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VOLUME 8
APPENDIX VI -
RIVER ICE SIMULATIONS,
SUSITNA RIVER, WATANA DAM TO
CONFLUENCE OF SUSITNA AND
CHULITNA RIVERS

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Volume 8

Appendix VI - River Ice Simulations, Susitna River, Watana Dam to Confluence of Susitna and Chulitna Rivers

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August 1984

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LIST OF EXHIBITS

A. The response by the Alaska Power Authority to the Federal Energy Regulatory Commission's Request for Supplemental Information of April 12, 1983 - Schedule B, Exhibit E, No. 2.41.

For a list of Exhibit B through Exhibit S see Table 15.

1.0 SUMMARY

This Appendix contains the results of river ice simulations. These simulations were requested by the Federal Energy Regulatory Commission (FERC) in April, 1983 as part of their Schedule B Request for Supplemental Information. A copy of the comment and the response of the Alaska Power Authority (Power Authority) is attached hereto as Exhibit A. Additionally, the simulations in this Appendix are cited in the Power Authority Technical Comments AQR071 and AQR037 on the Draft Environmental Impact Statement (DEIS) for the proposed Susitna Hydroelectric Project prepared by the FERC.

The simulations were carried out using the ICECAL model (Harza-Ebasco 1984a) which was submitted to FERC on April 30, 1984. Simulations were made for various hydrological and meteorological conditions, for four levels of project energy demands and for two winters of filling of Watana Reservoir. Case C minimum target flows as defined in the License Application were used.

Field observations of winter ice conditions have been undertaken during the past four years in order to evaluate the possible effects of river ice on the fishery habitat. These observations also provided the data for calibration of the ICECAL model. This chapter summarizes the significant observations of natural conditions and results of the river ice simulations.

1.1 NATURAL CONDITIONS

Observations of river ice (R&M 1981, 1982a, 1984a, 1984b) and slough hydrology (R&M 1982b) made by R&M Consultants, Inc. indicate that:

1. Overtopping of the upstream berm of Slough 8A occurs under natural conditions as observed in the winter of 1982-83. This overtopping allowed slush ice to flow into the slough and form an ice cover. The ice cover eventually deteriorated due to warm upwelling water in the slough, leaving open leads.

2. Overtopping of the berm at Slough 9 appears to have occurred during the winter of 1982-1983. Maximum water levels attained during the ice-covered period were equivalent to an open water flow of 30,000 to 40,000 cfs in the vicinity of the slough, (R&M 1982b) which would have resulted in overtopping of the berm.

3. Overtopping of the upstream slough berm at Slough 21 was not reported in 1982-1983. However, maximum ice-affected water surface levels reported for 1982-1983 (R&M 1984a) indicate staging in the vicinity of this slough which caused maximum water levels to be near overtopping of the berm.

The observations of 1982-1983 water levels near Slough 8A and Slough 9 verify the simulation results for natural conditions, which show overtopping of the upstream berms of both sloughs. The simulation of natural conditions was not extended upstream of Gold Creek because of the lack of data on ice production, so a comparison of simulated and observed conditions is not possible at Slough 21.

The mechanism of upstream berm overtopping at Slough 8A in the winter is described (R&M 1982b). In 1982-1983 the formation of an ice cover on the river caused elevated water levels and overtopping of a berm or berms in the vicinity of river mile 127 resulting in flow into the side channel upstream of the northeast berm of Slough 8A. The downstream end of this side channel (also identified as Slough B) was obstructed by ice and thus the flow was shunted over the northeast berm at the upstream end of Slough 8A, near river mile 126.7. Overtopping of the northwest berm at Slough 8A at river mile 126.1 was not reported.

Overtopping of the berm at the head of the side-channel at river mile 127.1 occurs at a mainstem flow of approximately 17,000 cfs (R&M 1982b). This would require a mainstem water level of approximately El. 582.5 (Exhibit 4-G, Harza-Ebasco 1984b). The simulation of natural conditions for the winter of 1982-1983 indicates a maximum water level of El. 582 at this same location. In order to provide consistency between the natural condition simulations and the observations that the Slough 8A berm was overtopped in 1982-1983 it has been assumed that cold mainstem water will enter Slough 8A when the water surface at river mile 127.1 reaches the Threshold El. 582.

1.2 SIMULATIONS

Instream ice simulations have been made for Watana filling, Watana operating with 1996 and 2001 energy demands and for Watana and Devil Canyon operating with 2002 and 2020 energy demands. A range of winter meteorologic conditions has been simulated to indicate the range of with-project ice affected water levels.

Meteorology and hydrology for the winters of 1971-1972, 1976-1977, 1981-1982 and 1982-1983 were used in the simulations. The winter of 1982-1983 generally gave the lowest water levels and shortest ice cover. The 1976-1977 and 1981-1982 winters both resulted in somewhat more ice and higher water levels than the 1982-83 winter. The winter of 1971-1972 resulted in the greatest ice accumulation and furthest progression of the ice front. In the simulations discussed herein, the winters of 1982-1983 and 1976-1977 represent average winters and 1981-1982 and 1971-1972 represent cold winters. Simulations have also been made for natural conditions for the winters of 1971-1972, 1976-1977, 1981-1982 and 1982-1983.

1.1.1 Winter of 1982-1983 - Average Air Temperatures

Simulated maximum with-project water levels for Watana only operating are generally three to five feet higher than natural in the reach where an ice cover forms; generally downstream of river mile 127. With Watana and Devil

Canyon operating (2002 energy demand), maximum water levels would be reduced and would be only one to four feet higher than natural where an ice cover forms; generally downstream of river mile 122. With the 2020 energy demand, the maximum water levels would typically be one to two feet higher than for 2002 and the ice front would advance to river mile 127.

For the first year of filling, with discharge through the low level outlet works, the maximum water levels would be one to five feet lower than natural and the ice front would be delayed in reaching Gold Creek until mid February.

In general, based on the simulations downstream of river mile 139, maximum water levels with-project will be lower than natural upstream of the with-project ice front.

1.2.2 Winter of 1976-1977 - Average Air Temperatures

Simulated natural condition water levels would be approximately two feet lower than for 1982-1983 natural conditions and the ice front would reach Gold Creek in early March; 2-1/2 months later than for 1982-1983 natural conditions. With-project ice simulations indicate, with Watana only operating, maximum water levels would be three to eight feet higher than natural downstream of Gold Creek. With Watana and Devil Canyon operating (2002 energy demand) the maximum water levels would be reduced and the ice front would extend to near river mile 127. Maximum water levels would be one to five feet above natural where an ice cover would form. For 2020 energy demands, it is expected that water levels would be one to two feet higher than for 2002 energy demands.

For this winter, with-project maximum water levels upstream of the ice cover tend to be equal to or greater than natural conditions due to the small amount of staging under natural conditions.

1.2.3 Winter of 1981-1982 - Cold Air Temperatures

Maximum water levels for natural conditions would be generally higher than for 1982-1983 conditions by up to four feet. However, in some locations, 1981-1982 natural conditions would result in lower maximum water levels by up to two feet. The ice front would reach Gold Creek in early January, about two weeks later than for 1982-1983. Simulated conditions with Watana operating show the ice front would reach Gold Creek in late January and maximum water levels would be two to eight feet higher than natural. With Watana and Devil Canyon operating (2002 energy demand), the ice front may only reach river mile 125. Maximum water levels, where an ice cover forms, would be one to three feet higher than natural. A simulation was not made for 2020 energy demands. However, it is expected that maximum water levels would be one to two feet higher than for the 2002 energy demand.

For the second year of filling, maximum water levels would be generally less than or equal to natural conditions and the ice front would not reach Gold Creek until mid-February.

Maximum with-project water levels upstream of the ice cover would generally be less than for natural conditions.

1.2.4 Winter of 1971-1972 - Cold Air Temperature

Maximum water levels for natural conditions would generally be equal to or higher than for 1982-1983 natural conditions. The average difference would be approximately two feet. Downstream of river mile 120 the two cases would be very similar. With-project simulations for Watana only operating indicate the ice front would reach Gold Creek three to five weeks later than natural and maximum water levels would be three to six feet higher than natural. With Watana and Devil Canyon operating (2002 energy demand) the ice front would be delayed by three months in reaching Gold Creek and maximum water levels would be one to three feet higher than natural. For 2020 energy demands the ice front would reach river mile 133 and maximum water levels would be two to six feet higher than natural.

In general, it appears that with-project maximum water levels upstream of the ice cover would be less than for natural conditions.

1.2.5 Watana Filling

The two simulations of Watana filling indicate possible bounds on river ice. The first winter of filling, when reservoir releases would be from the low level outlet works and relatively warm, was simulated with an average winter. The second year of filling, when reservoir releases would be from the surface and relatively cold, was simulated with a cold winter. The difference between the maximum water levels for the two simulations is on the order of one to two feet. The second year of filling simulation provided higher water levels downstream of river mile 134. Upstream of this point the simulations are similar. The ice front would reach Gold Creek one to two weeks earlier for the second year of filling. For both cases the maximum water levels would be generally less than or equal to natural conditions and the ice front would reach Gold Creek in mid to late February, six to ten weeks later than natural.

1.2.6 Watana Operating

In general, with Watana operating, berms at Sloughs 8A and 9 may be overtopped in winters that are colder than 1982-1983. The berm at Slough 21 would only be overtopped in a cold winter such as 1971-1972. Since the berm at Slough 8A is apparently overtopped regularly now and indications are that the berm at Slough 9 may also be overtopped, the frequency of overtopping of these berms with Watana in operation may be reduced from natural conditions.

1.2.7 Watana and Devil Canyon Operating

In general, with Watana and Devil Canyon operating, berms at Sloughs 8A and 9 would be overtopped only in cold winters such as 1971-1972. With-project simulations for 1976-1977, 1981-1982 and 1982-1983 did not result in overtopping of these berms. Slough 21 would not be overtopped.

2.0 INTRODUCTION

This Appendix contains the results of river ice simulations. These simulations were requested by the FERC in April, 1983 as part of their Schedule B Request for Supplemental Information. A copy of the comment and the response of the Alaska Power Authority is attached hereto as Exhibit A.

Additionally, the simulations in this Appendix are cited in the Power Authority's comments on the Draft Environmental Impact Statement for the proposed Susitna Hydroelectric Project prepared by the FERC (See comments AQR037 and AQR071).

3.0 METHODOLOGY

The simulations were carried out using the ICECAL model (Harza-Ebasco 1984a, submitted to FERC on April 30, 1984). Simulations were made for various hydrological and meteorological conditions, for four levels of project energy demands and for two winters of filling of Watana Reservoir. Case C minimum target flows as defined in the License Application were used.

The river ice simulations have been coordinated with the open water river temperature simulations. Open water temperature modeling, using SNTEMP, provided the link between the reservoir outlet, which was always above 0°C, and the 0°C isotherm or the upstream extent of the ice cover, whichever was further upstream.

Ice simulations were made for the reach of the Susitna River between Watana Dam site and the confluence of the Susitna and Chulitna Rivers. The ice cover was assumed to progress upstream of the Susitna-Chulitna confluence when the ice capacity of the reach between the Chulitna confluence and the Yentna confluence was full. Computations were made to determine the ice capacity of this reach and the time required to fill it based on the computed ice production in the Susitna, Chulitna and Talkeetna Rivers. It was assumed the ice cover would reach the Yentna confluence on November 1.

Observations indicate that under natural conditions the ice cover begins to progress upstream of river mile 9 near Cook Inlet in October and may reach the Yentna confluence in late October or early November. It is believed that, with project operation, the ice cover will not begin much later than this. Operation of the project will trap considerable frazil ice produced upstream of the dams, thereby reducing ice influent to the Lower Reach. However, operation of the project will not affect ice production on the Yentna River, which has been observed to contribute approximately half of the frazil ice in the Susitna River downstream of the Yentna confluence.

Additionally, ice bridge formation at river mile 9 may be dependent on tides and the occurrence of extremely cold weather, factors which are not influenced by the project. Ice front progression past the Yentna River may be delayed somewhat with project, but in order to provide conservatism in the study, November 1 was accepted as the starting date for computations of filling the Lower Reach with ice.

Table 1 describes the ice simulations provided in this Appendix.

TABLE 1
RIVER ICE SIMULATIONS

	Watana Operation		Watana/Devil Canyon Operations		Watana Filling	
Estimated Energy Demand for	1996	2001	2002	2020	First Winter	Second Winter
Simulated Period						
Nov. '82-May '83 Avg. Year Avg. Winter Temps	+	+	+	+	+	
Nov. '71-May '72 Wet Year Cold Winter Temps.	+	+	+	+		
Nov. '76-May '77 Dry Year Avg. Winter Temps.	+		+			
Nov. '81-May '82 Wet Year Cold Winter Temps.	+		+			+

Natural conditions were simulated for the period November 1982 through April 1983 for the purpose of calibrating the model and for comparison with simulated with-project conditions for that period. This simulation is also included in this Appendix. In the calibration report (Harza-Ebasco 1984a) natural conditions were also simulated for the period November through December 1983 for calibration purposes. With-project conditions were not simulated for this period, as weather and hydrologic conditions were similar to 1982- 1983.

Simulations of natural conditions were also made for the winters of 1971-1972, 1976-1977 and 1981-1982. These simulations were made for comparison with project simulations. There are insufficient observations to verify the simulated water levels for any of these years. Natural condition simulations were limited to the reach between river mile 139 and the Susitna-Chulitna confluence. This limitation was necessary in order that the frazil ice influent at the upstream boundary under natural conditions could be estimated. It was assumed that the quantity of frazil ice at river mile 139 would be related to air temperature. Observations from 1982-1983 and 1983-1984 at Gold Creek bridge (river mile 136.6) verified this assumption and gave the form of the relationship. It was further assumed that this relationship would hold for cold winters such as 1981-1982 and 1971-1972. No observations are available to confirm or deny this. The quantities of frazil ice influent to the study reach for natural conditions for 1971-1972, 1976-1977 and 1981-1982 were computed based on these assumptions and the relationship developed from 1982-1984 data.

With-project simulations were not constrained to this study reach downstream of river mile 139. The reservoir temperature and stream temperature simulation models provided the upstream boundary conditions for with-project simulations. This boundary was always one of the following:

1. the point in the river upstream of the existing ice cover where the stream temperature reached 0°C, or

2. the upstream end of the existing ice cover if the simulated temperature at the end of the ice cover was above 0°C.

When the 0°C isotherm was upstream of the existing ice cover, the ice simulation model would compute the amount of frazil ice produced in the reach upstream of the ice cover and downstream of the 0°C isotherm based on established heat transfer relationships (Harza-Ebasco 1984a). When the temperature at the upstream end of the ice cover was above 0°C, the model would compute ice cover melting.

In the simulated reach of the river, the entire river width was assumed to be available to pass flow except for overbank areas near certain sloughs which were assumed to be protected by raising of the berms. As indicated in the License Application (p. E-3-162), productive sloughs which would be overtopped more frequently than once in every five years would be protected. Therefore, overbank areas adjacent to the sloughs shown in Table 2 were considered ineffective for passing ice and water.

TABLE 2

SLOUGHS FOR WHICH OVERBANK AREAS WERE
CONSIDERED INEFFECTIVE FOR PASSING FLOW

Slough	Location (river mile)
Whiskers 1/	101.5
6A 1/	112.3
8	114.1
8C	121.8
8B 2/	122.5
Moose	123.5
A 1/	124.5
8A (west)	126.1
8A (east)	127.1
B	127.1
9	129.3
9A 2/	133.7
11	136.5
17 1/	139.3
21 (A6) 1/	141.8
21 (Head) 1/	142.2

1/ Not listed in License Application (p.E-3-162)

2/ Sloughs 8B and 9A were considered protected for all simulations except for the coldest winter of 1971-1972. Protecting these sloughs would result in localized changes (increases) in simulated water levels in the vicinities of the sloughs for 1971-1972 simulations. Simulated water levels at nearby habitat areas, however, would not change significantly, due to the steep gradient of the river. Simulated water levels at all locations for 1976-1977, 1981-1982 and 1982-1983 would not change.

The ice simulations presented in this Appendix should be considered as indicators of general trends rather than precise and exacting simulations. Although the ICECAL model is considered state-of-the-art, modeling of ice in rivers is a new field and many processes are only beginning to be understood. Field observations of ice affected water levels and ice thicknesses are as difficult to obtain in a reliable manner as are observations of ice impacts on fish. The calibration report (Harza-Ebasco 1984a), indicates the level of accuracy which can be attained. The model has been calibrated to observations for average winters; 1982-1983 and 1983-1984. Insufficient data are available to allow its calibration to a severe winter such as 1971-1972. Additionally, with-project simulations have been made for four winters, 1971-1972, 1976-1977, 1981-1982 and 1982-1983. During project operation, weather and flow conditions will not necessarily duplicate any of the simulated conditions.

Simulations made to date show the model is particularly sensitive to the timing of changes in air and water temperature. For example, a comparison of the 1996 and 2001 energy demand simulations for the winter of 1971-1972 shows that the maximum water surface elevations are similar downstream of river mile 137. Upstream of this location, at river mile 141, however, maximum simulated water levels for the 2001 energy demand are approximately 10 feet higher than for the 1996 demand. A comparison of reservoir outlet temperatures (Appendix IV) for these two energy demands for the winter of 1971-1972 shows a four week period beginning in mid December and lasting until early January when the reservoir outlet temperature for the 2001 simulation was approximately 1°C colder than for the 1996 simulation. This resulted in an extra 15 to 30 miles of river at 0°C for this period for 2001 as compared to 1996. The frazil ice generated in this reach resulted in greater ice deposition which caused the increased water levels in the indicated area. The reservoir temperature profiles for this period, for the 2001 simulation, indicate that water was available in the reservoir which could have been used to raise the outflow temperature to the same level as for 1996 (approximately 2°C) if a lower level outlet had been operated.

However, the rule for operating the multi-level intake is to take the water closest in temperature to natural conditions (License Application p. E-2-119) which, in winter, is 0°C.

The simulations included in this Appendix present a good picture of the expected winter regime of the study reach under a wide range of hydrological and meteorological conditions and for various energy demands and project scenarios.

4.0 RESULTS

The following discussion is based on an examination of the ice simulation results in this Appendix. The discussion is divided into six parts:

1. Natural Conditions
2. Watana Operation - average winter air temperatures
3. Watana and Devil Canyon Operation - average winter air temperatures
4. Watana Operation - cold winter air temperatures
5. Watana and Devil Canyon Operation - cold winter air temperatures
6. Filling of Watana reservoir

Results of the simulations are summarized in Tables 3 through 13 at the end of this section.

4.1 Natural Conditions

Simulations of natural conditions were made for the winters of 1971-1972, 1976-1977, 1981-1982 and 1982-1983 for comparison with project conditions. The simulation of 1982-1983 provided the basis for calibrating the ICECAL model to field observations. An additional calibration simulation was made for the 1983-1984 winter (see Doc. 1122). This simulation is not shown here and with-project simulations were not made for this year because of its similarity to 1982-1983 conditions. There are no observations of maximum water levels, ice thicknesses and ice front progression which can be compared to the simulated conditions for 1971-1972, 1976-1977 or 1981-1982 to verify these simulations.

For the winter of 1982-1983, the ice front advanced to Gold Creek by mid-January, after stalling for some time downstream of the Gold Creek bridge. The simulation of the 1982-1983 winter followed the progression of the ice front well until this point. The simulation showed an advance past Gold Creek approximately three weeks earlier than observed. Simulated ice thicknesses and water levels were within acceptable limits. The ice cover

resulted in staging of between two and six feet relative to open water levels.

The simulation of natural conditions for 1971-1972 indicated the ice front would progress past the Susitna-Chulitna confluence (river mile 103) in early November and reach Gold Creek by mid-December, similar to 1982-1983 conditions. Maximum water levels would be similar to 1982-1983 conditions downstream of river mile 120 and slightly higher upstream of that. The ice cover resulted in staging between three and ten feet relative to open water levels.

The simulation of natural conditions for 1976-1977 indicated the ice front would progress past the Chulitna-Susitna confluence in early December and reach Gold Creek in early March. Maximum water levels would be up to four feet lower than for 1982-1983. The ice cover resulted in staging of between two and five feet relative to open water levels.

The simulation of natural conditions for 1981-1982 indicated the ice front would advance to the Chulitna-Susitna confluence by mid-November and would reach Gold Creek by early January. Maximum water levels would generally be higher than 1982-1983 conditions. The ice cover resulted in staging of three to eight feet relative to open water levels.

4.2 Watana Operation - Average Winter Air Temperatures

For Watana only operating for the winter of 1982-1983, the maximum upstream extent of the ice cover for 1982-83 would be near river mile 127 for 1996 energy demands and river mile 124 for 2001 energy demands. A comparison of the simulated natural and with-project (Watana only) conditions for this year indicates that water levels attained near the berms of Slough 8A (RM's 126.1, 127.1) and Slough 9 (RM 129.3) with-project for both 1996 and 2001 energy demands are generally less than or equal to those attained under natural conditions. At Slough 8A, for a period of approximately three days in late December, the simulated water level for 1996 energy demand exceeds the natural conditions.

For the winter of 1976-1977, with Watana only operation, the maximum upstream extent of the ice cover reached river mile 137, upstream of the Gold Creek Bridge, for 1996 energy demands. Maximum water surface levels attained at the berms of Slough 8A were 4 to 6 feet higher than under simulated natural conditions. The maximum water level attained at the upstream berm at Slough 9 would be approximately 4 feet higher than simulated for 1982-1983 natural conditions.

For average winter conditions for Watana only operation, for the two simulations carried out, the maximum upstream extent of the leading edge varied betwen river miles 124 and 137. With-project, the ice front leading edge tends to respond to changes in air temperatures which induce changes in the water temperatures released from the reservoir or which induce changes in the rate of cooling of open water between the dam and the leading edge location.

It appears that where an ice cover exists with-project, the ice related water level will be higher than under natural conditions. However, this may not result in an increased frequency of slough berm overtopping since the leading edge of the ice may not progress upstream past Sloughs 8A, 9 and 21 as frequently as during natural conditions.

4.3 Watana and Devil Canyon Operating - Average Winter Air Temperatures

During average winters (as illustrated by 1982-83) with Watana and Devil Canyon in operation with energy demands as for 2002, the maximum upstream extent of the leading edge of the ice cover will reach river mile 122, approximately two to five miles downstream of the leading edge attained under similar conditions with Watana only operating, based on our simulations. Maximum ice thicknesses attained are somewhat similar to Watana only conditions downstream of river mile 117, and much thinner upstream of this. Maximum water levels attained are approximately 1 to 3 feet lower than with Watana only downstream of river mile 117 and 4 to 5 feet lower upstream. Downstream of river mile 117 the primary reason for the reduction in water surface level from Watana only operation is the

winter discharge which is less than the discharge with Watana only operation. For 2020 energy demands, the leading edge would progress to near river mile 126, similar to Watana only operation in the same winter. Maximum water levels would be lower than for Watana only operation downstream of river mile 115 and similar to those for Watana only operating upstream of river mile 115.

A comparison of the results with simulated natural conditions shows that in the reach where an ice cover forms, downstream of Slough 8A, maximum water levels will be 1 to 5 feet higher than for natural conditions.

Based on a simulation of 1976-1977 winter conditions, the ice cover would reach approximately river mile 127. Maximum water levels attained would be 1 to 4 feet lower than with Watana only operation. Maximum water levels would be higher than simulated natural conditions by 2 feet at the Slough 8A northwest berm, by 1 foot at the berm at river mile 127.1 and 1 foot lower than natural conditions at the Slough 9 berm. The northeast berm of Slough 8A might not be overtopped and the Slough 9 berm would probably not be overtopped.

4.4 Watana Operation - Cold Winter Air Temperatures

The simulation of Watana operation for the 1981-1982 winter for 1996 energy demands shows a maximum upstream progression of the ice leading edge to near river mile 137, upstream of Gold Creek Bridge. The maximum water levels attained are zero to one foot higher than the maximum water levels for the winter of 1982-1983 (Watana operation) in the reach downstream of river mile 116. In the reach upstream of river mile 116, maximum water levels are 2 to 5 feet higher with an average of 3 feet higher. The maximum attained water levels are between 2 and 8 feet higher than simulated natural conditions.

The simulation of the winter of 1971-1972 provided the highest water levels and furthest upstream progression of the ice front. Simulations were made for 1996 and 2001 energy demands. The results for 1996 and 2001 are

similar, although further upstream progression of the ice front occurs in the 2001 energy demand simulations. Between river miles 132 and 142 the 2001 energy demand simulation gives stages 3 to 10 feet higher than the 1996 demand simulation. For the 2001 simulation, the leading edge reached river mile 142 and maximum water levels were on the average 2 feet higher than for the winter of 1981-1982 for Watana only operating, 2 to 7 feet higher than the winter of 1982-1983 with Watana operating and 2 to 3 feet higher than the winter of 1976-1977 with Watana operating.

For the two cold winters simulated, the leading edge of the ice progressed to river miles 137 and 142. Water levels at Slough 8A berms were 2 to 3 feet above simulated natural conditions for the 1981-1982 simulation and 2 to 4 feet above simulated natural conditions for 1971-1972 conditions. Water levels at Slough 9 were 2 to 5 feet higher than simulated natural conditions for 1981-1982 and 1971-1972 simulations, respectively. This indicates that these sloughs would be overtopped.

4.5 Watana and Devil Canyon Operating - Cold Winter Air Temperatures

The winters of 1981-1982 and 1971-1972 were used for simulating cold winter conditions for Watana and Devil Canyon operating. The 1981-1982 simulation was made for 2002 energy demands and indicates that, with Devil Canyon operating, the maximum water levels attained in a cold winter are similar to those attained with Devil Canyon operating in an average winter (1982-83). Maximum water levels are generally within a foot of those attained in the average winter. In some places the maximum water levels in the cold winter are less than those in the average winter. In the 1981-1982 simulation the leading edge of the ice cover reached river mile 126, approximately 4 miles upstream of the average winter.

A comparison can also be made with the cold winter conditions for Watana only operating. This shows that with Devil Canyon the maximum water levels are 2 to 4 feet lower downstream of river mile 115 and 5 to 9 feet lower upstream of river mile 115. Additionally, the ice cover during the cold winter with Devil Canyon would only reach a point approximately 10 miles

downstream of the maximum extent with Watana only operating. With Devil Canyon operating, maximum water levels in a cold winter such as 1981-1982 would be only 1 to 2 feet higher than under natural conditions for an average winter. For the cold winter of 1981-1982, with Devil Canyon operating, the maximum upstream extent of the ice cover did not reach the berms at Slough 8A.

Simulations of ice processes were also carried out for the winter of 1971-1972 for Watana and Devil Canyon operating for 2002 and 2020 energy demands. The 2020 demands required greater discharge from the reservoirs resulting in maximum water levels approximately 2 feet higher than for 2002 energy demands. However, for 2020 demands, the leading edge of the ice front would reach river mile 133 approximately 4 miles downstream of its maximum extent for 2002 energy demands. The maximum water levels attained for 2020 energy demands would be approximately the same as for similar winter weather with Watana only operating with 2001 energy demands, although the maximum extent of the leading edge would be approximately 9 miles downstream of its extent for Watana operating. For 2020 energy demands the maximum water levels would be 2 to 6 feet higher than for simulated natural conditions. A comparison of maximum water levels for Watana and Devil Canyon operating in a cold winter with an average winter indicates that for the cold winter the water levels are generally the same or slightly higher (by 1-2 feet) downstream of river mile 117. Upstream of river mile 117 the water levels are generally 5 feet higher during the cold winter.

For Watana and Devil Canyon operating for a cold winter such as 1971-1972, the upstream berms of both Slough 8A and Slough 9 would be overtopped.

4.6 Watana Filling

River ice conditions have been simulated for the first and second winters of Watana filling for average and cold winter air temperatures, respectively. During the first winter of Watana filling the reservoir outflow would be similar to natural conditions in quantity but the temperature at the reservoir outlet would be near 4°C as the water would be drawn from the

bottom of the reservoir. During the second winter of filling the reservoir water level would exceed the elevation of the mid-level outlet works and relatively cold reservoir surface water would be discharged through the mid-level outlet works. The quantity of flow during the second winter would again be similar to natural conditions as indicated in the License Application (p. E.2.78). River ice conditions during the third winter of filling would be similar to those during normal Watana operation since the powerhouse would be operational.

In order to find the maximum upstream and downstream bounds of the ice cover during filling, the following simulations were made:

1. The first winter of filling when reservoir discharges would be near 4°C was simulated with the 1982-1983 average winter, and

2. The second winter of filling when reservoir discharges would be relatively cold was simulated with the 1981-1982 cold winter.

The simulations for both the first and second winters of filling indicate that the maximum water levels attained would be generally equal to or lower than those obtained for natural conditions for the average winter of 1982-1983. The ice front would reach the vicinity of Gold Creek, near river mile 135 in mid-February and early February for the first and second winters of filling, respectively. This would be much later than natural conditions. The simulations indicate that the ice front would reach river mile 162. However, field observations indicate that the continuous ice cover may only reach Gold Creek. Between Gold Creek and Devil Canyon the ice cover will form in a manner similar to natural conditions with border ice growth being the predominant mechanism. Insufficient data are available to allow accurate estimation of ice cover progression upstream of Gold Creek for filling simulations. There is inadequate channel geometry information available for Devil Canyon (upstream of river mile 152). However, it is believed the ice cover will form in this reach much the same way as under natural conditions.

TABLE 3

MAXIMUM ICE-AFFECTED WATER LEVELS FOR WINTER OF 1982-1983

Location	River Mile	Threshold Elev.[1]/	Simulated Natural Conditions	Energy Demand for Watana only		Energy Demand for Devil Canyon	
				1996	2001	2002	2020
Whiskers slough head	101.5	367	366	370	370	369	370
Side channel at head of Gash Creek	112.0		456	459	461	457	457
Mouth of Slough 6A	112.34		459	462	463	460	459
Slough 8 head	114.1	476	474	476	478	475	475
Side channel MS II	115.5	482	484	488	489	487	488
Side channel MS II	115.9	487	486	491	492	490	491
River Mile 120	120.0		520	525	521	520	523
Moose slough head	123.5		548	550	550	545	550
Slough 8A head (west)	126.1	573	570	572	568	568	573
Slough 8A head (east)	127.1	582	582	582	582	581	583
Slough 9 head	129.3	604	605	603	603	602	603
Side channel upstream of slough 9	130.6		621	617	617	616	617
Side channel upstream of 4th July Creek	131.8		630	628	628	627	628
Slough 9A head	133.7	651	651	650	650	650	650
Side channel upstream of slough 10	134.3	657	658	656	656	655	656
Side channel downstream of Slough 11	135.3		672	668	668	667	668
Slough 11 head	136.5	687	684	683	683	682	684
Slough 17 head	139.3		-	715	715	714	715
Slough 20 head	140.5	730	-	729	729	728	729
Slough 21 downstream end	141.8	747	-	746	746	746	747
Slough 21 head	142.2	755	-	753	753	752	753
Slough 22 head	144.8	788	-	786	786	785	787
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	127	124	122	126

Footnote for Table 3

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 4

MAXIMUM ICE-AFFECTED WATER LEVELS FOR WINTER OF 1976-1977

Location	River Mile	Threshold Elev.[1]	Simulated Natural Conditions	Energy Demand for Watana only 1996	Energy Demand for Watana only 2001[2]	Energy Demand for Devil Canyon 2002	Energy Demand for Devil Canyon 2020[3]
Whiskers Slough head	101.5	367	366	370		368	
Side channel at head of Gash Creek	112.0		454	457		455	
Mouth of Slough 6A	112.34		457	460		458	
Slough 8 head	114.1	476	472	475		474	
Side channel MS II	115.5	482	480	487		485	
Side channel MS II	115.9	487	483	489		488	
River Mile 120	120.0		520	525		521	
Moose slough head	123.5		546	554		550	
Slough 8A head (west)	126.1	573	569	575		571	
Slough 8A head (east)	127.1	582	581	585		582	
Slough 9 head	129.3	604	603	607		602	
Side channel upstream of slough 9	130.6		616	622		616	
Side channel upstream of 4th July Creek	131.8		626	633		627	
Slough 9A head	133.7	651	649	655		650	
Side channel upstream of slough 10	134.3	657	655	661		655	
Side channel downstream of Slough 11	135.3		668	672		667	
Slough 11 head	136.5	687	681	686		682	
Slough 17 head	139.3		-	715		714	
Slough 20 head	140.5	730	-	730		728	
Slough 21 downstream end	141.8	747	-	746		746	
Slough 21 head	142.2	755	-	753		752	
Slough 22 head	144.8	788	-	787		785	
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	137		127	

Footnotes for Table 4

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

2/ A simulation has not been made for this condition. However a comparison of ice simulations for the winter of 1982-1983 for 1996 and 2001 energy demands indicates that, for 2001 energy demands for 1976-1977 winter conditions, maximum water levels would be equal to or slightly higher than for 1996 demands, where an ice cover occurs, but that the maximum extent of the ice cover would be downstream of that for 1996 demands.

3/ River ice simulation has not been made for this condition. However, a comparison of ice simulations for 1971-1972 for 2002 and 2020 energy demands indicates that, for 2020 energy demands, the ice front would not advance as far as for 2002 energy demands but water levels in the ice covered area would be approximately 2 feet higher than for 2002 demands.

TABLE 5

MAXIMUM ICE-AFFECTED WATER LEVELS FOR WINTER OF 1981-1982

Location	River Mile	Threshold Elev.[1]	Simulated Natural Conditions	Energy Demand for Watana only 1996	Watana only 2001[2]	Devil Canyon 2002	Devil Canyon 2020[3]
Whiskers slough head	101.5	367	369	371		369	
Side channel at head of Gash Creek	112.0		455	460		456	
Mouth of Slough 6A	112.34		457	462		458	
Slough 8 head	114.1	476	473	477		475	
Side channel MS II	115.5	482	484	488		485	
Side channel MS II	115.9	487	485	491		488	
River Mile 120	120.0		523	527		520	
Moose slough head	123.5		547	555		548	
Slough 8A head (west)	126.1	573	571	574		568	
Slough 8A head (east)	127.1	582	583	585		581	
Slough 9 head	129.3	604	605	607		601	
Side channel upstream of slough 9	130.6		622	620		616	
Side channel upstream of 4th July Creek	131.8		634	631		627	
Slough 9A head	133.7	651	653	653		650	
Side channel upstream of slough 10	134.3	657	659	659		655	
Side channel downstream of Slough 11	135.3		670	670		667	
Slough 11 head	136.5	687	683	687		682	
Slough 17 head	139.3		-	715		714	
Slough 20 head	140.5	730	-	729		728	
Slough 21 downstream end	141.8	747	-	746		745	
Slough 21 head	142.2	755	-	753		752	
Slough 22 head	144.8	788	-	787		785	
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	137		126	

Footnotes for Table 5

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

2/ A simulation has not been made for this condition. However a comparison of ice simulations for the winter of 1982-1983 for 1996 and 2001 energy demands indicates that, for 2001 energy demands for 1981-1982 winter conditions, maximum water levels would be equal to or slightly higher than for 1996 demands, where an ice cover occurs, but that the maximum extent of the ice cover would be downstream of that for 1996 demands.

3/ River ice simulation has not been made for this condition. However, a comparison of ice simulations for 1971-1972 for 2002 and 2020 energy demands indicates that, for 2020 energy demands, the ice front would not advance as far as for 2002 energy demands but water levels in the ice covered area would be approximately 2 feet higher than for 2002 demands.

TABLE 6

MAXIMUM ICE-AFFECTED WATER LEVELS FOR WINTER OF 1971-1972

Location	River Mile	Threshold Elev.1/	Simulated Natural Conditions	Energy Demand for Watana only		Energy Demand for Devil Canyon	
				1996	2001	2002	2020
Whiskers slough head	101.5	367	369	372	372	371	372
Side channel at head of Gash Creek	112.0		456	459	459	458	459
Mouth of Slough 6A	112.34		459	462	461	460	461
Slough 8 head	114.1	476	474	478	476	475	476
Side channel MS II	115.5	482	485	490	489	487	490
Side channel MS II	115.9	487	486	492	491	489	492
River Mile 120	120.0		522	526	525	522	525
Moose slough head	123.5		552	556	555	553	555
Slough 8A head (west)	126.1	573	572	576	575	574	575
Slough 8A head (east)	127.1	582	584	587	586	585	585
Slough 9 head	129.3	604	605	609	610	606	608
Side channel upstream of slough 9	130.6		621	624	625	620	621
Side channel upstream of 4th July Creek	131.8		632	635	636	633	631
Slough 9A head	133.7	651	655	657	659	652	651
Side channel upstream of slough 10	134.3	657	663	663	665	659	657
Side channel downstream of Slough 11	135.3		673	675	676	670	668
Slough 11 head	136.5	687	685	688	690	685	684
Slough 17 head	139.3		-	717	727	714	715
Slough 20 head	140.5	730	-	732	741	728	729
Slough 21 downstream end	141.8	747	-	746	751	746	747
Slough 21 head	142.2	755	-	753	755	752	753
Slough 22 head	144.8	788	-	787	787	785	787
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	141	142	137	133

Footnote for Table 6

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 7

MAXIMUM ICE-AFFECTED WATER LEVELS FOR FILLING OF WATANA RESERVOIR

Location	River Mile	Threshold Elev.1/	Simulated Natural Conditions 1982-1983	First Winter of Filling 1982-1983	Simulated Natural Conditions 1981-1982	Second Winter of Filling 1981-1982
Whiskers slough head	101.5	367	366	367	369	367
Side channel at head of Gash Creek	112.0		456	455	455	455
Mouth of Slough 6A	112.34		459	457	457	457
Slough 8 head	114.1	476	474	473	473	473
Side channel MS II	115.5	482	484	481	484	483
Side channel MS II	115.9	487	486	485	485	486
River Mile 120	120.0		520	520	523	521
Moose slough head	123.5		548	546	547	548
Slough 8A head (west)	126.1	573	570	568	571	570
Slough 8A head (east)	127.1	582	582	580	583	582
Slough 9 head	129.3	604	605	602	605	603
Side channel upstream of slough 9	130.6		621	616	622	618
Side channel upstream of 4th July Creek	131.8		630	625	634	628
Slough 9A head	133.7	651	651	650	653	650
Side channel upstream of slough 10	134.3	657	658	658	659	655
Side channel downstream of Slough 11	135.3		672	670	670	668
Slough 11 head	136.5	687	684	682	683	682
Slough 17 head	139.3		-	712	-	713
Slough 20 head	140.5	730	-	727	-	729
Slough 21 downstream end	141.8	747	-	745	-	745
Slough 21 head	142.2	755	-	751	-	750
Slough 22 head	144.8	788	-	782	-	782
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	>137	>137	>137

Footnote for Table 7

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 8

MAXIMUM ICE-AFFECTED WATER LEVELS FOR NATURAL CONDITIONS

Location	River Mile	Threshold Elev.1/	Winter Weather Data Used			
			1971-1972	1976-1977	1981-1982	1982-1983
Whiskers slough head	101.5	367	369	366	369	366
Side channel at head of Gash Creek	112.0		456	454	455	456
Mouth of Slough 6A	112.34		459	457	457	459
Slough 8 head	114.1	476	474	472	473	474
Side channel MS II	115.5	482	485	480	484	484
Side channel MS II	115.9	487	486	483	485	486
River Mile 120	120.0		522	520	523	520
Moose slough head	123.5		552	546	547	548
Slough 8A head (west)	126.1	573	572	569	571	570
Slough 8A head (east)	127.1	582	584	581	583	582
Slough 9 head	129.3	604	605	603	605	605
Side channel upstream of slough 9	130.6		621	616	622	621
Side channel upstream of 4th July Creek	131.8		632	626	634	630
Slough 9A head	133.7	651	655	649	653	651
Side channel upstream of slough 10	134.3	657	663	655	659	658
Side channel downstream of Slough 11	135.3		673	668	670	672
Slough 11 head	136.5	687	685	681	683	684
Slough 17 head	139.3		-	-	-	-
Slough 20 head	140.5	730	-	-	-	-
Slough 21 downstream end	141.8	747	-	-	-	-
Slough 21 head	142.2	755	-	-	-	-
Slough 22 head	144.8	788	-	-	-	-
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	>137	>137	>137

Footnote for Table 8

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 9

MAXIMUM ICE-AFFECTED WATER LEVELS FOR FILLING OF WATANA RESERVOIR

Location	River Mile	Threshold Elev.1/	Winter Weather Data Used	
			First Winter 1982-1983	Second Winter 1981-1982
Whiskers slough head	101.5	367	367	367
Side channel at head of Gash Creek	112.0		455	455
Mouth of Slough 6A	112.34		457	457
Slough 8 head	114.1	476	473	473
Side channel MS II	115.5	482	481	483
Side channel MS II	115.9	487	485	486
River Mile 120	120.0		520	521
Moose slough head	123.5		546	548
Slough 8A head (west)	126.1	573	568	570
Slough 8A head (east)	127.1	582	580	582
Slough 9 head	129.3	604	602	603
Side channel upstream of slough 9	130.6		616	618
Side channel upstream of 4th July Creek	131.8		625	628
Slough 9A head	133.7	651	650	650
Side channel upstream of slough 10	134.3	657	658	655
Side channel downstream of Slough 11	135.3		670	668
Slough 11 head	136.5	687	682	682
Slough 17 head	139.3		712	713
Slough 20 head	140.5	730	727	729
Slough 21 downstream end	141.8	747	745	745
Slough 21 head	142.2	755	751	750
Slough 22 head	144.8	788	782	782
Maximum upstream Extent of Ice Cover in Winter (river mile)			>137	>137

Footnote for Table 9

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 10

MAXIMUM ICE-AFFECTED WATER LEVELS FOR 1996 ENERGY DEMANDS-WATANA OPERATING

Location	River Mile	Threshold Elev.1/	Winter Weather Data Used			
			1971-1972	1976-1977	1981-1982	1982-1983
Whiskers slough head	101.5	367	372	370	371	370
Side channel at head of Gash Creek	112.0		459	457	460	459
Mouth of Slough 6A	112.34		462	460	462	462
Slough 8 head	114.1	476	478	475	477	476
Side channel MS II	115.5	482	490	487	488	488
Side channel MS II	115.9	487	492	489	491	491
River Mile 120	120.0		526	525	527	525
Moose slough head	123.5		556	554	555	550
Slough 8A head (west)	126.1	573	576	575	574	572
Slough 8A head (east)	127.1	582	587	585	585	582
Slough 9 head	129.3	604	609	607	607	603
Side channel upstream of slough 9	130.6		624	622	620	617
Side channel upstream of 4th July Creek	131.8		635	633	631	628
Slough 9A head	133.7	651	657	655	653	650
Side channel upstream of slough 10	134.3	657	663	661	659	656
Side channel downstream of Slough 11	135.3		675	672	670	668
Slough 11 head	136.5	687	688	686	687	683
Slough 17 head	139.3		717	715	715	715
Slough 20 head	140.5	730	732	730	729	729
Slough 21 downstream end	141.8	747	746	746	746	746
Slough 21 head	142.2	755	753	753	753	753
Slough 22 head	144.8	788	787	787	787	786
Maximum upstream Extent of Ice Cover in Winter (river mile)			141	137	137	127

Footnote for Table 10

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 11

MAXIMUM ICE-AFFECTED WATER LEVELS FOR 2001 ENERGY DEMANDS-WATANA OPERATING

Location	River Mile	Threshold Elev.[1]	Winter Weather Data Used			
			1971-72	1976-77[2]	1981-82[2]	1982-83
Whiskers slough head	101.5	367	372			370
Side channel at head of Gash Creek	112.0		459			461
Mouth of Slough 6A	112.34		461			463
Slough 8 head	114.1	476	476			478
Side channel MS II	115.5	482	489			489
Side channel MS II	115.9	487	491			492
River Mile 120	120.0		525			521
Moose slough head	123.5		555			550
Slough 8A head (west)	126.1	573	575			568
Slough 8A head (east)	127.1	582	586			582
Slough 9 head	129.3	604	610			603
Side channel upstream of slough 9	130.6		625			617
Side channel upstream of 4th July Creek	131.8		636			628
Slough 9A head	133.7	651	659			650
Side channel upstream of slough 10	134.3	657	665			656
Side channel downstream of Slough 11	135.3		676			668
Slough 11 head	136.5	687	690			683
Slough 17 head	139.3		727			715
Slough 20 head	140.5	730	741			729
Slough 21 downstream end	141.8	747	751			746
Slough 21 head	142.2	755	755			753
Slough 22 head	144.8	788	787			786
Maximum upstream Extent of Ice Cover in Winter (river mile)			142			124

Footnotes for Table 11

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

2/ A simulation has not been made for this condition. However a comparison of ice simulations for the winter of 1982-1983 for 1996 and 2001 energy demands indicates that, for 2001 energy demands for 1976-1977 and 1981-1982 winter conditions, maximum water levels would be equal to or slightly higher than for 1996 demands, where an ice cover occurs, but that the maximum extent of the ice cover would be downstream of that for 1996 demands.

TABLE 12

MAXIMUM ICE-AFFECTED WATER LEVELS FOR 2002 ENERGY DEMANDS

WATANA AND DEVIL CANYON OPERATING

LOCATION	River Mile	Threshold Elev.[1/]	Winter Weather Data Used			
			1971-1972	1976-1977	1981-1982	1982-1983
Whiskers slough head	101.5	367	371	368	369	369
Side channel at head of Gash Creek	112.0		458	455	456	457
Mouth of Slough 6A	112.34		460	458	458	460
Slough 8 head	114.1	476	475	474	475	475
Side channel MS II	115.5	482	487	485	485	487
Side channel MS II	115.9	487	489	488	488	490
River Mile 120	120.0		522	521	520	520
Moose slough head	123.5		553	550	548	545
Slough 8A head (west)	126.1	573	574	571	568	568
Slough 8A head (east)	127.1	582	585	582	581	581
Slough 9 head	129.3	604	606	602	601	602
Side channel upstream of slough 9	130.6		620	616	616	616
Side channel upstream of 4th July Creek	131.8		633	627	627	627
Slough 9A head	133.7	651	652	650	650	650
Side channel upstream of slough 10	134.3	657	659	655	655	655
Side channel downstream of Slough 11	135.3		670	667	667	667
Slough 11 head	136.5	687	685	682	682	682
Slough 17 head	139.3		714	714	714	714
Slough 20 head	140.5	730	728	728	728	728
Slough 21 downstream end	141.8	747	746	746	745	746
Slough 21 head	142.2	755	752	752	752	752
Slough 22 head	144.8	788	785	785	785	785
Maximum upstream Extent of Ice Cover in Winter (river mile)			137	127	126	122

Footnote for Table 12

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

TABLE 13

MAXIMUM ICE-AFFECTED WATER LEVELS FOR 2020 ENERGY DEMANDS

WATANA AND DEVIL CANYON OPERATING

Location	River Mile	Threshold Elev.[1]	Winter Weather Data Used			
			1971-72	1976-77[2]	1981-82[2]	1982-83
Whiskers slough head	101.5	367	372			370
Side channel at head of Gash Creek	112.0		459			457
Mouth of Slough 6A	112.34		461			459
Slough 8 head	114.1	476	476			475
Side channel MS II	115.5	482	490			488
Side channel MS II	115.9	487	492			491
River Mile 120	120.0		525			523
Moose slough head	123.5		555			550
Slough 8A head (west)	126.1	573	575			573
Slough 8A head (east)	127.1	582	585			583
Slough 9 head	129.3	604	608			603
Side channel upstream of slough 9	130.6		621			617
Side channel upstream of 4th July Creek	131.8		631			628
Slough 9A head	133.7	651	651			650
Side channel upstream of slough 10	134.3	657	657			656
Side channel downstream of Slough 11	135.3		668			668
Slough 11 head	136.5	687	684			684
Slough 17 head	139.3		715			715
Slough 20 head	140.5	730	729			729
Slough 21 downstream end	141.8	747	747			747
Slough 21 head	142.2	755	753			753
Slough 22 head	144.8	788	787			787
Maximum upstream Extent of Ice Cover in Winter (river mile)			133			126

Footnotes for Table 13

1/ Rounded to nearest foot (see Table 14 for source of Threshold elevation). The threshold elevation is the water level at the given location which corresponds to the mainstem flow required to overtop the indicated slough or side channel berm.

2/ River ice simulation has not been made for this condition. However, a comparison of ice simulations for 1971-1972 for 2002 and 2020 energy demands indicates that, for 2020 energy demands, the ice front would not advance as far as for 2002 energy demands but water levels in the ice covered area would be approximately 2 feet higher than for 2002 demands.

5.0 REFERENCES

The following references were used in addition to those included in the Alaska Power Authority's official Document List.

1. Harza-Ebasco Susitna Joint Venture, 1984a, "Instream Ice, Calibration of Computer Model", Susitna Hydroelectric Project Report.

2. R&M Consultants, Inc. 1981, "Ice Observations 1980-81" Susitna Hydroelectric Project Report.

3. R&M Consultants, Inc., 1982a "Winter 1981-82 Ice Observations Report", Susitna Hydroelectric Project Report.

4. R&M Consultants, Inc., 1984a, "1982-1983 Susitna River Ice Study", Susitna Hydroelectric Project Report.

5. R&M Consultants, Inc. 1984b, "1983-1984 Susitna River Ice Study", (draft) Susitna Hydroelectric Project Report.

6. R&M Consultants, Inc., 1982b, "Slough Hydrology Interim Report" ~~(draft)~~ Susitna Hydroelectric Project Report.

7. Christopher Estes, Tim Quane, Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies, 1984, personal communication of provisional data.

8. Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies, 1983, "Phase II Basic Data Report, Vol. 4, Aquatic Habitat and Instream Flow Studies, 1982, Appendix D thru J." Susitna Hydroelectric Project Report.

9. Harza-Ebasco Susitna Joint Venture, 1984b, "Middle and Lower River, Water Surface Profiles and Discharge Rating Curves", Susitna Hydroelectric Project Report.

6.0 EXHIBITS

The exhibits in this Appendix have threshold elevations labeled. These are the elevations which the mainstem water level would have to reach at the indicated locations before overtopping of the upstream berm of the given slough would occur. An attempt was made to locate slough berm overflow areas on aerial photographs and on water surface profile plots and rating curves (Harza-Ebasco 1984b). However, due to the steep gradient of the river (one foot/0.1 mile), the complexity of the river channel, and the length of some berms, it was not possible to do this with sufficient accuracy so that implied overtopping flows as read from the profiles and rating curves matched values observed in the field. Therefore, the procedure adopted was to set the threshold elevation at a site near the berm equal to the mainstem water level corresponding to the observed overtopping flow at that site. Time histories shown in the Appendix were plotted for locations within 0.2 mile of the slough berms.

Table 14 lists the locations for which berm overtopping flows are available and for which threshold elevations were computed. Overtopping discharges were obtained from observations by R&M Consultants, Inc. (R&M 1982b) and the Alaska Department of Fish and Game (ADF&G 1983 and 1984). Overtopping discharges for Sloughs 8A, 9 and 21 are as indicated in the License Application (Appendix E.2.A).

TABLE 14

THRESHOLD ELEVATIONS AT SIGNIFICANT LOCATIONS

Location	River Mile[2]	Mainstem Overtopping Discharge[2]	Threshold Water Level[3]	Source
		(cfs)	(ft. msl)	
Whiskers Slough head	101.5	18,000	367	ADF&G 1983
Slough 8 head	114.1	25,000	476	ADF&G 1983
Side channel Mainstem II - NW head	115.5	12,000	482	ADF&G 1984
Side channel Mainstem II - NE head	115.9	23,000	487	ADF&G 1984
Slough 8A head (NW)	126.1	26,000	573	License Application
Slough 8A head (NE)	127.1	- [4]	582	R&M 1982b
Slough 9 head	129.3	20,500	604	License Application
Slough 9A head	133.7	19,600 (est.)	651	ADF&G 1984
Side channel upstream of Slough 10	134.3	<19,000	657	ADF&G 1984
Slough 11 head	136.5	42,000[5]	687	ADF&G 1983
Slough 20 head	140.5	20,000	730	ADF&G 1983
Slough 21 (A6)	141.8	18,000	747	ADF&G 1984
Slough 21 head	142.2	24,000 - 26,000[6]	755	License Application
Slough 22 head	144.8	21,000	788	ADF&G 1983

Footnotes for Table 14

1/ River mile indicated is within 0.2 mile of slough berm.

2/ Mainstem discharge at which indicated berm would be overtopped.

3/ Water surface elevation in mainstem at given river mile corresponding to overtopping flow, rounded to nearest foot.

4/ In the winter of 1982-1983, the ice affected water level in the vicinity of river mile 127 exceeded the elevation of the berm at the head of the side channel upstream of Slough 8A. At the same time ice was obstructing the downstream end of the side channel at river mile 126.5. This caused flow to be shunted into Slough 8A. The berm at river mile 127.1 would be overtopped at a flow of approximately 17,000 cfs (R&M 1982b). Therefore, it appears that the ice affected water level would need to exceed Elev. 582 at river mile 127.1 in order for Slough 8A to be overtopped, in the winter.

5/ The berm at the head of Slough 11 is in a side channel. The downstream end of this side channel is near river mile 136.2 It appears that when the water surface at river mile 136.2 reaches El. 684 (the level of the slough berm), backwater in the side channel will overtop the slough berm.

6/ Overtopping discharges for berms at northwest channel and northeast channel are 24,000 cfs and 26,000 cfs, respectively.

For the period November to April, the SNTEMP open-water temperature simulations provided in Appendix V should always be used in conjunction with the ice simulations in this Appendix for the same period. The SNTEMP model does not give accurate temperature simulations under an ice cover. Therefore, in areas where an ice cover is simulated to occur, the temperatures shown in this Appendix should be used. The temperatures in Appendix V are valid upstream of the ice cover. Under the ice cover, the temperatures would be as simulated by ICECAL and as shown on the plots in this Appendix. The approximate location of the ice front has been plotted on the exhibits in Appendix V to aid in the use of those plots.

The locations of the 0°C isotherm shown on the exhibits in Appendix V and Appendix VI were not plotted in the same manner. In Appendix V, locations of 0°C were plotted at mid-week of the week they were simulated for and the points were connected. For the ice simulation studies the locations of 0°C were used to represent conditions for the entire week and were plotted as weekly values. River ice simulations were made on a daily basis using weekly average flows and temperatures. This computation interval was necessary to provide accurate simulation of the mechanical processes involved in ice cover formation.

TABLE 15

RIVER ICE SIMULATIONS INCLUDED IN EXHIBITS

Exhibit	Project Status	Energy Demand Year	Meteorologic Hydrologic Data Year	Description	
				Winter Temps	Summer Flows
B	Natural Conditions		1971-1972	Cold	Wet
C	Natural Conditions		1976-1977	Average	Dry
D	Natural Conditions		1981-1982	Cold	Wet
E	Natural Conditions	--	1982-1983	Average	Average
F	Watana filling	first winter	1982-1983	Average	Average
G	Watana filling	second winter	1981-1982	Cold	Wet
H	Watana operating	1996	1971-1972	Cold	Wet
I	Watana operating	1996	1976-1977	Average	Dry
J	Watana operating	1996	1981-1982	Cold	Wet
K	Watana operating	1996	1982-1983	Average	Average
L	Watana operating	2001	1971-1972	Cold	Wet
M	Watana operating	2001	1982-1983	Average	Average
N	Watana & Devil Canyon operating	2002	1971-1972	Cold	Wet
O	Watana & Devil Canyon operating	2002	1976-1977	Average	Dry
P	Watana & Devil Canyon operating	2002	1981-1982	Cold	Wet
Q	Watana & Devil Canyon operating	2002	1982-1983	Average	Average
R	Watana & Devil Canyon operating	2020	1971-1972	Cold	Wet
S	Watana & Devil Canyon operating	2020	1982-1983	Average	Average

EXHIBIT A

Exhibit A

The Alaska Power Authority's Response to the Federal Energy Regulatory Commissions Request for Supplemental Information of April 12, 1983 - Schedule B, Exhibit E No. 2.41.

2. Water Use and Quality

Comment 41 (p. E-2-124-para. 2)

Provide documentation for ICESIM model. Provide validation of ICESIM model by comparing model predictions with ice observations on the Susitna River.

Response

Documentation for ICESIM is not available because the model is proprietary. However, as part of the on-going environmental studies, a comprehensive ice simulation model will be employed to verify results given in the application. This model will be fully available for documentation and will be verified for pre-project winter flow regimes on the Susitna, and, if sufficient information can be obtained, for other rivers with winter flow regimes similar to the post-project conditions.

The proposed work plan for the ice simulation modeling is given below:

Work Plan

The proposed work plan will be accomplished in three steps: model vertification, preliminary studies, and final studies.

Model Verification: A state-of-the-art mathematical model will be used to estimate ice production and ice cover progression and thickening. The mathematical model will first be calibrated with ice observation data on the Susitna River. In previous studies using ICESIM, it became apparent that the model could not simulate the ice regime at numerous cross sections where critical or near critical velocities occur in the river during low flow

conditions. However, since the post-project winter discharge will be significantly higher than pre-project winter flows, this verification to the available ice observation data would be useful only to demonstrate the accuracy of the model for extreme low winter releases. Therefore, other rivers with higher winter flow rates and stages will be considered if sufficient data can be obtained.

Preliminary Studies: Previous studies will be reviewed with an assessment of necessary changes to the scope of work. These studies will proceed as follows:

a. Review reservoir discharge quantity and temperature presented in the License Application for comparison with results from the most recent studies. Also compare open-river water profiles presented in the License Application with the latest available results.

b. Use available open-water surface and temperature profiles to proceed with preliminary ice-model runs. Compare results to runs common to both License Application level studies and current studies. The ice model will include an open-water temperature algorithm which will be used to determine both the temporal and spatial distribution of ice production. When the river temperature profiles from the instream temperature modeling using the SNTEMP model are available (see response to Comment 40), the starting location and timing of ice production may be adjusted.

c. Review the adequacy of License Application ice simulation runs especially in view of the difficulty in calibrating the model.

d. Review the adequacy of limiting hydraulic and ice studies to the reach upstream of Talkeetna.

e. Review the adequacy of assumptions made with regard to tributaries of the Susitna River between Watana dam site and Talkeetna.

Final Studies: Following verification of the model and preliminary runs, final runs will commence. Final runs will require temperature output data at Watana and Devil Canyon from the reservoir operation and reservoir temperature models and water profile data from the river hydraulic model. Results of instream temperature modeling using SNTEMP model will be considered and adjustment of the location of ice production may be required.

Typical production runs would include the following:

a. Open-water surface and temperature profiles downstream from the dam(s), for various power discharge hydrographs and for average and extreme winter weather conditions. These runs will estimate the initial location and timing of ice production in the river for the study conditions described.

b. Ice development runs for the time and location of ice production downstream from the dam(s) during the winter, including ice thickening, areal extent, "staging," and ice-cover break-up.

The expected schedule for completion of the new studies is as follows:

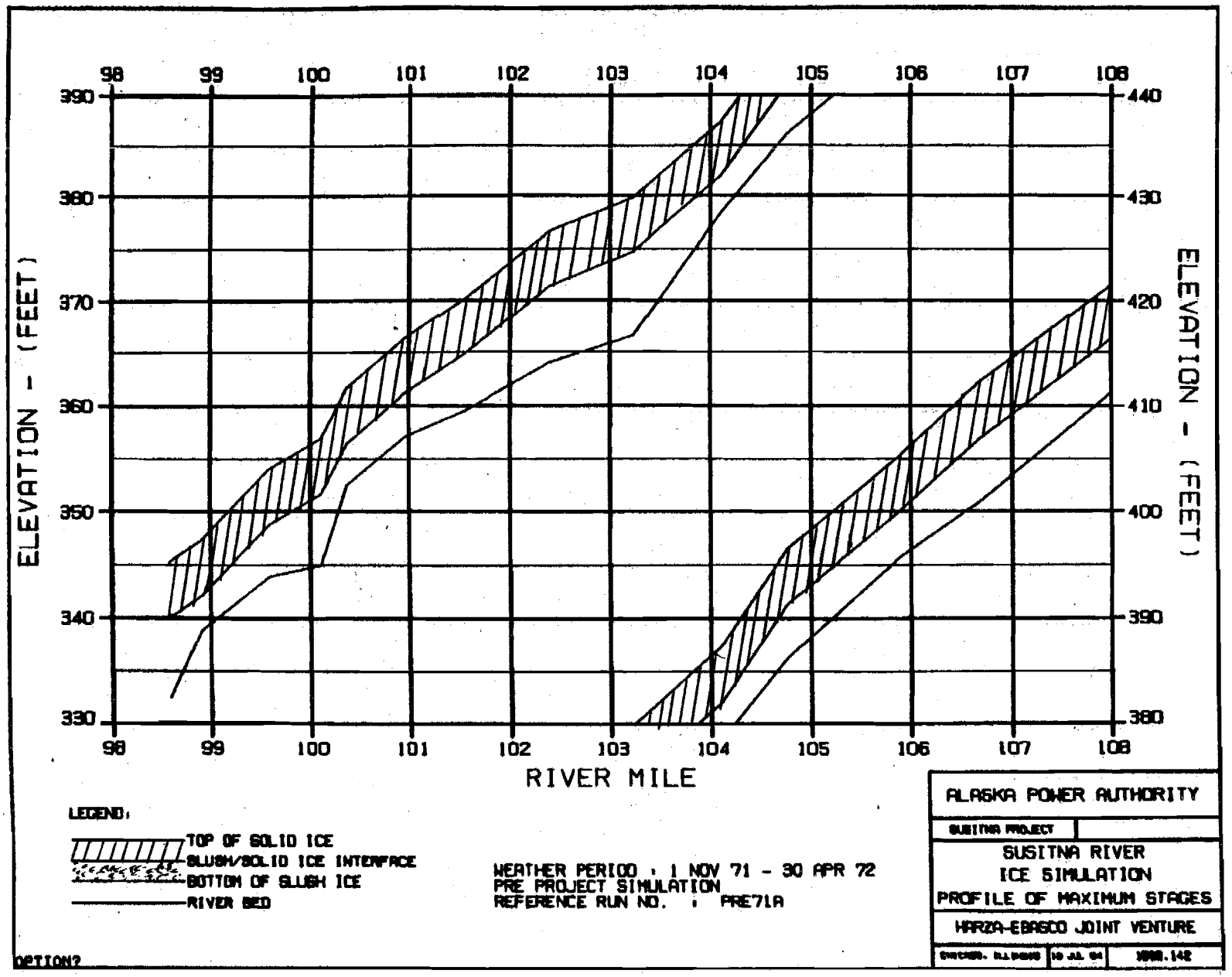
Model Verification	-	Dec. 1983
Preliminary Runs	-	Mar. 1984
Final Runs	-	June 1984

All documentation, model verification, and study results will be supplied as they become available.

Natural Conditions

EXHIBIT B

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 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
30 JUL 84
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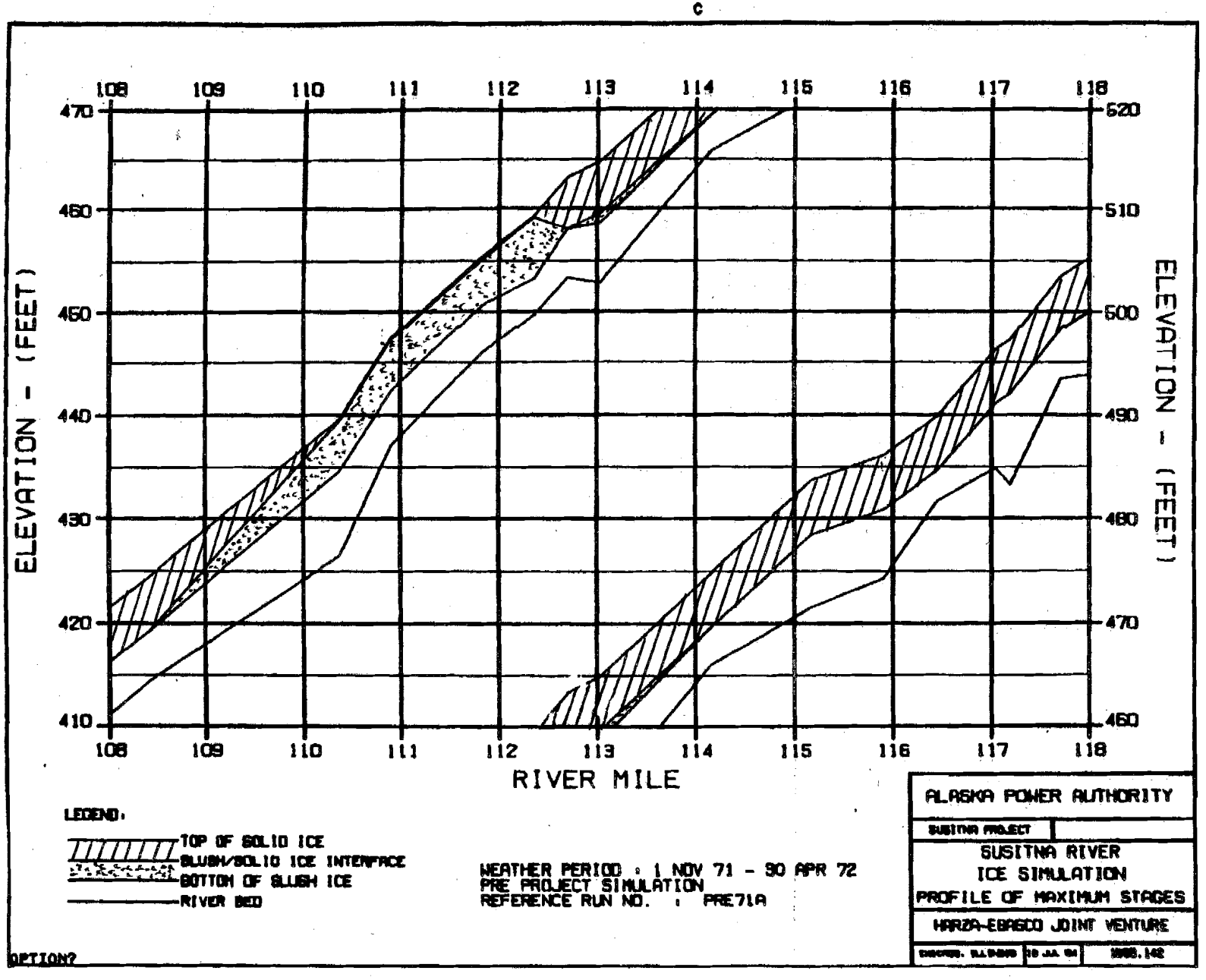
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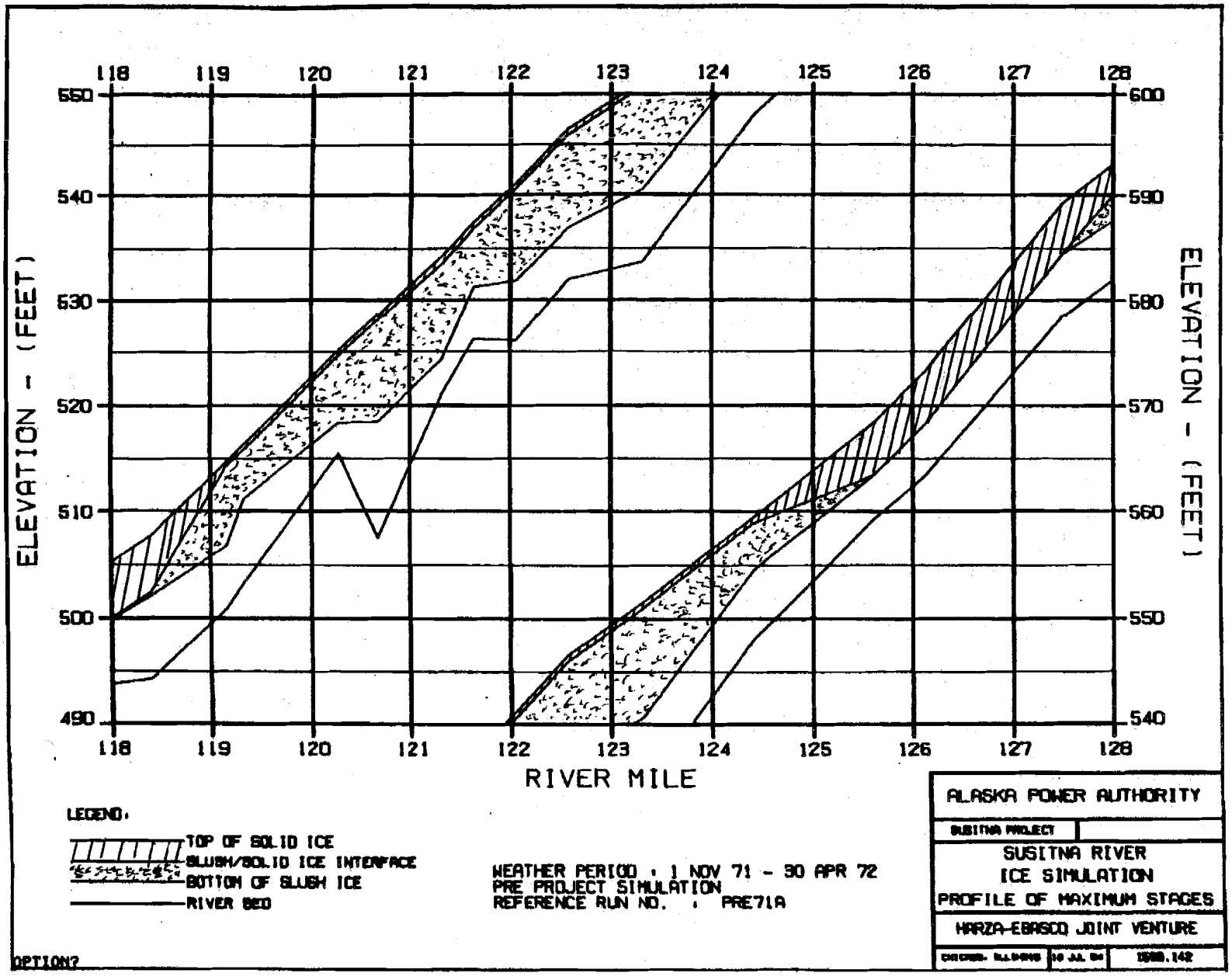
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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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 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A
ALASKA POWER AUTHORITY
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SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
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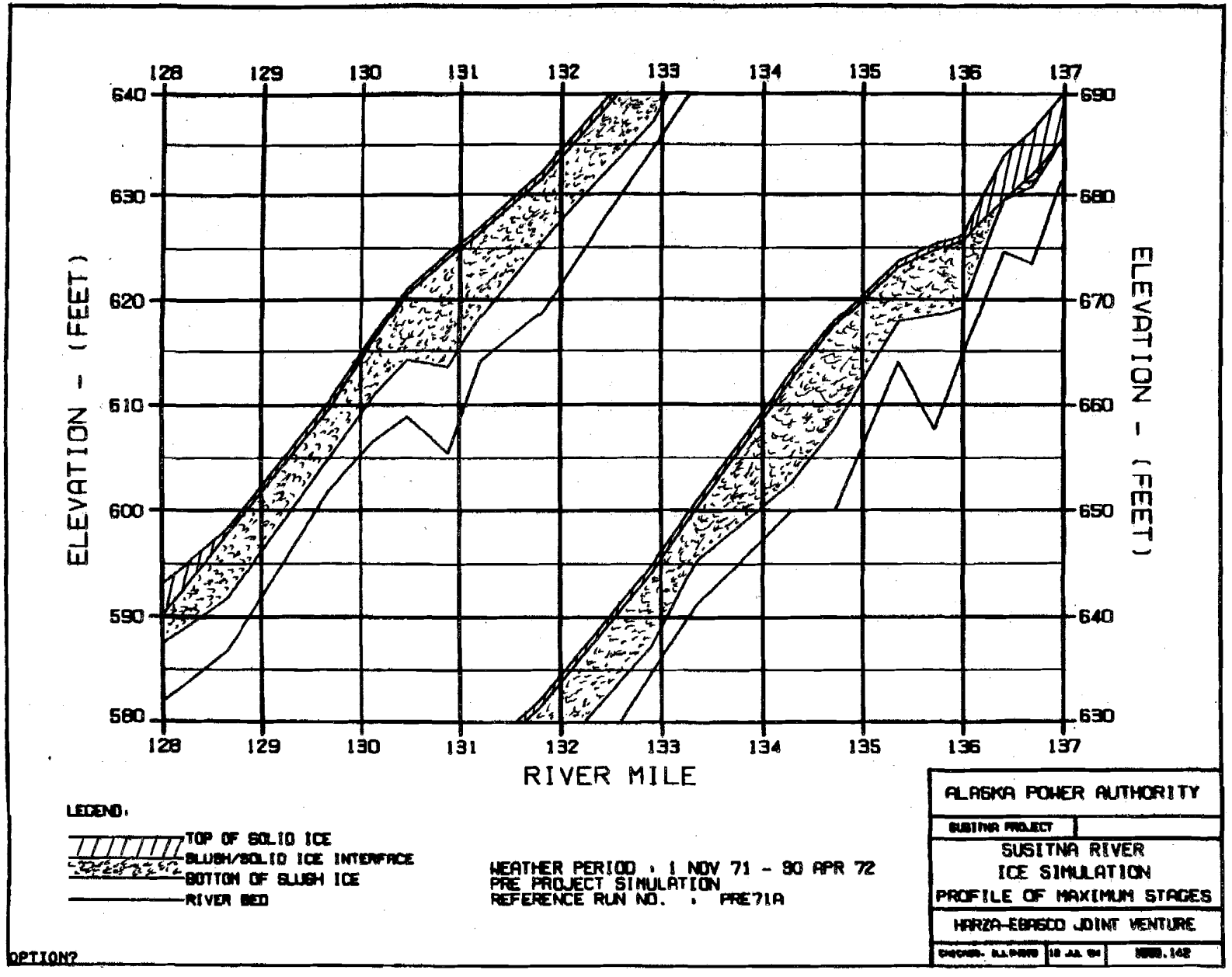
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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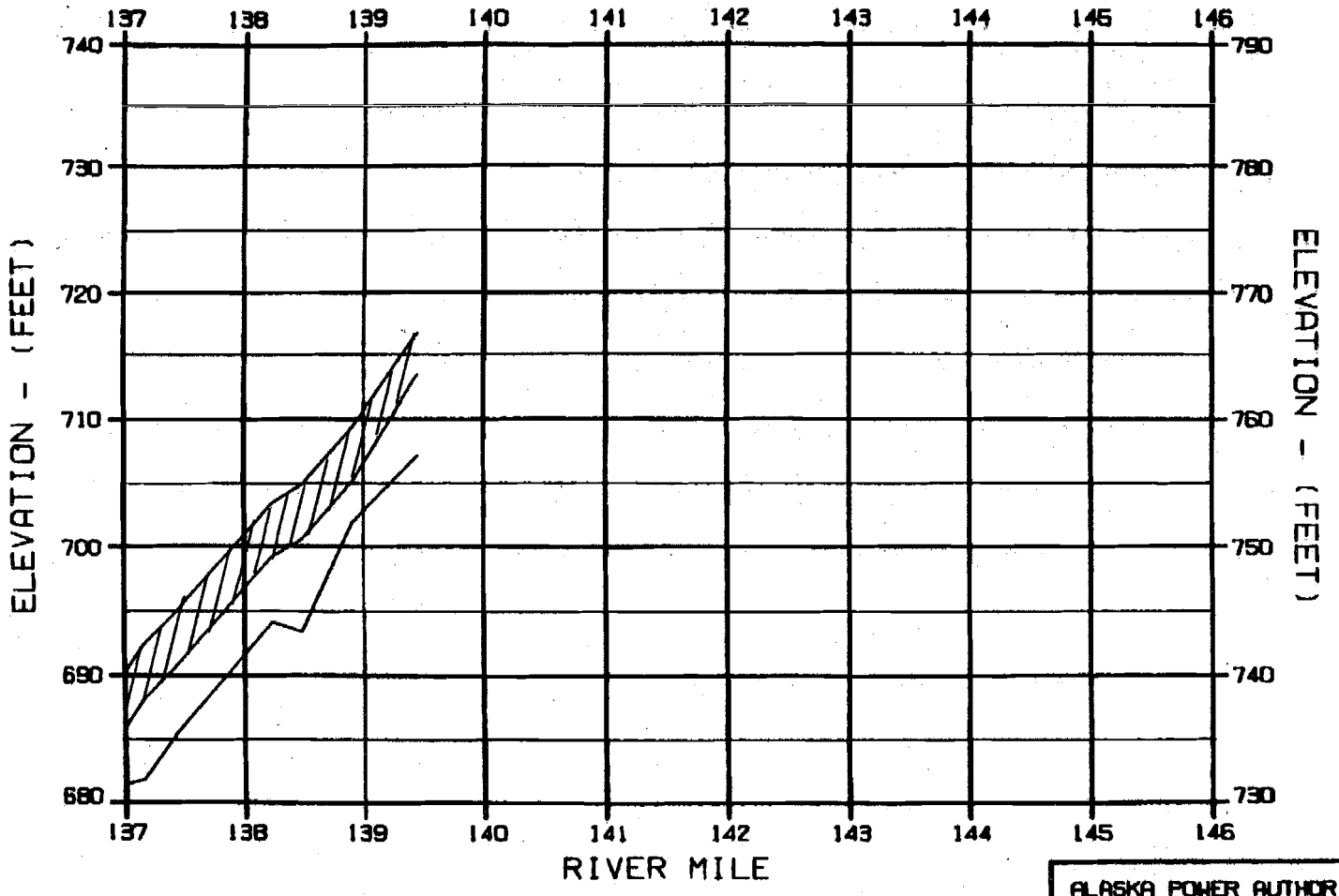


LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

OPTION2

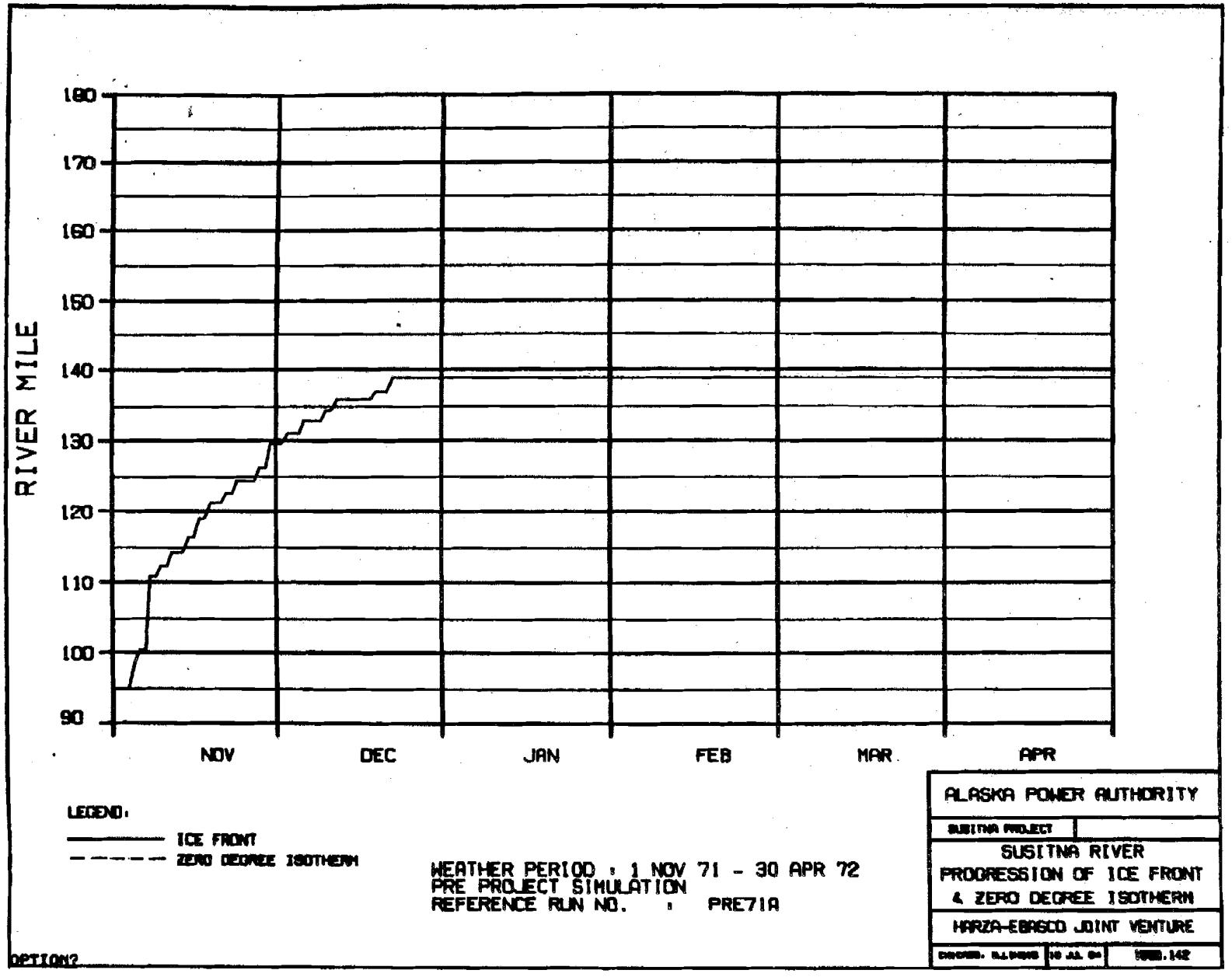
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1988.142


RIVER MILE
180
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150
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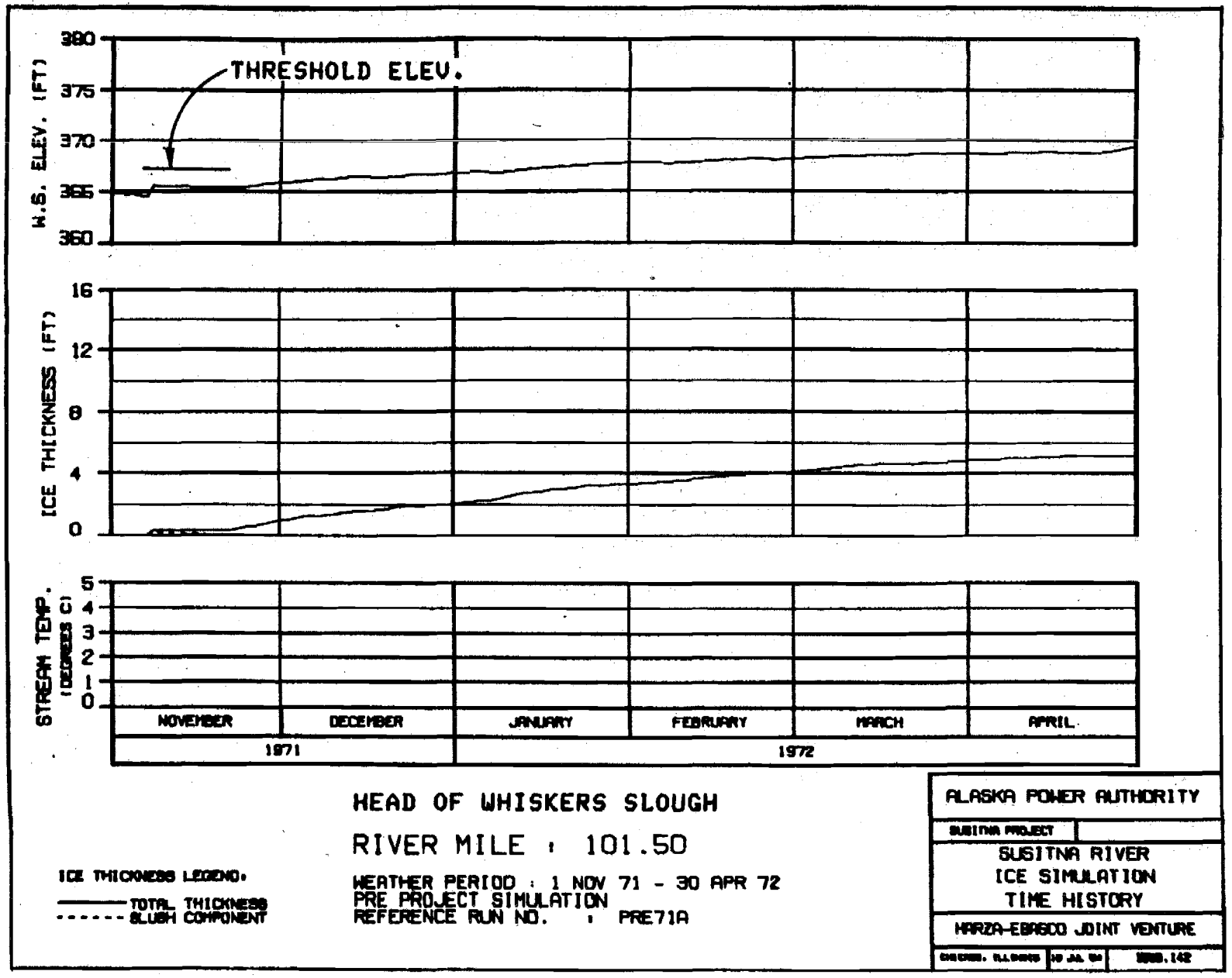
110
100
90
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION2



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:

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

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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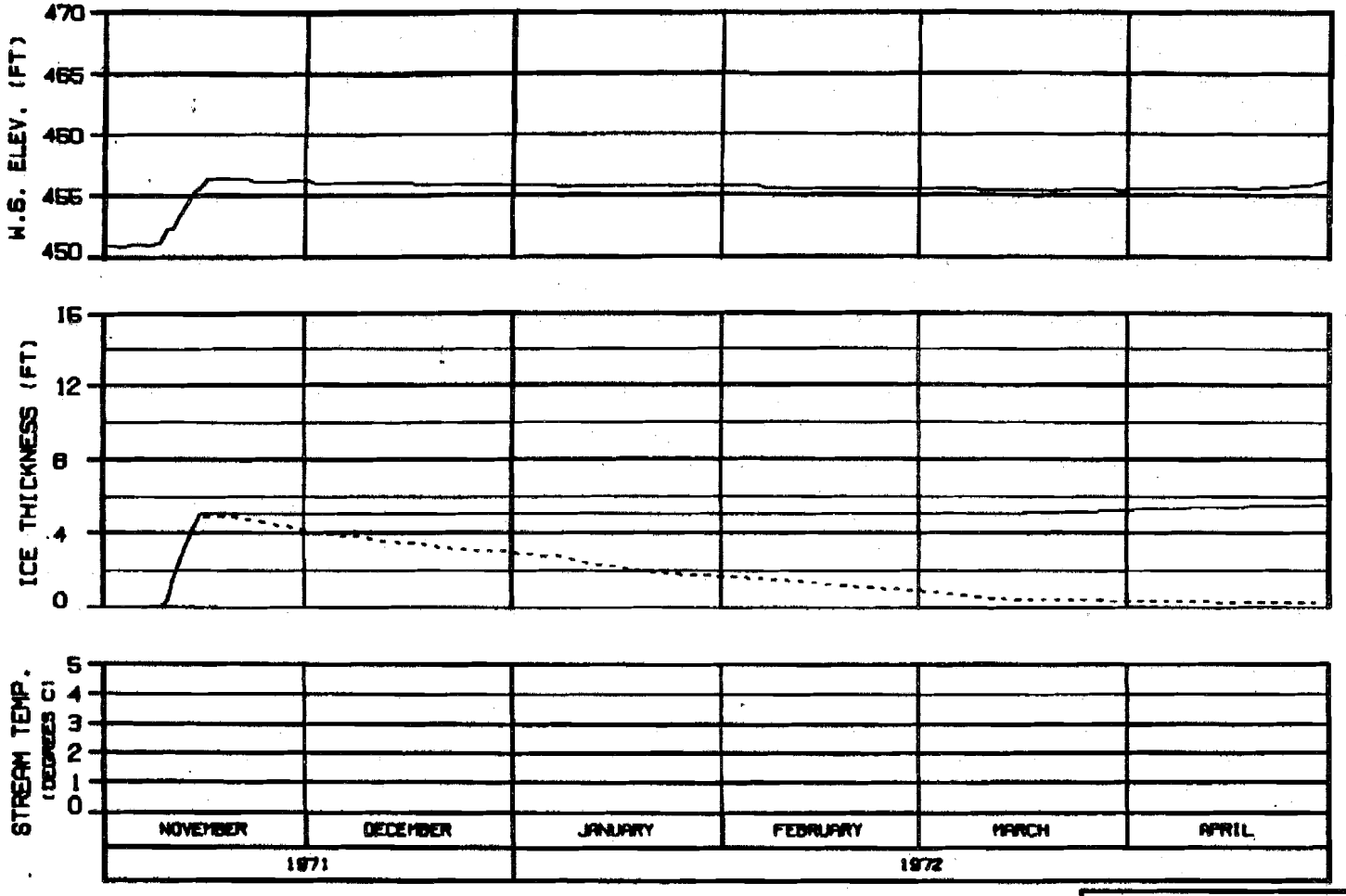


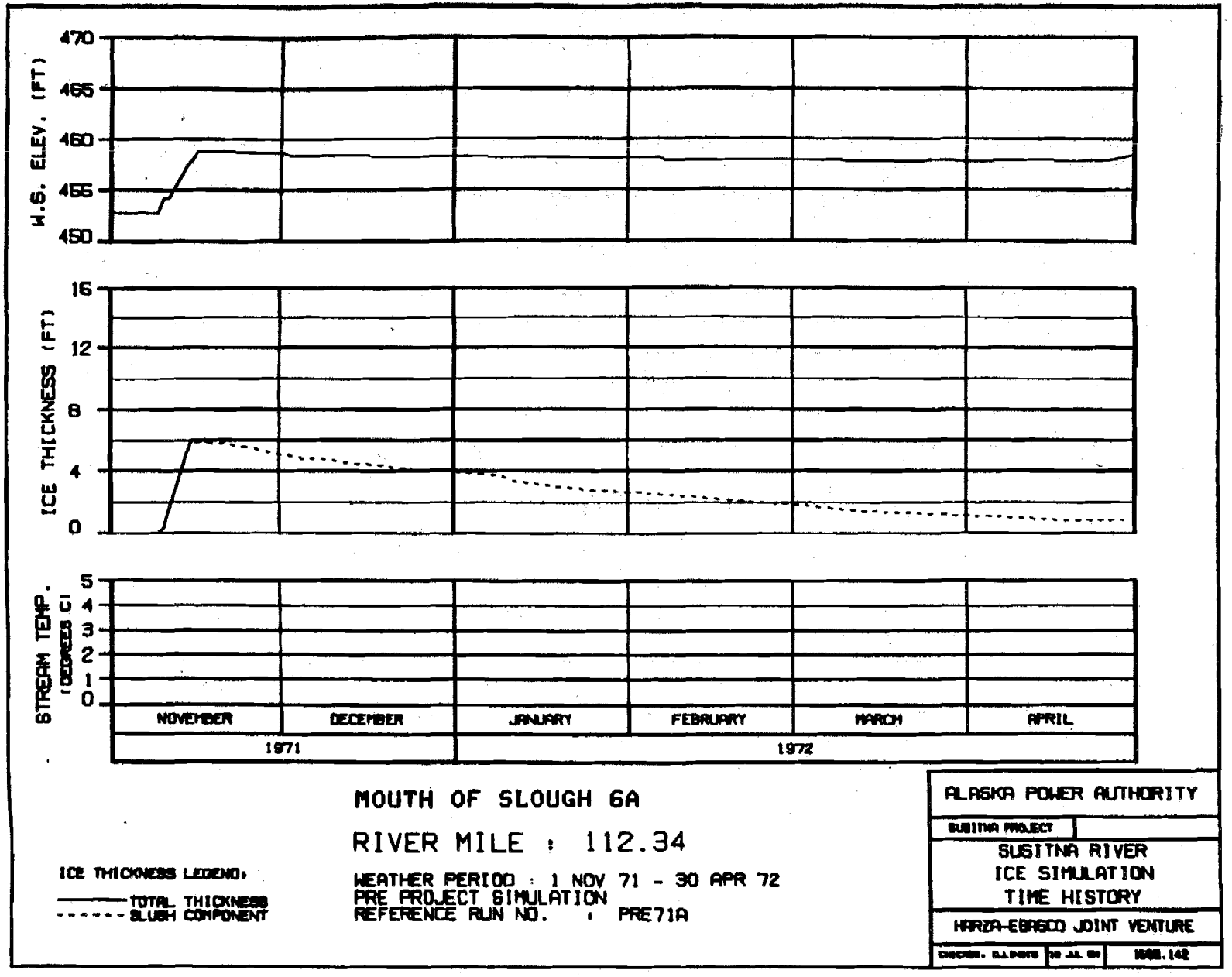
SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

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



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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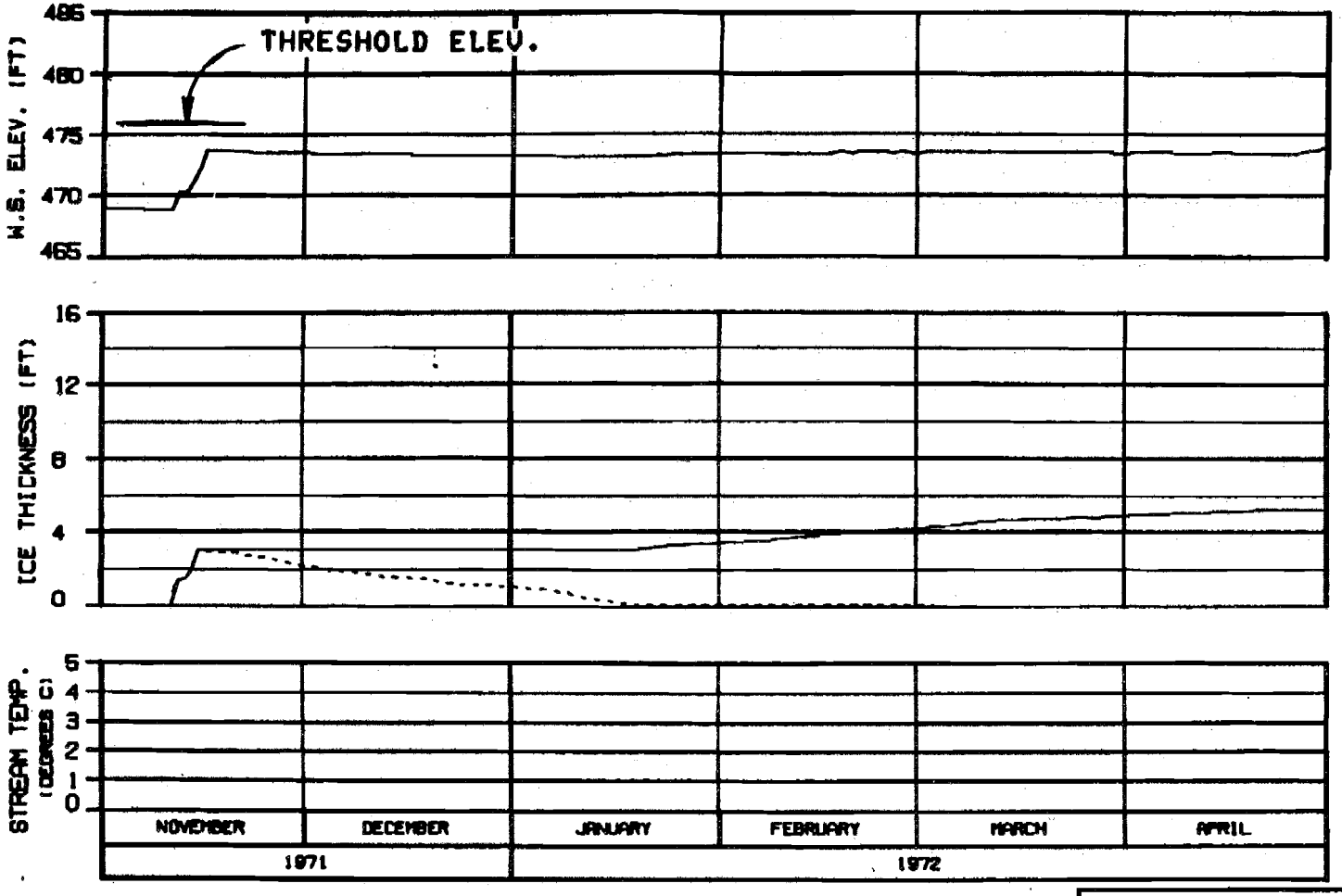


HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

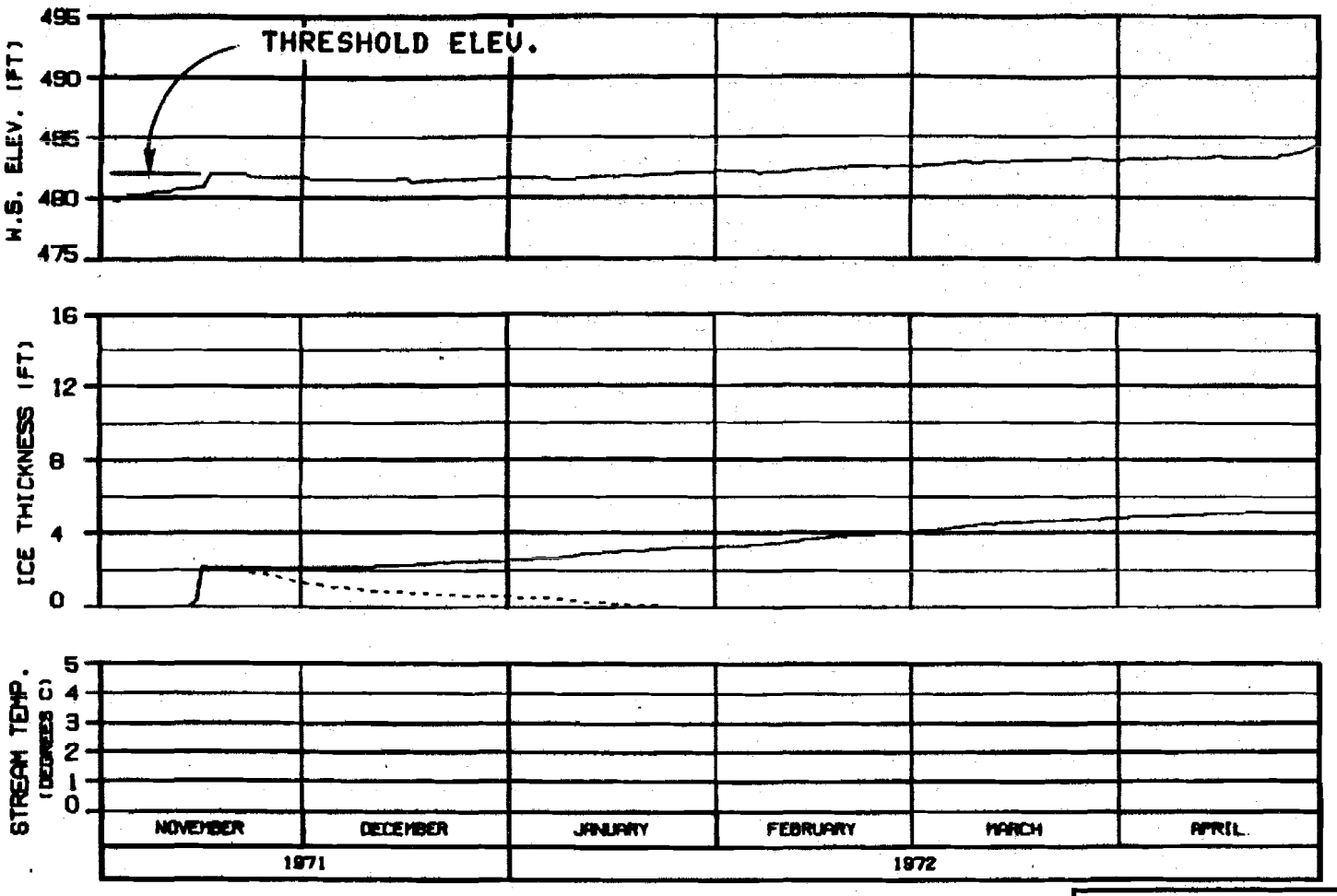
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

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

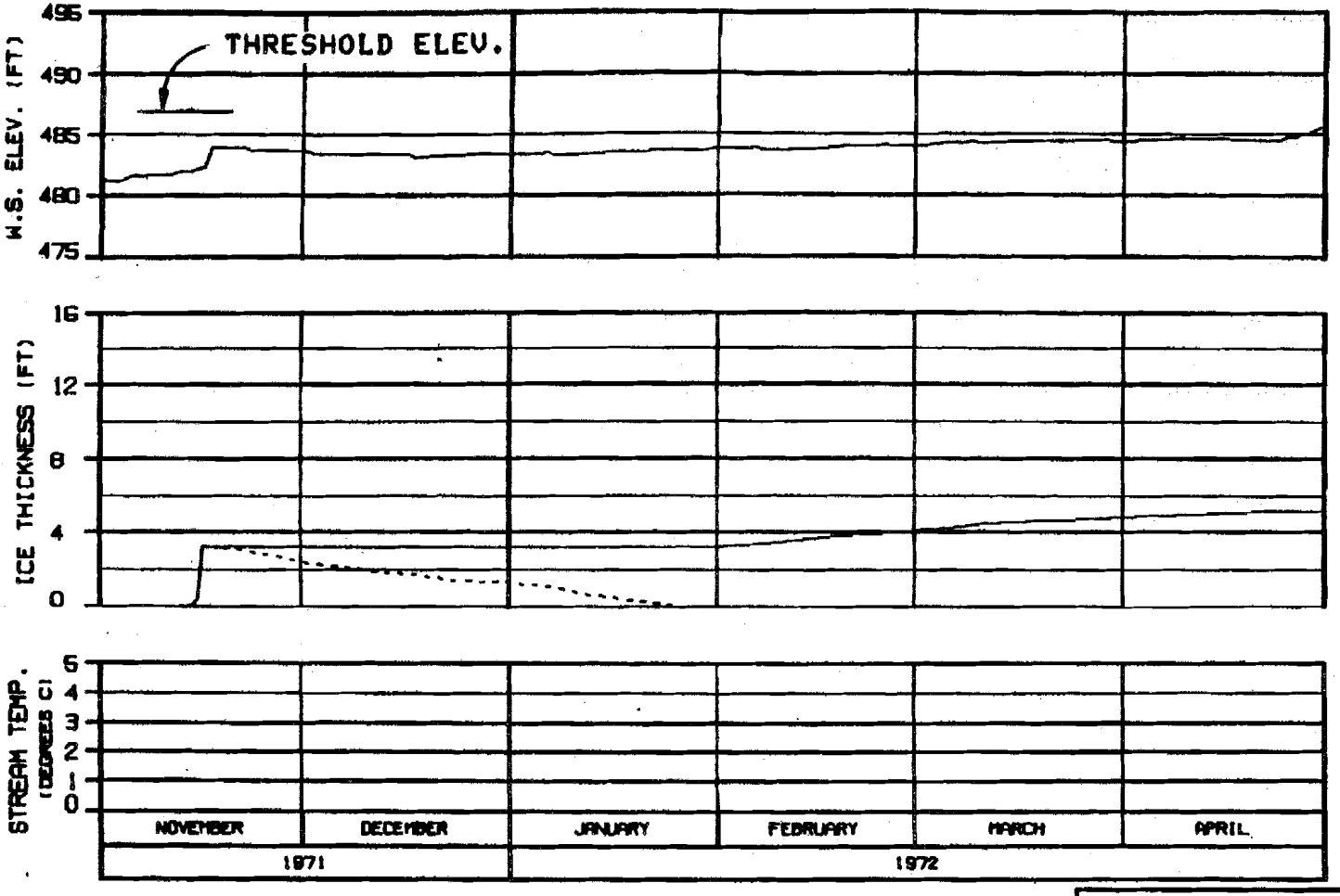
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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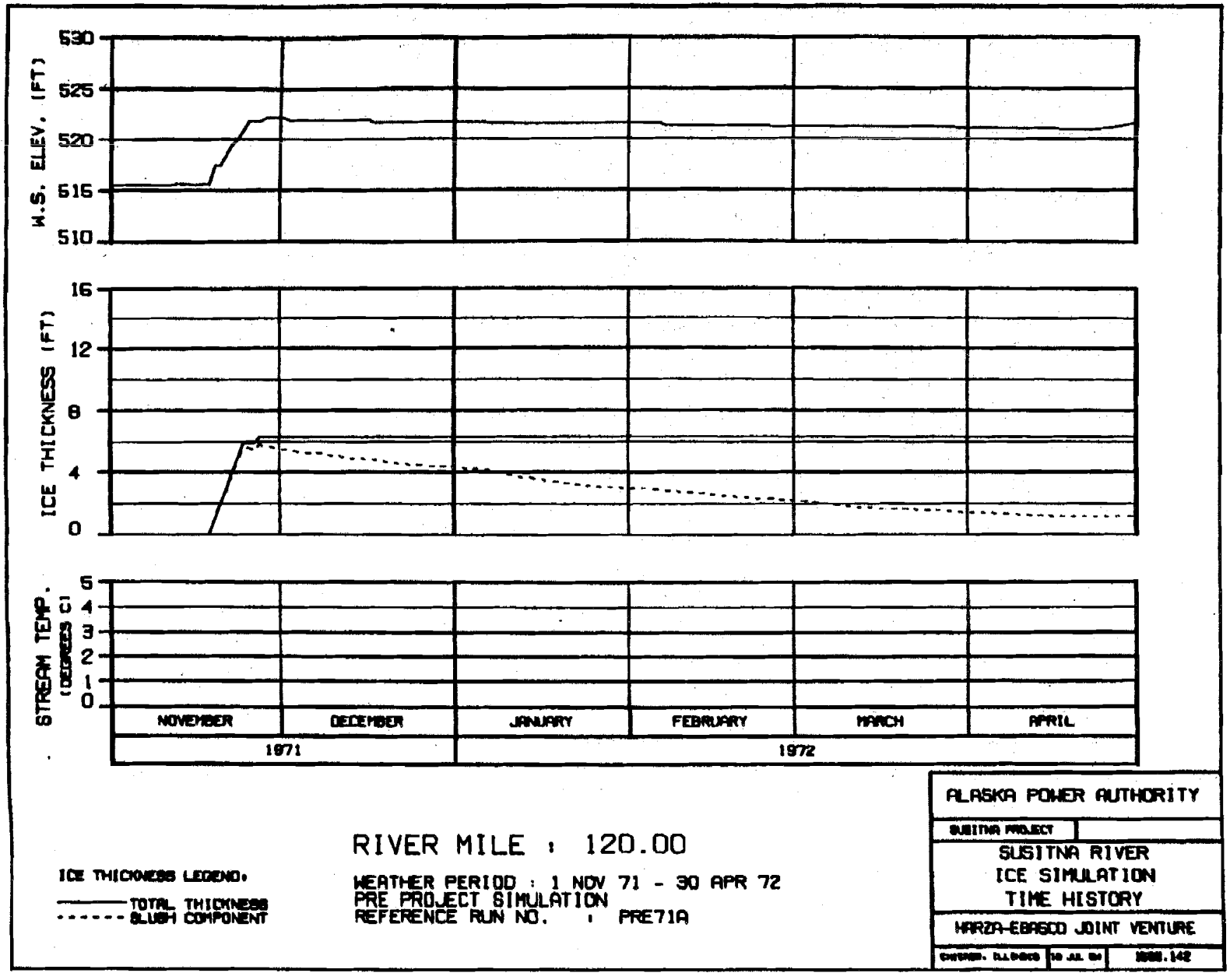


RIVER MILE : 120.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

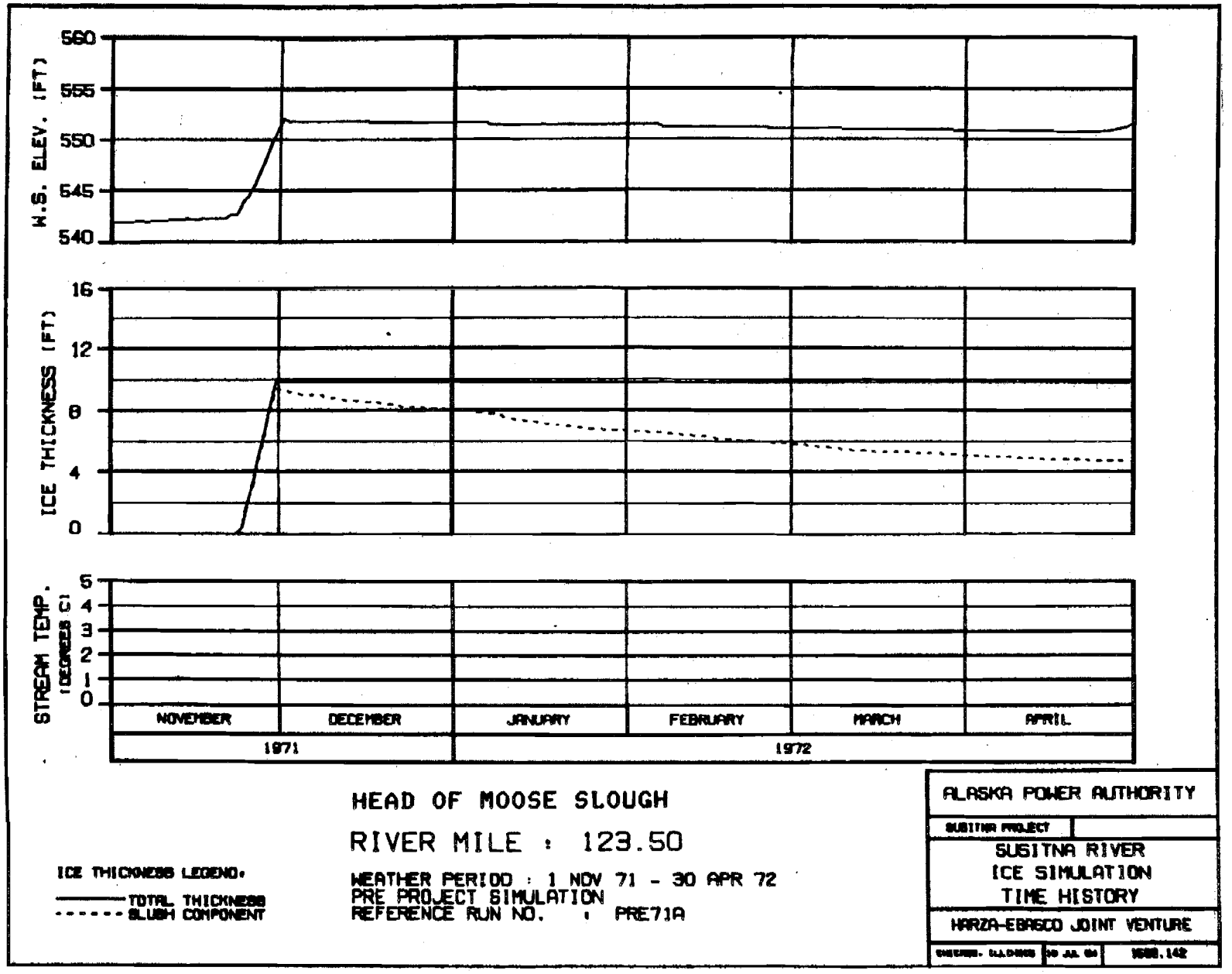
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



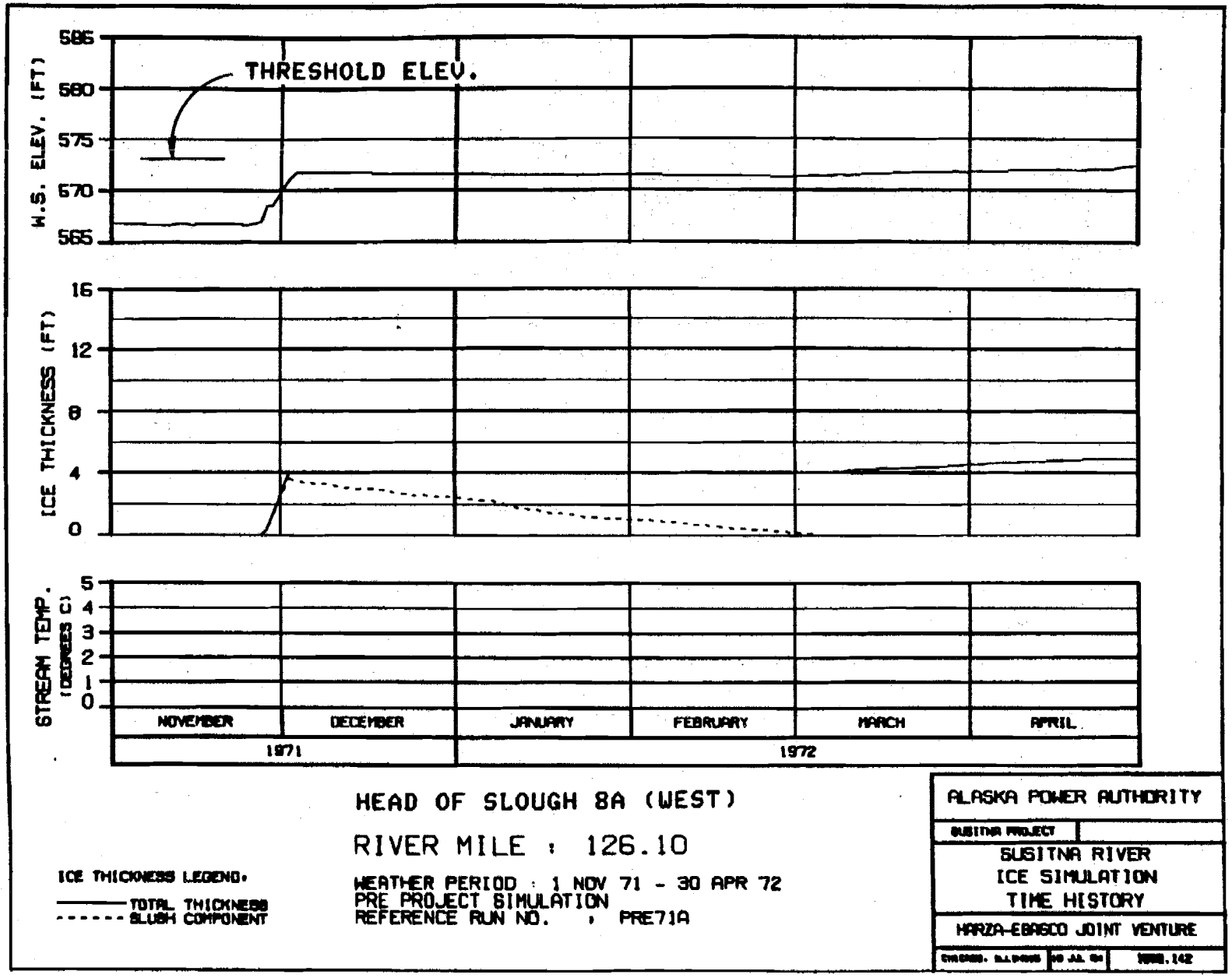
HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | 30 JUL 84 | 1688.142



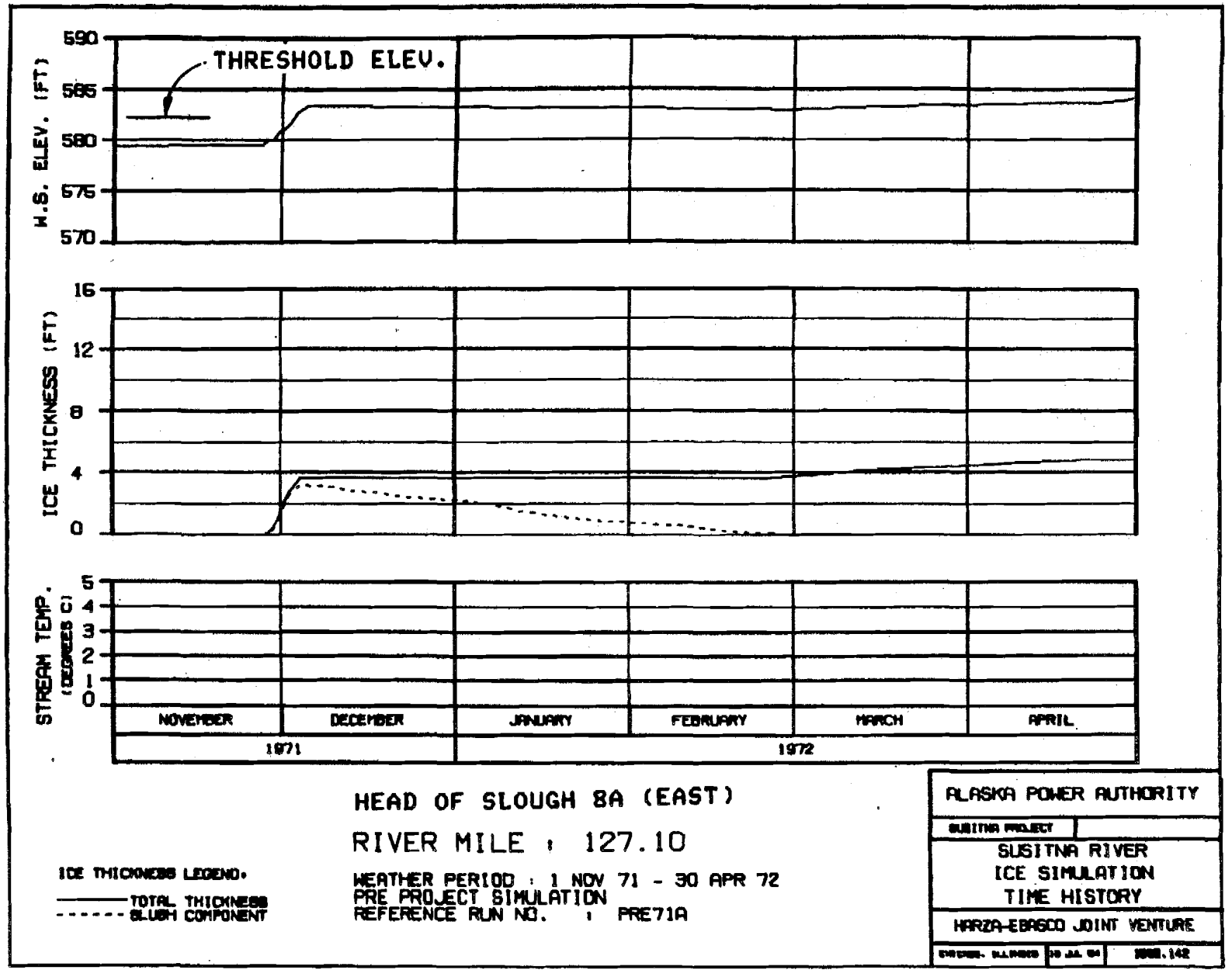
HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

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 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

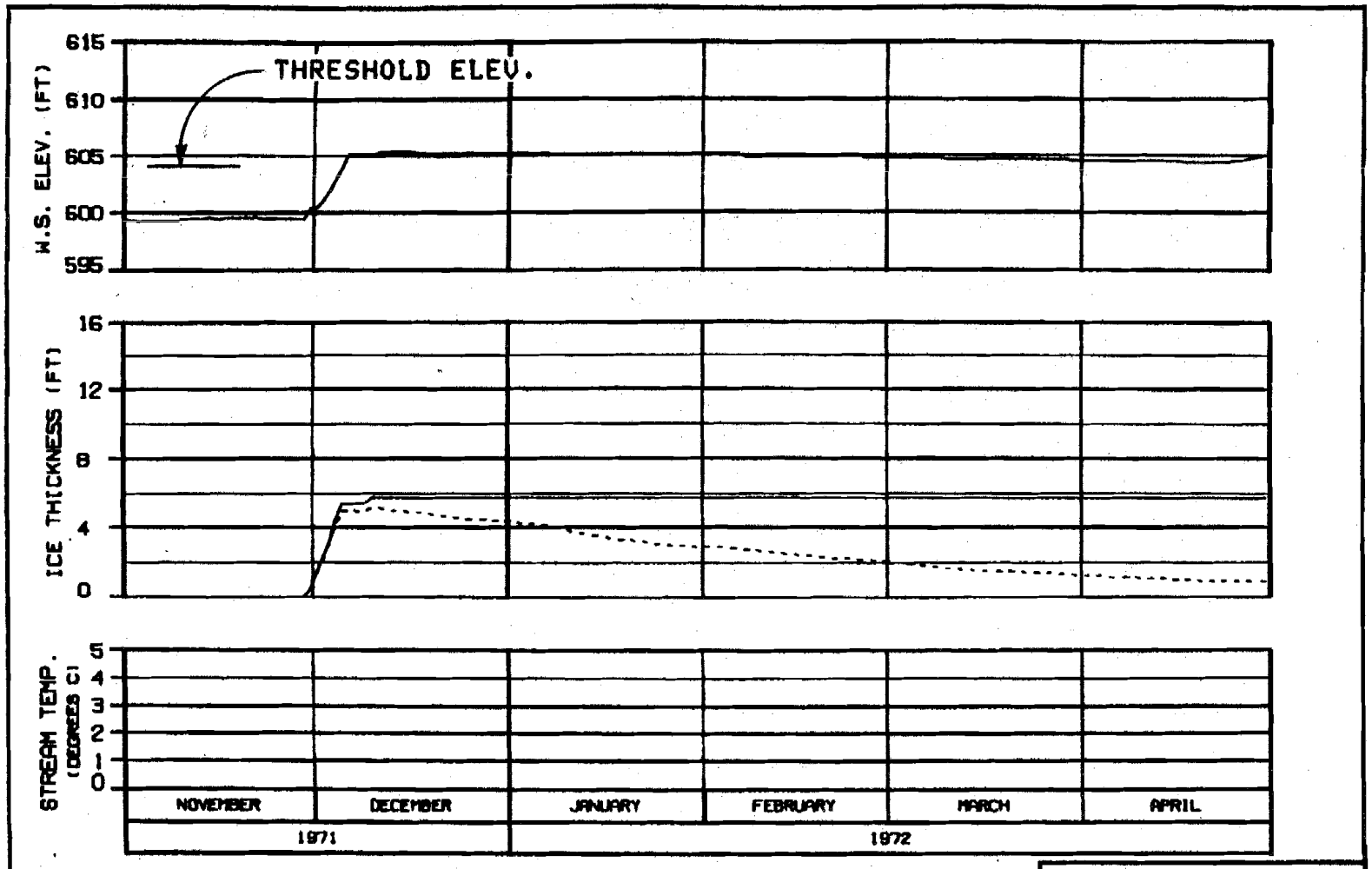
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

OPTION?

ALASKA POWER AUTHORITY

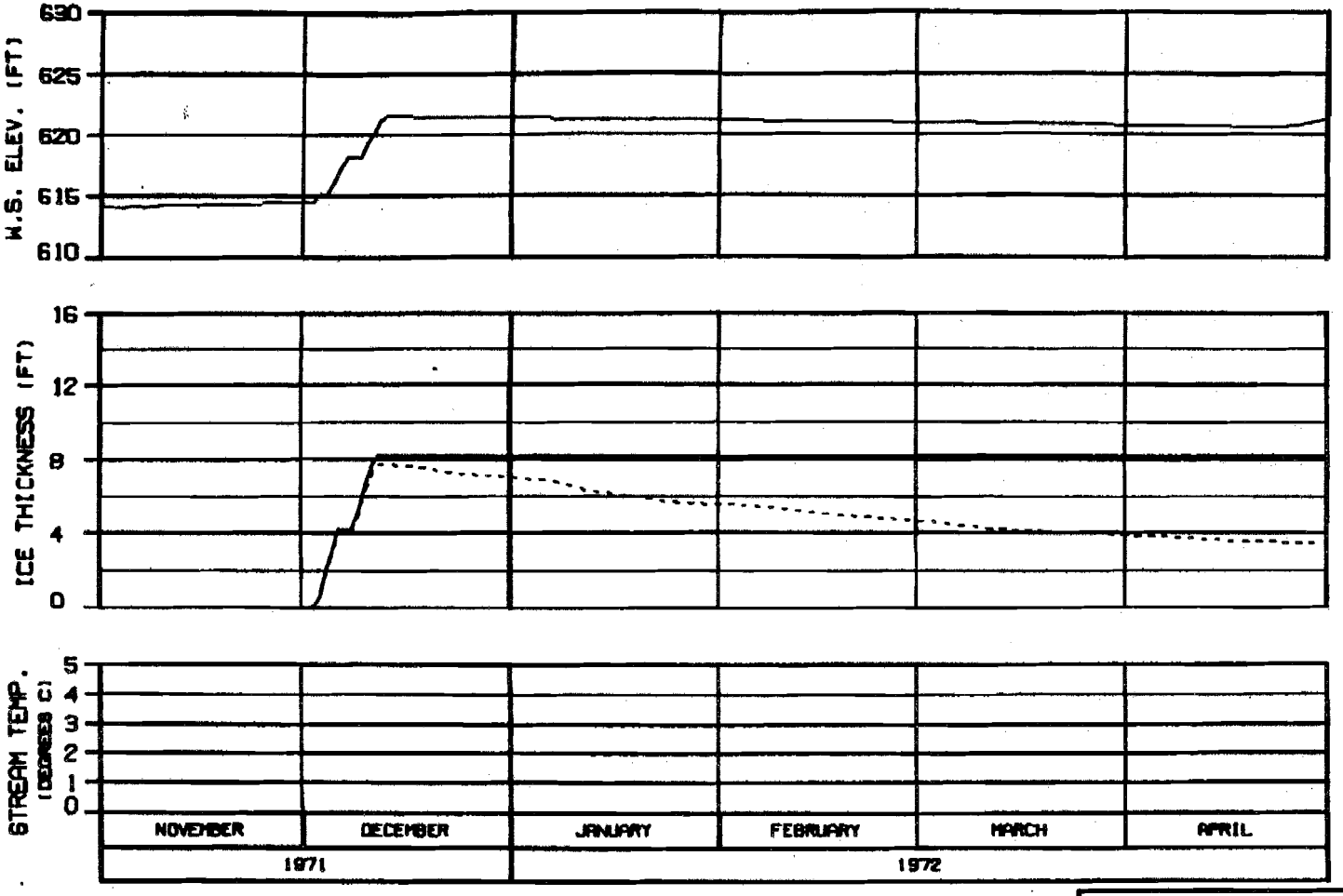
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.P.E.S. | 10 JUL 84 | 1000.142

OPTION7



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

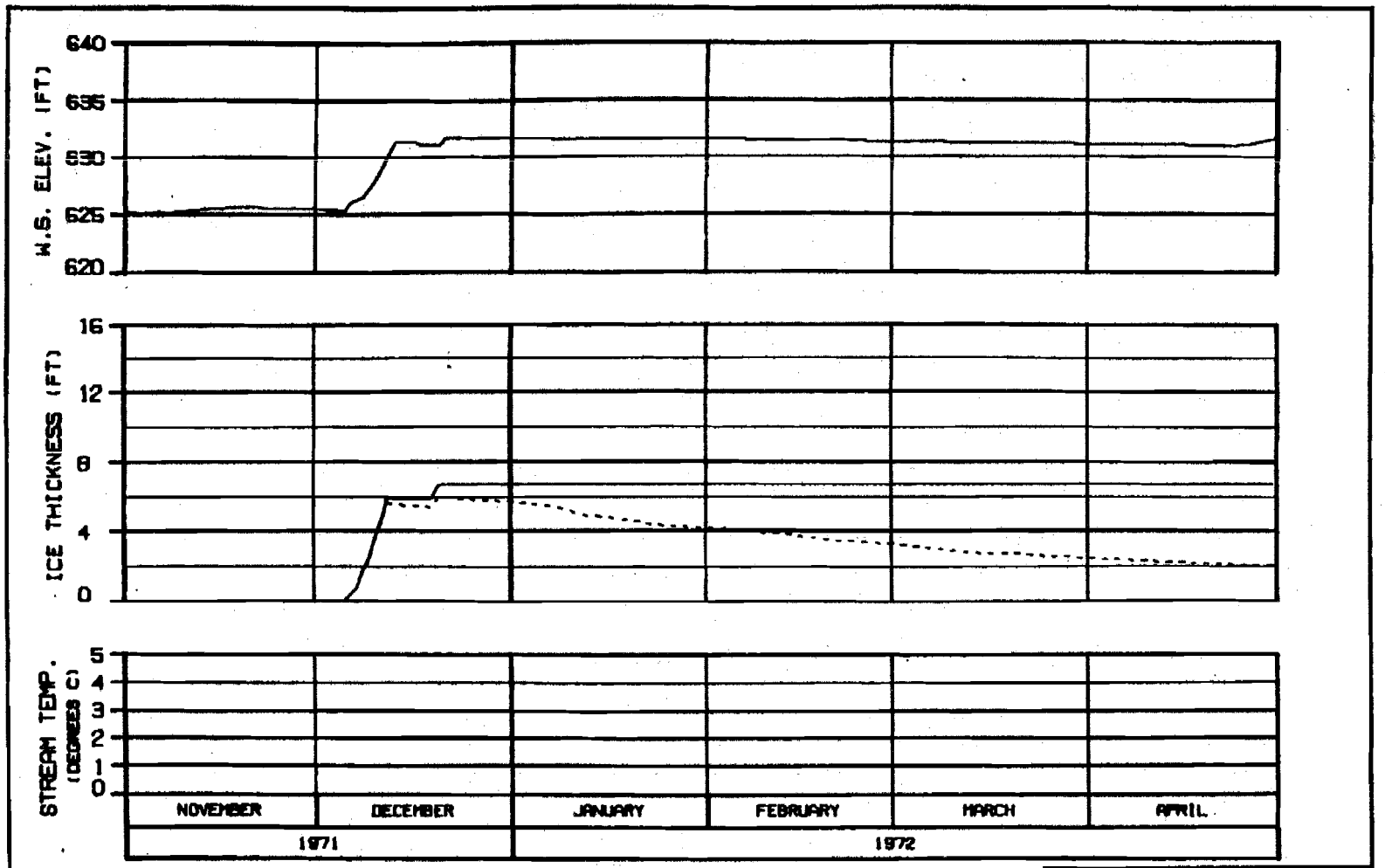
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: [illegible] 19 JUL 84 [illegible].142



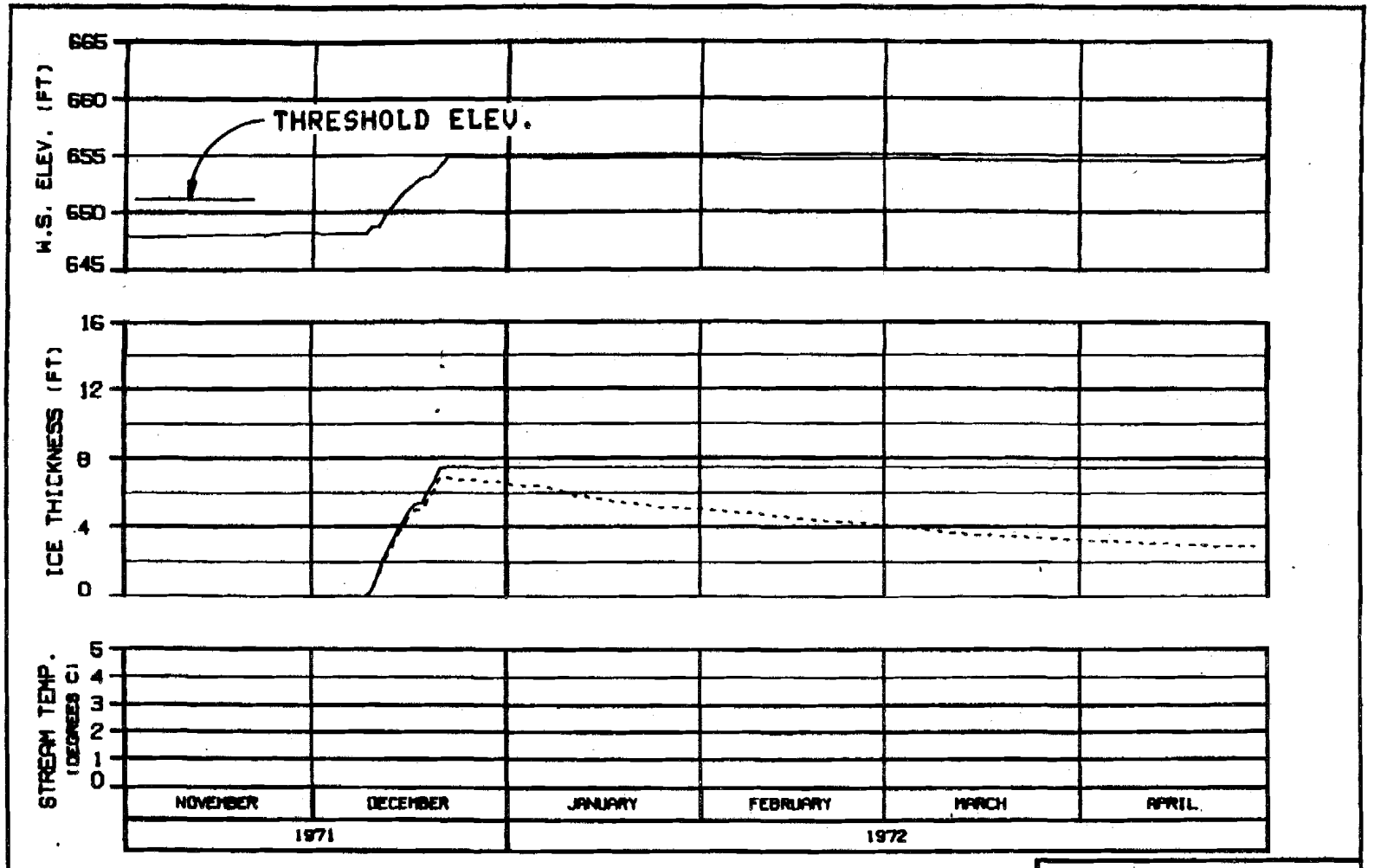
SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

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 9A

RIVER MILE : 133.70

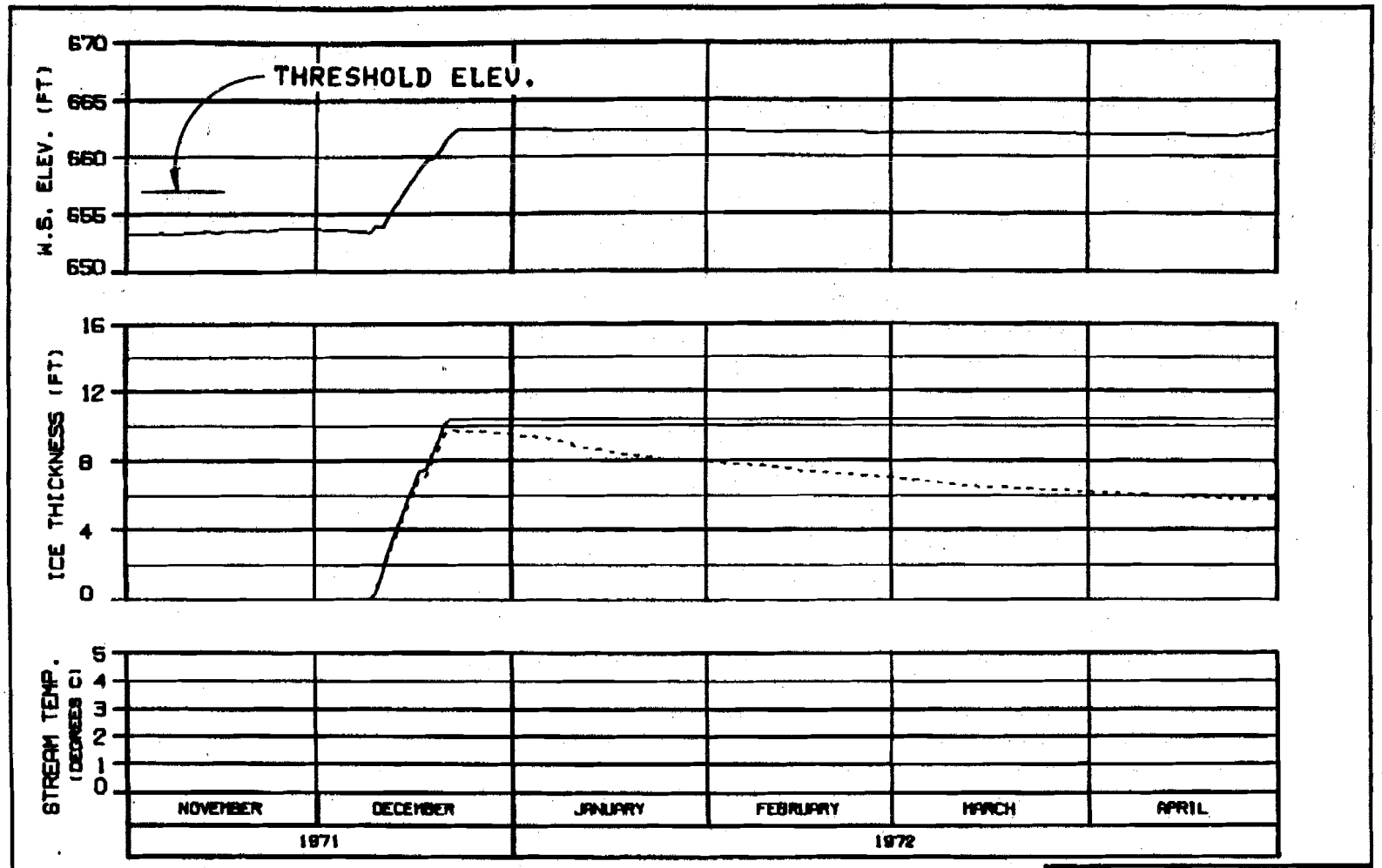
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	10 JUL 84	8888.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

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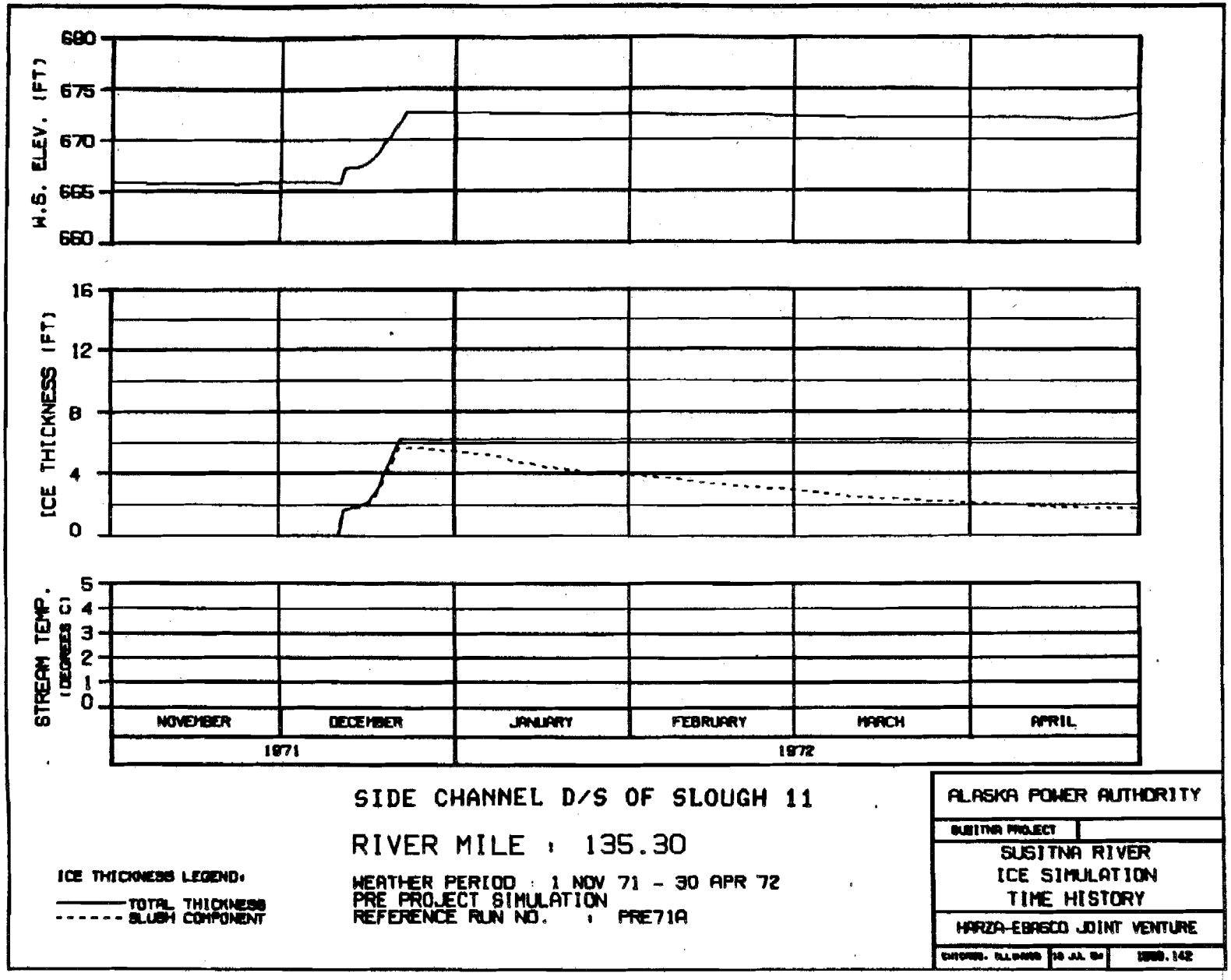
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	1988.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

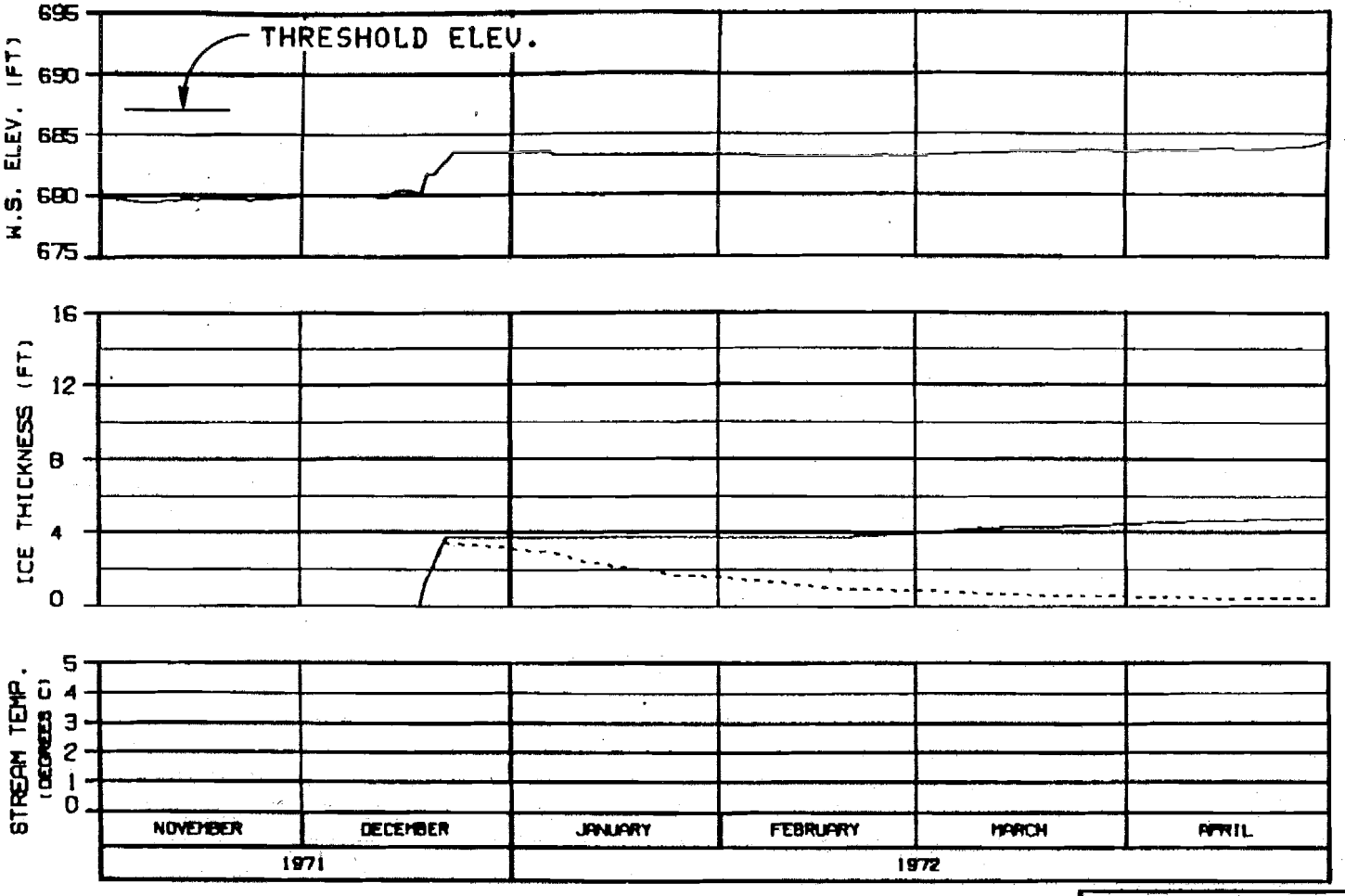
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 10 JUL 84 | 1880.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
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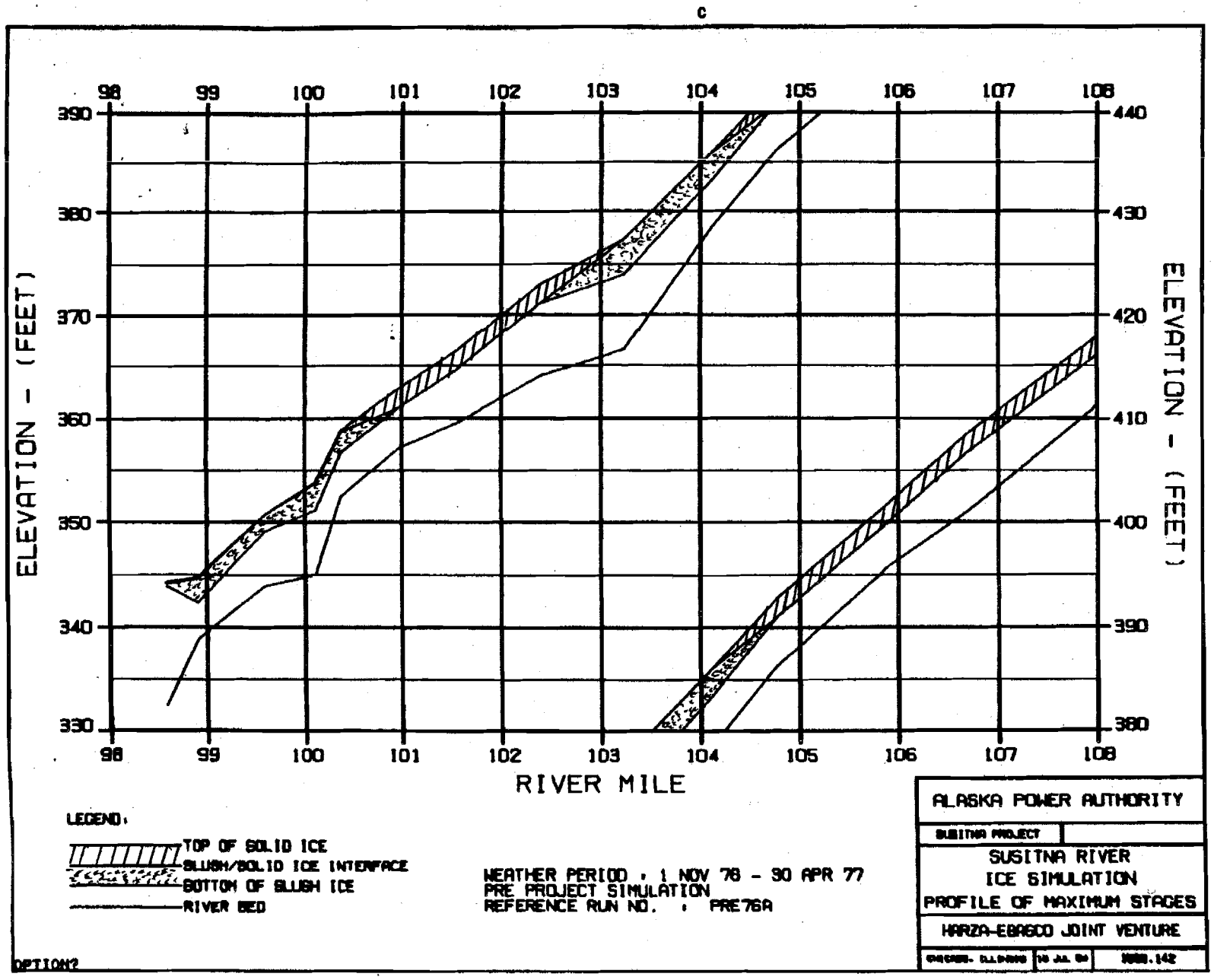
EXHIBIT C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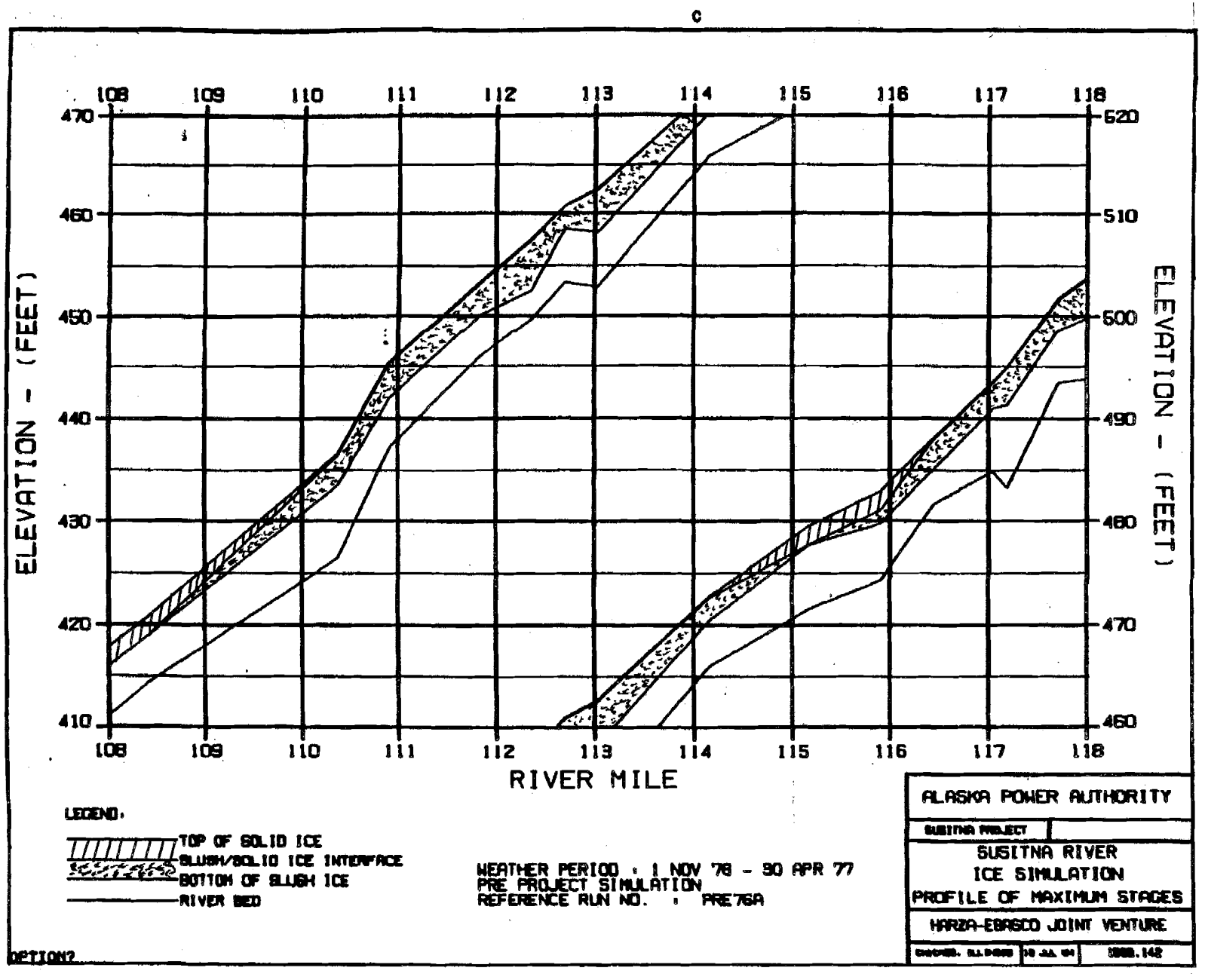
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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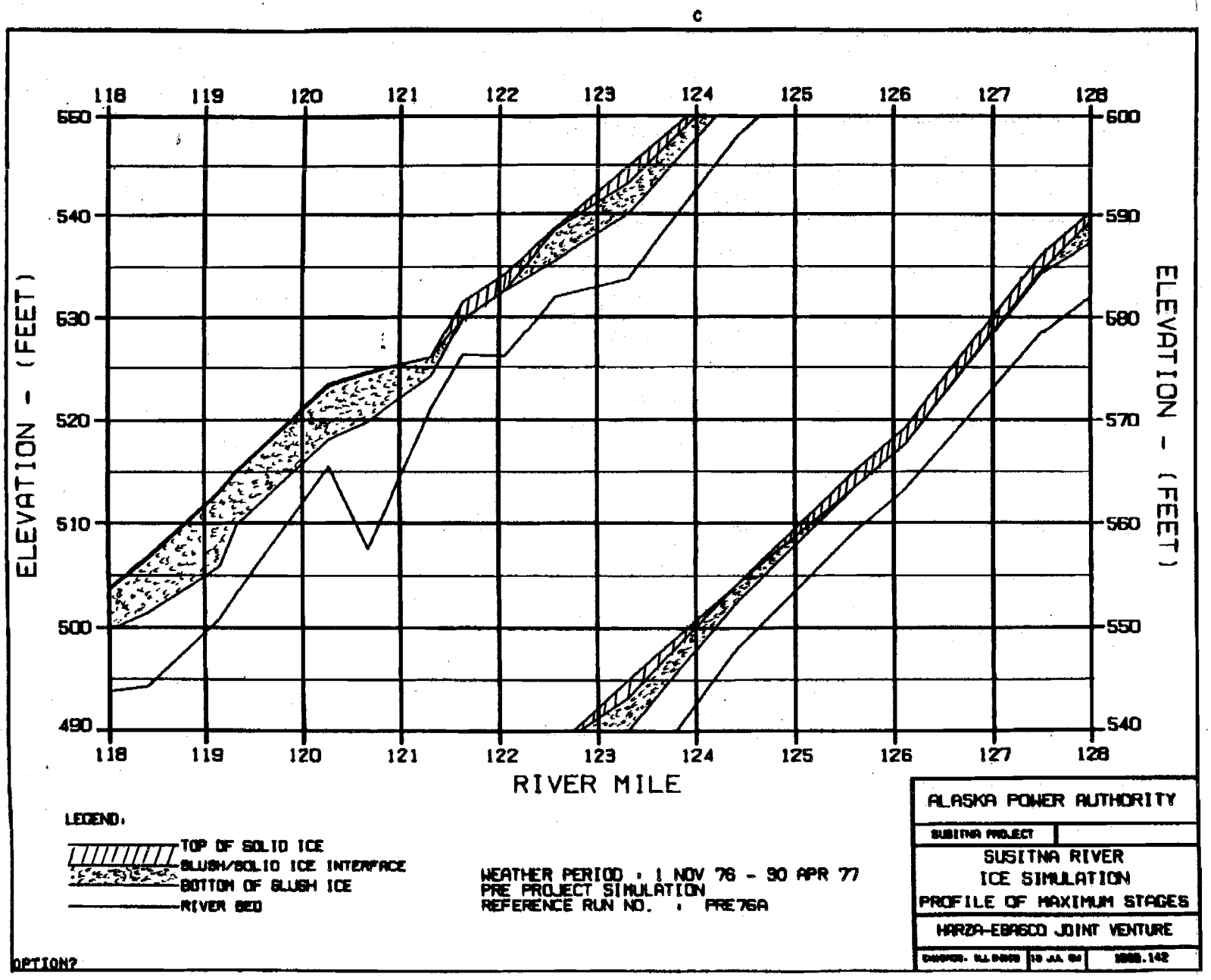
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV '76 - 30 APR '77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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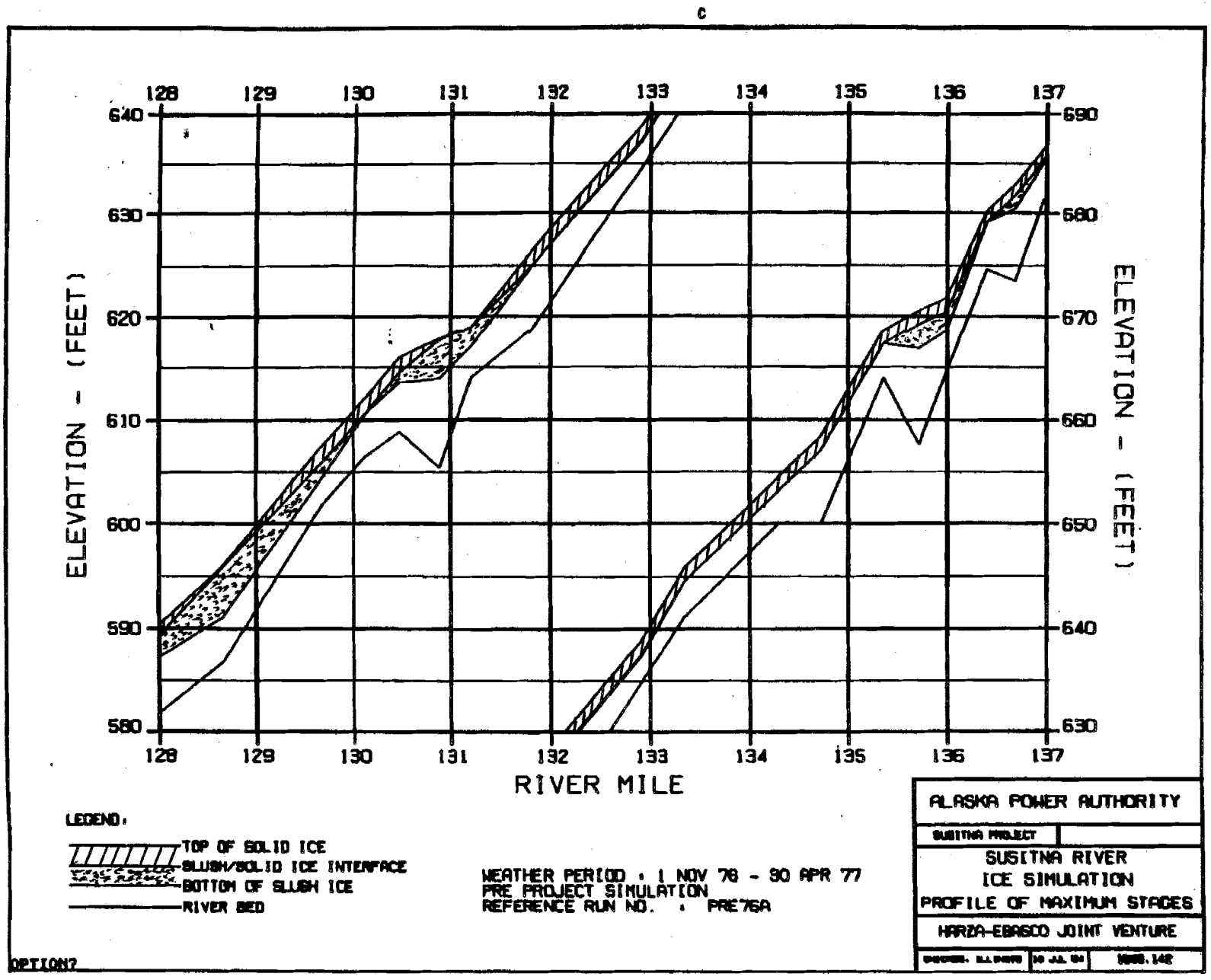
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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640
630
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
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

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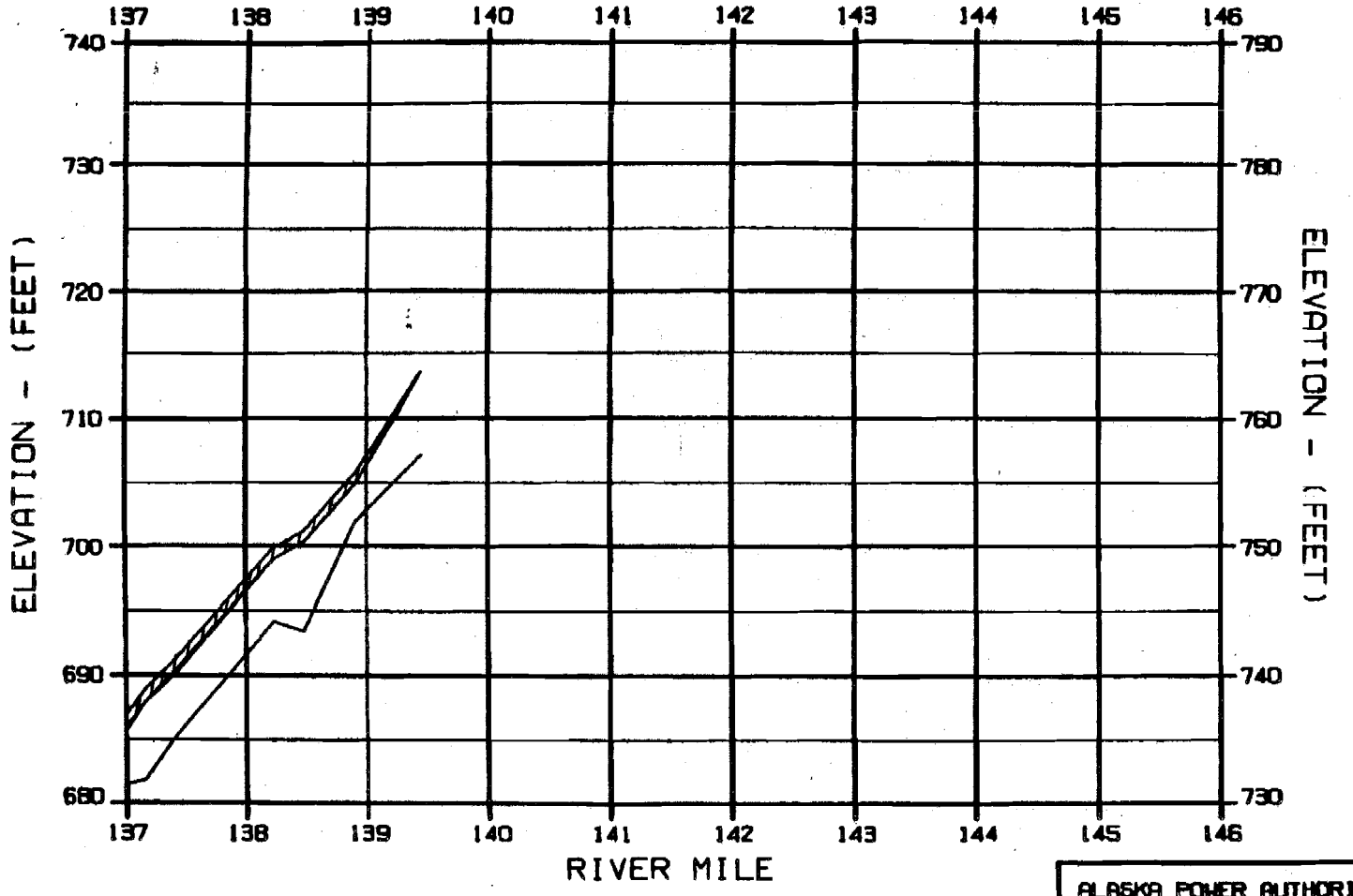


LEGEND:

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

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

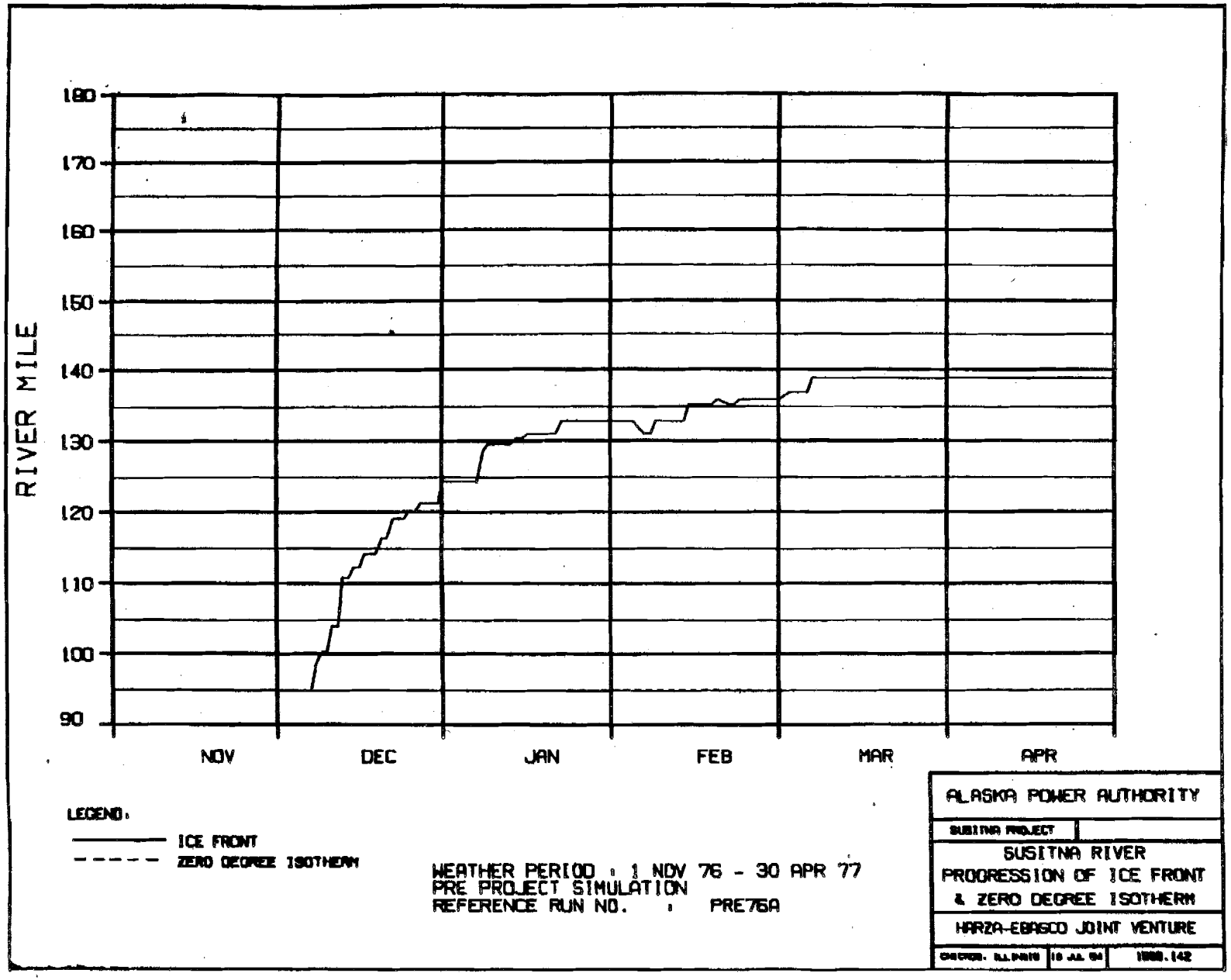
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JUL 84 | 1988.142

OPTION2


RIVER MILE
180
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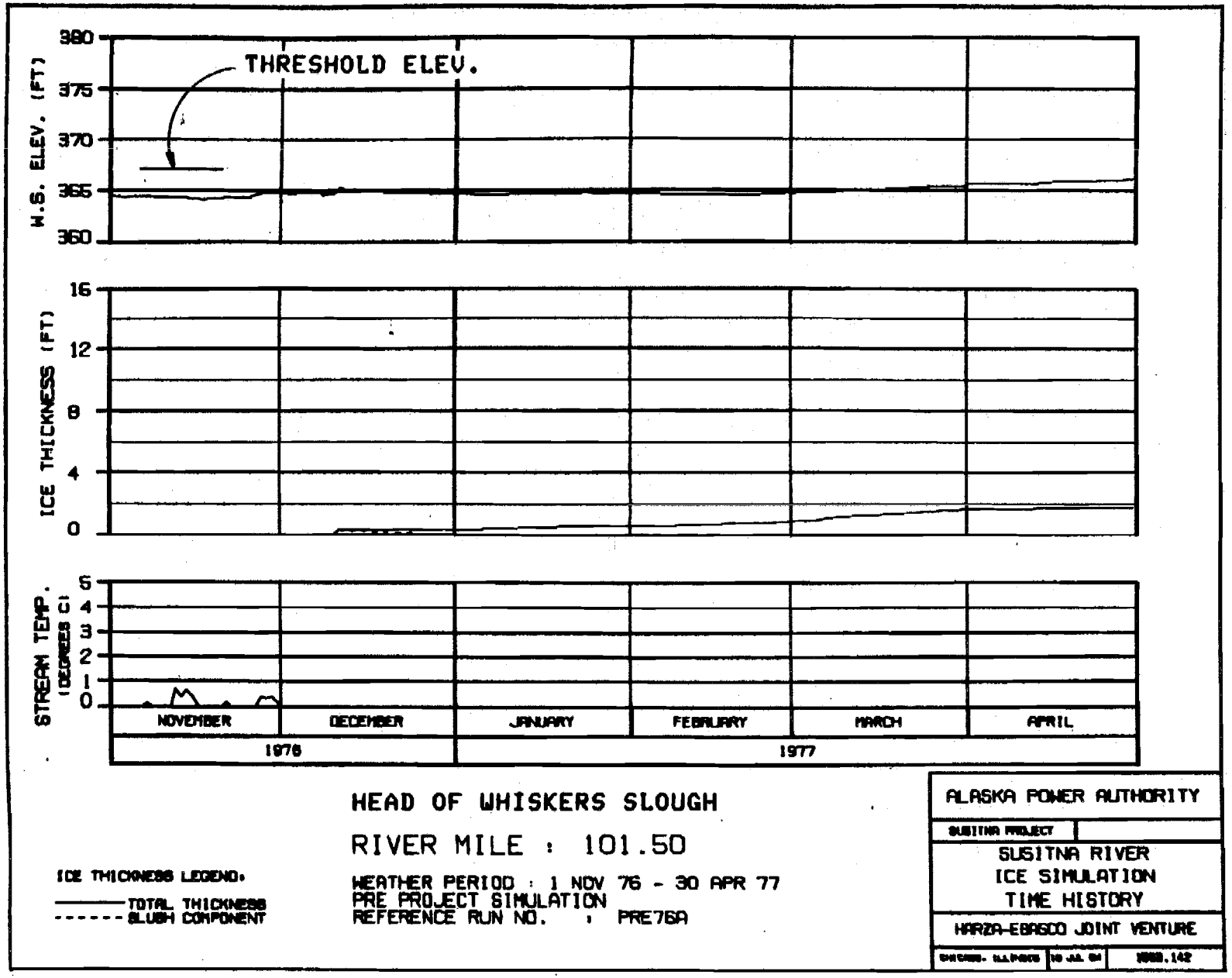
160
150
140
130
120
110
100
90
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
1988.142



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

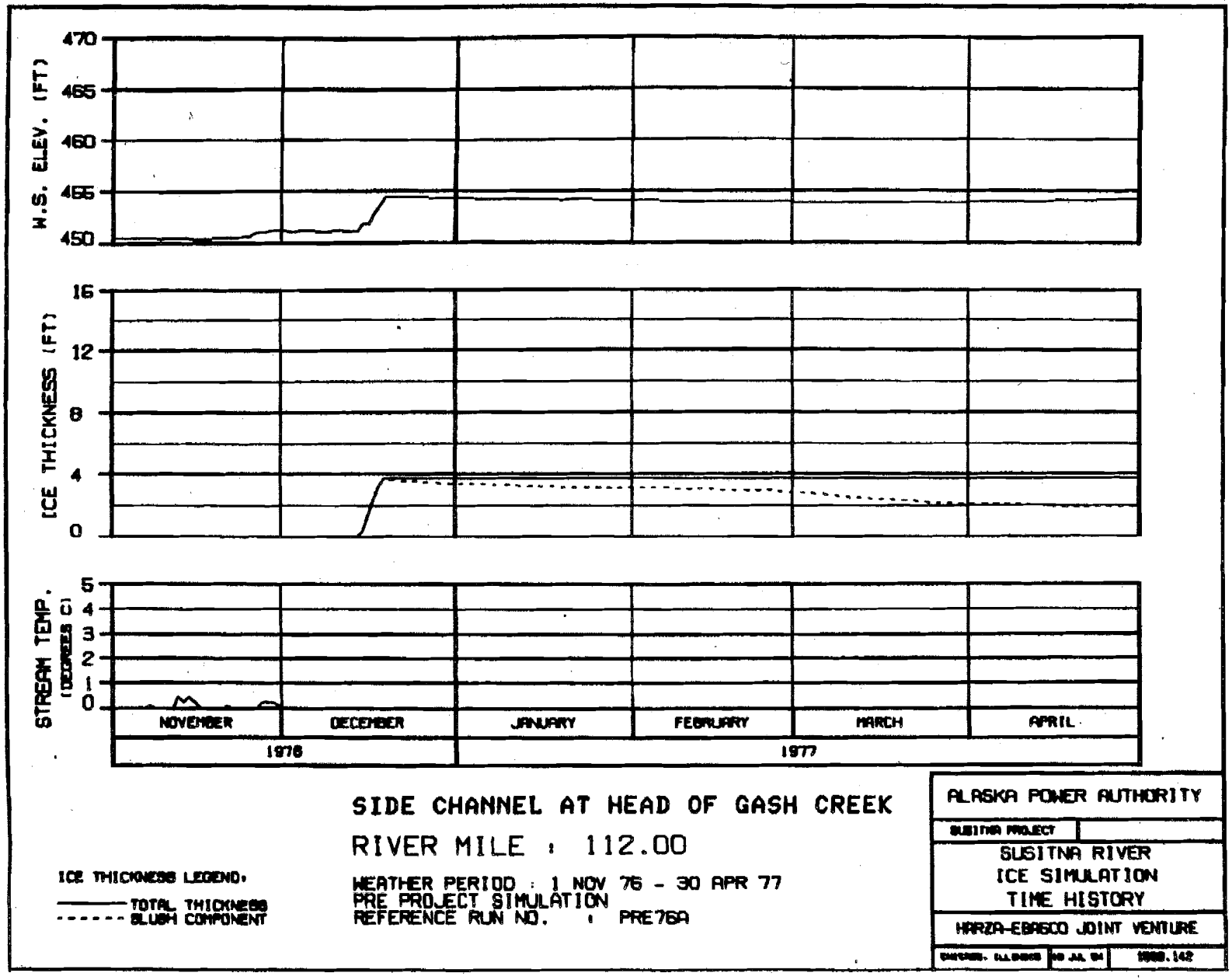
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1888.142



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
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

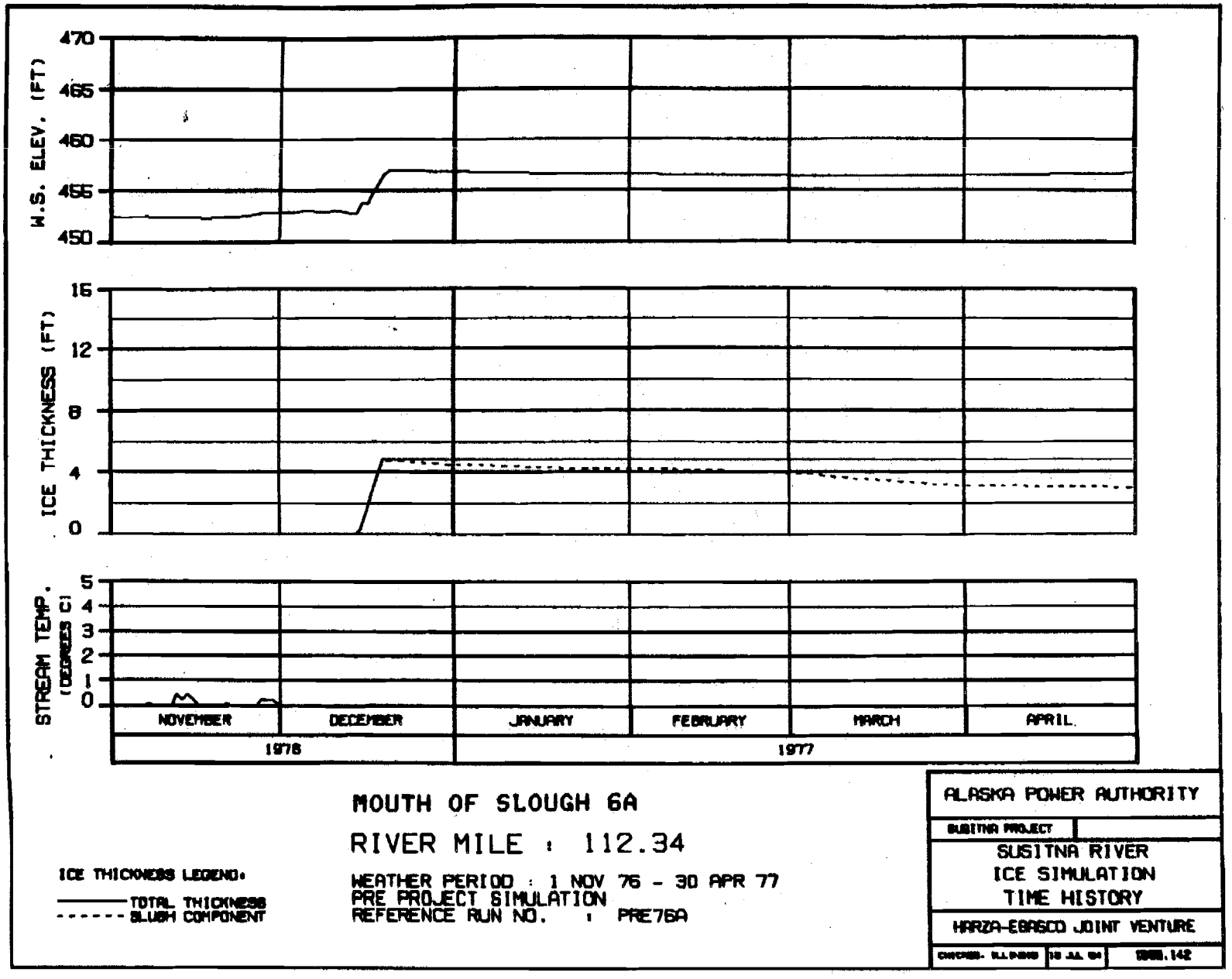
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] ILLINOIS | 30 JUL 84 | 1888.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

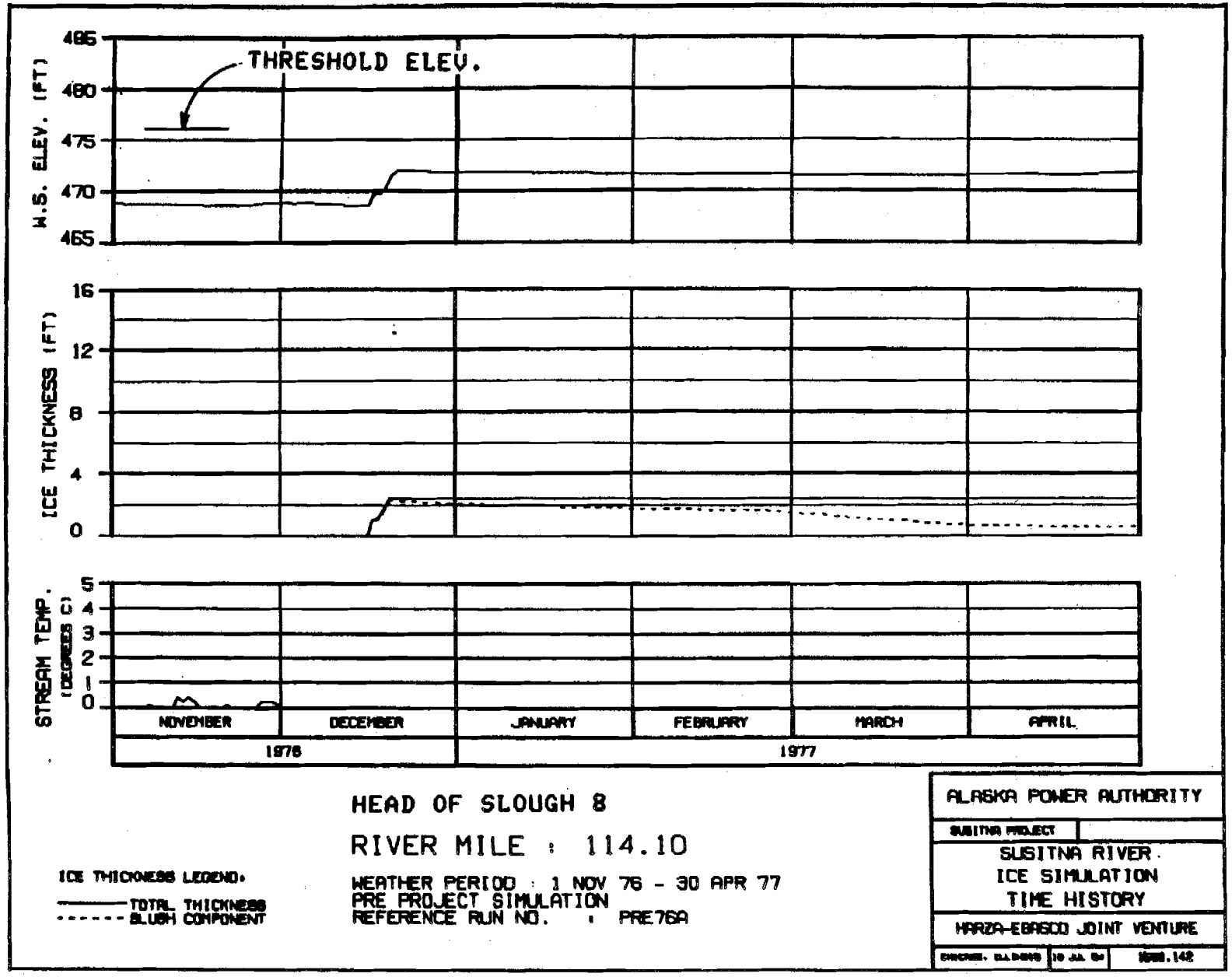
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.D. | 10 JUL 84 | 2685.142



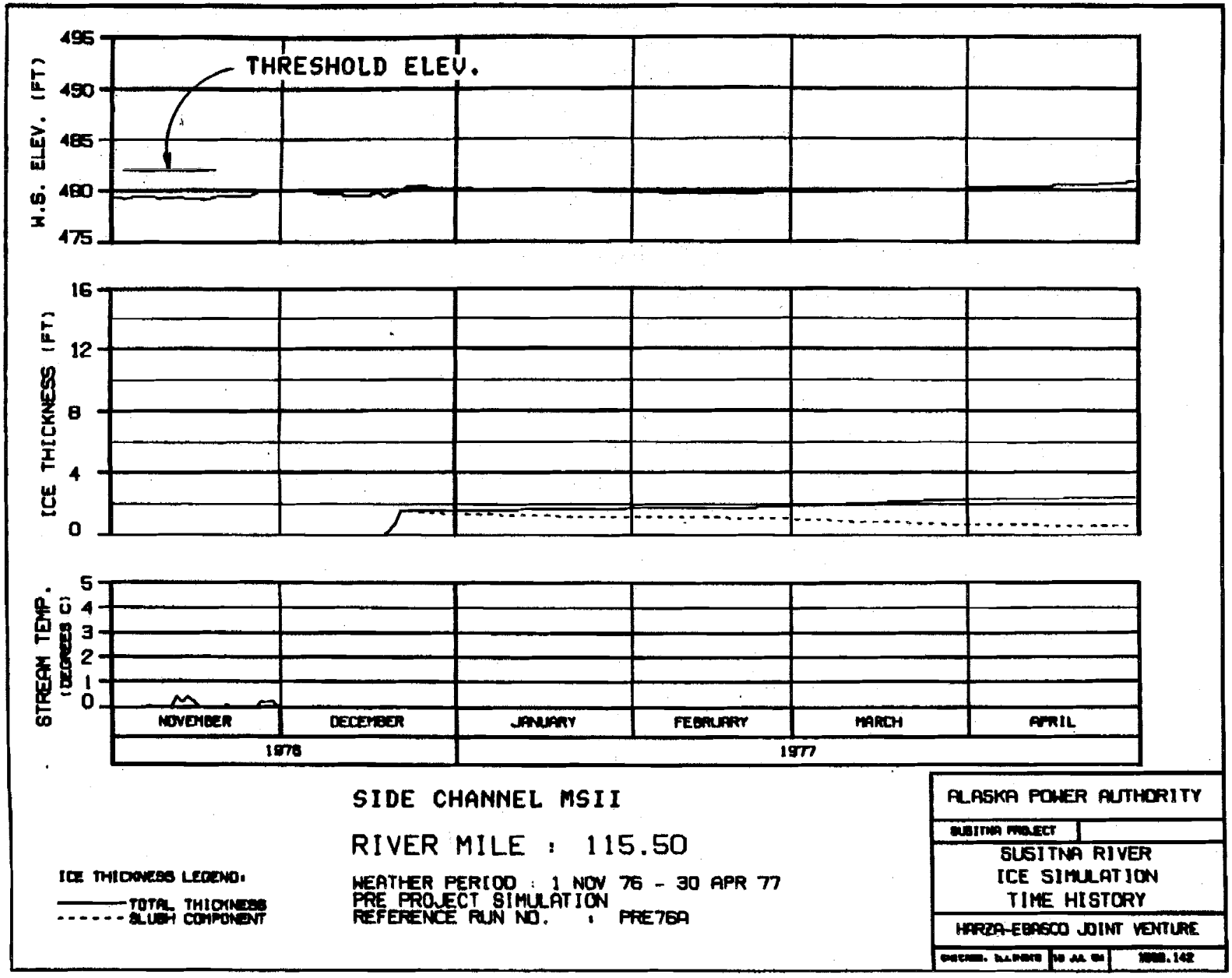
HEAD OF SLOUGH 8

RIVER MILE : 114.10

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

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

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
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

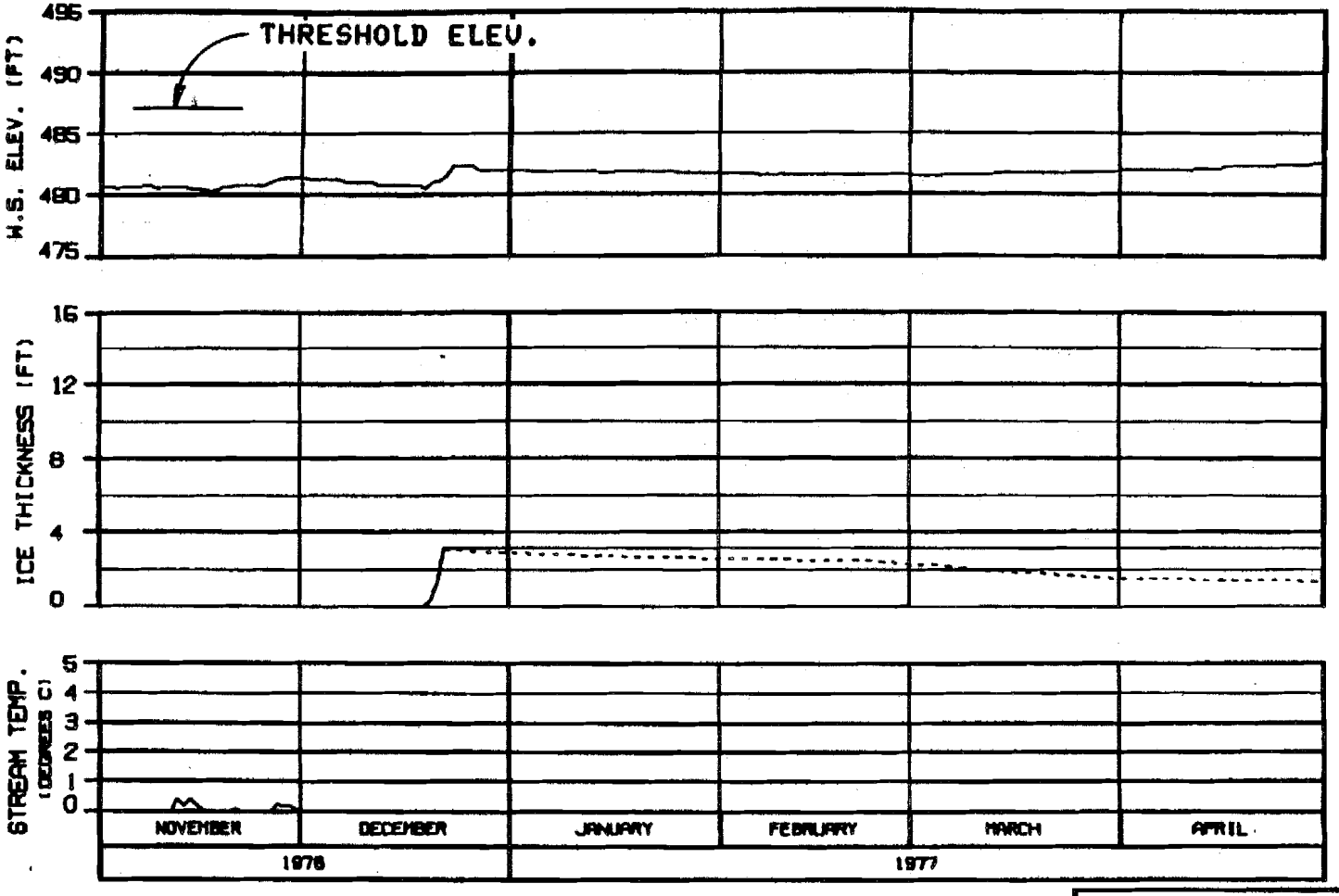
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: [illegible] | 10 JUL 84 | 1988.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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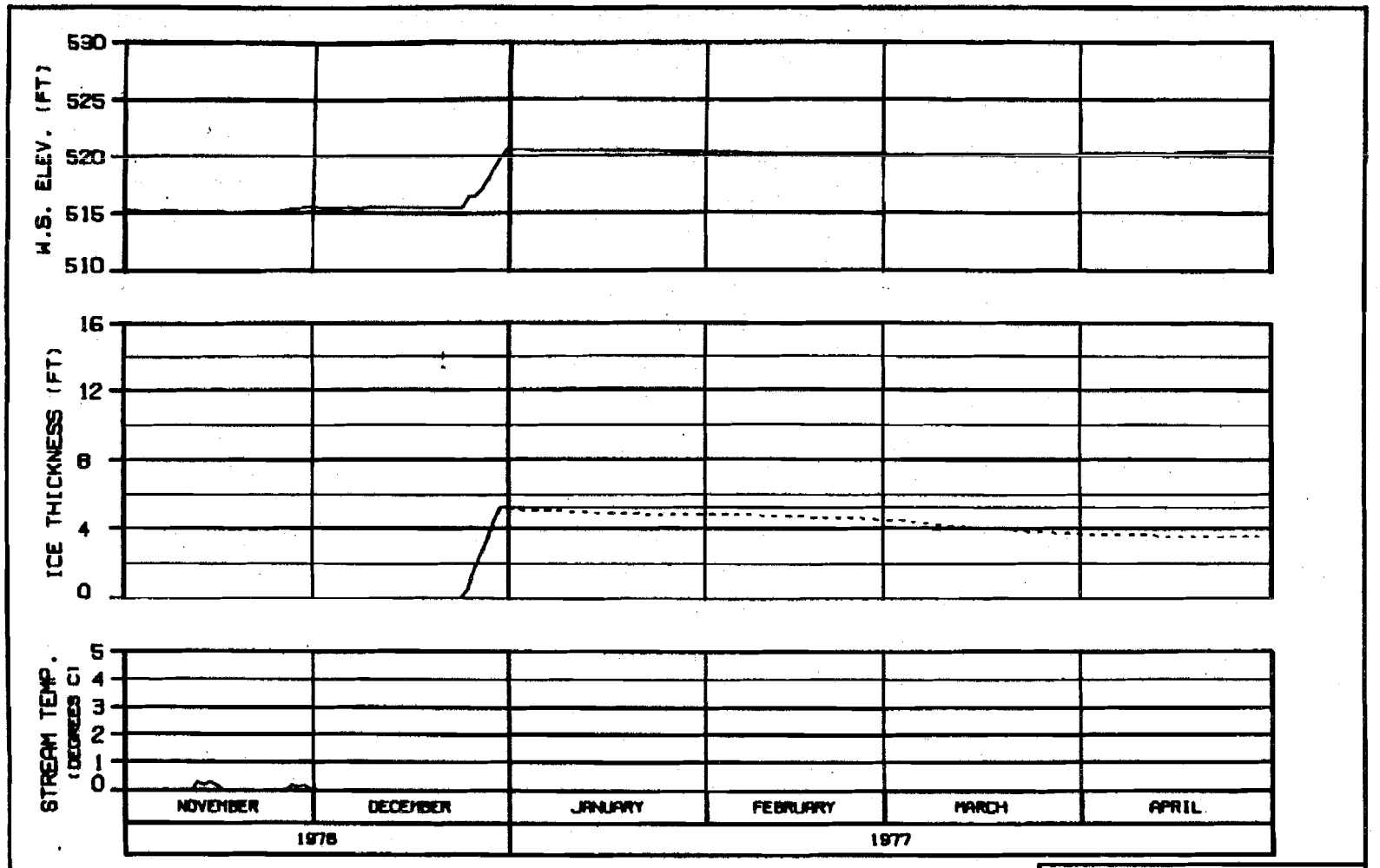


RIVER MILE : 120.00

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

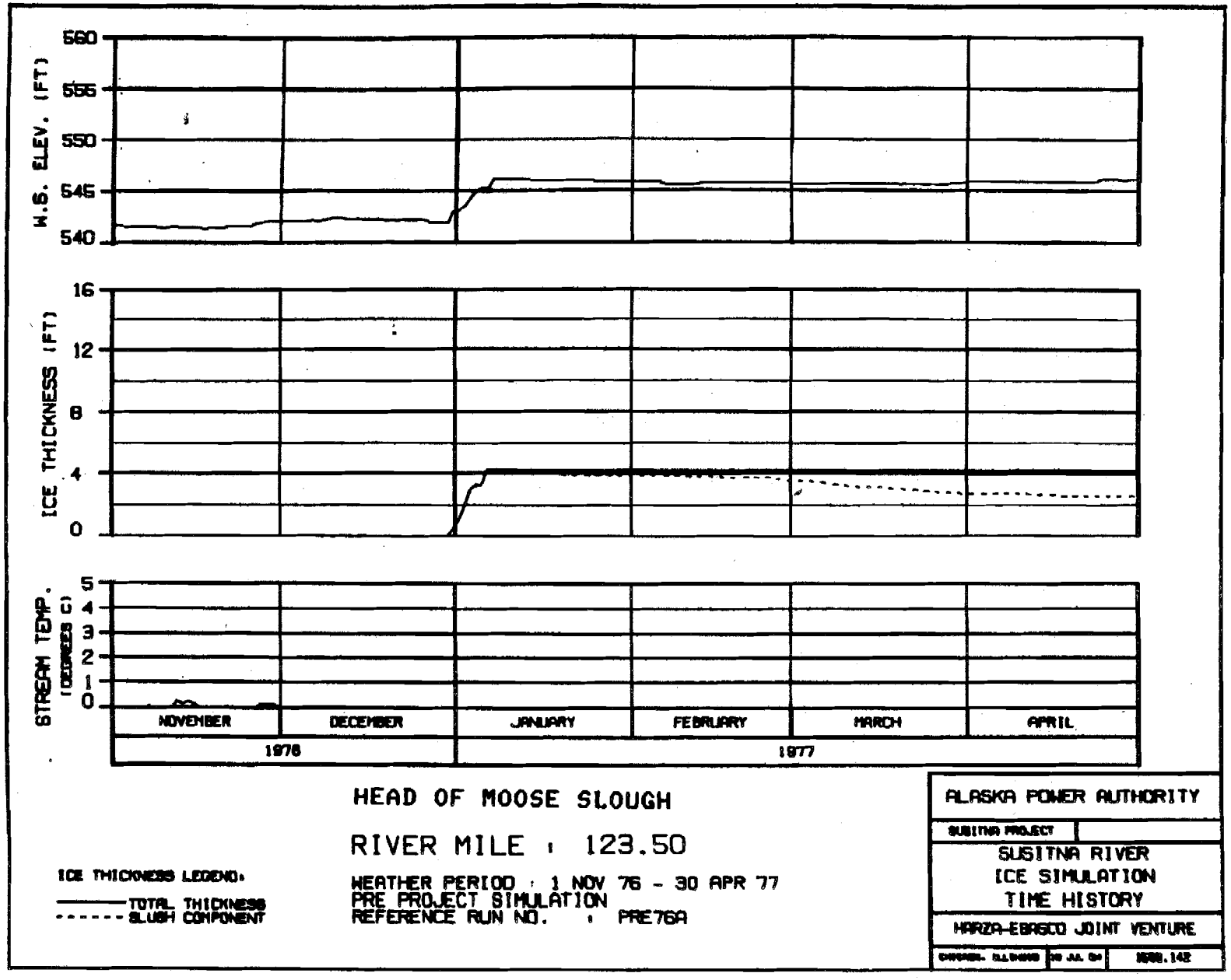
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

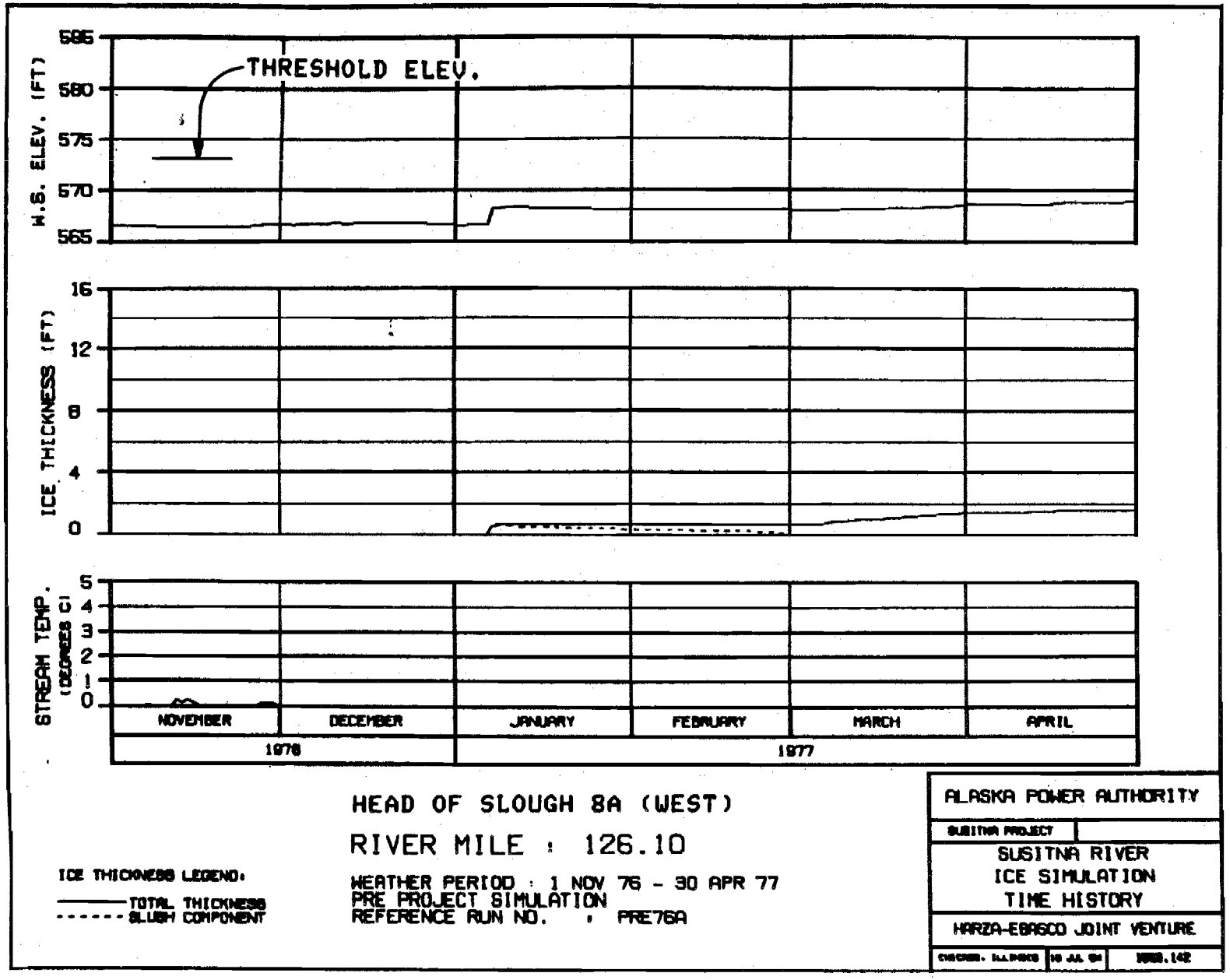
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 1988.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

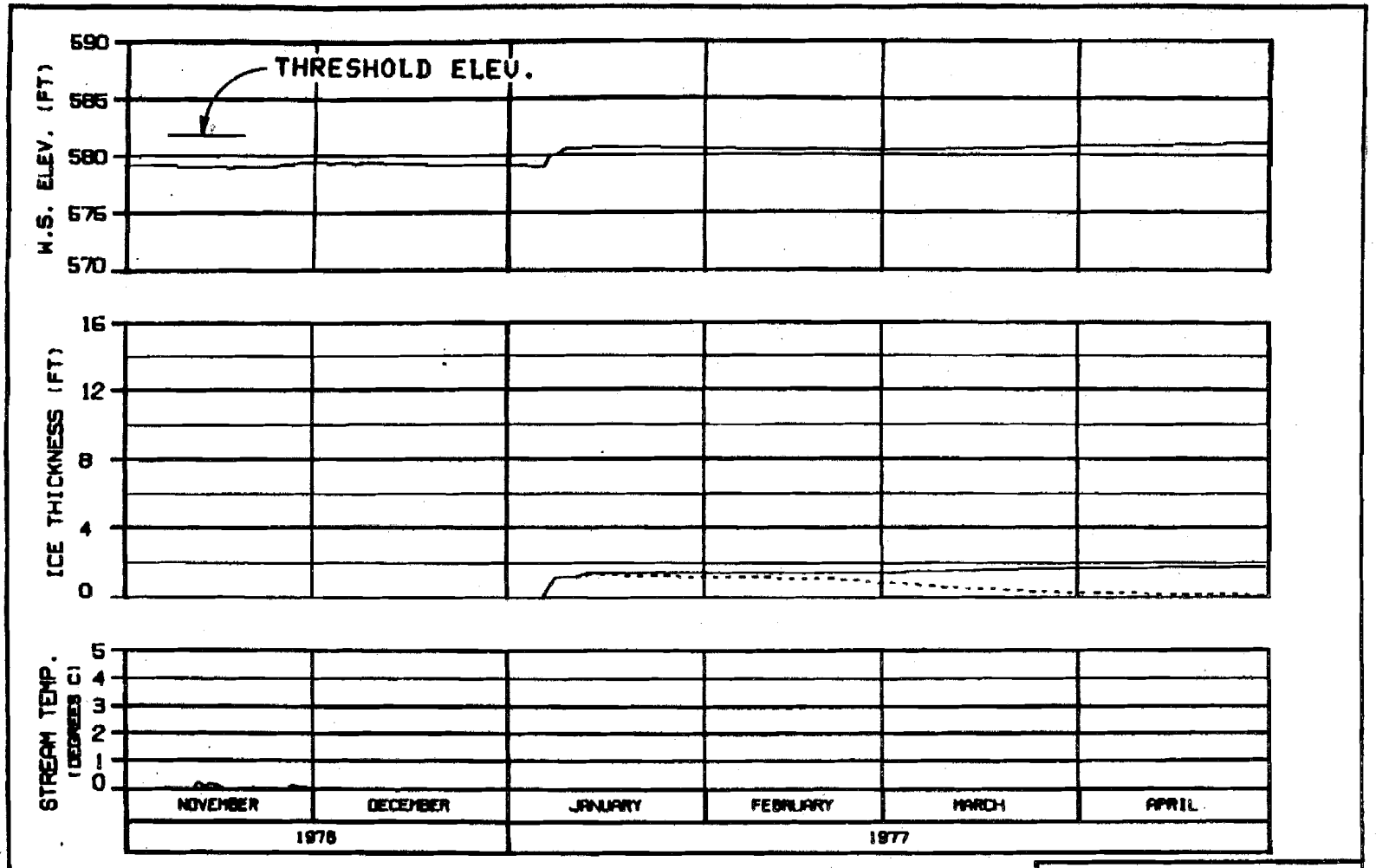
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	10 JUL 84



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

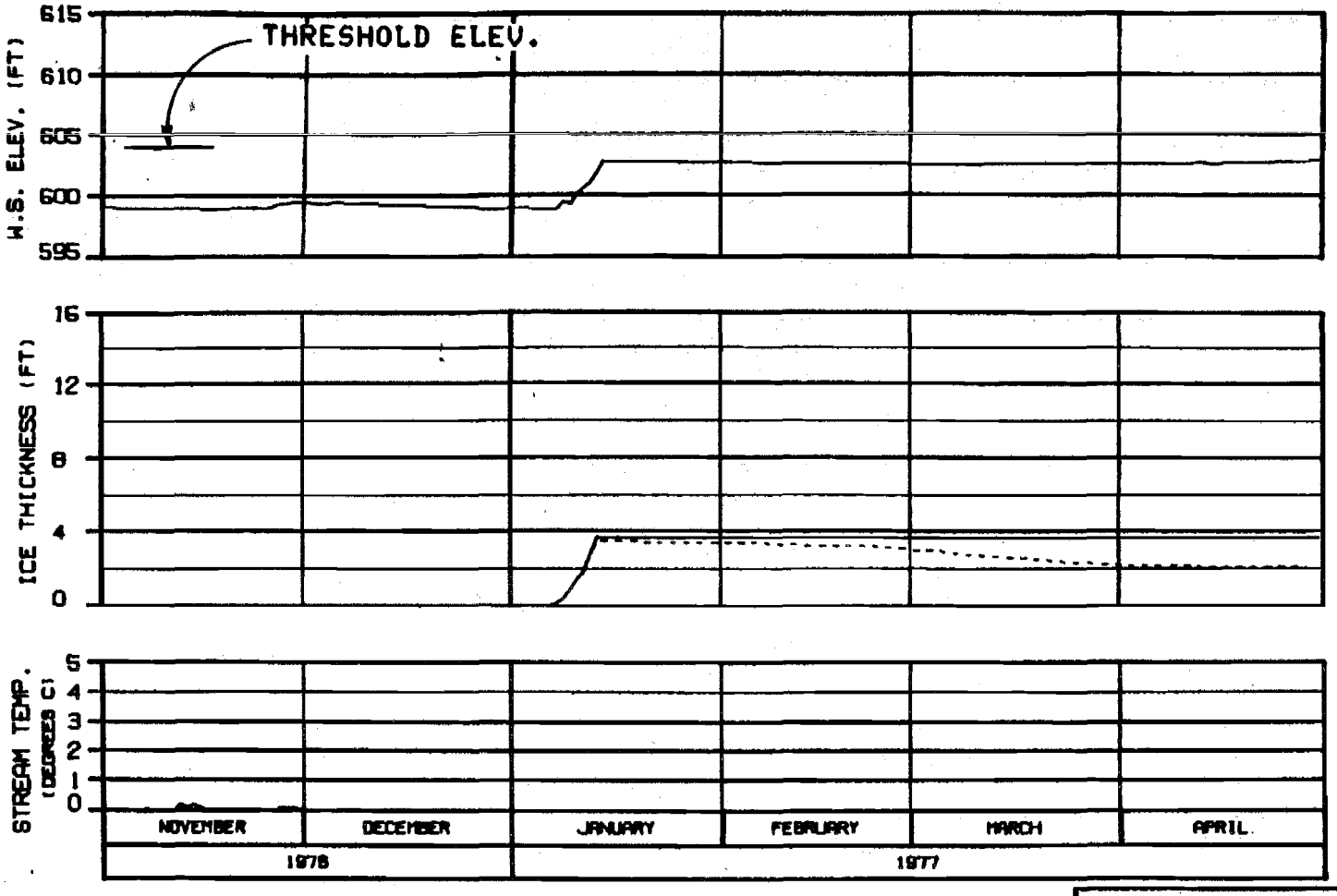
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: R.L.P.S.W. | 10 JUL 84 | 1988.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

OPTION2

ALASKA POWER AUTHORITY

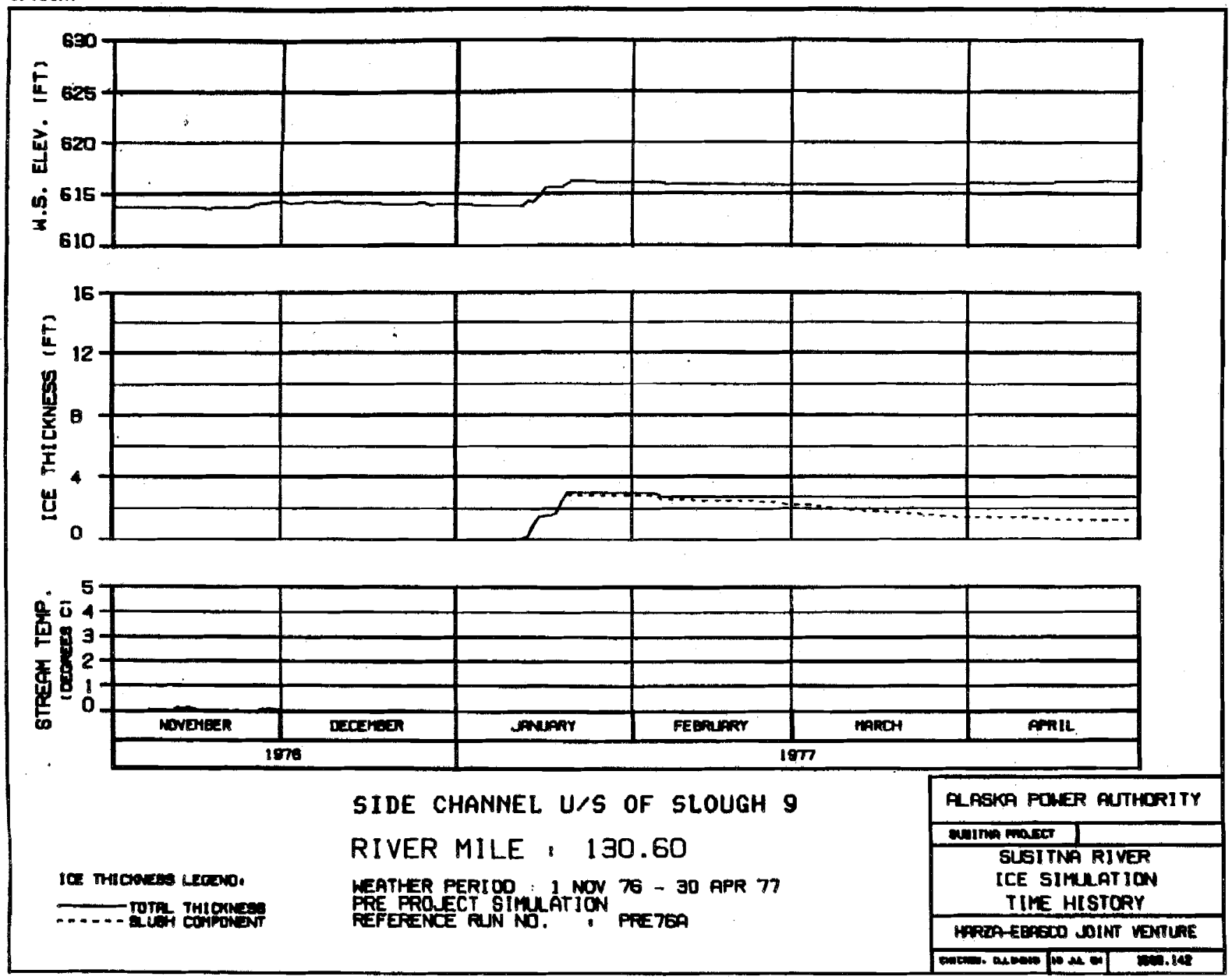
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: B.L.D.S.D. | 10 JUL 84 | 2868.142

OPTION7



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

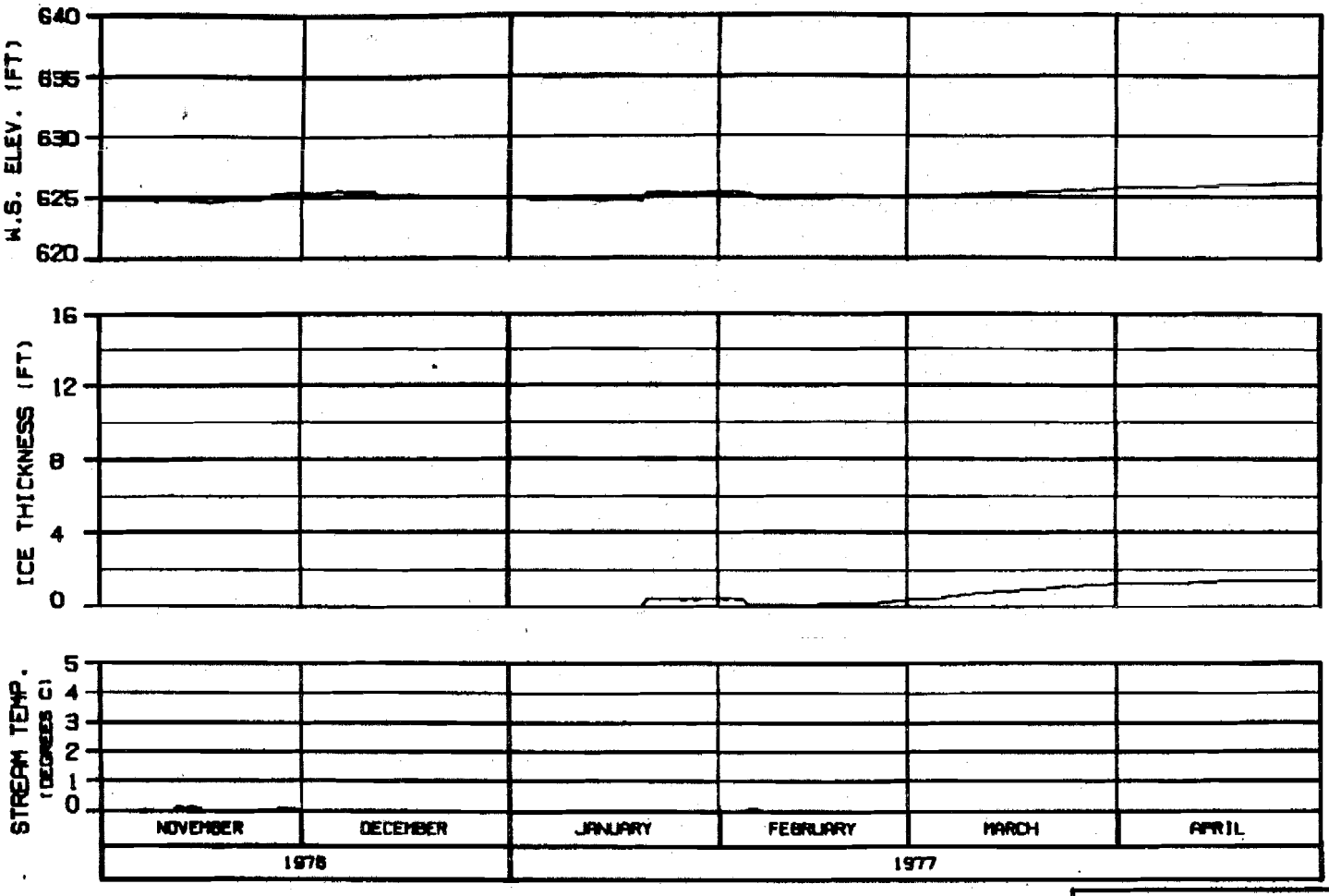
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: D.L.BOGGS	10 JUL 81	1986.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

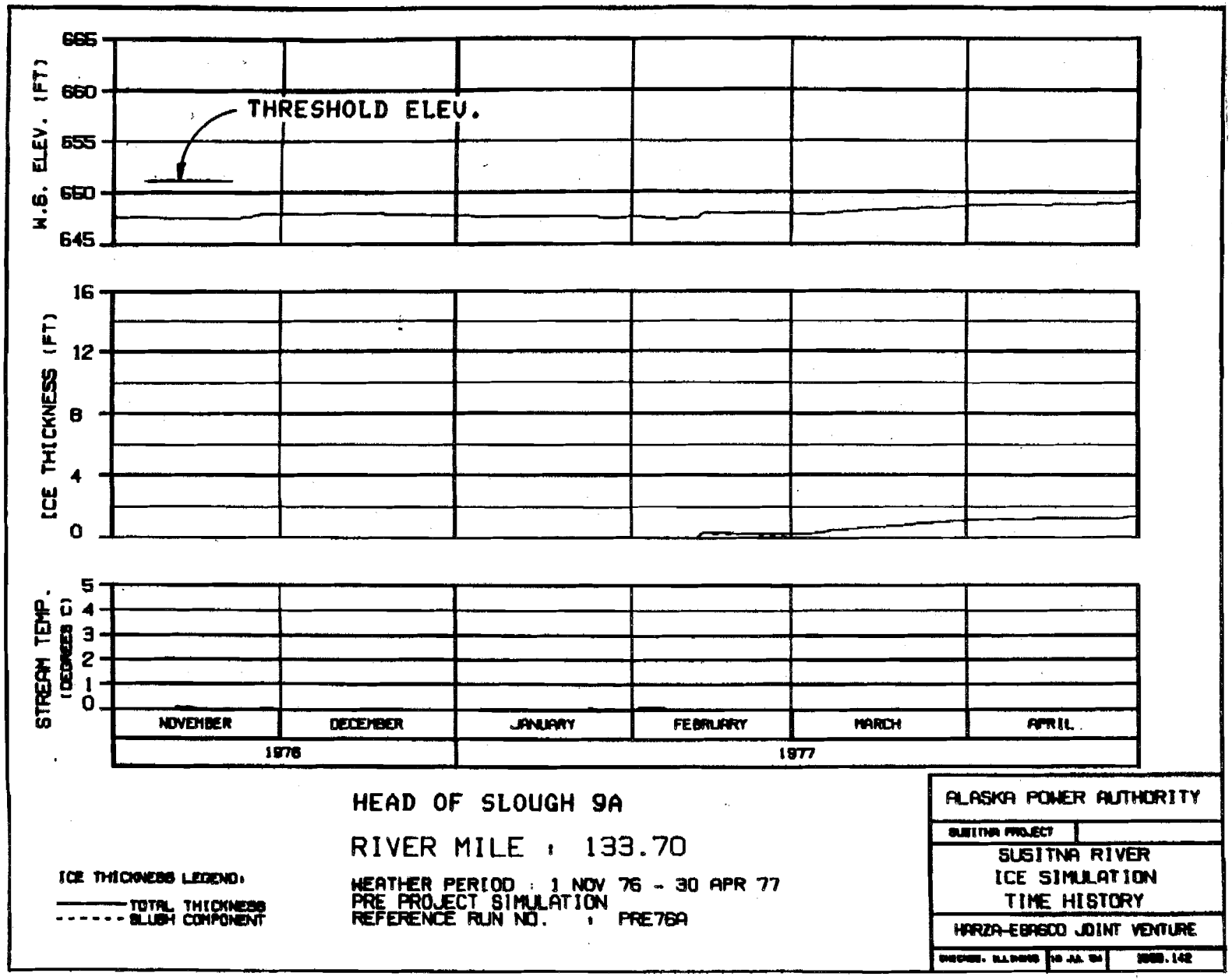
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

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

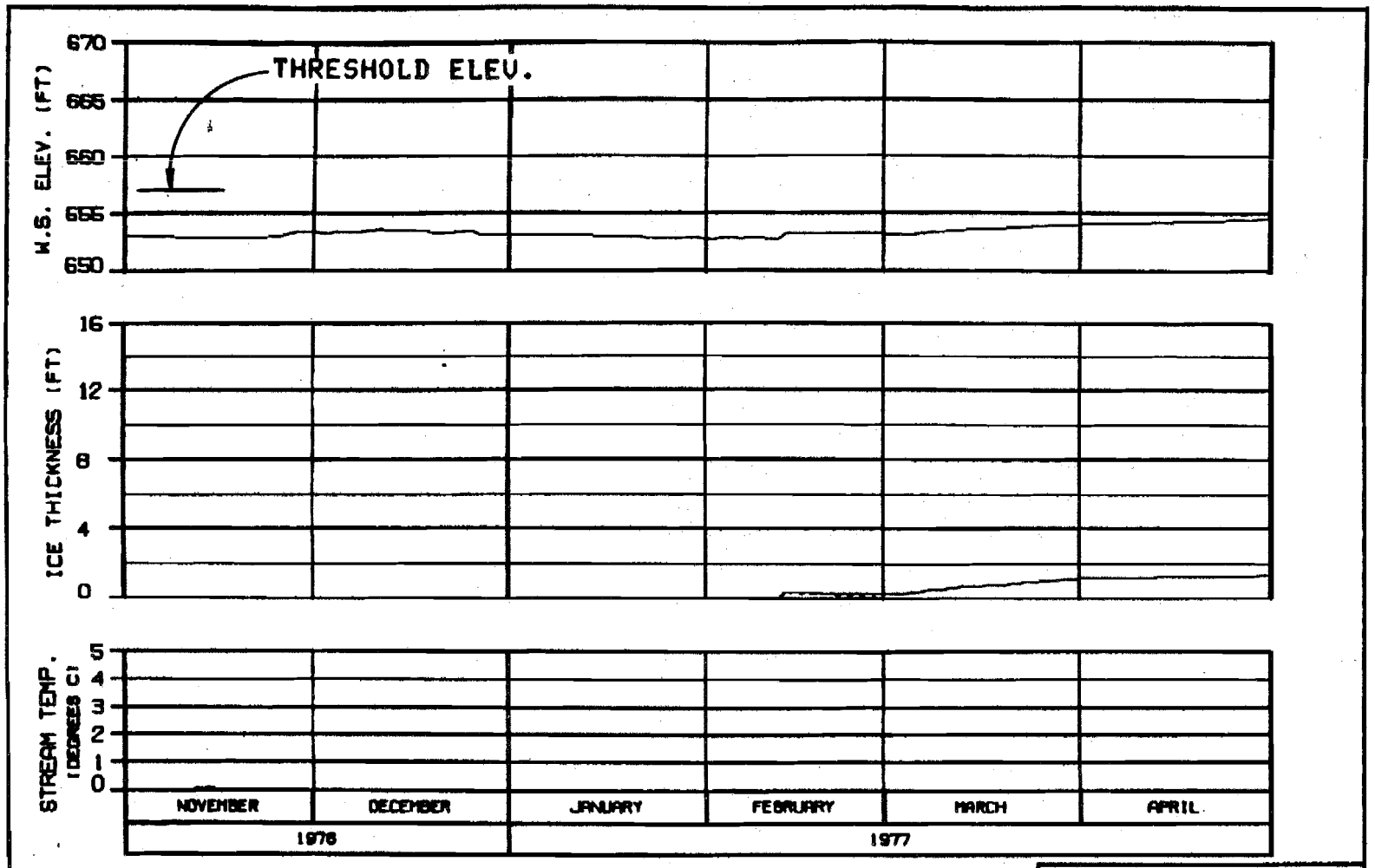
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 2685.142



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
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

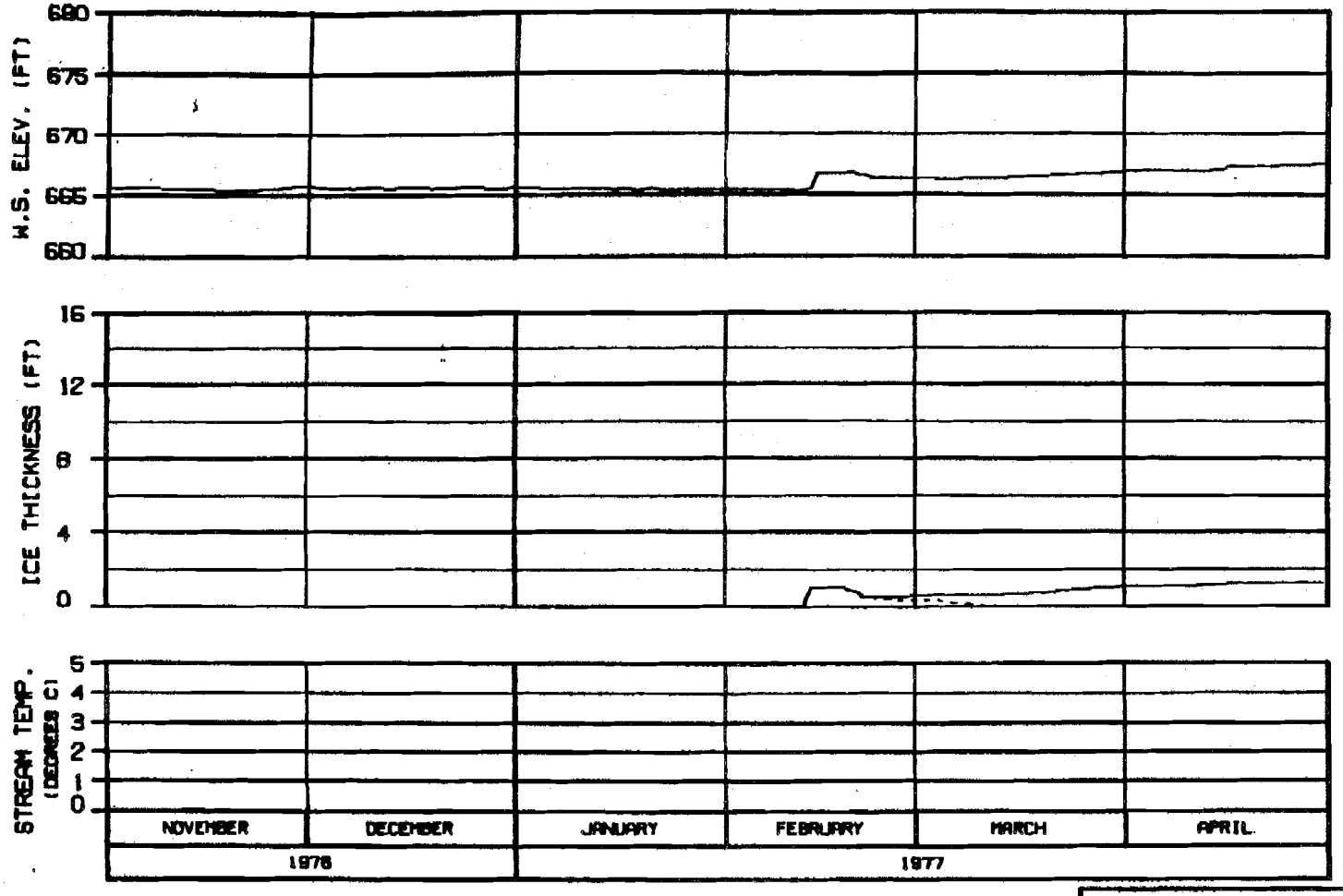
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] ILLINOIS | 30 JUL 84 | [illegible].142



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
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

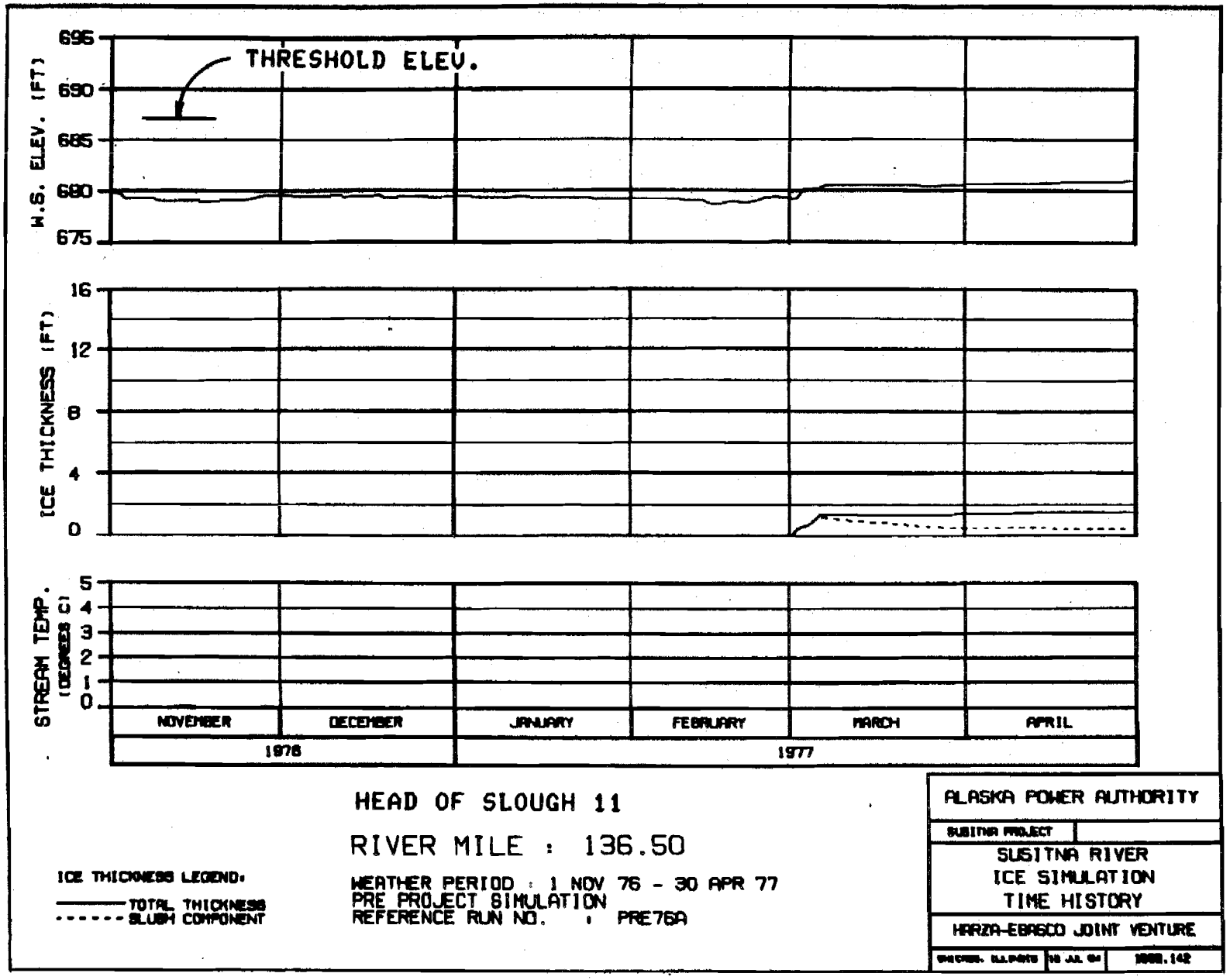
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 2688.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

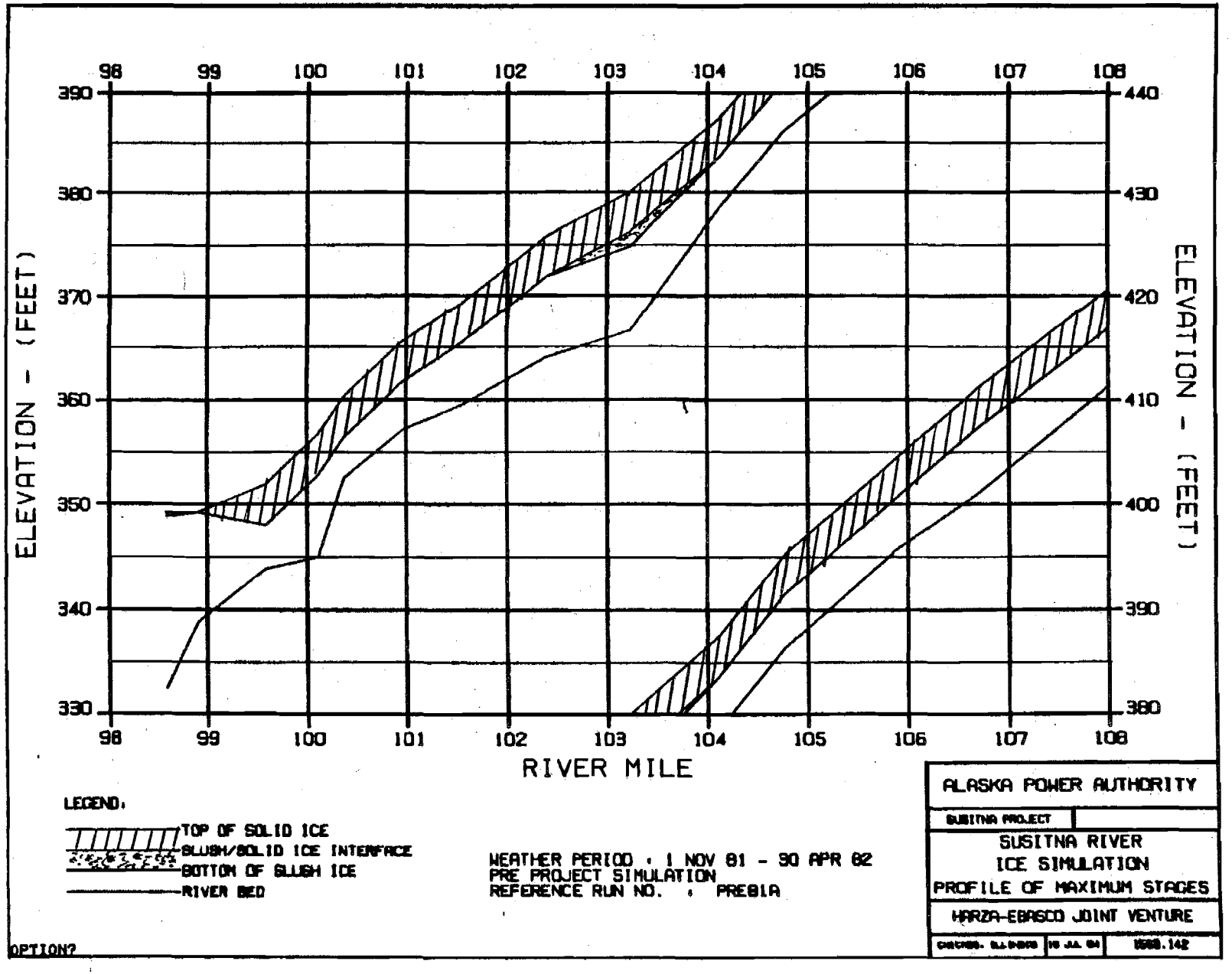
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 10 JUL 84 1888.142

EXHIBIT D

C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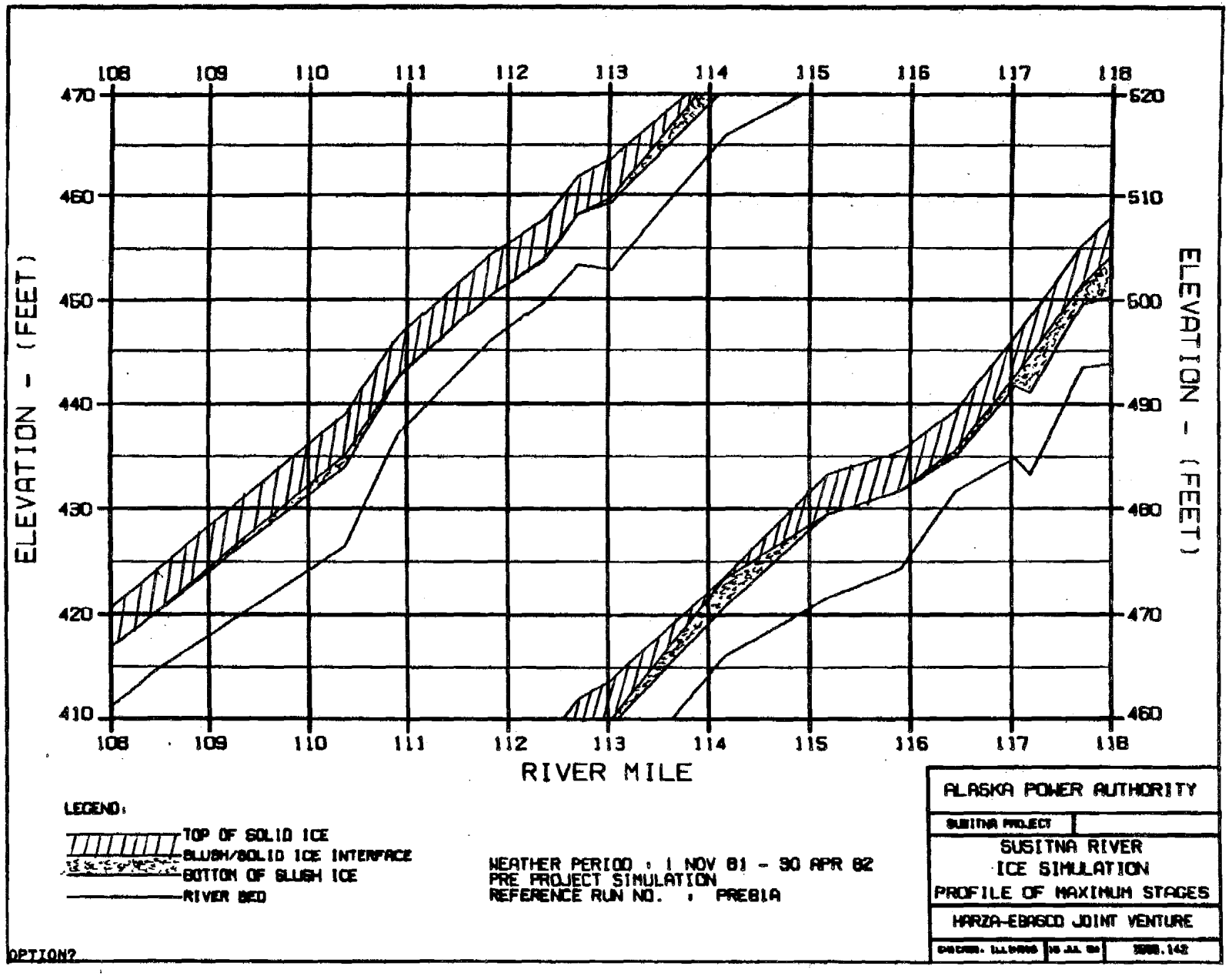
410
400
390
380
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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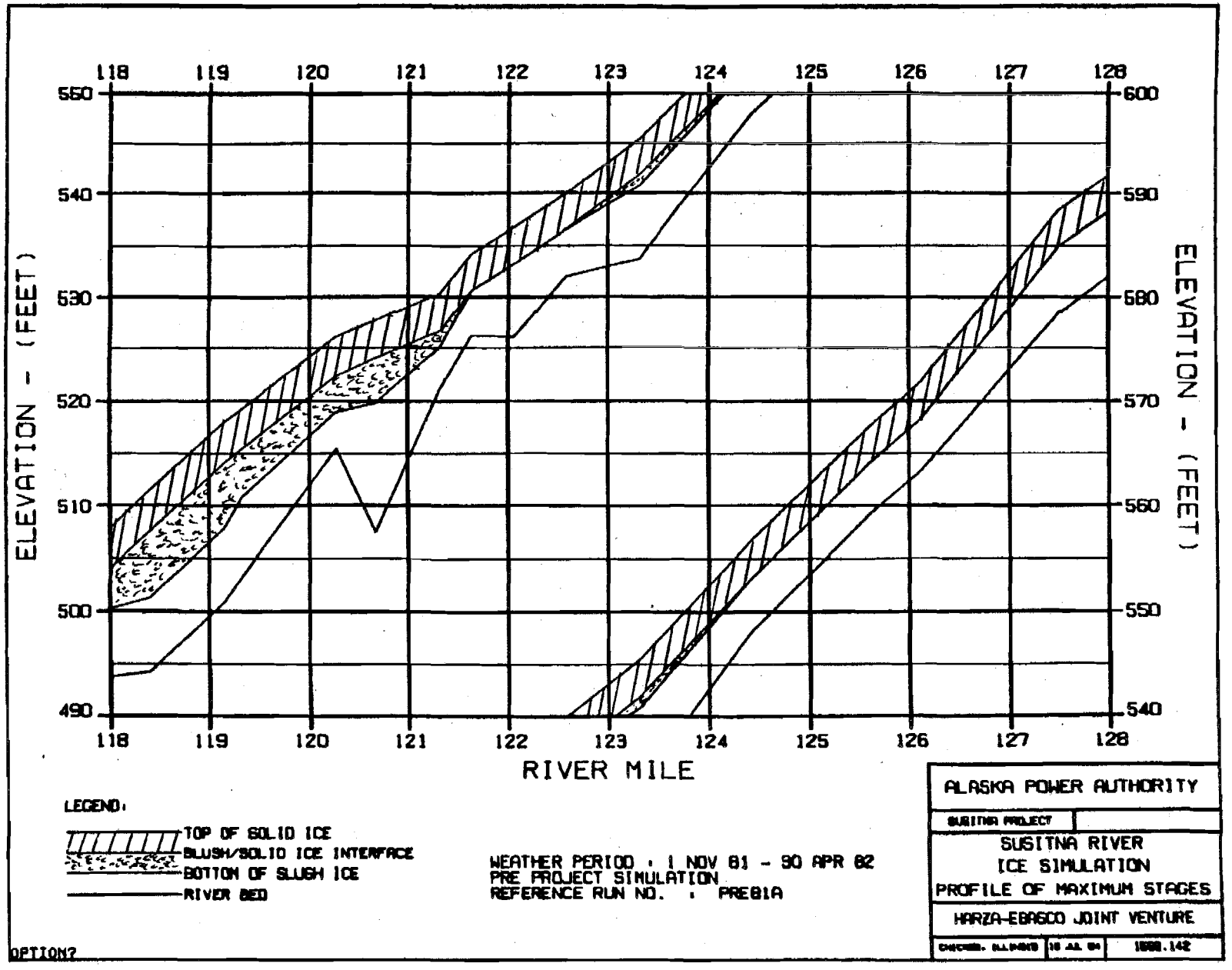
490
480
470
460
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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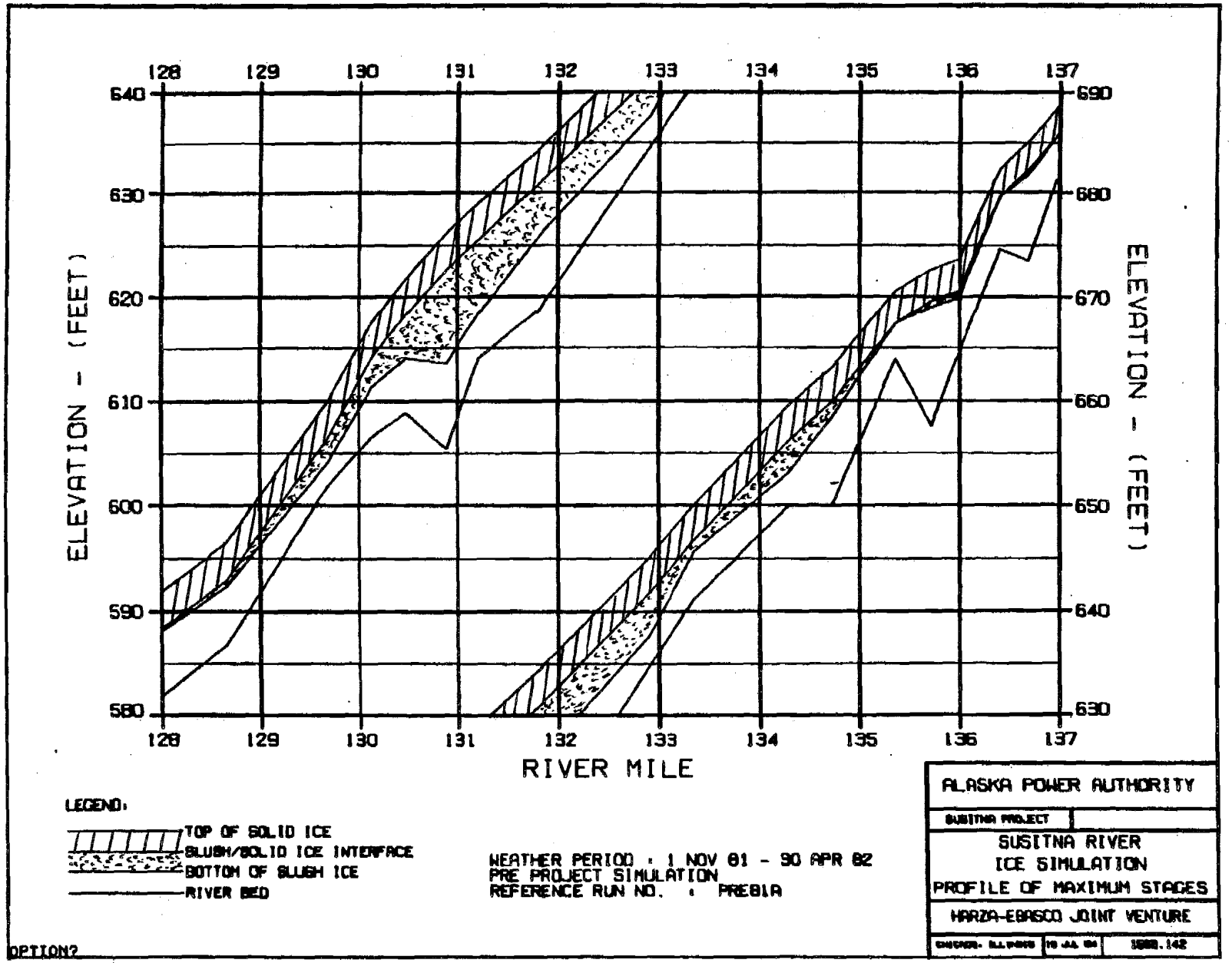
550
540
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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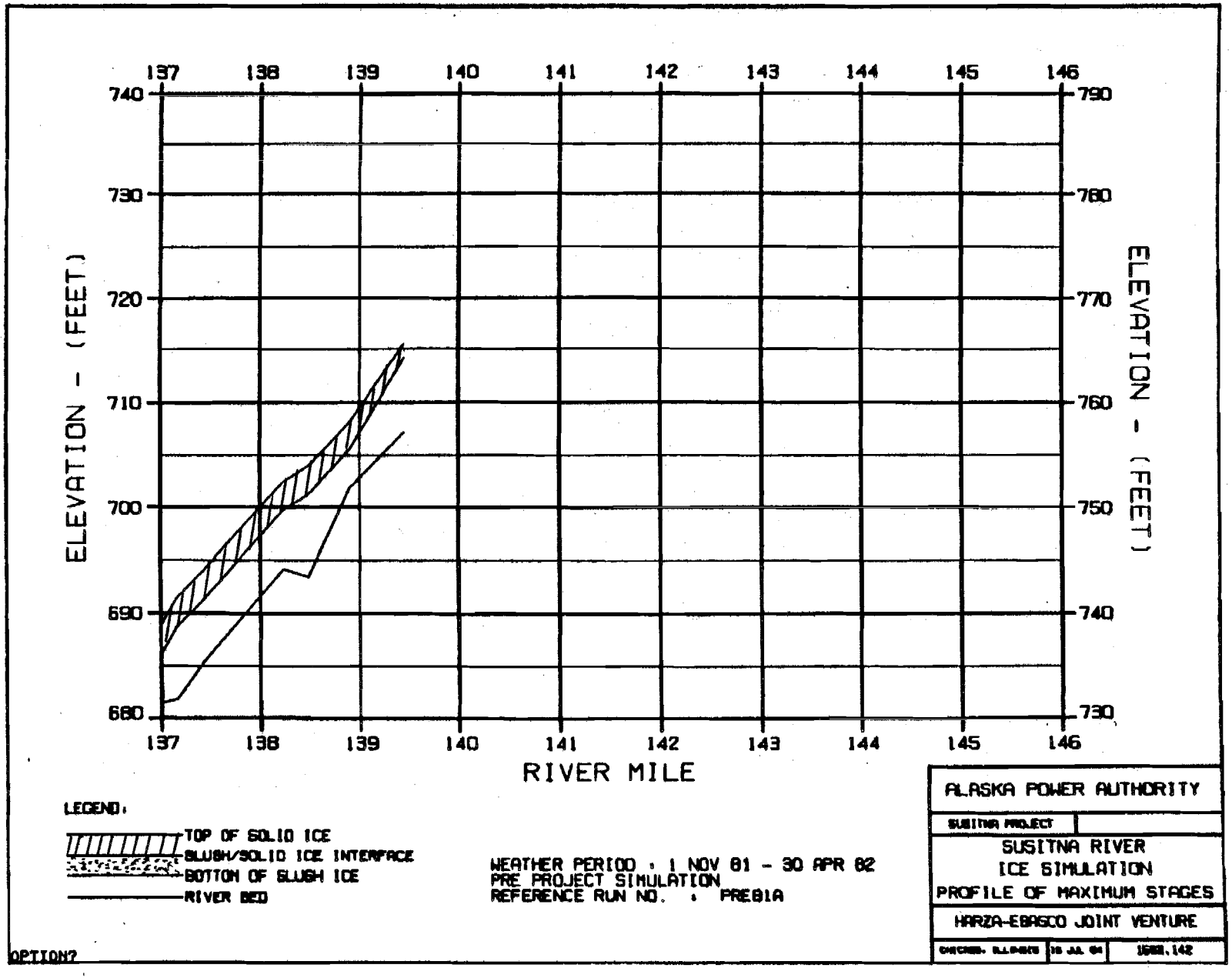
660
650
640
630
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PREBIA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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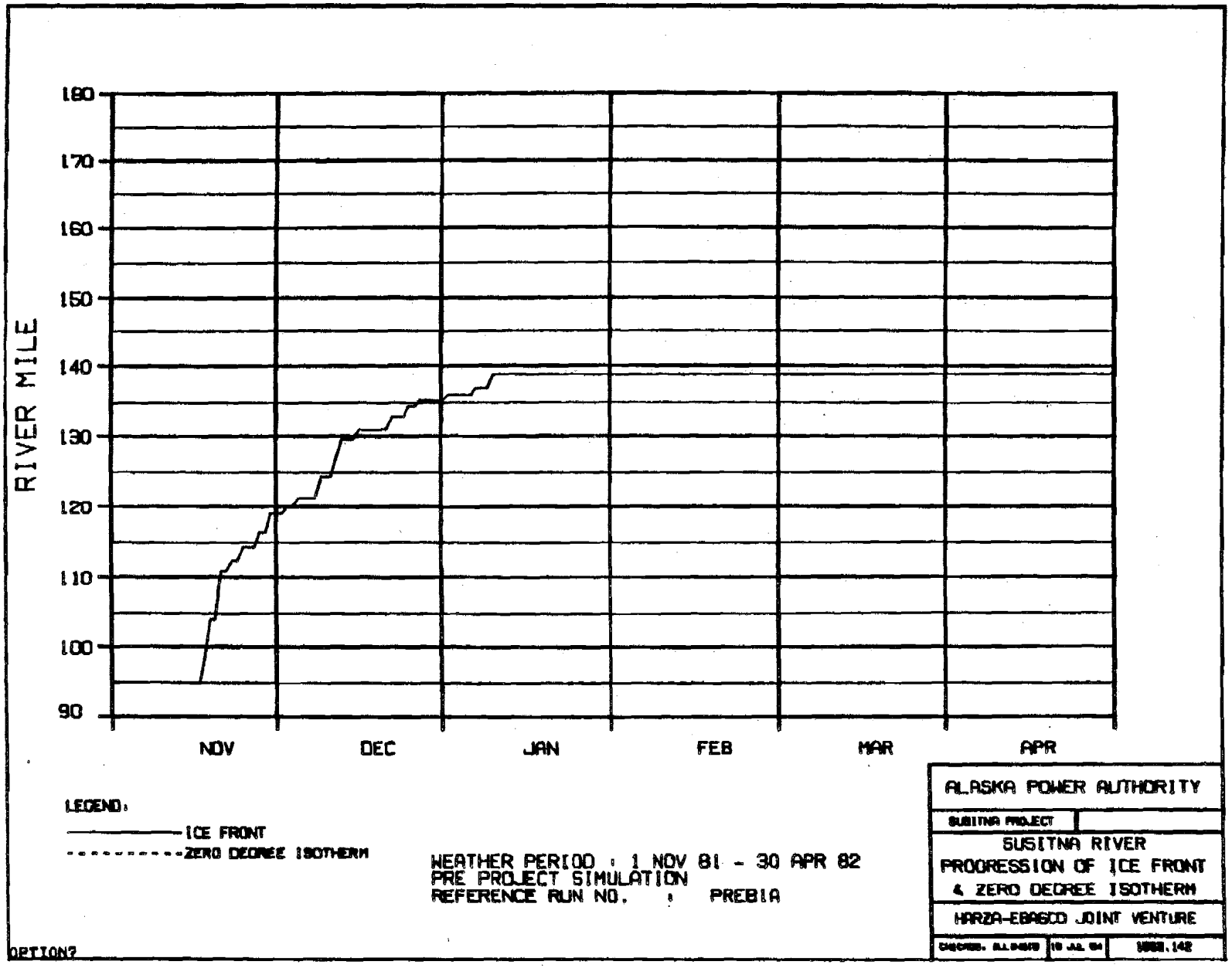
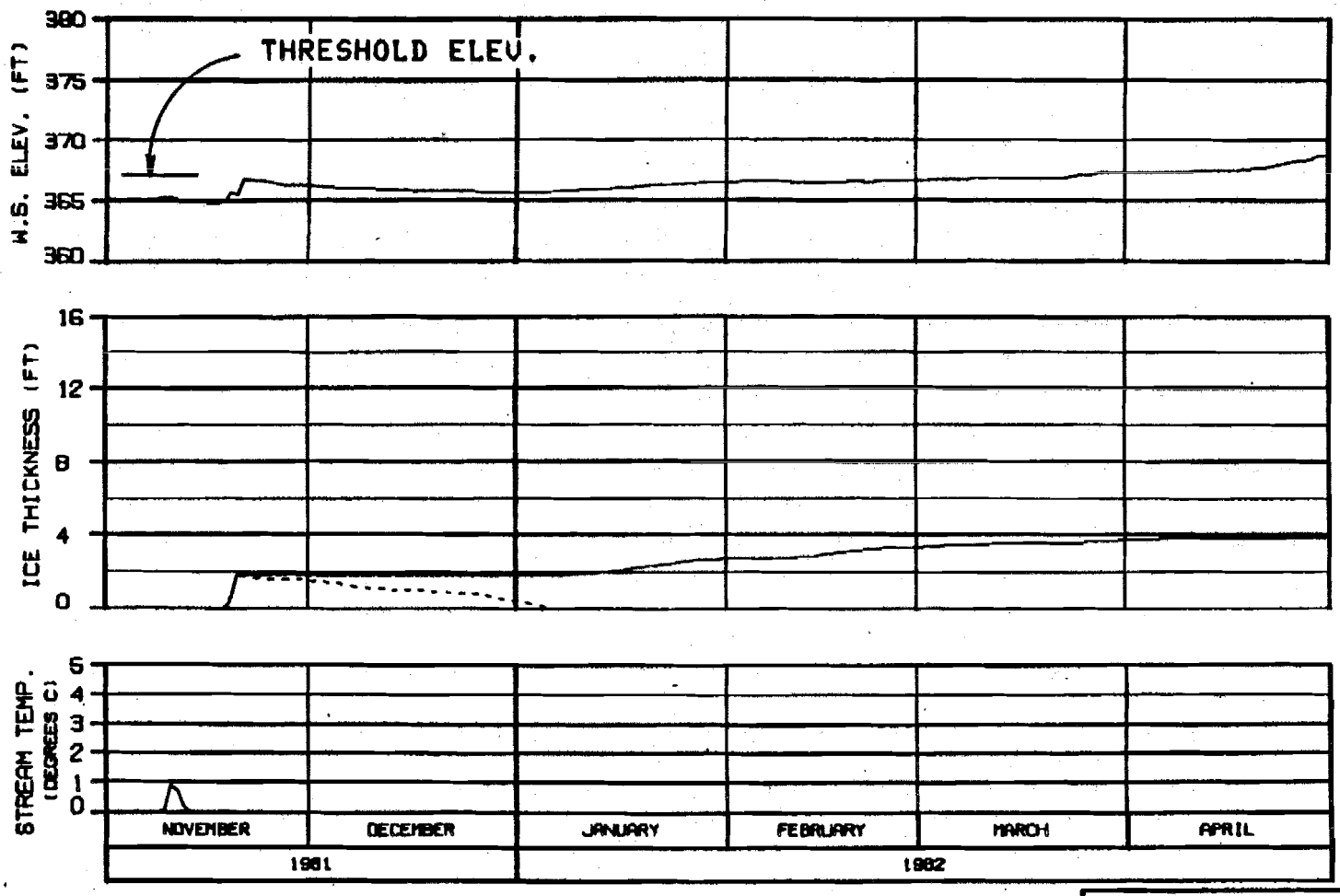
690
680
790
780
770
760
750
740
730
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PREB1A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?


