

REFERENCE 5

NEWFOUNDLAND AND LABRADOR HYDRO  
REPORT ON  
1980/81 CLIMATOLOGICAL MONITORING  
PROGRAM

PREPARED BY: Newfoundland and Labrador Hydro  
Engineering & Construction Division  
Transmission Line Design Group

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1.0 SUMMARY

The fourth annual climatological study conducted by Newfoundland and Labrador Hydro concluded on May 31, 1981.

During the observation period, from October 15, 1980 to May 15, 1981, 27 Passive Ice Meters and 2 Rosemount Ice Detectors were monitored.

Three anemometer systems were operational throughout the year at 4-Mile Pond, Sunnyside and Hawkes Bay. The system at Yankee Point was relocated to Savage Cove and activated in December 1980 and a new system was installed at Levi's Gulch in October 1980.

The emphasis for the Test Tower Program was placed on the Long Range Mountains Crossing Area with three new sites being established.

The Test Span instrumentation package was relocated from Brian's Pond to the more exposed Inner Pond Span.

This report summarizes the data collected during the study period and recommends that a complete review of the Program be undertaken by a qualified meteorologist.

2.0 OBJECTIVES

This annual summary entitled "Report on 1980/81 Climatological Monitoring Program" will discuss the observation period of June 1980 to May 1981 as funded under Work Orders 9718 and 9723.

The report will include the following:

1. A general discussion of the various aspects of the program with emphasis on any changes, additions or deletions, to the program.
2. A summary of all data collected during the 1980/81 observation period.

### 3.0 INTRODUCTION

The 1980/81 Climatological Monitoring Program was the fourth study, conducted by Nfld. and Lab. Hydro for the Lower Churchill Development Corporation, designed to collect raw data required to optimize transmission line design and route selection parameters for the HVDC line.

The emphasis of this study was placed on gathering general ice data for the Province and more particularly ice and wind data for specific sections of the HVDC line route in Southern Labrador and in the Long Range Mountains Crossing area.

To obtain the necessary data Passive Ice Meters, Anemometers, Rosemount Ice Detectors, Test Towers and Test Spans were monitored.

This report presents the summarized data collected from June 1980 to May 1981 and recommends future direction for the program.

#### 4.0 DISCUSSION OF PROGRAM

##### 4.1 PASSIVE ICE METER

The 27 observers involved in the program were responsible for submitting Monthly Data Sheets, from October 15, 1980 to May 15, 1981, which indicate the occurrence of any deposit on the meter. Detailed information concerning the deposit would be documented at least twice daily, where applicable, on an Ice Meter Observation form. A summary of this observed data is tabulated by location and month in Appendix 6.1 - Summary of Passive Ice Meter Data.

The Passive Ice Meters installed near the Test Tower Sites in the Long Range Mountains Crossing area were rendered ineffective when they were overturned by high winds and buried in the snow.

##### 4.2 ANEMOMETER

Data on wind speed and direction was obtained from three similar systems at 4-Mile Pond - Holyrood, Sunnyside and Hawkes Bay. The system formerly at Yankee Point was re-located to Savage Cove in December 1980, a distance of approximately 3 km, because of accessibility and power supply problems at Yankee Point. See Figure 7.1 - Location of Anemometers.

A new installation was completed and activated on October 1, 1980 at a selected site on the proposed Parsons Pond Route of the HVDC Transmission Line. This system was supplied and installed by the Scientific Division of the Atmospheric Environment Services at St. John's, Newfoundland.

#### 4.2 ANEMOMETER (CONT'D)

The system uses the cup-type anemometer and is connected to a long duration (90-day) battery operated recorder which is housed in a shelter heated by a propane furnace. Unlike the existing systems, which record up to a 2 second peak gust, this unit records the average wind speed in mph and a multiplying factor ranging between 1.2 - 2.0 must be applied to obtain an approximate peak wind speed.

The importance of being aware of microclimatic conditions has become increasingly apparent since this site has recorded wind conditions of 93 mph or 4 times that experienced at Daniel's Harbour which is approximately 13 km northwest and nearer the sea. The large difference in peaks can be attributed to the intensifying effect on the wind of the topography to the east of the anemometer site. The data collected from all the anemometer sites is tabulated in Appendix 6.2 - Summary of Anemometer Data.

#### 4.3 ROSEMOUNT ICE DETECTOR

One of the primary objectives of the Rosemount Ice Detector Program has been to establish, if possible, any correlation between actual ice accumulation and the number of instrument operations.

A recently obtained report entitled "Climatic Chamber Tests of a Surface Ice accretion Measurement System" dated March 26, 1979 and conducted by the Meteorology Division of the U.S. Air Force concludes that this correlation exists. The abstract of that report says:

4.3 ROSEMOUNT ICE DETECTOR (CONT'D)

"Climatic Chamber Test of an off-the-shelf ice detection system manufactured by Rosemount Engineering Company were conducted to evaluate its capability to determine ice amounts on cylinders. One-hour tests were run for a variety of wind speeds, temperatures and icing conditions. Some longer duration tests, up to 17 hours, were also performed. Analysis of the data indicates that the Rosemount system is highly correlated with the mass of ice measured on the cylinders when the data are divided into freezing rain and rime icing events. The Rosemount System is also highly correlated with ice thickness, but without the pronounced dependence upon the type of icing. In the light of positive test results, a method is proposed for utilising the Rosemount System for observing ice accretion at the earth's surface".

The U.S. tests were conducted with a Model of 871 FA detector which has a different size probe than the Model 871 CBI used by Hydro, however, it is hoped that the results of their field tests will be applicable to all detectors. If this proves to be the case then the data tabulated in Appendix 6.3 - Summary of Rosemount Ice Detector Data, and previous years records, will become increasingly valuable.

Close contact will be maintained with the testing agency to be certain that results of the latest tests will be obtained when they become available.



#### 4.4 TEST TOWER SITES

The analysis of data collected from three years monitoring of the Test Tower Sites lead to the conclusion that rerouting of the lines was necessary in Southern Labrador and that the Pinware River Valley was the logical choice of routes. To this end visits to the Labrador Sites were curtailed to 3 visits for the 1980/81 season.

Increased emphasis was placed on Long Range Mountains Crossing in the areas of the proposed routes as selected by the SNC Lavalin group. New Test Tower Sites were established along these routes at Sites 2d, 2e and 15 as shown in Figure 7.2 - Location of Test Sites & Test Spans.

Three of the towers removed from sites 5,6,7 and 8 were relocated to these new sites.

The observed data from the Test Tower Sites is tabulated in Appendix 6.4 - Summary of Test Tower Data.

#### 4.5 SALT CONTAMINATION

The existing Salt Contamination Program was terminated in January 1981, as recommended in the "Review of 1977-80 Climatological Monitoring Program", since it was felt sufficient collaborating data had been collected.

The emphasis will now be placed on the termination sites at both Labrador and Yankee Point and the surrounding areas.

