APPENDIX - I

Refinement to Reservoir and River
Temperature and Ice Studies
For Simulation Period
October 1976 to May 1977

Text Changes and
New Exhibits
G and N

For

Instream Ice Simulation Study by Harza-Ebasco for the Alaska Power Authority. Transmitted to the Federal Energy Regulatory Commission on November 2, 1984.

42164312
850204

SUSITNA HYDROELECTRIC PROJECT
INSTREAM ICE SIMULATION STUDY
FINAL REPORT, OCTOBER 1984
DOCUMENT NO. 1986

ERRATA

TEXT

a) Section 3.3, first paragraph, 4th sentence should read, "The maximum upstream extent of the ice front ranges from River Mile 126 (1976-77 winter) to River Mile 140 (1971-72 winter)."

b) Section 3.3, third paragraph should read, "The mildest simulated river ice conditions for the 1996 energy demand occur for the winter of 1976-77 (Exhibit G). Maximum total ice thicknesses for this simulation range from 1 ft. to 6 ft., of which 1 ft. is solid ice. These thicknesses exist downstream of River Mile 126 and are generally similar to those of natural 1976-77 conditions in the same reach. However, the maximum with-project river stages in this reach are 2 ft. to 7 ft. higher than natural conditions due to the higher with-project winter flows. Maximum river stages for the 1976-77 with-project simulation are 1 ft. to 8 ft. lower than those of the 1971-72 simulation."

c) Section 3.3, fourth paragraph, fourth sentence should read, "Maximum extent of the ice cover with the warm releases is River Mile 126, versus River Mile 140 with inflow-matching release temperatures."

d) Section 3.5, first paragraph, second sentence should read, "Results show that the beginning of the ice front progression at the Chulitna confluence ranges from early December to early January, approximately 0-2 weeks later than the corresponding Watana-only simulations, and 4-7 weeks later than natural conditons for the same winters."

e) Section 3.5, first paragraph, third sentence should read, "Maximum upstream extent of the ice front ranges from River Mile 123 to 137, and is 2-13 miles downstream of that with Watana only and 1996 energy demand."

f) Section 3.5, third paragraph, fourth sentence should read, "Maximum river stages, where an ice cover exists, are 1 ft. to 6 ft. higher than corresponding natural conditions."

g) Section 4.0, item number one, first sentence should read, "Relative to natural conditions, initial progression of the Middle Susitna ice front at the Chulitna confluence (River Mile 98.6) is expected to be delayed by 2 to 6 weeks with Watana operating alone, and 4 to 7 weeks with Watana and Devil Canyon operating together."

TABLES

Replace Tables IV, V, VI, VII, VIII and IX with the corresponding new tables attached.

EXHIBITS

Replace Exhibits G and N with the corresponding new Exhibits attached. (Reference Run #7696CNB replaces #7696CNA, and Reference Run #7602CNB replaces #7602CNA).

SUSITNA HYDROELECTRIC PROJECT
MAXIMUM SIMULATED WINTER RIVER STAGES

TABLE IV

Slough or Side Channel	River Mile	Threshold Elevation	NATURAL CONDITIONS				WATANA ONLY							WATANA AND DEVIL CANYON						WATANA FILLING	
							1996 DEMAND					2001 DEMAND		2002 DEMAND				2020 DEMAND		YR.1	YR. 2
			1971-72	1976-77	1981-82	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72[W]	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82
Whiskers	101.5	367	369	366	368	367	372	370	371	370	371	372	370	371	368	369	369	372	370	367	367
Gash Creek	112.0	Unknown	456	455	455	456	459	457	460	459	460	459	461	458	456	456	457	459	457	455	455
6A	112.3	(Upland)	459	457	457	459	462	460	462	462	463	461	463	460	459	458	460	461	459	457	457
8	114.1	476	474	472	472	474	478	475	477	476	477	476	478	475	474	475	475	476	475	473	473
MS II	115.5	482	484	480	484	484	490	486	488	488	488	489	489	487	486	485	487	490	488	481	483
MS II	115.9	487	485	482	486	486	492	489	491	491	490	491	492	489	489	488	490	492	490	485	486
Curry	120.0	Unknown	522	520	523	520	526	525	527	525	523	525	521	522	520	520	520	525	523	520	521
Moose	123.5	Unknown	552	546	549	548	556	552	555	550	552	555	550	553	547	548	545	555	550	546	548
8A West	126.1	573	572	569	571	570	576	574	574	572	572	575	568	574	568	568	568	575	572	568	570
8A East	127.1	582	584	581	583	582	587	583	585	582	582	586	581	584	581	580	581	585	582	580	582
9	129.3	604	605	603	606	605	609	603	607	603	603	610	603	606	601	601	602	608	603	602	603
9 u/s	130.6	Unknown	622	616	620	621	624	617	620	617	617	625	617	620	616	616	616	621	617	616	618
4th July	131.8	Unknown	632	626	629	630	635	628	631	628	628	636	628	633	627	627	627	631	628	625	628
9A	133.7	651	655	649	651	651	657	650	653	650	650	659	650	652	650	650	650	651	650	650	650
10 u/s	134.3	657	662	654	657	658	663	656	659	656	656	665	656	659	655	655	655	657	656	658	655
11 d/s	135.3	Unknown	673	667	670	672	675	667	670	668	668	676	668	670	667	667	667	668	668	670	668
11	136.5	687	684	681	683	684	688	684	687	683	683	690	683	685	682	682	682	684	684	682	682
17	139.3	Unknown	–	–	–	–	717	715	715	715	715	727	715	714	714	714	714	715	715	712	713
20	140.5	730	–	–	–	–	732	729	729	729	729	741	729	728	728	728	728	729	729	727	729
21 (AG)	141.8	747	–	–	–	–	746	746	746	746	745	751	746	746	746	745	746	747	747	745	745
21	142.2	755	–	–	–	–	753	753	753	753	753	755	753	752	752	752	752	753	754	751	750
22	144.8	788	–	–	–	–	787	787	787	786	787	787	786	785	785	785	785	787	787	782	782

Upstream Boundary of Natural Simulations

Upstream Extent of Ice Cover Progression

NOTES:

1. ☐ Indicates locations where maximum river stage equals or exceeds a known slough threshold elevation. See Exhibits A-T for duration of overtoppings.
2. "Case C" operating guide is assumed for with-project simulations.
3. 1971-72[W] simulation assumes warm, 4° C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
4. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.
5. All river stages in feet.
6. Winter air temperatures:
   - 1971-72 cold
   - 1976-77 very warm
   - 1981-82 average
   - 1982-83 warm

TABLE V

SUSITNA HYDROELECTRIC PROJECT
OCCURRENCES WHERE WITH-PROJECT MAXIMUM RIVER STAGES
ARE HIGHER THAN NATURAL CONDITIONS

Slough or Side Channel	River Mile	Watana Only Operating	Watana and Devil Canyon Operating	Watana Filling
Whiskers	101.5	6/6	6/6	0/2
Gash Creek	112.0	6/6	6/6	0/2
6A	112.3	6/6	5/6	0/2
8	114.1	6/6	6/6	1/2
MSII	115.5	6/6	6/6	0/2
MSII	115.9	6/6	6/6	0/2
Curry	120.0	6/6	2/6	0/2
Moose	123.5	6/6	4/6	0/2
8A West	126.1	5/6	3/6	0/2
8A East	127.1	4/6	1/6	0/2
9	129.3	3/6	2/6	0/2
9 u/s	130.6	3/6	0/6	0/2
4th July	131.8	3/6	2/6	0/2
9A	133.7	3/6	1/6	0/2
10 u/s	134.3	4/6	1/6	0/2
11 d/s	135.3	2/6	0/6	0/2
11	136.5	4/6	2/6	0/2

Notes:

1. For example, 4/6 means that 4 of the 6 with-project simulations resulted in a higher maximum river stage than the natural conditions for corresponding winters.

2. "Case C" operating guide and "inflow-matching" reservoir release temperatures are assumed for with-project simulations.

TABLE VI

SUSITNA HYDROELECTRIC PROJECT
EXPECTED PROJECT EFFECTS ON WINTER SLOUGH OVERTOPPING

Slough or Side Channel	River Mile	WATANA ONLY: 1998 DEMAND 1971-72	1976-77	1981-82	1982-83	1971-72[W]	WATANA ONLY: 2001 DEMAND 1971-72	1982-83	WATANA AND DEVIL CANYON: 2002 DEMAND 1971-72	1976-77	1981-82	1982-83	2020 DEMAND 1971-72	1982-83	WATANA FILLING YR.1 1982-83	YR. 2 1981-82
Whiskers	101.5		X							X					O	O
8	114.1	X		X	X	X	X	X					X			
MS II	116.8		X							X					O	
MS II	111.9	X	X	X	X	X	X	X	X	X	X	X	X	X		
8A West	128.1	X	X	X			X		X				X			
8A East	127.1		X					O			O	O			O	
9	126.3				O	O		O			O	O		O	O	O
9A	123.7				O	O		O			O	O		O	O	O
10 u/s	124.3				O	O		O			O	O		O		O
11	126.6	X		X			X									

LEGEND:

- X — Slough is overtopped with project, but not under simulated natural conditions for the corresponding winter.
- O — Slough is overtopped with simulated natural conditions, but not overtopped with project.

NOTES:

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72[W] simulation assumes warm, 4° C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Winter air Temperatures:
   - 1971-72 cold
   - 1976-77 very warm
   - 1981-82 average
   - 1982-83 warm

TABLE VII

SUSITNA HYDROELECTRIC PROJECT
SIMULATED ICE FRONT PROGRESSION

	Starting Date at Chulitna Confluence	Melt-Out Date	Maximum Upstream Extent (River Mile)
Natural Conditions			
1971-72	Nov. 5	--	137[N]
1976-77	Dec. 8	--	137[N]
1981-82	Nov. 18	May 10-15[B]	137[N]
1982-83	Nov. 5	May 10[B]	137[N]
Watana Only - 1996 Demand			
1971-72	Nov. 28	May 15[E]	140
1976-77	Dec. 26	April 18	126
1981-82	Dec. 28	April 3	137
1982-83[W]	Dec. 12	Mar. 20	126
1971-72[W]	Dec. 17	Mar. 27	126
Watana Only - 2001 Demand			
1971-72	Nov. 28	May 15[E]	142
1982-83	Dec. 19	March 16	124
Both Dams - 2002 Demand			
1971-72	Dec. 2	May 3[E]	137
1976-77	Jan. 8	April 14	124
1981-82	Dec. 30	Mar. 12	124
1982-83	Dec. 22	Mar. 20	123
Both Dams - 2020 Demand			
1971-72	Dec. 3	April 15	133
1982-83	Dec. 14	Mar. 12	126
Watana Filling			
1982-83 (YR.1)	Dec. 23	May 2[E]	156[I]
1981-82 (YR.2)	Dec. 23	May 30[E]	162[I]

Legend:
- B - Observed natural break-up.
- E - Melt-out date is extrapolated from results when occurring beyond April 30.
- N - Ice cover for natural conditions extends upstream of Gold Creek (River Mile 137) by means of lateral ice bridging.
- I - Computed ice front progression upstream of Gold Creek (River Mile 137) is approximation only. Observations indicate closure of river by lateral ice in this reach for natural conditions.

Notes:
1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72[W] simulation assumes 4°C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Weather conditions:
   - 1971-72: Cold winter
   - 1976-77: Very warm winter
   - 1981-82: Average winter
   - 1982-83: Warm winter

TABLE VIII

SUSITNA HYDROELECTRIC PROJECT
TOTAL ICE THICKNESS
MAXIMUM SIMULATED VALUES

Slough or Side Channel	River Mile	NATURAL CONDITIONS				WATANA ONLY							WATANA AND DEVIL CANYON						WATANA FILLING	
						1996 DEMAND					2001 DEMAND		2002 DEMAND				2020 DEMAND		YR. 1	YR. 2
		1971-72	1976-77	1981-82	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72[W]	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82
Whiskers	101.5	5	2	4	3	5	1	3	2	3	5	2	5	1	2	2	4	1	2	3
Gash Creek	112.0	5	4	4	4	5	3	5	5	6	5	7	5	2	2	3	4	1	3	4
6A	112.3	6	5	4	5	5	3	5	4	6	5	7	5	3	3	4	4	1	5	5
8	114.1	5	2	4	4	5	3	4	3	4	5	5	4	2	3	3	4	1	3	3
MSII	115.5	5	2	5	5	6	2	5	5	4	5	6	4	4	3	4	4	2	3	5
MSII	115.9	5	3	7	6	7	4	7	6	6	5	8	4	6	4	6	5	3	5	8
Curry	120.0	6	5	7	4	7	5	8	5	3	5	1	4	1	1	1	4	2	4	6
Moose	123.5	10	4	7	5	9	5	8	2	4	6	2	7	1	1		7	2	5	6
8A West	126.1	5	2	3	3	5	2	3	1	1	5		3				3	1	1	2
8A East	127.1	5	2	3	3	4		2			4		3				3		1	2
9	129.3	6	4	7	6	5		3			6		3				3		2	4
9 u/s	130.6	8	3	6	7	5		2			6		3				2		3	6
4th July	131.8	7	1	3	5	5		2			7		3				2		1	3
9A	133.7	7	1	3	3	6		2			8		3						3	2
10 u/s	134.3	11	1	3	4	7		2			9		4						6	2
11 d/s	135.3	6	1	3	5	6		2			8		3						3	3
11	136.5	5	1	3	4	3		2			5		1						3	4
17	139.3					2					13								1	4
20	140.5					2					12								1	4
21 (A6)	141.8										3								1	2
21	142.2										1								1	1
22	144.8																		1	1

Upstream Boundary of Natural Simulations

Upstream Extent of Ice Cover Progression

NOTES:

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72[W] simulation assumes warm, 4°C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.
4. All ice thickness in feet.
5. Winter air temperatures:
   - 1971-72 cold
   - 1976-77 very warm
   - 1981-82 average
   - 1982-83 warm

TABLE IX

SUSITNA HYDROELECTRIC PROJECT
SOLID ICE THICKNESS
MAXIMUM SIMULATED VALUES

		NATURAL CONDITIONS				WATANA ONLY							WATANA AND DEVIL CANYON						WATANA FILLING	
						1996 DEMAND					2001 DEMAND		2002 DEMAND				2020 DEMAND		YR. 1	YR. 2
Slough or Side Channel	River Mile	1971-72	1976-77	1981-82	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72[W]	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82
Whiskers	101.5	5	2	4	3	5	1	3	2	3	5	2	5	1	2	2	4	1	2	3
Gash Creek	112.0	5	2	4	3	5	1	3	2	2	5	1	5	1	2	1	4	1	2	3
6A	112.3	5	2	4	3	5	1	3	2	2	5	1	5	1	2	1	4	1	2	3
8	114.1	5	2	4	3	5	1	3	2	2	5	1	5	1	2	1	4	1	2	3
MSII	115.5	5	2	4	3	5	1	3	2	1	5	1	4	1	1	1	4	1	2	3
MSII	115.9	5	2	4	3	5	1	3	1	1	5	0	4	1	1	1	4	1	2	3
Curry	120.0	5	2	4	3	5	1	2	0	1	5	0	4	1	1	0	3	0	2	3
Moose	123.5	5	2	4	3	4	1	2	0	0	4	0	4	0	0		2	0	2	2
8A West	126.1	5	2	3	3	4	0	1	0	0	4		3				1	0	1	2
8A East	127.1	5	2	3	3	3		1			4		3				1		1	2
9	129.3	5	2	3	3	3		1			4		3				1		1	2
9 u/s	130.6	5	2	3	3	3		1			4		2				0		1	2
4th July	131.8	5	1	3	3	2		1			4		2				0		1	2
9A	133.7	5	1	3	2	2		0			4		1						1	2
10 u/s	134.3	5	1	3	2	2		0			3		1						1	2
11 d/s	135.3	4	1	3	2	2		0			3		0						1	2
11	136.5	4	1	3	2	1		0			3		0						1	2
17	139.3					0					2								0	2
20	140.5					0					2								0	2
21 (A6)	141.8										1								0	2
21	142.2										0								0	1
22	144.8																		0	1

Upstream Boundary of Natural Simulations

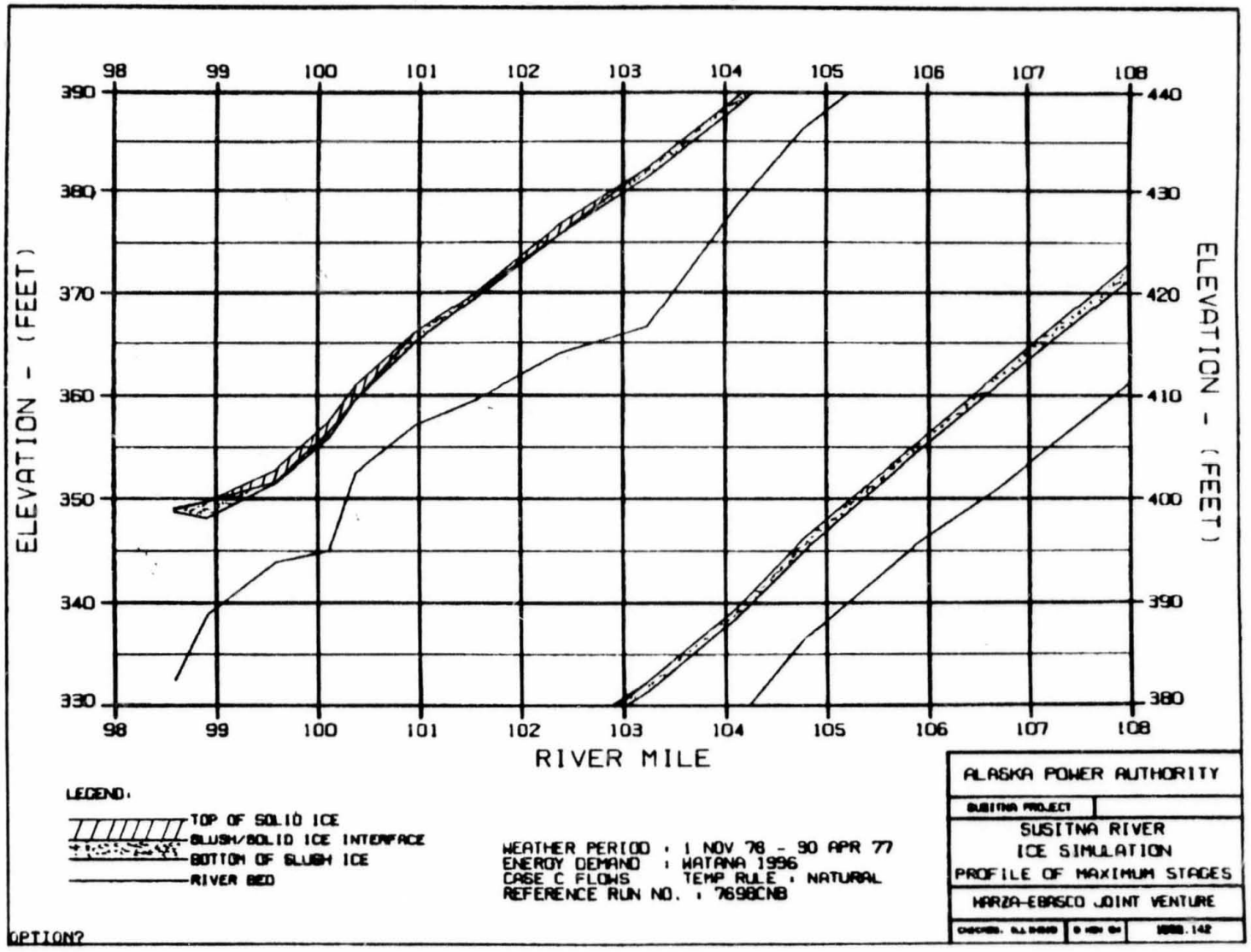
Upstream Extent of Ice Cover Progression

NOTES:

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72[W] simulation assumes warm, 4°C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.
4. All ice thickness in feet.
5. Winter air temperatures:
   - 1971-72 cold
   - 1976-77 very warm
   - 1981-82 average
   - 1982-83 warm

EXHIBIT G

C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400
390
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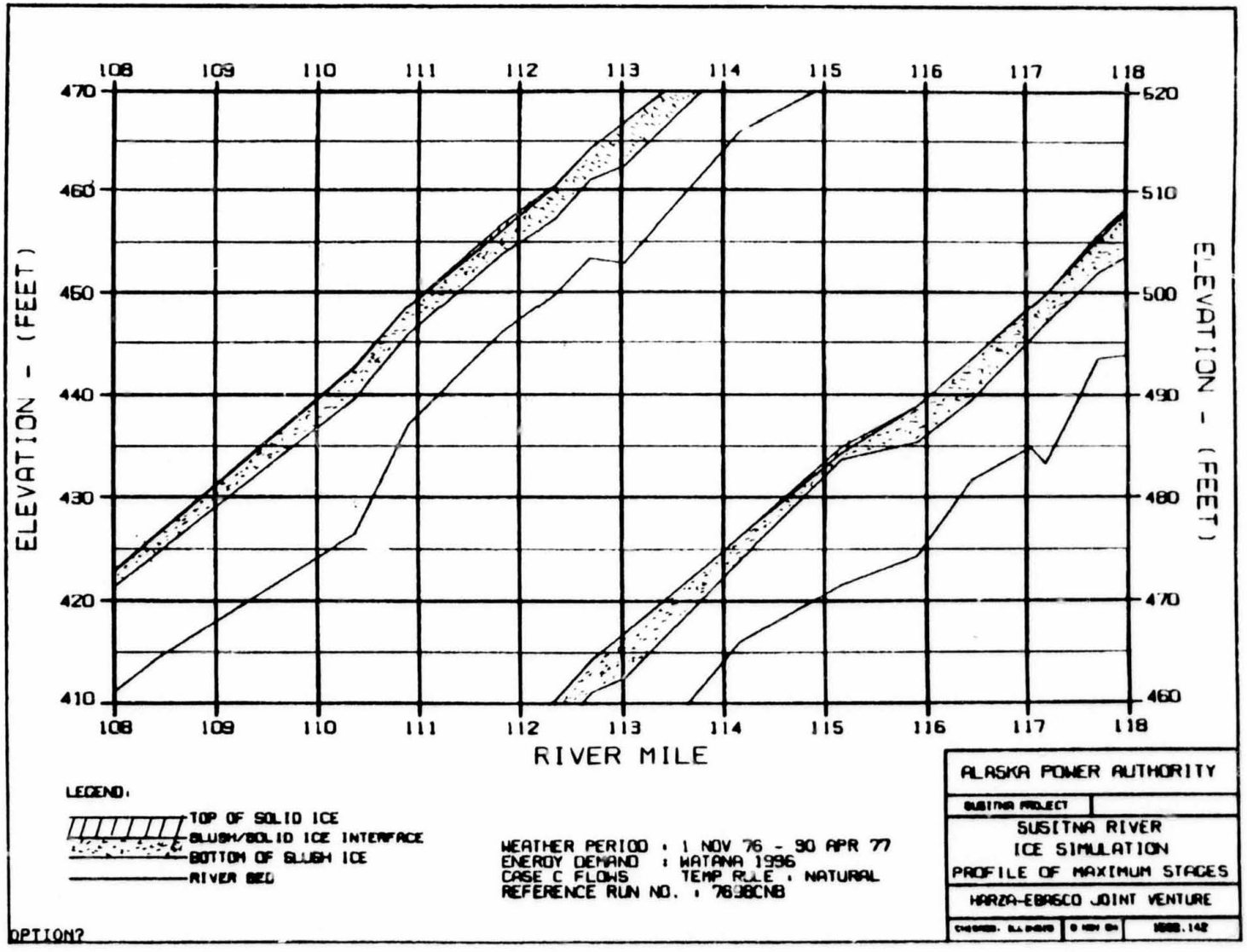
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7698CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION?

C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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7838CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION?

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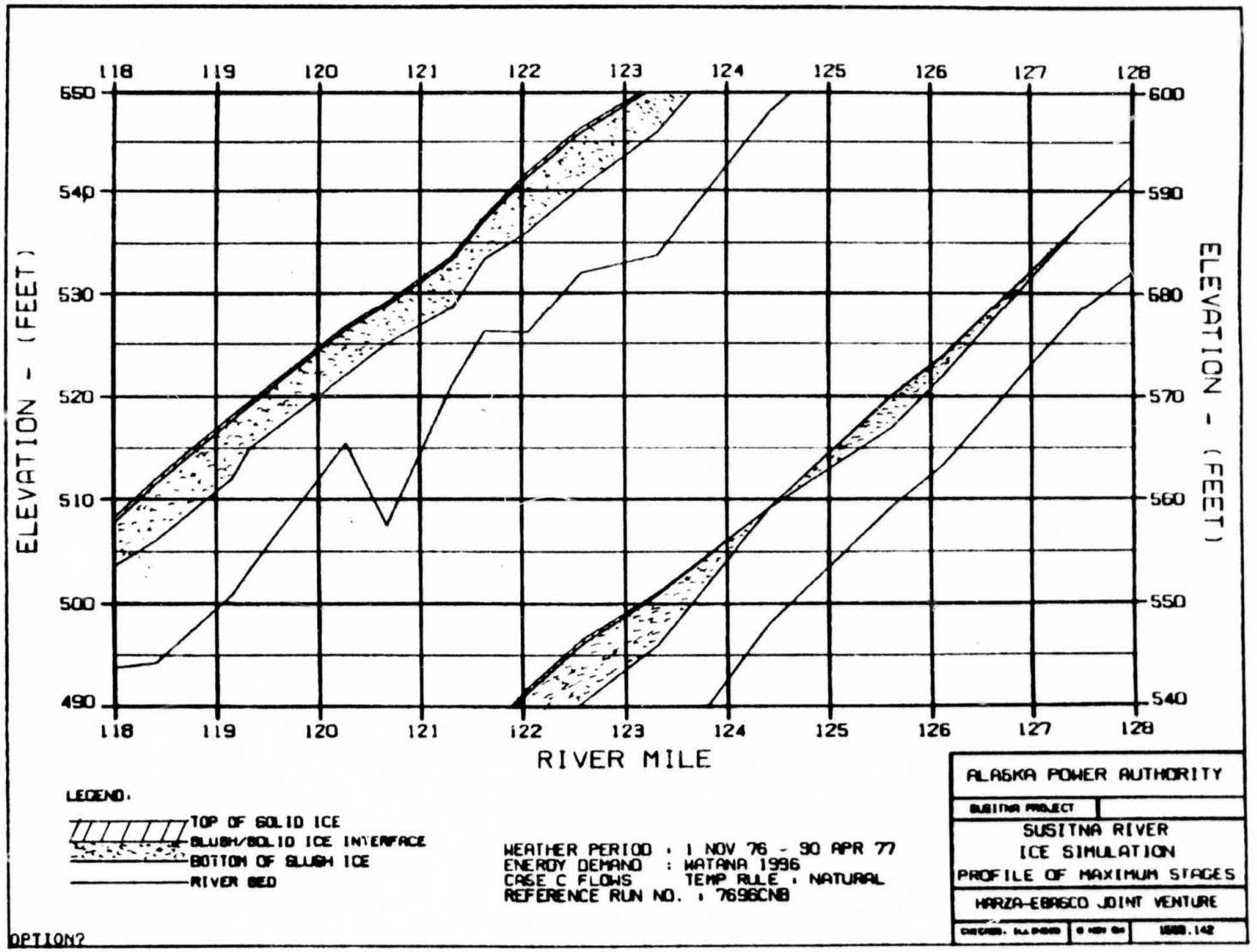
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ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB
ALASKA POWER AUTHORITY
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SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
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OPTION?