180
170
160
150
140
130
120
110
100
90
RIVER MILE
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PREB1A
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

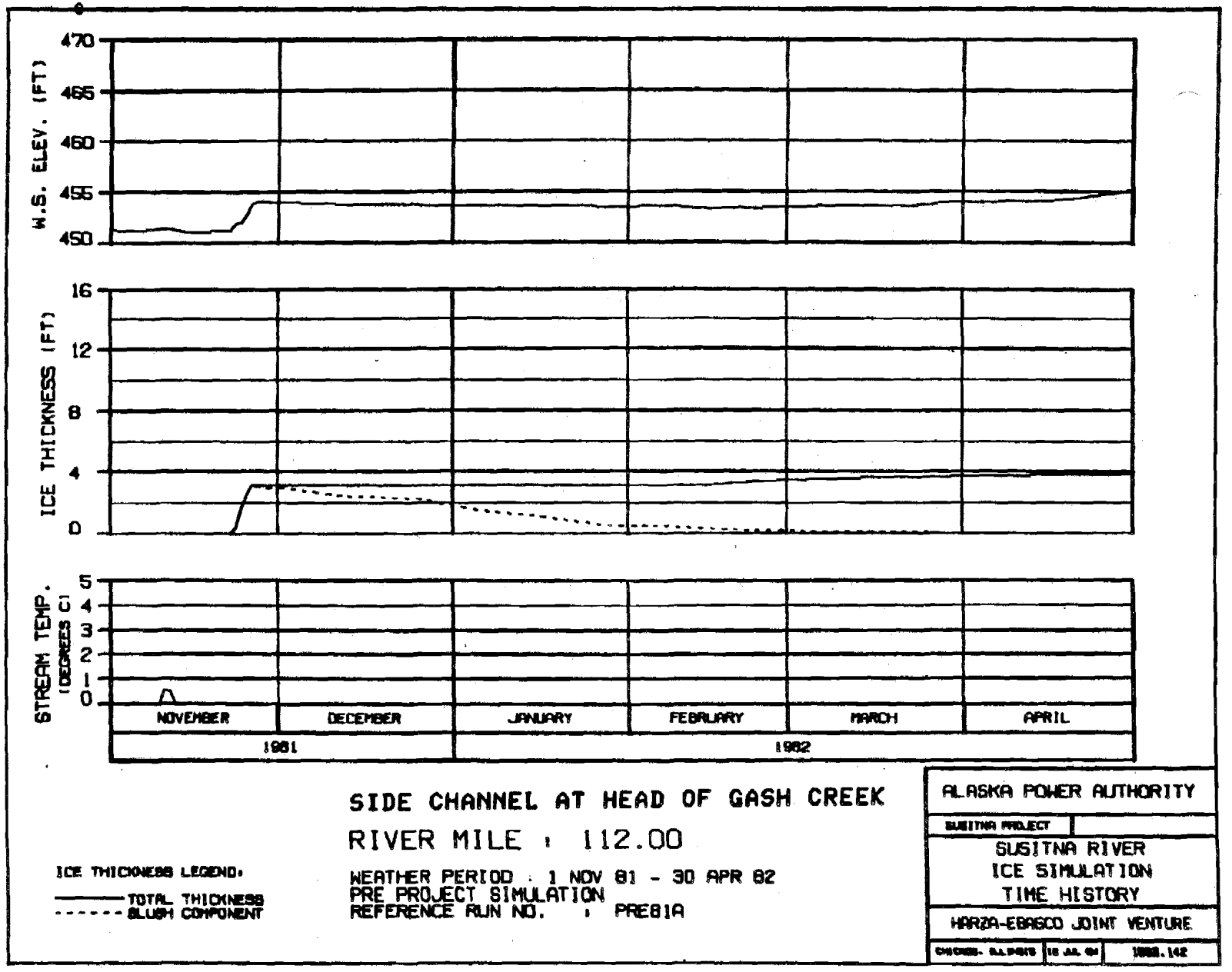
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	15 JUL 84	1668.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

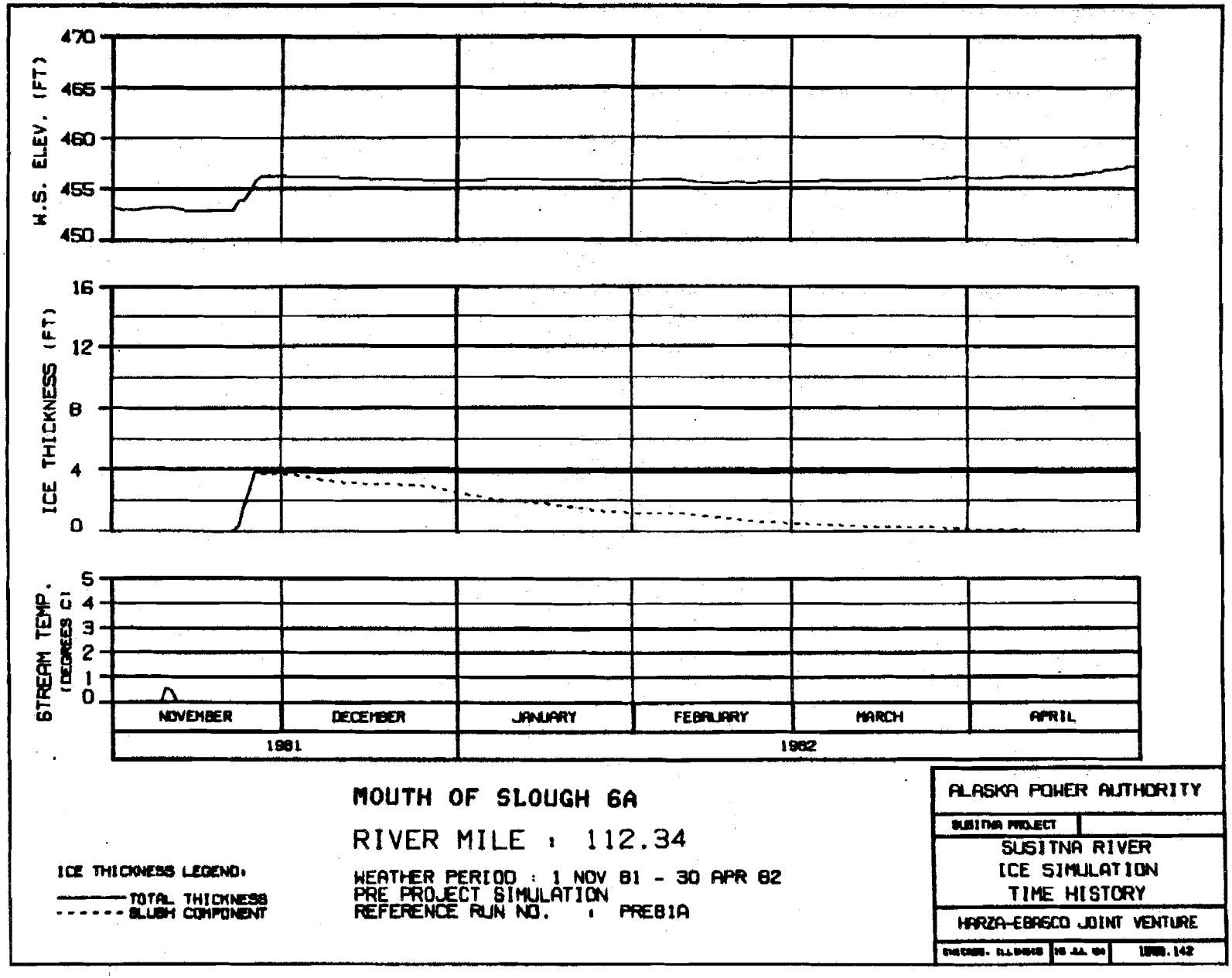
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: A.L.PAYNE | 18 JUL 88 | 1988.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY

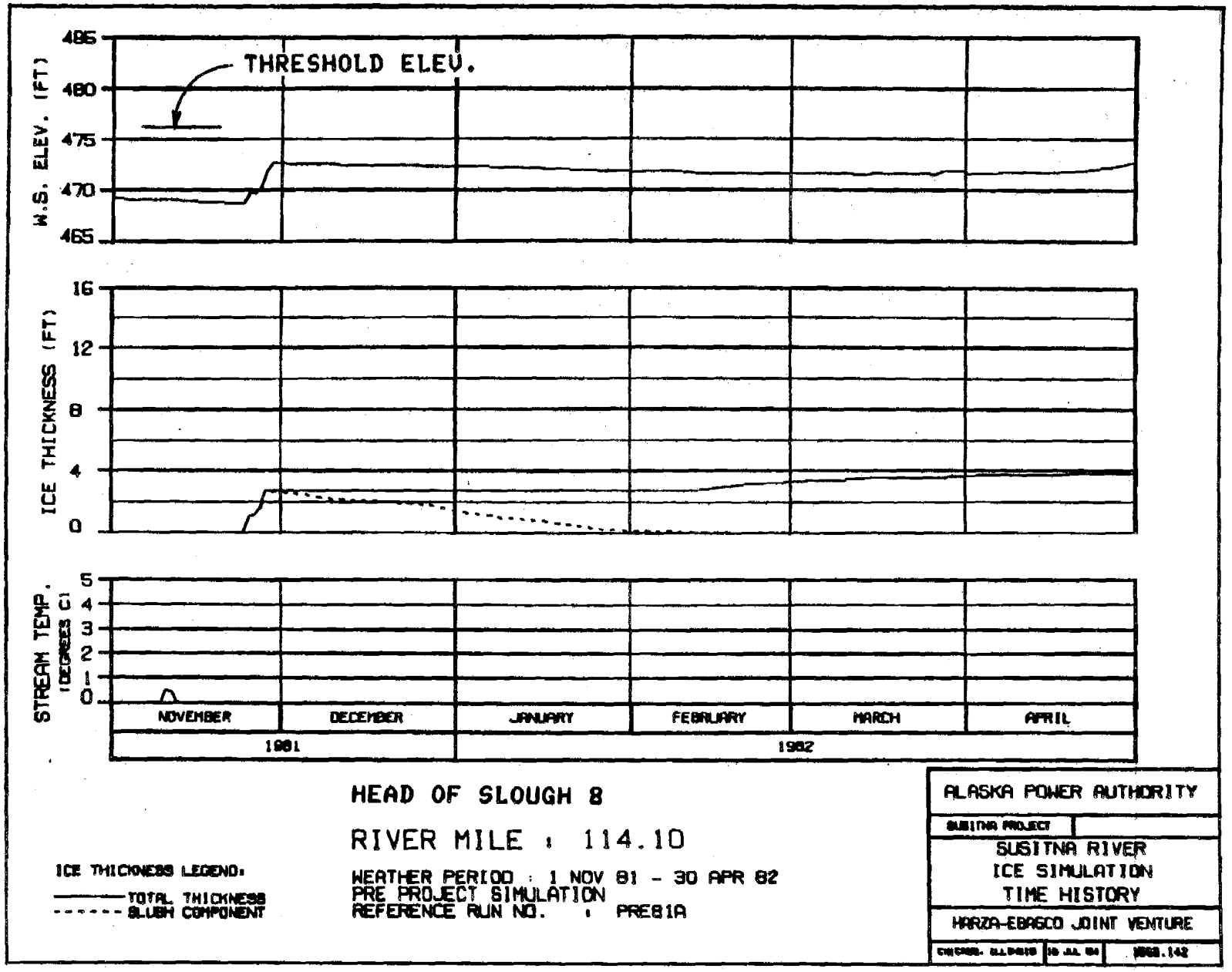
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142

OPTION7



HEAD OF SLOUGH 8

RIVER MILE : 114.10

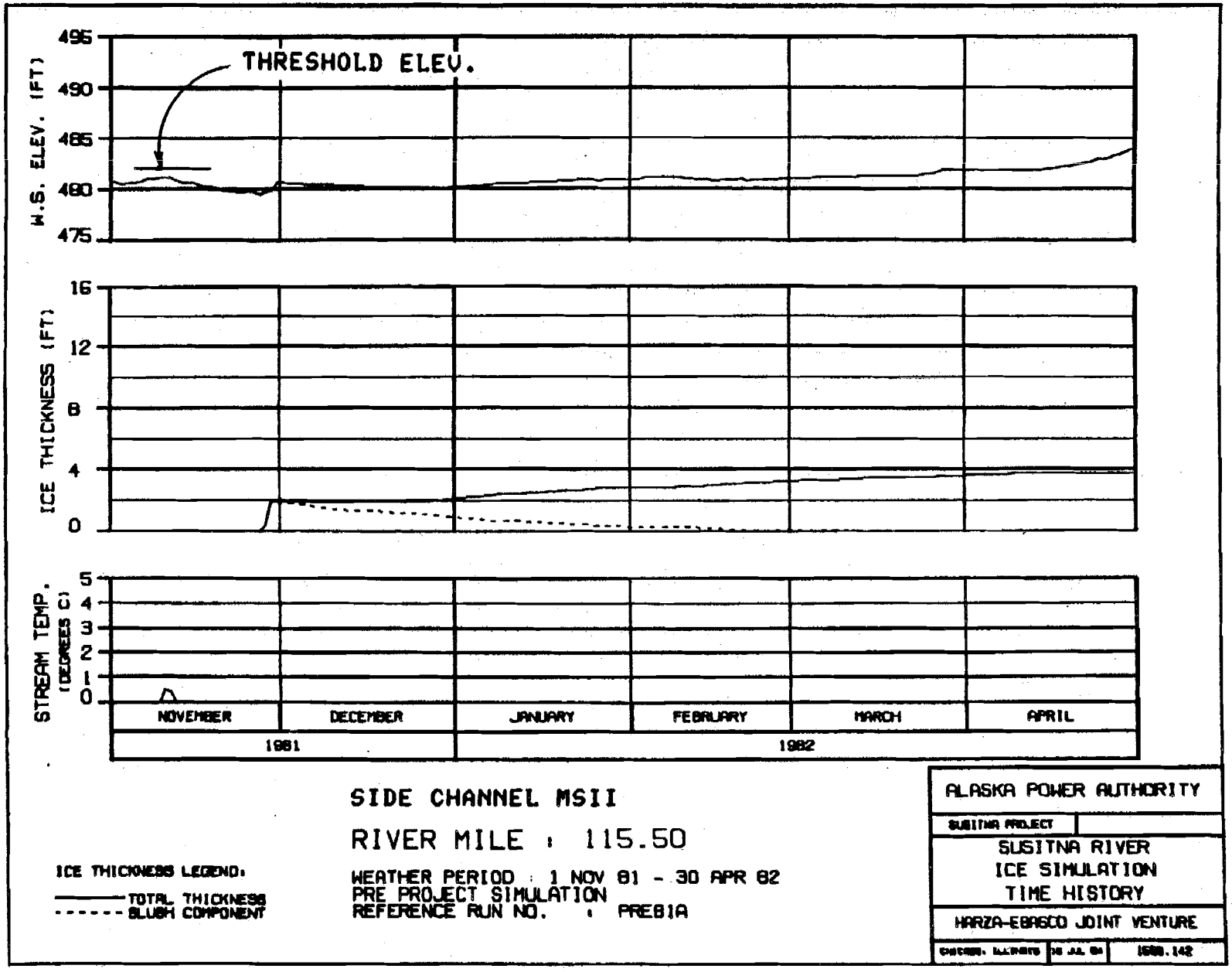
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	16 JUL 84	1868.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

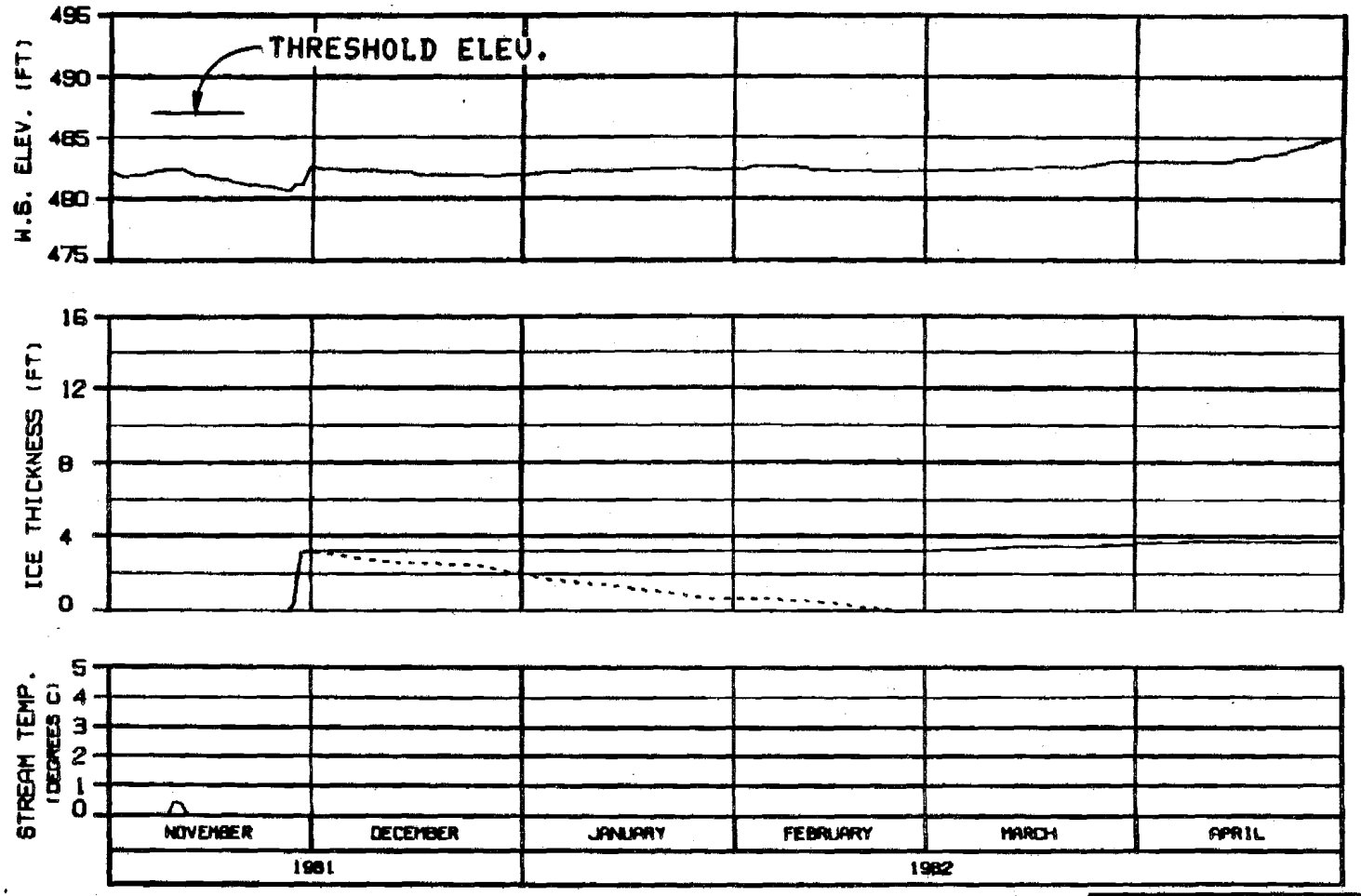
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 16 JUL 84 | 1680.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

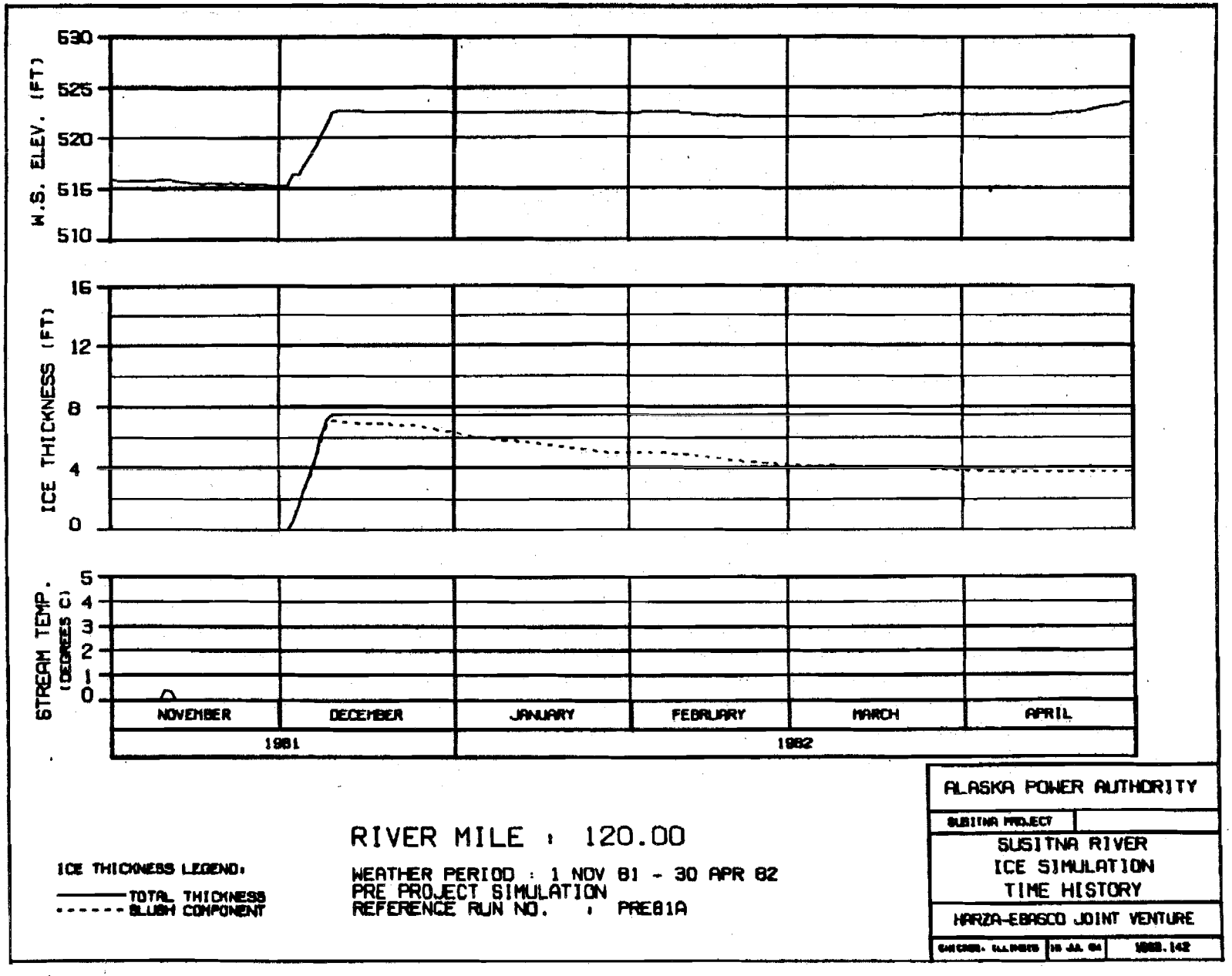
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

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



RIVER MILE : 120.00

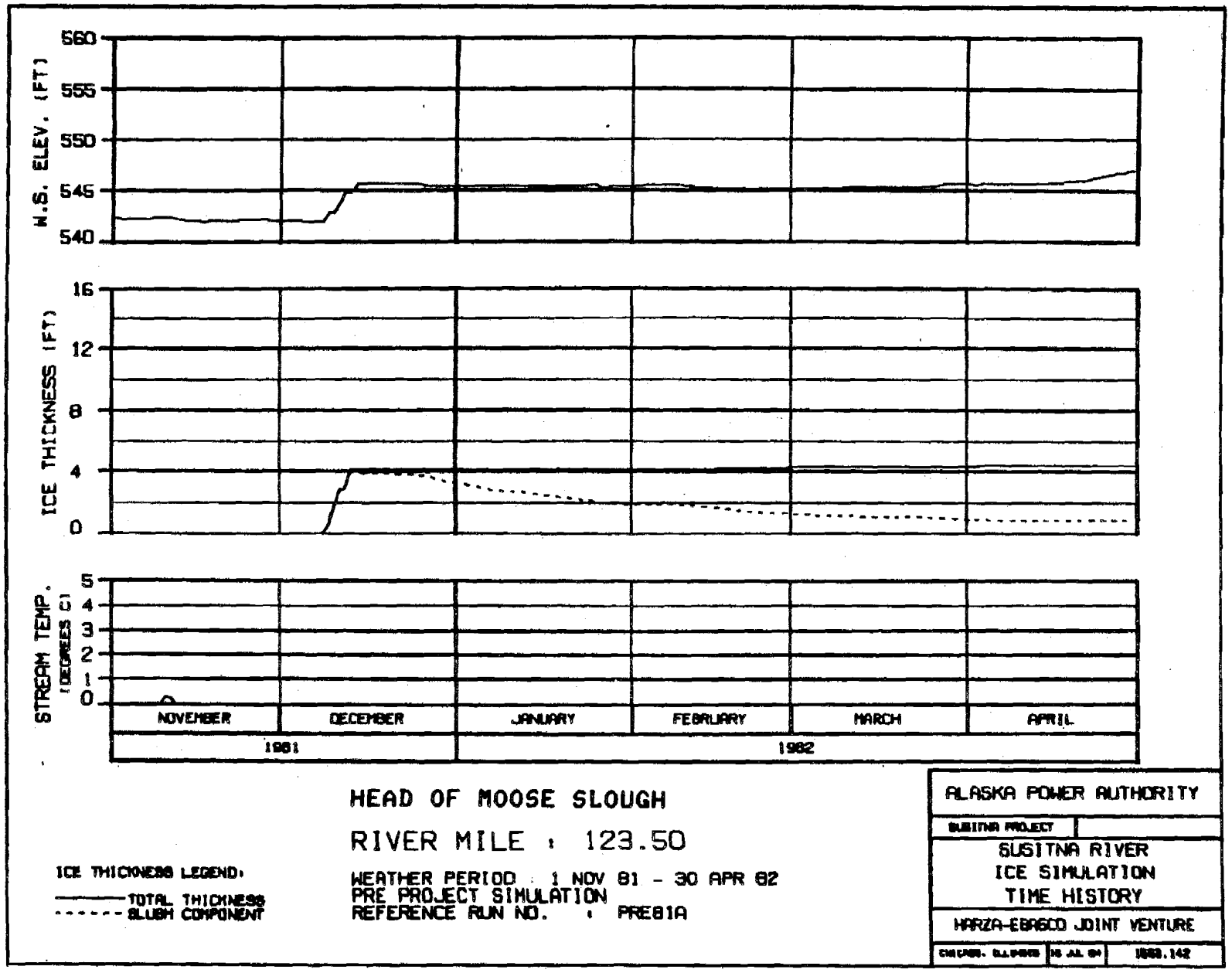
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	16 JUL 84



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

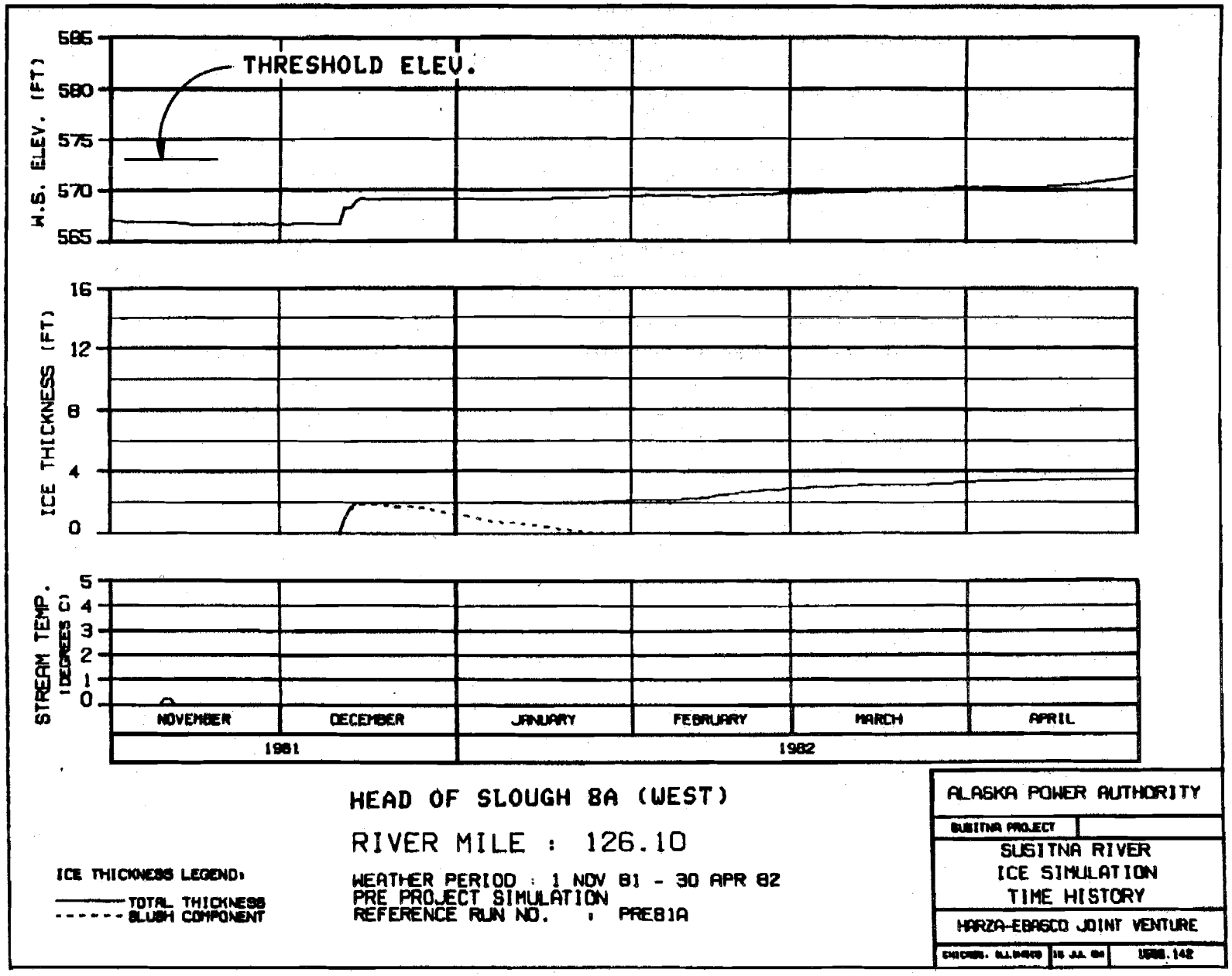
ICE THICKNESS LEGEND:

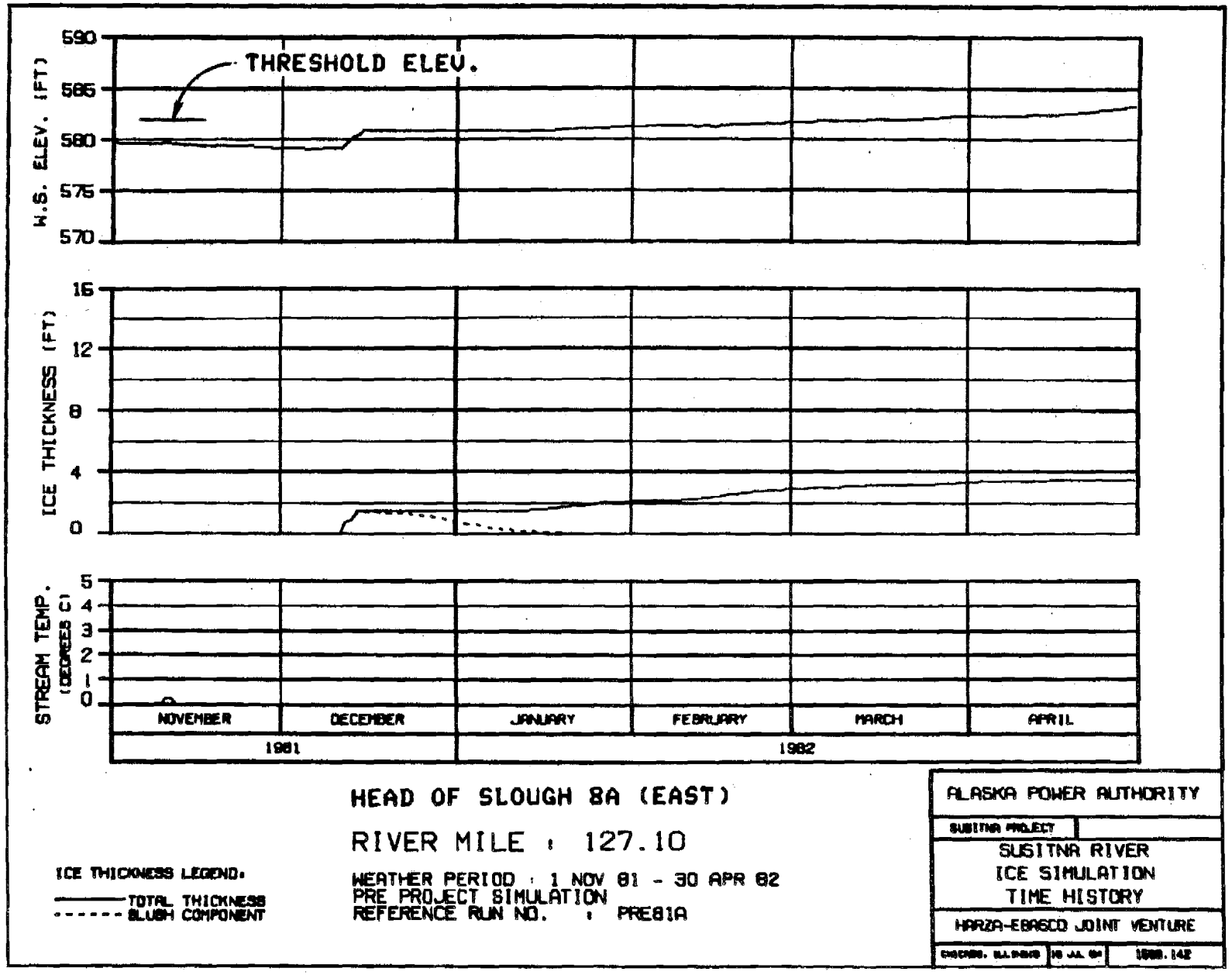
——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | 16 JUL 84 | 1868.142


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
1981
1982
HEAD OF SLOUGH 8A (WEST)
RIVER MILE : 126.10
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

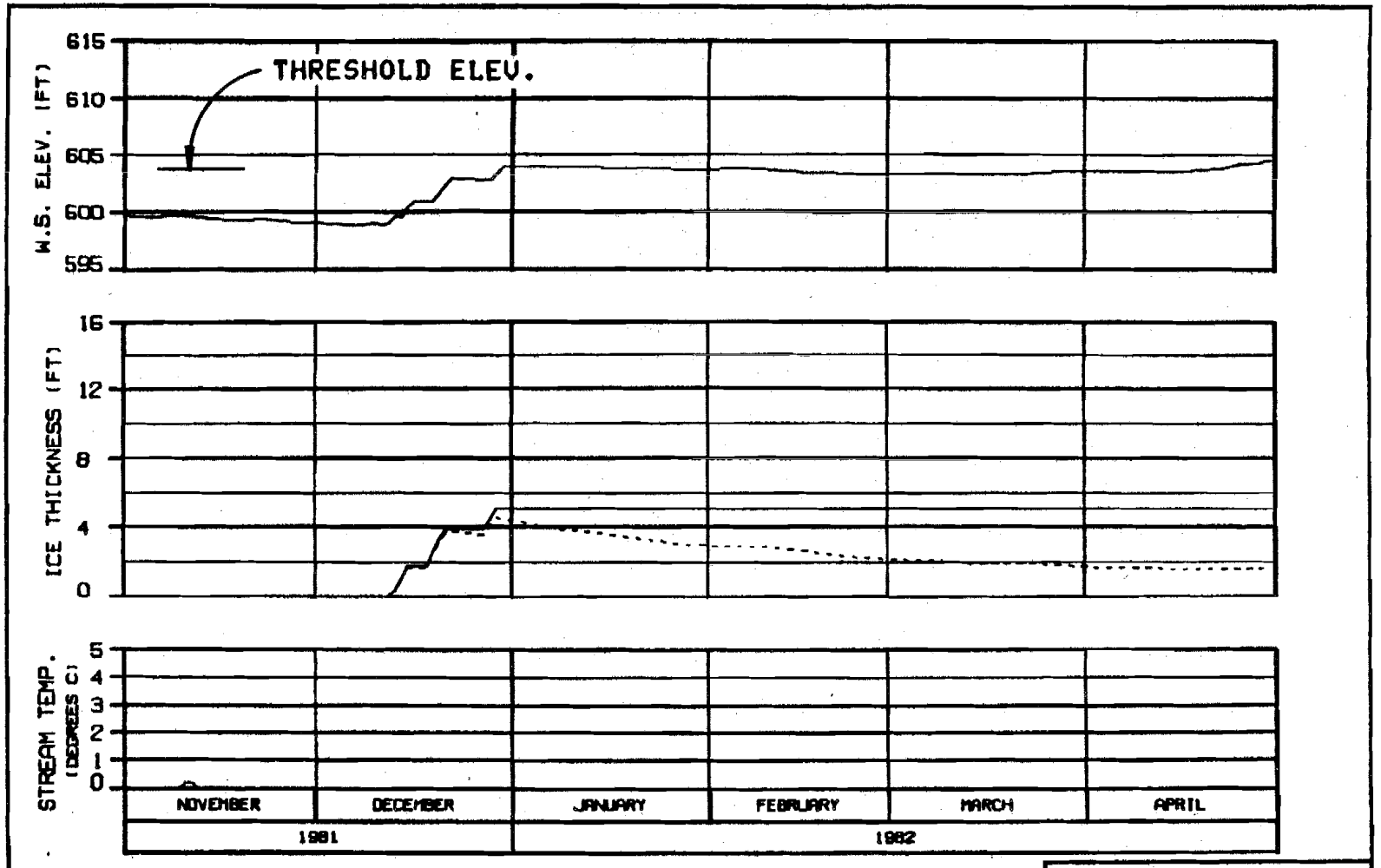
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 16 JUL 84 1888.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

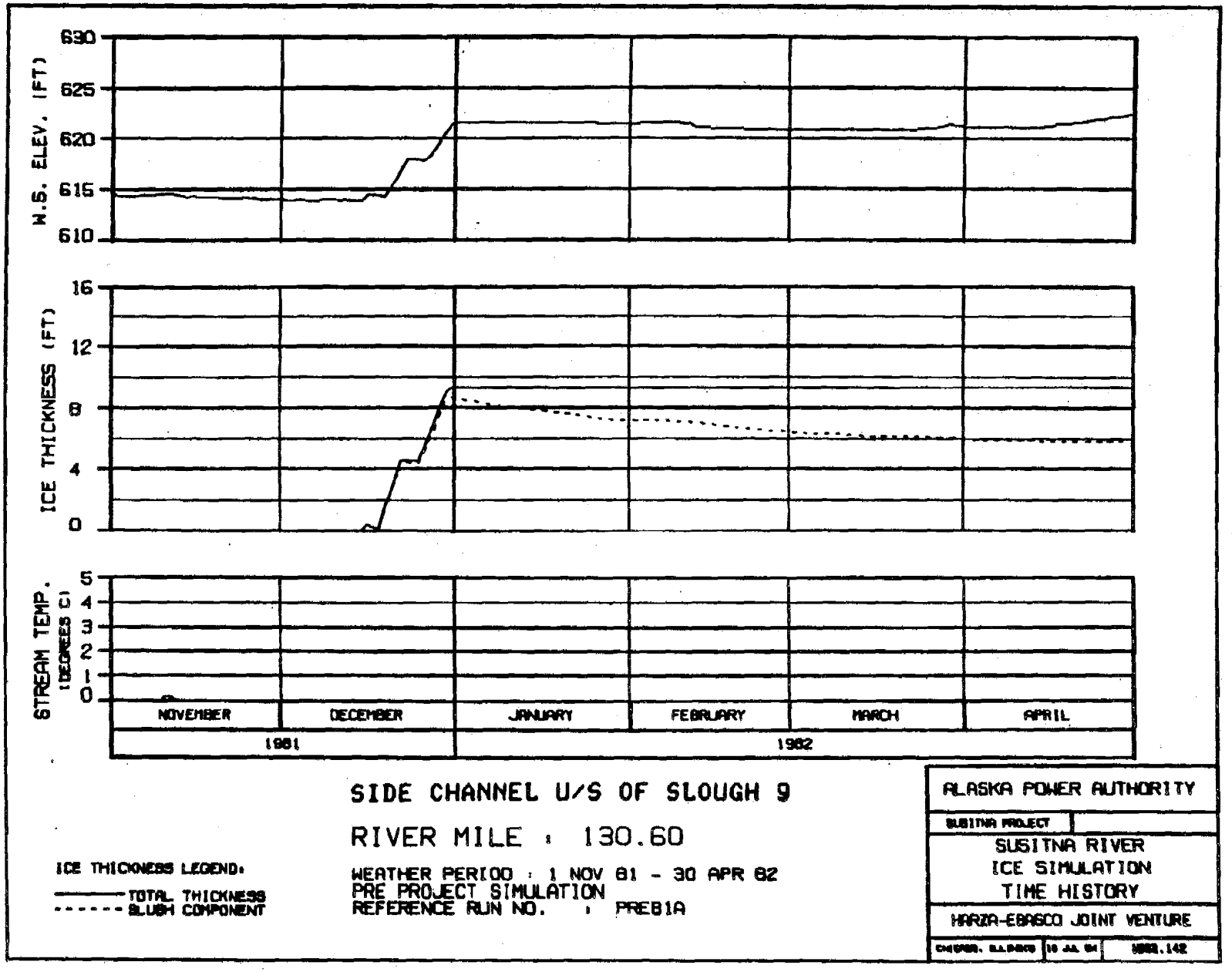
- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

OPTION?

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	19 JUL 84	1883.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PREB1A

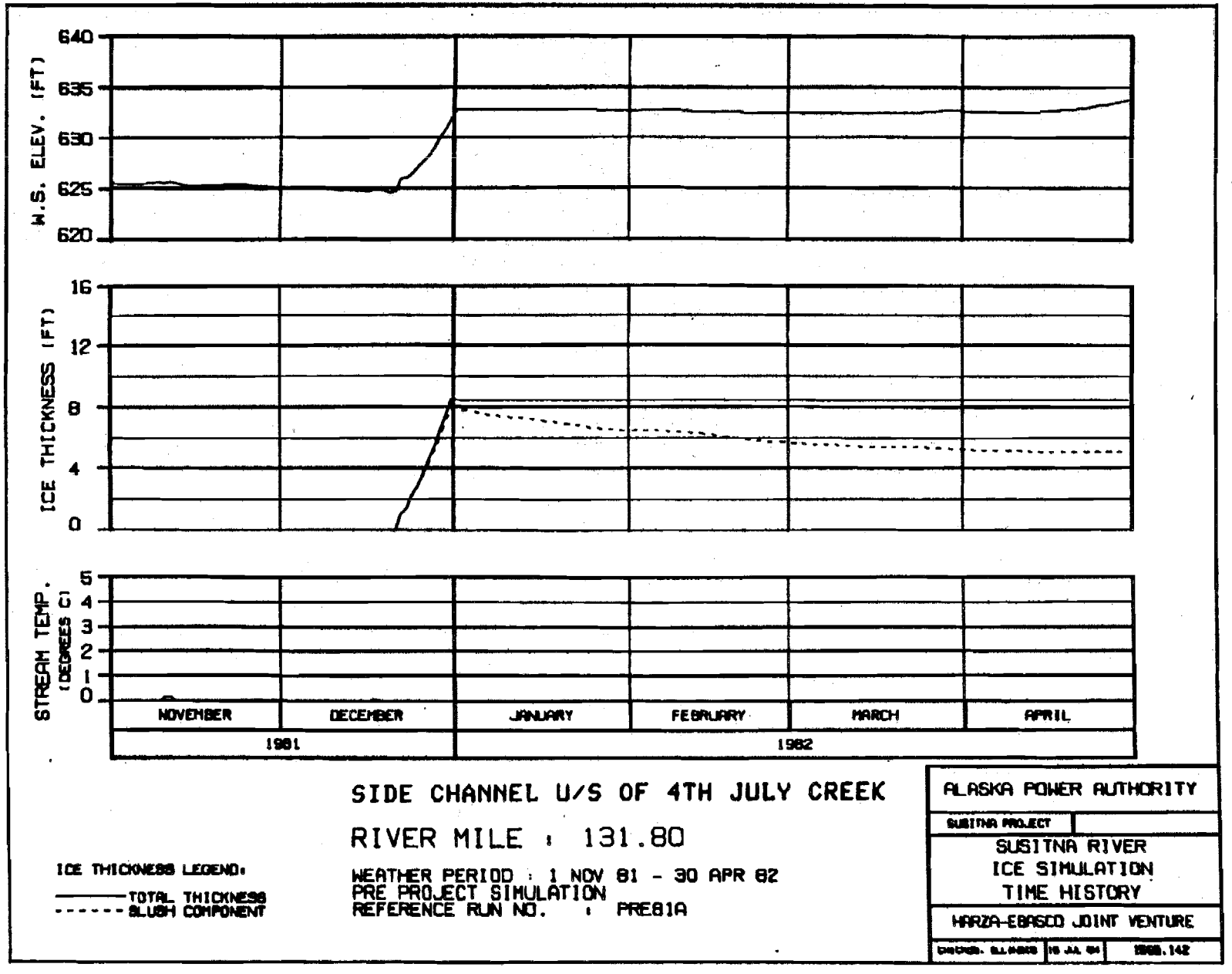
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHKD. [illegible] | 10 JUL 84 | [illegible].142



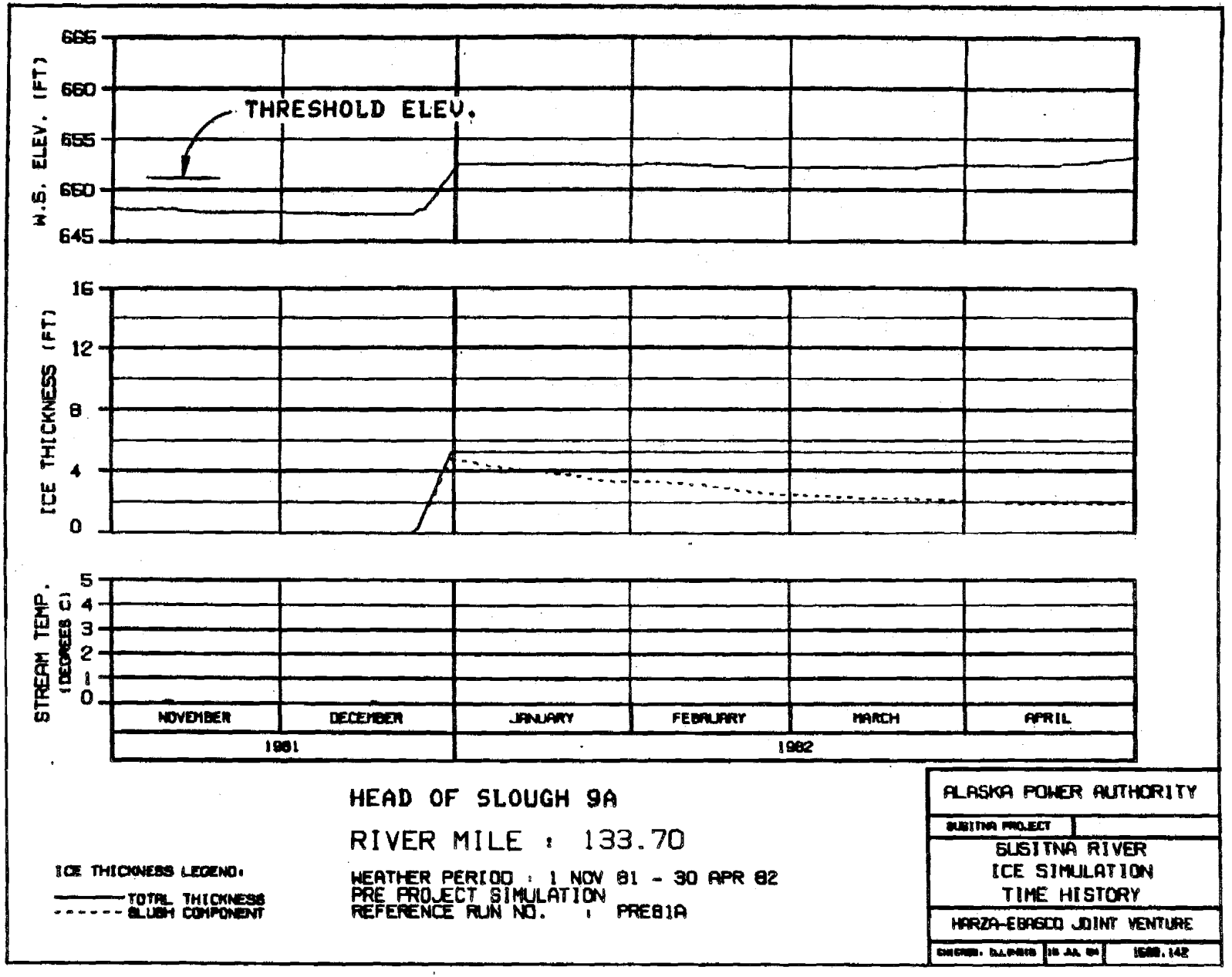
SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: B.L.A.B.B.	15 JUL 84 / 1988.142



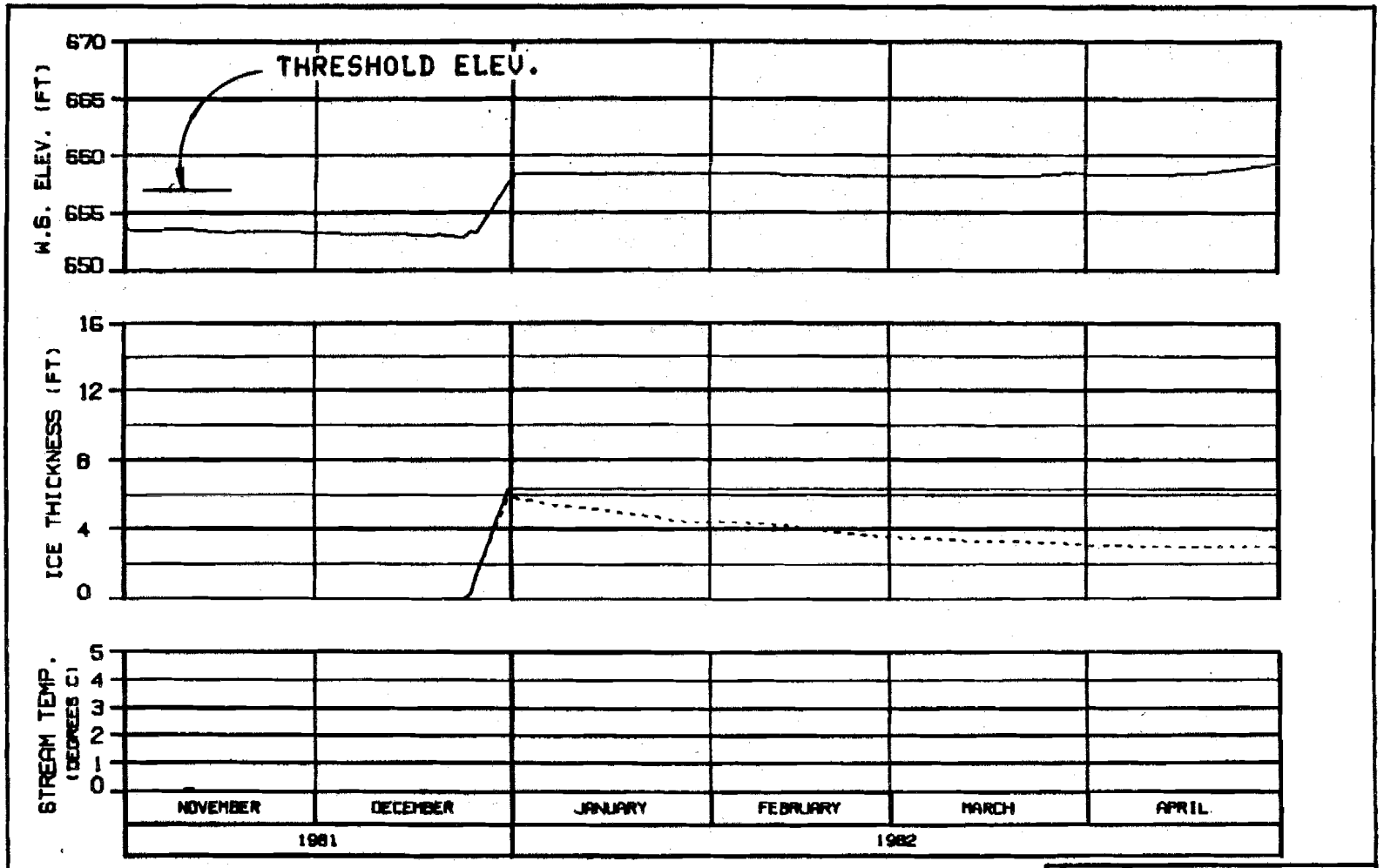
HEAD OF SLOUGH 9A

RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

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 SLOUGH 10

RIVER MILE : 134.30

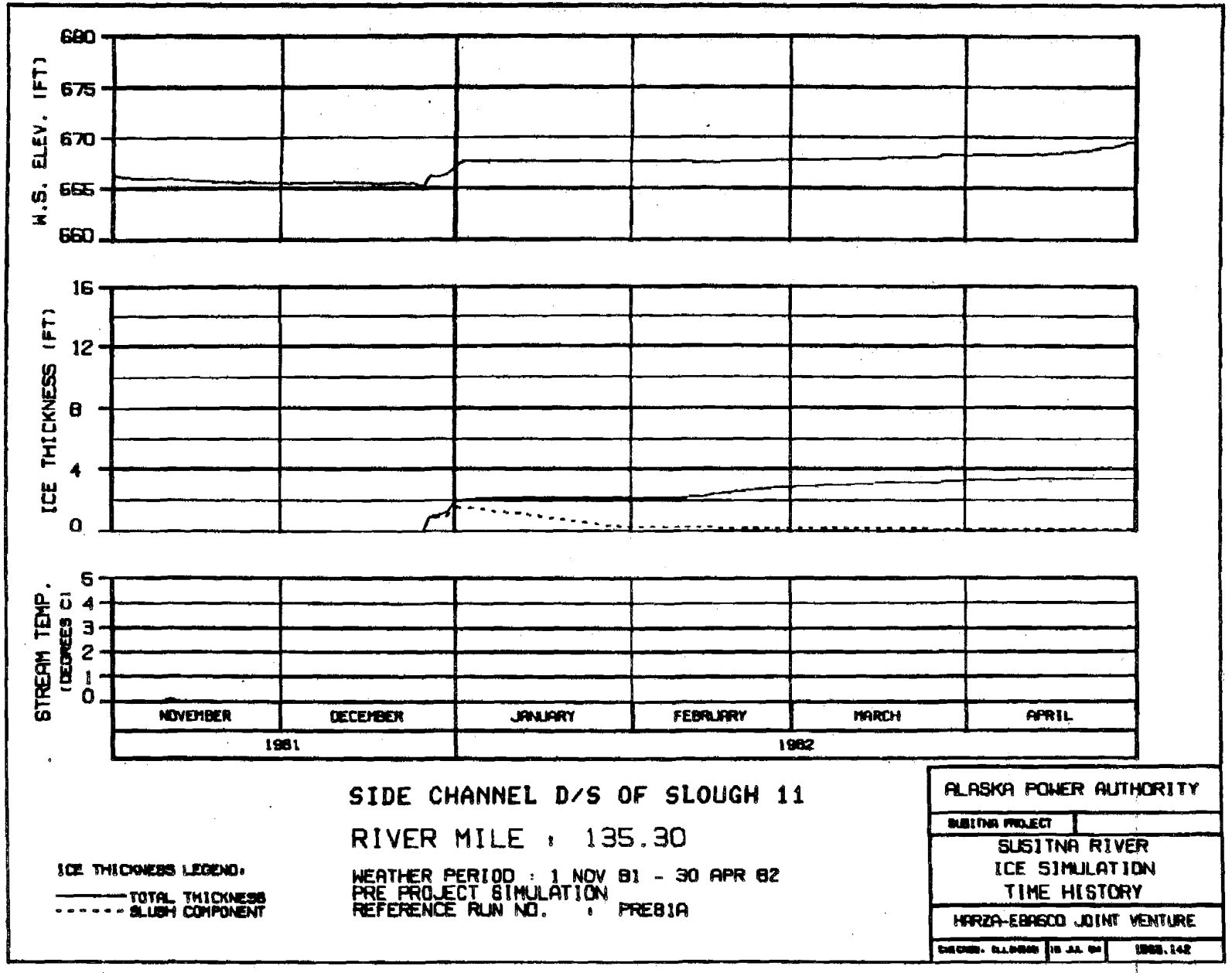
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	16 JA 84	1588.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

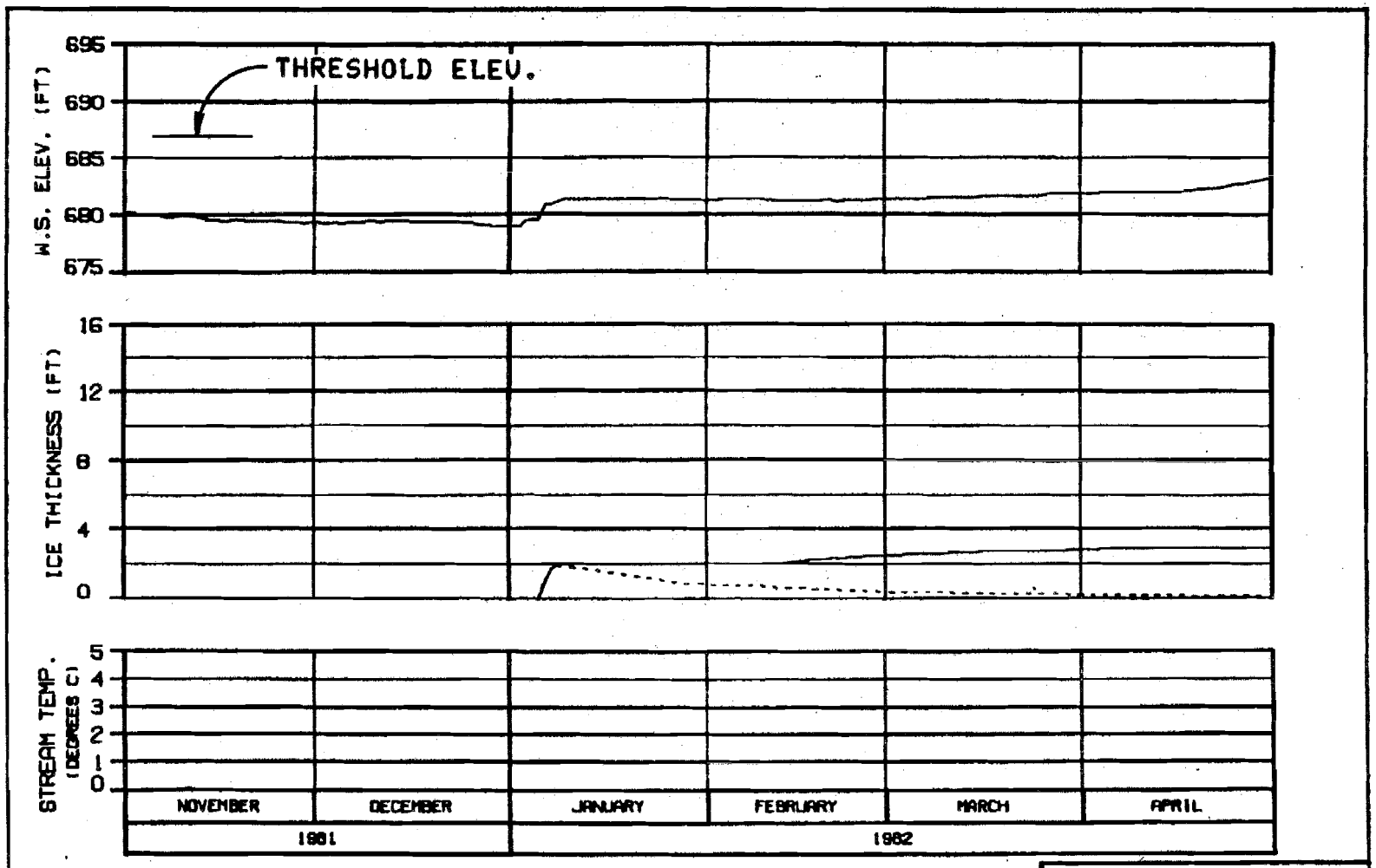
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 11

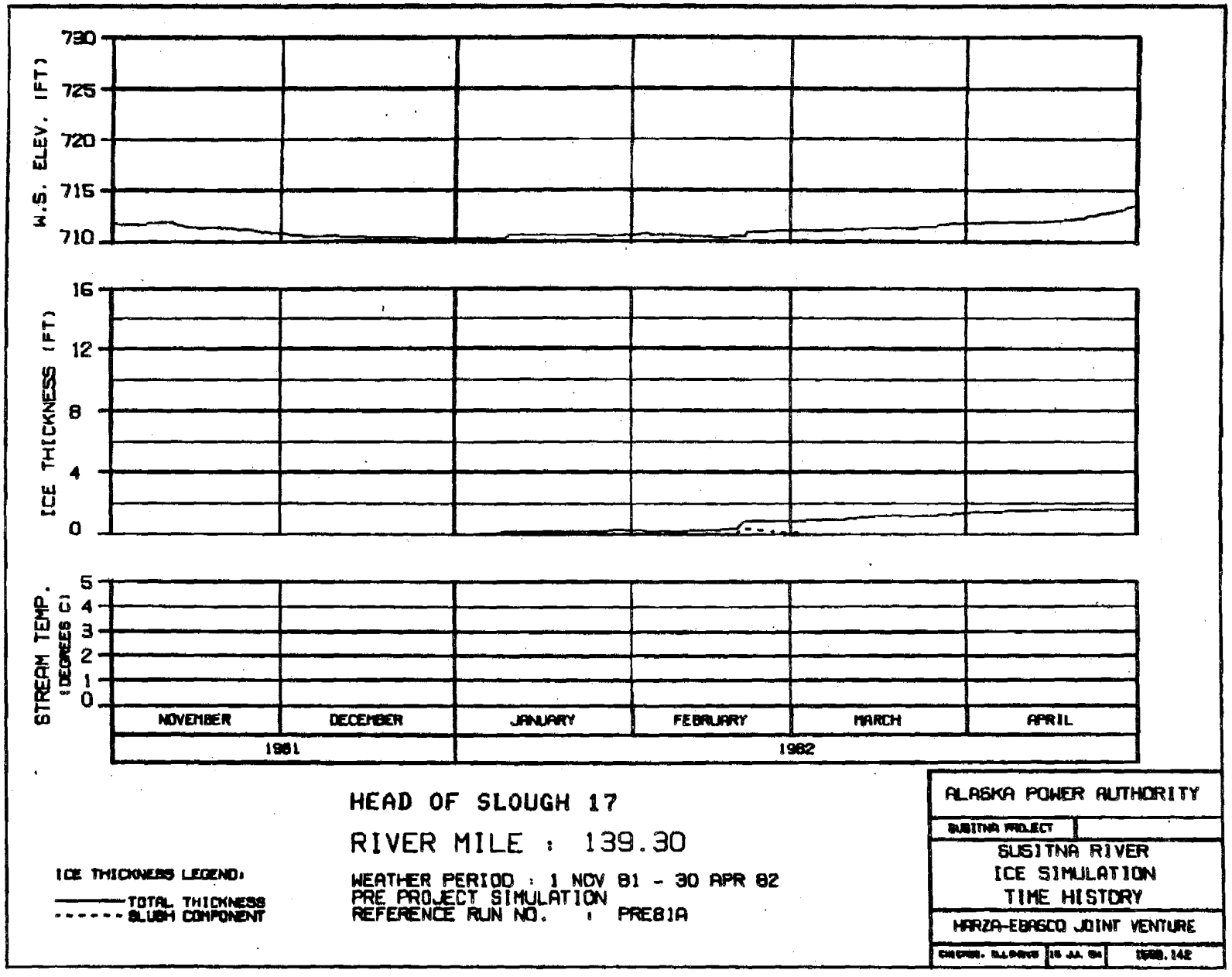
RIVER MILE : 136.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ICE THICKNESS LEGEND:

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
[illegible]	15 JUL 84 / 1888.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE81A

ALASKA POWER AUTHORITY

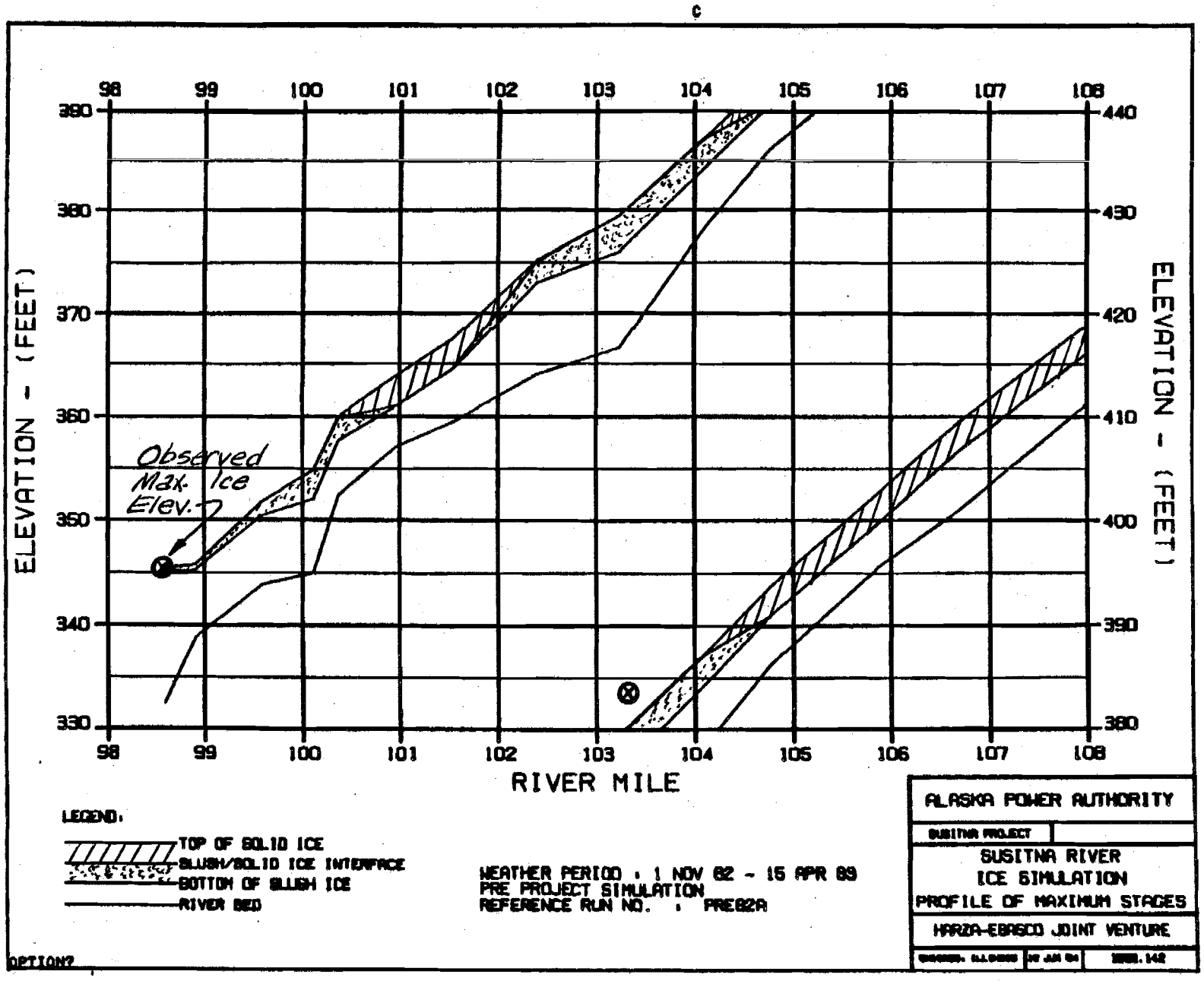
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.PARKS | 15 JUL 84 | 1588.142

EXHIBIT E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420
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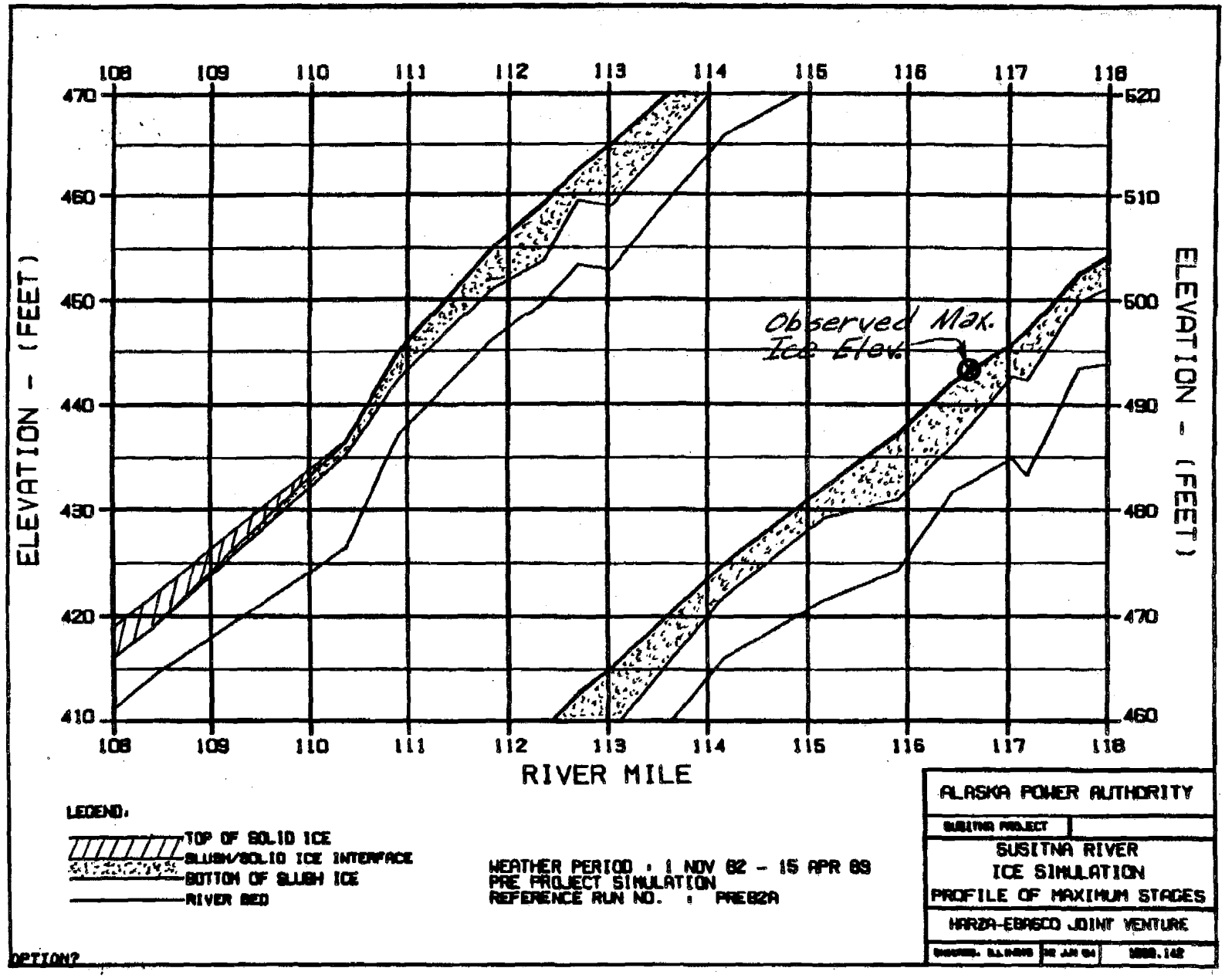
390
380
ELEVATION - (FEET)
ELEVATION - (FEET)
Observed Max. Ice Elev.
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

C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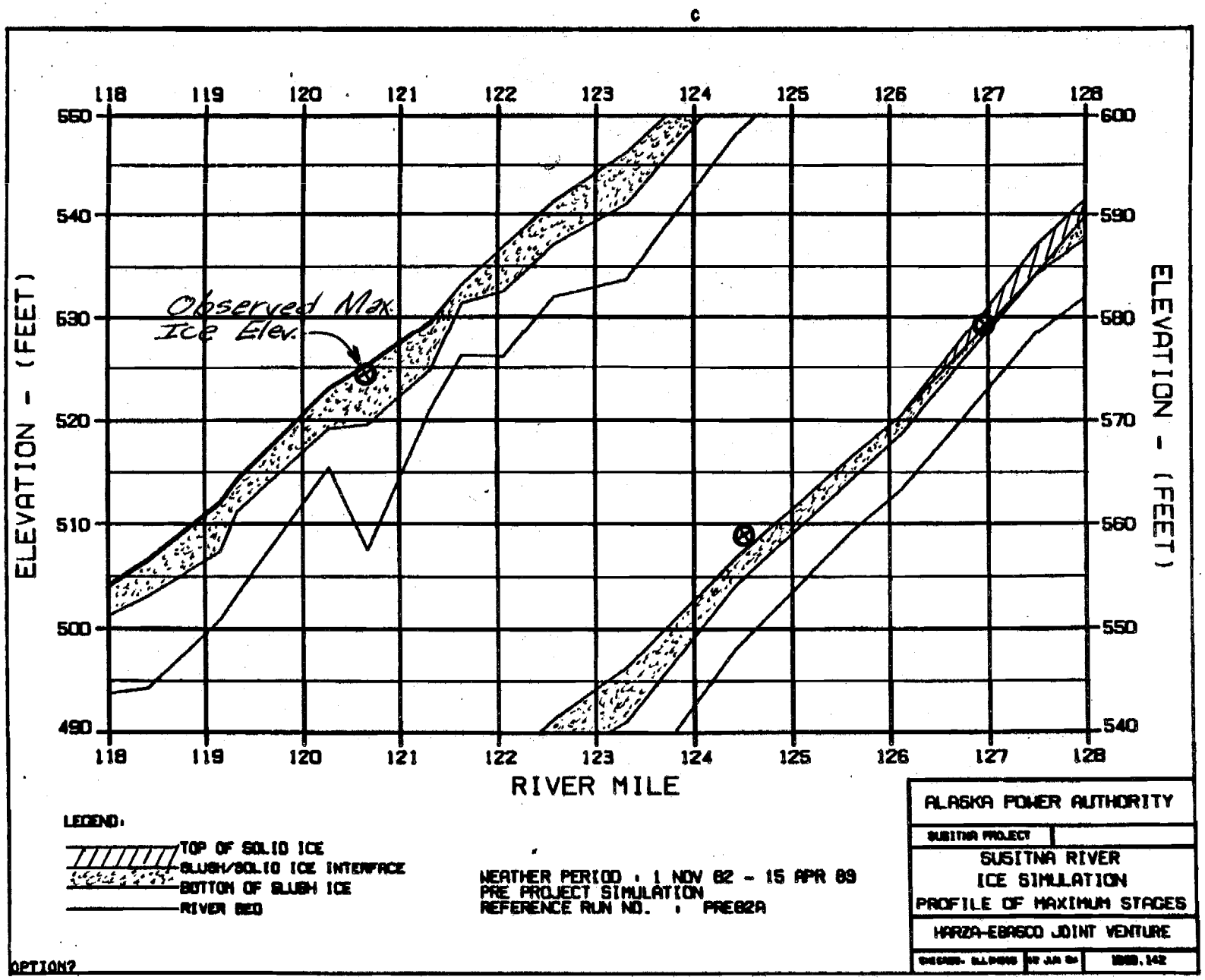
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
Observed Max. Ice Elev.
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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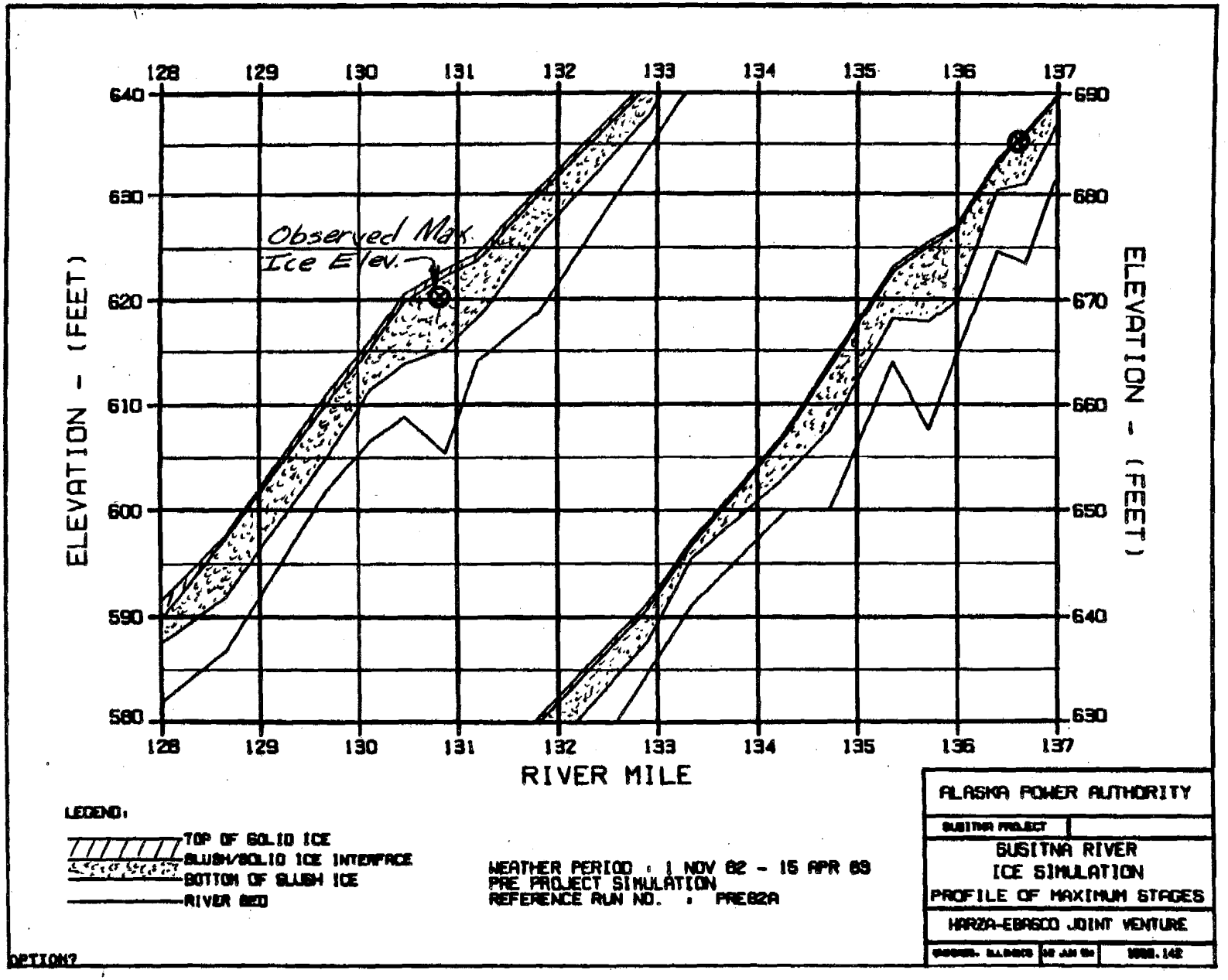
540
ELEVATION - (FEET)
ELEVATION - (FEET)
Observed Max. Ice Elev.
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 15 APR 89
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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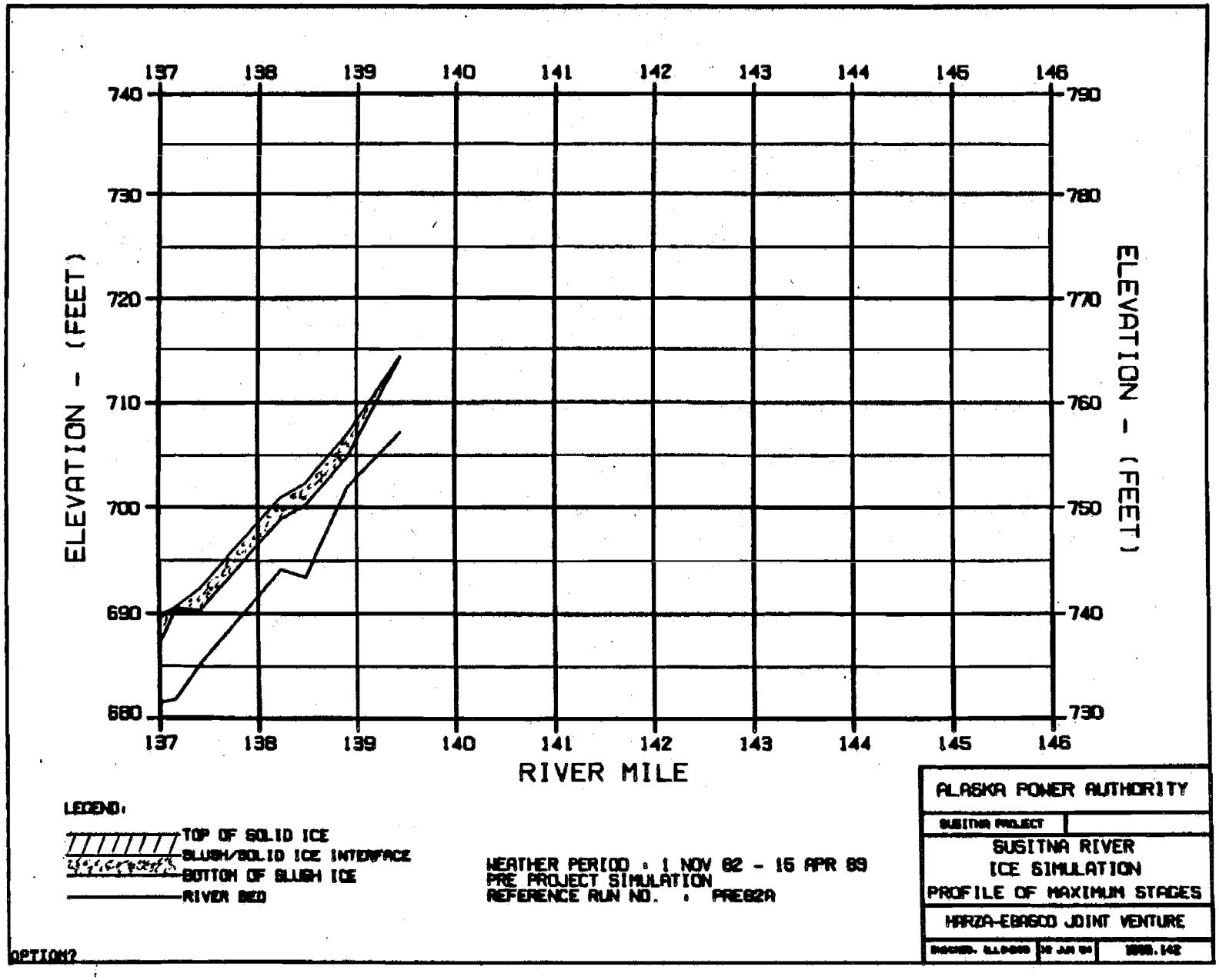
640
630
Observed Max. Ice Elev.
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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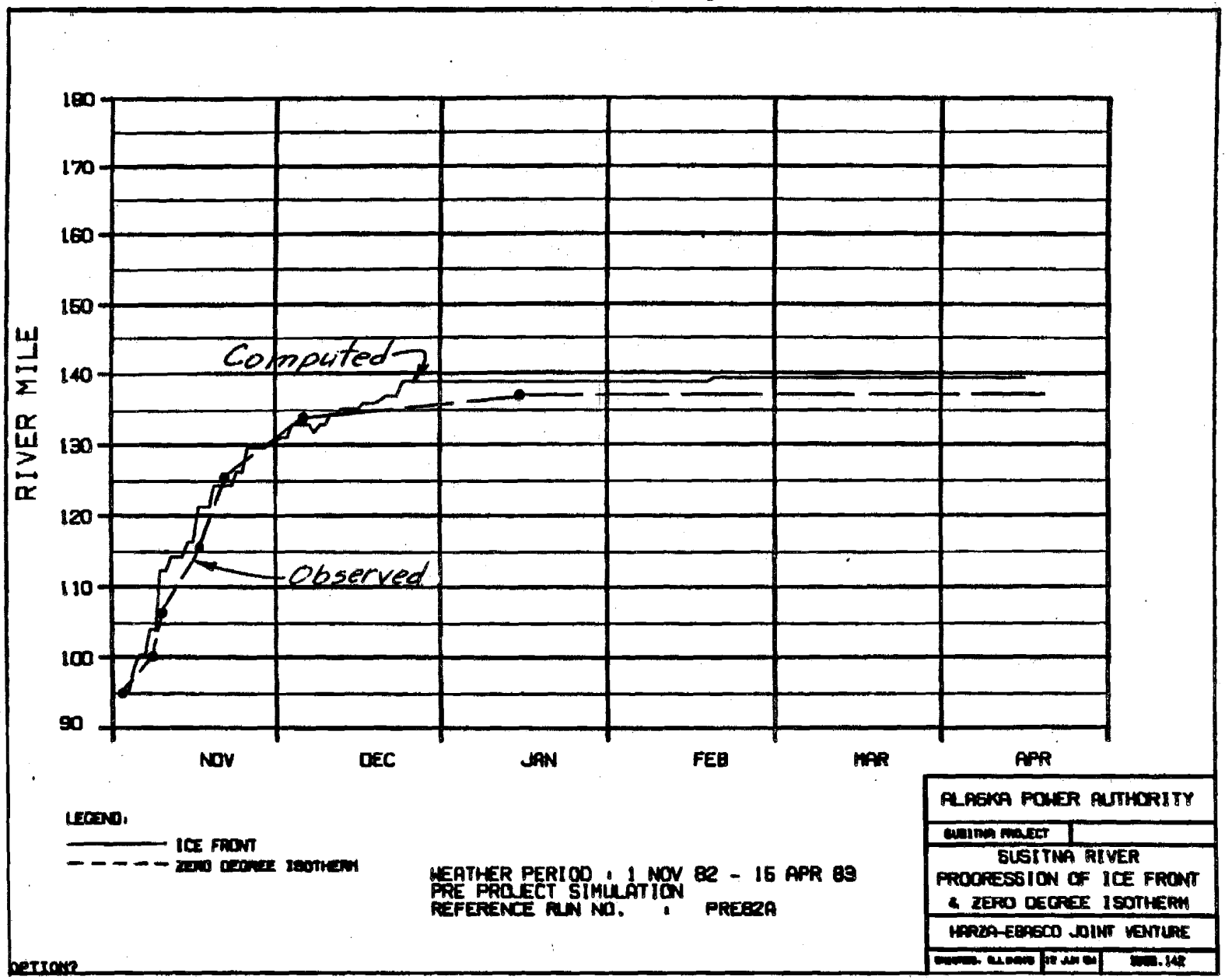
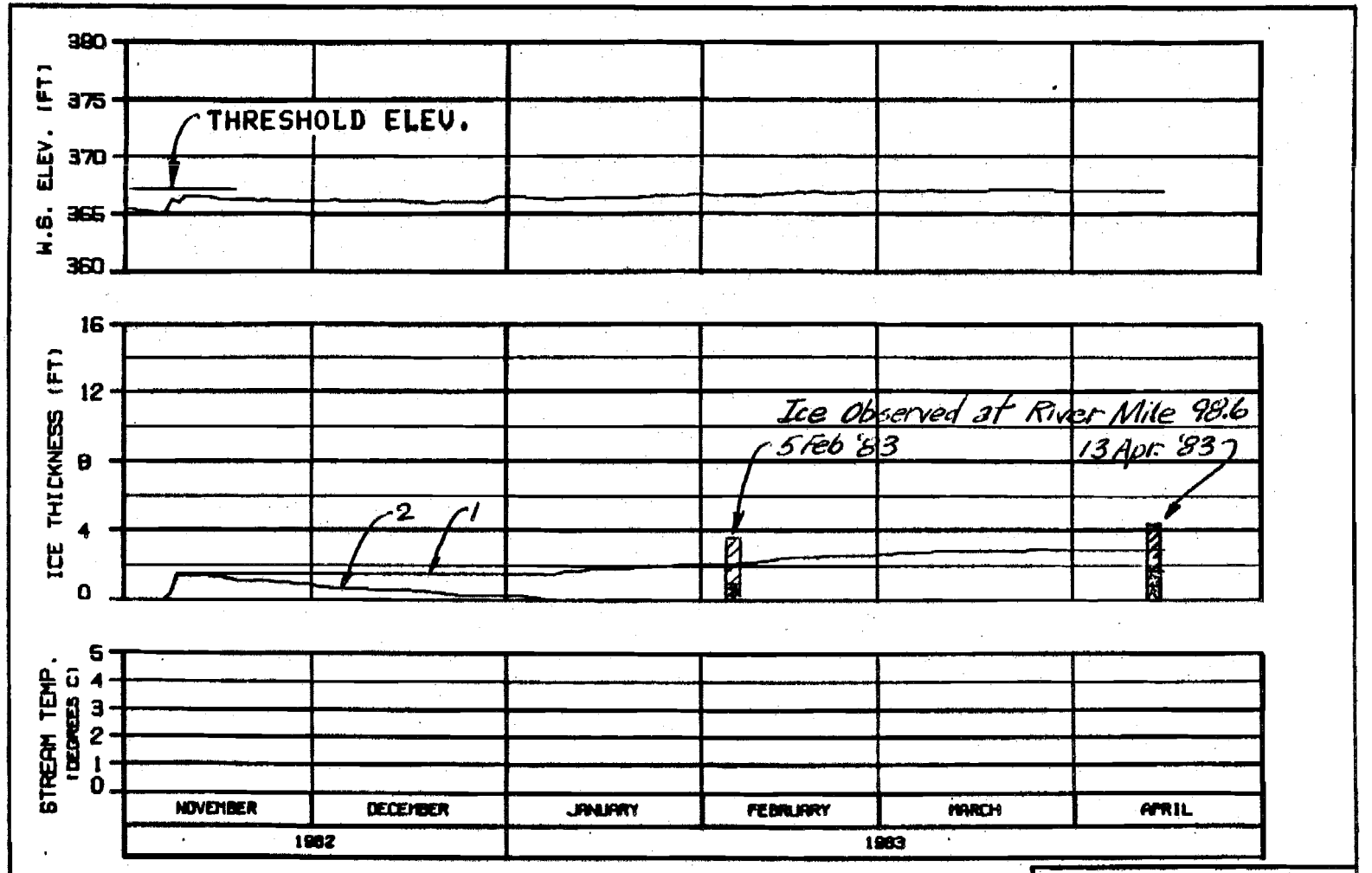
760
750
740
730
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2


RIVER MILE
180
170
160
150
140
130
120
110
100
90
NOV
DEC
JAN
FEB
MAR
APR
Computed
Observed
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE

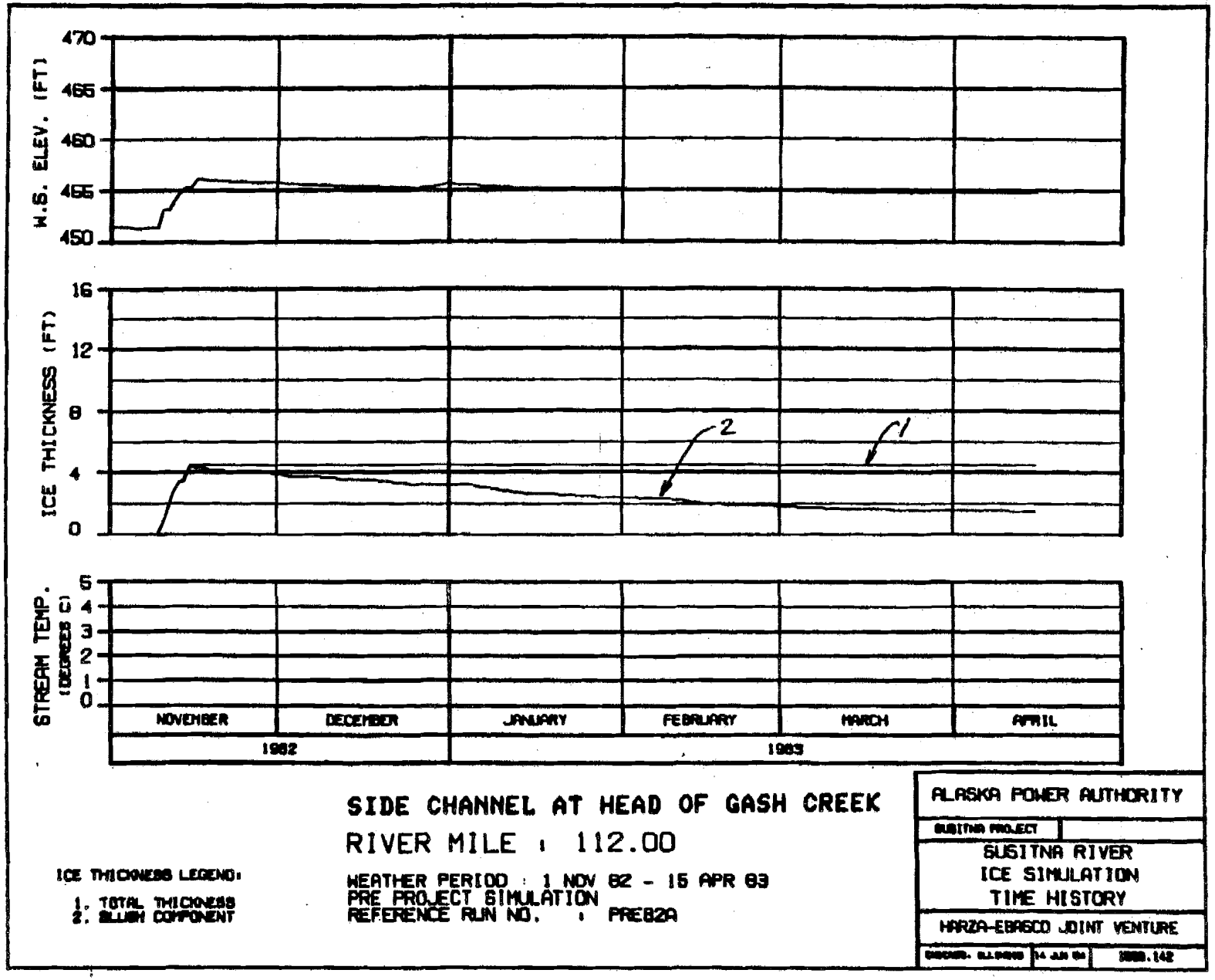


HEAD OF WHISKERS SLOUGH
RIVER MILE : 101.50

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

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



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

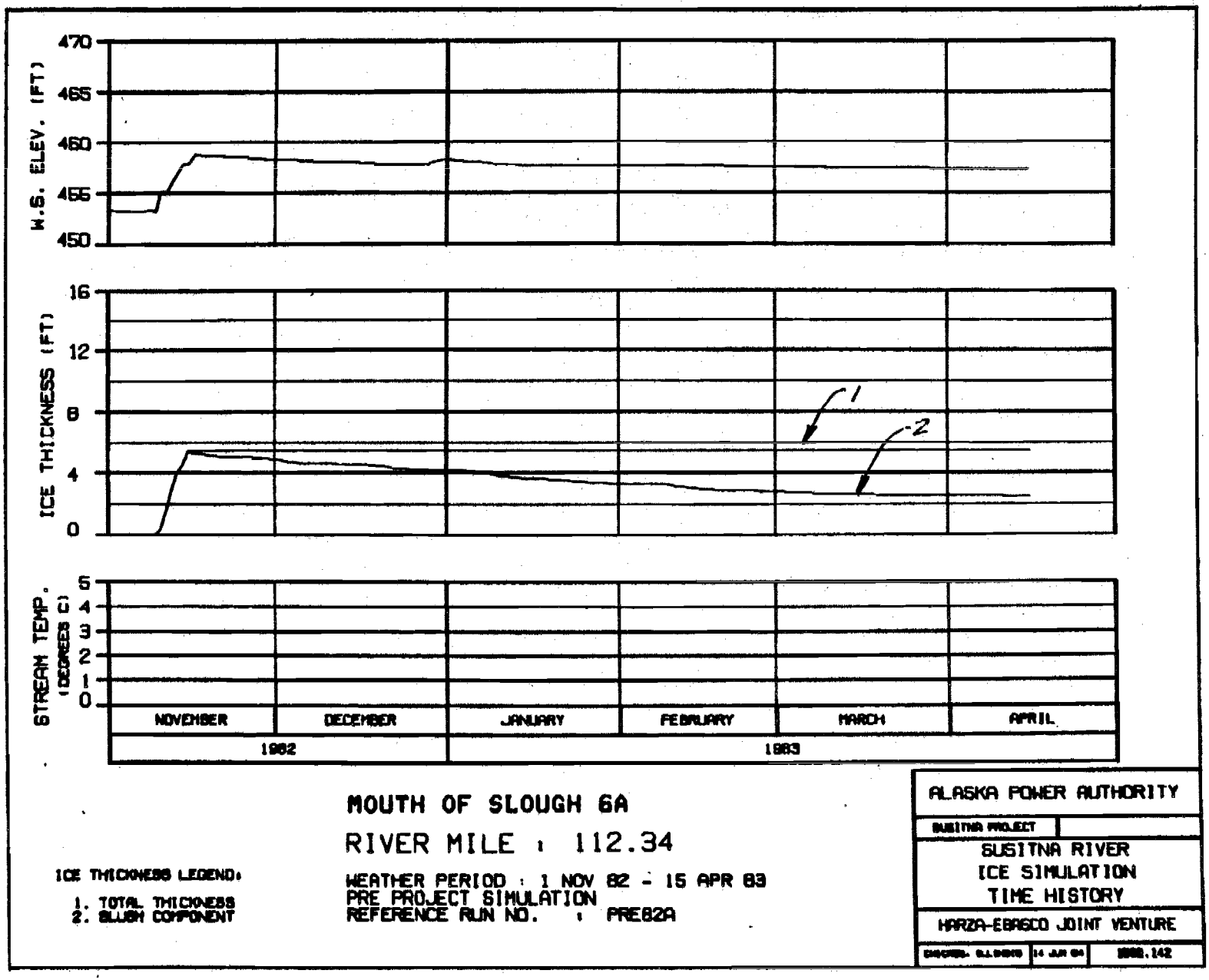
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: [illegible] | 14 JUN 84 | 3888.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

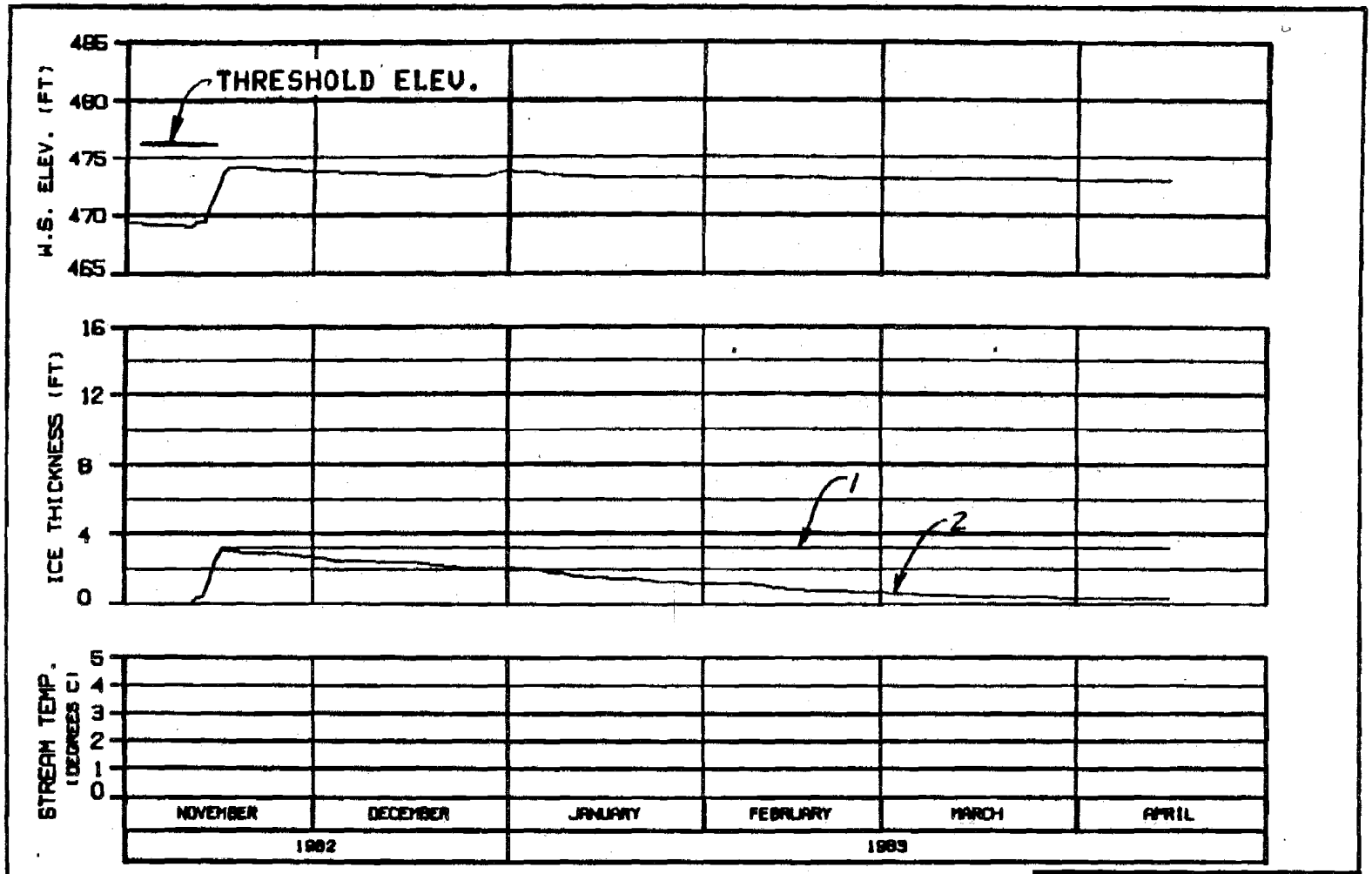
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: G.L.SIMMS | 14 JAN 84 | 8888.142



HEAD OF SLOUGH 8

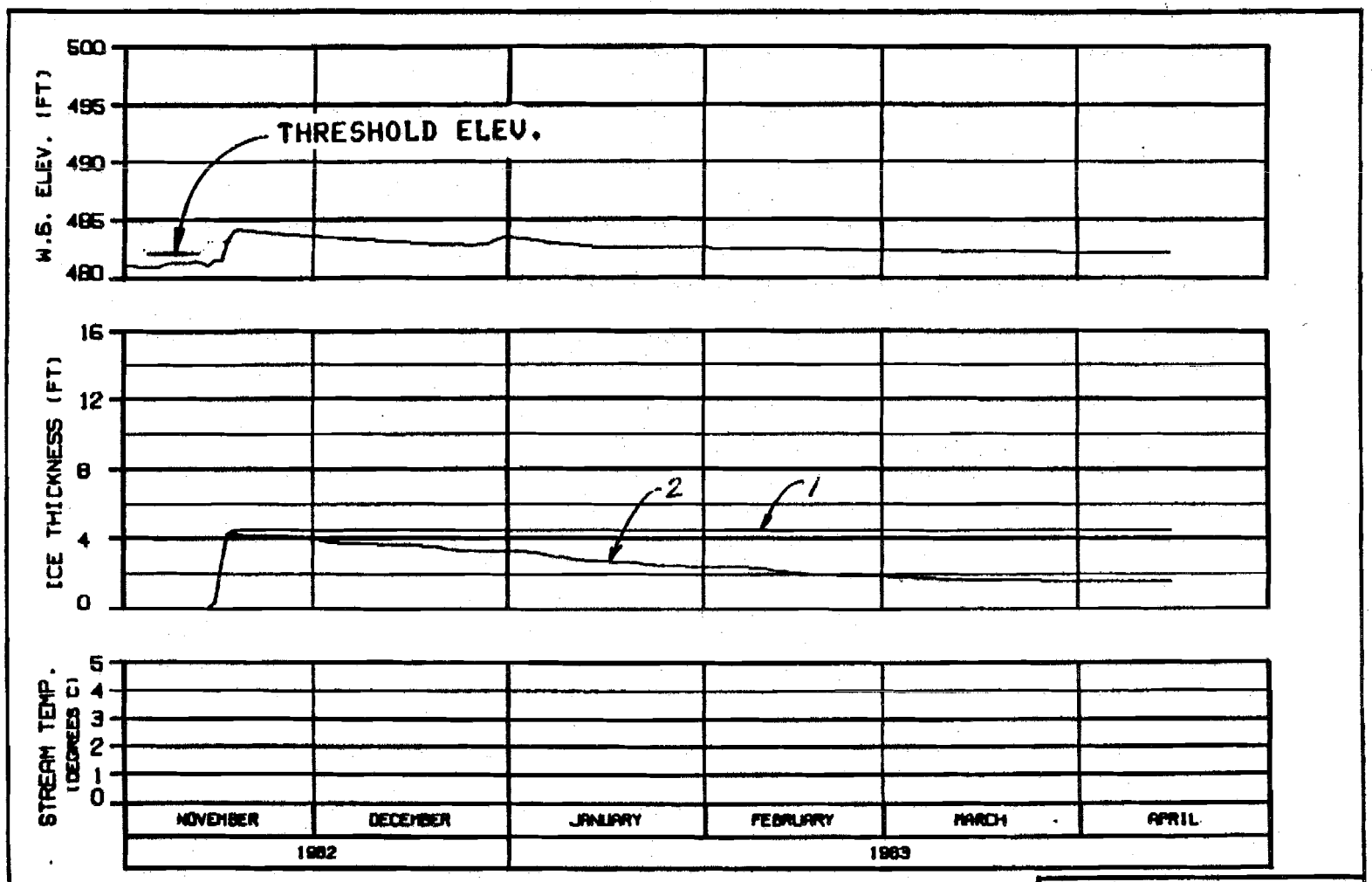
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 14 JUN 84 1988.142



SIDE CHANNEL MSII

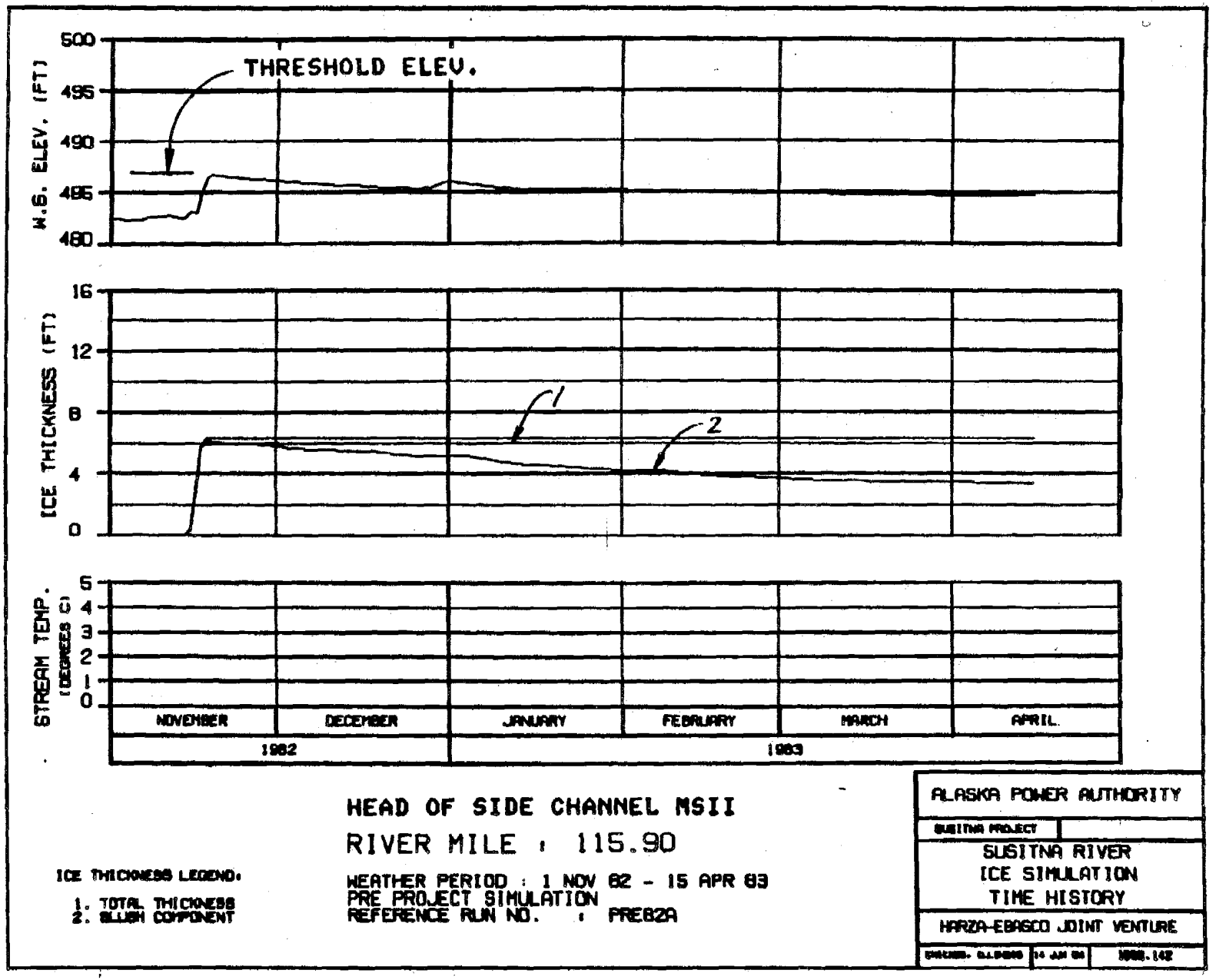
RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: G.L.S.	14 JAN 84



HEAD OF SIDE CHANNEL MSII

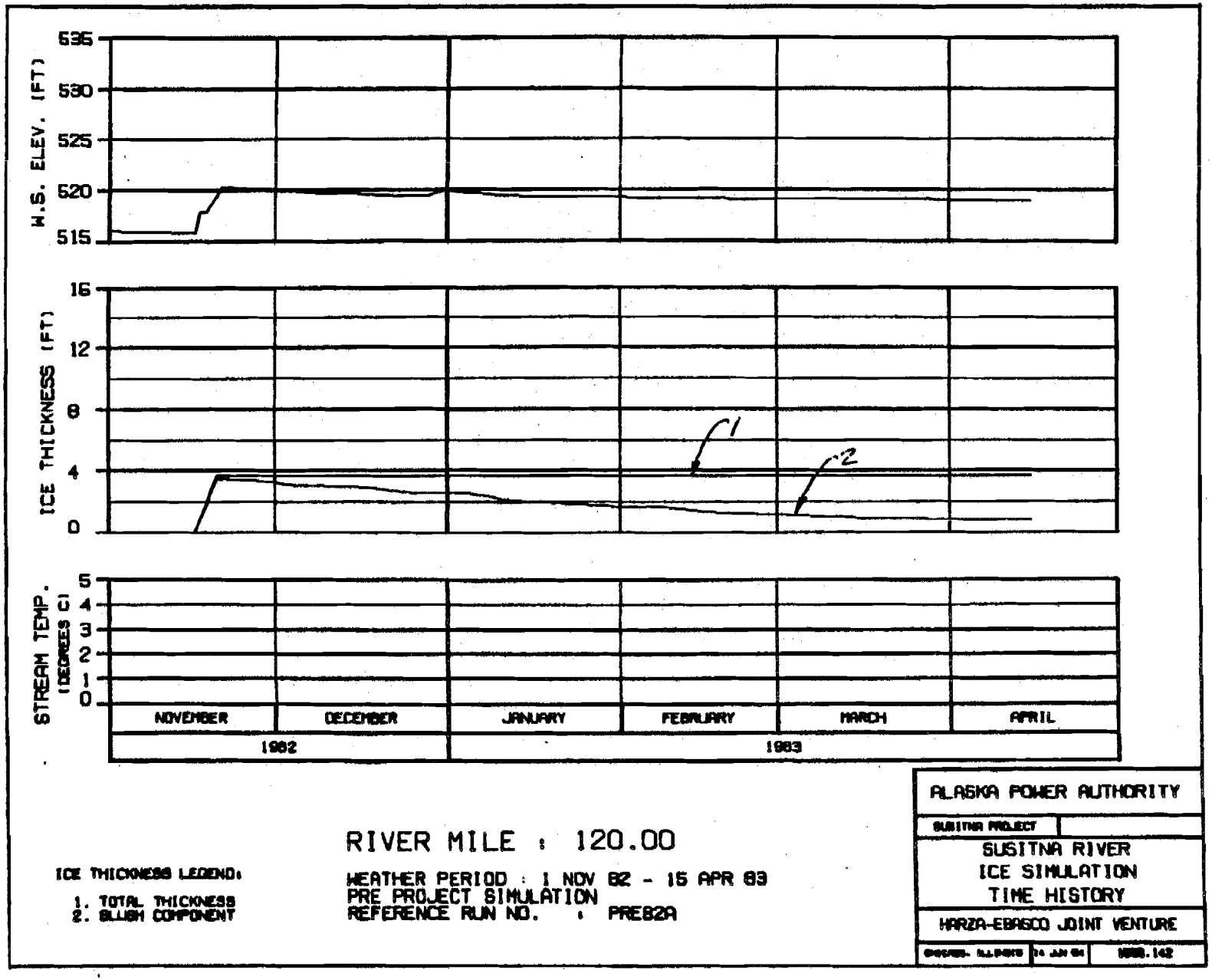
RIVER MILE : 115.90

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: D.L.BOSS	14 JAN 84



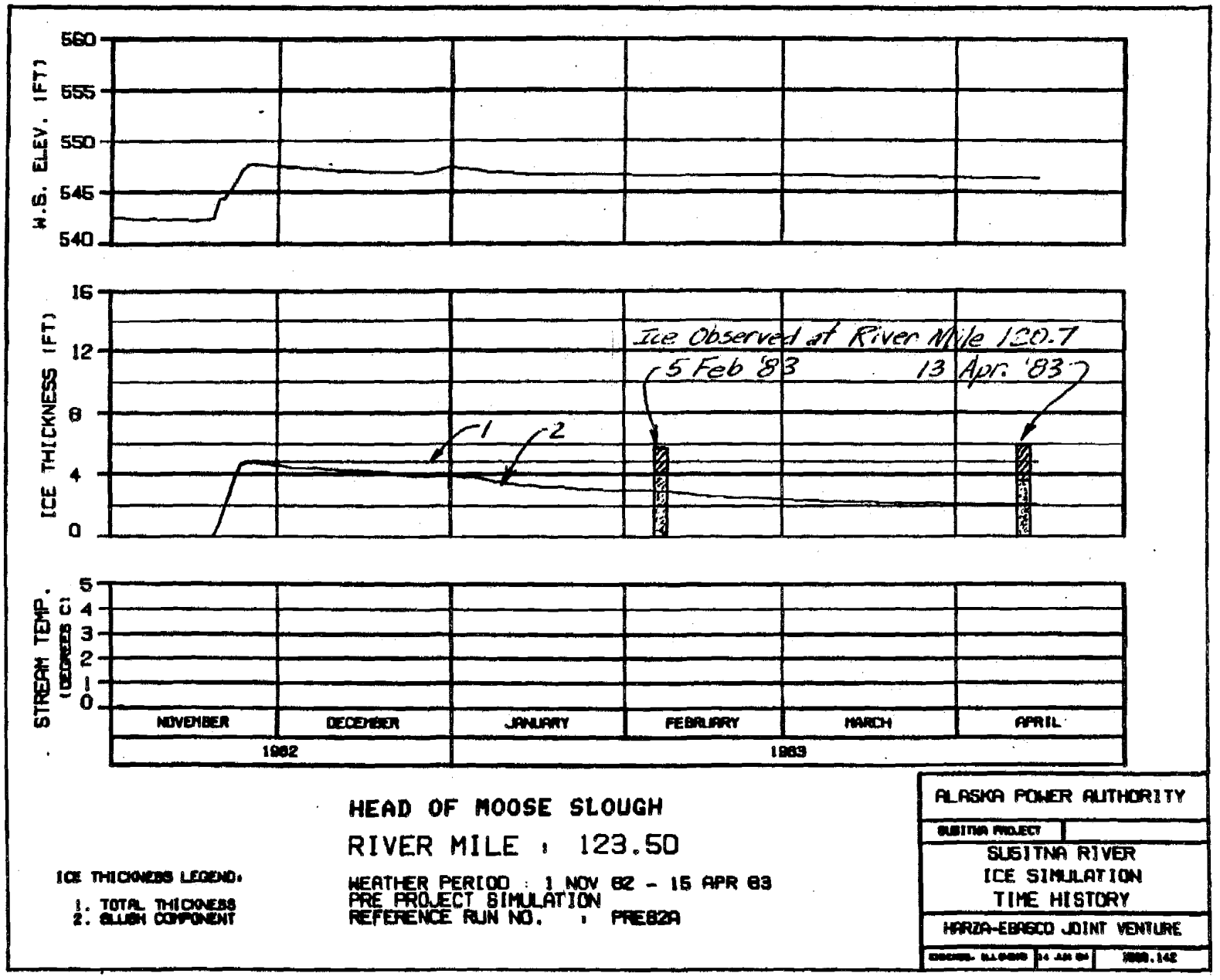
RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] 14 JAN 84 1888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

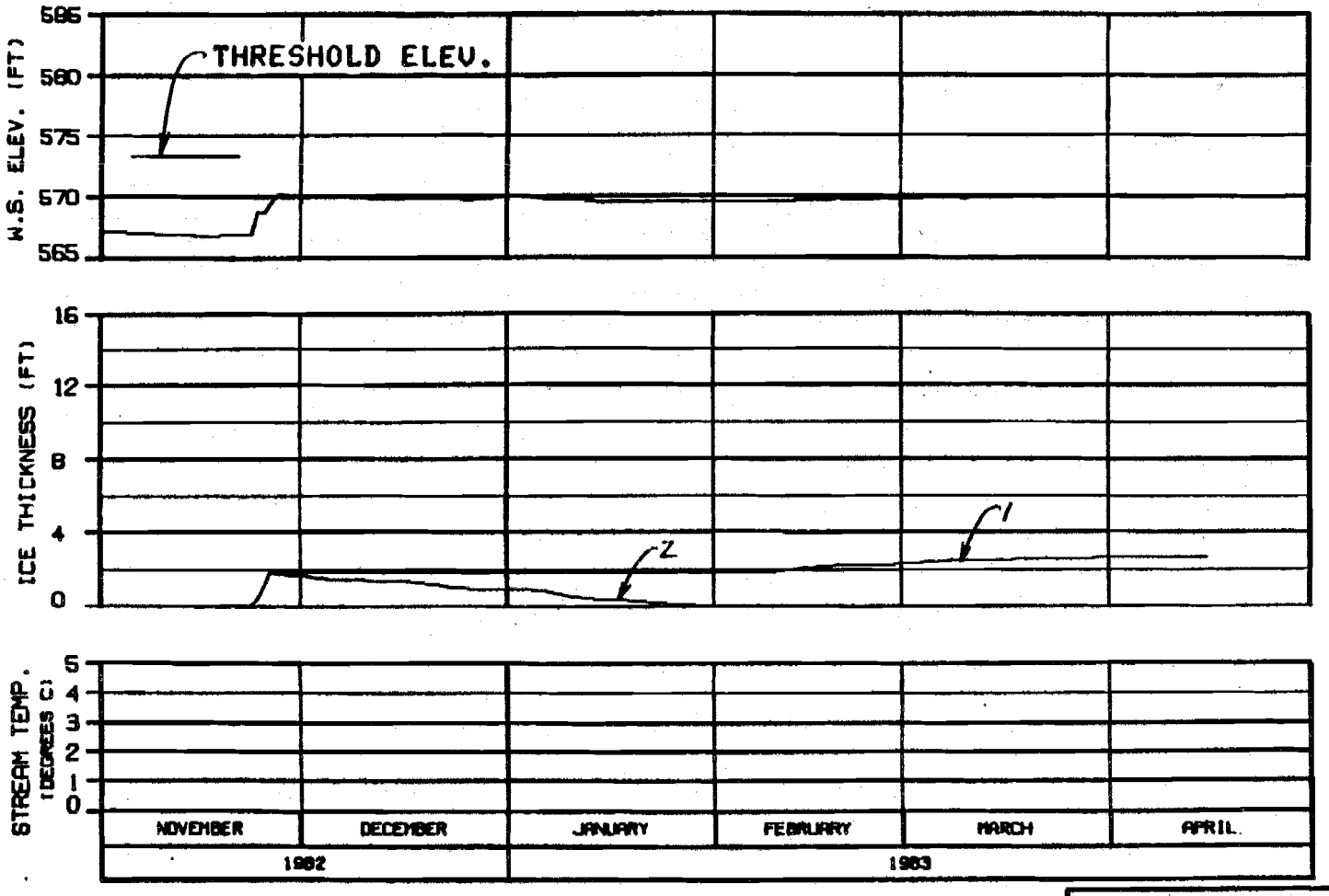
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

24 JAN 84 | 1888.142



HEAD OF SLOUGH 8A (WEST)

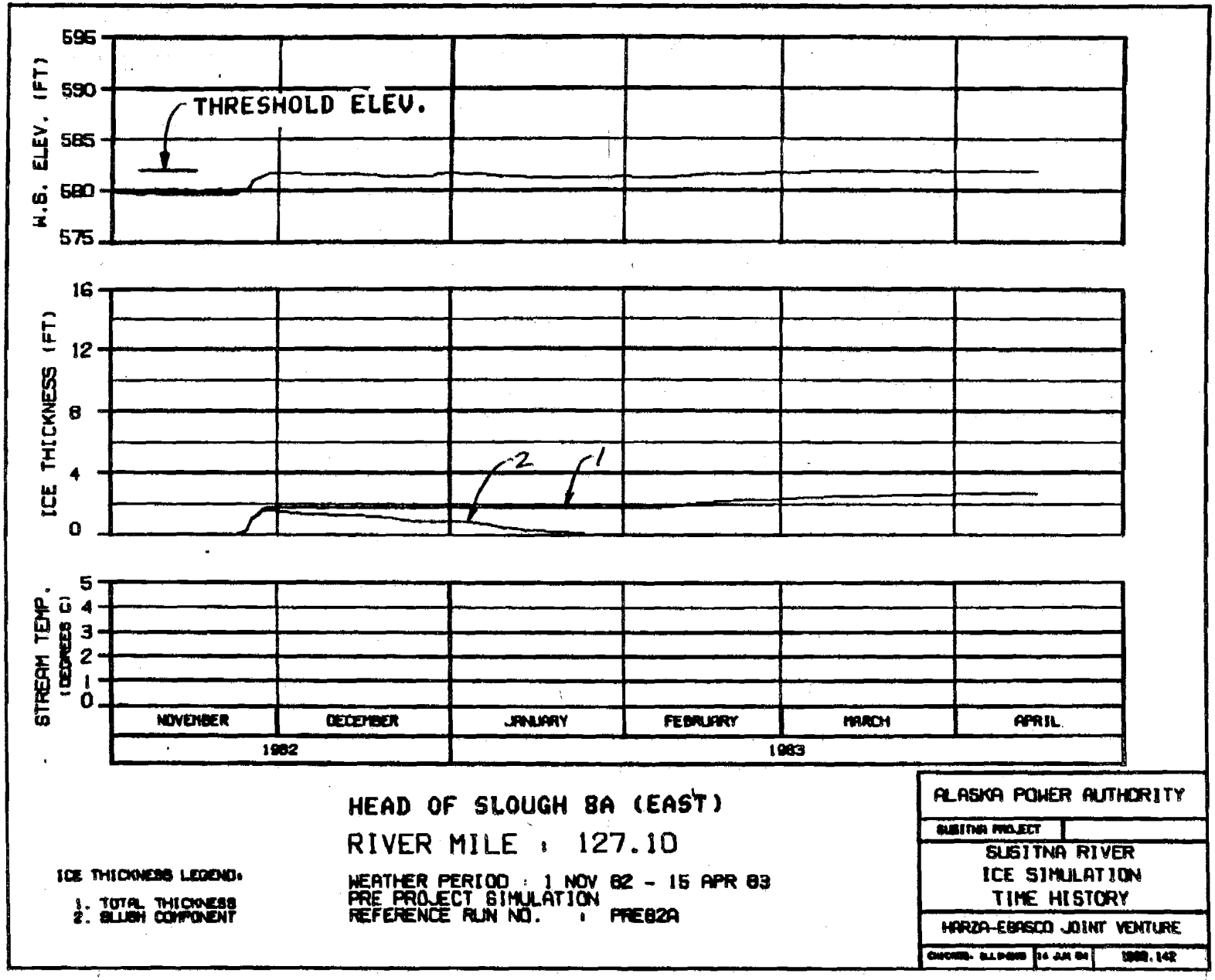
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DWG.	14 JAN 84	1588.142



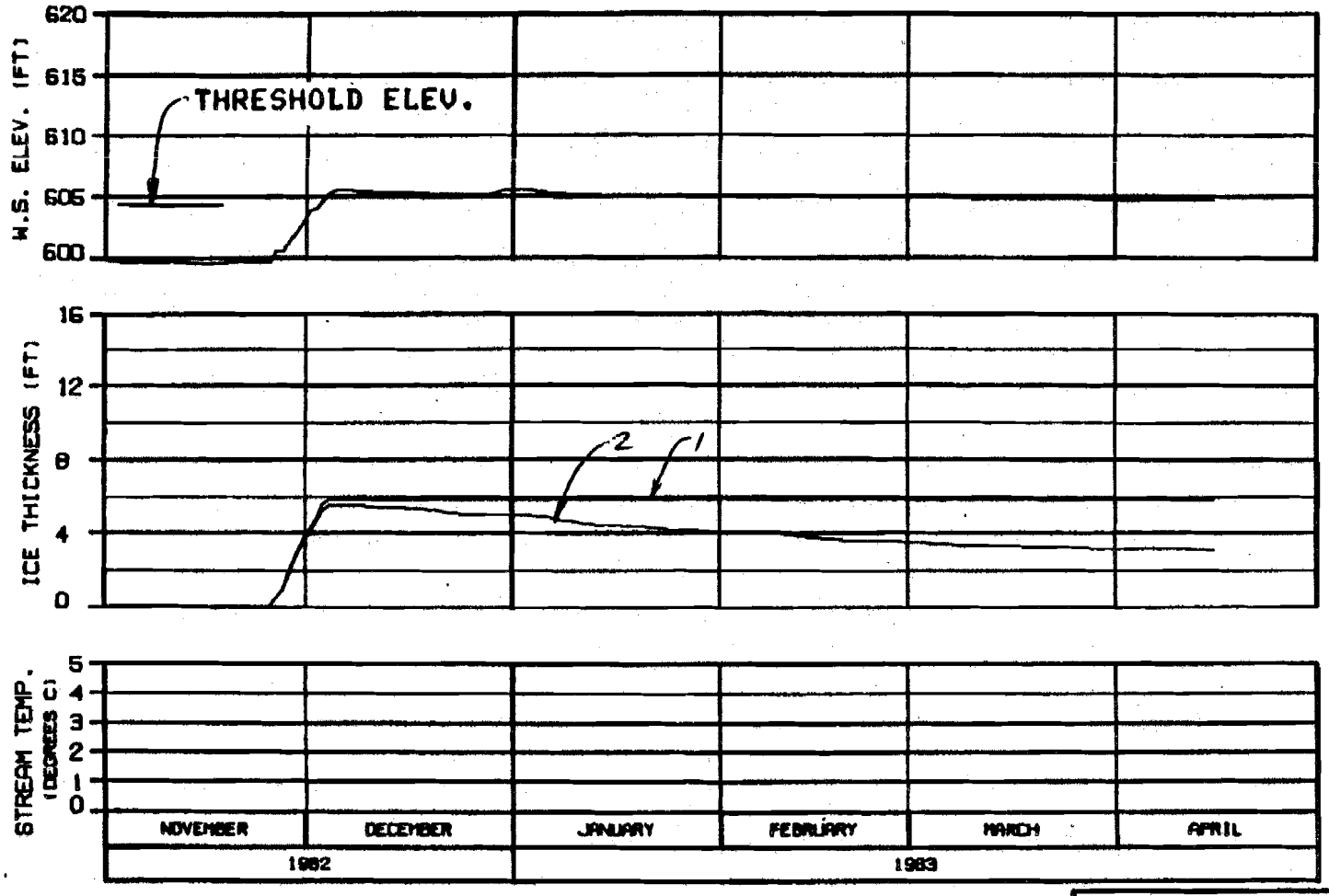
HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

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



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

OPTION?

ALASKA POWER AUTHORITY

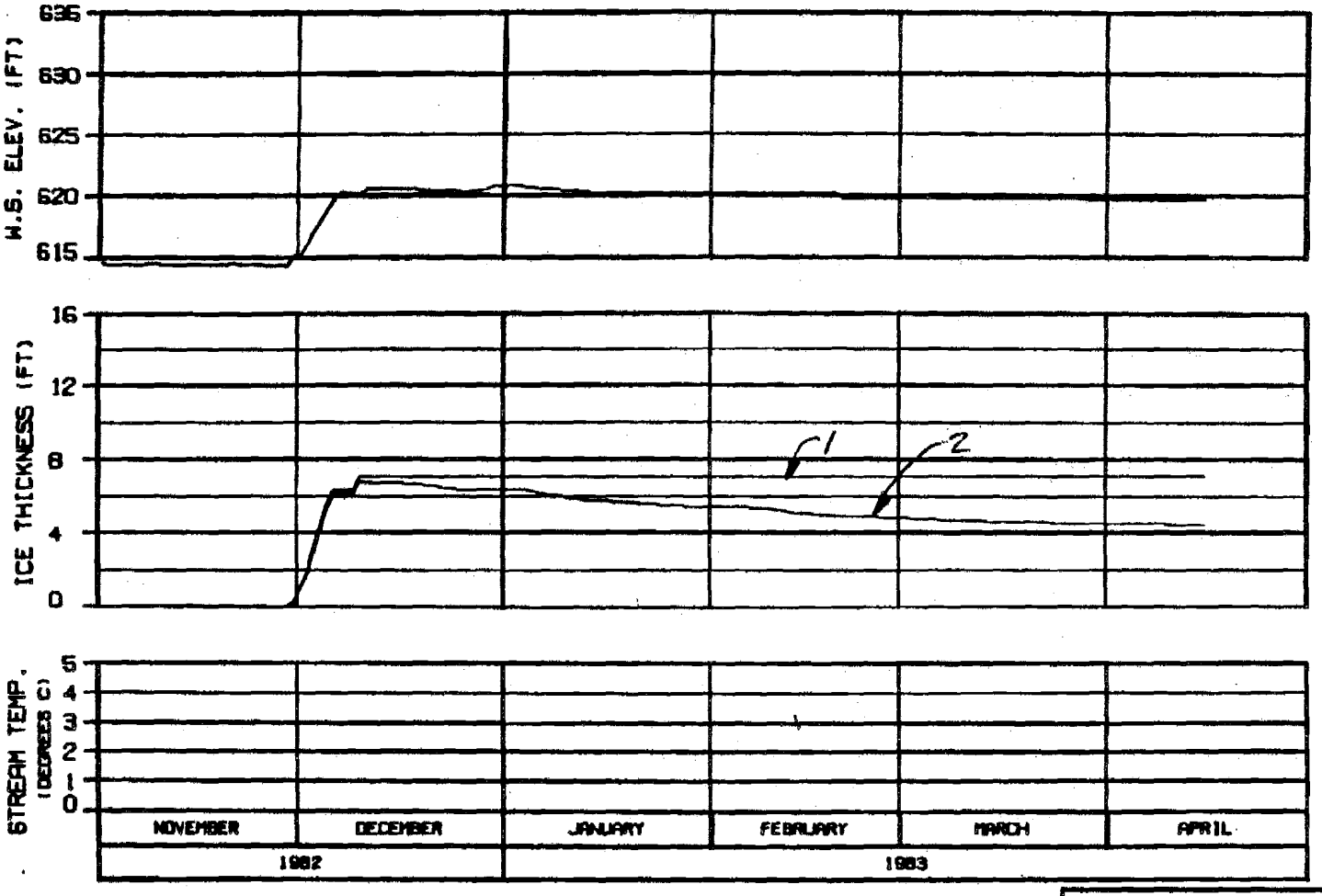
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 14 JUN 84 1886.142

OPTION7



SIDE CHANNEL U/S OF SLOUGH 9

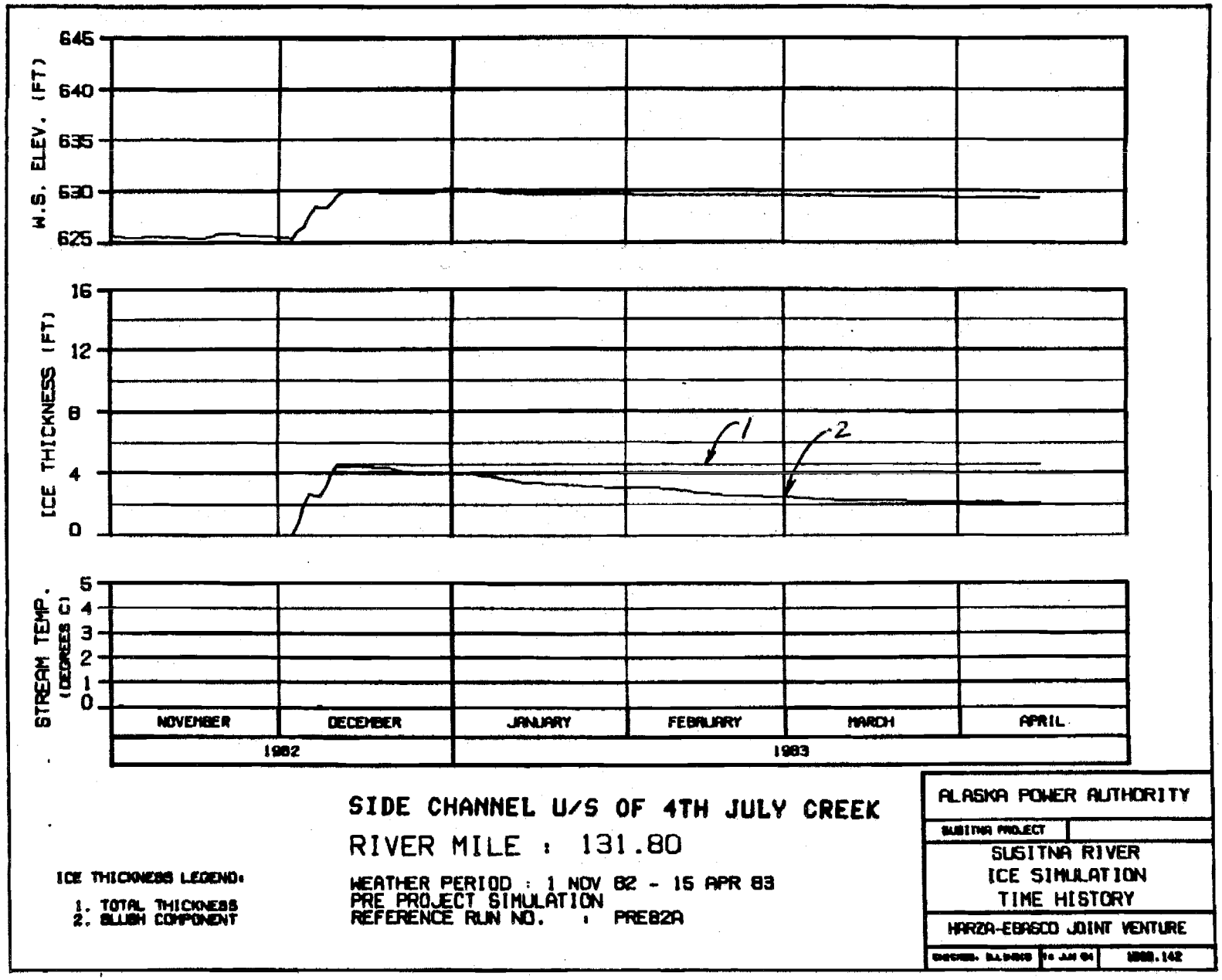
RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
[illegible]	14 JAN 84



SIDE CHANNEL U/S OF 4TH JULY CREEK

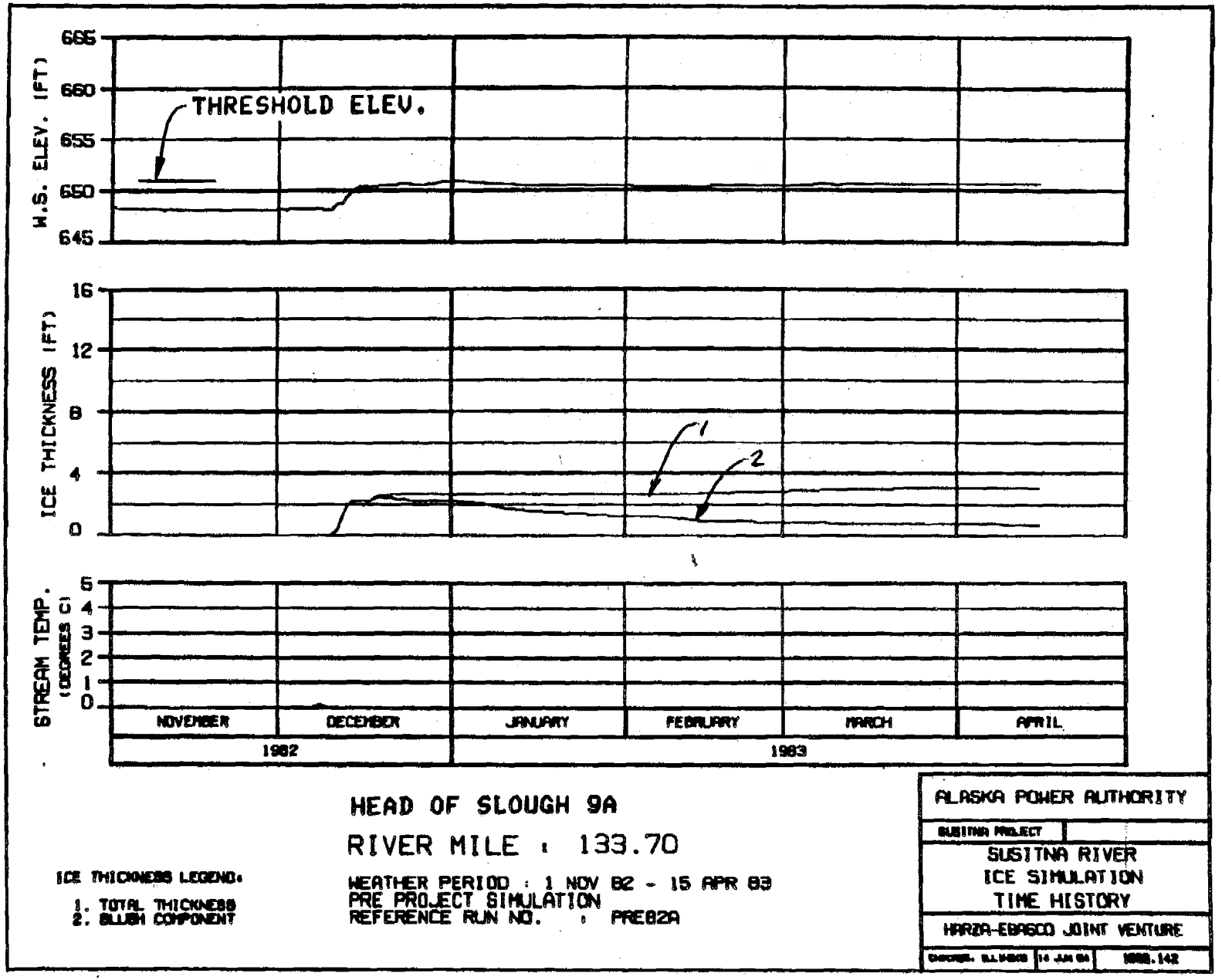
RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: B.A.BROS	10 JAN 84



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

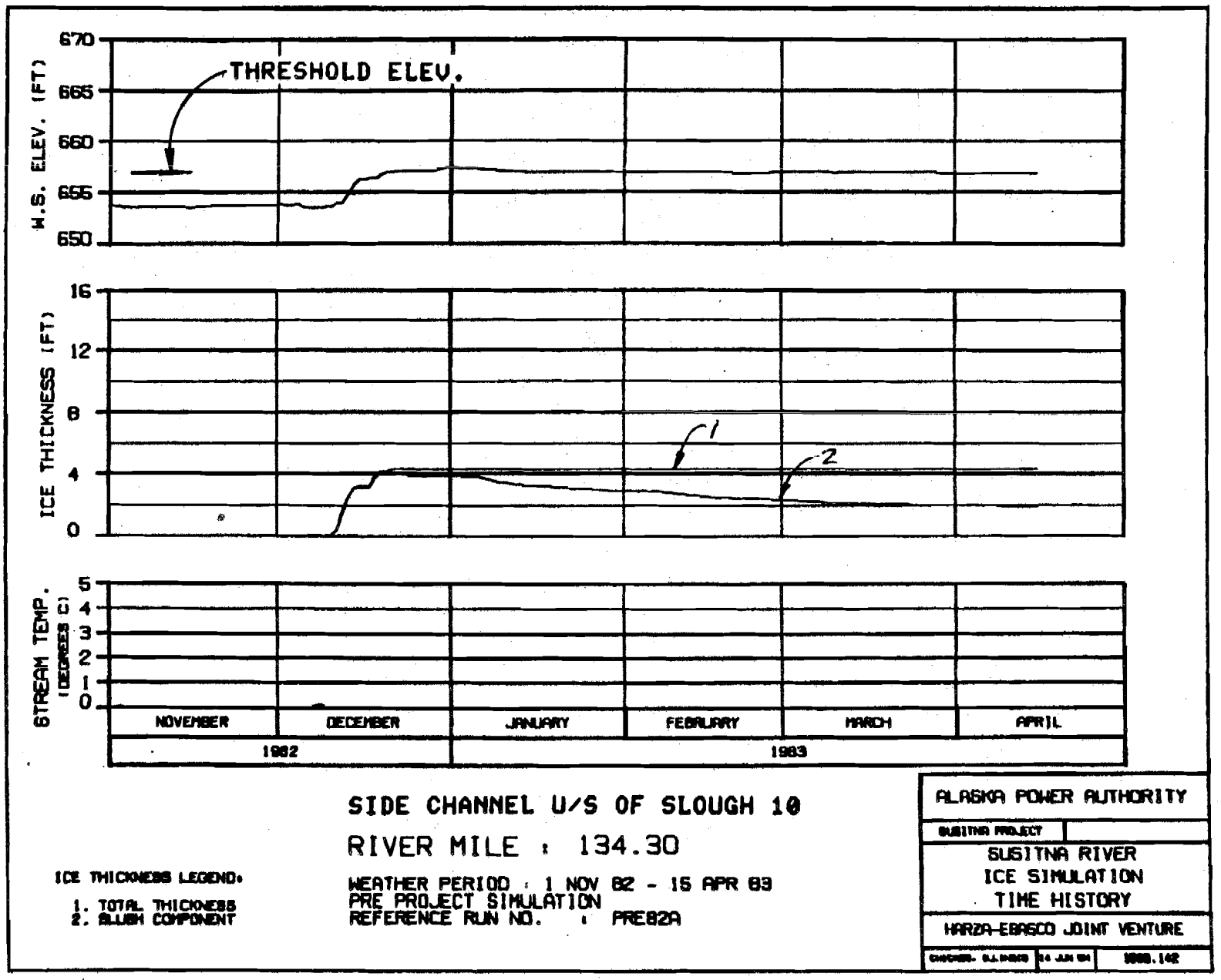
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DWG. NO. [illegible] | 14 JAN 84 | 1988.142



SIDE CHANNEL U/S OF SLOUGH 10

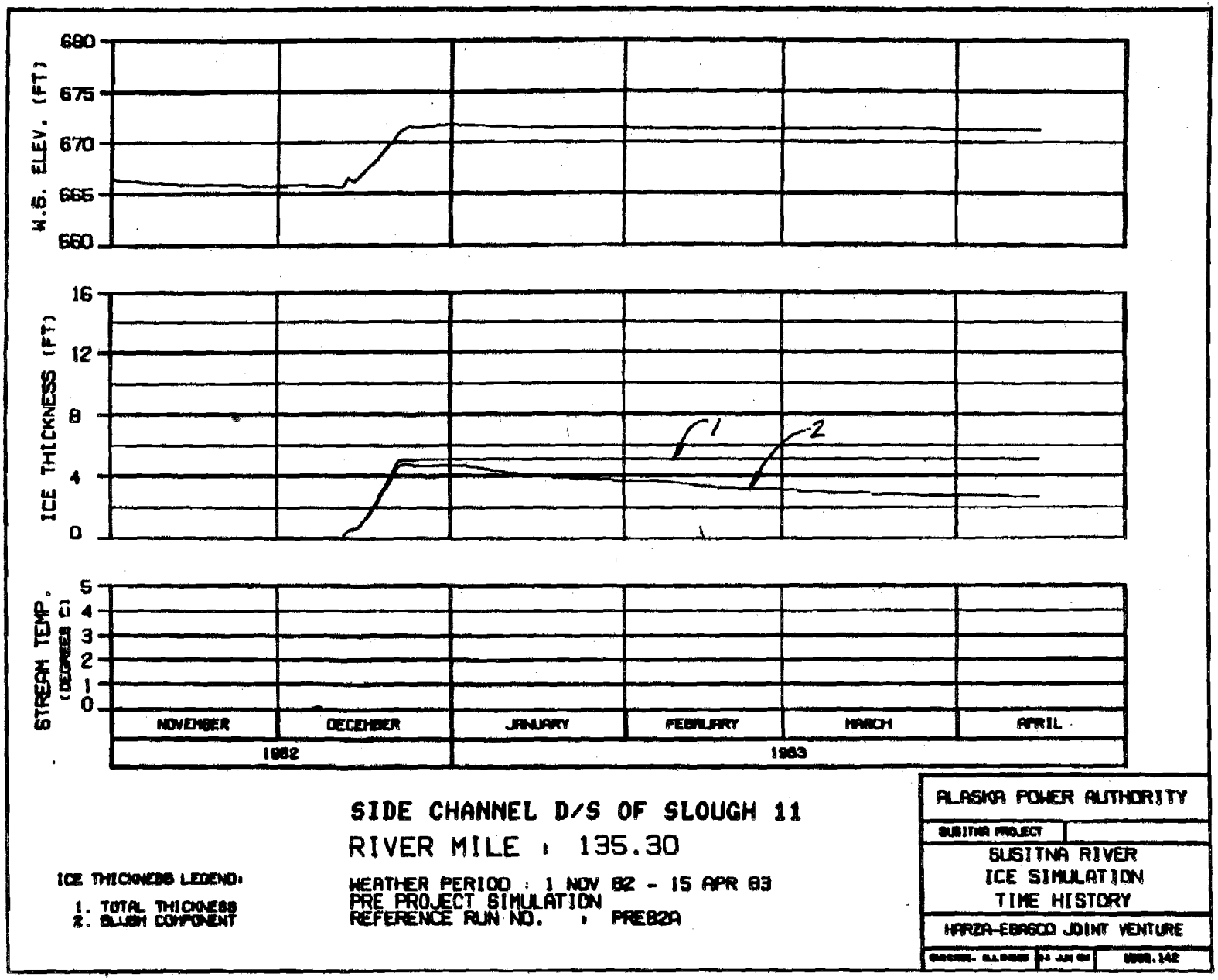
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 24 JAN 84 — 1988.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

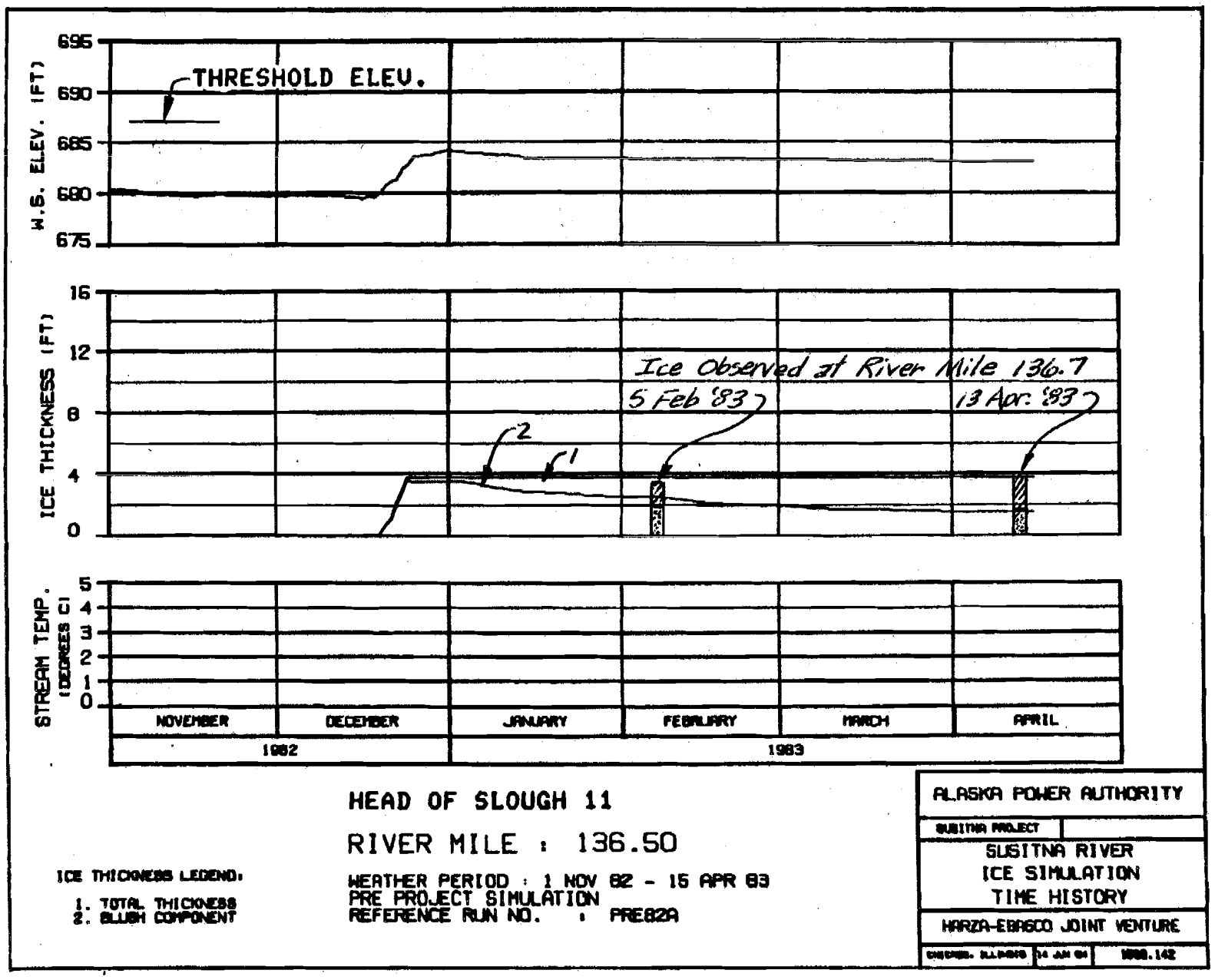
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | [illegible] | 8888.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

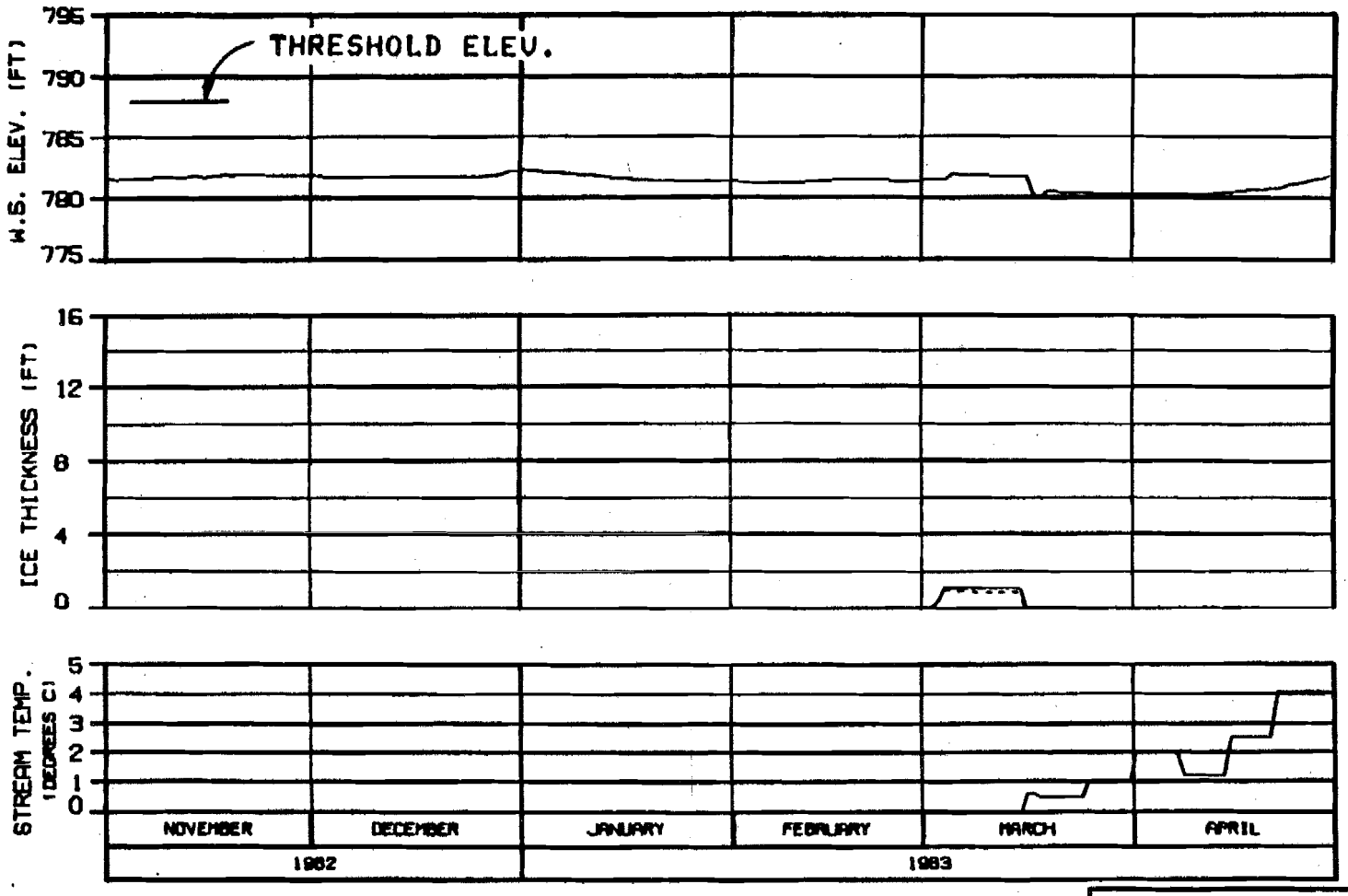
WEATHER PERIOD : 1 NOV 82 - 15 APR 83
PRE PROJECT SIMULATION
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	14 JAN 84	1988.142

Watana Filling

EXHIBIT F

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B2F1C-A

OPTION2

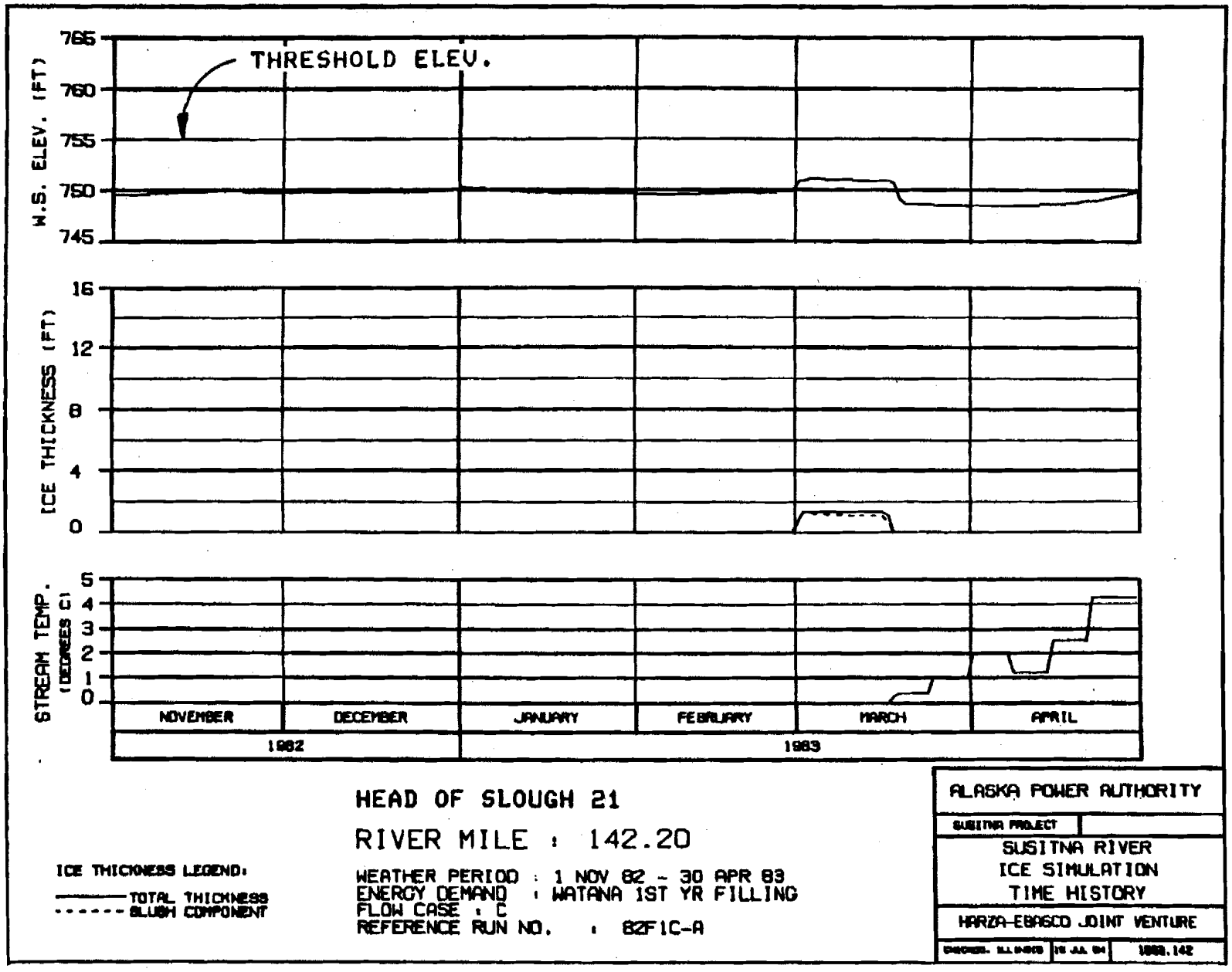
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 10 JUL 84 | 1588.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

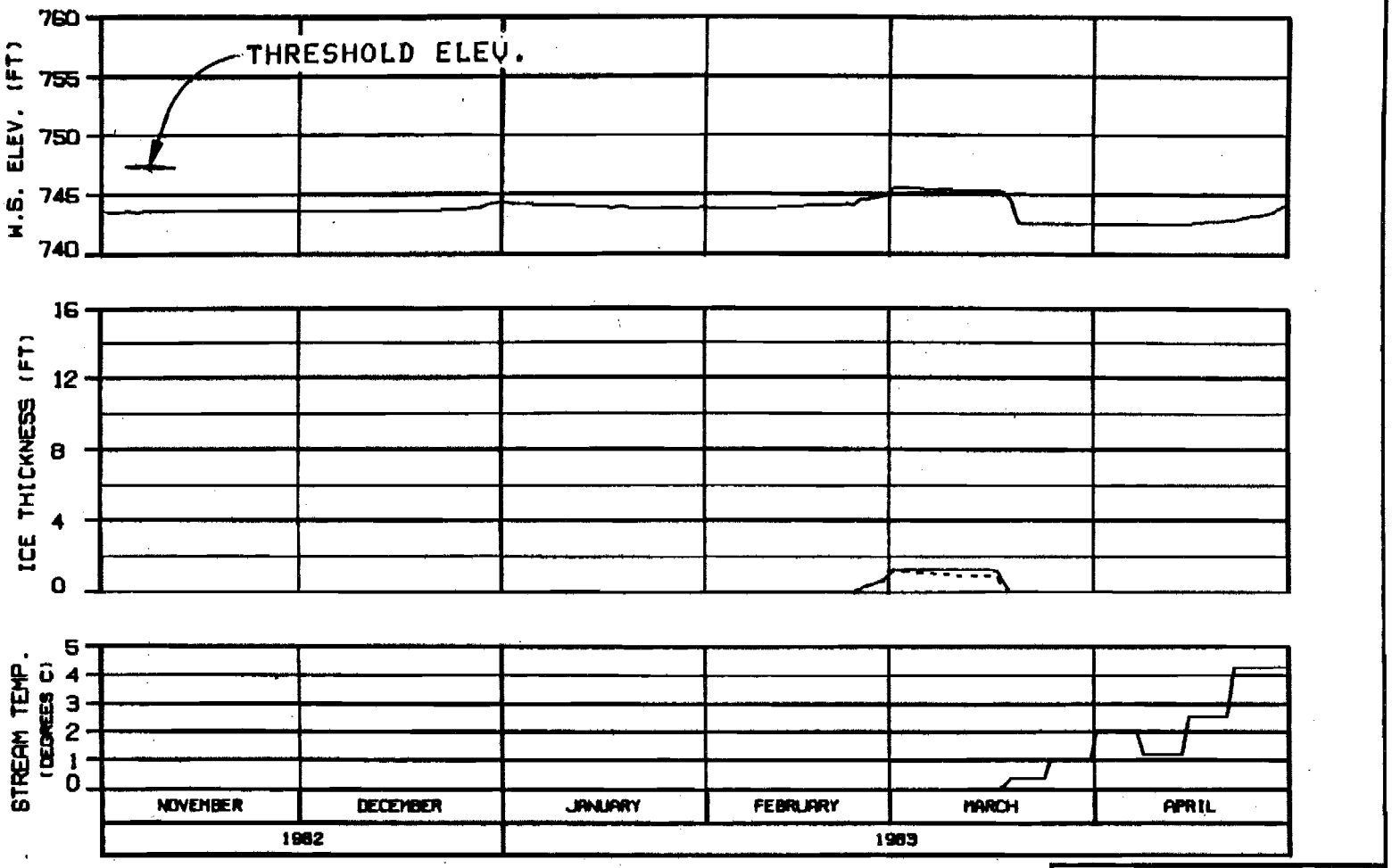
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DRAWN: [illegible]	19 JA 84	1888.142



SLOUGH 21 (ENTRANCE A6)

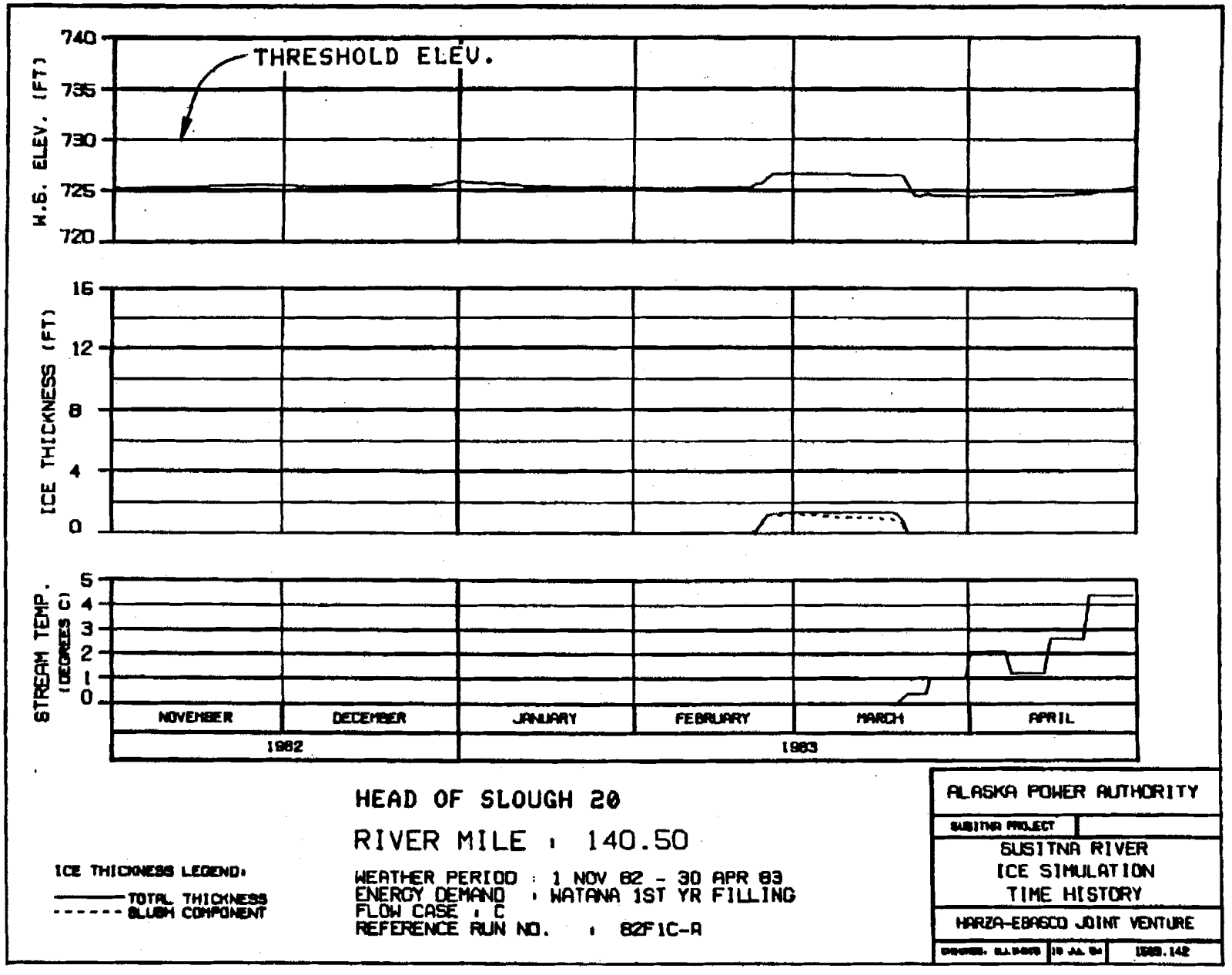
RIVER MILE : 141.80

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] 16 JUL 84 1588.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

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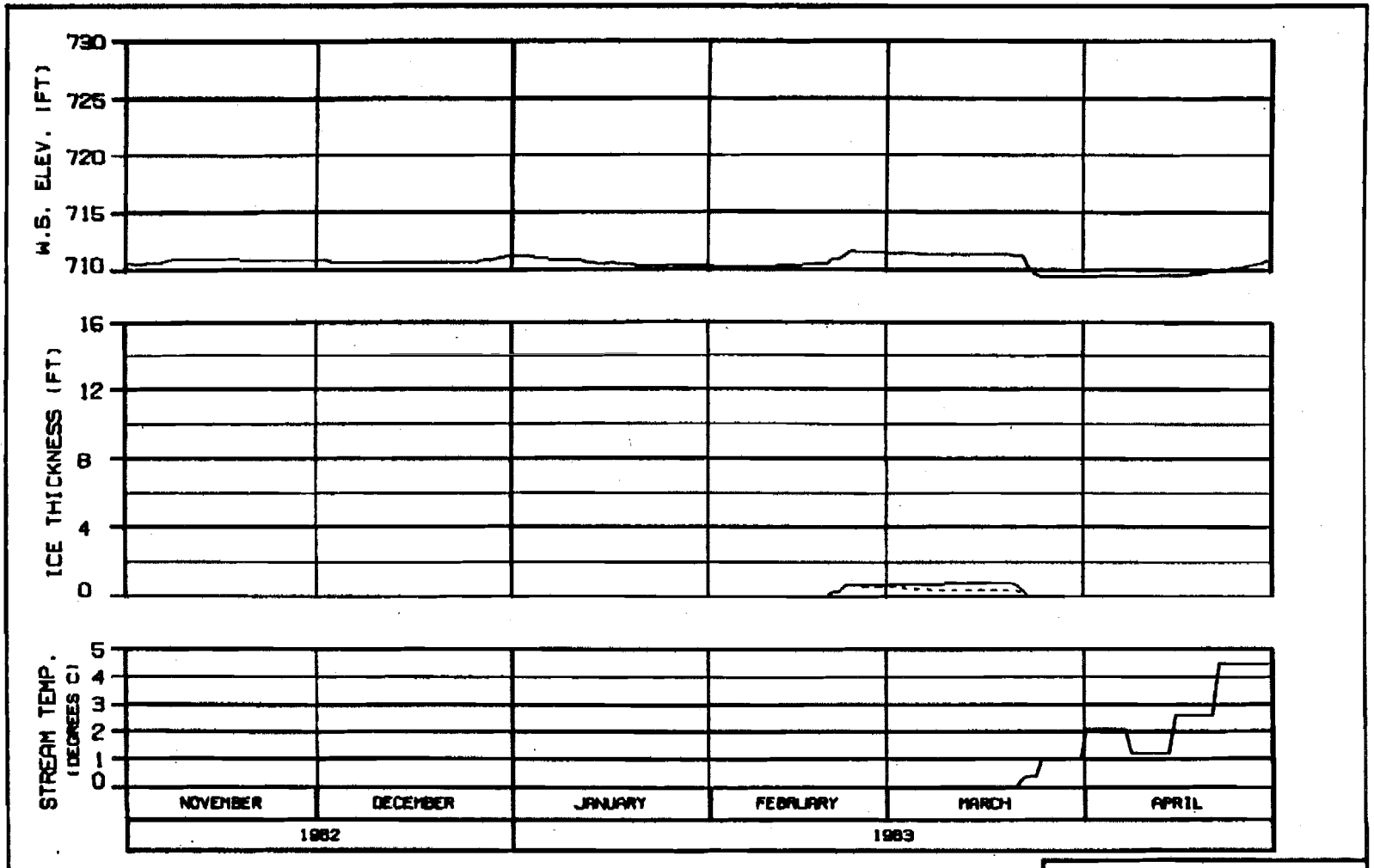


HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

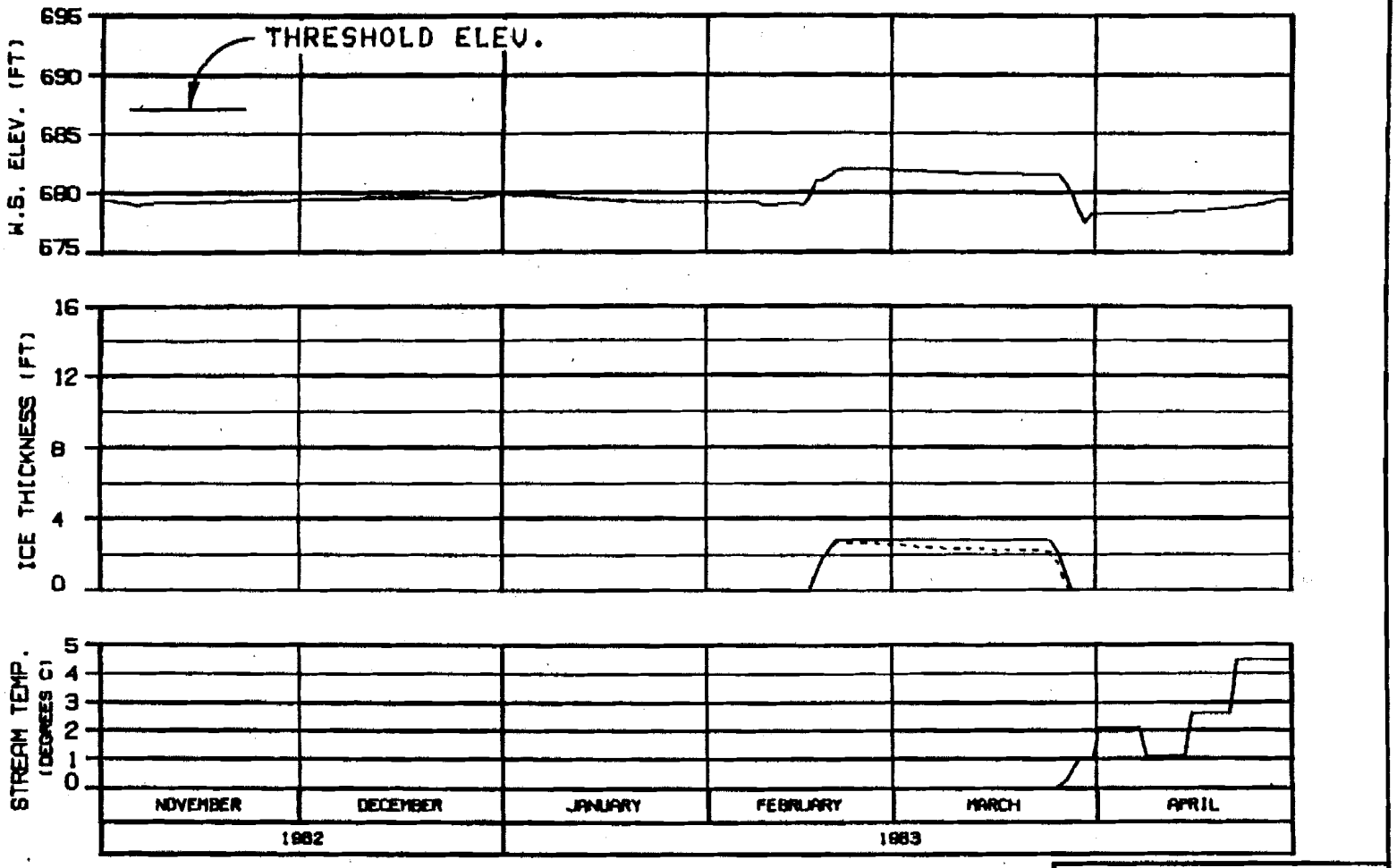
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 28 JUL 84 | 1588.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

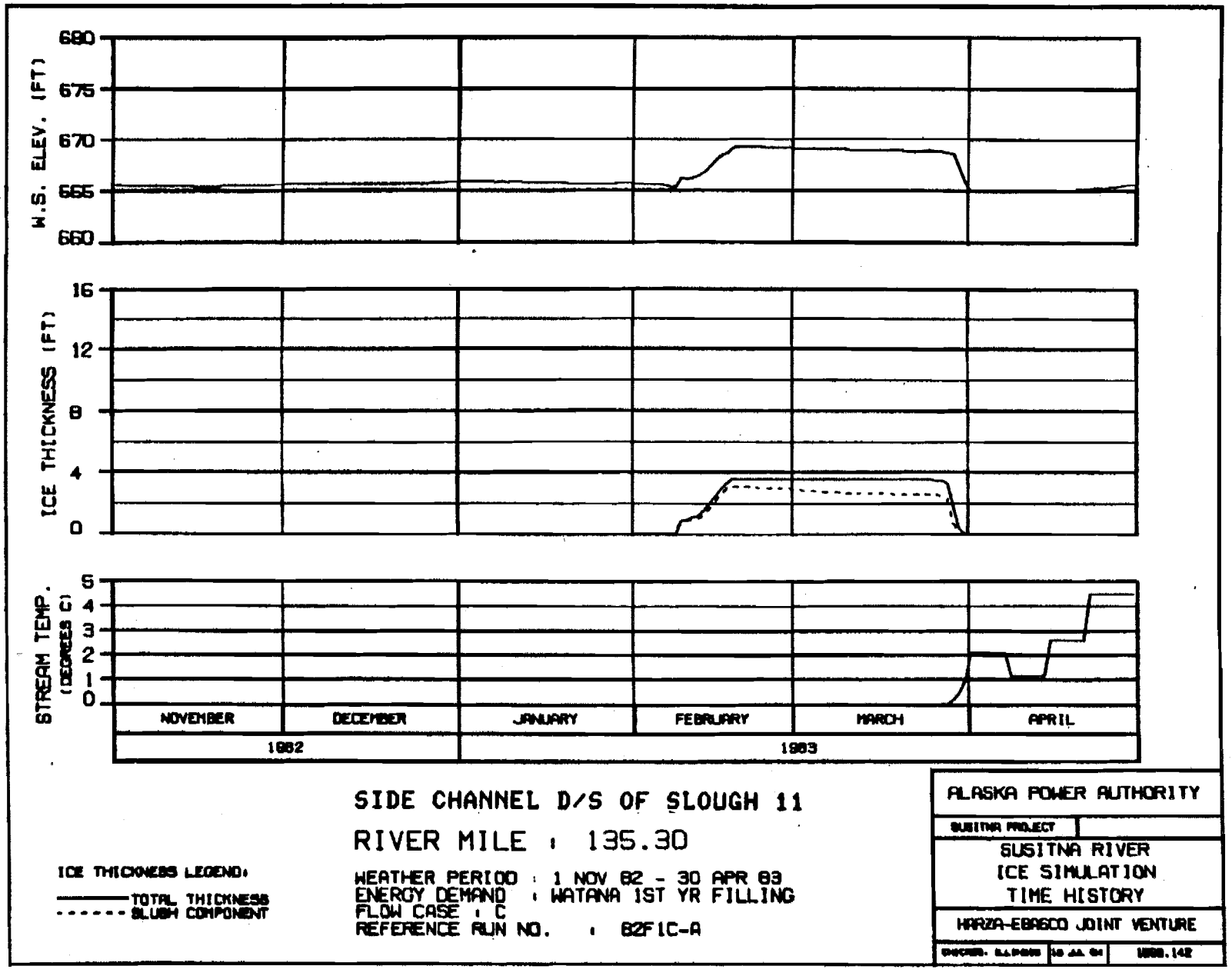
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S.A.PARKS | 18 JUL 84 | 1988.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

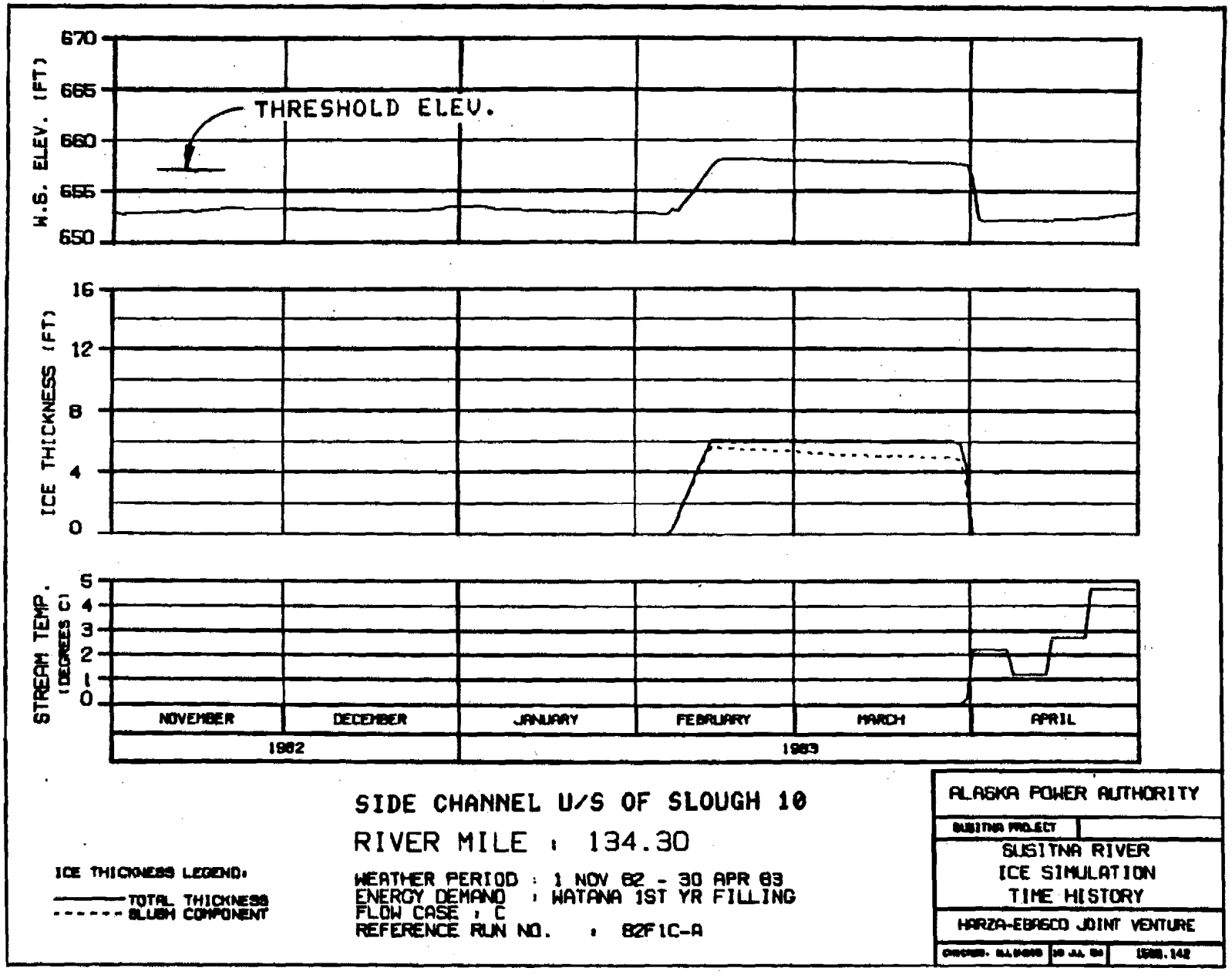
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 10 JAN 84 1888.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

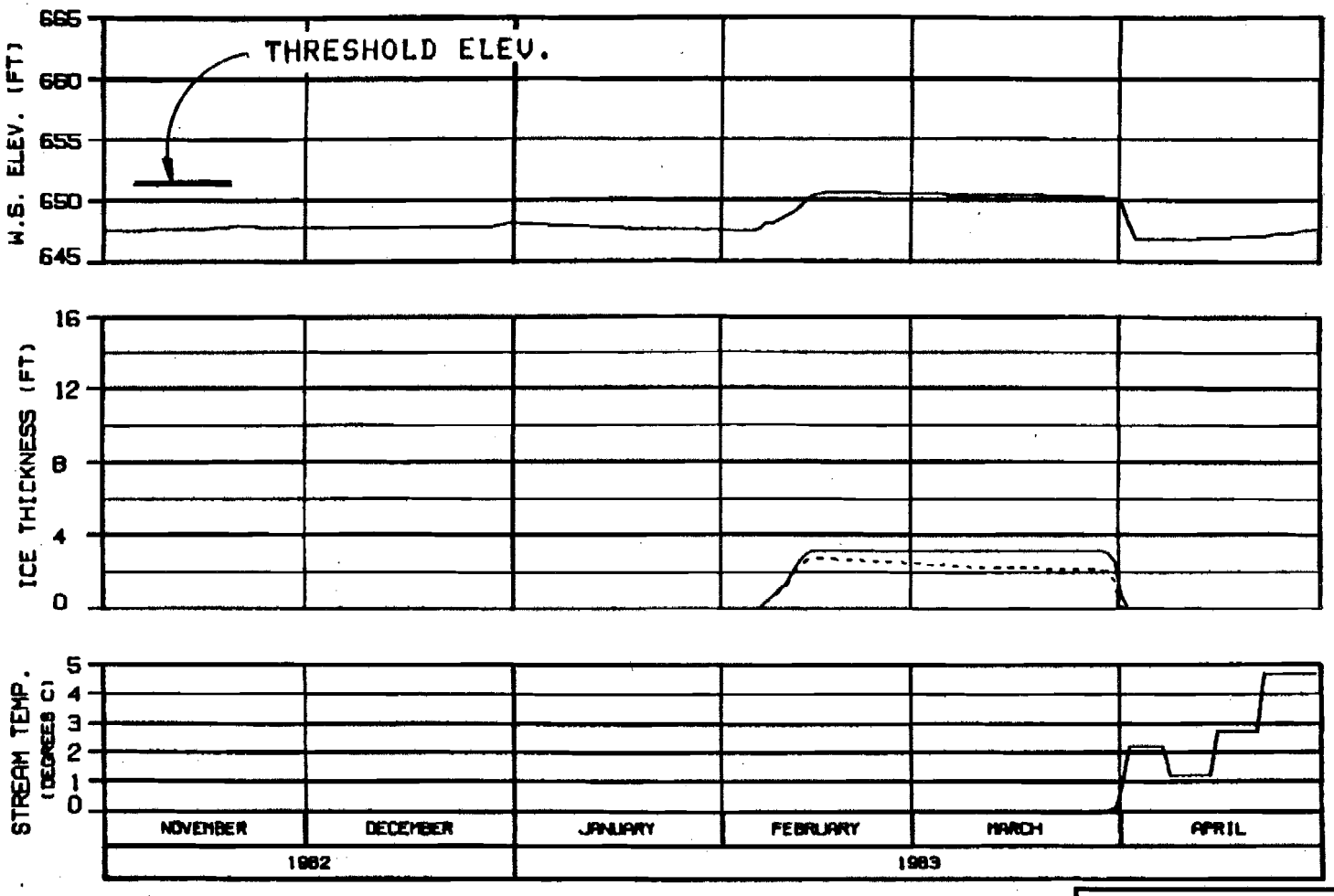
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 20 JUL 88 15BB.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

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

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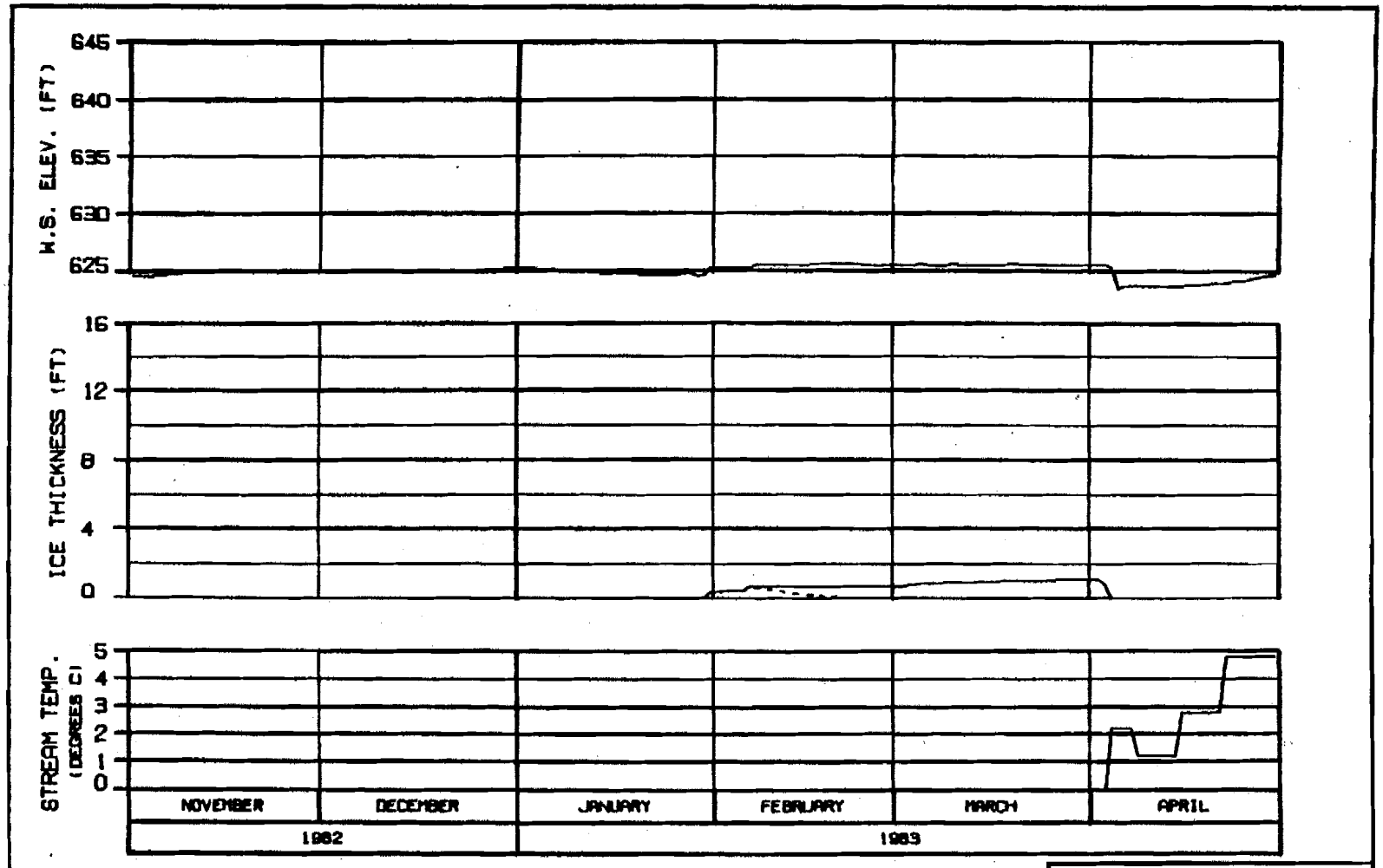


SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY

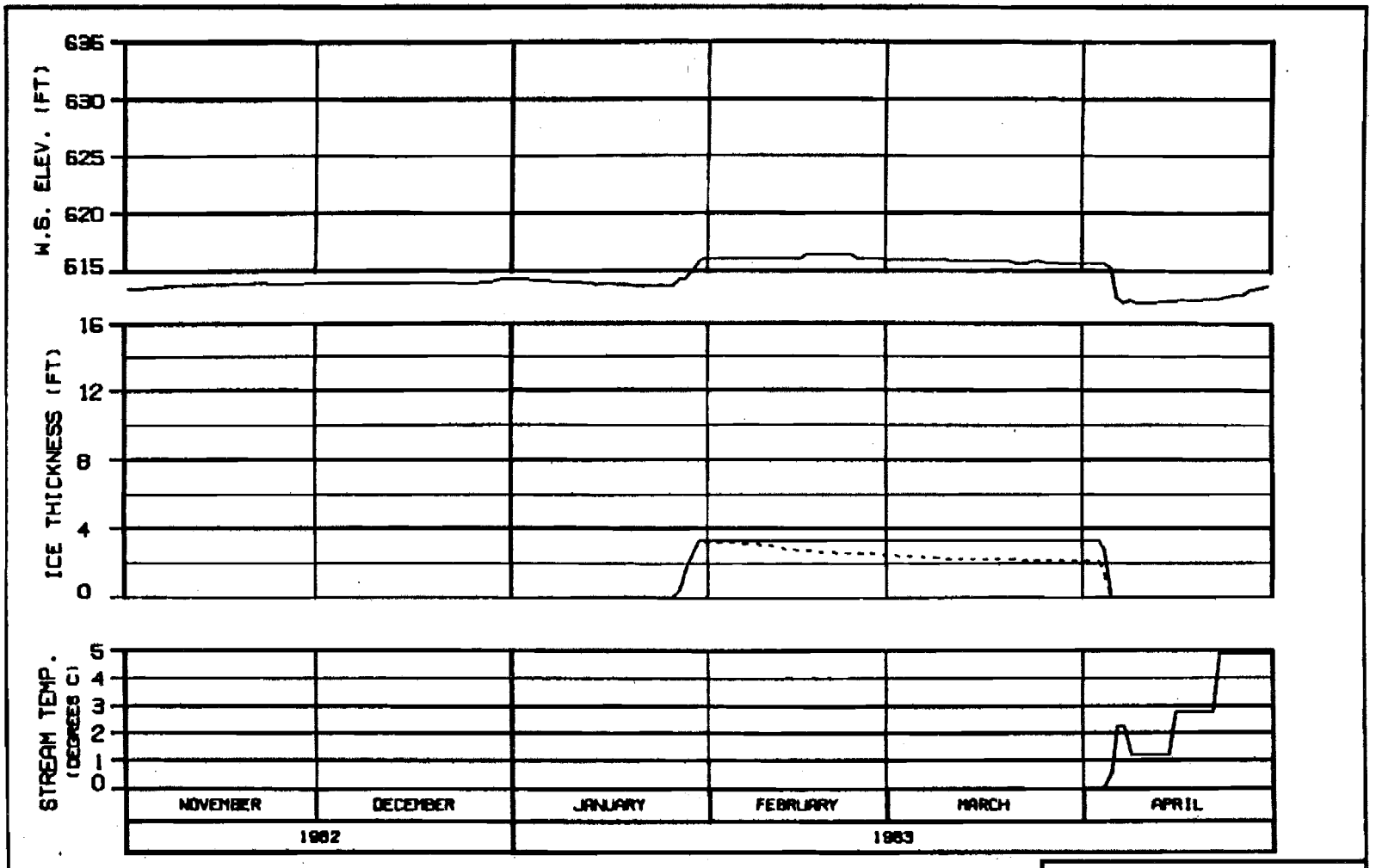
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DECATUR, ILLINOIS | 18 JUL 84 | 1988.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

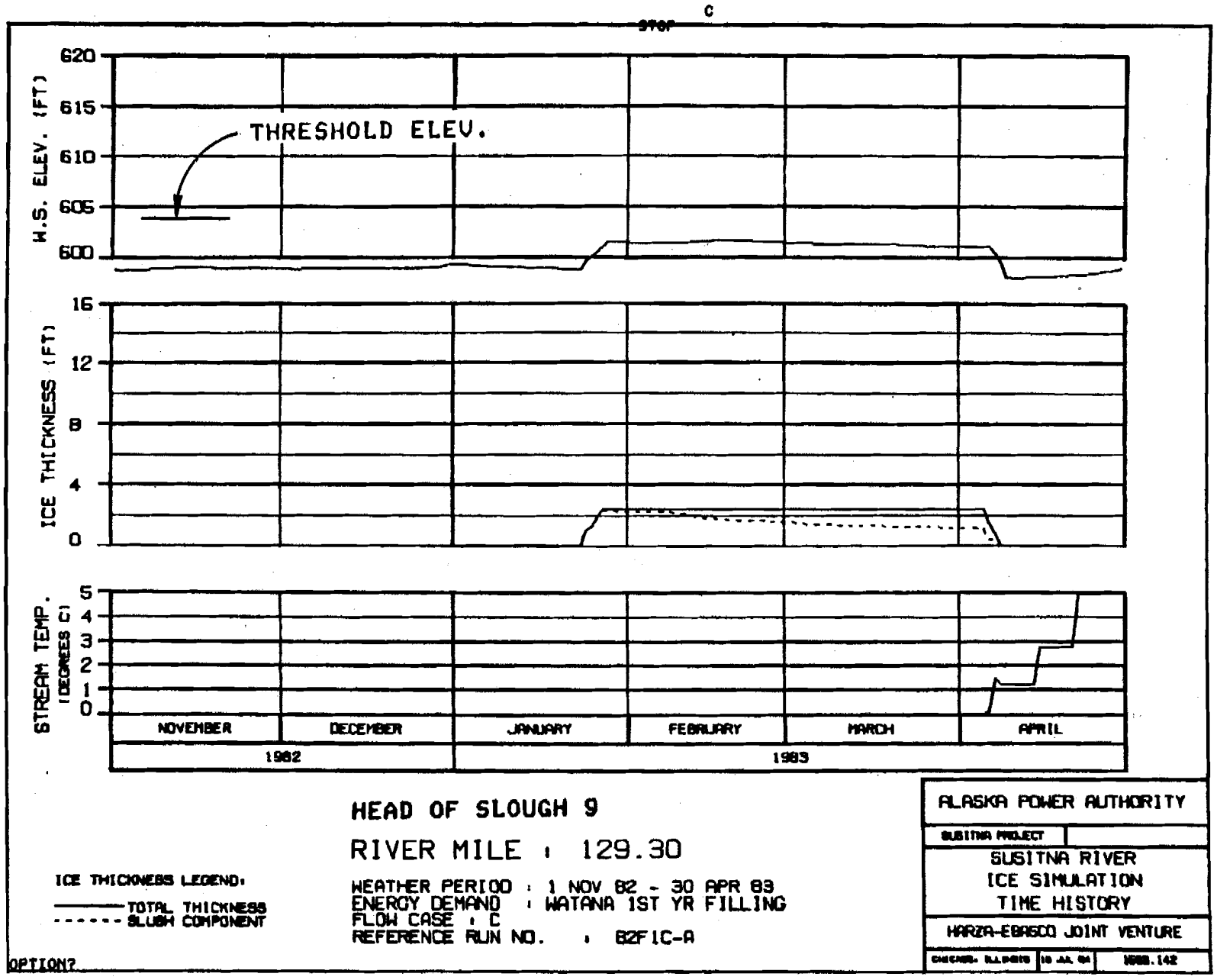
ALASKA POWER AUTHORITY

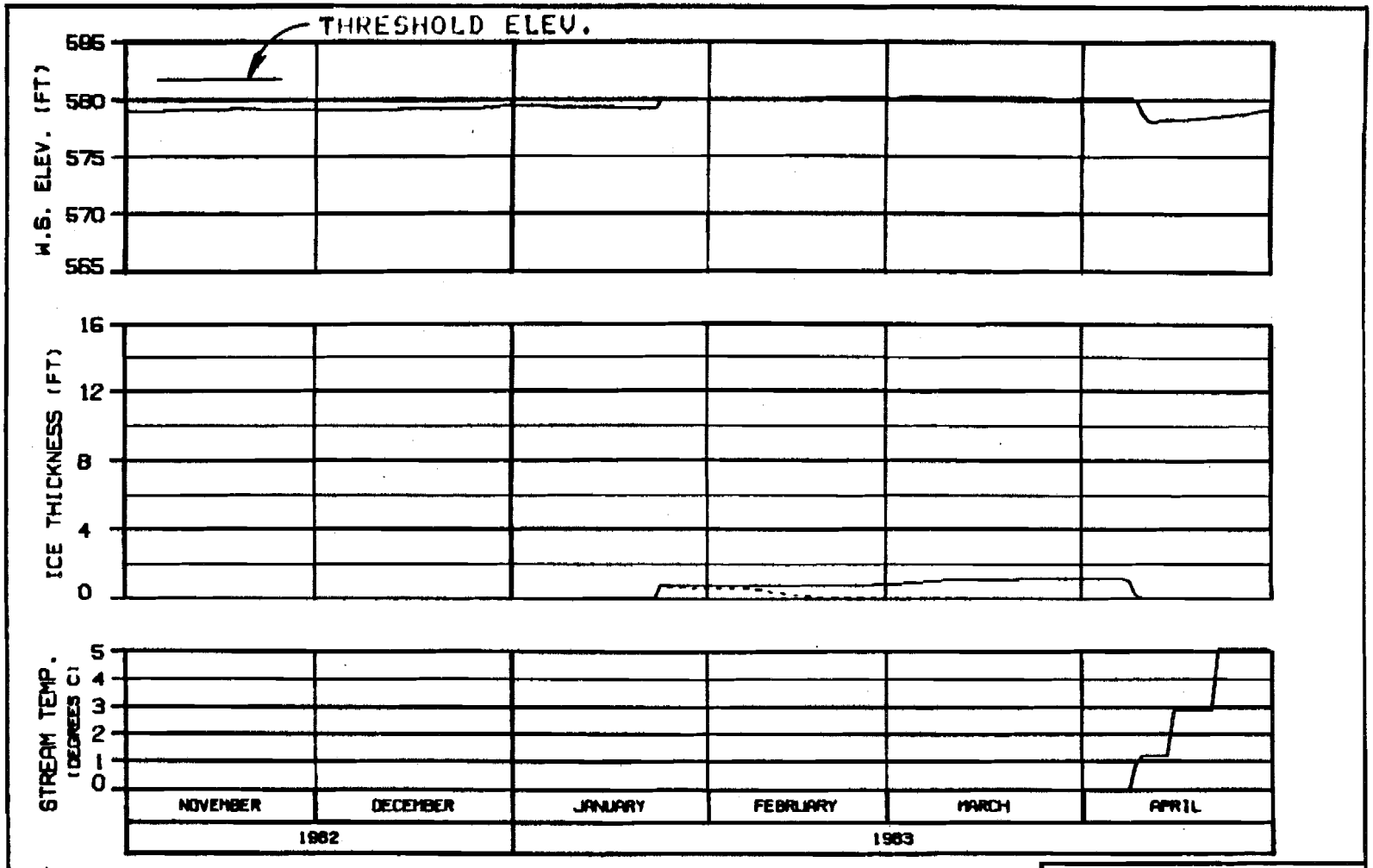
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.G.R.S. | 10 JUL 84 | 1988.142


C
STOP
620
615
610
605
600
W.S. ELEV. (FT)
THRESHOLD ELEV.
16
12
8
4
0
ICE THICKNESS (FT)
5
4
3
2
1
0
STREAM TEMP. (DEGREES C)
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1982
1983
HEAD OF SLOUGH 9
RIVER MILE : 129.30
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B2F1C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
OPTION?