Two sites will be constructed at each area, one near the water and the other inland, in an attempt to establish contamination levels and to confirm the pattern of fall-off

4.5 SALT CONTAMINATION (CONT'D)

with distance from the sea. See Figure 7.3 - Location of Salt Contamination Sites.

The sites will be constructed as shown in Figure 7.4 - Contamination Structure.

4.6 SALT CORROSION

The recommendation, of the "Review of 1977/80 Climatological Monitoring Program", to terminate the Salt Contamination Study, was implemented and hence no work was carried out during this monitoring period.

4.7 TEST SPANS

The recording equipment used at the Brians Pond Span, during the 1979/80 season, was reconditioned and installed at the most exposed, Inner Pond Span before the 1980 winter collection period.

As recommended by SNC, the unit was adjusted to the most sensitive scale, i.e. (to respond to small ice-wind loads). This was considered necessary since the relatively sheltered locations of the test spans protects them from the larger accumulations encountered at higher and more exposed areas and the increased sensitivity was required to ensure that even small ice-wind loads were detected.

The data obtained was forwarded to SNC to be abstracted and analyzed and in a letter to Mr. D. Collett dated May 12, 1981 the following observations were made:

4.7 TEST SPANS (CONT'D)

"Eduardo Middleton has examined the test span load transducer recordings forwarded under cover of your letters of January 28, and April 1, 1981. Again it is found the data collection suffers from the same phenomena, i.e. the 1:50 ice loadings don't occur every year. The test span and recording system seem to be operating correctly but the loads are too low to be of value in determining ice accumulation".

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

With the successful completion of the 1980/81 Climatological Data Collection Program another year of ice and wind information has been added to the existing data base established to enhance the HVDC Transmission Line design parameters and route selection.

The observations made during the relatively few visits to Southern Labrador confirm the choice of the Pinware River Valley as the logical transmission line route into the termination at Pointe Amour.

The additional year of data collected in the Long Range Mountains Crossing area confirms the necessity of taking advantage of all natural shelter and routing the line off the high lands.

The new anemometer system at Levi's Gulch, on the proposed Parsons Pond Route, has established some new record wind conditions.

The 1980/81 collection program has been instrumental in confirming earlier findings as well as pointing out new areas of concern. In light of the volume of data collected to date, at a cost of approximately \$500,000, it is strongly recommended that a complete review be made of the program and findings to date by a meteorological expert to determine the effectiveness of the data collection techniques and to establish the necessity and direction for a long term collection program.

- 6.1 Summary of Passive Ice Meter Data
- 6.2 Summary of Anemometer Data
- 6.3 Summary of Rosemount Ice Detector Data
- 6.4 Summary of Test Tower Data

APPENDIX 6.1

SUMMARY OF PASSIVE ICE

METER DATA

SUMMARY OF PASSIVE ICE METER DATA(1980 - 1981)

LOCATION	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY
Wabush	Trace Glaze -2 days	Trace Glaze -3 days	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Churchill Falls	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Goose Bay	No Accum.	0.5-2.0 cm Glaze-2 days	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Point Amour	No Accum.	No Accum.	0.3-1.3 cm Wet Snow 2 - days	1.5cm Glaze-1 day	0.8-1.3cm Glaze-2 days	No Accum.	No Accum.	No Accum.
Plum Point	No Accum.	No Accum.	No Accum.	Trace Glaze - 1 day	Trace Glaze - 2 days	Trace-0.1cm Glaze-1 day	0.2cm glaze 1 day	No Accum.
St. Anthony	-----NOT MONITORED-----							
Yankee Point	-	-	-	-	-	-	-	-
Hawkes Bay	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Daniel's Hr.	No Accum.	No Accum.	No Accum.	Trace Glaze - 1 day	-	-	-	-
Gros Morne Park	No Accum.	Trace Rime - 1 day	No Accum.	Trace Glaze - 1 day	0.5 cm Rime-2 days	0.6-0.9 cm Glaze-2 days	-	-
Stephenville	No Accum.	-	-	-	-	-	-	-
Port Aux Basque	No Accum.	No Accum.	No Accum.	No Accum.	0.5 cm Glaze-3 days	No Accum.	No Accum.	No Accum.
Burnt Pond	-	No Accum.	No Accum.	0.3 cm Glaze-1 day	0.6cm Glaze-1 day	No Accum.	-	-

SUMMARY OF PASSIVE ICE METER DATA

(1980 - 1981)

LOCATION	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY
Buchans	No Accum.	No Accum.	0.25 cm Glaze-1 day	0.5 cm Glaze-1 day	4.6 cm wet Snow-1 day	Trace Glaze - 1 day	Trace Glaze - 1 day	No Accum.
Deer Lake	No Accum.	Trace Rime - 2 days	Trace Glaze - 1 day	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Hampden	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Springdale	No Accum.	No Accum.	No Accum.	2.5 cm wet snow-1 day 1.3-2.5 cm Glaze-4 days 0.2-0.3 cm Glaze-3 days	No Accum.	No Accum.	No Accum.	No Accum.
Stony Brook	No Accum.	No Accum.	Trace Rime - 1 day	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.
Gander	No Accum.	Trace Glaze - 1 day	Trace Glaze - 3 days	0.9 cm Glaze-1 day	No Accum.	0.5 cm Glaze-1 day 0.2 cm Glaze-1 day	No Accum.	No Accum.
Bay D'Espoir	-	No Accum.	No Accum.	Trace Glaze - 2 days	Trace Glaze	No Accum.	-	-
Sunnyside	No Accum.	-	No Accum.	0.1 cm Rime-1 day	No Accum.	No Accum.	-	-
St. Lawrence	-----NOT MONITORED-----							
"S" Turn	-	-	-	-	-	-	-	-
Long Harbour	-	-	No Accum.	-	No Accum.	-	-	-
Western Avalon	-	No Accum.	No Accum.	2.0 cm Glaze-1 day Trace Glaze - 1 day	2.0 cm Wet snow - 1 day	No Accum.	-	-



SUMMARY OF PASSIVE ICE METER DATA(1980 - 1981)

<u>LOCATION</u>	<u>OCTOBER</u>	<u>NOVEMBER</u>	<u>DECEMBER</u>	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>	<u>APRIL</u>	<u>MAY</u>
Holyrood	No Accum.	No Accum.	No Accum.	Trace Glaze - 2 days	No Accum.	Trace Glaze - 1 day	-	-
St. John's Airport	No Accum.	No Accum.	No Accum.	-	-	-	-	-
Harbour Deep	-	-	-	No Accum.	No Accum.	No Accum.	No Accum.	-
Port Blandford	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.	No Accum.

