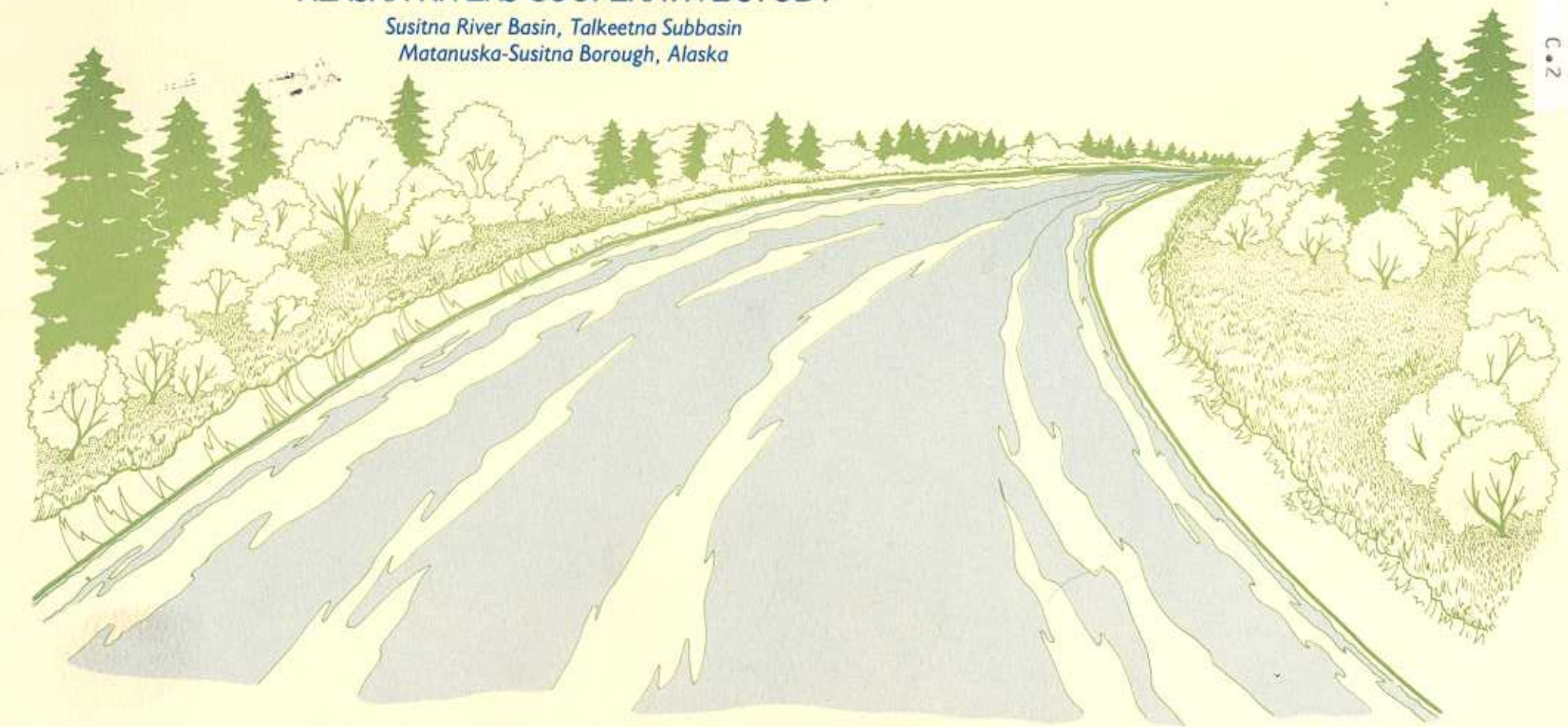
# FLOOD HAZARD STUDY

*196 Mile, Caswell, Sheep, Goose, Montana, Answer and Birch Creeks and Tributaries*

## ALASKA RIVERS COOPERATIVE STUDY

*Susitna River Basin, Talkeetna Subbasin*
*Matanuska-Susitna Borough, Alaska*



*April, 1981*

*Prepared by the*
*U.S. Department of Agriculture*
*Soil Conservation Service*
*Economics and Statistics Service*
*Forest Service*

*In cooperation with the*
*State of Alaska*
*Department of Natural Resources*
*Department of Fish and Game*

# FOREWORD

The flood hazard information in this report will serve as a basis for local government and planning groups in formulating flood plain land use and management programs, adopting regulations, and providing the public with information concerning flood hazards along 196 Mile, Caswell, Sheep, Goose, Montana, Answer and Birch Creeks.

The peak discharge-frequency data in this report will serve as a basis for obtaining peak discharges by frequency for use in flood hazard, flood insurance and flood plain information studies within the boundaries of the Knik, Matanuska, Susitna and Beluga Rivers, where stream gage data is absent or insufficient to make reliable frequency analysis. When adequate stream gage data records are available they should be used to determine peak discharges. The attached frequency curves should be used with caution when the drainage area of interest exceeds 500 square miles or is located outside the boundaries described above.

The Soil Conservation Service implemented the technical phases of the study. The State of Alaska and Matanuska-Susitna Borough, Alaska Soil Conservation District and Palmer, Wasilla, and Montana Subdistricts assisted in providing land use data, obtaining permission for field surveys, and made available materials to be used for the study. They will distribute the report and make interpretations of the study data so it may be used effectively in local flood plain management programs. The State of Alaska, Matanuska-Susitna Borough and the SCS encourage the immediate use of the flood hazard information in implementing these programs and upon request will assist in the interpretation and use of the data presented in the report.

The cooperation and assistance given by other federal, state and local agencies and property owners in the collection of data for this report are greatly appreciated.

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# INTRODUCTION

## Local Study Needs

The Matanuska-Susitna Borough requested the Soil Conservation Service, through the Alaska Soil Conservation District and Alaska Department of Natural Resources, to carry out flood studies of several streams which presently have development along the stream banks. The local government feels that rapid development will take place in the near future, along the Parks Highway, adjacent to these streams. Development will increase the potential flood damages to those properties in the flood plains. An immediate need exists to accurately define the existing flood hazard areas along existing travel routes. This report defines the areas subject to flooding so that adaquate flood plain management programs can be implemented that will regulate land use and development in flood prone areas. Such management programs will reduce potential flood damage, assure wise land use, and preserve and enhance the communities' physical environment.

Development of flood plain reports requires that peak discharge-frequency analysis be developed in sufficient detail that reliable peak discharges by frequency can be determined for each watershed area to be studied. The peak-frequency analysis includes all of the streams that drain into the Cook Inlet north of the Anchorage bowl around to and including McArthur River.

This report will include the 196 Mile, Caswell, Sheep, Goose, Montana, Answer and Birch Creeks. The details of work items involved in this analysis and authorities for USDA and State of Alaska agency participation are set forth in the Alaska Rivers Cooperative Study Plan of Work for the Willow and Talkeetna Subbasins dated February 1979.

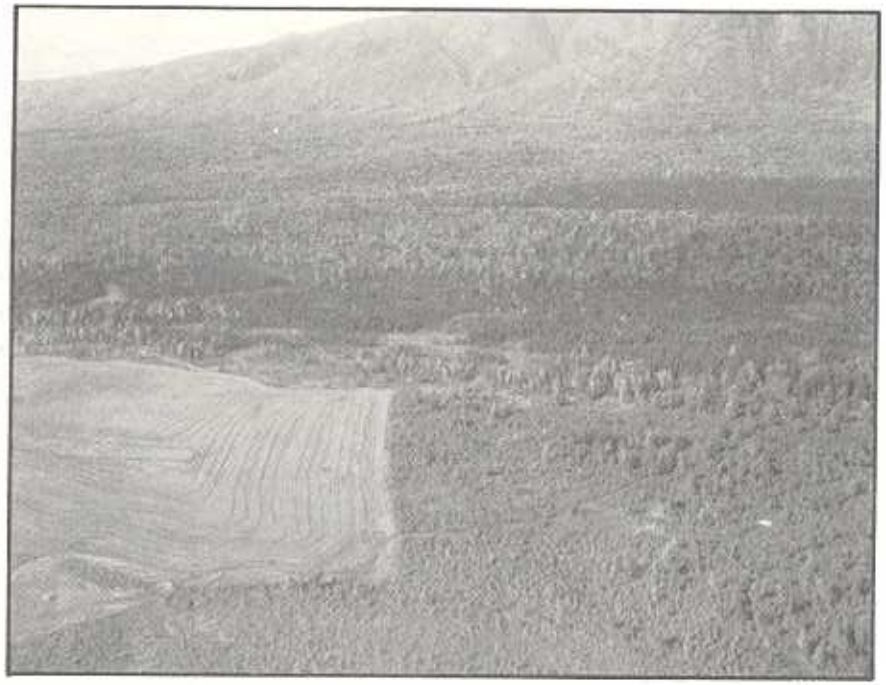
The U.S. Corps of Engineers has published a Flood Plain Information Report on a portion of the Talkeetna River which is within the Talkeetna Subbasin.

# DESCRIPTION OF THE STUDY AREA

The flood hazard report concerns the area of the Talkeetna Subbasin bounded by Little Willow-196 Mile Creek drainage divide on the south, Matanuska River Basin boundary on the east, the most southerly boundary of the Talkeetna River drainage on the north and the Susitna River on the west. The Soil Conservation Service is developing a detailed flood hazard study on the Kashwitna River, which is within this study area. The study area, for flood hazard concerns, encompasses about 424 square miles, excluding Kashwitna River drainage. The southern boundary of the area is about 90 miles by the road and 45 miles by air north of Anchorage. The area is within the USGS hydrologic unit number 19050002. This number designates the Cook Inlet subregion of the Southcentral Alaska Region. Figure 1 shows the location of the area and delineates watershed boundaries of the area covered by the flood hazard report.

*Source: SCS*

*Timber in lowlands with Talkeetna Mountains in background. Looking upstream at Kashwitna River Bridge.*



Source: SCS

*Typical lowland vegetation. Thick forest type with intermittent wet boggy areas.*

Elevations range from about 142 feet to about 6,700 feet above sea level. The area generally slopes to the west. The streams drain into the Susitna River. Sheep, Goose, and Montana Creeks head in the Talkeetna Mountains which are steep and rough. The remainder of the area is nearly level to undulating; low hills with irregular slopes are prominent; poorly drained bogs and other wetlands are common. The head waters of 196 Mile, Caswell, Answer, and Birch Creek are in this type of area.

Below timberline, about 2,000 feet above mean sea level elevation, on the better drained soils paper birch-white spruce stands are the predominant vegetation. Black spruce is predominant on the poorly drained soils associated with numerous sphagnum bogs. Cottonwood, alder and willow

Source: SCS

*Typical vegetation along stream banks is Birch, Alder, Willows, Cottonwood, and Spruce. Timber is common along the streams in the area inundated by the less frequent peak discharges.*

are common in the flood plains adjacent to the streams. Vegetation above timberline, 2000 feet to 6700 feet elevation, is predominately of the tundra type.

Stream channel slopes range from about 6 feet per mile in the lower reaches to about 100 feet per mile in the mountains. Highway 3 (Parks Highway) and the Alaskan Railroad, running north and south, cross most of the streams in the study area.

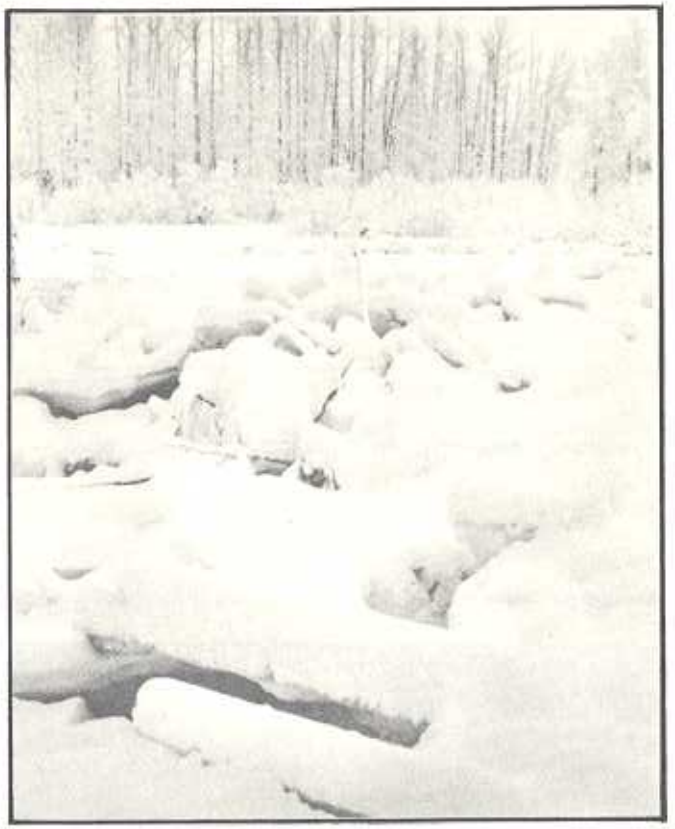
The climate of the area is influenced by marine conditions in the south and continental conditions in the east. The temperature range is from a minus 45 degrees F to plus 85 degrees F. The average daily maximum

*Source: Forest Science Lab*
*Typical tundra vegetation in the high mountainous areas. Thick spongy-like land cover.*

temperature in the summer is in the upper 60's with low 60's being common. Temperatures of 32 degrees F or lower have been recorded during every month of the year. Average maximum winter temperatures range from about zero to the midteens. The freeze free period averages about 80 to 95 days. Average annual precipitation ranges from about 28 inches in the southwest to about 60 inches in the mountains. In the southwestern portion of the area, over half of the precipitation occurs from June 1 through the end of September.

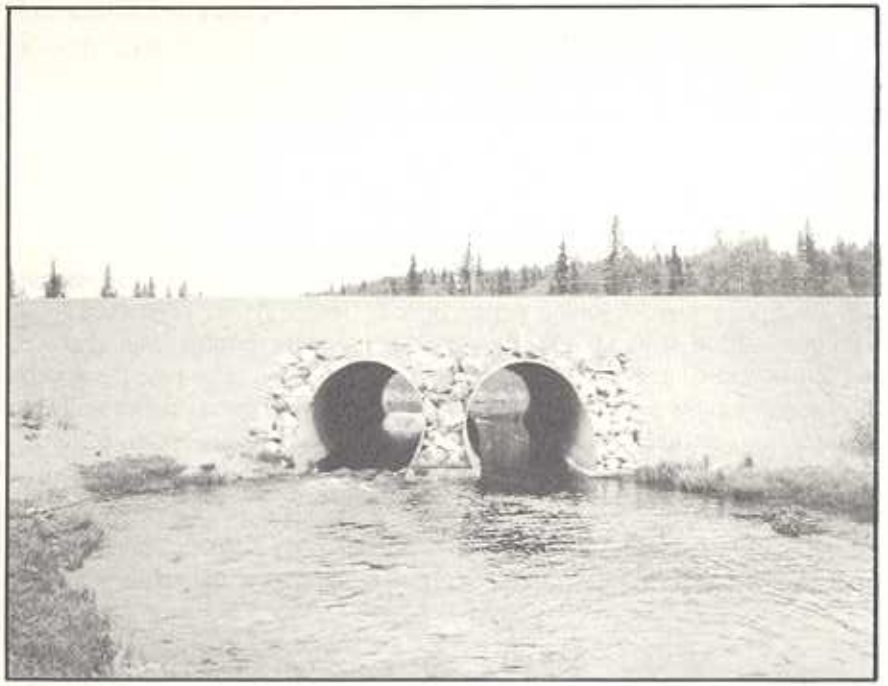
# FLOOD HISTORY

Development in the area is sparse and has taken place in recent years. Therefore, flood history is almost nonexistent.



*Source: SCS*
*This ice jam on Montana Creek in December 1979 is an example of what can occur on these streams.*

Channel obstruction is a factor which is significant in assessing flood damage. In December of 1979, ice jams and/or glaciation on Montana Creek caused some damages. Montana Creek Lodge was threatened several times during this period. Damages have occurred to railroad and highway bridges.



*Culverts in 196-Mile Creek at Parks Highway crossing.*

## 196-Mile, Caswell, and Birch Creeks

Flood water from storms the size of the 50-year event and greater produce velocities in excess of seven feet per second. Water flowing at these rates is capable of causing erosion to stream banks, flood plains and fill around highway and railroad structures. The rapidly rising and swiftly flowing flood water is a risk to human life and endangers private property.

## Sheep Creek

The flood flow caused by a storm with a return interval equal to or greater than the 50-year event will overtop the Parks Highway at the bridge approaches. The bridge approaches were designed and installed so the bridge structures would not be damaged from flood flows which exceed the bridge capacity, therefore major damages would be limited to the highway surface and fill at both approaches to the bridge. There may be one cabin that would be within the 100-year high water line.

*Source: SCS*

*Sheep Creek above Parks Highway bridge crossing.*

## Goose Creek

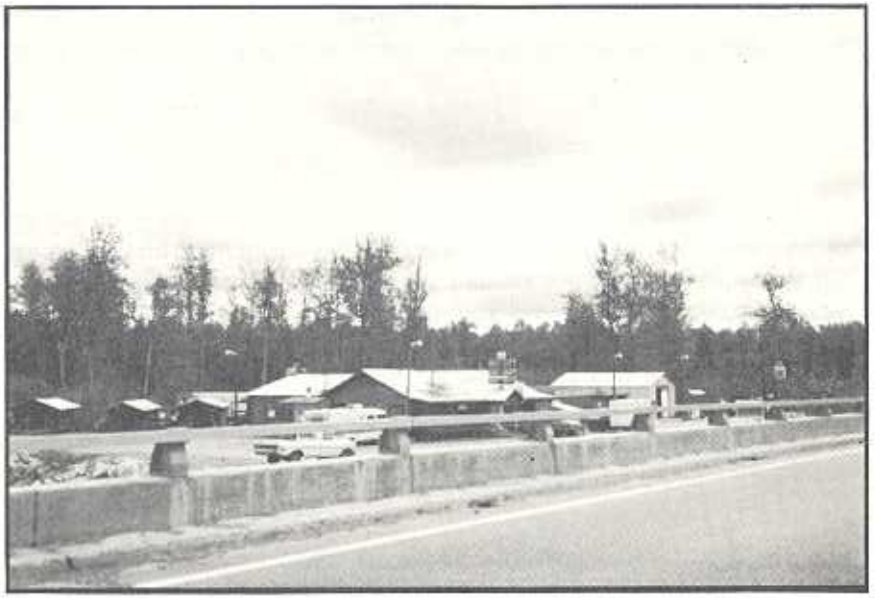
Peak discharges in excess of a five year frequency event will overtop the Parks Highway crossing. This would cause damage to the highway (a well traveled road) and possibly from the larger storms may endanger life and damage private property. The approaches to the culverts in the stream crossing are built to overflow before the flow capacity of the culverts is exceeded, therefore the culverts will not receive major damage. Flow velocities are in excess of seven feet per second which accelerates the rate of erosion around the highway and railroad structures, stream banks and the flood plain.

## Montana Creek

The flow from the 500-year events exceed the capacity of the Alaska Railroad bridge across the channel of Montana Creek. The railroad is

Source: SCS

*Parks Highway crossing over Goose Creek.*



Source: SCS

*Lodge at Montana Creek adjacent to the Parks Highway and Montana Creek.*

installed on a high earth fill structure. Overtopping the railroad fill will cause major damage to the railroad and bridge structure.

The flow capacity of the bridge at the Parks Highway crossing over the creek is exceeded by an event equal to or greater than the 50-year frequency event. Buildings are within the flood plain and will have water in the first flood level from flood discharges that are equal to or exceed the 50-year discharge. Stream velocity through the highway bridge structure is in excess of ten feet per second and is highly erosive to the stream banks, around the bridge structure and is a risk to human life.

## Answer Creek

The peak discharge produced by a storm equal to or greater than the 50-year event will overtop the Alaska Railroad structure across Answer Creek. The stream velocity at the railroad and highway structure across the creek may be as high as twelve feet per second causing erosion around the structures, to the flood plain, stream banks, and is a threat to human life.

## Birch Creek

The peak discharge produced by the 100-year frequency runoff event would cause velocities of about five feet per second at the highway culvert and would cause some damages to the highway fill and stream banks due to erosion.

## Technical Data and Related Material

The technical data and related material needed for the intended uses of this study are provided as figures, exhibits and tables in this report.

Figures 2 through 15 are drawings of selected valley cross sections showing the flood elevations for the 10-, 50-, 100-, and 500-year present land use conditions.

Table I (Appendix A) is a tabulation of frequency-discharge-elevation data for present conditions at cross sections for the 10-, 50-, 100-, and 500-year floods. This table may provide greater convenience and efficiency when information is needed at specific locations. Table II (Appendix B) is a listing of descriptions and elevations for selected elevation reference marks established in the study area. Their locations are shown on the appropriate photomap indicated in the table. They may be used in establishing the relative locations of existing or planned buildings, roadways, etc., with the floodwater elevations.

Exhibit I of Appendix D provides the index for Exhibit 2, flood profile sheets. Exhibit 2 provides plotting of the water surface elevations for the 10-, 50-, 100-, and 500-year peak discharges along the streams. The zero station for each stream is at its confluence with the Susitna River. The stations increase in an upstream direction from these points. The profiles for each stream were started at the average water surface in the Susitna River, assuming that the peak discharge from each stream would be passed before the peak discharge from the Susitna River would reach the confluence of the streams studied. A straight line interpolation was used between each cross section. These profiles may be used for those purposes which require flood elevations between cross sections or which require the location of flood boundaries on the ground.

To locate a flood profile elevation on the ground, determine on the appropriate photomap the distance along the stream from the point in question to the nearest cross section. On the appropriate profile sheet, use the distance from the reference cross section to determine the stream distance on the profile of the point in question and read the elevation of the desired flood frequency line. Transfer this elevation to the ground from the nearest reference mark. Check the depth of flow from the profiles to be sure that your ground elevation allows for an adequate depth of flow. Adjust upward if needed to provide a safe elevation.

Exhibit 3 of Appendix E is a Photomap Index to determine the sheet number of the photomap desired.

The Flood Hazard Area Photomaps, Exhibit 4 of Appendix E, show the area inundated by the 100-year flood. The actual limits of the 100-year flood line on the ground may vary somewhat from that shown because of the stereoscopic interpolation and the interpolation from USGS quadrangles with 50 feet or 100 feet contour intervals. These photomaps can be used to determine the location of points in question and their relationship to specific flood frequency as outlined above for Exhibit 2. They may also be used for flood plain management decisions or for purposes which require the approximate location of the 100-year flood plain.

Peak discharge-frequency analysis, Appendix F, Exhibit 5 through Exhibit 9, display envelopes of discharge-frequency curves ranging from the 50 percent (2-year frequency) of occurrence through the 0.2 percent chance (500-year frequency) of occurrence storms.

Three curves are shown on each exhibit. The high curve should be used for steep mountainous watersheds, median curve for streams that head in the steep mountains but the point of interest is downstream a distance of several miles from the steep mountainous influence, and the low curve for flat meandering streams and watersheds having many lakes and/or muskegs within the drainage area.

Exhibit 5 through Exhibit 9 can be useful for determination of a peak discharge for given storm frequencies on drainage areas with less than 500 square miles and/or without sufficient stream gage records to determine peak discharges with the necessary accuracy for use in studies such as flood insurance, flood hazard, flood information and design of bridges, culverts, etc. The following steps show how to use the curves.

1. Determine the drainage area.
2. Determine storm frequency or frequencies desired.
3. Determine which curve to use; high, medium or low, for the watershed conditions.
4. Enter appropriate Exhibit with drainage area in square miles.
5. Proceed vertically to the appropriate curve.
6. At right angles to the vertical, at the point of intersection, proceed horizontally to the left and read discharge in cubic feet per square mile.
7. Multiply cubic feet per square mile by drainage area in square miles to determine peak discharge for a given frequency.

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1. Determine the drainage area.
2. Determine storm frequency or frequencies desired.
3. Determine which curve to use; high, medium or low, for the watershed conditions.
4. Enter appropriate Exhibit with drainage area in square miles.
5. Proceed vertically to the appropriate curve.
6. At right angles to the vertical, at the point of intersection, proceed horizontally to the left and read discharge in cubic feet per square mile.
7. Multiply cubic feet per square mile by drainage area in square miles to determine peak discharge for a given frequency.

This procedure should be repeated for all frequencies needed, 2-year, 10-year, 50-year, 100-year, and 500-year. The peak discharges can then be plotted on logarithmic normal graph paper to obtain the frequency curve.

These curves should be used with caution outside the described boundaries.

The basin data used for determining the flood hazard information and peak discharge-frequency analysis in the report is on file in the office of the U.S. Department of Agriculture, Soil Conservation Service, 2221 East Northern Lights Blvd., Anchorage, Alaska 99504.

# FUTURE FLOOD POTENTIAL

The Matanuska-Susitna Borough is a participant in the HUD Flood Insurance Program administered by the Flood Insurance Administration. This participation guarantees that federally subsidized flood insurance coverage is available to owners and occupiers of all buildings and mobile homes (including contents) within the subbasin.

As required by the HUD Program the Borough has adopted land use management regulations which:

1. Insure that all new construction is designed to minimize flood loss, and

2. Require that all new construction or substantial improvements to existing structures have the first floor (including basement) level at or above the 100-year flood elevation and that all utilities be flood proofed.

With flood plain management regulations in effect it is expected that future residential, commercial, and industrial flood plain development will be such that flood damages to these properties will not increase above present levels. This presupposes that flood plains will be identified and used as a tool and a means for enforcing local ordinances and that the ordinances themselves are enforced. Should this fail to occur, damage potential will increase drastically with population growth.

Although the damage threat to occupied buildings is expected to be arrested, it is doubtful that the same will be true of highways and railroads. Transportation networks are often found in and adjacent to flood plain lands as a result of construction costs. Even when flood damage costs are added to construction, operation, and maintenance costs, it often remains less expensive to build on flat lowland areas than on more rugged upland terrain.

# FLOOD PLAIN MANAGEMENT

Regulatory measures presently adopted do not prevent flooding but, instead, reduce the threat of damage or loss of life from floods by discouraging development of homes and other buildings on flood plains. Without additional measures damage to existing property will continue and road and bridge related damages are likely to increase. As a means to minimize this situation the following alternatives are suggested.

1. For Existing Properties:

   a. Permanent measures built as an integral part of the structure, such as raising the elevation of the structure, water-proofing of basement and foundation walls, anchoring and reinforcing floors and walls, and use of water-resistant materials.

   b. Contingency measures which require action to be taken to make them effective, such as manually closed flood gates and removable bulkheads.

   c. Emergency measures carried out during floods according to prior emergency plans, such as sandbagging, pumping, and removal of contents to flood-free areas.

d. Reclamation of flood plains which includes the permanent evacuation of developed areas subject to inundation and the acquisition of these lands by purchase or land trades, the removal of structure, and the relocation of the population from such areas.

e. Use of flood watch or warning systems to provide advance notice of impending flood danger.

f. Buildings and mobile homes within or adjacent to the delineated flood hazard areas in Appendix A of this report should carry flood insurance on the structure and its contents. Although this will not reduce existing damage potential, it will have the positive effect of spreading the flood hazard risk.

2. For Future Road and Bridge Construction

a. When analyzing proposed alternative transportation routes, the costs of potential flood damage will continue to be investigated and included for use in the decision making process.

b. Construction designs will continue to reflect sound engineering judgement with regards to flood hazard potential. This includes the analysis of soils, geology, hydrology and hydraulics, as well as adequacy of construction materials.

### Recommendations

It is not the intent of this report to provide solutions to flood problems in the study area; however, it does furnish an information base for the adoption of an overall flood plain management program. Other management programs dealing with environmental values of flood plains may also benefit from this information. Following are recommendations which should be emphasized during development and implementation of this program.

1. Retain flood plain lands in Borough or State ownership with an appropriate safety buffer.

2. Adopt and/or enforce flood plain regulations in compliance with the National Flood Insurance Program as a minimum. The regulations should address such things as minimum floor elevations, floodways, greenbelt areas, adequate drainage facilities, building and housing codes, and sanitary codes with specific flood hazard provisions for all new construction.

3. Consider nonstructural measures for flood prevention such as flood plain acquisition, flood proofing, and flood forecasting and warning systems. Federal cost sharing for these measures may be available under Section 73(b) of Public Law 93-251. The realization of the need for a flood warning system is due to the projected rapid development of the flood plains that have occurred in the past decade and the high velocities in the streams. The National Weather Service of the National Oceanic and Atmospheric Administration issues frequent warnings of potential flood producing storms. Frequently the flood warnings are preceded by a "severe weather or flood watch."

4. Include in land development ordinance the provision for on-site runoff and sediment storage. A continuous maintenance program needs to be provided for these types of measures.

5. Owners of property subject to flood damage (including areas adjacent to the delineated flood hazard areas) should be encouraged to purchase flood insurance on their buildings, mobile homes, and their contents.

6. Develop a regular maintenance program to keep all hydraulic structure openings, approach channels, and outfall channels clear of sediment and debris.

# INVESTIGATIONS AND ANALYSES

The hydraulic and hydrologic investigations followed procedures in the SCS publications National Engineering Handbook, Section 4, Hydrology (NEH-4) and Section 5, Hydraulics (NEH-5), and other technical references. Computer programs developed by the SCS were used for most of the analyses.

## Field Surveys

Field surveys were completed in the summer of 1978 and 1979 for valley and road cross sections. Vertical control for surveys near roads and railroads was referenced to the National Geodetic Vertical Control Datum of 1965-1968. Other valley cross section elevations were referenced to contours from the USGS quadrangles.

A few key cross sections were surveyed and others were made by use of the key cross sections, USGS quadrangles and use of high altitude photography.

## Hydraulics

Elevation-discharge relationships were developed for all bridges, culverts, and valley sections utilizing the water surface profile computer program WSP2 outlined in SCS Technical Release No. 61. The hydraulic parameters of the channel and flood plain for the conditions existing prior to 1979 were input data for the WSP2 program. High water marks, stream gage records, and other historical flood data were used in checking the accuracy of the computer water surface profiles. One stream gage, on Montana Creek, is located in the study area. Records of this gage have been discontinued.

## Hydrology

Peak-frequency (annual series) studies were made by the USGS for all of Alaska. The USGS published a regional analysis, "Flood Characteristics of Alaskan Streams," Water Resources Investigations 78-129, dated 1979, which presents regional equations for two areas in Alaska, Area I and Area II.

The study area is located in Area II. Peak-frequency curves were developed using the equation proposed by USGS and by use of the Log-Pearson Type III method. Peaks calculated by these two frequency methods for given storm frequencies were compared to one another to determine the adequacy of the regional equation for this study. From these comparisons it was determined that the regional equation lacked sufficient accuracy for this type of study.

Twenty-six stream gages within the Southcentral Region were then used to develop peak-frequency curves in an effort to obtain more reliable peaks for the study area.

Thirteen of these gage records were discarded because watershed characteristics and/or drainage areas were not representative of the study area and/or the time of stream gaging records was too short for adequate frequency analysis.

Eleven of the gage records, on streams within the Cook Inlet drainage, were used to make a final determination of peak-frequency curves to be used in this study area.

An envelope for high, medium, and low peak discharge curves, for the 2-year, 10-year, 50-year, 100-year and 500-year events were developed. (See Appendix E, Exhibit 5, 6, 7, 8 and 9.) These curves and watershed characteristics such as watershed slope, channel length and slope, mean elevation, land cover and average annual precipitation, were used to develop a peak-frequency curve for each watershed at each cross section.

The peak discharge, for each area above each cross section, for the 10-, 50-, 100-, and 500-year storm events were taken from these curves and used for channel flood routing on each stream, except Goose Creek, to determine water surface elevations and area inundated.

The peak discharge from Goose Creek is calculated by using a much larger drainage area than the area of Goose Creek drainage proper. During the time that field surveys were in progress it was discovered that a large portion of the flow from Sheep Creek was flowing into the Goose Creek channel.

Cross section surveys and on-site study proved that with very little obstruction most or all of the peak discharge from Sheep Creek could be diverted into Goose Creek; therefore it was decided that peak discharges for Goose Creek would have to be developed using the drainage area of Sheep Creek, above the point of diversion plus the drainage area for Goose Creek proper.

# GLOSSARY

ANNUAL SERIES - A frequency series in which only the largest value in each year is used, such as the annual floods.

BACKWATER - The resulting high water due to a downstream obstruction or restriction or from high water elevations in an intersecting stream.

BM - Bench mark. See elevation reference mark.

CFS - Abbreviation for cubic feet per second. The rate of discharge or flow of water representing a volume of 1 cubic foot passing a given point during 1 second.

CHANNEL - A natural or artificially created open conduit that periodically or continuously conveys water. River, creek, stream, branch, and tributary are some of the terms used to describe channels.

CROSS SECTION (stream or valley) - The shape of a channel, stream, or valley viewed across the axis. In watershed investigations it is determined by a line approximately perpendicular to the main path of water flow, along which measurements of distance and elevation are taken to define the cross sectional area.

CSM - Abbreviation for cubic feet per second per square mile. (Rate of discharge per square mile of drainage area.)

DRAINAGE AREA - The area, measured in a horizontal plane, which drains into a stream at a specific location. See watershed.

ELEVATION REFERENCE MARK - A fixed reference, usually placed on or near the ground, giving the measurement in elevation of that point in relation to mean sea level. Bench mark is the common term used by surveyors.

FLOOD - An overflow or inundation of normal dry lands from a stream or other body of water; the high streamflow overtopping the banks of a stream; or a high flow as measured by either stage or discharge.

FLOOD HAZARD AREA PHOTOMAP - A photographic background map that indicates areas likely to be flooded by the 100-year frequency or the one percent chance flood (it has one chance in 100 of being equaled or exceeded in any given year) from an adjoining stream or water body.

FLOOD CREST - The maximum stage or elevation reached by the waters of a flood at a given location.

FLOOD FREQUENCY - The average interval of time between floods equal to or greater than a specified discharge or stage. It is generally expressed in years. Following are examples:

10-year flood or 10-year frequency flood. The flood which can be equaled or exceeded on an average once in 10 years; and which would have a 10 percent chance of being equaled or exceeded in any given year.

50-year flood ... two percent chance ... in any given year.

100-year flood ... one percent chance ... in any given year.

500-year flood ... two-tenths percent chance ... in any given year.

FLOOD HAZARD - A general term meaning the risk to life or damage to property from overflows of rivers or stream channels, extraordinary waves or tides occurring on lake or estuary shores; floodflows in intermittent or normally dry streams; floods on tributary streams; floods caused by accumulated debris or ice in rivers; or other similar events.

FLOOD PEAK OR PEAK DISCHARGE - The highest value of the stage or discharge attained by a flood, thus, peak stage or peak discharge.

FLOOD PLAIN OR FLOOD-PRONE AREA - The land area situated on either side of a channel or body of water which is subject to flooding.

FLOOD PLAIN MANAGEMENT - The operation of an overall program of corrective and preventive measures for reducing flood damage,

including but not limited to emergency preparedness plans, flood control works, and land use and control measures.

FLOOD PROFILES - A plot or graph defining the water surface elevation in relation to the distance along the stream during a particular flood.

FLOOD ROUTING - Determining the changes in a flood wave as it moves downstream through a valley or through a reservoir (then sometimes called reservoir routing). Graphic or numerical methods are used.

FREQUENCY-DISCHARGE-ELEVATION - The relationship of the flood frequency of discharges and the water elevations resulting from these discharges at a surveyed cross section or other point along a stream. This data may be shown as a plotted curve or in table form.

GREENBELT AREA - A strip of land kept in its natural or relatively undeveloped state or in agricultural use which is planned around the periphery of urban development or in the flood plain of a stream or body of water.

HEADWATER - (1) The source of a stream. (2) The water upstream from a structure or point on a stream.

LEFT FLOOD PLAIN - The flood plain on the left side of a river, stream, or watercourse, looking downstream.

MANNING'S "n" VALUE - A coefficienct of roughness in Manning's flow equation for determining stream velocities.

RIGHT FLOOD PLAIN - The flood plain on the right side of a river, stream, or watercourse, looking downstream.

RUNOFF - That portion of the precipitation on a drainage area that is discharged from the area in stream channels. Types include surface runoff, groundwater runoff, or seepage.

SEDIMENT - Solid material, both mineral and organic, that is in suspension, and is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth's surface.

STREAM - Any natural channel or depression through which water flows either continuously, intermittently, or periodically, including modification of natural channel or depression.

STRUCTURE - Anything constructed or erected, the use of which requires a more or less permanent location on or in the ground. Includes but is not limited to bridges, buildings, canals, dams, ditches, diversions, irrigation systems, pumps, pipelines, railroads, roads, sewage disposal systems, underground conduits, water supply systems, and wells.

SUPERCRITICAL FLOW - Those conditions of flow for which the depth is less than critical and the velocity is greater than critical. Critical flow is the term used to describe open channel flow when the discharge is maximum for a given specific energy head, or stated conversely, those which exist when the specific energy head is minimum for a given discharge.

TBM - Temporary bench mark. See elevation reference mark.

WATERSHED - The area contributing direct runoff to a stream. Usually it is assumed that base flow in the stream also comes from the same area. However, the groundwater watershed may be larger or smaller.