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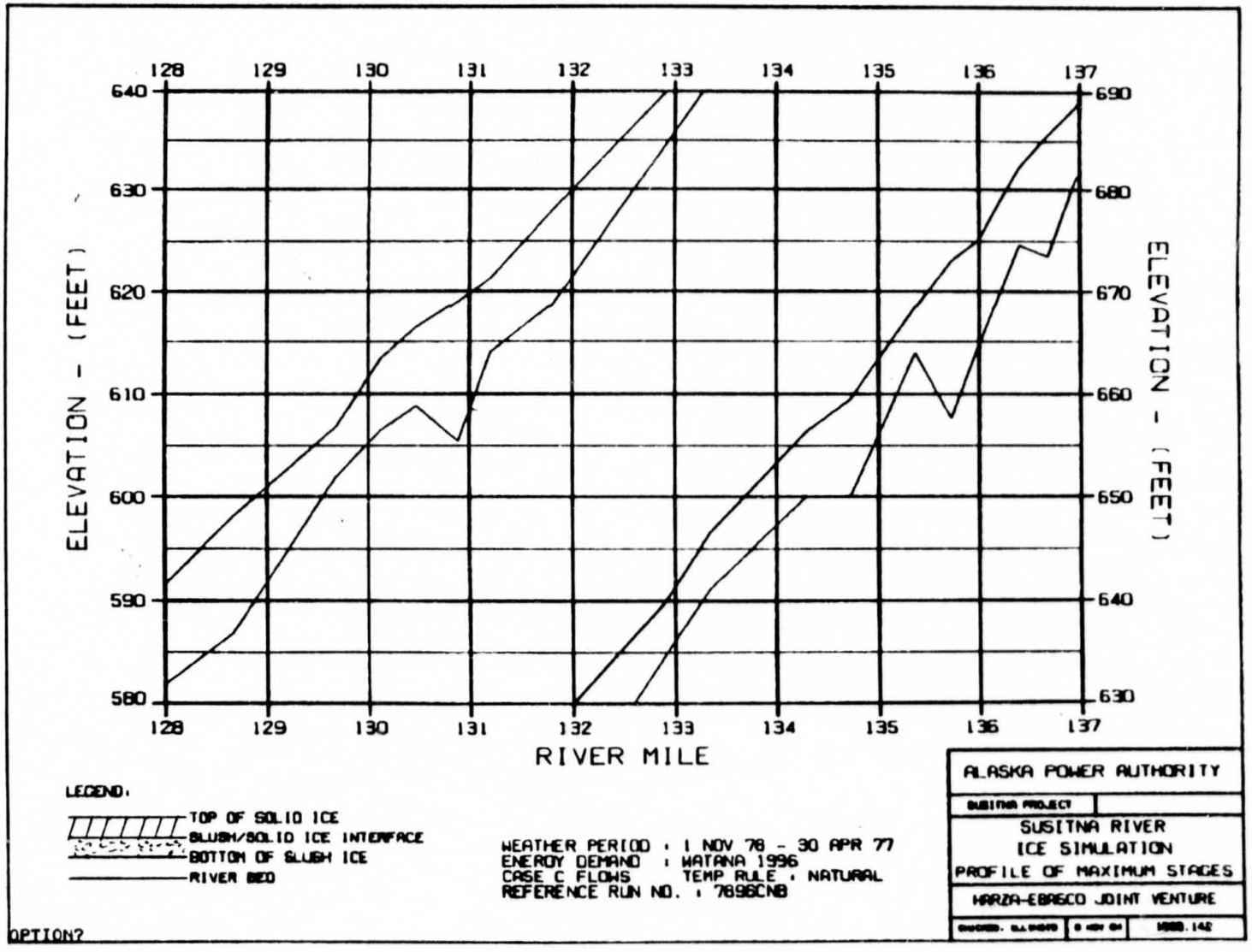
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION?

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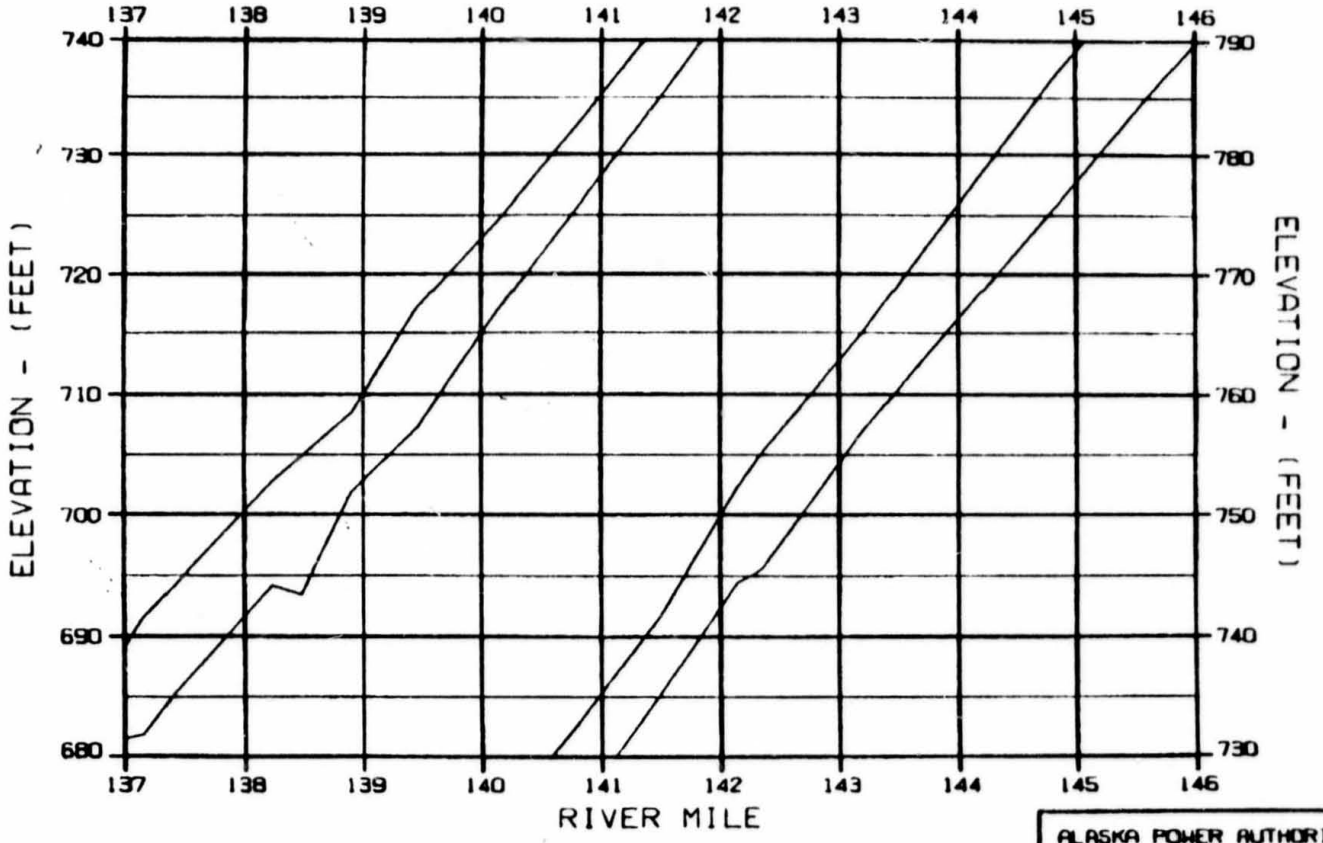


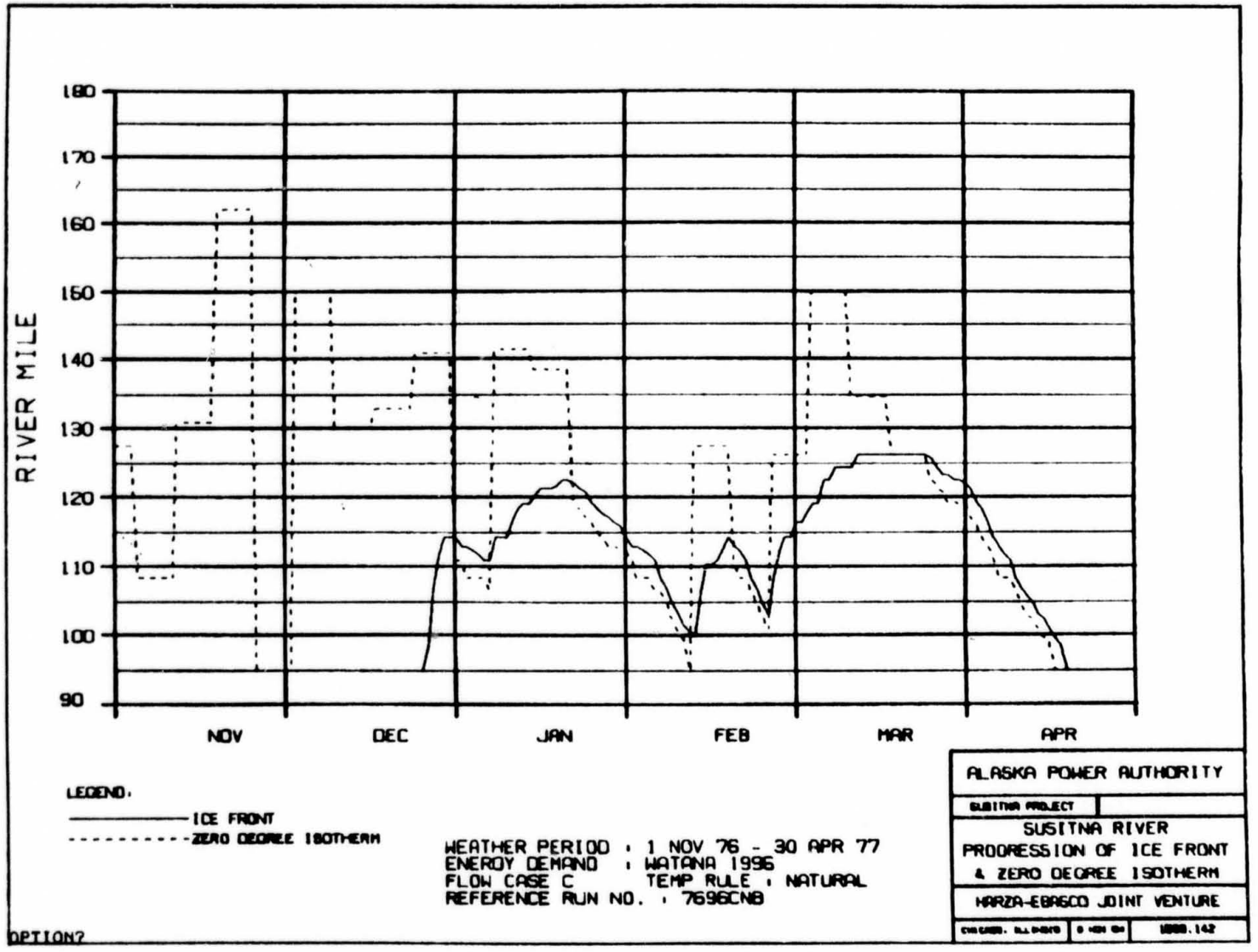
LEGEND:

TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS : TEMP RULE , NATURAL
REFERENCE RUN NO. : 7896CN8

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION?


RIVER MILE
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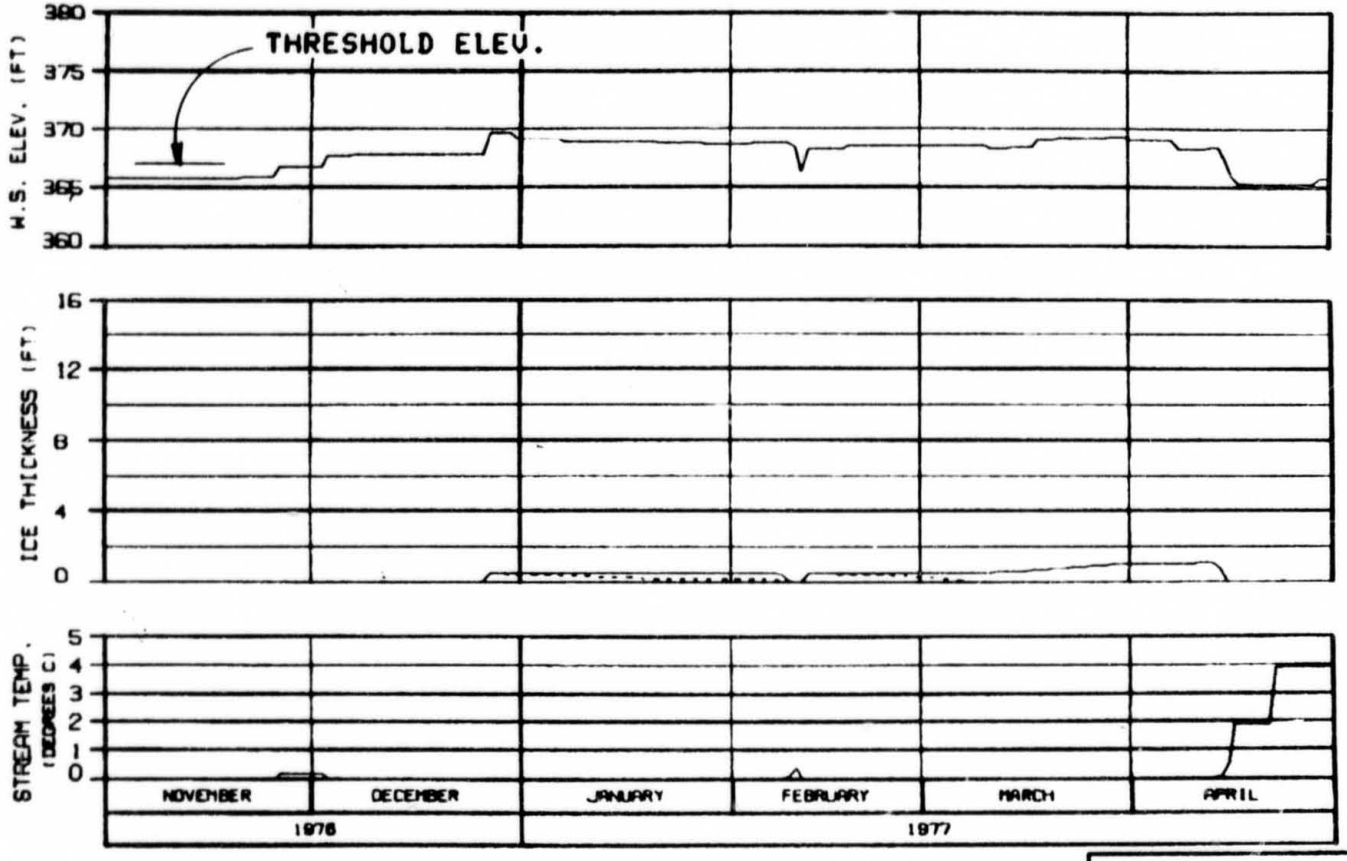
110
100
90
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
FLOW CASE C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

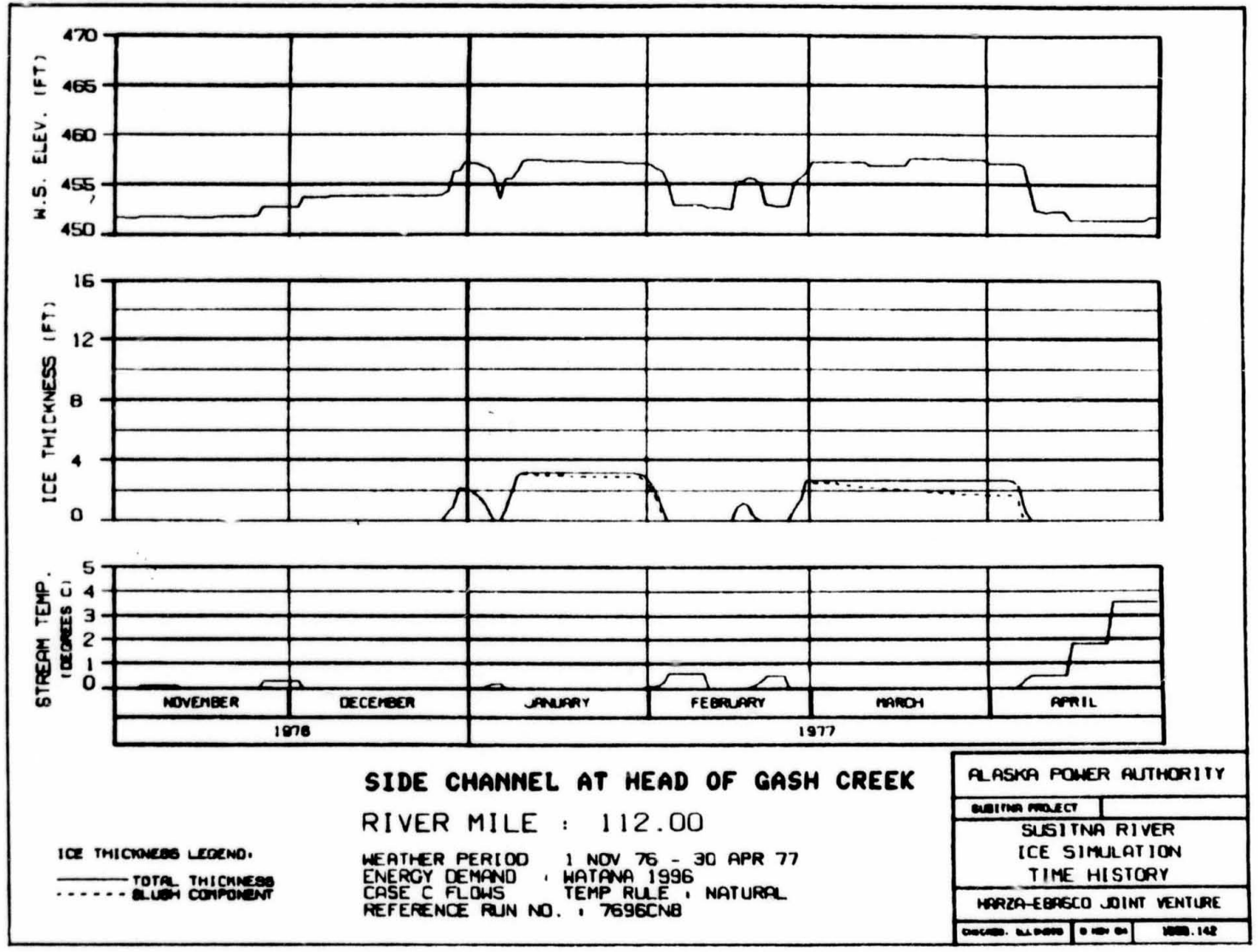
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS
- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS : TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

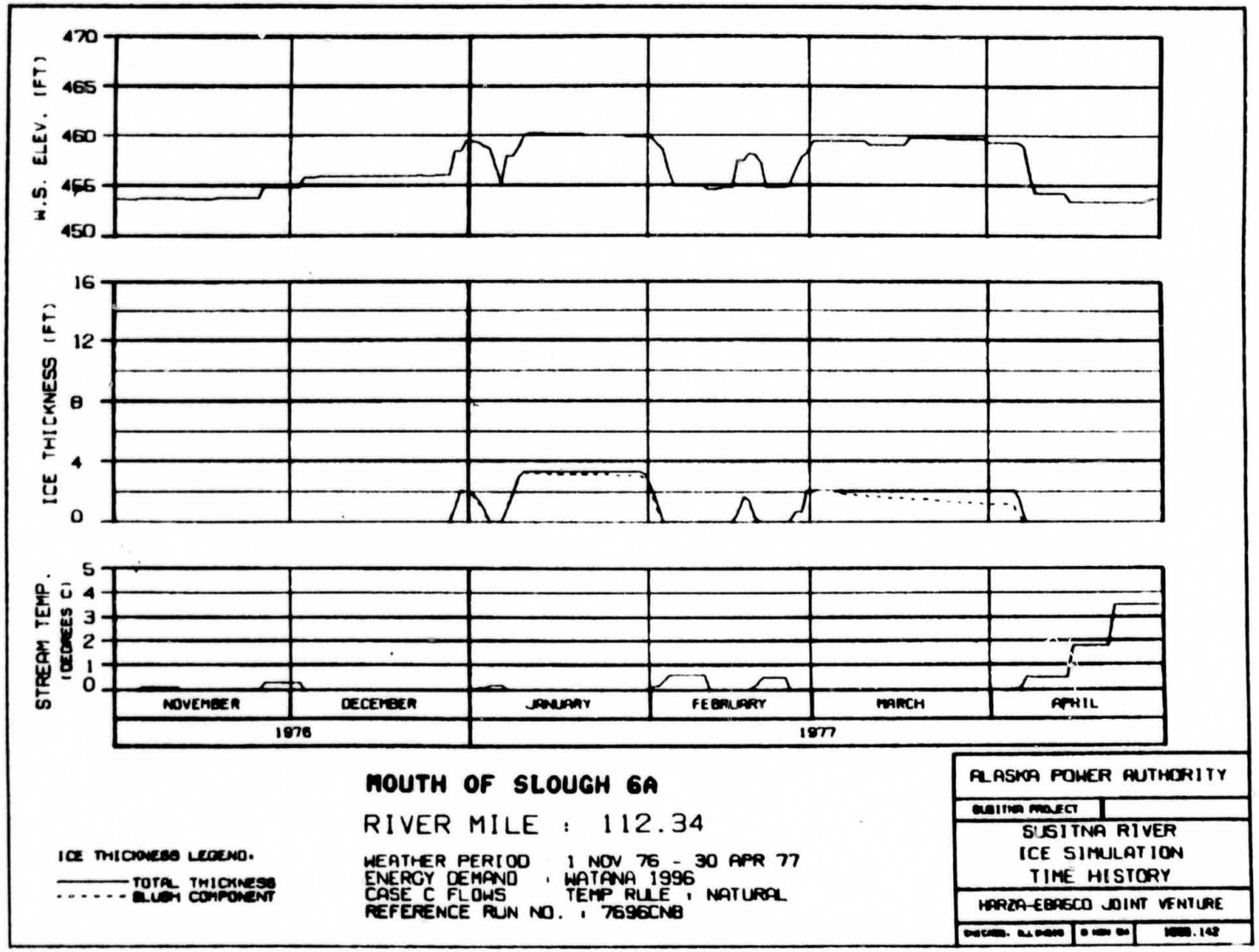
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: D.J. DAVIS | 9 NOV 84 | 1988.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

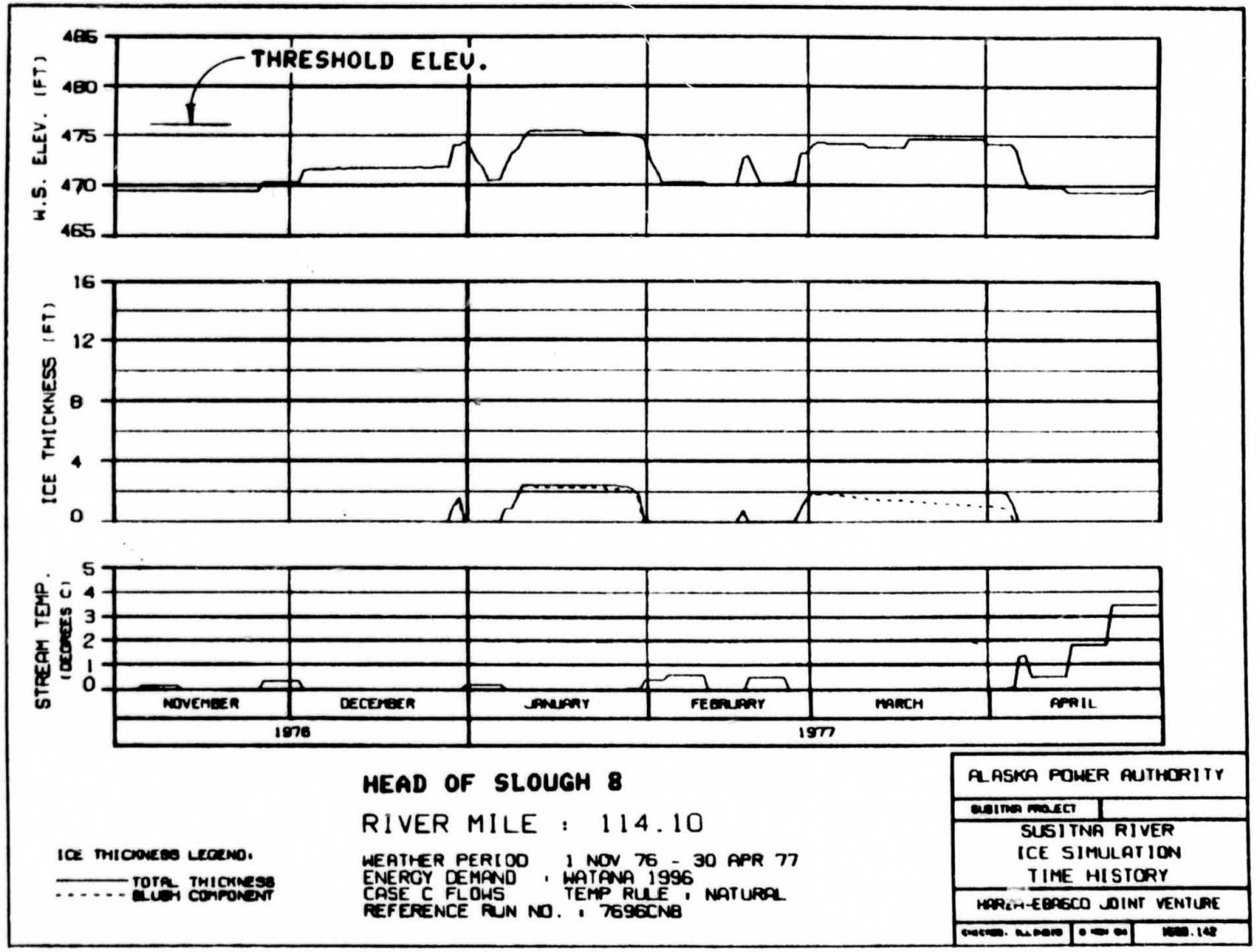
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DATE: 9 NOV 84 | 8888.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

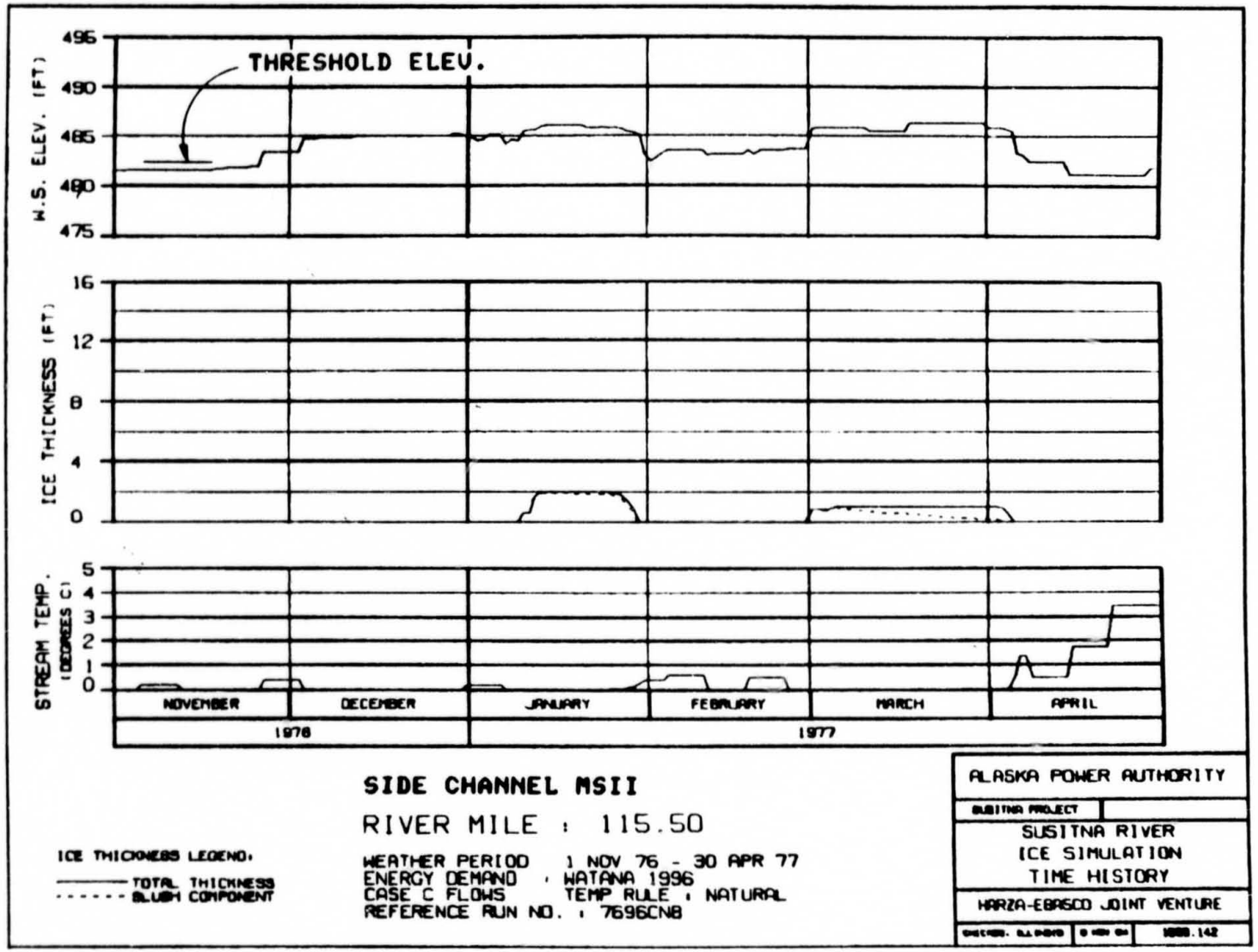
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