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

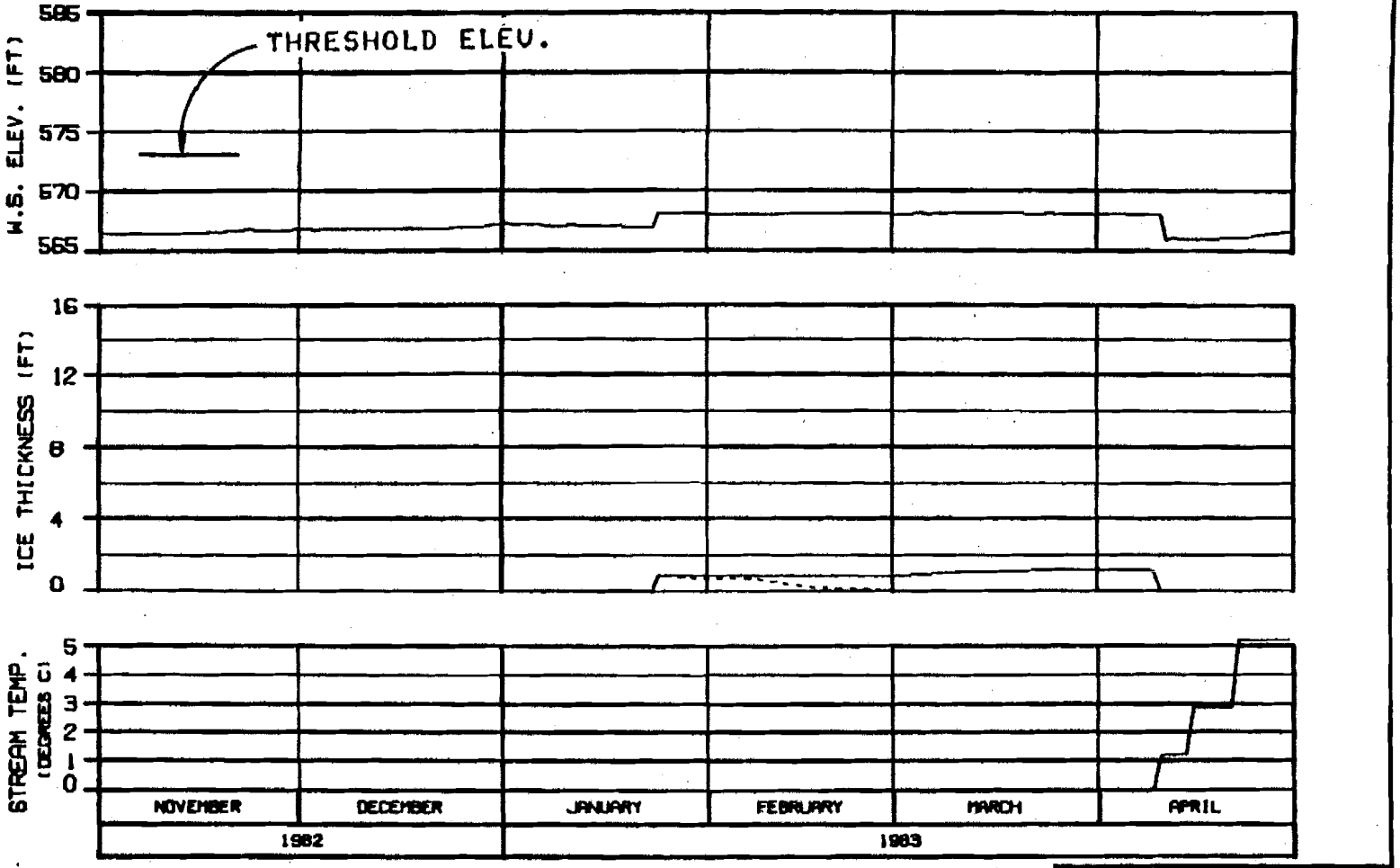
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

19 JUL 84 | 1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

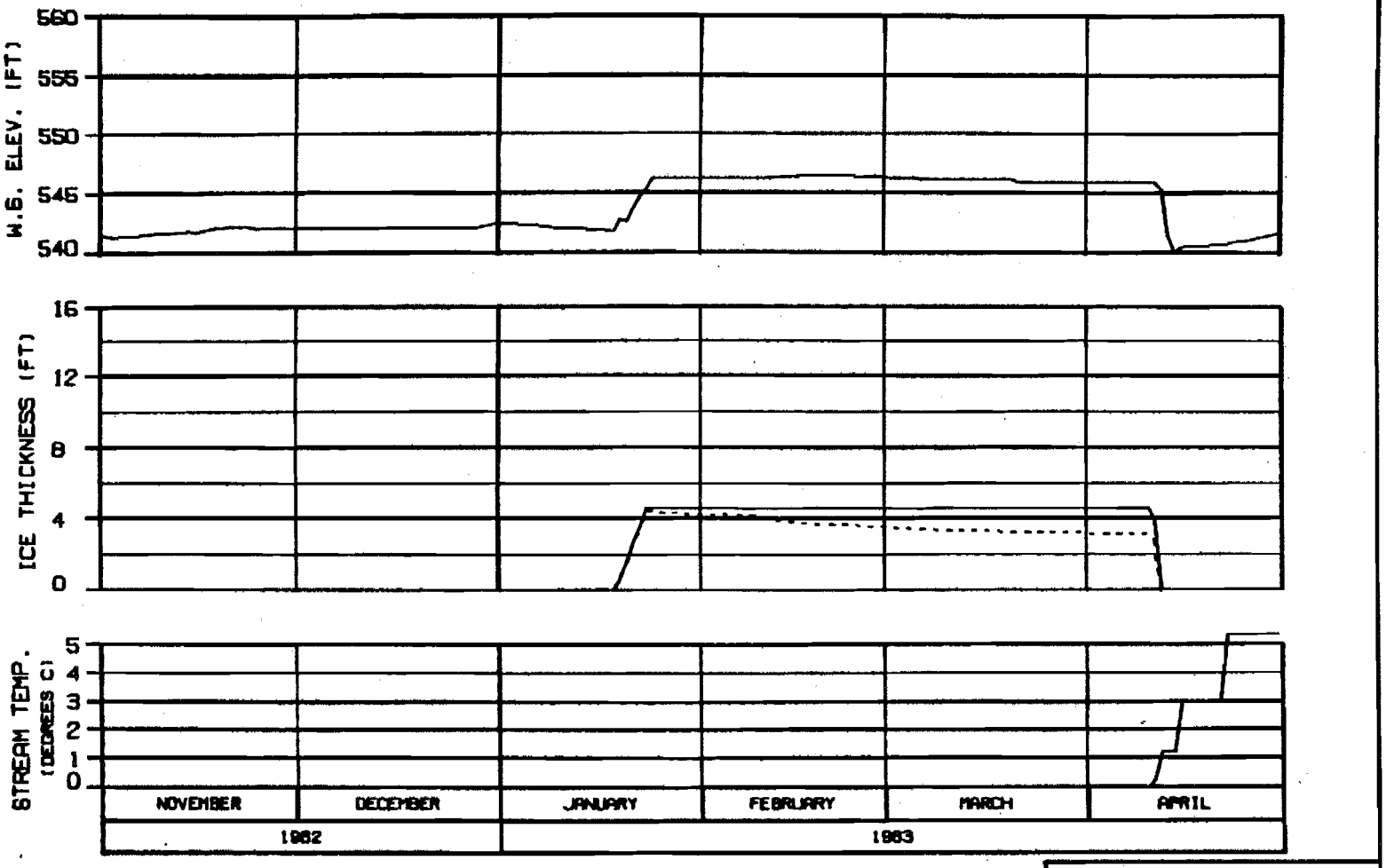
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: S.A.PAVIS | 18 JUL 84 | 1888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

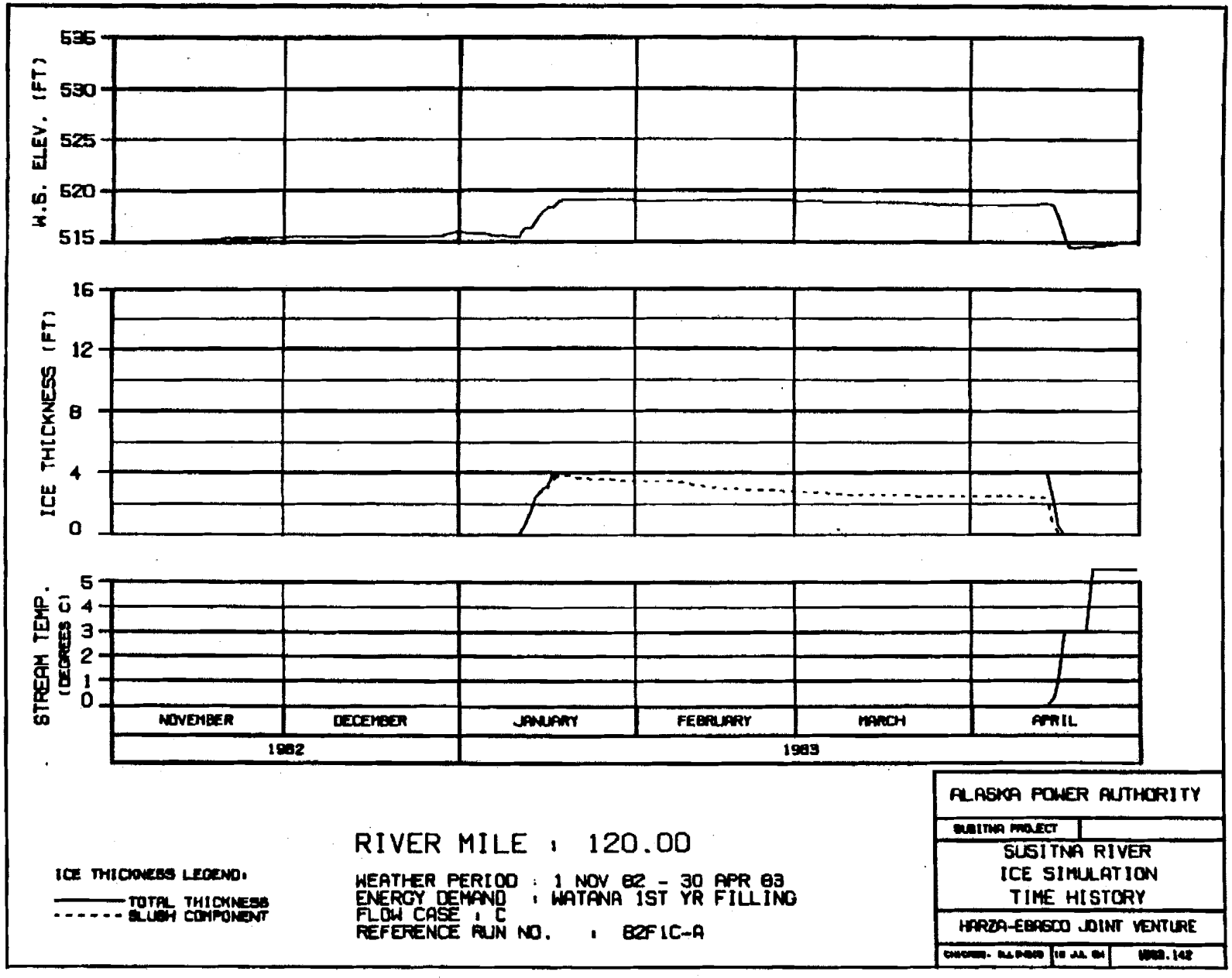
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 19 JUL 84 | 8888.142



ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

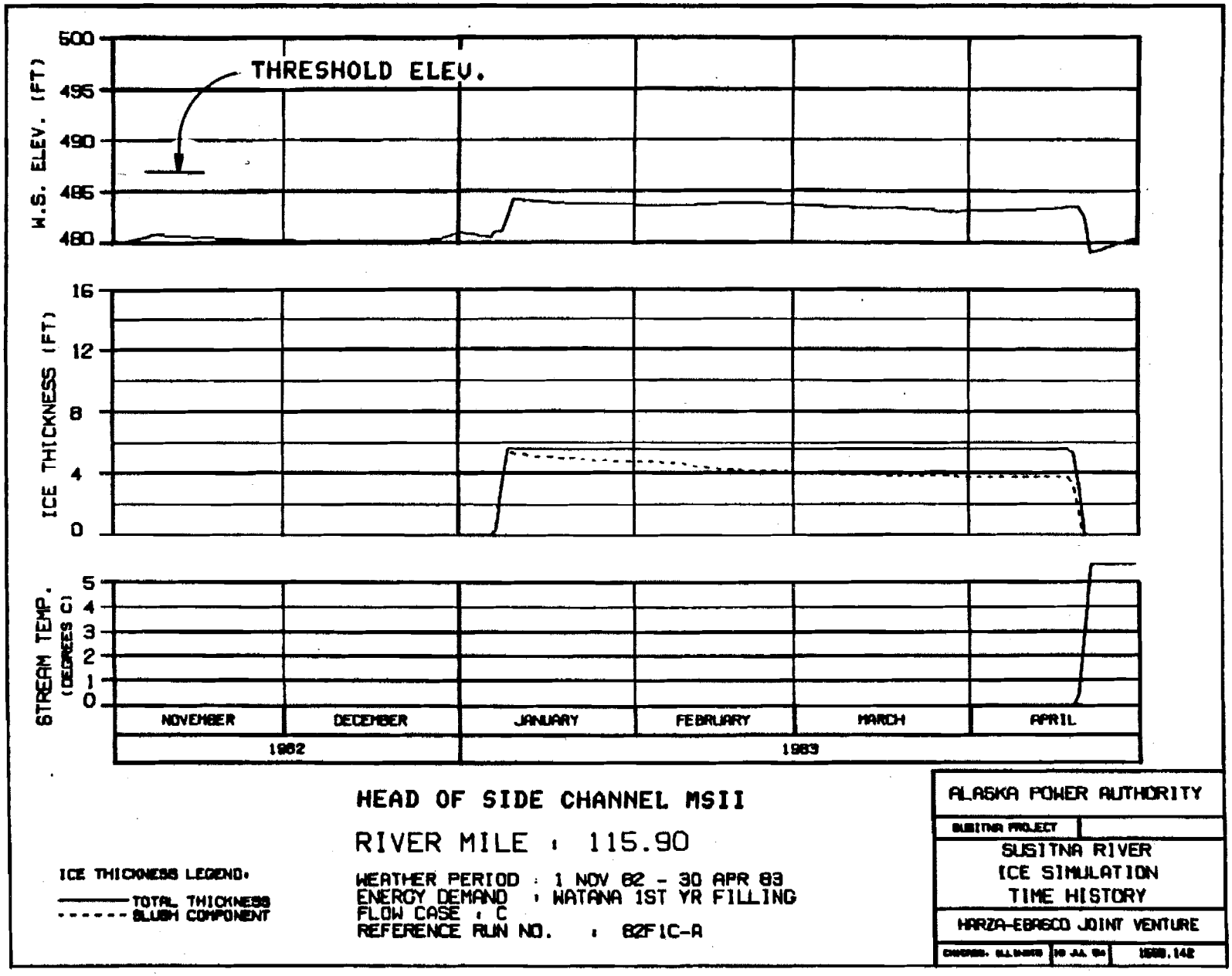
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.P.G.D. | 18 JUL 84 | 8888.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

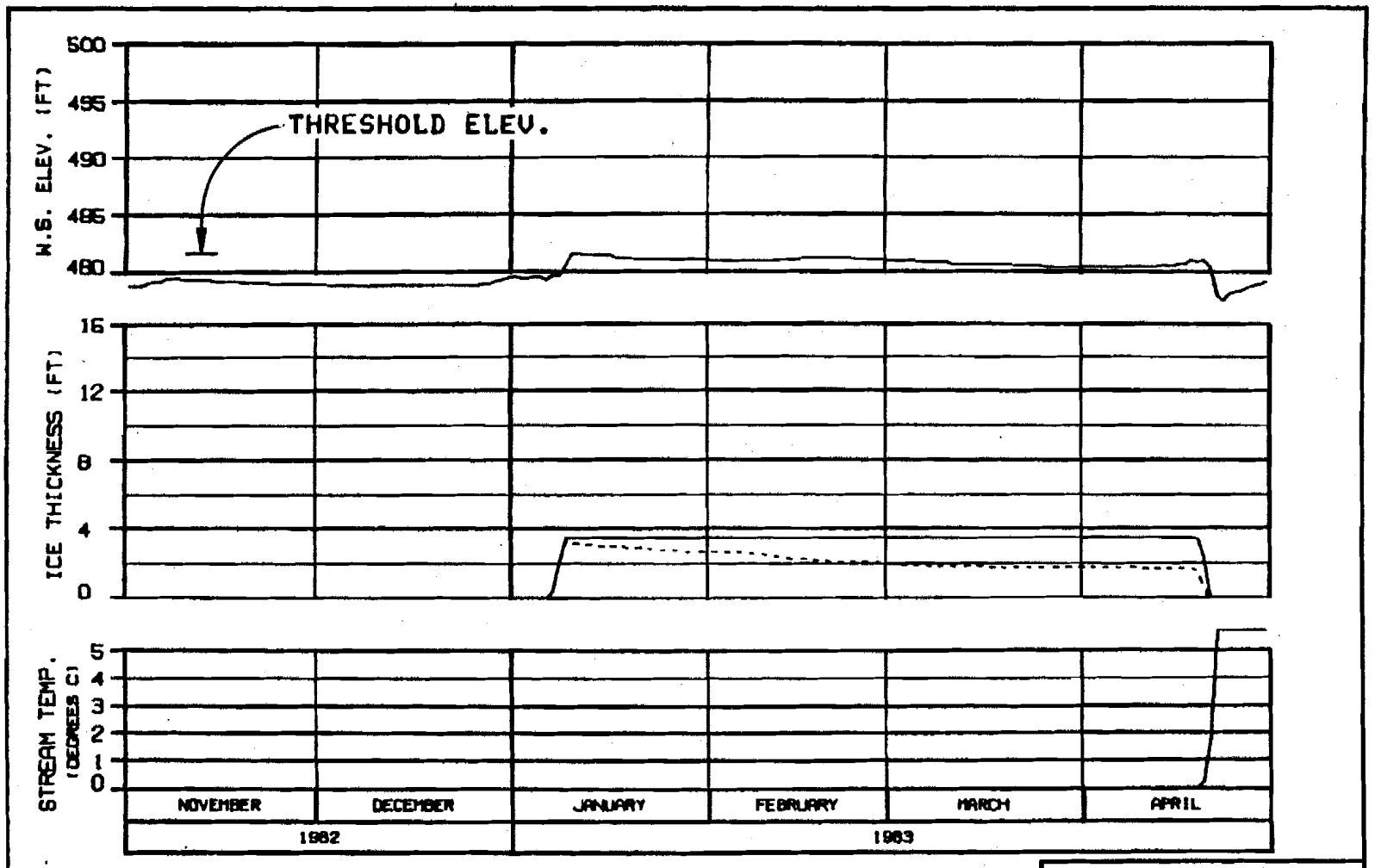
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

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 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

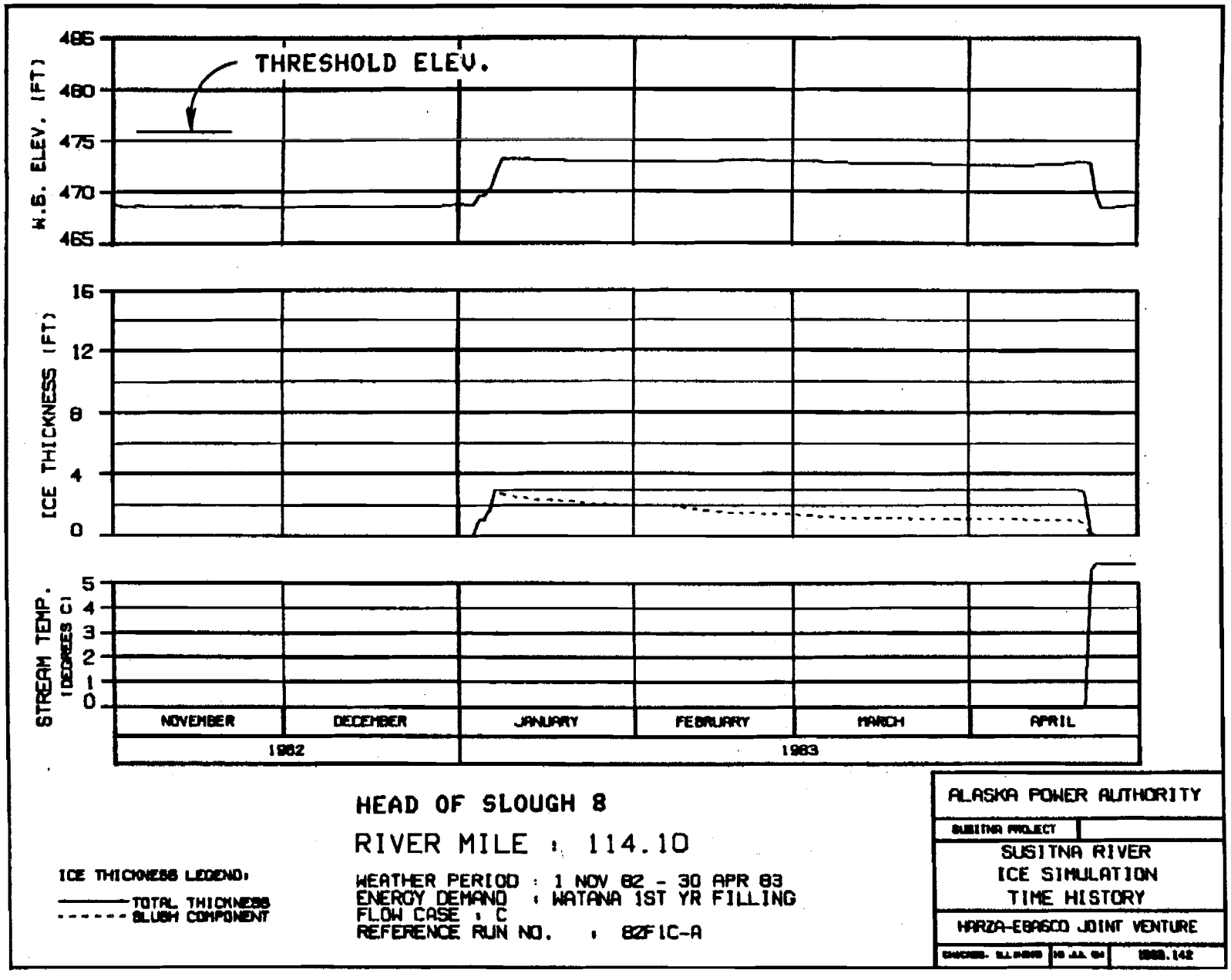
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 19 JUL 84 | 2686.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

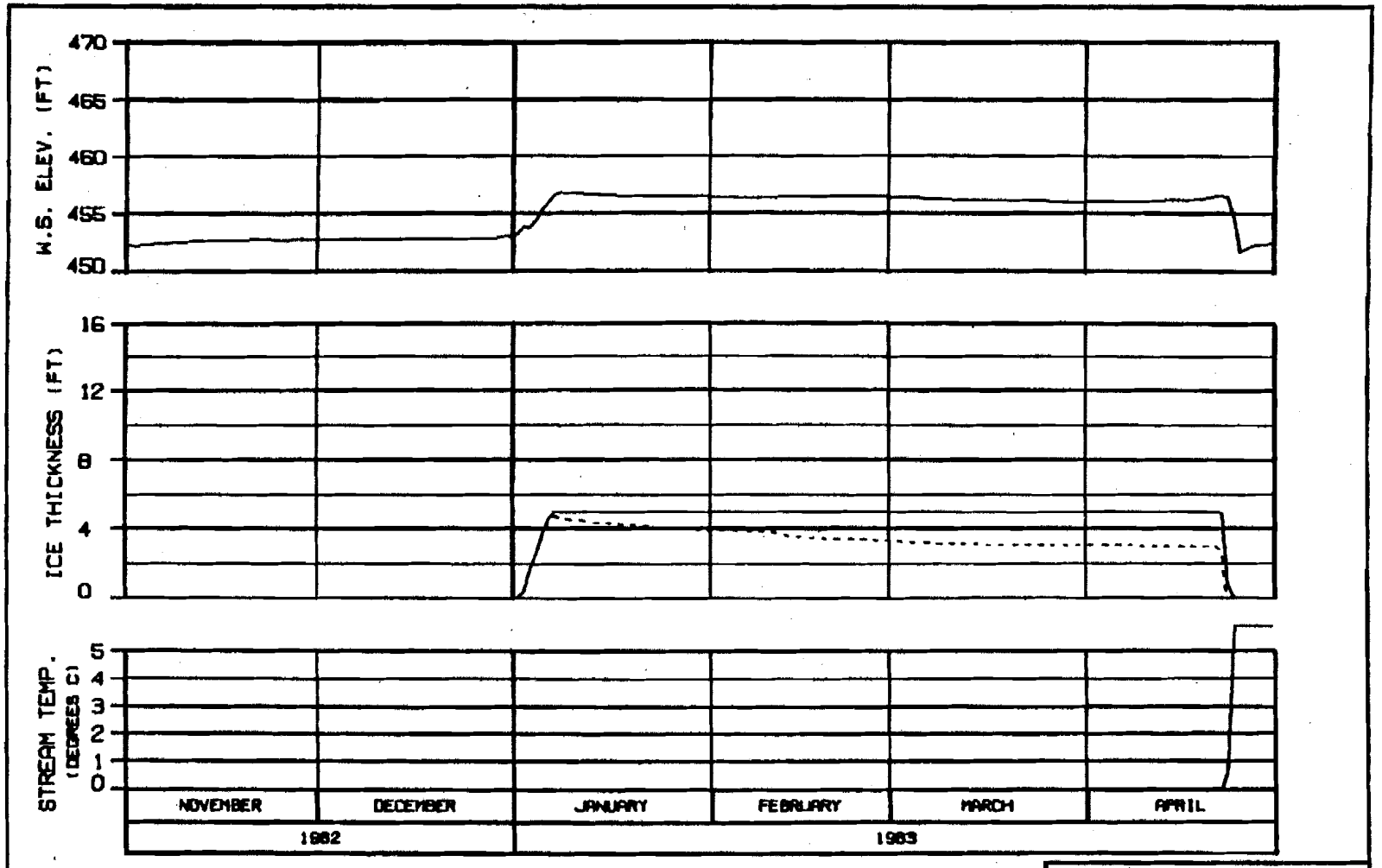
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82FIC-A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

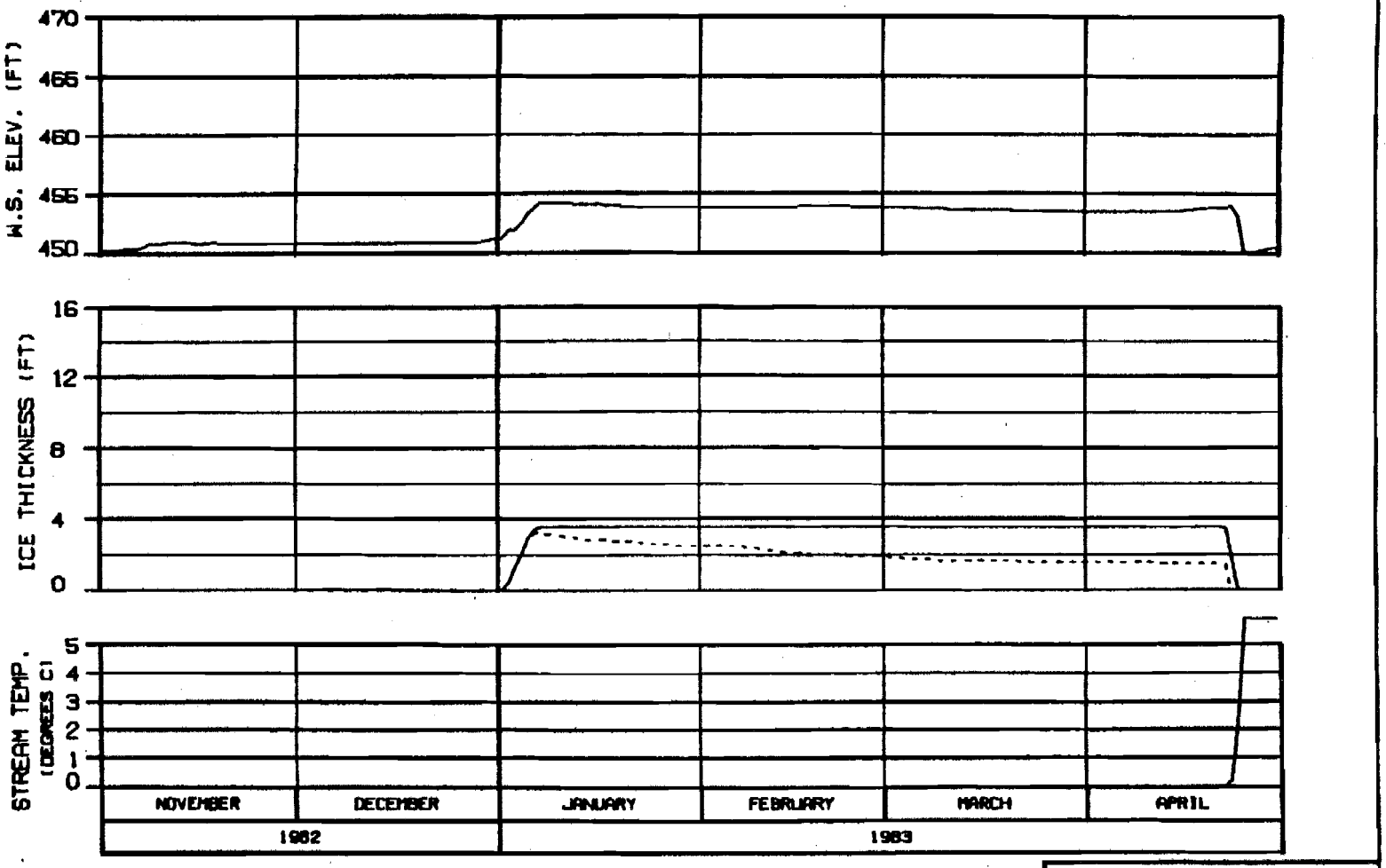
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1888.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

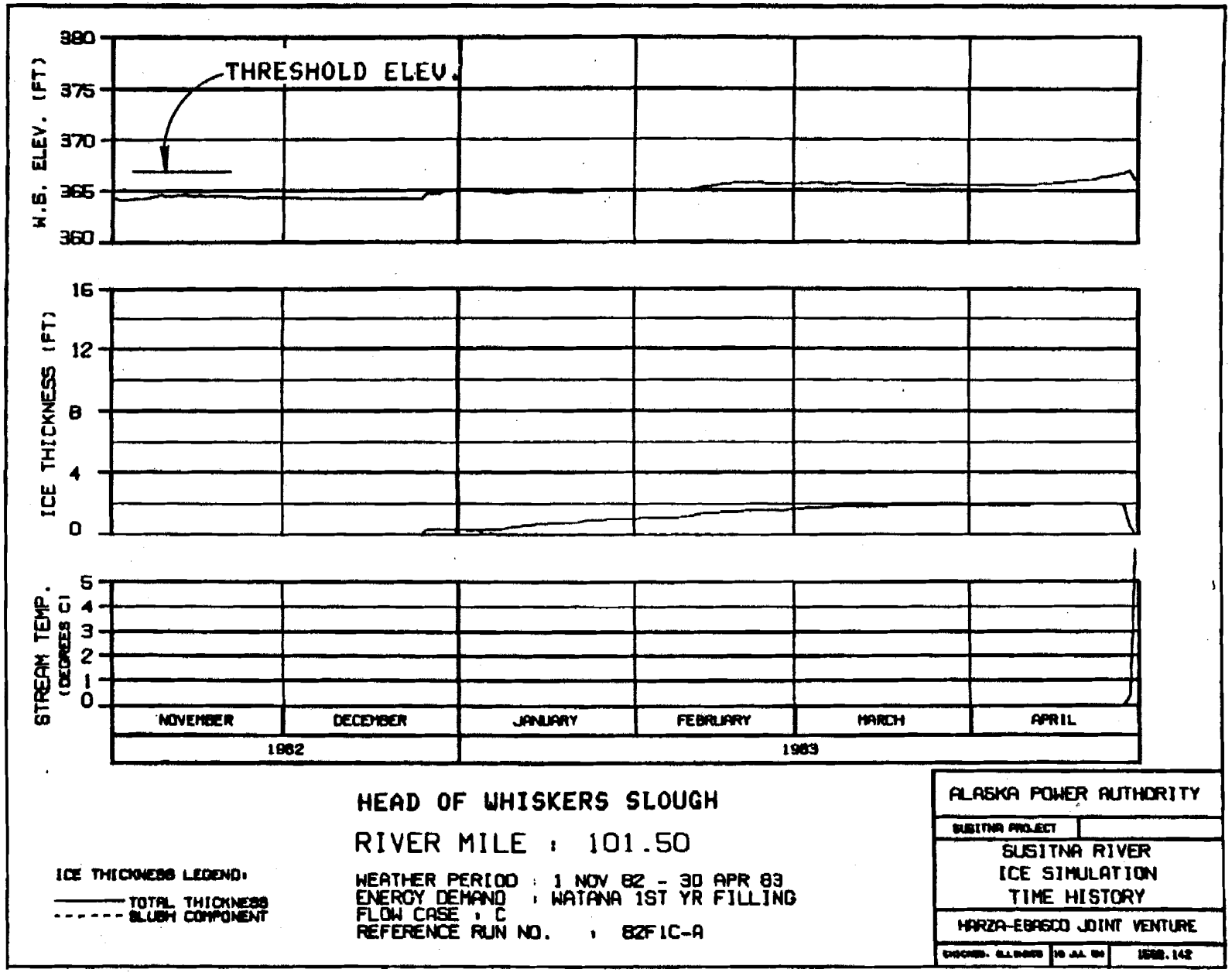
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 16 JUL 84 | 1588.142



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A

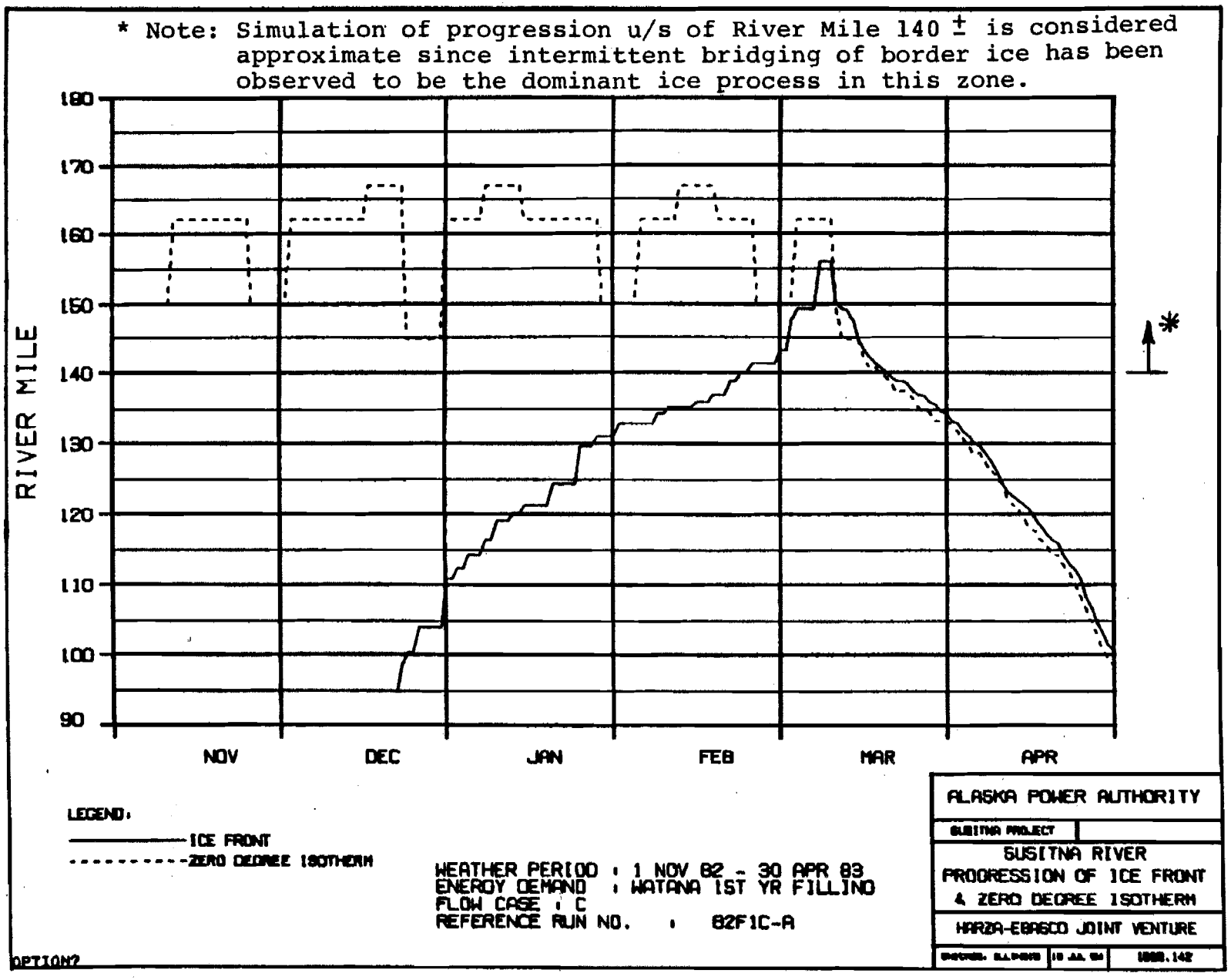
ALASKA POWER AUTHORITY

SUSITNA PROJECT

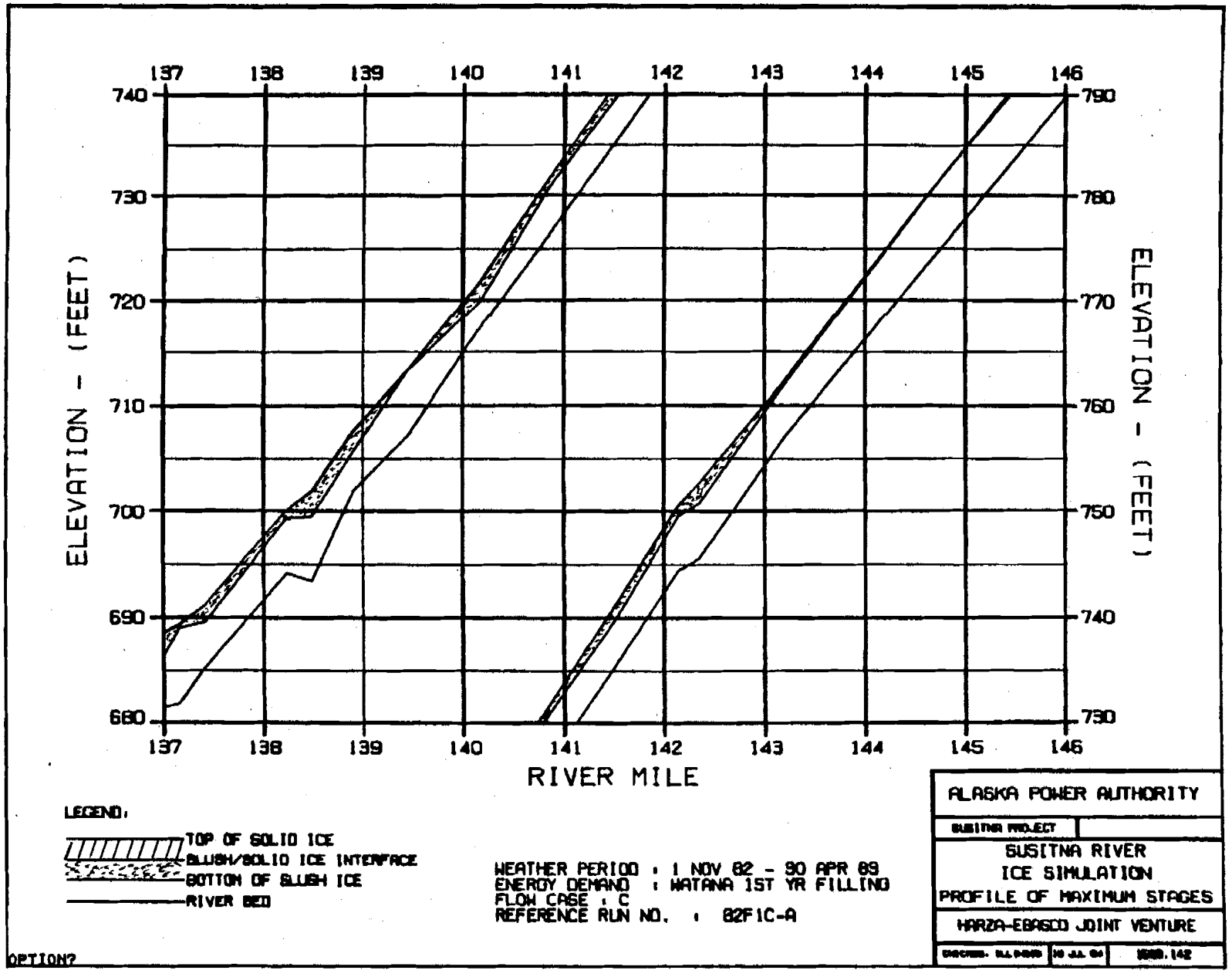
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1588.142


* Note: Simulation of progression u/s of River Mile 140 ± is considered approximate since intermittent bridging of border ice has been observed to be the dominant ice process in this zone.
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 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?

C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690
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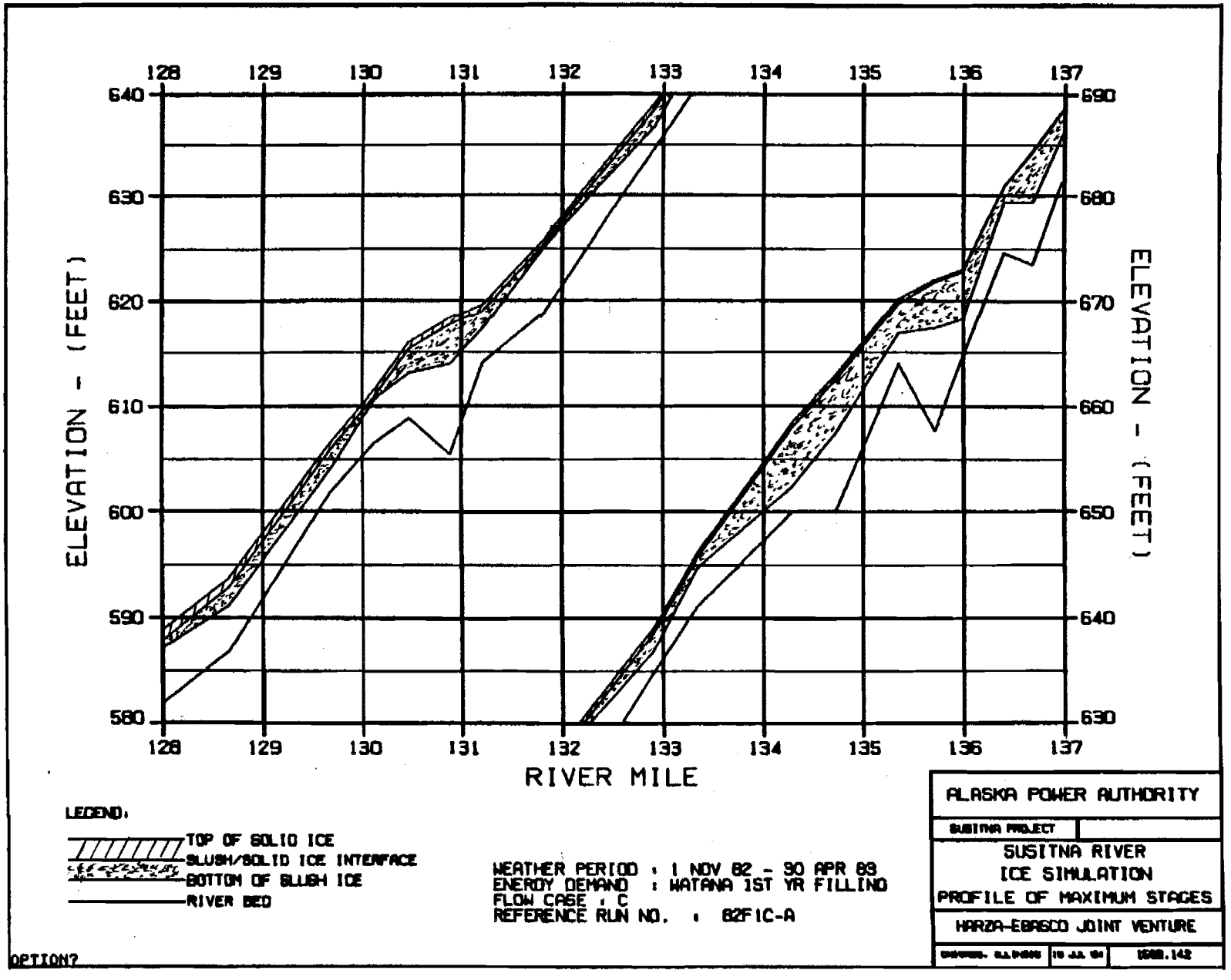
770
760
750
740
730
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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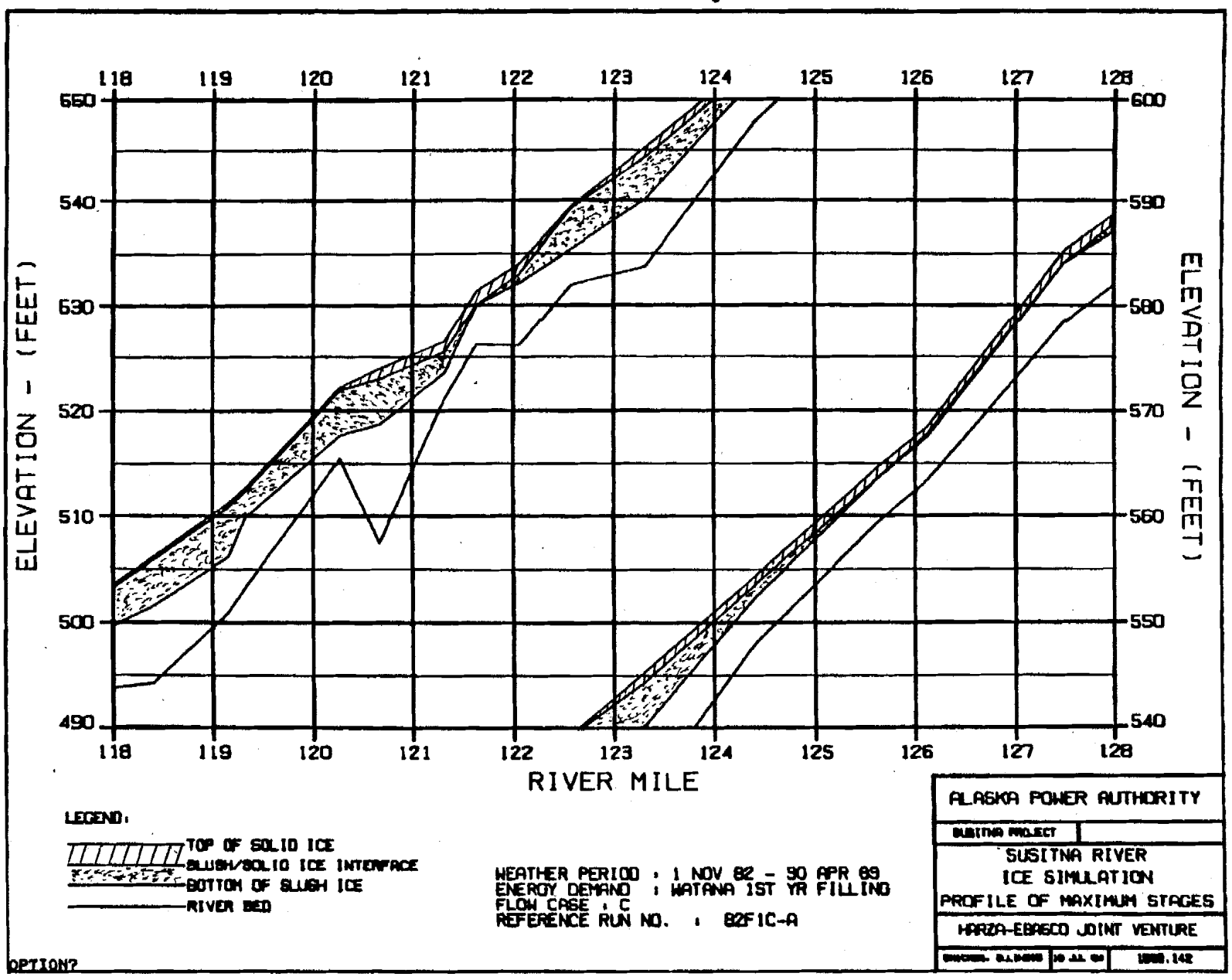
640
630
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

C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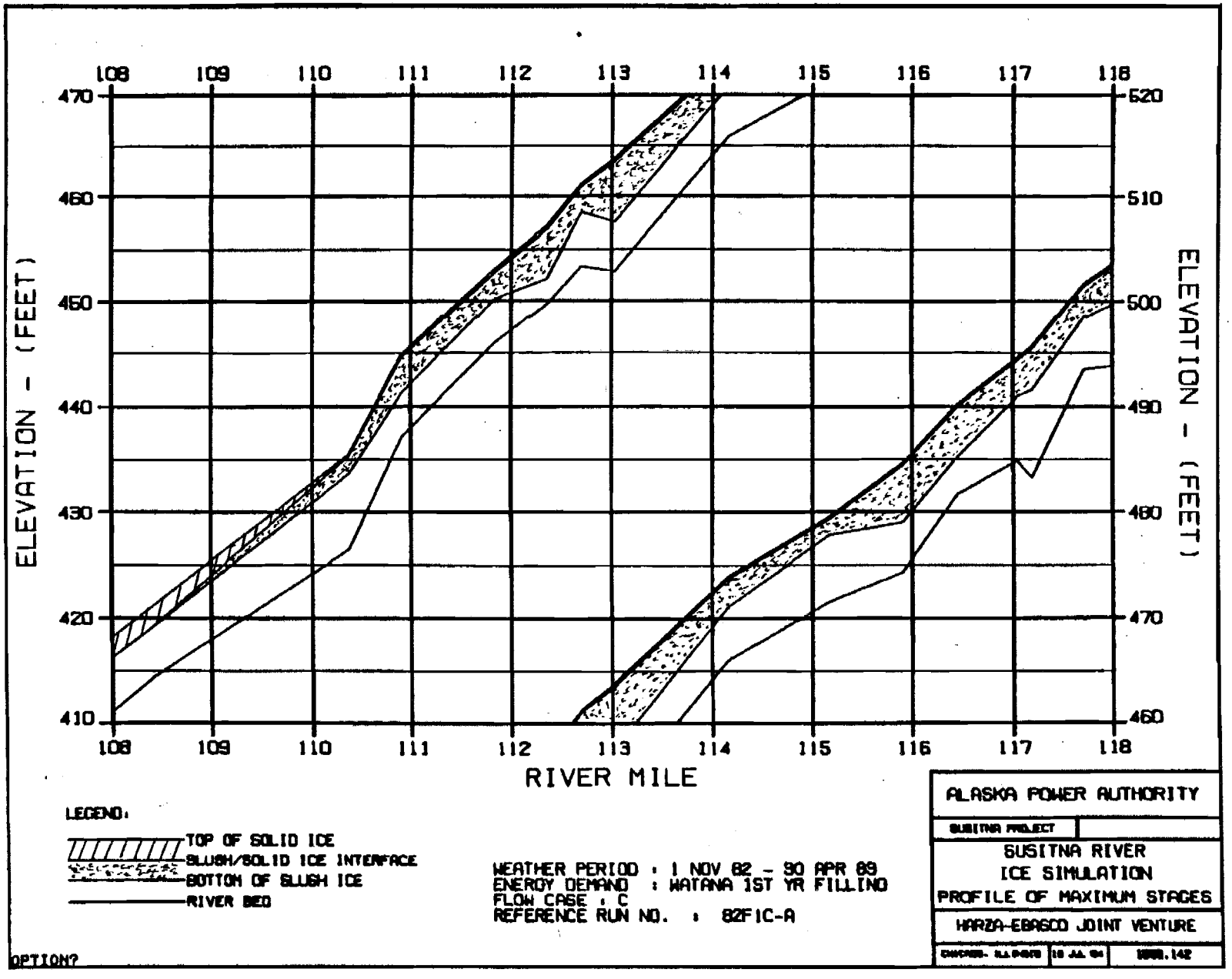
520
510
500
490
600
590
580
570
560
550
540
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82F1C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

C


108
109
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114
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116
117
118
470
460
450
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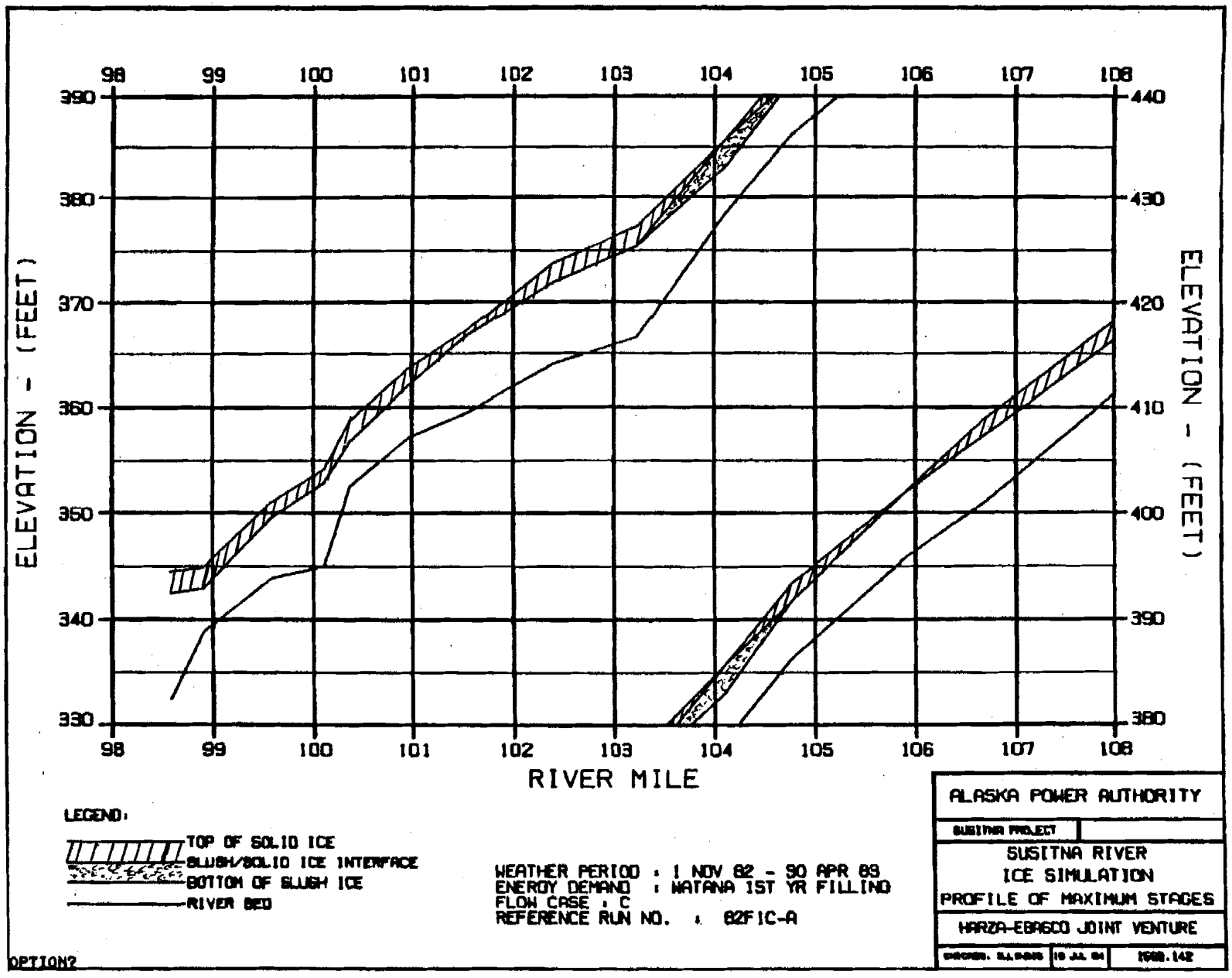
430
420
410
520
510
500
490
480
470
460
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82FIC-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?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99
100
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102
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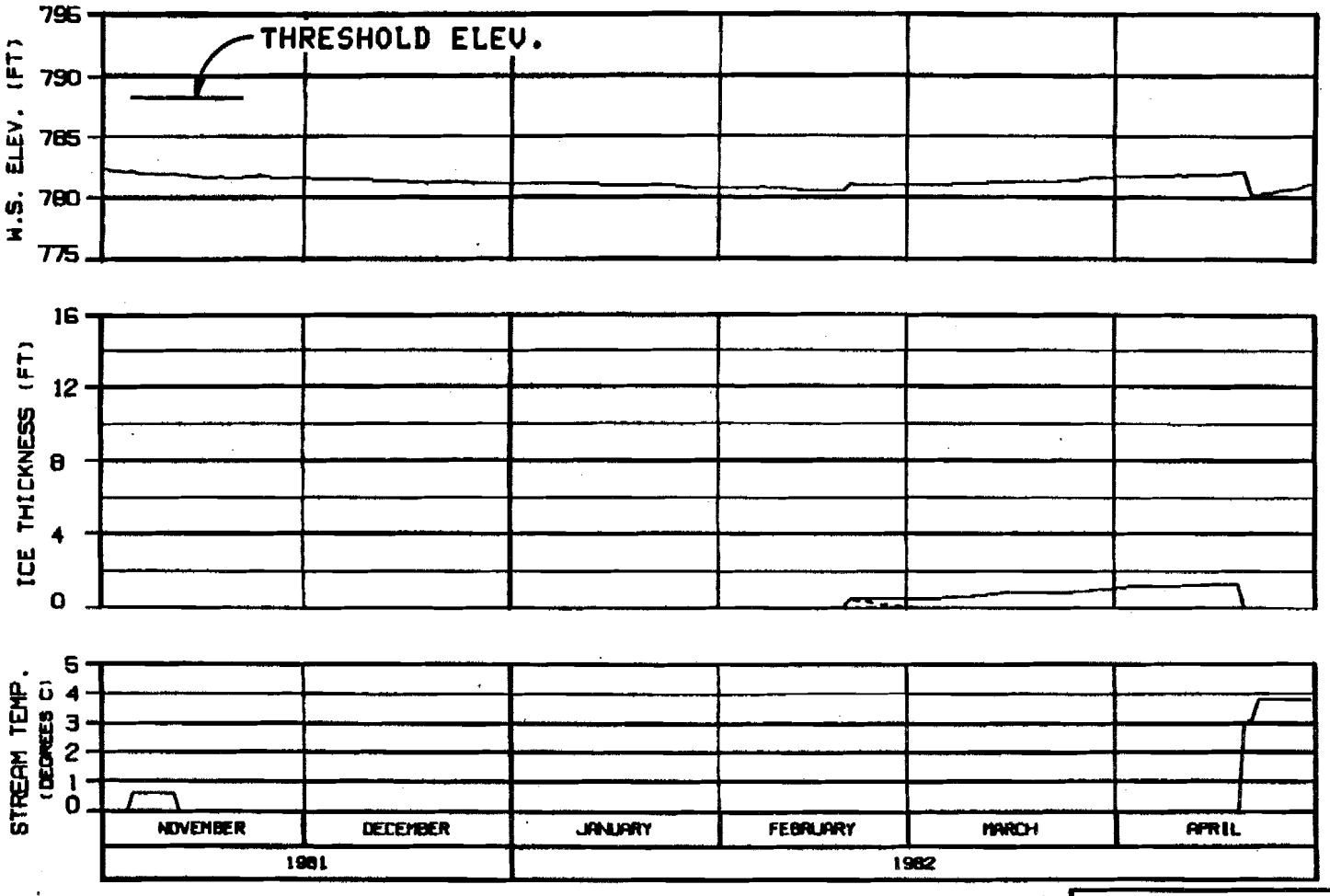
108
390
380
370
360
350
340
330
440
430
420
410
400
390
380
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : MATANA 1ST YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 82FIC-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
10 JUL 84
1988.142
OPTION2

The following study, entitled "Watana-First Year Filling" corresponds to the winter of 1991-92, as depicted in Exhibit E.2.138 of the License Application. The weather used corresponds to the winter of 1982-83, which is a mild winter. Releases from Watana under these conditions would be made thru the low-level outlet.

EXHIBIT G

EXHIBIT G

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

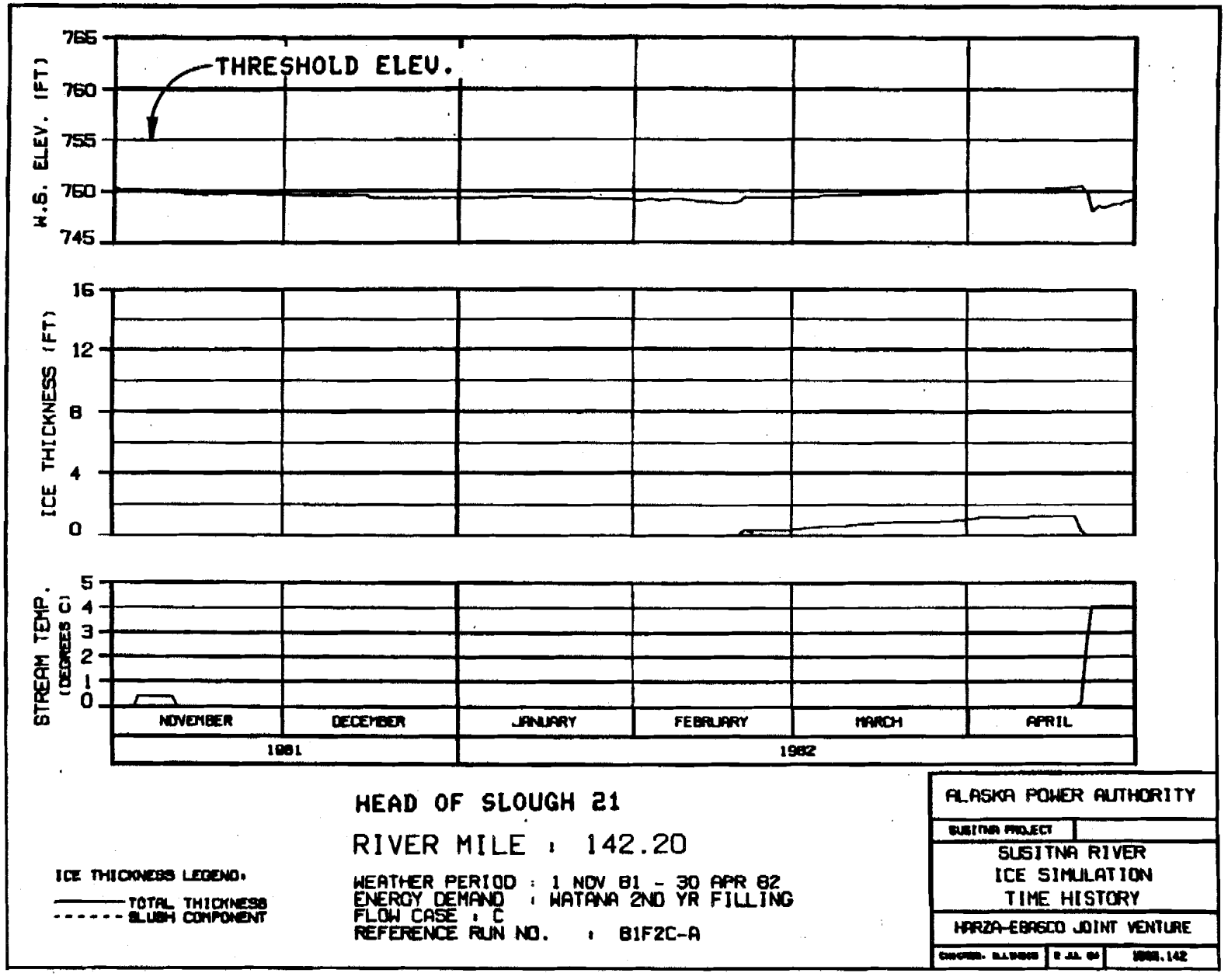
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

OPTION?



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

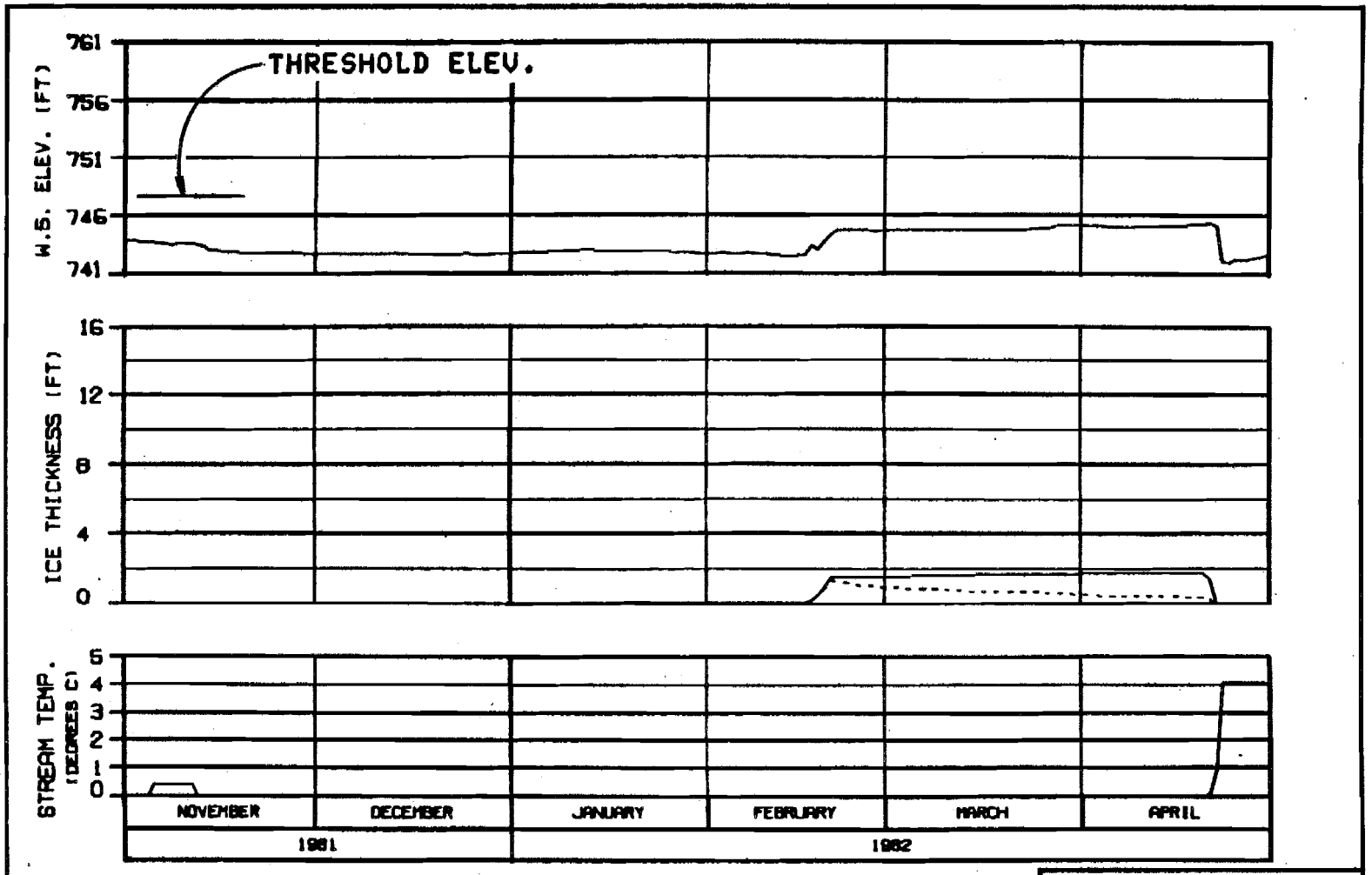
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

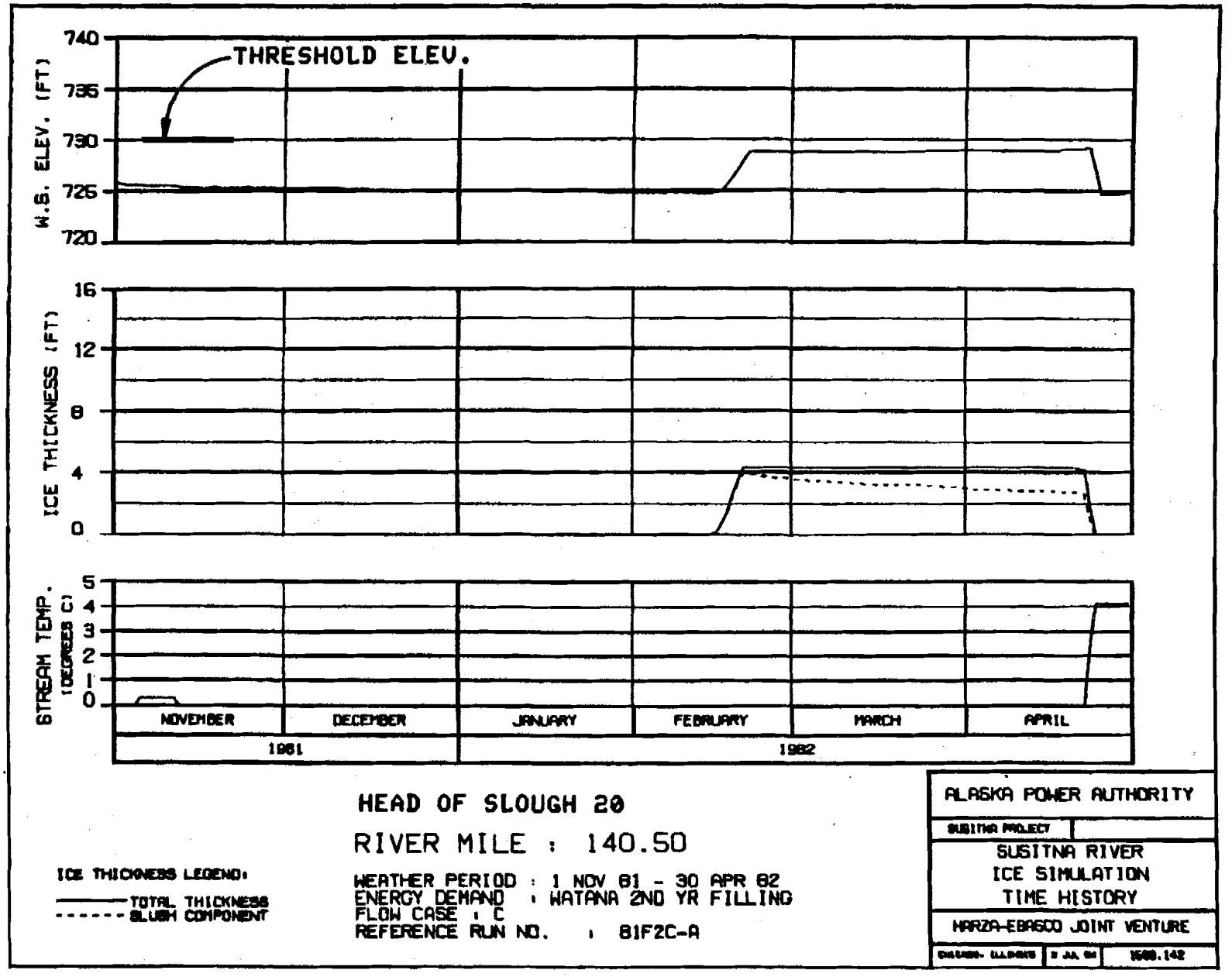
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 9 JUL 84 | 1888.142



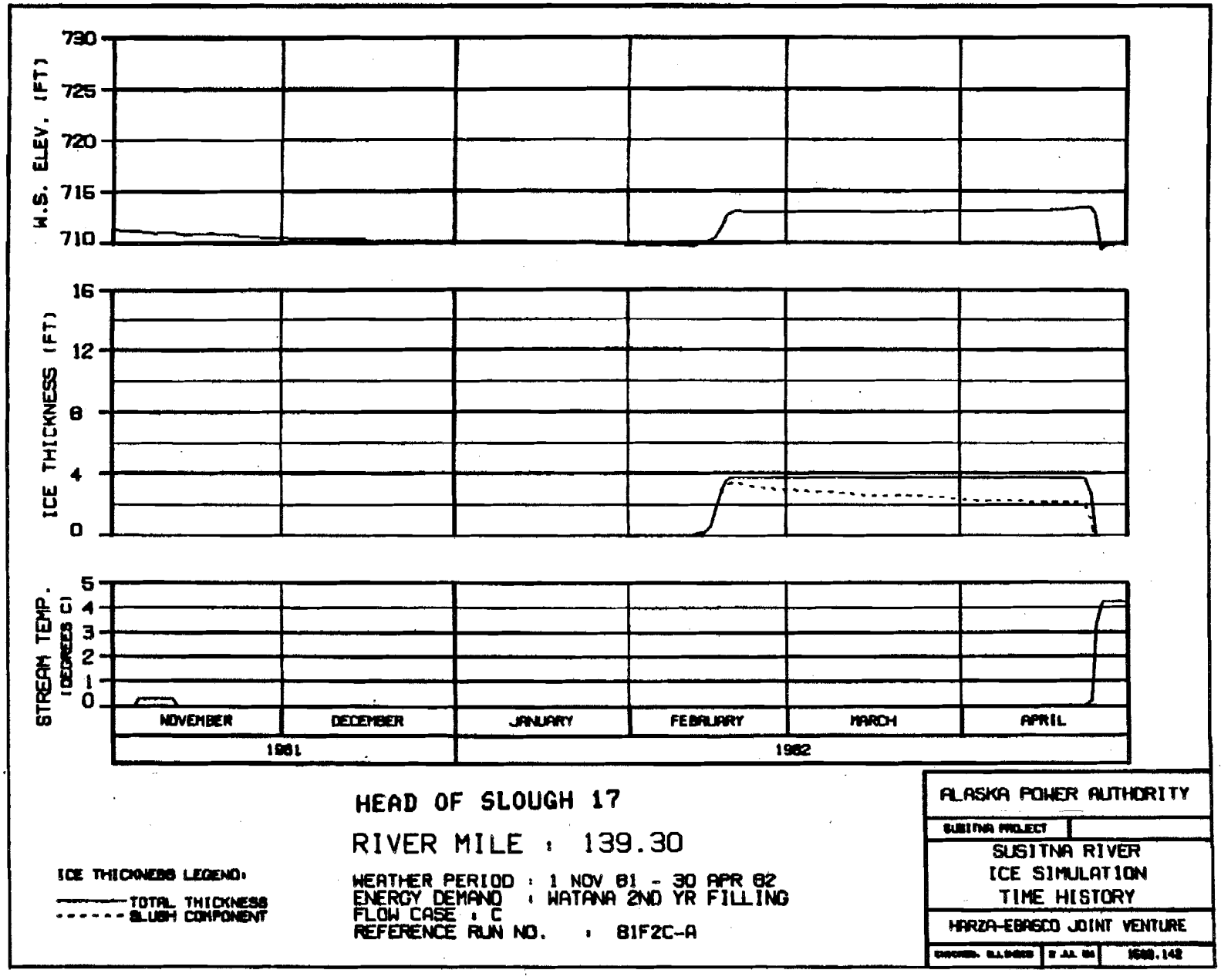
HEAD OF SLOUGH 20

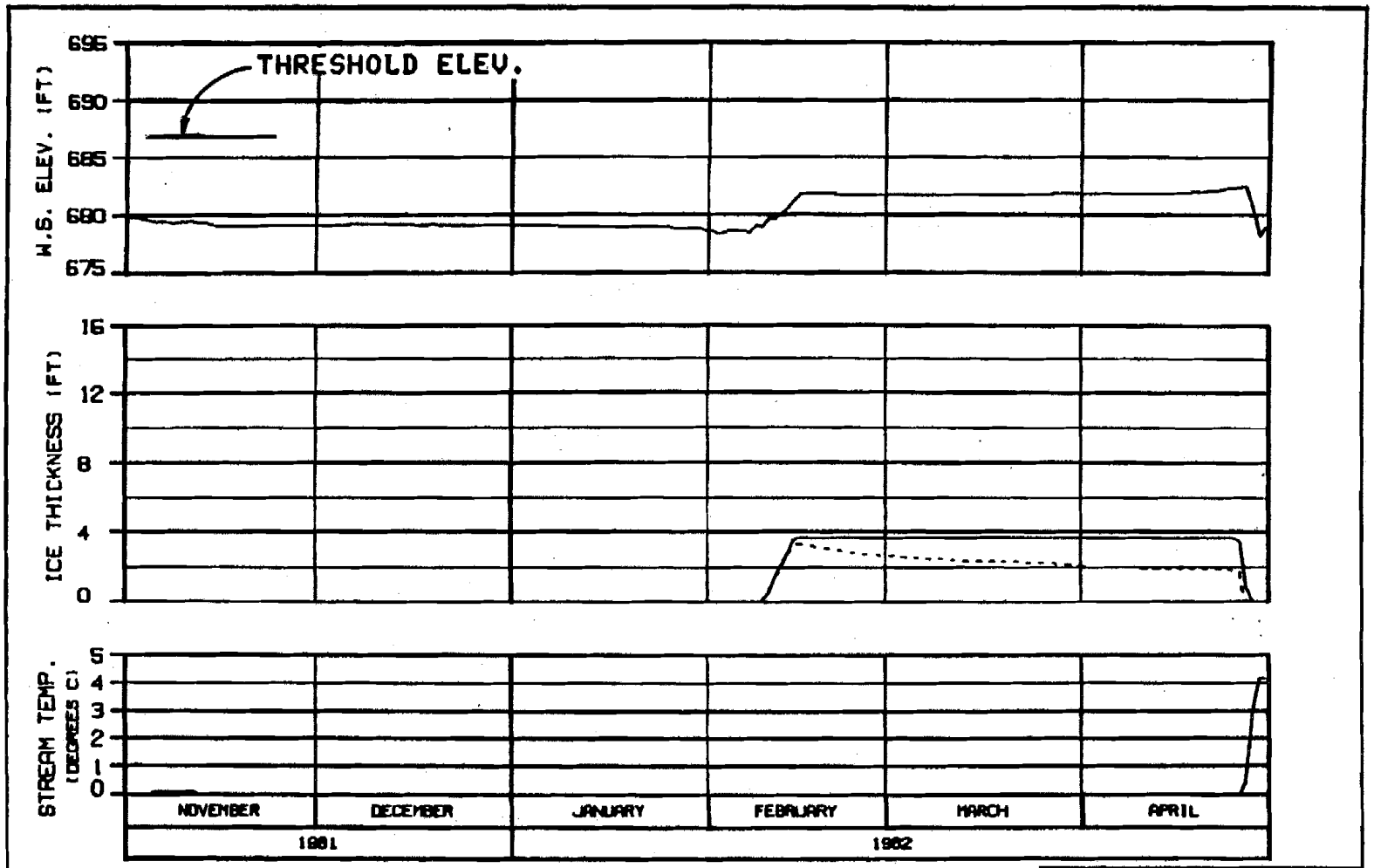
RIVER MILE : 140.50

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

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

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


W.S. ELEV. (FT)
730
725
720
715
710
ICE THICKNESS (FT)
16
12
8
4
0
STREAM TEMP. (DEGREES C)
5
4
3
2
1
0
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1981
1982
HEAD OF SLOUGH 17
RIVER MILE : 139.30
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1688.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

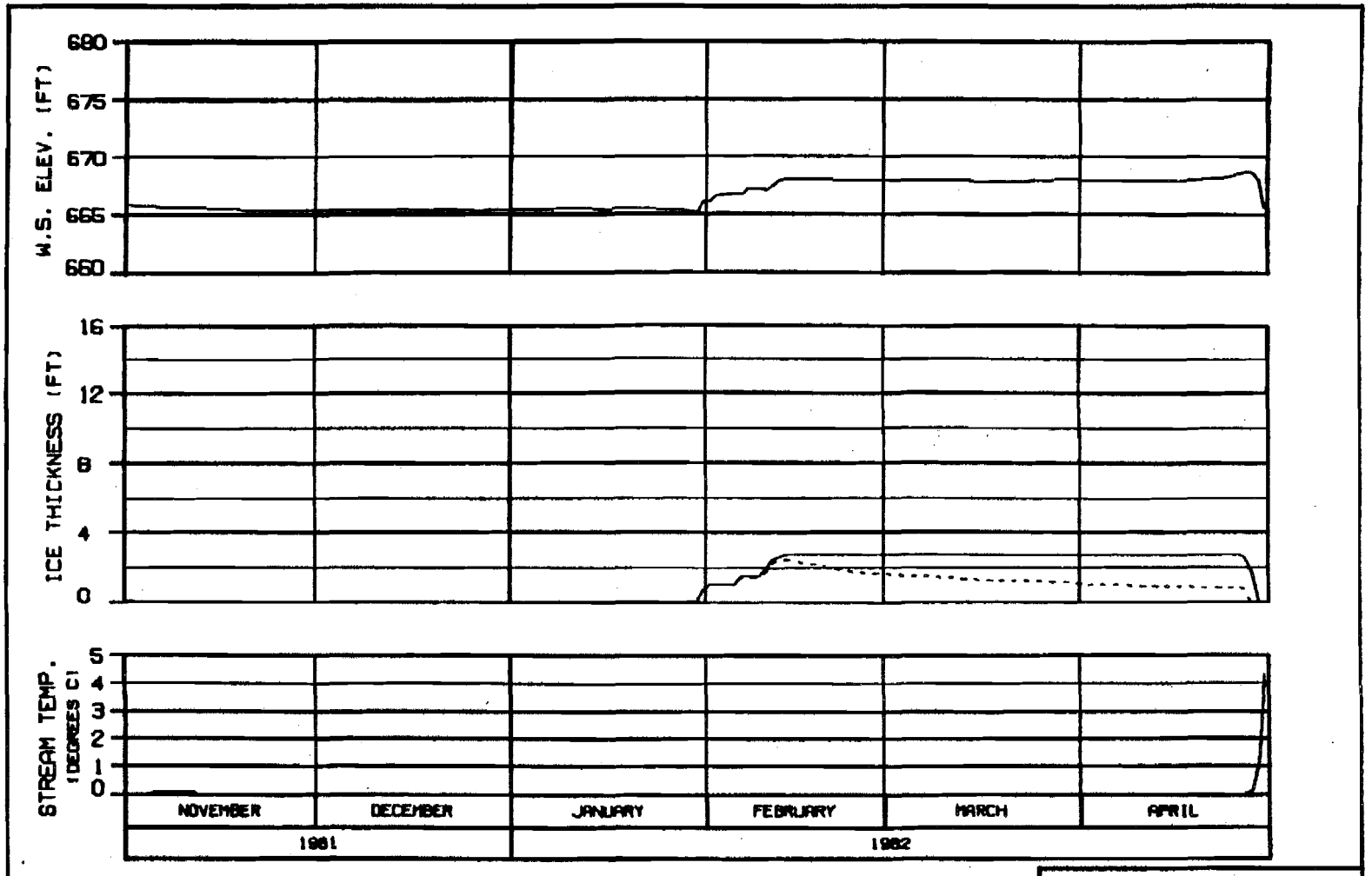
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] | T JUL 84 | 1888.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

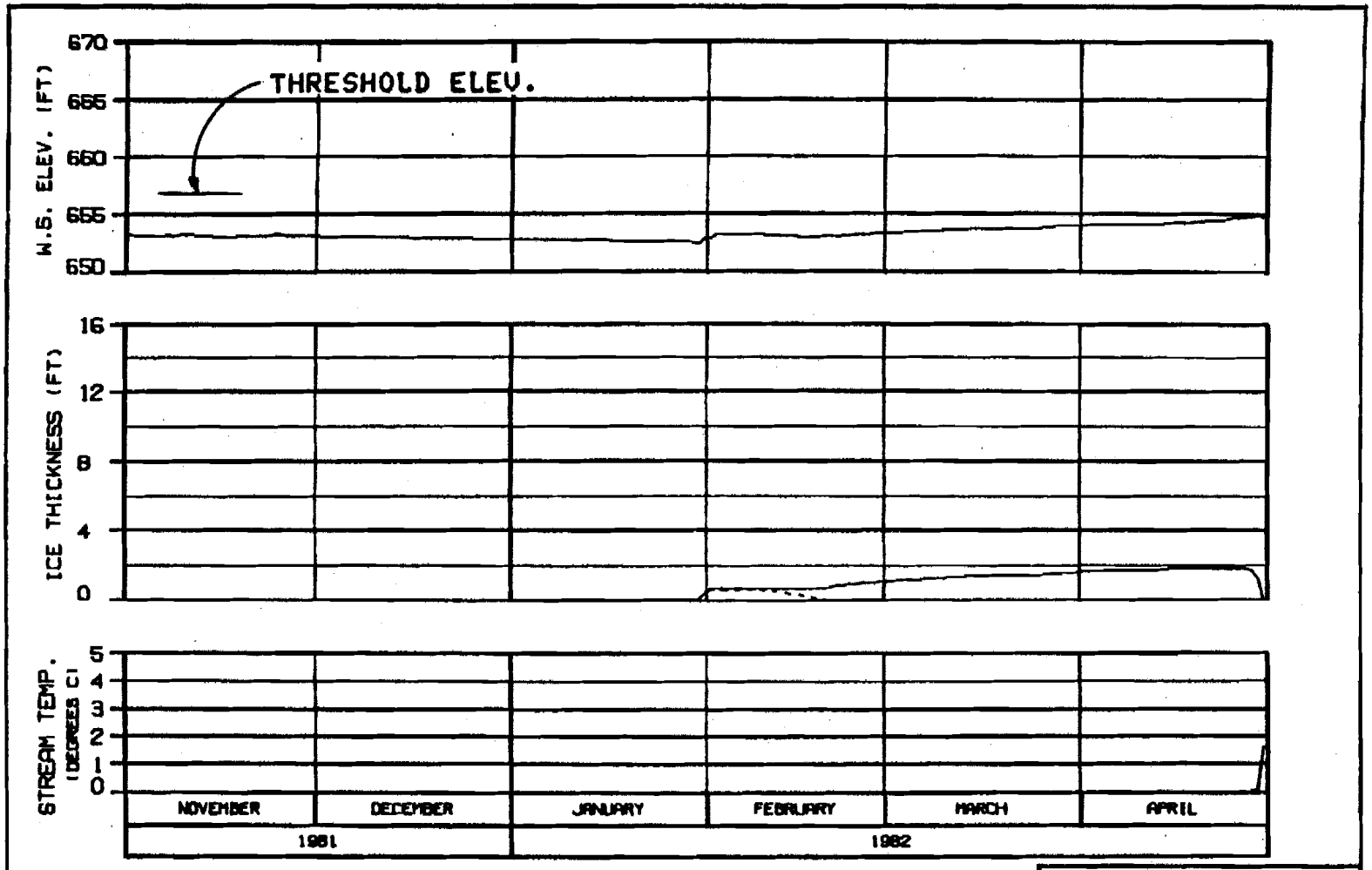
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

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

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

ICE THICKNESS LEGEND:

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

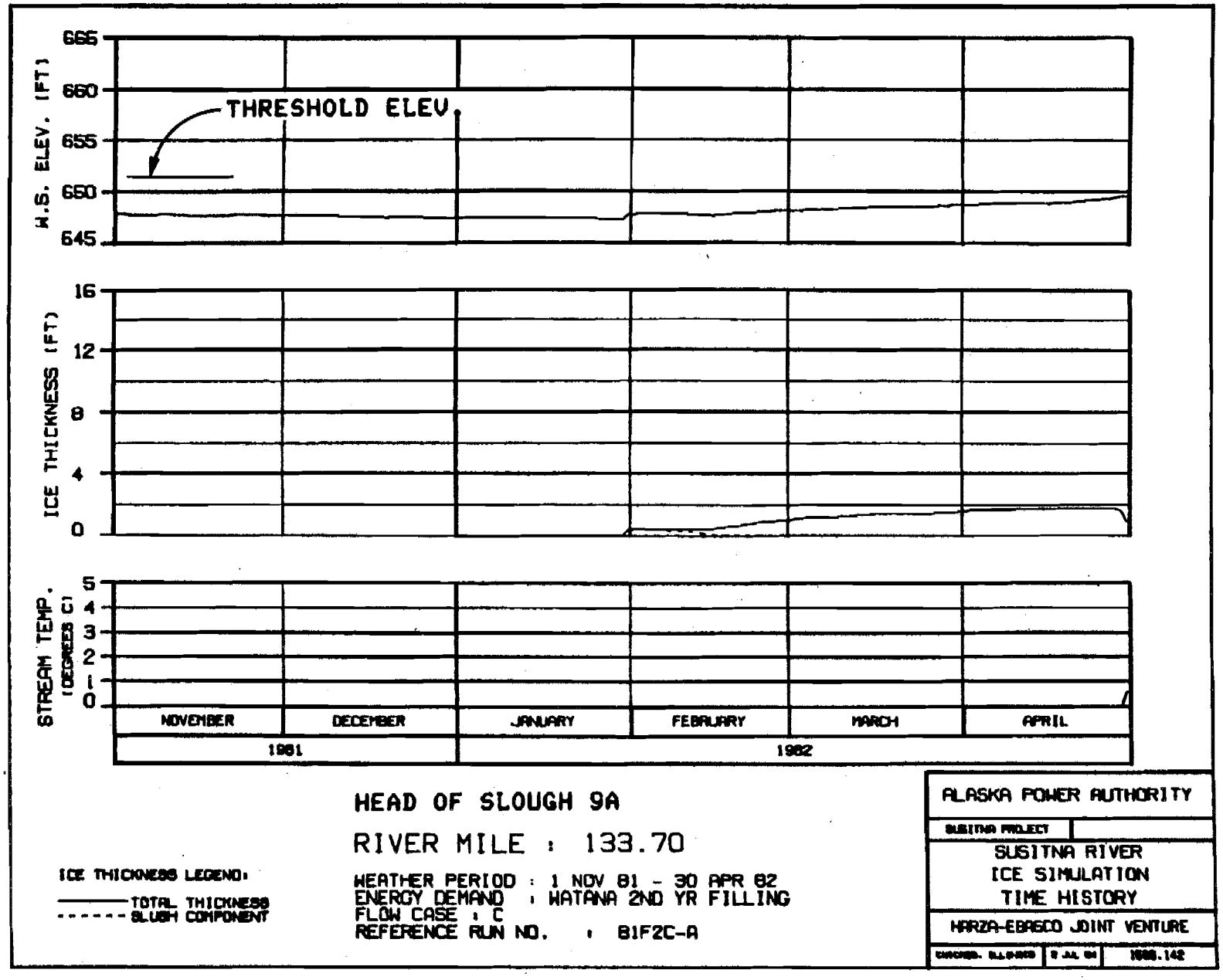
ALASKA POWER AUTHORITY

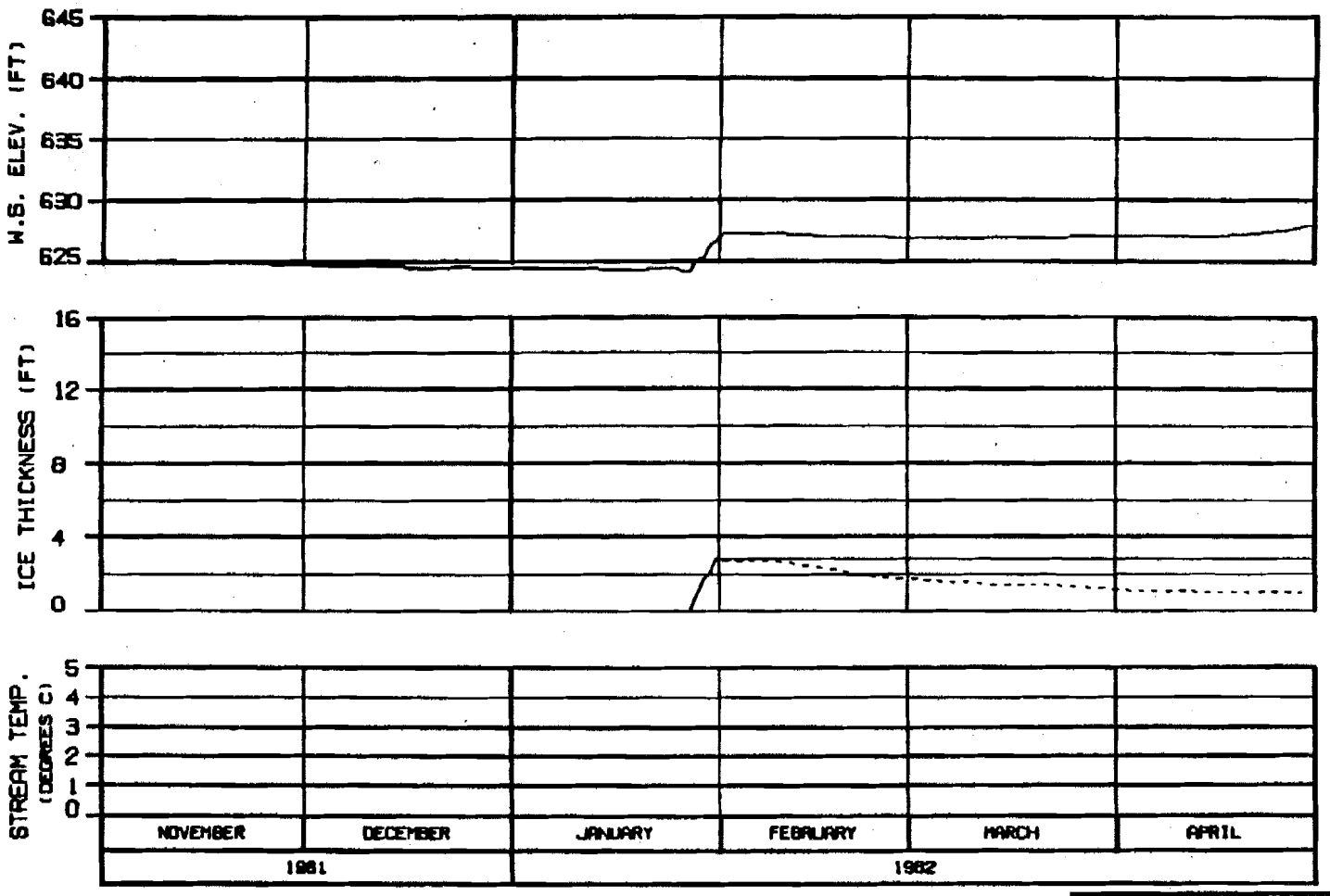
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 82 | 5SB.142


W.S. ELEV. (FT)
665
660
655
650
645
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
1981
1982
HEAD OF SLOUGH 9A
RIVER MILE : 133.70
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1986.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

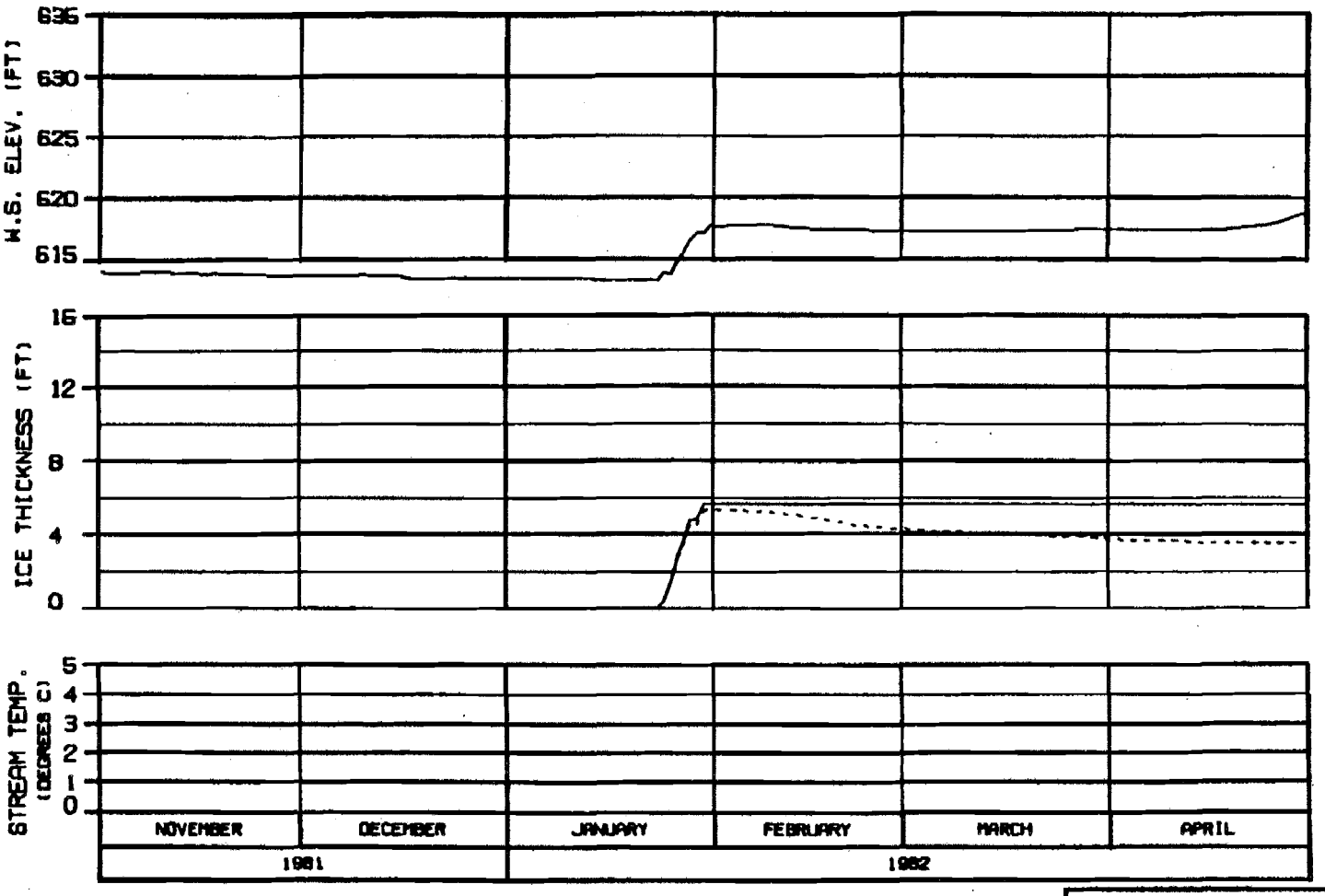
——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: G.L.PARKS | 9 JUL 84 | 1988.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

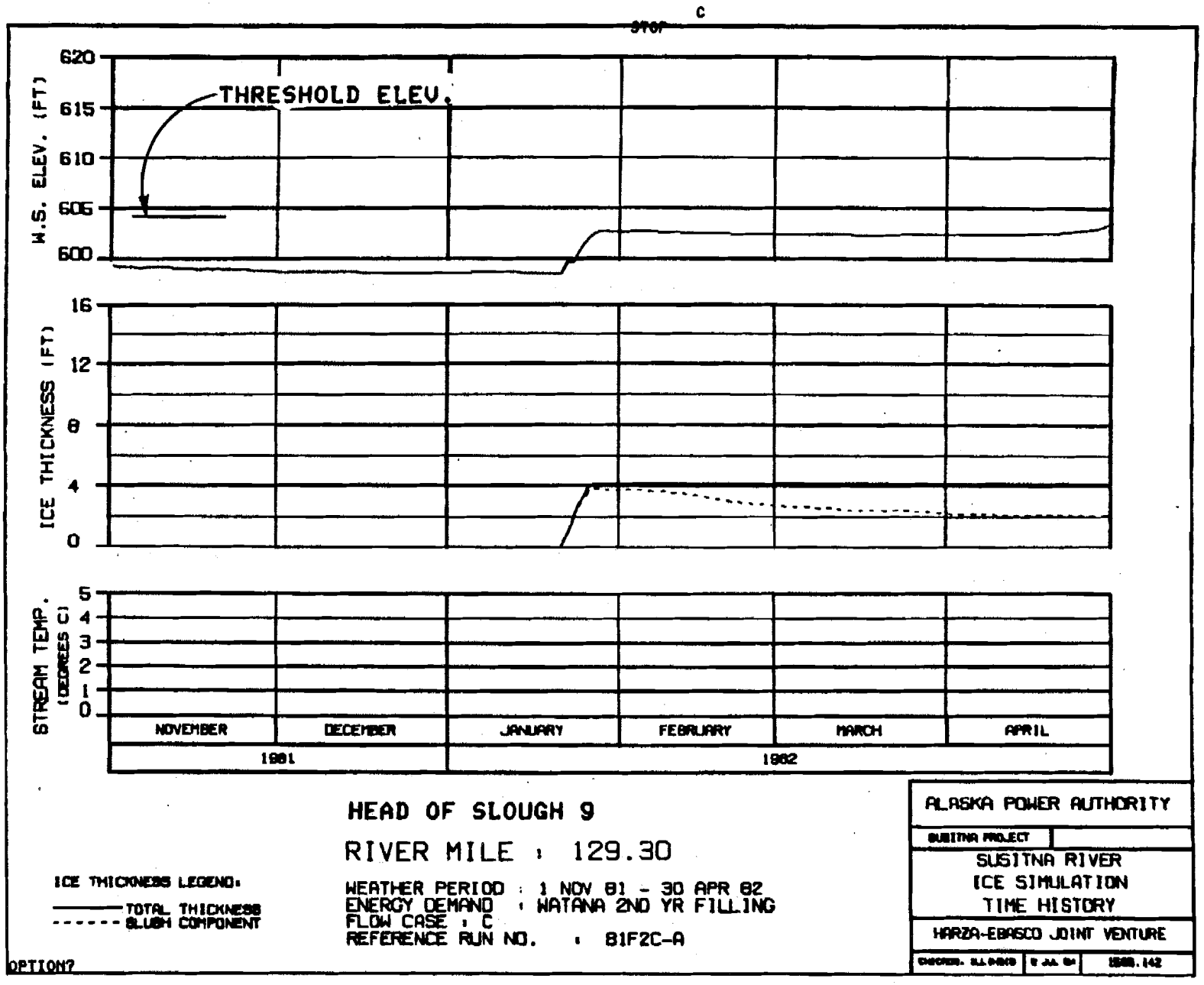
ALASKA POWER AUTHORITY

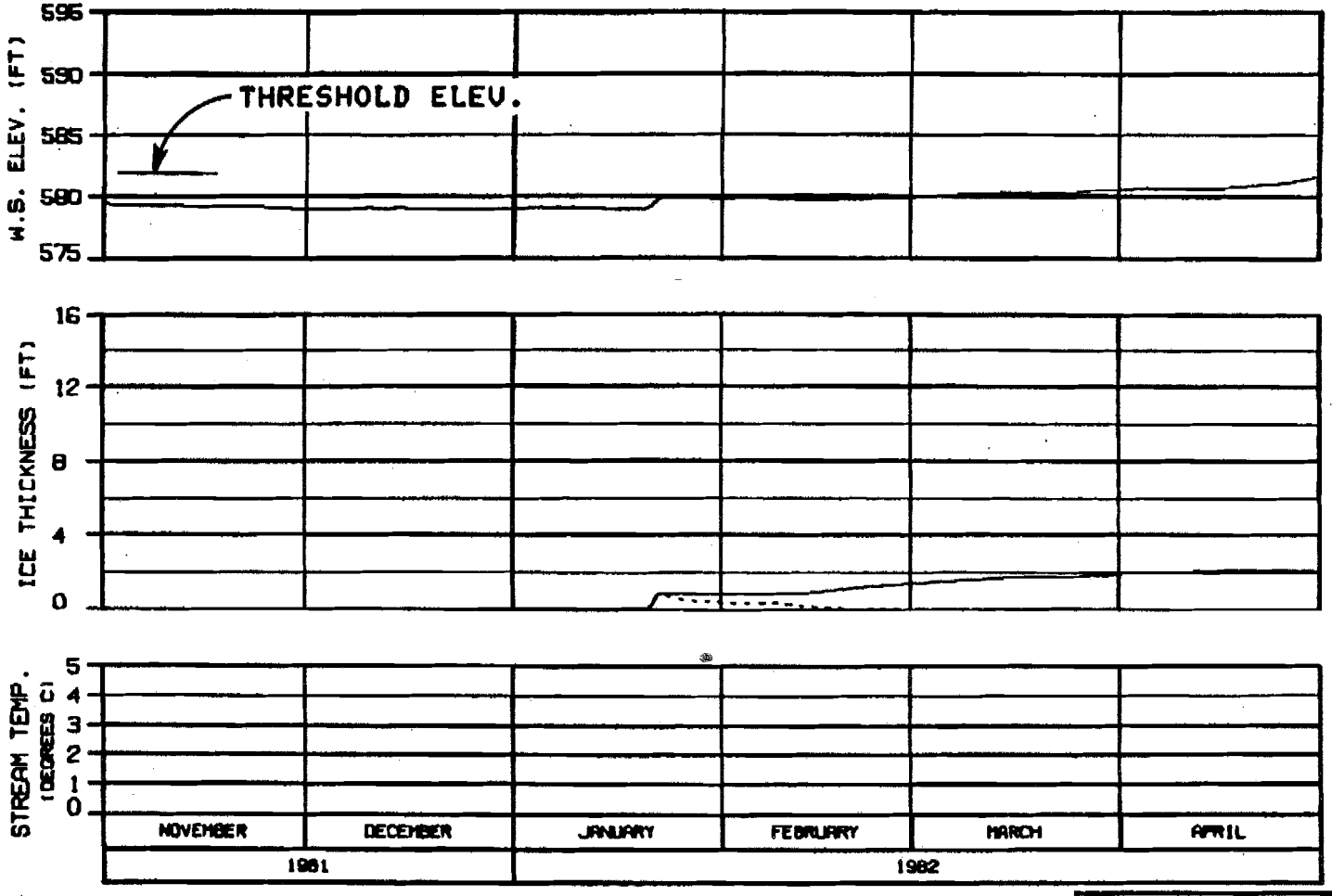
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | [illegible] | 1988.142


C
STOP
W.S. ELEV. (FT)
620
615
610
605
600
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
1981
1982
HEAD OF SLOUGH 9
RIVER MILE : 129.30
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
OPTION7
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 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

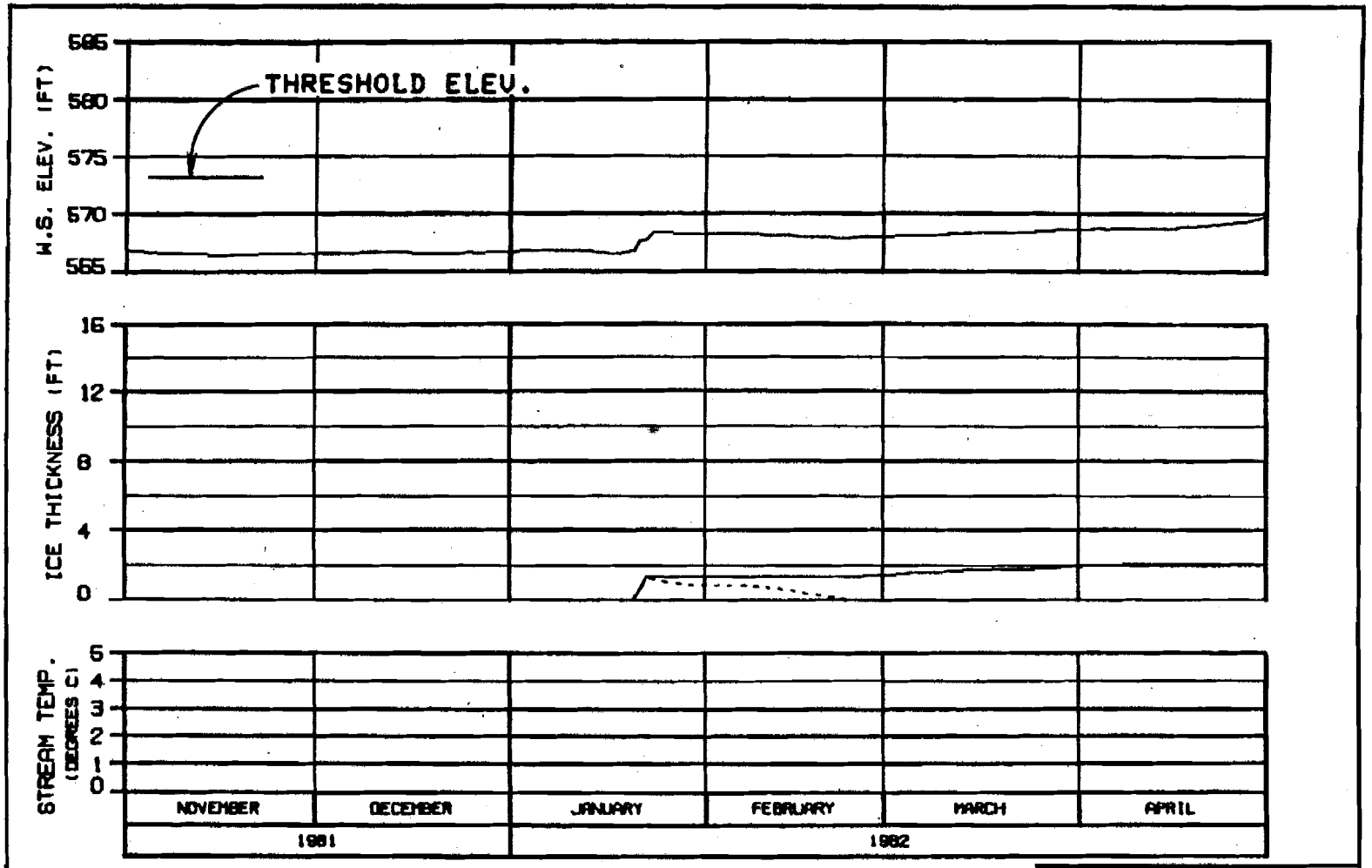
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 8 JUL 84 | 1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

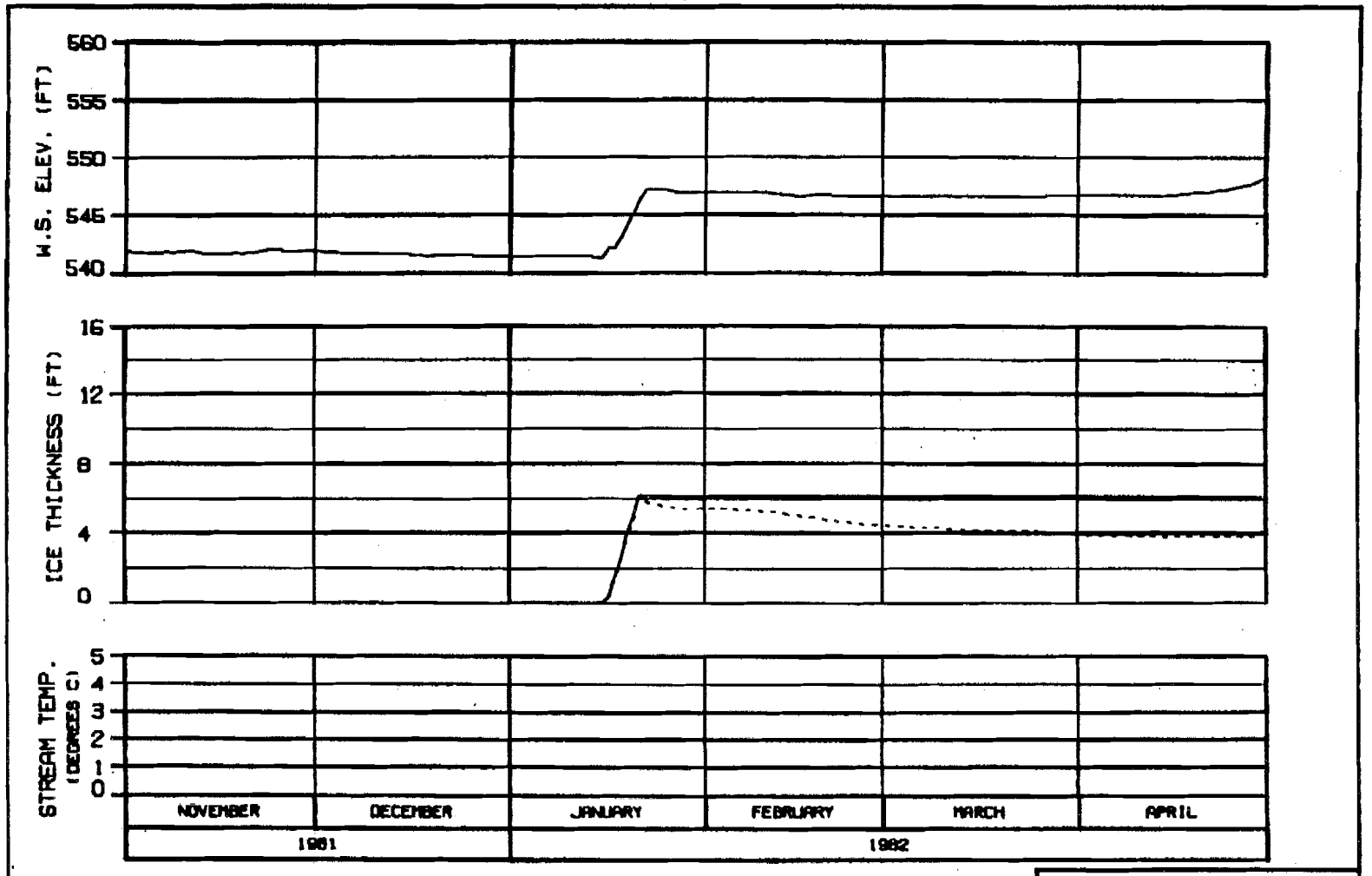
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | R JUL 84 | 1888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

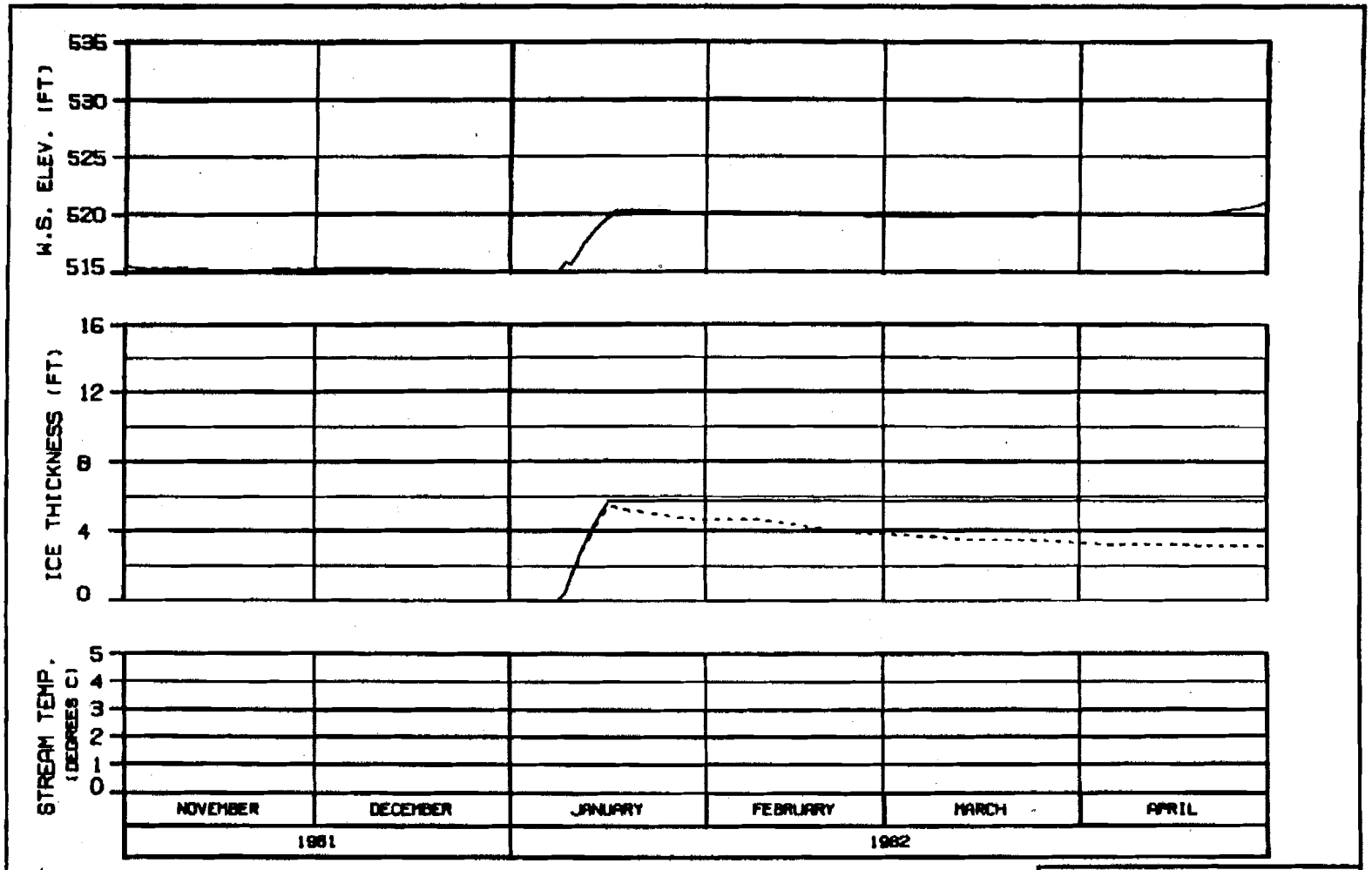
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 8 JUL 84 | 1988.142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

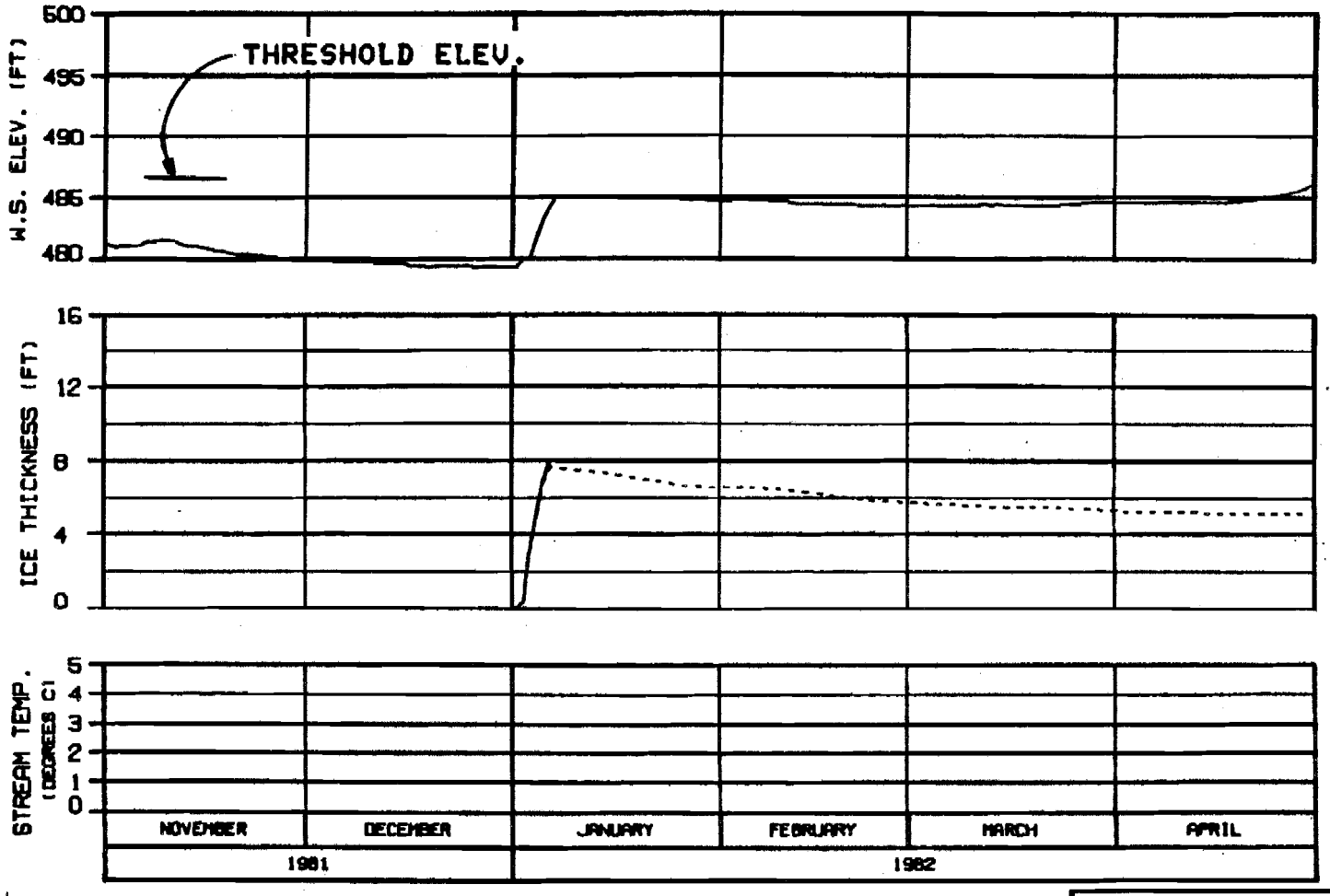
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.A.D'SOUZA | 8 JUL 84 | 1588.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

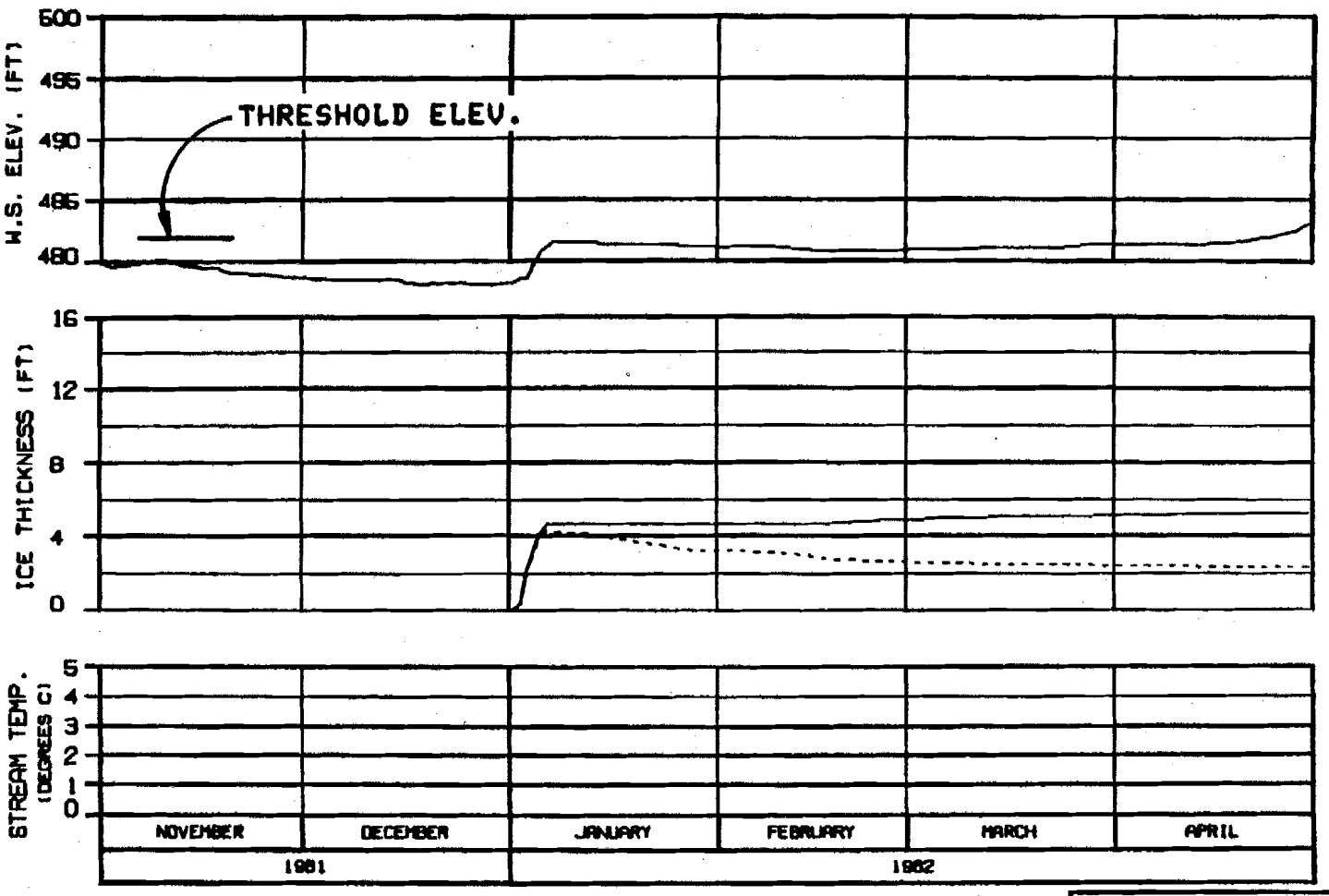
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 8 JUL 84 | 1588.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

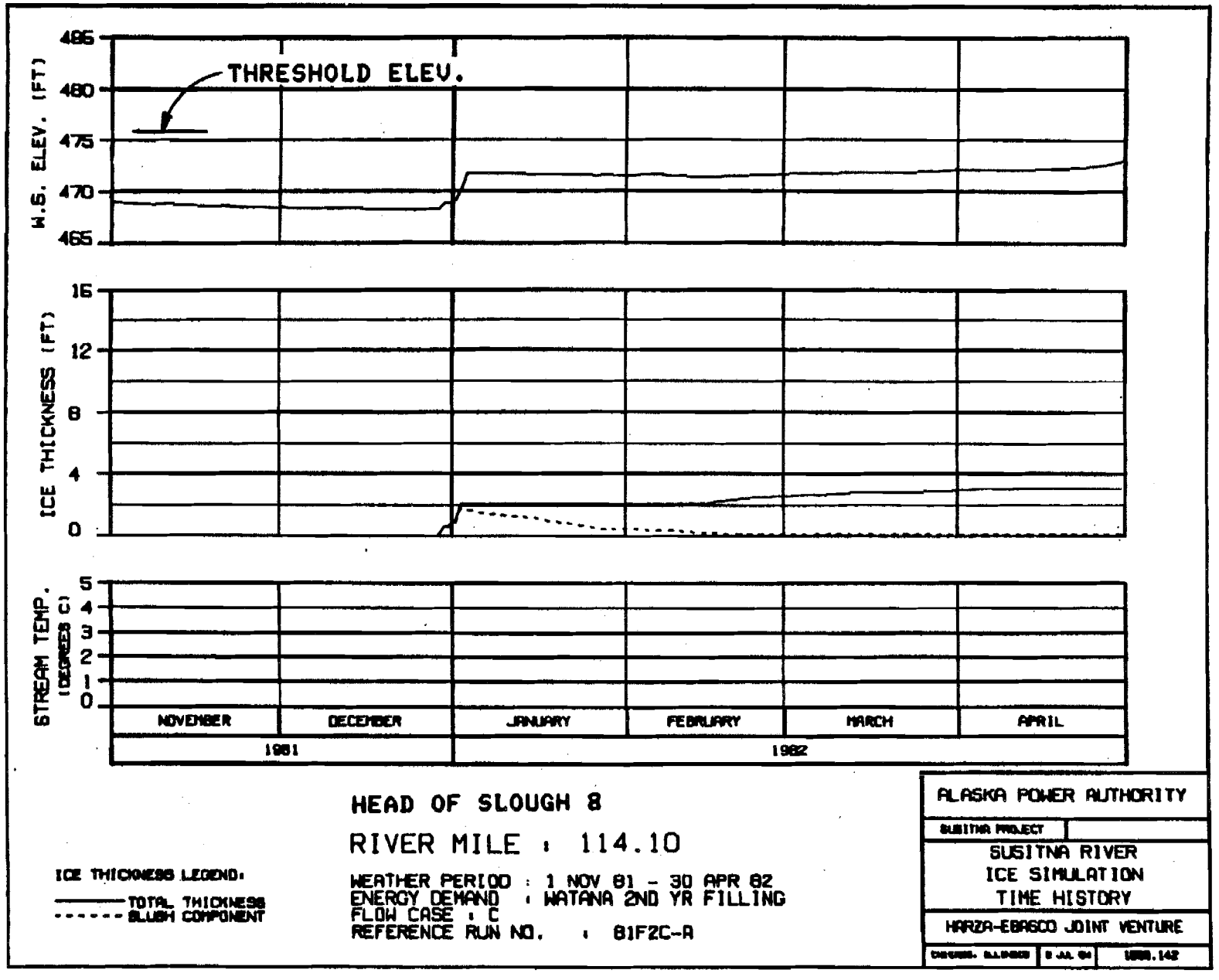
ALASKA POWER AUTHORITY

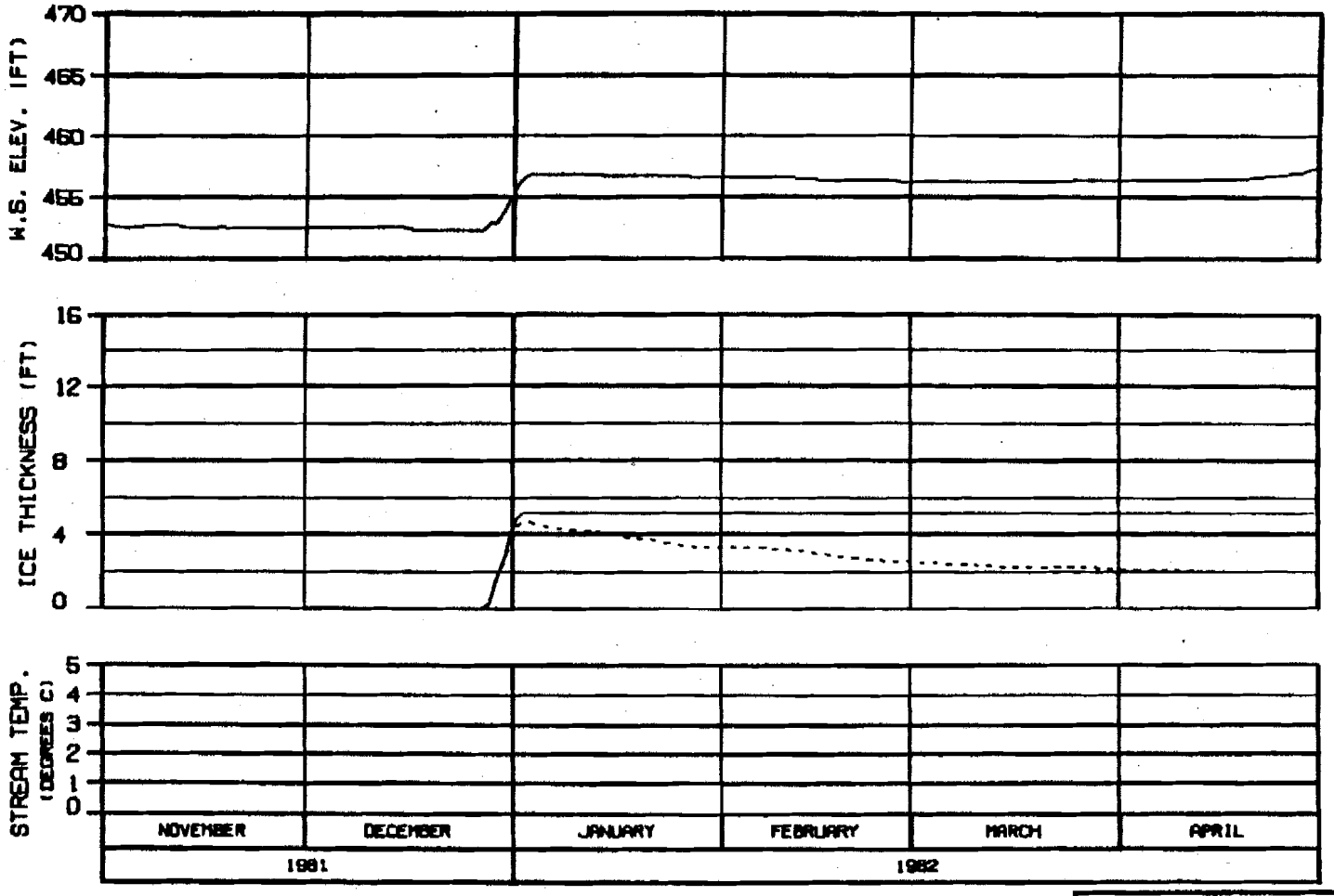
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 8888.142


W.S. ELEV. (FT)
485
480
475
470
465
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
1981
1982
HEAD OF SLOUGH 8
RIVER MILE : 114.10
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
8 JUL 84
1888.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

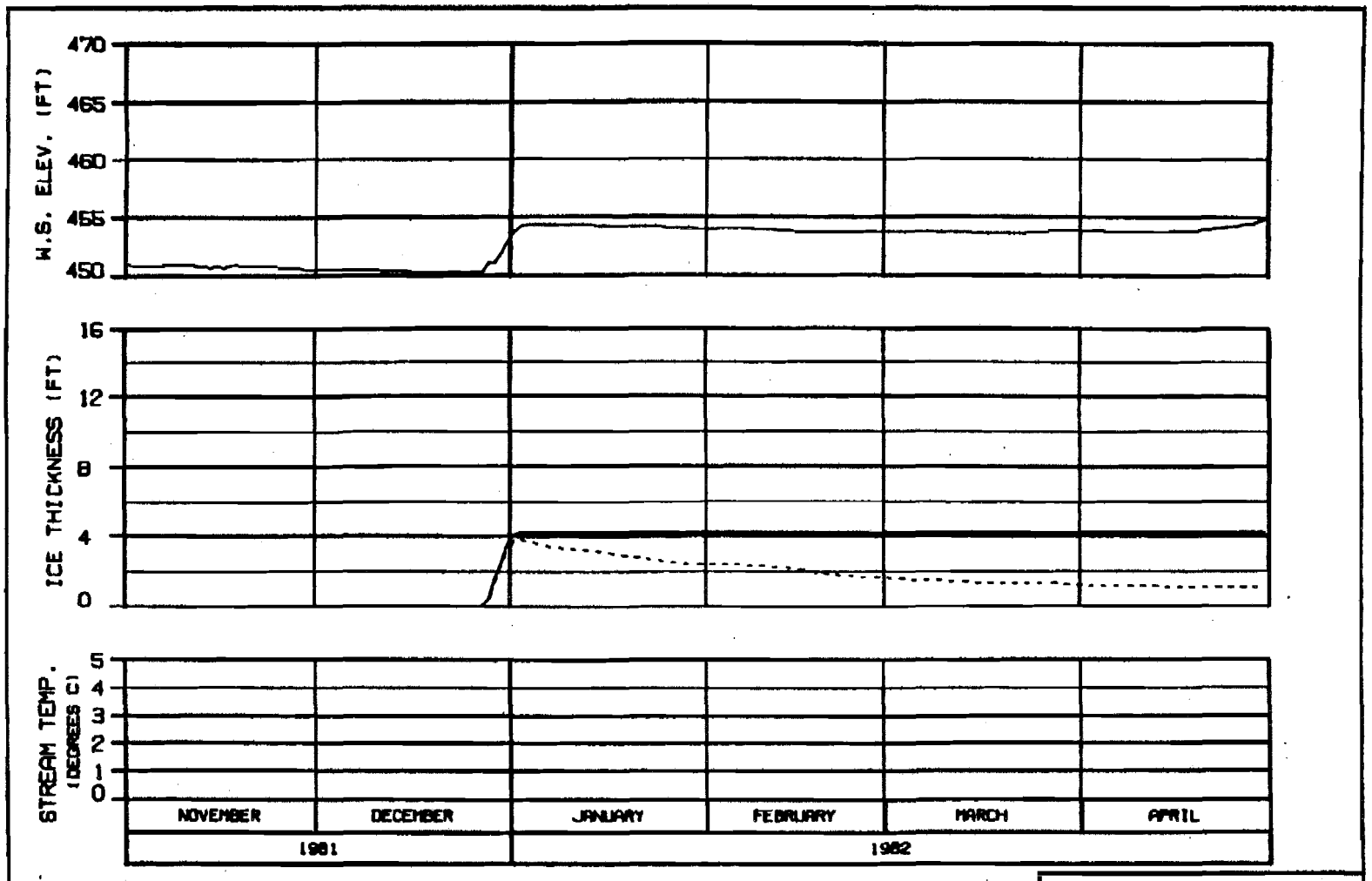
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 8 JUL 84 | 1988.142



SIDE CHANNEL AT HEAD OF GASH CREEK

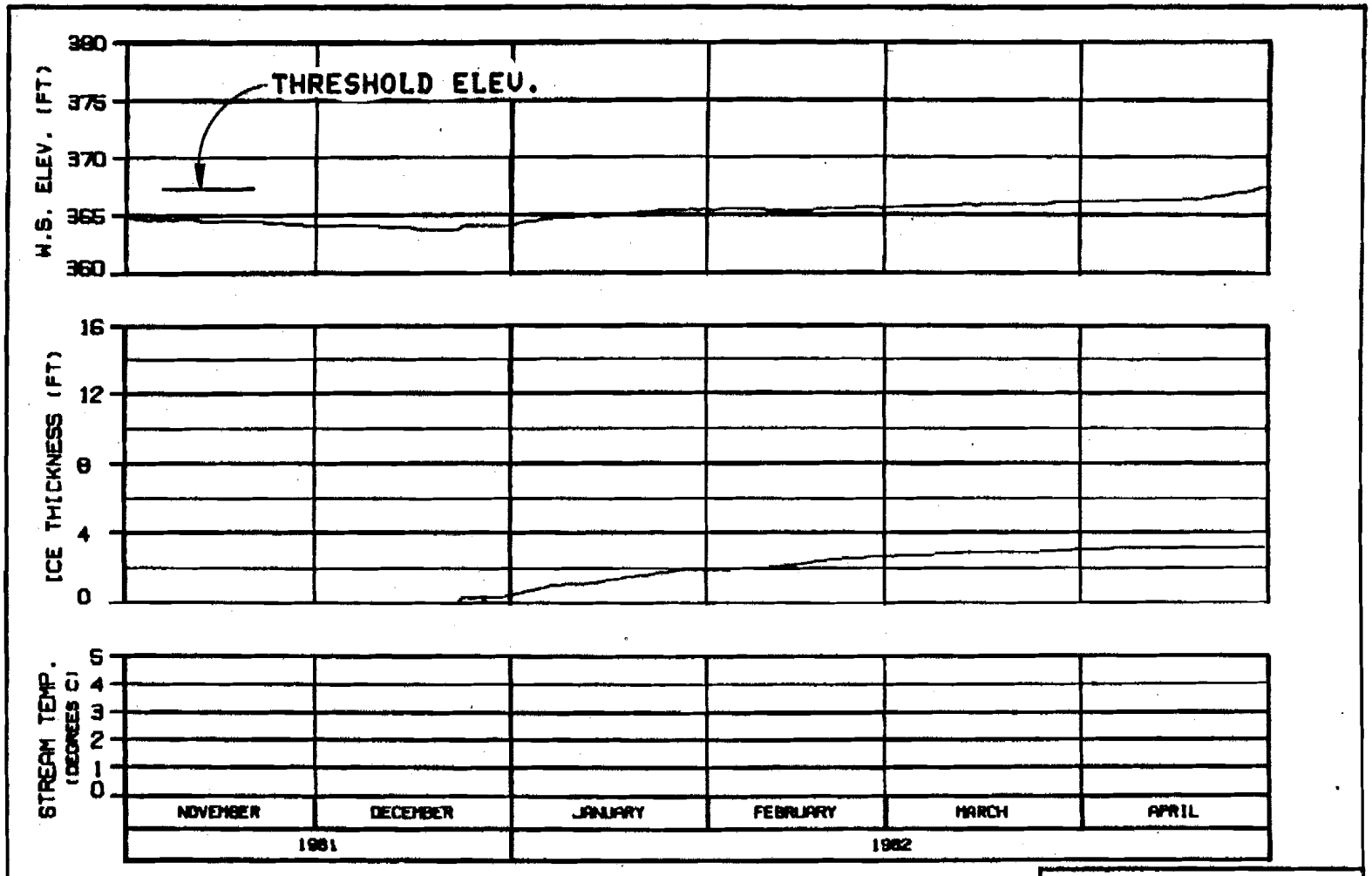
RIVER MILE : 112.00

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

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



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

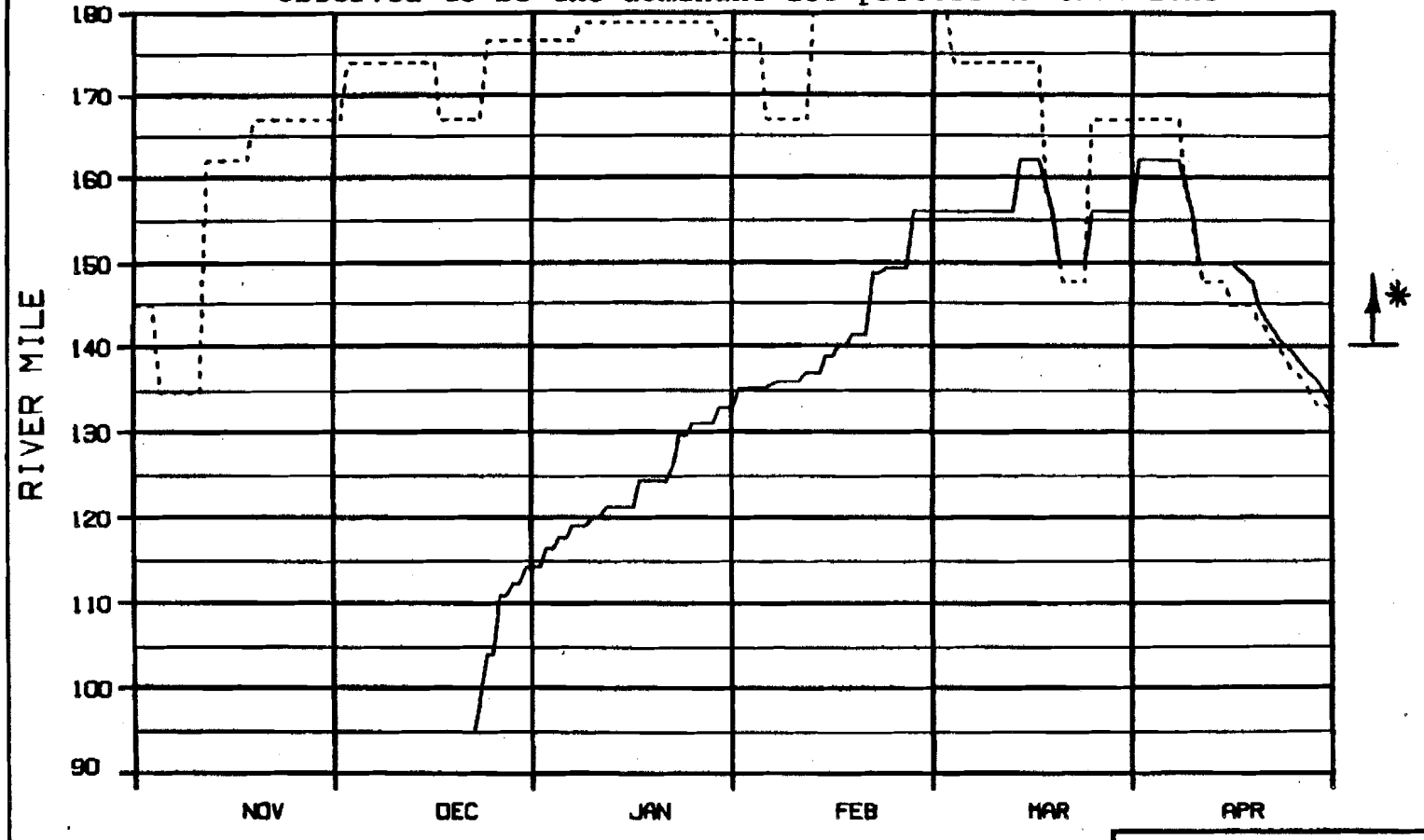
——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHECKED: R.L.D.H.S	8 JUL 84	1888.142

* Note: Simulation of progression u/s of River Mile 140 ± is considered approximate since intermittent bridging of border ice has been observed to be the dominant ice process in this zone.



LEGEND:

———— ICE FRONT

- - - - - - - - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

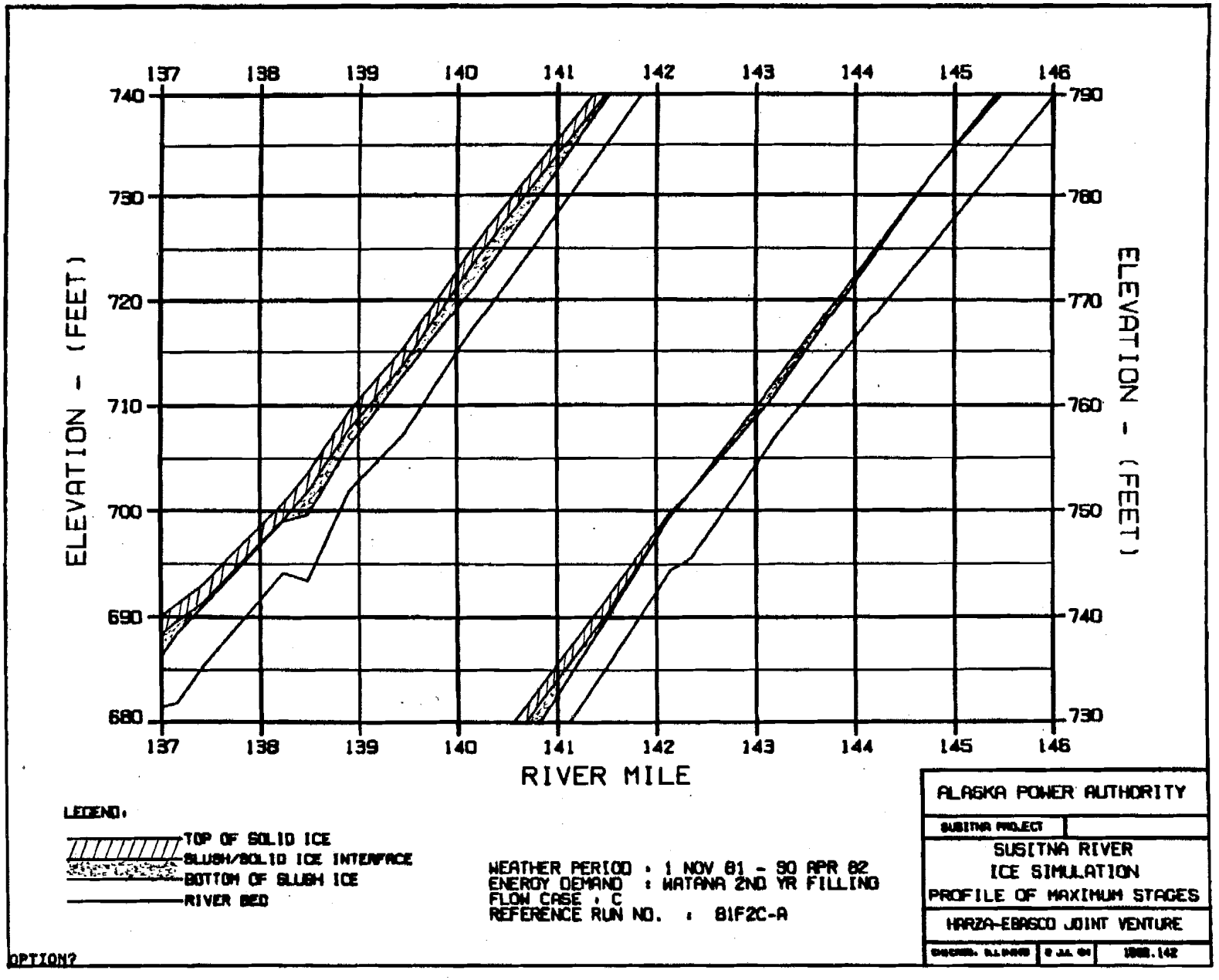
SUSITNA PROJECT

SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM

HARZA-EBASCO JOINT VENTURE

OPTION2

C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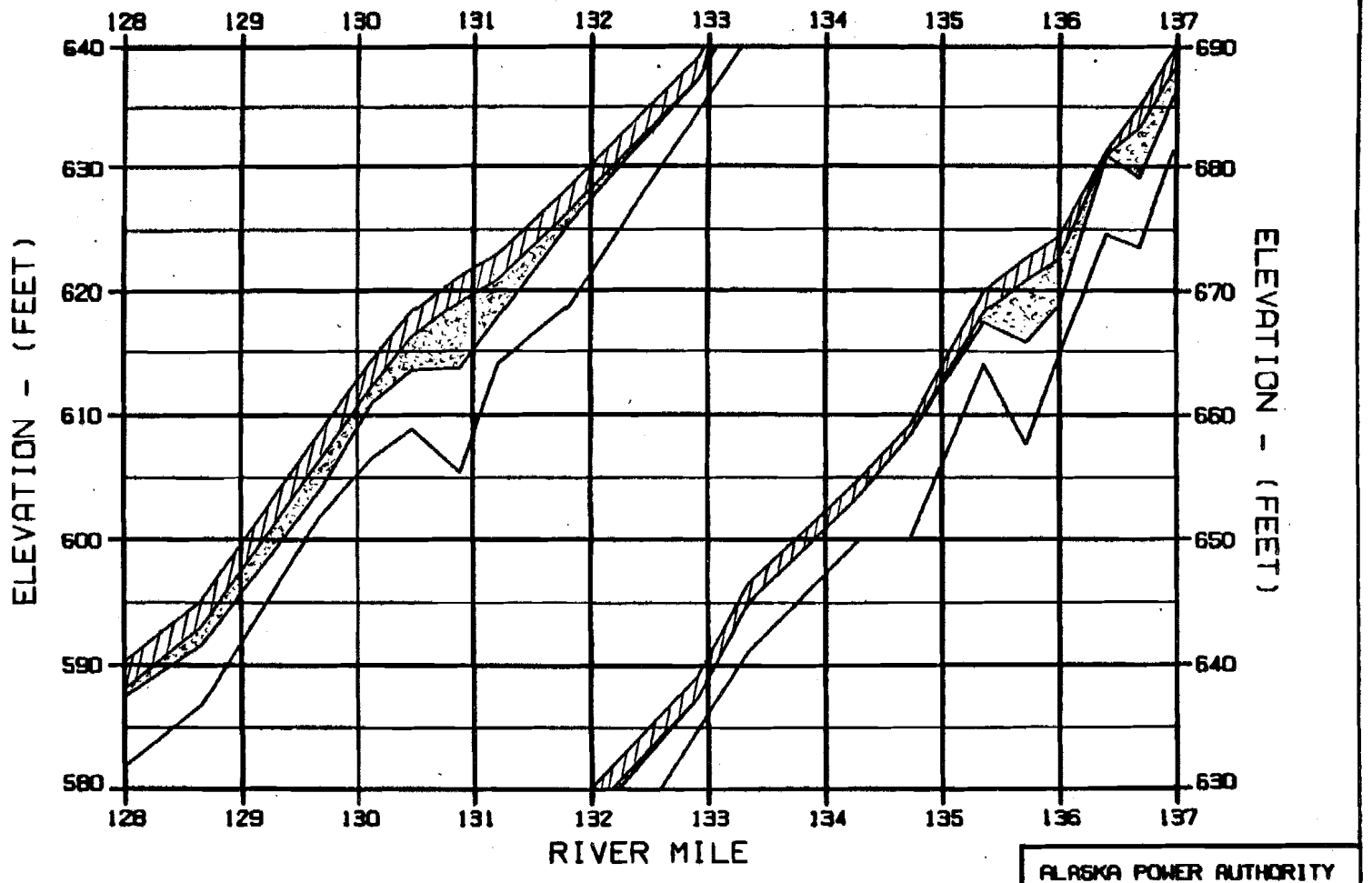
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?



LEGEND:

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

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

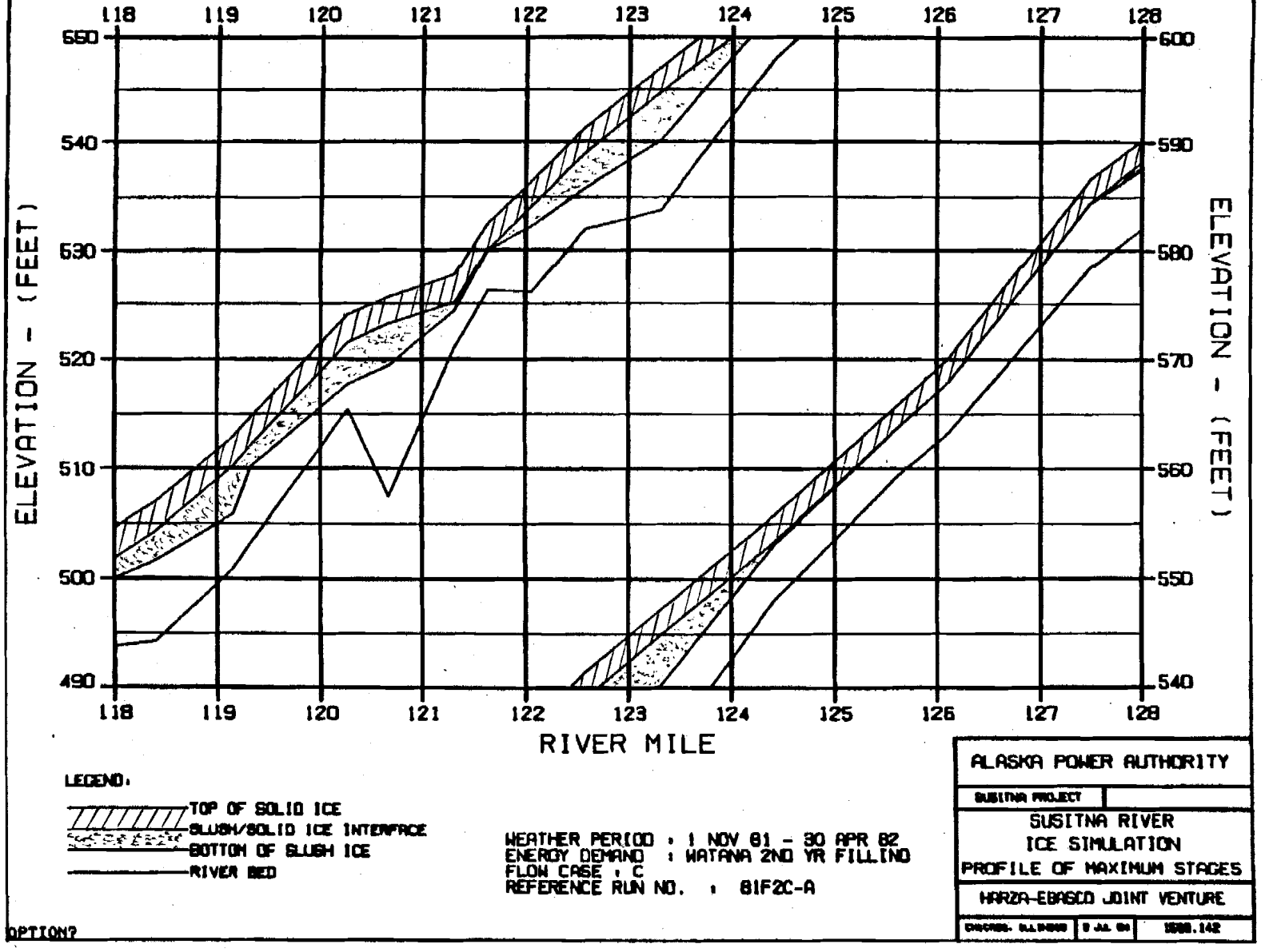
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

OPTION?

C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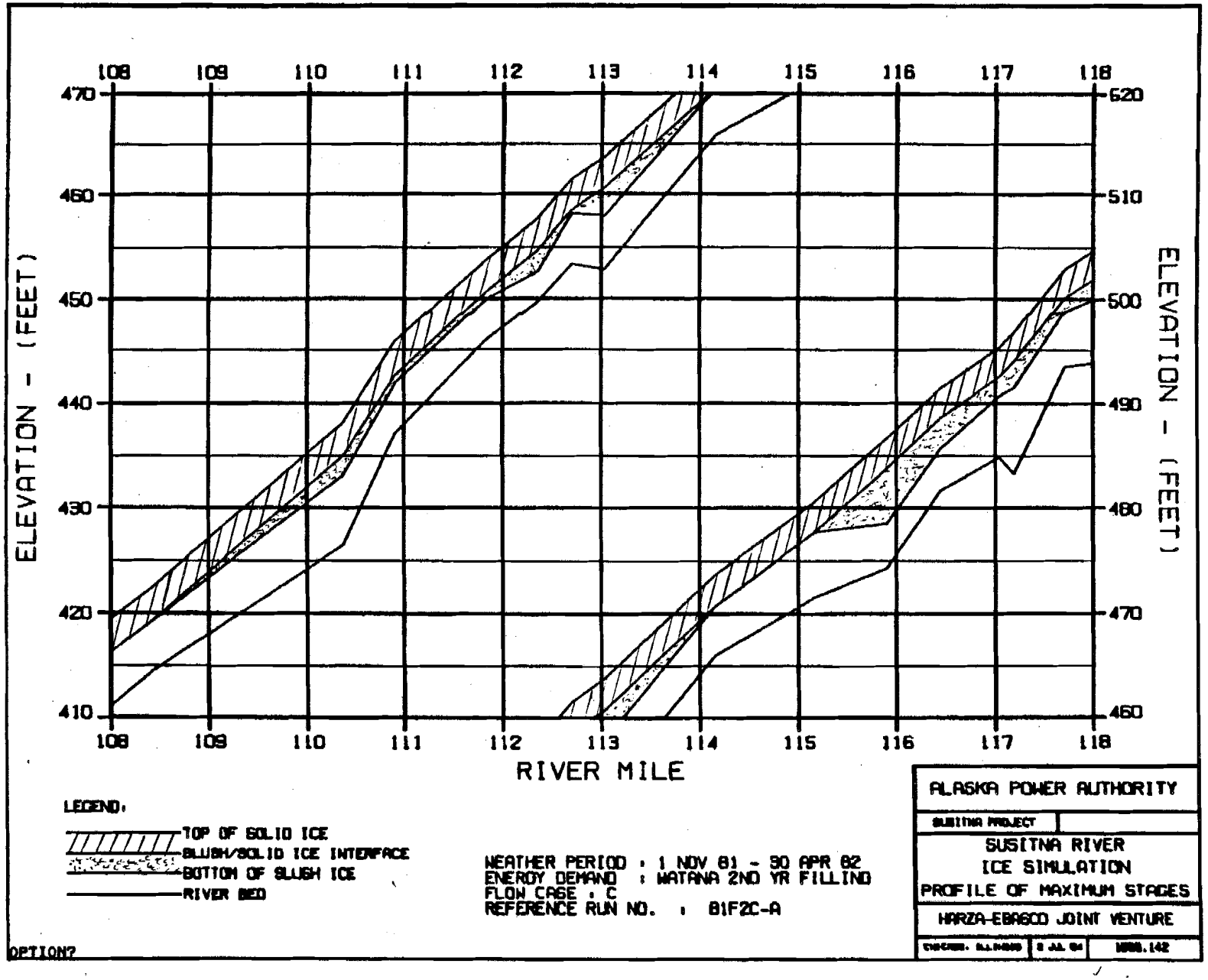
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
9 JUL 84
1588.142

OPTION?

C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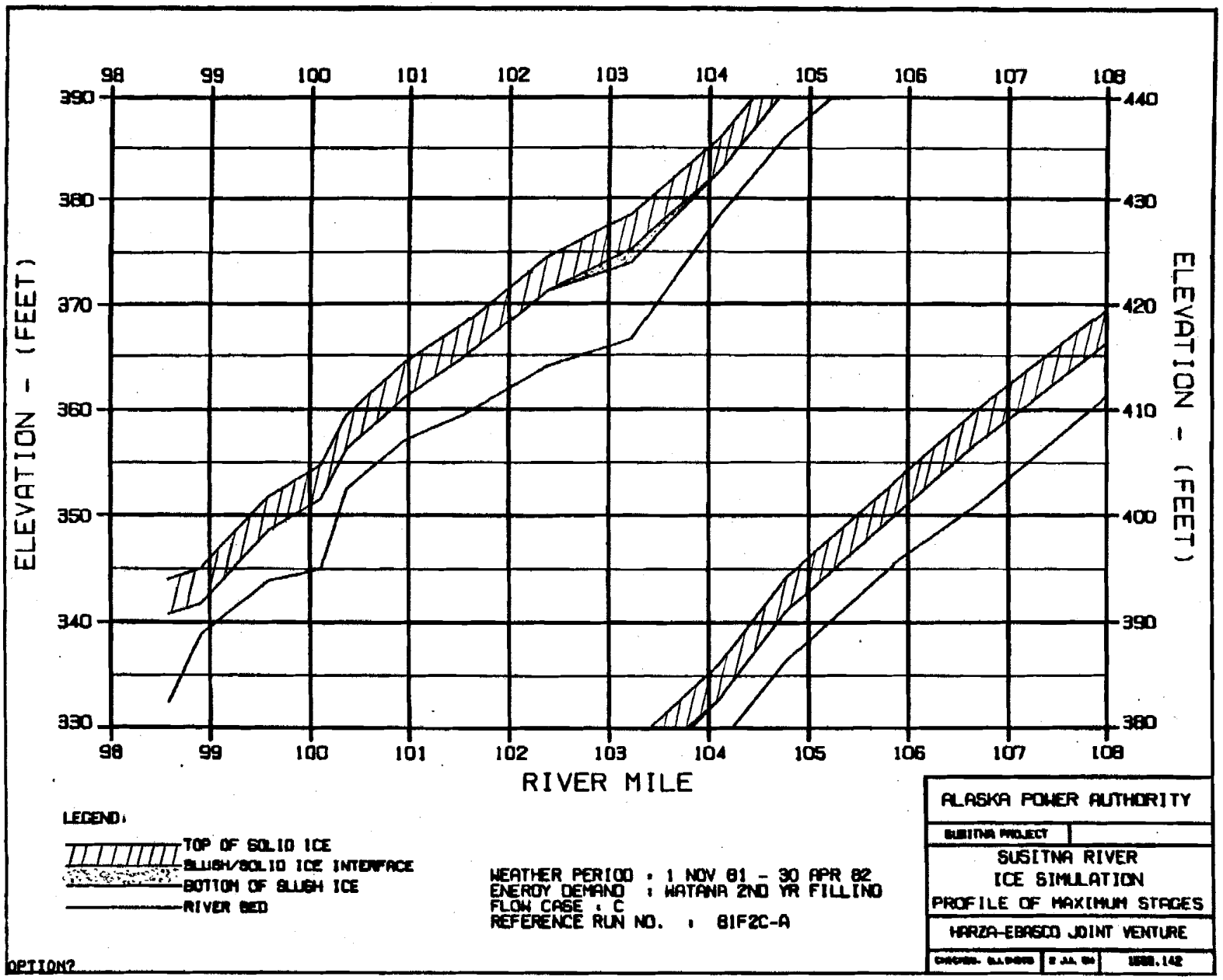
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
8 JUL 84
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 81 - 30 APR 82
ENERGY DEMAND : WATANA 2ND YR FILLING
FLOW CASE : C
REFERENCE RUN NO. : 81F2C-A
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

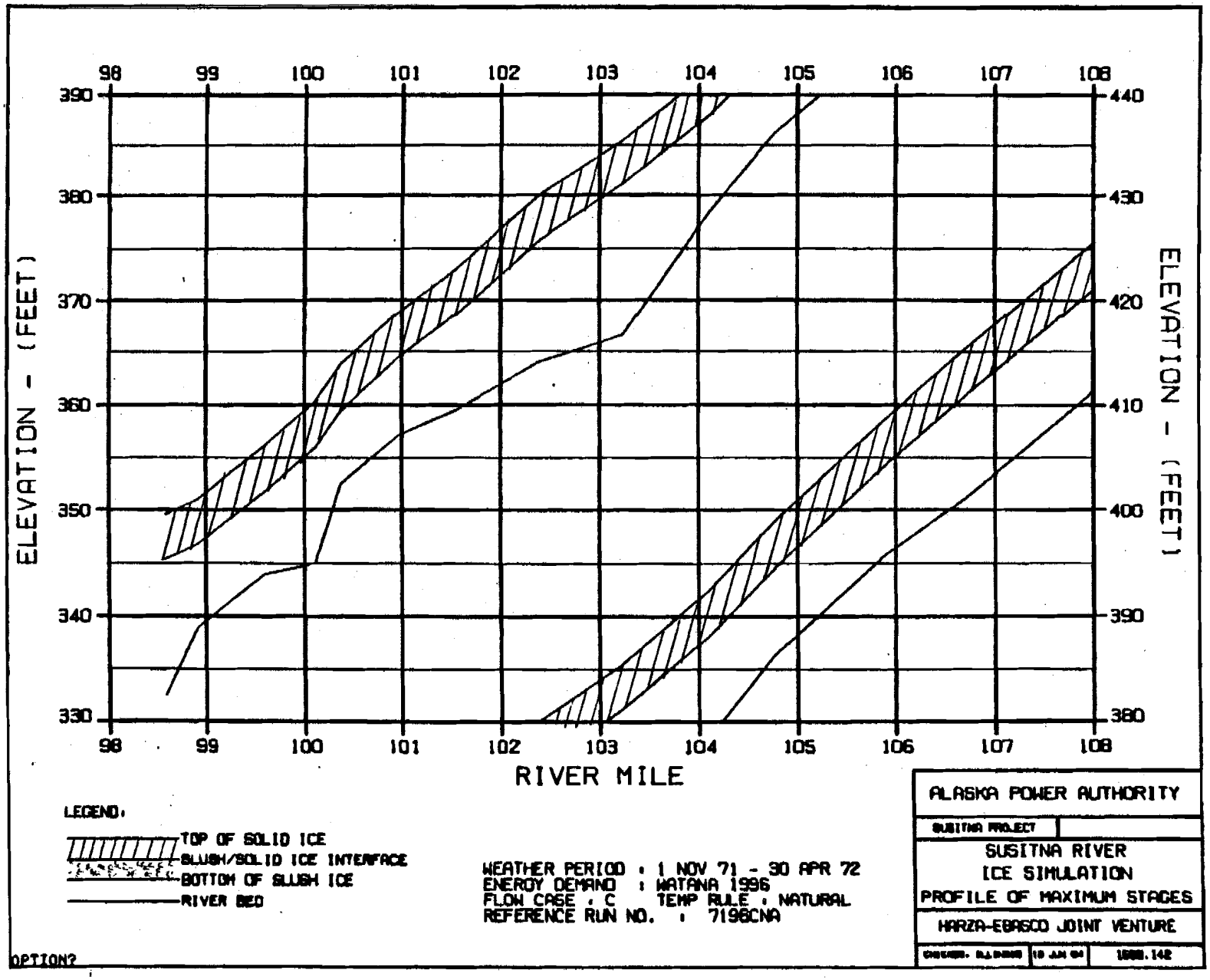
OPTION2

The following study, entitled "Watana-Second Year Filling" corresponds to the winter of 1992-93, as depicted in Exhibit E.2.138 of the License Application. The weather used corresponds to the winter of 1981-82, which is a cold winter. Releases from Watana under these conditions would be made thru the mid-level outlet.

Watana Operating

EXHIBIT H

C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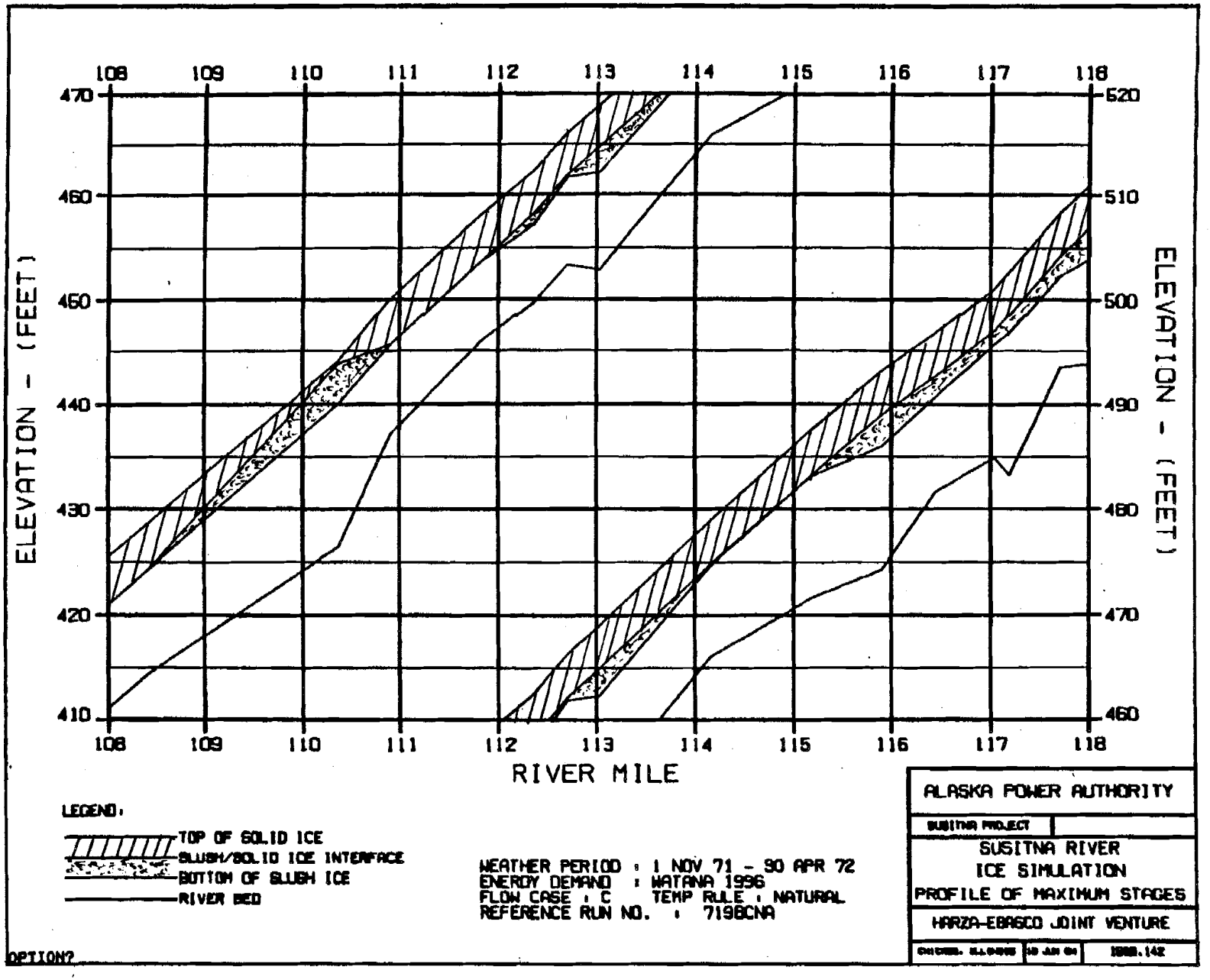
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : MATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
19 JAN 94
1588.142
OPTION2

C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470 460 450 440 430 420 410
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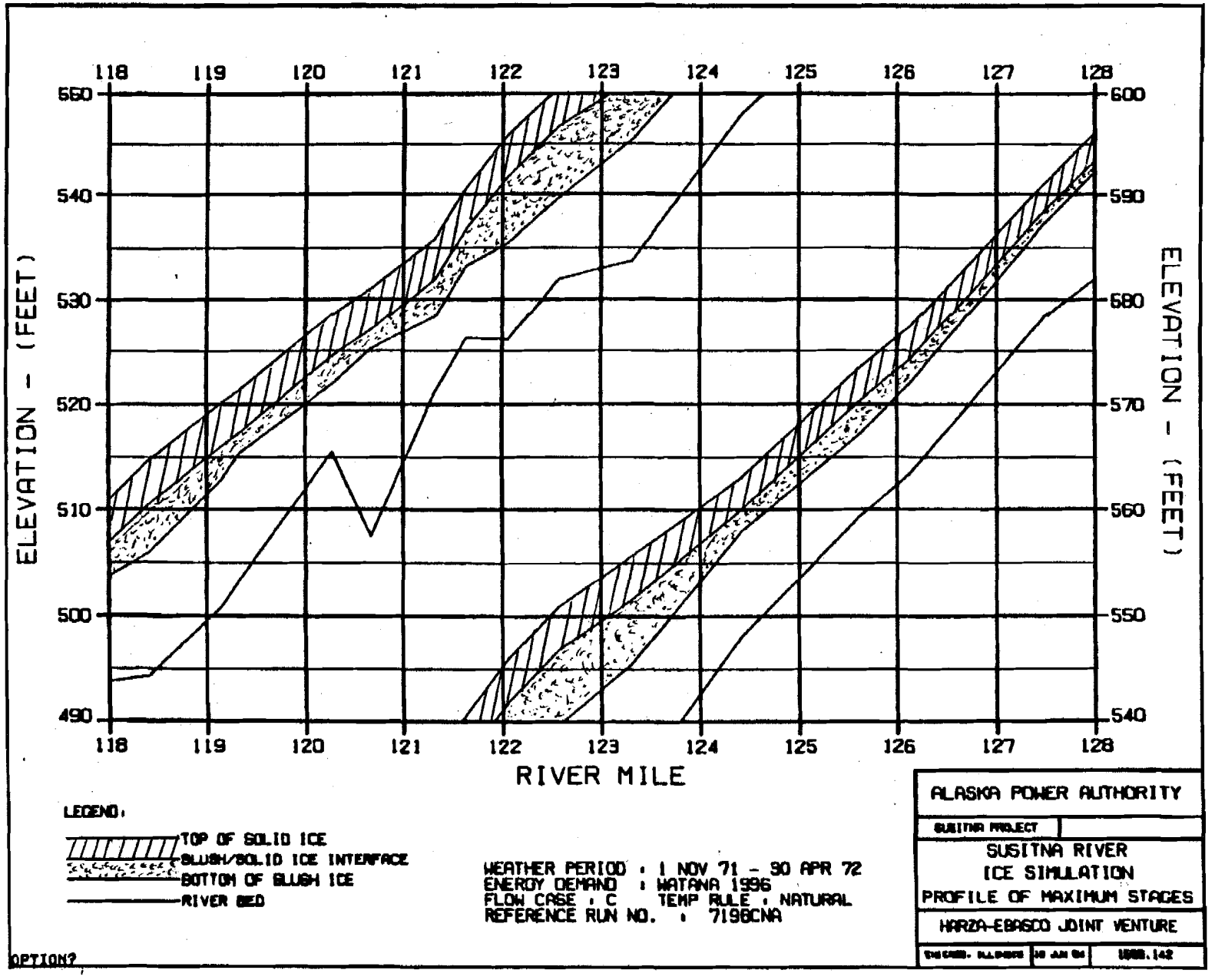
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7198CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
30 JAN 84
1988.142
OPTION2

C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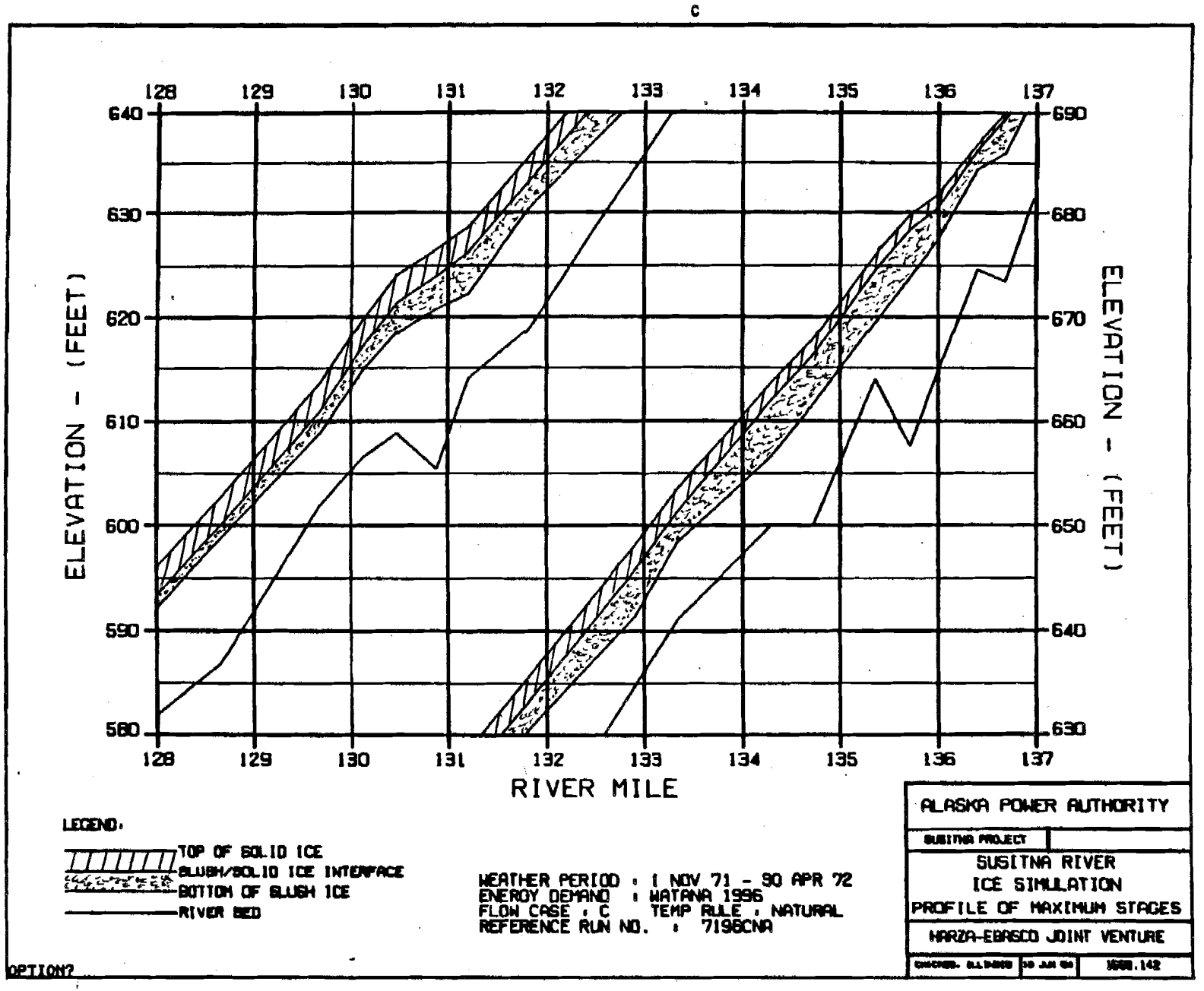
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
10 JAN 86
8888.142
OPTION?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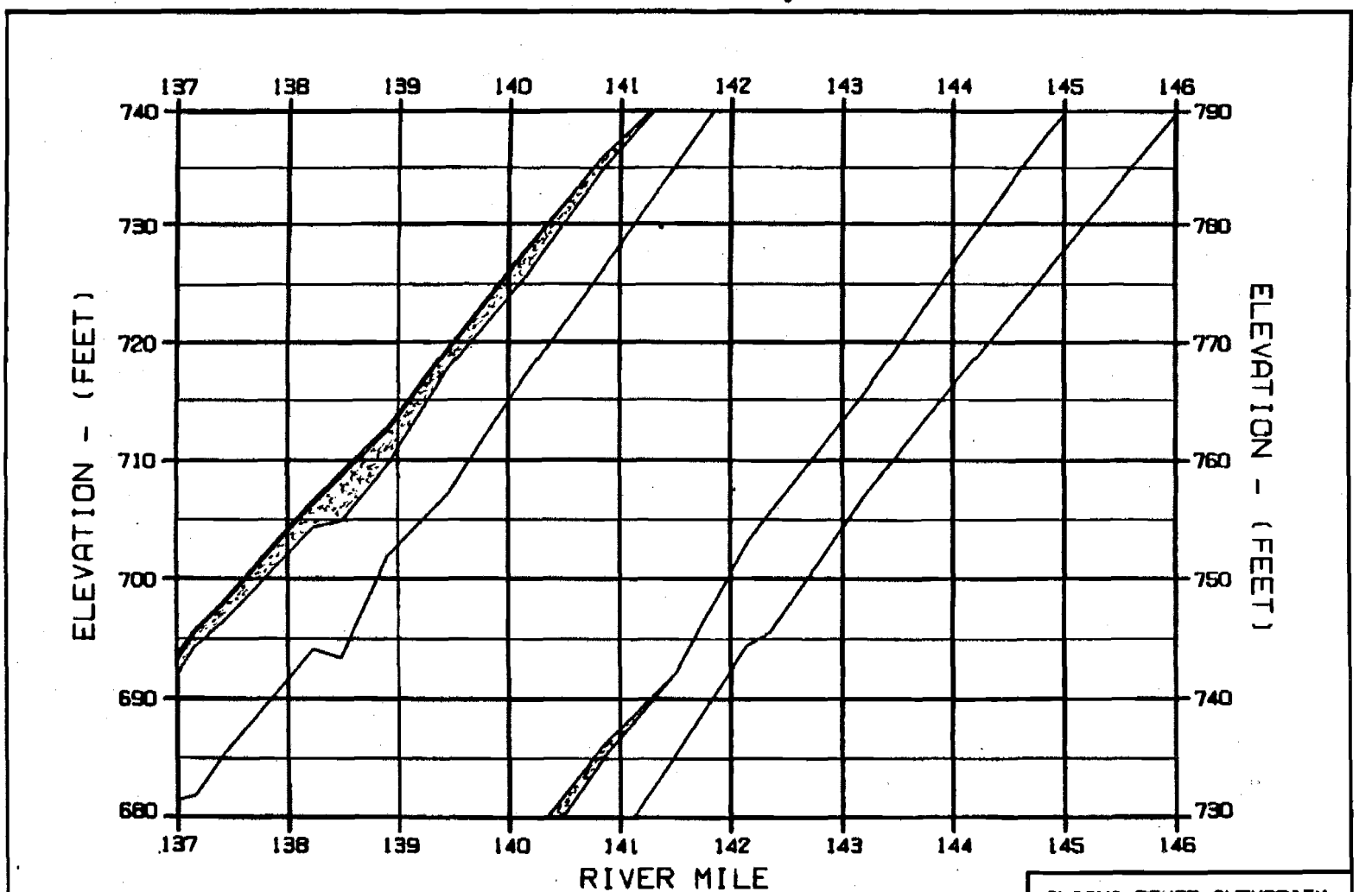
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

C



LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

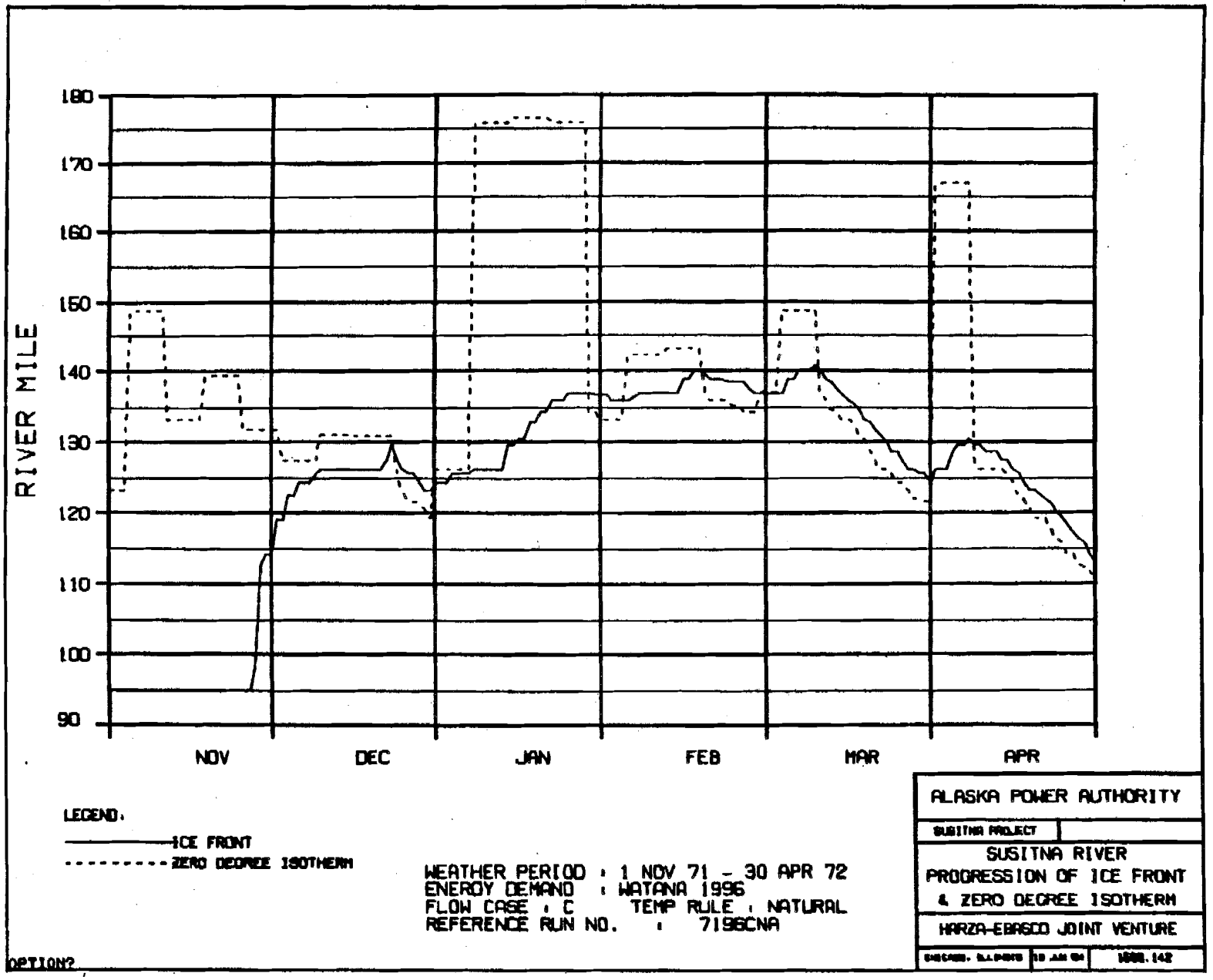
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

DRAWN: R.A.PARKS | 19 JAN 84 | 1588.142

OPTION?


RIVER MILE
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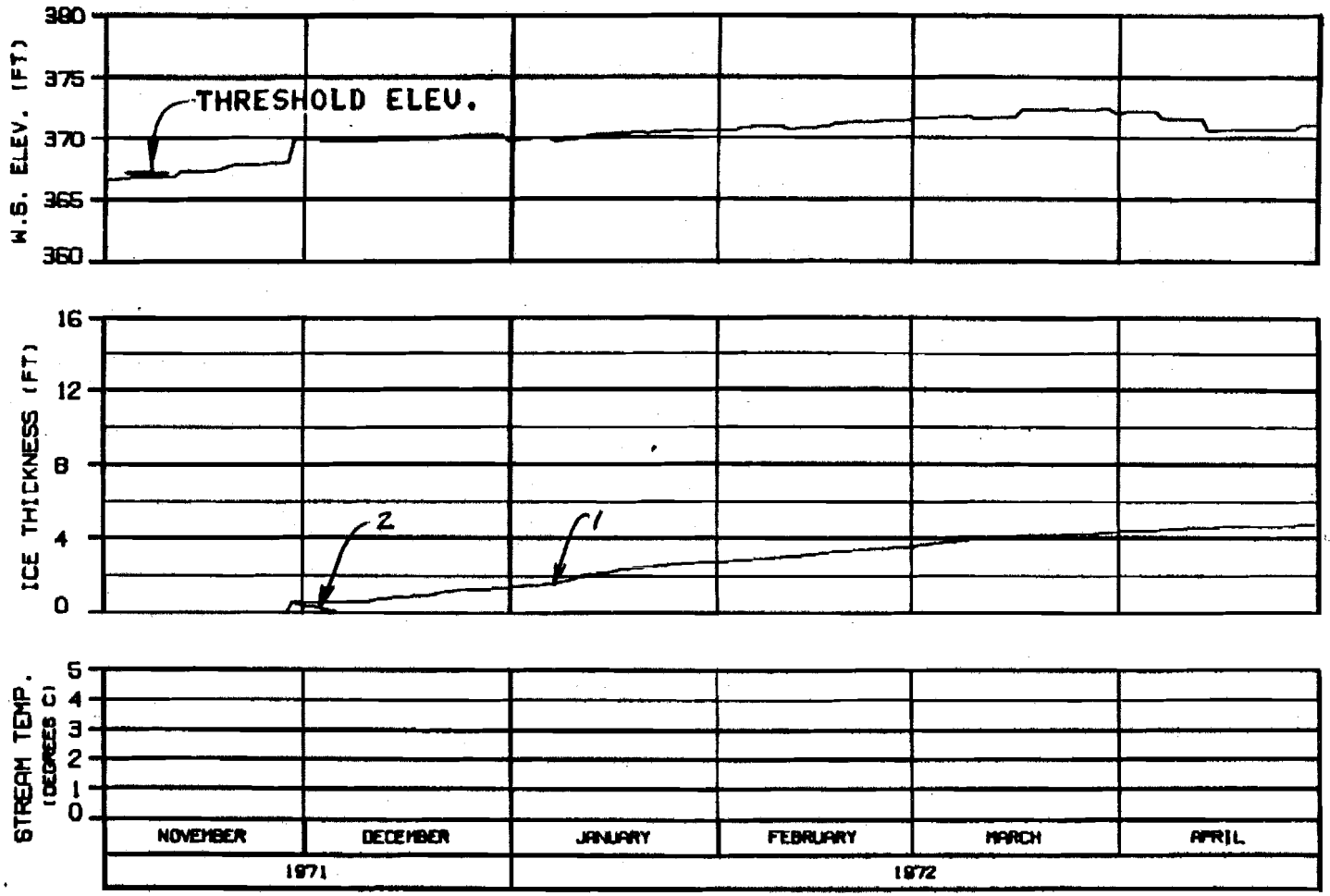
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

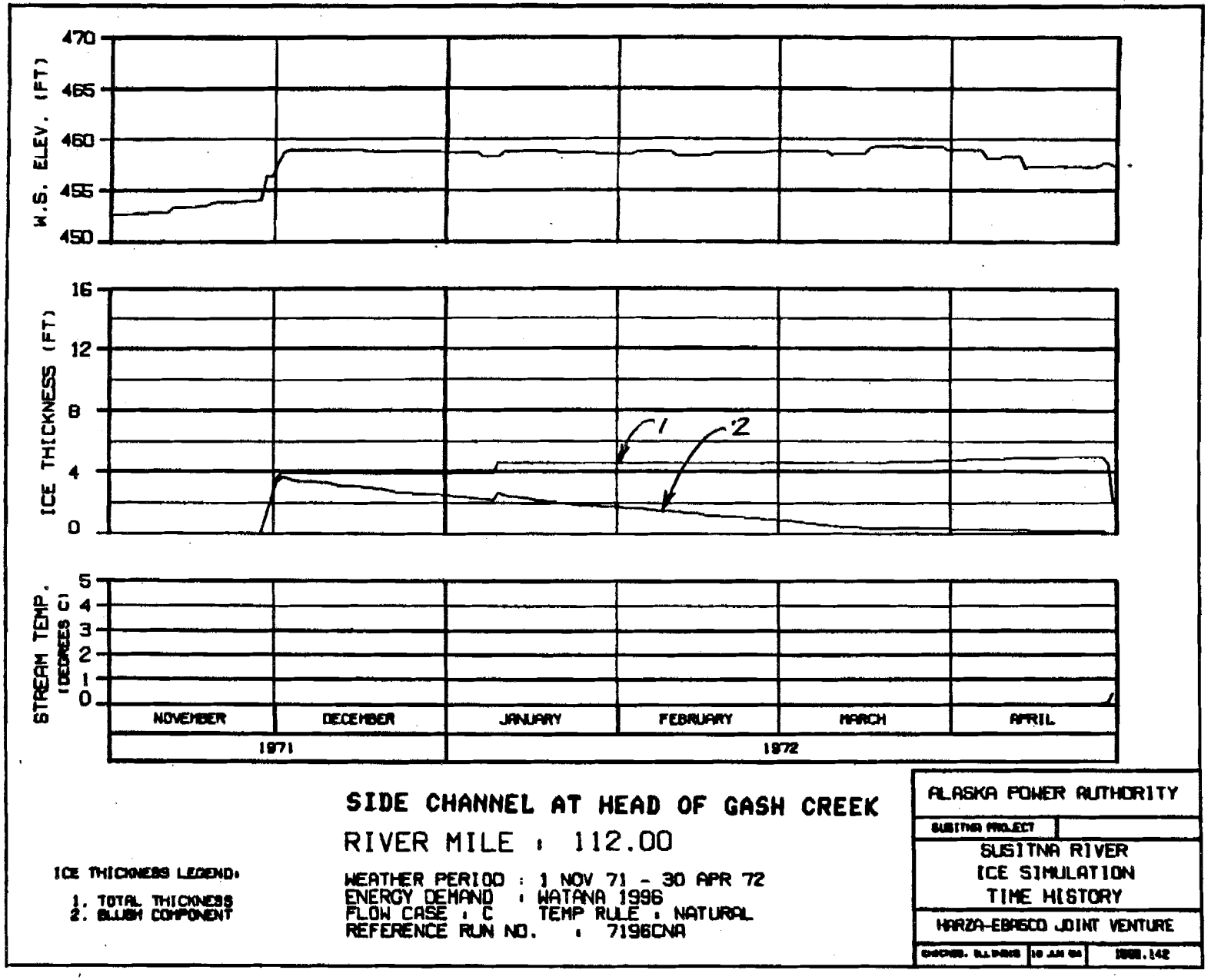
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ALLISON 10 JAN 84 1588.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

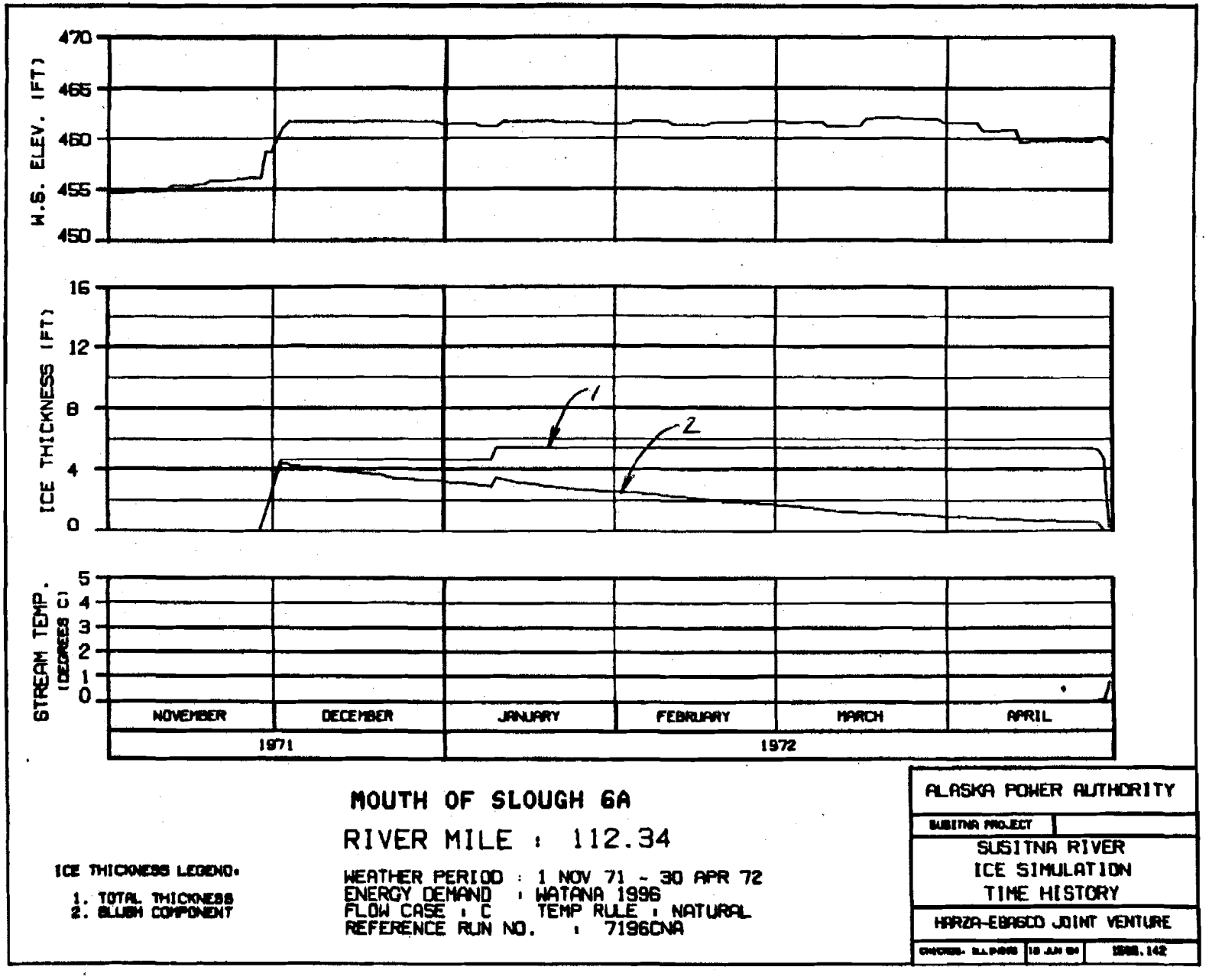
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S.L.PARKS | 10 JAN 86 | 8888.142



MOUTH OF SLOUGH 6A

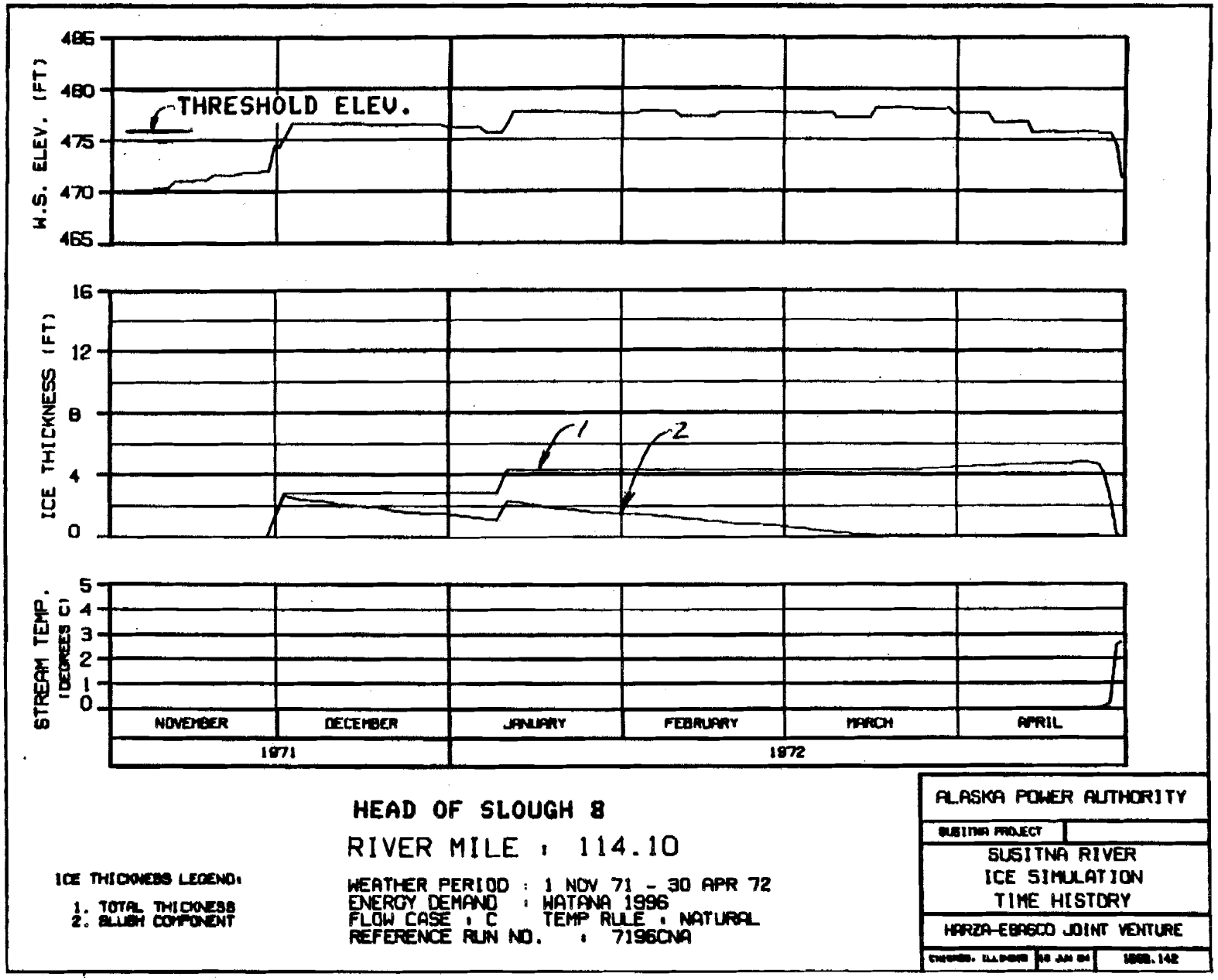
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 18 JAN 84 — 1988.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

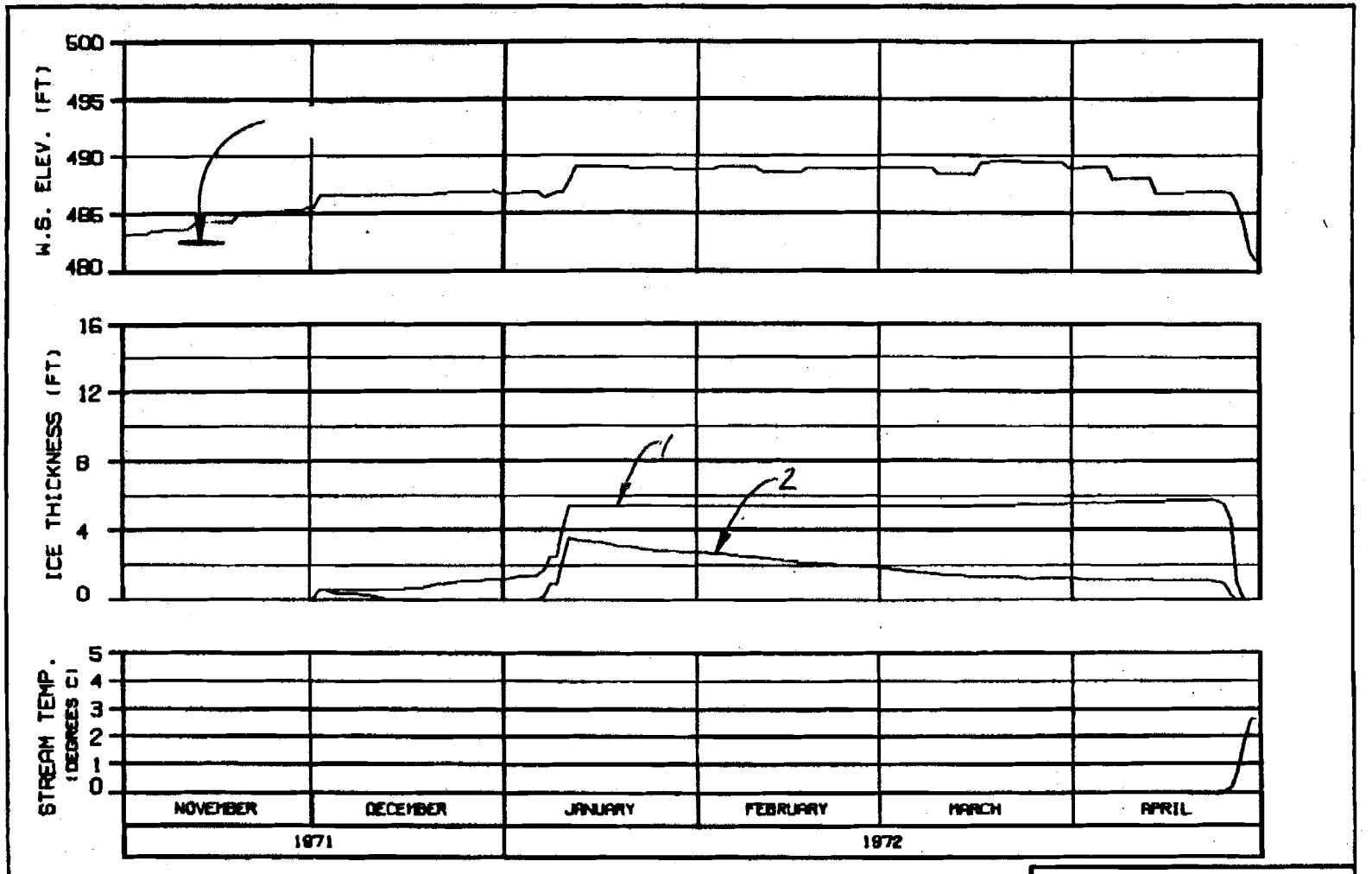
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JAN 84 | 1868.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

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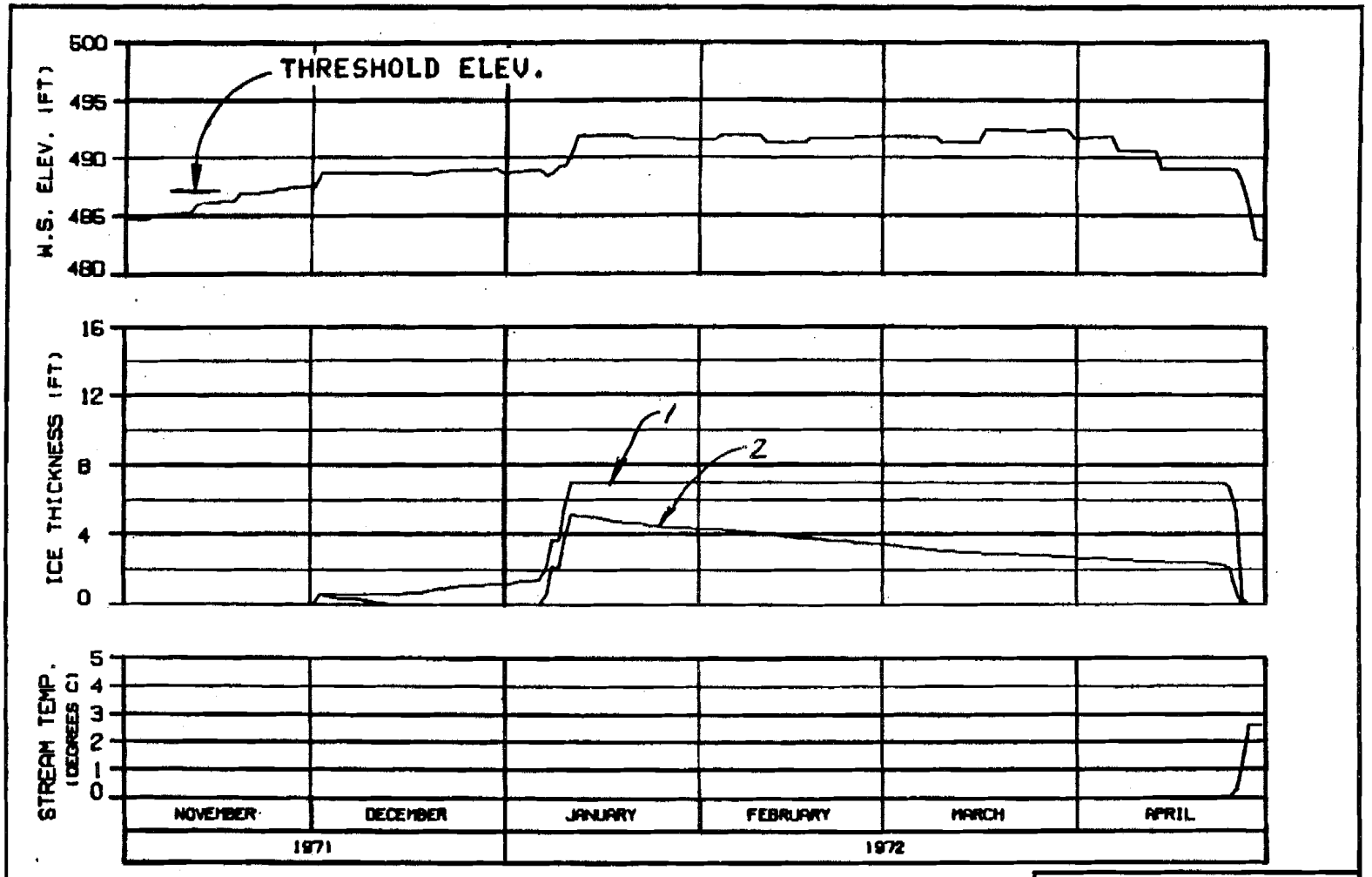


HEAD OF SIDE CHANNEL MSII

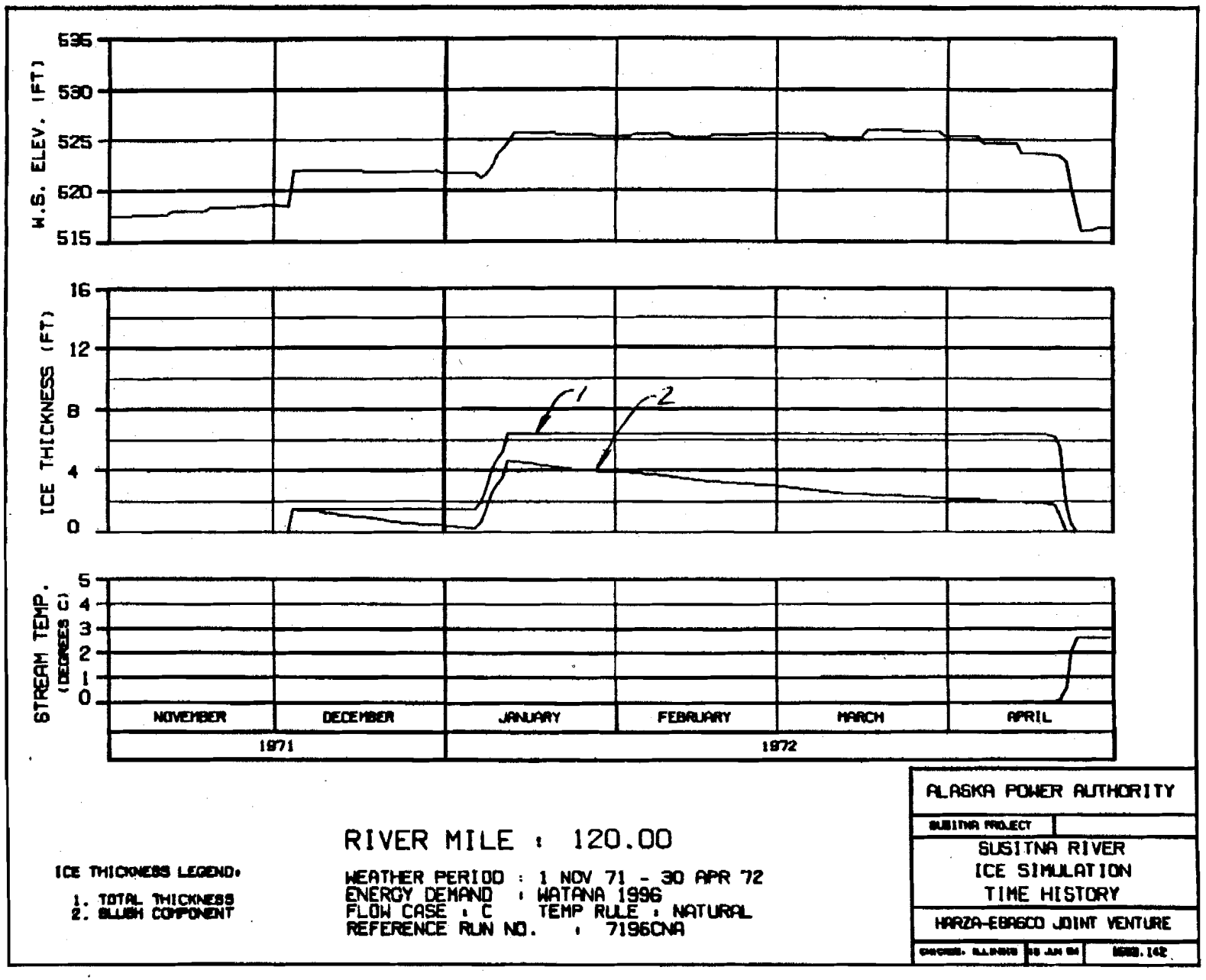
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

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



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

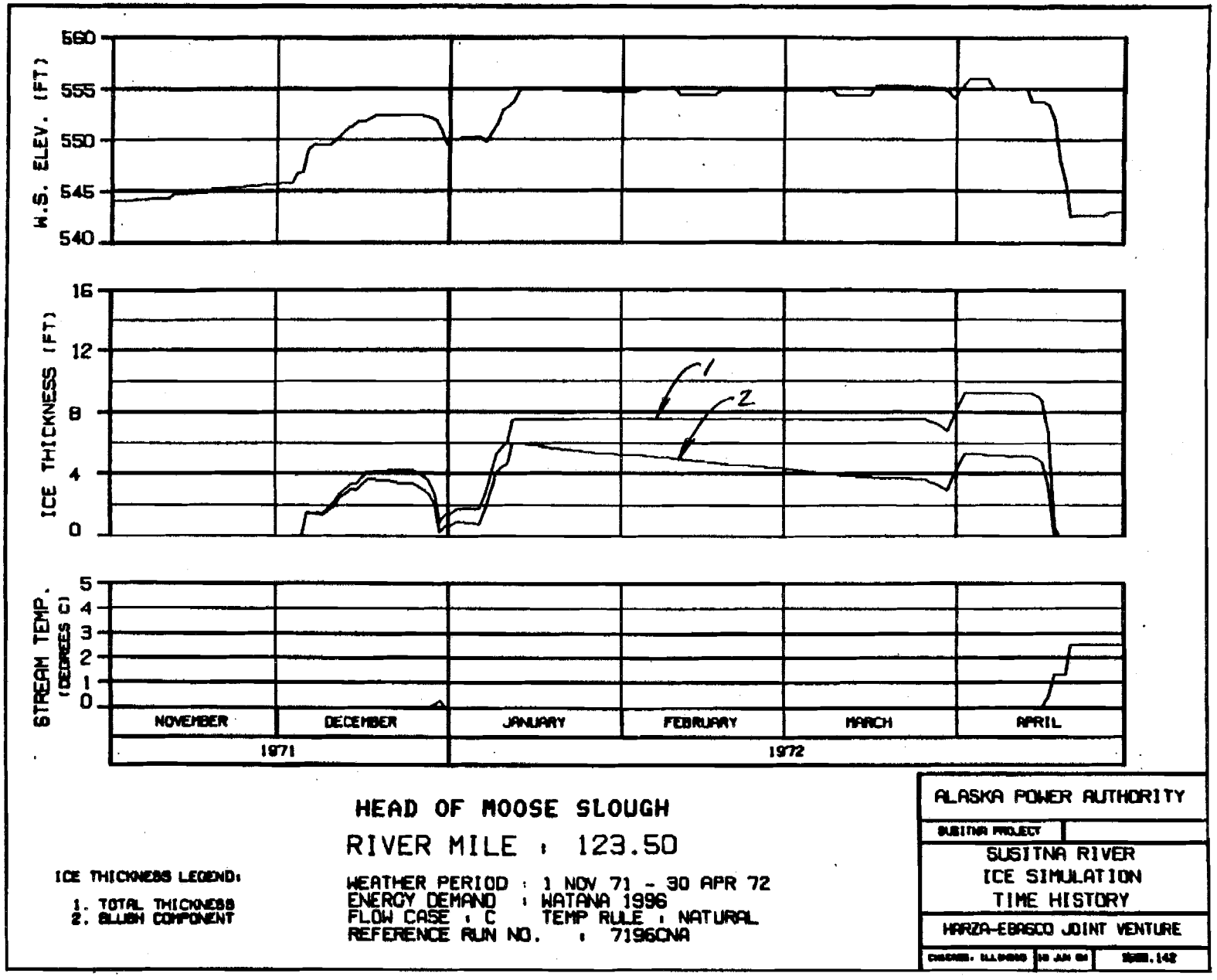
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 15 JAN 84 | HBB. 142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

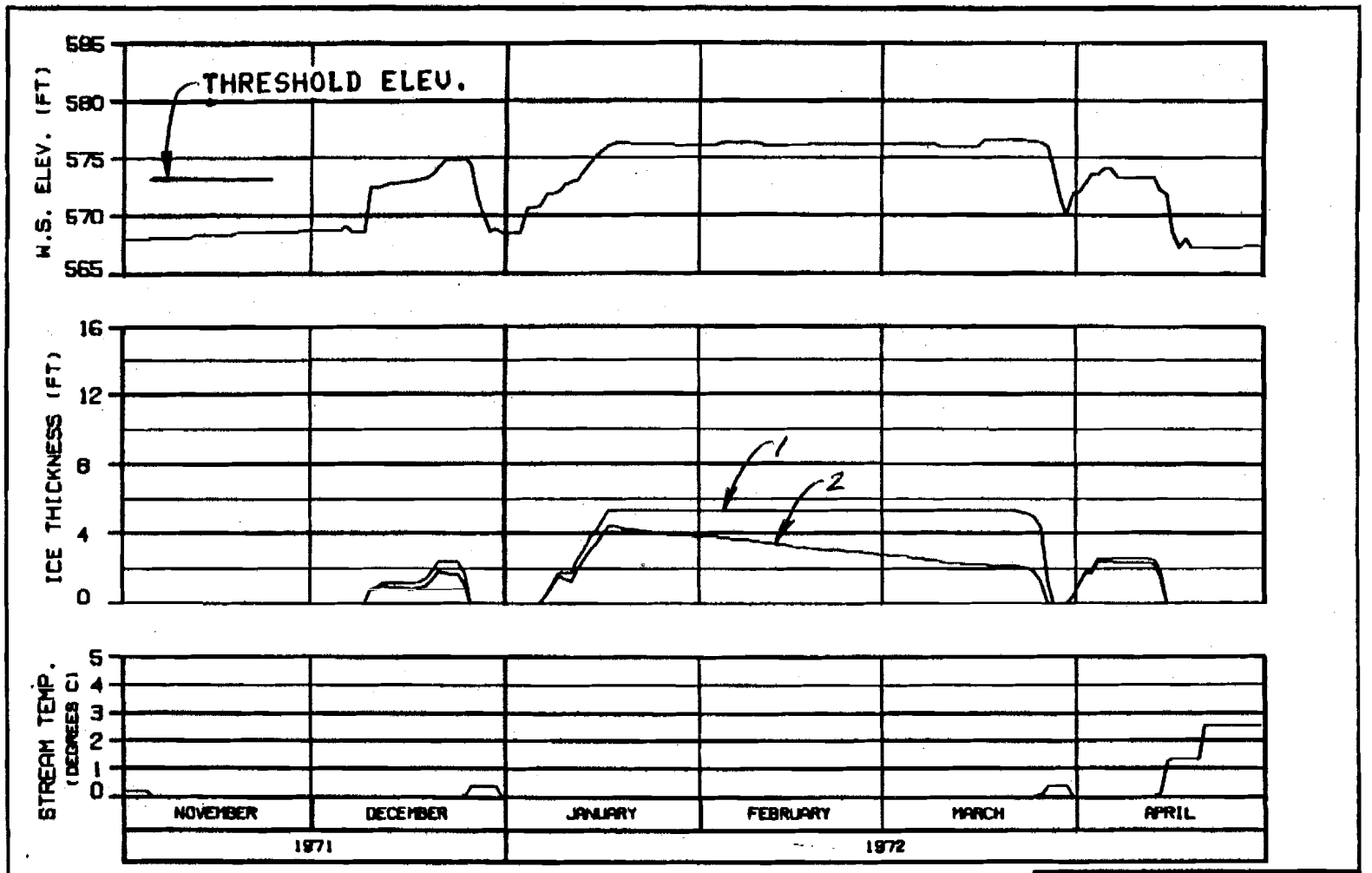
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ILLEGIBLE | 30 JAN 84 | ISSUE 142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

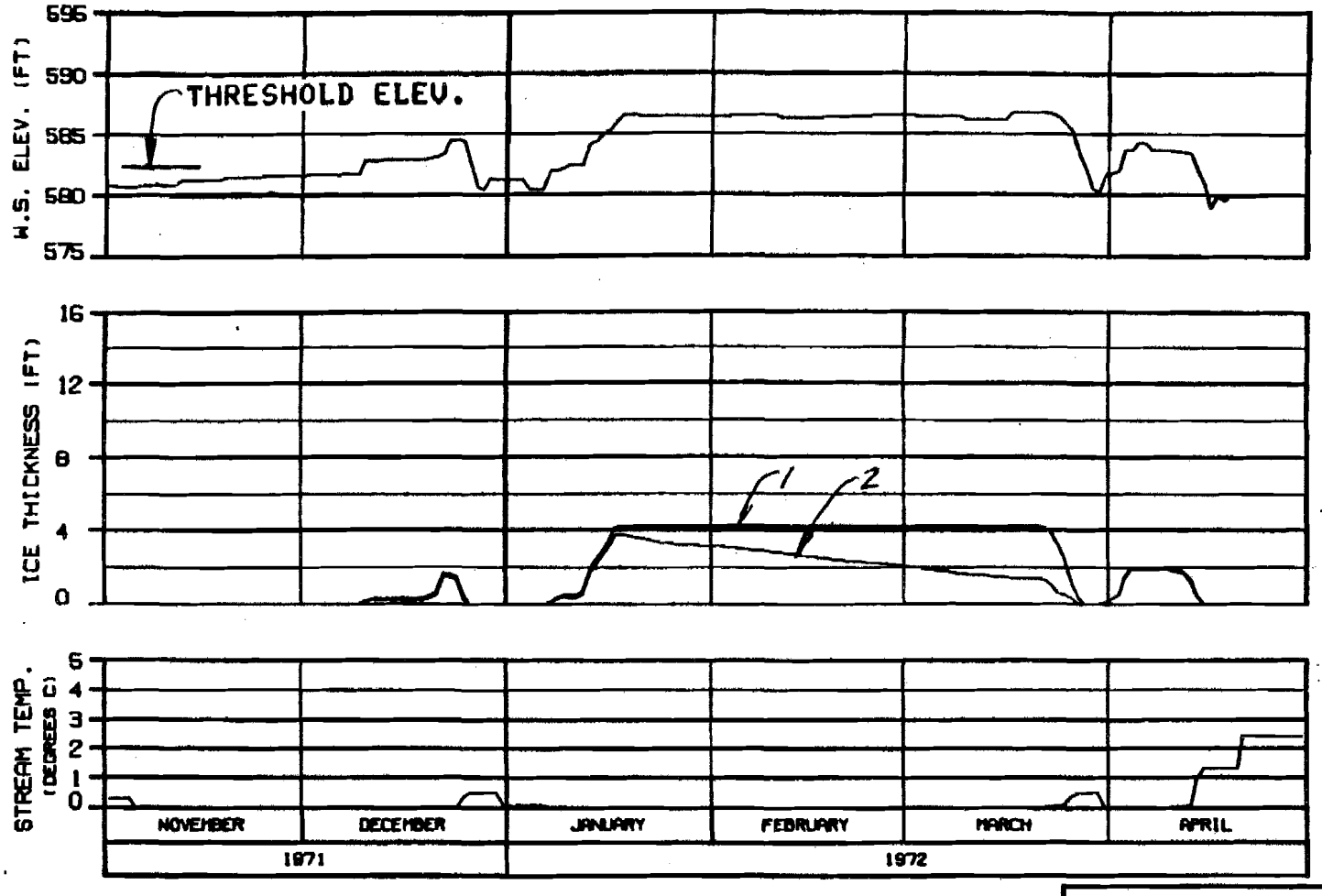
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ENGINEER: [illegible] 30 JAN 84 1862.142



HEAD OF SLOUGH 8A (EAST)

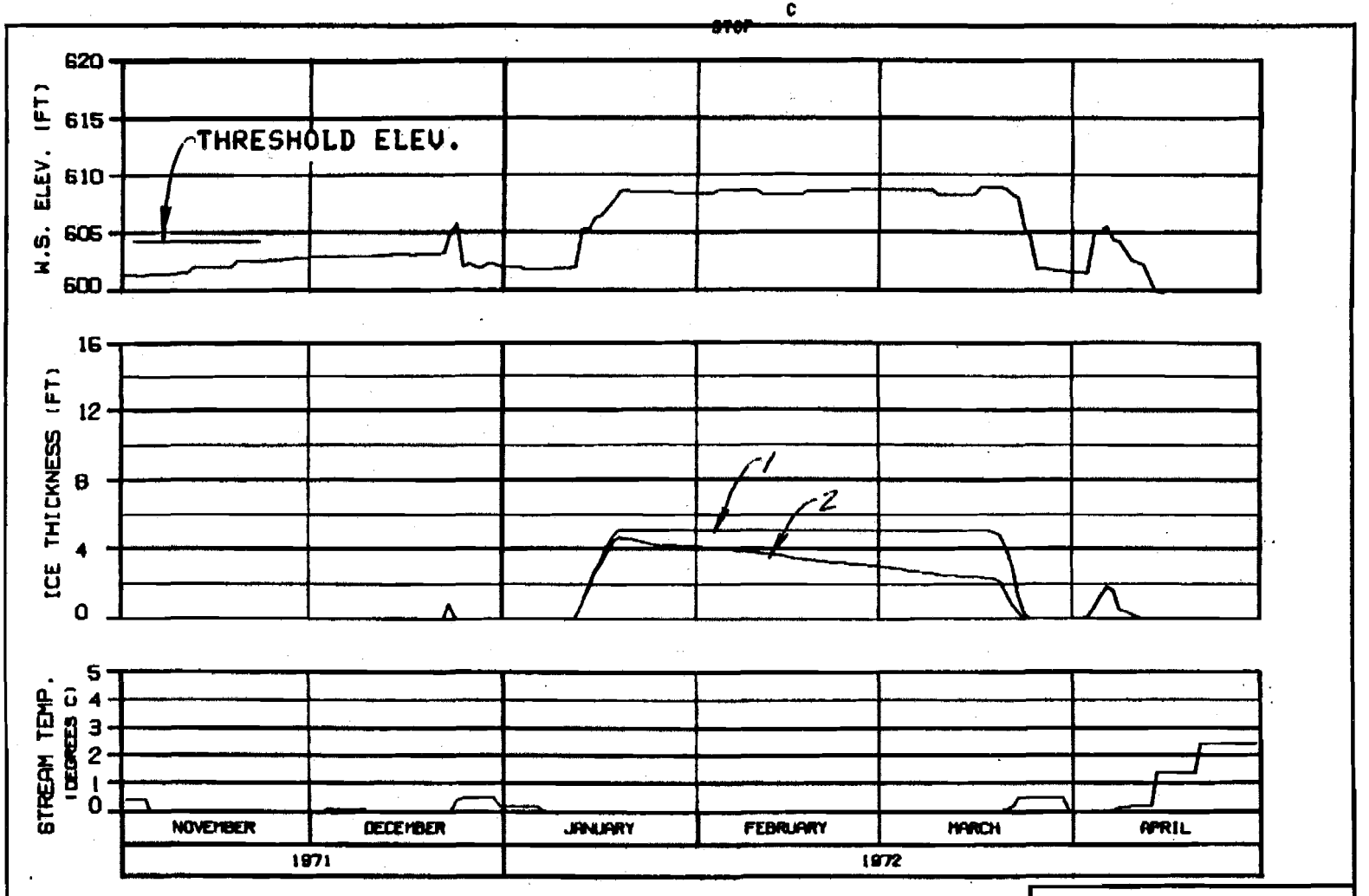
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 18 JAN 84 — 1863.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

OPTION?