APPENDIX 6.2

SUMMARY OF ANEMOMETER DATA

ABSTRACT OF THE WINDSUMMARYLEVI'S GULCH

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	Oct./80	Nov./80	Dec./80	Jan./81	Feb./81
Highest Hourly Average for Month (mph)	S or SE 93	-	E 92	NE 43	E 69

ABSTRACT OF THE WINDSUMMARYHAWKES BAY

	JUNE 80	JULY 80	AUG. 80	SEPT. 80	OCT. 80	NOV. 80	DEC. 80	JAN. 81	FEB. 81	MAR. 81	APR. 81	MAY 81
Total Mileage for Month	9079	6126	7589	9495	10730	9519	12741	10633	10260	9750	10079	7668
Greatest Mileage in 24 Hrs.	750	342	480	716	645	620	978	778	776	788	658	614
Greatest Mileage & Prevailing Dir. for 1 Hr.	SW-36	SW-36	SW-30	SW-42	W-38	SE-38	E-52	SE-48	SW-46	E-44	SW-36	SW-34
Date of Greatest Mileage for 1 Hr.	14th	5th	31st	30th	28th	29th	31st	8th	12th	18th	15th	10th
Average Speed for Month (mph)	12.8	8.9	10.2	13.2	14.8	13.5	17.3	14.3	15.4	13.9	14.0	10.3
Longest Continued - Direction	SW	W	E	SW	SW	NW	W	SW	SW	NE	E	SW
- Hours	39	26	24	24	27	37	41	28	48	57	50	42
Prevailing Direction - By Mileage	SW	E	E	SW	SW	N	W	SW	SW	NE	SW	SW
- By Total Hrs.	SW	E	E	SW	SW	E	W	SW	SW	NE	E	SW
Peak Gust (mph)	SW-52	SW-36	SW-36	S-52	W-44	NW-50	NE-62	SE-65	SW-60	E-57	SW-50	SW-46

NOTE: Instrument records in imperial units.

ABSTRACT OF THE WINDSUMMARYSUNNYSIDE

	JUNE 80	JULY 80	AUG. 80	SEPT. 80	OCT. 80	NOV. 80	DEC. 80	JAN. 81	FEB. 81	MAR. 81	APR. 81	MAY 81
Total Mileage for Month	7846	6219	5999	7867	6857	8086	8963	8734	6660	7891	9164	6780
Greatest Mileage in 24 Hrs..	478	382	358	420	401	493	625	692	579	507	590	369
Greatest Mileage & Prevailing Dir. for 1 Hr.	SW- 32	SW- 22	SW- 20	NW- 28	SW- 26	S- 32	W- 36	SW- 40	S- 40	NE- 30	S- 40	S- 24
Date of Greatest Mileage for 1 Hr.	9th	15th	31st	13th	22nd	5th	15th	3rd	9th	31st	15th	1st
Average Speed for Month (mph)	10.9	8.3	8.1	11.4	9.7	11.2	12.1	11.7	9.9	10.6	12.7	9.8
Longest Continued - Direction	SW	SW	SW	SW	SW	NE	NE	SW	SW	NE	SW	SW
- Hours	113	86	64	93	65	53	41	44	70	125	70	67
Prevailing Direction - By Mileage	SW	SW	SW	SW	SW	N	SW	SW	SW	NE	SW	SW
- By Total Hrs.	SW	SW	SW	SW	SW	NE	SW	SW	SW	NE	SW	SW
Peak Gust (mph)	SW- 42	NW- 36	NE- 44	SW- 41	S- 42	S- 52	SW- 59	SW- 62	S- 63	NE- 48	S- 61	S- 50

NOTE: Instrument records in Imperial units.

ABSTRACT OF THE WIND

SUMMARY

SAVAGE COVE

	JUNE 80	JULY 80	AUG. 80	SEPT. 80	OCT. 80	NOV. 80	DEC. 80	JAN. 81	FEB. 81	MAR. 81	APR. 81	MAY 81
Total Mileage for Month								10090	8151	6627	6261	5298
Greatest Mileage in 24 Hrs.								747	753	644	575	374
Greatest Mileage & Prevailing Dir. for 1 Hr.								NE-50	W-50	E-30	W-40	NW-30
Date of Greatest Mileage for 1 Hr.								4th	9th	18th	15th	9th
Average Speed for Month (mph)								15.9	13.9	10.8	9.1	7.1
Longest Continued - Direction								W	W	E	SE	W
- Hours								37	81	113	55	42
Prevailing Direction - By Mileage								NE	W	E	E	W
- By Total Hrs.								NE	W	E	E	NW
Peak Gust (mph)								NE	SW	E	W	NW
								68	66	49	56	40

NOTE: Instrument records in Imperial units.

ABSTRACT OF THE WINDSUMMARY4-MILE POND

	JUNE 80	JULY 80	AUG. 80	SEPT. 80	OCT. 80	NOV. 80	DEC. 80	JAN. 81	FEB. 81	MAR. 81	APR. 81	MAY 81
Total Mileage for Month		12965	7822	13735	14796	15296	16568	15730	12922	15639	17659	13468
Greatest Mileage in 24 Hrs.		712	629	795	711	1041	1004	1035	1069	1119	941	865
Greatest Mileage & Prevailing Dir. for 1 Hr.		SE-45	S-38	SW-45	SW-50	S-69	S-62	S-59	S-67	NE-51	S-62	S-43
Date of Greatest Mileage for 1 Hr.		1st	16th	3rd	19th	6th	25th	8th	9th	21th	15th	2nd
Average Speed for Month (mph)		17.5	17.7	21.7	19.9	21.2	22.3	21.1	19.2	21.0	24.5	18.9
Longest Continued - Direction		SW	N	S	W	W	N	W	W	N	SW	SW
- Hours		53	59	47	43	50	33	41	27	40	70	68
Prevailing Direction - By Mileage		SW	N	W	W	N	W	SW	W	N	SW	SW
- By Total Hrs.		SW	N	W	W	W	W	W	W	N	SW	SW
Peak Gust (mph)		SW	NW	W	E	S	S	SW	SW	E	S	S
		54	46	64	67	92	84	80	82	70	82	56

NOTE: Instrument records in imperial units.

APPENDIX 6.3

SUMMARY OF ROSEMOUNT ICE DETECTOR DATA



ROSEMOUNT ICE DETECTOR  
4-MILE POND

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (MILLIMETRES)
05/11/80	11:40 pm		
06/11/80	-2:15 am	15	7.6
19/11/80	1:36 am	1	0.5
19/11/80	2:55 am	1	0.5
19/11/80	7:40 am	1	0.5
19/11/80	12:40 pm	1	0.5
19/11/80	7:45 pm-9:36 pm	18	9.1
20/11/80	4:30 am-5:50 am	4	2.0
20/11/80	4:30 pm	1	0.5
28/11/80	3:20 am-11:00 am	22	11.8
29/11/80	2:32 am	1	0.5
30/11/80	4:50 am-5:30 am	2	1.0
04/12/80	11:50 pm-		
05/12/80	4:12 am	6	3.0
06/12/80	3:40 am-4:20 am	2	1.0
07/12/80	7:35 pm-		
08/12/80	12:22 am	8	4.1
08/12/80	3:30 am	1	0.5
08/12/80	5:28 am	1	0.5
09/12/80	1:12 pm-1:36 pm	3	1.5
13/12/80	11:03 pm-		
14/12/80	-12:24 am	11	5.6
17/12/80	3:48 am-4:15 am	5	2.5
24/12/80	2:40 pm-2:50 pm	4	2.0
26/12/80	1:40 am-1:50 am	8	4.1
26/12/80	9:36 am-11:07 am	82	41.7

NOTE: Calculated Accumulation = number of icing signals  
X 0.02" X 25.4"  
Probe calibrated to detect 0.02" of ice.

