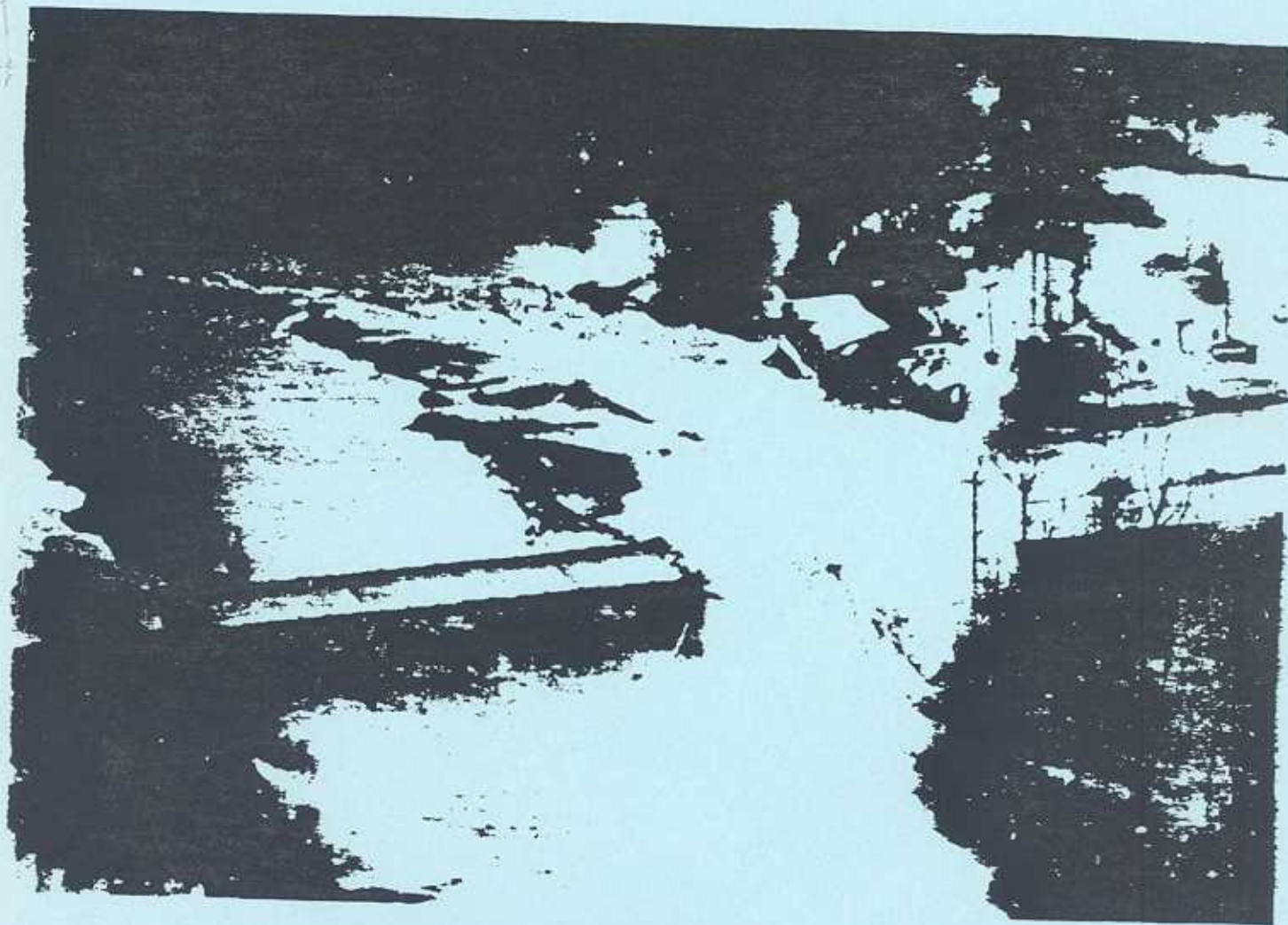


INTERAGENCY HAZARD MITIGATION REPORT



**FEMA-782-DR-AK
ALASKA**

NOVEMBER 14, 1986



Federal Emergency Management Agency

Region X

Federal Regional Center

Bothell, Washington 98021-9796

November 14, 1986

Interagency Hazard Mitigation Team Members and Other Participants

RE: Final Interagency Hazard Mitigation Report

Enclosed is your copy of the Interagency Hazard Mitigation Team Report for FEMA-782-DR-AK.

Thank you for your participation in the team's activities. Your assistance was valuable in providing background information and/or input for the team report. The report identifies mitigation alternatives which can be used to help reduce future losses in the affected communities.

FEMA Region X will monitor the work elements contained in this report. We may contact you for further information and assistance in implementing the mitigation report work elements.

Again, thank you for your support.

Joan Hodgins

Joan Hodgins
Federal Coordinating Officer

Enclosure

INTERAGENCY
FLOOD HAZARD MITIGATION REPORT

In Response to the October 27, 1986
Disaster Declaration
State of Alaska
FEMA 782-DR-AK

Prepared by the Region X
Interagency Hazard Mitigation Team

Covering: Matanuska-Susitna Borough
Kenai Peninsula Borough

FEDERAL AGENCIES

Federal Emergency Management Agency
Army Corps of Engineers
Department of Housing and Urban Development
National Weather Service
Small Business Administration
Soil Conservation Service
United States Geological Survey
Fish and Wildlife Service

STATE AGENCIES

Alaska Division of Emergency Services
Alaska Department of Community & Regional Affairs
Alaska Department of Fish & Game
Alaska Department of Natural Resources
Alaska Railroad Corporation

LOCAL GOVERNMENTS

Matanuska-Susitna Borough
Kenai Peninsula Borough
City of Seward

NOVEMBER 14, 1986

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INTERAGENCY FLOOD HAZARD MITIGATION REPORT

Introduction - Executive Summary

On October 27, 1986, the President determined that damages from a severe pre-winter storm resulting in extremely heavy rain and flooding caused a disaster in the State of Alaska. The Kenai Peninsula Borough and Matanuska-Susitna Boroughs were determined eligible for public and individual assistance.

Purpose of Report:

The recommendations of the Interagency Hazard Mitigation team are intended to provide the framework for Flood Hazard mitigation during the reconstruction period to reduce the potential for future flood losses. The report is being provided to the Regional Director, Region X of the Federal Emergency Management Agency, agencies that are party to the Interagency Agreement, and the affected state and local Governments.

Overview of Authority and Background:

Since 1936 federal, state and local government have expended in excess of \$12 billion for structural solutions to flood problems in the United States. In spite of this investment, flood losses have continued to rise. In an effort to stem continuing increases in disaster relief programs and development pressures within the nation's floodplains, the federal emphasis has shifted toward a comprehensive and coordinated approach to floodplain management.

An office of Management and Budget memorandum, dated July 10, 1980, provides the basis for the establishment of regional, interagency and intergovernmental hazard mitigation teams designed to promote a comprehensive approach to flood hazard mitigation during the post-flood recovery process. These teams were then formulated under the Interagency Agreement for Non-Structural Damage Reduction Measures of December 15, 1980. The Office of Management and Budget directive requires that a report be prepared by the team within 15 days of a Presidential disaster declaration, that the mitigation activities recommended in the report emphasize non-structural measures, and that federal agencies direct their recovery actions to the recommendations of this report to the fullest extent practicable.

The report is considered to be a conceptual guide for all federal agencies providing recovery assistance in the disaster. An interagency task force in Washington D.C. was also established by the Interagency Agreement. The national-level task force is available to coordinate activities and facilitate funding to implement the recommendations of this report.

The Hazard Mitigation Team was confronted with damage arising from unusual circumstances not routinely encountered in flooding situations. These sources of damage required the development of two new concepts to arrive at realistic mitigation measures. Viewing meanderbelts as flood plains in the Matnauska-Susitna Borough allowed the team to develop more meaningful recommendations. A new concept was developed to address the problem of erosion and deposition on streams crossing alluvial fans in the Seward area.