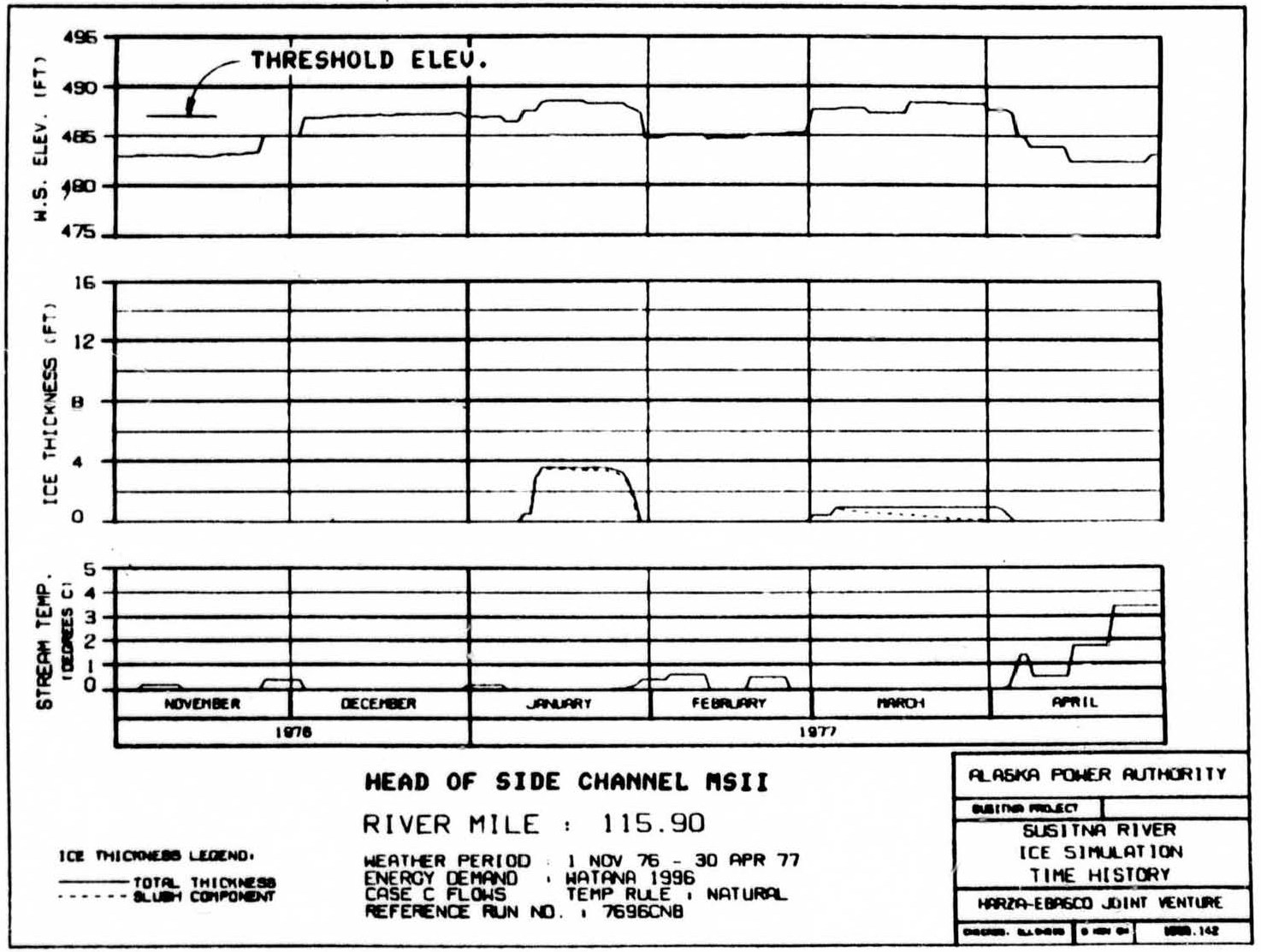
ALASKA POWER AUTHORITY

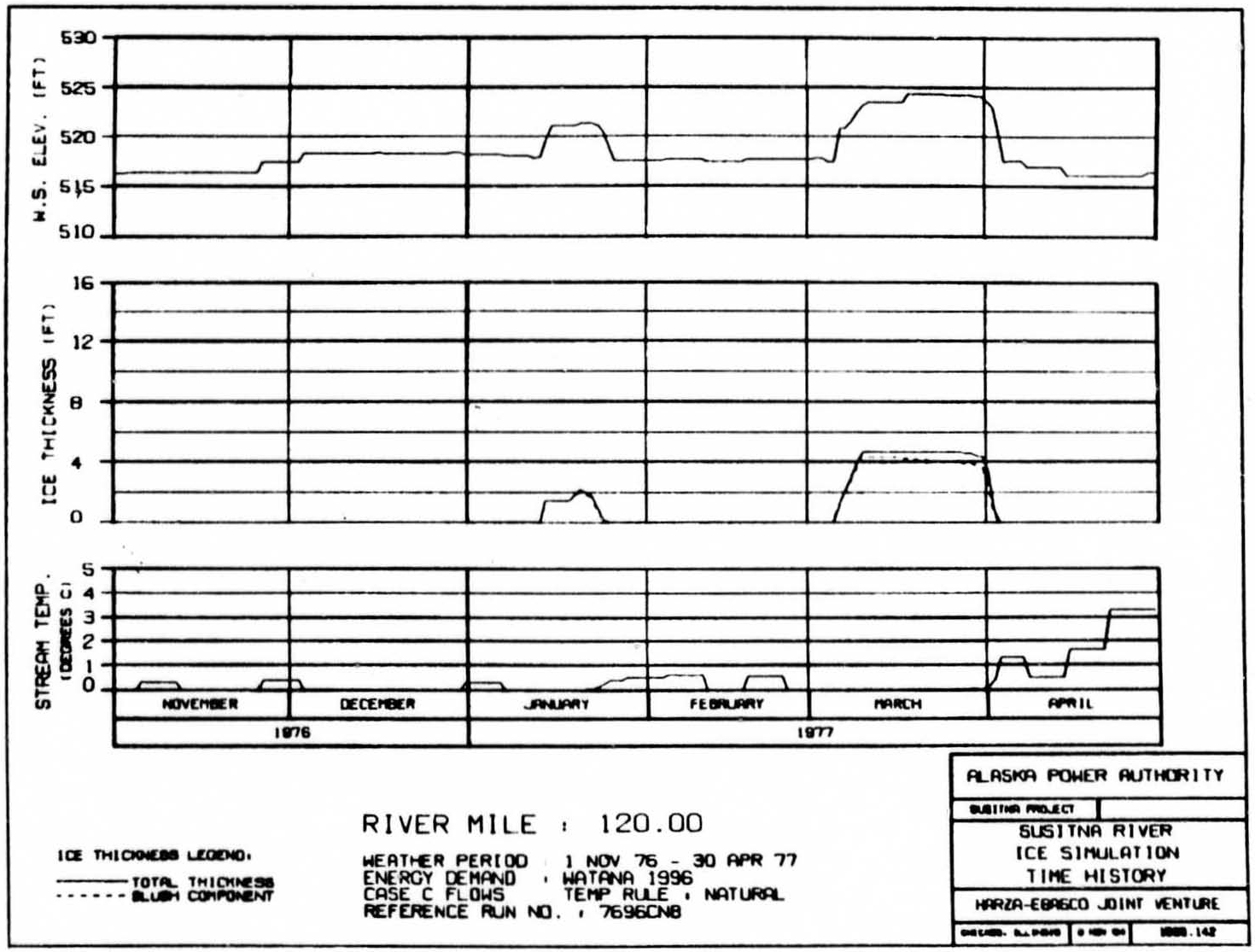
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1888.142


THRESHOLD ELEV.
W.S. ELEV. (FT)
495
490
485
480
475
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SIDE CHANNEL MSII
RIVER MILE : 115.90
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

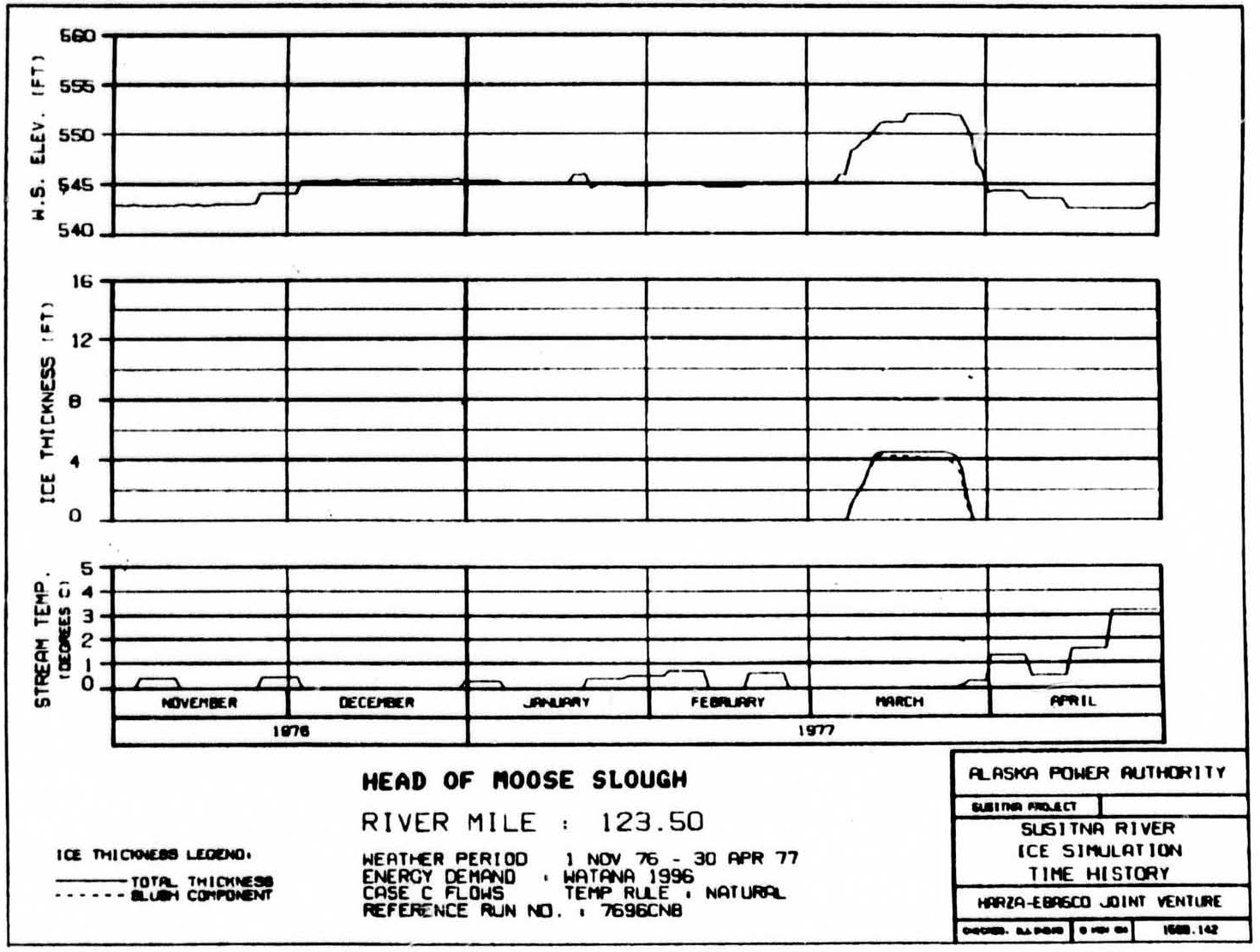
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1885.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

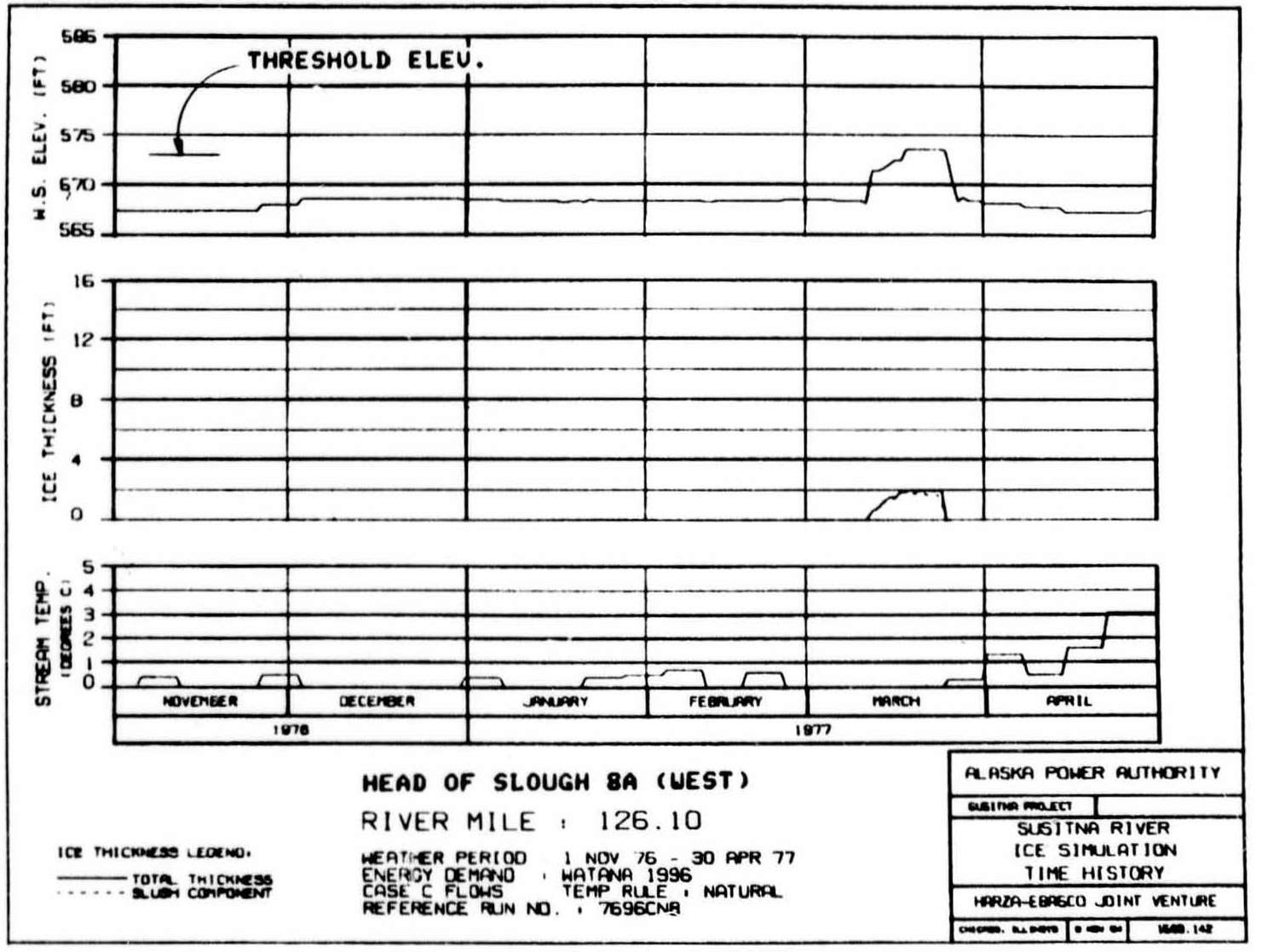
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNA

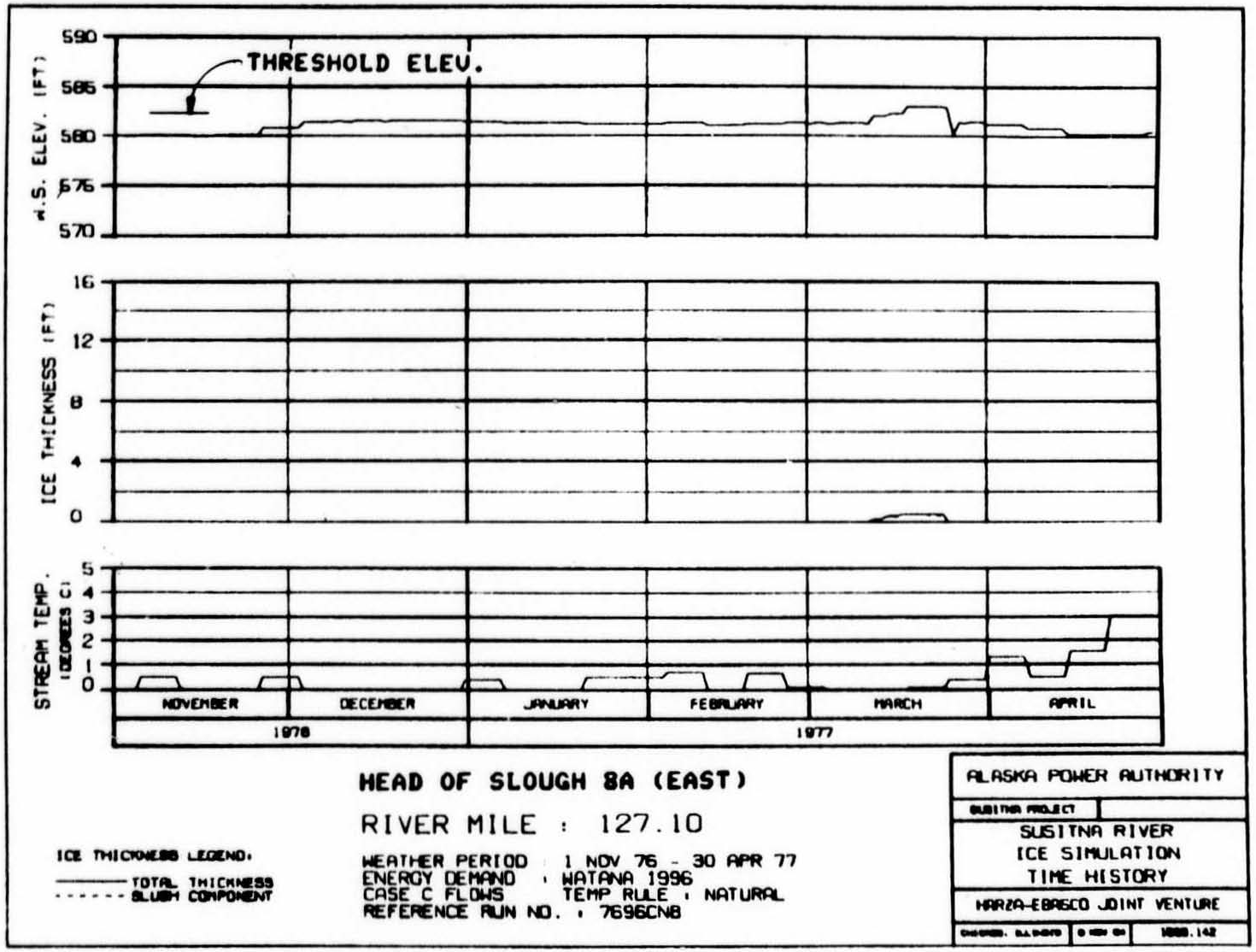
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | [illegible] | 1588.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

ALASKA POWER AUTHORITY

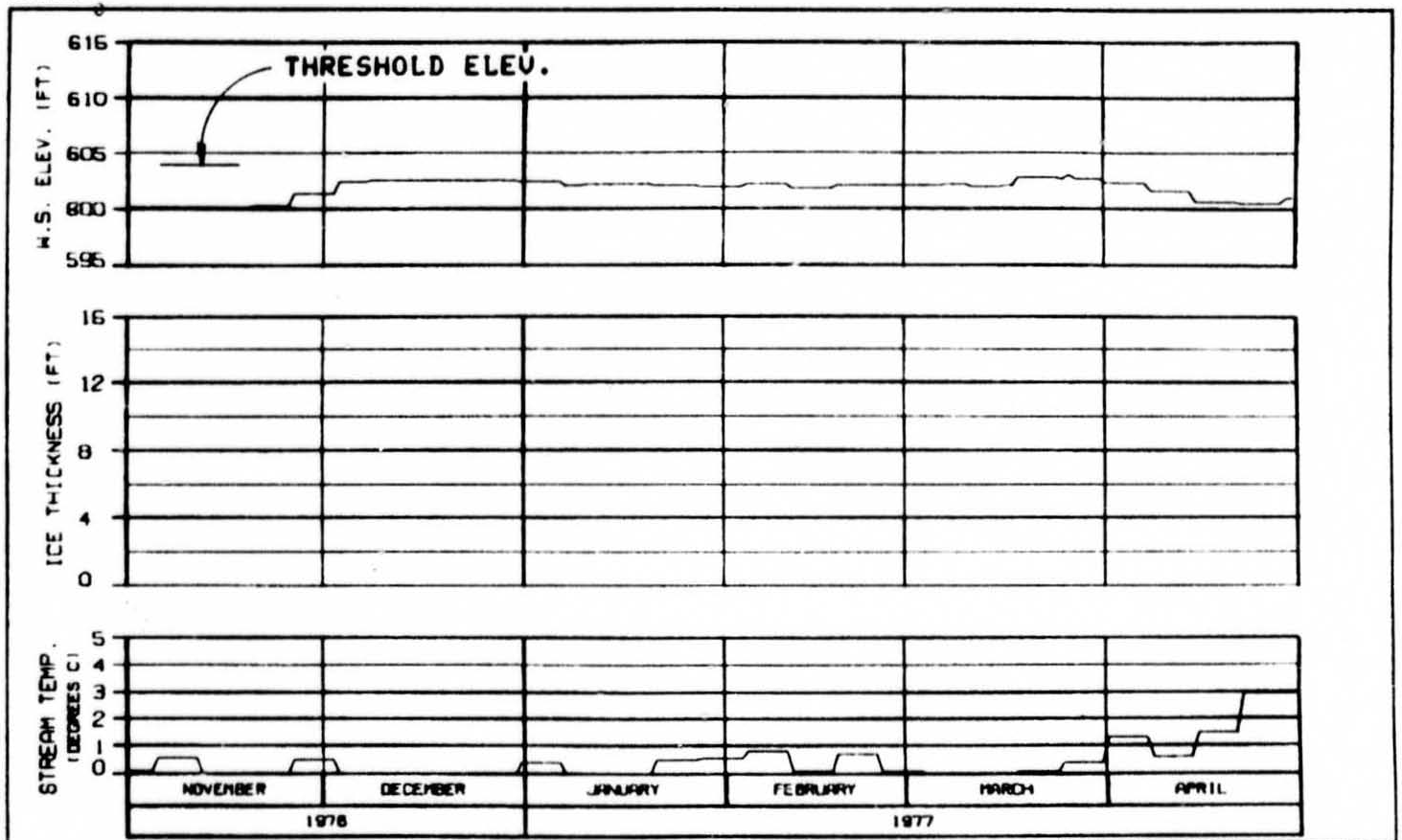
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142

OPTION?



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

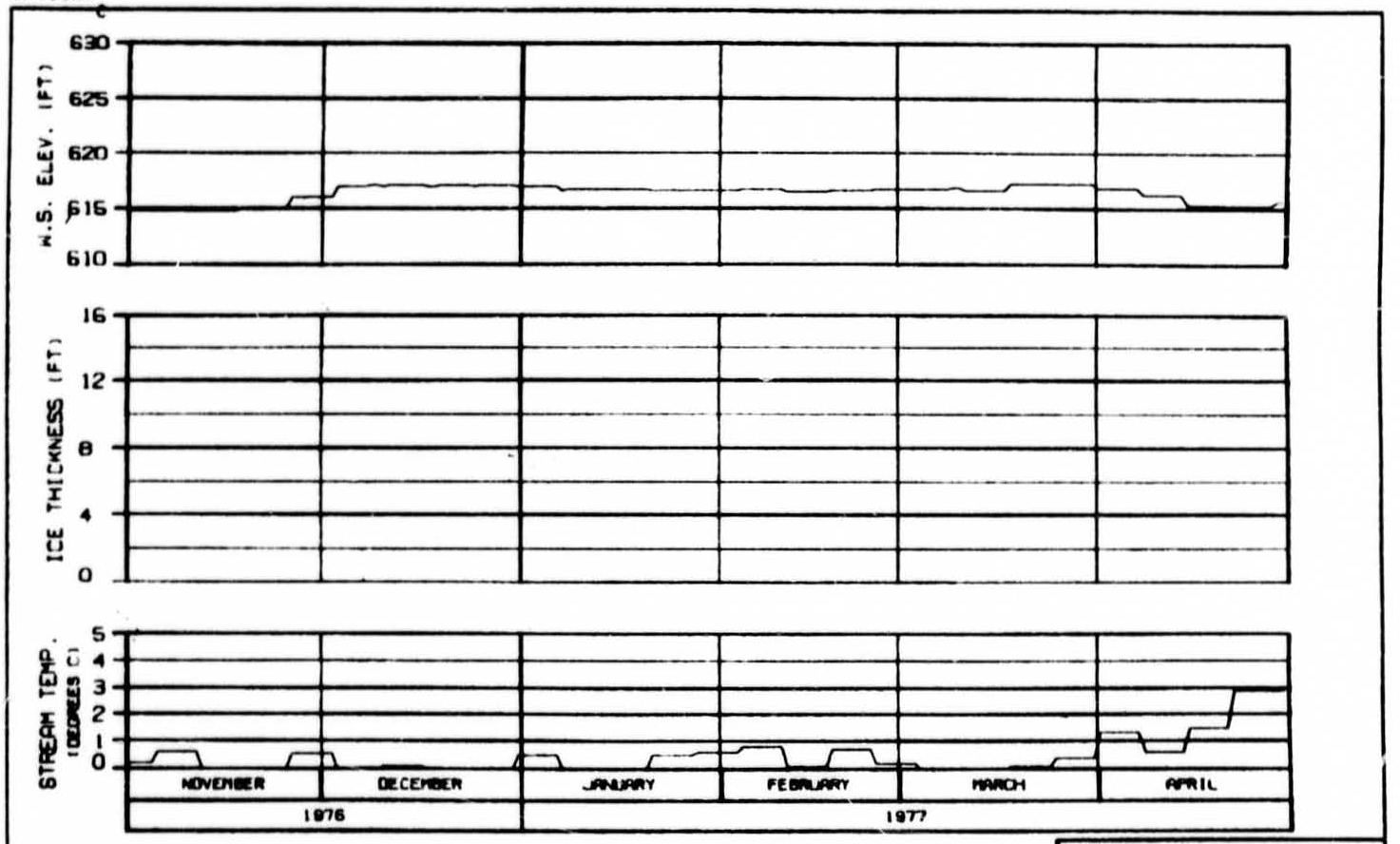
- - - - - SLUSH COMPONENT

WEATHER PERIOD : NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	1988.142

OPTION?

OPTION?