ROSEMOUNT ICE DETECTOR  
4-MILE POND

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (MILLIMETRES)
29/12/80	4:50 am-5:12 pm	32	16.3
29/12/80	6:20 pm-7:12 pm	45	22.9
31/12/80	1:06 pm-2:05 pm	22	11.2
31/12/80	9:10 pm-11:30 pm	64	32.5
02/01/81	10:24 pm-10:36 pm	11	55.9
03/01/81	12:40 am-12:50 am	9	4.6
03/01/81	2:50 am	1	0.5
03/01/81	3:15 pm-5:10 pm	3	1.5
04/01/81	2:20 am-2:34 am	14	7.1
04/01/81	3:15 am	1	0.5
04/01/81	5:12 am-5:30 am	12	6.1
05/01/81	5:22 am-5:48 am	26	13.2
07/01/81	3:40 pm-4:12 pm	27	13.2
07/01/81	10:48 pm-10:53 pm	6	3.0
08/01/81	2:00 pm	1	0.5
08/01/81	8:13 pm-9:40 pm	58	29.5
09/01/81	12:46 am-2:48 am	82	41.7
10/01/81	6:24 pm-6:40 pm	14	7.1
10/01/81	7:50 pm	1	0.5
10/01/81	8:15 pm	1	0.5
11/01/81	12:24 am-12:36 am	9	4.6
12/01/81	9:30 pm-10:00 pm	26	13.2
12/01/81	11:40 pm-		
13/01/81	-12:22 am	27	13.7
13/01/81	2:37 pm-3:27 pm	11	5.6
13/01/81	4:50 pm-5:02 pm	6	3.0
14/01/81	6:52 pm-9:48 pm	160	81.3
16/01/81	9:48 am-10:00 am	11	5.6
16/01/81	10:36 am-10:48 am	11	5.6

ROSEMOUNT ICE DETECTOR  
4-MILE POND

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (MILLIMETRES)
16/01/81	1:00 pm-1:20 pm	11	5.6
16/01/81	4:05 pm-4:12 pm	9	4.6
16/01/81	4:50 pm-	1	0.5
18/01/81	9:36 am-10:05 am	22	11.2
18/01/81	4:45 pm-5:05 pm	18	9.1
18/01/81	6:25 pm-7:08 pm	37	18.8
19/01/81	8:22 am-8:36 am	13	6.6
20/01/81	7:13 am-7:58 am	53	26.9
21/01/81	4:00 pm-		
22/01/81	12:15 am	451	22.9
23/01/81	4:30 pm-		
24/01/81	8:10 am	556	282.4
24/01/81	11:00 am	1	0.5
27/01/81	5:40 am-6:58 am	22	11.2
28/01/81	5:38 am-6:58 am	10	5.1
28/01/81	3:48 pm-4:00 pm	11	5.6
28/01/81	4:58 pm	1	0.5
28/01/81	7:55 pm-9:35 pm	37	18.8
29/01/81	1:13 am	1	0.5
01/02/81	1:30 am-1:40 am	9	11.4
01/02/81	11:10 am-11:38 am	22	11.2
04/02/81	6:18 am-12:24 pm	336	170.7
05/02/81	10:26 am-10:37 am	6	3.1
09/02/81	1:25 am-2:10 am	14	7.1
11/02/81	3:58 pm	1	0.5
17/02/81	8:15 am-10:38 am	106	53.8
17/02/81	12:22 pm-12:55 pm	31	15.7
17/02/81	7:45 pm-8:15 pm	23	11.7
17/02/81	8:50 pm-9:25 pm	18	9.1

ROSEMOUNT ICE DETECTOR  
4-MILE POND

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (MILLIMETRES)
20/02/81	2:20 am-2:24 am	3	1.5
20/02/81	3:24 am	1	0.5
20/02/81	5:15 am-5:18 am	2	1.0
22/02/81	4:30 pm-4:37 pm	9	4.6
22/02/81	6:53 pm-7:48 pm	11	5.6
24/02/81	10:18 am	1	0.5
24/02/81	11:18 am	1	0.5
24/02/81	9:50 pm-		
25/02/81	12:45	164	8.3
25/02/81	3:30 am-7:40 am	232	11.8
25/02/81	8:20 am-8:24 am	2	1.0
26/02/81	5:48 am-6:10 am	20	10.2
26/02/81	10:14 am	1	0.5
26/02/81	11:15 am	22	11.3
26/02/81	4:35 pm-6:00 pm	8	4.1
26/02/81	9:18 pm-9:48 pm	9	4.6
27/02/81	9:12 pm-9:48 pm	14	7.1
28/02/81	9:18 am-9:23 am	7	3.6
28/02/81	12:01 pm-12:36 pm	10	5.1
02/03/81	4:06 am-6:00 am	8	4.1
03/03/81	11:46 pm-11:53 pm	5	2.5
04/03/81	5:45 pm-5:55 pm	9	4.6
04/03/81	7:40 pm	1	0.5
05/03/81	8:40 am-9:00 am	19	9.7
05/03/81	10:05 am-10:15 am	10	5.1
06/03/81	8:55 am	1	0.5
07/03/81	1:36 am-4:14 am	146	7.5
08/03/81	5:57 pm-6:08 pm	10	5.1
08/03/81	6:48 pm-6:58 pm	5	2.5

ROSEMOUNT ICE DETECTOR  
4-MILE POND

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (MILLIMETRES)
08/03/81	9:00 pm-9:24 pm	21	26.7
08/03/81	10:00 pm-10:26 pm	25	12.7
08/03/81	11:38 pm-		
09/03/81	3:15 am	165	83.8
15/03/81	1:09 am-1:40 am	12	6.1
15/03/81	3:57 am	1	0.5
15/03/81	5:40 am	3	1.5
15/03/81	4:23 pm-6:45 pm	20	10.2
15/03/81	9:04 pm-9:22 pm	15	7.6
15/03/81	11:05 pm-11:24 pm	22	11.2
16/03/81	2:12 am-3:06 am	27	13.7
17/03/81	8:30 pm-8:38 pm	7	3.6
18/03/81	12:30 am-11:35 am	60	30.5
19/03/81	5:05 am-5:45 am	38	19.3
19/03/81	4:45 pm-5:34 pm	18	9.1
25-03-81	10:10 pm-11:00 pm	53	26.9
26-03-81	8:00 am- 9:24 am	68	34.5
29-03-81	9:40 pm-11:30 pm	51	25.9
30-03-81	12:30 am-12:36 am	5	2.5
31-03-81	5:04 am-12:15 am	12	6.1
31-03-81	7:39 am- 8:02 am	9	4.6
31-03-81	9:30 am- 9:48 am	5	2.5
31-03-81	12:30 pm-12:58 am	6	3.0
31-03-81	12:20 pm-12:30 pm	8	4.1
03-04-81	8:54 pm-10:36 am	71	36.1
12-04-81	5:48 am- 7:00 am	52	26.4
12-04-81	12:48 pm- 2:15 pm	60	30.5
12-04-81	5:05 pm- 6:25 pm	61	31.0
21-04-81	4:50 pm- 6:50 pm	27	13.7
23-04-81	4:30 pm- 6:12 pm	72	36.6
24-04-81	7:24 am- 7:49 am	10	5.1
26-04-81	2:30 pm- 3:15 pm	36	18.3