Additionally, mitigation measures were developed to aid in the immediate recovery area and a number of policies are suggested to guide future recovery efforts.

DESCRIPTION OF STORM AND FREQUENCY OF EVENT

During the period of heaviest precipitation on the Kenai Peninsula (Oct 10-11, 1986), the juxtaposition of a surface trough of low pressure along the 155th meridian and a ridge of high pressure along the British Columbia and Southeast Alaska coast produced a southerly jet of warm moist air that centered on the Kenai Peninsula. The jet was relatively stationary for the 36-hour period of the heaviest precipitation and the combined dynamic and orographic uplift produced the long period of moderate precipitation. The system slowly shifted eastward and weakened, but had sufficient strength to cause near flood producing rains in the Cordova area.

These patterns resulted in an extraordinary amount of precipitation in both the Seward/Kenai area and in the Matanuska-Susitna Borough in the vicinity of Willow and Talkeetna, producing in excess of 15 inches of precipitation in the Seward area and over 8 inches in Talkeetna area between October 9th and October 12th. These amounts were equivalent to, or greater than the expected return from a 100 year frequency storm.

Although the rainfall frequency for the October 1986 storm in the Kenai Peninsula Borough is on the order of the 100 year event, the flood frequency for the streams affected may be more or less than the 100 year event. Because precipitation was localized, the local drainages (Lost, Japanese, Lowell, Grouse, and Spruce Creeks) had flows approaching or in excess of a 100 year event. The major drainages of Salmon and Resurrection Creeks experienced far lessor flows.

A complicating factor in the Seward area of Kenai Peninsula Borough is the instability of the steeply sloped local drainage. Numerous land slides and debris jams formed during the storm which temporarily ponded water which was released producing larger flows. There is evidence that numerous incipient land slides developed as a result of the storm but did not release during the storm. Future storms of a much smaller magnitude could release these land slides ponding and releasing water and thus producing flows well in excess of what might be expected from these smaller magnitude storms.

It is the opinion of the Hazard Mitigation Team that the recurrence interval of high flows exiting the canyons surrounding Seward and carrying heavy debris loads probably has little basis in normal probability analysis and may, in fact, occur quite frequently. This is due to the flooding mechanism itself. That is, the canyons are the sites of frequent landslide activity, possibly accelerated by, meteorological events. These slides can and do impound stream flows, and can and do fail, resulting in sudden releases of the impoundments. There probably is a maximum flow associated with the canyon geometry and the available slide material at any single slide location.

Damage to property and facilities in the braided and meandering streams in the Matanuska-Susitna Borough results not only from high water but from very prevalent erosion and undercutting as the stream changes course and cuts new channels. The erosion and bank undercutting is not necessarily a function of high river stages but can occur at frequent intervals during moderately high water. This process is not described through the traditional concept of the 100 year flood plain.

DESCRIPTION OF DAMAGES

Kenai Peninsula Borough

Much of the damage in the Seward area (Kenai Peninsula Borough) resulted from water and debris diverted from the latest water channel in subdivisions platted on alluvial fans. Vast quantities of material originating from slide areas in upstream canyons was deposited across the face of the alluvial fans as the result of the constantly changing watercourse channels. It is normal for the watercourse channel to meander across the faces of the fan as the bedload is deposited in the channel, filling it, causing the stream to seek a new lower channel. This process is repetitious, impossible to map, and is the cause of danger to all development in newer unstabilized alluvial fan areas.

The greatest amount of damage in the Borough was to facilities of the City of Seward. There was extensive damage to the City-owned electric utility--including loss of primary transmission lines, distribution lines to various subdivisions and numerous transformers. Road damage includes the washout of numerous subdivision access roads, damage to bank protective works at the small boat harbor, and destruction of two city bridges. The rail and FAS highway links with the rest of Alaska were severed. The highway was repaired on an emergency basis for one lane traffic.

Damage outside the City of Seward in the Borough is in two areas, East Kenai Peninsula Road Maintenance Service Area and South Kenai Peninsula Road Maintenance Service Area. The Road Maintenance Service Areas are creatures of the Borough government, but have their own budget and considerable independence of action.

Matanuska-Susitna Borough

Damage to private property and public facilities, roads, and bridges resulted not only from conditions of high water but also from erosion and bank undercutting in the braided and meandering streams that characterize the damaged areas, particularly in the Matanuska-Susitna Borough. It was found that eroding and undercutting, as well as changing course and creating new channels, is common to braided and meandering streams during periods of high and even moderately high water. This characteristic, which can occur frequently in this type of stream, is not necessarily a function of river height or the flood stage and can be as devastating as flooding itself. Another important feature of the eroding-undercutting is the fact that the constantly changing course of the stream makes it impossible to map the floodway with any certainty, rendering the Flood Insurance Maps useless.

Much of the damage to property and structures resulted from erosion rather than high water levels.

Damage in this Borough consists of road damage and restoration costs to the telephone system operated by the Matanuska Telephone Association, a non-profit cooperative. Road damage is to 24 sites, the largest of which is a \$145,250 bridge. The roads damaged provide access to subdivisions, and are normally gravel surfaced. Approximately 100 families were without vehicle access because of the washouts.

Damage to Public facilities within the Kenai Borough, the Matanuska-Susitna Borough, the community of Cordova, and to facilities owned or operated by the Alaska State Parks and the State-owned Alaska Railroad amounted to approximately \$4,453,786.

While no deaths or injuries resulted from the storm, extensive damage to privately owned facilities and structures was recorded. Approximately 116 homes and mobile homes generally located in the communities of Willow, Talkeetna, and Skwenta in the Matanuska-Susitna Borough were destroyed or damaged. Approximately 166 homes and mobile homes in Seward and in the rural areas of the Kenai Peninsula Borough were damaged or destroyed. Total value of the destruction and damage including temporary housing costs, food stamps and commodities, and damage to 65 businesses is estimated to be \$5,755,000.

Damage to Federal Aid highways amounted to approximately \$8,272,000.

The Alaska Railroad damage was to the tracks only. There was no equipment damage. Track damage occurred at 69 sites and included serious damage to the bridge over Sheep Creek, washed out the approaches to the bridge over Montana Creek and serious damage or destruction to eight more minor bridges. Primary cause of the bridge washout was inadequate conveyance area resulting in approach and abutment failures.

GENERAL DESCRIPTION OF THE FLOOD AREA

Kenai Peninsula Borough

Kenai Peninsula Borough, in southcentral Alaska, governs an area of more than 25,600 square miles. Kenai Peninsula is surrounded by the Greater Anchorage Area Borough to the north, Cook Inlet to the west, and the Gulf of Alaska to the south and east. The City of Seward lies at the northern end of Resurrection Bay on the southern coast of Kenai Peninsula.

Resurrection River, which has a drainage area of approximately 170 square miles, has its origin near Upper Russian Lake in the Chugach Mountains. From its headwaters, the river flows southeasterly for 22 miles, through the Chugach National Forest and privately owned land, to its outlet in Resurrection Bay at Seward. Unlike Kenai and Kasilof Rivers, Resurrection River has a braided channel and a steep gradient (75 feet in three miles).