## CONVERSION TABLE

| Multiply inch-pound units | by | to obtain SI units |
|---|---|---|
| cubic feet per second ($ft^3/s$) | 0.0283 | cubic meters per second ($m^3/s$) |
| cubic feet per second per square mile [$(ft^3/s)/mi^2$] | 0.0109 | cubic meters per second per square kilometer [$(m^3/s)/km^2$] |
| square miles ($mi^2$) | 2.589 | square kilometers ($km^2$) |
| feet (ft) | 0.3048 | meters (m) |
| inches (in.) | 2.540 | centimeters (cm) |
| degrees Fahrenheit ($^oF$) | 5/9 ($^oF$-32) | degrees Celsius ($^oC$) |

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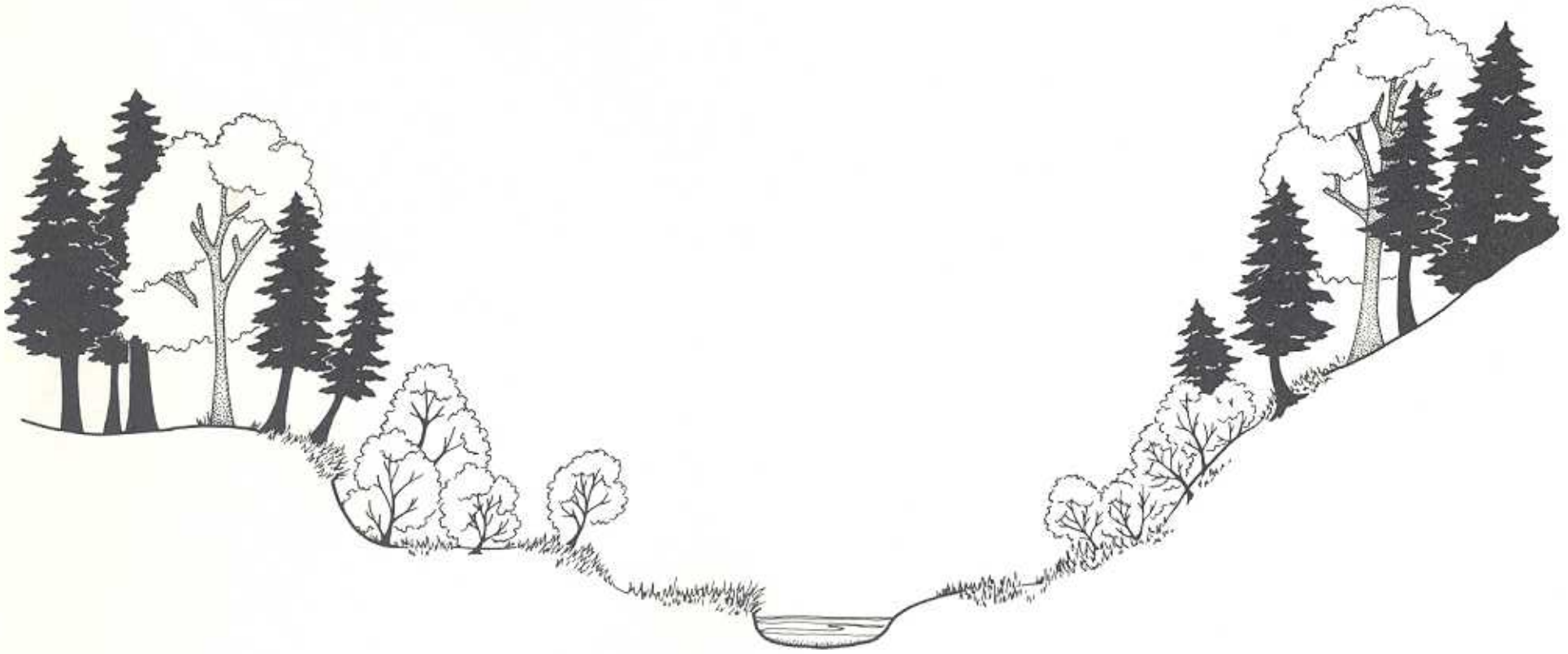
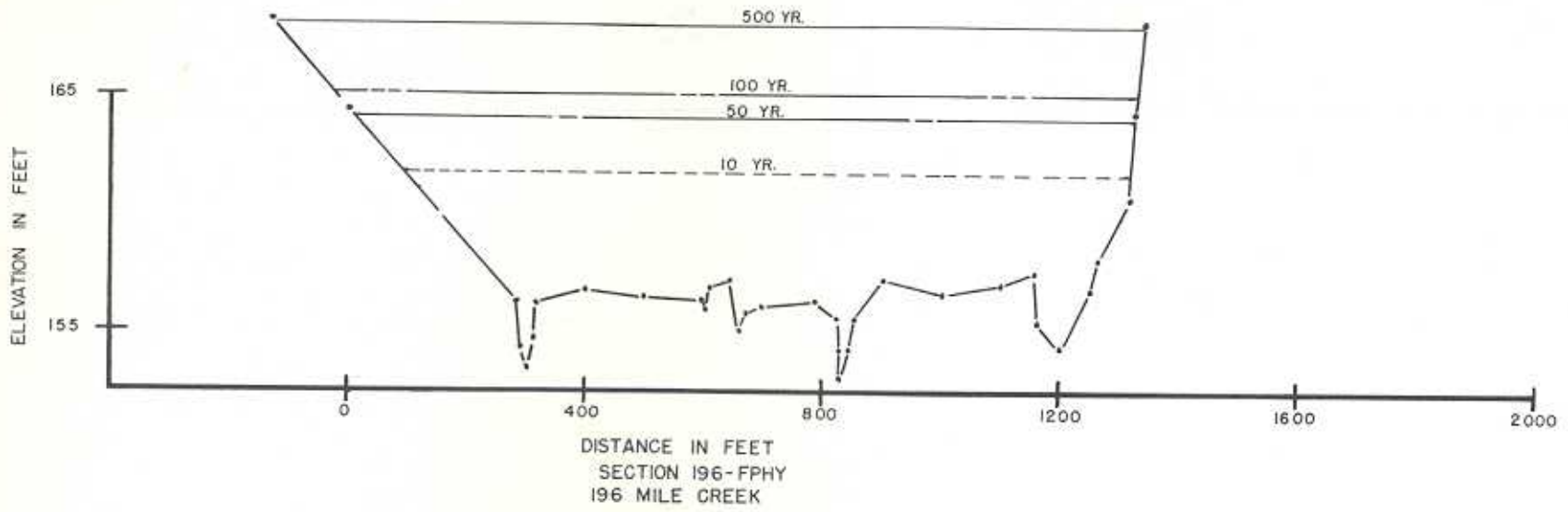


# Typical Valley Sections

## Figures 2 through 15

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

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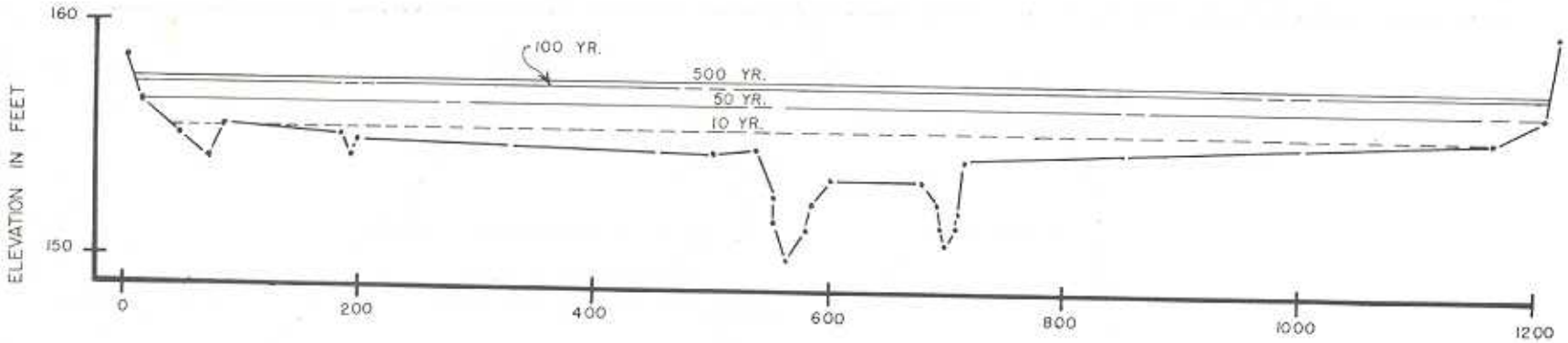
TALKEETNA SUBBASIN
MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 2

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS




DISTANCE IN FEET
SECTION 196-E
196 MILE CREEK

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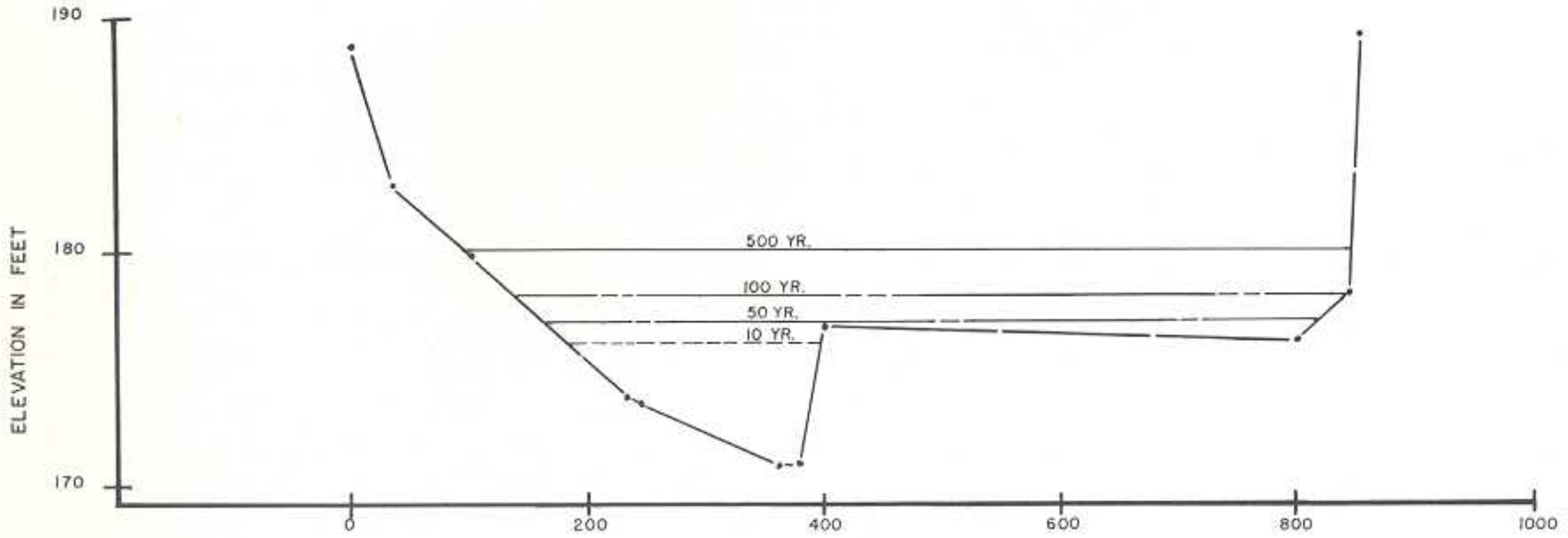
U.S. DEPARTMENT OF AGRICULTURE
TALKEETNA SUBBASIN
MATANUSKA-SUSITNA BOROUGH , ALASKA

FIGURE 3

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

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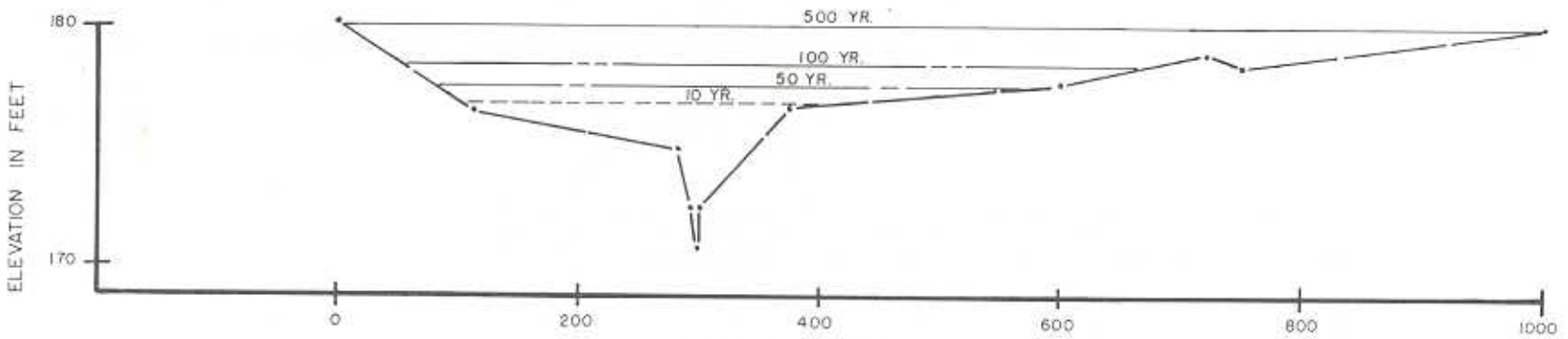
MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 4

# TYPICAL VALLEY SECTION
ALL PRESESNT FLOOD CONDITIONS




SECTION CW-F
CASWELL CREEK

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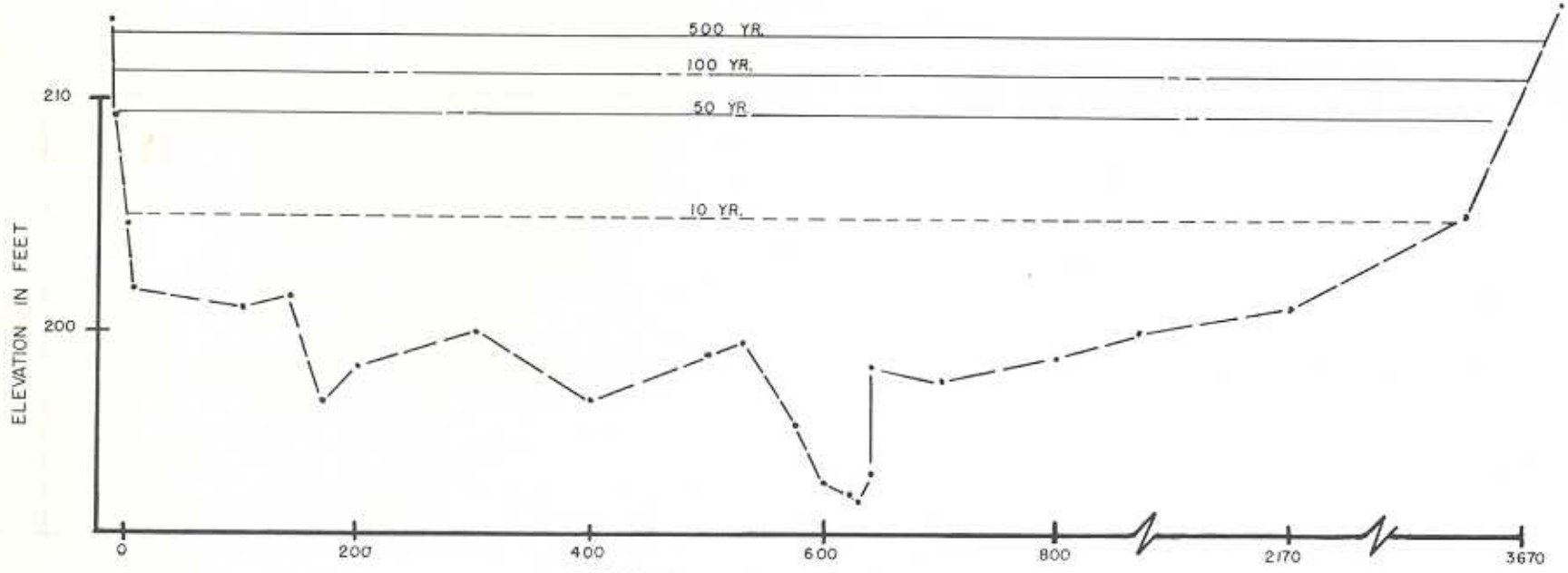
U.S. DEPARTMENT OF AGRICULTURE
TALKEETNA SUBBASIN
MATANUSKA - SUSITNA BOROUGH , ALASKA

FIGURE 5

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS

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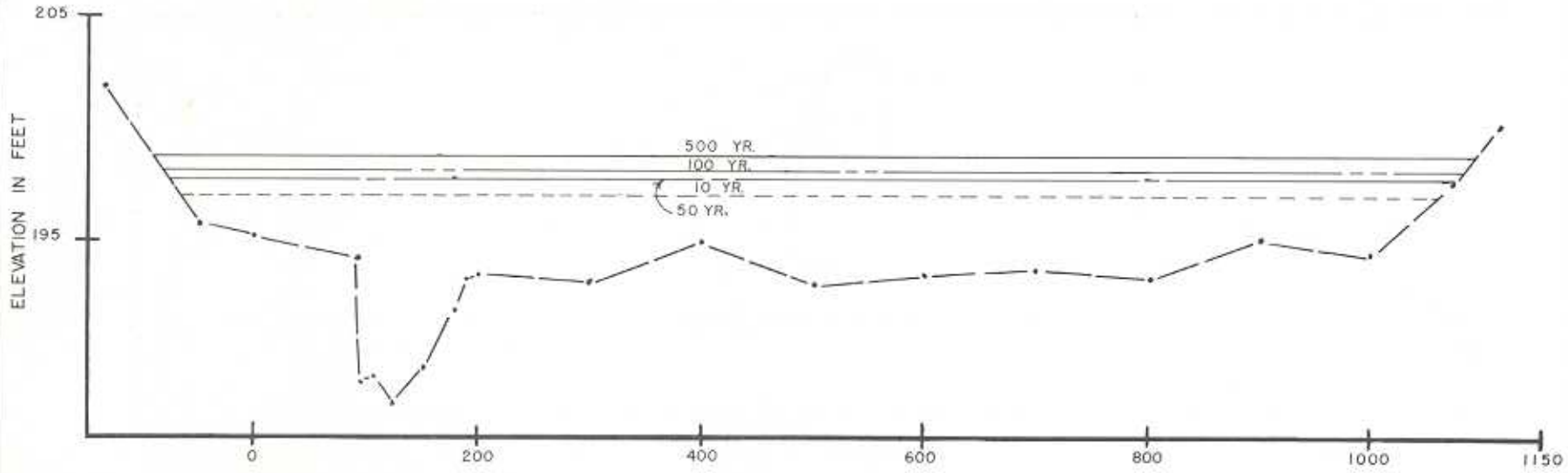
TALKEETNA SUBBASIN
MATANSKA-SUSITNA BOROUGH, ALASKA

FIGURE 6

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS




SECTION SP-H
SHEEP CREEK

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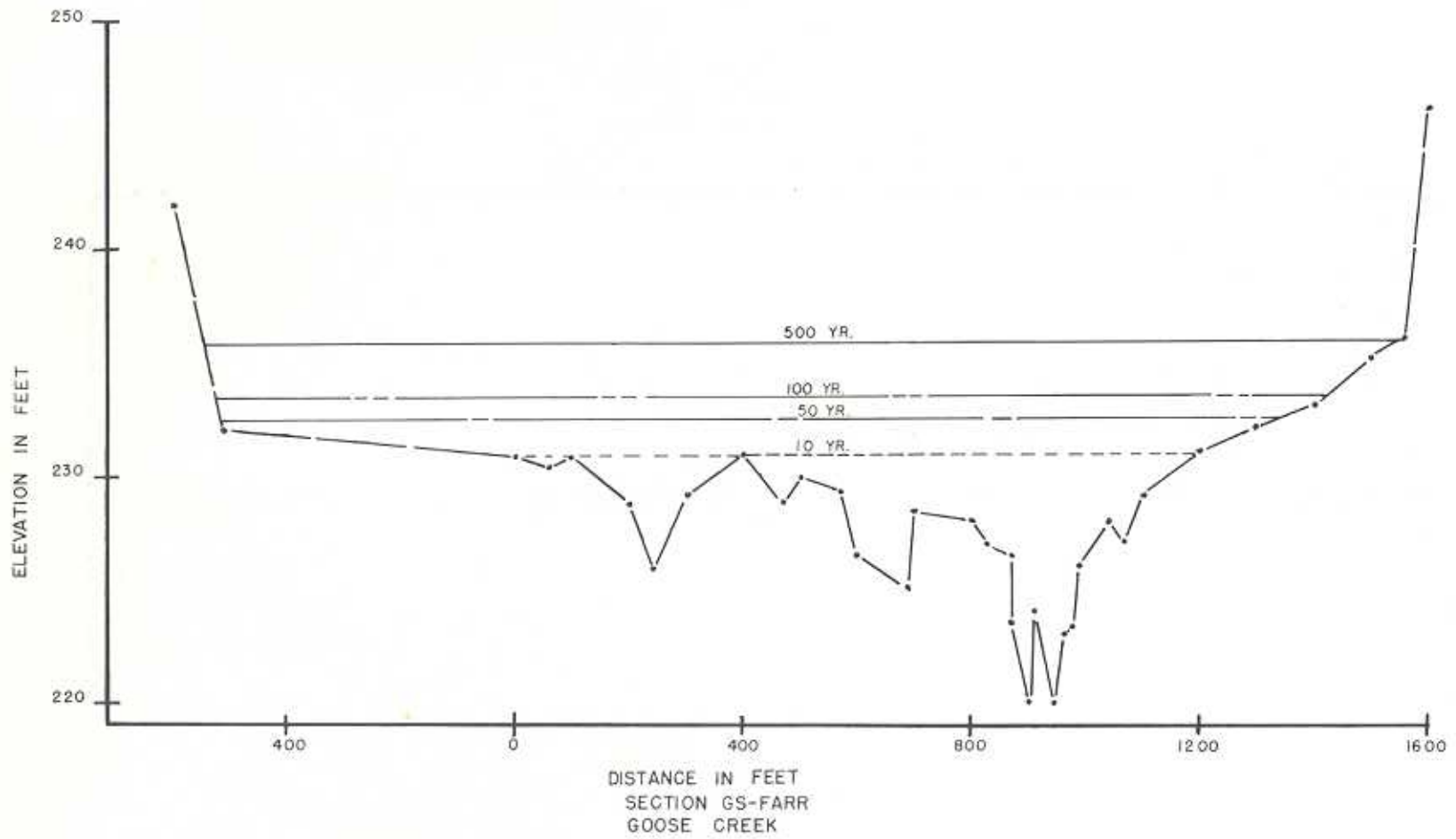
U.S. DEPARTMENT OF AGRICULTURE
TALKEETNA SUBBASIN
MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 7

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS

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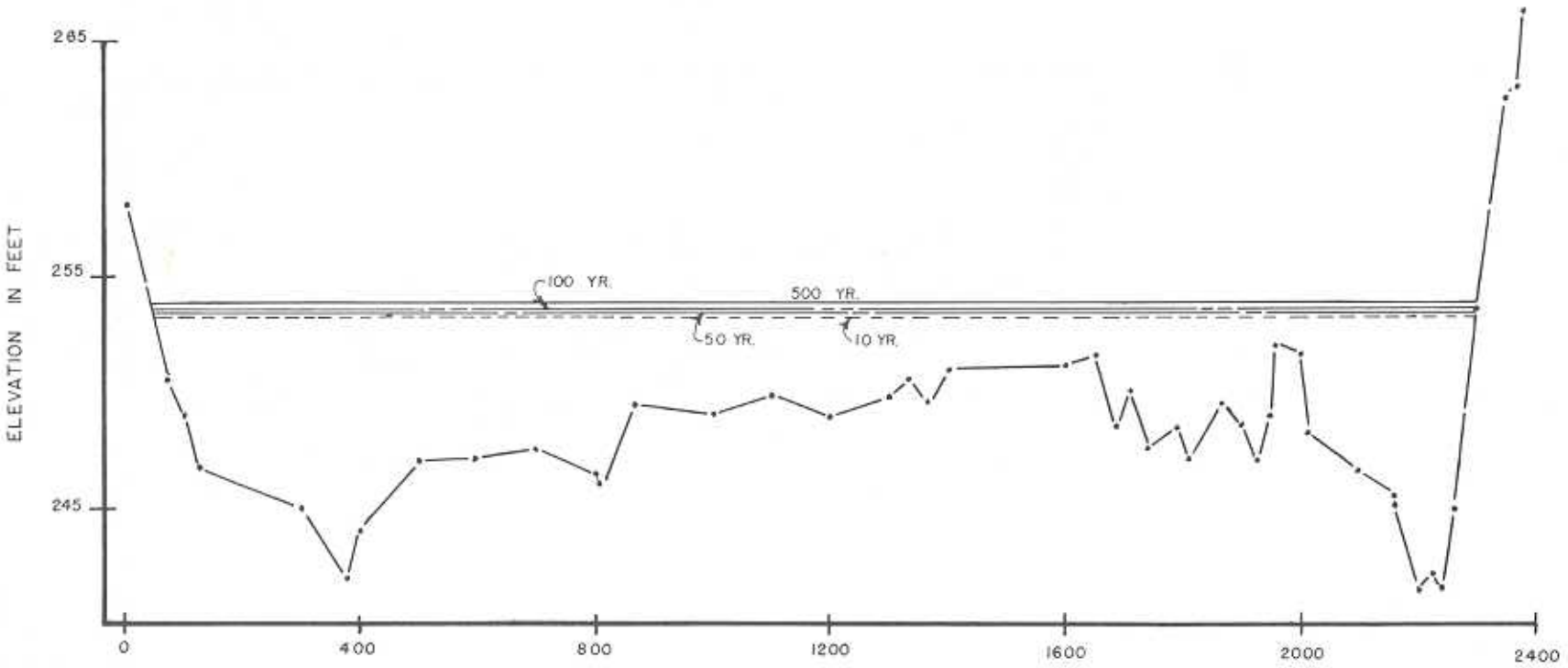
MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 8

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

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MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 9

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

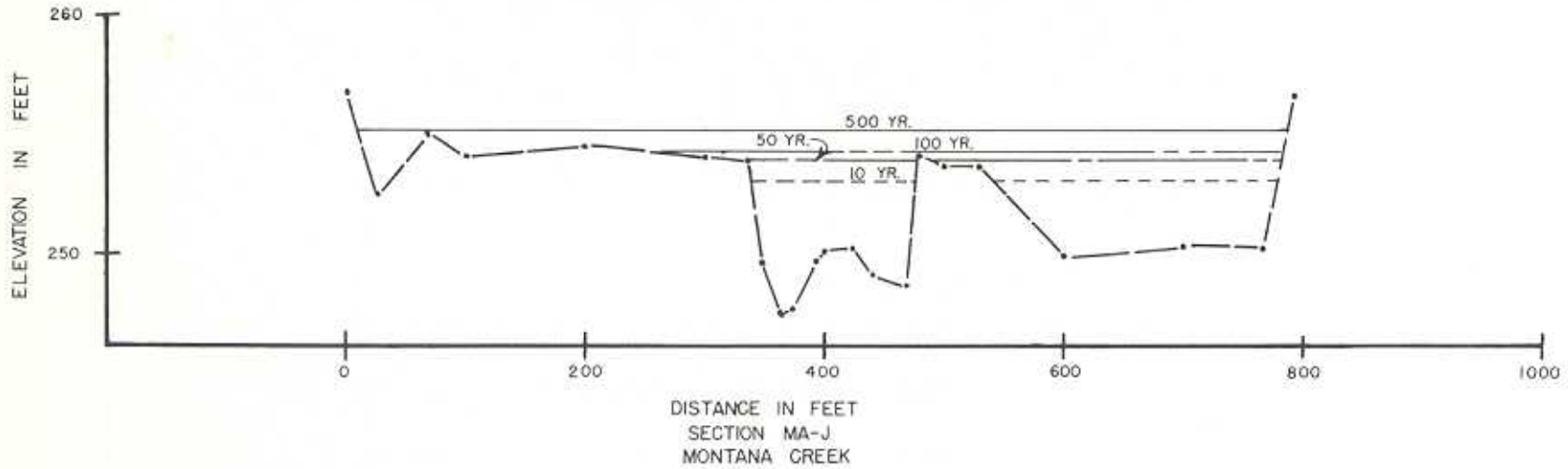


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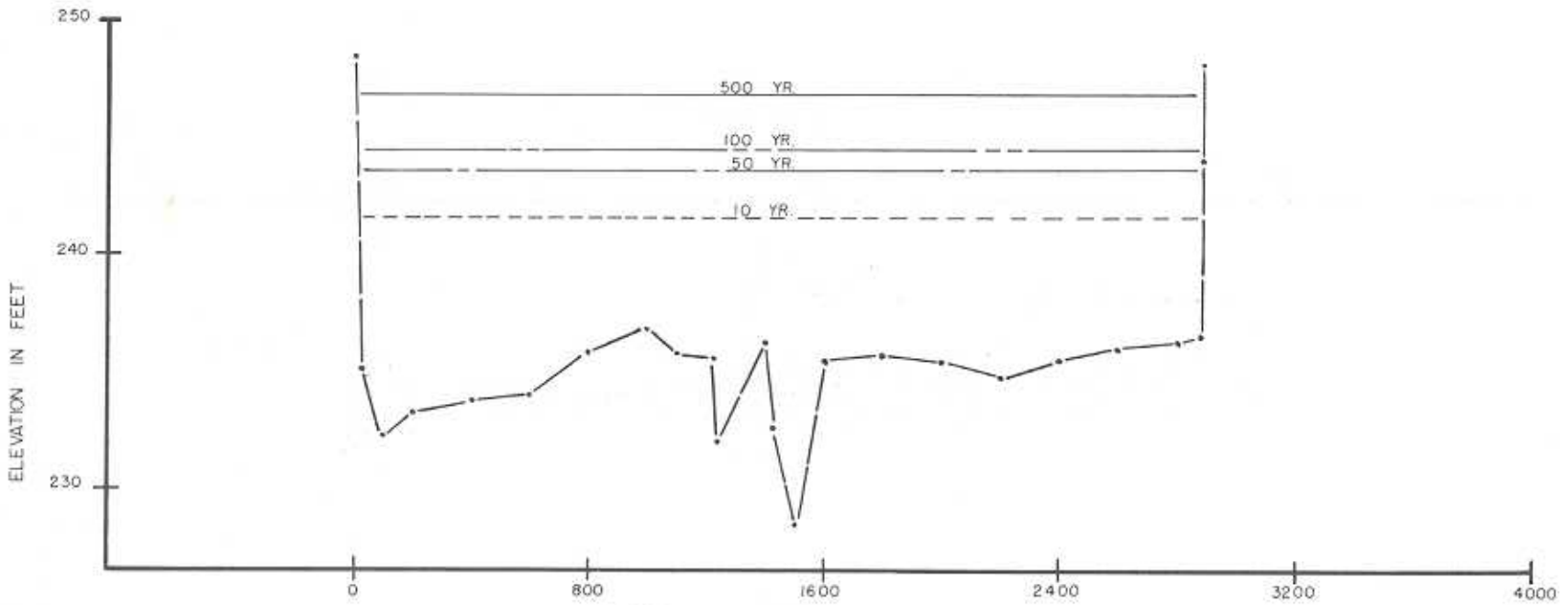
FIGURE 10

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

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MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 11

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

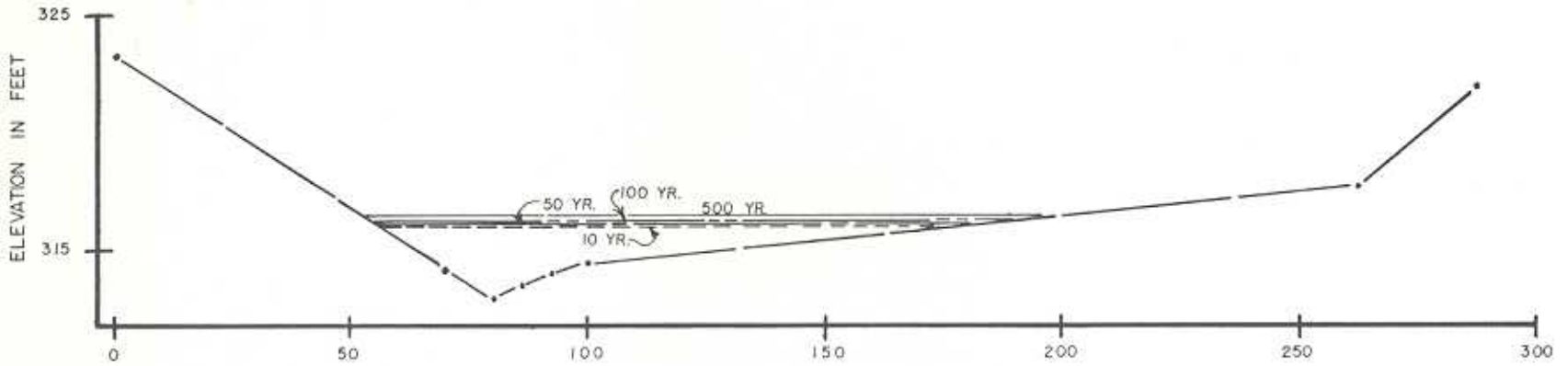


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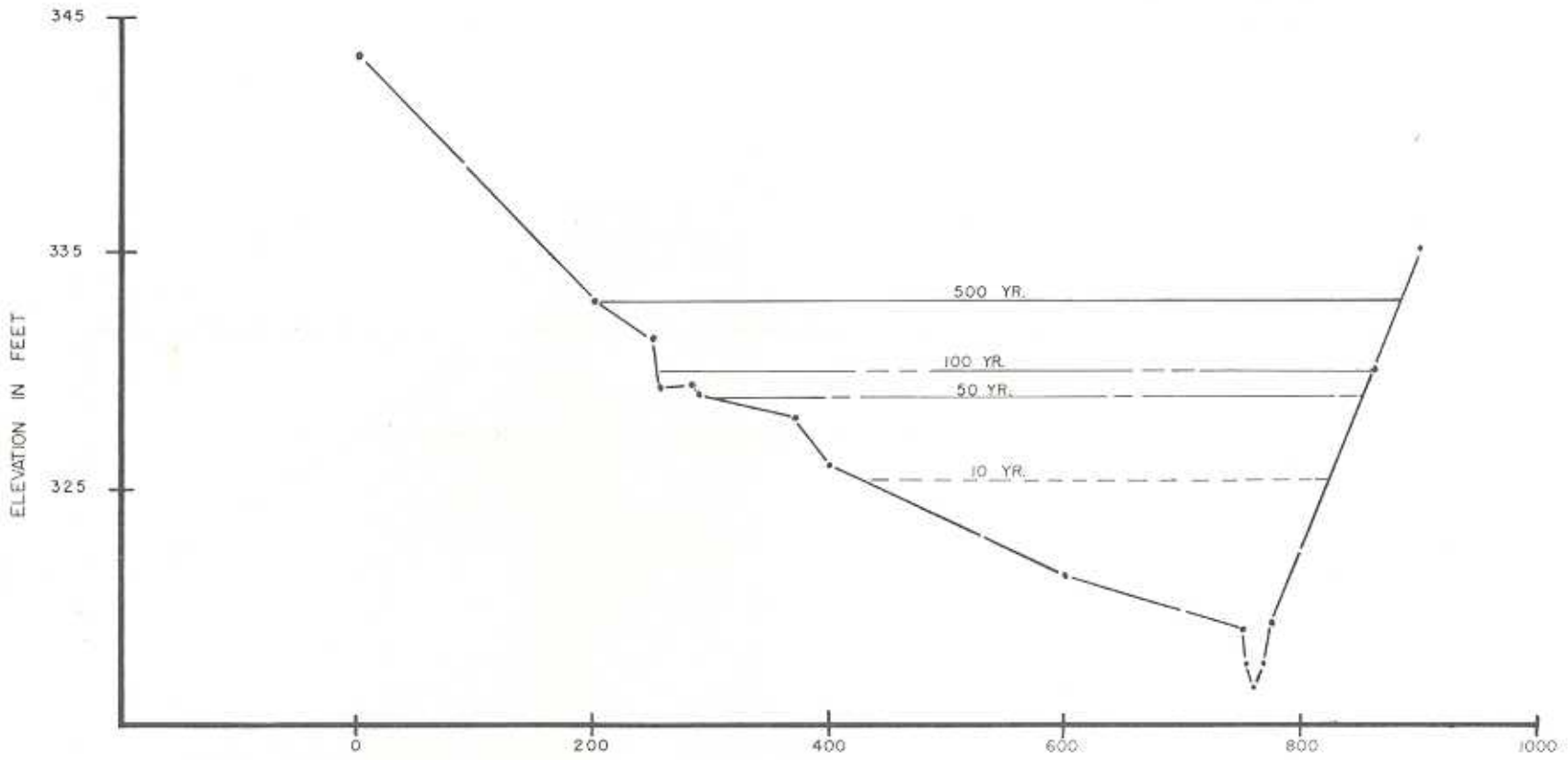
FIGURE 12

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS

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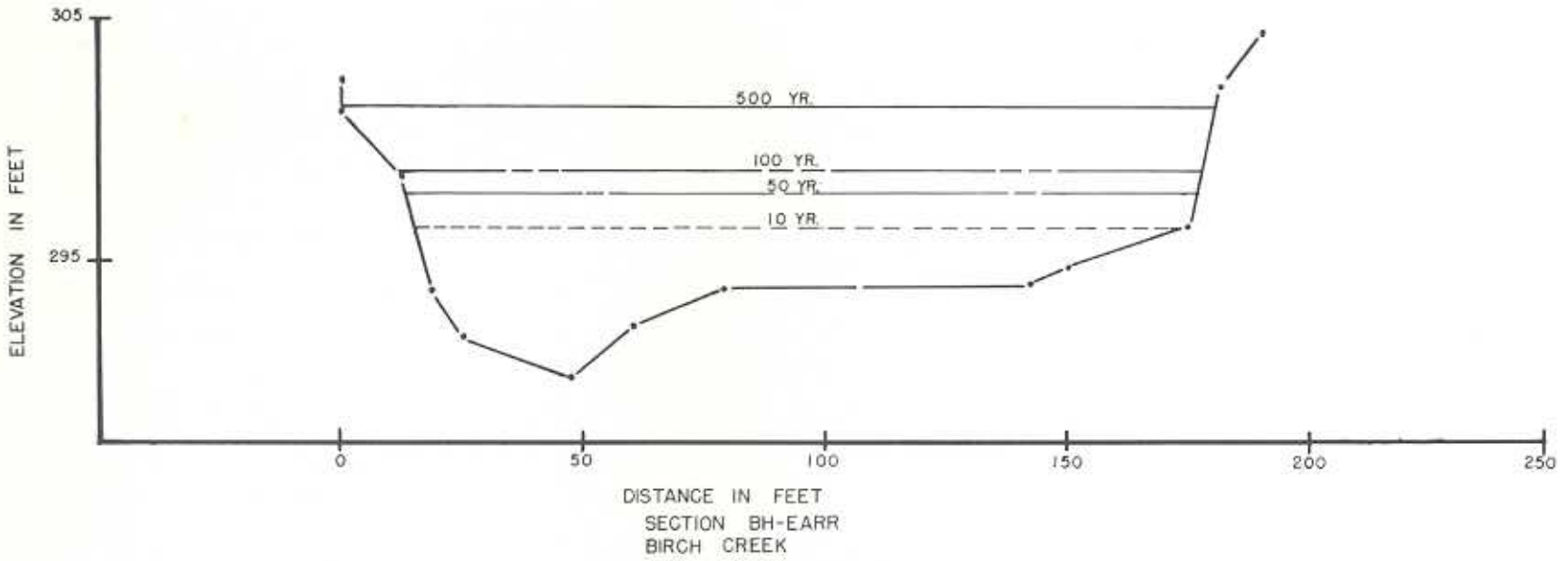
TALKEETNA SUBBASIN ,
MATANUSKA-SUSITNA BOROUGH , ALASKA

FIGURE 13

# TYPICAL VALLEY SECTION
ALL PRESENT FLOOD CONDITIONS




SECTION BH-EARR
BIRCH CREEK

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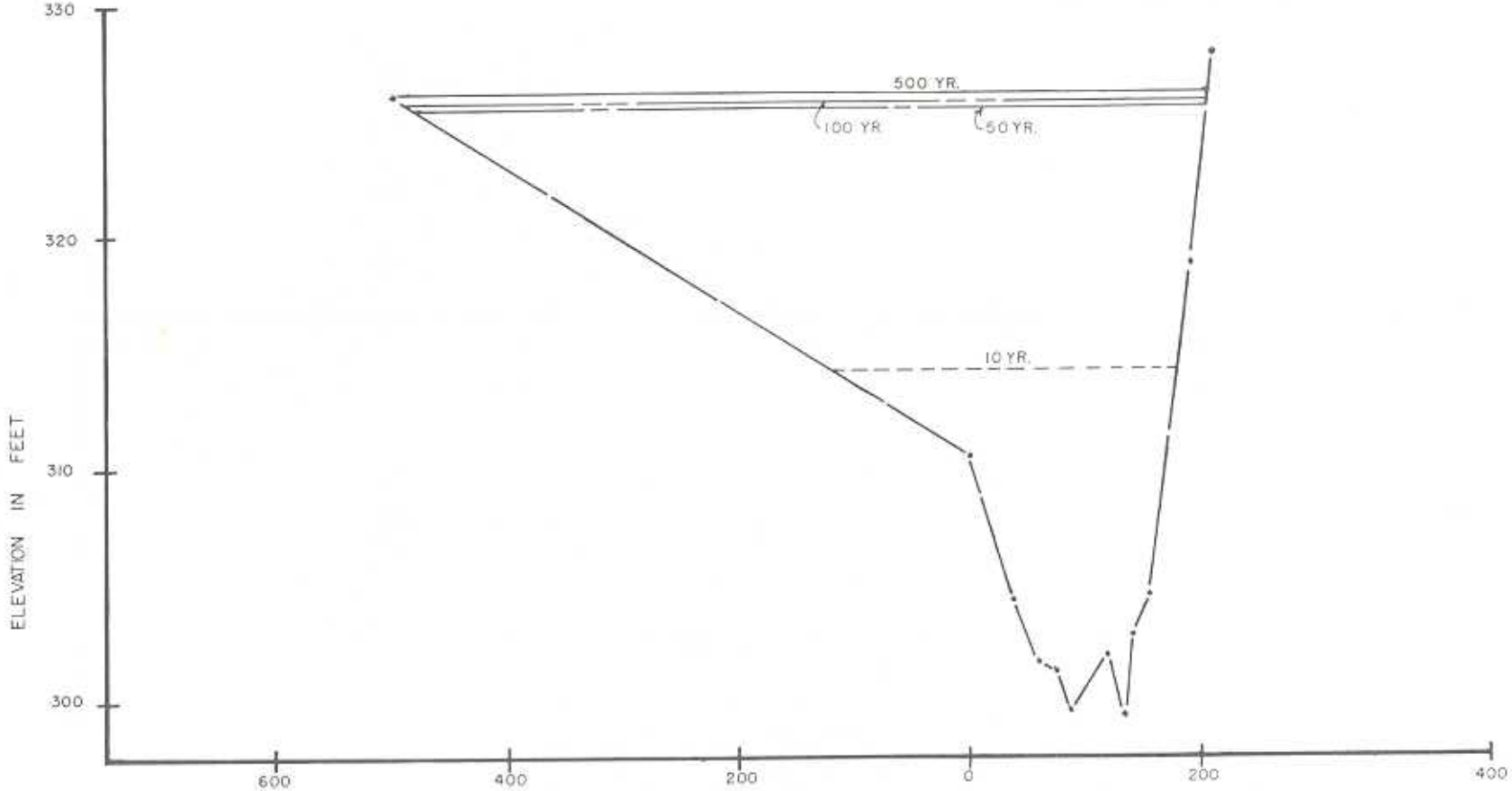
MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 14

# TYPICAL VALLEY SECTION

ALL PRESENT FLOOD CONDITIONS

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MATANUSKA-SUSITNA BOROUGH, ALASKA