ROSEMOUNT ICE DETECTOR

SUNNYSIDE

DATE	TIME	NO. OF ICING SIGNALS	CALCULATED ACCUMULATION (INCHES)
03-10-80	1:55 am	1	0.5
04-10-80	9:55 am - 10:14 am	2	1.0
19-11-80	2:25 am - 10:32 am	36	18.3
19-11-80	2:20 am - 8:34 pm	18	9.1
03-01-81	2:28 am	1	0.5
04-01-81	10:10 am	1	0.5
08-01-81	6:03 pm - 9:05 pm	9	4.6
13-01-81	7:13 am - 7:53 am	3	1.5
13-01-81	11:45 am - 4:10 pm	7	3.5
18-01-81	8:50 am - 9:10 am	2	1.0
04-02-81	5:28 am - 5:55 am	2	1.0
09-02-81	2:35 am - 3:25 am	3	1.5
18-02-81	9:50 pm		
19-02-81	1:55 am	4	2.0
20-02-81	8:00 pm		
21-02-81	8:05 am	10	5.1
21-02-81	6:40 pm - 11:40 pm	4	2.0
15-03-81	9:58 am	1	0.5
18-03-81	7:28 am - 8:48 am	9	4.6
19-03-81	10:29 am	1	0.5
29-03-81	9:00 pm - 11:50 pm	14	7.1
22-04-81	6:50 am	1	0.5

NOTE: Calculated Accumulation = number of icing signals X 0.02"  
X 25.4  
Probe calibrated to detect 0.02" of ice.

APPENDIX 6.4

SUMMARY OF TEST TOWER DATA

TABLE OF DATA  
SITE #2 PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	20-25	250° (WSW)	-5	½" hard rime at 5' level of tower leg 1" soft rime over same location ½" glaze on guy	90° E 260° W 90° E
10-01-81	12-18	150° (SE)	-10	* 1" pennant of hard rime at 5' level of leg and increasing to 6"-8" at tower top	250° (WSW)
18-01-81	UNABLE TO VISIT DUE TO WEATHER CONDITIONS				-
16-03-81	"	"	"	"	-
13-04-81	12-17	0° (N)	-5	3" hard rime on tower leg 1" hard rime on tower leg	225° (SW) 0° (N)



TABLE OF DATASITE # 2a PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
07-12-80	18-25	250 <sup>o</sup> (WSW)	-6	Bare	—
10-01-81	12	150 <sup>o</sup> (SE)	-10	¼" hard rime pennants at 5' level of leg	150 <sup>o</sup> (SE)
18-02-81	16-21	260 <sup>o</sup> (W)	-2	2" hard rime pennants at 5' level of leg	260 <sup>o</sup> (W)
16-03-81	6	210 <sup>o</sup> (WSW)	-4	1" soft rime at 5' level of leg 1" X 2 3/4" glaze on ground	210 <sup>o</sup> (WSW) -
13-04-81	6-12	0 <sup>o</sup> (N)	-5	Trace of rime	225 <sup>o</sup> (SW)

TABLE OF DATASITE # 2b PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	32-35	250 <sup>o</sup> (WSW)	-6	1½" to 2" pennants of hard rime at 5' level of tower leg	330 <sup>o</sup> (WNW)
10-01-81	12-17	150 <sup>o</sup> (SE)	-10	* hard rime at 5' level of leg 9" thick and 7" wide	300 <sup>o</sup> (NW) 230 <sup>o</sup> (SW)
18-02-81	29	260 <sup>o</sup> (W)	0	9" pennants of hard rime at 5' level of leg and 12"-14" at tower top	260 <sup>o</sup> (W)
16-03-81	23	210 <sup>o</sup> (WSW)	-5	1" soft rime at 5' level of leg	210 <sup>o</sup> (WSW)
13-04-81	12-17	0 <sup>o</sup> (N)	-5	1" hard rime on guy 1" hard rime on guy	0 <sup>o</sup> (N) 225 <sup>o</sup> (SW)

TABLE OF DATASITE # 2c PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	20-23	250 <sup>o</sup> (WSW)	-5	Trace of light rime	270 <sup>o</sup> (W)
10-01-81	2-3	150 <sup>o</sup> (SE)	-10	Trace of hard rime	180 <sup>o</sup> (S)
18-02-81	-	-	-	Hard rime ¼" thick at 5' level of leg	260 <sup>o</sup> (W)
16-03-81	calm	-	-3	Bare	-
13-04-81	6	0 <sup>o</sup> (N)	-6	Bare	-

TABLE OF DATASITE # 2d PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
1-12-80	9-12	250° (WSW)	-4	Base	—
10-01-81	2-6	150° (SE)	-10	1" hard rime at 5' level of leg	180° (S)
18-02-81	17	260° (W)	-1	4" pennants of hard rime at 5' level of leg	260° (W)
16-03-81	18-21	210° (WSW)	-4	1" soft rime at 5' level of leg 3" X 7" glaze on ground	210° (WSW) -
13-04-81	6-12	0° (N)	-5	Trace of rime	225° (SW)

TABLE OF DATASITE # 2e PORTLAND CREEK

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	21-23	250 <sup>o</sup> (WSW)	-2	Bare	—
10-01-81	-	-	-	Bare	—
18-02-81	14-17	260 <sup>o</sup> (W)	+2	Bare	—
16-03-81	14-18	210 <sup>o</sup> (WSW)	0	Bare	—
13-04-81	6	0 <sup>o</sup> (N)	-1	Bare	—

TABLE OF DATA

SITE # 3 HILLS OF ST. JOHN'S

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	21-28	250° (WSW)	-3	Bare	-
10-01-81	12	150° (SE)	-10	Bare	-
13-04-81	23-29	0° (N)	-5	Slight trace of glaze 2" X 4" Glaze on ground	270° (W) 90° (E)

TABLE OF DATASITE # 4 L' ANSE AU LOUP

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	14-16	290 <sup>o</sup>	-9	Soft rime over 1½"-2" of hard rime at 5' level of tower leg	120 <sup>o</sup> (SSE)
10-01-81	12	60 <sup>o</sup> (NE)	-13	4" hard rime over 2" glaze at 5' level of leg 10" hard rime at same location 10" to 12" pennants of hard rime on rods	0 <sup>o</sup> (N) 180 <sup>o</sup> (S) 180 <sup>o</sup> (S)
13-04-81	46-58	0 <sup>o</sup> (N)	-6	12" hard rime  1" X 3" hard rime on tower leg	45 <sup>o</sup> (NE)  135 <sup>o</sup> (SE)