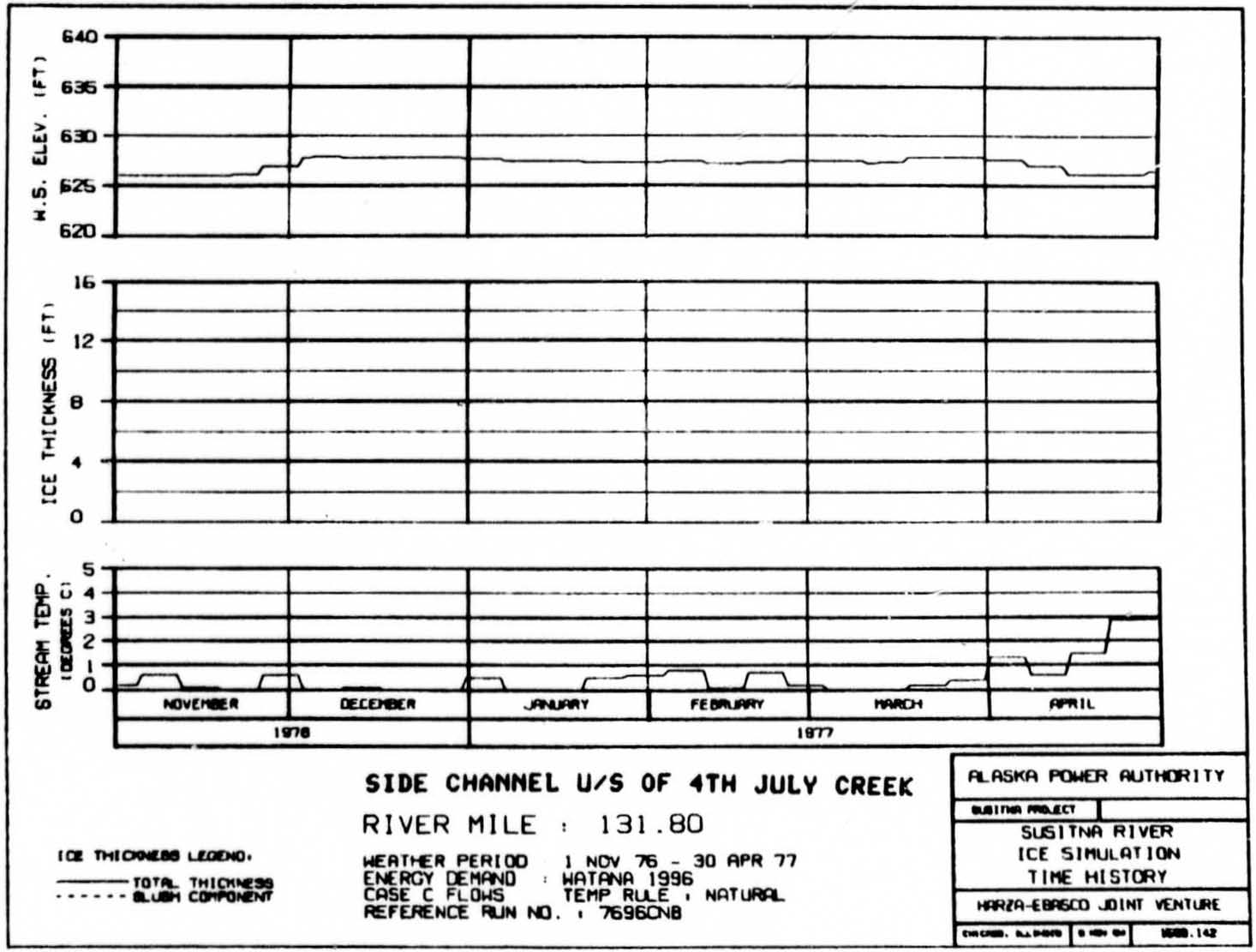
SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB

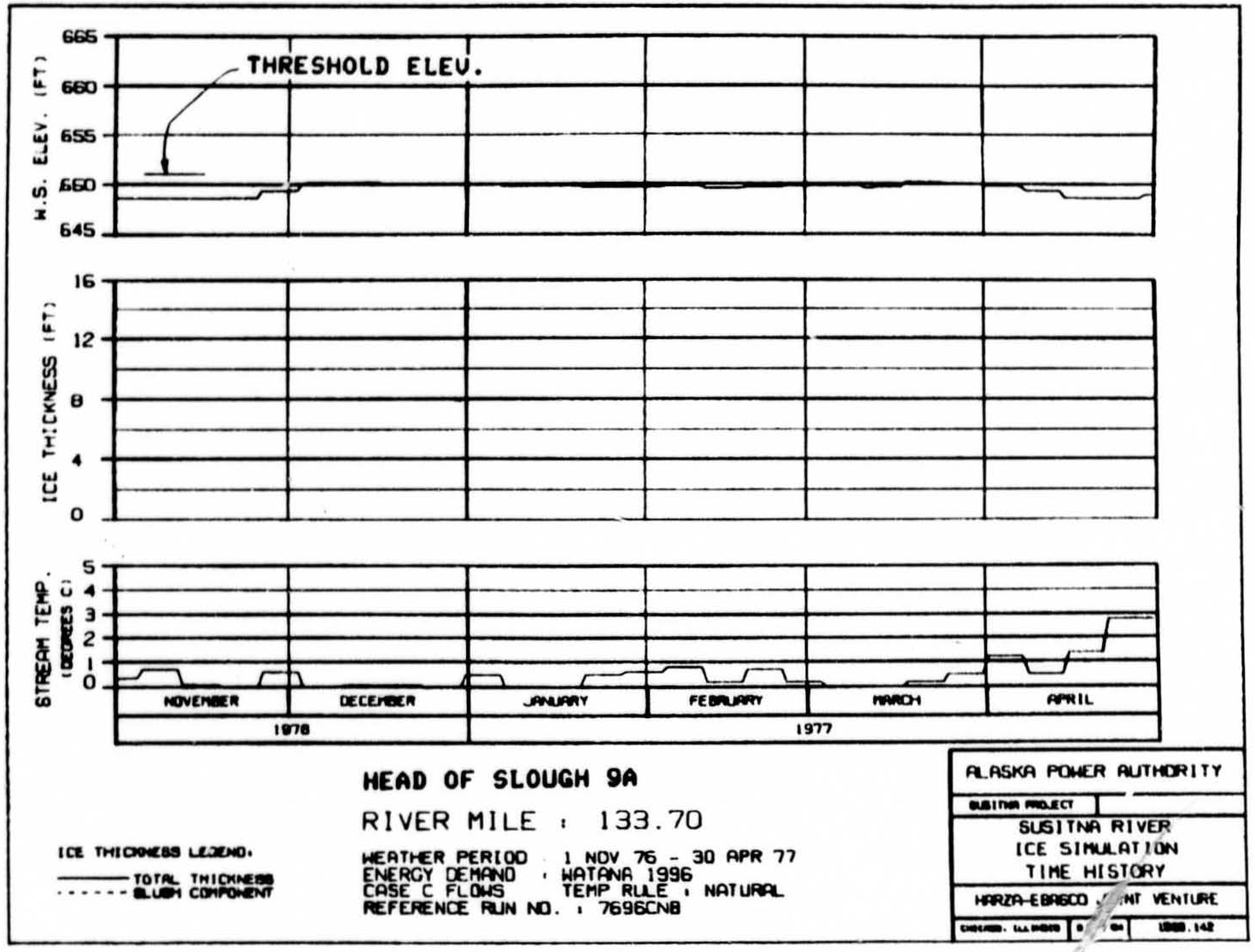
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



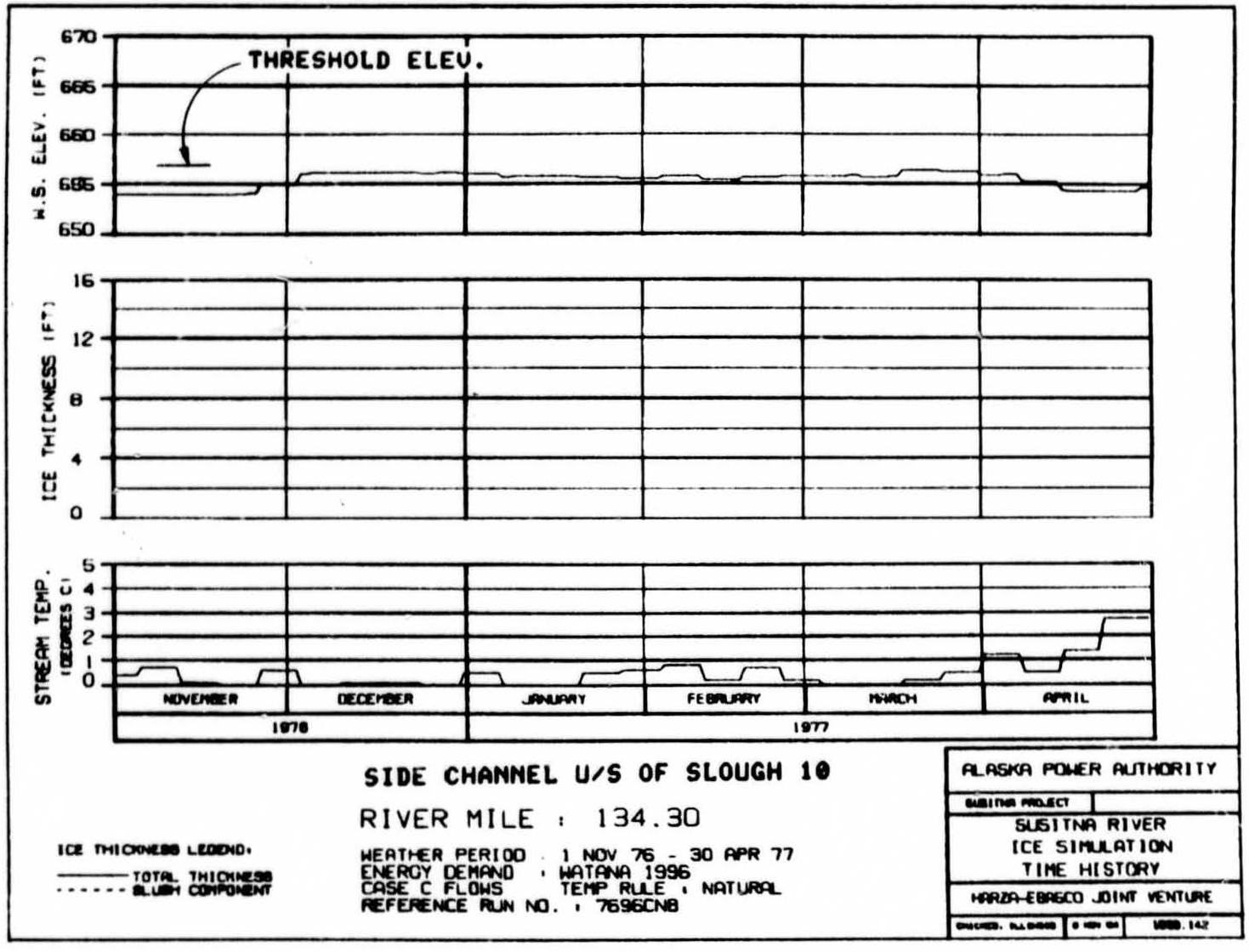
HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | 1868.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

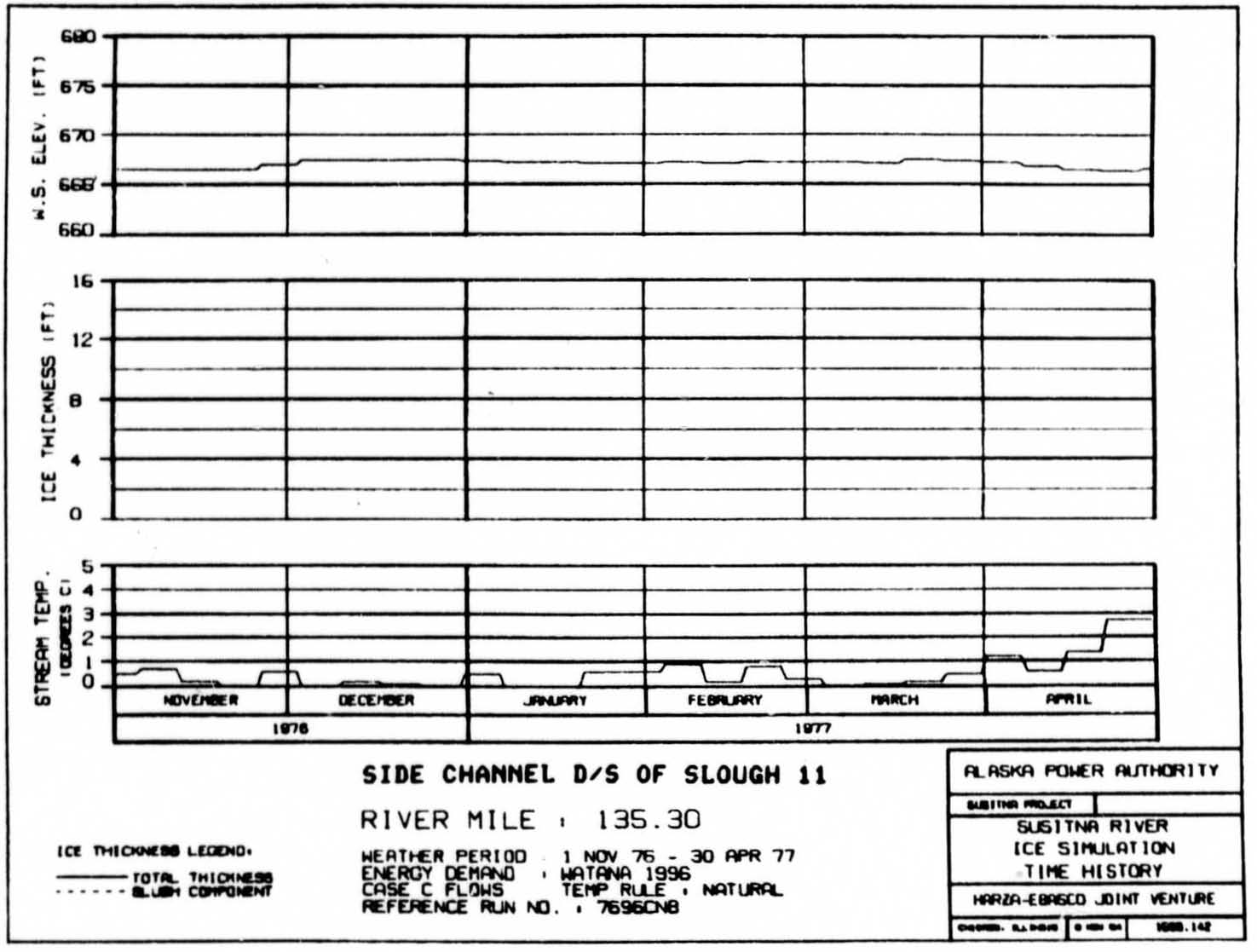
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

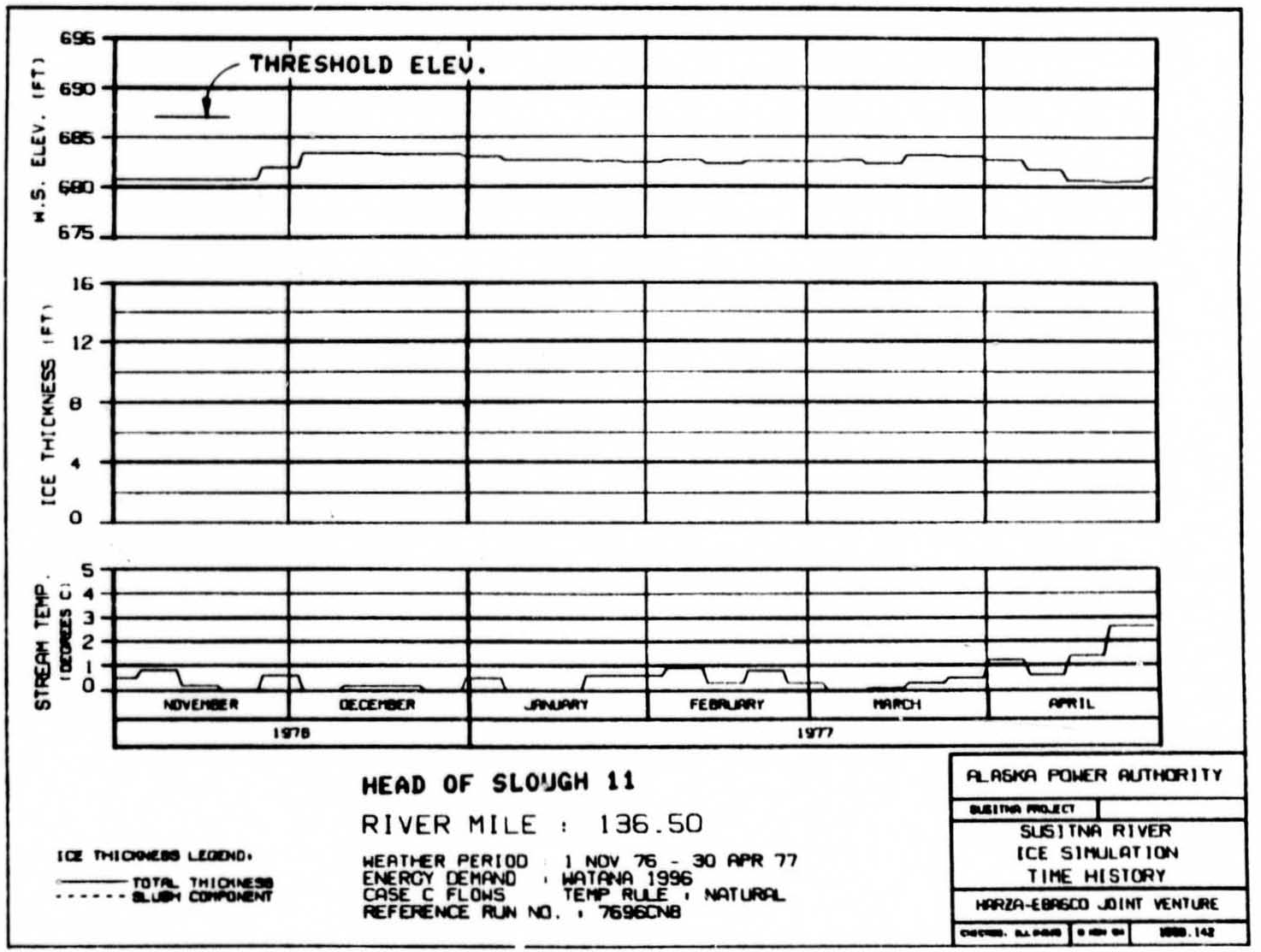
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
680
675
670
665
660
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
SIDE CHANNEL D/S OF SLOUGH 11
RIVER MILE : 135.30
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

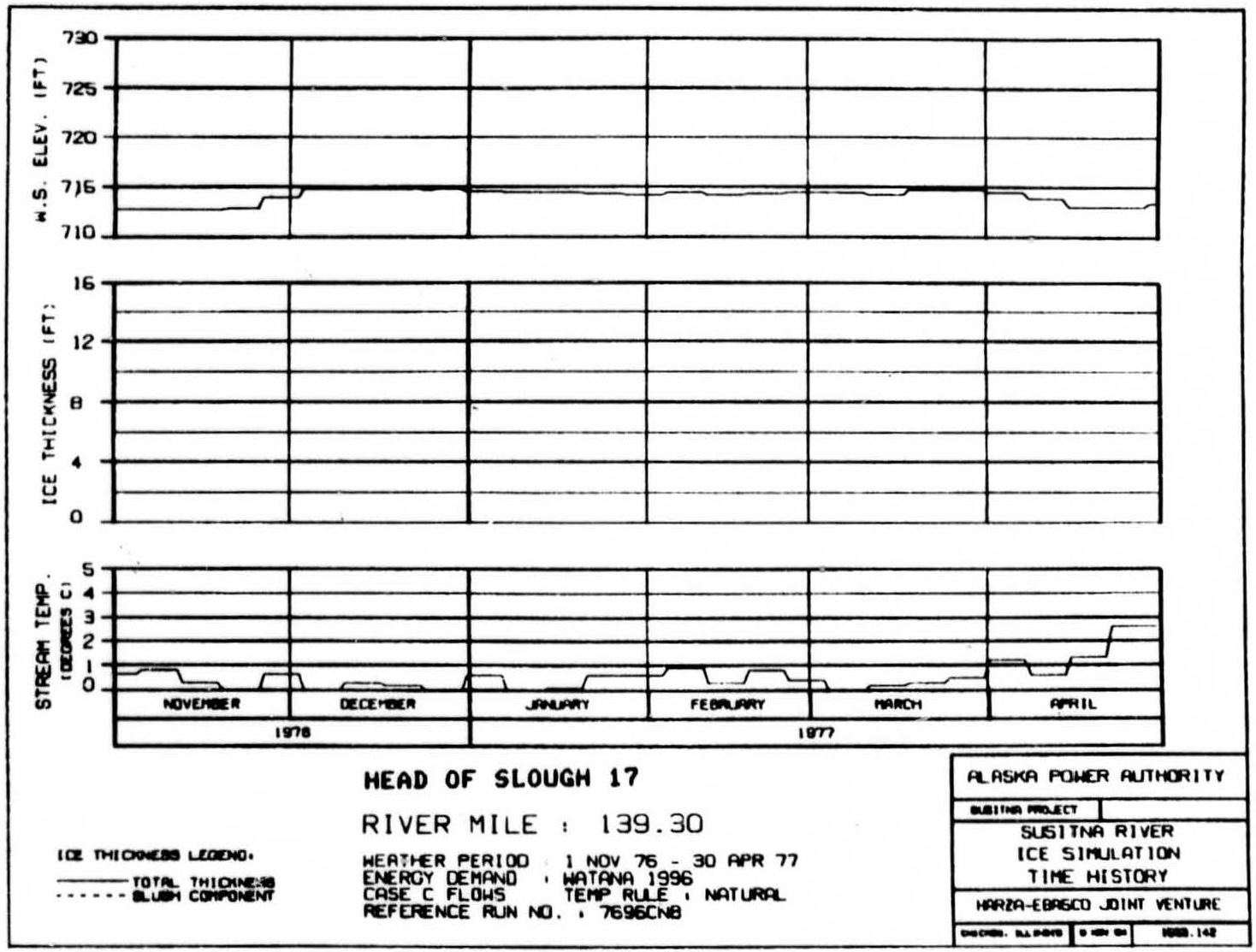
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1888.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

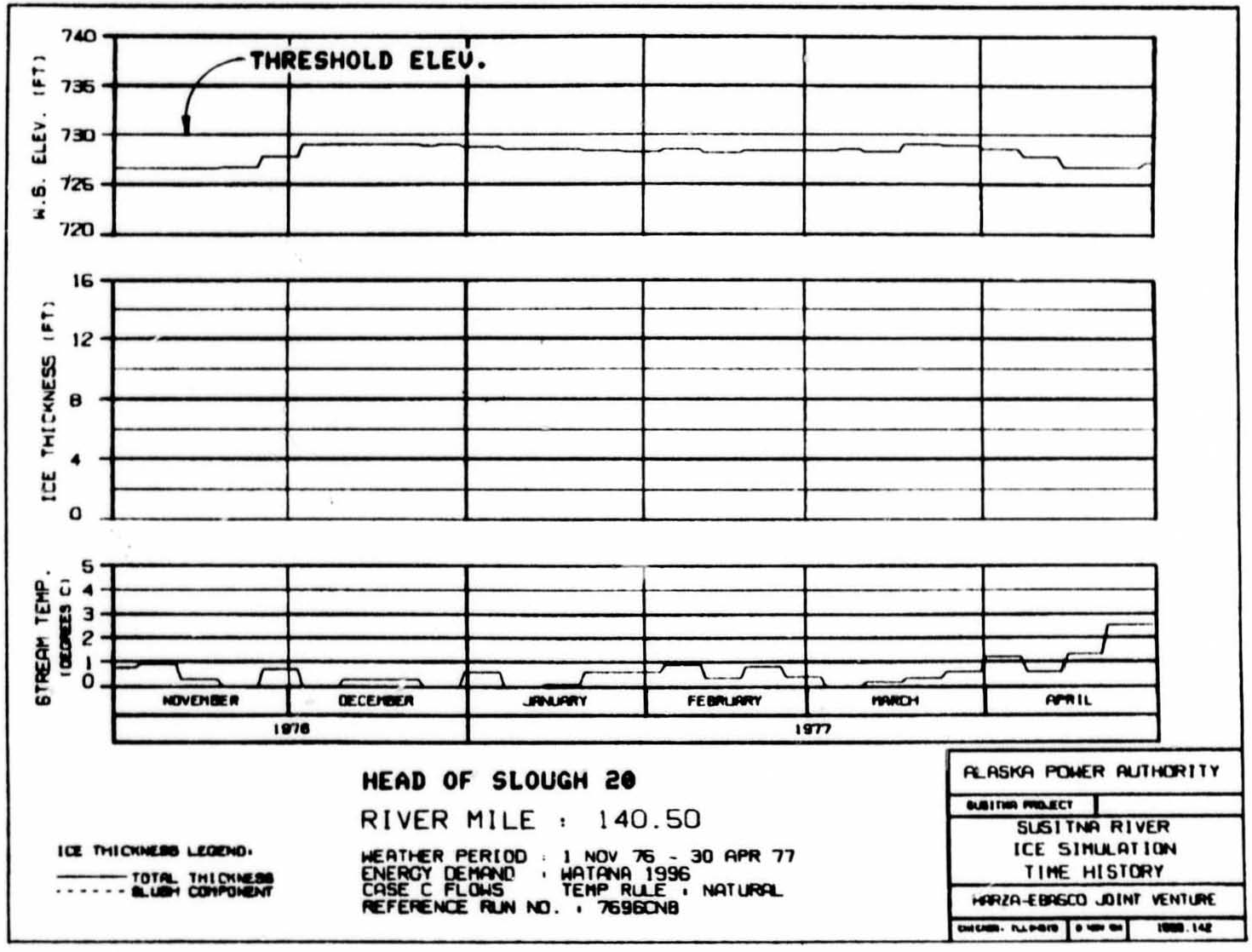
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNB

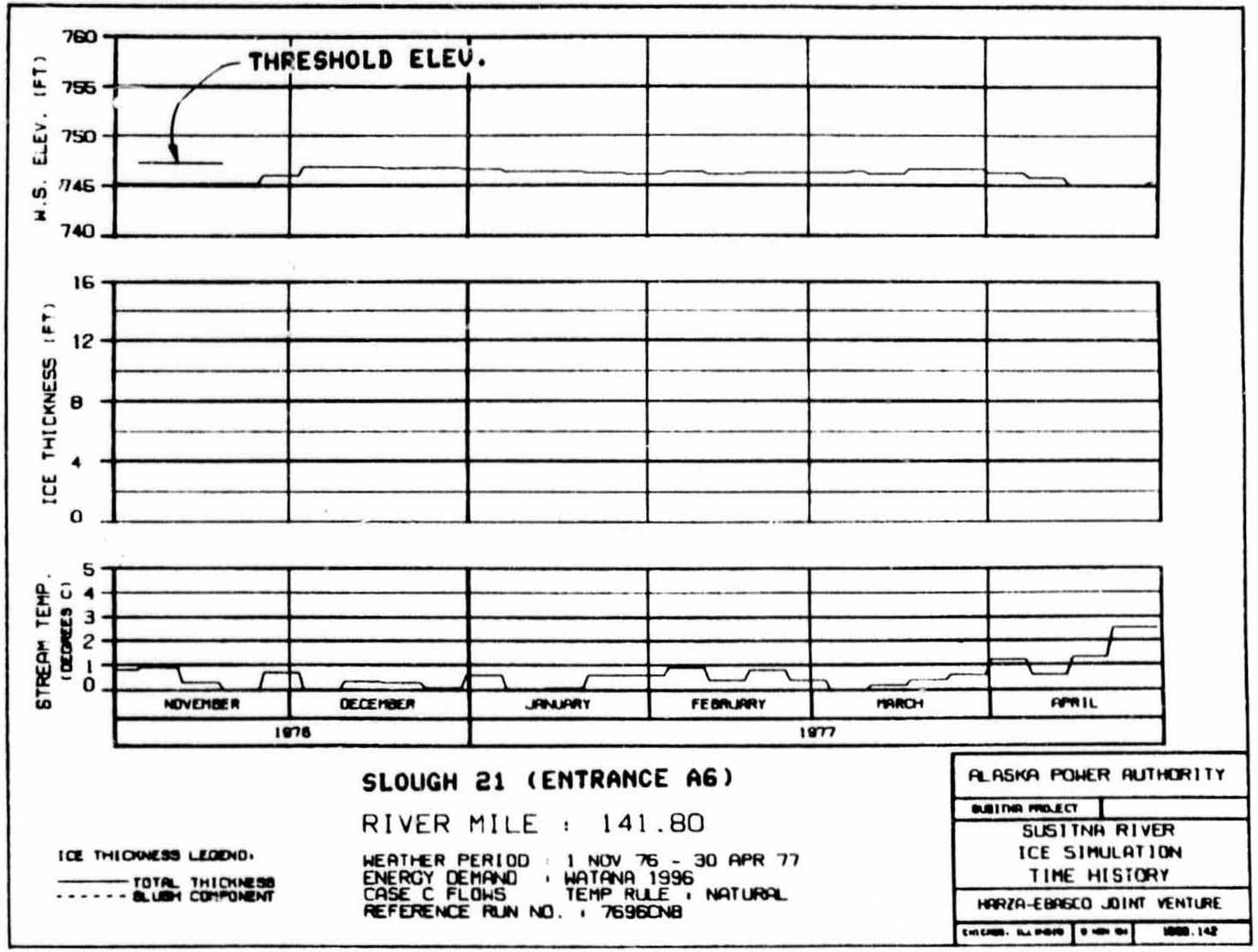
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

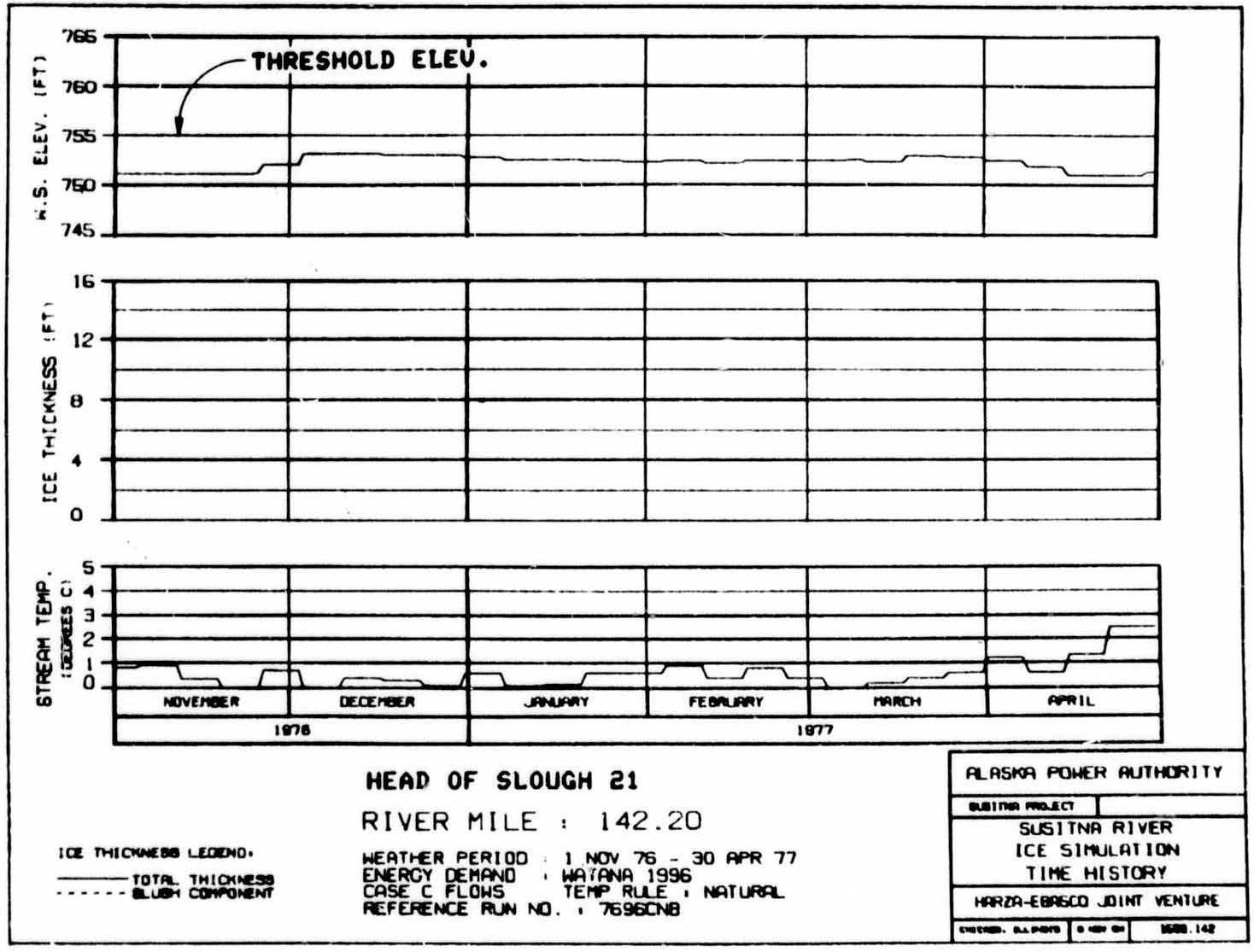
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