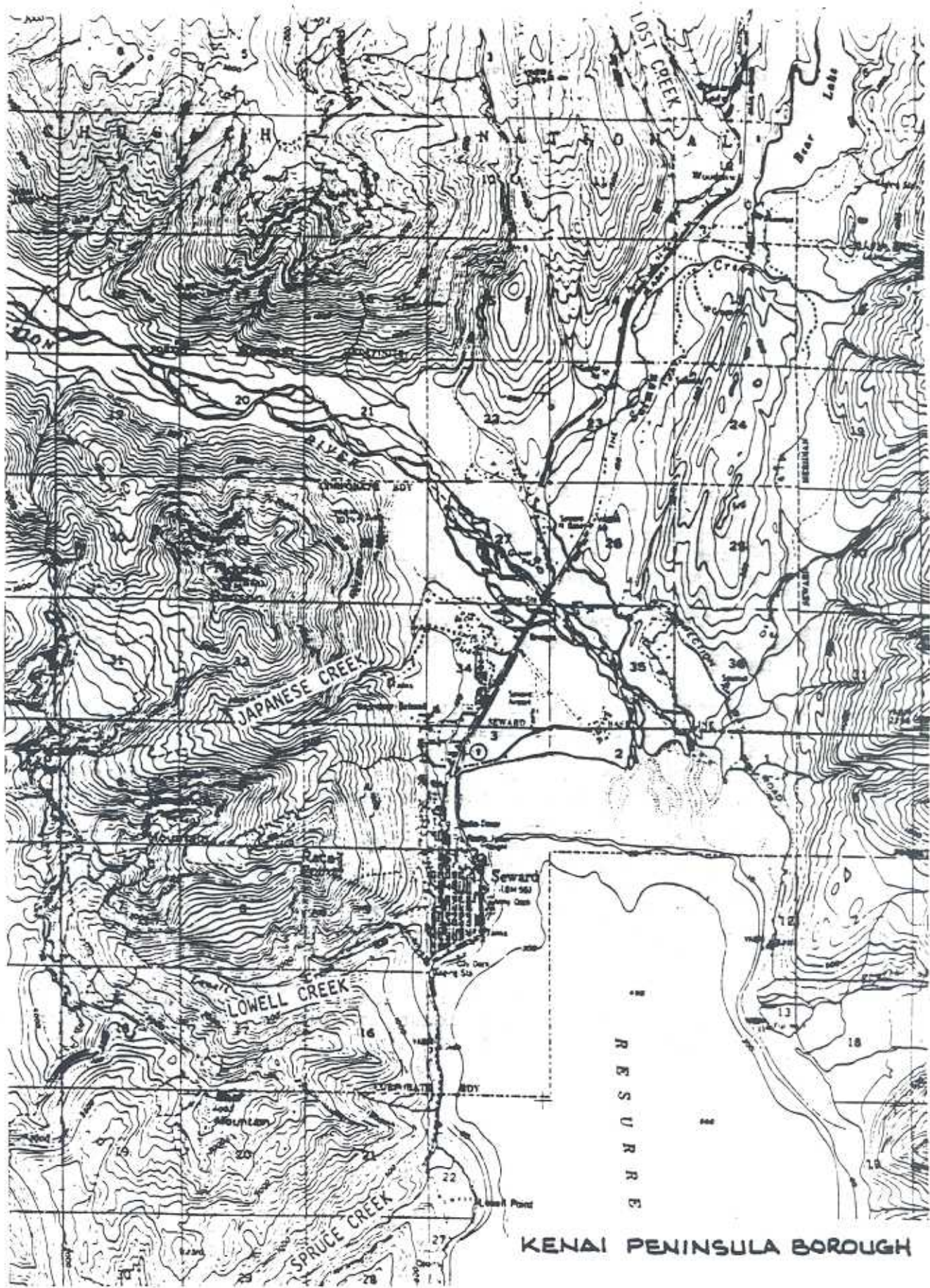
Salmon Creek, a tributary of Resurrection River, originates at the terminus of Bear Lake Glacier and flows adjacent to the Seward Highway for approximately 7 miles, generally southerly, to its confluence with Resurrection River. The creek is a glacier-fed stream which traverses a broad alluvial flood plain. Heavy debris and gravel bars cause numerous channel changes.

Salmon Creek Bypass is an overflow of Salmon Creek. It flows along the east side of the Alaska Railroad and rejoins Salmon Creek downstream.

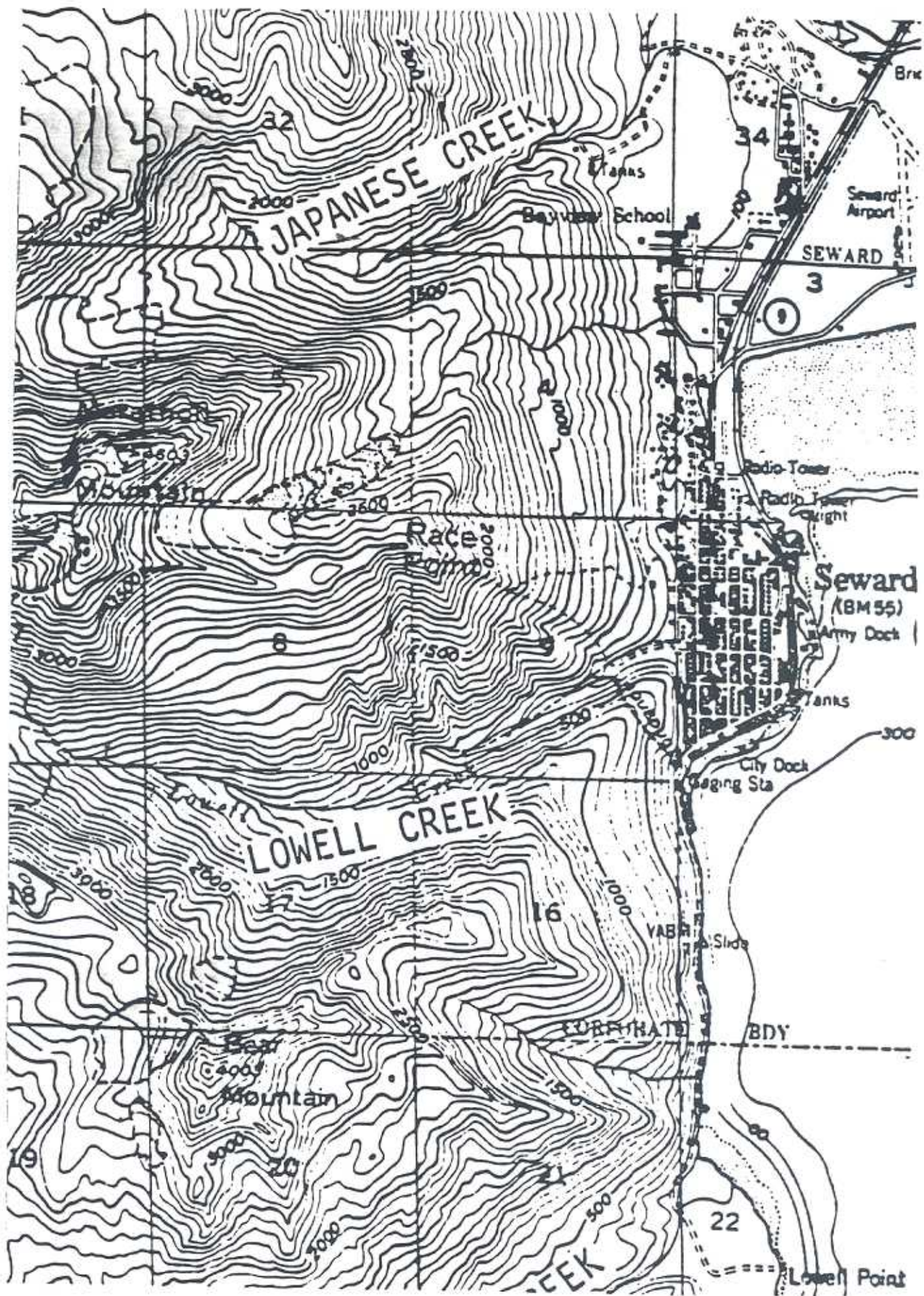
Development in the Resurrection River/Salmon Creek/Salmon Creek Bypass area has greatly increased, as the City of Seward can expand only in the direction of these streams because the mountains and Resurrection Bay surround the city on the other three sides. There is ample high ground on both sides of these streams to provide safe building sites.

Lost Creek, Grouse Creek, Japanese Creek, Lowell Creek and Spruce Creek are located in canyons which experience land slides as well as flood flows with heavy sediment loads. The heavy sediment loads and trees plugged portions of the channel and the diverted flows eroded the creek banks and the sediment load was deposited on the alluvial fan at the canyon mouths.