TABLE OF DATASITE # 4a L' ANSE AU LOUP

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	12-23	290 <sup>o</sup> (WNW)	-10	Soft rime over 3/4" to 1" of hard rime at 5' level of tower leg .	120 <sup>o</sup> (SSE)
10-01-81	7-9	90 <sup>o</sup> (E)	-13	2" hard rime over 1/2" glaze at 5' level of leg and 1 1/2" hard rime at same level	0 <sup>o</sup> (N) 180 <sup>o</sup> (S)
13-04-81	40-46	0 <sup>o</sup> (N)	-5	1" X 3" hard rime on ground	135 <sup>o</sup> (SE)



TABLE OF DATASITE # PW1 PINWARE RIVER

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	10	290° (WNW)	-9	Bare	-
07-01-81	-	-	-4	Bare	-
13-04-81	40-46	0° (N)	-2	Slight trace of hard rime	90° (E)

TABLE OF DATASITE # PW2 PINWARE RIVER

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	13	290° (WNW)	-7	Slight trace of rime or glaze	120° (SSE)
07-01-81	6	190° (S)	-7	½" hard rime at 5' level of leg	180° (S)
13-04-81	29-40	0° (N)	-5	¾" X 2 ½" hard rime on ground	90° (E)

TABLE OF DATASITE # PW3 PINWARE RIVER

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
01-12-80	23-25	290 <sup>o</sup> (WNW)	-9	Slight trace of rime	120 <sup>o</sup> (SSE)
10-01-81	2-3	60 <sup>o</sup> (NE)	-12	Bare	-
13-04-81	46-52	0 <sup>o</sup> (N)	-5	Trace of hard rime	-

TABLE OF DATA  
SITE # PW4 PINWARE RIVER

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	9-12	290 <sup>o</sup> (WNW)	-10	Bare	-
10-01-81	-	-	-14	Bare	-
13-04-81	12-17	0 <sup>o</sup> (N)	-3	1/2" hard rime on ground	135 <sup>o</sup> (SE)

TABLE OF DATASITE #9 28 MILE SECTION

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	9-12	290 <sup>o</sup> (WNW)	-4	Bare	-
10-01-81	-	-	-	Bare	-
18-02-81	8	260 <sup>o</sup> (W)	0	Bare	-
16-03-81	12	210 <sup>o</sup> (WSW)	-3	Bare * 1" X 2" Glaze on ground	-
13-04-81	6	0 <sup>o</sup> (N)	-7	Trace of rime	45 <sup>o</sup> (NE)

TABLE OF DATA  
SITE #10 MAIN RIVER

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	-	-	-4	Bare	-
10-01-81	-	-	-	Bare	-
18-02-81	-	-	+4	Bare	-
16-03-81	calm	-	0	Bare	-
13-04-81	2-6	0° (N)	0	Bare	-

TABLE OF DATASITE #13 PARSONS POND

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	2-5	290° (WNW)	-4	Bare	-
10-01-81	9-12	150° (SE)	-10	Bare	-
18-02-81	5	260° (W)	+1	Bare	-
16-03-81	7	210° (WSW)	-3	Bare 1" X 2" Glaze on ground	- -
13-04-81	6-12	0° (N)	-	Bare	-

TABLE OF DATASITE #14 PARSONS POND

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	12-14	290 <sup>o</sup> (WNW)	-7	1½" pennants of soft rime at 5' level of leg	290 <sup>o</sup> (WNW)
10-01-81	11-14	150 <sup>o</sup> (SE)	-10	1" pennant of hard rime at 5' level of leg	180 <sup>o</sup> (S)
18-02-81	5-7	260 <sup>o</sup> (W)	-1	4" hard rime pennants at 5' level of leg and 6"-8" at tower top	260 <sup>o</sup> (W)
16-03-81	18-21	210 <sup>o</sup> (WSW)	-4	1½" soft rime at 5' level of leg 2" X 2" glaze on ground	210 <sup>o</sup> -
13-04-81	17	0 <sup>o</sup> (N)	-8	Trace of rime	225 <sup>o</sup> (SW)



TABLE OF DATA  
SITE #15 PARSONS POND

DATE	WIND SPEED (MPH)	WIND DIR. (TRUE)	TEMP. °C	ACCUMULATION NOTED	DIRECTION OF ACCUMULATION
02-12-80	5	290° (WNW)	-4	Bare	—
10-01-81	12-17	150° (SE)	-10	Bare	—
18-02-81	6	260° (W)	+1	Bare	—
16-03-81	12	210° (WSW)	-4	Bare	—
13-04-81	6-12	0° (N)	-4	Bare	—

- 7.1 Location of Anemometers
- 7.2 Location of Test Sites & Test Spans
- 7.3 Location of Salt Contamination Sites
- 7.4 Contamination Structure