FIGURE 15

# APPENDIX A

**Table 1 - Present Conditions Frequency, Discharge, Elevation**

**Data at Valley Cross Sections**

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 196 Mile Creek | | | | | | | | | | | | |
| 196-A | 1 | 1 | 35.7 | 1120 | 154.0 | 1690 | 156.0 | 1950 | 157.0 | 2620 | 157.1 | 146.0 |
| 196-B | 1 | 1 | 35.7 | 1120 | 154.3 | 1690 | 156.1 | 1950 | 157.1 | 2620 | 157.2 | 148.0 |
| 196-C | 1 | 1 | 35.7 | 1120 | 154.7 | 1690 | 156.2 | 1950 | 157.1 | 2620 | 157.3 | 149.0 |
| 196-D 1/ | 1 | 1 | 35.7 | 1120 | 155.1 | 1690 | 156.4 | 1950 | 157.2 | 2620 | 157.5 | 149.5 |
| 196-E 1/ | 1 | 1 | 35.7 | 1120 | 155.4 | 1690 | 156.5 | 1950 | 157.3 | 2620 | 157.5 | 150.0 |
| 196-FPHY 1/ | 1 | 1 | 34.4 | 1120 | 161.5 | 1690 | 163.8 | 1950 | 164.8 | 2620 | 167.6 | 153.0 |
| 196-G 1/ | 1 | 1 | 34.4 | 1120 | 161.5 | 1690 | 163.8 | 1950 | 164.8 | 2620 | 167.6 | 153.5 |
| 196-H 1/ | 1 | 2 | 22.6 | 820 | 168.9 | 1230 | 169.4 | 1420 | 169.8 | 1910 | 170.7 | 163.3 |
| 196-I 1/ | 1 | 2 | 22.6 | 820 | 171.5 | 1230 | 171.8 | 1420 | 171.9 | 1910 | 172.3 | 167.5 |
| 196-J 1/ | 1 | 2 | 22.6 | 820 | 175.4 | 1230 | 175.7 | 1420 | 176.0 | 1910 | 176.4 | 171.4 |
| 196-KARR 1/ | 1 | 2 | 21.1 | 820 | 177.1 | 1230 | 178.4 | 1420 | 178.9 | 1910 | 179.0 | 172.0 |
| 196-L 1/ | 1 | 2 | 21.1 | 820 | 177.5 | 1230 | 178.5 | 1420 | 179.0 | 1910 | 179.2 | 174.1 |
| 196-M | 1 | 2 | 21.1 | 820 | 195.2 | 1230 | 196.0 | 1420 | 196.3 | 1910 | 197.0 | 190.3 |
| 196-N | 1 | 3 | 14.7 | 710 | 250.7 | 1070 | 250.9 | 1240 | 251.0 | 1670 | 251.1 | 147.5 |
| Tributary No. 1 | 1 | | | | | | | | | | | |
| 196-AA 1/ | 1 | 4 | 11.8 | 520 | 170.1 | 790 | 170.5 | 910 | 170.6 | 1220 | 171.3 | 166.4 |
| 196-BB 1/ | 1 | 4 | 11.8 | 520 | 185.2 | 790 | 185.9 | 910 | 186.3 | 1220 | 186.9 | 180.0 |
| 196-CC 1/ | 1 | 5 | 11.8 | 520 | 197.1 | 790 | 197.5 | 910 | 197.7 | 1220 | 198.1 | 194.7 |
| 196-DDAR 1/ | 1 | 5 | 11.8 | 520 | 200.4 | 790 | 201.5 | 910 | 201.8 | 1220 | 202.6 | 195.8 |
| 196-EE 1/ | 1 | 5 | 11.8 | 520 | 200.4 | 790 | 201.5 | 910 | 201.8 | 1220 | 202.6 | 196.7 |
| 196-FF | 1 | 6 | 10.3 | 520 | 213.3 | 790 | 213.8 | 910 | 213.9 | 1220 | 214.3 | 210.7 |
| 196-GG | 1 | 6 | 9.7 | 520 | 223.3 | 790 | 223.7 | 910 | 223.9 | 1220 | 224.2 | 220.7 |
| Caswell Creek | | | | | | | | | | | | |
| CW-A | 1 | 7 | 17.83 | 680 | 172.0 | 1020 | 176.0 | 1190 | 178.0 | 1598 | 180.0 | 164.6 |
| CW-B | 1 | 7 | 17.83 | 680 | 172.5 | 1020 | 176.0 | 1190 | 178.0 | 1598 | 180.0 | 165.6 |

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Caswell Creek (cont) | | | | | | | | | | | | |
| CW-C | 1 | 7 | 17.83 | 680 | 173.9 | 1020 | 176.2 | 1190 | 178.0 | 1598 | 180.0 | 167.6 |
| CW-D | 1 | 7 | 17.83 | 680 | 175.1 | 1020 | 176.5 | 1190 | 178.1 | 1598 | 180.0 | 168.6 |
| CW-E | 1 | 7 | 17.83 | 680 | 176.1 | 1020 | 177.0 | 1190 | 178.2 | 1598 | 180.1 | 169.6 |
| CW-F 1/ | 1 | 7 | 17.83 | 680 | 176.9 | 1020 | 177.6 | 1190 | 178.5 | 1598 | 180.1 | 170.6 |
| CW-GHW 1/ | 1 | 7 | 17.24 | 680 | 180.5 | 1020 | 183.3 | 1190 | 184.7 | 1598 | 187.9 | 170.9 |
| CW-H 1/ | 1 | 7 | 17.24 | 680 | 180.5 | 1020 | 183.3 | 1190 | 184.7 | 1598 | 187.9 | 170.7 |
| CW-I 1/ | 1 | 8 | 17.24 | 680 | 180.6 | 1020 | 183.3 | 1190 | 184.8 | 1598 | 187.9 | 174.7 |
| CW-J 1/ | 1 | 8 | 17.24 | 680 | 183.4 | 1020 | 184.7 | 1190 | 185.6 | 1598 | 188.1 | 179.7 |
| CW-K 1/ | 1 | 8 | 17.24 | 680 | 187.3 | 1020 | 187.9 | 1190 | 188.3 | 1598 | 189.5 | 183.7 |
| CW-L 1/ | 1 | 9 | 17.24 | 680 | 194.4 | 1020 | 194.7 | 1190 | 194.8 | 1598 | 195.1 | 189.3 |
| CW-MARR 1/ | 1 | 9 | 16.55 | 680 | 197.0 | 1020 | 198.2 | 1190 | 198.7 | 1598 | 199.8 | 190.3 |
| CW-N 1/ | 1 | 9 | 16.55 | 680 | 197.1 | 1020 | 198.2 | 1190 | 198.7 | 1598 | 199.8 | 191.3 |
| CW-O | 1 | 9 | 16.55 | 680 | 197.9 | 1020 | 198.6 | 1190 | 199.0 | 1598 | 199.9 | 192.3 |
| CW-P | 1 | 9 | 16.55 | 680 | 202.7 | 1020 | 203.1 | 1190 | 203.2 | 1598 | 203.4 | 197.2 |
| CW-Q | 1 | 9 | 16.55 | 680 | 205.5 | 1020 | 205.9 | 1190 | 206.1 | 1598 | 206.2 | 200.3 |
| CW-R | 1 | 9 | 16.55 | 680 | 211.4 | 1020 | 211.8 | 1190 | 212.0 | 1598 | 212.3 | 206.3 |
| CW-S | 1 | 10 | 16.55 | 680 | 219.9 | 1020 | 220.1 | 1190 | 220.2 | 1598 | 220.6 | 214.3 |
| CW-T | 1 | 11 | 16.55 | 680 | 227.8 | 1020 | 228.1 | 1190 | 228.2 | 1598 | 228.4 | 222.3 |
| CW-U | 1 | 11 | 13.61 | 566 | 235.6 | 849 | 235.9 | 991 | 236.0 | 1330 | 236.3 | 230.3 |
| CW-V | 1 | 12 | 12.88 | 566 | 245.6 | 849 | 245.9 | 991 | 246.0 | 1330 | 246.3 | 240.3 |
| Sheep Creek | | | | | | | | | | | | |
| SP-A | 1 | 13 | 136.5 | 5893 | 183.0 | 7917 | 185.0 | 8804 | 186.0 | 11005 | 188.0 | 172.8 |
| SP-B | 1 | 13 | 136.5 | 5893 | 184.9 | 7917 | 186.3 | 8804 | 187.0 | 11005 | 188.6 | 175.0 |
| SP-C | 2 | 13 | 136.5 | 5893 | 186.5 | 7917 | 187.6 | 8804 | 188.1 | 11005 | 189.4 | 176.6 |
| SP-D | 2 | 13 | 135.0 | 5893 | 188.3 | 7917 | 189.2 | 8804 | 189.6 | 11005 | 190.6 | 178.2 |
| SP-E | 2 | 14 | 135.0 | 5893 | 191.9 | 7917 | 192.5 | 8804 | 193.0 | 11005 | 193.7 | 181.8 |
| SP-F | 2 | 14 | 135.0 | 5893 | 193.0 | 7917 | 193.7 | 8804 | 194.1 | 11005 | 194.7 | 183.0 |

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sheep Creek (cont) | | | | | | | | | | | | |
| SP-G | 2 | 15 | 135.0 | 5893 | 194.9 | 7917 | 195.7 | 8804 | 196.0 | 11005 | 196.6 | 184.9 |
| SP-H | 2 | 15 | 134.0 | 5893 | 197.0 | 7917 | 197.8 | 8804 | 198.1 | 11005 | 198.8 | 187.2 |
| SP-I 1/ | 2 | 15 | 134.0 | 5893 | 201.9 | 7917 | 202.8 | 8804 | 203.2 | 11005 | 203.9 | 189.9 |
| SP-JHY 1/ | 2 | 15 | 134.0 | 5893 | 202.6 | 7917 | 205.2 | 8804 | 206.0 | 11005 | 206.4 | 190.0 |
| SP-K 1/ | 2 | 15 | 134.0 | 5893 | 202.9 | 7917 | 205.3 | 8804 | 206.1 | 11005 | 206.4 | 189.7 |
| SP-L 1/ | 2 | 16 | 134.0 | 5893 | 203.8 | 7917 | 205.7 | 8804 | 206.4 | 11005 | 206.9 | 185.3 |
| SP-MRR 1/ | 2 | 16 | 134.0 | 5893 | 204.8 | 7917 | 209.6 | 8804 | 211.2 | 11005 | 213.0 | 185.7 |
| SP-N 1/ | 2 | 16 | 134.0 | 5893 | 204.9 | 7917 | 209.6 | 8804 | 211.2 | 11005 | 213.0 | 185.7 |
| SP-O | 2 | 16 | 134.0 | 5893 | 205.1 | 7917 | 209.6 | 8804 | 211.3 | 11005 | 213.0 | 192.5 |
| SP-P | 2 | 16 | 134.9 | 5893 | 212.1 | 7917 | 213.1 | 8804 | 213.7 | 11005 | 214.5 | 204.0 |
| SP-Q | 2 | 17 | 131.0 | 5893 | 217.4 | 7917 | 218.0 | 8804 | 218.3 | 11005 | 218.8 | 209.7 |
| SP-R | 2 | 17 | 131.0 | 5893 | 232.1 | 7917 | 232.6 | 8804 | 232.9 | 11005 | 233.3 | 224.4 |
| SP-S | 5 | 17 | 131.0 | 5893 | 246.4 | 7917 | 246.9 | 8804 | 247.2 | 11005 | 247.6 | 238.7 |
| SP-T | 5 | 18 | 131.0 | 5893 | 258.6 | 7917 | 259.0 | 8804 | 259.3 | 11005 | 259.6 | 249.8 |
| SP-U | 5 | 18 | 131.0 | 5893 | 262.8 | 7917 | 263.3 | 8804 | 263.6 | 11005 | 264.0 | 253.2 |
| SP-V | 5 | 19 | 131.0 | 5893 | 266.4 | 7917 | 266.8 | 8804 | 267.0 | 11005 | 267.6 | 254.0 |
| SP-W | 5 | 19 | 127.0 | 5893 | 269.0 | 7917 | 269.6 | 8804 | 269.8 | 11005 | 270.4 | 256.7 |
| SP-X | 5 | 20 | 127.0 | 5893 | 272.5 | 7917 | 273.0 | 8804 | 273.3 | 11005 | 273.7 | 260.1 |
| SP-Y | 5 | 20 | 127.0 | 5893 | 275.9 | 7917 | 276.5 | 8804 | 276.6 | 11005 | 277.1 | 263.5 |
| SP-Z | 5 | 21 | 127.0 | 5893 | 281.9 | 7917 | 282.5 | 8804 | 282.7 | 11005 | 283.1 | 272.1 |
| SP-AA | 5 | 22 | 127.0 | 5893 | 285.2 | 7917 | 285.8 | 8804 | 286.0 | 11005 | 286.3 | 273.0 |
| SP-AB | 5 | 22 | 127.0 | 5893 | 289.0 | 7917 | 289.7 | 8804 | 289.8 | 11005 | 290.4 | 276.7 |
| SP-AC | 5 | 23 | 125.0 | 5893 | 308.2 | 7917 | 308.9 | 8804 | 309.1 | 11005 | 309.6 | 297.2 |
| SP-AD | 5 | 24 | 121.8 | 5893 | 407.3 | 7917 | 407.9 | 8804 | 408.2 | 11005 | 408.6 | 397.2 |
| SP-AE | 5 | 25 | 118.4 | 5561 | 437.7 | 7470 | 438.3 | 8308 | 438.5 | 10385 | 438.9 | 428.2 |
| Goose Creek | | | | | | | | | | | | |
| GS-A | 2 | 26 | 141.8 | 6120 | 224.0 | 8210 | 228.0 | 9080 | 230.0 | 11290 | 234.0 | 217.5 |
| GS-B | 2 | 26 | 141.8 | 6120 | 227.5 | 8210 | 229.0 | 9080 | 230.5 | 11290 | 234.1 | 218.2 |

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm | | 50-Year Storm | | 100-Year Storm | | 500-Year Storm | | Channel Bottom |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Disch. (cfs) | Elev. msl (feet) | Disch. (cfs) | Elev. msl (feet) | Disch. (cfs) | Elev. msl (feet) | Disch. (cfs) | Elev. msl (feet) | Elev. msl (feet) |
| Goose Creek (cont) | | | | | | | | | | | | |
| GS-C | 2 | 26 | 141.8 | 6120 | 228.7 | 8210 | 229.9 | 9080 | 231.0 | 11290 | 234.2 | 218.9 |
| GS-D | 2 | 26 | 141.8 | 6120 | 229.4 | 8210 | 230.5 | 9080 | 231.4 | 11290 | 234.3 | 219.4 |
| GS-E 1/ | 2 | 26 | 141.8 | 6120 | 230.0 | 8210 | 231.0 | 9080 | 231.8 | 11290 | 234.4 | 219.9 |
| GS-FARR 1/ | 2 | 26 | 140.6 | 6120 | 230.9 | 8210 | 232.5 | 9080 | 233.5 | 11290 | 235.9 | 219.9 |
| GS-G 1/ | 2 | 26 | 140.6 | 6120 | 231.0 | 8210 | 232.5 | 9080 | 233.5 | 11290 | 235.9 | 220.5 |
| GS-H 1/ | 2 | 26 | 140.6 | 6120 | 232.5 | 8210 | 233.5 | 9080 | 234.2 | 11290 | 236.2 | 223.2 |
| GS-I 1/ | 2 | 26 | 140.6 | 6120 | 236.4 | 8210 | 237.4 | 9080 | 237.8 | 11290 | 238.8 | 228.4 |
| GS-J 1/ | 2 | 26 | 140.6 | 6120 | 239.2 | 8210 | 240.0 | 9080 | 240.3 | 11290 | 241.1 | 231.1 |
| GS-K 1/ | 2 | 26 | 140.6 | 6120 | 247.9 | 8210 | 248.6 | 9080 | 248.9 | 11290 | 249.6 | 240.0 |
| GS-L 1/ | 2 | 27 | 140.6 | 6120 | 248.7 | 8210 | 249.5 | 9080 | 249.8 | 11290 | 250.5 | 241.1 |
| GS-MPH 1/ | 2 | 27 | 140.6 | 6120 | 253.2 | 8210 | 253.5 | 9080 | 253.6 | 11290 | 253.8 | 242.2 |
| GS-N 1/ | 2 | 27 | 140.6 | 6120 | 253.3 | 8210 | 253.5 | 9080 | 253.6 | 11290 | 253.8 | 241.2 |
| GS-O 1/ | 2 | 27 | 140.6 | 6120 | 254.3 | 8210 | 254.7 | 9080 | 254.9 | 11290 | 255.3 | 240.4 |
| GS-P | 2 | 27 | 140.6 | 6120 | 261.8 | 8210 | 262.5 | 9080 | 262.5 | 11290 | 263.1 | 250.0 |
| GS-Q | 2 | 27 | 136.8 | 6340 | 272.8 | 8100 | 273.4 | 8960 | 273.7 | 11140 | 274.1 | 260.0 |
| GS-R | 2 | 27 | 136.8 | 6340 | 278.7 | 8100 | 276.6 | 8960 | 280.0 | 11140 | 280.7 | 270.0 |
| GS-S | 2 | 28 | 136.8 | 6340 | 295.0 | 8100 | 295.5 | 8960 | 295.8 | 11140 | 296.2 | 282.5 |
| GS-T | 5 | 28 | 126.4 | 5700 | 312.6 | 7650 | 313.3 | 8460 | 313.5 | 10510 | 314.0 | 300.0 |
| Montana Creek | | | | | | | | | | | | |
| MA-A | 3 | 29 | 169.0 | 6720 | 234.0 | 8988 | 238.0 | 9996 | 240.0 | 12,306 | 244.0 | 226.6 |
| MA-1 | 3 | 29 | 169.0 | 6720 | 235.0 | 8988 | 238.1 | 9996 | 240.0 | 12,306 | 244.0 | 226.8 |
| MA-B | 3 | 29 | 169.0 | 6720 | 235.6 | 8988 | 238.1 | 9996 | 240.0 | 12,306 | 244.0 | 227.0 |
| MA-2 | 3 | 29 | 169.0 | 6720 | 236.0 | 8988 | 238.2 | 9996 | 240.1 | 12,306 | 244.0 | 227.0 |
| MA-C | 3 | 29 | 169.0 | 6720 | 236.4 | 8988 | 238.3 | 9996 | 240.1 | 12,306 | 244.0 | 227.4 |
| MA-3 1/ | 3 | 29 | 169.0 | 6720 | 236.5 | 8988 | 238.3 | 9996 | 240.1 | 12,306 | 244.0 | 227.7 |
| MADARR 1/ | 3 | 29 | 169.0 | 6720 | 240.6 | 8988 | 242.8 | 9996 | 243.7 | 12,306 | 245.9 | 227.7 |
| MA-4 1/ | 3 | 29 | 169.0 | 6720 | 240.6 | 8988 | 242.8 | 9996 | 243.7 | 12,306 | 245.9 | 228.4 |

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Montana Creek (cont) | | | | | | | | | | | | |
| MA-E 1/ | 3 | 29 | 169.0 | 6720 | 240.6 | 8988 | 242.8 | 9996 | 243.7 | 12,306 | 245.9 | 228.2 |
| MA-5 1/ | 3 | 29 | 169.0 | 6720 | 240.6 | 8988 | 242.8 | 9996 | 243.7 | 12,306 | 245.9 | 228.7 |
| MA-F 1/ | 3 | 29 | 169.0 | 6720 | 241.4 | 8988 | 243.1 | 9996 | 243.9 | 12,306 | 246.0 | 232.9 |
| MA-6 1/ | 3 | 29 | 169.0 | 6720 | 243.1 | 8988 | 244.1 | 9996 | 244.6 | 12,306 | 246.2 | 235.2 |
| MA-G 1/ | 3 | 29 | 169.0 | 6720 | 243.0 | 8988 | 244.7 | 9996 | 245.1 | 12,306 | 246.5 | 236.9 |
| MAHPHY 1/ | 3 | 29 | 169.0 | 6720 | 247.9 | 8988 | 249.6 | 9996 | 250.4 | 12,306 | 251.9 | 238.5 |
| MA-I 1/ | 3 | 29 | 164.0 | 6720 | 247.9 | 8988 | 249.6 | 9996 | 250.4 | 12,306 | 251.9 | 239.6 |
| MA-J 1/ | 3 | 29 | 164.0 | 6720 | 253.0 | 8988 | 253.9 | 9996 | 254.2 | 12,306 | 255.1 | 247.5 |
| MA-K | 3 | 29 | 164.0 | 6720 | 257.7 | 8988 | 258.5 | 9996 | 258.8 | 12,306 | 259.5 | 250.0 |
| MA-L | 3 | 30 | 164.0 | 6720 | 281.5 | 8988 | 282.2 | 9996 | 282.4 | 12,306 | 283.0 | 275.0 |
| MA-M | 6 | 31 | 163.0 | 6720 | 306.6 | 8988 | 207.3 | 9996 | 307.5 | 12,306 | 308.1 | 300.0 |
| MA-N | 6 | 31 | 163.0 | 6720 | 322.0 | 8988 | 332.8 | 9996 | 333.0 | 12,306 | 333.7 | 325.0 |
| MA-7 | 6 | 32 | 163.0 | 6720 | 343.7 | 8988 | 344.4 | 9996 | 344.7 | 12,306 | 345.3 | 337.5 |
| MA-O | 6 | 32 | 161.0 | 6720 | 355.9 | 8988 | 356.8 | 9996 | 357.1 | 12,306 | 357.6 | 350.0 |
| MA-P | 6 | 33 | 161.0 | 6720 | 381.6 | 8988 | 382.4 | 9996 | 382.6 | 12,306 | 383.2 | 375.0 |
| MA-Q | 6 | 33 | 125.0 | 5600 | 405.6 | 7490 | 406.4 | 8330 | 406.7 | 10,255 | 407.2 | 400.0 |
| MA-R | 6 | 34 | 122.0 | 5600 | 455.2 | 7490 | 455.8 | 8330 | 456.0 | 10,255 | 456.5 | 450.0 |
| MA-S | 6 | 34 | 122.0 | 5600 | 480.5 | 7490 | 481.2 | 8330 | 481.5 | 10,255 | 482.2 | 471.6 |
| MA-T | 6 | 35 | 122.0 | 5600 | 505.9 | 7490 | 506.7 | 8330 | 506.8 | 10,255 | 507.5 | 500.0 |
| Answer Creek | | | | | | | | | | | | |
| AN-A | 4 | 36 | 34.4 | 1281 | 274.0 | 1841 | 280.0 | 2079 | 284.0 | 2688 | 286.0 | 268.0 |
| AN-B | 4 | 36 | 34.4 | 1281 | 275.0 | 1841 | 280.1 | 2079 | 284.0 | 2688 | 286.0 | 268.6 |
| AN-C | 4 | 36 | 34.4 | 1281 | 275.7 | 1841 | 280.3 | 2079 | 284.1 | 2688 | 286.1 | 269.0 |
| AN-D | 4 | 37 | 34.4 | 1281 | 276.6 | 1841 | 280.5 | 2079 | 284.2 | 2688 | 286.2 | 269.9 |
| AN-E 1/ | 4 | 37 | 34.4 | 1281 | 277.4 | 1841 | 280.8 | 2079 | 284.3 | 2688 | 286.2 | 270.8 |
| AN-F 1/ | 4 | 38 | 34.4 | 1281 | 278.2 | 1841 | 281.1 | 2079 | 284.4 | 2688 | 286.3 | 271.7 |
| AN-GARR 1/ | 4 | 38 | 28.6 | 1281 | 280.2 | 1841 | 283.1 | 2079 | 285.3 | 2688 | 286.5 | 272.1 |

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

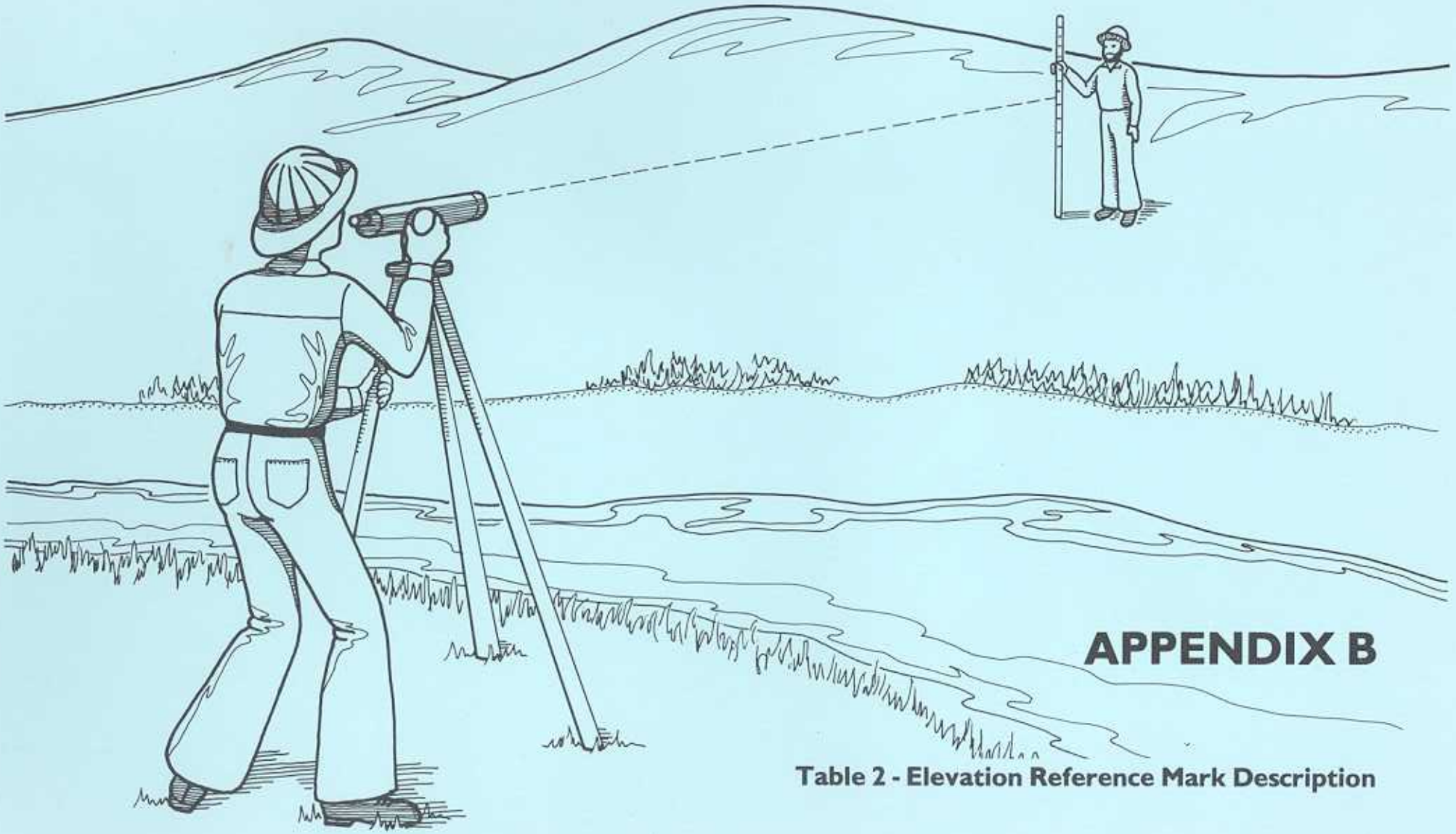
| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer Creek (cont) | | | | | | | | | | | | |
| AN-H 1/ | 4 | 38 | 28.6 | 1281 | 280.2 | 1841 | 283.1 | 2079 | 285.3 | 2688 | 286.5 | 272.7 |
| AN-I 1/ | 4 | 38 | 28.6 | 1281 | 295.0 | 1841 | 295.5 | 2079 | 295.8 | 2688 | 296.3 | 291.3 |
| AN-J 1/ | 4 | 39 | 26.6 | 990 | 306.0 | 1841 | 306.6 | 2079 | 306.8 | 2688 | 307.3 | 302.1 |
| AN-K 1/ | 4 | 39 | 26.6 | 990 | 316.3 | 1422 | 316.6 | 1606 | 316.7 | 2077 | 317.1 | 312.9 |
| AN-LTRD 1/ | 4 | 39 | 26.6 | 990 | 325.3 | 1422 | 328.8 | 1606 | 329.8 | 2077 | 332.9 | 315.2 |
| AN-M 1/ | 4 | 39 | 26.6 | 990 | 325.3 | 1422 | 328.8 | 1606 | 329.8 | 2077 | 322.9 | 317.3 |
| AN-N | 4 | 39 | 26.6 | 990 | 331.6 | 1422 | 332.6 | 1606 | 333.0 | 2077 | 334.4 | 327.0 |
| AN-O | 4 | 39 | 25.0 | 990 | 337.8 | 1422 | 338.2 | 1606 | 338.4 | 2077 | 339.0 | 333.0 |
| Birch Creek | | | | | | | | | | | | |
| BH-A | 4 | 40 | 29.4 | 970 | 292.0 | 1478 | 294.0 | 1742 | 296.0 | 2352 | 300.0 | 286.0 |
| BH-B | 4 | 40 | 28.9 | 970 | 294.5 | 1480 | 296.0 | 1742 | 297.3 | 2352 | 300.7 | 287.0 |
| BH-C | 4 | 41 | 28.9 | 970 | 295.4 | 1480 | 296.8 | 1742 | 298.0 | 2352 | 301.0 | 288.0 |
| BH-D 1/ | 4 | 41 | 28.9 | 970 | 296.2 | 1480 | 297.6 | 1742 | 298.6 | 2352 | 301.3 | 289.0 |
| BH-EARR 1/ | 4 | 41 | 27.8 | 970 | 296.4 | 1480 | 297.7 | 1742 | 298.7 | 2352 | 301.4 | 290.2 |
| BH-F 1/ | 4 | 41 | 27.8 | 970 | 297.5 | 1480 | 298.5 | 1742 | 299.2 | 2352 | 301.6 | 292.7 |
| BH-G 1/ | 4 | 42 | 27.8 | 970 | 300.0 | 1480 | 301.0 | 1742 | 301.5 | 2352 | 303.1 | 295.1 |
| BH-H 1/ | 4 | 42 | 27.8 | 970 | 302.2 | 1480 | 303.8 | 1742 | 304.2 | 2352 | 305.3 | 297.8 |
| BH-ITRD 1/ | 4 | 42 | 24.5 | 889 | 314.3 | 1355 | 324.7 | 1597 | 325.9 | 2156 | 326.2 | 300.2 |
| BH-J 1/ | 4 | 42 | 24.5 | 889 | 314.3 | 1355 | 325.7 | 1597 | 325.9 | 2156 | 326.2 | 300.9 |

1/ Elevations at these cross sections were determined by running differential leveling from U.S.N.G.S. Bench Marks to each cross section. The elevations from the rest of the cross sections are estimated from U.S.G.S. Topographic sheets. For specific locations, except at the highway and railroad crossings, depth of flow, using the channel bottom as reference, would be more accurate than elevations.

**Table 1. Present Conditions: Frequency-Discharge Elevation Data at Valley Sections 196 Mile, Caswell, Sheep, Goose, Montana, Answer, and Birch Creeks Matanuska-Susitna Borough, Alaska**

| Valley Section | Photo-Sheet (No.) | Profile Sheet (No.) | Drainage Area (Sq. Mi.) | 10-Year Storm Disch. (cfs) | 10-Year Storm Elev. msl (feet) | 50-Year Storm Disch. (cfs) | 50-Year Storm Elev. msl (feet) | 100-Year Storm Disch. (cfs) | 100-Year Storm Elev. msl (feet) | 500-Year Storm Disch. (cfs) | 500-Year Storm Elev. msl (feet) | Channel Bottom Elev. msl (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer Creek (cont) | | | | | | | | | | | | |
| AN-H 1/ | 4 | 38 | 28.6 | 1281 | 280.2 | 1841 | 283.1 | 2079 | 285.3 | 2688 | 286.5 | 272.7 |
| AN-I 1/ | 4 | 38 | 28.6 | 1281 | 295.0 | 1841 | 295.5 | 2079 | 295.8 | 2688 | 296.3 | 291.3 |
| AN-J 1/ | 4 | 39 | 26.6 | 990 | 306.0 | 1841 | 306.6 | 2079 | 306.8 | 2688 | 307.3 | 302.1 |
| AN-K 1/ | 4 | 39 | 26.6 | 990 | 316.3 | 1422 | 316.6 | 1606 | 316.7 | 2077 | 317.1 | 312.9 |
| AN-LTRD 1/ | 4 | 39 | 26.6 | 990 | 325.3 | 1422 | 328.8 | 1606 | 329.8 | 2077 | 332.9 | 315.2 |
| AN-M 1/ | 4 | 39 | 26.6 | 990 | 325.3 | 1422 | 328.8 | 1606 | 329.8 | 2077 | 322.9 | 317.3 |
| AN-N | 4 | 39 | 26.6 | 990 | 331.6 | 1422 | 332.6 | 1606 | 333.0 | 2077 | 334.4 | 327.0 |
| AN-O | 4 | 39 | 25.0 | 990 | 337.8 | 1422 | 338.2 | 1606 | 338.4 | 2077 | 339.0 | 333.0 |
| Birch Creek | | | | | | | | | | | | |
| BH-A | 4 | 40 | 29.4 | 970 | 292.0 | 1478 | 294.0 | 1742 | 296.0 | 2352 | 300.0 | 286.0 |
| BH-B | 4 | 40 | 28.9 | 970 | 294.5 | 1480 | 296.0 | 1742 | 297.3 | 2352 | 300.7 | 287.0 |
| BH-C | 4 | 41 | 28.9 | 970 | 295.4 | 1480 | 296.8 | 1742 | 298.0 | 2352 | 301.0 | 288.0 |
| BH-D 1/ | 4 | 41 | 28.9 | 970 | 296.2 | 1480 | 297.6 | 1742 | 298.6 | 2352 | 301.3 | 289.0 |
| BH-EARR 1/ | 4 | 41 | 27.8 | 970 | 296.4 | 1480 | 297.7 | 1742 | 298.7 | 2352 | 301.4 | 290.2 |
| BH-F 1/ | 4 | 41 | 27.8 | 970 | 297.5 | 1480 | 298.5 | 1742 | 299.2 | 2352 | 301.6 | 292.7 |
| BH-G 1/ | 4 | 42 | 27.8 | 970 | 300.0 | 1480 | 301.0 | 1742 | 301.5 | 2352 | 303.1 | 295.1 |
| BH-H 1/ | 4 | 42 | 27.8 | 970 | 302.2 | 1480 | 303.8 | 1742 | 304.2 | 2352 | 305.3 | 297.8 |
| BH-ITRD 1/ | 4 | 42 | 24.5 | 889 | 314.3 | 1355 | 324.7 | 1597 | 325.9 | 2156 | 326.2 | 300.2 |
| BH-J 1/ | 4 | 42 | 24.5 | 889 | 314.3 | 1355 | 325.7 | 1597 | 325.9 | 2156 | 326.2 | 300.9 |

1/ Elevations at these cross sections were determined by running differential leveling from U.S.N.G.S. Bench Marks to each cross section. The elevations from the rest of the cross sections are estimated from U.S.G.S. Topographic sheets. For specific locations, except at the highway and railroad crossings, depth of flow, using the channel bottom as reference, would be more accurate than elevations.



# APPENDIX B

**Table 2 - Elevation Reference Mark Description**

## TABLE 2
## ELEVATION REFERENCE MARK DESCRIPTION
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, AND BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

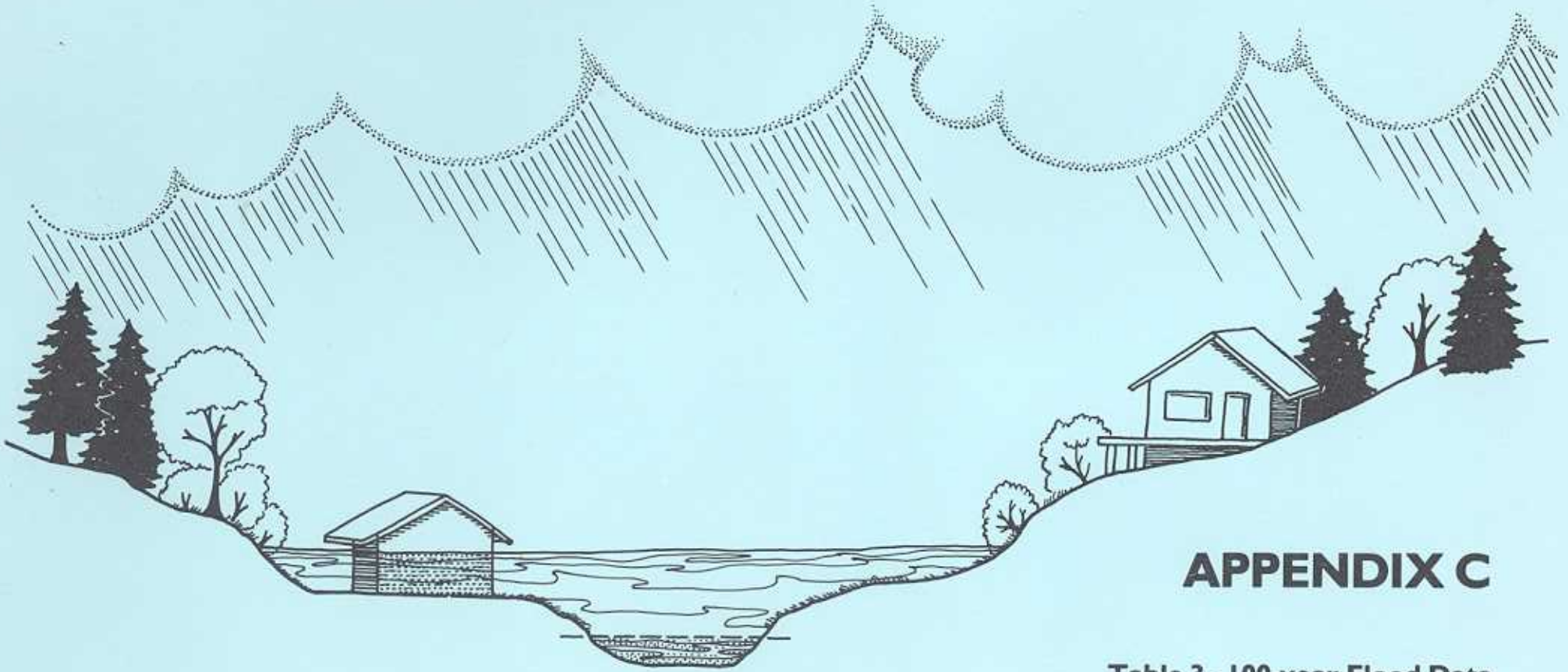
| BM No. | Photo-Sheet (No.) | Elev. MSL (feet) | Description and Location of Elevation Markers |
|---|---|---|---|
| **196 MILE CREEK** | | | |
| R-104 | 1 | 192.63 | C&GS vertical control data line 101. Brass cap stamped R-104 on top of a 5/8 inch copper coated rod, encased in a 5 inch orangeburg pipe which projects 0.5 foot above ground. Located 14.35 miles south along graveled road from the Alaska Railroad station at Talkeetna, thence 16.95 miles south along State Highway 3 (Parks Highway), at the junction of a dirt road leading west, 41 feet west of centerline of the highway, 15 feet north of centerline of the road, 1.2 feet north of metal witness post. |
| TBM 1 | 1 | 163.55 | SCS TBM, top of west end of most southerly culvert where the Parks Highway crosses 196 Mile Creek. (Valley sec. 196-HY) |
| TBM 2 | 1 | 210.38 | Top of 3 inch by 12 inch post supporting abutment at the northeast corner of railroad 196 DRR) |
| TBM 3 | 1 | 190.09 | Top of 4 inch by 6 inch post, southwest corner of bridge, at Alaska Railroad crossing of 196 Mile Creek. |
| **CASWELL CREEK** | | | |
| W-104 | 1 | 212.49 | C&GS Bench mark stamped W-104, line 101, leveling date May 1965, 14.35 miles south along a graveled road from the Alaska Railroad station at Talkeetna, thence 13.6 miles south along State Highway 3, at the intersection of two driveways leading east to a church 65 feet east of the centerline of the highway, 28 feet north of the centerline of a road leading east, 22 feet east-northeast of the north end of a 24 inch culvert, 1.4 feet south of a metal witness post, about 3½ feet higher than the highway, a disk on the top of a 5/8 inch copper coated rod encased in a 5 inch orangeburg pipe which projects 0.6 foot. |
| TBM 4 | 1 | 203.76 | SCS TBM, top of 4 inch by 12 inch post on southwest corner of railroad bridge across Caswell Creek by Mile post 200.9. |
| **SHEEP CREEK** | | | |
| A-105 | 2 | 211.27 | C&GS Bench mark disk stamped A-105, line 101, leveling date May 1965, 14.35 miles south along a graveled road from the Alaska Railroad station at Talkeetna, thence 10.0 |

## TABLE 2
## ELEVATION REFERENCE MARK DESCRIPTION
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, AND BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| BM No. | Photo-Sheet (No.) | Elev. MSL (feet) | Description and Location of Elevation Markers |
|---|---|---|---|
| SHEEP CREEK continued: | | | |
| | | | miles south along State Highway 3, 15½ feet east of the centerline of the highway, set in the top of the north end of the east concrete curb of concrete bridge 213 over Sheep Creek, 5.3 feet south of the north end of the curb and about 1/2 foot higher than the highway. |
| TBM 5 | 2 | 222.15 | SCS TBM at railroad bridge over Sheep Creek, top of southeast corner of bridge abutment. |
| GOOSE CREEK | | | |
| F-105 | 2 | 298.10 | C&GS Bench mark, stamped F-105, line 101, leveling date May 1965, 14.35 miles south along graveled road from the Alaska Railroad station at Talkeetna, thence 4.9 miles south along State Highway 3, 73½ feet east of centerline of highway, 2.1 feet south of a metal witness post, about 2½ feet lower than the highway, a disk on top of a 5/8 inch copper coated rod encased in 5 inch orangeburg pipe which projects 0.4 foot. |
| TBM 6 | 2 | 249.88 | SCS TBM, top of the middle 12 foot diameter corrugated metal pipe culvert on Goose Creek, 8th bolt head from inlet end of culvert, about 53 feet east of centerline of highway. |
| GOOSE CREEK continued: | | | |
| TBM 7 | 2 | 246.67 | SCS TBM, top of 1 inch by 2 inch stake, station 16+05 on the cross section at the Alaska Railroad bridge over Goose Creek, 605 feet north of most northerly end of bridge. |
| MONTANA CREEK | | | |
| J-105 | 3 | 258.46 | C&GS Bench mark, stamped J-105, line 101, leveling date May 1965, 14.35 miles south along graveled road from the Alaska Railroad station at Talkeetna, thence 2.2 miles south along State Highway 3, 15 feet northeast of the centerline of the road, set in the top of the northwest end of the northeast concrete curb of concrete bridge number 215 over Montana Creek, 7.3 feet southeast of the northwest end of the curb and about 1/2 foot higher than the highway. |
| TBM 8 | 3 | 249.26 | SCS TBM, top of 1 inch by 2 inch stake at station 0+00 of cross section along Alaska Railroad bridge across Montana Creek, about 1421 feet south of most southerly end of bridge. |