ALASKA POWER AUTHORITY

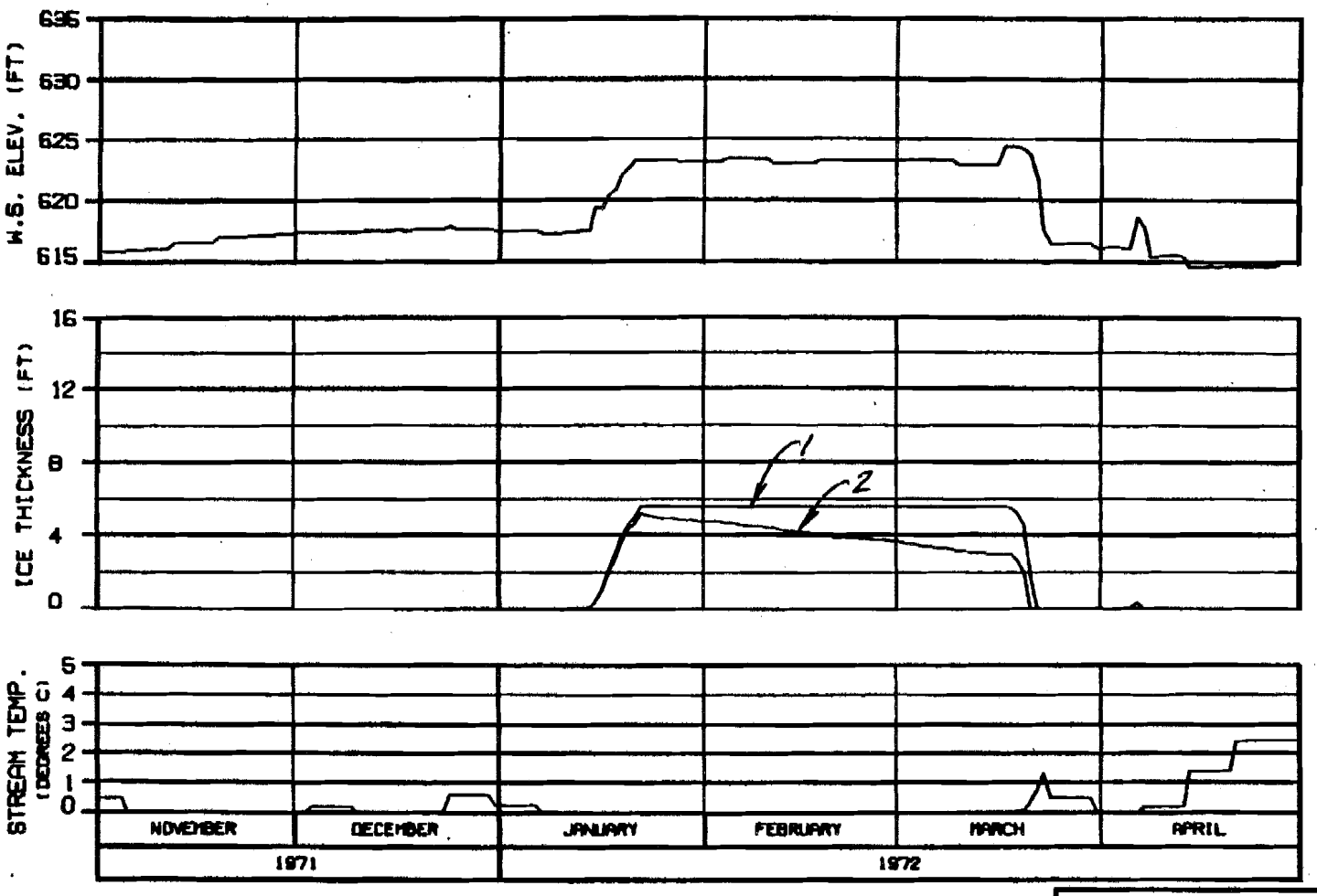
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: D.A.PONTE 28 JAN 84 1588.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

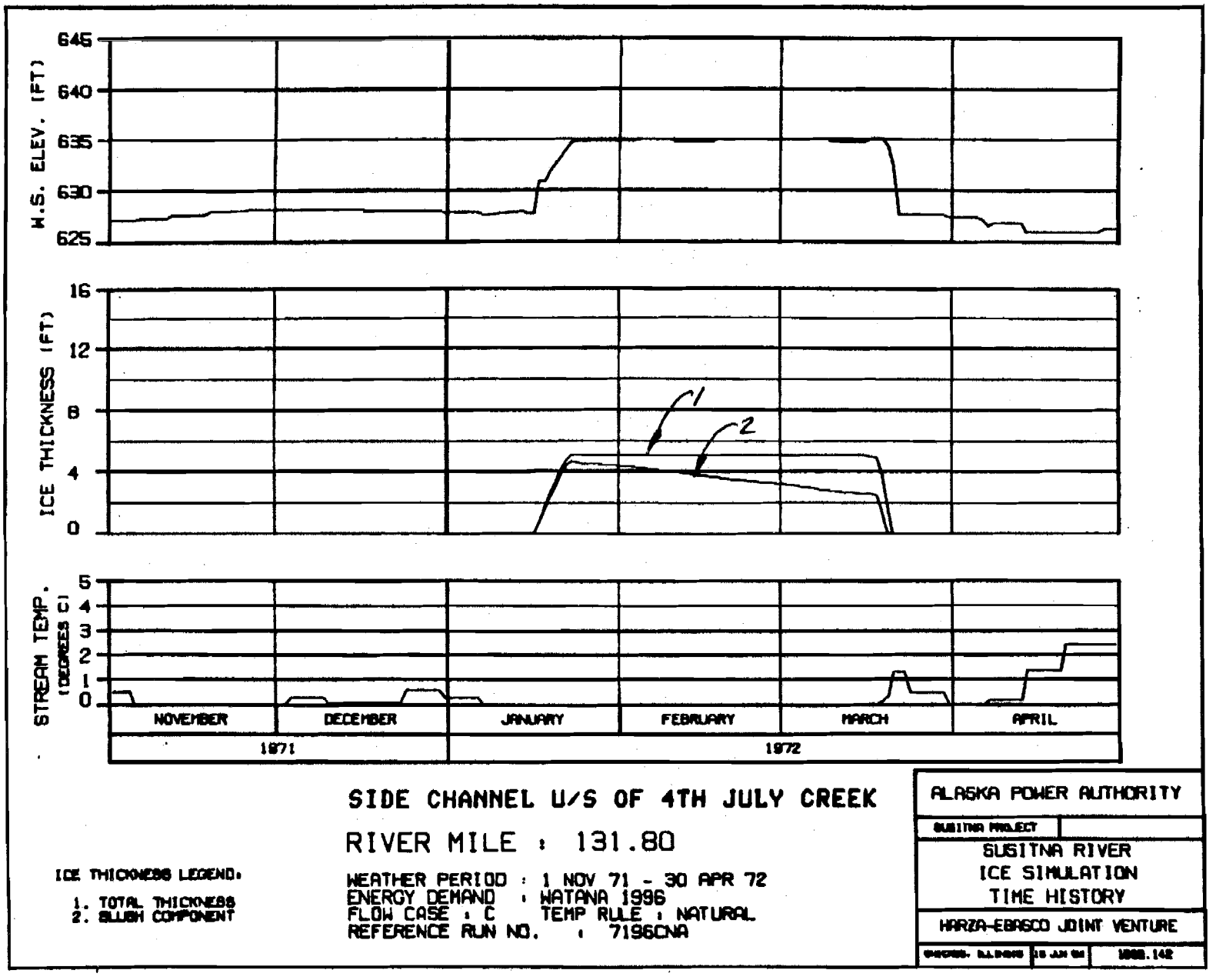
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: B.A.PARKS 10 JAN 84 1868.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

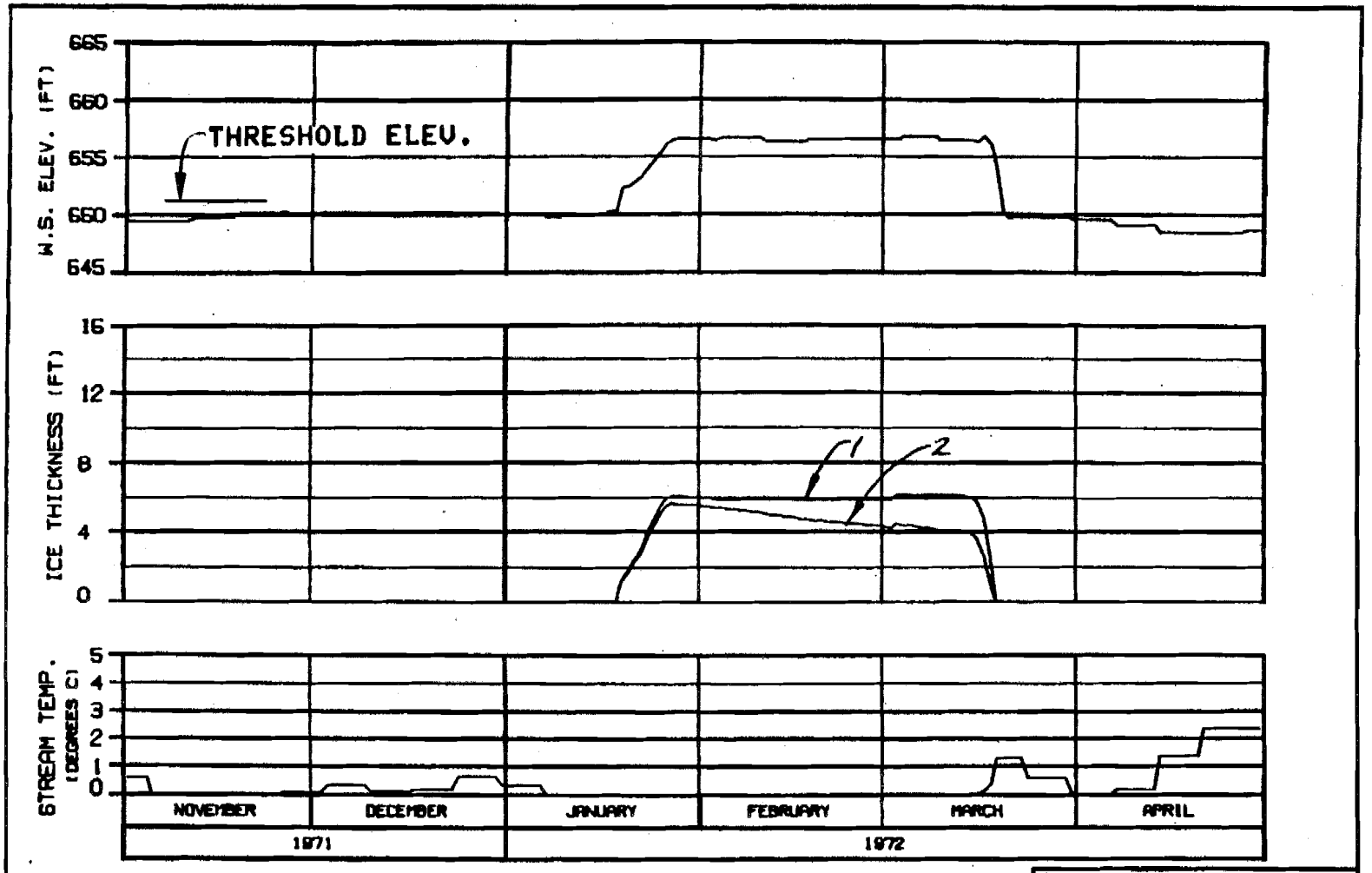
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 18 JAN 84 1868.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

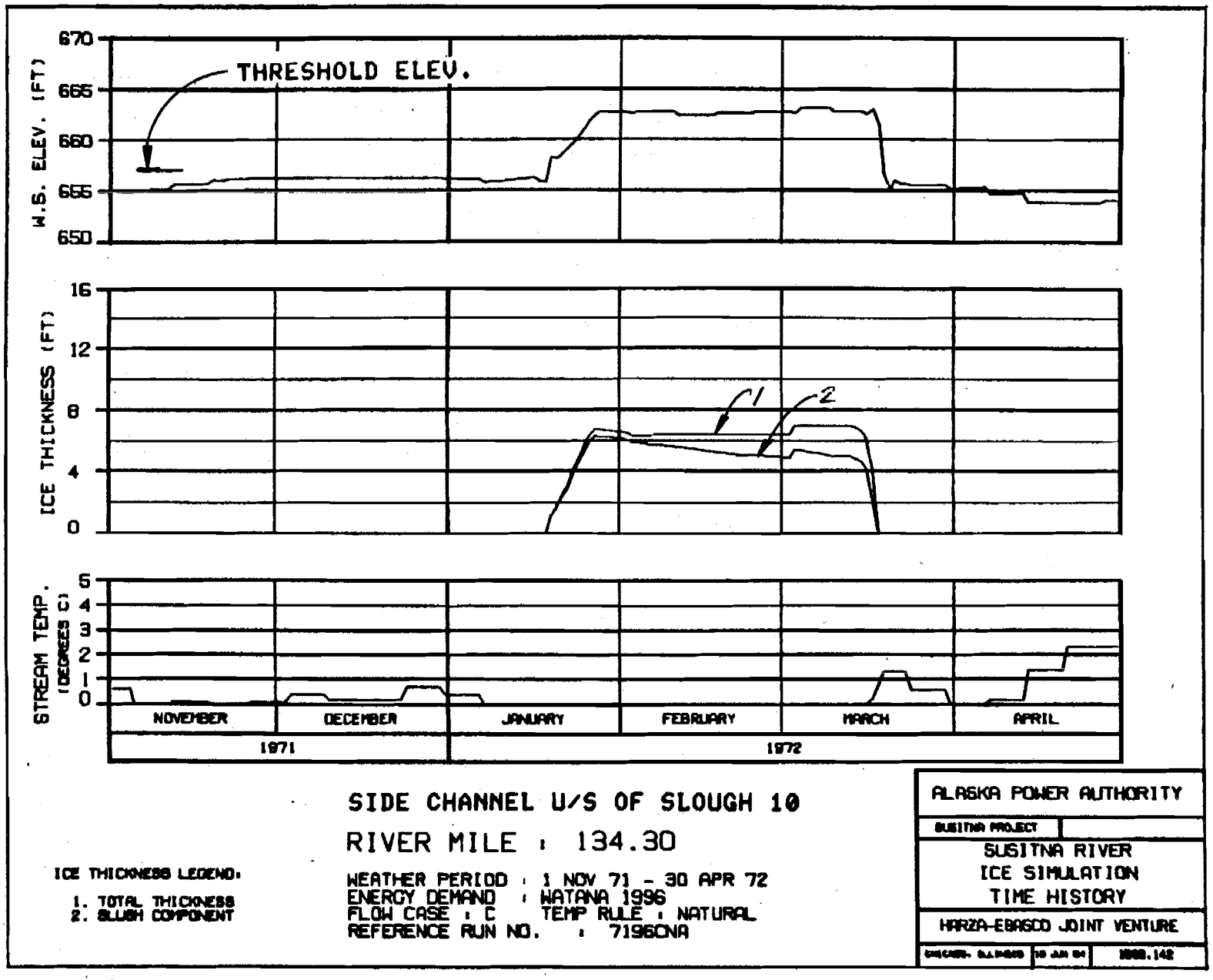
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

10 JAN 84

8888.142



SIDE CHANNEL U/S OF SLOUGH 10

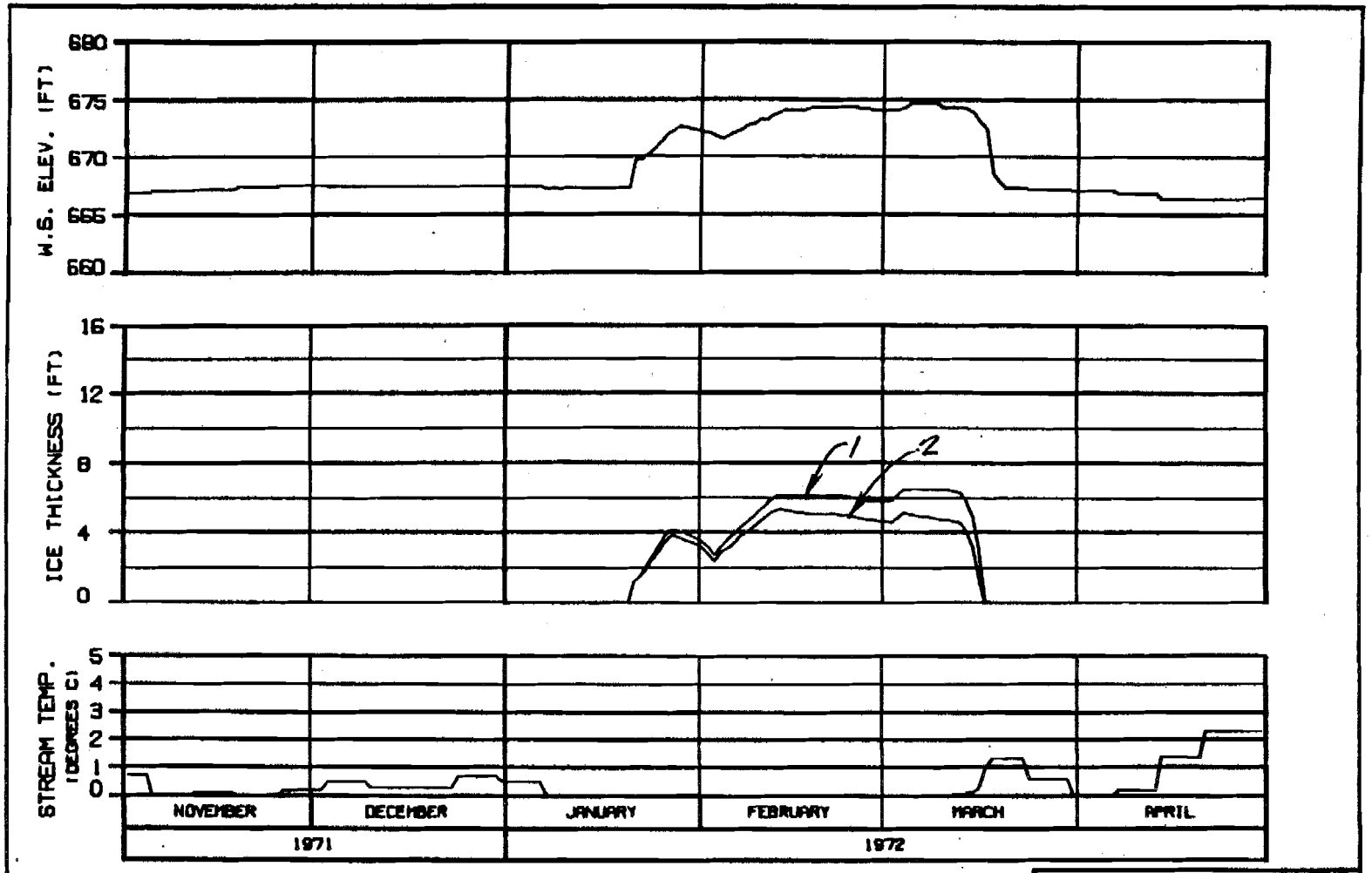
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	10 JAN 84



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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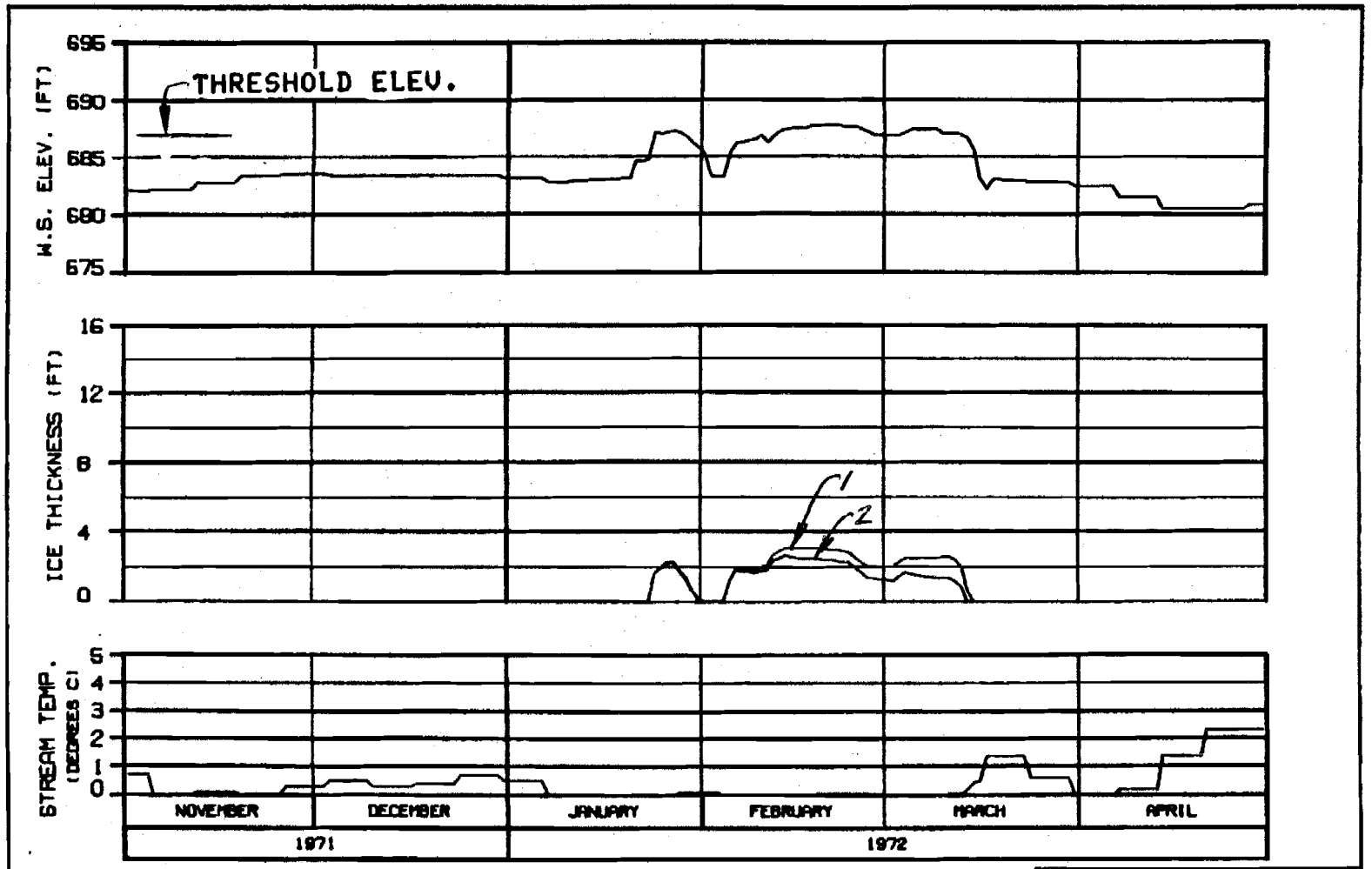


HEAD OF SLOUGH 11

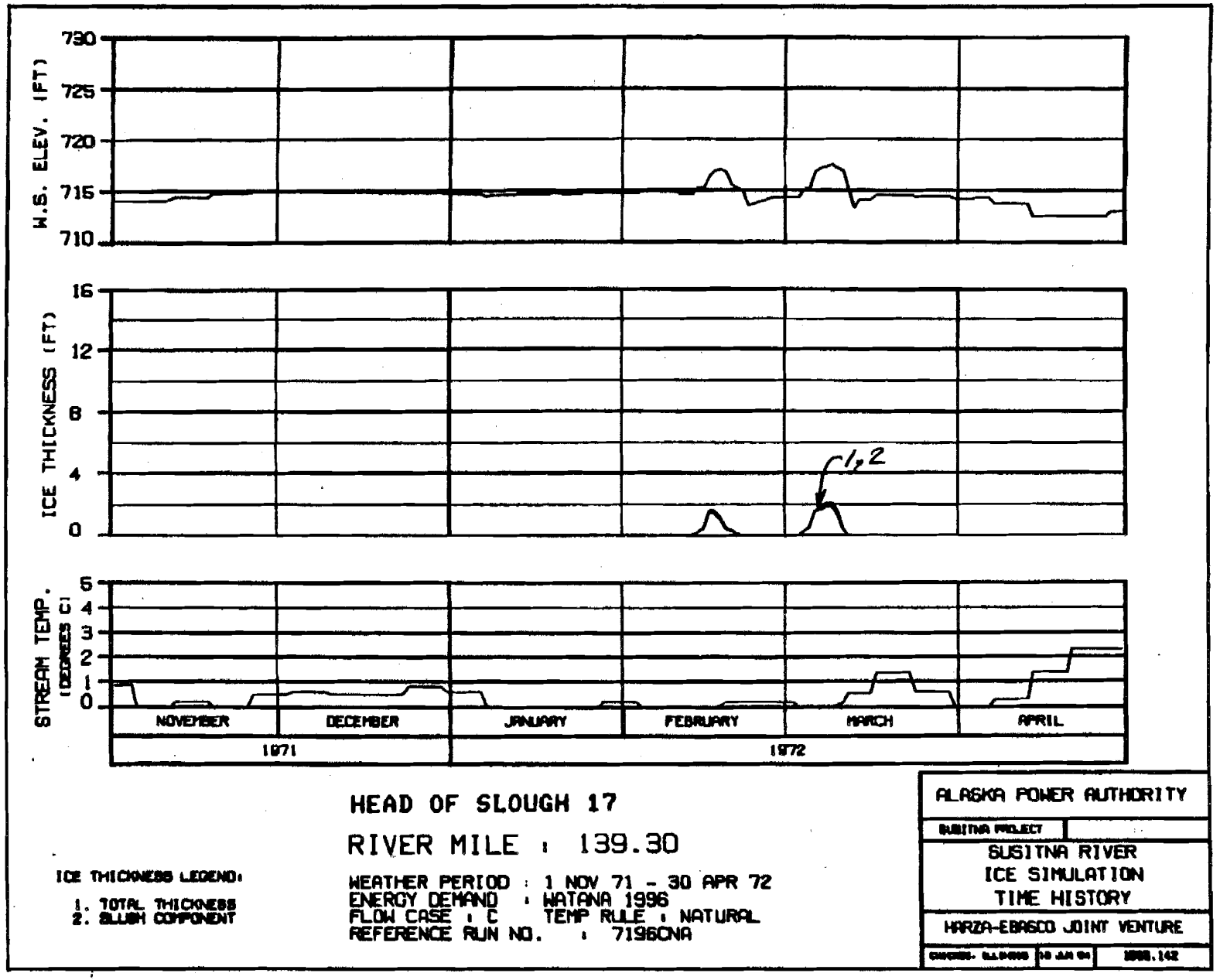
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: G.L.DAVIS 30 JAN 84 1986.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

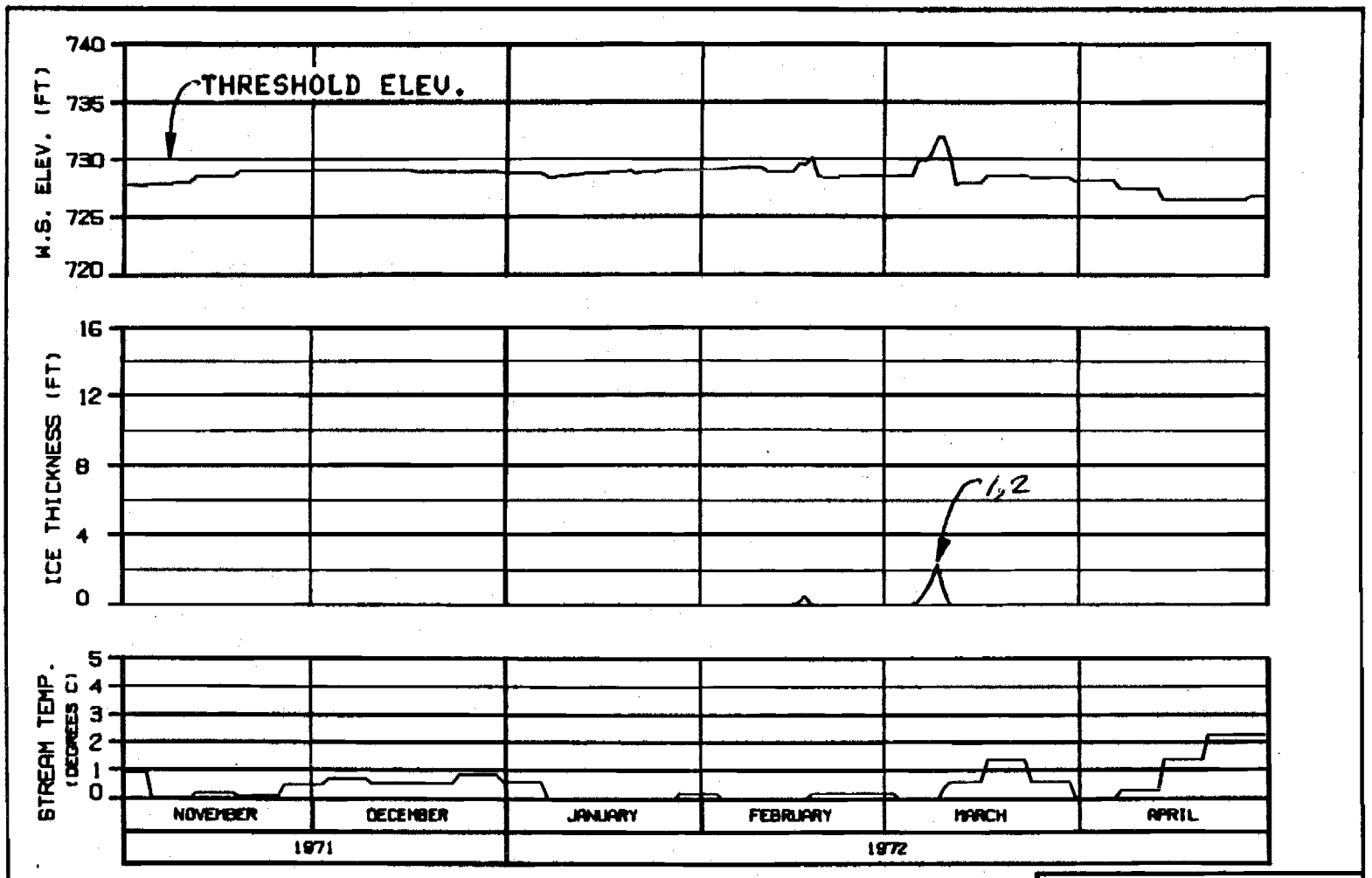
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 10 JAN 94 1898.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

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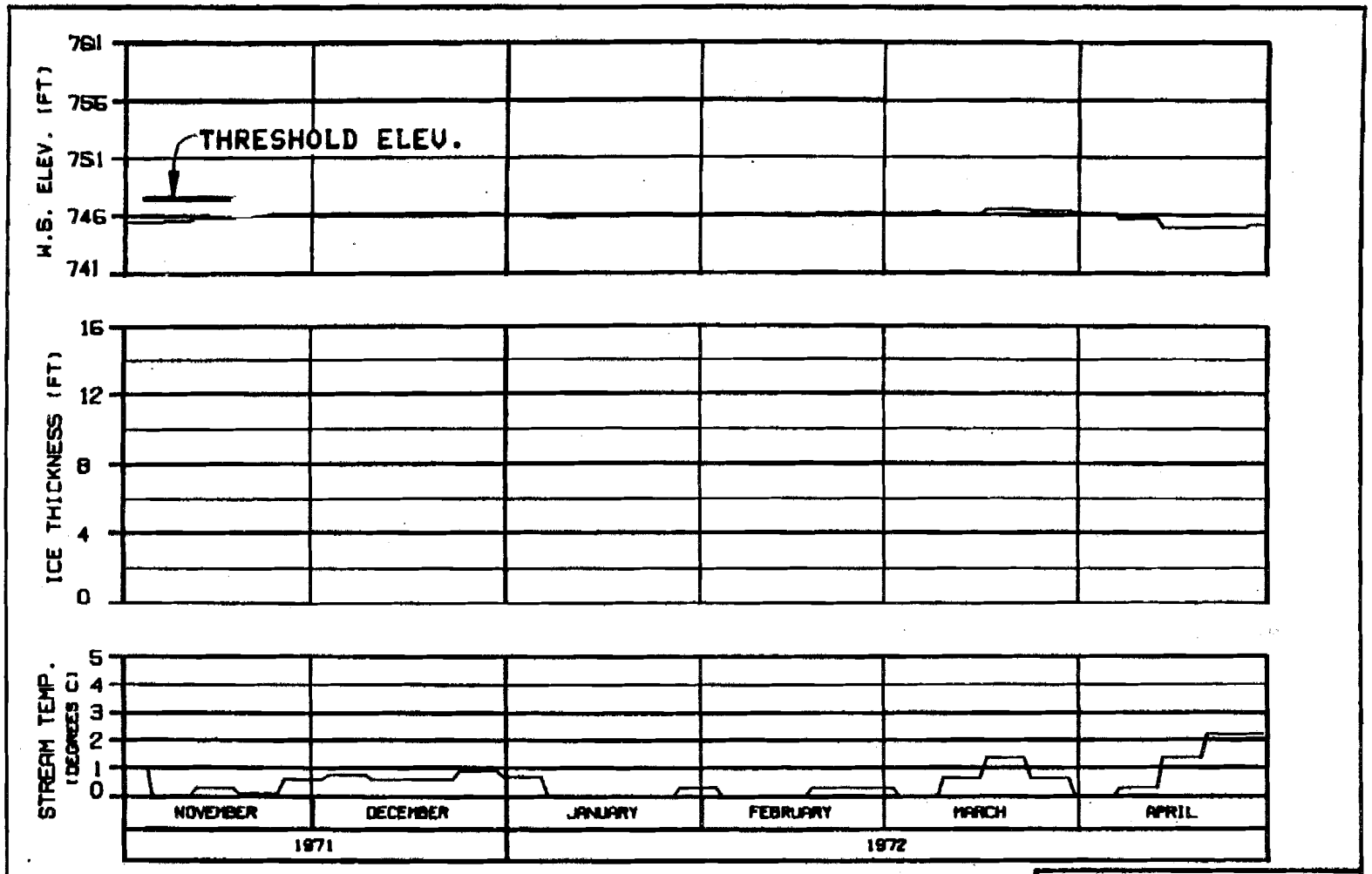


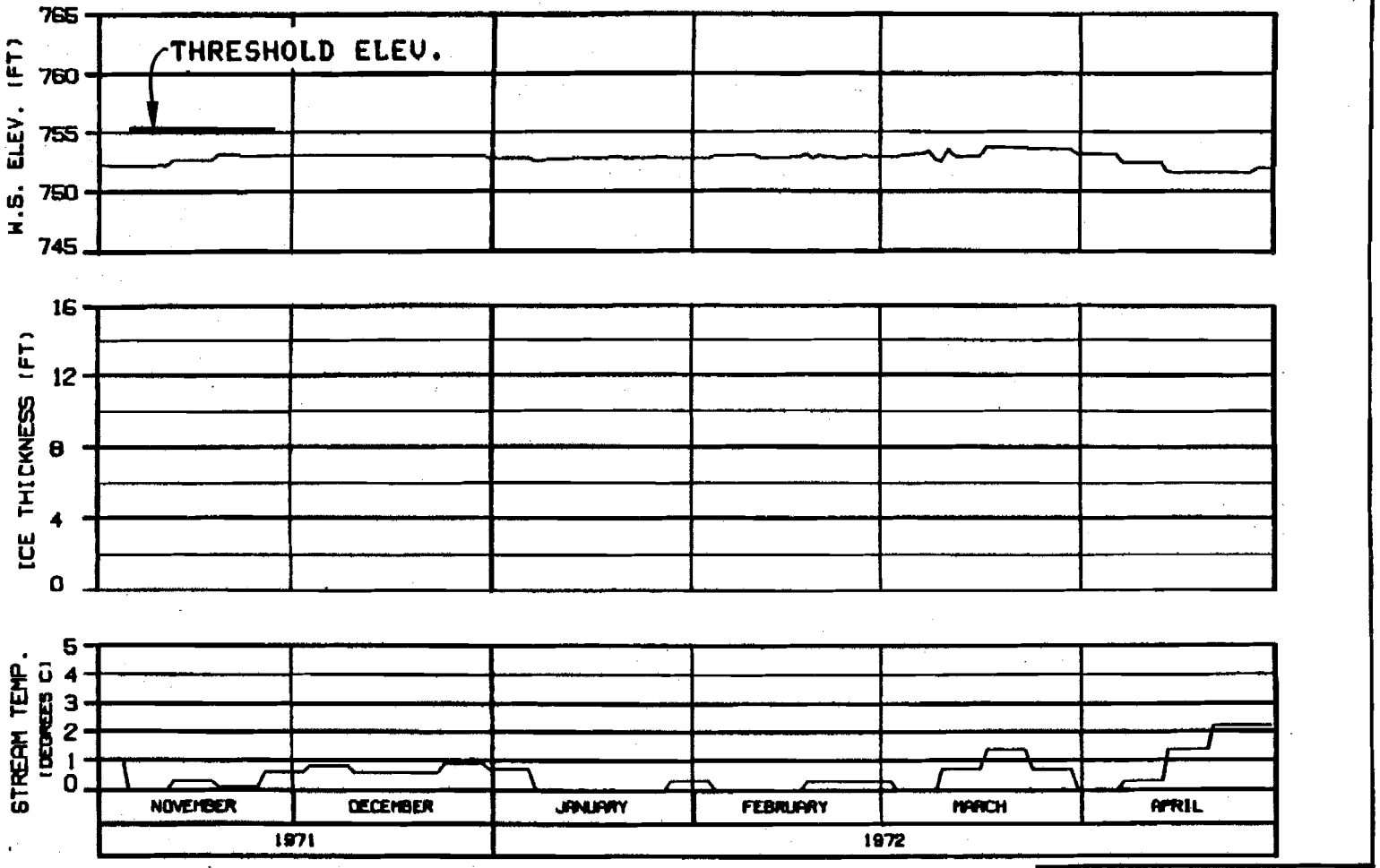
SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | JAN 94 | 1588.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

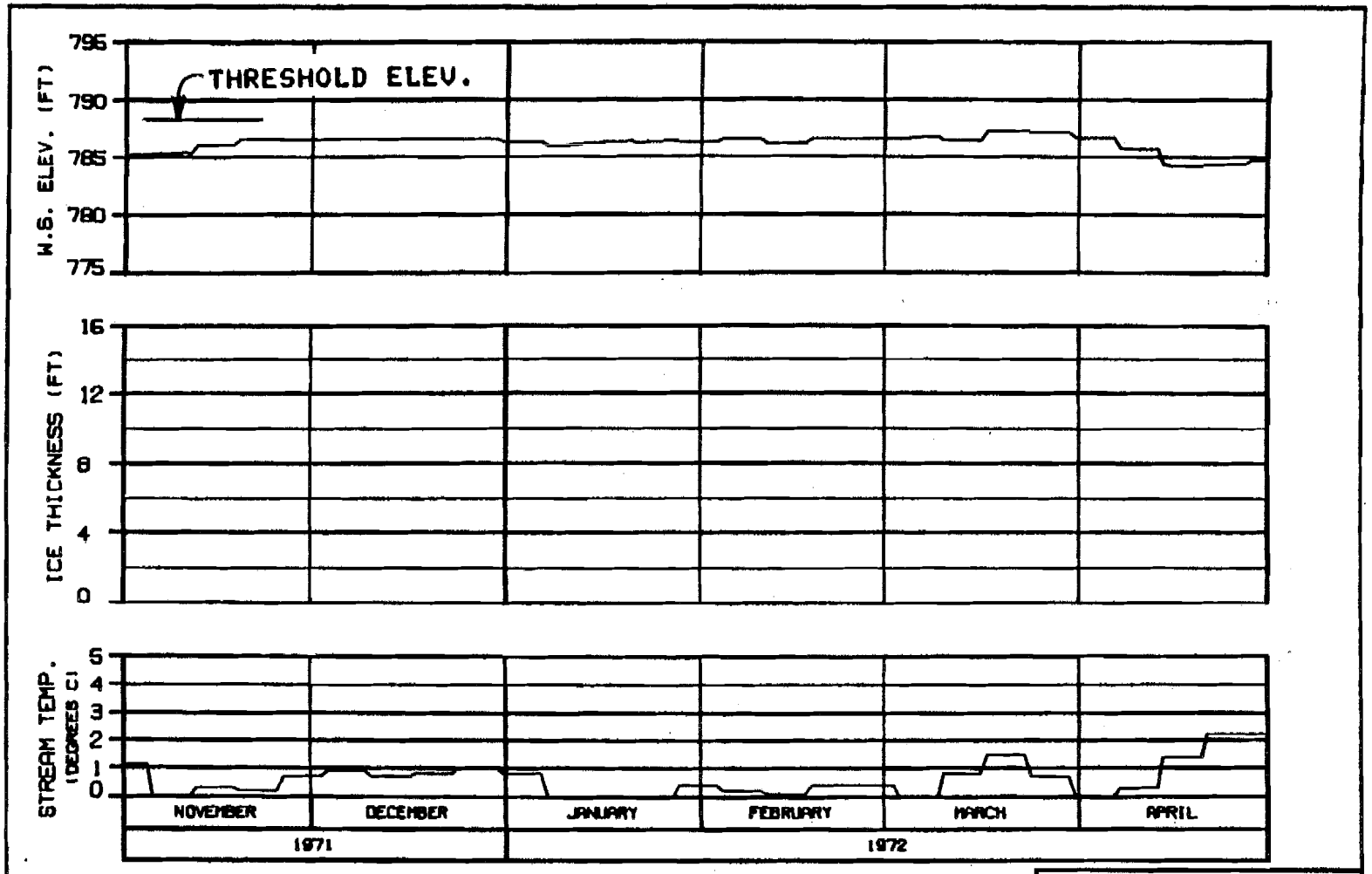
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7198CNA

OPTION2

ALASKA POWER AUTHORITY

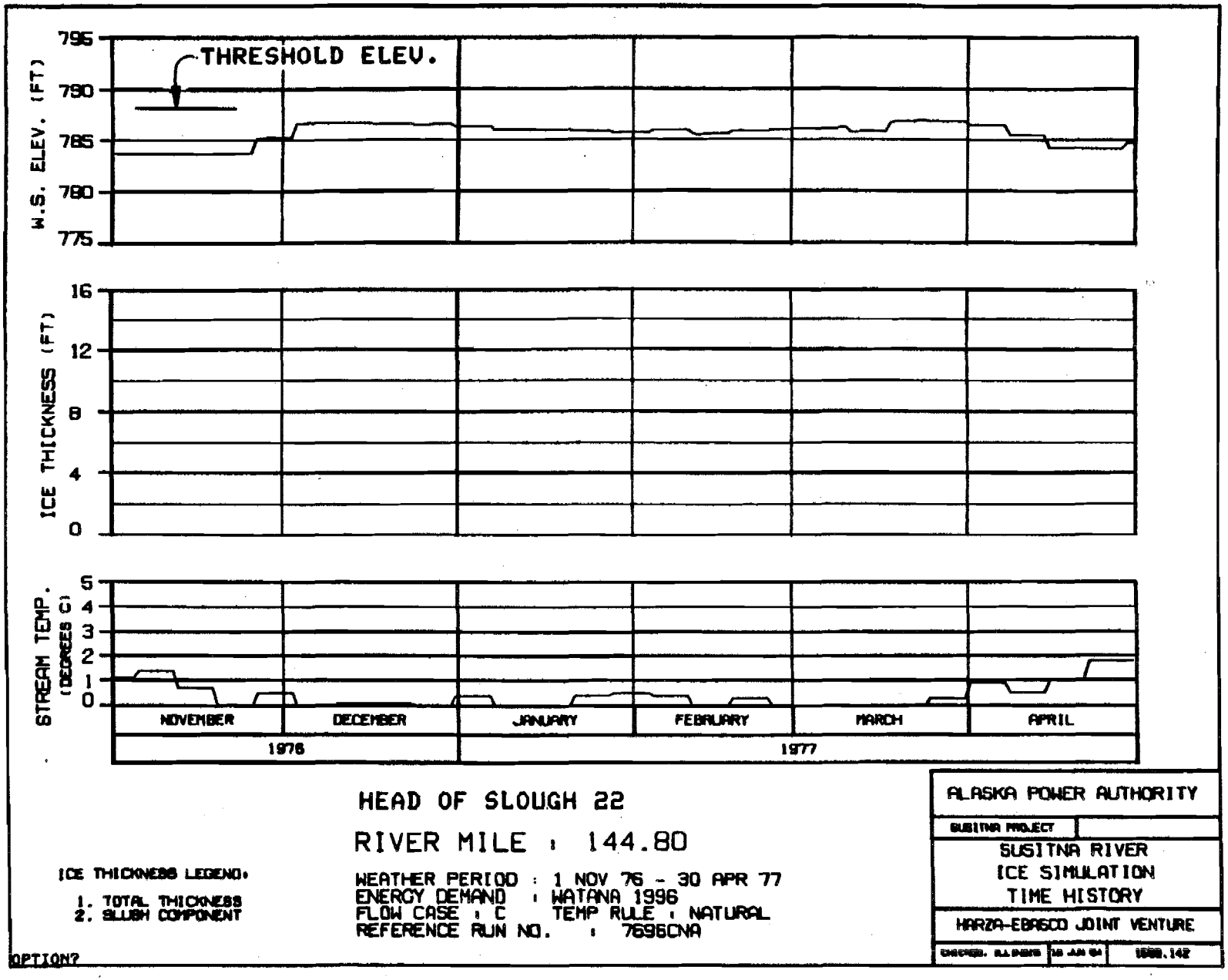
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 19 JAN 84 | 1588.142

EXHIBIT 1



HEAD OF SLOUGH 22

RIVER MILE : 144.80

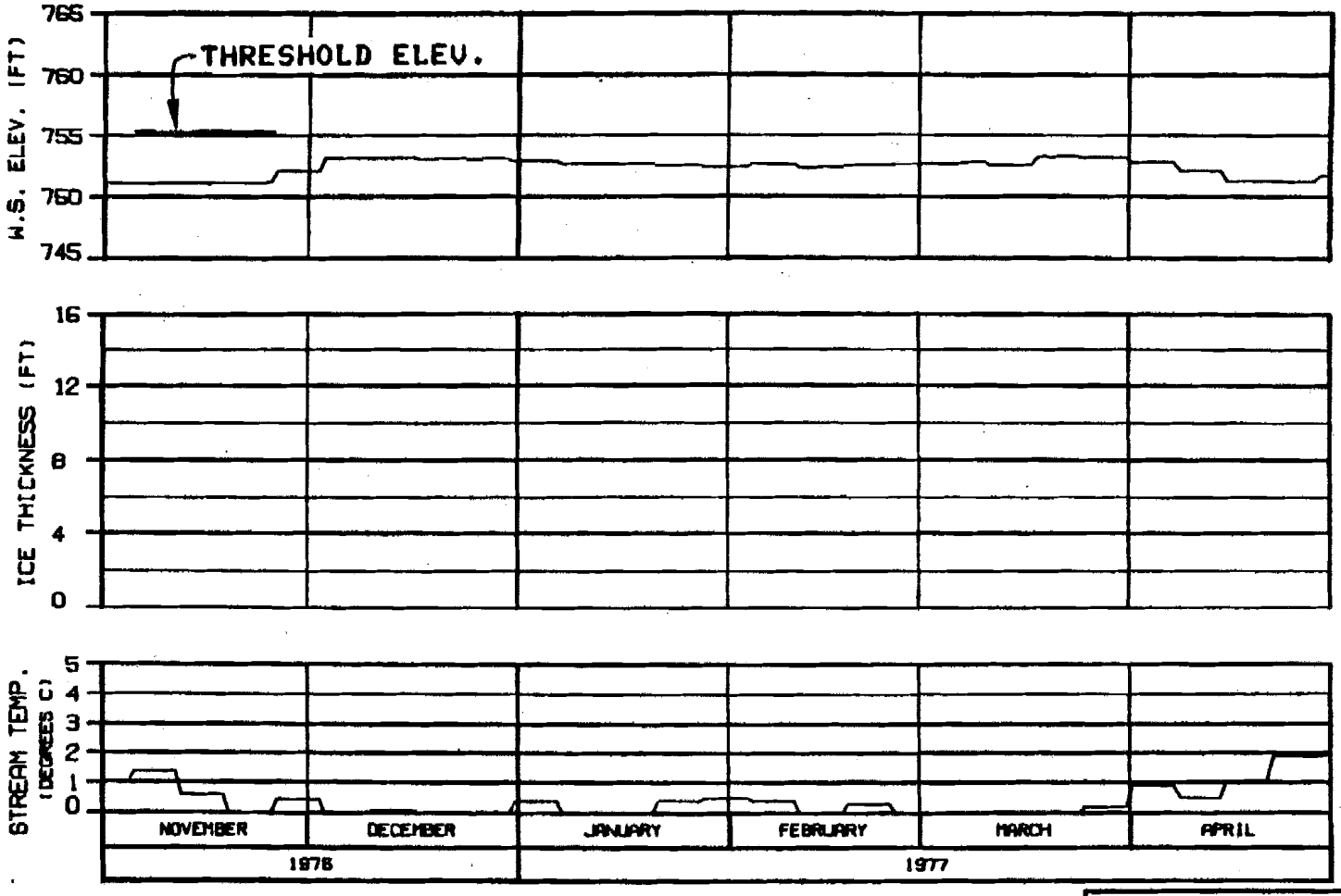
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

OPTION?

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



HEAD OF SLOUGH 21

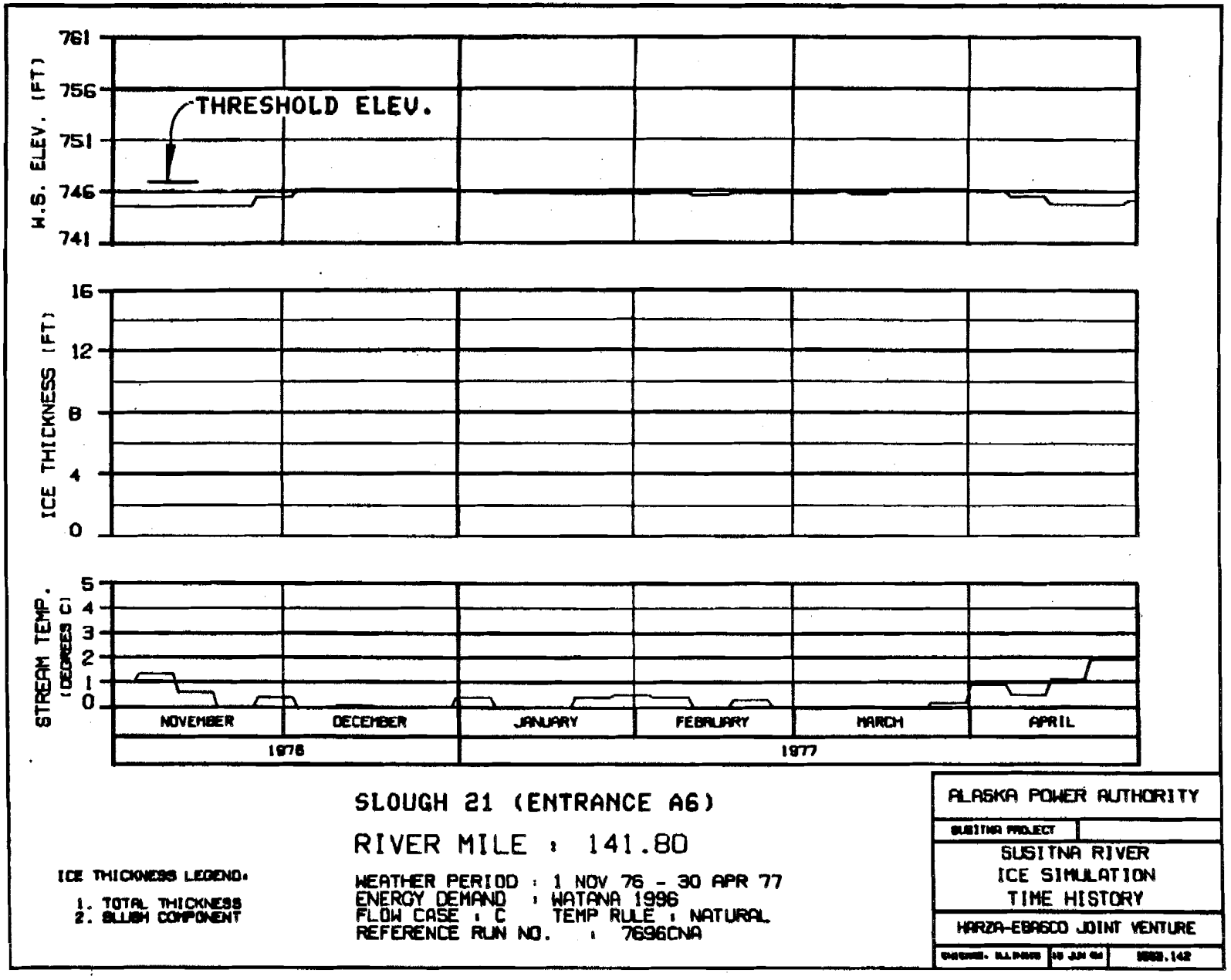
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: B.L.MOYE	10 JAN 84	1889.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

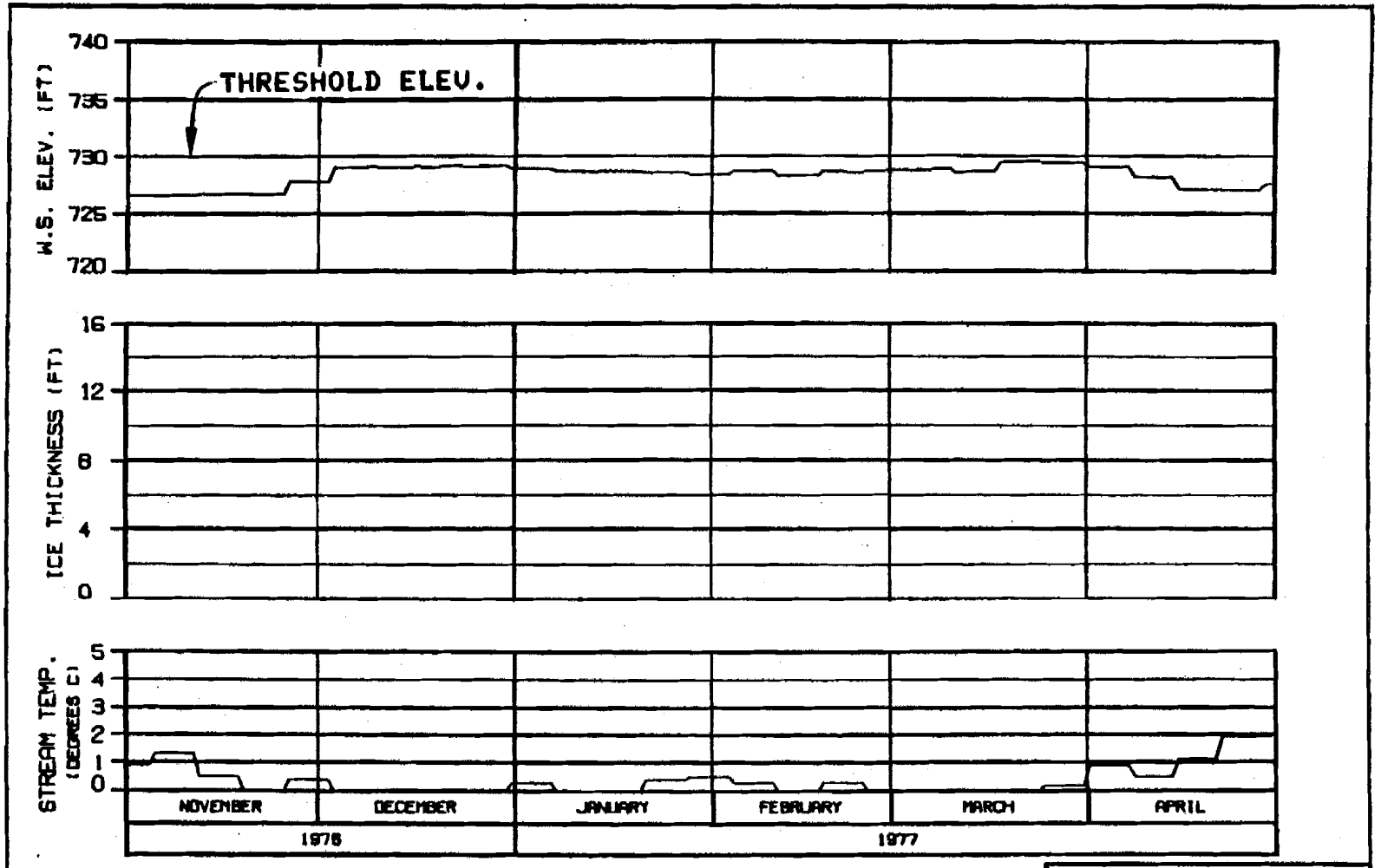
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 19 JAN 84 | 1868.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

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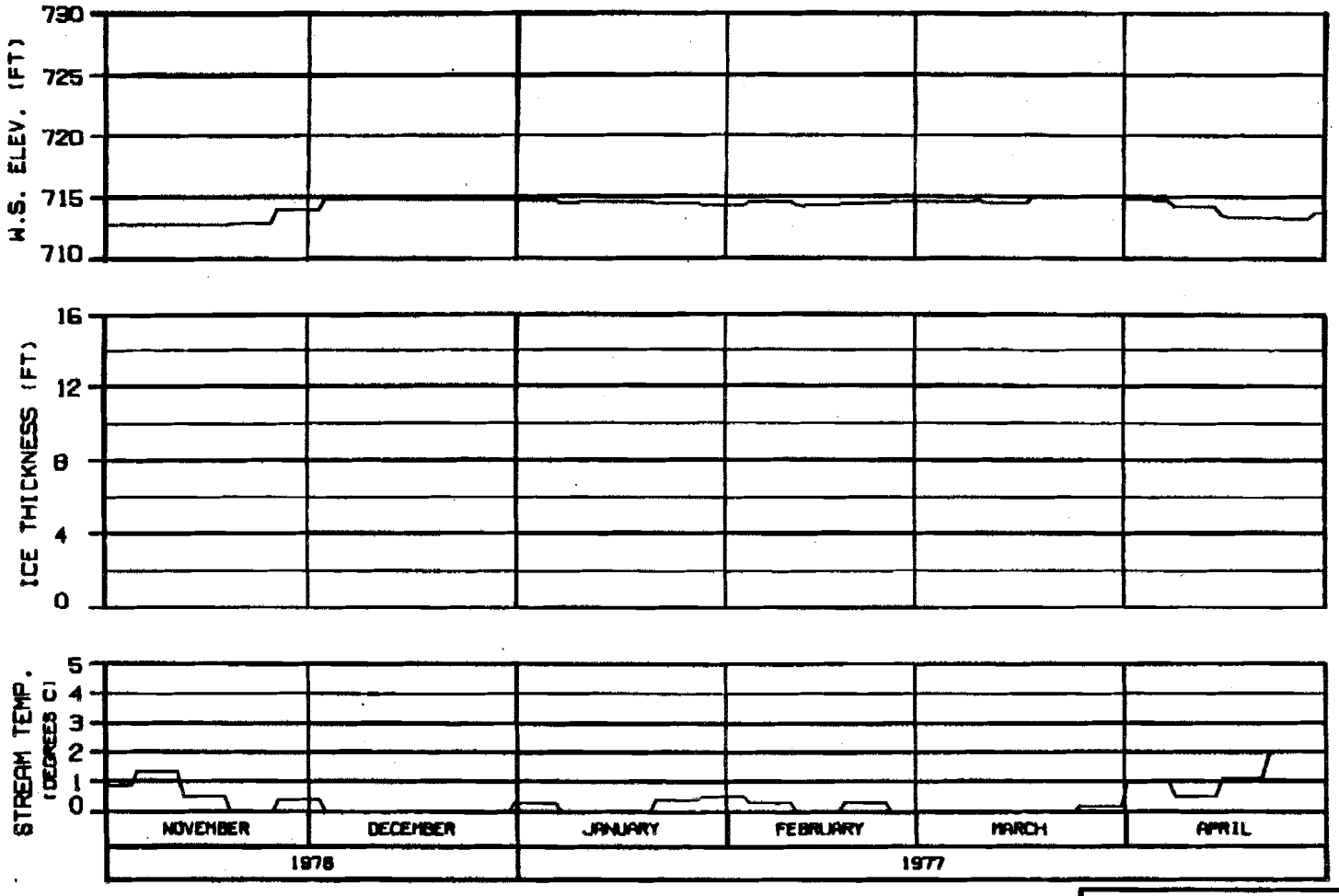


HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

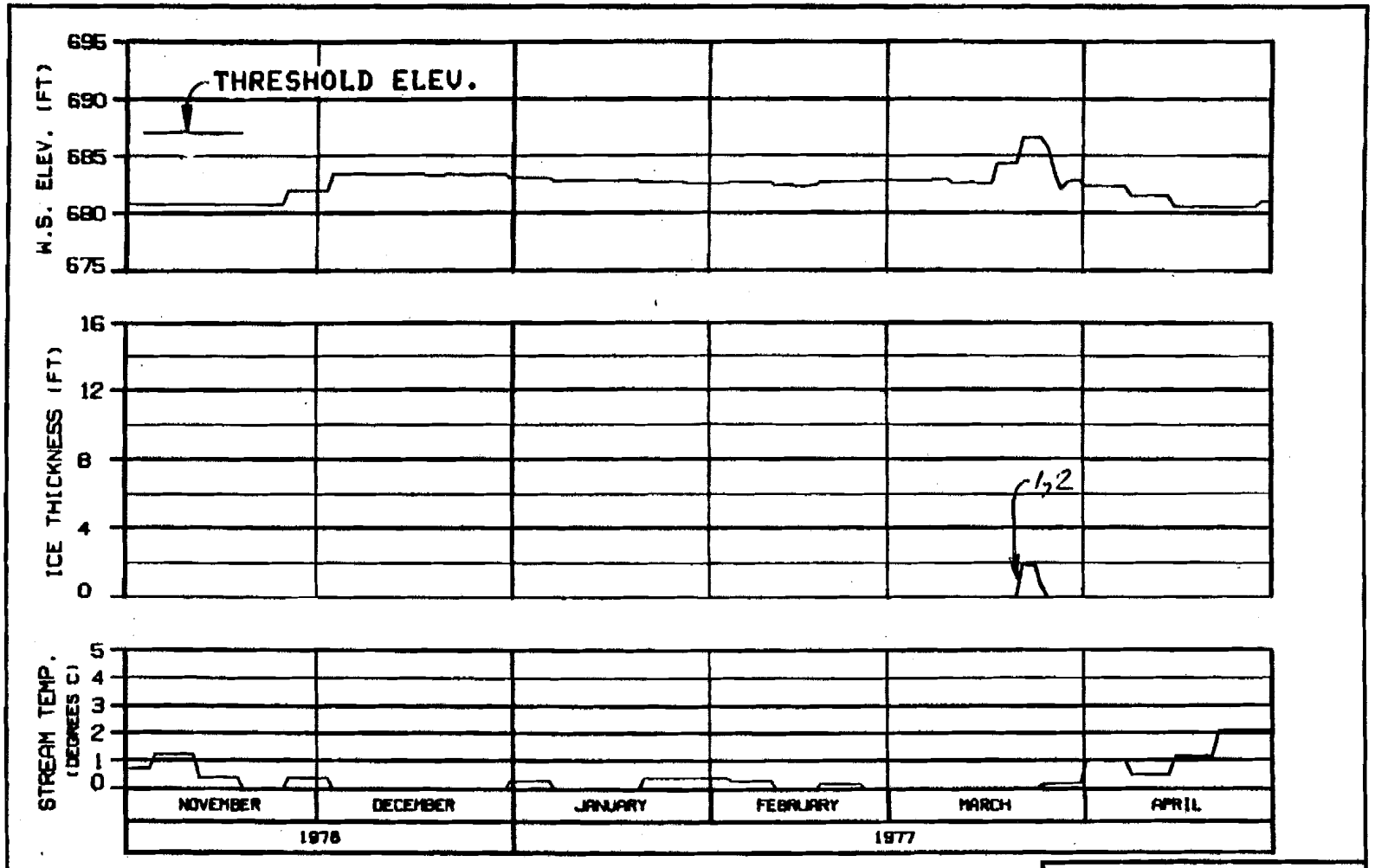
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHKD. [illegible] | 20 JAN 84 | 1883.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

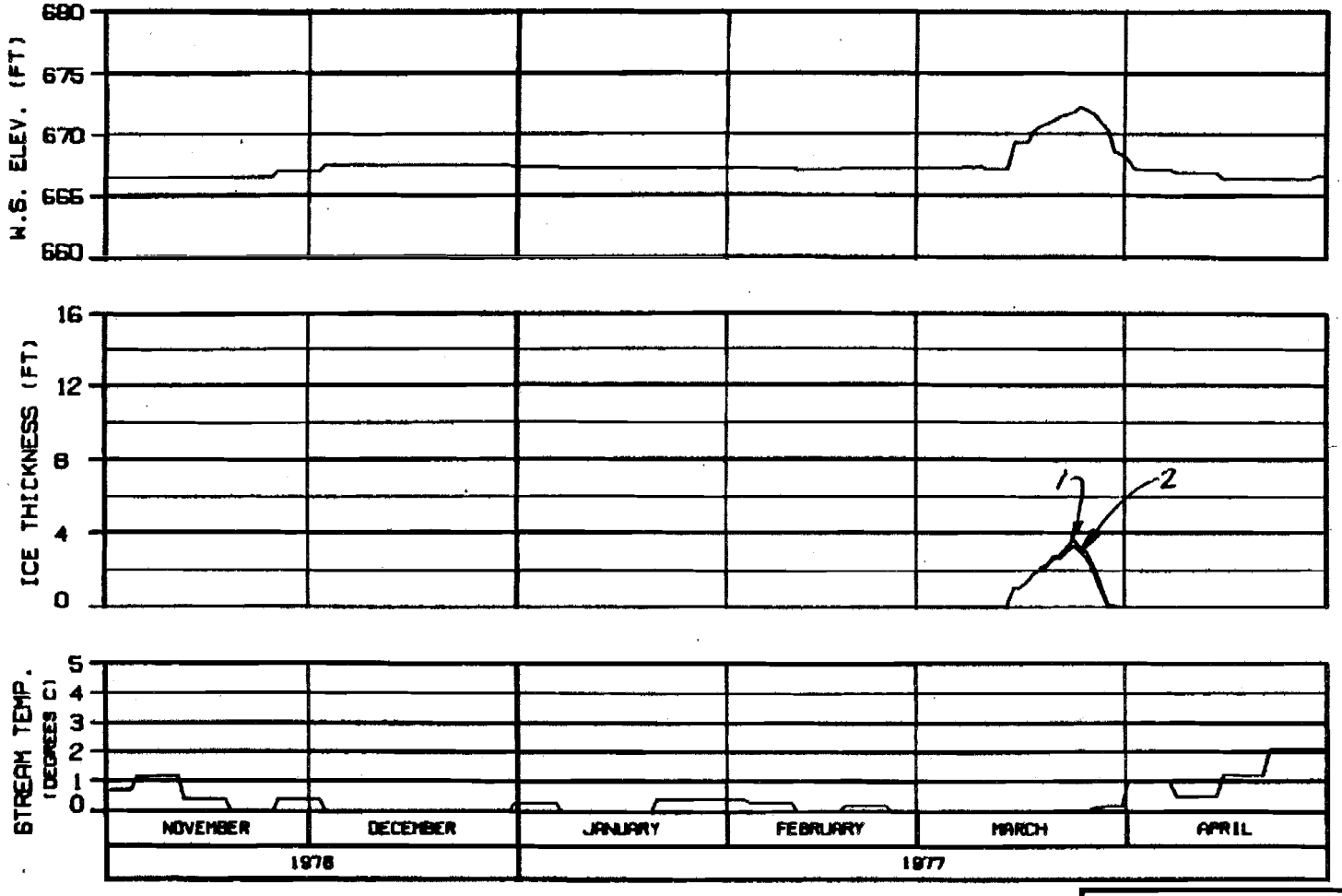
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JAN 84 | 1868.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

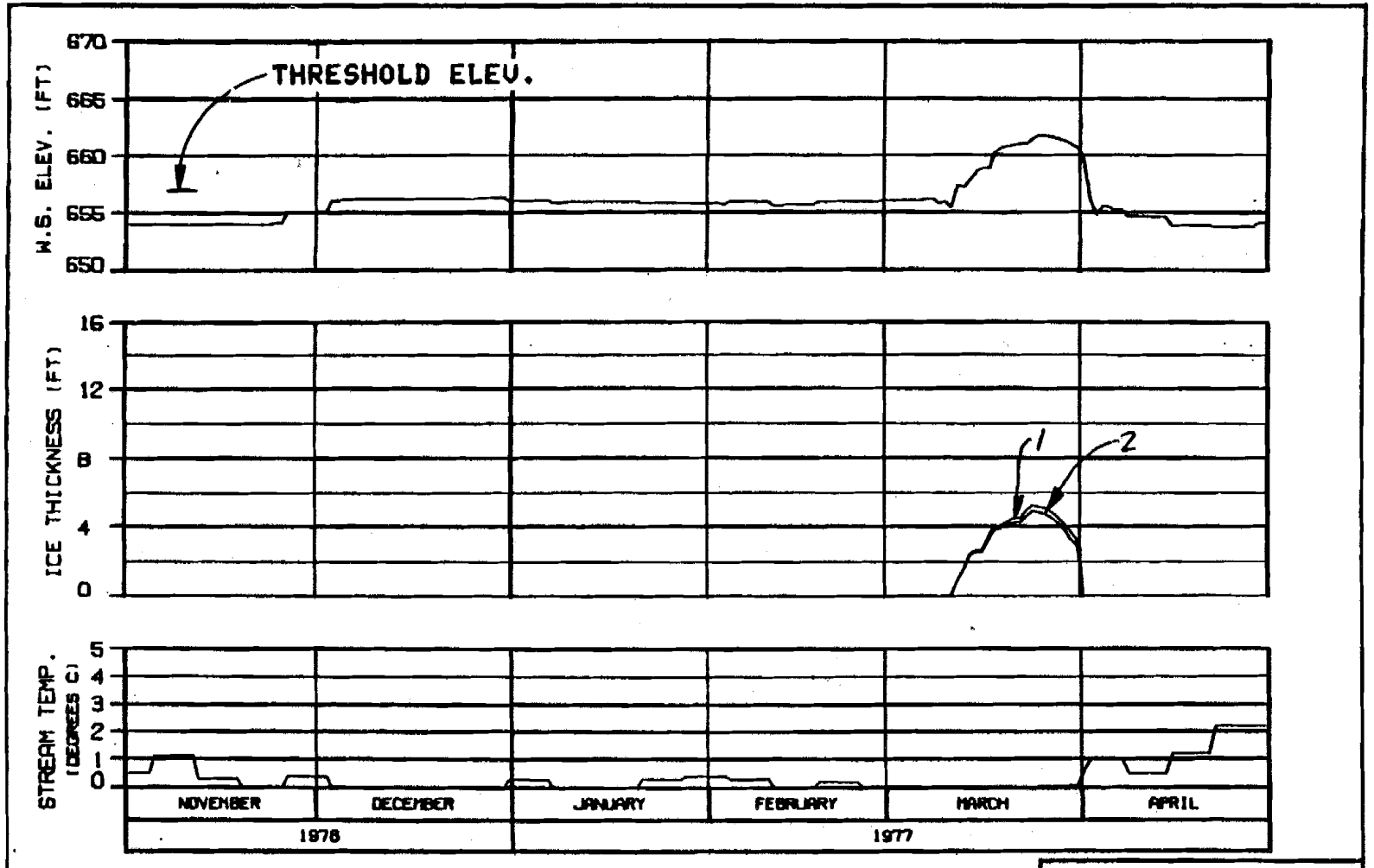
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL U/S OF SLOUGH 10

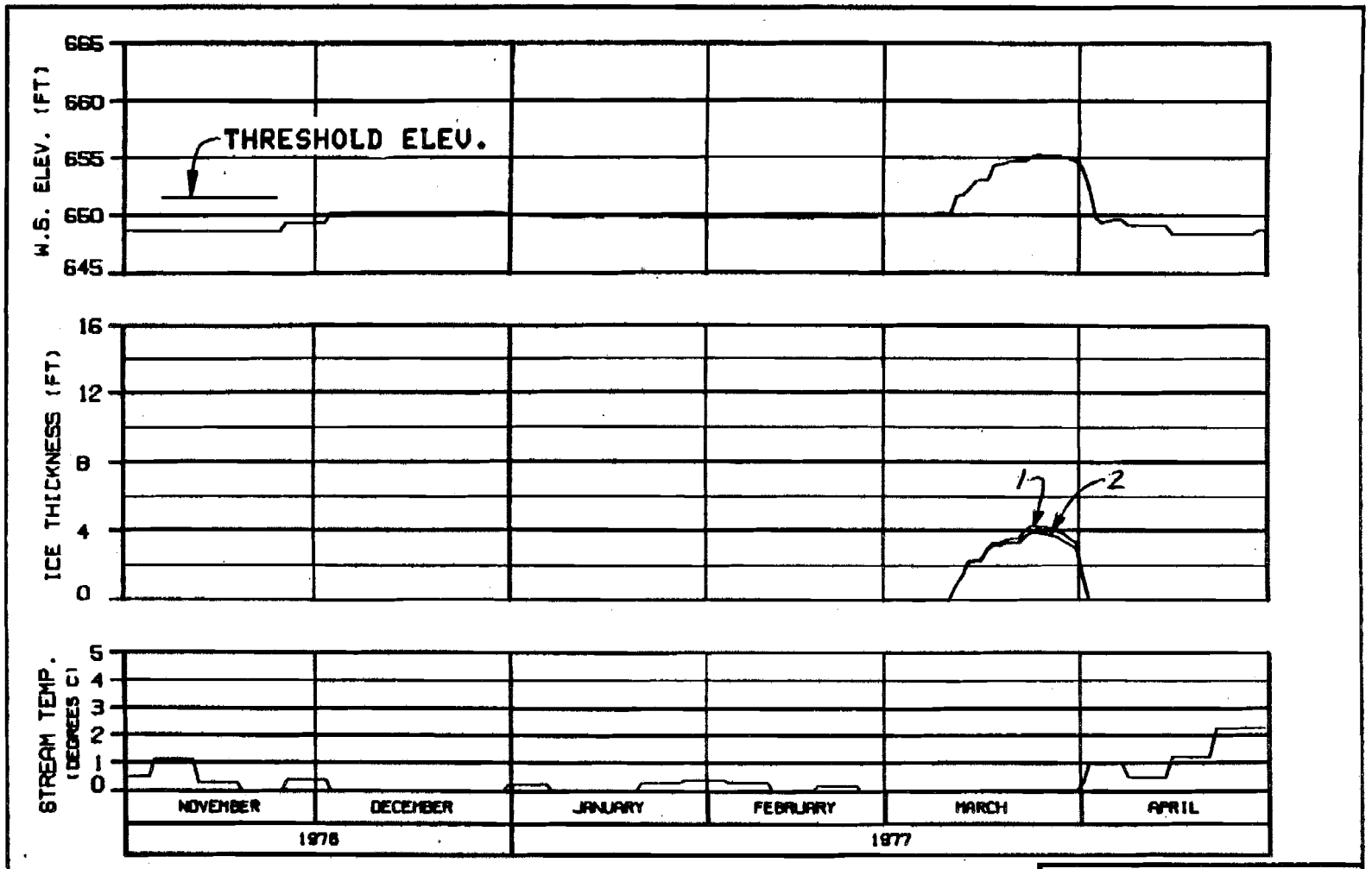
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DWG. NO. 1988.142



HEAD OF SLOUGH 9A

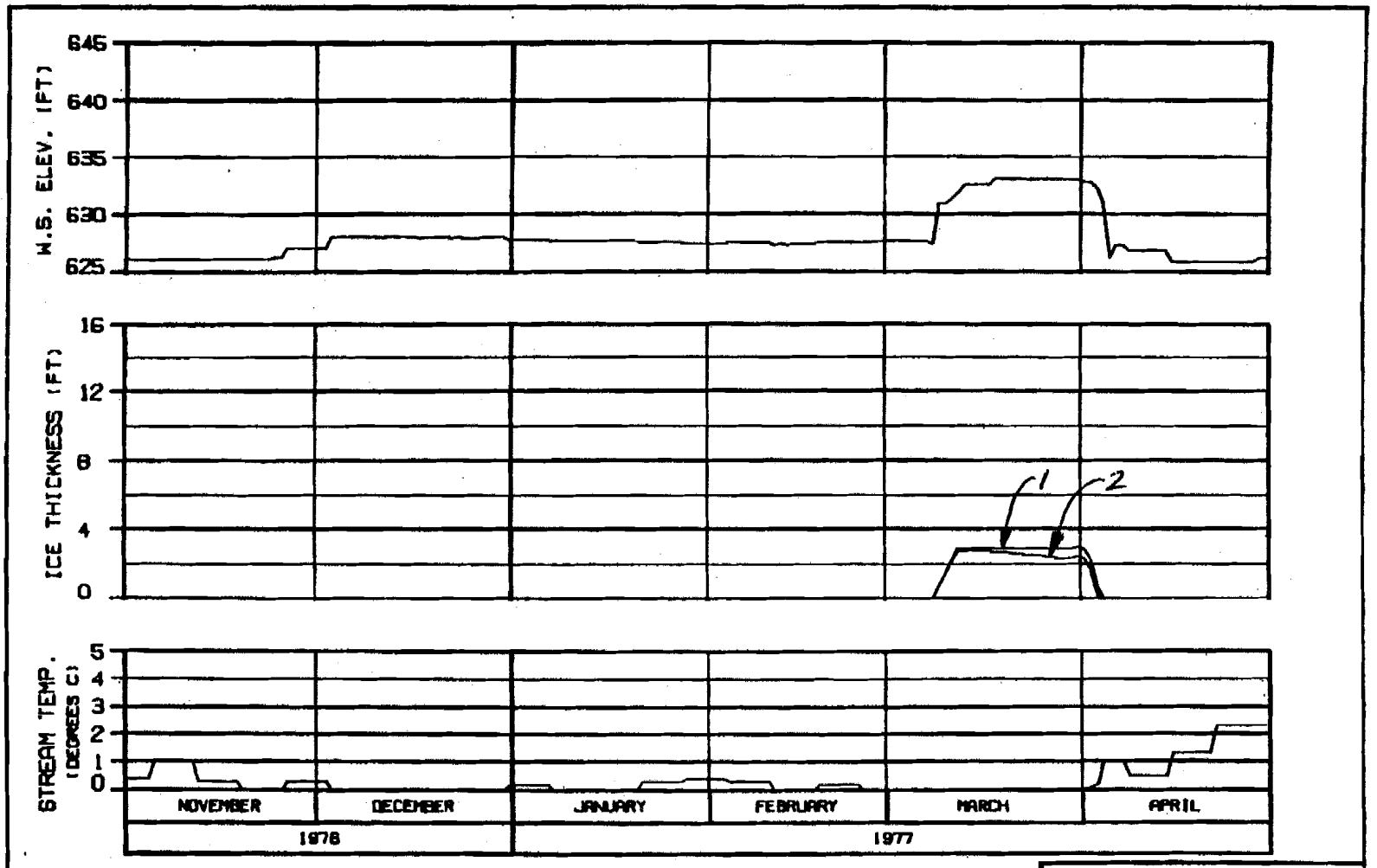
RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: D.L.EMERY	19 JAN 84	1568.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

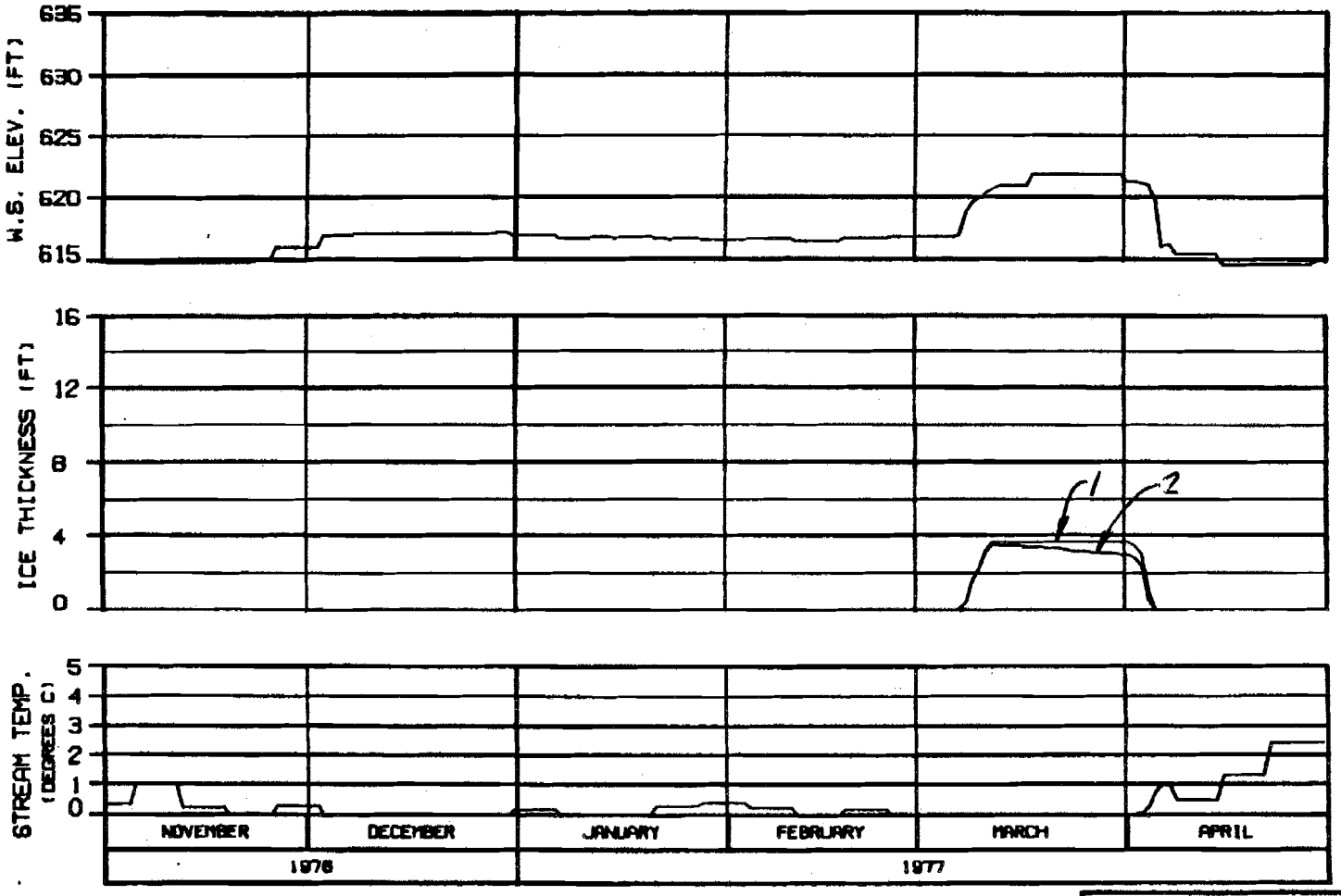
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: ILLEGIBLE	16 JAN 84

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
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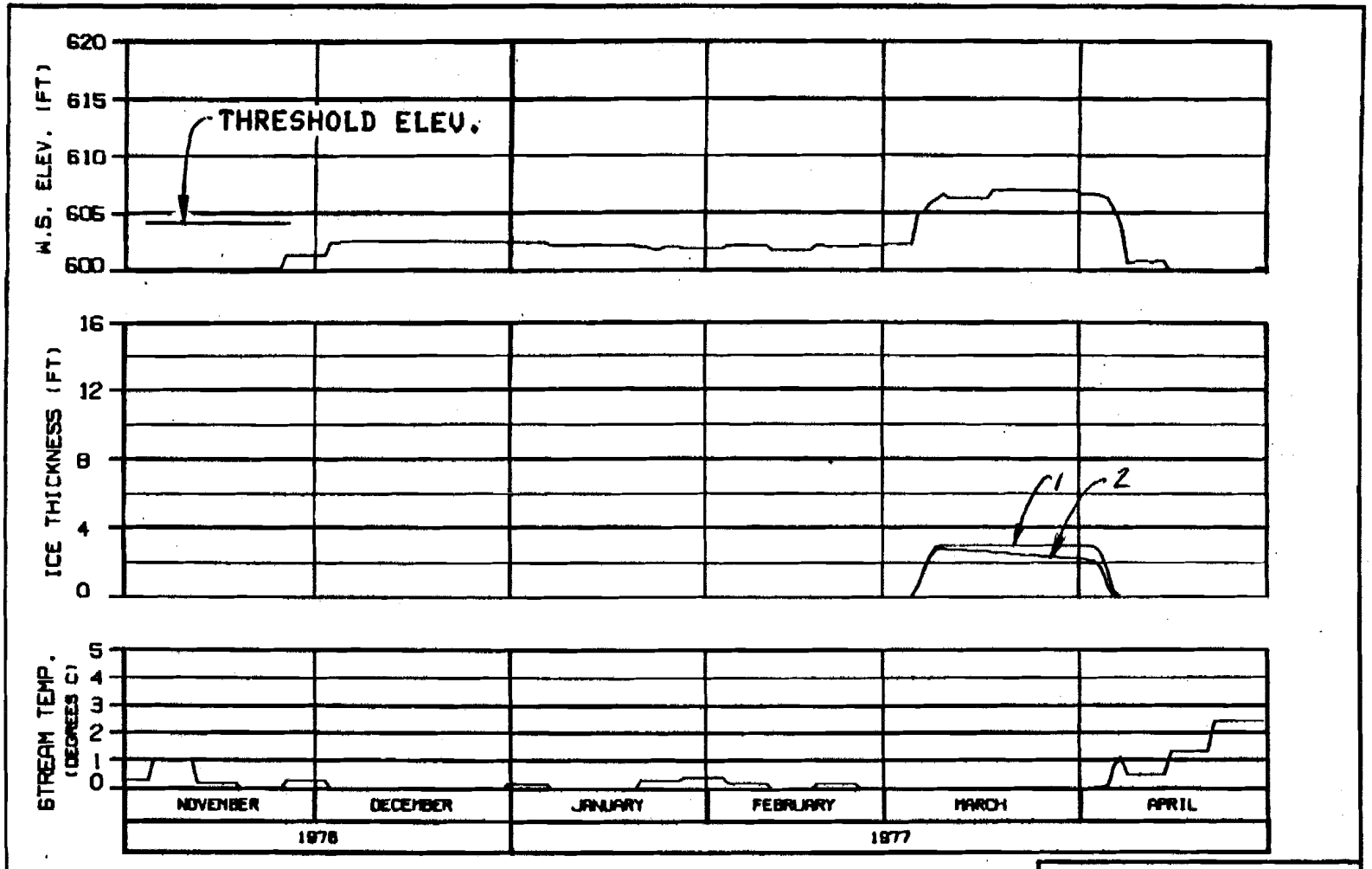


HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY

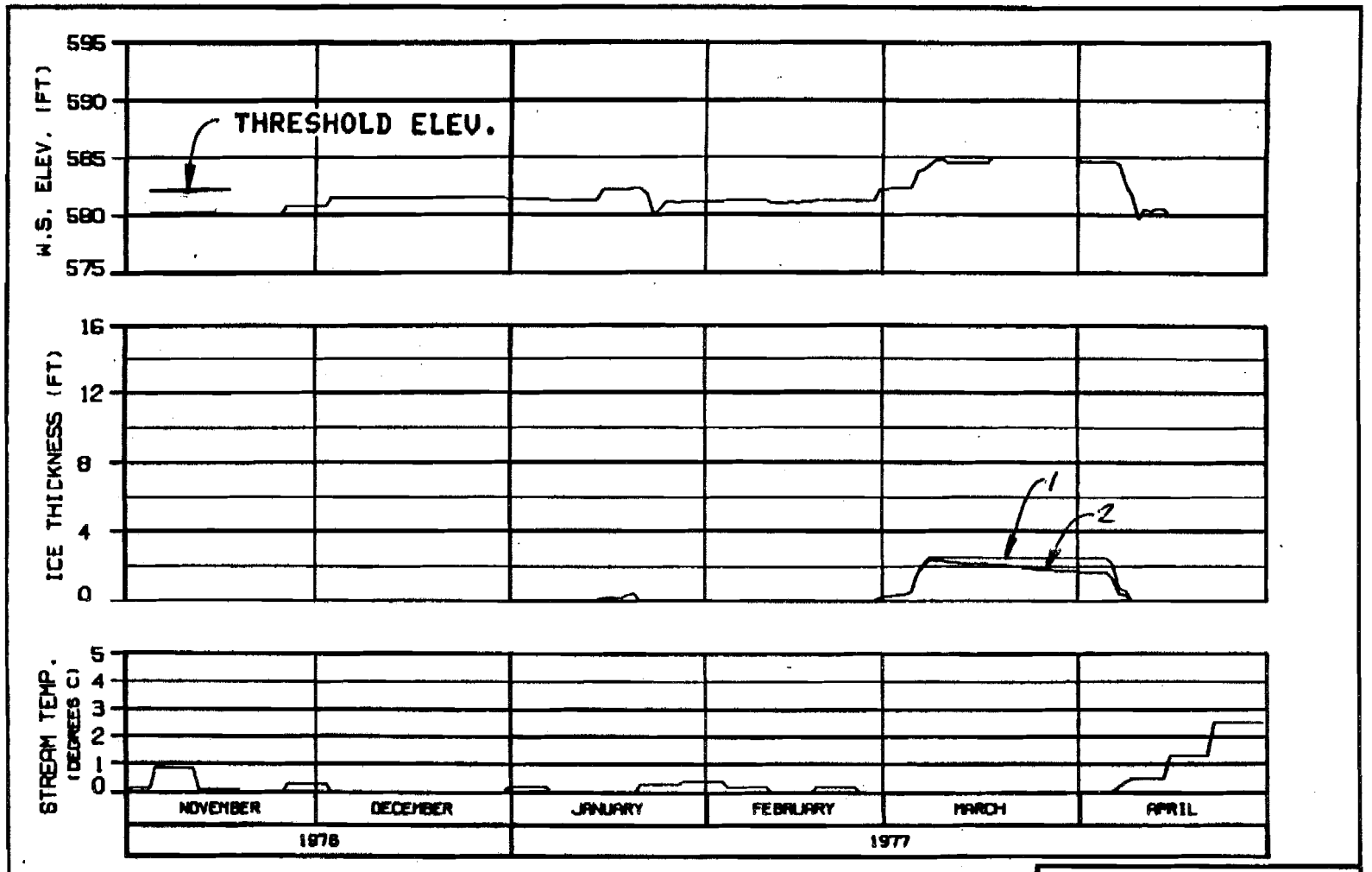
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: K.L.DAVIS | 10 JAN 84 | 1588.142

OPTION?



HEAD OF SLOUGH 8A (EAST)

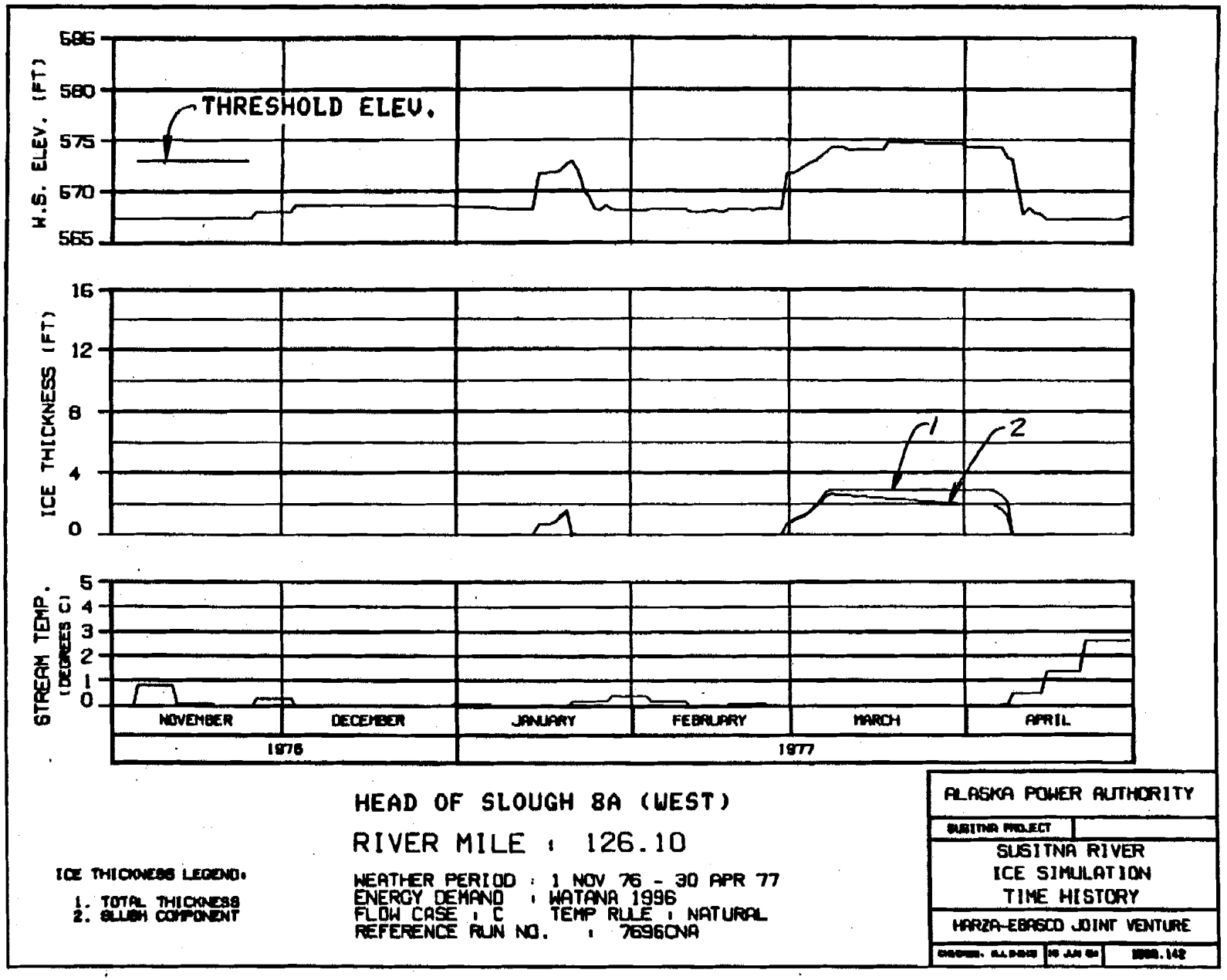
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: ILLINOIS	18 JUN 84	1988.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

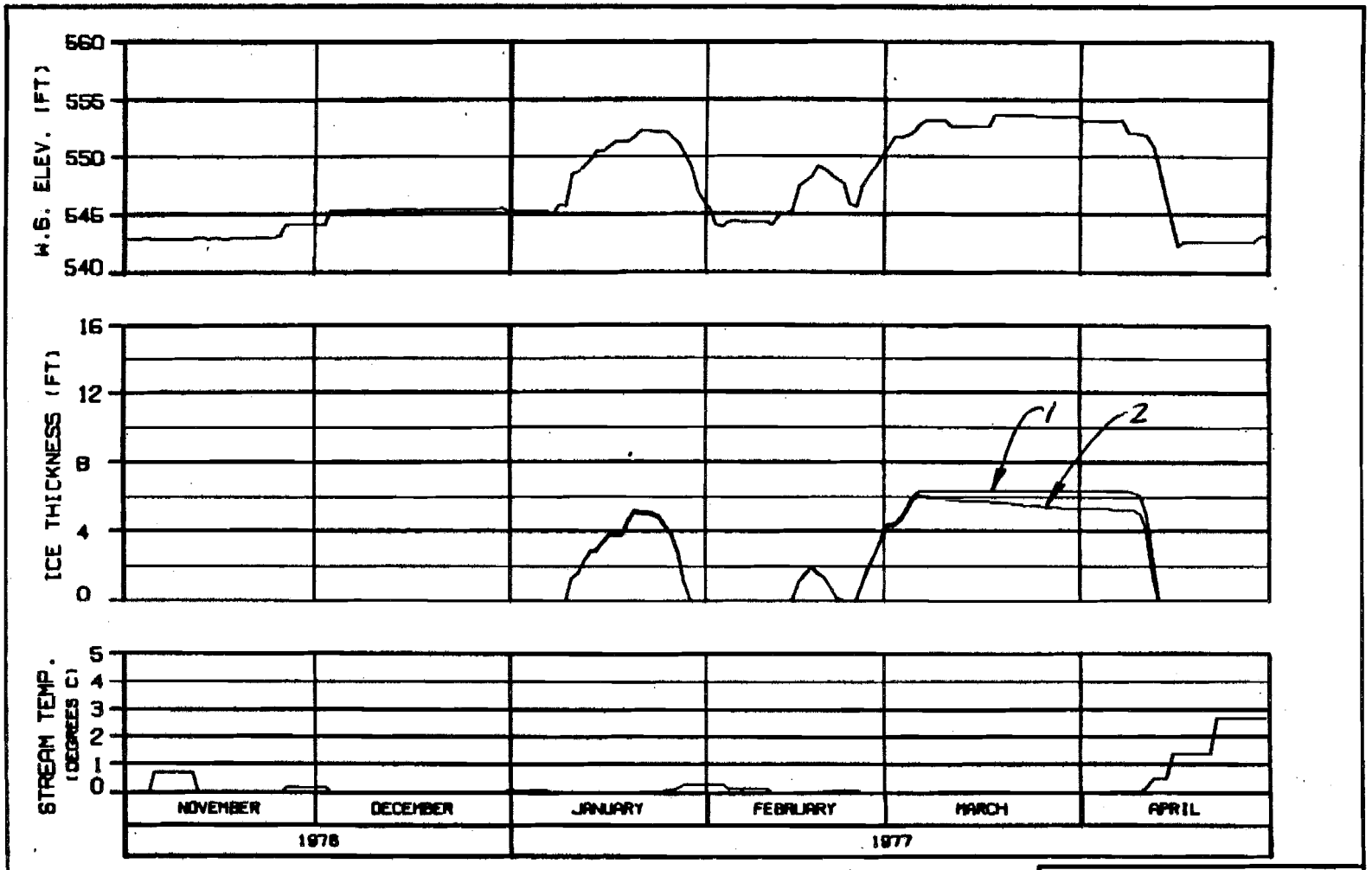
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: A.L.DIXIE | 16 JAN 84 | 8888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

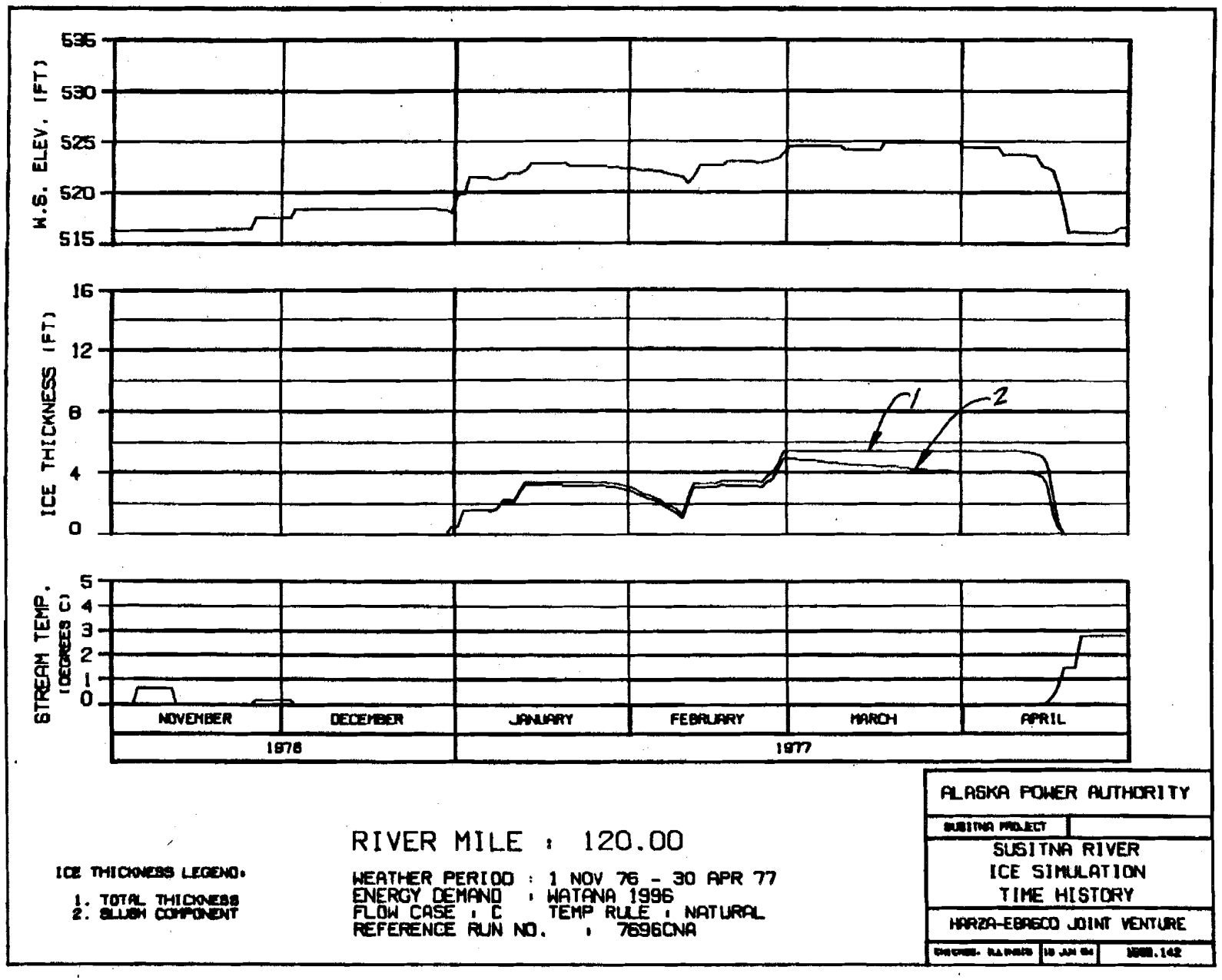
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 15 JAN 86 1988.142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

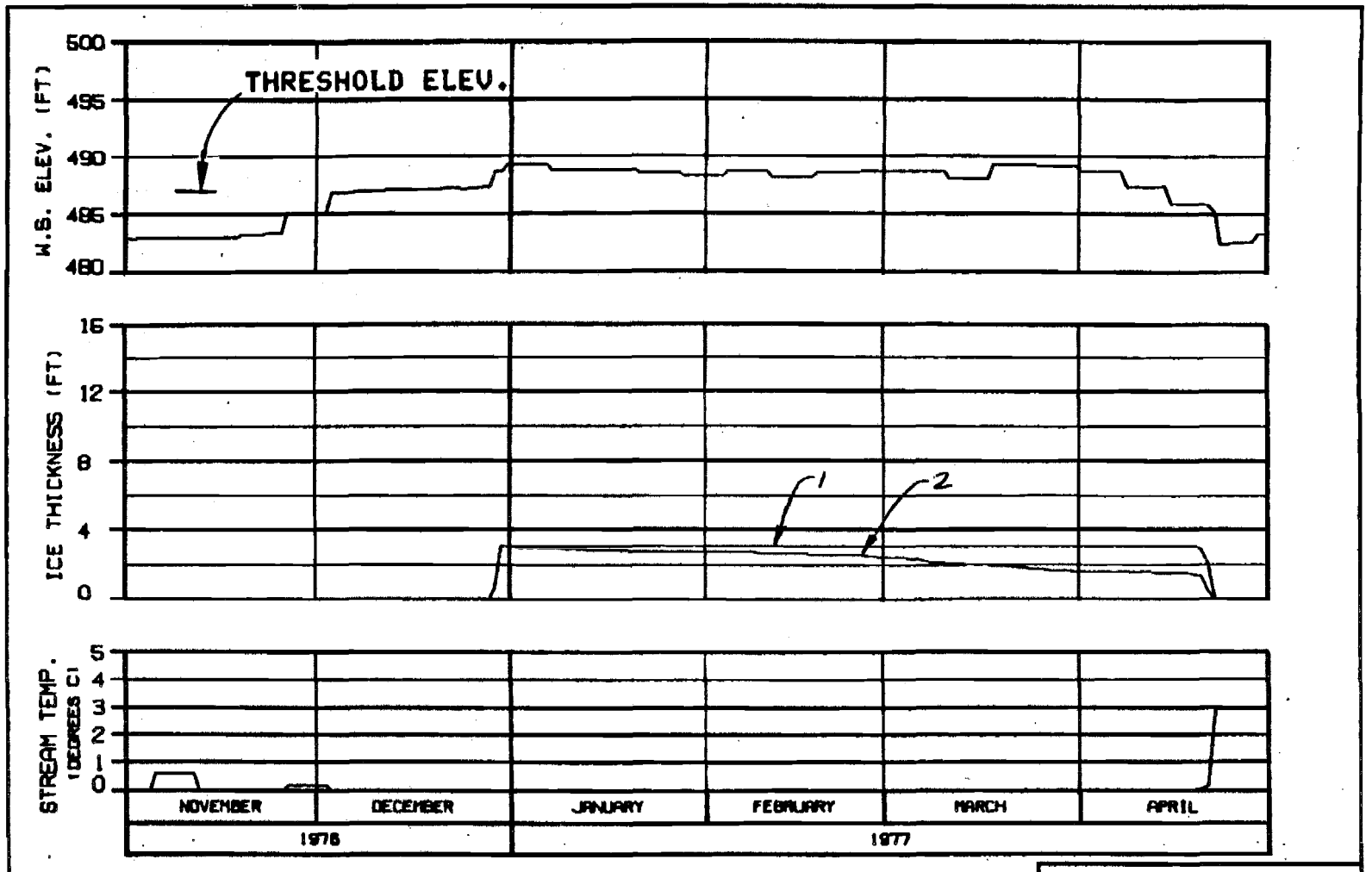
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 18 JAN 84 | [illegible].142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

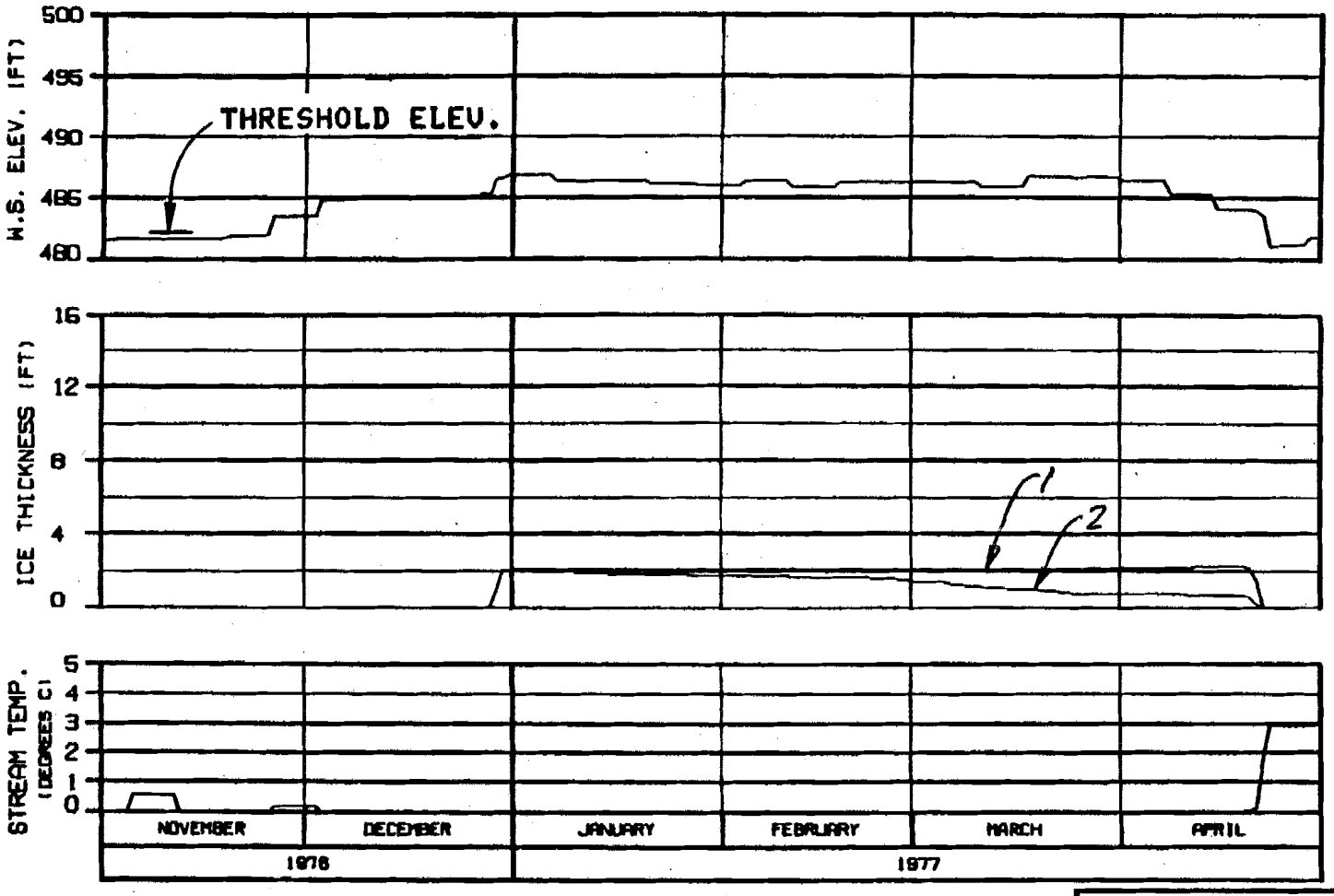
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.L.D. | 10 JAN 84 | 1988.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

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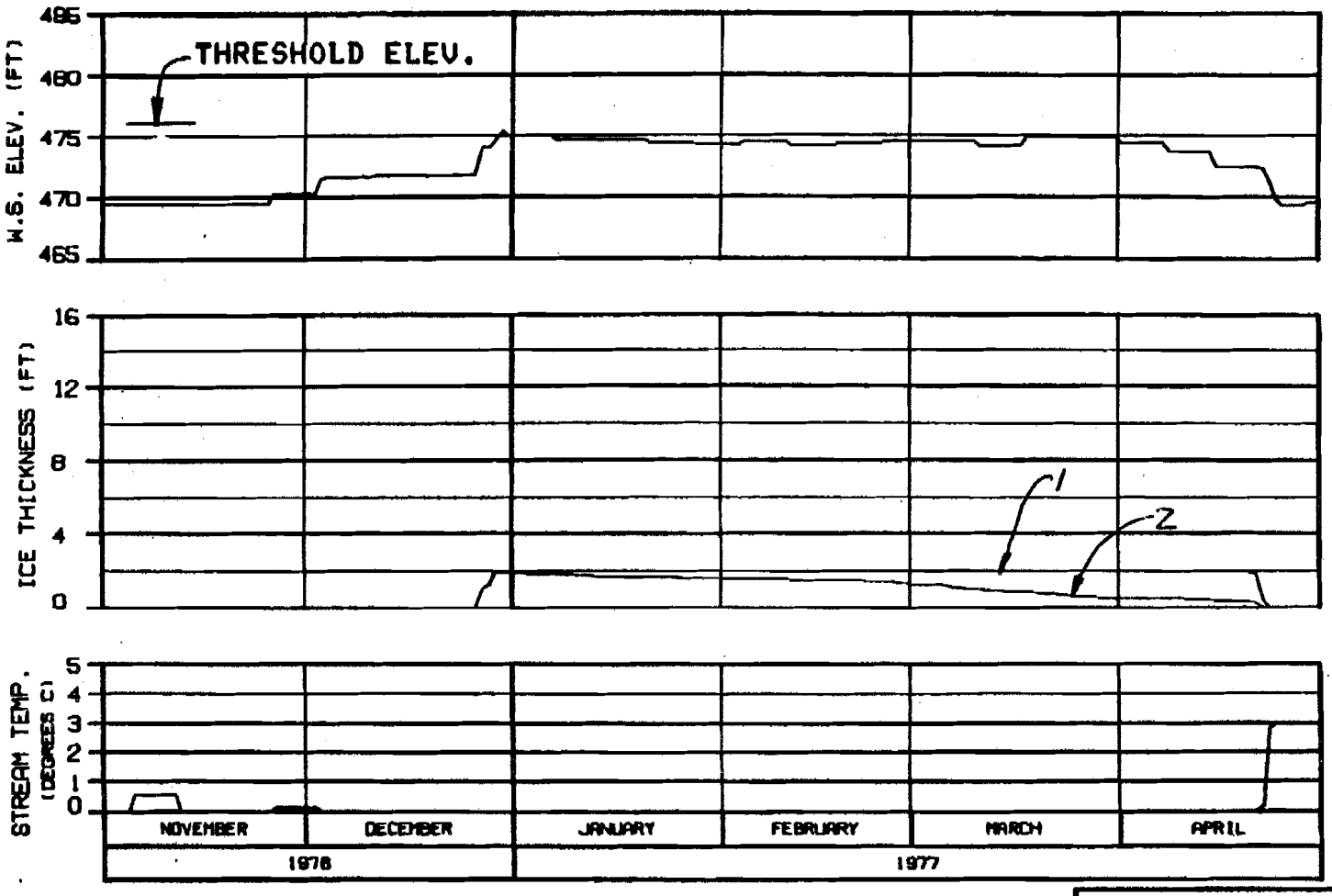

HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

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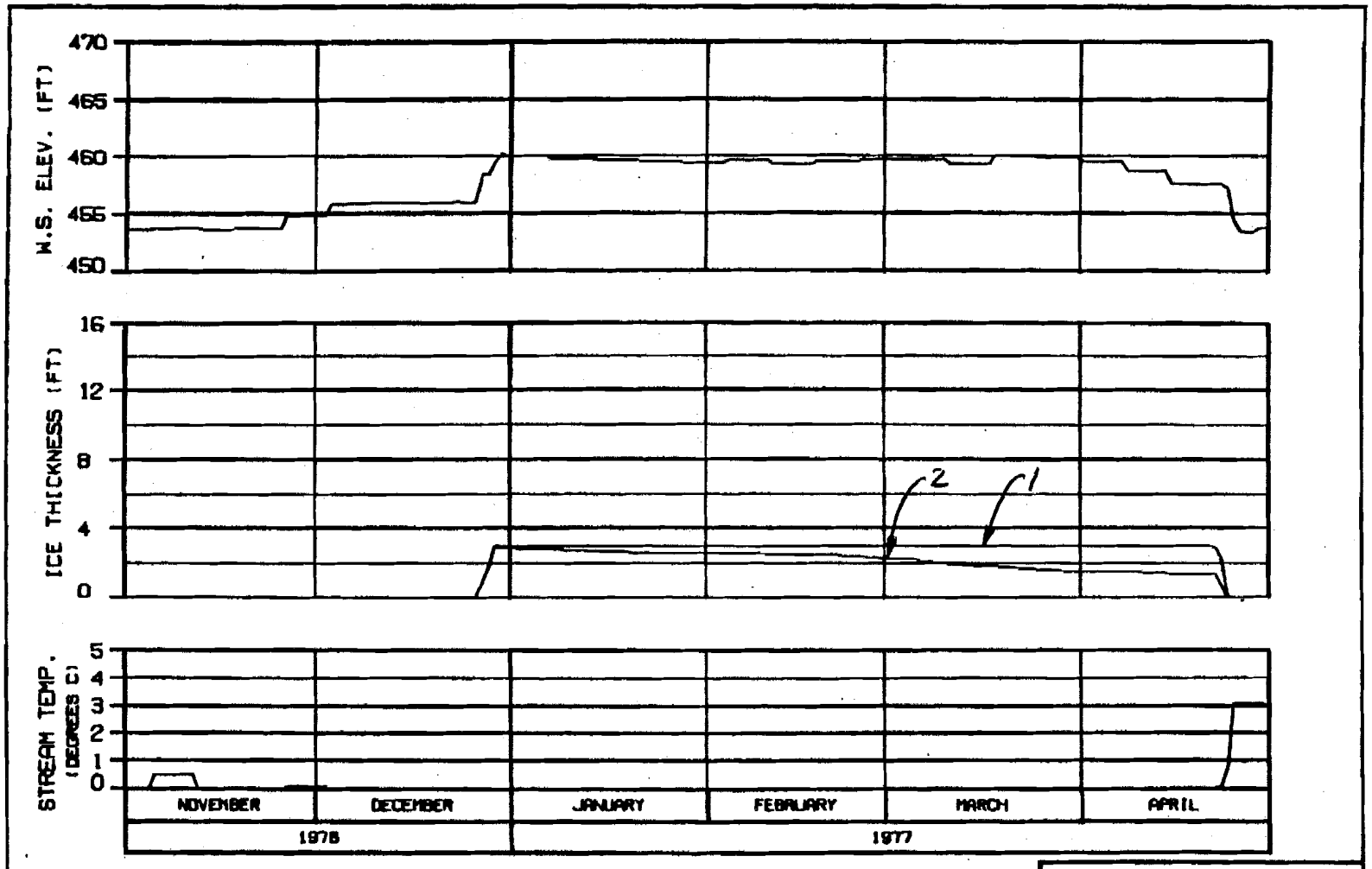


MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

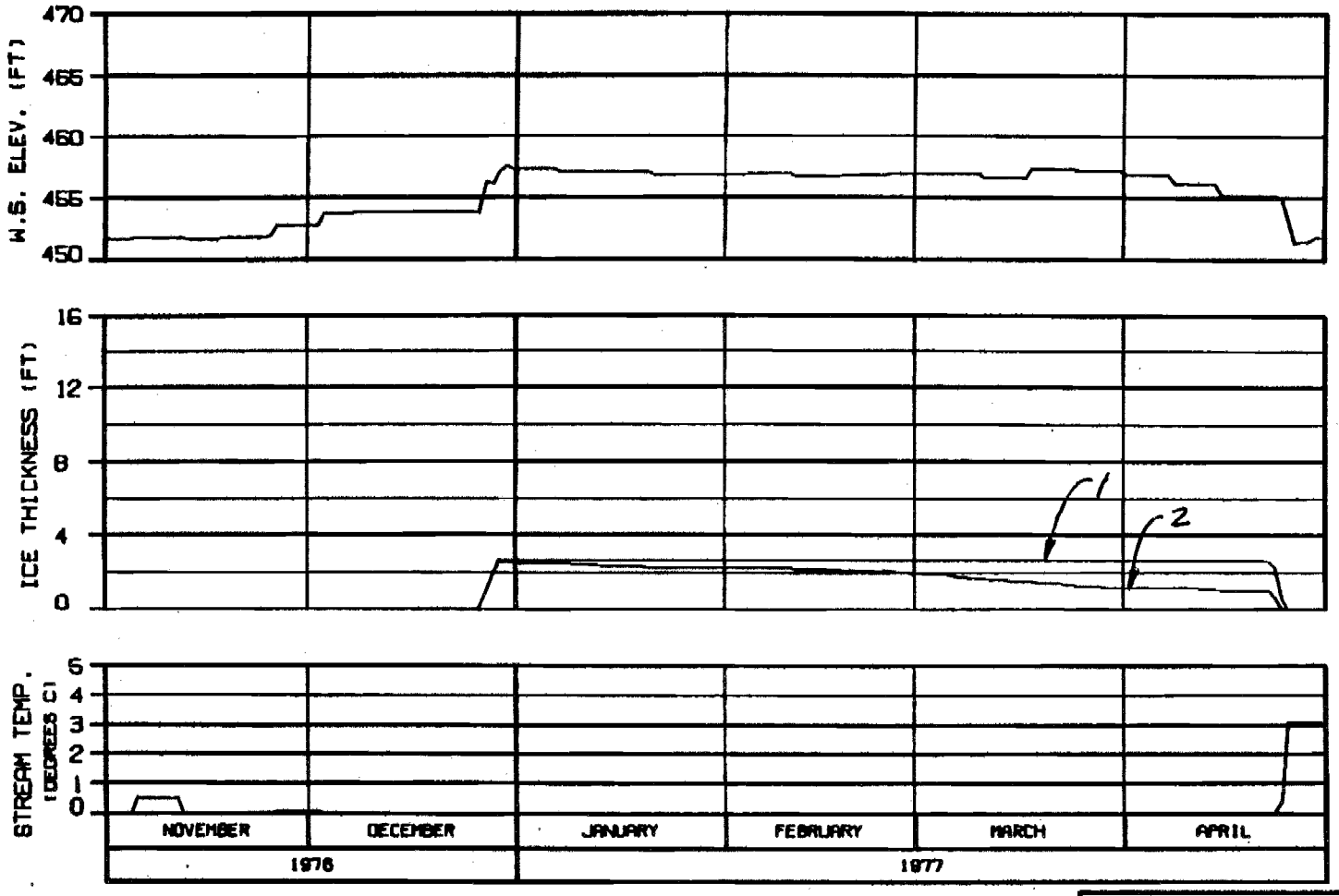
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.DAVIS | 10 JAN 84 | 1288.142



SIDE CHANNEL AT HEAD OF GASH CREEK

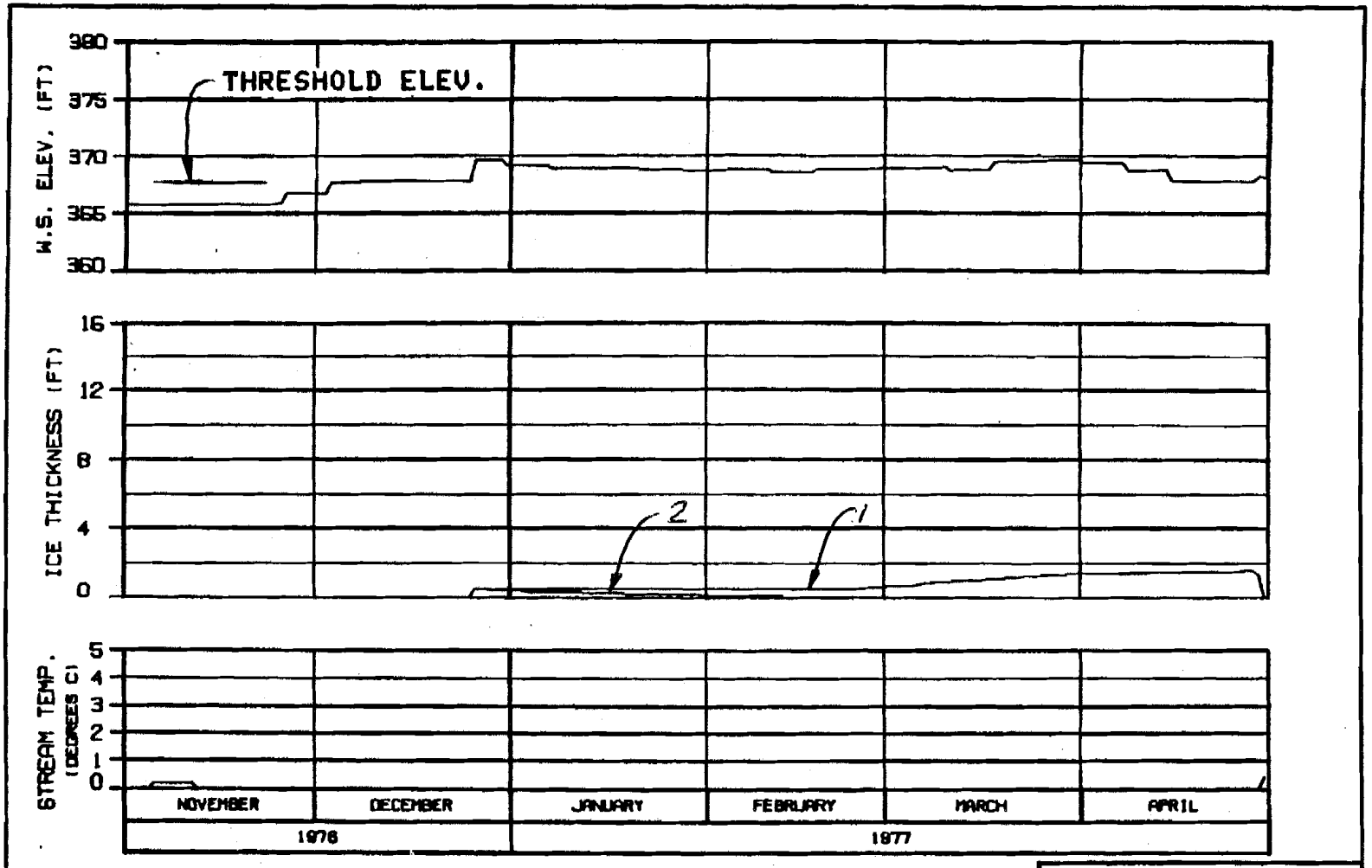
RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: D.L.S.	18 JAN 84	8666.142



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

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

ALASKA POWER AUTHORITY

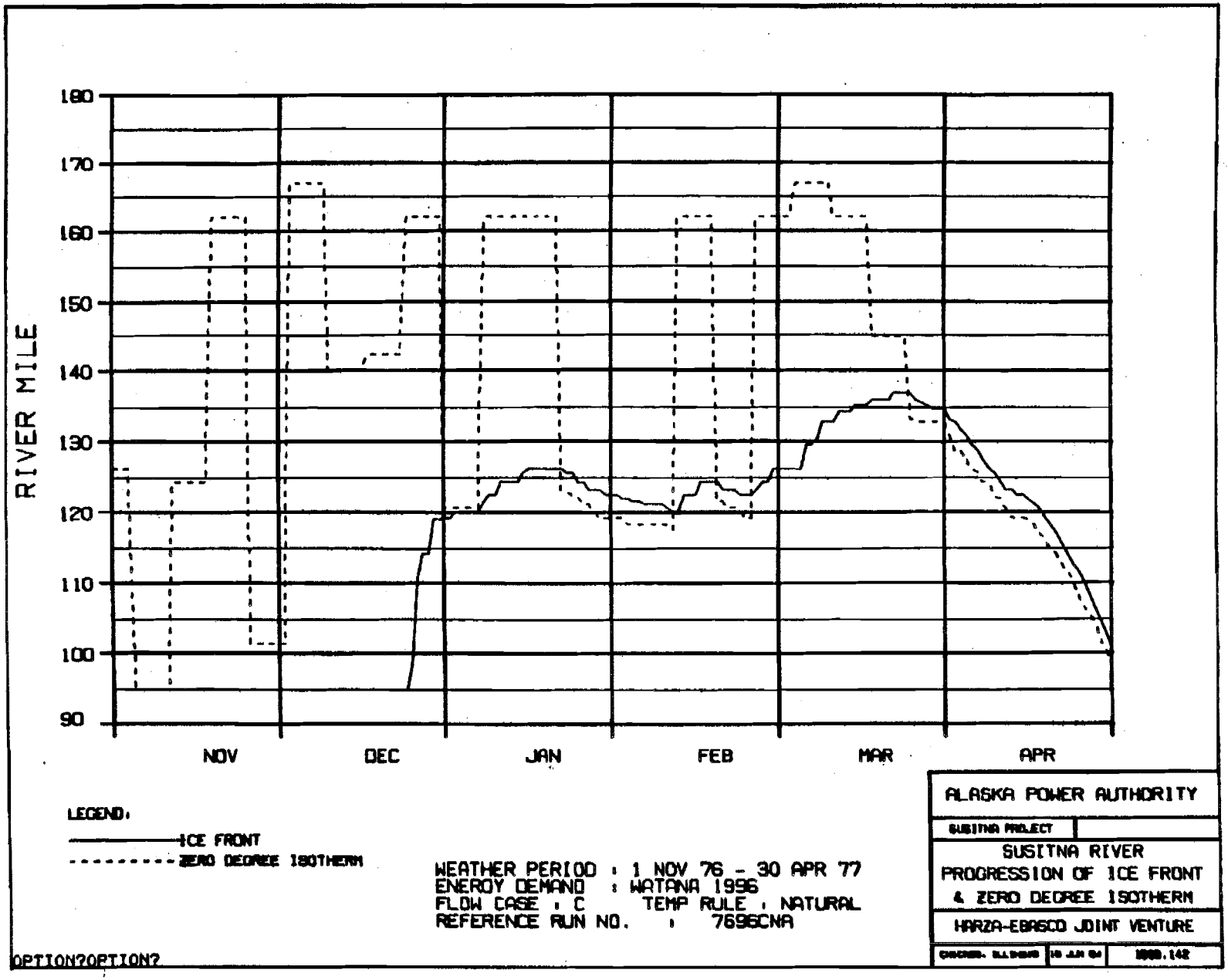
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.A.HICKS | 19 JAN 84 | 1888.142

C



OPTION?OPTION?

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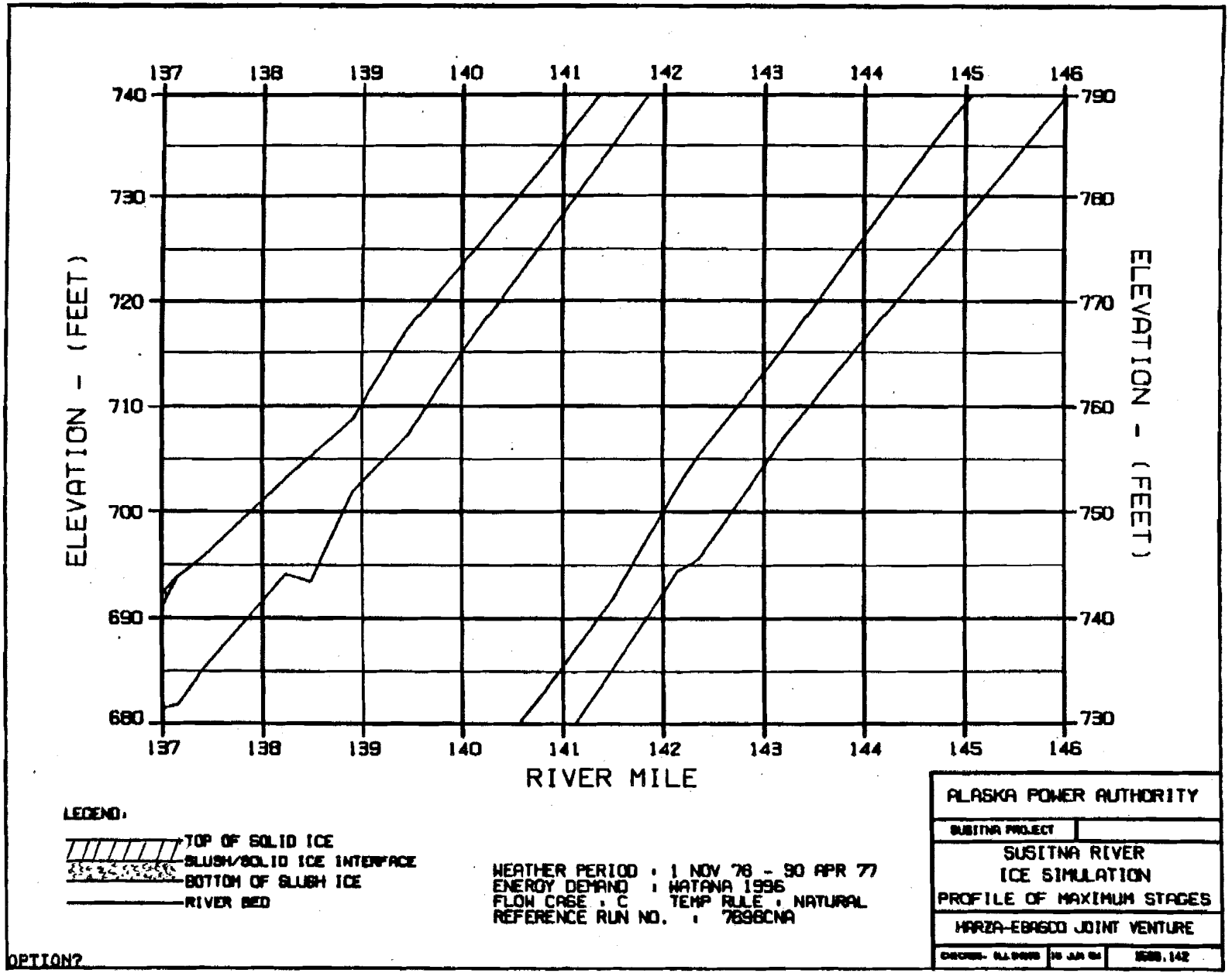
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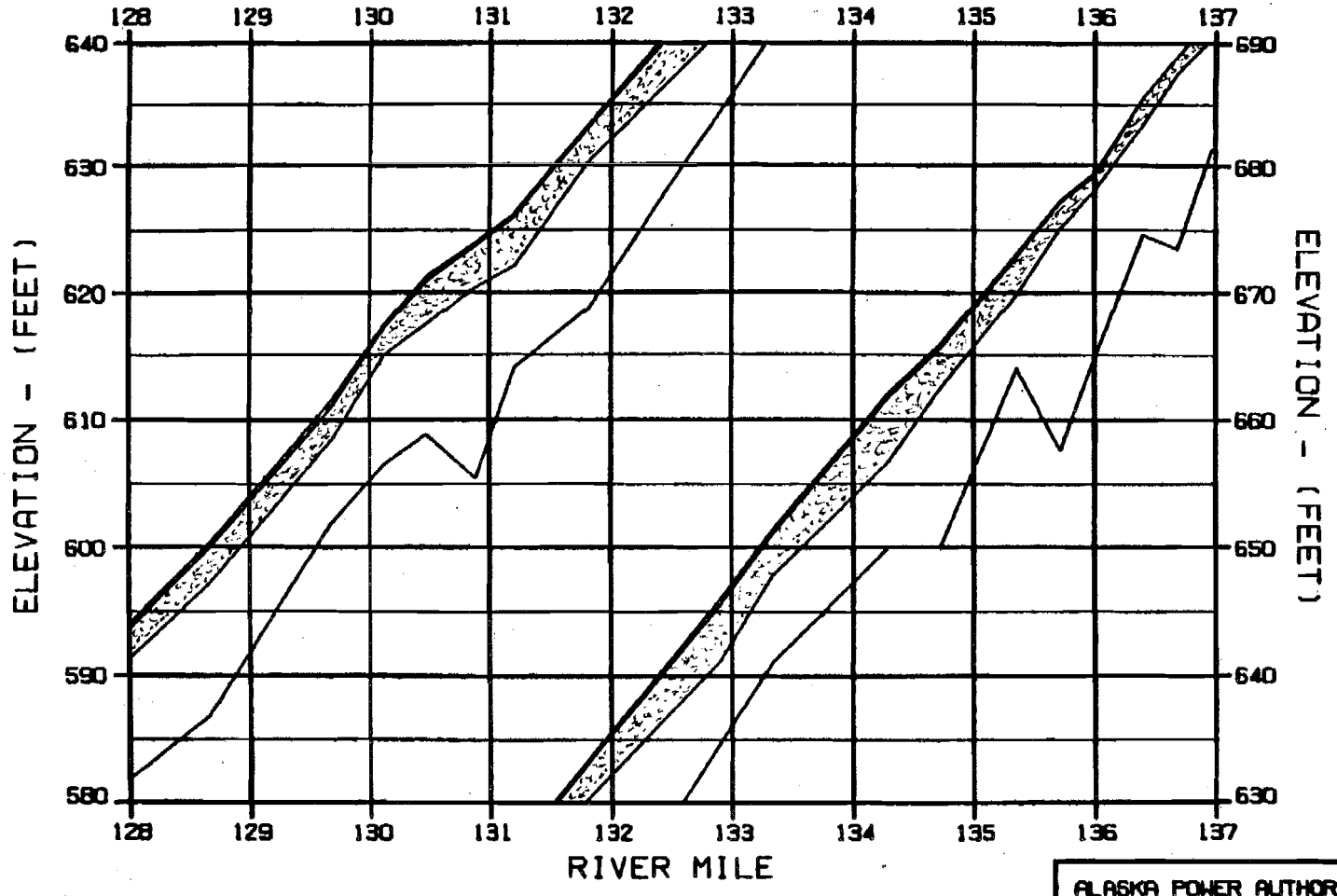
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

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 : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

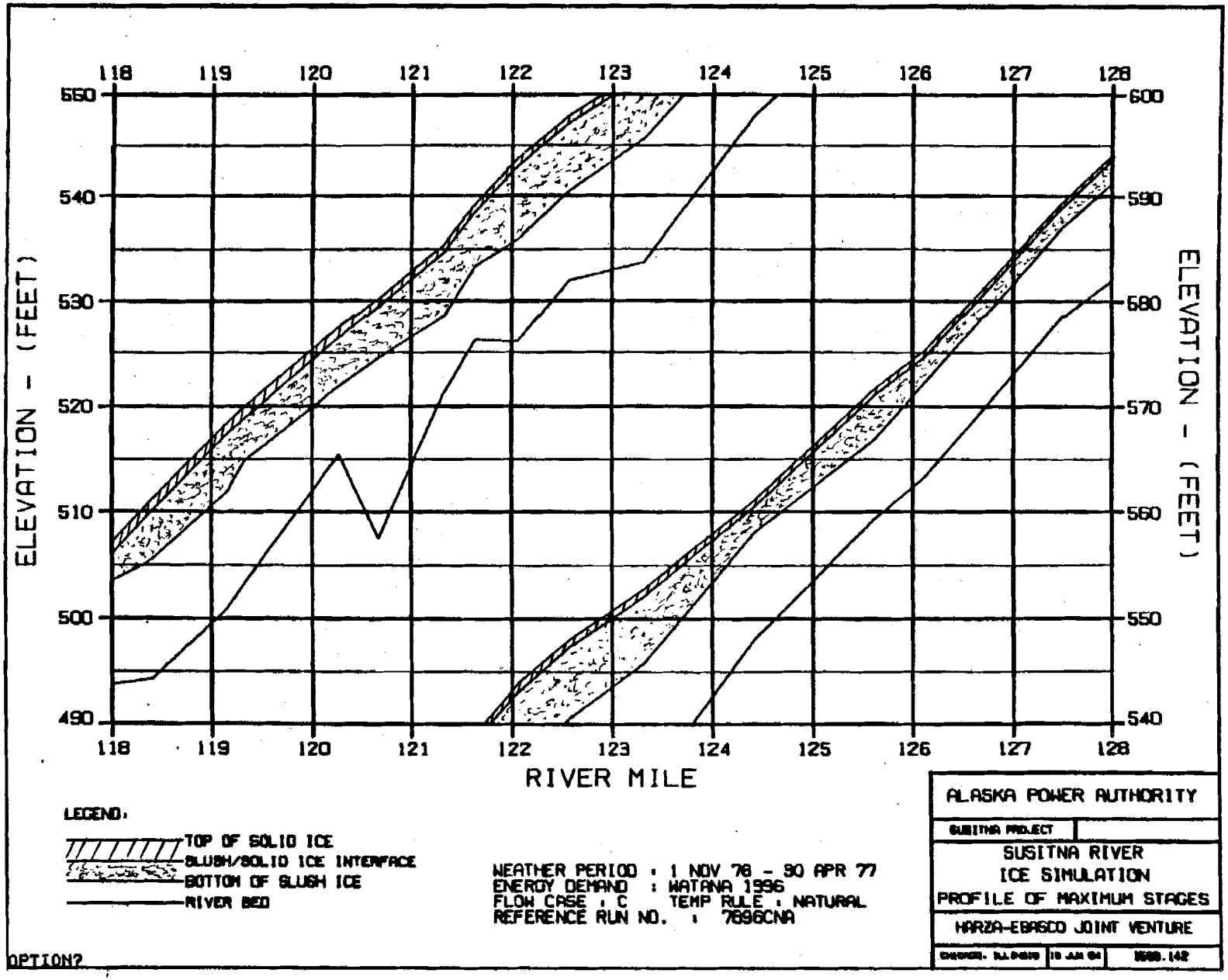
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

1886.142

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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7696CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1688.142

OPTION?

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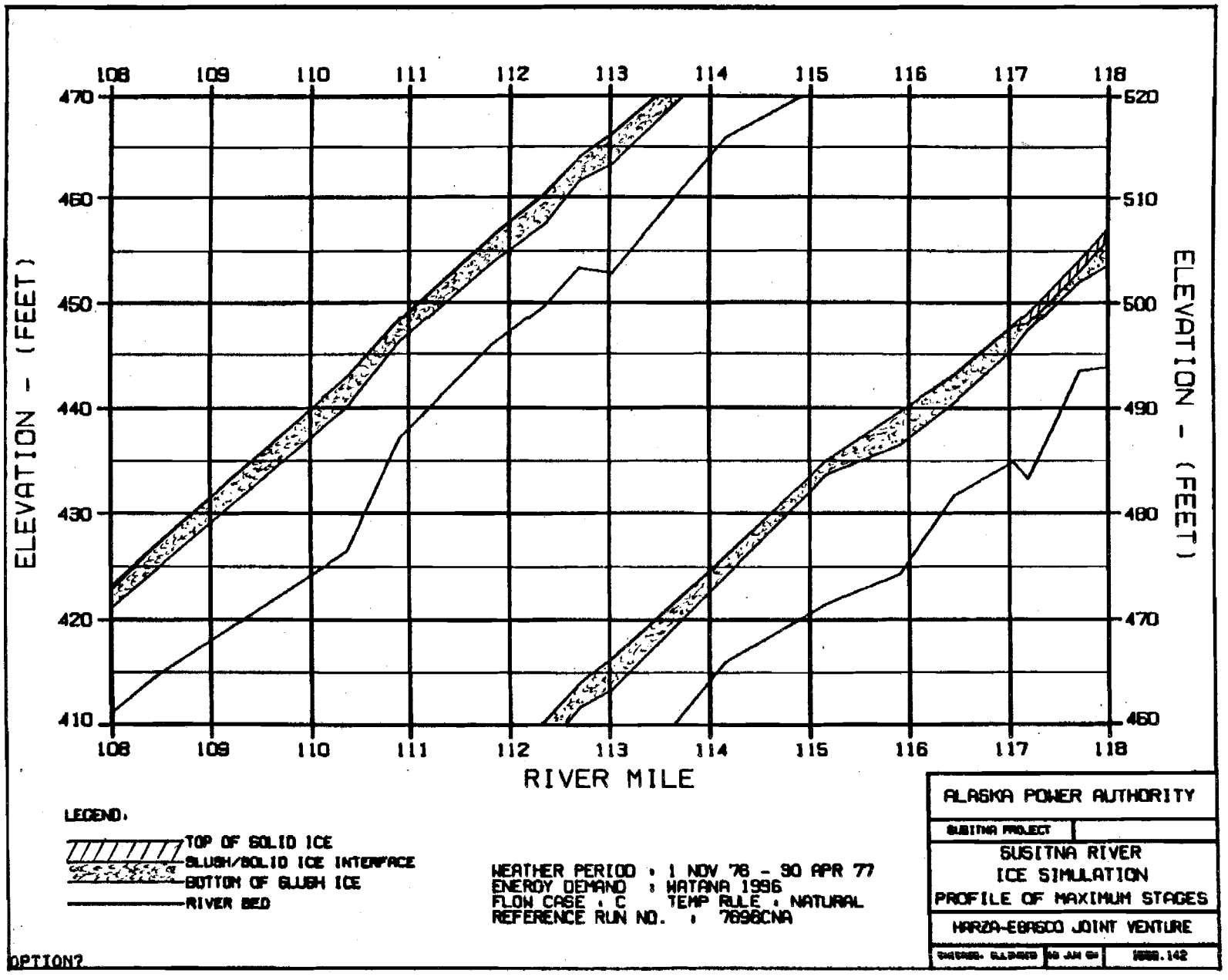
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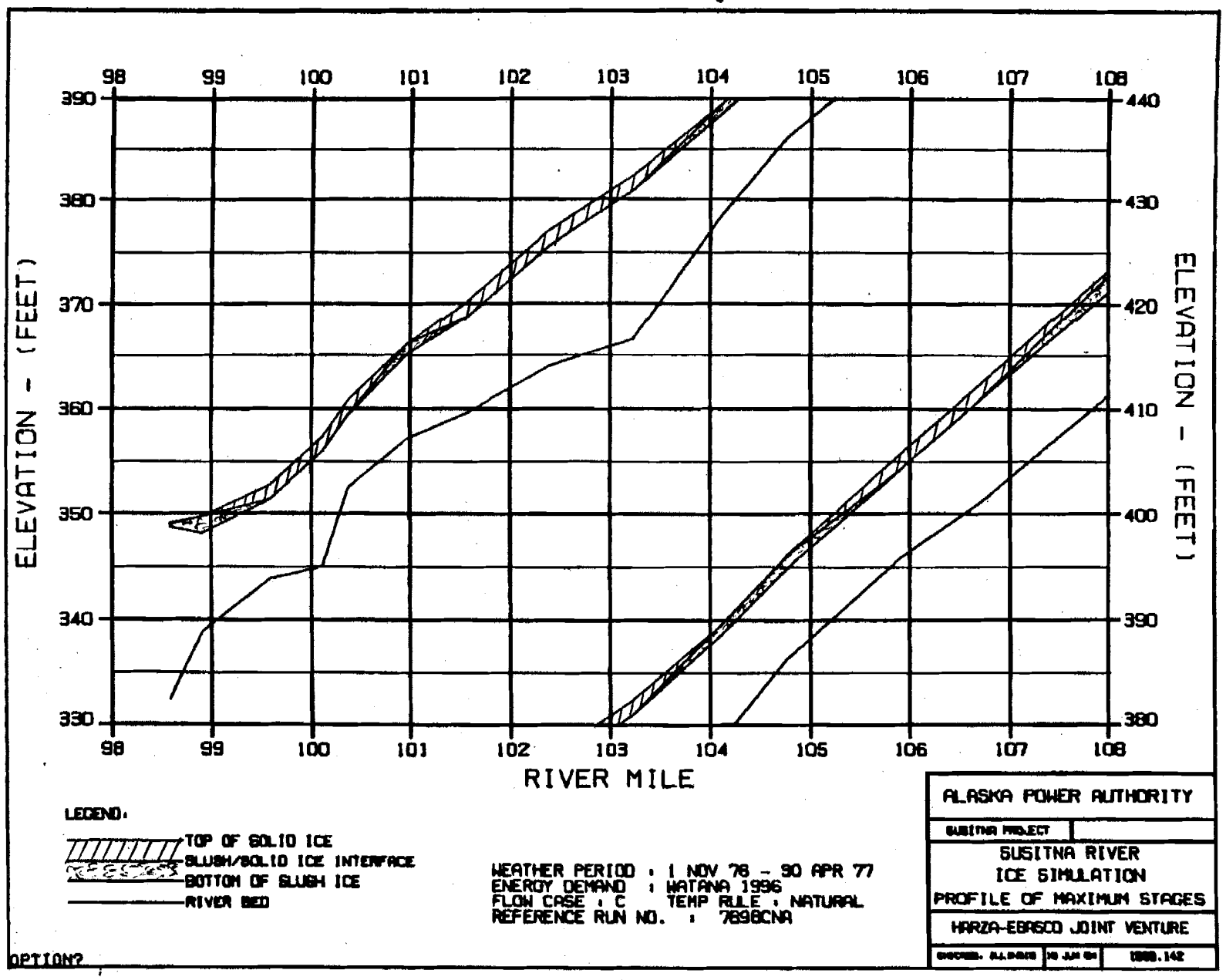
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV '76 - 30 APR '77
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7898CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?

C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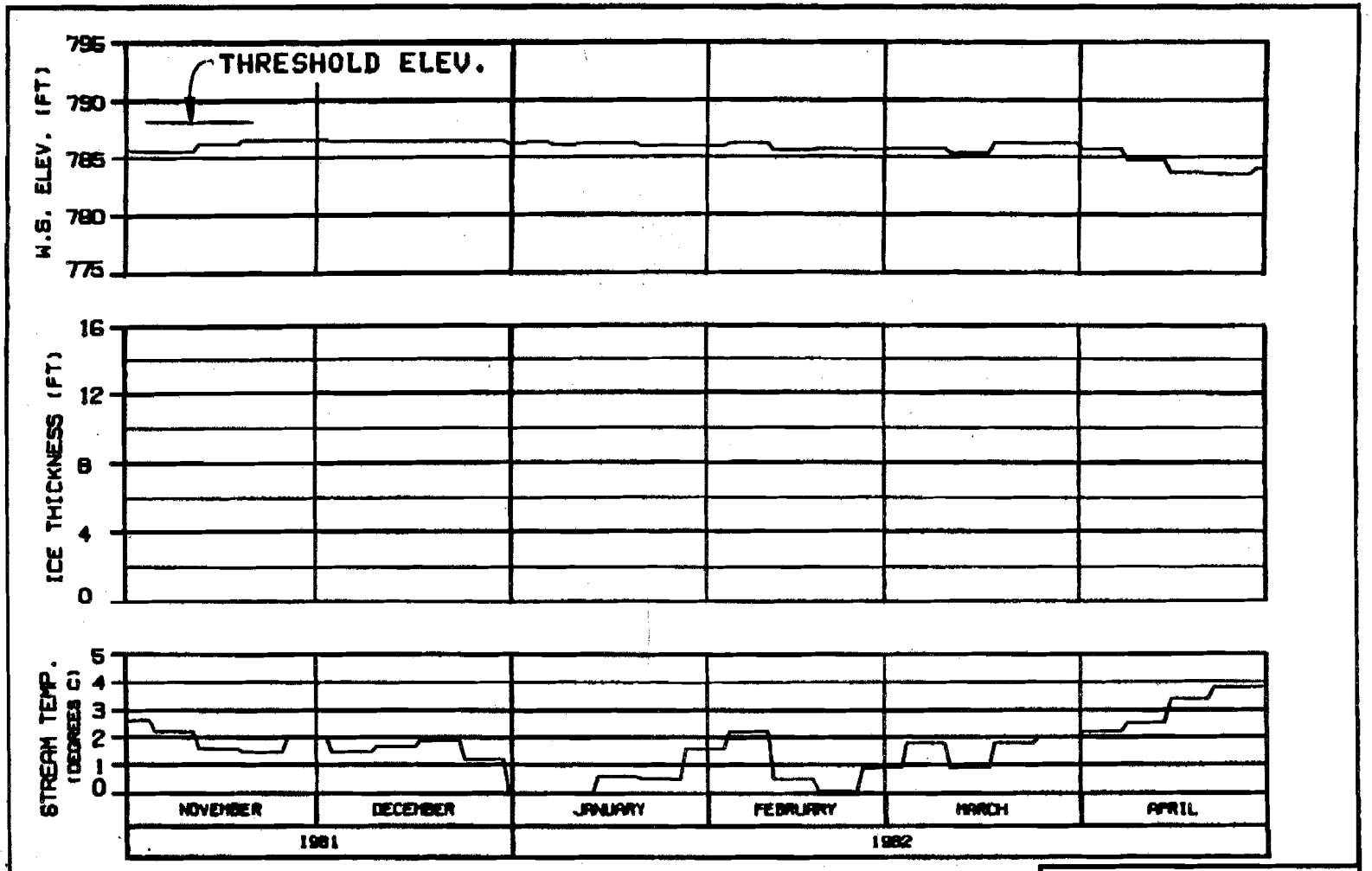
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV '76 - 30 APR '77
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7698CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?

EXHIBIT J

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

OPTION?

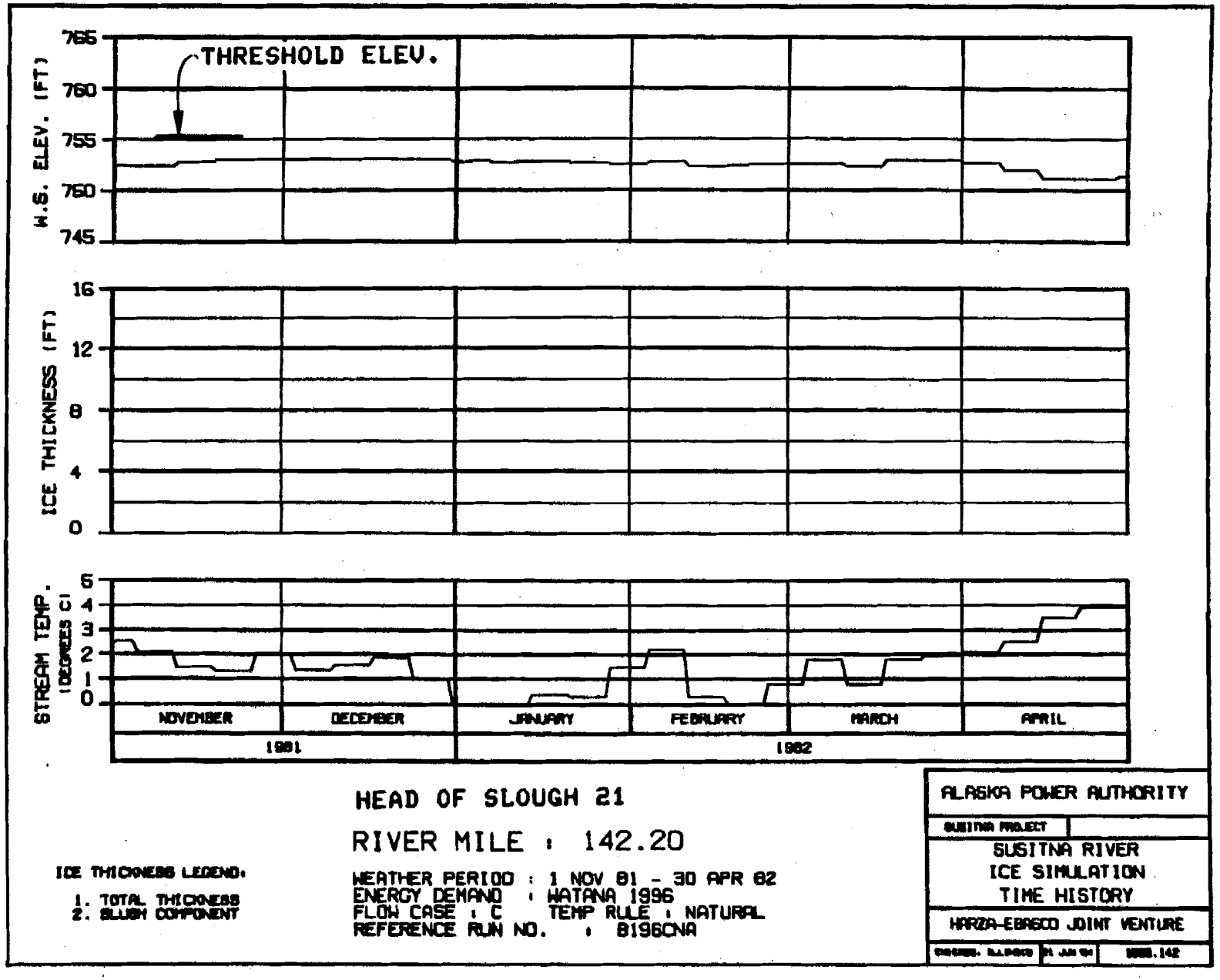
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: G.L.DAVIS 21 JAN 94 1898.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

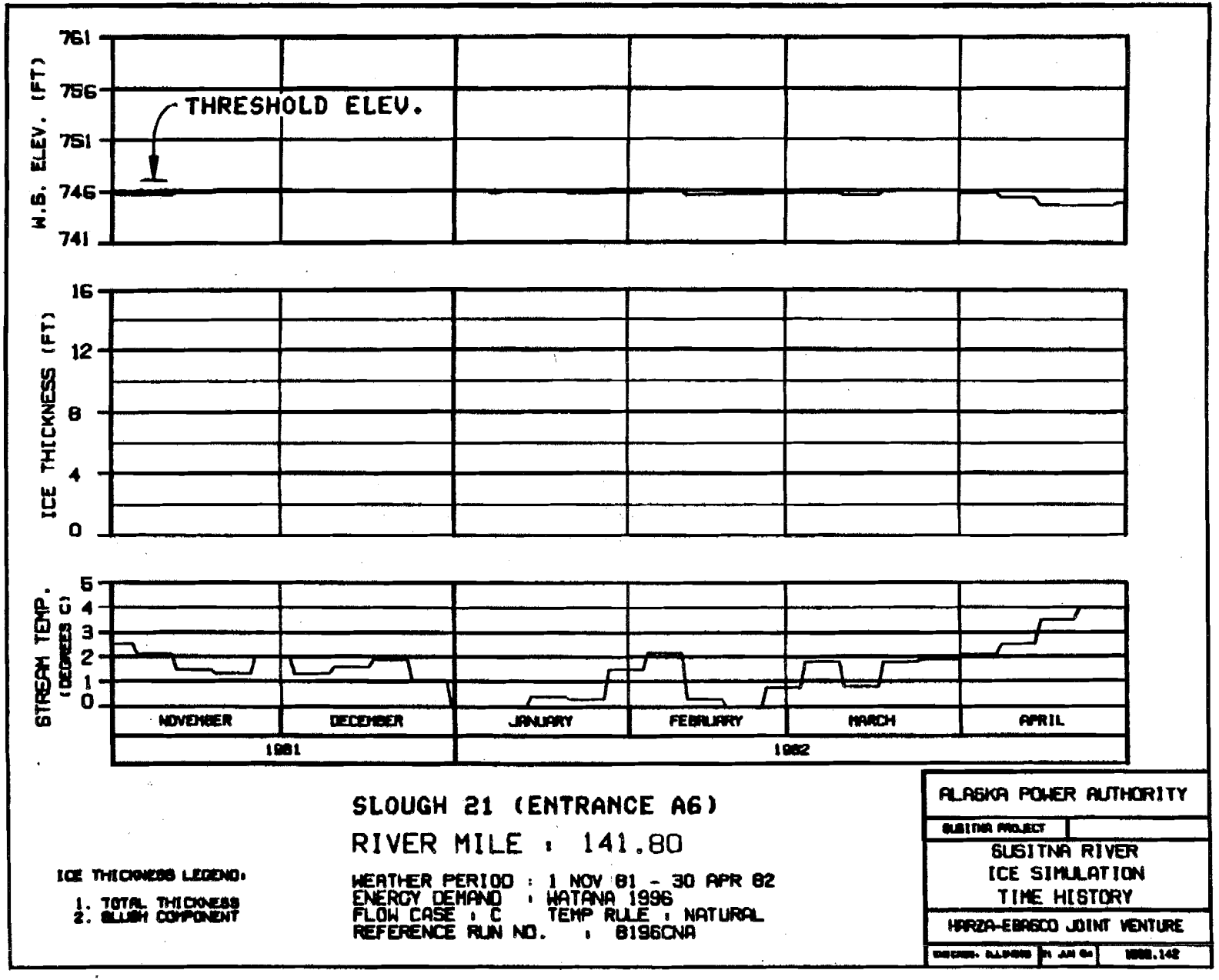
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: [illegible] 21 JAN 94 8888.142



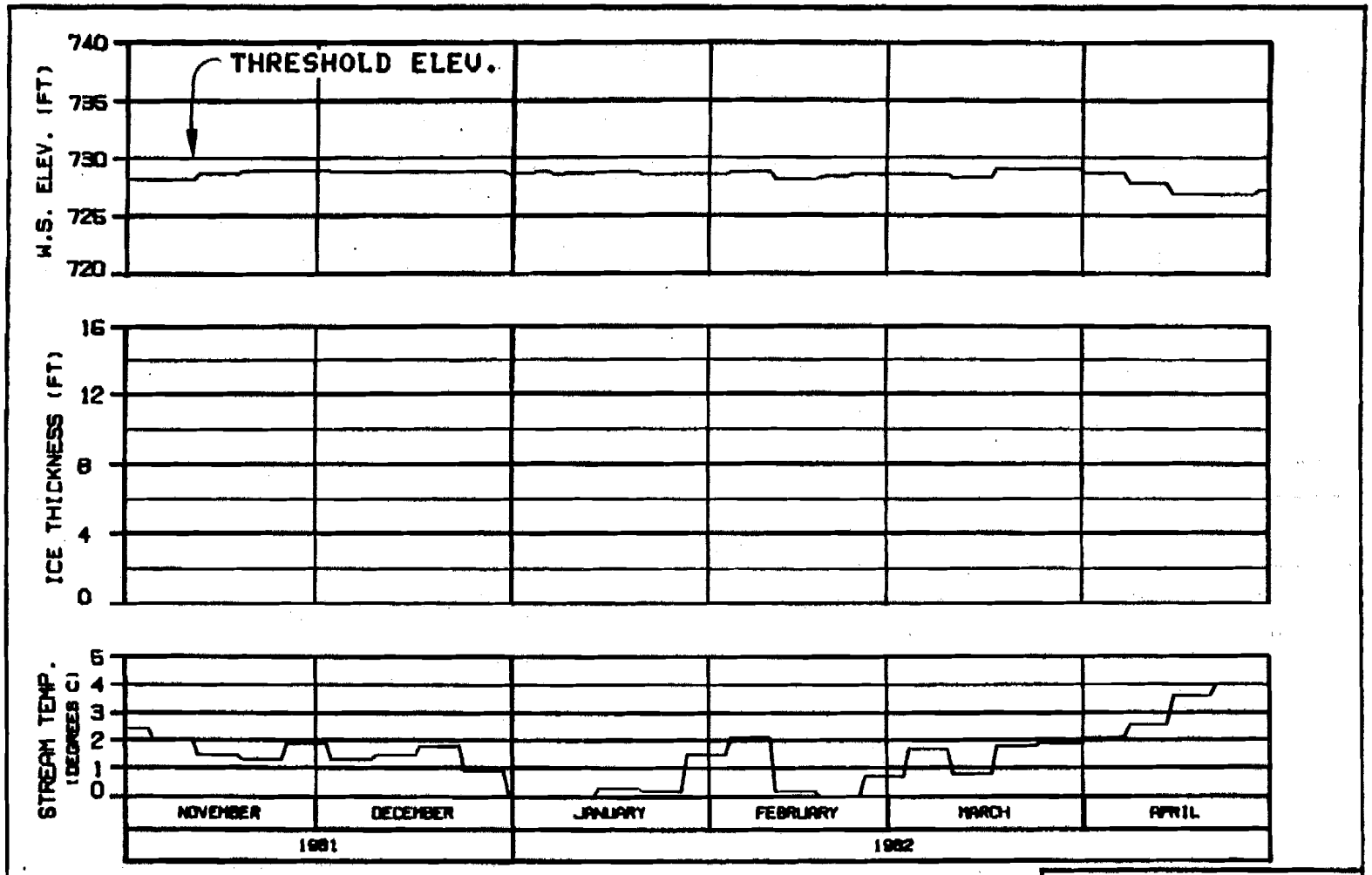
SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

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



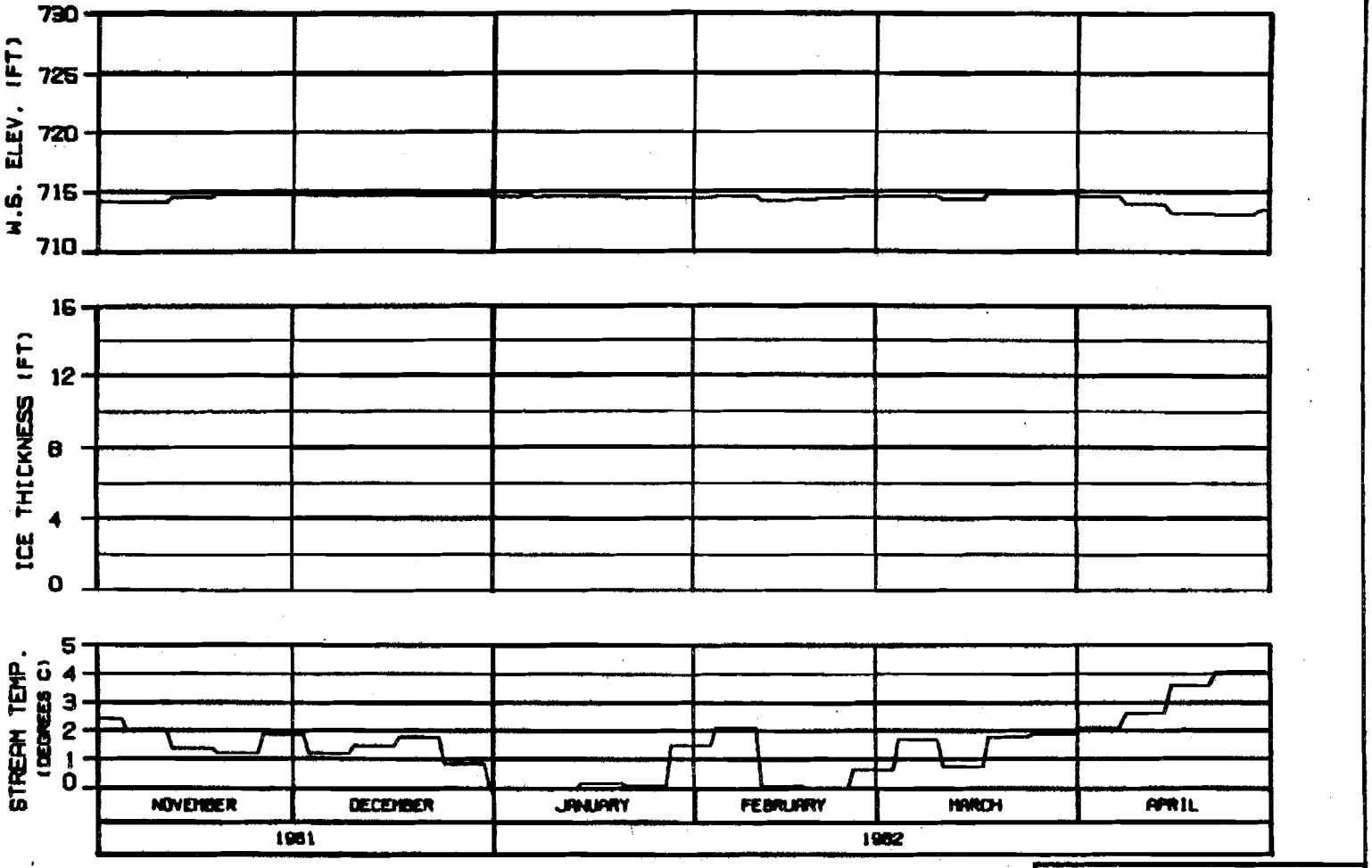
HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

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:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

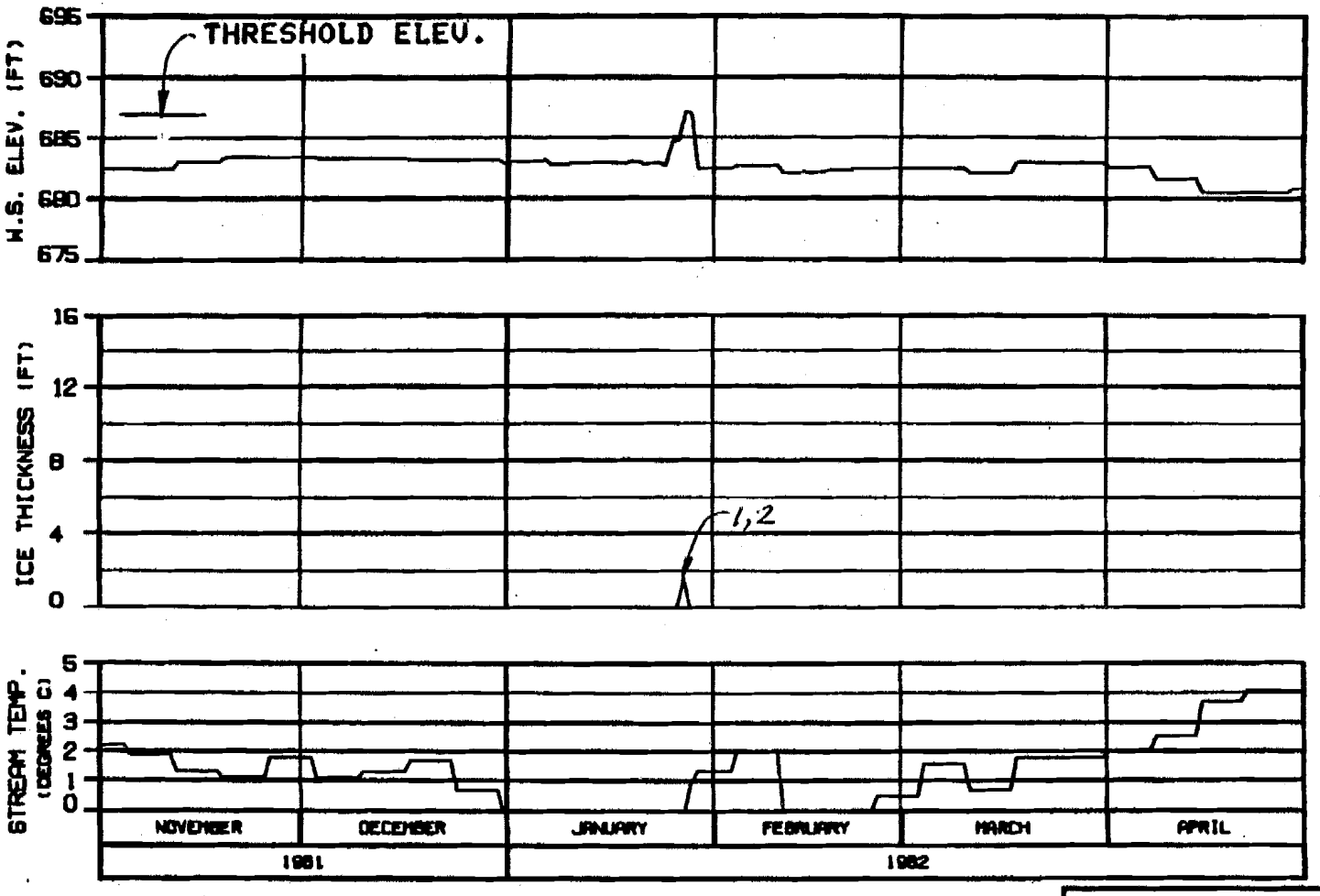
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S.L.PRICE | 21 JAN 94 | 8888.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

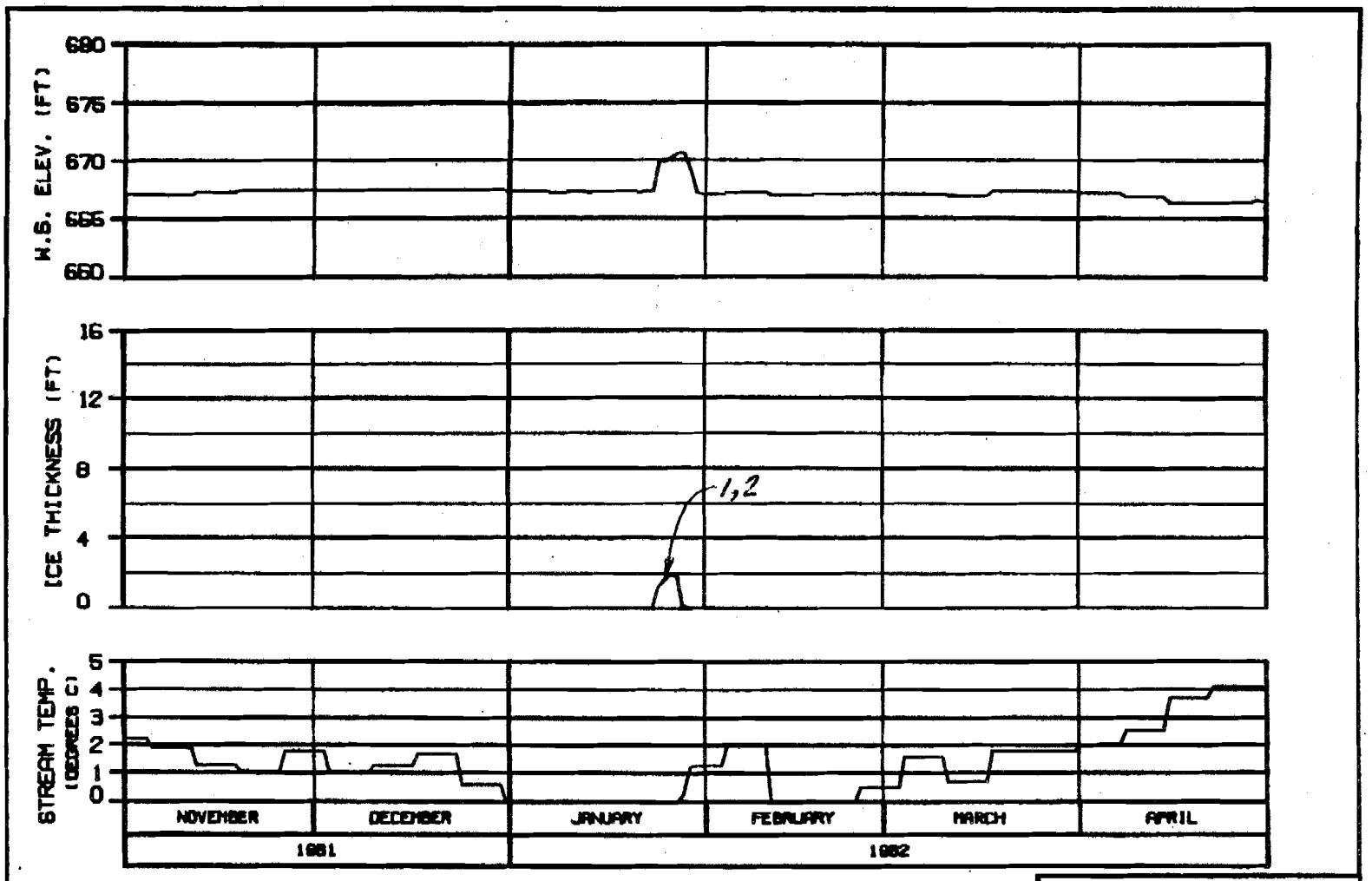
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

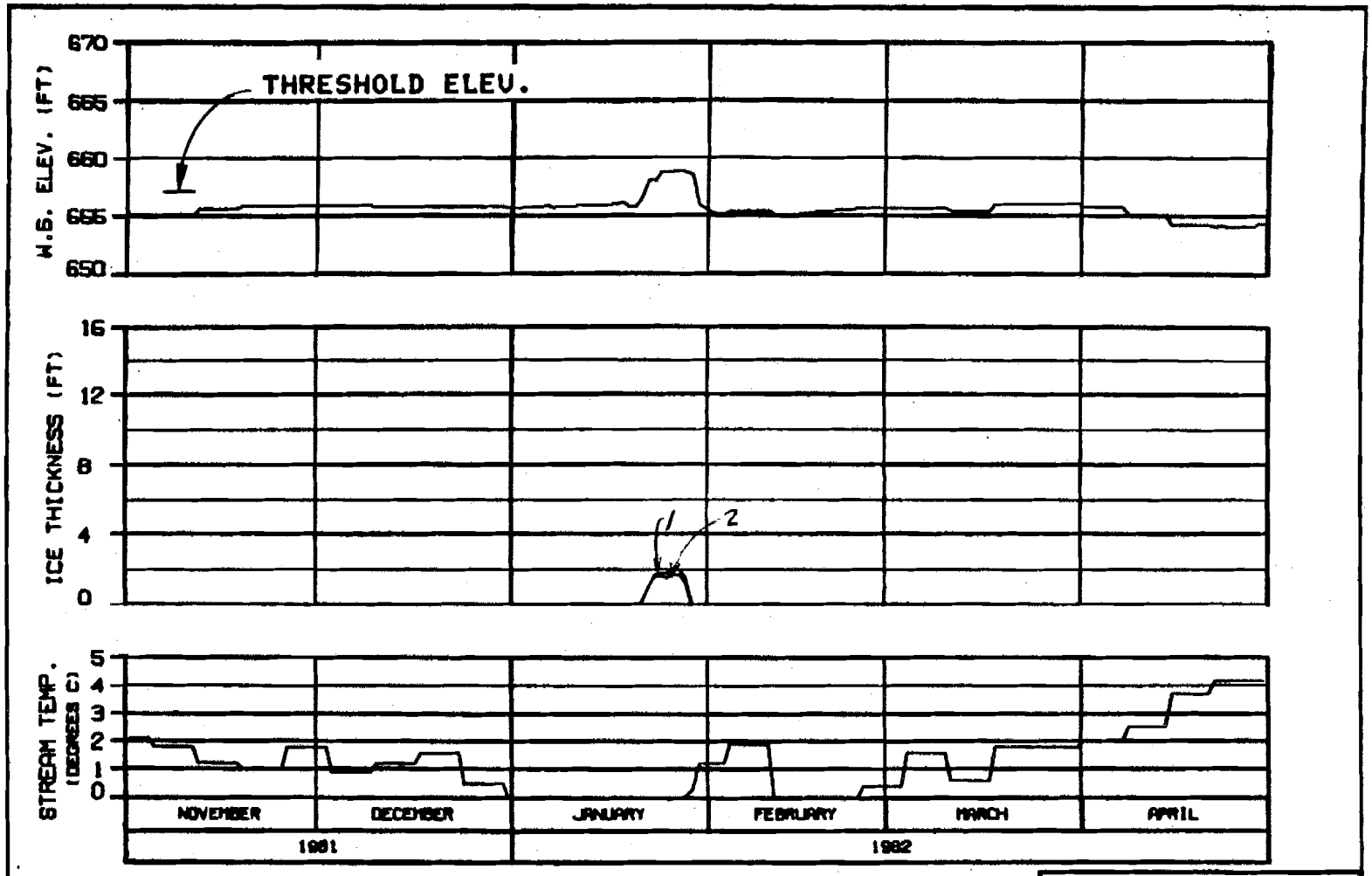
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 21 JAN 84 | [illegible].142



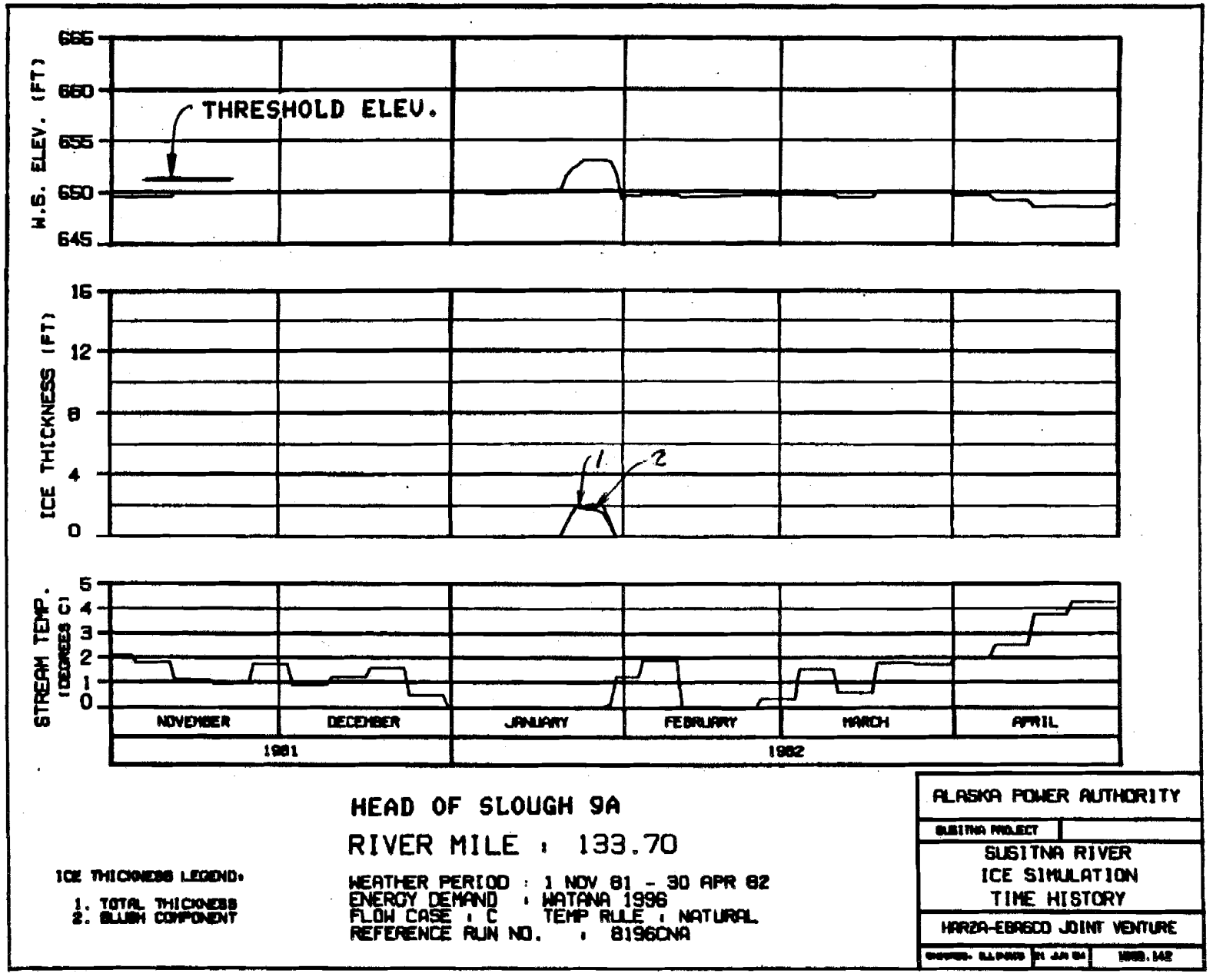
SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: A.L.PARKS 21 JAN 94	1868.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

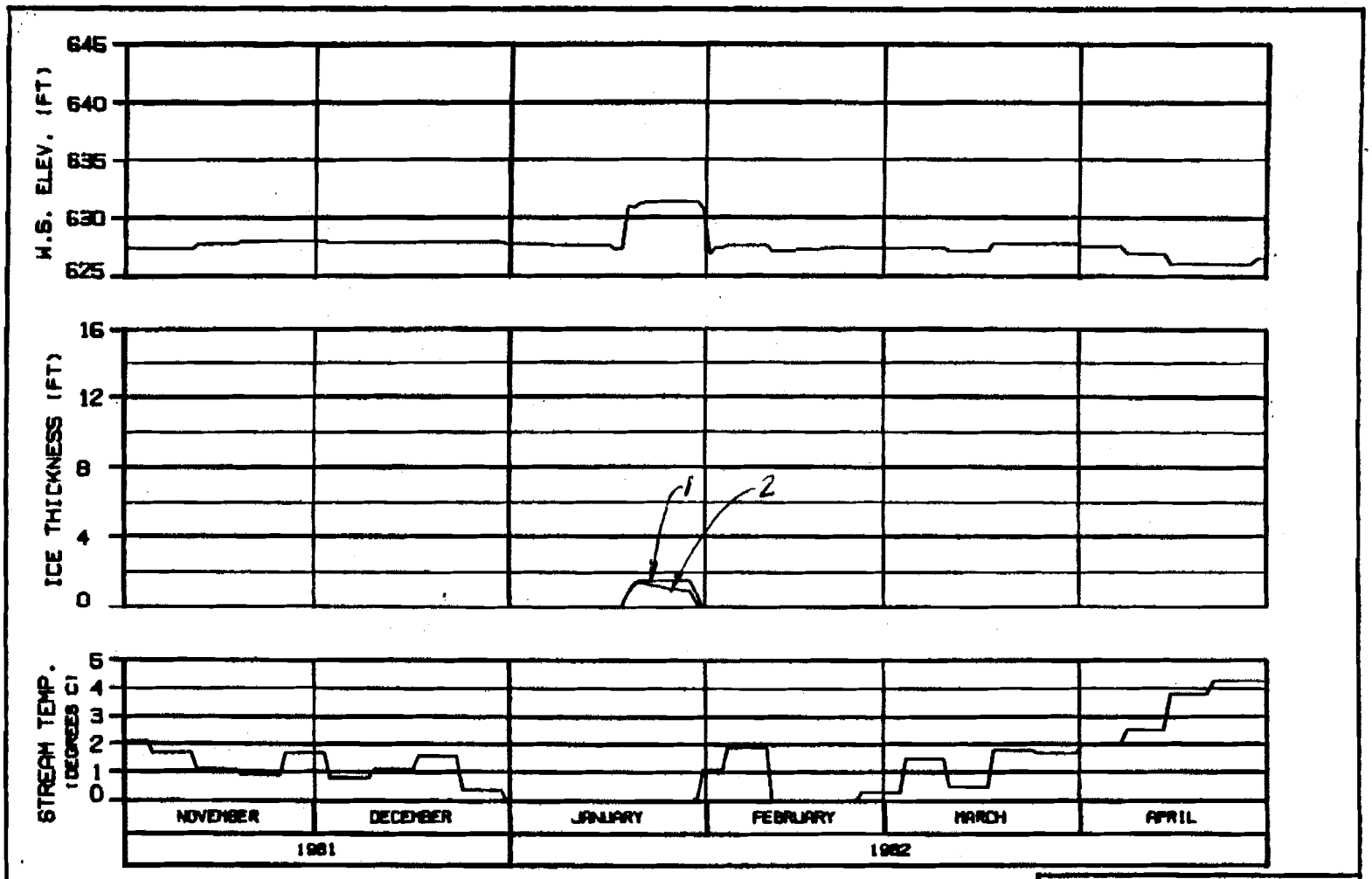
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

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:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

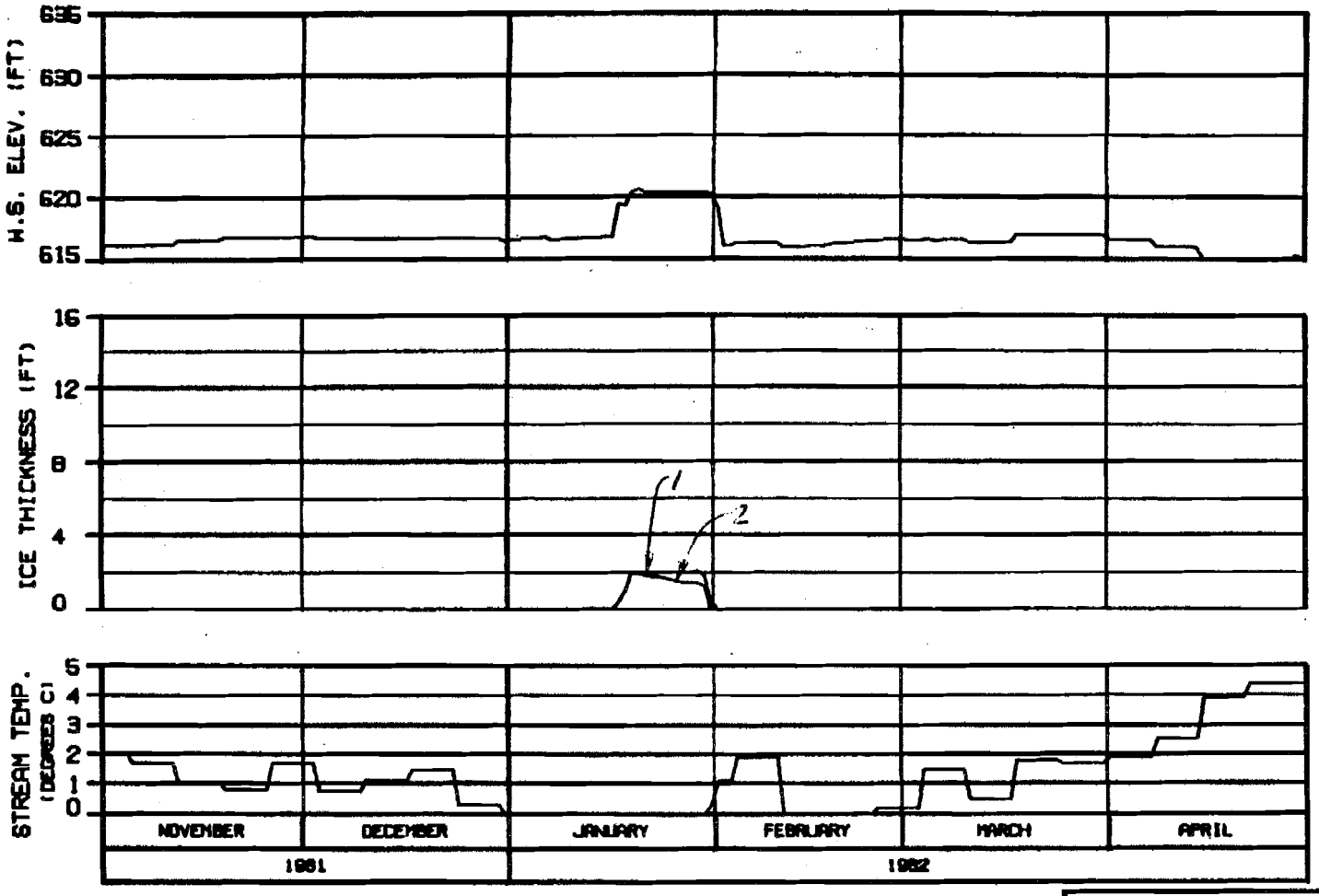
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 31 JAN 84 | 1988.142

OPTION7



SIDE CHANNEL U/S OF SLOUGH 9

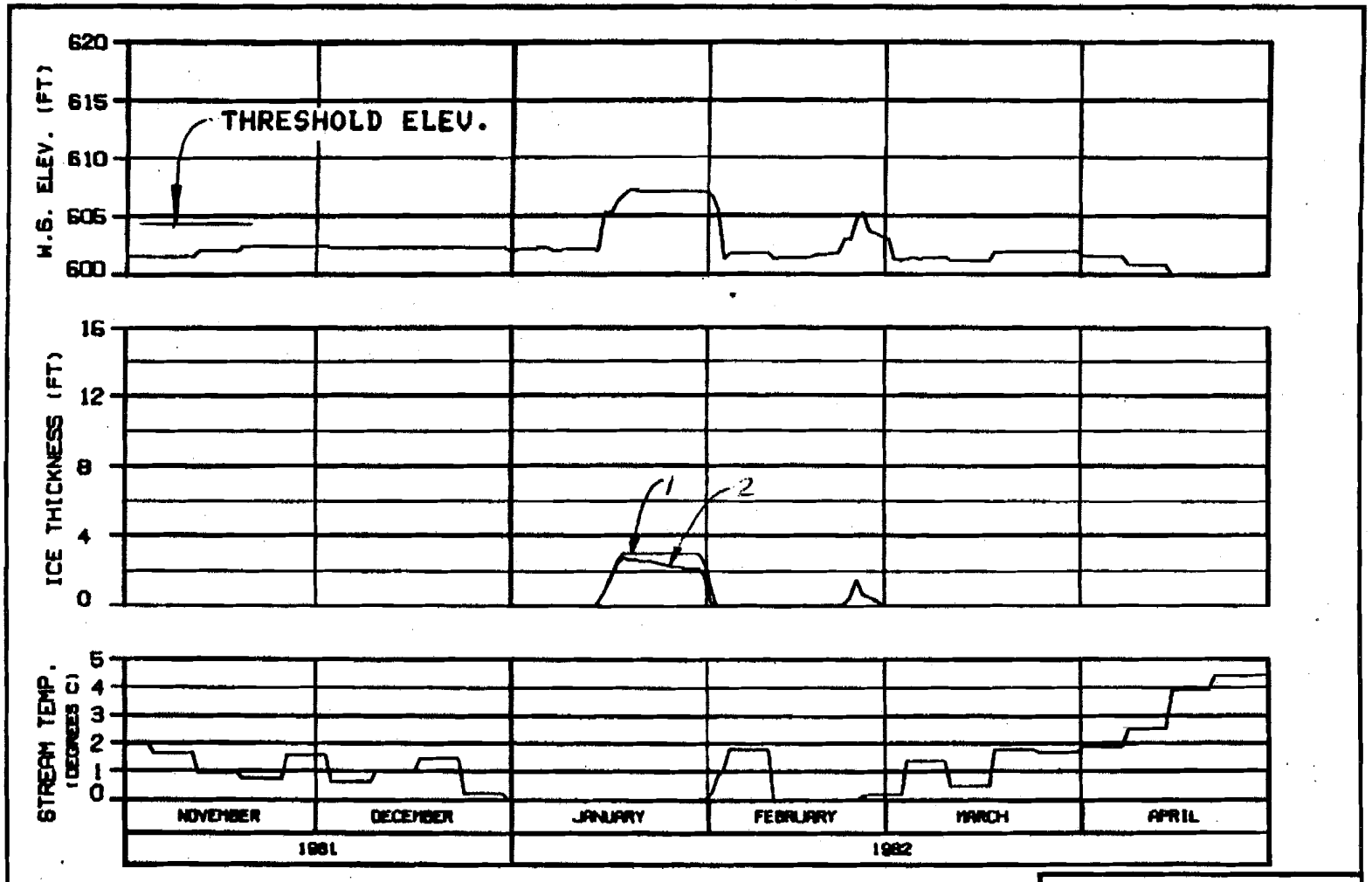
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1: TOTAL THICKNESS
2: SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: SLS 21 JAN 84 1988.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

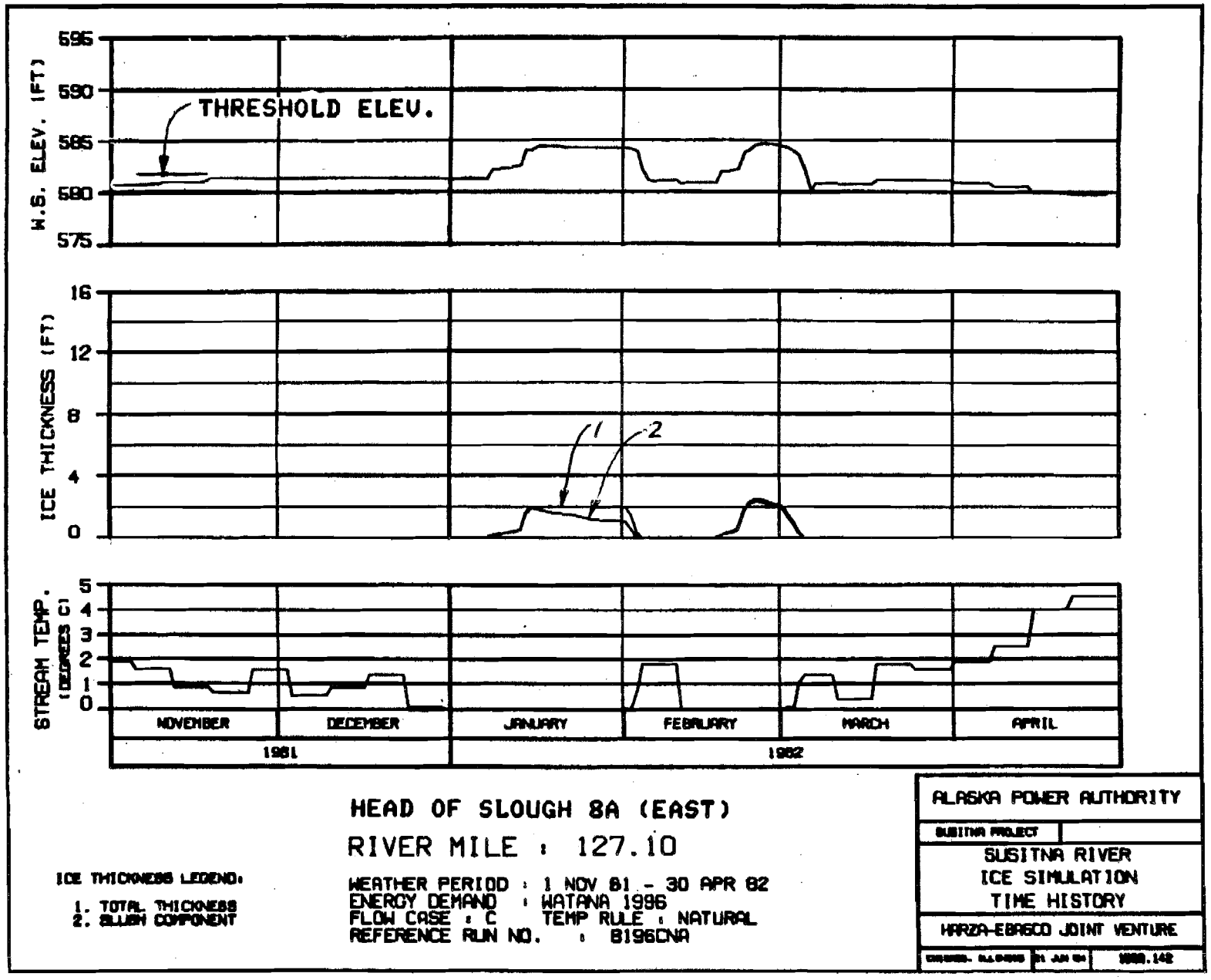
OPTION?

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:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B196CNA

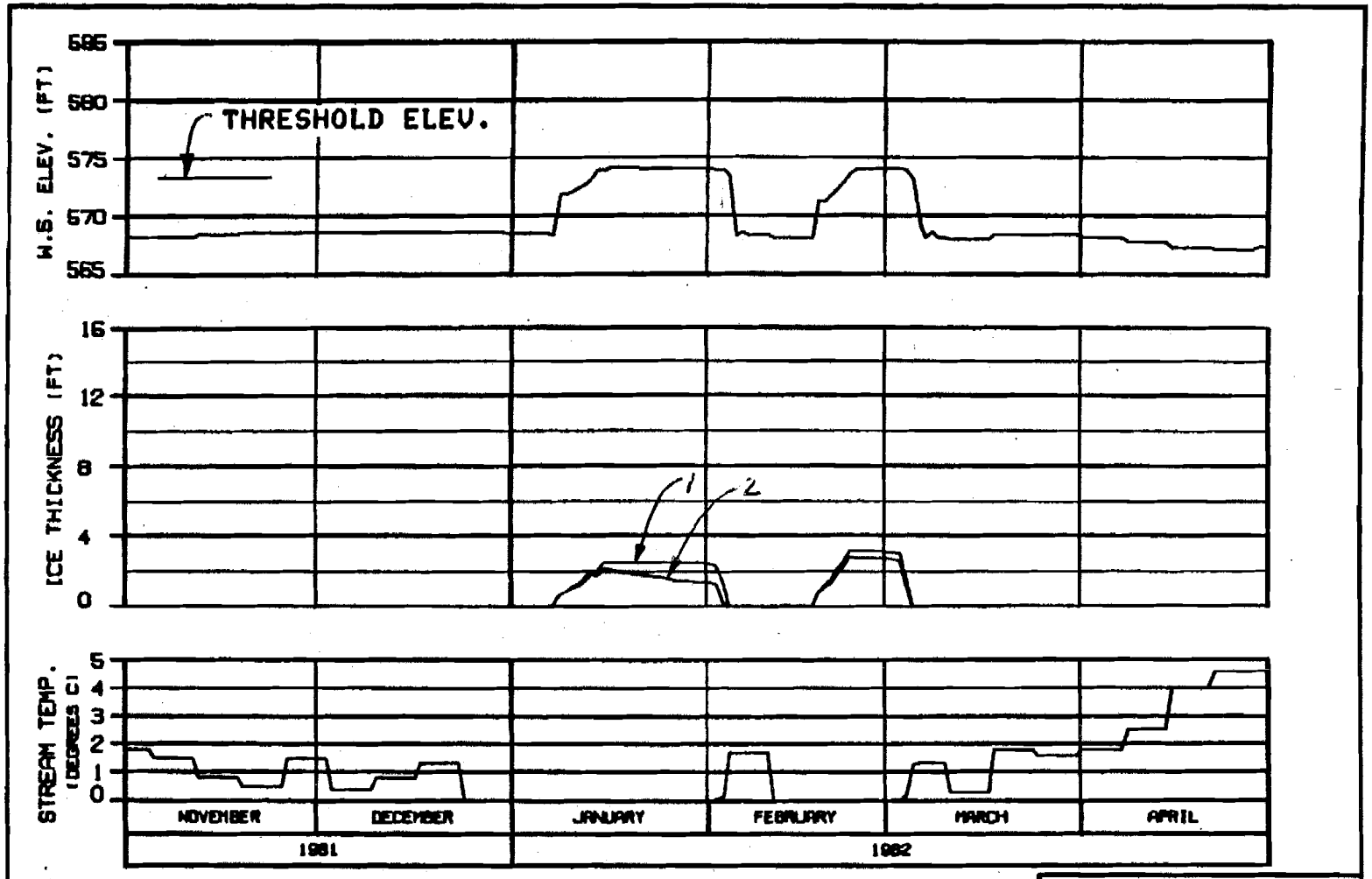
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ALLOWED | 31 JAN 84 | 1988.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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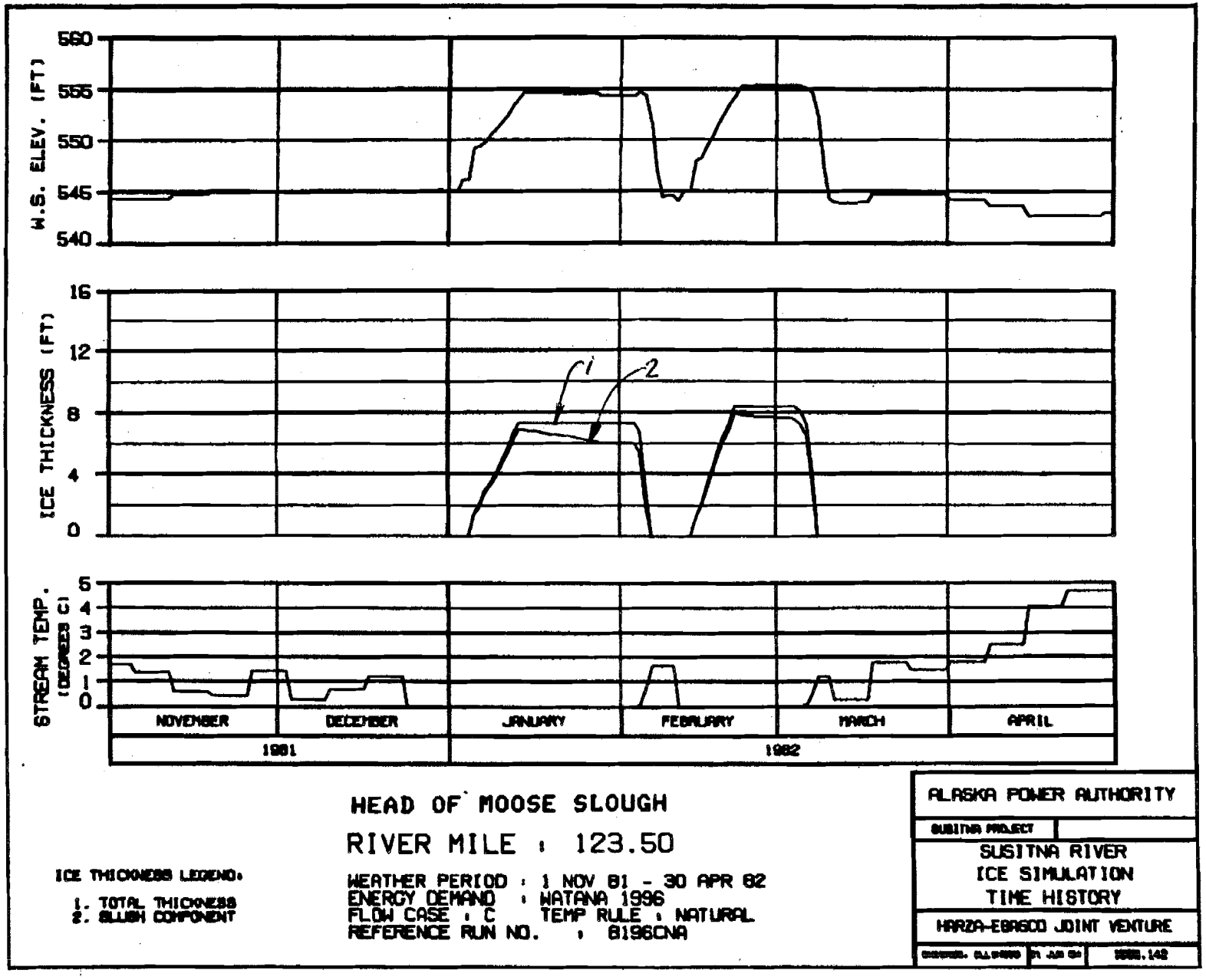

HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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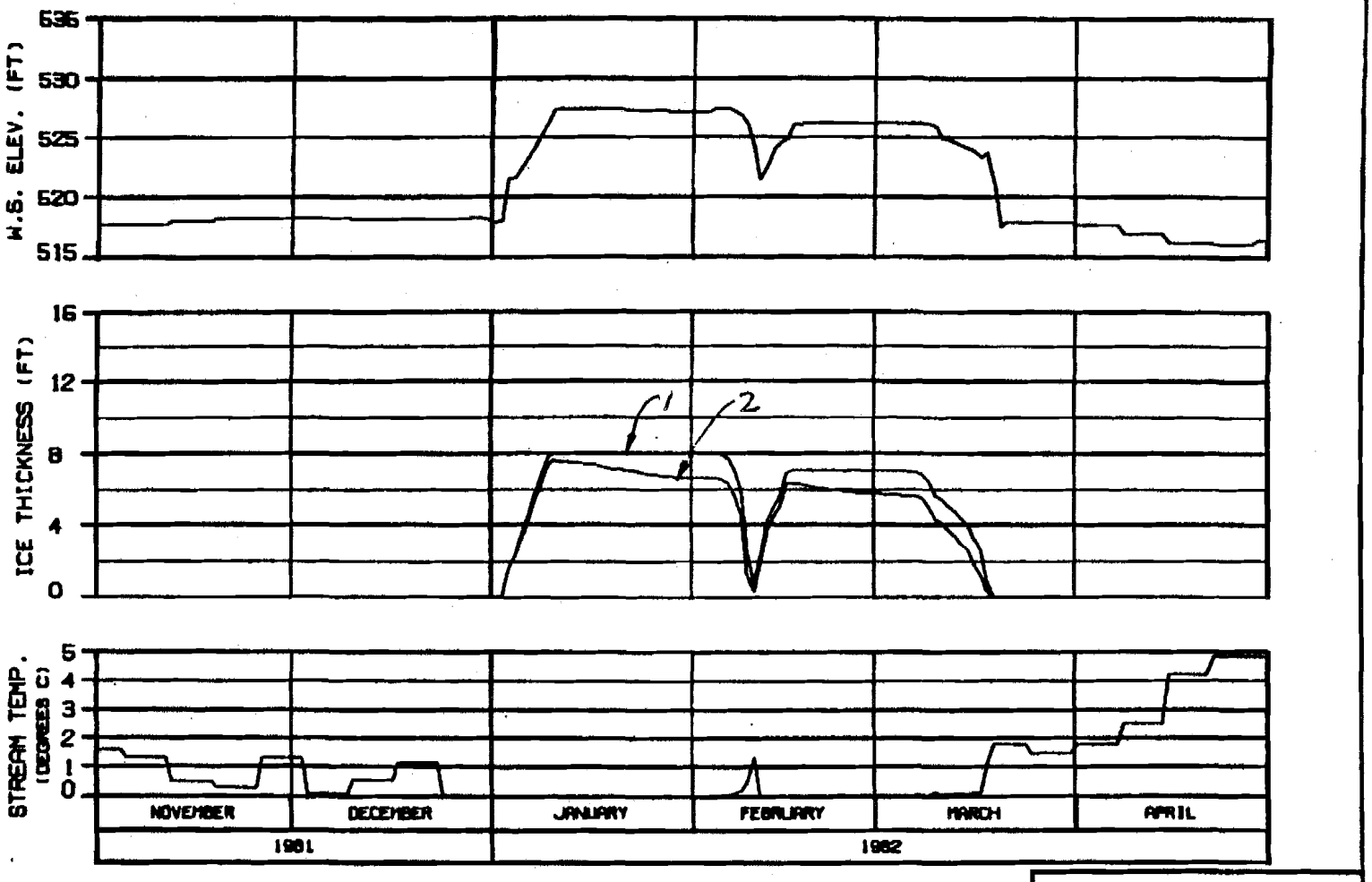


ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

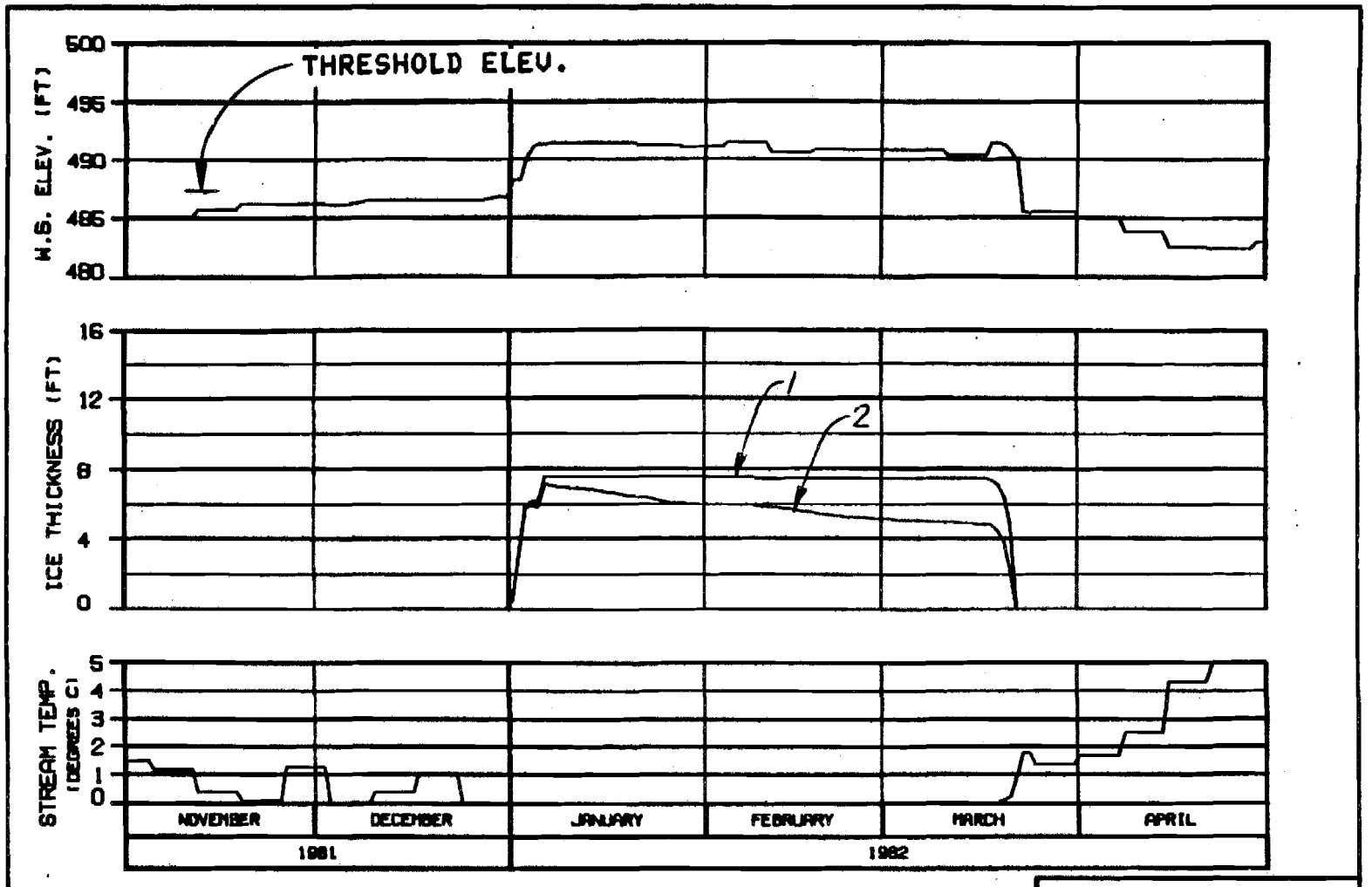
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S.L.SIMMS 21 JAN 84 8611.142



HEAD OF SIDE CHANNEL MSII

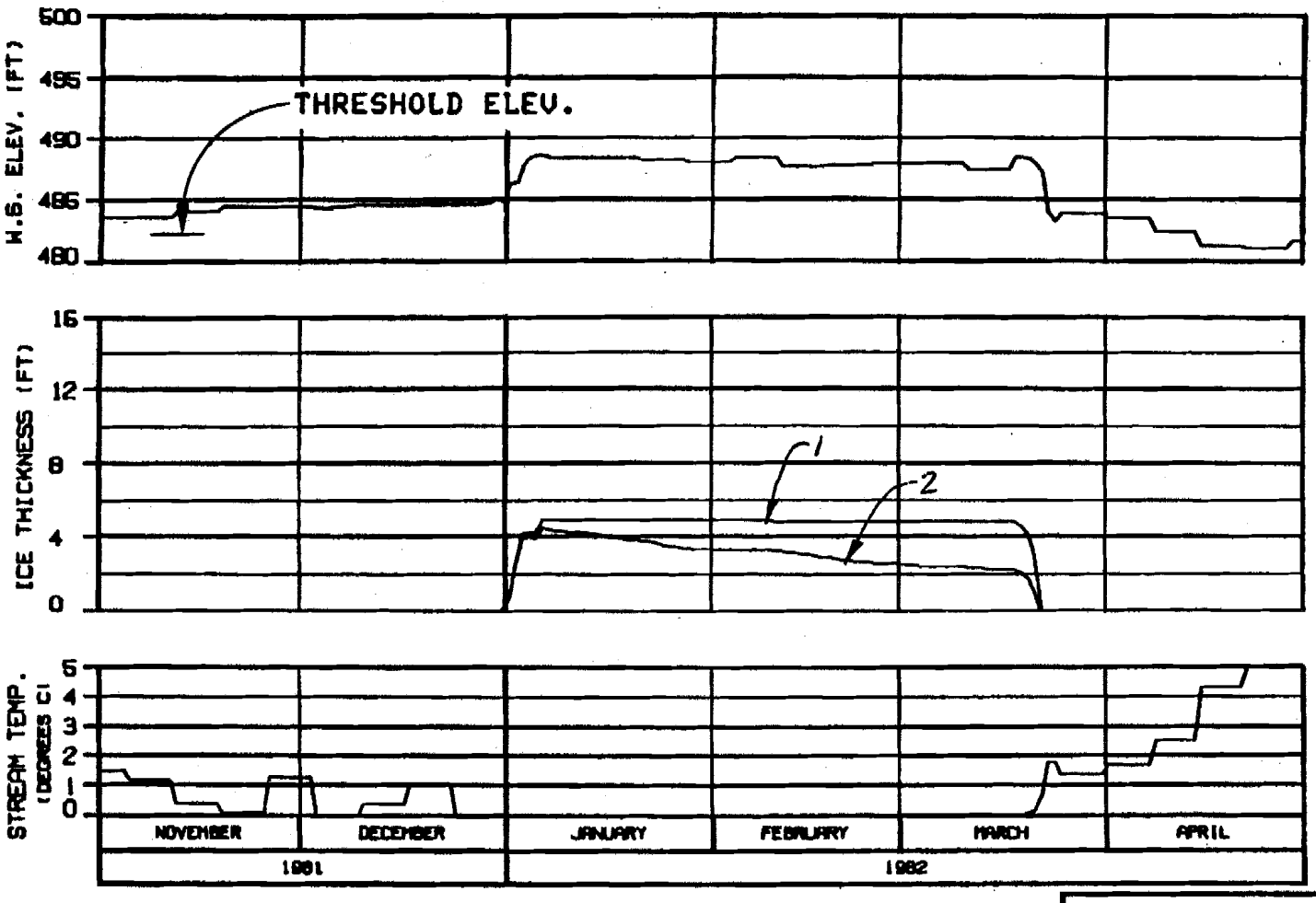
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

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



SIDE CHANNEL MSII

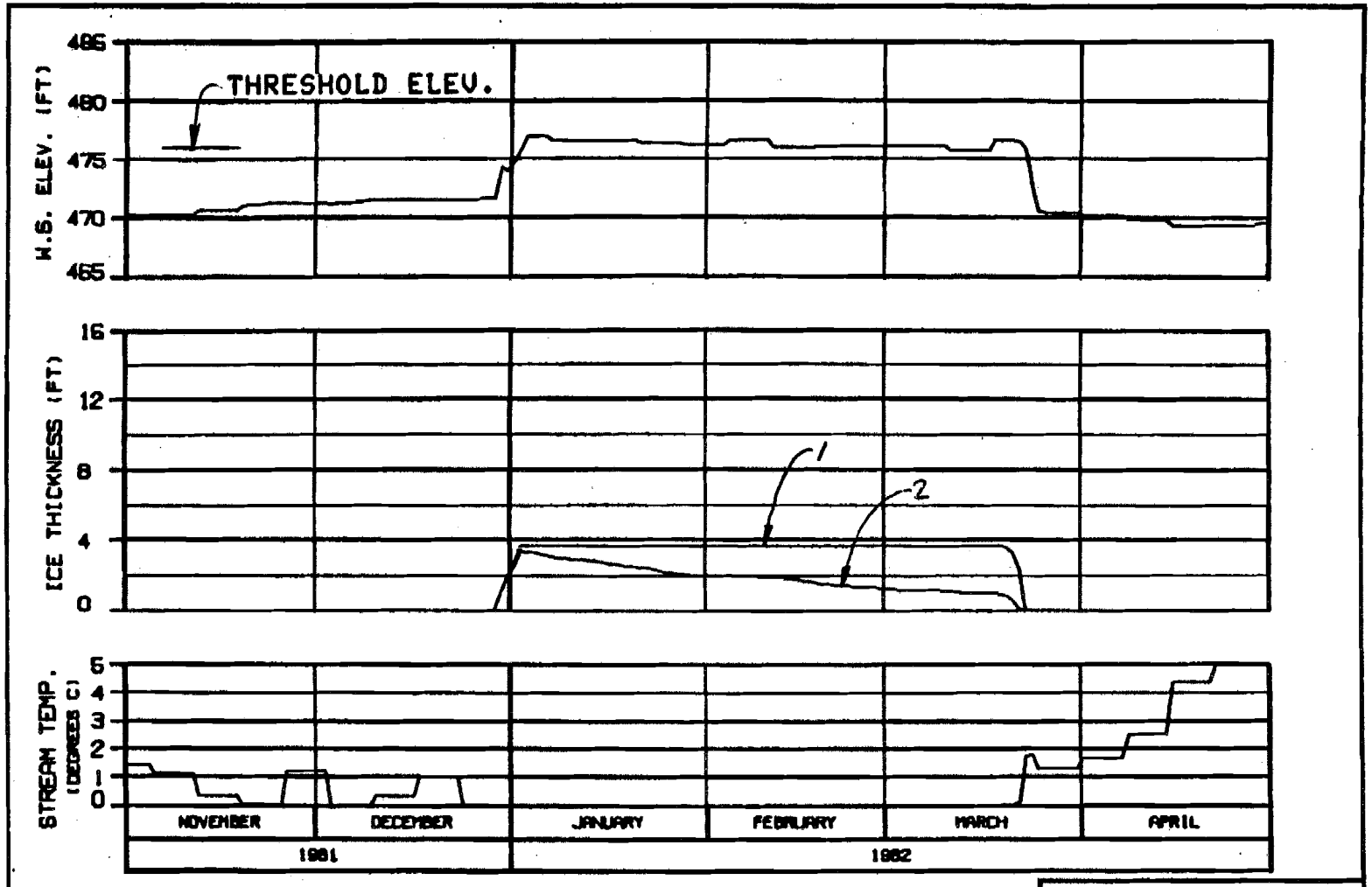
RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: G.L.DAVIS | JAN 84 | 1886.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

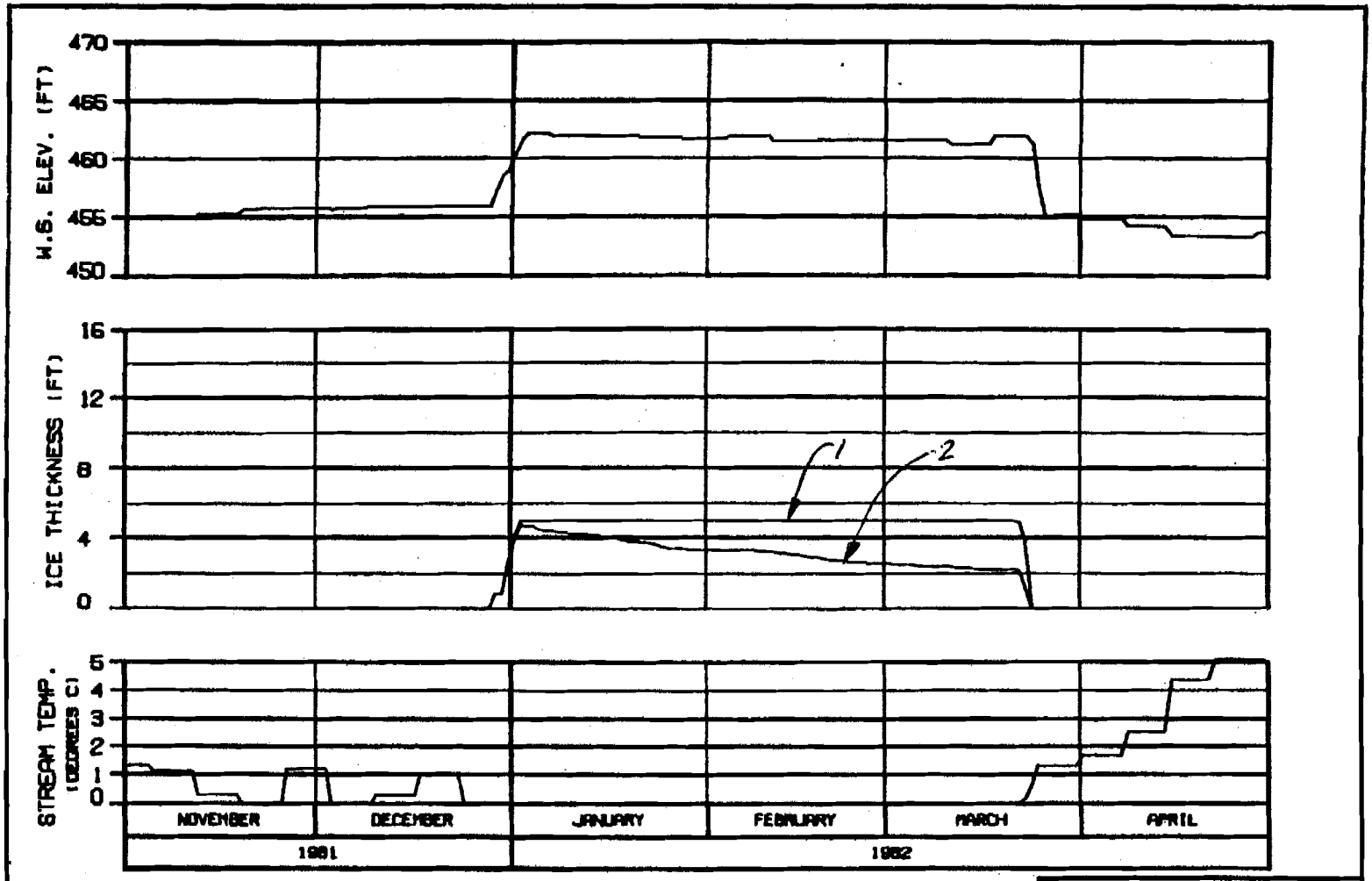
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 01 JAN 84 [illegible].142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

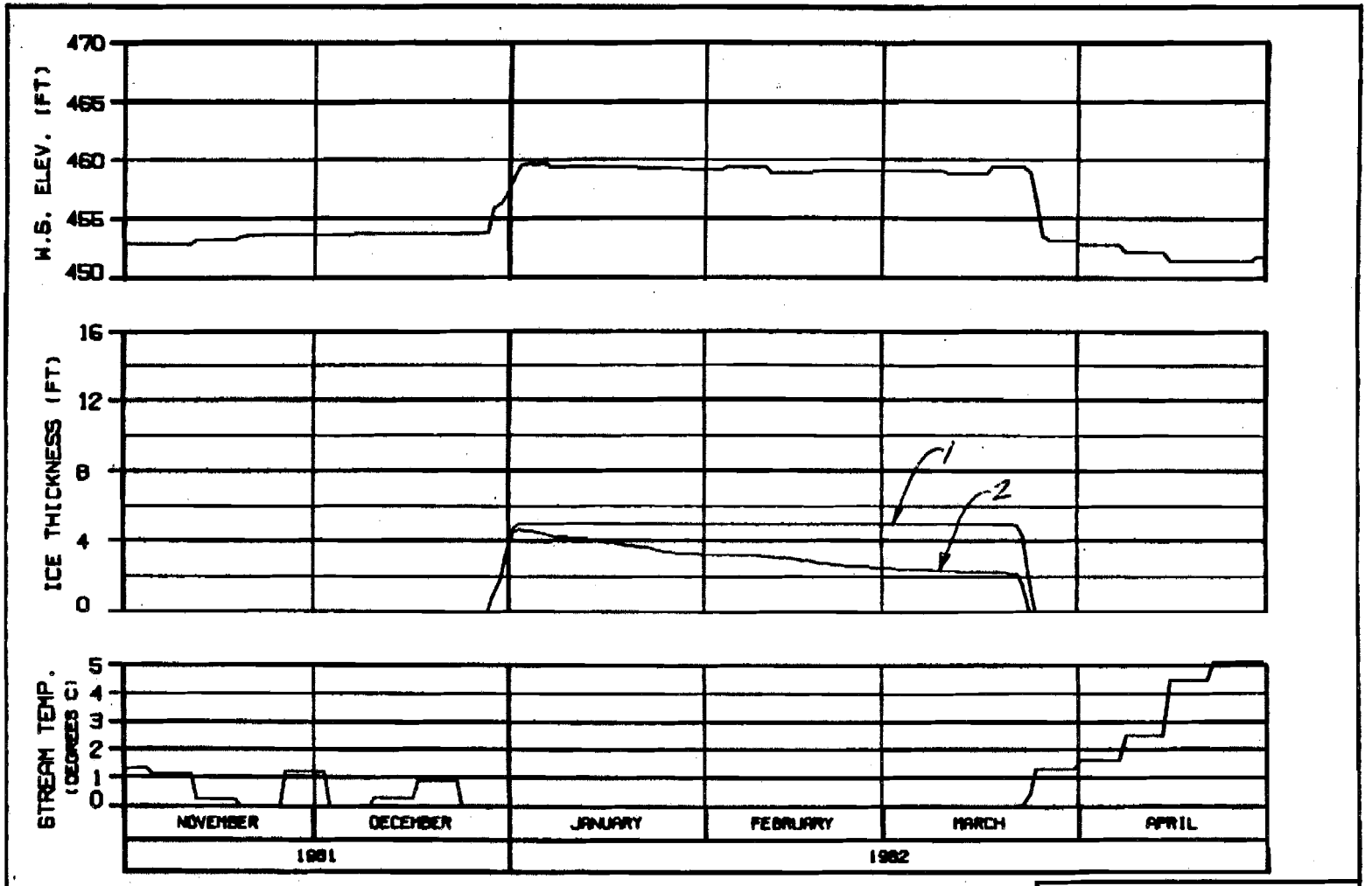
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: B.L.DEAN | 31 JAN 84 | 1988.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

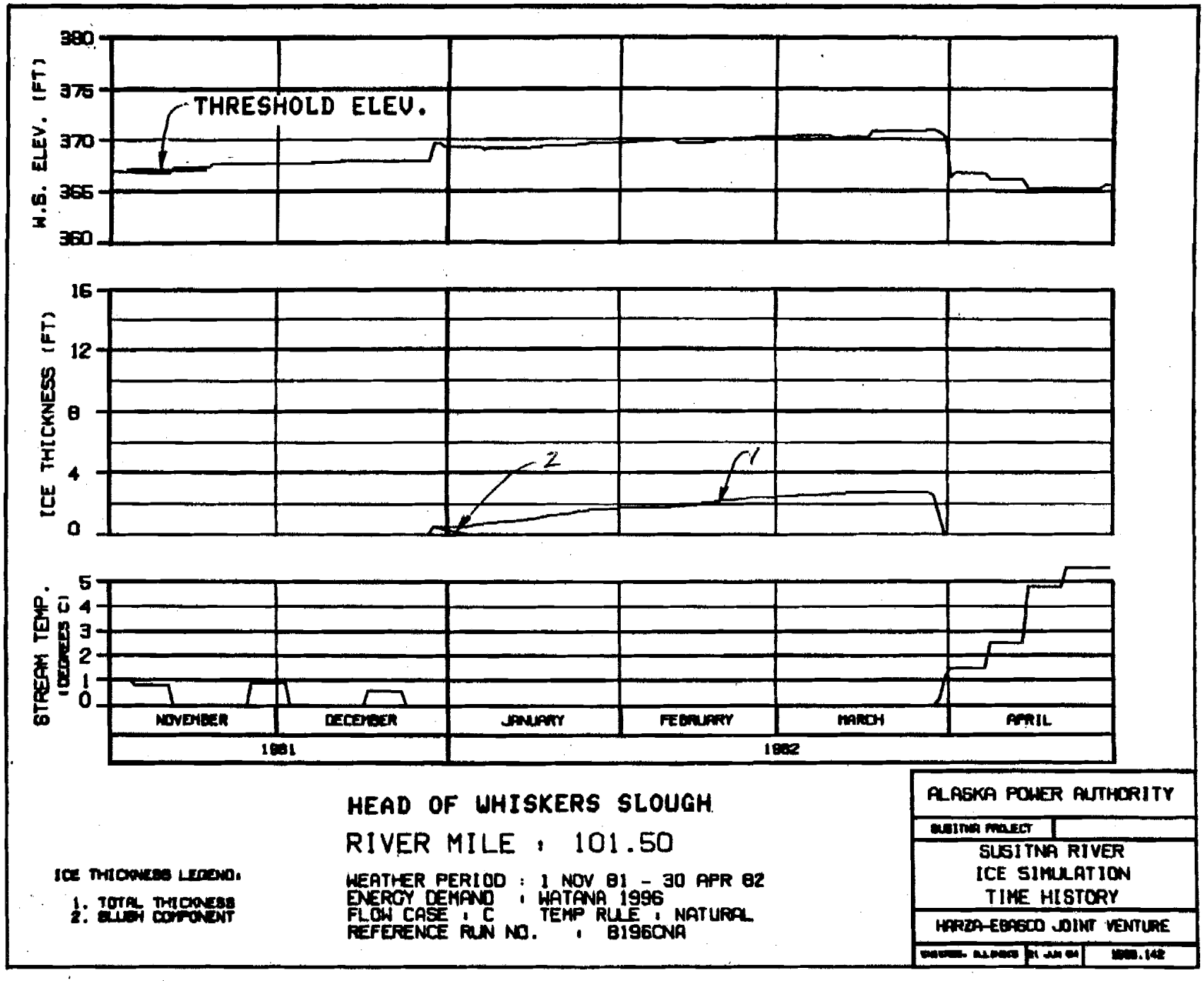
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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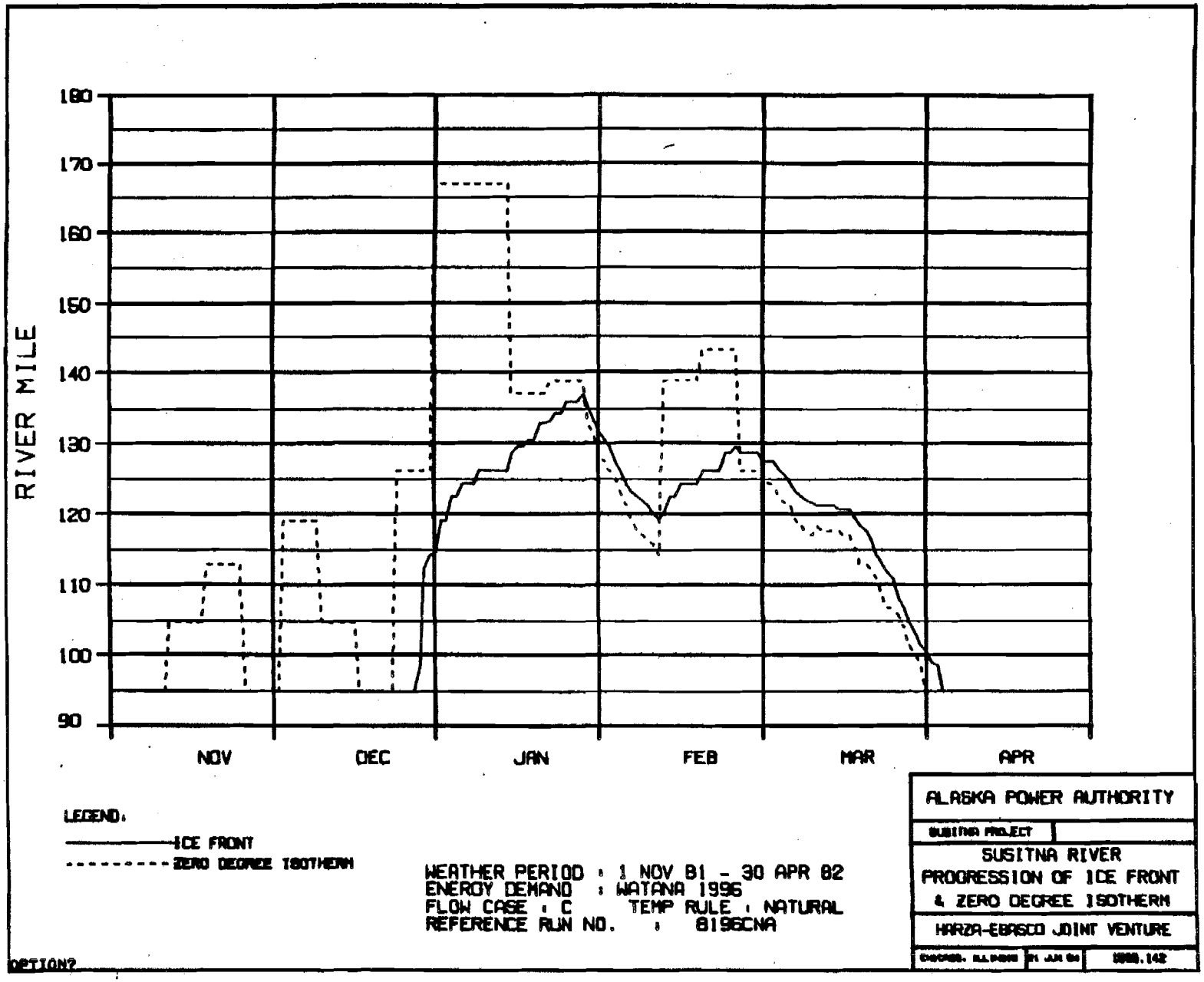
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LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?