Development in the Lost Creek, Grouse Creek and Japanese Creek areas has greatly increased and experienced extensive damage from sediment deposits left in the development.



KENAI PENINSULA BOROUGH



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Matanuska-Susitna Borough

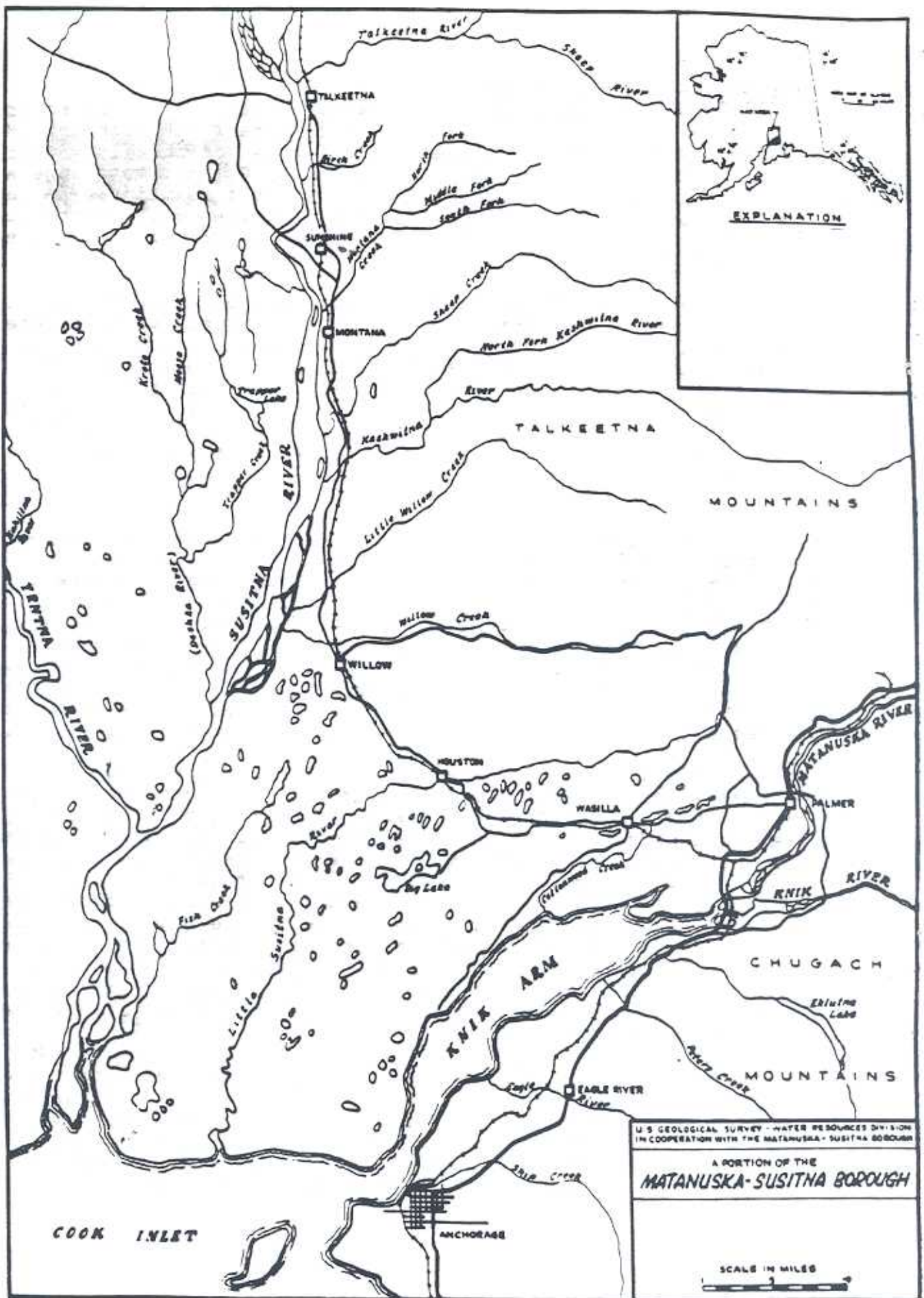
Matanuska-Susitna Borough governs an area of over 23,000 square miles extending from the Municipality of Anchorage in the south to Mt. McKinley National Park in the north. It is surrounded by unorganized areas to the north, east, and west, and by Greater Anchorage Area and Kenai Peninsula Boroughs to the south. The population of Matanuska-Susitna Borough was 6,509 in 1970 and increased 580 percent to 44,280 by 1986. It is estimated that over 2,000 people live near the streams discussed in this report.

Most of the flood damage was along Willow Creek, and the Little Susitna River. Development along these watercourses is low-density residential area. These streams are located in south-central Alaska, approximately 30 air miles and 70 miles by highway north of Anchorage. The area has been a focal point of increasing use for recreational activities. This increased recreational usage can be attributed to the area's esthetic qualities and closeness to Anchorage, the largest city in the State. Tremendous subdivision activities stressing recreational lots have been occurring in recent years.

The streams discussed in this report originate in the Talkeetna Mountains and flow west to the Susitna River. Physiographic characteristics are quite varied having developed from glacial activities and volcanic action. The study area is underlain primarily by bedrock consisting of weakly consolidated, coal-bearing rocks. It has been glaciated several times, so there are thick deposits of glacial drift and alluvial sediments made up of sandy and gravelly material. Permeability and internal drainage are highly variable, even over short distances. Poorly drained soils often occur on the slopes of moraines in close association with well-drained soils.

Most of the area is also covered with a mantle of silty loess probably derived from the Susitna River flood plains to the west. The loess ranges from a few inches to several feet in thickness. Poorly drained peat is common in scattered depressions, shallow basins between moraine hills, and other low-lying areas. The Willow area contains fifteen varying vegetative habitat types composed of mature stands of mixed coniferous and deciduous forests with an understory of a variety of forbs and woody plants, muskeg-black spruce bogs, and grassland areas. Generally, the vegetative ground cover is dense and provides substantial protection from erosion activity, particularly in the higher elevations where better drained soil conditions are found. Elevations range from 10,000 feet in the mountains to less than 100 feet in the southern valleys.

The region is in a transitional climatic zone between maritime and continental conditions. Pronounced temperature variations and cloudy weather are common during a large portion of the year. Mountain ranges to the south act as a barrier to the influx of warm air from the Gulf of Alaska, resulting in an average annual precipitation which is only 10 to 15 percent of that at stations located on the Gulf of Alaska.



U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION
 IN COOPERATION WITH THE MATANUSKA-SUSITNA BOROUGH
 A PORTION OF THE
MATANUSKA-SUSITNA BOROUGH

SCALE IN MILES
 0 1 2 3

GOVERNMENT AND REGULATORY STRUCTURE

First and Second class cities, home rule municipalities and boroughs have the planning and zoning authority under Alaska Statutes, Title 29, providing the second class cities and boroughs with the option to exercise planning (subdivision control) and zoning authority to manage flood hazard areas. No Building Code (UBC) regulations exist within either Borough, however, lenders exercise a degree of authority in this area in the absence of local government action.

Within the Kenai Peninsula Borough Planning and Zoning powers are exercised only within the incorporated cities of Homer, Soldotna and Kenai by the Cities, and within the City of Seward (and Seldovia) by the Kenai Peninsula Borough.

Within the Matanuska-Susitna Borough Planning and Zoning is only exercised in the Cities of Houston, Wasilla, Palmer and limited areas of residential zones in the Borough (outside cities). Subdivision powers are exercised by the Boroughs, however, Kenai Peninsula Borough lacks a comprehensive subdivision ordinance.

The Kenai Peninsula Borough has rejected participation in the National Flood Insurance Program. The Matanuska-Susitna Borough is enrolled in the Flood Insurance Program but has difficulty in enforcing its requirements.