# TABLE 2
# ELEVATION REFERENCE MARK DESCRIPTION
# 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, AND BIRCH CREEKS
# MATANUSKA-SUSITNA BOROUGH, ALASKA

| BM No. | Photo-Sheet (No.) | Elev. MSL (feet) | Description and Location of Elevation Markers |
|---|---|---|---|
| ANSWER CREEK | | | |
| D-106 | 4 | 361.07 | C&GS Bench mark disk stamped D-106, line 101, leveling date May 1965, 8.95 miles south along a graveled road from the Alaska Railroad station at Talkeetna, about 0.1 mile north of a 24 inch corrugated metal pipe culvert, about 0.05 mile south of a corrugated metal pipe culvert, on the crest of a small cut, 68 feet west of the centerline of the highway, 2 feet north of a metal witness post about 6½ feet higher than the highway, a disk on the top of a copper coated rod enclosed in a 5 inch orangeburg pipe which projects 0.7 foot. |
| TBM 9 | 4 | 328.99 | SCS TBM, top of upstream end of 12 foot diameter corrugated metal pipe culvert at Talkeetna Road crossing on Answer Creek, second rib from marker post on culvert. |
| TBM 10 | 4 | 283.42 | SCS TBM, top of post supporting southwest corner of Alaska Railroad bridge over Answer Creek. |
| BIRCH CREEK | | | |
| B-106 | 4 | 393.89 | C&GS Bench mark disk stamped B-106, line 101, leveling date May 1965, 7.0 miles south along a graveled road from the Alaska Railroad station at Talkeetna, about 0.1 mile south of a driveway leading west, 59 feet west of the centerline of the road, 1.6 feet south of a metal witness post, about 4 feet higher than the highway, a disk on top of a 5/8 inch copper coated rod encased in a 5 inch orangeburg pipe which projects 0.6 foot. |
| TBM 11 | 4 | 307.60 | SCS TBM, top of upstream end of 78 inch corrugated metal pipe culvert, most southerly culvert, at Birch Creek for Talkeetna Road crossing. |
| TBM 12 | 4 | 304.11 | SCS TBM, top of mile post 221.0, yellow paint mark, at southwest end of Alaska Railroad bridge over Birch Creek. |
| P-105 | 4 | 436.21 | C&GS Bench mark disk stamped P-105, line 101, leveling date May 1965, 7.95 miles south on graveled road from the Alaska Railroad station at Talkeetna, 61 feet north of the north end of a wide pullout, 56 feet west of the centerline of the highway, 4 feet north of a forked tree, 1.9 feet south of a metal witness post, about 2 feet lower than the highway, a disk on top of a 5/8 inch copper coated rod encased in a 5 inch orangeburg pipe which projects 0.7 foot. |



# APPENDIX C

**Table 3 - 100-year Flood Data**

**- PRESENT CONDITIONS -**

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS | | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| | | | | Distance to left (ft.) | Distance to right (ft.) | |
| 196 MILE CREEK | | | | | | |
| 196-A | 1 | 1 | 00 | 660 | 520 | 0.3 |
| 196-B | 1 | 1 | 2,112 | 660 | 520 | 0.4 |
| 196-C | 1 | 1 | 3,162 | 660 | 520 | 0.5 |
| 196-D | 1 | 1 | 4,224 | 660 | 520 | 0.6 |
| 196-E | 1 | 1 | 4,752 | 660 | 520 | 0.7 |
| 196-FPHY | 1 | 1 | 4,858 | 660 | 620 | 10.3 |
| 196-G | 1 | 1 | 4,958 | 300 | 800 | 0.6 |
| 196-H | 1 | 2 | 6,864 | 10 | 330 | 3.6 |
| 196-I | 1 | 2 | 7,656 | 20 | 1000 | 2.1 |
| 196-J | 1 | 2 | 8,448 | 10 | 320 | 3.5 |
| 196-KARR | 1 | 2 | 8,606 | 10 | 300 | 7.8 |
| 196-L | 1 | 2 | 8,765 | 140 | 210 | 1.7 |
| 196-M | 1 | 2 | 10,560 | 150 | 0 | 4.9 |
| 196-N | 1 | 3 | 16,632 | 0 | 2870 | 2.8 |
| TRIBUTARY NO. 1 | | | | | | |
| 196-AA | 1 | 4 | 6,850 | 1080 | 130 | 2.7 |
| 196-BB | 1 | 4 | 8,850 | 0 | 100 | 4.6 |
| 196-CC | 1 | 5 | 11,070 | 110 | 40 | 2.8 |
| 196-DRR | 1 | 5 | 11,170 | 0 | 0 | 9.1 |
| 196-EE | 1 | 5 | 11,270 | 680 | 2990 | 0.4 |
| 196-FF | 1 | 6 | 15,050 | 0 | 90 | 2.3 |
| 196-GG | 1 | 6 | 17,670 | 0 | 90 | 2.4 |
| CASWELL CREEK | | | | | | |
| CW-A | 1 | 7 | 1,584 | 300 | 1500 | 0.1 |
| CW-B | 1 | 7 | 2,640 | 300 | 1500 | 0.2 |
| CW-C | 1 | 7 | 3,960 | 300 | 1500 | 0.4 |
| CW-D | 1 | 7 | 5,280 | 300 | 1500 | 0.5 |
| CW-E | 1 | 7 | 6,336 | 280 | 700 | 0.8 |
| CW-F | 1 | 7 | 7,028 | 230 | 340 | 1.2 |
| CW-GHW | 1 | 7 | 7,128 | 280 | 500 | 11.0 |
| CW-H | 1 | 8 | 7,228 | 140 | 400 | 0.2 |

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS Distance to left (ft.) | Distance to right (ft.) | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| Caswell Creek (cont) | | | | | | |
| CW-I | 1 | 8 | 8,448 | 130 | 430 | 0.4 |
| CW-J | 1 | 8 | 10,560 | 20 | 10 | 1.5 |
| CW-K | 1 | 8 | 12,672 | 10 | 0 | 2.4 |
| CW-L | 1 | 9 | 13,892 | 5 | 260 | 4.3 |
| CW-MRR | 1 | 9 | 13,992 | 1600 | 3100 | 5.0 |
| CW-N | 1 | 9 | 14,092 | 2000 | 550 | 0.4 |
| CW-O | 1 | 9 | 14,784 | 1800 | 550 | 0.9 |
| CW-P | 1 | 9 | 16,368 | 600 | 250 | 2.4 |
| CW-Q | 1 | 9 | 17,160 | 500 | 350 | 2.8 |
| CW-R | 1 | 9 | 18,480 | 340 | 320 | 3.2 |
| CW-S | 1 | 10 | 22,440 | 330 | 300 | 2.4 |
| CW-T | 1 | 11 | 25,872 | 300 | 300 | 2.4 |
| CW-U | 1 | 11 | 28,512 | 300 | 550 | 2.6 |
| CW-V | 1 | 12 | 32,208 | 90 | 320 | 2.6 |
| SHEEP CREEK | | | | | | |
| SP-A | 1 | 13 | 00 | 1250 | 927 | 1.2 |
| SP-B | 1 | 13 | 2,112 | 1258 | 900 | 1.7 |
| SP-C | 2 | 13 | 3,696 | 910 | 900 | 2.0 |
| SP-D | 2 | 13 | 5,280 | 750 | 900 | 2.3 |
| SP-E | 2 | 14 | 8,976 | 705 | 895 | 2.2 |
| SP-F | 2 | 14 | 10,032 | 925 | 895 | 2.0 |
| SP-G | 2 | 15 | 11,880 | 680 | 900 | 2.0 |
| SP-H | 2 | 15 | 14,140 | 1025 | 900 | 2.5 |
| SP-I | 2 | 15 | 15,740 | 1950 | 1755 | 7.4 |
| SP-JHY | 2 | 15 | 15,840 | 1450 | 2130 | 8.6 |
| SP-K | 2 | 15 | 15,940 | 1900 | 2265 | 1.5 |
| SP-L | 2 | 16 | 17,224 | 937 | 470 | 2.5 |
| SP-MRR | 2 | 16 | 17,324 | 1200 | 545 | 11.3 |
| SP-N | 2 | 16 | 17,424 | 1140 | 545 | 0.9 |

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS | | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| | | | | Distance to left (ft.) | Distance to right (ft.) | |
| Sheep Creek (cont) | | | | | | |
| SP-O | 2 | 16 | 19,008 | 550 | 3160 | 0.2 |
| SP-P | 2 | 16 | 21,120 | 530 | 3200 | 2.3 |
| SP-Q | 2 | 17 | 22,176 | 400 | 2300 | 4.2 |
| SP-R | 2 | 17 | 24,816 | 385 | 700 | 4.5 |
| SP-S | 5 | 17 | 27,456 | 430 | 700 | 4.5 |
| SP-T | 5 | 18 | 29,568 | 525 | 3010 | 3.2 |
| SP-U | 5 | 18 | 32,208 | 525 | 1900 | 2.2 |
| SP-V | 5 | 19 | 34,848 | 530 | 2000 | 2.1 |
| SP-W | 5 | 19 | 36,960 | 530 | 600 | 2.0 |
| SP-X | 5 | 20 | 39,600 | 525 | 2400 | 2.0 |
| SP-Y | 5 | 20 | 42,240 | 530 | 1650 | 2.0 |
| SP-Z | 5 | 21 | 47,520 | 530 | 1650 | 2.3 |
| SP-AA | 5 | 22 | 49,632 | 530 | 1560 | 2.1 |
| SP-AB | 5 | 22 | 52,536 | 530 | 1560 | 2.1 |
| SP-AC | 5 | 23 | 57,816 | 530 | 1700 | 4.3 |
| SP-AD | 5 | 24 | 67,848 | 430 | 100 | 5.2 |
| SP-AE | 5 | 25 | 70,224 | 370 | 840 | 7.5 |
| GOOSE CREEK | | | | | | |
| GS-A | 2 | 26 | 1,056 | 1520 | 400 | 2.5 |
| GS-B | 2 | 26 | 1,584 | 1520 | 330 | 2.7 |
| GS-C | 2 | 26 | 2,112 | 1520 | 300 | 2.9 |
| GS-D | 2 | 26 | 2,481 | 1470 | 300 | 3.0 |
| GS-E | 2 | 26 | 2,804 | 1320 | 230 | 3.0 |
| GS-FARR | 2 | 26 | 2,904 | 1520 | 410 | 7.3 |
| GS-G | 2 | 26 | 3,004 | 1420 | 360 | 2.1 |
| GS-H | 2 | 26 | 3,404 | 970 | 200 | 3.7 |
| GS-I | 2 | 26 | 4,224 | 230 | 25 | 6.1 |
| GS-J | 2 | 26 | 4,646 | 290 | 25 | 6.6 |
| GS-K | 2 | 26 | 6,029 | 50 | 25 | 6.9 |

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

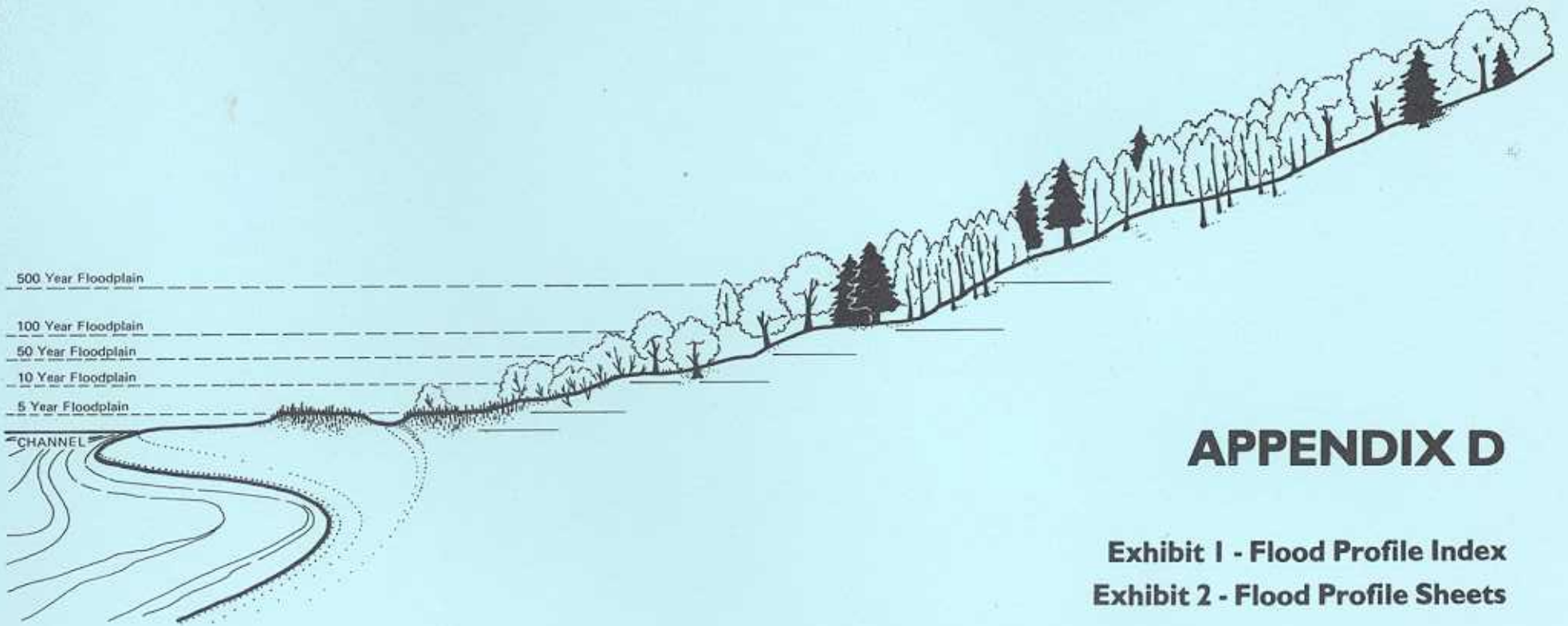
| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS | | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| | | | | Distance to left (ft.) | Distance to right (ft.) | |
| GOOSE CREEK (cont) | | | | | | |
| GS-L | 2 | 27 | 6,236 | 1900 | 280 | 2.4 |
| GS-MPH | 2 | 27 | 6,336 | 1900 | 280 | 9.1 |
| GS-N | 2 | 27 | 6,436 | 1850 | 50 | 0.9 |
| GS-O | 2 | 27 | 7.136 | 1030 | 40 | 3.8 |
| GS-P | 2 | 27 | 7,920 | 1010 | 20 | 9.5 |
| GS-Q | 2 | 27 | 10,032 | 1010 | 30 | 5.7 |
| GS-R | 2 | 27 | 12,144 | 635 | 20 | 2.8 |
| GS-S | 2 | 28 | 14,784 | 1210 | 30 | 6.5 |
| GS-T | 5 | 28 | 18,480 | 1210 | 30 | 5.7 |
| MONTANA CREEK | | | | | | |
| MA-A | 3 | 29 | 00 | 1420 | 1230 | 0.8 |
| MA-1 | 3 | 29 | 120 | 1420 | 1230 | 0.8 |
| MA-B | 3 | 29 | 528 | 1420 | 1230 | 0.8 |
| MA-C | 3 | 29 | 1,220 | 1420 | 1230 | 0.8 |
| MA-3 | 3 | | 1,245 | 1420 | 1230 | 0.9 |
| MADARR | 3 | 29 | 1,320 | 1400 | 1400 | 12.93 |
| MA-4 | 3 | 29 | 1,350 | 1360 | 1390 | 0.5 |
| MA-E | 3 | 29 | 1,420 | 1360 | 1390 | 0.5 |
| MA-5 | 3 | 29 | 1,470 | 1370 | 1380 | 0.6 |
| MA-F | 3 | 29 | 2,376 | 1370 | 1380 | 1.4 |
| MA-6 | 3 | 29 | 2,870 | 1670 | 670 | 2.8 |
| MA-G | 3 | 29 | 3,332 | 1670 | 720 | 1.9 |
| MAHPHY | 3 | 29 | 3.432 | 720 | 800 | 10.0 |
| MA-I | 3 | 29 | 3.532 | 1150 | 820 | 1.0 |
| MA-J | 3 | 29 | 3.960 | 90 | 300 | 7.7 |
| MA-K | 3 | 29 | 5,544 | 320 | 300 | 4.2 |
| MA-L | 3 | 30 | 8,976 | 320 | 290 | 6.2 |
| MA-M | 6 | 31 | 12,936 | 320 | 350 | 6.0 |
| MA-N | 6 | 31 | 15,840 | 320 | 450 | 6.6 |

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS Distance to left (ft.) | Distance to right (ft.) | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| MONTANA CREEK (cont) | | | | | | |
| MA-7 | 6 | 32 | 18,750 | 320 | 450 | 6.6 |
| MA-O | 6 | 32 | 21,648 | 320 | 450 | 6.2 |
| MA-P | 6 | 33 | 25,872 | 320 | 300 | 5.9 |
| MA-O | 6 | 33 | 28,512 | 320 | 300 | 6.5 |
| MA-R | 6 | 34 | 31,944 | 320 | 300 | 7.7 |
| MA-S | 6 | 34 | 35,640 | 320 | 300 | 6.6 |
| MA-T | 6 | 35 | 39,072 | 310 | 350 | 6.3 |
| ANSWER CREEK | | | | | | |
| AN-A | 4 | 36 | 00 | 180 | 210 | 0.6 |
| AN-B | 4 | 36 | 1,901 | 180 | 210 | 0.7 |
| AN-C | 4 | 36 | 3,960 | 150 | 210 | 0.7 |
| AN-D | 4 | 37 | 6,758 | 140 | 190 | 0.7 |
| AN-E | 4 | 37 | 8,976 | 140 | 190 | 0.8 |
| AN-F | 4 | 38 | 11,305 | 140 | 190 | 0.9 |
| ANGARR | 4 | 38 | 11,405 | 140 | 190 | 6.8 |
| AN-H | 4 | 38 | 11,505 | 100 | 190 | 0.8 |
| AN-I | 4 | 38 | 14,414 | 0 | 80 | 3.4 |
| AN-J | 4 | 39 | 16,106 | 0 | 80 | 4.0 |
| AN-K | 4 | 39 | 17,798 | 0 | 80 | 6.0 |
| AN-LTRD | 4 | 39 | 17,898 | 350 | 0 | 12.2 |
| AN-M | 4 | 39 | 17,998 | 490 | 80 | 0.5 |
| AN-N | 4 | 39 | 19,588 | 250 | 80 | 3.6 |
| AN-O | 4 | 39 | 20,909 | 250 | 80 | 3.7 |
| BIRCH CREEK | | | | | | |
| BH-A | 4 | 40 | 00 | 12 | 25 | 1.9 |
| BH-B | 4 | 41 | 7,920 | 10 | 115 | 1.8 |
| BH-C | 4 | 41 | 7,920 | 10 | 115 | 1.9 |

## TABLE 3. 100-YEAR FLOOD DATA - PRESENT CONDITIONS
## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER, BIRCH CREEKS
## MATANUSKA-SUSITNA BOROUGH, ALASKA

| VALLEY SECTION | PHOTO SHEET NO. | PROFILE SHEET NO. | PROFILE STATION (feet) | FLOOD WIDTHS | | AVERAGE VELOCITY (feet/sec.) |
|---|---|---|---|---|---|---|
| | | | | Distance to left (ft.) | Distance to right (ft.) | |
| BIRCH CREEK (cont) | | | | | | |
| BD-D | 4 | 41 | 10,032 | 15 | 115 | 2.0 |
| BH-EARR | 4 | 41 | 10,296 | 12 | 110 | 2.1 |
| BH-F | 4 | 41 | 10,560 | 10 | 115 | 4.0 |
| BH-G | 4 | 41 | 13,728 | 29 | 62 | 3.2 |
| BH-H | 4 | 42 | 16,368 | 45 | 82 | 3.5 |
| BHITRD | 4 | 42 | 16,632 | 500 | 90 | 5.1 |
| BH-J | 4 | 42 | 16,732 | 500 | 55 | 5.0 |

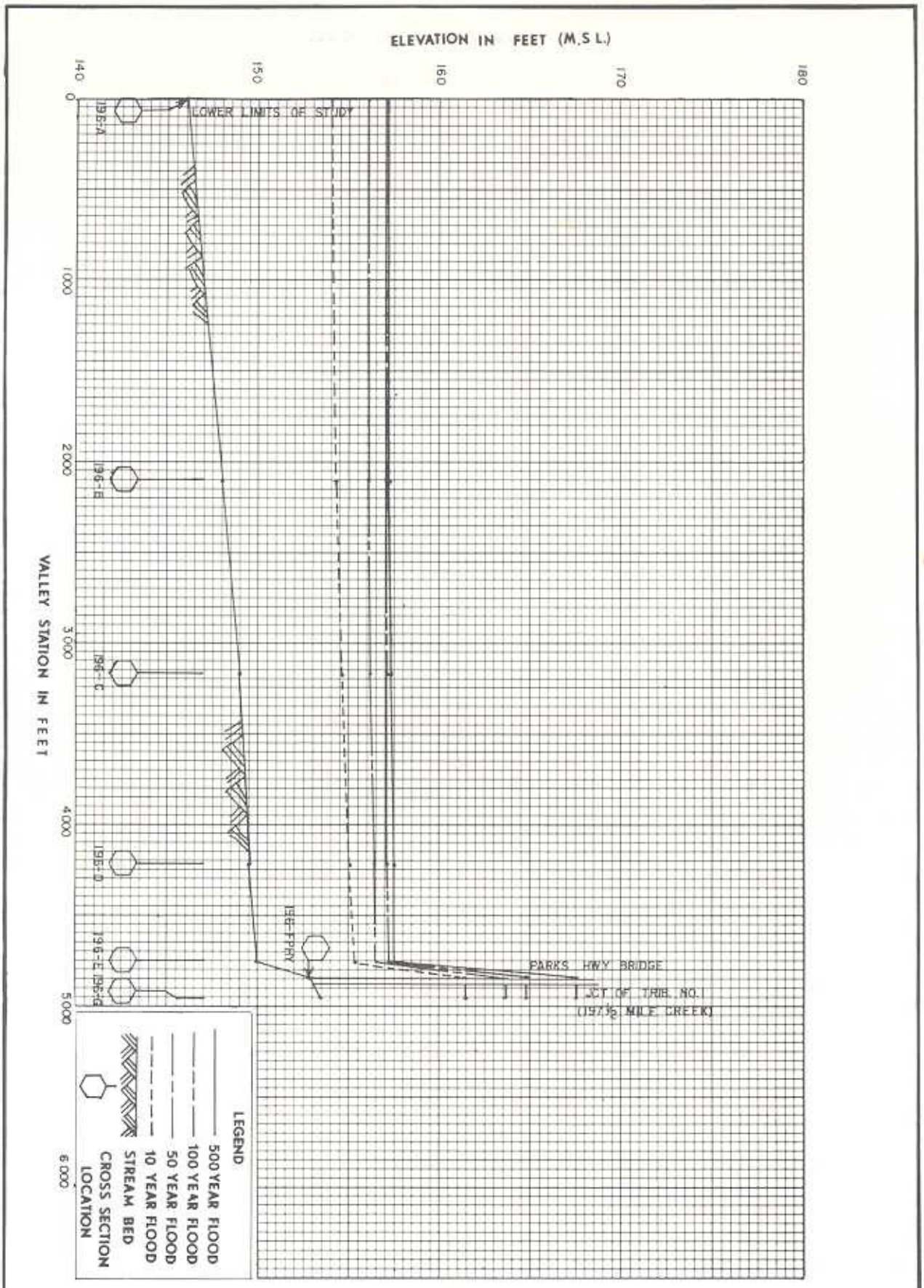



# APPENDIX D

**Exhibit 1 - Flood Profile Index**

**Exhibit 2 - Flood Profile Sheets**

**NOTE: ELEVATIONS ARE APPROXIMATE UNLESS OTHERWISE NOTED IN TABLE 1 (APPENDIX A)**



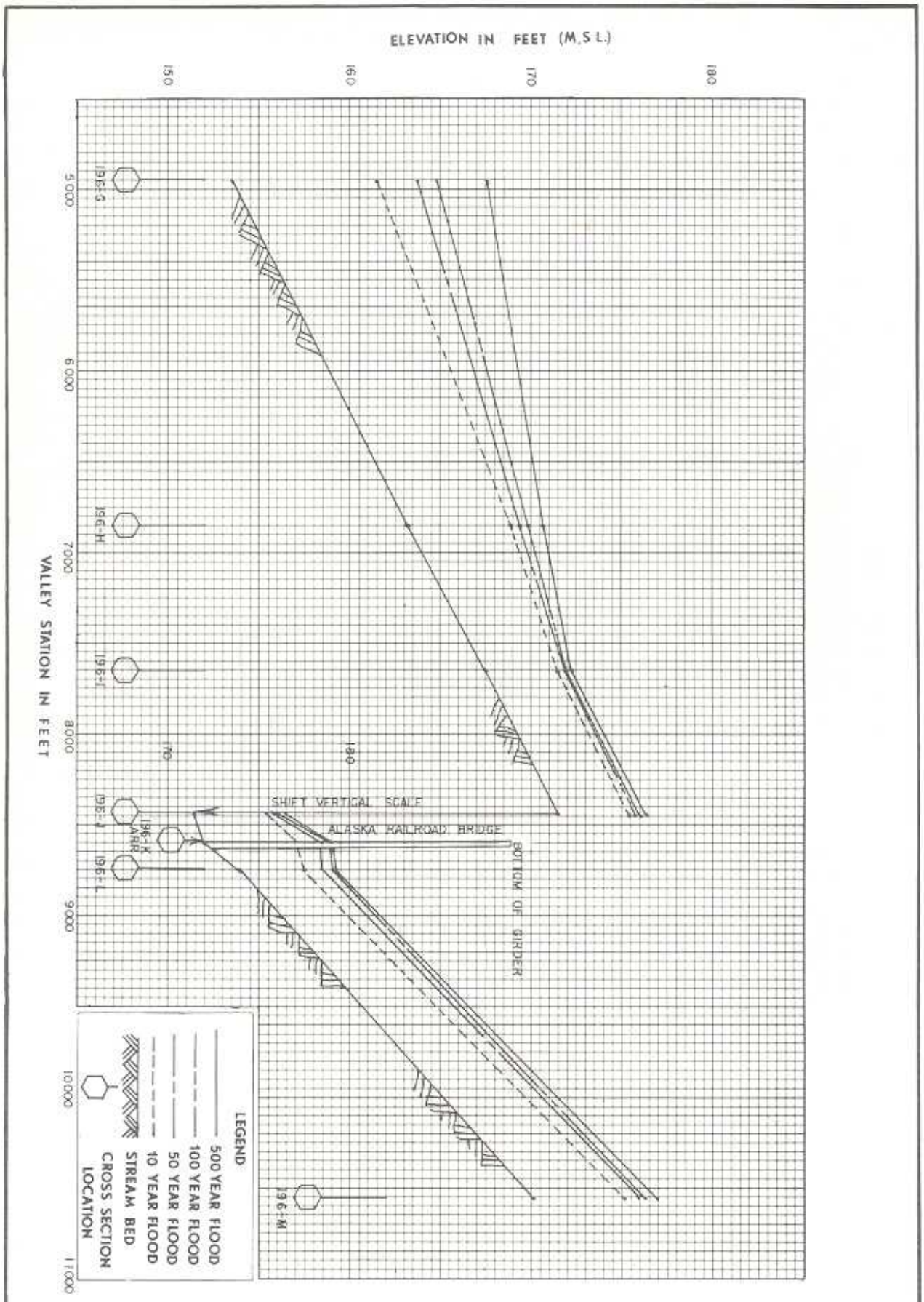

SHEET 1 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



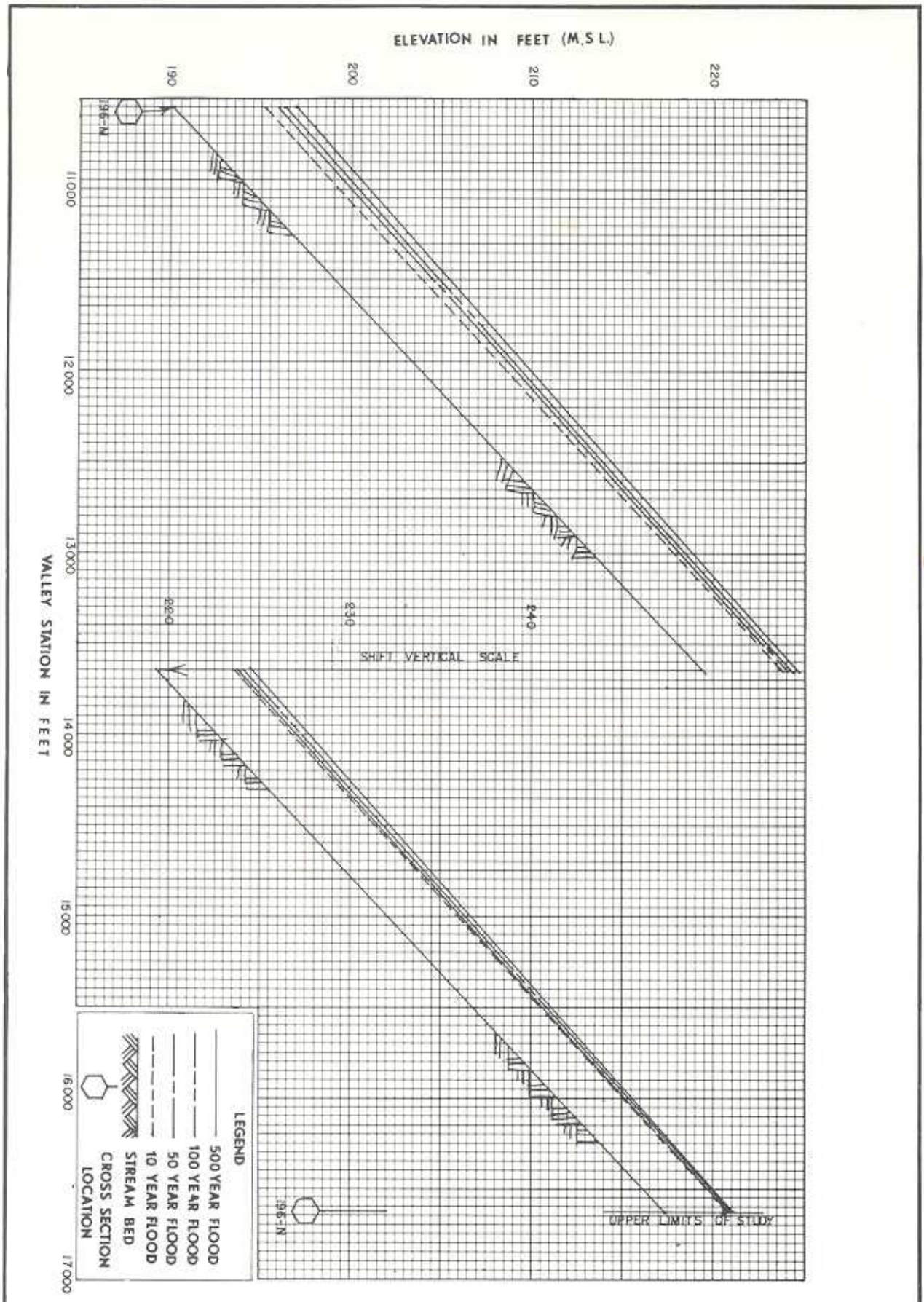

SHEET 2 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

196 MILE, CASHELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



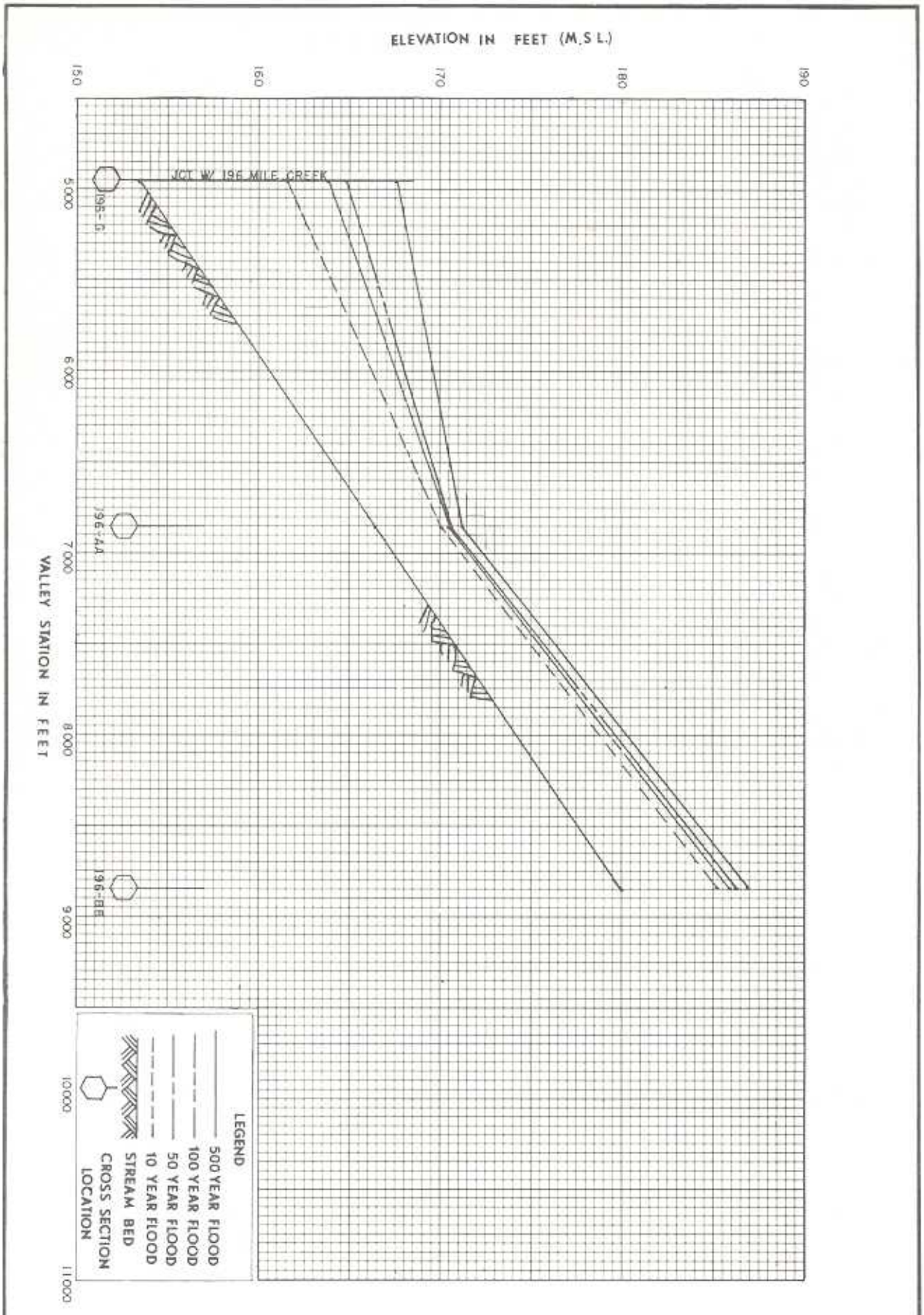

SHEET 3 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



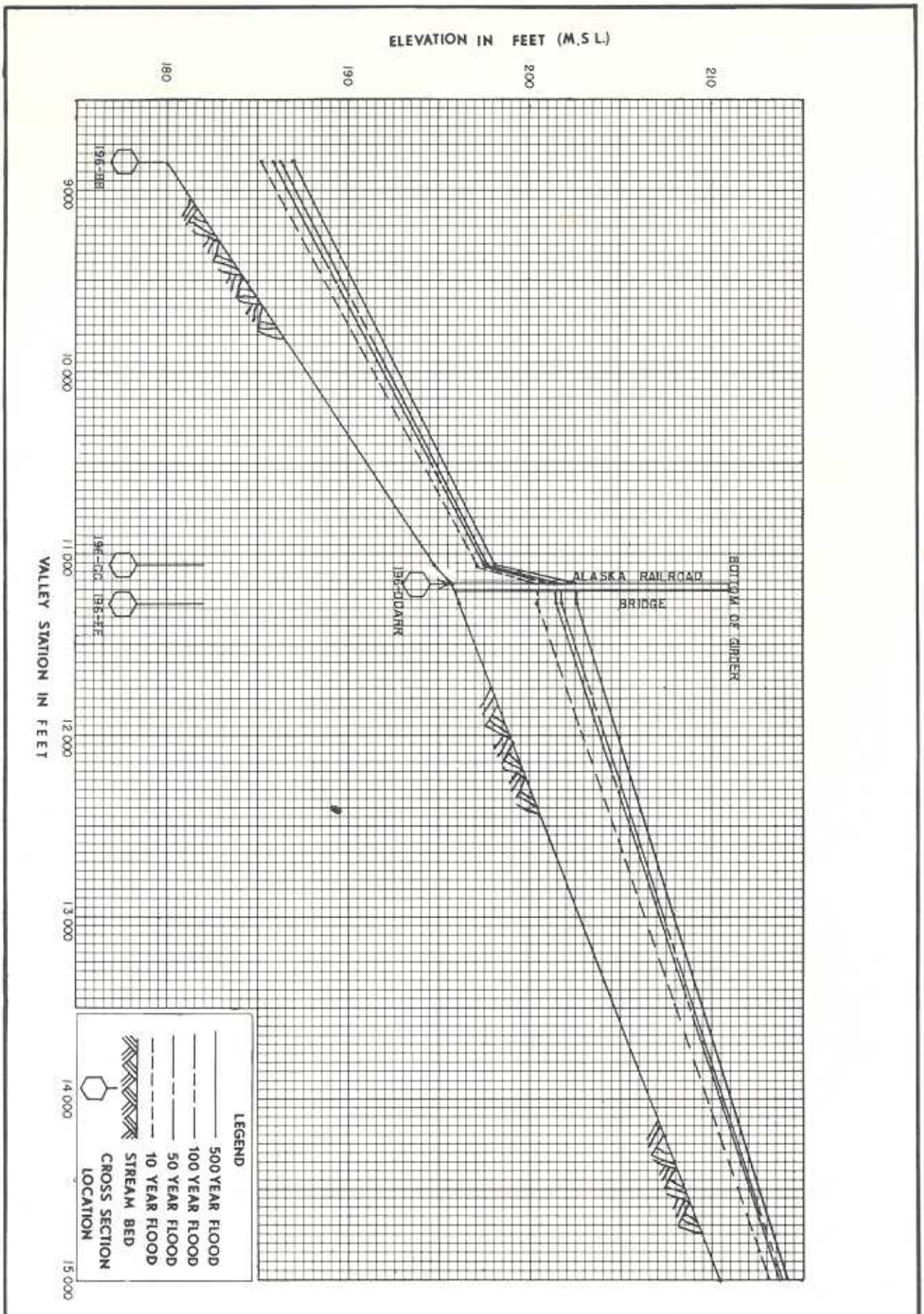

SHEET 4 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

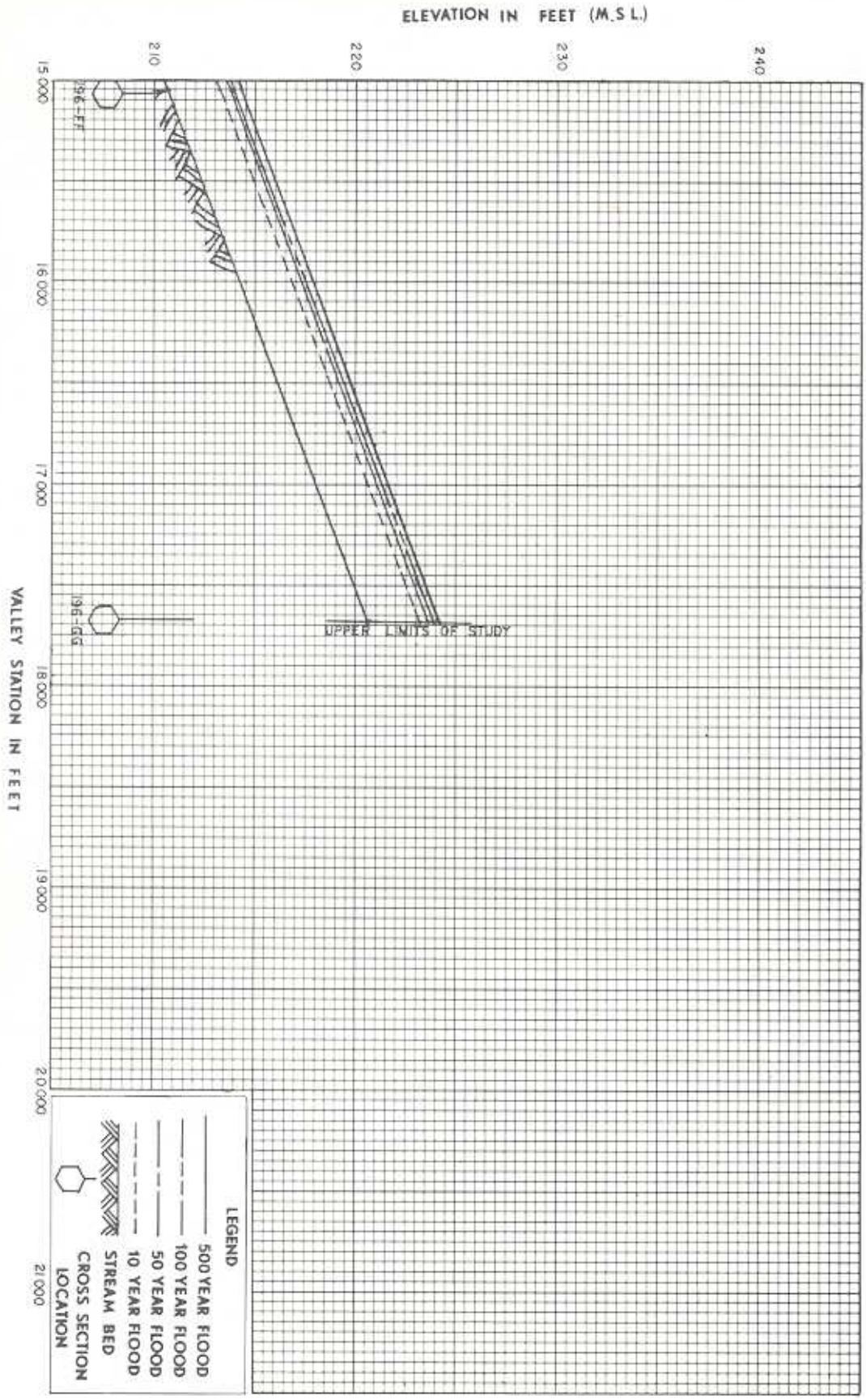
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 5 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