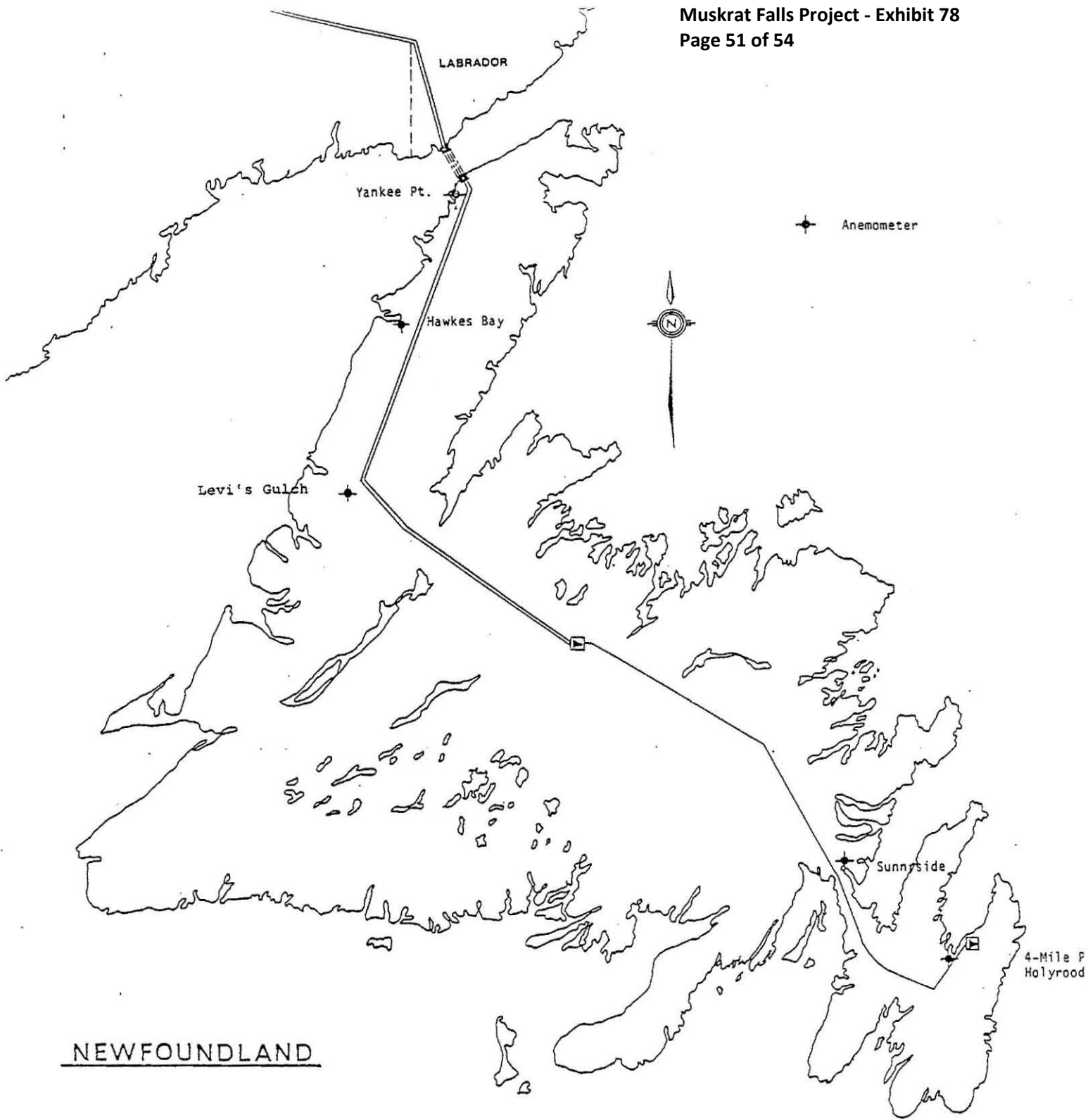
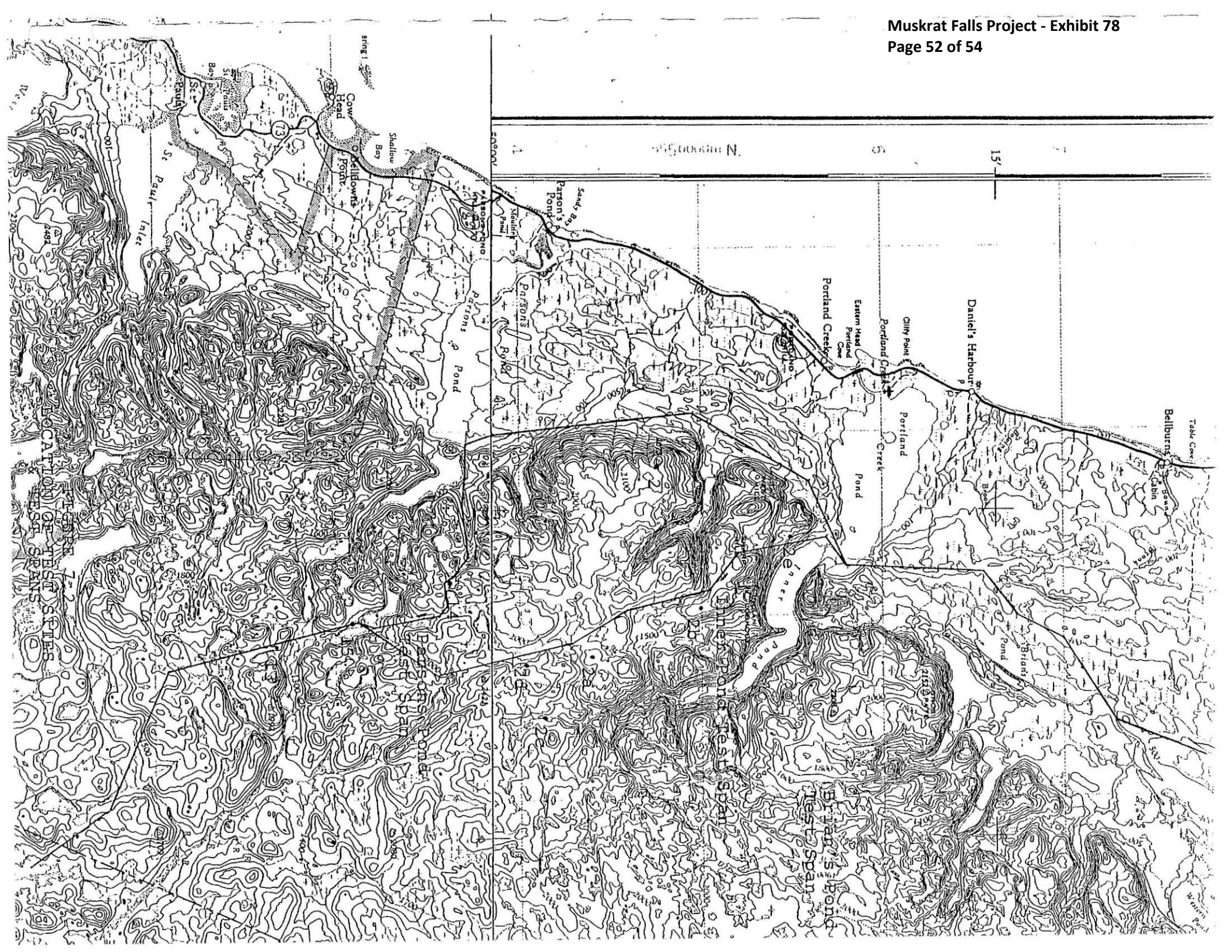


