.

#### Hired Equipment

Backhoes, draglines, ready mix concrete trucks and gravel trucks were hired under service contracts, when required. Helicopters were used in remote areas to transport staff and materials.



OLDMAN RIVER BELOW OLDMAN DAM  
EXCAVATING AND INSTALLING WELL





OLDMAN RIVER BELOW OLDMAN DAM  
COMPLETING STRUCTURE

ENVIRONMENTAL PRE-SCREENING

Prior to the commencement of the annual construction program, all the projects are pre-screened for potential environmental impacts. The pre-screening forms for 1992/93 follow this write-up.

Unfortunately, not all maintenance nor construction projects are known prior to the commencement of the construction season. Added to the construction projects during the season are such things as flood and erosion damages, road construction activities, vandalism, changes in the hydrometric program (new station requirements or cutbacks in programs), etc.. In 1992/93, 11 additional projects were initiated during the construction season.

The work performed at the 11 sites and these works' impacts are detailed below.

1. Beaver River near Goodridge

The lower intake was lowered and the site was backfilled with the original clay and soil that was removed. This area was sown with grass seed.

2. Crowsnest River at Frank

A new deadman was installed on the left bank with very little disturbance to the area.

3. Eunice Creek near Hinton

This station was discontinued. The well and shelter were dismantled and the site was restored to its former condition, including the re-seeding of grasses.

4. Freeman River near Fort Assiniboine

Installed a metal shelter to house recording equipment. There was very little disturbance to the area.

5. Kneehills Creek near Drumheller

The cableway towers and cable were removed with no disturbance to the area. The well and shelter are to be removed in the spring of 1993 and further restorations will be done then.

6. Lloyd Creek near Blufton

Installed a metal shelter to house recording equipment, with no disturbance to the area.

7. Oldman River below Oldman Dam

A stilling well and metal shelter were installed, with a slight aesthetic impact. It was installed near a pump house so it was not too noticeable.

8. Redearth Creek near Redearth

The lower intake was lowered and was back filled with the original clay and soil that was removed to do the job. The area was reseeded with grasses.

9. Wildhay River near Hinton

A new deadman was installed on the left bank with very little disturbance to the area.

10. Ministik Lake near New Sarepta

Installed a metal shelter to house equipment with very little disturbance to the area.

11. Modeste Creek below Buck Lake Creek

Installed a metal shelter to house equipment. Shelter was installed at the request of the City of Edmonton and is hidden in the trees.

## **REVIEW CRITERIA**

1. Clearing
2. Top soil removal
3. Culverting
4. Channel dredging
5. Weir construction
6. Rip rap placement
7. Herbicide usage
8. Stream infill
9. Chemical preservatives
10. Bank excavation
11. Permafrost disturbance
12. Drainage
13. Drilling and blasting

Figure 4. Components in a physical activity which determine the need for pre-screening (step 2)



# PRESCREENING FORM

Inland Waters Directorate  
Western & Northern Region

Branch/District Calgary District Responsibility Centre Manager G. H. Morton Fiscal Year 92-93

PROJECT DETAILS						CONCLUSION		
Location		Type of Work (a)	Components	Schedule		Potential Impact Area (b)	Mitigative Measures (c)	Consultation
River/Lake	latitude/longitude			Start	Finish			
W.I.D. Canal	51 01/113 50	2	10	Apr	Apr	4		
Ray Creek	52 00/113 35	2		Apr	Apr	3		
E.I.D. Main Canal	50 43/112 21	2		Apr	Apr	4		
Threepoint Creek	50 46/114 17	3	10	Apr	Apr	3		
Deer Creek	51 39/115 08	2		May	May	4		
E.I.D. N. Br. Canal	50 45/112 25	3	10	May	May	4		
James River	51 55/114 41	2		May	May	4	4*	
Buffalo Lake	52 27/112 52	3	10	May	May	3		
Oldman R/Waldrons	49 48/114 11	2		Jun	Jun	4		
Sunwapta River	52 13/117 13	2	8	Jun	Jun	3		
Meadow Creek	49 57/113 39	2	2, 10	Jun	Jun	4	4*	
Highwood River	50 24/114 29	2	2, 10	July	July	4	4*	
Pekisko Creek	50 28/114 12	2	2, 10	July	July	4	4*	
Brazeau River	52 52/116 34	2		July	July	4		
Pembina River	53 36/115 00	2		July	July	4		
Pembina River	54 27/113 59	2	2, 10	Aug	Aug	4	4*	
Wolf River	54 42/111 00	2		Aug	Aug	4	4*	
Little Red Deer R.	50 30/114 40	2	2, 10	Aug	Aug	4	4*	
Willow Creek	50 11/114 12	2		Aug	Aug	4		
Cataract Creek	50 17/114 35	2		Sep	Sep	4		
Drywood Creek	49 20/114 00	2	2, 10	Sep	Sep	3	4*	

- a) 1. Research  
2. Maintenance  
3. New facility

- b) 1. Ecological  
2. Social  
3. Aesthetic  
4. No impact

- c) 1. Design change  
2. Location change  
3. Schedule change  
4. Other (specify)

Signature of RCM \_\_\_\_\_

Date \_\_\_\_\_

\* Site restoration by replacing top soil and seeding grass.