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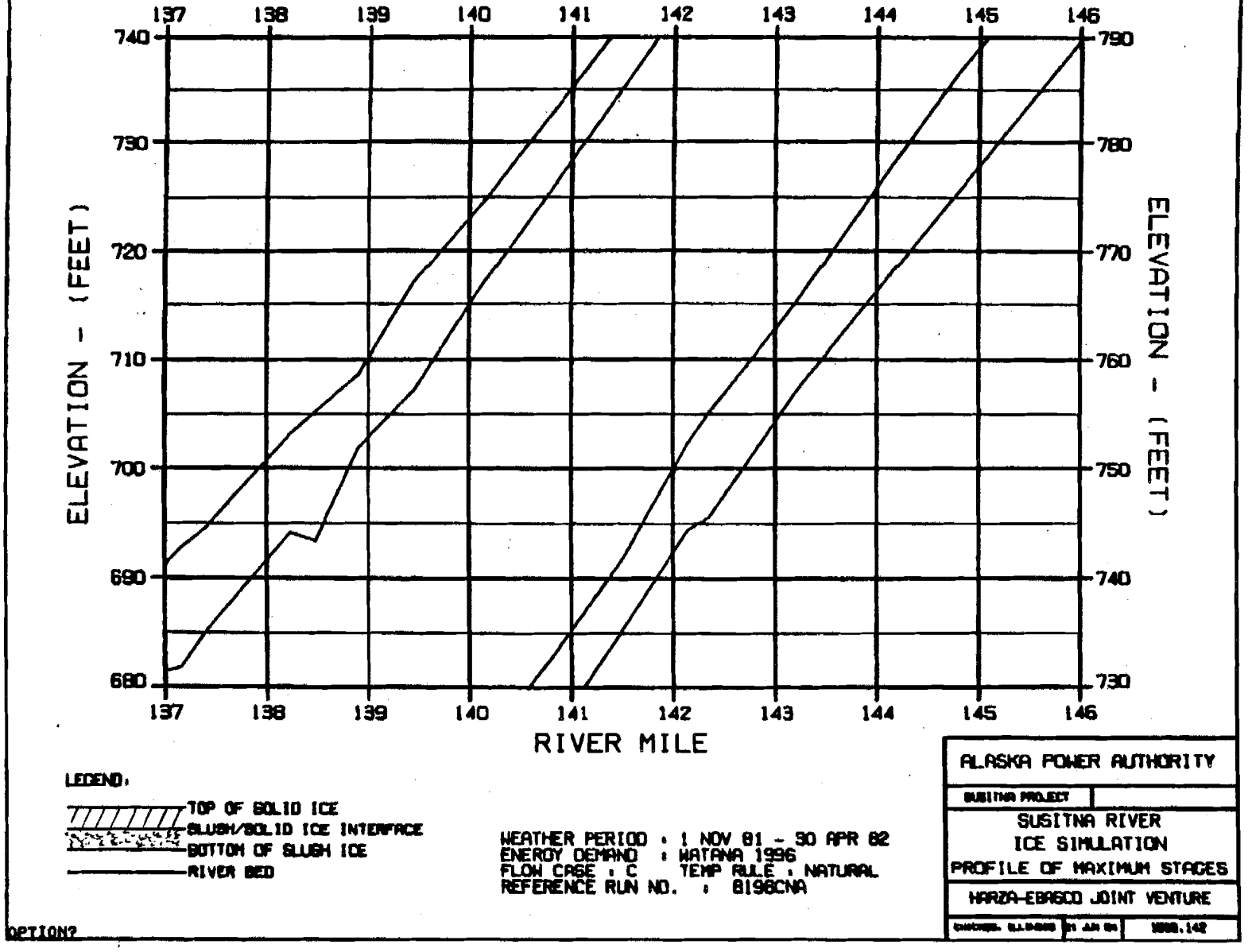
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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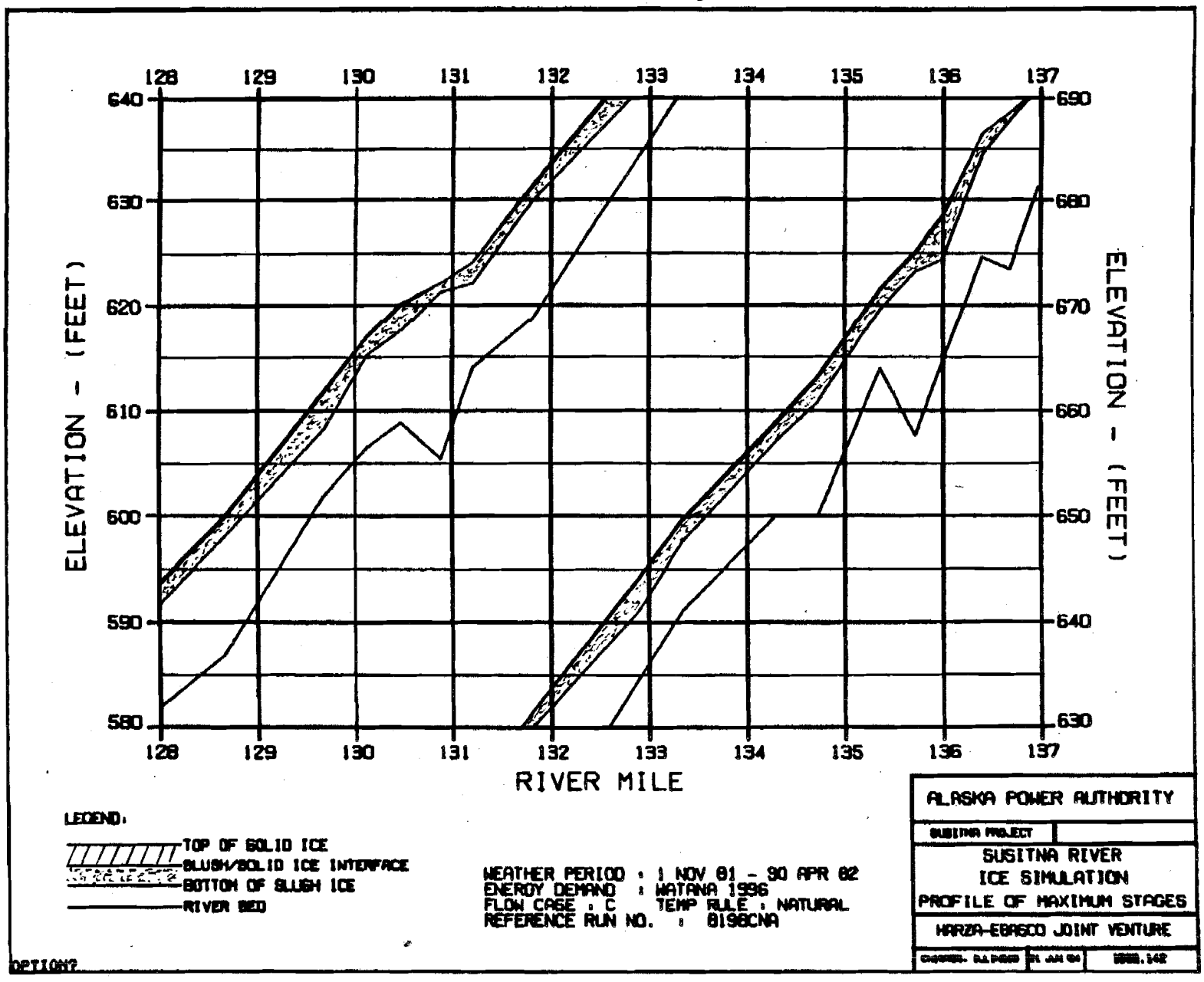
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ELEVATION - (FEET)
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8198CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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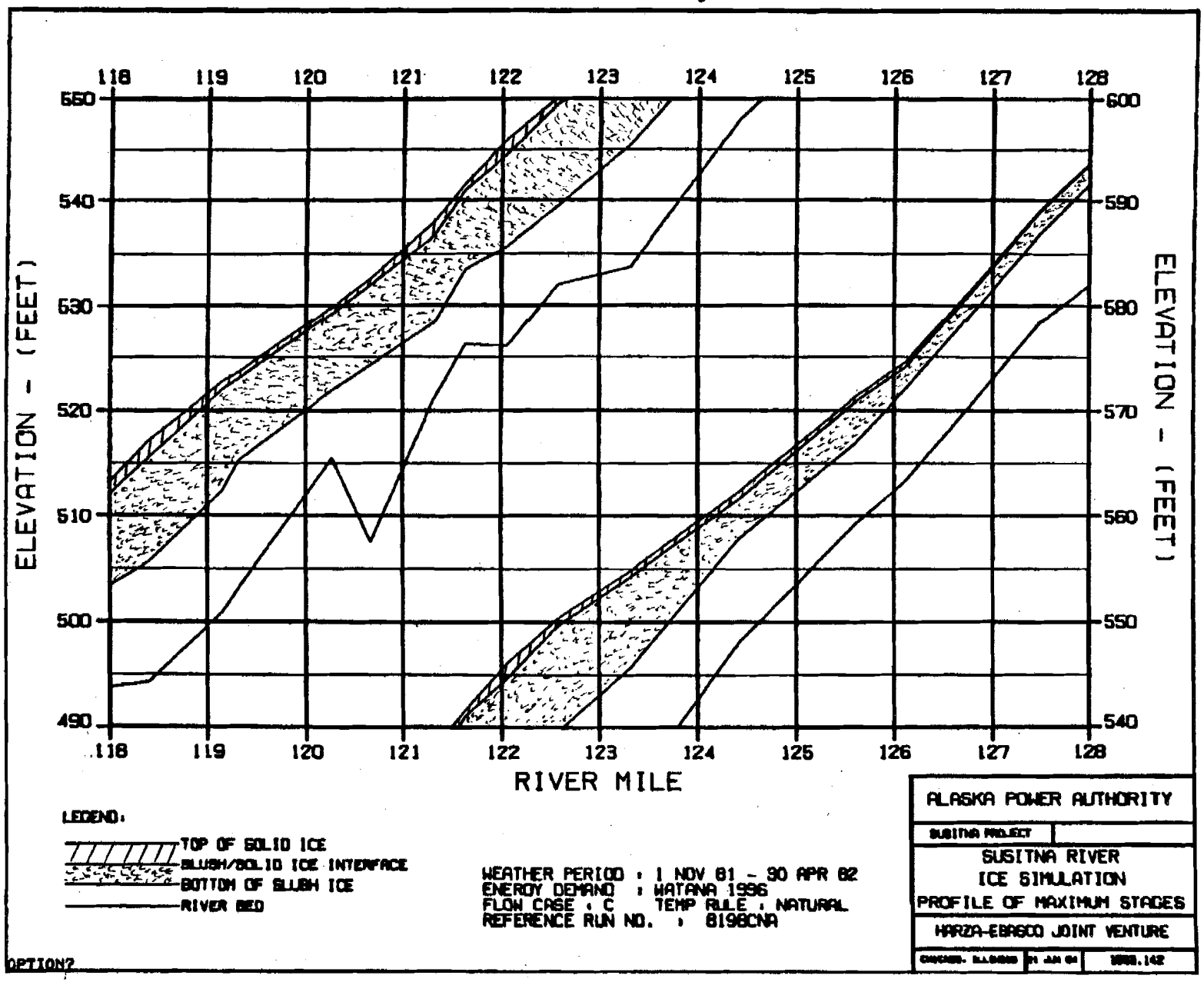
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ELEVATION - (FEET)
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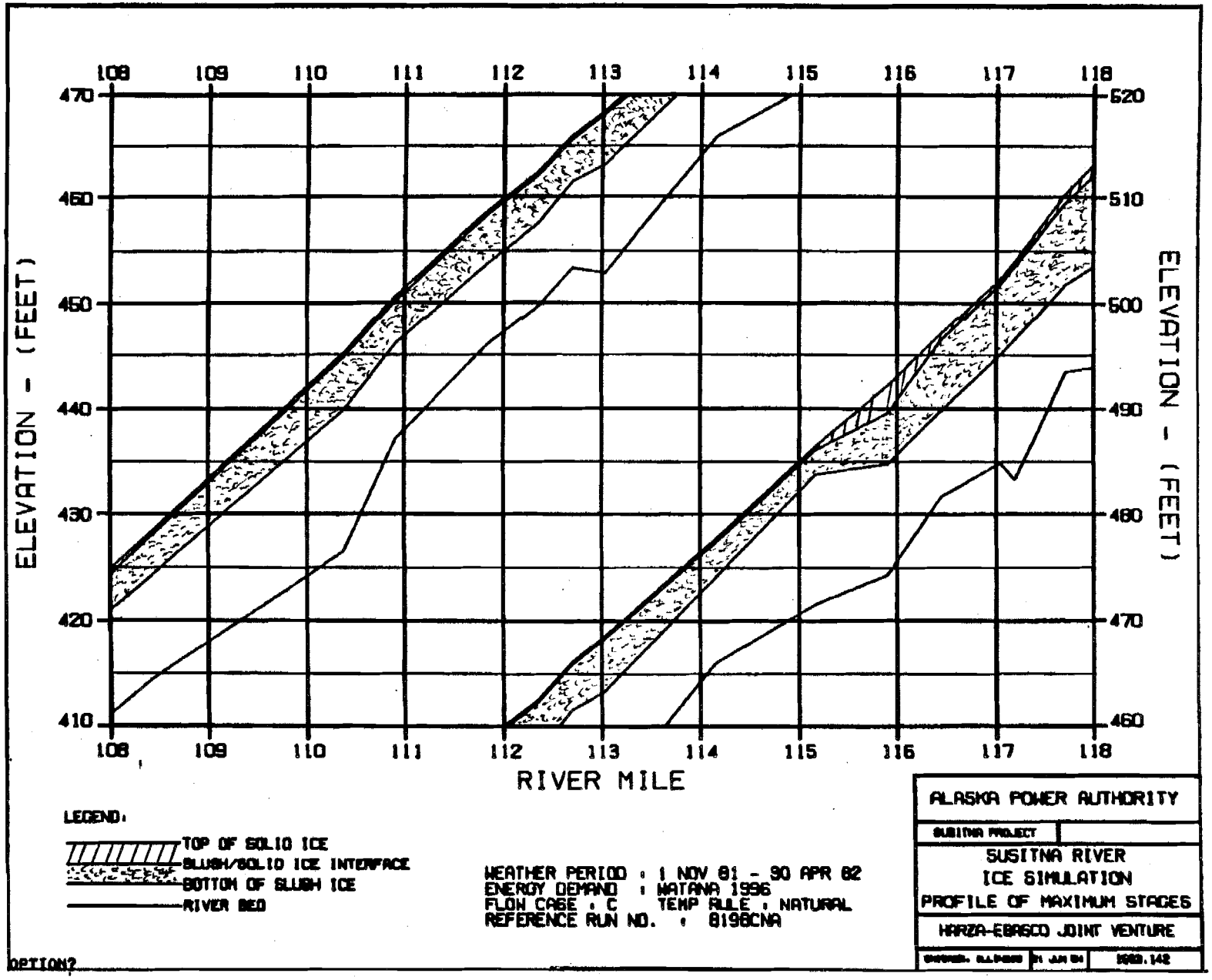
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8198CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2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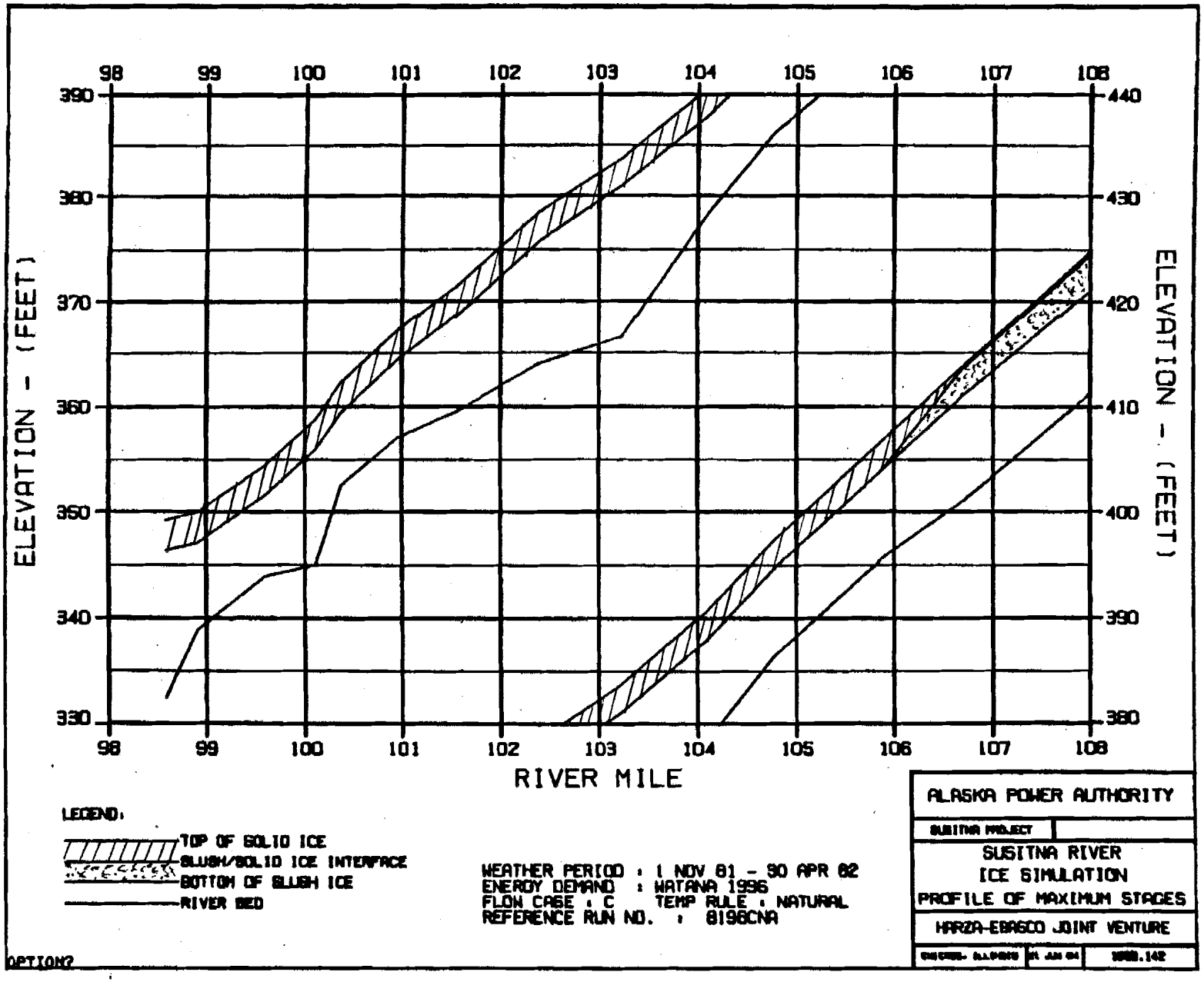
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8198CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
DRAWN: ALPHAS
31 JAN 84
8828.142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ELEVATION - (FEET)
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8196CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

EXHIBIT K

EXHIBIT K

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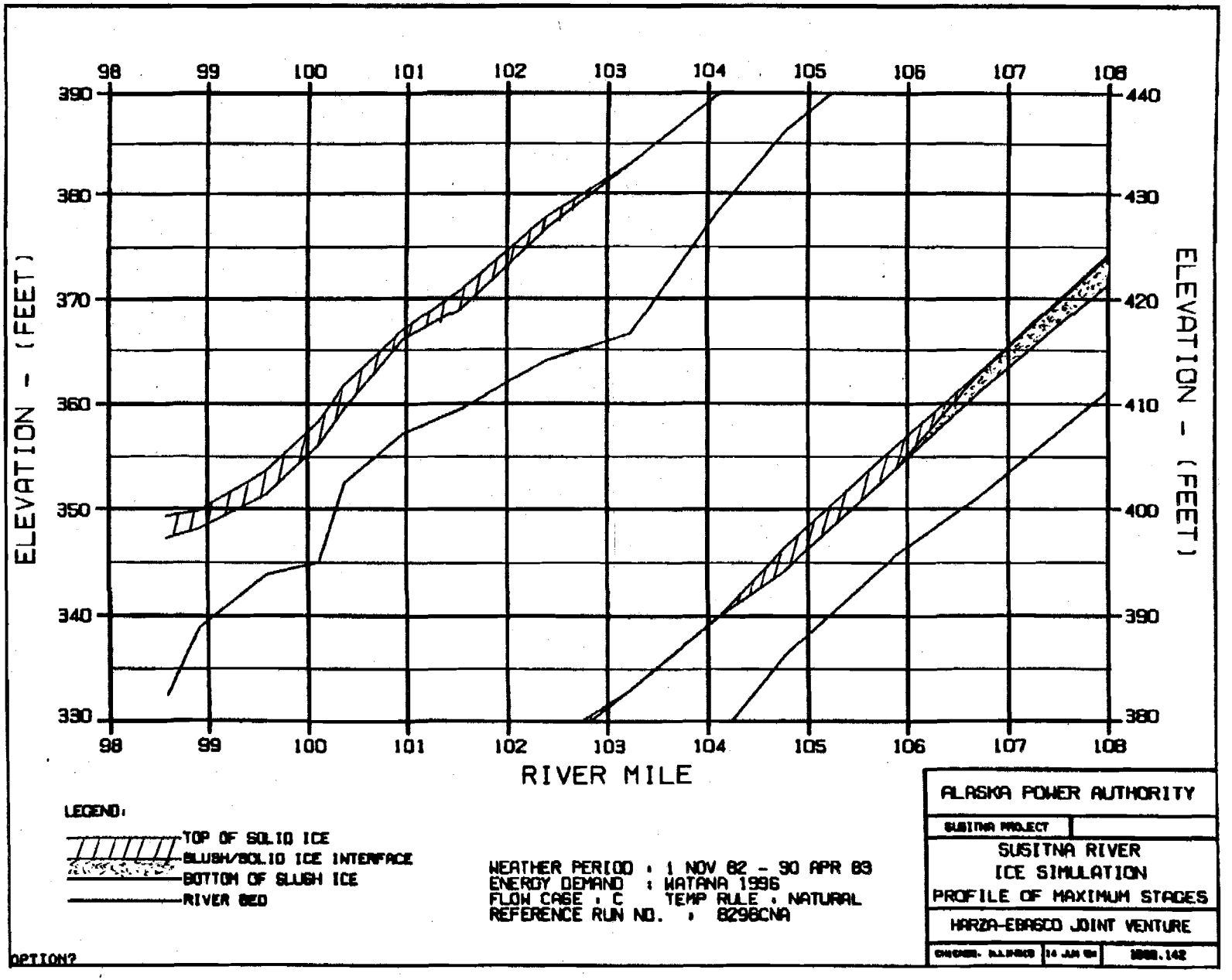
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ELEVATION - (FEET)
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8298CNA
OPTION2
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

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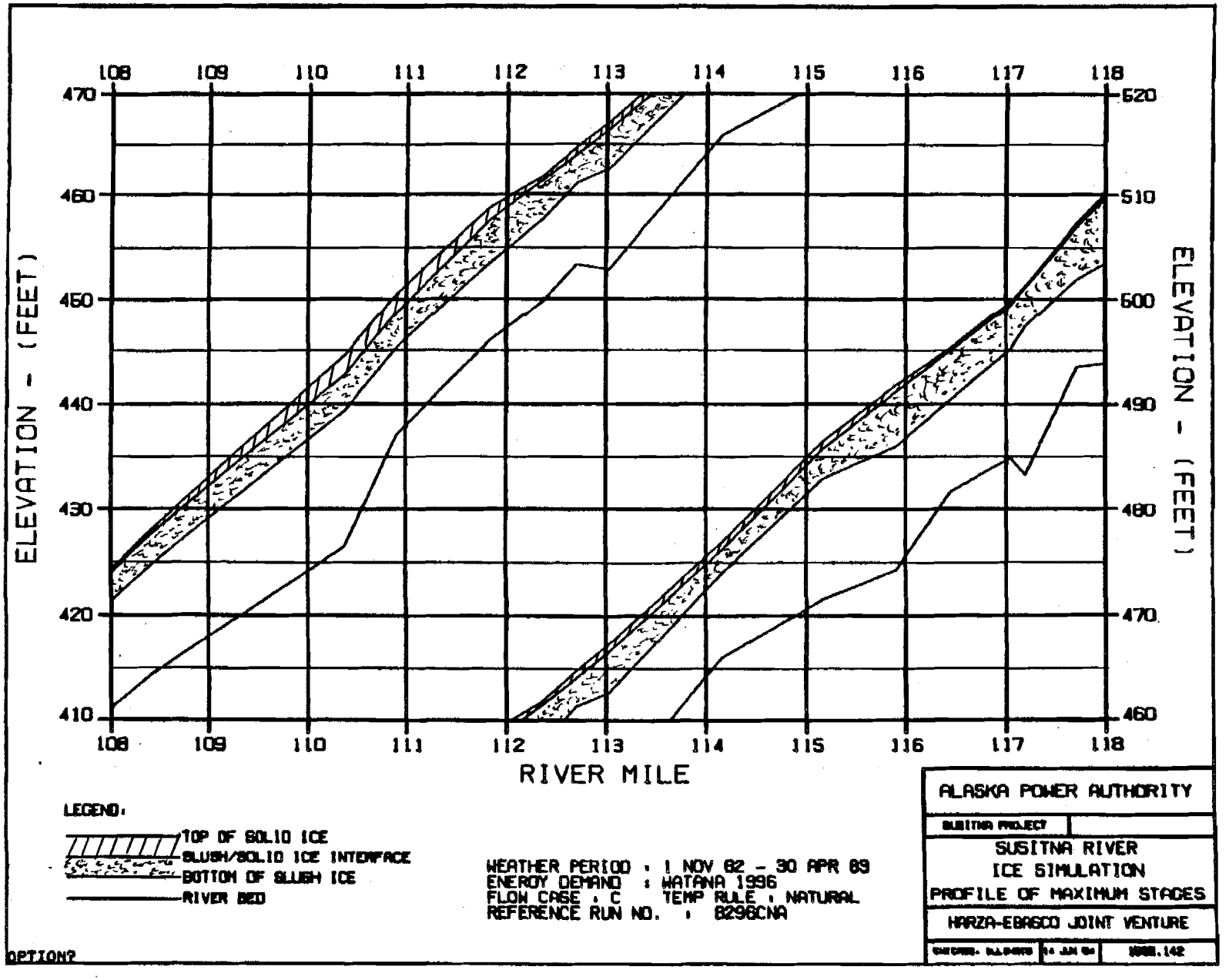
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 89
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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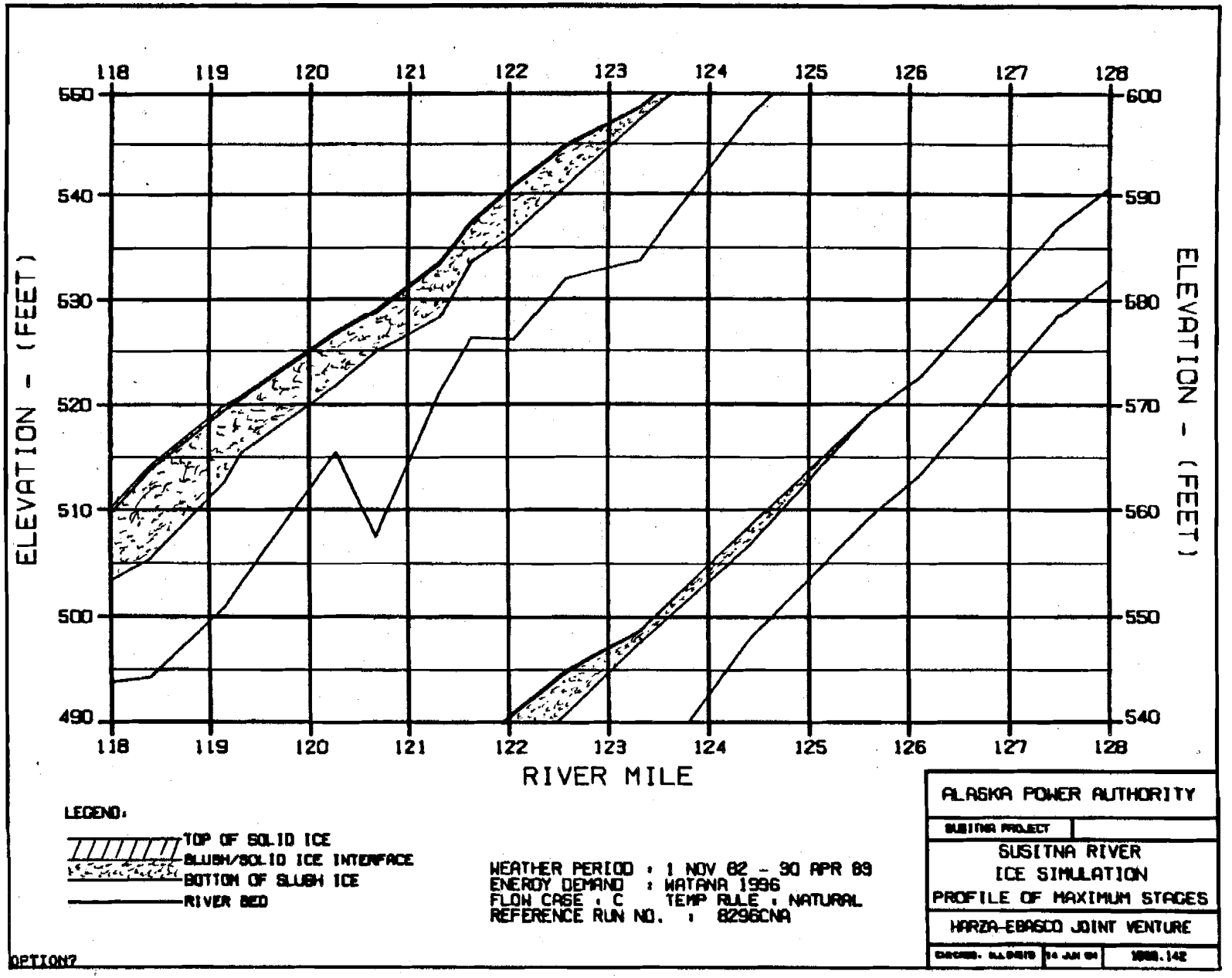
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 89
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

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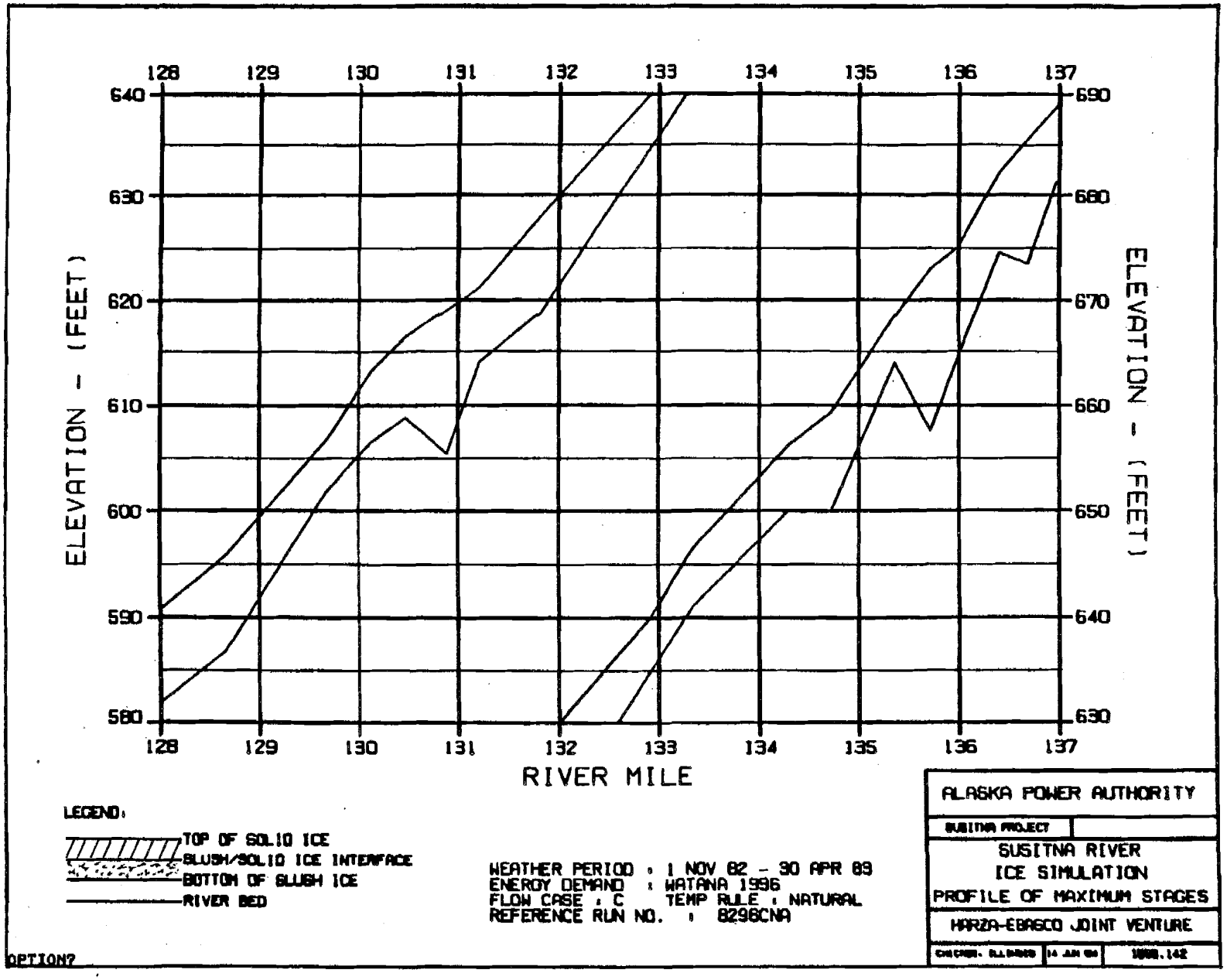
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
14 JAN 88
OPTION?

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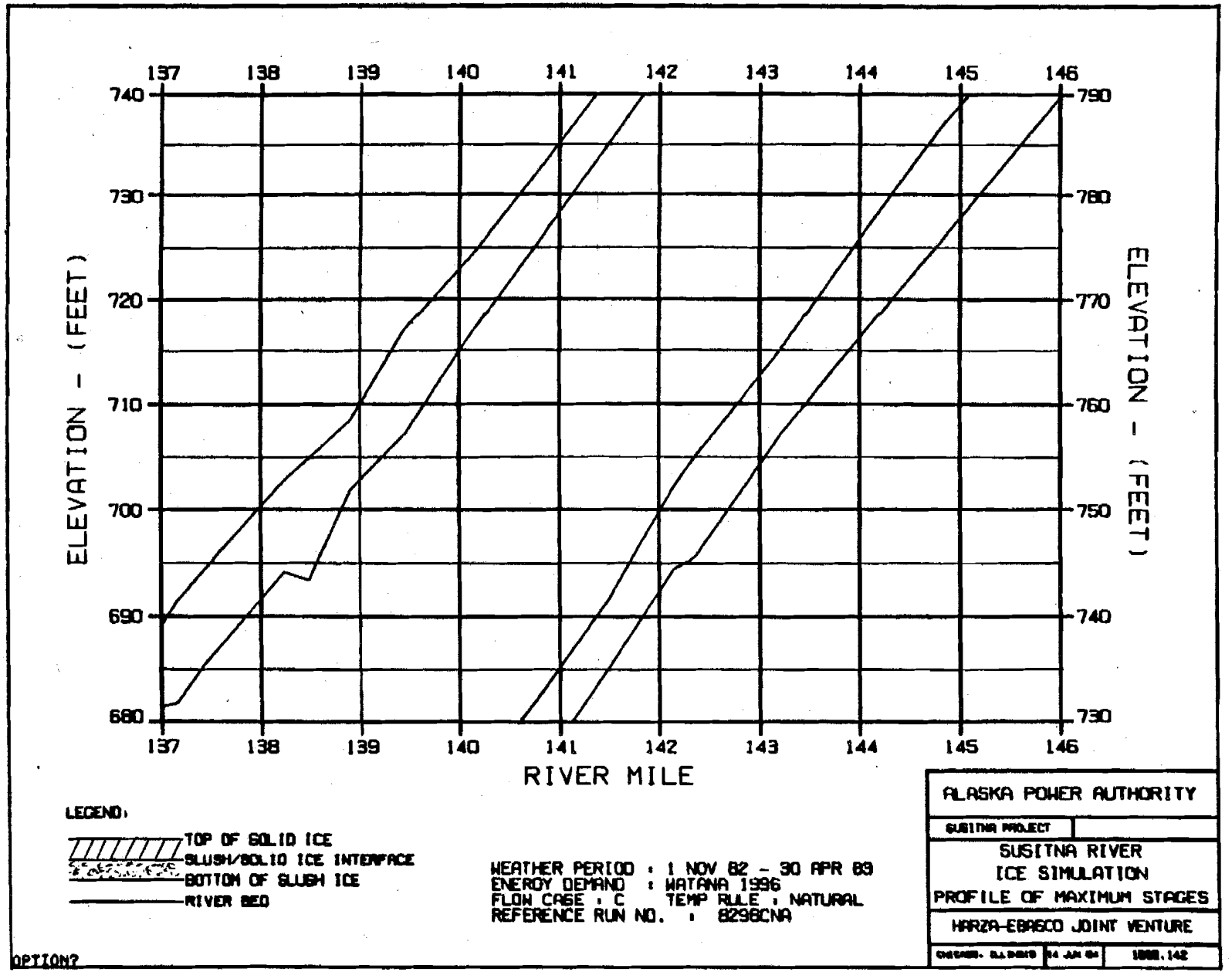
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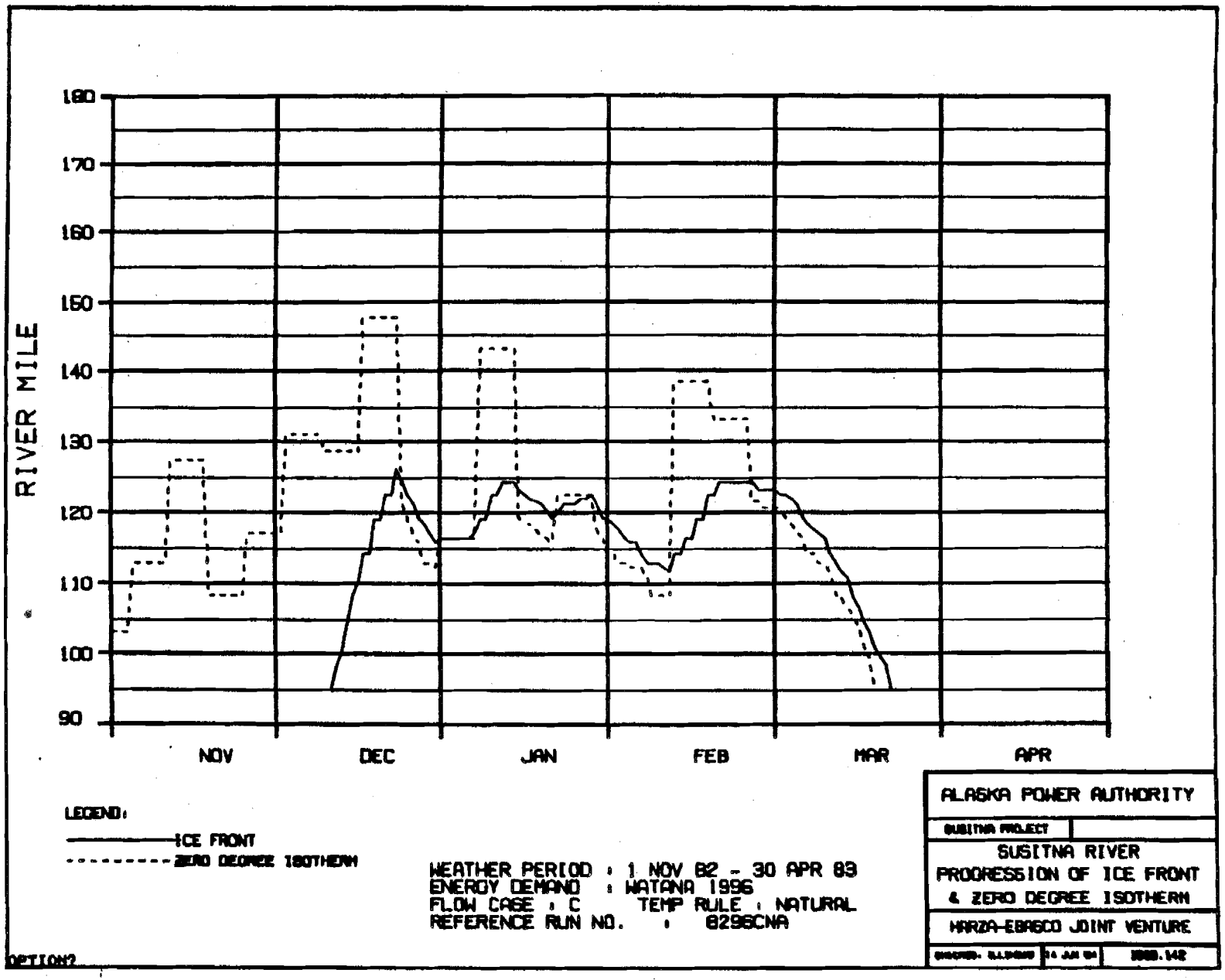
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : MATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8298CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2


RIVER MILE
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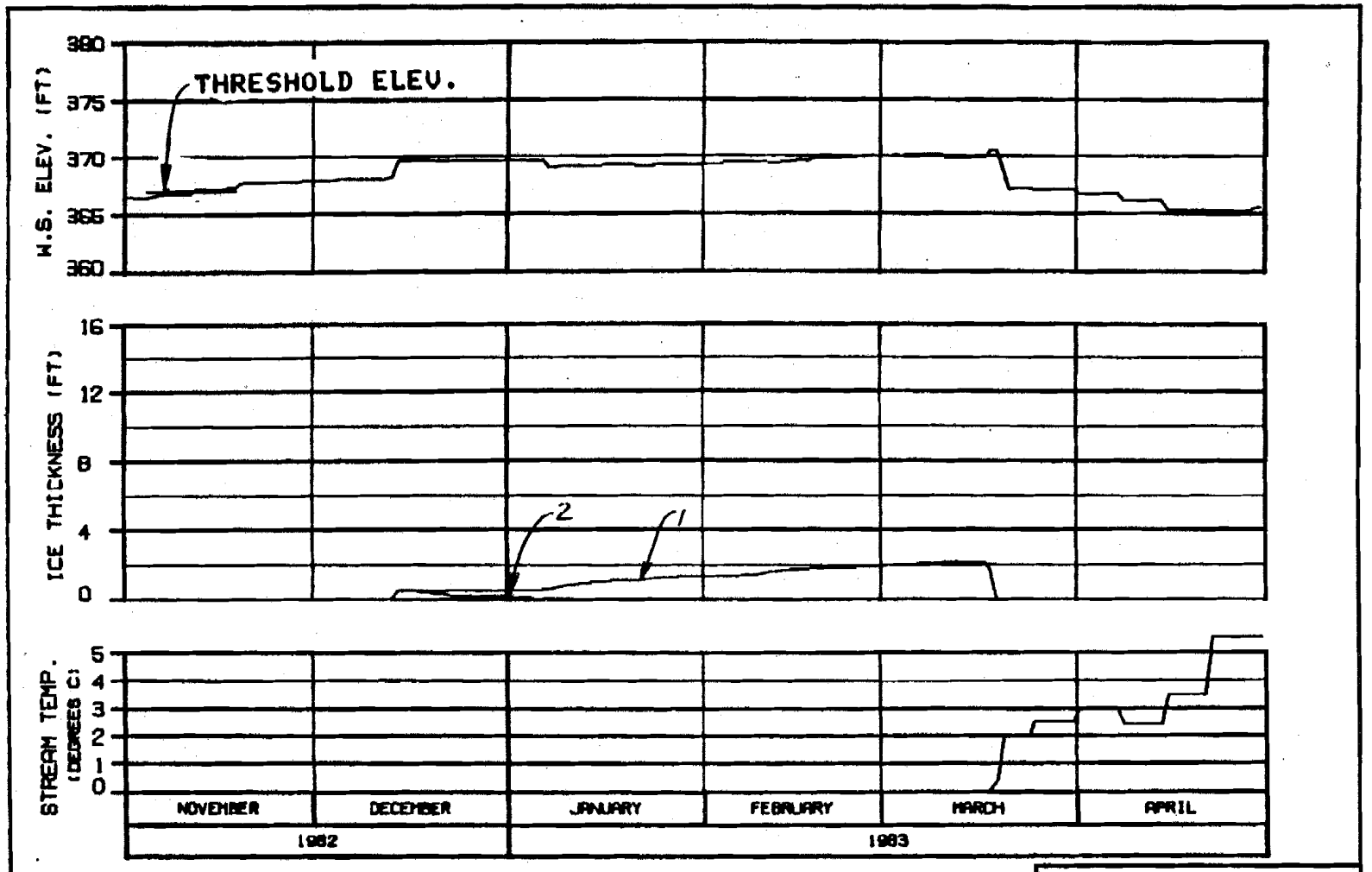
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION2



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

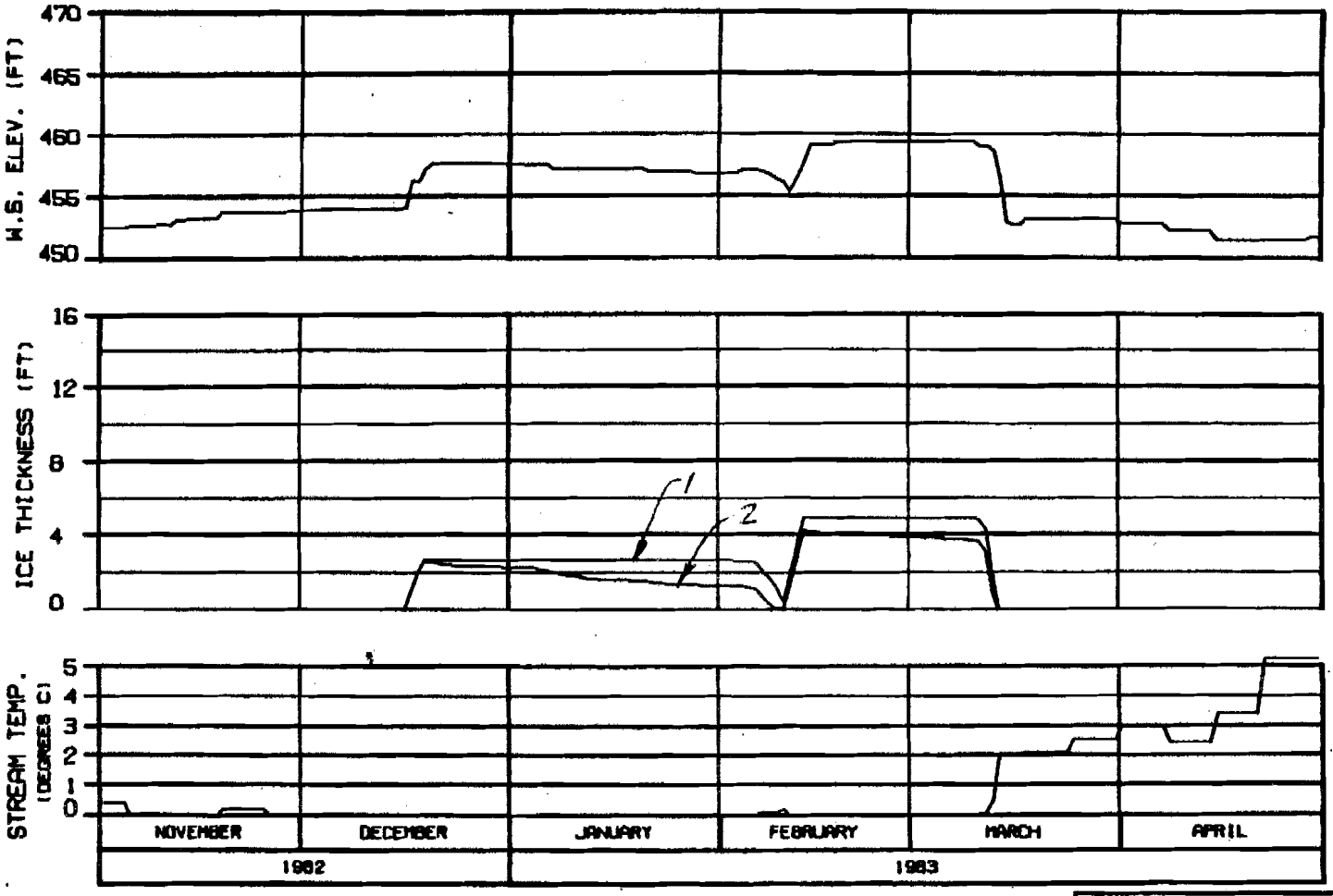
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: B.L.P.G.S. | 10 JAN 84 | 8888.142



SIDE CHANNEL AT HEAD OF GASH CREEK

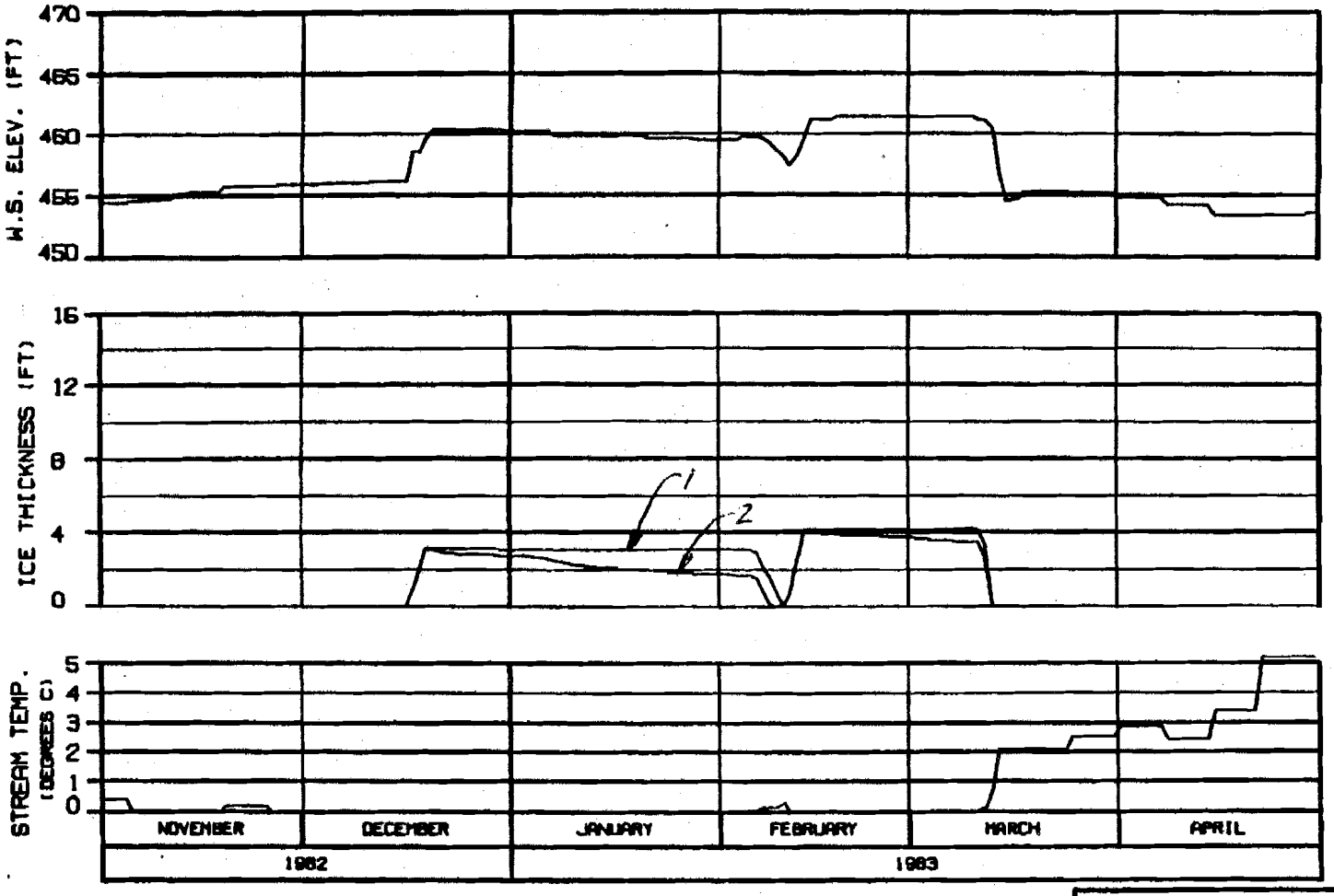
RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | 10 JAN 84 | 2868.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

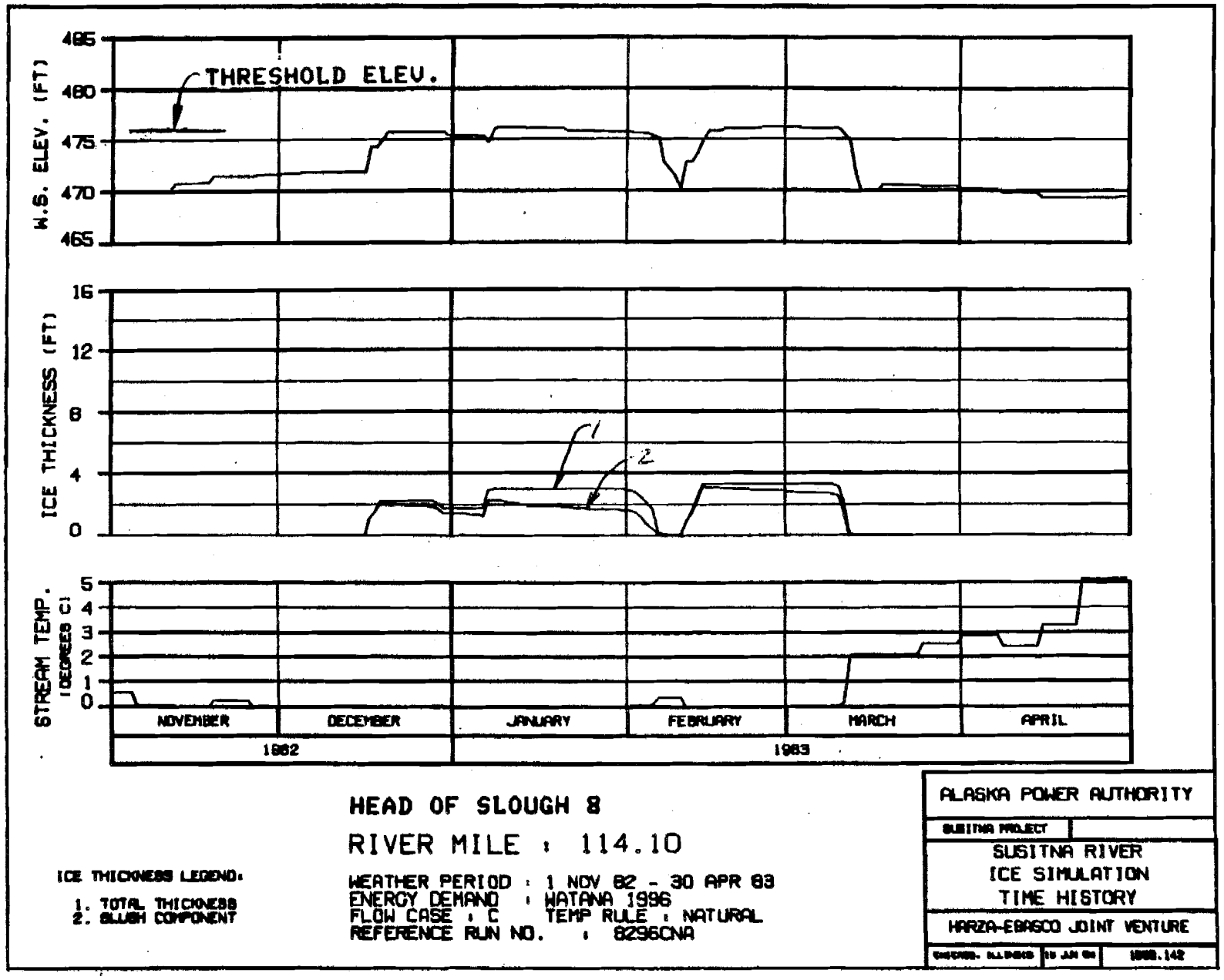
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

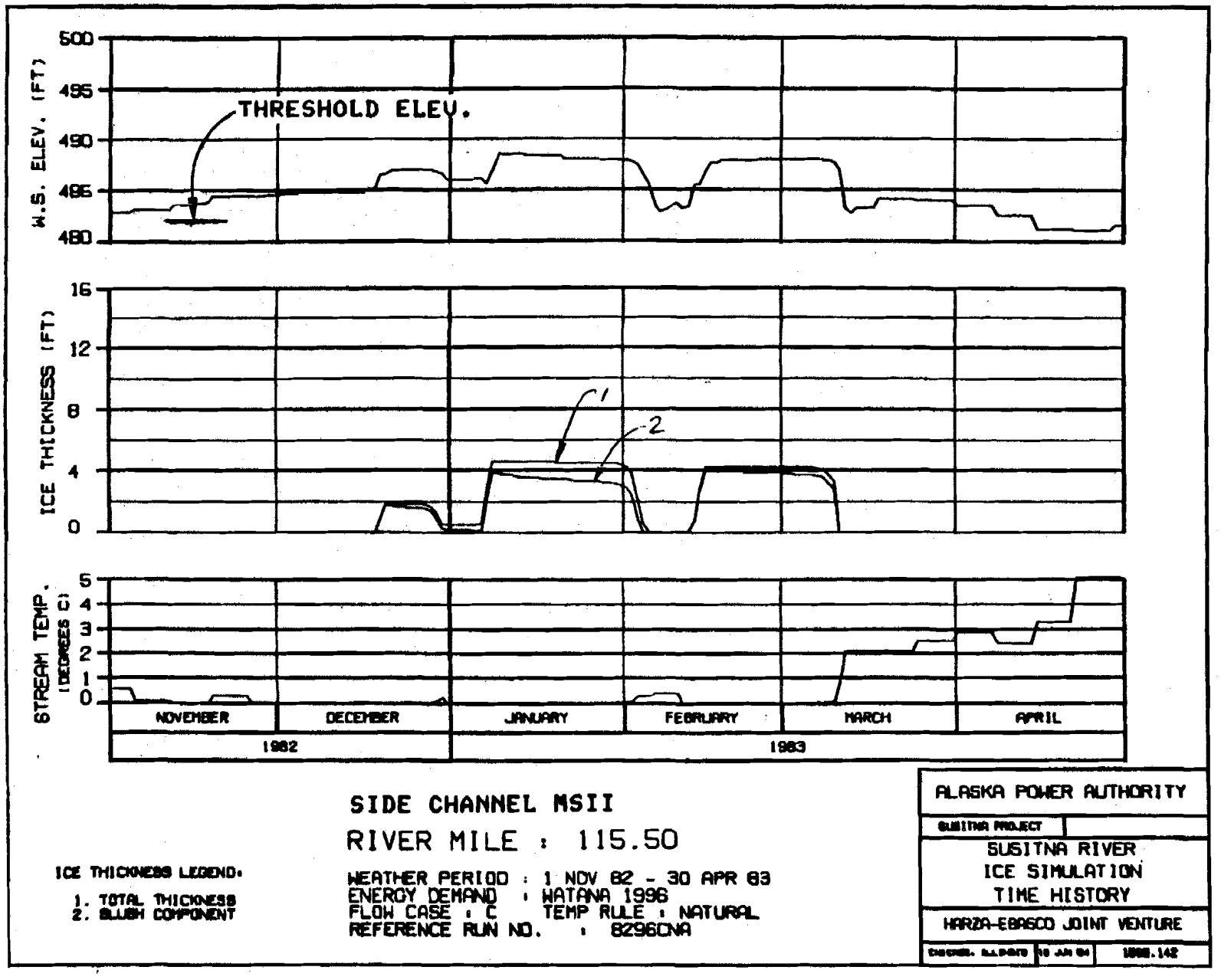
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 19 JAN 84 | 1868.142



SIDE CHANNEL MSII

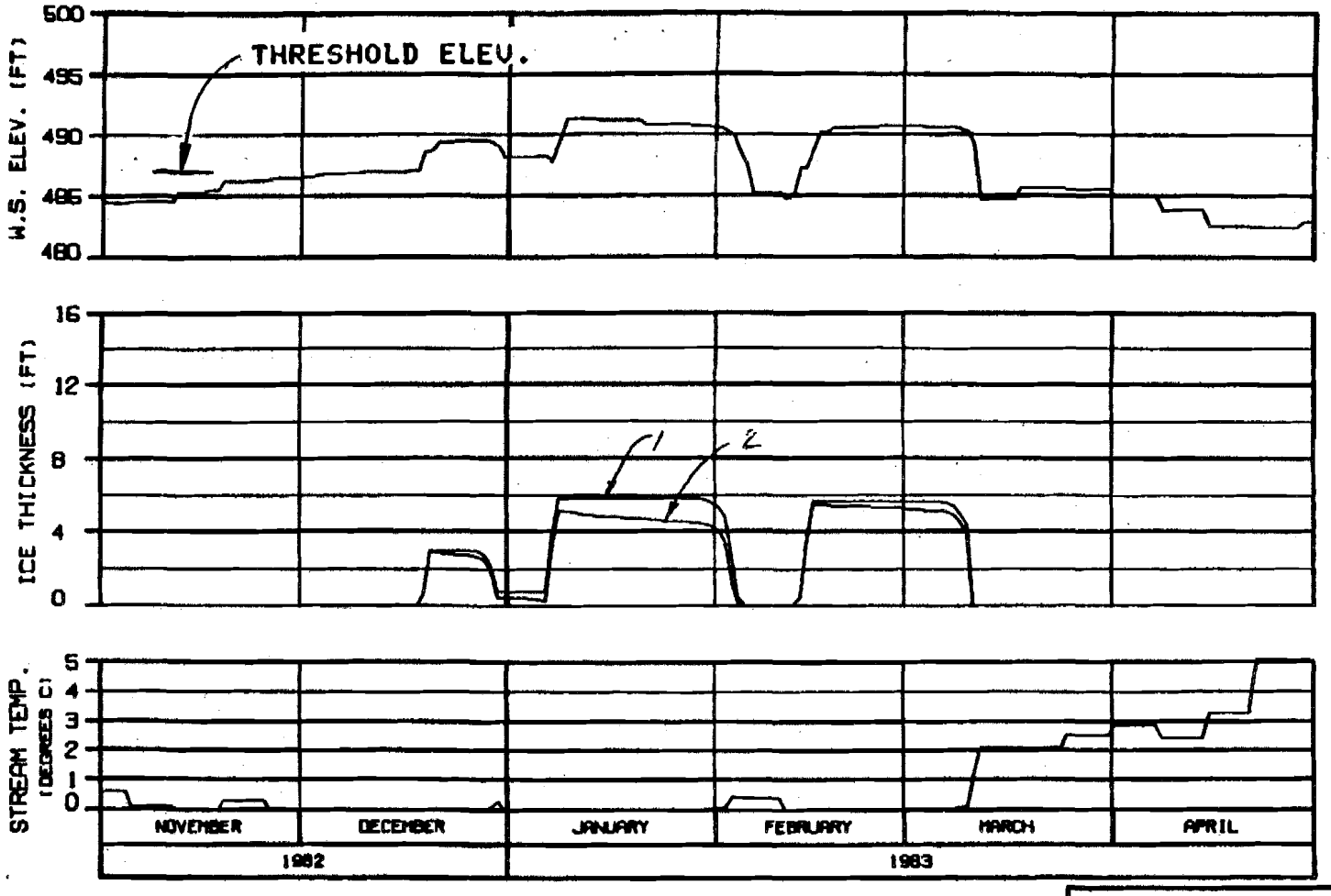
RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: S.L.PATE	18 JAN 84
	1868.142



HEAD OF SIDE CHANNEL MSII

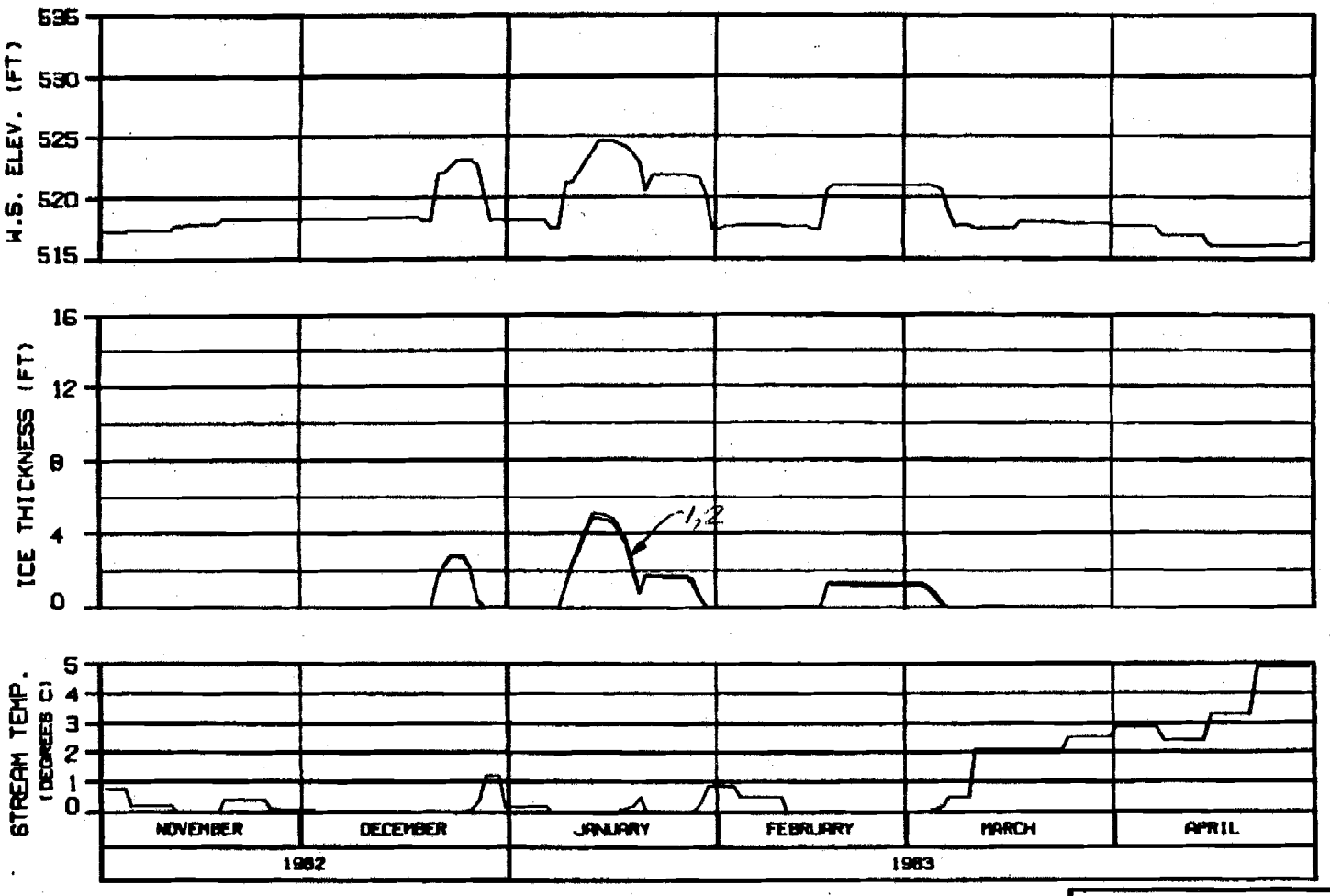
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	19 JUN 84 / M88.142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

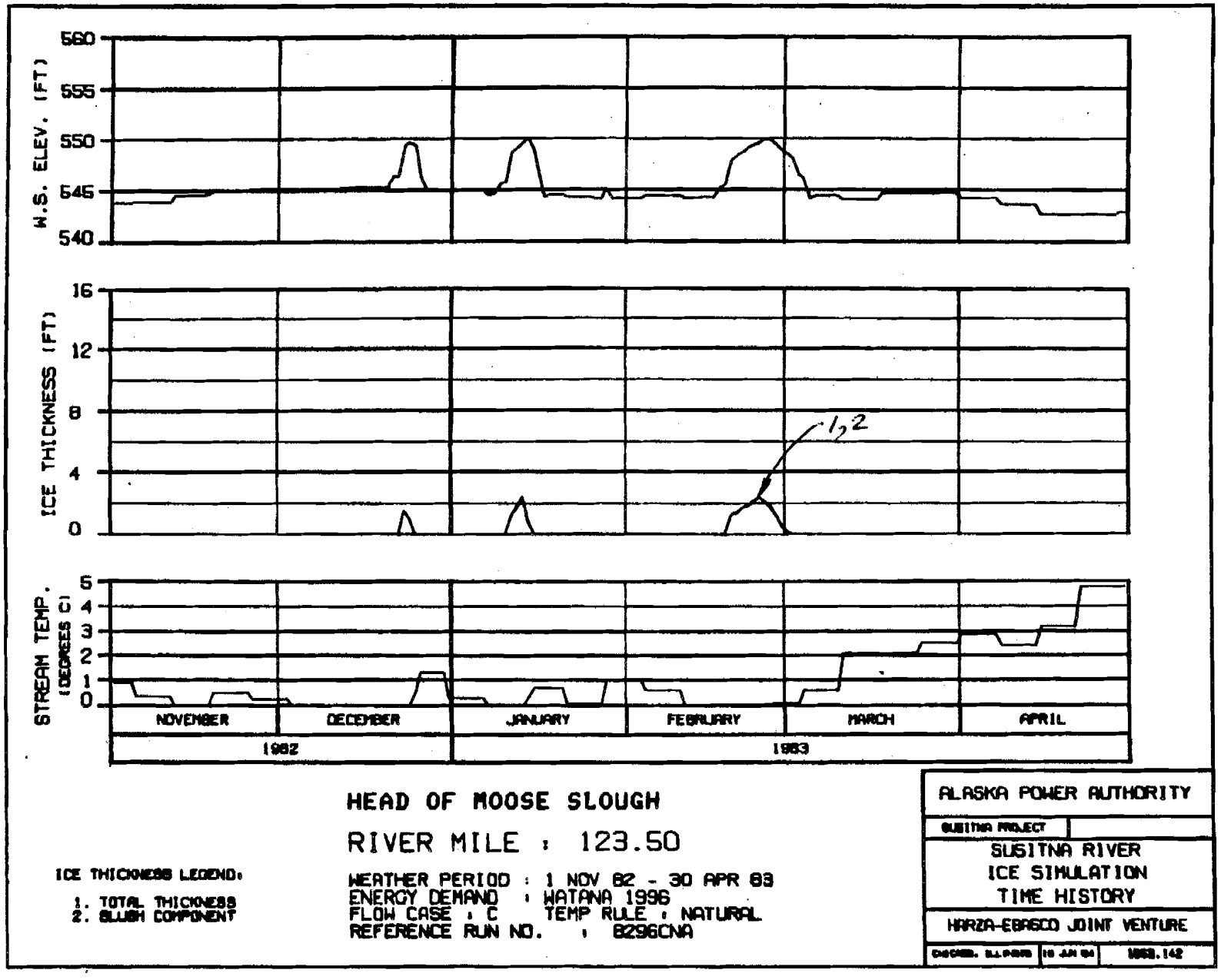
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1888.142



HEAD OF MOOSE SLOUGH

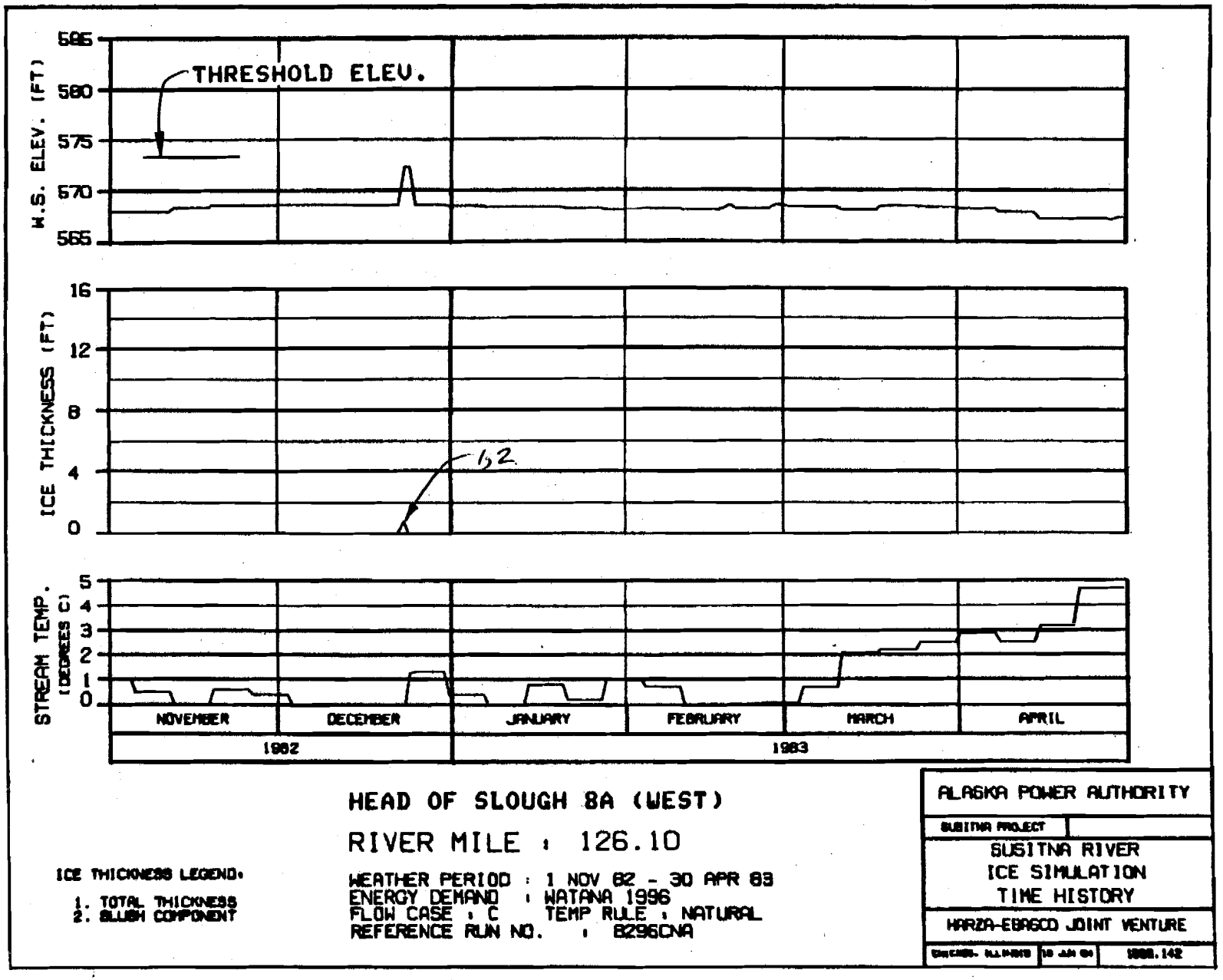
RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: S.L.P.S.S. | 10 JAN 84 | 1883.142



HEAD OF SLOUGH 8A (WEST)

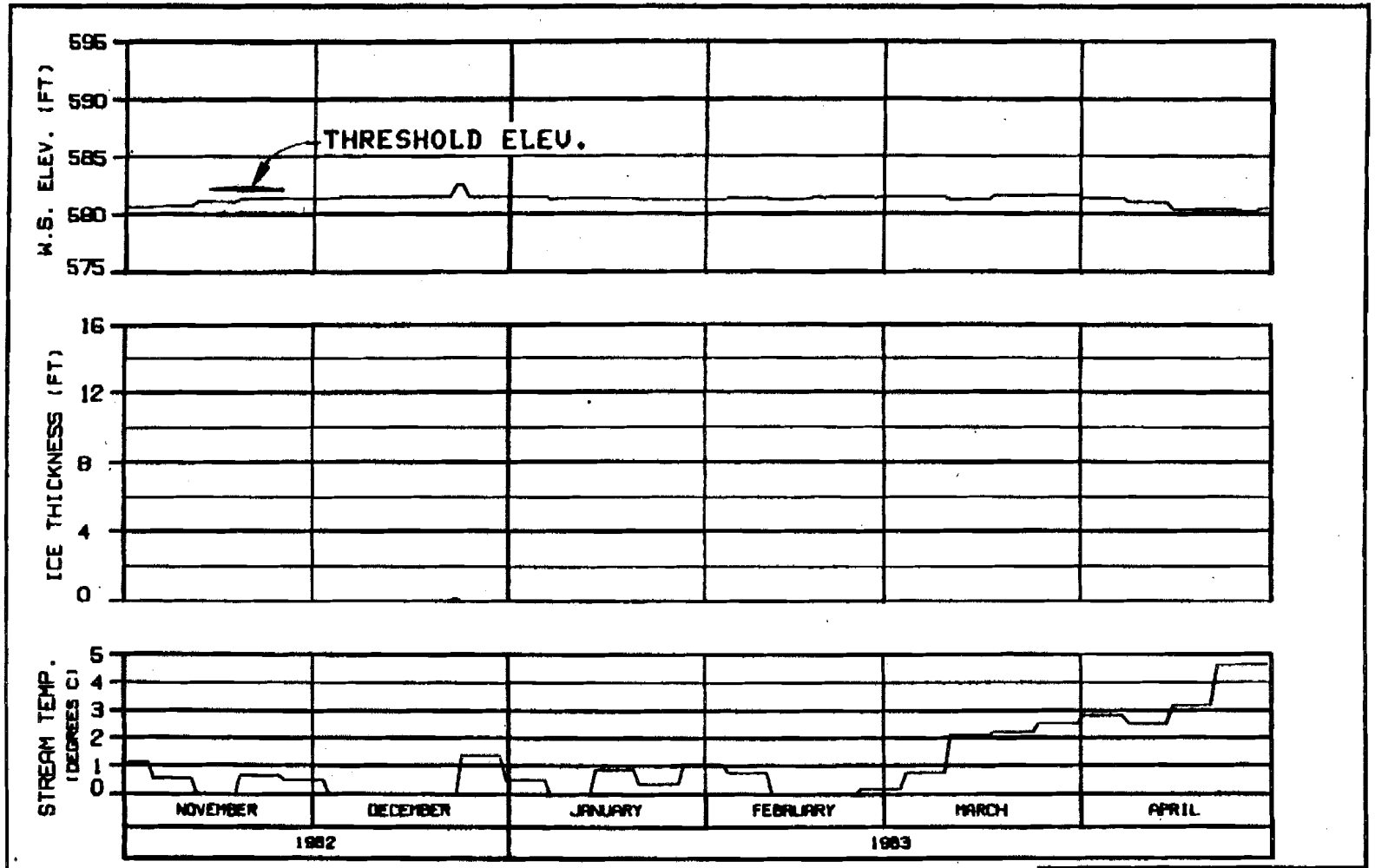
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	1988.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
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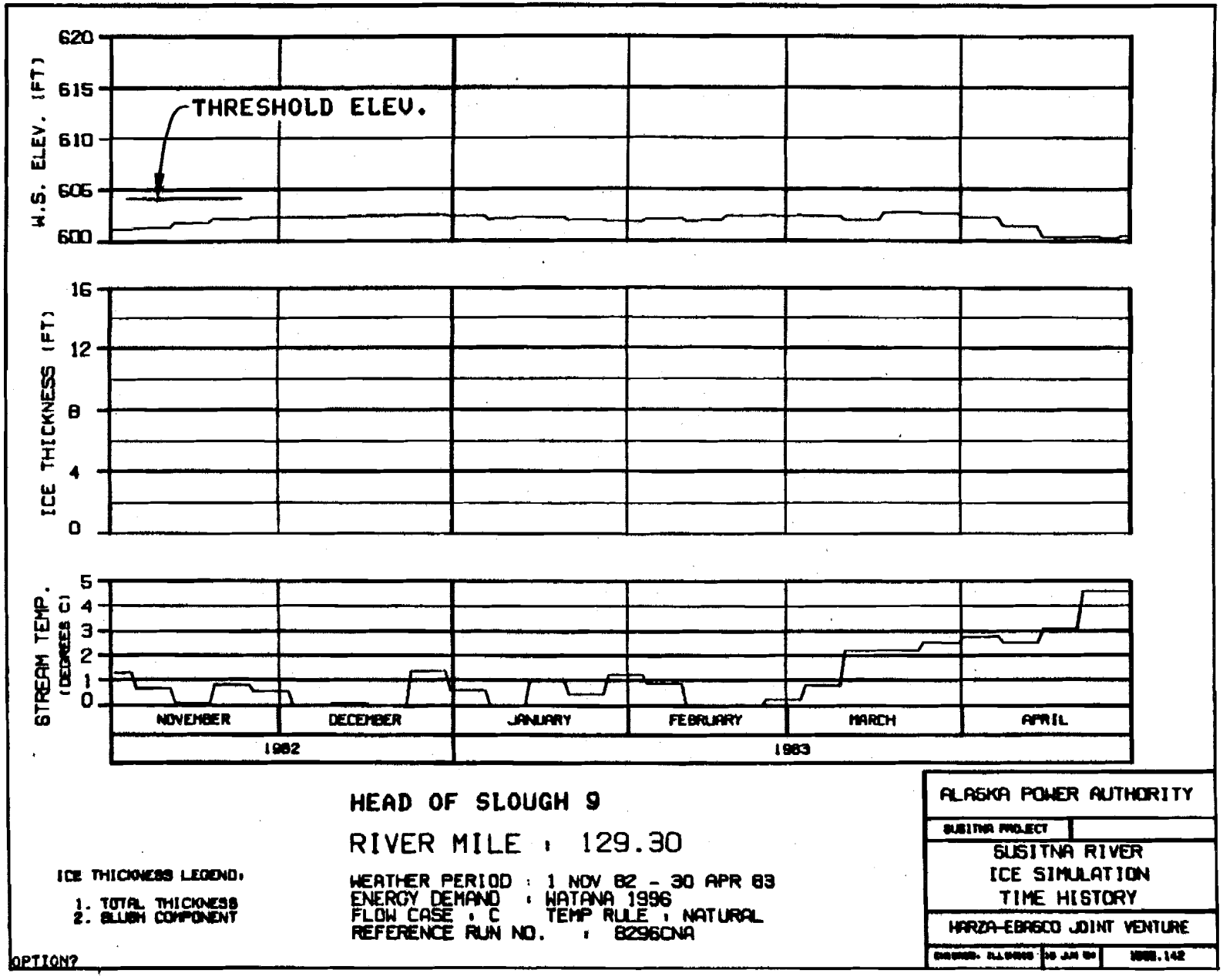
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: S.L.BASCO	1988.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

OPTION?

ALASKA POWER AUTHORITY

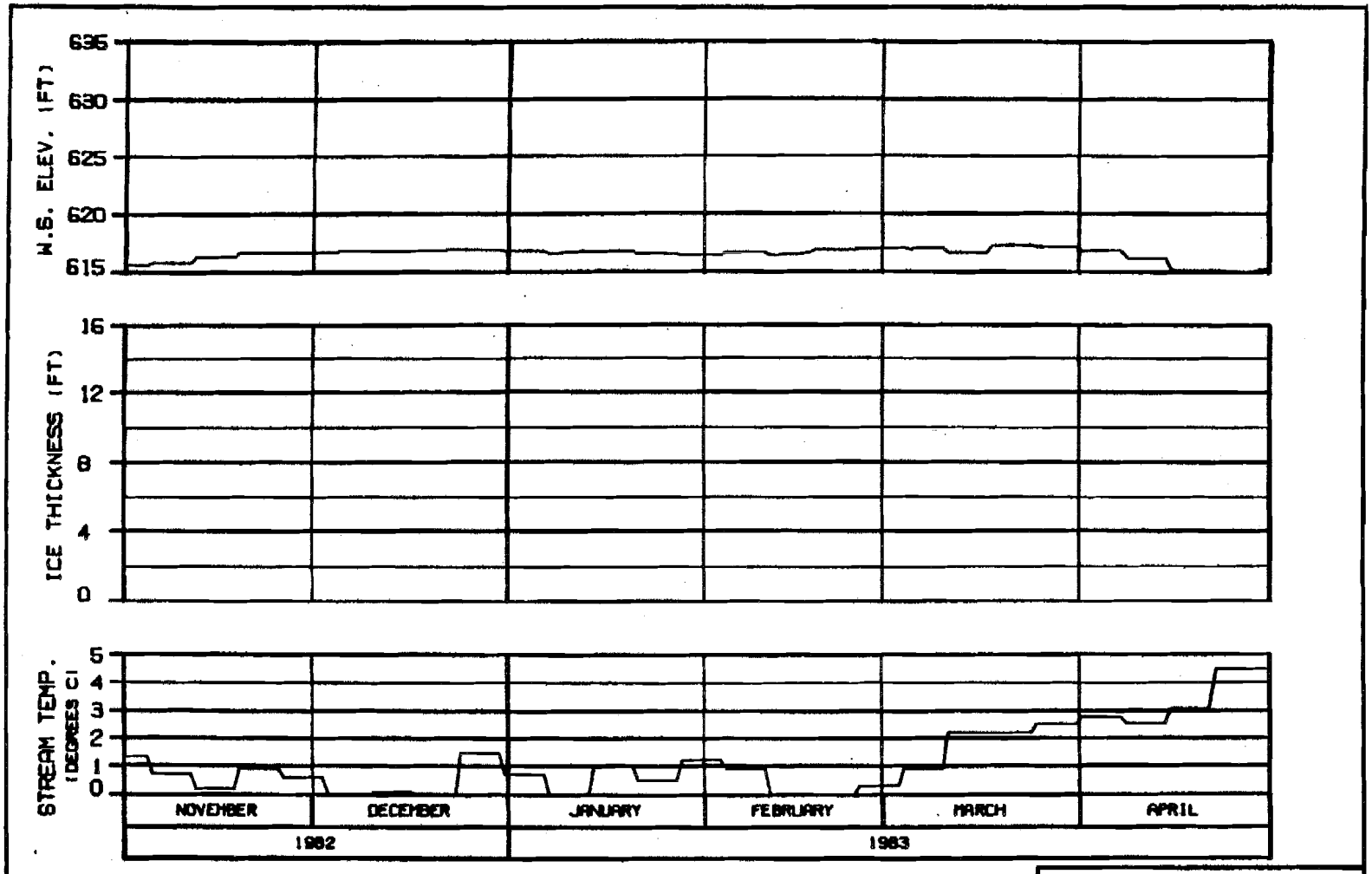
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 30 JAN 84 1888.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

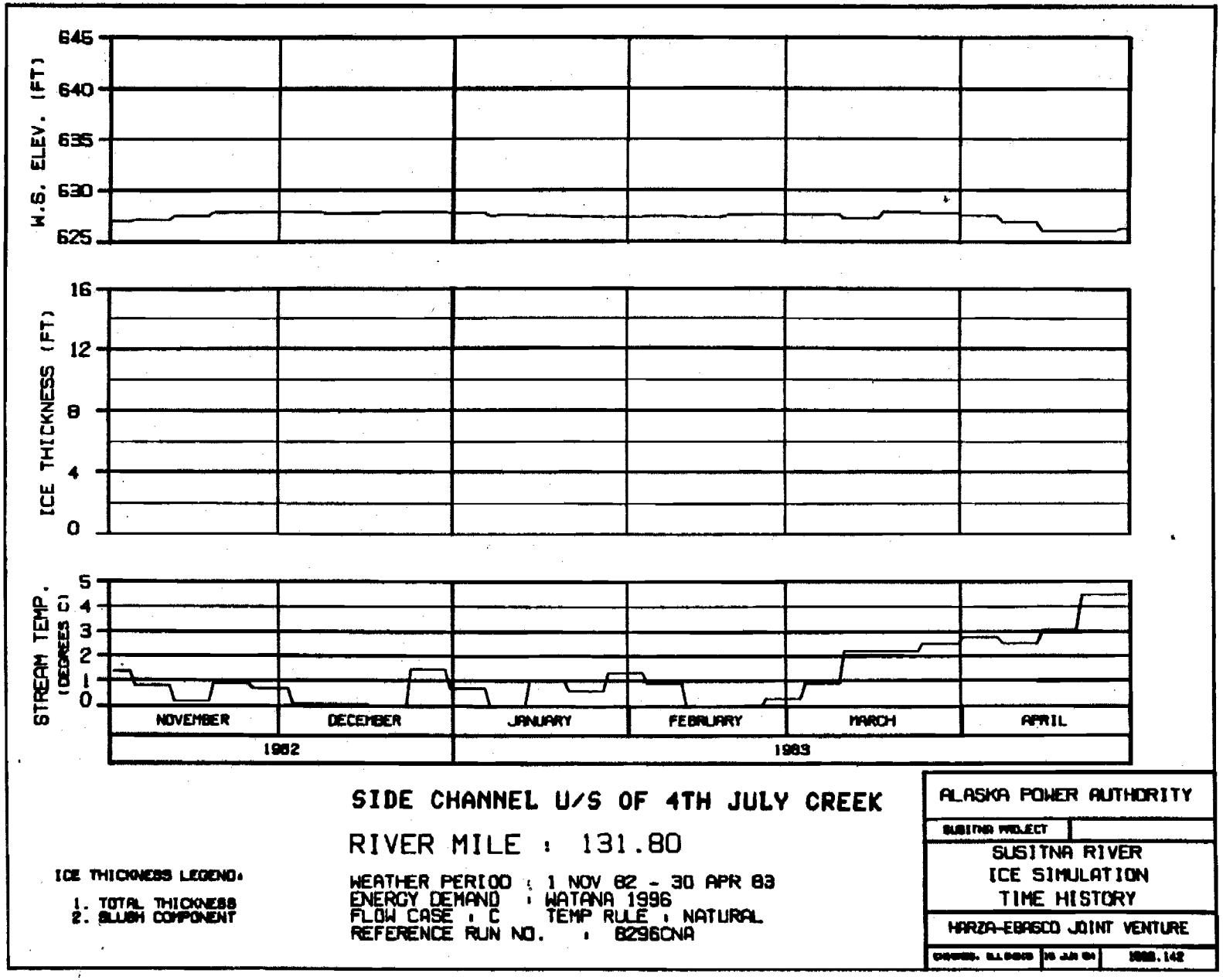
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
[illegible]	19 JAN 84



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

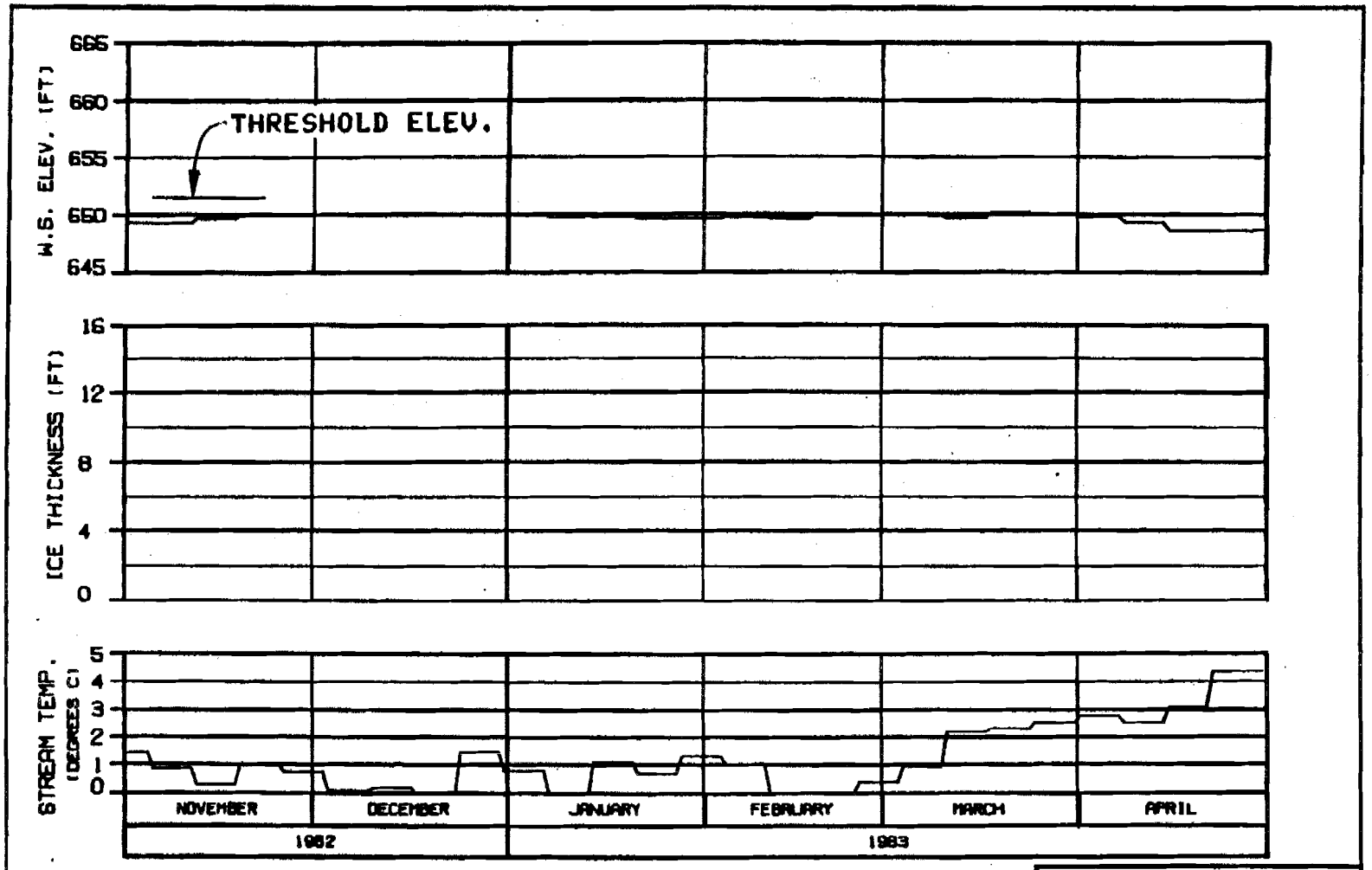
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: [illegible] 16 JAN 84 1988.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

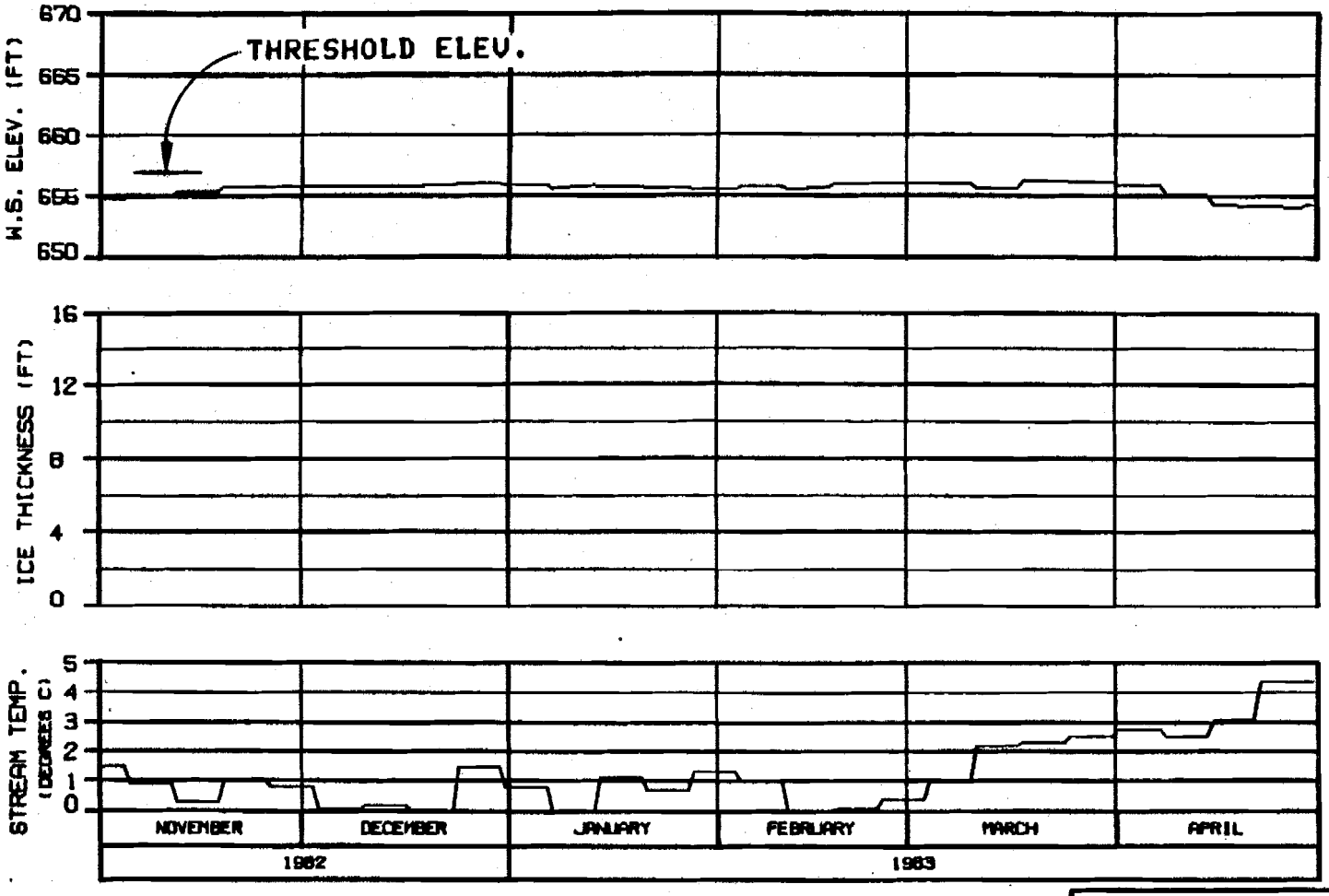
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



SIDE CHANNEL U/S OF SLOUGH 10

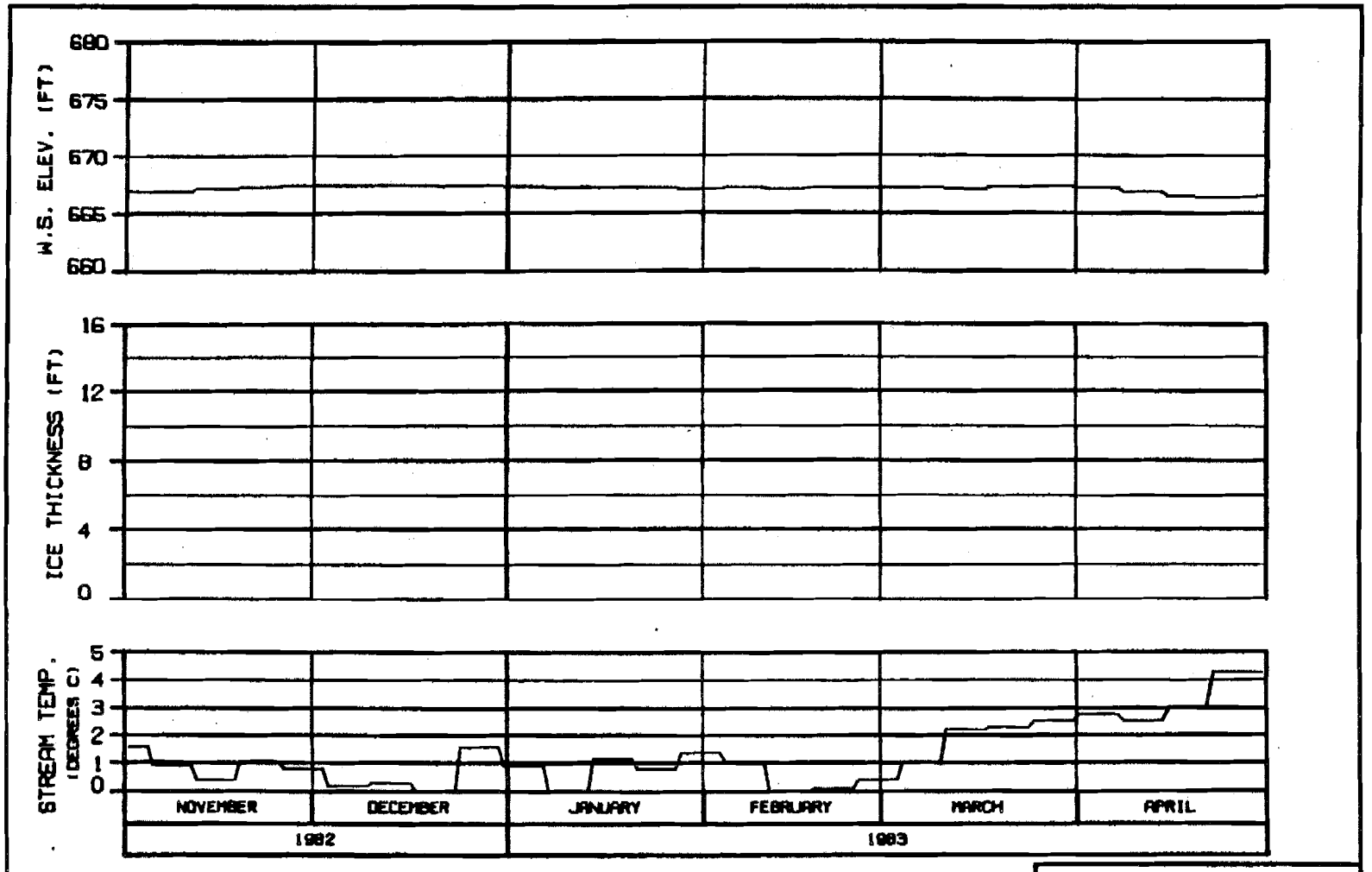
RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: S.L.D.B.S.S.	10 JUN 84 / 1986.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

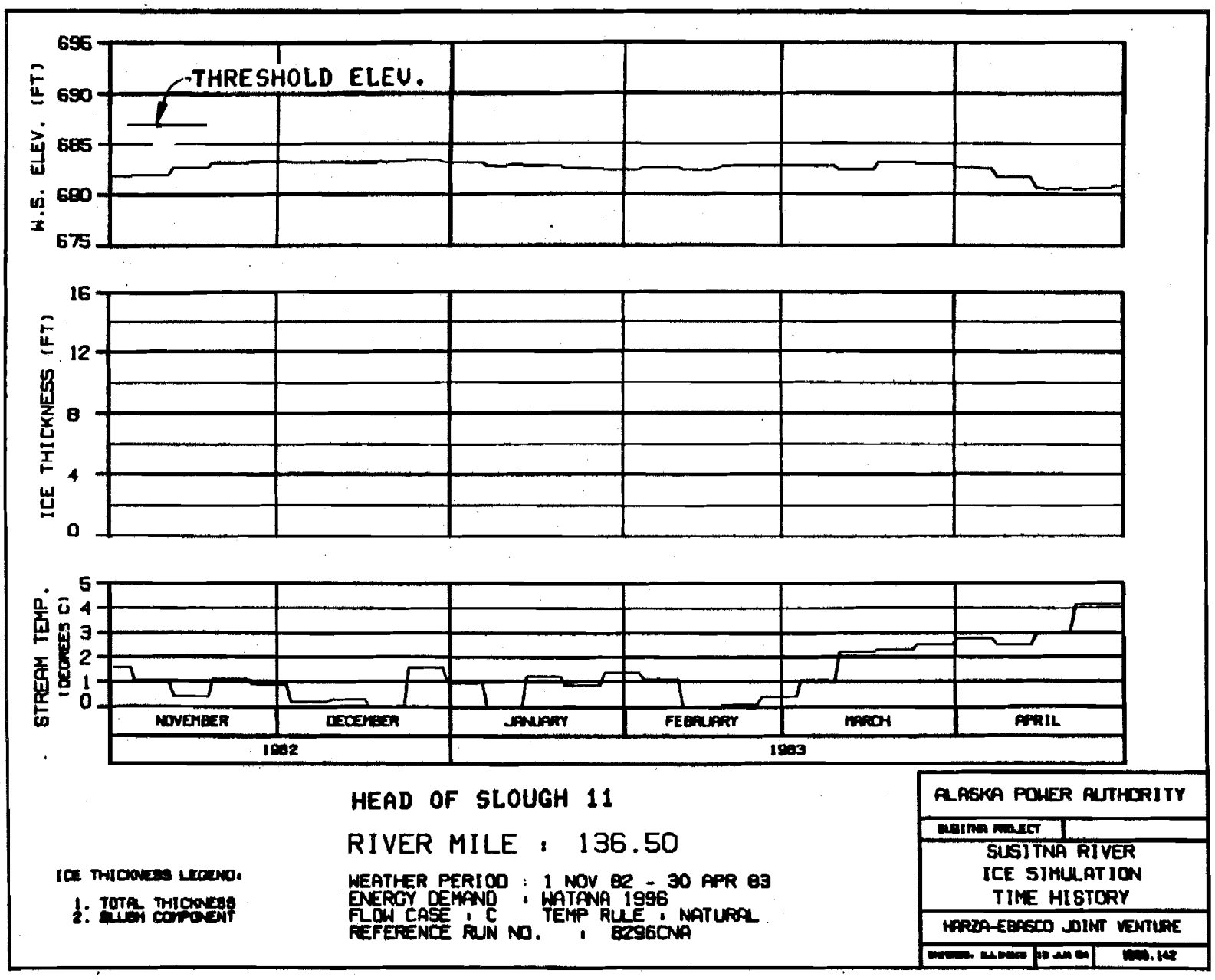
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.A.DAVIS | 18 JAN 84 | 1888.142



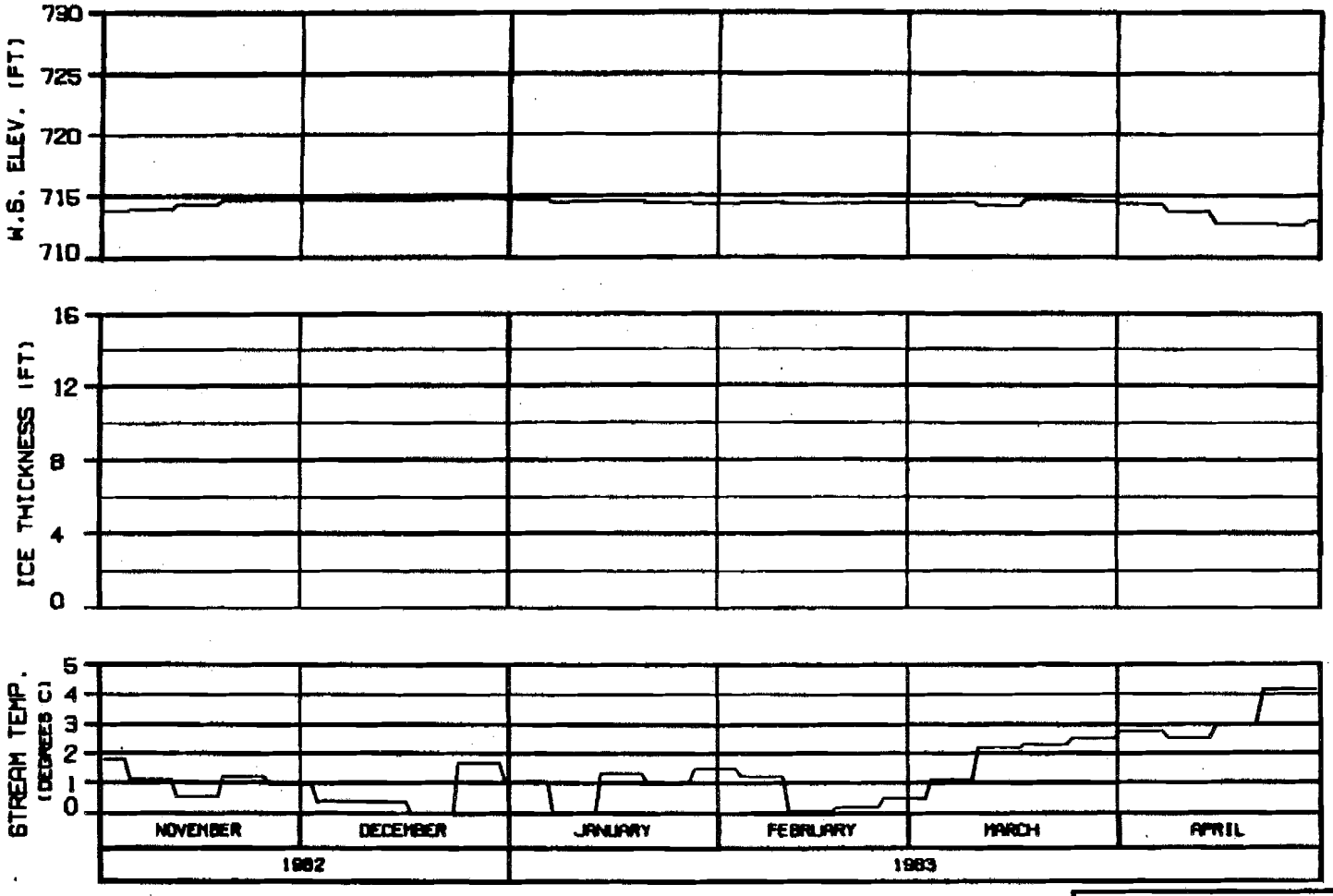
HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

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



HEAD OF SLOUGH 17

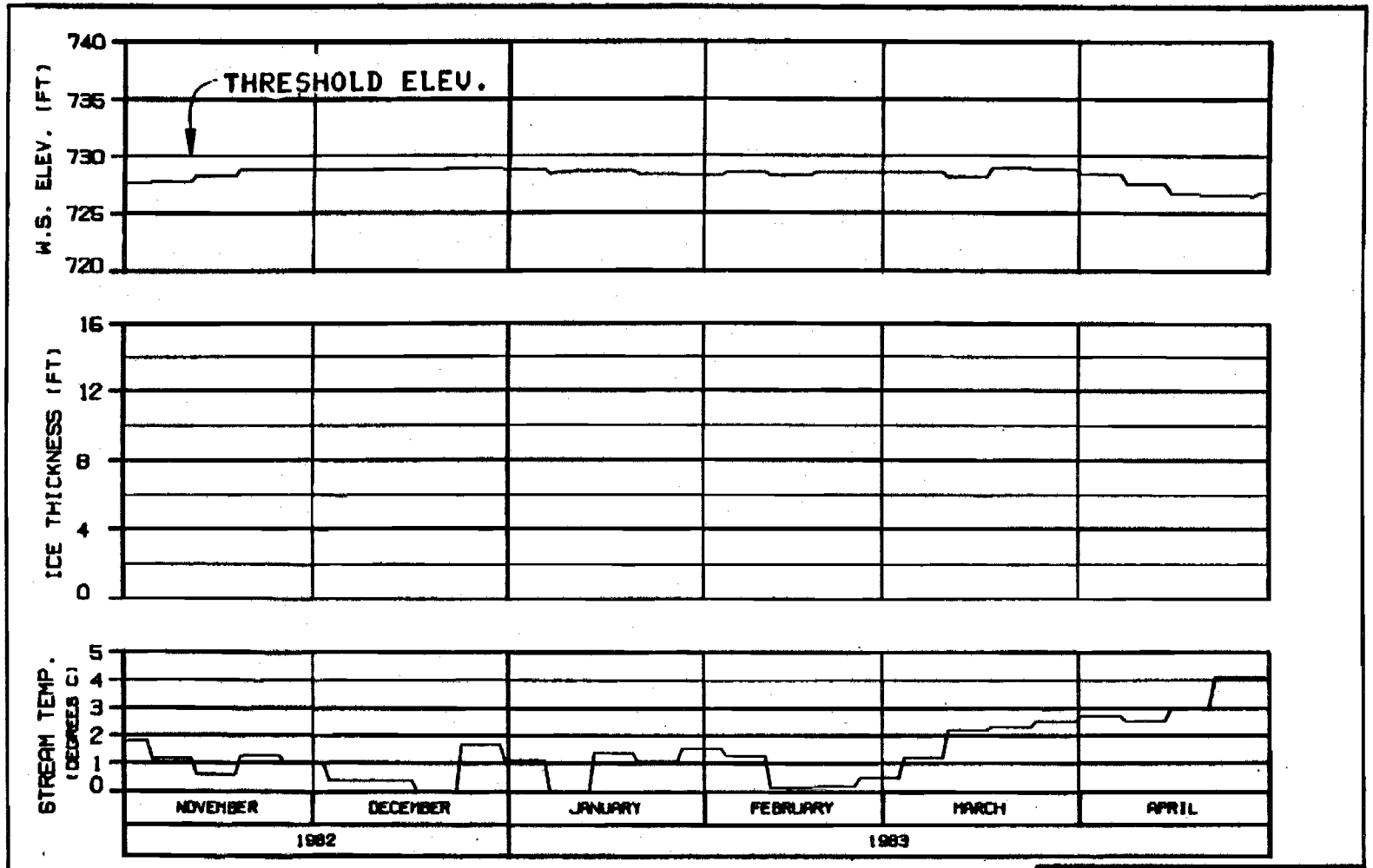
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
[illegible]	19 JAN 84 / 1988.142



HEAD OF SLOUGH 20

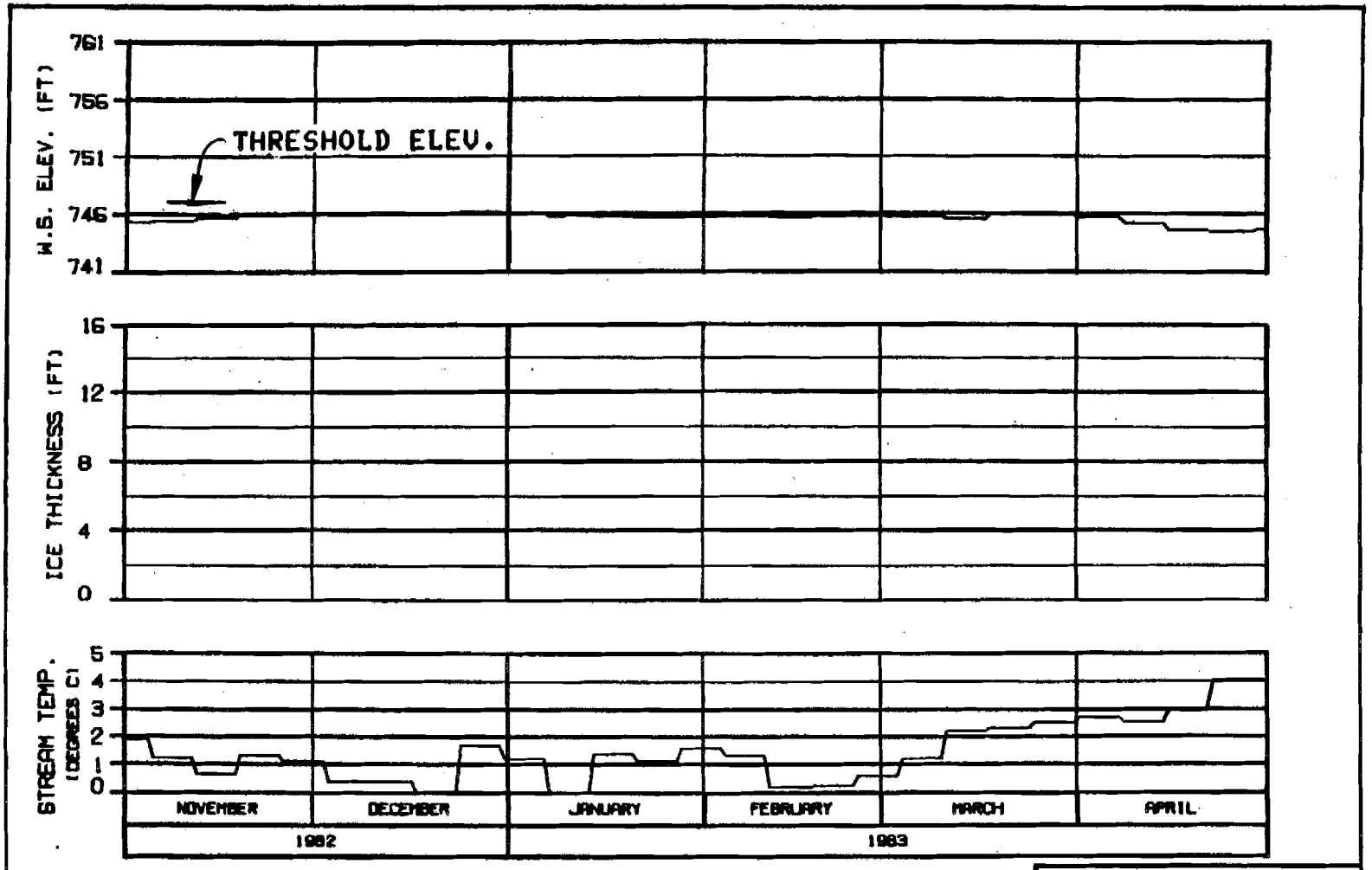
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

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



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

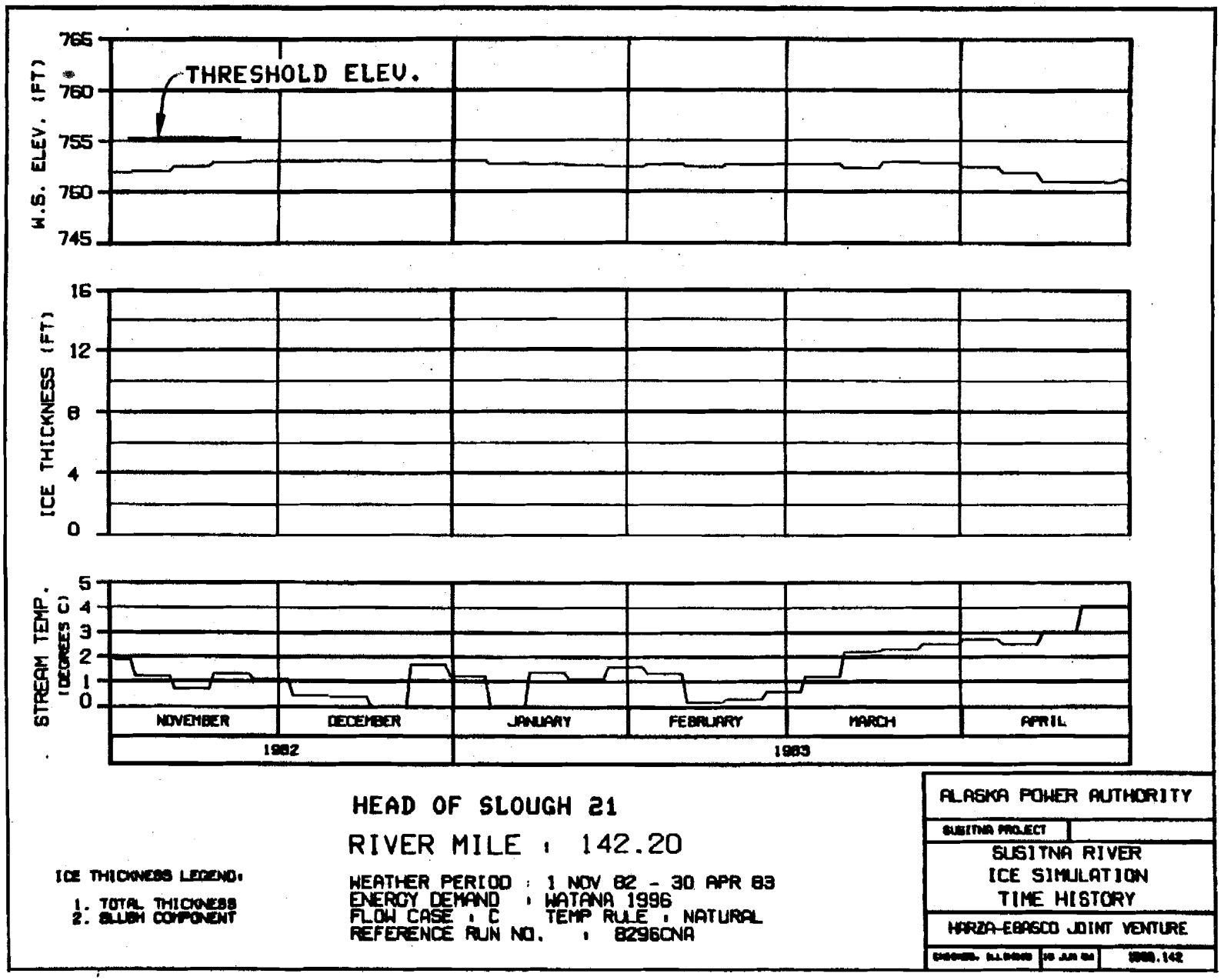
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 21

RIVER MILE : 142.20

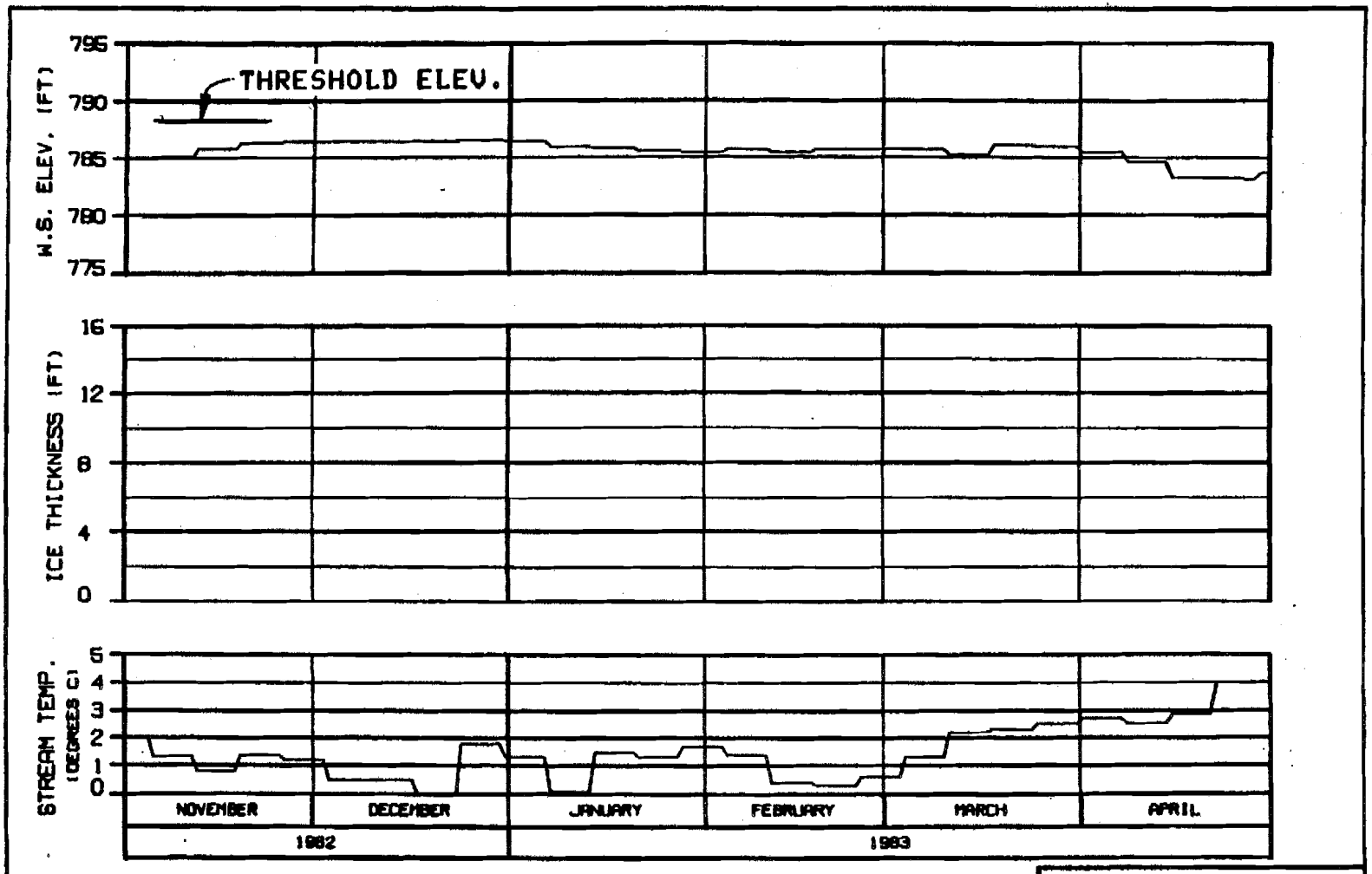
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: [illegible] 10 JAN 84 1988.142

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 1996
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8296CNA

OPTION?

ALASKA POWER AUTHORITY

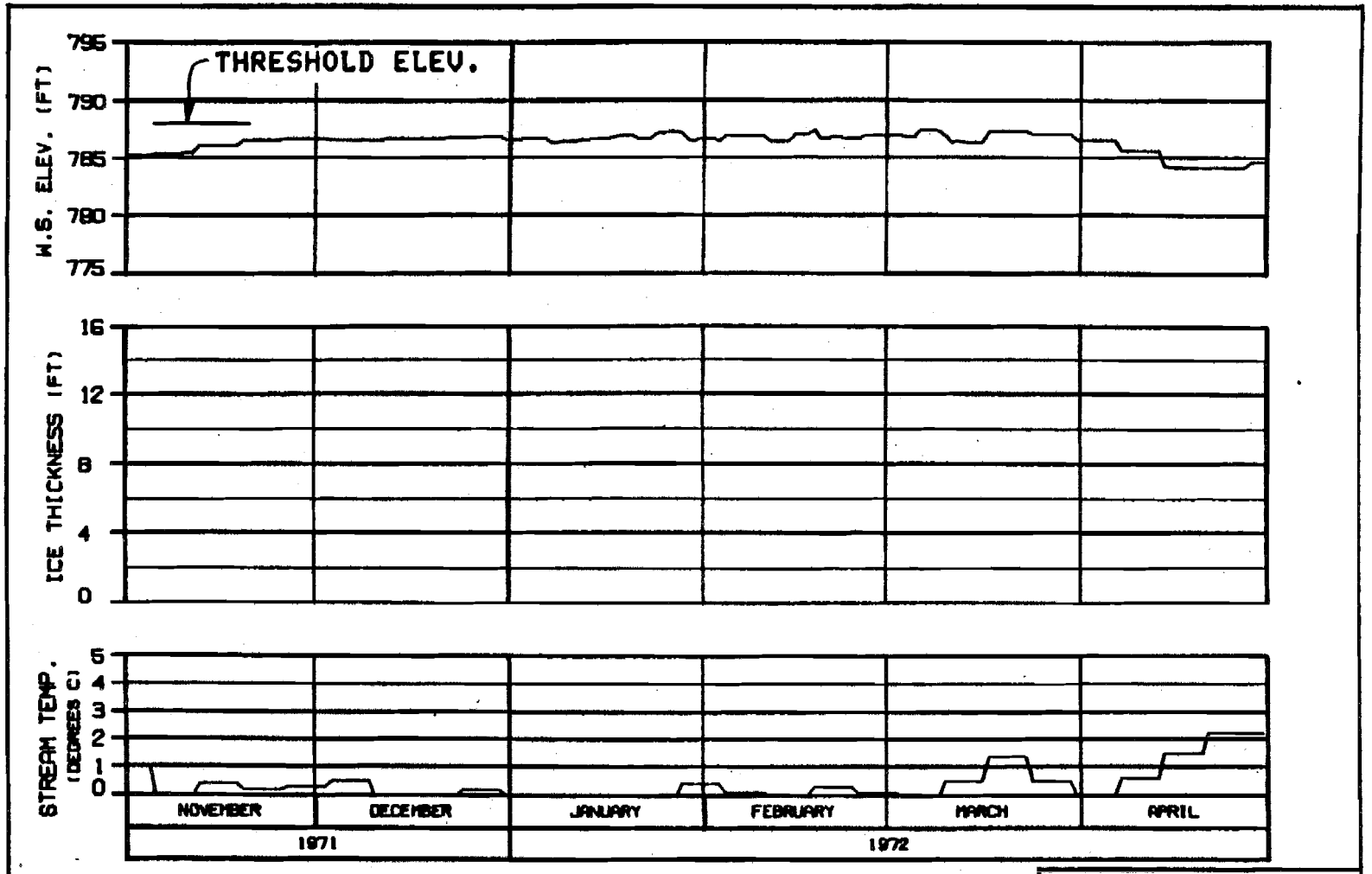
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 30 JAN 83 8296.142

EXHIBIT L



HEAD OF SLOUGH 22

RIVER MILE : 144.80

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

OPTION?

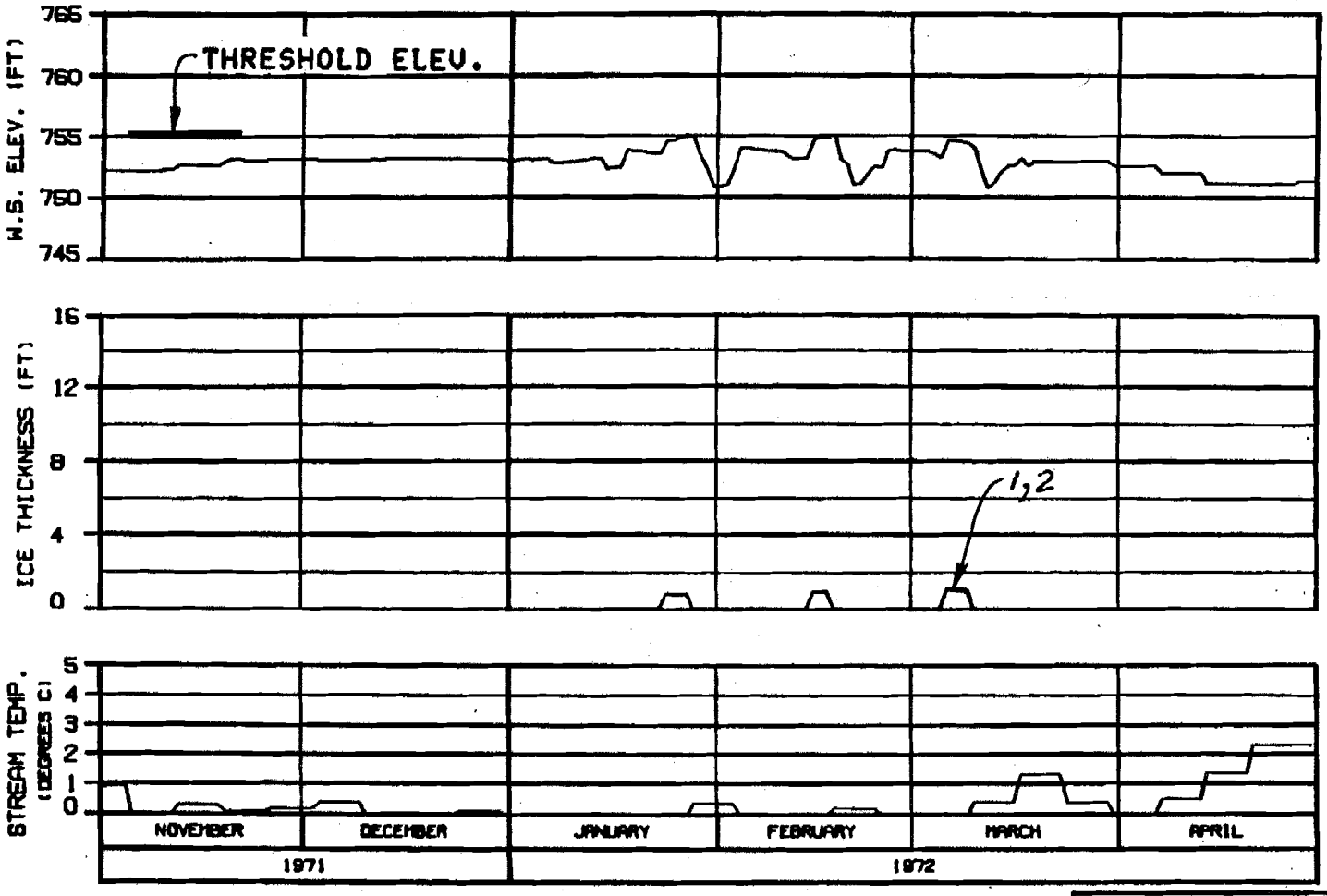
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



HEAD OF SLOUGH 21

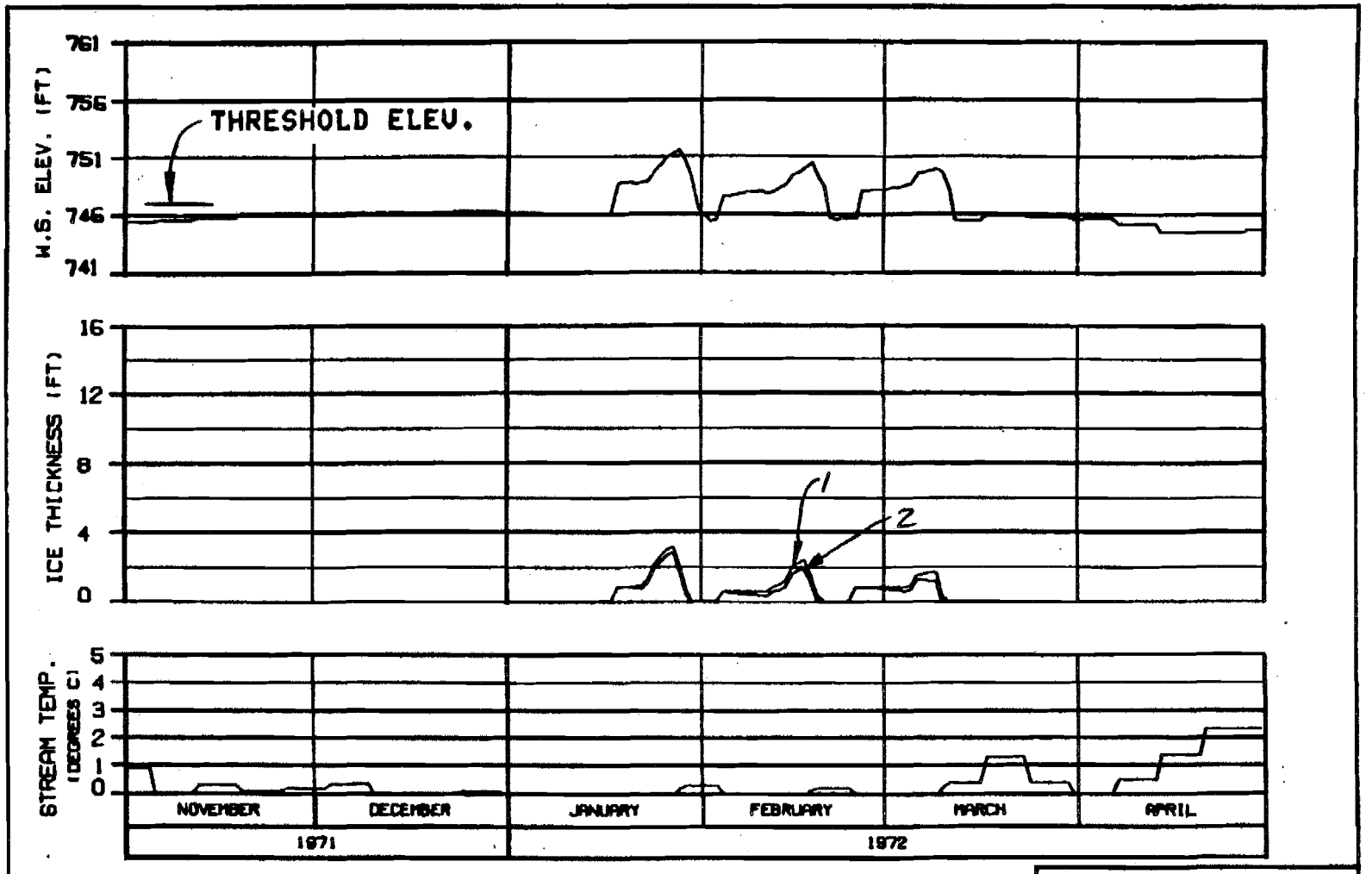
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] 27 JAN 84 1868.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

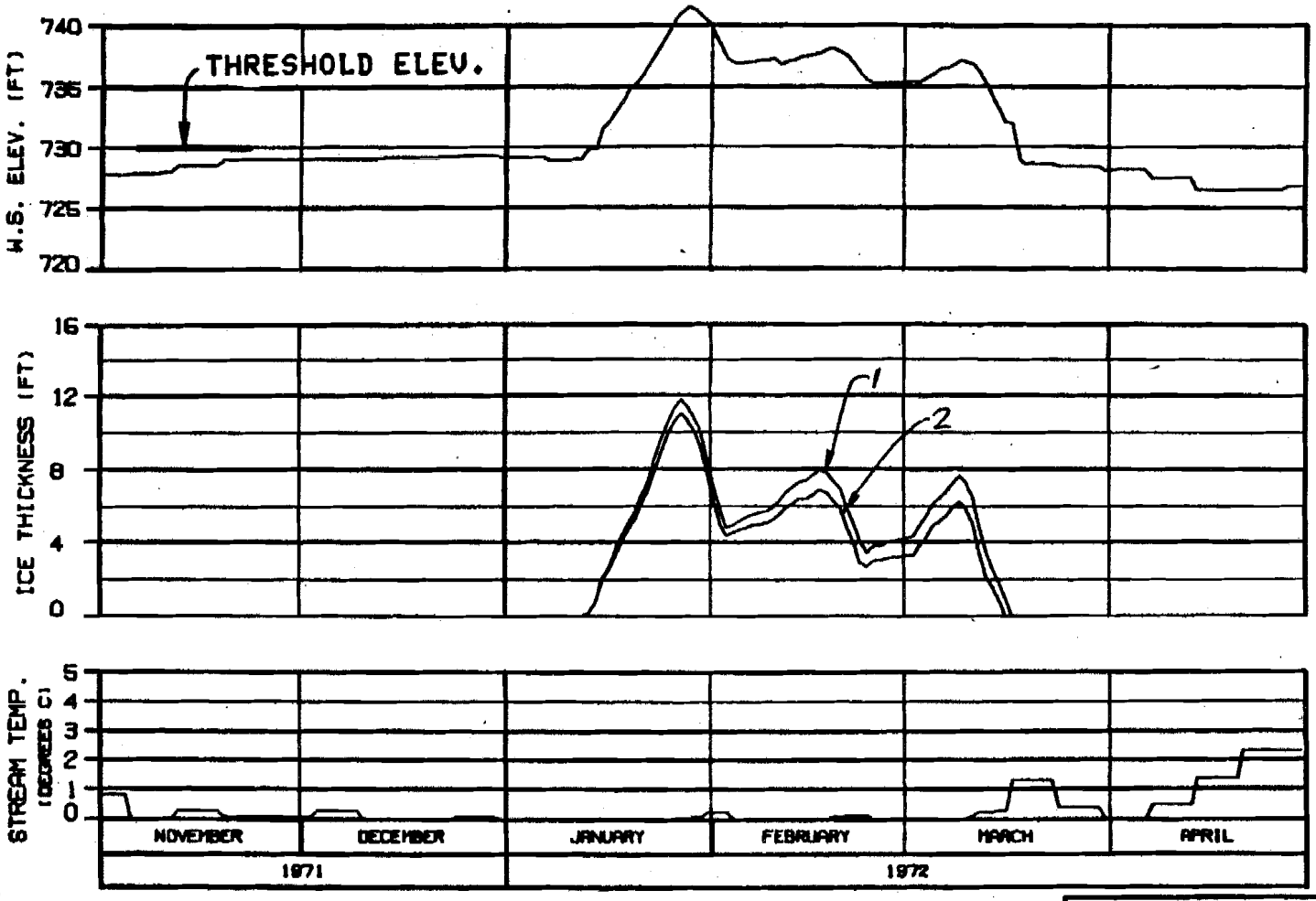
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: E.L.PAYS | 27 JUL 84 | 1889.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

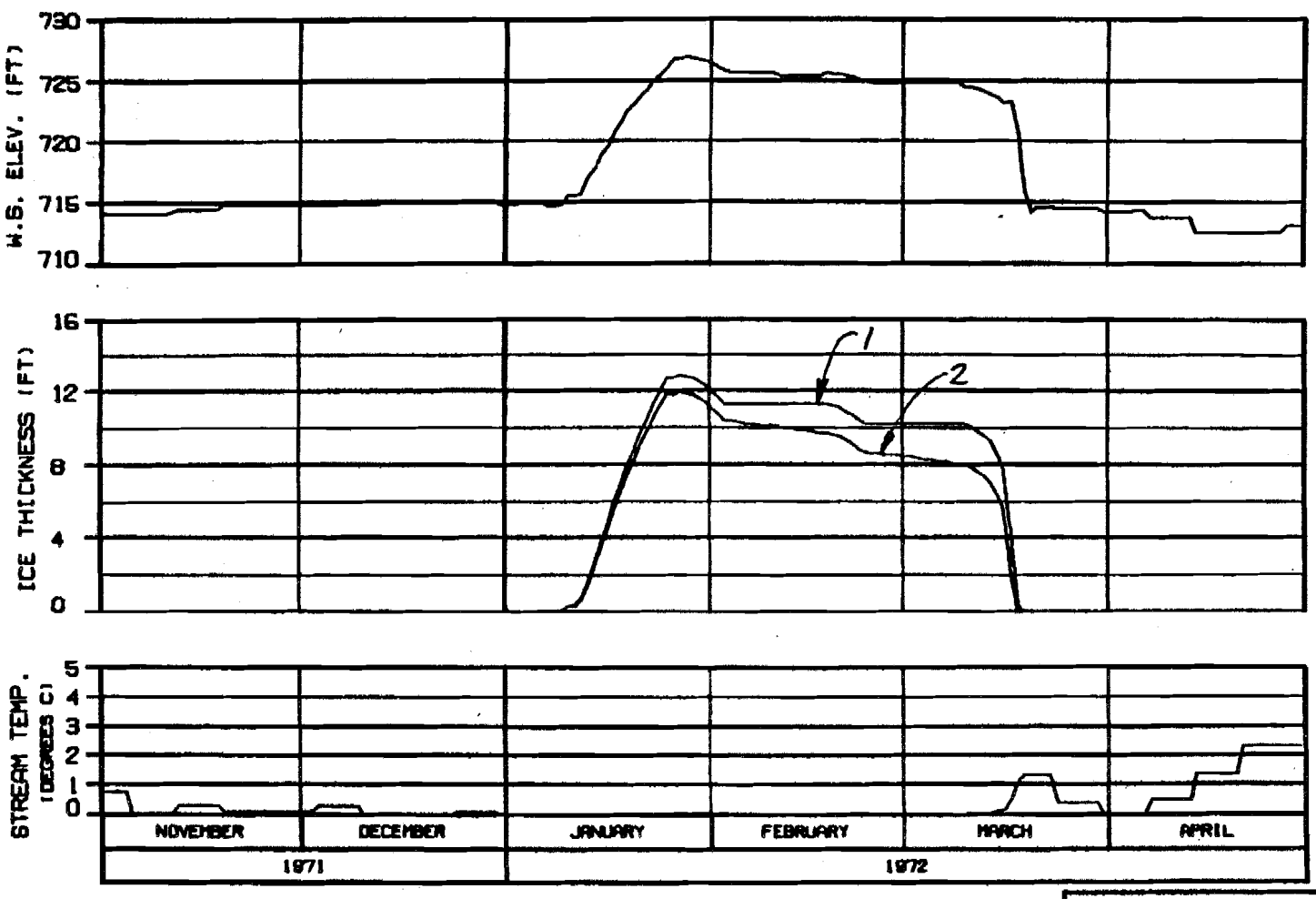
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHKD. [illegible] 27 JAN 84 1888.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

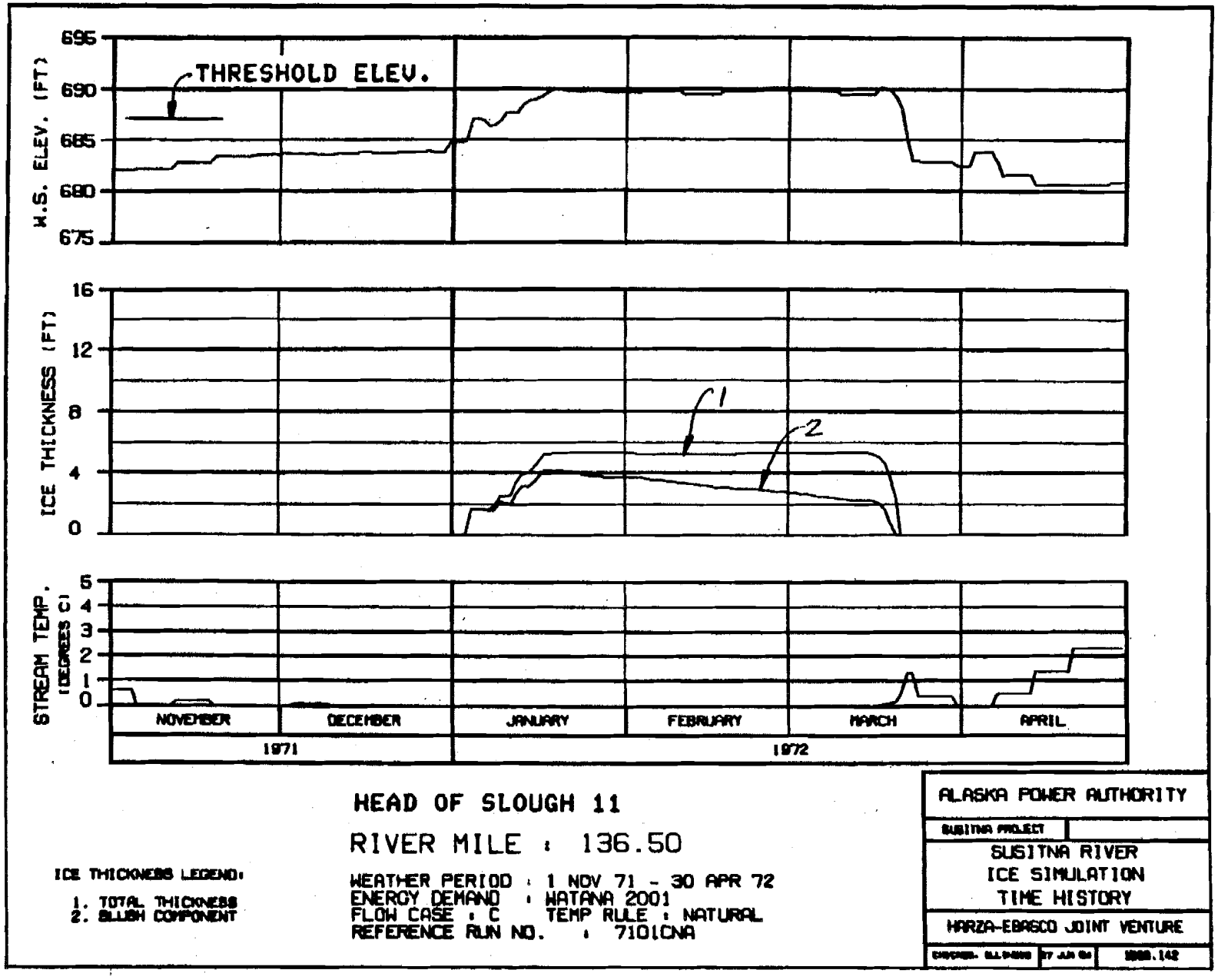
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

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:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

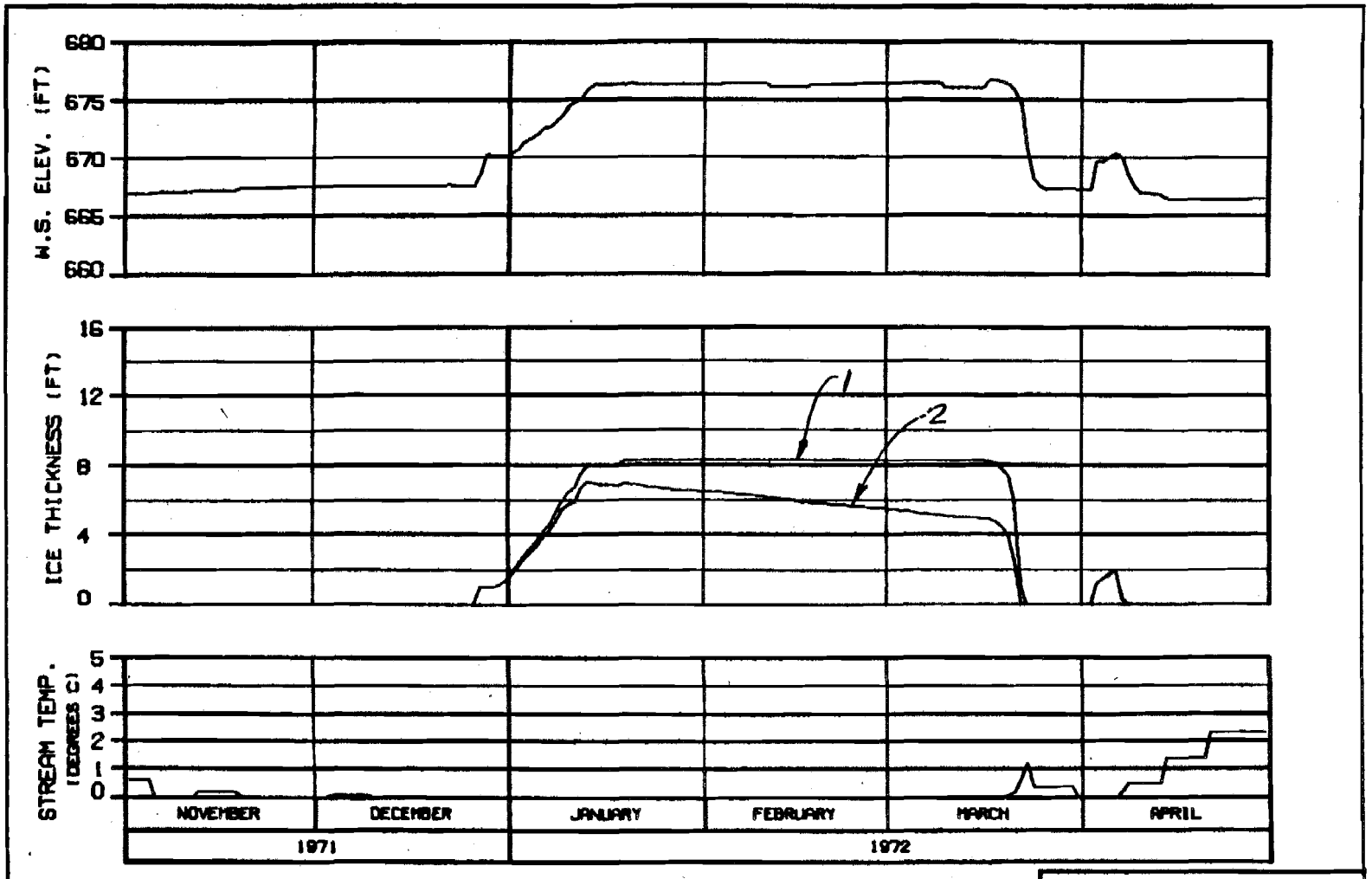
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ELLENSON 27 JUN 84 8888.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

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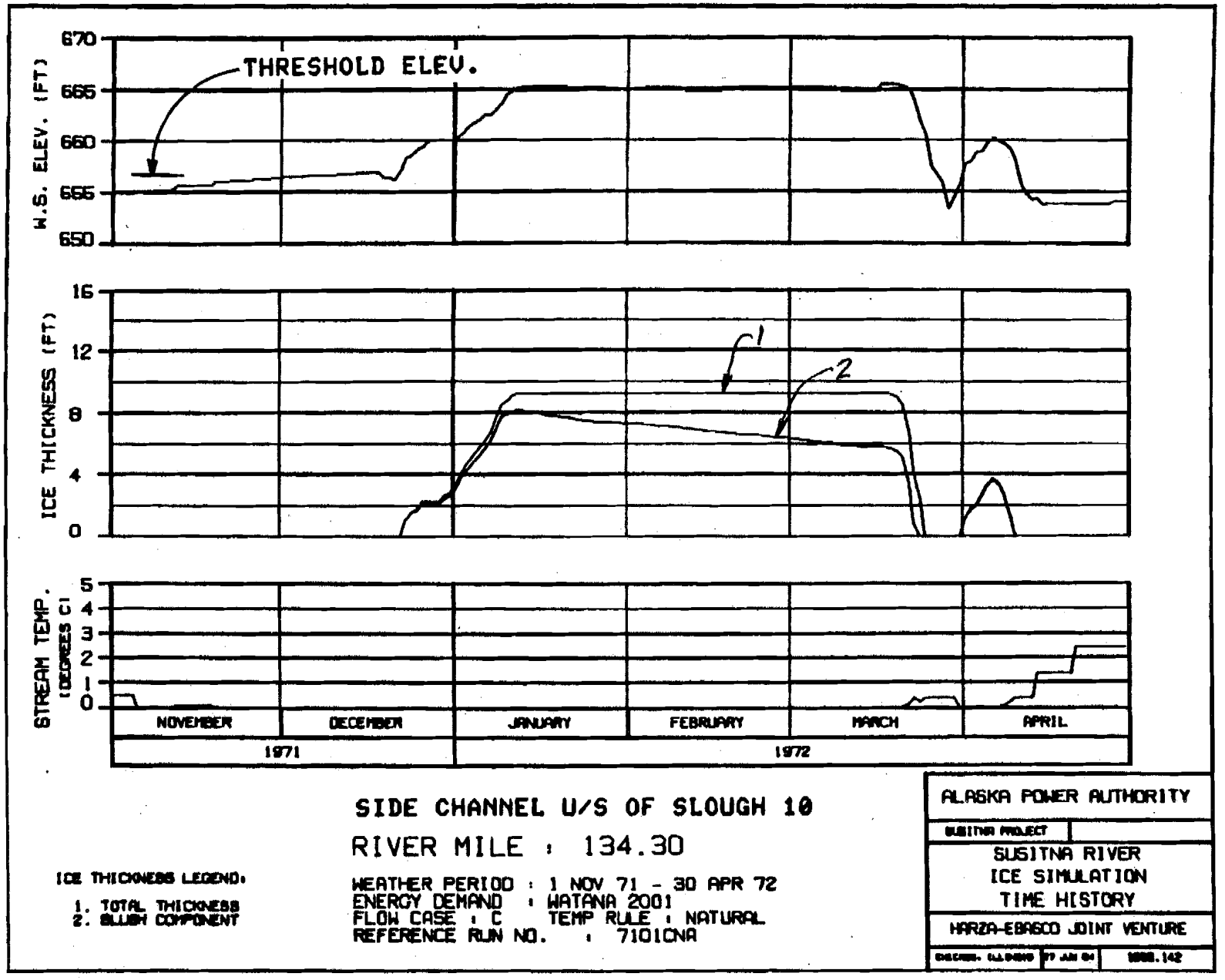


SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

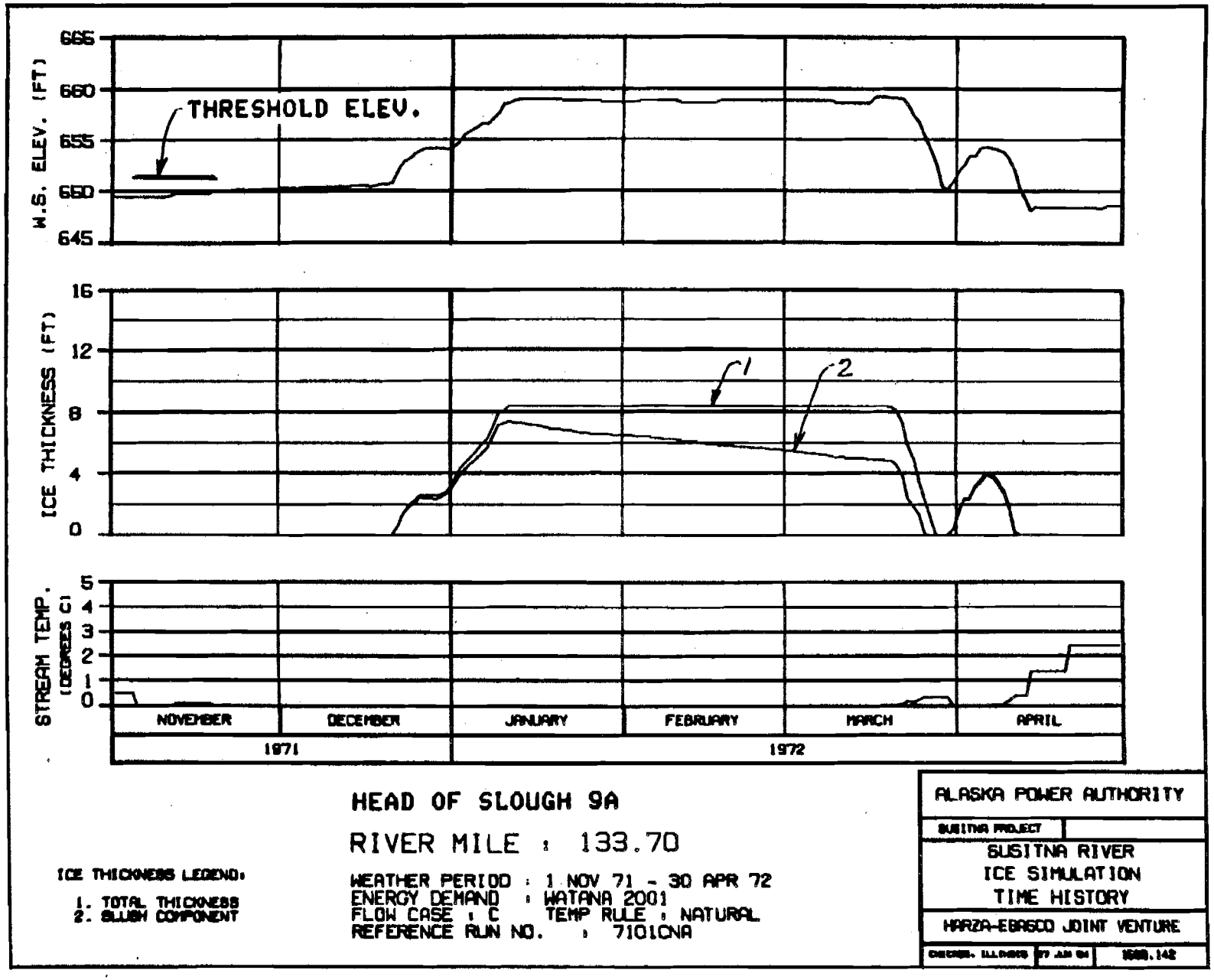
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: LLS/DWG | 27 JAN 84 | 1868.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

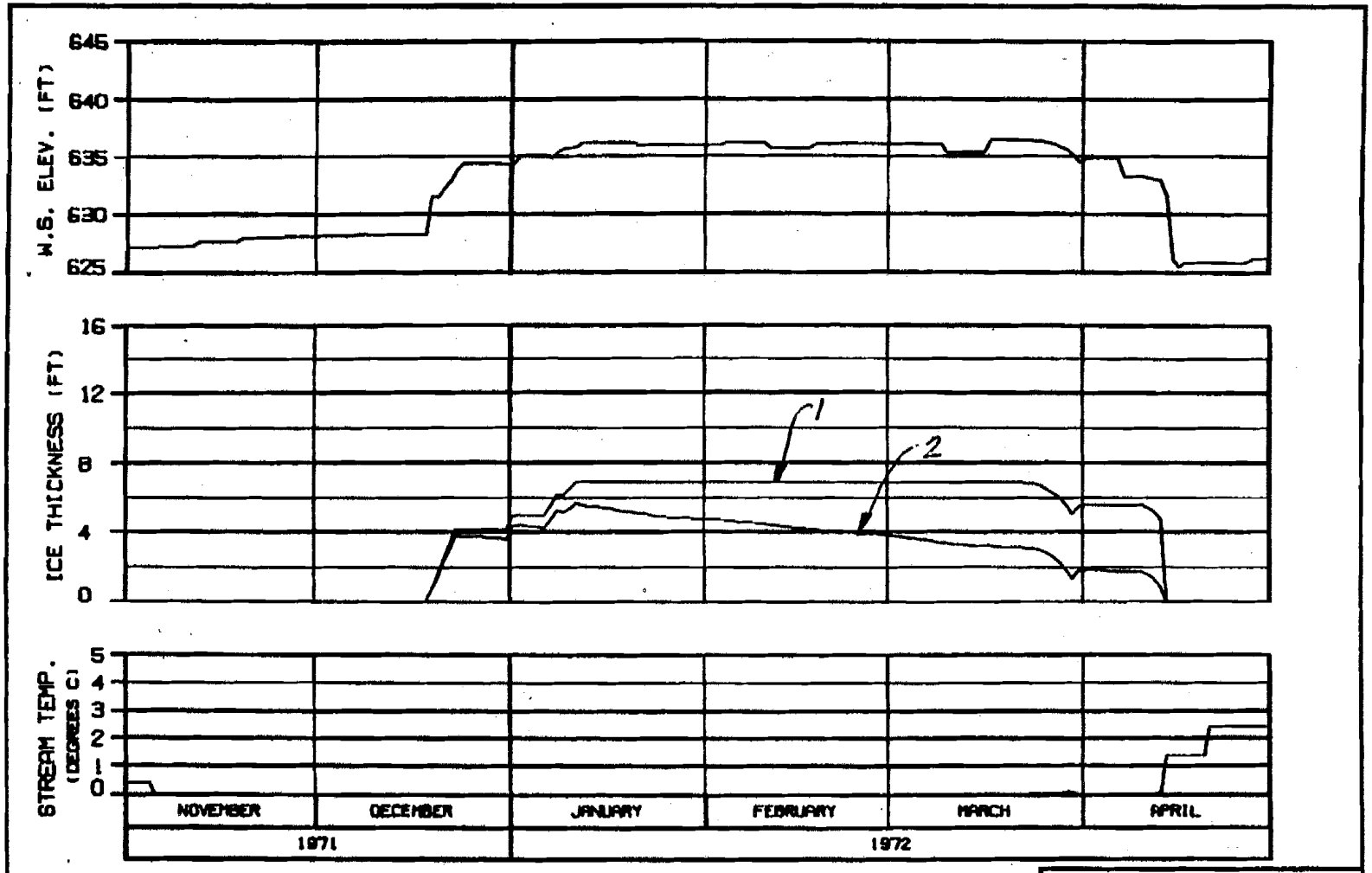
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DENVER, ILLINOIS | 27 JAN 84 | 1668.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

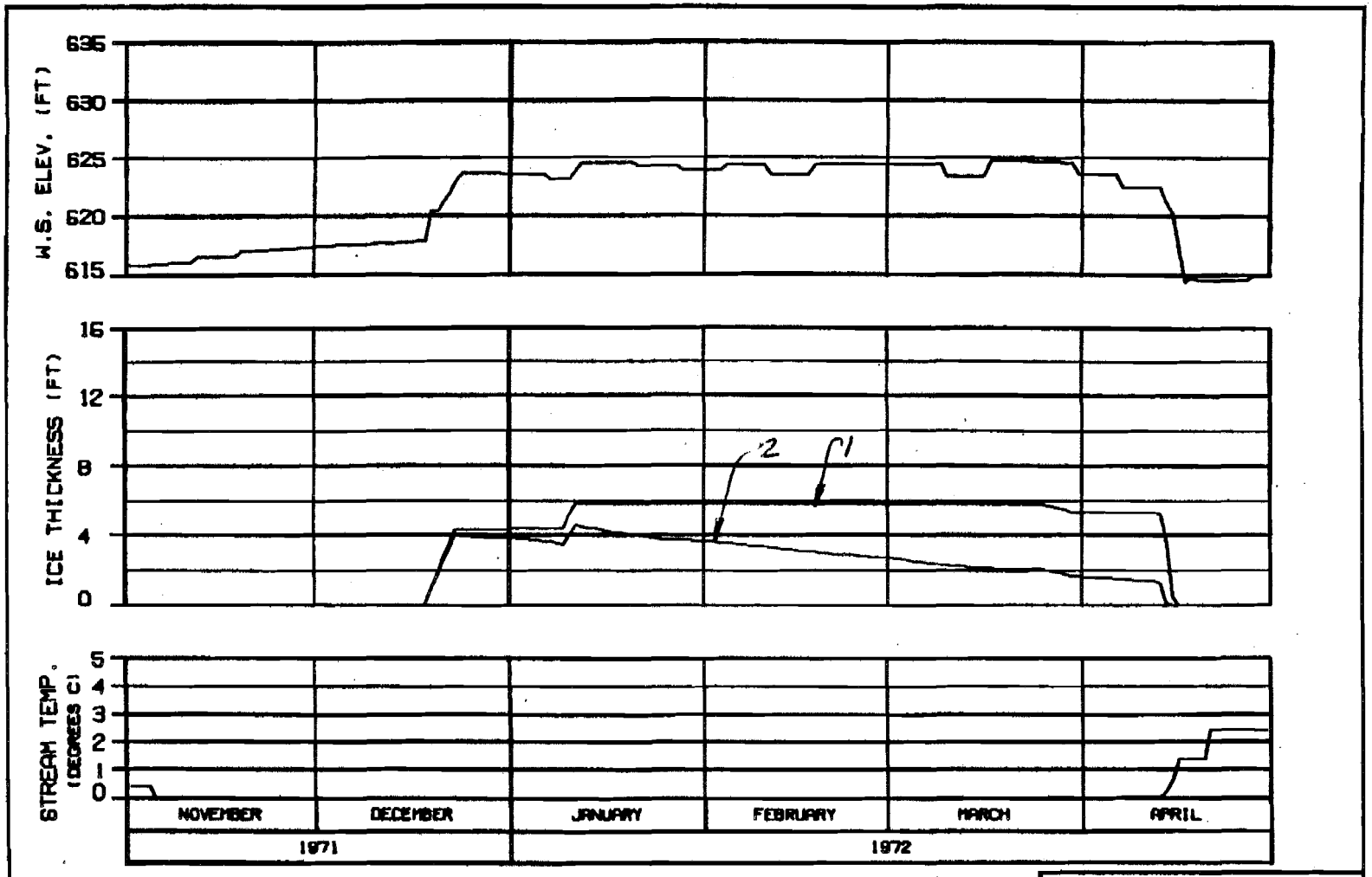
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: A.L.DAVIS | 27 JAN 84 | 1888.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

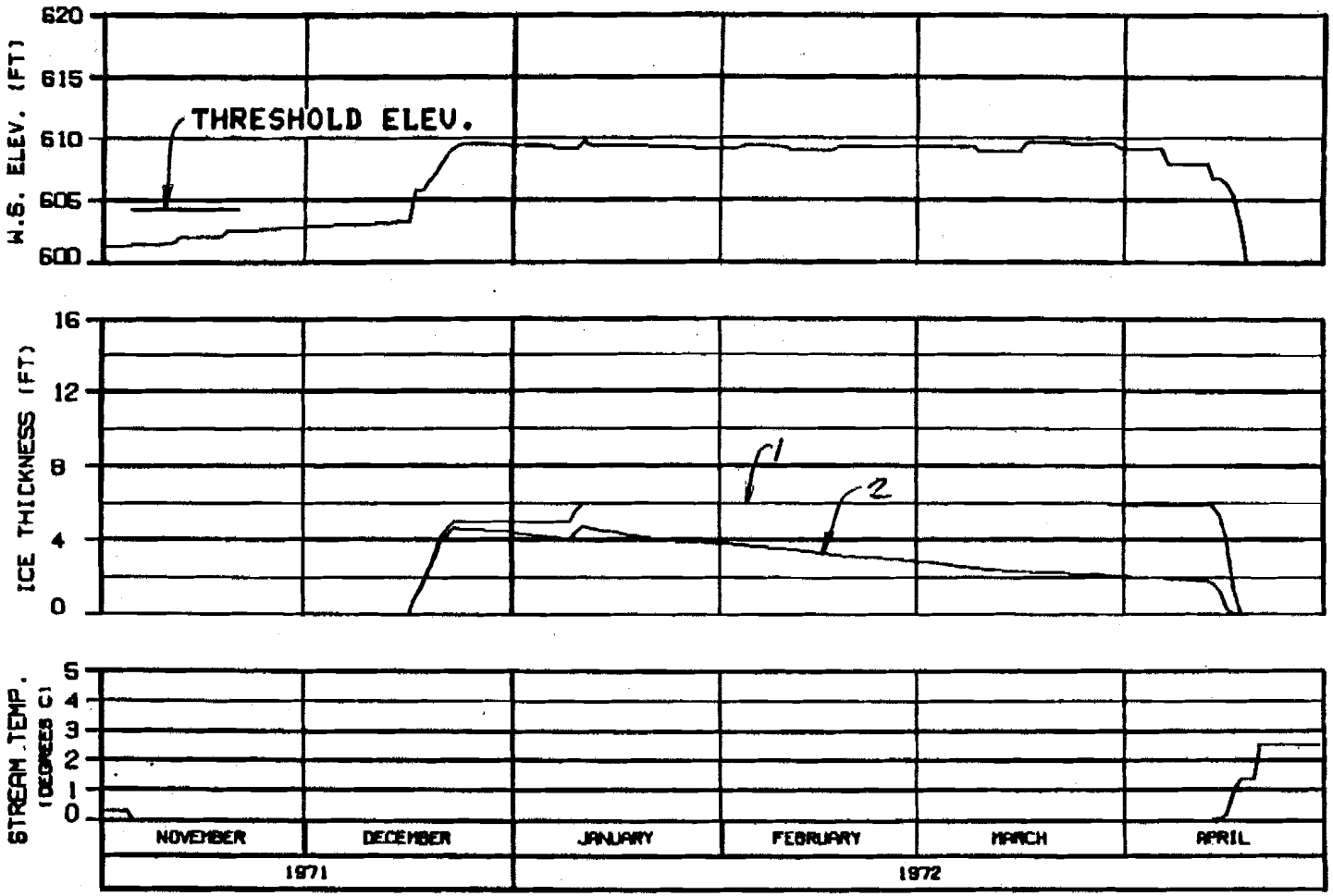
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 27 JAN 84 1988.142

C



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

OPTION?

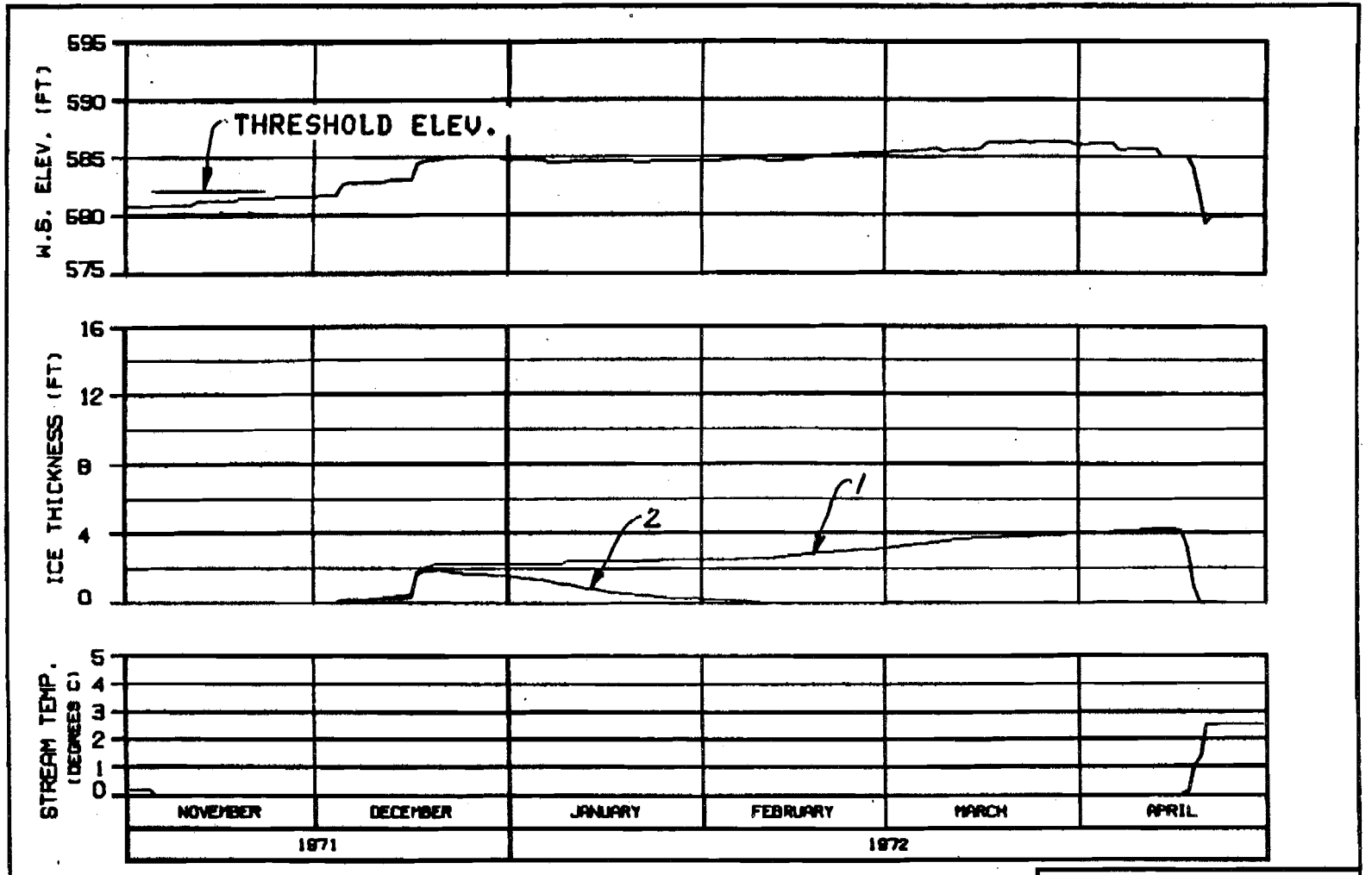
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 27 JAN 84 1888.142



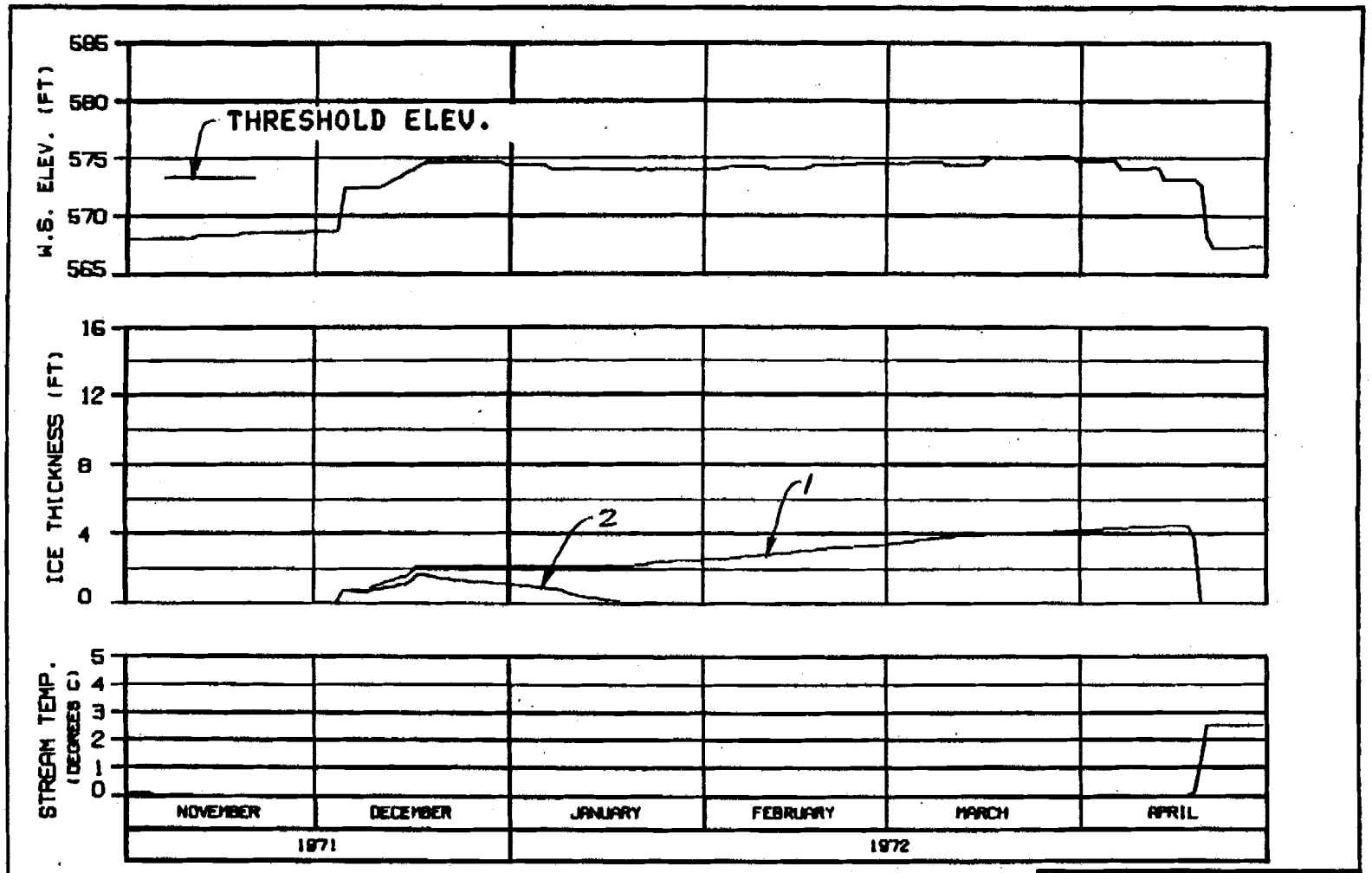
HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 27 JAN 84 — 1868.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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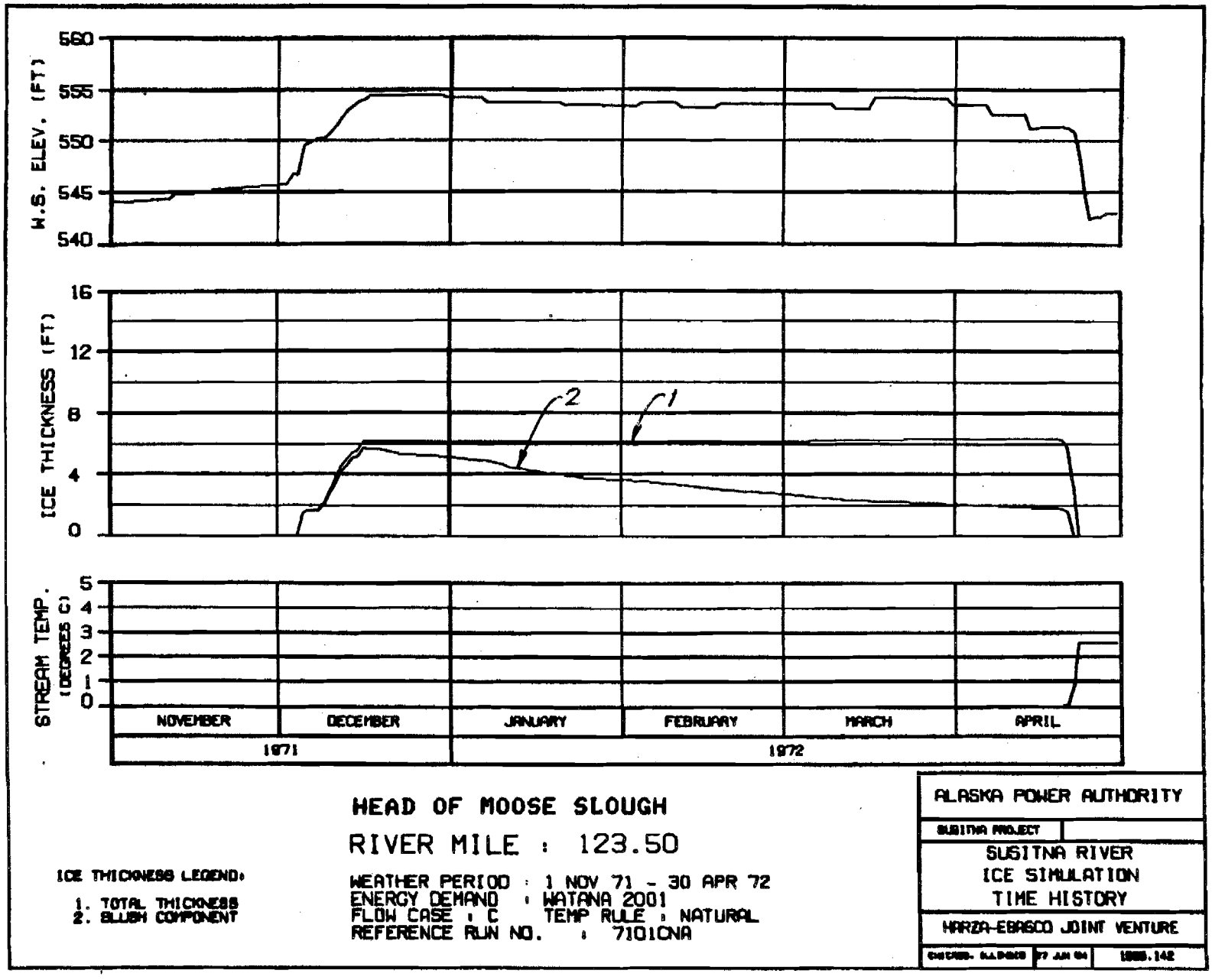


HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

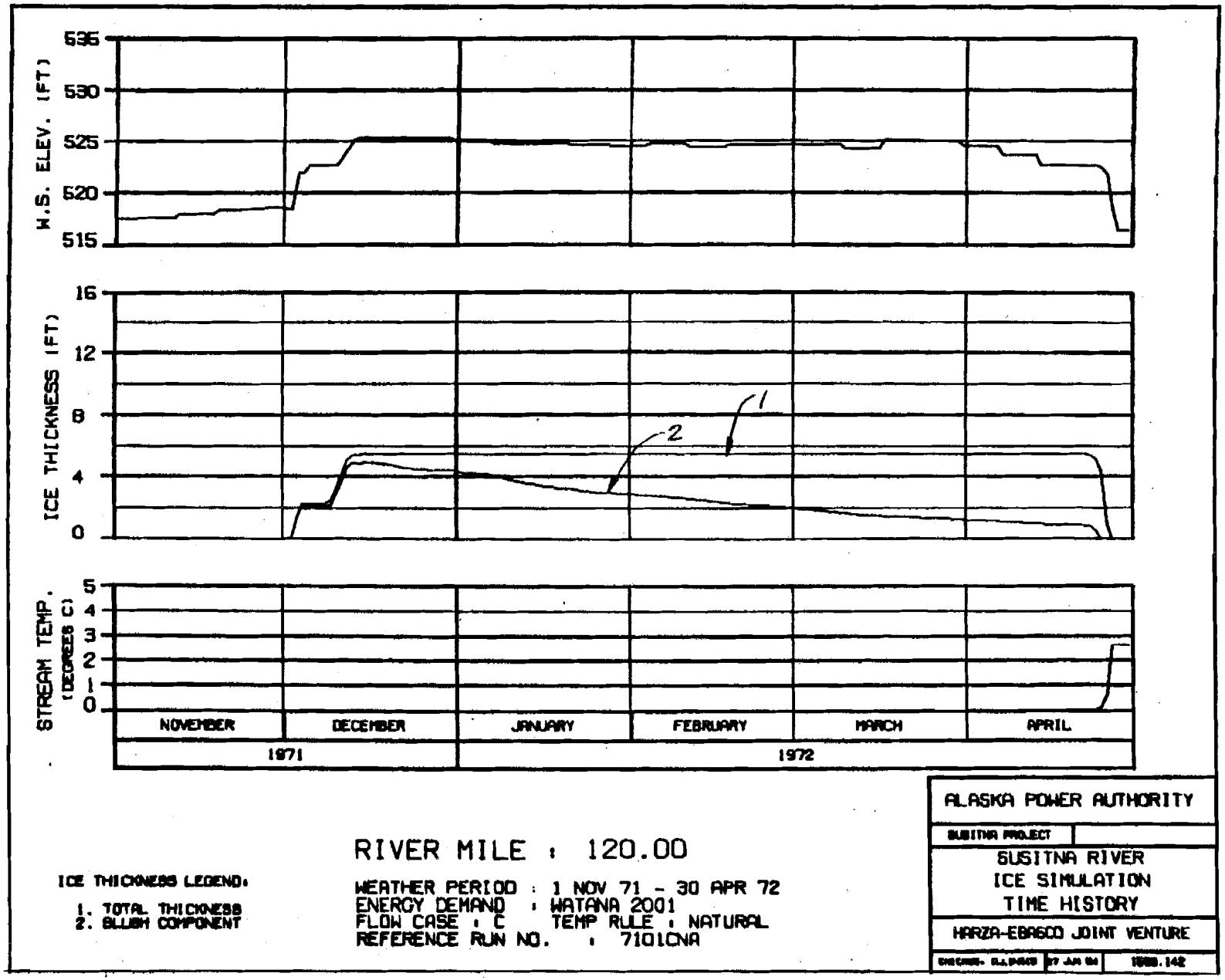
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

27 JAN 84 | 1885.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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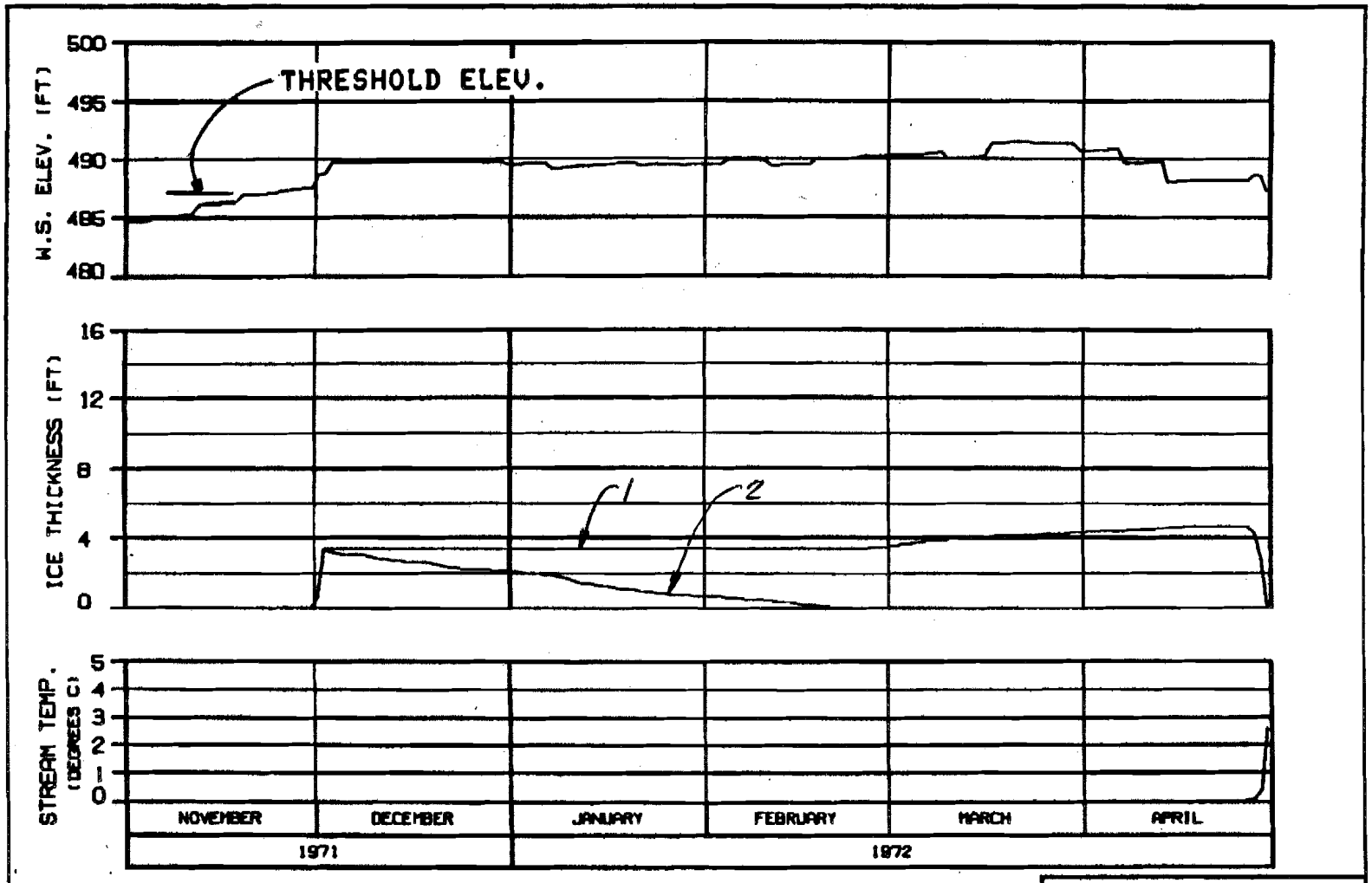


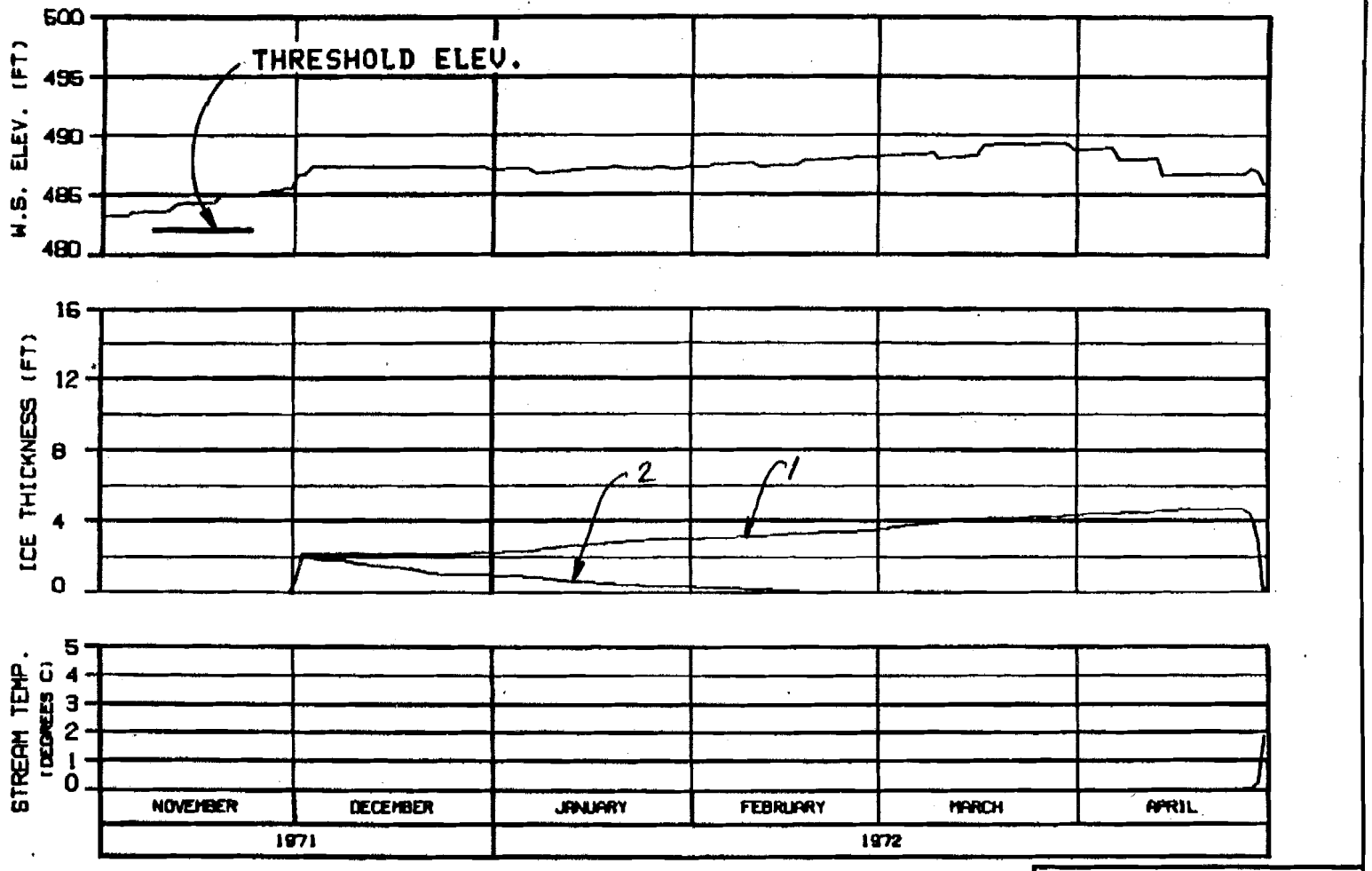
HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

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



SIDE CHANNEL MSII

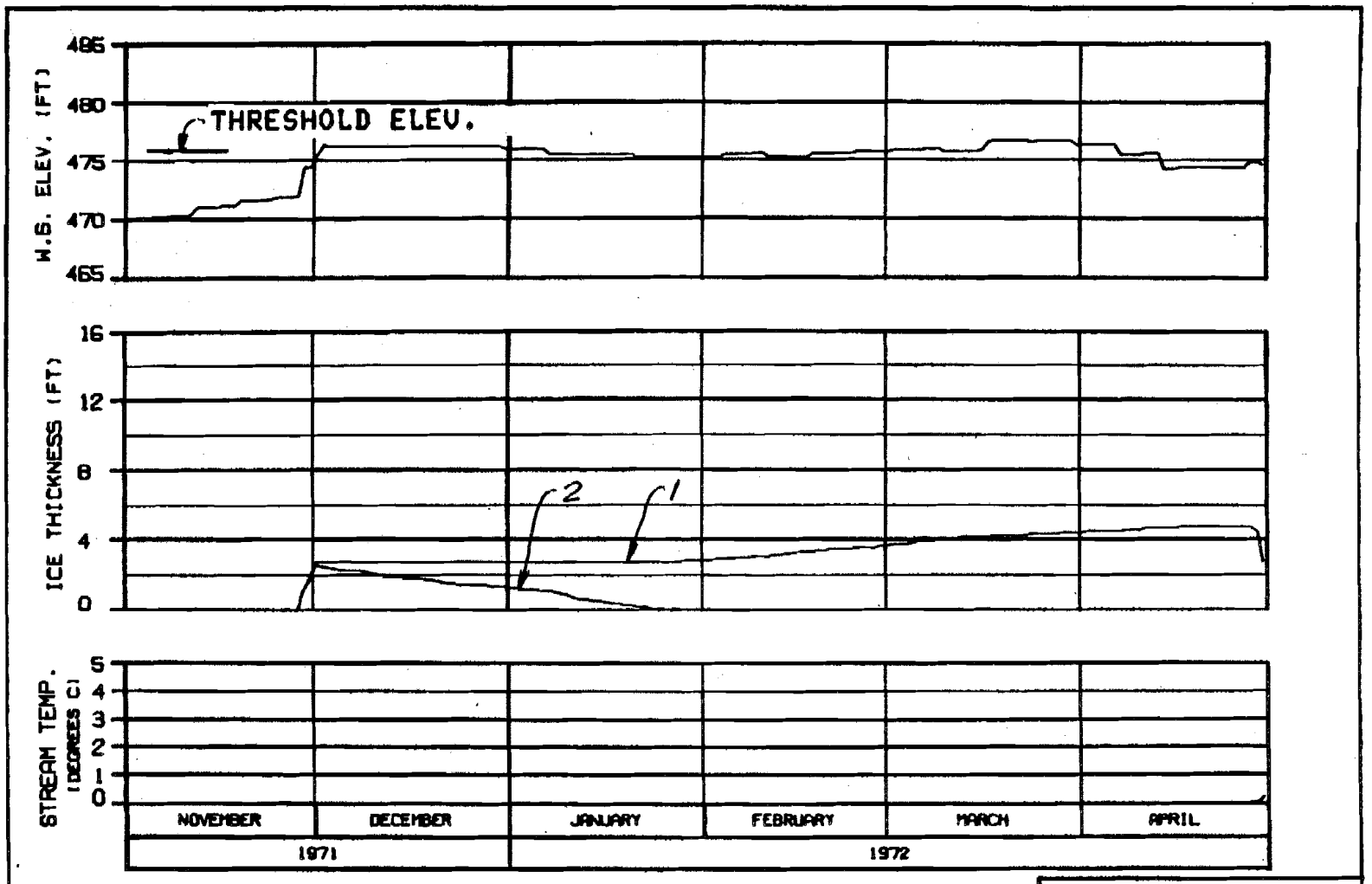
RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 27 JUN 84 1588.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

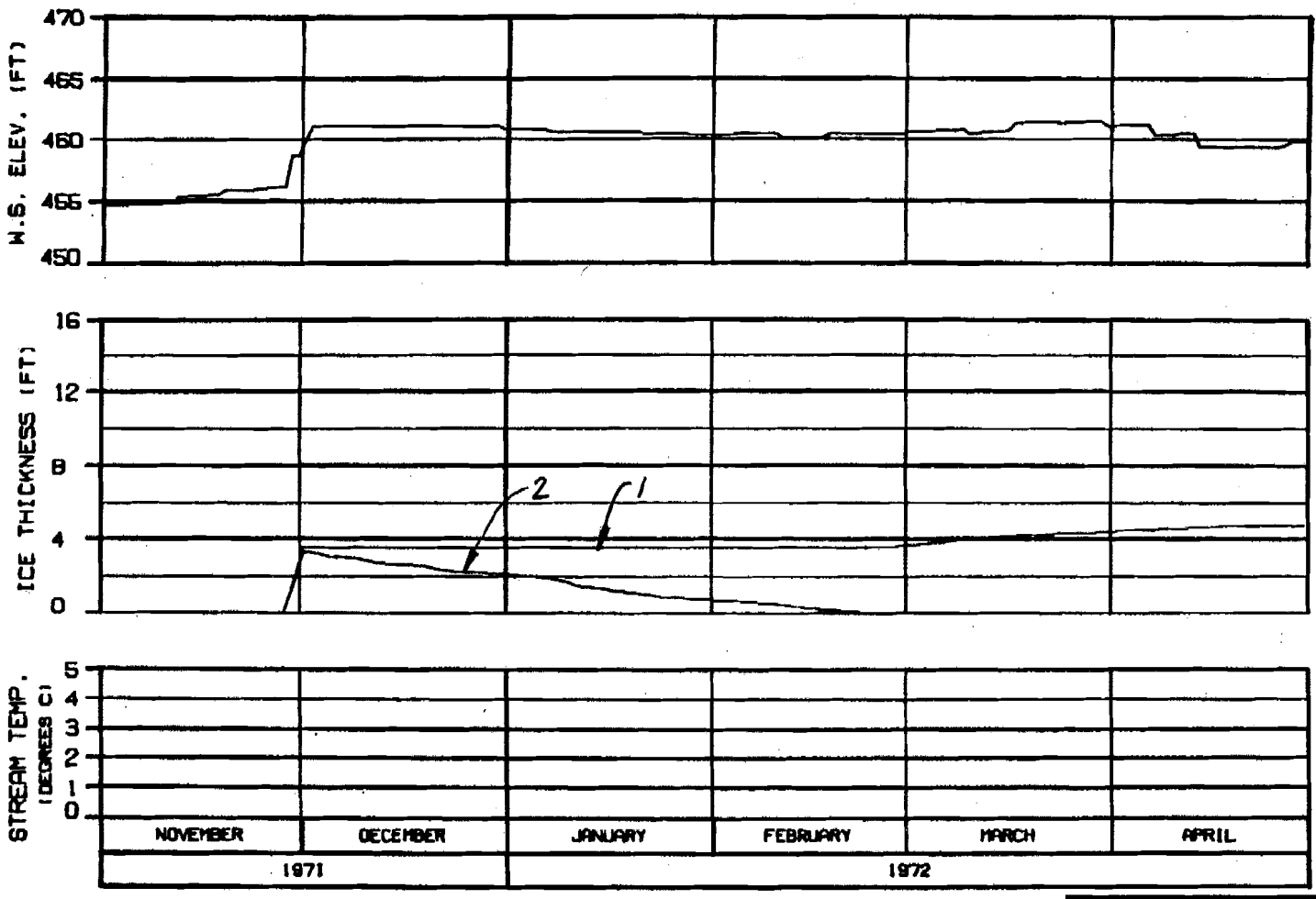
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

27 JAN 84 | 1588.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

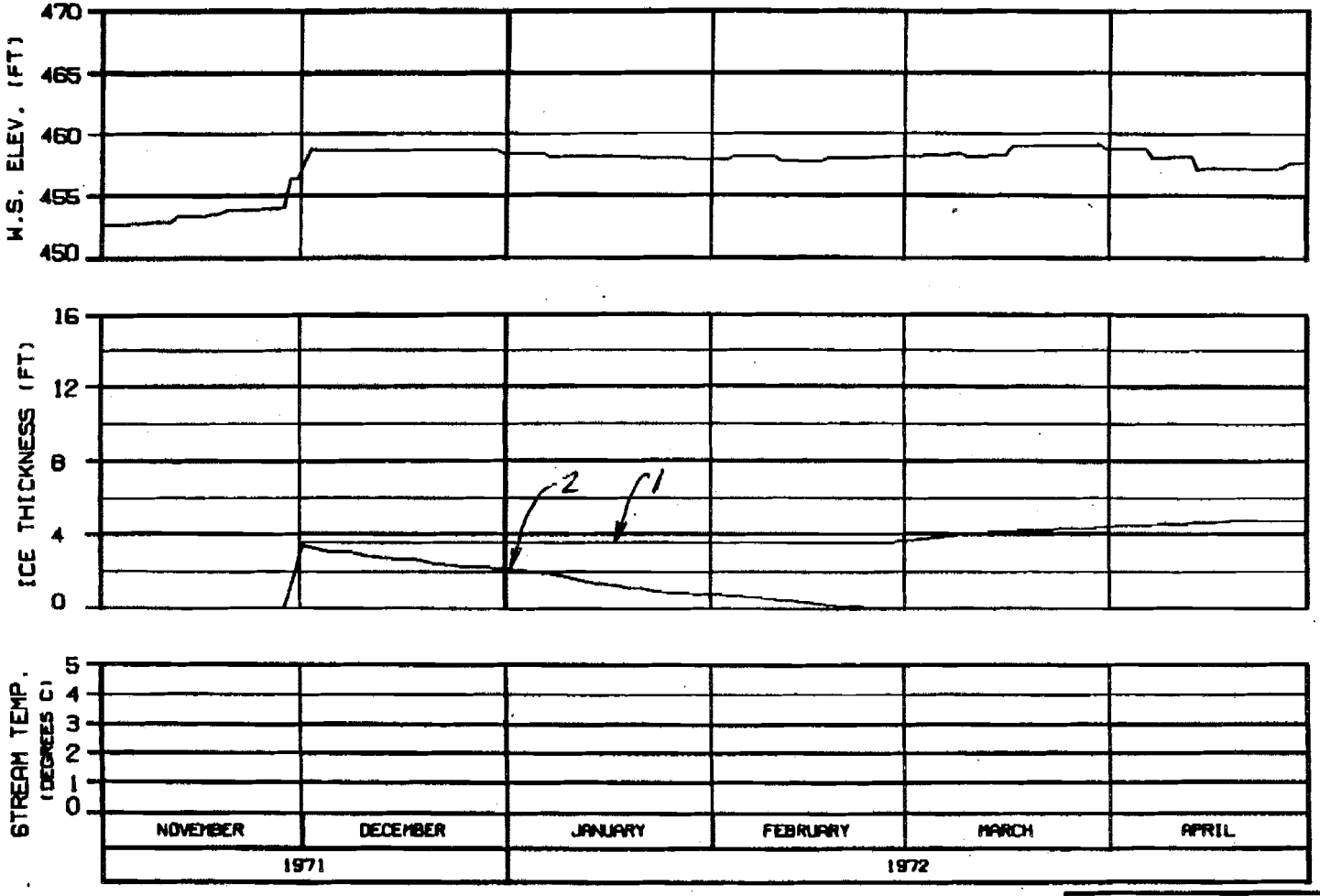
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] BY JAN 84 1588.142



SIDE CHANNEL AT HEAD OF GASH CREEK

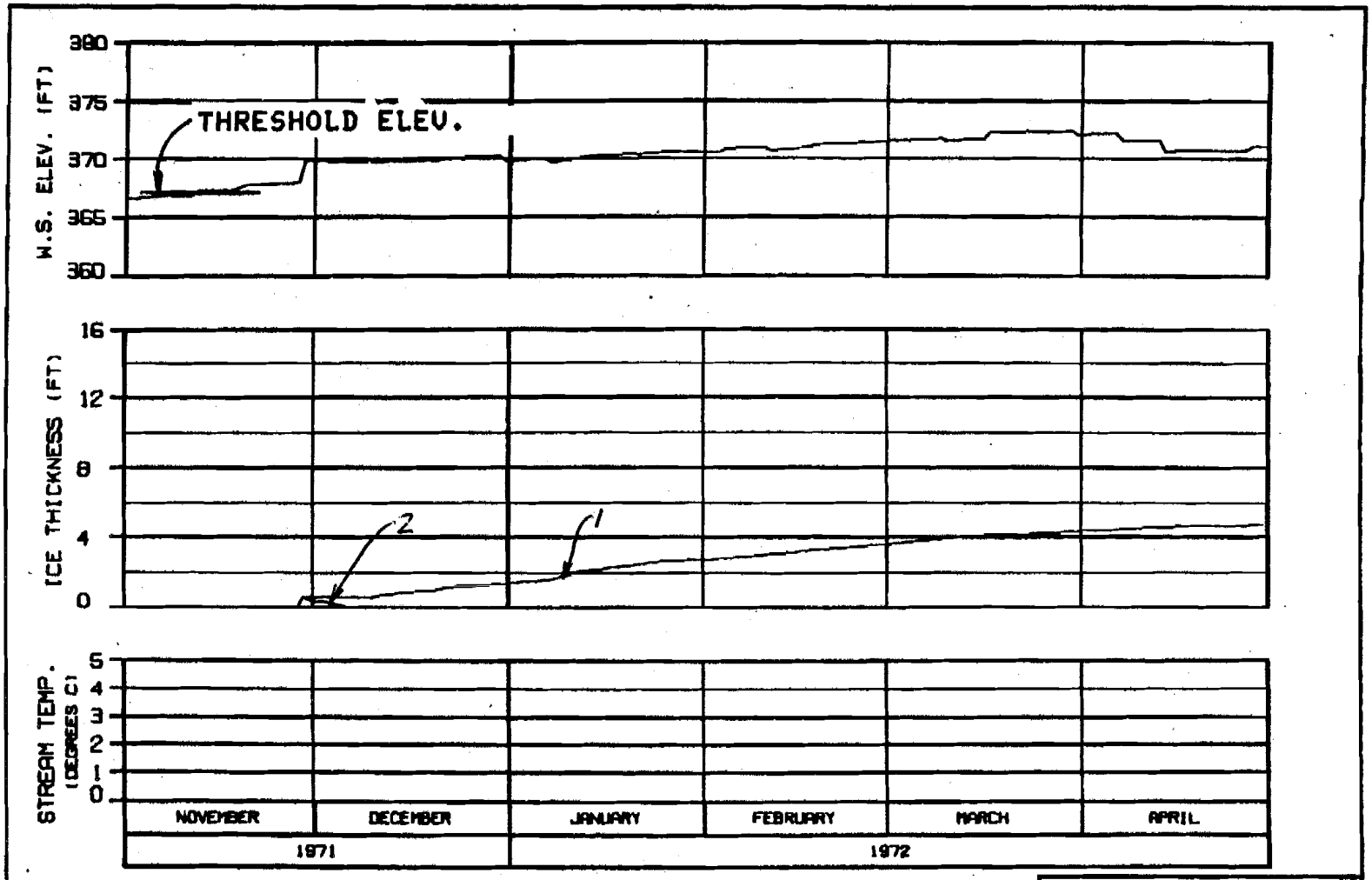
RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	27 JAN 84
1668.142	



HEAD OF WHISKERS SLOUGH

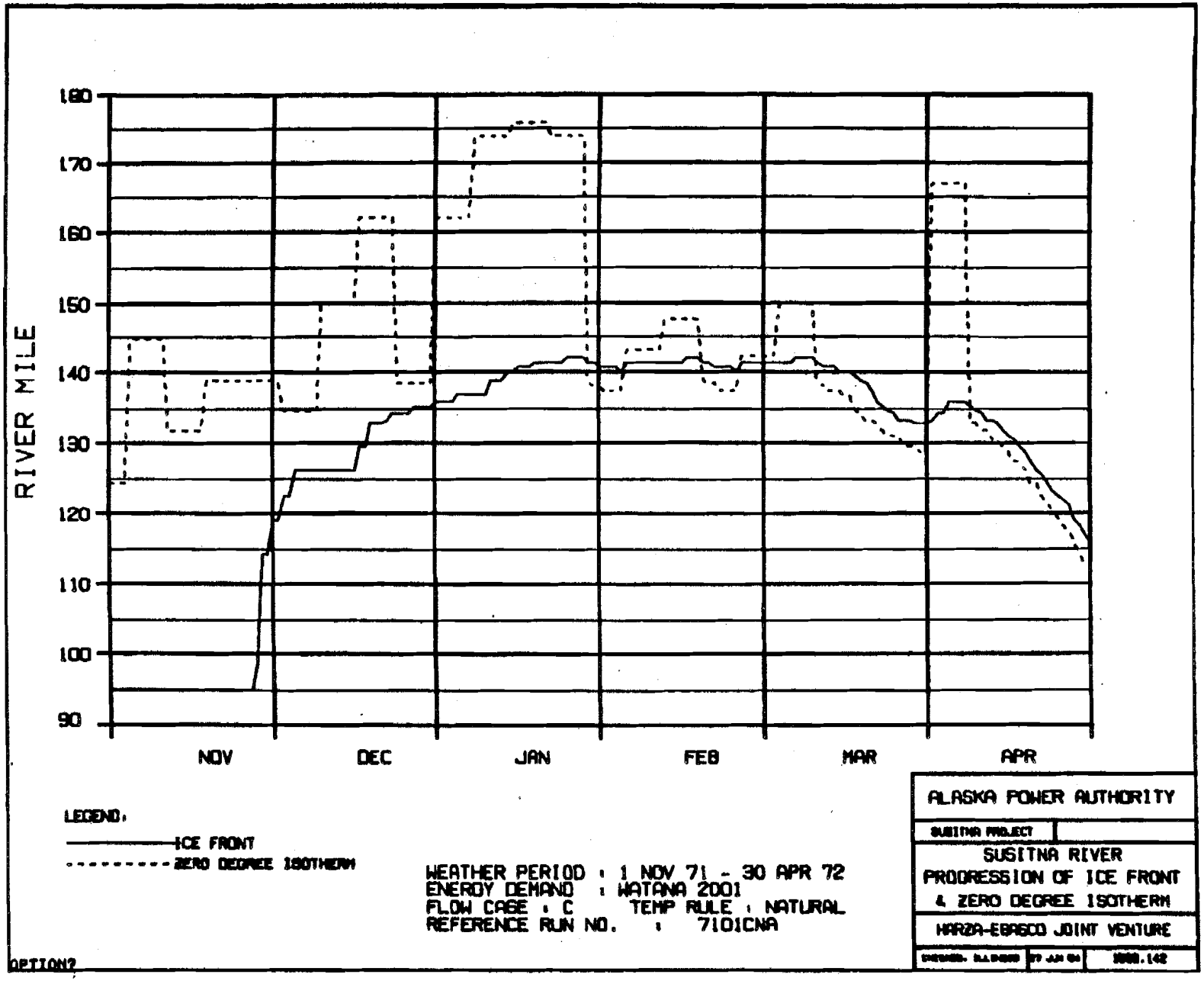
RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 27 JAN 84 — 1883.142


RIVER MILE
180
170
160
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140
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90
NOV
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JAN
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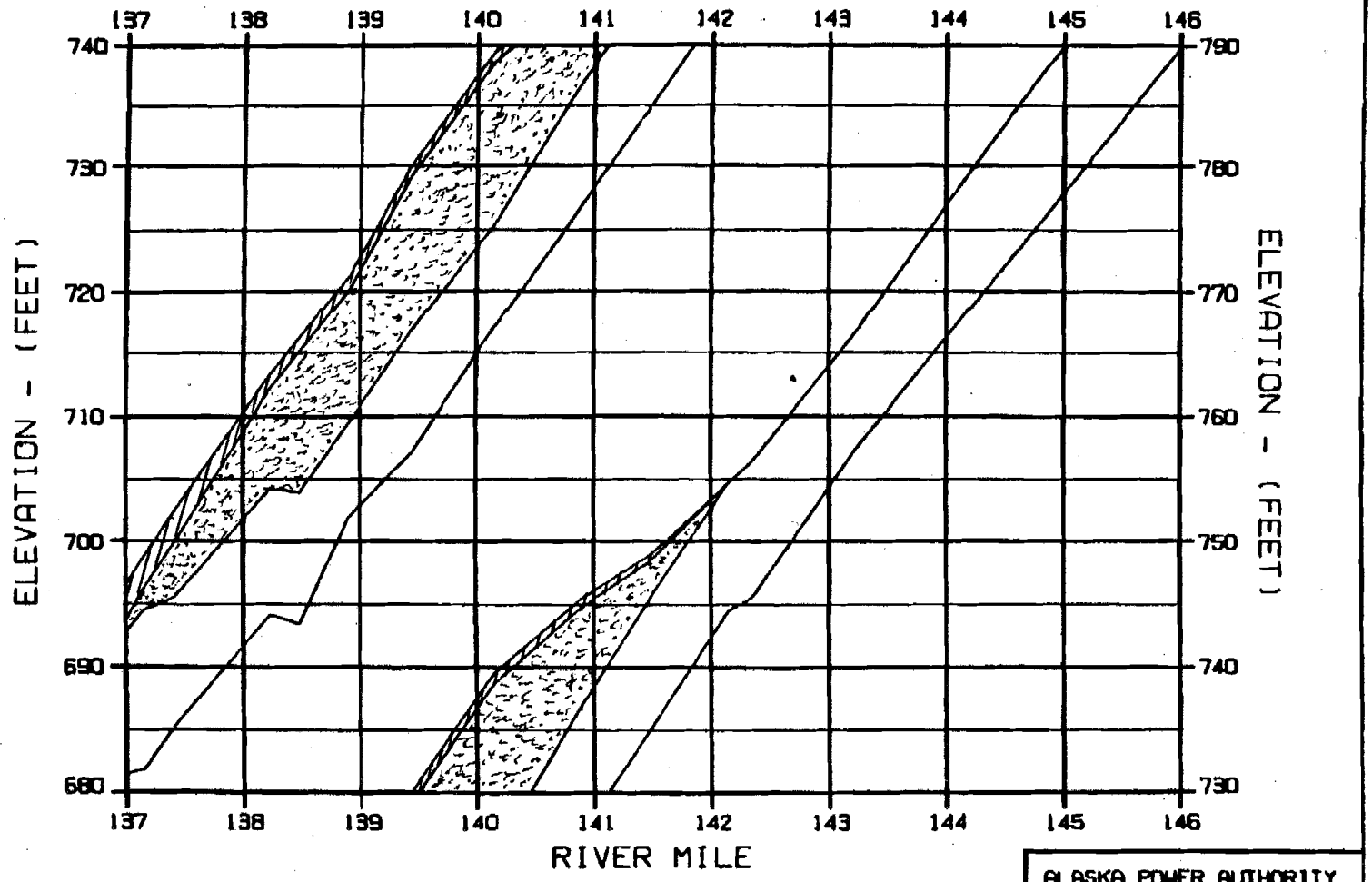
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?

c



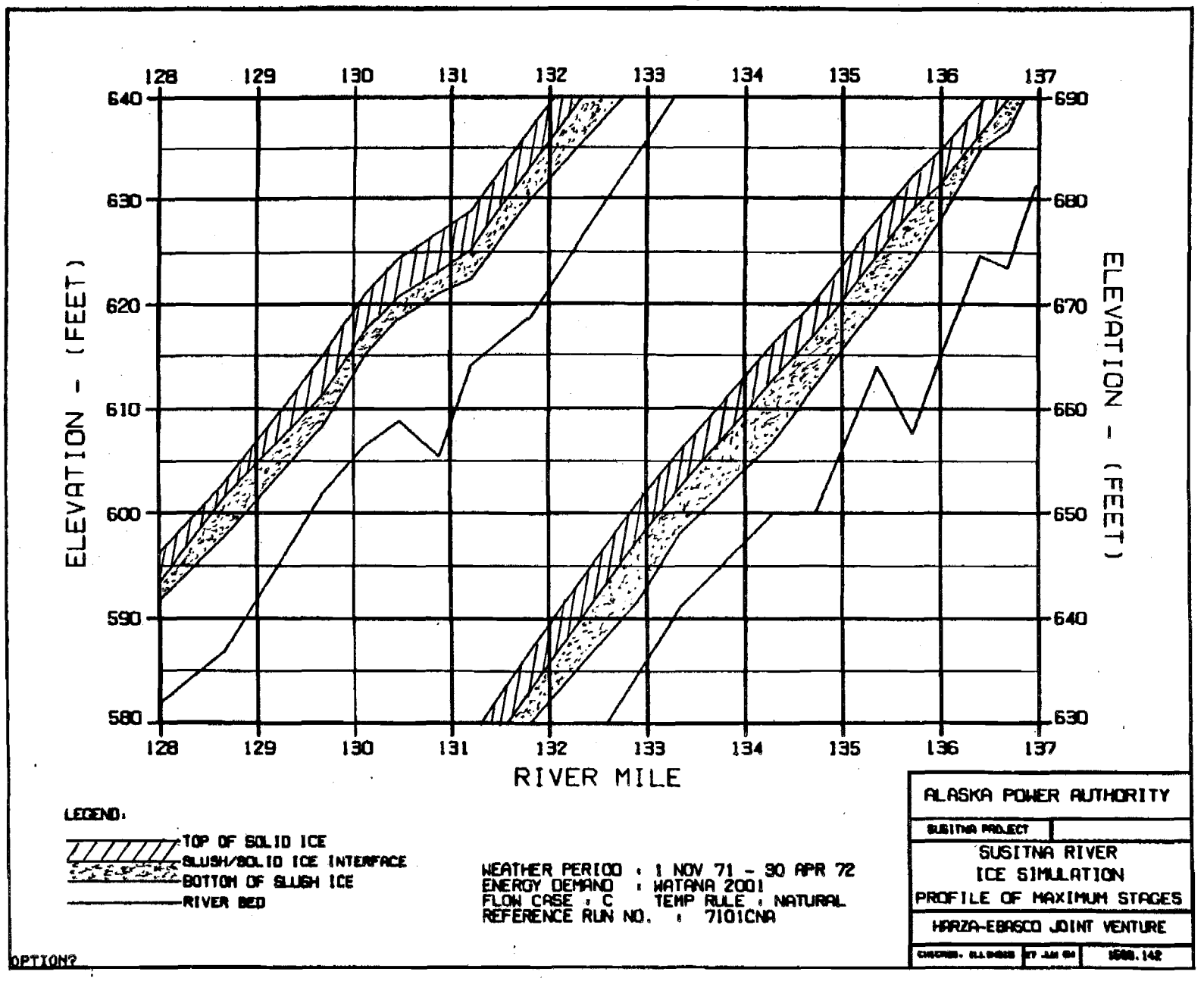
LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA

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

OPTION?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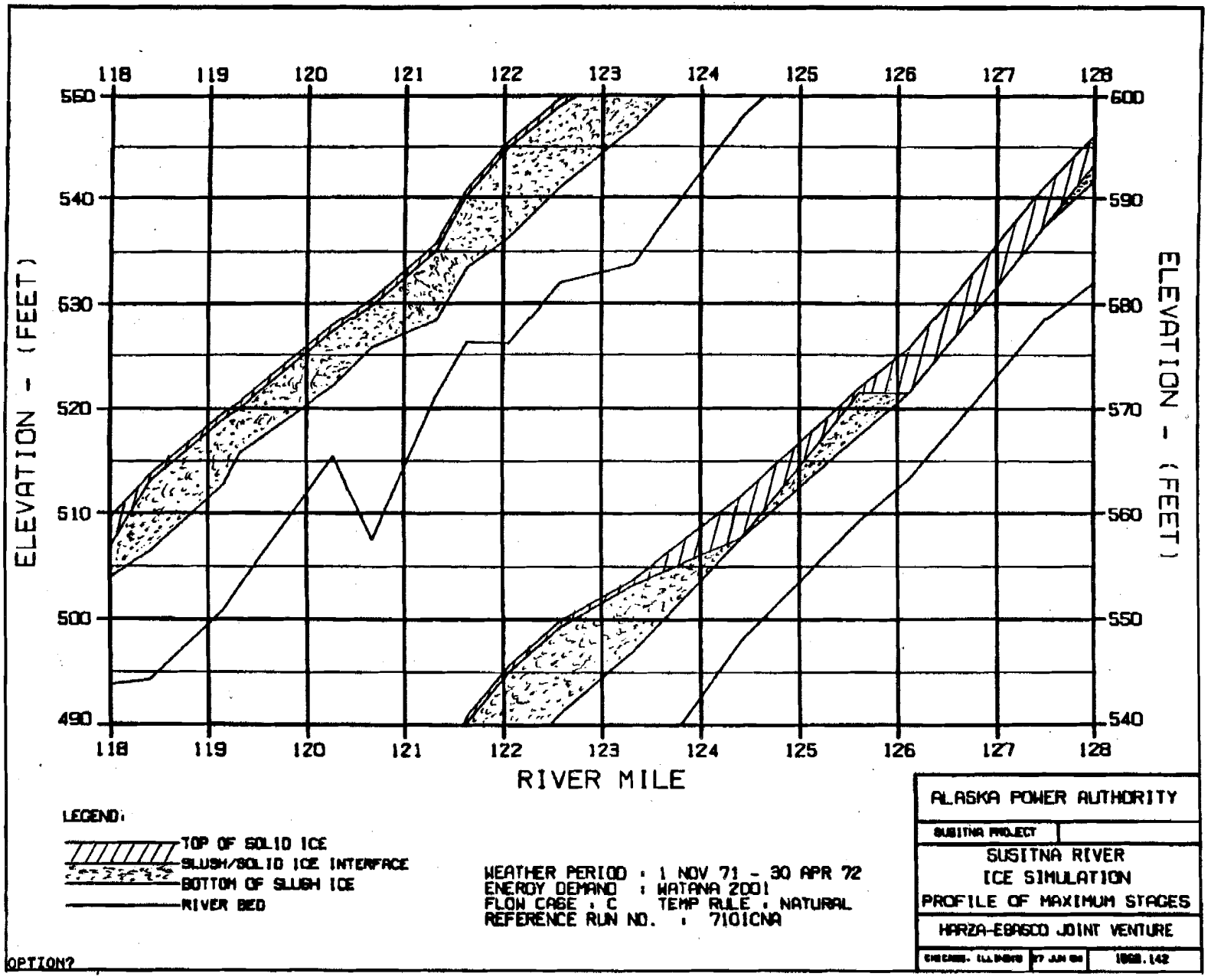
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

C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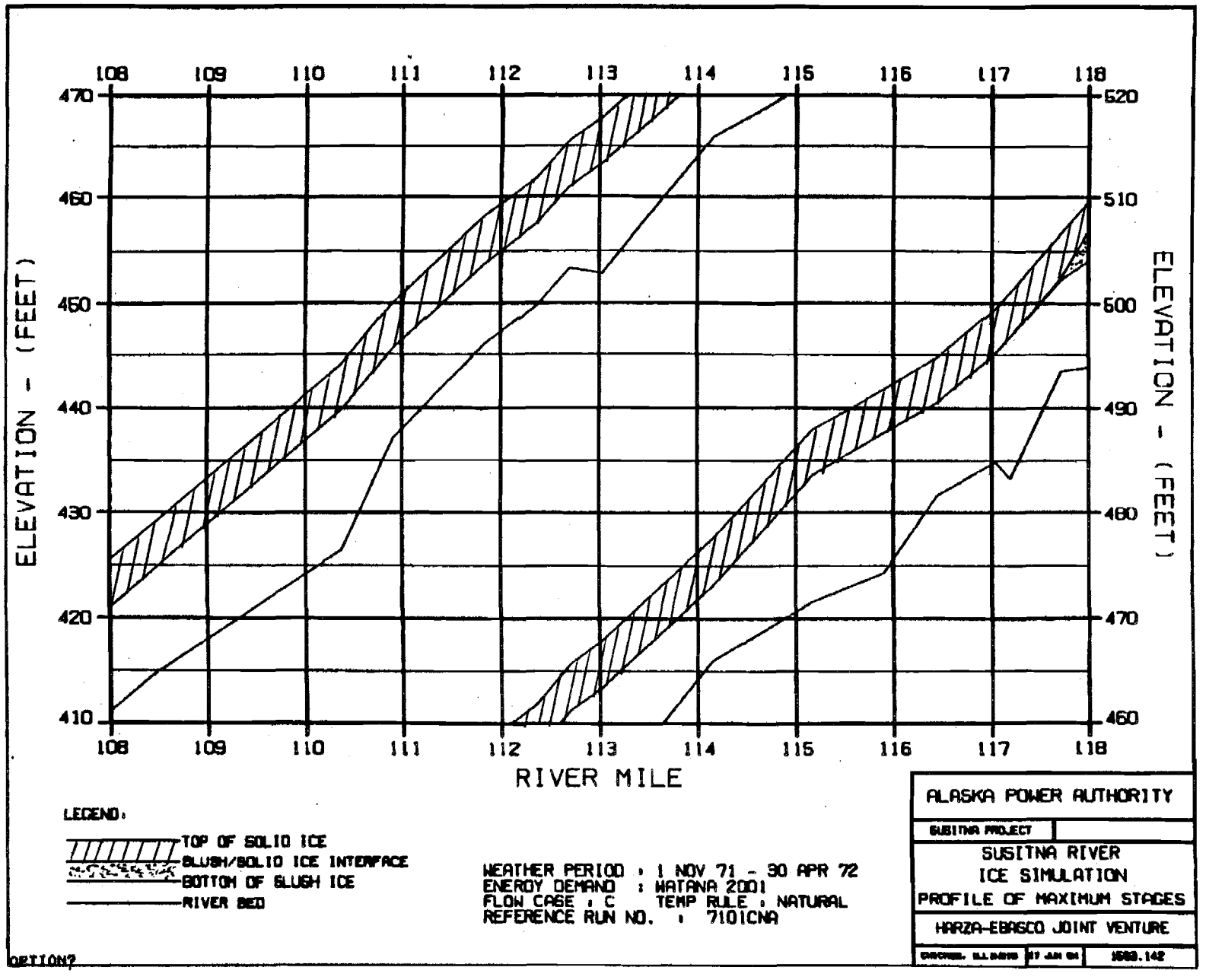
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS
17 JAN 84
1868.142
OPTION?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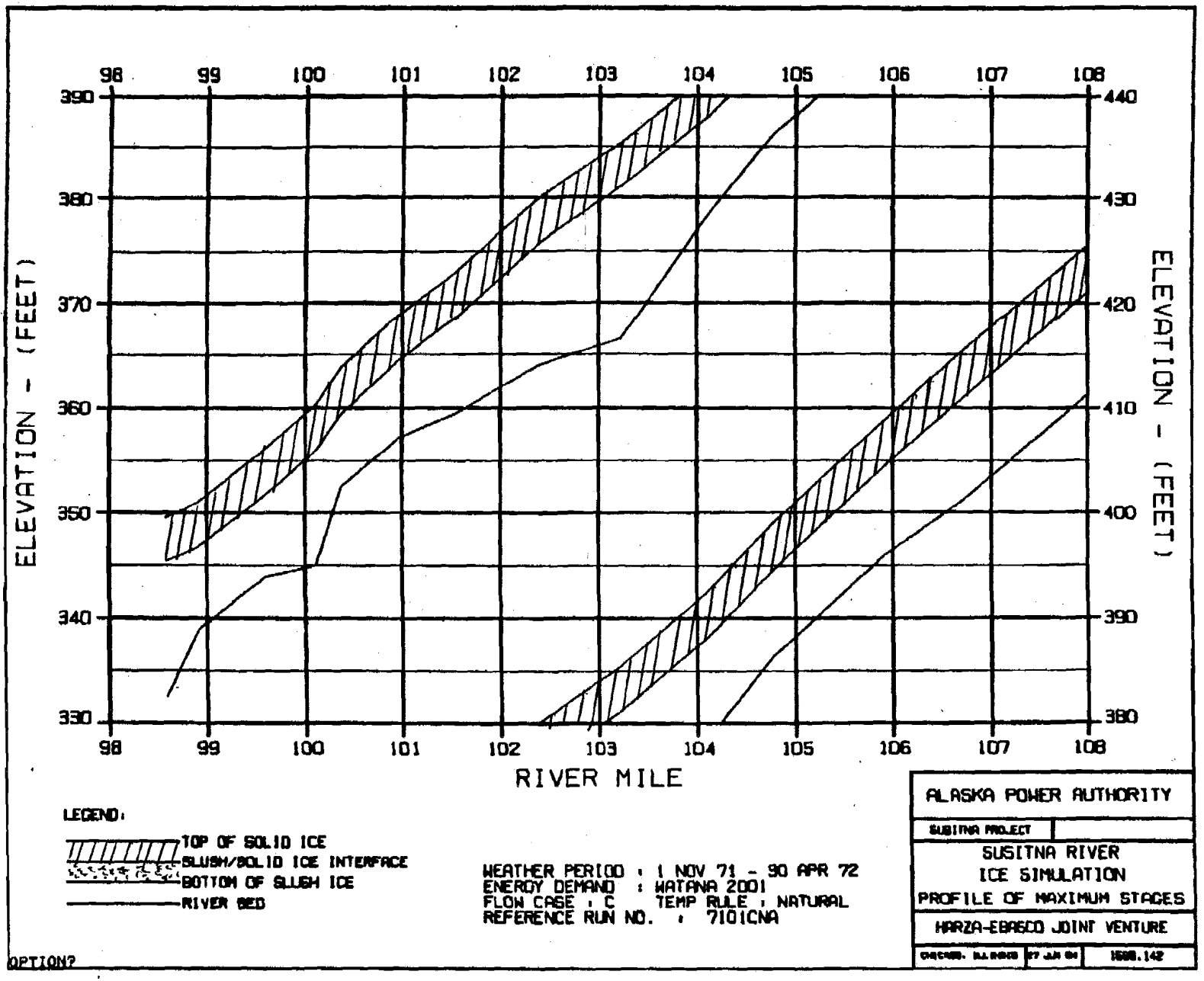
460
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : MATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION2

C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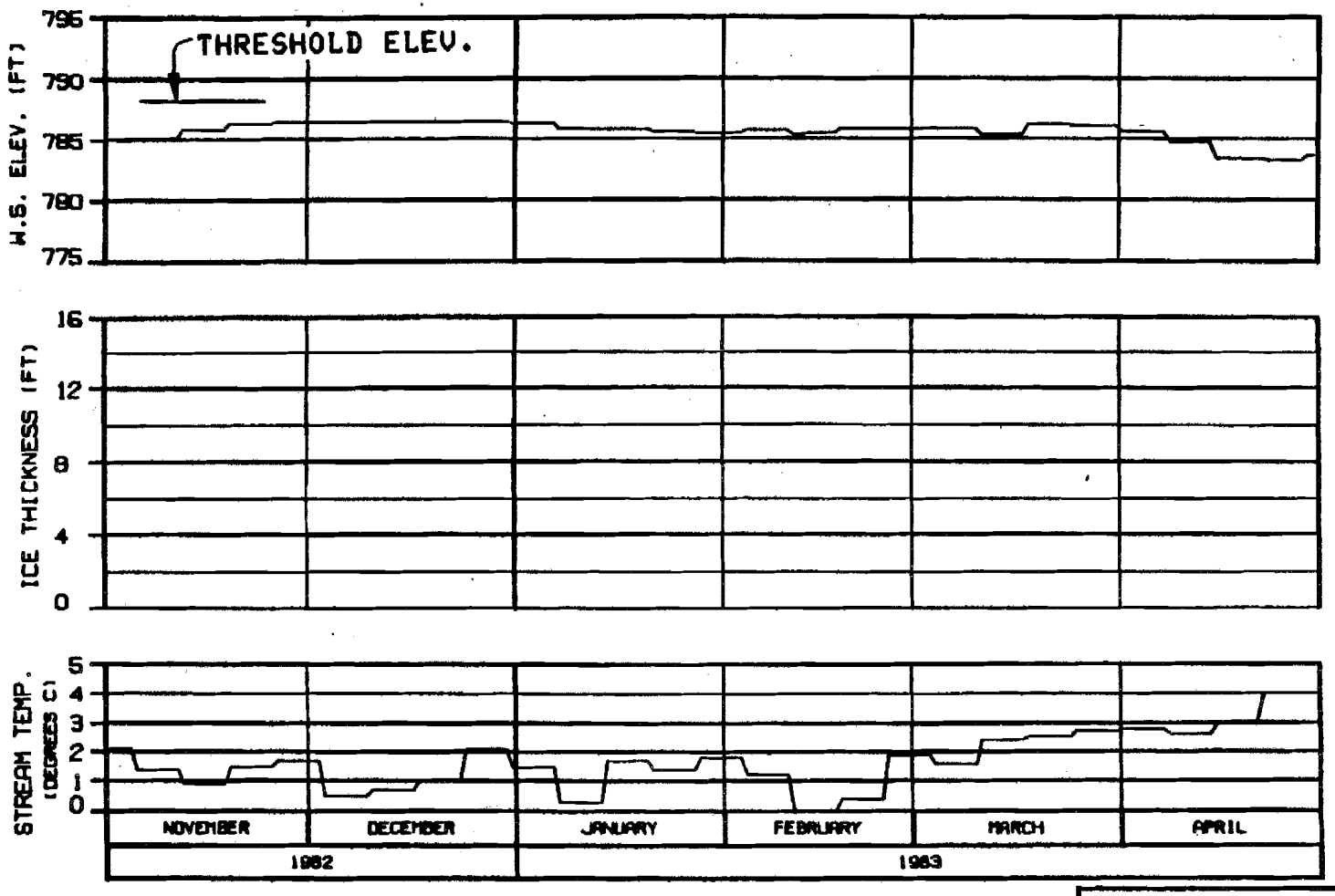
380
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7101CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1588.142

OPTION?