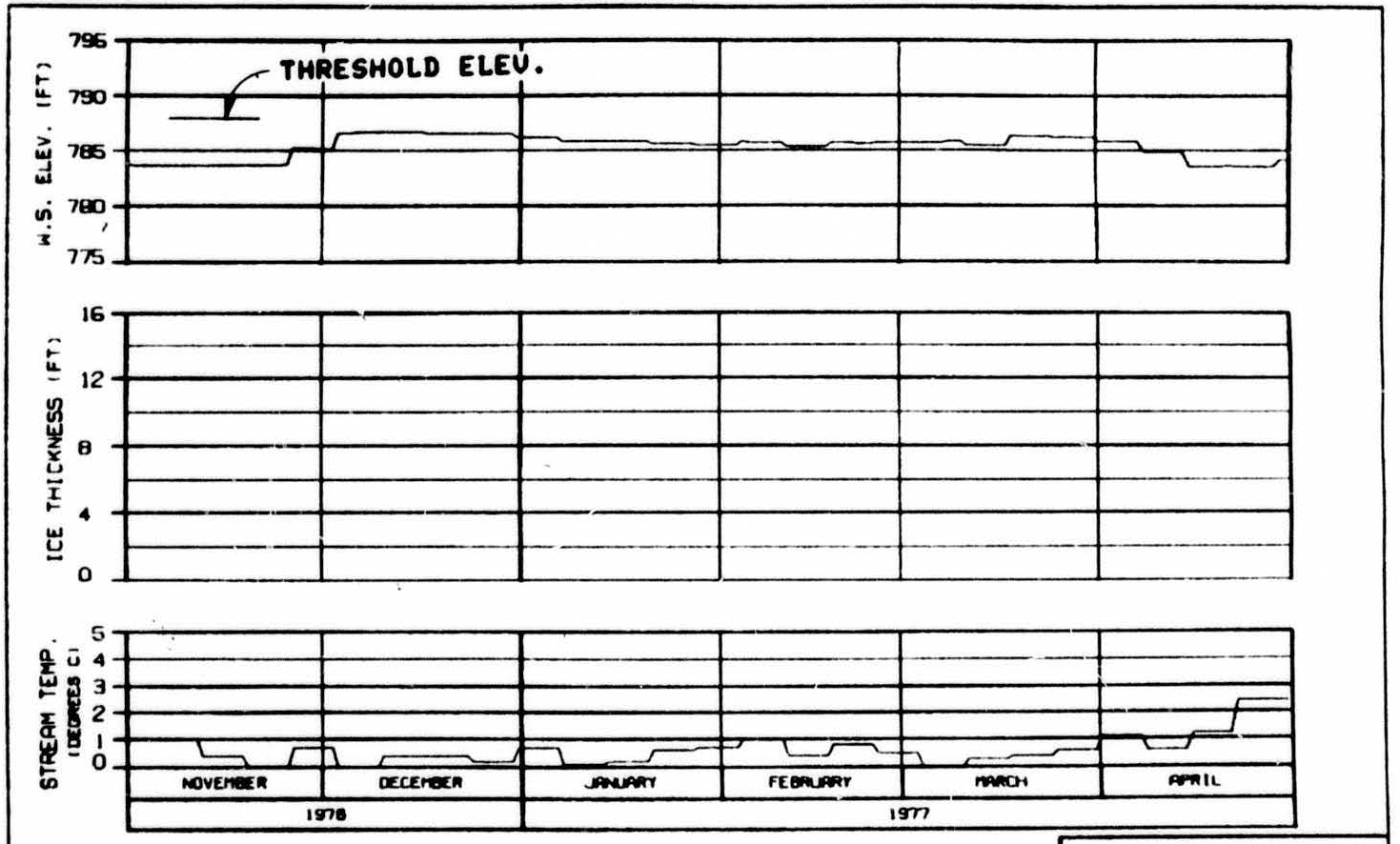
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
CASE C FLOWS TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CN8

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

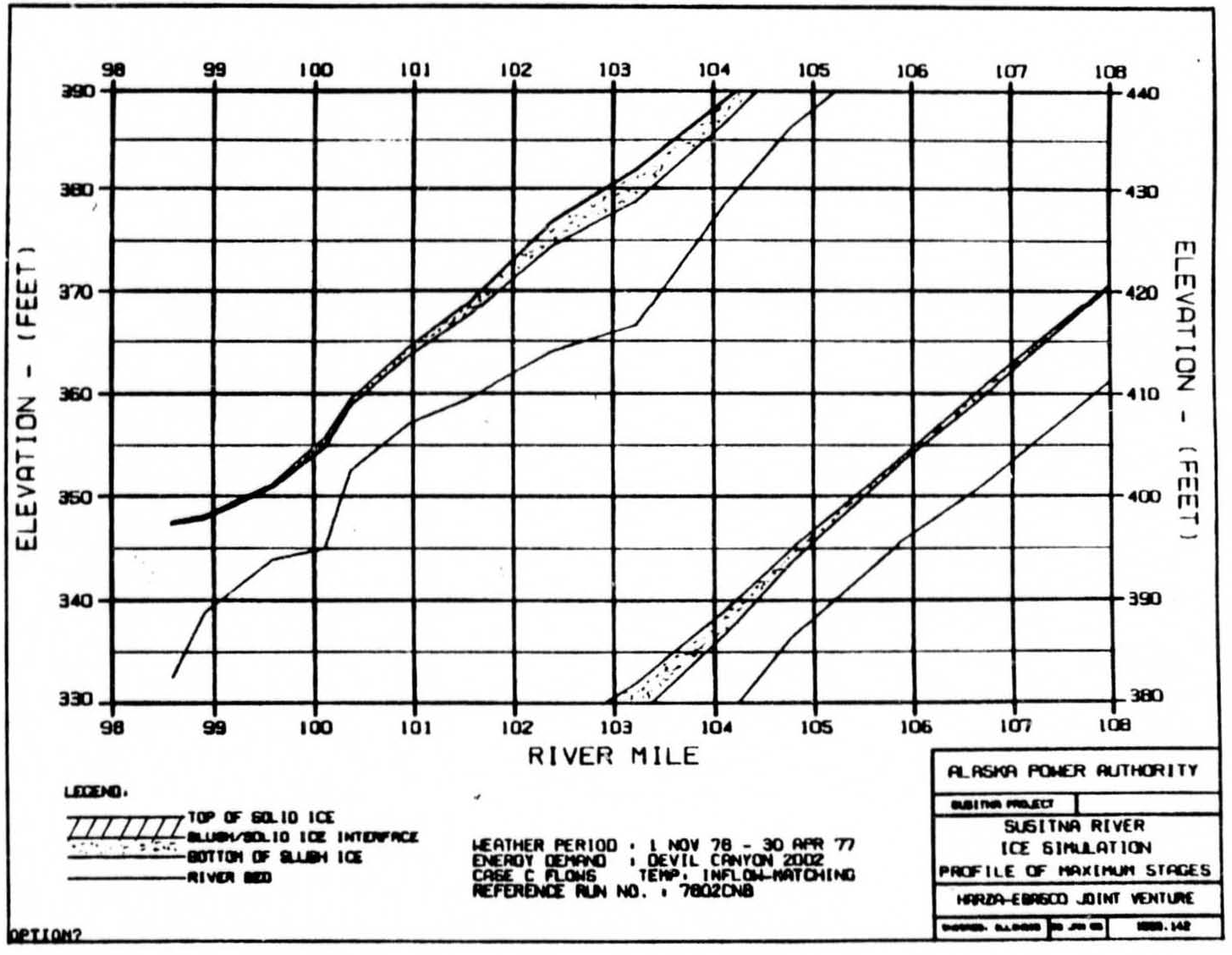
HARZA-EBASCO JOINT VENTURE

USBB.142

OPTION?

EXHIBIT N

C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330
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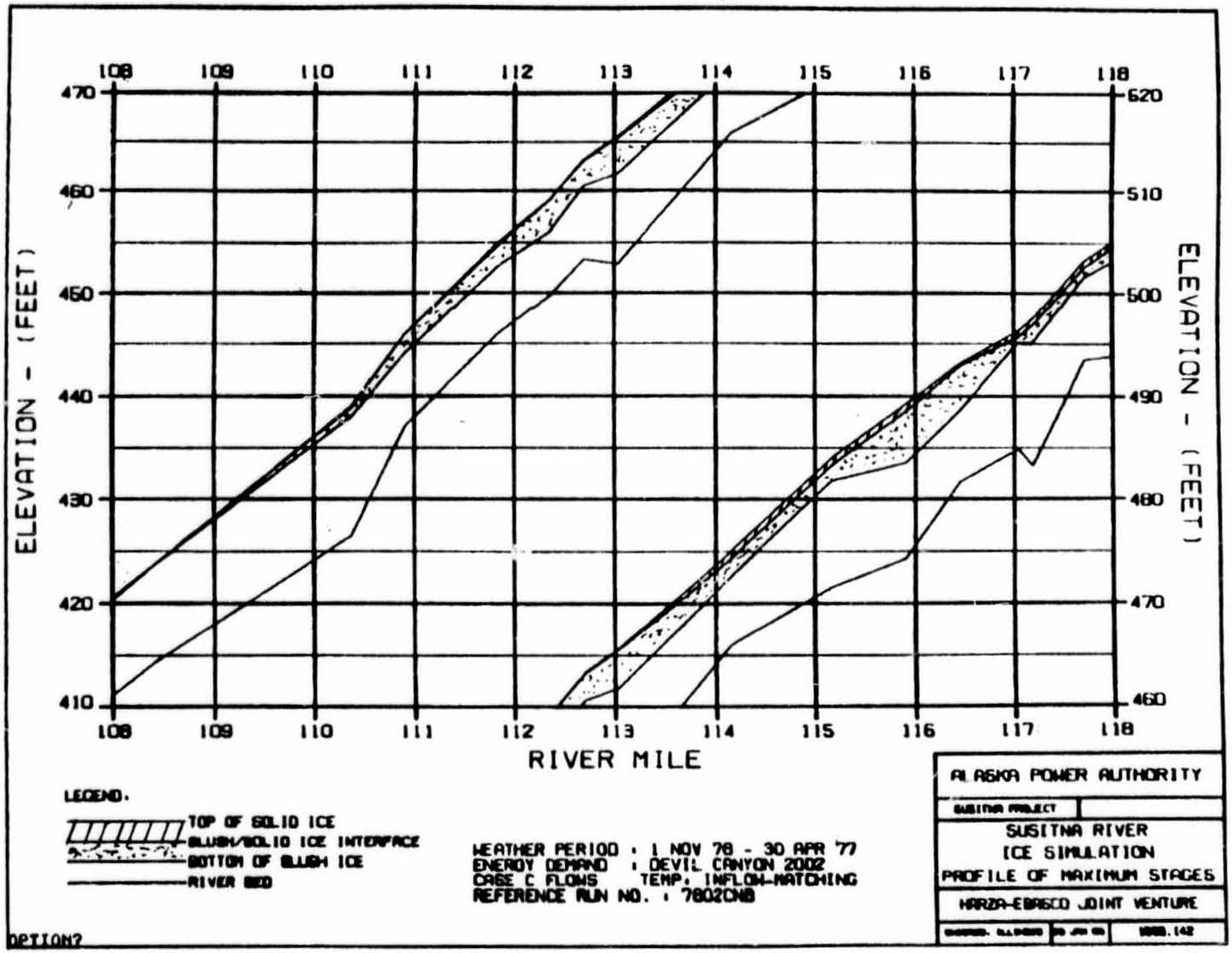
430
420
410
400
390
380
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7802CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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490
480
470
460
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND.
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP. INFLOW-MATCHING
REFERENCE RUN NO. : 7802CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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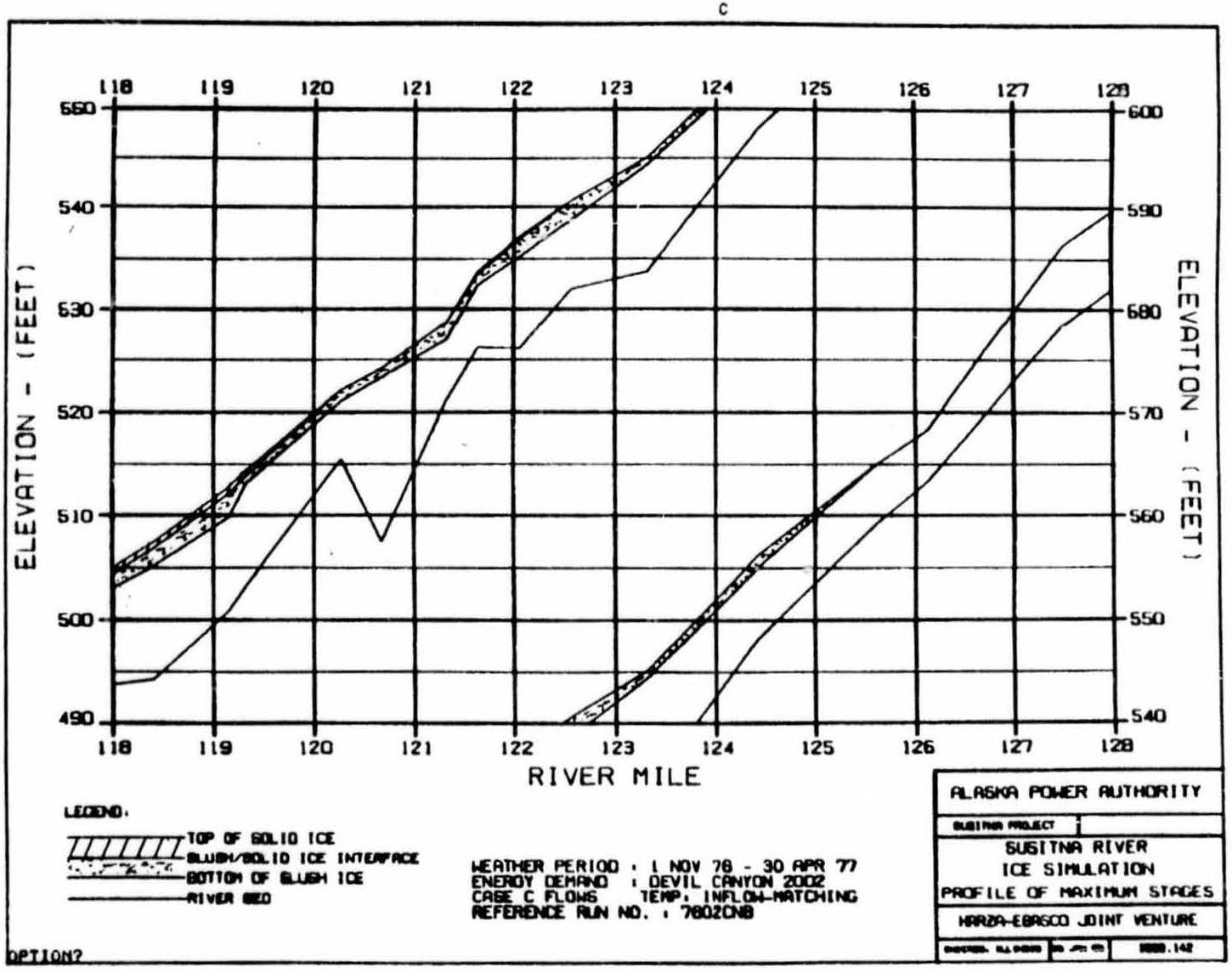
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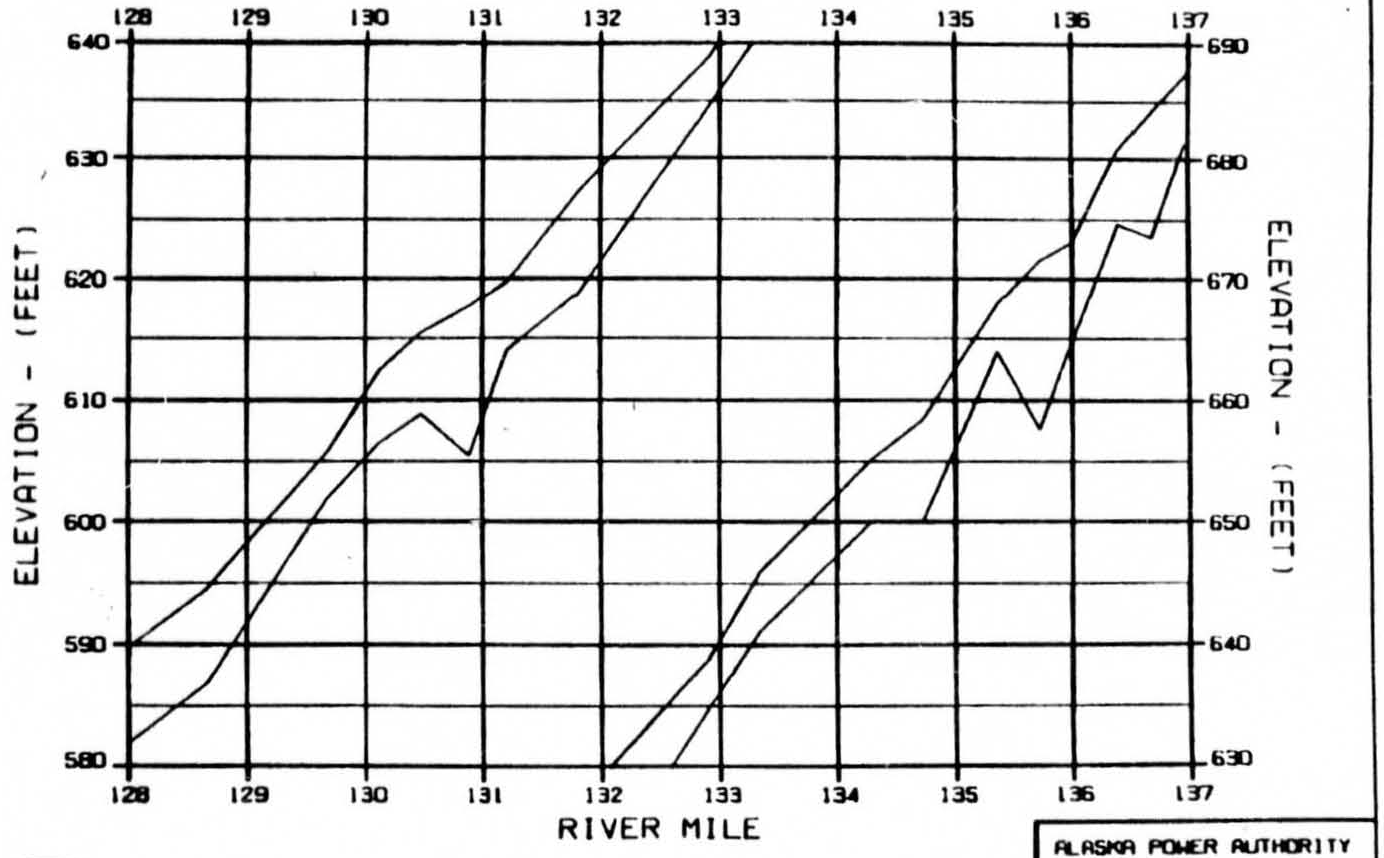
560
500
550
490
540
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
8888.142
OPTION?

C



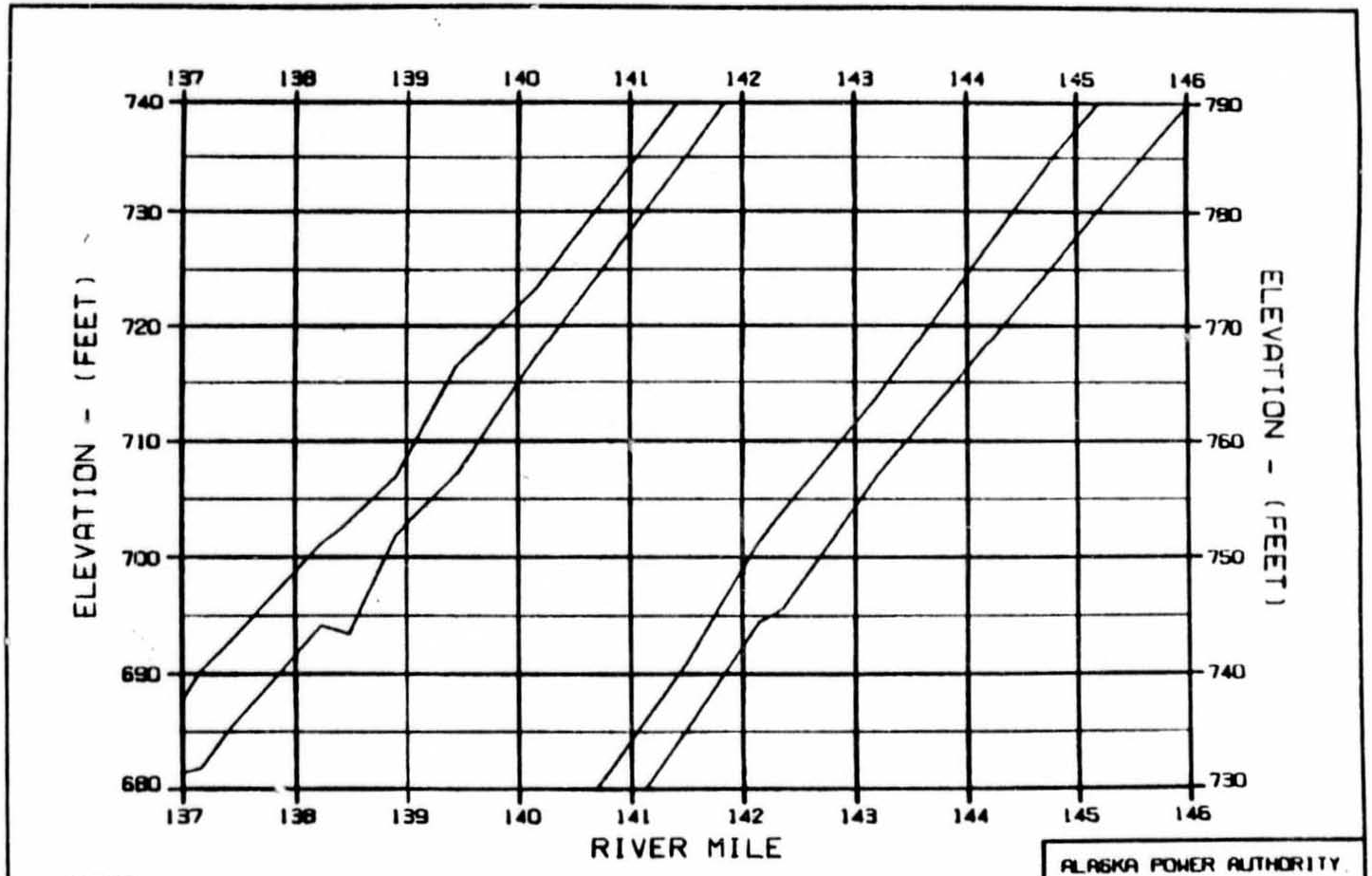
LEGEND:

TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP. INFLOW-MATCHING
REFERENCE RUN NO. : 7802CNB

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
2388.142

OPTION2



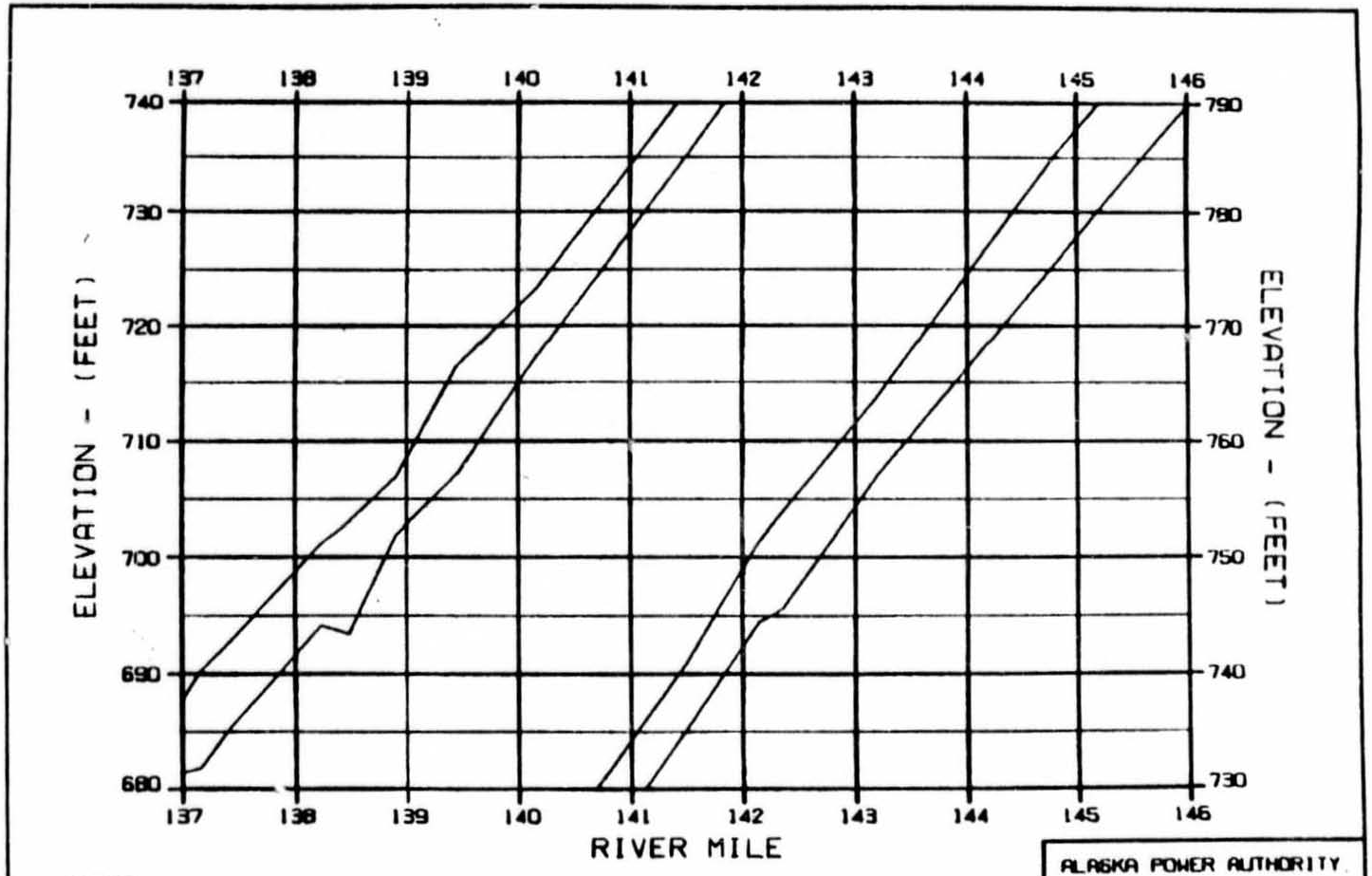
LEGEND:

TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7802CNB

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION7



LEGEND:

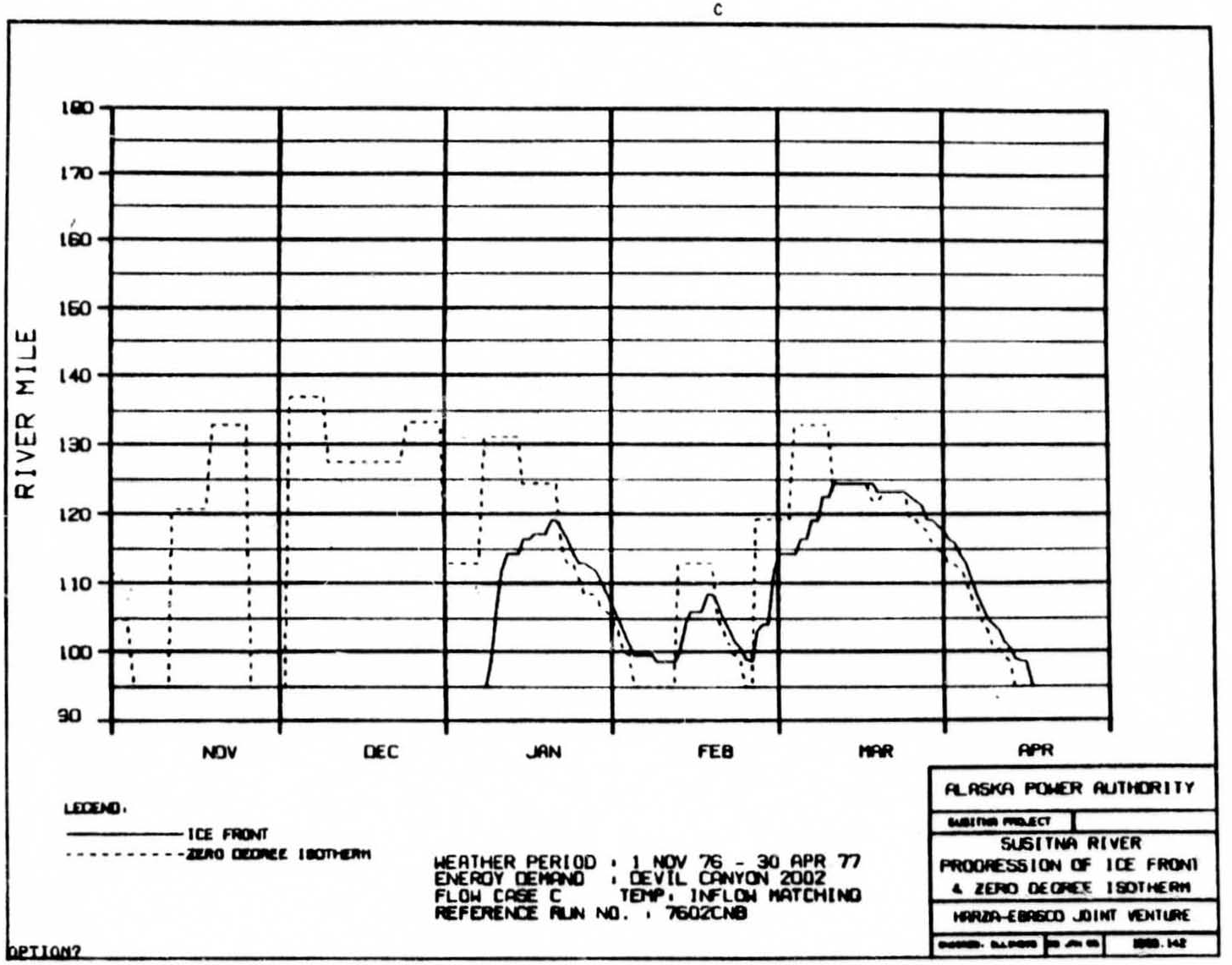
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED

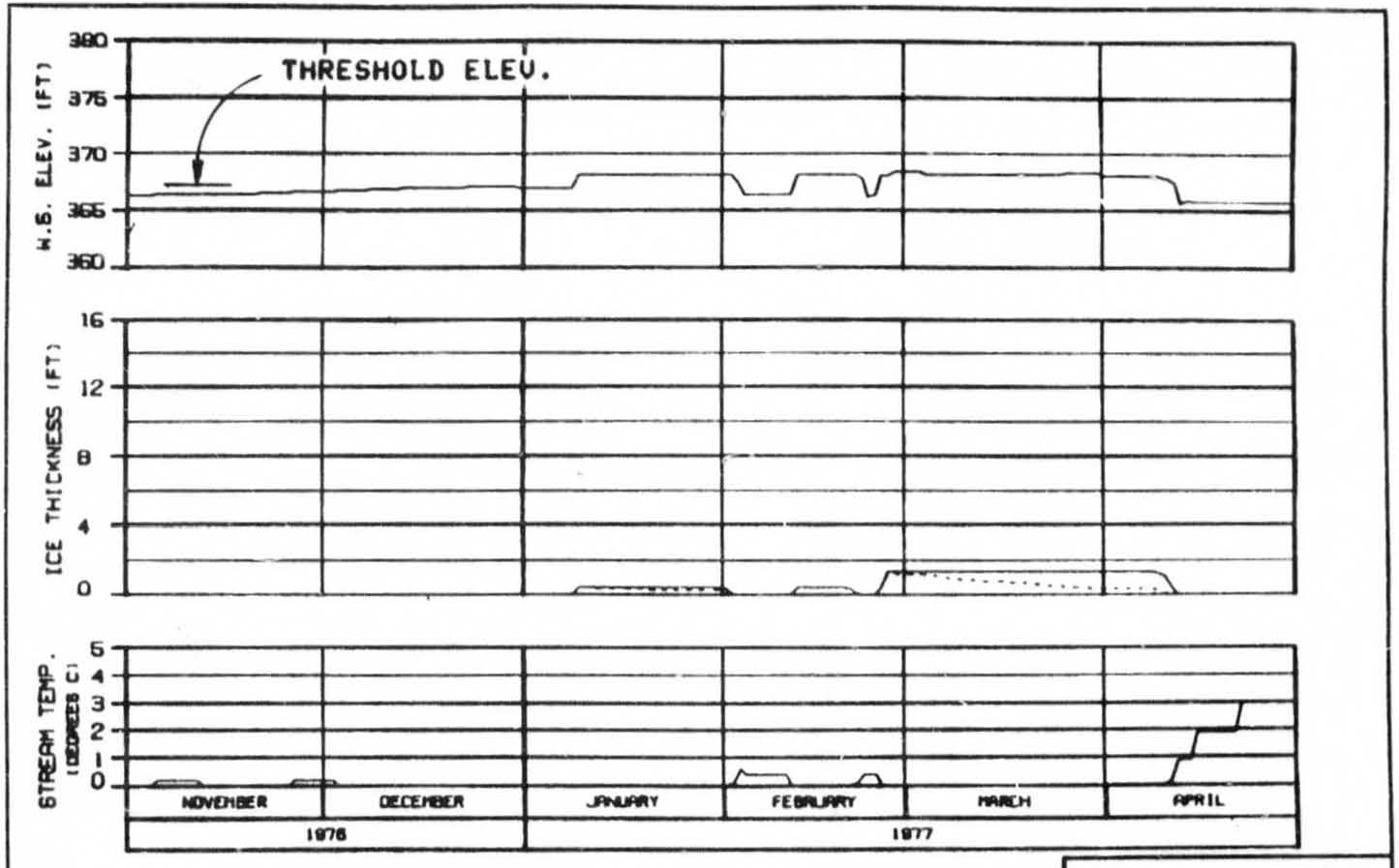
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7802CNB

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION7

C


RIVER MILE
180
170
160
150
140
130
120
110
100
90
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE C TEMP: INFLOW MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

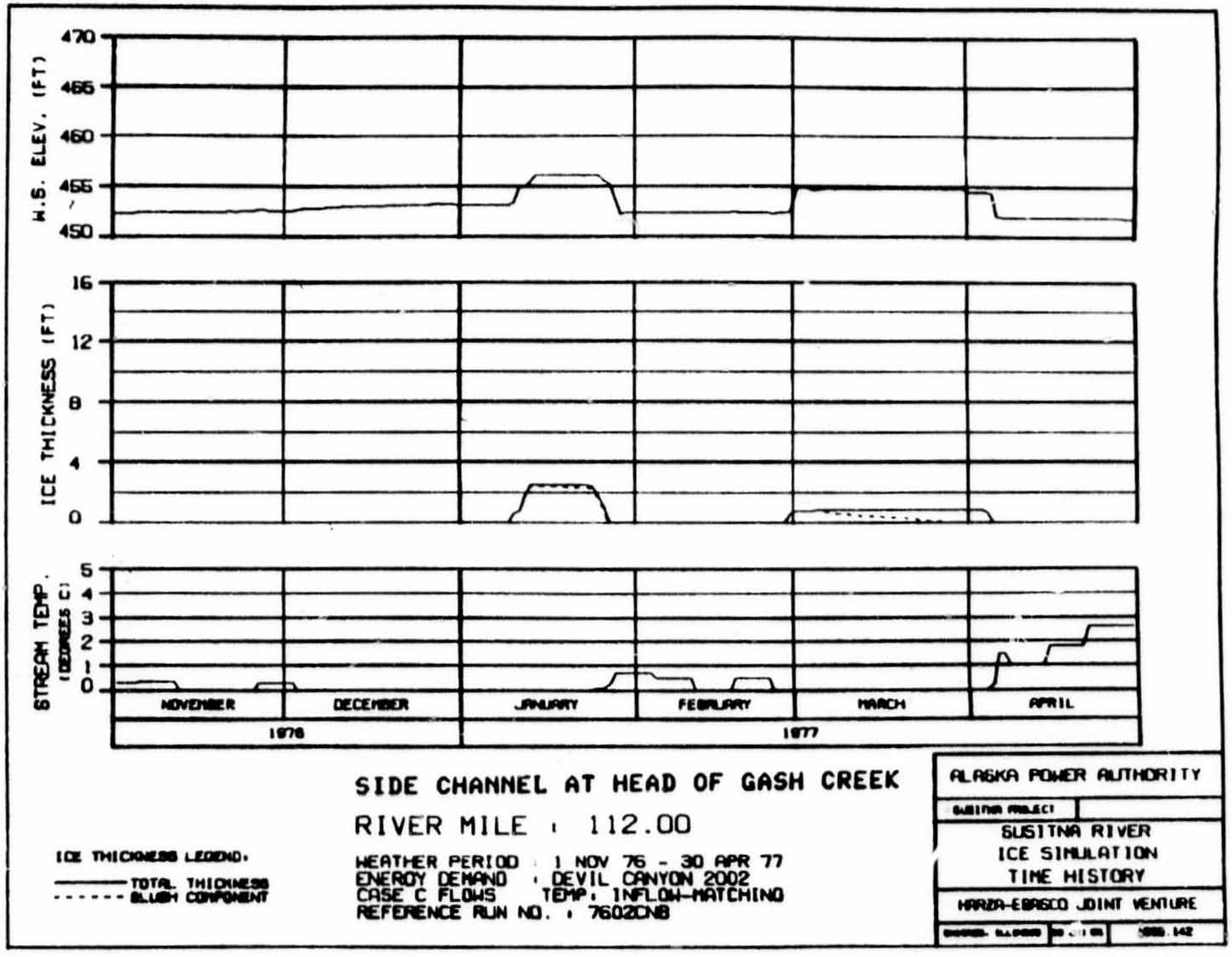
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1588.142



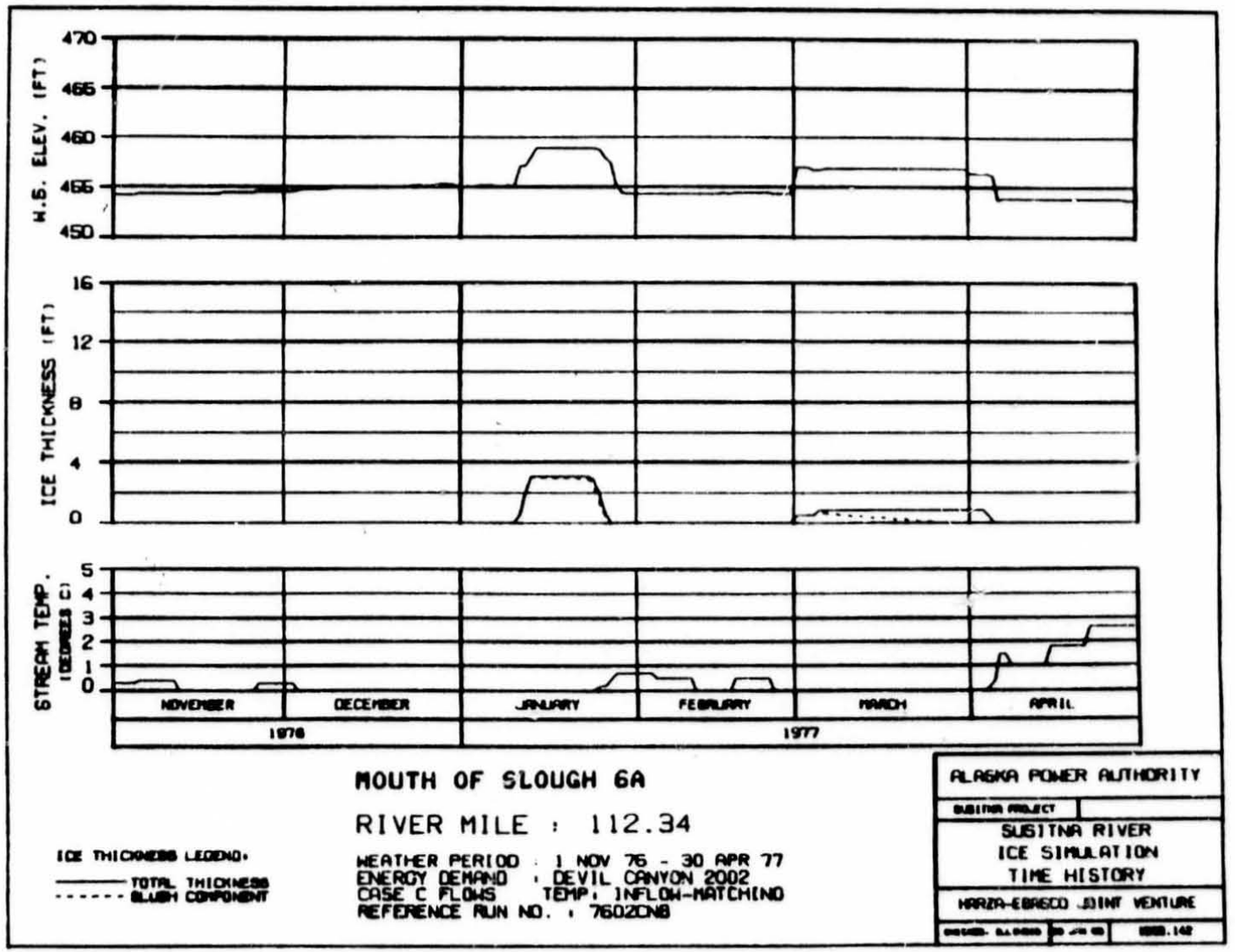
SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



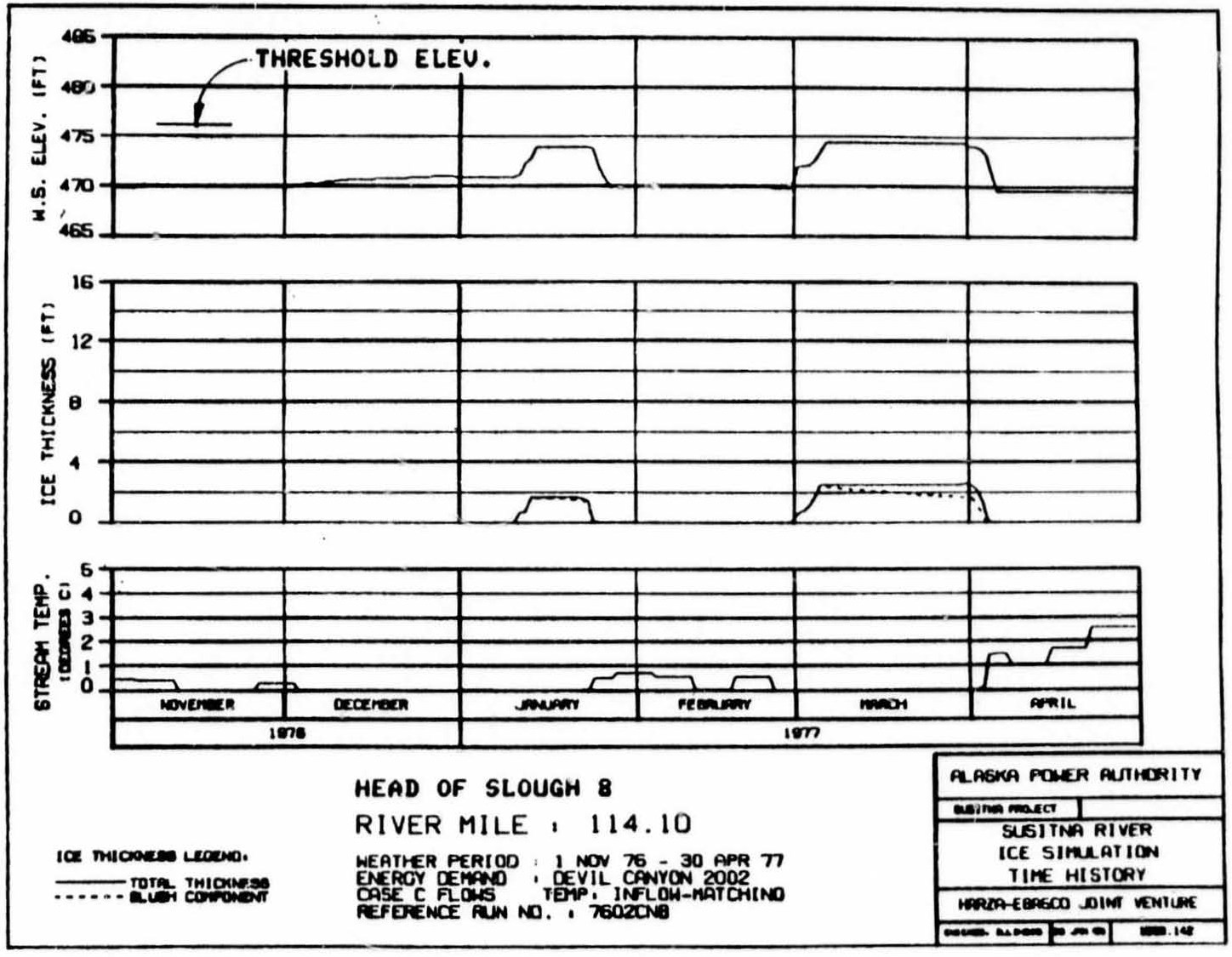
MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CNB

ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 8

RIVER MILE : 114.10

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

ICE THICKNESS LEGEND:

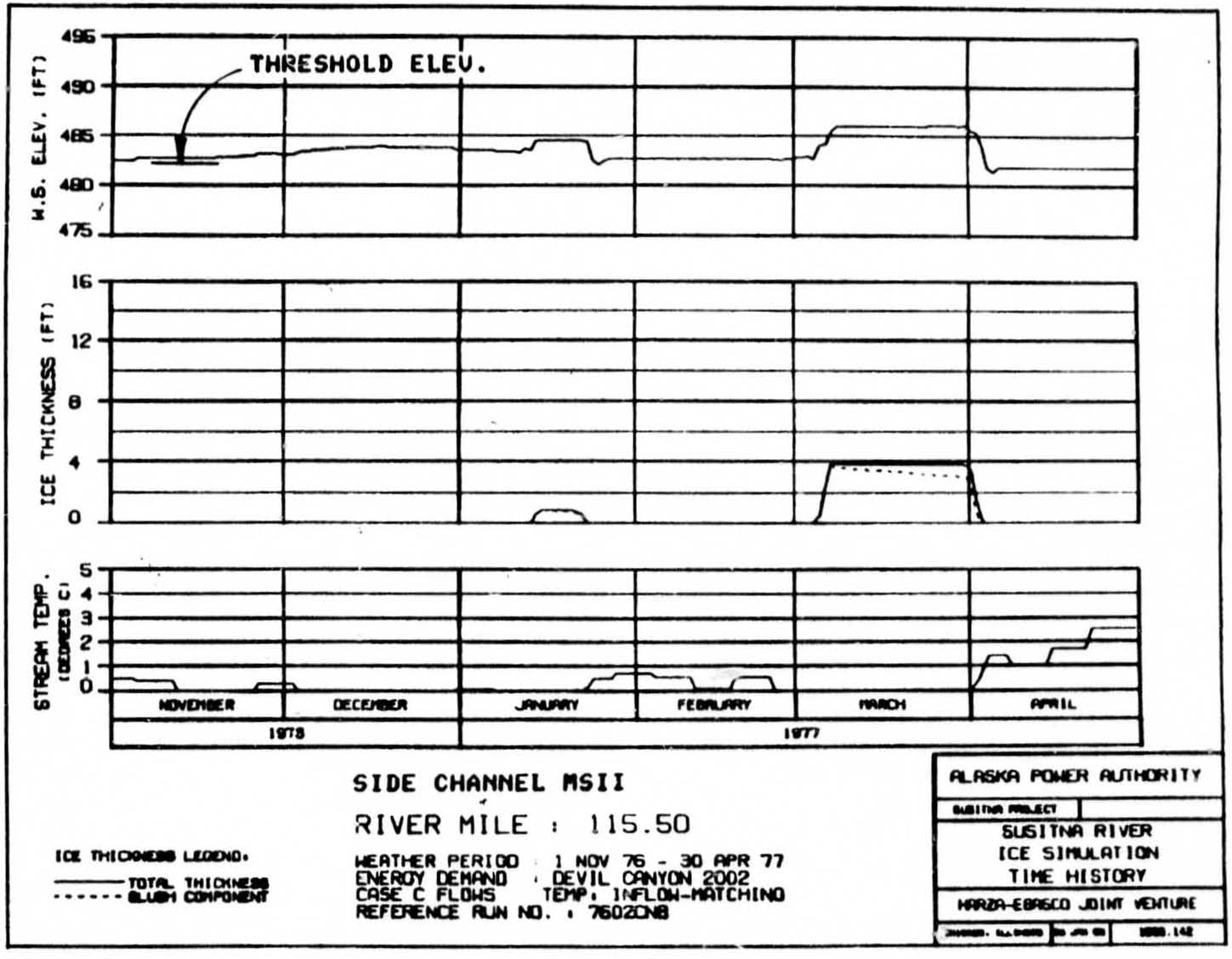
——— TOTAL THICKNESS
- - - - - - SLUSH COMPONENT

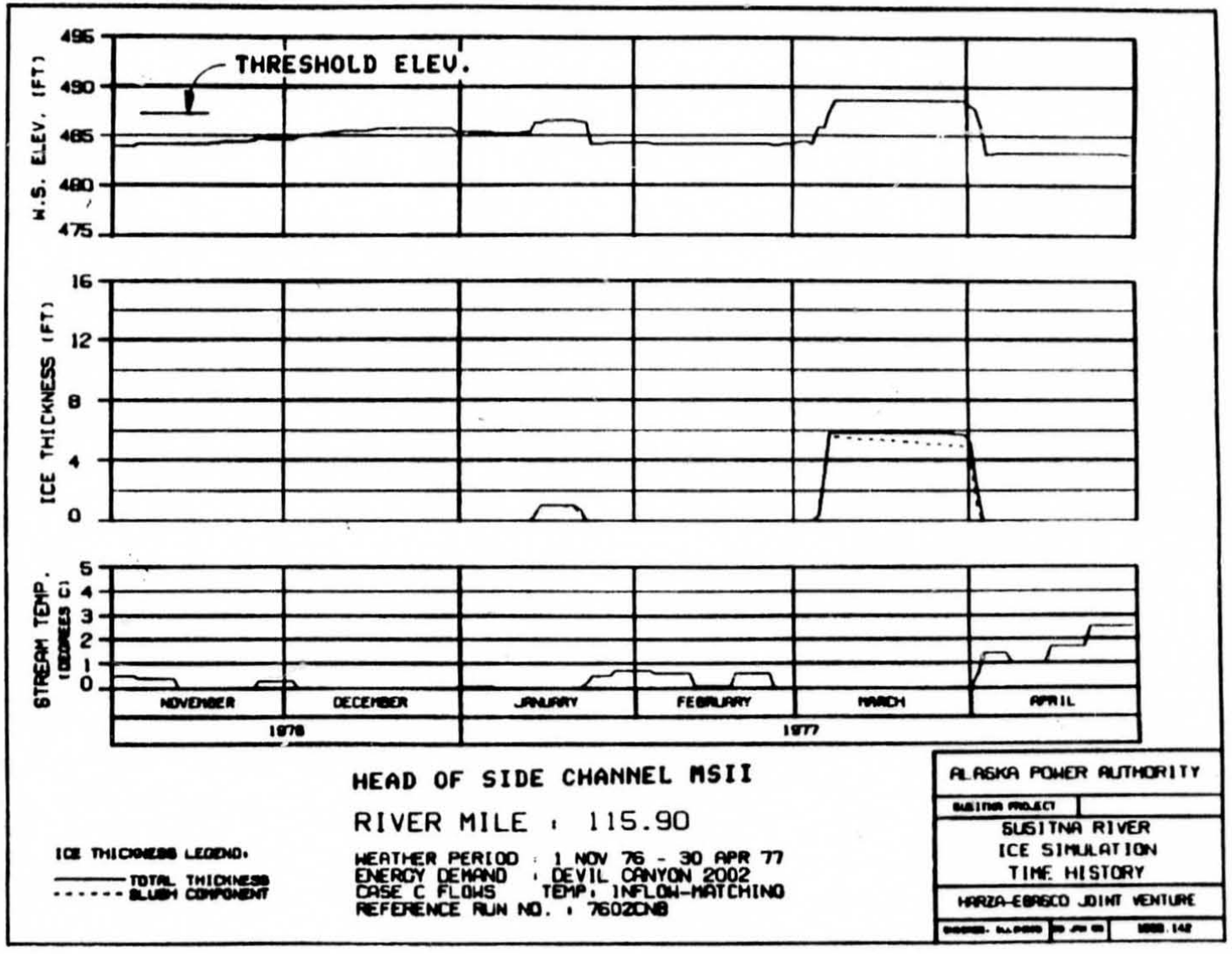
ALASKA POWER AUTHORITY

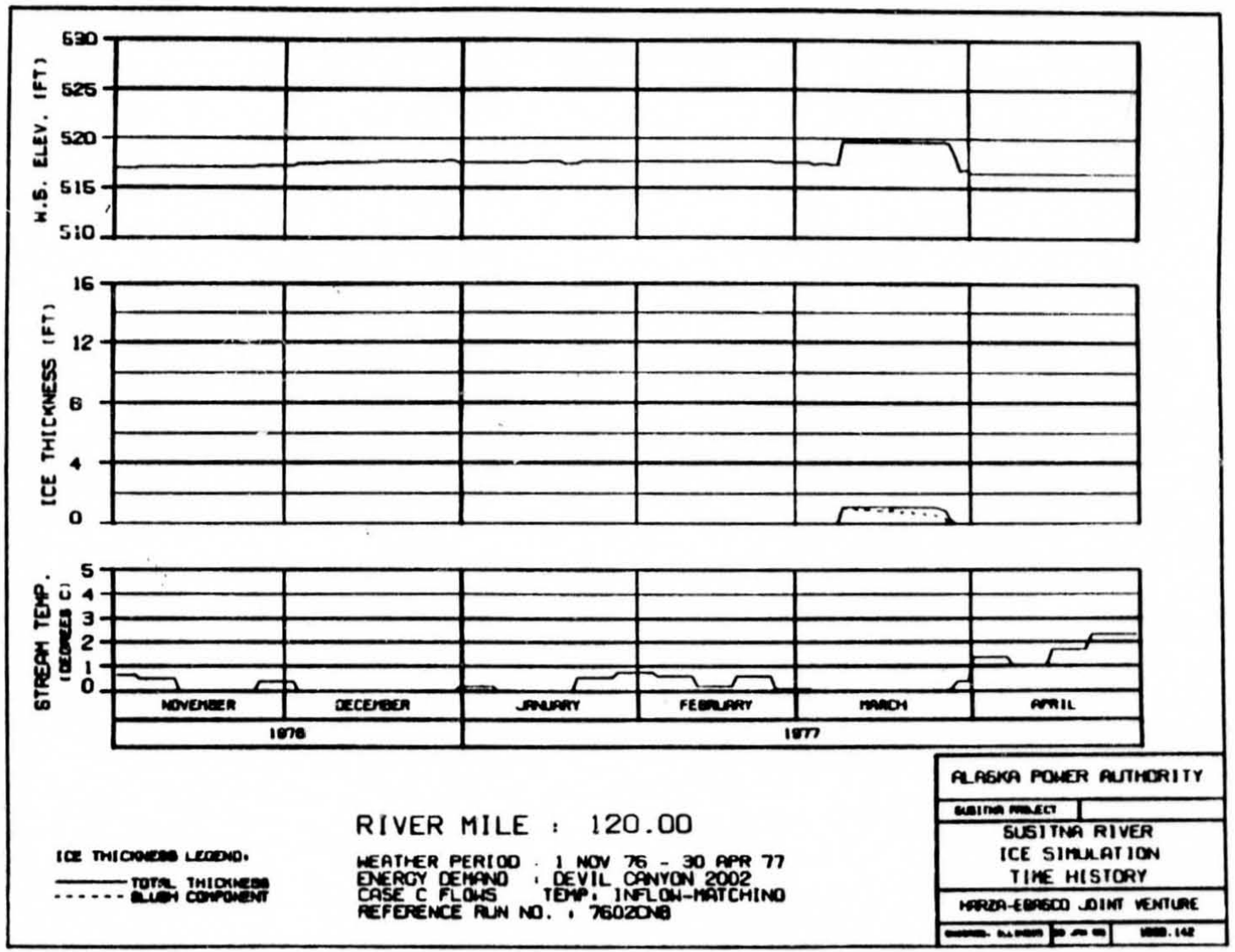
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
495
490
485
480
475
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
SIDE CHANNEL MSII
RIVER MILE : 115.50
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CNB
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
495
490
485
480
475
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SIDE CHANNEL MSII
RIVER MILE : 115.90
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