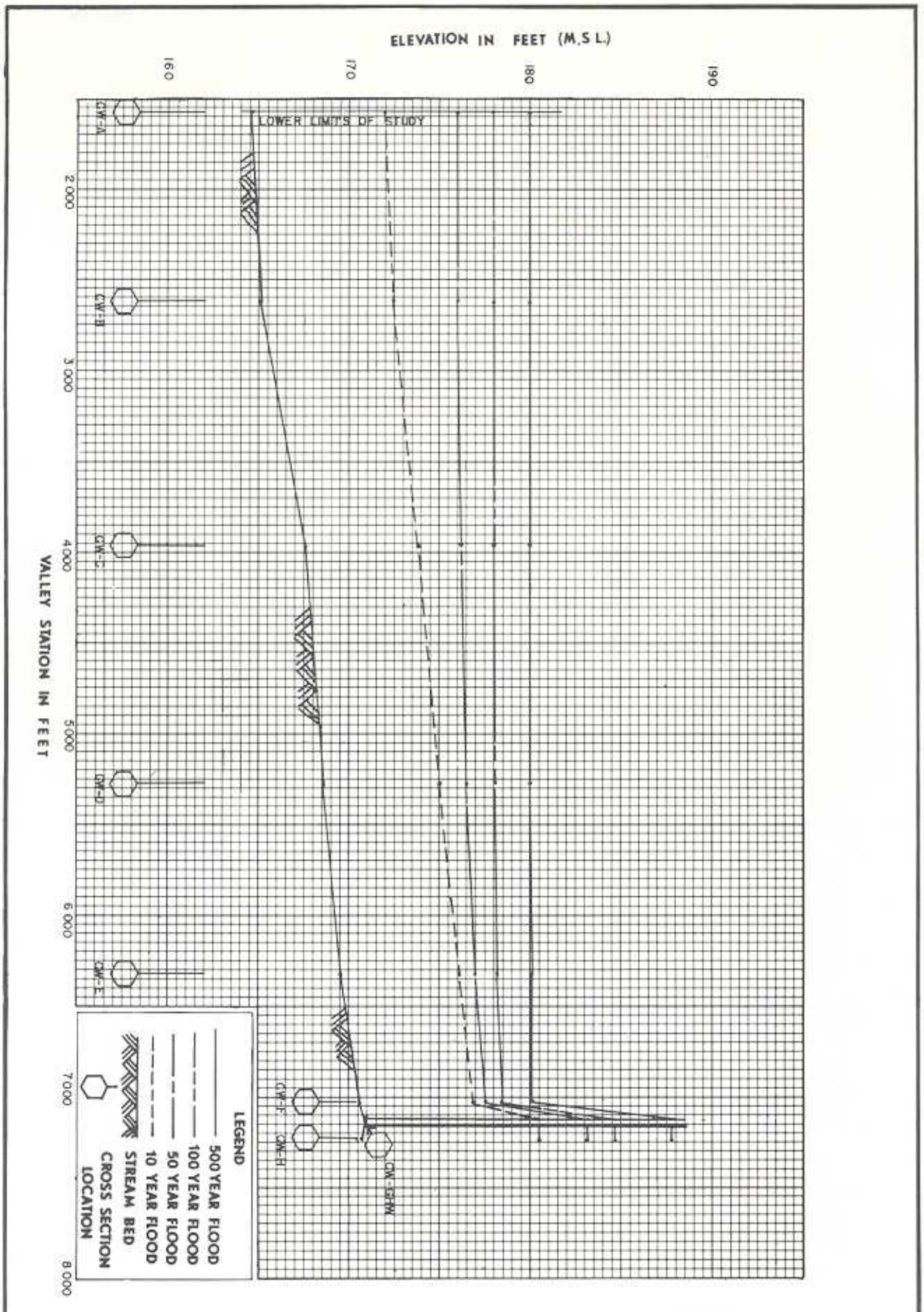

SHEET 6 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

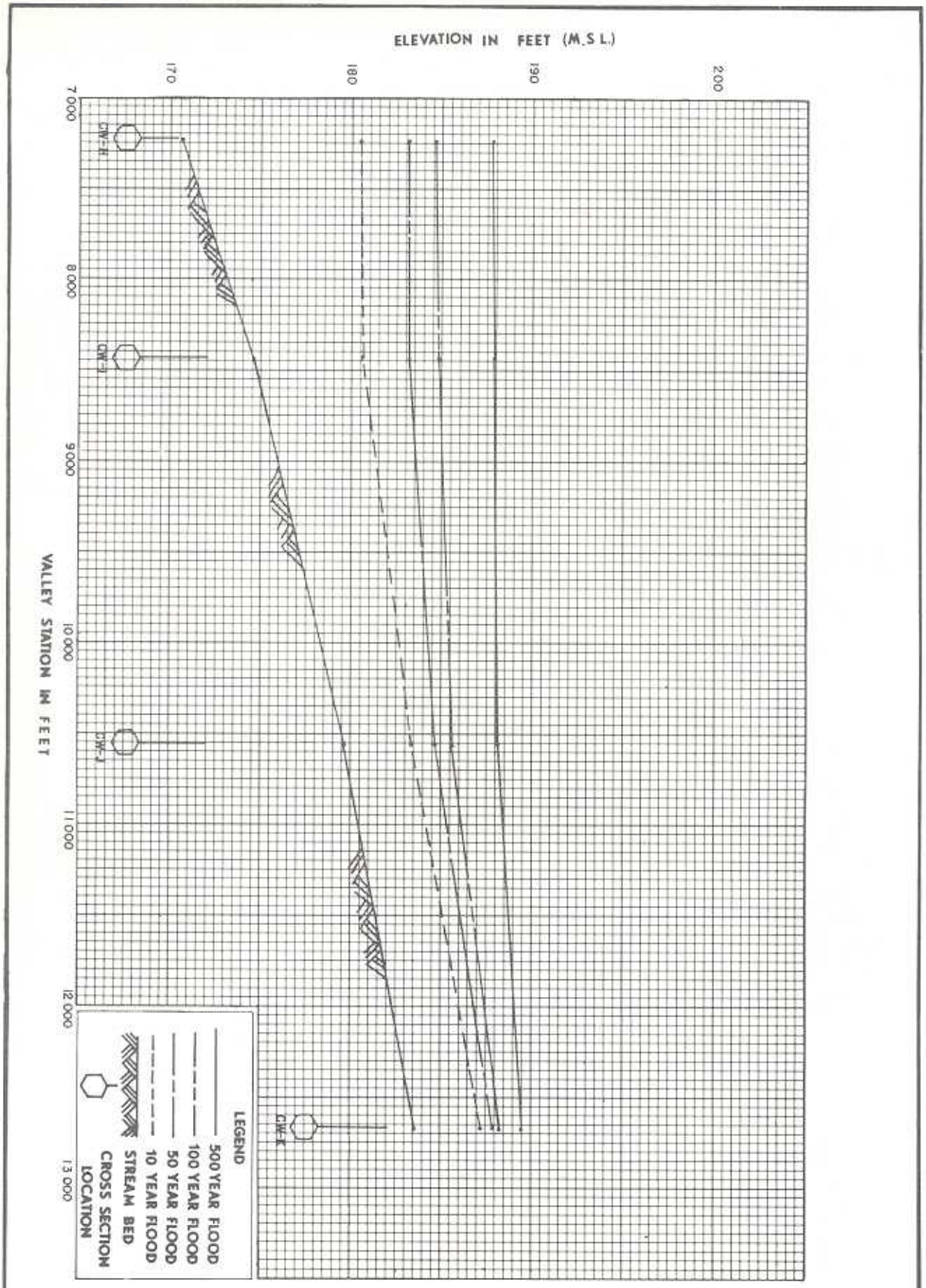
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 7 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



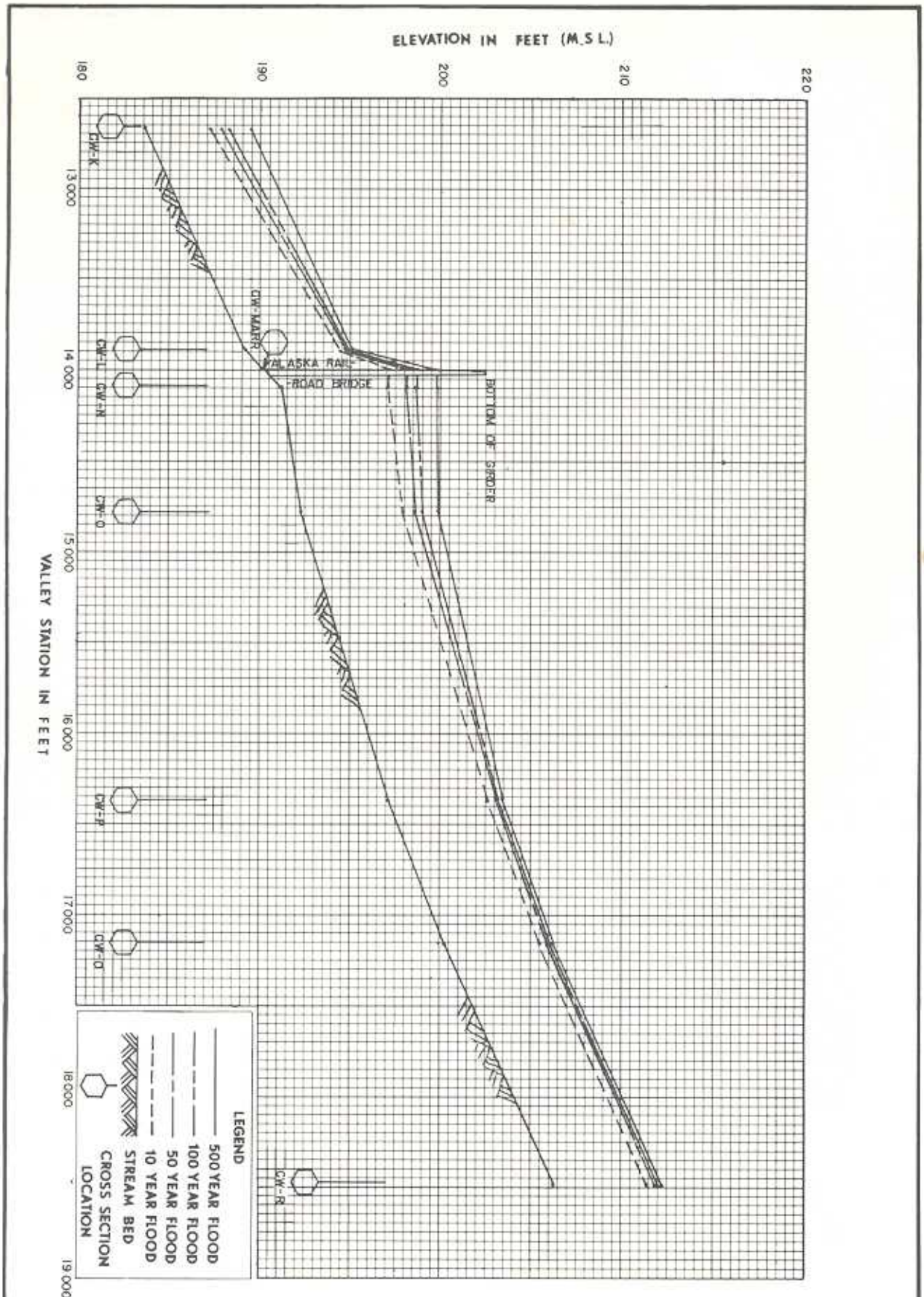

SHEET 8 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



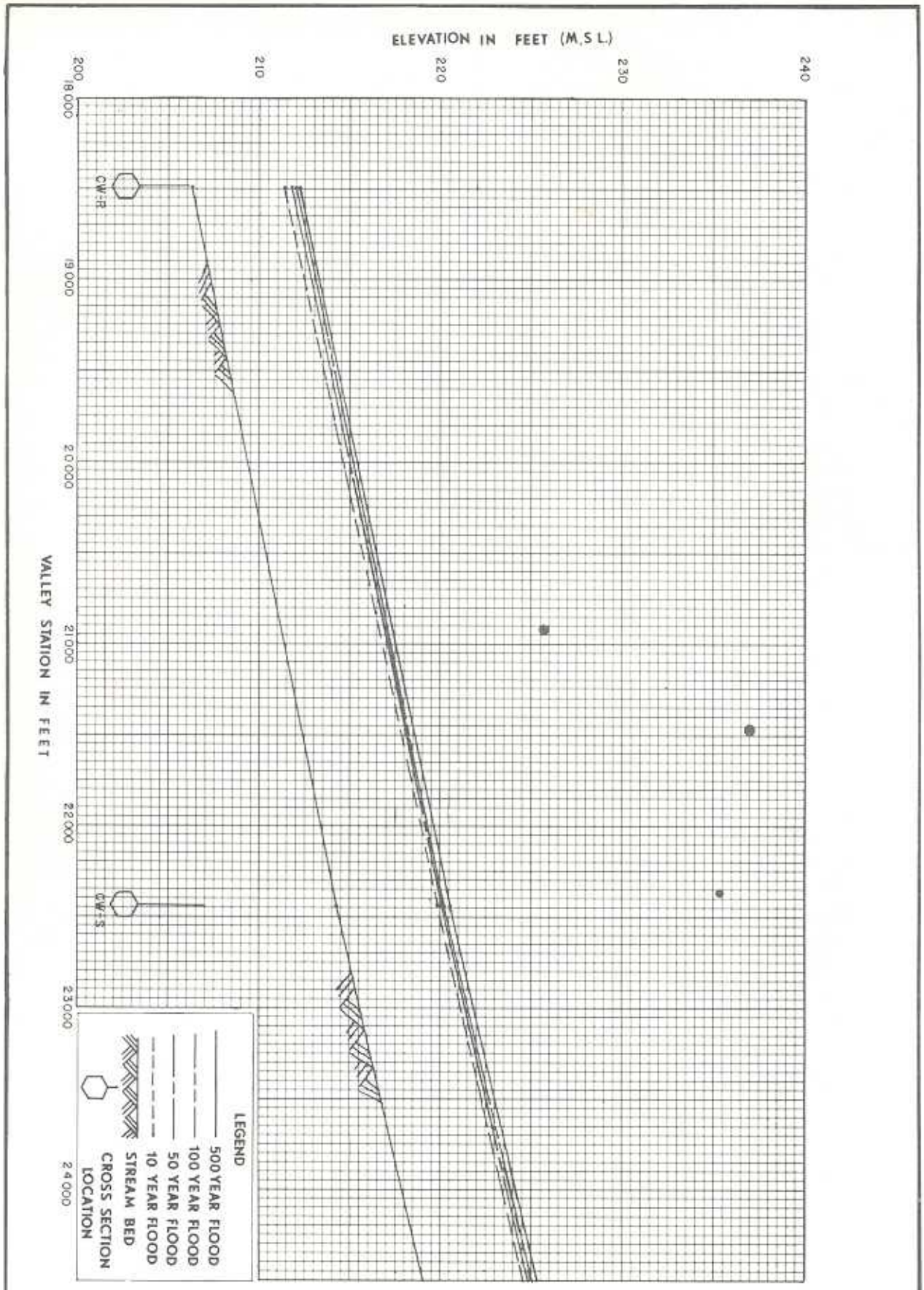

SHEET 9 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



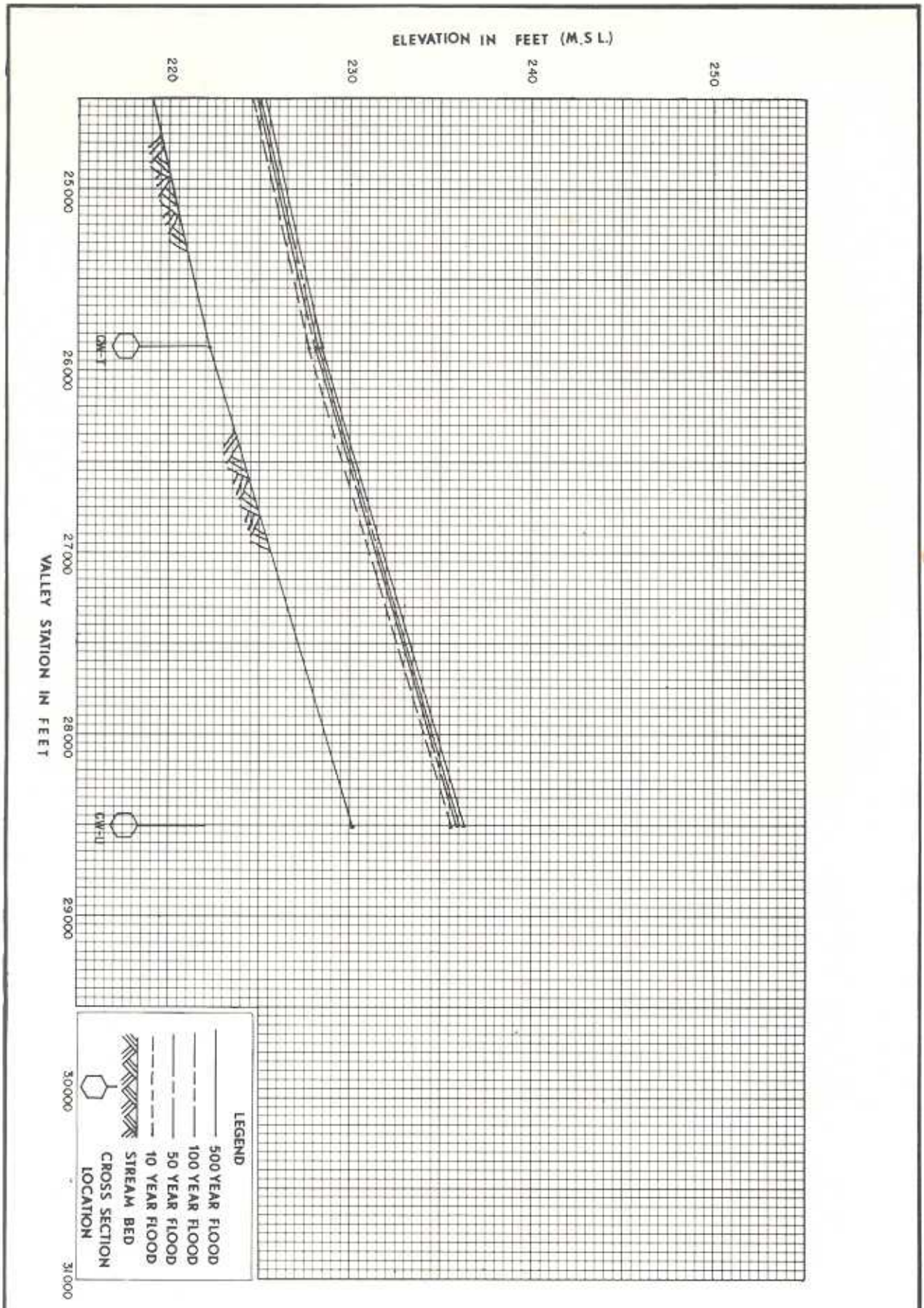

SHEET 10 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



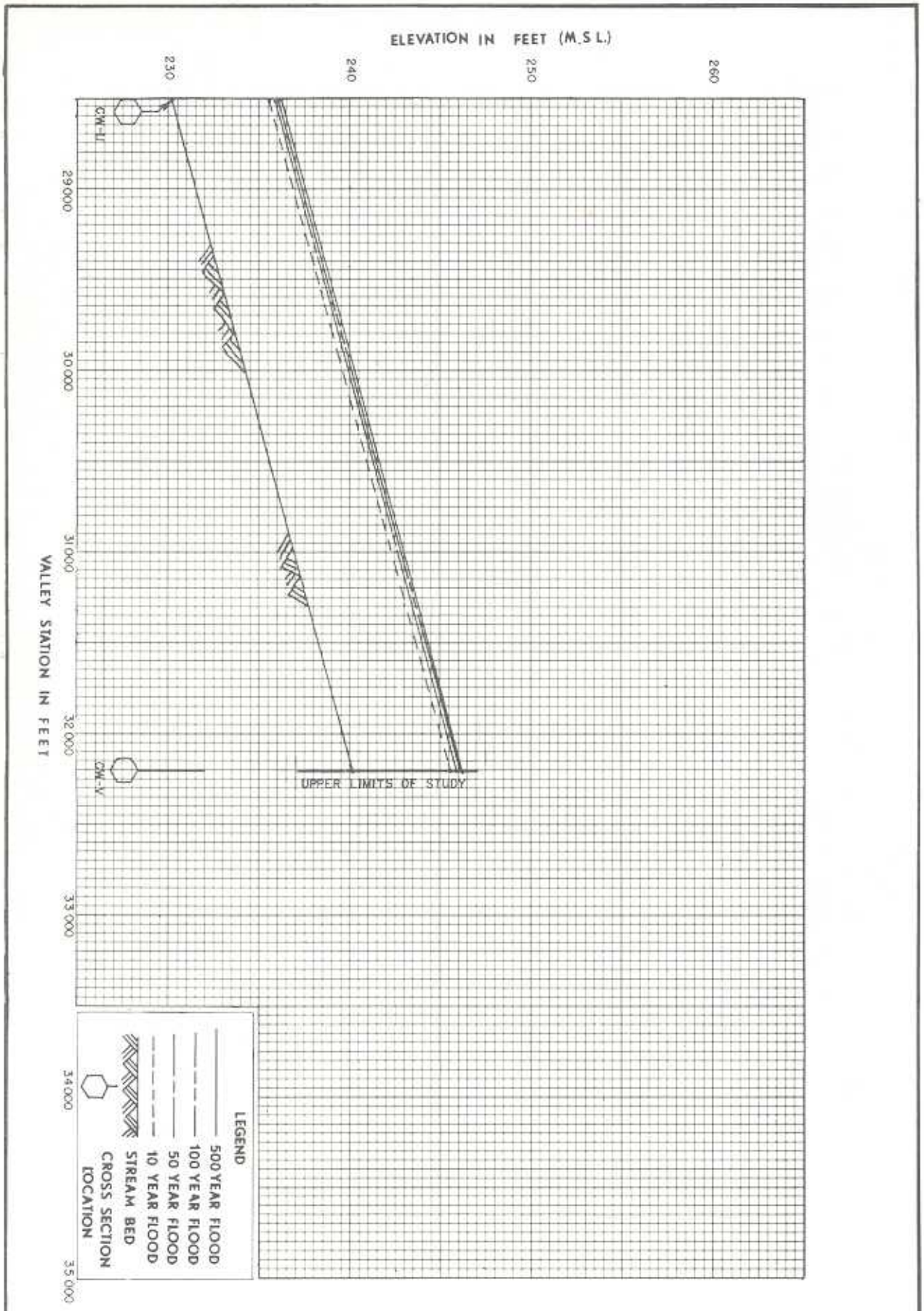

SHEET 11 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



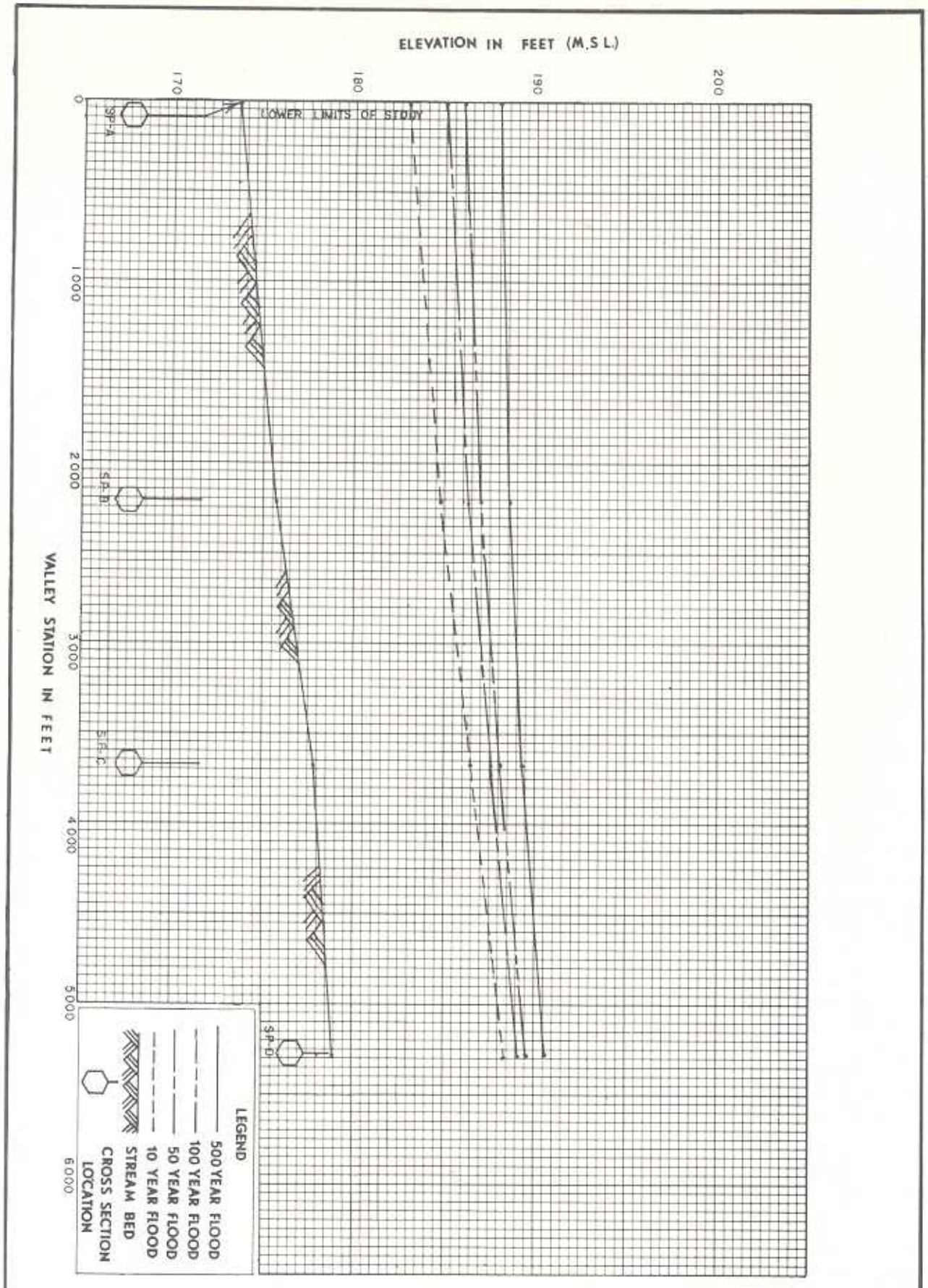

SHEET 12 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



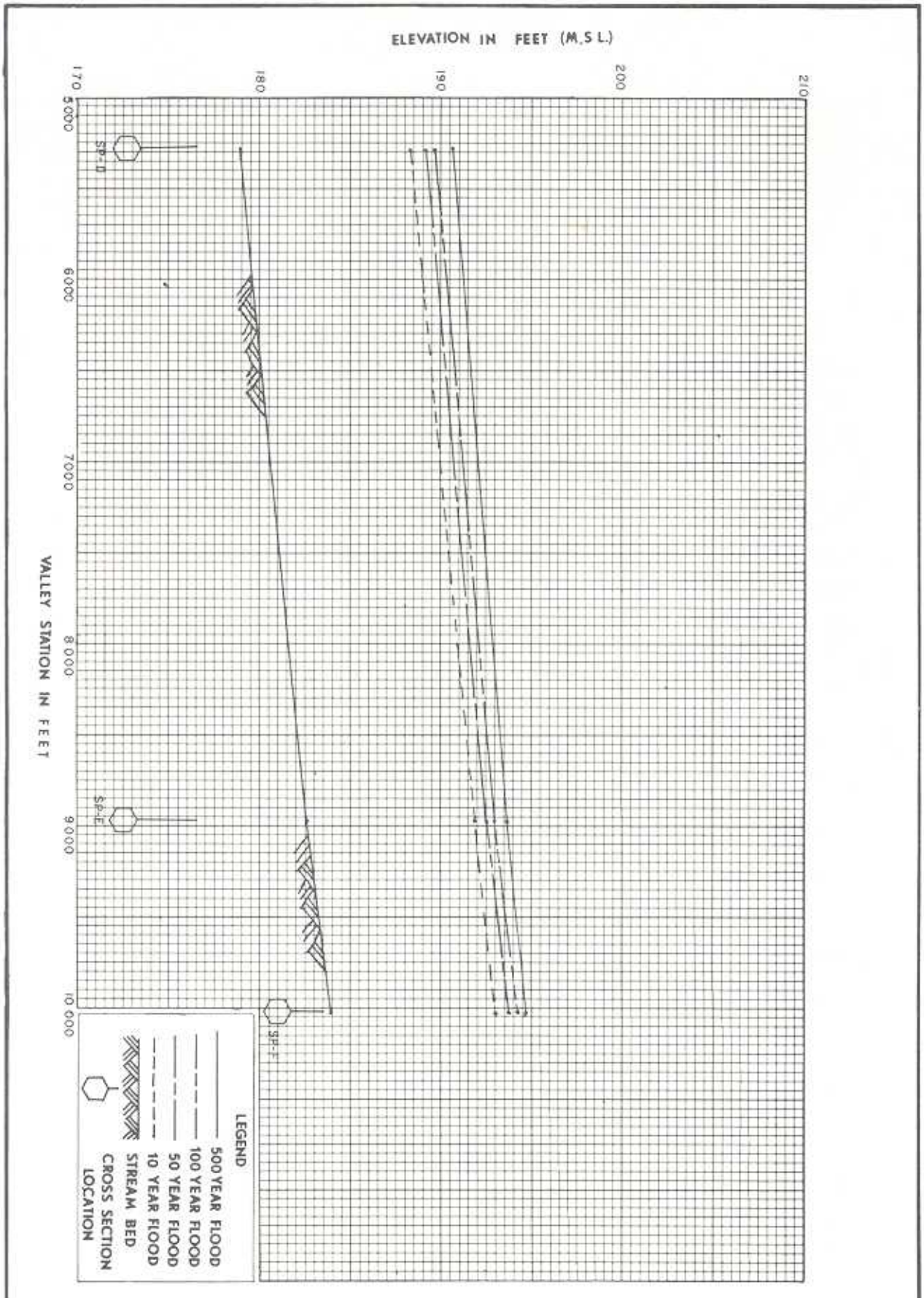

SHEET 13 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

# FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



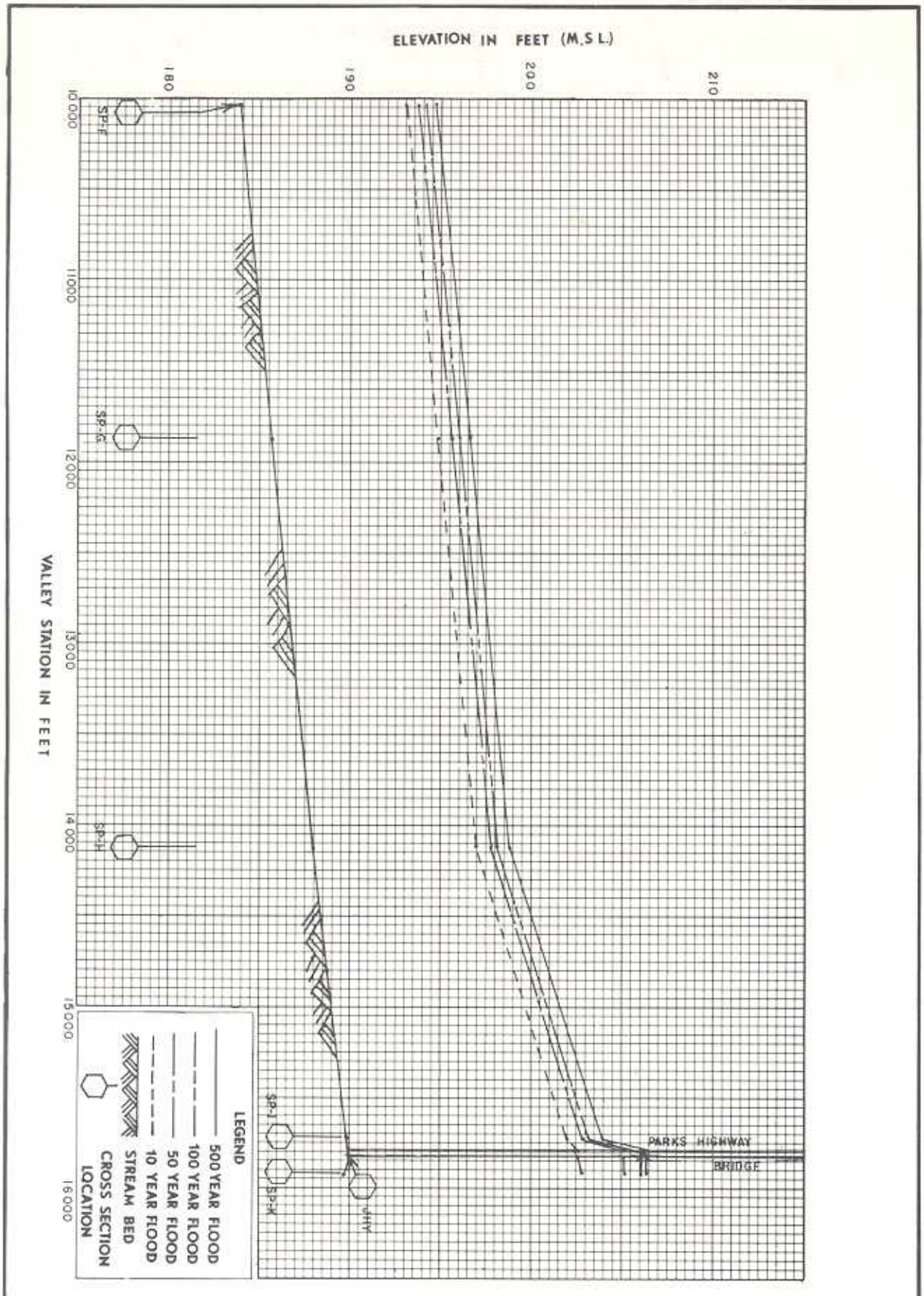

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

SHEET 14 OF 42

# FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



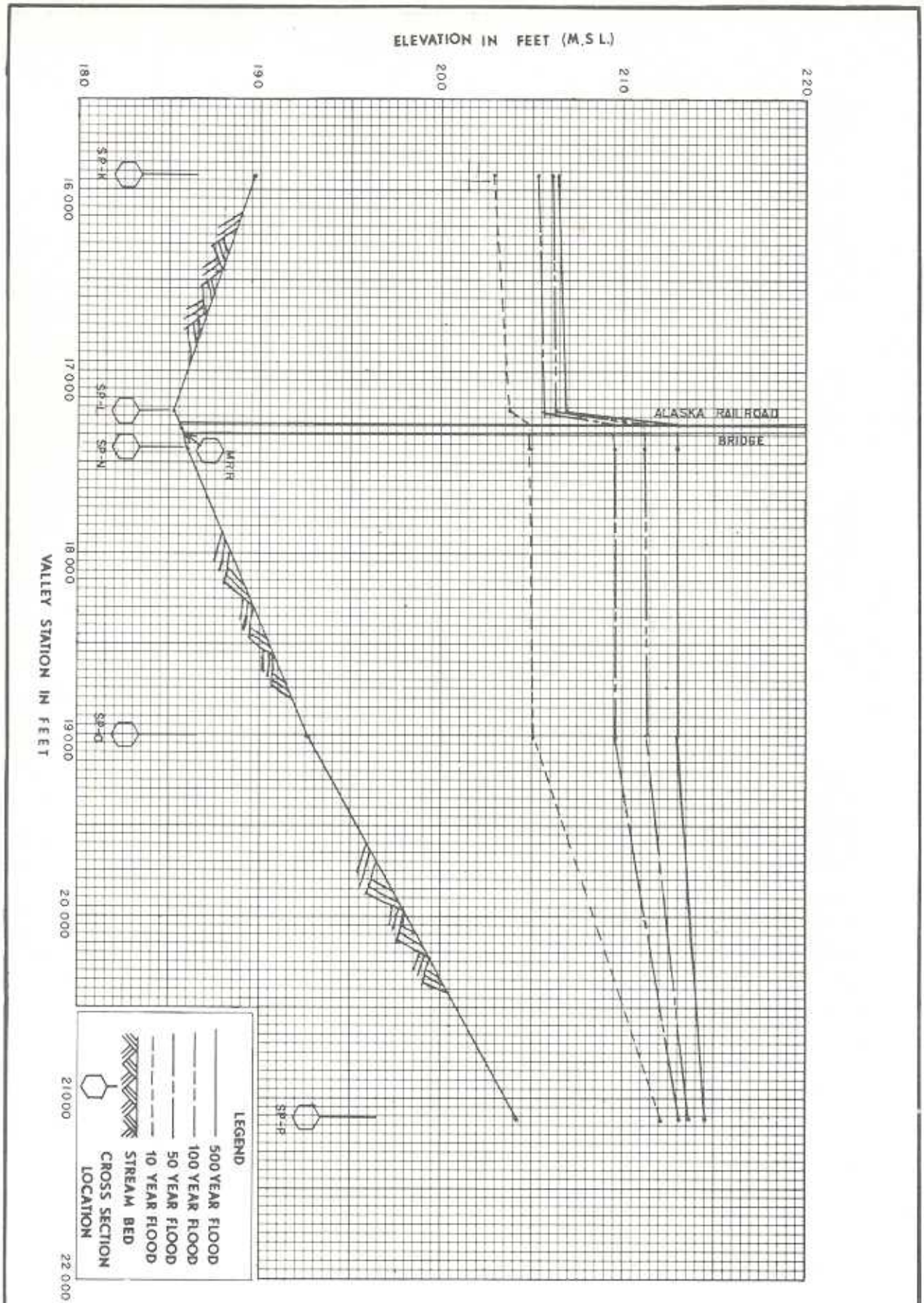

SHEET 15 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

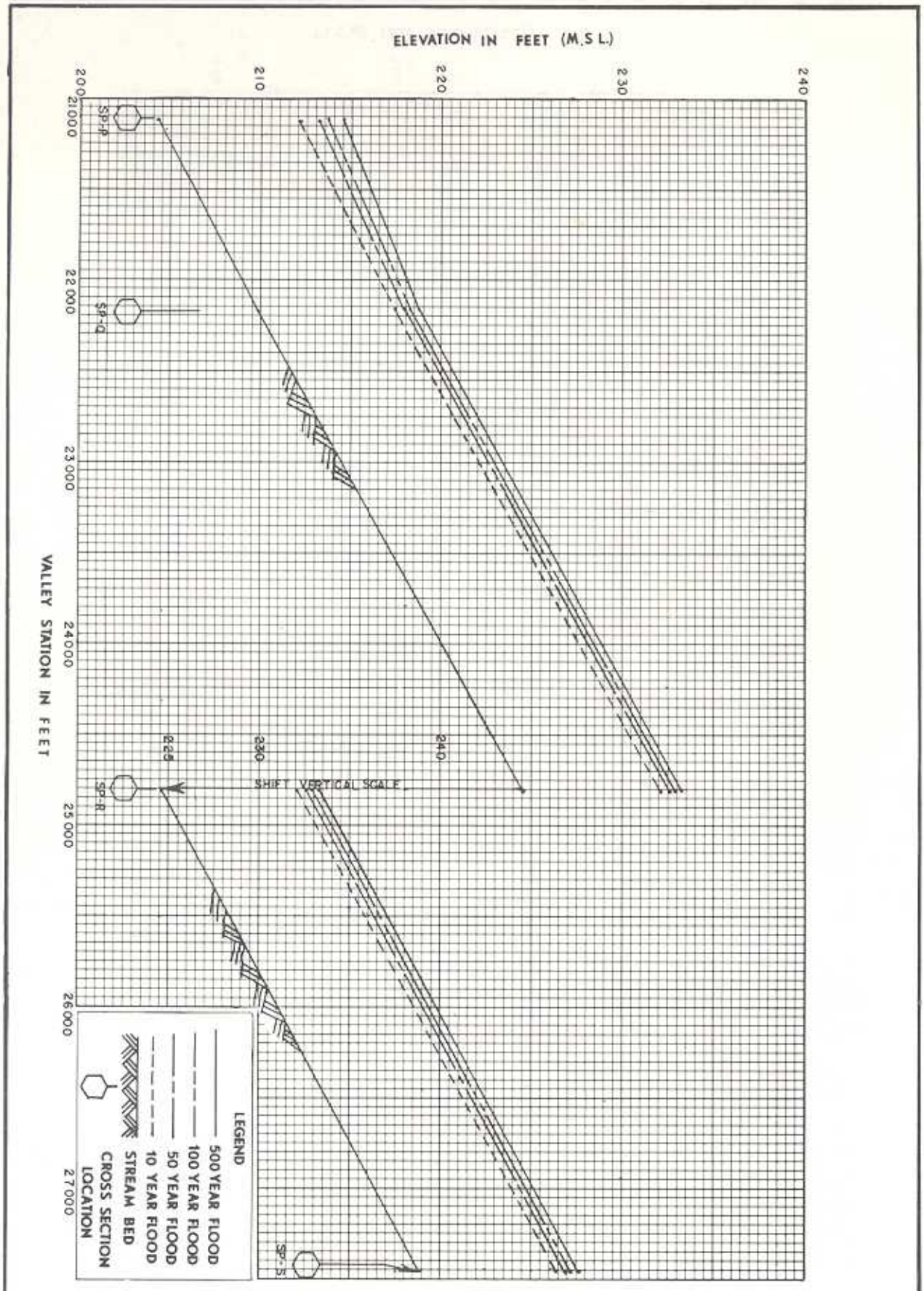
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