EXHIBIT M



HEAD OF SLOUGH 22

RIVER MILE : 144.80

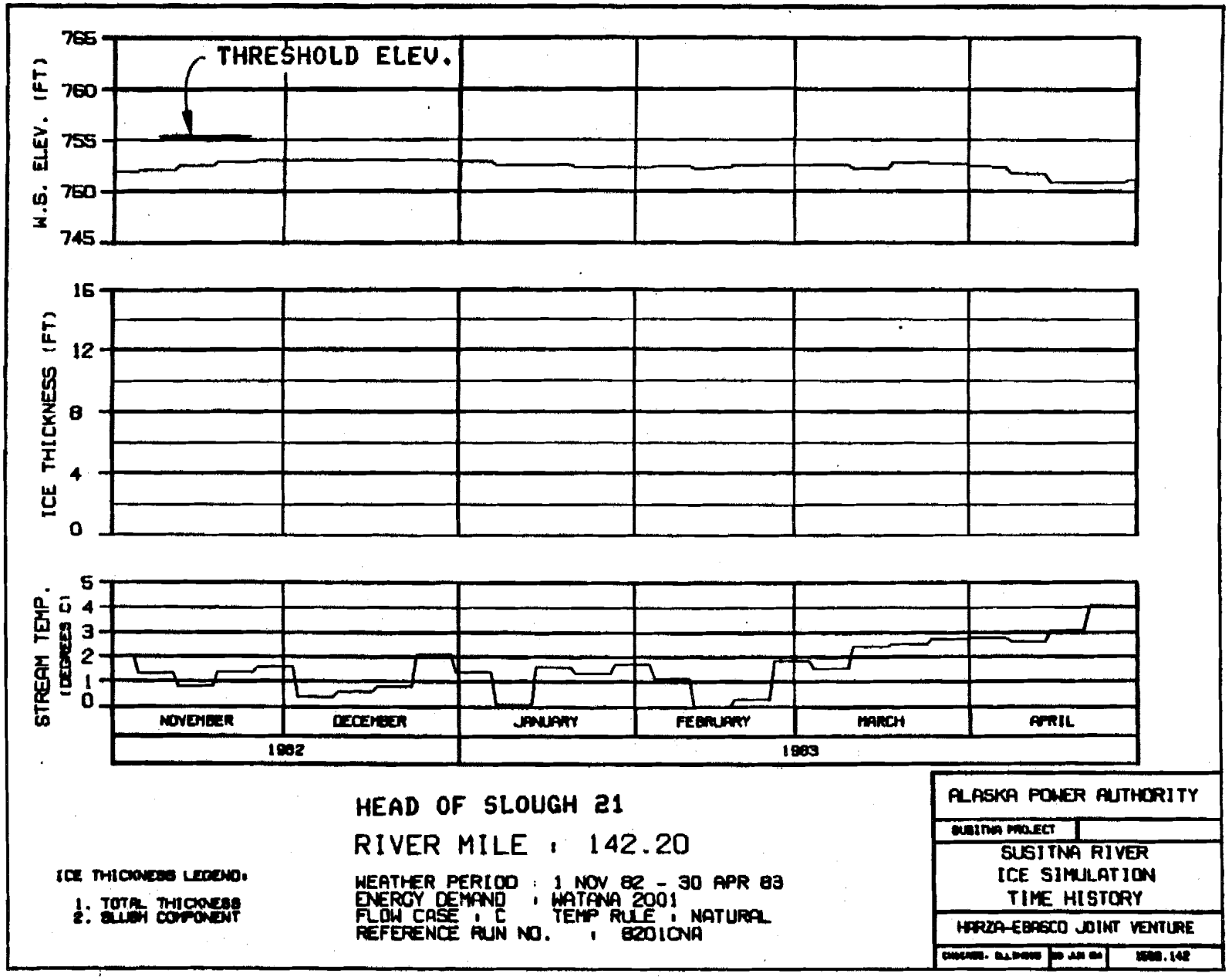
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

OPTION?

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	30 JAN 84	1868.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

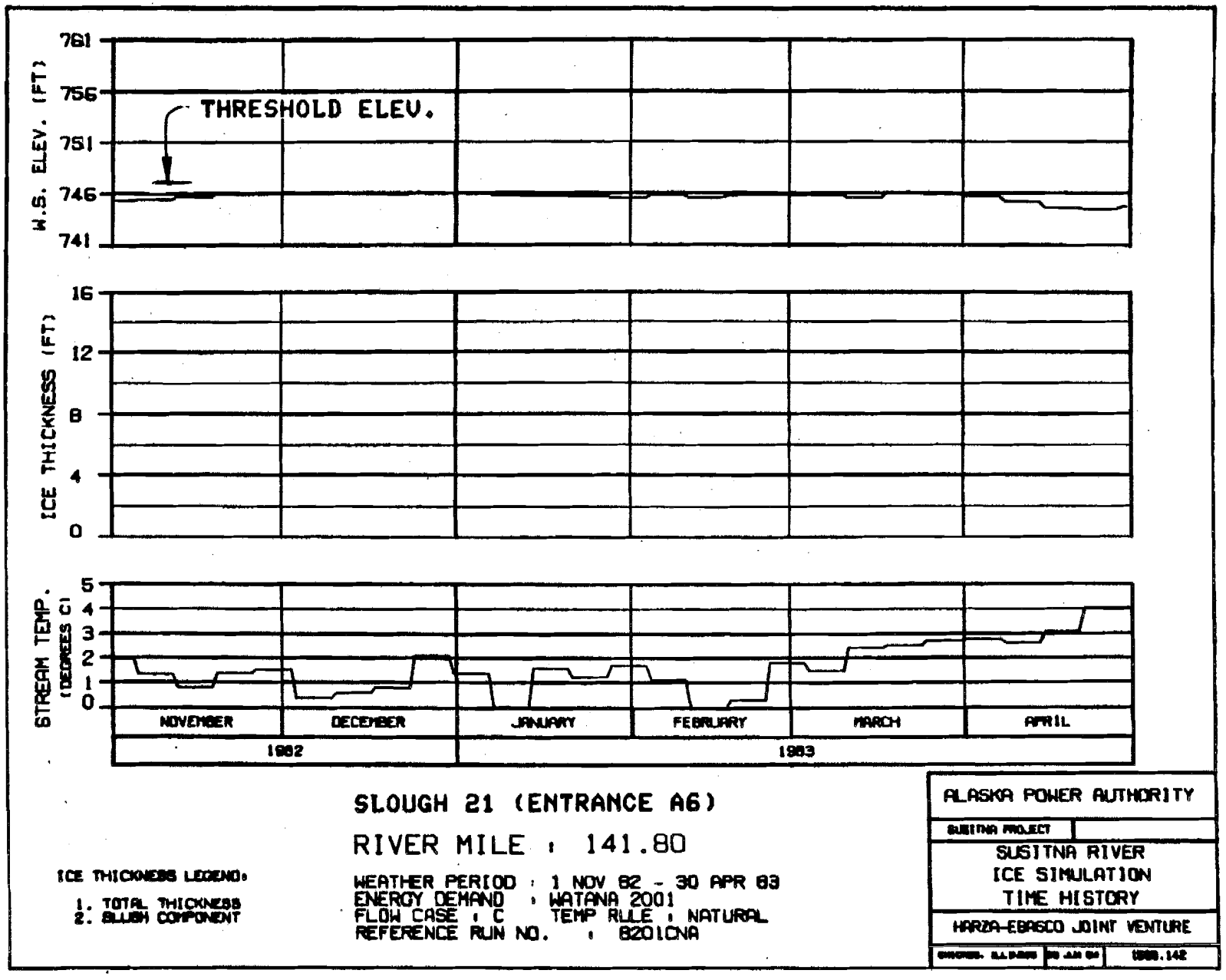
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 20 JAN 84 | 1588.142



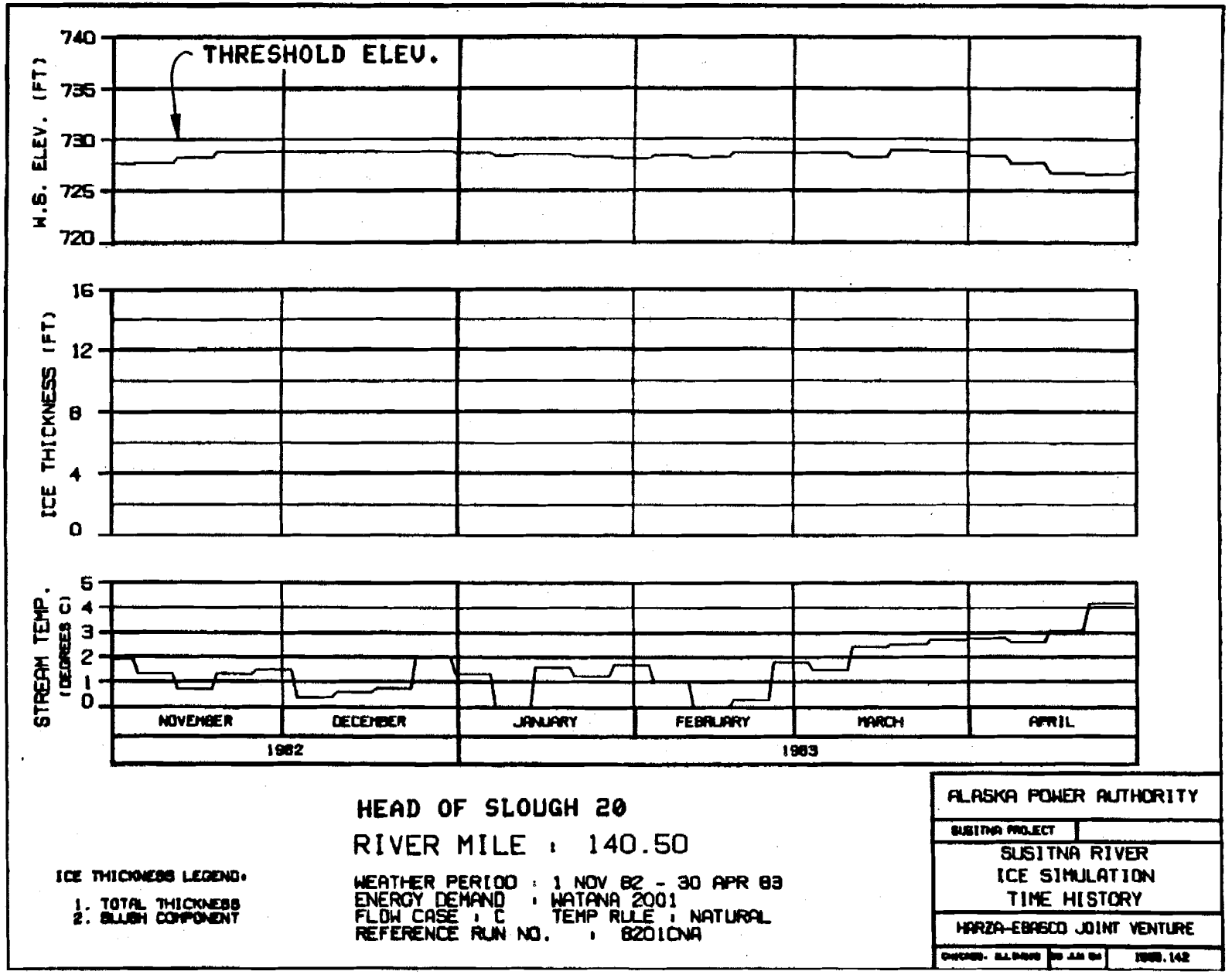
SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

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:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

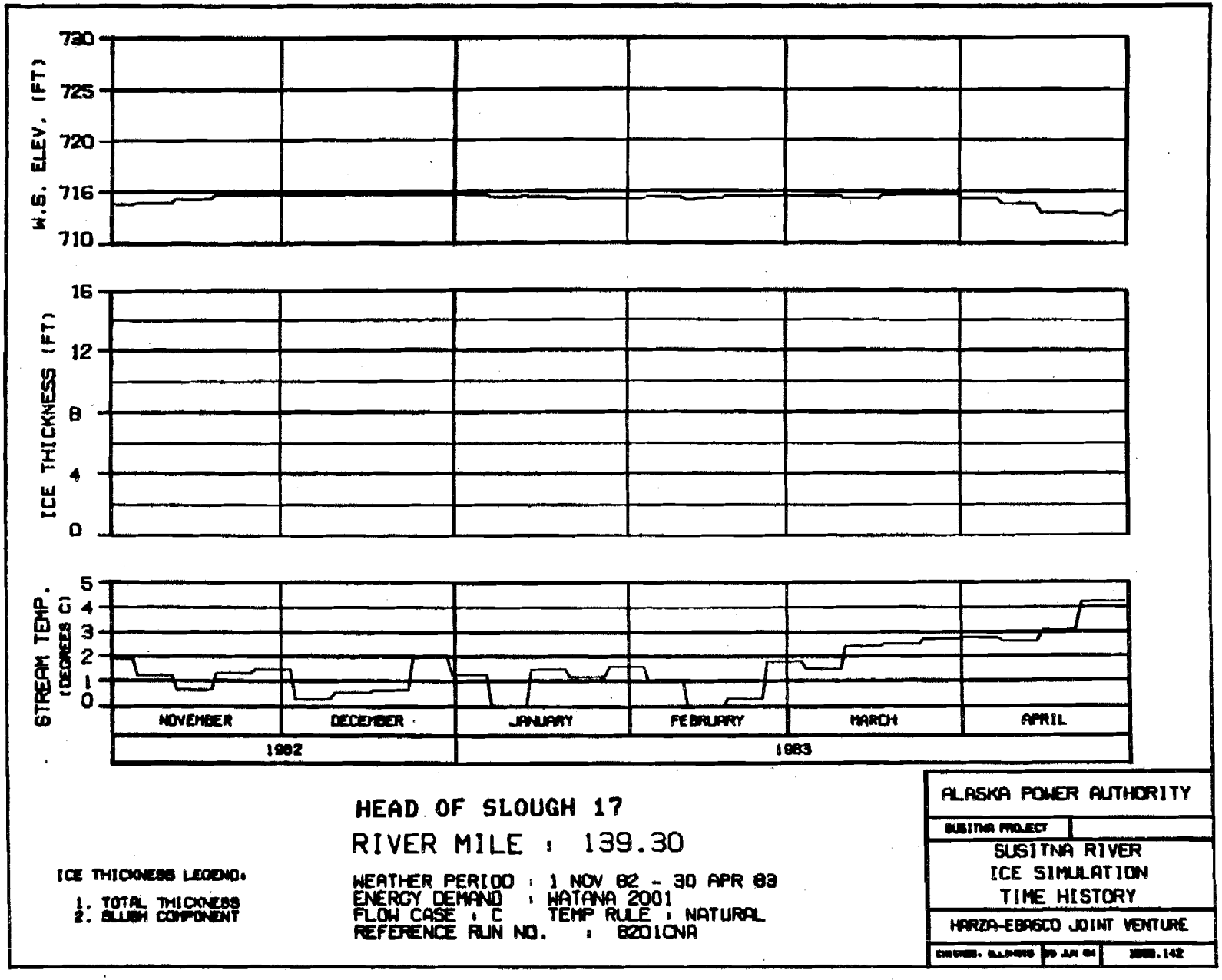
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142



HEAD OF SLOUGH 17

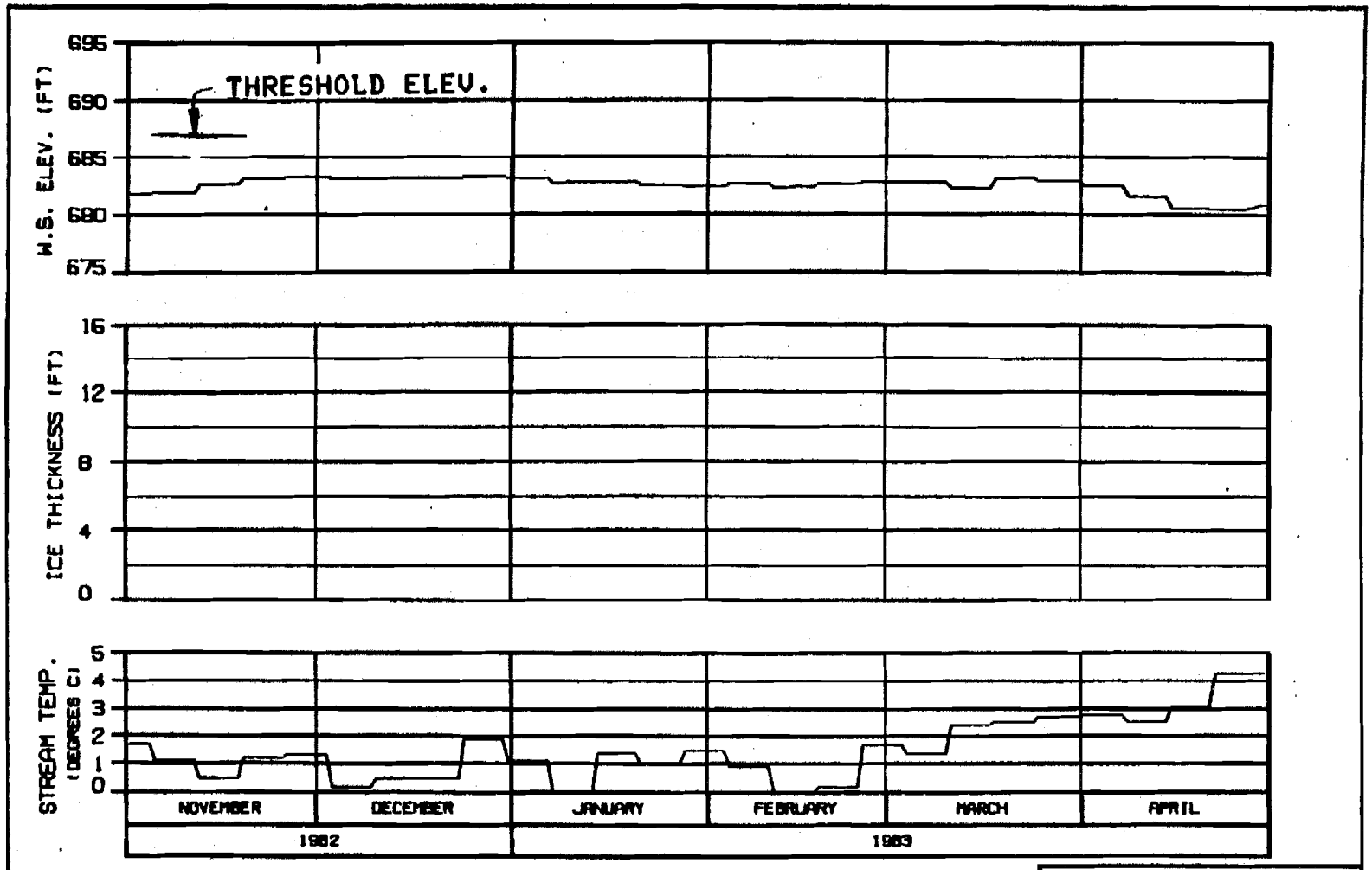
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1988.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

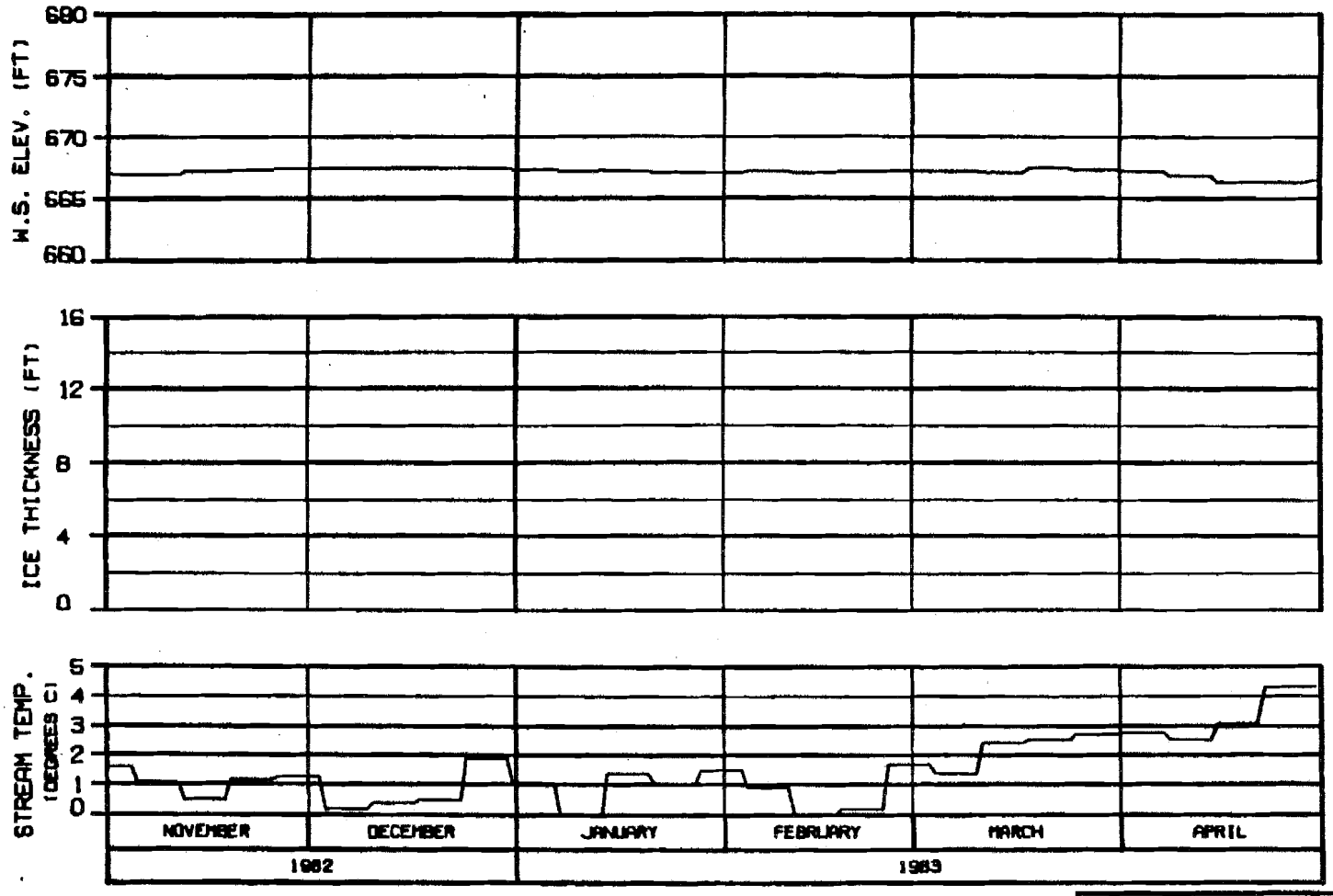
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JAN 84 | 2288.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

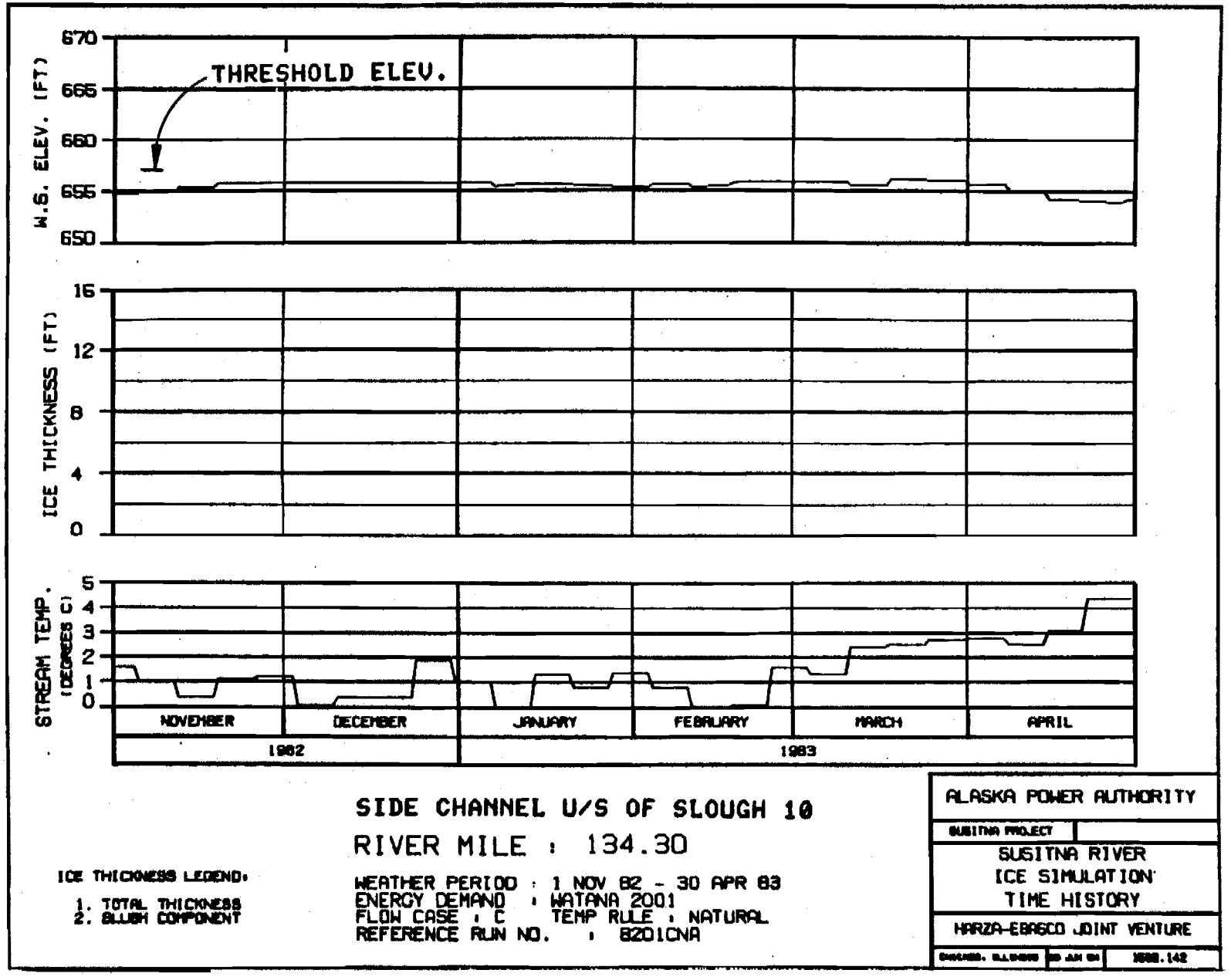
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DISCRS. LLL-9405 | 30 JAN 84 | 1988.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

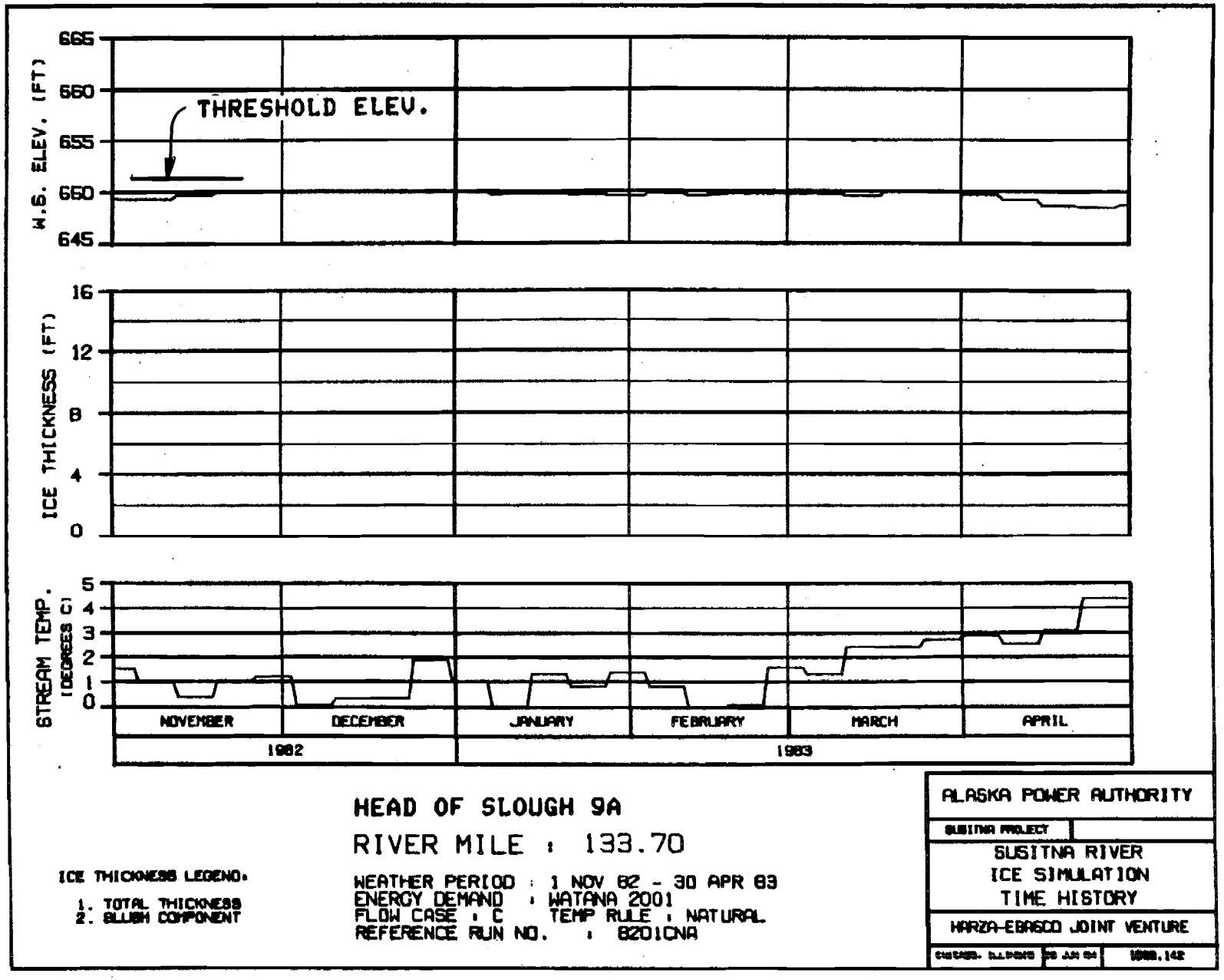
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JAN 84 | 1888.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

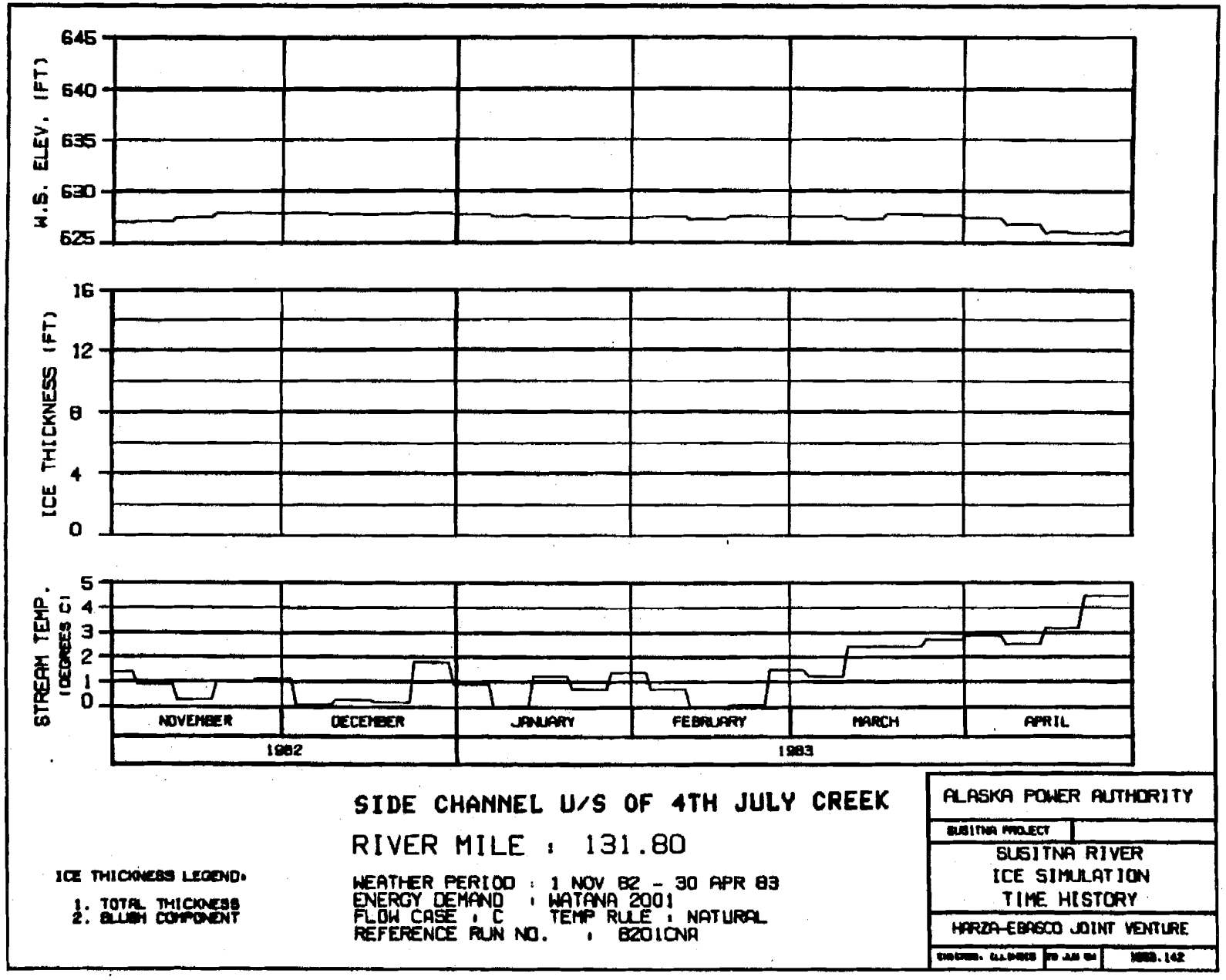
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JAN 84 | 1888.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

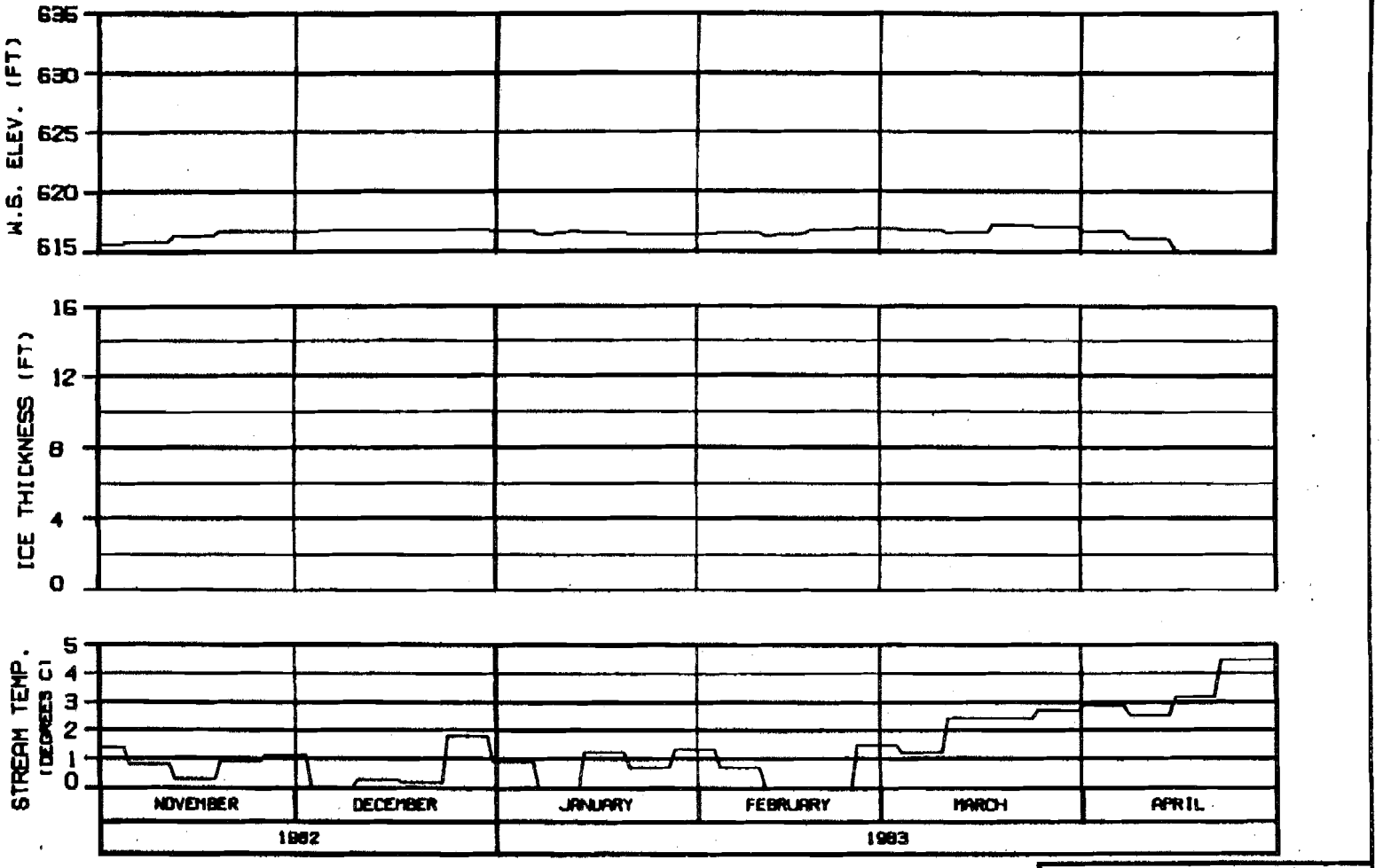
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] 142

OPTION?



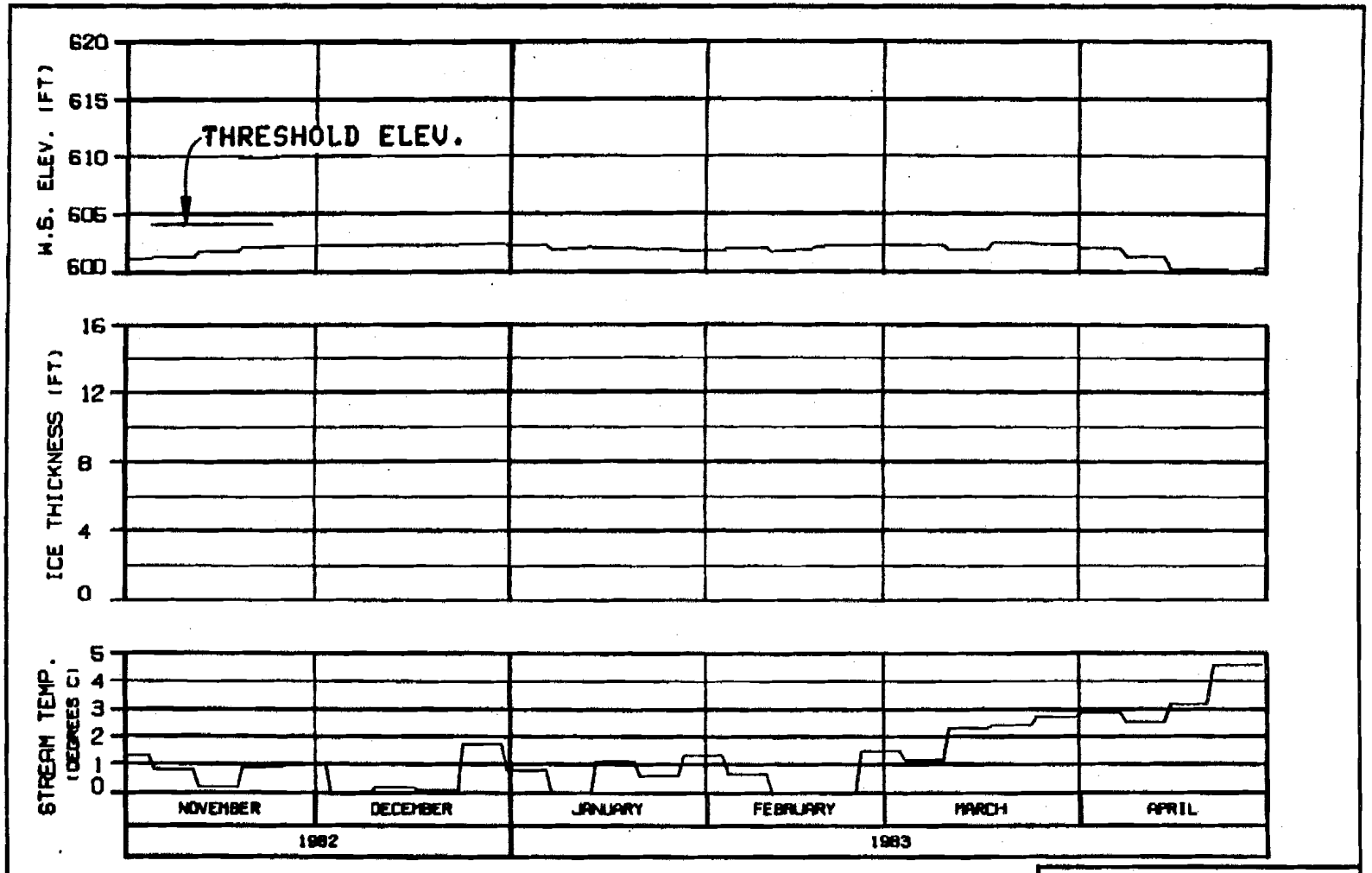
SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

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



HEAD OF SLOUGH 9

RIVER MILE : 129.30

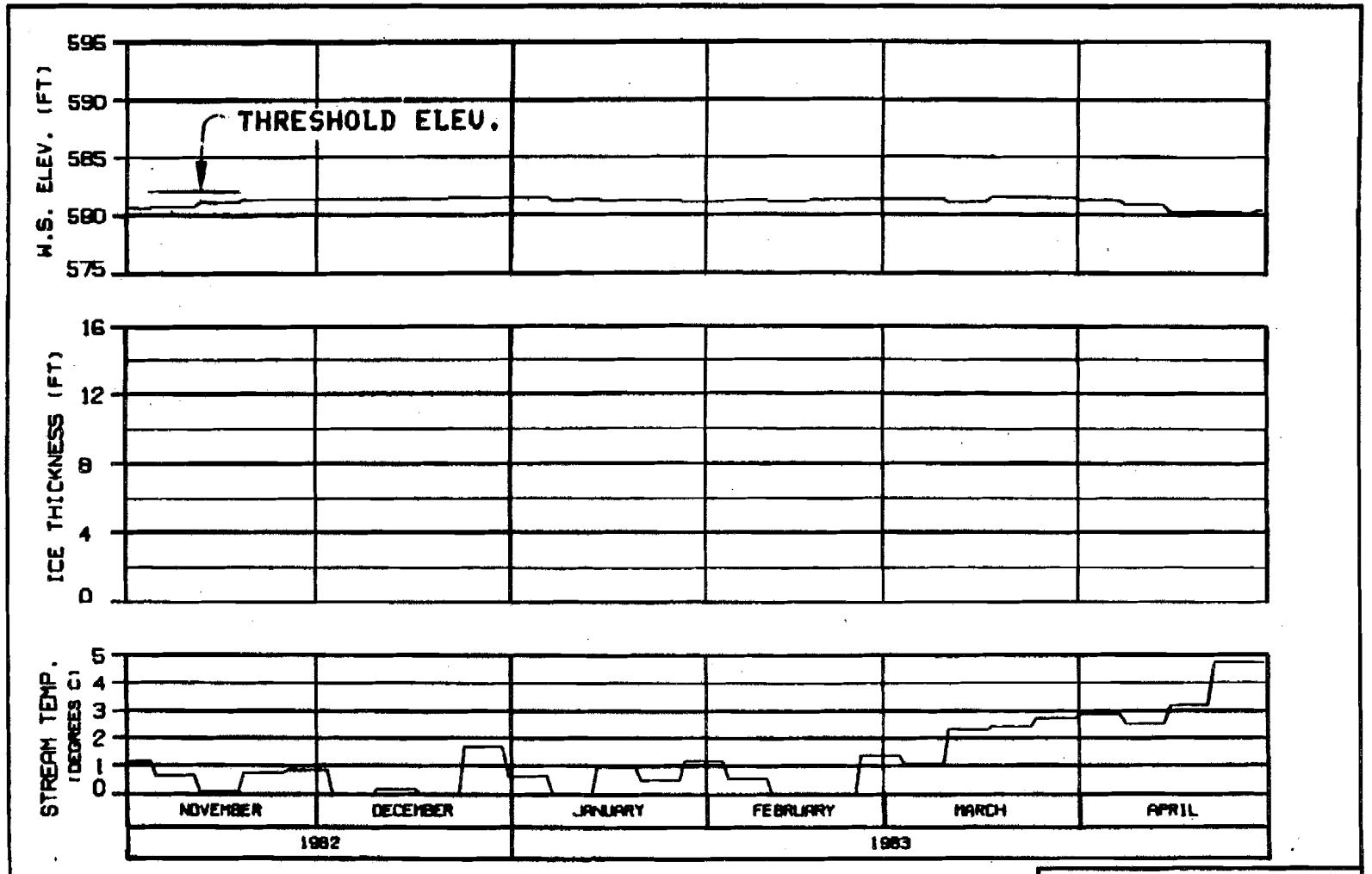
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

OPTION?

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
[illegible]	30 JAN 84 | 1688.142



HEAD OF SLOUGH 8A (EAST)

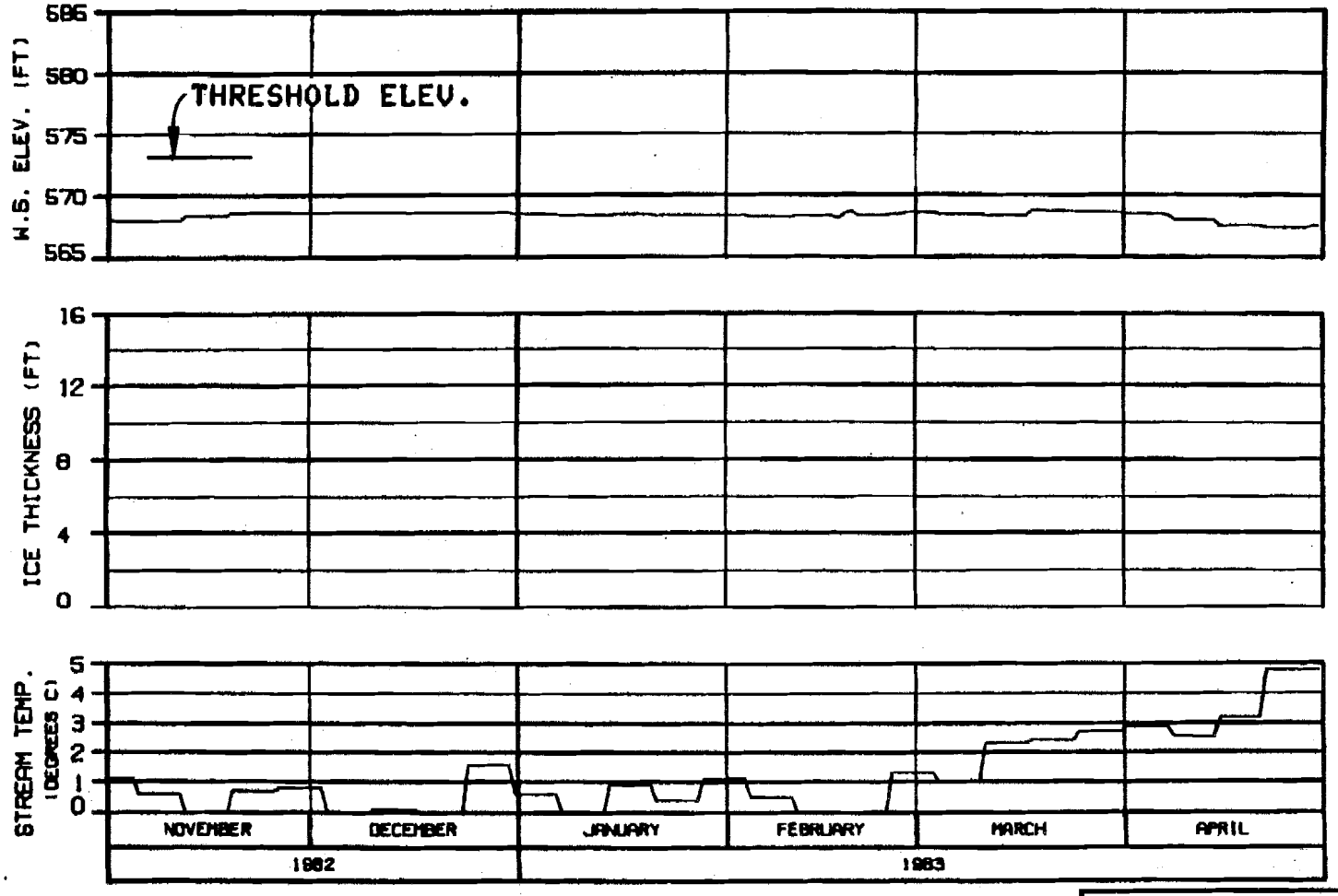
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

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



HEAD OF SLOUGH 8A (WEST)

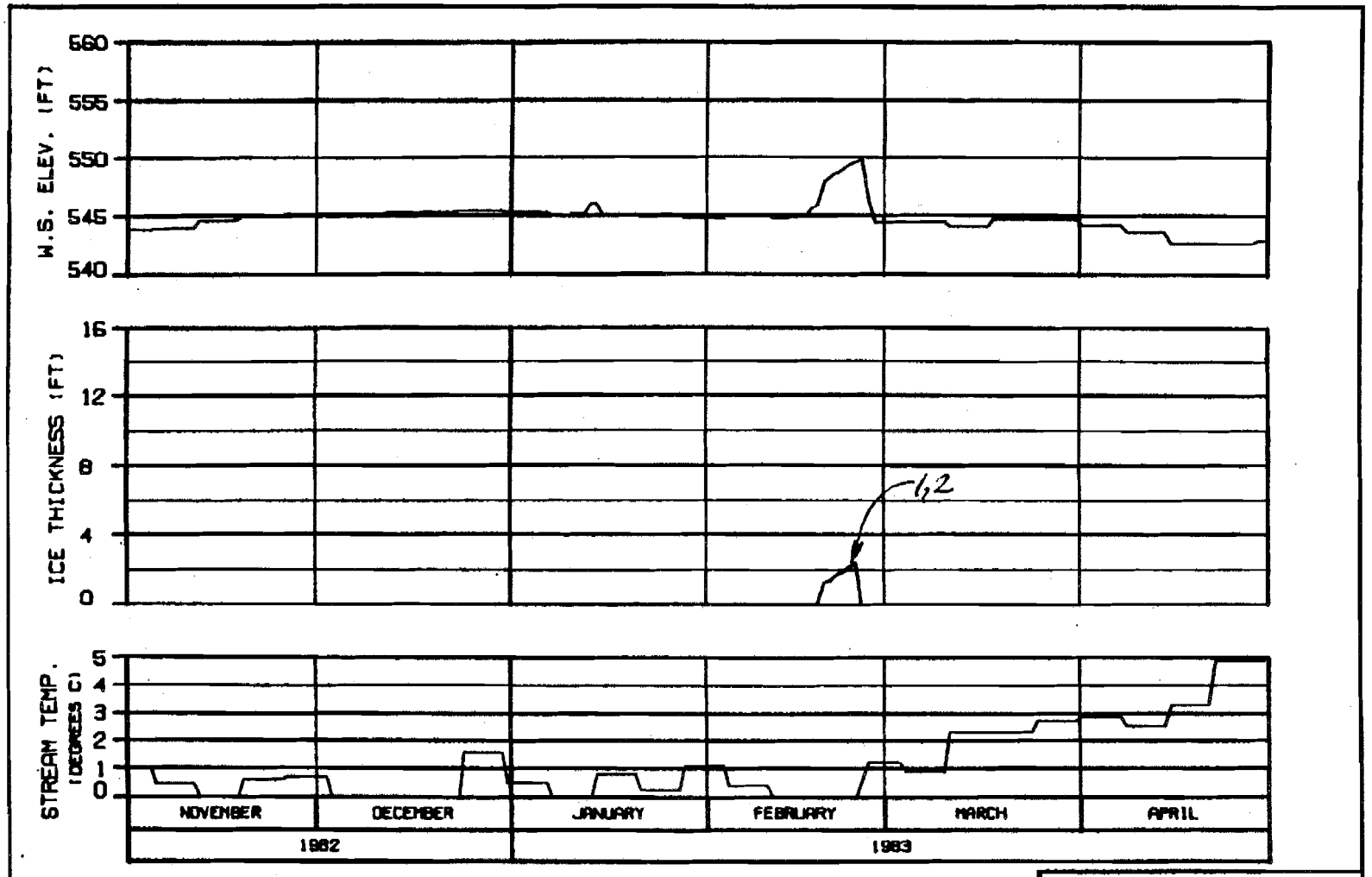
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
ENGNR. ILLEGIBLE 20 JAN 84 1868.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

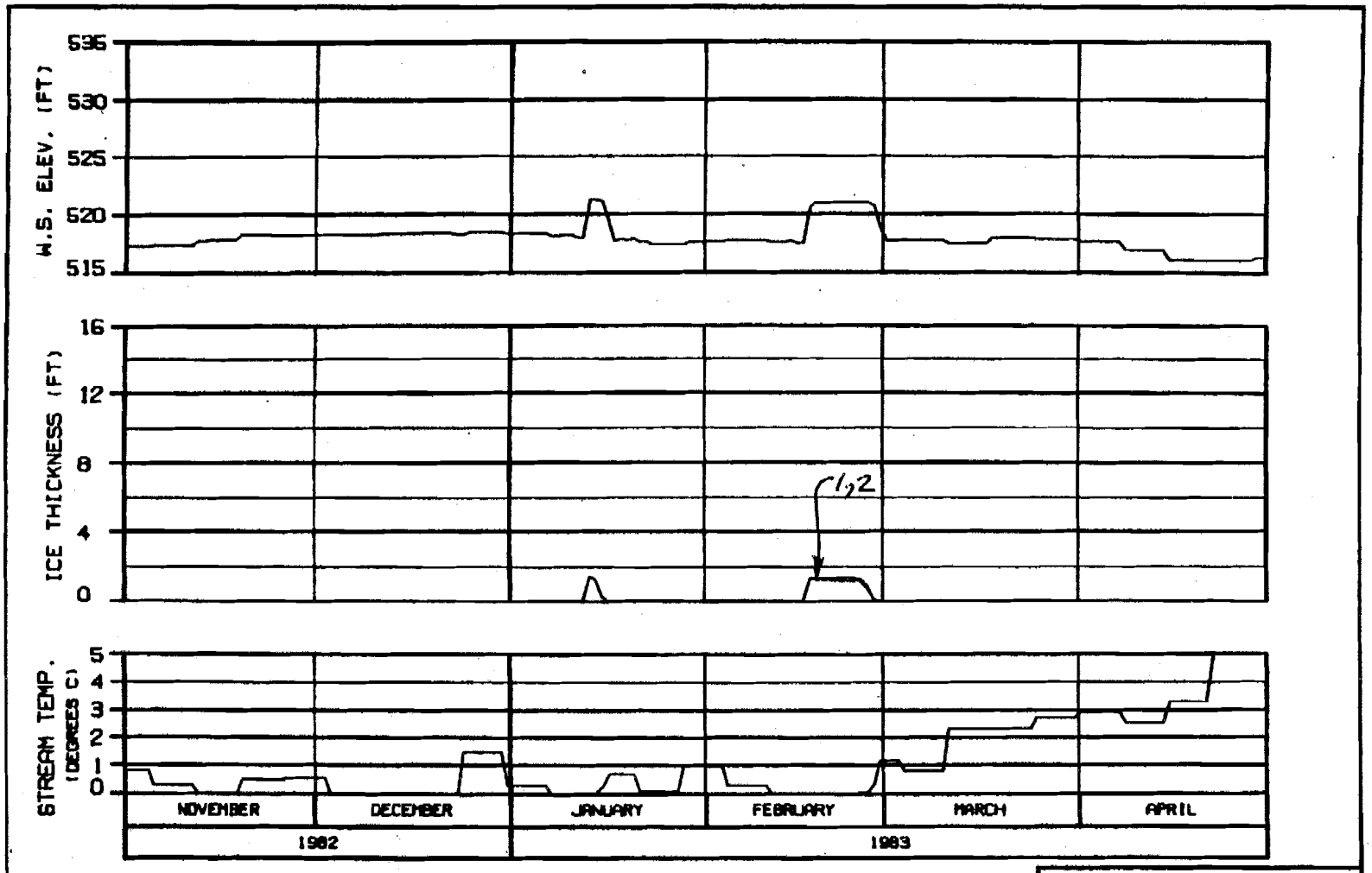
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



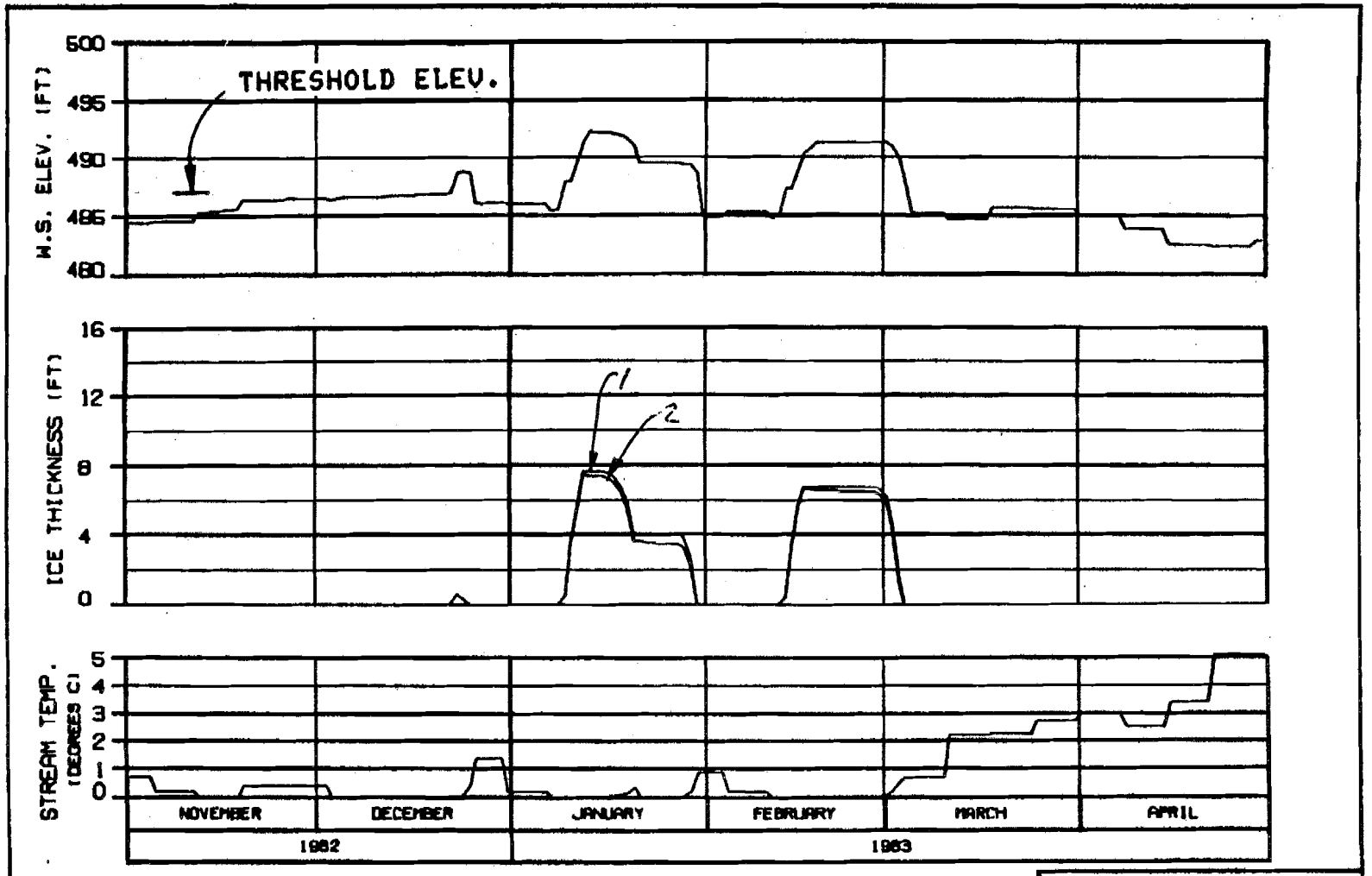
RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B201CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHKD. [illegible]	30 JAN 84	1883.142



HEAD OF SIDE CHANNEL MSII

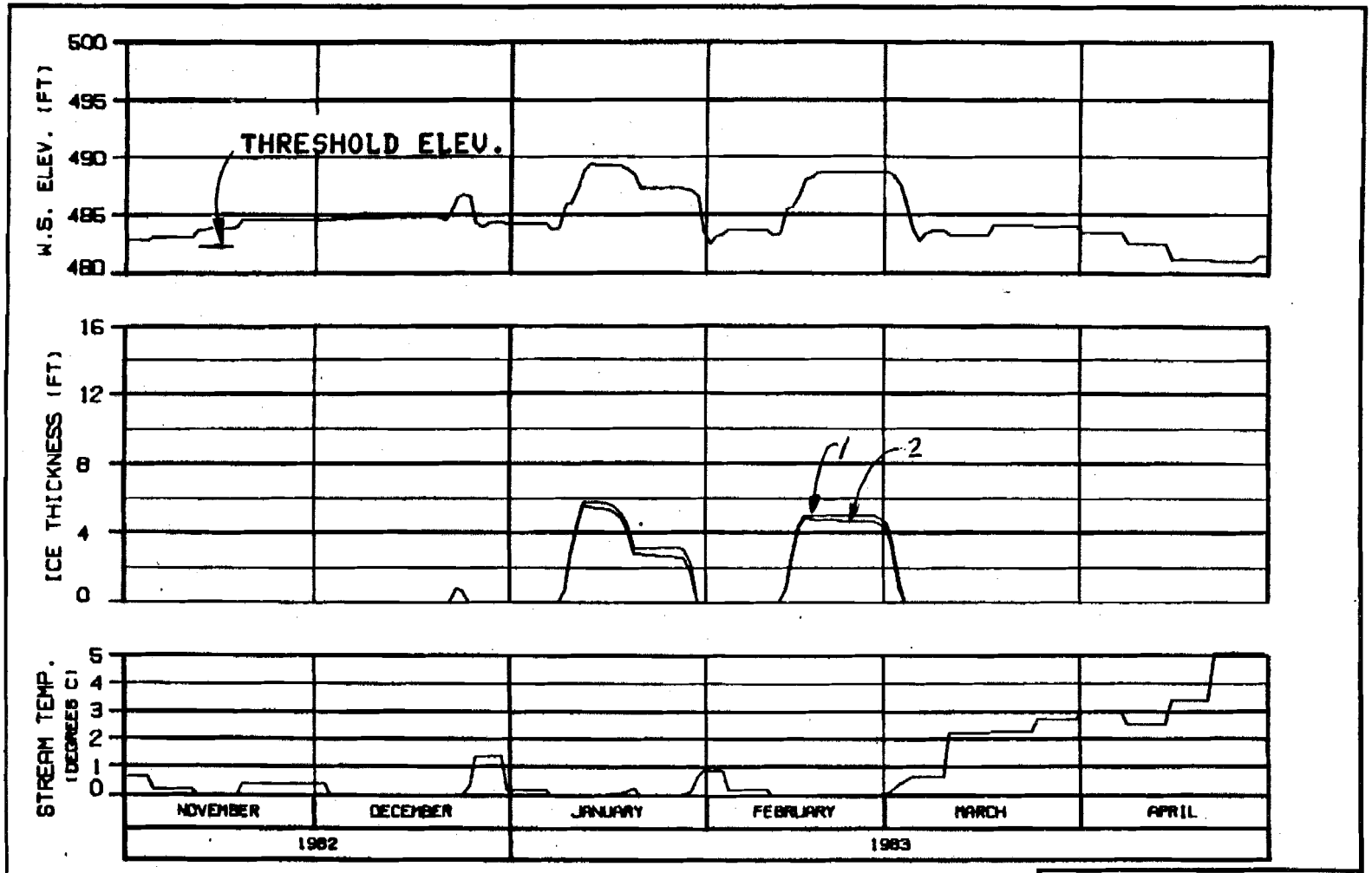
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — JAN 84 — 1988.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

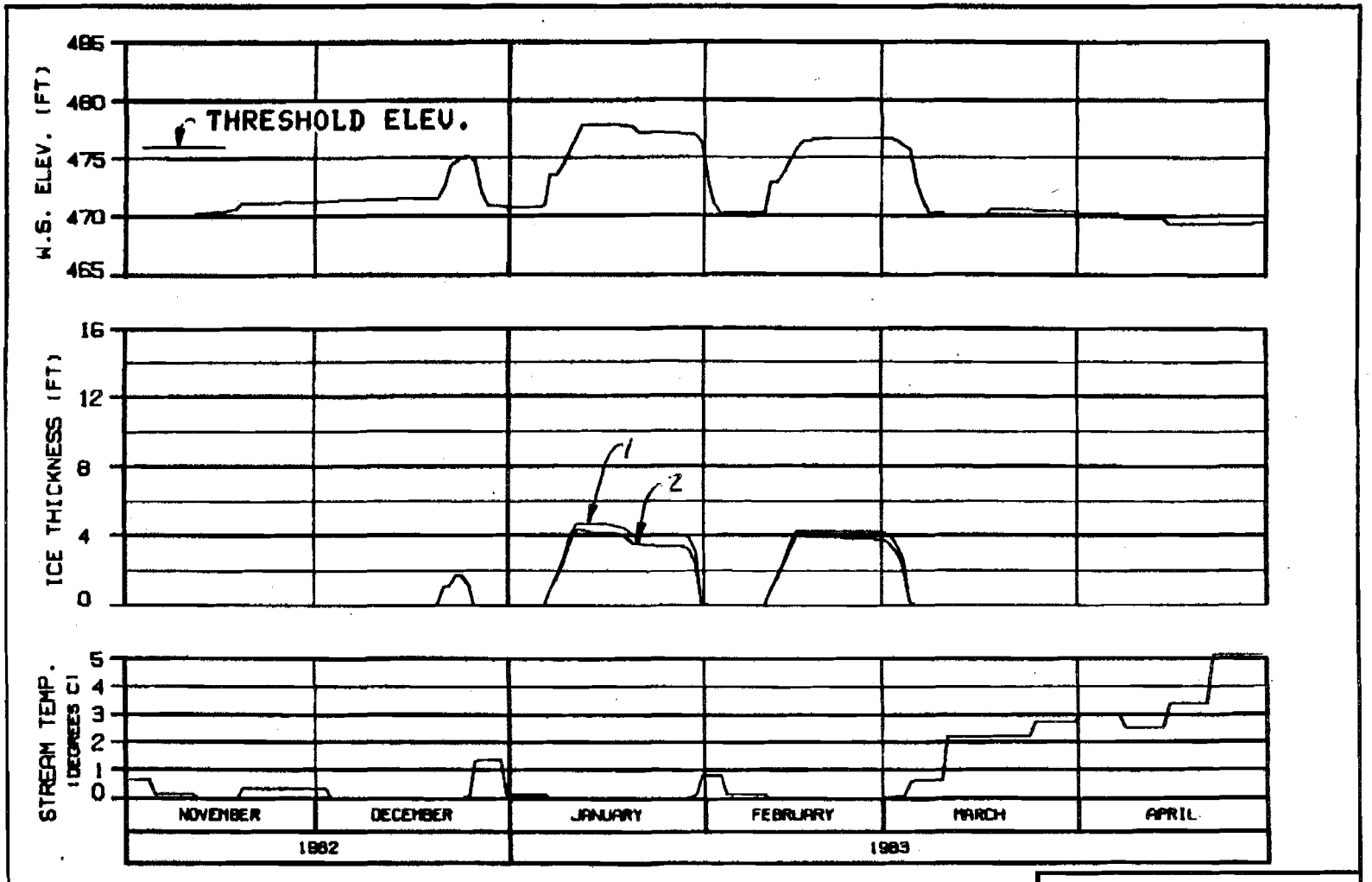
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 30 JUN 84 | 1868.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

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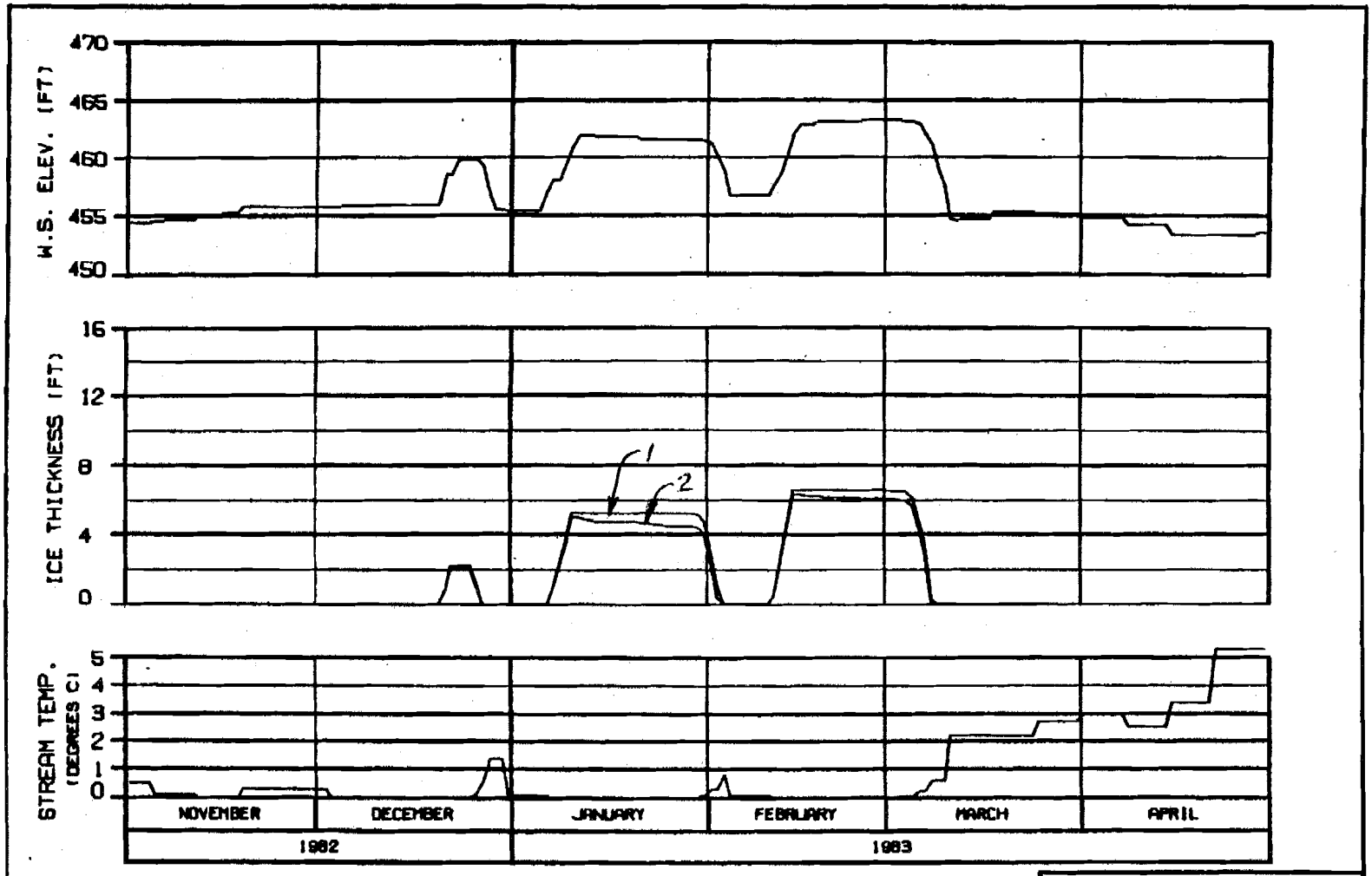


MOUTH OF SLOUGH 6A

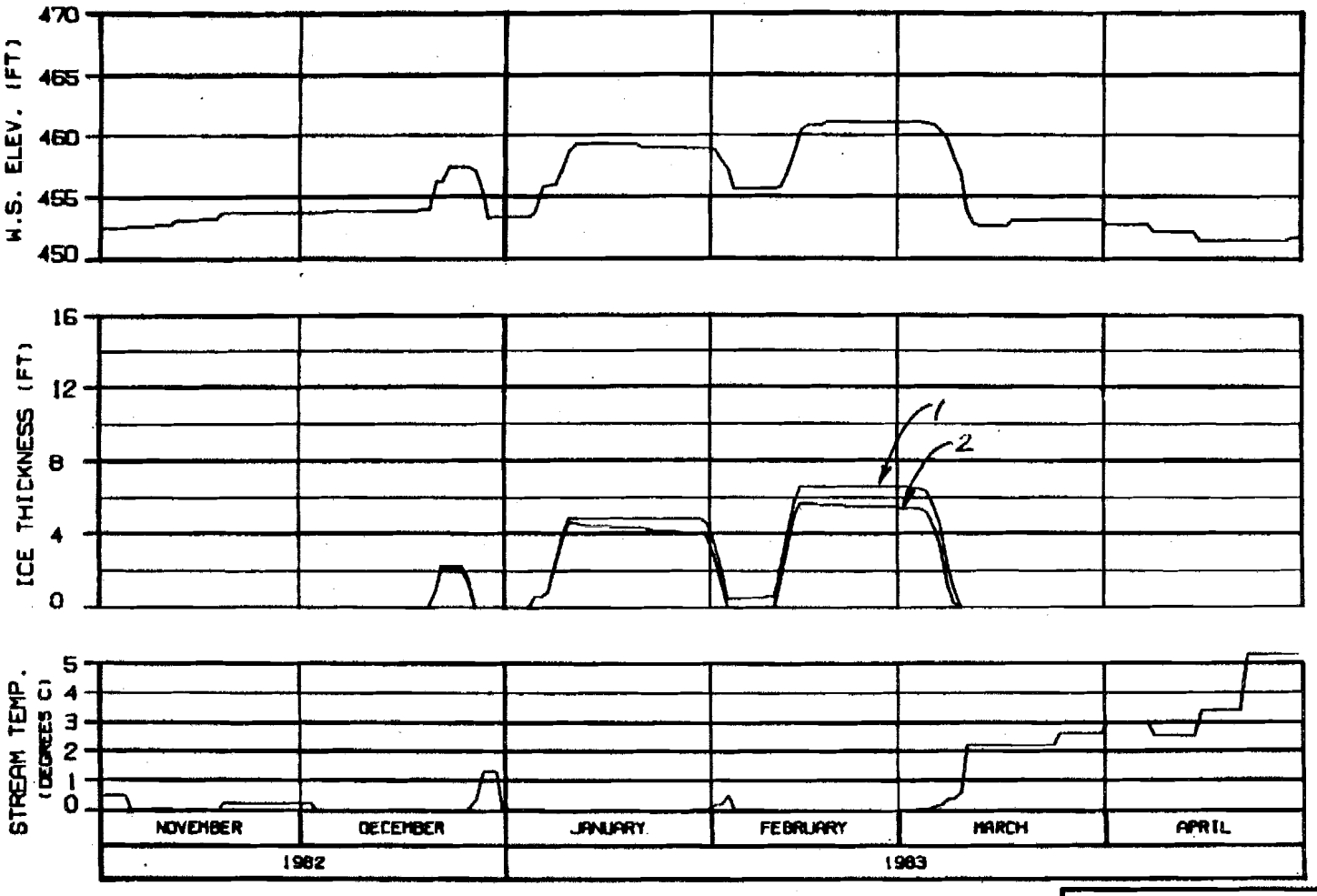
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 30 JAN 84 — 1868.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

ALASKA POWER AUTHORITY	
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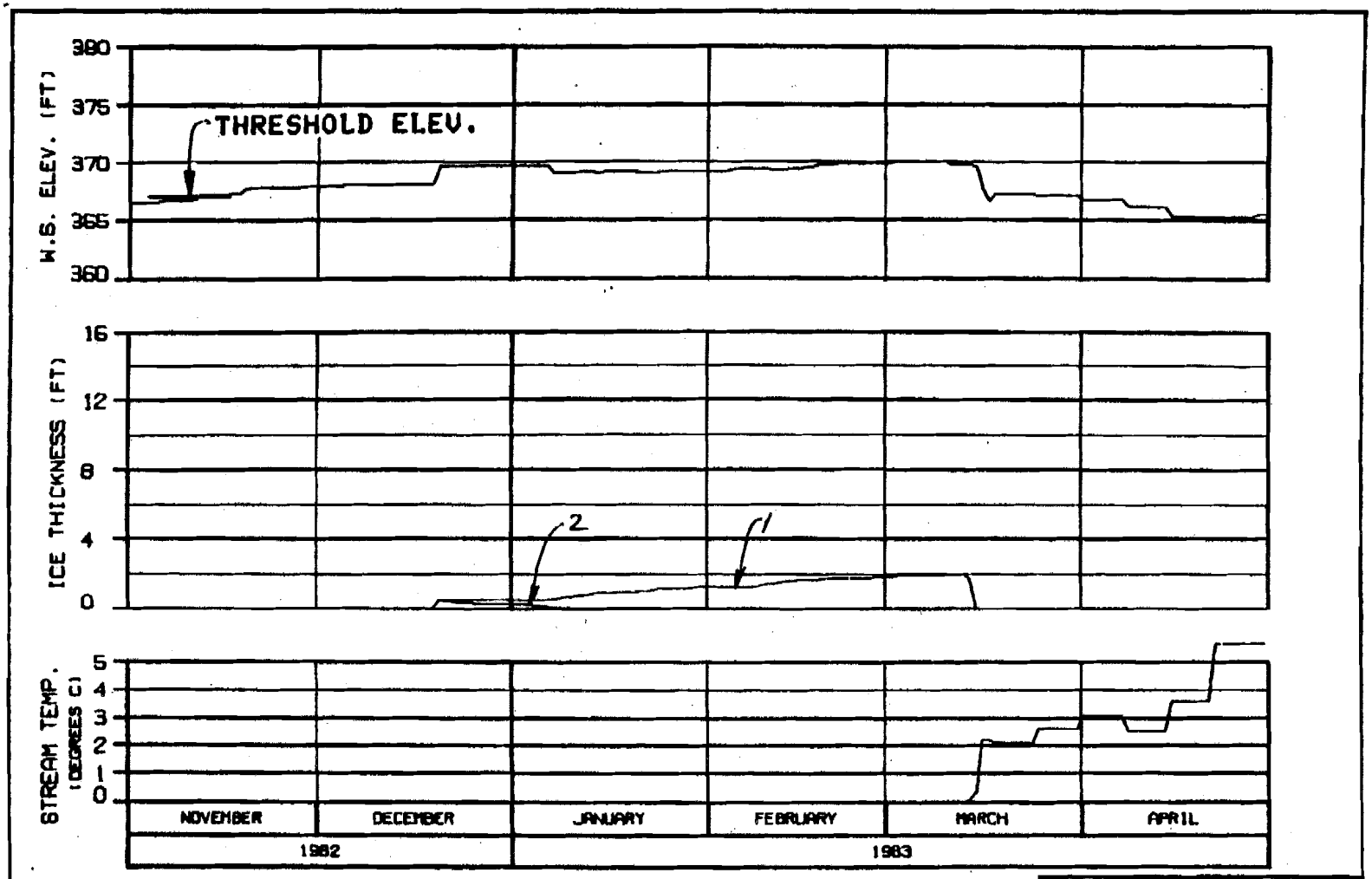


HEAD OF WHISKERS SLOUGH

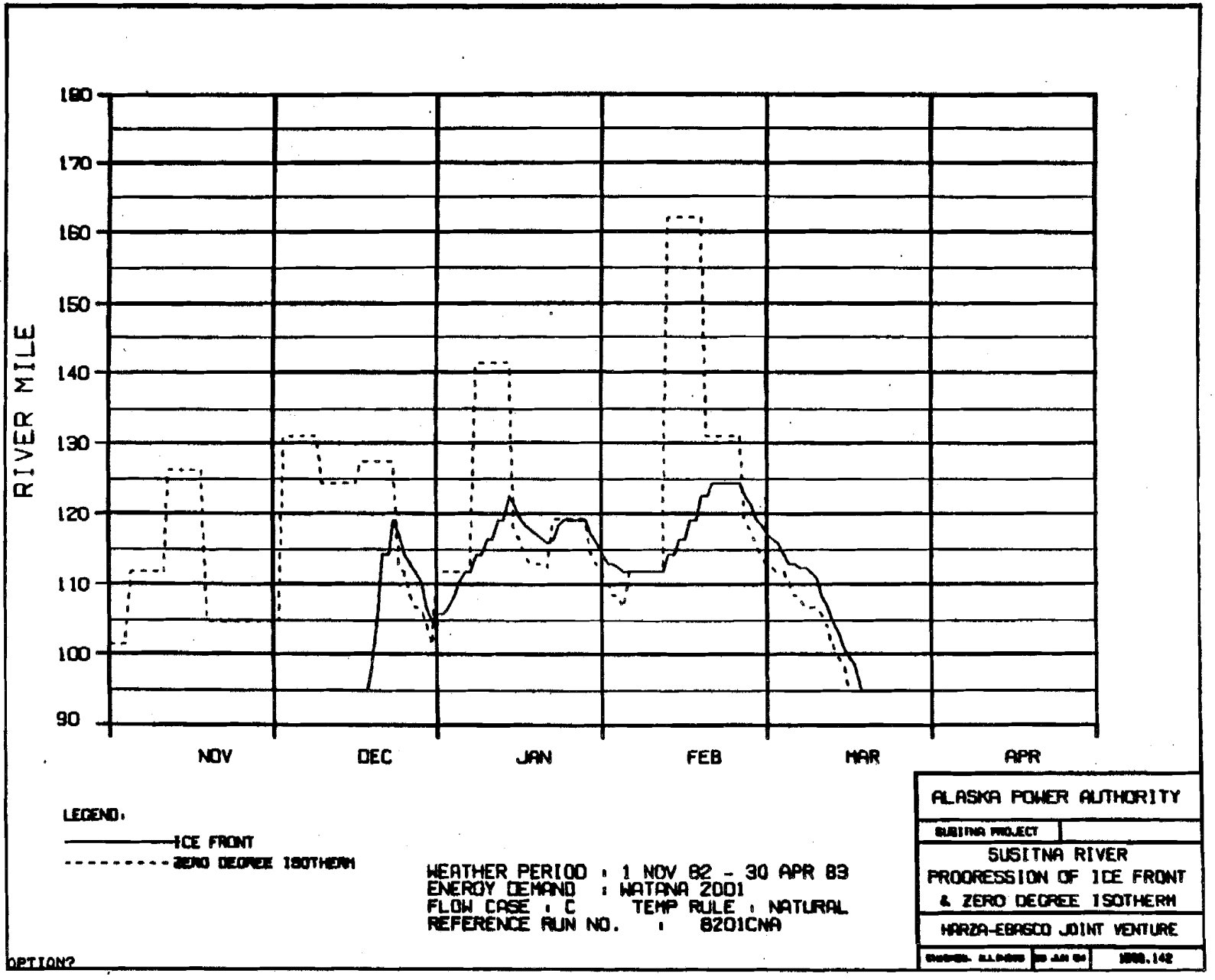
RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 29 JAN 84 1988.142


RIVER MILE
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LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?

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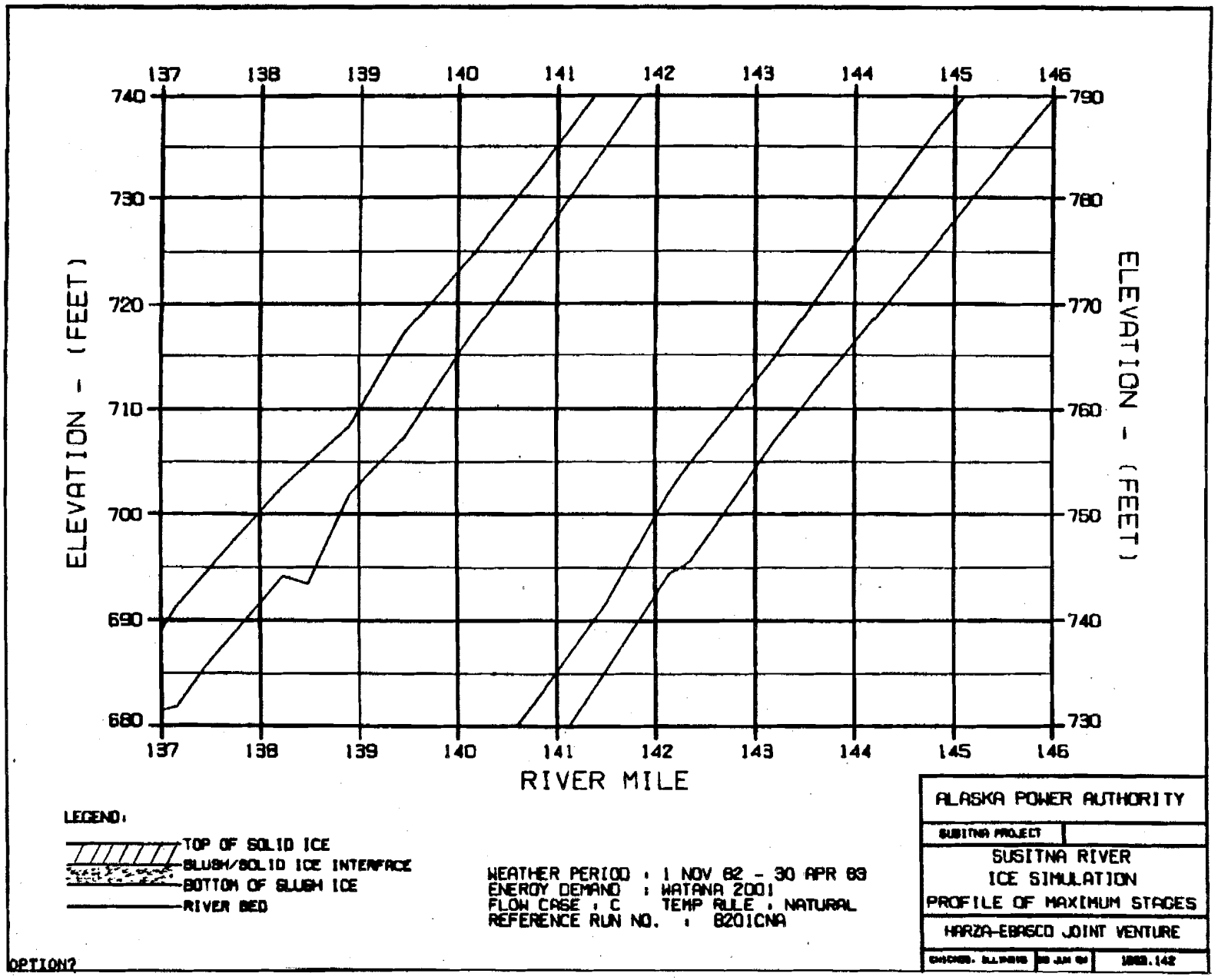
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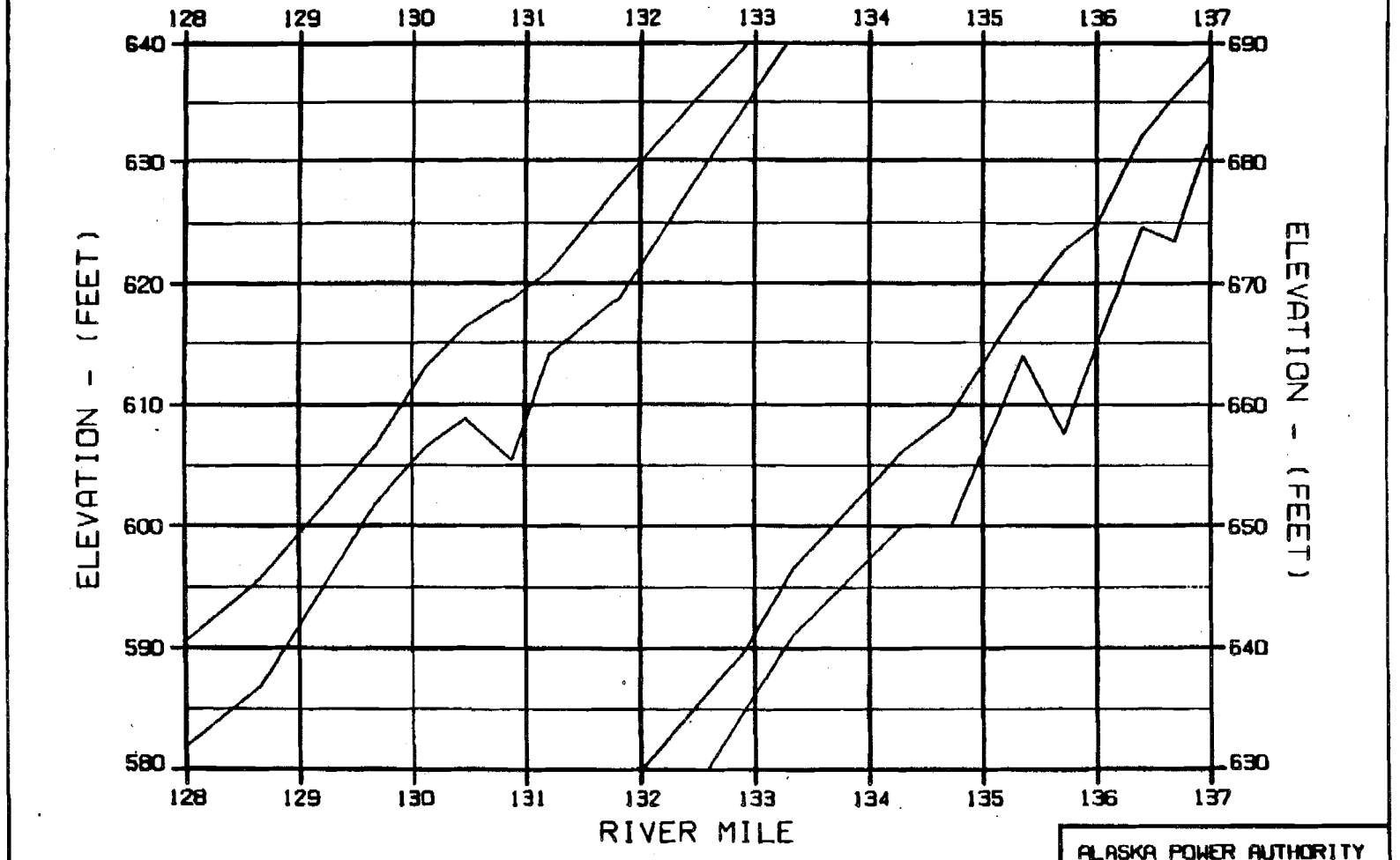
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1868.142
OPTION2

C



LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 30 JAN 84 1868.142

OPTION?

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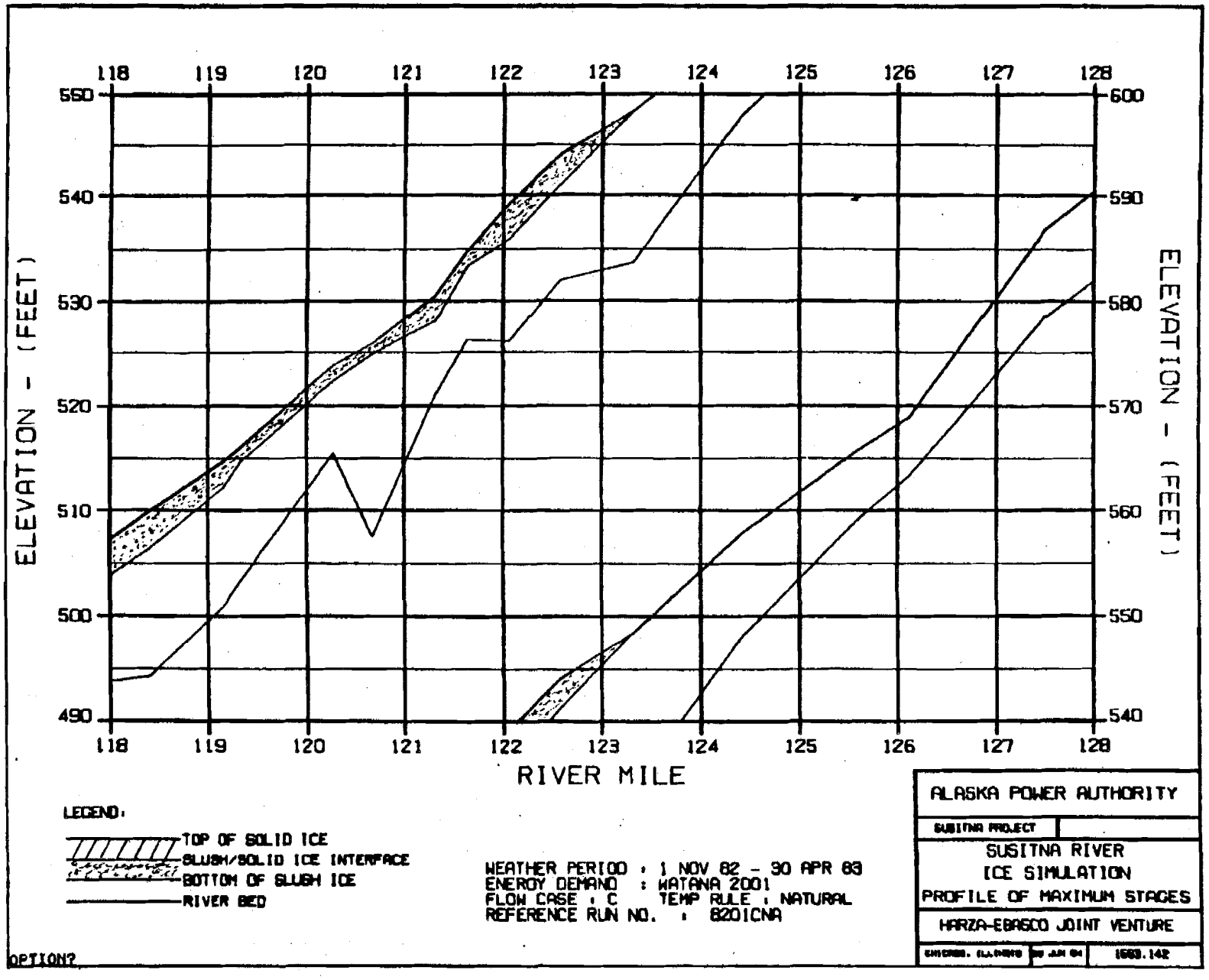
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 820ICNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1669.142

OPTION?

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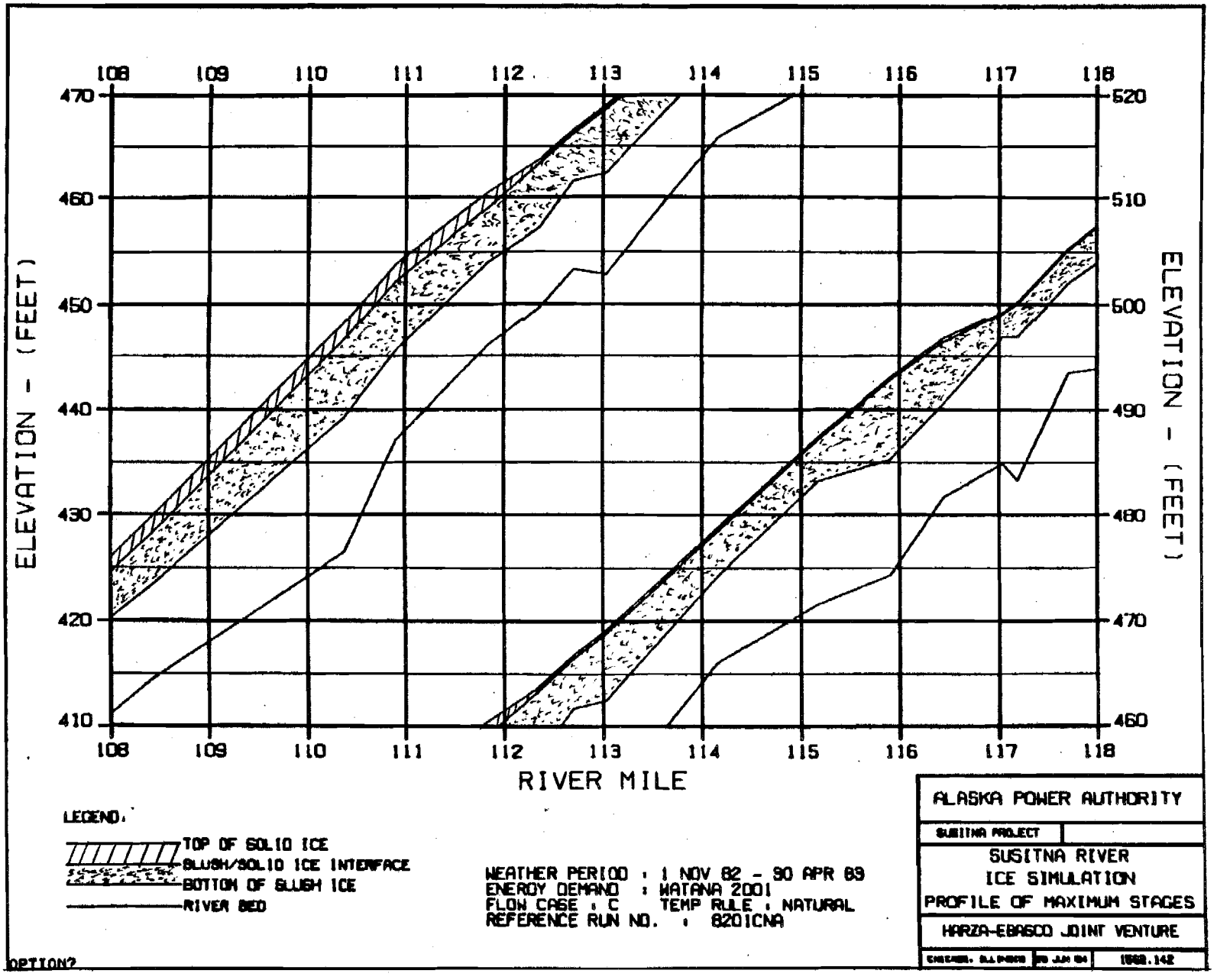
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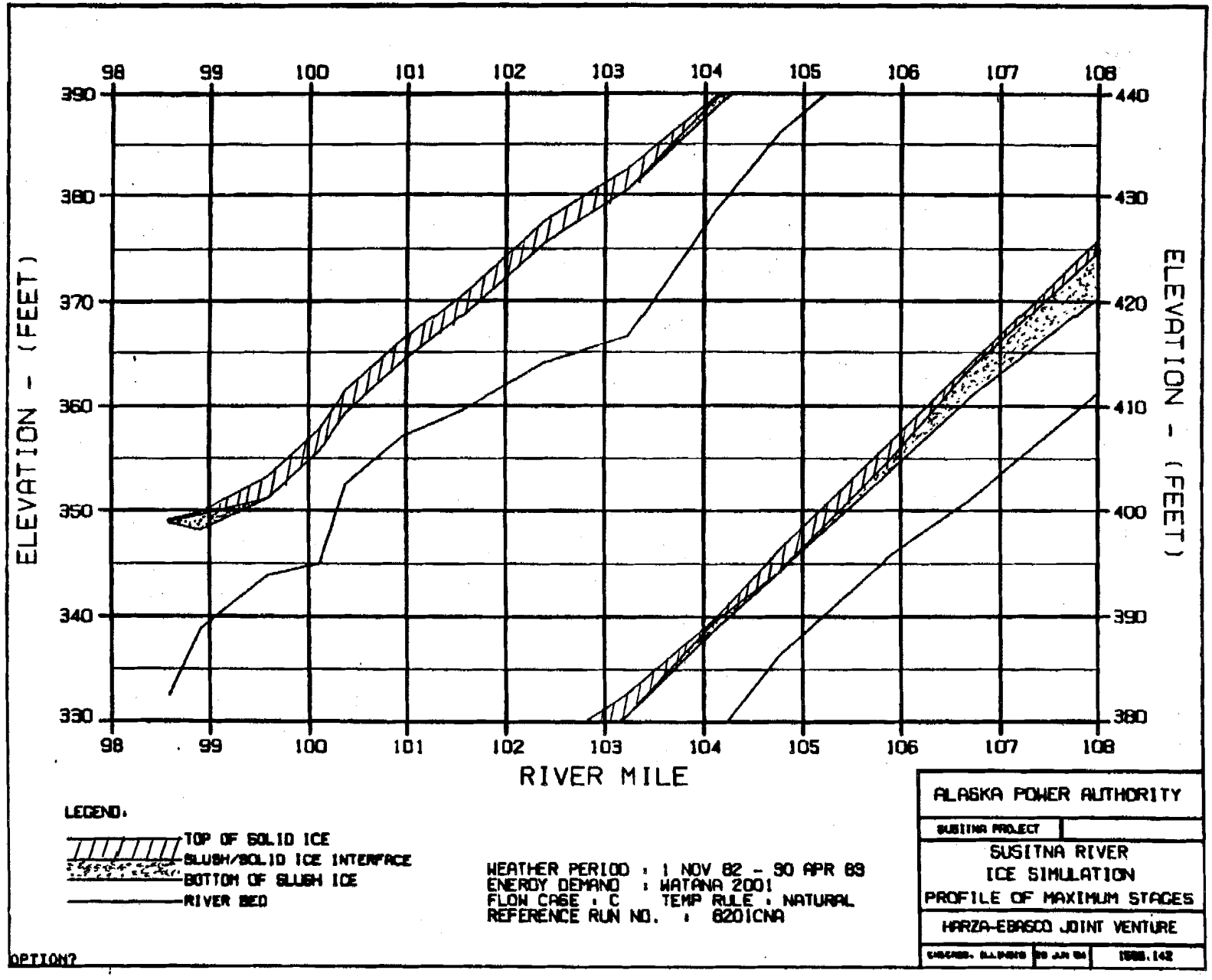
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : MATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
20 JAN 84
1868.142
OPTION2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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 82 - 30 APR 83
ENERGY DEMAND : WATANA 2001
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8201CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?

Watana and Devil Canyon Operating

EXHIBIT N

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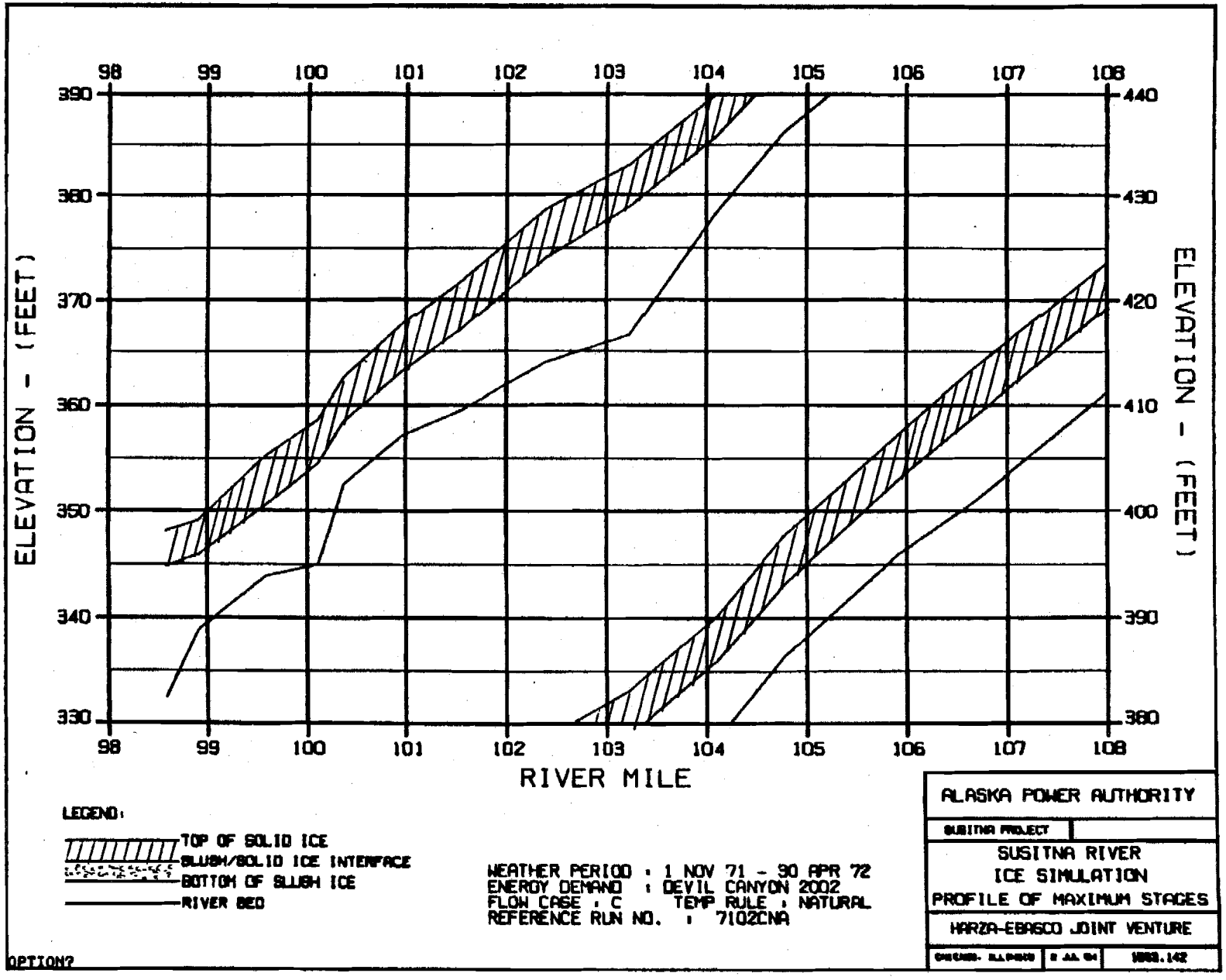
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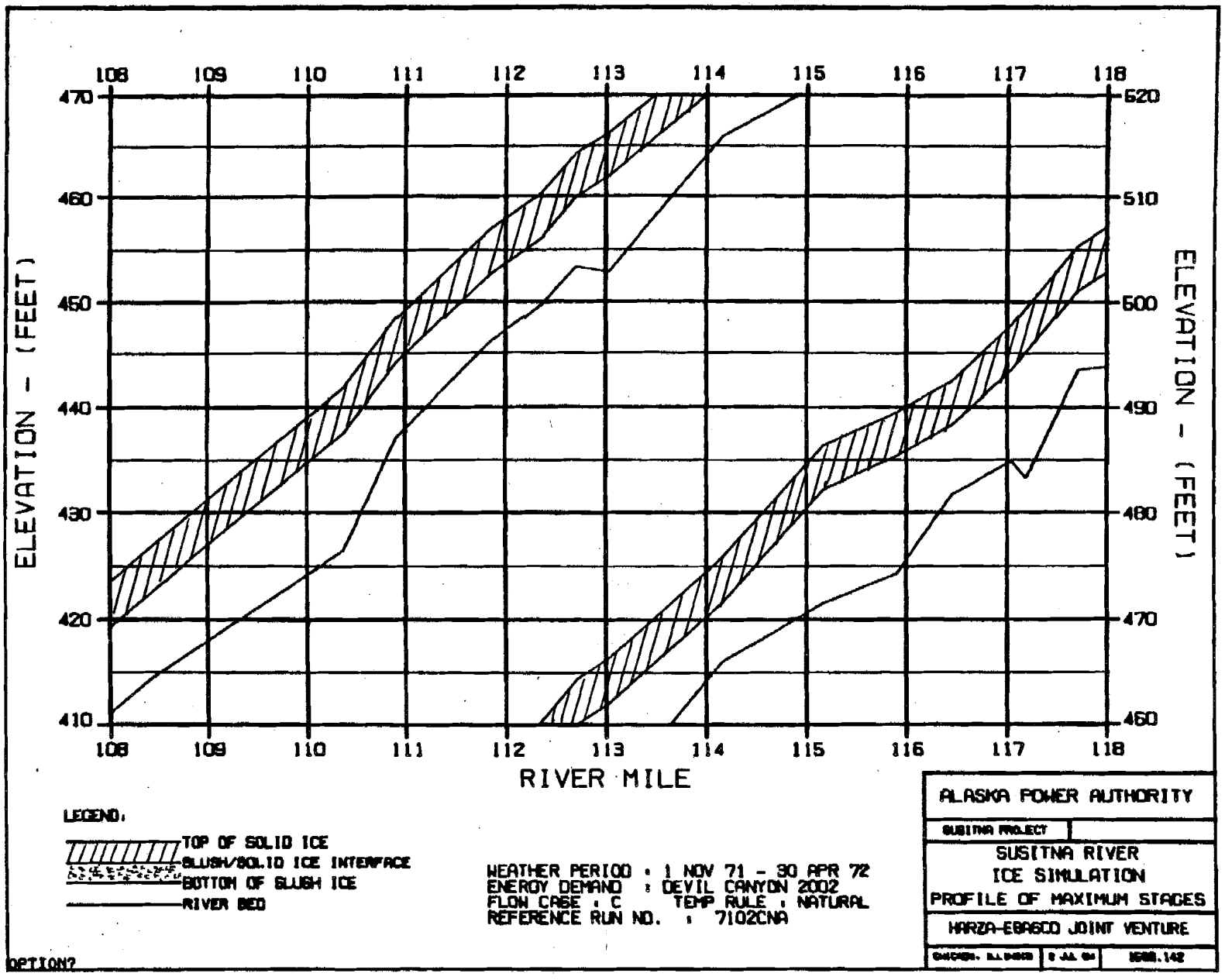
380
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA
OPTION?
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
2 JUL 84
1988.142

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 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA
OPTION2
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
8 JUL 84
8688.142

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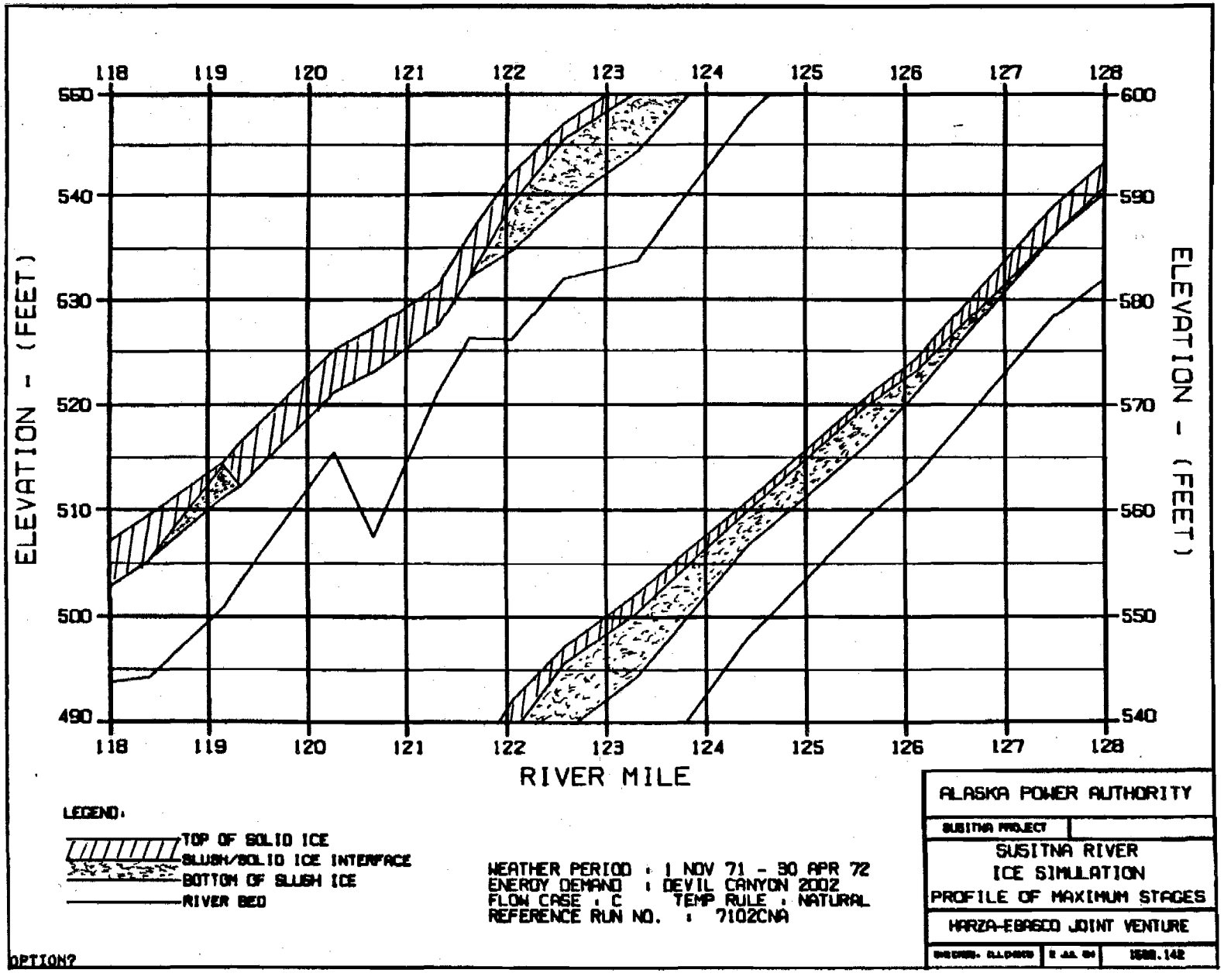
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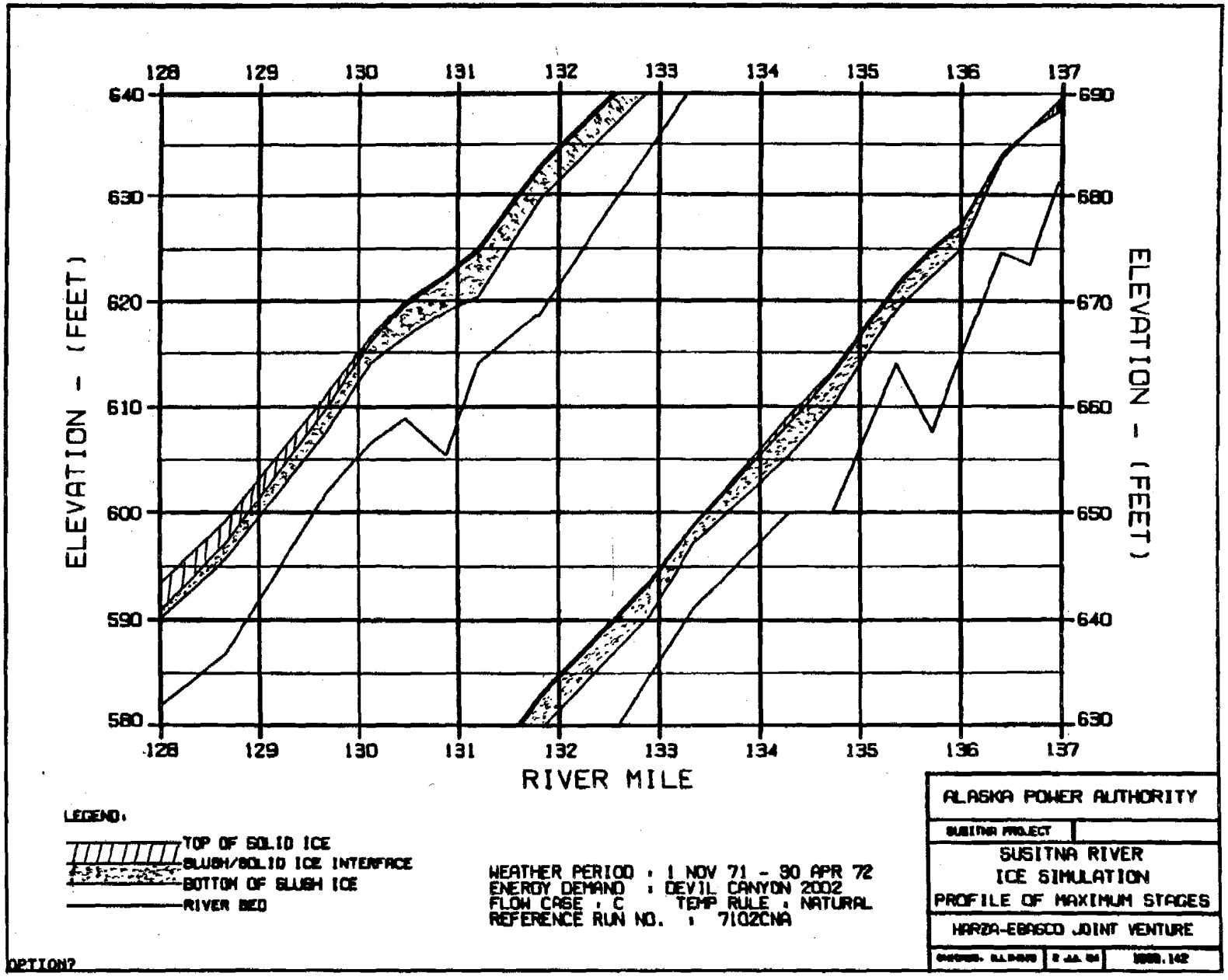
ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA
OPTION?
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

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 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA
ALASKA POWER AUTHORITY
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SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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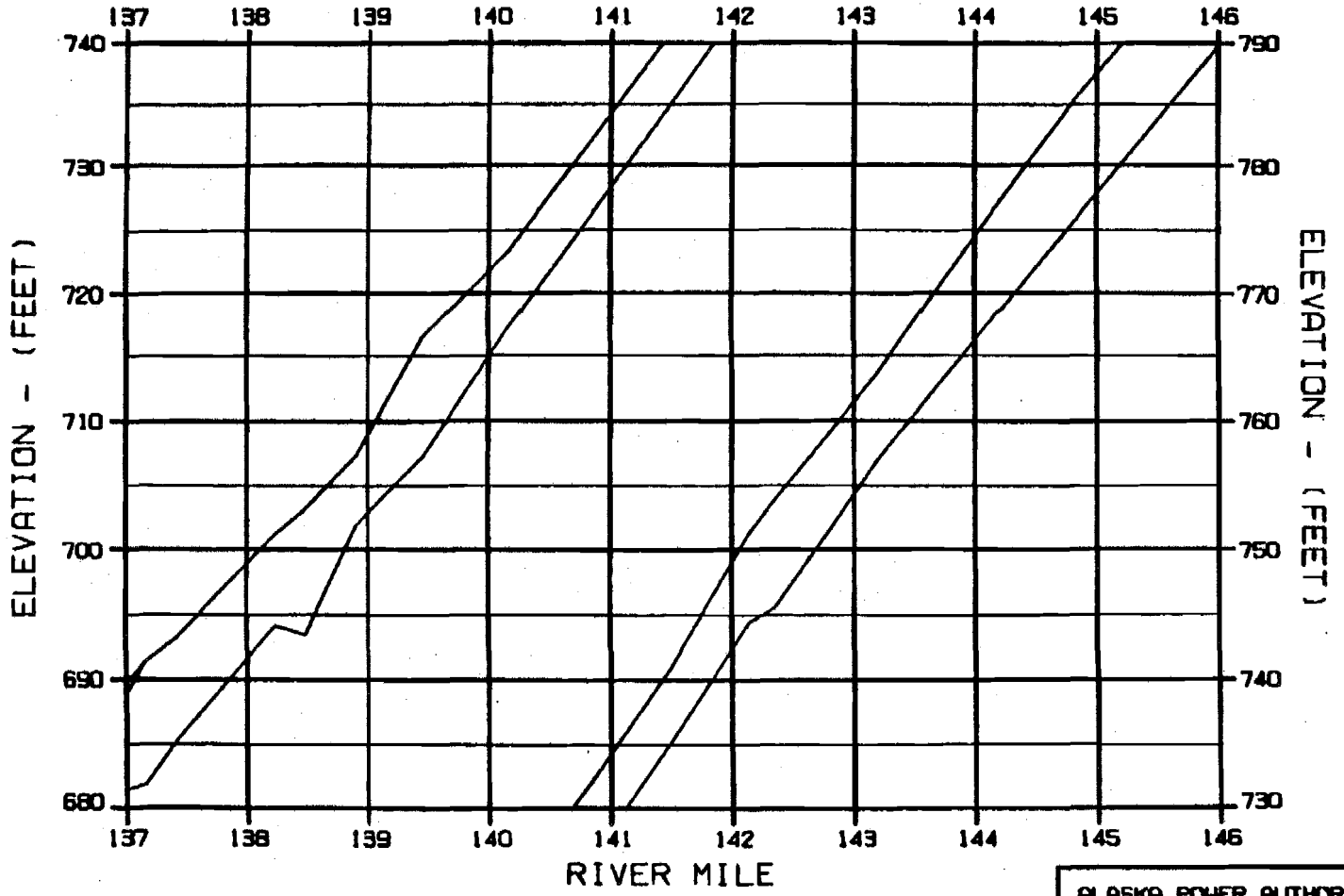


LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

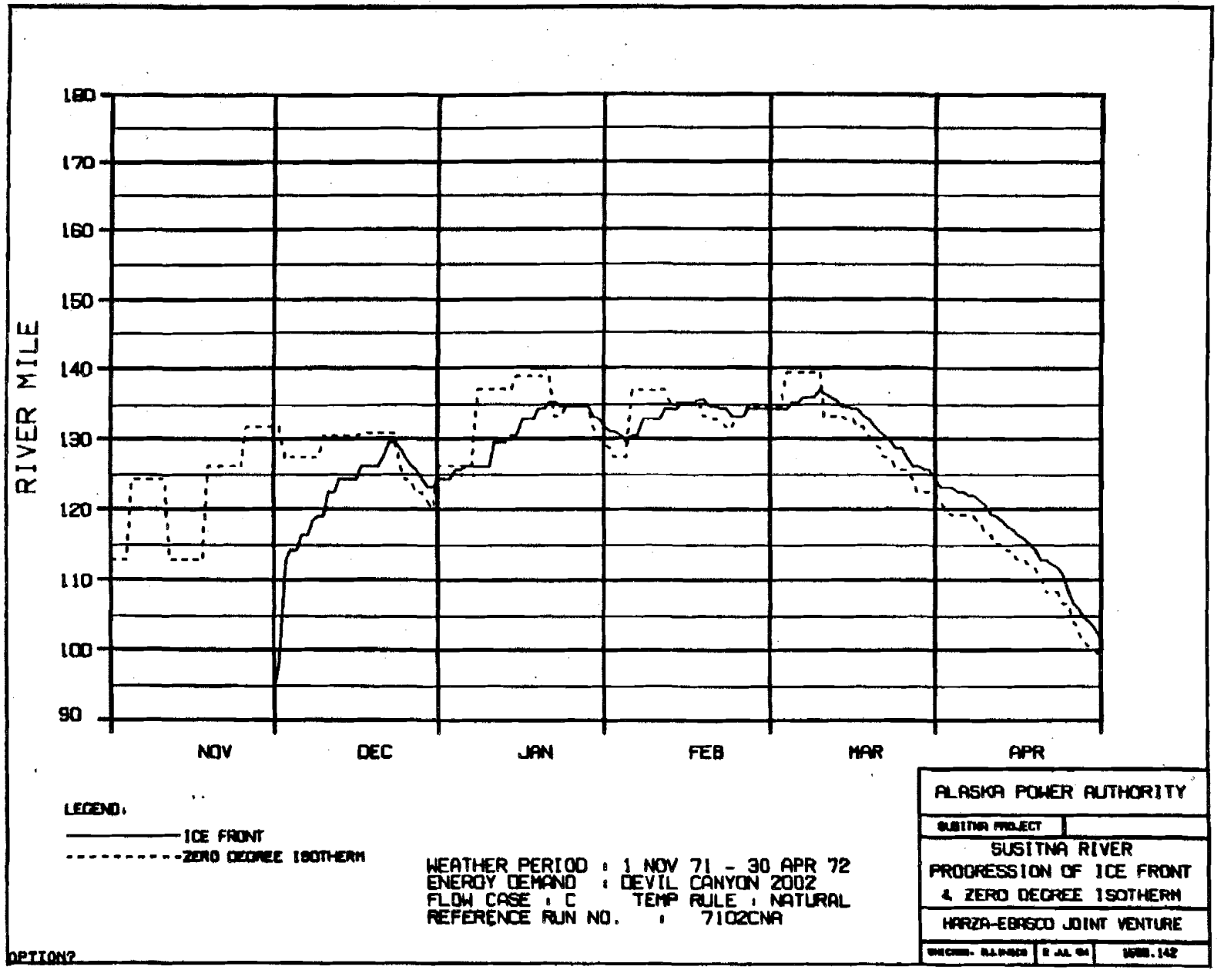
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

8 JUL 84 | 1889.142

OPTION?


RIVER MILE
180
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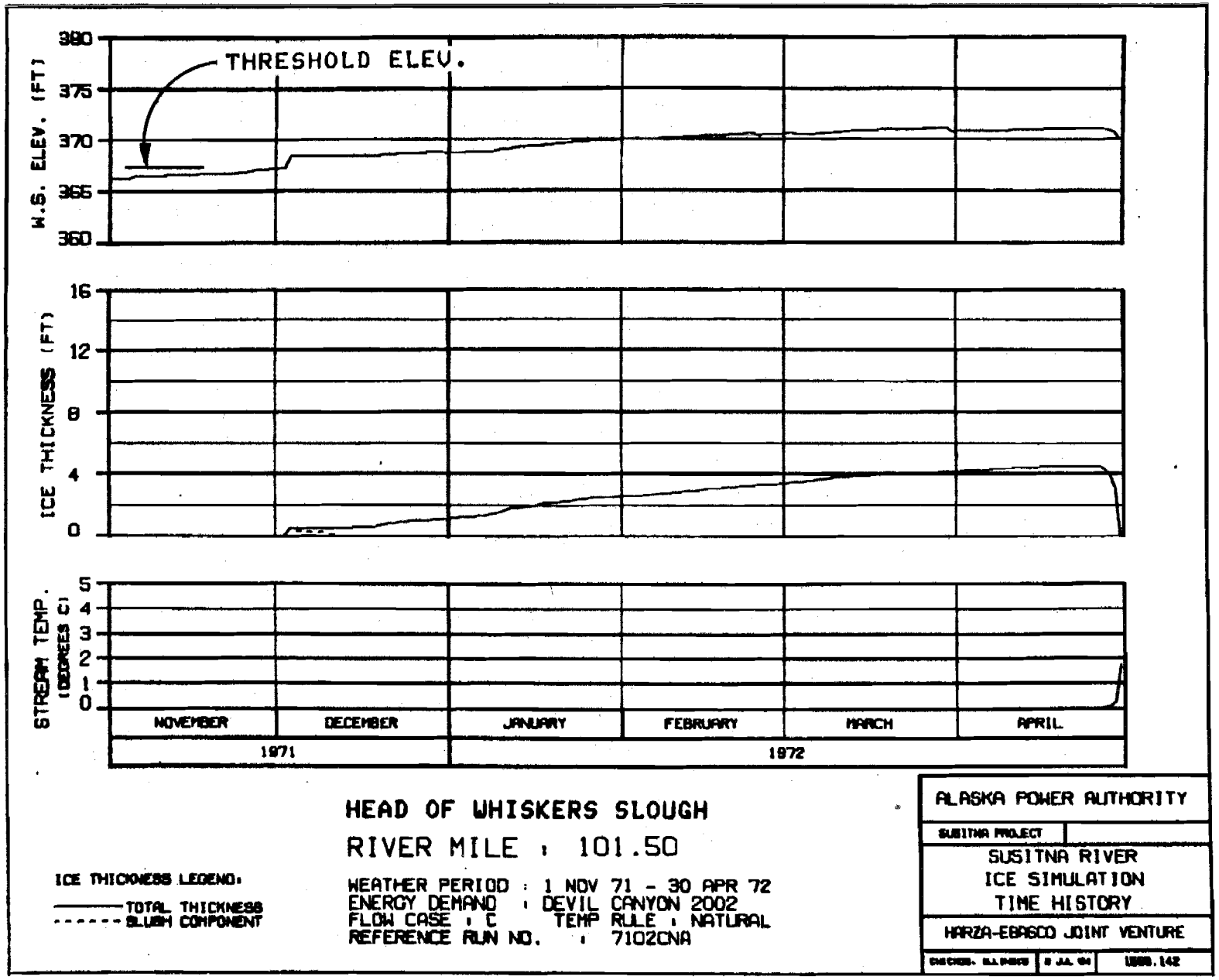
100
90
NOV
DEC
JAN
FEB
MAR
APR
LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
OPTION?



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

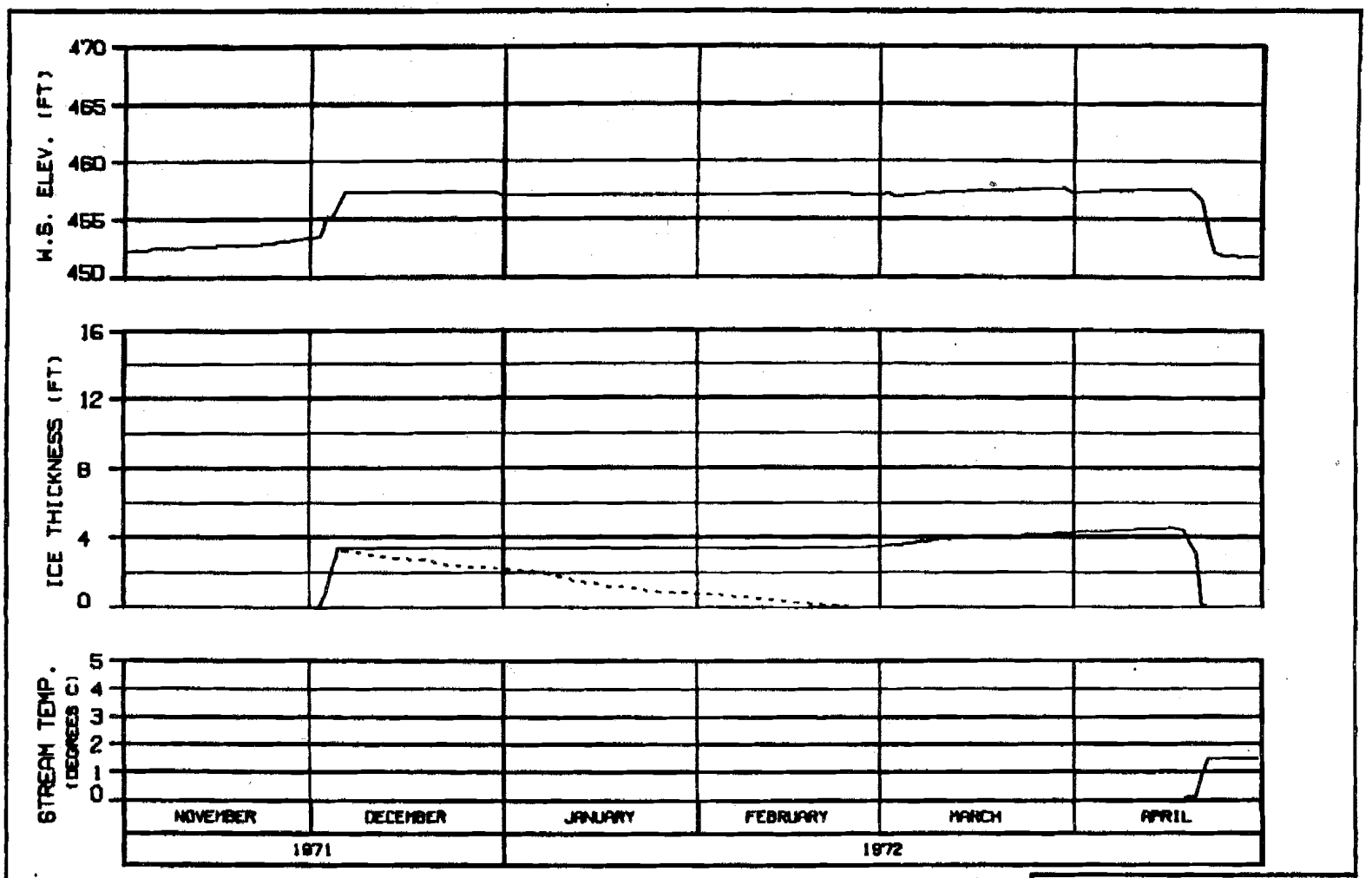
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 8 JUL 84 | 1888.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

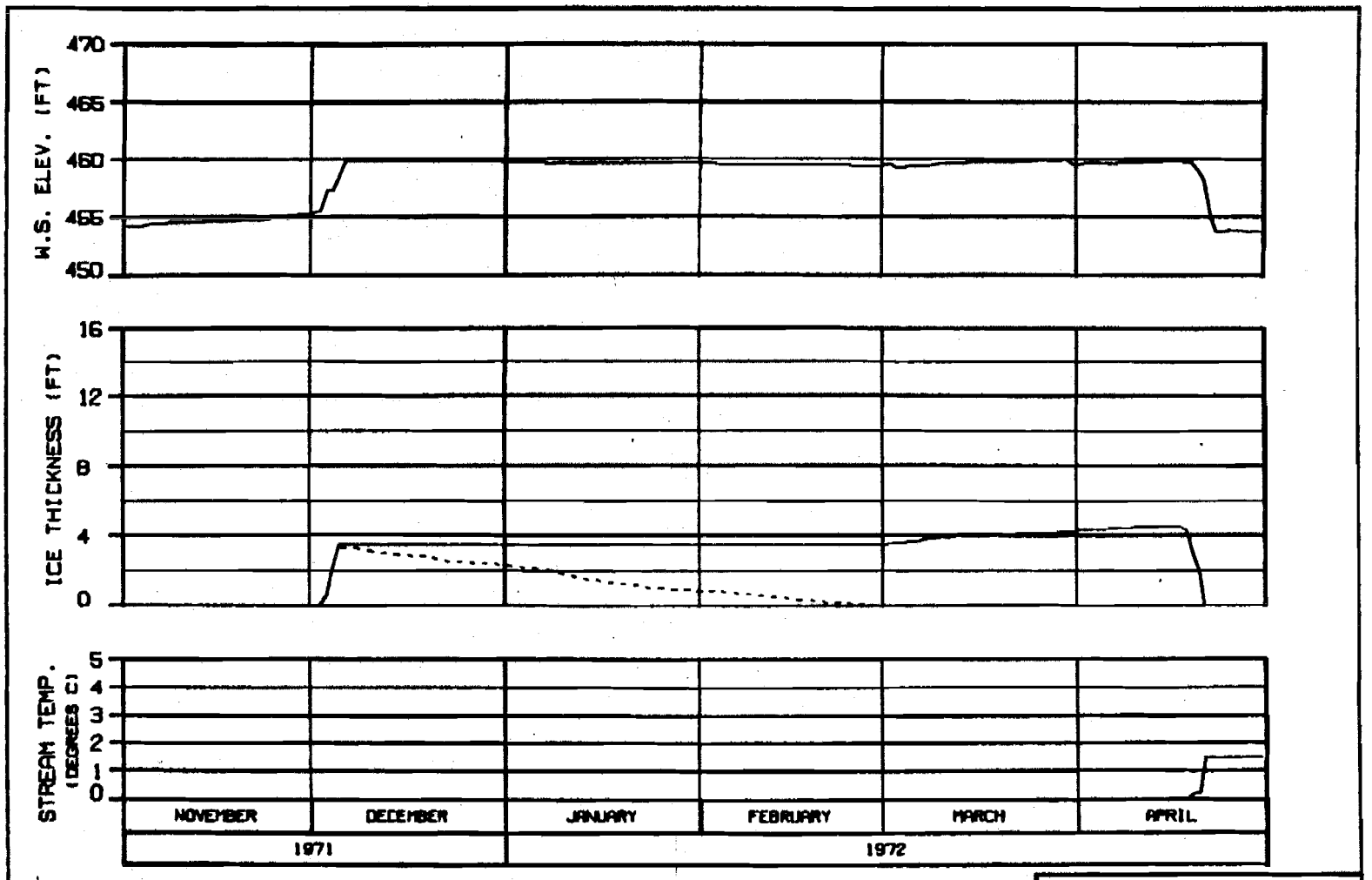
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.A.DAVIS | D.J.L. 84 | 8611.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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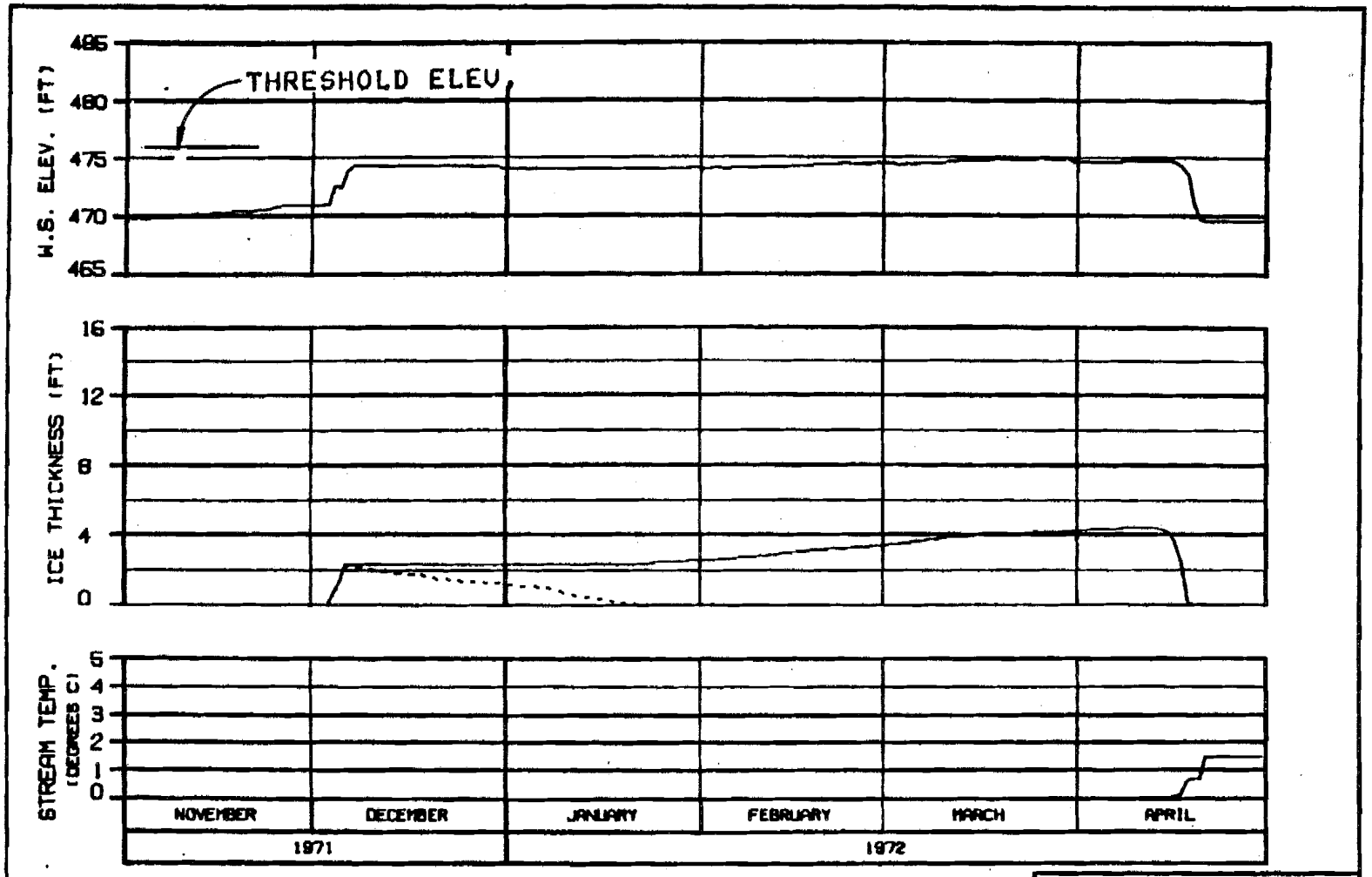


HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

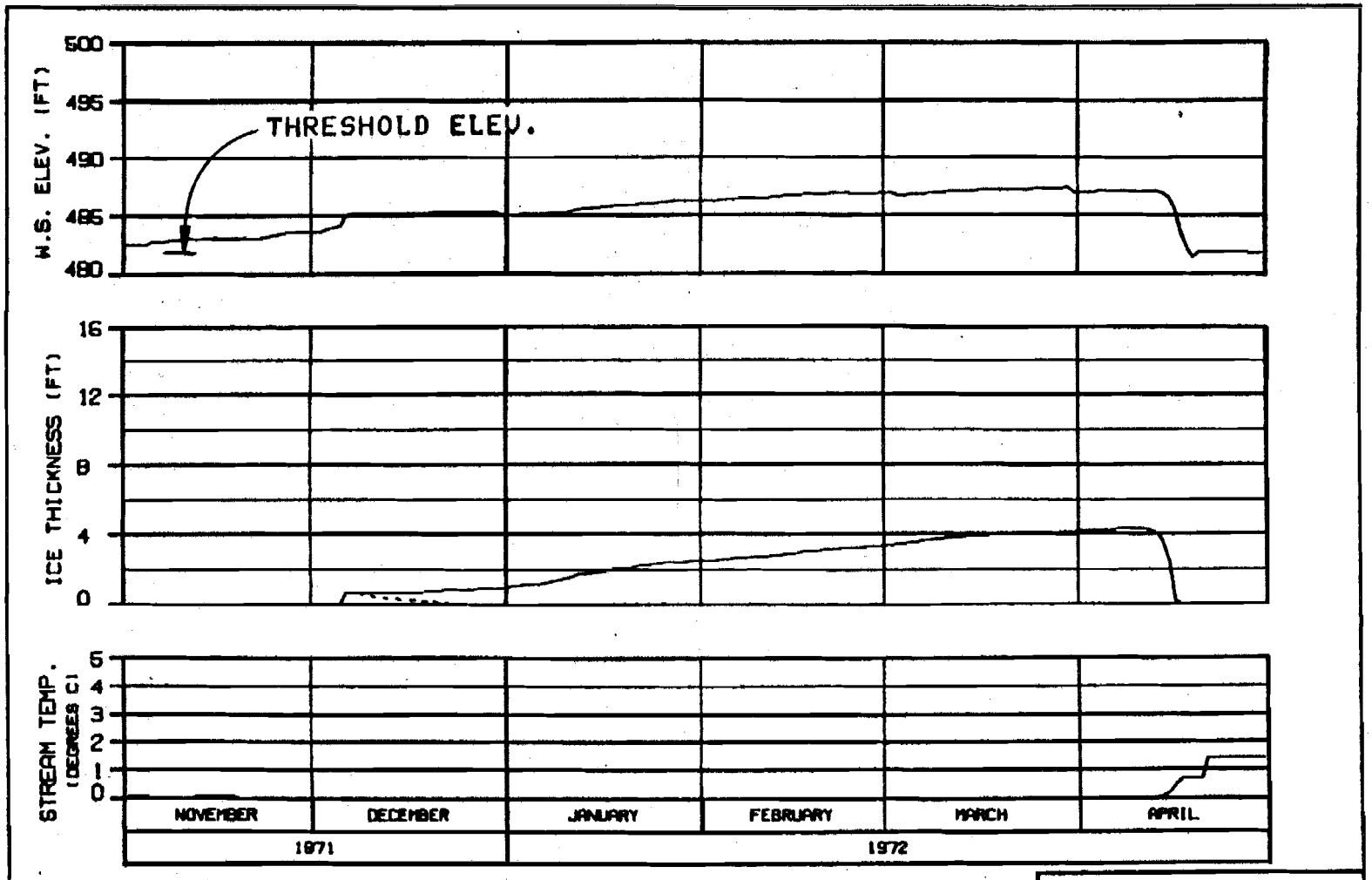
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1868.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

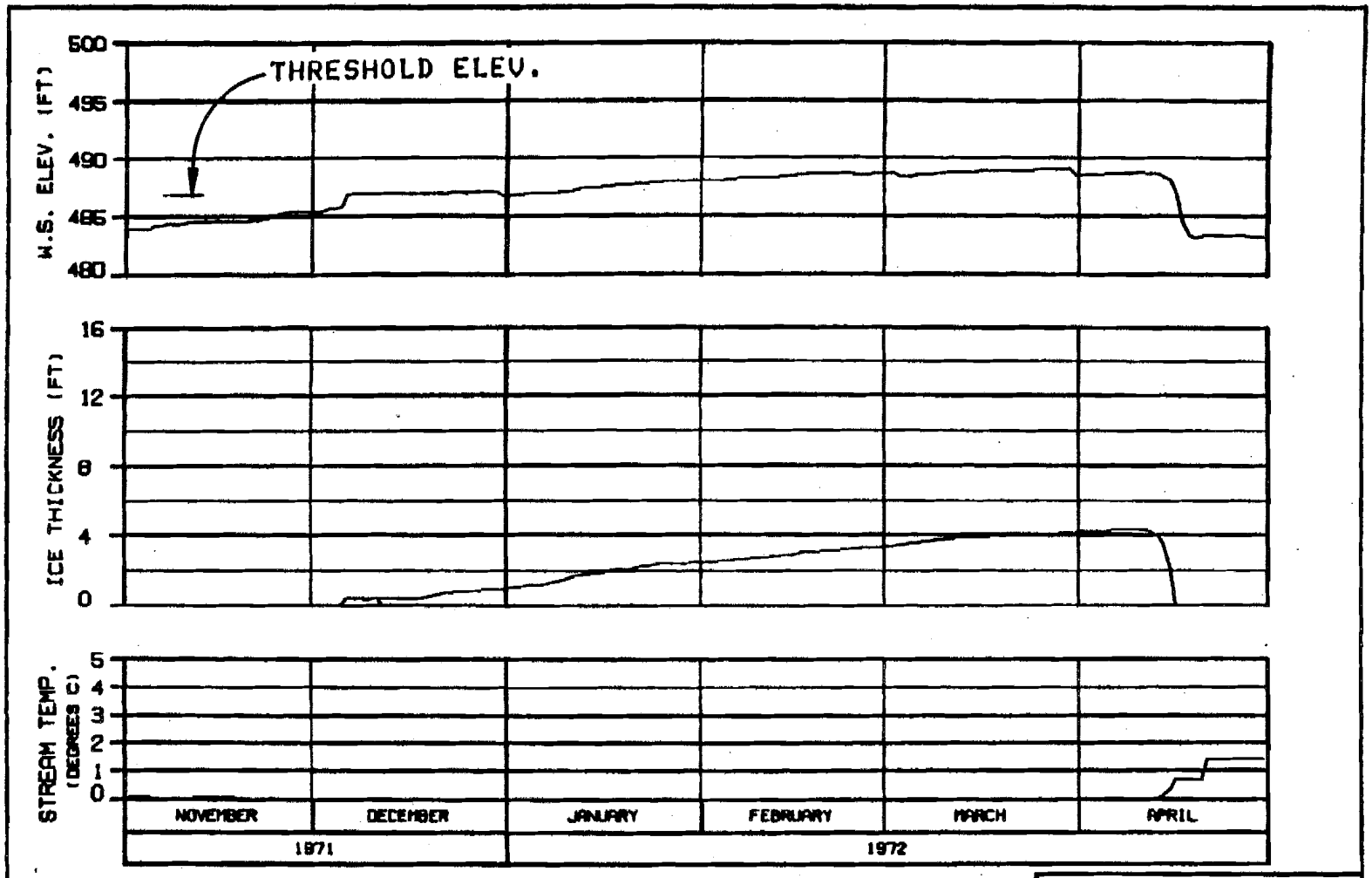
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

8 JUL 84 | 1588.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

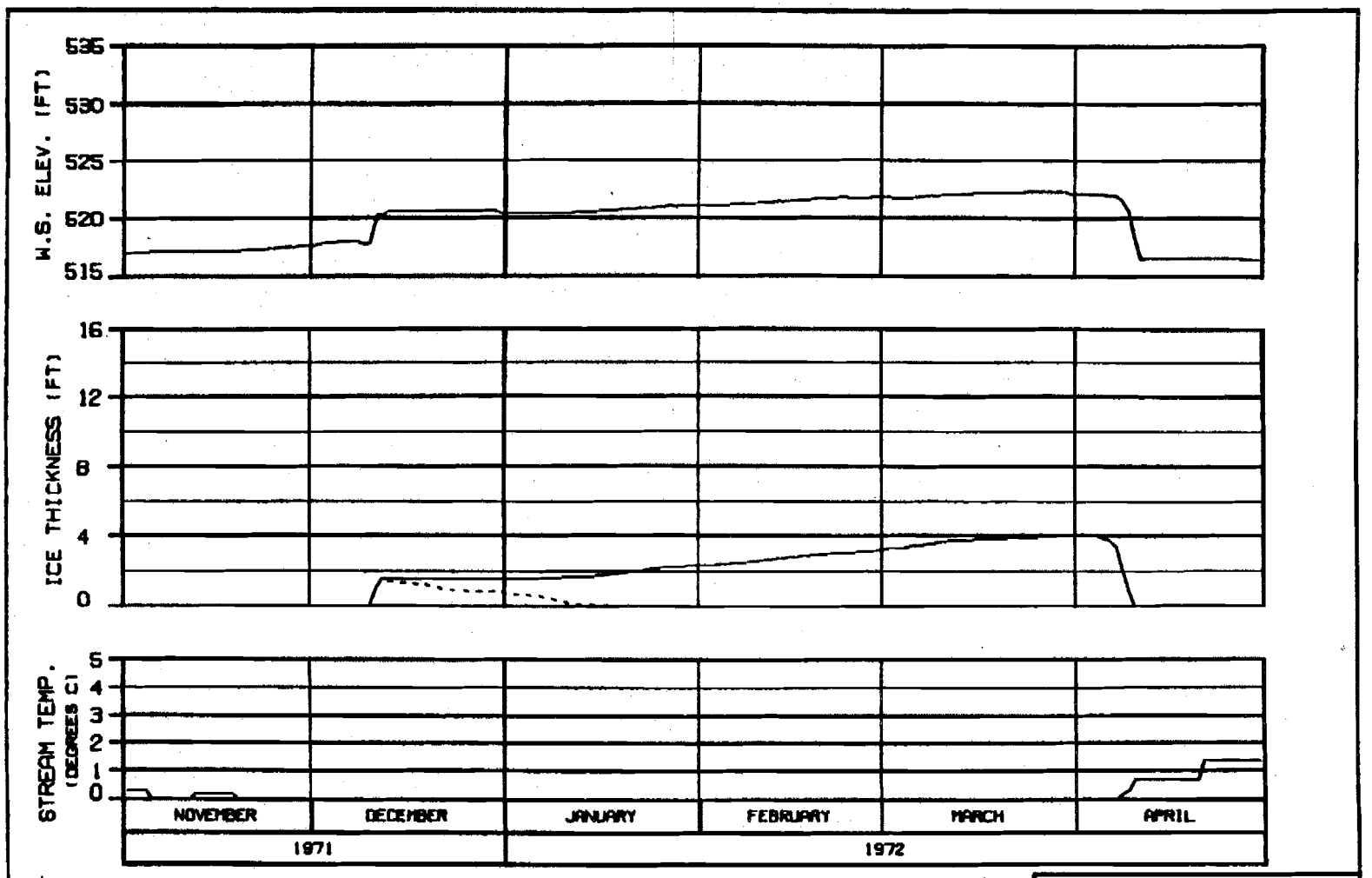
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.P. 8 JUL 84 USGS. 142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

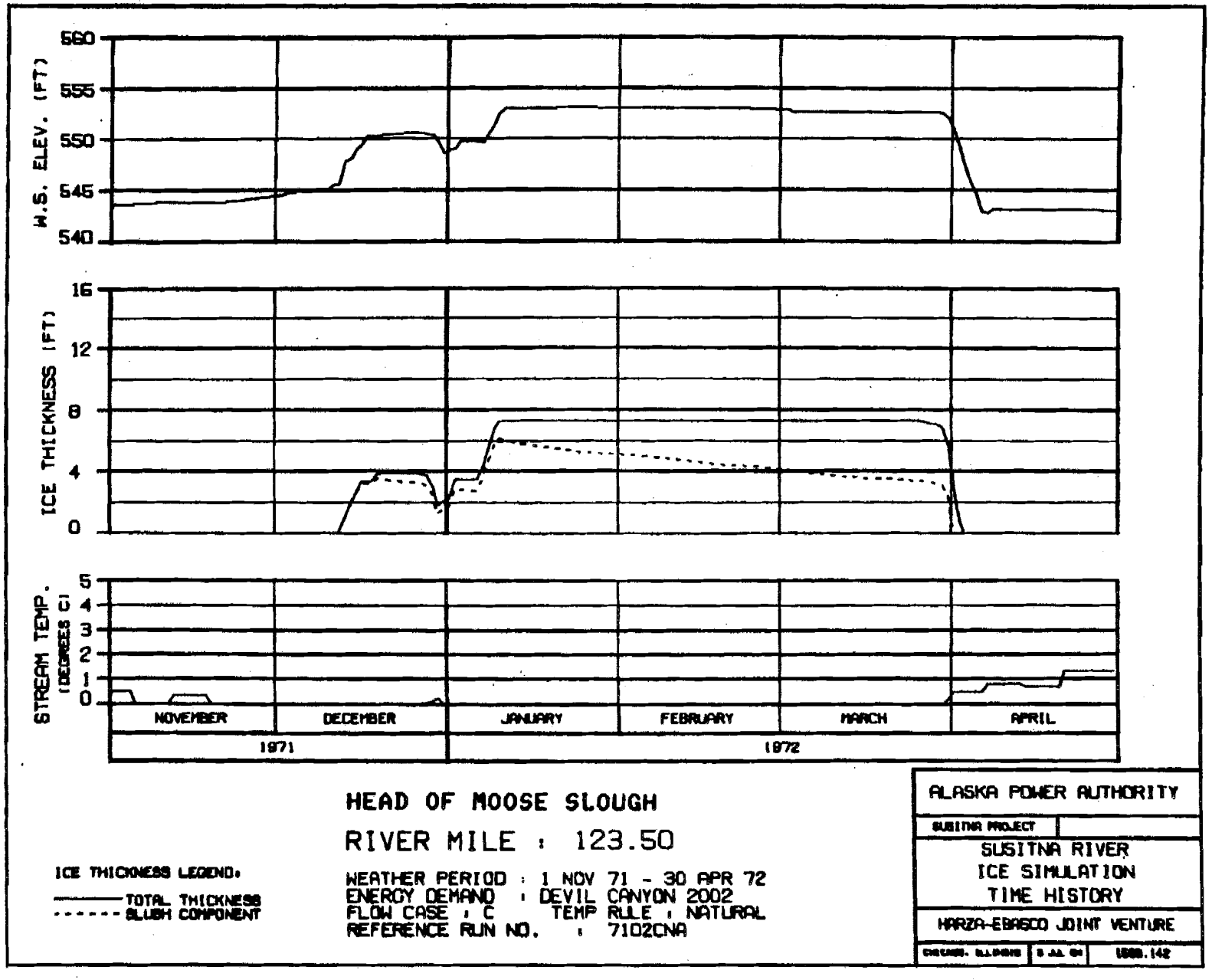
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 9 JUL 84 | 1888.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

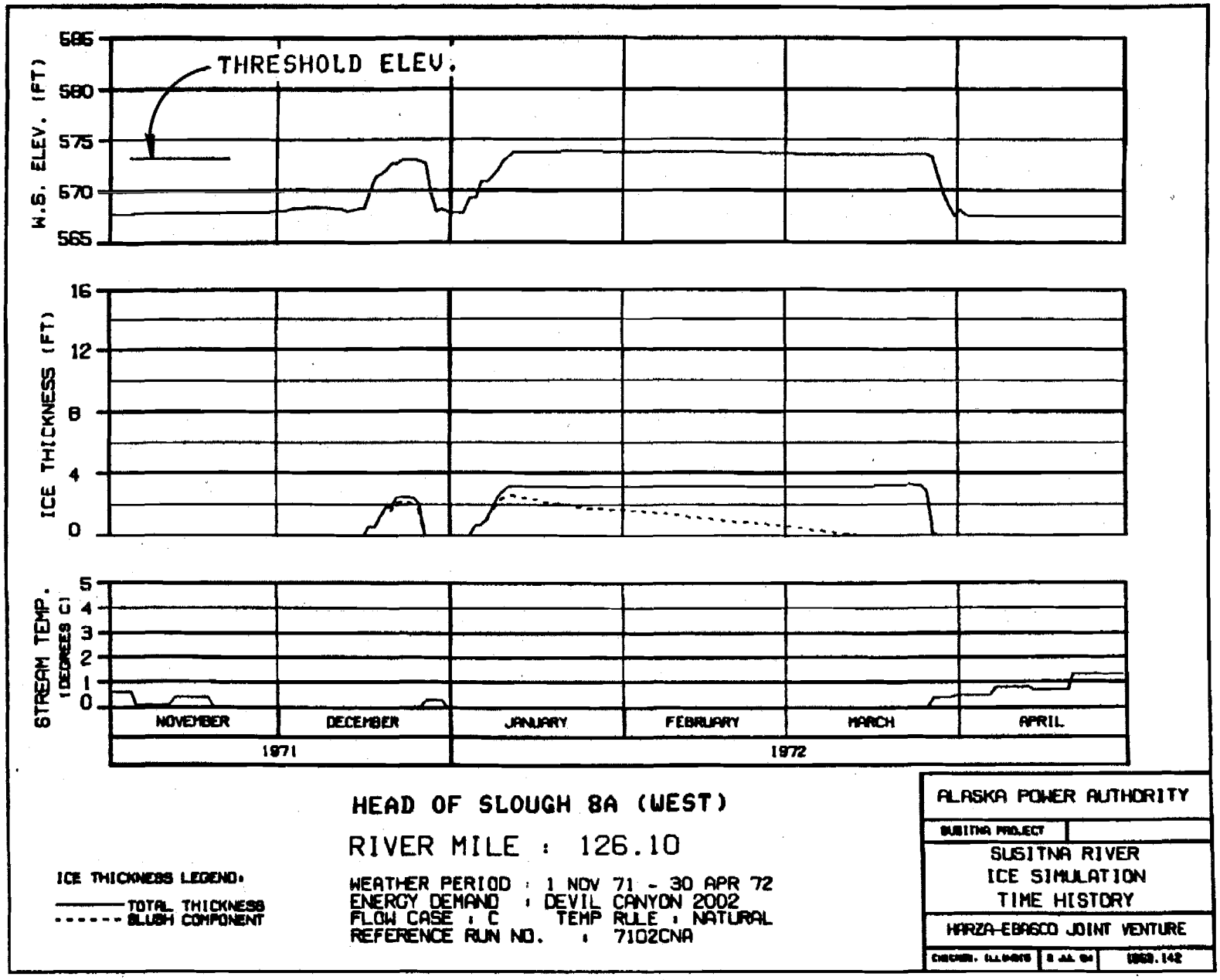
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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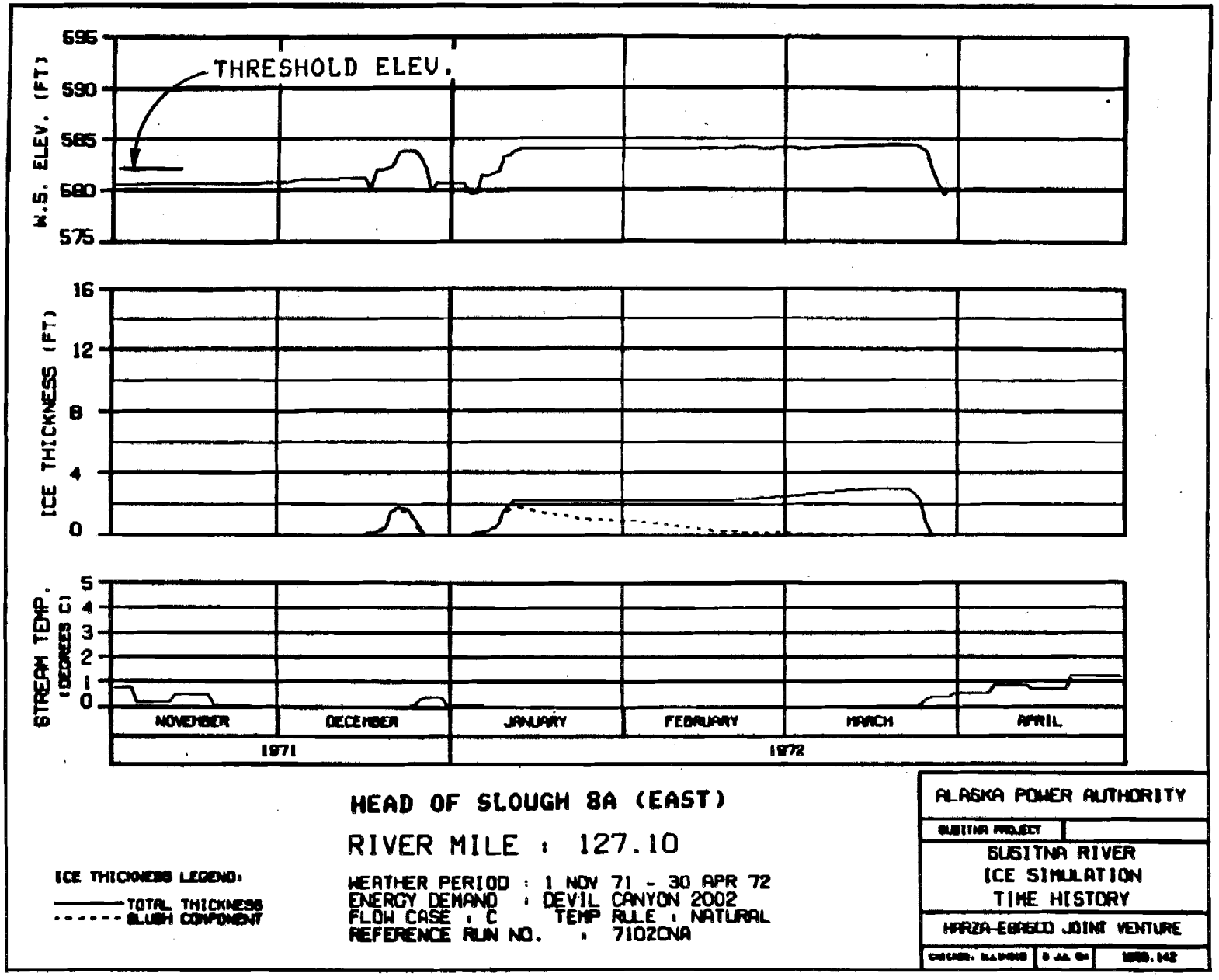


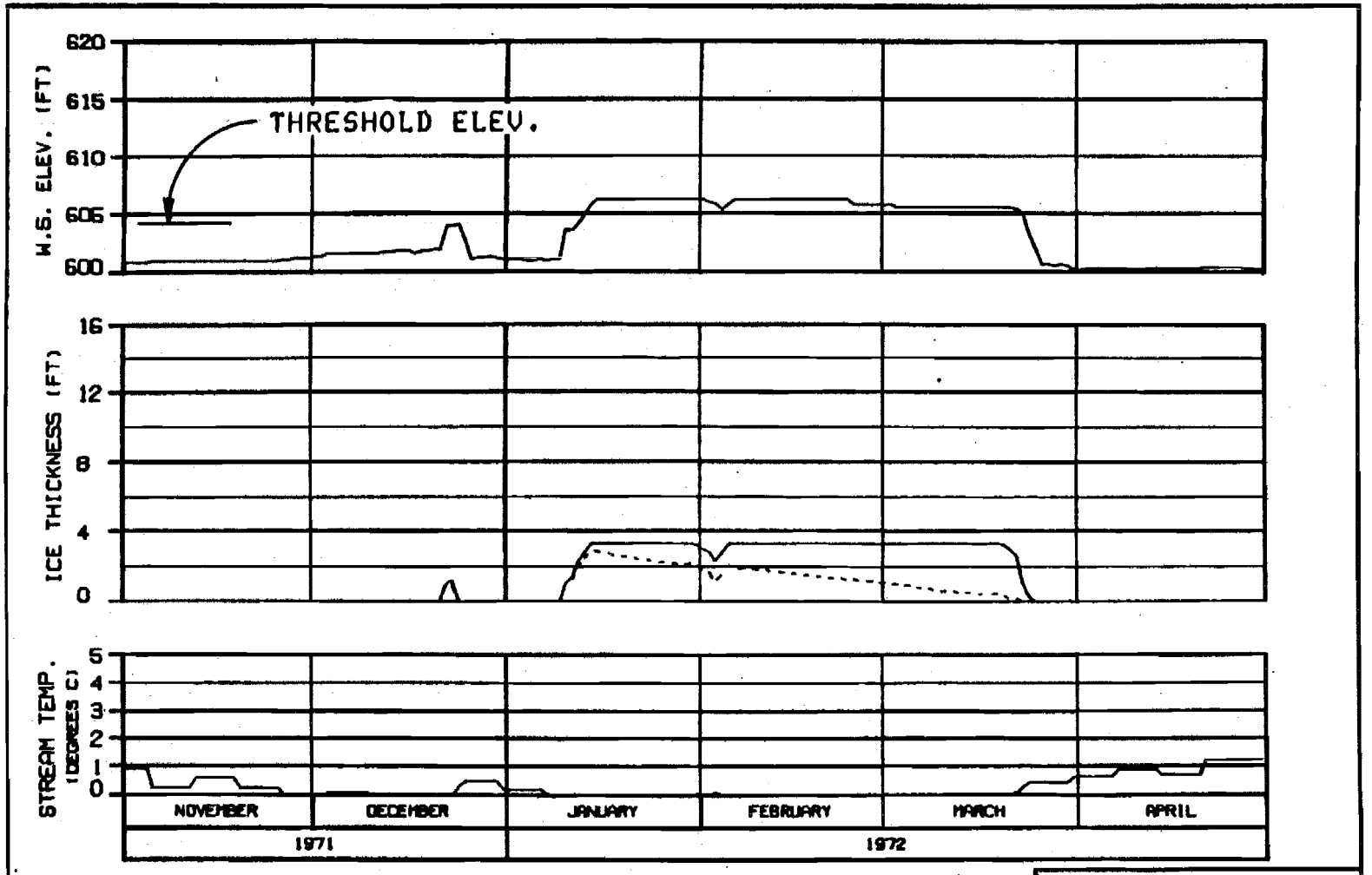
HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

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



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

OPTION?

ALASKA POWER AUTHORITY

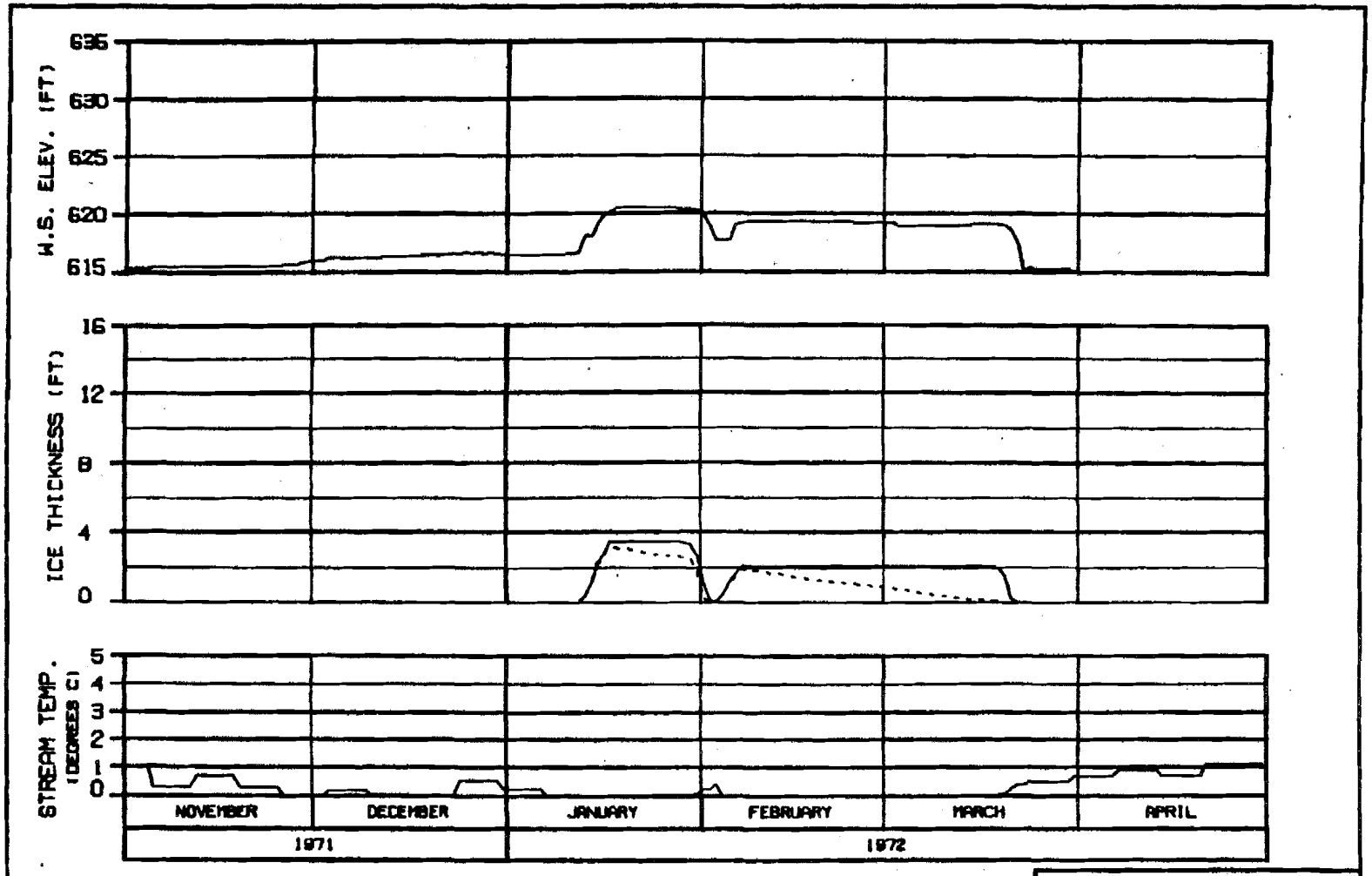
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 1888.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

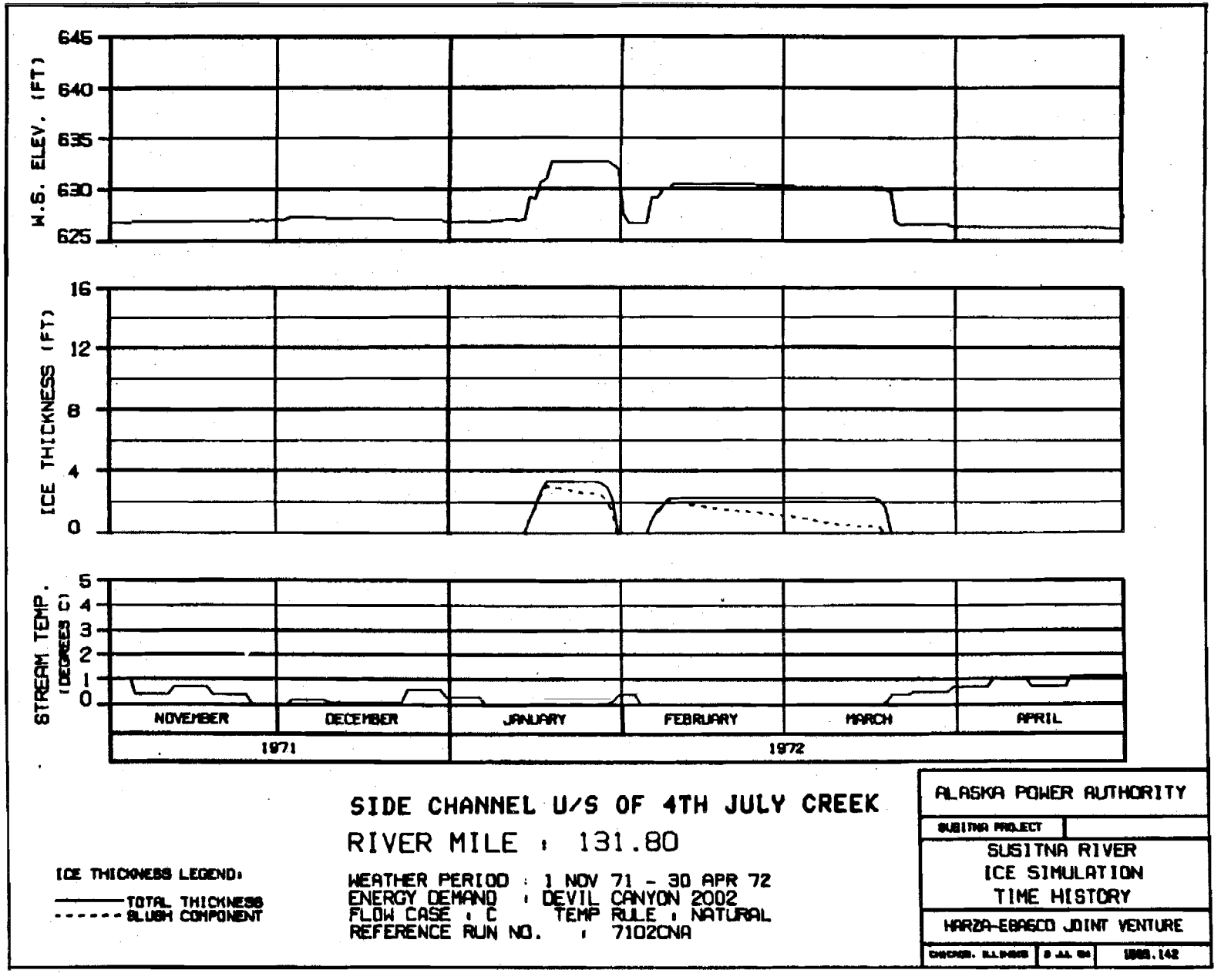
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 1868.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

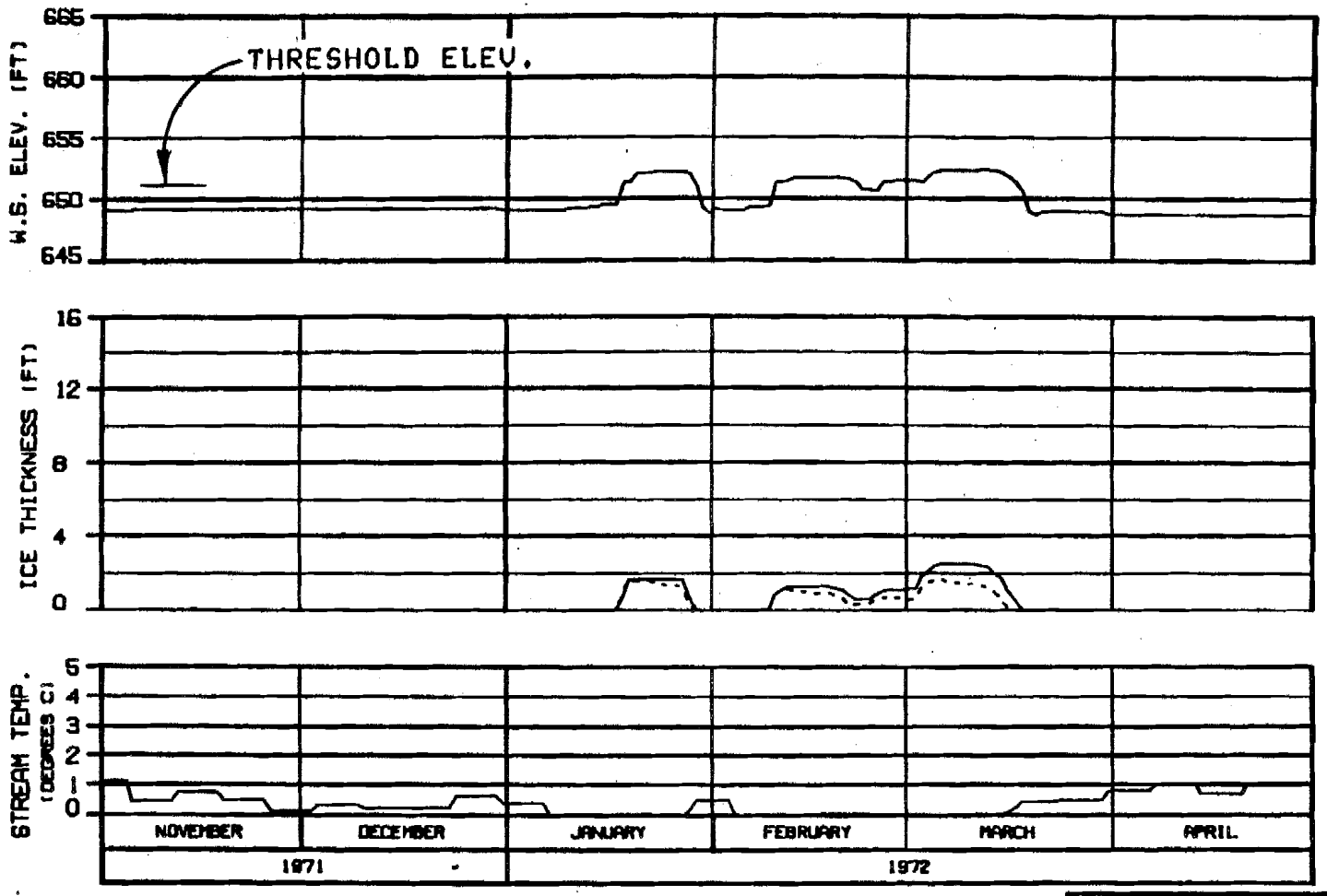
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

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



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

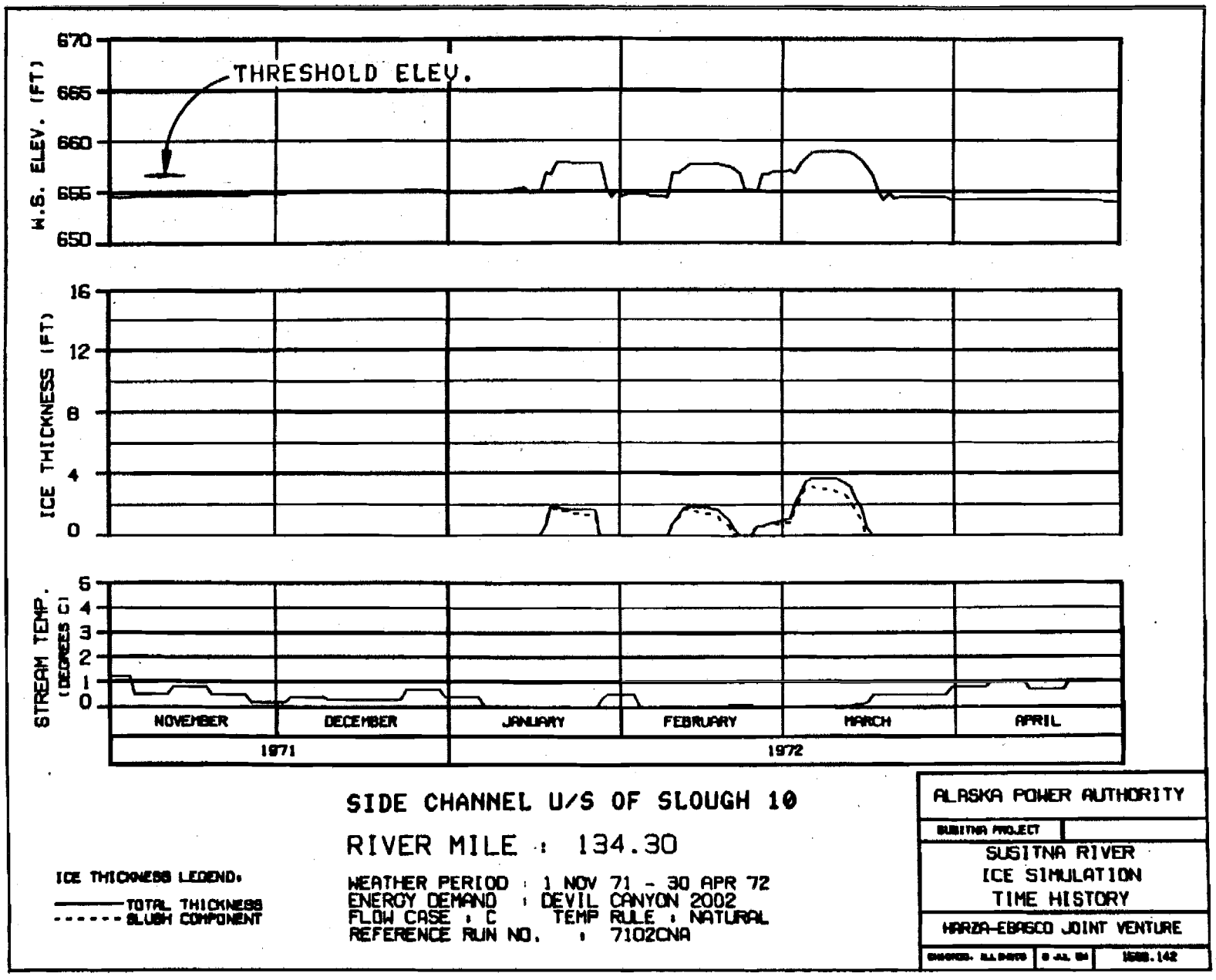
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1568.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

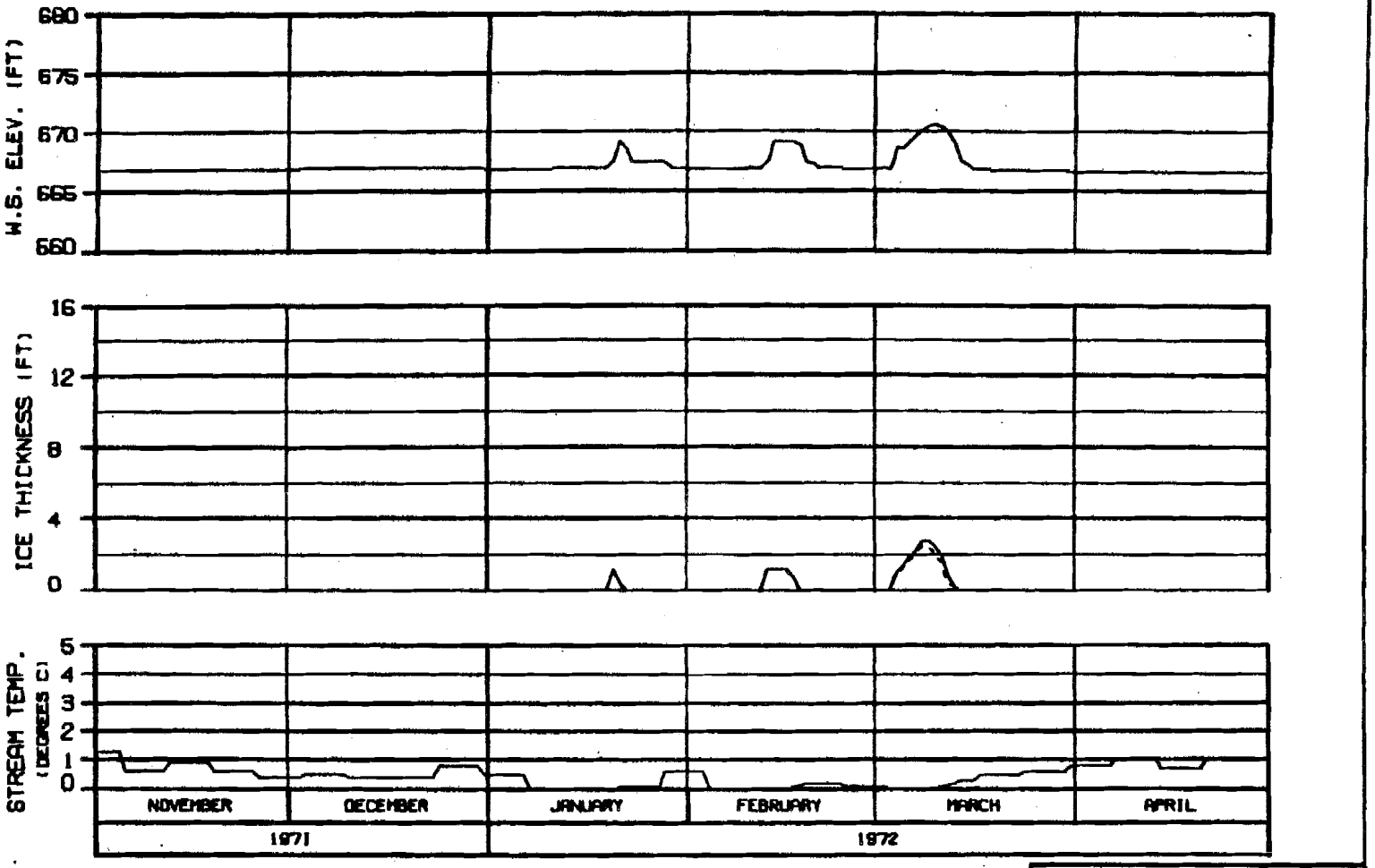
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

8 JUL 84

1588.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

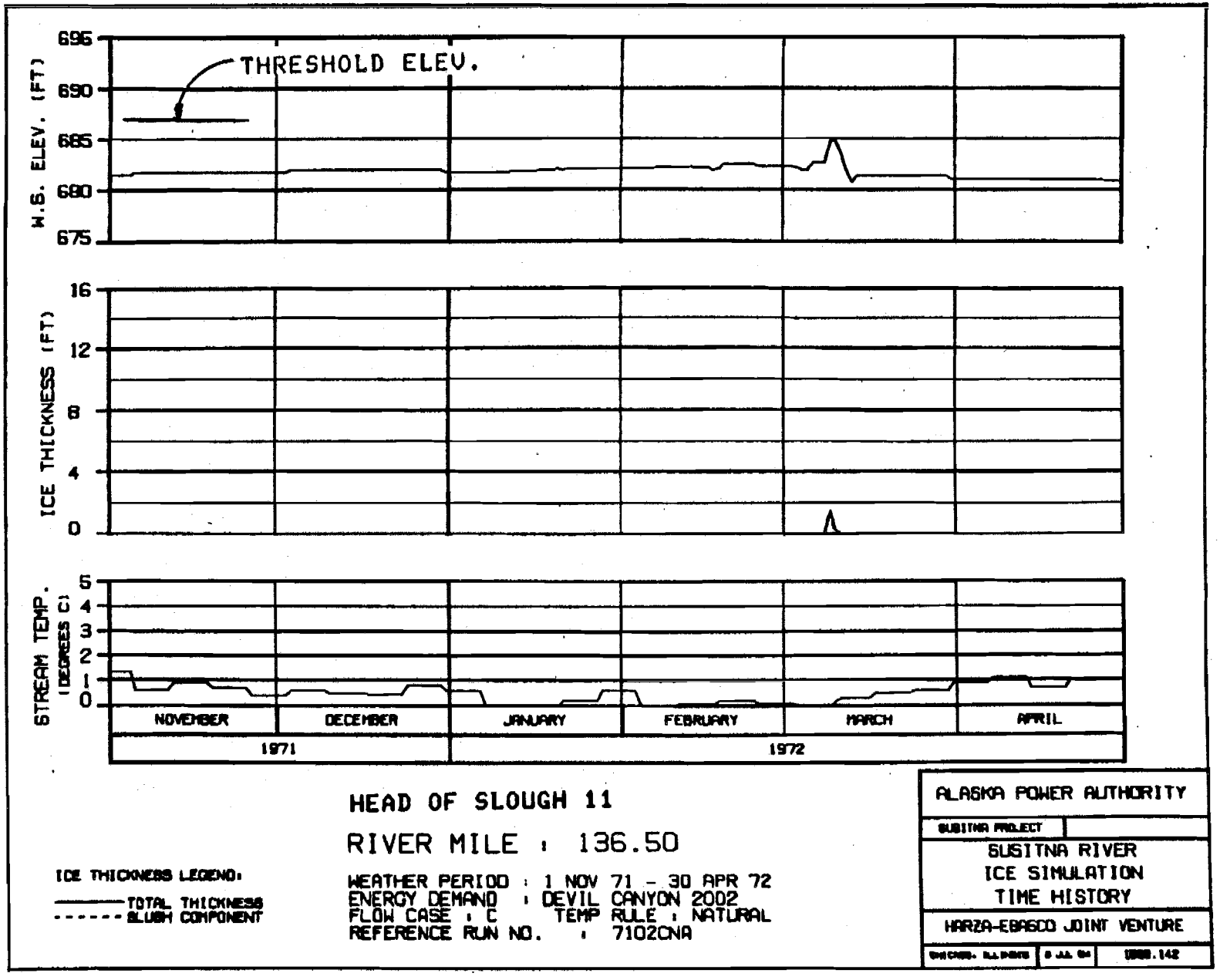
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 9 JUL 84 | 1988.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

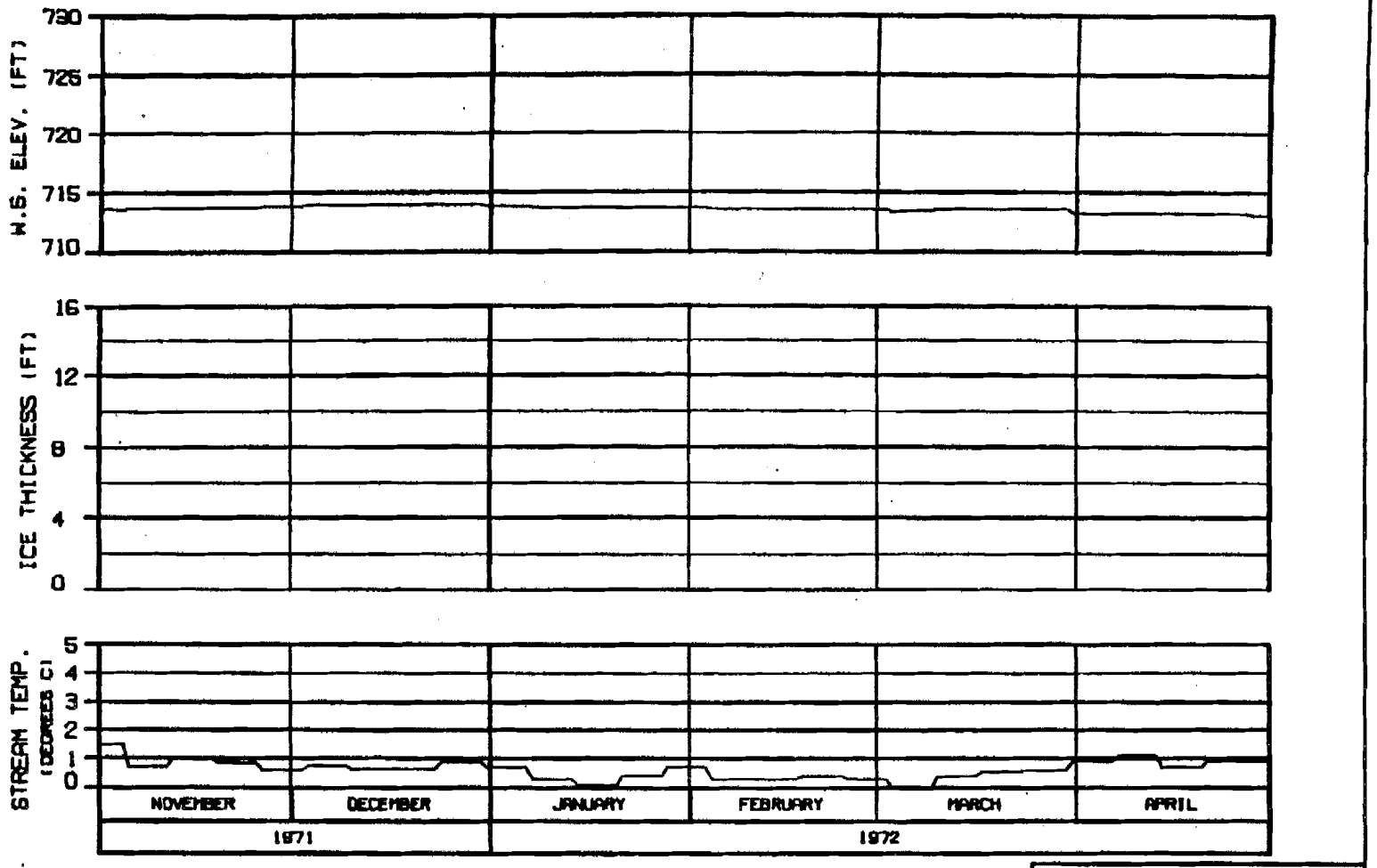
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

8 JUL 84 | 1588.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

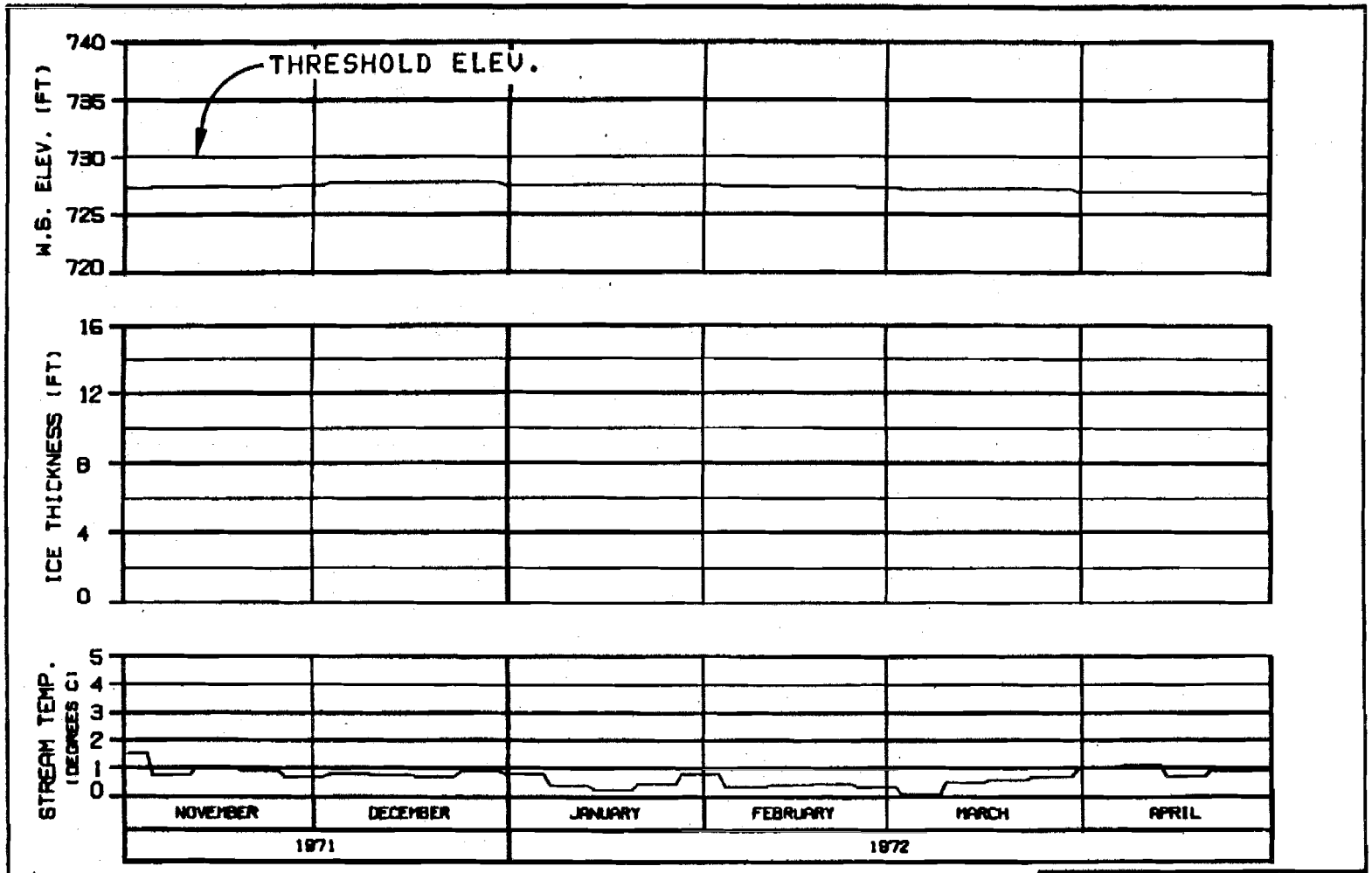
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ALLBAUGH | 8 JUL 84 | 1988.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

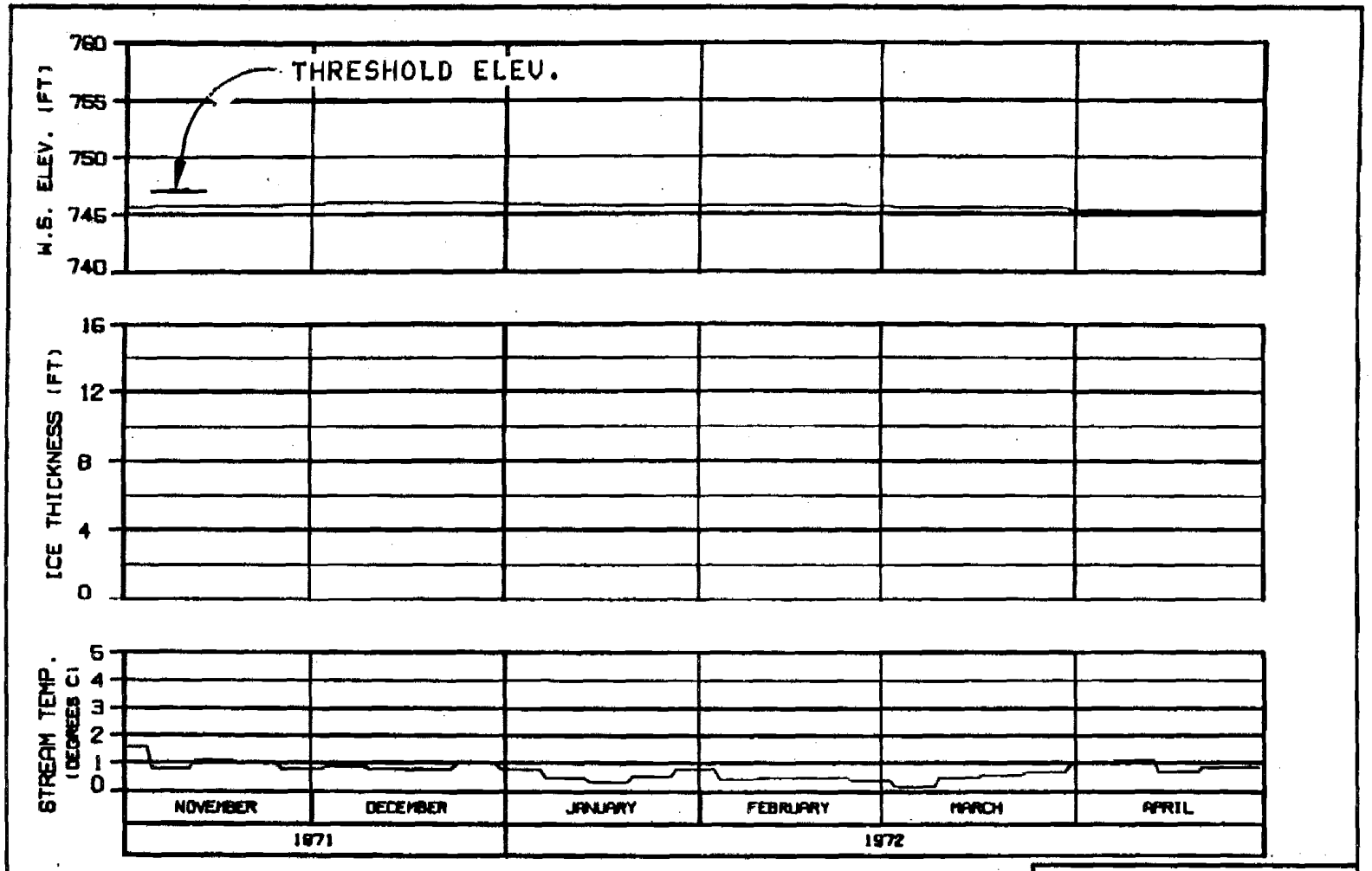
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED [illegible] | 8 JUL 84 | 1988.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

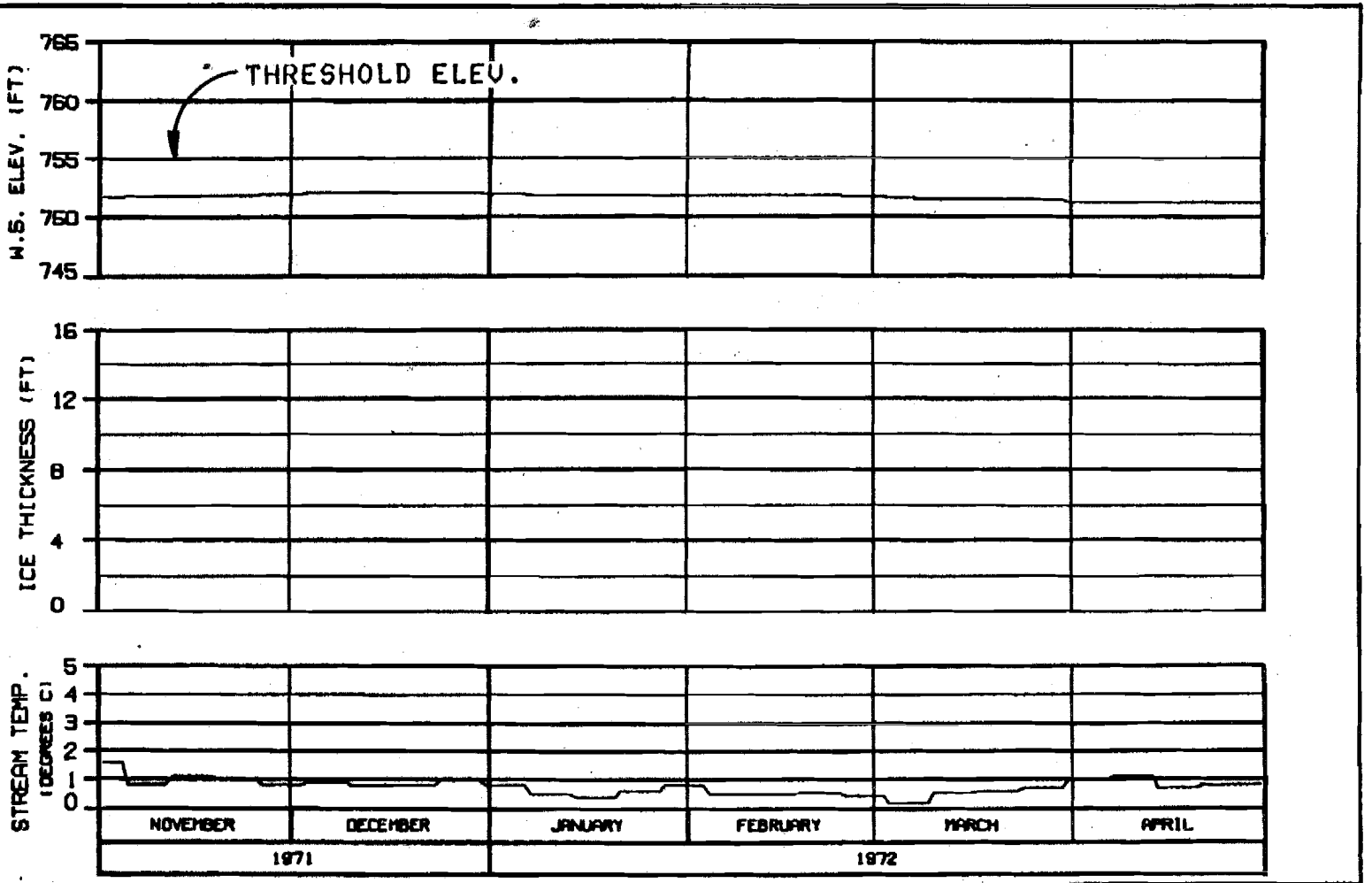
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S.L.H.S.D. | 5 JUL 84 | 1988.142

OPTION?



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

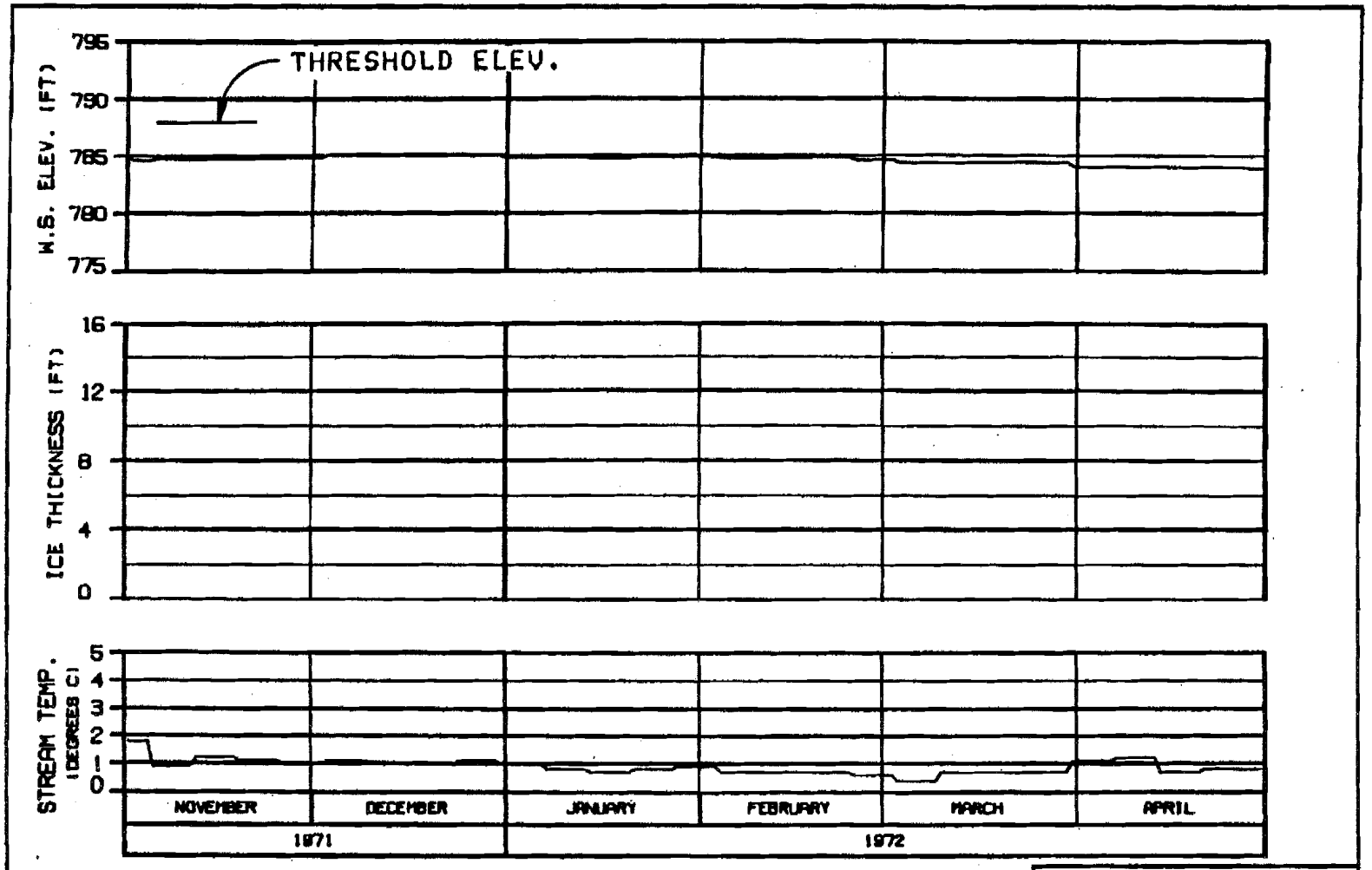
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

8888.142

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

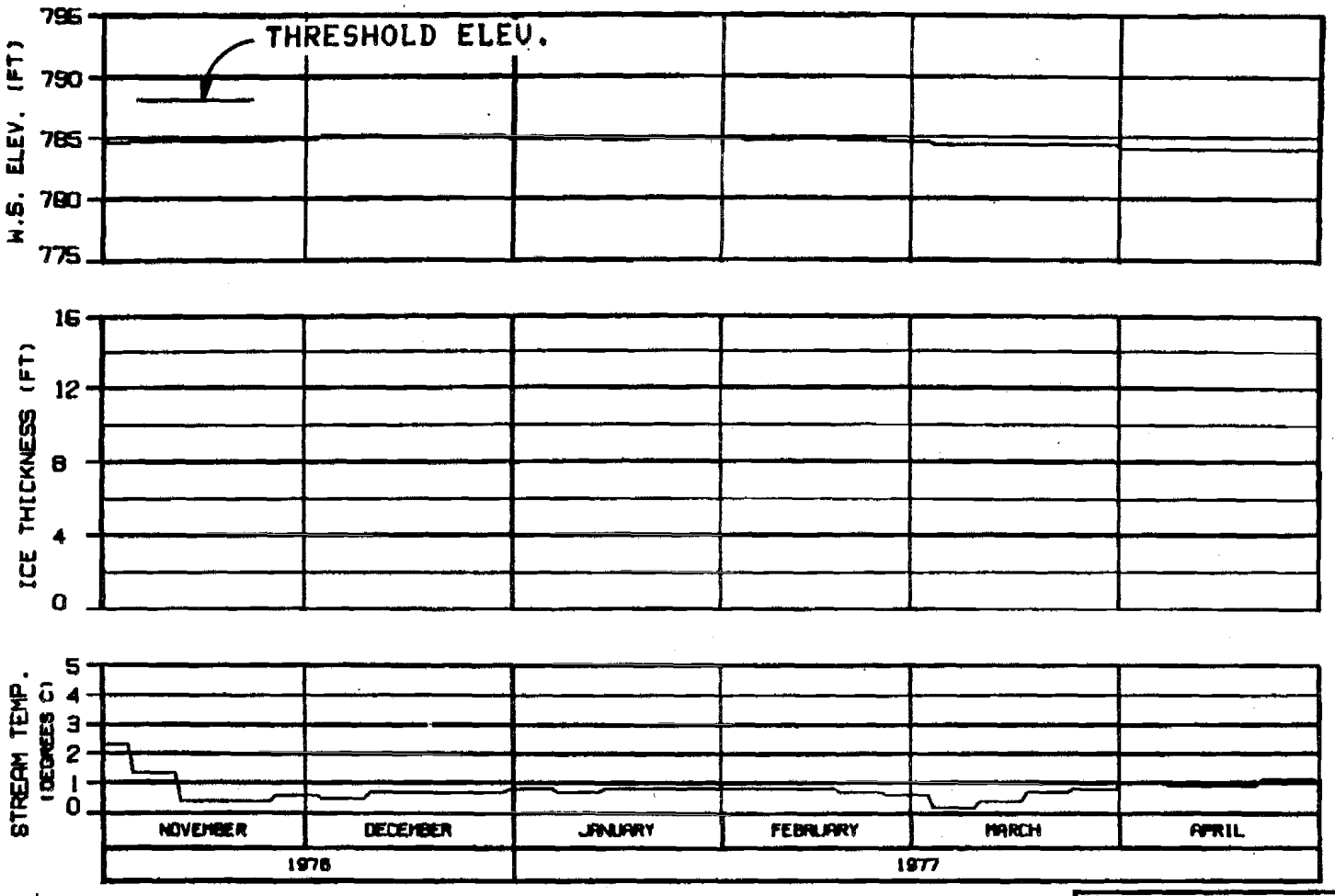
ICE THICKNESS LEGEND:
——— TOTAL THICKNESS
- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
8 JUL 84 1988.142

OPTION?

EXHIBIT O



HEAD OF SLOUGH 22

RIVER MILE : 144.80

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ICE THICKNESS LEGEND:

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

OPTION?