FIGURE 7.1  
LOCATION OF ANEMOMETERS



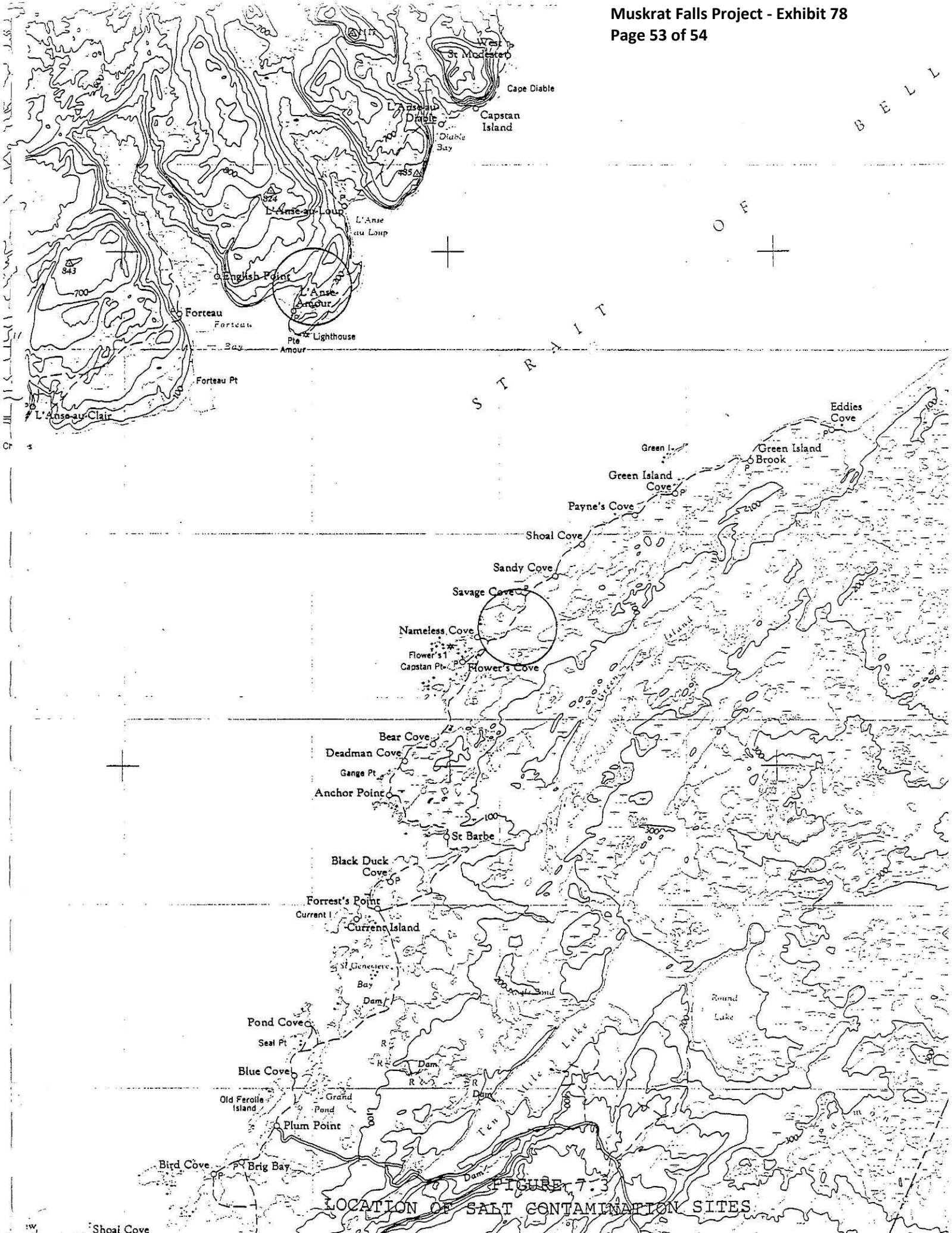
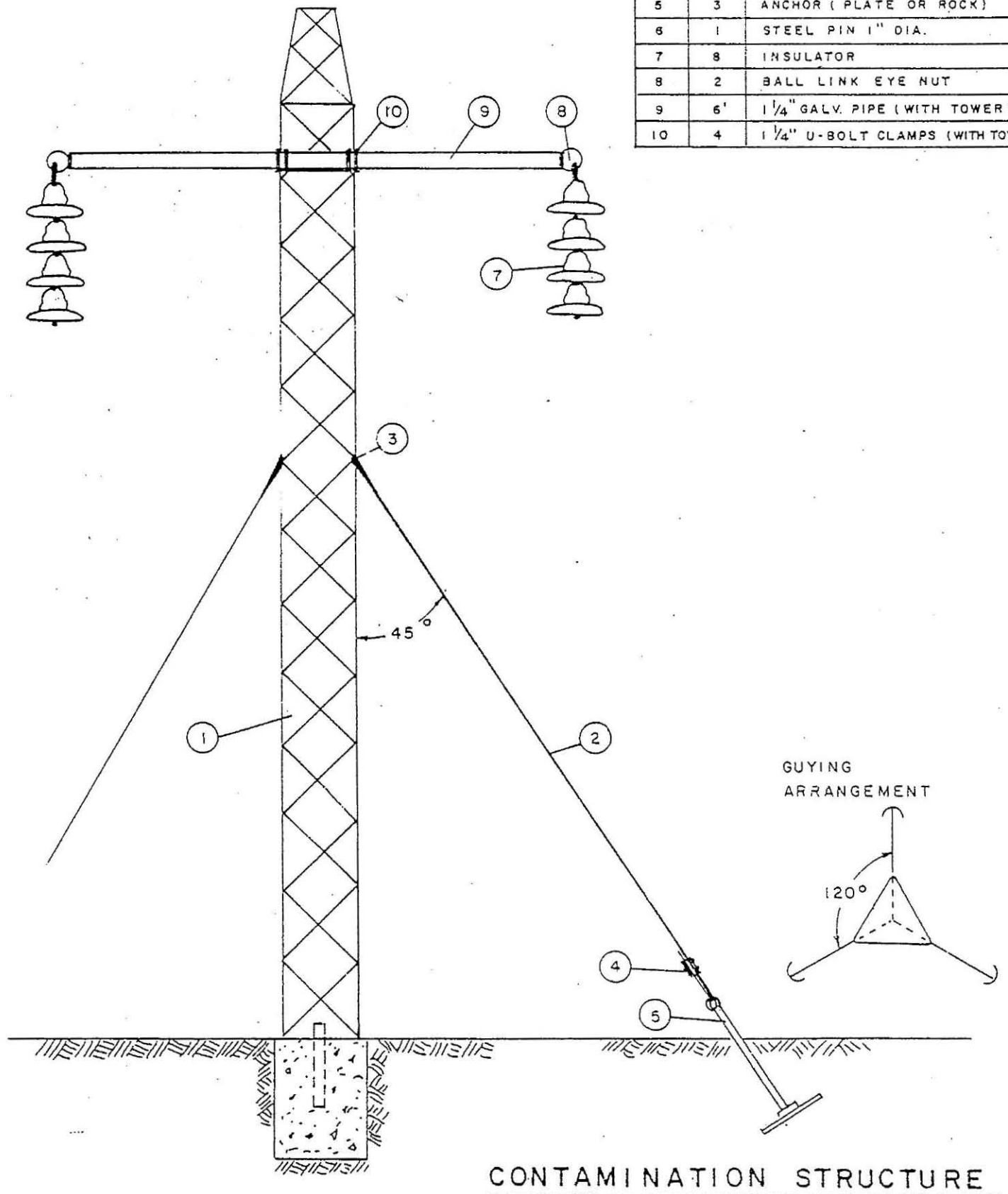


FIGURE 7-3  
LOCATION OF SALT CONTAMINATION SITES

Item No	Quan.	Description
1	1	28' DME 3 TOWER C/W BASE
2	AS REQD.	3/8" GUY WIRE
3	3	PREFORMED GUY GRIP 3/8"
4	3	3-BOLT CLAMP
5	3	ANCHOR (PLATE OR ROCK)
6	1	STEEL PIN 1" DIA.
7	8	INSULATOR
8	2	BALL LINK EYE NUT
9	6'	1 1/4" GALV. PIPE (WITH TOWER)
10	4	1 1/4" U-BOLT CLAMPS (WITH TOW



CONTAMINATION STRUCTURE

FIGURE 7.4