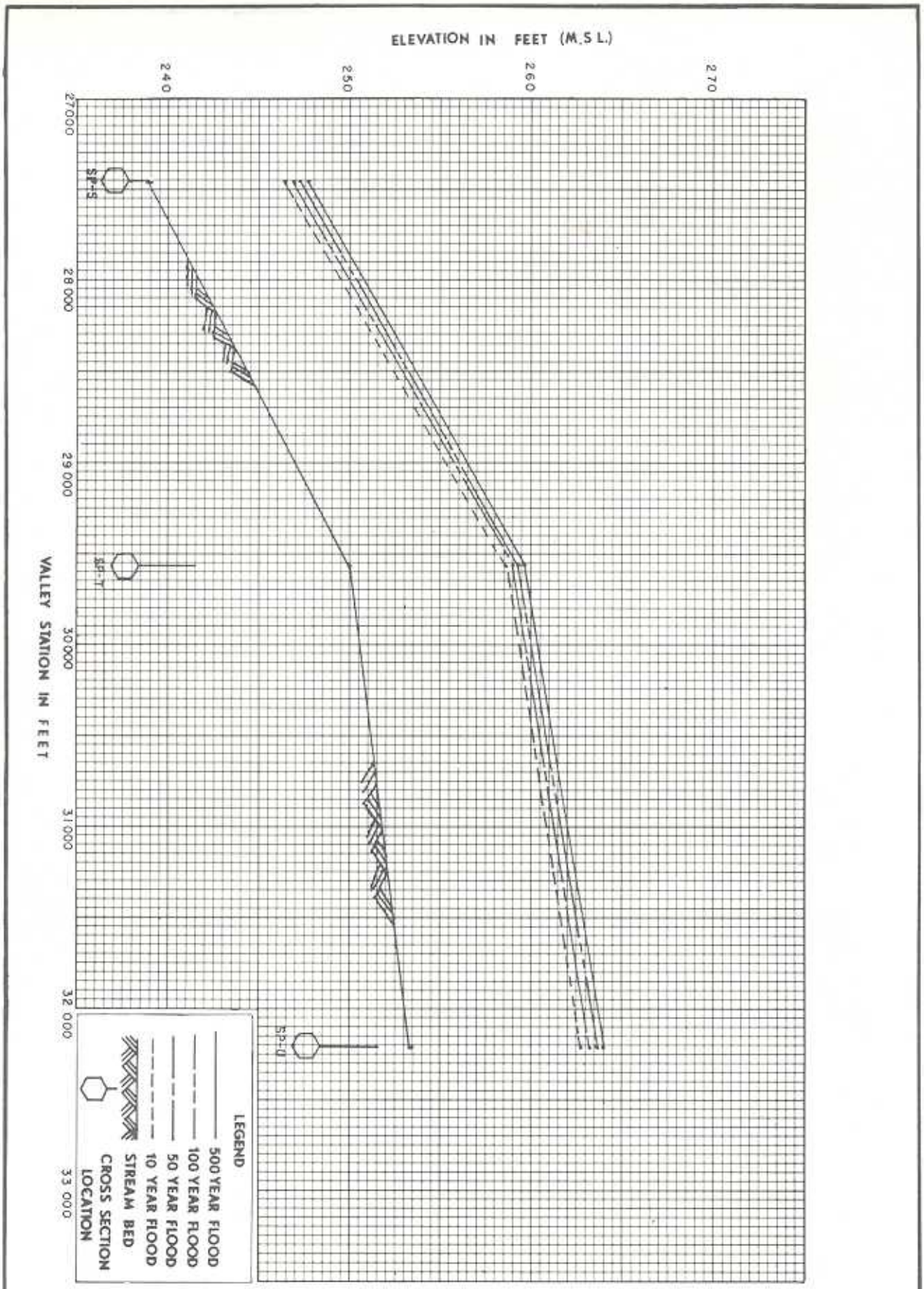

| | | |
|---|---|---|
| SHEET 16 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 17 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



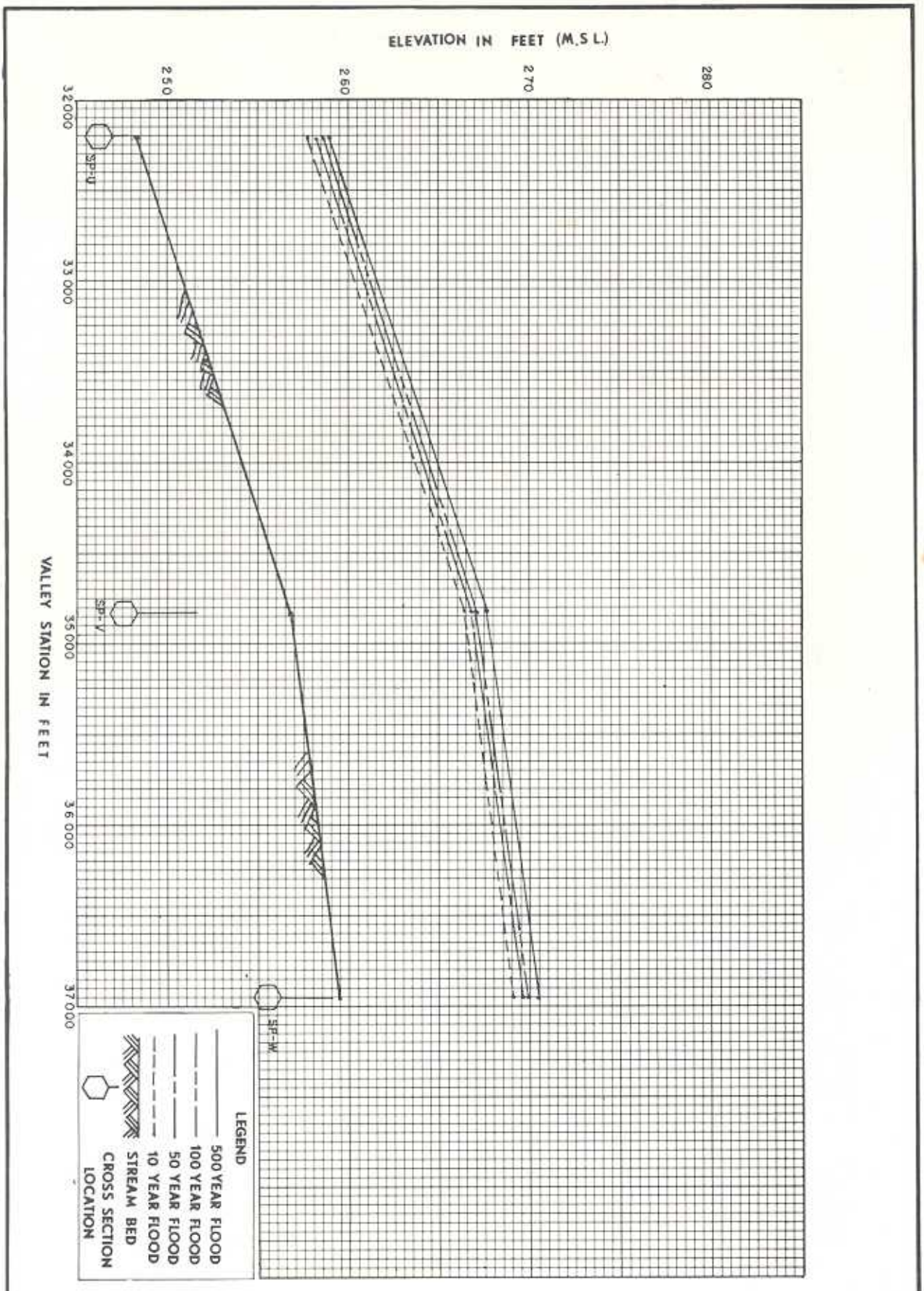

SHEET 18 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



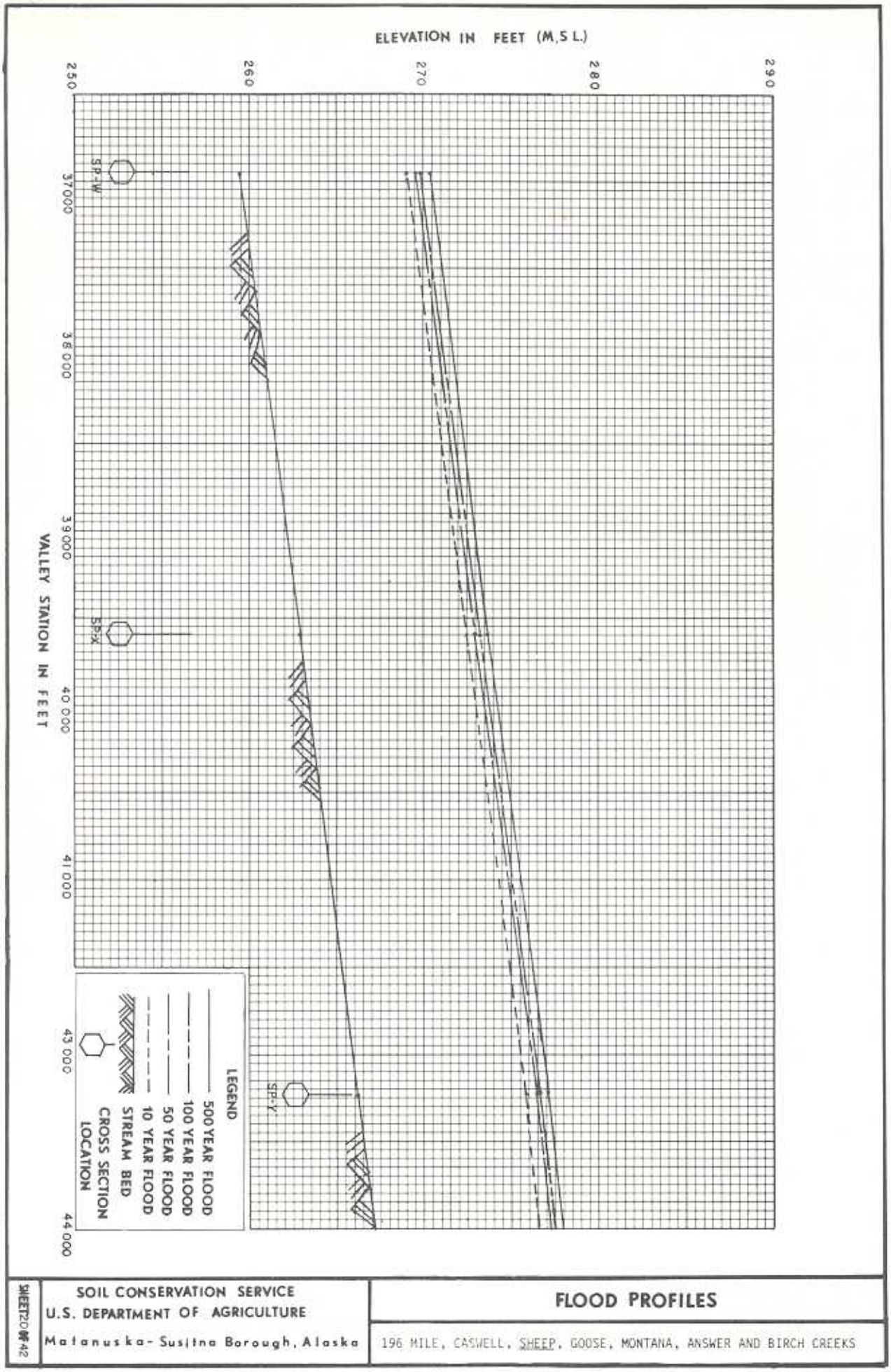

SHEET 19 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



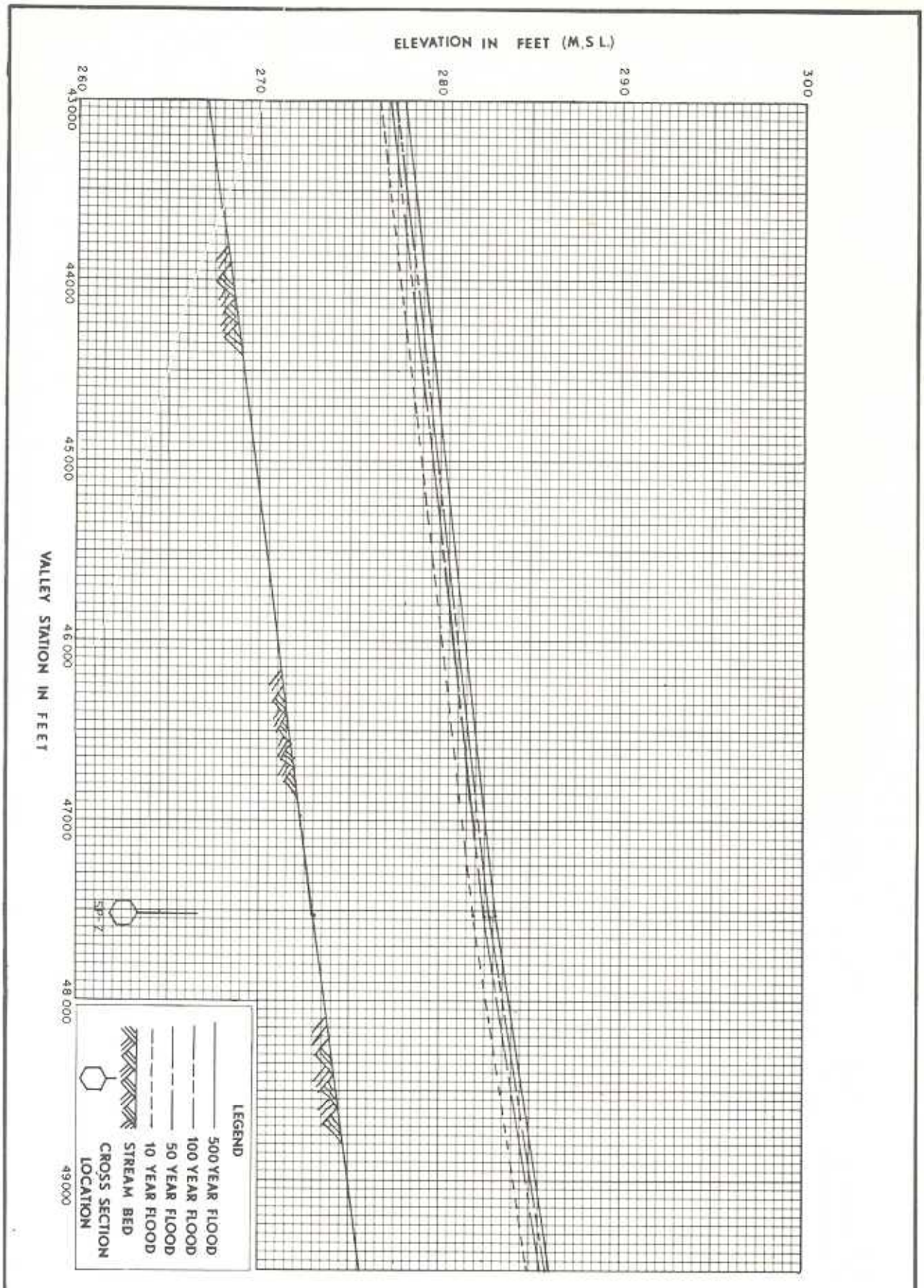

SHEET 20 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



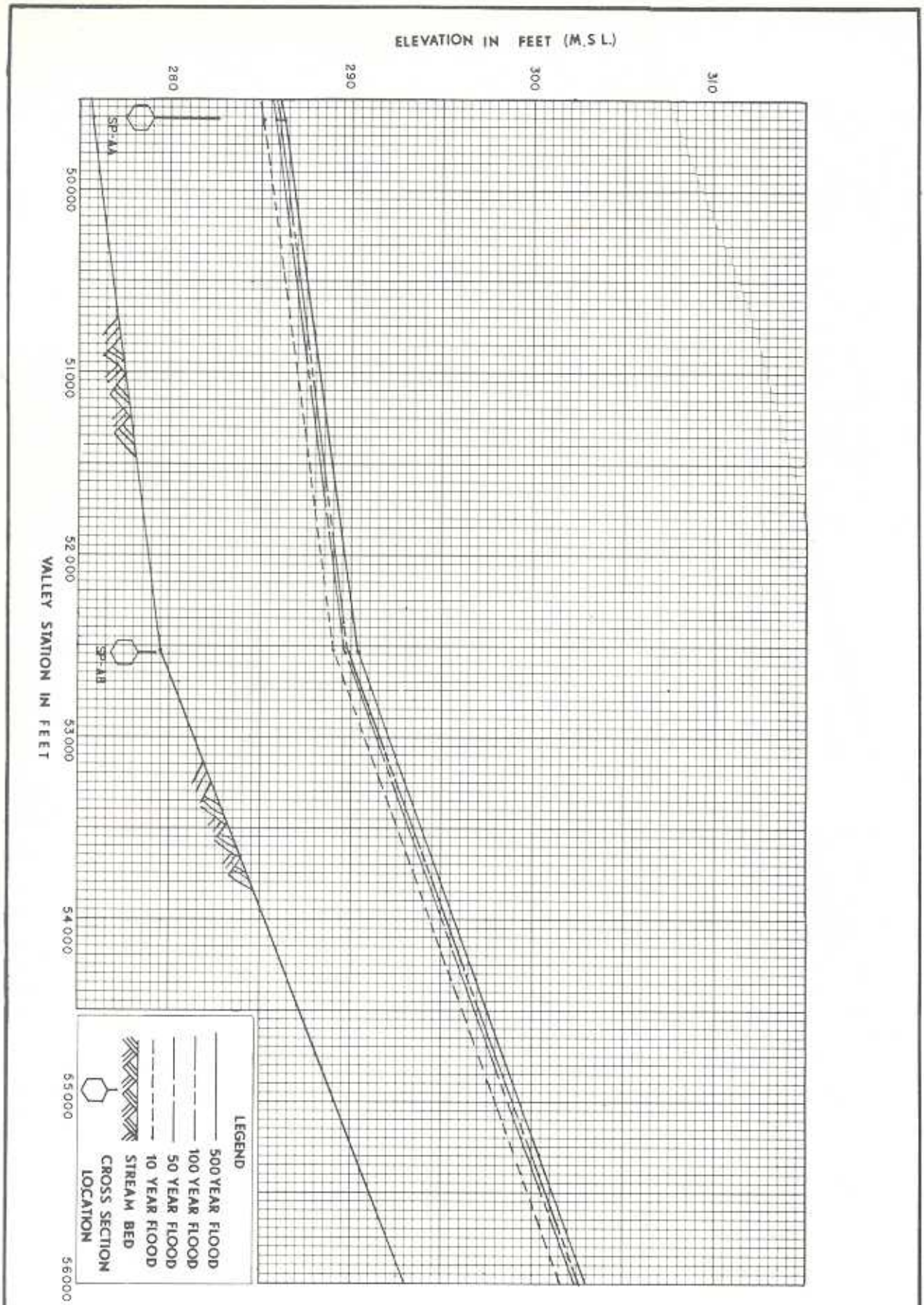

SHEET 21 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



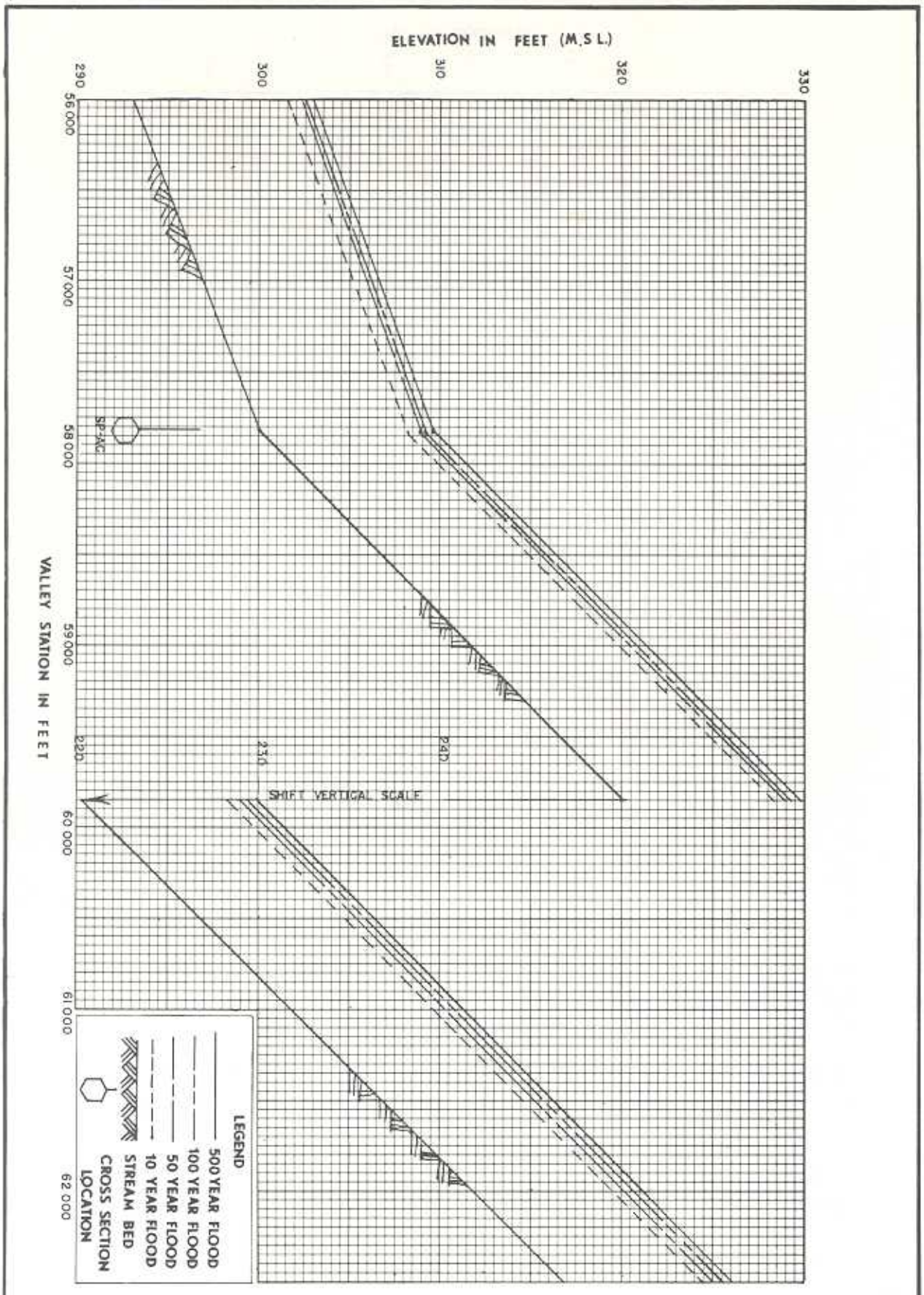

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

SHEET 22 OF 42

## FLOOD PROFILES

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



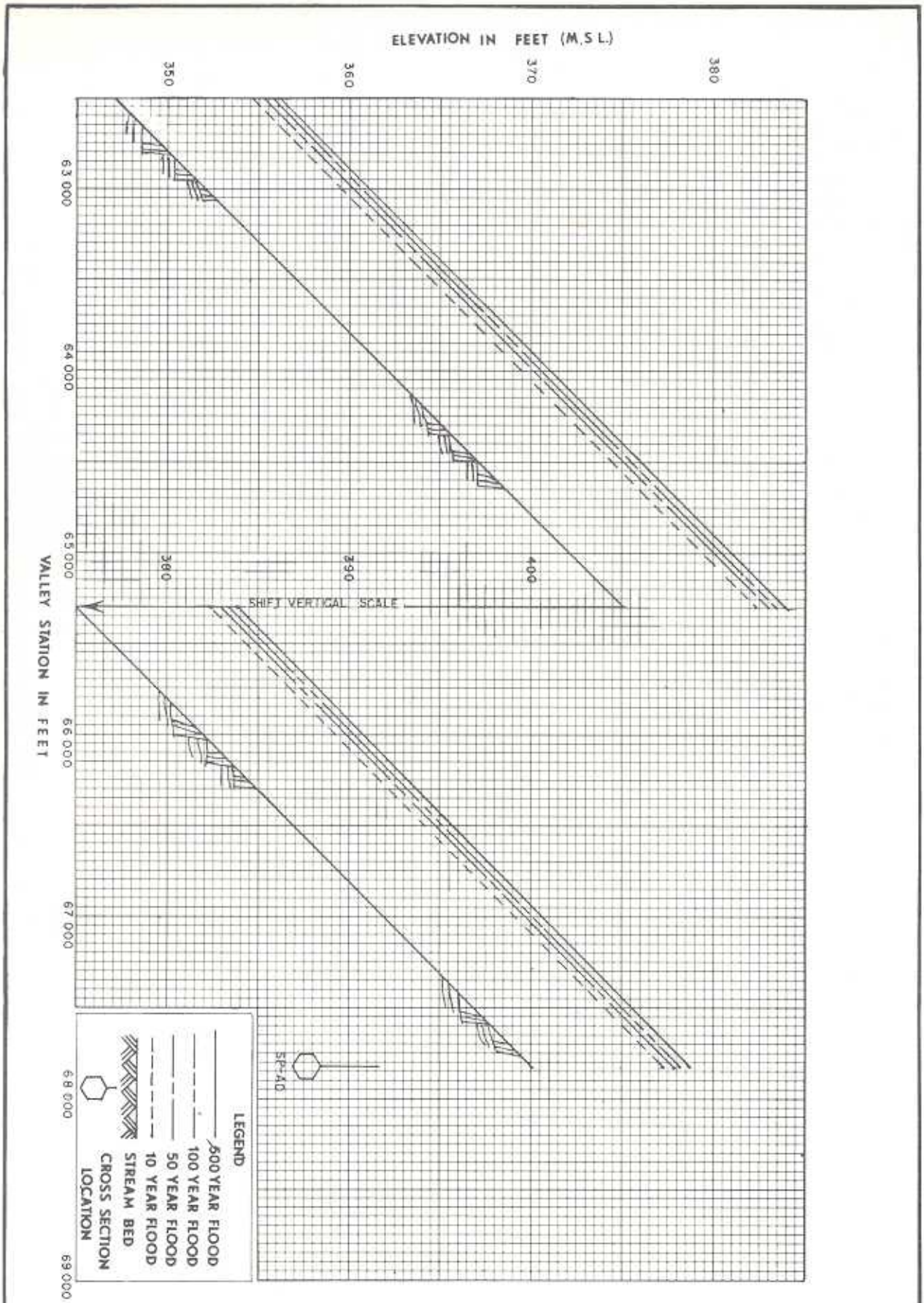

SHEET 23 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



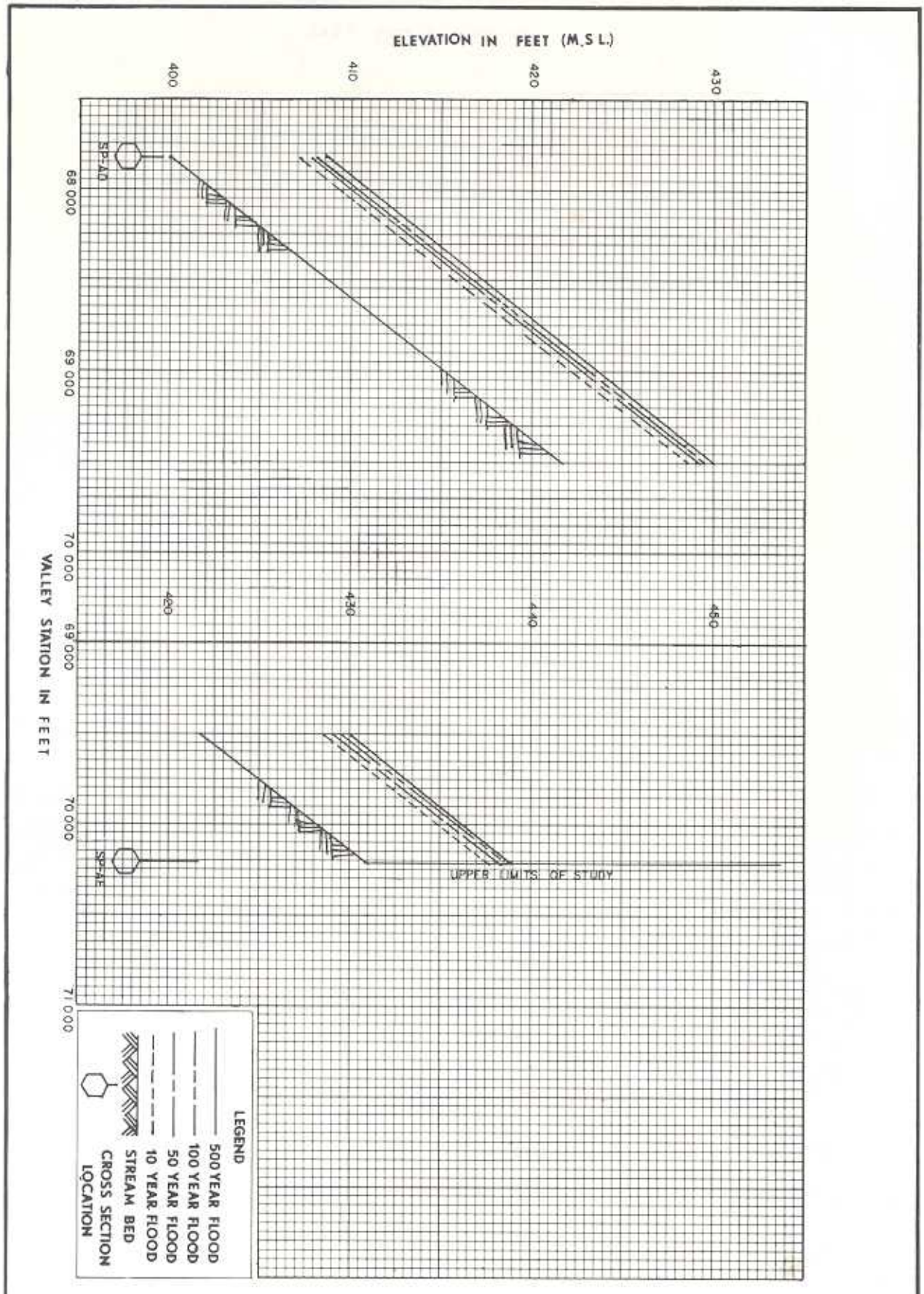

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

SHEET 24 OF 42

# FLOOD PROFILES

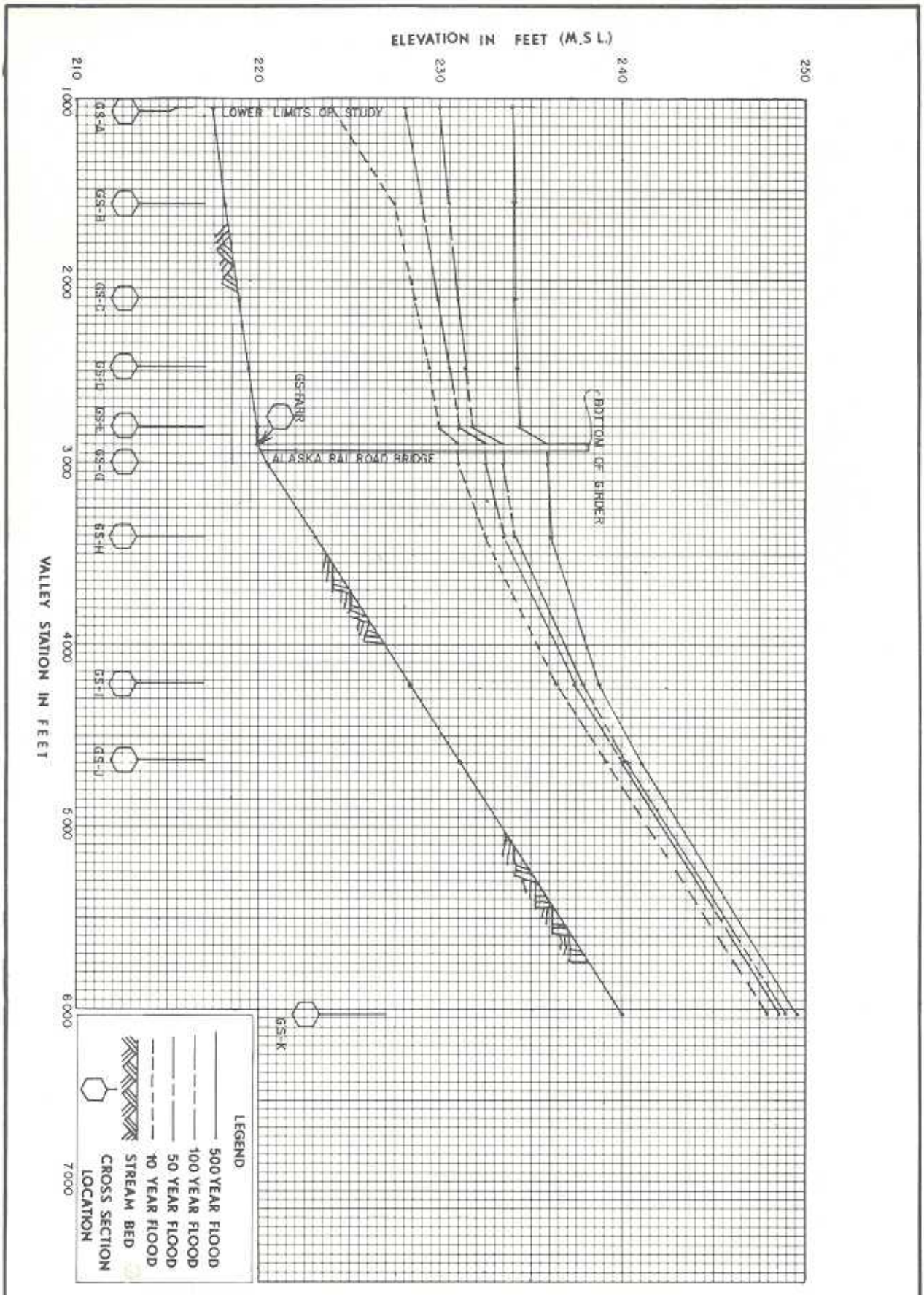
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 25 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | FLOOD PROFILES<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



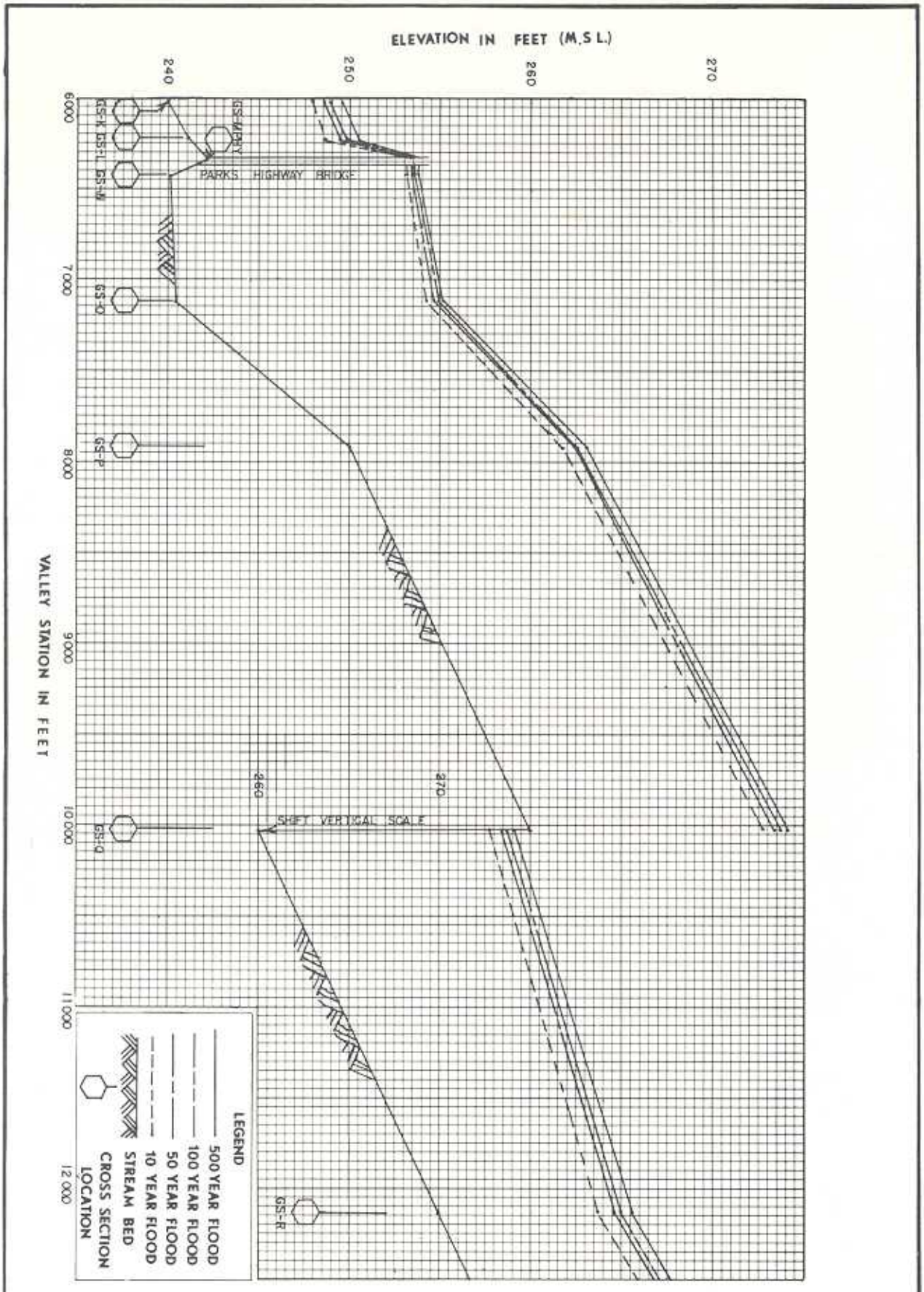

SHEET26OF42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



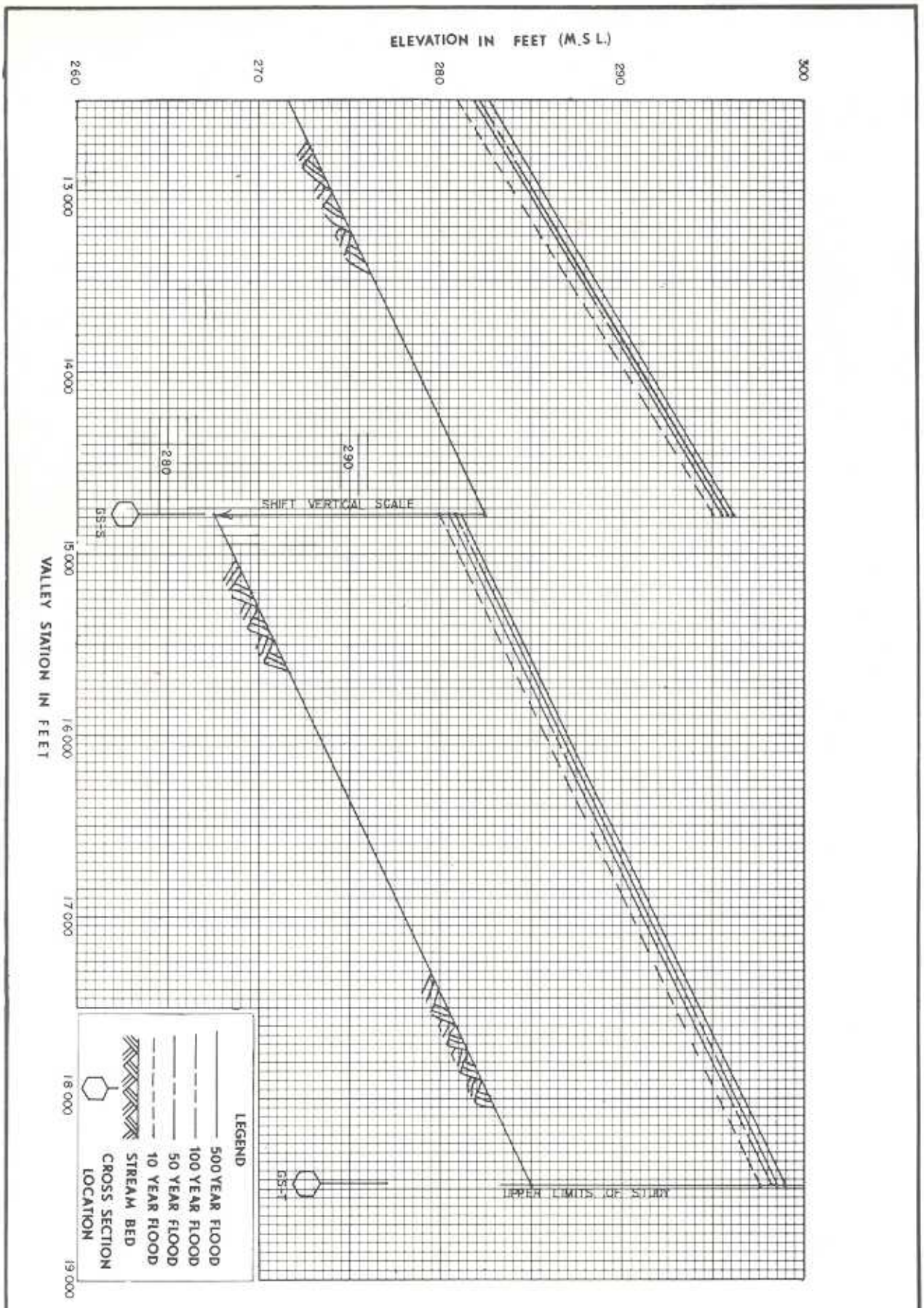

SHEET 27 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

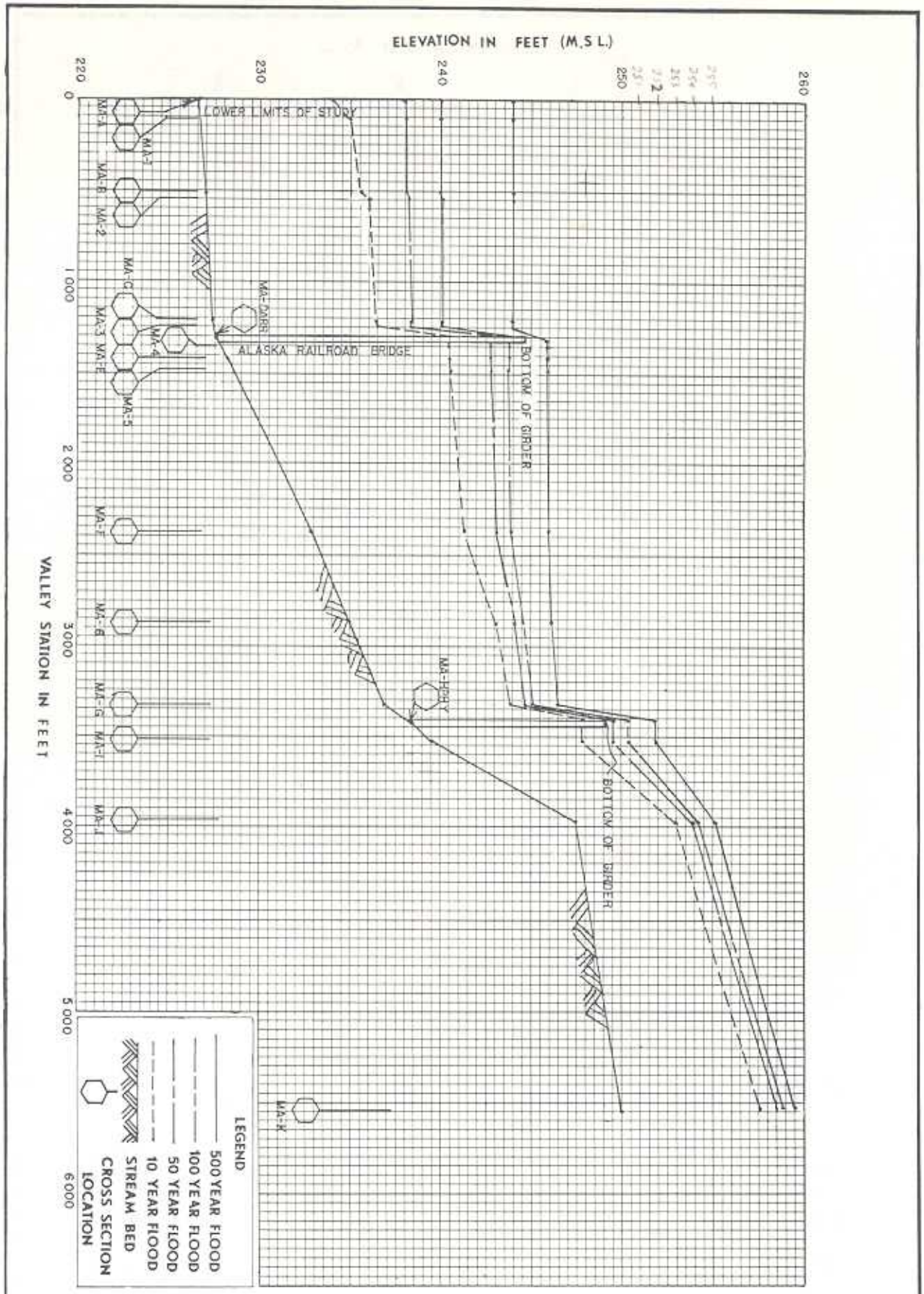
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 28 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