FLOOD HISTORY

Kenai Peninsula Borough Area

Floods on the Kenai Peninsula occur as a result of a combination of factors, which include heavy snowpack and snowmelt, high tides, and heavy precipitation.

High winds when combined with high tide create storm surge and wave runup, which flood coastal areas. Spring floods on streams may result when an above-normal snowfall during the winter is followed by an unusually warm spring and a rapid snowmelt. Summer and autumn floods usually result from intense precipitation.

As is typical of most of Alaska, there is little information available concerning historical floods on the Kenai peninsula. There is no record of a major flood with known discharge and documented water levels other than a flood report for the flood of October 1969, published by U.S.G.S.. Public agencies and longtime residents, however, can verify that floods have occurred.

Resurrection River and Salmon Creek have overflowed their banks several times in the Seward area, and have caused flood damages to the developed areas near their mouths.

Lost Creek, Grouse Creek, Japanese Creek, Lowell Creek, and Spruce Creek, the sources of major damage during this flood, have also been the source of major damage in the past. In fact, bridges in the old Mill Subdivision (Lost and Grouse Creeks) have been destroyed four times in the past five years.

Matanuska-Susitna Area

Floods in Matanuska-Susitna Borough occur as a result of a combination of factors, including heavy snow pack, temperature, sunshine, and precipitation. Spring floods on streams may occur as a result of an above-normal snowfall during the winter followed by an unusually warm spring and rapid snowmelt. Summer and fall floods usually result from intense precipitation. In addition, an ice jam could occur during the winter or during spring breakup causing overbank flooding. Ice jams have caused the highest flooding on these streams, but it is difficult to apply a frequency to this type of flood.

There is little information available concerning historical floods in Matanuska-Susitna Borough. Public agencies and longtime residents, however, substantiate that floods have occurred. Information on historical floods have been previously obtained from interviews with residents in the area.

The principal flood problems are caused by natural obstructions, manmade obstructions such as bridges and boat docks, ice jams, the accumulation of brush and debris along and within the streambed which can be carried downstream by high water and block bridge openings or other constrictions, and inadequately-sized culverts.

PART III: DEVELOPMENT OF RECOMMENDATIONS

The recommendations herein are not intended to address every damaged site nor do they represent a comprehensive recovery plan. This report is the result of an intensive week's effort by an inter-disciplinary intergovernmental team assembled to identify the more significant mitigation opportunities for reducing the amount and likelihood of recurring damage.

The Federal Agencies represented on the team were those that were party to the original OMB agreement. State and local representatives were invited by the State of Alaska Division of Emergency Services (ADES).

To develop these recommendations, the team met for four days. The initial briefing was held on November 3, 1986. The third and fourth days were devoted to the development of recommendations by study groups. Selected sites were toured during the second day.

A draft report was produced by FEMA, ADES and the involved Boroughs and city of Seward staffs from the efforts of these study groups. A draft was sent November 10, 1986 to all who attended the initial briefing. Comments were received and issues researched. The final Hazard Mitigation Report was sent on November 14, 1986 to all communities that received flood damage, participants in the hazard mitigation team, the media, the FEMA Regional Director, and the Director of the State of Alaska Division of Emergency Services.

The Hazard Mitigation Team was confronted with damage arising from unusual circumstances not routinely encountered in flooding situations. These sources of damage required rejection of traditional 100 year flood plain concepts. Two new concepts were needed to arrive at realistic mitigation measures. Viewing meanderbelts as flood plains in the Matanuska-Susitna Borough allowed the team to develop more meaningful recommendations. The identification and maintenance of debris corridors was used to address the problem of erosion and deposition on streams crossing alluvial fans in the Seward area.

Additionally, mitigation measures were developed to aid in the immediate recovery area and a number of policies are suggested to guide future recovery efforts.

PART IV - WORK ELEMENTS

Development and Implementation of New Concepts for Flood Related Hazards involving Sediments and Erosion

- #1: Mapping of meanderbelts in the Matanuska-Susitna Borough
- #2: Expanding the Floodplain management tools to include hazards associated with meanderbelts
- #3: Minimize Hazards associated with alluvial fans through identification and maintenance of debris corridors
- #4: Alternative to Work Element #3
- #5: Development and implement a public awareness program

Mitigation Recommendations Affecting the Immediate Recovery Effort

- #6: Seward, Alaska, Sewer Plant Protection
- #7: Seward, Alaska, Japanese Creek Threat Reduction
- #8: Coordinated Restoration Plan for Willow Creek
- #9: Require the Extension of the Railroad Dikes on Salmon Creek
- #10: Alaska Railroad Bridge at Montana Creek
- #11: Removal of Debris and Snags
- #12: Susitna Landing Public Boat Launch
- #13: Determine Impact to and restoration of Fish Resources

Recommended Policy to Guide Future Recovery Efforts

- #14: Bridge Ownership Responsibilities in Kenai Peninsula Borough
- #15: Obtain elevations of High Water Marks on various Matanuska-Susitna Streams
- #16: Upgrade Timber Trestles on the Alaska Railroad
- #17: Flood Warning - Data Collection in the Seward, Talkeetna, and Willow Areas
- #18: Subdivision Review
- #19: Availability of Flood Insurance

WORK ELEMENT #1: Mapping of Meanderbelts in the Matanuska-Susitna Borough

BACKGROUND: Two subdivisions along Willow Creek, (Deneki Meadows and Friday), suffered extensive damage from the October 11-13 1986 flood. A detailed Flood Insurance Study had been performed by the Alaska District Corps of Engineers for FEMA and a regulatory floodway had been designated. A field check of the inundated area against the flood plain mapping resulted in certain areas correlating quite well and other areas not correlating at all. This is due to the constant meandering characteristic of alluvial rivers, which quickly outdates any detailed mapping effort using conventional backwater analyses.

The flood insurance program using traditional mapping techniques provides effective tools for establishing a vertical threshold for protecting structures and contents from flooding. The program does not, however, provide adequate tools that recognize horizontal boundaries for reducing damages from erosion and sediment deposition from normal runoff typical of the newer meandering rivers having undefined channels. Approaches that recognize the need for both vertical and horizontal limits are needed.

RECOMMENDATIONS: THE LEAD AGENCY WILL ENTERTAIN A REQUEST FROM THE BOROUGH to determine a pilot meanderbelt for selected reaches of one or more rivers using aerial photography and detailed topographic mapping. This meanderbelt will be used as the basis of advising local residents of an inherent danger to their property from flooding and erosion in addition to the normal floodway flood plain information.

LEAD AGENCY: Alaska Dept of Emergency Services

FINANCING: Corps of Engineers-Alaska District
Federal Insurance Administration

SCHEDULE: Within one (1) year

WORK ELEMENT #2: Expanding Flood Plain Management tools to include hazards associated with meanderbelts (contingent on the implementation of Work Element #1).

BACKGROUND: Traditional flood plain protection techniques such as elevation and flood proofing do not adequately address the ongoing erosion and river meandering process.

Upon development of meanderbelts, flood insurance should be encouraged as a condition for obtaining financing of structures located in meander belts. Individuals already residing in the meanderbelt should be notified of the inherent dangers and informed of the availability of flood insurance.

RECOMMENDATION: Guidelines for new subdivision platting as well as the siting of individual structures within the meanderbelt flood plain would be assembled and presented to the borough. Informational documents would be prepared.

LEAD AGENCY: Dept of Community/Regional Affairs
Corps of Engineers-Alaska Div

FINANCING: State Assistance Program

SCHEDULE: When the Meanderbelts are mapped.

WORK ELEMENT #3: Minimize hazards associated with alluvial fans through the identification and maintenance of debris corridors.

BACKGROUND: Some development in the Seward area has taken place on alluvial fans located below narrow canyons. As indicated by the large number of existing plats, more development is anticipated. Stream flow exiting the canyons carries a high bedload as a result of frequent landslides contributing to the sediment buildup. It is recognized that a practical alternative to occupying the fans does not exist and that a practical upstream structural measure is probably not feasible, either.