RIVER MILE : 120.00

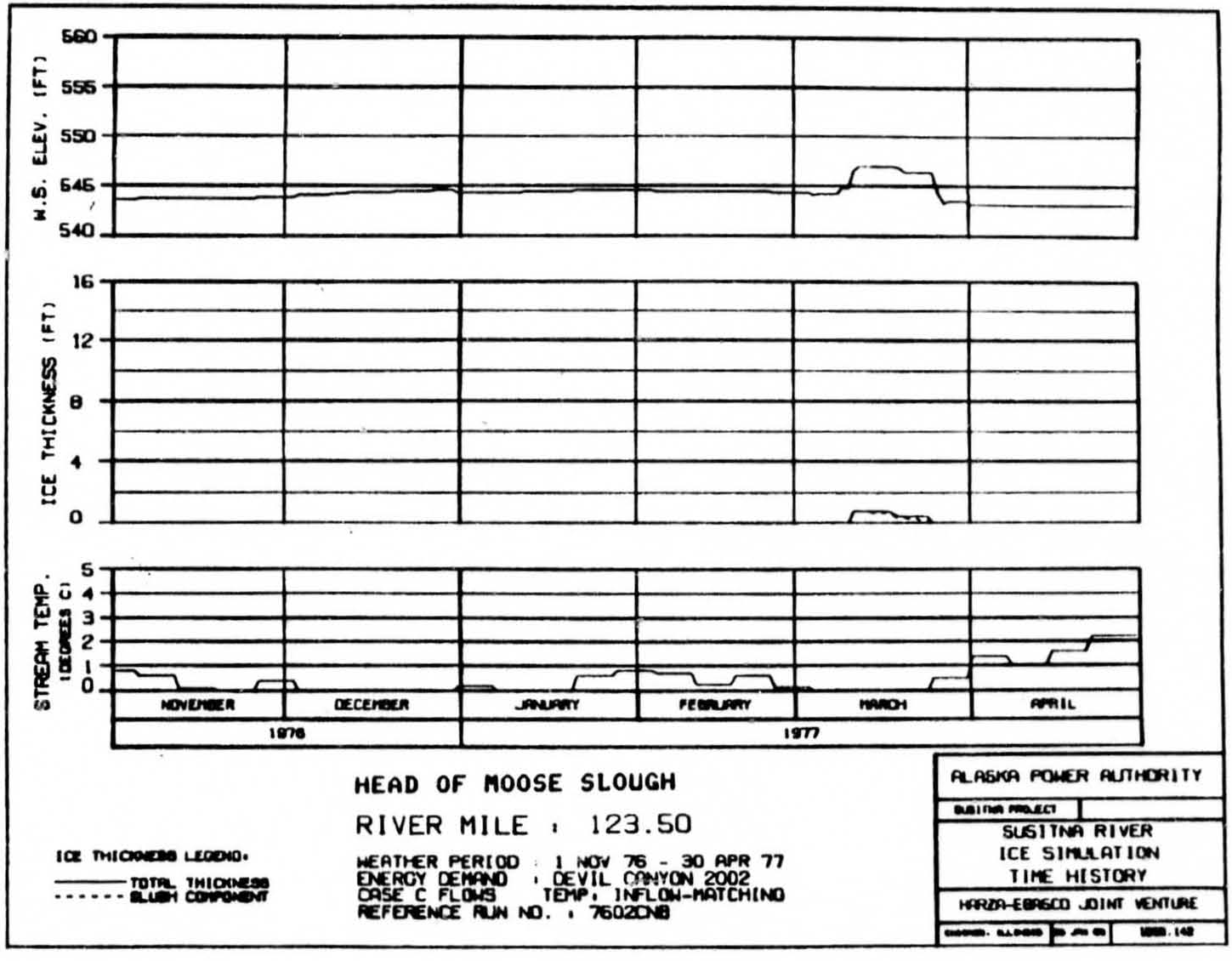
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

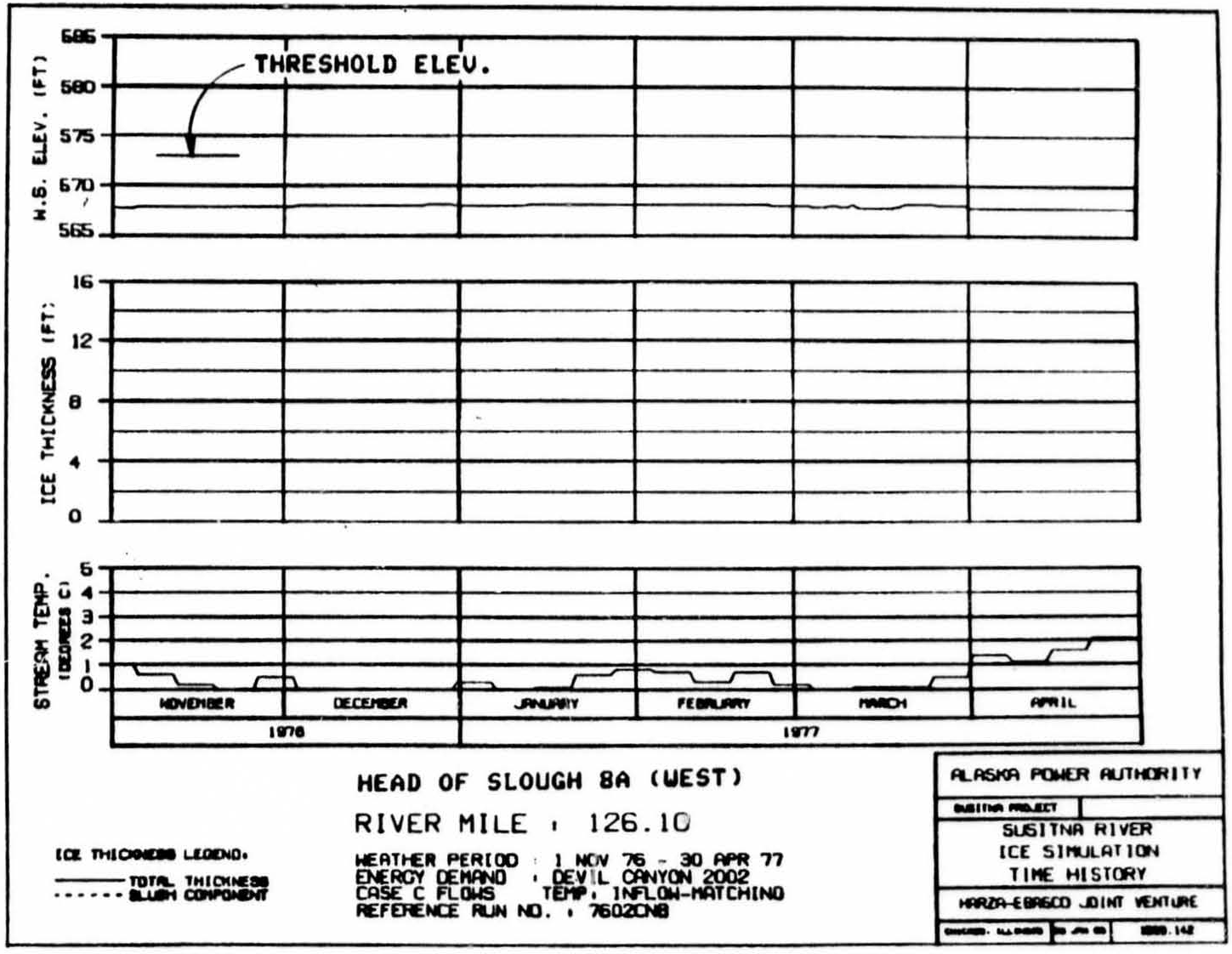
ALASKA POWER AUTHORITY

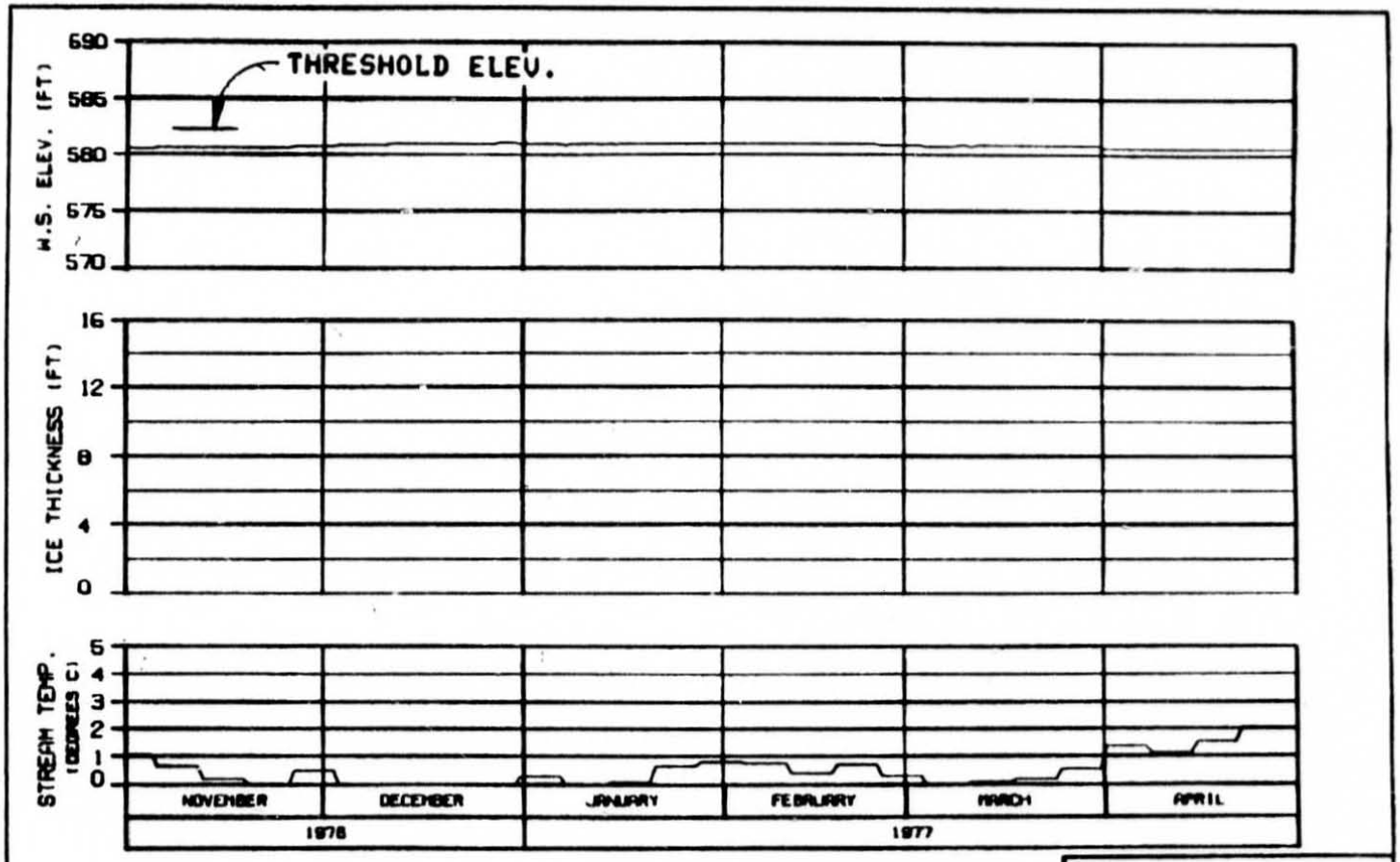
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
560
555
550
545
540
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF MOOSE SLOUGH
RIVER MILE : 123.50
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
585
580
575
570
565
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SLOUGH 8A (WEST)
RIVER MILE : 126.10
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

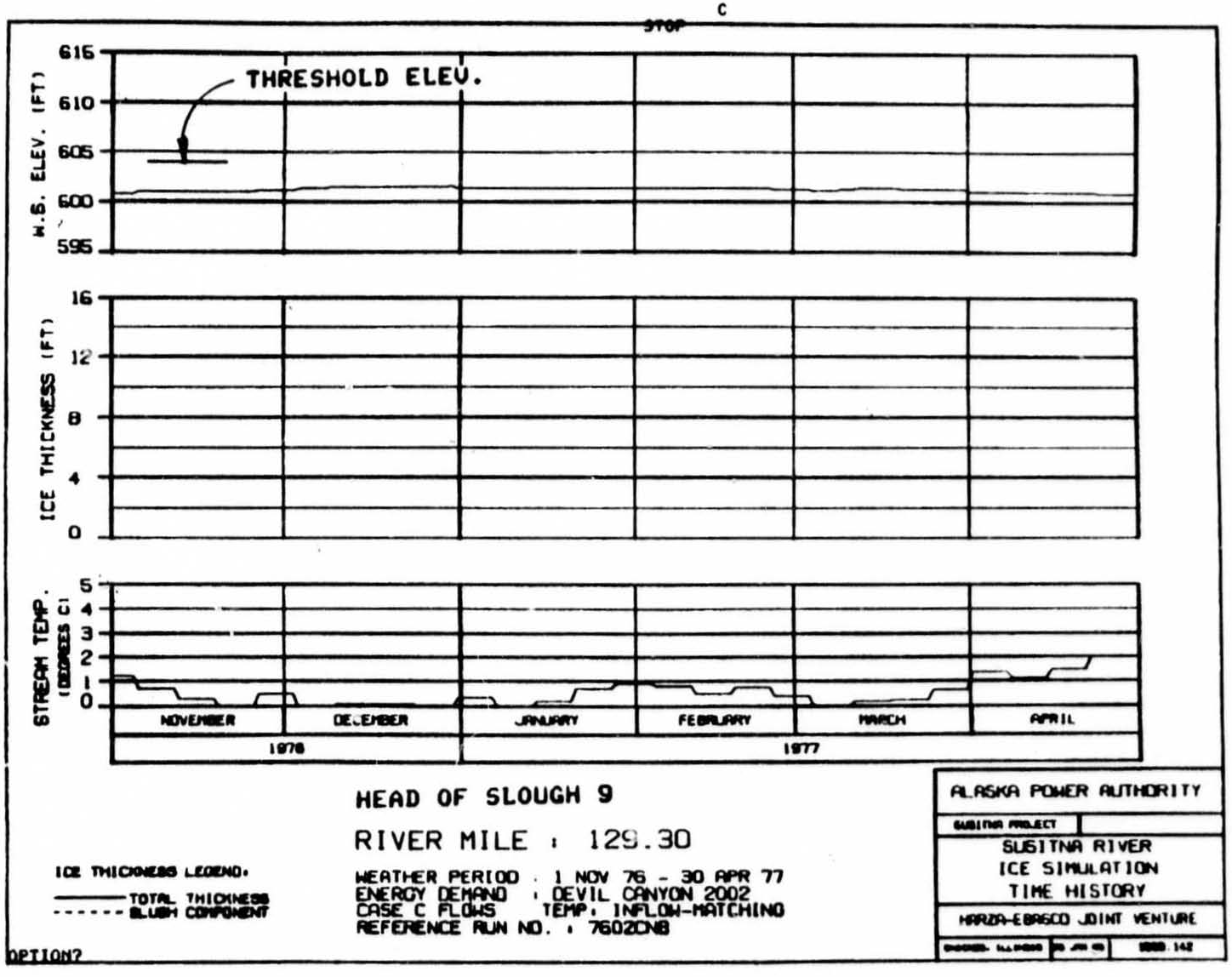
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

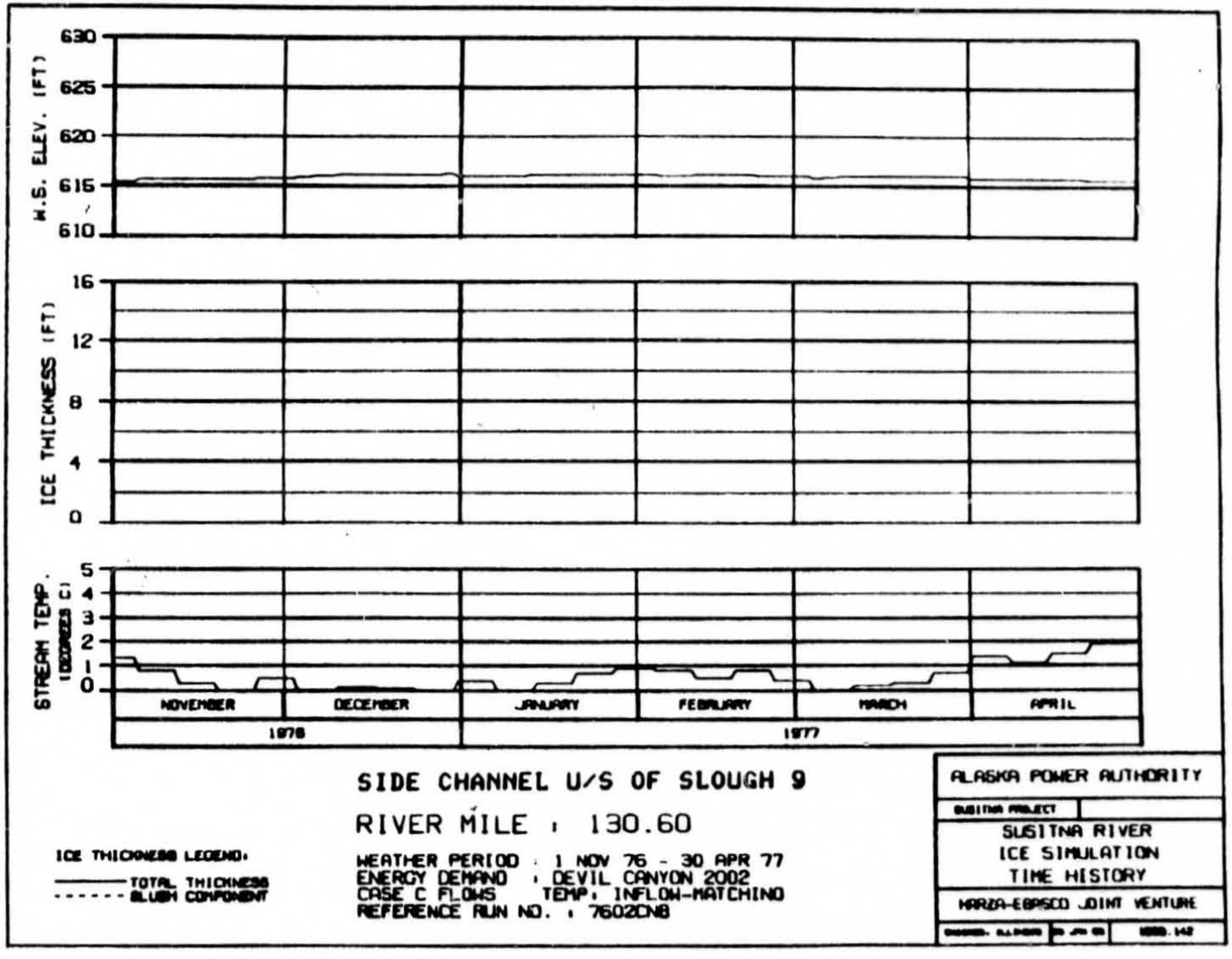
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

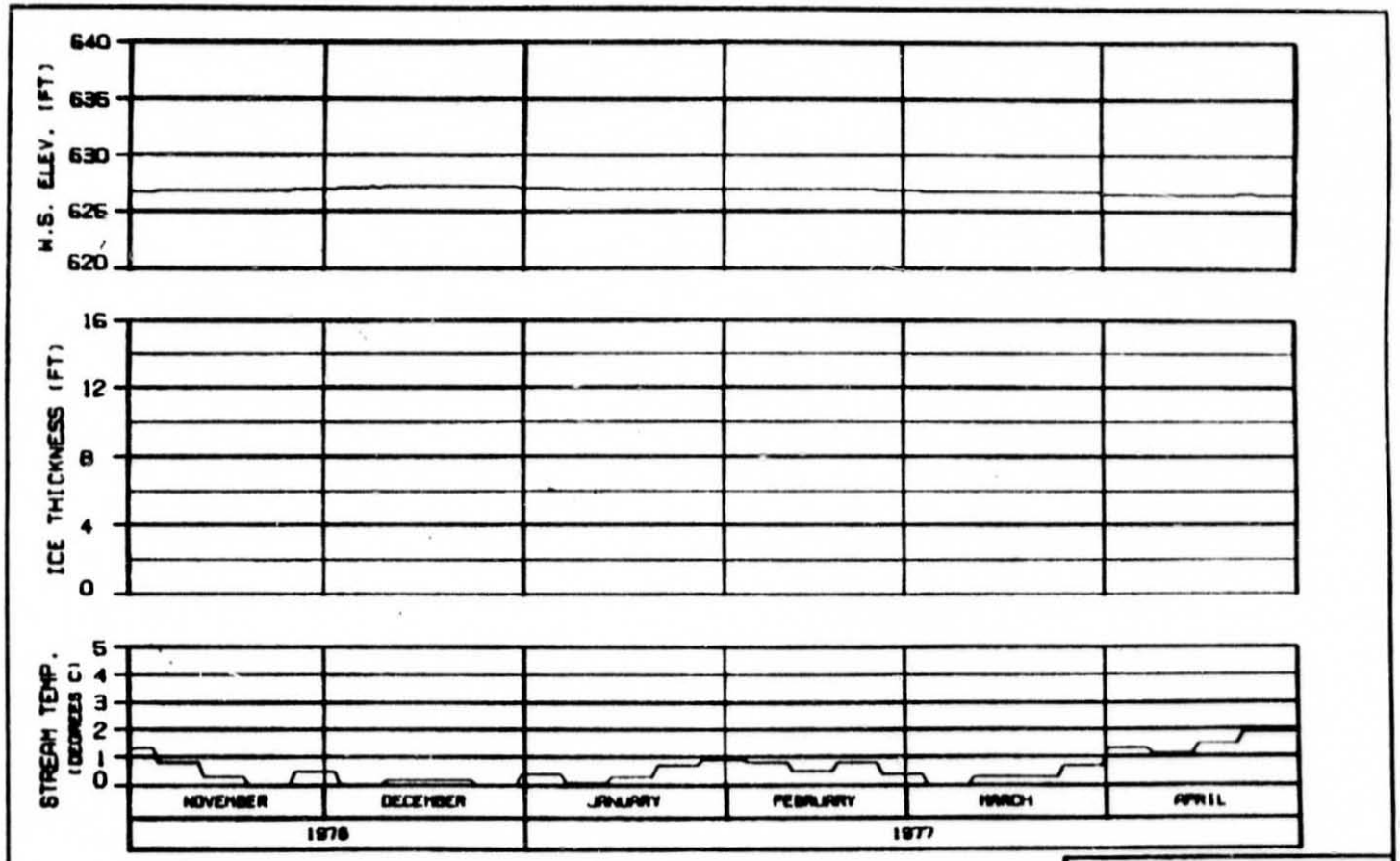
ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE

OPTION7

OPTION?


W.S. ELEV. (FT)
630
625
620
615
610
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
SIDE CHANNEL U/S OF SLOUGH 9
RIVER MILE : 130.60
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

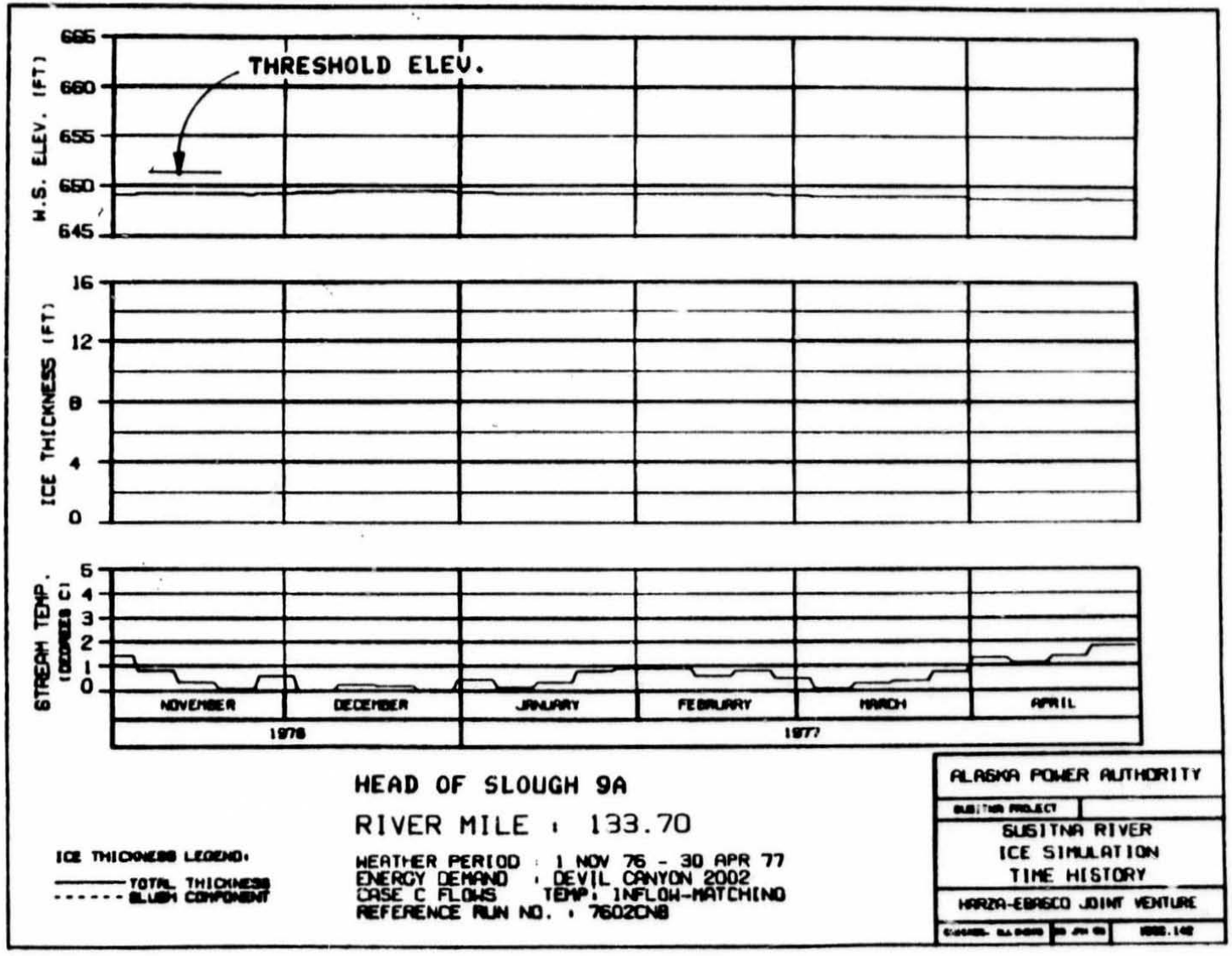
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