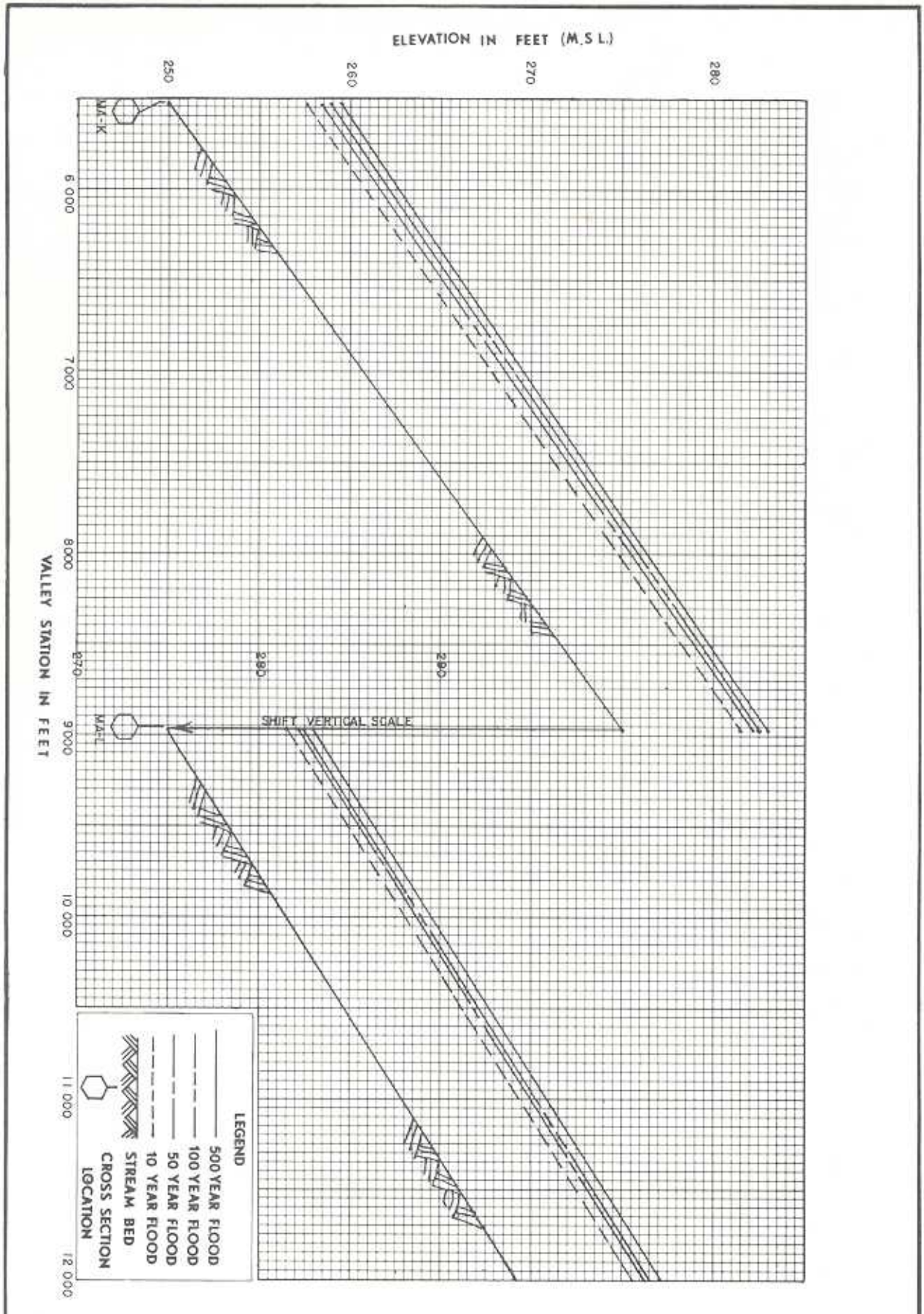

SHEET 2 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



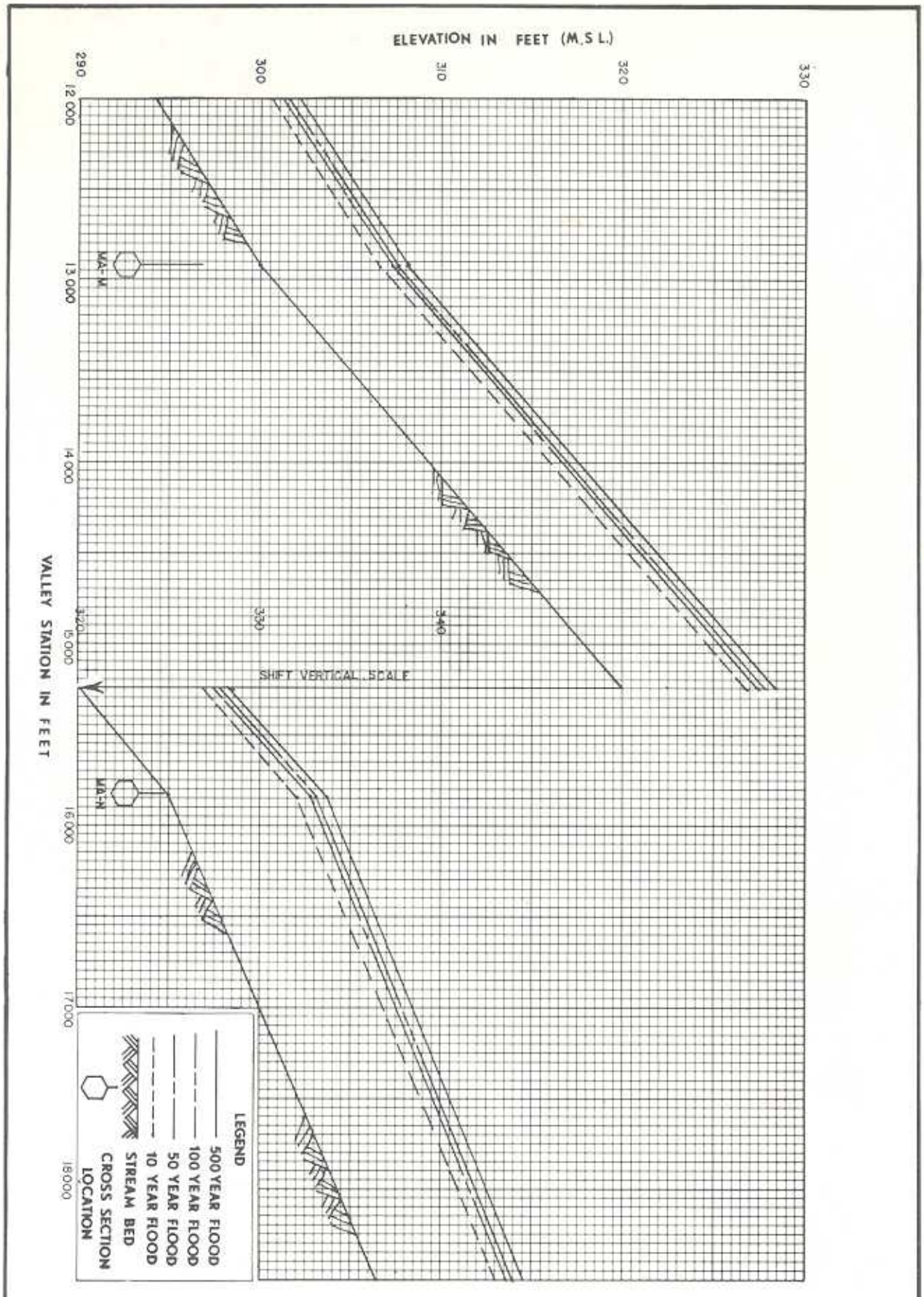

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

SHEET 30 OF 42

# FLOOD PROFILES

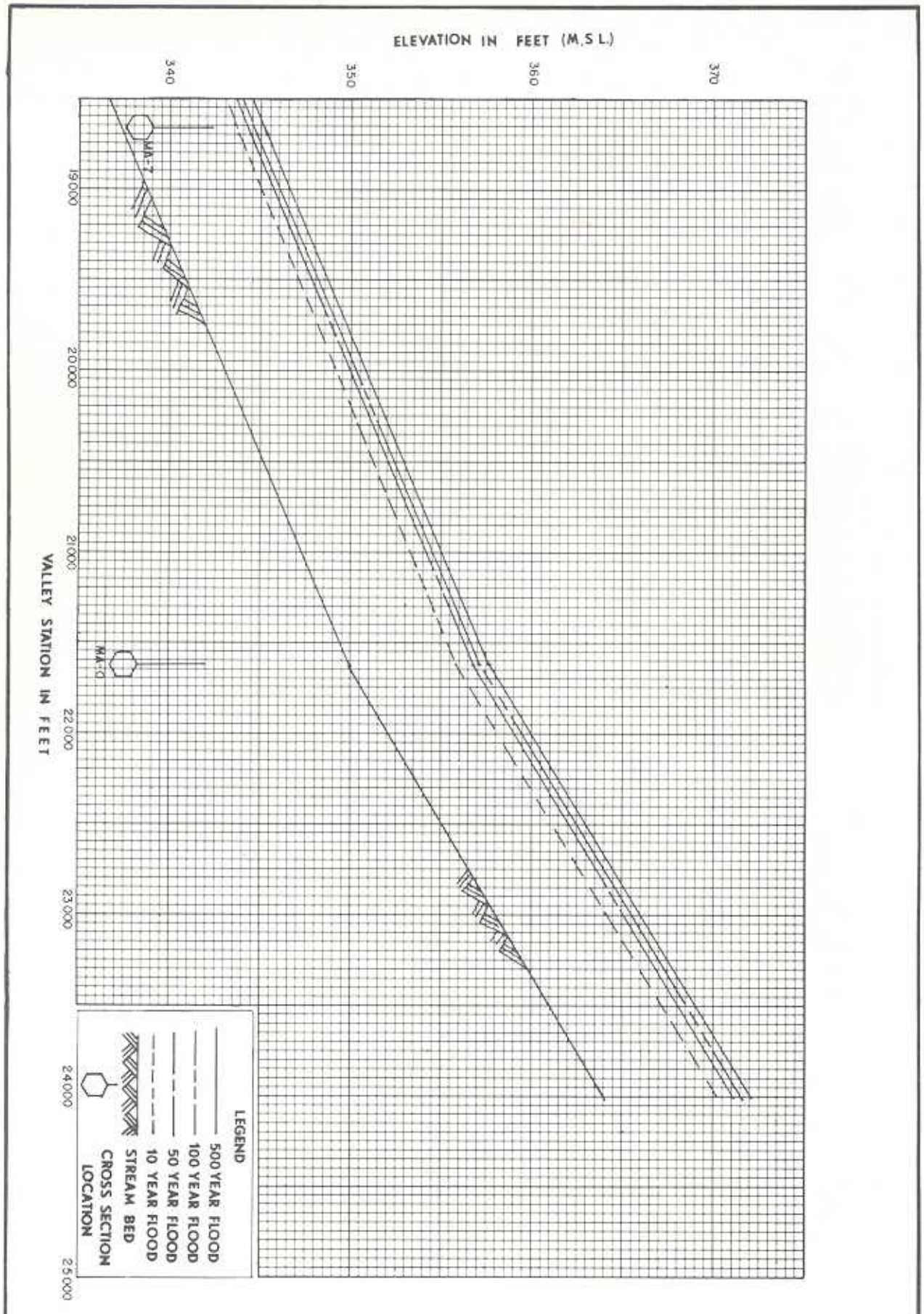
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



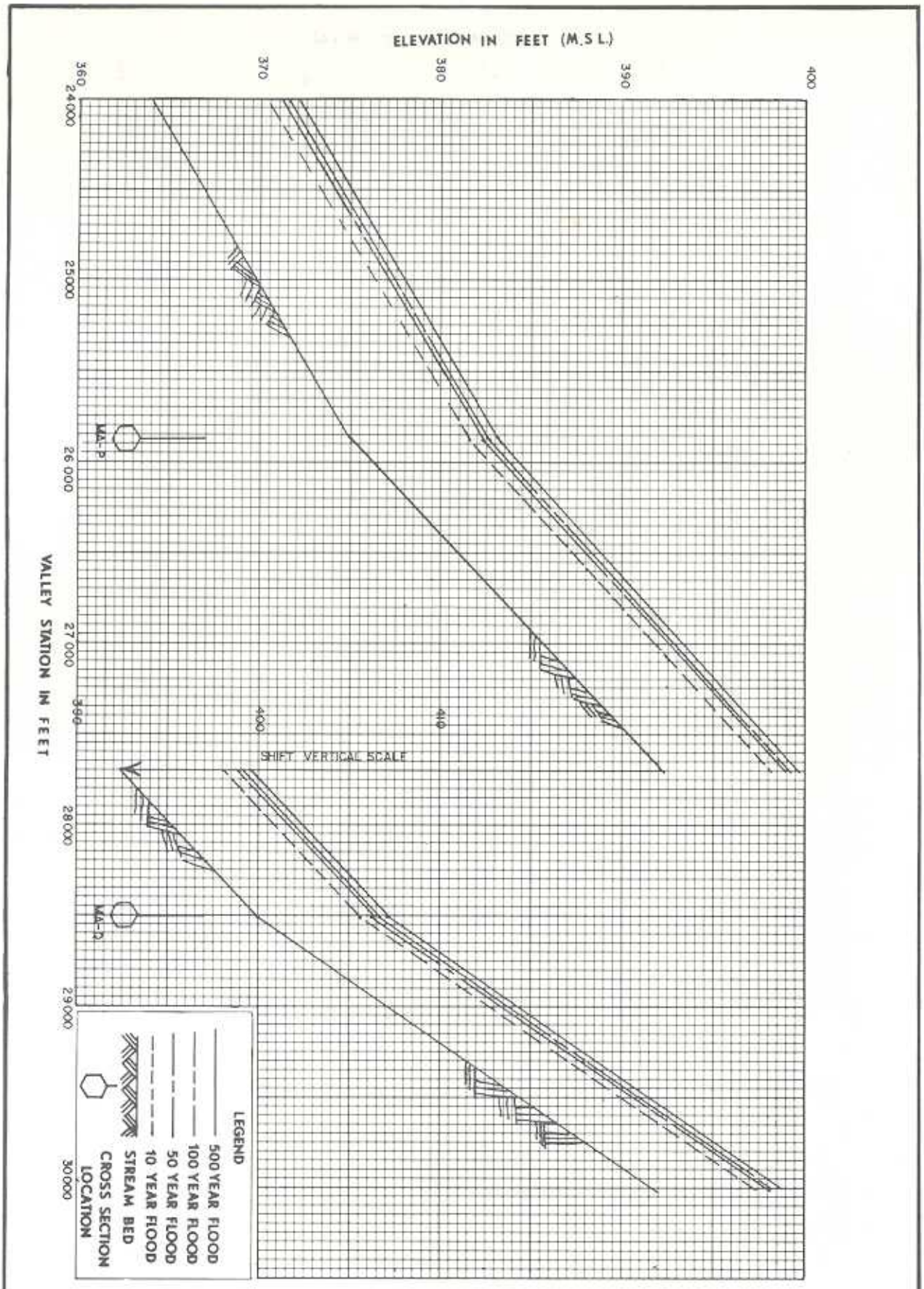

| | | |
|---|---|---|
| SHEET 31 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 32 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



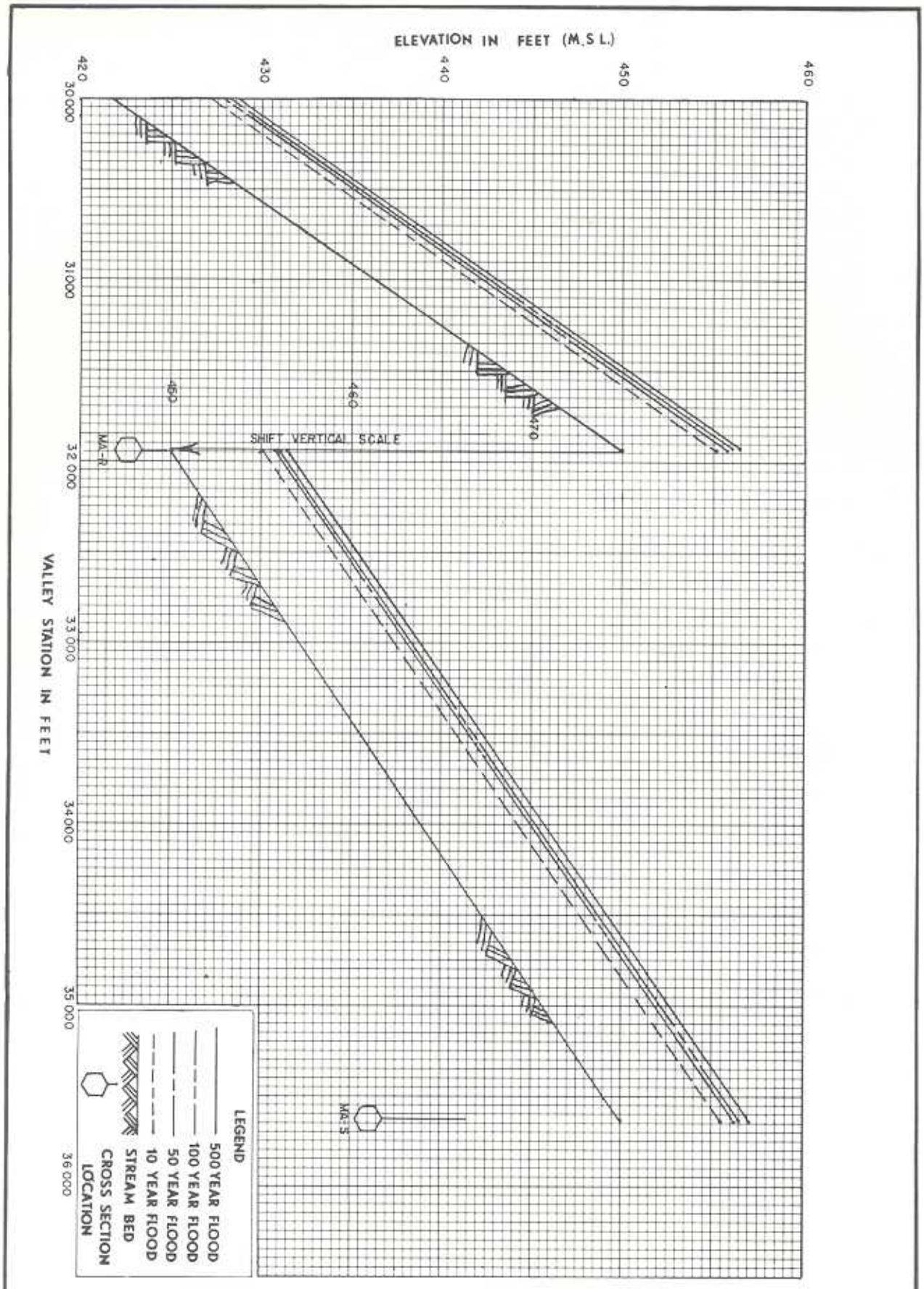

SHEET 33 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

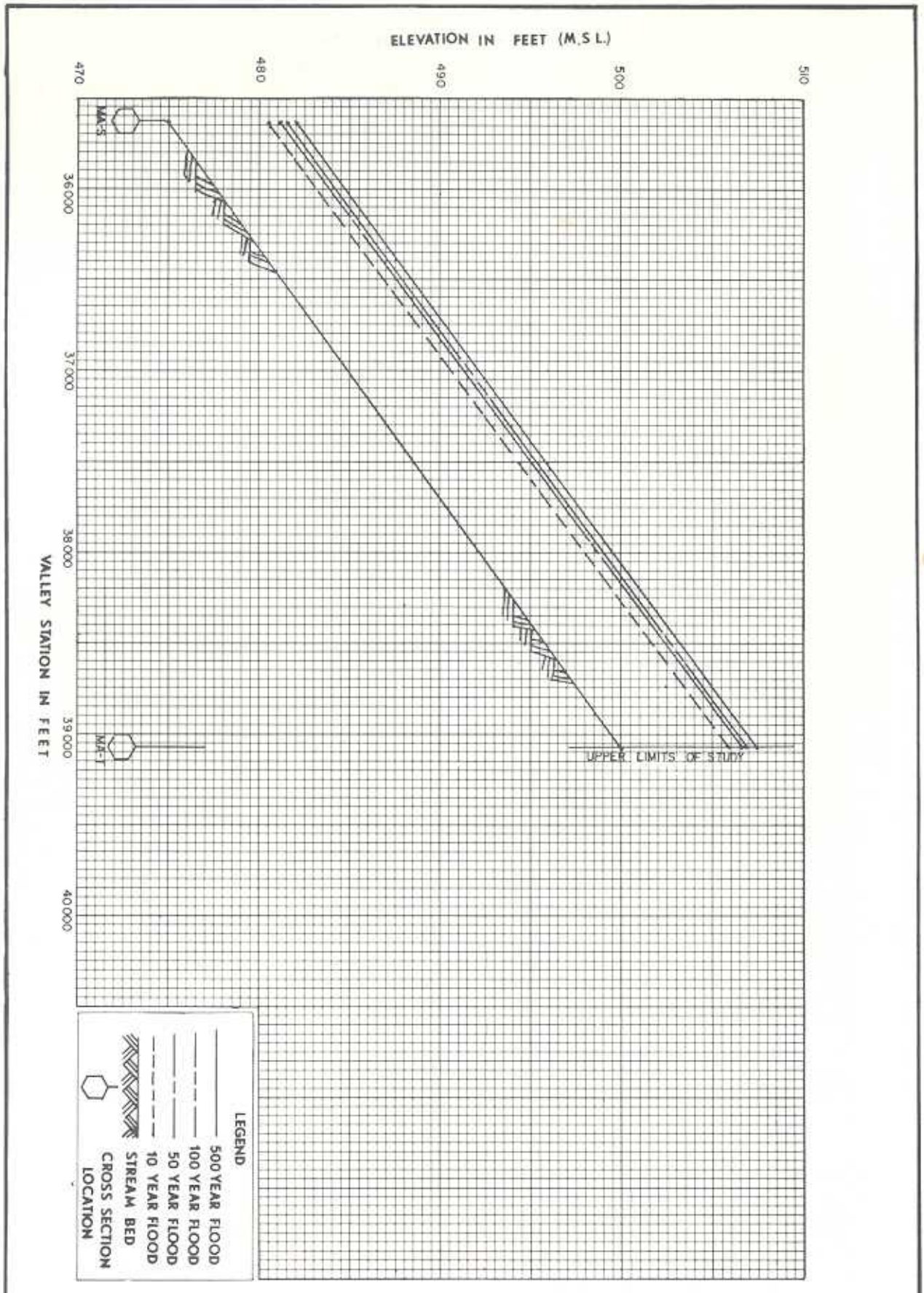
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



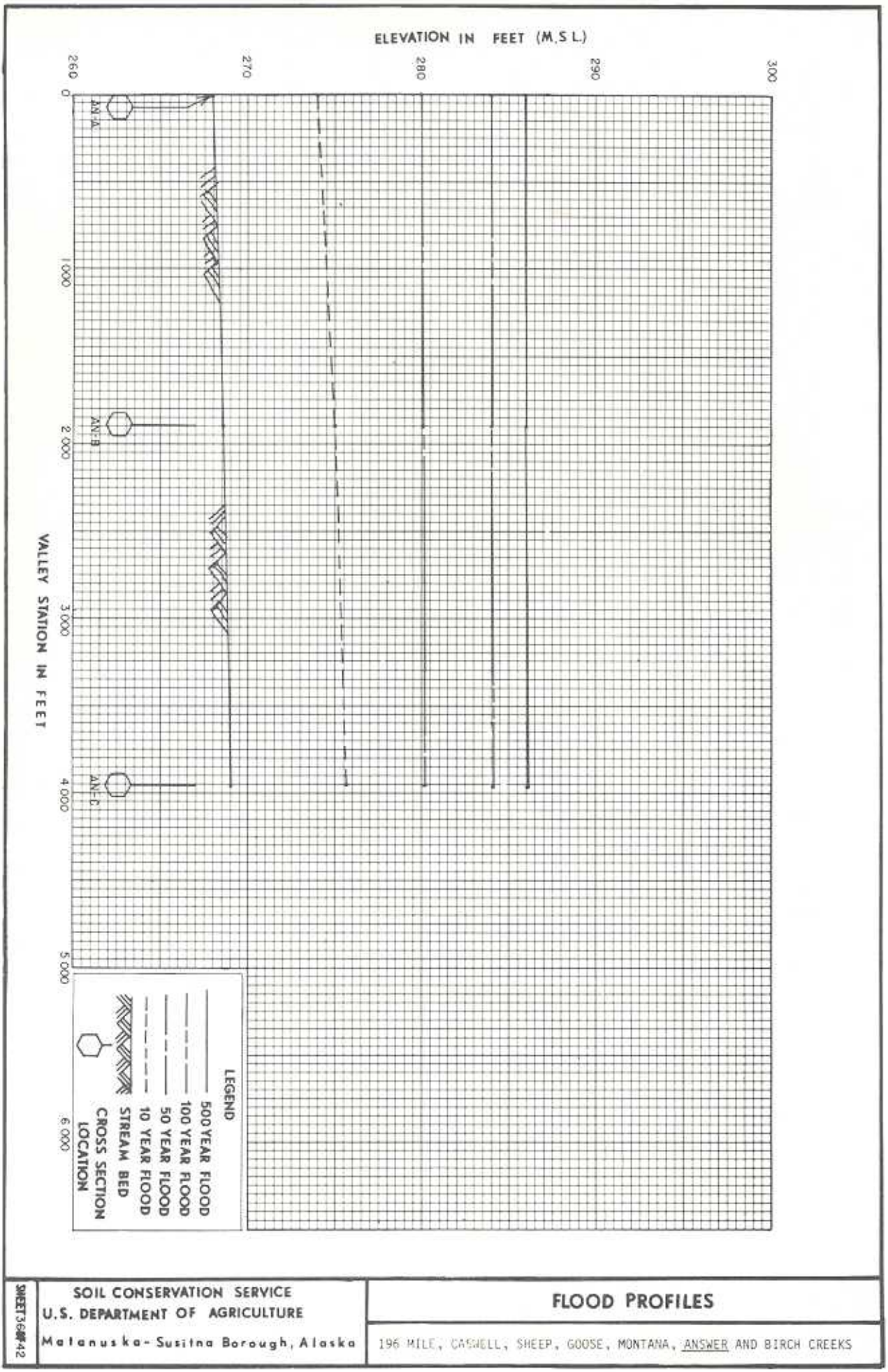

| | | |
|---|---|---|
| SHEET 3 of 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 35 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASHELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 7



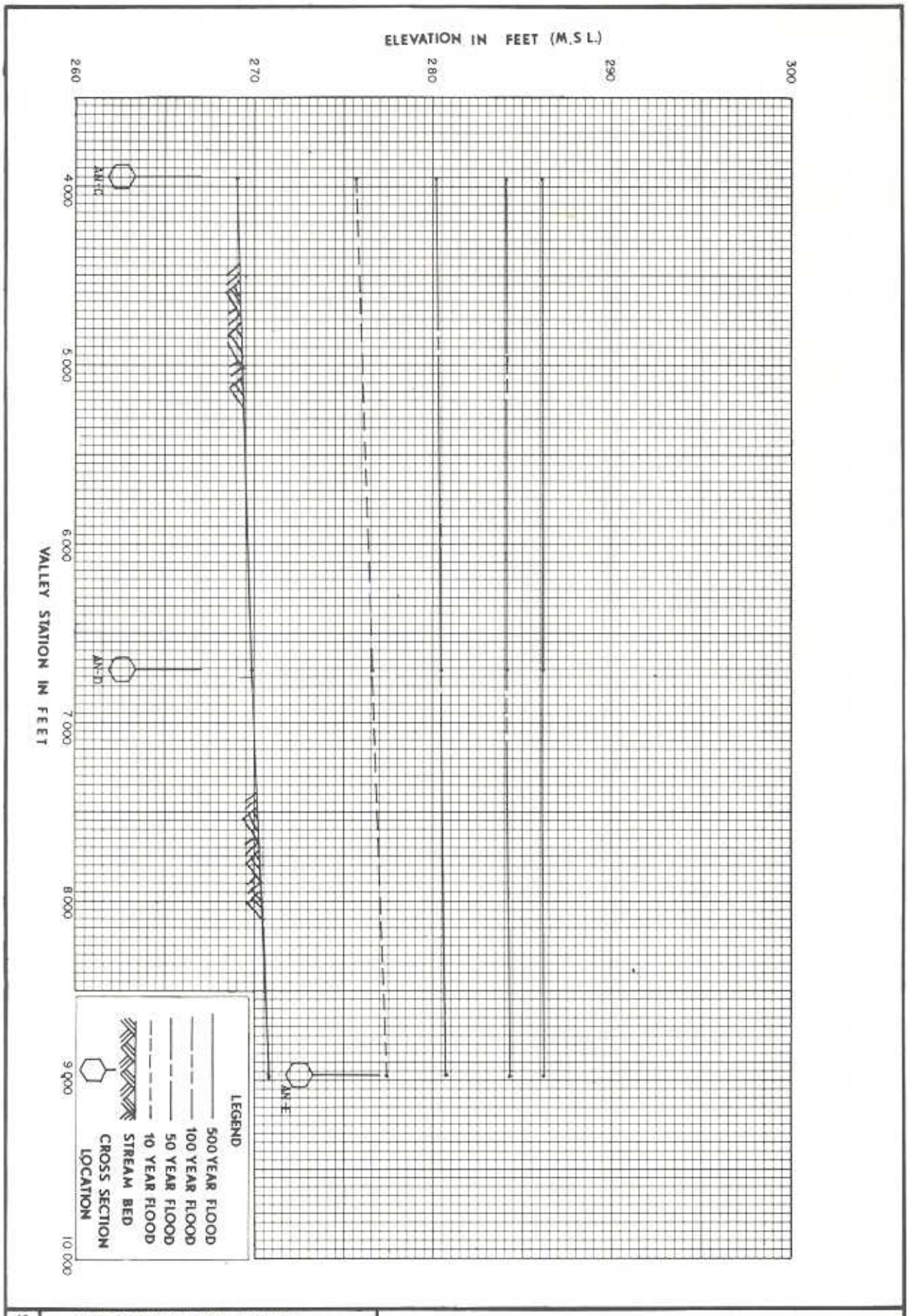

SHEET 36 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



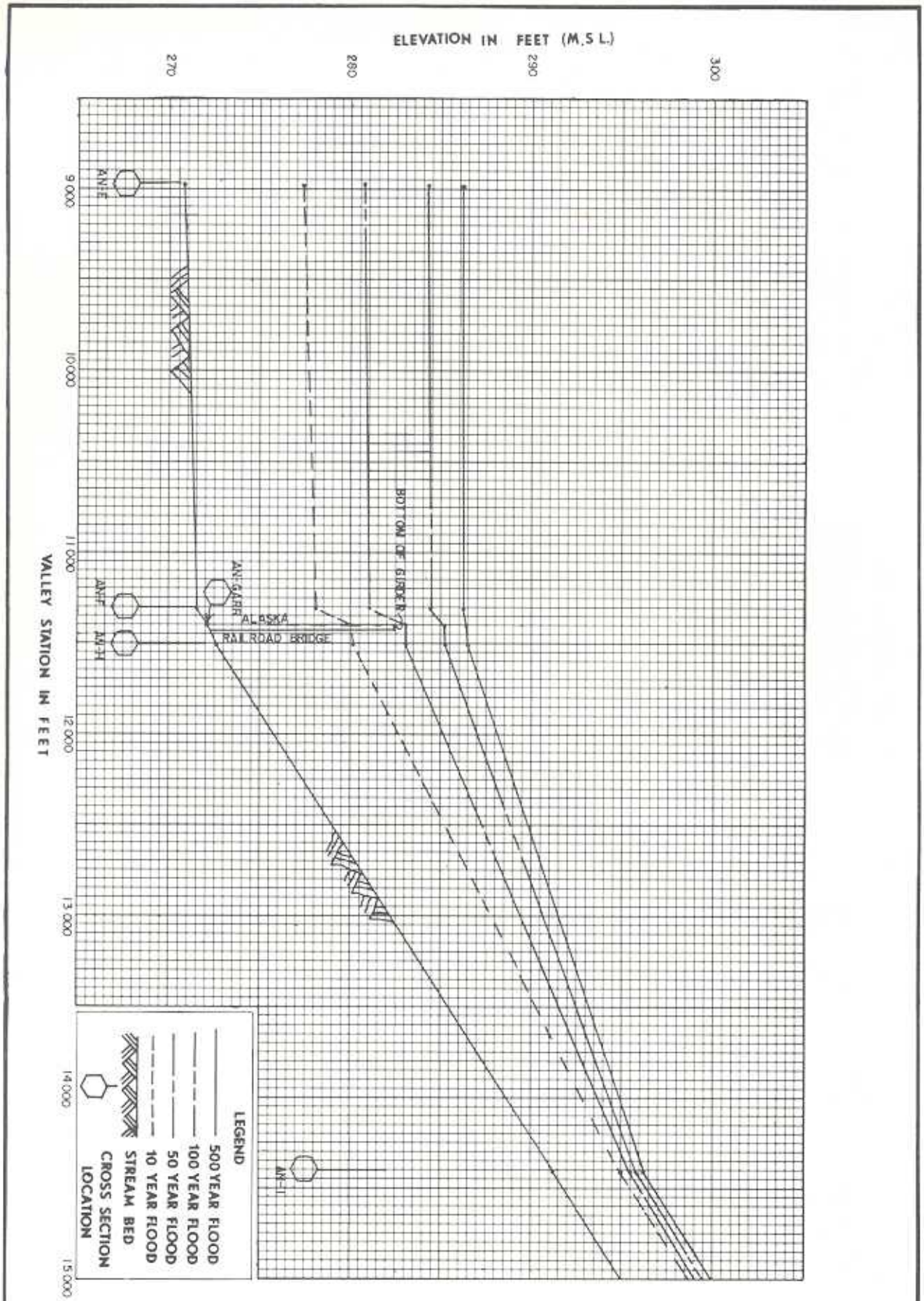

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

SHEET 37 OF 42

# FLOOD PROFILES

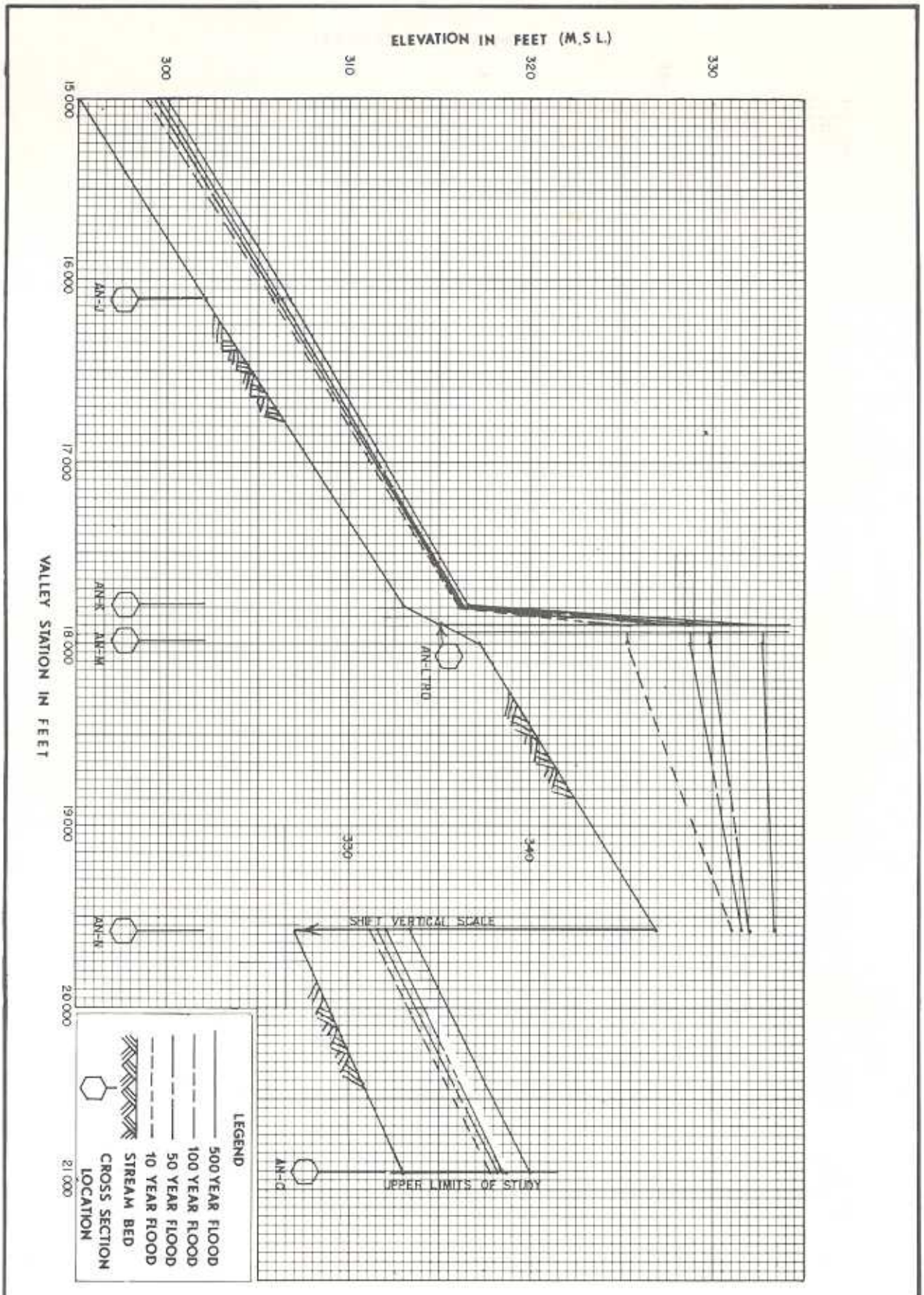
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