RECOMMENDATION: THE LEAD AGENCY WILL ACCEPT A REQUEST FROM THE BOROUGH to minimize the hazards associated with occupying the alluvial fans, by identifying debris corridors. Such corridors will be designed to convey flood waters and isolate sediment deposits.

A strategy to discourage development within those corridors and any adjacent areas required to defend the corridor, and a maintenance program to remove gravel and debris to maintain channel geometry should be part of the request.

LEAD AGENCY: Alaska Department of Emergency Services (ADES)
FINANCING: USGS & ADES
SCHEDULE: Prior to final State and Federal reimbursement

WORK ELEMENT #4: Alternative to Work Element #3

BACKGROUND: The Team considered revising the Flood Insurance Rate Maps (FIRMs) to include the Lowell, Japanese, and Lost Creek alluvial fans. This action would:

1. Help notify individuals and lending institutions of the hazards, and
2. Prevent the Federal Government from underwriting the risks associated with occupying hazardous areas by denying selected disaster assistance funds.
3. If Kenai Peninsula Borough joined the Flood Insurance Program it could
 - a. provide flood insurance at generally higher but more realistic premiums;
 - b. impose mandatory purchase flood insurance requirements;
 - c. allow disaster assistance to be available with the purchase of flood insurance.

This alternative was rejected because by implementing Work Element #3 the hazard would be sufficiently reduced thereby negating the need for redrafting the Insurance maps. Not amending the FIRMs to include the alluvial fan areas would:

1. Remove the mandatory purchase requirements for selected Federal instrumentalities. (i.e., Fannie Mae, Freddie Mac and Ginnie Mae), and
2. If the Borough joined the Flood Insurance Program it could
 - a. make insurance available generally at lower premium rates, and
 - b. remove all mandatory purchase requirements.

RECOMMENDATION: Amend Flood Insurance Rate Maps to include the Lowell, Lost, and Japanese Creek alluvial fans if Work Element #3 is not implemented.

LEAD AGENCY: FEMA

SCHEDULE: Within six (6) months.

WORK ELEMENT #5 :DEVELOP AND IMPLEMENT A PUBLIC AWARENESS PROGRAM

BACKGROUND: Regulation of flood prone lands is difficult in The Matanuska-Susitna Borough. The sheer size of the Borough, very low concentration of development, as well as the highly individualistic nature of many of its residents make enforcement difficult. These factors are even more pronounced in the Kenai Peninsula Borough, which has rejected participation in the National Flood Insurance Program on several occasions.

However, an orientation toward freedom from regulations and difficulty with program administration, should not be confused with a lack of interest or the lack of a willingness to minimize the affects of flood damage.

Therefore, the team feels that there is a greater need for an education and awareness program directed toward these two boroughs than in other similarly flood prone areas having a tradition of strong regulation. Such a program must demonstrate successes in reducing flood losses, and offer tools to guide construction. This program would include the material developed to address the unique hazards within meanderbelts and alluvial fan areas. (See Work Element #2 and #3.)

- RECOMMENDATIONS:
1. Conduct workshops where tools to reduce flood damage are presented. These tools would include those developed under Work Element #2.
 2. Produce map overlays of designated flood hazard areas at scales compatible with the Matanuska-Susitna Borough Tax/Road/Subdivision maps.
 3. Update the Matanuska-Susitna Borough tax parcel records to identify parcels affected by flood hazard, and inform property owners of the hazard.
 4. Identify financing institutions, developers, utility companies, builders, real estate agents, and insurance companies doing business within the Borough and inform them of the risks of flooding as well as their responsibilities under the Flood Hazard Program. This would include informing them of the risks of developing within meanderbelts and on alluvial fans along with those involving more traditional flood plains.

LEAD AGENCY: Dept of Community and Regional Affairs
Matanuska-Susitna Borough

FUNDING AGENCY: None

SCHEDULE: Within 180 days

WORK ELEMENT #6: Seward, Alaska, Sewer Plant Protection
(Threat Reduction)

BACKGROUND: During the period October 10-13, 1986, rains exceeding the 100 year 24-hour amounts fell in the Seward area. The heavy rains produced slides in the steep canyons and heavily laden debris flows. Much of the rock and tree debris settled out on the aluvial fans at the mouths of the canyons. The extensive damage to public and private property resulted in a Presidential Disaster Declaration on October 27, 1986.

The debris flows from Spruce Creek, one mile south of Seward, destroyed a bridge, severely eroded the bank, threatening the Seward Sewage Treatment Plant and even normal runoffs in future events could result in very serious damage to the plant and sewer lagoons.

RECOMMENDATION: About 1500 ft of Spruce Creek channel from the base of a large landslide to the mouth of the canyon should be cleaned of woody debris that could move with the next runoff event.

About 2500 ft of Spruce Creek channel from the mouth of the canyon to the edge of Resurrection Bay should be re-opened and the badly eroded banks should be protected with rock riprap. This project appears eligible for funding under Section 403, PL 95-334 Soil Conservation Service Emergency Watershed Protection, the City of Seward should pursue an application.

LEAD AGENCY: Soil Conservation Service with the City of Seward/
Alaska Dept of Emergency Services

FINANCING: 100% construction funds for exigency work is available from SCS through Section 403. Local sponsors must secure land rights and assume O&M responsibility.

SCHEDULE: Section 403 Funds must be obligated 10 days after receipt and work completed within 30 days, with some exceptions.

Work started on November 10 and will be completed by December 10, 1986.

WORK ELEMENT #7 Seward, Alaska - Japanese Creek Threat Reduction

BACKGROUND: Heavy rains during the period October 10-13, 1986 exceeded the 100 year 24-hour amounts in the Seward, Alaska area. The rains caused land slides in the steep canyons as well as flood flows with heavy sediment loads, trees from the land slides and the sediment load was deposited on the alluvial fans at the canyon mouths.

Japanese Creek is on the north side of Seward and exits the canyon onto an urban developed alluvial fan. The heavy sediment loads and trees plugged portions of the channel and the diverted flows eroded the creek banks. Subsequent normal flows could overtop the shallow banks and flow through a subdivision, High School, well field, power plant and other improvements.

RECOMMENDATIONS: About 2,000 ft of the Japanese Creek Channel from the end of the existing dike at the canyon mouth to the end of the north bend should be cleaned of woody debris, and the bank rebuilt to its predisaster location. The new bank will probably require rock riprap for stability. Since the work would not be an improvement on the predisaster condition, and would reduce the threat to property, the work may be eligible for assistance under Section 403, PL 95-334. Emergency Watershed Protection. The City of Seward should make application to the Soil Conservation Service for eligibility determination.

LEAD AGENCY: Soil Conservation Service and City of Seward/
Alaska Dept of Emergency Services

FINANCING: The SCS can provide 100% construction funds through Section 403. The City of Seward, as sponsors, would provide all land rights and permits.

SCHEDULE: Section 403 exigency funds must be obligated within ten days of receipt and work completed within 30 days with some exceptions.

Work started on November 10, and will be completed by December 10, 1986.

WORK ELEMENT #8 : Coordinated Restoration plan for Willow Creek:
Friday Subdivision to Willow Island Resort

BACKGROUND: The most intensively developed section of Willow Creek is the area from Friday Subdivision downstream to Willow Island Resort. Flooding and channel movement in this reach of the stream washed out several houses, bank stabilization structures, the Denecke Meadows Bridge, and resulted in the loss of many acres of private property. Individual land owners have attempted to remove debris, realign the channel, and build dikes to protect their property. These efforts were undertaken with little or no consideration of the effects of their activities on the streams fish resources or on property downstream.

Since changes in stream characteristics upstream can adversely affect fish resources and property downstream by changing deposition and erosion patterns, this entire reach of stream should be evaluated, and guidelines established to minimize further disruptions to property and fish resources.