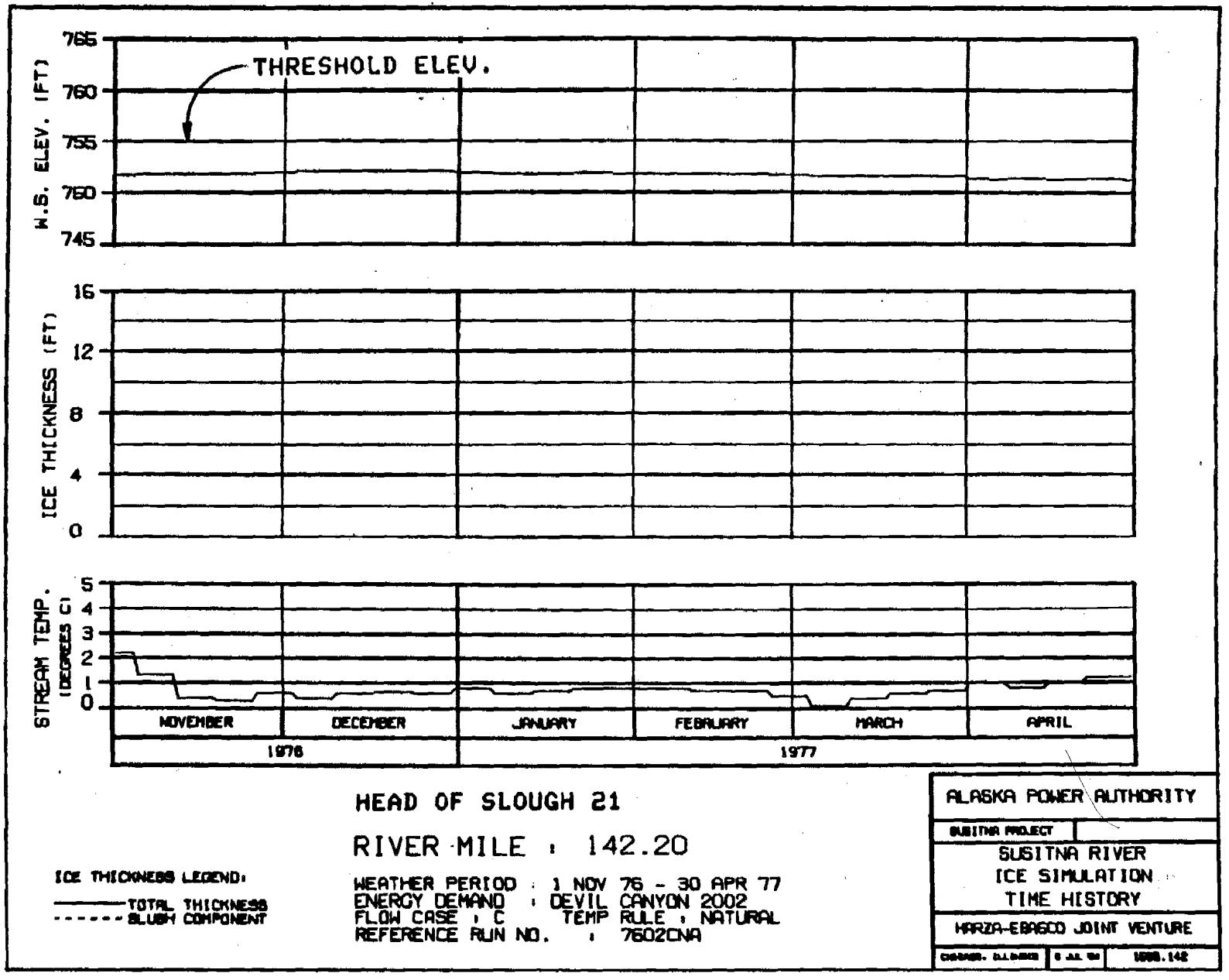
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

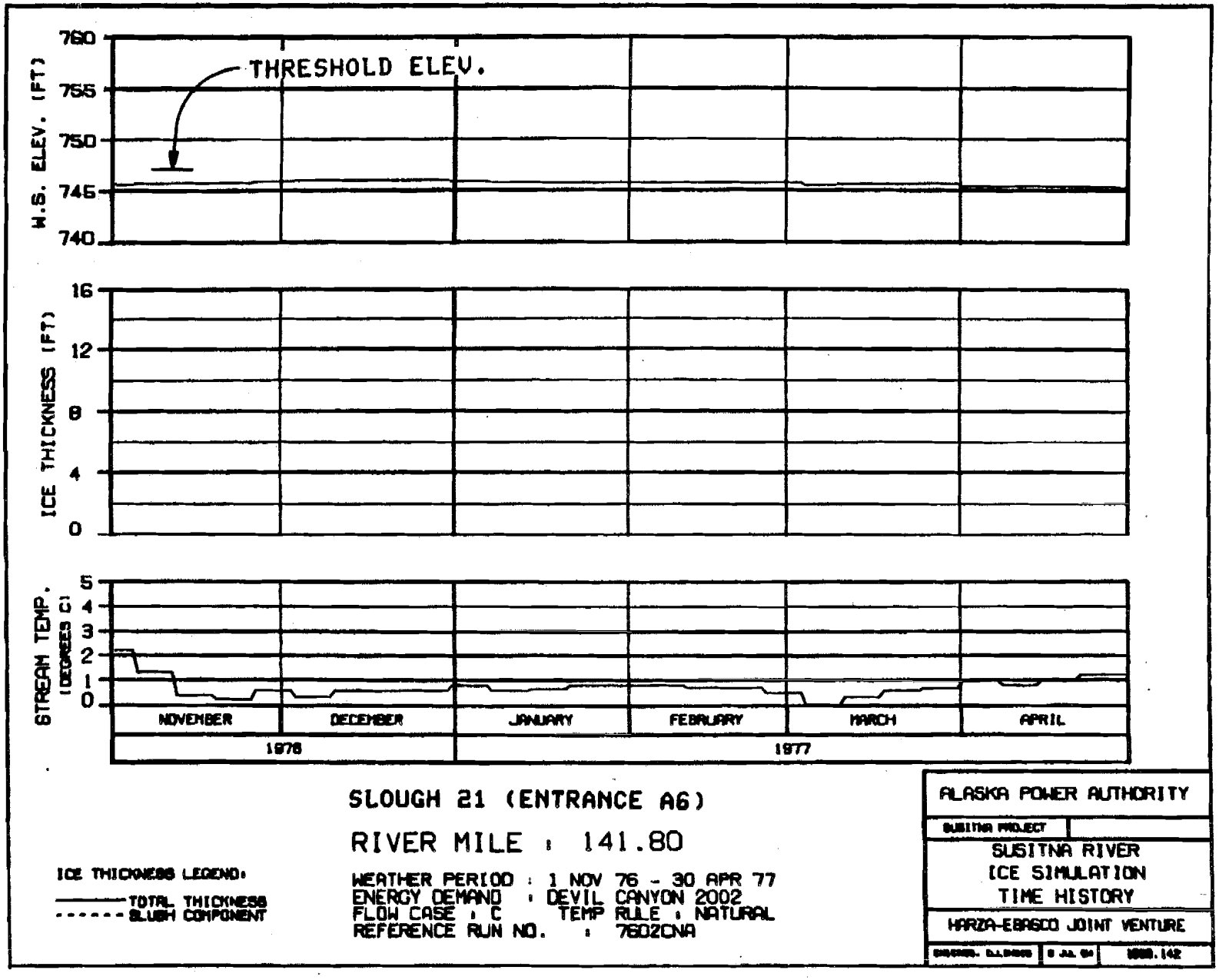
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1698.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

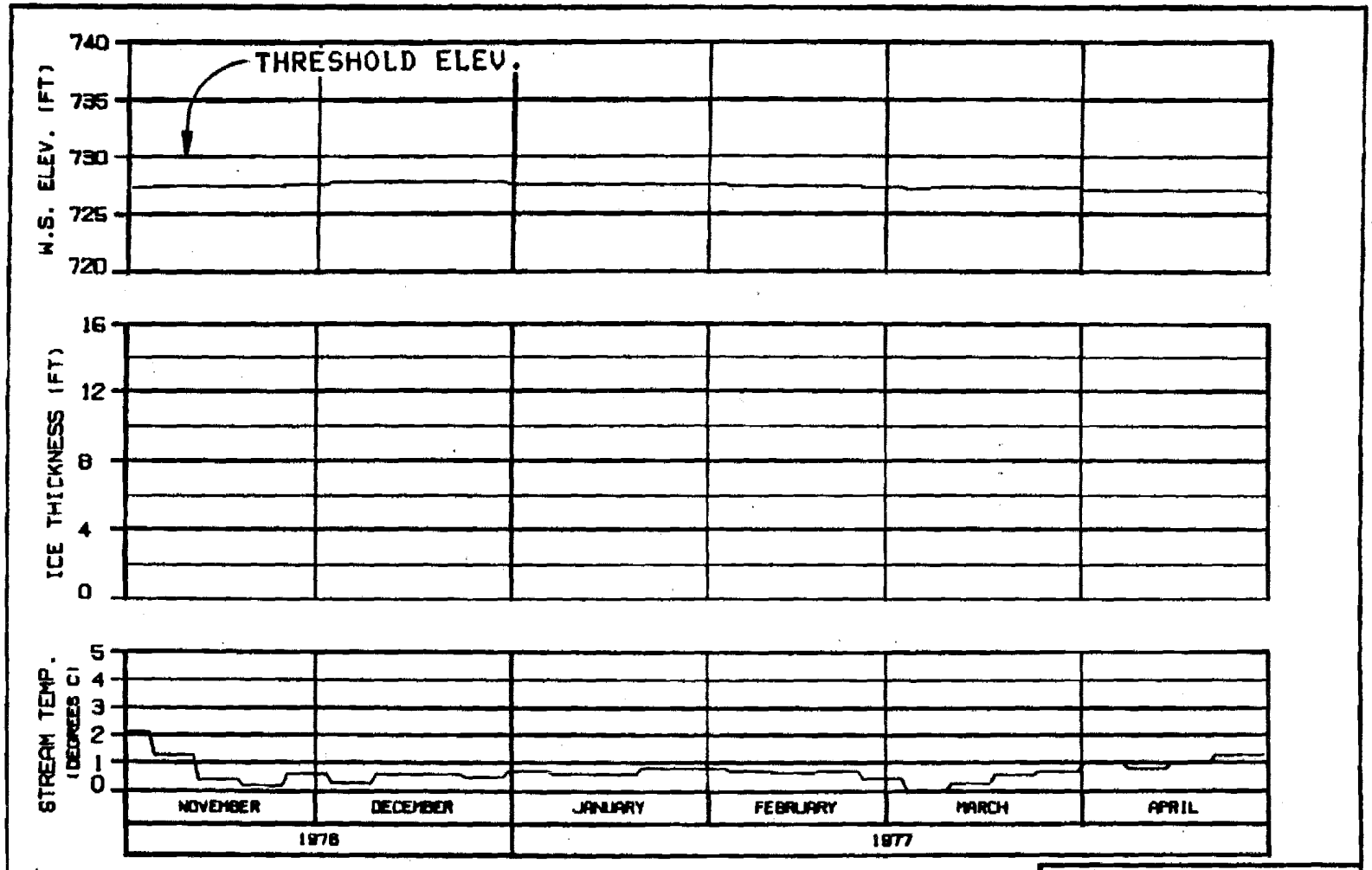
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: D.L.DAGG | 9 JUL 84 | 1868.142



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

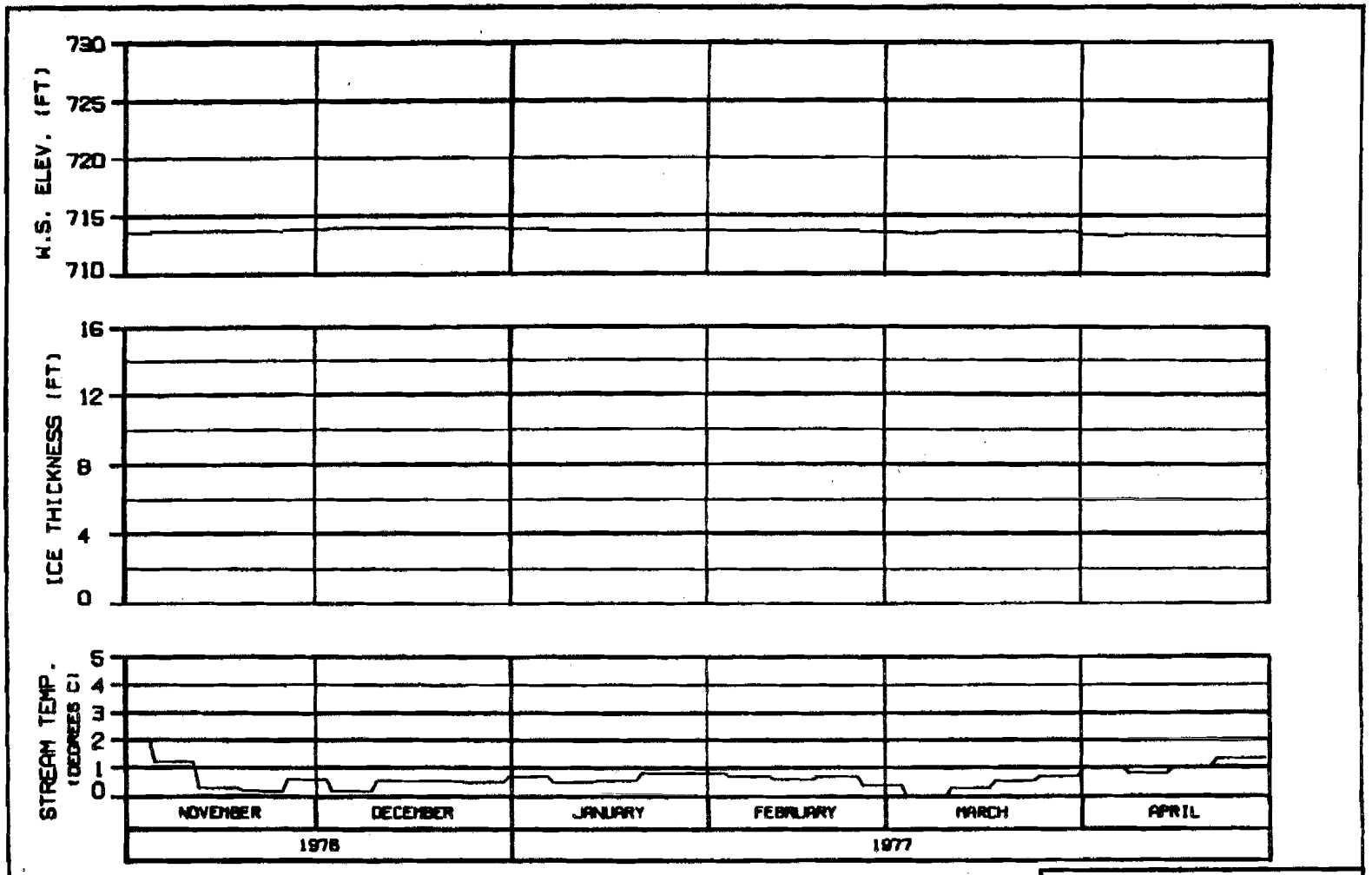
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.L.P.

8 JUL 84

1988.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

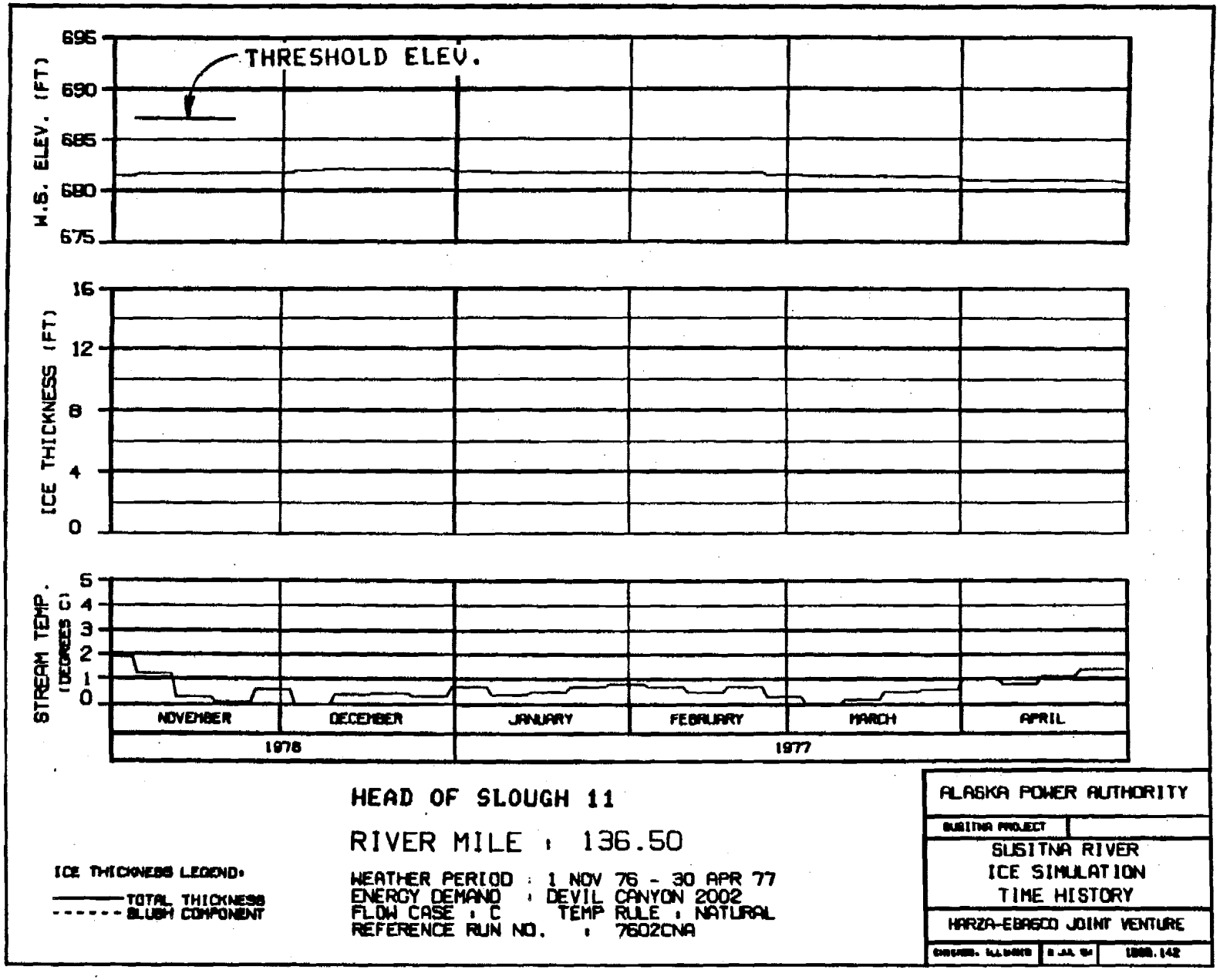
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 8 JUL 84 | 1988.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

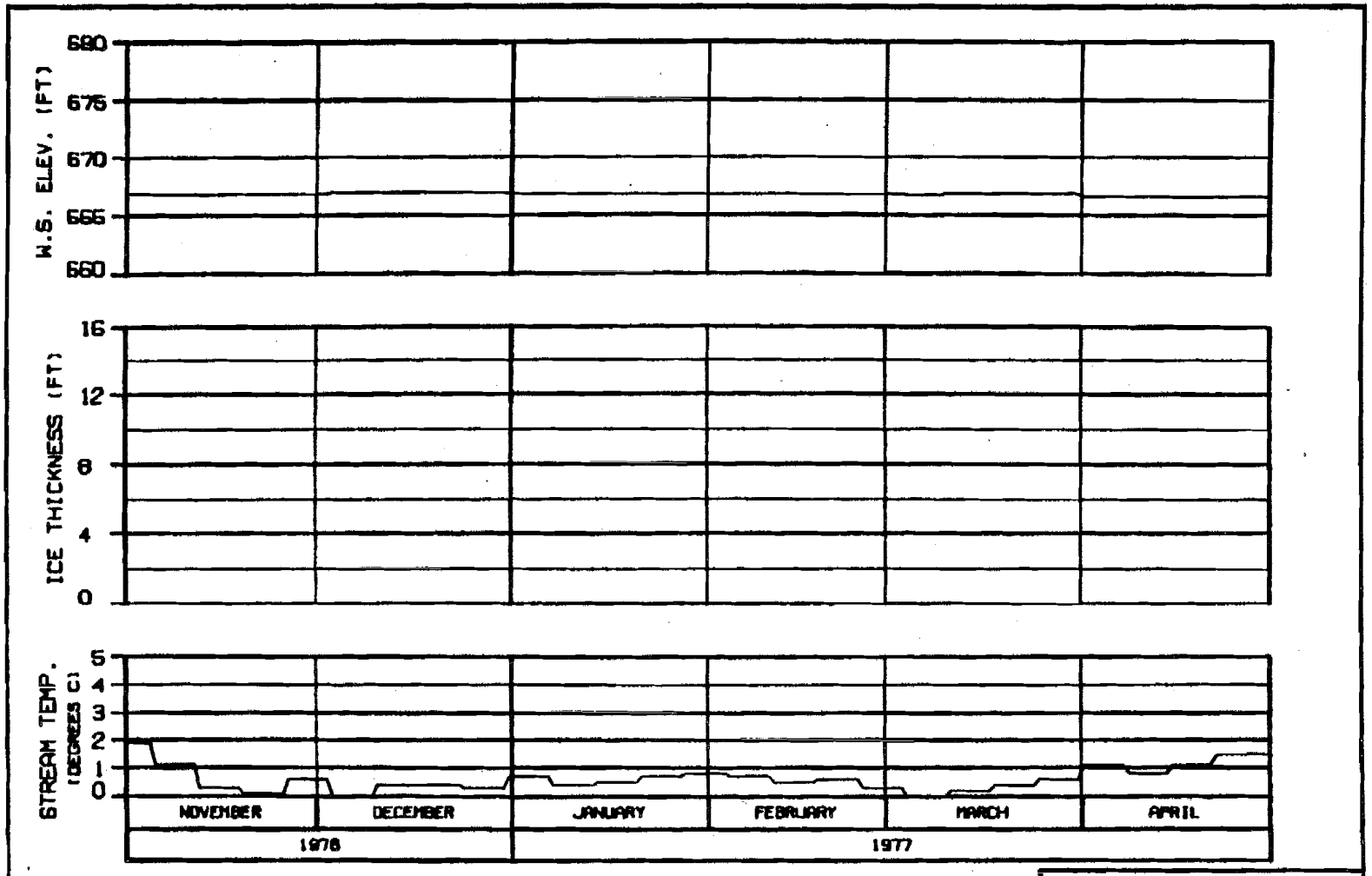
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

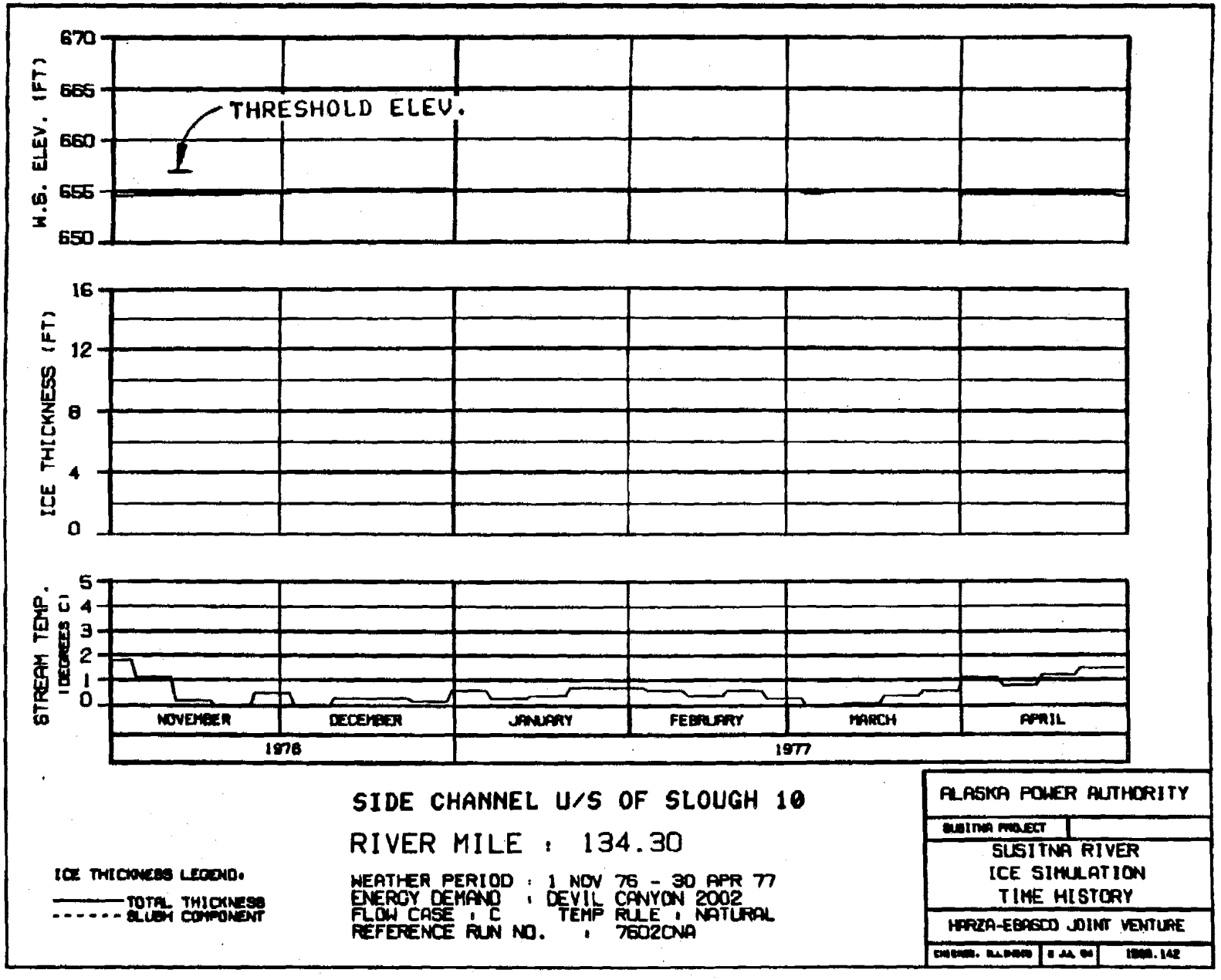
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 6 JUL 84 | 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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

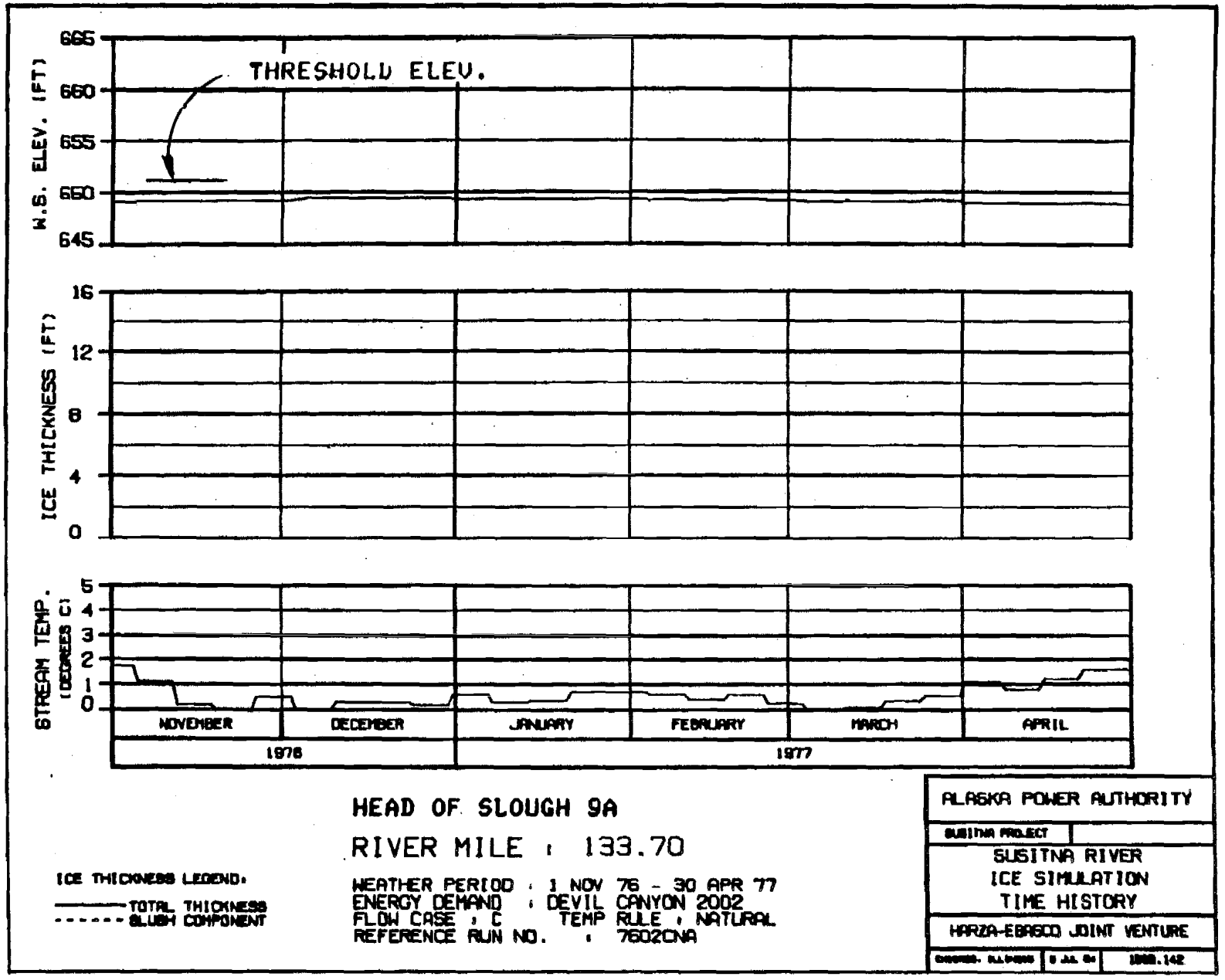
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.P.E.G. | 8 JUL 84 | 1868.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

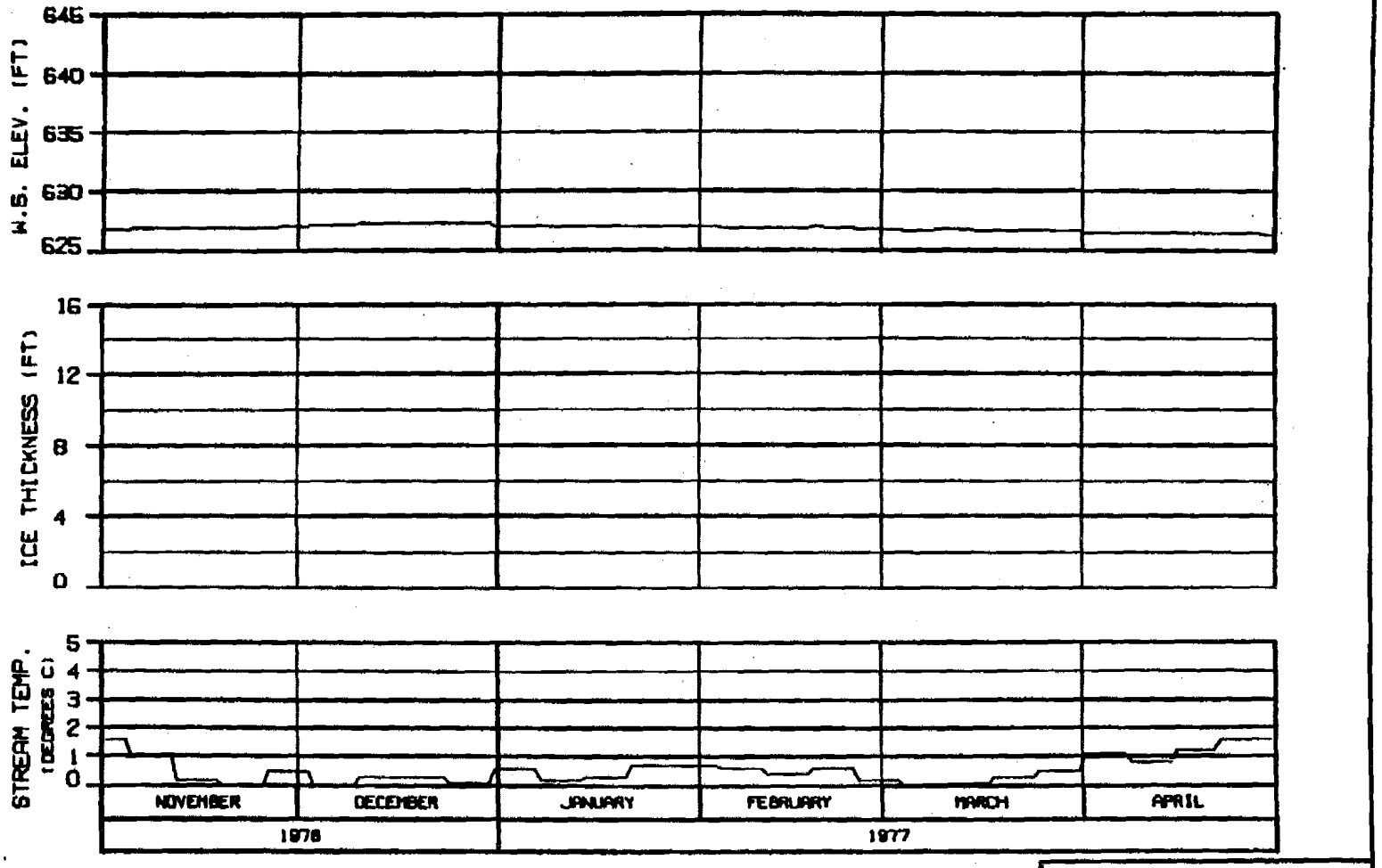
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.L.P. | 9 JUL 84 | 1868.142



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

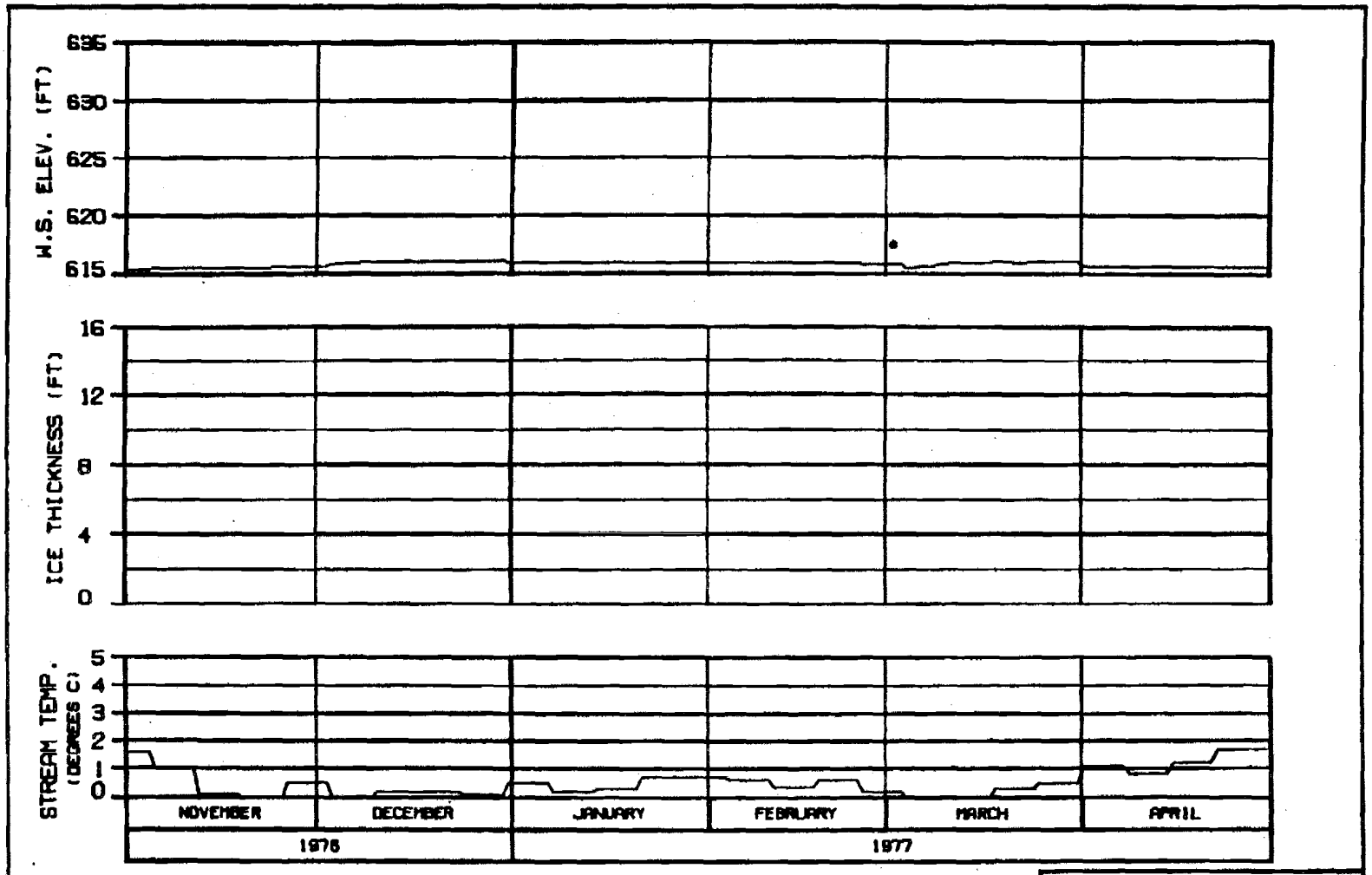
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: D.L.P.
8 JUL 84
1988.142

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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

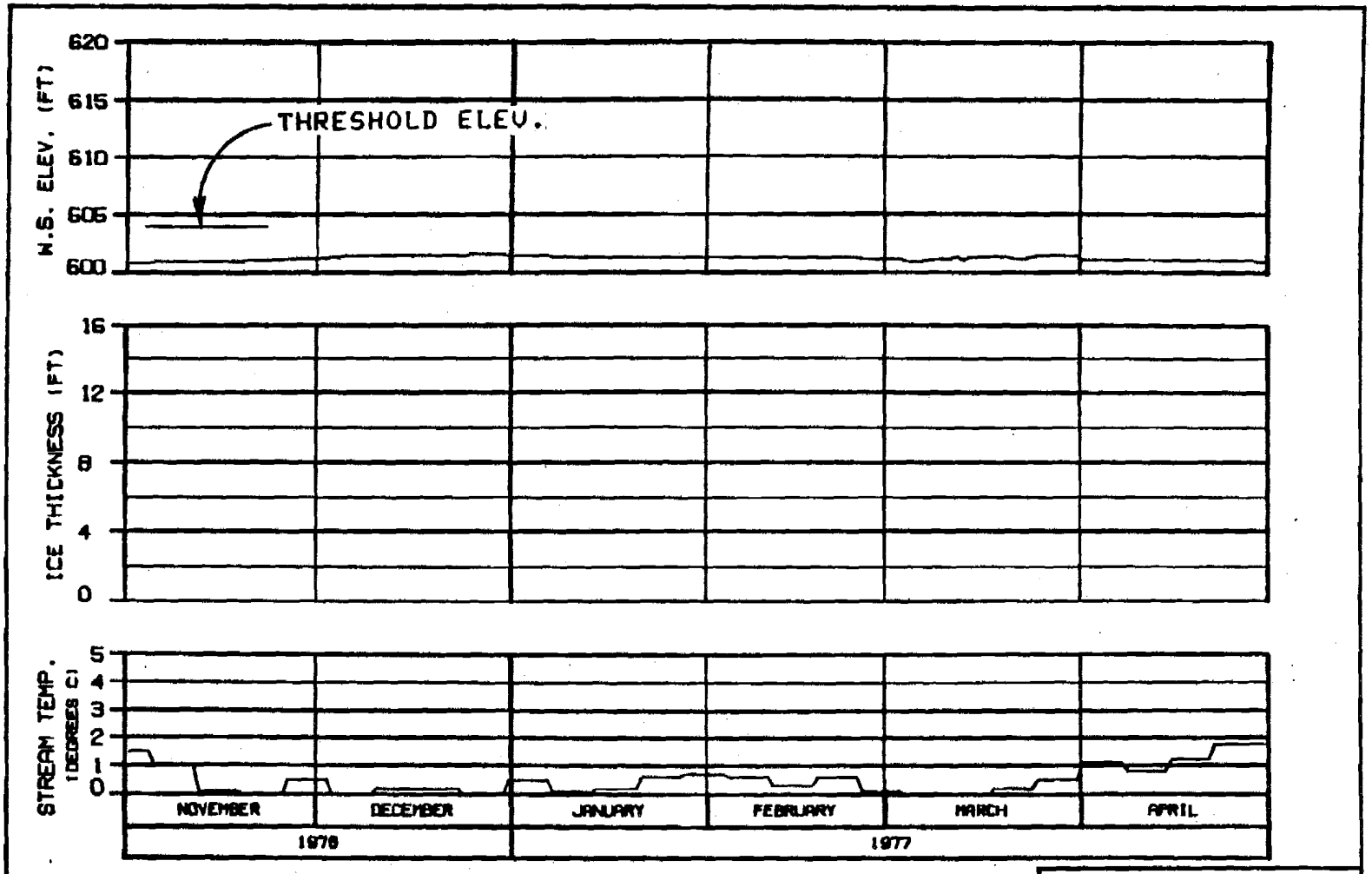
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

OPTION?

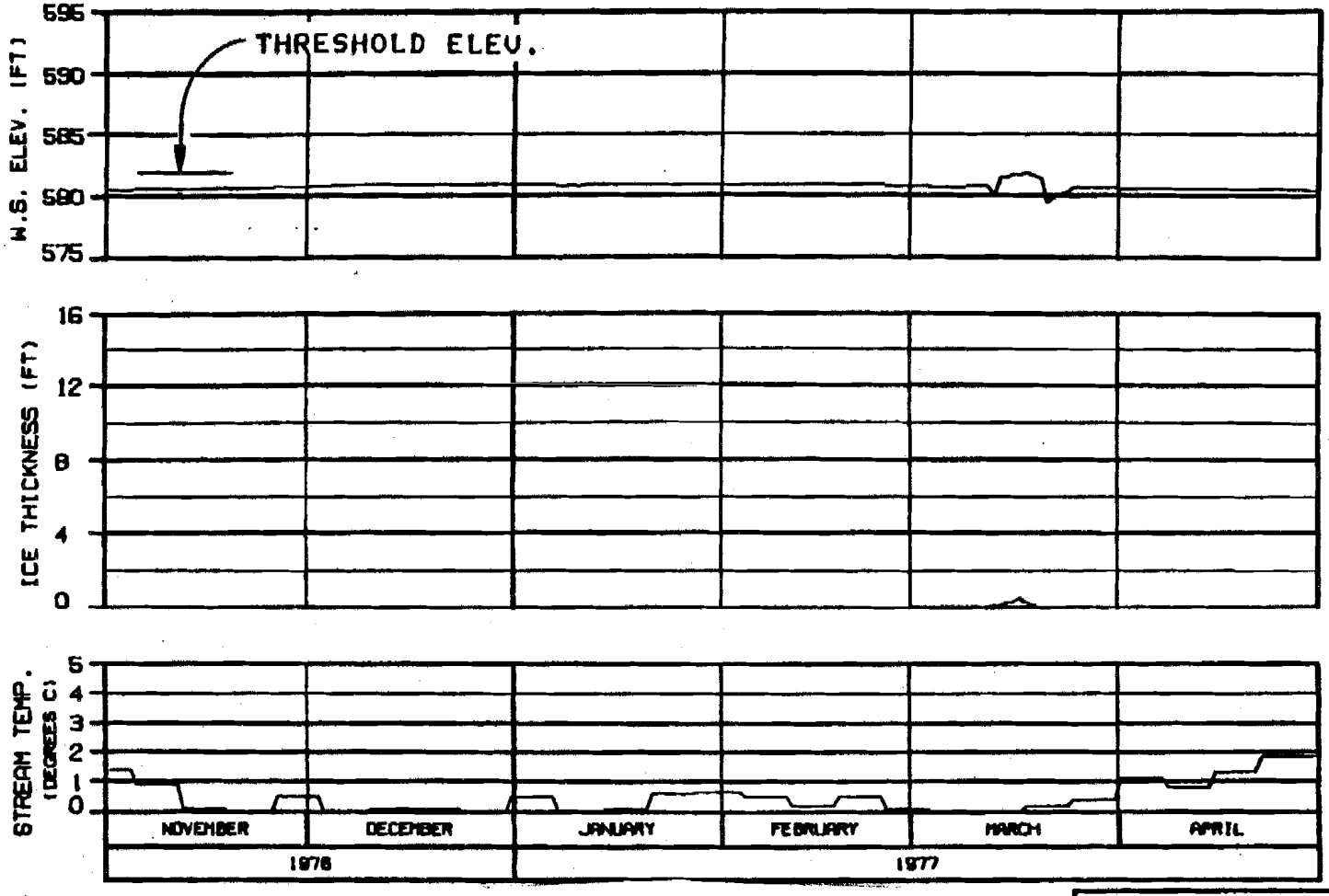
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

[illegible] | 5 JUL 84 | 1988.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

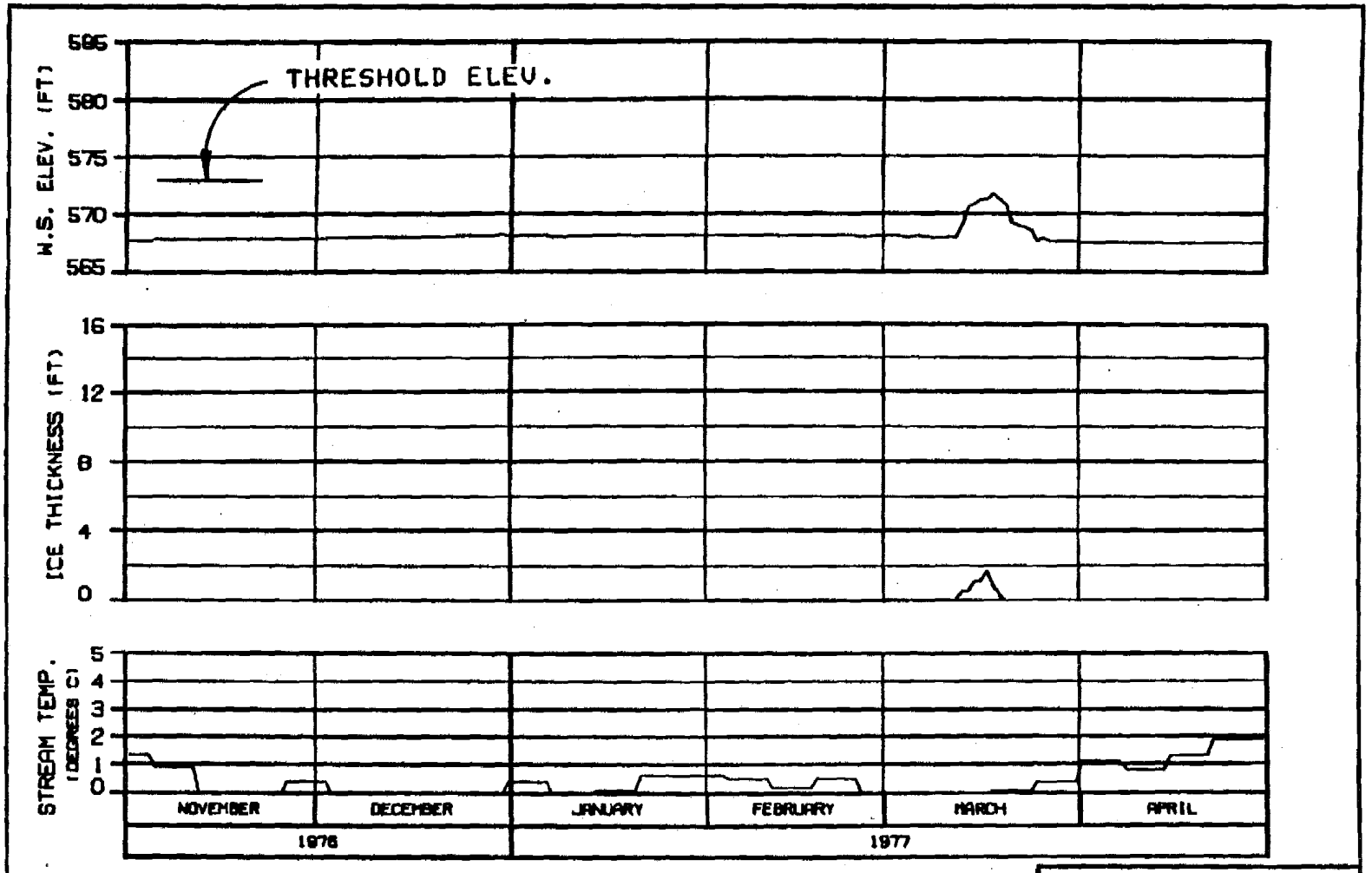
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 6 JUL 84 | 1868.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

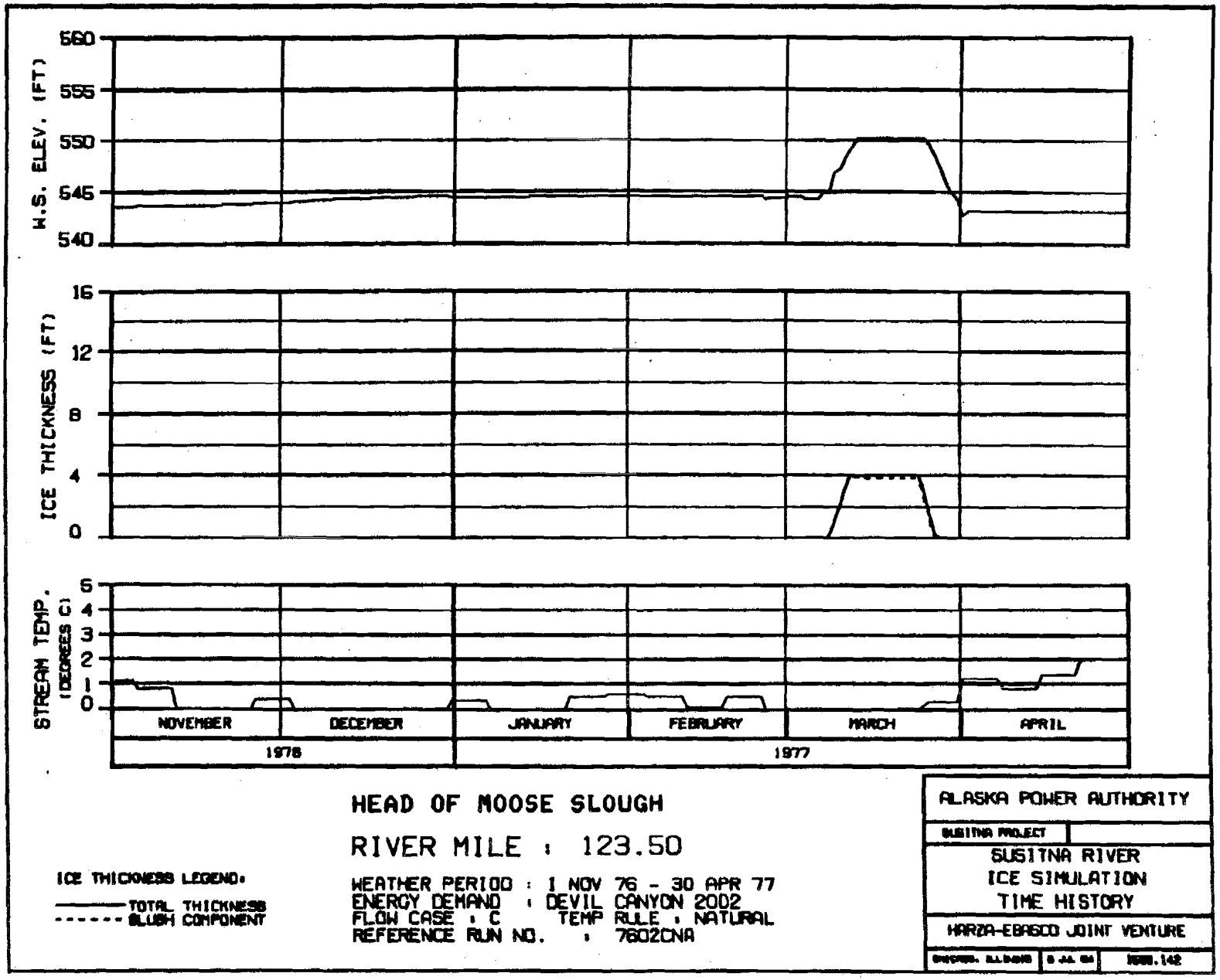
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 1988.142



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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

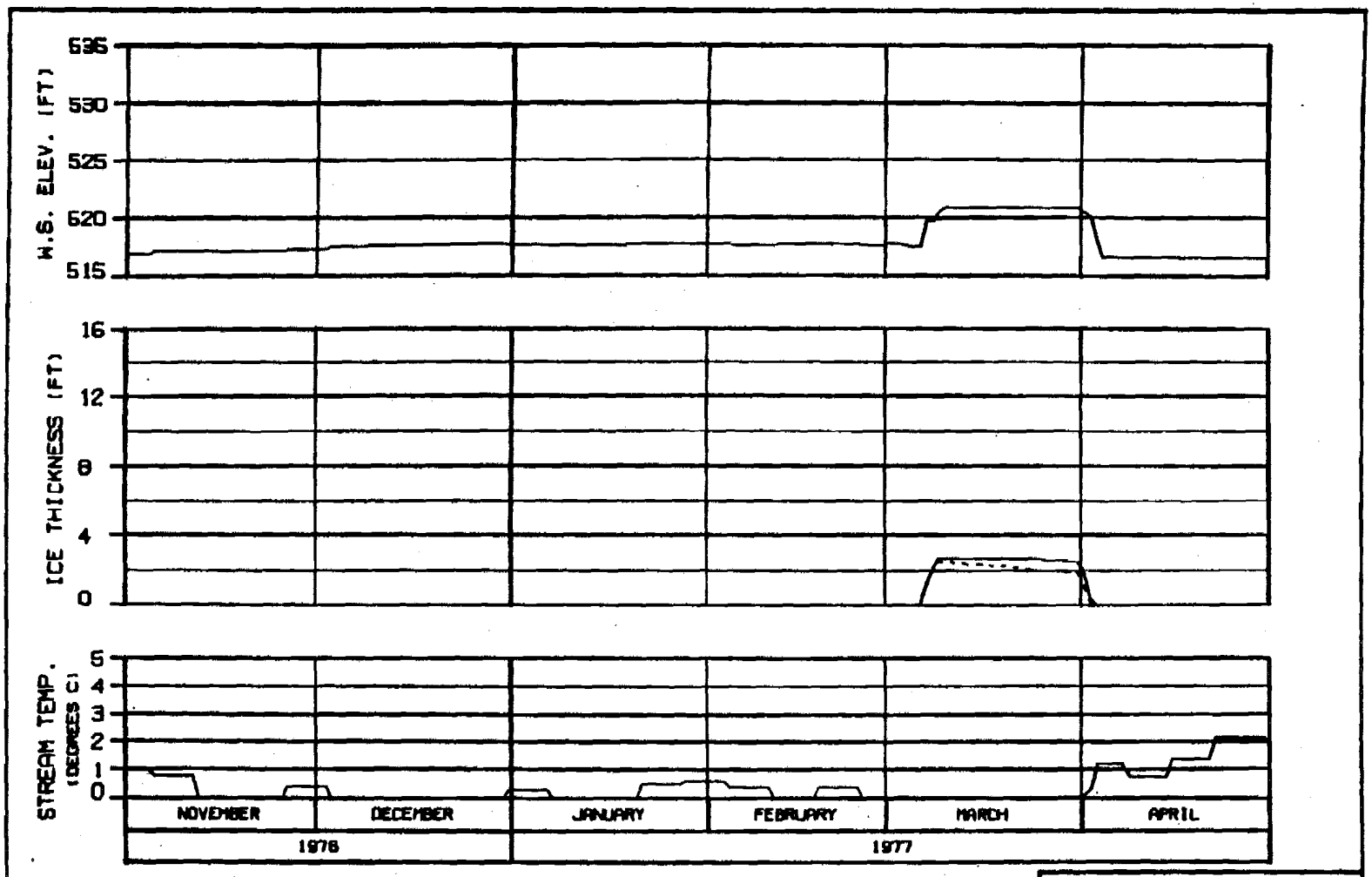
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: A.L.BANG | 8 JUL 86 | 1588.142



ALASKA POWER AUTHORITY

SUSITNA PROJECT

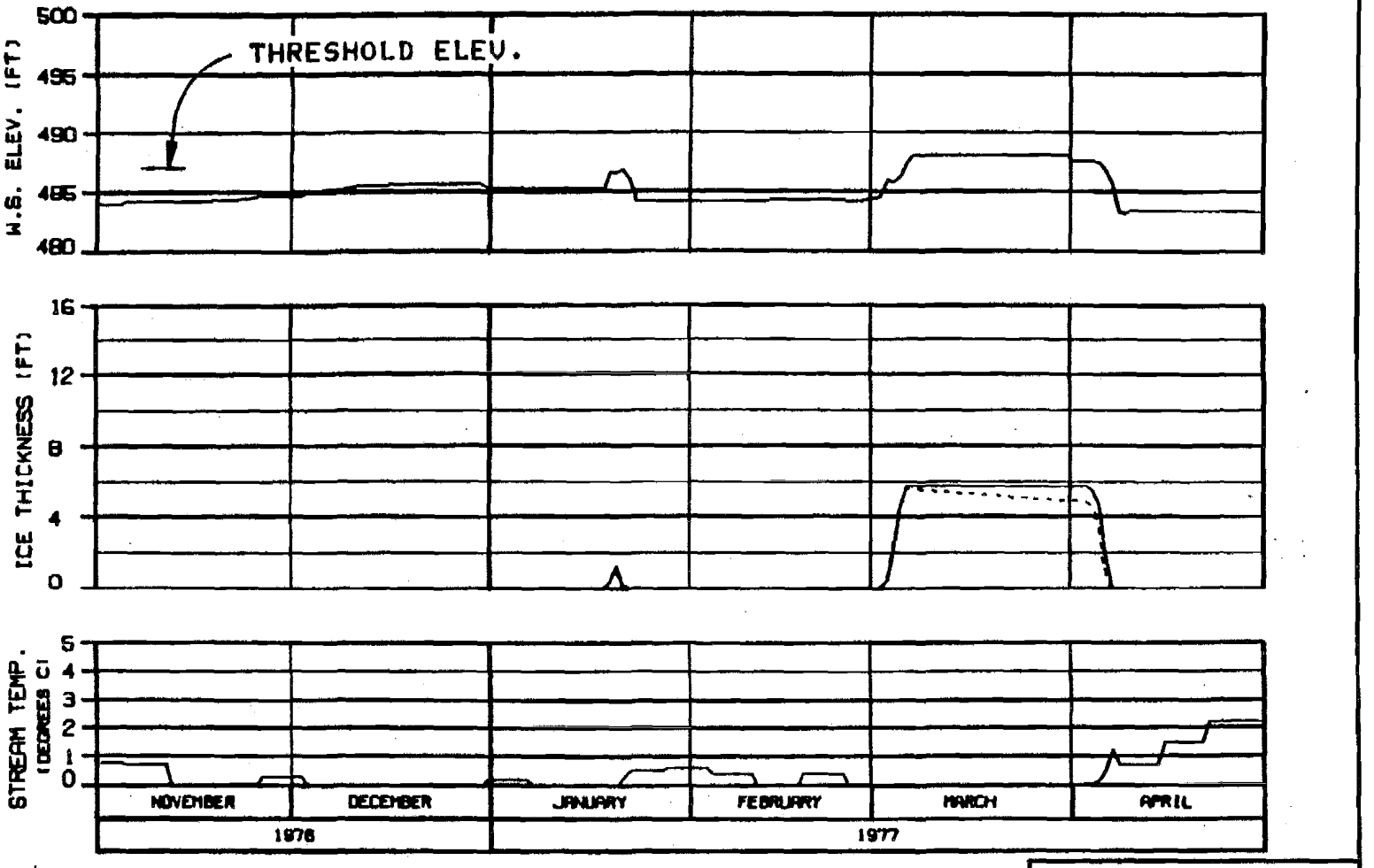
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

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 : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

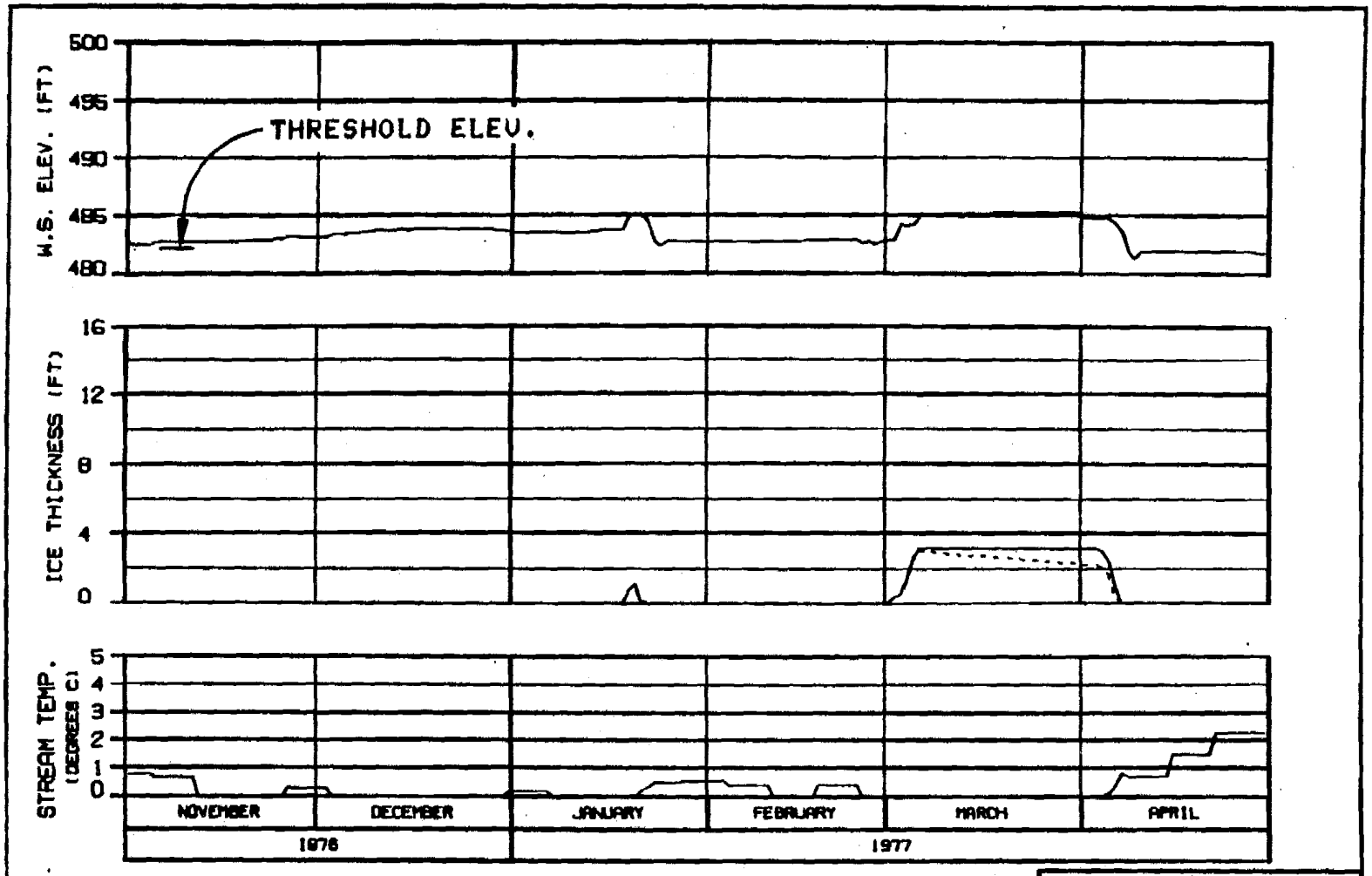
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: G.L.P.G.S. | 8 JUL 84 | 1588.142



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

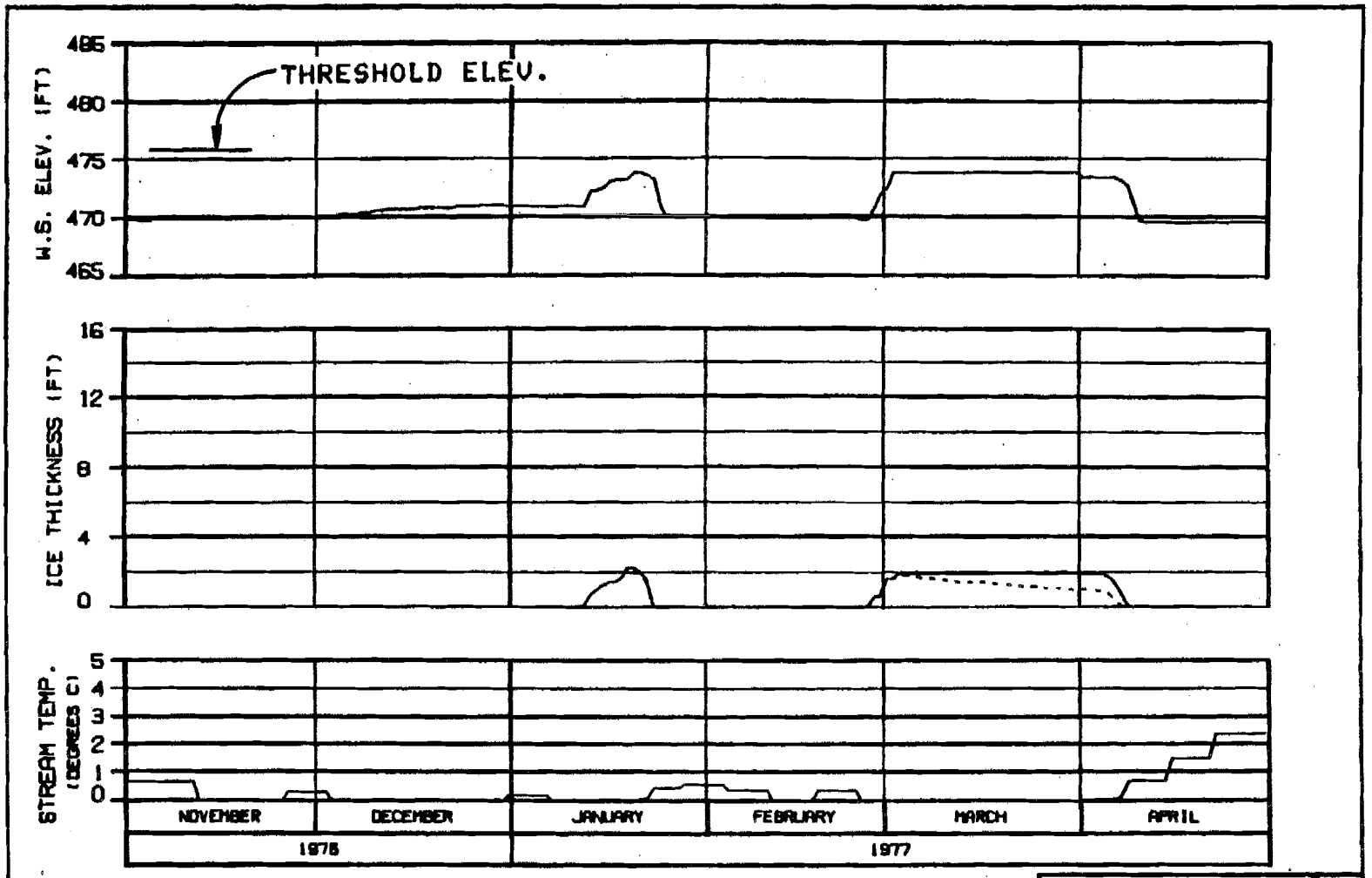
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] | 5 JUL 84 | 1988.142



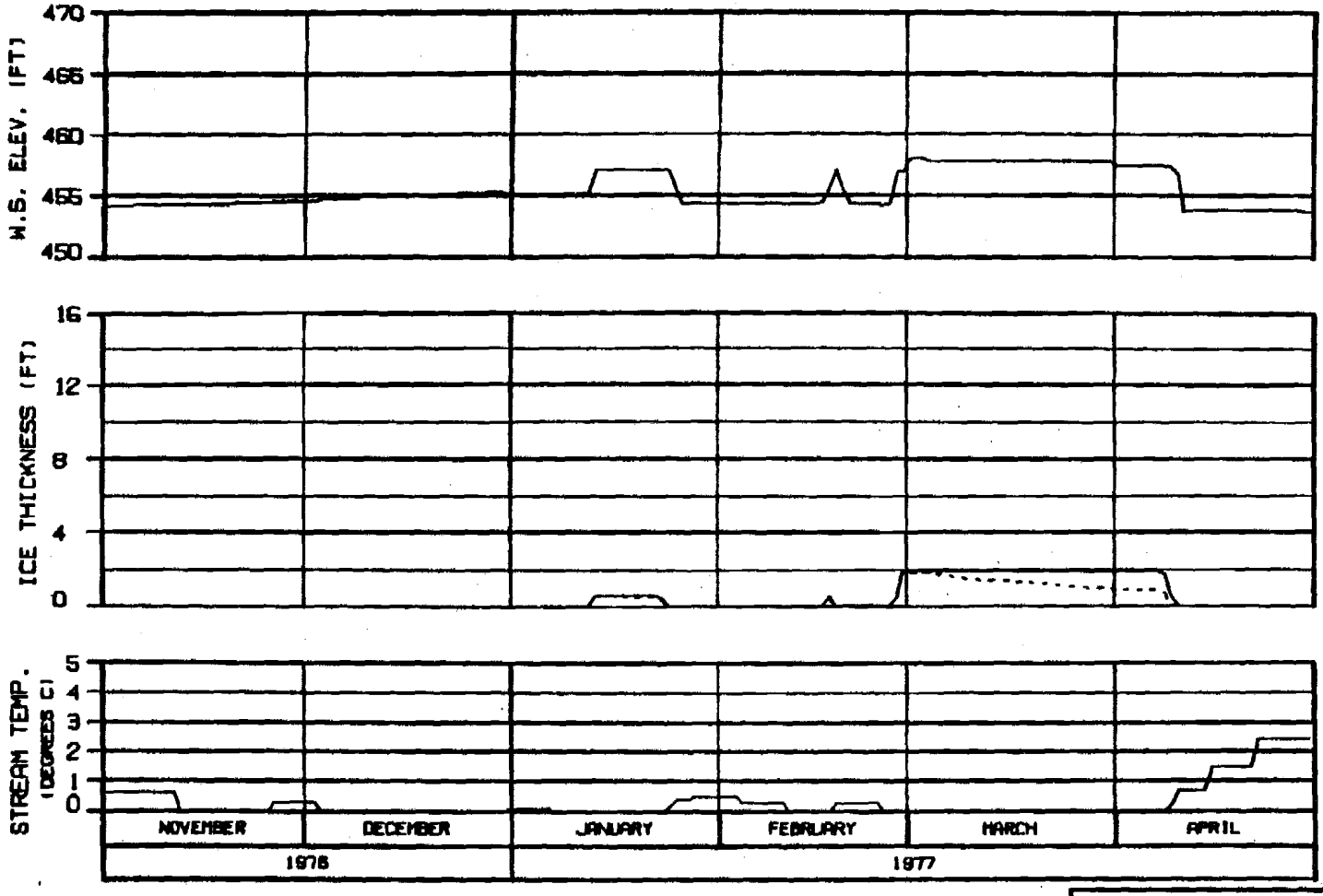
HEAD OF SLOUGH 8

RIVER MILE : 114.10

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

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

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



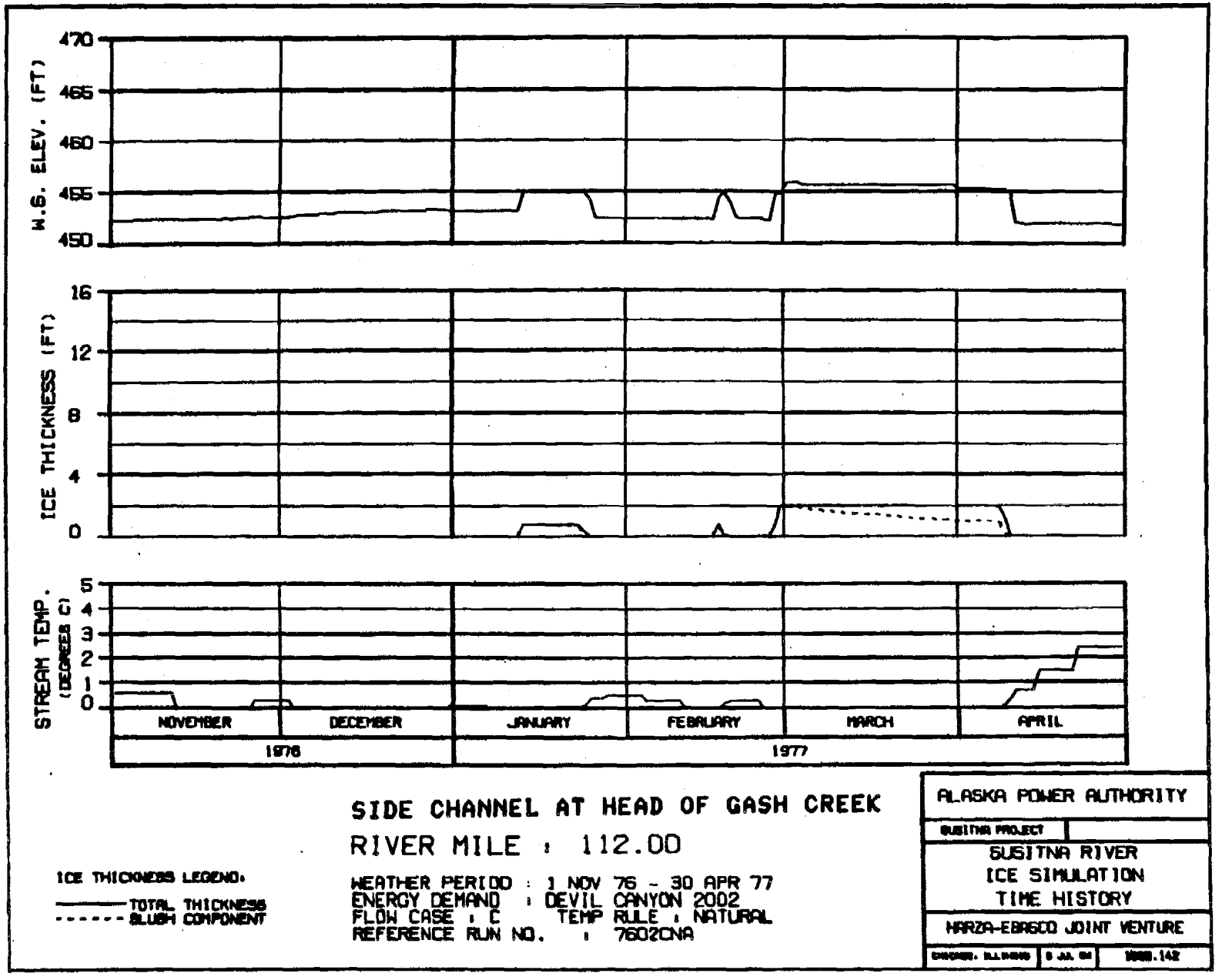
MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

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

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1682.142



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

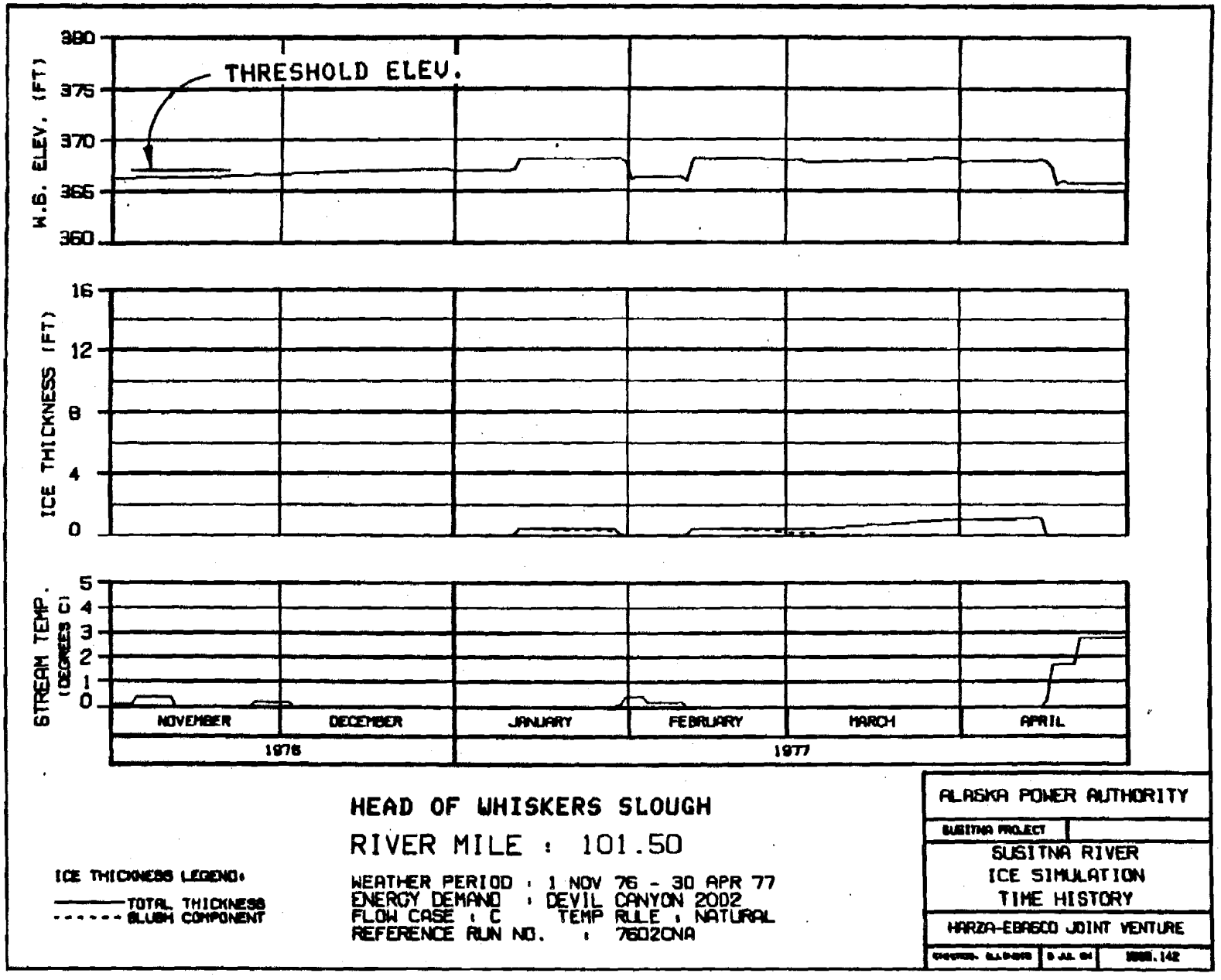
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.S. | 8 JUL 81 | 1988.142



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

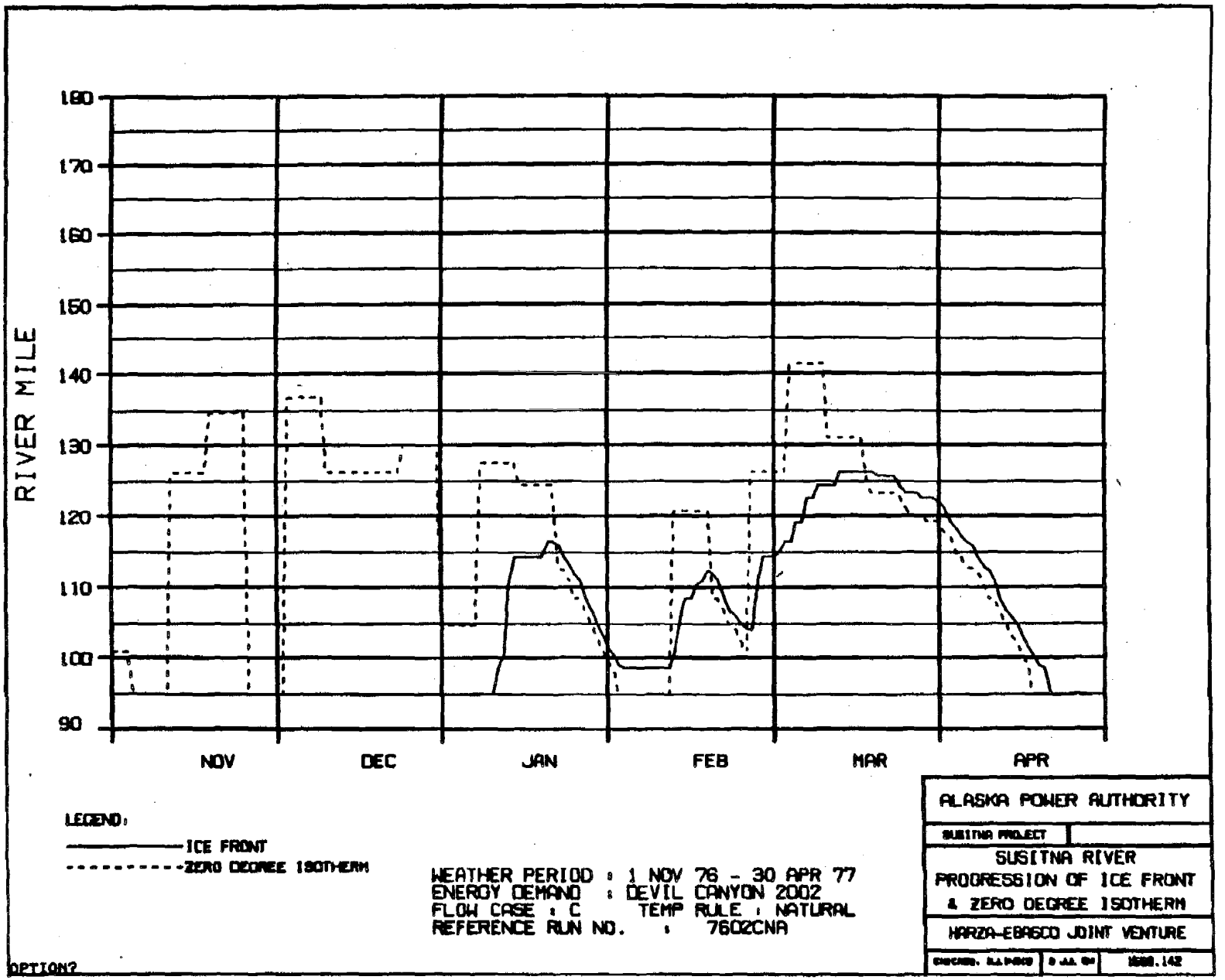
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

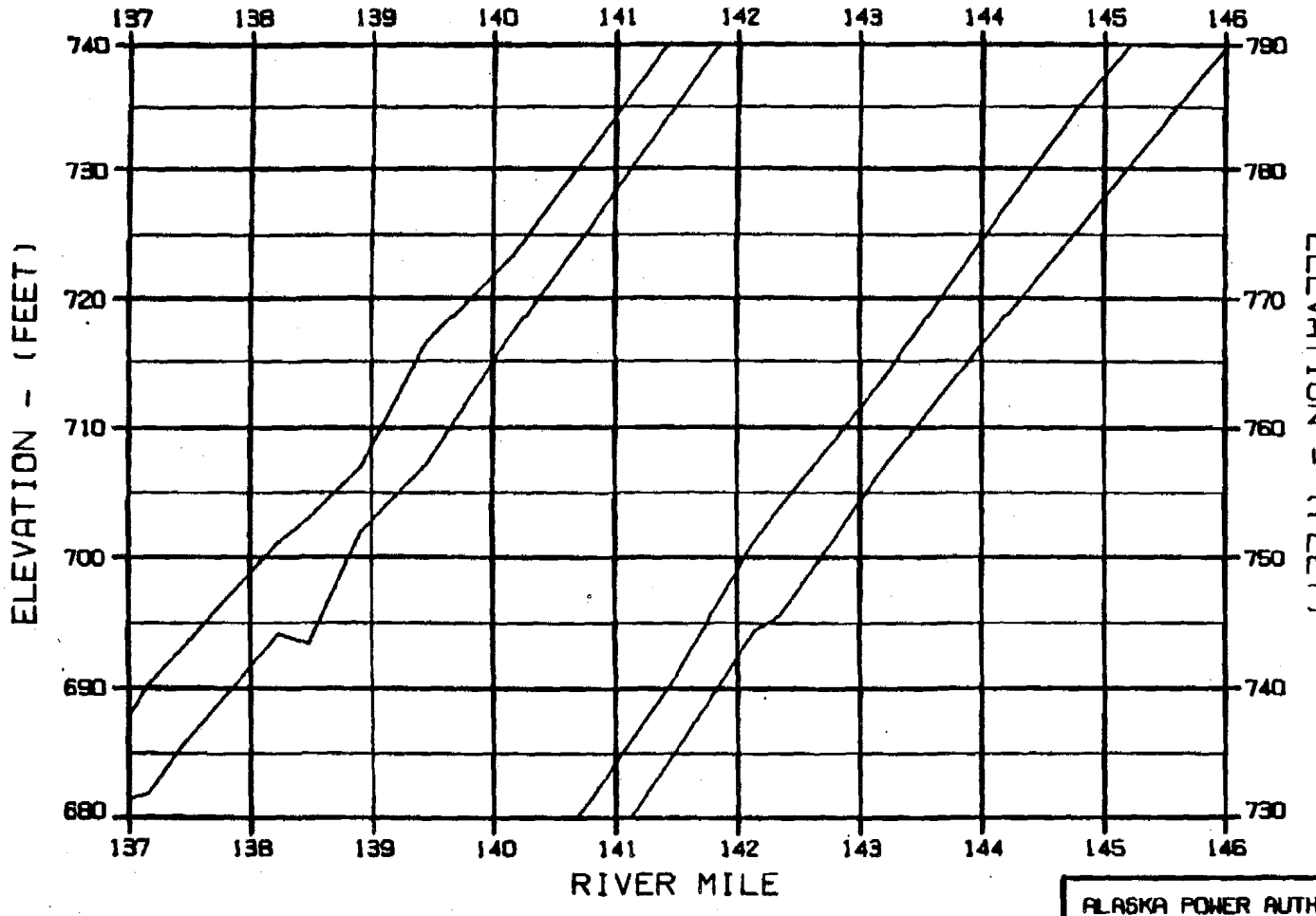
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE


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 RULE : NATURAL
REFERENCE RUN NO. : 7602CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
1588.142
OPTION?

CC



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
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 10000.142

OPTION7

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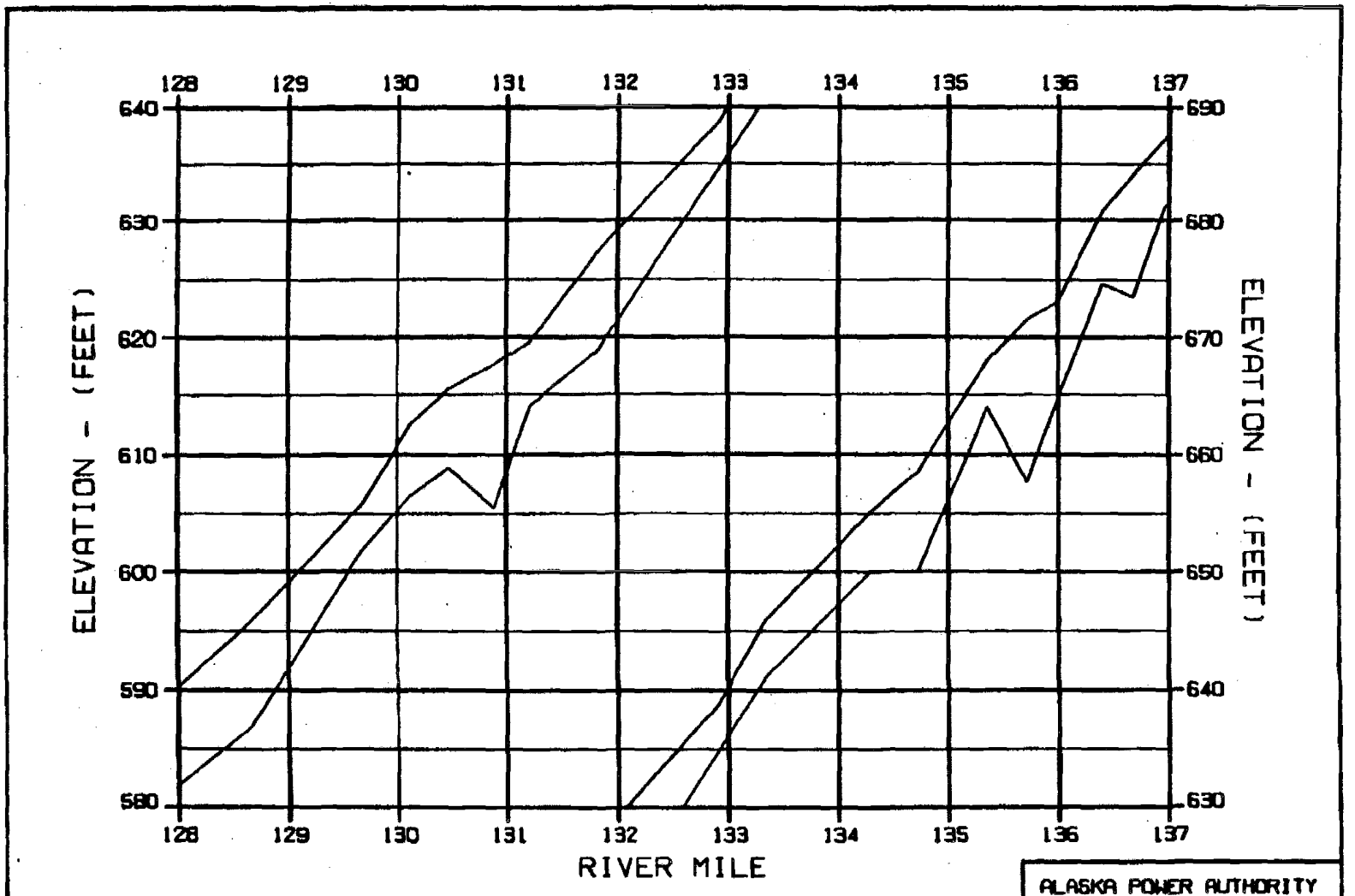

LEGEND:

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

WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA

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

OPTION?

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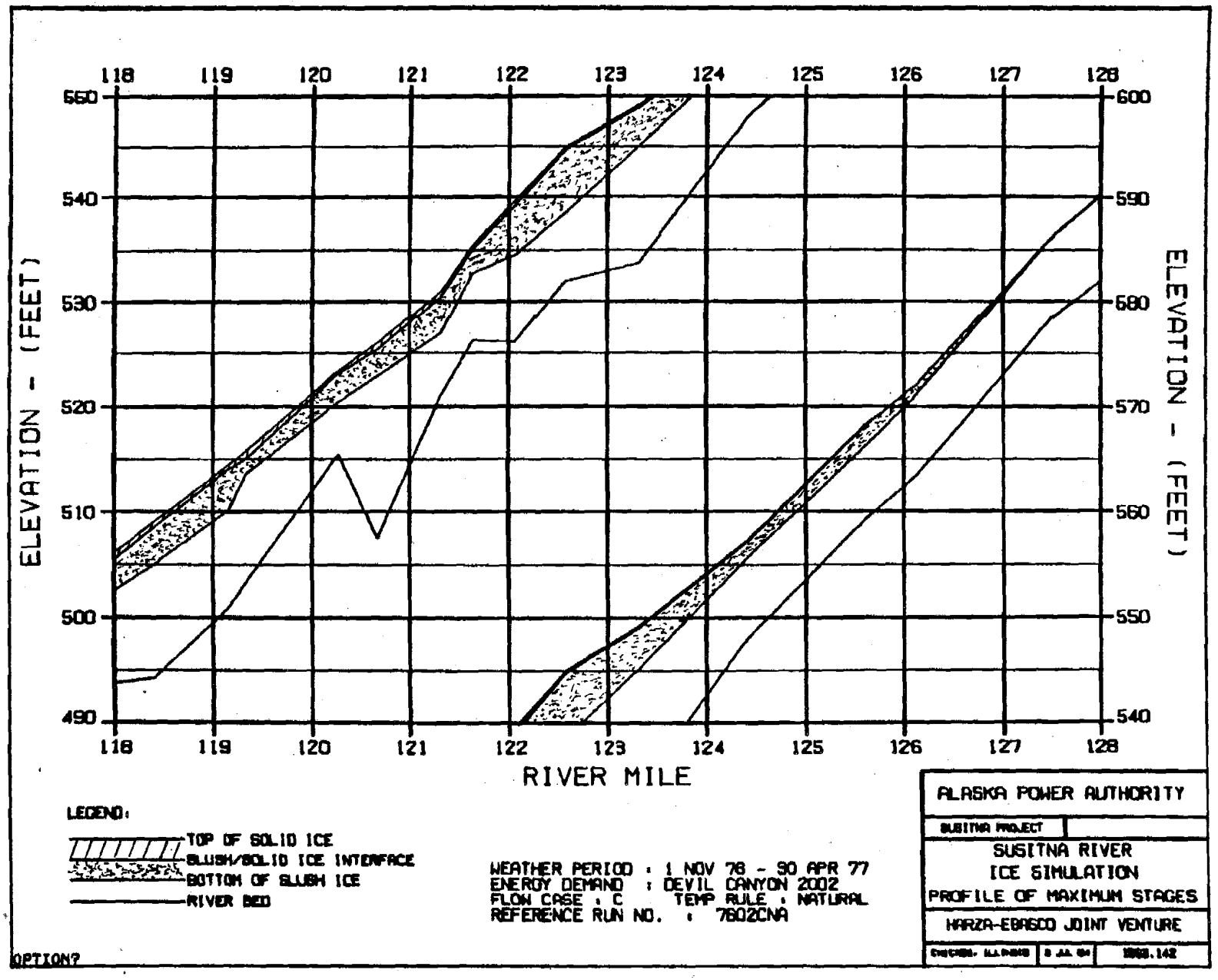
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE

OPTION?

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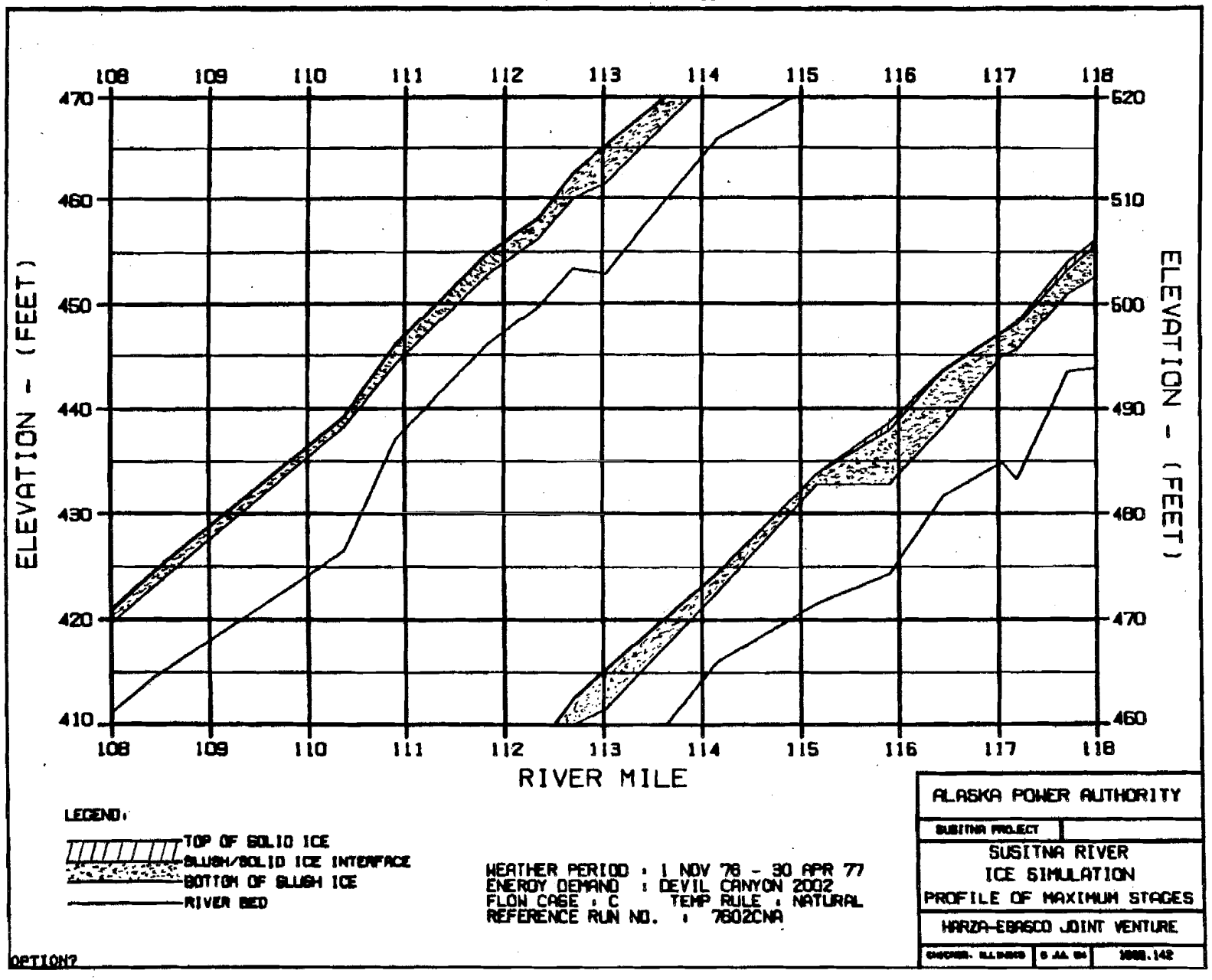
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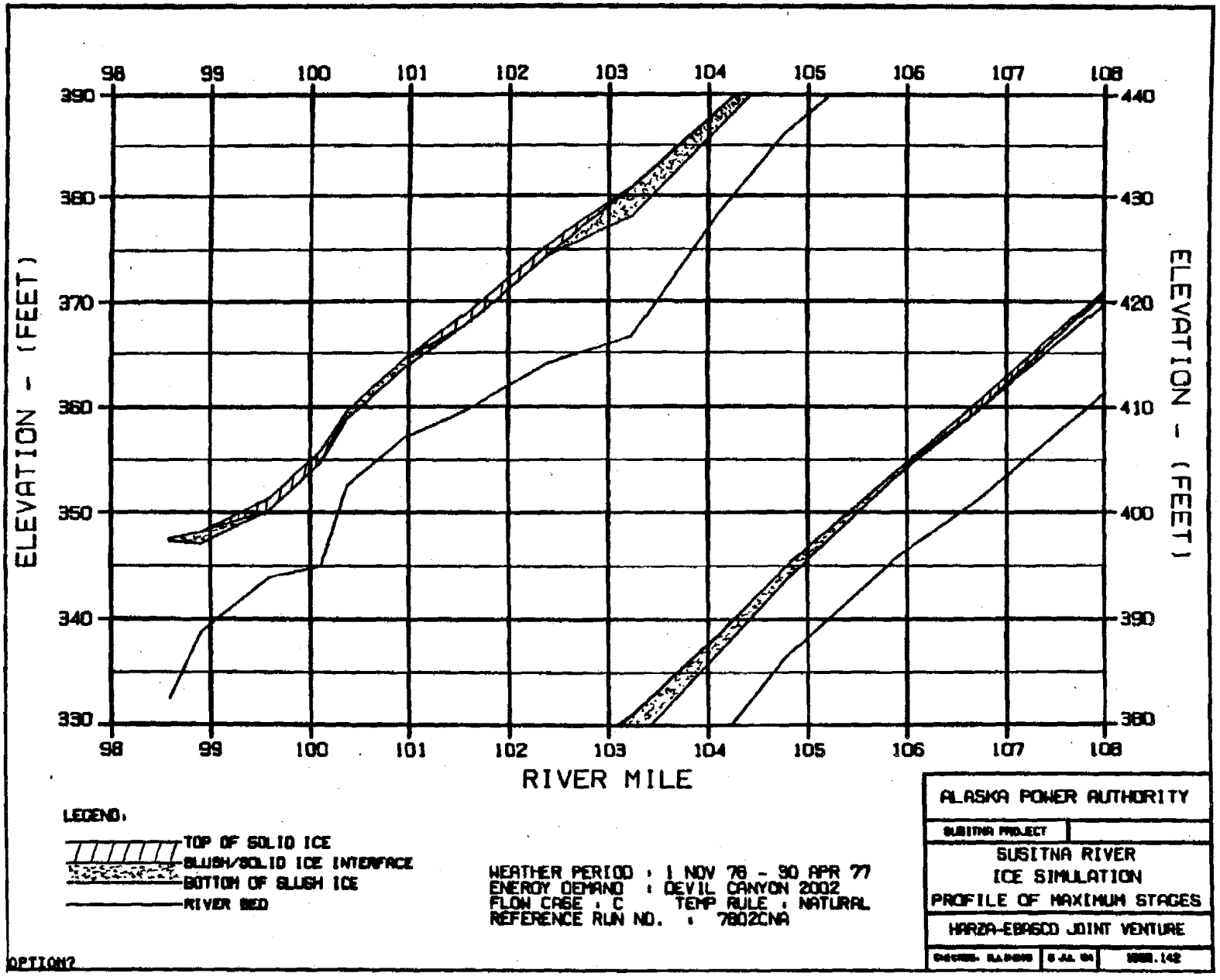
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION7

cc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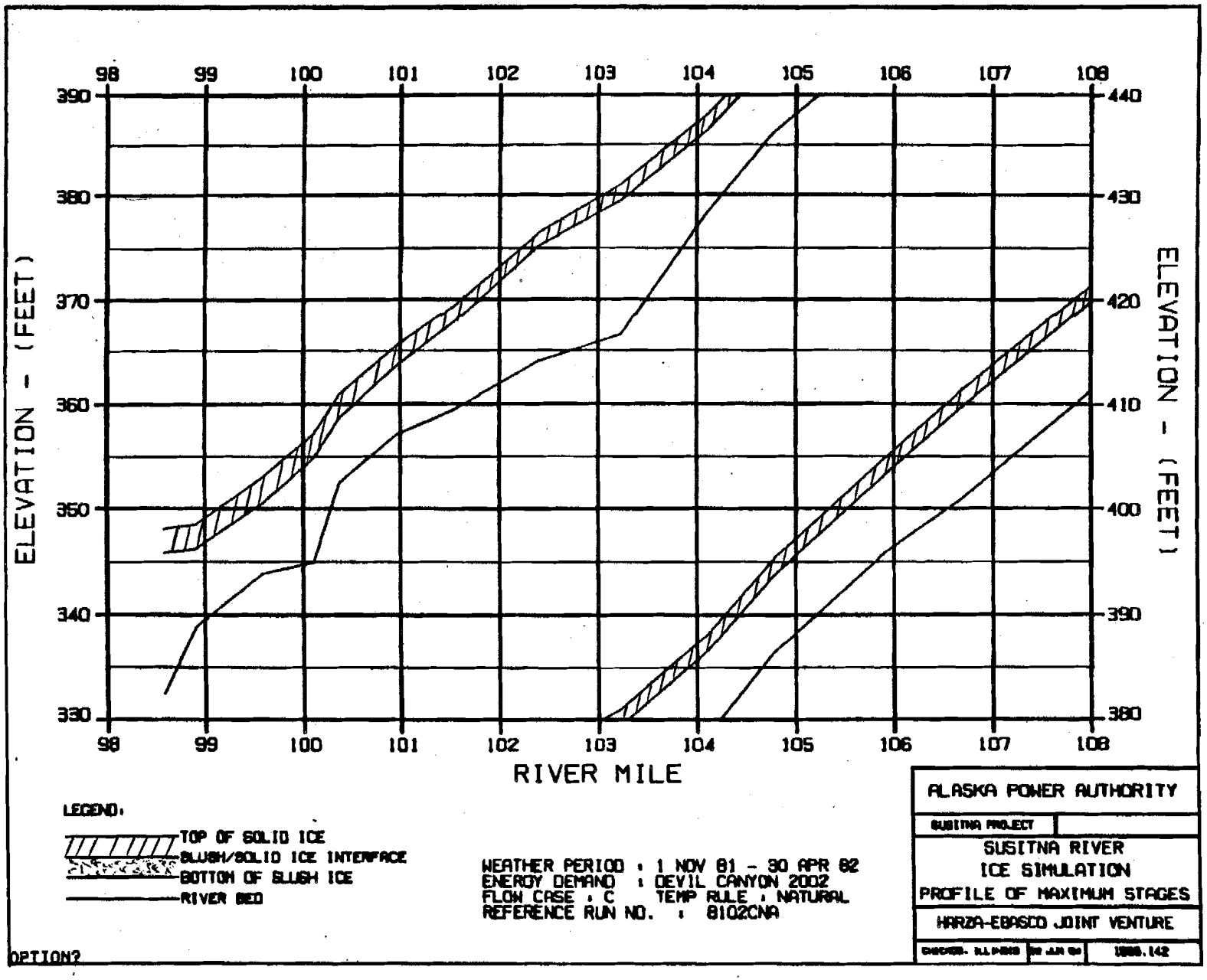
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 76 - 30 APR 77
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7602CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
8 JUL 84
OPTION2

EXHIBIT P

C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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1986.142
OPTION?

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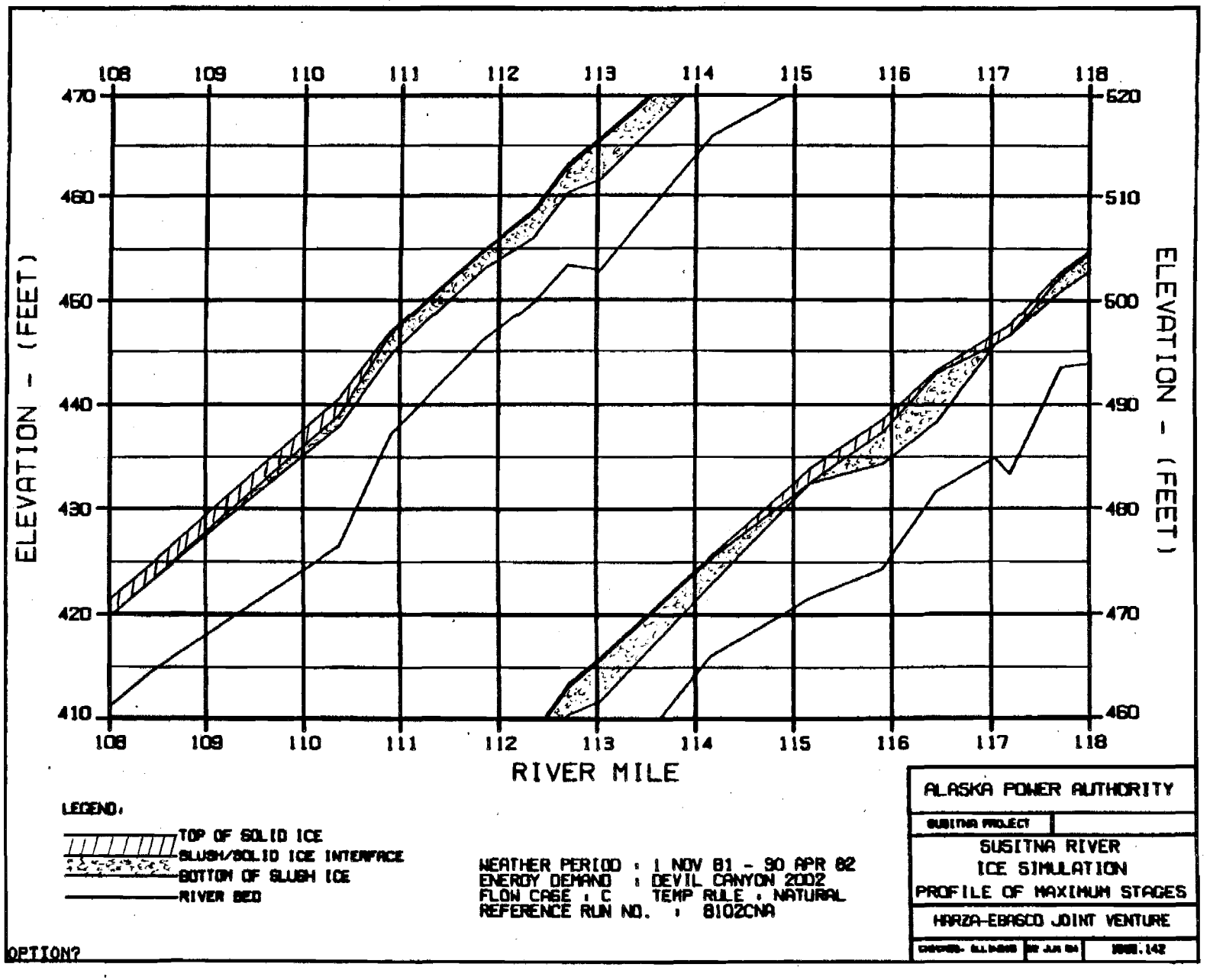
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ELEVATION - (FEET)
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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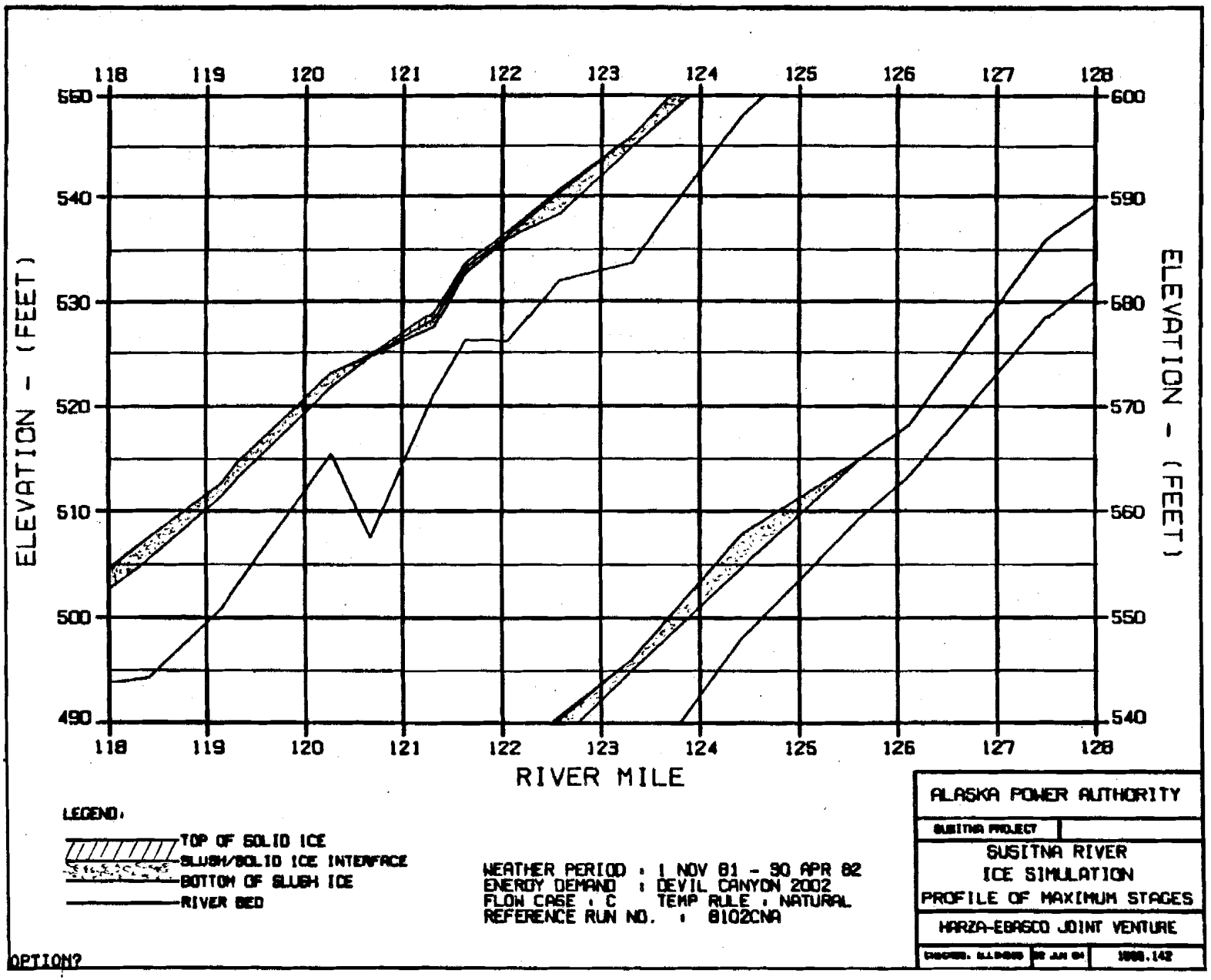
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
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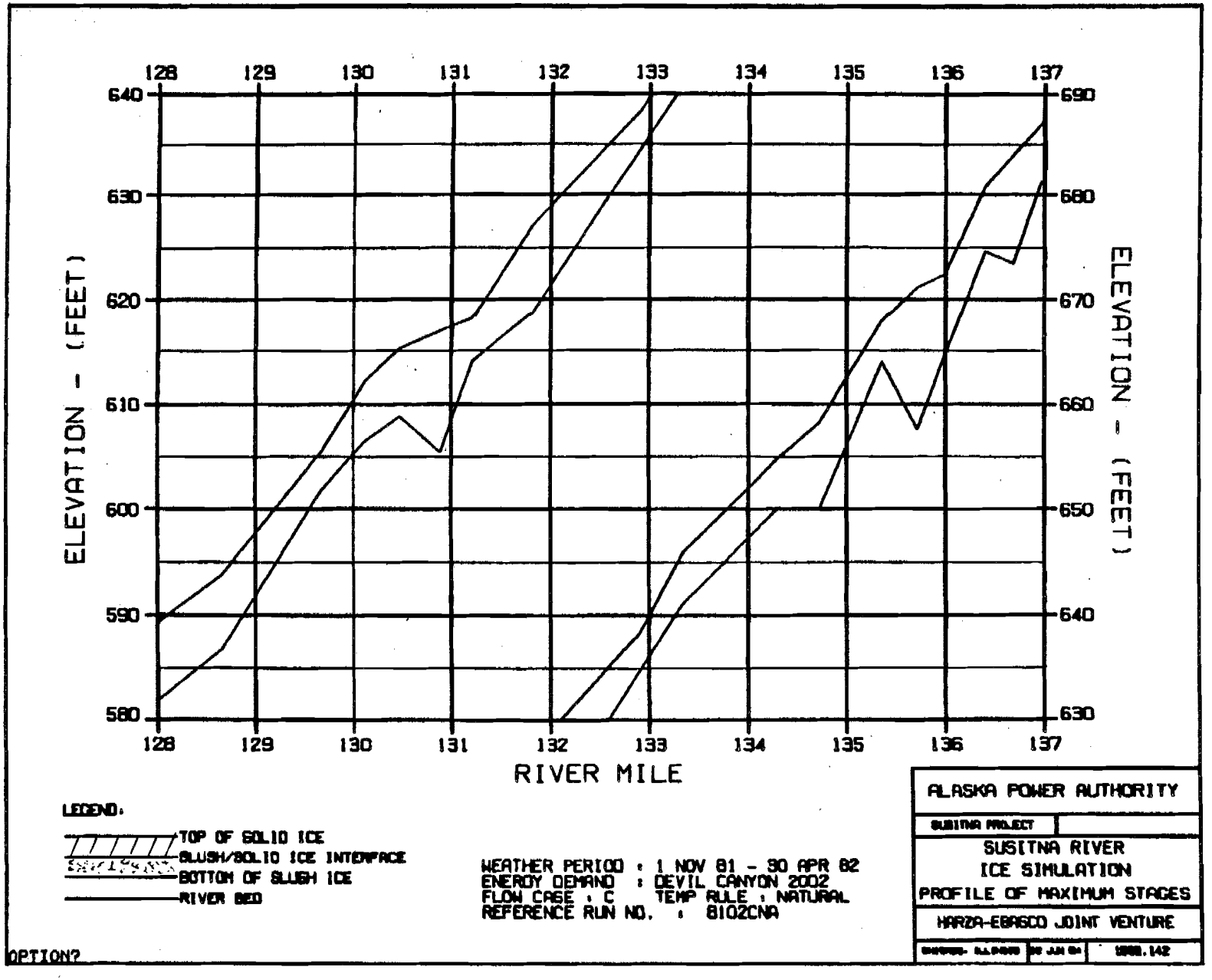
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?

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 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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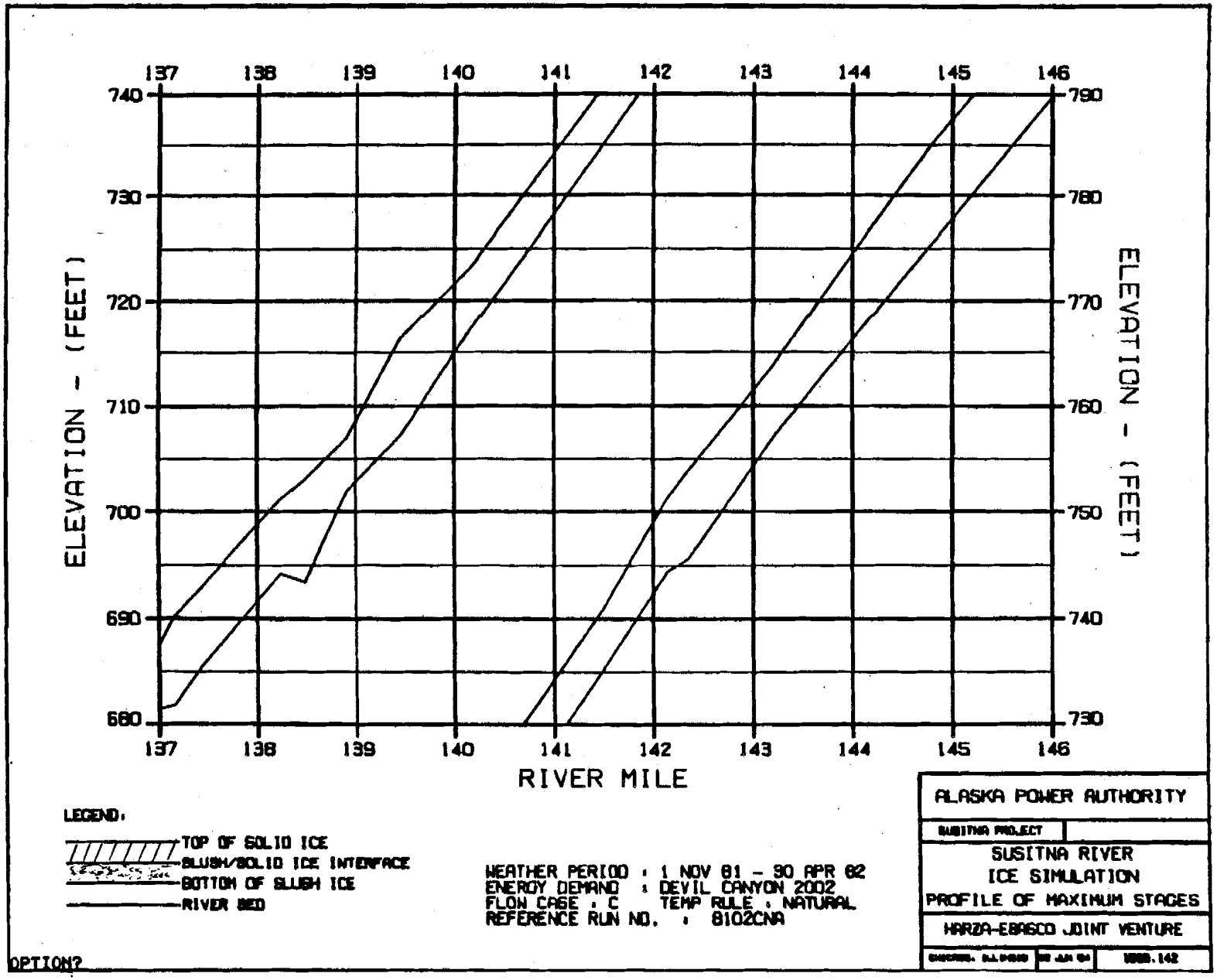
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
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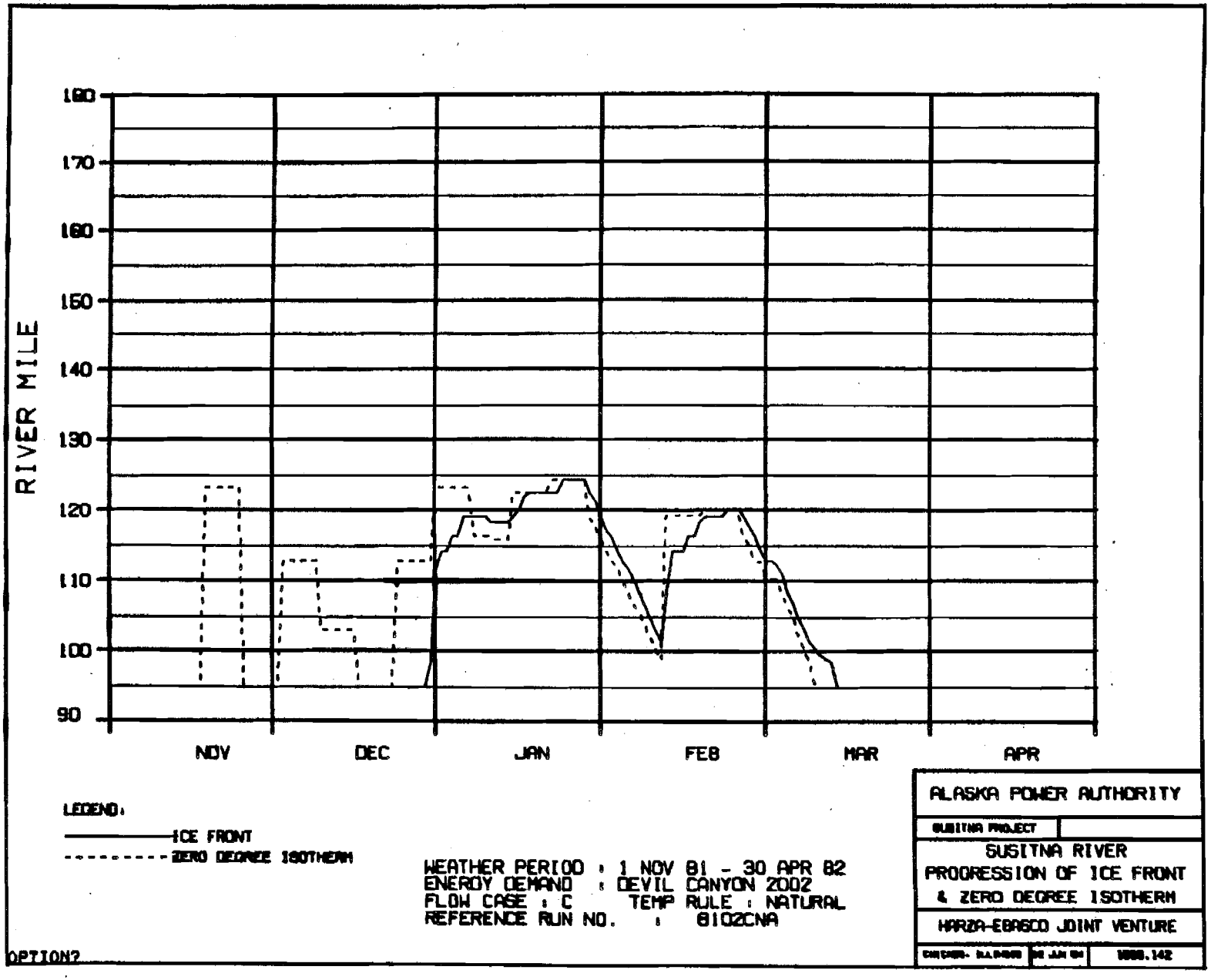
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1988.142

OPTION?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LEGEND:
ICE FRONT
ZERO DEGREE ISOTHERM
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
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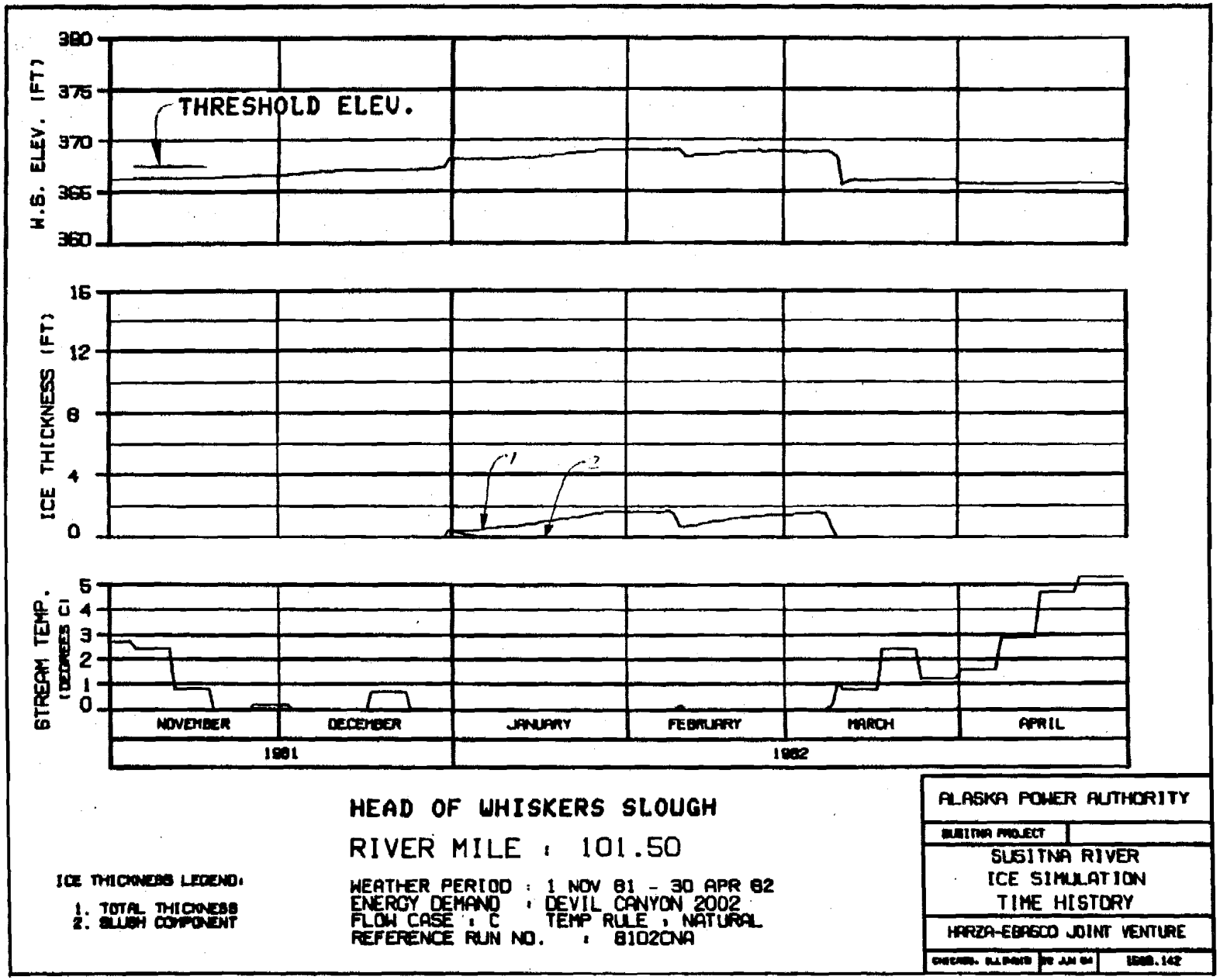
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM
HARZA-EBASCO JOINT VENTURE
1988.142
OPTION?



HEAD OF WHISKERS SLOUGH

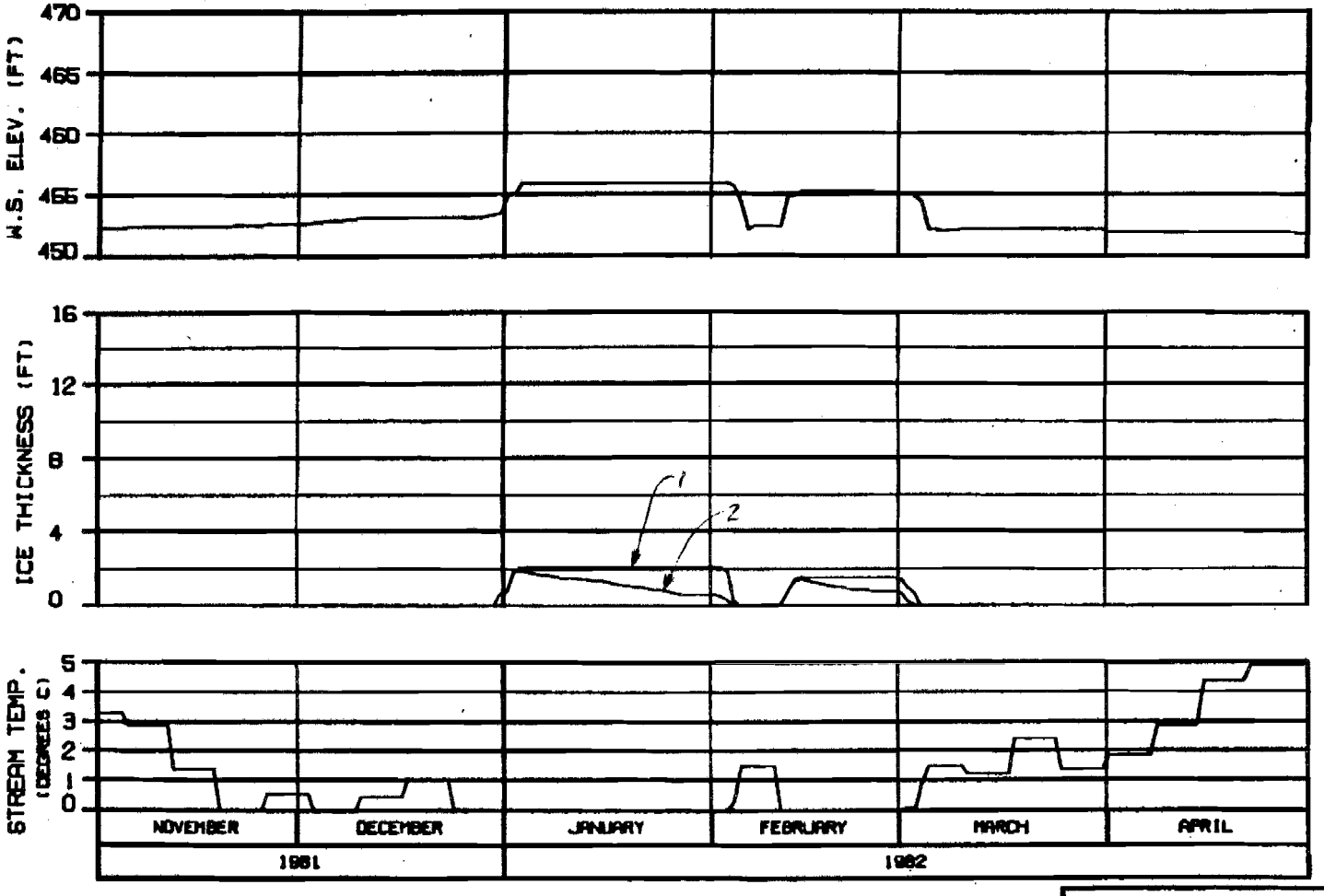
RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS — 20 JAN 84 — 1588.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

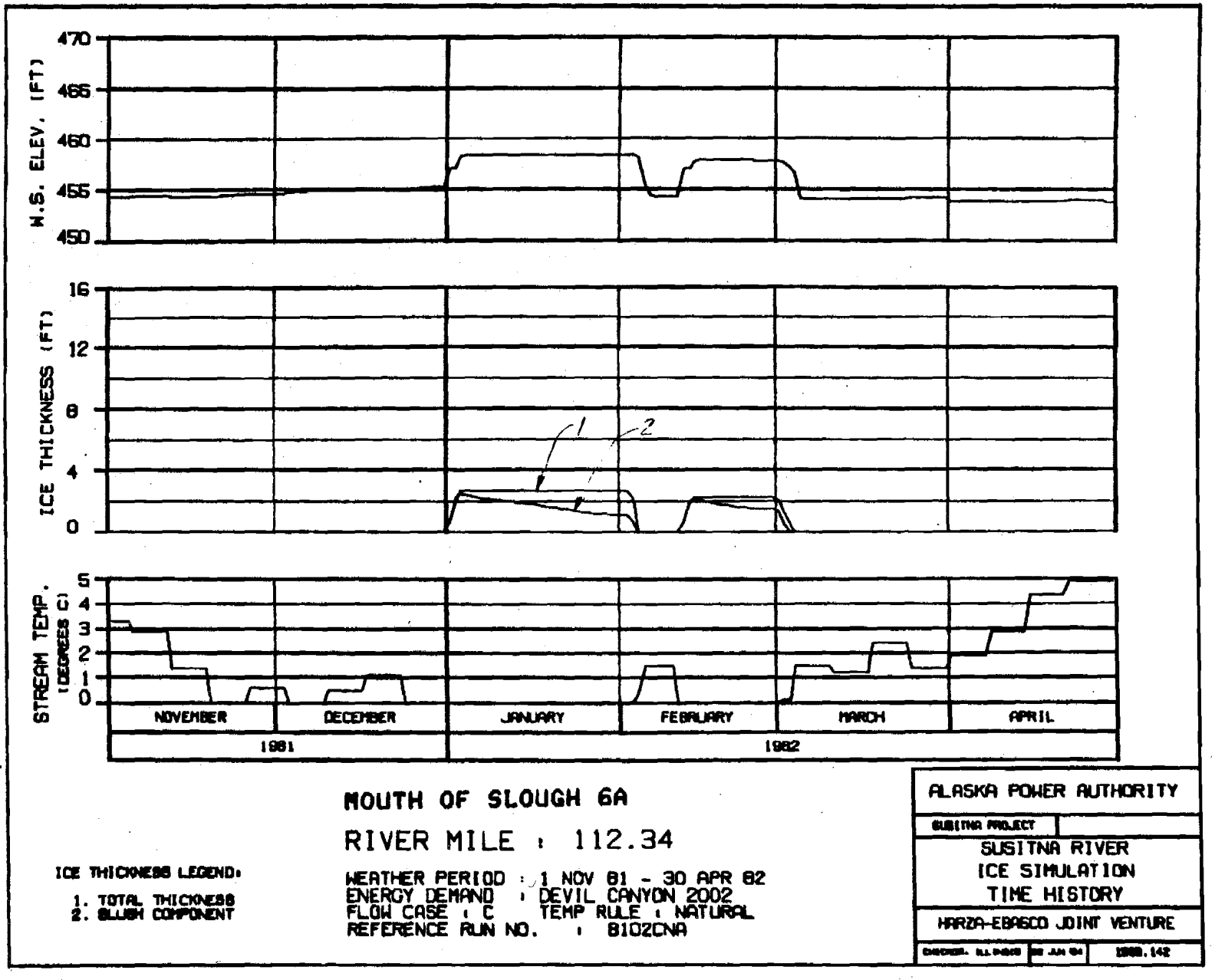
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1868.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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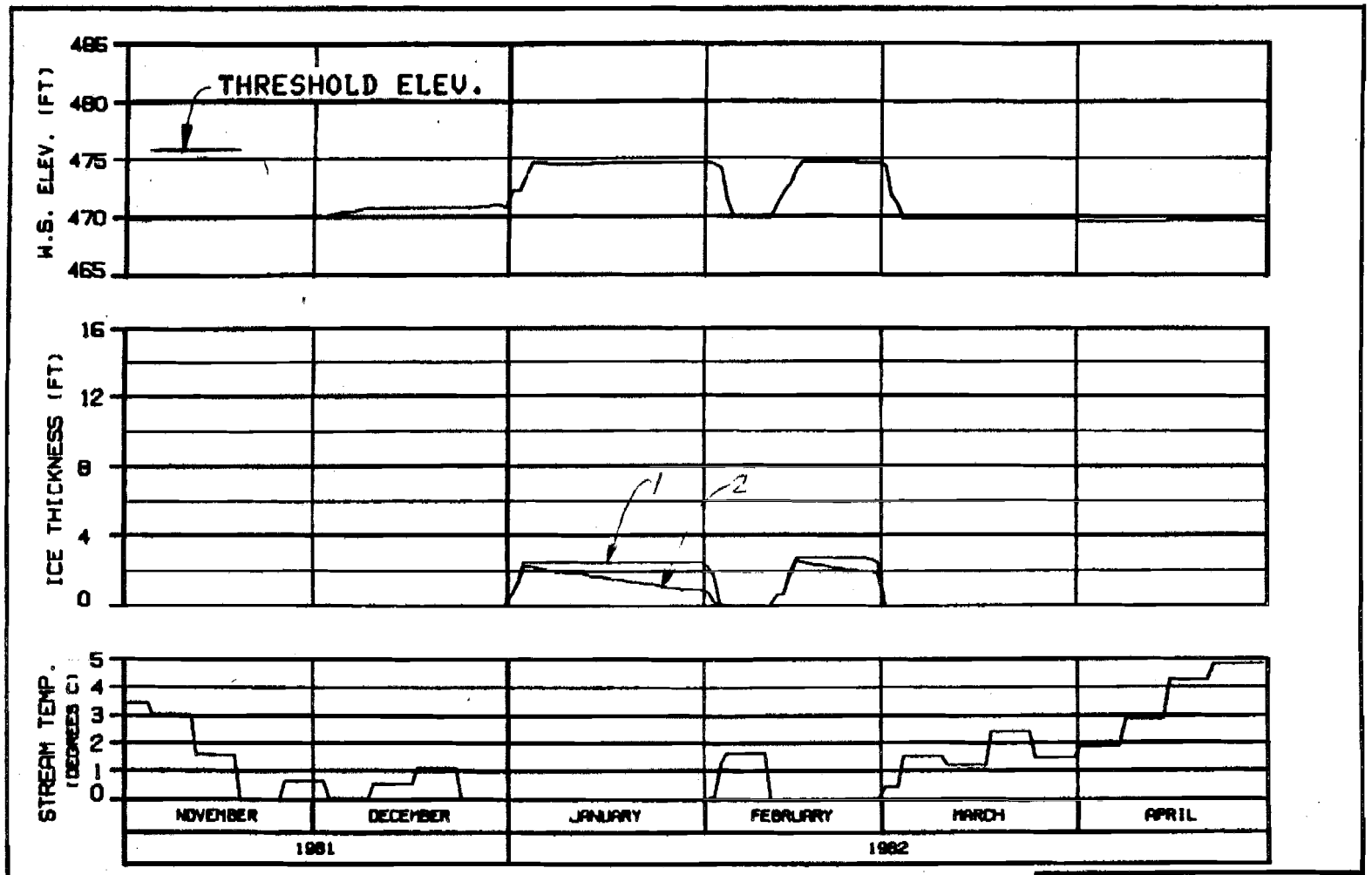

HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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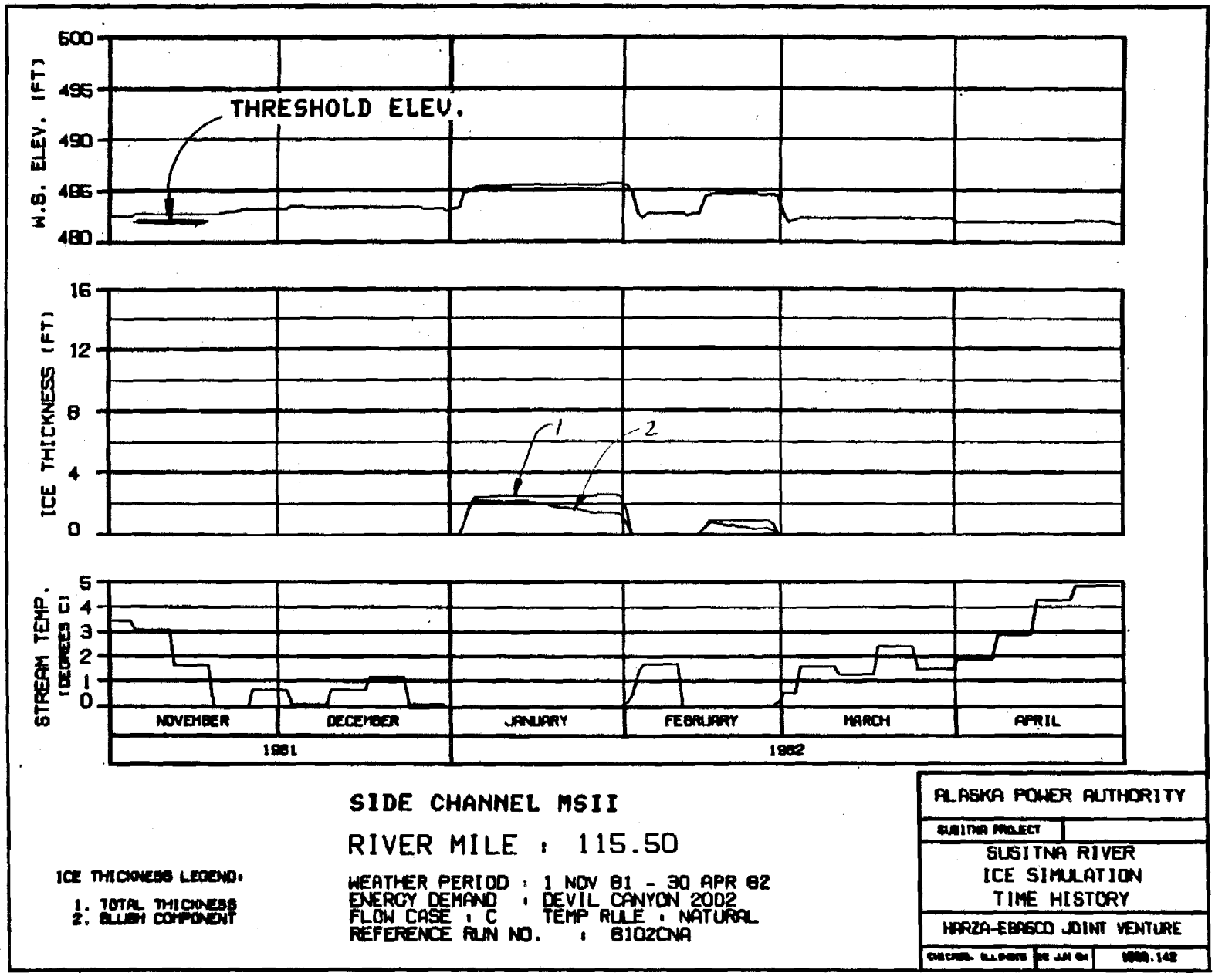

SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

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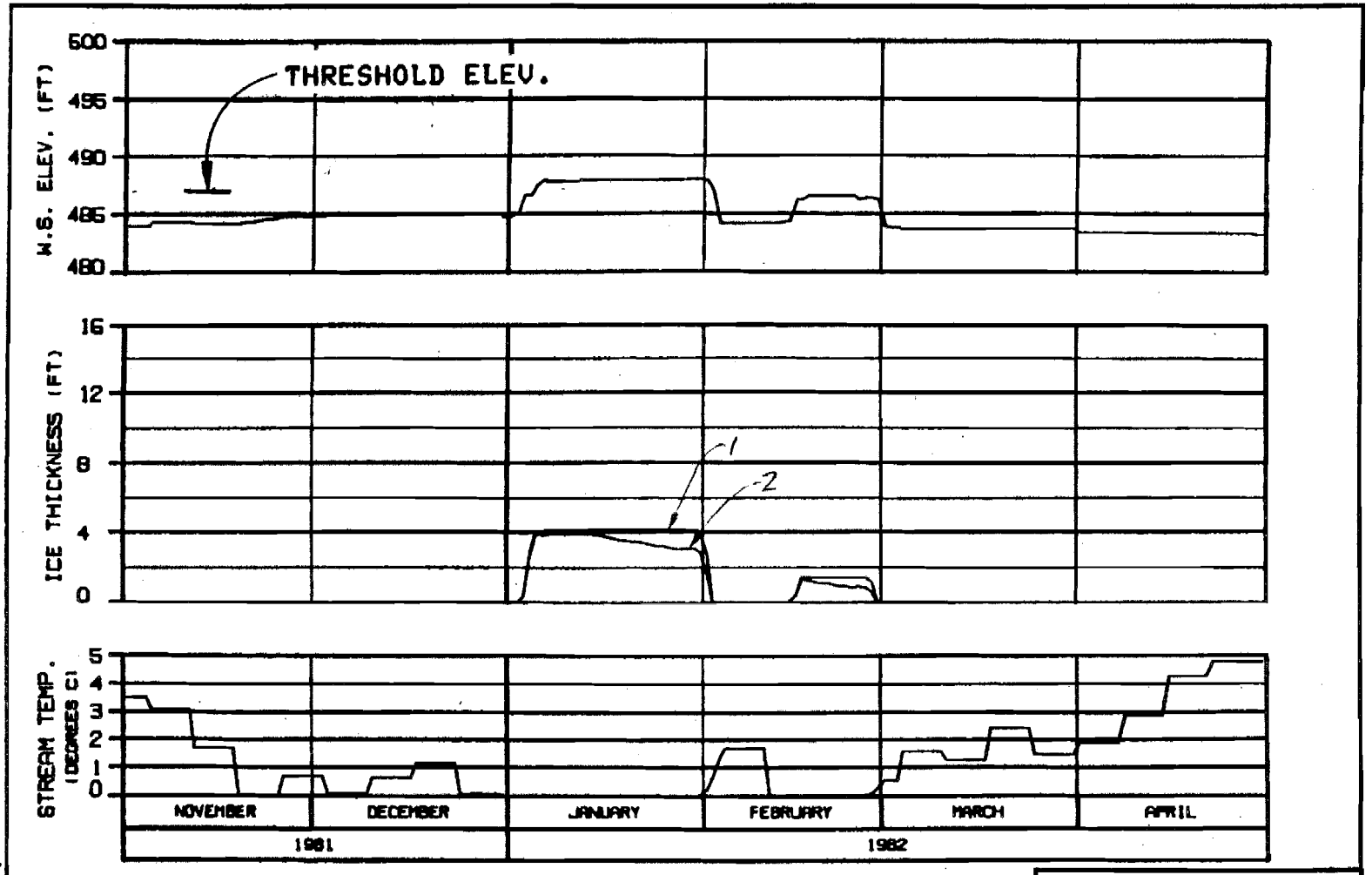

HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

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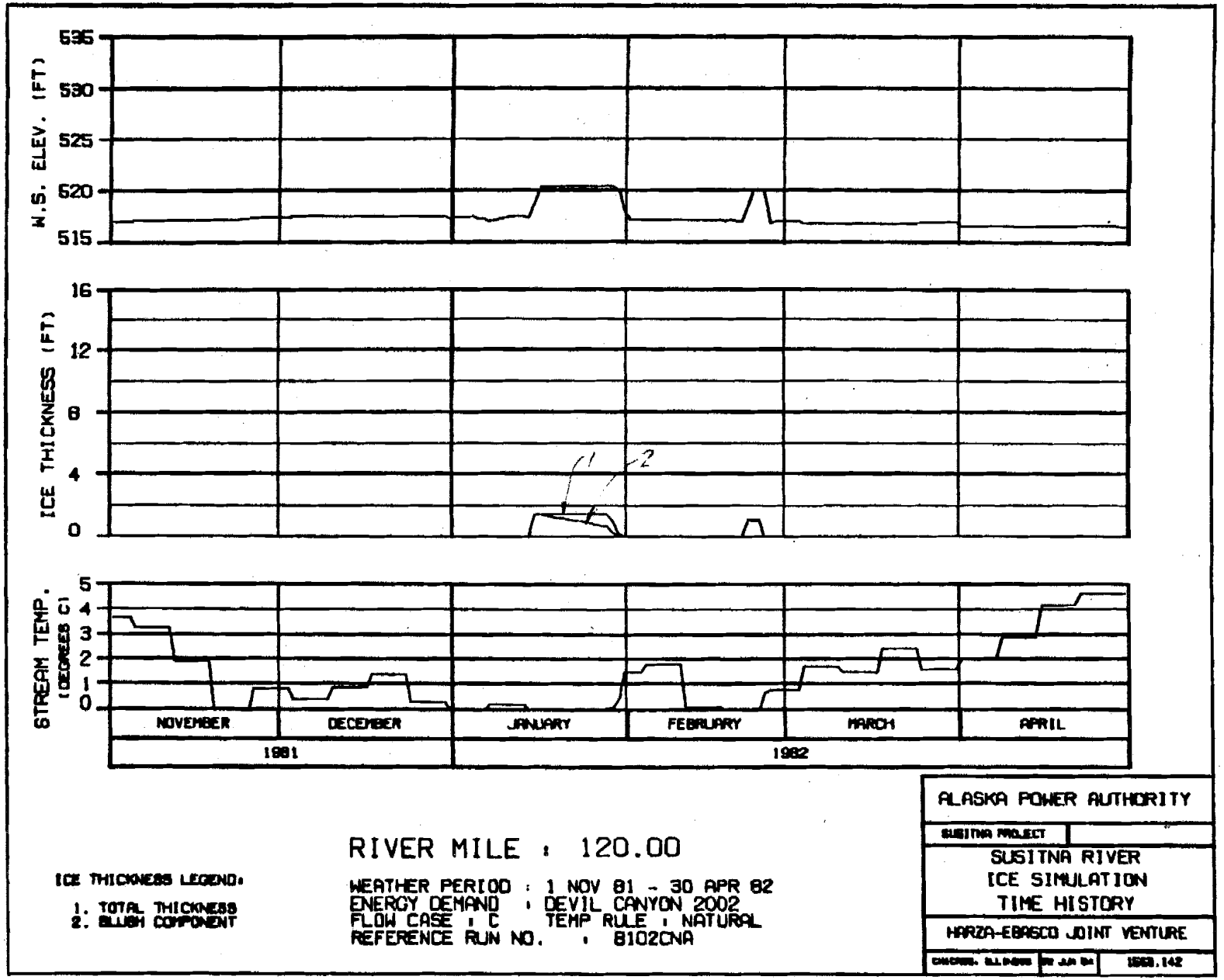


RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

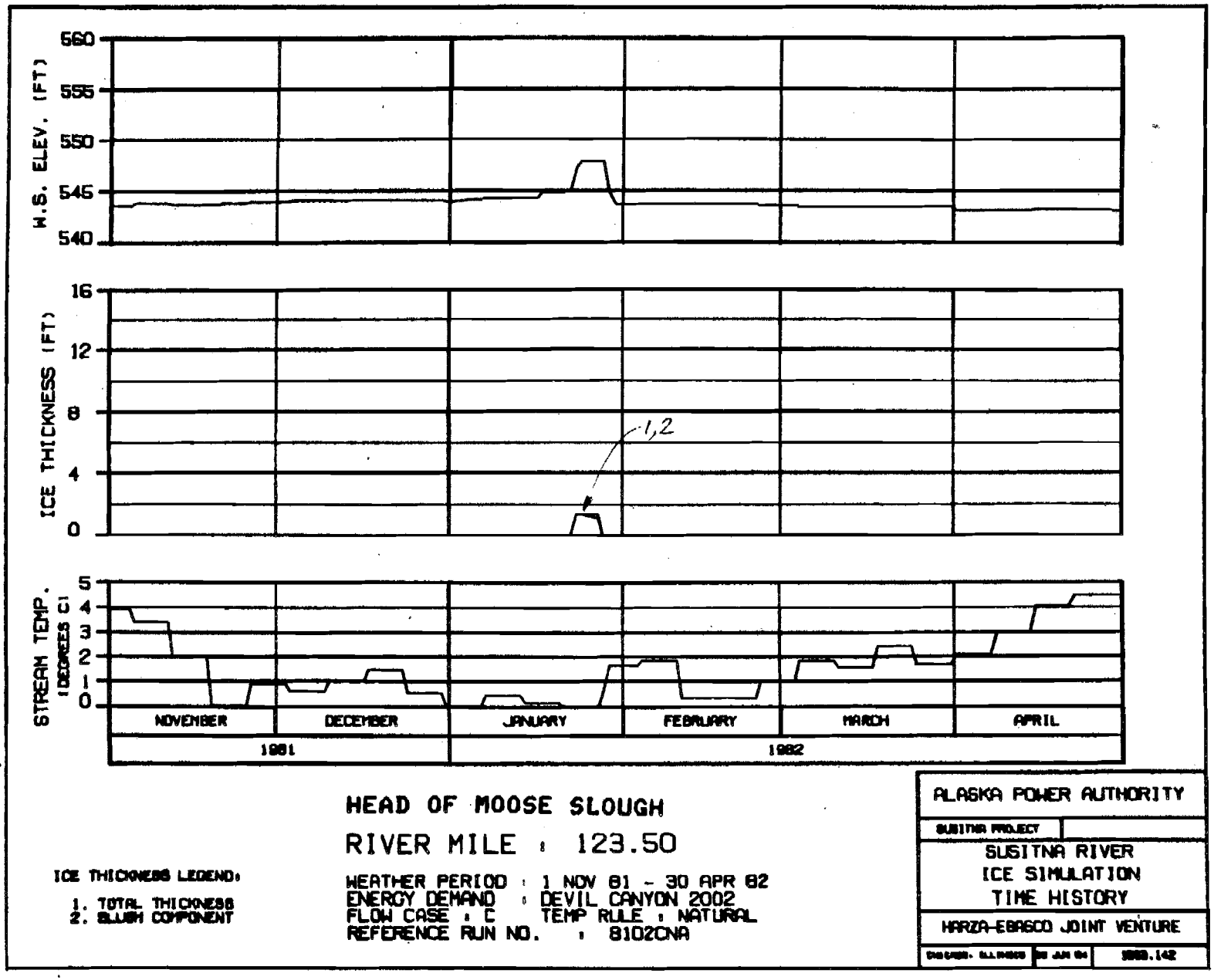
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | JAN 84 | 1868.142



HEAD OF MOOSE SLOUGH

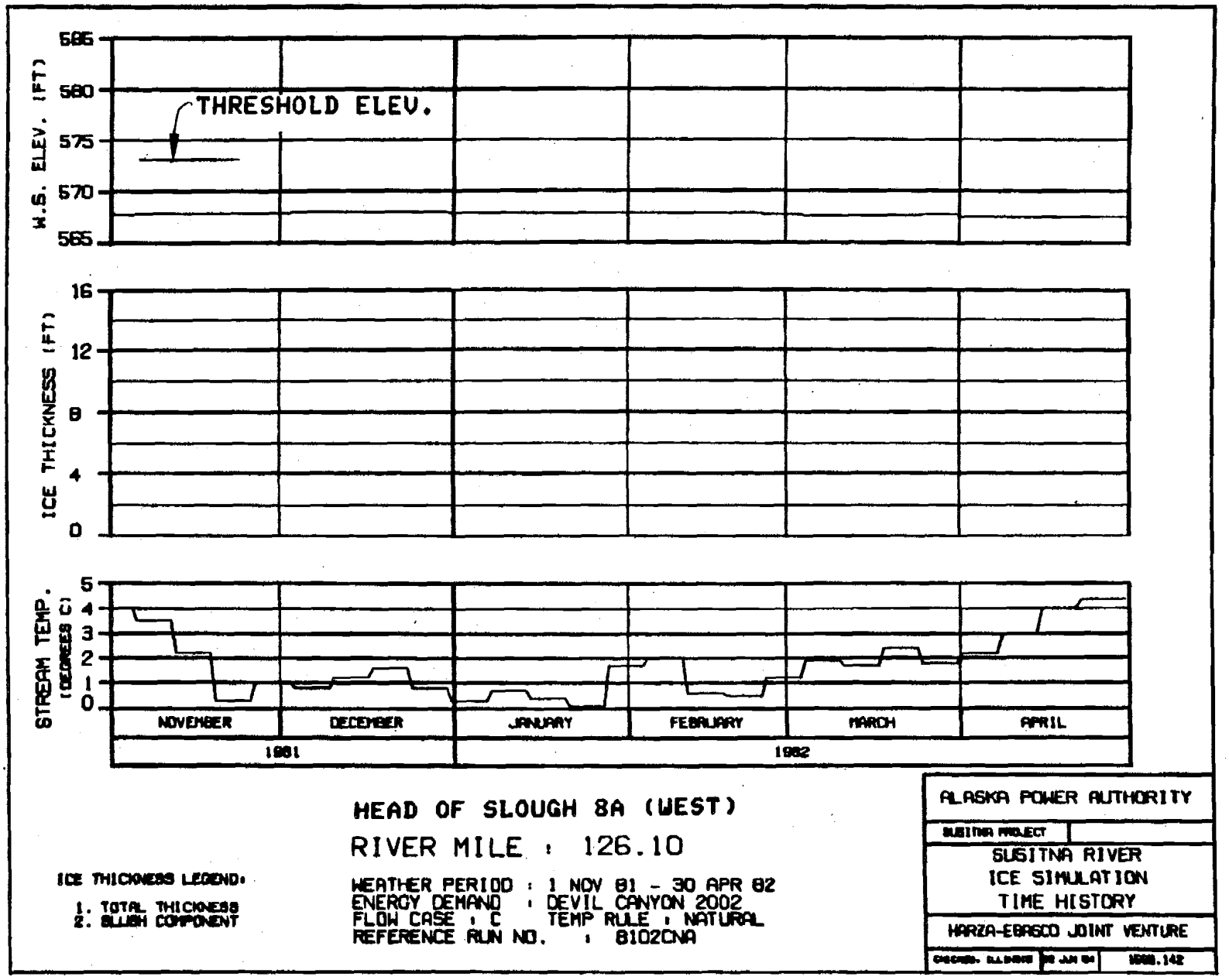
RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: G.L.H.S.S.	20 JAN 84 | 3269.142



HEAD OF SLOUGH 8A (WEST)

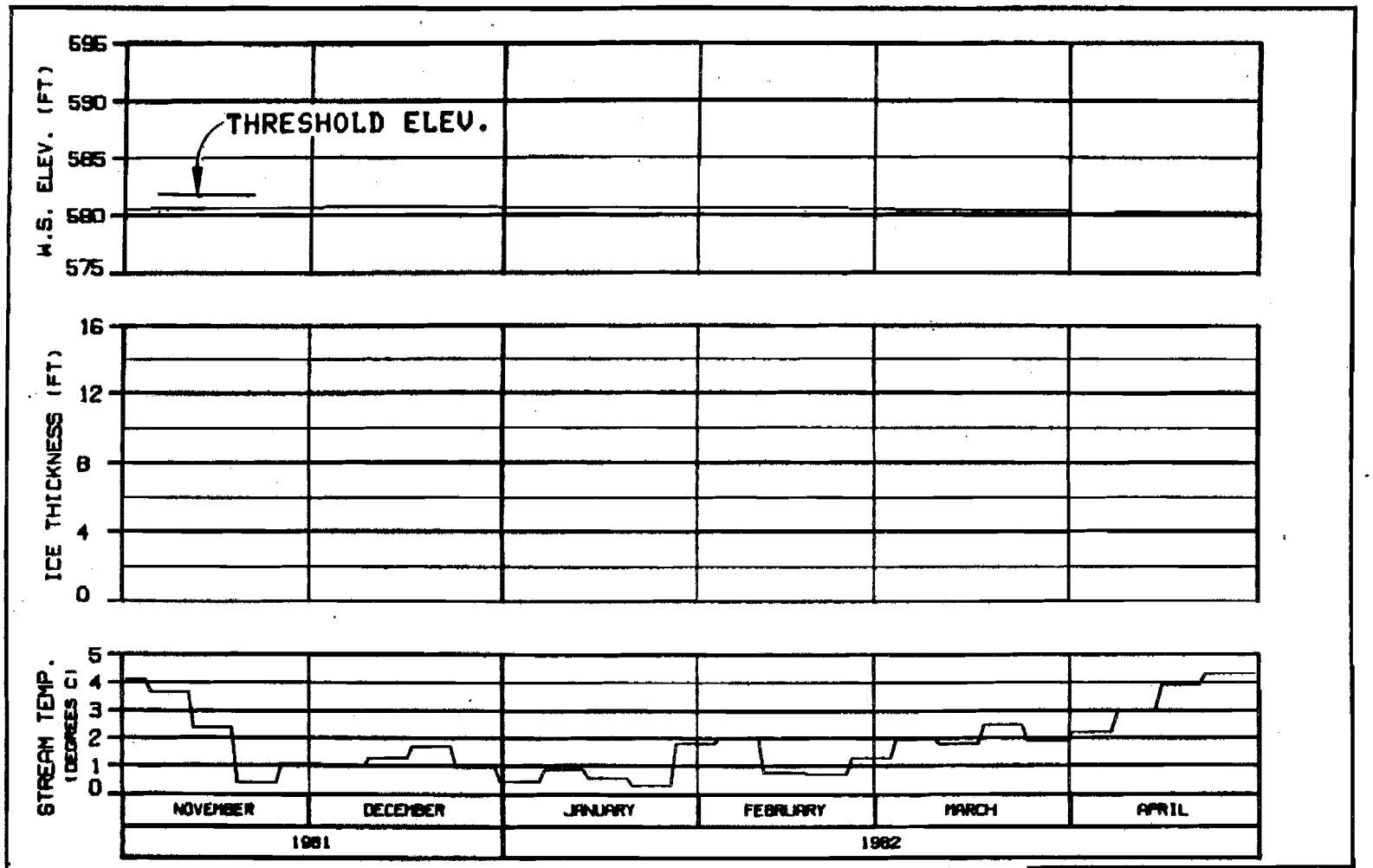
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: R.L.BANUS 18 JAN 84 1588.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: R.L.BASCO	22 JAN 84	1868.142

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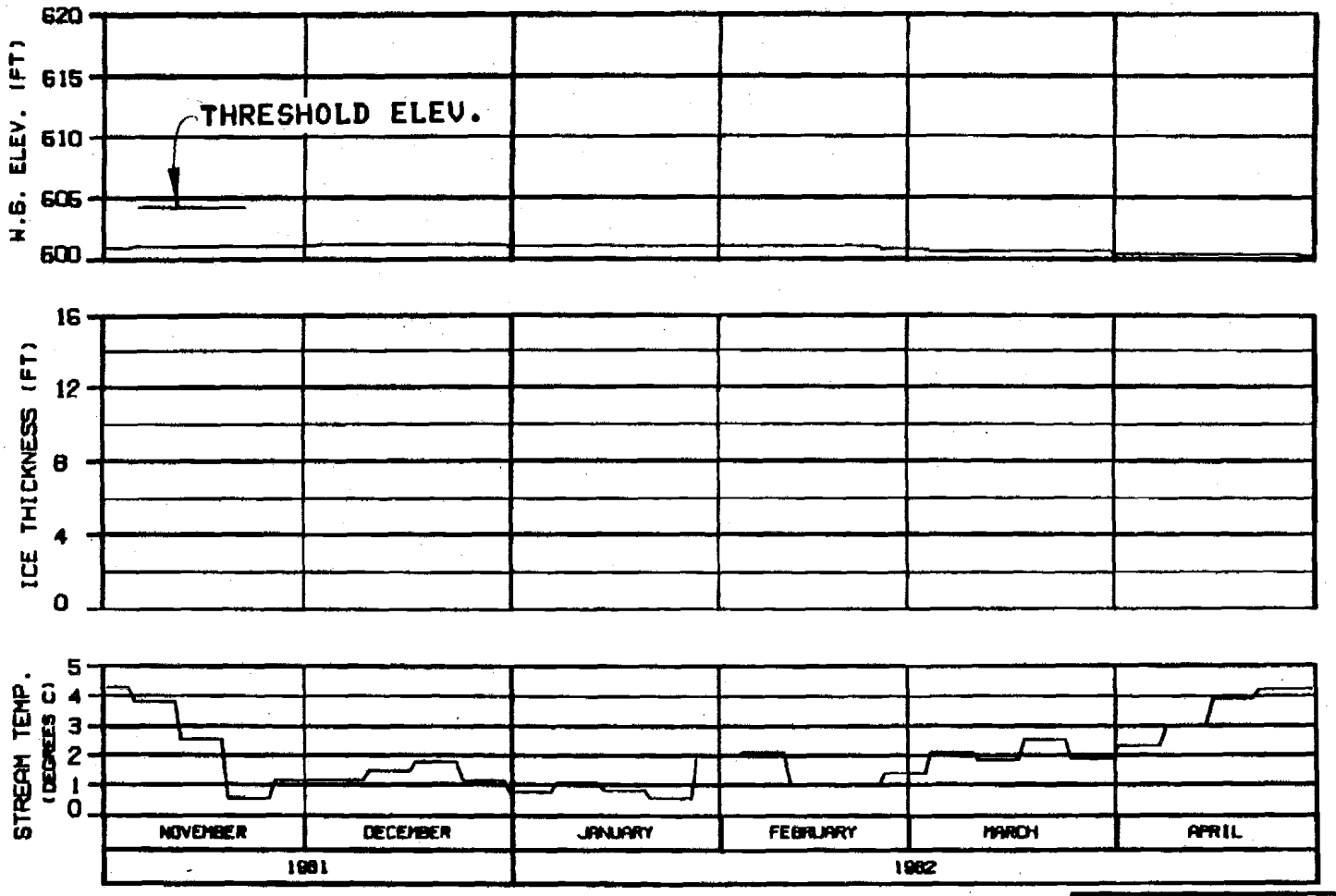
STOP



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B102CNA

ALASKA POWER AUTHORITY

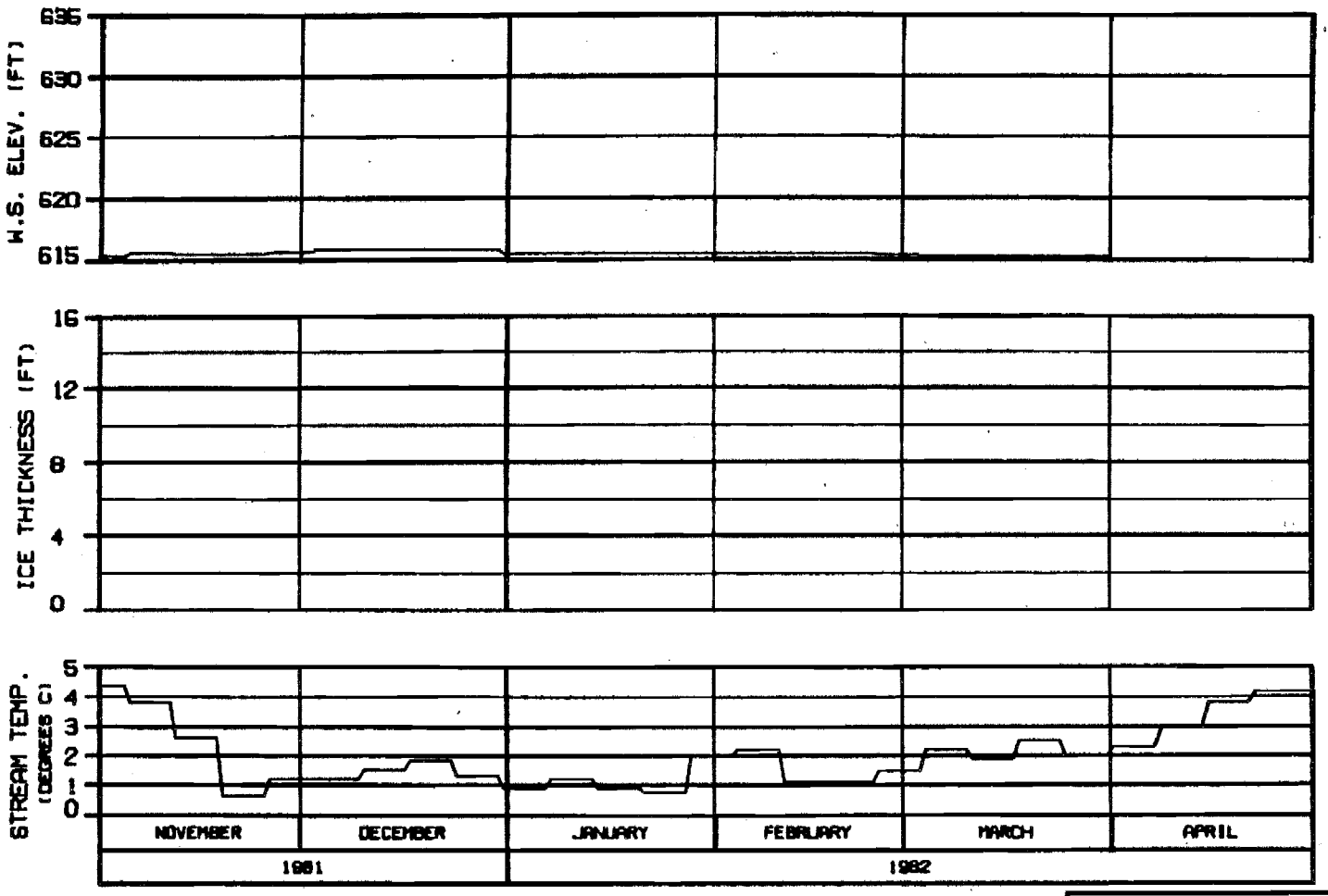
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

OPTION?

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

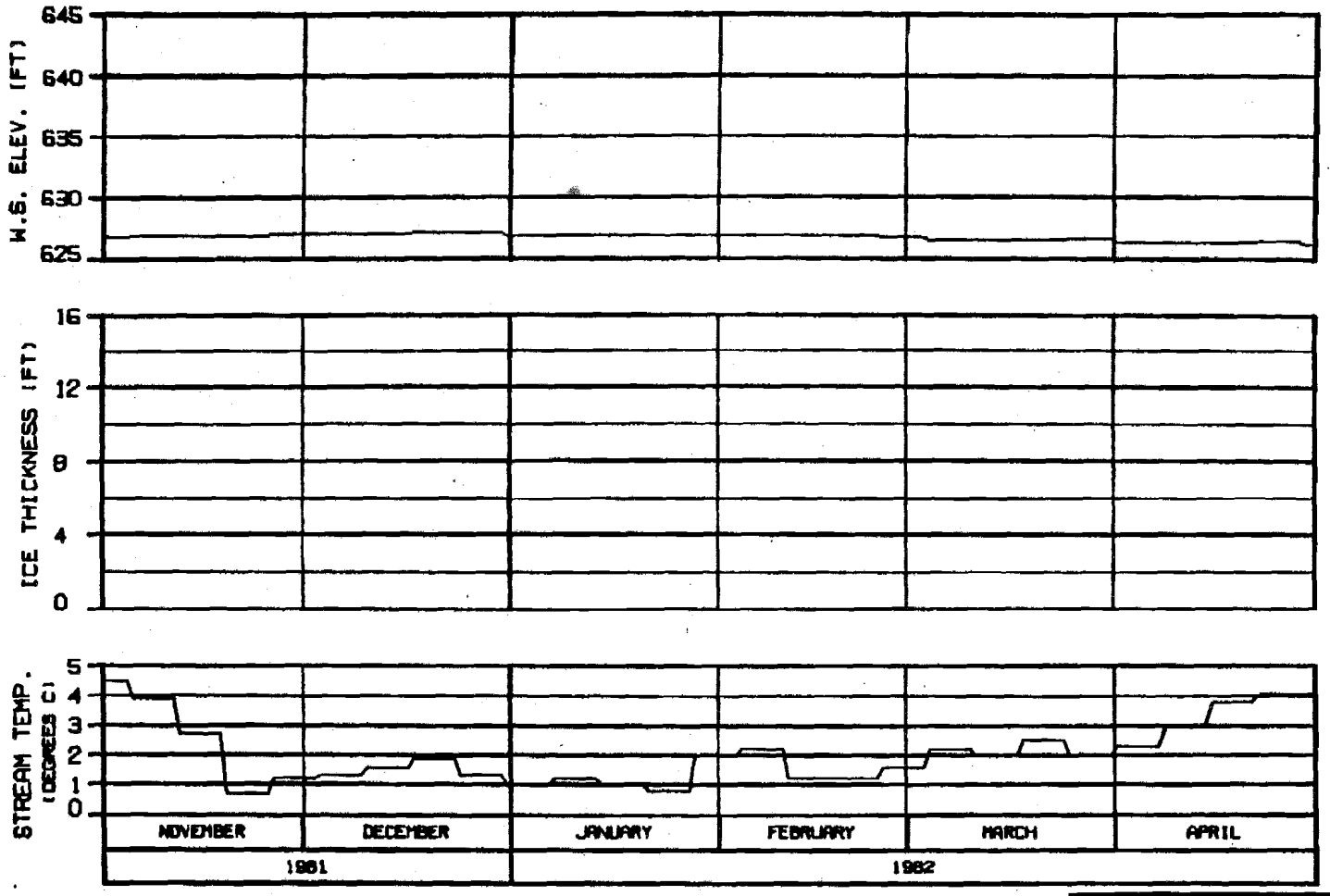
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: R.L.PARR | 12 JAN 84 | 8809.142



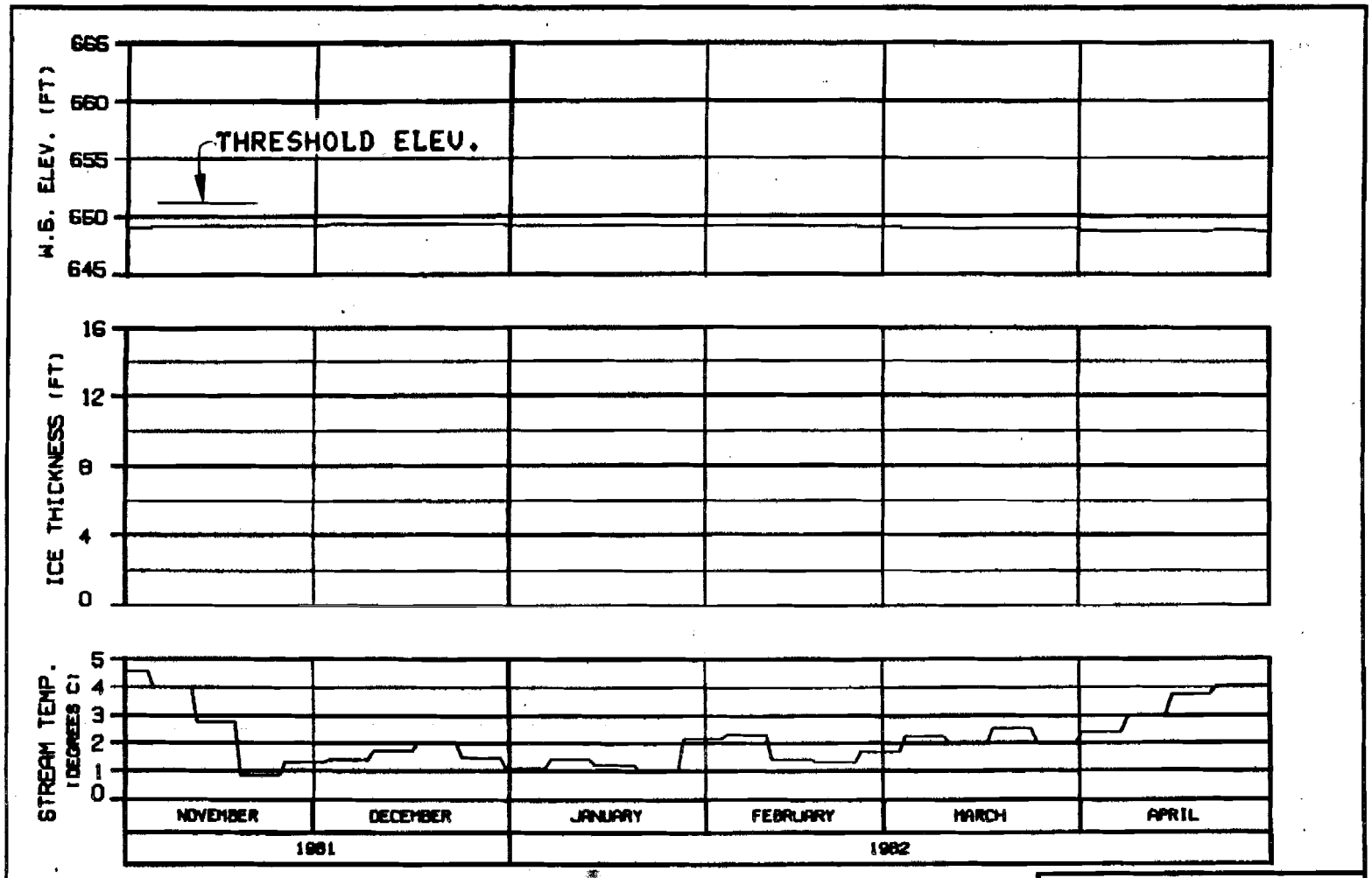
SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1988.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

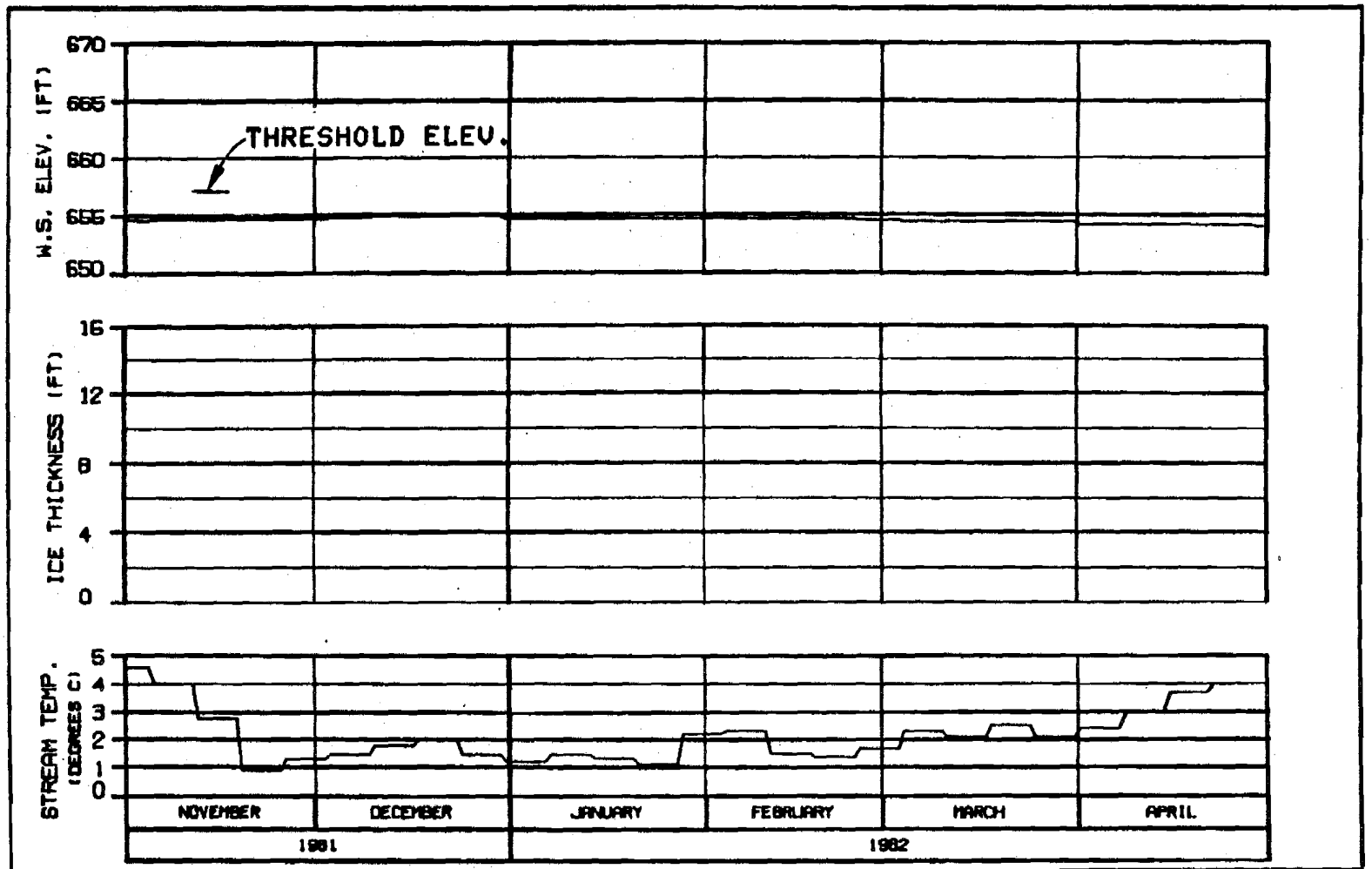
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 28 JAN 84 | 1868.142



SIDE CHANNEL U/S OF SLOUGH 10

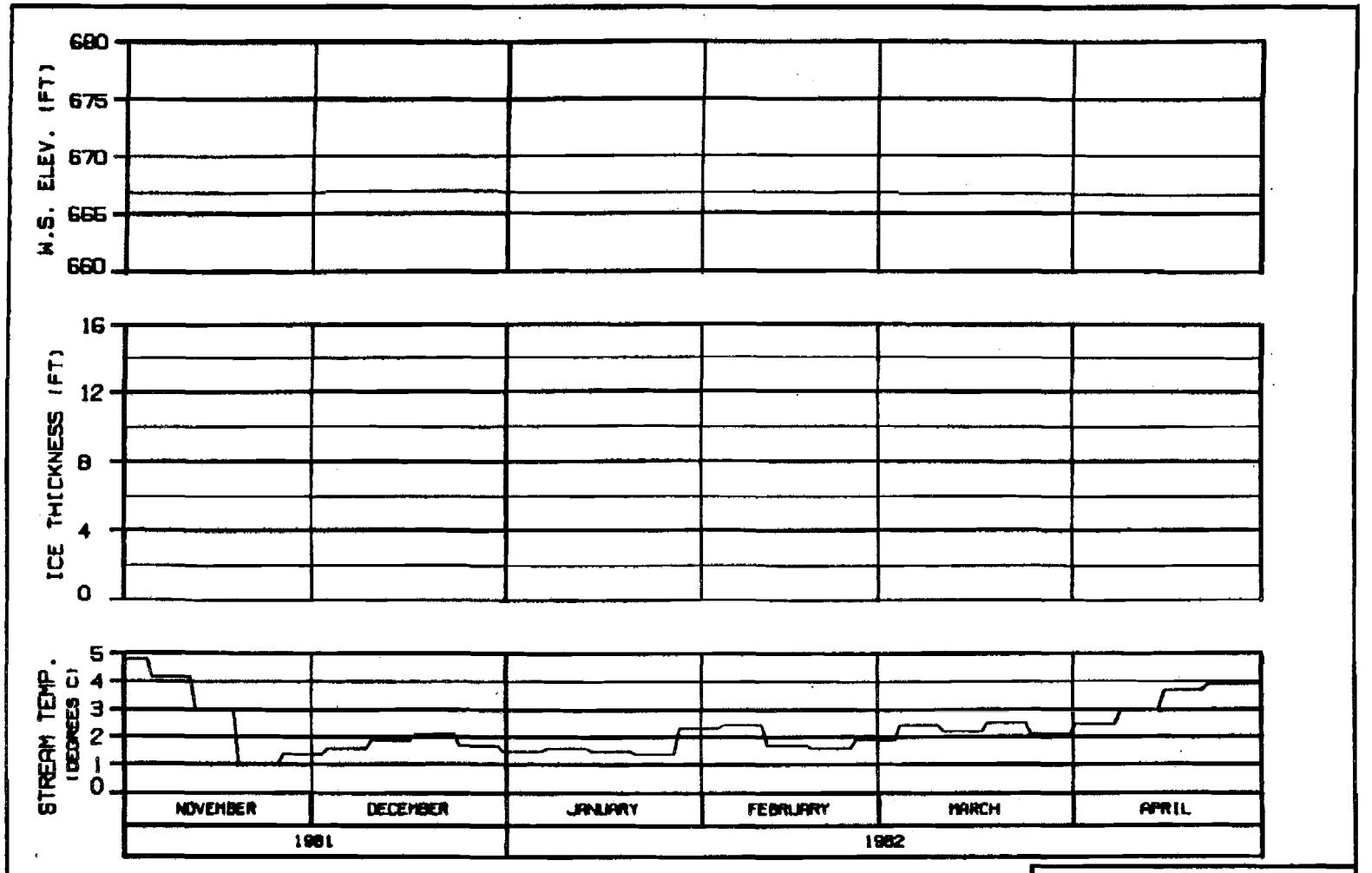
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1988.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

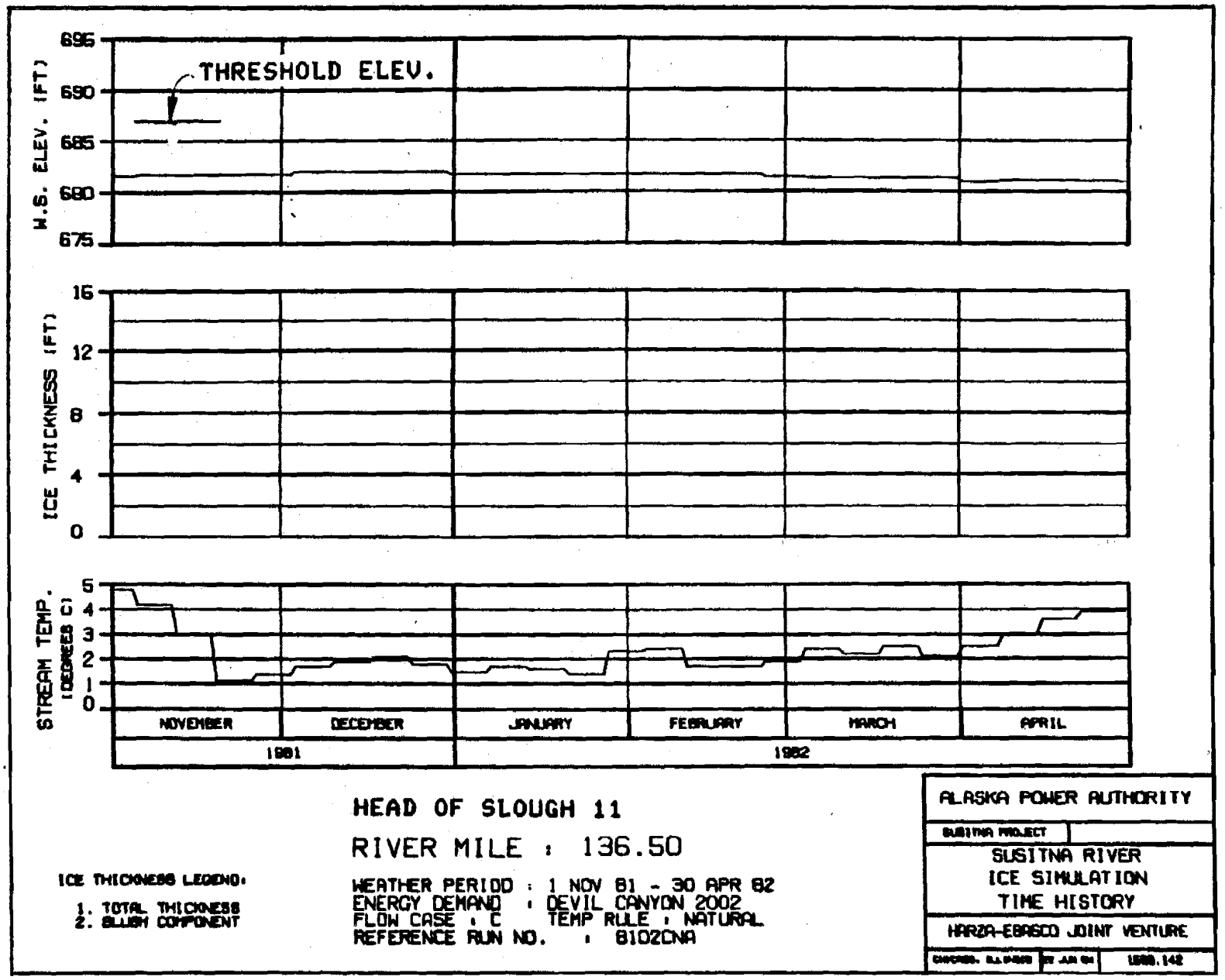
ALASKA POWER AUTHORITY

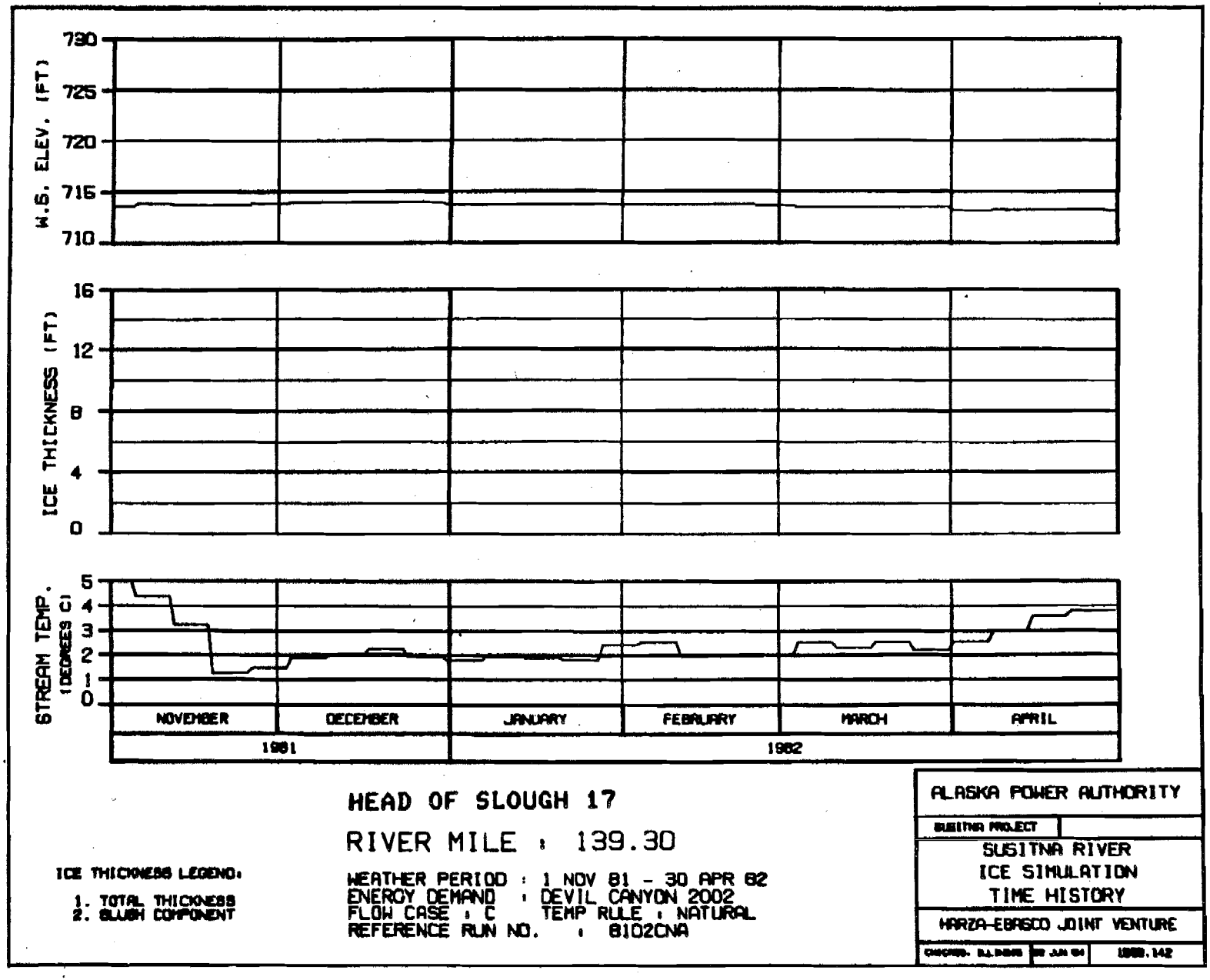
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 29 JAN 84 1888.142


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
1981
1982
HEAD OF SLOUGH 11
RIVER MILE : 136.50
ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1588.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

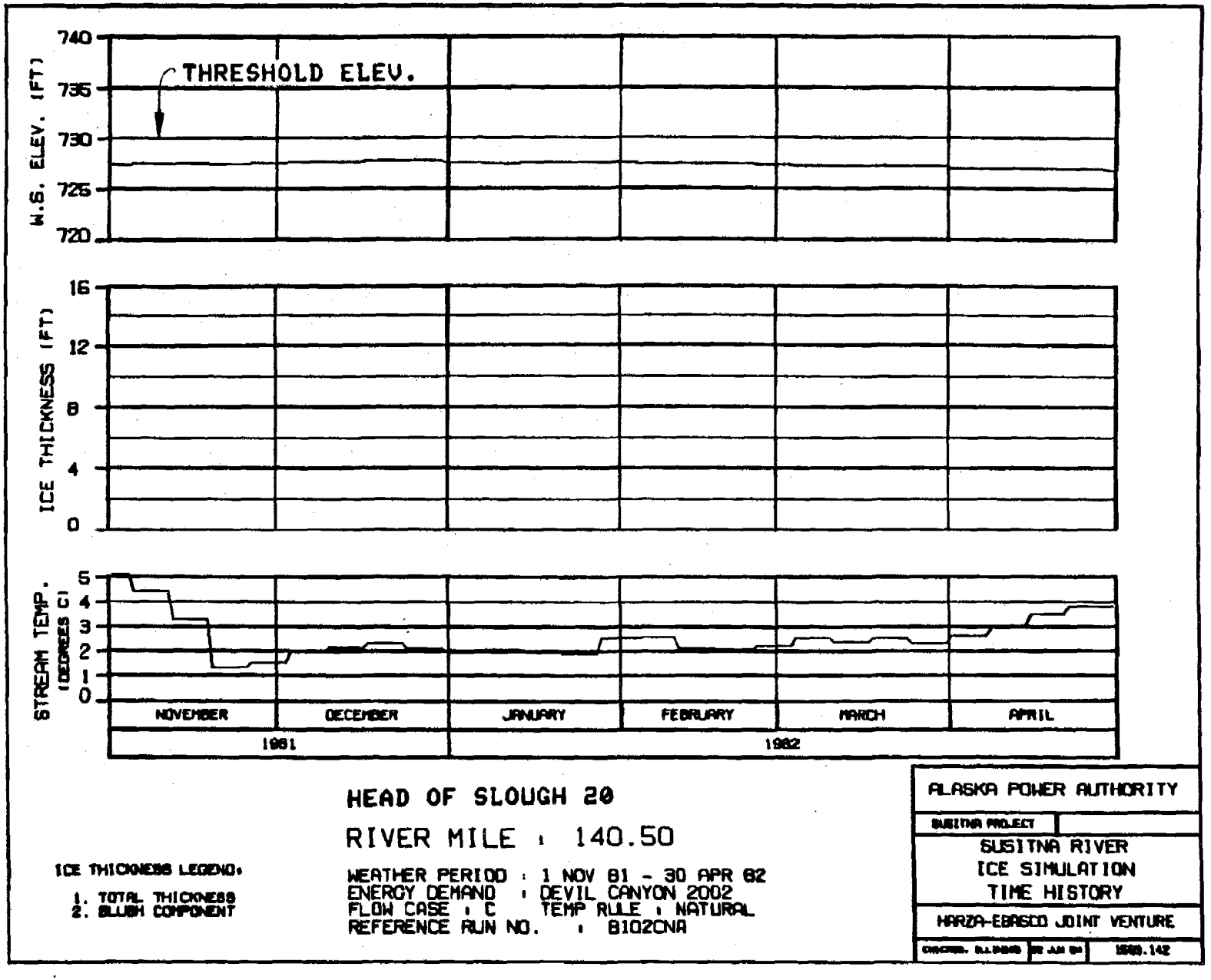
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: B.J.DEER | 29 JAN 84 | 1988.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B102CNA

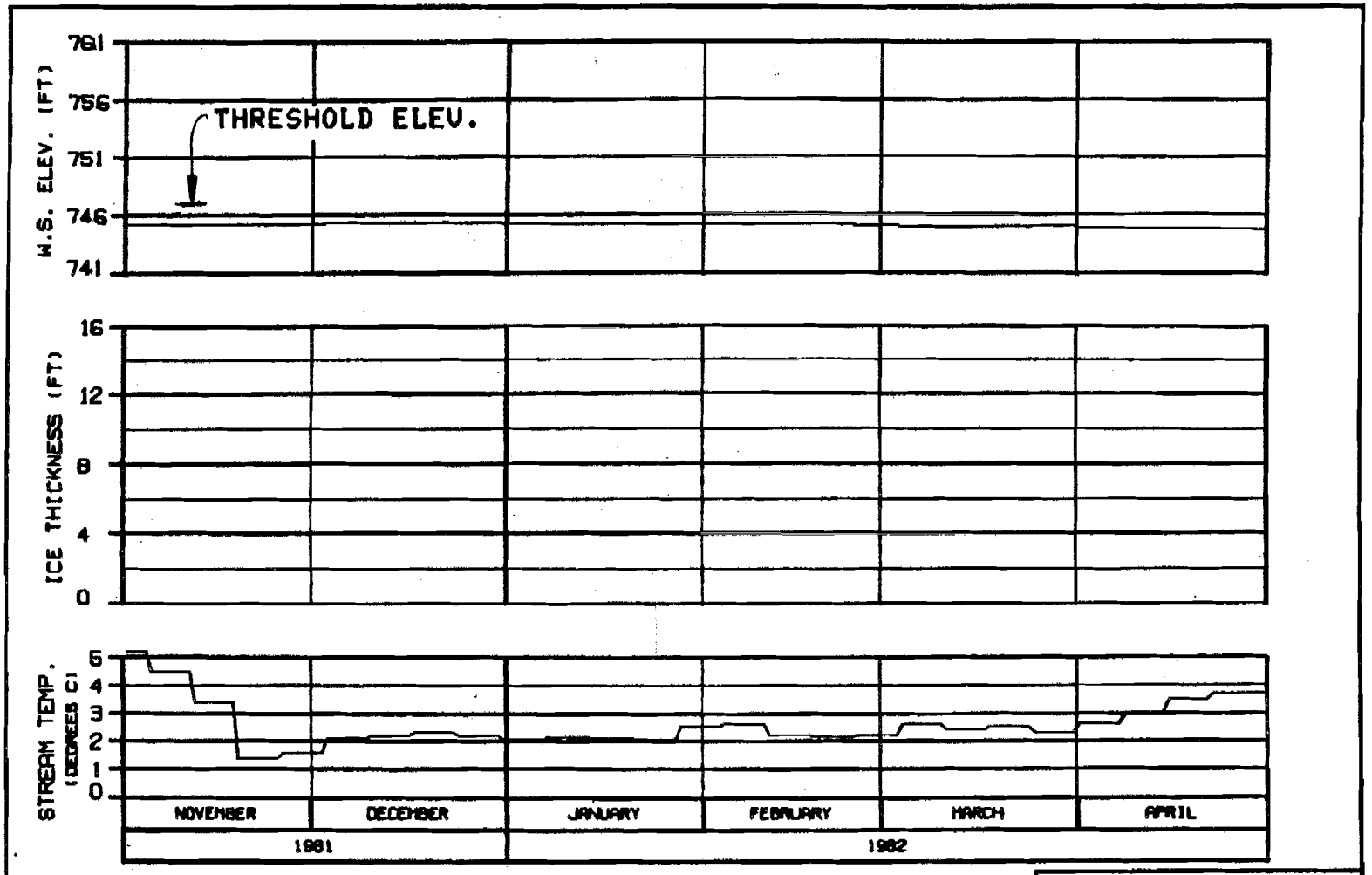
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



SLOUGH 21 (ENTRANCE A6)

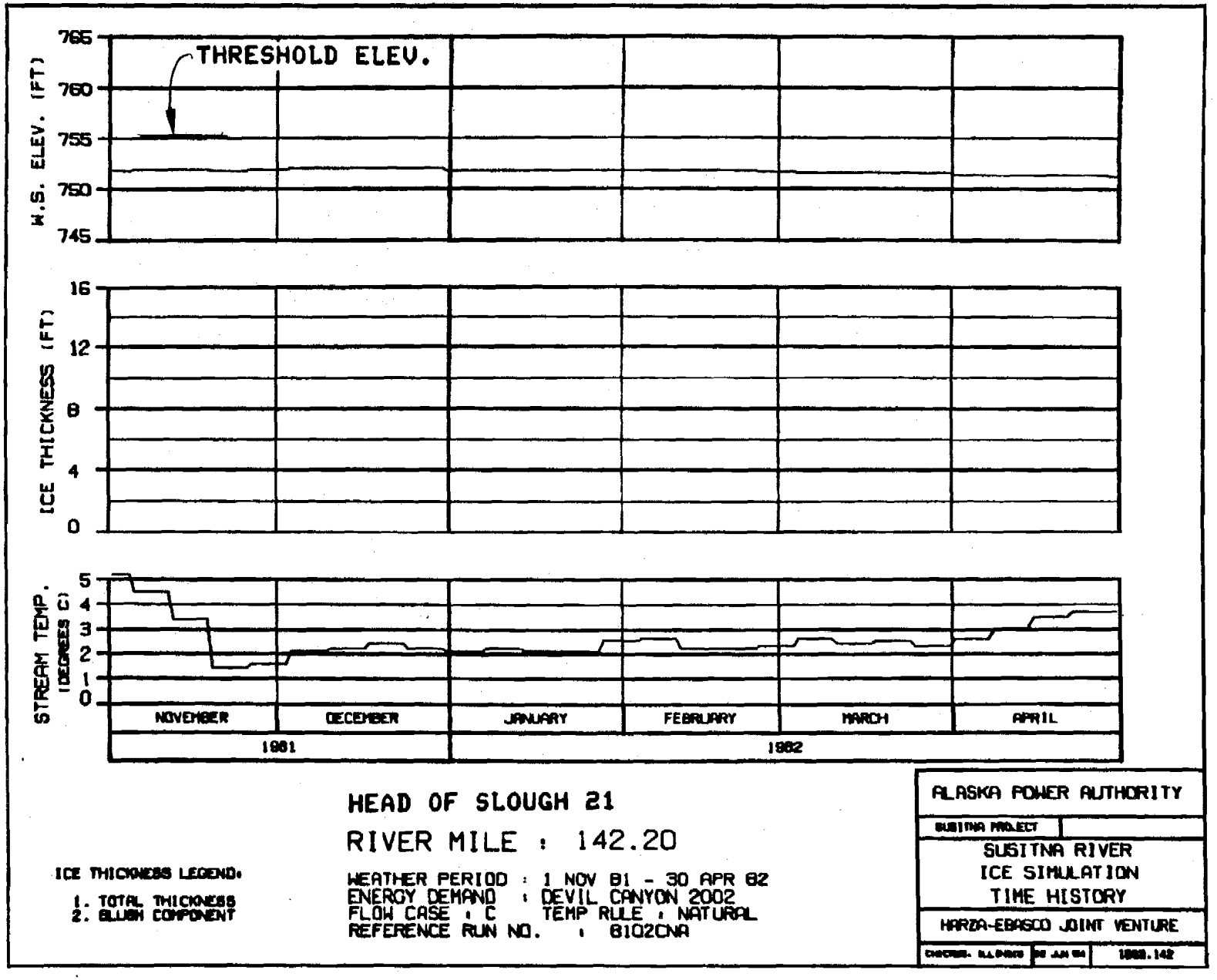
RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: R.A.DAVIS 20 JAN 84 — 1868.142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

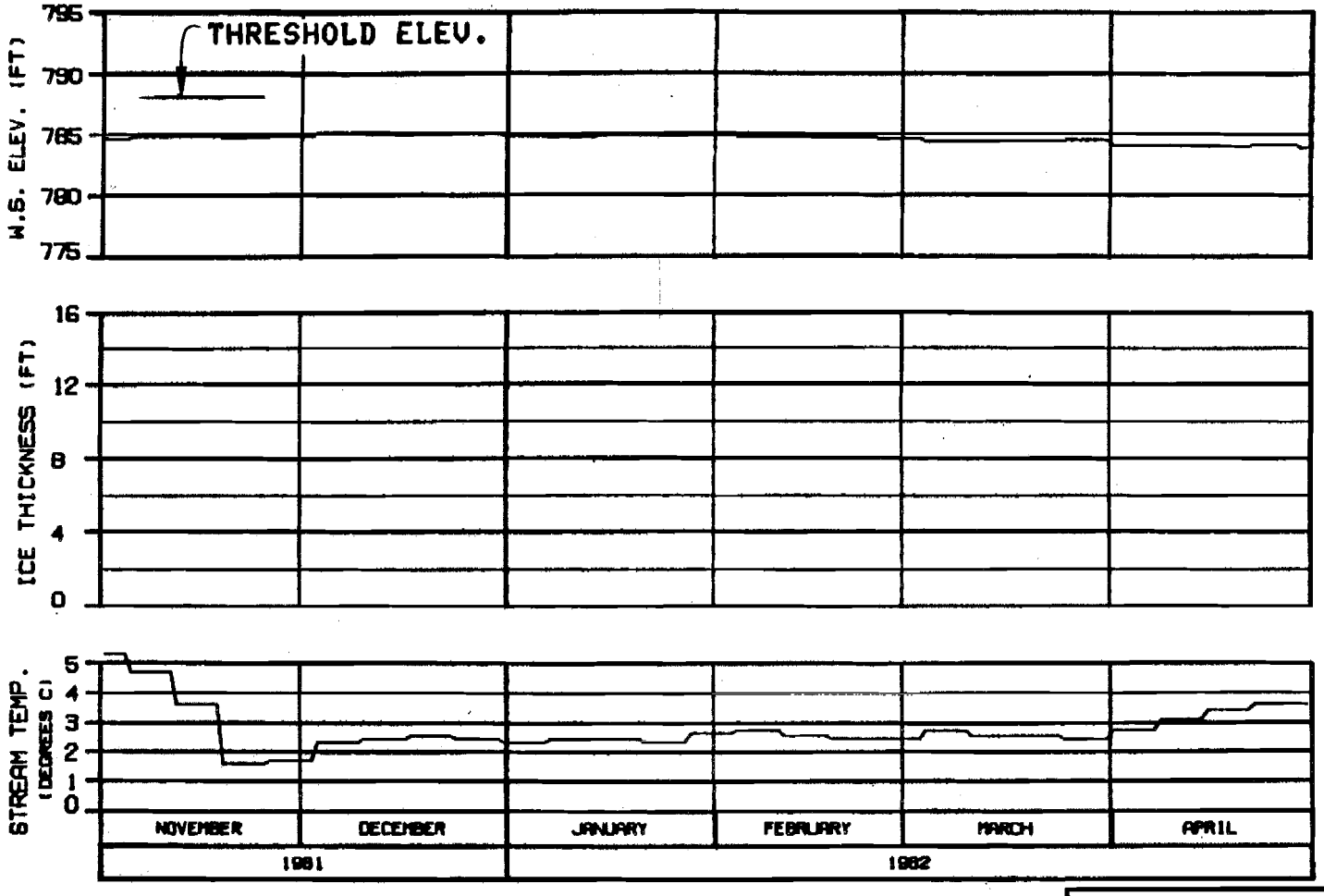
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: R.L.D'ALTO	DATE: JAN 84
	1868.142

C



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8102CNA

OPTION?

ALASKA POWER AUTHORITY

SUSITNA PROJECT

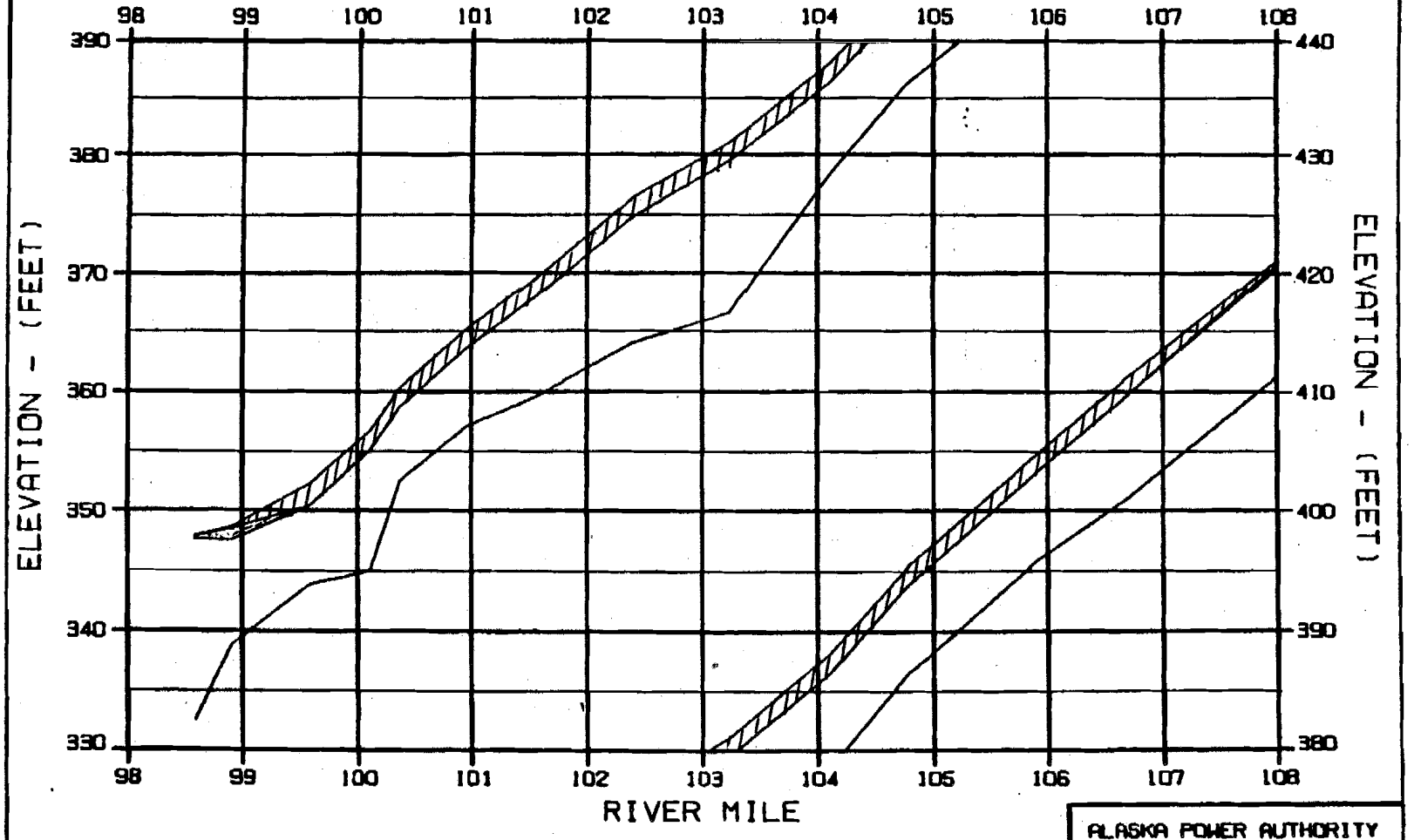
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1988.142

EXHIBIT Q

C



LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

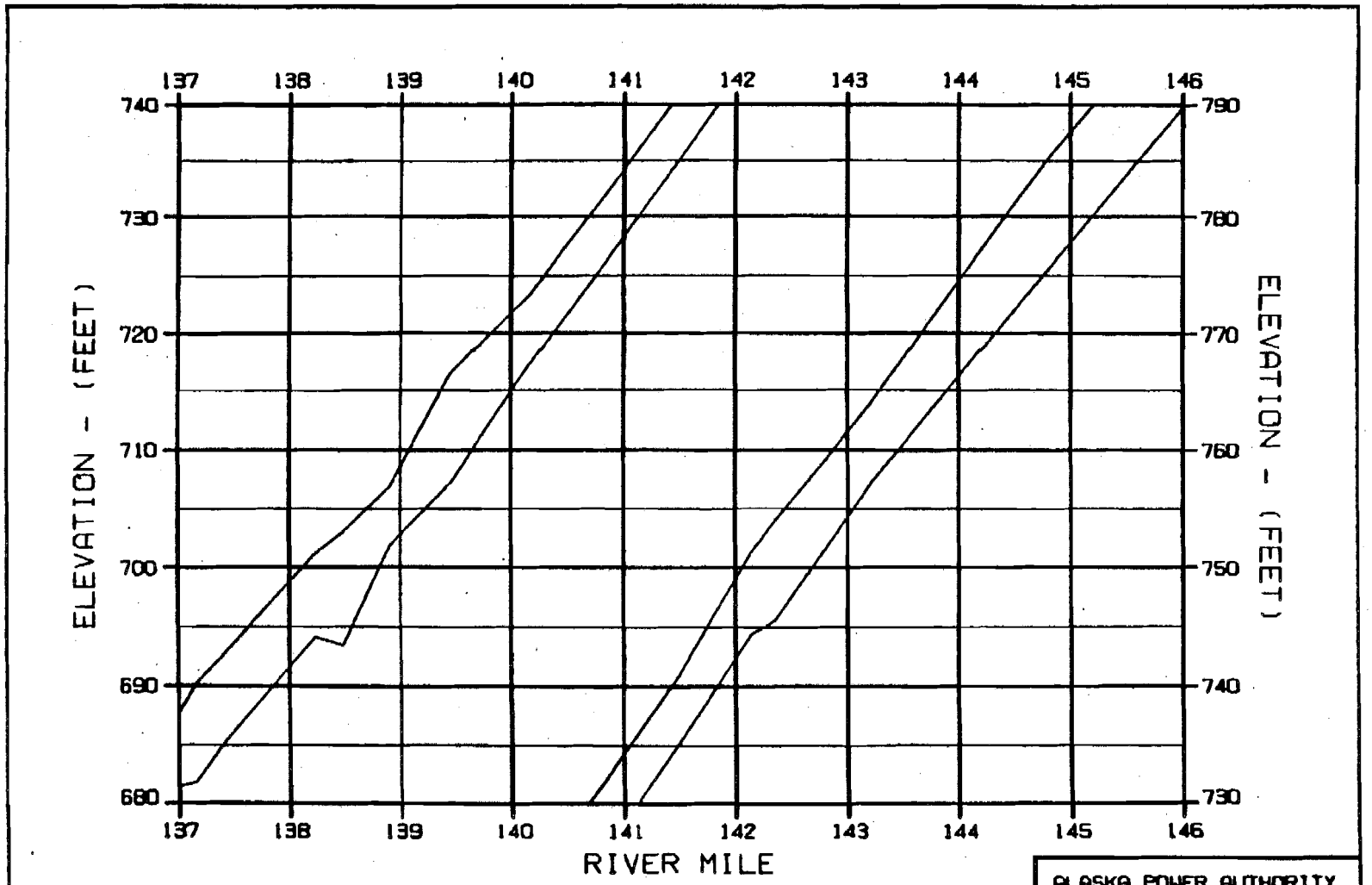
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

OPTION2



LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY

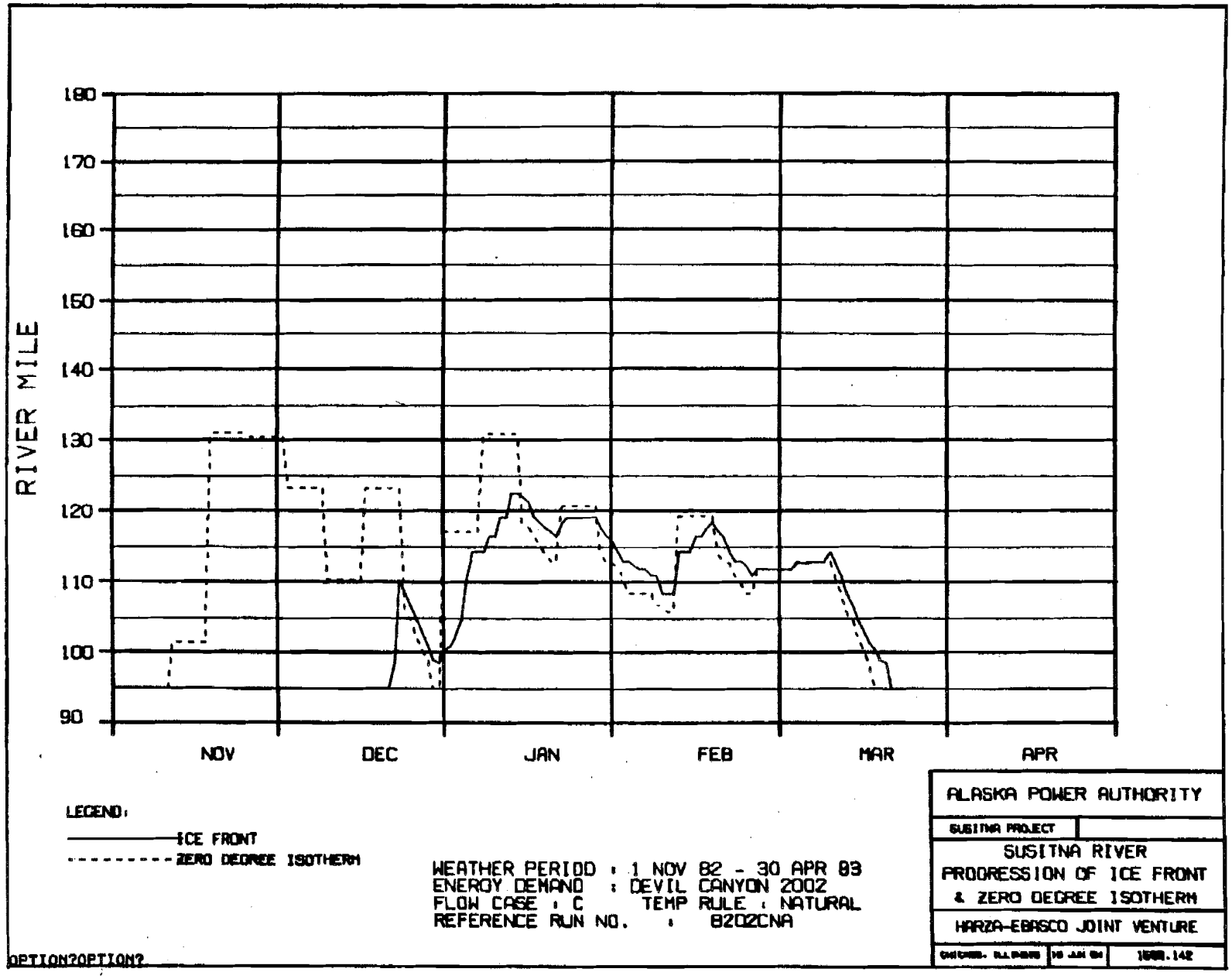
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

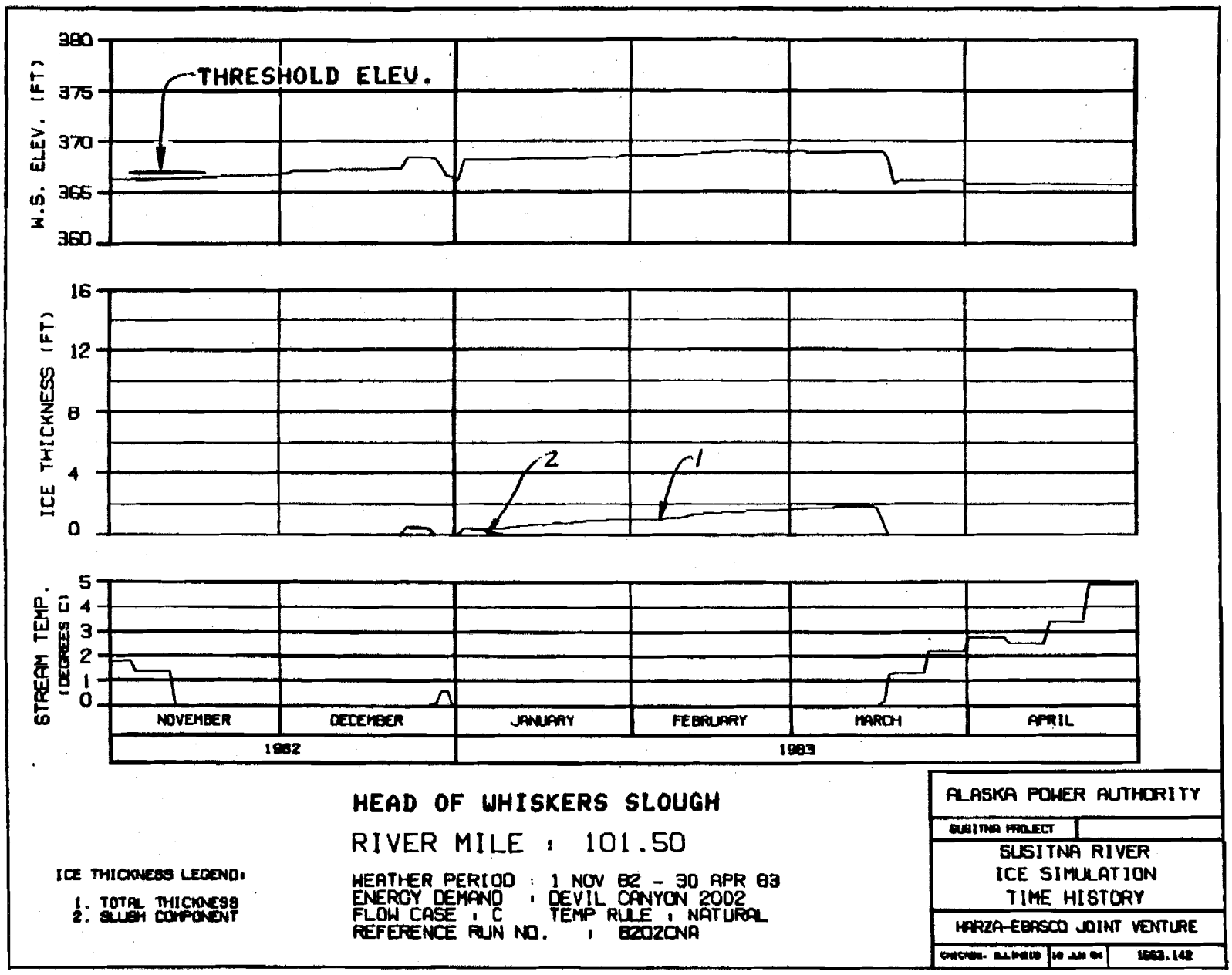
HARZA-EBASCO JOINT VENTURE

OPTION?

C



OPTION?OPTION?