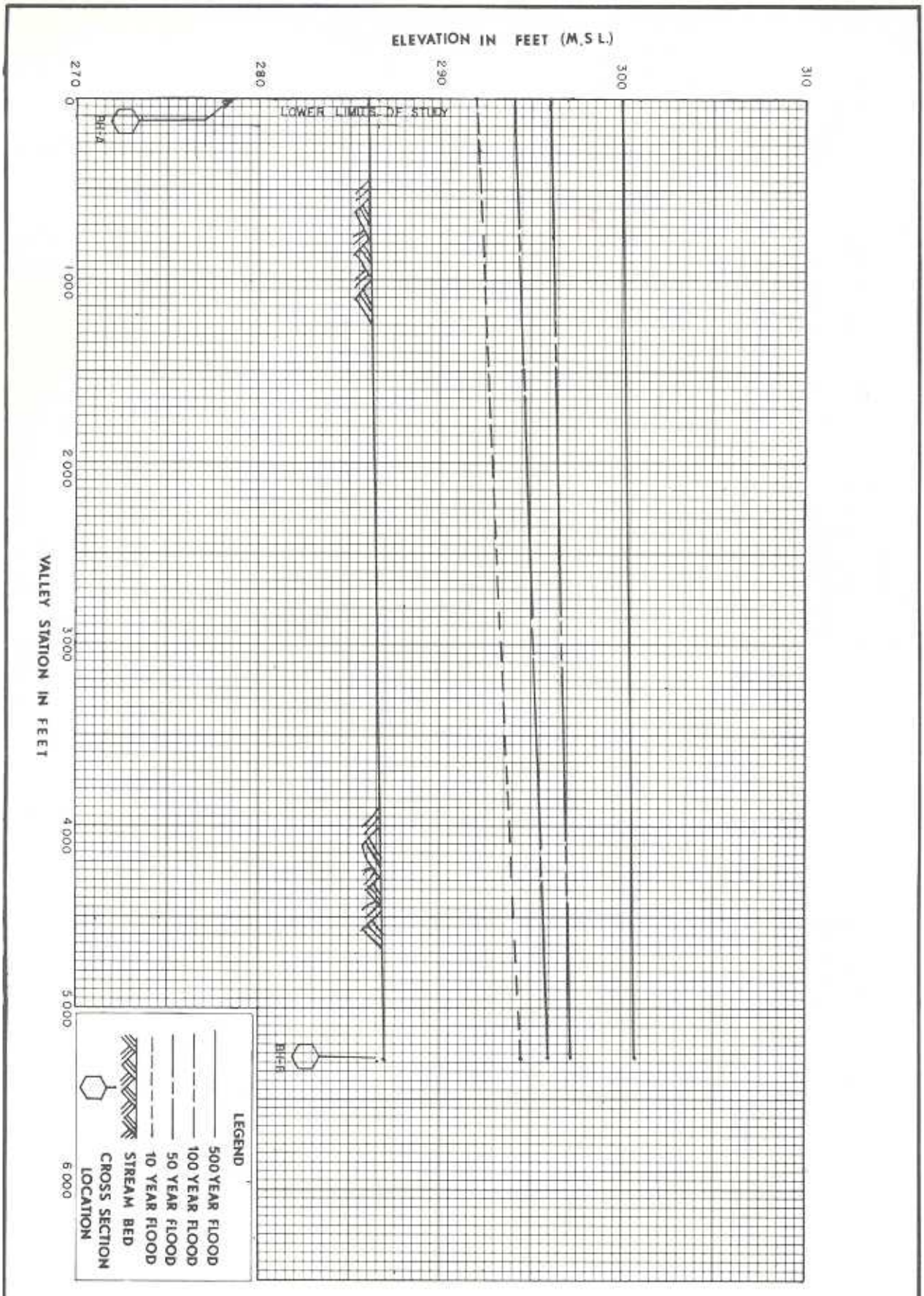

| | | |
|---|---|---|
| SHEET 38 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | FLOOD PROFILES<br>196 MILE, CASHELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 3 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



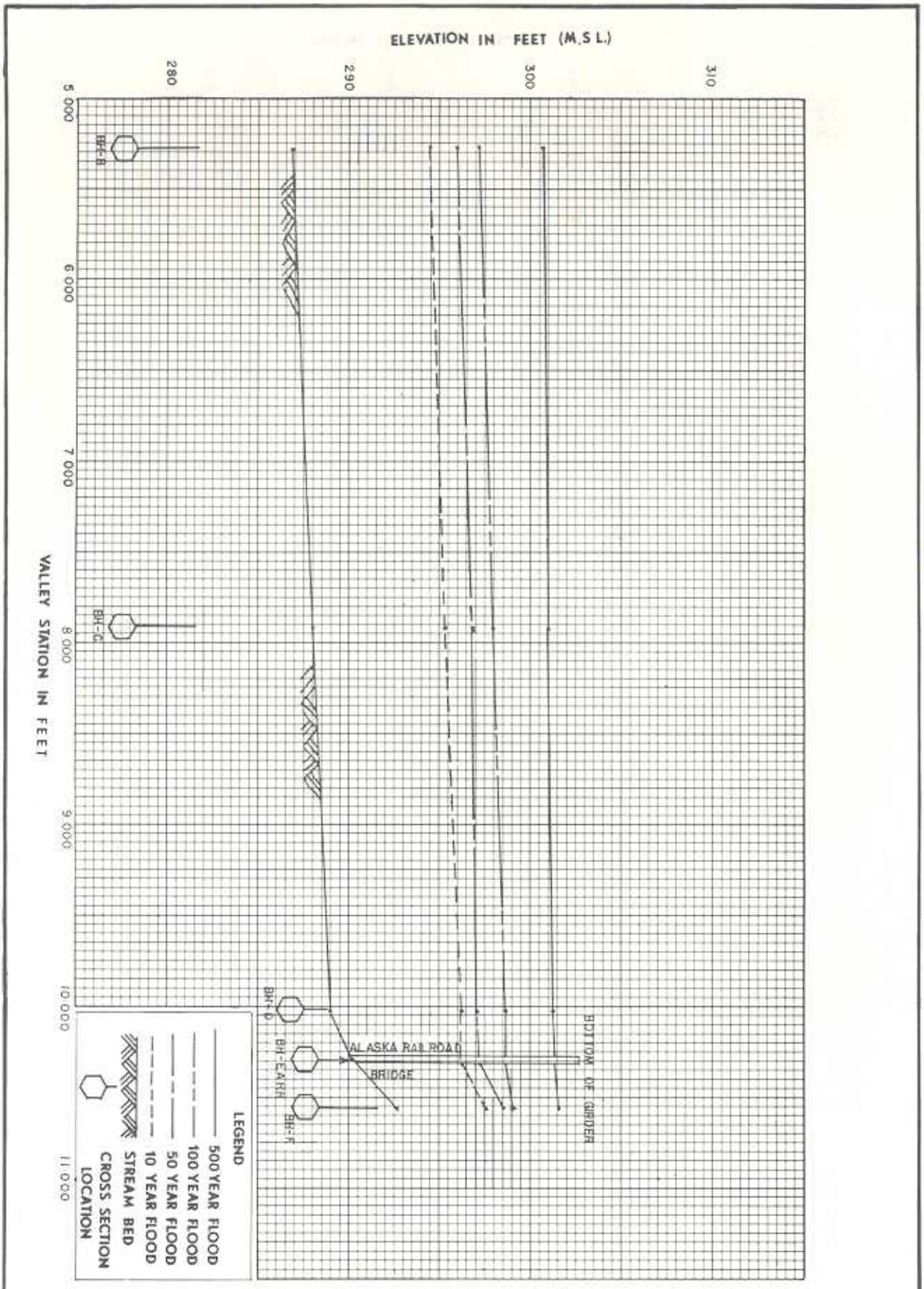

SHEET 4 OF 42

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Matanuska-Susitna Borough, Alaska

**FLOOD PROFILES**

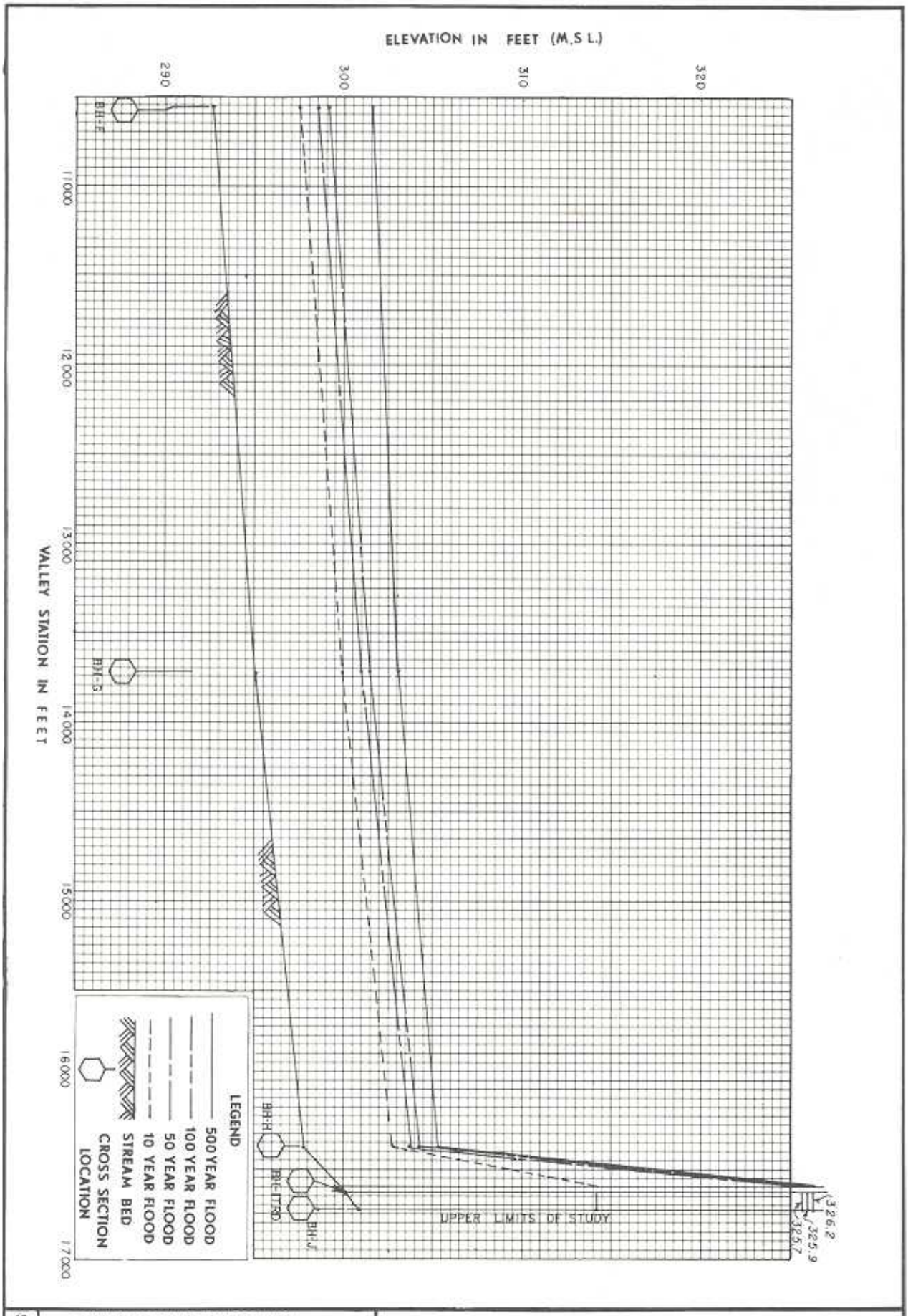
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 2



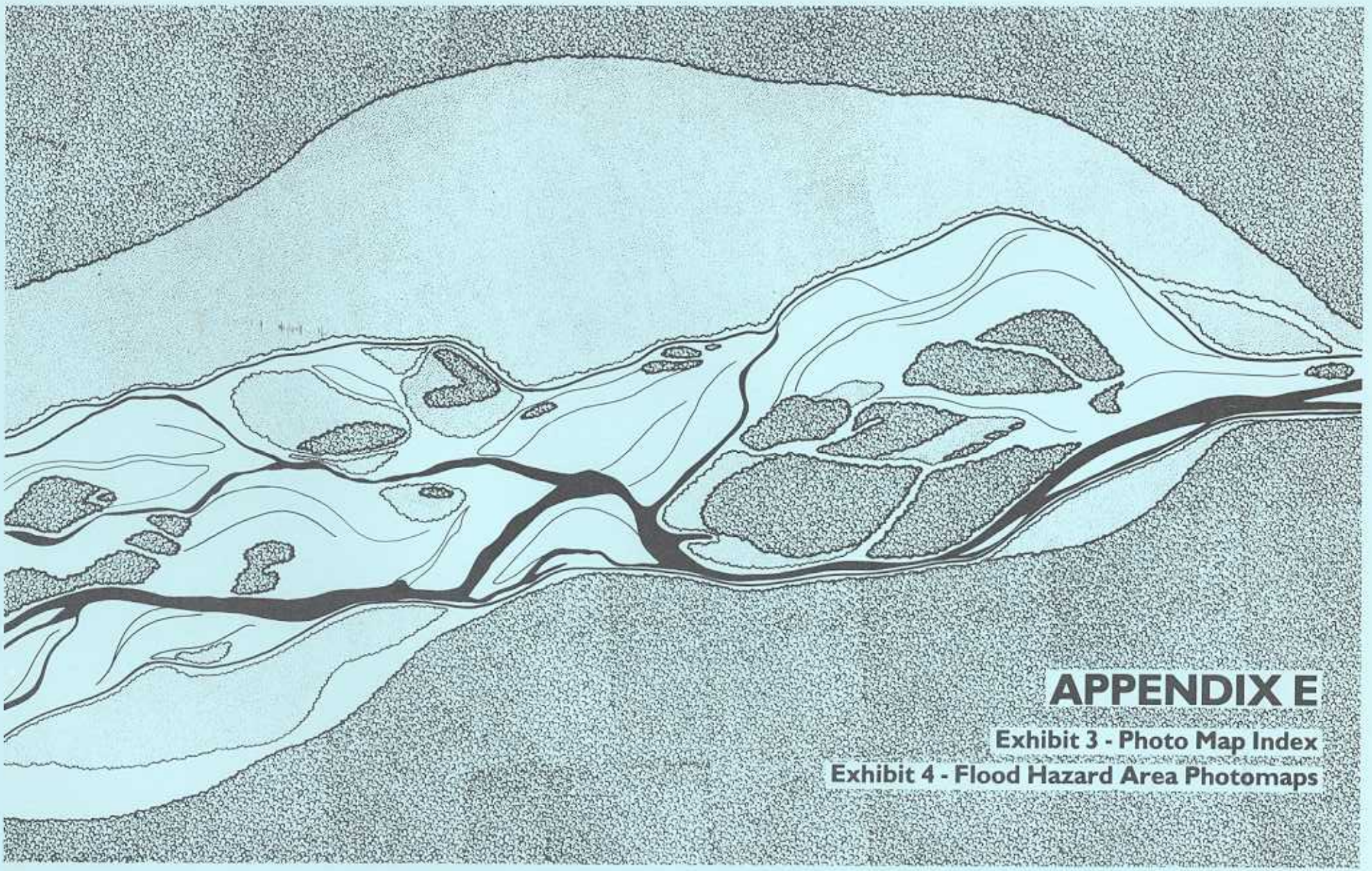

| | | |
|---|---|---|
| SHEET 41 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2




| | | |
|---|---|---|
| SHEET 42 OF 42 | SOIL CONSERVATION SERVICE<br>U.S. DEPARTMENT OF AGRICULTURE<br>Matanuska-Susitna Borough, Alaska | **FLOOD PROFILES**<br>196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS |

EXHIBIT 2



# APPENDIX E

**Exhibit 3 - Photo Map Index**

**Exhibit 4 - Flood Hazard Area Photomaps**

FIGURE 1

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

**VICINITY MAP**

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

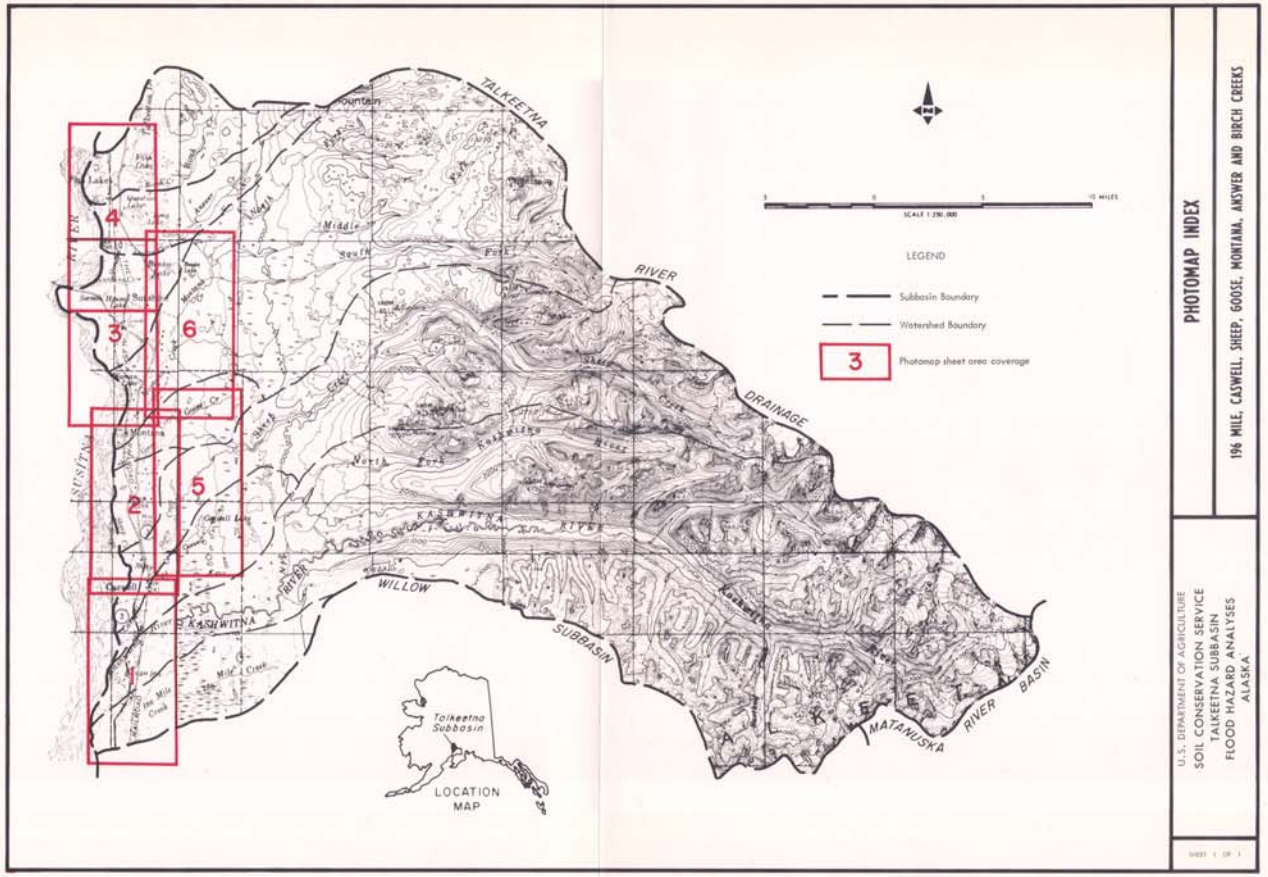
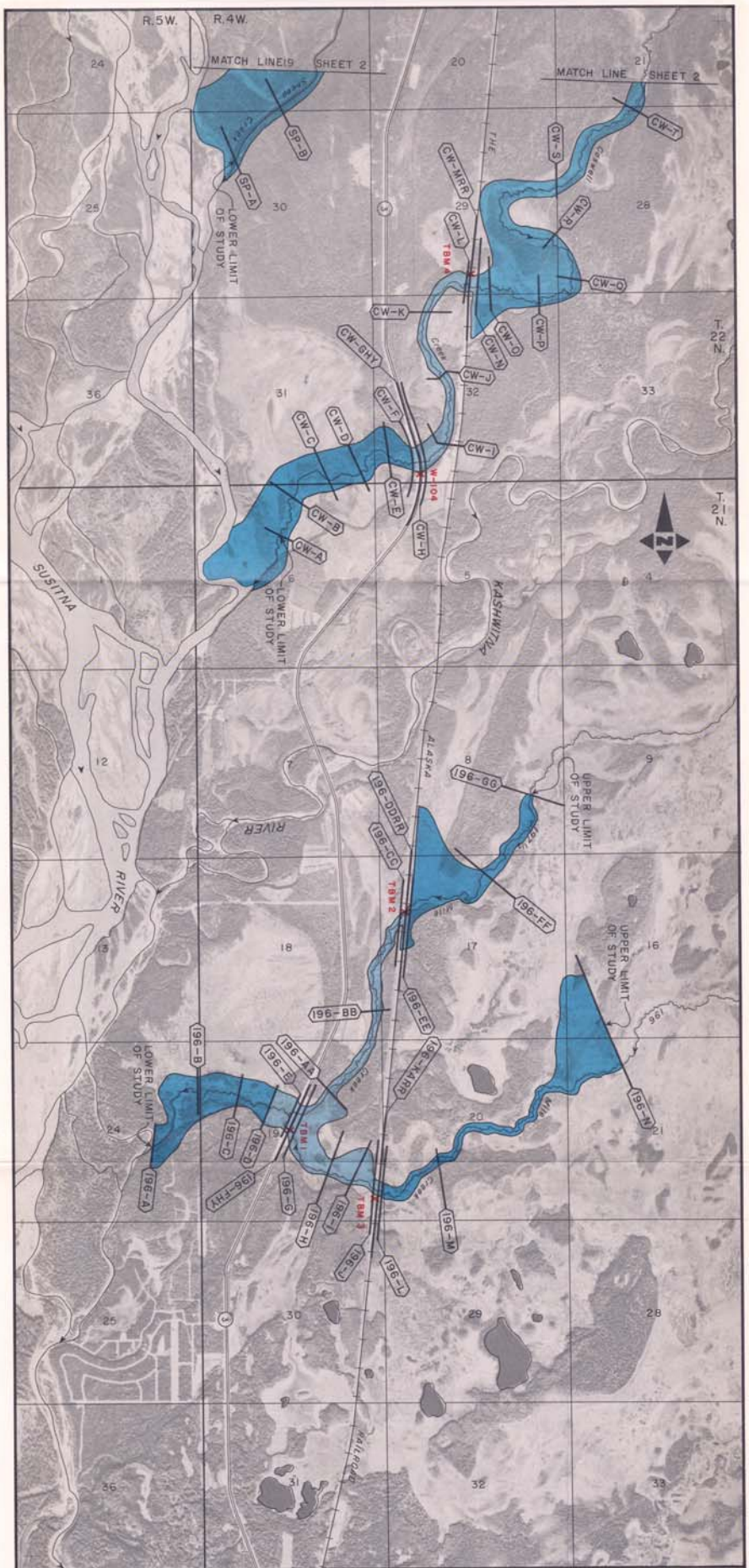

TALKEETNA
RIVER
DRAINAGE
WILLOW
SUBBASIN
KASHWITNA
RIVER
MATANUSKA
RIVER
BASIN
SCALE 1:250,000
LEGEND
Subbasin Boundary
Watershed Boundary
3
Photomap sheet area coverage
LOCATION MAP
Talkeetna Subbasin
PHOTOMAP INDEX
196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

EXHIBIT 3




LEGEND

100 Year Approximate Flood Hazard Area

100 Year Detailed Flood Hazard Area

GS-B Cross Section Location

X TBM 6 Elevation Reference Marks

Limits of flooding may vary from actual location on the ground.

Stream Channel

2000 0 2000

Scale in Feet

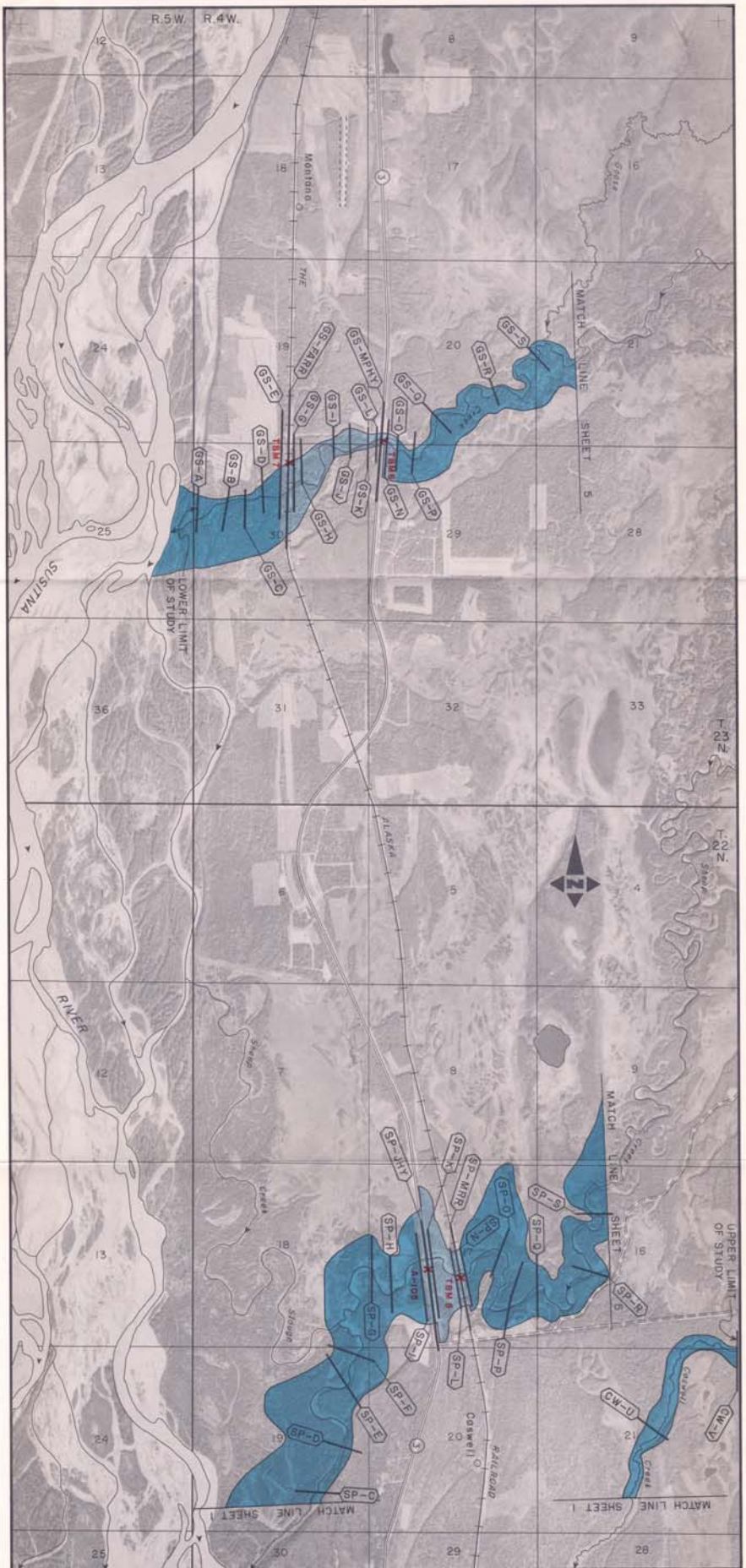
NASA Photography 8-76

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

# FLOOD HAZARD AREA

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 4




LEGEND

100 Year Approximate Flood Hazard Area

100 Year Detailed Flood Hazard Area

GS-B Cross Section Location

X TBM 6 Elevation Reference Marks

Stream Channel

Limits of flooding may vary from actual location on the ground.

2000 0 2000

Scale in Feet

NASA Photography 8.76

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

# FLOOD HAZARD AREA

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

SHEET 1 OF 4

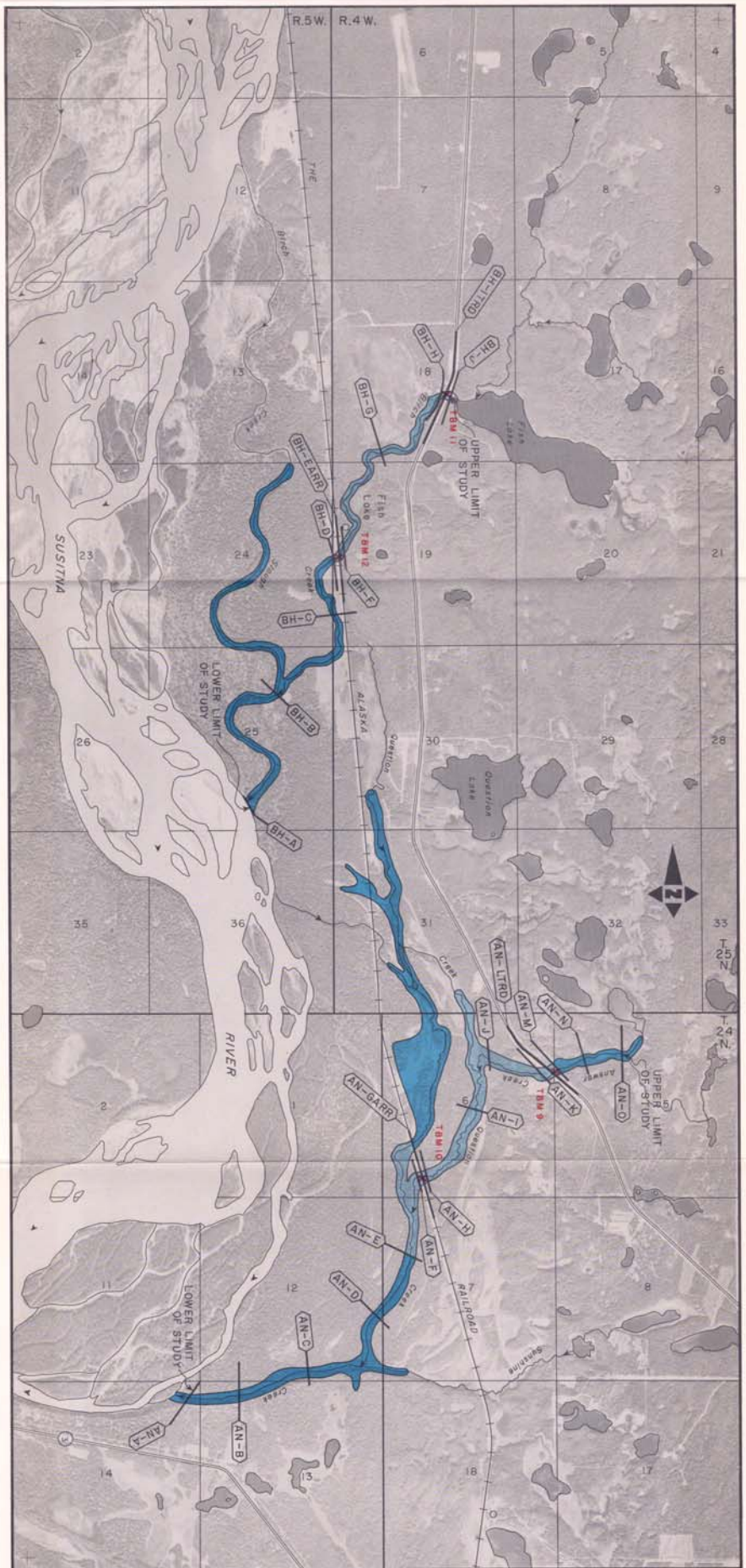
EXHIBIT 4


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

# FLOOD HAZARD AREA

196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 4




LEGEND

100 Year Approximate Flood Hazard Area

100 Year Detailed Flood Hazard Area

GS-B Cross Section Location

X TBM 6 Elevation Reference Marks

Limits of flooding may vary from actual location on the ground.

Stream Channel

2000 0 2000

Scale in Feet

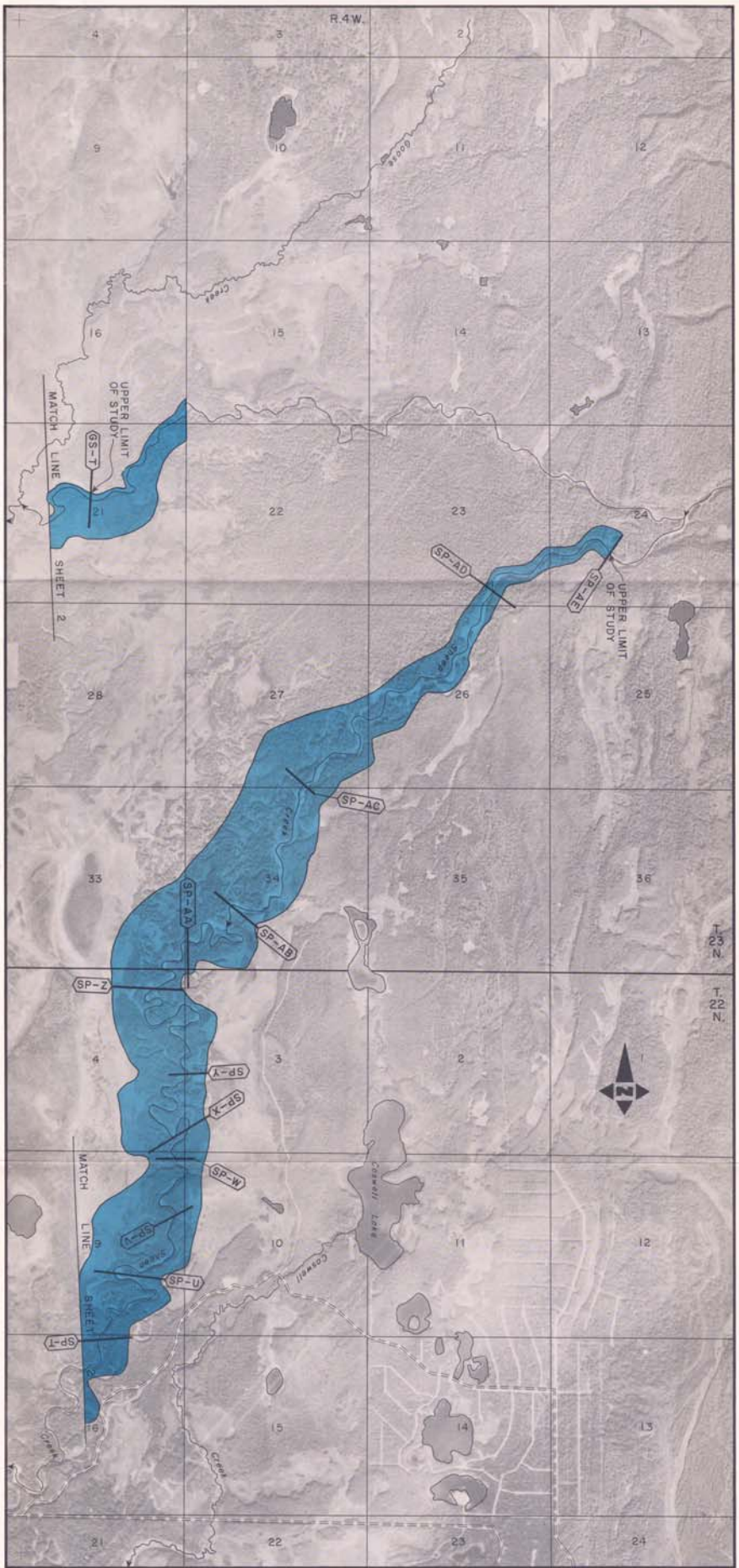
NASA Photography 8-76

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TALKEETNA SUBBASIN
FLOOD HAZARD ANALYSES
ALASKA

# FLOOD HAZARD AREA

## 196 MILE, CASWELL, SHEEP, GOOSE, MONTANA, ANSWER AND BIRCH CREEKS

EXHIBIT 4




LEGEND

100 Year Approximate Flood Hazard Area

100 Year Detailed Flood Hazard Area

GS-B Cross Section Location

X TBM 6 Elevation Reference Marks

Limits of flooding may vary from actual location on the ground.

Stream Channel

2000 0 2000

Scale in Feet

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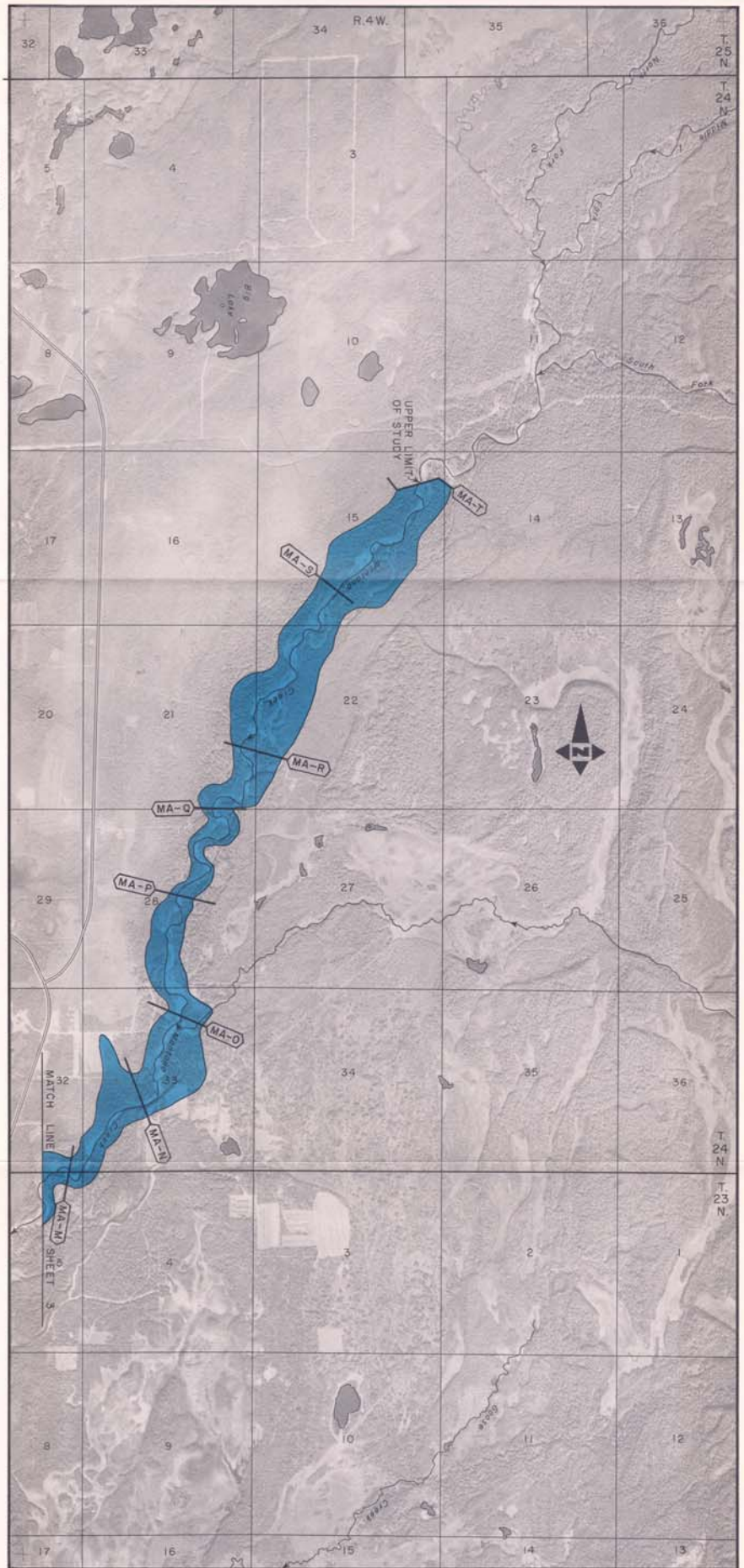


LEGEND

- 100 Year Approximate Flood Hazard Area
- 100 Year Detailed Flood Hazard Area
- GS-B Cross Section Location
- X TBM 6 Elevation Reference Marks
- Stream Channel

Limits of flooding may vary from actual location on the ground.

2000 0 2000
Scale in Feet

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SHEET 4 OF 4

EXHIBIT 4