RECOMMENDATIONS: In order to minimize further disruptions, local property owners, the Matanuska-Susitna Borough, and state and federal resources agencies should develop a plan for this section of the creek. The plan should address the following:

1. What, if any, modifications (including dikes) should be built, banks armored or stabilized, or the channel altered to protect property or to prevent future property damage. If so, how and where can this be accomplished to minimize downstream disruption to property and fish resources?
3. What work will be done by whom.

Once the proper course of action is established the work should be accomplished. No permits for work in this reach of Willow Creek should be issued (except in an emergency) until a decision on the entire stream reach is made.

LEAD AGENCY: Matanuska-Susitna Borough (Other agencies that should be involved include the Corps of Engineers, Alaska Dept of Emergency Services, Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, and local residents.)

FINANCING: FEMA/State of Alaska/Matanuska-Susitna Borough

SCHEDULE: Planning process 90 days, work May 15 - July 15.

WORK ELEMENT #9: Require the extension of the railroad dikes on the South side of Salmon Creek. (Threat Reduction)

BACKGROUND: The Developer of Camelot by the Sea Subdivision was required to construct a dike for flood protection along the south side of Salmon Creek by the Borough as a condition of approval.

Kenai Peninsula Borough did not have a compliance program, and consequently the dike was not constructed.

The unprotected area, where the dike was not constructed allowed flood waters to enter the subdivision and washout the existing section of railroad dike and cause extensive damage to homes and roads.

RECOMMENDATION: The dike on the south side of Salmon Creek should be extended an additional 300 ft, matching the elevation of the dike which has already been constructed by the Alaska Railroad.

The construction should be supervised by a licensed engineer and constructed by a contractor experienced in the construction of flood control dikes.

LEAD AGENCY: Kenai Peninsula Borough

FINANCING: Kenai Peninsula Borough

SCHEDULE: Immediate - must be done before spring

WORK ELEMENT #10: Alaska Railroad Bridge at Montana Creek

BACKGROUND: The Alaska Railroad fill to the approaches at Montana Creek Bridge washed out during the recent storm. Prior to the failure of the approach, backwater flooded the developed facilities of Montana Creek State Recreation site.

- RECOMMENDATIONS:
1. Perform a Hydrologic study prior to reconstruction of a permanent railroad crossing. The study would determine the optimum bridge opening/span and culvert sizes to avoid future backwater flooding.
 2. Permanent installation of the bridge and culverts should meet at least the minimum recommendations of the study.
 3. Inform the Alaska Fish & Game Department and the Alaska State Parks Division designees of the results of the study and continue to involve them in reviewing construction plans and on-site work.

LEAD AGENCY: Alaska Railroad

FINANCING: Alaska Railroad

SCHEDULE: Immediately

WORK ELEMENT #11: Removal of Debris and Snags.

BACKGROUND: During the flood of 1986 in Willow, Montana, Kashwitna, and Goose Creeks, a considerable amount of debris (trees, brush, roots, building, vehicles, etc) washed downstream and was deposited. Much of this debris contributed to damage sustained by bridges and other structures. Some debris and snags deposited in these creeks and their floodplains are a hazard because they may cause channel blockages and washouts during winter icing or higher water levels in the spring.

- RECOMMENDATIONS:
- (1) The Matanuska-Susitna Borough in consultation with the Alaska Department of Natural Resources, Divisions of Forestry and Fish and Game, and Corps of Engineers should identify debris and snag removal sites for each creek. (This was done for Montana and Willow Creeks on November 5, 1985.)
 - (2) Debris and snag removal methods, priority sites and timing should be identified.
 - (3) The Matanuska-Susitna Borough should have the work accomplished in accordance with the coordinated plans and schedules.

LEAD AGENCY: Matanuska-Susitna Borough

FINANCING: Matanuska-Susitna Borough/
Alaska Dept of Emergency Services

SCHEDULE: Immediately.

WORK ELEMENT #12 : Susitna Landing Public Boat Launch

BACKGROUND: The Susitna Landing boat launch is a state owned public facility that was severely damaged by flooding. Armoring the shoreline and boat launch basins would reduce the chances of similar damage in the future.

RECOMMENDATIONS: Place armor rock along the shoreline and boat launch basins.

LEAD AGENCY: Alaska Dept of Fish and Game;
Alaska Div. of Emergency Services

FINANCING: FEMA(with possible disaster proofing funds)/
State of Alaska/Alaska Div of Emergency Services

WORK SCHEDULE: 1987

WORK ELEMENT #13 : Determine impact to and Restoration of Fishery Resources

BACKGROUND: Significant anadromous and resident fishery resources were adversely impacted by the flood of 1986. Some water courses left their channel thereby dewatering spawning areas which resulted in the mortality of incubating eggs. Other spawning areas have also been lost to scouring and deposition of sediments resulting in the smothering of incubating eggs. These spawning areas are not suitable for future spawning.

Flood waters have also "blown out" rearing juvenile fish as well as resident species entrapping them in brush and other high locations when flood waters receded. Pools used by migrating salmon, and overwintering resident species have been lost. Some adverse impacts at creeks with easy human access (Willow, Montana) have been found; however, the full extent of impacts to fishery resources have not been assessed or fully identified.

Adverse impacts are known to have occurred in the creeks and rivers of the Matanuska-Susitna Valley and in the Seward area. However, adverse impacts are also anticipated in some of the creeks on the west side of Cook Inlet (Theodore, Alexander) and others in the Kenai Peninsula (Anchor).

- RECOMMENDATIONS:**
1. A task force, headed by Alaska Department of Fish & Game, consisting of fishery biologists, hydrologists, and potomologist(s), should be assembled to assess (survey) and identify the extent of impacts to fishery resources affected by the flood.
 2. Work conducted by the task force should include, but not be limited to, spawning gravel surveys, assessing egg survival (egg pumping), outmigration investigations (trapping), and a report of findings.
 3. The task force should develop and rank a list of recommendations for re-establishing salmon runs to their former quantity and quality. Such recommendations may include: management for increased escapement of salmon to affected rivers and creeks, establishment of spawning channels and other stream habitat rehabilitation measures.

LEAD AGENCY: Alaska Division of Fish and Game

FINANCING: State of Alaska

SCHEDULE: Immediately

WORK ELEMENT #14 BRIDGE OWNERSHIP RESPONSIBILITIES IN KENAI
PENINSULA BOROUGH

BACKGROUND: Six bridges (Lost Creek Bridge, Grouse Creek Bridge, Bruno Road Bridge, Chakok Bridge, Dorothy Bridge, and Russian Road Bridge) in Kenai Peninsula Borough were heavily damaged in the October storm. These bridges had been built by subdivision developers to provide access to several large residential subdivisions. Major repairs on the bridges have already been completed and these structures now meet the State standards for span bridges. The Borough has accepted the operation and maintenance responsibility for the subdivision roadways and approaches which adjoin these bridges.

The Borough is requesting FEMA/State Disaster Assistance for the repair of these bridges. The Borough government does not accept ownership and maintenance responsibilities for bridges within its jurisdiction. However, the mechanism for the Borough to accept these responsibilities is already in place due to the passage of a Borough Ordinance for road maintenance powers.

FEMA cannot participate in the funding of permanent bridge repair work when the local government has not accepted ownership and maintenance responsibilities for these structures prior to the disaster. FEMA regulations will allow participation in funding emergency repairs on non-public bridges when the work is essential for the preservation of life and property.

RECOMMENDATION: The team recommends FEMA assist in the reimbursement for emergency bridge work at these sites. The team also recommends FEMA participate in permanent repairs for these upgraded bridges if damaged in future disasters once the Borough has accepted bridge ownership and O&M responsibilities.

LEAD AGENCY: Kenai Peninsula Borough

FINANCING: FEMA

SCHEDULE: Prior to final Federal reimbursement

WORK ELEMENT #15: Survey and monument elevations of High Water Marks on various Matanuska-Susitna streams

BACKGROUND: In the Matanuska-Susitna Borough, Willow Creek was the only stream studied in detail. Montana Creek, Sheep Creek, Goose Creek, and the Talkeetna River in the Matanuska-Susitna Borough experienced severe flooding but development on these watercourses is currently light. Future development will probably lead to eventual detailed flood insurance studies that can benefit greatly from high water mark data.