HEAD OF WHISKERS SLOUGH

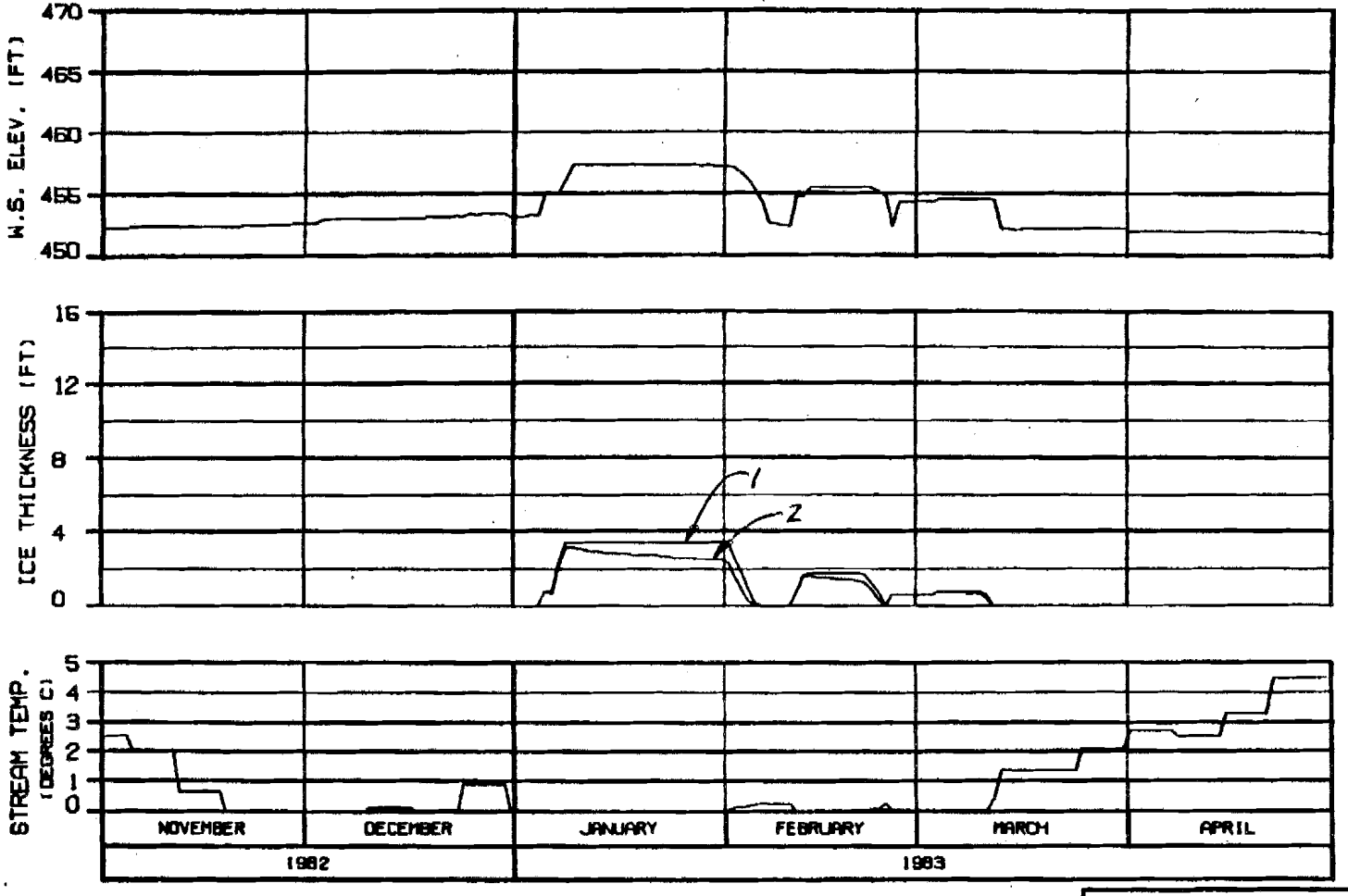
RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS | 10 JAN 84 | 1563.142



SIDE CHANNEL AT HEAD OF GASH CREEK

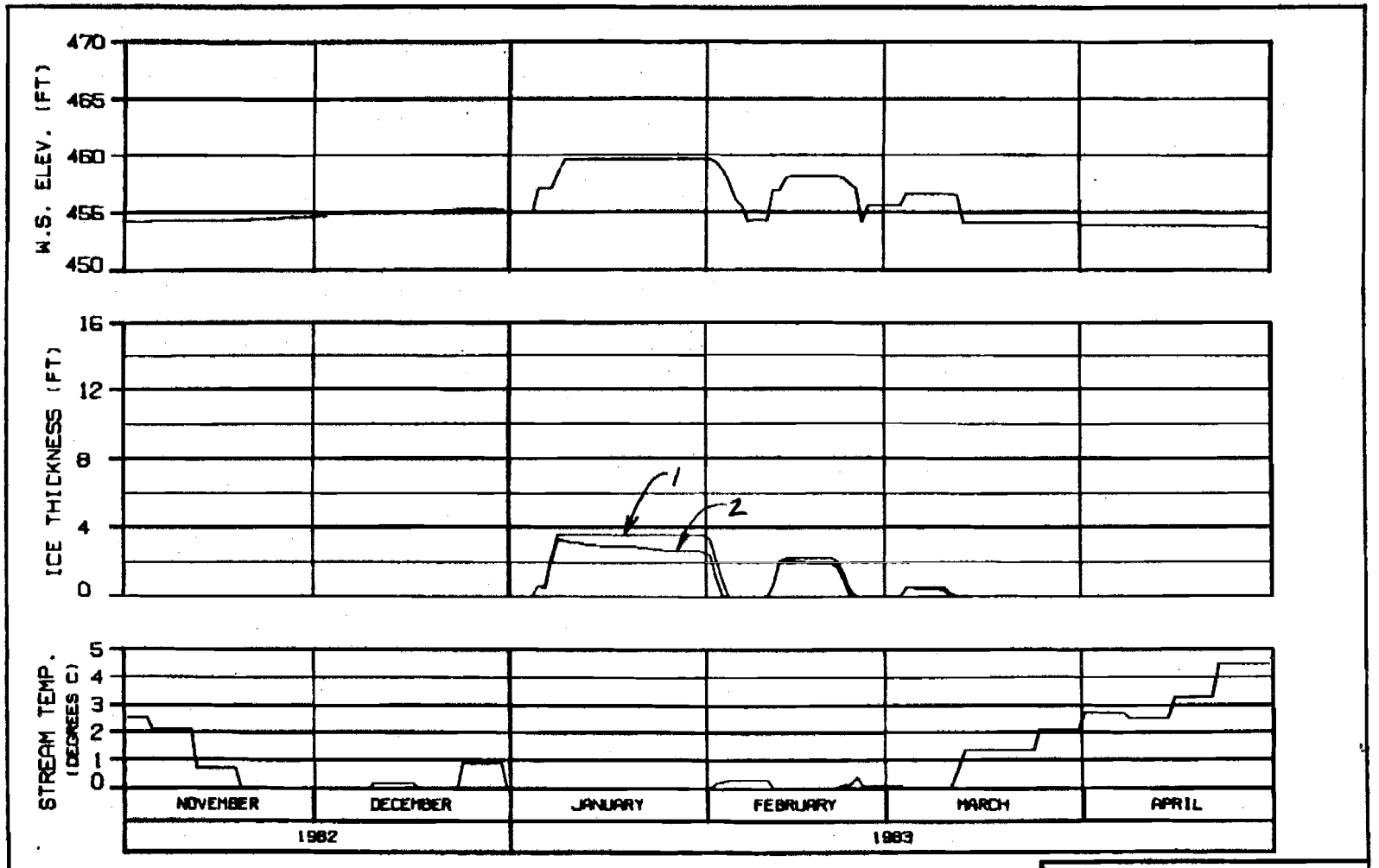
RIVER MILE : 112.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: [illegible]	30 JAN 84	1688.142



MOUTH OF SLOUGH 6A

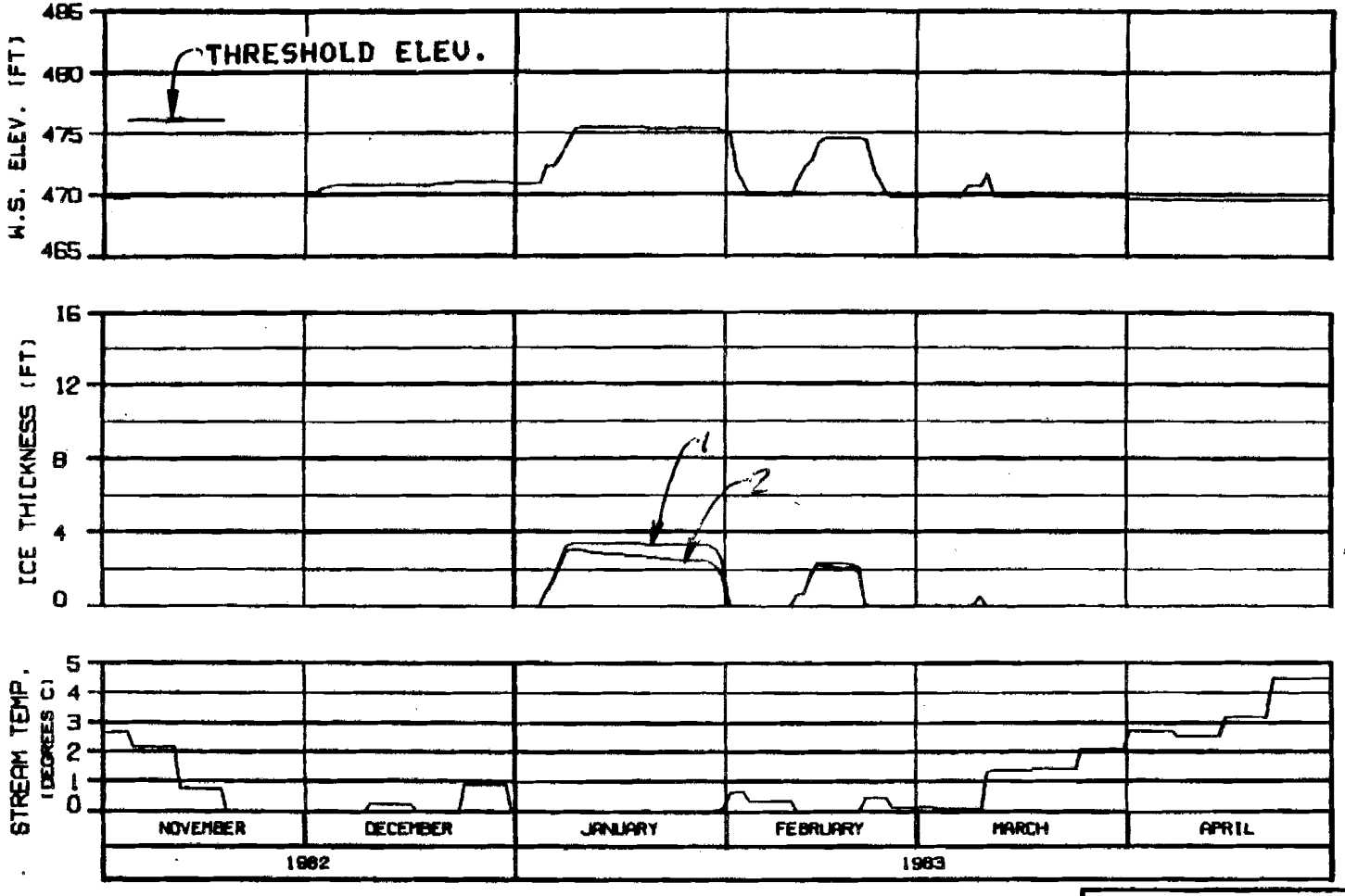
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 10 JAN 84 1988.142



HEAD OF SLOUGH 8

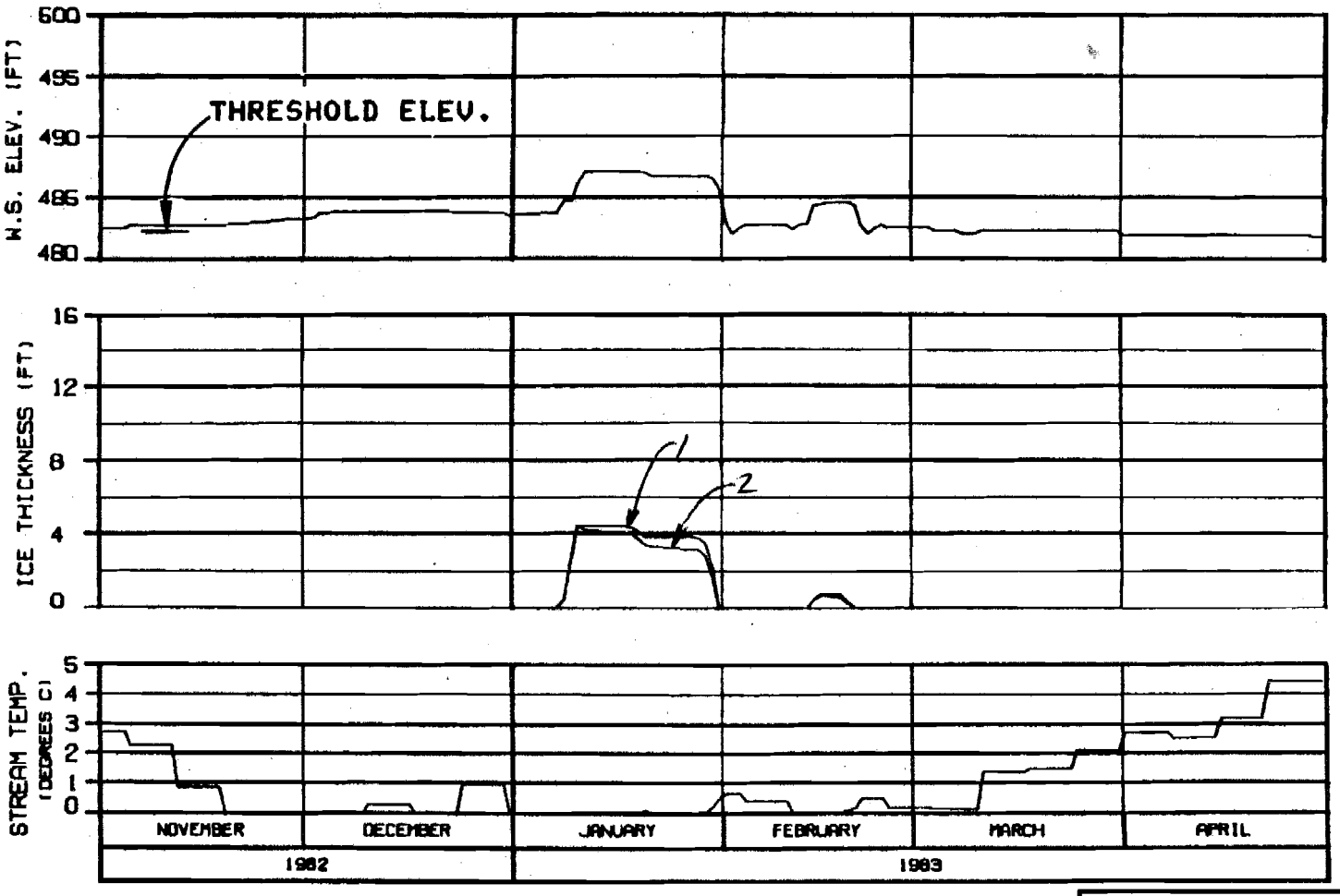
RIVER MILE : 114.10

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] 10 JAN 84 1588.142



SIDE CHANNEL MSII

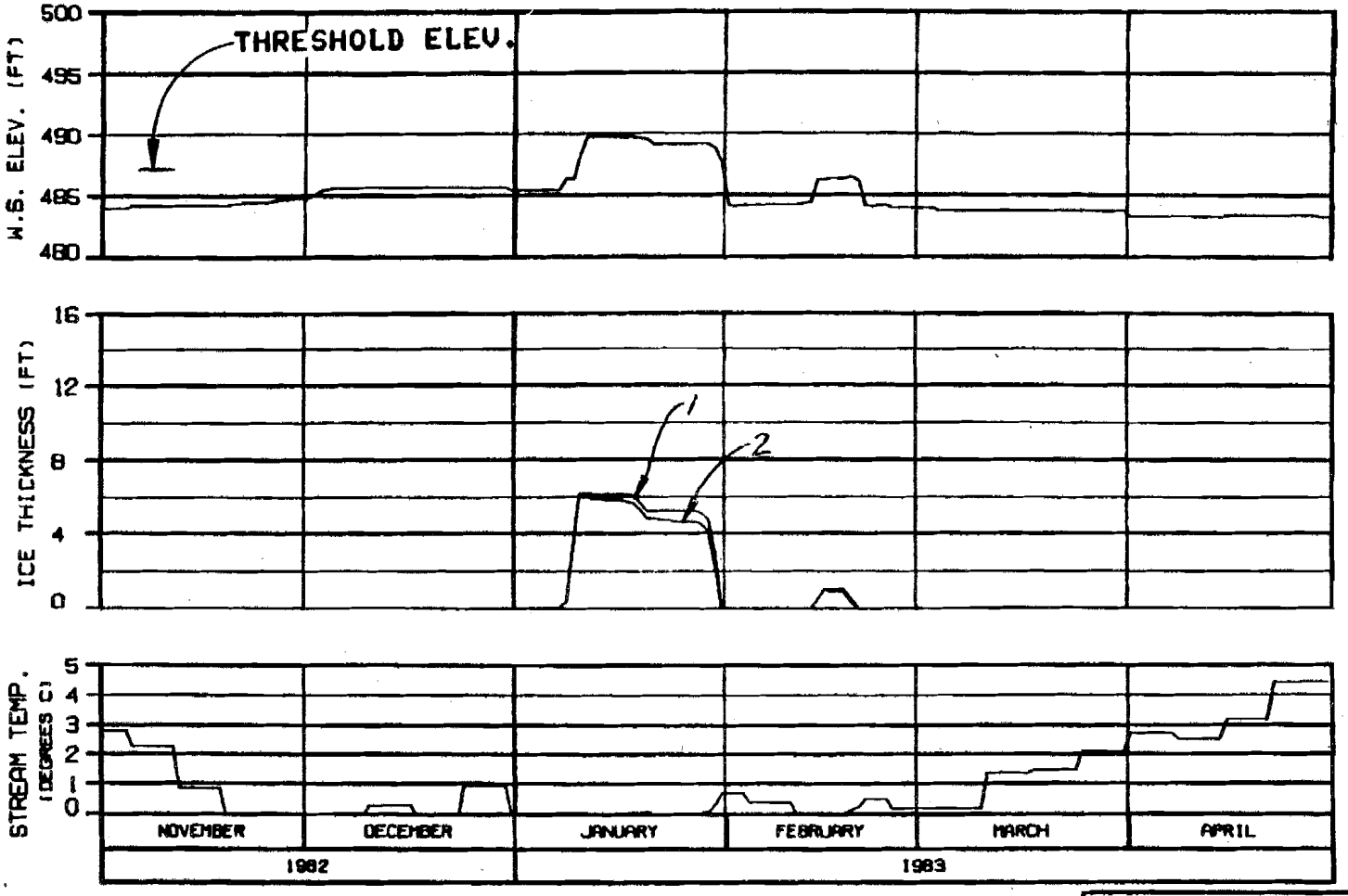
RIVER MILE : 115.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

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



HEAD OF SIDE CHANNEL MSII

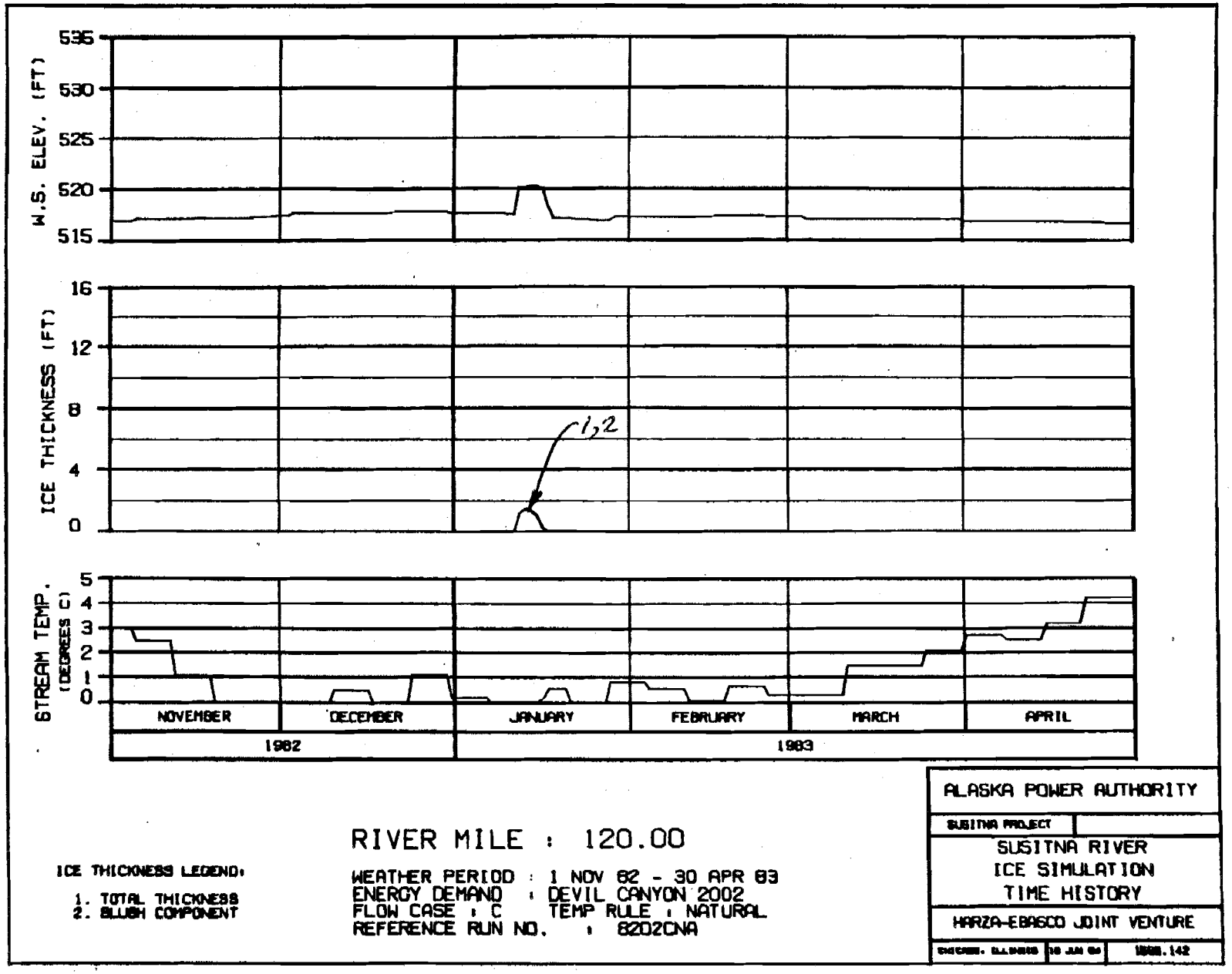
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
DRAWN: S.L.DAVIS | 19 JAN 84 | 1588.142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

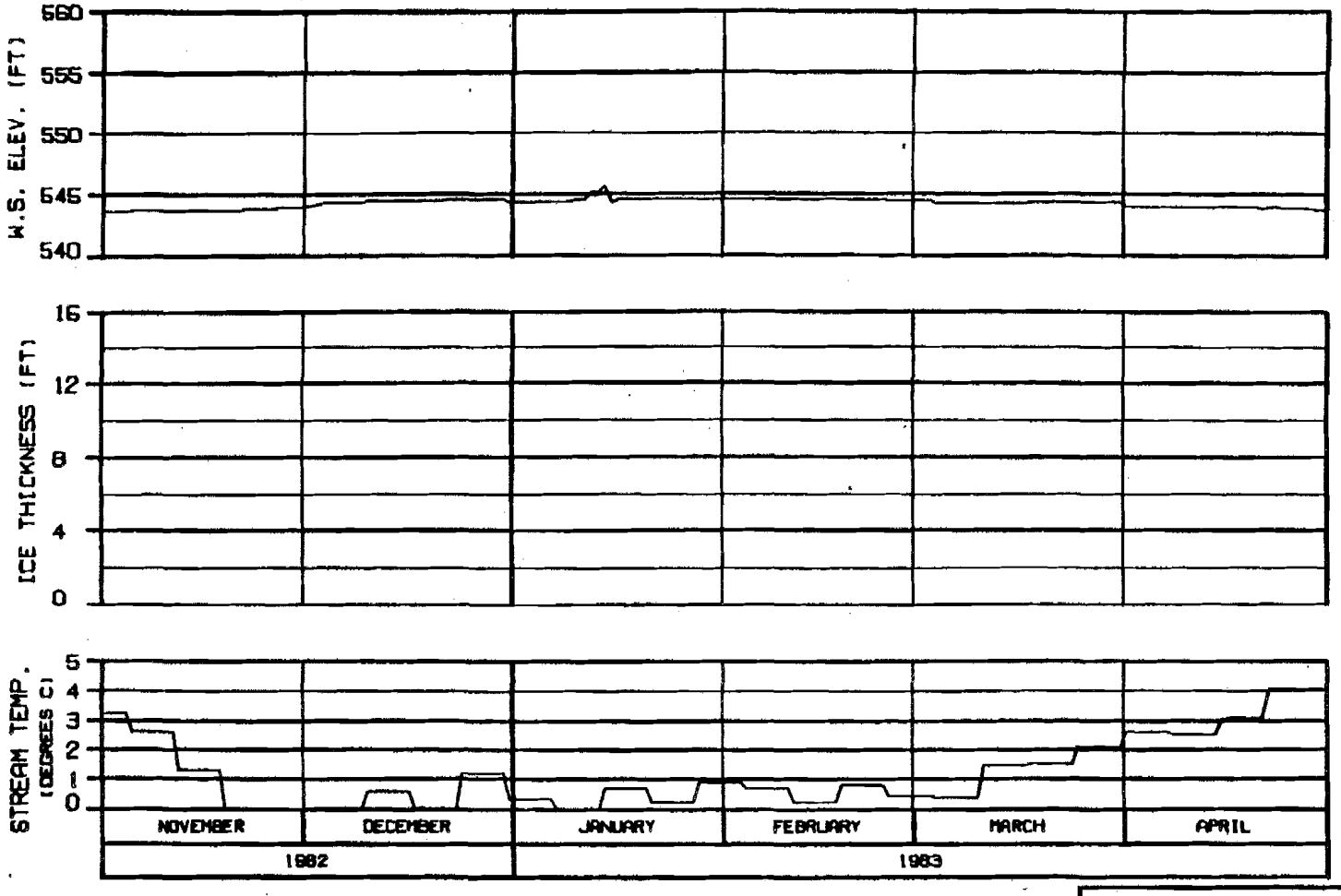
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JAN 84 | 1868.142



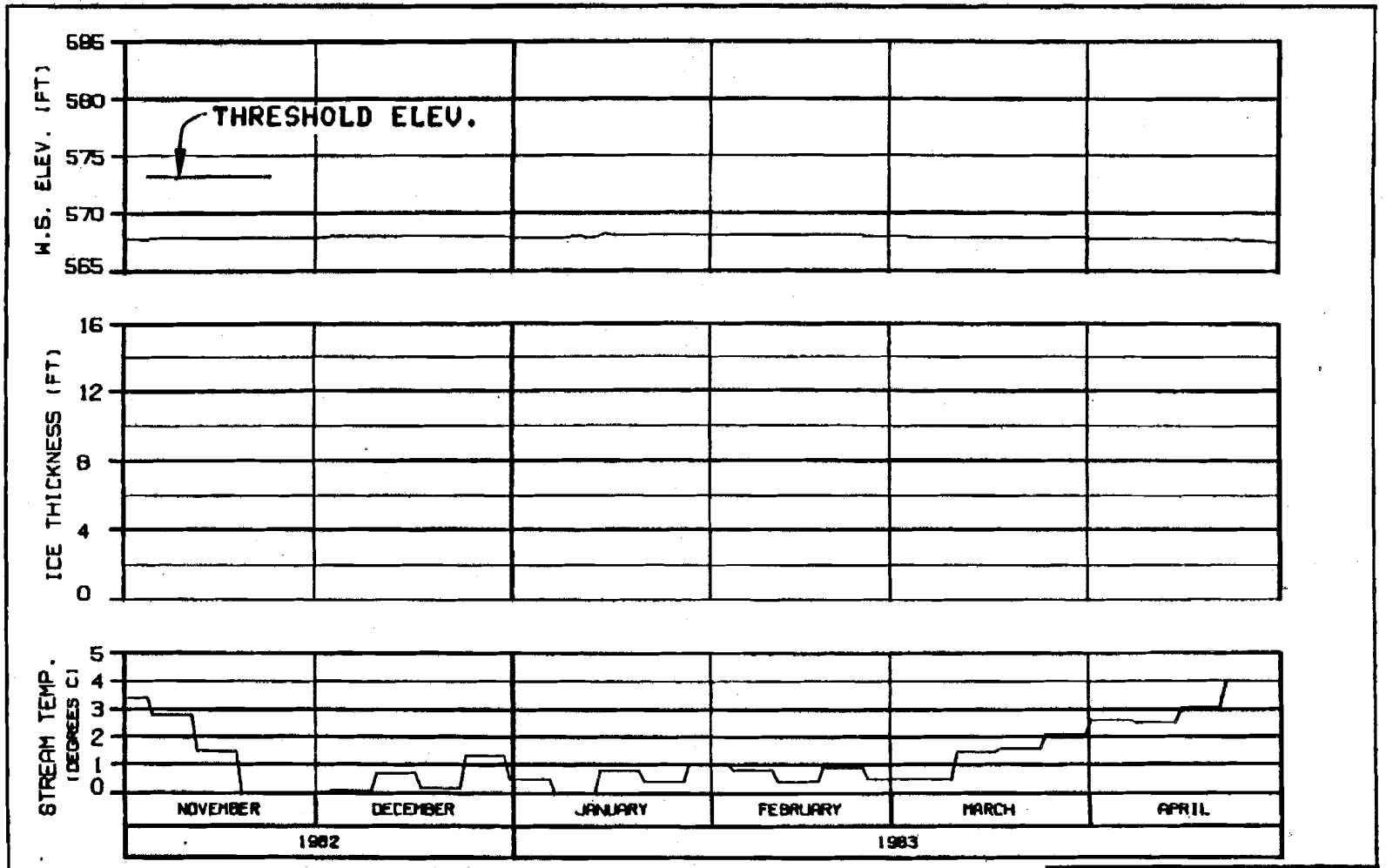
HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:
1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
[illegible] 10 JUN 84 1668.142



HEAD OF SLOUGH 8A (WEST)

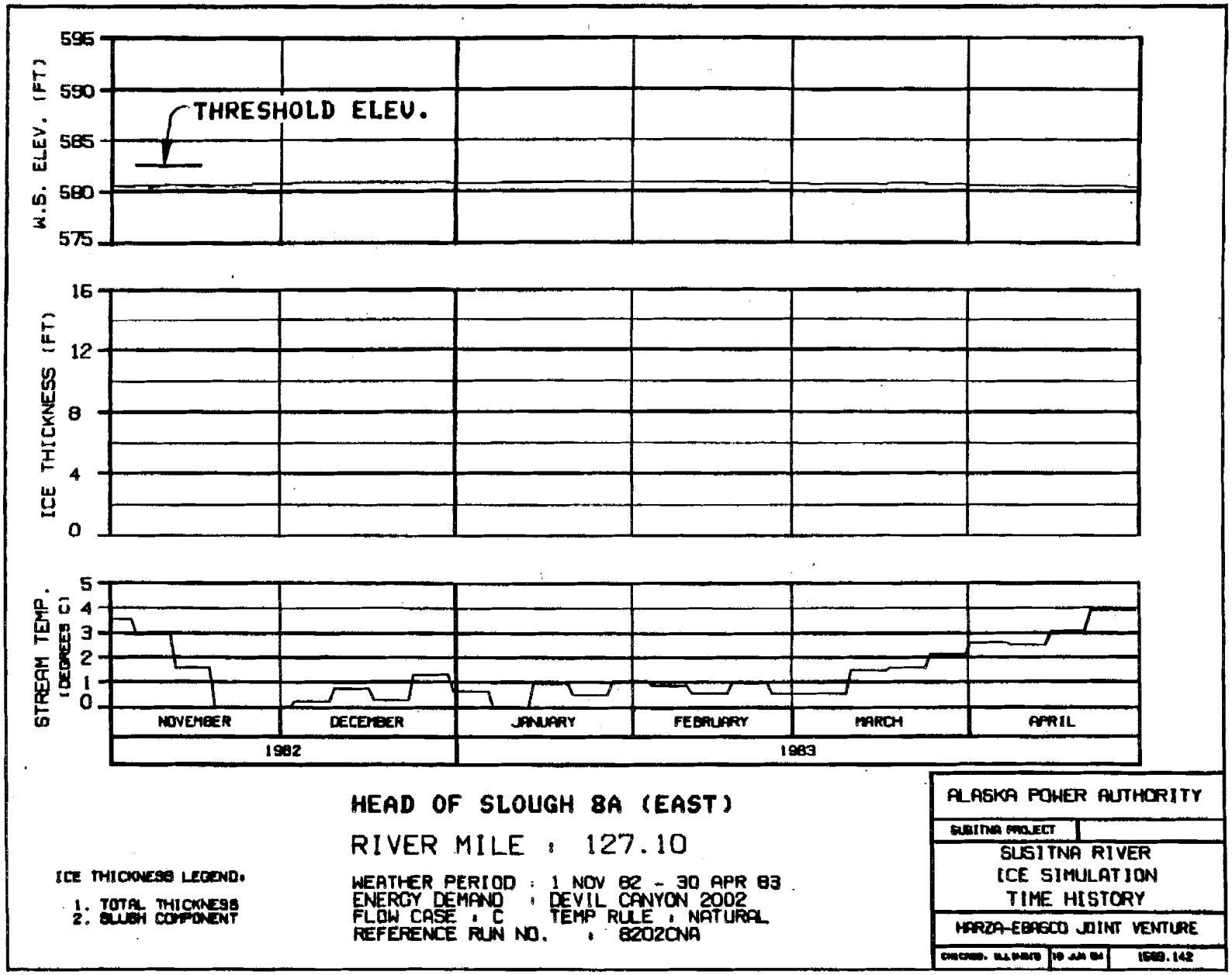
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : B202CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHICAGO, ILLINOIS	19 JAN 84	1568.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

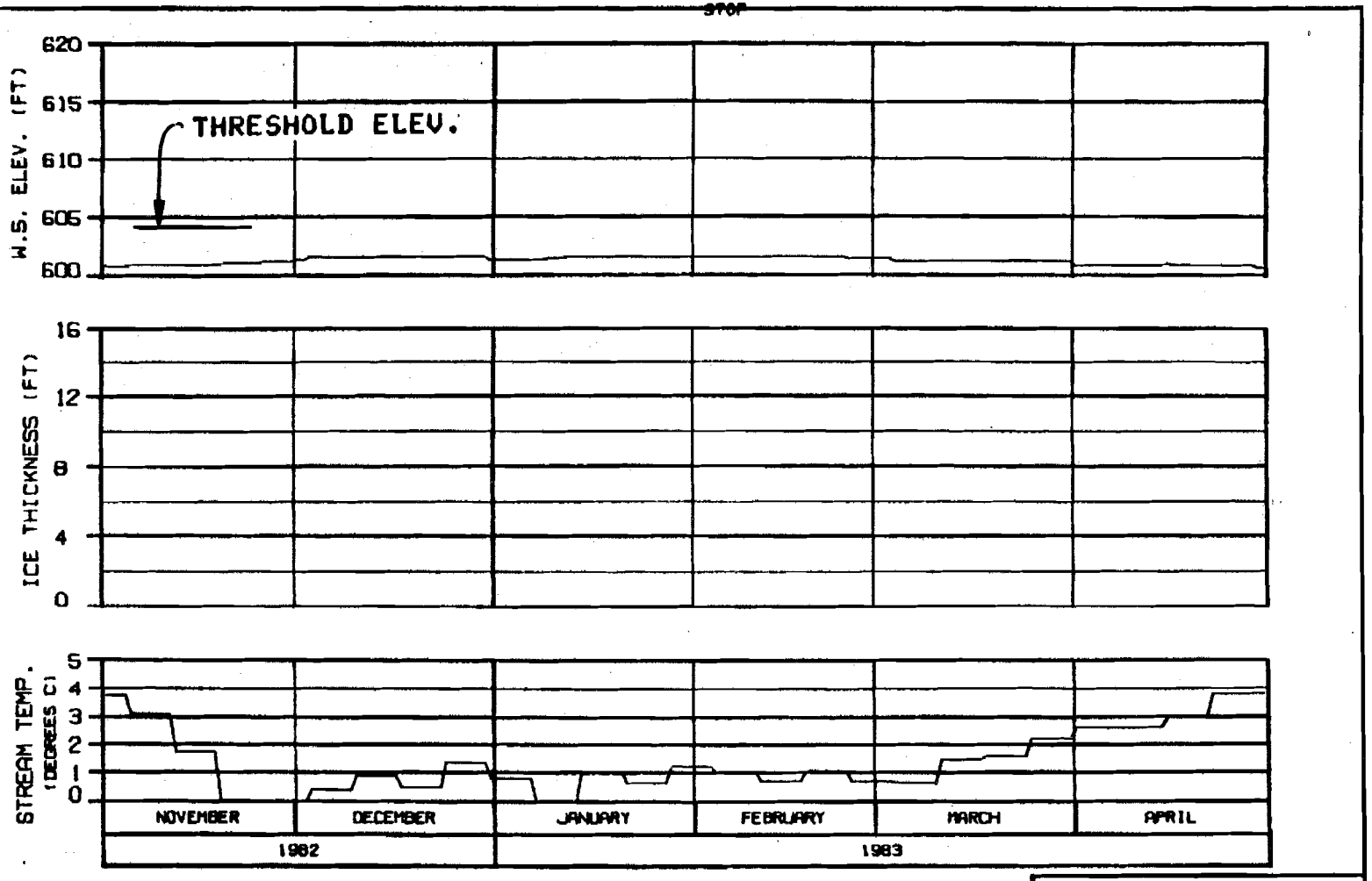
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 10 JAN 84 1588.142

C



HEAD OF SLOUGH 9

RIVER MILE : 129.30

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

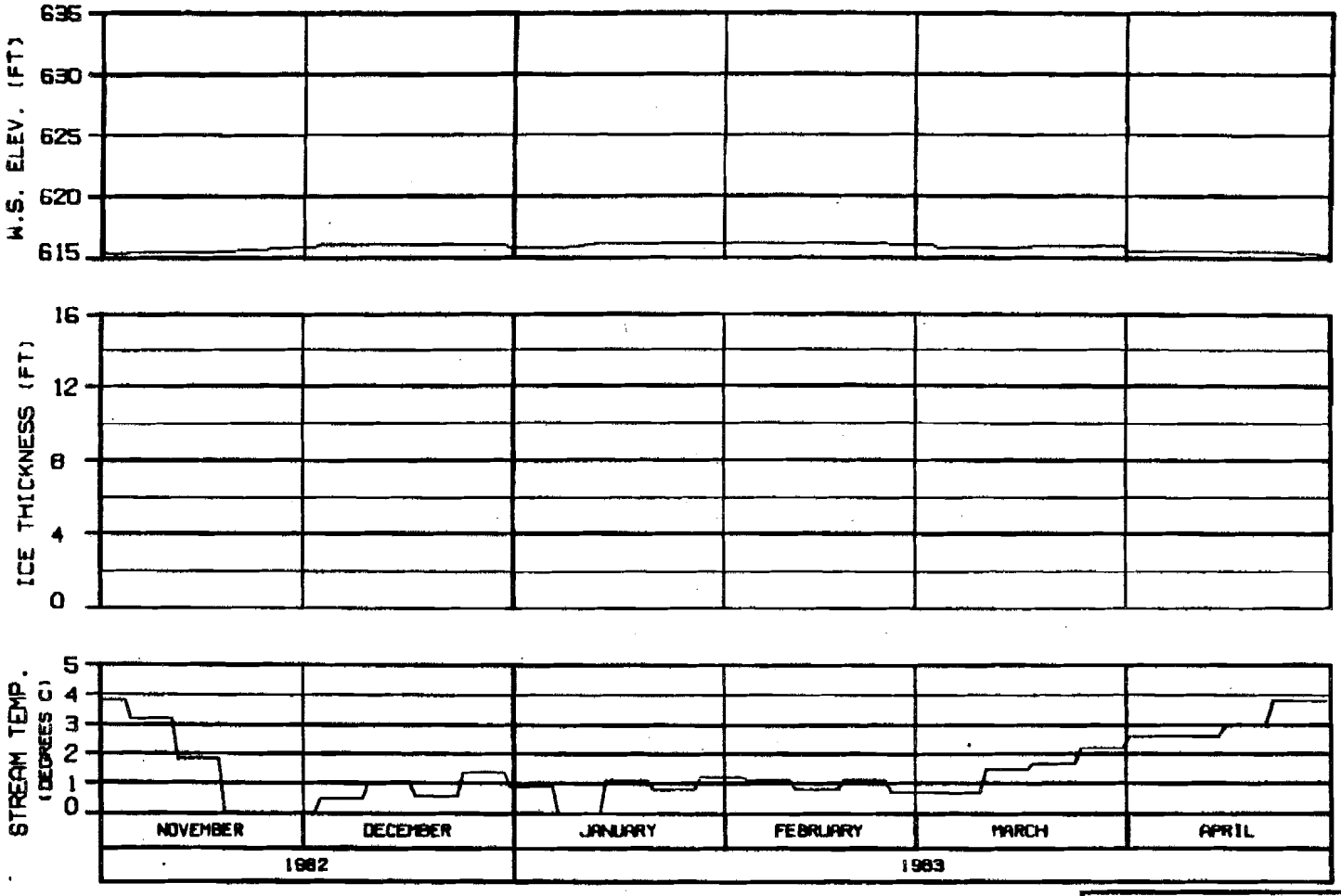
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

OPTION?

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: R.L.P. 18 JAN 84 1988.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

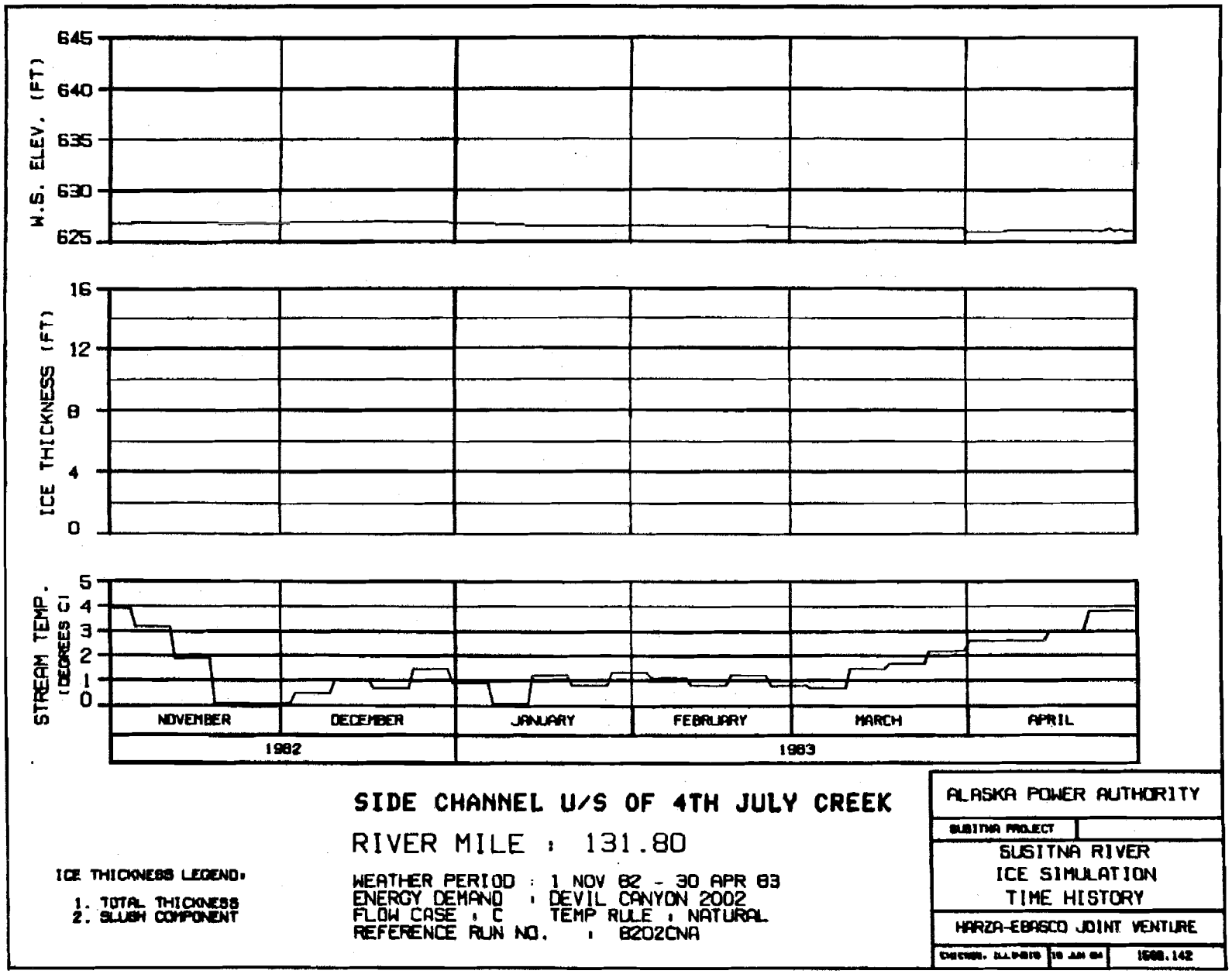
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	19 JAN 84



SIDE CHANNEL U/S OF 4TH JULY CREEK

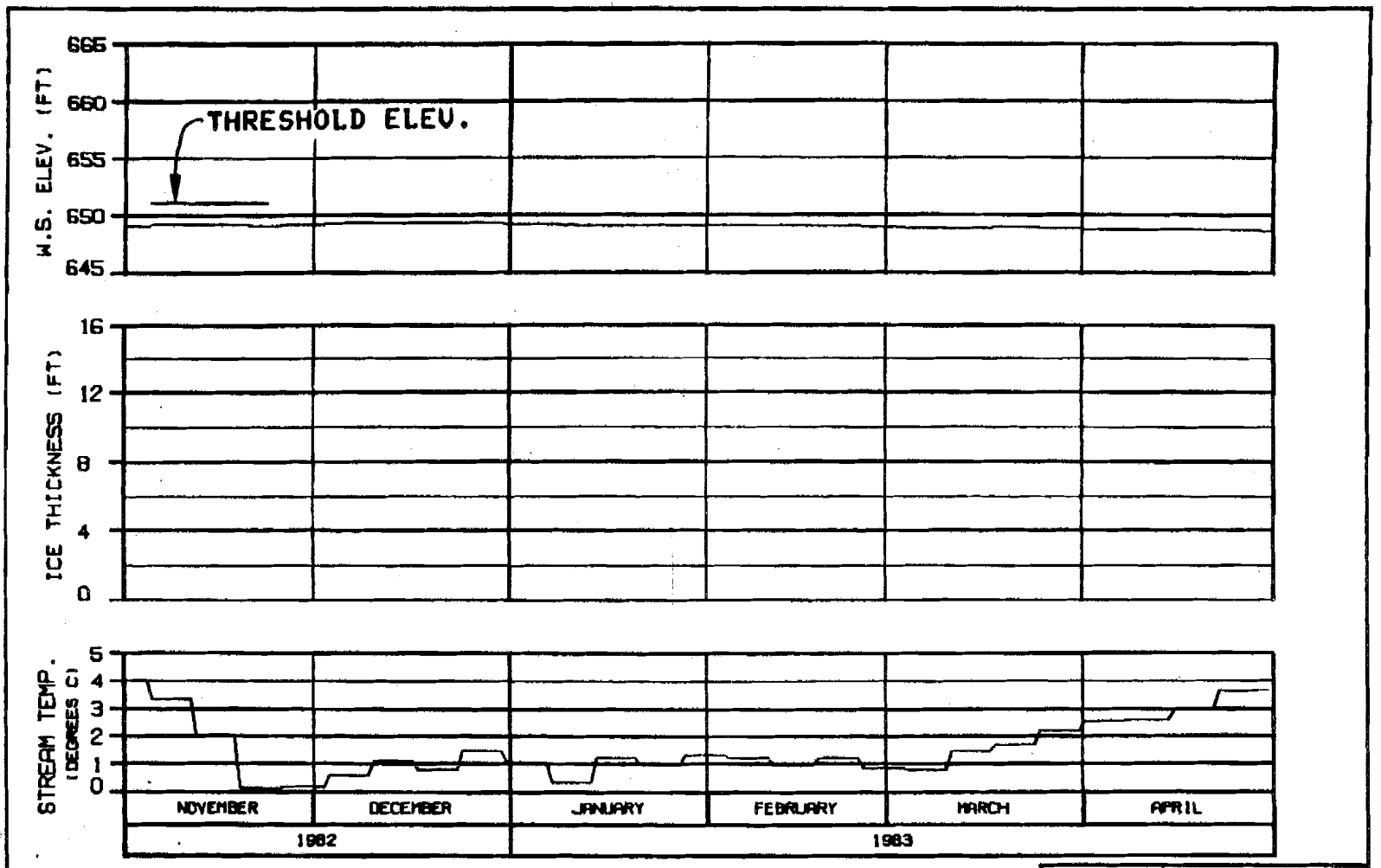
RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

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



HEAD OF SLOUGH 9A

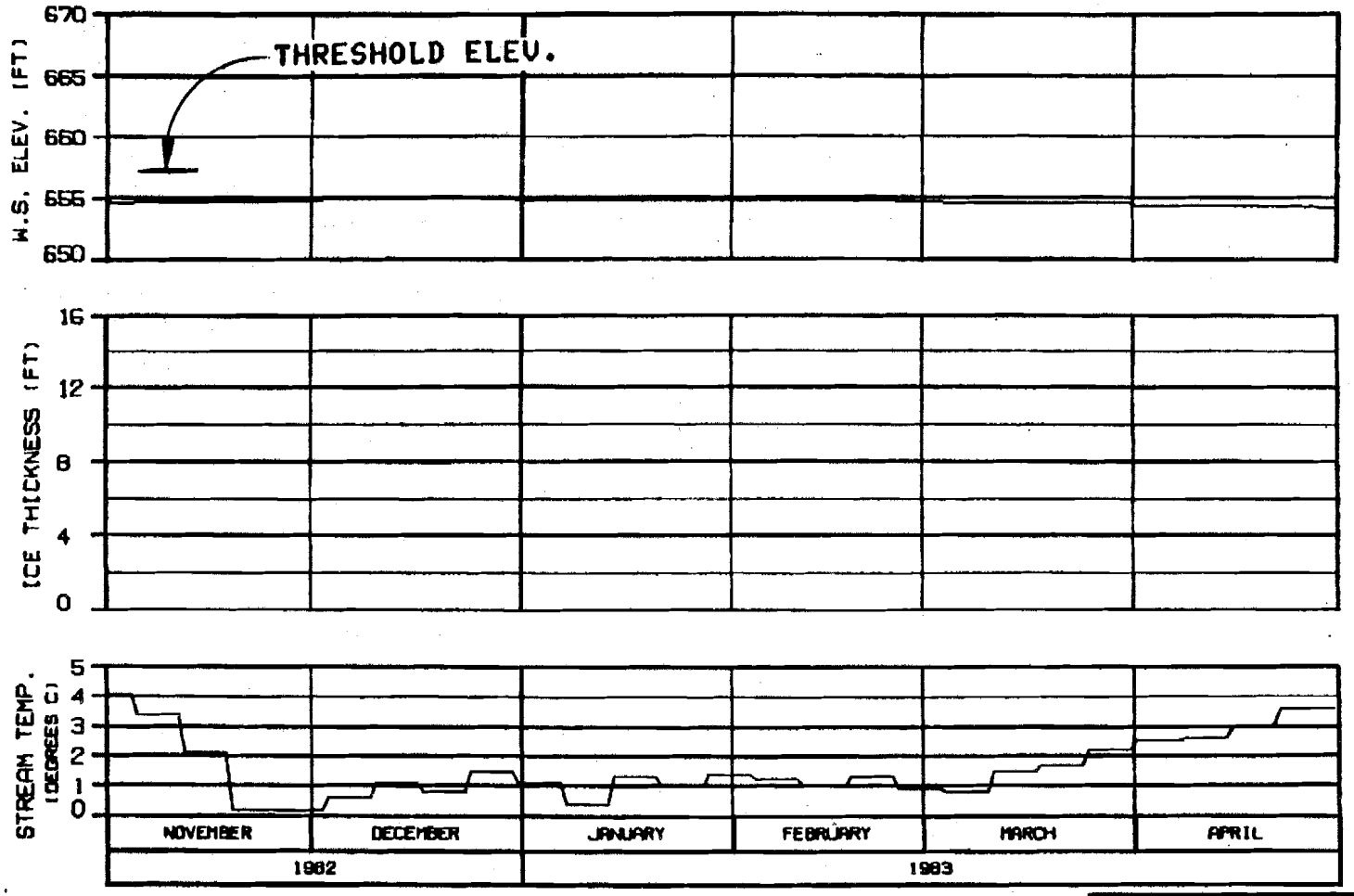
RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 18 JAN 91 1883.142



SIDE CHANNEL U/S OF SLOUGH 10

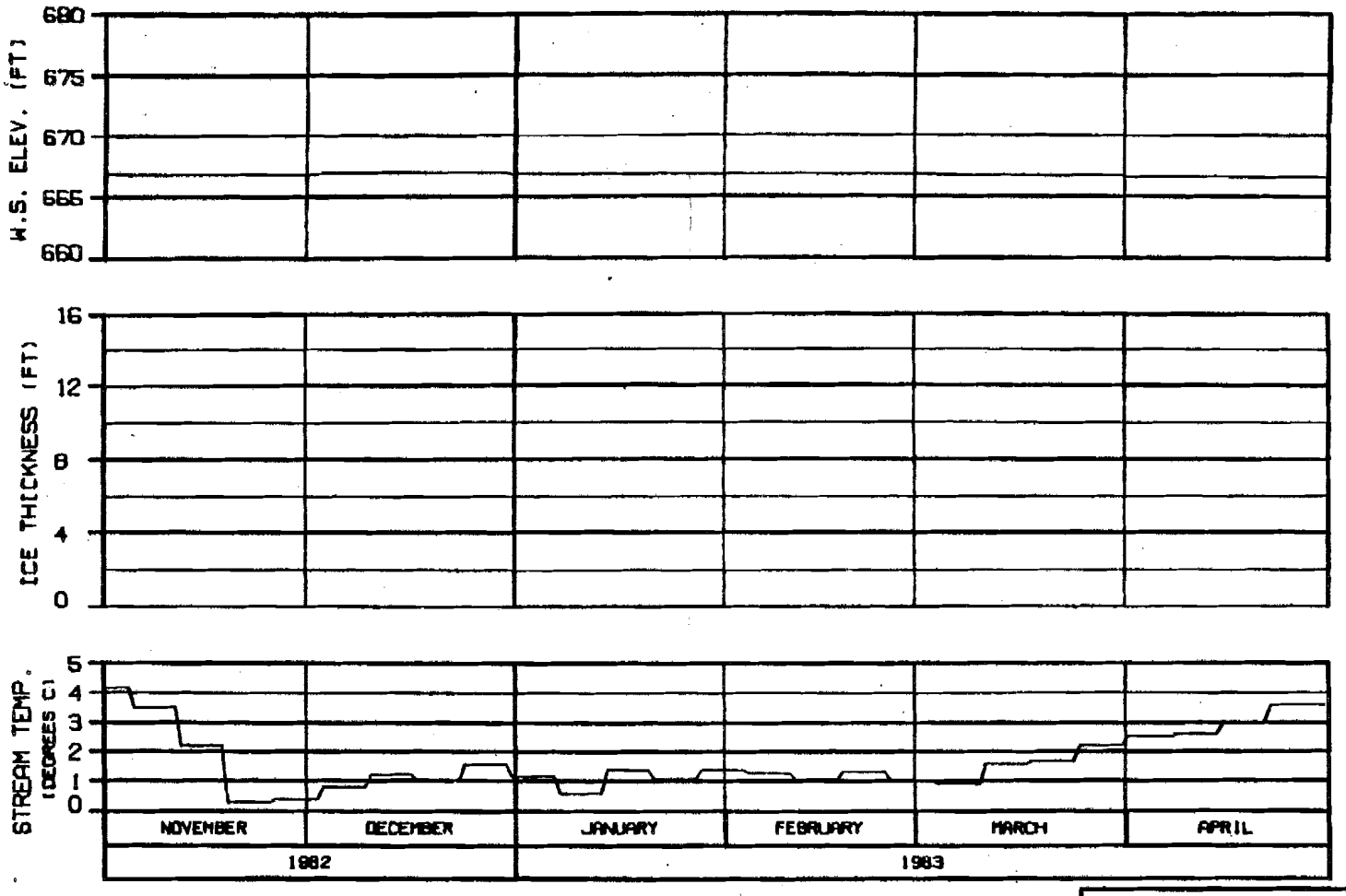
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DRAWN: [illegible]	18 JUN 84	1988.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

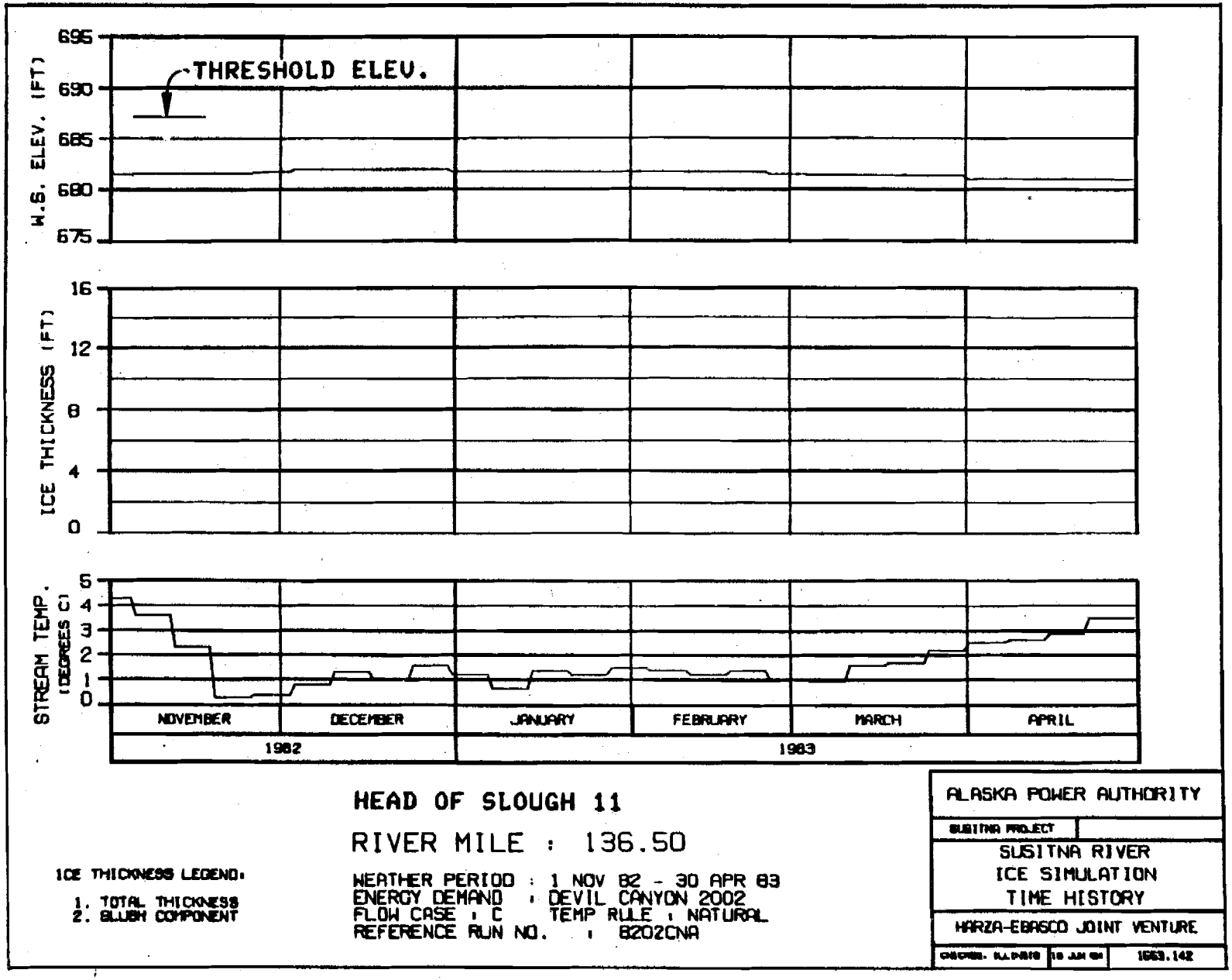
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: [illegible] 10 JUN 84 1988.142



HEAD OF SLOUGH 11

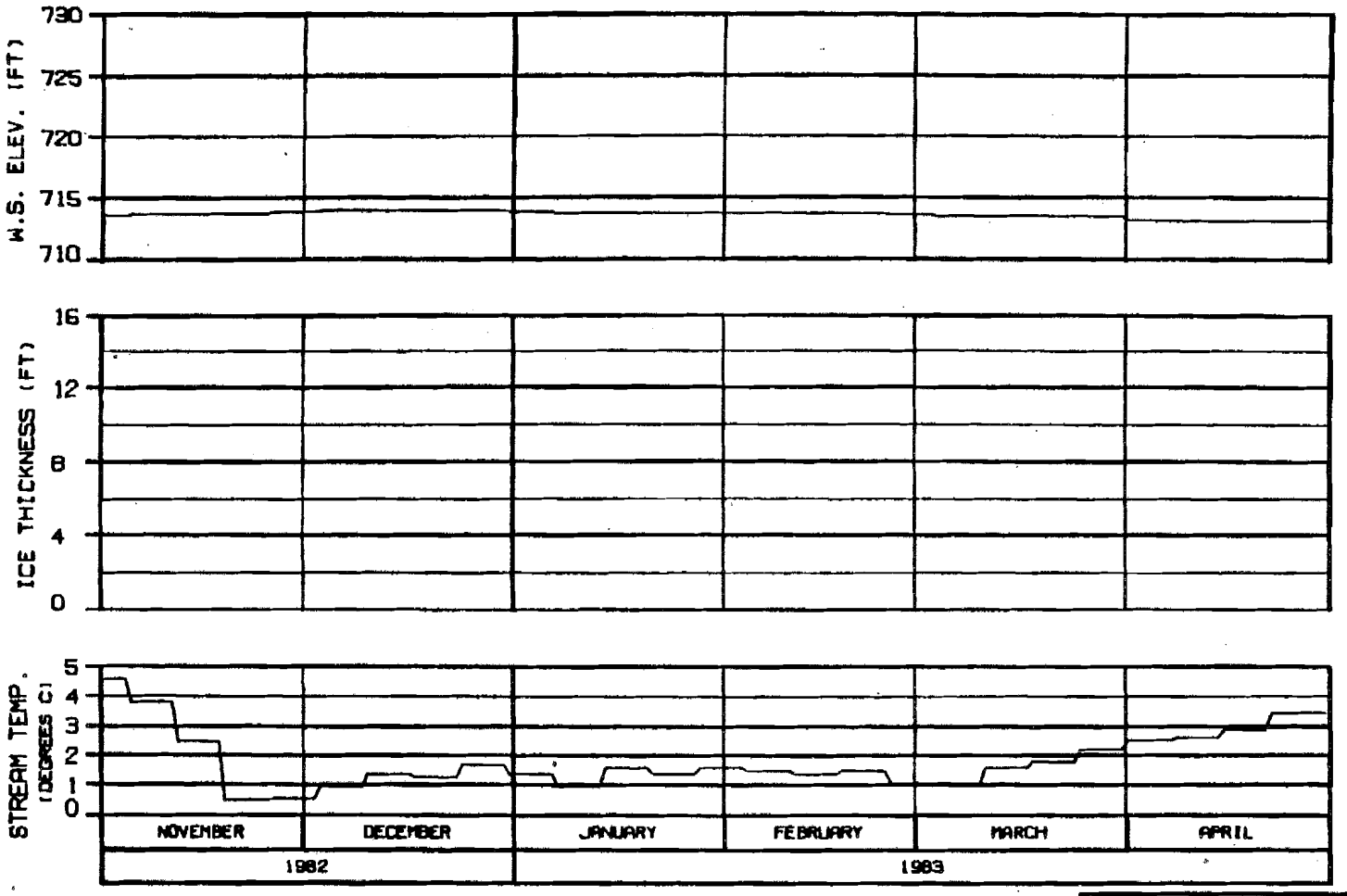
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: K.L.D.	1663.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

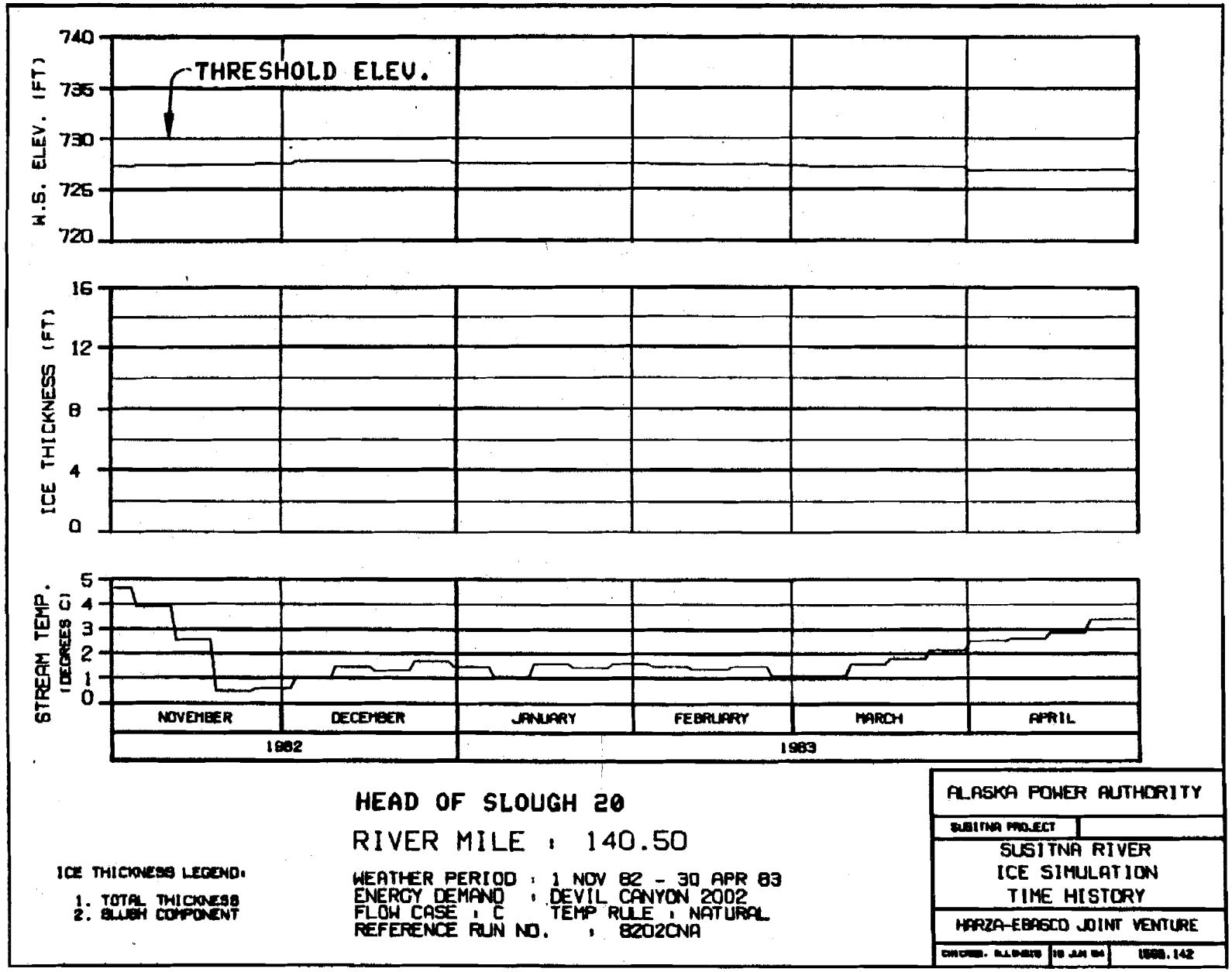
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JAN 84 | [illegible], 142



HEAD OF SLOUGH 20

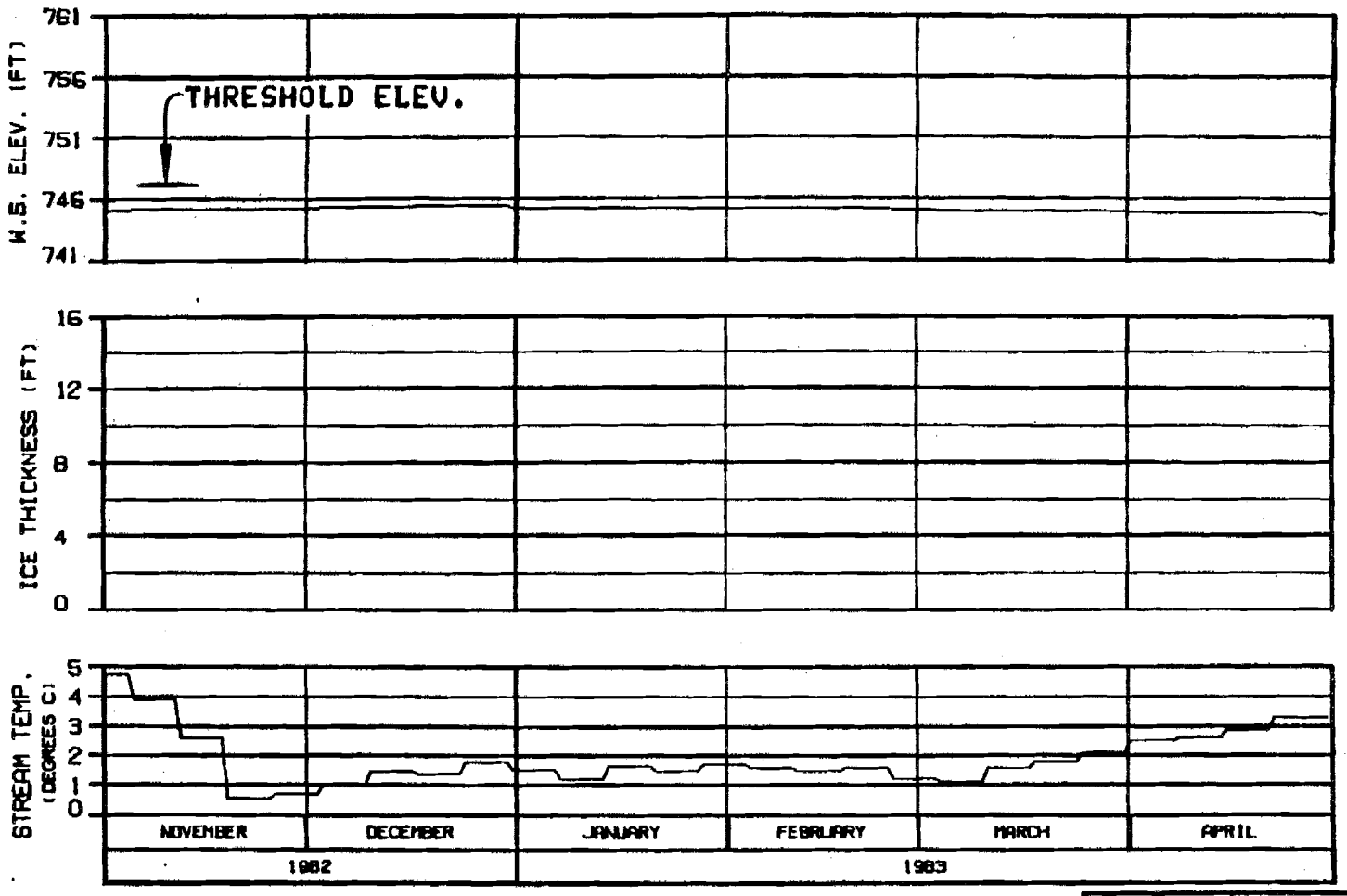
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER ICE SIMULATION TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: [illegible] 10 JAN 84 1588.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

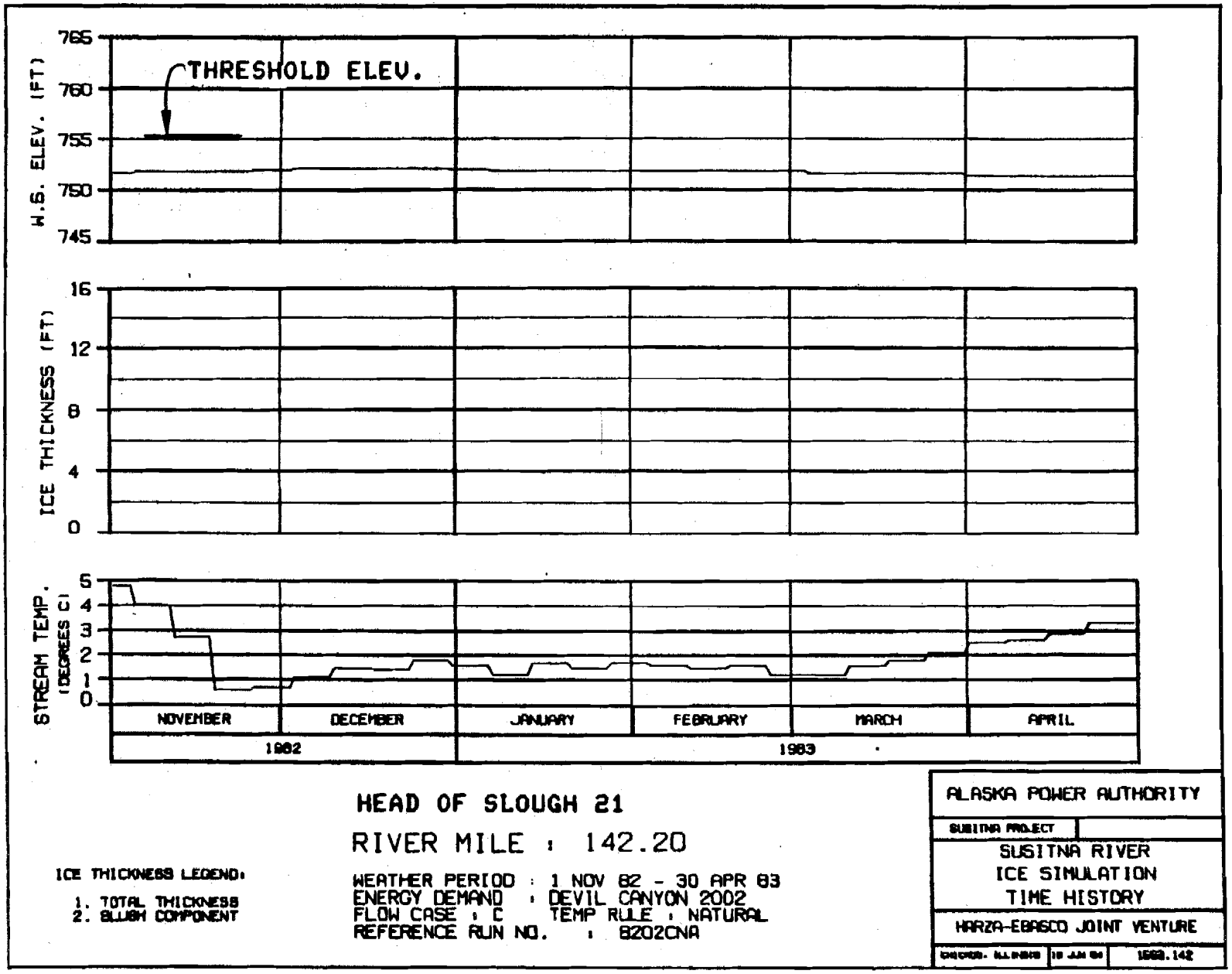
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: R.L.P.S. | 19 JAN 84 | 1868.142



HEAD OF SLOUGH 21

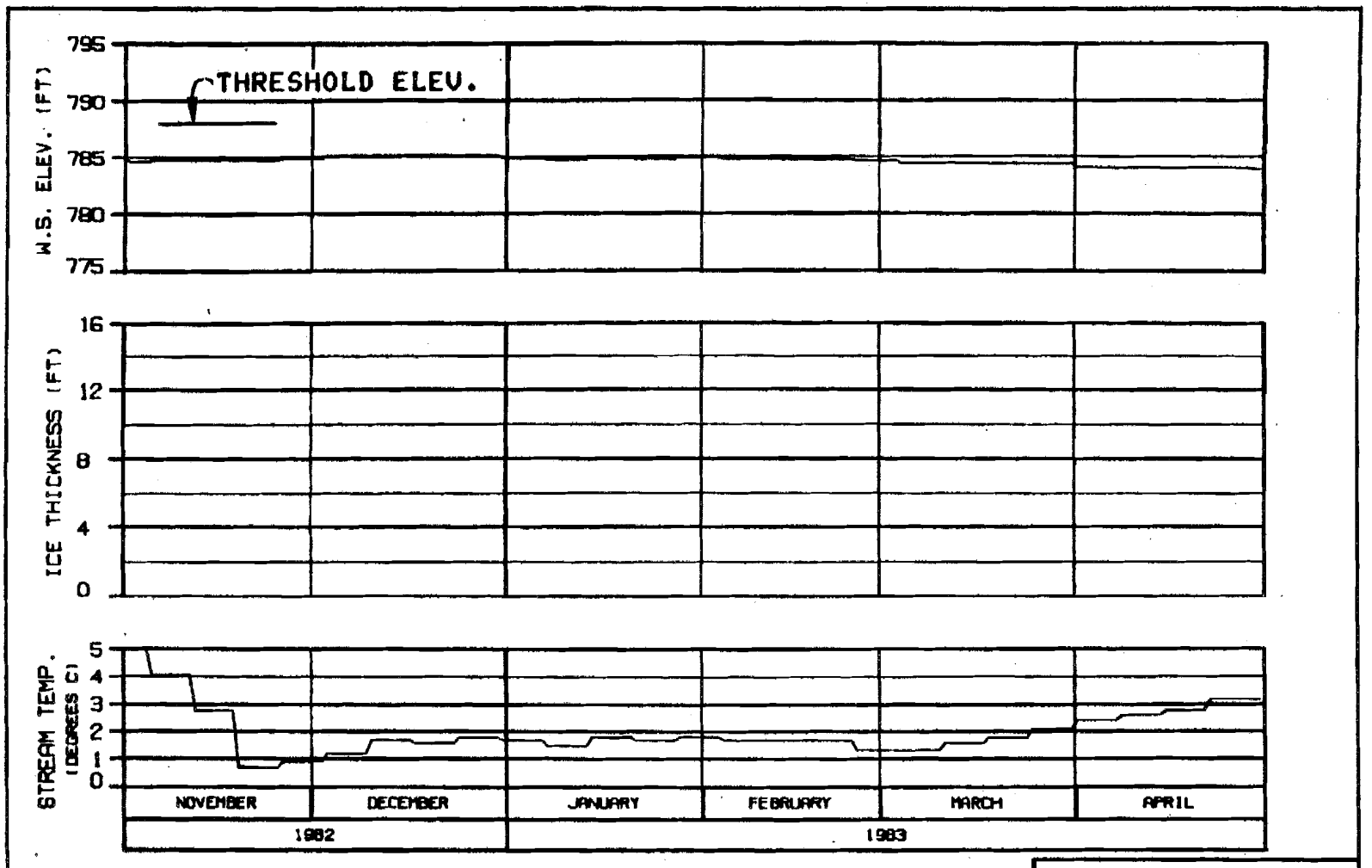
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	18 JAN 84	1868.142



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2002
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 8202CNA

OPTION?

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 19 JAN 84 | 1988.142

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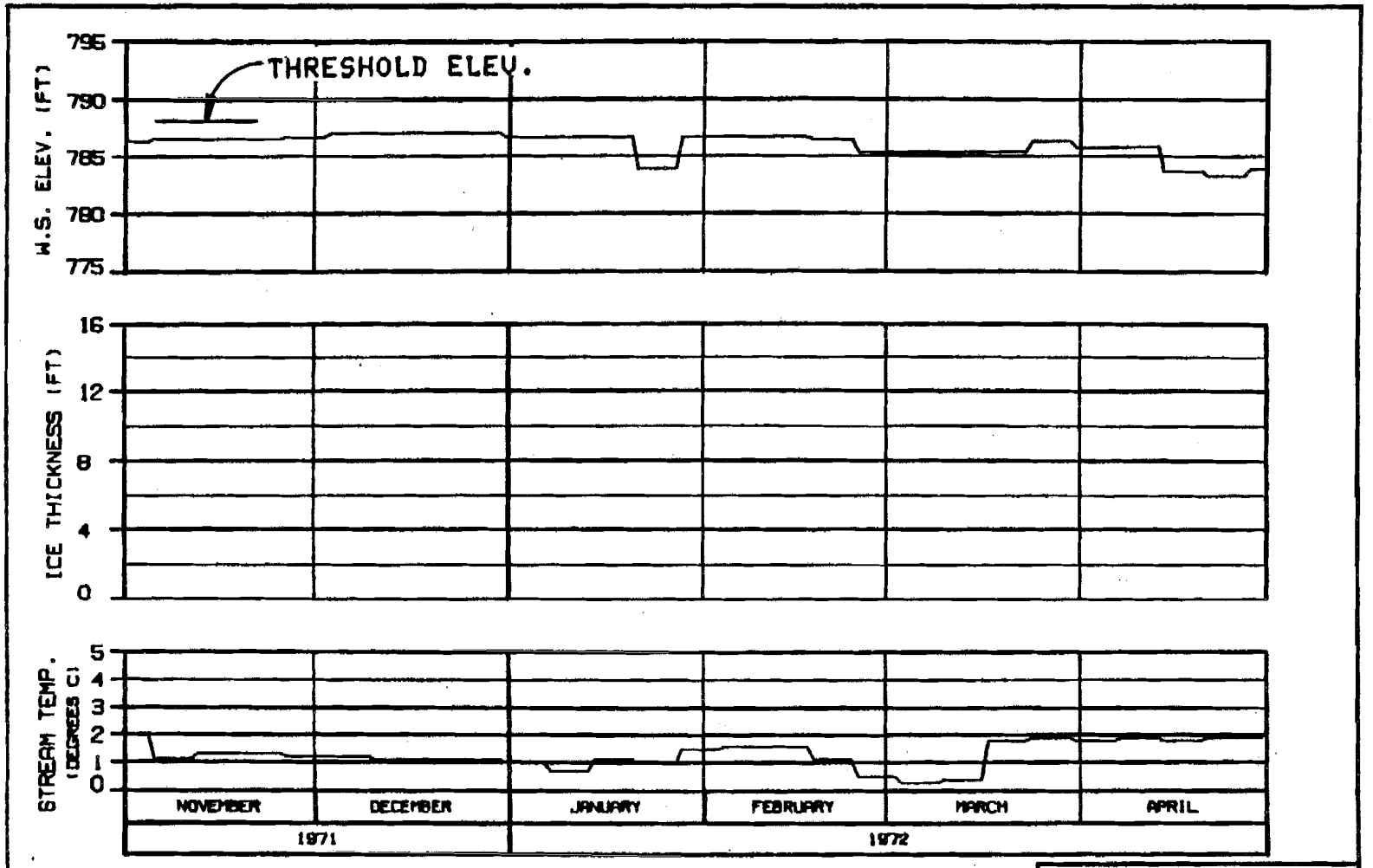


HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

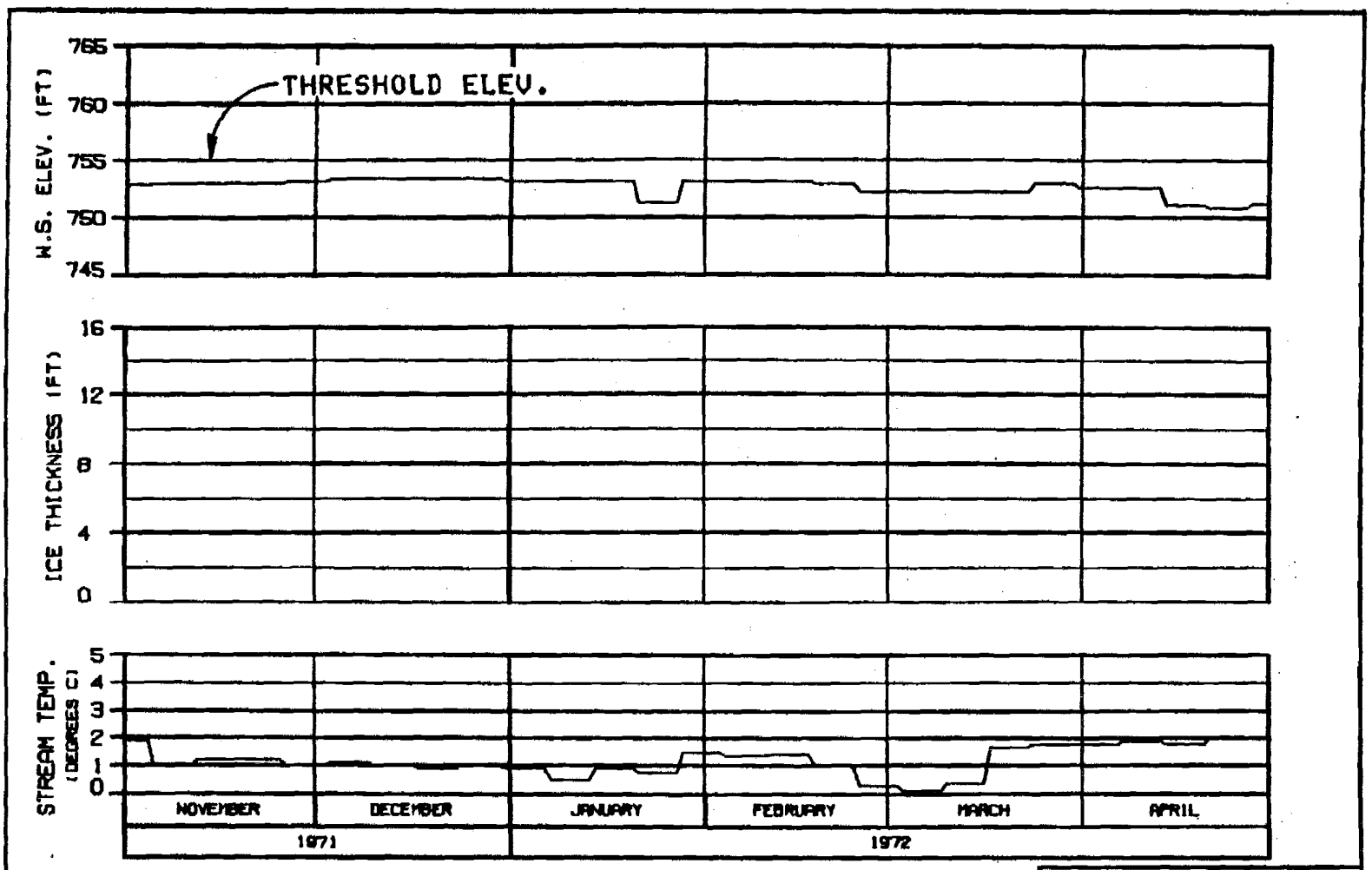
OPTION7

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

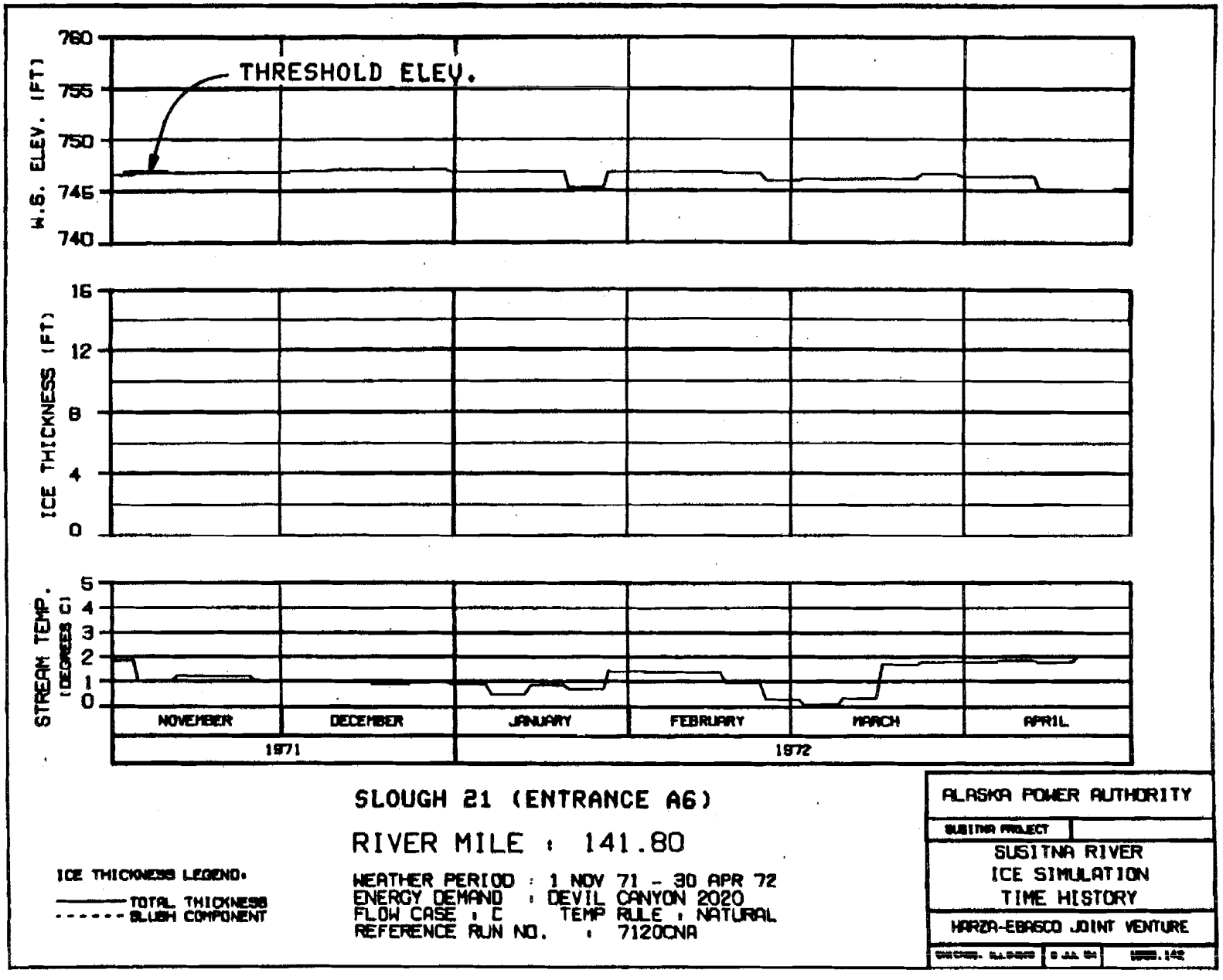
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 8 JUL 84 | 1868.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

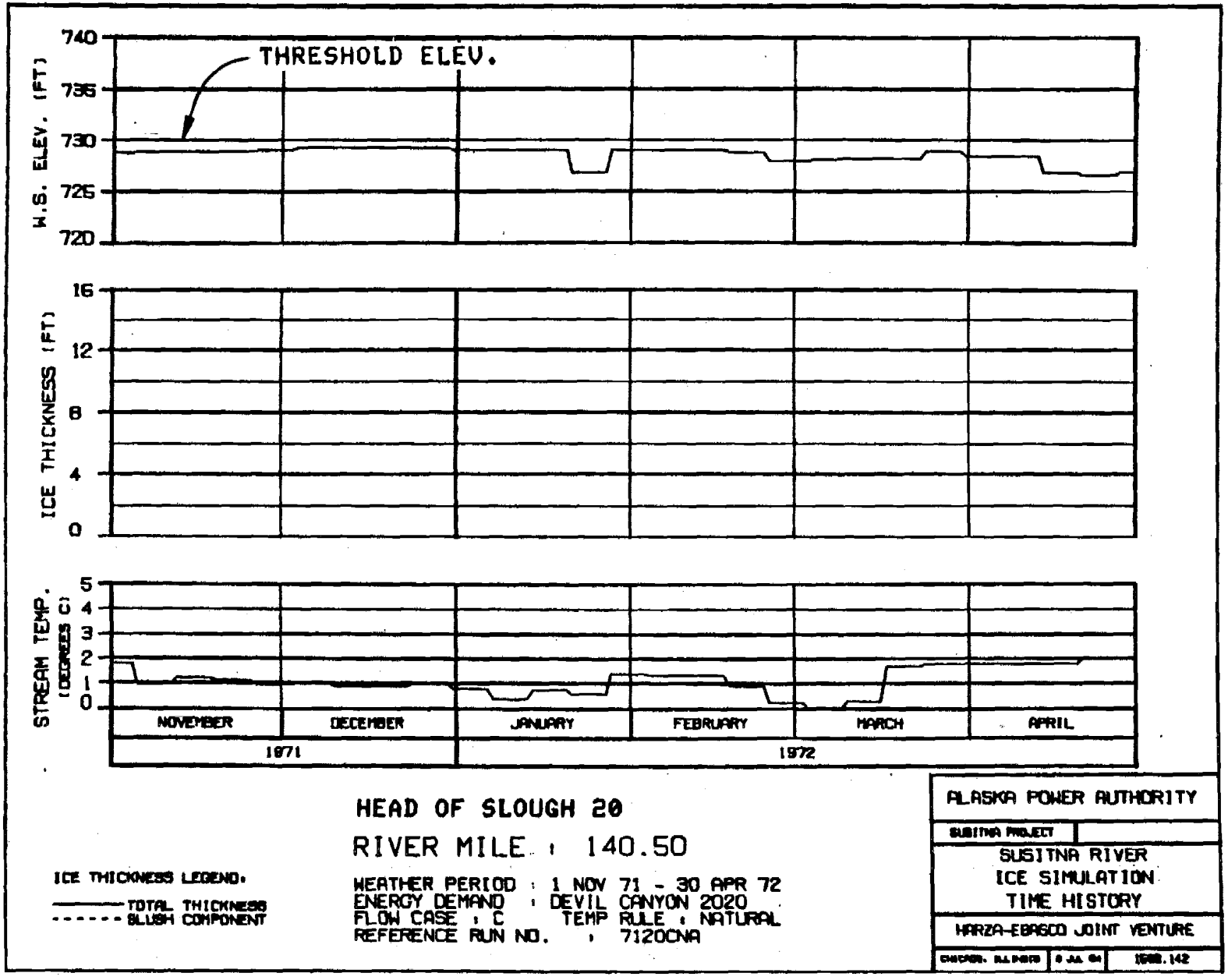
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 20

RIVER MILE : 140.50

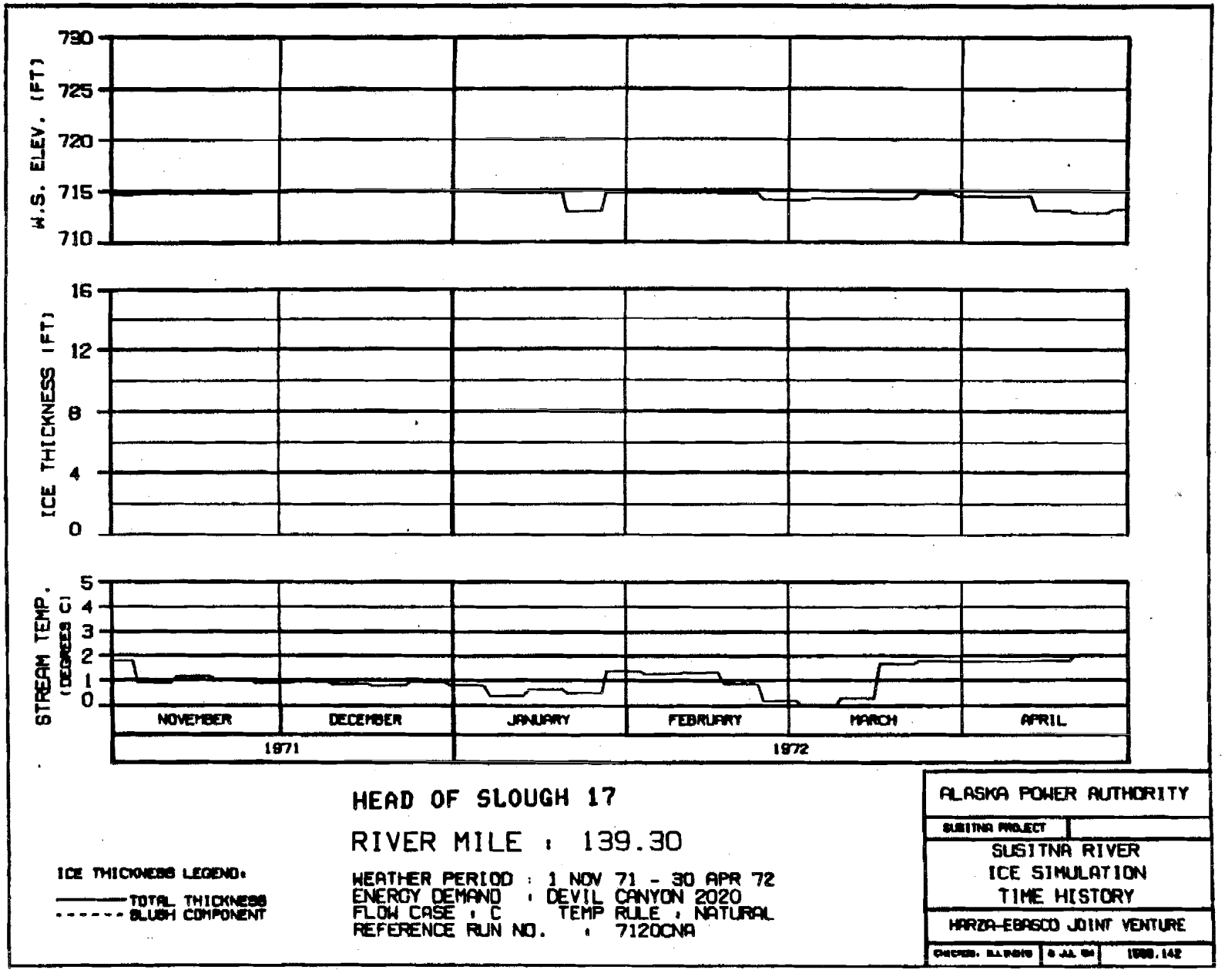
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	8 JUL 84



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

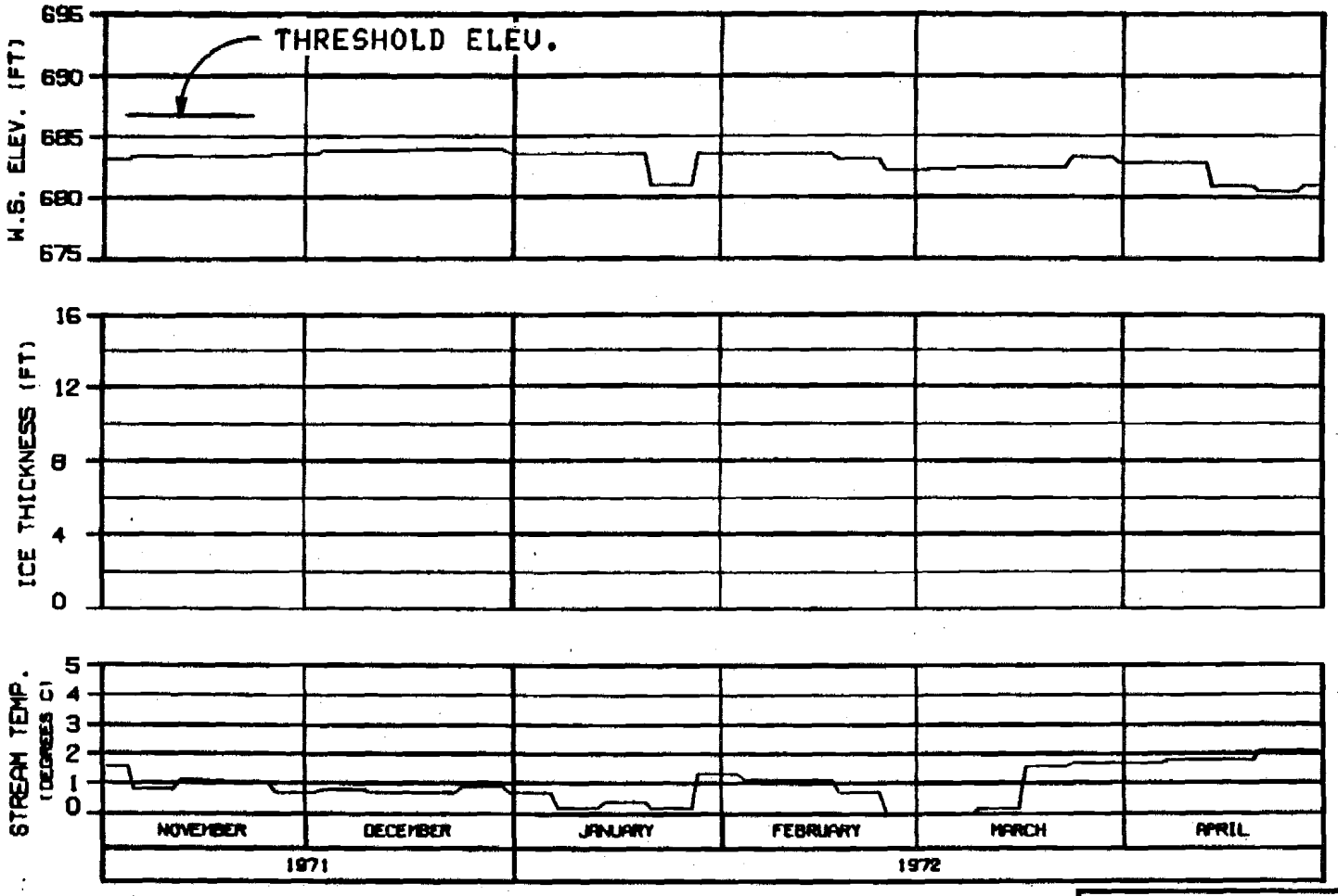
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 6 JUL 84 | 1988.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

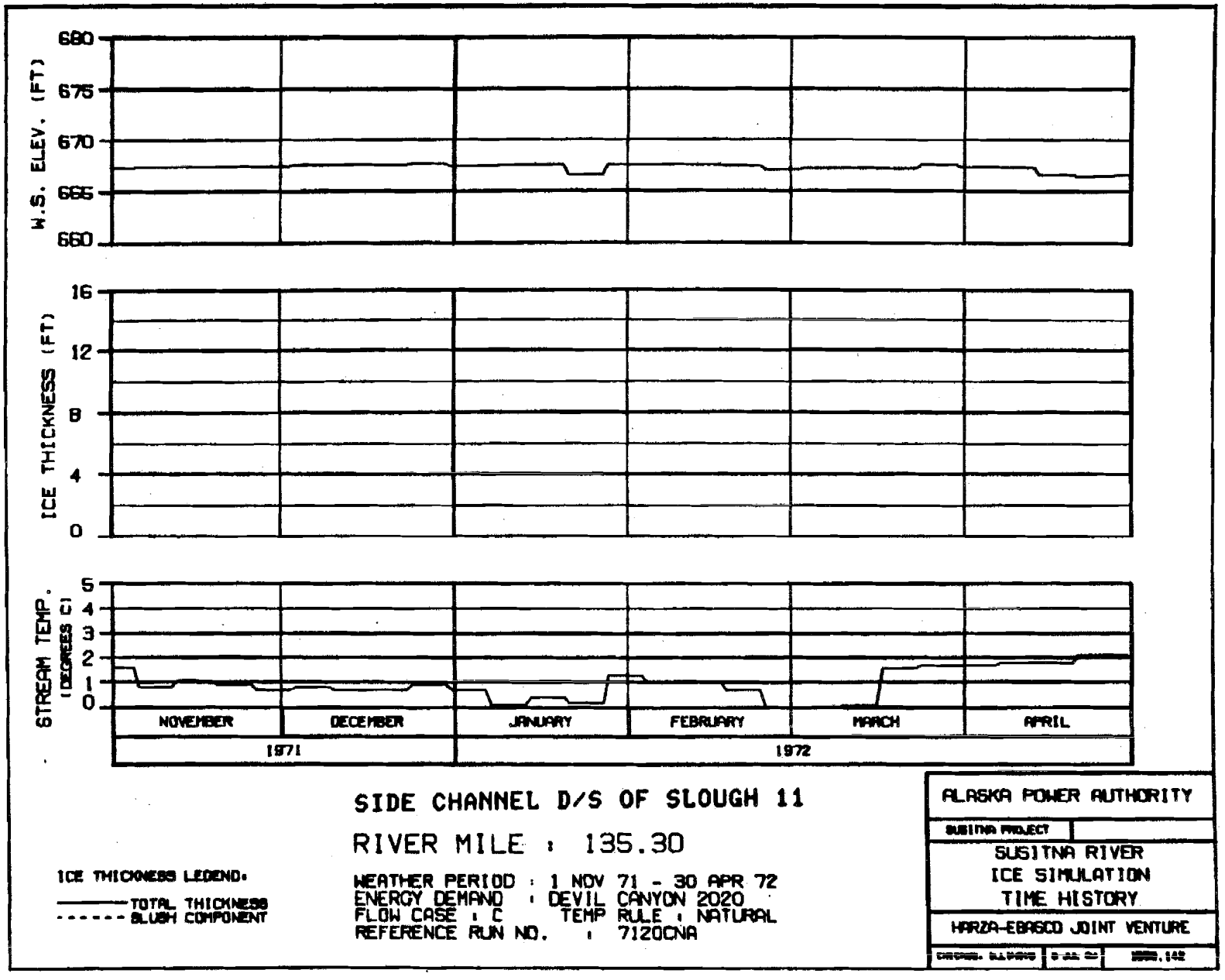
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: D.L.SMITH | 9 JUL 84 | 1868.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

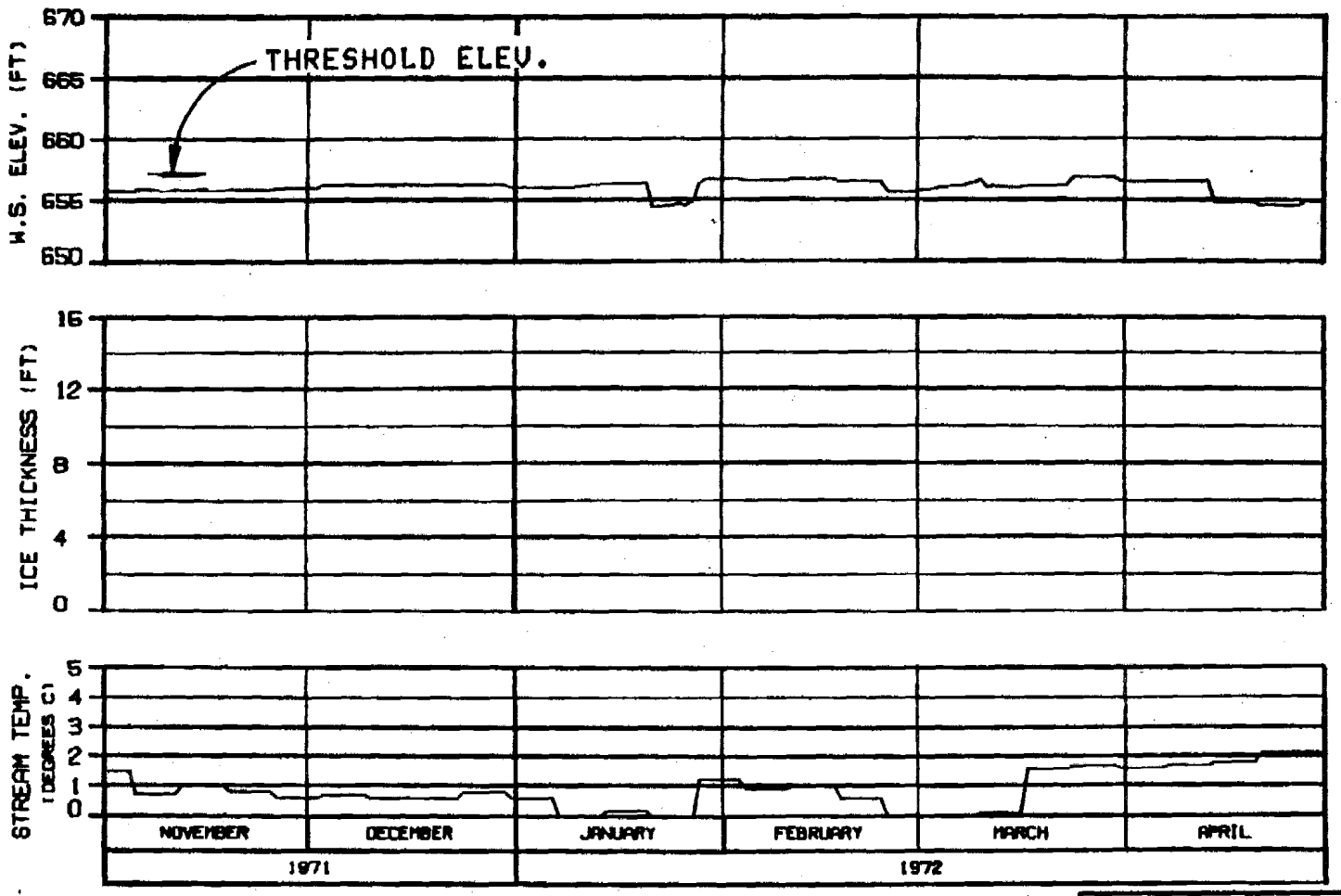
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

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

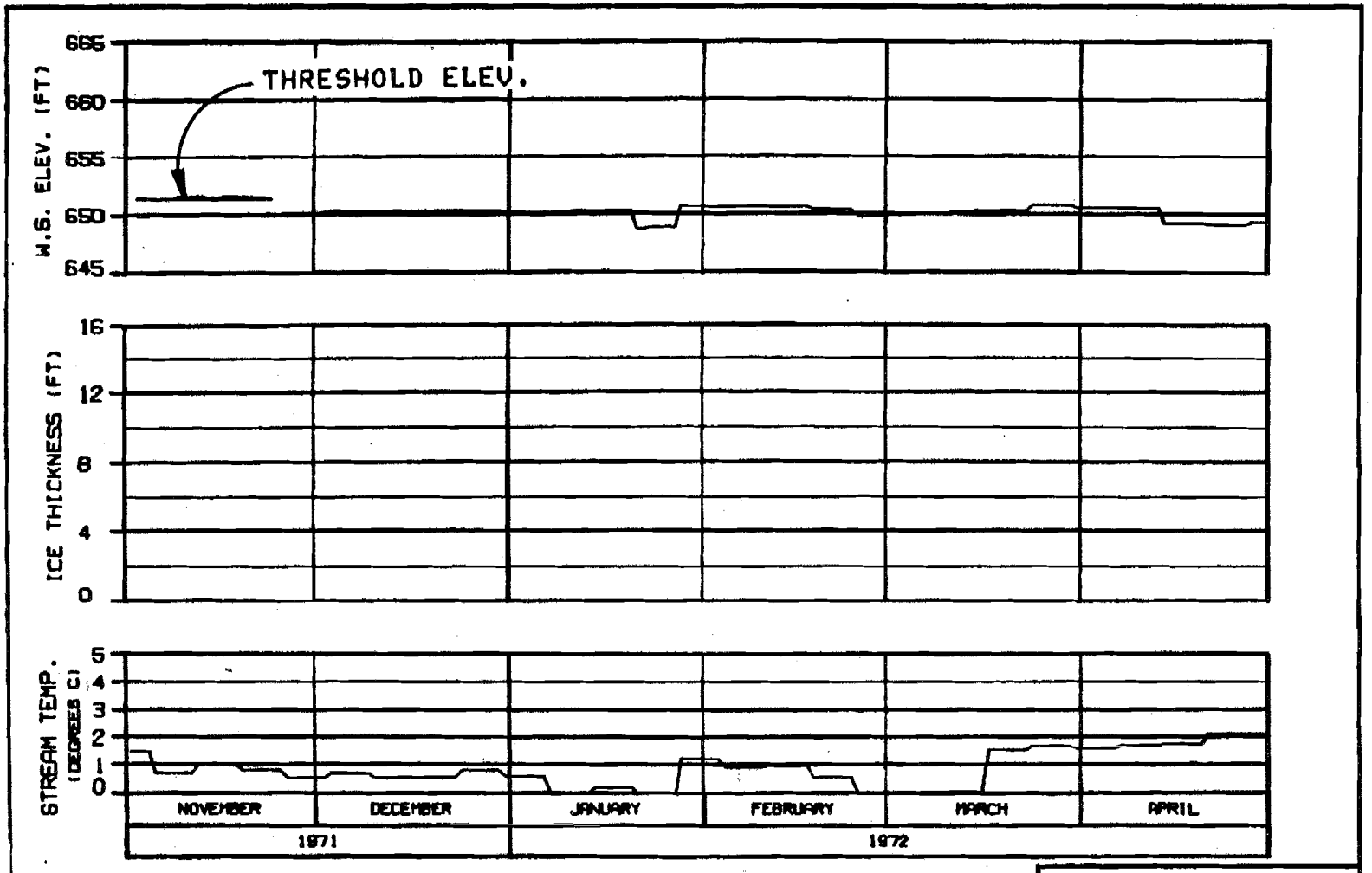
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	8 JUL 84	1868.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

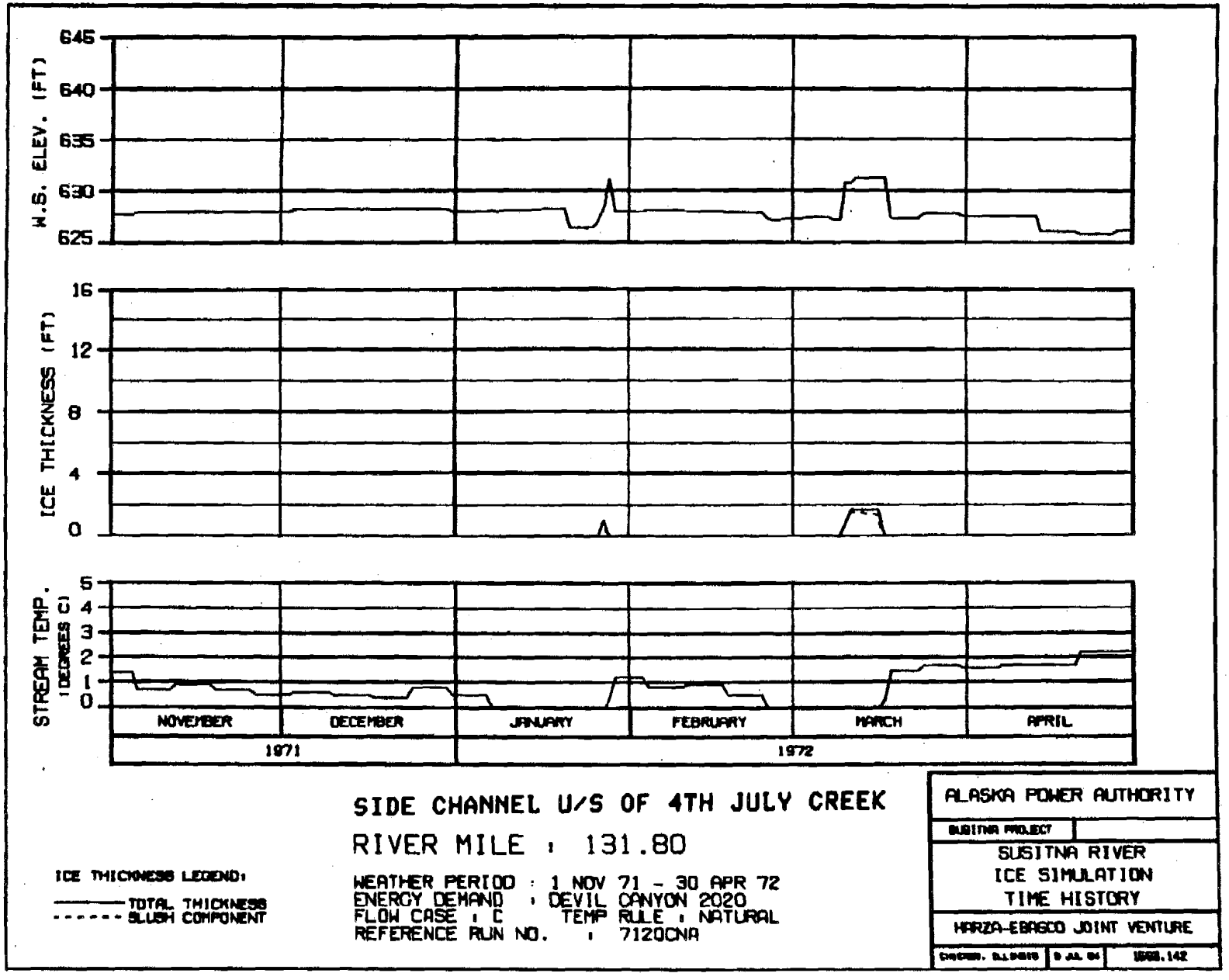
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ELLINGTON | 9 JUL 84 | 1888.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

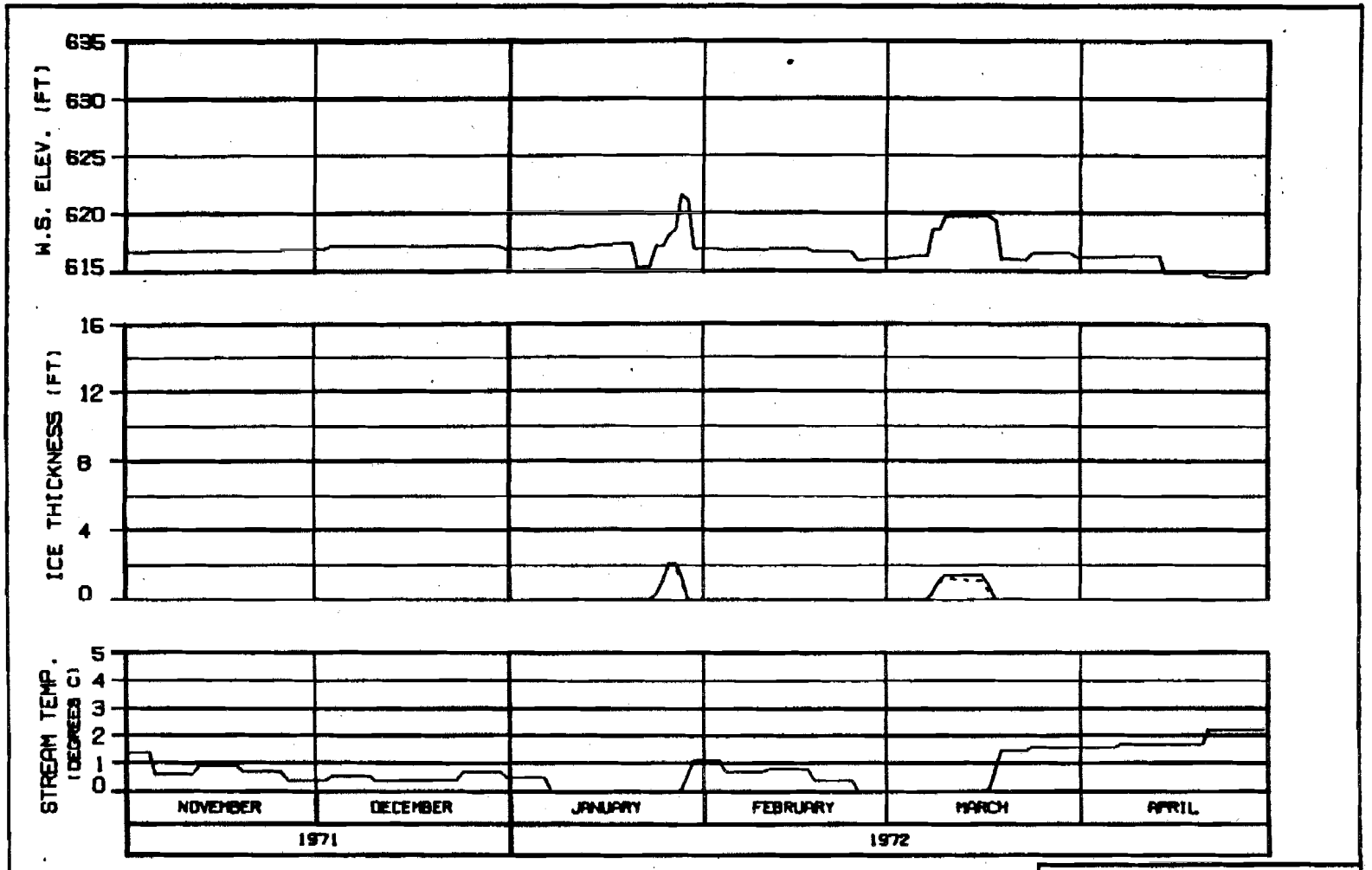
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.D.B.S.B. | 9 JUL 84 | 1588.142

OPTION7.



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

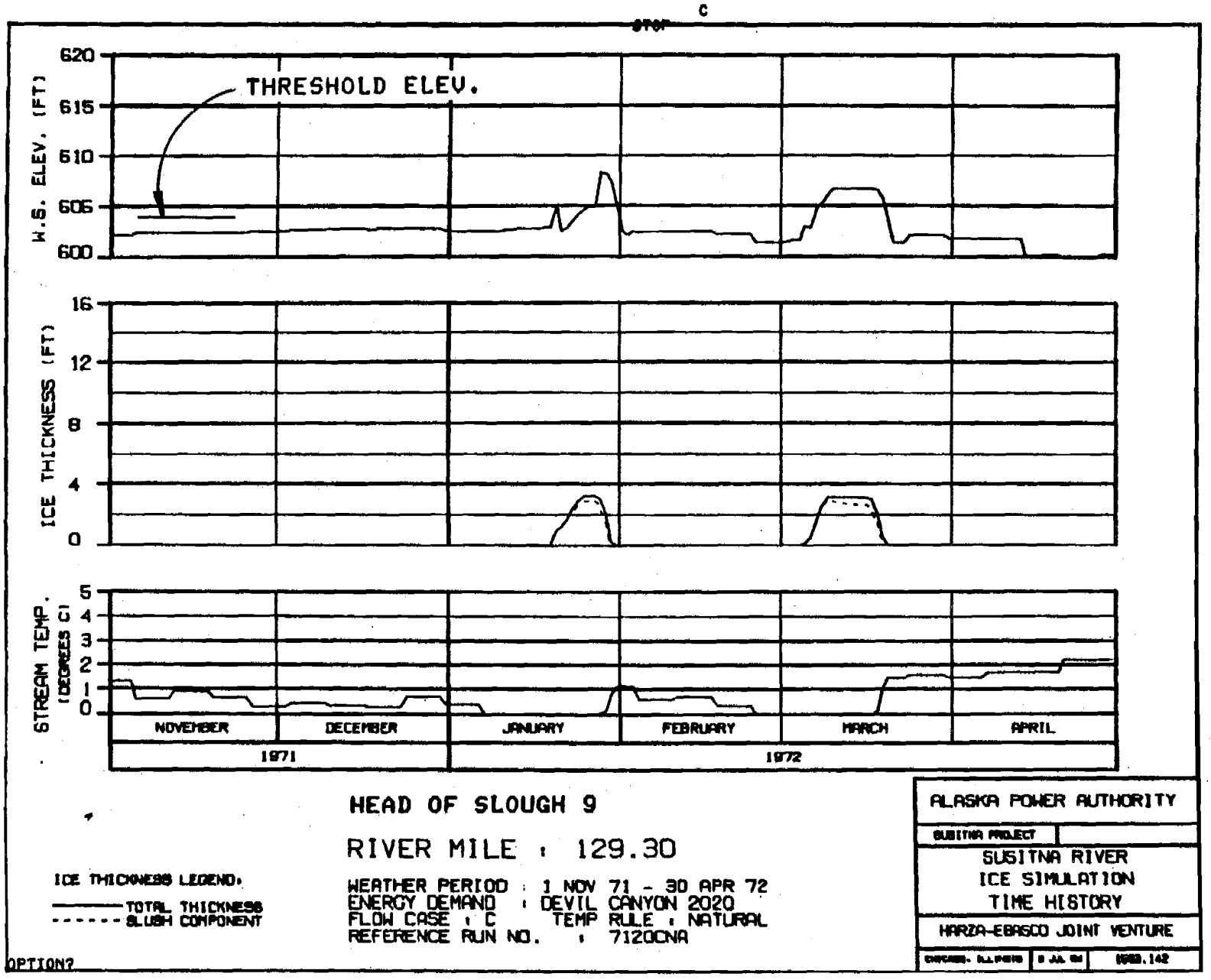
ICE THICKNESS LEGEND:

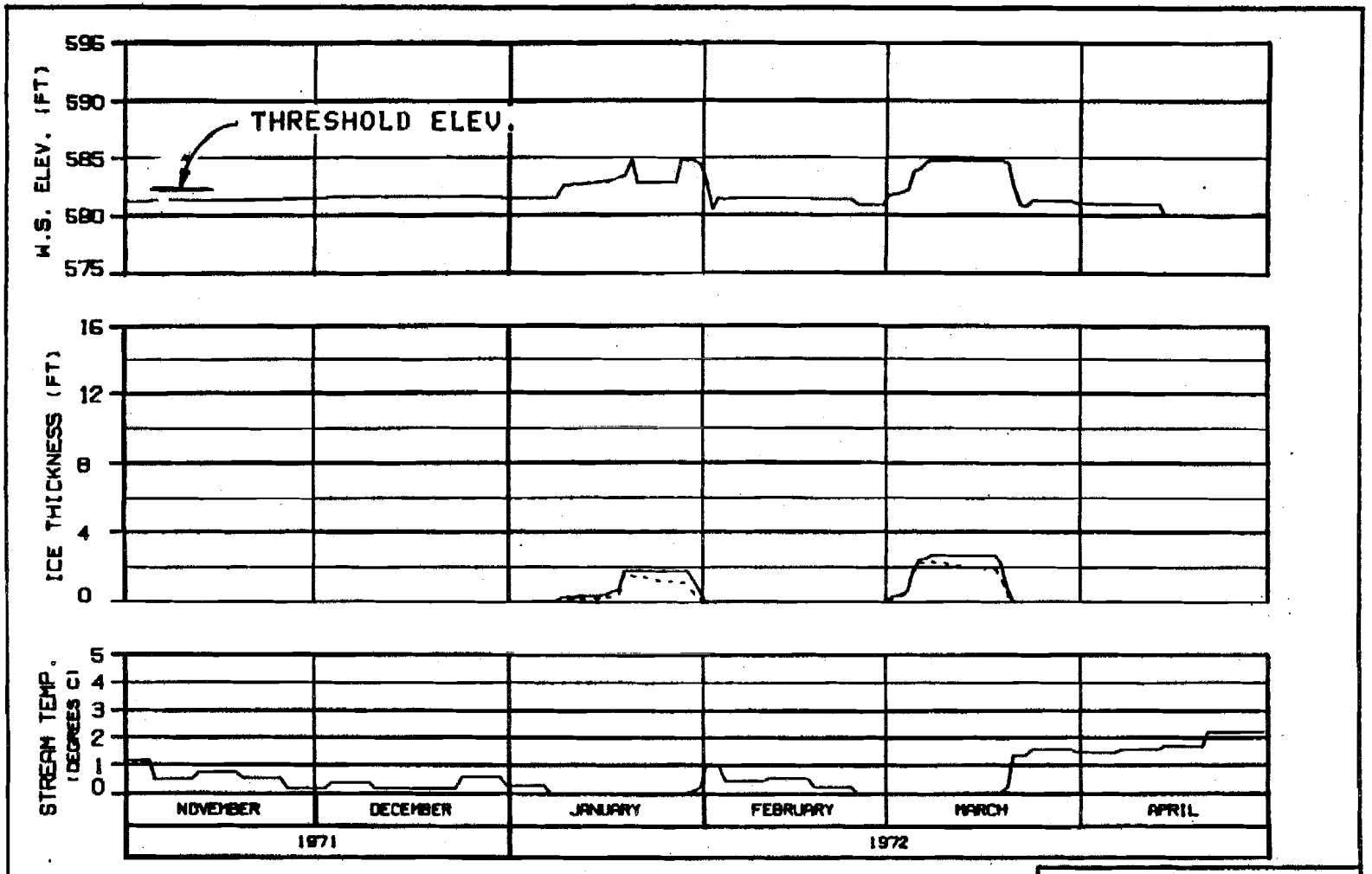
——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHECKED: R.L.PHOTO	8 JA 84	1988.142


C
STOP
620
615
610
605
600
W.S. ELEV. (FT)
THRESHOLD ELEV.
16
12
8
4
0
ICE THICKNESS (FT)
5
4
3
2
1
0
STREAM TEMP. (DEGREES C)
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1971
1972
HEAD OF SLOUGH 9
RIVER MILE : 129.30
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA
OPTION?
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

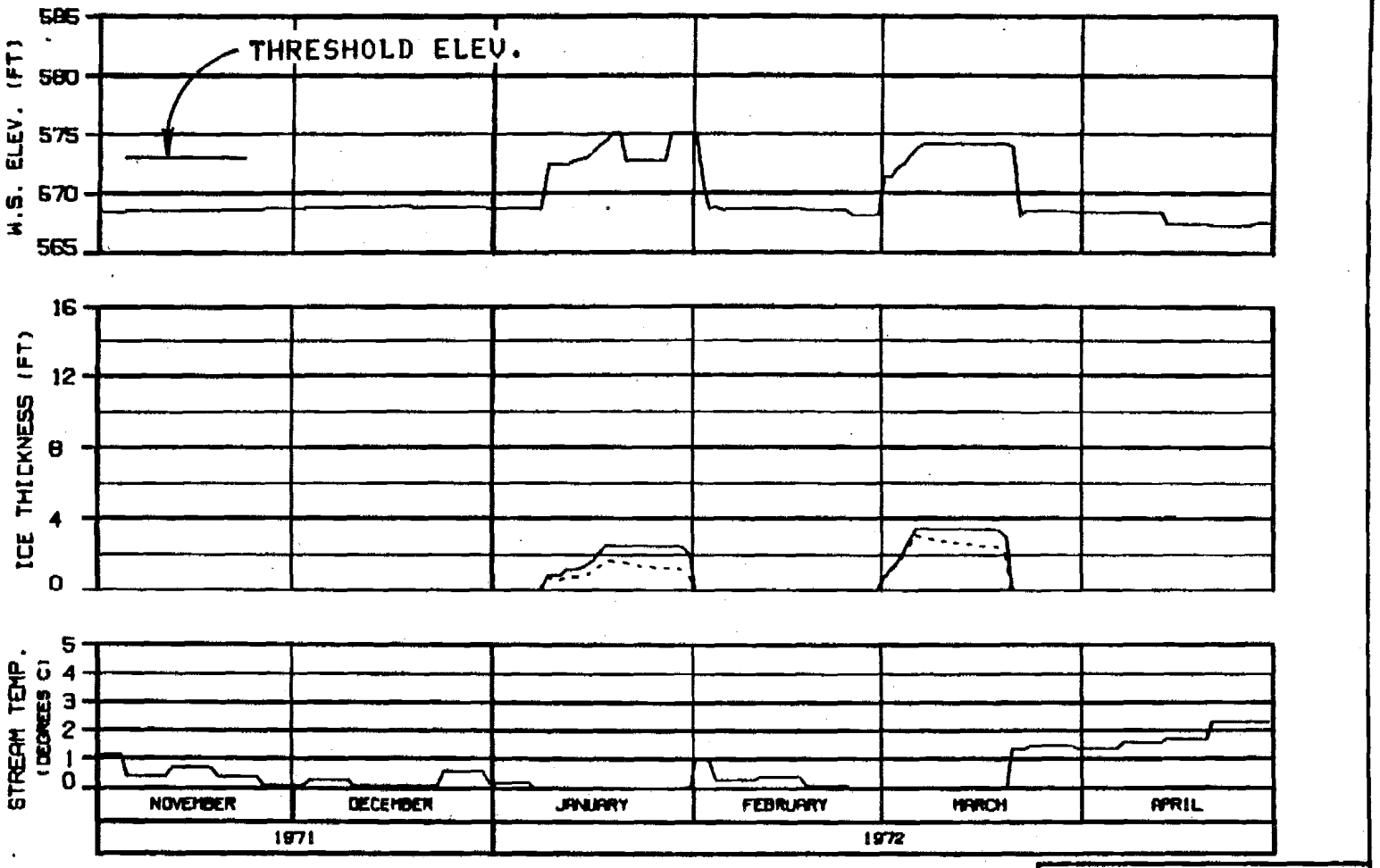
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHECKED: [illegible]	5 JUL 84	1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

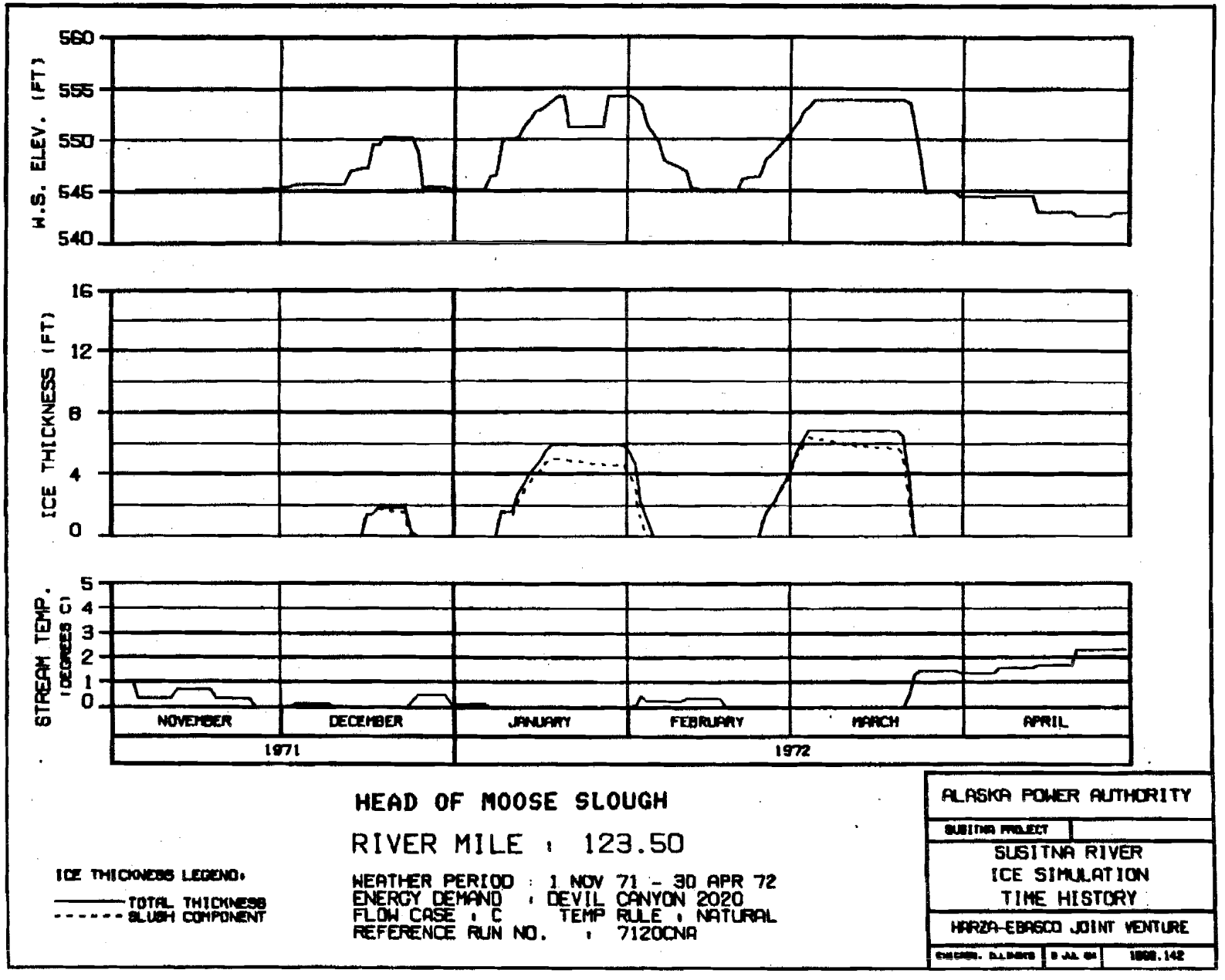
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.P. 8 JUL 84 1588.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

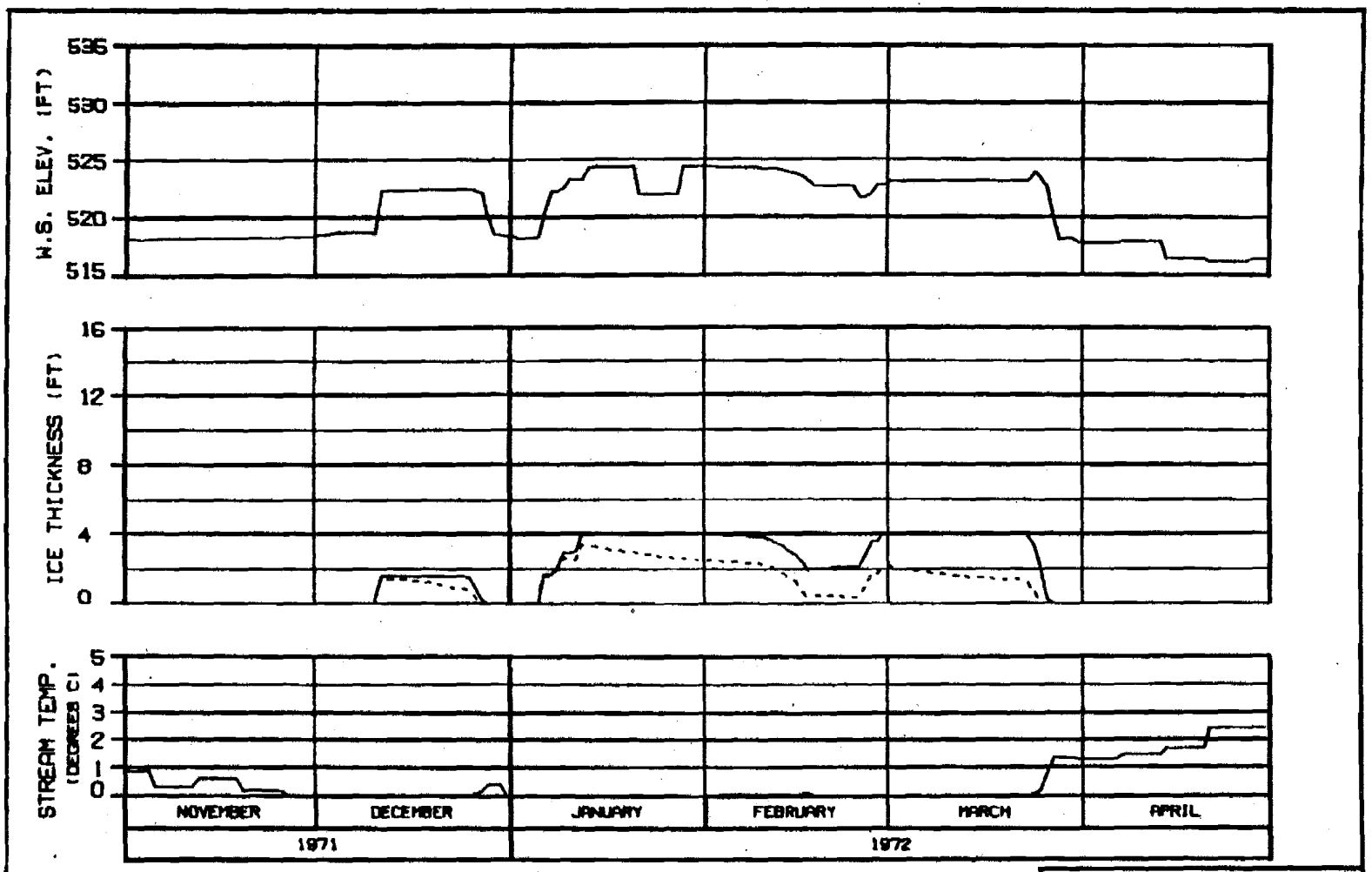
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHECKED: D.L.BARRETT	8 JUL 84	1868.142

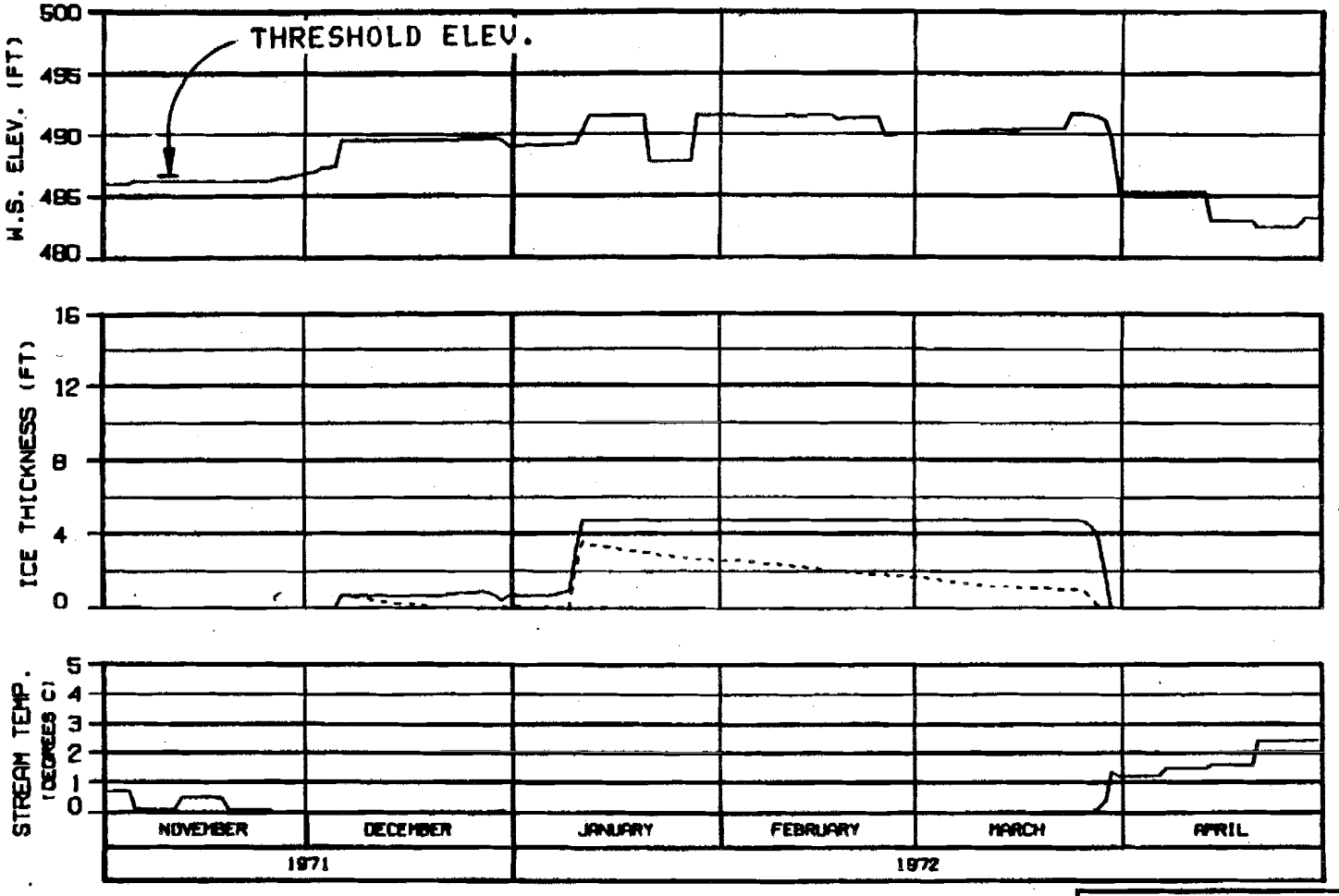


RIVER MILE : 120.00

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

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



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

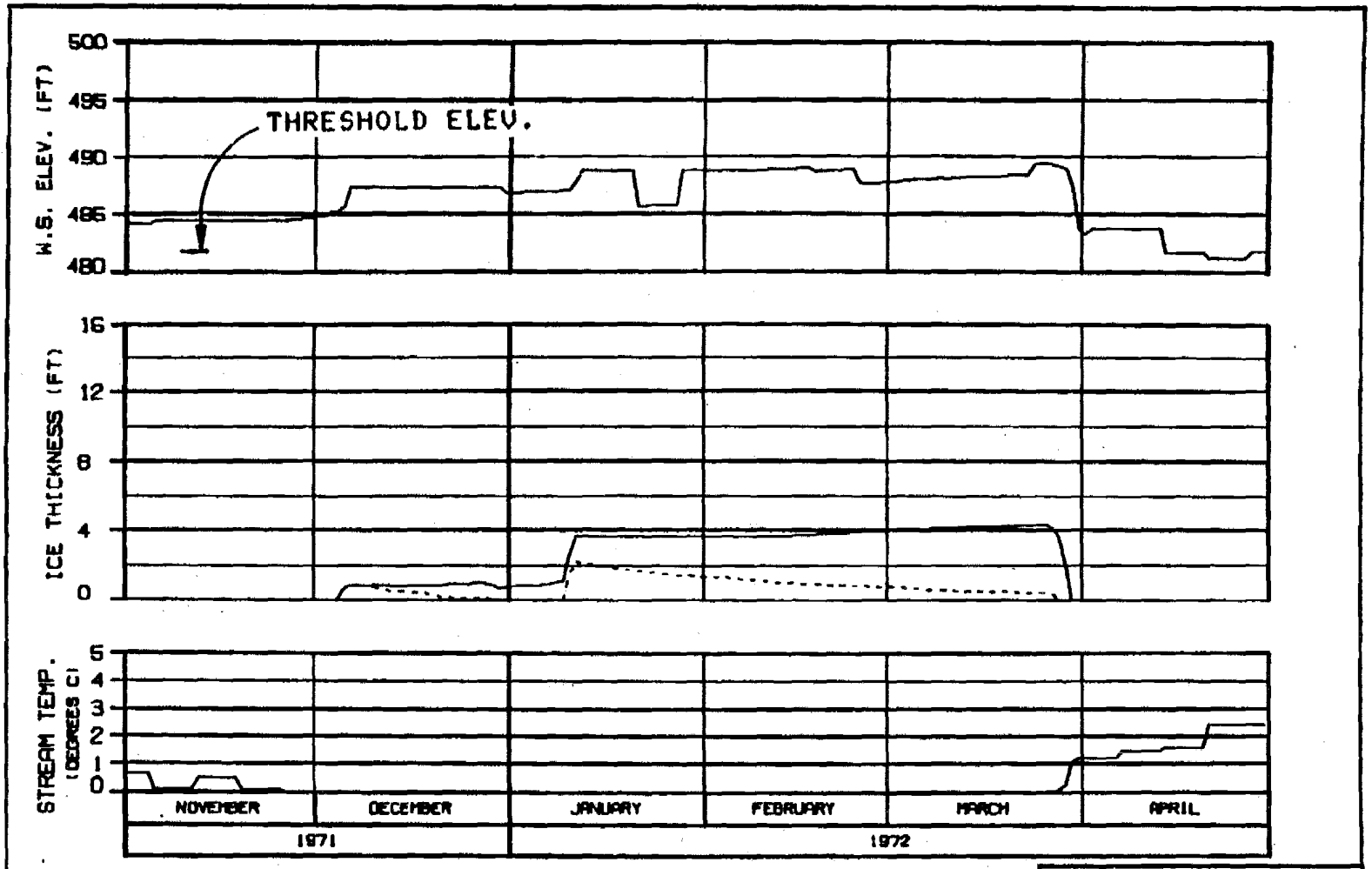
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1588.142



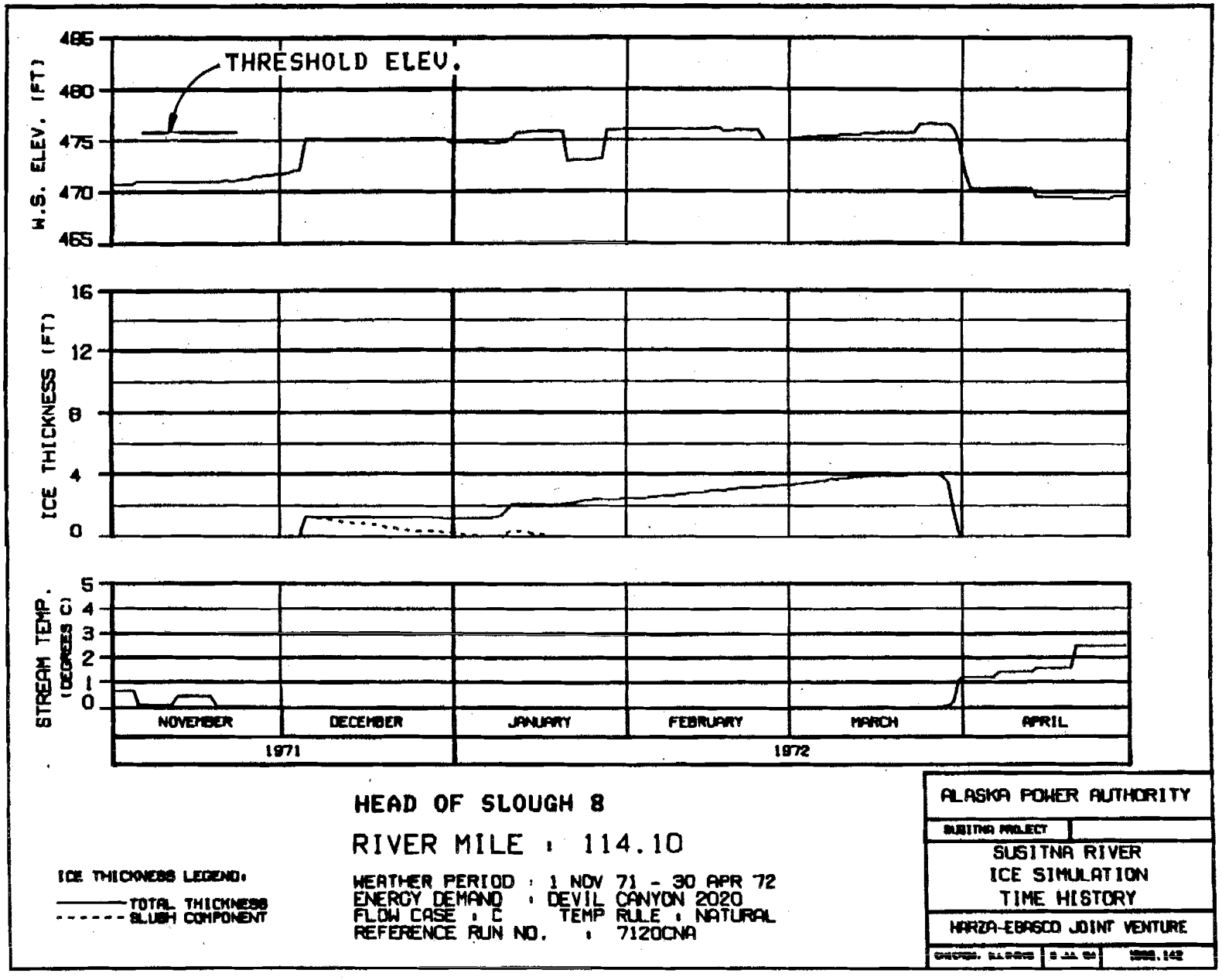
SIDE CHANNEL MSII

RIVER MILE : 115.50

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
1988.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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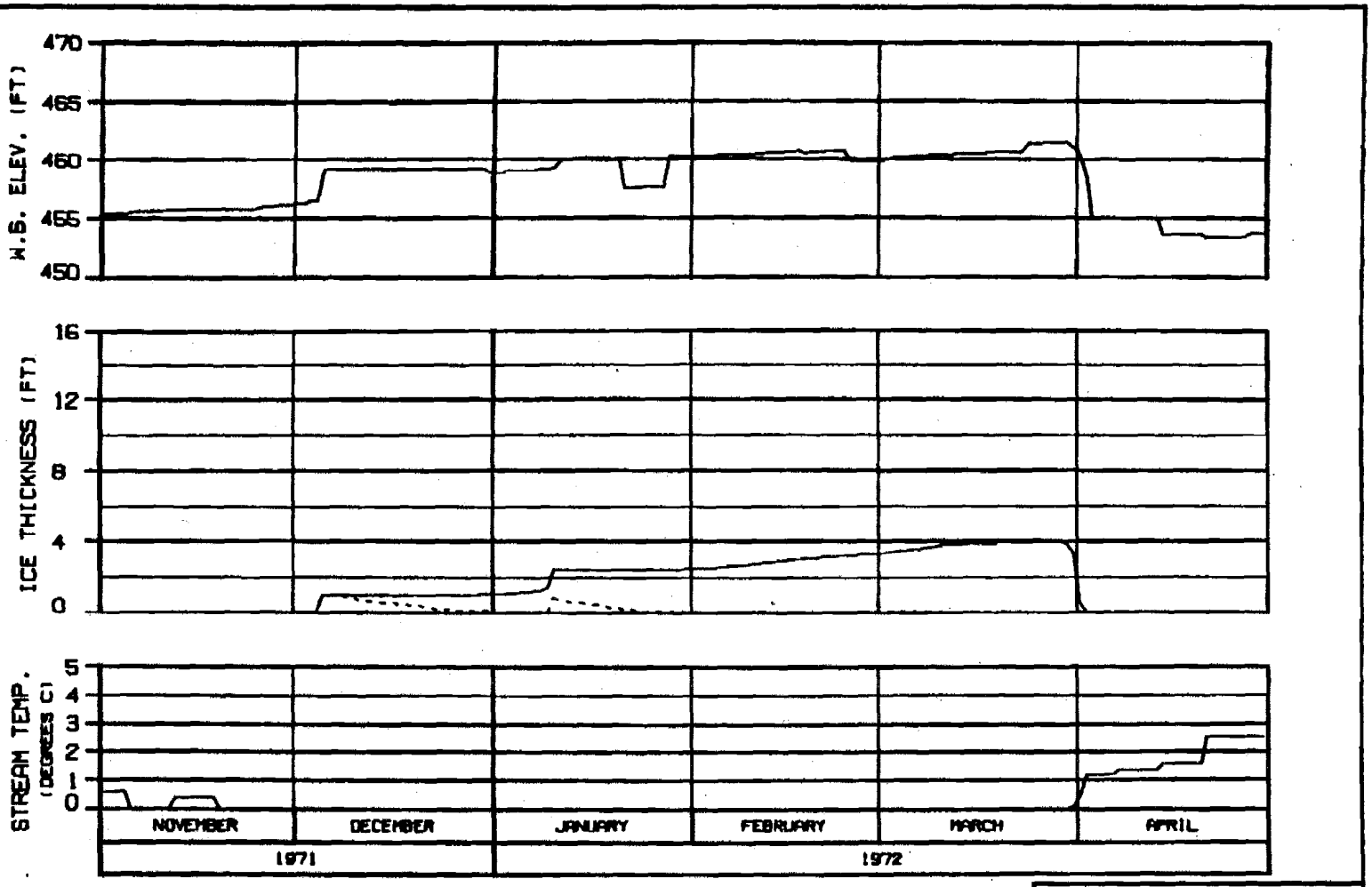


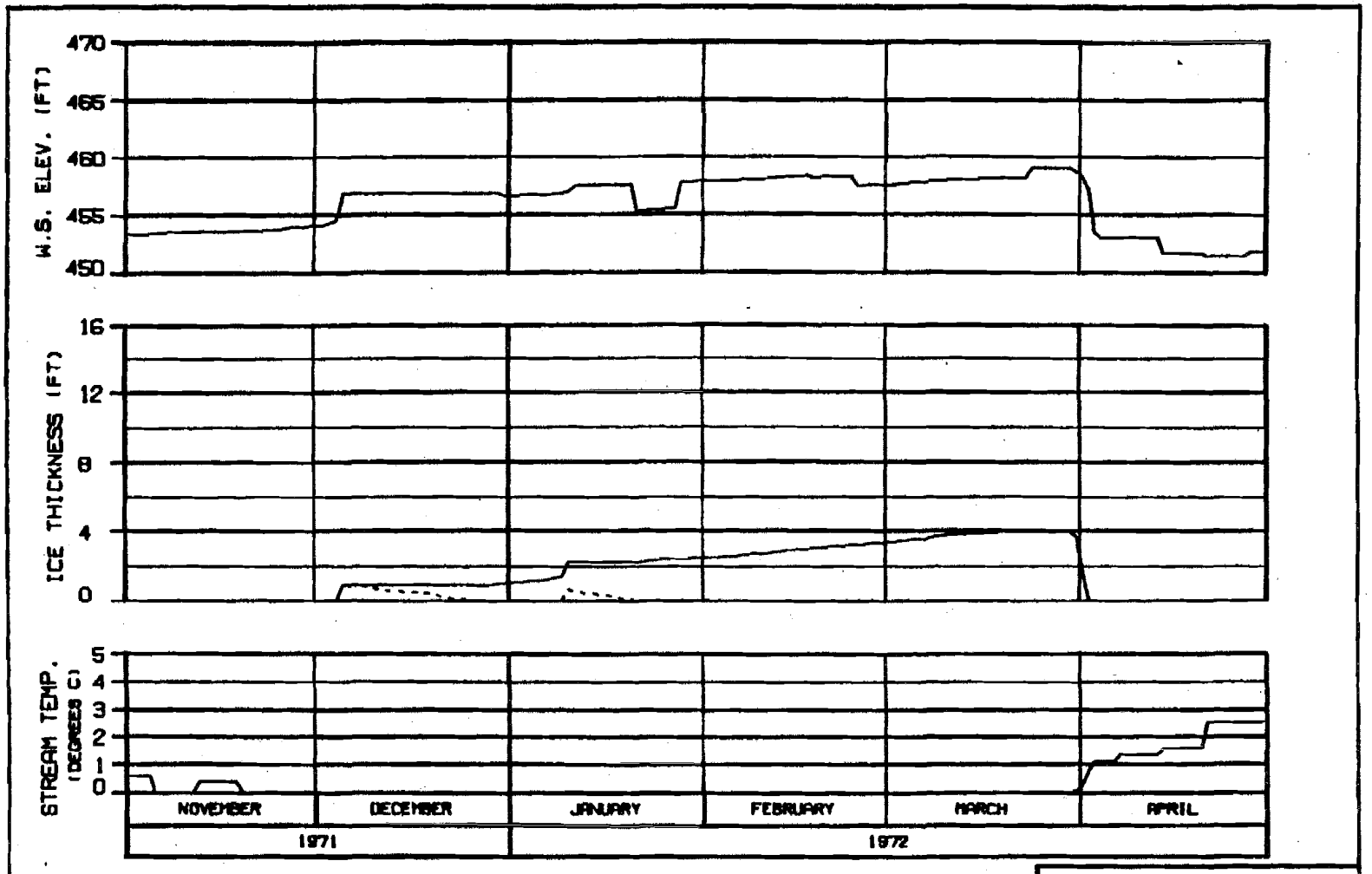
MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
CHECKED: R.L.DAVIS | 8 JUL 84 | 1868.142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

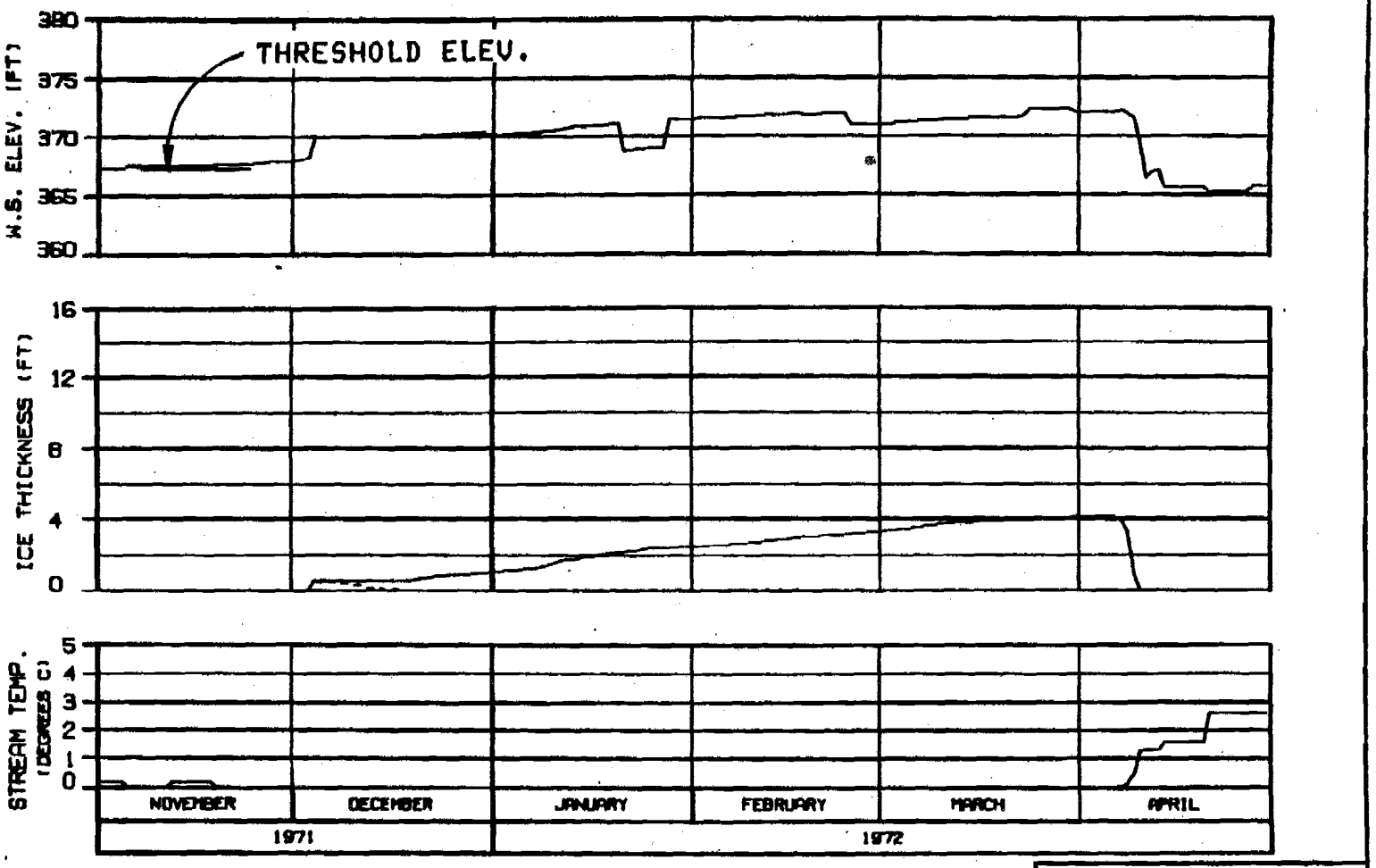
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE



HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.J.PARIS | 8 JUL 84 | 1588.142

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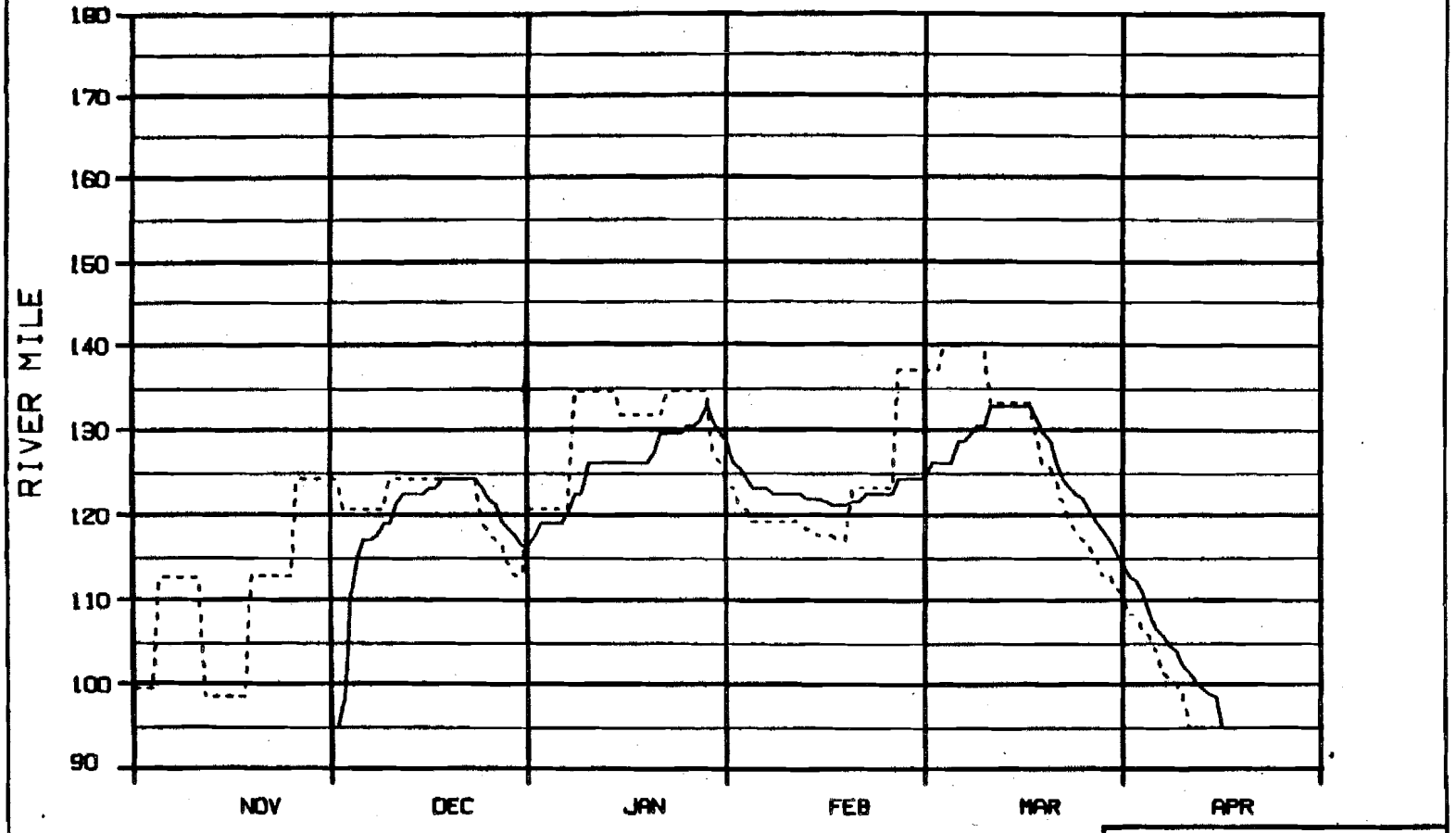

LEGEND:

———— ICE FRONT

- - - - - - - - - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
PROGRESSION OF ICE FRONT
& ZERO DEGREE ISOTHERM

HARZA-EBASCO JOINT VENTURE

OPTION?

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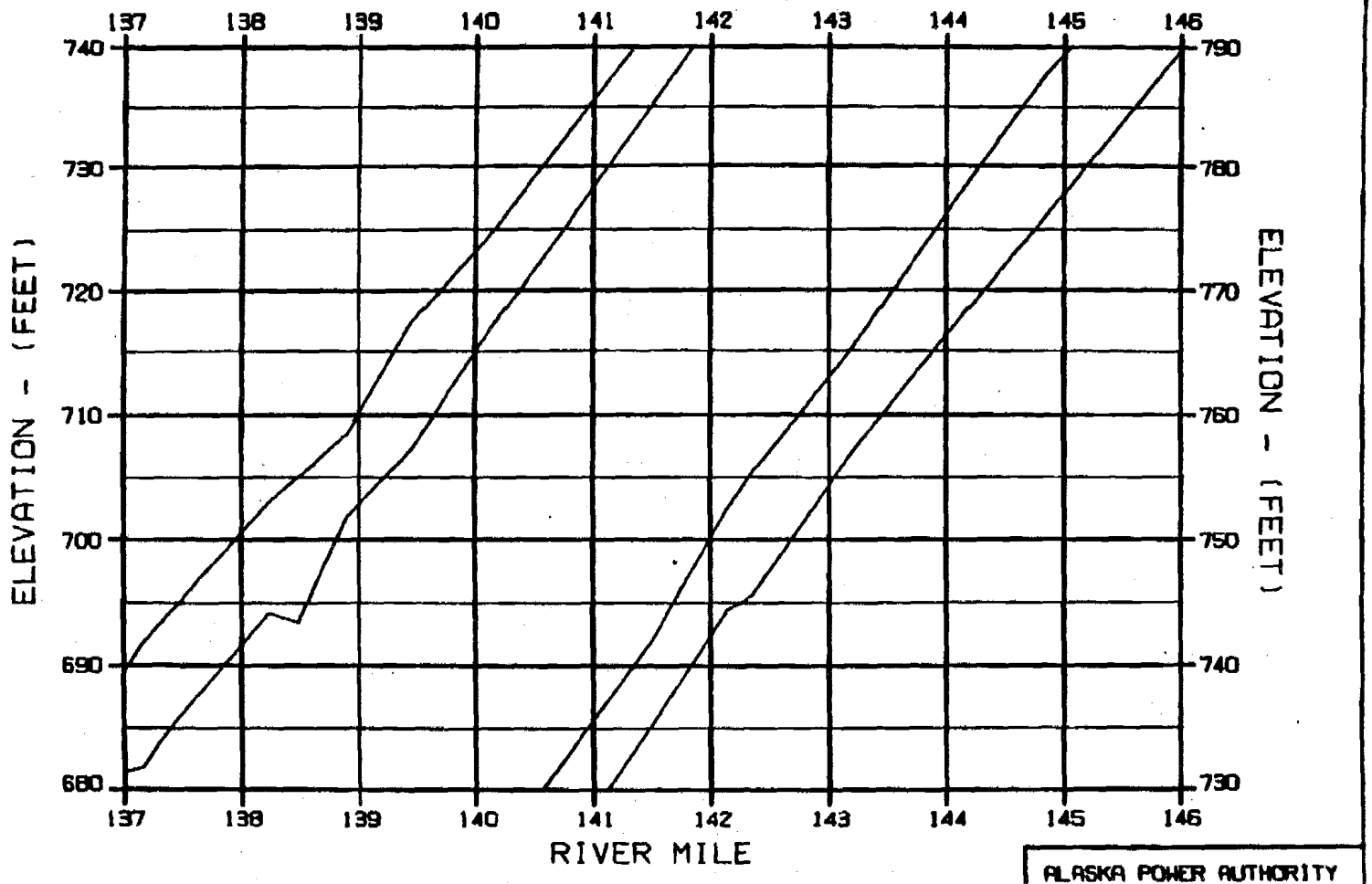

LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

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

OPTION?

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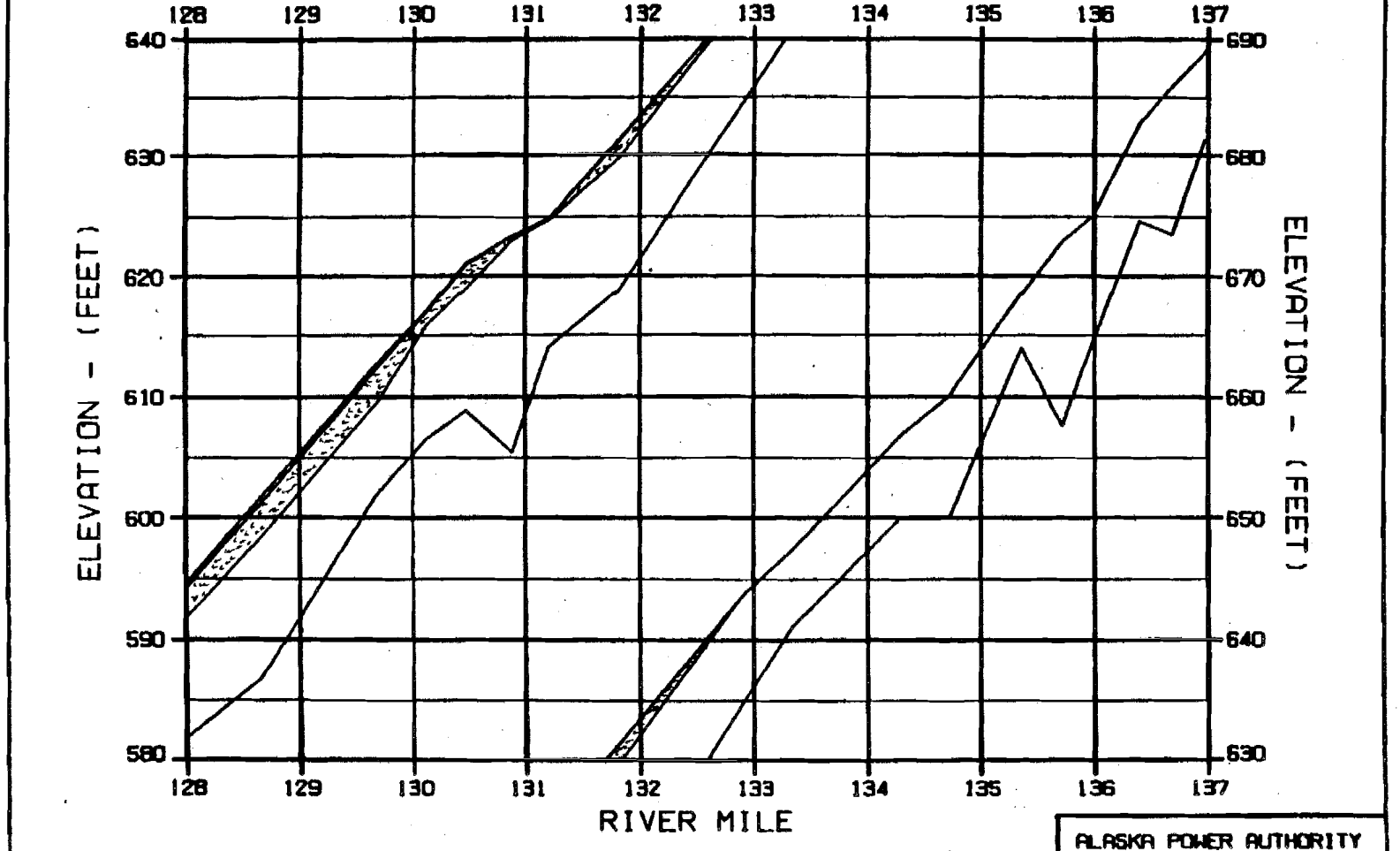

LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 712DCNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

DRAWN: G.L.DAVIS | 9 JUL 87 | 1988.142

OPTION?

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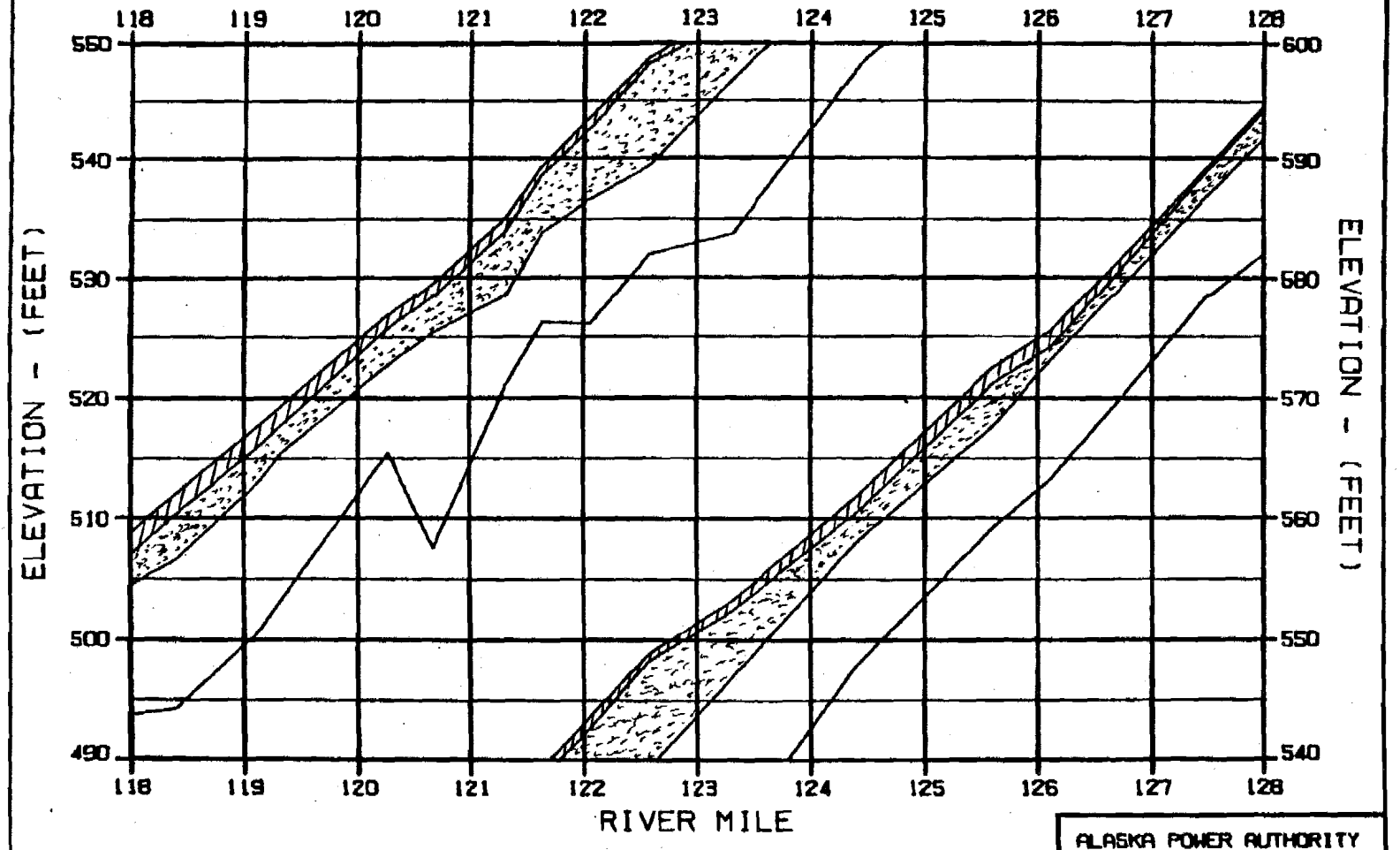

LEGEND:

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

WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

1988.142

OPTION?

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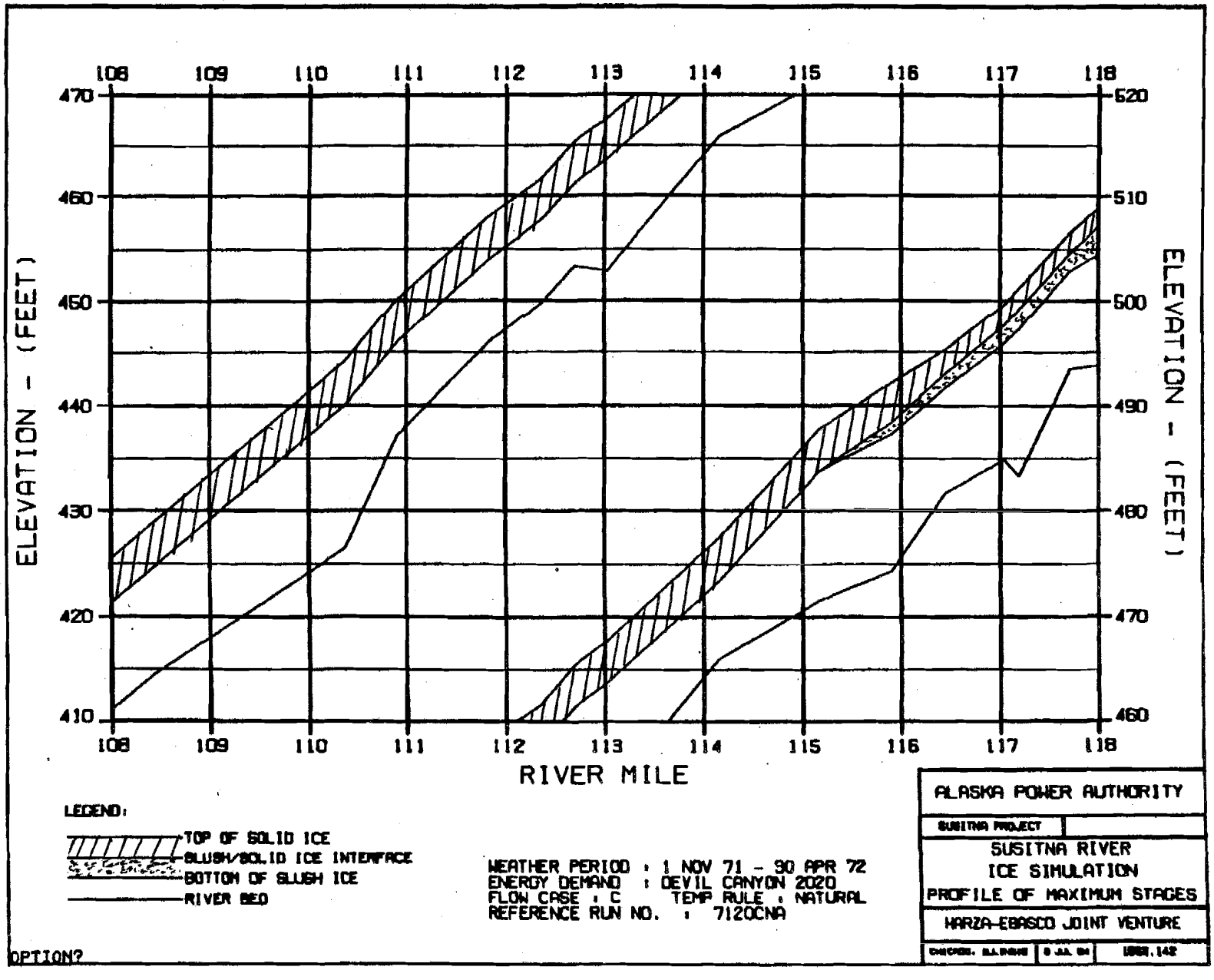
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
CHICAGO, ILLINOIS
8 JUL 84
USGS.142
OPTION?

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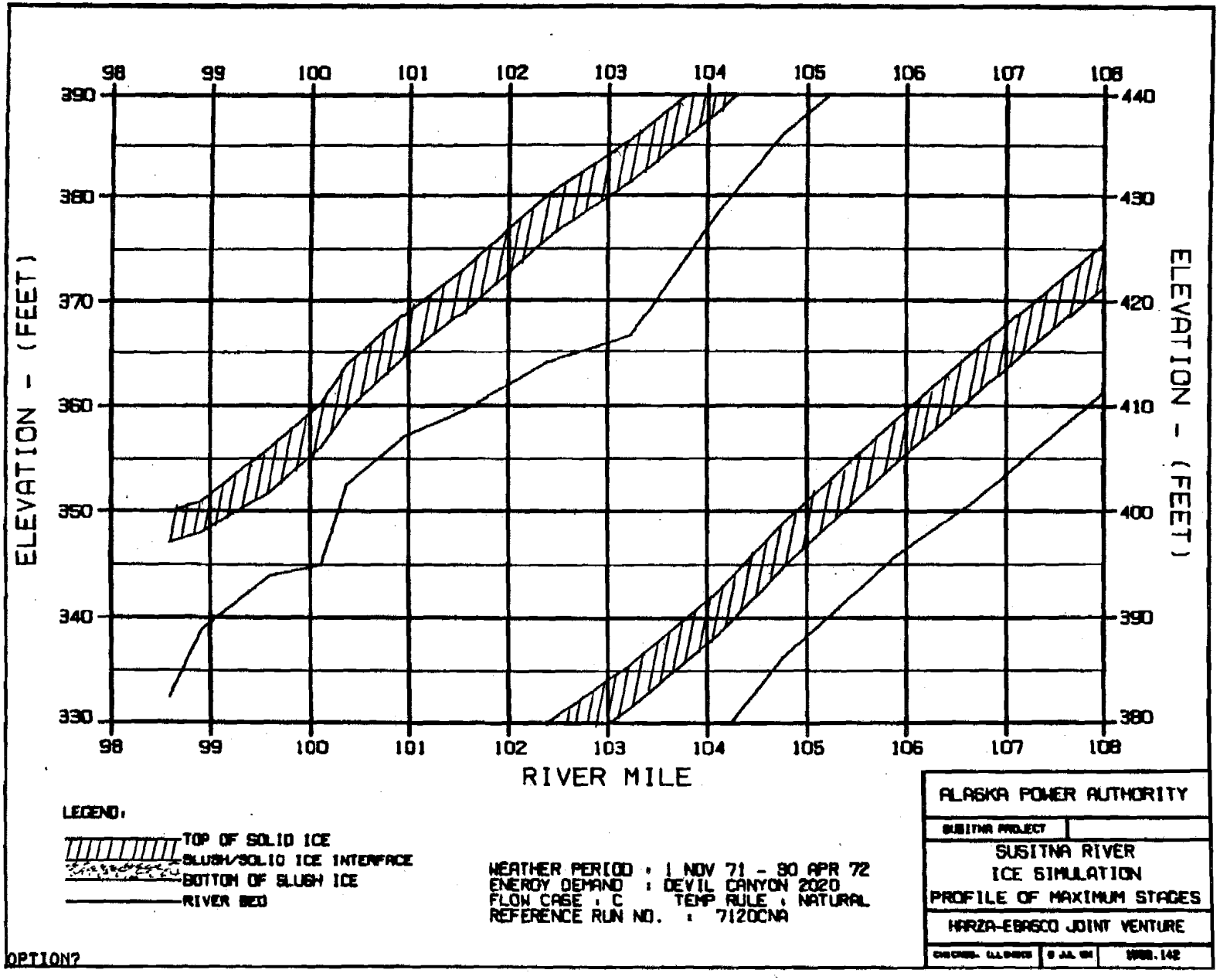
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ELEVATION - (FEET)
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RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 71 - 30 APR 72
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP RULE : NATURAL
REFERENCE RUN NO. : 7120CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
8 JUL 81
WBB.142
OPTION?

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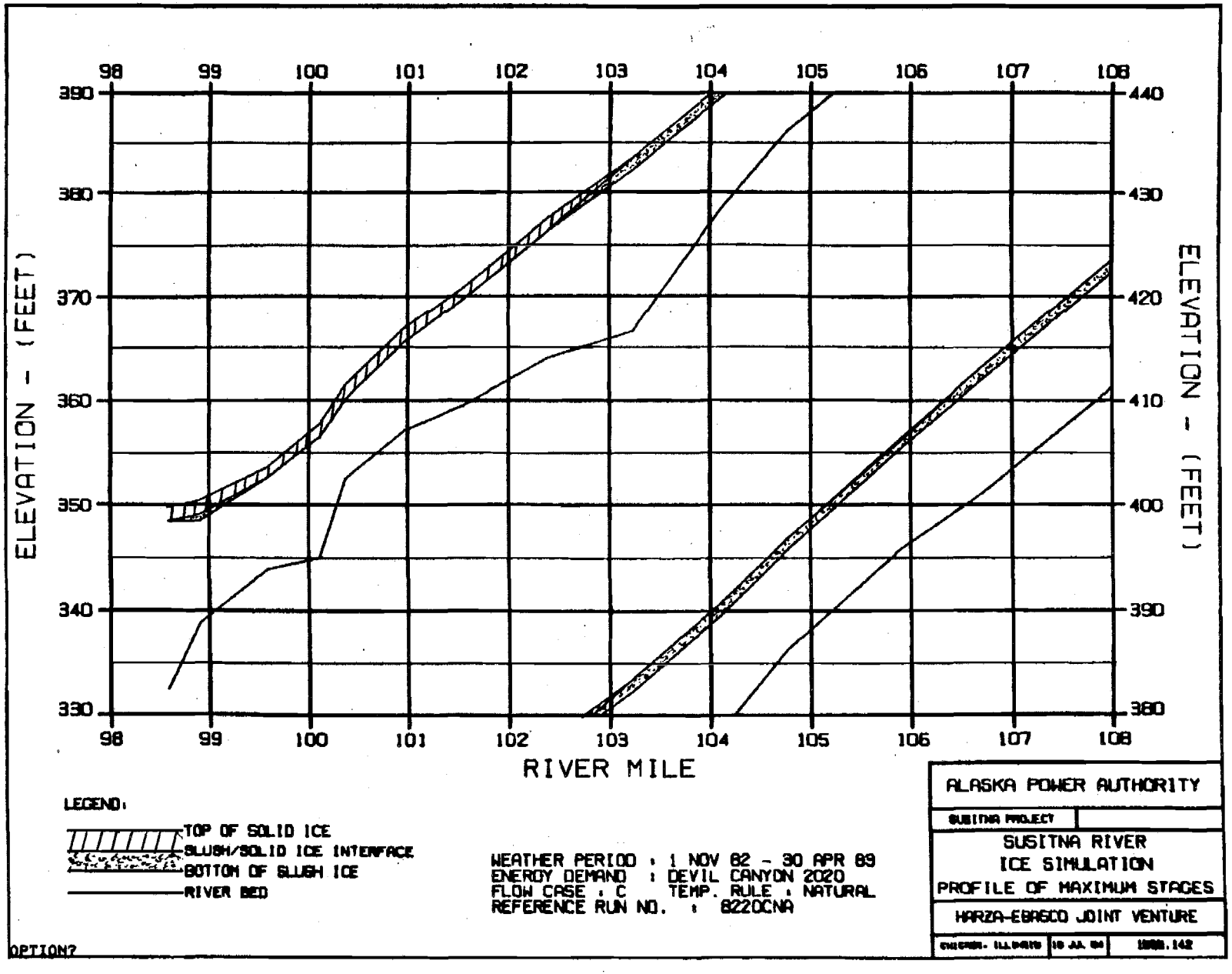
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
OPTION?

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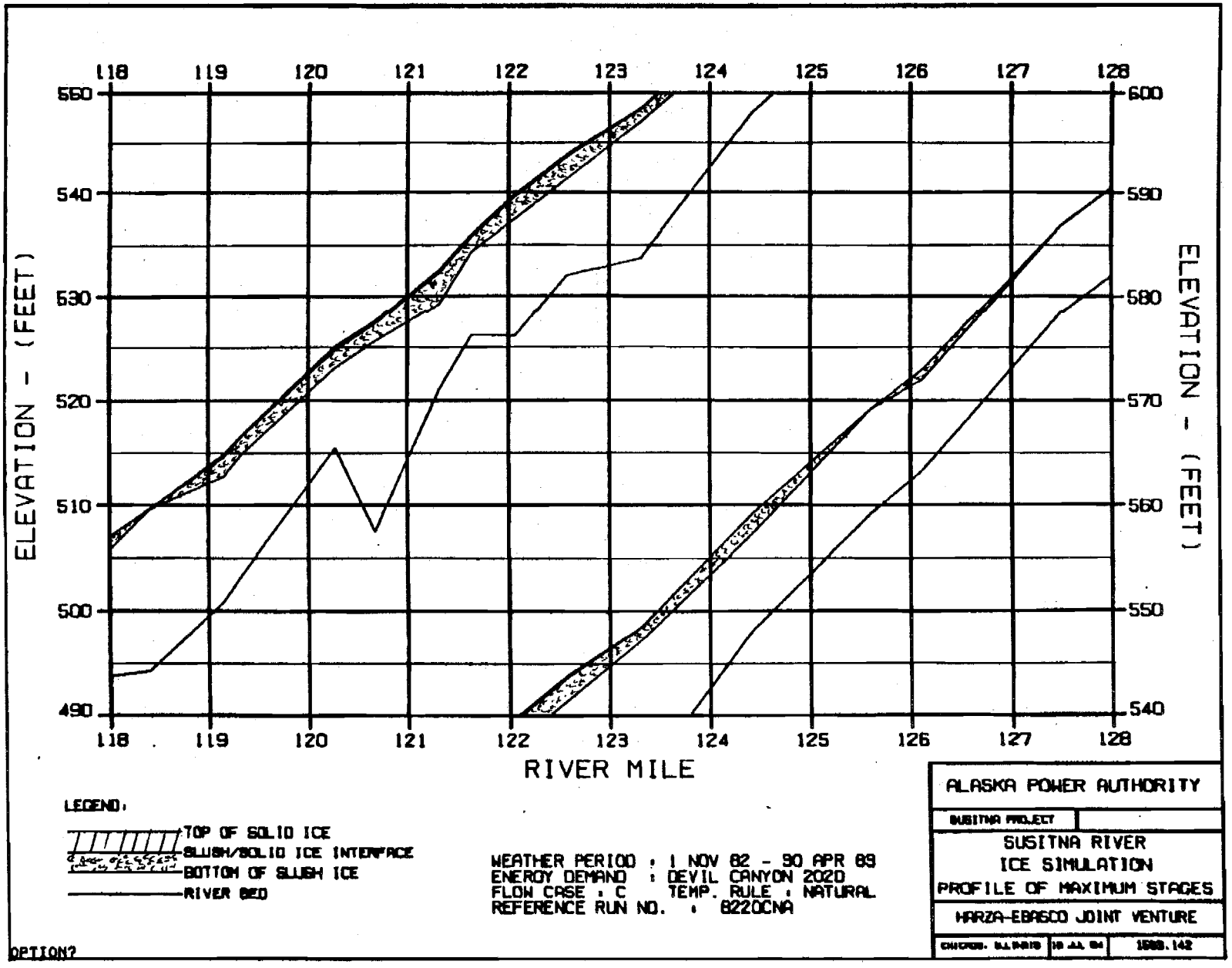
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ELEVATION - (FEET)
ELEVATION - (FEET)
RIVER MILE
LEGEND:
TOP OF SOLID ICE
SLUSH/SOLID ICE INTERFACE
BOTTOM OF SLUSH ICE
RIVER BED
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
PROFILE OF MAXIMUM STAGES
HARZA-EBASCO JOINT VENTURE
1588.142

OPTION?

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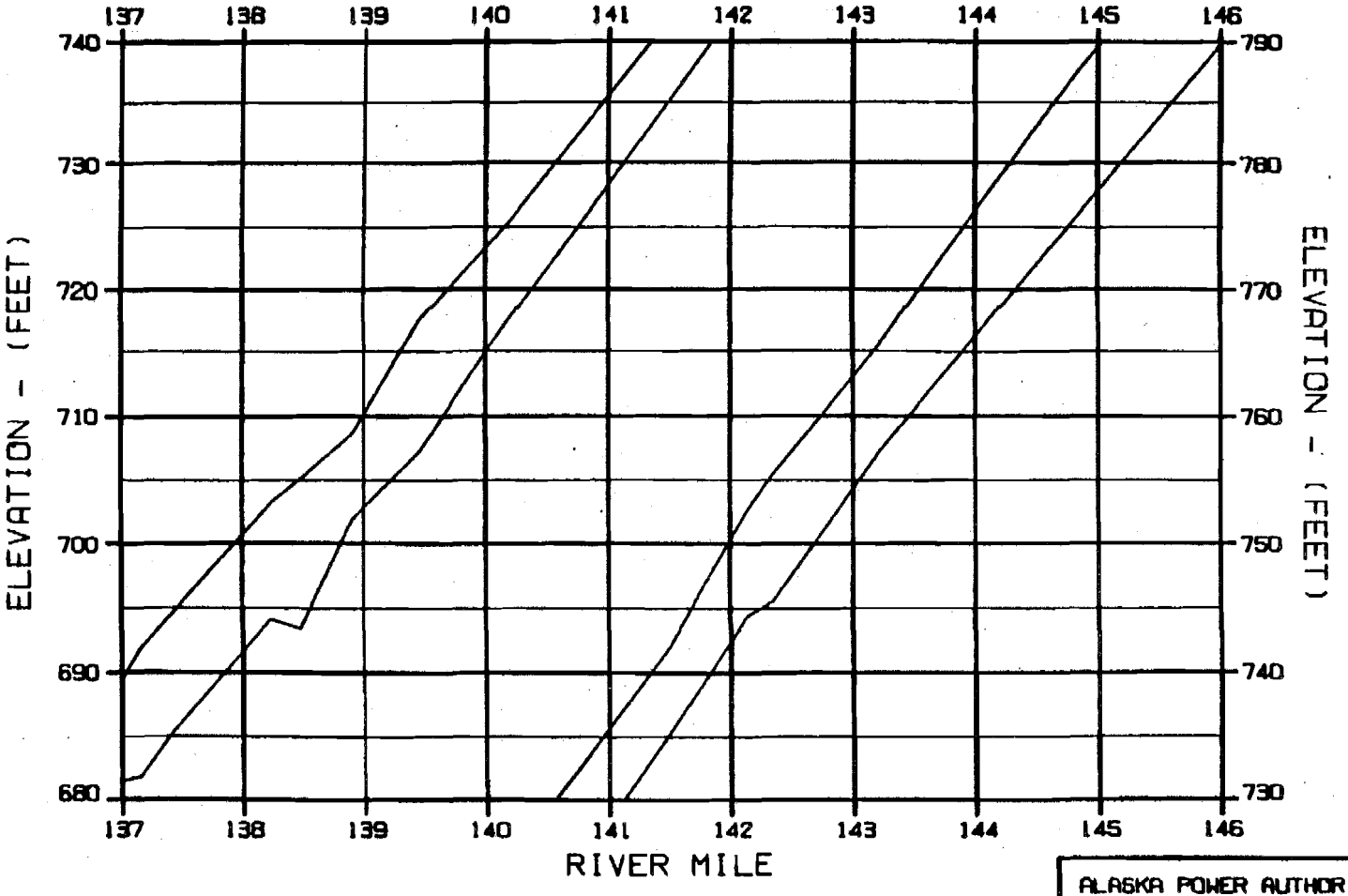


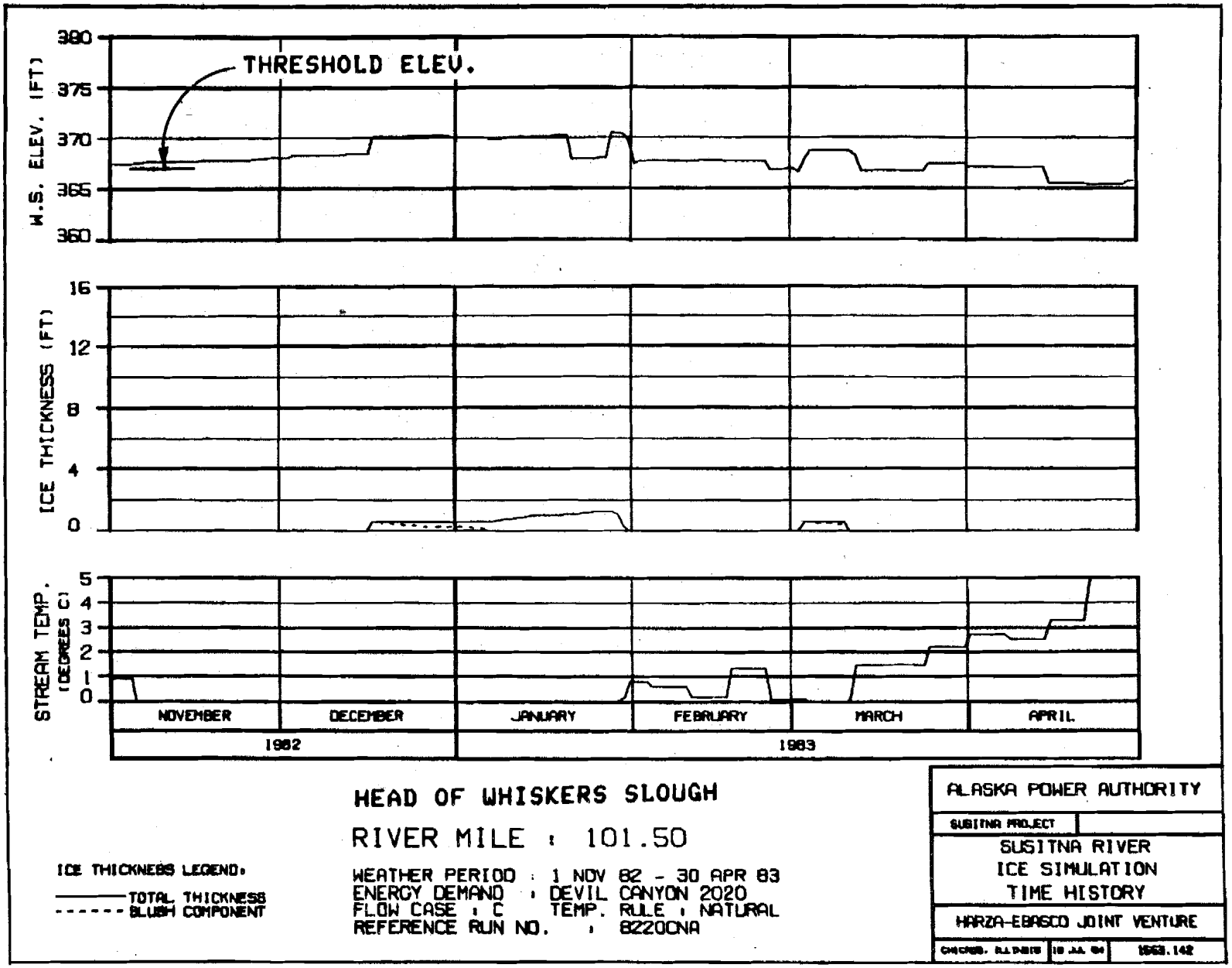
LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION PROFILE OF MAXIMUM STAGES	
HARZA-EBASCO JOINT VENTURE	
CHECKED: D.L.S.	10 JUL 84

OPTION?



HEAD OF WHISKERS SLOUGH

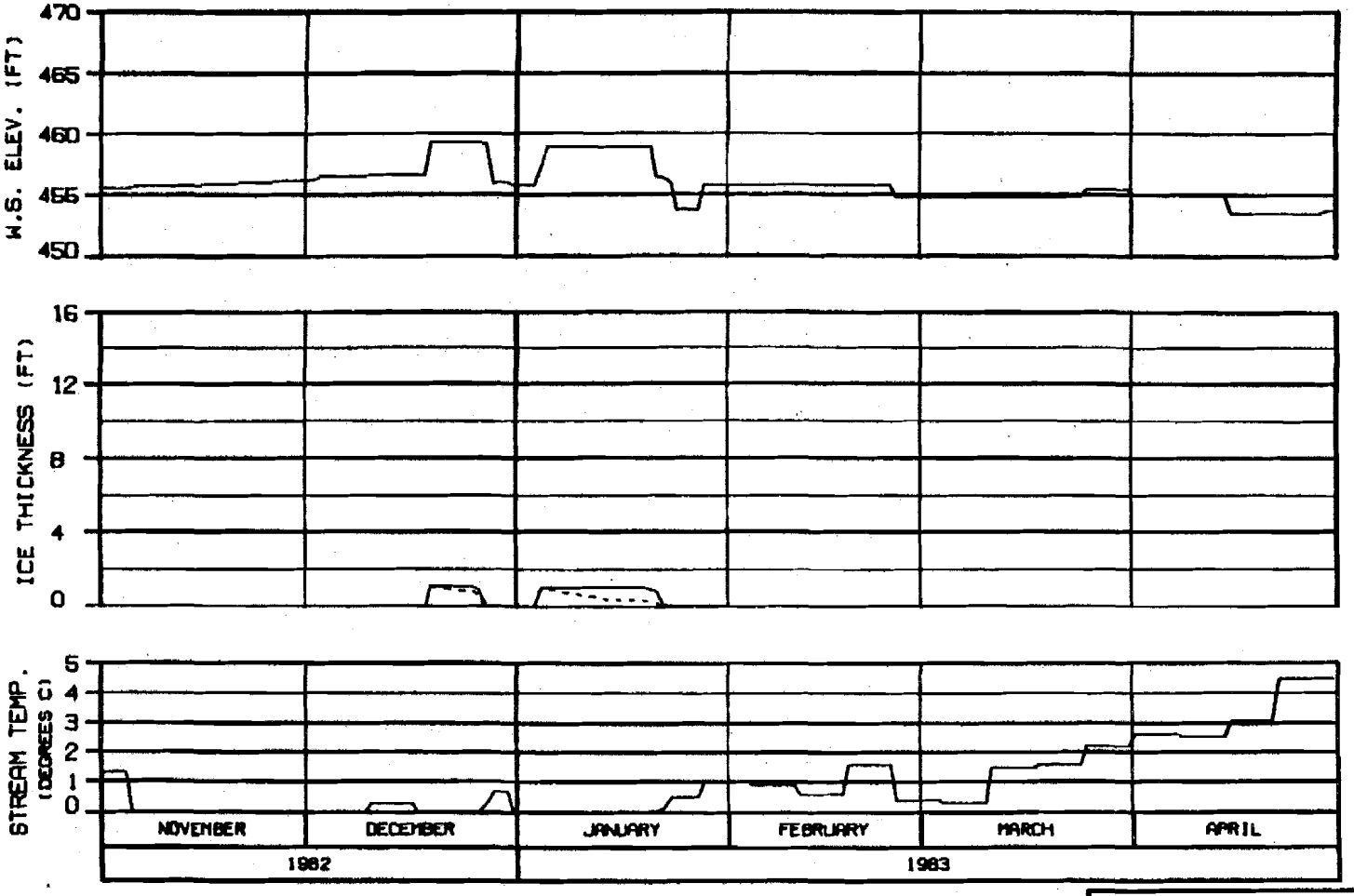
RIVER MILE : 101.50

ICE THICKNESS LEGEND:

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

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 82200NA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHICAGO, ILLINOIS	18 JUL 84	1563.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

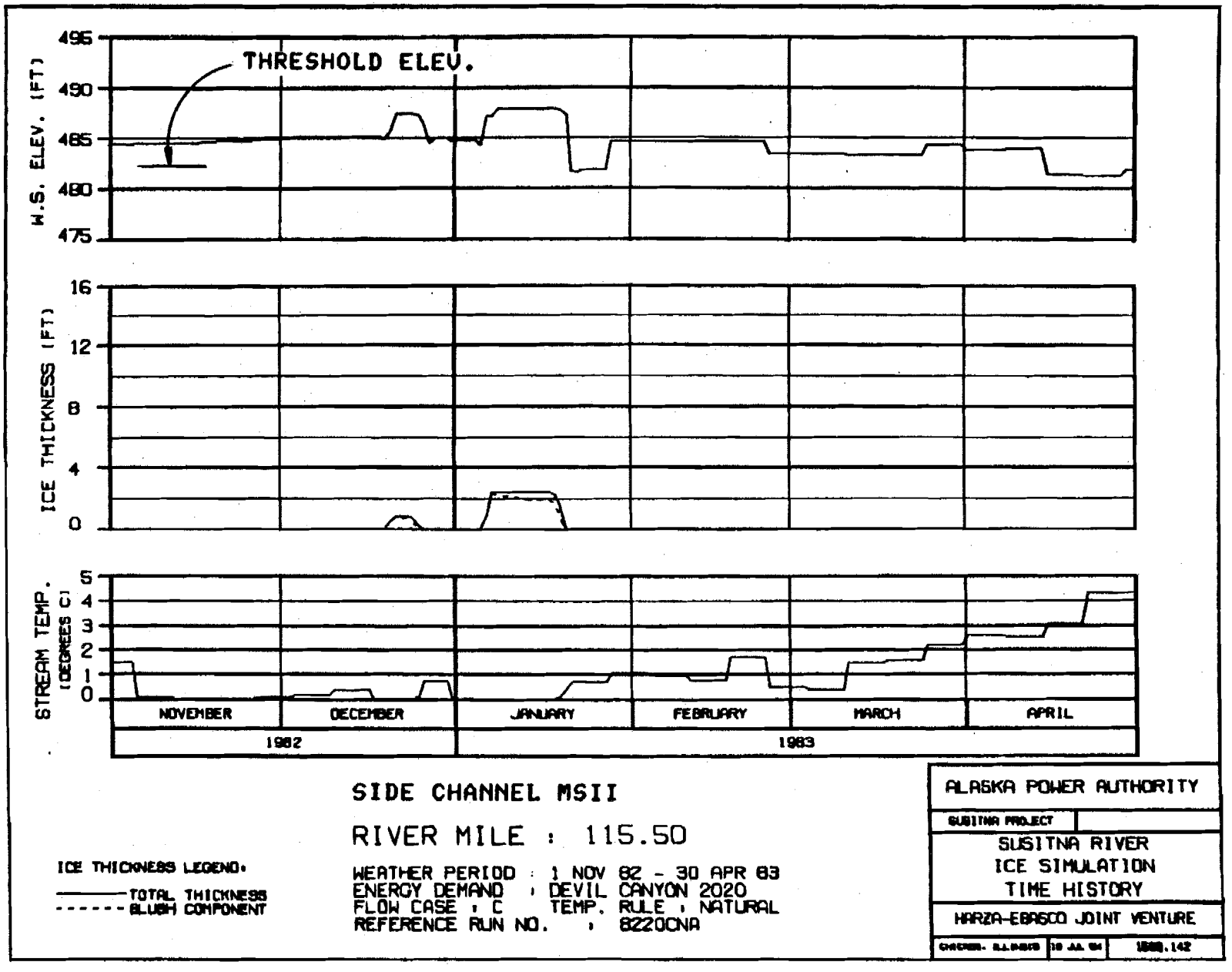
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JUL 84 | 1588.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

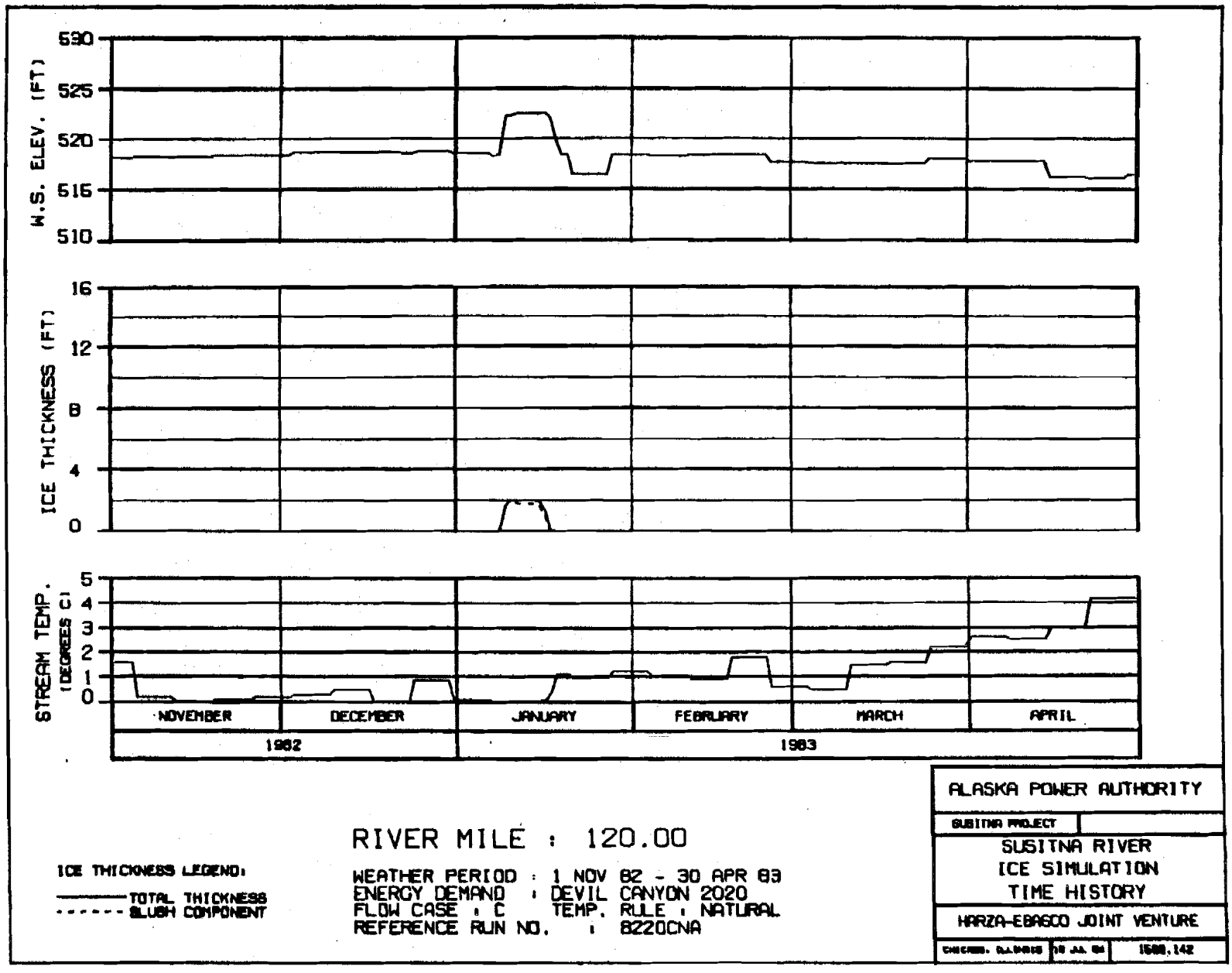
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: R.L.HEID 10 JUL 84 1588.142



RIVER MILE : 120.00

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

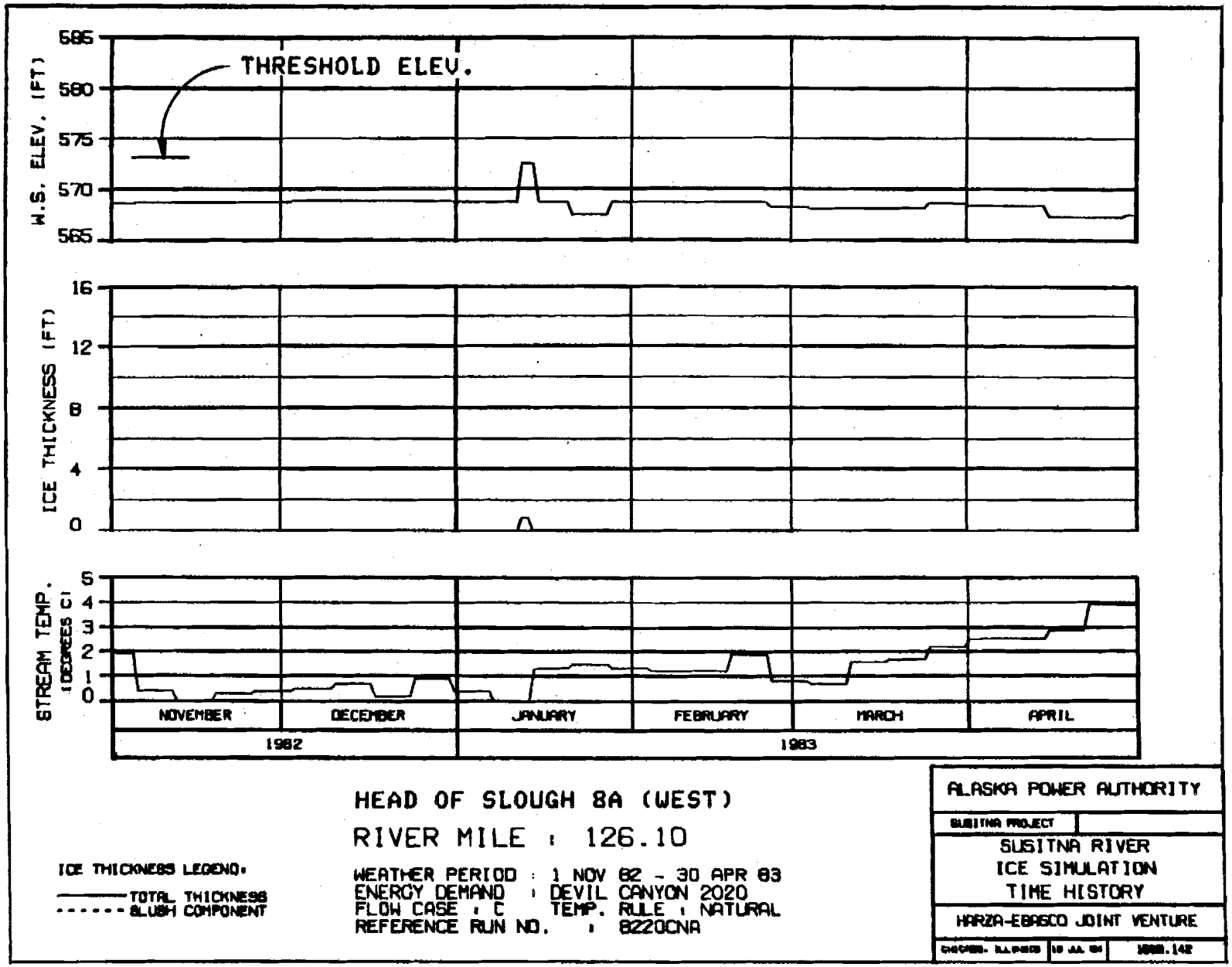
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: D.L.DAVIS 18 JUL 84 1588.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

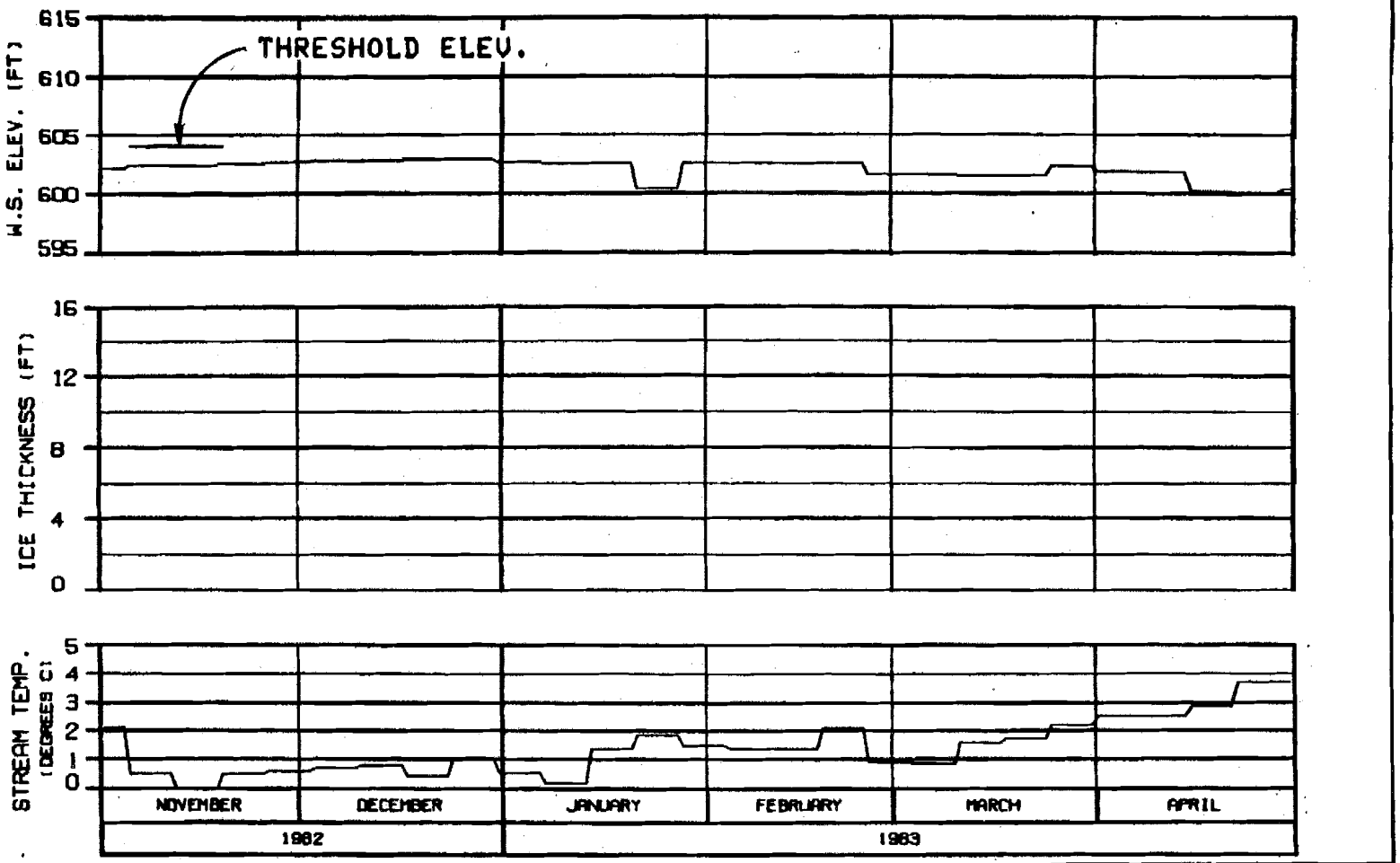
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS | 10 JAN 84 | 1888.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY

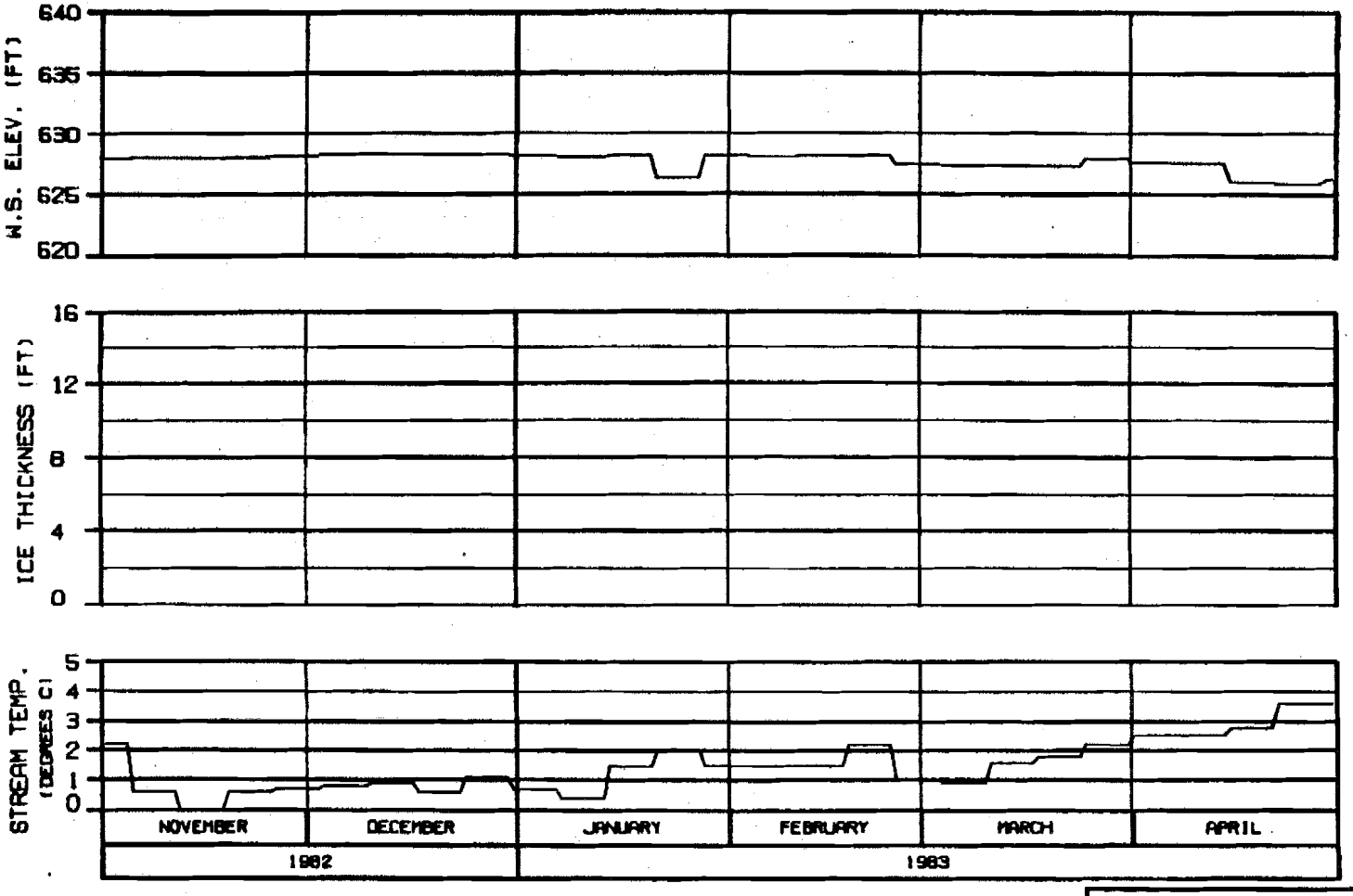
SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

1568.142

OPTION?



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 8220CNA

ICE THICKNESS LEGEND:

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

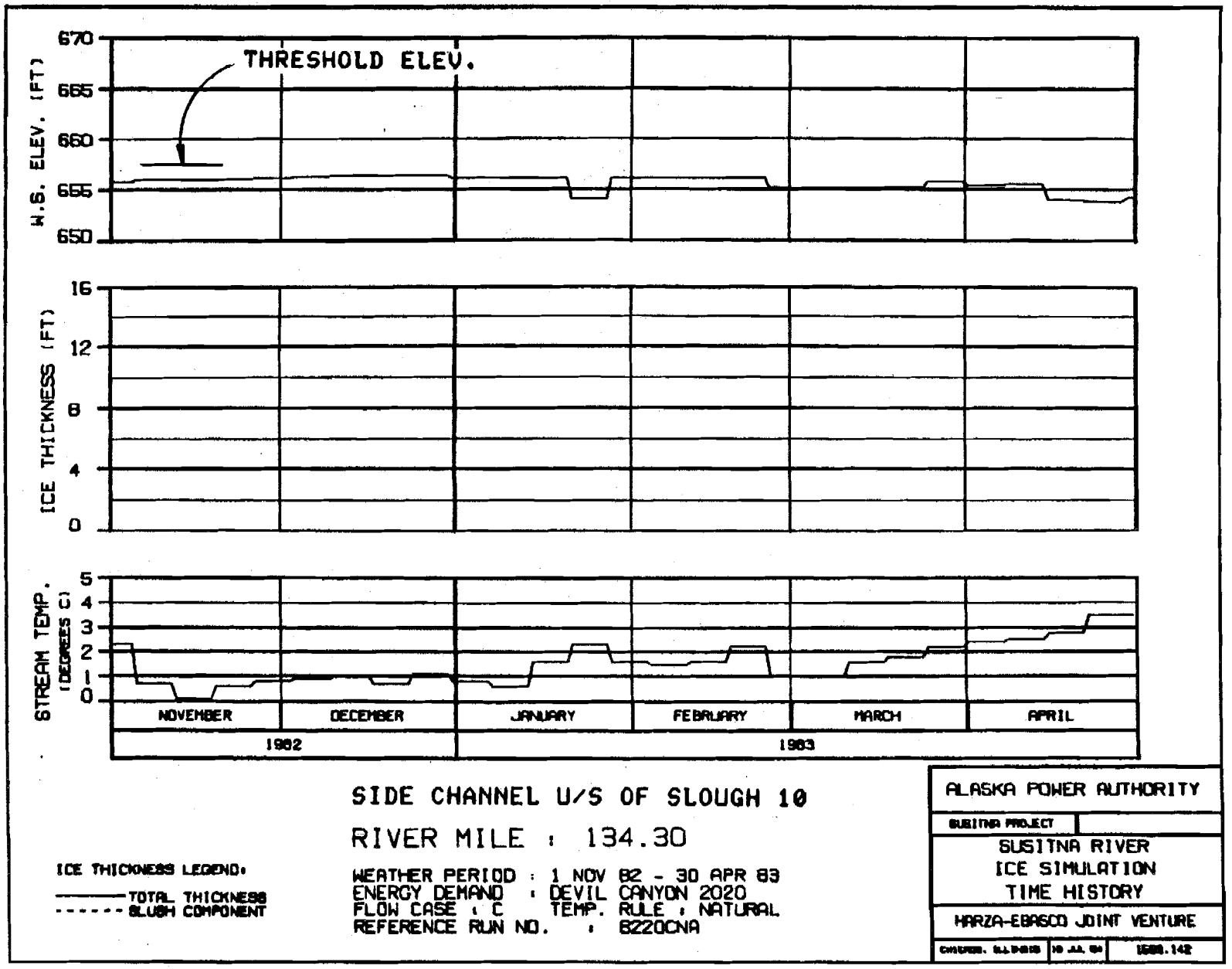
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: A.L.D.R.B. | 16 JUL 84 | 1588.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

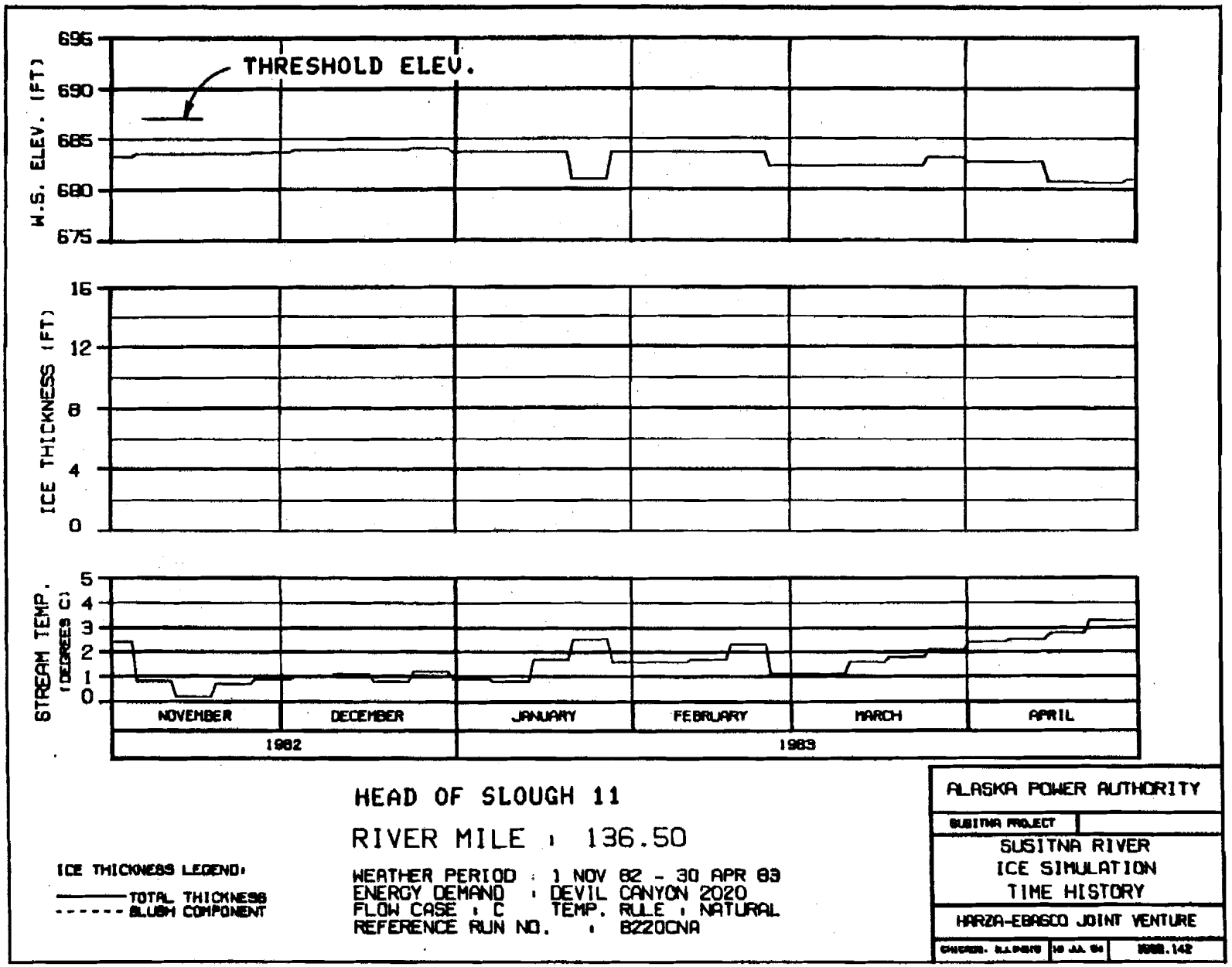
ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 82200NA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO, ILLINOIS	10 JUL 84	1588.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : B220CNA

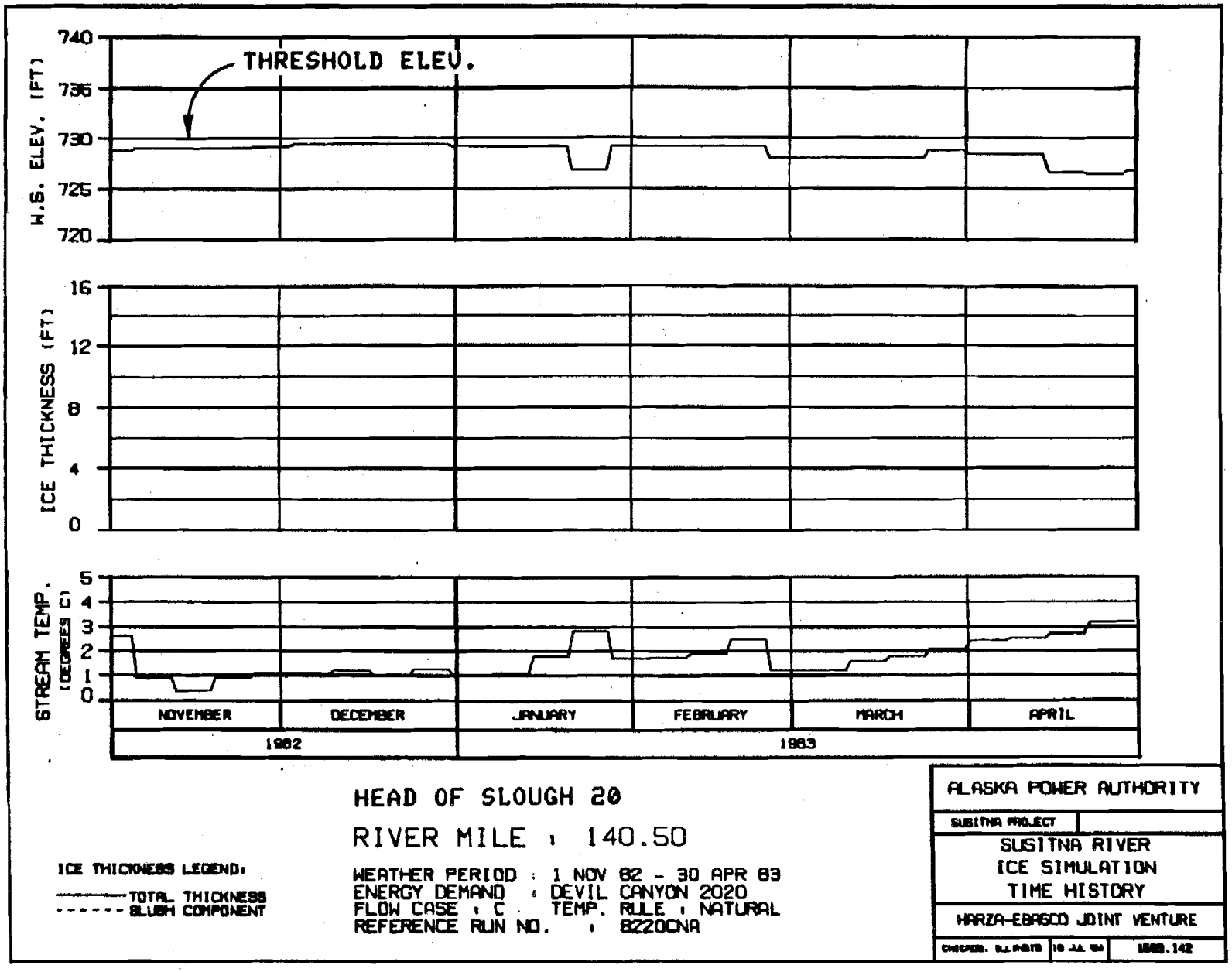
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DWGNO. 8.1.9870 | 10 JUL 84 | 8808.142


W.S. ELEV. (FT)
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725
720
THRESHOLD ELEV.
ICE THICKNESS (FT)
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STREAM TEMP. (DEGREES C)
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NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
1982
1983
HEAD OF SLOUGH 20
RIVER MILE : 140.50
ICE THICKNESS LEGEND:
TOTAL THICKNESS
SLUSH COMPONENT
WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : 82ZOCNA
ALASKA POWER AUTHORITY
SUSITNA PROJECT
SUSITNA RIVER
ICE SIMULATION
TIME HISTORY
HARZA-EBASCO JOINT VENTURE
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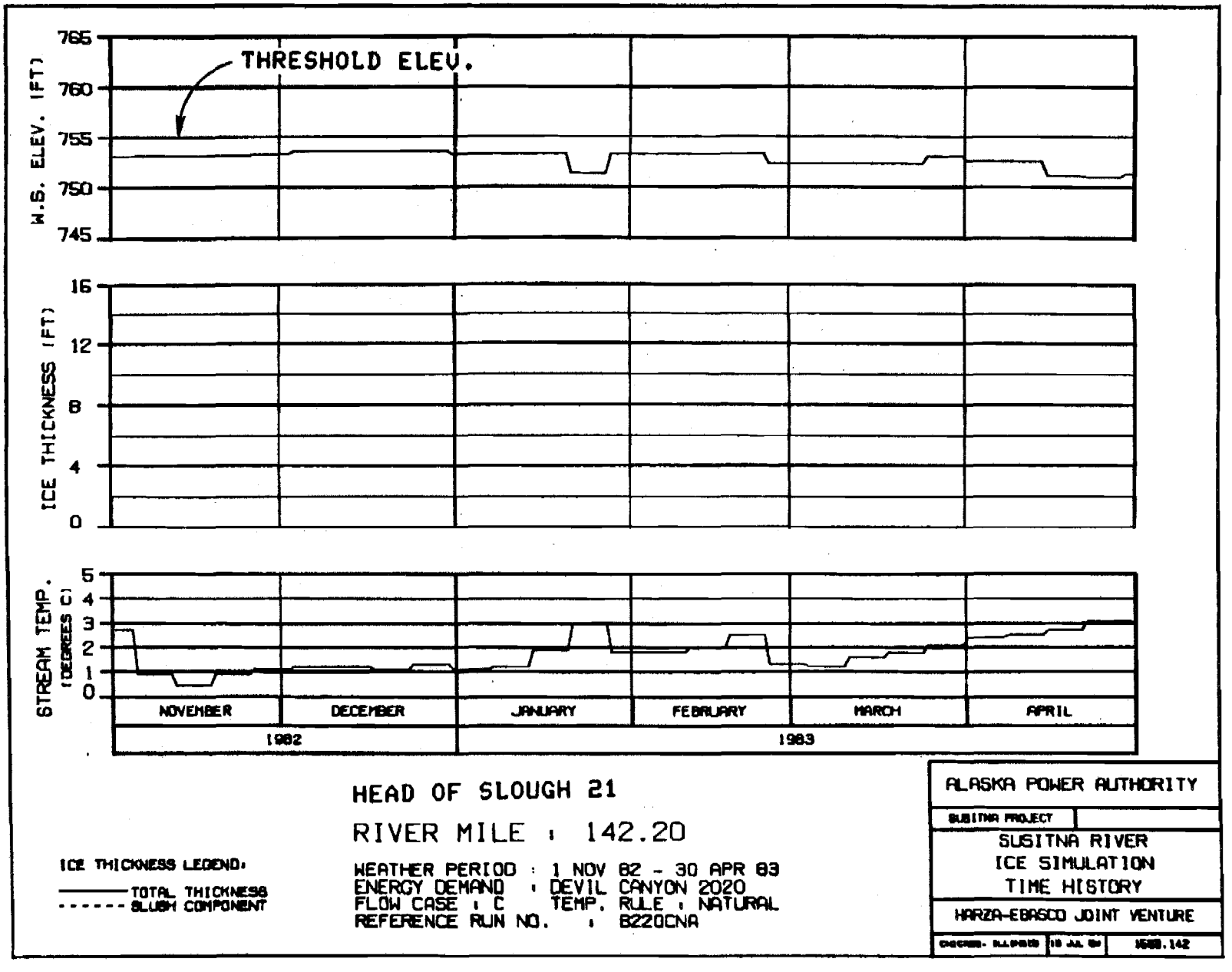

HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS

- - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83
ENERGY DEMAND : DEVIL CANYON 2020
FLOW CASE : C TEMP. RULE : NATURAL
REFERENCE RUN NO. : B220CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER
ICE SIMULATION
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

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