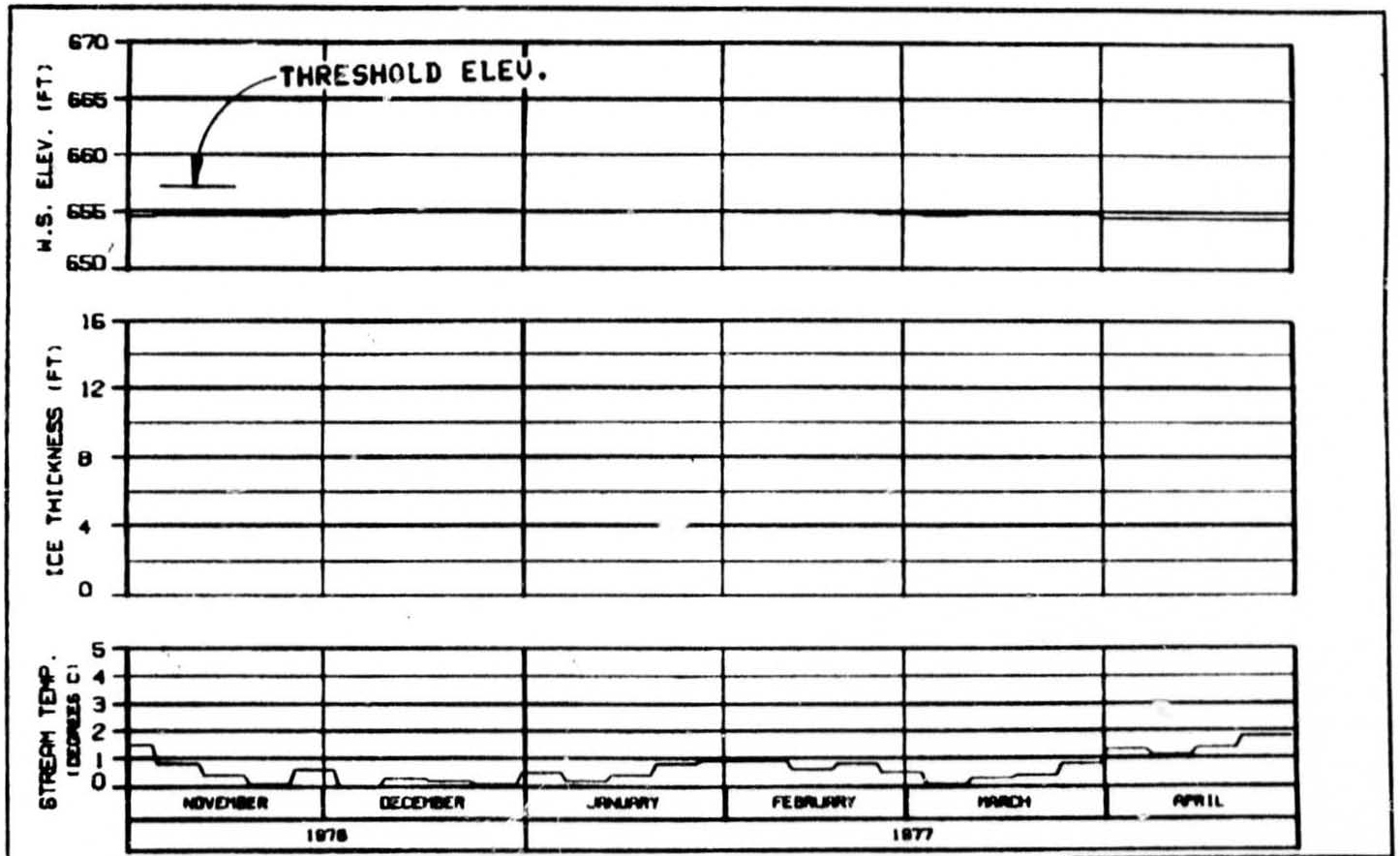
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
665
660
655
650
645
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP.
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SLOUGH 9A
RIVER MILE : 133.70
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

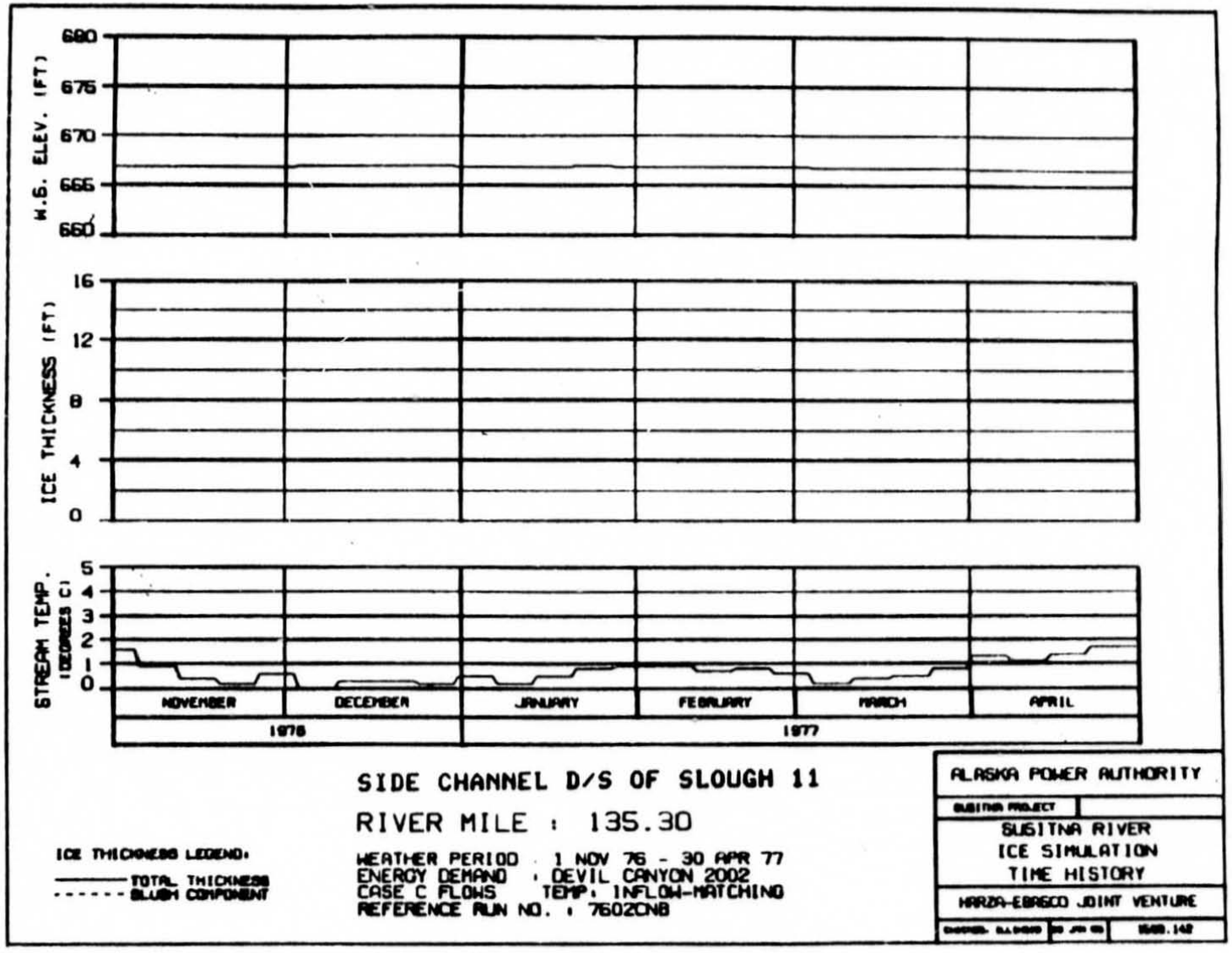
ALASKA POWER AUTHORITY

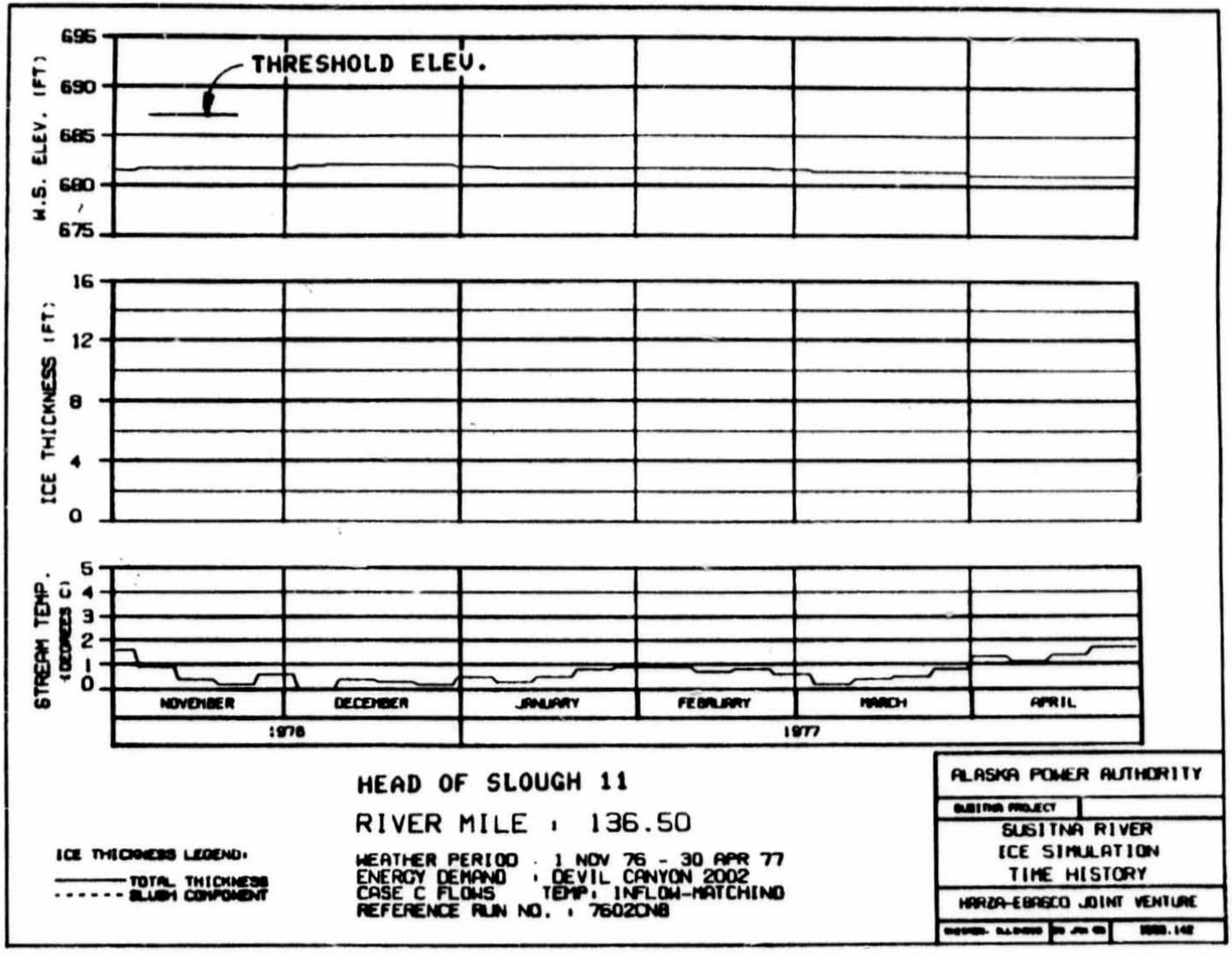
SUSITNA PROJECT

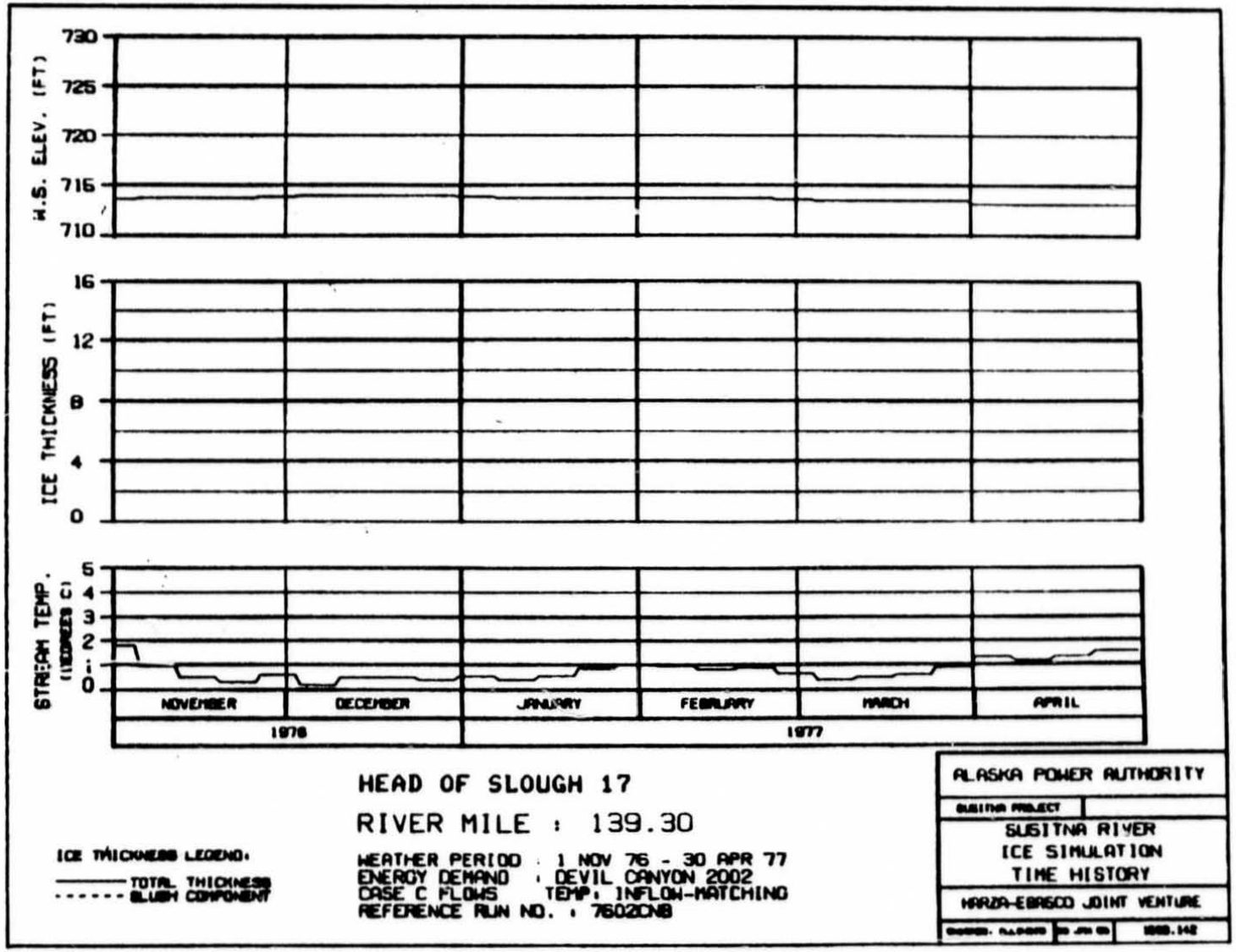
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWING NO. 1889.142


W.S. ELEV. (FT)
680
675
670
665
660
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
SIDE CHANNEL D/S OF SLOUGH 11
RIVER MILE : 135.30
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
695
690
685
680
675
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SLOUGH 11
RIVER MILE : 136.50
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHIND
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

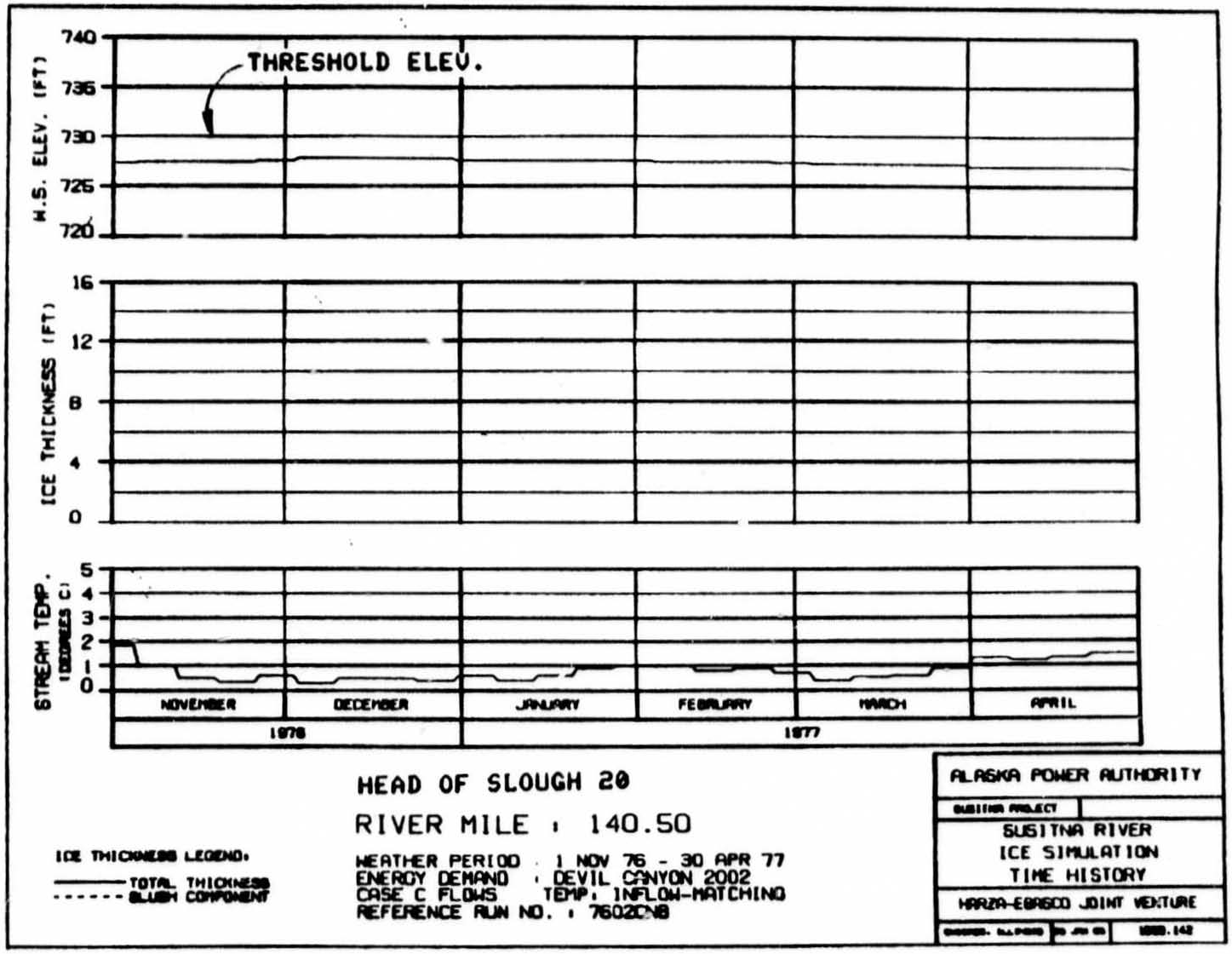
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8

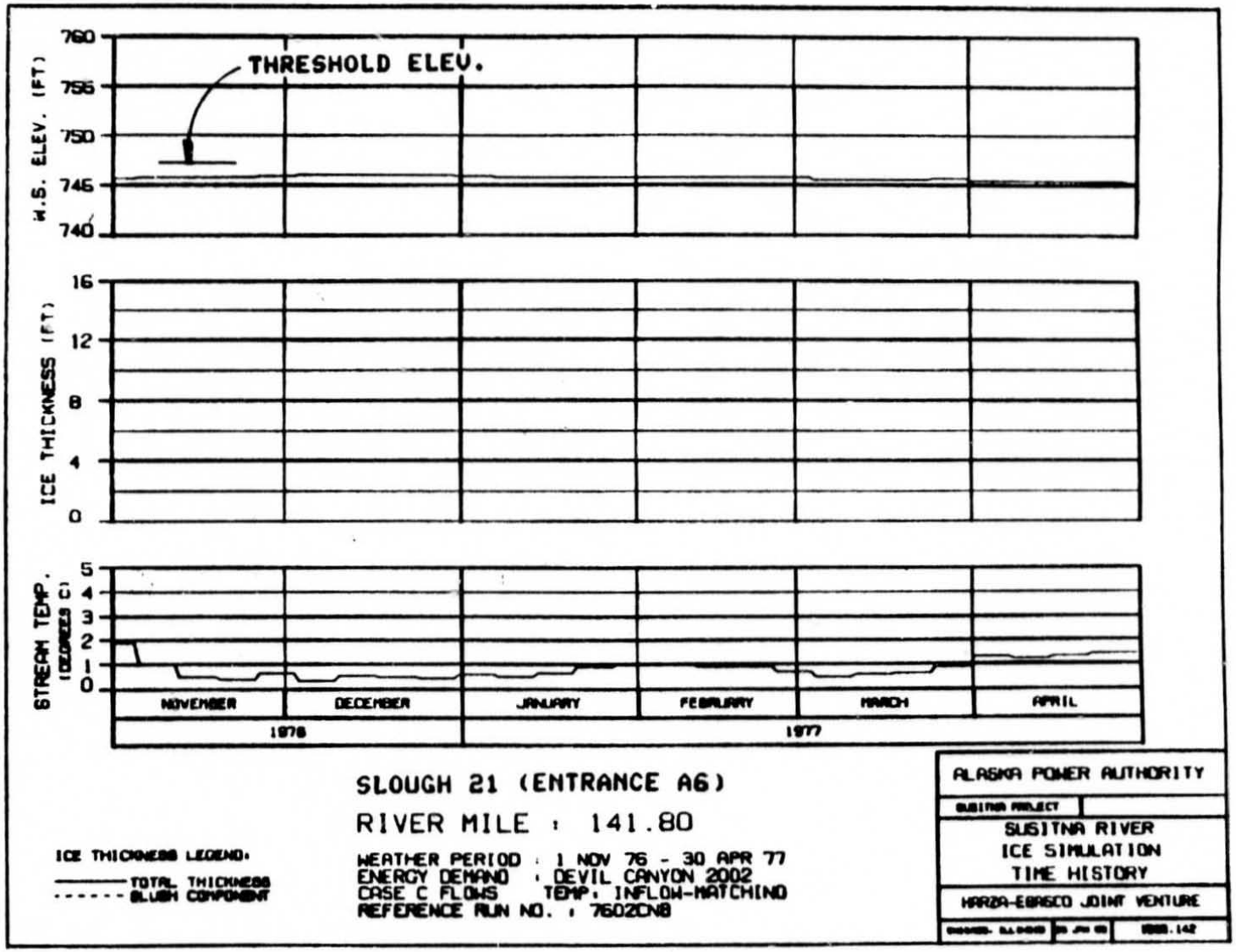
ALASKA POWER AUTHORITY

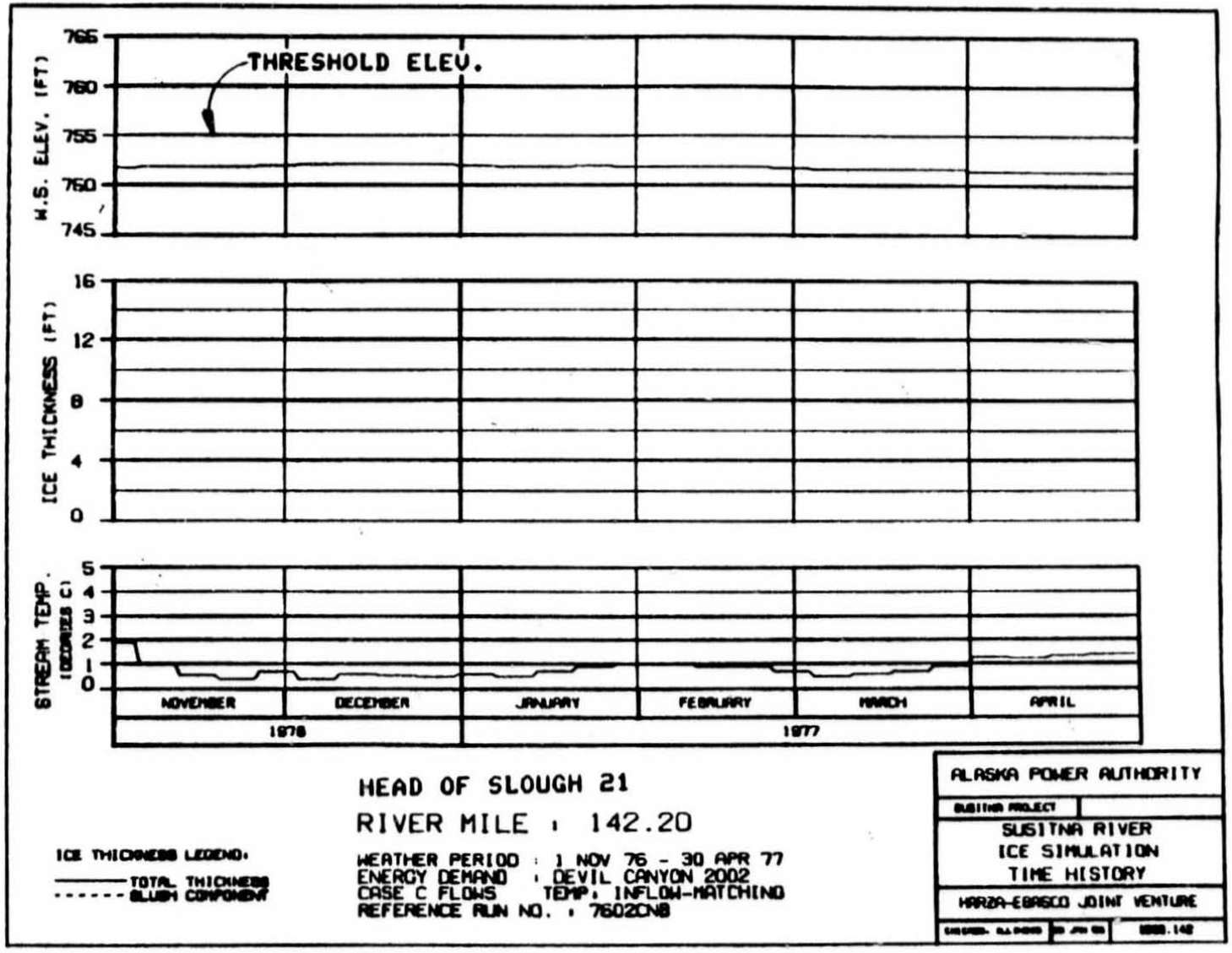
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

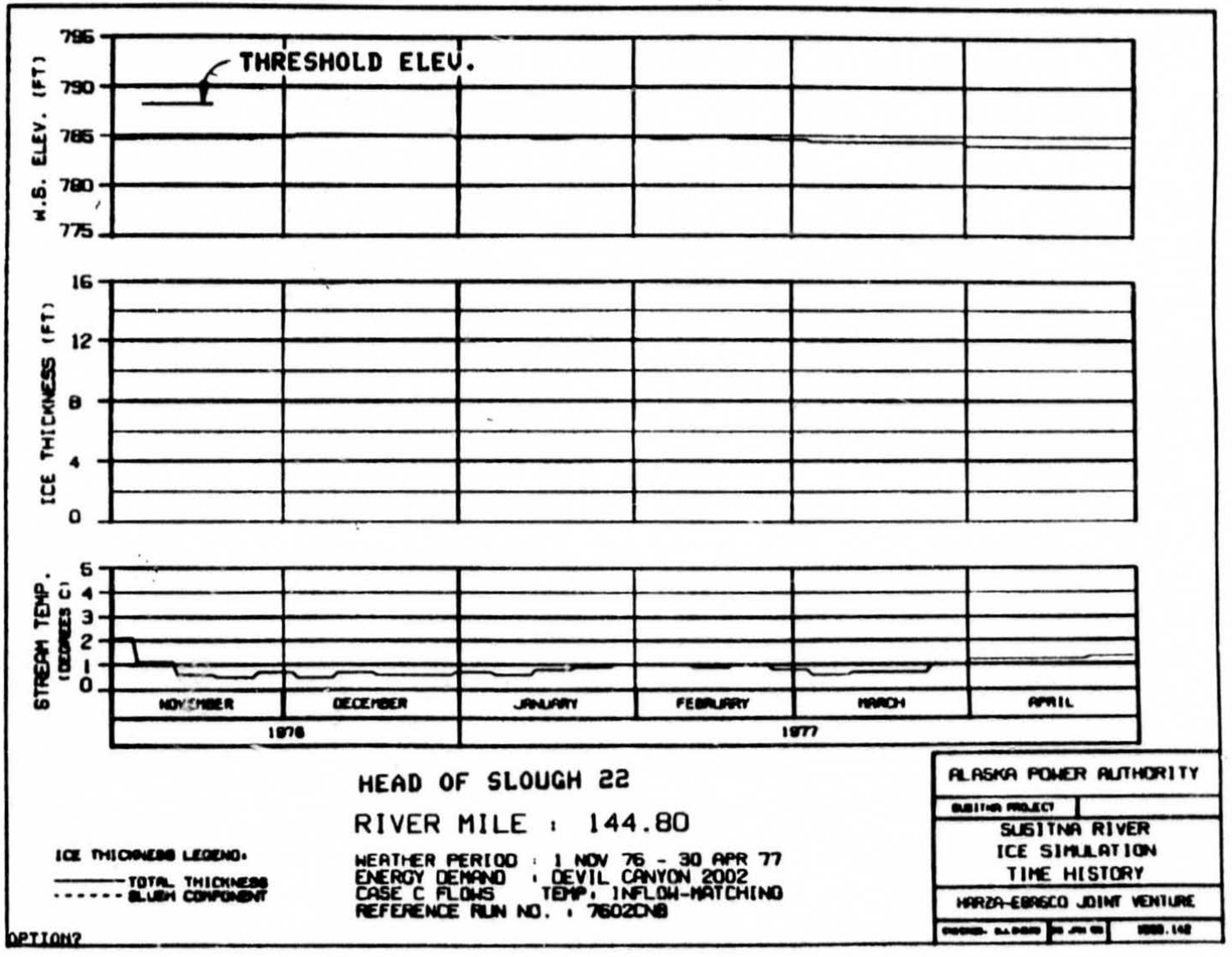
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
740
735
730
725
720
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SLOUGH 20
RIVER MILE : 140.50
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
760
755
750
745
740
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
SLOUGH 21 (ENTRANCE A6)
RIVER MILE : 141.80
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE


W.S. ELEV. (FT)
765
760
755
750
745
THRESHOLD ELEV.
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1976
1977
HEAD OF SLOUGH 21
RIVER MILE : 142.20
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CN8
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
CASE C FLOWS TEMP: INFLOW-MATCHING
REFERENCE RUN NO. : 7602CNB

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

OPTION2