RECOMMENDATION: Survey the already identified high water marks using the National Geodetic Vertical Datum (NGVD) and place markers in visible locations.

LEAD AGENCY: U.S. Army Corps of Engineers

FINANCING: FEMA/FIA Limited Map Maintenance Program, less than \$10,000

Schedule: 30 days

WORK ELEMENT #16 : Upgrade timber trestles on Alaska Railroad system.

BACKGROUND: A number of bridge structures along the route of the Alaska Railroad consist of timber trestles with a standard span of 14 feet. These structures were constructed a number of years ago and have been maintained in kind. They constitute a high maintenance requirement, and a severe hazard during flood conditions due to their inability to pass heavy debris.

RECOMMENDATION: Institute a long-range upgrade/replacement program throughout the railroad system, with the goal of replacing short span trestle structures with longer span girder or truss bridges. As a first step in the program, perform hydrologic analyses to determine optimum bridge opening sizes. Where analysis indicates structures to be inadequate for passing the design flow (50 year flood) structures should be increased in size to provide adequate opening.

LEAD AGENCIES: Alaska Railroad Corporation

FINANCING: Alaska Railroad Corporation

SCHEDULE: On-going.

WORK ELEMENT #17: Flood Warning - Data collection in the Seward and Talkeetna to Willow Areas.

BACKGROUND: Watersheds in the Seward area and along the Talkeetna Mountains are small and have a short time span between a flood producing rain storm and the beginning of flood damage. The present rain gage and river gage network does not provide data at the frequency needed to define a flood producing rain with enough lead time to give an adequate warning to the public and the responsible government officials.

RECOMMENDATION: Implement a local cooperative flood warning data collection network in the Seward area and in drainages along the southern and western fronts of the Talkeetna Mountains. This network must include telemetered and rainfall instrumentation.

ACTION AGENCIES: NOAA/NWS, Matanuska-Susitna and Kenai Peninsula Boroughs.

LEAD AGENCY: NOAA/NWS

FINANCING: Undetermined

SCHEDULE: Develop plan in 90 days.
Implement plan - June 1987

WORK ELEMENT #18 : Subdivision Review

BACKGROUND: Subdivisions in the Kenai Borough near Seward, and to a lesser degree in the Matanuska-Susitna Borough, were sited without regard to topography, hydrology or any natural features. As a result, extensive unnecessary damage resulted from this lack of physical planning and consideration of potential impacts of natural events. Subdivision reports as covered by federal law must include full disclosure of the hazard.

RECOMMENDATION: Subdivisions must be reviewed prior to approval to insure that the design is compatible with the site and that provisions are made to handle the drainage of normal and above normal runoffs, to channel debris and sediment safely through the subdivision, to consider practical methods of flood fighting, and debris containment.

These concerns must be addressed as a condition of participation in the National Flood Insurance Program, and should be considered law by the Matanuska-Susitna Borough. Should the Kenai Borough become a participant in the NFIP, they too, would have to develop a process to assure subdivisions are reviewed to minimize the potential for flood damage and provide for adequate drainage.

LEAD AGENCIES: Borough/Municipality

FINANCING: Borough/Municipality

SCHEDULE: Immediately

WORK ELEMENT #19: Availability of Flood Insurance

BACKGROUND: At the present time the Kenai Peninsula Borough is not enrolled in the Federal National Flood Insurance Program. The Matanuska-Susitna Borough is enrolled in the program, but has difficulty enforcing program regulations.

Nevertheless, the team felt that the availability of flood insurance would be in the best interests of the residents of both boroughs. This is in spite of the fact that, in the short term, making insurance available where many new structures would probably not be built to standards that would minimize the risks from flooding would represent a liability to both the insurance fund and the general taxpayer.

RECOMMENDATION: The Kenai Borough should join the National Flood Insurance Program, and the Matanuska-Susitna Borough should continue participation in the program.

LEAD AGENCY: Kenai Peninsula Borough/
Matanuska-Susitna Borough

FINANCING: None

SCHEDULE: None

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APPENDICES

HAZARD MITIGATION TEAM

AGENDA

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HAZARD MITIGATION TEAM

FEMA 782 ALASKA

November 3, 1986

Bob Freitag	FEMA, Seattle Office (Team Leader)	(206) 483-7301
Bob Schofield	FEMA, Region X	(206) 336-9410
George Currin	FEMA, Region X	(503) 485-7024
John Hensley	AK Div/Emerg Ser - Anchorage	(907) 376-3061
Tom Young	AK Div of Parks & Recreation	(907) 762-4548
Walter Robinson	FEMA, Region X	(206) 483-7345
Nelda Warkentin	AK Dept Comm/Regional Affairs	(907) 561-8586
Clancey Johnson	Director, OEM, Kenai Pen.Bor.	(907) 262-4910
John Glanville	Foreman, South Kenai Pen.Bor.	(907) 235-6321
Len Bunts	Road Maint.Mgr., Kenai Pen.Bor.	(907) 262-4441
Jim Carr	Alaska Railroad Corporation	(907) 265-2530
Jack Swanson	Alaska Railroad Corporation	(907) 265-2523
Don Smith	Housing & Urban Development	(907) 271-4603
Keith Jones	Soil Conservation Service	(907) 271-2424
Cevin Gilleland	Alaska Dept. Fish & Game	(907) 267-2284
Philip A. Emery	USGS-Water Resources Div.	(907) 271-4138
Stanley H. Jones	USGS-Water Resources Div.	(907) 271-4138
Jene Jernigan	SBA	(916) 978-4570
Dave McGilivray	US Fish & Wildlife Service	(907) 786-3471
Al Cucullu	AK Div/Emerg Ser/St HM Coord.	(907) 376-3061
Larry Babich	Soil Conservation Service	(503) 221-2841
Jerry Nibler	National Weather Service, AK	(907) 271-3477
Ken Hudson	Matanuska-Susitna Borough	(907) 745-9845
Gordon Taxer	C.O.E.-North Pacific Div.	(503) 294-5241
Allen Churchill	C.O.E.-Alaska District	(907) 753-2612
Christy Miller	AK Dept Comm/Regional Affairs	(907) 561-8586
Karen Oakley	Alaska Dept Fish & Game	(907) 262-2284
Keven Fenner	Kenai Peninsula Borough	(907) 262-4441
Paul Diener	City of Seward	(907) 224-3331

HAZARD MITIGATION TEAM - FEMA 782 - ALASKA
BOARD ROOM (RM 311) - UNIVERSITY HALL
4230 UNIVERSITY DRIVE - ALASKA PACIFIC UNIVERSITY
ANCHORAGE, ALASKA

1:00 PM - MONDAY, NOVEMBER 3, 1986

Welcome.Joan Hodgins, FCO

Purpose of MeetingBob Freitag, FEMA
Al Cucullu, State

Introduction of Team Participants

Description of StormJerry Nibler, NWS

Runoff InformationPhil Emry, USGS
Larry Babich, SCS

Stage Data/Flood
Characteristics.Allen Churchill, COE

Areas of Damage.Bob Freitag, FEMA

Description of Damage.Bob Freitag, FEMA
* Video Tape.John Hensley, State
* Slides . . Kanai AreaGeorge Currin, FEMA/Local
Willow Area.Bob Schofield, FEMA/Local

Background and Previous
Flood HistoryAllen Churchill, COE
Gordon Taxer, COE

Government Structure and
Existing RegulationsChristy Miller, State

Range of Possible RecommendationsBob Freitag, FEMA

Definition of Issues

Areas of Concern

Assignments

8:00 AM - TUESDAY, NOVEMBER 5, 1986

Tour of Damage Areas

8:00 AM - WEDNESDAY, NOVEMBER 5, 1986

Redefine Areas of Mitigation
Assignments

8:00 AM - THURSDAY, NOVEMBER 6, 1986

Review of Responses to Assignments